
CITY OF LAGUNA NIGUEL
LOCAL HAZARD MITIGATION PLAN



SEPTEMBER 2023

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PREFACE

Impacts from disasters (threats and hazards) are a challenge to a jurisdiction's budget, its citizens, its elected officials, and its staff. In addition to significant building damage, disruption to the economy, mass casualties, and loss of life, communities can experience power outages, loss of telecommunications and water service, limited access to fuel, and road closures. Depending on the magnitude, recovery from these disaster events can take weeks, months, and in some instances, years. The goal of many communities is to mitigate the potential impacts from disasters thus shortening the response and recovery time.

Mitigation is one of the Mission Areas identified under the National Preparedness System. Under the National Preparedness System, each Mission Area is supported by a “framework” document that identifies essential functions and core capabilities needed under each Mission Area. The five (5) National Preparedness System Mission Areas are:

- **Prevention-** to avoid, prevent, or stop an act of terrorism
- **Protection-** to safeguard against acts of terrorism and other hazards and threats
- **Mitigation-** to reduce the loss of life and property from hazards and threats
- **Response-** to stabilize a situation after hazards and threats
- **Recovery-** to restore, strengthen and revitalize after hazards and threats

Mitigation is seen as the primary Mission Area specifically dedicated to reducing damage or breaking the disaster cycle (**Figure 1**), as its goal is to build resiliency within the community, enabling a more efficient and effective response to and recovery from threats and hazards.

Figure 1- Disaster Cycle



The Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA) defines mitigation as “*any action taken to reduce and/or eliminate the long-term risk to human life and property from natural hazards and threats.*” Mitigation is considered local, with the primary responsibility for development and implementation of mitigation strategies lying with local jurisdictions (cities, counties, and special districts). Local jurisdictions, however, are not alone. Partners and resources exist surrounding jurisdictions and partners, and at the county, region, state, and federal levels of government. To assist communities implement mitigation and

become more resilient to threats and hazards, FEMA developed a program and guidance around the creation of Local Hazard Mitigation Plans (LHMPs). LHMPs promote a comprehensive planning process, requiring an assessment of local capabilities against impacts from threats and hazards to identify potential actions (mitigation measures) that will reduce and/or eliminate impacts.

The main goal of the LHMP is to establish a list of mitigation measures. While many of these mitigation measures are centered around reducing and/or eliminating the impact, some are focused on increasing current capabilities, fostering the development of partnerships, and providing public education outreach programs.

With an approved and adopted LHMP, local jurisdictions are eligible for federal Hazard Mitigation Assistance (HMA) grants offered through FEMA: *Hazard Mitigation Grant Program (HMGP)*, *Building Resilient Infrastructure and Communities (BRIC; formerly Pre-Disaster Mitigation- PDM)*, and *Flood Management Assistance (FMA)*. The HMA grants are a great source of funding to help implement mitigation measures identified in the LHMPs.

Throughout history, the residents of the City of Laguna Niguel have dealt with a variety of threats and hazards affecting the area. Photos, journal entries, and newspaper articles dating well back in to the 1800's show that the residents of the area have experienced earthquakes, flooding, wildfire, severe weather, and windstorms. Historically, these threats and hazards adversely affected the lives and the economy of the area. When factoring in development and growth (population, the built environment), exposure to these threats and hazards creates an even higher risk than previously experienced. In addition to the losses, it is equally important to recognize the increased cost and timeframe to recover from these threats and hazards.

While it is not always possible to predict exactly when these threats and hazards will occur or the exact extent to which they will impact the City, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the expected losses (injuries, fatalities, economic) that can result from these threats and hazards. Because of this, the City of Laguna Niguel realizes the importance of identifying effective ways to mitigate (reduce and/or eliminate) threats and hazards.

The update to the City of Laguna Niguel LHMP builds upon previous mitigation efforts in the City and incorporates new, relevant information into the plan. This update includes reassessing and reevaluating: mitigation capabilities (resources); community threats and hazards (identification, impacts, and prioritization); and mitigation goals, objectives, and actions. Significant consideration was given to new challenges and issues facing the City (i.e., pandemic, energy disruption, wind-driven wildfire events). Because of this, during this update, the City implemented a more comprehensive, strategic approach than was taken during the creation of the previous LHMP. This led to reorganizing the plan and to adding, renaming, and expanding threats and hazards, as well as, and consolidating or renaming mitigation actions.

Because the LHMP must include information to meet federal requirements and guidance it can include information not traditionally found in other planning documents. This can lead to a large, cumbersome document, making it difficult to easily access specific information. In an effort to ensure the plan contains all required information and is user-friendly; the LHMP has been organized as follows:

- Section 1: Introduction-** provides information on the purpose of the plan, outlines the scope of the work, and presents the adoption process and authority.
- Section 2: Planning Process-** provides information on the methodology used to prepare the LHMP, including a list of the Planning Team members, overview of stakeholder coordination, and the public outreach efforts.
- Section 3: Community Profile-** provides background information on the City, ensuring all Planning Team members have a common understanding of the dynamics within the community.
- Section 4: Capability Assessment-** provides information on current resources available to the City to support mitigation efforts, including department roles and responsibilities, existing mitigation plans/programs/codes, and available funding.
- Section 5: Hazard Assessment-** provides information on and prioritizes threats and hazards within the City.
- Section 6: Risk Assessment-** provides information on the potential impacts, through exposure and loss (damage) estimates for threats and hazards within the City.
- Section 7: Mitigation Strategies-** provides information on the actions (projects) the City is proposing to address the risk from threats and hazards within the City.
- Section 8: Plan Administration-** provides information on how the City intends to keep the LHMP current, incorporate it into other efforts, and share it with the public.

1 INTRODUCTION

This section presents general information about the Local Hazard Mitigation Plan (LHMP). The LHMP is a “*living document*” that should be reviewed, monitored, and revised to reflect changing conditions and new information. As required, an approved and adopted LHMP must be in place to receive federal Hazard Mitigation Assistance (HMA) grants offered through the Federal Emergency Management Agency (FEMA).

1.1 Purpose of the Plan

The purpose of this plan is to establish mitigation strategies (a list of actions, measures, projects) to help reduce and/or eliminate impacts from threats and hazards within the City of Laguna Niguel.

1.2 Scope of the Plan

The scope of this plan is to: 1) assess relevant existing conditions and capabilities within the City; 2) identify potential threats and hazards and their impacts within the City; and 3) propose mitigation measures to address the impacts to the threats and hazards within the City.

In support of the above scope, this plan will implement and document a comprehensive planning process, present actions to maintain and integrate the LHMP with other City plans and establish methods to continuously inform and educate the public on threats and hazards and the potential actions that can be taken to reduce and/or eliminate impacts.

1.3 Hazard Mitigation Planning Directive

In 2000, FEMA adopted revisions to Title 44 of the Code of Federal Regulations (44 CFR) known as “Disaster Mitigation Act (DMA) 2000”. Section 322 (a-d) of DMA 2000 requires that local governments, as a condition of receiving federal disaster mitigation funds, have an approved and adopted LHMP that describes the process for assessing hazards and risks, identifying and prioritizing mitigation actions, and engaging/soliciting input from the community (public), key stakeholders, and adjacent jurisdictions/agencies.

1.4 Promulgation Authority

The promulgation authority is vested in the members of the City Council. The City Council is the legislative body of the City of Laguna Niguel. It decides policy for the municipal government, enacts laws, and administers all activities of the City. A list of the members of Laguna Niguel City Council is provided in **Table 1.1**.

Table 1.1- City of Laguna Niguel Promulgation Authorities

Position	Elected Official
Mayor	Kelly Jennings
Mayor Pro Tem	Stephanie Oddo
Council Member	Ray Gennawey
Council Member	Foster “Gene” Johns
Council Member	Stephanie Winstead

1.5 Local Hazard Mitigation Plan Adoption

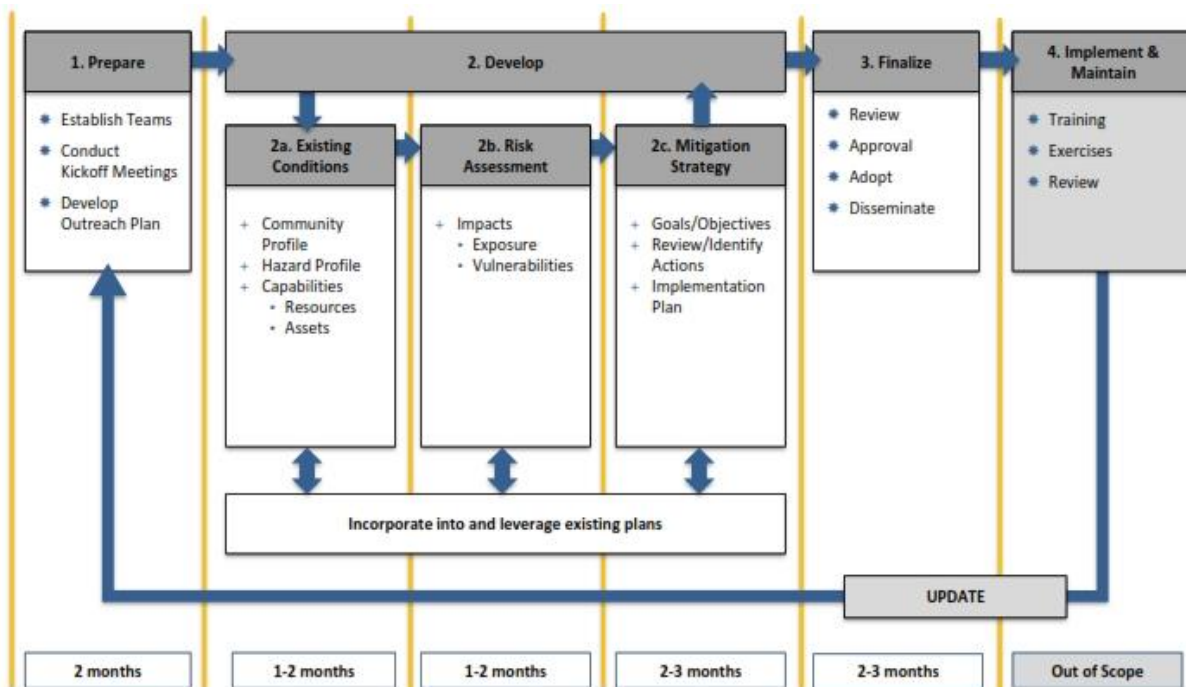
The update of the City of Laguna Niguel LHMP was reviewed and adopted by the City Council on January 16, 2024 under Resolution No. 2024-1461. A copy of the Resolution is in **Appendix**.

2 PLANNING PROCESS

This section demonstrates the methodology (planning process) used by the City of Laguna Niguel to develop the LHMP. FEMA's Local Mitigation Planning Handbook (2023) outlines guidance and offers examples to help local jurisdictions meet 44 CFR requirements when developing or updating Hazard Mitigation Plans. A significant part of the guidance emphasizes the involvement of the "*whole community*" in the planning process. The whole community concept promotes the inclusion of not only City emergency managers but other City department representatives (e.g., community development, public works, finance, administration), as well as, outside stakeholders and partners (e.g., surrounding counties/cities, special districts, lifelines companies, businesses leaders) to participate in the LHMP effort. The whole community concept also includes outreach to the general public to bring awareness to the LHMP update planning effort and LHMP content (community threats/hazards, mitigation actions). As part of this effort, the City also ensured representation of the needs of the underserved, socially vulnerable populations were included in the planning process. Soliciting and considering input from these diverse interests is essential to building a comprehensive plan and gaining community-wide support for the LHMP.

2.1 Methodology and Timeline

To update the LHMP, the City of Laguna Niguel implemented a three (3) phase planning process: 1) Prepare; 2) Develop; and, 3) Finalize (**Figure 2.1**). In addition to the phases, Figure 2.1 also depicts the timeline to complete the update to the LHMP. While this methodology is in alignment with the FEMA guidance, sequence and naming of phases were adjusted to better suit the City of Laguna Niguel's needs. Additional information about each phase is present below.

Figure 2.1- Planning Process Methodology

Under the *Prepare* phase general project tasks were completed. This included conducting an Administrative Kickoff meeting with the consultant, validation of the Planning Team, an identification of the Public Outreach effort, and a Kickoff meeting with the Planning Team. This phase also included the initial identification and collection of both internal and external documents and materials that may be beneficial to the LHMP update process.

Led by the consultant, the Planning Team worked through the *Develop* phase. The *Develop* phase has three (3) sub-phases. During the Existing Conditions sub-phase (2a), relevant characteristics and demographics of the City (Community Profile), confirmed current City mitigation abilities (Capabilities Assessment), and existing community threats and hazards (Hazard Assessment) were discussed. The Capabilities Assessment included the identification of departments supporting mitigation, current governance guiding mitigation efforts, identification of financial resource availability to possibly support mitigation, and discussion of assets; while the Hazard Assessment included the identification, description, and prioritization of local threats and hazards within the City. Under the Risk Assessment sub-phase (2b), the Planning Team reviewed potential impacts (exposure and vulnerabilities) of threats and hazards within the City and validated the prioritization of the threats and hazards. The final sub-phase, Mitigation Strategies (2c), had the Planning Team discuss previous mitigation actions, assess current capabilities, identify and prioritize new mitigation actions, and develop an implementation plan for each mitigation action.

Throughout the *Develop* Phase, plans and other documents, both internal and external, were analyzed and leveraged by the Planning Team to ensure decisions were based on the best available information and that proposed mitigation actions were compatible with other efforts. And conversely, efforts were made to encourage results from the LHMP planning process to be

considered and incorporated into other planning efforts. Additionally, during this phase outreach was done with the public to solicit input.

The last phase of the planning process methodology was *Finalize*. During this phase, the Planning Team reviewed and provided comments on the administrative draft of the LHMP. The administrative draft of the LHMP was then presented to the public for review and comment. After Planning Team and Public review, the draft LHMP was forwarded to the California Governor's Office of Emergency Services (Cal OES) and FEMA. This phase also included addressing both Cal OES and FEMA comments and working with the City Council to adopt the LHMP.

During the planning process, draft LHMP sections were disseminated for review and comment as the Planning Team moved through each phase and sub-phase. This helped the Planning Team focus their review on the subject matter at hand and enforced the relationship between the phases. At the end of the planning process, another review cycle was provided, this time with all draft sections under one cover.

2.2 Planning Team

Building on the whole community concept, a Planning Team was established to assist with the updating of the City of Laguna Niguel LHMP. The primary goal of the Planning Team is to help define and identify the mitigation strategies within the LHMP.

The Planning Team was led by representatives from the City of Laguna Niguel Public Safety and Administration Departments. The City of Laguna Niguel Public Safety Department and Administration Department representatives took on the responsibilities of Project Manager; and coordinated Planning Team activities. Additionally, the City of Laguna Niguel hired a consultant (*APetrow Consulting*) to provide technical support through the process and preparation of the final LHMP. The consultant was responsible for facilitating Planning Team meetings and updating the LHMP sections. Together, the City of Laguna Niguel and the consultant made up the "Core" Planning Team.

2.2.1 MEMBERS

The Planning Team was comprised of subject matter experts from a range of areas covered in the LHMP who could provide great benefit/insight to the team, as well as other community stakeholders and partners (i.e., surrounding jurisdictions, special districts, chamber of commerce, lifeline companies, higher education institutions, special interest groups, private organizations). Keeping the Planning Team to a manageable number of members while ensuring that all perspectives are captured and/or included in the process is always challenging. To balance this, the Planning Team members were urged to act as liaisons to other community groups with whom they regularly interact with to exchange thoughts on the LHMP. Planning Team members were encouraged to communicate the direction and status of the planning effort to outside members and in return they were expected to bring that outside perspective back to the Planning Team. This was especially true for underserved and socially vulnerable populations and businesses. The City had several City departments (i.e., Housing, Community Development) on the Planning Team that understood the challenges, needs, and special

interests of the underserved and socially vulnerable populations. While the Chamber of Commerce was able to provide great insight into many small business issues and concerns. This is also supported by the City special Committees (i.e., senior citizen, youth, and military support).

The City of Laguna Niguel took great efforts to engage and include as many Planning Team members as possible. The Core Planning Team used a phased approach to contact Planning Team members. This included conducting initial one-on-one phone calls to introduce the project and confirm the best point person (representative) for their organization. Next the City of Laguna Niguel sent out emails inviting the representatives to become part of the Planning Team. This was then followed up with meeting invites to attend each of the Planning Team meetings. The City of Laguna Niguel also reached back out to any Planning Team member who failed to respond and/or failed to attend Planning Team meetings. It is worth noting that while the City made extra efforts, because of varying reasons, some invited Planning Team members did not attend some meetings. Below is a list of the Planning Team (**Table 2.1**):

Table 2.1- Planning Team Members

Agency	Department	Staff	Position
City of Laguna Niguel	Administration	Favian Bravo	Management Analyst
City of Laguna Niguel	Community Development	Erich List	Senior Planner
City of Laguna Niguel	Police Services/Emergency Management	Phil Robinson	Emergency Services Coordinator
City of Laguna Niguel	Finance	Jarod Nozawa	Purchasing Manager
City of Laguna Niguel	Finance	Eric Hendrickson	Director
City of Laguna Niguel	Public Works	Kathy Nguyen	Engineering Services Manager
Chamber of Commerce	Chamber of Commerce	Scott Alevy	President
Aliso Viejo, City of	Police Services/Emergency Management	Sarah Limones	Emergency Services Coordinator
Department of Homeland Security, U.S. Citizenship & Immigration Services	California Service Center, Data & Operations Division; Chet Holifield Federal Building	Lidia Guardado	Data & Operations Specialist, Facility Security & Emergency Management
Department of Homeland Security, U.S. Citizenship & Immigration Services	California Service Center, Data & Operations Division; Chet Holifield Federal Building	Andrew Green	Operations Support Specialist, Facility Security & Emergency Management
Department of Homeland Security, U.S. Citizenship & Immigration Services	California Service Center, Data & Operations Division; Chet Holifield Federal Building	Harold Lang	Supervisor Operations Support Specialist, Facility Security & Emergency Management
Capistrano Unified School	Safety and Pupil	Scott Beekman	Executive Director

District	Services		
Dana Point, City of			Administration (James Shadle)- <i>invited</i>
Laguna Beach, City of	Fire Department	Brendan Manning	Emergency Services Coordinator
Orange County Sheriff Department	Laguna Hills Division, City of Laguna Hills representative	Matt Stiverson	Chief of Police Services
Mission Viejo, City of	Administration	Paul Catsimanes	Emergency Services Manager
Moulton-Niguel Water District	Operations	Len Barton	Safety & Compliance Coordinator
Moulton-Niguel Water District	Operations	Dan Horn	Water Distribution Supervisor
Moulton-Niguel Water District	Operations	Todd Novacek	Director of Operations
Orange County Fire Authority	Division 5	Mike Contreras	Division Chief
Orange County Fire Authority	Division 5	Jason Lopez	Administrative Captain
Orange County Sheriff Department	Emergency Management Division	Ethan Brown	Senior Emergency Management Program Coordinator
Orange County Sheriff Department	Emergency Management Division	Charles Volkel	Senior Emergency Management Program Coordinator
Orange County Sheriff Department	City of Laguna Niguel	Virgil Asuncion	Captain, Chief of Police Services
Orange County Transit Authority	Security & Emergency Preparedness	Matt Ankely	Emergency Management Specialist
San Juan Capistrano, City of			<i>Invited</i>
Southern California Edison	Public Affairs	Kelley Lee	Government Relations Manager
San Diego Gas and Electric	Local Public Affairs	Duane Cave	Senior Public Affairs Manager
Southern California Gas			Larry Andrews/Armando Torres- <i>invited</i>
South Orange County Wastewater Authority	Operations	Jim Burror	Director of Operations
South Orange County Wastewater Authority	Operations	Sean Peacher	Environmental Compliance Safety Risk Manager
Orange County Parks	Aliso & Woods Wilderness Park	Brad Barker	Senior Supervising Ranger

2.2.2 MEETINGS

There were a series of meetings held with the Planning Team. Each meeting had a primary focus and provided an opportunity to discuss/review information and exchange ideas. This structure also allowed the Planning Team opportunities to review and discuss draft LHMP sections. As mentioned above, draft LHMP sections were prepared throughout the planning process. The draft LHMP sections were in alignment with the primary focus of the previous Planning Team meetings. In other words, discussions and agreements from the previous meetings were captured and made available for the Planning Team to review. This allowed the Planning Team to review and comment while the information was still fresh in their minds. Because of response and recovery needs from a wildfire event within the City and conflicting schedules with Planning Team members, some Planning Team meetings were consolidated. Below is a list of the Planning Team meetings (**Table 2.2**). Planning Team member attendance for each Planning Team meeting can be found in **Appendix B**.

Table 2.2- Planning Team Meetings

Date	Focus
3/31/22	Prepare- Discussed: LHMP update planning process, FEMA Review Tool, Project Timeline, Goal/Objectives of LHMPs, Type of Information Needed, Role of the Planning Team, and Public Outreach Effort. Focus on how LHMP is and will be used.
4/28/22	Existing Conditions- Discussed relationship between other plans, planning process, and initial discussions of Community Profile and Capabilities. Solicit feedback on draft LHMP TOC
6/30/22	Existing Conditions and Hazard Assessment- Discuss Community Profile, Capabilities, Assets, and Threats and hazards (Identification and Priority). Solicit feedback on draft LHMP sections
8/4/22	Hazard Assessment- Discussion of needs on Planning Process, Community Profile, Capabilities Assessment, and Assets. Review of Hazard Profiles and validate Hazard Priority. Overview of Hazard Impacts (Exposure and Vulnerabilities). Solicit feedback on draft LHMP sections
8/18/22	Risk Assessment- Review of Hazard Impacts (Exposure and Vulnerabilities). Solicit feedback on draft LHMP sections
9/1//22	Mitigation Strategies- Review of 1) Previous Projects, 2) Previous Goals/Objectives, and 3) discussion of New Projects. Meeting also covered prioritizing projects and project implementation plan needs
Sep-Oct	Varies one-on-one ad hoc meetings with Planning Team members to discuss, validate, and revise, if necessary, information in the draft LHMP sections
Oct	Draft Plan- Review of draft Administrative LHMP. Draft provided on the team site
Various	Draft Plan- Review of Cal OES/FEMA Comments on draft LHMP

2.3 Stakeholder Coordination

The City of Laguna Niguel participates and coordinates with Emergency Management stakeholders on a regular basis. While some coordination is planned (or scheduled), some is ad hoc. The purpose of these stakeholder meetings is to provide a platform to discuss proposed and current actions, ensuring they are understood, compatible, and synchronized. Below is an overview of some of the Emergency Management stakeholder meetings and stakeholder resources materials utilized by the City of Laguna Niguel:

2.3.1 RECURRING MEETINGS

- Orange County Council of Governments
- Orange County Emergency Managers Organization/Council
 - Operational Area Executive Board
 - Emergency Response Team
- Orange County Emergency Managers Organization (OCOMO)
 - Disabled Access & Functional Needs Subcommittee
- Regional Transportation Plan/Sustainable Communities Strategies
- Regional Housing Needs Assessment
- Cities Advisory Committee
- City Engineering Association of Orange County
- Orange County Engineers Flood Plain Management
- Cal OES Mutual Aid Regional Advisory Committee (MARAC) meetings
- California Coastal Commission

2.3.2 MITIGATION RELATED PLANNING RESOURCES

Because the City of Laguna Niguel wanted a comprehensive LHMP, it emphasized the review and consideration of other plans outside of its jurisdiction; not only plans within its jurisdiction. These stakeholder plans contained an array of information on various topics that helped augment information within the City of Laguna Niguel LHMP. These plans provided additional insight into all sections within the City of Laguna Niguel LHMP (i.e., Community Profile, Hazard Profile, Capabilities Assessment, Risk Assessment, Mitigation Strategy, and Plan Maintenance). These plans include:

- Orange County Emergency Operations Plan
- Orange County Water and Wastewater Multi-Jurisdictional HMP
 - Moulton Niguel Water District HMP (Annex K)
 - South Orange County Wastewater Authority HMP (Annex D)
- Orange County Fire Authority Wildland Urban Interface (WUI) Plans
 - Aliso Viejo Plan, Niguel Plan, Pacific Island Plan
- Orange County Flood Control District Drainage Area Management Plan (DAMP)
 - Local Implementation Plan- Aliso Creek Specific Plan
 - Local Implementation Plan- South Laguna Specific Plan
- State of California HMP
- Orange County Operational Area LHMP
- Surrounding community LHMPs:
 - Dana Point
 - Laguna Beach
 - Mission Viejo
 - San Juan Capistrano
 - Laguan Hills
 - Aliso Viejo
 - South Orange County Community College District

2.4 Public Outreach

For the purposes of the LHMP, the public is defined as any person within the jurisdiction or adjacent areas, not part of the Planning Team nor acting in an official capacity of a recognized form or level of government. There were two (2) different Public Outreach campaigns used during the City of Laguna Niguel LHMP update process: the first informing the community of the LHMP efforts and the second educating the public on threats and hazards, and potential mitigation actions that can be taken. Below is a summary of the campaigns:

2.4.1 LHMP AWARENESS CAMPAIGN

This campaign is focused on engaging with the public during the LHMP update process. A significant piece of the FEMA's LHMP guidance is to ensure the "*whole community*" is involved, and a key element of the whole community concept is engaging with the general public.

The public outreach strategy under this campaign worked in conjunction with LHMP planning process and timeline. As the Planning Team completed critical milestones, key information was disseminated to the public for consideration and input. This outreach strategy shared information about the project kickoff, potential impacts of the threats and hazards within the community, current mitigation capabilities, and proposed mitigation actions.

The City of Laguna Niguel held two (2) public meetings: one (1) at the start of the project; and one (1) at the end of the project. The City also leveraged existing public outreach methods to engage the public. Information was shared through the City's official social media platforms (Facebook, X- *formerly Twitter*, Instagram, Nextdoor), as well as through the city website. The City also created a Local Hazard Mitigation Plan page on the City's website. The Local Hazard Mitigation Plan page provided basic information and encouraged the public to sign up to receive information on the LHMP update process.

The City determined that the City-sponsored Community Emergency Preparedness Fair was the best way to initially reach the general public. The Emergency Preparedness Fair was a public event that provided residents with informational resources about the importance of being prepared for an emergency and the simple steps that can be taken to get started in your preparation. The City of Laguna Niguel issued promotional materials, via the city website and official social media platforms, announcing the Emergency Preparedness Fair and a list of participants. The Emergency Preparedness Fair was held on Saturday March 26, 2022.

The Emergency Preparedness Fair included informational booths, interactive displays, and hands-on preparedness demonstrations from internal City departments and external partners and non-profit groups. The City of Laguna Niguel Public Safety Department and its consultant staffed a booth to engage with the public about the LHMP. An overview of the LHMP and its update process was provided. This included a discussion of the threats and hazards that were going to be included in the LHMP. Public feedback during the fair included support for the list of hazards the Planning Team identified and general curiosity about hazards and potential mitigation actions they could take.

During the Emergency Preparedness Fair, citizens were also encouraged to complete a survey on their level of knowledge and their level of preparedness for threats and hazards. This survey

was also made available through the City's social media platforms and the Local Hazard Mitigation Plan page on the City website. Between the fair and posting of the survey on the City's social media platforms, over 5,500 people reviewed the survey. However, less than 50 responses were received (29 through social media and 20 at the fair). Some of the main takeaways were that the public had experienced an impact from a hazard in the past, they did not feel prepared, and they were interested in learning more about hazards and what actions they could take.

Results from the fair and the survey were shared with the Planning Team. Since the public input supported and echoed concerns that had been raised and addressed by the Planning Team, no course of action adjustment was needed before moving on in the planning process.

On August 30, 2022, a second Public Outreach meeting was held to inform the public of the proposed mitigation actions and to invite them to review and submit comments on the draft LHMP. Because of the demographics of the City and the perceived gap of certain participants at the Emergency Preparedness Fair (underserved and socially vulnerable populations), the City decided to leverage an existing meeting at the Sea County Senior & Community Center. Information regarding the second Public Outreach meeting was widely disseminated within the community via the city website and social media platforms. During this meeting, information about the LHMP was provided (i.e., purpose, scope, update process) in addition to the type of mitigation measures identified by the Planning Team.

Attendance at the second Public Outreach meeting was good considering competing priorities and the continuing challenges of the COVID pandemic. During the meeting, most of the comments received were around clarification of information and concerns related insurance with regards to the recent wildfire in the City. Public comments from this meeting were shared with the Planning Team but as with the first meeting, the input did not alter the Planning Team's process.

In between the meetings, there was a series of status updates provided through the City website on the Local Hazard Mitigation Plan page. In addition to providing information about hazard mitigation, the page also encouraged citizens to sign up for local alerts, warnings, and notifications. One of the notifications platforms was used to inform the public of the availability of the updated LHMP and encouraged their comments. Other than the survey results mentioned above, no relevant Public input was received through the website or social media platforms.

In all, the public comments confirmed the Planning Team decisions and proposed mitigation strategy. As such, all public comments were incorporated into the LHMP where appropriate. The public announcements and presentations for both meetings can be found in **Appendix C**.

2.4.2 MITIGATION AWARENESS CAMPAIGN

As mentioned above, the City of Laguna Niguel utilizes several events and platforms to communicate with the public. The City intends to continue to leverage these events and platforms to disseminate information about threats and hazards in the community, relevant programs being undertaken to safeguard the public from the effects of these threats and hazards, and actions the public can take to prepare themselves for events. The City also

intends to look for new opportunities, through the City or in partnership with community stakeholders/partners, to reach out to the public and educate them on mitigation.

3 COMMUNITY PROFILE

The purpose of this section is to present an overview of the City of Laguna Niguel, providing the Planning Team with a common understanding of the existing conditions and perspective on aspects within the community. Gaining a common understanding of these existing conditions provides the basis on which the Planning Team can assess the impacts of threats and hazards, as well as identify needed mitigation actions.

3.1 Location

The City of Laguna Niguel, located in the southwestern portion of Orange County, was one of California's first master planned communities. The intent of the master planned community was to design a community where families' economic needs and social/cultural interests could be met within the community. The City of Laguna Niguel is located approximately fifty-six (56) miles south of downtown Los Angeles and approximately seventy-three (73) miles north of San Diego (Figure 3.1).

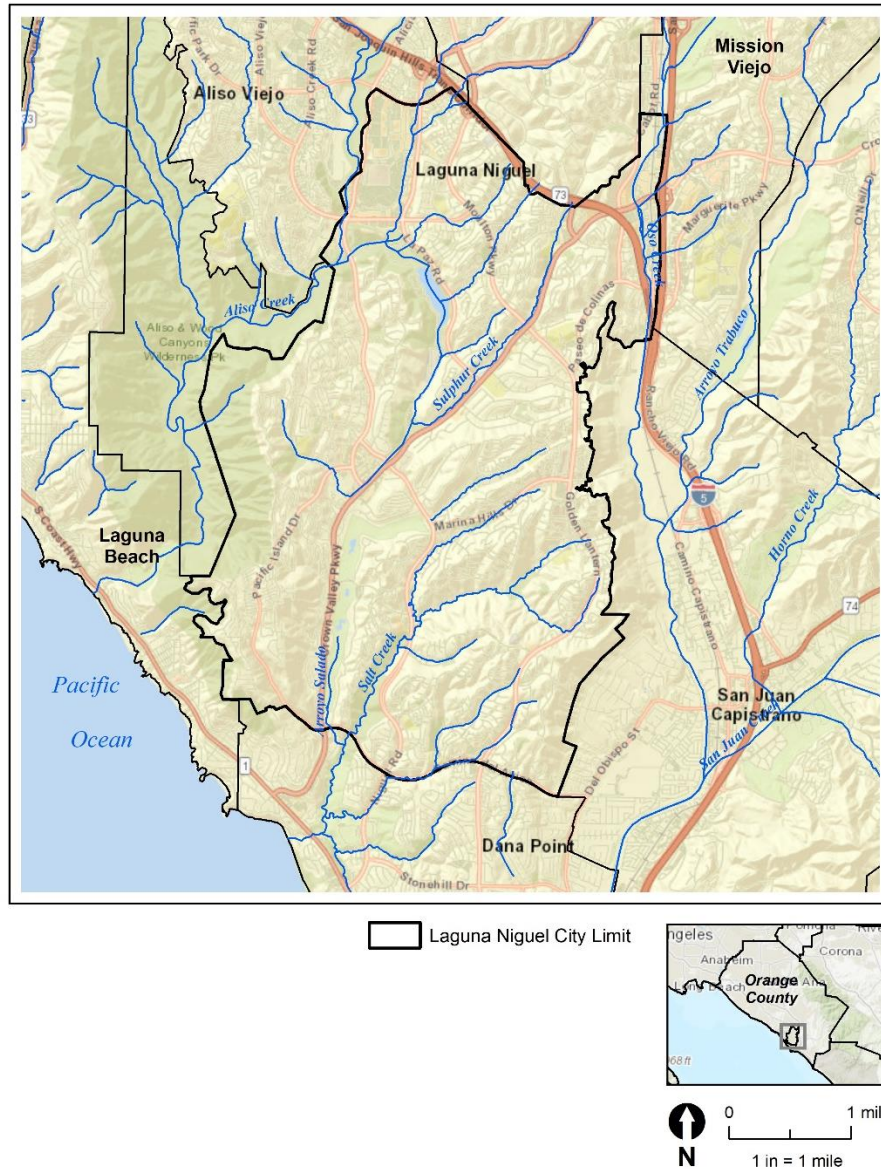
Figure 3.1- City of Laguna Niguel



The City is located within the San Joaquin Hills, bounded by the City of Dana Point to the south; the City of San Juan Capistrano to the east; the County of Orange (Aliso and Woods Canyon Regional Park), the City of Aliso Viejo, and the City of Laguna Beach to the west; and the cities of Laguna Hills and Mission Viejo and a small area of unincorporated Orange County to the

north (**Figure 3.2**). The City's planning area covers approximately 14.79 square miles. Although adjacent to unincorporated parts of Orange County, the City does not have a Sphere of Influence (SOI). Regional access to the City is mainly provided by Interstate 5 and California State Highway 73. California State Route 73 runs north of the city, diverging from Interstate 5 just northeast of Laguna Niguel.

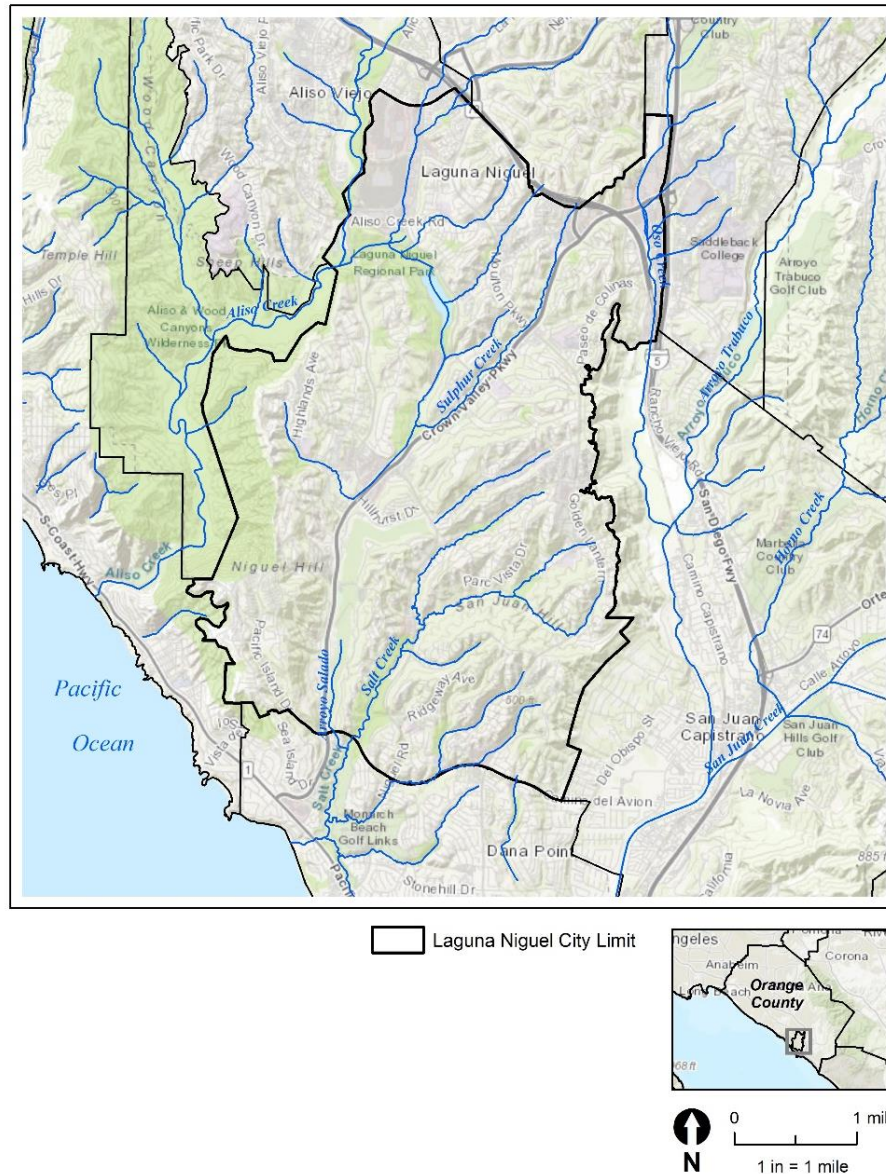
Figure 3.2- Surrounding Jurisdiction to the City of Laguna Niguel



3.2 Geography

As mentioned, the City of Laguna Niguel consists of a total area of 14.9 square miles; 0.05 square miles of which is water. Laguna Niguel occupies a hilly basin near the southern end of the San Joaquin Hills, a small coastal mountain range in southern Orange County. According to USGS, the average elevation in the City of Laguna Niguel is 400 feet; elevations range from near sea level to 936 feet at the summit of Niguel Hill, in the southwest corner of the city. Niguel Hill separates the City from Aliso Canyon, an immense gorge cut by Aliso Creek, one of the county's primary watercourses. The Aliso Canyon area is home to Aliso and Wood Canyons Regional Park, a large wilderness area in the southern county. Although the creek itself only brushes the northwestern border of the City, a major tributary, Sulphur Creek, drains most of northern Laguna Niguel. Sulphur Creek runs through Crown Valley in eastern Laguna Niguel, Crown Valley Park, Laguna Niguel Regional Park and Sulphur Creek Reservoir (Laguna Niguel Lake). The two parks and the lake lie just north of the geographic center of the City.

Low ridges dissect much of the Laguna Niguel area. Most of these mountain ridges, some of them attaining heights of one or two hundred feet, run northeast to southwest, delineating the hydrography of the area. Laguna Niguel's other primary drainage, Salt Creek, has two forks in the southern half of the City, flowing southwards to the Pacific Ocean. Laguna Niguel itself has no border on the ocean. The city of Dana Point to the south separates Laguna Niguel and the Pacific. On the east side, Laguna Niguel is separated from San Juan Capistrano by a significant ridge running along Trabuco Creek. To the north lie Aliso Viejo and Laguna Hills (**Figure 3.3**).

Figure 3.3- Physical Features Around Laguna Niguel

There are several creeks within the City: Sulphur Creek, Salt Creek, and Aliso Creek. Crown Valley Parkway runs along Sulphur Creek and the northern fork of Salt Creek, bisecting the City northeast to southwest. Niguel Road runs roughly parallel and east of Crown Valley Parkway along the Salt Creek canyon. Alicia Parkway follows Aliso Creek to where it joins Crown Valley Parkway near Crown Valley Park and the City Center. Other major roads in the area include Moulton Parkway/Street of the Golden Lantern runs along the eastern boundary of Laguna Niguel, Pacific Island Drive/Camino del Avión which follow parts of the west and south boundaries, respectively. Marina Hills Drive is the largest crossing between Niguel Road and Golden Lantern, and Aliso Creek Road runs east-west through northern Laguna Niguel.

3.3 History

The name "Laguna Niguel" is derived from the Spanish word "Laguna", which means lagoon, and the word "Nigueli" which was the name of a Juaneno Indian village located near Aliso Creek. In 1821, California became Mexican territory, and many rancheros were formed in southern California, including Rancho Niguel. During this period, Rancho Niguel was primarily used as a sheep ranch.

The first private landowner of the area was Juan Avila, a resident of San Juan Capistrano, who obtained land through a Mexican land grant in 1842. Juan Avila was also successful in re-establishing his title to the land after California became a U.S. territory in 1848 and remained the owner of "Rancho Niguel" until 1865. In 1895, the "Rancho Niguel" land became part of the Moulton Company, a company that would eventually control over 19,000 acres of local ranch land.

The genesis of today's Laguna Niguel was the establishment of the Laguna Niguel Corporation in 1959 by Cabot, Cabot and Forbes, making it one of the first master planned communities in California. The firm of Victor Gruen and Associates was retained to develop a detailed community plan for the approximately 7, 100-acre site. Land sales started to occur in 1961 in Monarch Bay and Laguna terrace subdivisions. Avco Community Developer acquired the Laguna Niguel Plan in 1971 and initiated development as set forth in the original Master Plan. During the early years of development in Laguna Niguel, the Laguna Niguel Homeowner Association, later to become the Laguna Niguel Community Services District, served in an advisory capacity to the Orange County Board of Supervisors on land use issues.

In 1986, Laguna Niguel residents, looking for local governance, took the first step toward Cityhood by forming a Community Services District. Three years later, on November 7, 1989, 89% of the voters favored incorporation and on December 1, 1989, Laguna Niguel became the 29th City in Orange County.

3.4 Climate

The City of Laguna Niguel experiences a Mediterranean Climate with warm summers, mild winters, and limited precipitation. Temperatures in the City range from an average low of 45 degrees in the winter months to an average high of 78+ degrees in the summer months (**Table 3.1**). However, the temperatures can vary over a wide range, particularly when the Santa Ana winds blow, bringing higher temperatures and very low humidity. Temperatures rarely exceed 80 degrees Fahrenheit in the summer months (June-September), and rarely drop below 40 degrees Fahrenheit in the winter months (November-March).

Table 3.1-Average Temperatures in Laguna Niguel (Weather Spark.com)

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	65°F	65°F	67°F	69°F	70°F	73°F	76°F	78°F	77°F	74°F	70°F	65°F
Temp.	57°F	57°F	58°F	60°F	62°F	65°F	69°F	69°F	69°F	66°F	61°F	57°F
Low	50°F	50°F	52°F	54°F	56°F	60°F	62°F	63°F	62°F	59°F	54°F	49°F

Rainfall in the City averages 13.1 inches of rain per year. However, the term "average rainfall" is misleading because over the recorded history of rainfall in the City, rainfall amounts have ranged from one-third the normal amount to more than double the normal amount. There are three (3) types of storms that produce precipitation in the southern California area: 1) winter storms, 2) locally generated thunderstorms, and 3) summer tropical storms. Furthermore, actual rainfall in southern California tends to fall in large amounts during sporadic and often heavy storms. In short, rainfall in southern California might be characterized as feast or famine within a single year.

3.5 Demographics

According to the City of Laguna Niguel's website the current estimated population in the City is 67,208, a result of a growth rate between 2010-2022 of 6.71%. The growth of the city is predicted to flatten out between 2022-2027 to 1.82%. **Table 3.2** presents an overview of the historic population within the City of Laguna Niguel according to the US census records.

Table 3.2- Historic Population Since 1970

Year	Population	% Change
1970	4,644	
1980	12,237	163.5%
1990	44,400	262.8%
2000	61,891	39.4%
2010	62,979	1.8%
2020	64,355	2.2%

The average population per square mile is 4,367 (US census 2020). Since its incorporation the City has made efforts to be all inclusive in its approach to managing the City. This has included ensuring the needs and challenges of underserved and socially vulnerable populations and the needs and challenges of businesses are factored into the City's decision-making process. In support of this, the City identifies, captures, and analyzes certain aspects (demographics) of its community. Some of these demographics for the City of Laguna Niguel include:

Age and Ethnicity

The Median Age is 45.66 years with 18% over 65 years and 4.3 % under 5 (city website). Other important demographics show that 51% are women, 65% white, 15.9% Hispanic, 11.3% Asian, 8.3% Mixed, and 1.9% Black (US census).

Income

The median family income \$119,608. Per Capita income is \$62,391.

Education

Some College: 19.61%; Associate Degree: 8.55%; and, Bachelor's Degree: 33.20%

Housing

There are 27,061 dwelling units in the City of Laguna Niguel. Of which, 18,740 (72.53%) are owner occupied and 7,096 (27.47%) are renter occupied. The average household size is 2.59, with an average household income of \$178,711. The median household price is \$1,076,278.

Business

The total number of employed in the City of Laguna Niguel is 35,784. Of which, 6,903 are self-employed and 4,448 work from home. There are a reported 1,333 (2.35%) unemployed in the City. The average travel time to work is 28 minutes.

3.6 Economy

The City of Laguna Niguel's economy is based on the service industries such as retail trade, professional management, and educational/health/social services. According to the City's 2021 Annual Comprehensive Financial Report, the largest employers include the US Department of Homeland Security, Costco Wholesale Corporation, Capistrano Unified School District, Albertson's LLC, and Smart & Final Stores, Inc. (**Table 3.3**). The US Census lists accommodation and food service, health care and social assistance, and transportation and warehousing as the major revenue generating industries. According to the City of Laguna Niguel website the existing space available for Office is 94,491 and Retail is 128,325. As mentioned under Demographics, the total number of employed: 35,784.

