

RESOLUTION NO. 2021-356

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ELK GROVE DECLARING ITS INTENT TO AMEND THE GENERAL PLAN SAFETY ELEMENT FOR CONSISTENCY WITH ASSEMBLY BILLS 747 AND 1409 FOR EVACUATION ROUTE PLANNING

WHEREAS, California Government Code Section 65300 requires the City to adopt a comprehensive, long-term General Plan for the physical development of the City; and

WHEREAS, Government Code Section 65302.15 was added in 2019 through Assembly Bill 747 and was modified in 2021 by Assembly Bill 1409; and

WHEREAS, Section 65302.15 requires that the Safety Element be “reviewed and updated as necessary to identify evacuation routes and their capacity, safety, and viability and evacuation locations under a range of emergency scenarios”; and

WHEREAS, an Environmental Impact Report was prepared and certified for the General Plan in 2019 (State Clearinghouse Number 2017062058); and

WHEREAS, the Planning Commission held a duly noticed public hearing on November 18, 2021, as required by law to consider all of the information presented by staff, and public testimony presented in writing and at the meeting and voted 5-0 to recommend approval of the Safety Element amendment; and

WHEREAS, the City Council held a duly noticed public hearing on December 8, 2021 as required by law to consider all of the information presented by staff, and public testimony presented in writing and at the meeting.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Elk Grove hereby finds no further CEQA review is required and declares its intent to amend the General Plan Safety Element for consistency with Assembly Bills 747 and 1409 for Evacuation Route Planning, to incorporate the Elk Grove Evacuation Scenario Analysis Report attached hereto as Exhibit A and incorporated herein by reference, pursuant to the following findings:

CEQA

Finding: No further environmental review is required under the California Environmental Quality Act pursuant to State CEQA Guidelines Section 15183 and 15162.

Evidence: An Environmental Impact Report (EIR) was prepared for the General Plan and certified by the City Council with adoption in February 2019 (State Clearinghouse Number 2017062058). CEQA Guidelines Section 15183 provides that projects consistent with the development density established by existing zoning, community plan, or general plan policies for which an EIR was certified shall not require additional environmental review, except where it might be necessary to examine project-specific effects peculiar to the project. Further, CEQA Guidelines

Section 15162 provides that when an EIR has been certified for a project no subsequent EIR shall be prepared unless the lead agency (City) determines, on the basis of substantial evidence, that there have been substantial changes to the project, the circumstances under which the project has been undertaken, or new information has become known. The proposed changes to the Safety Element do not alter the land use designations, zoning, or allowed density or intensity of development. The revisions provide additional background information for evacuation planning. The changes do not add any new programs or actions. Therefore, none of the circumstances described in Section 15162 have been triggered, the Project is consistent with the General Plan as provided under Section 15183, and no further environmental review is required.

General Plan Amendment

Finding: The proposed General Plan amendment is of substantial benefit to the City and the amendment is internally consistent with the General Plan.

Evidence: The proposed amendment will bring the General Plan into conformance with State law requirements for General Plans, as provided in Government Code Section 65302.15. The proposed amendments are consistent with the goals and policies of the General Plan, which provide for A Safe Community (Goal SAF-1) and require adequate emergency access (Policy SAF-1-6).

PASSED AND ADOPTED by the City Council of the City of Elk Grove this 8th day of December 2021




BOBBIE SINGH-ALLEN, MAYOR of the
CITY OF ELK GROVE

ATTEST:


JASON LINDGREN, CITY CLERK

APPROVED AS TO FORM:


JONATHAN P. HOBBS,
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Elk Grove Evacuation Scenario Analysis Report

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September 2021

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Elk Grove Evacuation Scenario Analysis Report

Introduction and Purpose

This report evaluates three potential disaster scenarios in the City of Elk Grove (City) and develops recommendations for a best-practice response and evacuation plan for residents, community members, and City staff. The goal of this analysis is for the City to facilitate an evacuation plan tailored to each of the three disaster scenarios evaluated. Rather than estimating the probability of these potential scenarios occurring, or the expected costs in damages, this analysis seeks to answer the question: How can the City of Elk Grove, Elk Grove residents, and community members prepare for this scenario (however unlikely) if it were to occur, and what are the best evacuation procedures based on the expected geographic spread of impacts and traffic on routes leading out of the impacted area?

This report answers these questions using data on the location and extent of the potential disaster scenarios, as well as present and maximum future traffic conditions by weekday and time. For each disaster scenario, this report identifies the evacuation area, the number of households and population within the evacuation area, vulnerability characteristics of populations within evacuation areas, major evacuation routes leading out of the evacuation area, and evacuation routes that are likely to be congested during an evacuation event. Each scenario analysis concludes with recommendations for evacuation planning procedures tailored to vulnerable populations residing in hazard areas, as well as recommendations for establishing contra-flow lanes, where traffic lanes in one direction are temporarily converted to additional lanes in the opposite direction to accommodate a higher volume of traffic leading out of the evacuation area.

Each of the three disaster scenarios evaluated originate from three specific locations within Elk Grove. They are:

1. An explosion (blast wave and resulting fire) at the Suburban Propane facility in southeastern Elk Grove.
2. A train derailment and potential toxic spill along the Union Pacific Railroad track running north to south through central Elk Grove with an at-grade crossing at Elk Grove Boulevard in the City's Old Town.
3. A major flooding event resulting from a Sacramento River levee break just west of Elk Grove.

Figure I-1 shows the three areas of study (hazard areas) for each of these three scenarios:

INTRODUCTION AND PURPOSE

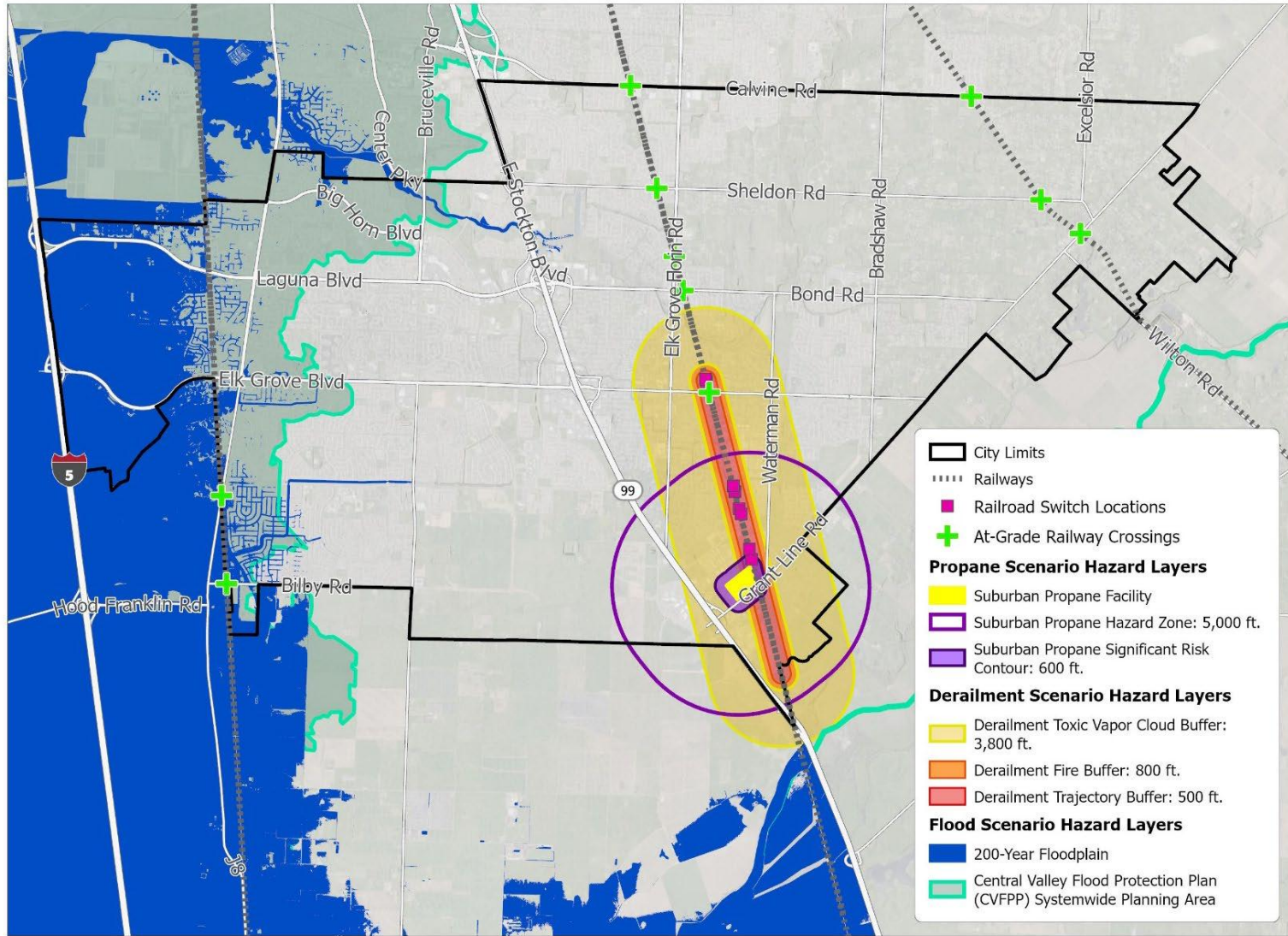


Figure I-1
Citywide Hazard Zones

The hazard area for the propane terminal scenario is defined by a 5,000-foot buffer around the propane terminal's perimeter, encompassing a comprehensive range of possible hazard scenarios (however unlikely) that could originate from the propane facility according to a risk study prepared for the facility in 2000 by Quest Consultants Inc.

The hazard area for the train derailment scenario is defined by a 3,800-foot buffer around the segment of railroad track through the City of Elk Grove beginning just north of an at-grade rail crossing with Elk Grove Boulevard and extending southward to the southern edge of Elk Grove. This encompasses a conservative estimate for the furthest extent of a toxic vapor cloud emitted from a toxic spill resulting from a train derailment.

The hazard area for the flooding scenario is defined by the Central Valley Flood Protection Plan (CVFPP) study area, which encompasses a comprehensive range of potential flooding scenarios.

The report concludes with a discussion of best-practice active alert systems available to the City, and recommendations for developing public awareness materials and programs to inform community members of disaster preparedness resources, including the interactive online Story Map developed concurrently with this report.

Background

This section discusses available data concerning the actual probabilities and risks associated with each scenario. While this report does not assess risk explicitly, it is important to have a contextual understanding of the significant differences in relative probabilities associated with all three scenarios.

SUBURBAN PROPANE SCENARIO

A quantitative risk analysis conducted for the Suburban Propane facility in Elk Grove found that any possible risk to the public associated with this facility is 0.000001% annually, or one chance in one million for the area beyond 600 feet of the facility itself (the closest non-industrial land use is over 2,000 feet away from the facility's perimeter). Within 600 feet of the propane facility, the risk increases to 0.001% in any given year, or one chance in one thousand.¹ The risk arises from thermal radiation, blast wave overpressure, or toxic gas from the facility. Examples of incidents that would cause such an event include failure of the storage tank(s) or a catastrophic failure at the transfer facility between the cargo transfer facility and a tank truck or rail car.

TRAIN DERAILMENT SCENARIO

Train derailment events in the United States are generally more likely than the probability of being affected by hazards originating from the Suburban Propane terminal, and less likely than a flooding event in Elk Grove. Train accidents are rare, but minor freight derailments are among the top three most common type of train accidents that occur. However, injury or loss of life associated with riding in trains or being near or in train crossings is very low, many times lower than the risk associated with car trips or crossing a street.² To illustrate,

¹ "Quantitative Risk Analysis for Suburban Propane's Propane Terminal and Georgia-Pacific's Formalin Tank" (Quest Consultants, 2000).

² Ian Savage, "Comparing the Fatality Risks in United States Transportation across Modes and over Time," *Research in Transportation Economics* 43, no. 1 (2013): 9–22.

between 2010 and 2020, 22,589 total rail accidents/incidents of any kind were reported to the Federal Railroad Administration (FRA).³ Of these, 14,344 were derailment incidents (63%). Out of all derailment incidents over this 10-year period, 27 resulted in human death (0.2%), and 1,633 resulted in non-fatal injuries (11%). Victims of non-fatal train-related injuries during this period are primarily employees on duty (56%), followed by ‘non-trespassers on railroad property’ (18%), while 80% of people killed in any train-related accident during this 10-year period (8,407 total) were ‘trespassers on railroad property’ according to the FRA accident reporting statistics.

FLOOD SCENARIO

The risk of a major flooding event is 0.5% in any given year. This scenario is often referred to as a “200-year flood” event. This event is based upon a theoretical levee break along the Sacramento River and corresponding flooding of the lands between the river and Elk Grove. In this event, the elevation of the flood waters is equal to or higher than the levee surrounding the Laguna West area of Elk Grove, resulting in flooding within the City. The depth of the flood waters ranges from a few inches to several feet and would result in the need for evacuation of residents and businesses from the area.

Methodology

Analysis of the three evacuation scenarios was divided into three primary tasks, summarized below.

1. Define Hazard Zone and Risk Parameters

First, the maximum area at potential risk, referred to as the hazard zone, was defined for each scenario based on background research and characteristics of each hazard. The hazard zone is the largest area in which populations may be at risk and need to evacuate during a disaster. In addition, areas of heightened risk or severity were defined within each hazard zone.

2. Identify Vulnerable Populations within Hazard Zones

The following five vulnerability indicators were first mapped by census tract using 2019 American Community Survey (ACS) 5-year estimates:

1. Householders over 65 living alone
2. Populations with a disability
3. Households with no vehicle
4. Households with no computer or smartphone
5. Limited English-speaking households (defined as households in which no member over 14 years old speaks English ‘very well’)

In addition, the number of low-income housing locations, residential care facilities, schools, and daycares were counted within each hazard zone and census tract using data provided by the City.

These indicators were chosen to represent populations or households that may need additional time, assistance, and/or specific resources during an evacuation event. For example, lower-income/lower-resourced households are more likely to have fewer options for shelter than higher-income/higher-resourced households

³ “Accident and Incident Reporting,” Federal Railroad Administration, n.d., <https://railroads.dot.gov/accident-and-incident-reporting/overview-reports/overview-reports>.

during an evacuation event (second homes, relatives with extra space, or hotels) and are therefore more likely to benefit from emergency shelter provided by the City. Households with no computer or smartphone have less access to online emergency preparedness resources and therefore should be prioritized for house calls and door-knocking. Neighborhoods with a high proportion of limited English-speaking households benefit from emergency preparedness programming and informative materials (e.g., mailers) specific to their area and in the primary languages spoken. Primary languages other than English spoken by Elk Grove residents include (in order of population share): Spanish, Tagalog (including Filipino), Chinese (including Mandarin and Cantonese), other Indo-European languages, and other Asian or Pacific Island languages.

Using land use data and aerial imagery, the number and location of residences within tracts exhibiting high proportions of any of these five characteristics and that also were within hazard zones and heightened risk areas were evaluated. The results informed recommendations for evacuation procedures in particularly vulnerable areas. For example, the City may deploy an evacuation shuttle service in neighborhoods within a hazard zone where a high proportion of households do not have a vehicle and prioritize sending paratransit vehicles to neighborhoods with a high percentage of residents with a disability.

3. Identify Evacuation Routes and Evaluate Expected Congestion Conditions

For each scenario, any road segment with a clear direction of travel leading away from the hazard zone was considered an evacuation route. This includes highways, arterials, and collector roads but excludes residential access streets for all three scenarios.

Traffic conditions and peak capacities are evaluated for each evacuation route segment based on the General Plan build-out traffic analysis and supplemented with daily average traffic snapshots from Google Maps for weekday morning peak hours, weekday evening peak hours, and weekend peak hours. Data from the Elk Grove General Plan traffic analysis is available for most but not all identified evacuation routes.

The General Plan traffic analysis evaluates the maximum expected congestion levels along roadway segments if land use designations were to be fully ‘built-out’ with the household and job densities associated with each designation. The average daily traffic (ADT) snapshots are a more accurate representation of current traffic levels, while the General Plan build-out scenario represents the maximum possible traffic load resulting from a maximum potential population increase over the next 20-year period. The General Plan build-out scenario represents an additional 60% increase in Elk Grove’s 2019 population, and therefore a conservative upper limit for potential congestion levels.

Two indicators used in the General Plan traffic model are used in this report to evaluate capacity and expected congestion levels along identified evacuation routes. The first of these is the ‘Volume to Capacity ratio,’ or V/C ratio, which is a measure of traffic volume on a roadway segment or intersection as a ratio of its total capacity (both the denominator and the numerator are expressed in vehicles per day). A ratio of between 0.75 and 1 indicates that the roadway is moderately over-capacity, and a ratio greater than 1 indicates that the roadway is severely over-capacity. This measure does not specify by time of day or direction but gives an overall idea of a roadway segment’s daily congestion level.

Another measure of capacity is Level of Service (LOS), an alphabetic rating from A to F corresponding to average delay in seconds for a vehicle to cross an intersection in a specific direction. LOS F corresponds to the most congested road segment and C or better is attributed to free-flowing traffic at the maximum permitted speed.

Table I-1 describes this relationship.

Table I-1: Level of Service Categories

LOS	Control Delay per Vehicle (sec/veh) signalized intersections	Control Delay per Vehicle (sec/veh) Non-Signalized Intersections	Description
A	Less than or equal to 10 seconds	0-10	Traffic flows at or above speed limit; complete mobility between lanes
B	Between 10 and 20 seconds	10-15	Slightly more congested than free-flow, with almost no limits to lane-changing mobility
C	Between 21 and 35 seconds	15-25	Stable flow where posted speed is maintained. Ability to pass or change lanes is somewhat limited.
D	Between 36 and 55 seconds	25-35	Approaching unstable flow, speeds somewhat reduced from posted limit with vehicles close together
E	Between 56 and 80 seconds	35-50	Flow becomes unstable (stop and go); consistent with volume to capacity (V/C) ratios of 0.9 and greater
F	More than 80 seconds	More than 50 seconds	Stopped traffic idling for up to minutes at a time

Google traffic snapshots were used both to supplement the General Plan traffic data and to evaluate evacuation segments not included in the General Plan traffic analysis. Google traffic data is displayed as a color scale with the following rough equivalencies to LOS:

- » Green (fastest, no traffic): LOS A-B
- » Orange: LOS C-D
- » Red: LOS D-E
- » Dark Red (slowest, severe traffic): LOS E-F

Results of this analysis combining the two traffic data sources inform recommendations for establishing contra-flow lanes during an evacuation event.

Currently, only two evacuation routes have ‘severe’ ADT rates for any peak period evaluated: A southbound portion of Highway 99 during weekend peak hours, and Laguna Boulevard during weekday and weekend peak periods.

All other evacuation segments currently show only moderate rates of congestion at most during all peak periods. However, the General Plan build-out scenario adds additional expected traffic pressure, particularly in the southern part of Elk Grove where most new developments are planned.

Scenario 1: Propane Terminal Evacuation Scenario

HAZARD ZONE AND RISK PARAMETERS

The hazard zone for the Suburban Propane explosion scenario is derived from the Quantitative Risk Analysis conducted in 2000 by Quest Consultants Inc. for the Elk Grove Suburban Propane terminal. The study defines contours for the furthest-possible area associated with any risk to individuals resulting from a comprehensive range of potential accidents at this location, which extends out to 5,000 feet beyond the site perimeter. However, the study noted that the individual risk probability associated with this contour is astronomically low, much lower than the individual risk probability associated with dying from an earthquake or getting struck by lightning on any given day. The level of risk associated with the Suburban Propane facility in Elk Grove that is deemed ‘unacceptable’ by most international standards for risk associated with hazardous land uses (one chance in one thousand per year), extends just 600 feet from the facility perimeter. This level of risk is expressed in General Plan Policy ER-1-2. This higher-risk contour does not intersect with any residential areas, parks, or other sensitive use. However, due to the size of this facility and the level of public concern that may arise from an event, this study considered a larger 5,000-foot buffer with which to perform the evacuation route analysis (the “hazard zone”).

Figure 1-1 shows the location of the Suburban Propane facility in Elk Grove, the 600-foot ‘unacceptable risk contour,’ and the 5,000-foot hazard zone buffer measured from the perimeter of the Suburban Propane facility perimeter.

