

# Draft Memorandum

Date: March 17, 2021

To: Michael Lloyd, P.E., City of Moreno Valley  
John Krenyi, P.E., City of Moreno Valley

From: Jason D. Pack, P.E.  
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**Subject: Moreno Valley General Plan Emergency Evacuation Assessment**

OC19-0685

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Fehr & Peers has completed a review of emergency evacuation preparedness for the City of Moreno Valley. This assessment is consistent with Assembly Bill 747 (AB 747) and Senate Bill 99 (SB 99) requirements.

This document is intended to provide an assessment of roadway capacity under the described fire scenarios and should not be considered an evacuation plan. Please note that emergency evacuation can occur due to any number of events. Additionally, fire movement is unpredictable as is individual behavior related to evacuation events. As such, this assessment is intended to provide the City with a broad “planning level” assessment of the capacity of the transportation system during an evacuation scenario; it does not provide guarantees as to the adequacy of the system nor can it guarantee that the findings are applicable to any or all situations.

Moreover, as emergency evacuation assessment is an emerging field, there is no established standard methodology. We have adopted existing methodologies in transportation planning that, in our knowledge and experience, we believe are the most appropriate. Nevertheless, such methodologies are necessarily also limited by the budgetary and time constraints in our scope of work, and by the current state of our knowledge.

The City should take care in planning and implementing any potential evacuation scenario and that this assessment should help the City better prepare for those events. We would be happy to conduct additional analyses in further detail, analyzing different scenarios, and employing other methodologies if desired. However, in no way can Fehr & Peers guarantee the efficacy of any of the information used from this



assessment as such would be beyond our professional duty and capability.

## Background

The following are recent pieces of legislation related to emergency access that are addressed in this assessment.

- AB 747 requires that the safety element be reviewed and updated to identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios. This will be a requirement for all safety elements or updates to a hazard mitigation plans completed after January of 2022.
- SB 99 requires review and update of the safety element to include information identifying residential developments in hazard areas that do not have at least two emergency evacuation routes.

## Approach

Fehr & Peers reviewed evacuation routes identified in the *City of Moreno Valley Emergency Operations Plan (2019)* and *Resilient IE*. These routes are provided as **Attachment A**. The City is bound by topography and other features which limits the number of evacuation routes. These are described below:

- Topography limits access to the north and east such that emergency access is limited to the following facilities:
  - Pigeon Pass Road,
  - Reche Canyon Road
  - Redlands Boulevard
  - Sr-60
  - Gilman Springs Road
- The Perris Reservoir limits access to the east and south of the City such that emergency access is limited to:
  - Heacock Street
  - Perris Boulevard
  - Lasselle Street
- March Air Force Base and Interstate 215 (I-215) limit access to the south and west such that emergency access is limited to:
  - Box Spring Road/Fair Isle Drive
  - Eucalyptus Avenue,



- Alessandro Boulevard,
- Cactus Avenue and
- I-215

Evacuation access Citywide was assessed by reviewing the distance evacuees must travel during an evacuation event. This assessment is a proxy for accessibility and can assist in identifying potentially vulnerable communities during an evacuation event. To complete this assessment, we broke up the City into geographic areas to facilitate the assessment. We used the TAZ<sup>1</sup> structure within the RIVTAM<sup>2</sup> travel demand model as it provides enough detail to represent specific neighborhoods but is manageable in the number of geographies to complete the accessibility assessment. Our assessment is presented as **Attachment B** and identifies areas of the City that need to travel the furthest and thus are potentially the most vulnerable in an evacuation event. In addition to assessing access to the City boundaries, we also reviewed potential access to evacuation centers (emergency operation centers and fire stations). That assessment is provided as **Attachment C**.

In general, our review identified that areas in the eastside of the City generally have the furthest distance to travel to access available evacuation centers and thus are potentially the most at risk in an evacuation event.

## Evacuation Capacity Assessment

Consistent with the requirements of AB 747, we reviewed the capacity of the transportation system during an evacuation event. For our assessment, we assumed access to/from the north and east were not available due to the evacuation event such as major fire, earthquake, or flood. As part of our assessment, we assumed that access from Reche Canyon Road, Redlands Boulevard, State Route 60 (SR-60), and Gilman Springs Road were not available. **Attachment D** presents the emergency event scenario barrier and assumed evacuation routes based on these assumed closures. The maximum evacuation distance increases from seven to 12 miles as several areas on the east side of the City must travel across the entire City to evacuate.