Table 3.3- Largest Employers in Laguna Niguel

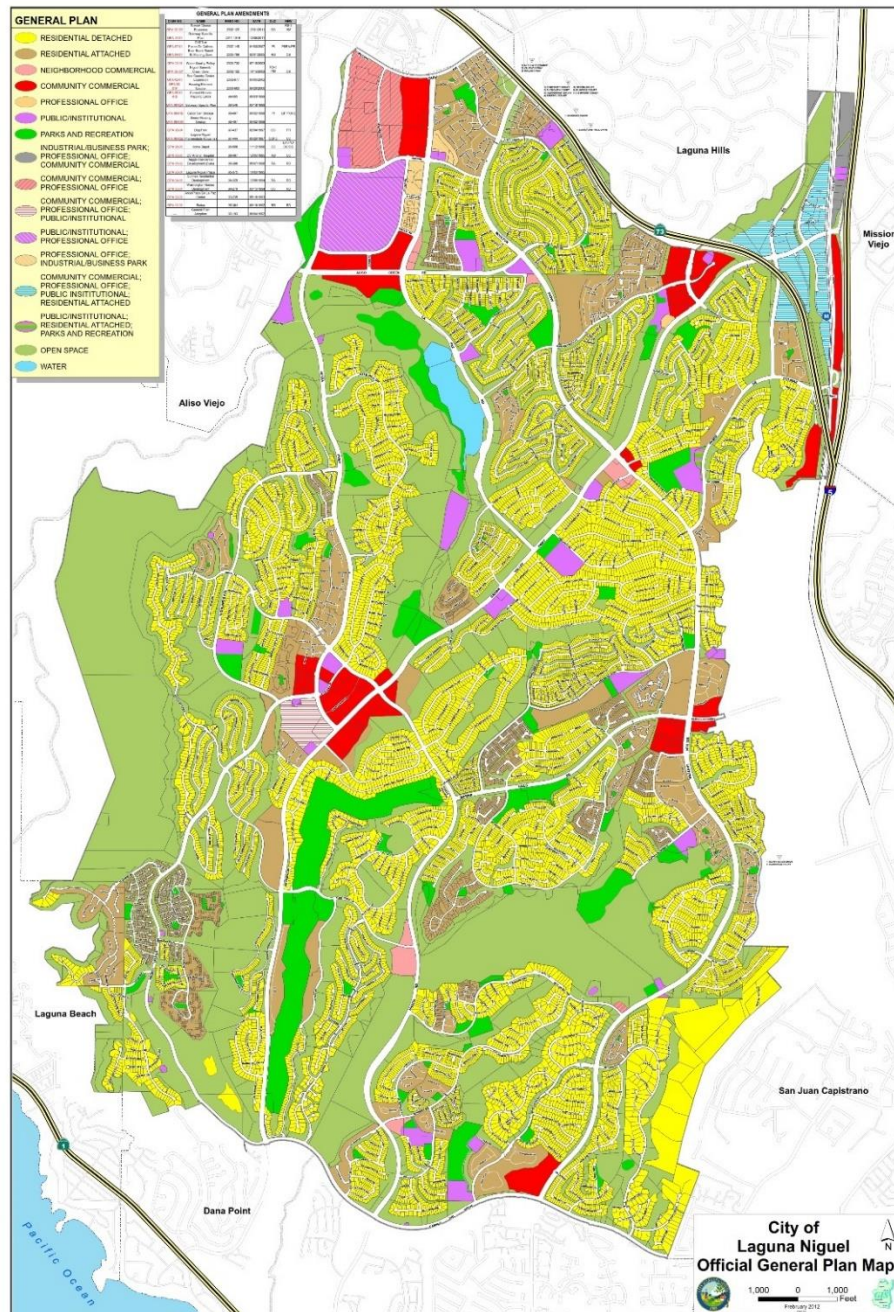
Employer	# of Employees
United States Government	2,200
Costco	657
Capistrano Unified School District	331
Wal-Mart	301
Lifetime Fitness	295
Whole Foods Market	232
Home Depot	215
Mercedes-Benz of Laguna Niguel	205
Albertsons	159
Vons	148

However, according to the City's 2021 Annual Comprehensive Financial Report, the City's largest revenue source is property tax. Actual property tax receipts in FY 2020-2021 totaled \$24.63 million. As a point of comparison, the prior year property tax receipts totaled \$23.58 million. Sales tax is the second largest revenue source in the City. Actual sales tax receipts in FY 2020-2021 totaled \$13.1 million.

3.7 Land Use

Laguna Niguel is predominantly a "bedroom" community with residential uses accounting for approximately sixty percent (60%) of the total land area. Most of the residential uses are concentrated in well-defined areas linked together by parks, greenbelts, and curvilinear landscaped streets. Over one-third of the City is devoted to open space. A combination of regional parks, community parks, neighborhood parks, private recreation facilities, open space corridors, greenbelts and landscaped slope banks are provided throughout the City. This large amount of open space establishes the open space character of the City. Retail, office, industrial and public/institutional land uses currently comprise only eight percent of the total land area of the City. Most of the retail land used in the City is situated within neighborhood and community shopping centers. Land use in the City is guided by the General Plan. The City's Community

Development Department implements the City's General Plan, which provides the land use policies to guide development and redevelopment of existing land uses. The General Plan Land Use Plan is presented in **Figure 3.4**.

Figure 3.4- Laguna Niguel General Plan Land Use Plan

3.7.1 EXISTING LAND USE

The land use pattern within Laguna Niguel is the result of several master planned communities and specific plans that were approved by the County of Orange over the last twenty (20) years, prior to the City's incorporation. Each of the planned communities prescribes specific land uses, site development standards, circulation routes, and infrastructure systems. Almost eighty-eight percent (88%) of Laguna Niguel is presently developed. The majority of the remaining vacant land in the City has approved development agreements or other entitlements.

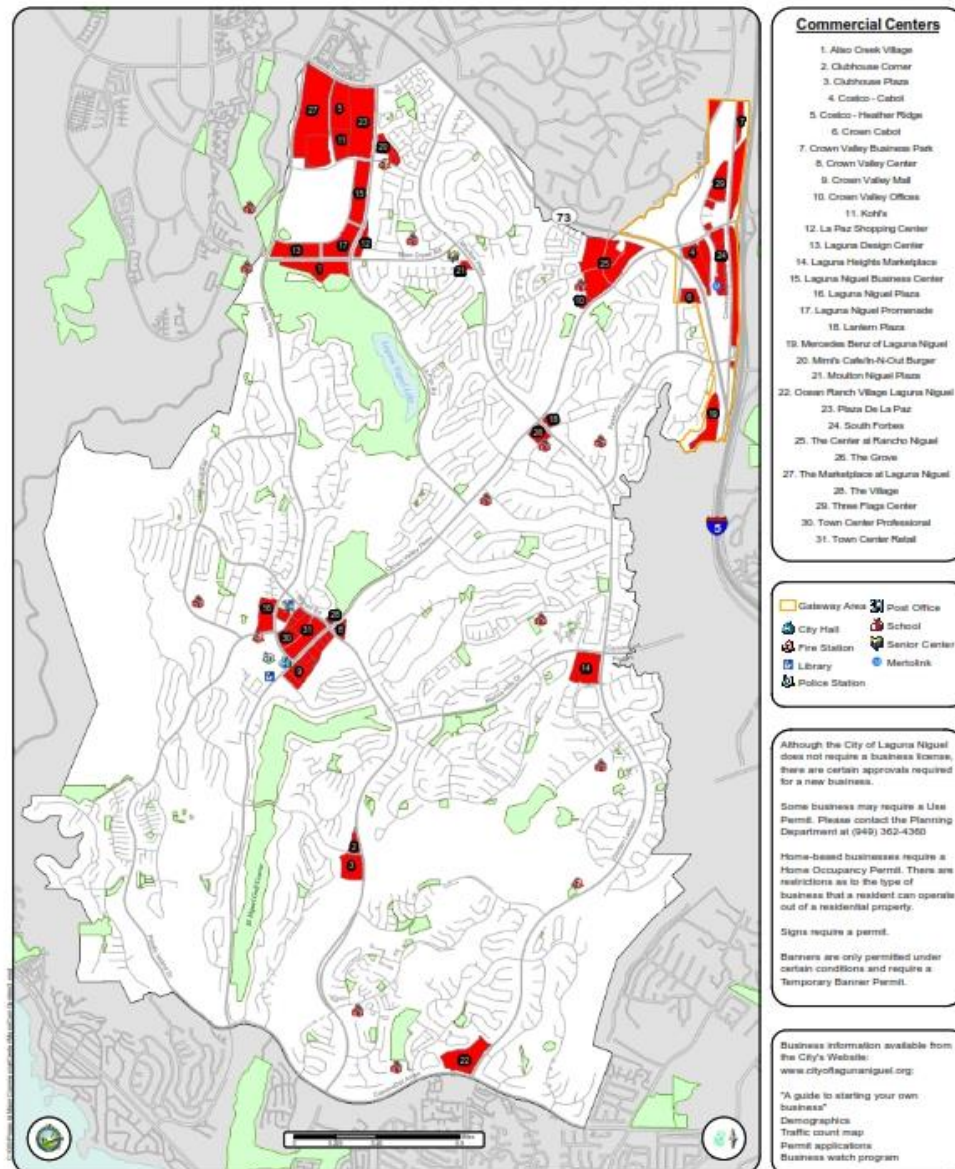
Existing and planned use of Laguna Niguel's 9,456 acres includes 3,566 acres residential, 738 acres commercial, 233 acres mixed uses, 222 acres public/institutional facilities and 4,531 acres designated to parks and open space and about 166 acres of street rights-of-way.

Almost forty-eight percent (48%) of Laguna Niguel is designated as open space. This significant amount of open space is one of the key features defining the character and urban form of the City. The City has two (2) community parks, twenty-three (23) neighborhood parks, three (3) mini-parks, one (1) dog park, two (2) county regional parks, two (2) small county parks, and the new Laguna Niguel Skate and Soccer Park.

Over the last ten (10) years Laguna Niguel and the surrounding Southern Orange County region have experienced an unprecedented rate of growth. Concurrent with this fast rate of growth, have been a significant increase in traffic congestion along the south Orange County segment of I-5. In an effort to enhance regional access, County transportation organizations have proposed construction of the San Joaquin Hills Transportation Corridor (Highway 73) and the Moulton Parkway/Golden Lantern improvements. Both of these transportation facilities are designed to facilitate regional access to and from Laguna Niguel, as well as other nearby communities.

The City of Laguna Niguel meets its public transportation needs through a mixture of a regional transit system (OCTA), Metrolink rail system, and various city contracted bus systems.

The majority of the office and industrial uses in the City are located within the Country Village/Narland Business Center, Town Center, and Camino Capistrano/Cabot Road Business Area. The Town Center area consists of a concentrated mix of office, public facility, retail, and restaurant uses. The Country Village/Narland and Business Center and the Camino Capistrano/Cabot Road Business Area include a mix of retail, office, and light industrial land uses (**Figure 3.5**).

Figure 3.5- Major Commercial Centers- Laguna Niguel

3.7.2 DEVELOPMENT TRENDS

Development in Southern California from the earliest days was a cycle of boom and bust. The Second World War, however, dramatically changed that cycle. Military personnel and defense workers came to Southern California to fill the logistical needs created by the war effort. The available housing was rapidly exhausted and existing commercial centers proved inadequate for the influx of people. Immediately after the war, construction began on the freeway system, and the face of Southern California was forever changed. Home developments and shopping centers sprung up everywhere and within a few decades the central basin of Los Angeles County was virtually built out. This pushed new development further and further away from the urban center, into Orange County and cities such as Laguna Niguel.

The environment of most Orange County cities is nearly identical with that of their immediate neighbors and the transition from one incorporated municipality to another is seamless to most people. The City of Laguna Niguel General Plan addresses the use and development of private land, including residential and commercial areas. This plan is one of the City's most important tools in addressing environmental challenges including transportation and air quality; growth management; conservation of natural resources; clean water and open spaces.

In the City of Laguna Niguel, the demand for housing outstrips the available supply, and the recent low interest rates have further fueled a pent-up demand. Demand for available housing is extremely high with few existing homes available. Demand for low to medium priced homes continues to be strong. Additionally, the City participates in HUD's Community Development Block Grant (CDBG) program that is designed to assist low- and moderate-income households.

The City of Laguna Niguel is relatively developed and there is no Sphere of Influence (SOI). As such, much of the development over the past 5-10 years has been infill projects. Depending on the scope and scale, infill projects are assessed to ensure risks from threats and hazards are considered and addressed through California Environmental Quality Act (CEQA). One of the larger infill projects is the Gateway Area Improvement Specific Plan. This plan provides for a transition from its predominately low intensity and fragmented development pattern into an attractive and desirable transit and pedestrian-oriented urban community containing distinct and quality mixed-use neighborhoods and districts with housing, office, retail, restaurants, personal services, hotels, community facilities, and parks. The Gateway Area Improvement Specific Plan includes the approximate 315-acre area along Crown Valley Parkway, Cabot and Forbes Roads, bounded by Interstate 5, San Joaquin Hills Transportation Corridor, and the City limits to the north and south. A significant portion of this plan has been implemented but more work is expected over the coming years. Development in and around this area references and leverages the Environmental Impact Report (EIR) prepared for the project. The purpose of the EIR is to identify and mitigate impacts from the proposed action (development), including the availability of local resources (i.e., water, electricity) and exposure to local hazards by the proposed population and structures. City staff who worked on the EIR were also members of the past and present mitigation Planning Teams, and such, brought that knowledge and information into the EIR process. Based on the EIR findings, the City of Laguna Niguel believes it is not increasing the City's exposure to hazards.

Below is a list of other proposed infill projects:

Chet Holifield Federal Building

The Chet Holifield Federal Building is one of Orange County's largest and easily recognizable buildings with its unique ziggurat-style architecture. The federal building is located between Alicia Parkway and La Paz Road at the Avila Road cross street. It is also the site of a large photovoltaic system that produces electricity to support building operations. Current Major tenants are the California Service Center for U.S. Citizenship and Immigration Services, IRS, U.S. Customs and Border Protection, and U.S. Immigration and Customs Enforcement. Currently, the Federal General Services Agency is exploring potential future uses for the site of the building.

City Center

The project site, approximately 25 acres in area, is owned by the County of Orange. The property consists of the South County Justice Center (closed in 2008), Orange County Library, County maintenance yard, Orange County Fire Authority Station No. 5, and undeveloped land. The site is immediately adjacent to City Hall. The site is generally bounded by Pacific Island Drive to the north, Alicia Parkway to the east, Crown Valley Parkway to the south, and multifamily residential communities to the west. As described by the Applicant team (Laguna Niguel Town Center Partners, LLC), the general vision of the Laguna Niguel City Center Mixed Use Project is to create a “downtown” environment that features specialty retail, restaurants, office, community-oriented event/programmable spaces, integrated residential apartment homes, a new community library, and extensive walkable open spaces, paseos, and plazas.

The proposal includes approximately 175,000 square feet of commercial and civic uses and 275 multifamily residential units. The commercial component would include approximately 158,600 square feet of commercial space with a wide range of uses, such as restaurants, retail shops, health/wellness-focused retail and medical office, and creative office space. The civic space is comprised of a new and larger county library (approximately 16,300 square feet with over 2,600 square feet of additional outdoor programmable space), which would replace the existing library (approximately 14,400 square feet with limited outdoor space). The residential component of the proposed project would consist of two separate apartment buildings, one 200-unit apartment building and one 75-unit apartment building.

Forbes South Multi-Family Residential

The 2.6-acre project site is comprised of three lots (27912, 27942, and 27972 Forbes Road) to be merged, generally south of Crown Valley Parkway and east of Forbes Road. The site is within the Mixed-Use Zone, Planning District H of the Laguna Niguel Gateway Specific Plan. The project includes a multi-family development consisting of 309 units (studios, one-bedroom, and two-bedroom) with contemporary architecture and a parking structure. The project brings with it right-of-way improvements, as well as other public benefits, including lot consolidation and the construction of a pedestrian bridge and trail improvements to complete a missing portion of the regional trail system and increasing overall connectivity in the Gateway area.

CUSD Townhomes

This project consists of the Cove @El Niguel and SunPointe developments and includes 53 residential lots. The project site is located at the southern terminus of Avenida Del Caballo, generally south of Paseo De Colinas, east of Cabot Road, and west of Star Drive, within the Single-Family District 3 (RS-3) District.

3.8 Assets

The term “assets” can have many meanings. For the purposes of the LHMP, there are two (2) categories of assets: General Assets and Key Assets.

3.8.1 GENERAL ASSETS

General Assets are the number of buildings, residents, and city employees within the City. This information is helpful to both understand potential exposure to risk and potential resources. City employees are individuals who are available to support a variety of necessary activities.

Number of Buildings

The total number of structures in the City is 18,788. Of which, 4,401 are for commercial use and 14,387 are for residential use.

Number of Residents

As presented under the Demographic subsection, the current estimated population in the City is 67,208. Of which, 18% over 65 years and 4.3 % under 5 years of age.

Number of City Employees

According to City of Laguna Niguel records there are 151 full-time and part-time employees working for the City in 2022.

3.8.2 KEY ASSETS

Key Assets can be classified by a variety of categories and in various ways (i.e., critical assets, essential assets). For the purposes of the LHMP, Key Assets will be categorized as assets needed to implementation emergency management concepts and strategies (response/recovery, continuity of operations; and mutual aid). It is worth noting that a subset of the buildings under the General Assets are buildings the City may rely on to implement emergency management concepts and strategies. Because of the role and importance of these facilities, the City needs to ensure the facilities are maintained and will be functional, especially during and after events. Another part of Key Assets is systems and equipment are used to perform certain functions and/or operations. **Table 3.4** provides a list of the Key Assets within the City of Laguna Niguel.

Table 3.4- List of Key Assets

Facility	Address	Notes
Laguna Niguel Civic Center	30111 Crown Valley Parkway	City Hall, Police Station, Emergency Management
Fire Stations		
<i>Station 39</i>	<i>24241 Avila Road</i>	North Laguna Niguel
<i>Station 49</i>	<i>31461 Street of Golden Lantern</i>	Bear Brand
<i>Station 5</i>	<i>23600 Pacific Island Drive</i>	Laguna Niguel
Hospitals		
<i>Mission Hospital</i>	<i>27700 Medical Center Road</i>	Mission Viejo
<i>Saddleback Medical Center</i>	<i>24451 Health Center Drive</i>	Laguna Hills
Water Distribution System	various locations	
Wastewater Collection System	various locations	
Regional Treatment Plant	29201 La Paz Road	

Coastal Treatment Plant	28303 Alicia Parkway	
Sulphur Creek Dam/Reservoir		
Schools		
<i>Elementary schools</i>	<i>6 locations</i>	
<i>Middle school</i>	<i>1 location</i>	
<i>High schools</i>	<i>2 locations</i>	Dana Point, Aliso Viejo
<i>Community College</i>	<i>1 location</i>	Mission Viejo
Library	30341 Crown Valley Parkway	

4 CAPABILITY ASSESSMENT

The purpose of this section is to capture the resources (or capabilities) available to the City of Laguna Niguel in support of mitigation. In an effort to efficiently demonstrate these resources, this section has been organized by: Personnel Resource; Mitigation Governance Resources; Technical Resources; and, Fiscal Resources. Although discussed in the individual Resource sections, a separate section is provided that highlights the City' ability to expand on and improve capability resources (Section 4.5).

4.1 Personnel Resources

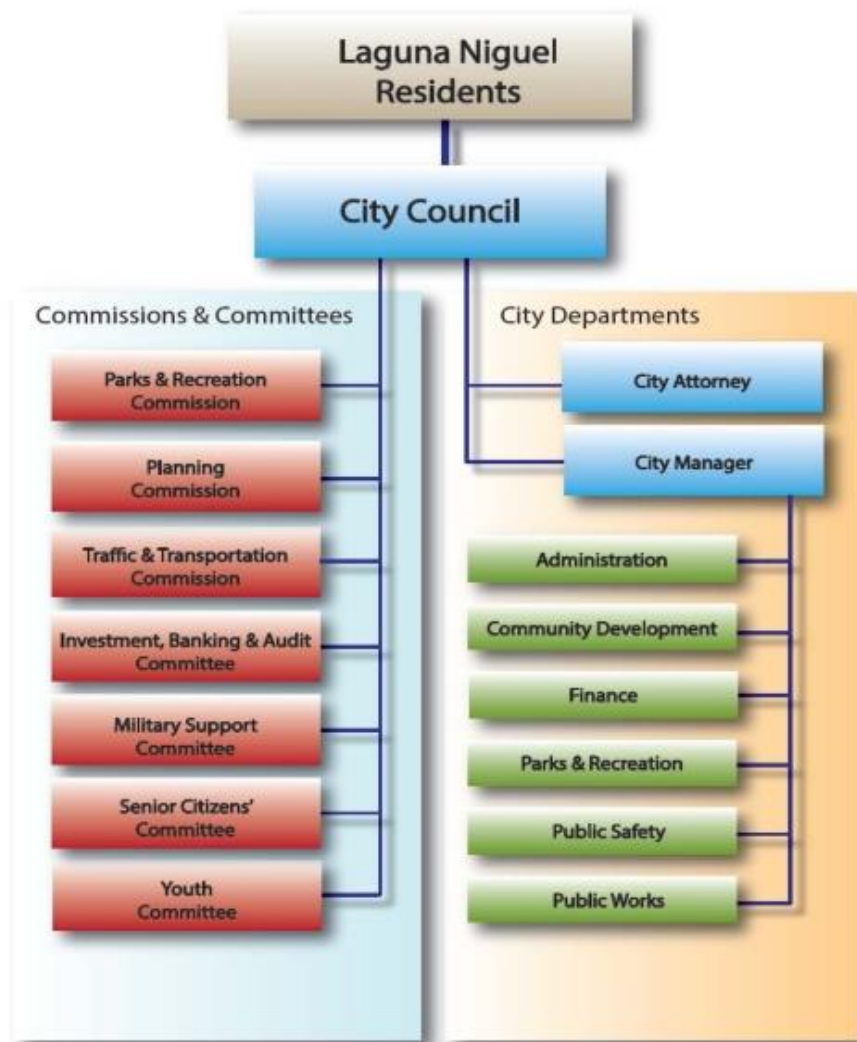
This section demonstrates the City of Laguna Niguel's capability to dedicate and/or assign, long-term or short-term, workforce to mitigation efforts. There are five (5) primary ways the City can provide personnel resources: directly from the City of Laguna Niguel government (City) workforce and/or through Contractor Employees, Volunteer Workers; Mutual Aid Support; and, Partnerships.

4.1.1 CITY WORKFORCE

The City of Laguna Niguel is a City Council/Manager, general law city. The council-manager form of government is the system of local government that combines the political leadership of elected officials in the form of a council or other governing body, with the managerial experience of an appointed local government manager. The City Council consists of five (5) members, elected from the City at-large, who serve four (4) year staggered terms. Annually, the City Council appoints a Mayor and a Mayor Pro Tempore from its own membership to serve a one-year term. The current City Council members are listed under subsection 1.4 (Promulgation Authority).

The Mayor is responsible for presiding over City Council meetings, representing the City Council at various business and ceremonial events, and executing all City ordinances, resolutions, and contracts. The Mayor Pro Tempore performs these duties in the absence of the Mayor. As a legislative body, the City Council is responsible for enacting local laws, adopting the annual budget and Capital Improvement Program, and reviewing and adopting policies, agreements, and other City business items.

The City Council appoints the City Manager and City Attorney, as well as the members of the various citizen advisory boards, commissions, and ad-hoc committees. The City Manager is responsible for hiring City Department Directors; and the City Department Directors are responsible for hiring department staff. **Figure 4.1** illustrates the City of Laguna Niguel organizational structure.

Figure 4.1- City of Laguna Niguel Organizational Chart

4.1.1.1 Commissions & Committees

The City of Laguna Niguel has a number of commissions and committees that perform a valuable service by providing a means by which the City Council can obtain the advice, opinions, and recommendations of City residents and other members of the community. To become a member of a commission and/or committee, citizens are asked to file an application with the City Clerk, prior to an interview and selection by the City Council. These selections normally occur in December of each year, or at other times when a vacancy occurs. Below is an overview of each commission and committee:

[Parks and Recreation Commission](#)

The Parks and Recreation Commission is responsible for reviewing and recommending plans for the development of the City's parks, recreation facilities, programs, and services in the City. The Commission also establishes working relationships with the South Coast YMCA and Capistrano Unified School District to maximize the coordination of programs and

use of facilities. The Commission consists of five (5) members and two (2) City Council Liaisons. All 5 Commission members serve two-year terms.

Planning Commission

The Planning Commission plays a central role in the planning process. The Planning Commission acts as an advisory board to the City Council on all planning and development issues, assures that the General Plan is implemented by reviewing development applications on a case-by-case basis, and functions as the decision-making body for new development and conditional use permits. The Planning Commission's actions are final but can be appealed to the City Council. The City Council can uphold the Commission's decision, overturn it, modify it, or send it back to the Commission for further study. The Commission consists of five (5) total members. Each Commission member serves a two-year term.

Traffic and Transportation Commission

The Traffic and Transportation Commission acts in an advisory capacity to the City Council on all traffic matters, such as reviewing traffic complaints, surveying, making recommendations relative to traffic conditions, and administering and enforcing traffic regulations. The Commission's duties also include the study of public transportation, traffic regulations and traffic control devices, parking, and vehicle and pedestrian safety within the public right-of-way. The Commission consists of five (5) members and two (2) City Council Liaisons. All Commission members serve two-year terms.

Investment, Banking & Auditing Committee

The Investment, Banking and Audit Committee is responsible for reviewing and making recommendations to the City Council on the City's Investment Policy and the Draft Comprehensive Annual Financial Report (CAFR). In addition, they periodically review the City's investment portfolio and investment practices to ensure conformance with the City's Investment Policy. The Committee consists of five (5) members and two (2) City Council Liaisons. The Committee Members serve two-year terms. The Committee Members are required to have substantial education and experience in one or more of the following the areas: accounting, finance, investment, banking, and other relevant experience.

Military Support Committee

The Military Support Committee was established to sustain and enhance the adoptive relationship between the City of Laguna Niguel, the USS Stockdale, the First Battalion, Fourth Marine Regiment and the 1st Assault Helicopter Battalion, 140th Aviation Regiment. The Military Support Committee is supported by the Laguna Niguel Military Support Foundation, a 501 (c)(3), non-profit organization. The Committee consists of eighteen (18) members and two (2) City Council Members who serve as Co-Chairs. Currently, fifteen (15) Committee members are serving two-year terms, and three (3) Committee members are serving one-year terms. The Committee has established several Ad-Hoc Committees, including Ex-Officio Members, to help carry out the duties and responsibilities of the Committee.

Senior Citizens Committee

The Senior Citizens Committee is an advisory group to the City Council and the Parks & Recreation Commission that reviews matters related to senior citizens. The Committee promotes involvement of senior citizens in community affairs and provides input regarding a variety of programs for the benefit of seniors. The Committee consists of seven (7) members and two (2) City Council Liaisons. The Committee also includes two (2) alternate members. All members serve two-year terms.

Youth Committee

The Youth Committee is responsible for maintaining and updating the Youth Community and Volunteer Services Directory and Youth Employment Directory. The Committee also plans and participates in an annual local youth job fair, review and recommend new teen recreation programs and events, and plan one or two teen recreation programs each year. Youth Committee members participate as volunteers at City sponsored events, provide youth input on various City projects, and work cooperatively with the Dana Point Youth Board. The Committee's goal is to create a positive working relationship with the City Council and other City organizations in an attempt to give the teens of Laguna Niguel a strong voice and presence in the community. The Committee consists of fifteen (15) members and two (2) City Council Liaisons. Committee members serve one and two-year terms. All Committee members are high school students residing in Laguna Niguel.

4.1.1.2 City Attorney

The City contracts with Best, Best, and Krieger, LLP for legal services. The City Attorney's Office provides legal support and advice to the City Council, Commissions and Committees, and City staff. Office functions generally fall into the categories of general counsel, prosecution, and litigation.

General Counsel

The City Attorney is the chief legal officer of the City and is responsible to the City Council for the proper administration and coordination of all City legal affairs. Among other things, the City Attorney prepares and/or reviews all City ordinances, resolutions, contracts and other legal documents, attends City Council, Planning Commission, Environmental Review Board, City Staff and other meetings, conducts legal research and renders opinions on a variety of City issues, and provides legal advice to City officials and employees.

Prosecution

The City contracts with the Orange County District Attorney's Office for the prosecution of most local municipal code violations (infractions and misdemeanors). The City Attorney coordinates with the District Attorney's Office and may personally represent the City in prosecution when appropriate.

Litigation

The City Attorney generally represents the City in litigation. In some cases, the City Attorney may recommend the engagement of other law firms to assist the City on certain cases. The City Attorney also monitors the performance of other agencies and special counsel (i.e.,

California Joint Powers Insurance Authority) in the handling of liability and other claims and lawsuits against the City.

4.1.1.3 City Manager

The City Manager is the Chief Administrative Officer responsible for the proper administration of all City business and directly reports to the City Council. The City Manager provides executive leadership, direction, review and coordination of all City department functions and operations. Among other things, the City Manager is expected to:

- Enforce all City laws and ordinances
- Appoint and remove Department Heads and City employees
- Offer professional advice on all aspects of the City's operations
- Review all City Council agenda material for content and the appropriateness of departmental recommendations
- Prepare and submit the annual City Budget and Capital Improvement Program
- Monitor the City's financial position and needs

Below is an overview of the City Departments:

Administration Department

The Administration Department is committed to providing the administrative support necessary to establish positive relationships with both City employees and the community by promoting professional development and excellent customer service and maintaining high standards and quality of life for the residents and businesses of the City. The City Clerk is now part of the Administrative Department. The City Clerk's Office is responsible for coordinating and preparing City Council agendas and minutes; records management; Municipal Code maintenance; election administration; administering local reporting requirements under the Political Reform Act, and reporting to the Fair Political Practices Commission and/or the Secretary of State. Following City Council meetings, the City Clerk's Office coordinates the execution of ordinances, resolutions, contracts, agreements, bond releases, and other official documents approved by the City Council. The Administration Department is responsible for:

- Employment Opportunities
- Benefits and Compensation
- Labor Relations
- Risk Management and Training
- Information Technology
- Public Information, Relations, and Communications
- Legislative Advocacy

Community Development Department

The Community Development Department guides and facilitates development in the City. This is accomplished in a spirit of creativity and with a commitment to provide the highest standard of development to preserve the health, safety, general welfare and quality of life for all people who live, work and visit Laguna Niguel. The Department is also responsible for

planning and building activity within the City and provides support to the City Council and Planning Commission.

Finance Department

The Finance Department is responsible for all aspects of the City's accounting process, prepares the City's budget, administers payroll, manages investments, and oversees purchasing.

Parks & Recreation Department

The Parks and Recreation Department is responsible for planning and administering all City recreation programs and activities, which include but are not limited to:

- Participating in the evaluation of facility needs
- Cooperating in the planning and scheduling of the City's Capital Improvement Program
- Administering recreation program registration
- Producing the Recreation Brochure
- Administering City facilities including Crown Valley Community Center and Sea Country Senior and Community Center
- Supporting the City Council, Parks and Recreation Commission, Senior Citizens Committee, and Youth Committee

Public Safety Department

- *Fire and Emergency Medical Services-* The City partners with the Orange County Fire Authority (OCFA) for fire and emergency medical services. OCFA provides comprehensive emergency services to residents through a regional approach. Three fire stations are located within City limits. OCFA is an "all risk" emergency response provider. While medical and fire emergencies are their primary response, they also respond to a wide range of other emergency incidents including hazardous materials response, floods, water rescues, earthquakes, bomb threats, terrorism and more. OCFA is also proactive in preventing emergencies. The Community Risk Reduction section works to assess fire and life safety risks and create education and prevention programs to reduce the chances of bad things happening. They want to ensure that all who work, live, and play in our communities recognize and actively participate in their safety.
- *Police Services-* Police Services are provided by contract with the Orange County Sheriff's Department (OCSD). The Sheriff's Department protects the citizens, enforces the laws, and encourages crime prevention. Law enforcement services include patrol, traffic enforcement, accident analysis and investigation, parking enforcement, and general and special investigations. The Chief of Police Services is the Department Head and is responsible for the day-to-day operations in the City.
- *Emergency Management Services-* The City's Emergency Management Services is overseen by an Emergency Management Coordinator. The Emergency Management Coordinator is a City employee but works under the Chief of Police. The role of Emergency Management Coordinator to ensure the City is prepared for impacts from

threats and hazards. In this capacity, the coordinator is responsible for maintaining the Emergency Operations Plan (EOP) and the Local Hazard Mitigation Plan (LHMP). They also assist with the Continuity of Government Plan and Continuity of Operations Plan (COG/COOP).

Public Works Department

Public Works is responsible for maintaining and improving all publicly owned streets, storm drains, traffic signals, traffic control devices, parks, median islands, City-owned slopes, and facilities. The Department also manages the solid waste and recycling programs as well as the Storm Water Program.

4.1.2 CONTRACTS AND CONTRACTORS

The City of Laguna Niguel is able to enter into contracts and hire contractors. The City relies on contracts for essential services, such as the provision of potable water, collection of wastewater, fire protection, public safety, and legal advice and representation. It relies on contracts for consulting services for engineering, special studies, special reports, technical review services and the development of plans. It also contracts for construction and maintenance of City facilities. The City can also hire contract employees for additional help and short-term projects.

4.1.3 VOLUNTEER WORKERS

The City of Laguna Niguel has the ability to leverage volunteer workers. A volunteer worker generally means anyone who agrees to work for free, California labor laws narrow in on a more specific definition of a volunteer. According to California Labor Code Section 1720.4, which defines volunteering in California labor law, an individual must perform services freely and without coercion for a civic, humanitarian or charitable purpose to be considered a volunteer. To legally volunteer, an individual must offer her services to a public agency or nonprofit organization. Businesses may not legally utilize volunteers.

California labor law permits the extension of workers' compensation to volunteers during their time in service. Workers' compensation is a type of insurance that covers employees in the event of industrial accidents or occupational injury. Often, public agencies will grant volunteers insurance protection under workers' compensation to help encourage volunteering and avoid the potential for lawsuits. In order to be deemed an employee for workers' compensation, the organization -- whether public or private -- usually must declare a volunteer as such prior to an injury incident. Under the law, this declaration should be in writing through a resolution of the governing body of the organization or agency, such as its board of directors.

Unpaid internships are another volunteer opportunity the City can leverage, however, some criteria must be met. California Labor Relations Department has provided some clarification regarding unpaid internships. Unpaid internships are a type of volunteering that is intended to provide educational opportunities -- and in some cases, school credit -- for volunteers. As of April 2010, the California Labor Relations Department applies six criteria based on federal law when determining the legality of an unpaid internship: 1) the experience must resemble those of vocational schools, 2) the experience is primarily for the benefit of the intern, 3) the intern does not displace a regular employee, 4) the intern's services provide no immediate advantage to the

employer, 5) the intern is not entitled to a job at the end of their internship, and 6) both the employer and intern have a mutual understanding that no compensation is expected for the internship.

4.1.4 MUTUAL AID SUPPORT

The City of Laguna Niguel has several mutual aid agreements, most focused on emergency management. An emergency management mutual aid agreement defines and formalizes the arrangement to lend assistance across jurisdictional boundaries in situations that exhaust internal resources or there is a need for increased capabilities. Some of the City of Laguna Niguel mutual aid agreements are with the state of California. This enables the state to either request or fulfill requests for mutual aid from one region to another; enabling locals to maintain readiness in their region.

4.1.5 PARTNERSHIPS

The City of Laguna Niguel has the ability to enter into partnerships with surrounding cities and counties, and outside agencies, special districts, and companies. Partnerships are an arrangement where parties agree to cooperate to advance their mutual interests. In most cases partnerships are done through a Memorandum of Understanding (MOU) outlining the scope of work, the mission, and roles and responsibilities. The City may also enter into agreements to provide services in partnership with other governmental agencies through a Joint Powers Authority.

4.2 Mitigation Governance Resources

There are a variety of governance directly related to or influence mitigation efforts within the City. This governance generally falls under: 1) Laws, Regulations, Codes, and Ordinances; 2) Plans, Studies, and Reports; and, 3) Programs and Policies. As mentioned, because the City of Laguna Niguel wanted a comprehensive LHMP, it emphasized the review and consideration of governance both within and outside of its jurisdiction. While the intent is to capture City-level information, there are other relevant governmental documents (state, county, surrounding city) that have direct (or indirect) implications on the City. This governance was collected because it contained information on various vital topics and provided and/or augmented information for several sections of the City of Laguna Niguel LHMP (i.e., Community Profile, Hazard Profile, Capabilities Assessment, Risk Assessment, Mitigation Strategy, and Plan Maintenance). While the City of Laguna Niguel does have some influence with other Mitigation Governance Resources, it only has the ability to create, revise, and remove governance under its authority. Departments within the City of Laguna Niguel regularly review governance and make recommendations for any necessary changes (i.e., expansion, revision, creation, elimination). This assessment of the City governance was also conducted as part of this process (see Section 7.3). This governance includes:

4.2.1 LAWS, REGULATIONS, CODES, ORDINANCES

- Code of Federal Regulations (CFR)- The Code of Federal Regulations (CFR) is the codification of the general and permanent regulations published in the Federal Register

by the executive departments and agencies of the federal government of the United States. CFR provides the rules and regulations for the Stafford Act which includes the FEMA Response, Recovery, and Mitigation programs.

- California Emergency Services Act- The California Emergency Services Act is the guiding policy document of the State of California to ensure the state is prepared to deal with threats and hazards. The document establishes authorities and presents the organizational structure (and system) to ensure the state is coordinated between its political subdivisions (Standardized Emergency Management System- SEMS). This act also establishes the California Disaster Assistance Act- CDAA.
- California Building Code- California Building Code 2019 Edition, California Residential Code 2019 Edition, Energy Code- California Energy Code 2019 Edition and California Green Building Standards Code 2019 Edition, California Historical Building Code 2019 Edition, California existing Building Code 2019 Edition, adopted and amended by on November 5, 2019
- California Plumbing Code- CPC 2019 Edition, adopted and amended by Ordinance No. 19-007 on November 5, 2019
- California Mechanical Code- California Mechanical Code 2019 Edition, adopted and amended by Ordinance No. 19-008 on November 5, 2019
- California Electrical Code- California Electrical Code 2019 Edition, adopted and amended by Ordinance No. 19-009 on November 5, 2019
- California Fire Code- California Fire Code 2019 Edition, adopted and amended by Ordinance No. 19-010 on November 5, 2019
- Laguna Niguel Zoning Code- The zoning code is intended to guide the development of the city in an orderly manner, implement the policies of the general plan, protect and enhance the quality of the natural and built environment, promote the public health, safety and general welfare by regulating the use of land and buildings and the location and basic form of structures, and provide the physical, environmental, economic, and social advantages that result from the orderly planned use of land resources.
- Public Works Standards- Also known as the “Green Books”, these standards are similar to Building Code standards but are focused on non-building elements (i.e., streets, street lights, sidewalks, gutters, pavements, medians, drainage)
- Senate Bill (SB) 379- In 2017, the California State Senate approved Senate Bill (SB) 379 which requires the General Plan’s Safety Element to address climate adaptation and resilience strategies. This must be done after the next revision to the Local Hazard Mitigation Plan (LHMP) or by January 2022 in the city/county does not have a LHMP. If the jurisdiction has an approved and adopted LHMP it shall be summarized and incorporated by reference into the Safety Element.
- Assembly Bill (SB) 477- In 2019, the California State Assembly approved Assembly Bill (AB) 477. AB 477 requires local jurisdictions (cities/counties) to include representatives from the access and functional needs population in the next update of the Emergency Plan. The primary focus areas include, but are not limited to emergency communications, emergency evacuations, and emergency sheltering.
- Assembly Bill (AB) 2140- In 2006, the California State Assembly approved Assembly Bill (AB) 2140. AB 2140 enables the state of California to provide greater than 75% of the

eligible state share if a local jurisdiction (city/county) has an approved and adopted LHMP as part of the General Plan's Safety Element.

4.2.2 PLANS, REPORTS, STUDIES

- Laguna Niguel General Plan- California law requires each City and County to adopt a comprehensive long-term general plan for its physical development. A City's General Plan is its blueprint for the future and through appropriate goals, policies, and programs, it serves as a decision-making tool to guide future growth and development.
- Laguna Niguel Strategic Plan- In 2019, the Laguna Niguel City Council adopted its first-ever Strategic Plan. Developing Laguna Niguel's first-ever Strategic Plan marks a major milestone for the community as a whole. The City initiated its strategic planning process to set goals and priorities for its future. Through the strategic planning process, the City has been able to create a blueprint for the future and develop a plan to accomplish its determined direction
- Laguna Niguel Emergency Operations Plan- The City's plan to capture preparedness efforts to ensure the City can respond to hazards. While not the current focus, the Emergency Operations Plan (EOP) may include actions to assist with recovery, mitigation, prevention, and protection.
- Laguna Niguel Annual Comprehensive Financial Report- The City's basic financial statements consist of three components: 1) government-wide financial statements, 2 fund financial statements, and 3) notes to the basic financial statements.
- Gateway Specific Plan- 2011, the Laguna Niguel City Council adopted a comprehensive update to the Laguna Niguel Gateway Specific Plan to provide for up to 2,994 residential units and 2.26 million square feet of retail, office, entertainment, hotel and other non-residential uses resulting in 28% fewer average daily trips than would have been generated under the previously approved 1999 Gateway Specific Plan. It allows existing businesses to remain but will serve as a guide for the private market to attract and develop new land uses that will gradually transition the Gateway area into an attractive and desirable transit and pedestrian-oriented urban village where people live, work, shop, are entertained and recreate.
- Laguna Niguel Water Quality Local Implementation Plan- This document constitutes the City of Laguna Niguel's Local Implementation Plan (LIP) prepared as part of a compliance program pursuant to the California Regional Water Quality Control Board, San Diego Region This plan describes the activities that the City is undertaking to meet the requirements and to protect and improve the quality of the creeks, streams and coastal waters within the urban areas of...the South Orange County Watershed Management Area (WMA) to which the city contributes runoff.
- Laguna Niguel Park and Recreation Master Plan- Provides a guide for the continued orderly development and/or management of park, recreation, and trails facilities in Laguna Niguel.
- Federal Building Specific Plan- The Chet Holifield Federal Building, also known as the "Ziggurat," is a seven-story, 1,053,233 square-foot (gross) office building situated on 89 acres in the heart of Laguna Niguel. The property includes 4,777 parking spaces, services support and security buildings, recreational and landscaped area, and non-contiguous utility parcels including a water reservoir building, cooling tower, and thermal energy storage tank. It is also the site of a large 3,840-cell photovoltaic system that

produces 914 kilowatts of electricity annually to support building operations. The federal government is transitioning the employees and the functions of this to another location and future use of the property will be captured in the specific plan.

- *Town Center Area Specific Plan*- Approximately 25 acres in area, is owned by the County of Orange. the general vision of the Laguna Niguel City Center Mixed Use Project is to create a “downtown” environment that features specialty retail, restaurants, office, community-oriented event/programmable spaces, integrated residential apartment homes, a new community library, and extensive walkable open spaces, paseos, and plazas. The proposal includes approximately 175,000 square feet of commercial and civic uses and 275 multifamily residential units. The commercial component would include approximately 158,600 square feet of commercial space with a wide range of uses, such as restaurants, retail shops, health/wellness-focused retail and medical office, and creative office space. The civic space is comprised of a new and larger county library (approximately 16,300 square feet with over 2,600 square feet of additional outdoor programmable space), which would replace the existing library (approximately 14,400 square feet with limited outdoor space). The residential component of the proposed project would consist of two separate apartment buildings, one 200-unit apartment building and one 75-unit apartment building.

4.2.3 PROGRAMS AND POLICIES

- *Laguna Niguel City Council Policies and Procedures*- been established by the City Council, City Manager, and Department Directors to promote organizational efficiencies and consistency in the delivery of City programs and services. These policies and procedures cover a broad range of topics from those established by the City Council, to general administration, to specific department operations.
- *Laguna Niguel Ordinance 2019-202*- Adopting and incorporating the Cal Fire Very High Fire Severity Zone and designating them into the City of Laguna Niguel.
- *Vegetation Management Maintenance Guidelines*- This guideline provided by the Orange County Fire Authority, is intended to assist property owners with vegetation-covered land within 100 feet from a structure residing in a wild/and-risk area.
- *Weed Abatement Program*- A City run program that conducts an annual inspection and conducts random inspection throughout year through its code enforcement unit. Because Orange County Fire Authority (OCFA) takes the lead in High Fire Severity Zones, the City focuses primarily on other areas within the City.
- *Water Quality Inspection Program*- A City run program that conducts an annual inspection of waterways. The responsibility is divided with the Community Development focusing on private property and Public Works focusing on public property.
- *FEMA Flood Insurance Rate Maps (FIRM)*- While not a participating member of the National Flood Insurance Program (NFIP), the City of Laguna Niguel references and utilizes the flood maps produced for the program.
- *Concierge Services Program*- A City policy focused on assisting residences through various City requirements (i.e., planning, engineering, development)
- *Business Simplified Action For Emergencies*- An emergency preparedness program implemented by the City of Laguna Niguel Police Services, in conjunction with the American Red Cross and Sheriff's Emergency Management to prepare local businesses for a disaster. The Business Simplified Action For Emergencies (B.S.A.F.E.) offers a 10-

step approach to business emergency preparedness. There is no cost to participate in B.S.A.F.E. and City Emergency Services personnel are available to make presentations to businesses, commercial and residential property management.

- Community Emergency Preparedness Academy- A free training course, utilizing the Community Emergency Response Team (CERT) training curriculum, offered to the public to educate them on Fire Safety, Disaster First Aid, Light Search and Rescue, and Earthquake Preparedness.
- Ready Laguna Niguel- Is a series of integrated programs that draws upon the Ready Orange County campaign to prepare citizens for emergencies. The program offers educational presentations, creation of special needs groups, and establishment of volunteer groups.

4.3 Technical Resources

As with Mitigation Governance Resources, the City of Laguna Niguel has the ability (and regularly assesses) its Technical Resources to identify needs, determine necessary resources, and recommend necessary actions in support of mitigation efforts. The Technical Resources are usually connected to the City's ability to augment or resign personnel outlined under Section 4.1 or to allocate or raise funding outlined under Section 4.4 but can also include the expanding and/or revising the use of proficiencies/expertise, technology, and communication technologies; including outreach programs and social media platforms to assist with mitigation efforts.

4.3.1 PROFICIENCIES AND EXPERTISE

The City of Laguna Niguel has many proficiencies and expertise that can be leveraged in support of mitigation efforts. In addition to public safety and fire suppression capabilities, the City has access to staff with skills in Engineering/Construction, Planning, Environment, Project/Grant Management, Economic Development, Debris Removal, and Water resources.

4.3.2 TECHNOLOGY

As with many jurisdictions, the City of Laguna Niguel has been increasing its technology capabilities. This includes providing secure platforms to store and access information, means of ensuring continuity of government, and general technical support. A significant capability available to support mitigation efforts is the establishment of the Geographic Information Systems (GIS) group. GIS is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. By relating seemingly unrelated data, GIS can help individuals and organizations better understand spatial patterns and relationships. The GIS group is able to analyze and generate reports of critical data (land use, built environment, natural environment), able to demonstrate potential ramifications of actions or events, and generate graphic representation of results.

4.3.3 COMMUNICATIONS

The City of Laguna Niguel has several platforms to communicate with staff, jurisdictions, and the general public. In addition to the traditional methods (telephone/cell phones, emails), the City also utilizes radio and satellite communications. In addition to the above 2-way

communications platforms, there are several 1-way communications platforms (also known as push communications) that can be used. These consist of television, mobile applications, website, and social media (Facebook, X- *formerly Twitter*, Instagram, Nextdoor).

The Auxiliary Communications Services (ACS) is an outgrowth of many volunteer communications programs, including the Radio Amateur Civil Emergency Service (RACES), the American Radio Relay League's Amateur Radio Emergency Services (ARES) program and other civilian and government programs. ACS is a part of the overall State of California Office of Emergency Services program for public safety. The ACS unit consists of Federal Communications Commission (FCC) licensed men and women ham radio operators who donate their time and talent to serve the public during emergencies and disasters. The ACS volunteers have the same training and responsibility as agency employees and are designated as "Disaster Services Workers" by the State of California. The ACS is a fully integrated part of the sponsoring government agency and can be activated by the Laguna Niguel Chief of Police services to assist in the event of a disaster or emergency. ACS utilizes the 400 MHZ Band.

