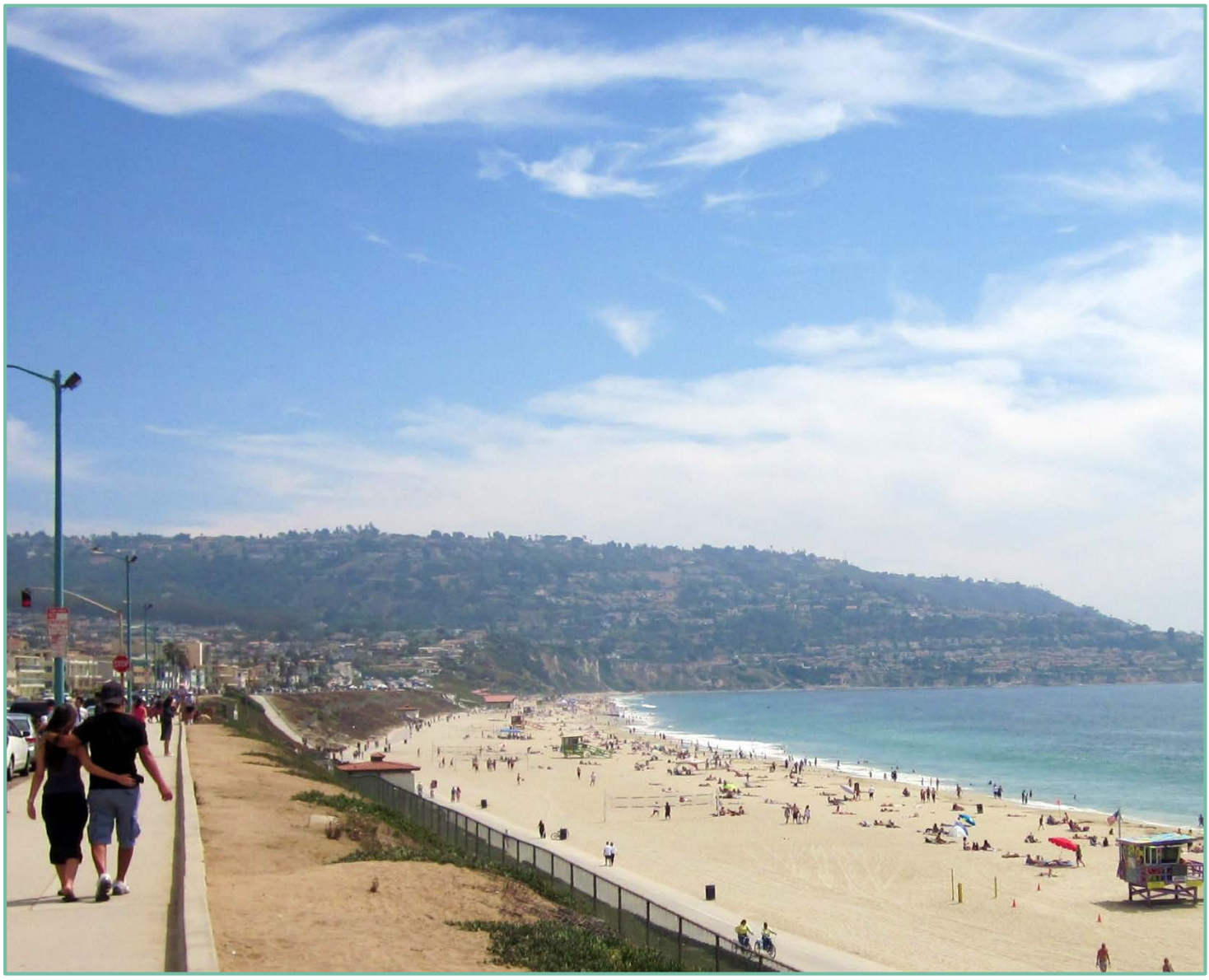
City of Torrance

LOCAL HAZARD MITIGATION PLAN



Public Review Draft | September 2016

City of Torrance

LOCAL HAZARD MITIGATION PLAN

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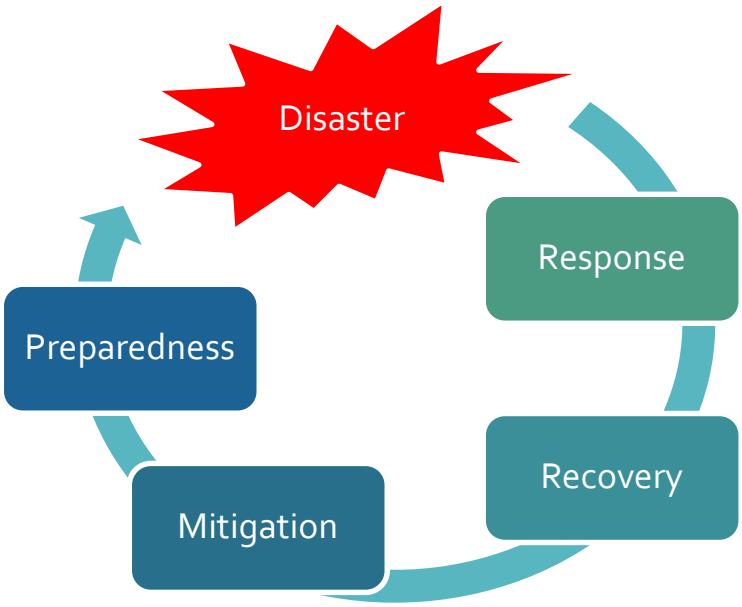
INTRODUCTION

Natural hazards have different impacts in varying locations and times, with the potential to severely impact human health and safety, property, ecosystems, and key services. Over a sufficient period of time, cyclical patterns of occurrence and recovery associated with natural hazards eventually become evident. These patterns can be identified and analyzed to create the most effective set of emergency management activities. Emergency management has five phases: the emergency or disaster itself, response, recovery, mitigation, and preparedness. By optimizing each phase, emergency planners and responders can help protect a community from the worst effects of disasters. A clear understanding of the potential hazards facing a community and a coordinated plan to address the risks posed by hazards are essential to an effective emergency management strategy. While no community can entirely protect itself against all potential impacts from natural hazards, communities can reduce the severity of these impacts by taking actions to become more resilient. This Local Hazard Mitigation Plan (LHMP, or Plan) is a blueprint for how the City of Torrance, California, may reduce the threat posed by natural hazards.



Purpose

Like many other communities, Torrance could face widespread devastation and loss of life, interruptions to vital services, and other substantial challenges in the event of a severe disaster. Even a natural hazard event of a smaller magnitude could cause significant disruptions and negative impacts to the community. This Plan is intended to help make Torrance a safer place to live, work, and visit by identifying effective and feasible actions to reduce the risks posed by various hazards. The City has developed this Plan to be consistent with current standards and regulations, to ensure that the understanding of hazards facing the community reflects current conditions and best available science, that the mitigation measures in the plan are grounded in best practices and available resources, and that the Plan is consistent with Federal Emergency Management Agency (FEMA) requirements.

Hazard mitigation plans such as this Plan have four overarching objectives:

- Establish and foster a basis for coordination and collaboration among public agencies, participating private organizations and companies, and other key stakeholders.
- Identify and prioritize future mitigation projects.
- Meet the requirements of federal assistant grant programs, including FEMA's Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) funding.
- Work in conjunction with other plans, including the City's General Plan.

Authority for the Plan

FEMA

The federal Robert T. Stafford Disaster Relief and Emergency Act (Stafford Act), as amended by the Disaster Mitigation Act of 2000 (DMA 2000) and supported by various pieces of regulation, directs hazard mitigation planning. The Stafford Act requires state, local, and tribal governments to develop and submit to FEMA a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the jurisdiction if the jurisdiction wishes to be eligible for federal hazard mitigation grant funds (United States Code Title 42, Section 5156(a)). FEMA has promulgated the Code of Federal Regulations (CFR) Title 44, Part 201 in order to implement the mitigation planning requirements of the Stafford Act. These regulations govern the planning process, plan content, and the process for obtaining FEMA approval for hazard mitigation plans. FEMA's Local Mitigation Plan Review Tool identifies the planning requirements set forth in the CFR.

The City of Torrance LHMP complies with DMA 2000 and the Stafford Act, as well as Title 44 Parts 201, 206, and 322 of the CFR.

State of California

The State of California enacted California Government Code Sections 8685.9 and 65302.6 through the passage of Assembly Bill (AB) 2140 in 2006. These sections address the federal requirements to have a hazard mitigation plan as a condition for certain federal grants.

Section 8685.9 limits the State of California's share of disaster relief funds to 75 percent of funds not covered by FEMA, unless the affected community receiving the disaster relief funds has adopted a valid hazard mitigation plan consistent with DMA 2000 and has incorporated the hazard mitigation plan as part of the community's general plan. In this case, the State may cover more than 75 percent of the costs. Section 65302.6 authorizes a local community to adopt a hazard mitigation plan as part of the safety element or comparable component of its general plan.

This LHMP includes information required by the appropriate sections of the California Government Code.

Plan Adoption

The City of Torrance will adopt this LHMP through a resolution of the City Council, following approval of the plan by FEMA. **Appendix D** contains the City Council resolution adopting the 2016 LHMP.

Plan Use

Each section of the LHMP contains information and resources to assist in the understanding of the natural hazards and related issues that may affect Torrance. The structure of the LHMP allows users to review each section as needed and allows the City to review and update sections with new data as it becomes available. The LHMP is made up of the following chapters:

- Chapter 1 – Introduction: Describes the background and purpose of the Plan, the goals and priorities, and the planning process used to develop it.
- Chapter 2 – Community Profile: Provides the history, physical setting, land use, and demographics of Torrance.
- Chapter 3 – Hazards: Identifies and describes the hazards that threaten Torrance, and how these hazards were selected and prioritized. For each hazard, this chapter discusses past hazards, the risk of future hazards, the impact of climate change on the hazard, and the vulnerability of the community.
- Chapter 4 – Mitigation Strategy: Provides the mitigation measures to reduce potential risks from hazards in Torrance, and an overview of the City's existing capabilities to improve resiliency to hazard events.
- Chapter 5 – Plan Maintenance: Describes the process for implementing, monitoring, and evaluating the Plan, as well as opportunities for continued public involvement.

Mitigation Priorities and Goals

The City of Torrance established goals as part of the planning process to develop the City's previous LHMP, which was adopted in 2004. The Planning Team modified these goals for this updated Plan while preserving the original intent. The goals for this LHMP are as follows:

- Make properties and structures more resilient to natural hazards, reducing injuries and damage.
- Improve assessments of hazards to encourage preventive measures.
- Create outreach and education efforts to increase public awareness of risks.
- Support the local environment through hazard mitigation planning efforts.
- Improve public and private participation to encourage leadership and prioritize hazard mitigation actions.
- Coordinate hazard planning and emergency operations by strengthening collaboration.

Hazard Mitigation Planning Process

State and federal laws and regulations do not require a specific planning process for developing hazard mitigation plans. Individual communities are allowed to develop and implement a planning process that is best suited for local conditions. FEMA guidance suggests that planning processes achieve the following objectives:

- Determine the planning area and resources it contains.
- Build the planning team.
- Create an outreach strategy.
- Review the community capabilities.
- Conduct a risk assessment.
- Develop a mitigation strategy.
- Keep the plan current.
- Review and adopt the plan.
- Create a safe and resilient community.

In keeping with FEMA's recommendations, the City of Torrance convened a Local Hazard Mitigation Planning Team (the Planning Team), made up of representatives from different City departments. The Planning Team included representatives from the following departments:

- City Attorney
- City Clerk
- City Manager
- City Treasurer
- Communications and Information Technology
- Community Development
- Community Services
- Finance
- Fire
- General Services
- Human Resources
- Police
- Public Works
- Transit

The Planning Team held three meetings throughout the plan development process. At these meetings, the Planning Team members discussed the objectives of the Plan, identified the appropriate hazards that pose a threat to Torrance, and prepared and reviewed the mitigation measures to improve community resiliency to hazards. **Table 1** summarizes the results of these meetings. **Appendix A** provides additional details and copies of materials used in these meetings.

Table 1: Planning Team Meeting Summaries

Meeting	Description
Meeting 1 – January 14, 2016	This meeting provided an overview of the hazard mitigation planning process, discussed the critical facilities inventory, and prioritized the hazards of concern.
Meeting 2 – May 5, 2016	This meeting discussed the hazard profiles and risk assessment analysis conducted as part of the planning process.
Meeting 3 – May 17, 2016	This meeting discussed the draft hazard mitigation actions, which included editing/removing actions deemed unnecessary, and concluded with a prioritization exercise of the remaining mitigation actions.

In addition to the work of the Planning Team, the City held a public engagement and outreach process so as to give community members the opportunity to learn about the Plan and contribute to its development. As part of this process, the City created an online survey for community members about hazard-related concerns and existing preparatory actions. Approximately 550 people responded to the survey. The key outcomes of the survey are presented below.

- Among respondents who were impacted by a disaster in their current home, approximately 49 percent were exposed to hazardous materials and approximately 44 percent were impacted by an earthquake. Other disasters impacted substantially fewer respondents.
- Earthquakes, severe weather, flooding, and exposure to hazardous materials were by far the hazards of greatest concern to respondents.
- Less than half of homeowners were certain that their homeowners insurance would be adequate to cover losses from a hazard event.
- While a substantial number (approximately 39 percent) of respondents were familiar with any special needs that their neighbors may have during an emergency situation, a significant majority (61 percent) were not.
- When asked how the City could help prepare respondents for disaster situations, approximately 86 percent requested effective emergency communication, 69 percent wanted increased community outreach, 59 percent requested training and education on preventing future damage, and 49 percent requested increased awareness of populations with special needs or increased vulnerability.

Appendix B contains a more detailed summary of the survey findings.

Public Review Draft

On [MONTH, DAY, 2016], the City of Torrance completed the public review draft LHMP and released it for review and comment by the general public for a period of 30 days. Electronic versions were published on the City's website [LINK], distributed to the Torrance Unified School District and local homeowners associations, and distributed through City social media outlets, including Facebook, Twitter, Nixle, and TorranceAlerts. Hard-copy versions of the Plan were provided at the following locations:

- Torrance City Hall
- Katy Geissert Civic Center Library (Main Library)
- Torrance senior centers

Supportive Plans, Studies, and Other Resources

The Planning Team relied on numerous plans, studies, technical reports, databases, and other resources to develop hazard discussions and mapping. **Table 2** shows key resources used for different sections of the Plan. A more extensive list of resources is given in the **Sources** section at the end of the main body of this Plan.

Table 2: Key Resources Used to Develop LHMP

Section	Key Resources
Multiple Hazards	• California State Hazard Mitigation Plan • City of Torrance General Plan and Environmental Impact Report • City of Torrance 2004 Local Hazard Mitigation Plan • California Geological Survey Regulatory Maps • City of Torrance Community Development GIS
Drought	• US Drought Monitor • City of Torrance Urban Water Management Plan
Seismic Hazards	• City of Torrance General Plan • US Geological Survey ShakeMap Scenarios • Third Uniform California Earthquake Rupture Forecast • Southern California Earthquake Data Center
Severe Weather	• Western Regional Climate Center • Cal-Adapt • National Weather Service

Section	Key Resources
Hazardous Materials	• California Environmental Protection Agency • California Department of Toxic Substances Control • California State Water Resources Control Board
Flood	• Federal Emergency Management Agency Flood Map Service Center • California Adaptation Planning Guide
Diseases and Pest Management	• Centers for Disease Control • California Department of Public Health

Note: All resources used for the Geologic Hazards section are given in the Multiple Hazards row of this table.

COMMUNITY PROFILE

Physical Setting

Torrance is a city in the South Bay region of Los Angeles County, approximately 11 miles from downtown Los Angeles at its closest point. As of 2014, Torrance had an estimated population of 147,181, making it the eighth-most populous city in Los Angeles County. Located in the urbanized Los Angeles Basin, Torrance is almost entirely developed and mostly surrounded by other urban areas. Although residential land uses make up approximately half of the community's area, Torrance also has extensive retail, office, and industrial land uses.

Torrance is bordered by the cities of Lawndale and Gardena and the unincorporated community of El Camino Village to the north, by the cities of Los Angeles and Lomita to the east, by the cities of Rolling Hills Estates and Palos Verdes Estates to the south, and by the city of Redondo Beach and the Pacific Ocean to the west. Interstate 405 runs through the northern part of the city; the Pacific Coast Highway (State Route 1) runs through southern Torrance; and Hawthorne Boulevard (State Route 107) runs through the length of the city. The community is divided roughly in two by rail lines, which are currently only used for freight.

History

The area which is now Torrance was originally inhabited by the Tongva people (also called the Gabrieleño people), who lived throughout the Los Angeles Basin. The Tongva were primarily hunter-gatherers, numbering as many as 5,000 to 10,000 by the time the Spanish arrived in the area in the late 1700s (Harkin 2004). In 1786, an area of 75,000 acres was granted by Spain to a soldier named Juan José Dominguez. This land grant, called Rancho San Pedro, extended east from the Los Angeles River to the Pacific Ocean and included what is now Torrance, along with the other communities of the South Bay region. When Mexico won independence from Spain, the grant was reduced to 48,000 acres, and then to approximately 43,000 acres after the United States took California during the Mexican-American War.

In 1911, Pasadena developer Jared Sidney Torrance purchased 3,701 acres in the area and hired the landscape architect Fredrick Law Olmsted Jr. to design a new town. The community, which was founded the following year, was named Torrance after its developer. Torrance incorporated in 1921 and oil was discovered in the area shortly thereafter, transforming the small town into an industrial center. The city's major industrial activities continued after World War II, as the community expanded and developed rapidly. Although growth slowed significantly after 1970, Torrance remains a major industrial and commercial hub. A number of large corporations, including Honda and the Torrance Refining Company, have a major presence in the community. Torrance has also emerged as a major health care center and is home to multiple hospitals, including the Torrance Memorial Medical Center and the Little Company of Mary Hospital.

Demographics

As of 2014, the US Census counted 147,181 residents in Torrance. The average Torrance resident is older than the average resident of Los Angeles County. Torrance residents are also more likely to have a higher household income and to have a smaller number of people in their household. **Table 3** shows the summary demographics for Torrance.

Table 3: Basic Demographics of Torrance (2014)

Category	
Total population	147,181 (71,517 male, 75,664 female)
Median age	41.6 years
Elderly population (65+ years)	23,448 (15.9%)
Foreign-born population	42,553 (28.9%)
Number of households	55,279
Average household size	2.64
Median household income	$78,286
Rental households	24,531 (44.4%)

Source: US Census Bureau 2014a, 2014b, 2014c, 2014d

As of 2014, slightly more than half of Torrance residents identified as white. Among residents who identified themselves as belonging to another race or ethnic group, most (70.3 percent of non-whites) identified as Asian. Hispanic or Latino persons of any race made up approximately 16 percent of Torrance residents. **Table 4** shows the race and ethnicity of Torrance residents.

Table 4: Race and Ethnicity of Torrance Residents (2014)

Race/Ethnicity	Population	Percentage
White	75,837	51.5%
Black or African-American	4,072	2.8%
American Indian and Alaska Native	524	0.4%
Asian	50,134	34.1%
Native Hawaiian and Other Pacific Islander	485	0.3%
Other race	6,711	4.6%

Race/Ethnicity	Population	Percentage
Two or more races	9,418	6.4%
Hispanic or Latino (of any race)	24,046	16.3%
Total	**147,181**	**100%**

Source: US Census Bureau 2014e, 2014f

Torrance residents at least 25 years of age demonstrate a high degree of educational attainment when compared to residents of Los Angeles County as a whole. Over 45 percent of Torrance residents at least 25 years old have achieved a bachelor's degree or higher, compared to approximately 30 percent for Los Angeles County. Approximately 7 percent of Torrance residents have not completed high school, compared to approximately 23 percent for all of Los Angeles County. **Table 5** shows educational attainment for Torrance residents at least 25 years of age.

Table 5: Educational Attainment of Torrance Residents (25+ years 2014)

Category	Percentage
Less than 9th grade	3.0%
9th grade to 12th grade (no diploma)	4.0%
High school graduate or equivalent	17.5%
Some college (no degree)	21.1%
Associate's degree	9.0%
Bachelor's degree	30.1%
Graduate or professional degree	15.3%

Source: US Census Bureau, 2014b

Torrance is a diverse community, which is reflected in the variety of languages spoken by residents. Among residents at least 5 years of age, approximately 62 percent speak English at home, while 38 percent speak another language. Commonly spoken languages in Torrance include Spanish, Korean, Japanese, and Chinese. A large number of residents who do not speak English at home speak English "less than very well," including a majority of Korean, Japanese, Vietnamese, and Persian speakers. **Table 6** shows language proficiency for Torrance residents who are at least 5 years old.

Table 6: Language Proficiency of Torrance Residents (5+ years, 2014)

Language Spoken at Home	Total Number of Speakers	Percentage Speaking English "less than very well"
English	86,482	0%
Spanish or Spanish Creole	12,981	32%
Korean	10,605	60%
Japanese	7,024	57%
Chinese	5,540	50%
Other Indo-European languages *	3,786	24%
Indic languages †	2,862	38%
Tagalog	2,762	34%
Other Asian languages ‡	1,860	31%
Vietnamese	1,735	55%
Semitic languages §	1,475	37%
Persian	986	51%
All other languages	999	21%
Total	**139,097**	**17%**

** Includes German, French, and Portuguese*

† Includes Hindi, Urdu, and Gujarati

‡ Includes Thai and Khmer

§ Includes Arabic and Hebrew

Source: US Census Bureau 2013, 2014f

Economic Trends

Torrance is the most populous city in the South Bay region of Los Angeles County and a regional hub for commercial and industrial activity. The community is not dominated by any individual economic sector, although many Torrance residents are employed in educational/health care/social services (20.3 percent), manufacturing (14.7 percent), professional/scientific/management/administrative (13.5 percent), and retail trade (10.6 percent) sectors. This economic diversity is reflected in the list of the city's ten largest employers, as shown in **Table 7**.

Table 7: Top Ten Employers in Torrance (2015)

Employer	Number of Employees	Percentage of Total Employment
Toyota Motor Sales/Credit Corp	3,886	5.2%
Torrance Unified School District	2,461	3.3%
Providence Little Company of Mary Medical Center	2,088	2.8%
American Honda	2,009	2.7%
City of Torrance	1,692	2.3%
Honeywell International	1,443	1.9%
Lisi Aerospace/Hi Shear Corporation	1,216	1.6%
Robinson Helicopter Company	1,212	1.6%
Alcoa Fastening Systems	865	1.2%
Torrance Refining Company	618	0.8%

Source: Torrance 2015a

Although not among the list of top ten employers in Torrance, other major employers in 2015 included the Torrance Refining Company and Torrance Memorial Medical Center (Torrance 2015a).

As a regional job center, Torrance attracts commuters from outside of the community. As of 2013, 87,531 residents of other communities traveled to the city for work, while only 51,282 Torrance residents traveled to work in other communities (13,216 Torrance residents worked in the city). Individuals who come into Torrance for work predominantly come from Los Angeles, Long Beach, Carson, Redondo Beach, and Gardena. Torrance residents who work elsewhere travel mostly to Los Angeles, El Segundo, Long Beach, Redondo Beach, and Carson (US Census Bureau 2016).

Land Uses

Residential buildings (predominantly single-family houses) are the most common land use in Torrance, although the community has extensive retail commercial, office, and industrial lands. A substantial part of the community is also given over to public, quasi-public, and open space uses. **Table 8** shows land use in Torrance as of 2010.

Table 8: Torrance Land Uses (2010)

Land use category and example land uses	Acres	Percentage
R-LO: Low density residential (single-family homes, up to 9 units per acre)	4,002	38.1%
R-LM: Low-medium density residential (small-lot single-family homes, duplexes, and townhomes, up to 18 units per acre)	420	4.0%
R-MD: Medium density residential (townhomes and low-rise multifamily buildings, up to 31 units per acre)	606	5.8%
R-HM: Medium-high density residential (low-rise and medium-rise multifamily buildings, up to 44 units per acre)	274	2.6%
R-HI: High density residential (medium-rise and high-rise multifamily buildings, up to 60 units per acre)	5	<0.1%
Total residential	**5,307**	**50.5%**
C-GEN: General commercial (retail, dining and entertainment, professional services, and mixed-use development)	825	7.9%
C-CTR: Commercial center (downtown, shopping malls, and mixed-use development)	402	3.8%
R-OF: Residential office (professional services, townhomes, and low-rise and medium-rise multifamily buildings)	41	0.4%
Total commercial	**1,268**	**12.1%**
I-HVY: Heavy industrial (manufacturing and processing facilities, particularly involving hazardous materials)	859	8.2%
I-LT: Light industrial (limited manufacturing and assembly, research and development facilities, warehouses and wholesalers, and professional offices)	527	5.0%
I-BP: Business park (professional offices, research and development facilities, light industrial uses, and supporting commercial facilities)	881	8.4%
Total industrial	**2,267**	**21.6%**
PUB: Public, quasi-public, and open space (City and other government facilities, schools, utilities, and open space)	1,218	11.6%
HM: Hospital and medical (hospitals, medical offices, and supporting uses)	62	0.6%
AIR: Airport (Torrance Municipal Airport)	313	3.0%
Others	73	0.7%
Total others	**1,666**	**15.9%**
Total	**10,506**	**100%**

Source: Torrance 2010a

Critical Facilities

Critical facilities are properties that serve an important function or service to the community and to the City government. In some instances, critical facilities help to provide key services, such as public safety or utilities, or serve as vital transportation links. Other critical facilities, such as administrative centers, are necessary to maintain government operations during a disaster and can help coordinate response and recovery activities. In some instances, critical facilities can act as temporary emergency shelters or as staging and coordination grounds for response and recovery operations.

The City of Torrance has identified 135 individual critical facilities. In some instances, these individual facilities are collectively part of a larger property (for example, the hangars at Torrance Municipal Airport are treated as three individual facilities, although they are similar in terms of function, location, and vulnerability). There are five categories of critical facilities in Torrance:

- Bridges: road and railway bridges, including overpasses
- Government facilities: City-owned properties, including administrative centers, fire and police stations, and community facilities (e.g., libraries, community centers, parks)
- Schools: public and private elementary, middle, and high schools, as well as vocational schools
- Transportation routes: key evacuation routes
- Utilities: water and wastewater infrastructure, including pumps, wells, and key pipe connections

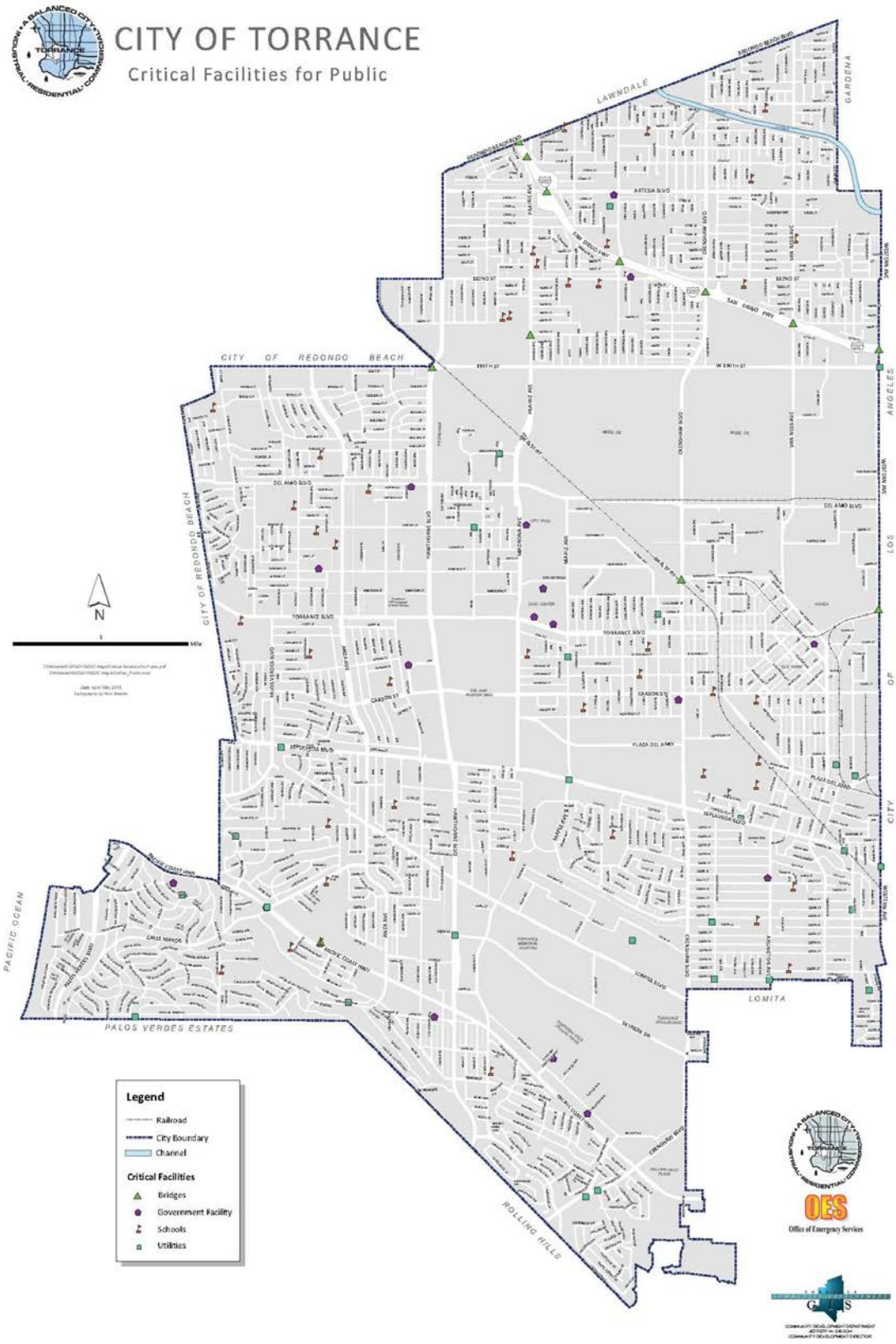
Most of the critical facilities (109, or 81 percent) have been prioritized on a scale of 1 to 3, with 1 being the most important. **Table 9** shows the number of critical facilities in Torrance by type and priority.

Table 9: City of Torrance Critical Facilities by Type and Priority

Facility Type	Number of Critical Facilities				
	Priority 1	Priority 2	Priority 3	No Priority Given	Total
Bridges	0	14	0	0	**14**
Government facilities	11	7	0	26	**44**
Schools	0	45	0	0	**45**
Transportation routes	0	2	0	0	**2**
Utilities	0	13	17	0	**30**
Total	**11**	**81**	**17**	**26**	**135**

Figure 1 shows the location and types of critical facilities.

Figure 1: Critical Facilities



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Development Trends

Recent development in Torrance has been mostly commercial, including a large-scale redevelopment of the Del Amo Fashion Center, several new vehicle dealerships, and the completion or construction of multiple retail and industrial buildings. Torrance Memorial Medical Center has completed a new tower, and work began on a regional transit terminal for Torrance Transit and other regional buses, which may eventually connect to the regional Green Line light rail line. Residential development has been slow, primarily remodeling of existing homes and new small-scale multifamily buildings. New development/redevelopment in Torrance has taken into consideration many of the hazards discussed in this plan, which are also highlighted in the City's General Plan and Zoning Code. As a result, these new developments not only take current hazard concerns into account, but also implement the latest building and safety codes, making these developments more resilient than what has been previously developed in the city.

Evacuation Routes

The major freeway in Torrance is Interstate 405, which runs through the northern part of the community and provides access to the San Fernando Valley to the north and Orange County to the east. Pacific Coast Highway, which traverses the southern part of the city, lies roughly parallel to Interstate 405 and provides access to the coastal communities of Los Angeles and Orange Counties and points beyond. Interstate 405 is a limited access freeway and is made up of several lanes in each direction, whereas Pacific Coast Highway is a primary surface street with no access limitations. While Interstate 405 has significantly more capacity than Pacific Coast Highway, it is also the most traveled freeway in the United States and is frequently congested. This congestion may lead to challenges if large numbers of Torrance residents use Interstate 405 as an evacuation route, particularly if an evacuation coincides with peak commute periods.

Other major freeways in the region that could serve as evacuation routes include Interstate 110 and State Route 91. Interstate 110 runs from Long Beach north to Pasadena through downtown Los Angeles, while State Route 91 originates about a mile east of Torrance and runs east to Riverside and San Bernardino through northern Orange County. Major north–south surface streets in Torrance that could serve as evacuation routes include Hawthorne Boulevard (State Route 107), Crenshaw Boulevard, and Western Avenue. Key east–west surface streets are Artesia Boulevard, 190th Street, and Sepulveda Boulevard.

Energy Infrastructure

Energy infrastructure, which consists of the delivery systems for electricity and natural gas, are critical systems during emergency situations. Energy is vital for public health and safety, and the availability of these services is crucial after a disaster has occurred. If these systems are damaged, they may also pose additional hazards, such as the risk of electrocution from a downed power line or the risk of an explosion from a leaking natural gas pipe.

Electricity

Torrance receives its electricity from Southern California Edison (SCE), a privately owned utility company. SCE procures its electricity from power plants throughout California and beyond, and delivers it to Torrance through a wide network of power lines and facilities called substations. There is one major power plant in Torrance at the Torrance Refining Corporation oil refinery, although it supplies electricity to the refinery facility itself and not to the wider community (CEC 2014a). The community has one major power transmission line owned by SCE, running roughly parallel to Artesia Boulevard through the northern part of the city, as well as a number of smaller transmission lines owned by SCE and the Los Angeles Department of Water and Power (LADWP) (CEC 2014b). Of the 13 substations in Torrance, 12 are owned by SCE and one is owned by LADWP (CEC 2015). Torrance is extensively connected to the electricity infrastructure of the wider Los Angeles region. Large sections of Torrance will lose electricity as a result of damage to a small number of power lines or substations, although a sufficiently large event could still cause a widespread power outage.

Natural Gas

Natural gas service in Torrance is provided by the Southern California Gas Company (SCG), a private utility. Although natural gas pipelines run throughout the community, high-capacity natural gas pipelines run along 190th Street and along Crenshaw Street north of 190th Street. There is also a natural gas compressor station in the community, near the intersection of the two high-capacity pipelines (CEC 2014c). These facilities help maintain pressure in the natural gas pipelines, keeping the gas moving through the pipes. Any disruption to these pipelines or to the compressor station may cause outages or reductions in service throughout Torrance, and potentially in surrounding communities.

HAZARDS

Hazard Identification

Members of the Planning Team reviewed a list of potential hazards consistent with FEMA guidance for inclusion in the Local Hazard Mitigation Plan. The team eliminated hazards that were not relevant to Torrance or did not pose a substantive threat, and added hazards that were not included in FEMA guidance but are applicable to the community. **Table 10** shows the possible hazards consistent with FEMA guidance that were evaluated to be included in the LHMP, and the reasoning behind the decision for each hazard.

Table 10: City of Torrance LHMP Hazard Evaluation

Hazard	Decision	Reason for Decision
Avalanche	Exclude	Torrance and the immediate environs do not receive any appreciable snowfall or snow accumulation, as would be necessary for an avalanche to occur.
Dam failure	Exclude	Torrance is not within the potential inundation zone for any dam.
Drought	Include	Droughts have been a recurring and potentially severe hazard in Torrance.
Earthquake	Include	Torrance has experienced multiple strong earthquakes in the past.
Erosion	Exclude	Erosion is not a recognized issue in Torrance.
Expansive soils	Include	Expansive soils are present in Torrance and have historically caused damage.
Extreme cold	Include	Extreme cold events occur occasionally in Torrance.
Extreme heat	Include	Extreme heat events occur occasionally in Torrance.
Flood	Include	Floods are a recognized threat in Torrance which have occurred in the past.
Hail	Include	Hail events have occasionally occurred in Torrance.
Hurricane	Exclude	Current and anticipated climatic conditions make hurricanes extremely unlikely to directly affect the city.
Landslide	Include	Landslides have historically occurred in Torrance.
Lightning	Exclude	While lighting occasionally occurs in Torrance, it has not caused sufficient damage or otherwise been a hazard of concern to merit inclusion.
Sea level rise	Exclude	Torrance has no buildings or structures in low-lying coastal areas.