Capacity assessments were performed for emergency evacuations scenario that required complete evacuations north of SR-60, east of and west of Perris Boulevard. The number of residents, anticipated vehicle ownership per household, and employees in the area were referenced to estimate the number of vehicles that would need to evacuate. **Table 1** summarizes land use information for the evacuation area.

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<sup>1</sup> TAZ = Transportation Analysis Zone in the traffic model.

<sup>2</sup> RIVTAM = The Riverside County Transportation Analysis Model.



Vehicle accessibility was also reviewed to identify the number of households in the area that would potentially have issues during an evacuation event due to limited mobility options. Approximately 3% of homes in the northeast evacuation area do not have access to a vehicle, which is half of the northwest average (6%). The Citywide average is also 6%. In the northwest evacuation area, 31% of the homes were estimated to have access to one vehicle while the remaining 62% have access to two or more vehicles. In the northeast evacuation area, 23% of the homes were estimated have access to one vehicle while the remaining 74% have access to two or more vehicles.

**Table 1: Evacuation Area Land Use**

Land Use	Existing (2018) Conditions
Households	3,911
Population	14,066
Employment	1,205

*Source: RIVTAM, 2021*

A worst-case condition was estimated where all employees and residents in the evacuation area would need to be evacuated according to **Table 2**. This estimate assumes that the zero vehicle households would require outside assistance (although outside the scope of this assessment, the City may want to consider a program that ensures evacuation of these households is achievable via public transit or other neighborhood program). This estimate also assumes that employment centers would provide evacuation assistance to employees without access to a vehicle. Additionally, it was assumed that some households with more than two vehicles likely would not be able to utilize all of their vehicles during an evacuation event (e.g. homes with three or four vehicles but with only two licensed drivers).



**Table 1: Evacuation Demand**

Evacuee Type	Total within NW Evacuation Area	Total within NE Evacuation Area	Average Evacuation Vehicles per HH or Emp	NW Evacuation Vehicles	NE Evacuation Vehicles
Zero Vehicle Households	730	115	1.00	730	115
One Vehicle Households	3,689	911	1.00	3,689	911
Two Vehicle Households	4,555	1,602	2.00	9,109	3,205
Three Vehicle Households	1,879	833	2.50	4,697	2,083
Four or More Vehicle Households	884	450	3.00	2,652	1,349
Employees <sup>1</sup>	3,160	1,205	0.94	2,970	1,133
<b>Total</b>	-	-	-	<b>23,847</b>	<b>8,795</b>

Notes:

1. Citywide average zero vehicle households is 6%.

Source: RIVTAM, 2021

This analysis assumes that north/south evacuation for the northwest area would be provided by Box Springs Road, Day Street, Pigeon Pass Road, Heacock Street, and Perris Boulevard and evacuation in the northeast area would be provided by Perris Boulevard, Nason Street, Moreno Beach Drive, Redlands Boulevard and Theodore Street. Evacuation is assumed to access SR-60 and/or evacuate south of SR-60 out of the evacuation areas. The *Highway Capacity Manual (6<sup>th</sup> Ed)* was referenced to estimate roadway capacity during an evacuation event. Ideal saturation flow on a roadway is assumed to be 1,900 vehicles per lane per hour. This assessment conservatively assumes that traffic signals throughout the evacuation routes distribute approximately half of the green time in the direction of evacuation such that only half of the available through capacity is available on the evacuation routes. Assumed roadway capacities are shown in **Table 3**.



