Attachment 7 – Technical Justification of Projects

This attachment provides the technical justification for the Chabot Dam Seismic Upgrade Project's claimed physical benefits.

Contents

7.1 Project Overview 2

7.2 Without Project Baseline 3

7.3 Summary of Benefits 3

7.4 Relationship of Project to Other Projects Included in the Proposal 4

7.5 Description of Expected Physical Benefits 4

7.6 Uncertainty of Benefits 21

7.7 Summary of Annual Project Physical Benefits 22

7.8 References 24

Appendix 7.1: Hazus Model Outputs 25

LIST OF FIGURES

Figure 7.1: Inundation along San Leandro Creek with Chabot Dam (1,000 Year Flood Event) 5
Figure 7.2: Inundation along San Leandro Creek without Chabot Dam (1,000 Year Flood Event) 7

LIST OF TABLES

Table 7.1: Population Affected by Flood Event, by Each Return Period 7
Table 7.2: Households (Estimated) Displaced Due to Flood and Associated Potential Evacuation 8
Table 7.3: Residents (Estimated) Seeking Temporary Shelter Due to Flood and Associated Potential Evacuation 8
Table 7.4: Number of Residential Buildings Expecting Damage 9
Table 7.5: Number of Commercial Buildings Expecting Damage 9
Table 7.6: Number of Industrial Buildings Expecting Damage 9
Table 7.7: Right-of-Way Debris Generated Under 6 Flood Scenarios, With and Without Project (Cubic Yards) 11
Table 7.8: Miles of Road Inundated Roads, With and Without Project, by Road Category and Return Period (i.e., Flood Frequency) 11
Table 7.9: Chabot Lake boat rental rates 14
Table 7.10: Avoided Recreation Losses Associated with the Project 17
Table 7.11: Avoided Loss of Emergency Water Supply from Chabot Reservoir 19
Table 7.12: Avoided Loss of Raw Water Supply from Chabot Reservoir for Irrigation 21
Table 7.13: Omissions, Biases, and Uncertainties and Their Effect on the Project 21
Table 7.14: Summary of Physical Quantifiable Benefits for the Project (Table 7 from Exhibit C of the SWFM PSP) 23

7.1 Project Overview

The Chabot Dam Seismic Upgrade Project provides for seismic upgrades to the Chabot Reservoir embankment dam (Chabot Dam) and outlet tower. This project would ensure safe, continued operation of the dam in the event of a design-level earthquake on the Hayward Fault, which is located approximately 0.5 km from the site.

Chabot Reservoir is one of five storage reservoirs operated by the East Bay Municipal Utility District (EBMUD). Water supply volume in the combined storage system of EBMUD, including Chabot reservoir, are an important factor in deciding whether to implement drought management programs and rationing for the region during extended dry periods. By improving Chabot Dam, this project helps assure that up to 10,000 AF in Chabot Reservoir remains a vital asset to serve the water needs of the East Bay region.

7.2 Without Project Baseline

The seismic improvements to the reservoir are mandated by the Division of Safety of Dams (DSOD). If the seismic upgrades are not performed, the dam and reservoir could not reliably serve flood control, water supply and recreation uses in the future. Therefore, the seismic upgrade project is compared to a without project baseline that includes dam removal.

Other options were reviewed before establishing this Without Project Baseline:

- Liquefaction and settlement in some foundation soils could result from a major earthquake and may require immediate drawdown the reservoir (Attach 3, Section 1.0). Following drawdown, most or all of the water supply, water based recreation, and flood control benefits of the dam would be lost. Yet, the facility would still be subject to DSOD jurisdiction because there is 2,640 AF of water storage below the outlet. Improvements would still be required for the dam without resulting water supply or recreation benefits. Flood control operations would be uncertain.
- The design earthquake would cause brittle failure of the outlet tower, potentially damaging the outlet pipeline. This could impact the ability to drain the reservoir, which is a safety concern.
- Transferring the dam and property to another entity at low or no cost for alternative uses is not feasible without addressing the deficiency of the dam or removing the hazard. The cost of repairing the deficient structure far outweighs the potential benefit of alternative uses that could be permitted, such as expanded parkland. If EBMUD decided not to proceed with dam improvements, EBMUD would need to remove the dam.

7.3 Summary of Benefits

This project results in a number of benefits relative to the without project baseline, including:

- Flood protection benefits (and avoided flood damage costs associated with the project)
- Avoided emergency water supply costs (i.e., avoided costs associated with importing water via emergency interties)
- Avoided dam removal costs

- Avoided loss of reservoir-based recreation activities at Chabot Lake Regional Park and adjoining Anthony Chabot Regional Park
- Increased water supply reliability
- Avoided loss of ecological benefits provided by Chabot Reservoir
- Improved water quality downstream of the dam because the dam prevents large amounts of sediment from entering San Leandro Creek, and ultimately San Leandro Bay.

To the extent feasible, we have quantified these benefits in both physical and monetary terms (physical benefits are described below and monetized benefits are presented in Attachment 8 of this grant application). For benefits that we were not able to quantify, we provide a qualitative discussion in Attachment 8, *Benefits and Cost Analysis*.

7.4 Relationship of Project to Other Projects Included in the Proposal

No other projects are included in this proposal. All benefits described are expected to accrue from the Chabot Dam Seismic Upgrade Project.

7.5 Description of Expected Physical Benefits

The following (quantifiable) physical benefits are expected from this project:

- Fewer downstream residents impacted by flooding with the project, including households displaced, number of residents seeking temporary shelter, and the number of residential, commercial, and industrial structures impacted.
- Reduced debris and miles of road inundated during flood events relative to the without project baseline
- Avoided reservoir-related recreation losses in terms of annual visitor days
- Avoided loss of emergency water supply in Chabot Reservoir
- Maintenance of 210 AF of raw water supply for irrigation at Chabot Golf Course (120 AF/year) and Willow Park Golf Course (90 AF/year)

Each benefit is discussed in further detail below.

Benefit: Reduced social impacts due to flooding, including fewer residents impacted, households displaced, and number of residents seeking temporary shelter

Flooding downstream of Chabot Reservoir affects varying levels of the population based on the size of the flood. Effects of flooding range from minor inconveniences and damage to actual displacement from one's home. By maintaining flood protection benefits, this project would reduce the social impacts associated with flooding relative to dam removal, including the number of residents affected by the flood, number of households displaced, and the number of people seeking temporary housing shelter. Figure 7.1 shows the modeled inundation area that would occur during a 1,000 year flood event if Chabot Dam remains in place, as proposed as part of the project.