Hazard	Decision	Reason for Decision
Severe wind	Include	Severe wind events have occurred in Torrance and occasionally have caused damage.
Severe winter weather	Exclude	Torrance is not in a climate that experiences severe winter weather.
Storm surge	Exclude	Torrance has no buildings or structures in low-lying coastal areas.
Subsidence	Exclude	There are no recognized past subsidence events in Torrance.
Tornado	Include	Tornadoes have occasionally occurred in the region.
Tsunami	Exclude	No buildings or structures in Torrance are within a recognized tsunami hazard area.
Wildfire	Exclude	Torrance is not located in or adjacent to any wildland or wildland-urban interface.

Source: FEMA 2013

The team then chose to amend the list of included hazards to be more accurate for local conditions, taking the following steps:

- Combine extreme heat and cold, hail, severe wind, and tornadoes as a single hazard called "extreme weather."
- Combine landslides with expansive soils and a new hazard, methane-containing soils, and label the combined hazard as "geologic hazards."
- Expand the definition of earthquake to include ground shaking, fault rupture, and liquefaction, and refer to the combined hazard as "seismic hazards."
- Add two new hazards: "diseases and pest management" and "hazardous materials."

The following are the hazards discussed in this LHMP:

- Drought
- Seismic hazards
- Extreme weather
- Hazardous materials
- Flood
- Diseases and pest management
- Geologic hazards

Hazard Prioritization

After determining which hazards to include in the LHMP, the Planning Team prioritized each hazard based on four criteria, on a scale of 1 to 4 for each:

- Probability: the likelihood that the hazard would occur in the future
- Location: the size of the area affected by the hazard
- Maximum probable extent: the intensity of direct damage to structures in the community
- Secondary impacts: the severity of indirect community impacts

The Planning Team weighed each criterion, with probability being the most important, followed by location, maximum probable impact, and secondary impacts. The Planning Team then combined the assigned value of 1–4 for each criterion with its weighing factor to determine the overall score for each. **Table 11** shows the scores and weighing factors.

Table 11: Hazard Ranking Scores and Weighing Factors

Probability		**Maximum Probable Extent (Primary Impact)**	
Based on estimated likelihood of occurrence from historical data	*Weighing Factor: 2.0*	*Based on percentage of damage to typical facility in community*	*Weighing Factor: 0.7*
Probability	Score	Impact	Score
Unlikely	1	Weak – little to no damage	1
Occasional	2	Moderate – some damage, loss of service for days	2
Likely	3	Severe – devastating damage, loss of service for months	3
Highly likely	4	Extreme – catastrophic damage, uninhabitable conditions	4
Location		**Secondary Impacts**	
Based on size of geographical area of community affected by hazard	*Weighing Factor: 0.8*	*Based on estimated secondary impacts to community at large*	*Weighing Factor: 0.5*
Affected Area	Score	Impact	Score
Negligible	1	Negligible – no loss of function, downtime, and/or evacuations	1

Probability		Maximum Probable Extent (Primary Impact)	
Limited	2	Limited – minimal loss of function, downtime, and/or evacuations	2
Significant	3	Moderate – some loss of function, downtime, and/or evacuations	3
Extensive	4	High – major loss of function, downtime, and/or evacuations	4

After the overall score for each criterion is calculated, the scores for location, maximum probable extent, and secondary impacts are summed to obtain the total impact score. The impact score is then multiplied by the probability score to determine the total score for each hazard. Hazards that score between 0 and 12 are considered low-threat hazards, 12.1 to 42 is a medium-threat hazard, and scores above 42.1 are considered high-threat hazards. **Table 12** shows the criterion scores, total scores, and threat levels for each hazard.

Table 12: Scores and Threat Levels by Hazard

Hazard	Probability	Impact			Total Score	Threat
		Location	Primary Impact	Secondary Impact		
Drought	4	4	4	4	64.0	High
Seismic hazards	4	4	4	4	64.0	High
Extreme weather	3	4	4	4	48.0	High
Hazardous materials	3	4	3	3	40.8	Medium
Flood	4	2	2	2	32.0	Medium
Diseases and pest management	3	2	2	2	24.0	Medium
Geologic hazards	2	2	3	3	20.8	Medium

Hazard Profiles

Drought

Hazard Description

In periods of low to no precipitation, long-term water shortages may emerge, creating a drought. In California's Mediterranean climate, a rainy season that is concentrated between October and March often leaves the state with dry summer months. However, when these winter rains do not fall as anticipated, the diminishing water supply is strained under the sustained demand from cities and farms. Drought can lead to increases in the cost of water and increased regulations on water use. If drought conditions persist and become more extreme, some communities may experience reduced availability of water, creating the need to import supplies. Vegetation and agriculture face severe impacts, especially plants and crops that are water-intensive.

Secondary impacts of sustained drought may create additional risks for Torrance. As moisture evaporates, local soils may harden and decrease in permeability. This means that when rain does come, the ground is less capable of absorbing all of the water, decreasing groundwater recharge and increasing flooding risk. These dry conditions, especially when paired with dry and dying vegetation, can increase the risk of wildland-urban interface (WUI) fires, although this risk is smaller within Torrance's boundaries, in which there is no WUI zone.

Location and Extent

Unlike other natural hazards, which can impact cities in sudden, specific, and often catastrophic ways, drought comes along slowly but is more distributed in its impacts, often gripping entire regions or states. It takes years of below-average precipitation to create a drought, and as a result it can take just as long to get out of one, requiring years of normal or above-average rainfall to remedy the impacts of drier years. The ramifications of drought vary across the cities in the largest impact area, depending on sources of local water supply, soil type, land use, and climate conditions. Communities that import water from drought-vulnerable regions of California may be more vulnerable to the impacts of drought because of a lack of sufficient local supply. The City's 2015 Urban Water Management Plan (UWMP) indicates that in 2015, approximately 88 percent of the City's potable water supply comes from imported sources, mainly the State Water Project and the Colorado River Aqueduct. State Water Project water is sourced from the northern Sierra Nevada, while water in the Colorado River Aqueduct comes from the Colorado River Basin, both of which regularly experience drought conditions (Torrance 2016a).

There are multiple classification systems that describe the severity of different drought conditions. **Table 13** shows the US Drought Monitor Classification Scheme, which combines many of these systems into a single index.

Hazard History

Droughts are a relatively frequent event in California, and many native plants and animals have evolved strategies to deal with long-term water shortages. Due to California's extensive water infrastructure networks, a drought in one part of the state may have a relatively small impact if the water supply in the affected area comes from another location that is not under drought conditions. However, if a city, such as Torrance, receives most of its water from distant, mountainous regions, a localized drought in the Sierra Nevada can have farther-reaching impacts. Occasionally the state may experience a widespread drought that lasts for multiple years. A drought from 1928 to 1937 affected all parts of the state and was the longest drought in California's recorded history. Between 1976 and 1977, California experienced one of its most severe droughts, with 1977 the state's driest year on record. Since 2012, California has been experiencing drought conditions statewide. This drought is among the most severe in the state's history, initiating widespread restrictions on water use. In January 2014, the Governor declared a State of Emergency in California in response to current drought conditions, which began in 2012. To date, 2015 is the driest year on record in California, and Water Year (WY) 2015 was the eighth of nine years with below average spring runoff, on which the State Water Project depends (DWR 2016).

Table 13: US Drought Monitor Classification Scheme

Category	Description	Possible Impacts
D0	Abnormally dry	Slower growth of crops and pastures compared to normal activities.
D1	Moderate drought	Some damage to crops and pastures. Streams, reservoirs, or wells low. Some water shortages may be developing or imminent.
D2	Severe drought	Likely crop and pasture losses. Water shortages are common, leading to restrictions.
D3	Extreme drought	Major crop and pasture losses. Widespread water shortages.
D4	Exceptional drought	Exceptional and widespread crop and pasture losses. Emergency shortages develop.

Source: US Drought Monitor 2016

Southern California, which depends largely on a water supply imported from outside the region and major metropolitan areas, has invested significant resources to promote water storage, reliability, and conservation programs. Over $12 billion has been spent on these efforts, resulting in a new water storage reservoir in Hemet. In Torrance, the City has continued to diversify its water supply, which relies heavily on imported water, as discussed above. The City has developed several new sources of local supply, including groundwater wells in north Torrance, expansion of a groundwater desalination plant, and improvements to the existing recycled water system (Torrance 2015b).

These efforts are all in response to the Southern California region's continual struggle with water supply. To support conservation efforts and address the impacts of drought within the community, the City of Torrance adopted a Water Conservation Ordinance (Ordinance 3717), which prohibits wasteful water uses and encourages sustained conservation through use restrictions. In 2015, the City elevated the level of the Water Conservation Ordinance to Level 2 of 3 in order to address new challenges posed by California's fourth year of severe drought (Torrance 2015b).

Risk of Future Hazards

The primary risks to Torrance in the future are continued drought and decreased snowpack in the Sierras and the Colorado River Basin, paired with a sustained reliance on a water supply imported from these regions. The Torrance Municipal Water Department (MWD) provides water to nearly 80 percent of the community. In addition to managing local water supply and procuring imports, the MWD is responsible for maintenance, operation, and repair of the water distribution system. Local, regional, and statewide drought conditions have the potential to impact the MWD's ability to provide water to its customers (Torrance 2016b).

Climate Change Considerations

Scientific evidence suggests that precipitation levels across California, including in Los Angeles County, will decline as a result of climate change. This reduction in precipitation is consequently expected to reduce the Sierra Nevada snowpack. The State Water Project depends on this snowpack's gradual springtime melt to provide fresh water across the state, but as the accumulation of snow decreases, so will the amount of water that can be released for urban use in drier months. The flow of the Colorado River will also be impacted by climate change–related decreases in snowpack and potential decreases in precipitation, further impacting Torrance's largely imported water supply, although significant uncertainties remain about future precipitation levels in the Colorado River Basin (USBR 2016). Recent scientific studies have found that California's drought, beginning in 2012, was exacerbated by climate change and that the overall likelihood of extreme droughts is likely to increase as a result (Williams et al. 2015).

Vulnerability Assessment

During drought events, drought conditions will be present throughout Torrance and will not vary to any significant degree in different parts of the community. All community members will experience similar conditions. While direct effects will be equal for all residents and businesses, lower-income residents may be disproportionately affected if the City elects to increase water rates or levy fines against water customers with significant use. No critical facilities are likely to be affected.

Seismic Hazards

The earth is made up of moving tectonic plates that move very slowly along each other. As the plates slide past each other, the stresses between them tend to cause a buildup of energy that when released causes an earthquake. The stored energy from the seismic process is released as seismic waves, causing ground shaking in the area around the slip. Above ground, the location of this slip is called a fault. The deformation of plates and accumulated stress from this process creates faults in a wider area around the plate boundary, meaning that earthquakes can happen even in areas that lie outside of the plate boundary itself.

Earthquakes vary in size and intensity with a range of potential impacts. The amount of damage from an earthquake is determined not only by the duration and intensity of ground shaking, but also by the conditions in the impacted area, including soil conditions, construction quality, distance from the center of the earthquake, and the type of fault rupture. This hazard profile covers ground shaking, liquefaction, and fault rupture, the most common impacts from an earthquake.

Ground Shaking

Hazard Description

Ground shaking is the primary cause of damage and injury during earthquakes. Ground shaking impacts can lead to surface rupture, liquefaction, landslides, and infrastructure failures, which could lead to fires and other secondary hazards. The geology of the impacted area alters the amount of ground shaking felt. Thick, water-saturated, unconsolidated materials will generally experience greater shaking motion than areas of firm bedrock.

The size and magnitude of an earthquake have different ways of being measured. The magnitude is a number that characterizes the relative size of an earthquake. Magnitude is based on measurement of the maximum motion recorded by a seismograph. Many scales, such as the Richter scale, do not provide accurate estimates for the magnitudes of large earthquakes. To account for these large earthquakes, the moment magnitude scale (abbreviated as MMS; denoted as M_W or M) is preferred for its ability to cover a wide range of earthquake sizes and be applied globally. The moment magnitude scale is based on the total moment release of the earthquake. Moment is a product of the distance a fault moved and the force required to move it. Moment is derived from modeling recordings of the earthquake at multiple stations.

The Modified Mercalli Intensity (MMI) Scale for Earthquakes, shown in **Table 14**, measures ground shaking intensity in terms of perception and damage and takes into account localized earthquake effects. The amount of shaking experienced at different locations varies based on not only the overall magnitude but also the distance from the fault that ruptured in the earthquake, geologic conditions, and the level of preparedness built into surrounding infrastructure.

Table 14: Modified Mercalli Intensity Scale for Earthquakes

Scale	Equivalent Moment Magnitude	Intensity	Earthquake Effects
I	1.0 to 2.0	Instrumental	Detected only on seismographs
II	2.0 to 3.0	Feeble	Some people feel it
III	3.0 to 4.0	Slight	Felt by people resting; like a truck rumbling by
IV	4.0	Moderate	Felt by people walking
V	4.0 to 5.0	Slightly Strong	Sleepers awake; church bells ring
VI	5.0 to 6.0	Strong	Trees sway; suspended objects swing; objects fall off shelves
VII	6.0	Very Strong	Mild alarm; walls crack; plaster falls
VIII	6.0 to 7.0	Destructive	Moving cars uncontrollable; masonry fractures; poorly constructed buildings damaged
IX	7.0	Ruinous	Some houses collapse; ground cracks; pipes break open
X	7.0 to 8.0	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread
XI	8.0	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards
XII	8.0 or greater	Catastrophic	Total destruction; trees fall; ground rises and falls in waves

Source: USGS 2014

Location and Extent

Horizontal ground acceleration, typically used to measure the rate of ground shaking, is one of the most destructive forces in a seismic event (Torrance 2008c). Many factors impact the damage caused by ground shaking, including size of the earthquake, proximity to the ruptured fault, and local soil conditions. In Torrance, soft, unconsolidated sediments and soils underlie most of the city to depths of 100 feet. Because soft rocks are more capable of free-form movement, the seismic waves released from a fault rupture can be amplified throughout the ground beneath the city, with the potential for intensity levels to nearly double. **Table 15** shows the estimated M_w and intensities that could result from the maximum plausible earthquake generated by the faults present in and around Torrance. This is not a complete list of all faults and potential maximum earthquake scenarios that could affect the community.

Table 15: Estimated Maximum Seismic Intensities in the Torrance Area

Fault name	Distance from Torrance (miles)	Maximum M_w	Maximum MMI
Palos Verdes	0–6.6	7.3	X–XII
Puente Hills Blind Thrust	0.5–6.2	7.1	X–XII
Puente Hills (Coyote Hills segment)	0.5–6.2	6.6	X–XII
Puente Hills (Los Angeles segment)	8.3–15	6.6	VIII–IX
Puente Hills (Santa Fe Springs)	10–16	6.5	VIII–IX
Newport-Inglewood (onshore)	3–10	7.1	IX–X
Elysian Park Thrust	10–19	6.7	VII–IX
Santa Monica	15–19	6.6	VII–VIII
Malibu Coast	16–20	6.7	VII–VIII
Hollywood	16–20	6.4	VII–VIII
Upper Elysian Park	12–19	6.4	VII–VIII
Anacapa-Dume	23–26	7.5	VII–VIII
Whittier	18–25	6.8	VII
Raymond	18–24	6.5	VI–VII
Verdugo	21–28	6.9	VII
San Andreas (equivalent 1857 rupture)	47–54	7.8	VI–VII

Source: Torrance 2008c

Hazard History

Earthquakes have impacted the land on which Torrance sits since the start of the region's recorded history. The City's General Plan EIR cites seismic events as far back as 1769, indicating the sustaining earthquake risk in the region. **Table 16** shows historic seismic events in Torrance.

Table 16: Historic Earthquake Events in Torrance

Name	Year	Description
Elsinore earthquake	1910	This magnitude 6 earthquake occurred on May 15, at 7:47 a.m., following two moderate tremors that occurred on April 10 and May 12. The Elsinore fault is thought to have caused the earthquake, although no surface rupture along this fault was reported.
San Jacinto earthquake	1918	This magnitude 6.8 earthquake occurred on April 21 near the town of San Jacinto.
Long Beach earthquake	1933	The Long Beach earthquake occurred on March 10 following a strong foreshock the day before. The earthquake ruptured the Newport-Inglewood fault and was felt from the San Joaquin Valley to Northern Baja.
Torrance-Gardena earthquakes	1941	Two small earthquakes struck the southern Los Angeles Basin, affecting surrounding communities. Although these earthquakes were relatively minor, they occurred close to the surface and caused significant although local damage. The magnitude 4.8 Torrance earthquake occurred on October 21. A second earthquake occurred less than a month later, on November 14 at 12:42 a.m., near Wilmington. Shaking during the second earthquake was reportedly stronger than the first, locally reaching intensity level VIII and felt as far away as Cabazon, Carpinteria, and San Diego.
San Jacinto fault earthquake	1954	Also known as the Arroyo Salada earthquake, this magnitude 6.4 earthquake struck on March 19. The Clark fault of the San Jacinto fault zone may have been involved.
Borrego Mountain earthquake	1968	This magnitude 6.5 earthquake struck on April 8. It resulted in about 18 miles of surface rupture along the Coyote Creek fault (a branch of the San Jacinto fault zone), and triggered slip was observed on fault systems up to 40 miles away.
San Fernando (Sylmar) earthquake	1971	This magnitude 6.6 earthquake occurred on the San Fernando fault zone, the westernmost segment of the Sierra Madre fault, on February 9. The surface rupture caused by this earthquake was nearly 12 miles long and occurred in the Sylmar-San Fernando area.
Oceanside earthquake	1986	This magnitude 5.4 earthquake occurred on the morning of July 13 at 6:47 a.m. The epicenter was about 32 miles offshore from Oceanside on an unidentified fault that may be related to the San Diego Trough or the Palos Verdes-Coronado Bank fault zones.
Whittier Narrows earthquake	1987	The Whittier Narrows earthquake occurred on October 1, at 7:42 a.m., with its epicenter approximately 21 miles northeast of Torrance. This magnitude 5.9 earthquake occurred on a previously unknown, north-dipping concealed thrust fault (blind thrust) now called the Puente Hills fault.

Name	Year	Description
Landers earthquake	1992	This magnitude 7.3 earthquake occurred on June 28 and was the largest earthquake to hit California in 40 years. The earthquake was centered approximately 120 miles from Los Angeles, in the small desert community of Landers. More than 50 miles of surface rupture associated with five or more faults occurred as a result of this earthquake.
Northridge earthquake	1994	On January 17, at 4:31 a.m., a M6.7 earthquake struck the San Fernando Valley. This moderate-sized tremor was the most expensive earthquake in United States history, due primarily to its proximity to the heavily populated northern Los Angeles area. The rupture occurred in the San Fernando Valley on the previously unidentified eastern continuation of the Oak Ridge fault, a blind thrust fault.
Hector Mine earthquake	1999	This magnitude 7.1 quake occurred on October 18 in a remote region of the Mojave Desert, 47 miles east-southeast of Barstow. MMIs of IV were reported in the Torrance area.

Source: Torrance 2008c

Risk of Future Hazards

As indicated by nearly two centuries of earthquake records, the impacts of ground shaking related to seismic activity are expected to remain a risk in Torrance. Given the maximum estimated potential earthquake from faults near the community, illustrated in **Table 15**, the impact to Torrance from these events could be severe. **Table 17** indicates the maximum odds of different sizes of events occurring on the faults in or near Torrance in the next 30 years.

Table 17: Maximum Likelihood of Earthquake Events by Size and Fault in the Next 30 Years

Fault	6.7 M_w	7.0 M_w	7.5 M_w	8.0 M_w
Palos Verdes	3.17%	2.84%	0.1%	—
Puente Hills	0.78%	0.58%	0.19%	—
Puente Hills (Coyote Hills segment)	0.95%	0.65%	0.19%	—
Puente Hills (Los Angeles segment)	1.01%	0.51%	0.15%	—
Puente Hills (Santa Fe Springs segment)	0.96%	0.76%	0.29%	<0.01%
Newport-Inglewood (onshore only)	0.99%	0.88%	0.43%	—
Elysian Park	0.06%	0.05%	0.02%	—
Santa Monica	1.19%	1.02%	0.29%	<0.01%
Malibu Coast	0.75%	0.65%	0.37%	<0.01%
Hollywood	1.59%	1.18%	0.29%	<0.01%

Fault	6.7 M_w	7.0 M_w	7.5 M_w	8.0 M_w
Upper Elysian Park	1.26%	0.78%	0.07%	—
Anacapa-Dume	0.90%	0.66%	0.25%	<0.01%
Whittier	1.58%	1.43%	0.80%	<0.01%
Raymond	1.70%	1.18%	0.35%	<0.01%
Verdugo	0.51%	0.45%	0.32%	<0.01%
San Andreas *	22.34%	19.68%	18.74%	6.91%

** Only fault sections in the greater Los Angeles region are included. This does not represent the risk of future events on the entire San Andreas fault.*

Note: The magnitude of the events shown in this table are for the site of the earthquake. Depending on the locations of the earthquake, the magnitude may be less severe within Torrance itself.

Source: USGS 2015a

According to seismic forecasts conducted by the US Geological Survey (USGS), a 6.9 M_w event on the Newport-Inglewood fault, centered approximately 13 miles southeast of the center of Torrance, could produce shaking measuring VIII on the Mercalli Intensity Scale throughout the community. A 7.1 M_w earthquake on the Palos Verdes fault, centered approximately 7 miles southeast of the center of the community, could be even more damaging, measuring IX on the Mercalli Intensity Scale in Torrance. The city's housing stock, 62 percent of which was built before 1970, may be especially vulnerable to a large ground shaking event, as these homes were constructed prior to strict building codes for resistance to ground shaking.

Climate Change Considerations

The likelihood, size, and severity of ground shaking during seismic events are not expected to be directly impacted by climate change, as the geologic processes that lead to the release of seismic energy are not impacted by atmospheric conditions.

Vulnerability Assessment

Ground shaking conditions in Torrance from an earthquake will be similar throughout the city, although parts of the community will likely experience slightly stronger or weaker shaking depending on the location of the earthquake and underlying soil conditions. Renters who may lack the control over their homes to conduct earthquake-resistant retrofits, or lower-income residents who may not have the financial resources for such retrofits, may be more severely impacted than the rest of the community. Renters may also be challenged by a potential shortage of available units in the event that a strong earthquake damages or destroys a large number of homes in the area. All critical facilities will be

affected by earthquakes, although the specific threat to the facility depends on the location and strength of the earthquake, underlying geologic conditions, and the condition of the facility itself.

Liquefaction

Hazard Description

Liquefaction happens when loosely packed sandy or silty materials saturated with water are shaken hard enough to lose strength and stiffness. Liquefied soils behave like a liquid and are responsible for tremendous damage in an earthquake, causing pipes to leak, roads and airport runways to buckle, and building foundations to be damaged. The risk of liquefaction depends on many factors, including the height of the groundwater table and the composition of the soil. Liquefaction susceptibility is typically defined on a scale ranging from very low to very high based on the intensity of the earthquake as described in **Table 14**.

Location and Extent

According to maps prepared by the California Geological Survey, areas of elevated liquefaction potential are only present in Torrance in very limited locations, as only a few places have both the high water table and the loose sediments in the soil that are necessarily to create a liquefaction risk. These areas are around the old Dominguez Creek (now Dominguez Channel) in northern Torrance (CGS 1999a, 1999b) and on the beach itself, although not including any blufftop developed areas (CGS 1999c). **Figure 2** shows a map of the liquefaction risk in Torrance.

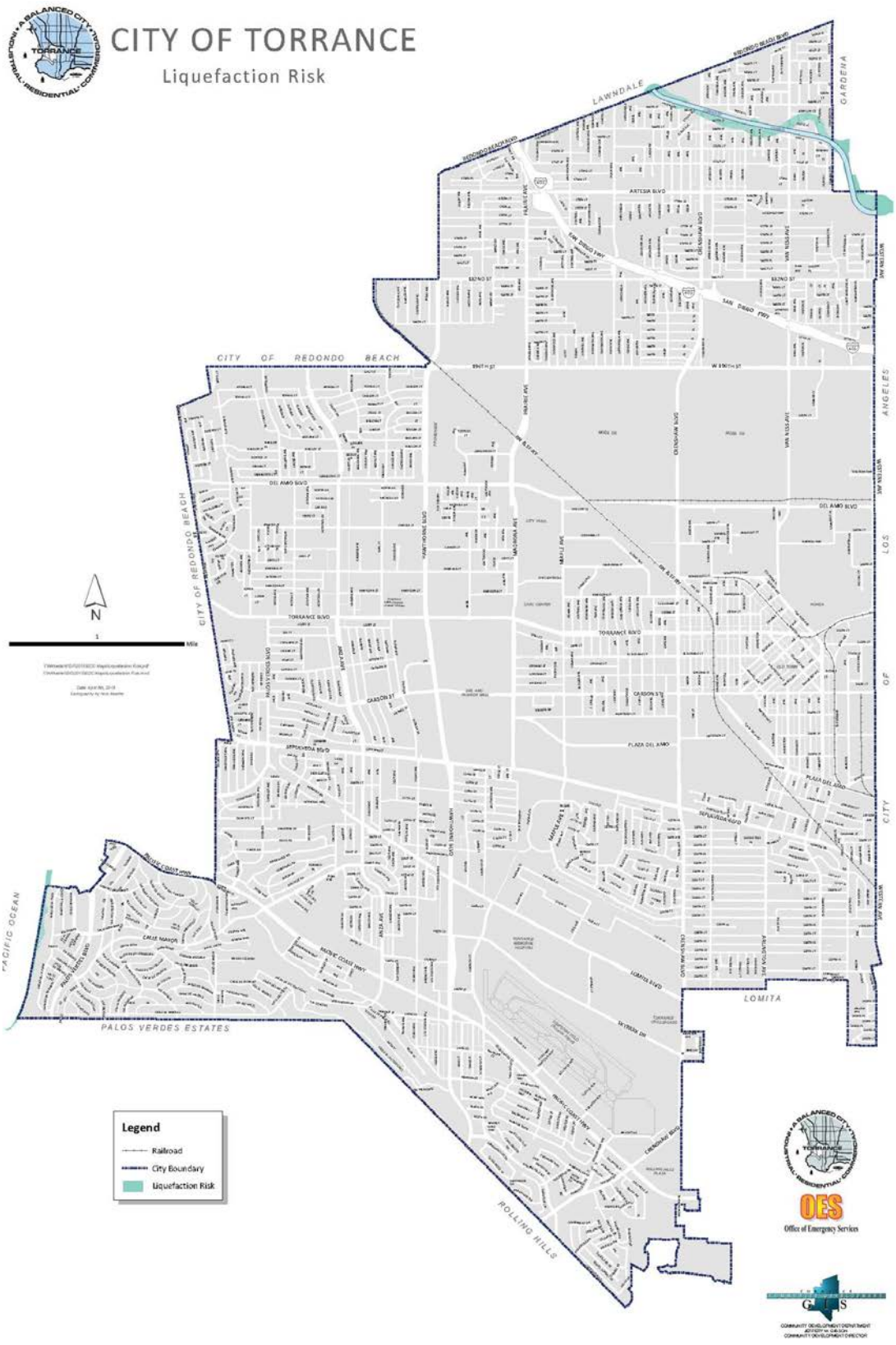
Hazard History

Given the limited presence of liquefaction-prone soils in Torrance, there is no substantial record of liquefaction within the community, although numerous liquefaction events have been recorded in the immediate area. In the 1933 Long Beach earthquake, liquefaction occurred in the San Pedro area, causing broken water lines and gas mains along with a foot-long crack in one of the berths at the Port of Los Angeles. Similar damage occurred at the Port of Los Angeles in the 1994 Northridge earthquake, and both the 1994 Northridge and 1971 San Fernando earthquakes caused widespread liquefaction damage throughout the Los Angeles Basin (CGS 1998).

Risk of Future Hazards

The liquefaction risk is expected to remain present in Torrance, as there is no known factor that will cause this risk to substantially decrease. Given the very small area of the city that is at risk of liquefaction, any future liquefaction risks are likely to be limited in scope. However, within these affected areas, damage from liquefaction may still be significant.

Figure 2: Liquefaction Risk



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Climate Change Considerations

While the likelihood, size, and severity of seismicity are not expected to be directly impacted by climate change, anticipated changes in the intensity and frequency of precipitation could alter groundwater aquifer levels, expanding or contracting existing potential for liquefaction in Torrance. Additional research is needed on how the effects of climate change may impact liquefaction risks.

Vulnerability Assessment

Liquefaction poses a hazard to a relatively small portion of Torrance. However, individuals and businesses in this area are highly vulnerable to liquefaction hazards, particularly if their homes or buildings have not been strengthened to reduce potential damage from liquefaction. There are no critical facilities within the liquefaction hazard zone.

Earthquake Fault Rupture

Hazard Description

Fault rupture is the actual movement and displacement of the ground's surface along the fault boundary when an earthquake occurs. Depending on the type of fault, this displacement may be horizontal, vertical, or both. Damage from fault rupture can be severe depending on the size of the displacement, but is limited to the relatively small area along the fault boundary where the slip occurred. Not all earthquakes result in fault rupture that is visible at the surface, and strong earthquakes can occur without any discernible displacement along the boundary. Such events are known as "blind thrust earthquakes."

Location and Extent

The risk of surface rupture exists in the immediate area around the Palos Verdes fault zone, which runs south of Pacific Coast Highway roughly parallel with it. This area is vulnerable to surface rupture if an earthquake occurs on the Palos Verdes fault, the only known fault in Torrance with the potential to cause surface rupture (Torrance 2009). **Figure 3** shows the fault lines in Torrance.

Hazard History

There is no known record of the Palos Verdes fault zone causing fault rupture within historic times. The Palos Verdes fault zone was believed to have last caused a surface rupture sometime in the Late Quaternary period, which ranges from approximately 700,000 years ago to the present day (SCEDC 2013).

Risk of Future Hazards

The hazard risk caused by the Palos Verdes fault zone is likely to remain in place. The fault zone is not known to have ruptured in historic times, although it is unknown whether the fault is "due" for another event. As shown in **Table 17**, the USGS (2015a) estimates that there is a 3.17 percent chance that the Palos Verdes fault zone will generate a 6.7 M_w

or greater earthquake within the next 30 years. However, a weaker earthquake, which has a higher chance of occurring, would still be capable of causing fault rupture in Torrance. Additionally, the Palos Verdes fault zone may cause an earthquake without resulting in fault rupture in the city.

Climate Change Considerations

The likelihood, size, and severity of fault rupture during seismic events are not expected to be directly impacted by climate change, as the geologic processes that lead to fault slip or rupture are not impacted by atmospheric conditions.

Vulnerability Assessment

As with liquefaction, fault rupture poses a risk to a relatively small portion of Torrance, but there is potential for significant damage within this area. Fault rupture is also difficult to protect against, and so it is possible that most residents and businesses within the fault rupture area will be substantially affected if a fault rupture event occurs. There are three critical facilities within 500 feet of fault lines in Torrance and thus vulnerable to fault rupture. **Table 18** shows the types these critical facilities. All facilities vulnerable to fault rupture are Priority 2.

Table 18: Critical Facilities at Risk of Fault Rupture by Type

Facility Type	Not at Risk	Within Fault Rupture Hazard Zone
Bridges	14	0
Government facilities	44	0
Schools	45	0
Transportation routes	2	0
Utilities	27	3
Total	**132**	**3**

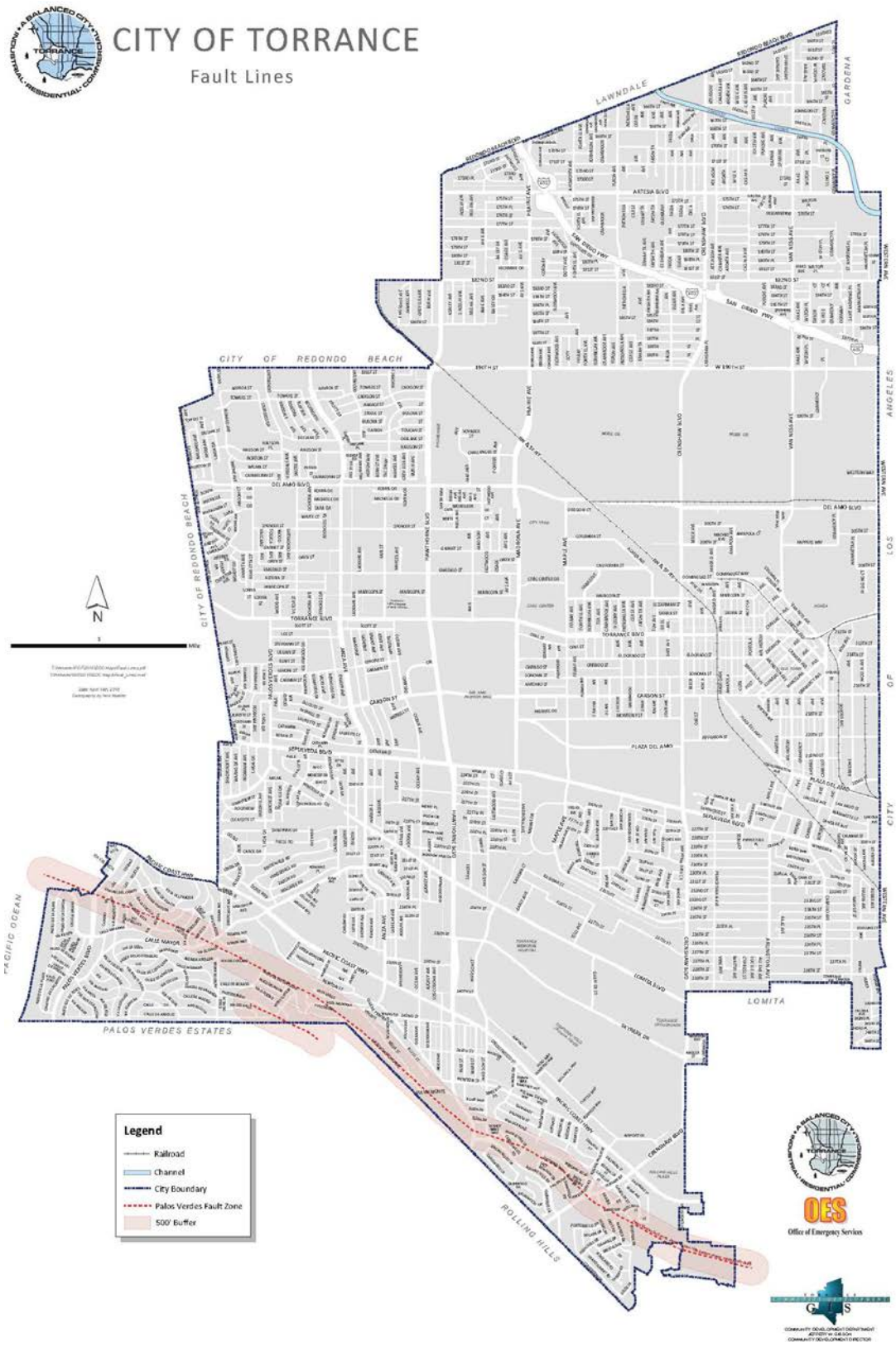
Extreme Weather

Extreme Temperatures

Hazard Description

While there is no single definition of extreme heat, it typically refers to a period of time in which the high temperature significantly exceeds normal levels. In California, government plans related to extreme heat generally define it as any day in which the maximum temperature falls above the 98th percentile of the maximum temperatures observed from May to October in 1961 to 1990 (CDPH 2013). Sustained high temperatures can create health issues such as heat exhaustion and heatstroke, especially for elderly persons and people who work outside. High humidity can exacerbate the problem by making already hot conditions feel even hotter (Cal OES 2013a).

Figure 3: Torrance Fault Lines



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Extreme cold temperatures, similar to extreme heat, occur when temperatures drop well below historical averages. In many parts of the state, this occurs when temperatures reach near freezing levels, although temperatures may have to fall substantially below freezing to constitute extreme cold in some higher elevations. Extreme cold can cause frostbite, which occurs when body tissue freezes, as well as hypothermia, which happens when body temperatures drop to abnormally low levels. Wind can make conditions feel colder than they actual are, a factor known as wind chill (Cal OES 2013b).

Location and Extent

Extreme temperatures are generally distributed fairly evenly across Torrance, as all areas of the community are likely to be subject to similar extremes, although impacts may be greater in areas with more vulnerable persons. In Torrance, the threshold for extreme heat is 87°F (CEC 2016). There is no precisely defined threshold for extreme cold, but average low temperatures in the city for the coldest months of the year are approximately 44°F, so any temperature below 35–40°F may constitute extreme cold (WRCC 2015). Extreme heat is most likely to occur in September and October, while extreme cold is most likely to happen in January (WRCC 2012).

