Rahn Conservation Consulting LLC
Environmental Planning Solutions

To: Carmen Borg, Urban Planner, Shute, Mihaly & Weinberger LLP
From: Matthew Rahn, PhD, MS, JD
Re: Harmony Grove Village South – Draft EIR, Wildfire Risk Analysis and Mitigation Measures
Date: June 13, 2017

Ms. Borg:

The following analysis is provided on behalf of Rahn Conservation Consulting ("RCC") at the request of Shute, Mihaly & Weinberger LLP. Our firm was retained to evaluate the Draft Environmental Impact Report ("DEIR"), Fire Protection Plan ("Plan"), and other associated documents related to wildfire risk and community protection for the Harmony Grove Village South Project ("Project" or "HGVS"), San Diego County, California (April 2017). For over twenty years, I have worked in the fields of environmental science and policy, with an emphasis on wildfires, land management, and planning (qualifications are provided in Appendix A).

As proposed, the Project is located within the unincorporated area of San Diego County, which is classified as a "very high fire severity zone" by CAL FIRE. This area has a regular occurrence of wildfires with the most recent incident occurring in 2014. Given the fire history of the site, the complex topography, access issues, and surrounding vegetation, this area should be considered an extremely high-risk development zone. The proposed Project and its mitigation measures do not provide long-term assurances that adequate wildfire protection and community safety will occur. The DEIR and the Plan also fail to address increased risks under future climatic and vegetative conditions. Finally, the Plan fails to adequately address community risk and protection standards related to fire brands and structure fires within the community.

If recent wildfire events in the area are any indication of the future, HGVS and surrounding communities are not only susceptible during "average" wildfire events, but are at considerable, and arguably catastrophic risk during higher intensity events (which are becoming more common in our region). Given that the backcountry is expected to experience drier climates, increased Santa Ana wind events, hotter temperatures, longer droughts, and increased abundance of invasive species, the risk of wildfire hazards will only increase in the future. In this case, the risk to the proposed community is so high that it is seemingly not a question of whether this area will experience a catastrophic loss, but when. Even more alarming is that alternative routes and access were dismissed without evidence that they are not feasible. The proposed Project would thus be constructed despite being noncompliant with emergency access standards where catastrophic losses are not only probable, but expected.

In summary, the following issues were identified in our review of the DEIR, Fire Protection Plan and supporting materials:

1) The DEIR and Plan fail to adequately describe the fire history and existing setting of the area;
2) Current understanding of fire branding and structure loss during a wildfire event is not adequately addressed in the DEIR and the Plan;
3) Evacuation plans, community design, and shelter in place measures proposed in the DEIR provide inadequate protection and assurance that the community can safely respond to severe wildfires;
4) The DEIR and Plan fail to adequately address future changes in precipitation, temperature, and wind;
5) The DEIR and Plan fail to consider how future land use change scenarios, invasive species, and habitat succession are expected to alter fire frequency and intensity;
6) The Plan as proposed does not adequately address actual wildfire community risks.

A detailed review of the Project is provided on the following pages, along with supporting references. If you have any questions, please feel free to contact me at any time.

Respectfully submitted,

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1.0 Introduction

There is always an inherent danger in placing an urban development in what is currently an undeveloped wildland area located within an historic fire corridor. Although the DEIR and the related Wildfire Risk Assessment claim that the HGVS Project meets or exceeds fire and building code requirements, the Project does not comply with standards related to emergency access. Furthermore, the DEIR proposes modifications to local and currently accepted standards related to dead end roads and evacuation routes, but the proposed measures are untested and have not been evaluated under real-world scenarios. The DEIR provides no evidence that during an emergency these measures will provide the same or higher level of community protection and safety. If anything, based on the high risks at the Project site, the County should apply more stringent standards that have a proven record of success.

Given that the proposed development is located in such a high risk wildfire area, it is incumbent on the County to integrate a prospective approach to decision-making and risk analysis. Unfortunately, the modified mitigation measures proposed in this Plan are tantamount to a community-level experiment, where untested measures are assumed to provide the same level of public safety that current code provides.

2.0 Fire History

Given the topography, climate, and vegetation, the Plan mischaracterizes the extreme wildfire risk of the proposed site. As recognized throughout the DEIR and supporting documents, wildfires are regular occurrences in and around the project area. However, the analysis fails to adequately describe the modern risk, diluting the modern history of the site with data from before 1950, when records and fire assessments were spotty at best. Modern history shows that the fire return interval within three miles of the site is not seven years. Rather, the local area has had eighteen fires from 1980-2014, suggesting a modern fire frequency of less than two years. Furthermore, the characteristics of wildfires are underestimated with regard to wind-driven events, with the analysis suggesting average and peak wind velocities that are lower than the documented conditions that occurred during recent wildfires (including the Witch Fire in 2007). Finally, while the data used are from actual recorded wildfire events, the numbers of actual ignitions is likely much higher. The analysis should have provided an assessment of *all* the known ignitions and areas for high historic wildfire risk. This underestimate (and lack of assessment of future climatic and vegetative scenarios described later) creates a faulty foundation on which the analysis and subsequent mitigation measures are based.