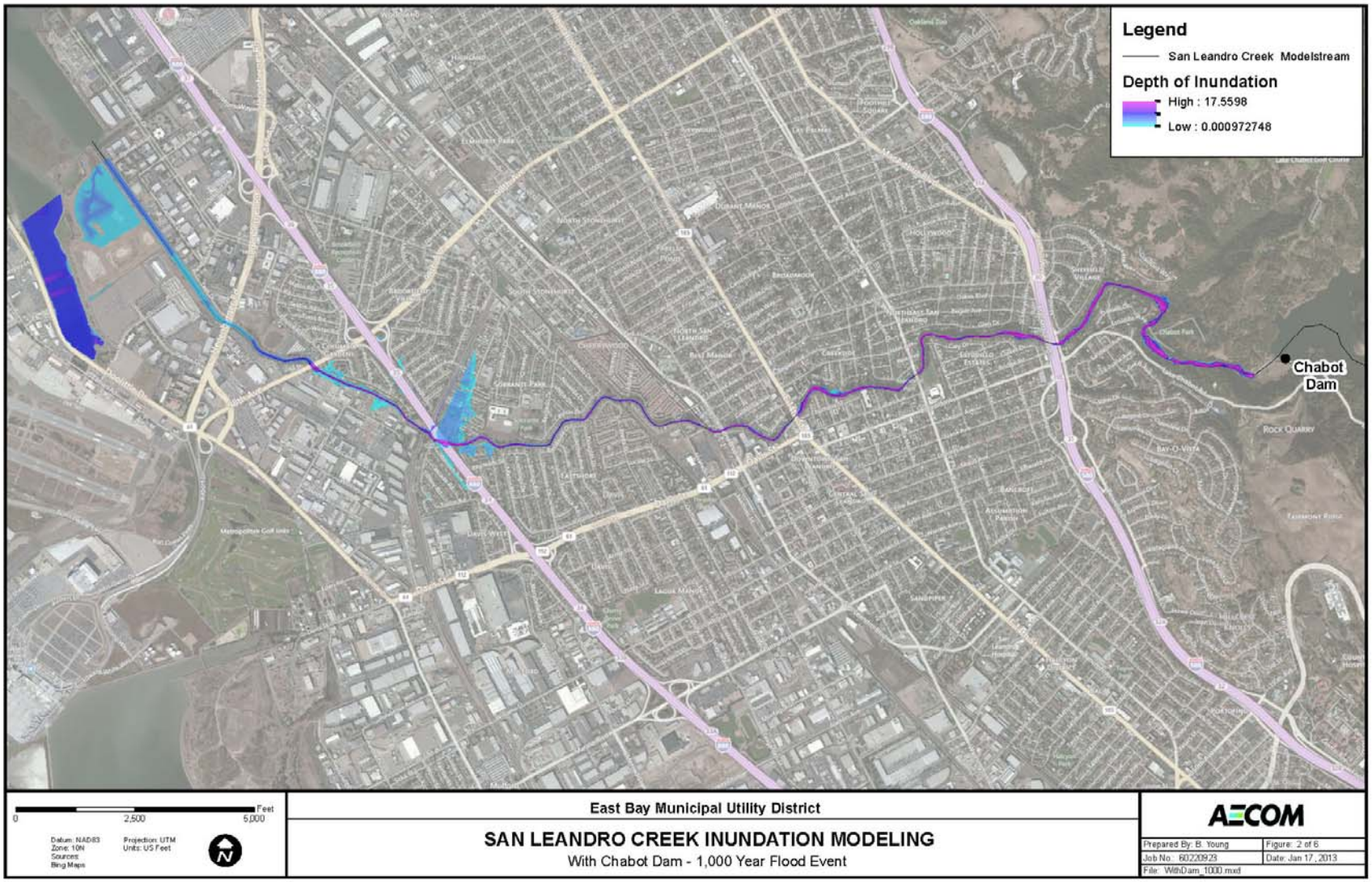

Figure 7.1: Inundation along San Leandro Creek with Chabot Dam (1,000 Year Flood Event)

Background and Historical Conditions

The Lake Chabot Dam has experienced nine overflows since records were started in the 1930s. A storm in April, 1958 caused perhaps the most flooding, based on hydrological estimates. As a result of this storm 150 residences were evacuated. In addition to these evacuations, numerous residences were affected either by suffering damages or by having materials such as silt deposited on their properties.

Without-Project Conditions

Under the without project scenario, flood protection benefits of the dam would be lost. Figure 7.2 shows the predicted inundation area that would occur during a 1,000 year flood event Chabot Dam were removed. This would result in a greater number of people being affected in the event of a flood.

Methods Used to Estimate Benefits

AECOM (EBMUD consultant) estimated the number of people, building structures, and contents that would be affected by flooding with the project (as well without the project) under 6 flooding scenarios (2, 10, 50, 100, 500, and 1,000-year flood events). These estimates are based on 2005 updates to 2000 Census figures.

AECOM uses the Hazus--MH (Hazus) model to estimate the number of households displaced as well as the number of people seeking shelter from flooding, based on the total household and population figures. The model also has an inventory of building structures by type of use, and estimates of building structure and contents values. Hazus is a nationally applicable standardized methodology that contains models for estimating potential losses from floods, as well as other natural disasters such as earthquakes and hurricanes. Hazus uses Geographic Information Systems (GIS) technology to estimate physical, economic, and social impacts of disasters. It graphically illustrates the limits of identified high-risk locations due to flooding. Users can then visualize the spatial relationships between populations and other more permanently fixed geographic assets or resources for the specific hazard being modeled. Model outputs are provided as Appendix 7.1 of this Attachment.

New Facilities Required to Achieve Benefit

No new facilities, policies, or actions would be required to obtain the flood protection benefits. With the dam improvement project, these benefits would be maintained.

Potential Adverse Physical Effects

There are no potential adverse physical effects associated with this benefit.

Benefit Summary

Under all flood scenarios examined, a greater portion of the population would be affected if the dam is removed (i.e., the without project scenario). Table 7.1 shows that the biggest difference occurs in the 500-year flood scenario.

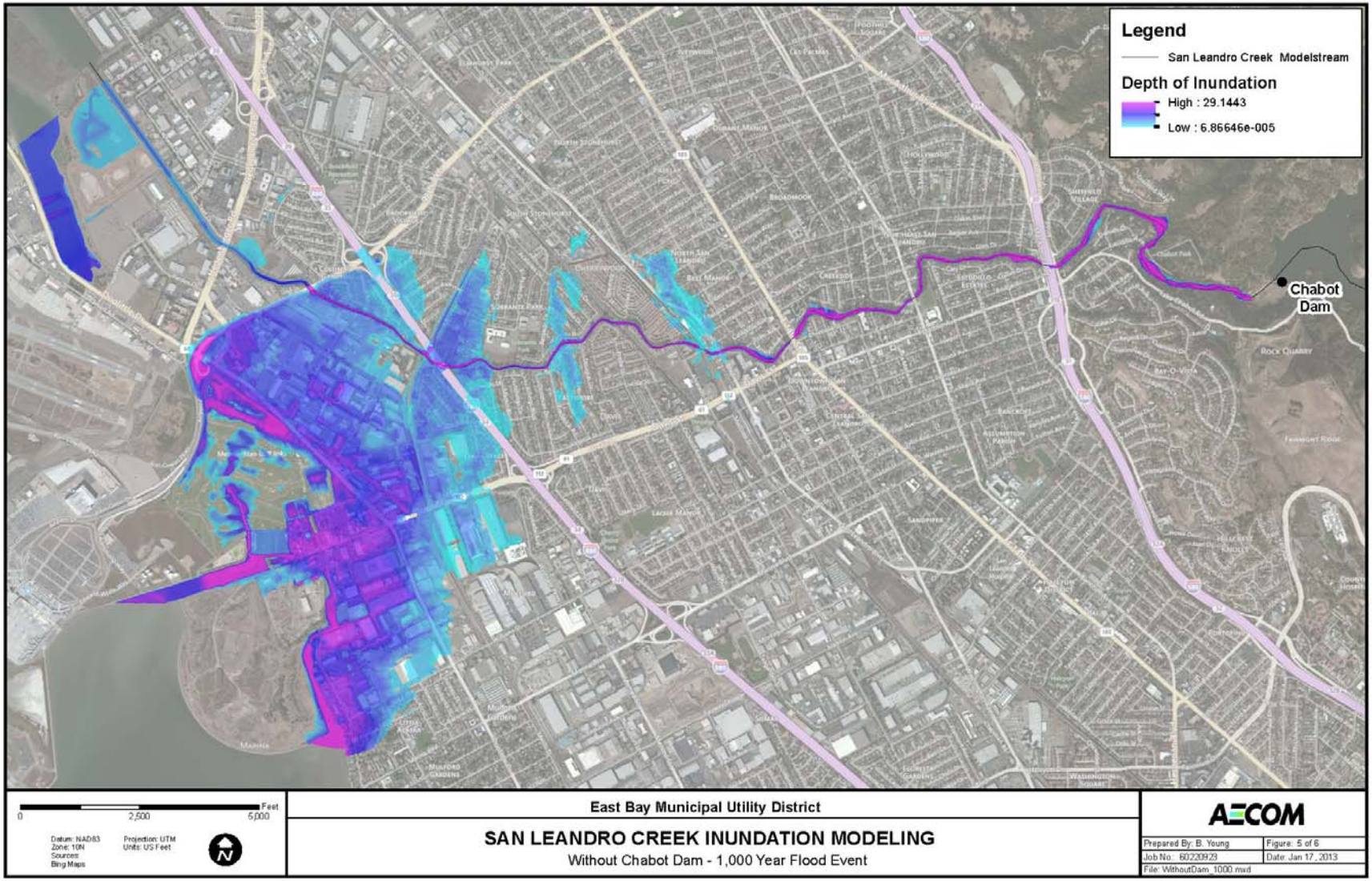

Figure 7.2: Inundation along San Leandro Creek without Chabot Dam (1,000 Year Flood Event)

Table 7.1: Population Affected by Flood Event, by Each Return Period

Flood Event	Population affected by flooding (with project)	Population affected by flooding (without project – dam removal)	Benefit due to project (fewer residents affected by flooding)
2-Year	4,118	5,237	1,119
10-Year	4,967	5,237	270
50-Year	5,237	9,628	4,391
100-Year	5,237	9,628	4,391
500-Year	5,951	13,412	7,461
1000-Year	7,780	14,240	6,460

Source: Hazus model, San Leandro Creek

In addition, as shown in Tables 7.2 and 7.3, there is a significant difference in the number of households displaced and the number of residents seeking temporary shelter under the with and without project scenarios. The dam upgrades would result in substantial social benefits due to increased flood protection for downstream residents associated with this alternative.