Hazard History

Extreme heat events occur at least once in most years, although the severity of these events can vary significantly. Particularly notable extreme heat events occurred in 1955, 1965, 1970, and 1987 (LACOA n.d.). More recently, a 2006 heat wave killed at least 147 people statewide, including in Los Angeles County, although due to difficulties in attributing deaths to extreme heat, the actual number of fatalities may be 2–3 times higher or more (CEC 2009). Notable extreme cold events occurred in 1988 and 1990, among other years (LACOA 2012).

Risk of Future Hazards

Given the past occurrences of extreme temperature events, these incidents are all but certain to occur in the future. While extreme cold should remain a hazard of concern in Torrance and the wider Los Angeles region, extreme heat is expected to continue to pose the greater risk.

Climate Change Considerations

As the temperature increases as a result of climate change, extreme heat events are likely to become much more frequent, although the forecasts vary significantly depending on how substantially climate conditions actually change. From an average of approximately four extreme heat days (those above 87°F) each year, Torrance may see approximately 20 to 40 extreme heat days annually by the end of the century, or in some scenarios well over 50 each year (CEC 2016). Extreme cold events are likely to decline as global temperatures become warmer, although they are unlikely to go away entirely.

Vulnerability Assessment

Extreme heat is particularly dangerous to older individuals. According to 2014 data from the US Census Bureau, there are approximately 23,440 residents in Torrance over the age of 65, making up 16 percent of the population (US Census Bureau 2014a). Many elderly residents take medication that can reduce their body's ability to maintain a safe internal temperature, increasing the risk of heat-related illnesses during heat waves. Elderly residents are also more likely to live alone and to be socially isolated, further increasing their vulnerability. Similar factors can make heat waves particularly dangerous for immunocompromised individuals and others with increased social isolation. Individuals who spend a lot of time outdoors, such as construction workers, are vulnerable to extreme heat. Households without air conditioning units, or lower-income households concerned about the cost of running an air conditioner, may also face an increased risk. There is no specific risk to critical facilities, although stress on some electrical or mechanical systems may increase during heat waves.

Elderly and socially isolated individuals may be vulnerable to extreme cold due to physical conditions and a generally smaller social support network available to provide assistance when needed. While most Torrance households have heating (the US Census Bureau reports that only 909 households, or less than 2 percent of Torrance households, do not), the households that lack heat are vulnerable to very cold conditions, as are lower-income residents who may be unwilling or unable to incur the cost of heating. No critical facilities face a specific risk from extreme cold.

Hail

Hazard Description

Hail is a form of precipitation, made up of rough lumps of ice. It is formed when strong winds in a thundercloud, called updrafts, force water droplets up into areas where the temperature drops below freezing, causing the droplets to turn into ice and stick together to form hailstones. Eventually, the weight of the hailstones becomes too heavy for the updrafts to keep them aloft, causing the hail to fall to the surface. Hail can damage windows, plants, and roofs. In rare instances, larger hail can cause more substantial damage, and in truly extreme instances, hail can cause serious injury or death. Hail should not be confused with sleet or freezing rain, which are different forms of precipitation.

Location and Extent

Hail is a fairly rare event in Torrance, although if it does occur, it is equally likely to occur anywhere in the community.

Hazard History

One of the most significant past hail events in the Torrance area occurred in November 2003. During a rare thunderstorm that caused some parts of the area to receive 5.3 inches of rain in under three hours, a few locations saw upwards of a foot of hail, although Torrance was not significantly affected (Broder 2003; Fovell 2004). Since 1955, Los Angeles County has seen 25 hail events, including two in the immediate vicinity of Torrance. One event occurred in

1959 and the other in 1979. There were no injuries or reported property damage associated with either occurrence (NOAA 2015a).

Risk of Future Hazards

Significant hail events are anticipated to continue to occur in Torrance, although based on the history of these incidents, they are likely to remain rare.

Climate Change Considerations

Climate change is expected to cause an increase in the average intensity of already intense storm events in Southern California. As a result, climate change could cause an increase in the risk of storm-related severe weather such as hail.

Vulnerability Assessment

The risk of hail is consistent across Torrance and does not vary by location. While truly damaging hail events are rare, it is likely that less-maintained homes face a greater risk of damage from these events. Such homes are more likely to be occupied by lower-income residents and renters, who may be more vulnerable to these events than other Torrance residents. All critical facilities generally face the same risk from hail events, but some weaker structures may suffer more damage if a significant hailstorm occurs.

Tornado

Hazard Description

Tornadoes are one of the most violent hazard types, defined as rotating columns of air that extend from a thunderstorm's base to the ground, often visible as a funnel cloud (FEMA 2016). These storms can travel at over 200 miles per hour, destroying infrastructure and endangering all life in its path. Tornadoes are a far more common hazard east of the Rocky Mountains, but they have the potential to occur anywhere at any time. The most damaging tornados form out of "supercells," which are rotating thunderstorms that can also cause severe winds, hail, and lightening (NOAA 2016). The strength of a tornado is measured using the Enhanced Fujita (EF) scale as depicted in **Table 19**, which is based on estimates (not actual measurements) of wind speed as a result of observed damage.

Table 19: Enhanced Fujita Scale

Enhanced Fujita Scale	3-Second Gust (mph)	Potential Damage
EF0	65–85	Minor to no damage
EF1	86–110	Moderate damage
EF2	111–135	Considerable damage
EF3	136–165	Severe damage
EF4	166–200	Extreme damage
EF5	Over 200	Total destruction of buildings

Source: NOAA 2006

Location and Extent

While tornadoes are rare in California, they are capable of occurring anywhere, and no single part of Torrance faces an elevated or lower risk of tornadoes relative to the rest of the city. Topographic features such as mountains, oceans, and rivers are often thought to prevent tornadoes from forming or to act as a barrier to moving tornadoes, although there is no evidence to support this theory. Similarly, heavily urbanized areas are sometimes thought to be resistant or immune to tornadoes, although numerous tornadoes have damaged urban areas, even downtowns of major cities.

Hazard History

Since 1955, 36 tornadoes have been recorded in Los Angeles County. On March 1, 1983, between 7:40 and 8:05 a.m., a F2 intensity tornado tore through Los Angeles. It caused the most damage to overhead pole-suspended power lines and telephone cables and old wood buildings. The tornado's path ran south to north through downtown Los Angeles, starting in South Los Angeles and following Interstate 110 north (NRC 1985). Although this tornado did not occur in Torrance, the tornado's path was less than 15 miles north of the city, indicating the possibility of this hazard occurring in Torrance. Two tornadoes have been recorded in the immediate vicinity, one in 1962 (EF1) and one in 1980 (EF0), neither of which caused any injuries. The 1962 tornado caused somewhere between $5,000 and $50,000 in damages, while the 1980 event caused less than $5,000 in damages (NOAA 2015b).

Risk of Future Hazards

Tornadoes are expected to continue to occur in and around Torrance based on past events and trends, although they are likely to remain very rare events.

Climate Change Considerations

As previously mentioned, climate change is expected to lead to an increase in the average intensity of storm events. It is possible that tornadoes may become a more frequent event as a result, although information about climate change's effects on tornadoes remains sparse and research is ongoing. However, tornadoes are already very rare in the area, and any increase due to climate change may not be significant enough to be readily noticed.

Vulnerability Assessment

Because the probability of a tornado occurring within the community is the same regardless of location, no residents are more or less likely to be exposed to these hazards. As tornadoes are very rare in the area, structures generally lack the specific features found in more tornado-prone regions that would make them more resilient to tornadoes. As a result, if a significant tornado does occur in the city, it is unlikely to have a greater impact on any specific subset of Torrance residents compared to other community members. All critical facilities are equally at risk of tornadoes, although more fragile structures may suffer greater damage.

Severe Wind

Hazard Description

Southern California, including Torrance, experiences warm, dry winds that blow from the eastern deserts across the region. Cooler temperatures in the desert, compared to warmer winter temperatures in the Los Angeles Basin, build pressure over the eastern region. When air flows pass over the desert, this pressure is released as a dry wind across the region. As the elevation between the desert and the Los Angeles Basin declines, the air compresses and increases the temperatures, causing the dry, hot winds that define the Santa Ana winds. Severe winds may also occur because of intense storms.

Location and Extent

Severe wind events may occur anywhere in Torrance and are not more or less likely to occur in any particular location.

Hazard History

There have been nine significant severe wind events in and around Torrance since 1955. The strongest of these occurred on April 18, 2000, and registered gusts of 87 miles per hour (mph). No injuries or significant damage has been recorded as a result of any of these events (NOAA 2015c).

Risk of Future Hazards

Based on past trends, significant wind events are likely to continue to occur in Torrance.

Climate Change Considerations

The effect of climate change on wind conditions is not yet fully understood, although there is some evidence that climate change will increase the intensity of coastal winds in California. Climate change's impacts on the Santa Ana winds remains unknown. It is possible that strong winds associated with storms may occur more frequently, as climate change is expected to cause already intense storms to become more intense in the Southern California area.

Vulnerability Assessment

All Torrance community members face an equal chance that they will be exposed to severe wind events. However, poorly built or poorly maintained structures may suffer greater damage, and such buildings are more likely to be occupied by renters or lower-income individuals. It is possible that these residents will be disproportionately affected by severe wind events. All critical facilities have an equal chance of being exposed to severe wind, but some structures may be less resistant to damage.

Hazardous Materials

Hazard Description

The California Health and Safety Code, Section 25501, defines a hazardous material as:

> *A substance that, because of physical or chemical properties, quantity, concentration, or other characteristics, may either (1) cause an increase in mortality or an increase in serious, irreversible, or incapacitating illness; or (2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or dispose of, or otherwise managed.*

Hazardous materials are a wide-ranging category of substances that include toxic substances, flammable or explosive materials, corrosive substances such as acids, infectious agents such as dangerous bacteria, and radioactive substances. While some hazardous materials are dangerous at all times, others may only be dangerous under specific conditions (flammable materials, for example, which may be perfectly inert and harmless until exposed to a spark or a heat source). Hazardous wastes refer to hazardous materials that are no longer used and have been disposed of or are awaiting disposal.

Emergencies involving hazardous materials often occur when a storage container holding the material is damaged or destroyed, allowing the substance to escape into the environment where people may be exposed to it. This sometimes occurs as a secondary impact of another emergency, such as an earthquake or flood, or because of human error or equipment malfunction. Hazardous material releases can occur from buildings such as factories and processing facilities, as well as from vehicles that transport these substances. Road vehicles, trains, and (more rarely) aircraft can all suffer accidents that cause a release of hazardous materials.

Location and Extent

The California Department of Toxic Substances Control (DTSC) maintains a list, known as the Cortese List, of all facilities where hazardous materials are released. One facility on the Cortese List is located in Torrance: an old Halbert's Lumber site at 2026 Abalone Avenue (CalEPA 2016). According to the DTSC, this site was contaminated with zinc, lead, chromium, and copper. Cleanup activities were completed in 1996 (DTSC 2016a). Beyond the Cortese List facilities, there are 94 sites in Torrance that are designated as hazardous material sites, although some properties may have multiple designated sites. These 94 sites are primarily active and historic industrial facilities, and many are currently undergoing cleanup operations even though activities involving hazardous materials may persist at the site (DTSC 2016b). The DTSC also reports 16 hazardous waste facilities in Torrance, most of which have already been closed or are in the process of being closed (DTSC 2016c).

The California State Water Resources Control Board (SWRCB) maintains a separate list of sites containing hazardous materials that may contaminate groundwater supplies. There are 182 such sites in Torrance, 130 of which have been successfully cleaned up. The other 52 locations are currently undergoing cleanup activities, evaluation, or monitoring activities (SWRCB 2016a). There are also 92 permitted underground storage tanks in Torrance which may store hazardous or potentially hazardous materials. While these tanks are not necessarily actively releasing hazardous materials into the environment, they may fail as a result of age, disasters such as an earthquake or flood, or other factors (SWRCB 2016b).

There are no sites in the Environmental Protection Agency's (EPA) Superfund program in Torrance, although two are located near the city. The 13-acre Montrose Chemical Corporation site, located less than half a mile east of Torrance in Los Angeles, was used to manufacture DDT from 1947 to 1982. The site was contaminated with DDT as well as polychlorinated biphenyls (PCBs, an environmental toxin and possible carcinogen). Cleanup activities at the site ended in 2002 (EPA 2016a). The 280-acre Del Amo industrial area east of Torrance, in Los Angeles and unincorporated Los Angeles County, was a rubber factory from 1943 to 1972 and introduced numerous contaminants into the groundwater and soil. Much of the site has been redeveloped, although cleanup activities remain ongoing at some parts of the property (EPA 2016b).

Hazard History

Due to the large number of industrial complexes in and around Torrance, along with close proximity to freeways and rail lines that transport hazardous materials, Torrance has seen a number of hazardous material releases. Since 1993, there have been 2,774 reported hazardous material releases in Torrance, ranging from less than 30 to approximately 350 events in any given year, most of which involve small amounts of material and do not pose a threat to surrounding properties. Of these events, 2,067 hazardous material releases (approximately 75 percent) occurred at the refinery (Cal OES 2016):

The refinery has seen a number of hazardous material releases during its operational life, including the following events:

- A butane leak at the refinery in 1979 resulted in a large fire when a spark from a nearby car ignited the cloud of butane gas. The fire killed three people, including two refinery workers (Belgium 1998).
- In 1984, a pipeline at the oil refinery ruptured, shooting superheated oil into the air, causing damage to nearby properties (The Daily Breeze staff 2015).
- A fire in November 1987 at the refinery caused damage at nearby properties and released approximately 100 pounds of highly toxic and corrosive hydrofluoric acid, although none of it spread beyond the refinery grounds (Belgium 1998).
- In June 1990, a leak of hydrofluoric acid and ammonia vapors at the refinery sent three workers to the hospital (Stein 1990).
- A leak of propane and butane gases at the refinery in October 1994 ignited, causing a fire and injuring 28 people (The Los Angeles Times staff 2015).
- In April 1999, a broken pipeline at the refinery caused a leak of isobutene (a refrigerant, aerosol propellant, and raw material for various industrial products) and hydrofluoric acid, causing three workers to be hospitalized (The Daily Breeze staff 2015).
- A hydrofluoric acid leak in July 2001 at the refinery forced nearby residents to remain indoors (The Daily Breeze staff 2015).
- A malfunctioning piece of equipment at the refinery caused a release of toxic hydrogen sulfide and sulfur dioxide gases in March 2007, although no injuries were reported (The Long Beach Press-Telegram staff, 2007).
- A February 2015 explosion at the refinery dispersed large clouds of catalyst material up to a mile away from the refinery site. There was no release of dangerous hydrofluoric acid, although a piece of debris from the explosion came very close to striking a tank of hydrofluoric acid (USCSB 2016). The catalyst material released by the explosion was nontoxic but was a skin, eye, and throat irritant (Vives and Rocha 2015).

Hazardous material releases in Torrance have often involved a fairly small number of substances, including ammonia, catalyst material, fuel oils such as gasoline and diesel, various nitrogen oxides (NO_x), sewage, and sulfur oxides (SO_x) (Cal OES 2016).

Risk of Future Hazards

Based on past trends, it is anticipated that future hazardous materials-related events and significant wind events are likely to continue to occur in Torrance.

Climate Change Considerations

Climate change is not directly linked to the risk of hazardous material releases. However, it may indirectly increase the risk by increasing the frequency, severity, or range of other hazards, such as severe temperatures or winds. It is possible that an increase in these other hazards may increase the likelihood of an accidental hazardous materials release as a secondary hazard.

Vulnerability Assessment

Hazardous material facilities, particularly those used to support industrial operations, are frequently found in neighborhoods with a greater number of lower-income households or otherwise disadvantaged individuals. It is unknown whether Torrance's hazardous material facilities are located in these neighborhoods, although all residents near hazardous material facilities face an increased risk to this hazard regardless of socioeconomic conditions.

Torrance has 17 critical facilities located near hazardous material facilities. These critical facilities, which have an increased risk of hazardous material–related emergencies, provide a wide range of functions. The types and priorities of critical facilities near hazardous material facilities, as well as their distance to the nearest hazardous material facility, are shown in **Table 20**.

Table 20: Critical Facilities at Risk of Hazardous Materials by Type and Priority

Facility Type	Number of Facilities at Risk				Not at Risk
	Within 100 Feet			Within 1,000 Feet	
	Priority 1	Priority 2	Priority 3	Priority 1 *	
Bridges	0	2	0	0	12
Government facilities	1	1	0	1	41
Schools	0	7	0	0	38
Transportation routes	0	0	0	0	2
Utilities	0	2	3	0	25
Total	1	12	3	1	118

** The only critical facility within the 1,000-foot hazardous material facility buffer is a Priority 1 facility*

Figure 4 shows the 1,000-foot buffer around hazardous material facilities and the critical facilities within these buffers.

Flood

Hazard Description

Flood events occur when normally dry land is partially or complete covered by water, which can happen in a number of different ways. The water levels in bodies such as lakes and creeks can rise high enough to overtop the water body's banks, usually due to intense precipitation, causing the water to flow into nearby low-lying areas. Precipitation can also be heavy enough so that soil cannot absorb it fast enough, or storm drains cannot carry all the water away, causing water to build up on the surface (ponding). Very high tides or the winds of a strong storm system can force the water in oceans and bays onto the shore, a condition called coastal flooding. Flood events can also happen when infrastructure fails, such as a burst water tank or collapsed dam. Some flood events are the result of multiple factors.

Regardless of the cause of flooding, these events can damage buildings by the force of the rushing water itself or by large debris carried along in the floodwaters. Flood events can wash away soils, making foundations weaker and increasing the risk that structures may collapse. Flood events also create the risk of personal injury or drowning, particularly in the event of flash floods that may occur too fast for people to escape from. Flood events are frequent in California and have been the cause of more disaster declarations than any other type of emergency situation except for fires (Cal OES 2013a).

Location and Extent

The risk of flooding is highest in low-lying areas, particularly those adjacent to water bodies or flood control channels. Areas downstream of dams may also be at risk from flooding in the event of dam failure. Flood risks are usually described in years, e.g., 100-year or 500-year flood events. A 100-year flood event is one that has a 1 percent chance of occurring in any given year, while a 500-year flood event has a 0.2 percent chance (1 in 500) of happening in a given year.[1] The areas within these flood risk zones are called the floodplain. The boundaries of the floodplains are established by FEMA and are re-evaluated as the need arises (USGS 2015b).

In Torrance, the main area at risk of flooding is the western half of the Madrona Marsh nature preserve, which lies partly in the 100-year floodplain and partly in the 500-year floodplain. Some land north of the nature preserve across Plaza del Amo is within the 500-year floodplain, and a block of land northeast of the preserve (bordered by Plaza del Amo, Del Amo Circle East, West Carson Boulevard, and Madrona Avenue) is within the 100-year floodplain. Elsewhere in the city, the areas around the intersections of California Street and Alaska Avenue and of Amsler Street and Dormont Avenue are both in the 100-year floodplain, as is part of an undeveloped area near the intersection of Hawthorne Boulevard and Via Valmonte. Some land west of Crenshaw Boulevard between 235th and 237th Streets is within the 500-year

[1] A 100-year or 500-year flood event has a 1 percent or 0.2 percent chance, respectively, of occurring in any given year. However, these are long-term averages and do not necessarily mean that these events occur only once every 100 or 500 years. It is possible to have multiple 100-year or 500-year flood events in a short period of time, even in the same year. The specific severity of a 100-year or 500-year flood event also changes as flood risks are re-evaluated (USGS 2015b).

Figure 4: Hazardous Material Sites Near Critical Facilities

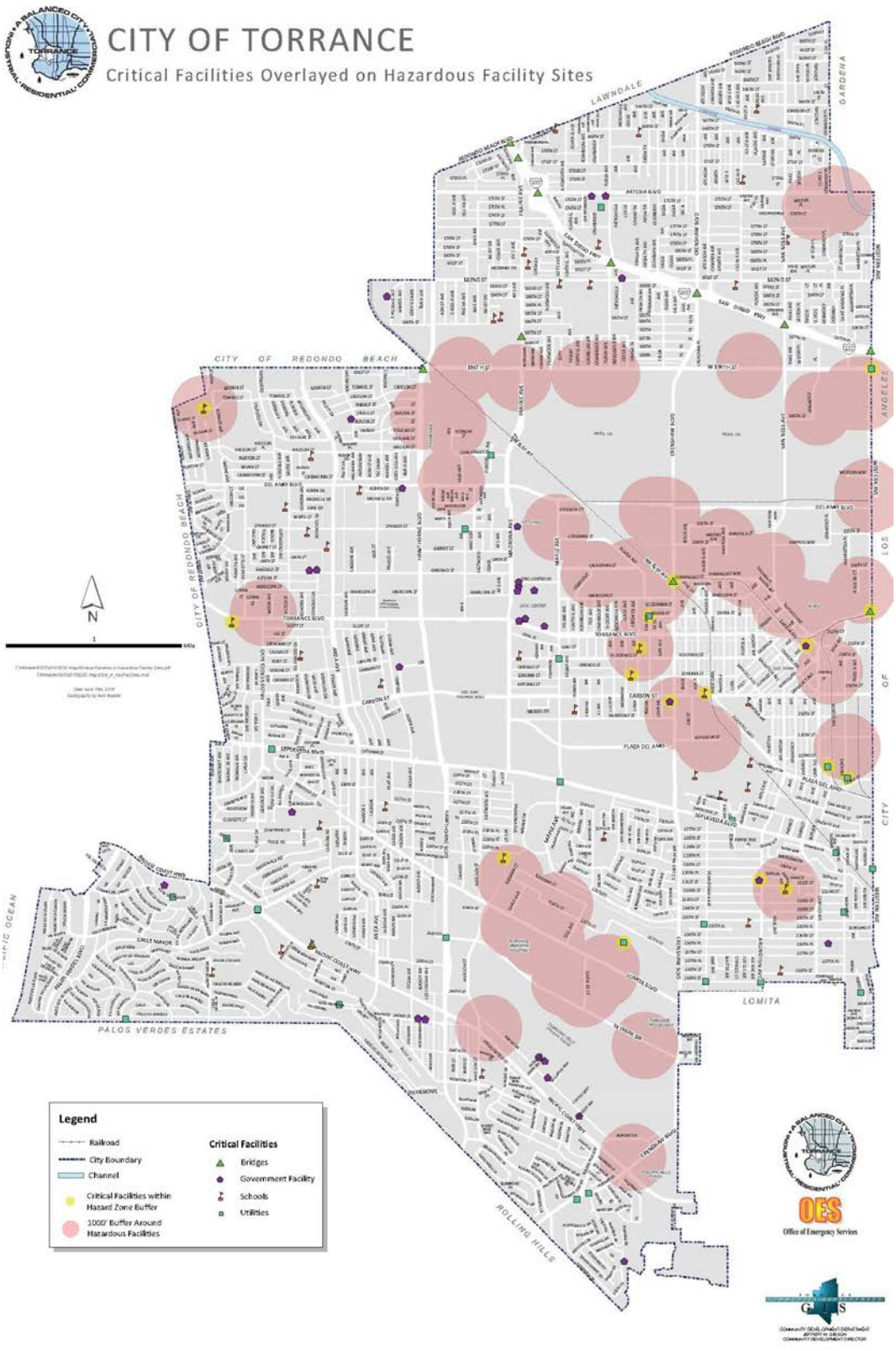

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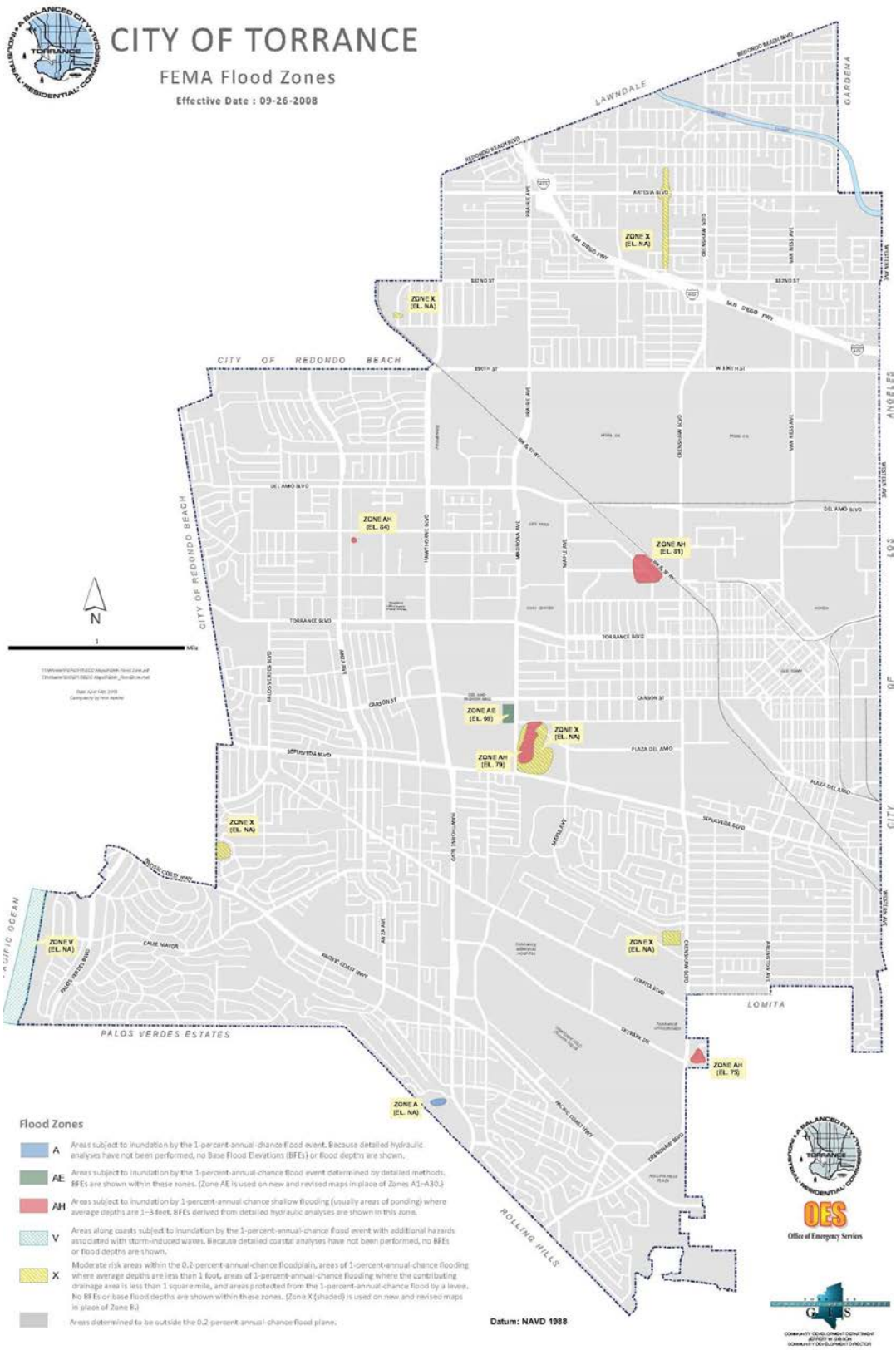
Figure 5: Flood Hazard Zones



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floodplain, as are parts of the St. Lawrence Martyr School along the city's border with Redondo Beach. Torrance's beaches also are at risk of coastal flooding, but beachside development is outside of both the 100-year and 500-year floodplains. **Figure 5** shows the flood hazard zones in Torrance.

Hazard History

While flooding has been an occasional hazard in the Los Angeles Basin, it has been mostly limited to the areas near major natural rivers such as the Los Angeles, San Gabriel, and Santa Ana Rivers. A series of major flood events in the first half of the 1900s sparked the beginning of widespread flood control efforts, including the channelization of the

area's major rivers. These efforts have reduced the frequency and severity of flood events although they have not removed the risk of flood entirely, as Los Angeles County still saw 32 declared flood-related disasters between 1950 and 2012 (Cal OES 2013a).

Torrance, which is not located near the major waterways of the Los Angeles Basin, has largely been free of significant flood events. Localized flooding has occurred occasionally, particularly prior to the construction of modern storm drains and water retention basins (Torrance 2004).

Risk of Future Hazards

Localized flooding is likely to continue to occur in the future, especially during significant storm events. Major storms in California are frequently the result of meteorological phenomena called atmospheric rivers, which are narrow bands of very most air which in effect act as pathways for heavy precipitation. Although these storms make up a relatively small number of weather systems that affect the western United States, they typically cause 30 to 50 percent of all precipitation in the area (NOAA 2015d). Another type of event, the El Niño Southern Oscillation (ENSO, or El Niño), can cause more intense storms and higher levels of precipitation in the western United States, especially in Southern California. Although Torrance does not have a history of significant flooding, a particularly severe storm or series of intense storms may cause more widespread flooding emergencies.

Torrance is also at risk of flooding from infrastructure failure. The Walteria and Ben Haggot Reservoirs, both owned by the City, are two buried water storage facilities with a combined capacity of 28.7 million gallons located along Crenshaw Boulevard near the city's border with Rolling Hills Estates. The failure of one or both facilities could create flooding in the area below the reservoirs (Torrance 2004). The prime risk of infrastructure failure to either reservoir is a significant earthquake, although the most likely outcome is cracks in the reservoirs that cause leaks and some localized flooding. However, a significantly strong earthquake could cause catastrophic failure of the reservoir walls. This "worst-case" scenario would drain the reservoirs in as little as 18 minutes and could inundate 215 acres. The inundation zone includes numerous residential and commercial properties, as well as the southeast portion of Torrance Municipal Airport (Torrance 2008a).

Climate Change Considerations

Although research on the subject is ongoing, there is a chance that climate change may increase the severity of intense storms. Some studies indicate that, while the number of atmospheric river storms in Southern California will remain unchanged, the storms themselves will become 10 to 20 percent more intense (Oskin 2014), increasing the flood risk from an individual storm event. It is not yet clear if climate change will have any impact on the frequency or severity of ENSO-related storm events.

Somewhat counterintuitively, climate change can also exacerbate flood risks by causing more frequent droughts. Drought conditions cause soil to harden and become less permeable, leading to increased flooding when precipitation does occur because the soil cannot absorb water as easily. Studies expect that precipitation levels will decrease throughout much of California (CNRA and Cal OES 2012) and that the overall likelihood of extreme droughts is likely to increase (Williams et al. 2015). These increases in drought conditions are likely to make soil less permeable for longer and more frequent periods, which could exacerbate flash flood conditions. A similar trend has already emerged as more land has been covered with impermeable surfaces such as asphalt and concrete, causing water to run off or pool rather than being absorbed. As a result, localized flooding would be significantly more common in Torrance and other parts of the urbanized Los Angeles Basin without extensive storm drains and flood control infrastructure (Torrance 2004).

Vulnerability Assessment

The flood risk in Torrance in limited to specific areas, as previously discussed. Elderly or disabled individuals or persons without access to a private vehicle within the flood hazard zone may face an increased vulnerability to flood events, as they may have difficulty evacuating if floodwaters rise high enough. Lower-income residents or renters may also be more vulnerable to flood events, as they may lack financial resources or sufficient control over their residences to install flood-resistant features. There are no critical facilities within Torrance's flood hazard zones.

Diseases and Pest Management

Hazard Description

In urbanized areas such as Torrance, the primary threats from diseases and pest management–related hazards are to human health and street trees. In some instances, people or plants may be infected by a disease-causing organism called a pathogen (e.g., a bacteria or virus), which may bring on sickness. Some pests may not actually cause diseases, but they may cause damage or injury through other means.

The main human health concerns in Torrance are easily contagious diseases or infections, which could spread quickly through the community and cause significant harm. This includes pandemics, which are infectious diseases that spread throughout a wide region and often require substantial resources to slow or halt. Influenza (the flu) is one of the most widespread of these potentially serious diseases. It can happen at any time of the year, although most cases occur in the winter. It is spread through the air (usually by coughing or sneezing) or by touching surfaces contaminated with the

flu virus. The symptoms of the flu can include fever, fatigue, congestion, aches, and gastrointestinal distress. Although often relatively mild, the flu can be severe, particularly for young children, elderly persons, and those with weakened immune systems. There have been numerous flu pandemics throughout history, including the 1918 Spanish flu pandemic that killed 20 to 100 million people (Nature 2016) and the 2009 H1N1 (swine flu) pandemic that killed up to 575,000 people (CDC 2012). Other diseases have historically caused pandemics or pandemic concerns in the United States, including cholera, measles, and severe acute respiratory syndrome (SARS).

West Nile virus (WNV) is another disease which poses a public health concern in California, although it is not contagious. It is spread by mosquitoes when the mosquitoes bite an infected bird and then bite a person. The virus has no observable impact on 80 percent of people, while 20 percent will experience symptoms such as a fever, headache, or other symptoms similar to a cold or mild flu. For less than 1 percent of infected persons, the virus can cause severe neurological issues and may lead to death or permanent impairment (CDC 2015).

The Zika virus emerged as a global health concern in 2015. Zika is transmitted primarily through mosquitos, although it can also be transmitted through sexual activity and by infected pregnant mothers to their children. Like WNV, most people infected with Zika have no symptoms, and symptoms that do develop are often mild and can include fever, aching, and a rash. Children born to pregnant mothers with Zika may have microcephaly and other malformations of the brain.

Street trees may also be threatened by diseases or pests, which may weaken or kill the trees. Affected trees may no longer provide shade or other landscaping benefits and may be more susceptible to toppling over or broken branches, which can damage property and cause injury or death. Insects called aphids are among the most common type of pest. Swarms of aphids suck the sap from a tree's tissues, weakening it by depriving it of resources, and potentially introducing pathogens or other pests that may further damage the tree. Other insects, as well as bacteria, viruses, and fungi, may infect street trees and cause potentially widespread damage if not controlled. Trees stressed by drought conditions may be more vulnerable to infection.

Location and Extent

Areas at risk of disease are not limited to any one part of Torrance, but diseases instead may affect any part of the community. The impacts of any disease may be more severe in some parts of the community with a greater proportion of vulnerable residents. Species of trees that are more vulnerable to infection or pest infestation may be more common in specific parts of Torrance, although the entire community is generally at risk from these hazards.

Hazard History

There is no specific history of disease or pest management–related hazards in Torrance. Los Angeles County generally sees some severe flu cases each year, although the number varies significantly. During the 2009 H1N1 pandemic, Los Angeles County saw 129 flu deaths and 219 further cases requiring intensive care (CDPH 2014). During the 1918 Spanish flu pandemic, the Los Angeles area saw 494 deaths for every 100,000 people, lower than many other American cities

(University of Michigan n.d.). Regarding pest management issues, the City is monitoring pests that impact city trees. One in particular that affects eucalyptus trees—the red gum lerp psyllid—is a known vector that causes stress on trees, which can contribute to higher tree mortality.

Risk of Future Hazards

It is likely that various infections and pest infestations will continue to be an issue in Torrance. The flu will likely continue to be the most prominent significant disease in the community, as the virus changes rapidly and has proven impossible thus far to eradicate, although basic hygiene substantially reduces the odds of being infected, and vaccines that provide protection against the most common flu strains are widely available. WNV has proven similarly difficult to eradicate, although it remains fairly rare and can be constrained by reducing the risk of mosquito bite by using insect repellents, using screens and protective clothing, and draining pools of stagnant water where mosquitoes breed. Regular inspections of street trees and selecting disease-resistant species can help reduce the loss of vegetation from pest infestation.

Climate Change Considerations

There is no clearly identified link between climate change and the flu, although changes in animal migration patterns may affect mutation of the flu virus. WNV may be spread more easily as the climate changes, as warmer temperatures are expected to expand the months when mosquitoes are most active, creating more opportunities for the disease to spread. Warmer temperatures may facilitate the spread of various pests that may affect trees and other vegetation. As climate change makes drought conditions more frequent, vegetation may also be weakened as a result of drought stress, increasing susceptibility to infestations.

Vulnerability Assessment

Disease and pest management hazards pose the greatest risk to elderly residents, young children, and immunocompromised individuals, as these persons are most likely to be severely affected by various pathogens. However, all residents may be affected by diseases, particularly influenza and other diseases that pose a risk of causing pandemics. Landscaping at critical facilities may be affected by plant diseases or pests, but buildings and structures themselves are not affected by disease and pest management hazards.