The DEIR and the Plan suggest that the development of the Project actually reduces wildfire risk because the project will result in the conversion of high risk fuels into an area of developed land with ignition resistant structures and landscaping. While there is no doubt that the development will remove existing habitat, simply placing a community within a high risk fire area does not reduce fire risk. To be certain, the risks still exist from the surrounding area, and the addition of a dense development into a high fire prone area has a long and demonstrated history of creating an environment where wildfires become

Wildland Urban Interface ("WUI") fires, posing an even higher risk to our first responders, residents, and infrastructure.

Today we are experiencing a shift in our natural fire regimes due to a multitude of anthropogenic factors, including man-made fires, increases in the wildland-urban interface, invasive species, and climate change. Since the 1970s the frequency and intensity of wildfires has increased across the United States, expanding from three million to an overwhelming eight million acres burned each year, with further increases projected.[1] A critical factor associated with wildfires is the current and continuing urbanization and the expansion of the wildland urban interface (WUI). As our region grows in the coming decades, decisions on where to locate future development and how to manage the WUI will determine our vulnerability and potential increases in wildfire risk.

There are now 44 million homes in 50,000 communities at risk within the WUI in the US, and the annual cost of WUI fires nationwide exceeds $14 billion.[2] California, not surprisingly, has the highest number of WUI housing units of any state (5.1 million). Expansion of the WUI is particularly alarming in California, where half of the twenty largest wildfires in California's recorded history have occurred in only the past decade. Many of these events have had an unprecedented physical and financial impact to the state.[3] For example, the 2003 wildfire event that consumed much of San Diego County cost the region nearly $2.5 billion. More recently, the 2008 wildfires in northern California burned over 1.2 million acres, destroyed over 500 structures, and killed 15 people.

Modern catastrophic wildfires are significantly different from the historic fire regime. Fires once started by lightning strikes or Native Americans would ignite smaller burn areas that created a heterogeneous vegetated landscape[4] whose patchiness created "natural fuel breaks" that prevented today's larger fire events.[5] Currently, only a fraction of the wildfires we experience in California are caused by natural events, with nearly ninety-five percent started by human activities. Future wildfire risk is not the exclusive result of human negligence or accidents. Rather, it highlights the concerns of firefighting agencies throughout the country: wildfire response and management must anticipate and adapt its practices and policies to deal with changing circumstances.

3.0 Problems with Modeling and Planning

With regard to traditional modeling, the type of data used to generate models is extremely important. Given the limited amount of weather data used and and lack of consideration for modern trends in wind, temperature, and precipitation patterns, the amount of error and uncertainty is a concern. With weather records covering a questionable temporal and spatial distribution, it is not clear whether the extent of the records used is sufficient to

[1] National Interagency Fire Center. 2007. Fire information: Wildland fire statistics, 1960-2006). Boise, ID.
[2] Nelson Bryner. 2012. National Institute of Standards and Technology, Wildfire Research Program. Personal Communication.
[3] Rahn , M.E. 2009. Wildfire Impact Analysis: 2003 Wildfires in Retrospect. San Diego State University. Wildfire Research Report No. 1. Montezuma Press. San Diego, CA.
[4] Bonnicksen, T. M. 2000. America's Ancient Forests: from the Ice Age to the Age of Discovery. John Wiley & Sons, Inc., New York. 594 p.
[5] Bonnicksen, T. M. and E. C. Stone. 1981. The giant sequoia-mixed conifer forest community characterized through pattern analysis as a mosaic of aggregations. Forest Ecology and Management 3(4): 307-328.

make decisions or inferences about historical climatology or determine long-term trends and future conditions. There is a meaningful need to assess the effectiveness of the Plan across a range of WUI community types and exposure conditions, as the assumptions for modeling must be meaningful, justified, and appropriate.[6] Overall, the modeling provided in the DEIR and supporting documents does not adequately address future conditions, nor does it address actual worst-case scenarios. As noted by the Wildfire Risk Analysis, the modeling conducted by Helix is deficient in its scope, characterization of the vegetative communities, fuel modeling, and weather data.[7] The DEIR needs to update its analysis to reflect our best understanding of wildfire modeling and a more realistic assessment of risk that addresses rate of spread, indefensible areas, and overall community hazards.

3.1 Fire Branding, Modeling, and Community Risk

The Fire Protection Plan asserts that "fires from off-site would not have continuous fuels across this site and would therefore be expected to burn around and/or over the site via spotting." The Plan further states that burning vegetation embers may land on structures, but are "not likely to result in ignition based on ember decay rates that would not impact the types of non-combustible and ignition resistant materials that will be used on site."[8] Yet the Wildfire Risk Analysis acknowledges that because branding may "travel a minimum of 1/4 mile and as much as 1 mile ahead, the entire proposed development site would therefore be subject to significant fire branding."[9] These statements are contradictory.