Table 7.2: Households (Estimated) Displaced Due to Flood and Associated Potential Evacuation

Flood Event	Households displaced (with project)	Households displaced (without project – dam removal)	Benefit due to project (fewer households displaced)
2-Year	141	205	64
10-Year	177	250	73
50-Year	215	641	426
100-Year	227	757	530
500-Year	317	1,446	1,129
1000-Year	388	1,668	1,280

Source: Hazus model analysis, San Leandro Creek

Table 7.3: Residents (Estimated) Seeking Temporary Shelter Due to Flood and Associated Potential Evacuation

Flood Event	Residents seeking temporary shelter (with project)	Residents seeking temporary shelter (without project – dam removal)	Benefit due to project (fewer residents seeking temporary shelter)
2-Year	162	267	105
10-Year	222	369	147
50-Year	279	1,404	1,125
100-Year	310	1,738	1,428
500-Year	540	3,664	3,124
1000-Year	737	4,359	3,622

Source: Hazus model analysis, San Leandro Creek

Finally, Tables 7.4 through 7.6 show the number of residential, commercial, and industrial structures impacted, with and without the project, under the 6 flooding scenarios. The greatest benefits occur for residential structures, where the difference in buildings damaged between project scenarios is greater

than the total number of residential structures affected if the dam is upgraded, for all flooding scenarios. Since no commercial or industrial buildings are estimated to be damaged if the project is implemented, benefits would be realized for all flood scenarios where damages will be expected if the project is not implemented (all scenarios except the 2- and 10-yr floods).

Table 7.4: Number of Residential Buildings Expecting Damage

Flood Event	Residential buildings damaged (with project)	Residential buildings damaged (without project)	Benefit due to project (fewer residential buildings damaged)
2-Year	0	12	12
10-Year	6	33	27
50-Year	16	90	74
100-Year	22	132	110
500-Year	41	333	292
1000-Year	81	397	316

Source: Hazus model analysis, San Leandro Creek

Table 7.5: Number of Commercial Buildings Expecting Damage

Flood Event	Commercial buildings damaged (with project)	Commercial buildings damaged (without project)	Benefit due to project (fewer commercial buildings damaged)
2-Year	0	0	0
10-Year	0	0	0
50-Year	0	18	18
100-Year	0	19	19
500-Year	0	30	30
1000-Year	0	28	28

Source: Hazus model analysis, San Leandro Creek

Table 7.6: Number of Industrial Buildings Expecting Damage

Flood Event	Industrial buildings damaged (with project)	Industrial buildings damaged (without project)	Benefit due to project (fewer industrial buildings damaged)
2-Year	0	0	0
10-Year	0	0	0
50-Year	0	6	6
100-Year	0	6	6
500-Year	0	10	10
1000-Year	0	9	9

Source: Hazus model analysis, San Leandro Creek

Benefit: Reduced damages due to flooding including tons of debris generated and miles of road inundated

Building damages as a result of flooding events can cause large amounts of debris to be scattered in right-of-way areas. By reducing flood damage, this project would in turn reduce the amount of debris in the flooding area should a flood occur. Additionally, the dam upgrade would result in fewer inundated roadways.

Background and Historical Conditions

The Lake Chabot Dam has experienced spillway overflows in 40 out of 96 years since records were started in 1915. A storm in April, 1958 caused perhaps the most flooding, based on hydrological estimates. As a result of this storm, numerous residences were affected either by suffering damages or by having materials such as silt deposited on lawns.

Without-Project Conditions

Without the project (i.e., if the dam is removed) all flood protection benefits associated with the dam would be lost. This would result in increased flood damages downstream of where the dam is currently located, including increased debris and miles of road inundated during flood events.

Methods Used to Estimate Benefits

AECOM used the Hazus model to estimate tons of debris generated under each of the 6 flood scenarios (2, 10, 50, 100, 500, and 1,000-year flood events). The model separates debris into three broad categories: Finishes, which includes items such as dry wall and insulation; Structural, such as wood or brick; and Foundations, which is comprised of denser materials like concrete and rebar. FEMA provides weight-to-volume conversions for different types of material based on density, and we apply these ratios to the figures provided by Hazus based on how closely the materials match the FEMA categories (FEMA, 2006; FEMA, 2010). Model outputs are provided as Appendix 7.1 of this Attachment.

Road inundation estimates are based on GIS analysis conducted by AECOM. Damages are separated into three categories: Highway, which we classify as arterial road; Major Arterial, which we classify as major road; and Local Street, which we identify as minor road.

New Facilities Required to Achieve Benefit

No new facilities, policies, or actions are required to obtain this physical benefit. Under the with project scenario, flood protection benefits are maintained.

Potential Adverse Physical Effects

There are no potential adverse physical effects associated with this benefit.

Benefits Summary

As shown in Tables 7.7 and 7.8, removing the dam would result in substantial damages relative to maintaining the dam and performing the seismic upgrades. Table 7.7 shows the total amount of debris (cubic yards) generated under the 6 flooding scenarios examined, both with and without the project. As shown, project benefits range from 167 fewer cubic yards of foundations debris (denser materials like concrete and rebar) generated by a 2-year flood to 48,602 fewer cubic yards of finishes debris (which includes items such as dry wall and insulation) generated by a 500-year flood. The 500-yr flood scenario demonstrates the greatest difference in physical damages between with- and with-out project conditions for total amount of debris.

Table 7.7: Right-of-Way Debris Generated Under 6 Flood Scenarios, With and Without Project (Cubic Yards)

	Finishes Debris[a]			Structural Debris			Foundations Debris		
	With Project	Without Project	Change	With Project	Without Project	Change	With Project	Without Project	Change
2-Year	520	4,305	3,785	-	546	546	-	167	167
10-Year	1,949	9,057	7,108	90	3,499	3,410	28	1,132	1,104
50-Year	5,327	24,805	19,478	972	9,302	8,330	296	3,242	2,946
100-Year	6,903	29,941	23,038	1,790	12,119	10,329	575	4,277	3,702
500-Year	10,806	59,409	48,602	4,863	22,796	17,934	1,621	8,290	6,669
1000-Year	26,776	66,344	39568	23563	25458	1,895	8301	9257	957

a. The Hazus model separates debris into three broad categories: Finishes, which includes items such as dry wall and insulation; Structural, such as wood or brick; and Foundations, which is comprised of denser materials like concrete and rebar.

Table 7.8: Miles of Road Inundated Roads, With and Without Project, by Road Category and Return Period (i.e., Flood Frequency)

	Arterial Roads (mi)			Major Roads (mi)			Minor Roads (mi)		
	With Project	Without Project	Change	With Project	Without Project	Change	With Project	Without Project	Change
2-Year	0	0.1	0.1	0	0.03	0.03	0.005	0.112	0.107
10-Year	0.03	0.1	0.07	0.03	0.04	0.01	0.1	0.1	0
50-Year	0.1	0.5	0.4	0.03	2.6	2.57	0.1	6.793	6.693
100-Year	0.1	0.5	0.4	0.04	2.6	2.56	0.1	7.256	7.156
500-Year	0.2	1.1	0.9	0.04	3.7	3.66	0.7	11.99	11.29
1000-Year	0.2	1.2	1	0.04	3.8	3.76	1.2	13.2	12

Benefit: Avoided reservoir-related recreation losses

Chabot Reservoir is an important regional recreational facility that supports water based recreation, (including fishing and boating), hiking, mountain biking, camping, picnicking, and horseback riding. Improvement of Chabot Dam would enable continued long term use of this regional recreational facility.

Background and Historical Conditions

Lake Chabot Regional Park, which encompasses Chabot Reservoir, is located directly adjacent to the 5,067 Anthony Chabot Regional Park. More than 250,000 visitors per year use the park, which is run by East Bay Regional Parks District (EBRPD). EBRPD employs 13 District staff members for oversight and maintenance of park facilities. All data and information relating to recreational uses within this attachment were obtained from EBRPD.[1]

The surface area of Chabot Lake ranges from 242 acres to 341 acres, as the reservoir level is operated to regulate seasonal releases in San Leandro Creek and to maintain recreational access. There are 6 miles of lakeshore that are accessible to support recreational activity. There are few reservoirs of this size in the Bay Area that allow water based recreation.

Park services include rental of canoes and boats, retail sales and dining at the Marina Cafe (a cafe and bait and tackle shop), picnicking, grassy play area, horseshoe pits, hiking, horseback riding, bicycling, jogging, and running trails, and seasonal lake tours aboard the tour boat "Chabot Queen." The following discussion describes the primary uses of the park, including quantitative estimates of visitor days for each activity, where available.

Fishing and Boating

Lake Chabot is stocked with trout and catfish (there are also bass, crappie, and other fish) and is open for fishing and boating throughout the year. There are several fishing piers in the park. One of the park's most popular events is the annual spring fishing derby.

The Lake Chabot Marina Cafe offers a well-stocked bait and tackle shop and is open year round. It features a restaurant that serves snacks, breakfast, and lunch. Rental boats and tour boat rides are available at the marina. Rental boats include row boats, canoes, pedal boats, kayaks, Duffy boats, and boats with electric trolling motors. Because Chabot is a drinking water reservoir, swimming and gasoline motor boats are not allowed. Canoe, kayaks, float tubes with full chest waders and scull craft 20 feet and under may be carried in. The Marina supports 14 employees, 3 of which are full-time (i.e., year-round).

Park representatives estimate that there are 20,000 fishing visitor days at Chabot Lake to each year (i.e., this means that fishing is the primary activity for visiting the park). This includes permitted fisherman, underage fisherman (who do not need a permit), and membership holders.

[1] Personal communication, EBRPD representative, Joe Britton, January 23, 2013.

