American Institute of Architects-Santa Barbara

Case Study

Executive Summary

Thomas Fire
Montecito Debris Flow

Community Recovery Team

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Principal Editor

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Case Study

Executive Summary

Thomas Fire (December 2017) and Montecito Debris Flow (January 2018)

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American Institute of Architects

Santa Barbara

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Disaster Summary

The Thomas Fire was a massive Santa Barbara and Ventura county wildfire and one of multiple wildfires that ignited in southern California in December 2017. The Thomas Fire burned approximately 281,893 acres (440 sq mi; 114,078 ha) before being fully contained on January 12, 2018; making it the largest wildfire in modern California history at the time. Immediately upon the heels of the Thomas Fire, in the early morning hours of January 9, mudflows struck the Montecito community, which had been affected by the Thomas Fire area, and other areas of Santa Barbara county, fueled by a freak high intensity rain event during the night before. An estimated 0.5 inches (13 mm) of rain fell within a five-minute period at approximately 3:30 a.m., causing mud and boulders from the Santa Ynez Mountains to flow down creeks and valleys that reach into the community of Montecito on their way to the Pacific Ocean. What started as mud flow became debris flows that were up to 15 feet (5 m) in height of mud, boulders, trees and eventually cars, houses and public infrastructure, moving at estimated speeds of 20 miles per hour (30 km/h) into the lower areas of Montecito. Over 20,000 people lost power, and a 30-mile (50 km) section of U.S. Route 101 (US101) and the railroad from Santa Barbara to Ventura was paralyzed as sections filled with two feet (60 cm) of mud and debris, some of which also reached beaches 2.25 miles (3.6km) from the mountains.

The established emergency response system, taxed from dealing with the Thomas Fire, were overwhelmed when the debris flow on January 9, 2018 occurred. First Responders were still dealing with post Thomas Fire issues and in an instant begin dealing with thousands of residents trapped, injured and those who parished. The true scope of the disaster was not realized until day break later than morning.

The Santa Barbara Chapter of the American Institute of Architects (AIA|SB) answered the call when the County of Santa Barbara asked for help in the recovery process. This effort initially started with helping the County to navigate the re-writing of the emergency "rebuild ordinance" to allow for relocation of distoryed or damaged houses away from water drainage courses. The formation of the *Community Recovery Team* (CRT) began with just a few design professionals, but quickly grew to more than 60, comprised of a wide variety of professionals (See complete list on page 18). CRT efforts consisted of public workshops and direct interaction with affected property owners, County staff, and elected officials. Its work continues nearly three years after the events of January 9, 2018. CRT's efforts are scalable to any disaster that effects property and the built environment. With the impacts of these two disasters affecting two counties, and thousands of people, and hundereds of structures, the CRT required an organized system for managing meetings (community and professionals), information and event content. This Case Study details the Thomas Fire and Montecito Debrief Flow events, and how AIA|SB helped in the recovery, applied design thinking to guide rebuilding efforts, and supported local officials in the recovery process . This Case Study also points out the unique challenges faced in rebuilding in areas prone to debris flow and flooding.

AIA Chapter Response

AIA|SB Community Recovery Team (CRT)

On Wednesday, January 17, Santa Barbara County opened a Local Recovery and Assistance Center (LRAC) to serve as a centralized, single point location for essential resources and services to help community members recover and rebuild. Representatives from various local, state and federal agencies provided counseling support, resource and housing assistance, information to aid in rebuilding, permitting, hazardous materials clean-up, loss of business or employment, basic health and human services, and other services. A number of local private-sector organizations were invited to participate in the LRAC, including the American Institute of Architects-Santa Barbara Component (AIA|SB). Tandum to this effort, AIA|SB had already planned and scheduled a training class for local Disaster Assesement certification through the California Office of Emergency Management. Following this one-day training class, the County

Architect arranged for the class to tour the activated EOC. During this tour, class participants were invited to an improtu meeting with EOC leadership during which the architects were asked what they though local government should do in the recovery process. The idea of the Community Recovery Team (CRT) was born out of this impromtu session.

In addition to providing permitting and rebuildings advise, AIA|SB was asked to assist local County Government with the broader issue of rebuilding a community in a more resilient way. AIA|SB answered the call and rose to the challenge by establishing a multi-discipline professional team comprised of archtiects, structural/civil/geology engineers, land planners, landscape architects, permitting agencies, cultural resource experts, researchers, geomorphic experts, soils engineers, land surveyors, mental health professionals, county executives, contractors, and media professionals: the AIA|SB Commuinty Recovery Team (AIA|SB CRT). The efforts of the CRT were coordinated by the Santa Barbara County Architect, waring his dual hat of both County Architect (and then) Vice President of AIA|SB.

The CRT quickly grew from a hand-full of members to over 60 professionals in the span of just a few weeks from the first call to action issued by the Santa Barbara County Executive Office to AIA|SB. The CRT began meeting weekly to facilitate getting the entire team up to speed on the scope of the events and to stratigize a plan of support. In an effort to manage the efforts of the CRT, a CRT-Steering Committee was created. The CRT Steering Committee is comprised of County Planning & Development executives and key AIA|SB members. Through the CRT Steering Committee the work of the larger CRT group was more focused on particular topics each time the larger CRT met, like: location of rebuilt houses; creek management; public outreach, and community workshops.