**Table 3: Evacuation Capacity**

Roadway	Outbound Lanes	Outbound Capacity (vehicles per hour)
<i>Northwest Evacuation Area</i>		
Box Springs Road	2	1,900
Day Street	2	1,900
Pigeon Pass Road	2	1,900
Heacock Street	2	1,900
Perris Boulevard	2	1,900
<b>Total</b>	<b>10</b>	<b>9,500</b>
<i>Northeast Evacuation Area</i>		
Perris Boulevard	2	1,900
Nason Street	1	950
Moreno Beach Drive	1	950
Redlands Boulevard	1	950
Theodore Street	1	950
<b>Total</b>	<b>6</b>	<b>5,700</b>

*Source: Highway Capacity Manual 6<sup>th</sup> Edition, Transportation Research Board, 2016*

From a theoretical perspective, the estimated 23,847 vehicles in the northwest area could be evacuated in approximately two and half hours while the estimated 8,795 vehicles in the northeast area could be evacuated in approximately one and a half hours. This assumes that the evacuation would be evenly distributed across each evacuation roadway. Due to population density, we would anticipate Perris Boulevard, Heacock Street and Nason Street to be more impacted than the other evacuation routes.

However, emergency scenarios are often unpredictable and driver behavior can be disorderly. Additionally, evacuation events are not linear in nature (e.g. even distribution during the evacuation time period) and it is anticipated that evacuees would vacate at a rate that more closely resembles a bell curve from the time that the evacuation order is issued. These are conditions which would affect the total evacuation time estimated in our assessment that are beyond the scope and budget of our assessment. There is also general unpredictability in operational issues such as traffic signal synchronization issues between City intersections and/or Caltrans ramps, or power issues that would trigger traffic signals to operate in "red flash."

## Evacuation Constrained Routes

An assessment was conducted to determine which residential streets are in hazard areas that only provide one emergency access route. These are defined as evacuation-constrained routes. **Attachment E** provides a map of all evacuation-constrained routes in Moreno Valley. This assessment focuses on residential areas



in hazard areas north of SR-60 and east of Nason Street and does not identify all cul-de-sacs throughout the City.

## Recommendations

As the City builds out the Circulation Element roadway network, special considerations should be taken to facilitate emergency evacuation, especially in hazard areas north of SR-60. These considerations are provided below:

- Future roadway design, especially in areas that have less accessibility and on key evacuation routes, should consider evacuation capacity and consider design treatments such as painted medians (instead of raised medians) that could assist in creating reversible lanes and facilitate additional capacity in an evacuation event scenario.
  - In evacuation events, painted medians could operate as additional egress lanes. Furthermore, a four-lane roadway with painted median could operate with four egress lanes and one ingress lane (for emergency vehicles).
  - In the assessment above, the northwest area evacuation capacity could be approximately doubled with this approach.
- Evacuation event signal timing should be periodically reviewed and updated to provide additional evacuation capacity.
  - In the assessment above, the capacities are based on traffic signal green time allocation assumptions that control capacity. If an evacuation coordination plan was developed in the direction of the evacuation, additional capacity would be provided.
  - The City currently has approximately half of its traffic signals connected to a Traffic Management Center (TMC) that allows real-time modifications to signal timing. The City should consider prioritizing traffic signals in vulnerable areas for improvements to be brought on-line and connected to the TMC.
- Davis Road south of Theodore Street to Ramona Expressway is a partially paved roadway that could be formally established to provide better emergency access to the east side of the City.
- Morton Road/Gernert Road is a roadway currently disconnected from Watkins Drive at the at-grade rail crossing and would provide better emergency access under emergency evacuation scenarios for the northwestern part of the City.