Hiking, Horseback Riding, and Bicycle Trails

Lake Chabot offers over 20 miles of trails, which connect to the additional 70 miles of trails in adjoining Anthony Chabot Regional Park. The paved, 3.52-mile West Shore and East Shore trails provide access to the south and east shores of the lake. The Lake Chabot bicycle loop (which includes the West Shore and East Shore trails) covers 12.42 miles via the Live Oak Trail, and 14.41 miles via the Honker Bay Trail. Various trails in Lake Chabot Regional Park provide access to the Skyline National Trail north of the lake in Anthony Chabot Regional Park. Most of the fire roads in the park are open to mountain bikes, and many trails allow horseback riding (Although most horseback riding occurs in Anthony Chabot Regional Park).

Park representatives estimate that there are approximately 250,000 visits to the park each year for hiking, walking, biking, and/or jogging on the park's trail system. The West Shore and East Shore are the most popular trails, attracting an average of 100 visitors per day. The number of horseback riding visits is unknown. The trails also support a number of special event runs that occur upwards of 20 times per year.

Picnicking

Picnic facilities (tables with barbecue pits) are located adjacent to the parking and marina area. These sites include first-come, first-served sites and 6 reservable picnic areas that accommodate 50-200 people each, depending on the site. Park representatives estimate that the park currently supports 88,000 picnicking visitor days each year.

Camping

Located in Anthony Chabot Regional Park and overlooking Lake Chabot is the Chabot Family Campground, a year-round campground that has 75 trailer, tent, or walk-in campsites, hot showers, Naturalist-led campfire programs, an amphitheater, and hiking/fishing access to Lake Chabot. Six other reservable group campsites are also located near the lake in Anthony Chabot Regional Park.

Without-Project Conditions

If the dam is removed, all fishing and boating recreational opportunities at the reservoir would be lost. Although other types of recreation would likely be altered in some way, we assume as a conservative estimate that hiking, picnicking, camping, and other activities would remain the same under the without project scenario. Rather than being centered on the lake, trails and surrounding park area would be centered on the restored stream channel.

Under the without project conditions, we assume that no new fishing activity would occur in the new stream channel. This is based on the fact that no fishing currently occurs downstream of the dam or in the stretch of river between Chabot Reservoir and Upper San Leandro Reservoir.

Methods Used to Estimate Benefits

Visitor days for fishing, trail activities, and picnicking were estimated by park staff. We assume that visitor recreation days would not increase substantially at the park in the future, as it already reaches maximum capacity of 5,000 people 20 to 25 times a year.

To estimate the number of visitor days for boating, we relied on revenue data from the park marina (based on revenue reports from the park concessionaire, provided on January 29, 2013). First, we know

that personal watercraft (including canoes, kayaks, float tubes, and scull craft 20 feet) must be inspected before entering the water (for quagga and zebra mussels) for a fee of $4. In 2012, boat inspection fees amounted to a total of $9,000. Thus, we estimate that there were 2,250 private boats brought to the park. EBMUD staff estimates that there are an average of 2.5 people per fishing boat (pers. comm. EBMUD Watershed Staff, Elizabeth Hill, January 29, 2013). To determine the number of boating visitor days, we adjust this number down to 2 to reflect non-fishing boats that may only have one-person in them (e.g., kayaks). Thus, we estimate about 4,500 private boating visitor days at the park.

In 2012, total revenues from boat rentals at the marina amounted to $330,750. The rental rates for different types of boats are shown in Table 7.9.

Table 7.9: Chabot Lake boat rental rates

Rental Types	Hourly	2 Hours	3 - 5 Hours	Daily
Rowboats	$20	$28	$32	$40
Single Kayaks and 2-person Kayaks	$20	$28	$32	$40
Pedal Boats	$20	$28	$32	$40
Electric Motor Boats	$25	$30	$45	$55
Patio Boat *4 hour maximum rental	$65	$130	$200*	—
Miscellaneous: Life Jackets, Battery, Volleyball, Horseshoes	—	—	—	$5

Source: Urban Park Concessionaire

To obtain a rough estimate of total boating visitor days for people who rent boats, we assume that the average rental price for a patio boat is about $185 (this represents the average cost of 2-hour and 3 to 5-hour rentals plus an average rental of 4 life jackets per boat). Lake Chabot currently has 6 patio boats for rent and they are usually booked every weekend. Assuming all 6 boats are rented once a day on the weekends and an average of 3 boats are rented each week (15 rentals a week), total revenues from patio boat rentals would amount to $144,300. This represents 780 patio boat rentals year-round. We assume an average of 4 people per boat as a conservative estimate (patio boats hold up to 8 people).

The remaining revenue of $186,450 is assumed to come from row boats, kayaks, pedal boats, and electric motor boats. Assuming an average rental cost of 35.80 (based on the average of 2-hour, 3 to 5-hour, and daily rental costs across the 4 different boat types), plus $7.50 on average for life jackets, this amounts to 4,306 boat rentals per year. Again, we assume an average of 2 people per boat for these types of boats.

Including patio boats and other water craft (i.e., row boats, kayaks, paddle boats, and electric motor boats), our analysis estimates that there are approximately 5,086 boats rented per year. Personal

communications with park marina staff indicate that a large percentage of all boat rentals are for fishing purposes.

Thus, with the assumptions on the average number of people per boat described above, there are 4,500 boating visitor days from people that bring their own boat, 3,120 boating visitor days from people that rent patio boats, and 8,612 boating visitor days from people who rent other types of boats. This totals 16,232 boating visitor days per year (many of these people also fish).

To ensure that we are not double counting benefits, we need to assign individuals that visit the park to both boat and fish into one category (i.e., either boating or fishing). For this analysis, we assume that 60% of people who boat are also fishing (based on pers. comm. with park marina staff on January 29, 2013). Thus, about 9,740 of the 16,232 boating visitor days involve fishing. We categorized these 9,740 visitor trips as being primarily boating trips and subtract them from the 20,000 fishing visitor days to avoid double counting. The trips are classified as boating trips to as a conservative estimate because the visitor day values are lower than those for boating (see Attachment 8, *Benefits and Costs Analysis*).

Revenue and employment lost under the no project scenario (e.g., marina revenues and employment) are not counted as a benefit because it is assumed that money spent for recreational activities would be spent elsewhere in the local economy (e.g., on other recreational/entertainment pursuits) and that jobs would likely be transferred to other locations or other sectors. The value associated with the marina is captured in the willingness-to-pay values for boating activities, as discussed in Attachment 8.

New Facilities Required to Achieve Benefit

No new facilities, policies, or actions would be required to obtain recreation-related benefits. With the project, current recreation would be maintained.

Potential Adverse Physical Effects

With the project, there would be temporary trail closures due to construction (trail closures are estimated to last 6 months). One of the biggest impacts is that it would close much of the Lake Loop Trail, including the West Shore Trail Section (which is partly made up by the dam). Closing the West Shore Trail would also affect many special event runs that happen upwards of 20 times per year.

Given that this trail supports more than 100 visitors per day (36,500 visitors per year), and the trail is expected to be closed from January to June of 2015, we estimate that approximately one-half of all trail activity on the West Shore will be lost in 2015. Thus, in 2015 there will be 18,250 fewer visitor days for hiking/trail activity under the With Project scenario. Impacts of special events are not estimated as it is uncertain whether these events could be modified or switched to different areas of the park.

Similar to the with-project scenario, the West Shore Trail is expected to be closed for at least six months (perhaps longer) under the without-project scenario. Other sections of the Lake Loop Trail may also be closed. After the dam is removed, the West Shore Trail would need to be re-built along a different alignment through the area where the dam was. For this analysis we assume that impacts during construction are equal under the with- and without-project scenarios.

Summary of Benefits

Chabot Lake currently supports 20,000 fishing visitor days (many of which also boat), about 16,232 boating visitor days (including boat rentals and private watercraft), 250,000 trail activity days (i.e., hiking,

walking, jogging, biking), and 88,000 picnicking days. Based on park employee input, we estimate that about 9,740 of the boating trips involve fishing. To obtain total fishing and boating visitor days, we subtracted the 9,740 fishing trips that are estimated to involve boats from the total 20,000 fishing visits because they are already counted as boating visits.

Under the without project scenario, all fishing and boating activities would be lost. As a conservative estimate, we assume that if the dam were removed, all other activities at the park would remain the same. These activities would be centered around the restored stream channel rather than the lake. Under the without project conditions, we assume that no new fishing activity would occur in the new stream channel. This is based on the fact that no fishing currently occurs downstream of the dam or in the stretch of river between Chabot Reservoir and Upper San Leandro Reservoir.

Construction is slated to begin in October of 2014 under both the with- and without-project scenarios (i.e., the seismic upgrades and the dam removal would be initiated at this time). If the dam is removed, fishing and boating activities would be available until construction begins (i.e., the first nine months of 2014). If the dam is not removed and the seismic upgrades are implemented, boating and fishing would not be impacted during construction. Trail activities would be impacted during construction under both scenarios. However, impacts associated with trail closures during construction are not expected to result in a net change in recreation between the with- and without-project scenarios.