Initial First Steps

Visit the field, connect with local government, and establish an identity.

A critcal, first task was to facilitate the entire CRT getting up to speed on what were the current ground conditions. To accomplish this, a tour of the most affected areas of the disaster zone was scheduled and coordinated through the Montecito Center for Preparedness, Recovery and Rebuilding, a newly formed activity of the OEM. Professionals in the geoscience space, call this "ground truthing." A vidoe team traveled with the carvan of vehicles to record the event that began with a briefing at the Santa Barbara County Administration Building prior to departure.

That video can be seen online at: https://www.dropbox.com/s/b8hpmtvpa3hcn0u/Montecito%20Tour--Video-iPhone.m4v?dl=0 .

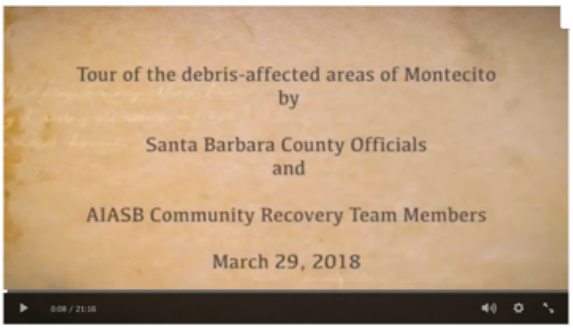


Figure 1: AIASB CRT Logo.

Another critical first step was to assist the County Planning & Development Department with identification of drawing resources that could demostrate pre-disaster built improvements to impacted property. Fortunately for Santa Barbara County, AIA|SB has maintained a drawings archive of permitted development since 1975. The AIA|SB Architectural Archive is among few community resource made available to property owners and project architects of permitted drawings (http://aiasb.com/archives/) in the country. After receiving a list of impacted properties from County Planning & Development, indicated by level of damage (Green/Yellow/Red tagged) and organized by permit number. That list was imported into a database application for organization by Assessor Parcel Number or Street Address. These property lists were used by a sub-group of CRT Members who spent a weekend gathering what drawings were available from archive resourses. What AIA|SB CRT returned to County Planning & Development (P&D) was an image of each drawing correlated to permit numbers. This information aided the P&D staff to approve reconstruction requestes in a much more effective manner.

Figure 2: CRT Mobilized for tour of disaster area.

The mission of the AIA|SB CRT is to help the community in the recovery efforts and facility the boarder conversation of rebuilding in a more resilient sustantable way.

Recovery/Rebuilding

Like many permitting jurisdictions, the ability of an impacted property owner who has sustained damages as a result of a disaster to rebuild is governed by the community bulding and zoning laws. California is unique in its approach to community planning and zoning, and its disaster mitigation planning. Development is regulated by community plans or general plans. These documents are translated into zoning codes and development standards that regulate how, where, and when development occurs. The hazard mitigation planning is contained in a Hazard Mitigation Plan, and in the case of Santa Barbara, a Multi-Juridiction Hazards Mitigation Plan. Unfortunately none of these documents study or plan for events like those in this Case Study.

Revising County "Like-for-Like" Zoning

The permiting and zoning rules exist to promote public safety, and facilitate the development process. They tend however, to be restrictive. For many of the affected property owners the existing codes would not allow for them to rebuild or to make improvements that did not match what was on the land before the disasters. However, the current codes do provide for a case-by-case review which gives the Planning Director flexibility in the rebuild effort. What complicates this process is that the affected area is within the California Coastal Zone, restricting rebuilding even more. Getting the current codes revised, and relaxed required both the California Coastal Commission and the County Board of

Figure 3: Santa Barbara County Board of Supervisors hearing on rebuild ordinance.

Supersivors to adopt an alternative set of rules. Mostly these "relaxed" rules would allow rebuilding in the same location, with the same (or very slightly modified) size and like materials. This method works well for rebuilding in anything but a debris flow event. Santa Barbara architects had experiene using a "like for like approach" for structures destroyed in previous fire events. As discussed previously, the one major difference with a debris flow is that the terrain levels can change dramatically. Where there was once a creek, is now fill-in land and where there were once solid ground, is now a creek. Where the ground elevation at the corner of pre-event building pad might have been 100 feet about sea level, is now 112 feet above sea level. Rebuilt structures can be relocated on their lots to meet top-of-bank setbacks, and can be built higher to comply with new base flood elevations

Clearly, some flexibility was required in the "Like-for-Like" rules. Fortunately, the P&D staff already figured this out and asked the AIA|SB CRT to help them communicate this to both discision makers and the community. AIA|SB CRT mobilized to pursaude County leadership to adopt the revised "like-for-like" zoning rand design review ules. Five months after the event, a special ordinance was adopted by the Board of Supervisors.