Geologic Hazards

Methane

Hazard Description

Methane (CH_4) is a colorless, odorless gas that is the simplest of a group of molecules called hydrocarbons, which includes other materials such as petroleum, benzene, and propane. Methane occurs naturally primarily by the decomposition of organic materials in an anaerobic (oxygen-free) environment, although it can also be produced

artificially through various processes. It is the primary component of natural gas, a valuable fuel source, and so is often found in high concentrations in the soil in areas with natural gas deposits. Methane is also commonly found near petroleum deposits.

Despite its usefulness, methane can pose a substantial health and safety hazard. Although methane itself is nontoxic, it is an extremely flammable gas, and potentially explosive in certain concentrations. A sufficiently high concentration of methane in the air may displace oxygen, creating a risk of asphyxiation if methane levels rise high enough. The gas can seep out from the ground into the surface, posing risks in areas above methane-containing soils. It can be trapped underneath impervious surfaces such as roadways, or in enclosed underground areas such as basements or tunnels, potentially allowing concentrations to rise to dangerous levels if the gas is not vented out.

Location and Extent

Methane-containing soils are usually associated with oil and gas deposits, both of which are found in Torrance. The Torrance Oil Field lies under the middle of the city, in an area roughly north of Lomita Boulevard and south of the main railway lines which run through the community (Torrance 2010b). This area is more likely to contain methane-containing soils, although such land may be found beyond the boundaries of the Torrance Oil Field and methane seeps are not present throughout the entire field. The pressure of the Torrance Oil Field is lower than other fields in the Los Angeles region, so extensive testing has not been conducted throughout the area. Any methane seeps in the area are believed to be small (Torrance 2008b).

Hazard History

Torrance has no history of methane-related emergencies. There have been emergency situations in some nearby communities, including a 1985 department store explosion in Los Angeles' Wilshire/Fairfax neighborhood approximately 13 miles north of Torrance. This event, which severely damaged the store and sent 23 people to the hospital, was caused by accumulated methane in a storage room (Hamilton and Meehan 1990). Buildings throughout Torrance, including multiple public schools, have methane ventilation systems to prevent gases from building to dangerous concentrations (Kuzina 2010).

Risk of Future Hazards

Methane leaks are a natural geologic feature in Torrance and so are likely to continue in the future, although the severity of the seepage may change depending on the type and volume of oil and natural gas extraction activities carried out at the Torrance Oil Field. Other local and regional activities may also influence the rate of seepage.

Climate Change Considerations

Although methane is a greenhouse gas and contributes to climate change, the effects of climate change are not expected to have any impact on the rate of methane seepage.

Vulnerability Assessment

The threat from methane-containing soils varies throughout the community, as some specific locations face an increased threat. Lower-income residents and renters in the threat zones for these hazards may not have the financial capacity or the control over their facilities to install features that make buildings resistant to these hazards. Because methane-containing soils have not been mapped in the community, it is unknown which critical facilities are at risk from methane.

Expansive Soils

Hazard Description

Expansive soils are those which contain high levels of materials that can absorb large amounts of water, such as certain types of clay. When the ground is wet, these materials absorb water and swell, and then shrink as they dry out. This process can exert significant force on structures, and over repeated cycles of expansion and contraction this force can be sufficient to crack foundations, floors, and other ground-level or subterranean structures. Cracks may form in expansive soils when they are dry, potentially creating a safety hazard.

Location and Extent

Expansive soils in Torrance are concentrated in two areas of the city: (1) northern Torrance, encompassing the area north of 190th Street and east of Hawthorne Boulevard; and (2) the southern part of the community, including the area south of Lomita Boulevard and east of Hawthorne Boulevard. An adjacent area, bounded by Pacific Coast Highway, Hawthorne Boulevard, Lomita Boulevard, and Calle Mayor High School, is in a study zone for expansive soils, although these soils may not be present in this area. **Figure 6** shows the location of expansive soil areas in Torrance.

Hazard History

The presence of expansive soils in Torrance has caused occasional damage to structures that were not built to be resilient to these soils. In southern Torrance, residents have noticed the effects of expansive soil since homes were constructed in the 1960s. Damages to these structures are not necessarily linked to a specific event. However, the problems may be exacerbated as a result of drought conditions, as occurred in the late 1980s (Schoch 1990).

Risk of Future Hazards

The community's expansive soils will continue to swell and contract as they get wet and then dry out, potentially causing damage.

Climate Change Considerations

It is possible that expansive soils may be affected by climate change, as climate change is expected to bring on more frequent drought conditions and may also cause more intense storms. These more extreme conditions may exacerbate the expansion and contraction of expansive soils.

Vulnerability Assessment

The risk of expansive soils varies depending on specific location. Lower-income residents and renters in the risk area for expansive soils may be more vulnerable to this hazard, as they may be unable to retrofit their buildings to resist the forces created by the swelling and contraction of expansive soils. Expansive soils are also a threat to 40 different critical facilities, as shown in **Table 21**.

Table 21: Critical Facilities at Risk of Expansive Soils by Type and Priority

Facility Type	Number of Facilities at Risk				Not at Risk
	Priority 1	Priority 2	Priority 3	No Priority Given	
Bridges	0	8	0	0	6
Government facilities	3	1	0	10	30
Schools	0	14	0	0	31
Transportation routes	0	0	0	0	2
Utilities	0	3	1	0	26
Total	**3**	**26**	**1**	**10**	**95**

Landslides

Hazard Description

Landslides occur when the soils on a hillside become unstable and slide down toward the base of the slope. This movement can damage or destroy structures built on or in the soil, and cause damage to objects in the path of the landslide. While landslides are often thought of as fast-moving events, they may unfold slowly over the course of days, weeks, months, or even years, depending on the conditions of the hillside and the factors causing the slide. The overall risk of a landslide is determined by the types of materials that make up the slope and the steepness of the hill.

Many different events may trigger a landslide, but earthquakes and moisture are the most common. Earthquake-induced landslides happen when ground shaking or liquefaction causes the soil to become loose, or when ground shaking or fault rupture fractures the rocks that make up a slope. In either instance, the earthquake creates enough instability in the slope that it begins to slide. In a moisture-induced landslide, precipitation, irrigation, or another water

source causes the soil to become waterlogged. If the soil absorbs enough water, it can lose its stability and slide. Water can also erode the base of a slope, causing material farther up on the hill to slide. A type of landslide called lateral spreading can occur in areas prone to liquefaction, when liquefied soils become fluid enough to slide down very minor slopes.

Location and Extent

In Torrance, the areas with an elevated landslide risk are along the southern border of the community along the base of the Palos Verdes Peninsula. The vast majority of these landslide areas are south of Pacific Coast Highway. The shores of Walteria Lake, north of Pacific Coast Highway, are also at risk from landslides (CGS 1999b, 1999c). Outside of these areas, there is also a risk of lateral spreading on soils that are prone to liquefaction. **Figure 7** shows the landslide hazard area in Torrance.

Figure 6: Expansive Soil Hazard Area

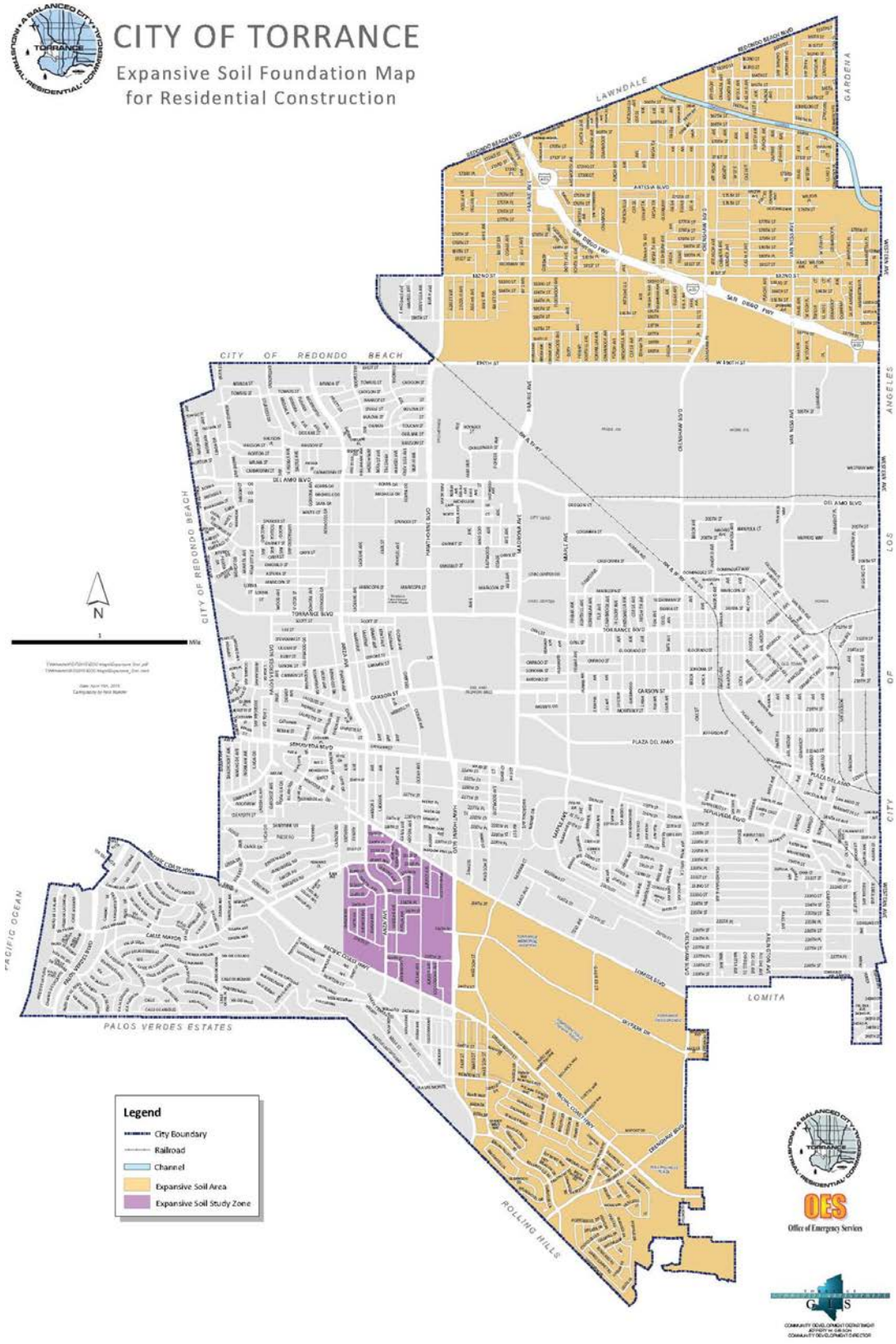

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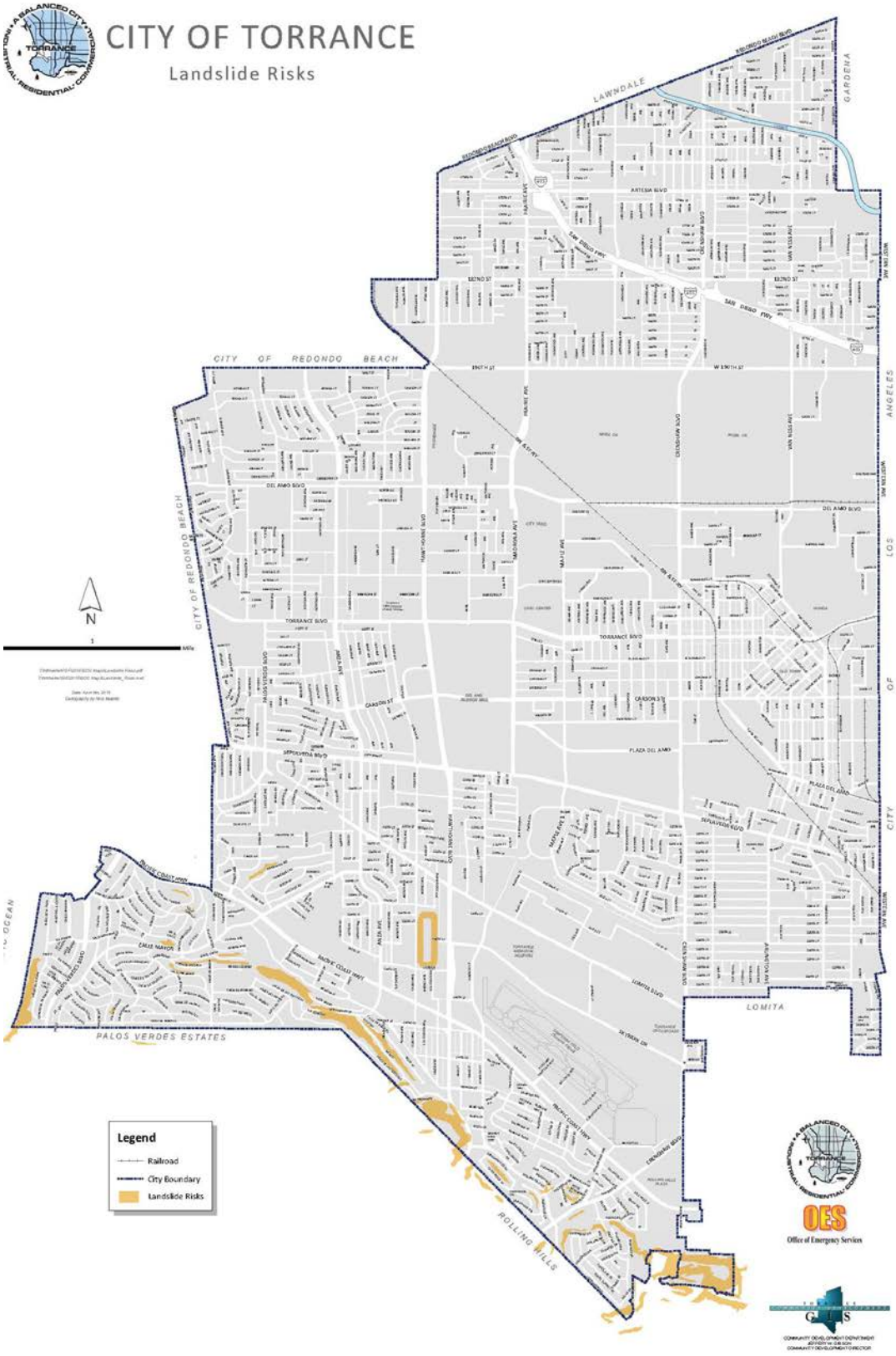
Figure 7: Landslide Hazard Zone



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Hazard History

Torrance has seen occasional landslides in the southern parts of the community along the sea cliff and the base of the Palos Verdes Peninsula. Two substantial landslides have occurred in recent history. In 1986, a landslide near Vista Largo and Via Corona caused severe damage to two homes, which were demolished as a result. A 1998 landslide near Carolwood Lane and Singingwood Drive affected the backyards of 24 homes (Torrance 2004, 2008c).

Risk of Future Hazards

Landslides are likely to continue to occur occasionally in Torrance. Increased development activities at the top or base of landslide-prone slopes, including construction activity in the Palos Verdes Peninsula communities above Torrance, may exacerbate landslide risks.

Climate Change Considerations

Landslides may be affected by the increased risk of flooding brought on by climate change, as soil subject to heavy rains may be more prone to sliding. However, more research is likely needed to determine the specific effects of climate change on landslide risks.

Vulnerability Assessment

The landslide risk area in Torrance, as previously mentioned, is located along the base of the Palos Verdes Peninsula. While there is no evidence that this area is more or less vulnerable than the rest of Torrance, some residents in this area may be unable to retrofit their homes to be more resilient to landslides (often due to limited financial resources or renting their home), so they may be disproportionally affected by landslides.

There is one critical facility, a Priority 2 utility facility, in the landslide hazard zone.

MITIGATION STRATEGY

Introduction

The City's Hazard Mitigation Strategy is made up of individual measures that collectively reduce the impacts of hazard events on individuals, private and public property, critical facilities, natural ecosystems, and important services within the community. It serves as a long-term blueprint to reduce the potential vulnerabilities discussed in the Vulnerability Assessment section of each hazard profile. Some of the mitigation measures in the strategy are based on the City's previous LHMP, updated as appropriate to reflect additional information or changing conditions. Other measures are new, intended to fill gaps in the previous Plan or to address new concerns since the previous Plan was adopted.

Capabilities Assessment

As part of developing the Hazard Mitigation Strategy, the Planning Team prepared a Capabilities Assessment, intended to identify existing local agencies, personnel, tools, technology, funding sources, and policies and programs that can support hazard mitigation activities. The Capabilities Assessment helps summarize the current condition of hazard mitigation activities for the City of Torrance by showing what resources currently exist for hazard mitigation. This assessment also helps identify gaps that can be filled by the new mitigation measures contained in this Plan. **Table 22** shows the results of the Capabilities Assessment.

Table 22: Capabilities Assessment

Resource Name	Type of Resource	Ability to Support Mitigation	Web Address
City of Torrance Resources			
General Plan	Plan Resource	The City's General Plan is a blueprint for the community. It is the main policy document that guides a variety of activities, including development and land uses, parks and recreation, environmental protection and natural resources, public safety, transportation, housing, and noise. The data and mitigation strategy from this LHMP can be incorporated into the General Plan.	http://www.torranceca.gov/8691.htm
Land Use Plan	Policy Resource	The Land Use Plan is Division 9 of the City's Municipal Code and serves as the primary tool to implement the City's General Plan. It establishes land use regulations and development standards for the community. Some mitigation measures in this LHMP can be integrated into the zoning code as changes to existing standards.	http://www.codepublishing.com/CA/Torrance
Building Code and Standards	Policy Resource	The Building Code and Standards is Division 8 of the City's Municipal Code. It contains numerous codes and ordinances that establish standards for new construction and significant renovations in Torrance. Some mitigation measures in this LHMP can be included in the Building Codes and Standards for Torrance as new standards or modifications to existing ones.	http://www.codepublishing.com/CA/Torrance
Urban Water Management Plan	Plan Resource	The Urban Water Management Plan guides and informs how the water supplied by the City's municipal system is sourced and used. It includes a summary of potential water shortages as an effect of droughts and contains information about water conservation activities and potential other water sources. Mitigation measures that affect water issues can be included in updates to the Urban Water Management Plan.	https://www.torranceca.gov/PDF/FinalTorrance2010UWMP_07-28-11.pdf

Resource Name	Type of Resource	Ability to Support Mitigation	Web Address
Capital Improvement Projects	Plan Resource	Capital Improvement Projects are upgrades to public facilities and infrastructure which the City has prioritized and allocated funding to. This includes upgrades to roadways and streetscapes, water and wastewater infrastructure, and bridges. The LHMP may recommend certain projects or types of projects to be included in the list of Capital Improvement Projects.	http://www.torranceca.gov/3239.htm
Fire Department	Personnel Resource	The City's Fire Department provides prevention and response activities for fires, hazardous material releases, rescue operations, and emergency medical services. The LHMP mitigation measures may direct the Fire Department to establish new programs or modify existing ones.	http://www.torranceca.gov/108.htm
Office of Emergency Services	Personnel Resource	The City's Office of Emergency Services conducts a variety of emergency preparation, response, and recovery activities. This includes issuing alerts and notifications, providing emergency training to City staff and community members, and managing disaster service volunteer programs. Measures in the LHMP may establish new programs for the Office of Emergency Services or modify existing ones.	http://www.torranceca.gov/TPD/DisasterPreparedness.htm
Community Development Department	Personnel Resource	The City's Community Development Department is responsible for all planning and building-related activities. This includes reviewing and permitting building and development projects, conducting environmental review, addressing housing issues, and preparing planning documents. The LHMP may direct the Community Development Department to implement specific mitigation measures.	http://www.torranceca.gov/111.htm

Resource Name	Type of Resource	Ability to Support Mitigation	Web Address
Public Works Department	Personnel Resource	The City's Public Works Department maintains and improves City-owned infrastructure, including streets, sidewalks, streetlights, traffic signals, water infrastructure, and sewer and stormwater infrastructure. It also provides water, wastewater, and sanitation services to the community. The LHMP may establish new or modified mitigation measures related to these issues that are the responsibility of the Public Works Department.	http://www.torranceca.gov/96.htm
General Services Department	Personnel Resource	The City's General Services Department is responsible for a number of support activities for City staff, including maintaining City-owned buildings. The department is therefore one of the agencies responsible for hazard mitigation activities that pertain to critical facilities.	http://www.torranceca.gov/107.htm
Community Services Department	Personnel Resource	The City's Community Services Department manages City parks and a number of other facilities that are designated as critical facilities. The LHMP may direct this department to implement hazard mitigation activities to strengthen the resilience of new or existing critical facilities that fall under the department's jurisdiction.	http://www.torranceca.gov/3737.htm
City Manager's Office	Personnel Resource	The City Manager's Office coordinates all high-level municipal activities, including emergency preparedness through the Office of Emergency Services. The City Manager's Office may have responsibility over mitigation activities that pertain to high-level strategic planning.	http://www.torranceca.gov/55.htm

Resource Name	Type of Resource	Ability to Support Mitigation	Web Address
County and Regional Agencies			
Los Angeles County Office of Emergency Management	Technical Resource	The County Office of Emergency Management coordinates emergency preparation activities across all jurisdictions in Los Angeles County. It also provides a variety of training and education programs. Measures in the LHMP may direct the City to coordinate with the County Office of Emergency Management on appropriate issues.	http://www.lacoa.org/aboutoem.html
Los Angeles County All-Hazard Mitigation Plan	Plan Resource	The All-Hazard Mitigation Plan is the hazard mitigation plan for Los Angeles County. While it only applies to the unincorporated areas of the county and not to incorporated communities such as Torrance, the plan serves as an important source of technical information. It also allows for increased coordination between Los Angeles County and the City of Torrance on hazard mitigation activities, which the LHMP may expand upon.	http://lacoa.org/PDF/hazmitgplan.pdf
Metropolitan Water District of Southern California	Technical Resource	The Metropolitan Water District provides water to local governments and private water companies across a wide swatch of Southern California, including in Torrance. As part of these duties, the district is responsible for planning for changes in water availability and use, as may be brought on by drought or other conditions. The LHMP may direct the City to work with the district on drought-related mitigation activities.	http://www.mwdh2o.com/
South Coast Air Quality Management District	Technical Resource	The South Coast Air Quality Management District is responsible for enforcing air quality standards in some regions of Southern California, including in Torrance. Airborne releases of hazardous or potentially hazardous materials fall under the district's jurisdiction. The LHMP may direct the City to work with the district on applicable hazardous material–related matters.	http://www.aqmd.gov/

Resource Name	Type of Resource	Ability to Support Mitigation	Web Address
State and Federal Resources			
California Office of Emergency Services	Technical Resource	The California Office of Emergency Services (Cal OES) provides guidance and resources on hazard mitigation planning for jurisdictions in California. It also issues notifications on funding opportunities, including funding for hazard mitigation activities.	http://www.caloes.ca.gov/
California Multi-Hazard Mitigation Plan	Plan Resource	The Multi-Hazard Mitigation Plan is California's plan for identifying hazards and developing effective responses. The plan is an important source of information on hazards in the state, and it provides opportunities for local governments to coordinate their actions with state programs.	http://hazardmitigation.calema.ca.gov/plan/state_multi-hazard_mitigation_plan_shmp
National Oceanic and Atmospheric Administration	Technical Resource	The National Oceanic and Atmospheric Administration (NOAA) is the national agency that provides information and forecasts on science related to climate, weather, and oceans. The National Weather Service (NWS) is part of NOAA. The agency serves as a source of data on weather-related hazards and the effects of climate change.	http://www.noaa.gov/
Federal Emergency Management Agency	Technical Resource	The Federal Emergency Management Agency (FEMA) provides guidance, direction, and best practices on hazard mitigation planning. It also offers a variety of grant funding programs to support hazard mitigation activities.	http://www.fema.gov
California Department of Transportation	Technical Resource	The California Department of Transportation (Caltrans) has jurisdiction over state-designated highways in Torrance, many of which function as important evacuation routes. The City can work with Caltrans on efforts to make these highways more resilient to natural hazards.	http://www.dot.ca.gov/

Resource Name	Type of Resource	Ability to Support Mitigation	Web Address
Private Resources			
California Water Service	Technical Resource	California Water Service (Cal Water) provides water service to part of Torrance, primarily the western side of the community, through its Hermosa-Redondo and Dominguez districts. Like the City, Cal Water is required to prepare an Urban Water Management Plan to address water sources and use. Through the Urban Water Management Plan and other activities, Cal Water is a key partner in drought mitigation actions.	https://www.calwater.com/about/district-information/rd/
Southern California Edison	Technical Resource	Southern California Edison (SCE) is the electrical provider for Torrance and owns the electrical transmission and distribution infrastructure in the community. As such, SCE is an important partner for the City to help make electrical infrastructure more resilient to hazard events. The City can also work with SCE on increased energy independence so as to make the community less vulnerable to service outages or disruptions.	http://www.sce.com
Southern California Gas Company	Technical Resource	The Southern California Gas Company (SoCal Gas or SCG) provides natural gas service to Torrance and owns the associated infrastructure. The City can partner with SCG to harden natural gas infrastructure against hazard events and to support energy conservation activities that reduce vulnerability to service interruptions.	https://www.socalgas.com/

Measure Development

FEMA requires local governments to consider the benefits and costs (both monetary and non-monetary) of potential hazard mitigation measures and to determine whether these benefits exceed the cost. Local governments are not required to calculate specific dollar values for the monetary benefits and costs, although they may choose to do so. When analyzing potential measures for inclusion in an LHMP, local governments should use the following criteria at a minimum during the evaluation:

- The frequency and severity of individual hazard types, and the vulnerability of the community to these hazards.
- The injuries, damages, or other impacts reduced or avoided by the measure.
- The number of people, properties, services, or other assets that the measure benefits.
- The critical facilities that the measure benefits, including the number of facilities and their importance.
- Any environmental benefits or negative consequences resulting from the measure.

The Planning Team excluded measures that did not have adequate benefits for the community as determined by these criteria.

STAPLE/E

The Planning Team discussed potential hazard mitigation measures using the STAPLE/E (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria. Under the STAPLE/E evaluation, these seven considerations are taken into account when considering potential courses of action, such as a hazard mitigation measure. This process helps to ensure that the mitigation measures included in the City of Torrance LHMP are equitable and feasible, least damaging, and provide the maximum benefit to the community given Torrance's specific conditions and requirements. Measures that fail one or more of the evaluation criteria are not necessarily excluded from the LHMP, but this does indicate the presence of barriers that may hinder implementation, and at a minimum should be taken into account.

The Planning Team did not conduct a formal and complete STAPLE/E analysis for potential mitigation measures, but the team did discuss how STAPLE/E would be used when applying for grant funding to implement the mitigation measures after the LHMP is adopted. The Planning Team also considered how the mitigation measures in the LHMP could be evaluated under STAPLE/E, intending that there be a more complete STAPLE/E analysis during the preparation and submittal of grant applications. **Table 23** shows the STAPLE/E criteria.

Table 23: STAPLE/E Criteria

Issue	Criteria
Social	• Is the measure socially acceptable to city residents? • Would the measure treat some individuals unfairly? • Could the measure reasonably cause potential social disruption?
Technical	• Is the measure likely to reduce the underlying risk from a hazard, or will it only reduce the symptoms or consequences of the risk? • Will the measure create more problems or exacerbate existing ones? • Is the measure the most useful course of action to address the risk, given the goals of the City and community members?
Administrative	• Does the City have the administrative capabilities to implement the measure? • Are City staff available to coordinate and lead implementation of the measure, or alternatively could the City reasonably hire staff for these duties? • Does the City have sufficient technical support, staff, and funding for measure implementation? • Are there administrative barriers to implementation?
Political	• Is the measure politically acceptable to the City and to other jurisdictions present within the city's borders? • Do community members support beginning and/or continuing measure implementation?
Legal	• Does the City have the authority to implement the measure and enforce it as needed? • Are there potential legal consequences or barriers that could reasonably hinder or prevent measure implementation? • Could the measure reasonably expose the City to potential legal liabilities for any action or lack of action as a result of measure implementation? • Could the measure reasonably face legal challenges?
Economic	• What are the monetary costs of the measure, and do these costs exceed the monetary benefits? • What are the start-up, maintenance, and administrative costs associated with the measure? • Has funding for the measure been secured, or alternatively is a potential funding source available? • How will the measure affect the City's financial capabilities? • Will the measure reasonably place any potential burden on the local economy or tax base? • What are the budgetary and revenue effects of the measure to the City, if any?
Environmental	• How will the measure reasonably affect the environment? • Will the measure need environmental regulatory approvals? • Will the measure meet local, regional, state, and federal environmental regulatory requirements? • Will the measure reasonably potentially affect any endangered, threatened, or otherwise sensitive species or species of concern?

Hazard Mitigation Measures

Based on the criteria and process discussed above, the hazard profile descriptions (including the vulnerability assessments), and the Capabilities Assessment, the Planning Team developed a list of mitigation measures to reduce the risk from natural hazards in Torrance. These measures collectively form the Hazard Mitigation Strategy. **Table 24** shows the proposed mitigation measures, the responsible City department, potential funding source(s), target completion data, and priority. Measures are organized by the applicable hazard or hazards.

Table 24: City of Torrance Hazard Mitigation Measures

	Mitigation Measure	Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
All Hazards					
1.1	Provide information about reducing the risk from disasters to residents and businesses through mailers, in-person meetings and events, local media, online and social media, and other methods as appropriate. Ensure that information is easy to understand and available in widely spoken languages within the city.	Police	General Fund Grant funding		Medium priority
1.2	In collaboration with community groups and residents, develop "shelter in place" fact sheets outlining what residents should do during shelter in place situations. Distribute fact sheets to all Torrance mailing addresses and make available online.	Police	General Fund Grant funding	December 2018	High priority
1.3	Coordinate with neighboring jurisdictions and Los Angeles County to support a unified approach to reducing risks in the South Bay area and the wider Los Angeles metropolitan region.	Police	General Fund Grant funding		Low priority
1.4	Coordinate with other agencies that provide important services in the community (e.g., school districts, hospitals, utility companies, telecommunication companies) to avoid siting key community facilities in hazard-prone areas. If this is unavoidable, work with owners to reduce the risk from these hazards for new facilities.	Police	General Fund Grant funding Service fees		Low priority

Mitigation Measure		Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
1.5	Work with other agencies that provide important services in Torrance to identify existing vulnerable facilities and to retrofit or replace facilities to reduce vulnerabilities.	Community Development, Emergency Services, Public Works	General Fund		Low priority
1.6	Continue to monitor the results of federal, state, and regional inspections of railroads, pipelines, and other infrastructure. Incorporate the results of inspections into future emergency planning activities.	Fire	General Fund		Low priority
1.7	Conduct hazard assessments for all new proposed City facilities and infrastructure early in the design process, and redesign facilities and infrastructure as needed to reduce vulnerability from any relevant hazards.	General Services	General Fund Grant funding		Low priority
1.8	Regularly assess the vulnerability of City-owned critical facilities, and retrofit or replace facilities as appropriate to reduce risks.	General Services	Bond financing Capital Improvement Plan General Fund Grant funding Service fees		Low priority

Mitigation Measure		Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
1.9	When upgrading or retrofitting City facilities, integrate features to improve resiliency to applicable hazard events.	General Services	Bond financing Capital Improvement Plan General Fund Grant funding Service fees		Low priority
1.10	Evaluate the backup power needs for all appropriate critical facilities. Install or upgrade backup power systems as needed, emphasizing the use of renewable energy generation and storage systems. Explore establishing a microgrid for critical facilities.	General Services	Bond financing Capital Improvement Plan General Fund Grant funding Service fees	December 2021	High priority
1.11	Protect and restore natural habitats to provide hazard mitigation benefits, and integrate natural systems into the built environment as appropriate to help reduce hazard risks.	Community Development	Bond financing General Fund Grant funding Improvement District funds		Low priority

Mitigation Measure		Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
1.12	Ensure that the City's water interconnections with California Water Service (Cal Water) and the City of Lomita are resistant to hazard conditions and sufficient to meet Torrance's needs during emergency conditions. Retrofit or replace interconnections as appropriate, and explore opportunities to add new interconnections to other water agencies.	Public Works	Bond financing Capital Improvement Plan General Fund Grant funding Service fees		Low priority
1.13	Work with developers and property owners to design and publicize examples of buildings with hazard-resistant features.	Community Development	Development fees General Fund		Low priority
1.14	Train plan review staff to be aware of strategies to enhance building resiliency to hazards and to encourage applicants to incorporate these strategies into plans.	Community Development	Development fees General Fund		Low priority
1.15	Work with appropriate federal, state, and regional agencies and institutions to improve understanding of future hazard locations, frequency, and severity, especially hazards that may be affected by climate change.	Police	General Fund		Low priority
1.16	Incorporate information about hazards and hazard mitigation strategies contained in the Local Hazard Mitigation Plan into the Torrance General Plan, the Torrance Municipal Code, and other planning efforts and City documents as appropriate.	Community Development, Emergency Services	General Fund Grant funding	Ongoing	Medium priority

	Mitigation Measure	Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
1.17	Continue to improve and refine the risk assessment for Torrance, including risks of injury or death, property damage, loss of important services, and other threats to personal health and well-being	Police	General Fund Grant funding		Medium priority
1.18	Regularly monitor funding opportunities for hazard mitigation activities, and pursue appropriate funding sources that become available.	Police	General Fund	Ongoing	High priority
Drought					
2.1	Partner with the Metropolitan Water District and evaluate long-term water availability for the community. In particular, consider the risks of increased drought frequency and severity as a result of climate change. Integrate the results of this analysis into future water management planning efforts.	Public Works	General Fund Service fees		Low priority
2.2	As feasible, construct planned wells and resolve any water quality issues at existing wells to maximize groundwater production within the City's adjudicated right. Ensure that all groundwater production is maintained at a sustainable level.	Public Works	Bond financing Capital Improvement Plan General Fund Grant funding Service fees		Medium priority

Mitigation Measure		Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
2.3	Explore constructing new water storage facilities, or expand the storage capacity of existing facilities, to maximize water availability during an emergency situation.	Public Works	Bond financing Capital Improvement Plan General Fund Grant funding Service fees		Low priority
2.4	Work with California Water Service (Cal Water) to provide free or low-cost water audits to Torrance residents and businesses.	Public Works	General Fund Grant funding Service fees		Low priority
2.5	Promote Property Assessed Clean Energy (PACE) programs to Torrance residents and businesses as a way to finance water efficiency retrofits, and distribute information about other financing mechanisms and available rebates.	City Manager	General Fund		Low priority
2.6	When creating new landscaped areas or renovating existing ones, choose plant species that require little or no irrigation to the extent possible.	Public Works	General Fund Improvement District funds		Medium priority
2.7	Publicize information on water conservation techniques through print media, television, online and in social media, in-person events and workshops, and other methods as appropriate.	Public Works	General Fund Grant funding		Low priority

	Mitigation Measure	Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
Seismic Hazards					
3.1	Maintain and regularly update records of seismically vulnerable structures in the community, such as soft first-story buildings or unreinforced masonry structures.	Community Development	General Fund Grant funding	Ongoing	High priority
32	Incentivize or require that seismically vulnerable buildings be retrofitted to improve resilience to seismic events, and develop financing mechanisms to help property owners support retrofits.	Community Development	Bond financing Development fees Grant funding		Low priority
3.3	When retrofitting existing City facilities or constructing new ones, design structures to still be usable following a major seismic event to the extent possible, rather than designing only to minimize injury to occupants.	General Services	Bond financing Capital Improvement Plan Grant funding	Ongoing	High priority
3.4	Install and maintain film on windows in City facilities to reduce injury from broken glass, and encourage private property owners to use similar features.	General Services	General Plan Grant funding		Low priority
3.5	Use flexible piping to the extent feasible for new water and wastewater pipes.	Public Works	Bond financing Capital Improvement Plan General Plan Grant funding Service fees		Low priority

	Mitigation Measure	Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
Extreme Weather					
4.1	Designate facilities throughout Torrance as cooling centers to provide relief during extreme heat events, set to automatically open when temperatures reach a certain level. Ensure that facilities are available in all parts of the city. Distribute information about the availability of cooling centers to community members, and alert community members when cooling centers are open.	Community Services	General Fund Grant funding		Medium priority
4.2	Train City outdoor workers, including landscaping, construction, and recreation staff, in reducing the risk from extreme heat and how to provide emergency first aid to persons suffering from heat-related conditions. Work with local businesses and community groups to encourage providing similar training to private sector employees.	Public Works	General Fund Grant funding		Low priority
4.3	Design new and substantially retrofitted public spaces to increase the use of shade trees or shade structures, high-reflectivity surfaces, and other features to reduce the urban heat island effect. Encourage private landowners to incorporate these features into new or substantially retrofitted developments.	General Services	Bond financing Capital Improvement Plan Development fees General Fund Grant funding Improvement District funds		Low priority

	Mitigation Measure	Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
4.4	In coordination with community organizations, provide increased outreach and check-ins to vulnerable individuals during extreme temperatures, including elderly residents, homeless individuals, and socially isolated persons.	City Manager	General Fund Grant funding		Low priority
4.5	Continue to support weatherization of older homes and those occupied by lower-income persons.	Community Development	General Fund Grant funding Improvement District funds		Low priority
4.6	Encourage new and significantly retrofitted buildings to use wind-resistant design features such as interlocking shingles, reinforced doors, and laminated or impact-resistant glass.	Community Development	Development fees General Fund		Low priority
4.7	In coordination with SCE, identify and strengthen or replace utility poles that may be old, damaged, or otherwise vulnerable to high winds. Support efforts to underground power lines where feasible.	City Manager	General Fund		Medium priority
Hazardous Materials					
5.1	Support efforts to require the use of stronger storage containers for hazardous materials, including aboveground storage tanks and freight cars.	City Manager	General Fund	Ongoing	High priority

	Mitigation Measure	Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
5.2	Coordinate with the South Coast Air Quality Management District and hazardous material facilities to ensure prompt and accurate distribution of information to emergency staff and members of the public in the event of a hazardous material release.	City Manager	General Fund		Medium priority
5.3	Establish and publicize additional collection sites for hazardous materials, including electronic waste, and conduct educational campaigns to raise awareness on the safe use and disposal of household hazardous materials.	Public Works	General Fund Grant funding		Low priority
5.4	Expand community outreach, training, and exercises surrounding large hazardous materials generators within the city and in surrounding areas.	City Manager	General Fund	Ongoing	High priority
Floods					
6.1	Use low-impact development (LID) strategies in City-maintained landscapes, roads, and parking lots to reduce runoff and erosion during flood events.	Public Works	Bond financing Capital Improvement Plan General Fund Grant funding Improvement District funds		Low priority

Mitigation Measure		Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
6.2	Encourage or require the use of LID strategies on new or significant renovations to private parking lots, plazas, or other large open areas.	Public Works	Development fees General Fund Improvement District funds		Low priority
6.3	Identify areas where ponding frequently occurs during heavy rainfall, and install new drains or upgrade existing ones to reduce ponding.	Public Works	Bond financing Capital Improvement Plan General Fund Grant funding Improvement District funds		Medium priority
6.4	Ensure that City-owned water reservoirs and storage tanks are extensively reinforced to minimize the risk of failure.	Public Works	Bond financing Capital Improvement Plan General Fund Grant funding Service fees	December 2021	High priority
6.5	Ensure that an adequate supply of sandbags is available to Torrance residents and businesses, including prefilled sandbags for individuals who may have difficulty filling their own.	Public Works	General Fund		Low priority

	Mitigation Measure	Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
Diseases and Pest Management					
7.1	To the extent possible, replace vulnerable street trees and landscaping with plant species that are more resistant to infection.	Public Works	Capital Improvement Plan General Fund Grant funding Improvement District funds		Low priority
7.2	In coordination with the Los Angeles County West Vector Control District, distribute information about reducing the risk of vector-borne diseases, particularly mosquito-borne diseases.	Public Works	General Fund Grant funding		Low priority
7.3	Continue to identify and repair areas of standing water at City facilities, including in maintenance yards and landscaped areas.	Public Works	General Fund		Low priority
7.4	Continue to monitor the status of mosquitoes at Madrona Marsh. Conduct abatement activities and/or close the marsh to members of the public as necessary.	Community Services	General Fund Grant funding		Low priority
7.5	Work with local and regional health care authorities to provide information on contagious diseases and to make vaccines and other forms of preventive care widely available.	City Manager	General Fund Grant funding		Low priority

	Mitigation Measure	Responsible Department(s)	Potential Funding Source(s)	Target Completion Date	Priority
Geologic Hazards					
8.1	Plant and maintain vegetation along cliffs and slopes to hold soil together and reduce the potential for landslides.	Public Works	Abatement District funds General Fund Grant funding Improvement District funds		Low priority
8.2	Evaluate installing landslide nets, walls, or other protective measures along roadways in landslide-prone areas.	Public Works	Abatement District funds Capital Improvement Plan General Fund Grant funding Improvement District funds		Low priority
8.3	Continue to require new construction in landslide-prone areas to prepare geologic studies, stabilize slopes, and incorporate design features to reduce the risk of landslides.	Community Development	Development fees General Fund		Low priority

PLAN MAINTENANCE

It is vital that the City of Torrance LHMP remain up to date, so as to best ensure that the community is protected against hazard events based on the most recent scientific information and best practices. A current LHMP also makes the City eligible for federal and state funding to support hazard mitigation activities. The Plan is organized so that individual sections can be easily upgraded and incorporated into the LHMP as needed, rather than updating the entire Plan.

