

Town of Woodside, California

Wildfire Evacuation Traffic Study

Simulations & Data Analysis

Ladrис Technologies, Inc.

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Executive Summary

The Town of Woodside's Evacuation Traffic Study is the result of close collaboration between visionary government officials and the implementation of innovative technology. Through consultation with the Town of Woodside and the Woodside Fire Protection District (WFPD), Ladris Technologies developed and refined visual models of six simulated wildfire evacuation scenarios using the Ladris EVAC-1 traffic modeling and FIRE-1 fire progression modeling software applications.

The scenarios created for this study were developed with instructions from the Town and WFPD, prioritizing the most critical evacuation scenarios for modeling and identifying opportunities for improving the success of evacuations in potential real world events. The combination of focus areas encompass all parts of the Town and its unincorporated regions, and the scenarios were developed with the Town's and WFPD's expert local knowledge of each area's existing conditions (terrain, elevation, route availability, vegetation density, neighborhood layouts) and the history of wildfires and evacuations in those areas where previous incidents have occurred.

For each of the simulated scenarios in this study, Ladris delivers a series of visualizations, along with several key metrics. The key metric for the wildfire progression simulations is the total acreage of the fire after the initial eight hours of its spread, while the evacuation simulations produce key metrics of total clearance time, individual vehicle trip times, and road network congestion. Additionally, plain language summaries are provided for every wildfire scenario as well as its simulation results, along with a plain language description of the history and relevant environmental, social, and economic qualities of each community/area in the Town.

The scenarios of this traffic study were deliberately designed so that evacuations from many of Town's communities could be modeled across *multiple scenarios*. Rather than simply projecting the dynamics of a possible evacuation from the Sky Londa community in only one possible scenario, for example, the scenarios that the Town and WFPD outlined instead incorporate Sky Londa in multiple scenarios throughout this study. This serves to reveal a range of possible complexities or complications that could arise for a single high risk community depending on which of its neighboring communities would also be evacuated.

Ladris is uniquely qualified to deliver this evacuation traffic study for the Town of Woodside. Having specifically provided local evacuation modeling services to Woodside, Portola Valley, and the Woodside Fire Protection District on an ongoing basis for nearly three years, Ladris is also equipped with significant local knowledge of the region and its particular complexities as a result of the company's close work with these stakeholders through in-person evacuation tabletop drills and training with the WFPD. Ladris has existing relationships with some of the individuals from the Town and WFPD who are directly involved in creating this evacuation traffic study. Relationships with these stakeholders largely began as Ladris models were tested at length against evacuation instances in Woodside, Portola Valley, and immediate surrounding regions.

Ladris provides direct support to emergency management, fire, police, and GIS agencies at cities and counties agencies throughout Southern and Northern California, including San Mateo County's Department of Emergency Management. Colorado, Montana, Washington, Oregon, and Idaho are actively working to comply with similar regulations in these states that mandate improvements to their evacuation preparedness.

Purpose of this Study

Recent events, such as the 2018 Camp Fire in Paradise, California, and the 2020 CZU Fire that came within a few miles of Woodside and Portola Valley, provide sufficient justification for conducting this evacuation traffic study. However, cities and counties in California no longer have the option to decide whether to enhance their emergency preparedness and community safety procedures. New state mandates have resolved this issue, requiring officials to take appropriate action.

The recent passage of three laws in California has introduced a new requirement for counties, cities, and towns to complete the kind of evacuation modeling made possible by the Ladris EVAC-1.

- **AB 747 (2019):** Requires the safety element to be reviewed to “identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios.”
- **SB 99 (2019):** Requires identification of residential addresses in hazard areas that do not have at least two egress routes by the time of the next housing element update.
- **AB 1409 (2021):** Requires safety elements to be reviewed to identify evacuation locations.

To facilitate the Town’s commitment to comply with these laws, this evacuation traffic study aims to present high-fidelity, detailed evacuation models, quantified estimates of time and route guidance, and straightforward summaries and analyses across a wide range of hypothetical wildfire emergency scenarios that could threaten life and property in the Town of Woodside and its unincorporated areas. While this study is not an exhaustive analysis of every possible emergency evacuation scenario that could occur in the Town, the simulations and the analysis in this study do cover every part of Woodside along with its open space areas in order to establish a comprehensive baseline of material for ongoing pre-planning exercises by the Town, WFPD, and other agencies in the area and by agencies at higher levels of county and state government.

To deliver the results in this study’s report, Ladris representatives developed and exported the simulations using the joint EVAC-1 and FIRE-1 software platform. It is very important to note that during *and* after this process, the Town and WFPD have direct access to the software with

the ability to simulate an unlimited number of evacuation scenarios at a fraction of the cost compared to traditional alternatives from conventional traffic modeling firms. The Town's and WFPD's past and ongoing use of Ladrис ensures that the insights derived from this study can be directly validated and translated into pre-planning and real-time operational use.

This study's most immediately practical purpose will be its value as an essential resource for the Town and WFPD to successfully develop their formal emergency evacuation plan, which is this study's ultimate intent. However, with this report, officials and general community members alike can also see clear value in the previous investment by the Town and WFPD to establish evacuation zones. Prior to Ladrис' execution of this study and other services, the Town and WFPD had contracted with Genasys, an unaffiliated third party company, to create these evacuation zones from on the ground local expertise of WFPD leadership. Such boundaries have made it possible to clearly structure the layout of this evacuation study, which underlines the importance of community members knowing which zone they are in so that they may fully benefit from the significant evacuation preparedness efforts by the Town and WFPD.

Data Collection

Scenarios were designed in consultation with officials from the Town of Woodside and the Woodside Fire Protection District (WFPD). Results were gathered using Ladrис' joint EVAC-1 and FIRE-1 platform for evacuation and wildfire simulations.

The Ladrис EVAC-1 is the most advanced commercially available solution for modeling evacuation scenarios. The platform utilizes high fidelity road network and parcel data in the simulations and considers the individual routes of each vehicle in the evacuation scenario based on the simulated traffic congestion.

For each scenario, the following key output metrics have been created, all numbers generated by the system should be regarded as estimates, real life evacuations are highly random events with a wide range of potential outcomes:

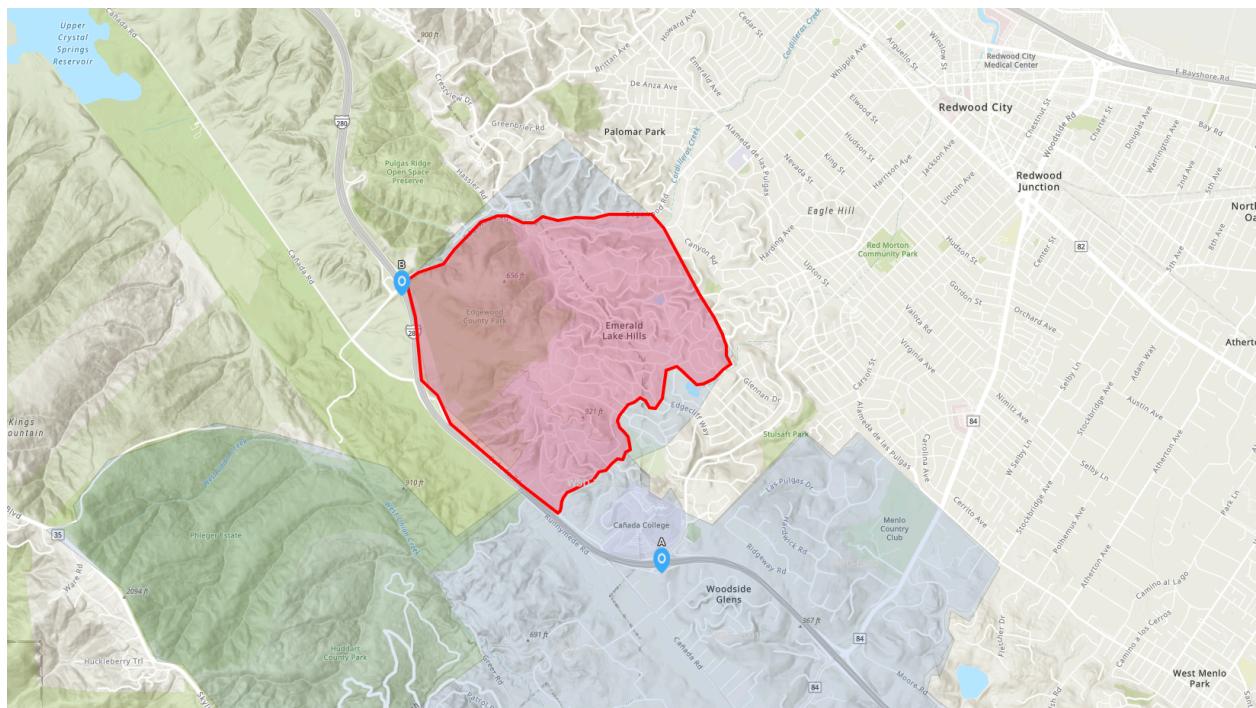
- **Maximum Trip Time** - The maximum value from the simulated distribution of single vehicle trip times in the simulation. The single vehicle trip time is the simulated amount of time a vehicle spends in transit between their starting location and the evacuation waypoint.
- **Clearance Time** - The total amount of simulated time between the beginning of the scenario and the moment at which all vehicles have reached their simulated destination.
- **Vehicle Count** - The total number of vehicles simulated in the scenario. These numbers are estimates produced by an analysis of the parcel count in the evacuated regions and modified under the guidance of the WFPD and larger study group
- **Address Count** - The number of unique parcels in the evacuated area

Ladrис' FIRE-1 program enables personnel without fire science expertise to almost instantly simulate any wildfire progression scenario in their jurisdiction using pre-programmed conditions

Emerald Hills | Simulated Evacuation - Ladris Input Parameters:

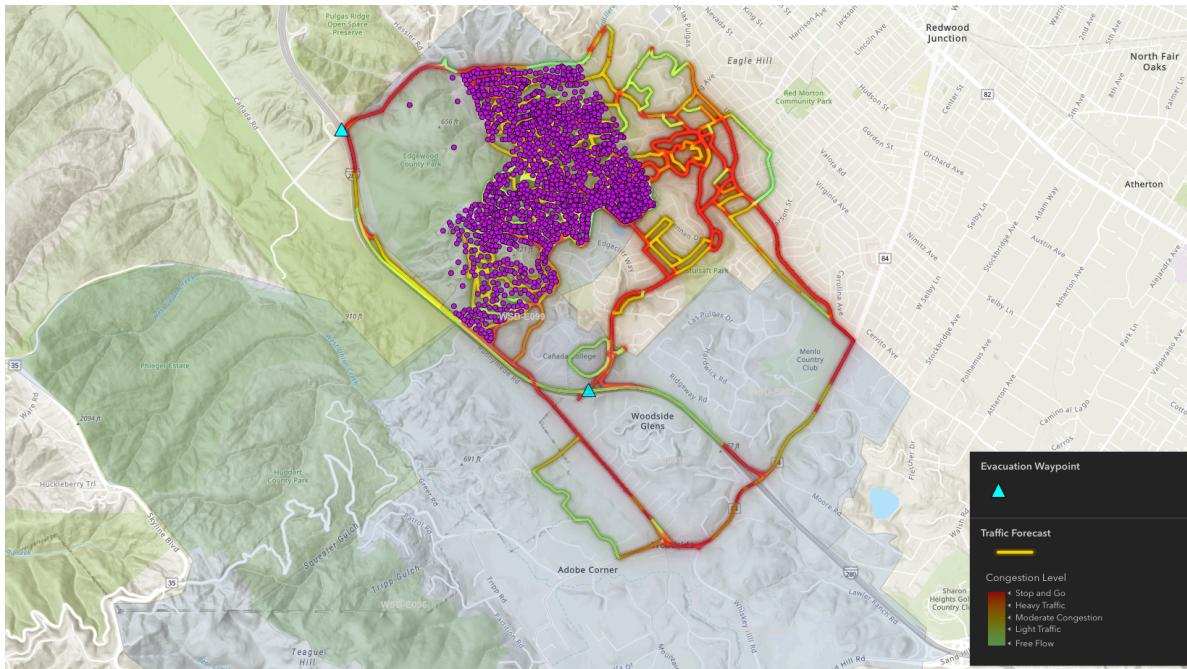
Impact Area	Emerald Hills between Jefferson, Cañada, Edgewood
Waypoints	A - 280/84 B - 280/Edgewood Rd
Vehicle Count	4320
Departure Time Frame	60 minutes
Road Blocks	None
Heavy Vehicle %	20%

Emerald Hills | Designated Evacuation Area:

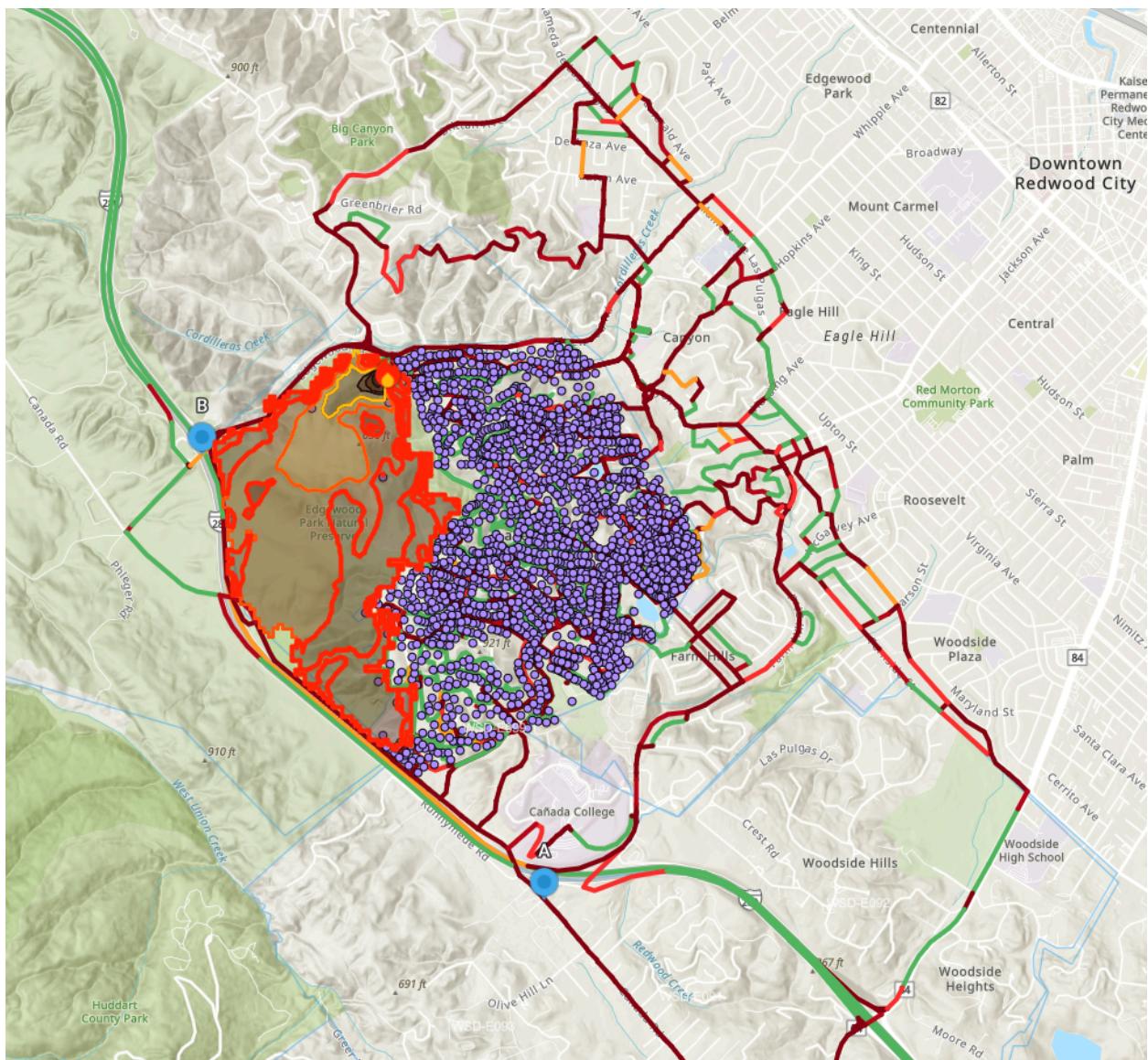


Emerald Hills | Evacuation Simulation Results:

Metric	Value
Total Clearance Time	1 hour, 24 minutes
Worst Case Single Vehicle	36 minutes
Average Single Vehicle	18 minutes



Emerald Hills | Wildfire Progression & Evacuation Overlay



Emerald Hills | Explanation of Results:

4,320 vehicles in this simulation began evacuating from **Emerald Hills** within a 60-minute window and continued onwards to the I-280 onramps at Farmhill Road and Edgewood Road (Waypoints A and B). After **1 hour and 24 minutes**, all vehicles reached safety. The **average travel time** for a single vehicle to reach safety is **18 minutes**. One vehicle evacuating reached safety after **36 minutes**, which was the **worst trip time** for a single vehicle during this scenario.

The wildfire simulation results show the **time-based stages of the first eight hours** of the wildfire's progression.

Scenario 2: The Glens

Community Conditions:

The Glens community was originally developed as a group of summer cabins. The units were built with the layout of a campground, where there is a one-way loop to enter and exit for all of the properties. Since their construction, these structures have been converted to permanent homes on their small lots.

As the main thoroughfare, the loop is a two-lane road that merges down to a one lane road within the neighborhood. Along the road, smaller dead-end roads branch off to access some of the properties that are further in the community's vegetation.

Like those in Emerald Hills, the roads in The Glens are very narrow and even broken up by properties in many parts of the neighborhood. Built before improvements to safety standards, some of the houses' garages are actually situated in the right-of-way. Additionally, the structures here were built very close to one another along these small roads.

All of these elements of The Glens community of course constitute compounding threats: a fire in this neighborhood could move from building to building very quickly, and the ingress/egress dynamics could become extremely dangerous or even impossible to travel.

While The Glens certainly has major risks that could very likely disrupt or prevent safe evacuations, the community does have an emergency route available that residents could use to evacuate through the back of the neighborhood. There is no such option for some other communities in Woodside; the value of an emergency route might be an important consideration when planning and completing infrastructure developments to improve evacuation safety throughout the Town.

The Glens | Wildfire Scenario:

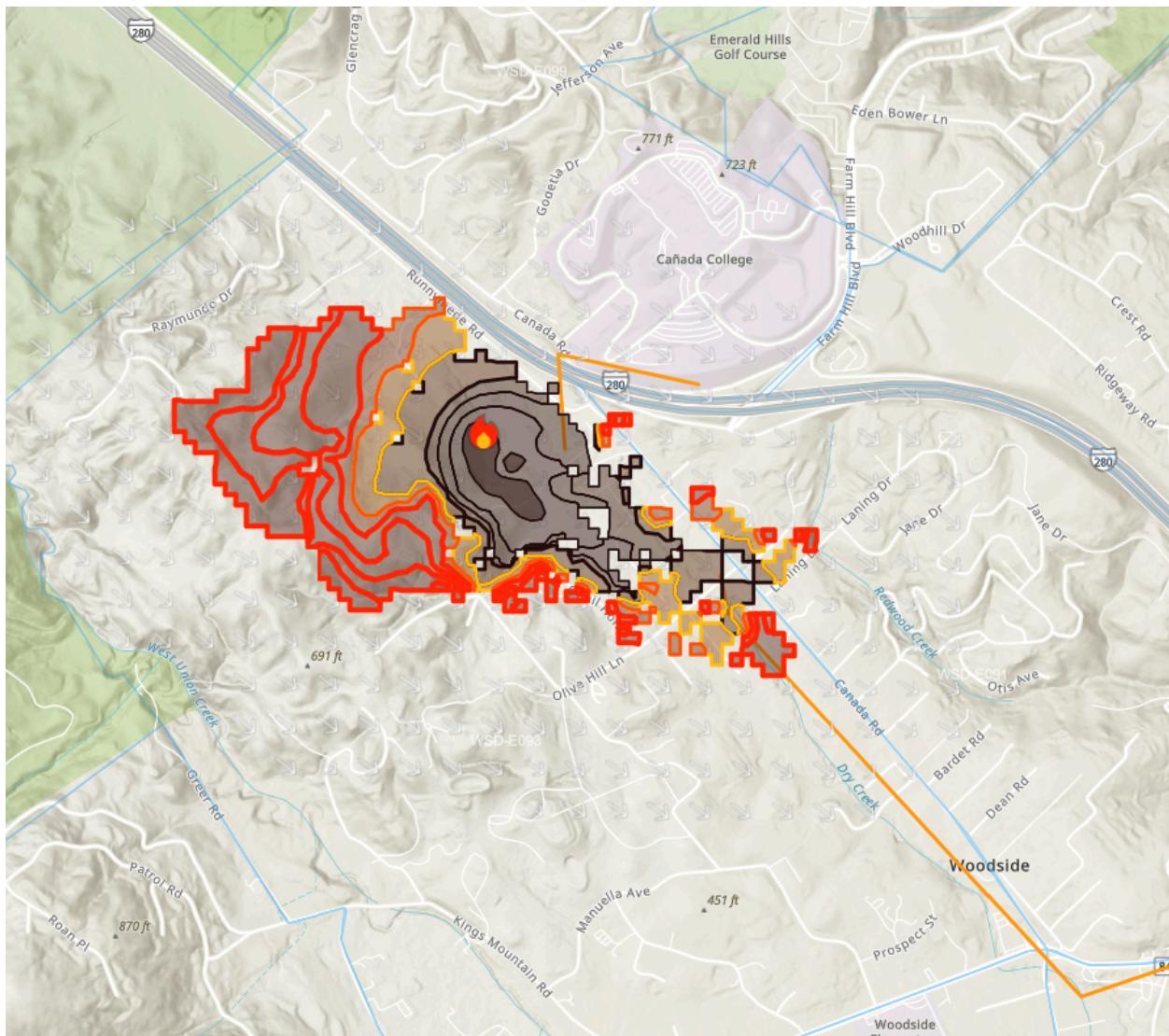
After a fire started in the backyard of a home northwest of the Cañada Road and Olive Hill Lane intersection, the entirety of The Glens community was placed under an immediate evacuation order. With a typical fire from the northwest threatening to push the fire across Cañada Road into the area just north of Mission Trail Road, the evacuees from The Glens were directed to travel east on Woodside Road to the other side of Highway 280, or south on Highway 280 to the Sand Hill Road exit.

In this simulation, the emergency access route was *not* used, but additional simulations can be used to compare the evacuation time frames in scenarios with and without the emergency route.

It's important to note that, in this simulated scenario, the evacuated area is evacuation zone E091, which is a formal zone that includes The Glens and the surrounding area that is bounded by HWY 280, Woodside Rd, and Cañada Rd.

The Glens | Simulated Wildfire Progression - First Eight Hours:

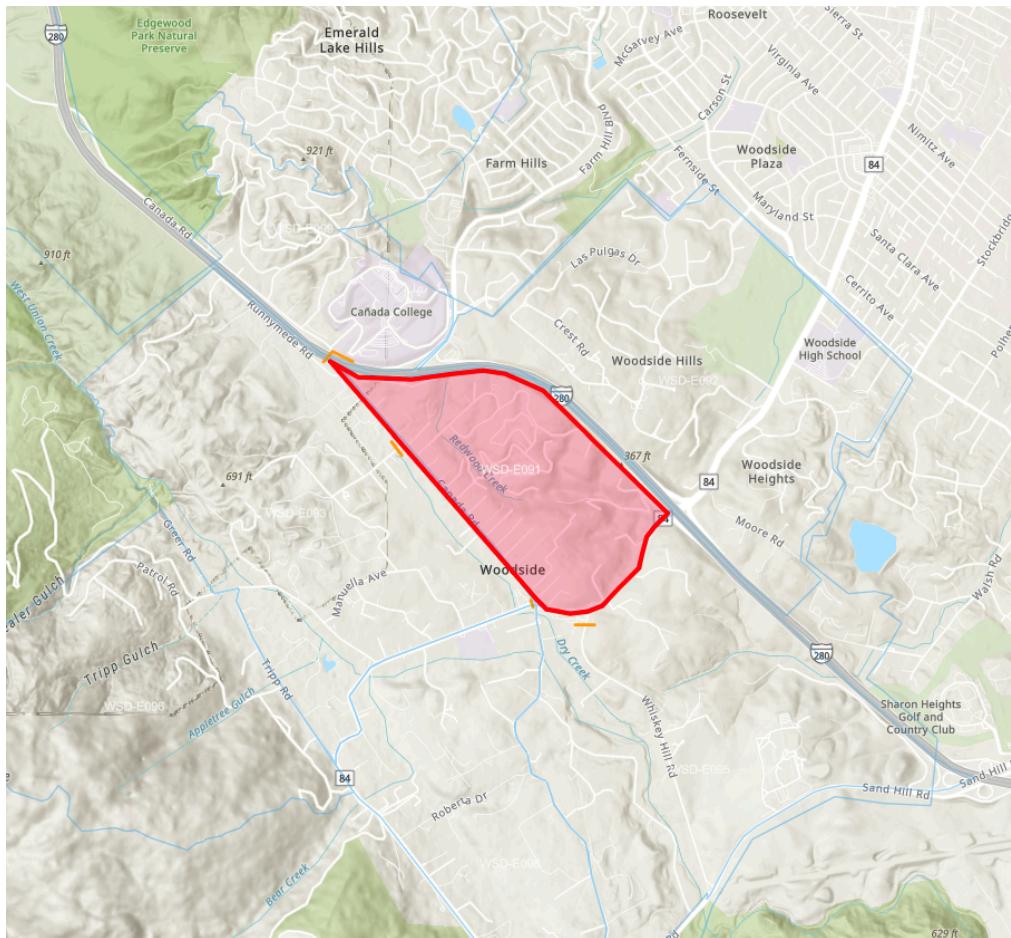
Ignition Point	Northwest of Cañada Rd and Olive Hill Ln intersection
Wind Direction	Northwest
Wind Speed	20 mph
Initial Size	213.61 acres
Timeframe	8 hours



The Glens | Simulated Evacuation - Ladris Input Parameters:

Impact Area	Woodside Glens Neighborhood, between Cañada Rd & Jane Dr
Waypoints	A - Intersection of Woodside Rd and Northgate St B - Highway 280 exit at Sand Hill Rd
Vehicle Count	627
Departure Time Frame	30 minutes
Road Blocks	None
Heavy Vehicle %	20%

The Glens | Designated Evacuation Area:



The Glens | Evacuation Simulation Results:

Metric	Value
Total Clearance Time	50 minutes
Worst Case Single Vehicle	30 minutes
Average Single Vehicle	22 minutes

Community Conditions:

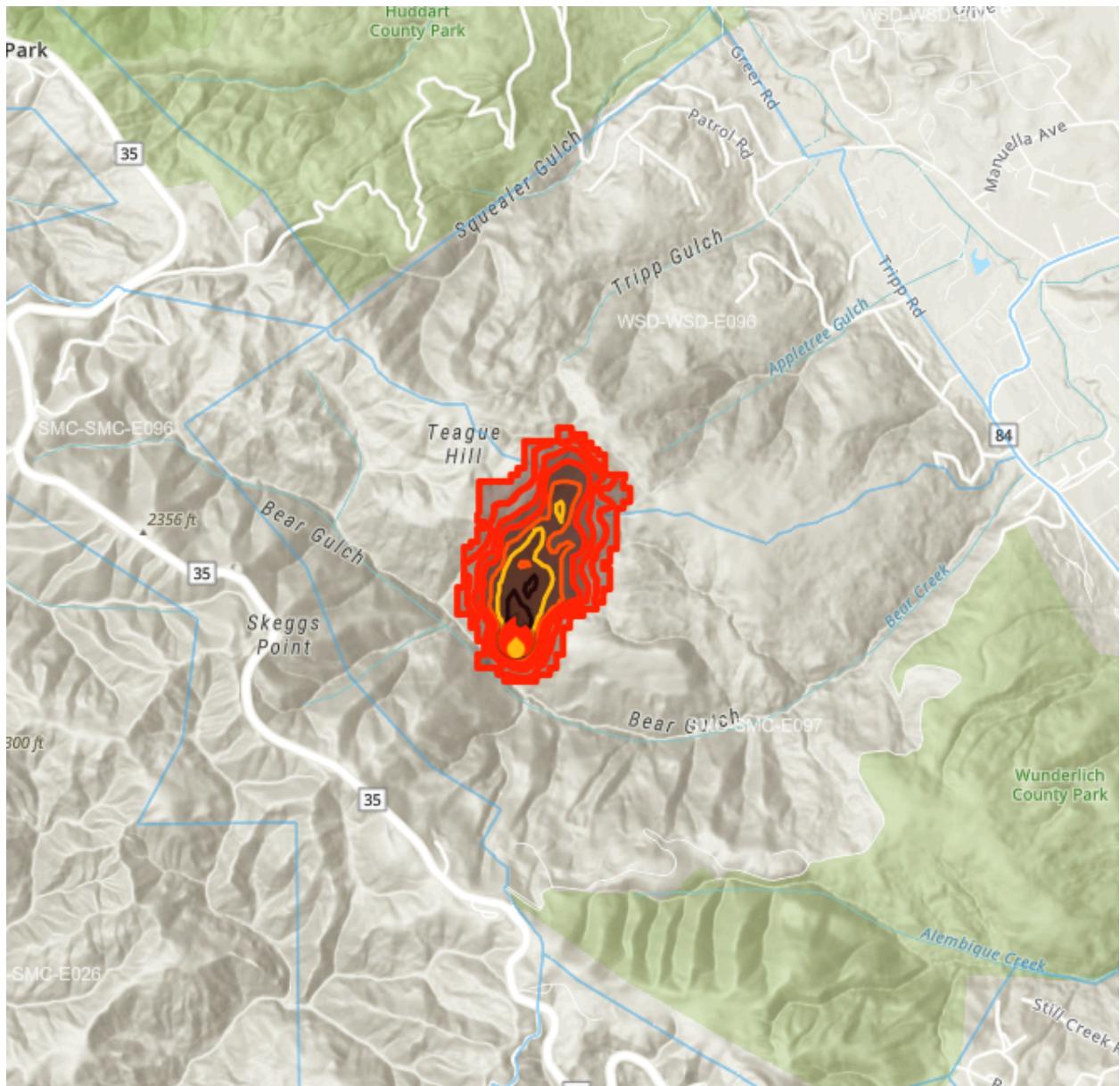
The dense vegetation of Western Hills is this area's greatest cause for concern. Fortunately, structure ignition is a relatively low risk issue, as the structures in the community are spread apart from one another. Most importantly, these aspects of Western Hills make the area an important defensible space for Woodside.