Attachments

A – Moreno Valley Evacuation Routes

B – Distance of TAZ to Gateway Outside of Moreno Valley

C – Distance of TAZ to Evacuation Center

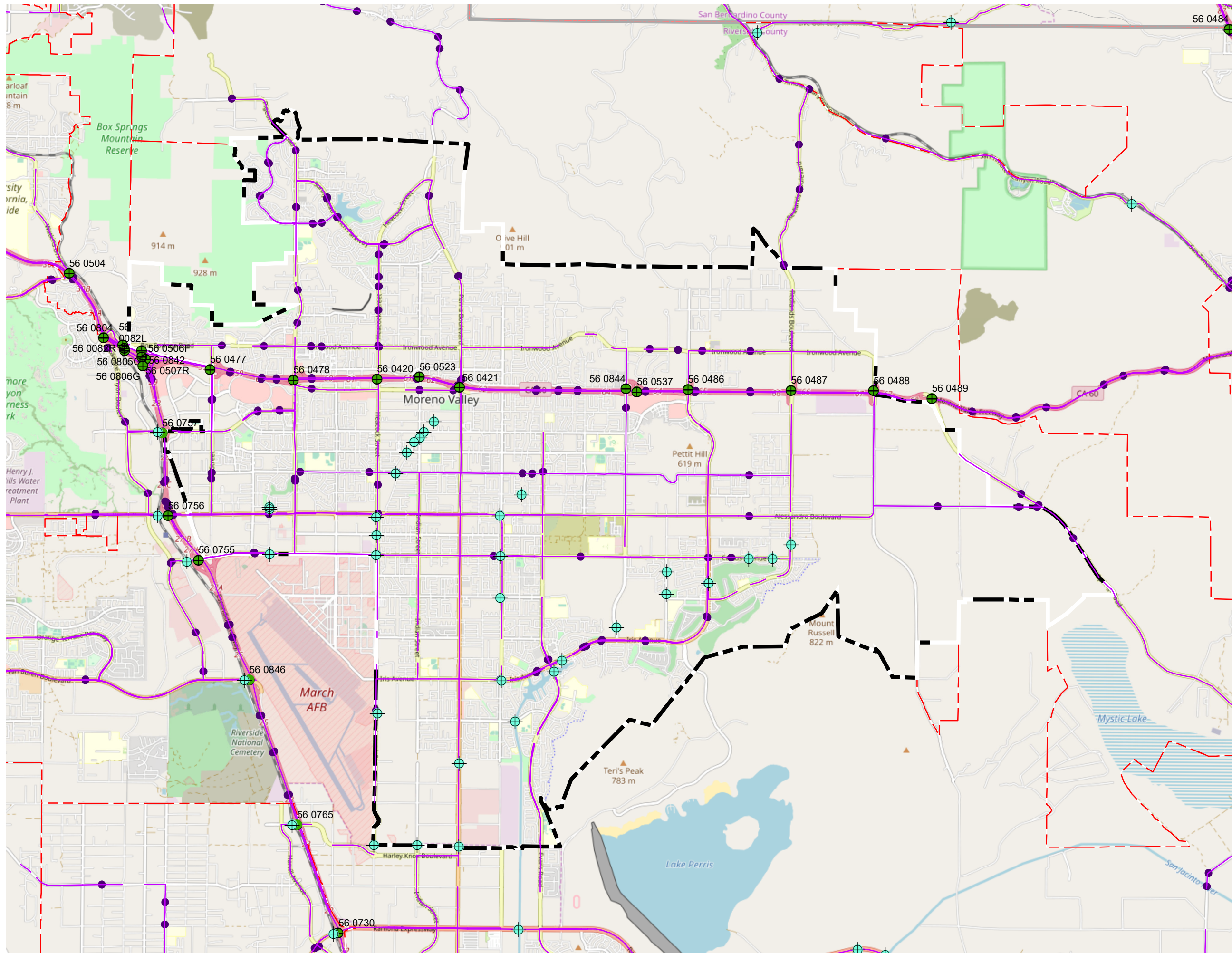
D – Distance of TAZ to Gateway Outside of Moreno Valley with Emergency Barrier