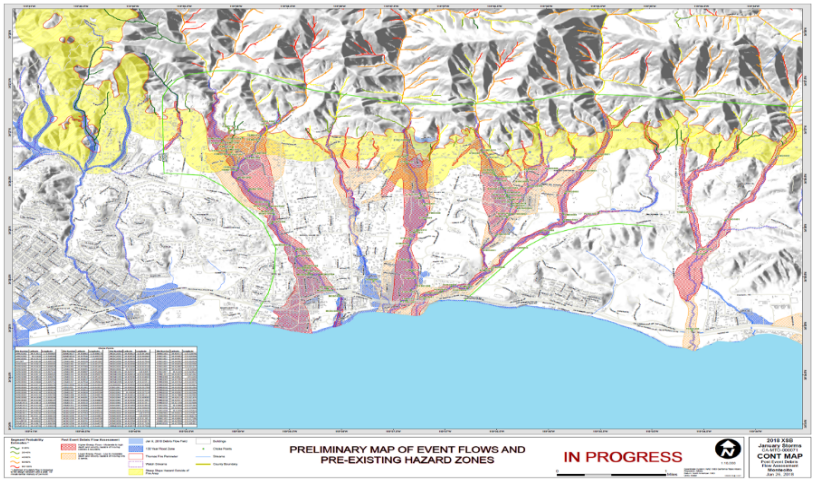


Figure 4: Map provide by County EOC indicating debris flow areas.

Neighborhood Thinking

Among the many skills architects bring to the recovery table, is the ability to "system-think". To facilitate this organizationaly thinking, the County EOC provided a map that indicated the affected parcels (by color code) and the boundary of the debris flow. CRT members then defined micro-neighborhoods on this map. This map created managable deliniated areas for support teams to work within. The groupings were based upon proximity and similar damage conditions. Once this mapping was completed and agreed upon by CRT, teams were assigned, first by volunteer, then by direct assignment of the County Architect for those micro-neighboods without an assigned team. Each team was comprised of a lead architect, support architect, landscape architect; and for the larger areas, a land planner. Other disciplines were available to all teams as roaming support that included: soils, civil and structural engineers, land use planners, mental health, and media professionals. The hardest hit micro-neighborhoods are Area 2 & 3 (making up the majority of lives lost), and Area 9 (with the broadest amount of physical damage). Each Area Team set out to connect with all of the residents in that area, assess the scale, and scope of damage, and begin working with that area as a group in recovery planning and excution. To aid in the discussion process, facilitate sharing of personal experiences by those who survived, and to aid in recovery planning; a series of before/after ariel photographs and nieghborhood mapping was created by the County Planning Department, mapping division, for each team.

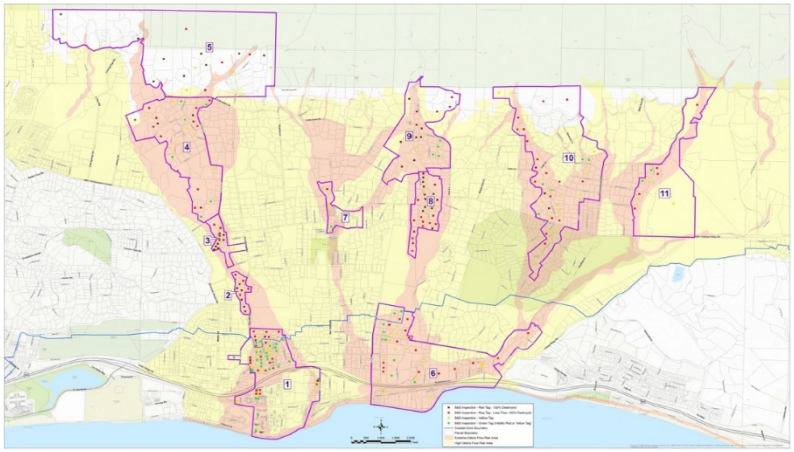


Figure 5: Map created by AIASB CRT wth micro-neighborhoods overlaid on debris flow areas.