As demonstrated by post-fire assessments by the National Institute of Standards and Technology (NIST), it is simply not true that embers and fire brands do not pose a significant risk to the proposed community. In fact, some of the most recent and devastating fires in our communities, including the nearby 2007 Witch Fire, were the result of impacts from fire brands and spotting that ignited homes within the interior of the community, and in some cases left homes at the perimeter unscathed. Current concepts of defensible space do not account for hazards of burning primary structures, hazards presented by embers, and the hazards outside of the home ignition zone, which is a serious deficiency in identifying actual risk.[10]

The Fire Protection Plan asserts that the potential for "off-site wildfire encroaching on, or showering embers on the site is considered moderate to high, but risk of ignition from such encroachments or ember showers is considered low based on the type of construction and fire protection features that will be provided for the structures."[11] However, given our current state of understanding about wildfires and how embers and brands actually lead to structure loss, this is an unsubstantiated and spurious assertion. Hardening of structures (e.g. building homes with materials or design features that reduce fire risk) is just one factor in structure risk and ignition. It is well documented that the actual operations and management of the community is just as important with regard to wildfire risk.

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[6] Mell, W.E. et al. 2010. The wildland-urban interface fire problem – current approaches and research needs. International Journal of Wildland Fire. 19: 238-251.
[7] Rhode and Associates, 2016. Pg 3.
[8] Dudek. 2017. Fire Protection Plan. Harmony Grove Village South. Appendix L, Draft Environmental Impact Report, April 2017. Pg. 19.
[9] Rhode and Associates. 2016. Harmony Grove Village South. Wildfire Risk Analysis. April 2016. Pg. 13.
[10] Maranghides, A. et al. 2015. A Case Study of a Community Affected by the Waldo Fire. Nist Technical Note 1910.
[11] Dudek. 2017. Pg 27.

Examples throughout the recent literature show that even hardened structures can be lost when residents install ornamental landscaping, build attached decks, have outdoor furniture adjacent to the home, stack firewood next to the wall, allow plant material to build up in the eaves and gutters, or allow landscaping to dry out during droughts. These are just a few examples of how an average community functions. It is dangerous and irresponsible to assume that any community built in this area will maintain a level of vigilance, operations, and maintenance for wildfire protection; this level of dedication and oversight is simply improbable and unrealistic. Moreover, history has demonstrated time and again that any community placed within a high risk area can suffer catastrophic losses, regardless of planning, design, or best intentions.

In fact (and as described below), it is recognized throughout the DEIR, the Plan, and other supporting documents that portions of HGVS would not be adequately protected. According to the Wildfire Risk Analysis, many of the existing properties in the area "generally lack defensible space" or safety zones and are "likely un-defendable" against critical fire behavior. In addition, the loss of these homes could "significantly contribute to fire intensity and fire branding," resulting in an estimated 15% of the homes being indefensible.[12] In addition, the report states that there exists critical exposure to chaparral fuels across two-thirds of the HGVS project site, creating a risk of impacts from direct flame, radiant energy, and heavy branding on the Project site.[13] The DEIR is obliged to evaluate and analyze the impacts of the Project, identify feasible measures to minimize, and mitigate the risks of severe fire, and consider alternatives that would reduce any significant impacts from the Project rather than just provide a triage of anticipated and acceptable losses. The Risk Analysis fails to meet this mandate and only further highlights how at-risk this community actually is and that losses are expected, if not inevitable.

The modeling for the Project's fire hazard impacts does not adequately characterize the structure exposure conditions (heat flux from flames and firebrands generated by burning vegetation or burning structures) for a range of WUI fire settings (e.g. housing density, terrain, vegetative fuels, winds, wildland fuel treatments). The Plan is also deficient in failing to assess the vulnerability of structure design and proposed building materials when subjected to a given level of exposure or wildfire incident. Not all materials are rated the same and not all materials have been put through appropriate testing and rigorous assessments by which to compare benefits (if any) of the design elements or materials chosen.

According to the National Institute of Standards and Technology (NIST), there is an urgent need to conduct a systematic, science-based, research effort to characterize how wildland fuel treatments alter the fire behavior, firebrand, and smoke generation from wildland fires. This must be done for wildland fires[14] and WUI communities,[15] and unfortunately has

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[12] Rhode and Associates, 2016.
[13] Rhode and Associates, 2016. Pg. 12.
[14] Carey H, Schumann M (2003) Modifying wildfire behavior – the effective- ness of fuel treatments, the status of our knowledge. National Community Forestry Center, Southwest Region Working Paper 2. Available at
http: // maps.wildrockies.org / ecosystem_defense / Science_Documents/
Carey_Schumann_2003.pdf

not been assessed for this Project. No real effort was made to address or quantify community exposure to ignitions from firebrands for this Project. Firebrands, from both vegetation and structures, are often a major source of structure ignition in WUI fires.[16] NIST has been actively engaged in WUI/firebrand research; results from this research should be included in modern planning. This is particularly important for the Project, since the majority of houses lost during local fires were not from direct flame contact, but rather from the intrusion of embers driven by winds.