PROPANE TERMINAL EVACUATION SCENARIO

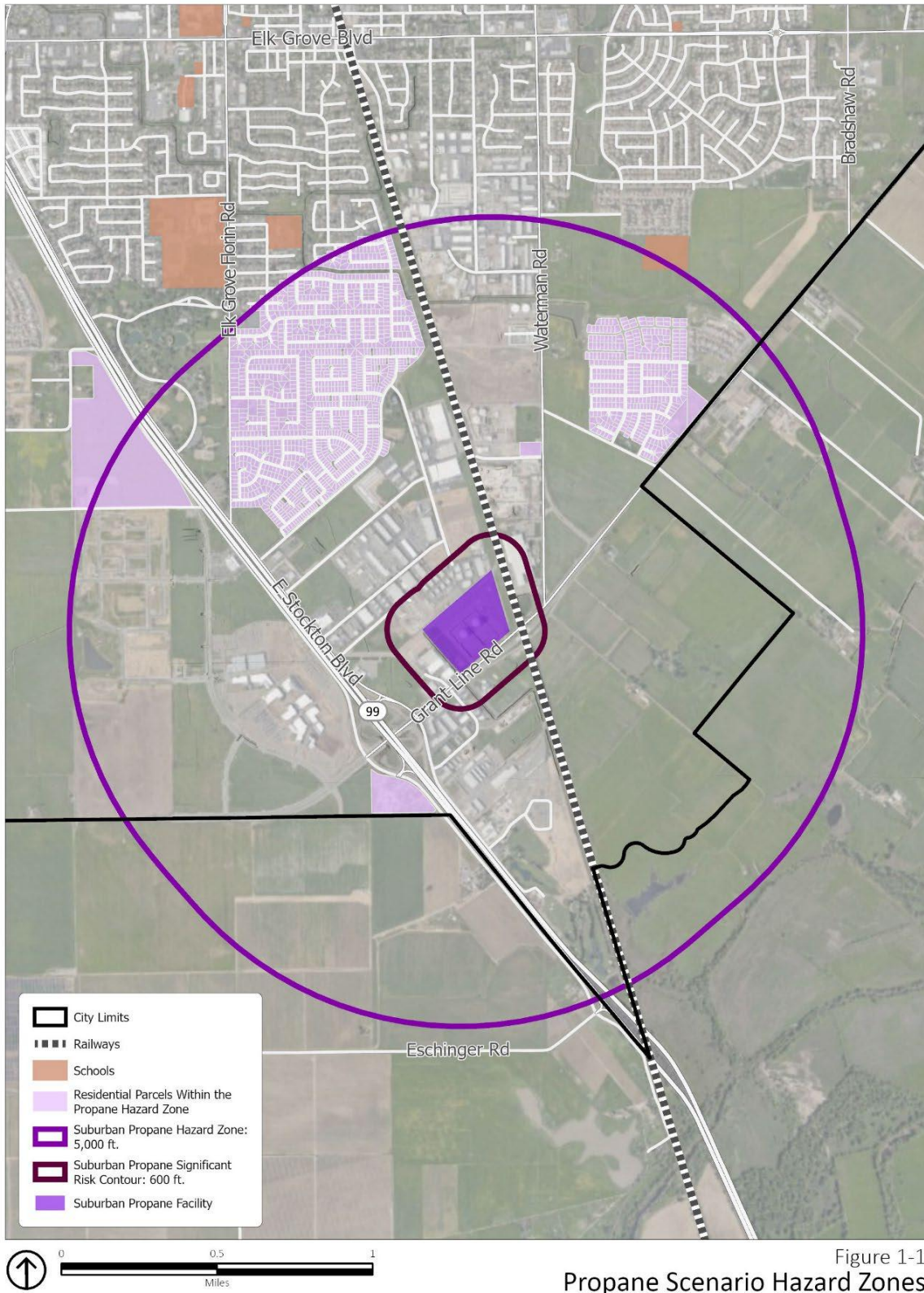


Figure 1-1
Propane Scenario Hazard Zones

The Suburban Propane facility is in an industrial area in southern Elk Grove. Industrial uses have very low nighttime population and a lower daytime population than other employment centers like office buildings or commercial centers. Only surrounding industrial uses (with equivalent associated risk) fall within the 600-foot significant risk contour. Approximately 2,486 residential parcels fall within the larger 5,000-foot hazard zone, including five residential care facilities, with a total of 1,582 housing units. The number of units is lower than the number of residential parcels because the hazard area encompasses the City's South Study Area, which is an area south of Kammerer Road and planned for future development, including a mix of industrial, office, retail, and residential uses. No Schools or daycares fall within the Suburban Propane hazard zone, but the southern half of Elk Grove Park lies within the larger 5,000-foot hazard zone. The nearest emergency shelters to the propane hazard zone are Elk Grove High School, Cosumnes Oaks High School, and Joseph Kerr Middle School. No emergency shelters in Elk Grove are located within the propane hazard area.

VULNERABLE POPULATIONS WITHIN HAZARD ZONES

Figures 1-2 through **1-6** show demographic vulnerability characteristics mapped by census tract for residential areas intersecting the propane terminal hazard zone.

PROPANE TERMINAL EVACUATION SCENARIO

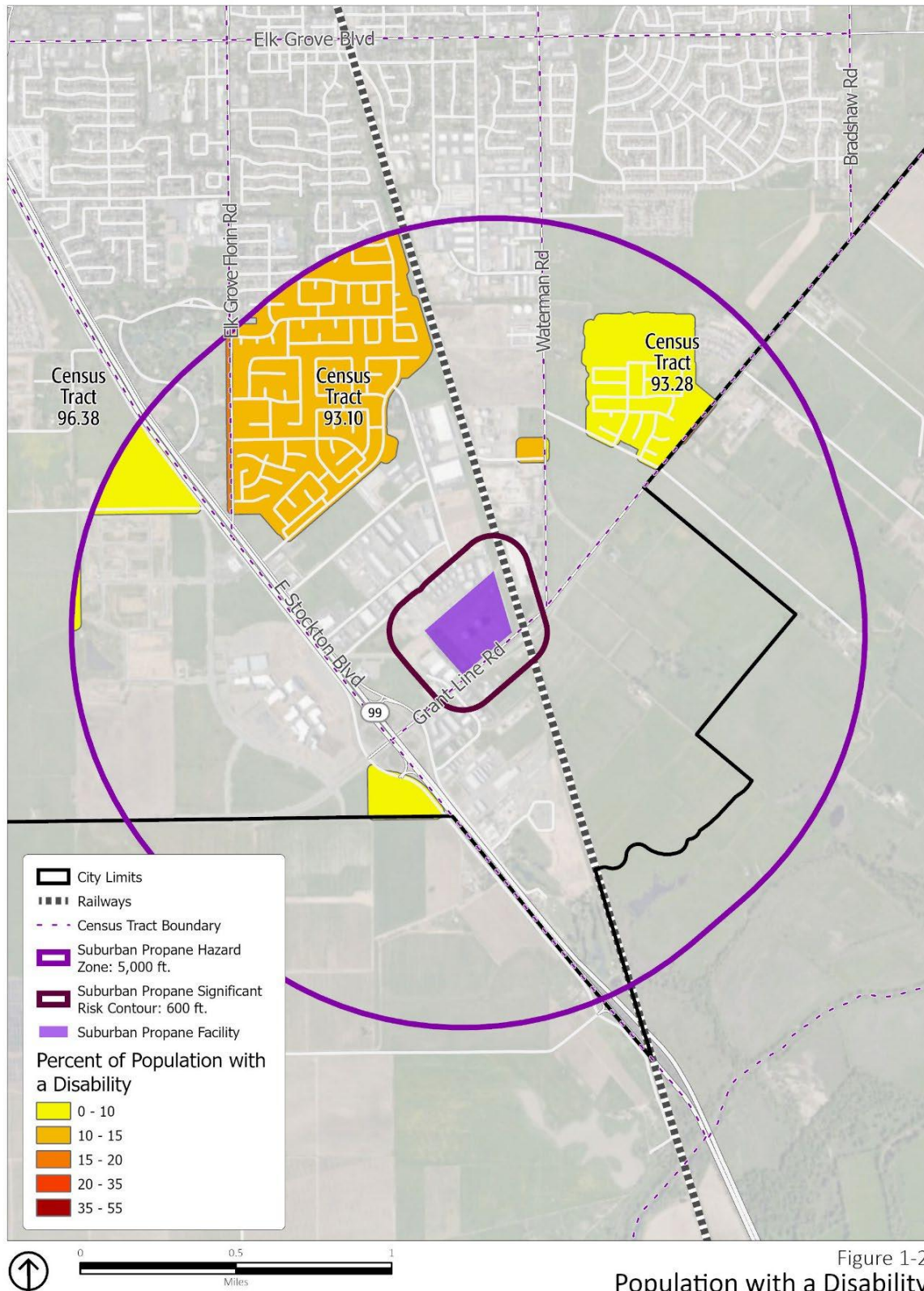


Figure 1-2
Population with a Disability

PROPANE TERMINAL EVACUATION SCENARIO

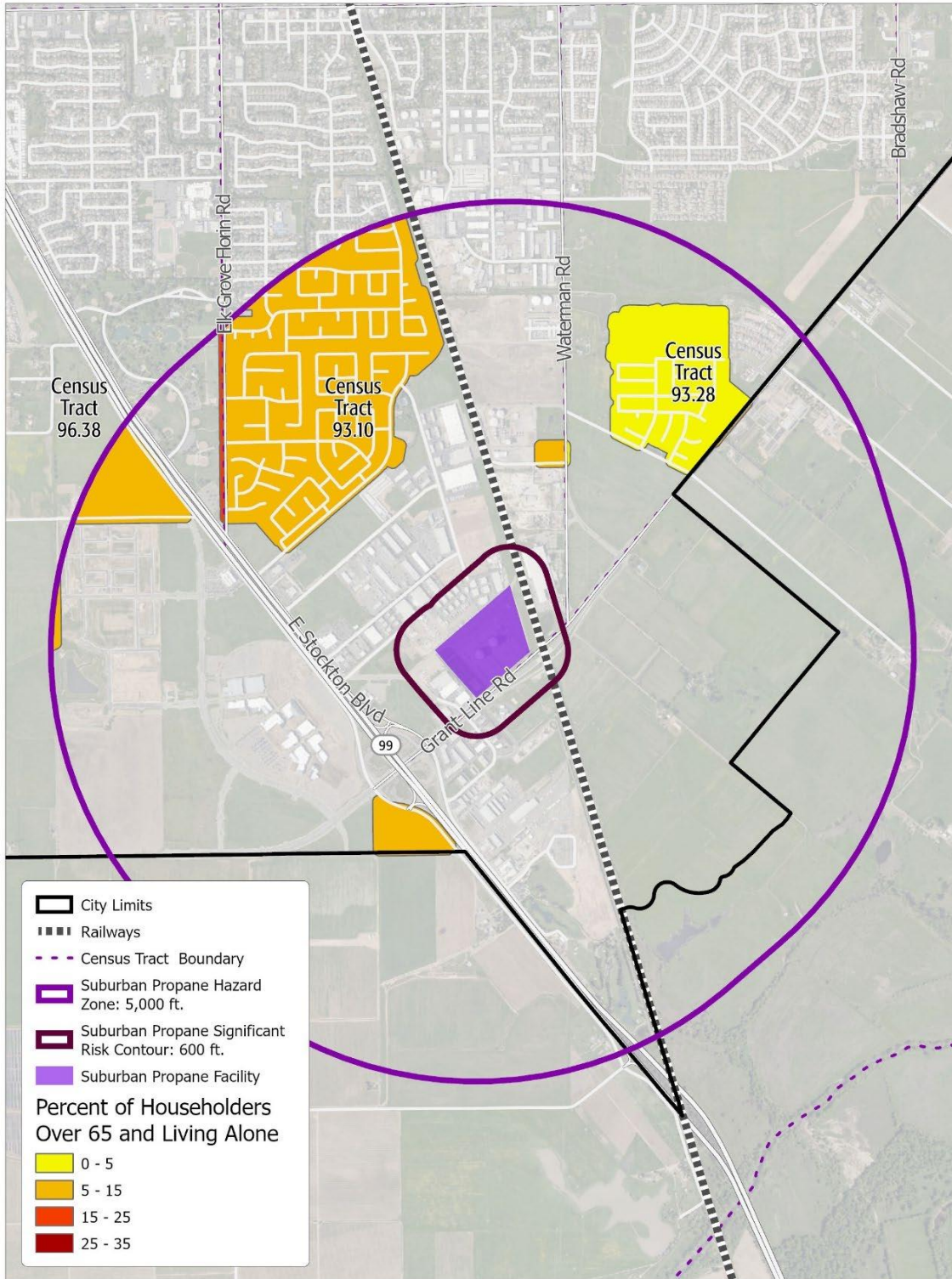


Figure 1-3
Householders Over 65 Living Alone

PROPANE TERMINAL EVACUATION SCENARIO

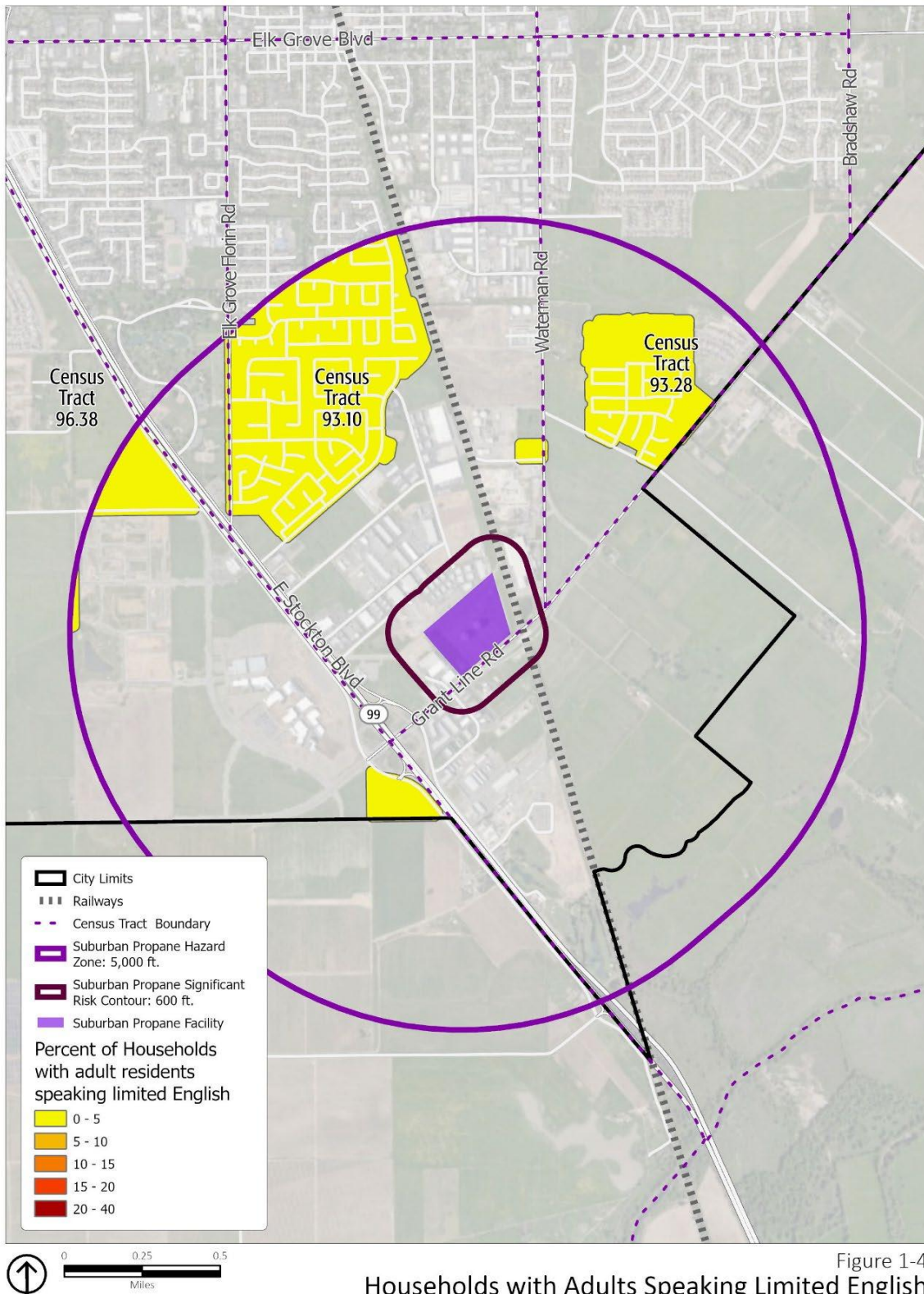


Figure 1-4
Households with Adults Speaking Limited English

PROPANE TERMINAL EVACUATION SCENARIO

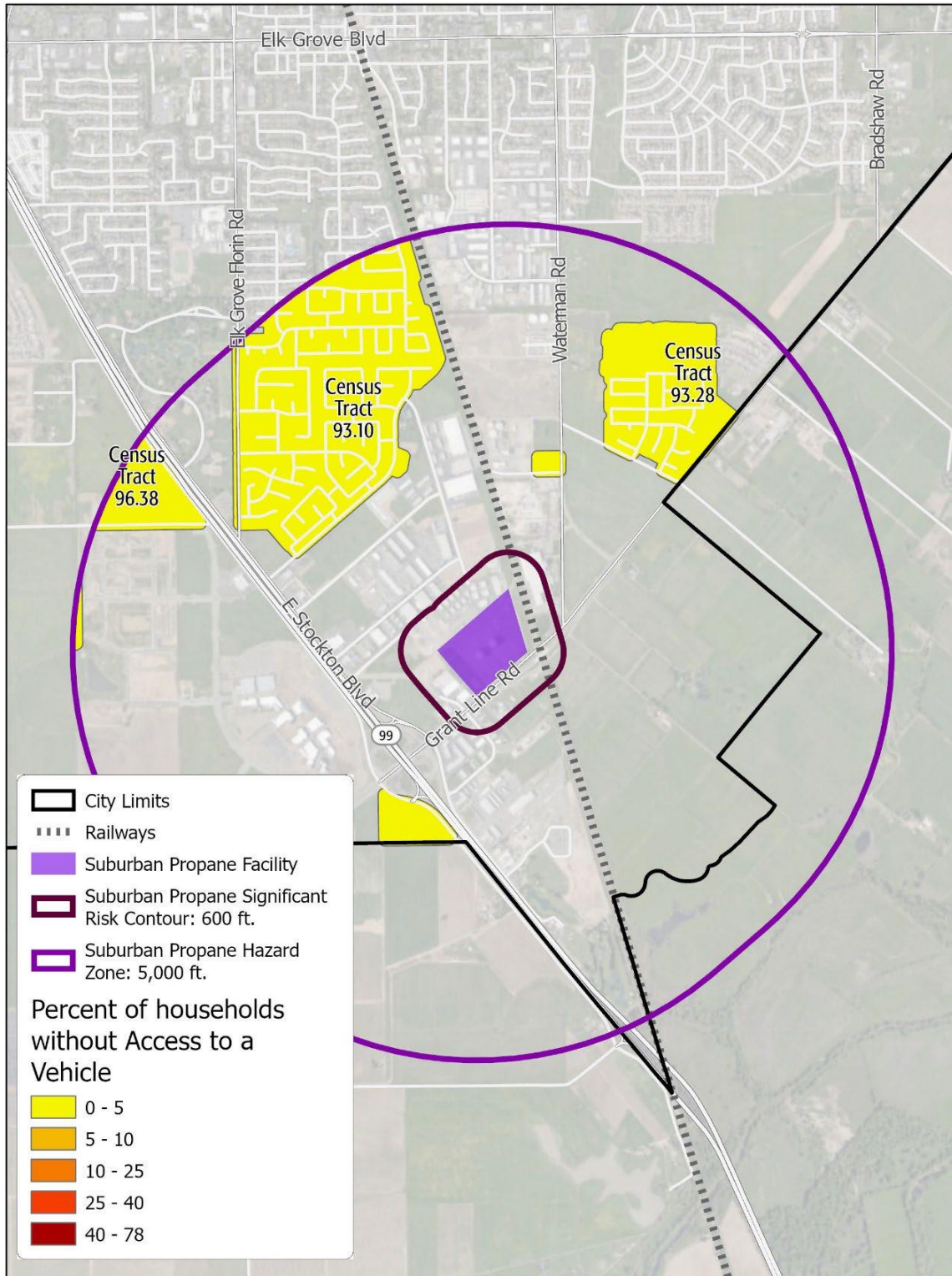


Figure 1-5
Households without Access to a Vehicle

PROPANE TERMINAL EVACUATION SCENARIO

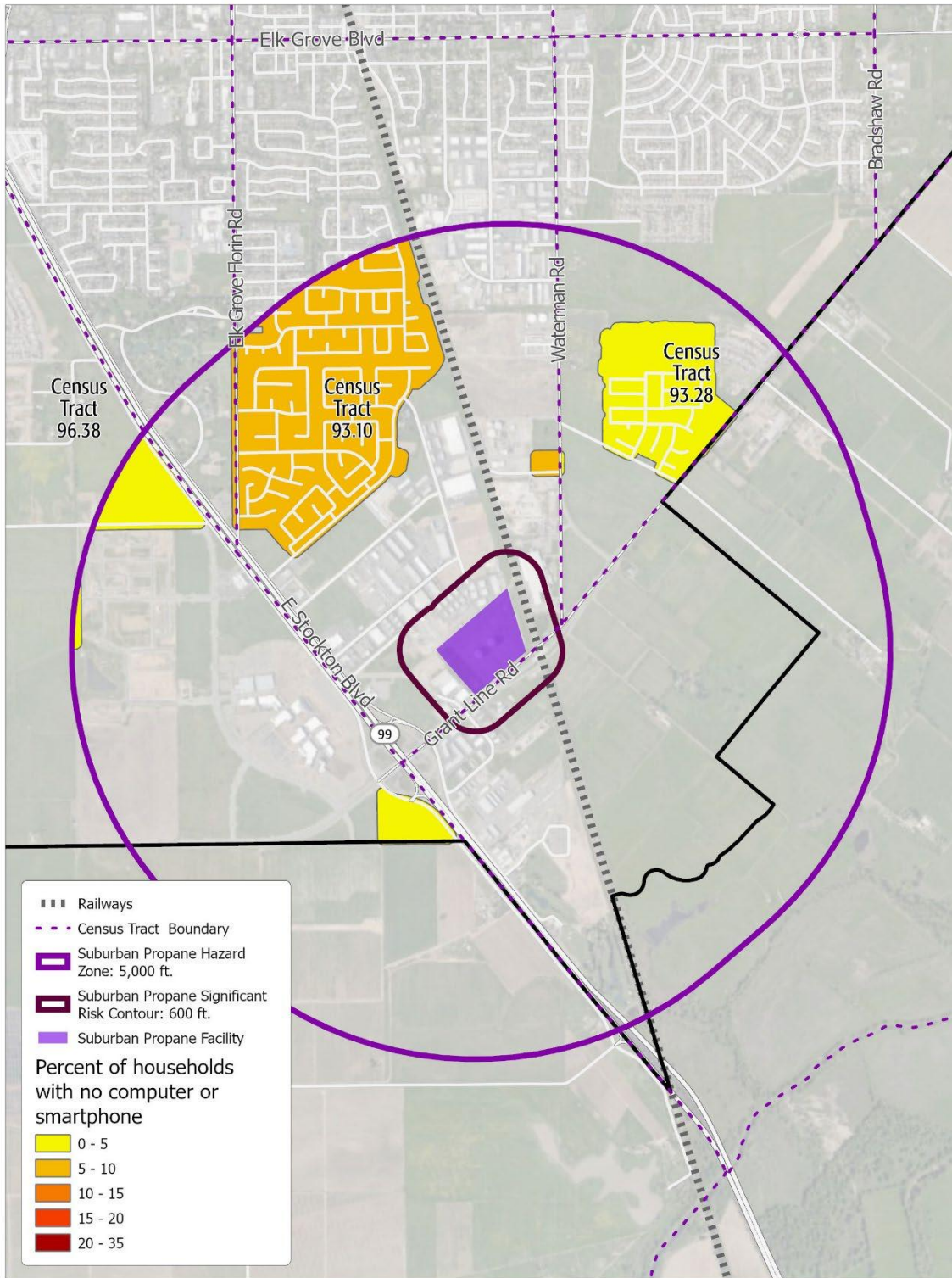


Figure 1-6

Households without Access to a Computer or Smartphone

Census tract 93.09 intersects with the propane hazard zone, has the highest proportion of residents over 65 living alone (23%) and second-highest proportion of residents with a disability (17.2%) compared to other census tracts in Elk Grove. However, the small southern portion of tract 93.09 that intersects with the propane hazard zone is the location of Elk Grove Park, which does not have any residential uses. The residential population exhibiting these characteristics within tract 93.09 are thus not located within the risk contour.