Western Hills | Wildfire Scenario:

Given the high-risk nature of Western Hills' vegetation, a fire is assumed to ignite in the southern section of the community. Before the fire has a chance to progress into Western Hills' homes, which are located near the northeastern border of the neighborhood, an evacuation order is issued.

Western Hills | Simulated Wildfire Progression - First Eight Hours:

Ignition Point	Wildland north of Bear Gulch Rd & HWY 35 intersection
Wind Direction	Southwest
Wind Speed	35 mph
Initial Size	139.89 acres
Timeframe	8 hours

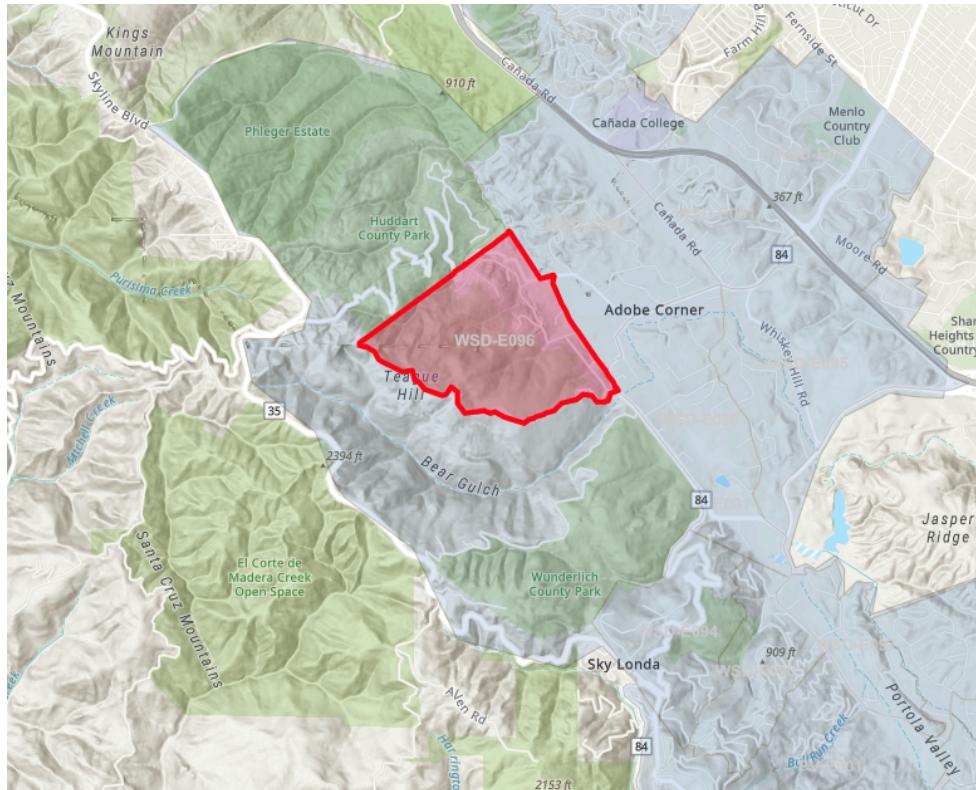


Western Hills | Simulated Evacuation - Ladris Input Parameters:

Impact Area	WSD - E096 Western Hills between Huddart Park & Wunderlich Park, including Patrol Rd, Kings Mountain Rd, and Summit Springs Rd
Waypoints	A - Intersection of HWY 35 / Kings Mountain Rd near SW corner of Huddart Park
Vehicle Count	340

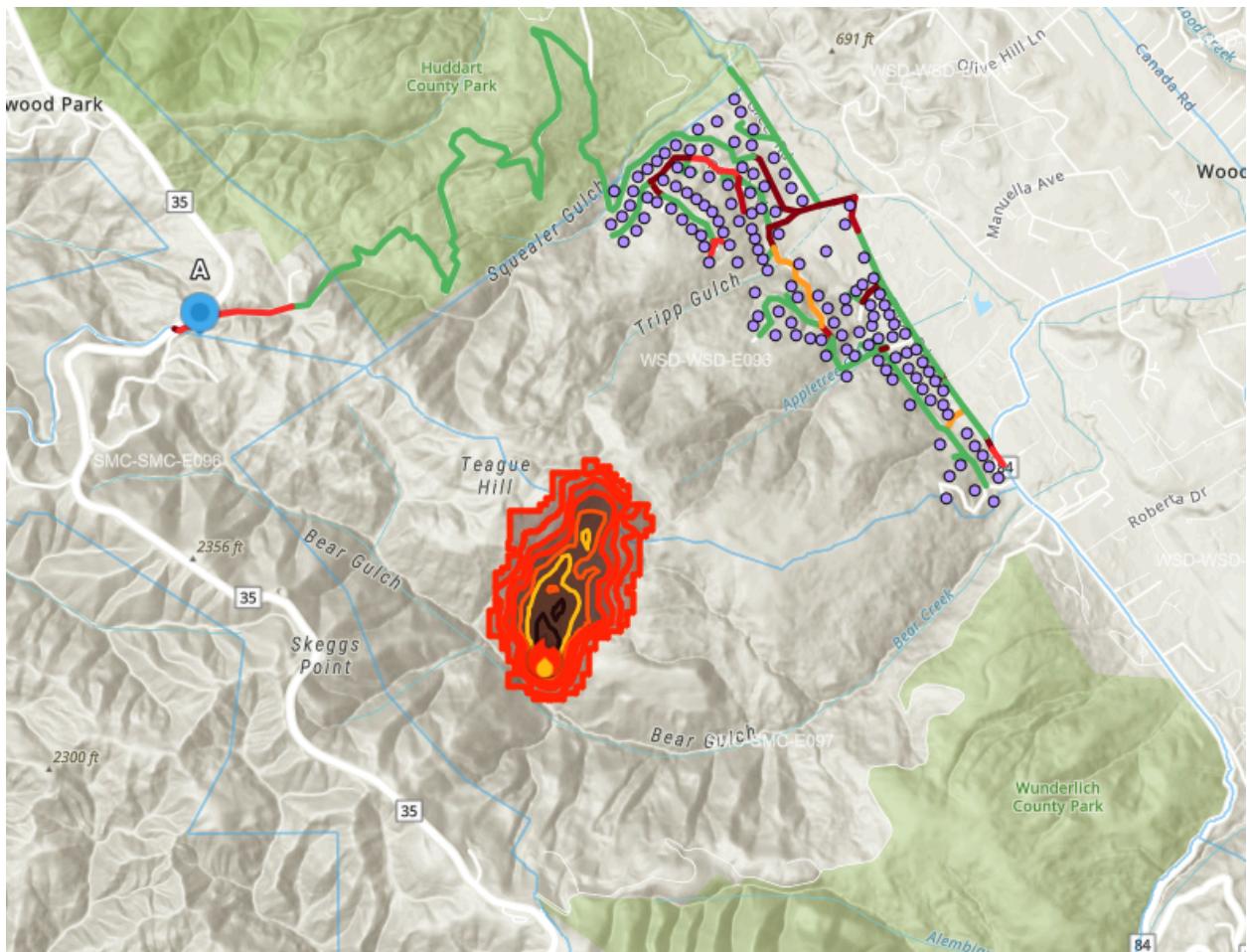
Departure Time Frame	15 minutes
Road Blocks	None
Heavy Vehicle %	20%

Western Hills | Designated Evacuation Area:



Western Hills | Simulation Results:

Metric	Value
Total Clearance Time	32 minutes
Worst Case Single Vehicle	19 minutes
Average Single Vehicle	13 minutes



Western Hills | Explanation of Results:

Once the evacuation began, **340 vehicles** began evacuating the **Western Hills** area within a 15-minute time frame, heading towards the intersection of Highway 35 and Kings Mountain Rd near the southwest corner of Huddart Park (Waypoint A). After **32 minutes**, **all vehicles** reached safety. The **average travel time** for a single vehicle to reach safety was **13 minutes**. The **worst travel time** for a single vehicle to reach safety is **19 minutes**.

The wildfire simulation results show the **time-based stages** of the first eight hours of the wildfire's progression.

Scenario 4: Southern Woodside

Community Conditions:

In the Southern Woodside area there are a small number of horse properties, but they are not as predominant here as they are in the valley. Many different connections to private roads were once available in this section of the Town, but they were lost decades ago. There are also many drainage ditch washouts in the area, some of the most high risk geographical features for rapid progression of wildfires.

In 2020, the Santa Cruz San Mateo Mountain Fire spread close to this part of the Town, coming within four or five miles and forcing a “false” but necessary evacuation.

An evacuation from this area would almost certainly require all of the surrounding area around the intersection of Highways 84 and 35. It would be extremely unlikely for a wildfire to force an evacuation only for the area north of Highway 35 without also endangering residents south of Highway 35.

For a more detailed description of Southern Woodside's Sky Londa area, please see the following section titled “Scenario 5: Sky Londa” - here, a very similar area of the Town was initially affected by a very different wildfire simulation that ultimately forced a much larger scale evacuation of the Town.