In addition, to the above-mentioned communications platforms, the City also has access to other communication platforms offered through the State of California (i.e., OASIS) or the County of Orange (i.e., OC Alert, Nixel, Everbridge). The City can request the State and/or the County to disseminate messages on their behalf.

4.4 Financial Resources

This sub section demonstrates the City's fiscal resources that may be leveraged to support mitigation efforts. This is generally done by understanding revenue streams and planned expenditures. This will provide insight as to how to obtain additional funds (Section 4.4.2.3) or how funds can be reallocated. The City's three major funds are the General Fund, the Miscellaneous Grants Fund, and the City Capital Projects Fund. The following information is from the City of Laguna Niguel Annual Comprehensive Financial Report (2021).

4.4.1 GENERAL FUND

Governmental funds focus on near-term inflows and outflows of spendable resources, as well as on balances of spendable resources available at the end of the fiscal year. The City has nine governmental funds for financial reporting purposes, of which three are considered major funds for presentation purposes. Each major fund is presented separately in the governmental funds balance sheet and in the governmental funds statement of revenues, expenditures, and changes in fund balances.

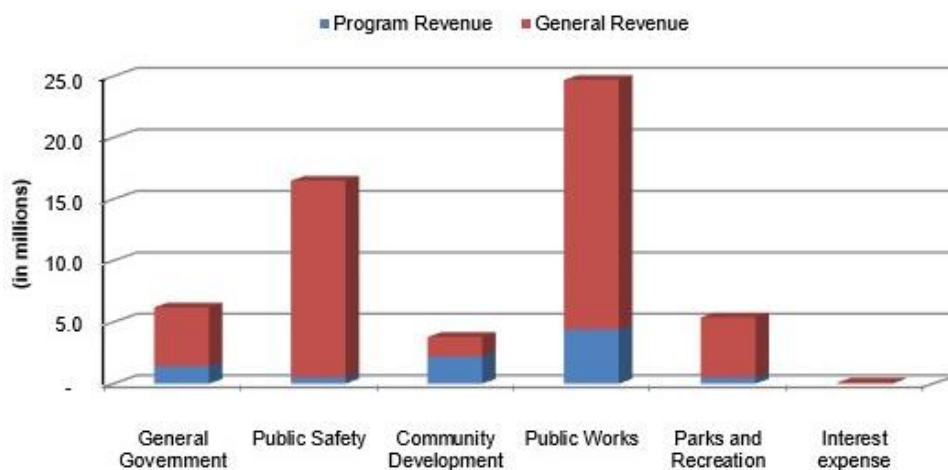
The City's three major funds are its General Fund, City Capital Projects Fund, and Miscellaneous Grants Fund. Data from the non-major governmental funds (e.g., Gas Tax Fund, Air Quality Improvement Fund, Law Enforcement Fund, Community Development Block Grant Fund, etc.) are combined into a single, aggregated presentation. The governmental funds financial statements can be found on pages behind the tab section titled Fund Financial Statements. Individual fund data for each of these non-major governmental funds is provided in the form of combining statements on pages behind the tab section titled Supplementary Schedules.

The City adopts an annual appropriated budget for all governmental funds. A budgetary comparison schedule has been provided for each of the funds to demonstrate compliance with this budget.

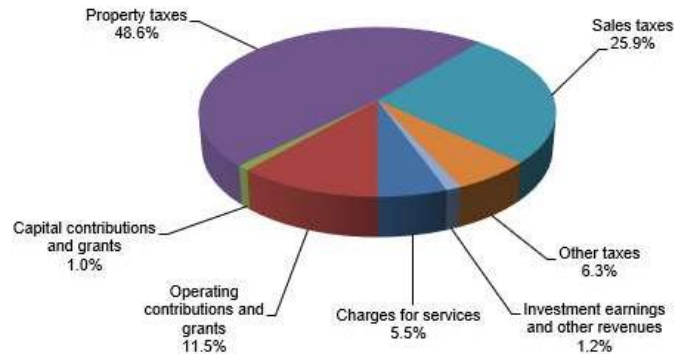
The City's total revenues were \$50.7 million in FY 2020-2021, while the total cost of all programs was \$56.7 million. Total revenues increased by \$1.8 million, or 3.6%, from prior year levels and total expenses also increased by \$1.4 million. FY 2020-2021 program revenue increased \$1.0 million from the prior year and general revenue increased \$0.8 million from the prior year. The \$0.8 million increase is primarily attributable to an increase in property tax revenue based on the continued strength of the housing market. Better than anticipated sales tax revenue also helped bolster general revenues.

The cost of all governmental activities this year was \$56.7 million. However, as shown in the Statement of Activities, the amount that our taxpayers ultimately financed for these activities through City taxes was \$47.6 million since some of the cost was paid by those who directly benefited from the programs (\$2.8 million) or by other governments and organizations that subsidized certain programs with contributions and grants (\$6.2 million). The following chart (**Figure 4.2**) graphically depicts the amount of general revenue used in relation to program revenue in funding governmental activities.

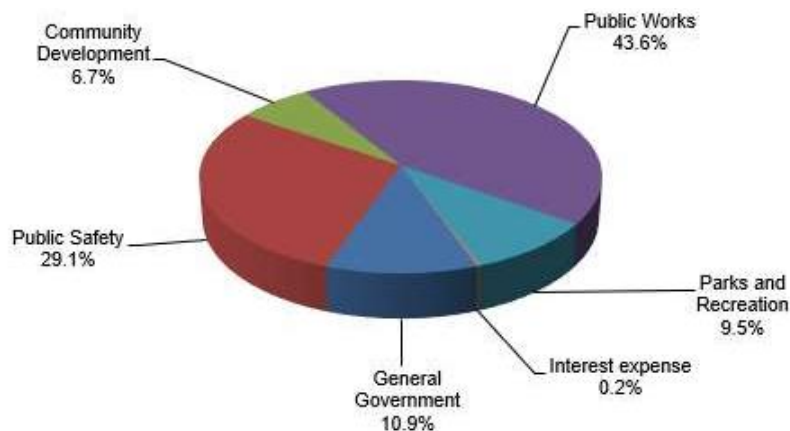
Figure 4.2- Funding of Governmental Activities



Approximately 80.9% of all revenues this past year came from some form of tax, which is slightly lower than the 81.2% of total revenues in FY 2019-2020. Tax revenues continued to increase (\$2.2 million), while the interest earnings decreased accounting for the change in proportional total revenues. Property tax revenue, the City's largest revenue source, accounted for 48.6% of total City revenue, compared to 49.5% last year. Sales tax revenue was the second largest revenue source at 25.9% of total revenues, up from 25.6% last year. The following chart (**Figure 4.3**) graphically depicts the City's governmental revenue sources.

Figure 4.3- Governmental Activities – Revenues by Sources

The Public Works function represents the largest activity in the City, accounting for 43.6% of total expenses in FY 2020-2021, compared to 37.8% last year. Public works expenses include all street maintenance, sweeping, and lighting; median, park, and slope maintenance; storm drain/water quality maintenance; Metrolink station maintenance and City Hall maintenance. The increase in Public Works expenses in relation to all governmental activities is primarily due to an increase in Parks and Recreation expenses. The Parks and Recreation function accounted for 9.5% of total expenses in FY 2020-2021, compared to 15.6% in the prior year. Public safety activities comprise the City's second largest function at 29.1%, and include police services, animal control, and emergency preparedness. Most of the public safety costs are for police services provided by the Orange County Sheriff, which were approximately \$15.2 million in FY 2020-2021. The following chart (**Figure 4.4**) graphically depicts the City's governmental expenses by function.

Figure 4.4- Governmental Activities – Expenses by Function

4.4.2 MISCELLANEOUS FUNDS

This fund accounts for revenues and expenditures made for various City projects with funding provided by Federal and State grants. For FY 2020-2021, this fund has been classified as major due to the funds received from the Federal government's American Rescue Plan Act (ARPA). At the end of the current fiscal year, total assets were \$4.7 million and total liabilities were \$4.7

million. The first tranche of ARPA funds was received in May 2021 and is classified as unearned revenue because the City had not spent any of the funds by fiscal year end June 30, 2021.

4.4.2.1 City Capital Projects Fund

This fund accounts for all expenditures relating to City capital projects. Revenues and transfers into the fund generally equal actual expenditures on capital projects; therefore, this fund usually reflects minimal fund balance at the end of the year. Total expenditures were \$4.9 million and subsequent transfers into the fund were also \$4.9 million for the current fiscal year, a decrease in expenditures of \$17.2 million from the previous fiscal year. This decrease is due to the completion of construction of the Crown Valley Community Center in FY 2020-2021.

4.4.2.2 Propriety Fund

The sole proprietary fund used by the City is an internal service fund. Internal service funds are an accounting device used to accumulate and allocate costs internally among the City's various functions. The City uses an internal service fund to account for its fleet of vehicles.

4.5 Ability to Expand On and Improve Capability Resources

As presented through each Capability Resource section above, the City has the ability to expand on and improve Capability Resources. The subsections below provide a summary of those actions.

4.5.1 PERSONNEL RESOURCES

There are four (4) primary ways the City can expand and/or improve personnel resources: deployment or reassignment of the City of Laguna Niguel government (City) workforce, through Contractor Employees, through Volunteer Workers; Mutual Aid Support; and, Partnerships. Depending on the needs of the project and/or action, the City can bring in additional staff to support mitigation efforts. This could include bringing in a project manager or support staff to implement a project or program or to help with public outreach. The City could also establish MOUs for mutual aid and/or partnership to provide a unique service or support City staff. The City also has very active volunteer groups that can be utilized for select roles and responsibilities.

4.5.2 MITIGATION GOVERNANCE RESOURCES

While the City of Laguna Niguel does have some influence with other Mitigation Governance Resources, it only has the ability to create, revise, and remove governance under its authority. Departments within the City of Laguna Niguel regularly review governance and make recommendations for any necessary changes (i.e., expansion, revision, creation, elimination). Some actions that the City could take include reviewing and revising its Weed Abatement Program and reviewing/revising Building Codes based on Lessons Learned after disasters in its or surrounding/similar communities.

4.5.3 TECHNICAL RESOURCES

As stated above, the City of Laguna Niguel has the ability (and regularly assesses) its Technical Resources to identify needs, determine necessary resources, and recommend necessary actions in support of efforts. The Technical Resources are usually connected to the City's ability to augment or resign personnel outlined under Section 4.1 or to allocate or raise funding outlined under Section 4.4 but can also include the expanding and/or revising the use of proficiencies/expertise, technology, and communication technologies; including outreach programs and social media platforms to assist with mitigation efforts. Actions could include increasing educational programs to bring hazard awareness to students and vulnerable populations, developing and offering traveling hazard awareness campaigns at street fairs and farmers markets, or utilizing its social media platforms to disseminate or expand on the amount of hazard and mitigation information shared with the public.

4.5.4 FINANCIAL RESOURCES

The City has historically maintained and will continue to maintain a strong General Fund with which to address projects. The City has a very robust Capital Improvement Program which regularly includes mitigation measures. The City also has several options it can explore if it decides not to utilize General Fund dollar to implement additional emergency management efforts and/or mitigation measures. The options to augment the General Fund include: Grants, Bonds, Loans, and Assessments. The method most likely utilized will be applying for grants. Because the City is committed to mitigation, it intends to seek grant funding opportunities to assist with implementation of mitigation efforts. The City will use its standard procedures for applying for grants, which includes seeking City Council approval. The grants could be used for implementation of projects and/or to pay for staff to assist with the mitigation effort. The other funding options, while available, will only be used after careful consideration and deliberation. In some instances, this may also include seeking public approval.

5 HAZARD ASSESSMENT

The purpose of this section is to capture the approach used by the City of Laguna Niguel to identify and prioritize (screen) threats and hazards in its community. This is an important step to ensure all potential threats and hazards are considered and relevant threats and hazards ranked as the greatest concern within the community.

This section also presents relevant information (profiles) on each hazard in the community. The “*Hazard Profiles*” provide a description of the hazard, the location and/or extent of the hazard within the community, the history of the hazard within the community, the probability of the hazard occurring in the community, and a discussion of any considerations needed due to changing conditions (i.e., climate). This information was referenced when prioritizing threats and hazards.

5.1 Hazard Identification

The Planning Team went through an extensive effort to identify all of the threats and hazards present in the community. The Planning Team started with the list of threats and hazards in the City of Laguna Niguel 2005 LHMP and revised the list as necessary. Revising the list included both adding and removing threats and hazards to create a list of all potential threats and hazards in the community. The Planning Team utilized several external resources to ensure they were considering all potential threats and hazards. These resources included the State of California HMP (2018), the Orange County Operational Area LHMP (2021), and several other surrounding community LHMPs (i.e., Dana Point, Laguna Beach, Mission Viejo). This helped the Planning Team understand statewide, countywide, and surrounding area hazard concerns. Each hazard identified in the external resources was reviewed and considered by the Planning Team. After careful review and consideration, the Planning Team identified the following threats and hazards for inclusion in the LHMP:

- Civil Disturbance
- Dam Failure
- Drought
- Earthquake
- Energy Disruption
- Extreme Temperatures
- Flood
- Infectious Disease
- Landslide
- Radiological Accident
- Technology Disruption
- Terrorism
- Transportation Accident
- Wildfire
- Windstorm

As a note, no threats and hazards from the City of Laguna Niguel 2005 LHMP were removed, however, the Planning Team added new threats and hazards: civil disturbance, dam failure,

drought, energy disruption, extreme temperatures, infectious disease, radiological accident, technology disruption, terrorism, and transportation accident. The Planning Team did revise the description of the windstorm/serve weather hazard. This led to separating the windstorm hazard and ensuring the severe weather hazard was included in the Flood hazard. The changes to the threats and hazards are captured under sub section 5.4- Hazard Profiles.

5.1 Hazard Screening and Prioritization

After the list of threats and hazards was identified, the Planning Team went through a process to prioritize (screened) the threats and hazards to determine which created the greatest concern in the community. The Planning Team utilized a non-numerical ranking system that was implemented within other LHMP. This process consists of generating a qualitative ranking, High, Medium, or Low rating for: 1) *Probability*; and, 2) *Impact* from each hazard. As part of this process, the following criteria (definitions) were applied:

- **Probability**

High: (Highly Likely/Likely) An event will most likely happen within five (5) years. There may or may not have been historic occurrences of the hazard in the community or region, but experts feel that it is likely that the hazard will occur in the community. Citizens feel that there is a likelihood of occurrence.

Medium: (Possible) An event may happen within five (5) years. There may or may not have been a historic occurrence of the hazard in the community or region, but experts feel that it is possible that the hazard could occur in the community. Citizens may feel that there is a likelihood of occurrence.

Low: (Unlikely) An event will most likely not happen within five (5) years. There have been no historical occurrences of the hazard in the community or region and both experts and citizens agree that it is highly unlikely that the hazard will occur in the community.

- **Impact**

High: (Catastrophic/Critical) Both experts and citizens feel that the consequences will be significant in terms of building damage, loss of life, and disruption to the economy; widespread geographic extent and/or higher than average magnitude.

Medium: (Limited, but not insignificant) Consequences are thought to be considerable in terms of building damage, loss of life, and disruption to the economy; extended geographic extent and/or average magnitude.

Low: (Negligible) Consequences are thought to be minimal in terms of building damage, loss of life, and disruption to the economy; may be limited in geographic extent and/or lower than average magnitude.

After each hazard was ranked using the above criteria, the results were displayed in a graph to assist the Planning Team validate the results (**Figure 5.1**). The Planning Team determined all threats and hazards falling within the orange-colored boxes were Tier I priority threats and

hazards, those within the blue-colored boxes were Tier II priority threats and hazards, and those within the gray-colored boxes were Tier III priority threats and hazards. The higher priority threats and hazards (Tier I and Tier II), reflect those threats and hazards the Planning Team determined the community should focus on over the next five (5) years. This does not mean that the community will not address the lower priority threats and hazards. It means if resources are limited (i.e., funding, staffing), the primary focus will be on the higher priority threats and hazards.

Figure 5.1- Hazard Prioritization Matrix

		Impact		
		High	Medium	Low
Probability	High	Wildfire	Infectious Disease	Drought Windstorm
	Medium	Earthquake	Flooding Landslide	Civil Disturbance Dam Failure Extreme Temperatures
	Low		Energy Distribution Radiological Accident Technology Disruption Terrorism Transportation Accident	

5.2 Threat and Hazard Profiles

The Threat and Hazard Profiles include the incorporation of all new information, material, and reports to better help the Planning Team and the community understand the hazard. The threats and hazards are organized alphabetically within the priority screening ranking (i.e., Tier I, Tier II, and Tier III). The threats and hazards assessed by the Planning Team are summarized below:

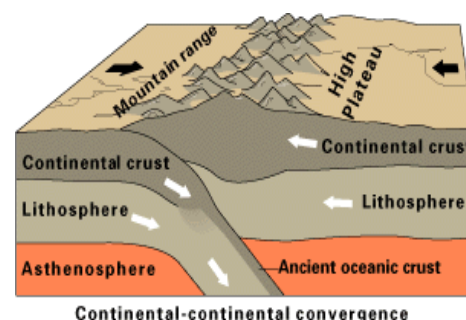
5.2.1 TIER I THREATS AND HAZARDS

The threats and hazards, in alphabetical order, under Tier I include: Earthquake; Infectious Disease; and Wildfire.

5.2.1.1 Earthquake

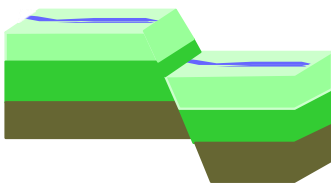
- **Ranking-** *Probability-* MEDIUM; *Impact-* HIGH
- **Description**

An earthquake is caused by a release of strain within or along the edge of the Earth's tectonic plates, producing surface fault rupture, ground motion, and secondary hazards such as ground failure. For millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the

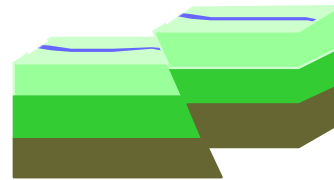


movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates. The severity of the shaking increases with the amount of energy released, decreases with distance from the causative fault or epicenter, and is amplified by soft soils. After just a few seconds, earthquakes can cause massive damage and extensive casualties.

A fault is a fracture between blocks of the earth's crust where one side moves relative to the other along a parallel plane to the fracture. There are three (3) different types of earthquake faults: 1) Normal, 2) Thrust, and 3) Strike-slip. Normal and Thrust faults are examples of dip-slip faults. Dip-slip faults are slanted fractures where the blocks mostly shift vertically. If the earth above an inclined fault moves down, the fault is called a normal fault, but when the rock above the fault moves up, the fault is called a reverse (or thrust) fault. Thrust faults have a reverse fault with a dip of 45° or less.



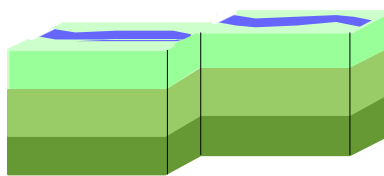
Normal Fault



Thrust Fault

Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observer's perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the shift is called a left lateral fault.

Strike-slip Fault



Ground shaking and ground deformation are the specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, magnitude, and the type of earthquake. Below is an overview of the hazards associated with earthquakes:

Ground Shaking - Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, distance from the epicenter (where the earthquake originates), and local soil conditions. Soils and soft sedimentary rocks near the earth's surface can amplify earthquake ground shaking. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of

amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk. Amplification can also occur in areas with deep sediment filled basins and on ridge tops. Peak Ground Acceleration (PGA) is a measure of the strength of ground shaking across the impacted area. Larger PGAs result in greater damage to structures. PGA is often used to depict the risk of damage from future earthquakes by showing earthquake ground motions that have a specified probability (10%, 5% or 2%) of being exceeded in 50 years return period. These values are often used for reference in construction design, and in assessing relative hazards when making economic and safety decisions.

Ground Deformation - consists of three (3) main classifications or types: 1) surface fault rupture, 2) landslides, and 3) liquefaction.

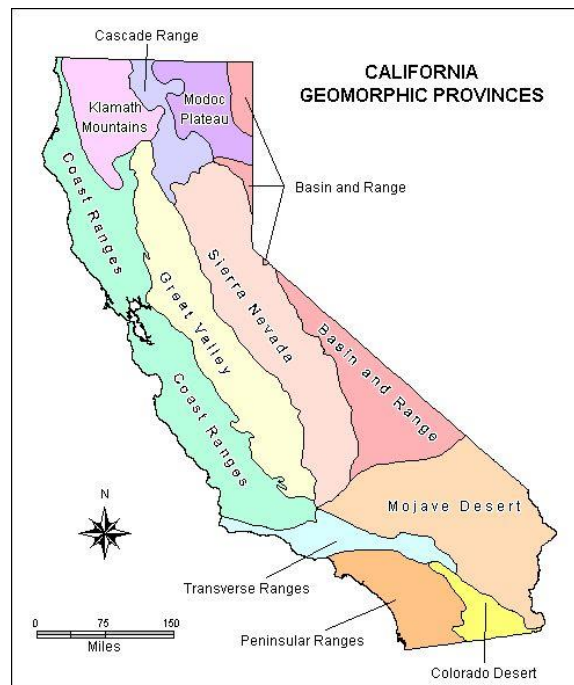
Surface Fault Rupture - As previously mentioned, the sudden sliding of part of the earth's crust releases the vast store of elastic energy in the rocks as an earthquake. The resulting fracture is known as a fault, while the sliding movement of earth on either side of a fault is called fault rupture. Fault rupture generally begins below the ground surface at the earthquake hypocenter, typically between three and ten miles below the ground surface in California. If an earthquake is large enough, the fault rupture will reach the ground surface (referred to as "surface fault rupture"), wreaking havoc on structures built across its path. Structures built across a fault are at risk of significant damage from surface fault rupture. Recent large earthquakes in Turkey and Taiwan have shown that few structures built across the surface traces of rupturing faults can withstand the displacements that may occur during a large earthquake.

Landslides - Earthquake-induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities necessary to respond and recover from an earthquake. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes. (NOTE: while mentioned here, landslides are addressed separately in a later section)

Liquefaction - Liquefaction is the phenomenon that occurs when ground shaking causes loose, saturated, sandy soils to lose strength and act like viscous fluid. Liquefaction results in two types of ground failure: lateral spread and loss of bearing strength. Lateral spreads develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength occurs when the soil supporting structures liquefy, causing the structures to settle, resulting in damage and, in some cases, collapse.

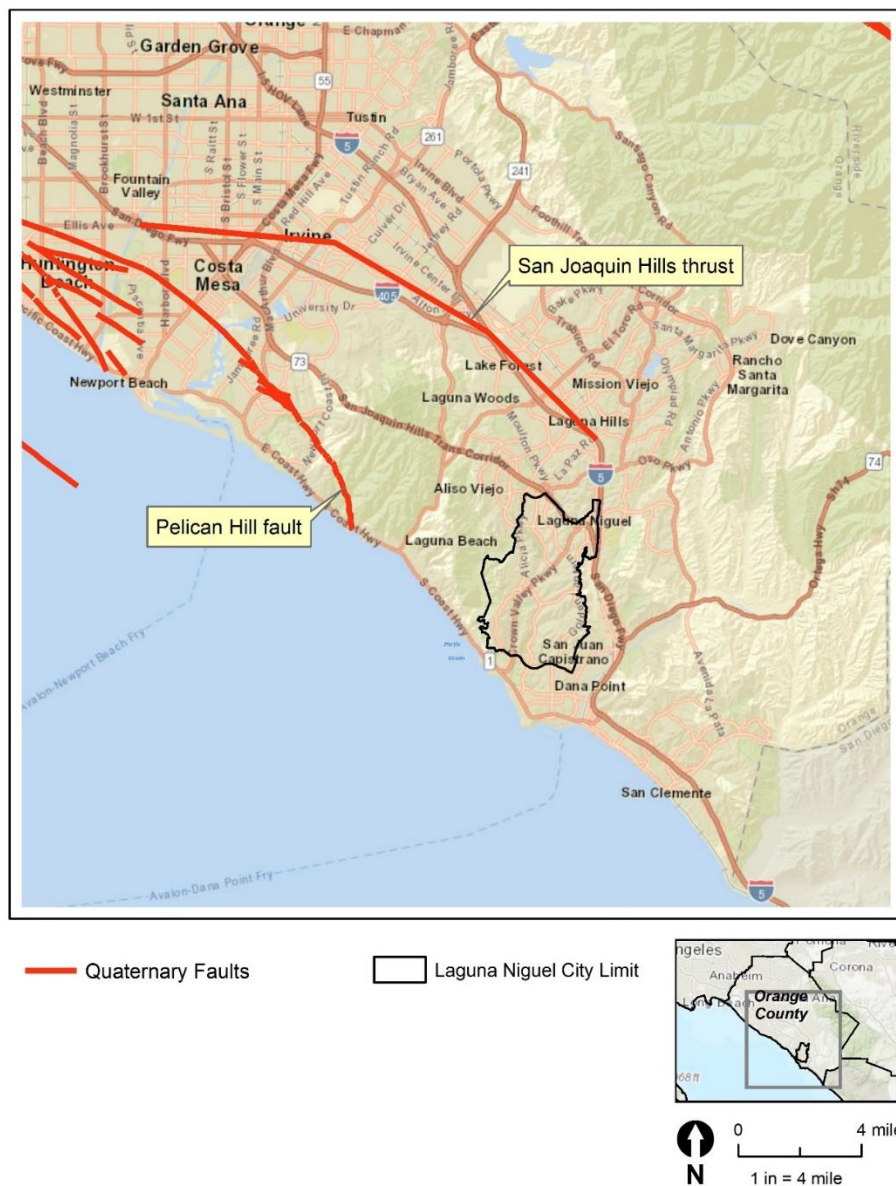
■ Location and Extent

As noted by the California Geological Survey, California is divided into eleven (11) geomorphic provinces. California's geomorphic provinces are naturally defined geologic regions that display a distinct landscape or landform. Each region displays unique, defining features based on geology, faults, topographic relief and climate. These geomorphic provinces are remarkably diverse. They provide spectacular vistas and unique opportunities to learn about the earth's geologic processes and history. These geomorphic provinces each have the potential to create significant earthquakes and associated hazards. Laguna Niguel is located in a high seismic activity zone in the Transverse Range geologic province. The Transverse Ranges are an east-west trending series of steep mountain ranges and valleys. The east-west structure of the Transverse Ranges is oblique to the normal northwest trend of coastal California, hence the name "Transverse." The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz islands. Its eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault. Intense north-south compression is squeezing the Transverse Ranges. As a result, this is one of the most rapidly rising regions on earth. Great thicknesses of Cenozoic petroleum-rich sedimentary rocks have been folded and faulted, making this one of the important oil producing areas in the United States.



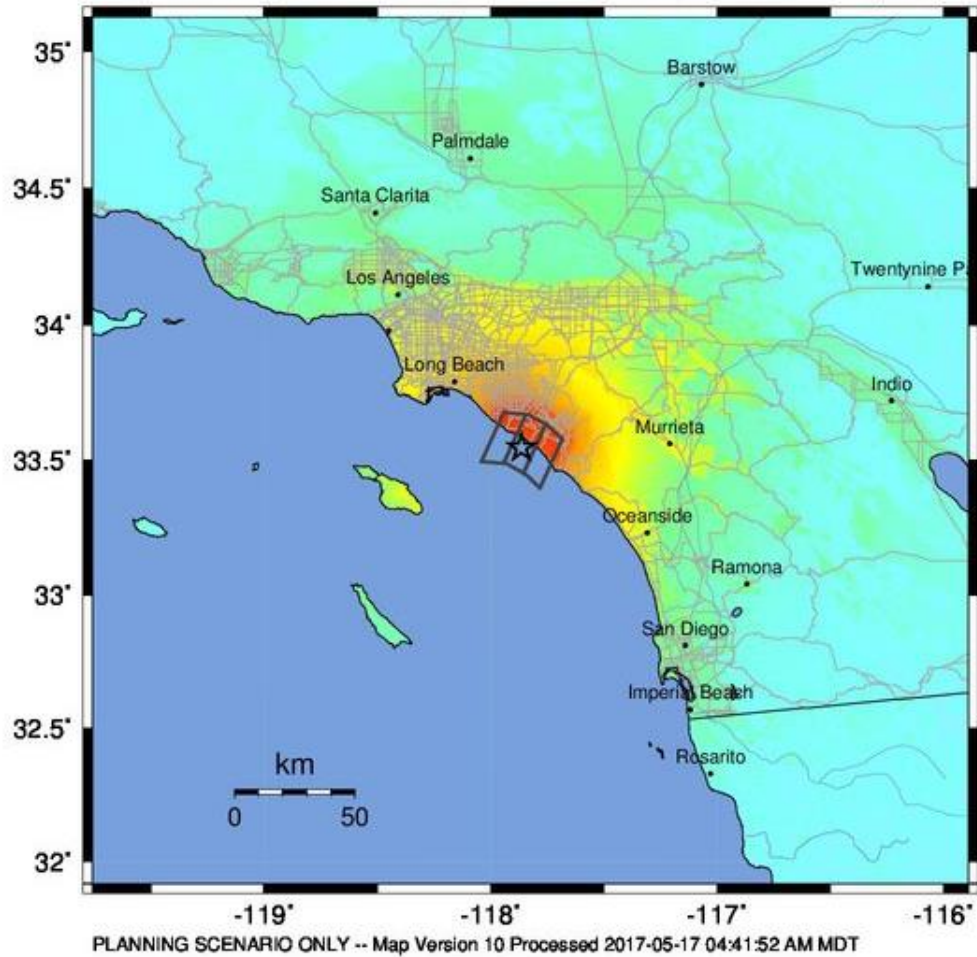
In California, the 1972 Alquist-Priolo Earthquake Fault Zoning Act prohibits the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting. The more significant faults within the region include the San Andreas Fault, the Elsinore Fault, the Newport-Inglewood Fault and the San Joaquin Hills Thrust Fault; these faults and their associated Alquist-Priolo Fault Zones are shown in **Figure 5.2**. In California, movement between the North American and the Pacific tectonic plates manifest primarily along a region known as the San Andreas Fault system. Experts believe the San Andreas Fault is capable of producing an earthquake of magnitude 8.0+ over the next few years. The San Andreas Fault is considered the "*Master Fault*" because it has frequent (geologically speaking), large earthquakes, and it controls the seismic hazard in southern California. Faults in the San Andreas Fault zone that passes through Southern California are part of the very active southern segment.

Figure 5.2- Earthquake Faults and Alquist-Priolo Fault Zones in the Vicinity of Laguna Niguel



As previously mentioned, hazards associated with earthquakes include ground shaking and ground deformation (i.e., surface fault rupture, liquefaction and landslides). Below are figures depicting the potential ground shaking for scenarios earthquakes of significance to Laguna Niguel and the surrounding area (**Figure 5.3** and **Figure 5.4**) and the exposure to liquefaction hazards for the City (**Figure 5.5**). Because the City has identified Landslide as a separate hazard, the landslide map is located under Section 5.3.2.6.

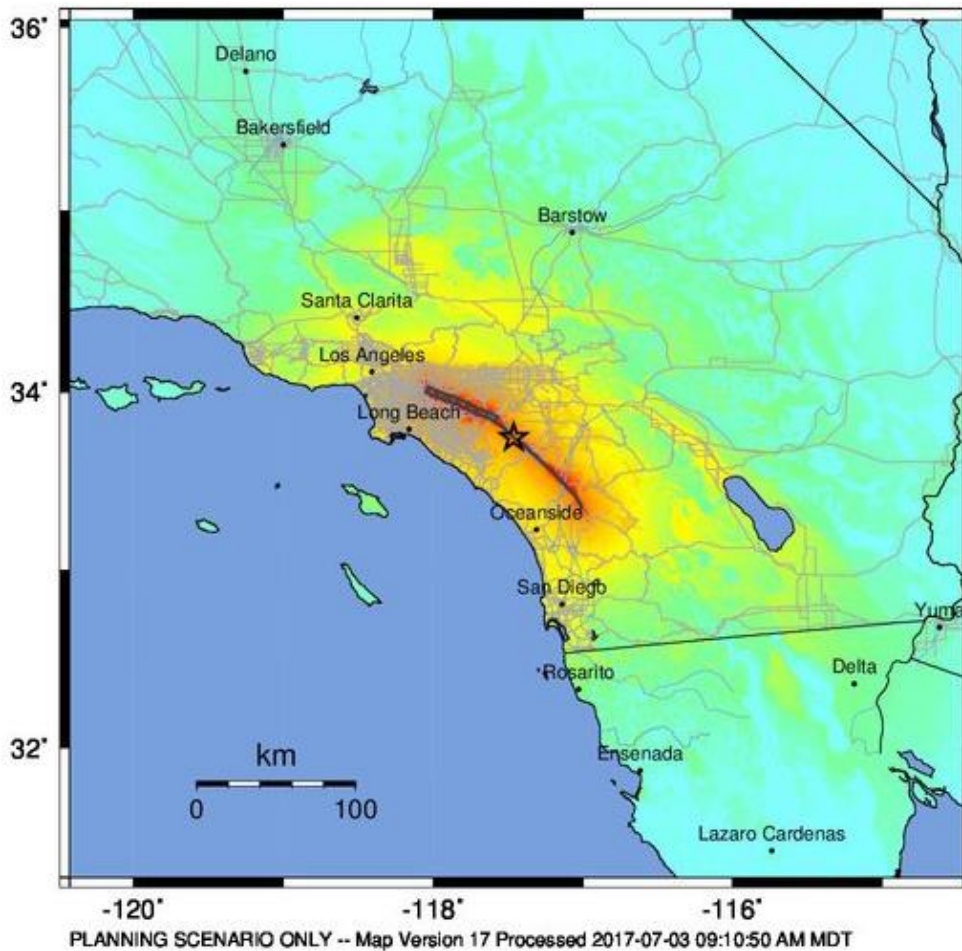
Figure 5.3- ShakeMap Ground Motions San Joaquin Hills Fault Earthquake Scenario (M7.0)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

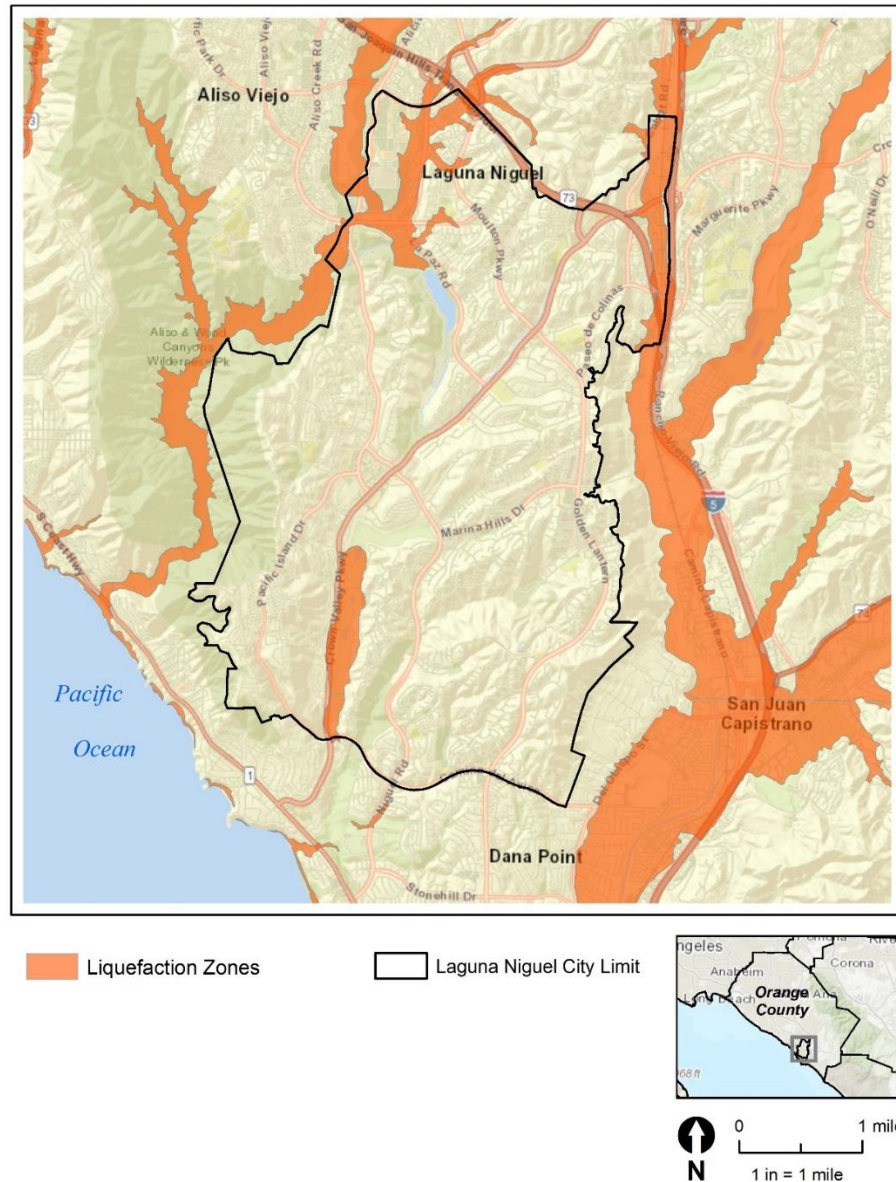
Scale based upon Worden et al. (2012)

Figure 5.4- ShakeMap Ground Motions Elsinore Fault Earthquake Scenario (M7.5)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC. (%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL. (cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

Figure 5.5- Liquefaction Hazard Zones in the Vicinity of Laguna Niguel

Earthquakes can occur any time of the year and their duration is usually measured in minutes. While there is some advanced warning with earthquakes associated aftershocks (or foreshocks), the majority of earthquakes occur without warning. The effect of an earthquake on various locations throughout the felt area is often measured in terms of shaking intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and total destruction of property. The intensity scale currently used in the United States is the Modified Mercalli Intensity (MMI) Scale (**Table 5.1**). It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale is composed of increasing levels of intensity, designated by Roman numerals that range from imperceptible shaking (MMI I) to catastrophic destruction (MMI X). It does not have a mathematical basis; instead it is an empirical scale based on observed effects.

Table 5.1- Modified Mercalli Intensity (MMI) Scale

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

In addition, most people are familiar with the Richter scale, a method of rating earthquakes based on the amplitude of seismic waves at their source, an indirect measure of energy released (**Table 5.2**). The Richter scale is logarithmic; each one-point increase corresponds to a 10-fold increase in the amplitude of the seismic waves and a 32-fold increase in the amount of energy released. For example, an earthquake registering magnitude 7.0 on the Richter scale releases over 1,000 times more energy than an earthquake registering magnitude 5.0. It should be noted that while an earthquake may have many intensity values across the impacted area, there is just one Richter magnitude associated with each event.

Table 5.2- Earthquake Effects Associated with various Richter Magnitudes

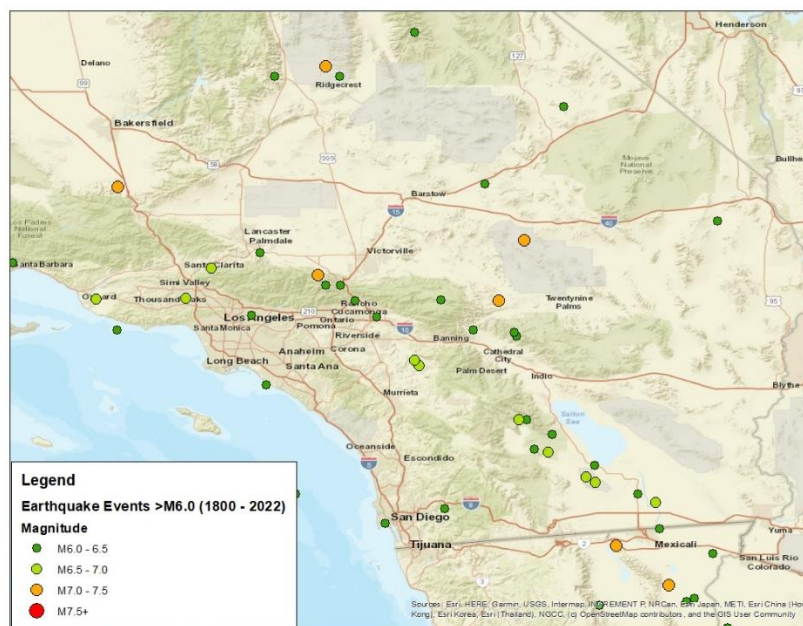
Magnitude	Earthquake Effects
0-1.9	<i>Micro-</i> Not felt by people
2.0-2.9	<i>Minor-</i> Felt by few people
3.0-3.9	<i>Minor-</i> Felt by some people, inside objective can be seen shaking
4.0-4.9	<i>Light-</i> Felt by most people, inside object shake and fall
5.0-5.9	<i>Moderate-</i> Felt by everyone, damage and possible collapse of unreinforced buildings
6.0-6.9	<i>Strong-</i> Felt by everyone, widespread shaking/damage, some buildings collapse
7.0-7.9	<i>Major-</i> Felt by everyone, widespread shaking/damage, many buildings collapse
8.0 or greater	<i>Great-</i> Felt by everyone, widespread shaking/damage, most buildings collapse

History

There are 45 states and territories in the United States at “*moderate*” to “*very high*” risk from earthquakes, and they are located in every region of the country. California experiences the most frequent damaging earthquakes; however, Alaska experiences the greatest number of large earthquakes—most of which occur in uninhabited areas. The largest earthquakes felt in the United States were along the New Madrid Fault Zone in Missouri, where a three-month long series of events from 1811 to 1812 included three earthquakes larger than Magnitude 8 on the Richter scale. These earthquakes were felt over the entire Eastern United States, with Missouri, Tennessee, Kentucky, Indiana, Illinois, Ohio, Alabama, Arkansas, and Mississippi experiencing the strongest ground shaking. According to the California Geologic Survey, California has a long history of significant seismic events, greater than magnitude 6.0 since 1800 (**Appendix D**).

Figure 5.6 displays historical epicenters of earthquakes located in Southern California since 1800 as reported by the US Geologic Survey. Southern California area has experienced several large earthquakes, including Fort Tejon in 1857 (M7.9), Owens Valley in 1872 (M7.4), and Northridge Earthquake in 1994 (M6.7). The Northridge Earthquake struck at 4:31 A.M. on Monday, January 17, 1994, in the San Fernando Valley. In the following days and weeks, thousands of aftershocks occurred, causing additional damage to affected structures. Effects of the earthquake were felt north into Ventura County, south in Orange County, and east into Riverside and San Bernardino Counties.

Figure 5.6- Significant Earthquakes in Southern California >M6.0

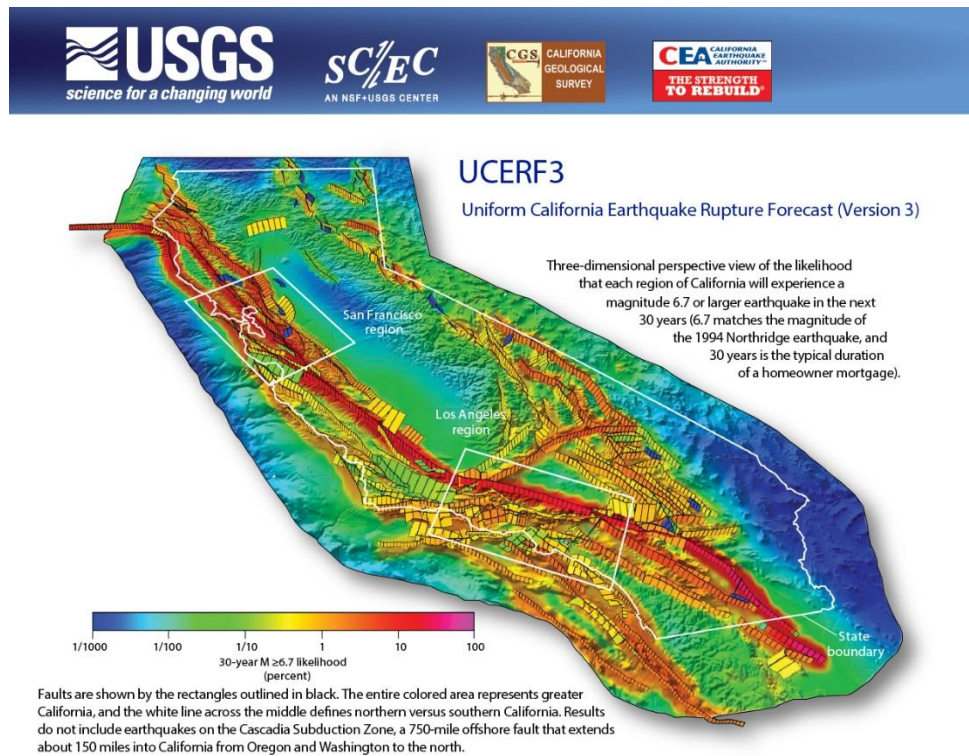


Probability

Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night. On a yearly basis, 70 to 75 damaging earthquakes occur throughout the world. The probability of a significant (M6.7 or greater) earthquake occurring in

Southern California in the next 30 years has been estimated to be 93% by the 2014 California Working Group on Earthquake Probability, as shown in **Figure 5.7**.

Figure 5.7- California 30-Year Earthquake Probabilities



Southern California region					
Magnitude (greater than or equal to)	Average repeat time (years)		30-year likelihood of one or more events		Readiness
5	0.24	(0.7)	100%	(1.0)	1.0
6	2.3	(0.9)	100%	(1.0)	1.0
6.7	12	(1.5)	93%	(1.0)	1.0
7	25	(1.4)	75%	(0.9)	1.1
7.5	87	(1.2)	36%	(0.9)	1.2
8	522	(0.4)	7%	(2.5)	1.3

■ Climate Change Considerations

To date, no credible evidence has been provided that links climate to earthquakes. However, climate and weather does play a significant role in the response and recovery from earthquakes. Effects from climate change could also create cascading complications and impacts.

5.2.1.2 Infectious Disease

- **Ranking-** *Probability-* MEDIUM; *Impact-* HIGH
- **Description**

Infectious Disease is a broad term used to describe illness caused by a specific type of bacterium, parasite, virus, or fungus organisms. Below is a brief overview of the main infectious disease types:

- *Bacterial Infections-* Responsible for a variety of diseases from strep throat to meningitis and tuberculosis.
- *Fungal Infections-* There are roughly 300 types of fungi known to cause infectious disease. Common types include ringworm, blastomycosis, histoplasmosis, and pneumocystis pneumonia.
- *Parasitic Infections-* Responsible for a variety of diseases including malaria, Chagas disease, and toxocariasis.
- *Viral Infections-* Responsible for a variety of diseases including the common cold, influenza, mononucleosis, smallpox, and HIV/AIDS.

These organisms can be transmitted:

- Person-to-person (e.g., measles, mumps, meningococcal disease, tuberculosis)
- By consuming contaminated food or water, also known as foodborne (e.g.: salmonella, E.coli, botulinum toxin)
- Through animal bites (i.e., mosquito, ticks, fleas) also known as vector-borne (e.g.: West Nile virus, dengue, Zika, malaria).

