Learning and Adapting in Pursuit of Resilience

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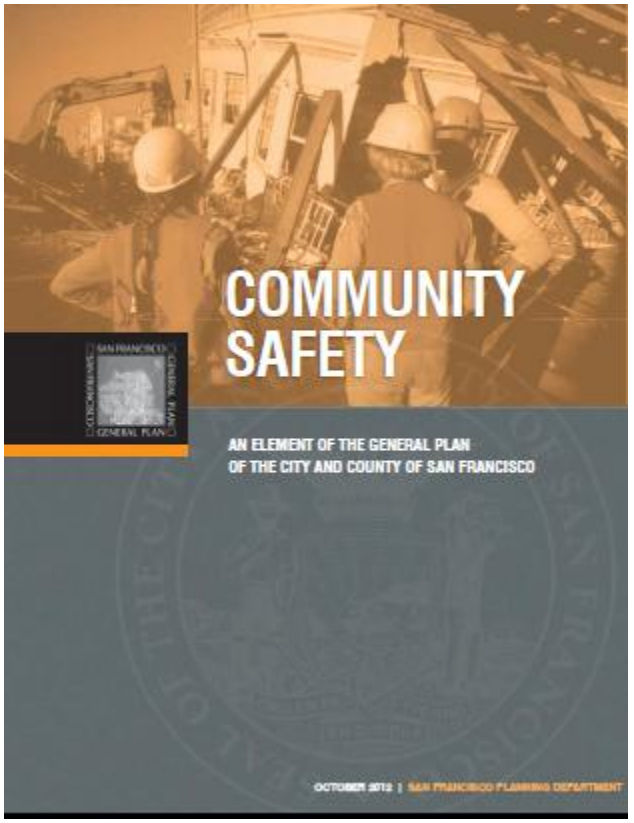
What is Different after 25 Years?

- URMs are retrofitted or demolished
  - (many will still be damaged in next quake)
- Concrete buildings inventoried
  - (1500 in LA, 3000 in SF)
- CalTrans retrofit of bridges and freeways
- Major upgrades and redundancies in water, transit, power systems
- Improved building codes for new construction
- Public Facilities upgraded

Resilient San Francisco

- Defined in the Community Safety Element of the General Plan
- Includes 4 Objectives and 83 Policies
  - Mitigation
  - Emergency Preparedness
  - Response
  - Recovery and Reconstruction
- One of the Rockefeller 100 Resilient Cities



Thanks to Chris Poland and SPUR for slides

SPUR's Role in Resilience Planning

- A member-supported nonprofit organization – begun 1910

- SPUR brings people together from across the political spectrum to develop solutions to our most pressing urban policy problem

  - Eight program areas: Community Planning, Disaster Planning, Economic Development, Good Government, Housing, Regional Planning, Sustainable Development and Transportation

SPUR
SAN FRANCISCO
PLANNING + URBAN RESEARCH
ASSOCIATION

What is Seismic Resilience?

Seismic resilience is the ability of the city to:

- ***contain the effects*** of earthquakes
- ***carry out recovery*** activities in ways that minimize social disruption
- ***rebuild*** in ways that mitigate the effects of future earthquakes
- Goal is to save the people, their neighborhoods, their cultural heritage and their local economy.

Achieving a Resilient Community

Requires a holistic approach before and after the event

- Human Resilience is the engine
- Physical Infrastructure Resilience is the foundation
- Recovery governance sets the pace and direction
- Financial Resources are the fuel

Requires public education, plans for interim governance and financing, and a sufficient physical infrastructure

Three Phases of Planning

Before the Disaster

Define goals, identify gaps, build better, mitigate deficiencies

Disaster Response

Rescue and stabilize, damage assessment, communication, public health and safety, restoration of vital systems

After the Disaster

Governance that facilitates recovery, build back better

Physical Infrastructure Resilience

The ability to return to full occupancy and function as soon as needed to support a well planned and expedited recovery.