E – Evacuation Constrained Routes

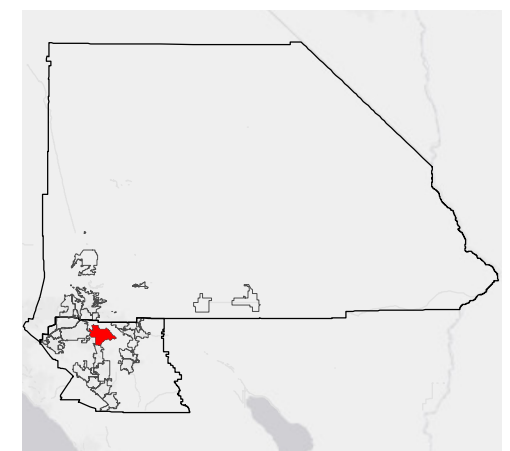


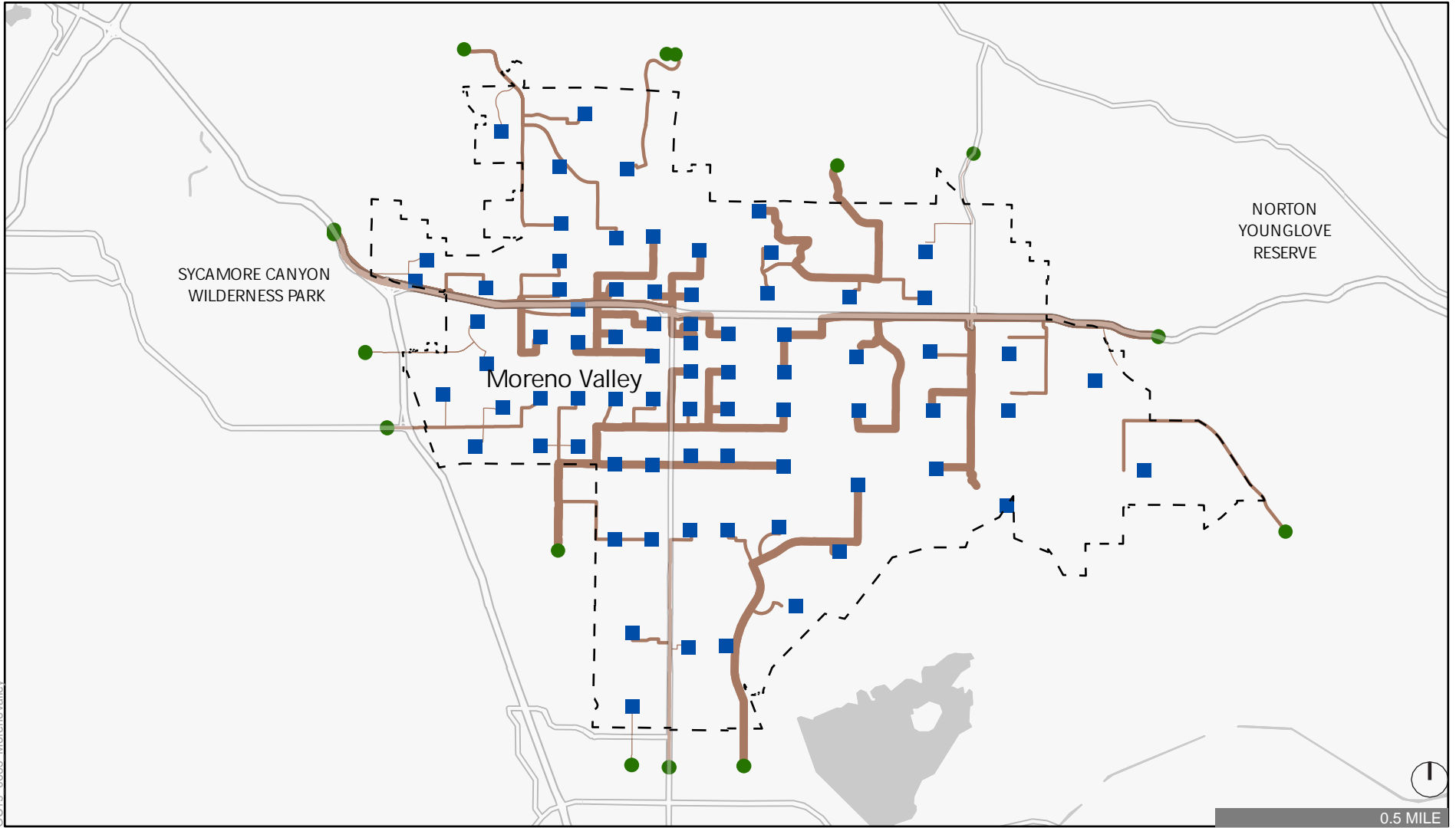
# Evacuation Routes

MORENO VALLEY



- Caltrans Local Bridges
- Caltrans State Bridges
- Water Crossings
- Evacuation Routes
- City Boundary
- Sphere of Influence
- WRCOG Boundary