Newly emerging infectious diseases include Ebola, Zika, Severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), avian influenza. The current pandemic (COVID-19) is linked to the SARS virus. The SARS coronavirus (SARS-CoV) is a virus identified in 2003. SARS-CoV is thought to be an animal virus from an as-yet-uncertain animal reservoir, perhaps bats, that spread to other animals (civet cats) and first infected humans in the Guangdong province of southern China in 2002. In 2019, in Wuhan China a new coronavirus was discovered. The coronavirus is closely related to the SARS coronavirus. The new virus goes by both COVID-19, standing for coronavirus disease 2019, and SARS CoV-2. Additional details about the impacts of COVID 19 can be found in the History section.

Also, of concern are the threats of potential biological terrorism (bioterrorism), the intentional release or spread of disease (or toxins). Bioterrorism, also known as biological warfare, is not new and has been used for centuries. As early as 600 BC, military leaders implemented practices to poison water supplies and infect citizens/soldiers to gain strategic advantages in their efforts to conquer territories. Today there have been occurrences are both at the large scale (by military) and small scale (by terrorist organizations or individuals). No matter the purpose, the release of organisms could have devastating effects on an international, national, state, or local level if it is a highly infectious disease.

▪ Location and Extent

An infectious disease incident can occur throughout the entire city any time during the year and can last a few weeks or in some cases years. While the initial occurrence of an Infectious Disease event can occur without warning, there are instances where the spread of the Infectious Disease can provide some warning or indication (i.e., Covid 19). Depending on the category of the Infectious Disease (see below), the duration can last a few days, all the way up to years.

Infectious disease emergencies are incidents caused by organisms, with the potential for significant illness or death in the population. The impact of infectious disease emergencies can also affect the local economy through loss of production and costs of treating or preventing spread of the disease. The ability to recover from an infectious disease emergency will depend on:

- The type of biological agent (organism)
- The availability of prophylaxis (i.e., vaccine) for responders and the public
- The scale of the current and ongoing exposure
- The mode of transmission and whether transmission can be interrupted
- Whether the event is affecting critical infrastructure such as transportation, law enforcement, health care, and the medical and food supply chains.

There are three (3) common levels (or categories) of infectious disease emergencies: Outbreaks, Epidemics, and Pandemics.

- Outbreak- when there are more cases than would be normally expected, often suddenly, of an infectious disease in a community or facility.
- Epidemic- when there are more cases than would be normally expected of an infectious disease, often suddenly, in a population of a large geographic area.
- Pandemic- refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

Outbreaks, epidemics, or pandemics can occur when a new virus emerges to which the population has little immunity. Public Health measures are used to control outbreaks, epidemics, or pandemics of infectious diseases, and are especially important for diseases with high morbidity or mortality and limited medical prophylaxis and/or rapid treatment. Public Health measures to control disease include:

- Isolation and quarantine of persons or products, and legal closure of food establishments
- Control of contaminated food through recall of product
- Control of contaminated water through “Do Not Use”, “Do Not Drink” or “Boil Water” orders
- Vector control spraying to target animals, bugs, and/or insects

■ History

Infectious diseases have been of concern for many years. It is only recently, because of COVID-19 that the potential risk has been realized. As cited by the Centers for Disease Control and Prevention (CDC), the 20th century saw three (3) pandemics, the most notable of which was the 1918 Spanish influenza pandemic that was responsible for 20 million deaths throughout the world. The pandemics are now known to represent three (3) different antigenic subtypes of influenza A virus: H1N1 (in 1918), H2N2 (Asian Influenza in 1957), and H3N2 (Hong Kong Influenza in 1968). Not classified as true pandemics are three (3) notable epidemics: a pseudo pandemic in 1947 with low death rates, an epidemic in 1977 that was a pandemic in children, and an abortive epidemic of swine influenza in 1976 that was feared to have pandemic potential. Major influenza epidemics show no predictable periodicity or pattern, and all differ from one another. Evidence suggests that true pandemics with changes in hemagglutinin subtypes arise from genetic reassortment with animal influenza A viruses.

Currently, the world is dealing with the effects of COVID-19. According to the CDC, COVID-19 was first identified in Wuhan, China, in December 2019. Although most people who have COVID-19 have mild symptoms, COVID-19 can also cause severe illness and even death. Some groups, including older adults and people who have certain underlying medical conditions, are at increased risk of severe illness. Because it is a new virus, scientists are learning more each day. New cases of and death rates from COVID-19 are rising globally each day. Potential vaccines are being tested but to date, there is no known cure.

Locally, the City of Laguna Niguel has been impacted by COVID-19 both from an economic standpoint, as well as its citizens impacted by the virus. This includes the 2009 H1N1, 2003 Avian Flu, 2015-17 Zika, 2014-16 West African Ebola; 2015 West Nile, 2013 large scale Tuberculosis, 2004 botulism Type A, 2003 West Nile.

■ Probability

There is an annual risk of experiencing an infectious disease outbreak in the City of Laguna Niguel. While there is a continued threat from a novel influenza virus the potential threat of outbreaks and epidemics have been increased due to expanding global trade and accessible national and international travel. Infectious disease outbreaks and epidemics occur on an ongoing basis.

Aside from the City of Laguna Niguel currently dealing with the effects from COVID-19, annual outbreaks of the seasonal flu usually occur during the late fall through early spring. Most people have natural immunity, and a seasonal flu vaccine is generally available. According to the CDC, in a typical year, approximately 5 to 20 percent of the population gets the seasonal flu and flu-related deaths range from 3,300 to 48,600 (average 23,600).

Bird flu (H5N1) is an influenza A virus subtype that is highly contagious among birds; although rare, some human infections with the Bird flu virus have occurred. Most confirmed cases have occurred in Asia, Africa, the Pacific, Europe and the Near East. According to the CDC, there are currently no confirmed human cases of Bird Flu infections, but it remains a serious concern with the potential to cause a deadly pandemic.

Swine flu (H1N1) was first detected in the United States in April 2009. This virus was a unique combination of influenza virus genes never previously identified in either animals or people. The Swine flu virus caused more illness in young people and pregnant women than is usual for prior flu seasons and was declared a Worldwide Pandemic by the World Health Organization.

- **Climate Change Considerations**

While many vector-borne diseases, such as malaria, yellow fever, dengue, and murine typhus, are rarely seen in the United States, the United States are susceptible to these vector-borne diseases. Many vector-borne diseases are climate sensitive and ecological shifts associated with climate change are expected to impact the distribution and incidences of these diseases. Changes in temperature and precipitation directly affect vector born disease transmission through pathogen-host interaction, and indirectly through ecosystem changes and species composition. As temperatures increase vectors can spread into new areas that were previously too cold. For example, two (2) mosquito vectors that carry malaria are now found at the U.S.-Mexico border.

5.2.1.3 Wildfire

- **Ranking-** *Probability- HIGH; Impact- HIGH*
- **Description**

There are three (3) different classes of wildfires: 1) surface; 2) ground; and, 3) crown. A “Surface fire” is the most common type and burns along the floor of a forest, moving slowly and killing or damaging trees. A “Ground fire”; usually started by lightning, are fed by subterranean roots, and smolders on or below the forest floor. A “Crown fire” spreads rapidly by wind and moves quickly by jumping along the tops of trees. Wildfires can also be classified as either a wildland fire or a wildland-urban interface (WUI) fire. Wildland fires involve situations where a fire occurs in an area that is relatively undeveloped except for the possible existence of basic infrastructure such as roads and power lines. A WUI fire includes situations in which a wildland fire enters an area that is developed with structures and other human developments. In WUI fires, the fire is fueled by both naturally occurring vegetation and the urban structural elements themselves. According to the National Fire Plan issued by the U.S. Departments of Agriculture and Interior, the wildland-urban interface is defined as “...*the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.*”

The WUI can be subdivided into three (3) categories (NWUIFPP, 1998): 1) classic wildland-urban interface; 2) the mixed wildland-urban interface; and, 3) the occluded wildland-urban interface. The classic wildland-urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas. The mixed wildland-urban interface is characterized by isolated homes, subdivisions, and small communities situated predominantly in wildland settings. The occluded wildland- urban interface exists where islands of wildland vegetation occur inside a largely urbanized area.

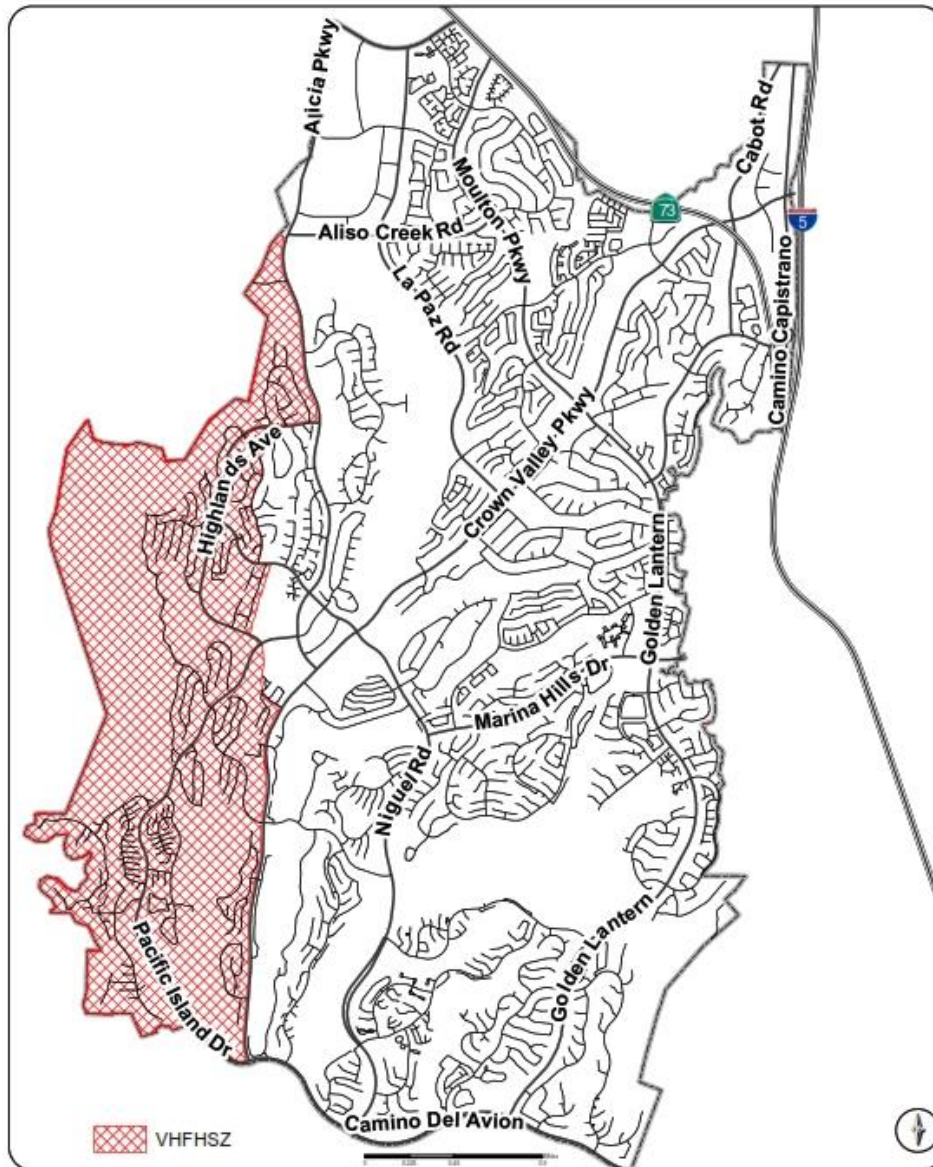
Certain conditions must be present for a wildfire hazard to occur; a large source of fuel must be present, the weather must be conducive (generally hot, dry, and windy), and fire suppression sources must not be able to easily suppress and control the fire. The cause of a majority of

wildfires is human-induced or lightning; however, once burning, wildfire behavior is based on three (3) primary factors: 1) fuel, 2) topography, and 3) weather. Fuel will affect the potential size and behavior of a wildfire depending on the amount present, its burning qualities (e.g., level of moisture), and its horizontal and vertical continuity. Topography affects the movement of air, and thus the fire, over the ground surface. The terrain can also change the speed at which the fire travels, and the ability of firefighters to reach and extinguish the fire. Weather as manifested in temperature, humidity and wind (both short and long term) affect the probability, severity, and duration of wildfires. Other factors that create concern are drought conditions and development (the built environment). Drought conditions bring on contributing concerns in that it can lead to relatively drier conditions and leave reservoirs and water tables lower, thus, creating hotter fires and less water to fight the fires. The expansion of the built environment into previously unoccupied areas introduces more people to the hazard and in some cases makes response actions more challenging.

- **Location and Extent**

The climate, topography, and vegetation in areas surrounding the City is conducive to wildfire events. Limited rainfall, low humidity, and seasonal high temperatures continue to contribute to the desiccation of the grasses and chaparral which cover the foothills, providing prime fuel for intense burns. Although some of the canyons are shielded from the direct impact of the powerful, dry Santa Ana winds, their occurrence generally aggravates the fire hazard. In addition, the presence of human activities in or near a wildland area dramatically increases the risk of a major fire due to careless smokers, illegal campfires, and other related risks.

The California Department of Forestry and Fire Protection, Fire and Resource Assessment Program (CDF-FRAP) was established and mandated to map areas of significant fire hazards based on fuels (vegetation), terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones, define the application of various mitigation strategies to reduce risk associated with wildland fires. CDF-FRAP developed data that displays the relative risk to areas of significant population density from wildfire. This data is created by intersecting residential housing unit density with proximate fire threat, to give a relative measure of potential loss of structures and threats to public safety from wildfire. The City of Laguna Niguel utilized this map when it adopted the City's Very High Fire Hazard Zone map (**Figure 5.8**).

Figure 5.8- City of Laguna Niguel Very High Fire Hazard Zone Map

The CDF has assessed both State Responsibility Areas (SRA) and Local Responsibility Areas (LRA). For the SRA CDF uses three (3) different zones to classify fire hazard severity in the State of California, while for the LRA, CDF uses eight (8) different zones to classify the fire severity zones. The CDF-FRAP Fire Hazard Severity Zones consist of:

- SRA- Moderate (Yellow):
- SRA- High- (Orange):
- SRA- Very High (Red)-:
- LRA- Very High (Red):
- LRA- High (Orange):
- LRA- Moderate (Yellow):
- LRA- Unzoned (Grey):

- LRA- Other Very High (Light Red):
- LRA- Other High (Light Orange):
- LRA- Other Moderate (Light Yellow):
- LRA- Other Unzoned (Light Grey):

The City of Laguna Niguel contacted CDF to obtain some clarification on the above categories but CDF indicated that the categories are based on many factors (i.e., terrain, fuel, weather) and are adjusted regularly based on new information (i.e., probability of an area burning, fire behavior). Because of the dynamic factors, CDF does not publish definitive definitions of the categories for public dissemination. However, the CDF website does provide this explanation: *“Classification of a wildland zone as Moderate, High or Very High fire hazard is based on the average hazard across the area included in the zone, which have a minimum size of 200 acres. In wildlands, hazard is a function of modeled flame length under the worst conditions and annual burn probability. Both these factors generally increase with increasing hazard level, but there may be instances where one value is Very High and the other is low, pushing the overall hazard into a more intermediate ranking. On average, both modeled flame length and burn probability increase by roughly 40-60% between hazard classes. Classification outside of wildland areas is based on the fire hazard of the adjacent wildland and the probability of flames and embers threatening buildings.”*

While Wildfire events can occur without warning, there are instances where the spread of the Wildfire can provide or some weather indicator (i.e., Red Flag Warning) can provide some warning. Wildfires events can occur any time of the year but are typically worse during hotter dryer months. Durations of wildfires can last a few hours, up to a few weeks.

■ History

Due to a combination of topography, weather, and fuel, and exacerbated by potentially high winds and limited access, the City and the County is highly susceptible to wildfire hazards. The 2015 Orange County Hazard Mitigation Plan lists 57 major fires that occurred between 1914 and 2015. In 2017, the Canyon Fire burned 9,217 acres in the Anaheim Hills, destroying 25 structures and forcing 16,570 to evacuate from areas in Anaheim, Orange, and Tustin. In October 2020, fires in the mountains near Irvine required the evacuation of over 60,000 residents. Most recently, the City experienced the 2,000-acre Coastal Fire that started in the Aliso and Wood Canyons Wilderness Park on May 11, 2022. A total of thirty-two (32) structures were impacted; of that, twenty residential structures were destroyed. The fire was fully contained by May 17. Other local wildfires include: Avery Fire in 2002 (129 acres), Ridge Line Fire in 1994 (706 acres), Monarch Fire in 1990 (101 acres), Ortega Fire in 1988 (2,470 acres), and Niguel Fire in 1979 (302 acres). The more significant wildfires can receive federal declarations. **Table 5.3** lists the most recent federally declared fires in Orange County.

Table 5.3- Federally Declared Fire History for Orange County

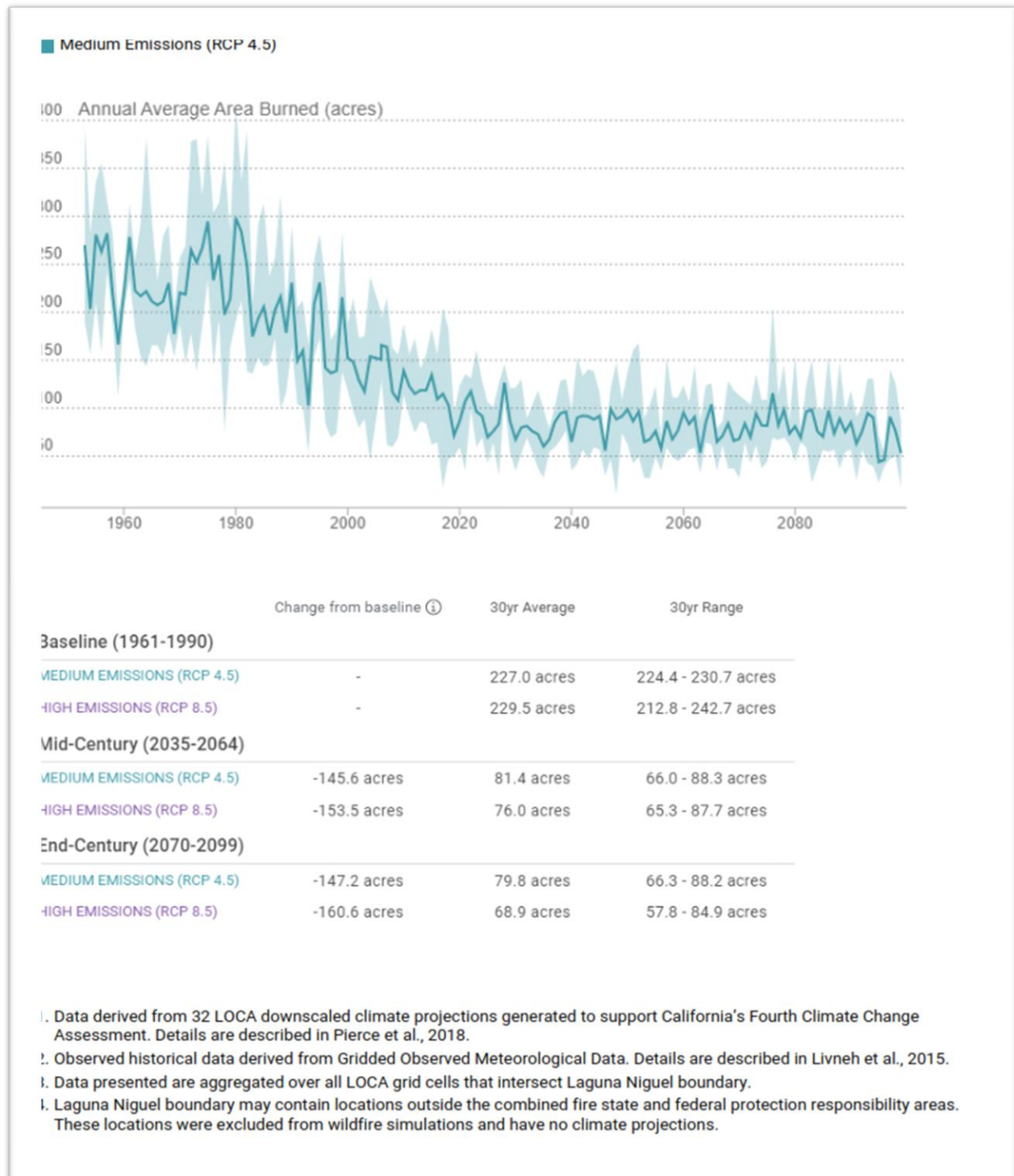
Declaration Number	Year	Type	Name
EM-3120	1996	Fire	Severe Firestorms
CDAA-97-03	1997	Fire	Wildfire
FS-2405	2002	Fire	San Antonio Fire
FM-2730	2006	Fire	Sierra Fire
FM-2737	2007	Fire	Santiago Fire
FM-2683	2007	Fire	241 Fire
EM-3279	2007	Fire	Wildfires
DR-1731	2007	Fire	Wildfire, Flooding, Debris Flows and Mudslides
FM-2792	2008	Fire	Freeway Fire Complex
DR-1810	2008	Fire	Wildfires
FM-5223	2017	Fire	Canyon 2 Fire
FM-5213	2017	Fire	Canyon fire
DR-4344	2017	Fire	Wildfires

■ Probability

The majority of work done to estimate the probability of wildfire occurrence has been focused on identifying the potential areas where wildfire could occur. According to the CDF, the FRAP Fire Hazard Severity Zone maps are based on data and models of potential fuels over a 30- to 50-year time horizon and their associated expected fire behavior and expected burn probabilities to quantify the likelihood and nature of vegetation for exposure to buildings. This indicates a very high likelihood of wildfire occurrence in the area.

As previously mentioned, vegetation, weather, and topography are the significant elements in identifying areas of potential threat of wildfire occurrences. The north part of the County is marked by mountains, foothills, and canyons that are covered in susceptible vegetation. A large amount of the native vegetation in the area is commonly called chaparral; chaparral is a dense and scrubby bush that has evolved to persist in a fire-prone habitat. Chaparral plants will eventually age and die; however, they will not be replaced by new growth until a fire rejuvenates the area. Chamise, manzanita and ceanothus are all examples of chaparral which are quite common in the area. The region's climate, with its warm and dry summers, contributes to low relative humidity and low fuel moistures. When combined with high fuel loading, the potential for a catastrophic wildfire event is significant. Three (3) weather conditions that may cause the ignition of and/or impact the behavior of wildfires are as follows: 1) thunder and lightning storms; 2) high wind events; and, 3) hot, dry (low humidity) periods.

The State of California has also developed tools under the Cal-Adapt project. The Cal-Adapt project provides the public, researchers, government agencies and industry stakeholders with essential data & tools for climate adaptation planning, building resiliency, and fostering community engagement. The following figure (**Figure 5-9**) was generated by Cal-Adapt work for the City of Laguna Niguel.

Figure 5.9- Annual Average Area Burned- City of Laguna Niguel

Climate Change Considerations

Climate change plays a significant role in wildfire hazards. The changing conditions from wet to dry can create more fuel, the increased possibility of high winds increase risk and present a

challenge, and drought conditions could hinder ability to contain fires. Large wildfires also have several indirect effects beyond those of a smaller, local fire. These may include air quality and health issues, road closures, business closures, and other forms of losses. Furthermore, large wildfires increase the threat of other disasters such as landslide and flooding.

5.2.2 TIER II THREATS AND HAZARDS

The threats and hazards, in alphabetical order, under Tier II include: Civil Disturbance, Dam Failure, Drought, Extreme Temperature, Flood, Landslide, and Windstorm.

5.2.2.1 Civil Disturbance

- **Ranking-** *Probability-* MEDIUM; *Impact-* MEDIUM
- **Description**

Civil Disturbance is a term generally used to describe disorderly conduct or a breakdown of orderly society by a large group of people. Civil Disturbance can range from a form of protest against major socio-political problems to riots.

- **Location and Extent**

Civil Disturbance can occur in any part of the City of Laguna Niguel. However, it is generally located within larger, more concentrated, commercial areas. Civil Disturbance events can last a few hours or in some cases a few days.

Civil Disturbance events can occur any time of the year and usually last from a few hours to a week or so. Some Civil Disturbance events can occur without warning, while other times there is limited advance warning. There is no universal or common scale to measure levels of Civil Disturbance. Most Civil Disturbance is generally defined by types of disturbance.

- **History**

No significant historical incidents to report to date. However, there have been a few small incidents that have occurred due to recent social and political movements.

- **Probability**

There are no studies that predict the probability of civil disturbance occurrences.

- **Climate Change Considerations**

While there is no direct linkage between climate change and civil disturbances, there could be indirect linkages. As climate change impacts are either felt or perceived to be felt it could ignite passions within people to demonstrate against possible causes or enablers.

5.2.2.2 Dam Failure

- **Ranking-** *Probability-* MEDIUM; *Impact-* LOW
- **Description**

Because of California's seasonal and climatic conditions, water storage is critical. Dams and reservoirs help reserve (store) water necessary for agriculture, hydroelectric power, recreational activities, environmental protection, and a stable drinking water supply. They are also critical

tools in flood and debris control. Based on the function, dams can be classified as: storage dams, diversion dams, detention dams, debris dams, or coffer dams. In addition to these functional classifications there are several types of dam constructions:

- *Gravity Dams*—concrete, rubber masonry
- *Embankment Dams*—earth or rock
- *Arch/Multiple Arch Dams*—concrete
- *Buttress Dams*—concrete, timber, steel

Along with their many benefits, dams and reservoirs present formidable consequences if not properly designed, built, and maintained. Failures to dams and reservoir are generally due to old age, poor design/construction, lack of maintenance, structural damage, improper siting, landslides flowing into a reservoir, or terrorist actions. Structural damage is often a result of a flood, erosion, or earthquake. A catastrophic dam/reservoir failure could inundate the area downstream. The degree of flood impact is dependent upon topography, vegetation, duration and intensity of rainfall with consequent storm water runoff. The force of the water is large enough to carry boulders, trees, automobiles, and even houses along a destructive path downstream. Another factor in dam/reservoir failures is heavy or increased precipitation, especially in very short periods of time. This increase in rainfall can crest dams, weaken structures, and erode supports. The potential for casualties, environmental damage, and economic loss is great. Damage to electric generating facilities and transmission lines could impact life support systems in communities outside the immediate hazard area.

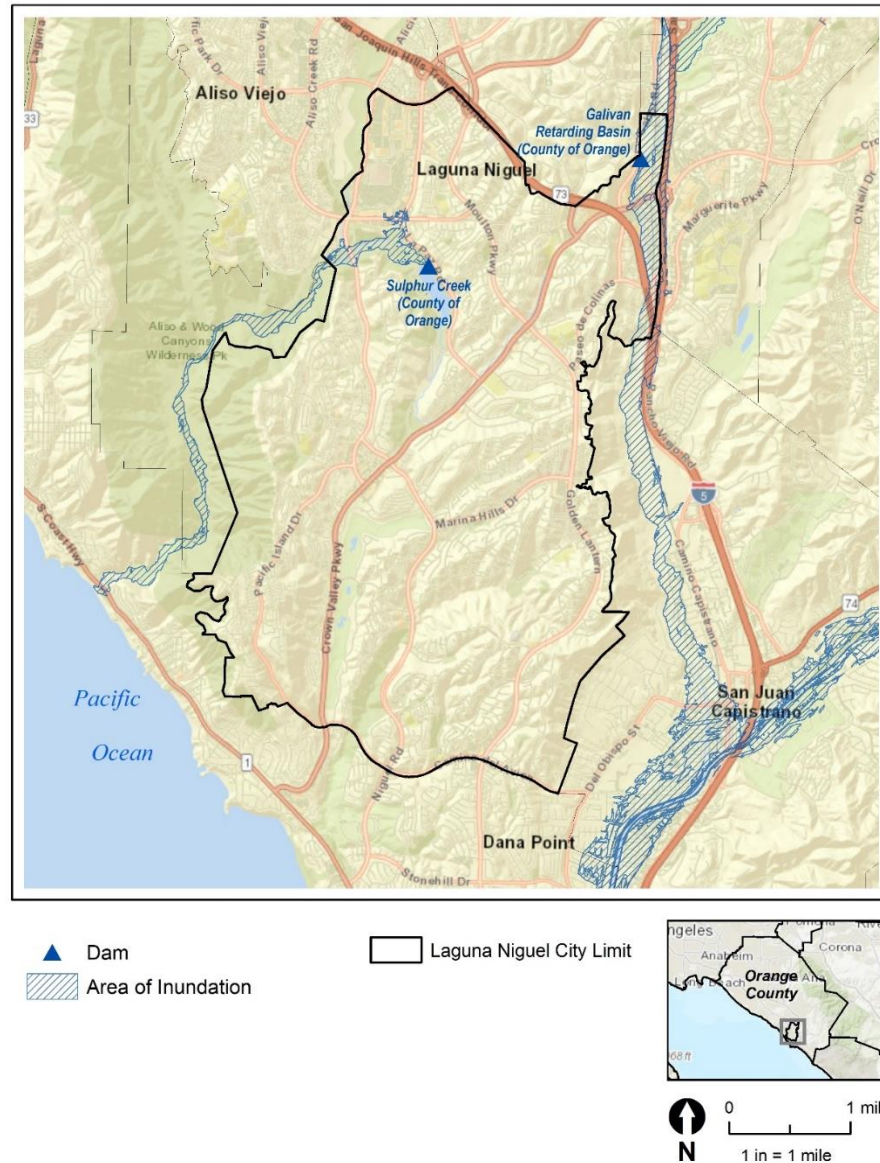
■ Location and Extent

The City has several dams in their vicinity that have the potential to inundate areas if failure were to occur. Some of the more significant dams, include:

- Sulphur Creek Dam: located in Laguna Nigel is an earthfill structure 42 feet (13m) high and 485 feet (148m) long with a concrete upstream face, and contains 150,000 cubic yards (110,000m³) of material.[1] There is a 24-inch (61cm) outlet gate on the east side of the dam, to release water into Sulphur Creek. The spillway is also located on the east side of the dam and consists of a concrete overflow section and stilling basin. The reservoir has a normal storage capacity of 520 acre-ft (640,000m³), and a maximum capacity of 1,065 acre-ft (1,314,000m³).
- Rattlesnake Canyon Reservoir: located on Rattlesnake creek, this 79-foot-high earth filled dam is owned by Irvine Ranch Water District. Built in 1959, this facility impounds 1,480-acre feet of recycled water primarily used for irrigation.
- Sand Canyon Reservoir: this 58-foot-high earth filled dam is owned by Irvine Ranch Water District. Built in 1912, this facility impounds 768-acre feet of recycled water, primarily used for irrigation.
- Syphon Canyon Reservoir: this 59-foot-high earth filled dam is owned by Irvine Ranch Water District. Built in 1966, this facility impounds up to 535-acre feet of recycled water, primarily used for irrigation.

- Peters Canyon Reservoir: located north of the City of Irvine (approximately 3 miles west of Santiago Dam), this 50-foot earth filled dam is owned by the County of Orange. Built in 1932, this facility impounds up to 626-acre feet of water.
- Santiago Dam: this 136-foot high earth filled dam is jointly owned by Irvine Ranch Water District and Serrano Water District. Built in 1931, this facility impounds approximately 25,000 acre-feet of water creating the largest freshwater lake contained wholly within Orange County (Irvine Lake).
- San Joaquin Reservoir: this 224-foot-high earth-filled dam is owned by Irvine Ranch Water District. Built in 1966, this facility impounds over 3,000 acre-feet of recycled water, primarily used for irrigation.
- Villa Park Dam: this 118-foot-high earthen filled dam is owned by the Orange County Flood Control District. Built in 1963, this facility has the capacity to impound over 15,000 acre-feet, which is primarily used for flood control purposes.
- Prado Dam: located along the Santa Ana River in Riverside County, this dam facility poses a great risk to northern Orange County cities.

As shown in **Figure 5.10**, the dam inundation zones within or adjacent to the City.

Figure 5.10- Dam Inundation Areas within or Adjacent to the City

Dam Failures can happen any time of the year. There is no universal or common scale to measure levels of Dam Failure. Most Dam Failures are defined by types of structural failure. While some Dam Failure events can occur without warning, sometimes limited advance warning is available. The duration of Dam Failures can range from a few hours to weeks, months, or even years (i.e., Oroville).

■ History

The State of California and the federal government have a rigorous Dam Safety Program. This is a proactive program that ensures proper planning in the event of failure, but also sets standards for dam design and maintenance. Because of this, many potential issues have been addressed and/or resolved. Within the City, no significant dam failures have occurred. The City has not suffered impacts from a dam inundation event. The closest (geographically) incident

involved an extensive episode of winter rains in 2005, which caused seepage along Prado Dam prompting the Army Corps of Engineers (ACOE) to release significant amounts of water downstream, resulting in the evacuations of approximately 3,000 Irvine residents. The flooding caused erosion along portions of the Green River golf course adjacent to the river. Since this event, the ACOE has made significant improvements downstream of the dam to increase capacity and reduce future flooding impacts.

There is one significant dam within the City limits, the Sulphur Creek Dam. Construction of Sulphur Creek Dam was completed in 1966 by the Moulton Niguel Water District. The lake was known as Sulphur Creek Reservoir and used to store treated reclaimed water for irrigation. In 1970 the Orange County Flood Control District purchased the dam and reservoir in conjunction with the city of Laguna Niguel for use as a park. In 1989 the county spent \$1.6 million to refurbish the dam and lake area. The lake was drained and about 10 feet (3.0 m) of silt were removed, increasing the water depth from 16 feet (4.9 m) to 25 feet (7.6 m). The dam was found to be in deteriorating condition and required concrete resurfacing and the replacement of the outlet gate.

- **Probability**

Dam failure events are infrequent and usually coincide with the events that cause them, such as earthquakes, landslides, excessive rainfall and snowmelt. These impacts can also be exacerbated by aging or poor maintenance of the structures. There is a “residual risk” associated with dams; residual risk is the risk that remains after safeguards have been implemented. For dams, the residual risk is associated with events beyond those that the facility was designed to withstand. However, the probability of occurrence of any type of dam failure event is considered to be low in today’s regulatory and dam safety oversight environment. As with other dams, the likelihood of the failure of the Sulphur Creek Dam is low. The inundation area is limited to outflow into the Aliso Creek drainage.

- **Climate Change Considerations**

Increased rainfall could present a risk to dams and reservoirs in the area if volume of runoff is greater than the dam’s capacity. This could cause the County to release stored water into the downstream water courses in order to ensure the integrity of the dam.

5.2.2.3 Drought

- **Ranking-** *Probability- HIGH; Impact- LOW*
- **Description**

Drought can best be thought of as a condition of water shortage for a particular user in a particular location. Drought is a gradual phenomenon and generally is not signified by one or two dry years. There are many considerations that are factored into the determining the drought status; these include consideration of status on the Palmer Drought Severity Index, CPC Soil Moisture Model, USGS Weekly Streamflow, Standardized Precipitation Index, and Objective Drought Indicator Blends.

California’s extensive system of water supply infrastructure (reservoirs, groundwater basins, and interregional conveyance facilities) generally mitigates the effects of short-term dry periods for

most water users. However, drought conditions are present when a region receives below-average precipitation, resulting in prolonged shortages in its water supply, whether its water supply is provided by atmospheric, surface, or ground water means.

Drought is not a purely physical phenomenon, but rather an interplay between natural water availability and human demands for water supply. The precise definition of drought is made complex owing to political considerations, but there are generally four (4) types of conditions that are referred to as drought:

- *Meteorological drought* is brought about when there is a prolonged period with less than average precipitation.
- *Agricultural drought* is brought about when there is insufficient moisture for average crop or range production. This condition can arise, even in times of average precipitation, owing to soil conditions or agricultural techniques.
- *Hydrologic drought* is brought about when the water reserves available in sources such as aquifers, lakes, and reservoirs fall below the statistical average. This condition can arise, even in times of average (or above average) precipitation, when increased usage of water diminishes the reserves.
- *Socioeconomic drought* associates the supply and demand of water services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall.

▪ **Location and Extent**

The entire City is subject to drought conditions. There are many considerations that are factored into the determining the drought status; these include consideration of status on the Palmer Drought Severity Index, CPC Soil Moisture Model, USGS Weekly Streamflow, Standardized Precipitation Index, and Objective Drought Indicator Blends. The U.S. Drought Monitor, established in 1999, is a weekly map of drought conditions produced jointly by the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the National Drought Mitigation Center at the University of Nebraska-Lincoln. The map is based on measurements of climatic, hydrologic and soil conditions as well as reported impacts and observations from more than 350 contributors around the country. Droughts are generally categorized into five (5) categories:

- D1- Abnormally Dry
- D2- Moderate Drought
- D3- Severe Drought
- D4- Extreme Drought
- D5- Exceptional Drought

Drought events can happen any time of the year and can last for months or in worst case scenarios, even years or may be declared after as few as 15 days. Drought events usually have advance notices as it is generally a worsening of condition over time.

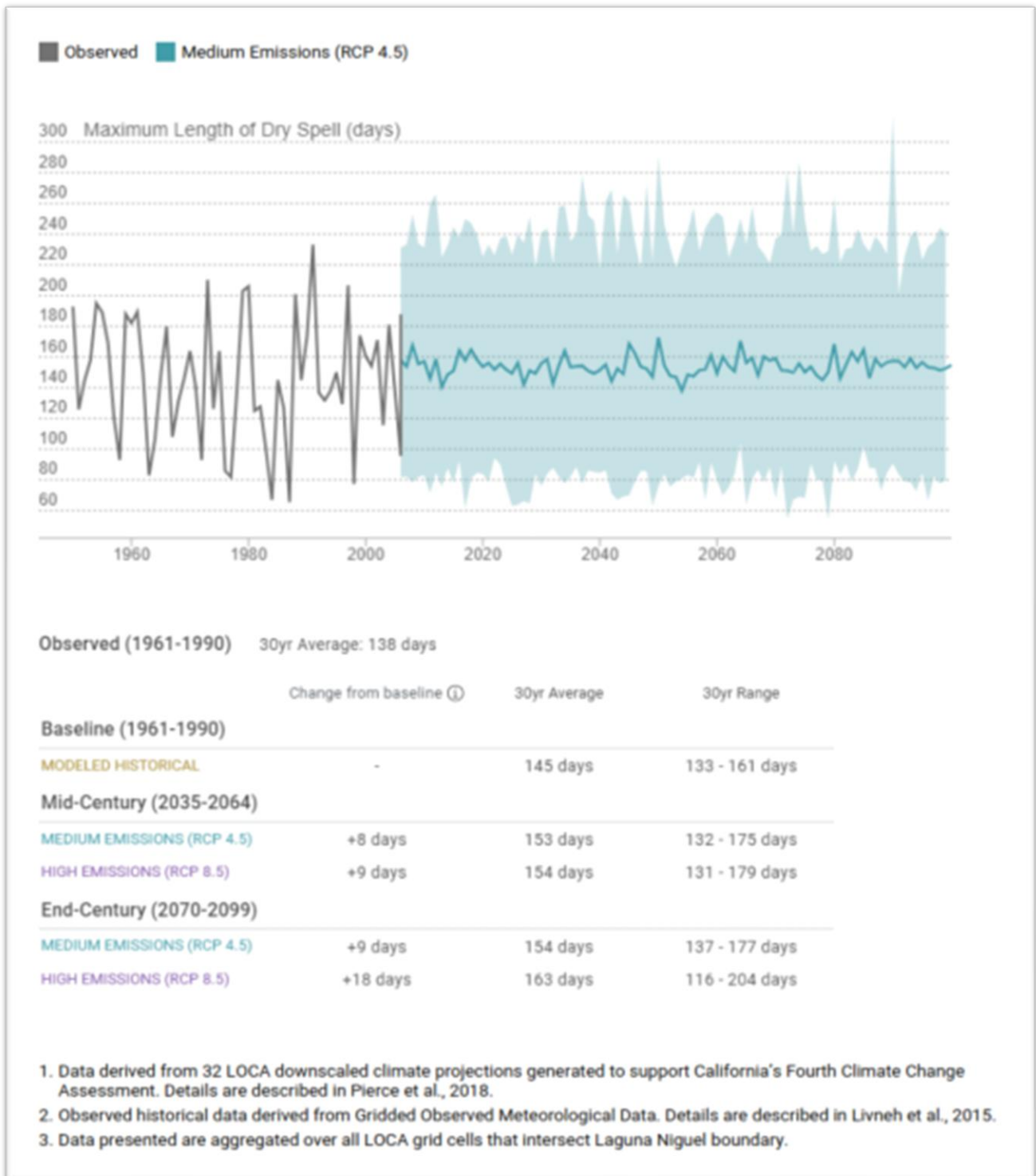
- **History**

The State of California recently emerged from a proclaimed a State of Emergency due to extremely dry conditions. The longest duration of drought (D1-D4) in California lasted 376 weeks beginning on December 27, 2011, and ending on March 5, 2019. The most intense period of drought occurred between 2014 and 2017, where at its peak, over 50% of the land in California was under Exceptional Drought (D4) conditions.

- **Probability**

In any given year, California and Orange County can be subject to drought conditions. This is especially true since much of the water supply is provided by outside resources, resources that are shared with others. It is also important to note that droughts do not happen overnight, they are a slow buildup of conditions. On average, seventy-five percent (75%) of the state's annual precipitation occurs in the "wet season"- *November through March*. December, January, and February generally see the most precipitation but there have been many early and late season storms that bring in a substantial amount of precipitation. One of the best ways to predict drought conditions is to study the status of the El Niño Southern Oscillation (ENSO) patterns. In California. ENSO is a periodic shifting of ocean atmosphere conditions in the tropical Pacific that ranges from El Niño (warm phase) to neutral to La Niña (cold phase). La Niña conditions tend to favor a drier outlook for Southern California; while the El Niño conditions favor stronger, and wetter storms.

The State of California has also developed tools under the Cal-Adapt project. The Cal-Adapt project provides the public, researchers, government agencies and industry stakeholders with essential data & tools for climate adaptation planning, building resiliency, and fostering community engagement. The following figure (**Figure 5-11**) was generated by Cal-Adapt work for the City of Laguna Niguel.

Figure 5.11- Maximum Length of Dry Spell- City of Laguna Niguel

- **Climate Change Considerations**

Climate change has the potential to make drought events more common in the West, including California. Extreme heat creates conditions more conducive for evaporation of moisture from the ground, thereby increasing the possibility of drought. A warming planet could lead to earlier melting of winter snow packs, leaving lower stream flows and drier conditions in the late spring and summer. Snow packs are important in terms of providing water storage and ensuring adequate supply in the summer, when water is most needed. Changing precipitation distribution and intensity has the potential to cause more of the precipitation to run-off rather than be stored. The result of these processes is an increased potential for more frequent and more severe periods of drought.

5.2.2.4 Extreme Temperature

- **Ranking-** *Probability-* MEDIUM; *Impact-* LOW
- **Description**

For the purposes of the LHMP, Extreme Temperature include both 1) extreme heat and 2) extreme cold weather conditions.

Extreme Heat conditions, according to the U.S. Environmental Protection Agency (EPA) and Centers for Disease Control and Prevention (CDC), are defined as weather that is much hotter and more humid than average for a particular time and place. The National Weather Services (NWS) issues the following excessive heat products:

- *Heat Advisory* is a period when excessive heat is expected. The combination of hot temperatures and high humidity will create a situation in which heat related illnesses are possible.
- *Excessive Heat Watch* is a prolonged period of dangerous excessive heat within about 48 hours.
- *Excessive Heat Warning* is a prolonged period of dangerous excessive heat within about 24 hours.

Extreme heat kills hundreds of Americans every year and causes many to become seriously ill. Extreme heat can result in significant economic impacts, affect agriculture and livestock, and may cause damage to homes and businesses. Measures to prevent illness are generally common sense, including staying cool indoors, keeping hydrated, limiting physical activity, and monitoring those at highest risk. Prolonged high temperatures can pose a risk to vulnerable populations, particularly if combined with power outages. Measures to prevent illness are generally common sense, including staying cool indoors, keeping hydrated, limiting physical activity, and monitoring those at highest risk.

Extreme Cold conditions are noted when there are sustained temperatures below freezing (32F). The NOAA provides three different categories of actions for freeze events: advisory, watch, and warning.

- *Frost Advisory* is issued when the minimum temperature is forecast to be 33 to 36 degrees on clear and calm nights during the growing season.
- *Freeze Watch* is issued when there is a potential for significant, widespread freezing temperatures within the next 24-36 hours.

- *Freeze Warning* is issued when significant, widespread freezing temperatures are expected.

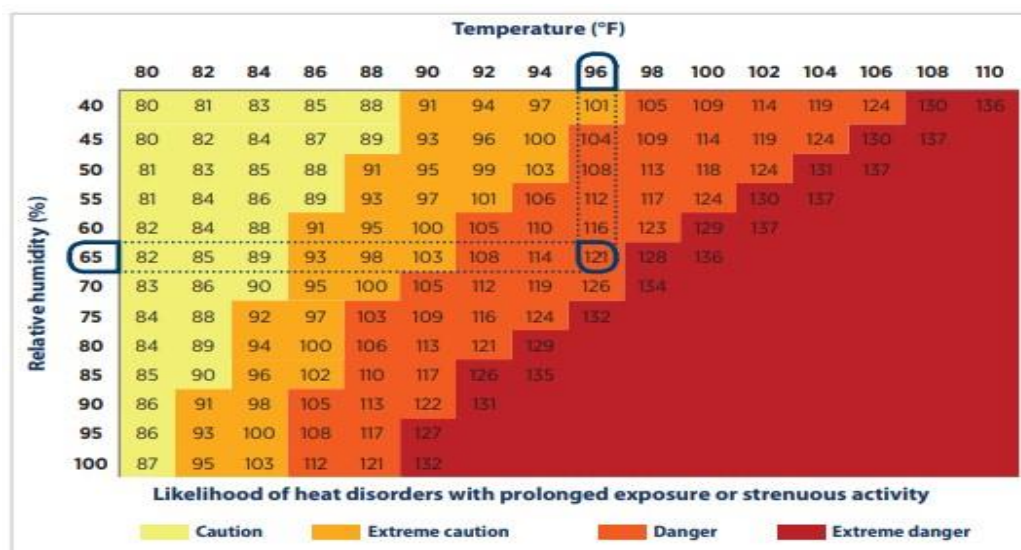
When combined with extreme cold temperatures, winds can compound the events creating a phenomenon known as “wind chill” factor. Wind Chill is the term used to describe the rate of heat loss on the human body resulting from the combined effect of low temperature and wind. As winds increase, heat is carried away from the body at a faster rate, driving down both the skin temperature and eventually the internal body temperature. Animals are also affected by wind chill; however, cars, plants, and other objects are not.