Table 7.10 provides a summary of the physical recreation-related benefits with the proposed project (e.g., avoided loss of fishing and boating visitor days) using Table 7 from Exhibit C of the SWFM PSP (provided below Table 7.14). As shown, benefits begin to accrue in 2014 (the year that construction begins).

Benefit: Avoided loss of emergency water supply

Water supply volume in the combined storage system of EBMUD, including Chabot reservoir, are an important factor in deciding whether to implement drought management programs and rationing for the region during extended dry periods. By improving Chabot Dam, this project helps assure that up to 10,000 AF in Chabot Reservoir remains a vital asset to serve the water needs of the East Bay region (e.g., as a source of emergency drinking water supply and other emergencies such as fire suppression). Given an assumed frequency and average amount of water accessed when emergency supplies are necessary, which is detailed below, the average annual benefit to EBMUD is about 300 AF per year.

Background and Historical Conditions

Lake Chabot's water supply was last used during the 1976-1977 drought for emergency potable services. Approximately 1,700 AF was drafted during the 10-month period from Dec 1976 to Sep 1977. During the 1928-1935 drought period, as Hetch Hetchy was undergoing construction, EBMUD provided supplemental supply to San Francisco Public Utilities Commission from Feb 1931 to Jan 1932 with water predominantly from Lake Chabot. Since the 1976-1977 drought, EBMUD records do not show use of Lake Chabot supply for any emergency use. Currently, there is no direct connection from Lake Chabot to the potable water distribution system.

Table 7.10: Avoided Recreation Losses Associated with the Project

Type of Benefit Claimed: Avoided recreational losses			
Measure of Benefit Claimed (Name of Units): visitor days			
Additional Information About this Measure:			
(a)	(b)	(c)	(d)
Physical Benefits			
Year/benefit	Without Project	With Project	Change Resulting from Project (b) – (c)
2012			
Fishing visitor days[a]	10,260	10,260	0
Boating visitor days	16,232	16,232	0
Trail activity days	250,000	250,000	0
2013			
Fishing visitor days[a]	10,260	10,260	0
Boating visitor days	16,232	16,232	0
Trail activity days	250,000	250,000	0
2014			
Fishing visitor days[a]	7,695	10,260	2,565
Boating visitor days	12,174	16,232	4,058
Trail activity days	250,000	250,000	0
2015			
Fishing visitor days[a]	0	10,260	10,260
Boating visitor days	0	16,232	16,232
Trail activity days	231,750	231,750	0
2016			
Fishing visitor days[a]	0	10,260	10,260
Boating visitor days	0	16,232	16,232
Trail activity days	250,000	250,000	0
2111 (last year of project life)			
Fishing visitor days[a]	0	10,260	10,260
Boating visitor days	0	16,232	16,232
Trail activity days	250,000	250,000	0
a. Fishing visitor days that involve boating are included as boating visitor days to avoid double-counting. To obtain total fishing and boating visitor days, we subtracted the 9,740 fishing trips that are estimated to involve boats from the total 20,000 fishing visits because they are already counted as boating visits.			

Without-Project Conditions

The loss of 10,000 AF of Lake Chabot's water supply would result in the need to secure additional supplemental water supplies for emergency use. Options for sources of supplemental supply include water transfers (i.e., inter-agency interties for emergency mutual aid), groundwater conjunctive use, and desalination. EBMUD has indicated that the most likely source of supplemental supply would be a short-term emergency water transfer, however, transfers may not be available at the time the emergency supply is needed.

Methods Used to Estimate Benefits

The first step to estimating this benefit is to determine the expected frequency with which EBMUD would need to access emergency supplies from Chabot Reservoir over the 100-year project life. Over the last century, EBMUD has accessed the reservoir for emergency drinking water supplies two times (to date, it has not yet been used for major fire suppression purposes). We assume that over the next 100-years, EBMUD would need to access this supply at least twice, and likely more often due to longer, drier periods of drought and increased risk of fires anticipated in the future due to climate change (California Department of Water Resources, 2007). As a conservative estimate, we therefore assume that EBMUD would access Chabot Lake Reservoir for emergency supplies three times over the 100-year project period.

To estimate this benefit, it is also necessary to assume an average amount of water that would be accessed when emergency supplies are necessary. During the drought of 1976 to 1977, EBMUD used about 1,700 AF of water from Lake Chabot to supplement drinking water supplies. When Hetch Hetchy was undergoing construction in the 1930's, EBMUD supplied an estimated 28,000 AF to SFPUC over a 12-month period (it is not known how much of this came from Chabot Reservoir). Going forward, more water will likely be necessary to supplement supplies during droughts due to longer drought periods under climate change and increased demands associated with increased populations. We assume that the full 10,000 AF of water available from Chabot Lake would need to be accessed in an emergency because this is the maximum amount of water that can be accessed over a short period. About 7,710 AF is available through extraction from the lowest outlet elevation of the dam and 2,640 AF is located below the outlet and would have to be extracted in another way, such as temporary pumps, or the entire supply could be accessed using multiple pumps at different locations for different purposes.

Thus, it is assumed that EBMUD would access 10,000 AF of emergency supplies from Lake Chabot three times over the project life time of 100 years. Because we do not know when in the future this would occur, we divide the total of 30,000 AF (10,000 AF multiplied by 3) by the number of years in the project life to determine an average annual benefit amount. Thus, 300 AF represents the average annual benefit of emergency supplies for EBMUD.

New Facilities Required to Achieve Benefit

To obtain emergency drinking water supplies, EBMUD will need to connect Chabot Reservoir to the potable distribution system by temporarily piping water from Chabot Reservoir uphill to Upper San Leandro Reservoir that has a conventional water treatment plan, or other temporary provisions would be investigated such as establishing a mobile treatment operation near Chabot Reservoir. The temporary pipeline option to Upper San Leandro is utilized for consideration here as construction could proceed quickly.

To access supplies for non-potable use, temporary fill stations could access non-potable supplies using temporary pumps brought to the site from elsewhere or the existing raw water pump that serves irrigation customers. For emergency situations up to 7,710 AF of water is assumed to be available for drinking water supplies and the 2,640 AF of water located below the lowest outlet elevation of the dam is assumed to be of lesser quality for non-potable uses only (unless blended in San Leandro Reservoir).

Potential Adverse Physical Effects

No potential adverse physical effects are anticipated. However, there may be some impacts associated with accessing water from Lake Chabot for emergency use (i.e., accessing the full 10,000 AF and connecting the reservoir to the potable distribution system). In order to be able to access drinking water supplies quickly from the reservoir, EBMUD would likely build a temporary 3.5 mile pipeline from Chabot Reservoir to Upper San Leandro Reservoir for treatment following established roads and trails. The San Leandro Water Treatment Plan is already connected to the water distribution system. For other emergencies such as fire suppression or to provide raw water, EBMUD would likely provide non-potable water by establishing a fill station for water trucks or fire trucks. The adverse physical effects associated with these options are expected to be minimal and temporary site disturbance effects. The costs of these options are discussed in Attachment 8, *Benefits and Costs Analysis*.

Summary of Benefit

Table 7.11 provides a summary of the physical (annualized) emergency water supply benefits with the proposed project (e.g., avoided loss of emergency water supply from Chabot Reservoir) using Table 7 from Exhibit C of the SWFM PSP. As shown, benefits begin to accrue in 2014, (the year construction begins) because before that time there are no avoided losses. Since construction does not begin until October of 2014, we assume that if the dam is removed under the without-project scenario, emergency water supplies would be available for the first nine months of that year. However, construction of the seismic upgrades would not impact the availability of emergency supplies, and the full 300 AF benefit applies in that year. Following project construction, benefits of the project would continue over the project life time.

Table 7.11: Avoided Loss of Emergency Water Supply from Chabot Reservoir

Project Title: Chabot Dam Seismic Upgrade Project			
Type of Benefit Claimed: Avoided loss of emergency water supply from Chabot Reservoir			
Measure of Benefit Claimed (Name of Units): AF			
Additional Information About this Measure:			
(a)	(b)	(c)	(d)
Physical Benefits			
Year/benefit	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	300	300	
2013	300	300	
2014	225	300	75
2015	0	300	300
2016	0	300	300
2111 (last year of project life)	0	300	300

Benefit: Maintenance of 210 AF of raw water supply for irrigation at Chabot Golf Course and Willow Park Golf Course

Currently, Chabot Lake serves as the primary source of water supply for raw water irrigation at both Chabot and Willow Park Golf Courses (both located near the reservoir). This project would maintain the 210 AF of raw water that the golf courses access from Chabot Reservoir each year.

Background and Historical Conditions

Chabot Golf Course currently uses 120 AF/yr to irrigate its full-length 18-hole course and shorter, 9-hole course designed for junior golfers and families. Willow Park uses 90 AF/yr to irrigate its 18-hole course. Both golf courses are located close to Lake Chabot Regional Park and serve as important recreational assets in the area.