Census tract 93.10 has the highest proportion of households within the propane hazard zone that exhibit proportions of any vulnerability characteristic over 10%. Out of approximately 7,494 residents in this tract, 10.6% have a disability and 9.5% are over 65 and live alone. Approximately 1,212 residential parcels within this tract are within the propane hazard zone, including 4 residential care facilities and 9 low-income housing sites out of 7 and 27 total in the census tract, respectively. The nearest residential parcels to the 'significant risk' contour are approximately 2,000 feet away from its perimeter.

Note, the current Census data does not include the developing Sterling Meadows project west of Highway 99. This project includes 1,184 single family units and one multifamily residential site. The Census data also excludes future development along Promenade Parkway, including the future Sky River Casino and other potential development in the Lent Ranch Special Planning Area.

RECOMMENDATIONS FOR EVACUATING VULNERABLE POPULATIONS WITHIN HAZARD ZONES

Residential neighborhoods intersecting the hazard areas are not in census tracts exhibiting disproportionate rates of vulnerability characteristics compared to the rest of Elk Grove. Additionally, no residential or other sensitive uses (like schools and daycares) are within the significant hazard zone identified in the Risk Analysis done by Quest Consultants Inc.

Residents within the larger and lower-risk hazard area are served by the following evacuation routes: Elk Grove-Florin Road northbound between East Stockton Boulevard and Elk Grove Boulevard, Grant Line Road eastbound between Mosher Road and Bradshaw Road, and Waterman Road northbound between Grant Line Road and Elk Grove Boulevard. All residential streets within the Propane Hazard Area feed into one of these three routes leading out of the hazard area. Future development on the west side of Highway 99 has access to Kammerer Road (westbound) and Promenade Parkway (northbound). Traffic conditions on these routes are discussed in depth within the next sub-section.

The most vulnerable populations within the propane hazard zone are employees working in the Suburban Propane facility and in the surrounding industrial sites within the 600-foot significant risk contour. Other than Suburban Propane, approximately eighteen businesses are located within the 600-foot significant risk contour surrounding the Suburban Propane facility, including the City of Elk Grove Special Waste Collection Center. The City may wish to contact these 18 businesses located in the significant risk contour to notify them of their proximity to the Suburban Propane facility, nearest recommended evacuation routes, local active alert systems and other disaster preparedness resources. The concluding sections of this report discuss recommendations for using active alert systems which can be tailored to each evacuation scenario, as well as recommendations for creating public awareness using targeted mailers and the online Story Map developed jointly with this report.

The following subsection discusses the recommended evacuation routes in more detail, including traffic conditions and recommendations for establishing contra-flow lanes.

TRAFFIC SCENARIOS AND IDENTIFICATION OF PINCH-POINTS

IDENTIFIED EVACUATION ROUTES

Figure 1-7 shows the identified evacuation routes by roadway class and recommended contra-flow lanes.

ELK GROVE DISASTER ANALYSIS
CITY OF ELK GROVE

EXPLOSION FROM SUBURBAN PROPANE

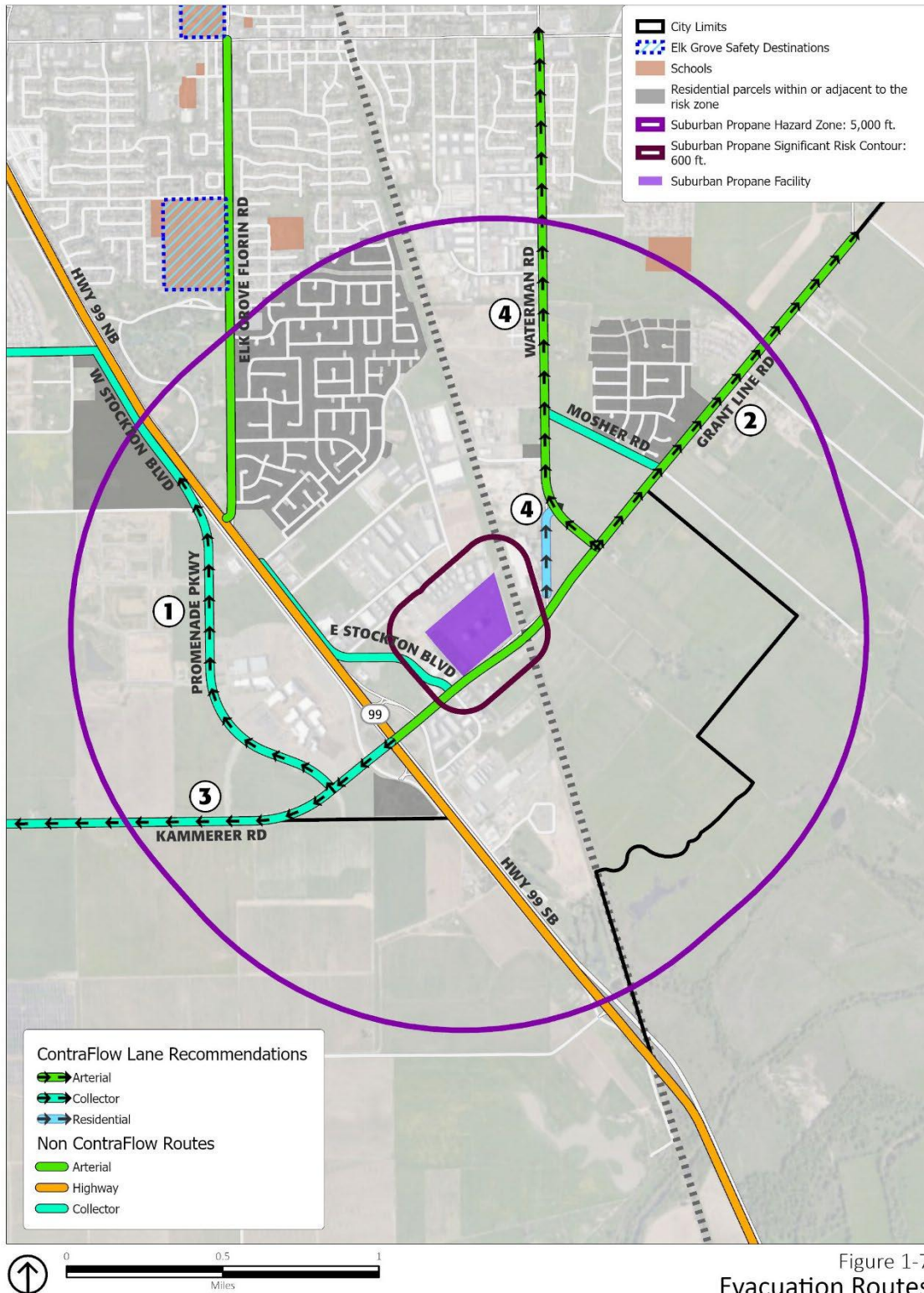


Figure 1-7
Evacuation Routes

The Suburban Propane facility is adjacent to Grant Line Road on the north side, just east of the intersection of Grant Line Road and Highway 99. Because the Suburban Propane terminal facility is a specific point, the hazard area is defined by a circular buffer around the facility's perimeter and evacuation routes radiate outwards in all directions from the hazard area. Evacuation routes were identified as routes having a clear direction of travel leading away from the hazard zone. The following evacuation routes (numbered corresponding to **Figure 1-7**) are recommended for temporary contra-flow lane conversion during an evacuation event based on traffic analysis summarized in **Tables 1-1** and **1-2**:

1. Promenade Parkway/West Stockton Boulevard northbound between Kammerer Road and Whitelock Parkway.
2. Grant Line Road north/eastbound between Waterman Road and Bradshaw Road.
3. Kammerer Road westbound between SR 99 and McMillan Road.
4. Waterman Road northbound between Grant Line Road and Elk Grove Boulevard.

Tables 1-1 and **1-2** describe traffic conditions on major evacuation routes leading out of the Suburban Propane hazard zone depicted in **Figure 1-7**. **Table 1-1** describes current traffic conditions by peak period, and **Table 1-2** describes expected future traffic conditions by peak period. General Plan traffic model results are available for weekday and evening peak periods but not for weekends, and not all evacuation segments were evaluated in the General Plan. Google's average traffic snapshots were analyzed to estimate weekend traffic conditions, to fill in data gaps not included in the General Plan traffic model, and to 'ground truth' or compare traffic model results for segments that are evaluated in the General Plan. Cells showing traffic conditions in each table are color coded to roughly correspond with the color scale used in Google average traffic snapshots: cells showing the segment as uncongested are displayed in green, cells showing the segment as moderately congested are shown in orange, and cells showing the segment as severely congested are shown in pink.

Table 1-1: Propane Hazard Zone Evacuation Routes Current Average Daily Traffic by Peak Period

Route Name	Primary Evacuation Route Segment	Traffic Lanes in Evacuation Direction	Weekday AM Peak	Weekday PM Peak	Weekend AM Peak	Weekend PM Peak
California State Route 99	Northbound between Grant Line Rd and East Stockton Blvd (Elk Grove Blvd Exit)	3 lanes	Congestion on northbound on-ramp from Grant Line Rd (LOS A)	Not congested	Not congested (congested southbound)	Not congested (congested southbound)
California State Route 99	Southbound between Grant Line Rd and Eschinger Rd	3 lanes merge into 2 lanes	Not congested (LOS B)	Not congested (LOS A)	Severely congested	Congested
Elk Grove Florin Road	Northbound between East Stockton Blvd and Elk Grove Blvd	1 lane	Not congested	Not congested (congested southbound)	Not congested	Congested
Grant Line Road (2 segments)	Eastbound between Waterman Rd to Bradshaw Rd	1 lane	Not congested (LOS B – A)	Not congested (LOS C – A)	Not congested	Not congested
Grant Line Road	Westbound between East Stockton Blvd and SR 99 / Kammerer Rd	3 lanes	Congested (LOS F)	Not congested (congested eastbound)	Congested	Not congested
Kammerer Road	Westbound between SR 99 and McMillan Rd	3 lanes merge into 1 lane west of Lent Ranch Pkwy	Not congested	Not congested	Not congested	Not congested
East Stockton Boulevard	Northbound from Grant Line Rd to Teresa Way	1 lane	Congested northbound at Grant Line Rd	Congested northbound at Grant Line Rd (and southbound)	Minor congestion where northbound lanes merge	Minor congestion where northbound lanes merge
Mosher Road	Both directions between Waterman Rd and Grant Line Rd	1 lane	Not congested (LOS D onto Grant Line Rd)	Not congested	Not congested	Not congested
Promenade Parkway / West Stockton Boulevard	Northbound from Kammerer Road to Whitelock Pkwy	2 lanes merge into 1 lane as Promenade Pkwy becomes W Stockton Blvd	Minor congestion north of Bilby Rd	Not congested (congested southbound)	Not congested (minor southbound congestion)	Not congested (minor southbound congestion)
Waterman Road	Northbound between Grant Line Road and Elk Grove Boulevard	1 lane splits into 2 lanes north of Charolais Way	Not congested (LOS B)	Not congested (LOS A)	Congested	Not congested

For evacuation segments that are evaluated for existing conditions in the General Plan, Google traffic results are displayed with corresponding LOS estimates from the General Plan traffic model in parenthesis underneath. ‘Not congested’ refers to the ‘green’ category used in Google Traffic snapshots (roughly corresponding to LOS A-B), ‘Congested’ refers to the orange color (roughly corresponding to LOS C-D), and ‘Severely congested’ refers to the red color (roughly corresponding to LOS E-F). LOS and V/C estimates are shown as a range in cases where evacuation routes consist of multiple segments evaluated and where the LOS varies by segment. For some evacuation route segments that were evaluated for current existing conditions in the General Plan, Google ADT snapshots are not exactly consistent with General Plan LOS estimates for the same peak period. These discrepancies are minor in all instances. For example, where the General Plan might show a segment as having an LOS A during a period, Google ADT snapshots may show that the same segment is moderately congested (orange, or roughly equivalent to LOS C-D). LOS C is typically considered the cutoff in the Highway Capacity Manual (HCM) where anything between D through F is considered congested.

Table 1-2: Propane Hazard Zone Evacuation Routes Buildout Traffic by Peak Period

Route Name	Primary Evacuation Route Segment	Weekday AM Peak	Weekday PM Peak	2040 GP Volume to Capacity (V/C) Ratio
California State Route 99	Northbound between Grant Line Rd and East Stockton Blvd (Elk Grove Blvd Exit)	LOS A on northbound ramps from Grant Line Rd	LOS A on northbound ramps from Grant Line Rd	Not evaluated
California State Route 99	Southbound between Grant Line Rd and Eschinger Rd	LOS B on southbound ramps from Kammerer Rd	on southbound ramps from Kammerer Rd	Not evaluated
Elk Grove Florin Road	Northbound between East Stockton Blvd and Elk Grove Blvd	Not evaluated (LOS F at Bond Rd NB)	Not evaluated (LOS F at Bond Rd NB)	1.02
Grant Line Road	Eastbound between Waterman Rd to Bradshaw Rd	LOS F	LOS D	0.79 - 0.84 (2 segments)
Grant Line Road	Westbound between East Stockton Blvd and SR 99 / Kammerer Rd	LOS F	LOS F	1.25 - 1.28 (2 segments)
Kammerer Road	Westbound between SR 99 and McMillan Rd	LOS D - F	LOS D - C	0.61 – 1.15 (4 segments)
East Stockton Boulevard	Northbound from Grant Line Rd to Teresa Way	LOS F	LOS F	1.48
Promenade Parkway / West Stockton Boulevard	Northbound from Kammerer Road to Whitelock Pkwy	Not evaluated	Not evaluated	0.23 – 0.51 (4 segments)
Waterman Road	Northbound between Grant Line Road and Elk Grove Boulevard	LOS D - F	LOS D - F	0.68 - 1.23 (2 segments)

For evacuation segments that are evaluated for existing conditions in the General Plan, Google traffic results are displayed with corresponding LOS estimates from the General Plan traffic model in parenthesis underneath. ‘Not congested’ refers to the ‘green’ category used in Google Traffic snapshots (roughly corresponding to LOS A-B), ‘Congested’ refers to the orange color (roughly corresponding to LOS C-D), and ‘Severely congested’ refers to the red color (roughly corresponding to LOS E-F). LOS and V/C estimates are shown as a range in cases where evacuation routes consist of multiple segments evaluated and where the LOS varies by segment. For some evacuation route segments that were evaluated for current existing conditions in the General Plan, Google ADT snapshots are not exactly consistent with General Plan LOS estimates for the same peak period. These discrepancies are minor in all instances. For example, where the General Plan might show a segment as having an LOS A during a period, Google ADT snapshots may show that the same segment is moderately congested (orange, or roughly equivalent to LOS C-D). LOS C is typically considered the cutoff in the Highway Capacity Manual (HCM) where anything between D through F is considered congested.

DISCUSSION AND EVACUATION PROCEDURE RECOMMENDATIONS

Table 1-1 (current ADT snapshots) shows Grant Line Road eastbound and Kammerer Road westbound as uncongested in both directions during all peak periods. Seven evacuation routes are moderately congested during at least one peak period (yellow cells), and two recommended routes: State Route (SR) 99 southbound and the small segment of Grant Line Road Westbound until it becomes Kammerer Road, are severely congested for at least one peak period during the week (pink cells). Table 1-2 shows six evacuation routes with severe congestion during more than one period in the General Plan Buildout model, except CA State Route 99 and Promenade Parkway/West Stockton Boulevard.

Out of all the evacuation routes evaluated, the Promenade Parkway/West Stockton Boulevard segment is the only route that is not congested in both directions all days of the week. However, West Stockton Boulevard was not evaluated in the General Plan traffic model because it is not anticipated to have significantly higher volumes associated with new growth and will be realigned by the extension of Promenade Parkway to the existing intersection of Whitelock Parkway and Lotz Parkway. For this reason, it is recommended as the first-priority route in which to implement contra-flow lanes in the northbound direction during an emergency evacuation event, requiring minimal time and resources to redirect existing traffic in the contra-flow direction.

Because congestion on the evacuation segment of SR 99 appears to occur most frequently in the southbound direction during weekend peak hours, it is recommended that the City direct evacuation traffic coming from Suburban Propane to SR 99 northbound as a primary evacuation route during an emergency related to the propane facility. However, it is not recommended that the City establish contra-flow lanes on the divided southbound section of SR 99, due to the potentially high volume of traffic in the southbound direction and additional time and resources required to establish contra-flow lanes on divided highways.

Recommended contra-flow lanes on evacuation route segments are summarized below in order of time-priority during an emergency evacuation event. Highest-ranked route segments are not congested in either direction according to current traffic estimates, and are not expected to be congested in either direction for build-out estimates. This includes segments that are not evaluated in the General Plan traffic analysis, because the traffic model only evaluates major road segments.

PROPANE EVACUATION SCENARIO CONTRA-FLOW ROUTE SEGMENTS BY TIME PRIORITY

Highest Time Priority: Little or no congestion in both directions on these routes. Recommend establishing contra-flow lanes in all opposing lanes and directing evacuees to this route.

- » Convert Promenade Parkway/West Stockton Boulevard southbound lanes between Kammerer Road and Whitelock Parkway to northbound lanes.

Second-Highest Time Priority: Recommend establishing contra-flow lanes on these routes to accommodate traffic in the direction of evacuation (little or no traffic in the opposing direction).

- » Convert Grant Line Road westbound lanes between Waterman Road and Bradshaw Road to eastbound lanes but re-evaluate pending new developments occurring over General Plan cycle.
- » Convert Kammerer Road eastbound lanes between SR 99 and McMillan Road/Big Horn Boulevard to westbound lanes but re-evaluate pending new development occurring over the General Plan cycle.
- » Convert Waterman Road southbound lanes between Grant Line Road and Elk Grove Boulevard to northbound lanes but re-evaluate pending new development occurring over the General Plan cycle.

Evacuation Routes Not Recommended for Contra-Flow Lanes: Congestion occurs in both directions, unclear direction of travel, and/or routes are divided highways.

- » SR 99
- » Elk Grove-Florin Boulevard
- » East Stockton Boulevard

SAFETY SHELTERS

In addition to recommended evacuation routes, Figure 1-7 illustrates safety shelters that are proximate to or within the propane hazard zone. These safety shelters may be used as an evacuation location for residents to assemble during the incident and seek shelter. However, incidents are often dynamic and there could be conditions that warrant alternative arrangements. The City's Emergency Operations Center/RTIC Manager shall assign safety shelters as evacuation locations based upon the nature of the incident, availability of the shelter, and population need. In addition to the shelters shown in Figure 1-7, the full list of shelters recommended for each scenario is provided in Appendix.

Scenario 2: Train Derailment Evacuation Scenario

HAZARD ZONE AND RISK PARAMETERS

Three railways run north to south through the City of Elk Grove, as shown in **Figure 2-1**.

All three rights-of-way are owned by Union Pacific Railroad, which also operates freight locomotives along these routes. Out of these three rail tracks, the center track was chosen as the study area for this analysis because of three attributes specific to the center track that increase the expected risk associated with any incident compared to the other two tracks: The first is the center track is more integrated with cross-traffic than the other two tracks. This track features an at-grade crossing with Elk Grove Boulevard through Old Town Elk Grove, a commercial center within the city, along with several other at-grade crossings. Secondly, this is the only track of the three that currently operates passenger rail, which runs at higher speeds compared to freight (note, passenger service will be transitioning to the west side tracks upon completion of the Valley Rail Project by the San Joaquin Joint Powers Authority as soon as 2023). Finally, this track features several switching locations where a single track cleaves into two tracks, which is associated with a higher risk of derailment.⁴ The other two tracks running through Elk Grove do not have switches and remain a single track throughout their length within Elk Grove.

Train derailments in Elk Grove are highly unlikely at any location along the track. However, as previously mentioned, the location with the highest probability of derailment in Elk Grove is at switching locations where a single track becomes two tracks. These locations, shown on the map, are just north of an at-grade rail crossing at Elk Grove Boulevard in Old Town Elk Grove, as well as several switches south of Elk Grove Creek for spur lines to adjoining industrial development. In Old Town, the track switches from a single-track north of this location to two tracks south of this location through the remaining southern portion of Elk Grove, including the at-grade crossing at Elk Grove Boulevard immediately south of the switch. According to the FRA's Rail Equipment Accident/Incident Database, 88% of any rail incidents occurring in the United States between 1991 to 2015 have occurred at intersections with mainline rail tracks and roadways. While incidents occurring at grade crossings are more likely to occur, they are less likely to cause a derailment than other types of rail incidents (approximately 0.4% to 1% of grade crossing collisions in the United States result in a train derailment according to the U.S. Department of Transportation Accident Prediction Model).⁵

⁴ Xiang Liu, M. Rapik Saat, and Christopher PL Barkan, "Analysis of Causes of Major Train Derailment and Their Effect on Accident Rates," *Transportation Research Record* 2289, no. 1 (2012): 154–63.

⁵ Samantha Chadwick, "Quantitative Analyses of Train Derailment Probability at Highway-Rail Grade Crossings" (PhD Thesis, University of Illinois at Urbana-Champaign, 2017).

TRAIN DERAILMENT EVACUATION SCENARIO



Figure 2-1

Railroads in Elk Grove (Tracks and Switches)

The hazard zone, or largest-possible area of risk, is represented by a 3,800-foot buffer around the railway beginning from the switching location north of Elk Grove Boulevard and extending down the remaining length of the two-track portion of the railway to where it intersects with the southern boundary of Elk Grove city limits. This 3,800-foot buffer encompasses the following:

- » 500 feet for train derailment trajectory
- » An additional 350 feet of potential conflagration area resulting from a fire
- » 3,800 feet of potential toxic vapor cloud release.

These proposed parameters are based on findings from the case studies and data described in the subsections below. These two case studies were selected because each represents extremely rare, high-impact examples of derailment events with far-ranging geographic distributions of impacts that are highly unlikely compared to most derailment incidents. The first case study involves a head-on collision between a passenger train and freight train moving at high speeds in opposite directions on parallel tracks, and the second involves a hazardous spill, fire, and toxic vapor release from 72 freight cars carrying crude oil. The intense and far-reaching impacts from these case studies represents an ‘upper bound’ for the range of impacts from a derailment event that could occur along this track in Elk Grove. Parameters estimated from these case studies are corroborated with data from the California Department of Transportation (Caltrans) regarding the speed and condition of this stretch of track running through Elk Grove.