- Transparent Hazard Definitions
- Transparent Performance Measures for Buildings and Lifelines
- Restoration Goals that support response and recovery

Hazard Levels

Routine	Remains fully operational without significant damage. M = 5.0
Expected	Remains functional at a level sufficient to support response and recovery. M = 7.2
Extreme	Maximum considered occurrence based on the historic record and anticipated changes due to climate change. M = 7.9

Transparent Performance Measures for Buildings

Category	Performance Standard
Category A	***Safe and operational**:* Essential facilities such as hospitals and emergency operations centers
Category B	***Safe and usable during repair**:* "shelter-in-place" residential buildings and buildings needed for emergency operations
Category C	***Safe and usable after repair**:* current minimum design standard for new, non-essential buildings
Category D	***Safe but not repairable**:* below standard for new, non-essential buildings. Often used as a performance goal for existing buildings undergoing voluntary rehabilitation
Category E	***Unsafe – partial or complete collapse**:* damage that will lead to casualties in the event of the "expected" earthquake - the killer buildings

Restoration Goals for the "Expected" Earthquake

Phase	Time Frame	Focus
I	1 to 7 days	Initial response and staging for reconstruction
II	7 to 60 days	Housing restored – ongoing social needs met
III	2 to 36 mos	Long term reconstruction

Target States of Recovery for Buildings and Infrastructure

Phase	Time Frame	Focus of Attention
I	**1 to 7 days**	**Initial response and staging for reconstruction**

EOC's,

City Buildings,

Hospitals,

Police and Fire Stations,

Shelters

San Francisco General Hospital

Building Category A: "Safe and Operational"

Lifeline Category I: "Resume essential service in 4 hours"

Target States of Recovery for Buildings and Infrastructure

Phase	Time Frame	Focus of Attention
II	**7 to 30 days**	**housing restored – ongoing social needs met**

Residential structures,

Schools,

Community retail centers,

Doctors offices

Building Category B: “Safe and usable while being repaired”

Lifeline Category II: “Resume 100% workforce service within 4 months”