▪ Location and Extent

Because of modern weather technologies, Extreme Temperature events usually have advance notices. An Extreme Temperature event can occur throughout the entire City and events can last a few days and, in some instances, they can last for a few weeks. Typically, extreme heat events happen in the summer months while extreme cold events happen in the winter months.

The heat index is a measure of how hot it feels when relative humidity is factored in with the actual air temperature (**Figure 5.12**). Relative humidity is the percentage of moisture in the air compared with the maximum amount of moisture the air can hold. Humidity is an important factor in how hot it feels because when humidity is high, water does not evaporate as easily, so it is harder for your body to cool off by sweating.

Figure 5.12- NOAA’s National Weather Service Heat Index



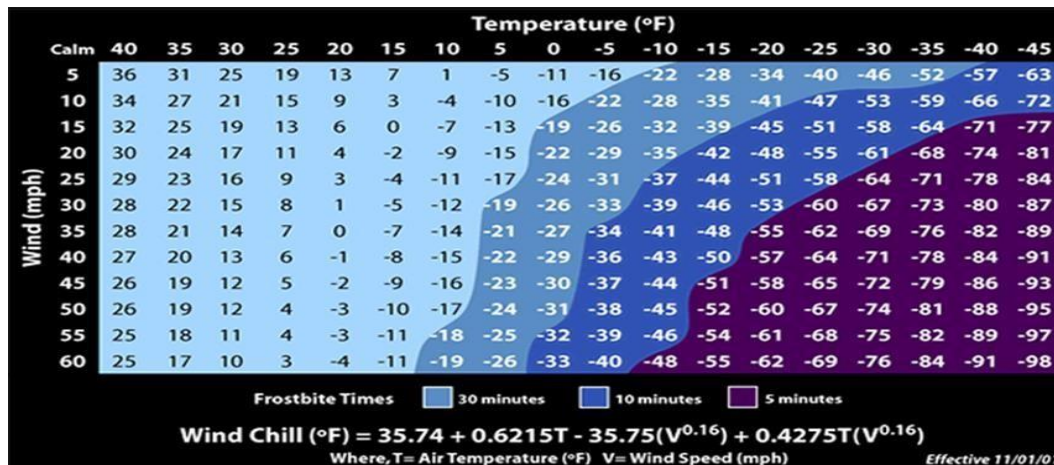
As the Heat Index rises, so do health risks. Specifically:

- When the Heat Index is 90°F, heat exhaustion is possible with prolonged exposure and/or physical activity.
- When it is 90° to 105°F, heat exhaustion is probable with the possibility of sunstroke or heat cramps with prolonged exposure and/or physical activity.

- When it is 105° to 129°F, sunstroke, heat cramps or heat exhaustion is likely and heatstroke is possible with prolonged exposure and/or physical activity.
- When it is 130°F and higher, heatstroke and sunstroke is extremely likely with continued exposure. Physical activity and prolonged exposure to the heat increase the risks.

Figure 5.13 shows the NWS Wind Chill Chart that uses science and other information to provide an accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures.

Figure 5.13- Wind Chill Chart



Prolonged freezing temperatures can pose a risk to vulnerable populations, particularly if combined with power outages. Exposure to cold can cause significant health problems, such as frostbite or hypothermia and become life threatening. When combined with precipitation, ice can form on roadways, trees, and power lines creating secondary hazard conditions. Extreme cold can result in significant damage to homes and businesses (e.g., from burst pipes), and can cause significant health problems, such as hypothermia and frostbite. Agriculture and livestock are subject to damage and life loss and may cause economic impacts as well.

History

While the City and/or Orange County have not experienced many extreme cold events (1 recent declaration event in 2002), they have experienced many extreme heat events. Some significant historic extreme temperature events include:

- September 1963, the temperature reached 113°F at the now repurposed El Toro Air Force Base and the surrounding region was hot as well, including coastal areas. Temperatures in Carlsbad and Oceanside reached 108°F. Schoolchildren and employees were sent home and some agricultural crops were destroyed.
- December 1988, A week of subfreezing temperatures in Southern California. 5 people died as a result of the cold,
- April 1989, daily high temperature records were set for all weather monitoring stations in Southern California. Los Angeles and Riverside set records at 106°F and 104°F respectively.

- October 2017, Southern California experienced two extreme heat days. The weather monitoring station at Long Beach Airport indicated that temperatures reached 105°F that day.
- July 2018, extreme heat waves occurred throughout Southern California. The hottest day of the heat waves occurred on July 6 when temperatures reached 114°F in Santa Ana, CA. A second but less intense extreme heat wave occurred on July 25 where regional temperatures went above 100°F in places like Burbank. While local temperature data is not available, the weather monitoring station at nearby Long Beach Airport indicates that the temperature reached 95°F that day.
- September 2020, A major heat wave struck the region, temperatures of 121 degrees were recorded in Los Angeles County (the highest temperature on record in County)
- June 2021, Strong high pressure brought a dry heat to inland areas. Temperatures reached 123° in Palm Springs, tying the highest reading on record.

The District has experienced several extreme temperature events. To date, the damage from the events has been marginal but they have created disruptions to District operations and services. However, because of its location within Southern California and changing conditions, the potential for more events remains high within the District.

- **Probability**

There are no studies that predict the probability of extreme temperature event occurrences. The State of California has also developed tools under the Cal-Adapt project. The Cal-Adapt project provides the public, researchers, government agencies and industry stakeholders with essential data & tools for climate adaptation planning, building resiliency, and fostering community engagement. The following figures (**Figure 5-14**, **Figure 5-15**, and **Figure 5-16**) were generated by Cal-Adapt work for the City of Laguna Niguel.

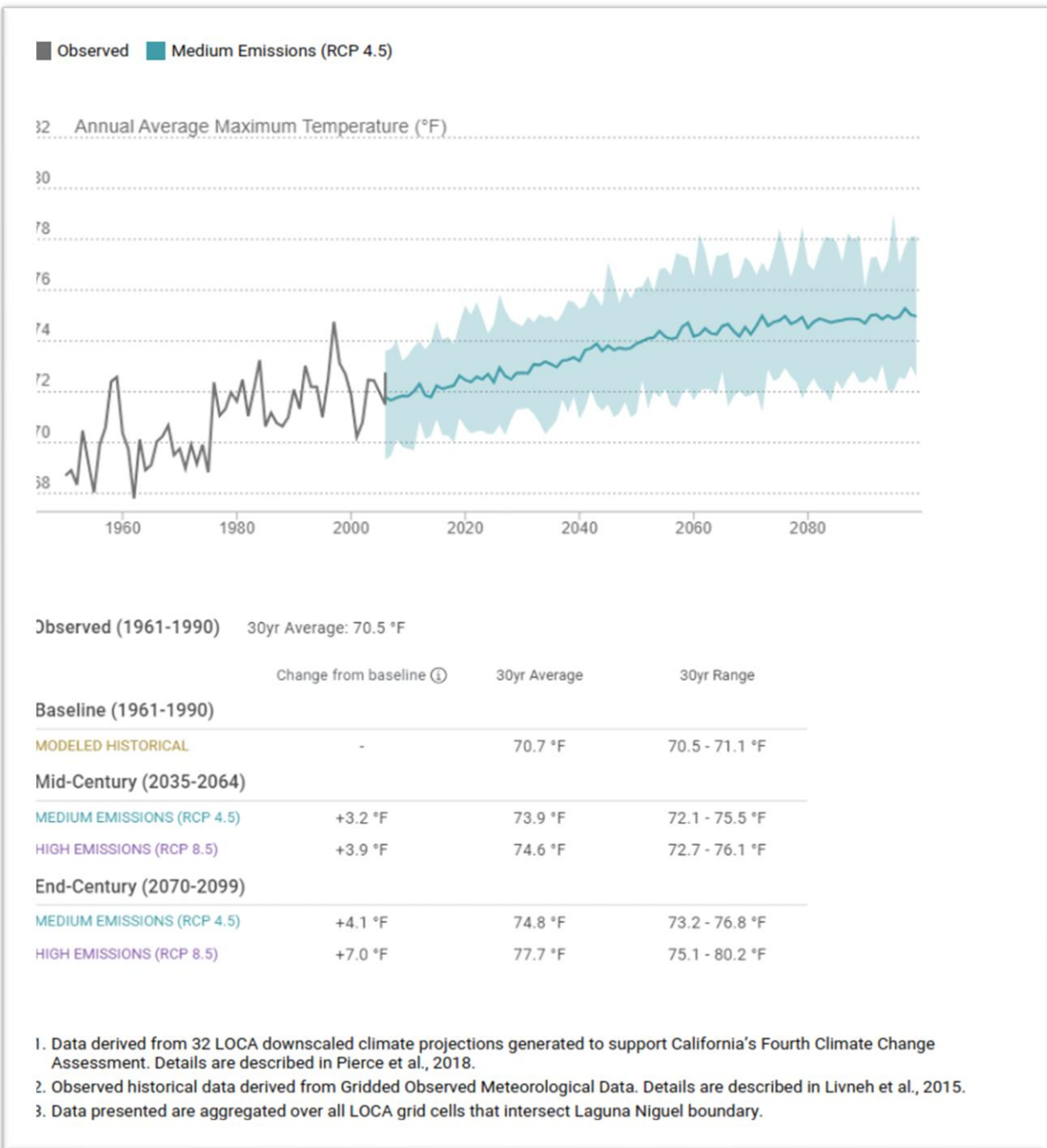
Figure 5.14- Annual Average Maximum Temperature- City of Laguna Niguel

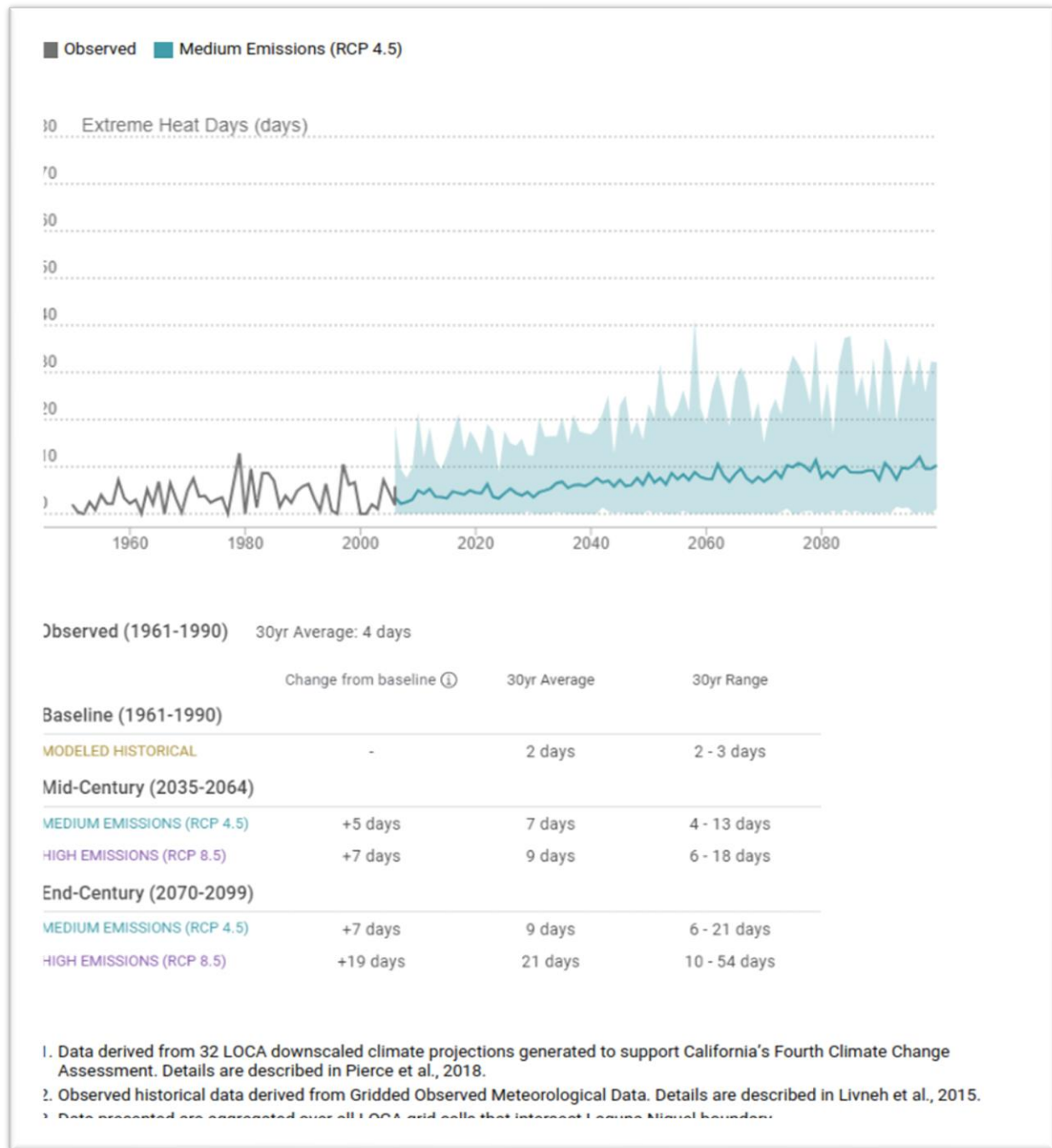
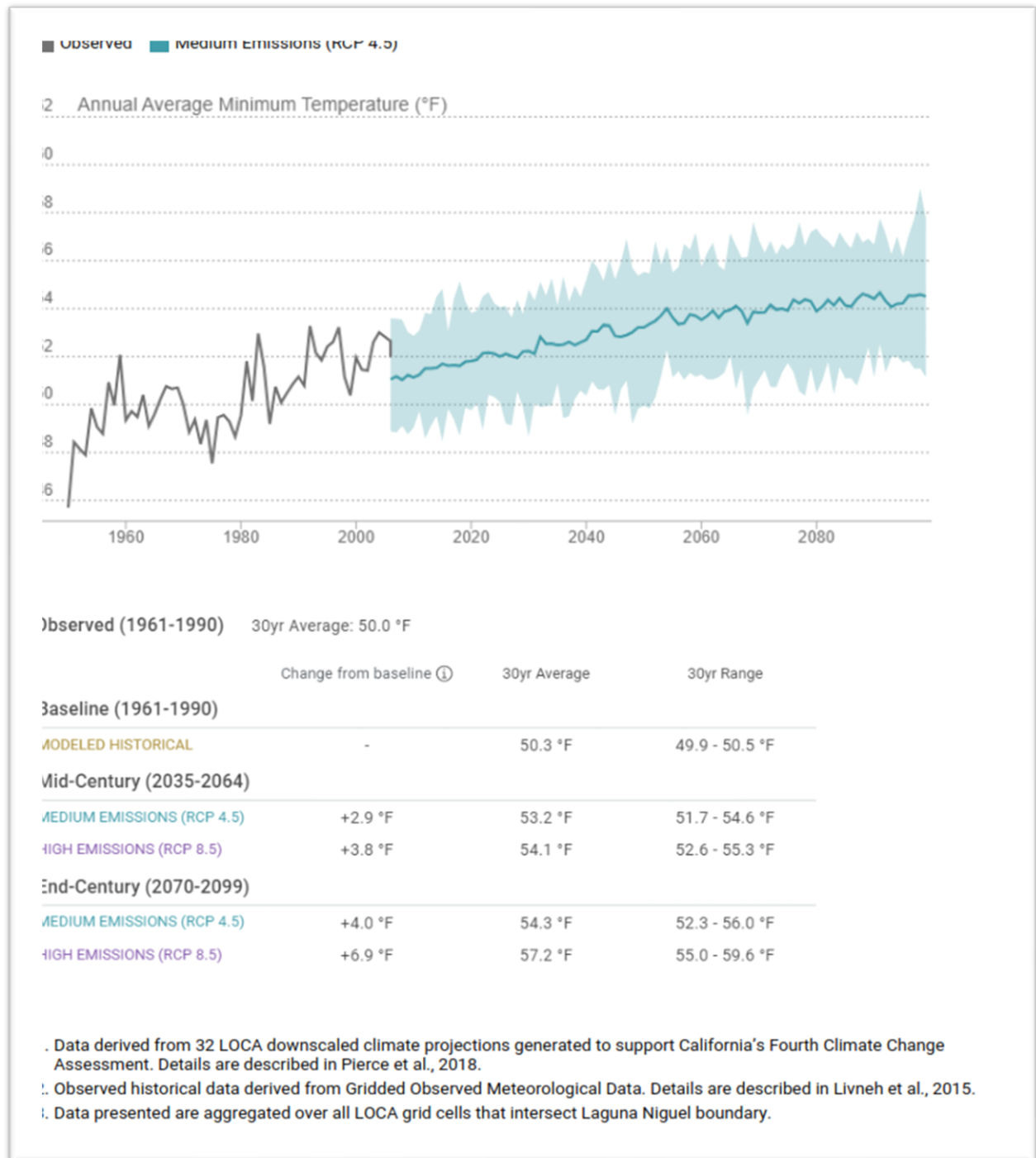
Figure 5.15- Extreme Heat Days - City of Laguna Niguel

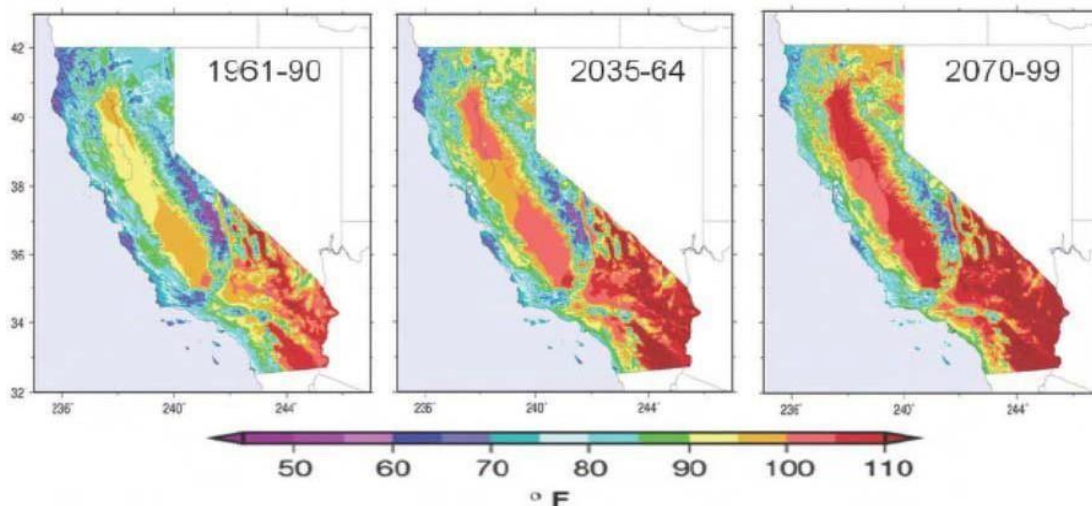
Figure 5.16- Annual Average Minimum Temperature - City of Laguna Niguel

Climate Change Considerations

Climate plays a significant role in Extreme Temperature events. As temperatures rise due to changing conditions, Californians will face greater risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat. By mid-century, extreme heat events in urban centers could cause two to three times more heat-

related deaths than occur today. By 2100, the California Energy Commission is projecting hotter temperatures throughout the state, with an increase of 3 to 5.5°F up to 8 to 10.5°F under different emissions scenarios. The potential change between historical and projected temperature increases is illustrated in **Figure 5.17**.

Figure 5.17- Comparison between Historic and Projected Temperature



5.2.2.5 Flood

- **Ranking-** *Probability-* MEDIUM; *Impact-* MEDIUM
- **Description**

A flood is a temporary condition (short-duration or long-duration) of partial or complete inundation on land that is normally dry. This condition is generally caused by precipitation (i.e., rainfall). Several factors determine the severity of floods, including rainfall intensity and duration, antecedent moisture conditions, surface permeability, and geographic characteristics of the watershed such as shape and slope. Other causes of flooding can include a ruptured dam or levee, rapid ice or snow melting in the mountains, under-engineered infrastructure, or even a poorly placed beaver dam can overwhelm a river or channel and send water spreading over adjacent land or floodplains. According to FEMA, there are several different types of floods and under some there are subtypes. The flooding types and subtypes include:

- Riverine Flooding- river/stream overbank flooding, flash floods, dam and levee failure, alluvia fans, ice jam flooding, moveable bed streams)
- Urban Drainage- flooding caused by older, undersized, or ill placed infrastructure.
- Ground Failures- mud flood and mud flows, subsidence, liquefaction (*NOTE: while mentioned here, mud flows are discussed under landslide hazards and Subsidence and Liquefaction hazards are discussed under earthquake hazards*).
- Fluctuating Lake Levels- water level in lakes fluctuates with changes in moisture balance (precipitation minus evaporation) within the lake basin.
- Coastal Flooding and Erosion- storm surge.

In California, the more common types of flooding are Riverine Flooding (including flash flooding), Urban Flooding, and Coastal Flooding (i.e., storm surge). Floods can take several hours to days to develop. A flash flood is a flood occurring in a watershed where the time of travel of the peak of flow from one end of the watershed to the other is less than six hours. Coastal flooding occurs when storms produce large ocean waves that sweep across coastlines making landfall. The following flood characterization designates the amount of time for response:

- *Flood Watch*—a flood is possible in the area. Advanced warning.
 - *Flood Warning*—flooding is already occurring or will occur soon in the area. Advanced warning.
 - *Flash Flood Watch*—a flash flood is possible in the area. Little-to-no advanced warning.
 - *Flash Flood Warning*—flooding is already occurring or will occur soon in the area. Little-to-no advanced warning.
- **Location and Extent**

Flooding tends to occur in the summer and early fall because of the monsoon and is typified by increased humidity and high summer temperatures. The standard measure for flooding is the "100-year flood", a benchmark used by the Federal Emergency Management Agency (FEMA) to establish a standard of flood control in communities throughout the country. The 100-year flood is also referred to as the "regulatory" or "base" flood. The term 100-year flood is often incorrectly used and can be misleading. The correct designation is "*the 1% annual chance flood*", meaning that the 100-year flood has a one percent chance of being equaled or exceeded during any given year, not that the flood will occur once every hundred years.

While the City does utilize FEMA National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM), it is not an NFIP participating member. The FIRM identifies potential flood risk in geographic areas. The FIRMs are the official map of a community on which FEMA has delineated both the special flood hazard areas and the risk premium zones applicable to the community. Historically, FIRMs were produced on paper; however, over recent years FEMA has begun the process of creating digital versions - *DFIRM*. Because of the volume of area, not all FIRMs have been digitized. Due to the limited detail and large scale of the base maps used for most FIRMs, much interpolation between contour lines is done in mapping the floodplain boundaries. This is why you may find discrepancies when actual ground elevations are surveyed: the maps are just the best available graphic representations of the Base Flood Elevations (BFEs).

The flood hazard areas identified on the FIRMs (i.e., the Special Flood Hazard Areas or SFHAs) for the City of Laguna Niguel are depicted in **Figure 5.18**. The flood hazard zones depicted on the map are derived from FEMA's DFIRM and indicate the probability of flooding happening over a given period of time. As defined by FEMA, Zone A, AE, AE Floodway, AH, and AO (lighter shades of blue) indicate a 1% annual chance of flooding; while Zone Shaded X (dark blue) indicates a 0.2% of annual chance of flooding (500-year flooding). Complete definitions of flood zone designations are provided in **Table 5.4**.

Figure 5.18- FEMA Special Flood Hazard Areas for Laguna Niguel



Table 5.4- FEMA Flood Zone Designations

Risk Level	Flood Zone	Description
High	A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
	AE	The floodplain where base flood elevations are provided.
	AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
	AO	River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
Moderate to Low	X (Shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods.
	X (Unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.
Undetermined	D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

Because of modern weather technologies Flood events usually have advance notices or some indication of the possibility of flooding in the area. Traditionally flooding has occurred in the winter months but the area has been known to have flooding in the spring and fall too. A Flood event can last a few hours or in some instances, they can last for a week or more.

■ History

Orange County has experienced several significant flood events; the most significant ones received federal declarations. A list of the County's most recent federally declared flood disasters is presented in **Table 5.5**.

Table 5.5- Recent Orange County Flood Disaster Declarations

Declaration Number	Year	Type	Description
DR 979	1993	Severe Storms	Severe Winter Storms, Flooding
DR 1044	1995	Severe Storms	Severe Winter Storms, Flooding, Landslides, Mudflows
DR 1046	1996	Severe Storms	Severe Winter Storms, Flooding, Landslides, Mudflows
DR-1203	1998	Severe Storm	Severe Storms, Flooding, Debris Flows, and Mudslides
	1998	Severe Storm	Severe Winter Storms, Flooding
DR 1585	2005	Severe Storms	Severe Storms, Flooding, Landslides, Mud and Debris Flows
DR-1577	2005	Severe Storms	Severe Storms, Flooding, Debris Flows and Mudslides

	2010	Storm	Severe Winter Storms, Flooding (Jan)
	2010	Storm	Severe Winter Storms, Flooding (Dec)
DR-1952	2011	Flood	Severe Winter Storms, Flooding, Debris and Mudflows
DR-4305	2017	Flood	Severe Winter Storms, Flooding, Mudslides
	2019	Storm	Severe Winter Storms, Flooding

■ Probability

While the methodology to estimate riverine flood frequency and probability is firmly established by FEMA (see Table 5.4), these methods do not apply to non-riverine (local) flooding related to poor site drainage. As defined by FEMA, Zone A, AE, AE Floodway, AH, and AO (lighter shades of blue) indicate a 1% annual chance of flooding; while Zone Shaded X (dark blue) indicates a 0.2% of annual chance of flooding (500-year flooding).

Additionally, according to the website Risk Factor, there are 1,000 properties in Laguna Niguel that have greater than a 26% chance of being severely affected by flooding over the next 30 years. This represents 7% of all properties in Laguna Niguel. Overall, Laguna Niguel has a moderate risk of flooding over the next 30 years, which means flooding is likely to impact day-to-day life within the community. This is based on the level of risk the properties face rather than the proportion of properties with risk.

The State of California has also developed tools under the Cal-Adapt project. The Cal-Adapt project provides the public, researchers, government agencies and industry stakeholders with essential data & tools for climate adaptation planning, building resiliency, and fostering community engagement. The following figures (**Figure 5-19** and **Figure 5-20**) were generated by Cal-Adapt work for the City of Laguna Niguel.

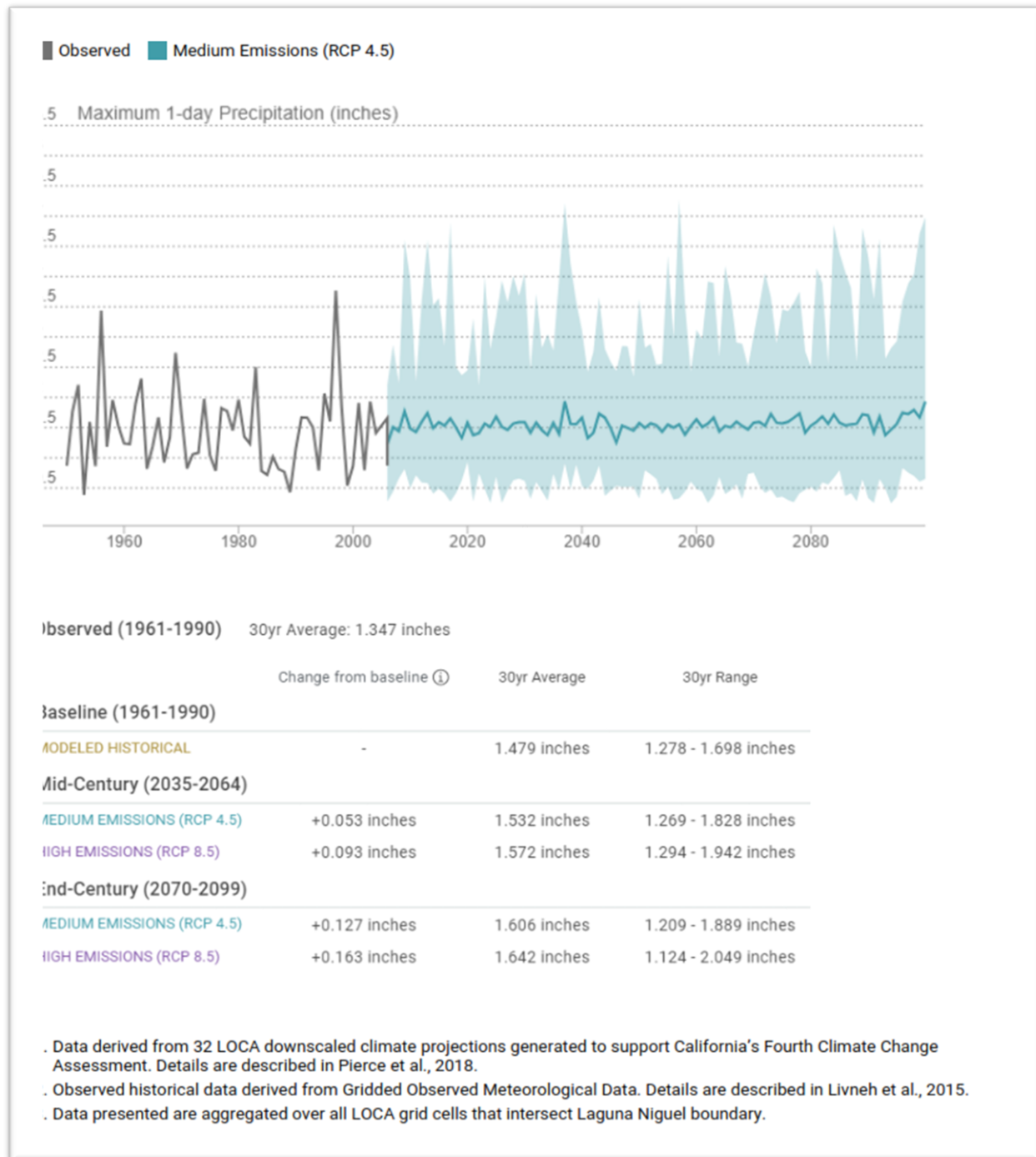
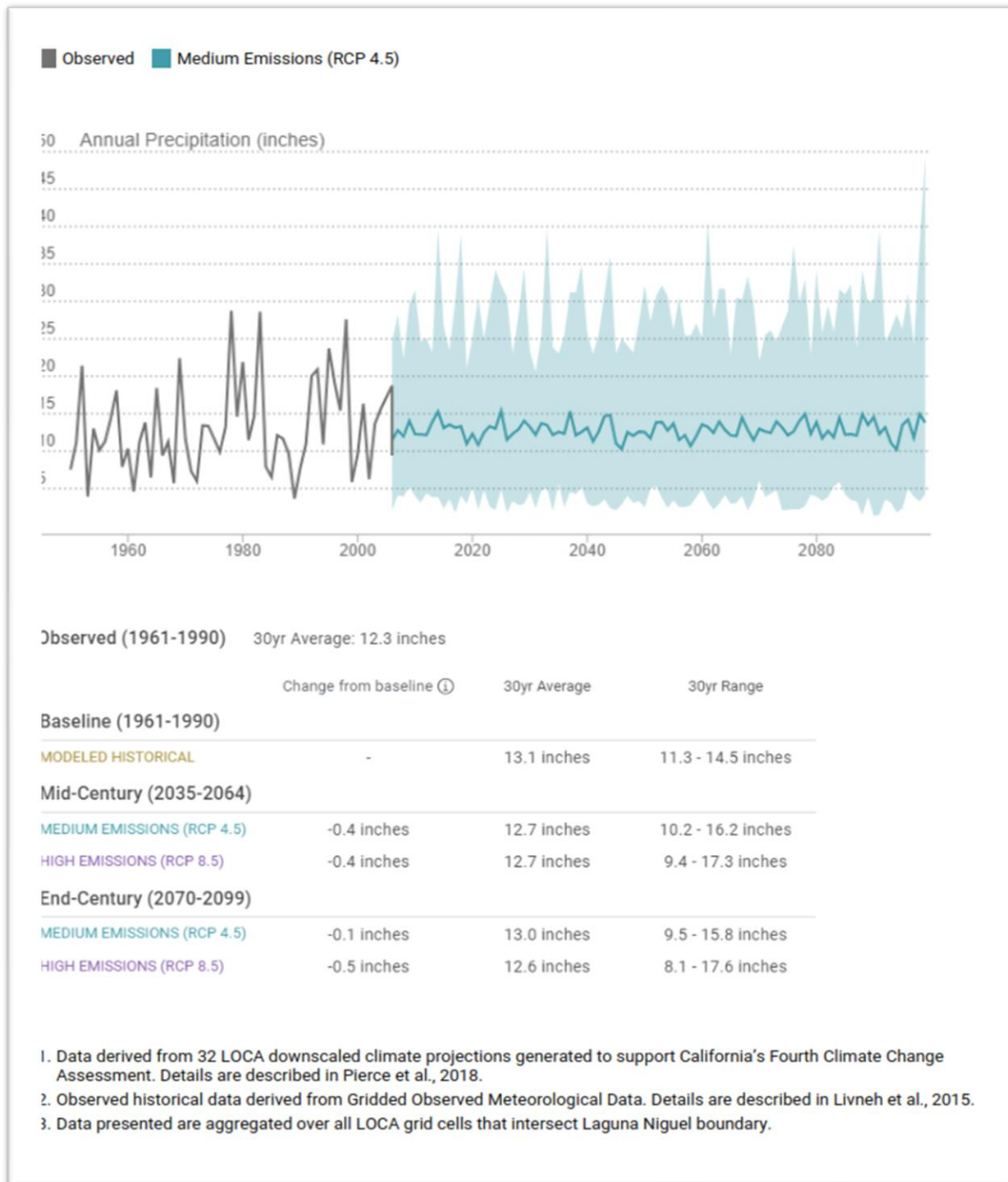
Figure 5.19- Maximum 1-day Precipitation- City of Laguna Niguel

Figure 5.20- Annual Precipitation- City of Laguna Niguel

■ Climate Change Considerations

Climate can act as an amplifier to flood hazards. Extreme weather events have become more frequent over the past 40 to 50 years and this trend is projected to continue. Rising sea levels and shifting weather patterns (temperature, winds) are expected to have a significant impact on rainfall frequency, intensity and distribution, which in turn will have a significant impact on the

frequency of flood occurrences. Additionally, warmer weather patterns increase snowmelt, which in turn produces more runoff to the lower elevations.

5.2.2.6 Landslide

- **Ranking-** *Probability-* MEDIUM; *Impact-* MEDIUM
- **Description**

Landslides can be defined as the movement of a mass of rock, debris, or earth down an incline. According to the USGS, the term “*landslide*” encompasses five (5) modes of slope movement: falls, topples, slides, spreads, and flows.

- Falls are masses of soil or rock that dislodge from steep slopes and free-fall, bounce, or roll downslope.
- Topples move by the forward pivoting of a mass around an axis below the displaced mass.
- Spreads (lateral) commonly induced by liquefaction of material in an earthquake, move by horizontal extension and shear or tensile fractures.
- Slides displace masses of material along one or more discrete planes.
 - In “rotational” sliding, the slide plane is curved and the mass rotates backwards around an axis parallel to the slope;
 - In “translational” sliding, the failure surface is more or less planar and the mass moves parallel to the ground surface.
- Flows mobilize as a deforming, viscous mass without a discrete failure plane.

Landslides can be caused by natural processes or by man-made activities. Landslides occur when down-slope forces (gravity) exceed the resistance (strength) of the earth’s materials. Landslides can be initiated by rainfall, snowmelt, changes in water level, stream erosion, changes in ground water, earthquakes, volcanic activity, disturbance by human activities, or any combination of these factors. Two (2) of the more common types of landslides include:

- Mudflows- defined as flows or rivers of liquid mud down a hillside on the surface of normally dry land. They occur when water saturates the ground, usually following long and heavy rainfalls, or rapid snow melt. Mud forms and flows down slope if there is no ground cover such as brush or trees to hold the soil in place.
- Debris Flow- defined when water begins to wash material from a slope or when water sheets off of a newly burned stretch of land. Chaparral land is especially susceptible to debris flows after a fire. The flow will pick up speed and debris as it descends the slope. As the system gradually picks up speed it takes on the characteristics of a basic river system, carrying everything in its path along with it.

Fast-moving (or rapidly-moving) landslides present the greatest risk to human life, and people living in or traveling through areas prone to rapidly moving landslides are at increased risk of serious injury. Debris- flows can travel down a hillside with speeds up to 200 miles per hour (though more commonly, 30-50 miles per hour), depending on the slope angle and type of earth and debris in the flow.

Slow-moving landslides can occur on relatively gentle slopes and can cause significant property damage but are less likely to result in serious human injuries. Slow-moving slides include rotational slides, where sliding material moves along a curved surface, and translational slides, where movement occurs along a flat surface. These slides are generally slow-moving and can be deep. Slumps are small rotational slides that are generally shallow.

The size of a landslide usually depends on the geology and the initial cause of the landslide. Landslides vary greatly in their volume of rock and soil; the length, width, and depth of the area affected; frequency of occurrence; and speed of movement. Some characteristics that determine the type of landslide are slope of the hillside, moisture content, and the nature of the underlying materials. Landslides are given different names, depending on the type of failure and their composition and characteristics.

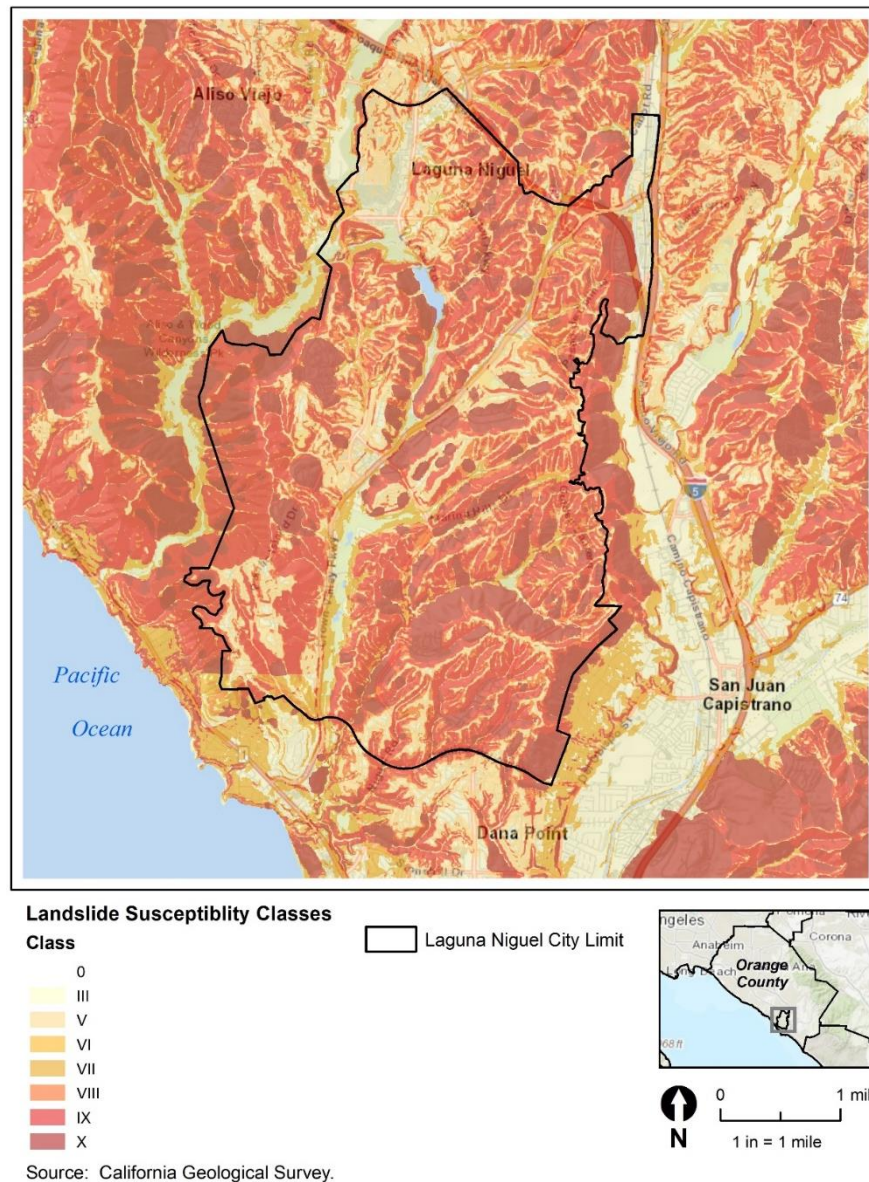
Many landslides are difficult to mitigate, particularly in areas of large historic movement with weak underlying geologic materials. As communities continue to modify the terrain and influence natural processes, it is important to be aware of the physical properties of the underlying soils as they, along with climate, create landslide hazards. Proper planning cannot completely eliminate the threat of landslides to the safety of people, property, and infrastructure; however, without proper planning, landslide hazards will be even more common and more destructive.

▪ Location and Extent

The California Geological Survey is in the process of recording and mapping historical and potential landslides in the state. The location and extent of landslides are extremely difficult to predict and are usually based on historical events and/or soil type and topography. The California Geological Survey has prepared landslide susceptibility maps that cover the City (**Figure 5.21**). According to CGS, susceptibility maps describe the relative likelihood of future landsliding based solely on the intrinsic properties of a locale or site. Prior failure (from a landslide inventory), rock or soil strength, and steepness of slope are the three site factors that most determine susceptibility. However, landslides have the potential to occur in areas with one or more of the following conditions:

- On or close to steep hills
- Steep road-cuts or excavations
- Existing landslides or places of known historic landslides (such sites often have trees tilted in various directions, cracks in the ground, and irregular-surfaced ground)
- Steep areas where surface runoff is channeled, such as below culverts, V-shaped valleys, canyon bottoms, and steep stream channels
- Fan-shaped areas of sediment and boulder accumulation at the outlets of canyons
- Canyon areas below hillside and mountains that have recently (within 1-6 years) been subjected to a wildland fire.

The City of Laguna Niguel is predominately located either on top of graded coastal hills or in the corresponding valleys or canyons. Hillside development is subject to landslides and development in the bottoms of valleys or canyons is subject to liquefaction. During the El Nino storms in the winter of 1998, the City experienced three major landslide events.

Figure 5.21- Landslide Susceptibility for Laguna Niguel

According to the California Geological Survey (CGS) website, CGS has produced numerous maps that show landslide features and delineate potential slope-stability problem areas. Preparation of these maps has been episodic, often driven by landslide disasters and subsequent legislative mandates. Many CGS landslide maps and related products have been produced for local or state agencies in response to their specific needs. Four (4) principal types of information describing the various classes of landslides are portrayed by different landslide maps prepared by the CGS: (1) inventories of existing landslides, (2) landslide hazard—expressed as landslide susceptibility or landslide potential maps, (3) landslide risk maps, and (4) landslide zone maps. Each landslide is classified based on the recency of activity into one of four categories based on the system of Keaton and DeGraff, (1996). The landslide activity categories are graphically portrayed with the colors used to delineate landslide activity on the

maps. The designation of activity shows an estimate of how recently the landslide moved, but also suggests the type of hazard represented. The CGS uses four (4) categories for landslide: Active/Historic; Dormant (Young); Dormant (Mature); and, Dormant (Old). Within these categories, CGS also delineates Confidence of Interpretation: Definite (solid line); Probable (dotted line); and, Questionable (dashed line).

Landslide events can occur any time of the year. Because of modern weather technologies some Landslide events can have advanced notices or some indication of the possibility of landslides in the area. However, there are Landslide events which provide limited to no warning. A Landslide event can last a few hours, and, in some instances, they can last for years (i.e., La Conchita).

- **History**

Historically, landslides are a known hazard in the City the most significant having occurred in the winter of 1998 relating to the Winter Storms and the DR 1203 declaration.

Vista Plaza Drive

In February of 1998, a landslide occurred in a 30-year-old residential neighborhood located along Vista Plaza Drive. The 50-foot-tall landslide damaged two homes beyond repair and back yard improvements of four downhill lots. The slide continued to threaten at least 8 single-family homes in the immediate area.

Alicia Parkway

In February of 1998, a landslide occurred on the east side of Alicia Parkway, just north of Crown Valley Parkway. The 30-foot-tall landslide resulted in the complete closure of the right lane in the northbound direction along Alicia Parkway. The landslide occurred below Alicia Parkway, causing the right travel lane to slide partially down the hill. Fortunately, the slide slid onto the adjoining commercial center's parking lot and no buildings were damaged.

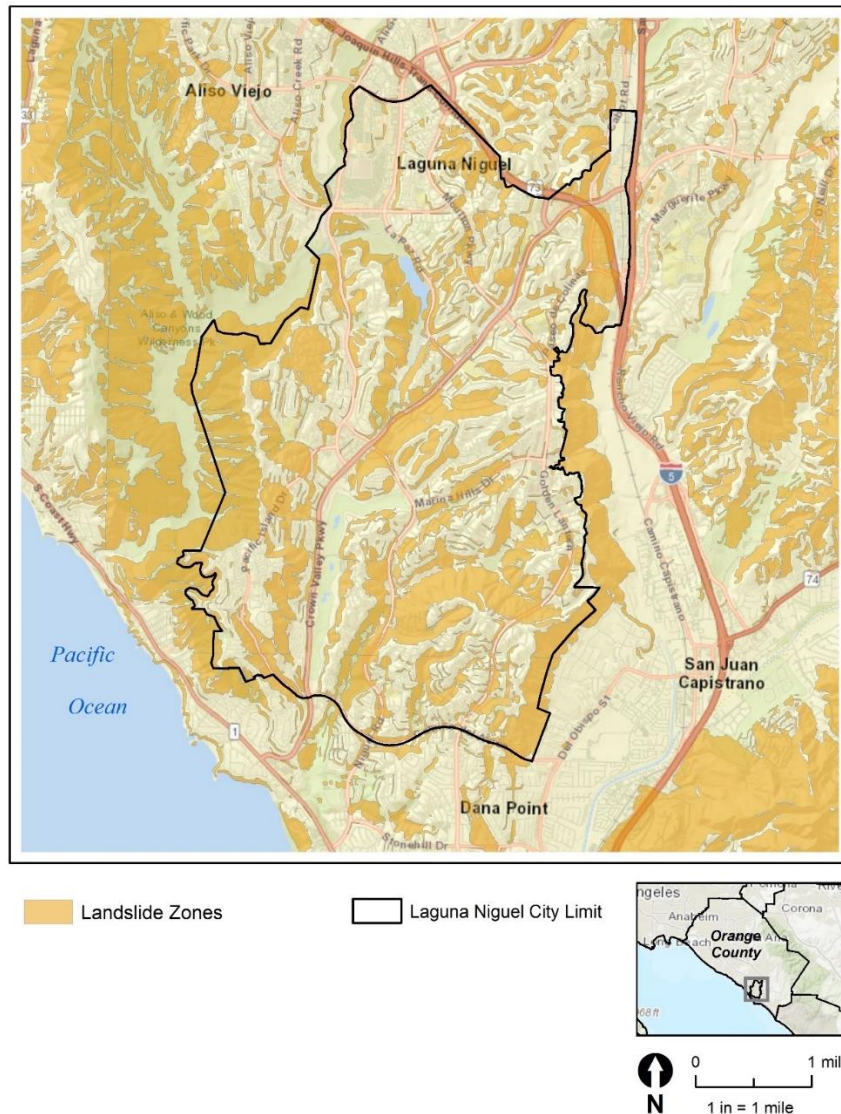
Via Estoril Drive

In the early morning of March 18, 1998, a landslide involving a 125-foot tall, engineered slope occurred. Prior to the event in March, the landslide was a slope creep, which is a slow debilitating process that, with time, causes significant damage to anything in its path. On December 6, 1997, a severe rainstorm increased movement on the landslide resulting in damage and the subsequent evacuation of five condominiums located at the base of the slope. On March 18, 1998, the severe rains accelerated the movement of the landslide and forced the evacuation of five homes at the top of the slope on Via Estoril Drive and five condominiums at the bottom of San Felipe Drive; additionally, four condominiums were threatened. The backyard of one of the Via Estoril homes dropped up to five feet. On March 19, 1998, two houses on Via Estoril collapsed. Seven more houses on the same street were threatened and evacuated; twelve condominiums were damaged and nine more evacuated. On March 20, 1998, a third home on Via Estoril toppled down the headscarp of the landslide. On March 24, 1998, DMG received one other report from the USGS of continued movement on the Laguna Niguel landslide where at least 10 condos were evacuated and

five were destroyed. On March 29, 1998, a fourth house, adjacent to the other three collapsed homes on Via Estoril, split in half and plunged into the graben of the slide.