CASE STUDY 1—DERAILMENT WITH NO HAZARDOUS SPILL

The first case study occurred in the United Kingdom in February 2001. A passenger train going 88 miles per hour (mph) derailed and collided with an oncoming freight train travelling 54 mph in the opposite direction on the parallel track. Ten lives were lost, and 80 people sustained serious injuries in the Selby rail crash in Yorkshire, United Kingdom, which is considered the worst United Kingdom rail disaster of the 21st century. The collision occurred after the passenger train hit a stationary vehicle blocking the track and derailed, crashing into the oncoming freight train on the parallel track.⁶ The crash occurred on flat terrain and a linear stretch of track. The furthest derailed train car was a passenger train car found 437 feet away from the track. Because this was a head-on collision with two trains going at high speeds in opposite directions, the 437-foot trajectory of the furthest derailed car represents the furthest expected derailment trajectory that could occur along this two-way length of railway in Elk Grove. As a conservative measure, an additional 63 feet was added to the hazard area buffer surrounding the track for a total of 500 feet.

CASE STUDY 2—DERAILMENT WITH HAZARDOUS SPILL

The other high-profile case study occurred in the town of Lac-Mégantic in Quebec, Canada, in 2013. Here, a freight train carrying 72 tank cars filled with crude oil behind five head-end locomotives derailed while rolling down a hill unmanned and powered by gravity from its night stop location uphill from the town.⁷ The train reached a maximum downhill speed of nearly 62 mph before derailing at a curve at the bottom of the hill. The 79 train units derailed close to the tracks, piling up on the tracks in an accordion-like fashion. However, much

⁶ “Selby Rail Crash: Disaster Remembered 20 Years On,” *BBC News*, February 28, 2021, sec. York & North Yorkshire, <https://www.bbc.com/news/uk-england-york-north-yorkshire-56085631>.

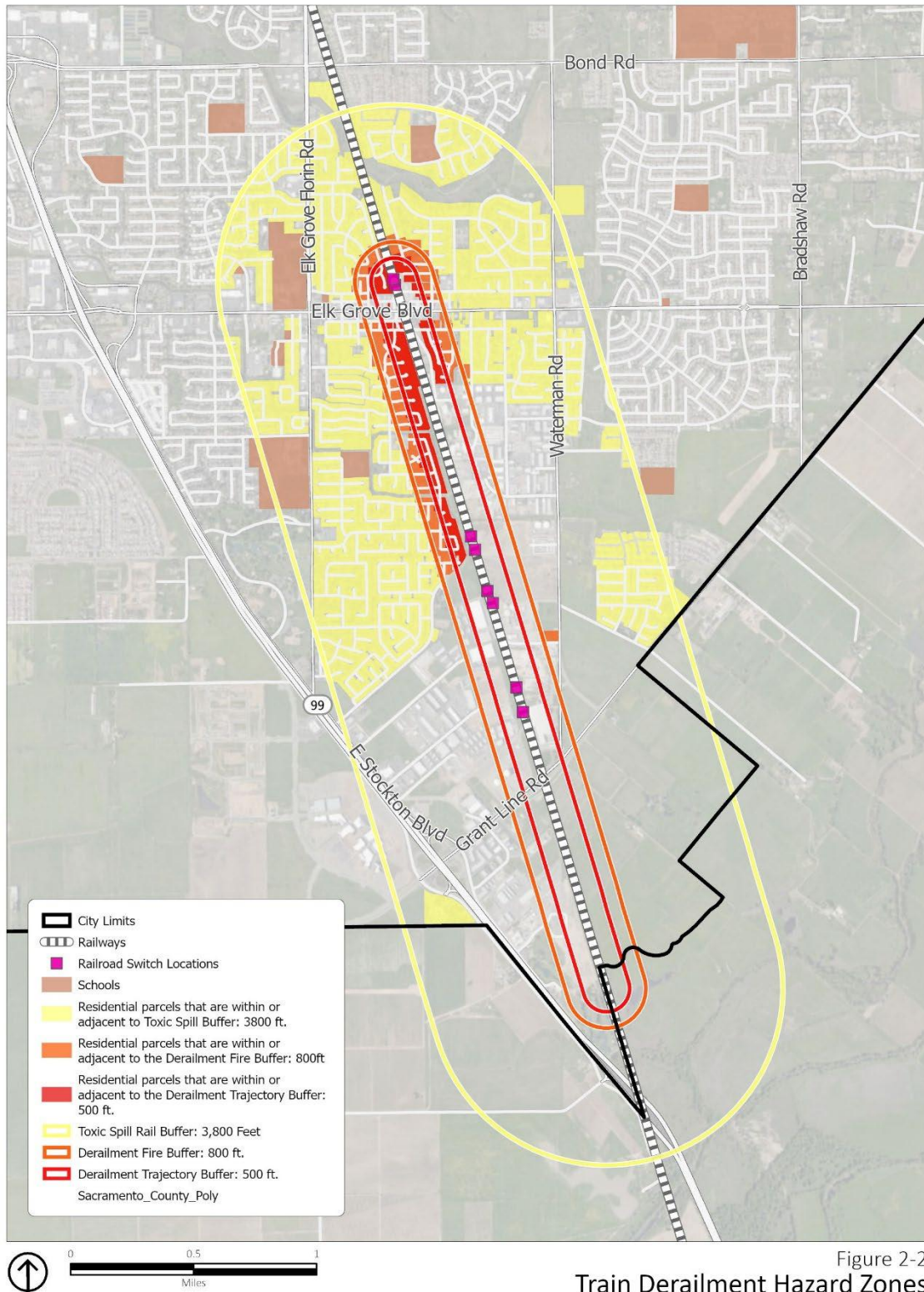
⁷ Mélissa Généreux et al., “The Public Health Response during and after the Lac-Mégantic Train Derailment Tragedy: A Case Study,” *Disaster Health* 2, no. 3–4 (November 11, 2015): 113–20, <https://doi.org/10.1080/21665044.2014.1103123>.

of the crude oil spilled and caught fire, causing destruction out to (conservatively) 850 feet from the track at the location of the disaster, and an additional toxic vapor cloud reaching 3,800 feet downwind from the site of the disaster. The hazard area analyzed in this report is represented by the 3,800-foot vapor cloud radius from this case study as the maximum-distance hazard zone for the train derailment scenario, with a higher-risk conflagration zone within the hazard zone defined by an 850-foot radius reflective of the maximum distance affected by the Lac-Mégantic train derailment fire. This fire, resulting from the derailment of 72 tank cars filled with crude oil, is expected to encompass the maximum possible distance covered by a potential fire resulting from any train derailment scenario in Elk Grove. Further, it is less likely that heavier freight train units carrying flammable materials would derail as far as the proposed 500-foot maximum derailment buffer, which was derived from the Selby case study involving a much lighter passenger train moving at a much faster speed than the Lac-Mégantic train derailment. Because freight vehicles are heavier and restricted to slower speeds than passenger trains, they are likely to derail closer to the track than 500 feet. For this reason, the proposed 800-foot conflagration radius was measured from the track centerline rather than the perimeter of the furthest possible derailment buffer (500 feet), so that the conflagration radius adds an additional 300-foot radius beyond the derailment zone perimeter, and the vapor cloud adds an additional 3,000-foot radius beyond the conflagration buffer, for a total of 3,800 feet of total risk area measured from the center line of the two-track rail segment between just north of Elk Grove Boulevard and the industrial area in southern Elk Grove. The track is linear at this location and throughout the City of Elk Grove, so there is no increased derailment risk associated with unsafe speeds around curves.

Geographic information system (GIS) data available publicly from Caltrans was evaluated to ‘ground truth’ the proposed parameters derived from these case studies. The condition of this length of track is FRA Track Class 4. Each class (from 1 to 6) represents track quality and minimum standards specified for each class per regulation. Speed restrictions are associated with each Track Class: A track class of 1 is associated with lowest quality and an associated speed of up to 10 mph. A track class of 6 represents the highest quality and associated speeds of up to 110 mph. Track Class 4 is associated with a speed restriction of 60 mph. This is the same speed at which the unmanned freight cars were traveling when they derailed in Lac-Mégantic, and slower than the speed at which both the freight and passenger trains was moving during the Selby crash.

Figure 2-2 shows the 500-foot derailment buffer, additional 300 feet of conflagration area, and total 3,800-foot toxic gas cloud buffer, all measured from the track center line.

TRAIN DERAILMENT AND POTENTIAL TOXIC SPILL



Elk Grove Boulevard, the northernmost street intersecting the hazard area, is a major commercial corridor within the City. Elk Grove Boulevard has a high daily traffic volume, and commercial uses surround the intersection at this location. North of this intersection, the track is lined with residential uses on both sides (east and west). South of this intersection, residential uses continue to line the west side of the track, but the east side becomes industrial in character within several blocks south and remains industrial for the remaining southern portion of the track extending to the southern edge of Elk Grove city limits. The west side of the track transitions to industrial uses further south, with the southernmost residential use along the track on this side marked by Jennie McConnell Park in southern Elk Grove. Approximately 4,558 residential parcels and approximately 5,035 residential units fall within the 3,800-foot vapor cloud hazard area associated with a train derailment event resulting in a toxic spill. The following seven schools (including one planned) and one daycare are in the 3,800-foot toxic vapor cloud buffer around the track (but not within the two higher-risk inner buffers):

- » Joseph Kerr Middle School
- » Melrose Christian Preschool
- » Elk Grove High School
- » Florence Markofer Elementary School
- » Elk Grove Elementary School
- » Jessie Baker Elementary School
- » Radcliffe Daycare and Preschool
- » One planned school (not yet developed) on Wyland Drive

Joseph Kerr Middle School and Elk Grove High School are both designated safety shelters but are not recommended for use as safety shelters in the event of a train derailment event given their proximity to the Union Pacific railway. The closest safety shelters outside of the hazard zone are Cosumnes Oaks High School on the west side of the railroad track, and Katherine Albiani Middle School/Pleasant Grove High School on the east side.

VULNERABLE POPULATIONS WITHIN HAZARD ZONES

Figures 2-3 through 2-7 show demographic vulnerability characteristics mapped by census tract for residential areas intersecting the train derailment and toxic spill hazard zone.