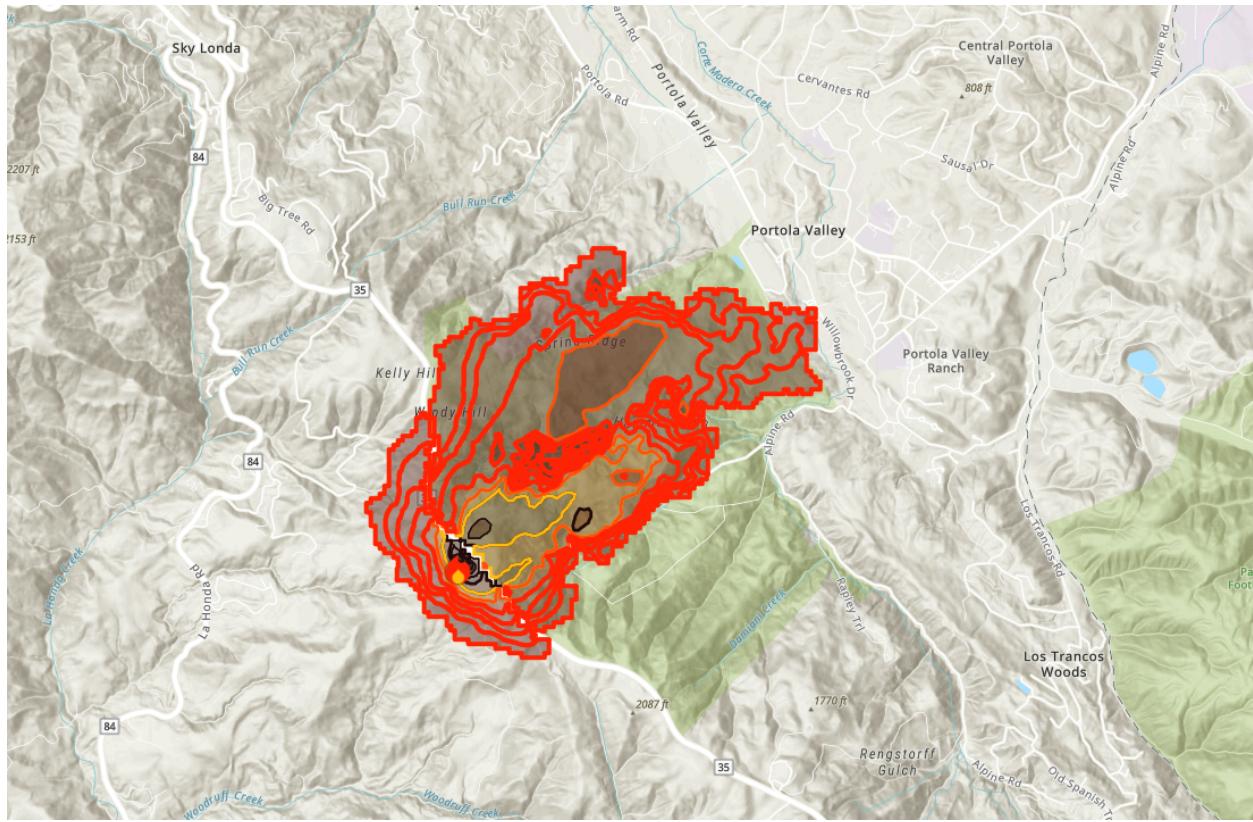
Southern Woodside | Wildfire Scenario:

As a wildfire began spreading north towards Woodside from Skyline Blvd, an immediate evacuation order was issued for zones WSD - E003, WSD - E094, WSD - E090, and WSD - E097.

Given enough time to react and mitigate the fire, WFPD and other agencies initially placed Woodside zones further north under an evacuation warning but later notified residents in those areas that the fire had been stopped and was fully contained.

Southern Woodside | Simulated Wildfire Progression - First Eight Hours:

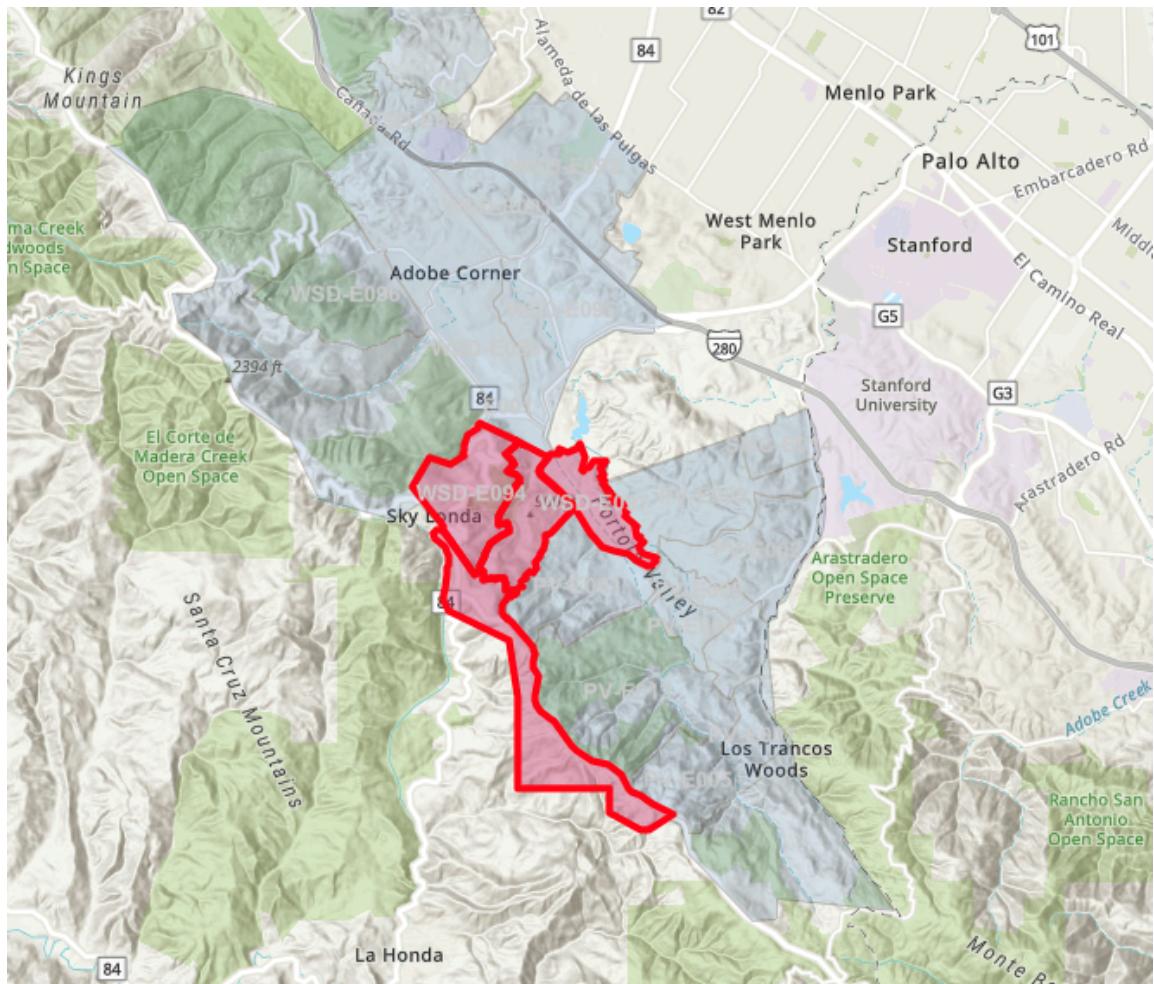
Ignition Point	North of Rapley Ranch Rd near HWY 35
Wind Direction	Southwest
Wind Speed	35 mph
Initial Size	1032.13 acres
Timeframe	8 hours



Southern Woodside | Simulated Evacuation - Ladris Input Parameters:

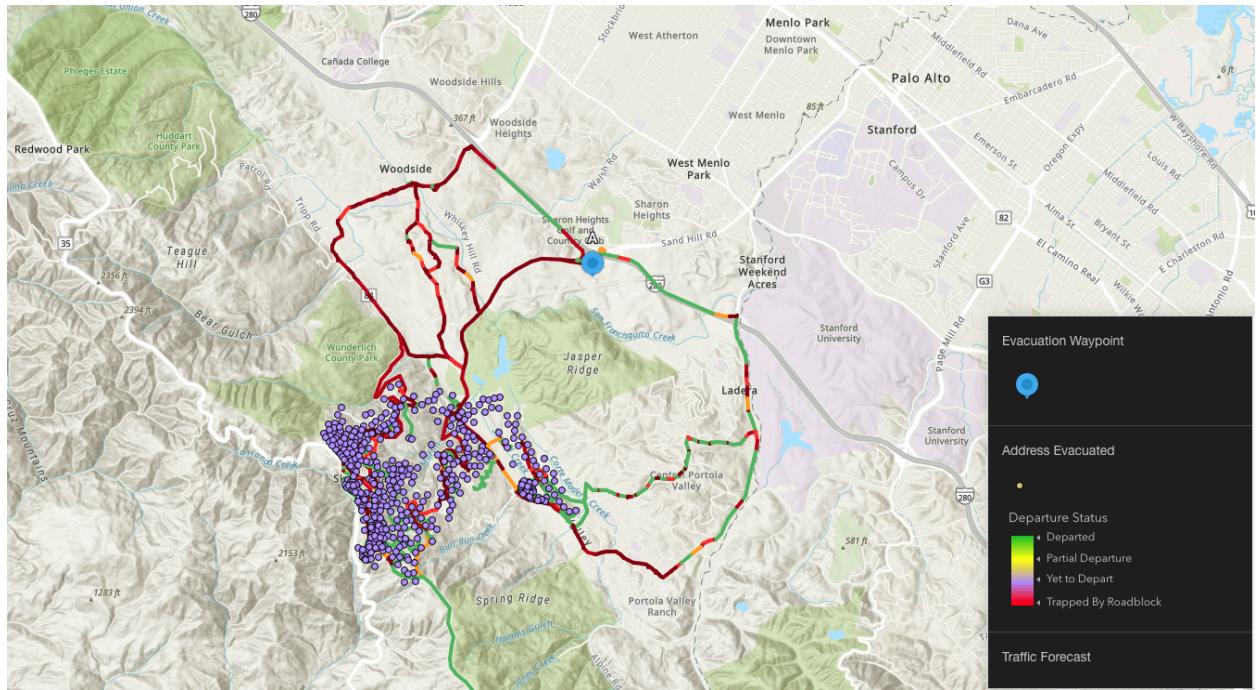
Impact Area	WSD - E003 WSD - E094 WSD - E090 WSD - E097
Waypoints	A - Sand Hill Rd and HWY 280
Vehicle Count	1,177
Departure Time Frame	60 minutes
Road Blocks	None
Heavy Vehicle %	20%