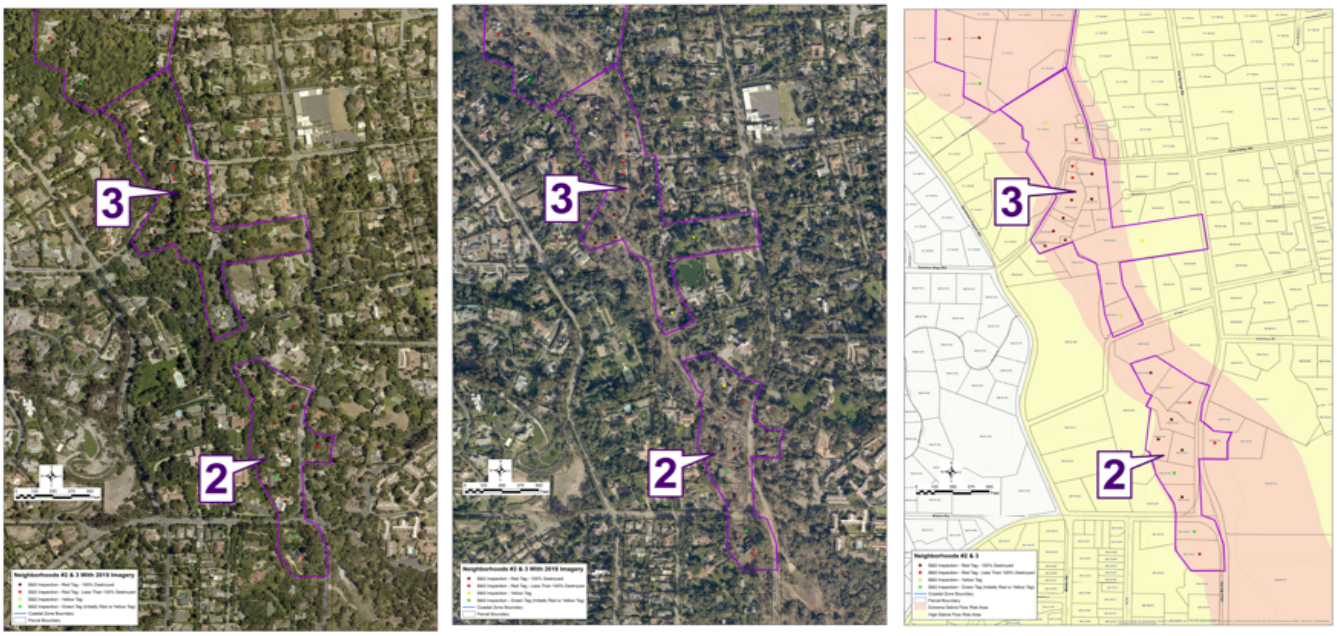


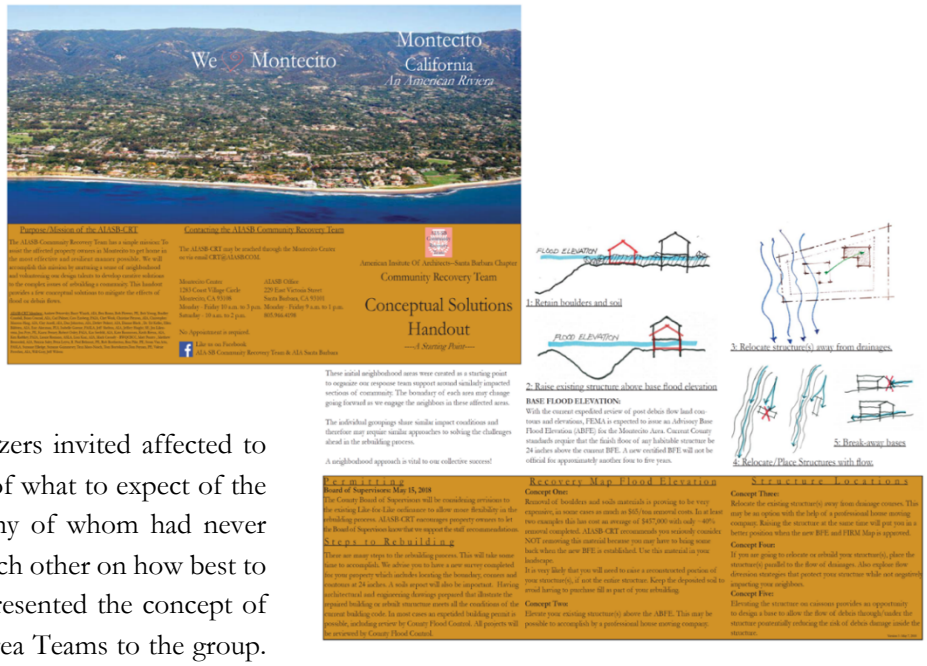
Figure 6: AIASB CRT Micro-Neighborhood- Before and After Debris Flow Ariel Photo and Team Map.

Community Workshops

CRT held a series of public workshops inviting affected property owners and public, and spent a few hours presenting in detail the proposed changes to the existing rules and micro-neighborhood concept along with diagrams that illustrate resilient rebulding ideas.

Recovery Half-Day Workshop

Armed with support materials, revised permitting/zoning rules and conceptual drawings all in support of a more resilient rebuilding process, AIA|SB CRT was ready for its second public workshop. This workshop was planned to take an entire morning as nieghborhood teams met with area affected property owners one-on-one.



AIA|SB CRT workshop organizers invited affected to share their story, provided an overview of what to expect of the morning and encouraged residents (many of whom had never met prior to this event) to engage with each other on how best to proceed with recovery. Discribed and presented the concept of micro-neighborhoods and introduced Area Teams to the group. The venue was organized into eleven areas that represented the eleven micro-neighborhoods that the CRT has created a few weeks prior.

Figure 7: First public workshop hosted by AIASB and the CRT. Printed materierlas provided to property owners.

Each micro-nieghborhood was then free to take as much time as needed to hear from residents on a one-on-one exchange, take input on micro-neighborhood specific constraints or concerns, and to document the general charatristics of each area.

In one area, a single resident showed, who on a whim, decided to stop by the morning workshop on the way to the store. Our CRT Area Team was ready for them. For Areas 2 & 3, only surviving family members remain. Only one family attended the morning workshop—that was a very difficult experince for the team. Another reason for having mental health professionals on-site. All we could do is listen and comfort. Another great skill of architects—good listeners.

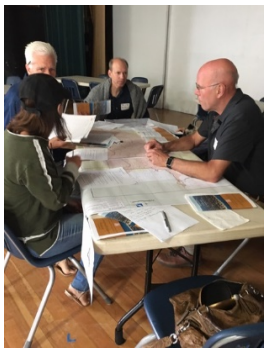


Figure 8: Second workshop—breakout sessions by micro-neighborhood.

Opportunities

Being Resilient

In the engineering and construction fields, resilience is an objective of design, maintenance and restoration for buildings and infrastructure, as well as communities that require replacement either from new development or from disaster. It is the ability to absorb or avoid damage without suffering complete failure. A more comprehensive definition through the lens of disaster, is that it is the ability to respond, absorb, and adapt to, as well as recover in a disruptive event. A resilient structure/system/community is expected to be able to resist an extreme event with minimal damages and functionality disruptions during the event. After the event, it should be able to rapidly recovery its functionality in short periods of time.