TRAIN DERAILMENT AND POTENTIAL TOXIC SPILL

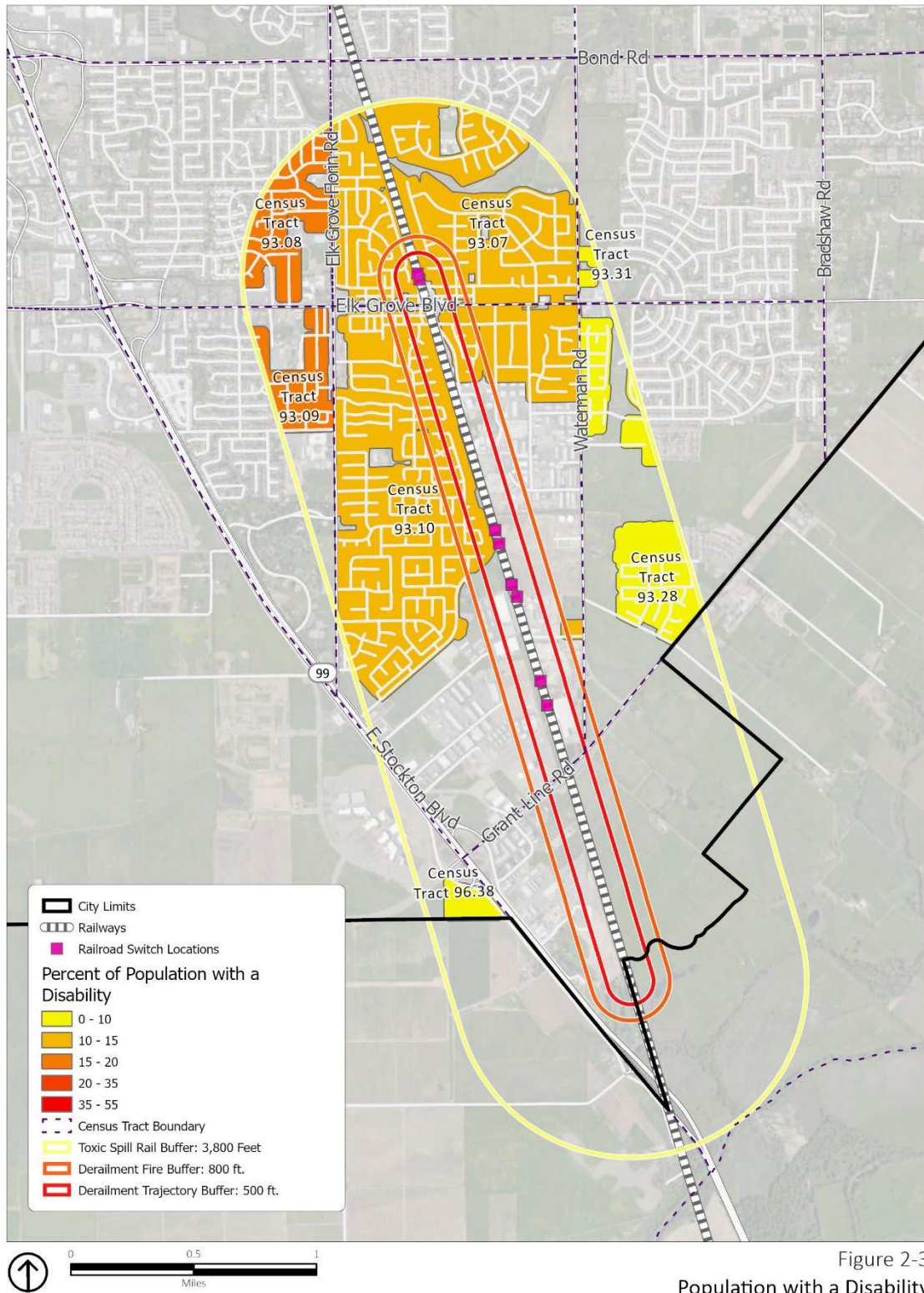


Figure 2-3
Population with a Disability

TRAIN DERAILMENT AND POTENTIAL TOXIC SPILL

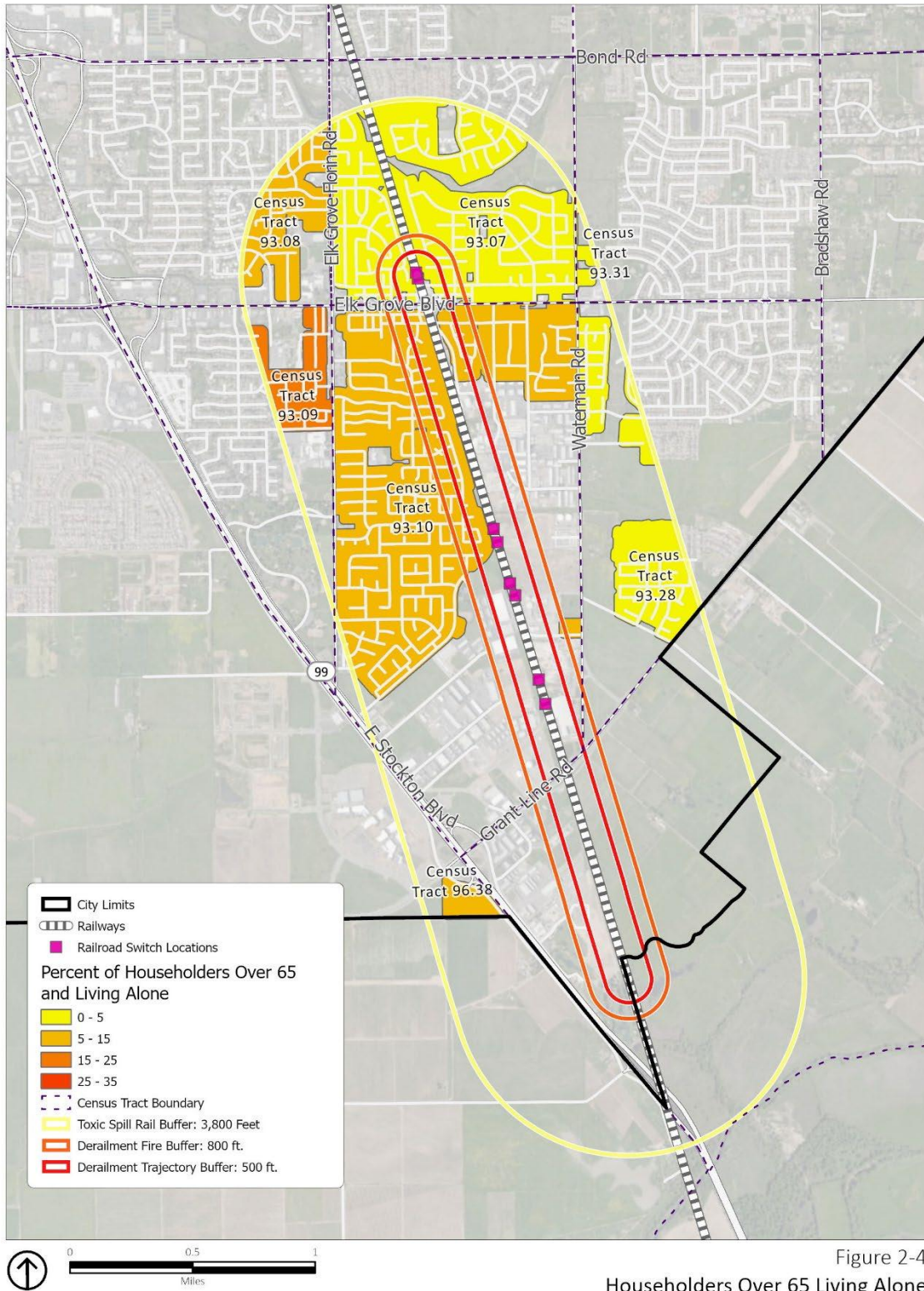


Figure 2-4
Householders Over 65 Living Alone

TRAIN DERAILMENT AND POTENTIAL TOXIC SPILL

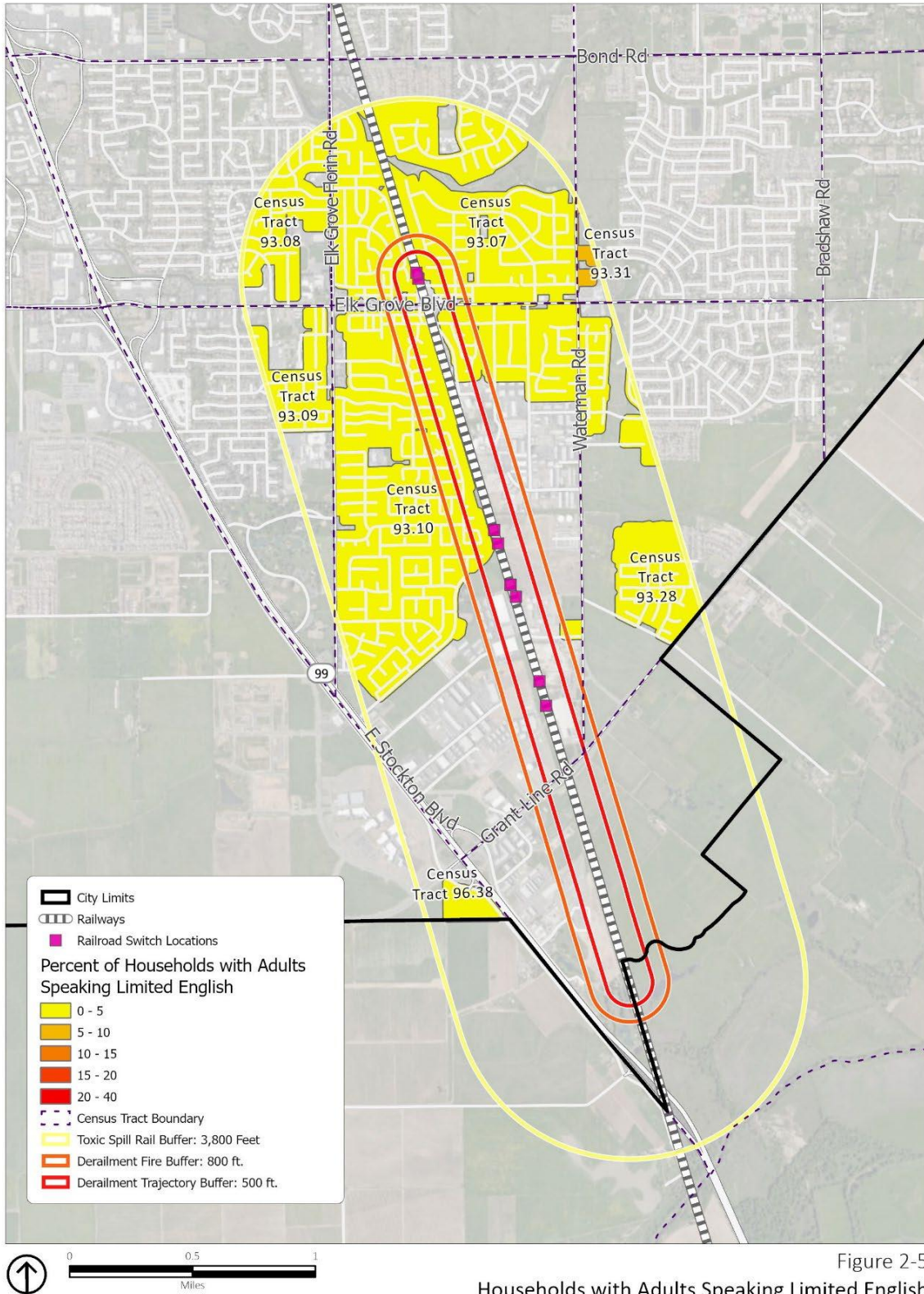


Figure 2-5
Households with Adults Speaking Limited English

TRAIN DERAILMENT AND POTENTIAL TOXIC SPILL

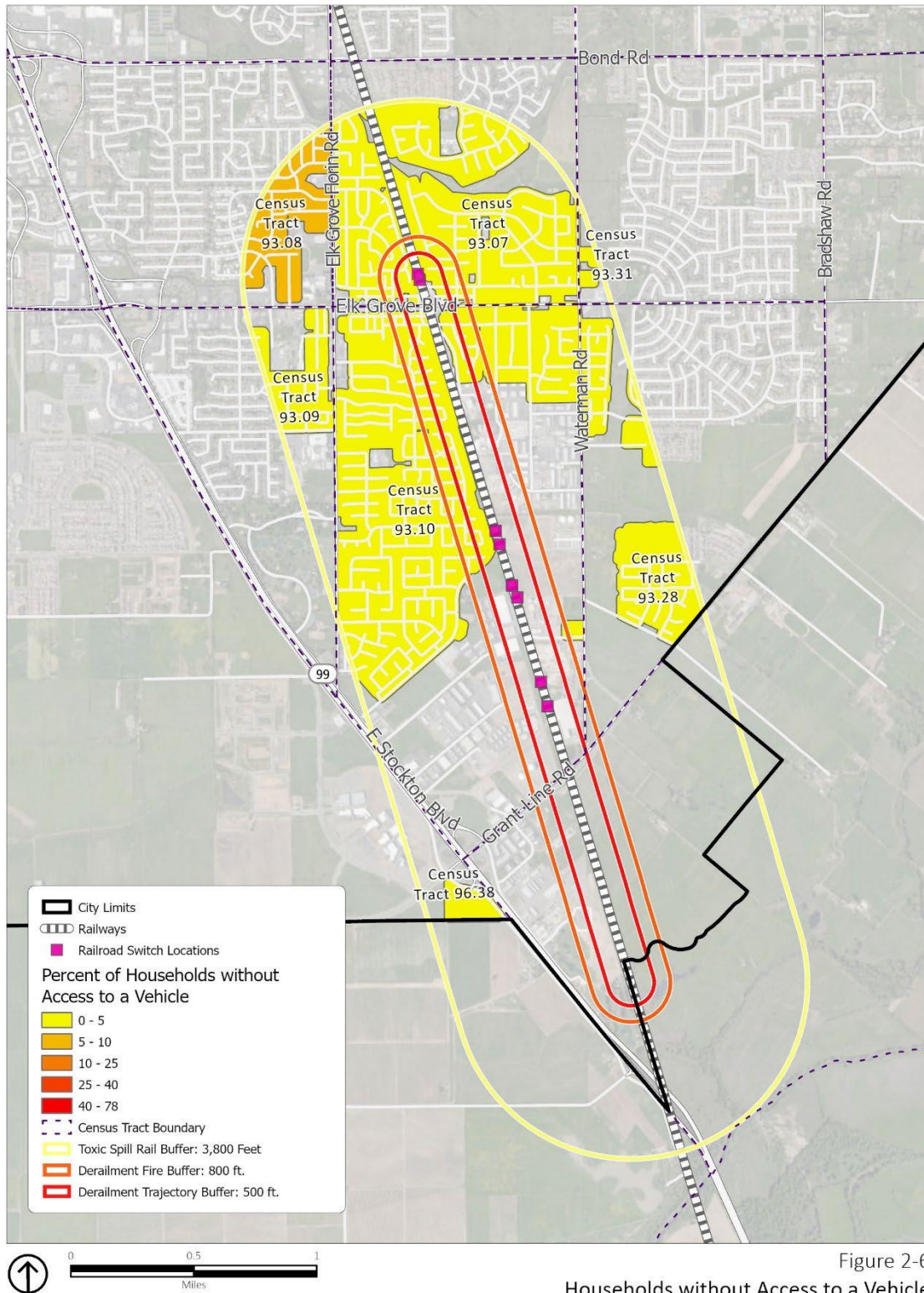


Figure 2-6
Households without Access to a Vehicle

ELK GROVE DISASTER ANALYSIS
CITY OF ELK GROVE

TRAIN DERAILMENT AND POTENTIAL TOXIC SPILL

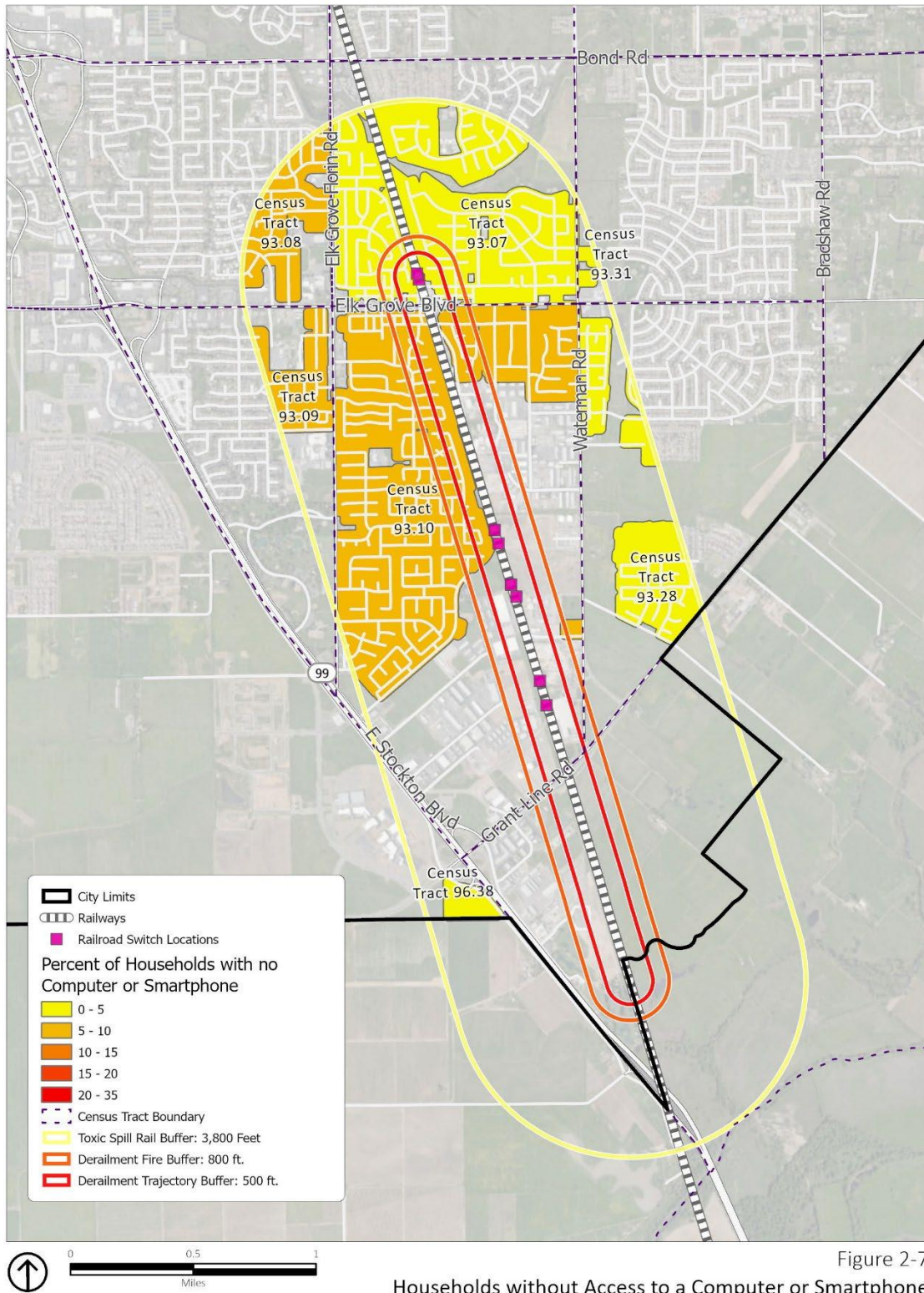


Figure 2-7

Households without Access to a Computer or Smartphone

The hazard area surrounding this linear stretch of track intersects eight different census tracts. Census tract 93.08 has the highest proportion of residents with a disability (18.5%), second-highest proportion of householders over 65 living alone (10.3%), second-highest proportion of households with no computer or smartphone (8.6%), or no internet (10.7%), and the second-highest proportion of households without any vehicle (6%) compared to other census tracts in Elk Grove. Approximately 322 households within this tract lie within the vapor cloud hazard zone (out of 2,210 total households in the tract), including six residential care facilities and two low-income housing locations (out of 35 and 8 within the tract respectively). All parcels within this tract lie outside the derailment and fire hazard zones.

A northeastern portion of census tract 93.09 (also discussed in the propane terminal scenario) intersects with the larger toxic vapor cloud hazard zone associated with a train derailment event but remains outside the derailment trajectory and fire hazard zones. This tract has the highest proportion of residents over 65 living alone (23%) and residents with a disability (17.2%) compared to other census tracts in Elk Grove. Approximately 167 residential parcels within this tract, including three assisted care facilities, also lie within the vapor cloud hazard zone. In addition to these residential parcels, tract 93.09 also includes Elk Grove Park, Elk Grove High School, and approximately 18 parcels with retail or office uses that all lie within the vapor cloud hazard zone.

RECOMMENDATIONS FOR EVACUATING VULNERABLE POPULATIONS

The two tracts identified as having significant proportions of vulnerable residents lie on the west side of the rail track. In this portion of the hazard area, the nearest evacuation routes are Elk Grove Boulevard westbound, Elk Grove-Florin Road northbound (north of the intersection with Elk Grove Boulevard), and Valley Oak Lane westbound towards SR 99. Results of the vulnerability analysis indicate that residents in these areas are more likely to be over 65 and living alone, more likely to have a disability, more likely not to have access to a vehicle, and for tract 93.09, more likely not to have access to a computer or smartphone compared to all census tracts in Elk Grove. There are few enough residences within these two tracts that intersect the hazard area (under 500), that the City could employ staff and/or volunteers to make targeted phone calls or house visits asking residents what specific assistance they would need to evacuate (e.g., phone call alerts during an evacuation event, paratransit or non-paratransit evacuation shuttles, information about nearby safety shelters in a specific language). The concluding sections of this report discuss additional recommendations for using active alert systems which can be tailored to each evacuation scenario, as well as recommendations for creating public awareness using targeted mailers and the online Story Map developed jointly with this report.

TRAFFIC SCENARIOS AND IDENTIFICATION OF PINCH-POINTS

IDENTIFIED EVACUATION ROUTES

Figure 2-8 shows the identified evacuation routes by roadway class.

TRAIN DERAILMENT AND POTENTIAL TOXIC SPILL

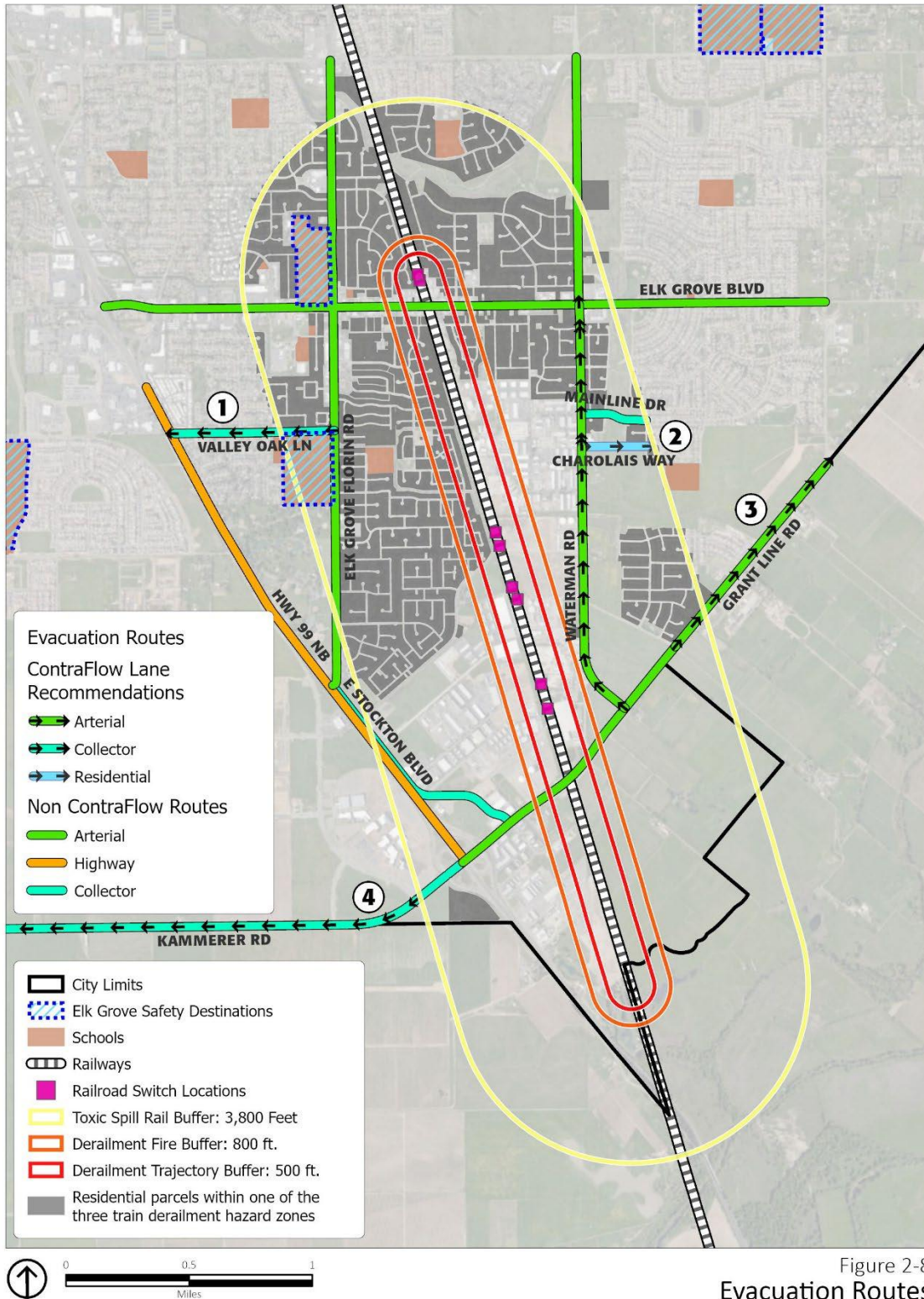


Figure 2-8
Evacuation Routes

The segment of track defining the train derailment hazard zone runs north to south for approximately three miles between the switch location just north of Elk Grove Boulevard to the Emerald Lakes Golf Course at the southern end of Elk Grove. Rather than being centered around a geographic point like the propane evacuation scenario, the hazard zone in the train derailment scenario is defined by a circular buffer around the three-mile linear stretch of rail track. Evacuation routes radiate eastward on the east side of the track, and westward on the westward side of the track away from the hazard area.

The following evacuation routes (numbered corresponding to **Figure 2-8**) are recommended for contra-flow lanes based on traffic analysis summarized in **Tables 2-1** and **2-2**:

1. Valley Oak Lane westbound between Elk Grove Florin Road and East Stockton Boulevard.
2. Charolais Way eastbound between Waterman Road and Black Swan Drive.
3. Grant Line Road north/eastbound between Waterman Road and Bradshaw Road.
4. Kammerer Road westbound between SR 99 and McMillan Road/Big Horn Boulevard.

Tables 2-1 and **2-2** describe traffic conditions on major evacuation routes leading away from the train derailment hazard zone depicted in **Figure 2-8**. For this scenario, major evacuation routes were identified as having a clear direction of travel leading away from the hazard zone (westward on the west side of the tracks and eastward on the east side of the tracks), as well as major north-south routes that connect residential streets to the major east-west evacuation routes. Unlike the east-west routes running perpendicular to the rail track, the parallel north-south routes evaluated in this analysis do not have a specific direction of travel away from the hazard area because the direction of travel on these routes depends on the nearest east-west route for those evacuating, and on the exact location along the track where the derailment occurs. Although these routes do not have a clear direction of travel away from the derailment hazard area, they are included in the traffic pinch-point analysis because they connect residential neighborhoods in the hazard area to evacuation routes, and an assessment of overall traffic conditions is still relevant for disaster preparedness purposes. However, recommendations cannot be made for potential contra-flow lanes on these routes because the direction of travel away from the evacuation varies.

Table 2-1 describes current traffic conditions by peak period, and **Table 2-2** describes expected buildout traffic conditions by peak period. General Plan traffic model results are available for weekday and evening peak periods but not for weekends, and not all evacuation segments were evaluated in the General Plan. Google's average traffic snapshots were analyzed to estimate weekend traffic conditions, to fill in data gaps not included in the General Plan traffic model and compare traffic model results for segments that are evaluated in the General Plan. Cells showing traffic conditions in each table are color coded to roughly correspond with the color scale used in Google average traffic snapshots: cells showing the segment as uncongested are displayed in green, cells showing the segment as moderately congested are shown in orange, and cells showing the segment as severely congested are shown in pink.

Table 2-1: Derailment Hazard Zone Evacuation Routes Current Average Daily Traffic by Peak Period

Route Name	Primary Evacuation Route Segment	Traffic Lanes in Evacuation Direction	Weekday AM Peak	Weekday PM Peak	Weekend AM Peak	Weekend PM Peak
California State Route 99	Northbound between Grant Line Rd and East Stockton Blvd (Elk Grove Blvd Exit)	3 lanes	Congested on northbound on-ramp from Grant Line Rd	Not congested	Not congested (congested southbound)	Not congested (congested southbound)
Elk Grove Boulevard	Westbound between 1 st Ave/ Walnut St Railroad St Alley and East Stockton Blvd	1 lane splits to 2 lanes west of Elk Grove Florin Rd	Not congested (LOS D at Elk Grove Florin Rd)	Congested in both directions (LOS C)	Not congested	Not congested
Elk Grove Boulevard	Eastbound between Railroad St and Bradshaw Blvd	1 lane	Not congested (LOS B - C)	Congested in both directions (LOS B - C)	Not congested	Not congested
Elk Grove Florin Road	Both directions between East Stockton Blvd and Elk Grove Blvd	1 lane	Not congested	Not congested (congested southbound)	Not congested	Congested (both directions)
Grant Line Road	Eastbound between Waterman Rd to Bradshaw Rd	1 lane	Not congested (LOS B – A)	Not congested (LOS C – A)	Not congested	Not congested
Grant Line Road	Westbound between East Stockton Blvd and SR 99 / Kammerer Rd	3 lanes	Congested (LOS F)	Not congested	Congested	Not congested
Waterman Rd	Northbound from Grant Line Blvd to Bond Rd	1 lane splits into 2 lanes north of Charolais Way	Not congested (LOS B-C)	Not congested (LOS B-C)	Congested	Not congested
Charolais Way	Eastbound between Waterman Rd and Black Swan Dr	1 lane	Not congested	Not congested	Not congested	Not congested
Kammerer Road	Westbound between Hwy 99 and Promenade Pkwy	3 lanes merge into 1 lane at Lent Ranch Pkwy	Not congested	Not congested	Not congested	Not congested
Mainline Drive	Eastbound between Waterman Rd and Black Swan Dr	1 lane	Not congested (congested westbound)	Not congested	Congested	Not congested (congested westbound)
Mosher Road	Eastbound between Waterman Rd and Grant Line Rd	1 lane	Not congested (LOS D onto Grant Line Rd)	Not congested	Not congested	Not congested
E Stockton Boulevard	Northbound between Grant Line Rd and Elk Grove Florin Rd	1 lane	Congested northbound at Grant Line Rd	Congested northbound at Grant Line Rd	Minor congestion where northbound lanes merge	Minor congestion where northbound lanes merge
Valley Oak Lane	Westbound from Elk Grove Florin Rd and E Stockton Blvd	1 lane	Not congested	Not congested	Congested	Not congested

For evacuation segments that are evaluated for existing conditions in the General Plan, Google traffic results are displayed in each table with corresponding LOS estimates from the General Plan traffic model in parenthesis underneath. ‘Not congested’ refers to the ‘green’ category used in Google Traffic snapshots (roughly corresponding to LOS A-B), ‘Congested’ refers to the orange color (roughly corresponding to LOS C-D), and ‘Severely congested’ refers to the red color (roughly corresponding to LOS E-F). LOS and V/C estimates are shown as a range in cases where evacuation routes are made up of multiple segments evaluated and where the LOS varies by segment. For some evacuation route segments that were evaluated for current existing conditions in the General Plan, Google ADT snapshots are not exactly consistent with General Plan LOS estimates for the same peak period. These discrepancies are minor in all instances. For example, where the General Plan might show a segment as having an LOS A during a period, Google ADT snapshots may show that the same segment has minor congestion (orange, or roughly equivalent to LOS C-D). LOS C is typically considered the cutoff, where anything between LOS D through F is considered ‘congested’.

Table 2-2: Derailment Hazard Zone Evacuation Routes Buildout Traffic by Peak Period

Route Name	Primary Evacuation Route Segment	Weekday AM Peak	Weekday PM Peak	2040 GP Volume to Capacity (V/C) Ratio
California State Route 99	Northbound between Grant Line Rd and East Stockton Blvd (Elk Grove Blvd Exit)	LOS A on northbound ramps from Grant Line Rd	LOS A on northbound ramps from Grant Line Rd	Not evaluated
Elk Grove Boulevard	Westbound between 1 st Ave/ Walnut St Railroad St Alley and East Stockton Blvd	LOS F	LOS D - F	1.19 - 1.28 (2 segments)
Elk Grove Boulevard	Eastbound between Railroad St and Bradshaw Blvd	LOS D	LOS E	0.84 – 0.99 (2 segments)
Elk Grove Florin Rd	Both directions between East Stockton Blvd and Bond Rd	LOS F approaching Bond Road northbound	LOS E approaching Bond Road northbound	0.94 – 1.02 (2 segments)
Grant Line Road	Eastbound between Waterman Rd to Bradshaw Rd	LOS A - D	LOS A - D	0.79 - 0.84 (2 segments)
Grant Line Road	Westbound between East Stockton Blvd and SR 99 / Kammerer Rd	LOS F - B	LOS F - B	1.25 - 1.28 (2 segments)
Waterman Rd	Northbound from Grant Line Blvd to Bond Rd	LOS D	LOS E	0.68 - 1.23 (2 segments)
Charolais Way	Eastbound between Waterman Rd and Black Swan Dr	Not Evaluated	Not Evaluated	Not evaluated
Kammerer Road	Westbound between Hwy 99 and Promenade Pkwy	LOS D - F	LOS D - C	0.61 – 1.15 (2 segments)
Mainline Drive	Eastbound between Waterman Rd and Black Swan Dr	Not evaluated	Not evaluated	Not evaluated
Mosher Road	Eastbound between Waterman Rd and Grant Line Rd	LOS D	LOS D	0.38
E Stockton Boulevard	Northbound between Grant Line Rd and Elk Grove Florin Rd	LOS F	LOS F	1.48
Valley Oak Lane	Westbound from Elk Grove Florin Rd and E Stockton Blvd	Not evaluated	Not evaluated	Not evaluated

For evacuation segments that are evaluated for existing conditions in the General Plan, Google traffic results are displayed in each table with corresponding LOS estimates from the General Plan traffic model in parenthesis underneath. ‘Not congested’ refers to the ‘green’ category used in Google Traffic snapshots (roughly corresponding to LOS A-B), ‘Congested’ refers to the orange color (roughly corresponding to LOS C-D), and ‘Severely congested’ refers to the red color (roughly corresponding to LOS E-F). LOS and V/C estimates are shown as a range in cases where evacuation routes are made up of multiple segments evaluated and where the LOS varies by segment. For some evacuation route segments that were evaluated for current existing conditions in the General Plan, Google ADT snapshots are not exactly consistent with General Plan LOS estimates for the same peak period. These discrepancies are minor in all instances. For example, where the General Plan might show a segment as having an LOS A during a period, Google ADT snapshots may show that the same segment has minor congestion (orange, or roughly equivalent to LOS C-D). LOS C is typically considered the cutoff, where anything between LOS D through F is considered ‘congested.’