Current wildfire research supports the need to augment and improve existing modeling and actual causes of structure loss as a high priority. Recently, NIST conducted a post-fire study of a community burned by the nearby Witch and Guejito fires during the October 2007 southern California firestorm.[17] Those fires destroyed 30% of the structures within the fire line, 40% of the structures on the perimeter (in closest proximity to wildland fuels), and 20% in the interior were destroyed. Firebrands were responsible for at least two out of every three structures lost. More worrisome is that the fire during this event spread up to 500 meters into the interior of the community. This demonstrates the importance of modeling for firebrands and of implementing protection measures during the planning process rather than relying solely on heat flux radiation or direct flame contact. Understanding the impact of firebrands and embers is a serious consideration for modern planning, and our current understanding of the causes of structure loss should be incorporated into the DEIR and supporting documents. This is particularly important for this Project, as much of the most insightful research on this topic was conducted on 2007 fires near the Project site.

3.2 Inadequate Emergency Access and Evacuation

The Fire Protection Plan states that secondary access for the project site is infeasible, citing challenges with biological resources, topography, and land-owner agreements/easements. Secondary access is not something that can be dismissed due to logistical constraints – it is a development standard for very important reasons. For example, the National Fire Protection Association 2016 standards provide guidelines for disaster planning, mitigation and evacuation, with experts roundly stressing that people should have multiple evacuation routes, if possible, as fire conditions can change rapidly.[18] Similarly, as described in the Plan, local and state standards emphasize multiple access routes for communities in high risk wildfire areas.[19] Ignoring this long-established and necessary requirement may potentially be acceptable in areas with low risk, but extreme fire risk areas, such as the HGVS site, should arguably never be approved without adequate secondary access.

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[15] Mell et al.
[16] Maranghides A, Mell WE (2009) A case study of a community affected by the Witch and Guejito fires. National Institute of Standards and Technology, Technical Note 1635. (Gaithersburg, MD) Avail- able at http://www2.bfrl.nist.gov/userpages/wmell/PUBLIC/TALKS_PAPERS/NIST_Witch_Fire_TN1635.pdf [Verified 22 February 2010]
[17] Maranghides and Mell.
[18] National Fire Protection Association. 2016. 1600-Standard on Disaster/Emergency Management and Business Continuity/Continuity of Operations Programs.
[19] California Building Code (Chapter 7a) and County of San Diego Consolidated Fire Code (2014).

A single access road is also problematic because such access does not allow efficient and safe movement of residents out of the area in a timely manner. With an estimated 1,500 to 1,800 vehicles (for just this community – depending on the analysis and report cited) attempting evacuation during a wildfire, a best-case evacuation time would take at least one hour and thirty minutes.[20] Given that the modeling predicts that wildfires can result in spread rates of 17 mph, the development and its evacuation route can become encircled by a wildfire in less than five minutes. Moreover, wind speed and direction of wildfires can change in unpredictable and rapid ways (something that is not accounted for in traditional modeling or this risk assessment).

It is widely recognized that evacuations can result in traffic jams, traffic collisions, nervousness and panic, which can cause harm to people during fire events and result in a breakdown of the best designed plans. Evacuation is further complicated when having to evacuate large and small animals and residents with special needs. The DEIR as well as supporting documentation should be revised to address these issues. The DEIR should also include a comprehensive worst case evacuation scenario accounting for the total time that would be required to evacuate the entire surrounding community that ultimately uses Country Club Drive to Auto Park Way that addresses the population of Harmony Grove, Eden Valley, Hidden Hills and Elfin Forest. Unfortunately, none of this analysis was performed in the DEIR.

Widening the road should be discussed not just for the section contemplated in the DIER, but also to ensure that residents are able to get "all the way out" to safety. It is not enough to simply address widening the section of road directly at the point of egress from the proposed development without a comprehensive analysis of broader evacuations and potential needs for extending the road widening to ensure full evacuation. Furthermore, direct flame impingement, radiant heat, heavy smoke, and limited visibility can significantly contribute to evacuation breakdowns. Having a single point of entry/exit only exacerbates an already tenuous and dangerous situation. Given the propensity of both interior and perimeter homes to ignite during a wildfire, excessive evacuation times, and single evacuation route, the potential for catastrophic losses cannot be overlooked.

Compounding the community emergency response and overall risk is the applicant's request that the County approve a modification of the dead end road length rules in County Fire Code section 503.1.3. Again, the request is being made because of the alleged constraints due to topography, geology, and environmental conditions that make this infeasible (although the request appears to also be driven by a lack of agreement with landowners for access and easements). The standards of care regarding maximum dead end road lengths are established to ensure adequate opportunity for emergency vehicle access, turn around, and ease of evacuation. The fact that there are alleged conditions that may make meeting the existing regulations unattainable only emphasizes the unsuitability of this location because public safety and community protection cannot be assured. Ultimately, failure to secure secondary access results in significant Project-related impacts

[20] Dudek 2017.

related to wildfire hazards and public safety the extent of which have been inadequately addressed and mitigated in the Fire Protection Plan and DEIR.