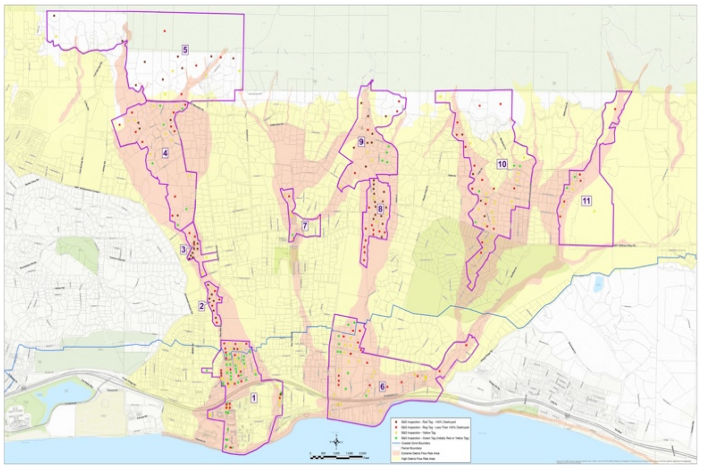


Figure 9: Micro-Neighborhood Map based upon debris flow mapping.

The concept of resilience originated from ecology and then was gradually applied to other fields. It is related to that of vulnerability. Both terms are specific to the event perturbation, meaning that a system/infrastructure/community may be more vulnerable or less resilient to one event than another one. However, they are not the same. One obvious difference is that vulnerability focuses on the evaluation of system susceptibility in the pre-event phase; resilience emphasizes the dynamic features in the pre-event, during-event, and post-event phases. In general, the lower the vulnerability that exists, the more resilient the community will be when faced with a peturbation.

Resilience is a multi-faceted property, covering four dimensions: technical, organization, social and economic. Therefore, using one metric may not be representative to describe and quantify resilience. In engineering, resilience is characterized by four Rs: robustness, redundancy, resourcefulness, and rapidity. Current research studies have developed various ways to quantify resilience from multiple aspects, such as functionality- and socioeconomic- related aspects. For architure reasiliency addresses the way in which a design meets a chosen design performance standard. This might be the adopted local building code, but more likely is will be a threshold of perturbation should not be exceeded.

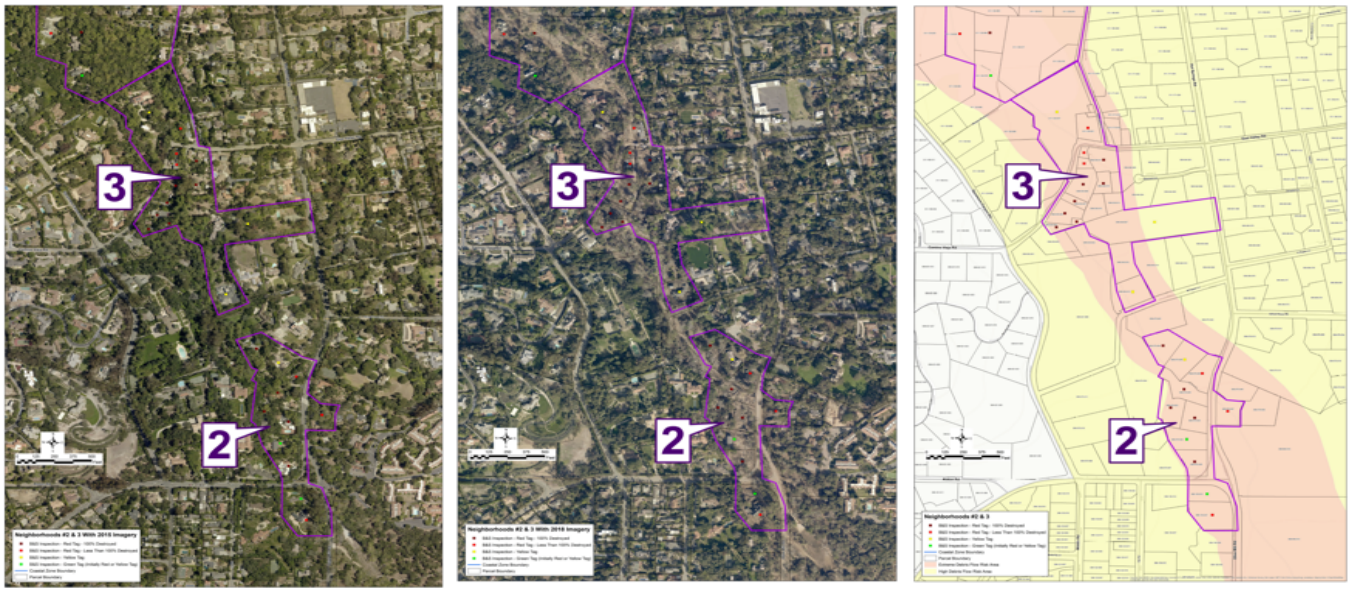


Figure 10: AIASB CRT Micro-Neighborhood- Before, After Debris Flow Ariel Photos and Team Map.