Without-Project Conditions

Under the without project scenario, the golf courses would have to switch to irrigating with potable supplies from EBMUD. This would minimally increase demand for imported water supplies.

Methods Used to Estimate Benefits

This physical benefit is represented by the avoided loss of raw water for irrigation at Chabot and Willow Park Golf Courses (210 AF/year). No change is expected over the project life-time because the number of acres of turf grass irrigated at the golf course is not expected to change.

New Facilities Required to Achieve Benefit

No new facilities, policies, or actions are required to obtain this physical benefit. With the project, raw water supplies at Chabot and Willow Park Golf Courses would be maintained.

Potential Adverse Physical Effects

There are no potential adverse effects associated with this physical benefit.

Summary of Benefit

Table 7.12 provides a summary of the physical (annualized) raw water supply benefits with the proposed project (e.g., avoided loss of raw water supply for irrigation for Chabot and Willow Park Golf Courses) using Table 7 from Exhibit C of the SWFM PSP (provided below Table 7.14). As shown, benefits begin to accrue in 2014, (the year construction begins) because before that time there are no avoided losses. Since construction does not begin until October of 2014, we assume that if the dam is removed under the without-project scenario, raw water supplies would be available for the first nine months of that year. However, construction of the seismic upgrades would not impact the availability of raw water supplies, and the full 210 AF benefit applies in that year. Following project construction, benefits of the project would continue over the project life time.

Table 7.12: Avoided Loss of Raw Water Supply from Chabot Reservoir for Irrigation

Project Title: Chabot Dam Seismic Upgrade Project			
Type of Benefit Claimed: Avoided loss of raw water supply from Chabot Reservoir			
Measure of Benefit Claimed (Name of Units): AF			
Additional Information About this Measure:			
(a)	(b)	(c)	(d)
Physical Benefits			
Year/benefit	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	210	210	
2013	210	210	
2014	158	210	52
2015	0	210	210
2016	0	210	210
2111 (last year of project life)	0	210	210

7.6 Uncertainty of Benefits

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In most cases, omissions lead to a downward bias in benefits: the project is expected to be much more beneficial than the subset of benefits that can be quantified indicates. These issues are listed in Table 7.13.

Table 7.13: Omissions, Biases, and Uncertainties and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Warning times for flooding events	+	Warning times used in this analysis to calculate flood damages are calculated based on the time difference between maximum inundation at the Lake Chabot Dam and the San Leandro Bay on the other side of the city. Since flooding (as well as resulting damages) would begin before reaching maximum inundation in a flooded area, these warning times are likely overestimations. Thus, people would likely have less time to prepare for a flood and would experience greater impacts than estimated (because they would not be able to implement damage prevention measures). This results in an underestimation of project benefits.
Debris Removal Cost	U	We convert debris tonnage estimates from the Hazus model into cubic yards based on categories of debris used by Hazus and conversion rates based on categories provided by FEMA. Since these categories are not exact matches, debris volume could be more or less than the estimate provided by the weight-to-volume conversion.

Table 7.13: Omissions, Biases, and Uncertainties and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Recreation benefits	U	For this analysis, we assume that only fishing and boating activities would be lost as a result of dam removal. However, if the lake is removed and restored to a stream channel, the nature of recreation would change at the site. This may result in a decrease in user days for other activities if recreators prefer lake-centered recreation. At the same time, dam removal may encourage alternative activities such as kayaking.
Frequency of accessing emergency water supply from Chabot Reservoir over the project life	+	We assume that emergency water supplies would be accessed 3 times over the project life. Given the expected increase in frequency and severity of both drought and wild fires associated with climate change, it is likely that this source would be tapped more often.
Impacts of construction on trail closures	+	It is likely that under the without project scenario (i.e., dam removal), trails would be closed for a period of longer than 6 months (i.e., longer than if the seismic upgrades are implemented) because the trail would need to be rebuilt through the dam area after the dam is removed. However, we assume as a conservative estimate that the trail would reopen after a 6 month period and that impacts under the with and without project scenarios are equal.

*Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates
++ = Likely to increase net benefits significantly
– = Likely to decrease benefits
– – = Likely to decrease net benefits significantly
U = Uncertain, could be + or –

7.7 Summary of Annual Project Physical Benefits

As shown in Tables 7.1 through 7.8 above, this project would result in substantial flood protection benefits relative to the without project baseline of dam removal. These benefits include fewer residents affected by flooding, fewer households displaced, and fewer residents looking for temporary shelter under all 6 flood event scenarios. In addition, fewer miles of road would be inundated and less debris generated in the event of a flood under the with-project scenario. The degree of benefits depends on the severity of the flood event analyzed.

In addition to flood control benefits, this project would result in the following annual physical benefits:

- Avoided loss of 10,260 fishing visitor days and 16,232 boating visitor days at Chabot Lake Park

- Avoided loss of up to 10,000 AF of emergency water supply from Chabot Lake (an average annual benefit of 300 AF per year of emergency supplies based on the frequency and amount of water accessed during emergencies over the project life)

- Avoided loss of 210 AF per year of raw water used for irrigation at Chabot and Willow Park Golf Courses

Table 7 from Exhibit C of the SWFM PSP is provided below (provided here as Table 7.14) to present a summary of the physically quantifiable benefits for the Chabot Dam Seismic Upgrade Project.

Table 7.14: Summary of Physical Quantifiable Benefits for the Project (Table 7 from Exhibit C of the SWFM PSP)

Project Title: Chabot Dam Seismic Upgrade Project			
Type of Benefit Claimed: Avoided recreational losses			
Measure of Benefit Claimed (Name of Units): visitor days			
Additional Information About this Measure:			
			(d)
Physical Benefits			
Year/benefit	Without Project	With Project	Change from Project (c) – (b)
2012			
Fishing visitor days[a]	10,260	10,260	0
Boating visitor days	16,232	16,232	0
Trail activity days	250,000	250,000	0
Avoided loss of emergency supply (AF)	300	300	0
Avoided loss of raw water supply (AF)	210	210	0
2013			
Fishing visitor days[a]	10,260	10,260	0
Boating visitor days	16,232	16,232	0
Trail activity days	250,000	250,000	0
Avoided loss of emergency supply (AF)	300	300	0
Avoided loss of raw water supply (AF)	210	210	0
2014			
Fishing visitor days[a]	7,695	10,260	2,565
Boating visitor days	12,174	16,232	4,058
Trail activity days	250,000	250,000	0
Avoided loss of emergency supply (AF)	225	300	75
Avoided loss of raw water supply (AF)	158	210	52
2015			
Fishing visitor days[a]	0	10,260	10,260
Boating visitor days	0	16,232	16,232
Trail activity days	231,750	231,750	0
Avoided loss of emergency supply (AF)	0	300	300
Avoided loss of raw water supply (AF)	0	210	210
2016			
Fishing visitor days[a]	0	10,260	10,260
Boating visitor days	0	16,232	16,232

Project Title: Chabot Dam Seismic Upgrade Project			
Type of Benefit Claimed: Avoided recreational losses			
Measure of Benefit Claimed (Name of Units): visitor days			
Additional Information About this Measure:			
			(d)
Physical Benefits			
Year/benefit	Without Project	With Project	Change from Project (c) – (b)
Trail activity days	250,000	250,000	0
Avoided loss of emergency supply (AF)	0	300	300
Avoided loss of raw water supply (AF)	0	210	210

7.8 References

California Department of Water Resources. http://www.water.ca.gov/climatechange/docs/062807factsheet.pdf

Urban Park Concessionaire website: http://www.norcalfishing.com/chabot/entry.php

FEMA, 2006. Debris Operations: A Field Perspective. FEMA Florida Long Term Recovery Office – Debris Operations. May, 2006. Available online at: P:\Prop84_Rd2\Projects.EBMUD.1E\Debris Removal\debris_ops.pdf

FEMA, 2010. Debris Estimating Field Guide. September, 2010. Available online at: P:\Prop84_Rd2\Projects.EBMUD.1E\Debris Removal\debris_estimation_outline.pdf

Appendix 7.1: Hazus Model Outputs

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Hazus-MH: Flood Event Report

Region Name: Alameda 2yr with dam

Flood Scenario: 2yr With Dam Analysis

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,007,193	67.7%
Commercial	365,147	24.5%
Industrial	69,181	4.6%
Agricultural	1,947	0.1%
Religion	31,531	2.1%
Government	7,609	0.5%
Education	6,146	0.4%
Total	**1,488,754**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 2yr with dam
Scenario Name:	2yr With Dam Analysis
Return Period Analyzed:	2
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 65 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 3 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 141 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 162 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 0.63 million dollars, which represents 0.04 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 0.63 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 72.73% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.25	0.03	0.00	0.00	0.28
	Content	0.20	0.12	0.00	0.01	0.34
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.46**	**0.15**	**0.00**	**0.01**	**0.63**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.46**	**0.16**	**0.00**	**0.01**	**0.63**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 2yr without dam