DISCUSSION AND EVACUATION PROCEDURE RECOMMENDATIONS

Because the train derailment hazard area overlaps significantly with the propane hazard area in the southern part of Elk Grove, the two scenarios share several of the same evacuation routes, including: SR 99 northbound, Elk Grove Florin Road northbound, Grant Line Road in both directions, Waterman Road northbound, Kammerer Road westbound, and East Stockton Boulevard northbound. The same pattern discussed in the propane evacuation scenario is also evident here: Arterials serving the large, undeveloped area in southern Elk Grove, where most of the City's approved future development is located, show a significant increase in expected congestion in the General Plan full build-out scenario compared to their current levels. Seven of the thirteen recommended major evacuation routes for the train derailment scenario are expected to be critically congested with LOS levels of E or F during at least one major peak period under the build-out scenario, whereas currently only two segments appear significantly congested during any period (Grant Line Road westbound and East Stockton Boulevard northbound).

Three smaller residential collector roads are recommended as evacuation routes leading out of the hazard zone: Charolais Way eastbound, Mainline Drive eastbound, and Valley Oak Lane westbound. These residential collector roads connect larger arterials and have residential streets feeding into them. Neighborhood streets that feed into them are already built-out and are less likely to have significantly higher levels of traffic associated with future development. These three routes are recommended as priorities for establishing contra-flow lanes during an emergency because they are not congested in either direction according to current traffic estimates, and they are not expected to be congested in either direction according to build-out estimates. Establishing contra-flow lanes on these routes is likely to require less time to divert existing traffic in the contra-flow direction compared to other evacuation routes.

These and other recommendations for establishing contra-flow lanes on evacuation route segments are summarized herein in order of time priority during an emergency evacuation event.

DERAILMENT EVACUATION SCENARIO CONTRA-FLOW ROUTE SEGMENTS BY TIME PRIORITY

Highest Time Priority: Little or no congestion in both directions on these routes. Recommend establishing contra-flow lanes in all opposing lanes and directing evacuees to this route.

- » Convert Valley Oak Lane eastbound lanes to westbound lanes between Elk Grove Florin Road and East Stockton Boulevard.
- » Convert Charolais Way westbound lanes between Waterman Road and Black Swan Drive to eastbound lanes.

Second-Highest Time Priority: Little or no traffic in the opposing direction. Recommend establishing contra-flow lanes on these routes to accommodate traffic in the direction of evacuation.

- » Convert Grant Line Road westbound lanes between Waterman Road and Bradshaw Road to eastbound lanes but re-evaluate pending new developments occurring over General Plan 2040 Cycle.
- » Convert Kammerer Road eastbound lanes between SR 99 and McMillan Road to westbound lanes but re-evaluate pending new development occurring over the General Plan 2040 Cycle.

Evacuation Routes Not Recommended for Contra-Flow Lanes: Congestion occurs in both directions, unclear direction of travel, and/or routes are divided highways.

- » SR 99
- » Elk Grove Boulevard
- » Elk Grove Florin Road
- » East Stockton Boulevard
- » Mainline Drive
- » Mosher Road
- » Waterman Road

SAFETY SHELTERS

In addition to recommended evacuation routes, Figure 2-8 illustrates safety shelters that are proximate to or within the train derailment hazard zone. These safety shelters may be used as an evacuation location for residents to assemble during the incident and seek shelter. However, incidents are often dynamic and there could be conditions that warrant alternative arrangements. The City's Emergency Operations Center/RTIC Manager shall assign safety shelters as evacuation locations based upon the nature of the incident, availability of the shelter, and population need. The full list of shelters recommended for each scenario is provided in Appendix B.

Scenario 3: Flooding Evacuation Scenario

HAZARD ZONE AND RISK PARAMETERS

The hazard zone in this scenario is defined by the plan area covered by the Central Valley Flood Protection Plan (CVFPP), passed in 2021 by the California Department of Water Resources (DWR) and the Central Valley Flood Protection Board.⁸ The CVFPP establishes flood protection requirements as part of local land-use decision-making processes (e.g., General Plans) for jurisdictions within the CVFPP area. The CVFPP area covers the entire Sacramento-San Joaquin River and Delta system and encompasses the Elk Grove Planning Area.

The CVFPP study area includes lands subject to flooding given the current condition of the Sacramento-San Joaquin River Flood Management System under 200-year flood conditions, 500-year flood conditions, and a levee break scenario. In other words, the plan area covers the largest potential area of risk under a comprehensive range of flooding events for the Sacramento-San Joaquin River valley.

The 200-year floodplain represents areas with a 0.5% chance of flooding in any given year (and thus with a 100% chance of flooding over a 200-year period). The CVFPP requires that jurisdictions attain a level of flood protection necessary to withstand 200-year floods for all development within the 200-year floodplain estimated to have a population over 10,000.⁹ Similar to the Suburban Propane evacuation scenario, the area within the larger and more conservative CVFPP hazard zone outside of the 200-year flood zone is associated with minimal risk compared to the area within the 200-year flood zone, and constitutes a highly conservative study boundary in which to analyze demographics and transportation conditions relevant to evacuation. The total flood risk zone (encompassing a 500-year floodplain) and the higher-risk 200-year flood risk zone are both shown in **Figure 3-1**.

⁸ https://gis.water.ca.gov/arcgis/rest/services/Boundaries/i03_SystemwidePA_20101007/MapServer

⁹ [Elk Grove General Plan 2040 Services, Health and Safety Element, 8-14 – 8-17. Adopted February 27, 2019.](#)

FLOODING EVACUATION SCENARIO

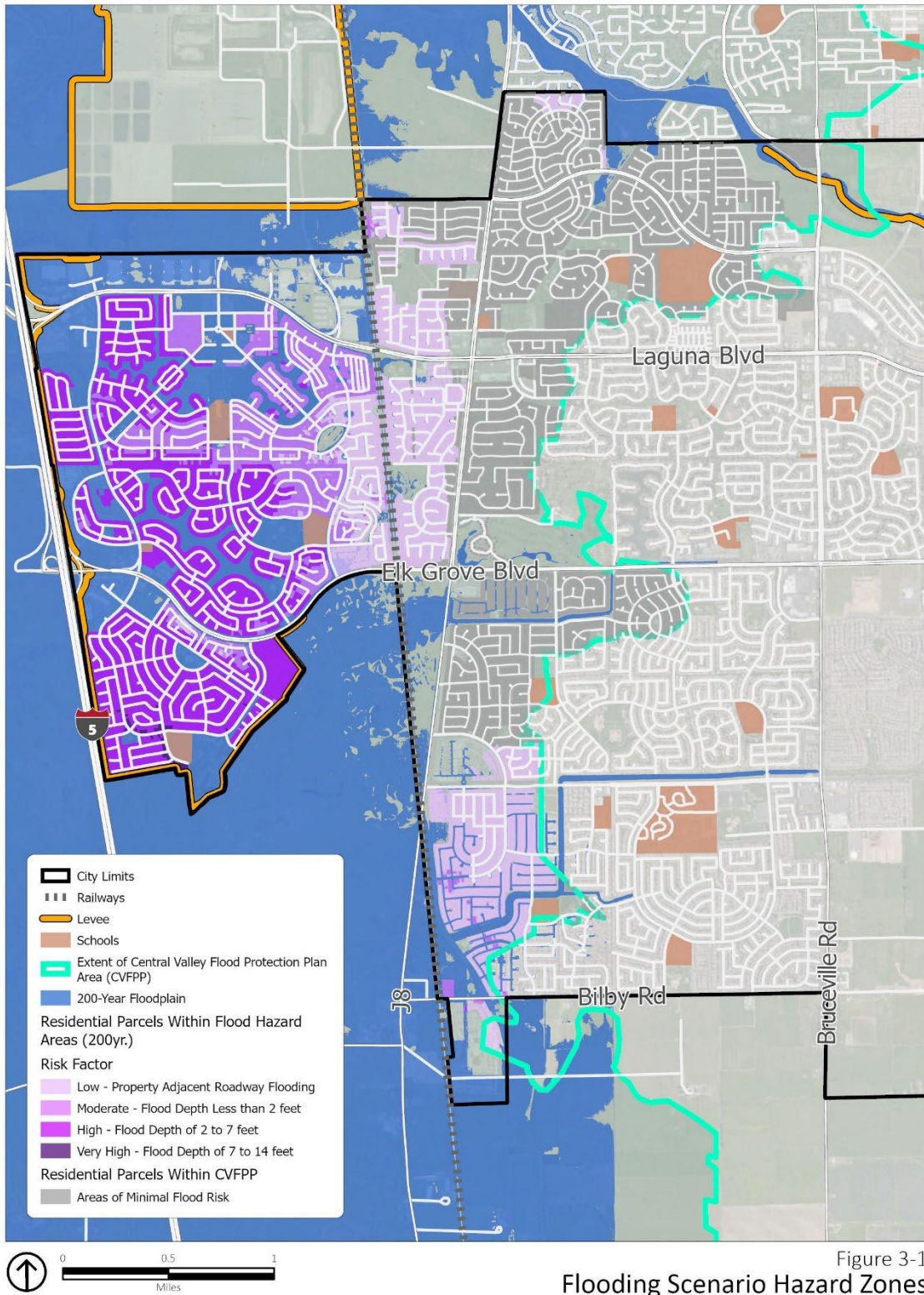


Figure 3-1
Flooding Scenario Hazard Zones

As **Figure 3-1** indicates, the larger CVFPP area covers a large and primarily residential western portion of Elk Grove adjacent to the Sacramento River and levee system. The CVFPP area also covers smaller rural-residential areas of eastern Elk Grove adjacent to Deer Creek and Cosumnes River in the East, South, and West Study Areas, as well as some areas in northeastern Elk Grove surrounding Camden Lake/Camden Park and Laguna Creek. This report defines the hazard zone as the western portion of Elk Grove covered by the CVFPP area, because it is a much larger area covering multiple residential neighborhoods in their entirety, including those served by a single residential collector road, and, overall, having limited access from only two arterials (Elk Grove Boulevard and Laguna Boulevard). These areas are much more likely to be congested during an evacuation event related to flooding, whereas the eastern parts of Elk Grove covered by the CVFPP area include areas primarily along creeks, with ample evacuation routes for all affected properties in these locations. There are 16,959 total households in the flood hazard area, representing approximately one-third of existing Elk Grove households. The following five schools and five daycares are located in the 200-Year flood zone:

- » Kinder Care Learning Center Preschool and Kindergarten
- » Joseph Sims Elementary
- » Merryhill Country
- » Stone Lake Elementary
- » Peekaboo Daycare
- » The Happy Bunch Wee Care
- » Laguna KinderCare
- » Suzanne’s Daycare (nearby roads are partially flooded)
Buzy Bees Child Care (nearby roads are partially flooded).

Six additional schools and six additional daycares lie within the lower-risk CVFPP area:

- » Marion Mix Elementary
- » Peace Preschool
- » John Ehrhardt Elementary
- » Laguna Creek High
- » Helen Carr Castello Elementary
- » Franklin Elementary
- » Lisa’s Family Daycare
- » Dalia’s Daycare
- » Acres of Learning Childcare
- » Silver Springs WeeCare
- » Confidential Daycare Services
- » Wee Kids Child Care

Two Elk Grove safety shelters are located within the 200-year flood hazard zone and are therefore not recommended for use as safety shelters in the event of a flood. These are: Stone Lake Elementary School, and Joseph Sims Elementary School. Although Laguna Creek High school is within the larger CVFPP area, it is outside the 200-year FEMA flood zone and is in an area classified as having minimal risk within the CVFPP. For this reason, it is recommended that the City avoid using Laguna Creek High School as an evacuation shelter while an acute flood event is occurring, but re-evaluate once flood levels have stopped rising. Because it is proximal to the flood risk area but in an area of minimal risk, Laguna Creek High School may be an optimal location from

which to conduct search and rescue efforts in flooded areas. Other Elk Grove safety shelters that are proximal to but outside of the flood risk area include: Good Shepherd Catholic Church, Harriet Eddy Middle School, and Franklin High School.

VULNERABLE POPULATIONS WITHIN HAZARD ZONES

Figures 3-2 through **3-6** show demographic vulnerability characteristics mapped by census tract for residential areas intersecting the flood risk hazard zone.