Target States of Recovery for Buildings and Infrastructure

Phase	Time Frame	Focus of Attention
III	2 to 36 months	Long term reconstruction

Industrial Buildings

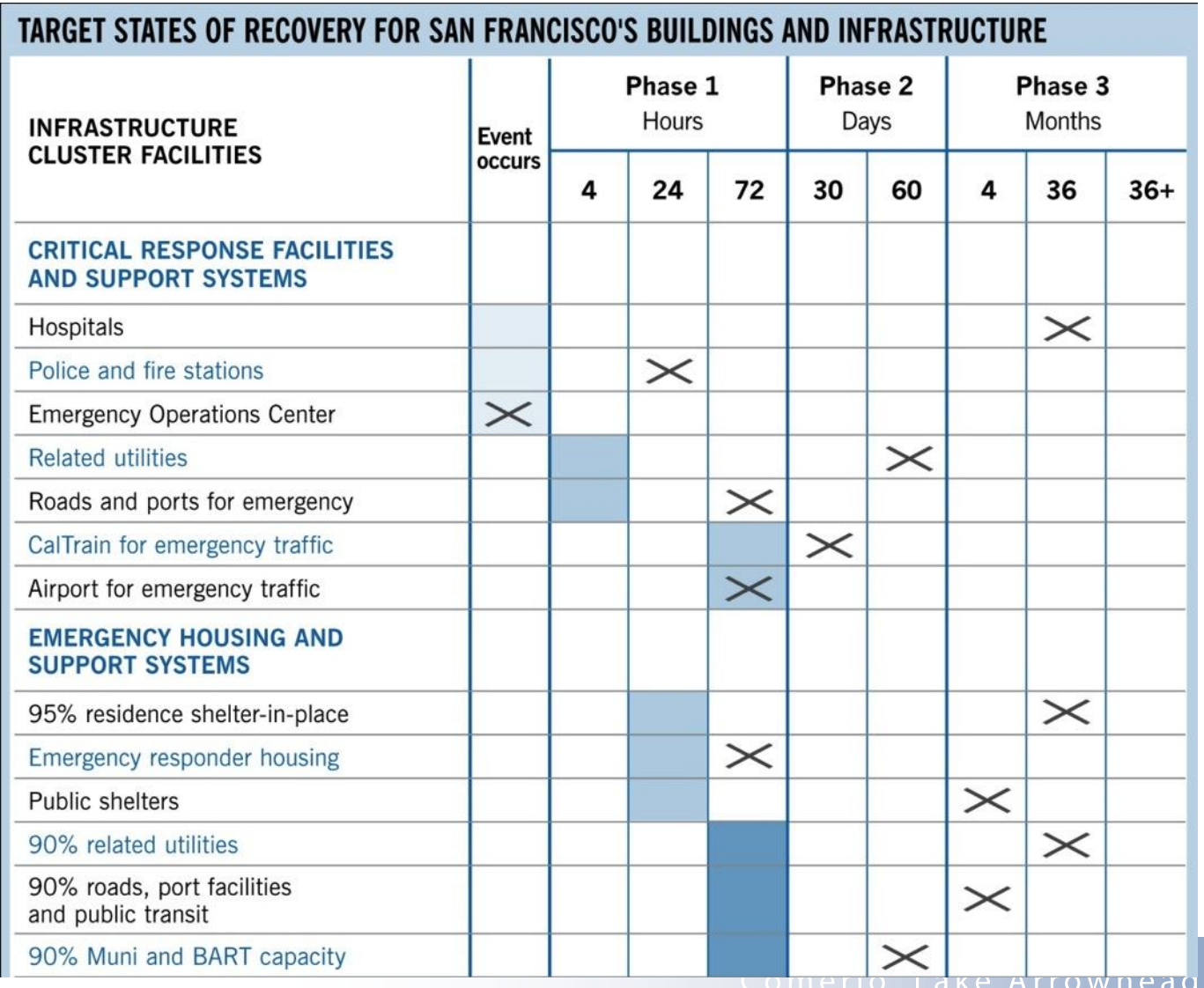
Commercial buildings

Historic buildings

Building Category C: “Safe and usable after repair”

Lifeline Category III: “Resume 100% commercial service within 36 months”

Target States of Recovery for Buildings and Infrastructure



TARGET STATES OF RECOVERY FOR SAN FRANCISCO'S BUILDINGS AND INFRASTRUCTURE

INFRASTRUCTURE CLUSTER FACILITIES	Event occurs	Phase 1 Hours			Phase 2 Days		Phase 3 Months		
		4	24	72	30	60	4	36	36+
CRITICAL RESPONSE FACILITIES AND SUPPORT SYSTEMS									
Hospitals								X	
Police and fire stations			X						
Emergency Operations Center	X								
Related utilities						X			
Roads and ports for emergency				X					
CalTrain for emergency traffic					X				
Airport for emergency traffic				X					
EMERGENCY HOUSING AND SUPPORT SYSTEMS									
95% residence shelter-in-place								X	
Emergency responder housing				X					
Public shelters							X		
90% related utilities								X	
90% roads, port facilities and public transit							X		
90% Muni and BART capacity						X			

TARGET STATES OF RECOVERY

Performance measure	Description of usability after expected event	
	BUILDINGS	LIFELINES
	Category A: Safe and operational	
	Category B: Safe and usable during repairs	100% restored in 4 hours
	Category C: Safe and usable after moderate repairs	100% restored in 4 months
	Category D: Safe and usable after major repairs	100% restored in 3 years
X	Expected current status	

Note: Categories A–D are defined on page 10.

Sample Policies for Achieving Resilience

Existing and New Buildings, Lifelines

Mandated retrofit of soft-story, woodframe, multifamily housing.

Develop strong incentives and a clear communication of seismic performance expectations that encourage building to higher seismic standards.

Establish a “Lifelines Council for comprehensive planning.

Establish partnerships with regional, state, and private sector entities to address multi-jurisdictional and regional systems.

Components of SPUR's Post-Disaster Recovery Planning

1. Transportation
2. Governance
3. Planning
4. Housing

EXAMPLE Safe Enough to Stay:

What will it take to enable San Franciscans to shelter-in-place after an earthquake?

How much of our housing stock needs to meet shelter-in-place standards?