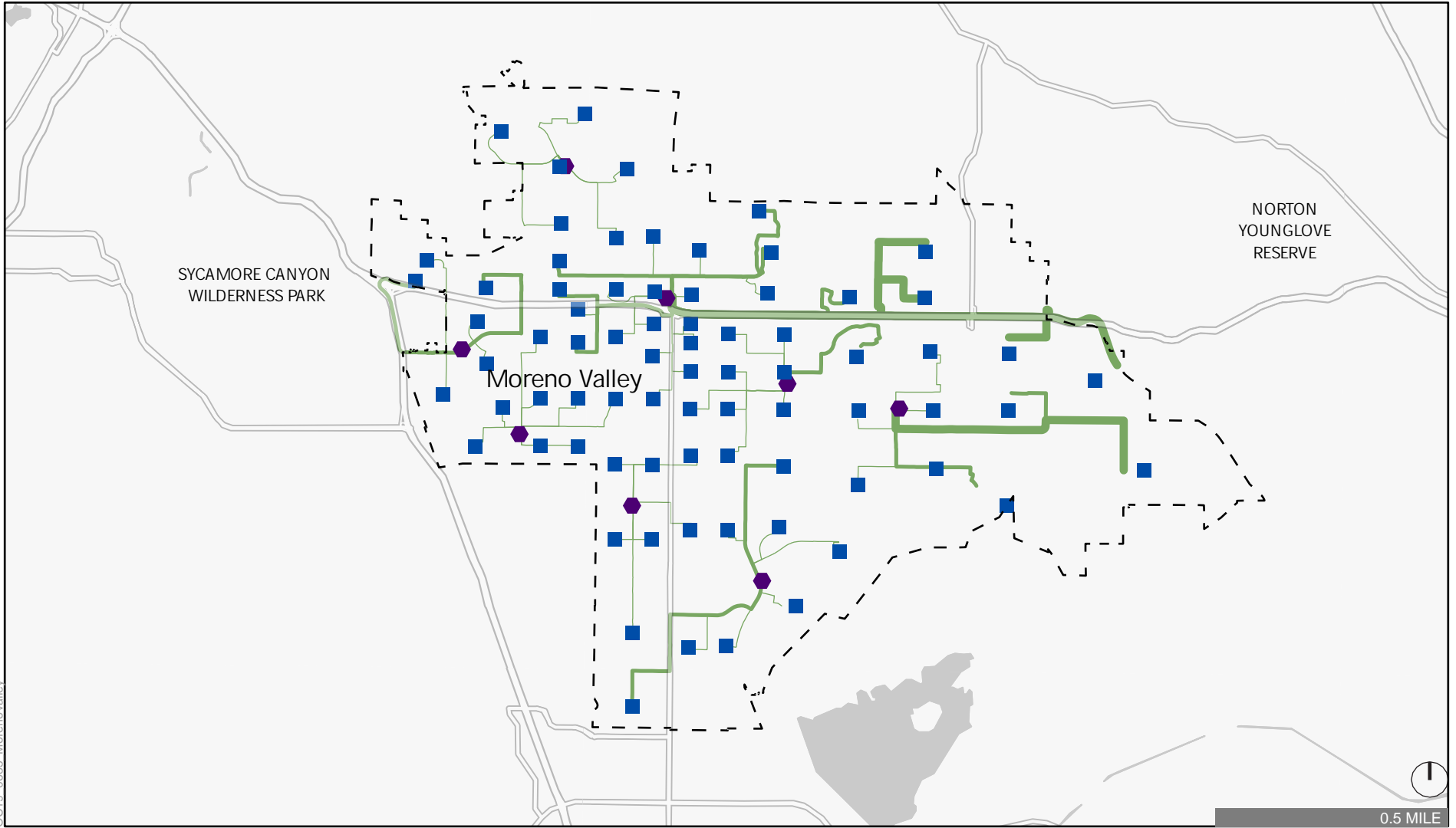




- Gateways Outside Moreno Valley Distance (Miles) TAZ to Gateway
- TAZ Centroid
- 0-2 mi
- 2-4 mi
- 4-7 mi