Southern Woodside | Designated Evacuation Area:

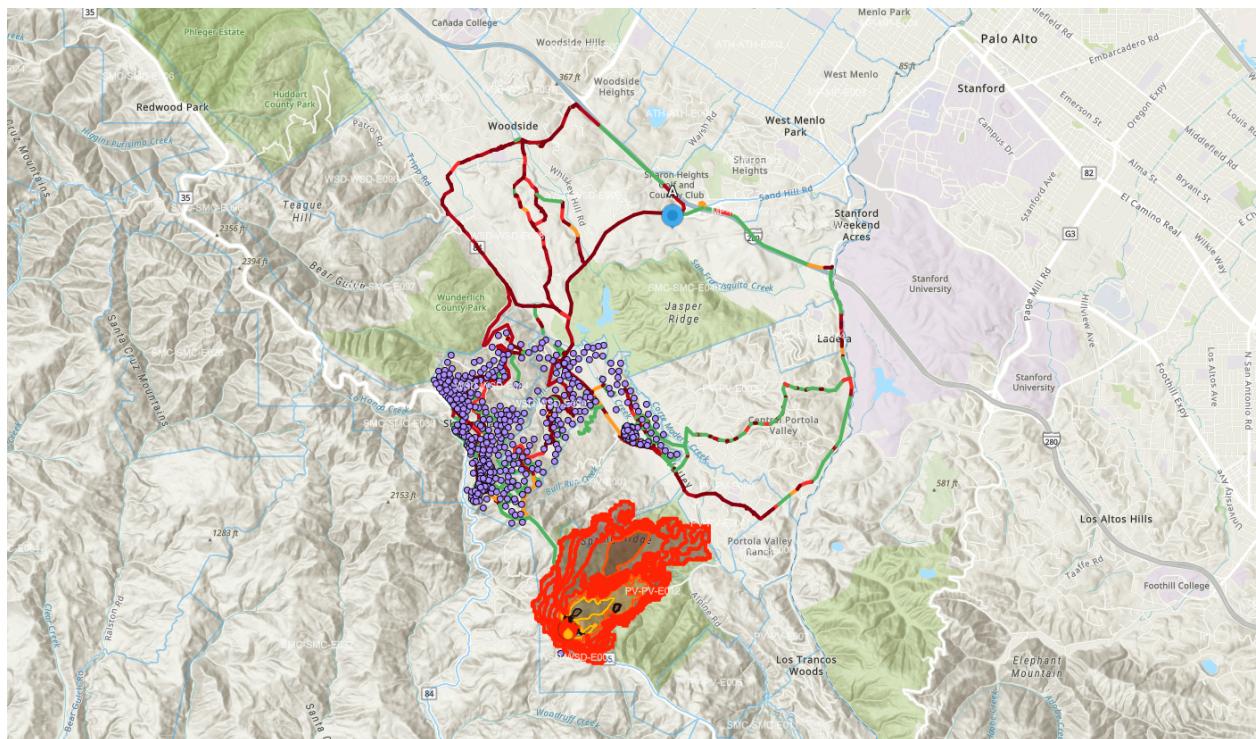


Southern Woodside | Evacuation Simulation Results:

Metric	Value
Total Clearance Time	1 hour and 27 minutes
Worst Case Single Vehicle	38 minutes
Average Single Vehicle	21 minutes



Southern Woodside | Wildfire Progression & Evacuation Overlay



Southern Woodside | Explanation of Results:

Once one of the vehicles entered the roadway to evacuate, 60 minutes passed before all **1,177 vehicles** had begun their evacuation out of the **Southern Woodside area**. These vehicles drove towards safety in the direction of the intersection of Sand Hill Road and Highway 280 (Waypoint A). The evacuation required **1 hour and 27 minutes for all vehicles** to reach safety. The **average vehicle** reached safety after **21 minutes of travel**. One vehicle had to travel for **38 minutes** to reach safety, which was the **worst-case trip time** during this evacuation.

The wildfire simulation results show the **time-based stages of the first eight hours** of the wildfire's progression.

Scenario 5: Sky Londa

Community Conditions:

Fortunately, located just north of this intersection is the California Department of Forestry Skylonda Fire Station/San Mateo County Fire Station.

A part of southern Woodside, the Sky Londa community is an area of particularly great concern. Through the neighborhood's suburban layout, runs Sky Londa Road, a very narrow one lane road that winds between trees in the neighborhood's mountainous terrain. At some points along the roadway, motorists must stop to allow traffic to pass that's coming from the other direction. The roads here are actually former logging roads, and the homes in the area are interspersed throughout the winding routes.

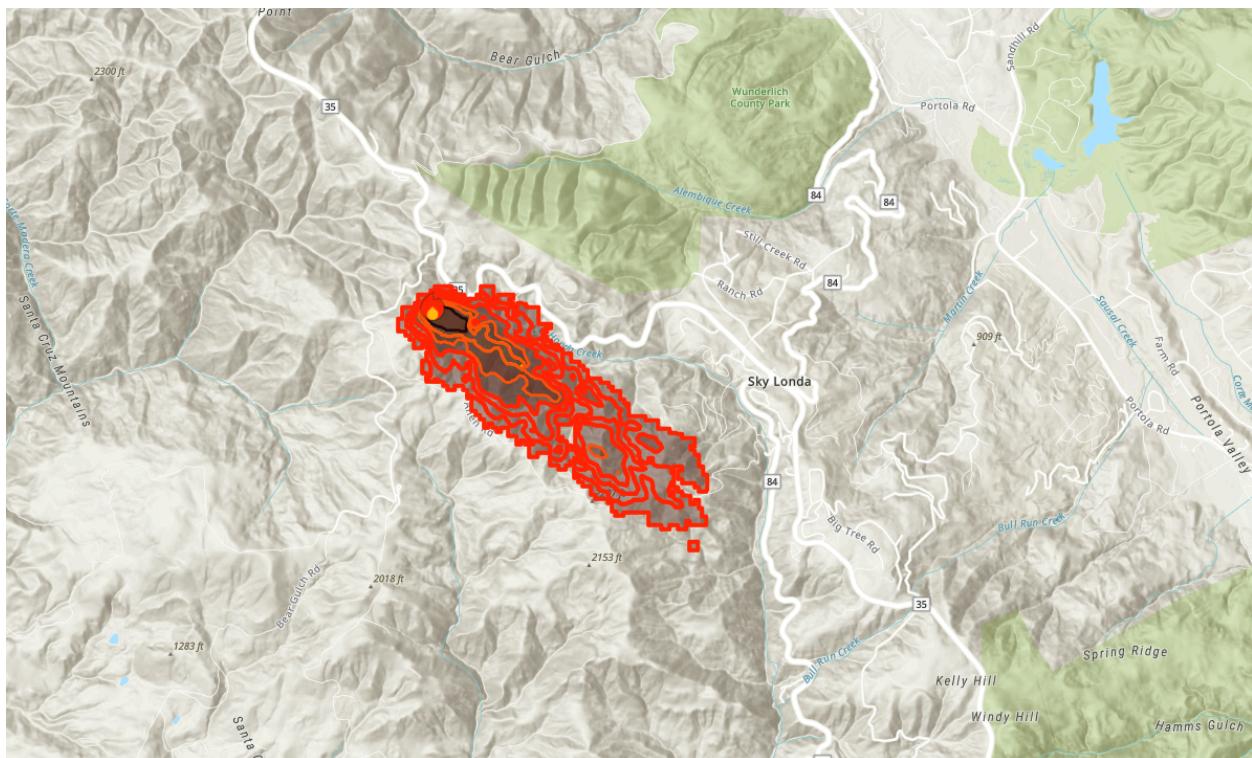
It's important to note that the residents in this area are generally self-sufficient and industrious. Town Manager, Kevin Bryant, reported during the development of this study that there have even been instances of residents dealing with trees that have fallen across the road by themselves. Residents of this area often carry a chainsaw and other tools in their vehicles, prepared for the common disruption to traffic.

Sky Londa | Simulated Wildfire Scenario:

In this simulated scenario, a fire originated in the La Honda Creek Open Space. After ignition, the fire traveled north towards the ridgeline of Highway 35, which is located just west of Sky Londa. In the incipient phase of this wildfire, the flame front was approximately one mile long, extending a half-mile in each direction from the intersection of Highway 84 and Highway 35.

Sky Londa | Simulated Wildfire Progression - First Eight Hours:

Ignition Point	La Honda Creek Open Space
Wind Direction	Northwest
Wind Speed	45 mph
Initial Size	401.22 acres
Timeframe	8 hours



Evacuation Phase 1:

With high winds at the time of the fire, embers traveled over the top of the ridge and fell into Woodside's zones WSD - E096, WSD - E094, WSD - E090, and WSD - E003; Portola Valley's PV - E001; and the Woodside open space area zoned as SMC - 097. Given their immediate proximity to the fire's spread, these zones received an immediate evacuation order.

With long range spotting, there was significant potential for separate fires to ignite further into the Woodside community. While many residents of these zones located deeper within Woodside understandably were eager to evacuate before receiving an evacuation order, the safety of those evacuees closest to the fire depended on the ability to access egress routes away from the Highway 35 ridgeline without additional congestion from their neighboring zones to the north. For this reason, the Woodside Fire Protection District, along with responders from San

Mateo County and the State strategically monitored to ensure evacuees were able to reach safety during Phase 1 of the evacuation.

Evacuation Phase 2:

Given the fire's high potential for spreading further to the north, Phase 2 of the evacuation was launched. At this time, zones WSD - E093, WSD - E097, WSD - E098, PV - E006, PV - E004 received the next evacuation order.