It is worth repeating: the proposed modifications to currently acceptable standards related to dead end roads and evacuation routes have never been adequately tested or evaluated under real-world scenarios. The current standards exist for a reason and modifications should only be approved if it can be clearly demonstrated that they meet the intent of the code. The DEIR and the Plan provide no empirical evidence to demonstrate that the proposed measures provide the same or higher levels of community protection and safety during an emergency as the required secondary access. The following issues highlight the faulty assumptions made in asserting the mitigation measures meet or exceed existing code and should therefore be approved as meeting the intent of the code:

- The third travel lane provides a widened road, but simply widening a road does not address issues where the only way to enter or exit the community is limited by unforeseen factors including fire impingement, vehicle collisions, etc.
- While fuel management zones are an important aspect of community protection, the plan still fails to address fire embers and branding that enter the community during a wildfire
- Current research has shown that ember resistant vents provide limited protection during a wildfire. Reducing the size of the mesh can simply cause the embers to burn down to a smaller size before entering the attic, and can still result in a structure ignition.[21] In fact, current ASTM standards for vents do not address the ability of these vents to completely exclude entry of flames of firebrands.[22] And while requiring 1/8th inch vents screening (rather than ¼ inch) seems to improve protection, no clear evidence suggests that this is the case, and has the problem of adding a maintenance burden on the homeowner (related to clogged vents, over spraying and clogging during painting, etc.).[23]
- While increasing parking within the community may assist in minimizing potential obstructions and emergency vehicle access, it does not contribute to addressing the single access road issue. Furthermore, restricting parking may seem like a good idea, and while there may be requirements for single residence events over 10 persons to park off site and shuttle to the residence, a serious parking situation could occur when several homes (on a holiday for instance) all have up to nine visitors, and avoid parking mitigation measures yet still create a dangerous situation for emergency vehicle access and community evacuation.
- Restricting landscaping adjacent to structures 1-3 feet away is another untested strategy to reduce risk. In fact, any vegetation adjacent to the home would still carry flame lengths sufficient to ignite the wall, particularly during a wind driven fire.

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[21] Manzello SL, Park SH, Suzuki S, Shields JR, Hayashi Y. Experimental investigation of structure vulnerabilities to firebrand showers. Fire Safety Journal 2011;46: 568-578.

[22] ASTM Standard E2886/E2886M – 14, 2014, "Standard Test Method for Evaluating the Ability of Exterior Vents to Resist the Entry of Embers and Direct Flame Impingement," ASTM International, West Conshohocken, PA, 2014.

[23] Quarles, T. and TenWolde, A. 2004. Attic and Crawlspace Ventilation: Implications for homes located in the Urban-Wildland Interface. Woodframe Housing Durability and Disaster Issues Conference, Las Vegas, NV.

- Structure spacing and density is widely recognized and a critical component in WUI fires, influencing how firefighters can respond. Community design can significantly reduce effectiveness and their ability to respond quickly to stop fire spread in a community. As with so many protection plans, no empirical evidence or evaluation is provided to address defensibility from structure to structure fire spread, or defensibility from dangerous topographic configurations. Further, the DEIR and Fire Protection Plan provide no clear evaluation or analysis to identify exposure and structure vulnerabilities, including an assessment for high and low fire and ember exposure risk, nor are the fuel treatment standards assessed to quantify exposure reduction for different topographical and weather conditions.

3.3 Shelter in Place

Recognizing that there may be serious deficiencies in ingress/egress during an emergency, the planning documents for Harmony Grove discuss a "shelter in place" philosophy for the community. In fact, the Wildfire Risk Analysis states that the shelter in place requirement is "derived primarily from either high intensity wildfire threats to escape routes, or the rapid onset of high intensity wildfire which denies civilians an opportunity for escape."

While this is seen as a last resort option, confusingly the community is not seeking an official shelter in place status. Arguably, the standards for obtaining this status are significant, and likely are triggered when there is no other option available to the community. However, as a newly planned community, appropriate evacuation options should be designed into the project. The community center building is proposed as an evacuation center, yet again the Plan and DEIR acknowledge that is it not actually "planned as an evacuation center."[24] While this may seem to be a suitable option, the risk that the facility, like all others within HGVS, may ignite due to fire brands or ignition by adjacent structures is not adequately addressed.

Shelter in place is not only a dangerous strategy, it has a long history of catastrophic failures and can be terribly tragic. In 2009, wildfires in Australia cost the lives of 173 individuals who chose to stay in the community rather than evacuate. The results of a review by the Royal Commission asserted that abandoning the philosophy entirely is not appropriate, yet the policy should not apply in severe fire conditions, stating that leaving early is still the safest option, and there needs to be an emphasis on education and qualifications for those that stay behind.[25]

In contrast, the DEIR emphasizes a shelter in place scenario during the most extreme conditions. While we refer to this philosophy as "shelter-in-place" in California, communities like those in Australia use the "Stay and Defend" terminology. A significant distinction between these two philosophies highlights the challenges in adopting and promoting this community protection standard. Unlike shelter-in-place, stay-and-defend connotes residents actively patrolling the community, putting out small spot fires, keeping rooftops and vegetation wet, and potentially combating actual fires. The issue is that

[24] Dudek 2017. Pg. 39.
[25] http://www.nfpa.org/news-and-research/publications/nfpa-journal/2011/september-2011/features/stay-or-go

residents lack the proper training, equipment, and resources necessary, giving a false sense of security and faulty assumption that homeowners are as capable as firefighters. Another key distinction is that a shelter-in-place strategy may place residents at risk if (for instance) entry by first responders into the community is cut off or significantly delayed. In that scenario, homes are then at risk for catching on fire and having fire spread throughout the community as the homes have been largely left unprotected and un-monitored.