This chapter discusses the process for reviewing and updating the Plan to ensure it remains actively used, relevant and appropriate to the community, and consistent with applicable state and federal requirements. It describes how the City will incorporate the mitigation measures discussed in the previous chapter into existing City programs and planning mechanisms. This chapter also discusses how the City will make public participation a key component of the Plan maintenance, implementation, and update process.

Monitoring, Evaluating, and Updating the Plan

Coordinating Body

The City of Torrance Planning Team is responsible for maintaining this Plan and updating it as needed. The City's Police Department is the primary municipal department responsible for this process, under the direction of the Emergency Services Coordinator (ESC) or other appropriate staff member. The ESC or their designee will serve as the LHMP project manager and will coordinate maintenance of the Plan, conduct the formal review process, and direct the Plan updates. The project manager will assign tasks, which may include collecting data, developing new or updated mitigation measures, updating sections of the Plan, and presenting the Plan to others. Other key departments on the Planning Team are:

- City Attorney
- City Clerk
- City Manager
- City Treasurer
- Communications and Information Technology
- Community Development
- Community Services
- Finance
- Fire
- General Services
- Human Resources
- Police
- Public Works
- Transit

All Planning Team members are responsible for implementing and evaluating the Plan as appropriate.

Evaluation

When the Plan is not being updated, the Planning Team should meet at least once each year to focus on the timing of implementing the mitigation measures, evaluating the measures that are currently being implemented and determining if they are successful, revising priorities as necessary, and integrating the mitigation measures into other planning documents. These annual meetings will begin in the 2017 calendar year. To the extent possible, the meetings should be timed with the overall department planning and budgeting process as part of the City's budget development.

When evaluating the Plan and the hazard mitigation measures, the Planning Team should consider the following items:

- Any hazard events that have occurred in Torrance in the previous year, and the impact of these hazards on the community.
- Mitigation measures that have been successfully implemented.
- Mitigation measures that were scheduled for implementation, but were not implemented.
- The implementation schedule for future mitigation measures, and whether it is appropriate and feasible to adjust the schedule.
- Any issues not covered by existing mitigation measures that could be addressed by new or revised measures.
- Any potential or observed changes in funding opportunities, including grants, which can support mitigation activities.
- New scientific or mapping data related to the hazards discussed in the Plan.
- Any other planning programs or initiatives that involve hazard mitigation and are applicable to Torrance.

The Planning Team will summarize the results of this annual evaluation in a progress report for City department heads and the Torrance City Council. The progress report will also be posted to the City's website and distributed through other means and to the media as appropriate. Members of the public will have opportunities to comment on the progress report.

Method and Schedule for Plan Updates

Title 44, Section 201.6(d)(3) of the Code of Federal Regulations requires that local hazard mitigation plans be reviewed, revised as needed, and resubmitted to FEMA for review and approval every five years in order for communities to remain eligible for the benefits under the Disaster Mitigation Act, as discussed in Chapter 1. The City of Torrance will seek to maintain a five-year update schedule from the date of this Plan's adoption, in order to maintain eligibility for these benefits. The update process should begin no later than four years after the Plan is adopted, allowing a year for

the new plan to be updated, reviewed, and adopted before the older Plan expires. The update process is set to begin in 2020, one year before the expiration of this Plan. The update process may be accelerated as circumstances require, including under the following conditions:

- A Presidential Disaster Declaration for Torrance or any area that includes Torrance
- A hazard event resulting in a loss of life in Torrance

The update process will add new planning methods, demographic data and community information, hazard data and events, vulnerability analyses and climate change considerations, mitigation measures and best practices, and other new information as warranted. This process will ensure that the Plan remains current. The Planning Team will determine specific needs for the update as part of the annual review, although the update should follow the following guidance:

- Involve at least one member from each City department in the Planning Team.
- Contact local agencies and other applicable stakeholders at the beginning of the process to gauge their interest and involve them in the update process.
- Review and update the hazard profiles and vulnerability assessments to be consistent with best available information and best practices.
- Update and improve hazard mapping and critical facility analyses.
- Review and revise mitigation measures to address items that have been completed, deferred, cancelled, or revised due to an updated vulnerability assessment or new policies in other City documents.
- Send the draft updated Plan to the appropriate external agencies.
- Make the draft updated Plan available for public comment prior to adoption.
- Transmit the draft updated Plan to Cal OES and FEMA for review and approval.
- Adopt the final updated Plan within one year of the commencement of the update process.

Adoption

The Torrance City Council is responsible for adopting the updated Plan. Adoption should occur once every five years, and as mentioned above should occur within one year of the commencement of the update process, before the current Plan expires. Adoption should happen after FEMA notifies the City that the Plan is Approved Pending Adoption. Once the City Council adopts the LHMP, the City of Torrance Police Department will transmit the adopted Plan to FEMA.

Implementation

This Plan's effectiveness depends on how effectively the mitigation measures it contains are implemented. Implementation activities include incorporating the mitigation measures into existing City plans, policies, programs, and other mechanisms. The City has prioritized the Plan's mitigation measures and identified those that will be implemented through existing mechanisms as the resources to do so become available.

The LHMP project manager is responsible for implementing, coordinating, promoting, and maintaining this Plan through all appropriate mechanisms. The project manager is also responsible for facilitating implementation of the Plan and meetings related to Plan maintenance. While the Planning Team is collectively responsible for implementation and evaluation of the Plan, specific mitigation measures fall under the responsibility of the lead department(s) identified for each measure.

The City of Torrance General Plan is an integral partner of this Plan, particularly the Safety Element, which provides a high-level framework for the City's hazard mitigation and preparedness. This Plan allows the City to expand upon the policies in the Safety Element and other applicable sections of the General Plan. The General Plan and this LHMP work together to help reduce the impacts of hazards on human health and safety activities, public and private property, the environment, and key services. Many of the mitigation measures will be implemented as part of programs created or guided by the General Plan and other adopted plans.

Continued Public Involvement

When the LHMP is evaluated, the City will continue to inform members of the public about City actions and the status of the process through the City's website and other appropriate media. Copies of the annual progress report will be distributed to members of the public. When the LHMP is updated, the Planning Team will develop a revised public involvement strategy that reflects the needs and capabilities of Torrance at that time. This strategy shall, at a minimum, include direction on the use of the City of Torrance's website, local media outlets, and other appropriate information systems such as social media.

Point of Contact

The City of Torrance Police Department is responsible for preparing future updates of the Torrance LHMP.

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City of Torrance | Local Hazard Mitigation Plan

Public Review Draft | September 2016

APPENDIX A
PROJECT MEETING MATERIALS

Kick-off Meeting | January 14, 2016

Included Materials

1. Meeting overview
2. Meeting agenda
3. Data collection packet
4. Meeting presentation
5. Public engagement strategy
6. Draft survey
7. Hazards worksheet
8. Mitigation actions tracker

City of Torrance

Local Hazard Mitigation Plan

Kick-off Meeting

January 14, 2016 | 10:00 am

Agenda

1. Introductions (5 minutes)
2. Project Goals & Expectations (10 minutes)
3. Staffing & Communication Protocols (5 minutes)
4. Local Hazard Mitigation Plan (LHMP) Overview (20 minutes)
5. Engagement & Outreach (20 minutes)
    a. LHMP Planning Team
    b. Public survey
6. Data Collection & Critical Facilities
    a. Hazards of concern (20 minutes)
    b. Critical facilities (15 minutes)
    c. Hazard Prioritization (15 minutes)
7. Work Plan & Schedule Review (10 minutes)
    a. Overview of work program, key tasks, and schedule
    b. Wrap-up and next steps

Project Overview

The City of Torrance is initiating a planning effort to prepare a Local Hazard Mitigation Plan (LHMP). This plan serves as the City's five-year strategic plan to analyze and mitigate natural hazards in the community. Preparation of the LHMP increases the City's eligibility for future disaster mitigation and post-disaster grant funding from FEMA.

Local Hazard Mitigation Plan

DMA 2000 (Public Law 106-390) provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions and replacing them with a new set of requirements that emphasize the need for State, local, and Indian Tribal entities to closely coordinate mitigation planning and implementation efforts. The requirement for a State mitigation plan is continued as a condition of disaster assistance, adding incentives for increased coordination and integration of mitigation activities at the State level through the establishment of requirements for two different levels of state plans. DMA 2000 also established a new requirement for local mitigation plans and authorized up to 7 percent of HMGP funds available to a State for development of State, local, and Indian Tribal mitigation plans.

Completion and acceptance of the City's LHMP by FEMA opens up access to the following competitive FEMA grant programs for the next 5 years:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)

Under these programs up to 75% of the cost of an implementation project could be covered by a FEMA grant.

Preliminary Goals of the Project

At the kick-off meeting, the project team will have the opportunity to discuss and confirm project goals. Based on guidance from the City's 2004 Hazard Mitigation Plan, preliminary goals for the HMP to consider include the following:

- Protect life and property by making homes, businesses, infrastructure, critical facilities, and other property more resilient to hazards. Reduces losses and repetitive damage from chronic hazards.
- Improve hazard assessment information to focus new development away from at-risk areas and to encourage preventative measures for existing development in vulnerable areas.
- Create education and outreach programs to increase public awareness of hazard risks. Provide information on tools, partnerships, and funding to help implement hazard mitigation efforts. Support public participation in developing hazard mitigation strategies.

- Conduct hazard mitigation planning along with watershed planning, natural resource management, and land use planning, to protect life, property, and the environment. Protect, restore, and enhance natural systems to provide natural hazard protections.
- Improve participation between public agencies, citizens, non-profit organizations, businesses, and industry. Encourage leadership on hazard mitigation in both the public and private sectors.
- Coordinate hazard mitigation planning with emergency operation plans and procedures. Involve non-profit organizations, businesses, and industry to strengthen emergency operations.

Project Objectives

Drawn from the preliminary goals identified above, the following project objectives have been drafted. Each objective has a corresponding question that will help refine the Plan's approach.

A. Continued coordination with key stakeholders and other agencies, including surrounding communities.
    a. Who are key stakeholders to contact?
B. A flexible and engaging public outreach campaign.
    a. What are the lessons learned from previous outreach events?
C. A more effective and up-to-date approach to reducing the risk from hazards.
    a. What hazard mitigation efforts have been successful or unsuccessful in the past?
D. Address aging infrastructure and critical facilities issues to reduce/minimize future hazards and disasters.
    a. What facilities and infrastructure are at risk in your opinion?

Torrance Hazard Mitigation Planning Team

This core team of City staff members will participate in actively reviewing and commenting on the City's Local Hazard Mitigation Plan. The following is a listing of City departments and external stakeholders that should be involved. At least one staff member from each department should be in attendance for any meetings scheduled for the project.

- City of Torrance Building and Safety Department
- City of Torrance Office of the City Manager
- City of Torrance Disaster Council
- City of Torrance Economic Development Department
- City of Torrance Emergency Preparedness (E-Prep)Team
- City of Torrance Finance Department
- City of Torrance Fire Department
- City of Torrance GIS
- City of Torrance Hazard Mitigation Advisory Committee
- City of Torrance Community Development Department
- City of Torrance Police Department
- City of Torrance Public Works Department
- City of Torrance Community Services
- City of Torrance Environmental Services

Critical Facilities

See attached Data Collection Packet

Engagement Strategy

See attached Engagement Strategy

Hazards of Concern Prioritization

See Hazards Ranking Worksheet

Schedule

Task	Anticipated Deadline
Conduct meeting #1	January 14, 2016
Preparation of Draft Online Survey	January 14, 2016
City Review of Draft Online Survey	January 28, 2016
Online Survey collection	February 2016
Conduct meeting #2	February 2016
Conduct Meeting #3	March 2016
Preparation of Administrative Draft LHMP	April 2016
City Review of Administrative Draft LHMP	May 2016
Preparation of Draft LHMP	June 2016
City Review/Approval of Draft LHMP	June 2016
Public Review Period for Draft LHMP	July 2016
Cal OES/FEMA Review of Draft LHMP	August 2016
Preparation of Final LHMP	TBD
Public Hearings	TBD

Kick-off Attendee Sign-In Sheet (January 14, 2016)

Name	Department/Company	Telephone	Email

Name	Department/Company	Telephone	Email

City of Torrance

Local Hazard Mitigation Plan

Kick-off Meeting

January 14, 2016 | 10:00 am

Agenda

1. Introductions (5 minutes)
2. Project Goals & Expectations (10 minutes)
3. Staffing & Communication Protocols (5 minutes)
4. Local Hazard Mitigation Plan (LHMP) Overview (15 minutes)
5. Engagement & Outreach (30 minutes)
    a. LHMP Planning Team
    b. Public survey
6. Data Collection & Critical Facilities
    a. Hazards of concern (20 minutes)
    b. Critical facilities (15 minutes)
    c. Mitigation strategies (15 minutes)
7. Work Plan & Schedule Review (10 minutes)
    a. Overview of work program, key tasks, and schedule
    b. Wrap-up and next steps

City of Torrance

Local Hazard Mitigation Plan Data Collection

1) GIS Data

GIS layers for the following data will be needed for analyses and mapping:

- Locations of critical facilities and assets
- City limits
- Streets and highways
- Land use designations
- Earthquake shaking zones
- Liquefaction zones
- Tsunami hazard zones
- Landslide risk zones
- Flood zones (including 100-year and 500-year floodplains)
- Location of hazardous materials facilities
- Dam inundation zones
- Other hazard risk zones

Please provide GIS layers to apfannenstiel@mbakerintl.com. If the files are too large to email, contact Aaron Pfannenstiel at 909.918.2998 for access to our FTP site. Please feel free to provide any other data layers you would like us to include in the analysis or feel would be useful.

2) Hazards

The following hazards were identified in the draft LHMP. Please confirm that these hazards are still present in the community.

- Earthquakes (including liquefaction)
- Flooding
- Landslides
- Public health emergencies (pandemics)
- Severe weather (winds/tornadoes)
- Tsunamis
- Technological/Human caused hazards (hazardous materials)

If other hazards have appeared in the community since 2004, or if the definitions of the above hazards should be expanded, please list them or explain below.

3) Critical Facilities and Assets

Facility Name	Address	Building Replacement Value	Contents Replacement Value
City Facilities			
City Hall	3031 Torrance Blvd.		

Facility Name	Address	Building Replacement Value	Contents Replacement Value
City Hall North Wing	3031 Torrance Blvd		
Library	3301 Torrance Blvd.		
Southeast Library	23115 S. Arlington		
Personnel Office Bldg.	3231 Torrance Blvd		
Civic Center-Police Facility	3300 Civic Center Dr.		
Cable Communication	3350 A Civic Center Dr.		
Fire Station #1	1701 Crenshaw Blvd.		
Fire Test Pit	25135 Robinson Way		
Fire Station #2	25135 Robinson Way		
Fire Training Tower	25135 Robinson Way		
Fire Station #4	5205 Calle Mayor		
Fire Station #5	3940 Del Amo Blvd.		
Historical Museum	1345 Post Avenue		
No. Torr. Library	3604 W. Artesia		
Walteria Library	3815 W. 242nd Street		
Henderson Library	4805 Emerald Street		
Airport Control Tower	25301-25311 Aeroway		
Pump Bldg. #1	174th & Yukon		
Pump Bldg. #2	174th & Yukon		
Water Pump Bldg.	Crenshaw & Crest		
Bartlett Center	1318 Cravens Avenue		
Delthorne Park Rest Room	3401 Spencer Street		
Recreation Bldg.	3624 W. Artesia		
Restrooms & Storage	3624 W. Artesia		
Mcmaster Park Bldg.	3624 W. Artesia		
Switchhouse & Storage	3624 W. Artesia		
Swimming Pool	3331 Civic Center		
Civic Center Bath House	3331 Torrance Blvd.		
Attic Teen Center	2320 W. Carson		
Scout Center	2365 Plaza Del Amo		
Walteria Rec. Bldg.	3855 W. 242nd St.		
Picnic Area Shelter	3855 W. 242nd Street		
Walteria Maint. Bldg.	3855 W. 242nd St.		
Walteria Park Restroom	3855 W. 242nd St.		

Facility Name	Address	Building Replacement Value	Contents Replacement Value
Sea Aire Recreation Bldg.	22730 Lupine Drive		
Sea Aire Maint. Bldg.	22730 Lupine Drive		
Restroom & Storage	19501 Inglewood Ave.		
La Romeria Rec. Bldg.	19501 Inglewood Ave		
Community Center/Tillum	3612 W. Artesia		
El Nido Rec. Bldg.	18301 Kingsdale		
El Nido Restrooms Showers	18301 Kingsdale		
El Nido Restroom & Storage	18301 Kingsdale		
Switchhouse	18301 Kingsdale		
Recreation Center	3341 Torrance Blvd.		
Joslyn Center	3335 Torrance Blvd.		
Hickory Park Restrooms	2850 232nd Street		
Victor Park Restrooms	4727 Emerald St		
Victor Park Shelter	4727 Emerald St.		
El Retiro Library	126 Vista Del Parque		
El Retiro Rec. Bldg.	126 Vista Del Parque		
El Retiro Restroom	126 Vista Del Parque		
El Retiro Rotary Bldg.	126 Vista Del Parque		
El Retiro Rotunda And Picnic Shelter	126 Vista Del Parque		
Alta Loma Recreation	26126 Delos Drive		
Alta Loma Restroom	26126 Delos Drive		
Wilson Park-Garage	2300 Crenshaw Blvd.		
Yard	25640 Crenshaw Blvd.		
Fire Station #3	3535 W. 182 St.		
Sur La Brea Restrooms	23610 Cabrillo Avenue		
Sur La Brea Rec. Center	26310 Cabrillo Avenue		
Columbia Park Restrooms	190th & Prairie		
Picnic Canopy	4045 190th		
15 Executive T-Hangars - 2735 B -P	3239 Airport Drive		
36 Medium T-Hangars - 2719 F-N; 2723 E-M	3239 Airport Drive		
271 Small T-Hangars - Numbers/Map On File	3239 Airport Drive		
Public Works Garage-Bus Servicing	20500 Madrona Ave.		

Facility Name	Address	Building Replacement Value	Contents Replacement Value
Public Works Garage-Service Center	20500 Madrona Ave.		
Fire Station #6	21401 Del Amo Circle		
Volunteer Center	1230 Cravens		
Building #1	20500 Madrona		
Building #2	1520 Greenwood Ave		
Building #3	1520 Greenwood Ave.		
Computer Equipment	3031 Torrance Blvd		
Theater	3330 Civic Center Dr.		
Cultural Arts Marketing Room	3330 Civic Center Drive		
Cultural Arts Building	3330 Civic Center Drive		
Cultural Arts Children Arts Building	3330 Civic Center Drive		
Office, Garage, Storage	2223-2227 Border Ave.		
Clubhouse	25924 Rolling Hills Rd		
Dee Hardison Sports Center	2400 Jefferson		
Nature Center	3201 Plaza Del Amo		
City Yard	20500 Madrona		
Downtown Pcc	1215 El Prado		
Water Pumps	Elm & Sierra		
Well #7/Water Pumping Station	2223 Border Ave.		
Calle Mayor Water Pump Station	5205 Calle Mayor		
Vista Del Parque Sewer Pump Station	168 Vista Del Parque		
General Aviation Center	3301 Airport Drive		
Vista Montana Water Pump Station	4249 Vista Montana		
Water Facility - 200' E. Of Palos Verdes Blvd.	5210 Sepulveda		
Cypress St. Pump Station	Cypress & Sepulveda		
Huber Ave. Pump Station	24011 Huber		
Pennsylvania Ave. Pump	23507 Pennsylvania		
Walteria Water Pump Station	25640 Crenshaw		
Water Reservoir	Crenshaw & Crest		
Cal Water Well*	502 Calle De Arboles		
Walteria Stormwater Pump Station	Skypark & Hawthorne		
Amie Stormwater Pump	Amie & Spencer		

Facility Name	Address	Building Replacement Value	Contents Replacement Value
El Dorado Stormwater Pump	El Dorado & Maple		
Madrona Marsh Stormwater Pump	Maple & Sepulveda		
Pioneer Stormwater Pump	Pioneer & Challenger		
Doris Way Stormwater Pump Station	23042 Doris Way		
237th Street Stormwater Pump Station	237th & East Of Telo		
Mwd Connection T-1*	190th St & Western Ave		
Mwd Connection T-5*	Walnut & Pacific Coast Hwy		
Mwd Connection T-6*	Walnut & 234th St.		
Mwd Connection T-7*	Walnut & Pacific Coast Hwy		
Mwd Connection T-8*	Sepulveda Ave. & Western Ave.		
Tmwd Water Well*	2332 Abalone Ave.		
Tmwd Emergency Connection*	Ellinwood & Sepulveda Ave.		
Tmwd Emergency Connection	Walnut & Sepulveda Ave.		
Tmwd Emergency Connection*	Pennsylvania Ave. & 239th St.		
Tmwd Emergency Connection*	Arlington Ave & 239th St.		
405 Fwy/Artesia Overpass & Ramps*	Artesia Blvd. & I405 Fwy		
405 Fwy/Crenshaw Overpass & Ramps*	Crenshaw Blvd. & I405 Fwy		
405 Fwy/Prairie Overpass*	Prairie Ave. & I405 Fwy		
405 Fwy/Rbb Overpass & Ramps*	Redondo Beach Blvd. & I405 Fwy		
405 Fwy/Van Ness Overpass*	Van Ness Blvd. & I405 Fwy		
405 Fwy/Western Overpass & Ramps*	Western Ave. & I405 Fwy		
405 Fwy/Yukon Overpass*	Yukon Ave. & I405 Fwy		
Railroad Bridge - Crenshaw Blvd.*	Crenshaw Blvd. & Dominguez		
Railroad Bridge - Hawthorne/190th St.*	Hawthorne & 190th		

Facility Name	Address	Building Replacement Value	Contents Replacement Value
Del Amo Extension	Maple To Crenshaw		
Pedestrian Bridge	Prairie & 187th St		
Historic Bridge	Torrance & Western		
Pedestrian Bridge	4801 Pacific Coast Hwy		
Railroad Bridge	190th St./Hawthorne		
Railroad Bridge	Prairie / Mobil		
Schools			
Arlington Elementary	17800 Van Ness Ave		
Ascension Elementary	17910 Prairie		
Carr Elementary	3404 W. 168th St		
Casmir Middle	17220 Casmir		
Children's Center	4120 W 185th St		
Edison Elementary	3800 W 182nd St		
Hamilton Adult	2606 W 182nd St		
Lincoln Elementary	2418 W 166th St		
Magruder Middle	4100 W 185th St		
North High School	3620 W 182nd St		
School Of Life Elem/Middle	18090 Prairie Ave.		
St. Catherine Elem/Middle	3846 Redondo Beach Blvd		
Yukon Elementary	17815 Yukon Ave.		
Anza Elementary	21400 Ellinwood		
Bishop Montgomery High School	5430 Torrance Blvd		
Burt Lynn Middle	5038 Halison		
Jefferson Adult	21717 Talisman		
South Bay Academy	4400 Del Amo Blvd		
St. James Elementary	4625 Garnet		
Towers Elementary	5600 Towers		
Victor Elementary	4820 Spencer		
West High School	20401 Victor		
Kinder Care Center	1520 Greenwood		
Fern Elementary	1314 Fern Ave		
First Lutheran Elementary	1725 Flower St		
Madrona Middle	21364 Madrona		
Nativity Catholic Elem/Middle	2371 Carson St		
Socalroc	2300 Crenshaw		

Facility Name	Address	Building Replacement Value	Contents Replacement Value
Sherry High School	2600 Vine St		
Torrance Adult	2291 Washington		
Torrance Elementary	2125 Lincoln		
Torrance High School	2200 Carson St		
Arnold Elementary	4100 W 227th St		
Calle Mayor Middle	4800 Calle Mayor		
Newton Adult	23751 Nancy Lee		
Richardson Middle	23751 Nancy Lee		
Riviera Elementary	365 Paseo De Arena		
Seaside Elementary	4651 Sharynne		
South High School	4801 Pacific Coast Hwy		
Adams Elementary	2121 W 238th St		
Hickory Elementary	2800 W 227th St		
Hull Middle	2080 W 231st St		
Levy Adult	3420 W 229th St		
Walteria Elementary	24465 Madison St		
Wood Elementary	2250 35th St		

If any facilities should be added or removed, please explain. The City may wish to consider adding key non-government facilities, such as hospitals.

4) Recent Disasters

Please provide information about any disasters that occurred since the 2004 LHMP was adopted.

In any of the recent disasters, were critical facilities damaged or destroyed? If so, please provide information below.

Facility	Type of Disaster	Description of Damage

Facility	Type of Disaster	Description of Damage

5) Annexations and Current Projects

Describe any recent, ongoing, or planned future annexations. Discuss any large construction projects in the community that are under construction, approved, or otherwise planned.

6) Emergency Responders

Please describe any mutual aid agreements the City is committed to.

Michael Baker
INTERNATIONAL

We Make a Difference

City of Torrance

Local Hazard Mitigation Plan

Project Kickoff

Meeting Objectives

- Goals, expectations, and schedules
- Staffing and communication protocols
- Plan development process
- Public outreach and engagement
- Critical facilities
- Hazard prioritization

Project Goal and Objectives

Responsibilities

Our job

- Facilitate the process
- Provide technical expertise
- Do the heavy work

Your job

- Participate
- Make final decisions
- Ensure plan is feasible and meets needs
- Provide local insight

Data Needs

- Every person can provide vital data
  - GIS data (City facilities and hazards)
  - Information and experience about past events
  - Institutional knowledge
- If you have useful data, please contact *Aaron Pfannenstiel*

  (909) 919-2998

  apfannenstiel@mbakerintl.com

Goals for Hazard Mitigation Planning

LHMP Goals

From the City's 2004 Hazard Mitigation Plan:

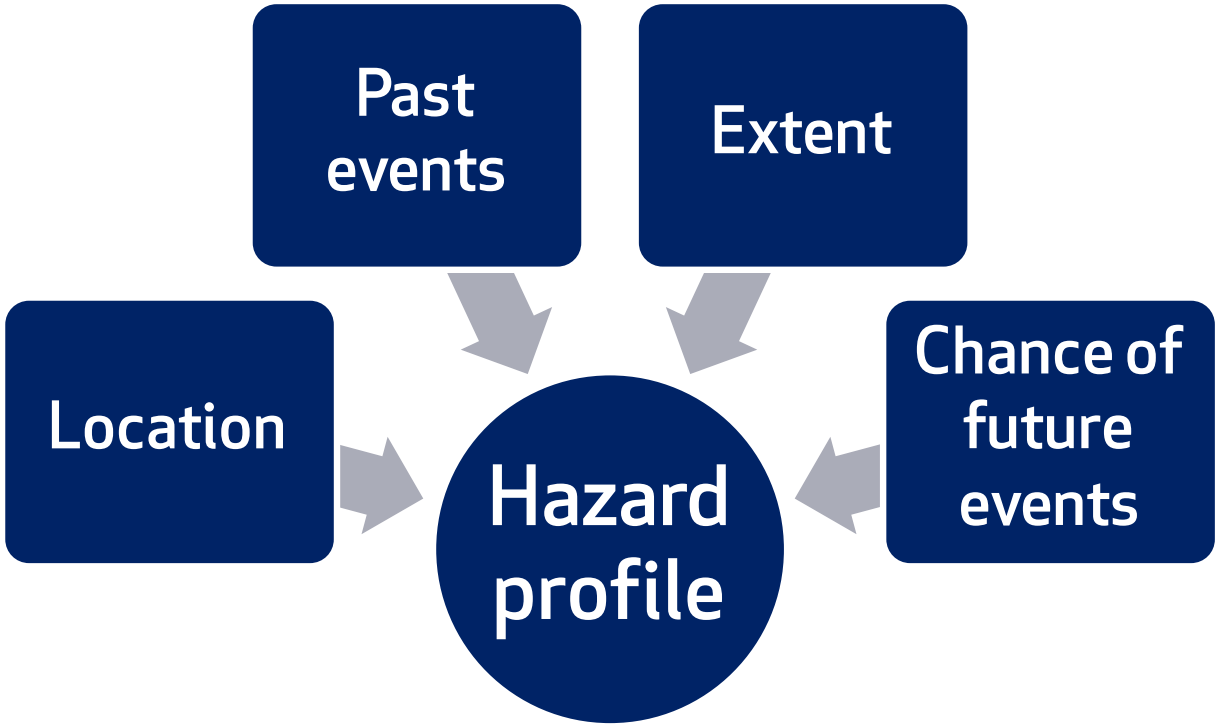
- Make structures more resilient
- Improve hazard assessments
- Create education and outreach efforts
- Support the local environment through hazard planning
- Improve public and private participation
- Coordinate hazard planning and emergency operations

Local Hazard Mitigation Plan (LHMP) Development

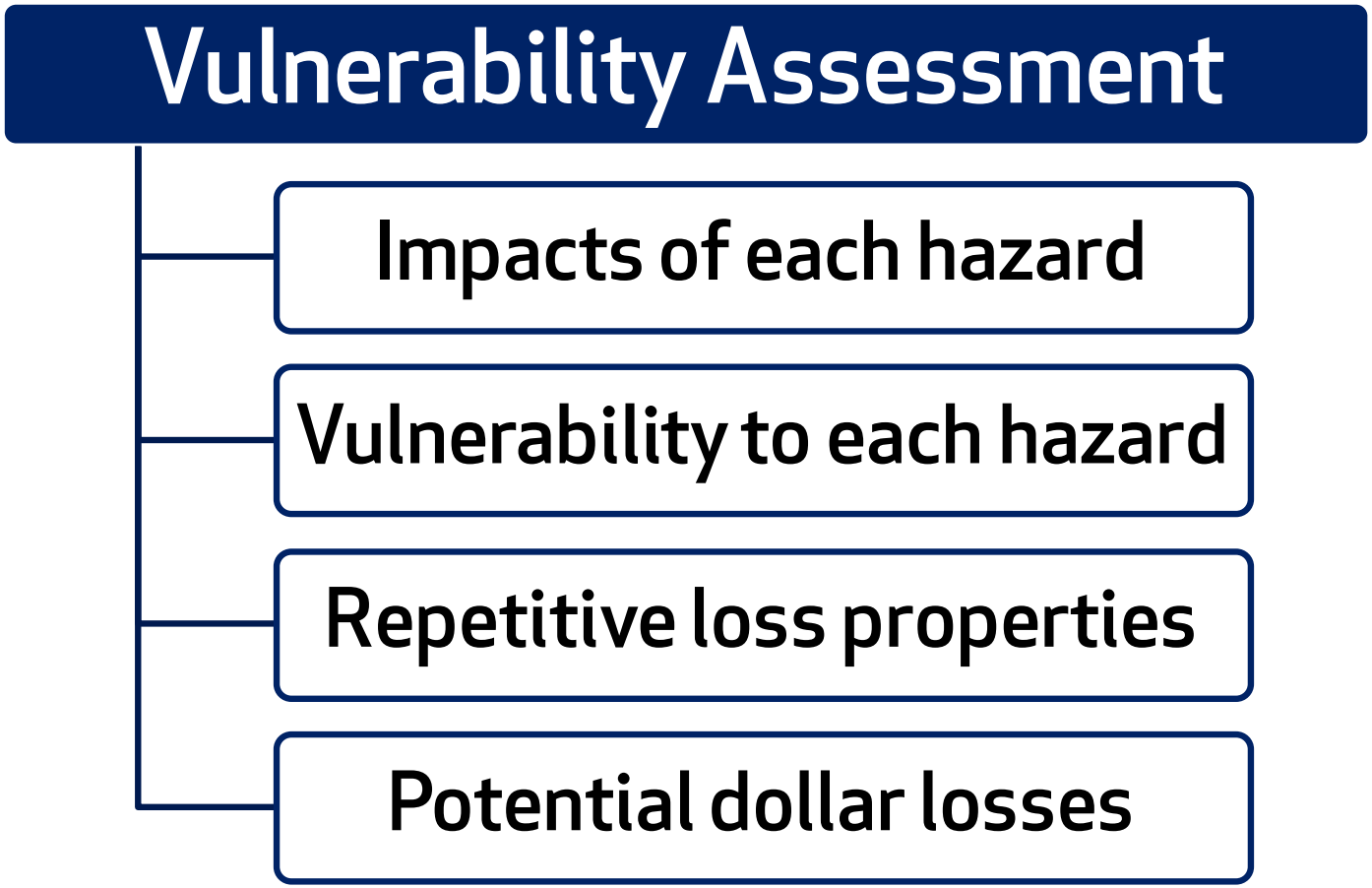
Plan Development Process

Plan Process – Hazard Identification and Risk Assessment

- Describe all hazards that affect the community.
- Provide rationale for excluding recognized hazards.