Given:

Emergency shelter bed capacity:

60,000 beds

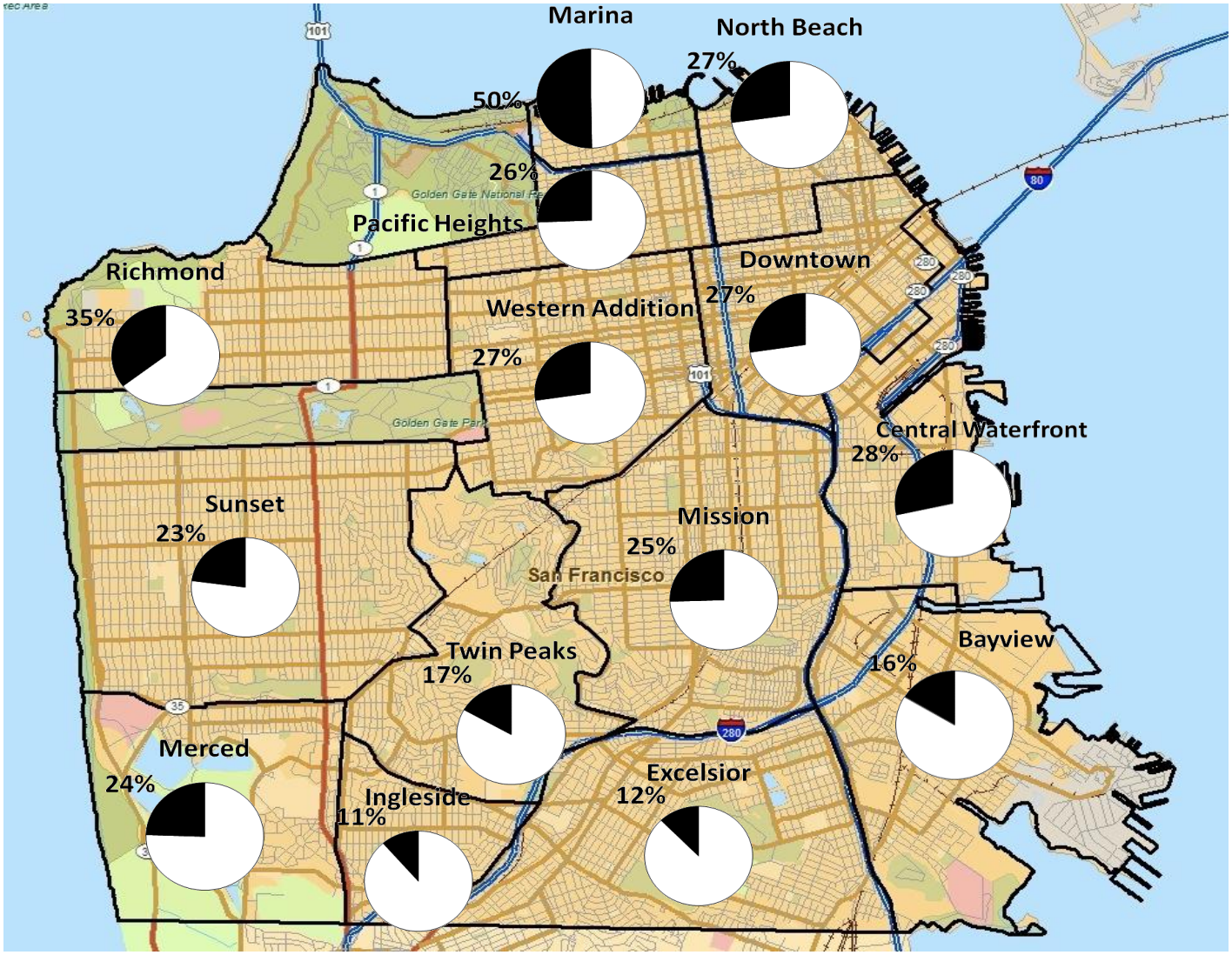
Potential interim housing need**:**

80,000 + households or **25%** of San Francisco's population

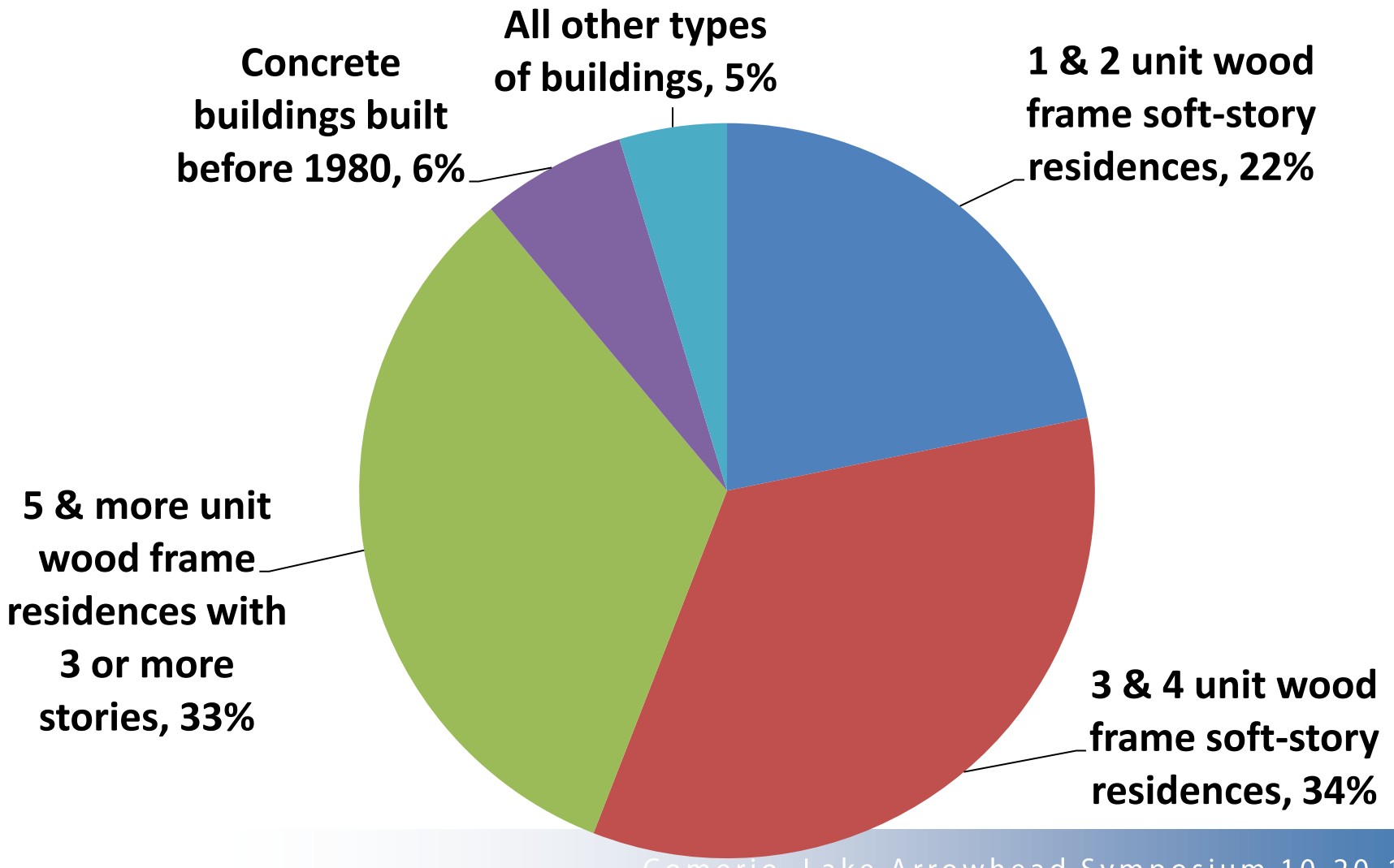
Current Capacity: 75%

% of Housing Units Usable and Unusable by Neighborhood

San Andreas 7.2 Magnitude Earthquake Scenario