Flood Scenario: 2 year Without Dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,095,627	69.2%
Commercial	367,285	23.2%
Industrial	69,315	4.4%
Agricultural	1,947	0.1%
Religion	32,818	2.1%
Government	7,609	0.5%
Education	7,746	0.5%
Total	**1,582,347**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 2yr without dam
Scenario Name:	2 year Without Dam
Return Period Analyzed:	2
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 12 buildings will be at least moderately damaged. This is over 52% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	1	8.33	8	66.67	2	16.67	1	8.33	0	0.00
Total	**0**		**1**		**8**		**2**		**1**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	1	8.33	8	66.67	2	16.67	1	8.33	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 758 tons of debris will be generated. Of the total amount, Finishes comprises 71% of the total, Structure comprises 18% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 30 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 205 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 267 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 6.22 million dollars, which represents 0.39 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 6.21 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 84.17% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	2.96	0.16	0.05	0.01	3.18
	Content	2.27	0.49	0.13	0.11	3.00
	Inventory	0.00	0.01	0.03	0.00	0.04
	Subtotal	**5.23**	**0.65**	**0.21**	**0.12**	**6.21**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**5.23**	**0.65**	**0.21**	**0.12**	**6.22**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 10 yr with dam

Flood Scenario: 10 yr with dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,060,945	68.7%
Commercial	367,024	23.8%
Industrial	69,247	4.5%
Agricultural	1,947	0.1%
Religion	31,761	2.1%
Government	7,609	0.5%
Education	6,146	0.4%
Total	**1,544,679**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 10 yr with dam
Scenario Name:	10 yr with dam
Return Period Analyzed:	10
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 6 buildings will be at least moderately damaged. This is over 33% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	1	16.67	5	83.33	0	0.00	0	0.00	0	0.00
Total	**0**		**1**		**5**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	1	16.67	5	83.33	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 280 tons of debris will be generated. Of the total amount, Finishes comprises 87% of the total, Structure comprises 8% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 11 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 177 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 222 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 2.68 million dollars, which represents 0.17 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 2.68 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 86.03% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1.29	0.06	0.01	0.00	1.37
	Content	1.01	0.21	0.04	0.04	1.30
	Inventory	0.00	0.01	0.01	0.00	0.01
	Subtotal	**2.30**	**0.28**	**0.06**	**0.04**	**2.68**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**2.30**	**0.28**	**0.06**	**0.04**	**2.68**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 10yr without dam

Flood Scenario: 10 year Without Dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

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Note:
Appendix A contains a complete listing of the counties contained in the region.

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There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

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Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
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Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,095,627	69.2%
Commercial	367,285	23.2%
Industrial	69,315	4.4%
Agricultural	1,947	0.1%
Religion	32,818	2.1%
Government	7,609	0.5%
Education	7,746	0.5%
Total	**1,582,347**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 10yr without dam
Scenario Name:	10 year Without Dam
Return Period Analyzed:	10
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 33 buildings will be at least moderately damaged. This is over 73% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	1	3.03	12	36.36	6	18.18	14	42.42	0	0.00
Total	**0**		**1**		**12**		**6**		**14**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	1	3.03	12	36.36	6	18.18	14	42.42	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 2,573 tons of debris will be generated. Of the total amount, Finishes comprises 44% of the total, Structure comprises 34% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 103 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 250 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 369 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 14.72 million dollars, which represents 0.93 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 14.71 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 85.28% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	7.18	0.37	0.15	0.04	7.73
	Content	5.37	0.94	0.34	0.25	6.90
	Inventory	0.00	0.02	0.06	0.00	0.08
	Subtotal	**12.55**	**1.32**	**0.55**	**0.29**	**14.71**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**
ALL	**Total**	**12.55**	**1.33**	**0.55**	**0.29**	**14.72**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 50yr with dam

Flood Scenario: 50 year With Dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,095,627	69.2%
Commercial	367,285	23.2%
Industrial	69,315	4.4%
Agricultural	1,947	0.1%
Religion	32,818	2.1%
Government	7,609	0.5%
Education	7,746	0.5%
Total	**1,582,347**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 50yr with dam
Scenario Name:	50 year With Dam
Return Period Analyzed:	50
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 16 buildings will be at least moderately damaged. This is over 59% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	1	6.25	10	62.50	3	18.75	2	12.50	0	0.00
Total	**0**		**1**		**10**		**3**		**2**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	1	6.25	10	62.50	3	18.75	2	12.50	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,057 tons of debris will be generated. Of the total amount, Finishes comprises 63% of the total, Structure comprises 23% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 42 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 215 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 279 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 8.00 million dollars, which represents 0.51 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 8.00 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 85.07% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	3.88	0.19	0.07	0.02	4.16
	Content	2.92	0.57	0.17	0.14	3.80
	Inventory	0.00	0.01	0.03	0.00	0.04
	Subtotal	**6.81**	**0.77**	**0.27**	**0.16**	**8.00**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**
ALL	**Total**	**6.81**	**0.77**	**0.27**	**0.16**	**8.00**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 50yr without dam

Flood Scenario: 50 year Without Dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,343,409	56.5%
Commercial	729,617	30.7%
Industrial	237,138	10.0%
Agricultural	5,807	0.2%
Religion	37,387	1.6%
Government	8,097	0.3%
Education	14,971	0.6%
Total	**2,376,426**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 50yr without dam
Scenario Name:	50 year Without Dam
Return Period Analyzed:	50
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 107 buildings will be at least moderately damaged. This is over 36% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	7	38.89	11	61.11	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	5	83.33	1	16.67	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	7	7.78	35	38.89	12	13.33	36	40.00	0	0.00
Total	**7**		**23**		**36**		**12**		**36**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	4	33.33	7	58.33	1	8.33	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	1	25.00	3	75.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	1	25.00	3	75.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	1	1.09	8	8.70	35	38.04	12	13.04	36	39.13	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	1	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 7,047 tons of debris will be generated. Of the total amount, Finishes comprises 44% of the total, Structure comprises 33% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 282 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 641 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,404 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 150.22 million dollars, which represents 6.32 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 149.49 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 18.00% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	15.63	17.91	14.15	0.62	48.31
	Content	11.34	45.16	35.75	2.27	94.52
	Inventory	0.00	1.59	4.98	0.09	6.66
	Subtotal	**26.97**	**64.65**	**54.88**	**2.98**	**149.49**
Business Interruption						
	Income	0.01	0.23	0.01	0.00	0.25
	Relocation	0.02	0.08	0.01	0.00	0.12
	Rental Income	0.02	0.06	0.00	0.00	0.08
	Wage	0.02	0.26	0.01	0.01	0.29
	Subtotal	**0.06**	**0.63**	**0.03**	**0.01**	**0.74**
ALL	**Total**	**27.04**	**65.29**	**54.91**	**2.99**	**150.22**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 100 yr with dam

Flood Scenario: 100 year with dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

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Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

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There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

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Building Exposure by Occupancy Type for the Study Region

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Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,095,627	69.2%
Commercial	367,285	23.2%
Industrial	69,315	4.4%
Agricultural	1,947	0.1%
Religion	32,818	2.1%
Government	7,609	0.5%
Education	7,746	0.5%
Total	**1,582,347**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 100 yr with dam
Scenario Name:	100 year with dam
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 22 buildings will be at least moderately damaged. This is over 69% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	1	4.55	11	50.00	4	18.18	6	27.27	0	0.00
Total	**0**		**1**		**11**		**4**		**6**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	1	4.55	11	50.00	4	18.18	6	27.27	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,598 tons of debris will be generated. Of the total amount, Finishes comprises 54% of the total, Structure comprises 28% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 64 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 227 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 310 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 10.77 million dollars, which represents 0.68 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 10.76 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 85.31% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	5.26	0.26	0.10	0.02	5.63
	Content	3.92	0.73	0.23	0.19	5.07
	Inventory	0.00	0.01	0.04	0.00	0.06
	Subtotal	**9.18**	**1.00**	**0.37**	**0.21**	**10.76**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**
ALL	**Total**	**9.19**	**1.00**	**0.37**	**0.21**	**10.77**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 100 yr without dam