The simple fact that this Project is even contemplating a shelter-in-place option (due to threats along evacuation routes among other factors) only serves to highlight the risk to the proposed Project area and the existing community; it is an acknowledgement that evacuation may not only be infeasible, but impractical in certain (unspecified) conditions. Given the propensity for fire branding and the spread of fire within the community, shelter-in-place is even more worrisome. Additionally, current research on smoke exposure and the significant health risks associated with fires within the WUI places residents in a serious situation where the short term benefits of sheltering in place are potentially outweighed by the long-term risks associated with cancer, respiratory, and cardiac issues. Those engulfed in WUI fires are exposed to unsafe levels of high-risk contaminants including trace metals, polycyclic aromatic hydrocarbons (PAHs), benzene, carbon monoxide (CO), nitrogen and sulfur oxides, cyanide, volatile organic compounds (VOCs), airborne acids, and particulates. When extreme physiological conditions exist in an environment where ambient heat, smoke, and high-risk exposures are commonplace, a WUI fire can exceed the limits of what the human body should withstand. The DEIR fails to evaluate these impacts.

Furthermore, under this plan, the DEIR and the Wildfire Risk Analysis acknowledge that extreme wildfire events may require those who shelter in place to "reposition" themselves during an incident to avoid radiant heat.[26] Not only are individuals in this scenario not adequately prepared to protect themselves from the threats of radiant heat (among other risks), but they are also being asked to know when to move and respond to changing circumstances and safely navigate what is arguably one of the most intense and risky environments on the planet. This is a dangerous strategy and a substantial expectation of residents that could have extreme consequences on the health and welfare of the community.

4.0 The Future of Wildfires

4.1 Climate Change

There is consensus within the scientific community that climate change will generally increase fire risk due to its effects on fuel loads and weather,[27] and in fact we have seen a dramatic shift in the frequency and intensity of wildfires throughout North America. Shifting climatic conditions and land use change are combining to produce more frequent

[26] Rhode and Associates 2016. Pg 16.
[27] Moritz, M.A. and S.L. Stephens. 2008. Fire and sustainability: Considerations for California's altered future climate. Climatic Change (2008) 87 (Suppl 1):S265–S271

and intense wildfires while also expanding the overall annual wildfire season.[28] California is considered a climate change hotspot likely to experience higher than average impacts when compared to the rest of the United States.[29] In fact, we may already be seeing these effects. Compounding this risk is the prediction that large fires (defined as 500 acres or more) will increase nearly 35% by 2050, and an alarming 55% by the end of the century.[30] If our population expands into and increases the WUI, there is a concomitant increase in the probability of property losses due to wildfires. All of these high risk factors describe the HGVS Project.

4.1.1 Temperature Changes

Climate change has broad implications for wildfires, spanning both the physical and natural environment. Recent research suggests that regional temperatures in California may increase from 1.7 C to 5.8 C by 2100, depending on the climate model used and the emissions scenarios assumed.[31] This of course leads to an increase in the number of days of high or extreme fire risk (as assessed by CAL FIRE in their daily wildfire risk warning system). In fact, recent research suggests that the fire seasons are already longer than they were historically.[32]

4.1.2 Changes in Wind

As identified in the Plan, fires in the area were historically wind driven. In the modeling of the planning area, winds were calculated at variable speeds up to 50 mph. Ultimately the fire season is predicted to become longer in California, with predicted increases in the number of Santa Ana wind days under future climate scenarios.[33] Therefore, wind driven fires are predicted to change in the future. Wind modeling can assist fire managers in estimating local wind patterns and the potential for wind-based increases in fire spread rate and intensity.[34] Recurrent wind patterns, such as those that arise during Santa Ana wind events, can be modeled to help identify local areas that have high potential for Santa Ana wind-based increases in fire spread and intensity. Unfortunately, the limited analysis performed to evaluate this Project introduces considerable uncertainty into efficacy of the mitigation measures and the Fire Protection Plan.

The ability to model fire intensity spread is of utmost importance in planning. However, the planning process is only as good as the modeling used and the availability of suitable data. Without this, creating hazard maps and identifying indefensible areas is problematic. Given what we know about wind modeling and the lack of empirical data for the HGVS planning area, there are inherent problems for developing an effective fire plan for the HGVS project. The lack of data can lead to a serious misrepresentation and underestimation of onsite conditions, wind events, temperature, and fuel moisture. Planning done under this scenario can lead to an inaccurate model that does not truly represent onsite conditions. When it

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[28] A.L. Westerling, H.G. Hidalgo, D.R. Cayan, and T.W. Swetnam, *Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity*, 313 Science 940 (2006).