Unusable Units by Structure Type

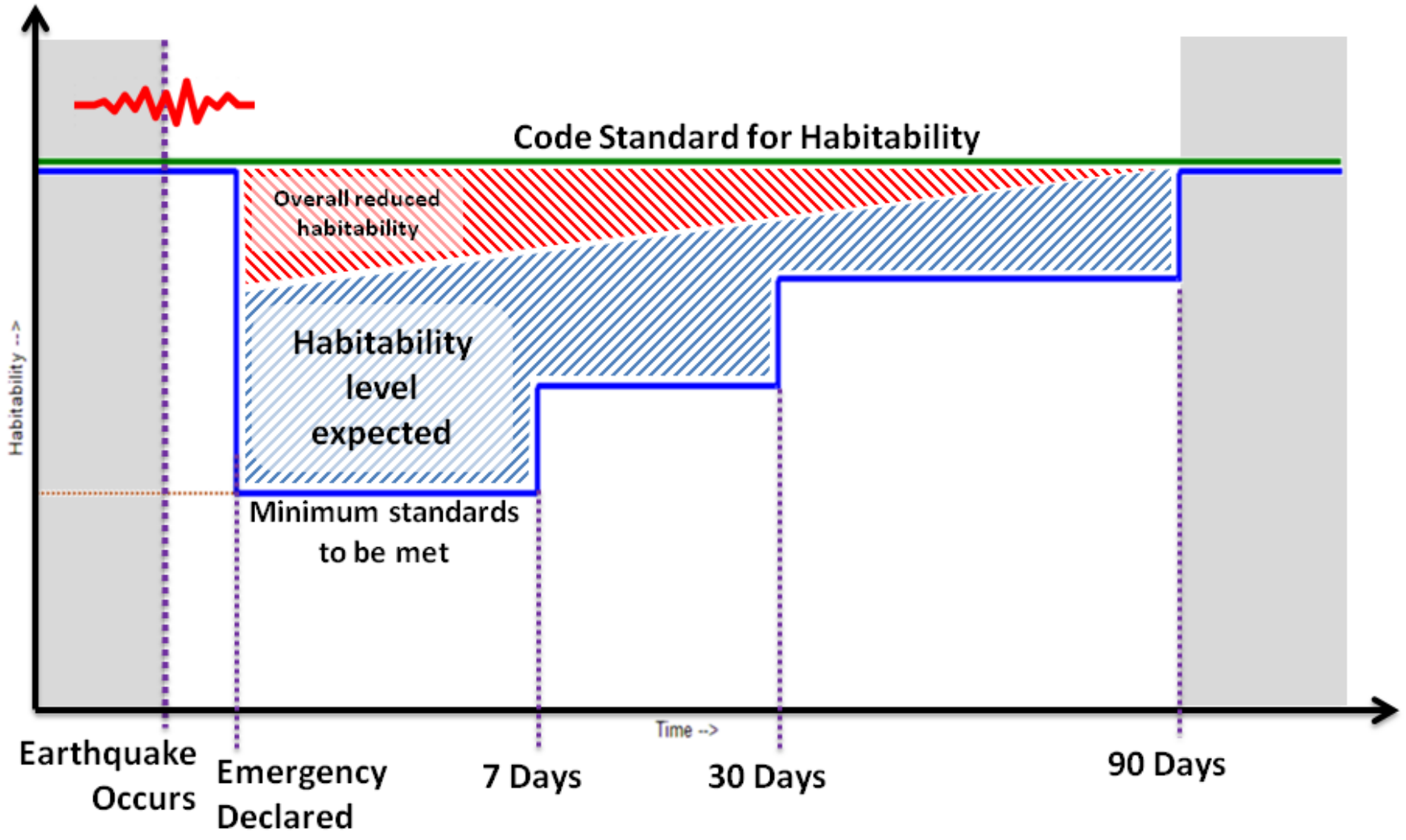


Summary of Recommendations

Shelter in Place

1. Adopt recovery targets for the housing
2. Implement mandatory soft story retrofit program
3. Develop soft-story retrofit program for smaller soft-story buildings
4. Develop retrofit programs for other vulnerable housing types
5. Focus on developing an interim housing strategy for the City
6. Develop engineering criteria for voluntary, mandatory, and triggered seismic work on residential buildings
7. Prepare and adopt regulations for shelter-in-place habitability standards in a declared “housing emergency” and plans for neighborhood support centers