Flood Scenario: 100 year Without Dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,345,934	56.6%
Commercial	729,617	30.7%
Industrial	237,138	10.0%
Agricultural	5,807	0.2%
Religion	37,387	1.6%
Government	8,097	0.3%
Education	14,971	0.6%
Total	**2,378,951**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 100 yr without dam
Scenario Name:	100 year Without Dam
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 153 buildings will be at least moderately damaged. This is over 40% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	3	15.79	16	84.21	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	1	16.67	4	66.67	1	16.67	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	16	12.12	60	45.45	12	9.09	44	33.33	0	0.00
Total	**4**		**36**		**61**		**12**		**44**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	1	8.33	10	83.33	1	8.33	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	1	20.00	4	80.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	1	33.33	2	66.67	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	17	12.78	60	45.11	12	9.02	44	33.08	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	1	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 8,911 tons of debris will be generated. Of the total amount, Finishes comprises 42% of the total, Structure comprises 34% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 356 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 757 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,738 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 165.16 million dollars, which represents 6.94 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 164.41 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 19.68% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	18.96	19.16	15.36	0.66	54.14
	Content	13.47	48.35	38.81	2.40	103.02
	Inventory	0.00	1.72	5.43	0.10	7.25
	Subtotal	**32.42**	**69.23**	**59.60**	**3.16**	**164.41**
Business Interruption						
	Income	0.01	0.24	0.01	0.00	0.26
	Relocation	0.03	0.08	0.01	0.00	0.12
	Rental Income	0.02	0.06	0.00	0.00	0.08
	Wage	0.02	0.26	0.01	0.01	0.30
	Subtotal	**0.07**	**0.64**	**0.03**	**0.01**	**0.75**
ALL	**Total**	**32.50**	**69.87**	**59.63**	**3.17**	**165.16**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 500yr with dam

Flood Scenario: 500 year With Dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,124,192	67.1%
Commercial	421,506	25.2%
Industrial	71,514	4.3%
Agricultural	4,753	0.3%
Religion	32,818	2.0%
Government	7,609	0.5%
Education	12,911	0.8%
Total	**1,675,303**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 500yr with dam
Scenario Name:	500 year With Dam
Return Period Analyzed:	500
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 41 buildings will be at least moderately damaged. This is over 56% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	1	2.44	11	26.83	5	12.20	24	58.54	0	0.00
Total	**0**		**1**		**11**		**5**		**24**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	1	2.44	11	26.83	5	12.20	24	58.54	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 3,377 tons of debris will be generated. Of the total amount, Finishes comprises 40% of the total, Structure comprises 36% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 135 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 317 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 540 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 17.98 million dollars, which represents 1.07 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 17.97 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 85.69% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	8.86	0.44	0.18	0.06	9.54
	Content	6.53	1.08	0.40	0.33	8.33
	Inventory	0.00	0.02	0.07	0.01	0.10
	Subtotal	**15.40**	**1.53**	**0.65**	**0.39**	**17.97**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.01	0.00	0.00	0.00	0.01
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.00**	**0.00**	**0.00**	**0.01**
ALL	**Total**	**15.41**	**1.53**	**0.65**	**0.39**	**17.98**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 500yr without dam

Flood Scenario: 500 year Without Dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,601,607	59.7%
Commercial	751,631	28.0%
Industrial	258,982	9.7%
Agricultural	5,890	0.2%
Religion	39,299	1.5%
Government	9,997	0.4%
Education	15,038	0.6%
Total	**2,682,444**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 500yr without dam
Scenario Name:	500 year Without Dam
Return Period Analyzed:	500
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 370 buildings will be at least moderately damaged. This is over 43% of the total number of buildings in the scenario. There are an estimated 10 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	3	10.00	23	76.67	4	13.33	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	5	50.00	4	40.00	1	10.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	57	17.12	188	56.46	15	4.50	63	18.92	10	3.00
Total	**3**		**85**		**196**		**16**		**63**		**10**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	2	10.53	12	63.16	4	21.05	1	5.26	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	1	11.11	6	66.67	2	22.22	0	0.00	0	0.00	0	0.00
Steel	0	0.00	4	66.67	2	33.33	0	0.00	0	0.00	0	0.00
Wood	0	0.00	60	17.86	188	55.95	15	4.46	63	18.75	10	2.98

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 17,270 tons of debris will be generated. Of the total amount, Finishes comprises 43% of the total, Structure comprises 33% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 691 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,446 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3,664 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 289.68 million dollars, which represents 10.80 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 288.34 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 21.62% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	37.35	32.88	26.92	1.15	98.29
	Content	25.15	82.64	66.05	4.02	177.86
	Inventory	0.00	3.04	8.93	0.23	12.20
	Subtotal	**62.50**	**118.55**	**101.90**	**5.39**	**288.34**
Business Interruption						
	Income	0.01	0.39	0.02	0.01	0.42
	Relocation	0.07	0.15	0.01	0.00	0.23
	Rental Income	0.03	0.10	0.00	0.00	0.13
	Wage	0.03	0.41	0.02	0.10	0.54
	Subtotal	**0.13**	**1.05**	**0.05**	**0.10**	**1.33**
ALL	**Total**	**62.63**	**119.60**	**101.94**	**5.50**	**289.68**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 1000yr with dam

Flood Scenario: 1000 year with dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,195,841	64.0%
Commercial	481,742	25.8%
Industrial	133,282	7.1%
Agricultural	5,072	0.3%
Religion	33,243	1.8%
Government	7,609	0.4%
Education	12,911	0.7%
Total	**1,869,700**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 1000yr with dam
Scenario Name:	1000 year with dam
Return Period Analyzed:	1000
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 81 buildings will be at least moderately damaged. This is over 76% of the total number of buildings in the scenario. There are an estimated 46 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	14	17.28	10	12.35	11	13.58	46	56.79
Total	**0**		**0**		**14**		**10**		**11**		**46**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	0	0.00	14	17.28	10	12.35	11	13.58	46	56.79

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 13,388 tons of debris will be generated. Of the total amount, Finishes comprises 25% of the total, Structure comprises 42% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 536 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 388 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 737 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 37.87 million dollars, which represents 2.03 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 37.85 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 82.84% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	19.72	1.34	0.36	0.56	21.99
	Content	11.64	2.08	0.67	1.19	15.57
	Inventory	0.00	0.05	0.12	0.13	0.29
	Subtotal	**31.36**	**3.46**	**1.15**	**1.88**	**37.85**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.01
	Relocation	0.01	0.00	0.00	0.00	0.01
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.02**	**0.01**	**0.00**	**0.00**	**0.02**
ALL	**Total**	**31.37**	**3.47**	**1.15**	**1.88**	**37.87**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**

Hazus-MH: Flood Event Report

Region Name: Alameda 1000yr without Dam

Flood Scenario: 1000 year Without Dam

Print Date: Tuesday, January 22, 2013

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

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Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 737 square miles and contains 14,831 census blocks. The region contains over 523 thousand households and has a total population of 1,443,741 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 427,149 buildings in the region with a total building replacement value (excluding contents) of 137,973 million dollars (2006 dollars). Approximately 91.60% of the buildings (and 78.25% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 427,149 buildings in the region which have an aggregate total replacement value of 137,973 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,963,004	78.2%
Commercial	20,025,171	14.5%
Industrial	6,308,496	4.6%
Agricultural	163,487	0.1%
Religion	1,606,235	1.2%
Government	571,780	0.4%
Education	1,334,486	1.0%
Total	**137,972,659**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,645,268	60.2%
Commercial	755,029	27.6%
Industrial	264,024	9.7%
Agricultural	5,890	0.2%
Religion	39,724	1.5%
Government	9,997	0.4%
Education	15,038	0.5%
Total	**2,734,970**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,777 beds.
There are 568 schools, 14 fire stations, 29 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Alameda 1000yr without Dam
Scenario Name:	1000 year Without Dam
Return Period Analyzed:	1000
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 431 buildings will be at least moderately damaged. This is over 43% of the total number of buildings in the scenario. There are an estimated 17 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	3	10.71	21	75.00	4	14.29	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	4	44.44	4	44.44	1	11.11	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	72	18.14	231	58.19	16	4.03	61	15.37	17	4.28
Total	**3**		**97**		**239**		**17**		**61**		**17**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	2	10.53	12	63.16	4	21.05	1	5.26	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	1	12.50	5	62.50	2	25.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	4	66.67	2	33.33	0	0.00	0	0.00	0	0.00
Wood	0	0.00	74	18.55	231	57.89	16	4.01	61	15.29	17	4.26

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,777 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,777 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	16	0	0	0
Police Stations	29	0	0	0
Schools	568	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 19,286 tons of debris will be generated. Of the total amount, Finishes comprises 43% of the total, Structure comprises 33% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 771 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,668 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 4,359 people (out of a total population of 1,443,741) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 305.79 million dollars, which represents 11.18 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 304.38 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 23.25% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	42.58	33.98	27.86	1.30	105.73
	Content	28.36	85.18	68.06	4.46	186.05
	Inventory	0.00	3.13	9.17	0.30	12.60
	Subtotal	**70.93**	**122.29**	**105.09**	**6.06**	**304.38**
Business Interruption						
	Income	0.01	0.41	0.02	0.01	0.44
	Relocation	0.08	0.15	0.01	0.00	0.25
	Rental Income	0.03	0.10	0.00	0.00	0.14
	Wage	0.03	0.42	0.02	0.12	0.58
	Subtotal	**0.15**	**1.09**	**0.05**	**0.13**	**1.41**
ALL	**Total**	**71.08**	**123.38**	**105.14**	**6.18**	**305.79**

Appendix A: County Listing for the Region

California

- Alameda

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Alameda	1,443,741	107,963,004	30,009,655	137,972,659
Total	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**
Total Study Region	**1,443,741**	**107,963,004**	**30,009,655**	**137,972,659**