Distance of TAZ to Gateway Outside of Moreno Valley

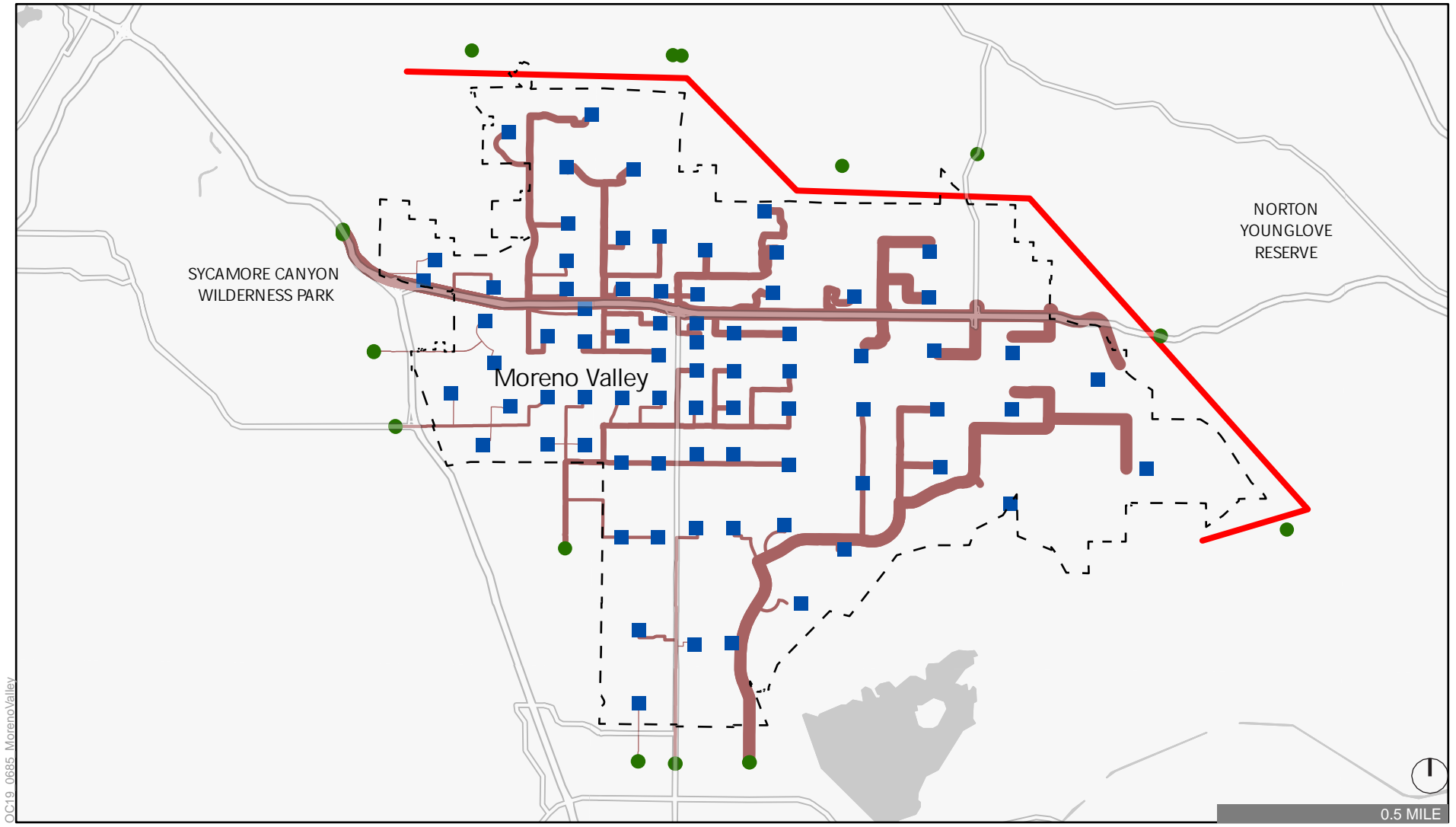


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- ◆ Evacuation Center
  - TAZ Centroid
- Distance TAZ to Evacuation Center
- 0-2 mi
  - 2-4 mi
  - 4-7 mi