- **Probability**

Landslides are a common hazard in California. Weathering and the decomposition of geologic materials produce conditions conducive to landslides, and human activity further exacerbates many landslide problems. While difficult to estimate the probability of occurrence for landslide the California Geologic Survey has produced landslide zone maps for the City (**Figure 5.22**). According to CGS, landslide zone maps depict areas with a higher probability of landsliding, within which specific actions are mandated by California law prior to any development. Zone maps may be derived from landslide potential or susceptibility, but some have been based simply on slope gradient or landslide-inventory maps. As in many areas in Southern California, there has been increased probability for mud and debris flows due to wildfire events in the area.

Figure 5.22- Landslide Zone Map for Laguna Niguel

■ Climate Change Considerations

Climate change can increase the probability, frequency, and/or intensity of landslides. Changes in precipitation, specifically the increased frequency of intense precipitation, can result in significant water run-off, which may cause landslides. Additionally, an increase in wildfire hazards will result in loss of hillside vegetation. The loss of hillside vegetation will increase the likelihood of debris and mudflows. This could result in landslides occurring in areas not previously identified.

5.2.2.7 Windstorm

- **Ranking-** *Probability-* HIGH; *Impact-* LOW
- **Description**

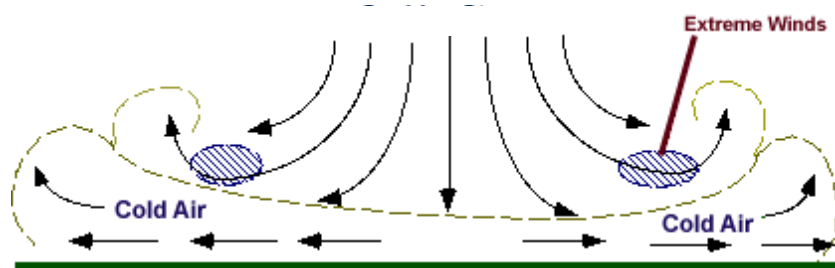
Winds are often referred to according to their strength, and the direction from which they are blowing. Wind is caused by the difference in pressure from one point on the earth's surface to another. Wind is created by air moving from the area of “*higher*” pressure to the area of “*lower*” pressure; the difference in pressure over a certain distance, determines the strength of the wind. Air does not move directly from the point of highest pressure to the point of lowest pressure. The earth's rotation affects the air flow by deflecting it to the right. This effect is called the Coriolis Effect. In the Northern Hemisphere, this causes air to flow clockwise around high-pressure areas and counter-clockwise around low-pressure areas.

For the purposes of this LHMP, windstorms are defined as straight-line winds and cyclonic winds. These storms have wind speeds capable of reaching up to 100 mph, producing a path of damage extending for hundreds of miles.

Straight-line Winds- Straight-line winds are generally associated with little-to-no precipitation. However, some straight-line winds (i.e., thunderstorm) can produce significant precipitation. The winds can gust to 130 mph and winds of 58 mph or more and can last for more than twenty minutes. Terms and characteristics of damaging straight-line windstorm events include:

- *Derecho Storms-* Derechos, Spanish for “straight”, are widespread, long-lived, straight-line wind storm events that are associated with a land-based, fast-moving group of severe thunderstorms. Derechos can cause hurricane-force winds, tornadoes, heavy rains, and flash floods. A warm-weather phenomenon, derechos occur mostly in summer, especially during June, July, and August.
- *Updrafts/Downdrafts-* Localized regions of warm or cool air will exhibit vertical movement (updrafts/downdrafts). Updrafts are small-scale current of rising air, often within a cloud. A mass of warm air will typically be less dense than the surrounding region, and so will rise until it reaches air that is either warmer or less dense than itself. The converse will occur for a mass of cool air, and is known as subsidence. This movement of large volumes of air, especially when regions of hot, wet air rise, can create large clouds, and is the central source of thunderstorms. Drafts can also be conceived by low or high-pressure regions. A low-pressure region will attract air from the surrounding area, which will move towards the center and then rise, creating an updraft. A high-pressure region will then attract air from the surrounding area, which will move towards the center and sink, spawning a downdraft.
- *Downburst-* Strong, downdraft winds flow out of a thunderstorm cell. A downburst is a straight- direction surface wind in excess of 39 miles per hour caused by a small-scale, strong downdraft from the base of convective thundershowers and thunderstorms. Downbursts of all sizes descend from the upper regions of severe thunderstorms when the air accelerates downward through either exceptionally strong evaporative cooling or by very heavy rain, which drags dry air down with it. When the rapidly descending air

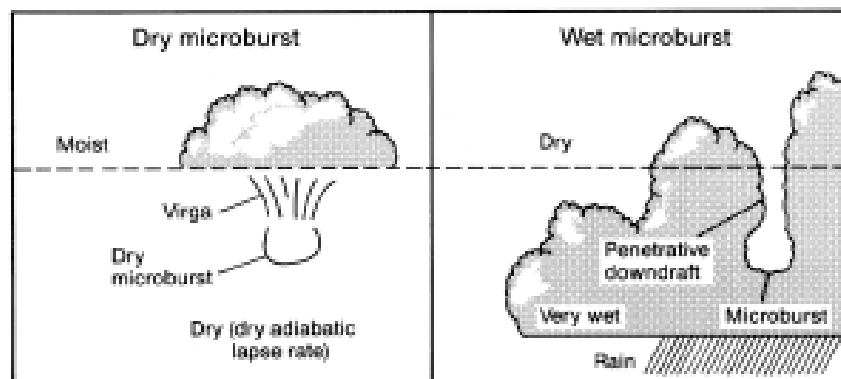
strikes the ground, it spreads outward in all directions, like a fast-running faucet stream hitting the bottom of the sink.



There are two (2) sub-categories of downbursts: the larger macrobursts and smaller microbursts.

Macroburst- Macrobursts are downbursts with winds up to 117 miles per hour which spread across a path greater than 2.5 miles wide at the surface and which last from 5 to 30 minutes.

Microburst- Microbursts are strong, damaging winds which strike the ground and often give the impression a tornado has struck. They frequently occur during intense thunderstorms. The origin of a microburst is downward moving air from a thunderstorm's core. But unlike a tornado, they affect only a rather small area, less than 2.5 miles in diameter from the initial point of downdraft impact. An intense microburst can result in damaging winds near 170 miles per hour and often lasts for less than five minutes. There are two (2) types of microburst windstorms: dry and wet.



- **Gust Front-** A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- **Haboob-** Haboobs, Arabic for blasting/drifts, is a type of intense dust storm carried on an atmospheric gravity current (i.e., thunderstorm), also known as a weather front. When a thunderstorm collapses, and begins to release precipitation, wind directions reverse, gusting outward from the storm and generally gusting the strongest in the direction of the storm's travel. Haboobs occur regularly in arid regions throughout the world.

Cyclonic Winds- Cyclonic winds are associated with higher winds and significant amount of precipitation (hurricanes and tornadoes). Cyclonic winds swirl counter-clockwise in the northern hemisphere or clockwise in the southern hemisphere. The biggest differences between hurricanes and tornadoes are how big they are and how long they last. Hurricanes are typically hundreds of miles in diameter, with high winds and heavy rains over the entire region. Hurricanes can last for days or even weeks. Tornadoes usually last no more than a few minutes. However, damaging wind from thunderstorms is much more common than damage from tornadoes. In fact, many confuse damage produced by thunderstorms (i.e., straight-line winds) are often erroneously attribute to tornadoes. Characteristics of damaging cyclonic windstorm events include:

- *Tornado*- A rapidly rotating column of air that is in contact with both the surface of the Earth and a cumulonimbus cloud or, in rare cases, the base of a cumulus cloud. Tornadoes come in many shapes and sizes, and are often visible in the form of a condensation funnel originating from the base of a cumulonimbus cloud, with a cloud of rotating debris and dust beneath it. Most tornadoes have wind speeds less than 110 miles per hour, are about 250 feet across, and travel a few miles before dissipating.
- *Hurricane*- A rapidly rotating storm system characterized by a low-pressure center, a closed low-level atmospheric circulation, strong winds, and a spiral arrangement of thunderstorms, with no fronts, that produce heavy rain and squalls.

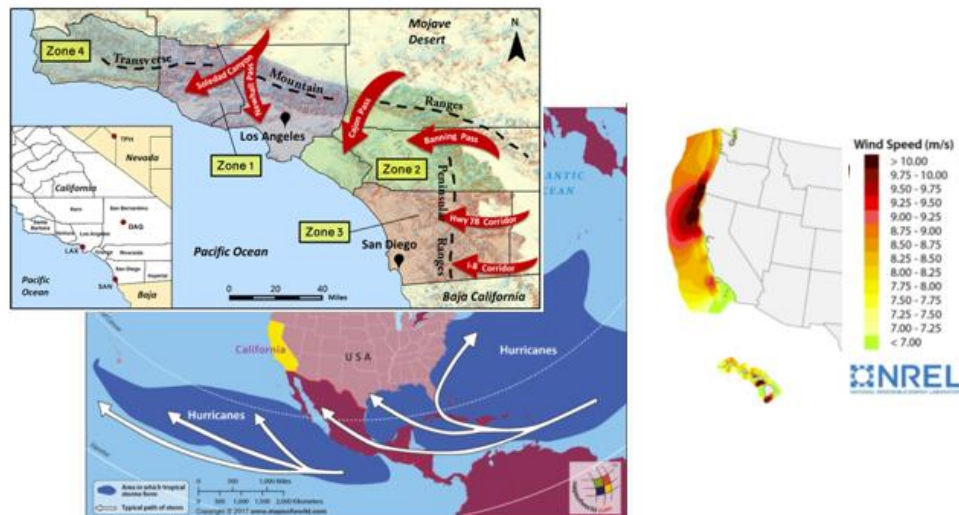
In Southern California, Santa Ana winds are considered a straight-line windstorm event. Santa Ana winds are katabatic winds - Greek for "*flowing downhill*". These winds occur below the passes and canyons of the coastal ranges of Southern California and in the Los Angeles basin. Santa Ana winds often blow with exceptional speed in the Santa Ana Canyon (the canyon from which it derives its name). Santa Ana winds are strong, extremely dry (low humidity) down-slope winds that originate from cool, dry high pressure air masses in the Great Basin region (the high plateau east of the Sierra Mountains and west of the Rocky Mountains, including most of Nevada and Utah) and affect Southern California. These winds come up, over, and are pulled southward down the eastern side of the Sierra Nevada Mountain range and into the Southern California region. The air warms as it descends toward the California coast at the rate of 5 degrees Fahrenheit per 1000 feet due to compressional heating. Thus, compressional heating provides the primary source of warming. The air is dry since it originated in the desert, and it dries out even more as it is heated.

Forecasters at the National Weather Service offices in Oxnard and San Diego usually place speed minimums on these winds and reserve the use of "*Santa Ana*" for winds greater than 25 knots (29 mph). These winds accelerate to speeds of 35 knots (40 mph) as they move through canyons and passes, with gusts of 50 - 60 knots (57.5 - 69 mph). Santa Ana winds can happen any time during the year but are most prevalent in the autumn and winter months. The most significant hazard associated with Santa Ana winds is an increased wildfire danger, but Santa Ana winds can also cause downed trees and power lines, and property damage, as well as causing potentially hazardous conditions for RV's, semi-trailers, aircraft and boaters.

Location and Extent

The entire City is susceptible to various windstorms. Windstorm events can occur any time of the year and generally last for a few hours but in some instances can last for days. Because of modern weather technologies, there are generally advanced warning for Windstorm events. **Figure 5.23** depicts the wind patterns (i.e., Santa Ana wind paths, hurricane paths, and onshore wind intensities) that influence the area and are the primary driving force behind windstorms.

Figure 5.23- Wind Patterns Affecting Southern California



As mentioned, winds are categorized by types and each type is associated with wind speeds: breeze (<31 mph), gale (32-54 mph), storm (55-72 mph), and hurricane (>73 mph). Within each category are sub classifications with differential names depending on geographic location (i.e., tropical depression, tropical storm/cyclone) and/or categories (i.e., category 3 hurricane). Winds are also measured using the Beaufort Scale. The Beaufort Scale categories winds by wind speed, using Force categories between 0-12 to measure speed and summarize descriptions (**Table 5.6**).

Table 5.6- Beaufort Scale

Category (Force)	Speed (MPH)	Description
0	0-1	Calm. Smoke rises vertically and the sea is flat.
1	1-3	Light air. The direction of the wind is shown by drifting smoke, but not wind vanes.
2	4-7	Light breeze. Wind is felt on the face, leaves rustle, and wind vanes move. Small wavelets appear on the ocean, but do not break
3	8-12	Gentle breeze. Leaves and small twigs are in motion, and light flags extend. Large wavelets appear on the ocean and crests begin to break.
4	13-18	Moderate breeze. Dust and loose paper become airborne, and small branches move. Small waves appear on the ocean.
5	19-24	Fresh breeze. Small trees begin to sway and moderate waves appear.
6	25-31	Strong breeze. Large branches are in motion, and holding an umbrella becomes difficult. Large waves begin to form.
7	32-38	Near gale. Whole trees are in motion, and walking against the wind can be hard.

		Foam from breaking waves is blown in streaks.
8	39-46	Gale. Walking is difficult and twigs break off trees.
9	47-54	Severe gale. There is slight structural damage, and the crests of waves begin to topple.
10	55-63	Storm. Trees are uprooted and there is considerable damage to structures. Very high waves form in long, overhanging crests.
11	63-72	Violent storm. There is widespread structural damage, exceptionally high waves form, and the ocean is completely covered in foam.
12	>73	Hurricane. There is devastating structural damage. On the ocean, the air is filled with foam and spray.

Hurricanes are measured using the Saffir-Simpson Hurricane Winds Scale (**Table 5.7**), while tornadoes are measured using the Fujita Tornado Scale (**Table 5.8**). The Fujita scale rates tornadoes by damage. An F0 tornado, the weakest category, damages trees, but not substantial structures. An F5 tornado, the strongest category, rips buildings off their foundations and can deform large skyscrapers.

Table 5.7- Saffir-Simpson Hurricane Wind Scale

Category	Speed (MPH)	Description
1	74-95	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days
2	96-110	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes
4	130-156	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months
5	>156	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months

Table 5.8- Fujita Tornado Scale

Category	Speed (MPH)	Description
F0	40-72	Gale Tornado. Light Damage: Some damage to chimneys; breaks twigs and branches off trees; pushes over shallow-rooted trees; damages signboards; some windows broken; hurricane wind speed begins at 73 miles per hour.
F1	73-112	Moderate Tornado. Moderate Damage: Peels surfaces off roofs; mobile homes pushed off foundations or overturned; outbuildings demolished; moving autos pushed off the roads; trees snapped or broken.
F2	113-157	Significant Tornado. Considerable Damage: Roofs torn off frame houses; mobile homes demolished; frame houses with weak foundations lifted and moved; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	158-206	Severe Tornado. Severe Damage: Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forests uprooted; heavy cars lifted off the ground and thrown; weak pavement blown off roads.
F4	207-260	Devastating Tornado. Devastating Damage: Well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and disintegrated; large missiles generated; trees in forest uprooted and carried some distance away.
F5	261-318	Incredible Tornado. Incredible Damage: Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 300 feet (100 meters); trees debarked; incredible phenomena will occur.
F6-12	>319	The maximum wind speeds of tornadoes are not expected to reach the F6 wind speeds.

History

While there have been hundreds of smaller windstorm events, below is a list of the stronger wind events recorded in and around the City:

- In November 1957, Santa Ana winds exacerbated wildland fires, endangered air traffic, and triggered sandstorms in the Fontana area.
- In April 1962, strong Santa Ana winds howled throughout the region, uprooting trees, causing property damage and interrupting power transmission to customers.
- In November 1996, Santa Ana winds blew at 35 to 45 miles per hour throughout most of southern California, although winds were recorded close to 100 miles per hour in certain areas.
- In December 1996, gusts were recorded in Fremont Canyon near Tustin at 111 miles per hour. Injuries were recorded in Huntington Beach when a 60-foot tree was uprooted by the winds and fell on top of people.
- In October 1997, a fire caused by scrap metal was carried by 45-mile-per-hour Santa Ana winds throughout the Santa Ana Mountains, causing widespread property damage in eastern Orange County.
- In October 1998, a thunderstorm sent destructive winds through Orange County. Trees were uprooted and blown onto vehicles and buildings. A power outage affected more than 18,000 utility customers across the communities of Los Alamitos, Rossmore, Cypress, Tustin, Santa Ana, and Garden Grove.

- In October 2007, winds up to 85 miles per hour blew through Fremont Canyon near Tustin. These winds caused extensive damage to structures and vehicles. The winds also exacerbated existing wildland fires, causing widespread evacuations and the burning of more than 49,000 acres.
- In November 2008, strong Santa Ana winds exacerbated and spread the Freeway Complex Fire, one of the most destructive fires in Southern California history. More than 30,000 acres were burned.

- **Probability**

The City is at risk of windstorms at any given time during the calendar year. However, as previously mentioned they are more prevalent in the autumn and winter months. Santa Ana winds, which commonly occur between October and February, can reach speeds of more than 100 miles per hour.

- **Climate Change Considerations**

Climate change will play a significant role in windstorm events. The changing conditions are expected to cause a significant amplification to many existing conditions. Because of this, climate change might impact the frequency, duration, and intensity of windstorms. Climate change, although still being studied, could have an effect on high- and low-pressure zones. High- and low-pressure zones are created by many factors, but many are related to uneven heating of the earth's surface by the sun. Many of the factors that go into the heating of the earth's surface, but many may be impacted by climate change (i.e., type of vegetation in areas impact ability to absorb heat, amount of snow cover which reflects heat). In addition to altering and, possibly, increasing frequency of significant winds in the area.

5.2.3 TIER III THREATS AND HAZARDS

The threats and hazards, in alphabetical order, under Tier III include: Energy Disruption, Radiological Accident, Technology Disruption, Terrorism, and Transportation Accident.

5.2.3.1 Energy Disruption

- **Ranking-** *Probability- LOW; Impact- LOW*
- **Description**

For the purposes of this LHMP, energy disruption includes energy shortage/power outage and energy shortage/power outage is confined to rolling blackouts or brownouts and Public Safety Power Shutdown (PSPS) events. A brownout is a partial, temporary reduction in total system capacity, while a blackout is a complete interruption in power. A brownout is caused by high electricity demand that is near or above a utility's production capacity. When this occurs, the utility may reduce the flow of electricity to certain areas to prevent a blackout. A blackout is a large-scale service interruption that can happen as a result of severe weather or equipment failure at power plants.

PSPS events are initiated by power utility companies and are implemented in response to severe weather events. The purpose is to mitigate the increased fire risk during "red flag"

weather conditions. Red flag weather conditions include: high winds, low humidity, and high temperatures. By shutting off power, the utility companies are ensuring that electrical equipment, which can arc and spark, during severe events, will not exacerbate or start a fire.

- **Location and Extent**

Energy Disruption events can occur throughout the City, they can occur anytime of the year, and generally last for a few hours or in some cases a few days. Depending on the cause of energy disruption there may or may not be advanced warning (i.e., PSPS). There is no universal or common scale to measure levels of Energy Disruption. Most Energy Disruption is generally defined by types (cause) of disruption and duration.

- **History**

The City of Laguna Niguel, like most of California, has had power outages related to the failure of the statewide or regional systems not being able to meet demand, system shutdowns related to fire threats, localized outages related to severe weather, accidents, and localized system failures. System wide outages have become more frequent due to extreme heat and fire threats.

- **Probability**

There are no studies that predict the probability of Energy Shortage and/or Power Outage event occurrences. However, the California Independent System Operator (Cal ISO) does monitor energy supply and demand and provides some near-time predictions when there may be energy shortages and recommend “Flex Alerts” orders. Similarly, PSPS events are implemented and managed by private utility companies. While historically, they have not consistently provided advanced notice of when and where the power would be shutoff, or when the power will be restored, there are noticeable improvements to notifications over recent events.

- **Climate Change Considerations**

Climate plays a significant role in Energy Shortage and/or Power Outage events. As temperatures rise, there will be significant impacts on energy supply and demand. Additionally, increased wildfire risk will increase the frequency and duration of PSPS events.

5.2.3.2 Radiological Accident

- **Ranking-** *Probability- LOW; Impact- LOW*

- **Description**

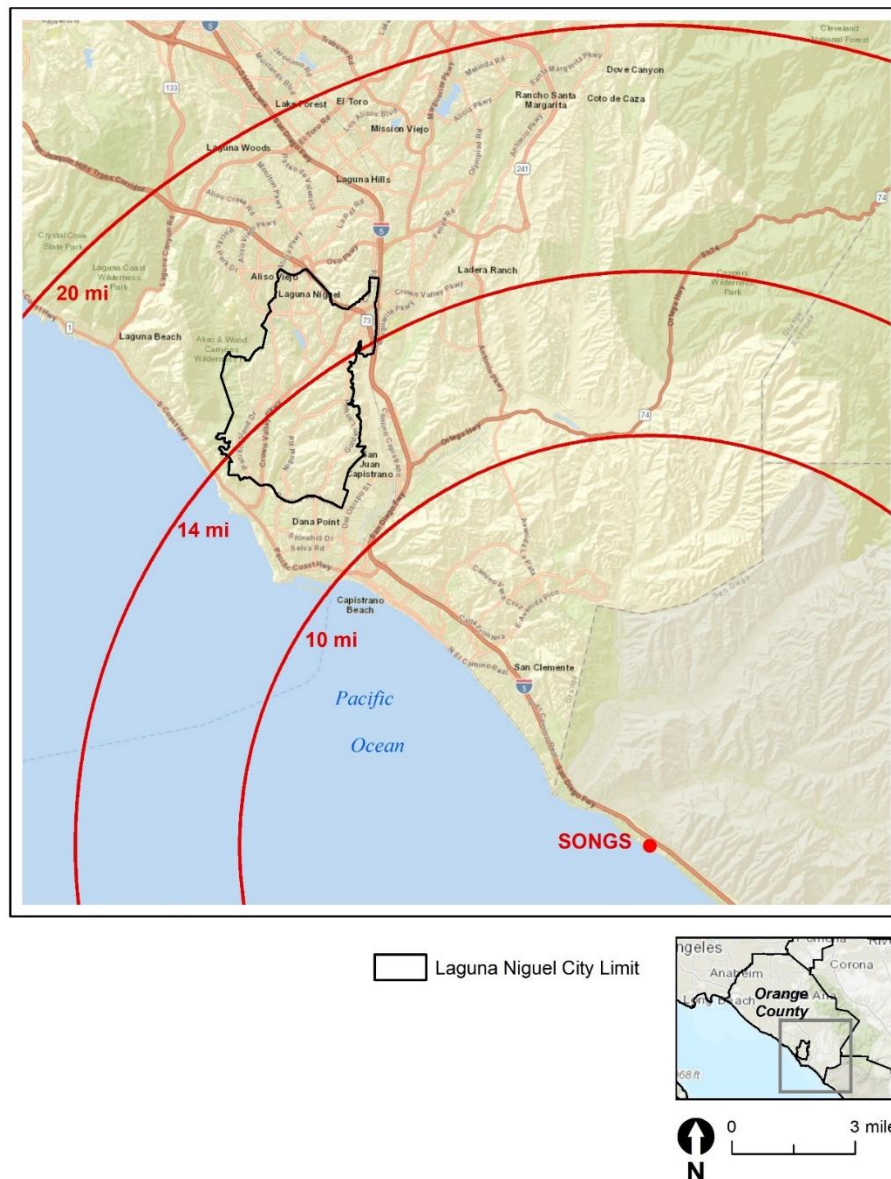
For the purposes of this LHMP, Radiological Accident is limited to a significant event at the San Onofre Nuclear Generating Station (SONGS). While SONGS is permanently closed, it still houses nuclear waste. (NOTE: other radiological-type of accidents are covered under Terrorism.)

- **Location and Extent**

SONGS is located on the Orange County and San Diego County border just west of Interstate 5 (**Figure 5.24**). SONGS is governed by several agencies, each ensuring proposer maintenance and safety protocols are in place. As part of this oversight, SONGS maintains an Emergency Preparedness Information document. One of the primary out products of the document is the creation of the three (3) emergency zones: Emergency Planning Zone- EPZ (10-mile radius),

Public Education Zone- *PEZ* (20-mile radius), and the Ingestion Pathway Zone- *IPZ* (50-mile radius). Figure 5.25 shows the EPZ and the IPZ. The City of Laguna Niguel falls within the IPZ, with Saddleback also falling within the PEZ.

Figure 5.24- SONGS Emergency Planning Zone and Ingestion Pathway Zone



According to the International Atomic Energy Agency (IAEA), has established an International Nuclear and Radiological Event Scale (INES); a tool for communicating the safety significance of nuclear and radiological events to the public. Member States use INES on a voluntary basis to rate and communicate events that occur within their territory. It is not a notification or reporting system to be used in emergency response.

Member States use INES to provide a numerical rating that indicates the significance of nuclear or radiological events.

- Events are rated at seven (7) levels (**Figure 5.25** and **Table 5.9**). The scale is logarithmic – that is, the severity of an event is about ten times greater for each increase in level of the scale.
- Events are considered in terms of:
 - Impact on people and the environment
 - Impact on radiological barriers and control
 - Impact on defence in depth
- Events without safety significance are rated as Below Scale/Level 0.
- Events that have no safety relevance with respect to radiation or nuclear safety are not rated on the scale.

Figure 5.26- INES Rating Levels

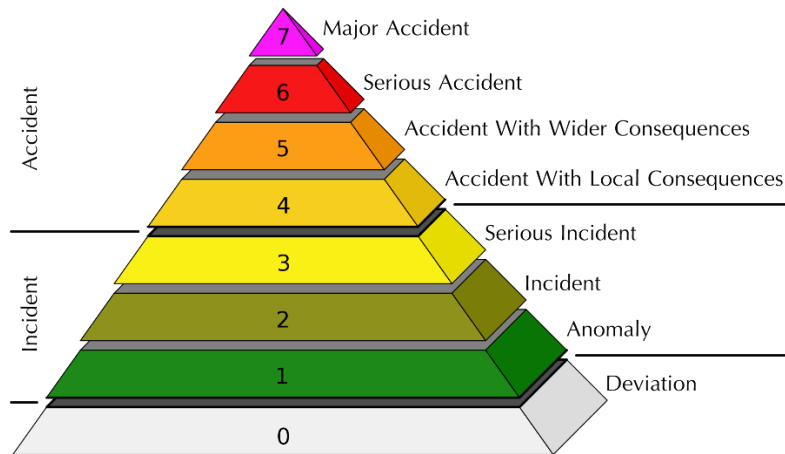


Table 5.9- INES Rating Descriptions

Level	Classification	Description
7	Major accident	Impact on people and environment: <ul style="list-style-type: none"> Major release of <u>radioactive material</u> with widespread health and environmental effects requiring implementation of planned and extended countermeasures.
6	Serious accident	Impact on people and environment: <ul style="list-style-type: none"> Significant release of radioactive material likely to require implementation of planned countermeasures.
5	Accident with wider consequences	Impact on people and environment: <ul style="list-style-type: none"> Limited release of radioactive material likely to require implementation of some planned countermeasures. Several deaths from radiation. Impact on radiological barriers and control: <ul style="list-style-type: none"> Severe damage to reactor core. Release of large quantities of radioactive material within an installation with a high probability of significant public exposure. This could arise from a major criticality accident or fire.
4	Accident with local consequences	Impact on people and environment: <ul style="list-style-type: none"> Minor release of radioactive material unlikely to result in implementation of planned countermeasures other than local food controls. At least one death from radiation. Impact on radiological barriers and control: <ul style="list-style-type: none"> Fuel melt or damage to fuel resulting in more than 0.1% release of core inventory. Release of significant quantities of radioactive material within an installation with a high probability of significant public exposure.
3	Serious incident	Impact on people and environment: <ul style="list-style-type: none"> Exposure in excess of ten times the statutory annual limit for workers. Non-lethal deterministic health effect (e.g., burns) from radiation. Impact on radiological barriers and control: <ul style="list-style-type: none"> Exposure rates of more than 1 Sv/h in an operating area. Severe contamination in an area not expected by design, with a low probability of significant public exposure. Impact on <u>defence-in-depth</u> : <ul style="list-style-type: none"> Near-accident at a nuclear power plant with no safety provisions remaining. Lost or stolen highly radioactive sealed source. Misdelivered highly radioactive sealed source without adequate procedures in place to handle it.
2	Incident	Impact on people and environment: <ul style="list-style-type: none"> Exposure of a member of the public in excess of 10 mSv. Exposure of a worker in excess of the statutory annual limits. Impact on radiological barriers and control: <ul style="list-style-type: none"> Radiation levels in an operating area of more than 50 mSv/h. Significant contamination within the facility into an area not expected by design. Impact on defence-in-depth: <ul style="list-style-type: none"> Significant failures in safety provisions but with no actual consequences. Found highly radioactive sealed orphan source, device or transport package with safety provisions intact. Inadequate packaging of a highly radioactive sealed source.
1	Anomaly	Impact on defence-in-depth: <ul style="list-style-type: none"> Overexposure of a member of the public in excess of statutory annual limits. Minor problems with safety components with significant defence-in-depth remaining. Low activity lost or stolen radioactive source, device, or transport package.
0	Deviation	No safety significance.

Radiological Accidents can occur anytime of the year, with little to no warning. However, there are instances where there is a worsening of conditions in and around the plant that provide some advanced warning of imminent threat of an accident. Depending on the level of the Radiological Accident, events can last a few hours, a few days, or in the worse case scenario years (i.e., Three Mile Island, Chernobyl)

- **History**

There are no documented reports of accidents or accidental release of radiological material at SONGS.

- **Probability**

There are no official studies that address the probability of radiological accidents. However, it is worthwhile to note that SONGS was closed because of potential operational risk.

- **Climate Change Considerations**

There have been no direct links between radiological (nuclear) accidents and climate change. Additionally, because SONGS is closed, the likelihood of an accident has decreased. However, some consideration could be made towards sea-level rise. There have been several recent studies looking at the potential impacts from rising seas but most studies indicate that the SONGS location is well protected and situated to withstand the potential impacts.

5.2.3.3 Technology Disruption

- **Ranking-** *Probability- LOW; Impact- LOW*
- **Description**

Technology disruption includes both deliberate (cyber-attacks) or accidental (equipment failure or human error) actions that can cause the loss of use of technology and/or data. A cyber threat/attack is a circumstance or event that has or indicates the potential to exploit technology vulnerabilities and to adversely impact organizational operations, organizational assets (including information and information systems), individuals, other organizations, or society. Critical infrastructure, such as utilities and telecommunications, are also potential targets. Cyber threats/attacks are most easily described as either external threats (where attacks originate outside of established networks) or internal/insider threats (where attacks originate from users who have existing access to an internal network). Examples of cyber threats/attacks include: malware and hacking, phishing, denial of service attacks, ransomware, and state-sponsored hacking. Any one of these threats, if initiated, and successful, can produce a cyber-attack that has major implications throughout the organization. Recent report produced by Verizon (2020) analyzes 32,002 security incidents and 3,950 confirmed breaches from 81 global contributors from 81 countries and indicate the following trends:

- 86% of data breaches are for financial gain - up from 71% in 2019
- Cloud-based data under attack – web application attacks double to 43%
- 67% of breaches caused by credential theft, errors and social attacks
- Clearly identified cyber-breach pathways enable a “Defender Advantage” in the fight against cyber-crime

- On-going patching successful - fewer than 1 in 20 breaches exploit vulnerabilities
- 37% of credential theft breaches used stolen or weak credentials
- 25% involved phishing
- Human error accounted for 22%

- **Location and Extent**

Technology disruptions can happen anywhere within the City but are generally focused on administrative (i.e., website, administrative records) or facility (i.e., utilities, communications) type of functions. Depending on the cause of the distribution, there may or may not be advanced warning and Technology Disruptions events can last a few hours, days, and in some instances a few weeks/months. There is no universal or common scale to measure levels of Technology Disruption. Most Technology Disruption is generally defined by types (cause) of disruption and duration.

- **History**

While there have been several small cyber threats/attacks and minor equipment failures and human errors, none have reached a level of significance.

- **Probability**

The probability of occurrence of technology disruption is on the rise globally, nationally, and locally. With the increased reliance on the internet and cloud-based computing, there are more opportunities for cyber threats/attacks and/or the loss of connectivity. However, cyber threats/attacks generally target larger corporations or state/national governments. Several local government agencies are increasingly being targeted by cyber criminals on the basis that they have fewer resources to defend themselves. Unlike natural hazards, where there is historical data, and some predictive modeling, cyber threats/attacks are more challenging to anticipate.

- **Climate Change Considerations**

While there is no evidence to link climate change to increase occurrences of technology disruptions, cyber-attacks targets could be related to individuals or companies they perceive to have effect on the climate (i.e., greenhouse gas producers) within the community.

5.2.3.4 Terrorism

- **Ranking-** *Probability- LOW; Impact- LOW*
- **Description**

Terrorism has become an undeniable reality throughout the United States. The term terrorism refers to intentional, criminal malicious acts. There is no single, universally accepted definition of terrorism, and it can be interpreted in many ways. Terrorism is defined in the Code of Federal Regulations as “...the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.” (28 CFR, Section 0.85). For the purposes of this plan, terrorism refers to the use of weapons of mass destruction, including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial

sabotage and intentional hazardous materials releases; and cyber terrorism. Many of these incidents can be a well-planned, coordinated attacks with multiple suspects, or the result of a lone individual on a rampage. Conventional Attacks/Active Shooter incidents are generally considered a lone individual incident.

- **Location and Extent**

Terrorism can occur throughout the entire City but due to terrorisms' intended purpose - to cause the greatest amount of destruction - it would most likely happen in more populous areas (high value, visually recognized targets) where more devastation, fear, and chaos will ensue. Except in rare cases, Terrorism events have no advanced warning and can last hours, days, weeks, months, and in some worst cases, years. There is no universal or common scale to measure levels of Terrorism. Most Terrorism events are generally defined by types of events or the intended target.

- **History**

There have been no significant terrorism events.

- **Probability**

Because of the intended purpose of terrorism - to create devastation (and fear) - terrorist incidents would most likely happen in more populous urban areas, rather than within the City. However, the adjacent areas contain several high-value targets (i.e., Santa Ana Airport, Disneyland, Anaheim Stadium, Honda Center) that a terrorist organization could target. While not directly within the City, fallout from the incident could impact residence, employees, facilities, and operations.

- **Climate Change Considerations**

While there is little evidence to link climate change increasing occurrences of terrorism, the motivation behind the incident may be targeting individuals and/or organizations they perceive to have effect on the climate (i.e., greenhouse gas producers) within the community. Climate conditions could also intensify the incident (i.e., Improvised Explosive Device- IED during high wind event) and/or hinder the response and recovery efforts (i.e., evacuation during flooding).

5.2.3.5 Transportation Accident

- **Ranking-** *Probability- LOW; Impact- LOW*
- **Description**

Transportation Accidents are defined as accidents involving aircraft, trains, natural gas pipelines, and vehicles.

Aircraft Accidents is defined as both those that occur “*in-flight*” and those that occur “*on ground*”; and definitions delineate those that cause death and injuries and those that cause substantial damage to the aircraft. For this LHMP, the Planning Team is defining Aircraft Accident as an occurrence associated with in- flight accidents only.

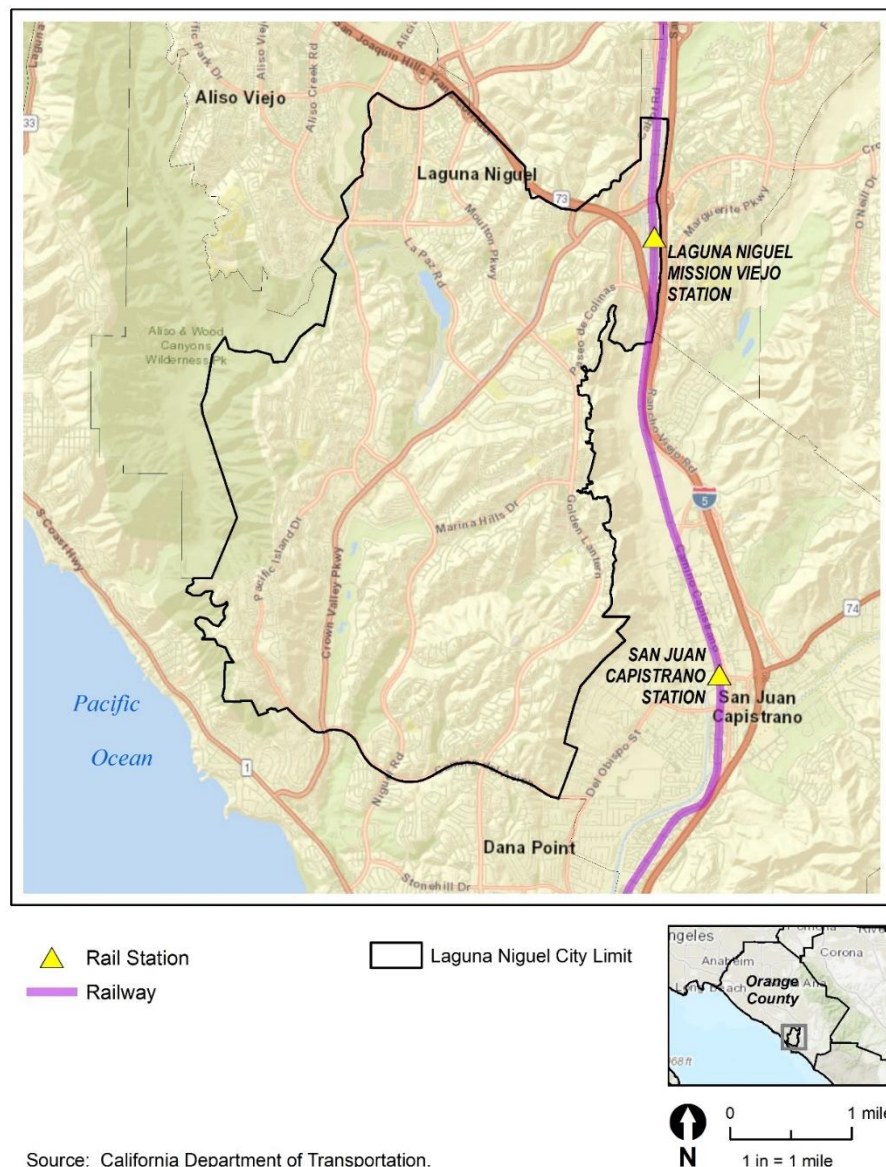
Train Derailments are defined as any accidents involving public or private trains carrying passengers or cargo along the rail corridor. Cargo commodities include such things as hazardous materials, fuel (including oil), agriculture, meats, and non-consumables.

Natural Gas Pipeline Accidents is transported via the interstate pipelines, and some of the California-produced natural gas, is delivered into the Pacific Gas and Electric Company (PG&E) and Southern California Gas (SoCal Gas) intrastate natural gas transmission pipeline systems (commonly referred to as California's "backbone" natural gas pipeline system). Natural gas on the utilities' backbone pipeline systems is then delivered into the local transmission and distribution pipeline systems, or to natural gas storage fields. PG&E and SoCal Gas own and operate several natural gas storage fields that are located in Northern and Southern California. Generally speaking, natural gas transmission lines are large-diameter steel pipes carrying natural gas at high pressure and compressed to provide higher carrying capacity. Transmission lines are both interstate and intrastate, with the latter connecting to smaller distribution lines delivering gas directly to homes and businesses. Compounding the potential risk is the age and gradual deterioration of the gas transmission system due to natural causes. Significant failure, including pipe breaks and explosions, can result in loss of life, injury, property damage, and environmental impacts. Causes of and contributors to pipeline failures include construction errors, material defects, internal and external corrosion, operational errors, control system malfunctions, outside force damage, subsidence, and seismicity.

Vehicle Accidents involve accidents on freeways, highways, and major corridors. These accidents can involve single vehicles or can involve multi-car pile ups. They have the potential to create significant disruptions in the community and can involve significant loss of life.

- **Location and Extent**

The following figure (**Figure 5.26**) depicts the location of the significant: 1) airports, 2) rail lines, 3) natural gas pipelines, and 4) freeways, highways, and major corridors in and around the City. In addition to the public airports that operate in the region, Joint Forces Training Base Los Alamitos is also located within the County and Camp Pendleton is located approximately 35 miles south of the City. These facilities are actively used for military training purposes; however, the frequency of flights is anticipated to be less than the number from the commercial airports.

Figure 5.26- Significant Transportation Corridors

Transportation Accidents can occur anywhere in the city but are generally around larger, major transportation networks (i.e., freeways, highways, trail tracks). Transportation Accidents can occur anytime of the year but the more significant accidents usually occur during times of the year when there is bad weather. Transportation Accidents usually last for a few hours. There is no universal or common scale to measure levels of Transportation Accident. Most Transportation Accident is generally defined by types (cause) of disruption and duration.

■ History

The area has not experienced many natural gas pipeline and/or train derailment accidents but there have been accidents in other areas of the state and nation that have experienced

significant accidents. While these accidents did not occur within the area, some of the same elements and conditions are present. The City has experienced several vehicle accidents; however, none have risen to the level of significant. There have been several aircraft accidents in the area. John Wayne Airport has suffered numerous accidents/incidents in the past. **Table 5.10** provides an overview of the events that have occurred over a 36-year period (1982-2018), as tracked by the National Transportation Safety Board (NTSB).

Table 5.10- Aircraft Accidents at John Wayne Airport- 1982-2018

Accidents	62
Fatal Accidents	14
Incidents	6
Aircraft Destroyed	13
Injuries	37
Total Fatal	
Total Serious	7
Total Minor	16
Total Uninjured	666

Notable historic aircraft accidents within Orange County include:

- August 31, 1986: A DC-9 jetliner collided with a smaller aircraft. Neither aircraft was destroyed in the air, but the operability of both aircraft was compromised, causing them to fall more than 6,000 feet from their flight paths, eventually crashing into a housing tract in Cerritos. 16 homes were destroyed and 15 residents in the area of the impact were killed.
- June 30, 2017: A small plane crashed on the 405 Freeway in Costa Mesa near John Wayne Airport shortly after takeoff. No injuries or deaths occurred on the ground, but the freeway was shut down for many hours.
- August 5, 2018: A small plane seemingly exhausted its fuel reserves and crashed into a strip mall parking lot in Santa Ana, CA near SNA. No injuries or deaths occurred on the ground, but four parked vehicles were destroyed.
- February 3, 2019: A pilot of a small plane lost control of the aircraft and crashed into a housing tract in Yorba Linda, CA, destroying two homes and killing four people on the ground.

■ **Probability**

The possibility of an aircraft incident occurring in the City will continue to exist. Based on historic events, it is anticipated that future impacts will be similar in nature. A key component to aircraft safety is the Airport Environs Land Use Plan for John Wayne Airport. This plan identifies safety zones that require land use restrictions to minimize potential impacts. While these efforts can assist in reducing impacts on the ground, there is little that can be done to reduce the impacts associated with aircraft flying overhead under normal flight conditions. The risk to the City associated with these types of incidents is similar to other parts of Orange County and southern California.

- **Climate Change Considerations**

While there are many devices that monitor and/or track weather conditions, it is expected that changing conditions are going to impact air travel. From the simplest of impacts from temperatures altering takeoffs and landing, to increase in rains and winds altering flight patterns, change in our environment could increase the likelihood of an aircraft incident.

6 RISK ASSESSMENT

The purpose of this section is to estimate the potential risk (impacts) of threats and hazards within the City of Laguna Niguel. While an emphasis was on the built environment (residential, non-residential, facilities, etc.), the economy, general population, lifeline infrastructure, and other areas (i.e., environment) were considered and assessed. The step of understanding potential impacts (damage and losses) is essential to decision-making at all levels of government, providing a basis for developing plans, policies, programs, and projects. The Risk Assessment for the City also factored in the National Risk Index. The National Risk Index is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards. It was designed and built by FEMA in close collaboration with various stakeholders and partners in academia; local, state and federal government; and private industry. It includes data about the expected annual losses to individual natural hazards, social vulnerability and community resilience. The Risk Index leverages available source data for natural hazard and community risk factors to develop a baseline risk measurement for each United States county and Census Tract. However, Census Tract do not always coincide with jurisdictional boundaries (i.e., City, County, Special District). This is the case for Laguna Niguel. To combat this, county level-data was used with the LHMP.

6.1 Risk Assessment Approaches

There were two (2) different approaches used to understand the potential impacts: Quantitative Assessment and Qualitative Assessment.

Quantitative Assessment

The quantitative assessment provided actual estimates of potential damage and losses. The FEMA Hazus model (see: <https://www.fema.gov/flood-maps/products-tools/hazus>) was utilized in support of the quantitative assessment. Hazus is a nationally applicable standardized methodology that estimates potential losses from floods, earthquakes, hurricane winds and tsunamis. Hazus uses state-of-the-art Geographic Information Systems (GIS) software to map hazard data and estimate potential *physical damage* to residential and commercial buildings, schools, critical facilities, and infrastructure; *economic loss*, including lost jobs, business interruption, repair, and reconstruction cost; and *social impacts*, including estimating shelter requirements, displaced households, and population exposure to the hazard. Hazus' standard configuration allows for "out-of-the-box" regional or community-wide loss assessment using default (Level 1) building inventory databases, aggregated to the census tract level for earthquakes. The quantitative assessment was also supported by FEMA's National Risk Index. Although the National Risk Index looks at other factors (social vulnerability and community resilience), the Planning Team only included the Expected Annual Loss estimates in the LHMP.