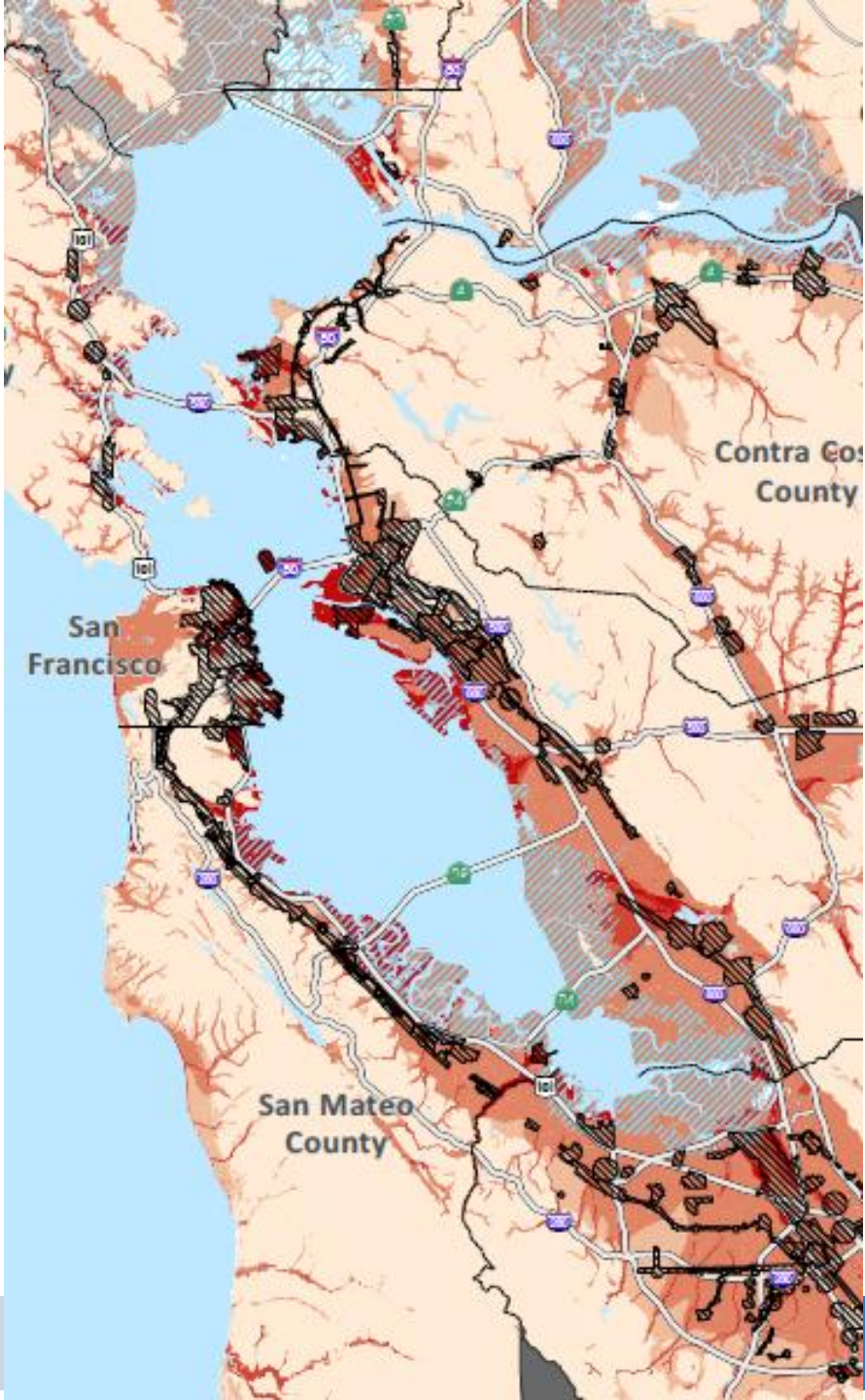
Habitability Standards following Earthquake