[29] Diffenbaugh, N. S., F. Giorgi, & J.S. Pal (2008). Climate change hotspots in the United States. Geophys. Res. Lett. 35: L16709.

[12] Westerling, A, et al. 2006. Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity, 313 Science 940.

[31] D. Cayan, A. L. Luers, M. Hanemann, G. Franco, and B. Croes, *Scenario of Climate Change in California: Overview*, CEC-500-2005-186-SF (2006).

[32] *Id*.

[33] Running, S.W., 2006. Is Global Warming Causing More, Larger Wildfires? Science 313: 927-928.

[34] Butler, B.W., M. Finney, L. Bradshaw, J. Forthofer, C. McHugh, R. Stratton, and D. Jimenez. 2006. WindWizard: A new tool for fire management decision support. USDA Forest Service Proceedings RMRS-P-41.

comes the health and safety of the HGVS residents, it is important to either provide the type of project-specific data needed, or introduce significantly larger estimates of uncertainty in establishing larger buffer areas for community protection and mitigation measures.

4.1.3 Changes in Precipitation

Most studies suggest that there may be considerable changes in inter-annual and decadal fluctuations in precipitation.[35] Studies also suggest that the availability of water for vegetation communities will be significantly reduced during the dry seasons (spring through fall) leading to decreased fuel moisture and increased fire risk.[36] Live fuel moisture, an important determinant of fire danger in southern California's Mediterranean climate, is affected by environmental variables such as late spring rain delay and dry winters.[37] There is an increasing trend in regional drought dieback, with increased fuel loads creating firestorm conditions throughout southern California.[38] For the Project area, historic (and future) drought conditions contribute to an increase in dead fuels, which in turn leads to dryer and more explosive fuels. However, this information is not integrated into the DEIR or the supporting technical documents.

4.1.4 Succession and Invasive Species

Modeling fuel treatment effectiveness is one of the most difficult aspects of fire planning. It requires the modeler to make assumptions about the future conditions of fuels and vegetation structure, which is difficult at best. This analysis however is critical to the plan itself. It is therefore extremely problematic that the analysis here relies on existing vegetation conditions and fails to address that as succession occurs, how future habitat conditions may pose significantly higher risks for the community than what was is currently modeled.[39] Therefore, it is not clear what future states of the vegetation community will look like or how that influences community risk.

It is also not clear how problem invasive species (with a high fire risk) will impact the area in the future. In particular, nonnative grasses, herbs, and forbs pose a significant threat. While the Fire Protection Plan recognizes the impacts of invasive species, it does not provide suitable analysis or mitigation for this problem. For example, some insect species instigate high fire risk conditions. Vegetation mortality from insects and pathogens can become a significant contributor to wildfire risk.[40] Insect infestations and pathogens are predicted to increase as a direct result of changing climate.[41] This occurs because future climate scenarios may actually enhance the survival and spread of invasive species and reduce vegetation health, thereby making the vegetation community more susceptible to damage or disease.[42]

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[35] Cayan.
[36] Westerling.
[37] Dennison, P.E., D.A. Roberts, S.R. Thorgusen, J.C. Regelbrugge, D. Weise, and C. Lee. 2003. Modeling seasonal changes in live fuel moisture and equivalent water thickness using a cumulative water balance index. Remote Sensing of Environment 88(4):441-442.
[38] Franklin, S.E. 1995. Fuel management, fire behavior and prescribed burning. In: Brushfires in California Wildlands: Ecology and Resources Management. Edited by J.E. Keeley and T. Scott. International Association of Wildland Fairfield, WA.
[39] Dudek 2017. Pg. 28.
[40] Logan, J.A., Régnière, J., Powell, J.A. 2003. Assessing the impacts of global warming on forest pest dynamics. Front Ecol Environ 1(3): 130–137.
[41] Joyce, L.A., et al., 2008. National Forests. In: Preliminary review of adaptation options for climate-sensitive ecosystems and resources. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research, U.S. Environmental Protection Agency, Washington, DC, USA: 3-1 to 3-127.
[42] USDA Forest Service, 2007. California Forest Pest Conditions – 2007, California Forest Pest Council.

Climate change is also likely to augment the spread of invasive species, which is already occurring in the planning area and surrounding habitat. This can occur when the normal disturbance regimes under which the native community evolved are altered. Throughout the western United States, we have witnessed the spread of invasive species, particularly grasses, which change the fire frequency and intensity and shorten the return interval of fires. This results in a feedback loop where wildfires advance the spread of invasive species, ultimately leading to a type-conversion of the habitat to a nonnative dominated ecosystem.[43,44] Therefore, what was modeled in the DEIR and supporting documents was not the worst-case scenario, but one based largely on existing conditions.

In sum, the DEIR relies on a faulty model which yields a faulty analysis and inadequate mitigation.