FLOODING EVACUATION SCENARIO

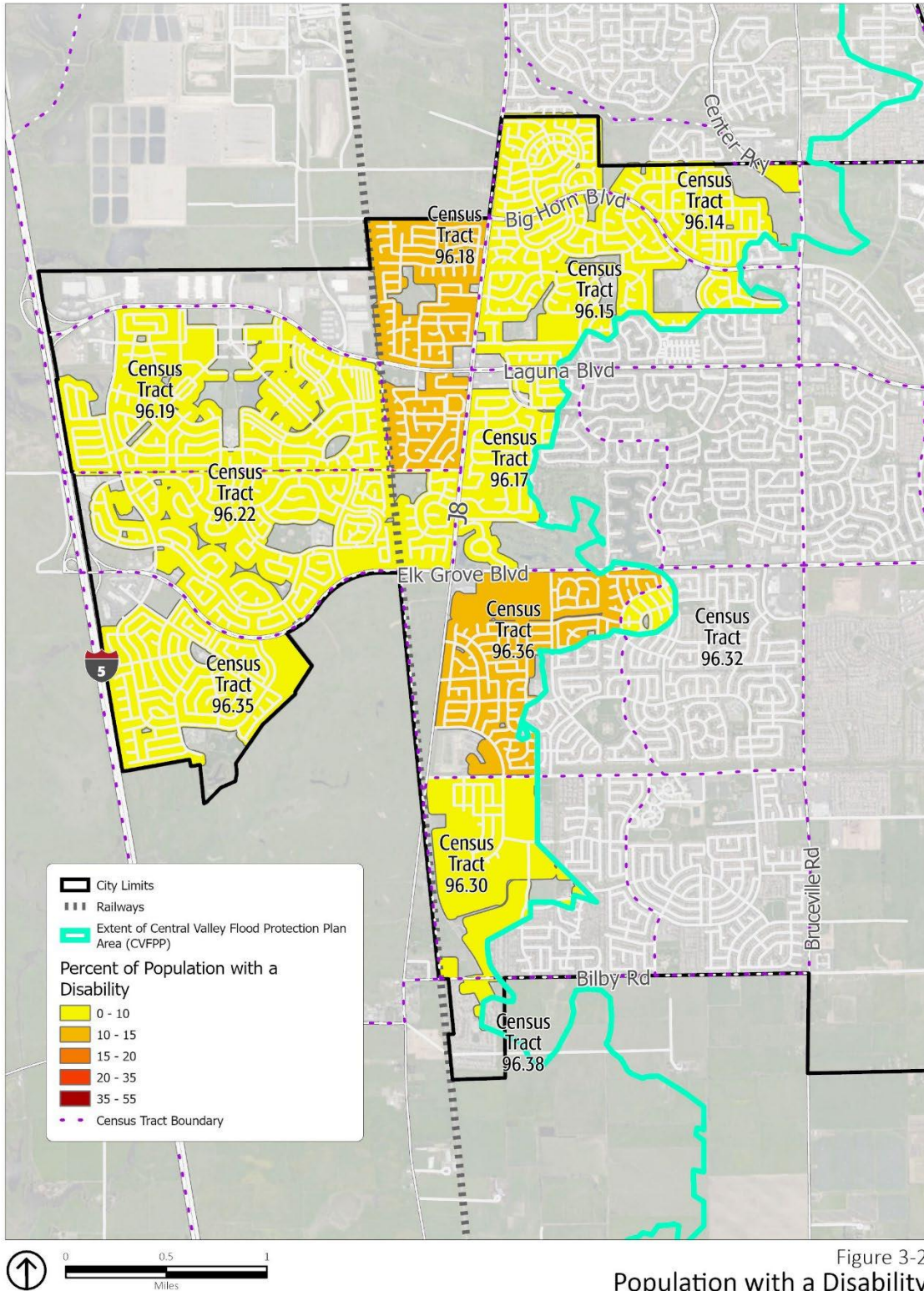


Figure 3-2
Population with a Disability

FLOODING EVACUATION SCENARIO

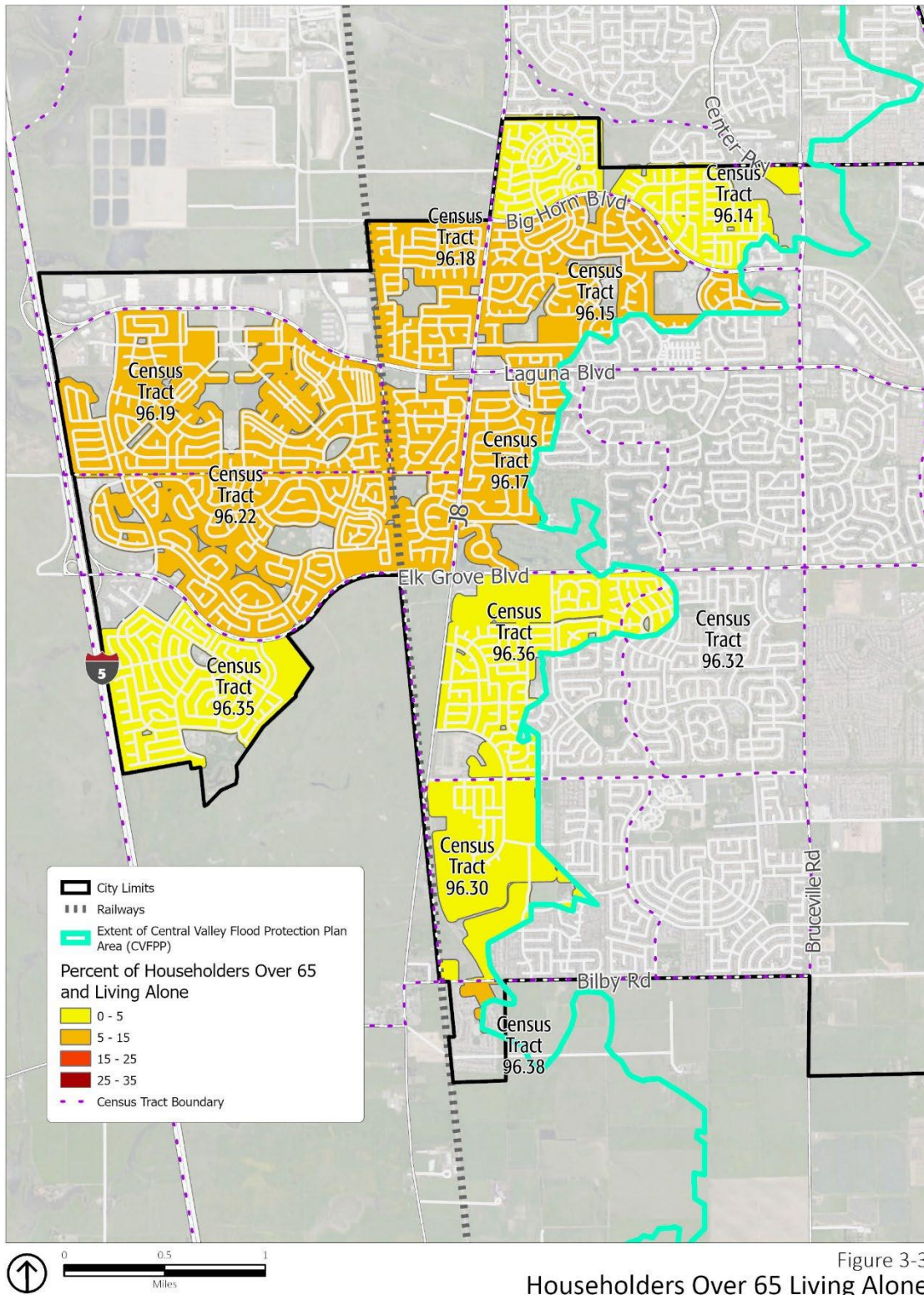


Figure 3-3
Householders Over 65 Living Alone

FLOODING EVACUATION SCENARIO

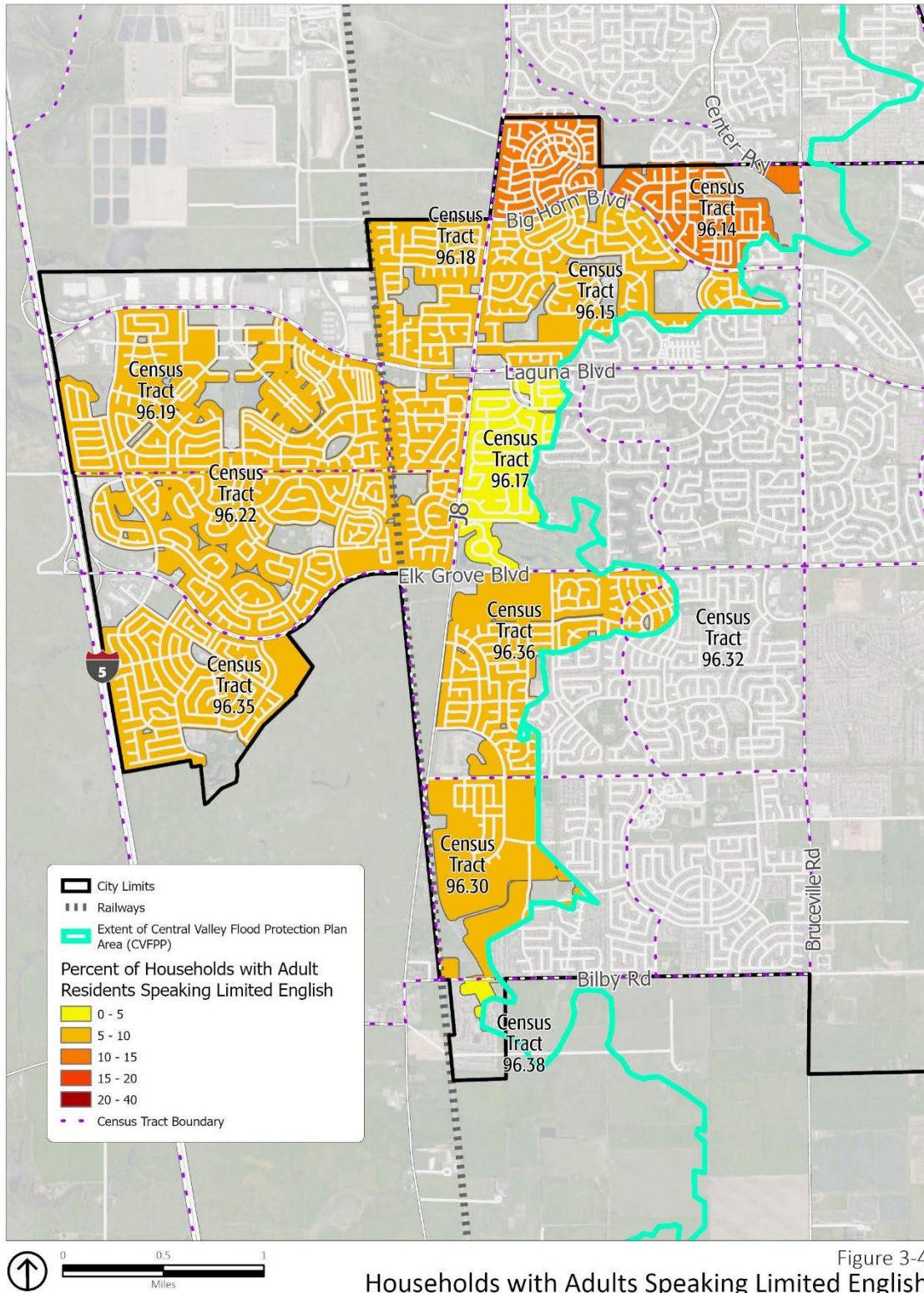


Figure 3-4
Households with Adults Speaking Limited English

FLOODING EVACUATION SCENARIO

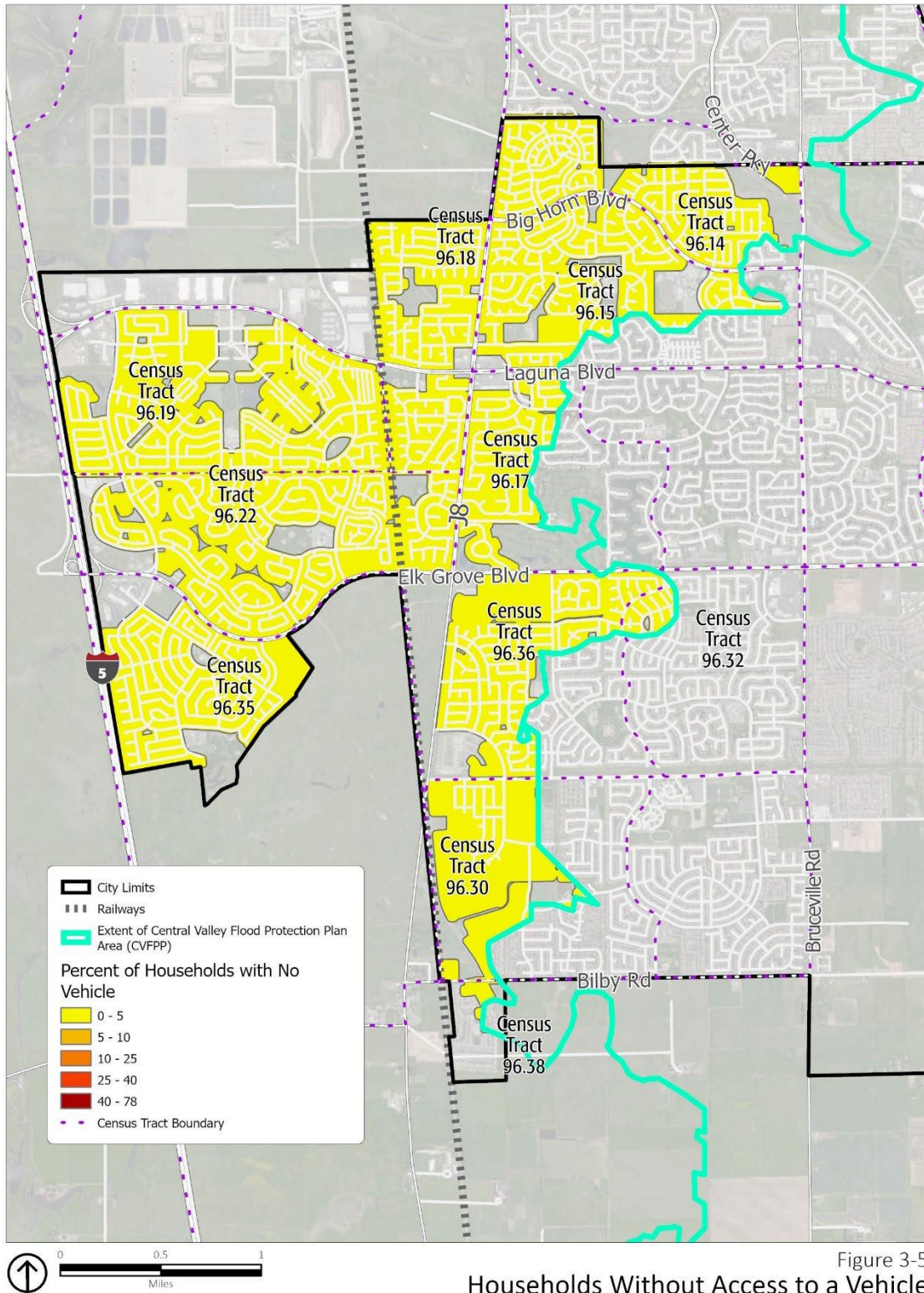


Figure 3-5
Households Without Access to a Vehicle

FLOODING EVACUATION SCENARIO

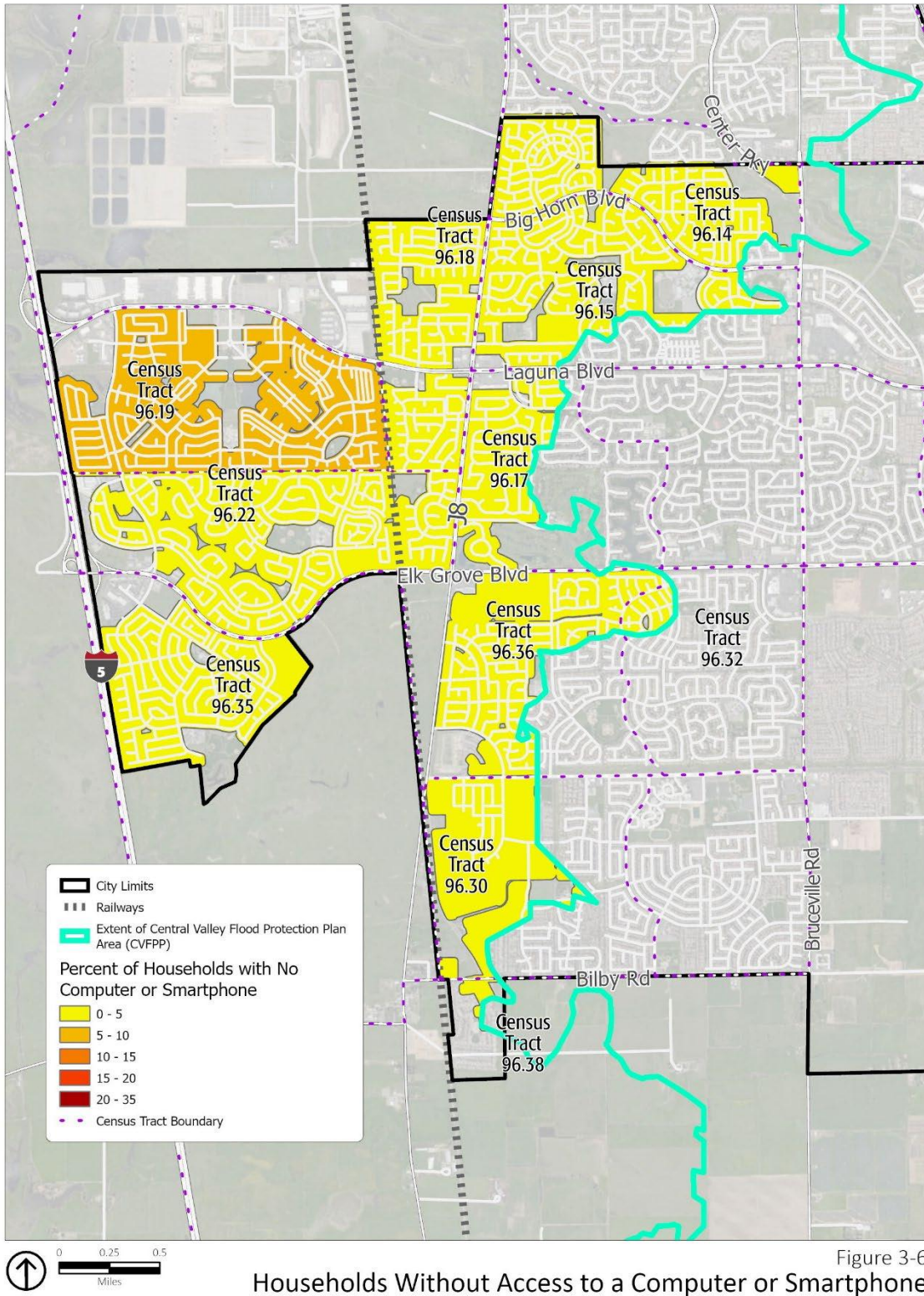


Figure 3-6
Households Without Access to a Computer or Smartphone

Census tract 96.14, is entirely covered by the flood hazard area, and has the highest proportion of limited-English speaking households in Elk Grove at 12%. Other Elk Grove census tracts fall between 3% and 10% for the proportion of households speaking limited English. This tract also contains 36 low-income housing locations and 6 residential care facilities. Census tract 96.14 is the only tract with residential neighborhoods intersecting the flood hazard zone and with a significantly higher proportion of residents with any one of the five vulnerability characteristics evaluated.

RECOMMENDATIONS FOR EVACUATING VULNERABLE POPULATIONS WITHIN HAZARD ZONES

The flooding scenario encompasses the largest hazard area with the highest number of residents compared to the other two evacuation scenarios evaluated in this report. It is also the most likely scenario, and likely contains a higher proportion of residents who may not be able to access emergency preparedness information provided in English compared to other Elk Grove census tracts. The concluding sections of this report discuss recommendations for creating public awareness around disaster preparedness (including recommendations for multi-lingual outreach), as well as recommendations for using active alert systems which can be tailored to each evacuation scenario. For active alerts related to flooding specifically, City staff can use the following resources to determine when to issue evacuation warnings prior to or in the early stages of a flooding event:

- » The Active Alert NOAA weather radio: <https://www.weather.gov/nwr/>, which broadcasts continuous weather information from the nearest National Weather Service office, based on physical location of the user or searched location,
- » And the NWS flood-specific landing page: <https://www.weather.gov/safety/flood>. This page provides a link to an interactive map where users can view real-time flooding conditions, as well as the location of water level gauges, including several along the Sacramento River and major tributaries near Elk Grove. Users can choose NWS offices providing live forecasts from the drop-down menu to the right of the map to see real-time flood information for that region, including one located in Sacramento County.

If flooding conditions are anticipated, City staff may wish to employ multi-lingual staff, volunteers, and/or hired interpreters to prioritize in-person door knocking in census tract 96.14. Door-knocking staff could notify residents of potential flooding conditions, refer residents to active alert NOAA weather radio for real-time weather updates, and provide recommendations for evacuation (e.g., what to include in a 'go-bag' and the location of safety shelters in Elk Grove). More recommendations for evacuation during a flooding event are provided in the following subsection discussing traffic conditions along identified evacuation routes.

TRAFFIC SCENARIOS AND IDENTIFICATION OF PINCH-POINTS

IDENTIFIED EVACUATION ROUTES

Figure 3-7 shows the identified evacuation routes by roadway class.

FLOODING EVACUATION SCENARIO

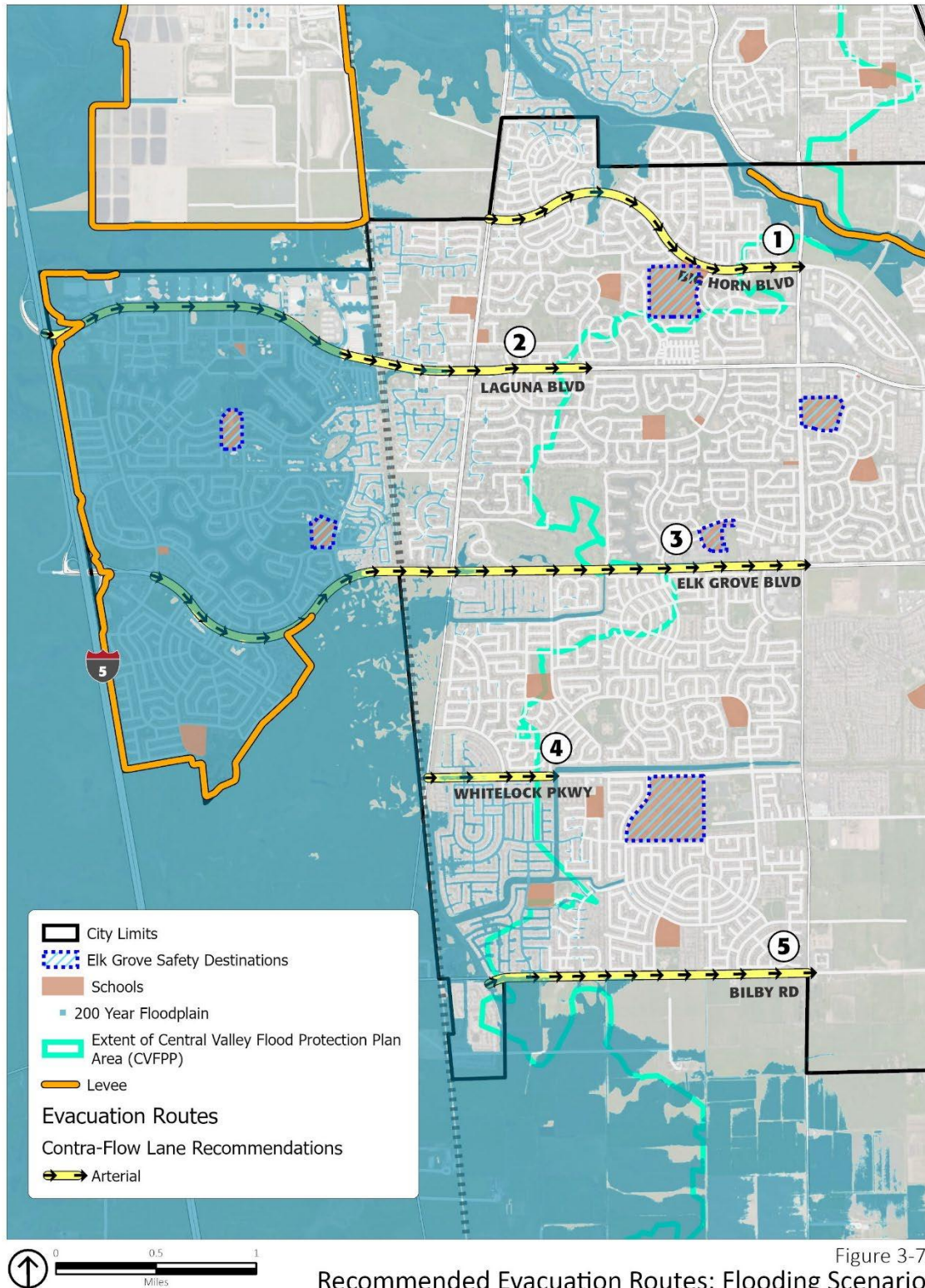


Figure 3-7
Recommended Evacuation Routes: Flooding Scenario

The Sacramento River is just west of the City of Elk Grove, so the hazard zone relating to a flooding scenario covers Elk Grove's western neighborhoods, like Laguna West and Stonelake.

The following evacuation routes are recommended for contra-flow lanes based on traffic analysis summarized in **Tables 3-1** and **3-2**:

1. Big Horn Boulevard eastbound from Portofino Drive to Bruceville Road.
2. Laguna Boulevard eastbound from Willard Parkway to Bruceville Road.
3. Elk Grove Boulevard eastbound from I-5 Freeway exit to Bruceville Road.
4. Whitelock Parkway between eastbound from I-5 Freeway exit to Laguna Park Drive.
5. Bilby Road between SR 99 and McMillan Road eastbound from Franklin Boulevard/Willard Parkway to Bellaterra Drive.

Tables 3-1 and **Table 3-2** describe the major evacuation routes leading out of the flood hazard zone depicted in **Figure 3-7**. These are road segments identified as having a clear direction of travel leading away from the hazard zone. **Table 3-1** describes current traffic conditions by peak period and **Table 3-2** describes expected buildout traffic conditions by peak period for each evacuation route. General Plan results (both existing and future) are available for weekday and evening peak periods but not for weekends, and not for all identified evacuation routes. Google's average traffic snapshots are used to estimate weekend traffic conditions, to evaluate segments not included in the General Plan traffic model and compare traffic model results for segments that are evaluated in the General Plan. Cells showing traffic conditions in each table are color coded to roughly correspond with the color scale used in Google average traffic snapshots: cells showing the segment as uncongested are displayed in green, cells showing the segment as moderately congested are shown in orange, and cells showing the segment as severely congested are shown in pink.

Table 3-1: Flood Hazard Zone Evacuation Routes Current Average Daily Traffic by Peak Period

Route Name	Primary Evacuation Route Segment	Traffic Lanes in Evacuation Direction	Weekday AM Peak	Weekday PM Peak	Weekend AM Peak	Weekend PM Peak
Big Horn Boulevard (2 segments)	Eastbound from Portofino Dr to Bruceville Rd	1 lane splits into 2 at Franklin Blvd, and then into 3 lanes at Vicino Dr	Not congested (LOS C – D)	Congested in both directions east of Meadowspring Dr (LOS C – E)	Not congested	Mild congestion in both directions (small segments)
Bilby Road (3 segments)	Eastbound from Willard Pkwy to Bruceville Rd	1 lane	Not congested (LOS B – C)	Not congested (LOS B – C)	Not congested	Mild congestion at intersections
Elk Grove Boulevard (5 segments)	Eastbound from I-5 Freeway exit to Bruceville Rd	3 lanes	Not congested (LOS A – C)	Congested in both directions east of Foulks Ranch Dr (LOS A – D)	Congested in both directions east of Foulks Ranch Dr	Congested in both directions east of Foulks Ranch Dr
Laguna Boulevard (4 segments)	Eastbound from I-5 Freeway exit to Laguna Park Dr	3 lanes	Not congested (LOS B – D)	Congested in both directions (LOS C – F)	Mild congestion at intersections	Congested in both directions
Whitelock Parkway (2 segments)	Eastbound from Franklin Blvd/Willard Pkwy to Bellaterra Dr	2 lanes	Not congested (LOS B – C)	Congested (not congested westbound) (LOS A – C)	Congested east of Foulks Ranch Dr	Congested (not congested westbound)

For evacuation segments that are evaluated for existing conditions in the General Plan, Google traffic results are displayed in each table with corresponding LOS estimates from the General Plan traffic model in parenthesis underneath. ‘Not congested’ refers to the ‘green’ category used in Google Traffic snapshots (roughly corresponding to LOS A-B), ‘Congested’ refers to the orange color (roughly corresponding to LOS C-D), and ‘Severely congested’ refers to the red color (roughly corresponding to LOS E-F). LOS and V/C estimates are shown as a range in cases where evacuation routes are comprised of multiple segments evaluated and where the LOS varies by segment. For some evacuation route segments that were evaluated for current existing conditions in the General Plan, Google ADT snapshots are not exactly consistent with General Plan LOS estimates for the same peak period. These discrepancies are minor in all instances. For example, where the General Plan might show a segment as having an LOS A during a period, Google ADT snapshots may show that the same segment has minor congestion (orange or roughly equivalent to LOS C-D). LOS C is typically considered the cutoff, where anything between LOS D through F is considered ‘congested.’

Table 3-2: Flood Hazard Zone Evacuation Routes Buildout Traffic by Peak Period

Route Name	Primary Evacuation Route Segment	Weekday AM Peak	Weekday PM Peak	2040 GP Volume to Capacity (V/C) Ratio
Big Horn Boulevard (2 segments)	Eastbound from Portofino Dr to Bruceville Rd	LOS C – D	LOS D – E	0.51 - 0.89
Bilby Road (3 segments)	Eastbound from Willard Pkwy to Bruceville Rd	LOS D – E	LOS D – E	0.53 - 0.68
Elk Grove Boulevard (5 segments)	Eastbound from I-5 Freeway exit to Bruceville Rd	LOS A – E	LOS A – D	0.65 - 0.99
Laguna Boulevard (4 segments)	Eastbound from I-5 Freeway exit to Laguna Park Dr	LOS B – F	LOS C - F	0.60 – 1.05
Whitelock Parkway (2 segments)	Eastbound from Franklin Blvd/Willard Pkwy to Bellaterra Dr	LOS B – E	LOS A - E	0.23 – 0.99

For evacuation segments that are evaluated for existing conditions in the General Plan, Google traffic results are displayed in each table with corresponding LOS estimates from the General Plan traffic model in parenthesis underneath. ‘Not congested’ refers to the ‘green’ category used in Google Traffic snapshots (roughly corresponding to LOS A-B), ‘Congested’ refers to the orange color (roughly corresponding to LOS C-D), and ‘Severely congested’ refers to the red color (roughly corresponding to LOS E-F). LOS and V/C estimates are shown as a range in cases where evacuation routes are comprised of multiple segments evaluated and where the LOS varies by segment. For some evacuation route segments that were evaluated for current existing conditions in the General Plan, Google ADT snapshots are not exactly consistent with General Plan LOS estimates for the same peak period. These discrepancies are minor in all instances. For example, where the General Plan might show a segment as having an LOS A during a period, Google ADT snapshots may show that the same segment has minor congestion (orange or roughly equivalent to LOS C-D). LOS C is typically considered the cutoff, where anything between LOS D through F is considered ‘congested.’