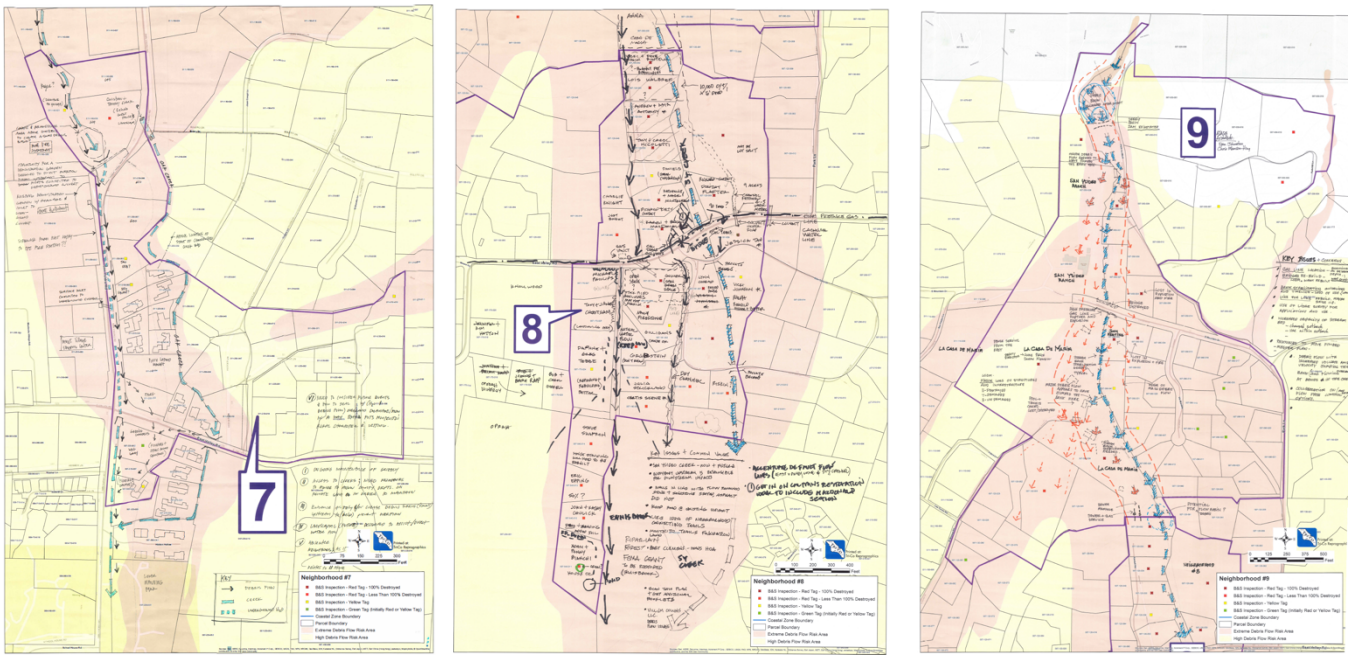


Figure 11: Micro-Neighborhood mapping with CRT notes and comments gathered from property owners.

Environmental Design

Environmental design is the process of addressing surrounding environmental parameters when devising plans, programs, policies, buildings, or products. Classical prudent design may have always considered environmental factors; however, the environmental movement beginning in the 1940s has made the concept more explicit. Environmental design can also refer to the applied arts and sciences dealing with creating the human-designed environment. These fields include: architecture, geography, urban planning, landscape architecture, and interior design. Environmental design can also encompass interdisciplinary areas such as historical preservation and lighting design. In terms of a larger scope, environmental design has implications for the industrial design of products: innovative automobiles, wind power generators, solar-powered equipment, and other kinds of equipment could serve as examples.

Resilient Conceptural Design

The CRT design team offered the following concepts to residents, property owners and permiting officials during two public workshops. Each concept is an eligant way to resolve particular issues that generate the site plan. They also address the actual hazard threat present in the Montecito area. Here architects are use "context" to informa the design. The Japanese after the Tohoku earthquake and tsunami offered up five generalized land use strategies emerged from their analyses: (1) relocate inland away from the tsunami inundation areas; (2) consolidate residential areas in nearby safer locations; (3) consolidate residential areas on artificially raised lands; (4) partially relocate residential areas inland and partially consolidate residential areas on raised lands; and (5) rebuild on-site. The complexity of private property ownership in the United States presents hurdles that make it challenging to implement options presents in Japan, and the event was not a tsunami, but a debris flow. CRT did propose a consolidation of property with a consentration of new buildings to replace those damaged. This strategy did not gain much support with the property owners. Relocating to higher ground or more inland sites was also not practical. All of these option le to a single strategy of rebuilding on the same site.

Go with the Flow

In mutilple cases in the Montecito Community, structures are sited perpendicular to the flow of the creek making these buildings vulnerable to heavy damage as the creeks flood and entrained debris stricks the house. In rebuilding these structures, siting them as to be parralelle to the flow of the creek is a more resilient solution. Additionally, if the up-stream side of the structure is designed to deflect on coming debris, will give these structure a much better chance of remaining functional after the event and thus keeping the occupants safer. This is akin to the life-safety principle used for seismic design in California.

