FEHR ✦ PEERS

Evacuation Planning & Resilience

Climate change is affecting both the frequency and magnitude of emergency evacuation events. Additionally, recent state regulations (like SB 99, AB 747, and AB 1409) increase the importance of addressing emergency evacuation as part of required General Plan Element updates. Recent CEQA litigation has further increased the importance of assessing emergency evacuation in recent court cases from Lake County, identifying the need to address new development's impact to existing residents as it relates to emergency evacuation.

Fehr & Peers is assisting multiple agencies to address a wide range of questions asked about evacuation. These include design-related requirements (such as our work with CalFire on the Fire Safe Regulations (FSR) update), SB 99 assessment to identify parcels with only one point of access, and emergency evacuation capacity assessment using our EVAC+ tool.

EVAC+ was specifically created to address some of the most complex emergency evacuation questions. It begins by interfacing with a regional travel demand model, refining it to estimate trips associated with an evacuation event (such as number of vehicles per household, number of people, number of employees, etc.), the distribution of those trips during the event (using distribution curves depending on the time needed during an evacuation), and ending with a dynamic traffic assignment (DTA) model to capture evacuation times as queues build over space and time. Our understanding of traffic operations and travel demand forecasting provides a unique platform to assist in evaluating emergency evacuation scenarios as part of this effort. Ultimately, our goal is to provide meaningful information to our clients that will benefit the community during an emergency evacuation event.

Climate and Resiliency Experts

Fehr & Peers is an experienced multimodal transportation planning and engineering firm. We were an early industry leader in the planning and quantification of climate change impacts, as illustrated by our firm's role in co-authoring (founding principal Jerry Walters) the national publication Growing Cooler: The Evidence on Urban Development and Climate Change (2007) that was a collaborative effort of Urban Land Institute, the Center for Clean Air Policy, and Smart Growth America. Today, we remain a recognized leader in the industry, helping jurisdictions and agencies develop new approaches to meeting climate objectives through shifts in managing demand for vehicle travel and quantifying the benefits associated with reductions in vehicle miles traveled (VMT). We bring leading edge thinking around climate adaptation for transportation, leveraging our longstanding expertise in travel behavior forecasting and transportation engineering with our growing practice areas of resilience and equity.

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Fehr & Peers combines the latest research and innovative technology combined with extensive public engagement to analyze, forecast, design, and evaluate transportation systems and the effects of changes to those systems on the people who rely on them. We use this information to develop visually-compelling plans that fit the local context and put people first while positioning leaders for success with competitive funding pursuits. Much of our contemporary research has begun to infuse our transportation modeling and scenario planning work into adaptation planning and vulnerability assessments for the changing environment. We integrate equity analyses into projects to maintain a comprehensive community focused approach. We understand vulnerable populations' needs and how operational characteristics of the transportation system play a role in community preparedness.

Customized Tools

Evac+
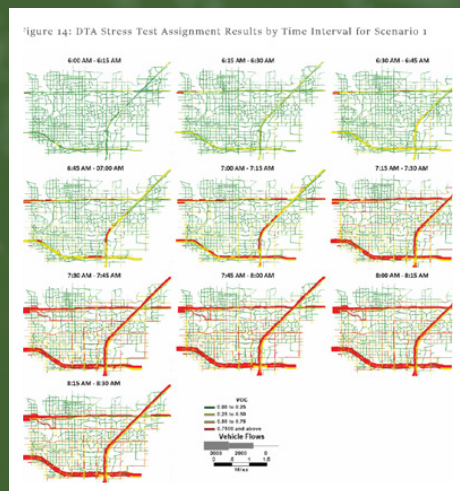
An evacuation planning module that we use to conduct quantitative evaluation of evacuation scenarios. The module estimates the number of trips during evacuation and evaluates the roadway network using dynamic traffic assignment (DTA). DTA bridges the gap between static regional travel models and microscopic traffic simulation models, making it just the right scale for evacuation studies. DTA uses an iterative process to dynamically reassign traffic based on changing congestion levels over time. This is a more accurate way of estimating trip assignment and identifying bottleneck locations on a network that should be considered during an evacuation event.