Qualitative Assessment

Because scientific loss estimation models are not available for all types of threats and hazards, a different approach was used on some threats and hazards to identify potential impacts; qualitative assessment. Qualitative assessments are generally exposure

assessments. There are two (2) kinds of exposure assessments: 1) when there is a hazard exposure area (or footprint); and, 2) when an exposure area (footprint) does not exist. A hazard exposure footprint enables you to determine areas in the planning area where you are either “in” or “out” of the hazard (e.g., wildfire). With this footprint, the Planning Team was able to determine elements within the hazard area and conduct a qualitative assessment of the potential impact. For those threats and hazards where an exposure footprint does not exist (e.g., infectious disease, energy shortage/power outage), a qualitative assessment is done for the entire planning area (City). Neither approach provides an estimate of potential damage but does provide an understanding of the exposure and as such, the potential loss during events.

6.2 Summary of Data Used for Risk Assessment

Both types of assessments (quantitative and qualitative) require the use of data. While Hazus utilizes default data, there is no single data set for the exposure analysis. However, there are data sets which can be used together to help better understand the potential impacts (i.e., census data, demographic data, Hazus building data, asset data). The types of elements that were considered during the exposure assessment were general building stock, populations, economy, and key assets. **Table 6.1** provides a summary of the relevant data considered during the risk assessment.

Table 6.1- Summary of Risk Assessment Data for Laguna Niguel

Building Stock	Building Count	Building Sq. Ft. (1,000 Sq. Ft.)	Building Replacement Value (\$1,000)	Contents Replacement Value (\$1,000)
Residential	19,778	41,451	\$8,719,470	\$4,359,746
Commercial	979	5,457	\$961,817	\$1,025,041
Industrial	216	702	\$98,412	\$130,686
Other	166	996	\$200,012	\$200,012
TOTAL	21,139	48,606	\$9,979,711	\$5,715,485
Concrete	276	1,604		
Mfg Housing	53	63		
Precast Concrete	249	1,229		
Reinforced Masonry	524	2,187		
Steel	301	1,473		
URM	85	472		
Wood Frame (Other)	268	1,517		
Wood Frame (SFR)	19,383	40,061		
TOTAL	21,139	48,606		
Asset				
See Section 3.8				
TOTAL				
Population	Citizens	% of Population		
Under 5	2,767	4.3%		
Between 18-65	50,004	77.7%		
Over 65	11,584	18%		
TOTAL	64,355			
Economy	People	Jobs		
Employed in City	35,784			

Self-employed	6,903			
Work from home	4,448			
Larger Employers				
US Government		2,200		
Costco		657		
Capistrano USD		331		
Wal-Mart		301		
Lifetime Fitness		295		
Whole Foods		232		
Home Depot		215		
Mercedes-Benz		205		
Albertsons		159		
Vons		148		
TOTAL		4,743		

It is worth noting that FEMA indicates that data from various organizations were used by the National Risk Index (i.e., the Centers for Disease Control Agency, University of South Carolina). While there is an overlap between datasets, there is no guarantee that the datasets are identical. This can create some discrepancies if attempting to conduct a relative comparison.

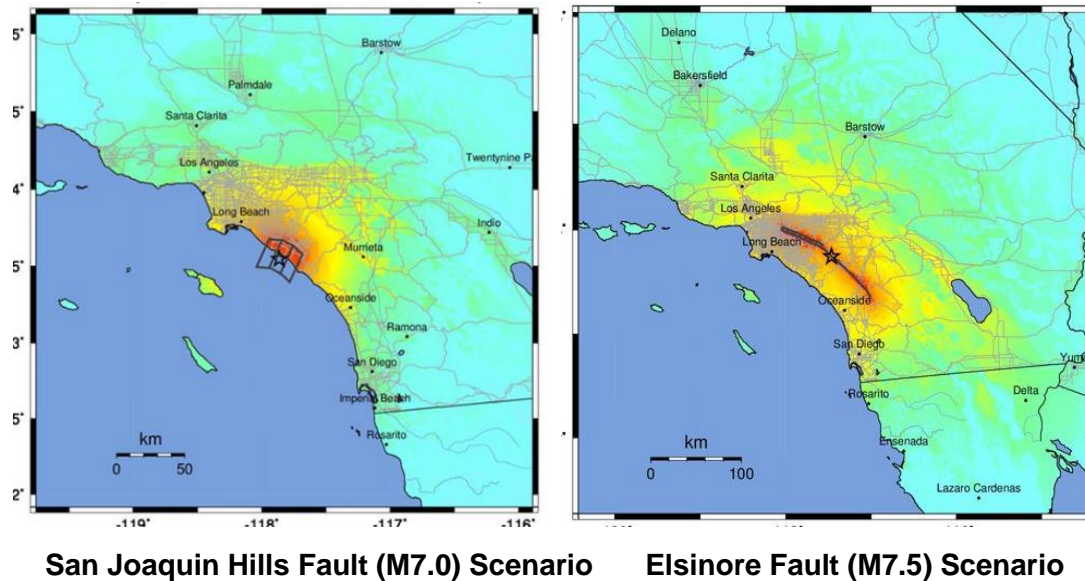
6.3 Hazard Impacts

The following subsection presents the qualitative and where applicable, the quantitative assessment results for each hazard in the City of Laguna Niguel. The risk assessment results are grouped alphabetically under the three (3) tiers of priority threats and hazards established in Section 5.0- Hazard Assessment of the LHMP. During the planning effort, the Planning Team ranked threats and hazards into tiers: Tier I, Tier II, and Tier III threats and hazards. While a slight emphasis is placed on Tier I priority threats and hazards, all threats and hazards are considered significant within the City of Laguna Niguel.

6.3.1 TIER I THREATS AND HAZARDS

6.3.1.1 Earthquake

To understand the risk from Earthquakes within the City of Laguna Niguel, a quantitative assessment was done. The quantitative assessment was done applying the FEMA scientific loss estimation model (Hazus). To provide a better perspective on impacts from earthquakes, two (2) different earthquake scenarios were run in Hazus. This enables the City of Laguna Niguel to understand a more localized event occurring in the area (San Joaquin Hills Fault) and a larger, more regional event happening in the southern California area (Elsinore Fault). **Figure 6.1** depicts the USGS scenario ShakeMaps maps for the San Joaquin Hills Fault (Magnitude 7.0) and Elsinore Fault (Magnitude 7.5) events.

Figure 6.1- USGS ShakeMaps for Earthquake Scenarios Assessed Using Hazus

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC. (%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL. (cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

The following table (**Table 6.2**) presents the results of the Hazus model runs for each of the earthquake scenarios, including economic loss estimates, casualty and shelter estimates, and debris quantities. In an effort to provide further perspective, the estimated impacts for Orange County are also provided. This will help the City of Laguna Niguel understand the surrounding impacts which could affect and/or hinder its ability to respond to and recover from the event as there may be competition and/or limited resources and further to travel to get resources if available.

Table 6.2- Hazus-Estimated Earthquake Impacts for Laguna Niguel and Orange County

		City of Laguna Niguel		Orange County	
		M7.5 Elsinore	M7.0 San Joaquin Hills	M7.5 Elsinore	M7.0 San Joaquin Hills
Direct Economic Losses for Buildings (\$1,000)					
	Total Building Exposure Value	9,979,711		394,284,954	
Capital Stock Losses	Cost of Structural Damage	21,979	259,503	3,414,925	6,140,514
	Cost of Non-Structural Damage	108,119	1,132,336	14,027,830	25,282,246
	Total Building Damage (Str+Non-Str.)	130,098	1,391,839	17,442,756	31,422,761
	Building Loss Ratio %	1.3%	13.9%	4.4%	8.0%
	Cost of Contents Damage	34,841	369,158	5,144,528	9,132,903
	Inventory Loss	317	3,772	157,886	232,603
Income Losses	Relocation Loss	9,254	126,883	1,634,475	2,950,761
	Capital-Related Loss	3,552	45,328	771,419	1,487,674
	Rental Income Loss	4,566	55,515	823,720	1,567,899
	Wage Losses	4,362	53,276	930,936	1,671,700
	Total Direct Economic Loss	186,990	2,045,770	26,905,720	48,466,302
Casualties					
Day Casualties	Casualties - 2 pm				
	Level 1 - minor injuries, basic first aid	31	941	8,697	16,147
	Level 2 - hospital treat & release	4	277	2,199	4,390
	Level 3 - injuries requiring hospitalization	0	46	345	714
	Level 4 - fatalities	1	89	645	1,341
	Total Casualties	36	1,353	11,885	22,591
Night Casualties	Casualties - 2 am				
	Level 1- minor injuries, basic first aid	14	222	3,241	5,987
	Level 2- hospital treat & release	1	46	582	1,230
	Level 3- requiring hospitalization	0	5	57	132
	Level 4- fatalities	0	9	105	245
	Total Casualties	15	282	3,986	7,594
Shelter					
Shelter	Number of Displaced Households	46	1,510	14,131	33,486
	Number of People Requiring Short-term Shelter	24	787	10,549	21,405
Debris (thousands of tons)					
Debris	Brick, Wood & Other (Light) Debris	9.2	108.4	1586.5	2848.0
	Concrete & Steel (Heavy) Debris	9.4	186.3	3481.9	6499.7
	Total Debris	18.7	294.7	5,068.4	9,347.6

Table 6.3 provides a breakdown of expected building damage by general building type (i.e., Concrete, Steel, etc.). This information, developed using Hazus' default construction type relationships, is provided to support potential consideration of targeted building mitigation

strategies. It should be noted that the results produced here are based on regional construction patterns and assumptions; potential mitigation of hazardous building types would require more detailed assessments to determine the true number of buildings of each type within the City.

Table 6.3- Hazus-Estimated Building Damage by General Building Type for Laguna Niguel and Orange County

		City of Laguna Niguel		Orange County	
	Damage State	M7.5 Elsinore	M7.0 San Joaquin Hills	M7.5 Elsinore	M7.0 San Joaquin Hills
Concrete	None	192	21	6,852	4,636
	Slight	52	52	3,456	3,508
	Moderate	26	84	2,609	3,335
	Extensive	5	70	1,244	2,062
	Complete	0	49	510	1,129
	TOTAL	276	276	14,671	14,671
Manuf. Housing	None	23	0	5,836	2,858
	Slight	14	1	6,541	4,351
	Moderate	13	9	10,355	9,839
	Extensive	3	20	7,002	10,004
	Complete	0	22	3,002	5,684
	TOTAL	53	53	32,737	32,737
Precast Concrete	None	162	10	5,722	3,832
	Slight	46	28	2,906	2,738
	Moderate	34	78	3,184	3,831
	Extensive	7	78	1,316	2,161
	Complete	0	55	440	1,006
	TOTAL	249	249	13,568	13,568
Reinforced Masonry	None	406	47	13,617	9,670
	Slight	66	71	4,217	4,472
	Moderate	43	166	4,106	5,535
	Extensive	8	159	1,772	3,270
	Complete	0	80	440	1,205
	TOTAL	524	524	24,151	24,151
Steel	None	201	13	6,440	4,061
	Slight	55	29	3,241	2,830
	Moderate	38	92	3,898	4,510
	Extensive	7	101	1,891	3,186
	Complete	1	66	777	1,662
	TOTAL	301	301	16,247	16,247
Unreinforced Masonry	None	52	1	1,751	1,040
	Slight	18	6	1,046	881
	Moderate	11	20	979	1,139
	Extensive	3	25	436	742

		City of Laguna Niguel		Orange County	
	Damage State	M7.5 Elsinore	M7.0 San Joaquin Hills	M7.5 Elsinore	M7.0 San Joaquin Hills
	Complete	1	33	266	677
	TOTAL	85	85	4,478	4,478
Wood Frame (Other)	None	191	22	6,466	4,464
	Slight	59	69	3,824	4,012
	Moderate	18	99	2,296	3,198
	Extensive	1	53	586	1,192
	Complete	0	25	228	533
	TOTAL	268	268	13,400	13,400
Wood Frame (Single-family)	None	14,892	3,470	400,511	308,091
	Slight	3,884	8,159	216,823	255,006
	Moderate	587	6,480	64,741	108,278
	Extensive	16	975	5,262	13,587
	Complete	4	298	1,382	3,756
	TOTAL	19,383	19,383	688,718	688,718
ALL BUILDING TYPES	None	16,119	3,586	447,194	338,652
	Slight	4,194	8,416	242,053	277,799
	Moderate	769	7,028	92,168	139,665
	Extensive	50	1,482	19,509	36,204
	Complete	6	627	7,045	15,650
	TOTAL	21,139	21,139	807,970	807,970

According to the National Risk Index report, the Expected Annual Loss (EAL) for earthquakes in the County is \$926,116,576. This equates to a score of 99.9 and a Very High rating.

6.3.1.2 Infectious Disease

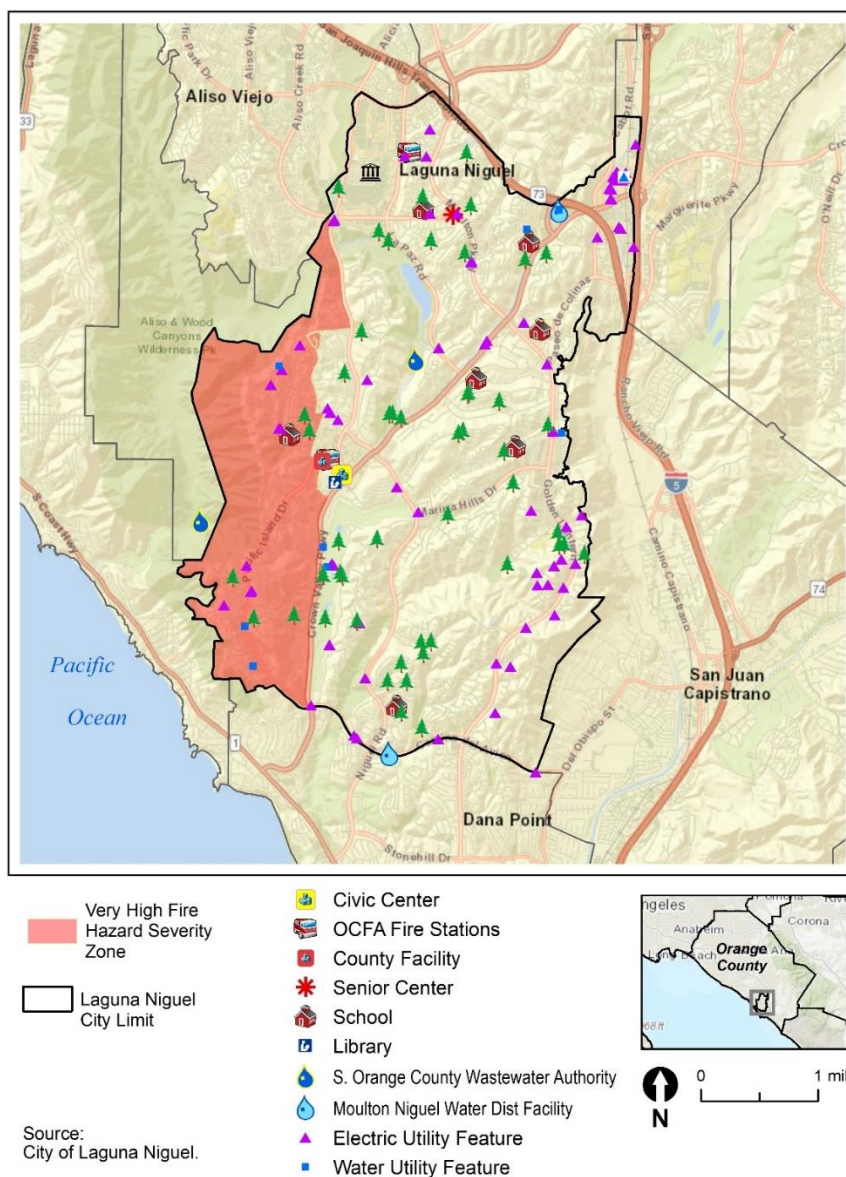
To understand the risk of Infectious Disease within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts over the entire city. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. The City of Laguna Niguel, as well as the county, state, country, and the world, are vulnerable to infectious disease caused by either newly emerging or existing diseases spread person to person, through a vector, or through food. A significant infectious disease outbreak, epidemic, and/or pandemic could impact a large portion of the population, create challenges on the built environment, overburden essential public services, and affect the economy. Depending on the type of Infectious Disease event, impacts to buildings may include increased use of equipment (i.e., HVAC, water) and adaptive reuse of space for response and/or recovery from the event. Additionally, it could also include deferred maintenance to equipment if employees and vendors are unavailable. Limited staffing could also impact associated business and the economy within the City. All of this could lead to loss of jobs as well. Actions to address the Infectious Disease

could create higher demands on lifeline systems and cause damage from over/under use or curtailment of services. Infectious Disease could have the following qualitative impact:

- Population- fatal and non-fatal injuries; restricted access/use
- Buildings- possible loss of use due to deferred maintenance, repurposing
- Economy- loss of revenue/property, cost of response/care/clean up, increased operating costs
- Environment- possible loss of vegetation/wildlife, contamination
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

6.3.1.3 Wildfire

To understand the risk to Wildfire within the City, an exposure assessment was used. Because there is a hazard exposure area (or footprint), the Planning Team assessed potential impacts for portions of the City within the hazard footprint as presented in Section 5.0. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. **Figure 6.2** City's identified assets over the City's Very High Fire Zone map and **Table 6.4** estimates the potential exposure, relative to the Hazus building inventory data.

Figure 6.2- City Asset Exposure to Wildfire Hazards*Table 6.4- Hazus Default Data Exposure to Wildfires*

	Building Value (\$1,000)	Building Count
Total Exposure	909,273	2,070
% of City Exposed	9%	10%

In addition to the fire zones, the City is also at risk to secondary effects from wildfires (i.e., flying ambers, poor air quality). While this cannot be shown on a map, the risk can be discussed qualitatively. A significant wildfire event could impact a large portion of the population, destroy buildings, and affect the economy. Wildfires could have the following qualitative impact:

- Population- fatal and non-fatal injuries; restricted access/use
- Buildings- structural and non-structural damage, loss of building content (equipment) and functionality
- Economy- loss of revenue/property, cost of response/care/clean up, increased operating costs
- Environment- loss of vegetation/wildlife, contamination
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

According to the National Risk Index report, the Expected Annual Loss (EAL) for Wildfire in the County is \$49,545,003. This equates to a score of 99.8 and a Very High rating. While the Planning Team was unsure of factors included in the Wildfire events, the National Risk Index did include Lightning. Lightning strikes have been known to cause Wildfires. This becomes worse during high wind events (high wind events are included under a separate hazard). According to the National Risk Index, the EAL for Lightning is \$147,219. This equates to a score of 65.9 and a Relatively Low rating.

6.3.2 TIER II THREATS AND HAZARDS

6.3.2.1 Civil Disturbance

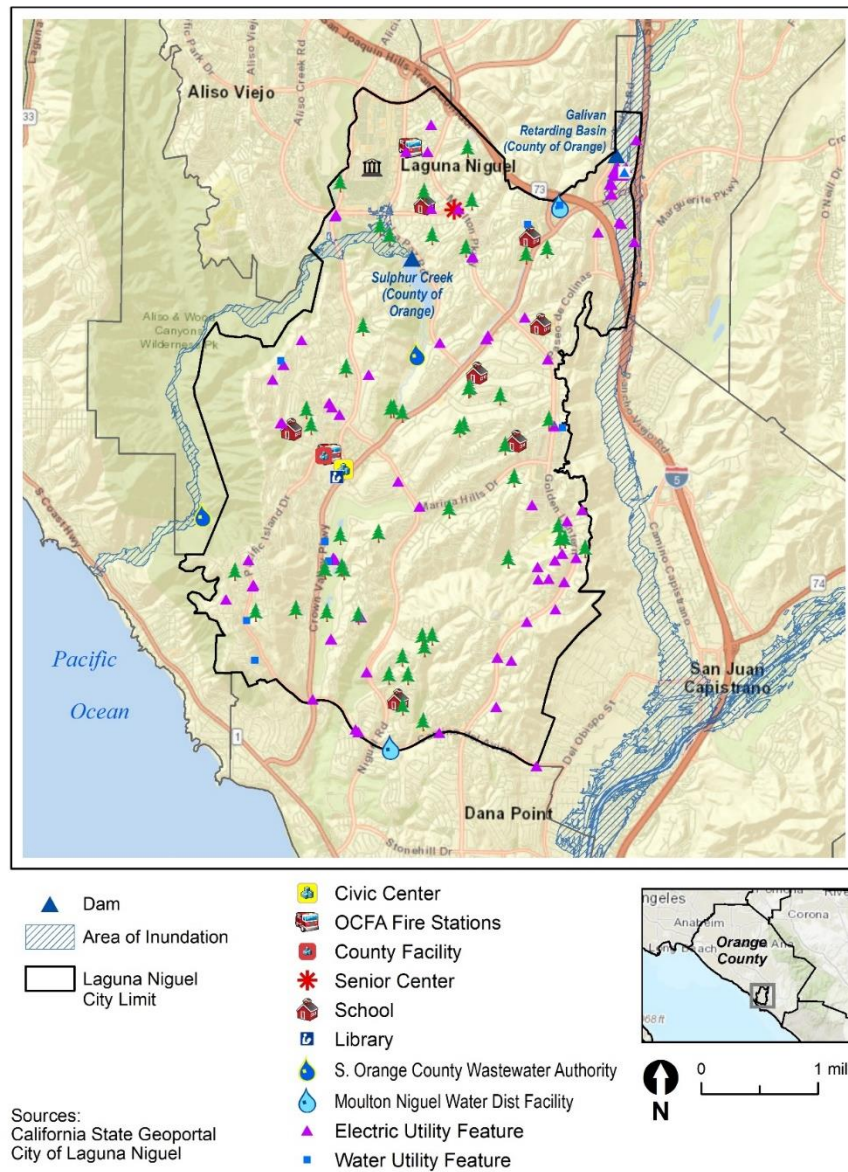
To understand the risk of Civil Disturbance within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts within the entire City. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. Southern California is a frequent site of demonstrations due to its high profile and presence of significant government functions and buildings. It is conceivable that a demonstration (or movement) depending on the cause and effect, could turn to violence and spread into neighboring communities. Civil disturbance can vary in size and length of time, however, within the City, it is expected to be smaller and of limited time. Civil Disturbance could have the following qualitative impact:

- Population- fatal and non-fatal injuries; restricted access/use
- Buildings- structural and non-structural damage, loss of building content (equipment) and functionality, repurposing
- Economy- loss of revenue/property, cost of response/care/clean up, increased operating costs
- Environment- loss of vegetation, contamination
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

6.3.2.2 Dam Failure

To understand the risk to Dam Failure within the City, an exposure assessment was used. Because there is a hazard exposure area (or footprint), the Planning Team considered potential impacts for portions of the City within the hazard footprint. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed

under Section 5.0. While there are governmental agencies that oversee and regulate dams in California, failures have occurred within the state (i.e., Oroville Dam). The dam inundation studies predict the possible coverage (or area) of water exposure but generally they do not provide for water depths. Also, there are other factors to consider when assessing dam failures, such as how much water is behind the dam or is there time to release some water ahead of time. It is known that elements further away from the dams could experience impacts, but the majority of devastation will occur closer to the dams. **Figure 6.3** provides an overview of the potential impact within the City.

Figure 6.3- City Assets Exposure to Dam Failure Hazards

A Dam Failure event could have the following qualitative impact:

- Population- restricted access/use
- Buildings- No damage expected
- Economy- cost of response/care/clean up
- Environment- contamination
- Lifelines- Potential loss of utilities from impacts to outside system failures (secondary impacts)

6.3.2.3 Drought

To understand the risk to Drought within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts within the entire City. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. California recently reproclaimed a State of Emergency due to extremely dry conditions over an extended period of time after just coming out of a drought emergency. Drought could have the following qualitative impact:

- Population- restricted access/use
- Buildings- No damage expected
- Economy- increased operating costs
- Environment- loss of vegetation/wildlife
- Lifelines- Potential loss of utilities from impacts to outside system failures (secondary impacts)

As requested by Cal OES and required by FEMA, the City of Laguna Niguel is providing an estimate of the vulnerabilities (i.e., loss estimation) within the jurisdiction to Drought hazard events. These estimates are judgement-based estimates utilizing available historical data. These requested estimates do not utilize a formal engineering or scientific analysis and do not consider any change in weather/environment conditions. Below are the Drought hazard event estimates:

- Costs between \$250,000 and \$1,000,000- Costs associated with staff time conducting/addressing maintenance, monitoring, inspections, code enforcement, and reviewing/adjusting municipal policies and programs issues and actions.
- Costs between \$100,000 and \$500,000- Costs associated with the removal and replacement of vegetation during and/or after the event. It is expected that some vegetation will die requiring removal for safety reasons (i.e., trees) and/or replacement for defensible space and aesthetics reasons.
- Costs between \$500,000 and \$2,000,000- Costs associated with taking actions on City-owned structures caused by expansive soils. During prolonged drought events some soils (i.e., clay) tend to dry up and reduce in size. This occurrence can create structural and foundational issues.
- Costs in the millions- Costs associated with this are connected to the loss on private property. Private property owners could be faced with the same issues the City will face (i.e., removal and replacement of vegetation, addressing structural and foundational issues).

The costs above have large ranges because of the uncertainty of the duration and intensity of the drought. Not all drought periods are the same, many will have different conditions and restrictions. Additionally, the estimates do not include costs associated with utility companies (i.e., SoCal Gas, Southern California Edison, SDGE) for response and repair, or the costs associated with loss of functionality to their customers.

Providing more accurate estimates would require extensive work and effort, similar to the work conducted for development of the FEMA-sponsored Hazus model. The Hazus model is a multi-hazard (earthquake, flood) loss estimation model that takes into account a variety of factors regarding the hazard, populations, structures, systems, environment, and vulnerabilities to estimate potential damage against a scenario. To develop equivalent loss estimation for other hazards would require increased funding, time, and scope outside of the LHMP. The City believes this level of effort may be achieved by creating an additional scope area that is contracted and managed under a separate effort. As such, the City recognizes the need and value to this kind of effort and has identified mitigation measures to meet these needs.

According to the National Risk Index report, the Expected Annual Loss (EAL) for Drought in the County is \$70,453. This equates to a score of 63.7 and a Relatively Low rating.

6.3.2.4 Extreme Temperature

To understand the risk to Extreme Temperatures within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts within the entire City. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. While it is more likely the City will experience extreme heat events, the area has experienced extended periods of cold weather. In either case, extreme weather events are expected to become more common and intensify. An Extreme Temperature event could have the following qualitative impact:

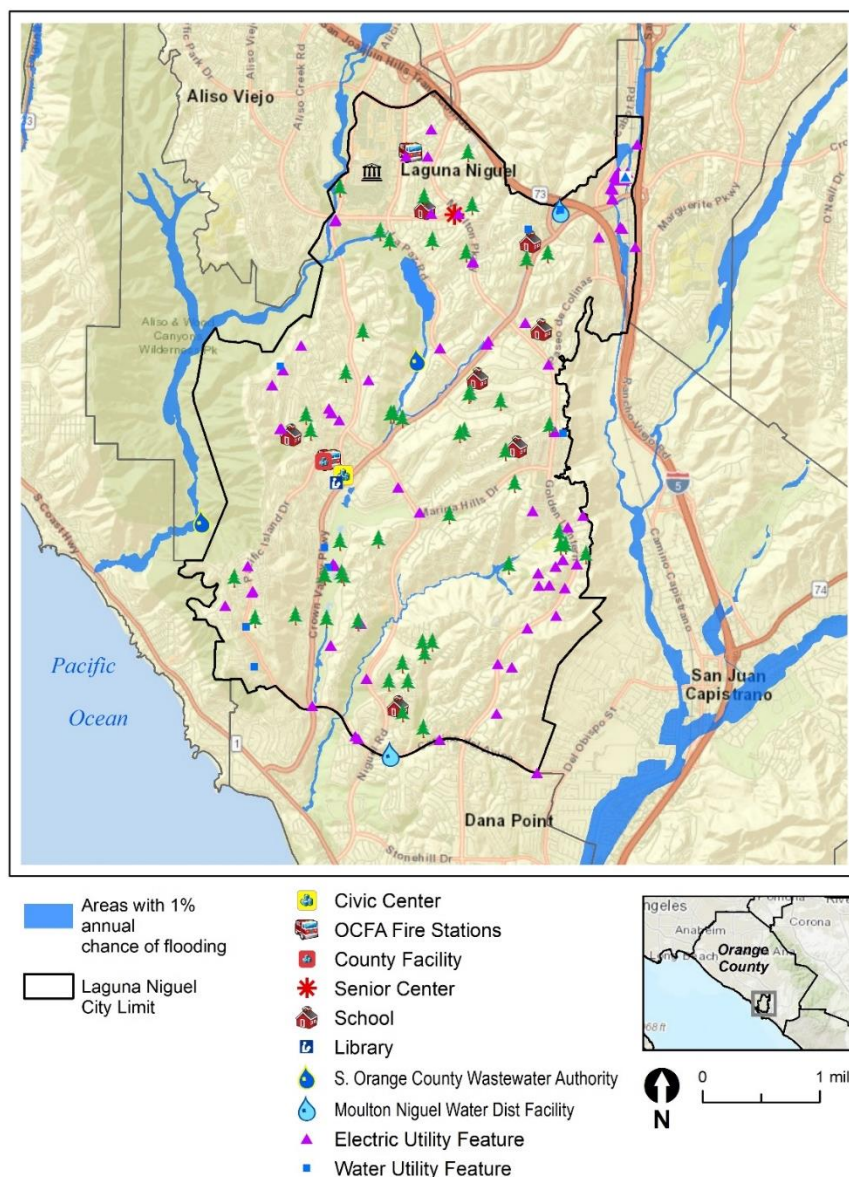
- Population- Exposure to extreme heat can result in illness (such as heat stroke or heat exhaustion) or death for those at greatest risk, including infants and children up to four years of age; people who overexert during work or exercise; people 65 years of age or older; people who are ill or on certain medications; and, people who are overweight
- Built Environment- Extreme heat conditions can cause equipment to become overburden and possible fail. Depending on the type of equipment impacted, it could overheat structures, create electrical overloads, and warp (or melt) pieces.
- Lifeline Infrastructure- Both systems and equipment can become over worked and whelmed. This can lead to temporary shutdowns or system failures. Additionally, lifeline interdependencies need to be considered (i.e., water systems needing electricity to move water).
- Economy- If lifeline systems shutdown and/or fail, there are rippling effects on the economy as there is an inability to provided services and/or move merchandise. Additionally, extreme heat events may require implementation of mitigation actions that impact operating budgets.
- Environment- During extreme heat events, there could be noticeable depletion of water supplies and dehydration of vegetation/landscape. This could cause reduction and/or loss of flora and fauna and altering of landscape.

According to the National Risk Index report, the Expected Annual Loss (EAL) for Heat Wave in the County is \$795,214. This equates to a score of 88.2 and a Relatively Low rating. A Cold Wave under the National Risk Index for the County is \$0; no expected annual losses.

6.3.2.5 Flood

As discussed in the Flood hazard under Section 5.0- Hazard Assessment, there are several types of flood risk (i.e., riverine, coastal, urban). The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. Because of the City's location, coastal flooding is not an issue. Riverine flooding is well studied and researched by FEMA's National Flood Insurance Program (NFIP). Based on review of the expected 100-year riverine flood hazard zones within the City as mapped in FEMA's National Flood Hazard Layer (**Figure 6.4**), it was determined that the flood extent expected within the City was sufficiently limited and would not be the cause of the damage. In other words, no populations, structures, or assets were significantly threatened by the impact of a 100-year flood event. This is also why it did not warrant a Hazus flood assessment.

Figure 6.4- City Asset Exposure to 100-year Flood Event Hazards



The greatest flooding risk within the City is around urbanized flooding. This pertains to damage caused by infrastructure issues; under engineered infrastructure and/or blockage of infrastructure. This type of hazard is common in some places within the City. Types of impacts that can be expected include:

- Population- non-fatal injuries (slips and falls); restricted access/use
- Buildings- some structural damage but mainly loss of building content and functionality due to water backing up into the structure and/or seeping into lower-level areas.
- Economy- loss of property, cost of response/care/clean up, increased operating costs (i.e., keeping air condition and/or heating on to properly ventilate the building).
- Environment- some possible contamination if the water is exposed and carries certain chemicals and pollutants.
- Lifelines- possible damage to facilities/infrastructure/systems (i.e., powerhouse, power plant) or loss of equipment if flooding occurs.

As requested by Cal OES and required by FEMA, the City of Laguna Niguel is providing an estimate of the vulnerabilities (i.e., loss estimation) within the jurisdiction to Flood hazard events. As mentioned in the LHMP, the flood issue within the City is from urbanized flooding; not riverine. Because of this, the Hazus model was not used as they would show little to no results. These estimates are judgement-based estimates that utilize available historical data. These requested estimates do not utilize a formal engineering or scientific analysis and do not consider any change in weather/environment conditions. Below are the Flood hazard event estimates:

- Costs on average of \$350,000 annually- Costs associated with City Public Works staff conducting additional maintenance, monitoring, inspections, and code enforcement; and implementing prevention measures and removing of debris. Damage for storms In the area typically do not cause damage to City-owned structures.
- Costs between \$250,000 and \$1,000,000 annually- Costs associated with the repair, replacement, improvements, and/or the development of new infrastructure to address runoff.
- Costs between \$350,000 and \$900,00 annually- Costs associated with staff time outside of Public Works to respond and support flooding issues. This includes OCSD to conduct traffic control and evacuations, OCFA to respond to hazardous conditions (i.e., downed power lines), and Park and Recreation to address onsite issues and prepare sites for support (i.e., staging areas, shelter).
- Costs in the millions- Costs associated with the loss on private property. Private property owners could be faced with many issues caused by flooding issues on their or adjacent properties.

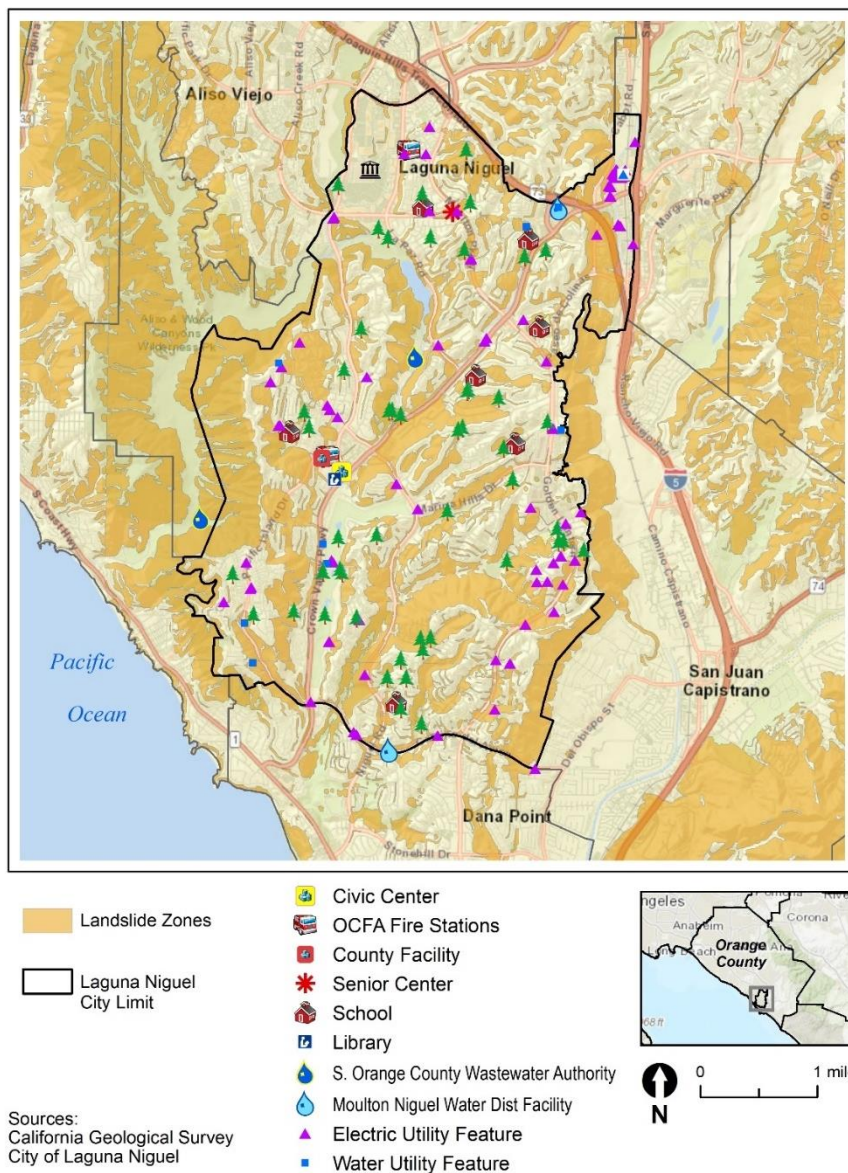
The costs above are based on a typical rainy season consisting of between 5-10 storms per year and does not include costs associated with utility companies (i.e., SoCal Gas, Southern California Edison, SDGE) for response and repair, or the costs associated with loss of functionality to their customers.

Providing more accurate estimates would require extensive work and effort, similar to the work conducted for development of the FEMA-sponsored Hazus model. The Hazus model is a multi-hazard (earthquake, flood) loss estimation model that takes into account a variety of factors regarding the hazard, populations, structures, systems, environment, and vulnerabilities to estimate potential damage against a scenario. To develop equivalent loss estimation for other hazards would require increased funding, time, and scope outside of the LHMP. The City believes this level of effort may be achieved by creating an additional scope area that is contracted and managed under a separate effort. As such, the City recognizes the need and value to this kind of effort and has identified mitigation measures to meet these needs.

The National Risk Index looked at two (2) Flooding risk within the County: Coastal and Riverine. According to the National Risk Index report, the Expected Annual Loss (EAL) for Coastal Flooding in the County is \$72,431. This equates to a score of 47.9 and a Relatively Low rating. Riverine Flooding is estimated at \$7,228,030 EAL. This equates to a score of 95.6 and a Relatively High rating. While the Planning Team was unsure of factors included in the different Flooding events, the National Risk Index did include Winter Weather. Winter Weather in the area have been known to cause Flooding. According to the National Risk Index, the EAL for Winter Weather is \$53. This equates to a score of 4.7 and a Very Low rating.

6.3.2.6 Landslide

To understand the risk to Landslides within the City, an exposure assessment was used. Because there is a hazard exposure area (or footprint), the Planning Team considered potential impacts for portions of the City within the hazard footprint. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. **Figure 6.5** provides an overview of the potential impact within the City.

Figure 6.5- City Asset Exposure to Landslide Hazards

A Landslide event could have the following qualitative impact:

- **Population**- non-fatal injuries; restricted access/use
- **Buildings**- structural and non-structural damage, loss of building content (equipment) and functionality
- **Economy**- loss of revenue/property, cost of response/care/clean up, increased operating costs
- **Environment**- loss of vegetation, ground displacement
- **Lifelines**- damage to facilities/infrastructure/systems, loss of equipment

As requested by Cal OES and required by FEMA, the City of Laguna Niguel is providing an estimate of the vulnerabilities (i.e., loss estimation) within the jurisdiction to Landslide hazard events. These estimates are strictly judgement-based estimates that rely on the utilization of available historical data. These requested estimates do not utilize a formal engineering or scientific analysis and do not consider any change in weather/environment conditions. Below are the Landslide hazard event estimates:

- Costs between \$1,000 and \$50,000: Costs for small scale landslides (estimated at around 50 cubic feet) within the City. Costs associated with this are connected to protecting property and infrastructure, debris removal, and stabilization. No property damage involved.
- Costs greater than \$10,000,000: Costs for large scale landslide (estimated at around 14 million cubic feet) within the City. Costs associated with this are connected to protecting, debris removal, and stabilization. Costs also include consideration for property damage; estimated to include over 40 single and/or multi family living units.
- Costs in the millions: Costs associated with this are connected to the loss on private property. Private property owners could be faced with the same significant cost to repair and/or replace structures and contents (i.e., private belongings).

The costs above are based on historical landslide events in the City and does not take into account costs associated by utility companies (i.e., SoCal Gas, Southern California Edison, SDGE) for response and repair, or the costs associated with loss of functionality to their customers.

Providing more precise estimates would require extensive work and effort, similar to the work conducted for development of the FEMA-sponsored Hazus model. The Hazus model is a multi-hazard (earthquake, flood) loss estimation model that takes into account a variety of factors regarding the hazard, populations, structures, systems, environment, and vulnerabilities to estimate potential damage against a scenario. To develop equivalent loss estimation for other hazards would require increased funding, time, and scope outside of the LHMP. The City believes this level of effort may be achieved by creating an additional scope area that is contracted and managed under a separate effort. As such, the City recognizes the need and value to this kind of effort and has identified mitigation measures to meet these needs.

According to the National Risk Index report, the Expected Annual Loss (EAL) for Landslide in the County is \$257,345. This equates to a score of 95.1 and a Relatively High rating.

6.3.2.7 Windstorm

To understand the risk to Windstorms within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts within the entire City. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. While many wind events are short in duration, some windstorms have the capability of having longer, sustained durations. While longer duration events can have more significant impact on the community; shorter duration events can be just as damaging if the winds are powerful. Windstorm events could also trigger other hazards. For example, prolonged periods of high

winds could damage powerlines, creating power outages and/or wildfires. A Windstorm event could have the following qualitative impact:

- Population- fatal and non-fatal injuries; restricted access/use
- Buildings- structural and non-structural damage, loss of building content (equipment) and functionality
- Economy- loss of revenue/property, cost of response/care/clean up, increased operating costs
- Environment- loss of vegetation
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

The National Risk Index looked at two (2) types of Wind events: Tornado and Strong Wind. According to the National Risk Index report, the Expected Annual Loss (EAL) for Tornado in the County is \$4,799,429. This equates to a score of 86.8 and a Relatively Moderate rating. A Strong Wind under the National Risk Index for the County is \$201,184. This equates to a score of 37.3 and a Relatively Low rating.

6.3.3 TIER III THREATS AND HAZARDS

6.3.3.1 Energy Disruption

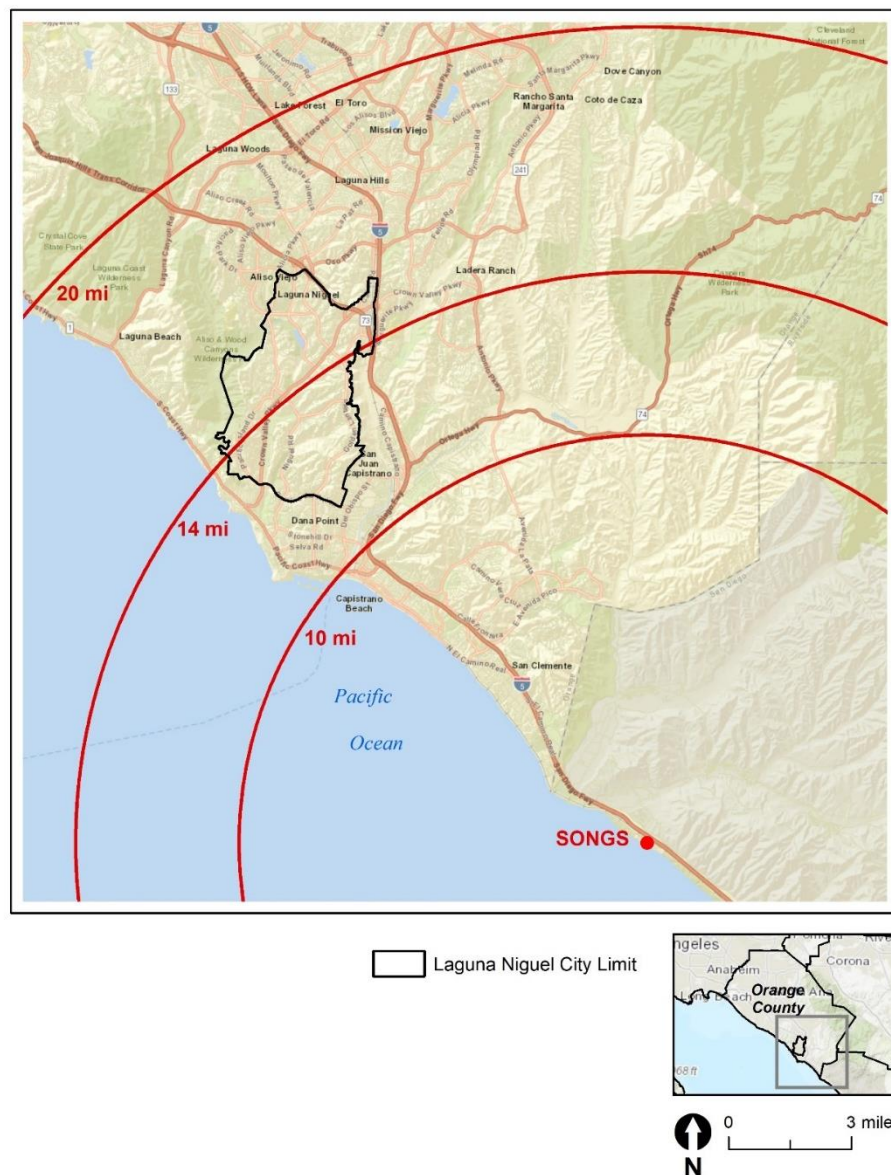
To understand the risk of Energy Disruption within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts within the entire City. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. An Energy Disruption event could have a considerable impact on the community. Society has become more reliant on power for devices, appliances, and equipment to perform daily activities. When there is a disruption to the energy it will not only be an inconvenience but could become a life-threatening experience. While in most cases it will not damage buildings, the loss of power will impact the buildings functionality. This includes loss of lighting, HVAC, electrical outlets, communications, and access to elevators in taller buildings. Because of interdependencies, the loss or shortage of power can impact several other lifeline systems (i.e., water, telecommunications, natural gas, fuel). An Energy Disruption event could have the following qualitative impact:

- Population- fatal and non-fatal injuries; restricted access/use
- Buildings- structural and non-structural damage, loss of building content (equipment) and functionality, repurposing
- Economy- loss of revenue/property, cost of response/care/clean up, increased operating costs
- Environment- None expected
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

6.3.3.2 Radiological Accident

To understand the risk of Radiological Accident event within the City, an exposure assessment was used. Because there is a hazard exposure area (or footprint), the Planning Team considered potential impacts within the hazard zones. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. The San Onofre Nuclear Generating Station (SONGS) is located in San Clemente has been decommissioned but still houses nuclear waste. There are three (3) emergency zones: Emergency Planning Zone- *EPZ* (10 to 14-mile radius), Public Education Zone- *PEZ* (20-mile radius), and the Ingestion Pathway Zone- *IPZ* (50-mile radius). As shown in **Figure 6.6** the City falls within the *IPZ*.