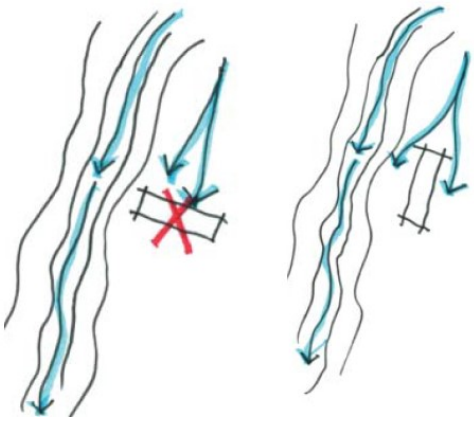


Figure 12: Graphic illustrating re-oreintation of structures.

Rise Above

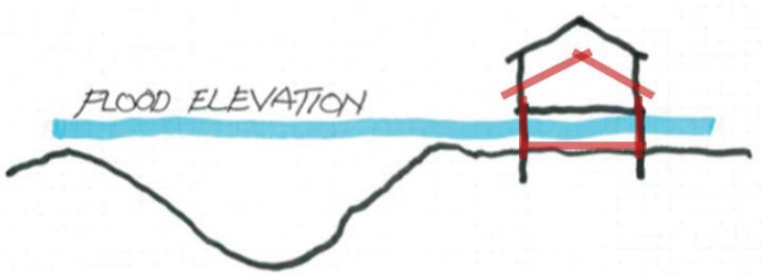


Figure 13: Graphic illustration elevation of structure.

In many cases, raising the house will be a requirement of FEMA Flood Map conditions and the County Flood Control District. The current flood control code, the first habitable level of a building in a mapped flood area is required to be two-feet above the base floodplain elevation (BFE). Because many of the houses in the Montecito Community were constructed prior to the current floodplain regulations, there remains hundreds of structures at vulnerable elevations. Many of these structures were not affected in the January 9, 2018 event and will find it very difficult to obtain flood insurance without raising the structure to meet the regulations. Now with a revised flood insurance mapping area being worked on, the current flood elevation will most likely be higher. The hundered or so structures that were damaged or distroyed, will be required to place two-feet above the new floodplain elevation. To understand what this potentially look like, FEMA produced a Recovery Flood Map (https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=85304fbd44344071aa126716894be054).

The Recovery Map covers the entire central coast of Santa Barbara from the Montecito Communinty, south, to Carpinteria. It is an interactive map where one can zoom in to a parcel to investigate the overlay of topographic layers. This map is only for reference while the official Flood Plain Map is being worked on, which will take the better part of five-years to complete. In the more impacted areas, the floodplain has changed in elevation five to ten feet. These conditions will have a visual impact on the rebuilding process as adjacent houses may be five to ten feet off-set in verticle elevation to each other.

Use the Land

Because the area received millions of tons of soil, affected property owners should keep the soil on site. This valuable resource can be utilized to create barriers, nicley landscaped, to protect the living places from flood or debirs flows in the future. Creek maintenance is also a critical aspect of future protection of property and life. Many of the drainages and creeks are on private property and not under the manangement of the County Flood Control District. If the property owners do not maintain these drainages or creeks, the result is an adverse effect during an event.

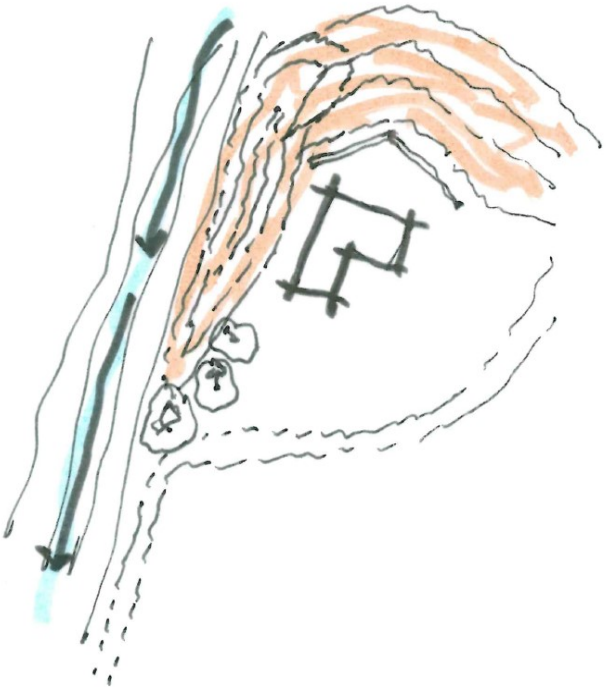


Figure 14: Graphic illustrating using debris as berming materials.

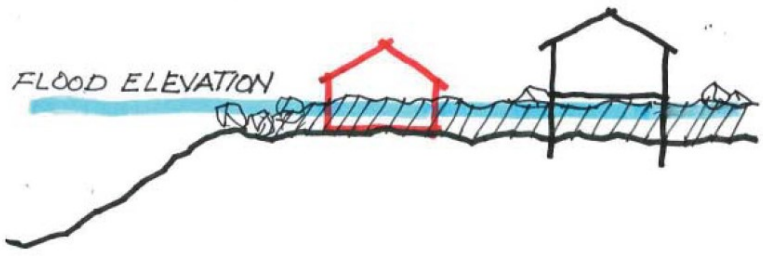


Figure 15: Graphic illustrating relocation and eleveation of structure.