Resilience+
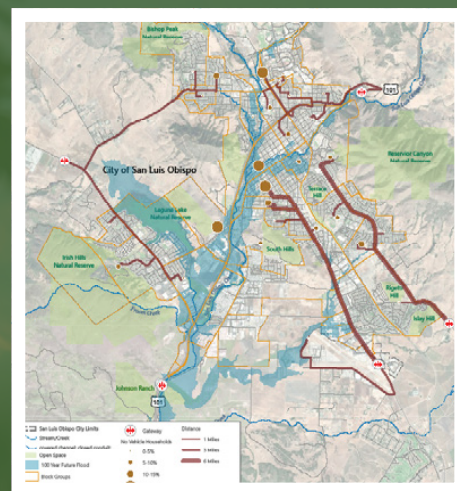
An assessment of the underlying hazards and appropriate access to City evacuation routes, evacuation centers, and resilience hubs is completed to facilitate the development of reliable and accurate communication strategies for emergency needs and evacuations. With the projected increases in the frequency and severity wildfire events and large storm events expected to occur due to climate change, new methods of administering evacuation information have been evolving. Iterative development and updating of the emergency preparedness plans are critical and should identify a communication plan for residents and visitors on how to evacuate in case of an emergency.

TravelAccess+
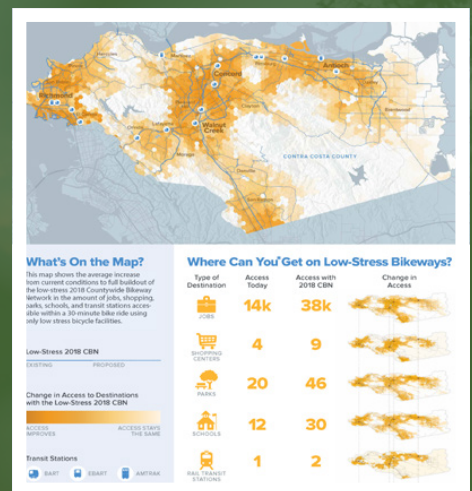
Our travel accessibility tool analyzes how multi-modal transportation networks provide access to opportunities such as employment, evacuation areas, medical services, and education. Using Network Analyst in ArcGIS, OpenStreetMap, General Transit Feed Specification data, and historical traffic data when available, we build a digital version of a multi-modal transportation network to efficiently analyze and visualize how much access is provided by each mode to reach destinations of interest. In addition, the tool can incorporate census data to help users understand how access varies among different demographic groups and where gaps may exist for particular priority populations.

Relevant Project Experience

Our resilience work supports clients in planning for and responding to transportation system disruptions caused by climate change and other natural disasters, in order to keep people connected to the places they need to go.

Calabasas SB 99 and AB 747 Assessment

Fehr & Peers is conducting emergency evacuation analysis in support of the City of Calabasas Safety Element Update. In response to 2019 legislation (AB 747), Safety Element updates must include capacity evaluation for evacuation routes in high-risk areas. The analysis includes working with City staff to develop emergency evacuation scenarios, analyzing traffic operations under each scenario to identify congestion hot spots and bottlenecks on the City's evacuation routes, and developing recommendations to improve traffic flows during each evacuation scenario. In addition to coordinating with City staff, Fehr & Peers is coordinating with the LA County Fire Department, Sheriff Department, and Office of Emergency Management.

Montecito Evacuation Study

Fehr & Peers is supporting the Montecito Fire Department in understanding more about evacuation patterns and outcomes related to wildfire risk. Using a subarea extraction from the Santa Barbara County Association of Governments' (SBCAG) Travel Demand Model, Fehr & Peers is deploying our tool, EVAC+, to run dynamic traffic scenarios in response to input parameters that reflect conditions that MFD is interested in testing. EVAC+ produces a variety of metrics related to evacuation outcomes, such as average evacuation times for an area, location of bottlenecks on the network, and number of evacuating vehicles for an area. Following the analysis, our team will develop recommendations to manage the congestion, improve communication with residents, and strategically allocate staff resources during an evacuation.