Plan Process – Vulnerability Assessment



Plan Process – Mitigation Strategies

Goals

- Overarching objectives

Strategies

- Comprehensive, specific actions

Action plan

- Prioritizes actions
- Includes responsibilities and cost-benefit review

LHMP Requirements

Plan Requirements – Mitigation Strategies

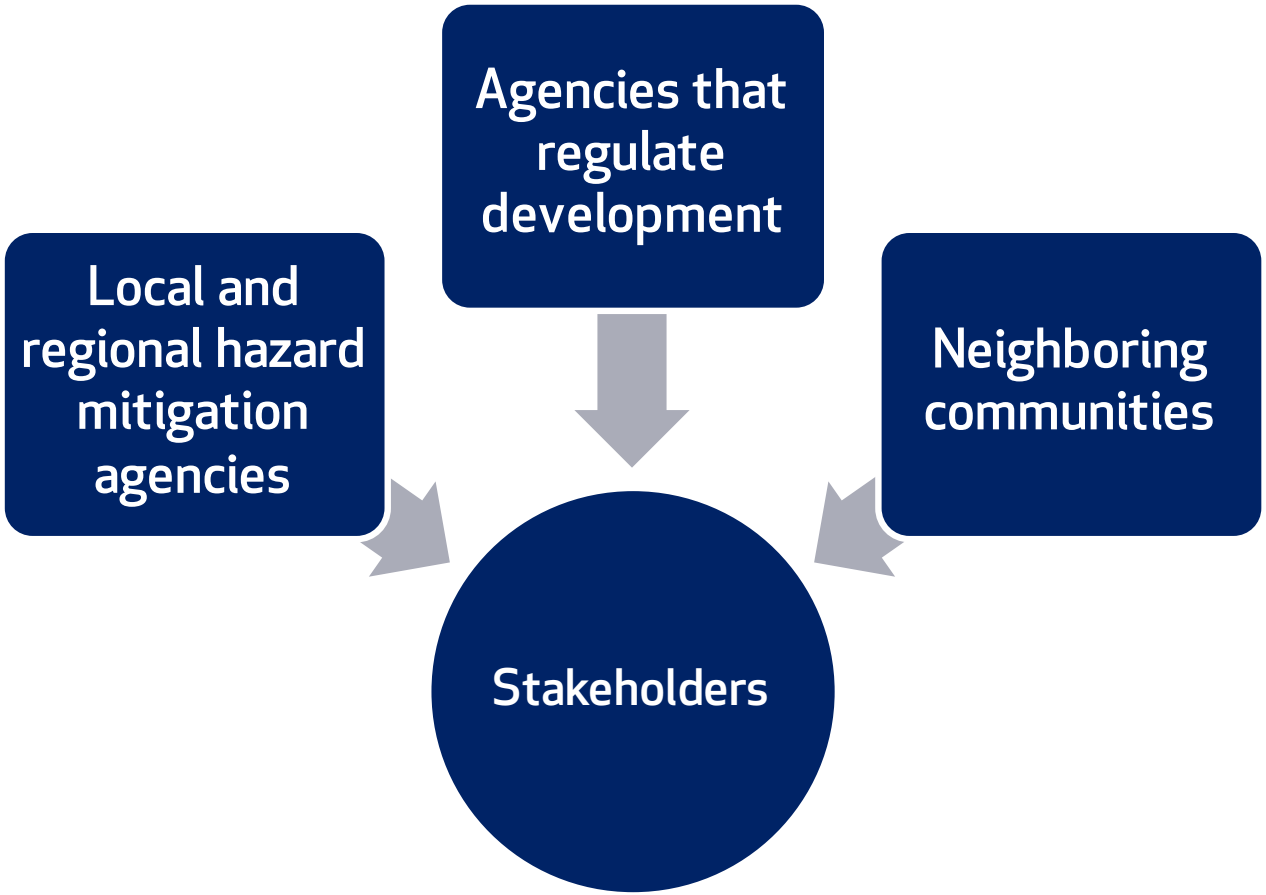
- Strategy identifies existing authorities, policies, programs, and resources to mitigate hazards
- Includes description of participation in National Flood Insurance Program

Plan Requirements

Must describe:

- How the plan was prepared
- Who was involved
- Opportunities for public and stakeholder involvement
- Review and inclusion of existing plans, reports, studies, etc.
- Continual public participation
- Monitoring and updating of the plan

Plan Requirements - Stakeholders



Plan Requirements - LHMP Planning Team

- Agency representatives to advise and contribute to plan preparation
- Three LHMP Planning Team meetings:
  - Meeting 1 – Review and discuss hazard mitigation process, and prioritization of hazards
  - Meeting 2 – Review and discuss risk assessment, mitigation goals, and actions discussion
  - Meeting 3 – Review and discuss draft mitigation action prioritization, implementation, and monitoring.

Plan Requirements – Planning Process
LHMP Planning Team

- City of Torrance Building and Safety Department
- City of Torrance Office of the City Manager
- City of Torrance Disaster Council
- City of Torrance Economic Development Department
- City of Torrance Emergency Preparedness (E-Prep) Team
- City of Torrance Finance Department
- City of Torrance Fire Department
- City of Torrance GIS
- City of Torrance Hazard Mitigation Advisory Committee
- City of Torrance Community Development Department
- City of Torrance Police Department
- City of Torrance Public Works Department
- City of Torrance Community Services
- City of Torrance Environmental Services

Engagement and Outreach

Public Outreach Strategy – Online Survey

- Awareness of potential hazards
- Preventative/resiliency actions
- Insurance status
- Current state of readiness
- Special needs
- Hazard education and training
- Impacts of past hazards

Hazard Identification and Prioritization

FEMA-Suggested Hazards

Avalanche	Flood	Seismic hazards
Climate change	Geological hazards	Severe winter storm
Coastal erosion	Hailstorm	Tornado
Coastal storm	Hazardous materials	Tsunami
Dam failure	Human-caused hazards	Volcano
Disease/pest management	Hurricane	Wildfire
Drought	Land subsidence	Wind
Earthquake fault rupture	Landslide and mudflow	Windstorm
Expansive soils	Liquefaction	
Extreme heat	Sea level rise	

Relevant Hazards

Avalanche	Flood	Seismic hazards
Climate change	Geological hazards	Severe winter storm
Coastal erosion	Hailstorm	Tornado
Coastal storm	Hazardous materials	Tsunami
Dam failure	Human-caused hazards	Volcano
Disease/pest management	Hurricane	Wildfire
Drought	Land subsidence	Wind
Earthquake fault rupture	Landslide and mudflow	Windstorm
Expansive soils	Liquefaction	
Extreme heat	Sea level rise	

Hazards in Draft Plan

- Earthquakes and liquefaction
- Flooding
- Landslides
- Public health emergencies (pandemics)
- Severe weather (wind/tornadoes)
- Tsunamis
- Technological/human-caused hazards (hazardous materials)

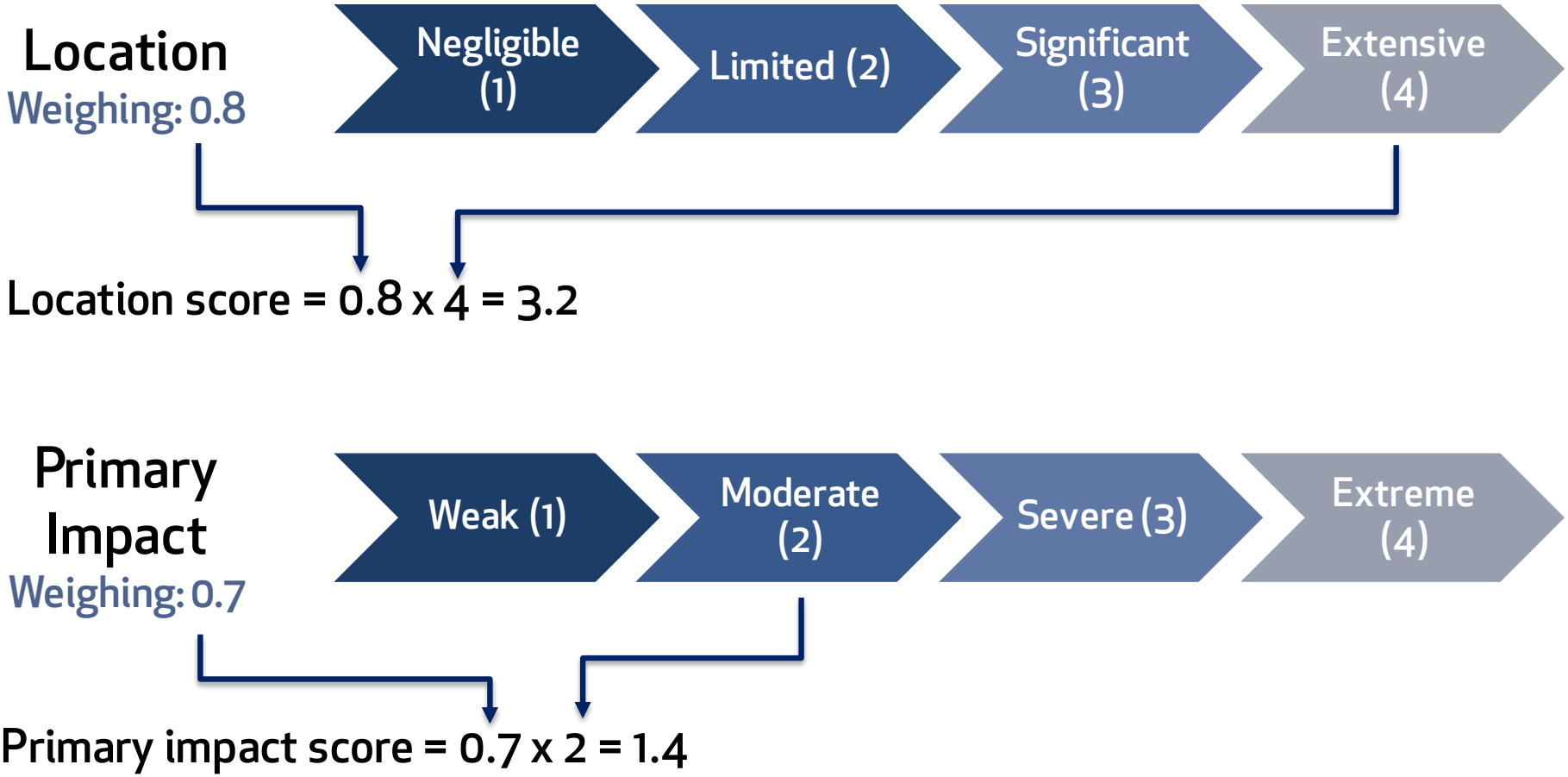
Past Hazard Events

- Long Beach earthquake, 1933
- Localized flooding, up to 1950s
- Intense storms and flooding, 1983
- Landslides, 1986 and 1998
- Exxon refinery explosion, 2015

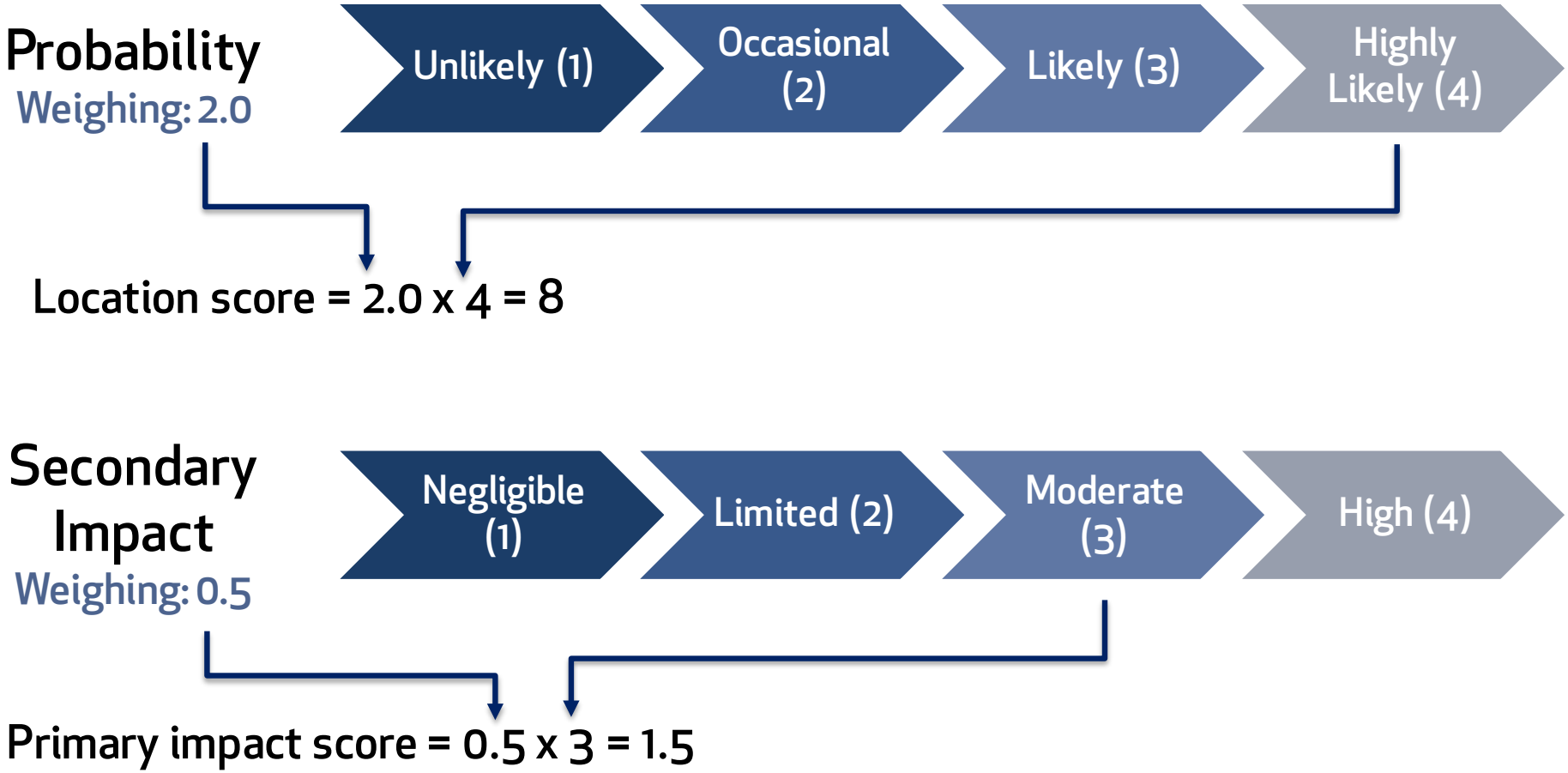
Hazard Prioritization

- Four criteria [Weightings]
  - Probability (likelihood of occurrence) [2.0]
  - Location (size of potentially affected area) [0.8]
  - Maximum Probable Extent (intensity of damage) [0.7]
  - Secondary Impacts (severity of impacts to community) [0.5]
- Each criteria is judged on a scale of 1-4
- Every criteria has an Importance Score (weighing)
  - Affects the influence of an individual criterion
  - Criteria and Importance values are combined to calculate a Total Score

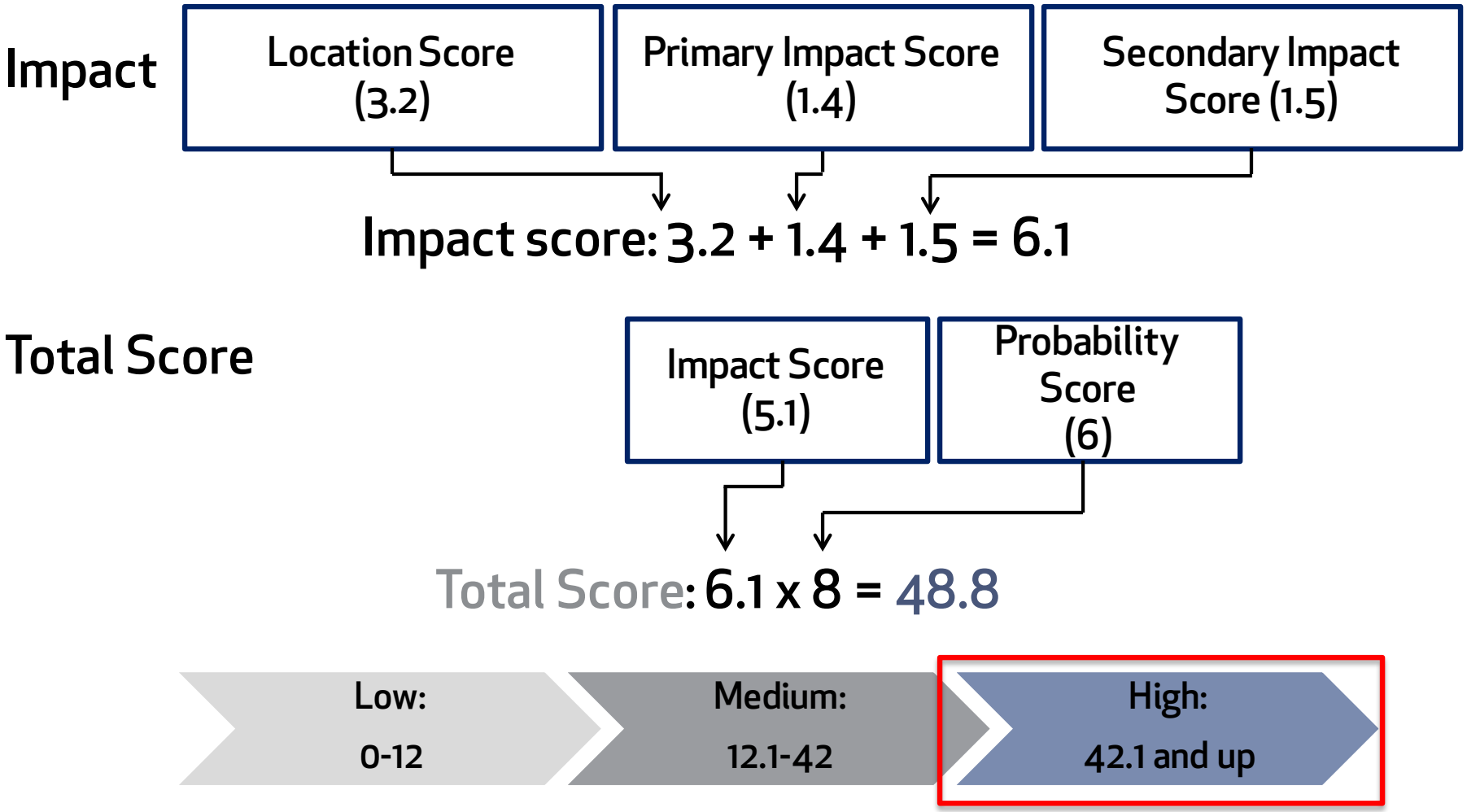
Score Example: Drought



Score Example: Drought



Score Example: Drought



Critical Facilities

Critical Facilities

- Facilities that provide key services to City residents and businesses
  - Can be owned by the City, other government agencies, or private groups
- Possible examples
  - City Hall
  - Fire stations
  - Schools
  - Hospitals
  - Airport control tower
  - Community centers
  - Water wells and pumps
  - Freeway overpasses

Critical Facilities

- Risk assessment looks at what facilities are in hazard zones.
  - Considers their replacement cost and value to the community.
- Mitigation strategies reflect vulnerabilities of critical facilities.
  - Strengthen existing vulnerable facilities.
  - Avoid building new ones in at risk-areas.

Next Steps

Task	Timeframe
Conduct meeting #1	January 14, 2016
Preparation of Draft Online Survey	January 14, 2016
City Review of Draft Online Survey	January 28, 2016
Online Survey collection	February 2016
Conduct meeting #2	February 2016
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Preparation of Final LHMP	TBD
Public Hearings	TBD

Questions/Comments?

Aaron Pfannenstiel
apfannenstiel@mbakerintl.com
909-918-2998

City of Torrance

Local Hazard Mitigation Plan - Public Engagement Strategy

FEMA requires an open public involvement process during the development of local hazard mitigation plans. Jurisdictions such as Torrance must document the opportunities for public engagement both during the initial drafting stage of the plan and prior to plan approval. The following outreach task will meet FEMA requirements while providing a meaningful opportunity for public input. This recommended approach provides an opportunity to engage local residents along with those from neighboring communities, agencies, businesses, and other organizations.

Online Survey regarding Hazards

Survey Period: February 2016

The Michael Baker International team proposes the development of an online survey that can be distributed online to respondents of the City's choice enlisting input on the hazard mitigation planning process. This survey will be developed online using SurveyMonkey, allowing respondents to answer questions regarding hazards and hazard-related issues in the City. Michael Baker recommends posting the survey during the month of February to allow for public comment. This provides residents an ongoing opportunity to provide input on hazards during plan development. Following the close of the survey, Michael Baker will download survey results and provide a tabulated summary of responses for inclusion as an appendix in the LHMP.

2016 City of Torrance Hazard Mitigation Plan Survey

I. Introduction

Dear Community Member,

The City of Torrance, in an effort to continually protect and serve its customers, is conducting a local effort to prepare a Hazard Mitigation Plan. This plan identifies natural hazards throughout the City and assesses the vulnerability of critical infrastructure and facilities to these hazards. Using this understanding, the plan lists potential actions to reduce risk and future damage.

Is your home or office building susceptible to damage from earthquakes, floods, or fire? Do you want to recover more quickly from disasters and prevent future damage from these and other natural hazards? Your participation in this survey can make the City more resilient to disasters. Your responses to this survey will inform the plan preparation. Thank you for your time and cooperation to respond to the brief survey below.

II. Hazard Awareness

1. Please indicate whether you live or work in City of Torrance
   a. I live in City of Torrance
   b. I work in City of Torrance
   c. I live and work in City of Torrance
   d. Neither apply to me, but I am interested in the City's resiliency
2. What is the ZIP Code of your home?

   _____

3. Have you been impacted by a disaster in your current residence?
   a. Yes
   b. No
4. If you answered yes to the previous question, please select the type of disaster that you have been impacted by (select all that apply).
   a. Earthquakes
   b. Flooding
   c. Landslides
   d. Extreme heat
   e. Fire
   f. Severe weather
   g. Exposure to hazardous materials

Please list any additional hazards that have previously impacted your neighborhood or home.

5. The following hazards could potentially impact the City. Please mark the THREE (3) hazards that are of most concern to your neighborhood or home.
   a. Dam failure
   b. Flooding
   c. Severe weather (high winds, hail, heavy rain, etc.)
   d. Earthquakes

Please list any additional hazards that present a threat to your neighborhood or home.

6. The planning team is using various data sources to identify hazards in your community; however, some of these data sources do not provide local data at a general City-wide level. Are there any small-scale issues, such as ponding at a certain intersection during rain, that you would like the planning team to consider?
   a. I am not aware of any local hazards
   b. I am aware of local hazards

If you are aware of such hazards, please provide as much detail as possible, including location and type of hazard.

7. If you are a homeowner, do you have adequate homeowners insurance to cover the hazards that could impact your home?
   a. Yes, my insurance coverage should be adequate.
   b. No, I don't believe my insurance coverage would be adequate for a major disaster.
   c. Unsure.
   d. I do not have an insurance policy.
   e. Not applicable; I rent my current residence.
8. If you rent your residence, do you have renters insurance?
   a. Yes
   b. No
   c. Not applicable; I own my residence.
9. Do you have flood insurance for your home?
   a. Yes, I own my home and have flood insurance.
   b. Yes, I rent my home and have flood insurance.
   c. No, but I am interested in reviewing flood insurance options (http://www.floodsmart.gov/floodsmart/).
10. Please note any additional insurance you have for your home or property.

11. Have you done anything to your home to make it less vulnerable to hazards such as earthquakes, floods, and fires? Do you plan to?
    a. Yes, I have taken action to make my home less vulnerable to hazards.
    b. I have not taken action to make my home less vulnerable to hazards, but do plan to.
    c. No, I have not and do not place to take action to make my home less vulnerable to hazards.

12. If a severe hazard event occurred today such that all services were cut off from your home (power, gas, water, sewer) and you were unable to leave or access a store for 72 hours, which of these items do you have readily available?
    a. Potable water (3 gallons per person)
    b. Cooking and eating utensils
    c. Can opener
    d. Canned / nonperishable foods (ready to eat)
    e. Gas grill / camping stove
    f. Extra medications
    g. First aid kit / supplies
    h. Portable AM/FM radio (solar powered, hand crank, or batteries)
    i. Handheld "walkie-talkie" radios (with batteries)
    j. Important family photos / documentation in a water- and fireproof container
    k. Extra clothes and shoes
    l. Blanket(s) / sleeping bag(s)
    m. Cash
    n. Flashlight (with batteries)
    o. Gasoline
    p. Telephone (with batteries)
    q. Pet supplies
    r. Secondary source of heat

What else do you have in your emergency kit?

For more information on preparing an emergency kit, please visit: http://m.fema.gov/build-a-kit

13. Are you familiar with the special needs of your neighbors in the event of a disaster situation (special needs may include limited mobility, severe medical conditions, memory impairments)?
    a. Yes
    b. No
14. Are you a trained member of your Community Emergency Response Team (CERT)?
    a. Yes
    b. No, but I would like to learn more about CERT.
    c. No, I am not interested in being a trained CERT member.

For more information about CERT, please visit: www.citizencorps.gov/cert.

Please share with us why you are a trained CERT member or why you are not yet part of CERT.

15. How can the City help you become more prepared for a disaster? (choose all that apply)
    a. Provide effective emergency notifications and communication.
    b. Provide training and education to residents and business owners on how to reduce future damage.
    c. Provide community outreach regarding emergency preparedness.
    d. Create awareness of special needs and vulnerable populations.
    e. Other (please specify)

If you do NOT work in the City of Torrance, please skip to question 19.

16. What is the ZIP code of your workplace?
17. Does your employer have a plan for disaster recovery in place?
    a. Yes
    b. No
    c. I don't know
18. Does your employer have a workforce communications plan to implement following a disaster so they are able to contact you?
    a. Yes
    b. No

III. Recommendations and Future Participation

19. Please list any studies you are aware of conducted in the City or the region regarding the risk of future hazard events (e.g., mining impact studies, dam inundation analyses).

20. Would you like to review and comment on the draft of the 2015 City of Torrance Hazard Mitigation Plan?
    a. Yes; please notify me using my contact information in the next question.
    b. No
21. If you would like to be notified of future opportunities to participate in hazard mitigation and resiliency planning, please provide your name and e-mail address. If you do not have an e-mail address, please provide your mailing address.

Full Name:	
E-Mail Address:	
Street Address:	
City, State, Zip:	

22. Please provide us with any additional comments/suggestions/questions that you have regarding your risk of future hazard events.

Thank you for taking the time to complete this survey. If you have any questions, or if you know of other people/organizations that should be involved, please contact Aaron Pfannenstiel at apfannenstiel@mbakerintl.com.

City of Torrance

Hazard Ranking Tool

Definitions

Importance

The importance of each category is a weight assigned to each category. In the default setting of this tool, probability is weighted more highly than other categories. The user can define these weights based on the relative importance of these categories to the community for its decision making process.

Probability

The probability of a hazard occurring should be based on estimated likelihood of occurrence from historical data. These definitions are from FEMA in the Local Mitigation Planning Workbook, March 2013. This tool assigns numeric values to each level of probability.

Definitions:

Unlikely: Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.

Occasional: 1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.

Likely: 10 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.

Highly Likely: 90 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.

Potential Hazards*
Avalanche
Climate Change
Coastal Erosion
Coastal Storm
Dam Failure
Disease/Pest Management
Drought
Earthquake Fault Rupture
Expansive Soils
Extreme Weather
Extreme Heat
Flood
Geological Hazards

Location

Based on size of geographical area of community affected by hazard. Definitions are from the FEMA Local Mitigation Planning Handbook, March 2013.

Definitions:

Negligible: less than 10 percent of planning area or isolated single point occurrences

Limited: 10 to 25 percent of the planning area or limited single point occurrences

Significant: 25-75 percent of planning area or frequent single-point occurrences

or consistent single-point occurrences

Maximum Probable Extent (Impact)

Based on percentage of damage to typical facility in community. Definitions are from the FEMA Local Mitigation Planning Handbook, March 2013.

Definitions:

Weak: Limited classification on scientific scale, slow speed of onset or short duration of event, result in little to no damage.

Moderate: Moderate classification of scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days

fast speed of onset or long duration of event,

Extreme: Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions.

Hail
Hazardous Materials
Human-Caused Hazards
Hurricane
Land Subsidence
Landslide and Mudflow
Liquefaction
Lightning
Sea Level Rise
Seismic Hazards
Severe Wind
Severe Winter Weather
Storm Surge
Tornado
Tsunami
Volcano
Wildfire
*Adapted from FEMA Local Mitigation Planning Handbook, March 2013

Secondary Impacts

Based on estimated secondary impacts to community at large. These impacts are not from FEMA but constitute important impacts that ripple through communities.

Definitions:

Negligible: no loss of function, downtime, and/or evacuations

Limited: minimal loss of function, downtime, and/or evacuations

Moderate: some loss of function, downtime, and/or evacuations

High: major loss of function, downtime, and/or evacuations

Hazard Planning Consideration

Hazard planning consideration is a numerical score calculated for each hazard. This score enables users to rank the potential impacts of hazards and get a sense for their relative dangers. These values are not derived from FEMA guidance but have been widely used in hazard planning.

Each hazard is scored along four categories on a scale of 1-4. These values are then multiplied by the importance assigned to each category.

Overall Importance

The overall importance of a hazard is a summary descriptor use defined by the FEMA Local Mitigation Handbook. There are no numeric ratings assigned to the overall importance of a hazard though these designations are roughly equivalent to the numeric scoring used in this tool.

Definitions:

Low: Two or more criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with minimal or unknown record of occurrences or for hazards with minimal mitigation potential.

Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is sometimes used for hazards with a high extent rating but very low probability rating.

High: The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area.

HAZARD RANKING WORKSHEET - City of Torrance						DATE: 1/14/2016
Hazard Type	**Probability**	**Impact**			**Total Score**	**Hazard Planning Consideration**
		Location	**Primary Impact**	**Secondary Impacts**		
Drought	4	4	4	4	64.00	High
Seismic Hazards	4	4	4	4	64.00	High
Earthquake Fault Rupture	4	2	4	4	51.20	High
Hazardous Materials	3	4	3	3	40.80	Medium
Severe Wind	3	4	3	2	37.80	Medium
Extreme Weather	2	4	4	4	32.00	Medium
Flood	4	2	2	2	32.00	Medium
Disease/Pest Management	3	2	2	2	24.00	Medium
Geological Hazards	2	2	3	3	20.80	Medium

Probability

Based on estimated likelihood of occurrence from historical data

Importance
2.0

Probability	Score
Unlikely	1
Occasional	2
Likely	3
Highly Likely	4

Location

Based on size of geographical area of community affected by hazard

Importance
0.8

Affected Area	Score
Negligible	1
Limited	2
Significant	3
Extensive	4

Maximum Probable Extent (Primary Impact)

Based on percentage of damage to typical facility in community

Importance
0.7

Impact	Score
Weak - little to no damage	1
Moderate - some damage, loss of service for days	2
Severe - devastating damage, loss of service for months	3
Extreme- catastrophic damage, uninhabitable conditions	4

Secondary Impacts

Based on estimated secondary impacts to community at large

Importance
0.5

Impact	Score
Negligible - no loss of function, downtime, and/or evacuations	1
Limited - minimal loss of function, downtime, and/or evacuations	2
Moderate - some loss of function, downtime, and/or evacuations	3
High - major loss of function, downtime, and/or evacuations	4

Total Score = Probability x Impact, where:

Probability = (Probability Score x Importance)

Impact = (Affected Area + Primary Impact + Secondary Impacts), where:

Affected Area = Affected Area Score x Importance

Primary Impact = Primary Impact Score x Importance

Secondary Impacts = Secondary Impacts Score x Importance

Hazard Planning Consideration

Total Score	Range	Distribution	Hazard Level
0.0	12.0	9	Low
12.1	42.0	6	Medium
42.1	64.0	3	High

The probability of each hazard is determined by assigning a level, from unlikely to highly likely, based on the likelihood of occurrence from historical data. The total impact value includes the affected area, primary impact and secondary impact levels of each hazard. Each level's score is reflected in the matrix. The total score for each hazard is the probability score multiplied by it's importance factor times the sum of the impact level scores multiplied by their importance factors . Based on this total score, the hazards are separated into three categories based on the hazard level they pose to the communities: High, Medium, Low.

HAZARD RANKING WORKSHEET - City of Torrance DATE: 6/14/2016

Hazard Type	Probability	Impact			Hazard Planning Consideration
		Location	Primary Impact	Secondary Impacts	
Drought	Highly Likely	Extensive	Extreme	High	
Seismic Hazards	Highly Likely	Extensive	Extreme	High	
Earthquake Fault Rupture	Highly Likely	Limited	Extreme	High	
Hazardous Materials	Likely	Extensive	Severe	Moderate	
Severe Wind	Likely	Extensive	Severe	Limited	
Extreme Weather	Occasional	Extensive	Extreme	High	
Flood	Highly Likely	Limited	Moderate	Limited	
Disease/Pest Management	Likely	Limited	Moderate	Limited	
Geological Hazards	Occasional	Limited	Severe	Moderate	
Hazard 10					
Hazard 11					
Hazard 12					
Hazard 13					
Hazard 14					
Hazard 15					
Hazard 16					
Hazard 17					
Hazard 18					

Probability — Importance: 2.0

Based on estimated likelihood of occurrence from historical data

Score	Probability
1	Unlikely
2	Occasional
3	Likely
4	Highly Likely

Maximum Probable Extent (Primary Impact) — Importance: 0.7

Based on percentage of damage to typical facility in community

Score	Impact
1	Weak
2	Moderate
3	Severe
4	Extreme

Location — Importance: 0.8

Based on size of geographical area of community affected by hazard

Score	Affected Area
1	Negligible
2	Limited
3	Significant
4	Extensive

Secondary Impacts — Importance: 0.5

Based on estimated secondary impacts to community at large

Score	Impact
1	Negligible
2	Limited
3	Moderate
4	High

Overall Importance (Based on overall hazard to community)

Low	Minimal impact on the planning area. Hazards have minimal or unknown record of occurrences or minimal mitigation potential.
Medium	Event's impacts on the planning area are noticeable but not devastating. Hazards with a high extent rating but very low probability rating.
High	Event is likely/highly likely to occur with sever strength over a significant to extensive portion of the planning area.

Multi-Hazard Action Items	Status
Protect Life and Property	
Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to natural hazards.	
Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.	
Improve hazard assessment information to make recommendations for discouraging new development and encouraging preventative measures for existing development in areas vulnerable to natural hazards.	
Public Awareness	
Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.	
Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.	
Natural Systems	
Balance watershed planning, natural resource management, and land use planning with natural hazard mitigation to protect life, property, and the environment.	
Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.	
Partnerships and Implementation	
Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.	
Encourage leadership within public and private sector organizations to prioritize and implement local, county, and regional hazard mitigation activities.	
Emergency Services	
Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.	
Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.	
Coordinate and integrate natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	

If completed or in progress, what has been completed?