Challenge for Resilience

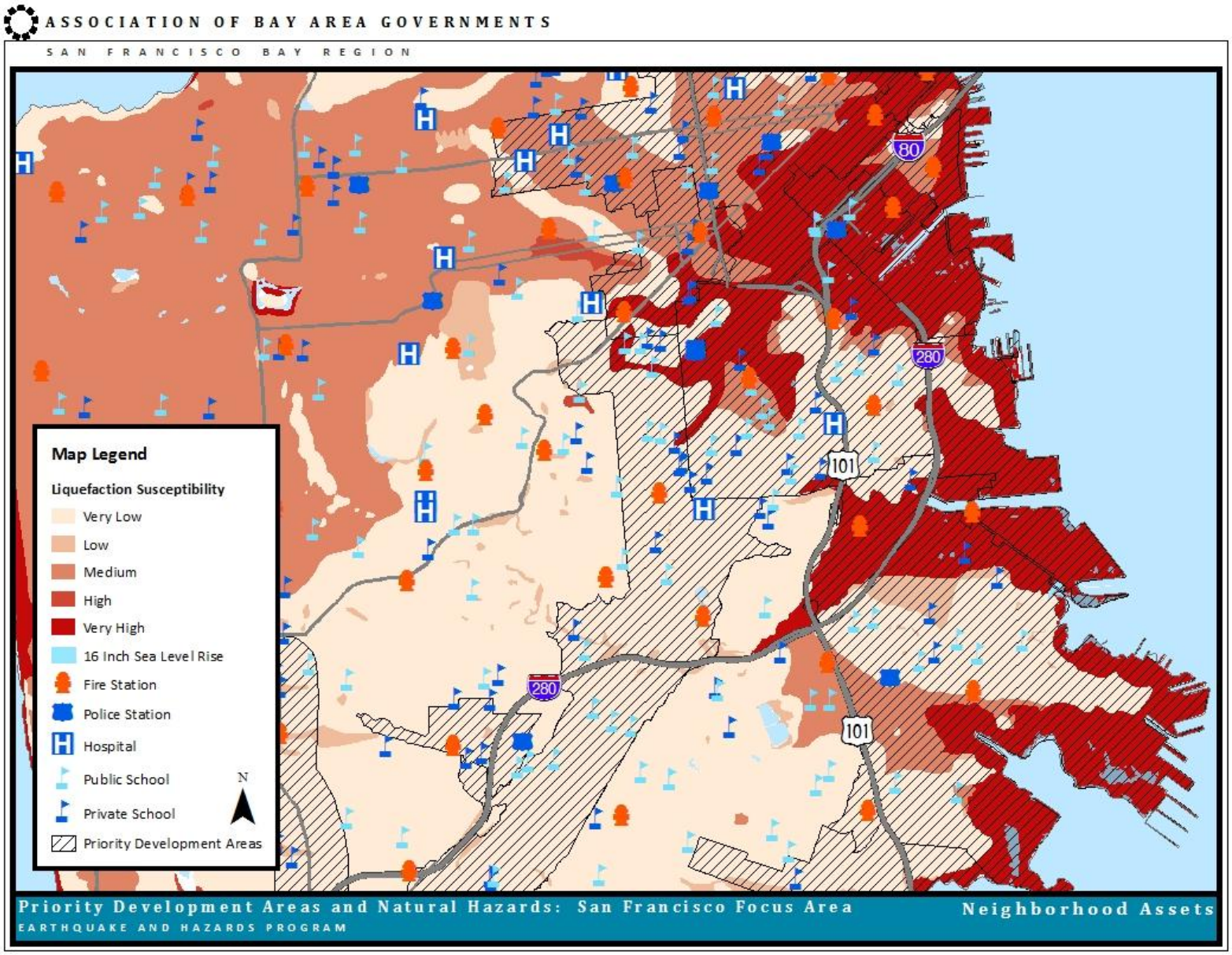
- Build Hazards Mitigation into Land Use

- California SB375
- Priority Development Areas for CO_2 reduction
- Overlaid with Natural Hazards



Map: ABAG

Micro-zone for Development Opportunity



More Information

- SPUR Resilient Cities Initiative
  www.spur.org

- Earthquake Safety Improvement Program
  www.sfgsa.org/ESIP

- NIST Resilience Framework
  www.nist.gov/el/
  building_materialresilience/
  framework.cfm

Implementation in San Francisco

- The Community Action Plan for Seismic Safety (CAPSS) Program begun in 1998 and the study completed 2010
- SPUR Disaster Planning 2001-present
- The Earthquake Safety Implementation Program (ESIP) began in early 2012 as a 30 year program.
- April, 2013, Mayor Ed Lee signed into law the Mandatory Soft Story Retrofit Ordinance.

Lesson:
Incremental Policy Approach

- Learn from experience with retroactive ordinances for masonry and soft-story buildings
- Engage civic groups, owners and tenants in discussion of policy options, retrofit finance and time-lines
- Build coalitions of support for community seismic safety
- Creative incentives are essential
- Expect long planning and implementation timelines