Rancho Cucamonga Emergency Evacuation Study

City of Rancho Cucamonga General Plan & Evacuation Plan Modeling, which includes evacuation route identification, zone and scenario testing to identify areas with limited accessibility and test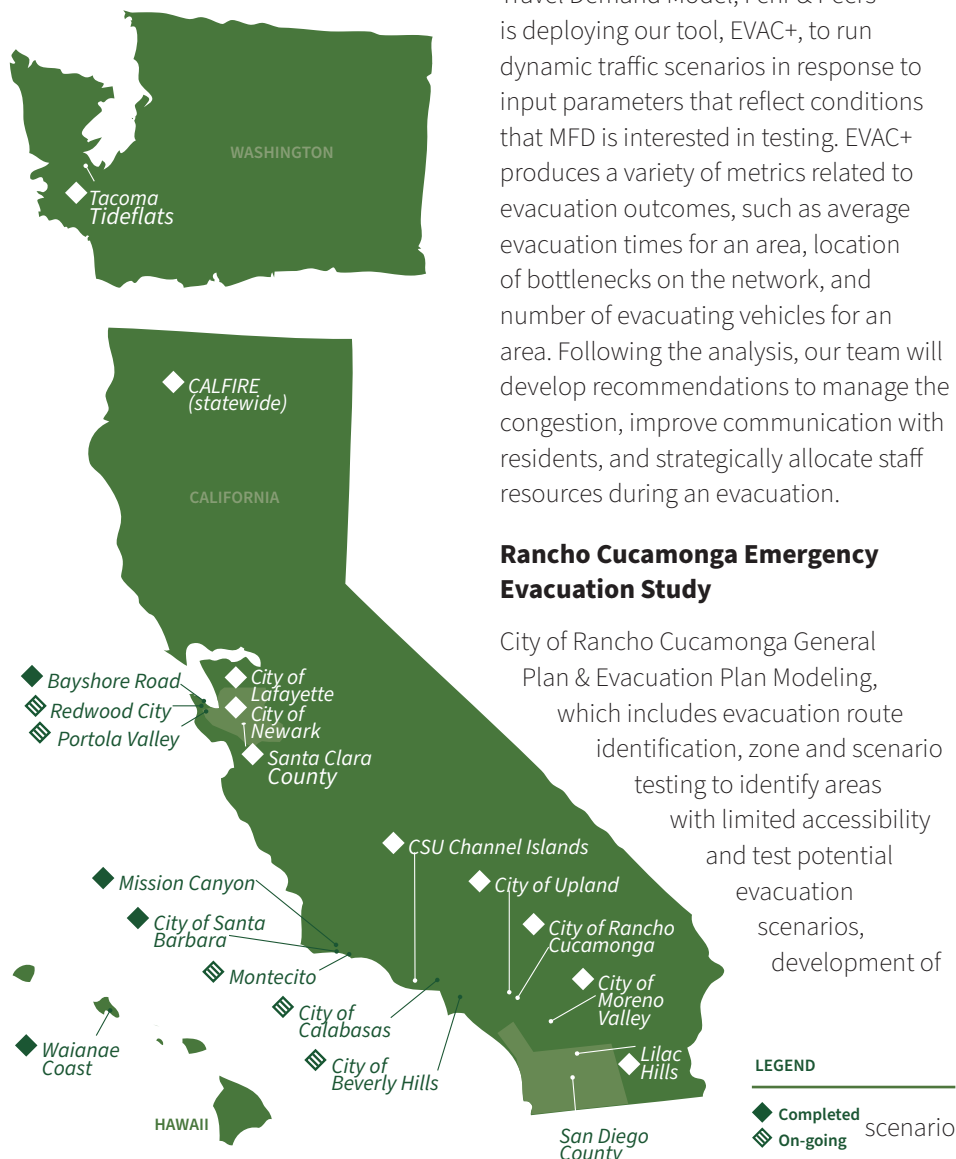 potential evacuation scenarios, development of recommendations that focus on potential circulation and capacity issues, and identification of policies and implementation programs recommended for incorporation into the "PlanRC project." The evacuation work included an SB 99 assessment (identifying parcels with only one point of access) and an AB 747 assessment (to evaluate the capacity of the evacuation system). The SB 99 assessment also applied Fehr & Peers' RESILIENCY+ tool, which supplements the SB 99 assessment by also identifying areas of the that have the longest distance to travel during an evacuation event. The AB 747 assessment utilized EVAC+, a Fehr & Peers tool that estimates travel demand during an evacuation, extracts regional travel demand and behavior from the regional travel demand model, and incorporates it into a Dynamic Traffic Assignment (DTA) model that dynamically assigns traffic based on how congestion builds over space and time.
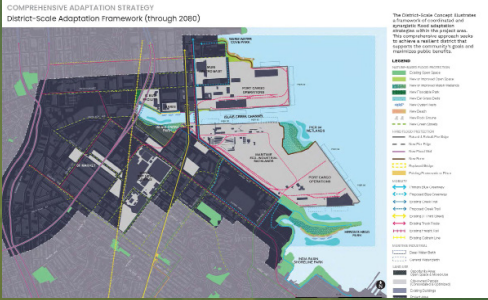
Resilient SLO