If not started or abandoned, why?

#	Mitigation Action Items
Natural Hazard: Earthquake	
Short Term #1	The City shall monitor ongoing research on faults in the area.
Short Term #2	Continue to upgrade and enforce building codes for the design of new construction that resists seismic activity and geologic hazards.
Long Term #1	Encourage education and information dissemination to reduce the risk of non-structural and structural earthquake hazards in homes, schools, businesses, and government offices.
Long Term #2	Protection of life and property from fire, geologic, and seismic hazards.
Long Term #3	To provide the Citizens of Torrance with the safe disposition of hazardous waste.
Long Term #4	To mitigate property loss and death. Provide for uninterrupted services and continuation of government after a seismic event.
Natural Hazard: Landslide	
Short Term #1	Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas.
Short Term #2	Improve soil stability through vegetation placement and management plans.
Long Term #1	Limit activities in identified potential landslide areas through regulation and public outreach.
Natural Hazard: Floods	
Short Term #1	City Staff shall monitor the Supervisory Control and Data Acquisition (SCADA) System that monitors, via a computer system the pressure, flow, and water level of the above-ground tanks, reservoirs, water retention bases, and water pipelines in the City.
Short Term #2	Engage in Community Outreach and Education.
Long Term #1	Enhance and update data and mapping for flood prone information within the City, as needed, which includes surface water drainage obstructions.
Long Term #2	Capital Improvement Plan updating
Natural Hazard: Multi Hazard	
Short Term #1	Integrate the goals and action items from the City of Torrance Natural Hazard Mitigation Plan into existing regulatory documents and programs, where appropriate.
Short Term #2	Identify and pursue funding opportunities to develop and implement local and City mitigation activities
Short Term #3	Develop inventories of City facilities and infrastructure.
Long Term #1	Continue multi-hazard approach to disaster planning and mitigation.

Coordinating Organization	Status
Community Development/Building and Safety	
Building and Safety	
Emergency Services Coordinator	
Fire Department	
Fire Department/Public Works	
General Services/CIT/Police Department	
Community Development Department	
Building and Safety	
Community Development Department	
Water Department	
Street Department/Emergency Services Coordinator	
Building and Safety	
Public Works	
Community Development Department	
Emergency Services Coordinator	
General Services/Public Works	
City Emergency Preparation Team	

If completed or in progress, what has been completed?

If not started or abandoned, why?

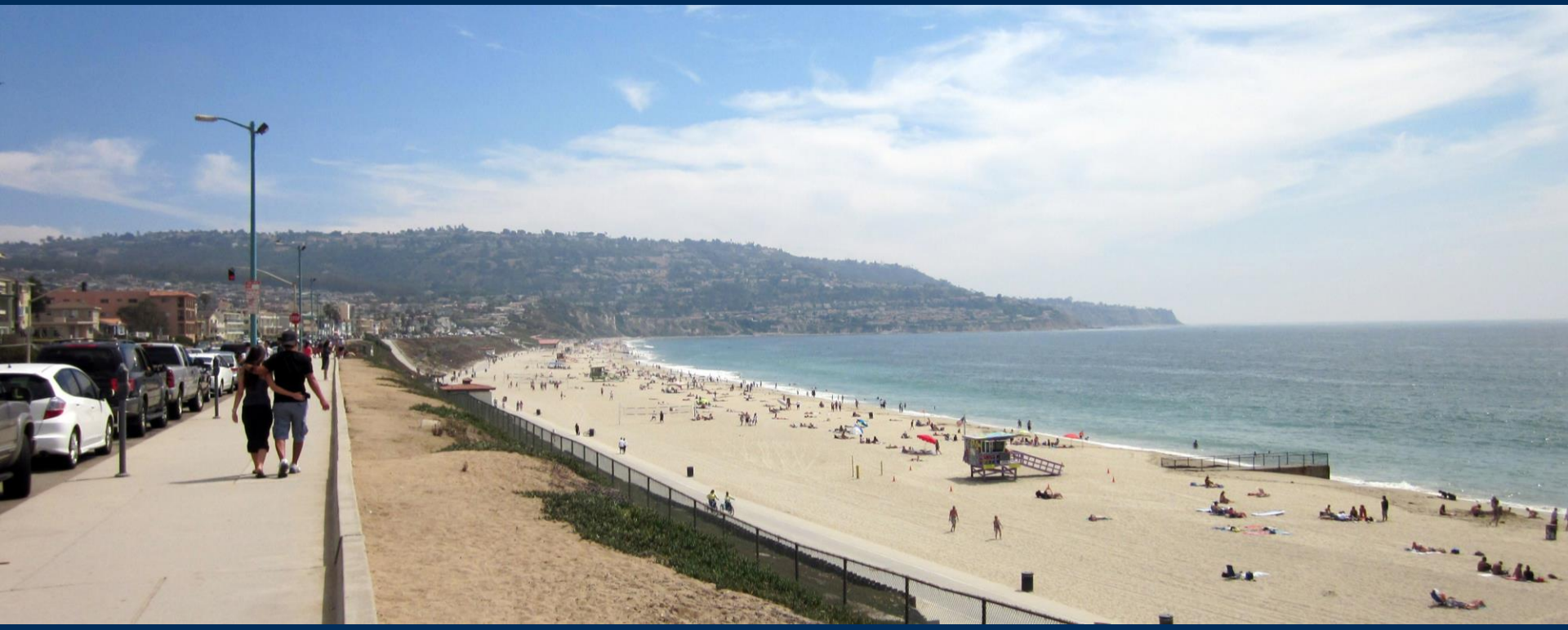
Project Meeting 2 | May 5, 2016

Included Materials

1. Meeting presentation

Michael Baker
INTERNATIONAL

We Make a Difference



City of Torrance

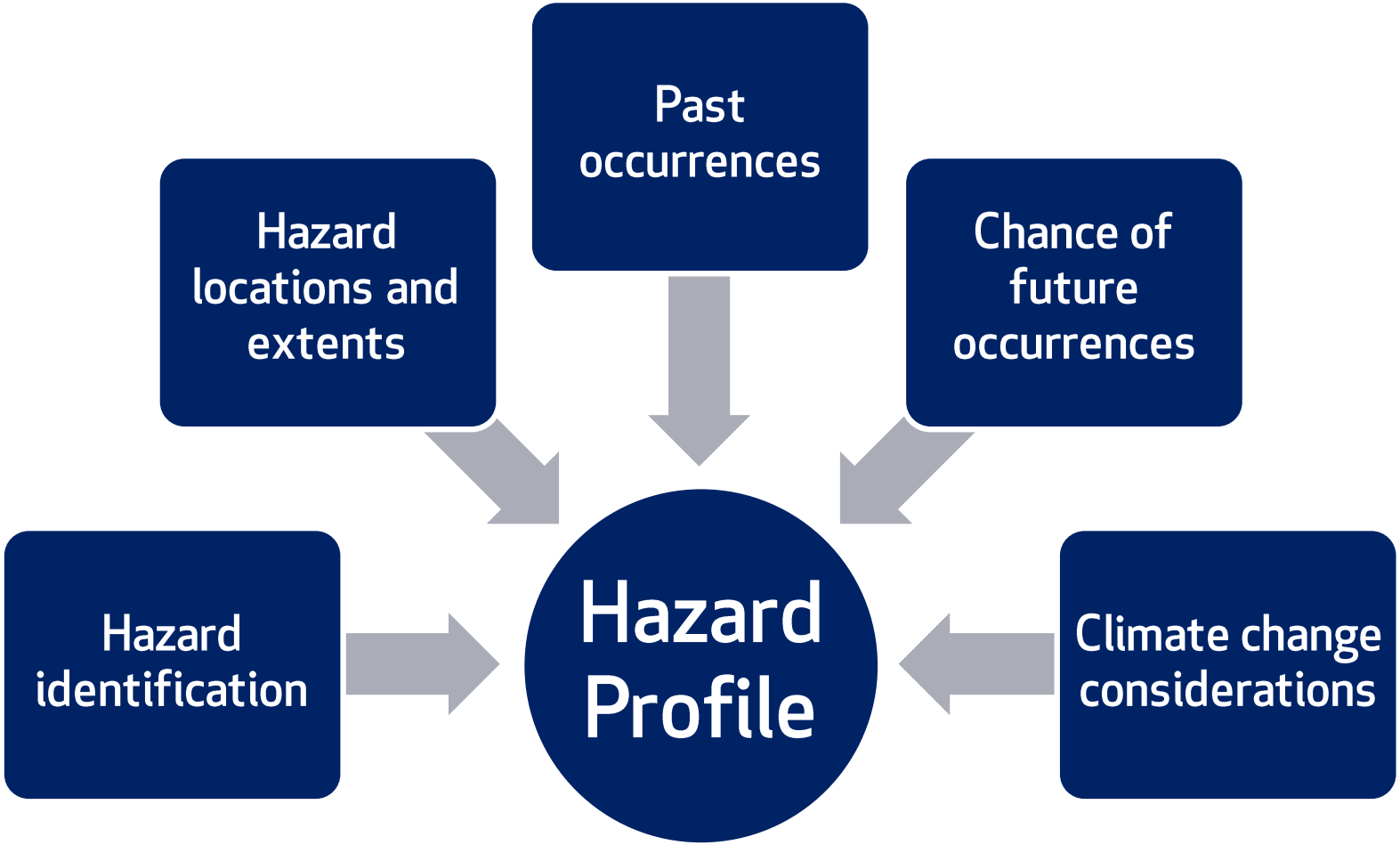
Local Hazard Mitigation Plan

Team Meeting #2

Meeting Objectives

Hazard Profiles

Hazard profile components



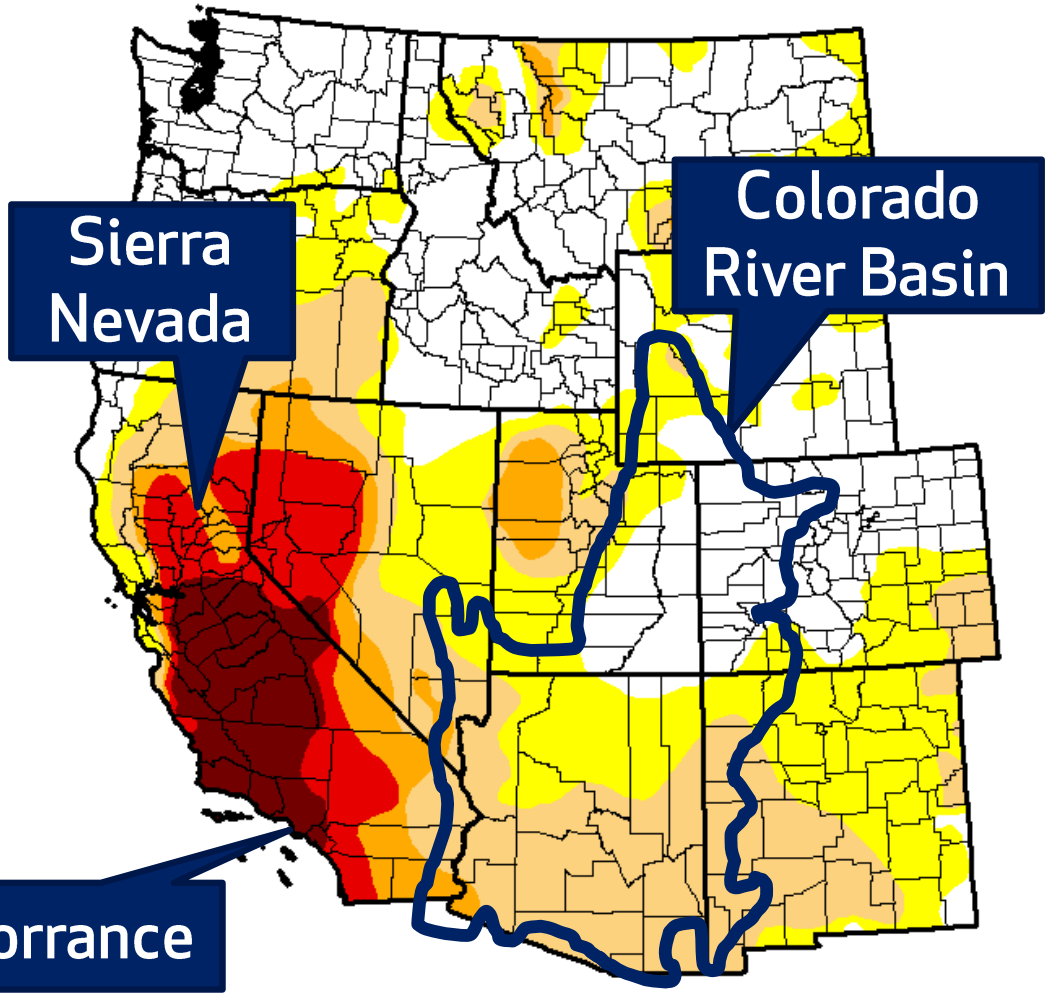
Identified hazards

- Drought
- Seismic hazards
- Hazardous materials
- Extreme weather
- Flood
- Disease and pest management
- Geologic hazards

Drought

- Primary threat is to City water supply
- Most water comes from drought-prone Sierra Nevada and Colorado River basin
- Groundwater is more resilient to droughts
  - Not immune
- Multiple past droughts
- Current drought is the worst in recorded history
- Exceptional Drought identified in the City
- Drought conditions expected to worsen with climate change

Current drought conditions



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	38.50	61.50	35.64	15.09	9.53	4.33
Last Week 3/29/2016	32.63	67.37	34.24	14.82	9.53	4.74
3 Months Ago 1/5/2016	33.48	66.52	45.17	25.43	13.09	6.85
Start of Calendar Year 12/29/2015	33.17	66.83	45.07	29.30	15.92	6.85
Start of Water Year 9/29/2015	22.77	77.23	57.81	42.42	26.50	7.62
One Year Ago 4/7/2015	27.70	72.30	59.80	37.72	17.04	7.63

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

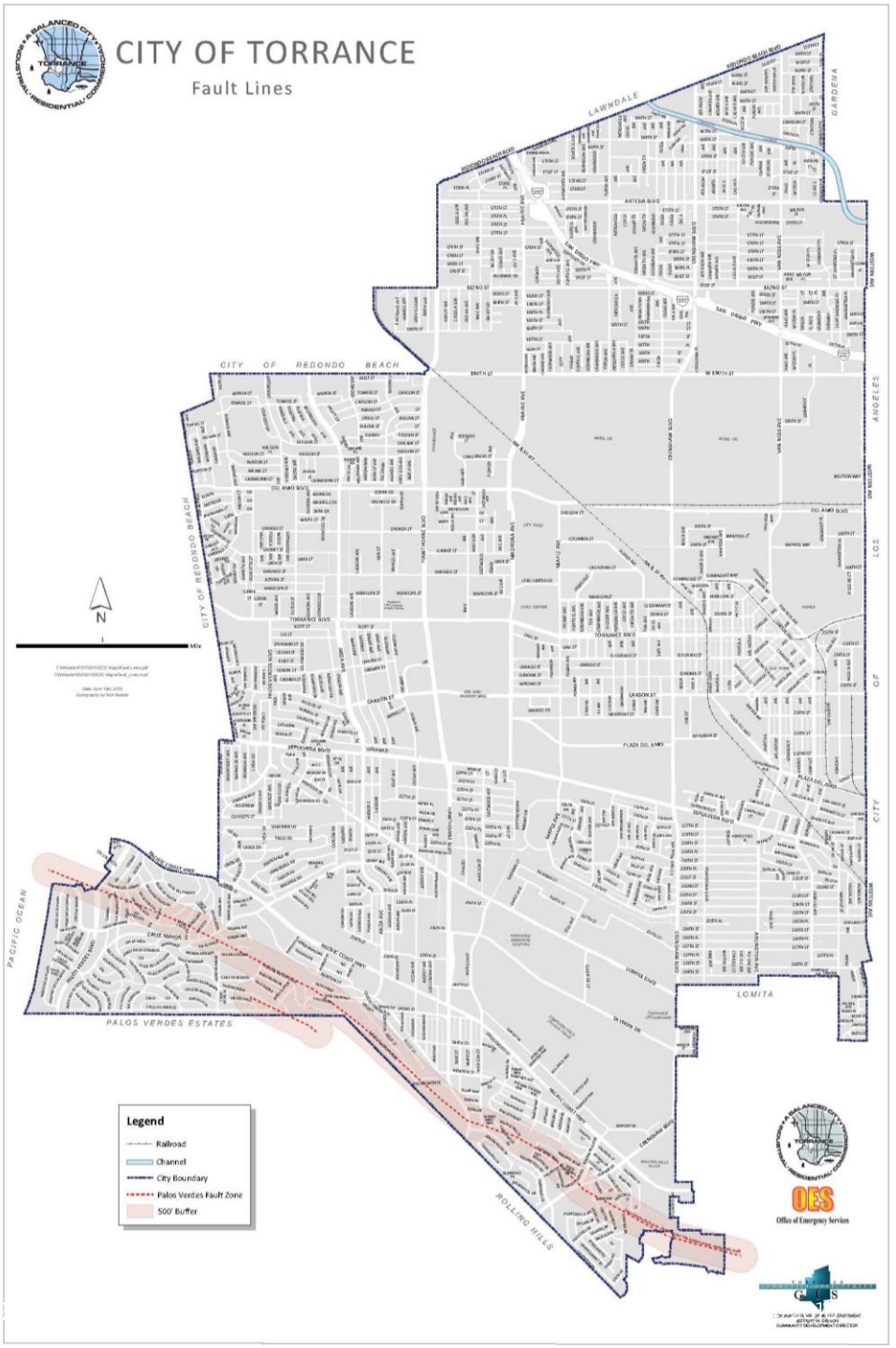
Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

Seismic hazards

- Seismic hazards include ground shaking, fault rupture, and liquefaction
- All of Torrance is at risk of ground shaking
- Fault rupture and liquefaction affects certain areas
- Older buildings are more vulnerable to seismic hazards
- Past major earthquakes: 1933, 1971, and 1994

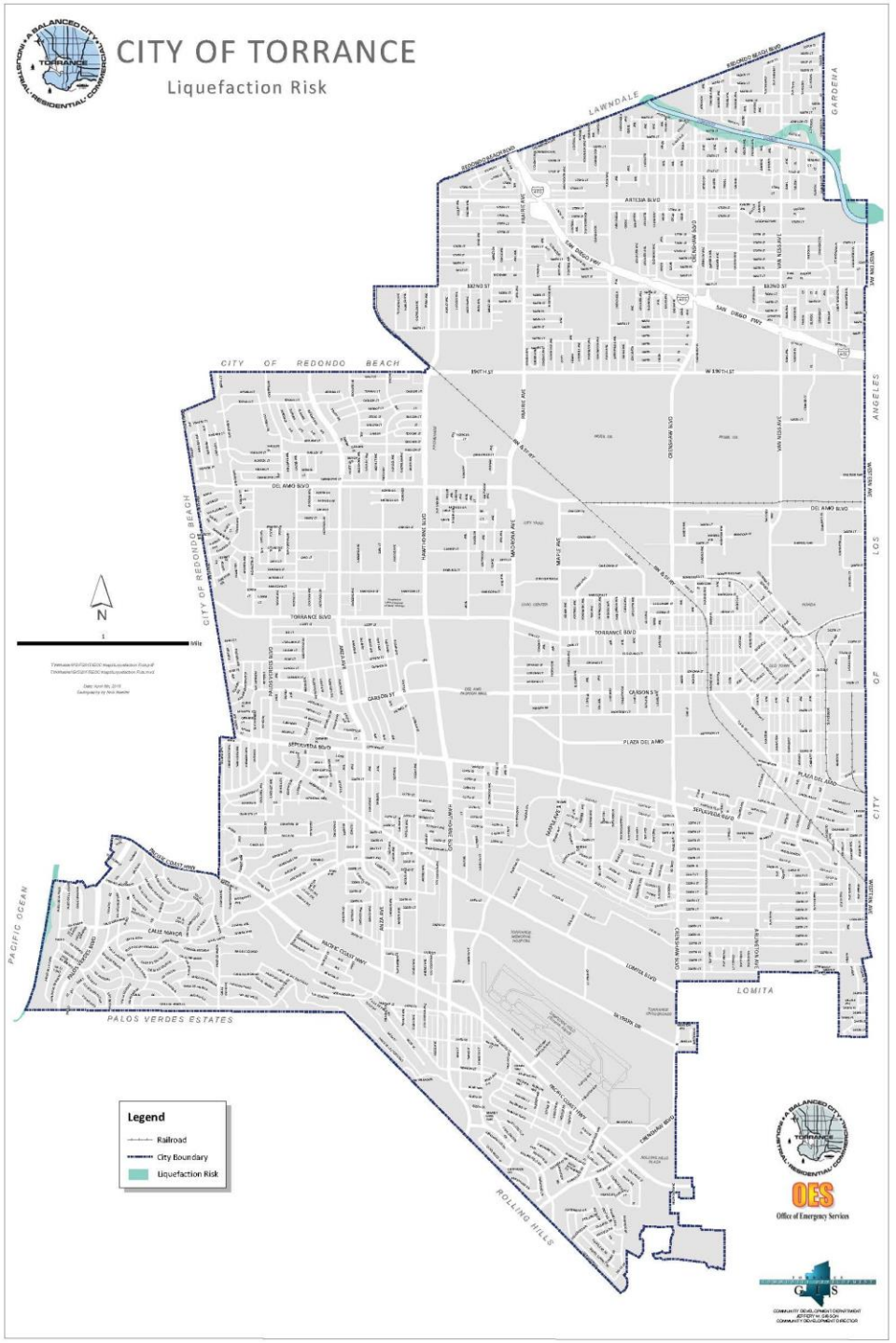
Hazard Map: Fault Rupture

Portions of the Newport Inglewood Fault located in the southern portion of the City.



Hazard Map: Liquefaction

Areas in the northeastern portion of the City along the Dominguez Channel

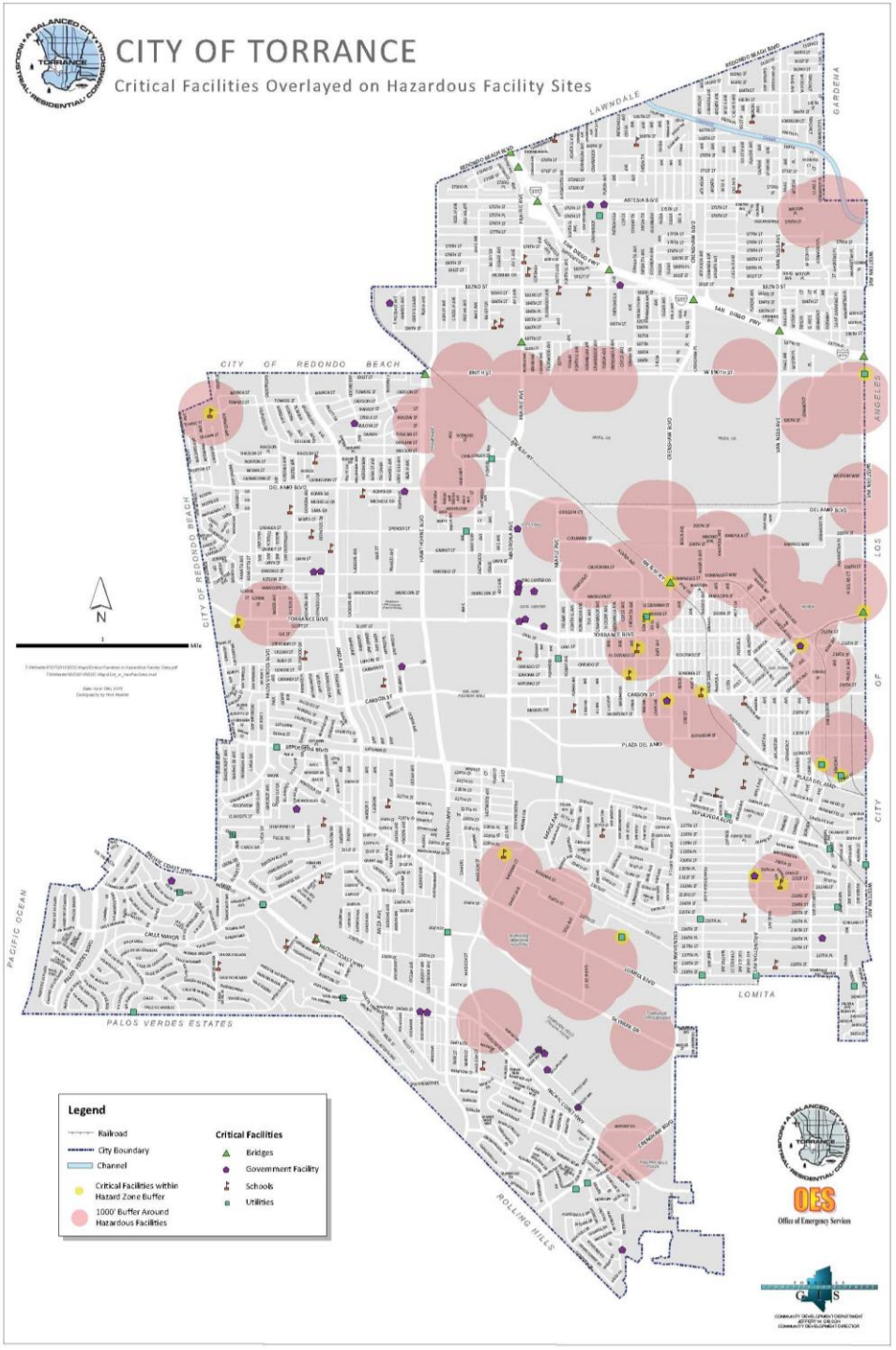


Hazardous materials

- Wide range of substances
  - Toxic, flammable, explosive, corrosive, infectious, radioactive
- Mostly found in industrial settings
- Can seep into soil and groundwater

- Events usually occur from accidental spills
  - Damaged storage tanks
  - Vehicle accidents
  - Pipeline ruptures

Hazard Map: Hazardous Materials



Legend

- Railroad
- City Boundary
- Channel
- Critical Facilities within Hazard Zone Buffer
- 1000' Buffer Around Hazardous Facilities

Critical Facilities

- Bridges
- Government Facility
- Schools
- Utilities

Extreme weather

- Heat waves, hail, tornadoes, and severe wind
- Can affect any part of Torrance
- Heat waves are of greatest concern
- Climate change is likely to make heat waves more intense and frequent
- Changes to other extreme weather are unknown

Flooding

- Flood risk greatest near Madrona Marsh
- Other small flood risk areas scattered throughout Torrance
- Beaches themselves at risk of coastal flooding
- Risk of flooding from water storage failure
- Few major flood events in the past
- Occasional local flood events
- Flood risk may increase in the future
  - Future storms may become more intense and unpredictable

Hazard Map: Flooding

Flood Zones

A	Areas subject to inundation by the 1-percent-annual-chance flood event. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown.
AE	Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. BFEs are shown within these zones. (Zone AE is used on new and revised maps in place of Zones A1–A30.)
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are 1–3 feet. BFEs derived from detailed hydraulic analyses are shown in this zone.
V	Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves. Because detailed coastal analyses have not been performed, no BFEs or flood depths are shown.
X	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. (Zone X (shaded) is used on new and revised maps in place of Zone B.)
	Areas determined to be outside the 0.2-percent-annual-chance flood plane.

Disease and pest management

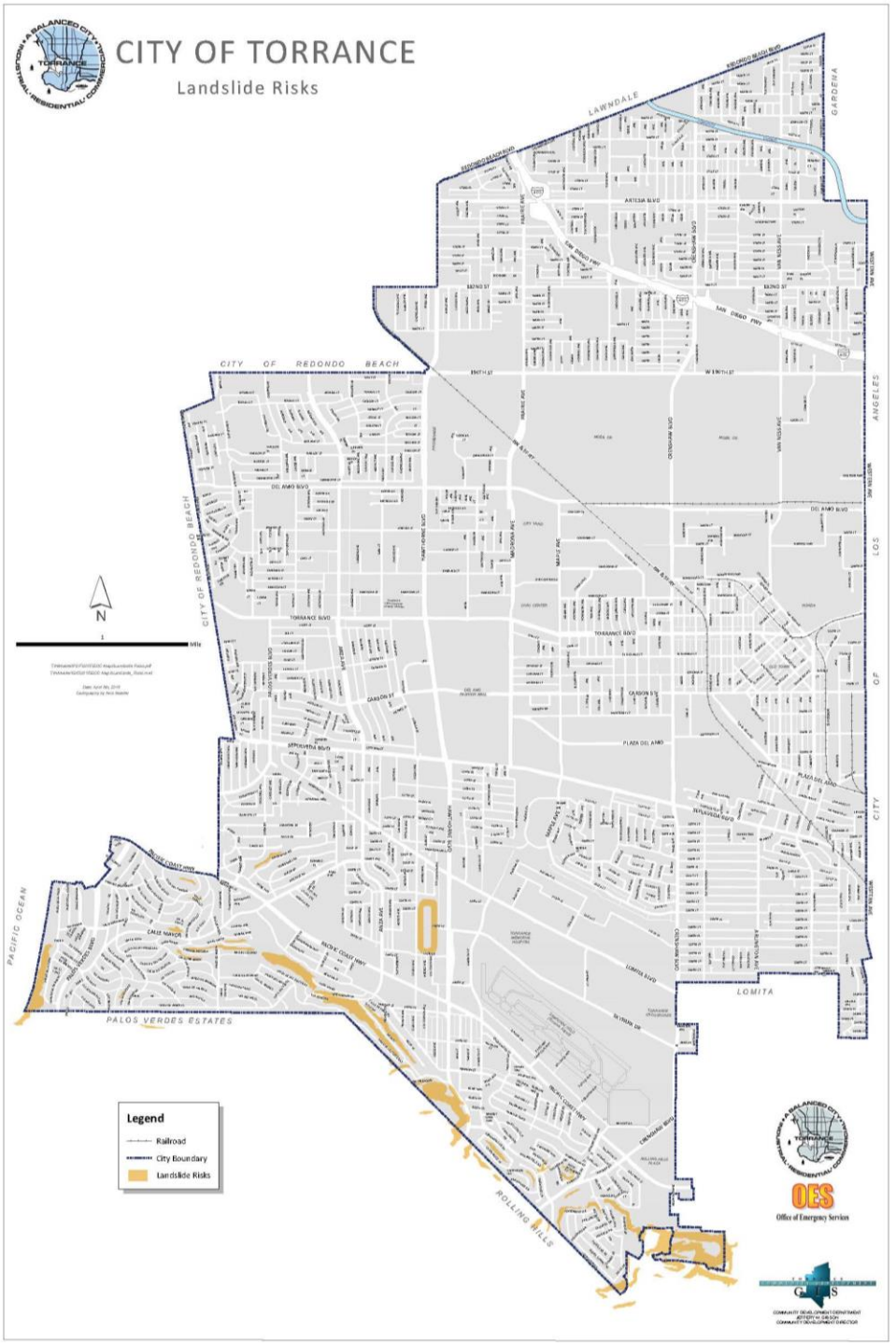
- Flu and West Nile virus are major human health concerns
- Pests and pathogens may affect street trees and landscaping
- Threat likely to persist in the future
- Some evidence that West Nile virus and plant infestations may be more common with climate change

Geologic hazards

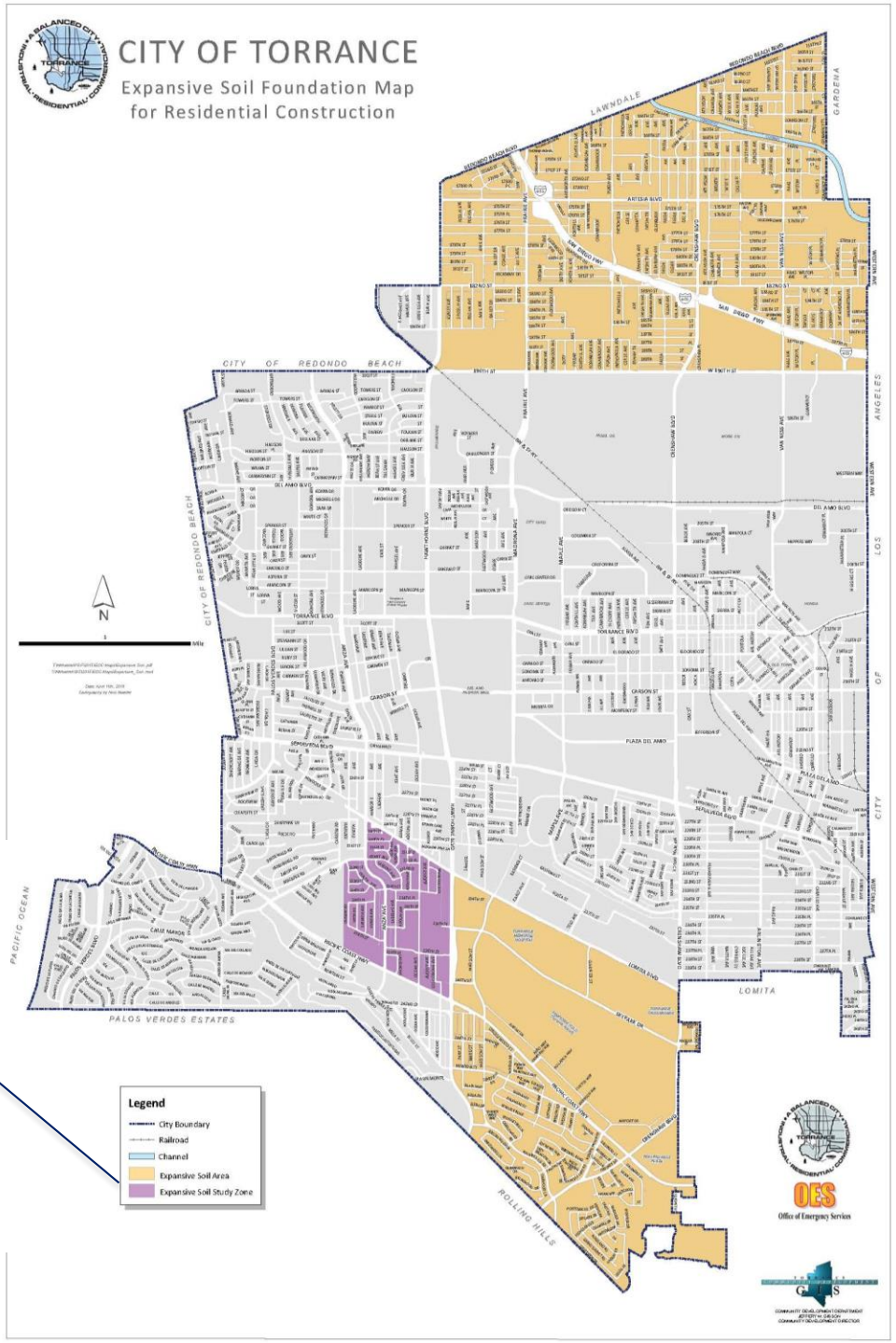
- Methane, expansive soils, and landslides
- Methane seeps from Torrance Oil Field
  - Likely small
- Landslide risk near Palos Verdes Peninsula
- Two past large landslides (1986, 1998)
- Risks expected to continue
- Climate change impacts not yet known, but possible

Hazard Map: Landslides

Areas in the southern portion of the City along the Coast and areas bordering Palos Verdes Estates