DISCUSSION AND EVACUATION PROCEDURE RECOMMENDATIONS

Because the flood hazard area encompasses the western third of Elk Grove (the area nearest to the Sacramento River) and includes extensive residential development, all evacuation routes for the flood scenario are major east-west arterials connecting residential neighborhoods to Interstate 5 on the west side and SR 99 on the east side. Most of these routes become congested during peak hours (except Bilby Road), often in both directions. Notably, according to Google Traffic daily snapshots, none of these routes are congested in either direction during AM peak hours currently, but all except Bilby Road become moderately congested in both directions starting at approximately 11 a.m., lasting until the end of PM peak hours (7 p.m.). However, all routes were evaluated in the General Plan traffic scenario to have LOS E during either the morning or evening peak hours. Whitelock Parkway and Bilby Road are not significantly congested currently but do show high levels of congestion for the General Plan buildout analysis. This is because these two east-west routes bound the northern and southern edges of the large southern area of Elk Grove slated for most of the City's development in the General Plan. Additionally, Whitelock Parkway will ultimately provide a new connection with SR 99, making this roadway more attractive.

All flooding evacuation routes are expected to be congested during at least one peak period under the General Plan buildout scenario. In addition (and as shown in Figure 3-7) most evacuation routes themselves are expected to flood other than Big Horn Boulevard. Whitelock Parkway in particular shows flood risk extending from Bellaterra Drive eastward to Bruceville Road such that eastbound evacuation traffic may need to be diverted northbound with onto Bellaterra Drive to Toscano Drive north away from Whitelock Parkway. The lengths of Elk Grove Boulevard and Laguna Boulevard are also expected to be completely flooded west of Franklin Boulevard. For these reasons, the City may wish to prioritize evacuating the areas around Whitelock Parkway, Elk Grove Boulevard, and Laguna Boulevard first if potential flooding conditions are anticipated but have yet to impact roadways, followed by Bilby Road and Big Horn Boulevard, which show less potential flood risk compared to the other evacuation routes.

FLOODING EVACUATION SCENARIO CONTRA-FLOW ROUTE SEGMENTS BY TIME PRIORITY

Because all areas at risk of being impacted by flooding must travel eastward away from the Sacramento River, it is recommended that the City establish contra-flow lanes on all evacuation routes in the eastbound direction if the risk of critical flooding arises. In the near-term, if the City were to issue an evacuation warning in advance of anticipated flooding conditions and before evacuation routes become flooded, it is recommended that the southern routes (Bilby Road and Whitelock Boulevard) be prioritized for establishing contra-flow lanes first because they are the least likely to be congested already until more of southern Elk Grove becomes built-out.

In the early stages of extreme weather that could result in flooding, City could assign public safety staff to monitor flood conditions at key intersections on identified evacuation routes and provide real-time updates to designated City staff responsible for issuing emergency alerts. Staff responsible for issuing emergency alerts during a flood event can respond to real-time updates from on-the-ground public safety officials by either directing evacuees towards non-flooded routes, or by directing those in flooded areas to remain where they are and seek higher ground to await rescue (like upper floors, attics, or rooftops). The National Weather Service (NWS) notes that flood waters often have swift currents, requiring only a six-inch depth to sweep pedestrians into the current, and a twelve-inch depth to sweep vehicles into a flood current. For this reason, it is recommended that any emergency alert issued during a flood event or

public awareness materials specific to the flooding scenario contain content advising evacuees not to cross roadways that are flooded with more than twelve inches of water.¹⁰

SAFETY SHELTERS

In addition to recommended evacuation routes, Figure 3-7 illustrates safety shelters that are proximate to or within the flood hazard zone. These safety shelters may be used as an evacuation location for residents to assemble during the incident and seek shelter. However, incidents are often dynamic and there could be conditions that warrant alternative arrangements. The City's Emergency Operations Center/RTIC Manager shall assign safety shelters as evacuation locations based upon the nature of the incident, availability of the shelter, and population need. The full list of shelters recommended for each scenario is provided in Appendix B.

¹⁰ <https://www.weather.gov/safety/flood-turn-around-dont-drown>

Active Alert Systems

FEMA's Integrated Public Alert & Warning System (IPAWS) was established in 2006 and is the most used alert system for local and regional governments. Local governments can apply to be an IPAWS 'alerting authority,' enabling them to broadcast tailored messages to all mobile phone users in a specific area for specific events like the three scenarios evaluated in this report.

IPAWS combines the federal Emergency Alert System (EAS) program, which broadcasts to televisions and radios, and the Wireless Emergency Alerts (WEAs) program, which extends this service to wireless communication devices like mobile phones. The WEA is a partnership between FEMA, the Federal Communications Commission (FCC), and private wireless communication providers to deliver free emergency alerts to all users of wireless communication devices.¹¹

FEMA notes that, while 'there is no cost to send messages through IPAWS, there may be costs to acquire the compatible alert origination software that meets IPAWS requirements.' The basic steps to becoming an alerting authority using the IPAWS system are:

1. Completing the IPAWS web-based training,
2. Selecting IPAWS compatible software,
3. Applying for a Memorandum of Agreement (MOA) with FEMA,
4. And applying for Public Alerting Permissions

These steps are detailed in the IPAWS web page for public safety agencies:

<https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/public-safety-officials/sign-up>

In addition, public safety agencies for the Counties of Sacramento, Placer, and Yolo have partnered to administer a regional emergency notification system called Sacramento Alert. Residents of these counties can opt in to receive emergency alerts tailored to specific locations and events within the region, including severe weather, unexpected road closures, and evacuation notices.¹² The City of Elk Grove could partner with Sacramento County public safety staff responsible administering the Sacramento County alert system to establish a protocol for issuing evacuation warnings specific to the three scenarios discussed in this report. Emergency alert messages can include information like evacuation routes and the nearest safety shelters outside of each hazard zone.

¹¹ <https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system>

¹² www.Sacramento-Alert.org

Recommendations for Developing Public Awareness

This report recommends a framework for public awareness consisting of several components. The first is the publicly available online Story Map developed concurrently with this report, where users can learn about each of the three scenarios as well as identify locations within each hazard zone and the nearest evacuation route using an address look-up function. This Story Map could be integrated with the City's existing emergency preparedness webpage.

The second component is multi-lingual mailers sent to addresses within each hazard zone. Mailers can inform recipients of nearest evacuation routes and the location of safety shelters for each scenario, as well as direct recipients visit to the online Story Map. Mailers can also link to important disaster preparedness resources, like the following:

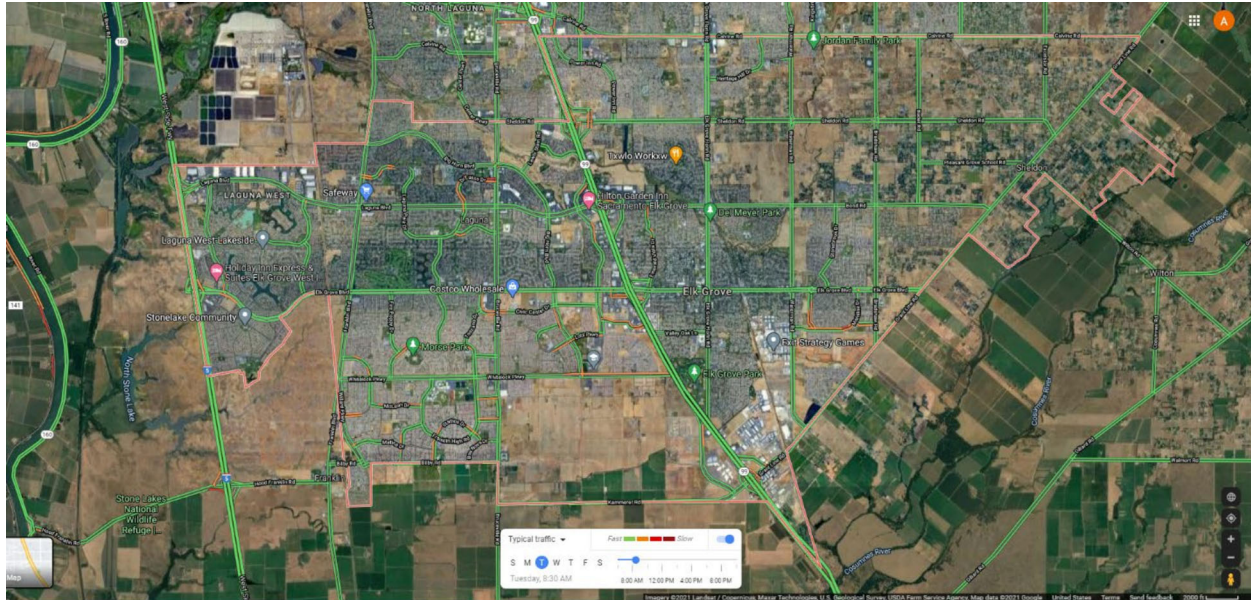
- » Sacramento County Active Alert Sign Up: www.Sacramento-Alert.org
- » Sacramento Ready, Sacramento County's disaster preparedness site offering preparedness guides for households and other resources: <https://sacramentoready.saccounty.net/Pages/default.aspx>
- » Wireless Emergency Alerts (WEA) Fact sheet for cell phone users: <https://www.ready.gov/sites/default/files/2020-08/wea-fact-sheet.pdf>
- » WEA Fact Sheet and word search for young children: <https://www.ready.gov/sites/default/files/2020-07/wea-for-kids.pdf>
- » NOAA weather radio: <https://www.weather.gov/nwr/> (relevant to flood scenario only)
- » National Weather Service Flood landing page: <https://www.weather.gov/safety/flood> (relevant to flood scenario only)
- » National Weather Service Public Service Announcement about what to do when encountering a flooded roadway: <https://www.weather.gov/safety/flood-turn-around-dont-drown>
- » City of Elk Grove Emergency Preparedness Page (potential landing page for online Story Map): https://www.elkgrovecity.org/city_hall/departments_divisions/emergency_preparedness
- » Ready.gov web page describing different types of emergency alerts: <https://www.ready.gov/alerts>

Mailer content could either be repeated in multiple languages, like Spanish, Mandarin, Cantonese, and Filipino (the top languages spoken by Elk Grove residents besides English according to the 2019 American Community Survey), or language-specific content could refer readers to email addresses or phone numbers established as hotlines for language-specific disaster preparedness information. Multi-lingual City staff members, non-profit community partners, and/or community volunteers fluent in these languages could monitor disaster preparedness hotlines and respond to inquiries.

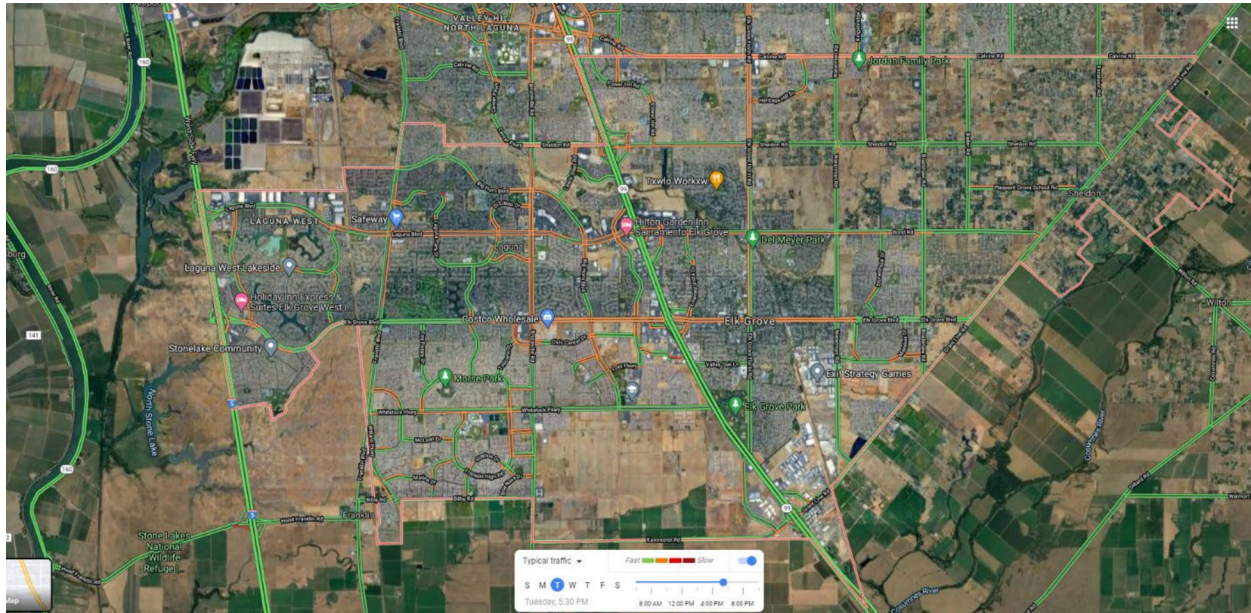
City staff could supplement mailers with in-person drop-in sessions at libraries, community centers, and community events (where a screen and computer are accessible) to walk community members through the online Story Map and address look-up tool to identify evacuation routes for locations of interest and to identify safety shelter locations outside of hazard zones for each scenario. The City could employ multi-lingual City staff to host these sessions, and/or partner with local community organizations, especially those who serve people with disabilities, specific age groups, and/or communities primarily speaking languages besides English.

Appendix A: Current Google Average Daily Traffic Snapshots

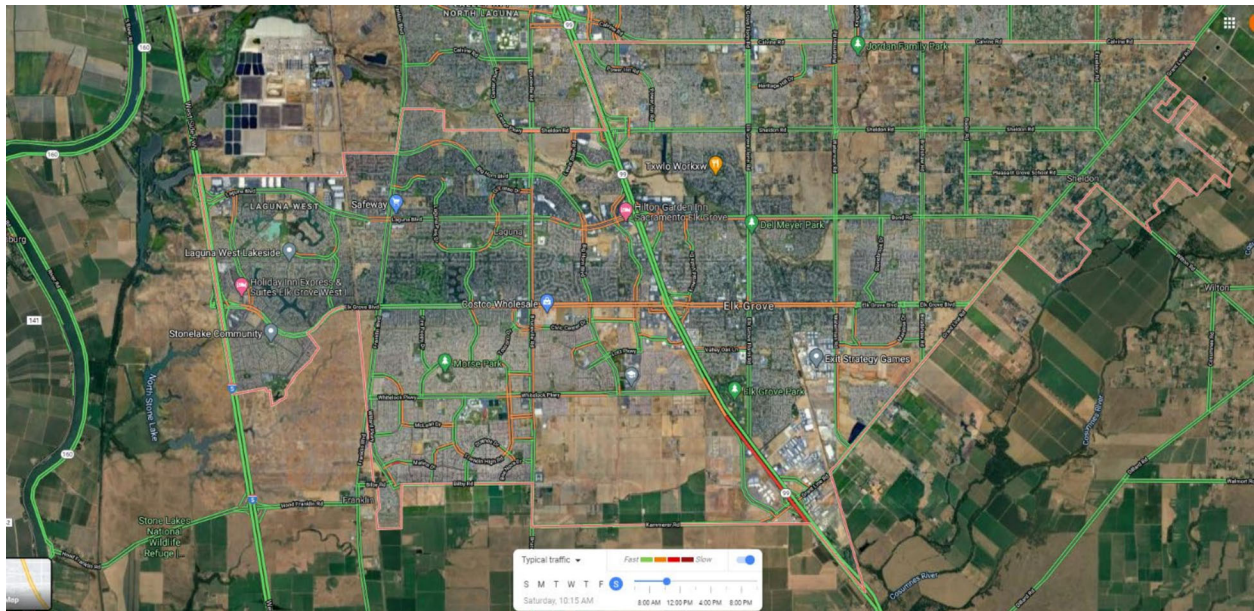
8:30AM TUESDAY DAILY AVERAGE TRAFFIC



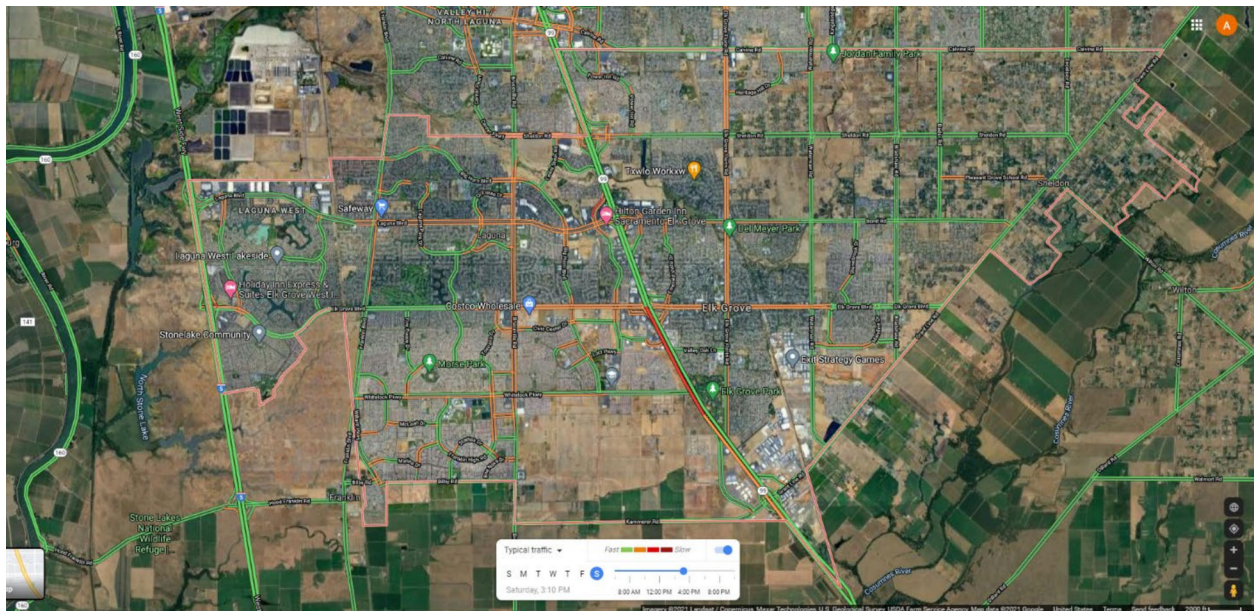
5:30PM TUESDAY DAILY AVERAGE TRAFFIC



10:15AM SATURDAY DAILY AVERAGE TRAFFIC



3:10PM SATURDAY DAILY AVERAGE TRAFFIC



Appendix B: Recommended Safety Shelters by Scenario

There are fifteen locations in the City of Elk Grove that are designated for use as safety shelters during an emergency. Safety shelters for each scenario are defined as any of these locations outside of the hazard zone defined for each scenario.

All fifteen safety shelters are outside of the propane hazard zone and are therefore recommended for use during an evacuation event involving the Suburban Propane Terminal in southern Elk Grove:

- » Cosumnes Oaks High School
- » Elk Grove High School
- » First Baptist Church
- » Franklin High School
- » Good Shepherd Catholic Church
- » Harriet Eddy Middle School
- » Joseph Kerr Middle School
- » Joseph Sims Elementary School
- » Katherine Albiani Middle School
- » Laguna Creek High School
- » Monterey Trail High School
- » Pleasant Grove High School
- » Sheldon High School
- » St. Peter's Lutheran Church
- » Stone Lake Elementary

Thirteen out of the total fifteen safety shelters are outside of the train derailment hazard zone:

- » Cosumnes Oaks High School
- » First Baptist Church
- » Franklin High School
- » Good Shepherd Catholic Church
- » Harriet Eddy Middle School
- » Joseph Sims Elementary School
- » Katherine Albiani Middle School
- » Laguna Creek High School

- » Monterey Trail High School
- » Pleasant Grove High School
- » Sheldon High School
- » St. Peter's Lutheran Church
- » Stone Lake Elementary

Joseph Kerr Middle School and Elk Grove High School are located within the derailment hazard zone and are therefore not recommended for use as safety shelters in the event of a train derailment along the central Elk Grove rail track.

Twelve out of fifteen safety shelters are outside of the flood hazard zone:

- » Cosumnes Oaks High School
- » Elk Grove High School
- » First Baptist Church
- » Franklin High School
- » Good Shepherd Catholic Church
- » Harriet Eddy Middle School
- » Joseph Kerr Middle School
- » Katherine Albiani Middle School
- » Monterey Trail High School
- » Pleasant Grove High School
- » Sheldon High School
- » St. Peter's Lutheran Church

Joseph Sims Elementary School, Laguna Creek High School, and Stone Lake Elementary School are within the flood hazard zone and are therefore not recommended for use as safety shelters in the event of a flood in western Elk Grove. However, while Laguna Creek High School is located within the larger and more conservative flood hazard zone, it is still within an area that is determined by FEMA to be at minimal flood risk during a 200-year flood. The City may wish to evaluate whether to use this location as an emergency shelter depending on specific conditions during an actual flood event.

CERTIFICATION
ELK GROVE CITY COUNCIL RESOLUTION NO. 2021-356

STATE OF CALIFORNIA)
COUNTY OF SACRAMENTO) ss
CITY OF ELK GROVE)

I, Jason Lindgren, City Clerk of the City of Elk Grove, California, do hereby certify that the foregoing resolution was duly introduced, approved, and adopted by the City Council of the City of Elk Grove at a regular meeting of said Council held on December 8, 2021 by the following vote:

AYES: **COUNCILMEMBERS:** *Singh-Allen, Suen, Hume, Nguyen*

NOES: **COUNCILMEMBERS:** *None*

ABSTAIN: **COUNCILMEMBERS:** *None*

ABSENT: **COUNCILMEMBERS:** *Spease*



Jason Lindgren, City Clerk
City of Elk Grove, California