Egress Routes:

Evacuees in each of the two phases of this simulated scenario had the following egress routes to reach safety:

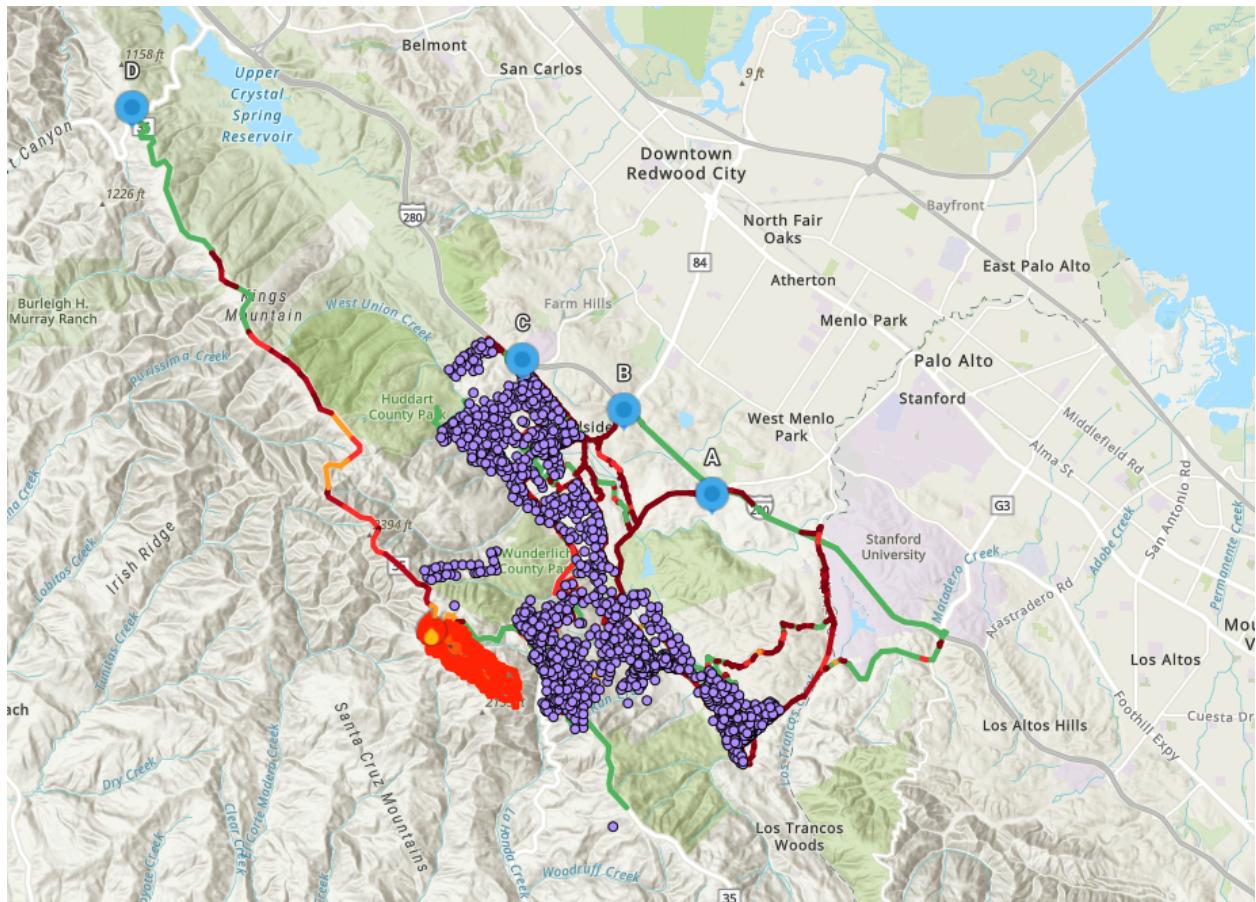
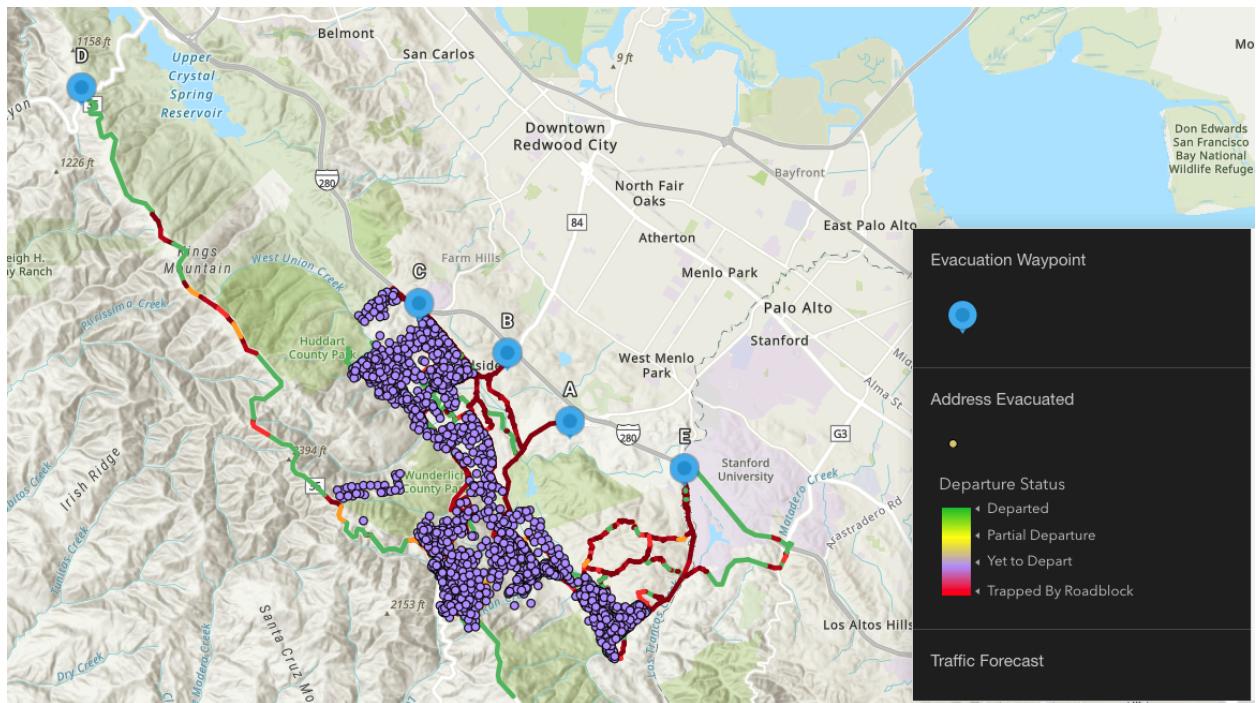
- Traveling on Highway 35 North gave access to Highway 92, from which evacuees had the option to travel down into Half Moon Bay or directly into San Mateo.
- Evacuees were also able to travel to Highway 280 on Cañada Road.
- Sand Hill Road to Highway 280 was also a viable route.
- Alpine Road to HWY 280 was open to traffic, which was especially important for evacuees from zones PV-E004 and PV-E006
- Lastly, Highway 84 East gave the most direct route back through town towards Highway 280, but the viability of this route is critically less certain and would depend on the extent of the fire spotting ahead of the main front.

It's important to note this simulated scenario is much like the CZU Fire of 2020.

"Although no one in Portola Valley or Woodside was ultimately forced to evacuate because of the nearby CZU August Lighting Complex fires that burned over 86,000 acres, it was a wake-up call to the two small wooded towns that fire danger needs to remain top of mind." - *The Almanac* - July 15, 2021

Sky Londa | Simulated Evacuation - Ladris Input Parameters:

Parameter Name	Phase 1
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Sky Londa | Explanation of Results:

In the **first phase** of the evacuation, **1,354 vehicles** started evacuating within a 60-minute window of time from one of the zones that received the first evacuation order. Then, *once all the vehicles from the first phase of zones had begun their evacuation commute* within that 60-minute time frame, the second evacuation phase began. At this point, **1,109 additional vehicles** began evacuating from much of the Woodside area after another 60-minute timeframe.

Because this was a phased evacuation, the flow of traffic was dispersed enough that all waypoints were available to the vehicles in both evacuation phases (Waypoint A - HWY 35 & Alpine Road; Waypoint B - HWY 35 & HWY 92; Waypoint C - HWY 280 and Cañada Road; Waypoint D - HWY 35 and HWY 92; Waypoint E - HWY 280 and Alpine Road)

All 2,457 vehicles from the two phases reached safety after **3 hours and 4 minutes** in this simulated scenario. However, it is very important to note that this total time to safety might be deceptively long to some. Because the first phase of the evacuation had 60 minutes to evacuate *before the second phase*, the travel time is much better than it would be if all vehicles would begin evacuating in the same timeframe. With a phased evacuation like this, the evacuees in the immediate path of the fire have the opportunity to evacuate first, while preserving the ability for the evacuees further from the fire front to evacuate safely.

On average, it took 52 minutes for one of these vehicles to reach safety, while the **worst travel time** for one vehicle to reach safety was **2 hours and 12 minutes**.

The wildfire simulation results show the **time-based stages of the first eight hours** of the wildfire's progression.

Scenario 6: Phleger Estate/Huddart Park Open Area

Community Conditions:

With the San Andreas fault line as its eastern border, the Phleger Estate area is made up of steep terrain and dense vegetation that create conditions for high levels of fuel and fire spreading up the ravine formed for the Fault.

Kings Mountain Road, the major thoroughfare running through Huddart Park, winds with a nearly constant run of sharp turns from Skyline Boulevard into the heart of the Town.

Just south of Huddart Park is the Teague Hill Open Space Preserve. While not densely populated, there are a number of homes located in this area of the community.

Initially, zones WSD - E096, WSD - E093, WSD - E098, WSD - E099, and WSD - E091 received an immediate evacuation order. Including WSD - E091 in this initial phase was crucial for the safety of the residents in The Glens community. *“Scenario 2: The Glens” in this study gives a detailed description of the community and a separate wildfire scenario, given how complicated and time-intensive an evacuation from this area could be.*

Evacuation Phase 2:

Once the first phase of the evacuation had been mostly complete, Phase 2 began with an evacuation order being given for the following zones: SMC - E097, SMC - E046, WSD - E092, WSD - E094, WSD - E090, WSD - E097, and WSD - E095.

Egress Routes:

Residents that were evacuating from WSD - E093, WSD - E091, and WSD - E099 largely sought egress on Cañada Road, traveling north to its intersection with Highway 280.

At the time of their evacuation, most residents from WSD - E098, WSD - E094, WSD - E090, and WSD - E097 exited the area and headed south on Highway 35 to Page Mill Road.