Distance of TAZ to Evacuation Centers



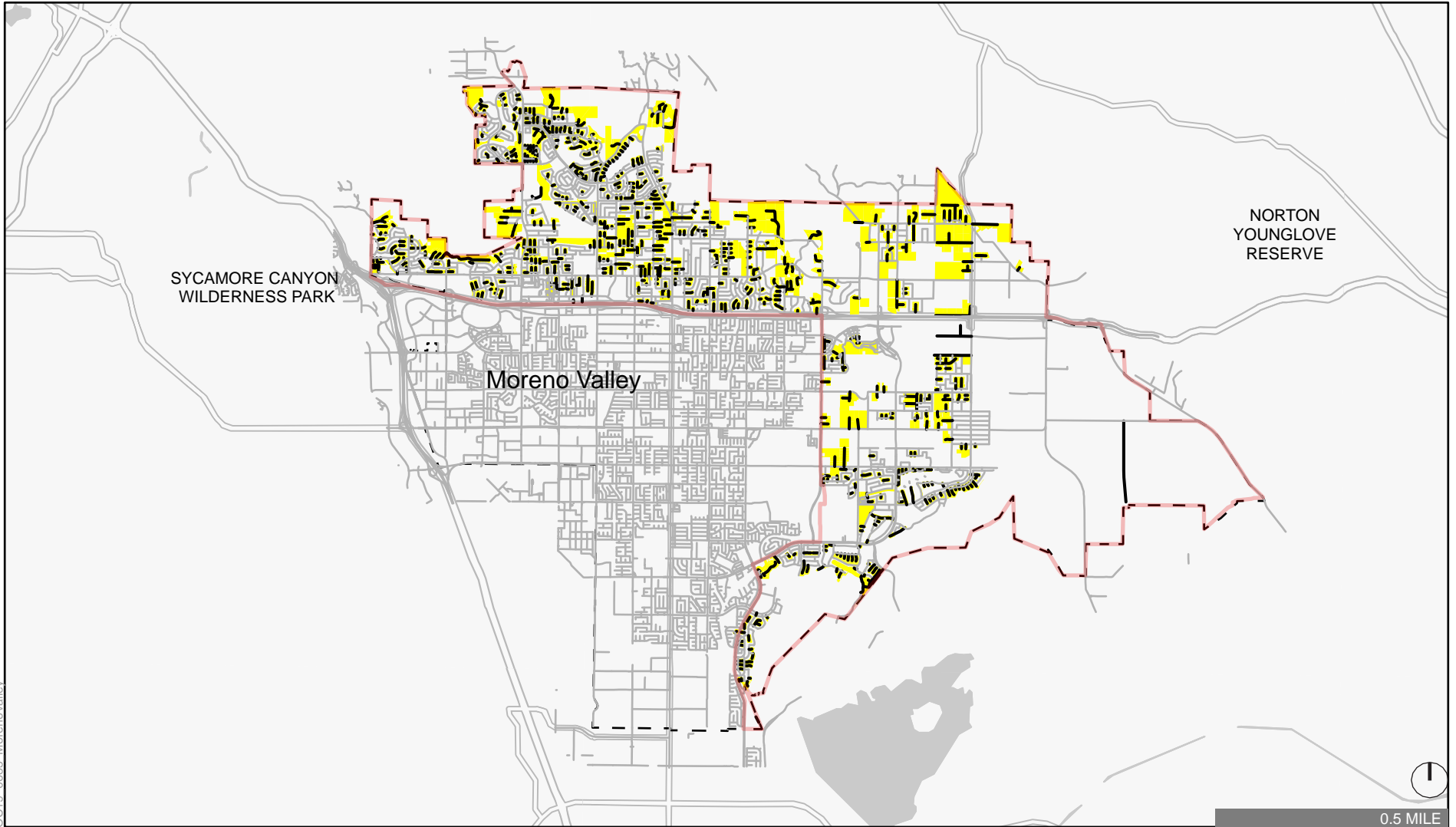
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- Gateways Outside Moreno Valley
- TAZ Centroid
- Potential Fire Barrier
- 0-2 mi
- 2-4 mi
- 4-6 mi
- 6-8 mi
- 8-12 mi



Distance of TAZ to Gateway Outside of Moreno Valley with Fire Barrier





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- Roads
- Roads with Limited Access
- Evacuation Constrained Residential Parcels
- Hazard Area Boundary



Limited Evacuation - Residential Parcels within Hazard Area Boundary