4.2 Changes in the Causes of Wildfires

While historic fires were generally recorded under wind events, future fires will likely not be exclusively wind driven. Given recent trends and possible changes due to a myriad of interrelated factors such as climate change, succession, and invasive species, there may be a concomitant increase in both human-caused fire events and lightning-caused wildfires. These scenarios are not addressed in the DEIR or the Plan. For example, human-caused ignition events are predicted to increase with population.[45] This is exacerbated by the prediction that there will also be an increase in the frequency of lightning as a result of climate change.[46] This, of course, has direct implications for the risk of wildfires that we are already experiencing.

In 2008, over 2,000 wildfires were started by over 6,000 dry-lightning strikes in Northern California. The record number of lightning strikes and extreme drought conditions created catastrophic conditions that burned nearly 1.2 million acres, destroyed over 500 structures, and killed 15 people.[47] It is assumed that climate change is stimulating this change, and may bring lightning-caused fires to areas in quantities never seen in recorded history.[48] Adding additional homes to an already burdened fire district adds the potential for an increase in human-caused fire events. It should be noted that this is not just in reference to arson. Most wildfires today are the cause of human negligence or accidents from vehicles, heavy equipment, lawn care equipment, etc.

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[43] Klinger, R. C., M. L. Brooks, and J. M. Randall, Fire and Invasive Plant Species, in Sugihara, N. G., J. W. van Wagtendonk, K. E. Shaffer, J. Fites-Kaufman, and A. E. Thode (eds). 2006. Fire in California's Ecosystems. University of California Press.
[44] Harrison, S., B.D. Inouye, and H.D. Safford. 2003. Ecological heterogeneity in the effects of grazing and fire on grassland diversity. Conservation Biology 17:837-845.
[45] Syphard, A., V. Radeloff, J. Keeley, T. Hawbaker, M. Clayton, S. Stewart, and R. Hammer. 2007. "Human influence on California fire regimes." Ecological Applications 17:1388– 1402.
[46] Price, C., 2008. Thunderstorms, Lightning and Climate Change. in Lightning - Principles, Instruments and Applications, ed. H.D. Betz, Springer Publications.
[47] http://www.fire.ca.gov/index_incidents_overview.php
[48] http://www.usnews.com/science/articles/2010/04/21/an-arctic-with-fire.html

5.0 Conclusion

Wildfires are a predictable occurrence, and will happen again. Even with best practices and mitigation measures, wildfire hazard risk to the proposed HGVS development and to existing and future residents in the area would be significant. In fact, there is a high likelihood that the community could suffer catastrophic losses to structures, infrastructure, and poses a considerable risk to public safety, community resilience, and the safety of first responders. Like most of southern California, wildfire events that threaten HGVS can occur under the most adverse environmental conditions, and (if recent fire history is a guide) can likely occur during times of a regional fire siege of multiple large fires. Under an extreme (yet all too common) fire siege, the number of first responders and resources required to be assigned for adequate structure defense at HGVS may be deficient. While mitigating the need for resource deployment is a laudable goal, the extreme risk to this proposed community and the surrounding area is undeniable, and places a significant burden on area residents, forcing them to make critical decisions (without adequate training) that can be consequential to their safety and survival during a wildfire.

The analysis of fire risks and mitigation measures for the Project is based on faulty modeling, which led to a faulty analysis and unsubstantiated conclusions and recommendations. No clear evidence is provided that a secondary access is infeasible or that the proposed measures are a superior option. This is not how communities should be planned today – it was how we did it things in the past, and we saw the catastrophic results of those bad decisions. Rolling back our planning process and standards for this Project is not justified.

It is alarming to see that the solution to a regional fire siege threat is to rely on untested strategies designed to reduce the need for resource deployment for structural defense, while also ignoring many of the time tested measures that are known to provide adequate protection (e.g. multiple access roads and dead-end road standards). Despite the assertion throughout the DEIR and supporting documents that the Project design and proposed mitigation measures will provide adequate community protection, the DEIR provides no evidence to support this conclusion. With no significant empirical evidence to support the effectiveness of the proposed measures, the Project will regrettably become an experimental community, designed to test whether certain features can improve community resilience and public safety. The consequences of this approach could be tragic.

The County has a responsibility to be prospective and protective in its planning decisions, particularly when they involve high fire risk areas like the Project site. The Project should include an adaptive management framework that provides for the flexibility to anticipate issues such as changes in extreme climate conditions and heightened wildfire risk (at a level informed by the best available science). While, advancements in our understanding of fire risks lag behind community planning and risk assessment needs, this is no excuse for placing a community in a high risk area with inadequate and untested protection measures. A lack of critical information and understanding in this area creates a situation in which pivotal land use decisions are made based on such malleable factors as public perception or budgetary constraints.

Regardless of analysis used or the models evaluated, it must be remembered that these are simply tools that are meant to provide information to assist in making an informed decision. We must remember that these tools are fraught with considerable uncertainty. Ultimately, the decision to approve a development is based on the level of risk that we are willing to accept for a community. Ideally, decision-makers should operate under the precautionary principle that states: "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."[49] Failure to adhere to a "caution is best" approach can have serious repercussions on the long-term sustainability and resilience of our neighborhoods and the success or failure of community planning.

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[49] The most widely cited definition of the precautionary principle comes from the Wingspread Statement on the Precautionary Principle, 1998.