Resilient SLO goals and objectives are to evaluate the current and future hazards to the City of San Luis Obispo's transportation network. Including how predicted climate change will alter these hazards, identify where vulnerabilities exist, and lastly prioritize adaptation strategies for these expected changes.
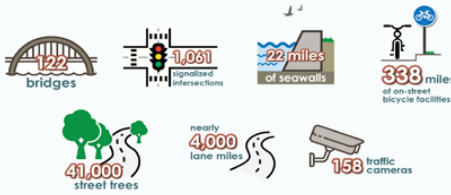
Additional Relevant Projects

- » Beverly Hills Evacuation Study
- » Santa Barbara Emergency Evacuation Study
- » Portola Valley Emergency Evacuation Study
- » Lafayette SB 99 and AB 747 Assessment
- » Redwood City Emergency Evacuation Study
- » Moreno Valley SB 99 and AB 747 Assessment
- » Newark AB 747 Assessment
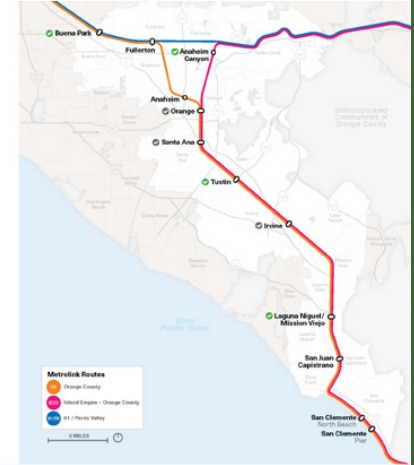- » California Fire Safe Regulations Update

WASHINGTON

Tacoma Tideflats

CALFIRE (statewide)

CALIFORNIA

Bayshore Road
Redwood City
Portola Valley
City of Lafayette
City of Newark
Santa Clara County

Mission Canyon
City of Santa Barbara
Montecito
City of Calabasas
City of Beverly Hills

Waianae Coast

HAWAII

CSU Channel Islands
City of Upland
City of Rancho Cucamonga
City of Moreno Valley
Lilac Hills
San Diego County

LEGEND

◆ Completed
⬧ On-going

COMPREHENSIVE ADAPTATION STRATEGY
District-Scale Adaptation Framework (through 2080)

Stations Amenities Prioritization Framework

OCTA RAIL DEFENSE AGAINST CLIMATE CHANGE PLAN

The Seattle Department of Transportation (SDOT) develops, maintains, and operates the city's transportation system that includes:

- 122 bridges
- 1,061 signalized intersections
- 22 miles of seawalls
- 338 miles of on-street bicycle facilities
- 41,000 street trees
- nearly 4,000 lane miles
- 158 traffic cameras

WEST CLIFF DRIVE
Location 3a

Not to scale

Development Setback Zone | 8' Sidewalk | 14' Travel Lane | 12' At Grade Two-Way Cycle Track | 9' Walking Path

3' Bike Buffer (Flexible Pylons)

2' Planting Buffer

Project Generated VMT

Project Effect on VMT (Boundary VMT)