Meanwhile, evacuees departing WSD - E096 were able to travel either north on Cañada Road or to the southern safety point at Page Mill Road.

Sand Hill Road and Woodside Road served as the main egress routes for WSD - E095 and WSD - E092, but Highway 280 South also gave safe egress towards its intersection with Page Mill Road.

Evacuees from WSD - E094 were also able to exit on Highway 84 South and travel towards the coast, which was especially important for folks leaving homes at higher elevation areas of that zone near Sky Londa. This route also helped relieve the additional congestion level that could have accumulated on Highway 35 South.

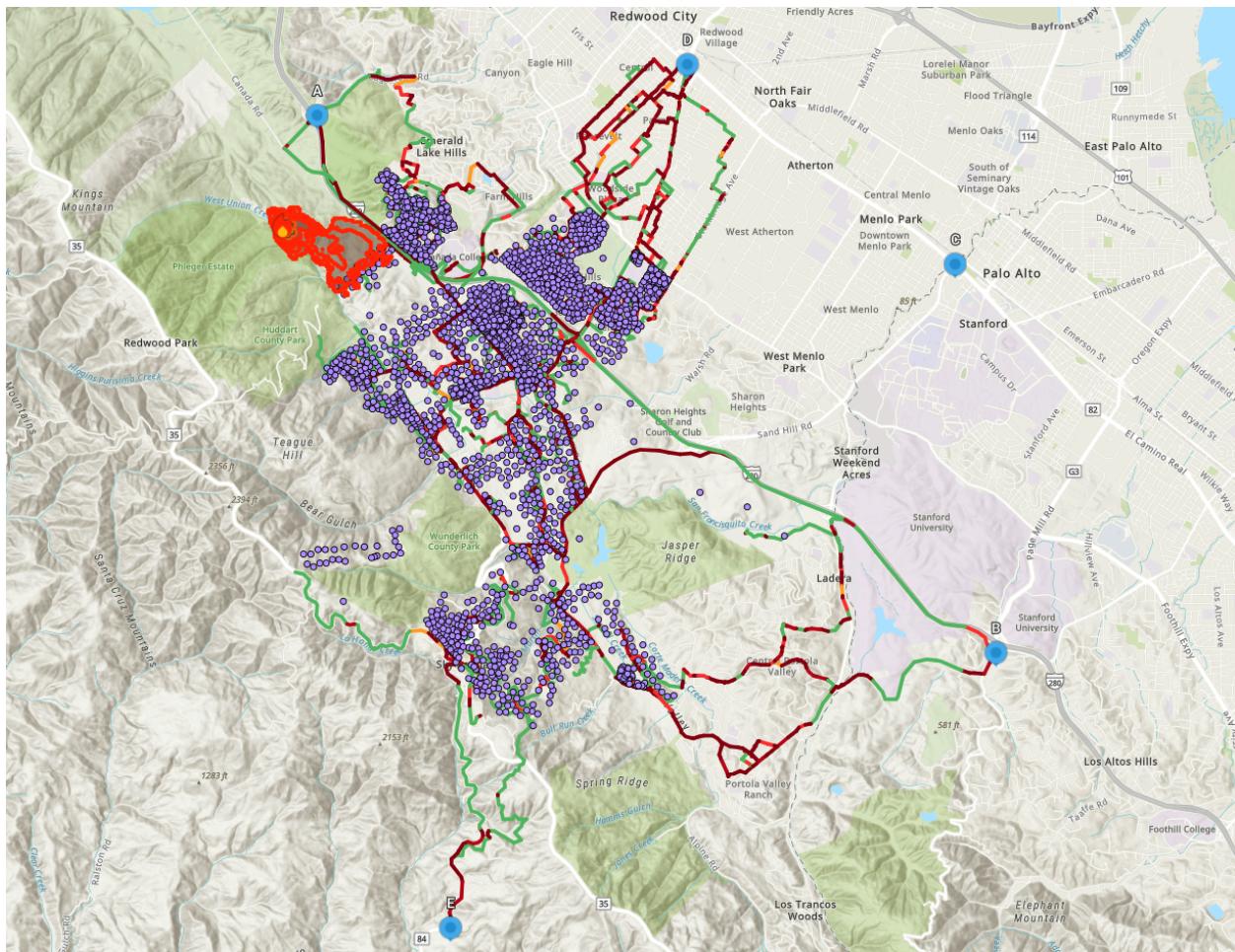
Given the ignition point and spread of the wildfire, there were no viable routes to the north or due west towards the coast.

Phleger Estate/Huddart Park | Ladris Input Parameters:

Parameter	Phase 1
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Impact Area	WSD - E096 WSD - E093 WSD - E098 WSD - E099 WSD - E091
Waypoints	A - HWY 280 and Edgewood Rd B - HWY 280 & Page Mill Rd C - El Camino Real & San Hill Rd D - El Camino Real & Woodside Rd E - South on HWY 84
Vehicle Count	3,262
Departure Time Frame	60 minutes
Road Blocks	None
Heavy Vehicle %	20%

Parameter	Phase 2
Impact Area	SMC - E097 SMC - E046 WSD - E092 WSD - E094 WSD - E090 WSD - E097 WSD - E095
Waypoints	A - HWY 280 and Edgewood Rd B - HWY 280 & Page Mill Rd C - El Camino Real & Sand Hill Rd D - El Camino Real & Woodside Rd E - South on HWY 84
Vehicle Count	1,908
Departure Time Frame	60 minutes
Road Blocks	None
Heavy Vehicle %	20%



Phleger Estate/Huddart Park | Explanation of Results:

The worst case single vehicle trip time and average vehicle trip times could appear surprisingly short in these results. Because this scenario operates with an assumption of a wildfire origin and progression that gives room for possible waypoints to the north, east, and south of the evacuated area, many vehicles have access to safety with trip times that are much shorter than the times seen in other simulated scenarios.

3,262 vehicles began traveling out of the northern Woodside area during the first phase of this evacuation. After 60 minutes, all of these vehicles had begun their evacuation, and they started

heading south on Highway 84 or head to one of the following intersections that were markers of safety: Highway 280 & Edgewood Rd (Waypoint A), Highway 280 & Page Mill Rd (Waypoint B), El Camino Real & Sand Hill Rd (Waypoint C), or El Camino Real & Woodside Rd (Waypoint E).

Once all of the Phase 1 vehicles had at least departed from their addresses, Phase 2 of the evacuation order was issued to the remaining zones that had initially been under evacuation warning. From the zones evacuated in Phase 2, **1,908 vehicles** began their departure within 60 minutes and continued their evacuation to one of the same waypoints accessed during Phase 1.

All 5,170 vehicles that evacuated across the two phases ultimately reached safety after **2 hours and 20 minutes** in this simulated evacuation. The simulated **average travel time** for a single vehicle to reach safety was **20 minutes**. The **simulated worst travel time** for a single vehicle to reach safety is **35 minutes**.

The wildfire simulation results show the **time-based stages of the first eight hours** of the wildfire's progression.

Recommendations

As has been previously stated, the Town of Woodside and WFPD had already made significant investments for evacuation preparedness prior to the additional investment to create this traffic study.

Having well-defined evacuation zones gives Woodside government officials and community members a major step ahead of the threat of unsafe or inefficient evacuations. These evacuation zones should be used, along with the results from this study and with further engagement with the Ladrис EVAC-1 modeling software, to mitigate the hazards of evacuation through continual iteration on these and other evacuation simulations and through intentional public education initiatives that encourage the general community to align and do their part by following directions with zone-based evacuation planning.

Furthermore, it is recommended that WFPD and Town of Woodside continue joint tabletop exercises with stakeholders from other city, county, and state agencies like the exercises that have been previously held. Ladrис has provided support services to plan and facilitate one such exercise in the past, the Ladrис team is available to assist in future exercises as often as once every three months under the WFPD and the Town's annual subscriptions to the software.

As noted in the main text above, it can be advantageous for communities like The Glens neighborhood to have some roadway that can be used as an emergency egress route during an

evacuation scenario. Routes like these that might usually be unused can significantly and safely reduce the total evacuation time from an area. Reviewing and possibly pursuing the development of similar routes for other areas is highly recommended. The Ladris EVAC-1 platform makes it possible to model evacuation scenarios with hypothetical developments to the roadway infrastructure, and this could be used to evaluate the possible benefits of allocating resources to create evacuation routes like the one that is available out of The Glens.

Limitations

Modeling Limitations

While the Ladris Software uses scientifically backed modeling techniques for traffic simulation and evacuation behavior, there are a variety of factors for which the model cannot account for. These factors include car crashes, highly erratic behavior by evacuees, and more.

Scenario Limitations

While the scenarios modeled were determined to be high priority by the Ladris team and local officials, not every potential evacuation scenario was modeled. It is possible that there are many serious scenarios that were not analyzed in this study.

In particular, this study did not address large scale evacuation scenarios such as all of San Mateo County needing to evacuate at once.

General Risk

In general, evacuations are a highly variable event and the results of any mathematical modeling may vary significantly from real world outcomes.

Additionally, this study has not analyzed the potential severity of wildfire conditions or other threats along the roadway in question. Therefore, it is highly possible that the roads presented in this study, despite having the highest levels of evacuation traffic, may not pose the highest risk in a disaster scenario.

Residents with Disabilities in Evacuations

Throughout the design and simulation of these wildfire evacuation scenarios, Chief Kim Giulacci of the Woodside Fire Protection District stressed the importance of further analysis and planning for community members who are partially or fully disabled. The specific issues associated with ensuring the safety of disabled evacuees during a wildfire emergency must be thoroughly and strategically addressed.

This raises the question of how many emergency vehicles must travel against the flow of traffic *specifically to reach and assist disabled members of the community* during an emergency like one of the scenarios simulated for this traffic study.

At this time, EVAC-1 does not model the flow of emergency vehicles traveling towards at-risk areas, so this constitutes a moderate but civically important limitation with the simulation results presented here.

As a product of this traffic study, it is clear how important it will be for Town and WFPD officials to identify the residences of disabled residents and develop appropriate plans for each of the Town's regions depending on the number and locations of those who cannot independently evacuate during an emergency.

Appendices

Map NH4: Very High Severity Fire Hazard Zone