Figure 6.6- City Asset Exposure to Radiological Accident Hazards



A Radiological Accident event could have the following qualitative impact:

- Population- fatal and non-fatal injuries; restricted access/use
- Buildings- structural and non-structural damage, loss of building content (equipment) and functionality, repurposing
- Economy- loss of revenue/property, cost of response/care/clean up, increased operating costs
- Environment- loss of vegetation/wildlife, contamination
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

6.3.3.3 Technology Disruption

To understand the risk of Technology Disruption within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts within the entire City. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. The City of Laguna Niguel, as well as others, are vulnerable to Technology Disruption. As with our society, the City is becoming heavily reliant upon technology to perform daily work routines. Whether loss of communication with each other or loss of access to data and materials, this disruption can seriously impact and/or alter the way the City conducts business. A Technology Disruption event could have the following qualitative impact:

- Population- restricted access/use
- Buildings- loss of building content (equipment) and functionality
- Economy- loss of revenue, cost of response/care/clean up, increased operating costs
- Environment- None expected
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

6.3.3.4 Terrorism

To understand the risk to Terrorism within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts within the entire City. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. The City, as well as others, are vulnerable to Terrorism. However, terrorist groups are more prone to target larger, more populous, nationally recognized places since the goal in most cases is to create the greatest amount of destruction while striking fear and create chaos to largest number of people. In the unlikelyhood of a significant terrorism event, there could be considerable impact within the City. A Terrorism event could have the following qualitative impact:

- Population- fatal and non-fatal injuries; restricted access/use
- Buildings- structural and non-structural damage, loss of building content (equipment) and functionality, repurposing

- Economy- loss of revenue/property, cost of response/care/clean up, increased operating costs
- Environment- loss of vegetation/wildlife, ground displacement, contamination
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

6.3.3.5 Transportation Accident

To understand the risk of Transportation Accidents within the City, an exposure assessment was used. Because there is not a hazard exposure area (or footprint), the Planning Team considered potential impacts within the entire City. The potential impacts derived by the Planning Team also factored in consideration for changing climate conditions as discussed under Section 5.0. While there are several transportations elements in or next to the City (see Figure 5.18), it is difficult to determine the potential exposure since there are many variables to consider (i.e., location of accident, type of accident, weather conditions, time of day). A Transportation Accident event could have the following qualitative impact:

- Population- fatal and non-fatal injuries; restricted access/use
- Buildings- structural and non-structural damage, loss of building content (equipment) and functionality, repurposing
- Economy- loss of revenue/property, cost of response/care/clean up, increased operating costs
- Environment- loss of vegetation/wildlife, ground displacement, contamination
- Lifelines- damage to facilities/infrastructure/systems, loss of equipment

7 MITIGATION STRATEGIES

The purpose of this section is to present the proposed mitigation measures the City of Laguna Niguel has identified to help reduce and/or eliminate impacts from threats and hazards within the City. The intent of Mitigation Strategies is to help create a disaster resistant and sustainable community. The City of Laguna Niguel Mitigation Strategy was derived from the in-depth review of the work done to gain a common understanding of the community (Section 3.0) and its mitigation capabilities (Section 4.0) and assessing that against the threats and hazards within the City (Sections 5.0 and 6.0) to identify actions the City can take to reduce the impacts and/or increase its capabilities to respond and recover from the threats and hazards.

The Mitigation Strategy is guided by the goals and objectives, recognizing both mitigation challenges and opportunities. This section also reassesses previously proposed measures to determine if they are still valid and needed moving forward. Included in the Mitigation Strategy is an implementation plan and a relative ranking for each mitigation measure.

7.1 Mitigation Goals and Objectives

To better assist with the identification of mitigation strategies, mitigation goals and objectives were developed. The mitigation goals and objectives support the City's mitigation mission to create a disaster resistant and sustainable community. Well defined goals and objectives help focus efforts and ensure progress toward the mitigation mission. The mitigation goals and objectives were developed based on mitigation needs with careful consideration of the goals and objectives within the City's current LHMP, the City's General Plan, and the City's Emergency Operations Plan (EOP). While the LHMP, the General Plan, and the EOP serve different purposes, there is overlap between the plans. Ensuring that the mitigation goal and objectives are compatible with the General Plan and EOP will help ensure all of the plans are working together. The mitigation goal and objectives were used by the Planning Team as a starting point prior to identifying mitigation measures. The goals and objectives include:

- **GOAL 1: Minimize Life Loss and Injuries**

- Objective 1.1 Improve understanding of the threats and hazards (location, vulnerability) and actions that can and should be taken

- Objective 1.2 Exchange information about threats and hazards, vulnerabilities, and mitigation measures with all levels of governments, private sector, and the public.

- Objective 1.3 Ensure that all facilities meet current applicable regulations, codes, standards, and ordinances designed to protect life safety.

- Objective 1.4 Identify and modify high risk structures to meet life safety standards.

- Objective 1.5 Improve emergency communications and public warning systems.

- Objective 1.6 Develop policies and procedures to better serve disadvantaged and vulnerable populations.

- **GOAL 2: Minimize Damage to Structures, Property, and Equipment**

- Objective 2.1 Encourage new development to occur in locations that avoid or minimize exposure to threats and hazards.

- Objective 2.2 Develop and adopt enhanced land use, design, and construction policies designed to reduce property loss to threats and hazards.
- Objective 2.3 Incorporate mitigation into repairs, major alterations, new development, and redevelopment projects in areas subject to substantial life safety risks.
- Objective 2.4 Ensure that all facilities meet current applicable regulations, codes, standards, and ordinances,
- Objective 2.5 Encourage incorporation of mitigation measures for all structures.
- Objective 2.6 Encourage non-structural retrofitting of elements and equipment within facilities.

■ **GOAL 3: Protect the Environment**

- Objective 3.1 Implement mitigation and watershed protection strategies that reduce loss of wildlife, habitat, and water.
- Objective 3.2 Implement mitigation and protection strategies that reduce loss of cultural, historic and environmental resources.
- Objective 3.3 Enhance, rehabilitate, and protect natural systems and environmental resources.
- Objective 3.4 Encourage balance between natural resource management and land use planning.

■ **GOAL 4: Promote Public Awareness of Threats and Hazards**

- Objective 4.1 Develop and implement strategies to bring a greater understanding of the risks associated with threats and hazards, individual preparedness activities, and the benefits of hazard mitigation.
- Objective 4.2 Develop and implement strategies to bring a greater understanding of mitigation, disaster preparedness, and recovery programs.
- Objective 4.3 Establish and maintain partnerships between all levels of local government, the private sector, the business community, community groups, and institutions of higher learning that exchange information on threats and hazards and the benefits of mitigation measures.
- Objective 4.4 Strengthen, develop, leverage, and implement public communication tools

■ **GOAL 5: Strengthen Emergency Management Capability**

- Objective 5.1 Identify the need for, and acquire, any special emergency management equipment to enhance response capabilities for specific threats and hazards.
- Objective 5.2 Develop and maintain emergency plans (Response, Recovery, Preparedness, Prevention, Mitigation)
- Objective 5.3 Establish and maintain emergency management systems and facilities
- Objective 5.4 Develop and maintain Public-Private Partnerships
- Objective 5.5 Develop and maintain Memorandums of Understanding/Mutual Aid Agreements and partnerships

Objective 5.6 Develop, maintain, and share essential data (demographics, threats, hazards, buildings and other infrastructure, resources, personnel)

Objective 5.7 Develop, maintain, and implement emergency management training curriculum

Objective 5.8 Design and implement disaster response exercises (tabletop, functional, full-scale)

■ **GOAL 6: Ensure Continuity of Government and Operations**

Objective 6.1 Develop, maintain, and exercise Business Continuity Plans; ensuring compatibility with emergency management plans.

Objective 6.2 Ensure reliability for vital communications

Objective 6.3 Protect vital records

Objective 6.4 Protect essential Information Technology equipment and systems

Objective 6.5 Promote resiliency of essential functions to minimize economic loss/disruption

Objective 6.6 Maintain list of Key Assets and ensure their functionality after hazard events

Objective 6.7 Maintain a list of essential personnel and vendors with contact information

Objective 6.8 Identify and acquire any necessary equipment to maintain functionality

7.2 Progress Implementing Mitigation Measures

As part of the LHMP update process, the Planning Team reviewed the mitigation actions included in the previous LHMP. The review included identifying the status (*Completed, In Progress, Ongoing, Not Started, or No Longer Needed*) for the listed mitigation actions. Those mitigation actions that were determined to be “Ongoing” were removed from the new project list and captured under the Mitigation Governance section of Capabilities Assessment chapter. The Planning Team deemed that since the mitigation measure did not have a start or stop date, it should be captured under the Mitigation Governance section with the other ongoing mitigation programs. For mitigation actions listed as “Not Started”, the Planning Team discussed whether the mitigation measure was still needed. If deemed unnecessary, the status was changed to No Longer Needed, and the mitigation measure was not carried over to the new list of mitigation measures. Additionally, all of the carried over mitigation measures were reviewed, and, in some cases, the name and scope were changed and/or merged with another the mitigation measures.

The City of Laguna Niguel has been actively working to reduce and/or eliminate risk from threats and hazards over the past five (5) years. Some of the work was guided by the City’s 2005 LHMP but a large percentage of the work was identified after the approval and adoption of the plan, through the Capital Improvement Program. **Table 7.1** identifies the status of previous mitigation measures included in the 2005 LHMP.

Table 7.1- Status of Previous Proposed Mitigation Measures

Mitigation Measure	Status
Integrate LHMP into regulatory documents and programs	Ongoing
Establish a formal role for the Planning Team	Not Started
Develop an inventory of at-risk buildings and infrastructure	Not Started
Strengthen Emergency Services preparedness and response	Ongoing
Continue to implement hazard and mitigation education programs	Ongoing
Retrofit the Paseo de Colinas Bridge over Camino Capistrano	No Longer Needed
Require seismic resistant designs and construction for new buildings	Ongoing
Build the Cabot Road to Camino Capistrano Bridge connection	No Longer Needed
Construct the Hidden Crest storm drain improvement project	No Longer Needed
Assess the risk of the 11 water reservoirs	Complete
Evaluate and identify mitigation actions for flood prone areas	Not Started
Maintain public and private storm drain and flood control facilities	Ongoing
Prevent development in flood plain areas	Ongoing
Prevent development in steep hillside areas	Ongoing
Enforce the Subdivision Code and Hillside Protection and Grading Ordinance	Ongoing
Implement the Water Quality Management Plan	Ongoing
Require fire protection design and construction standards	Ongoing
Enforce the Fuel Modification Zone and Weed Abatement Program	Ongoing
Continue the Annual Tree Trimming and Removal program	Ongoing
Underground all utility lines	Not Started

7.3 Mitigation Measures

As mentioned, the proposed mitigation measures were identified from an assessment of the current LHMP and an in-depth review of the work done during the LHMP update process (Community Profile- Section 3.0, Capabilities Assessment- Section 4.0, Hazard Assessment- Section 5.0, and Risk Assessment- Section 6.0). The proposed measures focused on actions the City can take to reduce the impacts and/or increase its capabilities. The focus of the mitigation measures was on the “high” priority (Tier I) threats and hazards (Earthquake; Infectious Disease; and Wildfire); however, mitigation measures were considered for all threats and hazards. Part of this work included an assessment of current capabilities (i.e., plans, policies, laws, programs) to determine if they are effective at addressing the risk or whether it needed to be expanded and/or improved. If adjustments of the capabilities were needed, they were included as a mitigation measure. If no action was needed, the capability (i.e., plans, policies, laws, programs) was not included in the list of mitigation measures since they are captured in Section 4.0. However, while the capability was not included on the mitigation measure list, it is important the City continues to support, expand, and implement the capabilities (i.e., CERT training). Because the existing LHMP was developed in 2005, most of the previous projects were completed, are no longer needed, or have become an “ongoing” program. As such, not many of the previous projects were not carried over to this LHMP. Additionally, some of the previous projects were carried over but in some instances the title was changed or merged with another mitigation measure. **Table 7.2** represents the proposed mitigation measures identified by the Planning Team.

Table 7.2- Proposed Mitigation Actions

	Mitigation Action	Hazard	Goal
1	Create and Maintain a list of Assets, including essential attribute data (i.e., square footage, type of construction, replacement/content value, day/night occupancy, backup power generation)	Multi-hazard	1, 2, 5, 6
2	Establish a role and maintain the Hazard Mitigation Planning Team	Multi-hazard	5, 6
3	Establish and Maintain a primary and alternative Emergency Operations Center(s); acquire necessary equipment to support implementation	Multi-hazard	1, 2, 3, 5, 6
4	Assess, Develop, Maintain, and Educate public on Emergency Circulation (Traffic) Plan(s); implement recommendations, including installation of cameras and synchronization of traffic lights. Include messaging targeting underserved and socially vulnerable populations	Multi-hazard	1, 3, 4, 5
5	Assess, Develop, and Maintain Continuity Plans, emphasize loss of technology (Tech Down) situation. Implement recommendations	Multi-hazard	1, 2, 3, 5, 6
6	Assess, Develop, and Maintain an Emergency Public Communications Plan; acquire necessary equipment and develop/maintain systems and procedures to support implementation. Include messaging targeting underserved and socially vulnerable populations.	Multi-hazard	1, 2, 3, 4, 5, 6
7	Develop and Maintain an Energy Strategic Plan; implement recommendations	Multi-hazard	1, 2, 3, 5, 6
8	Update and Maintain the Emergency Operations Plan (EOP); acquire necessary equipment/systems to support implementation. Ensure Recovery part of the planning effort. Include considerations for underserved and socially vulnerable populations	Multi-hazard	1, 2, 3, 5, 6
9	Assess, Develop, and Maintain a Vegetation Management Plan	Multi-hazard	1, 2, 3, 4, 5
10	Assess, Develop, and Maintain a Technology Master Plan; implement recommendations	Multi-hazard	1, 2, 4, 5, 6
11	Assess, Develop, and Maintain IT Incident Response Plans; implement recommendations	Multi-hazard	1, 2, 4, 5, 6
12	Assess, Develop, and Maintain Memorandums of Understanding (MOUs) and Public-Private Partnerships in support of emergency management and business continuity.	Multi-hazard	1, 2, 3, 4, 5, 6
13	Assess, Develop, and Maintain a Threats and hazards Public Outreach Program; implement recommendations. Include messaging targeting underserved and socially vulnerable populations	Multi-hazard	1, 2, 3, 4, 5
14	Develop a Policy to Incorporate Risk from threats and hazards into other plans and development efforts to better ensure development outside of hazard areas	Multi-hazard	1, 2, 3, 4, 5, 6
15	Assess, Develop, and/or Incorporate Emergency Management Training and Exercise Program into existing training and exercise programs	Multi-hazard	1, 2, 3, 4, 5, 6
16	Conduct an assessment of City-owned Facilities; implement recommendations (i.e., Structural and Non-structural Retrofits, defensible space)	Multi-hazard	1, 2, 3, 4, 5, 6

	Mitigation Action	Hazard	Goal
17	Develop a report of typical building construction types in the City; develop a program to assess building condition and support/encourage implementation of mitigation	Multi-hazard	1, 2, 3, 4, 5, 6
18	Increase coordination with Lifeline Infrastructure Stakeholders to better understand and support their improvements, mitigation, and resiliency efforts. Encourage incorporation of public notifications and outreach	Multi-hazard	1, 2, 3, 4, 5, 6
19	Coordinate with the County, surrounding local cities, and the regional Fusion Center. Acquire equipment, supplies, and other material as needed to support mission	Multi-hazard	1, 2, 3, 4, 5, 6
20	Chapparosa Park Soccer Field Synthetic Turf Replacement	Multi-hazard	1, 4, 5
21	Marina Hills Park Improvements	Multi-hazard	1, 4, 5
22	Parks Modernization Project	Multi-hazard	1, 4, 5
23	Crown Valley Parkway Traffic Signal Synchronization/TMC Improvements	Multi-hazard	1, 4, 5
24	Golden Lantern/Moulton Parkway Traffic Signal Synchronization	Multi-hazard	1, 4, 5
25	Crown Valley Parkway Westbound Widening	Multi-hazard	1, 4, 5
26	Intersection Vehicle Detection Improvements	Multi-hazard	1, 4, 5
27	Emergency Battery Back-up Installation	Multi-hazard	1, 2, 3, 5, 6
28	Identify, develop, maintain, and implement technology to support Emergency Management practices and program delivery	Multi-hazard	1, 2, 3, 4, 5, 6
29	La Paz Road Construction and Stabilization project	Multi-hazard	1, 5
30	Develop protocols and ensure appropriate personnel are signed up and receive Earthquake Notifications from USGS	Earthquake	1, 2, 3, 4, 5, 6
31	Assess, Develop, Maintain, and educate the public on the Infectious Disease Response Plan; implement recommendations. Include services targeting underserved and socially vulnerable populations	Infectious Disease	1, 4, 5, 6
32	Ensure Fire Resistant Materials are incorporated into existing building modifications and/or future development	Wildfire	1, 2, 3, 4, 5, 6
33	Incorporate and Enforce Defensive Space Standards in existing and future building designs	Wildfire	1, 2, 3, 4, 5, 6
34	La Paz Road Earth Movement Evaluation	Landslide	1, 2, 3, 4, 5, 6
35	Coordinate with NTSB, Regional Association of governments, and County Transportation Department; acquire equipment, supplies, and other material as needed to support role	Transportation Accident	1, 2, 3, 4, 5
36	Assess, Develop, and Maintain a Drought Emergency Plan; implement recommendations. Include messaging targeting underserved and socially vulnerable populations	Drought	1, 2, 3, 4, 5, 6
37	Assess, Develop, Maintain, and Educate the public on the Extreme Temperature Emergency Plan; implement recommendations. Include messaging targeting underserved and socially vulnerable populations	Extreme Temperatures	1, 2, 3, 4, 5, 6
38	Pacific Island Drive- Drainage and Wall Improvements	Flood	1, 2, 3, 4, 5
39	Installation of Trash Control Devices on Storm Water Catch Basins	Flood	1, 2, 3, 4, 5

7.4 Mitigation Measure Prioritization

The Planning Team used the STAPLEE Criteria to evaluate the feasibility of each of the mitigation measures being considered for inclusion in the LHMP update. A feasibility assessment helps understand possible challenges that could hinder the ability to implement a mitigation measure. STAPLEE is an acronym with each letter representing an area that should be assessed for the project (Social, Technical, Administrative, Political, Legal, Economic, and Environmental). While there is a series of questions that can be asked under each area, the list below presents the general concept behind each area:

- **Social:** Do you have community support to implement the project?
- **Technical:** Does the technology exist to implement the project?
- **Administrative:** Do you have the organization/staff to implement and sustain the project?
- **Political:** Do you have the political support to implement the project?
- **Legal:** Do you have appropriate legal authority to implement the project?
- **Economic:** Do you have the funds to implement and is it cost-effective?
- **Environmental:** What kind of impact will the project have on the environment?

Each proposed mitigation measure was assessed against the STAPLEE and given a score between 1–5, where 5 is favorable/beneficial (or no major issues/opposition) and 1 is unfavorable/not beneficial (or major issues/opposition) for each of the STAPLEE criteria. The scores were then totaled, and a final score was established for each mitigation measure. A relative comparison of mitigation measures helps understand which mitigation measure may have the greatest success for implementation. However, this ranking does not preclude the City from funding mitigation measures lower on the list, especially if funding is available.

7.5 Mitigation Measure Implementation Plan

The following table (**Table 7.3**) reflects the implementation plan for each mitigation measure. The implementation plan identifies the lead department responsible for the action, the estimated cost, potential funding source to support the action, and the proposed timeframe for completion. Because there are some unknowns, the City developed ranges for both the project costs and project timeframes. Additionally, while some funding sources are listed, the City intends to actively search for other possible funding sources to help implement mitigation measures. It is also worth noting that the City has listed Hazard Mitigation Assistance (HMA) grants under several of the mitigation measures. The City recognizes that HMA grants include the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC), and Flood Mitigation Assistance (FMA) funding. It was deemed better by the Planning Team to list it collectively, instead of only selecting 1 or 2 of the grant programs as to not limit consideration under the other grant programs.

Table 7.3- Mitigation Measure- Implementation Plan

	Mitigation Action	Lead	Cost	Timeframe	Funding	Priority Score
30	Develop protocols and ensure appropriate personnel are signed up and receive Earthquake Notifications from USGS	Administration	<\$100,000	1 year	General Fund	32
12	Assess, Develop, and Maintain Memorandums of Understanding (MOUs) and Public-Private Partnerships in support of emergency management and business continuity.	City Manager	\$100,000-\$500,000	1-3 years	General Fund	31
1	Create and Maintain a list of Assets, including essential attribute data (i.e., square footage, type of construction, replacement/content value, day/night occupancy, back up power generation)	Community Development	\$100,000-\$500,000	1-3 years	General Fund	30
6	Assess, Develop, and Maintain an Emergency Public Communications Plan; acquire necessary equipment and develop/maintain systems and procedures to support implementation. Include messaging targeting underserved and socially vulnerable populations.	Administration	\$100,000-\$500,000	1-3 years	General Fund, HMA, EMPG, UASI	30
2	Establish a role and maintain the Hazard Mitigation Planning Team	City Manager	<\$100,000	<1 year	General Fund, HMA	29
5	Assess, Develop, and Maintain Continuity Plans, emphasize loss of technology (Tech Down) situation. Implement recommendations	Administration	\$500,000-\$1,000,000	1-3 years	General Fund, HMA, EMPG, UASI, DOJ	29
4	Assess, Develop, Maintain, and Educate public on Emergency Circulation (Traffic) Plan(s); implement recommendations, including installation of cameras and synchronization of traffic lights. Include messaging targeting underserved and socially vulnerable populations	Public Safety	\$100,000-\$500,000	1-3 years	General Fund, HMA, EMPG, UASI	28
8	Update and Maintain the	City Manager	\$100,000-	1-3 years	General	28

	Mitigation Action	Lead	Cost	Timeframe	Funding	Priority Score
	Emergency Operations Plan (EOP); acquire necessary equipment/systems to support implementation. Ensure Recovery part of the planning effort. Include considerations for underserved and socially vulnerable populations		\$500,000		Fund, HMA, EMPG, UASI	
18	Increase coordination with Lifeline Infrastructure Stakeholders to better understand and support their improvements, mitigation, and resiliency efforts. Encourage incorporation of public notifications and outreach	Public Works	\$100,000-\$500,000	1-3 years	General Funds	28
19	Coordinate with the County, surrounding local cities, and the regional Fusion Center. Acquire equipment, supplies, and other material as needed to support mission	Public Safety	\$100,000-\$500,000	1-3 years	General Funds, DOJ, UASI	28
13	Assess, Develop, and Maintain a threats and hazards Public Outreach Program; implement recommendations. Include messaging targeting underserved and socially vulnerable populations	Administration	\$100,000-\$500,000	1-3 years	General Fund, HMA, EMPG, UASI, DOJ, HUD	27
14	Develop a Policy to Incorporate Risk from threats and hazards into other plans and development efforts to better ensure development outside of hazard areas	City Manager	<\$100,000	1-3 years	General Fund, HMA, EMPG, UASI, DOJ, DOE, DOD, CEC, HUD	27
31	Assess, Develop, Maintain, and educate the public on the Infectious Disease Response Plan; implement recommendations. Include services targeting underserved and socially vulnerable populations	Administration	\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI, DOJ, Dept of Public Health, HUD	27
35	Coordinate with NTSB, Regional Association of	Public Safety	\$100,000-\$500,000	1-3 years	General Fund,	27

	Mitigation Action	Lead	Cost	Timeframe	Funding	Priority Score
	governments, and County Transportation Department; acquire equipment, supplies, and other material as needed to support role				HMA, UASI, CalTrans	
3	Establish and Maintain a primary and alternative Emergency Operations Center(s); acquire necessary equipment to support implementation	City Manager	\$500,000-\$1,000,000	1-3 years	General Fund, HMA, EMPG, UASI	26
9	Assess, Develop, and Maintain a Vegetation Management Plan	Public Works	\$100,000-\$500,000	1-3 years	General Fund, Dept of Agriculture	26
10	Assess, Develop, and Maintain a Technology Master Plan; implement recommendations	Administration	\$100,000-\$500,000	1-3 years	General Fund, HMA, EMPG, UASI, DOE, DOJ, CEC	26
11	Assess, Develop, and Maintain IT Incident Response Plans; implement recommendations	Administration	\$100,000-\$500,000	1-3 years	General Fund, HMA, EMPG, UASI, DOE, DOJ, CEC	26
27	Emergency Battery Back-up Installation	Public Works	\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI, DOE, CEC	26
28	Identify, develop, maintain, and implement technology to support Emergency Management practices and program delivery		\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI, DOJ	26
32	Ensure Fire Resistant Materials are incorporated into existing building modifications and/or future development	Community Development	\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI	26
33	Incorporate and Enforce Defensive Space Standards in existing and future building designs	Community Development	\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI	26
15	Assess, Develop, and/or	Administration	\$500,000-	1-3 years	General	25

	Mitigation Action	Lead	Cost	Timeframe	Funding	Priority Score
	Incorporate Emergency Management Training and Exercise Program into existing training and exercise programs		\$1,000,000		Fund, HMA, EMPG, UASI	
16	Conduct an assessment of City-owned Facilities; implement recommendations (i.e., Structural and Non-structural Retrofits, defensible space)	Public Works	\$100,000-\$500,000	1-3 years	General Fund, HMA	25
17	Develop a report of typical building construction types in the City; develop a program to assess building condition and support/encourage implementation of mitigation	Public Works	\$100,000-\$500,000	1-3 years	General Fund, HMA	25
23	Crown Valley Parkway Traffic Signal Synchronization/TMC Improvements	Public Works	>\$1,000,000	1-3 years	General Fund, HMA, UASI, DOJ, DOE, CEC, CalTrans	25
24	Golden Lantern/Moulton Parkway Traffic Signal Synchronization	Public Works	\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI, DOJ, DOE, CEC, CalTrans	25
25	Crown Valley Parkway Westbound Widening	Public Works	>\$1,000,000	1-3 years	General Fund, HMA, UASI, DOJ, DOE, CEC, CalTrans	25
26	Intersection Vehicle Detection Improvements	Public Works	\$500,000-\$1,000,000	1-3 years	General Fund, HMA, UASI, DOJ, DOE, CEC, CalTrans	25
36	Assess, Develop, and Maintain a Drought Emergency Plan; implement recommendations. Include	Public Works	\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI,	25

	Mitigation Action	Lead	Cost	Timeframe	Funding	Priority Score
	messaging targeting underserved and socially vulnerable populations				DOJ, DOE, CEC, HUD	
38	Pacific Island Drive-Drainage and Wall Improvements	Public Works	\$500,000-\$1,000,000	1-3 years	General Fund, HMA, CalTrans	25
39	Installation of Trash Control Devices on Storm Water Catch Basins	Public Works	\$500,000-\$1,000,000	1-3 years	General Fund, HMA, UASI, CalTrans	25
22	Parks Modernization Project	Public Works	\$100,000-\$500,000	1 year	General Fund, HMA, UASI	24
29	La Paz Road Construction and Stabilization project	Public Works	\$500,000-\$1,000,000	1-3 years	General Fund, HMA, UASI, DOJ, DOE, CEC, CalTrans	24
37	Assess, Develop, Maintain, and Educate the public on the Extreme Temperature Emergency Plan; implement recommendations. Include messaging targeting underserved and socially vulnerable populations	Administration	\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI, DOJ, DOE, CEC, Dept of Health	24
7	Develop and Maintain an Energy Strategic Plan; implement recommendations	Public Works	\$100,000-\$500,000	1-3 years	General Fund, HMA, EMPG, UASI, DOE, CEC	23
34	La Paz Road Earth Movement Evaluation	Public Works	\$100,000-\$500,000	1-3 years	General Fund, HMA, UASI, CalTrans	23
20	Chapparosa Park Soccer Field Synthetic Turf Replacement	Public Works	\$100,000-\$500,000	1 year	General Fund, HMA, UASI	21
21	Marina Hills Park Improvements	Public Works	\$100,000-\$500,000	1 year	General Fund, HMA	21

8 PLAN ADMINISTRATION

The purpose of this section is to present the actions the City of Laguna Niguel will take to ensure the LHMP remains current and up to date over the next five (5) years. In addition to ensuring the LHMP remains current, this section presents the efforts the City will take to educate and bring awareness to stakeholders and the general public about threats and hazards, City efforts to address the threats and hazards, and potential actions that can be taken within the community. This section also presents the City's intention to encourage the incorporation of information from the LHMP into other planning efforts. The City believes the effectiveness of the LHMP depends on the implementation of proposed mitigation measures and the integration of information into other existing City plans, policies, and programs.

8.1 Monitoring, Evaluating and Updating the Plan

The City of Laguna Niguel Emergency Management Coordinator will work with the Planning Team to monitor, evaluate, review, and update information in the LHMP. And although the City took significant efforts to include all relevant stakeholders and partners during the update process, additional efforts will be taken to expand the Planning Team to include other community stakeholders and partners that may not have participated. The City of Laguna Niguel Emergency Management Coordinator will facilitate an annual meeting with the Planning Team to review all of the information in the LHMP, with a heavy emphasis on the proposed mitigation measures. Each City Department identified as the lead for the mitigation measure will validate the need, discuss the intent and benefit of the mitigation measure, and provide a status update. This review will coincide with the development of the City's and its Departments annual budget increasing the chances of inclusion of mitigation measures in the Capital Improvement Program. While there is not a confirmed meeting schedule, the Emergency Management Coordinator will ensure that the first annual meeting will occur within one (1) year from the date of FEMA approval.

In addition to the annual Planning Team meeting, City of Laguna Niguel Emergency Management Coordinator will facilitate ad hoc meetings to review the LHMP after: an emergency declaration (Federal, State, Regional, County, and/or City), after an event that required activation of the City's Emergency Operations Center, or during an update of the City of Laguna Niguel's General Plan. Some of the discussion will focus around validating the Goals and Objectives, reviewing the Hazard Profiles, and calibrating the potential impacts (risk).

The City of Laguna Niguel Emergency Management Coordinator will also encourage the integration of mitigation topics into other City and stakeholder/partner planning meetings. The Emergency Management Coordinator will ensure that the LHMP is an agenda item and/or incorporated into the discussion during those meetings whenever appropriate.

The City of Laguna Niguel Emergency Management Coordinator will also lead the effort to update the LHMP. The City of Laguna Niguel Emergency Management Coordinator will ensure all information obtained from all of these meetings will be captured and made available for the next LHMP update. Understanding the need not to have the LHMP expire, the Emergency Management Coordinator will begin the process of updating the LHMP two (2) years prior to the plan expiration date. If the City decided to seek a Hazard Mitigation Assistance grant and/or the

assistance of a consultant to support the LHMP update effort, the Emergency Management Coordinator will incorporate appropriate time to account for those needs.

8.2 Integration with Other Planning Efforts

Integration of the LHMP with other City programs, processes, and planning efforts is essential to the success of building a disaster resilient community. Ensuring all City plans and programs are consistent and working together towards common goals is vital part of this effort. The City of Laguna Niguel supports an all-hazard approach, encouraging information sharing between City Departments and the incorporation of information into other planning efforts. As other plans are developed, the LHMP information will be leveraged and incorporated when other plans could benefit from a better understanding of threats and hazards and the potential mitigation measures that can be taken. After adoption and approval of this LHMP, the City of Laguna Niguel will work to better incorporate and validate the information in the City of Laguna Niguel General Plan and the City of Laguna Niguel Emergency Operations Plan (EOP). As any other plans are developed, the City will encourage the incorporation of information from the LHMP and/or encourage the use of the LHMP to assess other efforts.

In the past, integration of the LHMP has not been without challenges. Along with ever evolving, competing priorities, the City experienced past challenges of personnel changes and competitive allocation of funding. The past changing of staff led to delays. The City had not fully incorporated the LHMP into the General Plan or EOP. The General Plan was adopted several decades ago and as such the City will be updating its General Plan over the coming years.

While the LHMP was not integrated into other plans and planning efforts, some *formal* actions were accomplished. The information in the LHMP was leveraged in the creation of the annual Capital Improvement Program Project list. Issues identified through the LHMP process augmented the work done annually to assess capabilities and needs. The LHMP has also assisted with discovery and mitigation actions in the EIR process.

The City remains committed to ensuring the LHMP efforts are leveraged into other plans and planning efforts. The intent and methodology of the City to maintain and encourage the incorporation of the plan is outlined under Section 8.1.

8.3 Continued Stakeholder and Public Involvement

A critical part of maintaining the LHMP is ongoing stakeholder and public review and participation. The City is committed to the direct involvement of stakeholders and the public, offering them a platform to provide feedback and comments on the LHMP on a continued basis. As mentioned, during the update of the LHMP, the City made an effort to be all inclusive in the planning process. At the beginning of the process, extra effort was conducted to reach out to non-governmental organizations and private organizations, some of whom are advocates for underserved and socially vulnerable populations. Even though according to some state and federal programs/documentation the City does not possess underserved or socially vulnerable populations, Laguna Niguel recognizes conditions do exist in the community. As such, the City is dedicated to continuing to engage with these communities and bringing greater awareness of these community needs. This statement is supported by the City's support for standing City

Committees (Senior Citizen, Youth, Military Support). In addition to normal practices, the City intends to extend invitations to community leaders when reviewing the LHMP and other emergency management plans (i.e., Response Plans, Recovery Plans); ensuring needs are captured and incorporated into future planning. While their participation in the effort was limited because of competing priorities, an understanding and appreciation of the communities they serve were a consideration in all update activities.

The City is also looking for better opportunities to engage directly with the communities (i.e., workshops, meetings) to both educate each other and exchange ideas. The City is hoping that this continued (and improved) outreach will lend itself to better participation in the next update of the LHMP. This may include more targeted messaging and contact with underserved and socially vulnerable populations (i.e., the elderly, non-English speaking, homeless, transportation disadvantaged, and the Disabled, Access, and Functional Needs- *DAFM*). As an ongoing effort, stakeholders and the public will continue to be apprised of LHMP actions through the City's website, City social media platforms, and through the local media. The City will leverage the communication capabilities presented in section 4.3.3 and followed during the LHMP public involvement processes described under Section 2 of this Plan.

8.4 Point of Contact

While the LHMP is viewed as a citywide document, requiring participation from all City departments, it is important to identify a single person responsible for the administration of the plan. As mentioned, the City of Laguna Niguel Emergency Management Coordinator will act as the lead, facilitating and encouraging participation from all Planning Team members to monitor, evaluate, review, and update information in the LHMP. Without this collective input and participation, the City recognizes the potential shortfall of the LHMP. Below is the contact information for the City of Laguna Niguel Emergency Management Coordinator:

Phil Robinson
30111 Crown Valley Parkway Laguna Niguel, CA 92677
(949) 362-4312/ PRobinson@cityoflagunaniguel.org

APPENDIX A- CITY COUNCIL RESOLUTION

RESOLUTION NO. 2024-1461

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LAGUNA NIGUEL
ADOPTING THE UPDATED CITY OF LAGUNA NIGUEL
LOCAL HAZARD MITIGATION PLAN 2023**

WHEREAS, the City is subject to various natural, human-caused, and technological hazards; and

WHEREAS, the goal of a Local Hazard Mitigation Plan (LHMP) is to develop potential mitigation strategies to reduce and/or eliminate the potential loss of life, property damage, and environmental impacts caused by natural, human-caused, and technological hazards; and

WHEREAS, the Disaster Mitigation Act of 2000 requires all cities, counties, and special districts to update a LHMP every five (5) years in order to be eligible for and to receive disaster mitigation funding from the Federal Emergency Management Agency (FEMA); and

WHEREAS, the City established a Planning Team of various community stakeholders and partners and undertook a comprehensive planning effort in developing the LHMP by organizing resources, assessing risks, developing a mitigation strategy, and establishing a LHMP monitoring process; and

WHEREAS, the City developed the updated LHMP in accordance with the Disaster Mitigation Act of 2000, followed FEMA's 2011 and 2023 Local Hazard Mitigation Plan policy guidance, and has received an *Approval Pending Adoption* determination from FEMA; and

WHEREAS, the City adopts this Local Hazard Mitigation Plan and urges all officials, employees, public and private organizations, and citizens, individually and collectively, to do their share in furthering the goals and objectives of the Local Hazard Mitigation Plan within the City.


NOW, THEREFORE, BE IT RESOLVED, that City Council of the City of Laguna Niguel hereby adopts the updated Local Hazard Mitigation Plan 2023 (Exhibit A) which has been approved by FEMA.

IT IS FURTHER RESOLVED that City Council authorizes the City Manager, Assistant City Manager, or their duly appointed representative, to make necessary administrative and operational changes to the Local Hazard Mitigation Plan that are in keeping with the intent of the plan as approved.

IT IS FURTHER RESOLVED that City Council authorizes the City Manager, Assistant City Manager, or their duly appointed representative, to perform the duties required to carry out the Local Hazard Mitigation Plan.


IT IS FURTHER RESOLVED that the City Clerk shall certify to the adoption of this Resolution, which shall become effective immediately upon adoption.

PASSED, APPROVED AND ADOPTED this 16th day of January, 2024.



Kelly Jennings, Mayor

ATTEST:



Marissa J. Asistin, City Clerk

CERTIFICATION

STATE OF CALIFORNIA)
COUNTY OF ORANGE)ss
CITY OF LAGUNA NIGUEL)

I, Marissa J. Asistin, CMC, City Clerk of the City of Laguna Niguel, California, do hereby certify that the foregoing is Resolution No. **2024-1461**, which was adopted at a regular meeting of the City Council, held on January 16, 2024, by the following vote:

AYES: Council Members Gennawey, Johns, Winstead; Mayor Pro
 Tem Oddo and Mayor Jennings.

NOES: None.

ABSTENTIONS: None.

ABSENT: None.



Marissa J. Asistin, CMC, City Clerk
City of Laguna Niguel

APPENDIX B- PLANNING TEAM MEMBER MEETING ATTENDANCE

Laguna Niguel Hazard Mitigation Planning Team Attendance								
Members		Agency	#1	#2	#3	#4	#5	#6
Last	First		3/31/2022	4/28/2022	6/30/2022	8/4/2022	8/18/2022	9/1/2022
Alevy	Scott	LN Chamber of Commerce	X	X				
Andrews	Larry	SoCal Gas						
Ankley	Matt	OCTA	X	X		X		
Asuncion	Virgil	OCSD-LN			X			
Barton	Len	MNWD	X	X		X	X	X
Beekman	Mike	CUSD	X					
Bolivar	Jerry	SoCal Gas		X				
Bravo	Favian	LN-City Manager	X	X	X	X	X	X
Brown	Ethan	OCSD-EMD / OA	X	X				
Burror	Jim	SOCWA	X					
Catsimanes	Paul	Mission Viejo						
Cave	Duane	SDGE						
Contreras	Mike	OCFA				X		
Green	Andy	Chet Holifield		X			X	X
Guardado	Lidia	Chet Holifield	X	X				
Horn	Dan	MNWD	X	X		X		
Lang	Harold	Chet Holifield						
Lee	Kelley	SCE						
Limonas	Sarah	Aliso Viejo	X	X				
List	Erich	LN-Com Dev						X
Lopez	Jason	OCFA	X	X		X		X
Manning	Brendan	Laguna Beach	X	X		X		X
Moreno	Daniel	LN-APetrow Consulting			X	X		X
Nguyen	Kathy	LN-Public Works	X	X		X		X
Novacek	Todd	MNWD					X	X
Nozawa	Jarod	LN-Finance				X	X	X
Pecher	Sean	SOCWA	X	X		X	X	X
Petrow	Andy	LN-APetrow Consulting	X	X	X	X	X	X
Robinson	Phil	LN-Emergency Mgt.	X	X	X	X	X	X
Rowden	John	LN-APetrow Consulting			X	X		X
Seligson	Hope	LN-APetrow Consulting		X	X	X		X
Shadle	James	Dana Point						
Simmons	William	Jacob Green & Associates	X					
Stigall	Lindsey	San Juan Capistrano						
Stiverson	Matt	Laguna Hills (OCSD)					X	X
Torrez	Armando	SoCal Gas						
Volkel	Charles	OCSD-EMD / OCSD-LN	X	X				

APPENDIX C- PUBLIC OUTREACH MEETING ANNOUNCEMENTS AND PRESENTATIONS

APPENDIX D- SIGNIFICANT CALIFORNIA EARTHQUAKES

DATE	MAGNITUDE	NAME	REPORTED LOSSES
1800, Nov 22	6.3 estimated	San Diego and San Juan Capistrano region	Damaged adobe walls of missions in San Diego and San Juan Capistrano
1812, Dec 21	7.1 estimated	Los Angeles, Ventura, Santa Barbara	1 dead
1812, Dec 8	7.3 estimated	Wrightwood	40 dead at San Juan Capistrano
1836, Jun 10	6.4 estimated	Near San Juan Bautista	
1838, Jun	7.4 estimated	San Francisco to San Juan Bautista	Damage to San Francisco and Santa Clara
1852, Nov 29	6.5 estimated	Near Fort Yuma, Arizona	
1857, Jan 9	7.9	Great Fort Tejon earthquake	1 dead; damage from Monterey to San Bernardino
1860, Mar 15	6.5 estimated	Carson City	
1865, Oct 8	6.5	Santa Cruz Mountains	\$0.5 million in property damage
1868, Oct 21	7.0	Hayward Fault	30 dead; \$350,000 in property damage
1872, Apr 11	6.8	Owens Valley	Aftershock of March 26, 1872 quake
1872, Mar 26	7.4	Owens Valley	27 dead; 56 injured; \$250,000 in property damage
1872, Mar 26	6.8	Owens Valley	Aftershock of previous entry
1873, Nov 23	6.9	Crescent City region	Damage in California-Oregon border area
1890, Feb 9	6.8	Uncertain; San Jacinto fault suspected	Little damage
1892, Apr 19	6.6	Vacaville	1 dead; \$225,000 in property damage
1892, Feb 24	7.3	Laguna Salida, Baja California	Damage to San Diego and Imperial Valley
1898, Apr 15	6.7 estimated	Fort Bragg - Mendocino	Damage from Fort Bragg to Mendocino; 3 houses collapsed; landslides reported
1898, Mar 31	6.4	Mare Island	\$350,000 in property damage
1899, Apr 16	7.0	Offshore, about 80 miles W of Eureka	
1899, Dec 25	6.7	San Jacinto and Hemet	6 dead; \$50,000 in property damage
1899, Jul 22	6.4	Wrightwood	Chimneys knocked down; landslides reported
1906, Apr 18	7.8	Great 1906 San Francisco	3,000 dead; \$524 million in property

		Earthquake and Fire	damage (includes damage from fire)
1911, Jul 1	6.6	Morgan Hill area	
1915, Nov 21	6.6	Mexico, about 60 miles S of El Centro	
1918, Apr 21	6.8	San Jacinto	1 dead; \$200,000 in property damage
1918, Jul 15	6.5	Offshore, about 40 W of Eureka	
1922, Jan 31	7.3	Offshore, about 70 mi W of Eureka	
1923, Jan 22	7.2	Off Cape Mendocino	Destructive in Humboldt County
1925, Jun 29	6.8	Santa Barbara	13 dead; \$8 million in property damage
1927, Nov 4	7.1	40 km W of Lompoc	Damage in Santa Barbara and San Luis Obispo counties
1932, Dec 21	7.2	Cedar Mountain, near Gabbs, NV	
1933, Mar 11	6.4	Long Beach	115 dead; \$40 million in property damage
1934, Dec 30	6.5	Mexico, about 40 miles S of El Centro	
1934, Dec 31	7.0	Mexico, about 100 miles SE of El Centro	
1934, Jul 6	6.5	Offshore, about 100 mi WNW of Eureka	
1940, May 19	7.0	Imperial Valley	9 dead; \$6 million in property damage
1941, Feb 9	6.6	Offshore, about 65 miles W of Eureka	
1942, Oct 21	6.6	West of Westmorland	
1947, Apr 10	6.5	East of Yermo	
1952, Jul 21	7.3	Kern County earthquake	12 dead; \$60 million in property damage
1954, Aug 24	6.8	Rainbow Mountain, near Fallon, NV	
1954, Dec 16	7.3	Fairview Peak, near Fallon, NV	
1954, Dec 16	7.1	Dixie Valley, near Fallon, NV	
1954, Dec 21	6.6	East of Arcata	1 dead; \$2.1 million in property damage
1954, Jul 6	6.8	Rainbow Mountain, near Fallon, NV	
1956, Feb 9	6.5	Mexico, about 80 miles SW of El Centro	
1968, Apr 8	6.6	Borrego Mountain	

1971, Feb 9	6.6	San Fernando	65 dead; > 2,000 injured; \$505 million in losses
1976, Nov 26	6.8	Offshore, about 100 mi WNW of Eureka	
1979, Oct 15	6.5	Imperial Valley	9 injured; \$30 million in property damage
1980, May 25	6.3	Mammoth Lakes	9 injured; \$2 million in property damage
1980, Nov 8	7.4	West of Eureka	6 injured; \$2 million in property damage
1983, May 2	6.4	Coalinga	
1984, Apr 24	6.2	Morgan Hill	\$8 million in property damage
1986, Jul 21	6.4	Chalfant Valley	\$2.7 million in property damage
1987, Nov 24	6.2	Superstition Hills	\$3 million in property damage
1987, Nov 24	6.6	Superstition Hills	Included with losses reported above
1987, Oct 1	6.0	Whittier Narrows	8 dead; \$358 million in property damage to 10,500 homes and businesses
1989, Oct 17	6.9	Loma Prieta	63 dead; 3,737 injured; \$6 billion in property damage
1991, Aug 17	7.0	Offshore, about 100 miles NW of Eureka	Preceded by two quakes (M6.3 and M6.2) on Aug 16 and 17
1991, Jul 12	6.6	Offshore W of Crescent City	
1992, Apr 25	7.2	Petrolia	356 injured; \$48.3 million in property damage
1992, Apr 26	6.6	Petrolia	Aftershock of the Apr 25 quake
1992, Apr 26	6.6	Petrolia	Another aftershock of Apr 25 quake
1992, Jun 28	7.3	Landers	1 dead; 402 injured; \$91.1 million in property damage
1992, Jun 28	6.5	Big Bear	Included with Landers losses
1994, Jan 17	6.7	Northridge	57 dead; < 9,000 injured; about \$40 billion in property damage
1994, Sep 1	7.0	Offshore, about 70 miles W of Cape Mendocino	
1999, Oct 16	7.1	Bullion Mountains (Hector Mine)	Minimal injuries and damage; sparse population
2003, Dec 22	6.5	San Simeon	
2010, Apr 4	7.2	Calexico	
2010, Jan 9	6.5	Ferndale	
2014, Aug 24	6.0	South Napa	2 dead; total economic losses estimated at \$443 million to \$800

			million
2014, Mar 9	6.8	Ferndale	
2016, Dec 8	6.5	Ferndale Offshore	
2019, Jul 4	6.4	Ridgecrest	
2019, Jul 6	7.1	Ridgecrest	1 dead; preliminary estimate of economic losses \$1 billion to \$5 billion