Hazard Map: Expansive Soils

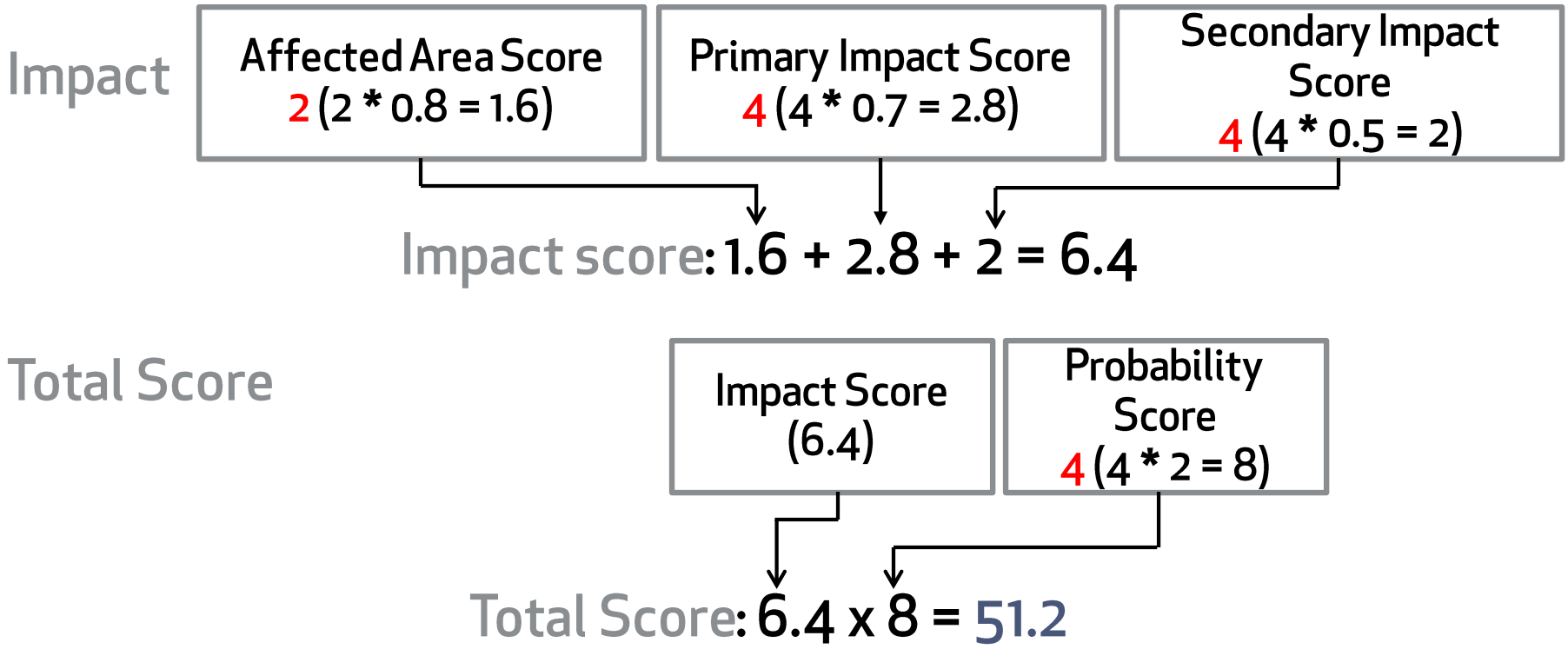


Hazard Prioritization

Hazard Prioritization

- Four criteria [Weightings]
  - Probability (likelihood of occurrence) [2.0]
  - Location (size of potentially affected area) [0.8]
  - Maximum Probable Extent (intensity of damage) [0.7]
  - Secondary Impacts (severity of impacts to community) [0.5]
- A value of 1-4 is assigned for each criteria
- Every criteria has an Importance Score
  - Can be used to weigh the influence of an individual criterion
  - Criteria and Importance values are combined to calculate a Total Score

Score Example: Fault Rupture

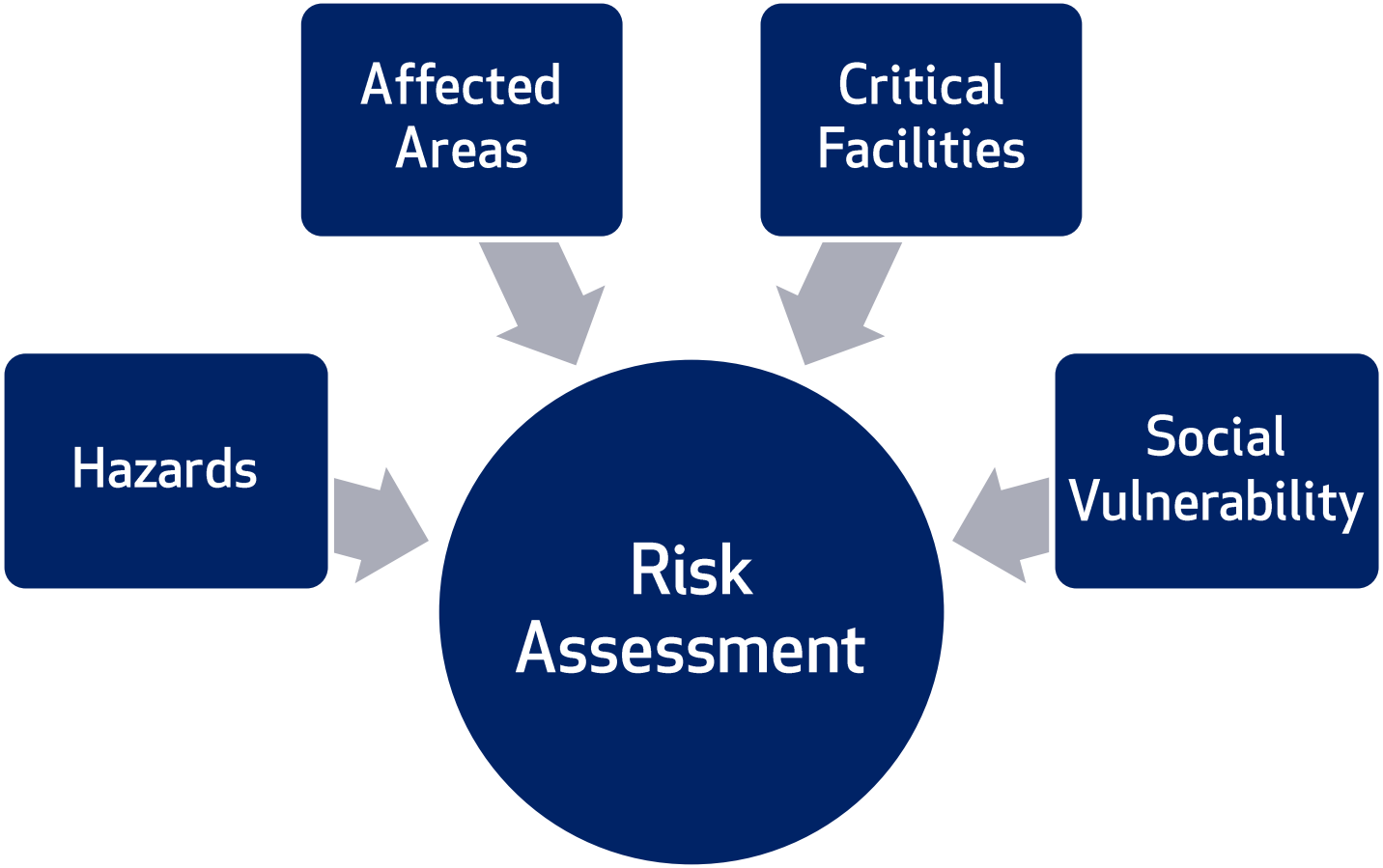


Priority list

- High risk
  - Drought
  - Liquefaction and ground shaking
  - Fault rupture
- Medium risk
  - Hazardous materials
  - Severe wind
  - Hail, tornadoes, and extreme heat
  - Flood
  - Disease and pest management
  - Geologic hazards

Risk Assessment

Risk Assessment



Critical Facilities

Facility Type	Number of Facilities				
	Priority 1	Priority 2	Priority 3	No Priority	Total
Bridges	0	14	0	0	14
Government facilities	11	7	0	26	44
Schools	0	45	0	0	45
Transportation routes	0	2	0	0	2
Utilities	0	13	17	0	30
Total	11	81	17	26	135

Social Vulnerability

- Consider that some people may be at greater risk
  - Elderly residents
  - Young children
  - Disabled/immunocompromised persons
  - Lower-income households
  - Renters
  - Socially-isolated persons
  - Individuals without cars
  - People in certain industries

Vulnerable Critical Facilities

Facility Type	Number of Vulnerable Facilities by Hazard				
	Fault Rupture	Haz Mat	Flood	Expansive Soils	Land slides
Bridges	0	2	0	8	0
Government facilities	0	3	0	4	0
Schools	0	7	0	14	0
Transportation routes	0	0	0	0	0
Utilities	3	5	0	4	1

Social Vulnerability

- Lower-income households and renters face increased risk of damage to homes
- Elderly residents, disabled individuals, and persons without cars may have difficulty evacuating
- Elderly, young children, and immunocompromised people at risk of disease-related hazards
- Elderly persons, outdoor workers, and lower-income residents at risk of extreme temperatures

Next Steps

Next Steps

- Wrap up online survey
- Prepare draft mitigation strategies
- Conduct meeting to review draft mitigation strategies (May 9th)

Questions/Comments?

Aaron Pfannenstiel
apfannenstiel@mbakerintl.com
909-918-2998

Project Meeting 3 | May 17, 2016

Included Materials

1. Draft mitigation measure list

	Mitigation Measure	Priority
All Hazards		
1.1	Provide information about reducing the risk from disasters to residents and businesses through mailers, in-person meetings and events, local media, online and social media, and through other methods as appropriate. Ensure that information is easy to understand and available in widely spoken languages within the City.	
1.2	Encourage residents and businesses to install solar photovoltaic panels and battery backup systems to maintain energy service during a power grid failure. Promote financing mechanisms to support construction of these systems.	
1.3	In collaboration with community groups and residents, develop “shelter in place” fact sheets outlining what residents should do during shelter in place situations. Distribute fact sheets to all Torrance mailing addresses and make available online.	
1.4	Partner with local merchants to explore providing people with discounted items for emergency kits as a giveaway for participating in hazard mitigation events and activities.	
1.5	Coordinate with neighboring jurisdictions and Los Angeles County to support a unified approach to reducing risks in the South Bay area and wider Los Angeles metropolitan region.	
1.6	Coordinate with other agencies that provide important services in the community (e.g. school districts, hospitals, utility companies, telecommunication companies) to avoid siting key facilities in hazard-prone areas. If this is unavoidable, work with owners to reduce the threat from these hazards for new facilities.	
1.7	Work with other agencies that provide important services in Torrance to identify existing vulnerable facilities, and to retrofit or replace facilities to reduce vulnerabilities.	
1.8	Continue to monitor the results of federal, state, and regional inspections of railroads, pipelines, and other infrastructure. Incorporate the results of inspections into future emergency planning activities.	
1.9	Conduct hazard assessments for all new proposed City facilities and infrastructure early in the design process, and redesign facilities and infrastructure as needed to reduce vulnerability from any relevant hazards.	
1.10	Avoid locating any new City-owned facilities and infrastructure in identified hazard threat zones to the extent possible. If this is unavoidable, ensure facilities and infrastructure are designed to reduce vulnerability from applicable hazards.	
1.11	Regularly assess the vulnerability of City-owned critical facilities, and retrofit or replace facilities as appropriate to reduce risks.	
1.12	When upgrading or retrofitting City facilities, integrate features to improve resiliency to applicable hazard events.	
1.13	Evaluate the backup power needs for all appropriate critical facilities. Install or upgrade backup power systems as needed, emphasizing the use of renewable energy generation and storage systems. Explore establishing a microgrid for critical facilities.	
1.14	Protect and restore natural habitats to provide hazard mitigation benefits, and integrate natural systems into the built environment as appropriate to help reduce hazard risks.	

	Mitigation Measure	Priority
1.15	Ensure that the City's water interconnections with the California Water Services Company and the City of Lomita are resistant to hazard conditions and sufficient to meet Torrance's needs during emergency conditions. Retrofit or replace interconnections as appropriate, and explore opportunities to add new interconnections to other water agencies.	
1.16	Work with developers and property owners to identify and publicize examples of buildings with hazard-resistant features.	
1.17	Train plan review staff to be aware of strategies to enhance building resiliency to hazards, and to encourage applicants to incorporate these strategies into plans.	
1.18	Work with appropriate federal, state, and regional agencies and institutions to improve understanding of future hazard locations, frequency, and severity, especially hazards that may be affected by climate change.	
1.19	Incorporate information about hazards and hazard mitigation strategies contained in the Local Hazard Mitigation Plan into the Torrance General Plan, the Torrance Municipal Code, and other planning efforts and City documents as appropriate.	
1.20	Continue to improve and refine the risk assessment for Torrance, including risks of injury or death, property damage, loss of important services, and other threats to personal health and well-being	
1.21	Identify barriers to a safe and rapid evacuation of part or all of Torrance, and develop policies to reduce these barriers.	
1.22	Regularly monitor funding opportunities for hazard mitigation activities, and pursue appropriate funding sources that become available.	
Diseases and Pest Management		
2.1	To the extent possible, replace vulnerable street trees and landscaping with plant species that are more resistant to infection.	
2.2	Apply Integrated Pest Management (IPM) strategies on street trees and in public landscaped areas to emphasize pest prevention techniques and to minimize the use of pesticides.	
2.3	In coordination with the Los Angeles County West Vector Control District, distribute information about reducing the risk of vector-borne diseases, particularly mosquito-borne diseases.	
2.4	Identify and eliminate areas of standing water on City facilities, including in maintenance yards and landscaped areas.	
2.5	Continue to monitor the status of mosquitos at Madrona Marsh. Conduct abatement activities and/or close the marsh to members of the public as necessary.	
2.6	Work with local and regional health care authorities to provide information on contagious diseases, and to make vaccines and other forms of preventative care widely available and affordable.	

	Mitigation Measure	Priority
Drought		
3.1	Partner with the California Water Services Company and evaluate long-term water availability for the community, in partnership with the Metropolitan Water District. In particular, consider the risks of increase drought frequency and severity as a result of climate change. Integrate the results of this analysis into future water management planning efforts.	
3.2	As feasible, construct planned wells and resolve any water quality issues at existing wells to maximize groundwater production within the City's adjudicated right. Ensure that all groundwater production is maintained at a sustainable level.	
3.3	Explore constructing new water storage facilities, or expand the storage capacity of existing facilities, to maximize water availability during an emergency situation.	
3.4	Work with the West Basin Municipal Water District to increase the available supply of recycled water and to provide recycled water service in a wider area of the community.	
3.5	In coordination with the West Basin Municipal Water District, community members, and neighboring communities, explore recycling water for potable uses.	
3.6	Use permeable surfaces to the extent possible in public areas to promote increased groundwater recharge. Encourage the increased use of permeable surfaces on private property.	
3.7	Work with the California Water Services Company to provide free or low-cost water audits to Torrance residents and businesses.	
3.8	Promote Property Assessed Clean Energy (PACE) programs to Torrance residents and businesses as a way to finance water efficiency retrofits, and distribute information about other financing mechanisms and available rebates.	
3.9	When creating new landscaped areas or renovating existing ones, choose plant species that require little or no irrigation to the extent possible.	
3.10	Evaluate the effectiveness of existing water use restrictions, and revise restrictions to increase effectiveness as appropriate during drought conditions.	
3.11	Publicize information on water conservation techniques through print media, television, online and in social media, in-person events and workshops, and other methods as appropriate.	

	Mitigation Measure	Priority
Extreme Weather		
4.1	Designate facilities throughout Torrance as cooling centers to provide relief during extreme heat events, set to automatically open when temperatures reach a certain level. Ensure that facilities are available in all parts of the city. Distribute information about the availability of cooling centers to community members, and alert community members when cooling centers are open.	
4.2	Move City recreation programs to indoor air-conditioned buildings during extreme heat events.	
4.3	Work with Torrance Unified School District to minimize student exposure to extreme heat, particularly during games, athletic practice, or other intensive outdoor activities.	
4.4	Train City outdoor workers, including landscaping, construction, and recreation staff, in reducing the risk from extreme heat and how to provide emergency first aid to persons suffering from heat-related conditions. Work with local businesses and community groups to encourage providing similar training to private employees.	
4.5	Design new and substantially retrofitted public spaces to increase the use of shade trees or shade structures, high-reflectivity surfaces, and other features to reduce the urban heat island effect. Encourage private landowners to incorporate these features into new or substantially retrofitted developments.	
4.6	Work to provide heating and cooling equipment to low-income residents without these systems in their houses	
4.7	In coordination with community organizations, provide increased outreach and check-ins to vulnerable individuals during extreme temperatures, including elderly residents, homeless individuals, and socially isolated persons.	
4.8	Continue to support weatherization of older and lower-income homes.	
4.9	Work with residents and property owners in homes that are vulnerable to severe winds, such as manufactured housing, to strengthen structures against wind damage.	
4.10	Encourage new and significantly retrofitted buildings to use wind-resistant design features such as interlocking shingles, reinforced doors, and laminated or impact-resistant glass.	
4.11	Monitor publicly-owned trees, and promptly remove diseased or weakened branches or trees that could pose a threat during high winds. As necessary, replace trees with wind-resistant species.	
4.12	In coordination with SCE, identify and strengthen or replace utility poles that may be old, damaged, or otherwise vulnerable to high winds. Support efforts to underground power lines where feasible.	

	Mitigation Measure	Priority
Flood		
5.1	Use low-impact development (LID) strategies in City-maintained landscapes, roads, and parking lots to reduce runoff and erosion during flood events.	
5.2	Encourage or require the use of LID strategies on new or significant renovations to private parking lots, plazas, or other large open areas.	
5.3	Regularly inspect City-owned stormdrains during the rainy season to remove debris.	
5.4	Identify areas where ponding frequently occurs during heavy rainfall, and install new drains or upgrade existing ones to reduce ponding.	
5.5	Explore strategies to restrict new development within the 100-year floodplain, including prohibiting all new development, limiting the types of new developments, or requiring increased hazard studies and flood mitigation strategies. As feasible, expand these strategies to include the 500-year floodplain.	
5.6	Encourage property owners in floodplains to install flood-resistant features on their property.	
5.7	Ensure that City-owned water reservoirs and storage tanks are extensively reinforced to minimize the risk of failure.	
5.8	Ensure that an adequate supply of sandbags are available to Torrance residents and businesses, including pre-filled sandbags for individuals who may have difficulty filling their own.	
Geologic Hazards		
6.1	Plant and maintain vegetation along cliffs and slopes to hold soil together and reduce the potential for landslides.	
6.2	Evaluate installing landslide nets, walls, or other protective measures along roadways in landslide-prone areas.	
6.3	Continue to require new construction in landslide-prone areas to prepare geologic studies, stabilize slopes, and incorporate design features to reduce the risk of landslides into the project.	
6.4	Conduct testing of soils throughout the community to determine the location of any methane-containing soils, and require methane abatement techniques in new or significantly retrofitted buildings in areas with methane-containing soils.	

	Mitigation Measure	Priority
Hazardous Materials		
7.1	Support efforts to require the use of stronger storage containers for hazardous materials, including above-ground storage tanks and freight cars.	
7.2	Support efforts to frequently monitor pipelines containing hazardous materials, including petroleum and natural gas, and to require pipeline owners to immediately conduct repairs if damages are found.	
7.3	Work with the owners of pipelines containing hazardous materials to reinforce these pipelines against hazard events such as seismic activity, landslides, and liquefaction.	
7.4	Coordinate with the South Coast Air Quality Management District and hazardous material facilities to ensure prompt and accurate distribution of information to emergency staff and members of the public in the event of a hazardous material release.	
7.5	Establish and publicize additional collection sites for hazardous materials, including electronic wastes, and conduct educational campaigns to raise awareness on safe use and disposal of household hazardous materials.	
7.6	Continue to avoid siting new residences or community facilities near large hazardous material facilities.	
7.7	Expand community outreach, training, and exercises surrounding large hazardous materials generators within the City and surrounding areas.	
Seismic Hazards		
8.1	Maintain and regularly update records of seismically vulnerable structures in the community, such as soft first-story buildings or unreinforced masonry structures.	
8.2	Incentivize or require that seismically vulnerable buildings be retrofitted to improve resilience to seismic events, and develop financing mechanisms to help property owners support retrofits.	
8.3	Continue to require new and significantly retrofitted homes to meet minimum seismic safety standards, and encourage project applicants to exceed minimum standards to improve safety.	
8.4	In partnership with neighboring communities and regional educational and scientific institutions, conduct detailed earthquake scenario modeling to more accurately determine potential impacts to Torrance from a significant seismic event.	
8.5	When retrofitting existing City facilities or constructing new ones, design structures to still be usable following a major seismic event to the extent possible, rather than designing only to minimize injury to occupants.	
8.6	Install and maintain film on windows in City facilities to reduce injury from broken glass, and encourage private property owners to use similar features.	
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6.3	Continue to require new construction in landslide-prone areas to prepare geologic studies, stabilize slopes, and incorporate design features to reduce the risk of landslides into the project.	
6.4	Conduct testing of soils throughout the community to determine the location of any methane-containing soils, and require methane abatement techniques in new or significantly retrofitted buildings in areas with methane-containing soils.	

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7.4	Coordinate with the South Coast Air Quality Management District and hazardous material facilities to ensure prompt and accurate distribution of information to emergency staff and members of the public in the event of a hazardous material release.	
7.5	Establish and publicize additional collection sites for hazardous materials, including electronic wastes, and conduct educational campaigns to raise awareness on safe use and disposal of household hazardous materials.	
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7.7	Expand community outreach, training, and exercises surrounding large hazardous materials generators within the City and surrounding areas.	
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8.1	Maintain and regularly update records of seismically vulnerable structures in the community, such as soft first-story buildings or unreinforced masonry structures.	
8.2	Incentivize or require that seismically vulnerable buildings be retrofitted to improve resilience to seismic events, and develop financing mechanisms to help property owners support retrofits.	
8.3	Continue to require new and significantly retrofitted homes to meet minimum seismic safety standards, and encourage project applicants to exceed minimum standards to improve safety.	
8.4	In partnership with neighboring communities and regional educational and scientific institutions, conduct detailed earthquake scenario modeling to more accurately determine potential impacts to Torrance from a significant seismic event.	
8.5	When retrofitting existing City facilities or constructing new ones, design structures to still be usable following a major seismic event to the extent possible, rather than designing only to minimize injury to occupants.	
8.6	Install and maintain film on windows in City facilities to reduce injury from broken glass, and encourage private property owners to use similar features.	
8.7	Use flexible piping to the extent feasible for new water and wastewater pipes.	

APPENDIX B
PUBLIC ENGAGEMENT SURVEY

The City of Torrance prepared an online survey for members of the public to assist with the development of the LHMP. The survey gauges respondents' awareness of potential hazards, past hazard experiences, preparedness for future hazards, and thoughts on effective hazard mitigation strategies. The survey received approximately 550 responses, although not all respondents answered each question. This section provides a summary of the survey questions and the results.

Awareness of Potential Hazards

Survey respondents were asked about hazards that could potentially affect Torrance, and which hazards were of greatest concern to respondents. Earthquakes were by far the hazards of greatest concern to survey respondents. A majority of respondents were also concerned about severe weather and flooding, and a substantial number of respondents ranked hazardous material releases, particularly from large industrial facilities, as a hazard of significant concern. Approximately a third of respondents had specific local issues of concern that they wanted to bring to the attention of the Planning Team. Small-scale ponding during flood events was the most common local issue.

What are the three hazards that are of most concern to your neighborhood or home?

Response	Number of Respondents	Percent of respondents
Earthquake	514	97.2%
Severe weather	450	85.1%
Flooding	319	60.3%
Hazardous material releases	156	29.5%
Fire	19	3.6%
Energy or water shortage	19	3.6%
Dam failure	11	2.1%
All others	46	8.7%
Total	**529**	

Are there small-scale local issues that you would like the Planning Team to consider?

Response	Number of Respondents	Percent of respondents
No	337	66.7%
Yes	168	33.3%
Total	**505**	
Issues of concern among respondents who provided additional feedback		
Ponding and limited flooding	101	59.1%
Hazardous material releases	31	18.1%
Traffic safety	15	8.8%
All others	24	14.0%
Total	**171**	

Past Hazard Experiences

Most respondents said that they have not been impacted by a disaster in their current residence. Among respondents who had been impacted, most had been affected by disasters which involved actual or potential hazardous material exposure. Many respondents also stated that they had been affected by earthquakes and severe weather. Slightly more than half of respondents who had been affected by a disaster in their current residence were living in Torrance at the time.

Have you been impacted by a disaster in your current home of residence?

Response	Number of Respondents	Percent of respondents
Yes	83	15.3%
No	459	84.7%
Total	**542**	

If you have been impacted by a disaster in your current home of residence, did you live in Torrance at the time?

Response	Number of Respondents	Percent of respondents
Yes	75	54.7%
No	62	45.3%
Total	**132**	

If you have been impacted by a disaster in your current home of residence, what type or types of disaster were you impacted by?

Response	Number of Respondents	Percent of respondents
Exposure to hazardous materials	72	80.0%
Earthquakes	39	43.3%
Severe weather	22	24.4%
Flooding	16	17.8%
Extreme heat	13	14.4%
Fire	10	11.1%
Landslide	5	5.6%
Others	10	11.1%
Total	**90**	

Preparedness

Insurance

Among homeowners, somewhat more than half felt that their homeowners insurance would be sufficient to cover potential hazards that could affect their homes. However, a substantial minority of homeowners did not believe that their insurance is sufficient, or were unsure. Among renters, a majority had renters insurance. Approximately 26 percent of survey respondents had flood insurance, and many respondents also commented that their insurance policy covered damage from earthquakes.

If you are a homeowner, do you have adequate homeowners insurance to cover the hazards that could impact your home?

Response	Number of Respondents	Percent of respondents
Yes, my insurance coverage should adequate	250	46.6%
No, I don't believe my insurance coverage would be adequate for a major disaster	116	21.6%
Unsure	84	15.6%
I do not have an insurance policy	1	0.2%
Not applicable, I rent my current residence	86	16.0%
Total	**537**	

If you rent your residence, do you have renters insurance?

Response	Number of Respondents	Percent of respondents
Yes	65	16.3%
No	39	9.8%
Not applicable, I own my residence	295	73.4%
Total	**399**	

Do you have flood insurance for your home?

Response	Number of Respondents	Percent of respondents
Yes, I own my home and have flood insurance	91	20.5%
Yes, I rent my home and have flood insurance	14	3.2%
No, but I am interested in reviewing flood insurance options	338	76.3%
Total	**399**	

Personal Resiliency

Close to half of respondents had taken action to make their homes more resilient to hazard, and approximately a quarter of residents had not yet done so but planned to take this action. Many survey respondents also had access to a sufficient supply of food, water, and other important goods. However, only approximately a quarter of survey respondents had access to walkie-talkie radios with batteries, important documents and photos in a solid (e.g. fire and water-resistant container), and a secondary supply of heat. Large numbers of respondents also lacked access to a telephone with batteries, pet supplies, a portable AM/FM radio, cash, or a sufficient supply of water. When asked about how the City of Torrance should help respondents be more prepared for an emergency situation, a very large majority of respondents felt it was important for the City to provide effective emergency communications, including notifications. Most respondents emphasized the importance of community outreach and training, and approximately half of respondents felt it was important for the City to help increase awareness of the emergency requirements for people with special needs and vulnerable populations.

Have you done anything to your home to make it less vulnerable to hazards such as earthquakes, floods, and fires?

Response	Number of Respondents	Percent of respondents
Yes, I have taken action to make my home less vulnerable	242	47.4%
I have not taken action, but do plan to	125	24.5%
I have not taken action and do not plan to	143	28.0%
Total	**510**	

If a severe hazard event occurred today such that all services (power, gas, water, sewer, etc.) were cut off from your home, and you were unable to leave your home or access a store for 72 hours, which of these items do you have readily available?

Response	Number of Respondents	Percent of respondents
Can opener	441	96.9%
Flashlight with batteries	425	93.4%
Cooking and eating utensils	420	92.3%
First aid supplies	409	89.9%
Ready-to-eat canned/nonperishable foods	401	88.1%
Blankets and sleeping bags	375	82.4%
Extra clothes and shoes	356	78.2%
Potable water (3 gallons per person)	334	73.4%
Portable AM/FM radio	309	67.9%
Extra medication	302	66.4%
Gas grill or camping stove	299	65.7%
Cash	274	60.2%
Telephone with batteries	239	52.5%
Pet supplies	210	46.2%
Important photos and documents in a solid container	124	27.3%
Handheld walkie-talkies with batteries	114	25.1%
Secondary source of heat	107	23.5%
Gasoline	80	17.6%
Total	**455**	

How can the City help you to become more prepared for a disaster?

Response	Number of Respondents	Percent of respondents
Provide effective emergency notifications and communication	442	86.0%
Provide community outreach regarding emergency preparedness	352	68.5%
Provide training and education to residents and business owners on how to reduce future damage	304	59.1%
Create awareness of special needs and vulnerable populations	250	48.5%
Total	**514**	

Neighborhood and Community Preparedness

While many respondents felt they were familiar with the special needs of their neighbors in a disaster situation and could lend assistance, a majority of respondents were not. Approximately half of survey respondents were either a member of their local Community Emergency Response Team (CERT) or were interested in learning more about the program. Many respondents had heard of CERT, but were not aware that it was an active program in Torrance.

Are you familiar with the special needs of your neighbors in the event of a disaster situation?

Response	Number of Respondents	Percent of respondents
Yes	205	38.5%
No	328	61.6%
Total	**533**	

Are you a trained member of your Community Emergency Response Team (CERT)?

Response	Number of Respondents	Percent of respondents
Yes	61	11.8%
No, but I would like to learn more about CERT	185	35.6%
No, and I am not interested in learning more about CERT	273	52.6%
Total	**519**	

Workplace Preparedness

Most respondents stated that their employers had disaster recovery/business continuity plans in place, along with workforce communication plans to reach employees during emergencies. However, there were still substantial minorities who were not aware of these plans or uncertain about them. Many respondents skipped the questions on workforce preparedness, suggesting a high level of uncertainty about these issues.

Does your employer have a plan for disaster recovery or business continuity plan in place?

Response	Number of Respondents	Percent of respondents
Yes	106	59.9%
No	30	16.9%
Unsure	41	23.2%
Total	**177**	

Does your employer have a workforce communications plan to implement following a disaster so they are able to contact you?

Response	Number of Respondents	Percent of respondents
Yes	114	67.1%
No	56	32.9%
Total	**170**	

Demographics

Do you live or work in the City of Torrance?

Response	Number of Respondents	Percent of respondents
I live in the City of Torrance	406	74.2%
I work in the City of Torrance	30	5.5%
I live and work in the City of Torrance	92	16.8%
I do not live or work in the City of Torrance, but I am interested in the City's resiliency	19	3.5%
Total	**547**	

Where do you live?

Response	Number of Respondents	Percent of respondents
Torrance	481	88.3%
Redondo Beach	28	5.1%
Los Angeles	9	1.7%
Palos Verdes Peninsula communities	7	1.3%
Other communities (Los Angeles County)	17	3.1%
Other communities (Orange County)	2	0.4%
Total	**545**	

Where do you work?

Response	Number of Respondents	Percent of respondents
Torrance	120	71.9%
Los Angeles	10	6.0%
Redondo Beach	7	4.2%
El Segundo	5	3.0%
Other communities (Los Angeles County)	16	9.6%
Other communities (Orange County)	2	1.2%
Retired	7	4.2%
Total	**167**	

APPENDIX C
CRITICAL FACILITIES LIST

Facility Name	Facility Type	Priority	Address *
237th Street Stormwater Pump Station	Utilities	Priority 3	Crenshaw Boulevard and Lomita Boulevard
Airport – Executive Hangars	Government Facility	No priority given	3239 Airport Drive
Airport – FAA Tower	Government Facility	Priority 1	25311 Aero Way
Airport – General Aviator Center	Government Facility	No priority given	3301 Airport Drive
Airport – Medium Hangars	Government Facility	No priority given	3239 Airport Drive
Airport – Small Hangars	Government Facility	No priority given	3239 Airport Drive
Alta Loma Recreation	Government Facility	No priority given	26126 Delos Drive
Alta Loma Restroom	Government Facility	No priority given	26126 Delos Drive
Arlington Elementary School	Schools	Priority 2	17800 Van Ness Avenue
Ascension Elementary School	Schools	Priority 2	17910 Prairie Avenue
Bishop Montgomery High School	Schools	Priority 2	5430 Torrance Boulevard
Carr Elementary School	Schools	Priority 2	3404 W 168th Street
Casmir Middle School	Schools	Priority 2	17220 Casmir Avenue
Children's Center School	Schools	Priority 2	4120 W 185th Street
City Kids Childrens Center	Schools	Priority 2	1520 Greenwood Avenue
Crenshaw Boulevard Railway Bridge	Bridges	Priority 2	Crenshaw Boulevard and Dominguez Street
Downtown Police Community Center	Government Facilities	Priority 1	1215 El Prado Avenue
Edison Elementary School	Schools	Priority 2	3800 W 182nd Street
Fern Elementary	Schools	Priority 2	1314 Fern Ave Avenue
Fire Station #1	Government Facilities	Priority 1	1701 Crenshaw Boulevard
Fire Station #2	Government Facilities	Priority 1	25135 Robinson Way
Fire Station #3	Government Facilities	Priority 1	3535 182nd Street
Hamilton Adult School	Schools	Priority 2	2606 W 182nd Street
Historic Bridge	Bridges	Priority 2	Torrance Boulevard and Bow Avenue
Hull Middle School	Schools	Priority 2	2080 W 231st Street

Facility Name	Facility Type	Priority	Address *
I-405 – Artesia Boulevard Overpass and Ramps	Bridges	Priority 2	Interstate 405 and Artesia Boulevard
I-405 – Crenshaw Boulevard Overpass and Ramps	Bridges	Priority 2	Interstate 405 and Crenshaw Boulevard
I-405 – Prairie Avenue Overpass	Bridges	Priority 2	Interstate 405 and Prairie Avenue
I-405 – Redondo Beach Boulevard Overpass and Ramps	Bridges	Priority 2	Interstate 405 and Redondo Beach Boulevard
I-405 – Van Ness Avenue Overpass	Bridges	Priority 2	Interstate 405 and Van Ness Avenue
I-405 – Western Avenue Overpass and Ramps	Bridges	Priority 2	Interstate 405 and Western Avenue
I-405 – Yukon Avenue Overpass	Bridges	Priority 2	Interstate 405 and Yukon Avenue
Levy Adult School	Schools	Priority 2	3420 W 229th Strett
Lincoln Elementary School	Schools	Priority 2	2418 W 166th Street
Magruder Middle School	Schools	Priority 2	4100 W 185th Street
McMaster Park – Park Building	Government Facility	No priority given	3624 W Artesia Boulevard
McMaster Park – Recreation Building	Government Facility	No priority given	3624 W Artesia Boulevard
McMaster Park - Restrooms and Storage	Government Facility	No priority given	3624 W Artesia Boulevard
McMaster Park – Switchhouse and Storage	Government Facility	No priority given	3624 W Artesia Boulevard
Metropolitan Water District Interconnection	Utilities	Priority 3	190th Street and Western Avenue
Nativity Catholic Elementary and Middle School	Schools	Priority 2	2371 Carson Street
North High School	Schools	Priority 2	3620 W 182nd Street
North Torrance Library	Government Facilities	Priority 2	3604 W Artesia Boulevard
Pedestrian Bridge	Bridges	Priority 2	Prairie Avenue and 186th Street
School of Life Elementary and Middle School	Schools	Priority 2	18090 Prairie Avenue

Facility Name	Facility Type	Priority	Address *
Southeast Branch Library	Government Facilities	Priority 2	23115 Arlington Avenue
St. Catherine Elementary and Middle School	Schools	Priority 2	3846 Redondo Beach Boulevard
Towers Elementary	Schools	Priority 2	5600 Towers Street
Vista Montana Water Pump Station	Utilities	Priority 2	4249 Vista Montana
Walteria Elementary School	Schools	Priority 2	24465 Madison Street
Walteria Stormwater Pump Station	Utilities	Priority 3	Hawthorne Boulevard and Lomita Boulevard
Walteria Water Pump Station	Utilities	Priority 2	25640 Crenshaw
Water Pumps	Utilities	Priority 2	Crenshaw Boulevard and Torrance Boulevard
Water Reservoir	Utilities	Priority 2	Crenshaw Boulevard and Crest Road
Water Well	Utilities	Priority 3	Plaza del Amo and Western Avenue
Well #6 and Pumping Station	Utilities	Priority 2	Artesia Boulevard and Yukon Avenue
Well #7 and Pumping Station	Utilities	Priority 2	Cabrillo Avenue and Plaza del Amo
Yukon Elementary School	Schools	Priority 2	17815 Yukon Avenue

** For security reasons, the specific addresses of some utility-related facilities are withheld. In these instances, the nearest major cross-streets are provided.*

APPENDIX D
ADOPTION RESOLUTION

[To be added at a later date]