Elevated-Break Away Foundation

Within the last dozen years a number of new residenses in the Montecito Community have been built on a raised foundation system comprised of concrete cassions. This allows the spaces between the suppoting cassions to be designed as to break away during flooding or debris flows. While this concpet may not be applicable to all reconstructed structures, for those located in the most vulnerable sites, near creeks or located in lower elevations, may benefit from this design solution. The CRT toured the post event exclusion zones on March 29, 2018, while on that tour they viewed a house perched on concrete cassions, there was no damage to the structure. This provides guidance for "adatable design" solutions.

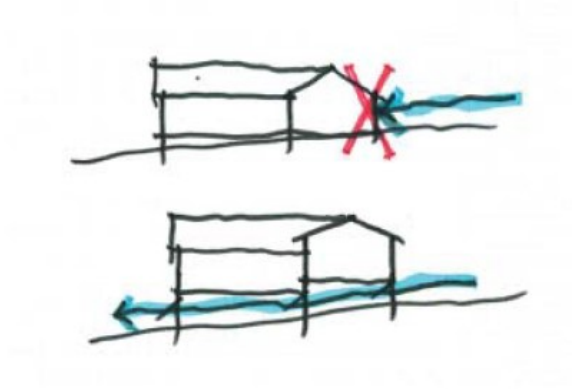


Figure 16: Graphic illustrating elevation of structure with soft story breakouts.

Conclusion

Scalability is the capability of a system, network, or process to handle a growing amount of work, or its potential to be enlarged to accommodate that growth. For example, a system is considered scalable if it is capable of increasing its total output under an increased load when resources (typically hardware) are added. An analogous meaning is implied when the word is used in an economic context, where a company's scalability implies that the underlying business model offers the potential for economic growth within the company.

Scalability, as a property of systems, is generally difficult to define and in any particular case it is necessary to define the specific requirements for scalability on those dimensions that are deemed important. It is a highly significant issue in electronics systems, databases, routers, and networking. A system whose performance improves after adding hardware, proportionally to the capacity added, is said to be a scalable system. Another example is the Incident Command System (ICS), the emergency management system used across response agencies in the United States. ICS can scale resource coordination from a single-engine roadside brushfire to an interstate wildland fire, for example. The first resource on scene establishes Incident Command IC, with authority to order resources and delegate responsibility within the span of control (managing five to seven officers, who will again delegate to up to seven, and on as the incident grows). Senior officers assume command at the top as complexity warrants. This proven system is remarkably simple, fully scalable and has been saving lives and property for nearly half a century.

The AIA|SB CRT is a highly scalable model. It begins as a small team (in this case six people) , and as issues or topics arise, a subject matter expert is added. In some cases a number of redunant subject matter experts are added to a single topic. Ultimately, the CRT grew to over 70 subject matter experts. The colaboration between the various subject matter experts remained fluid and self-driven. A dynamic combination of subject matter experts self-formed around the needs of a micro-neighborhood or individual property owner.

CRT Materials and Education

After the generation of mapping, ariel photography, and rebuilding graphics, the California University at San Lius Obispo (CalPoly) contacted CRT to request the use of these materials for a course on disaster recovery. AIASB, CRT and the County were happy to provide the materials and learn of the outcome for the course. Under the direction of William J. Sienbieda, the architectural students presented a varity of methods to rebuild the disaster zone.

Post-Event Results

During the CRT April 19, 2018 Workshop, the Area 9 Design Team conducted a brainstorming session with the property owners in this section. One of the ideas raised by those property owners was the concept of converting their property into a mini-debris basin. This was a radical idea, if implemented, would require these owners to give up their dream property to the benefit of all the downstream property owners. What an alturistic gesture. This idea is now a reality as the Santa Barbara County Board of Supervisors took action in March 2019 to aqcuire a number of parcels in Area 9, indicated on the Area 9 Map above as a potential mini-debris basin. With this complex land transaction completed, the County Flood Control District can proceed with the design and ultimate construction of a mini-debris basin that will provide protection to the downsteam property owners and with warning systems, give these downstream property owners advanced warning to evacuate. It is important to note that this concept is generated from the people in the community, not government. It is a bottom's up solution.

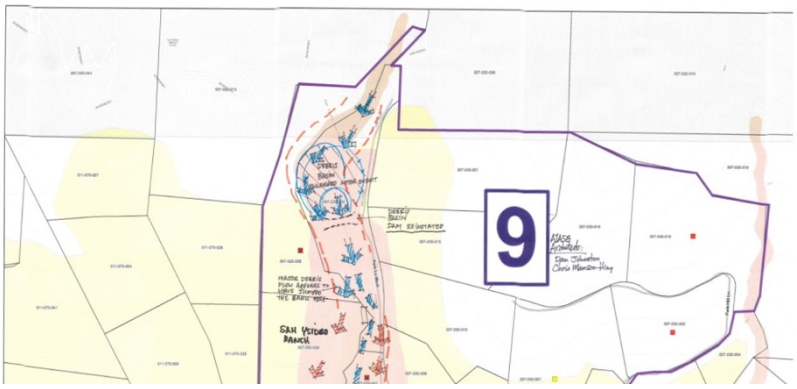


Figure 17: Graphic illustrating upper area of Randall Road.

Under the push, and support of area property owners, debris nets have been permitted, funded and install at the headwaters of each identified creek. This effort has received great support, and media exposure.

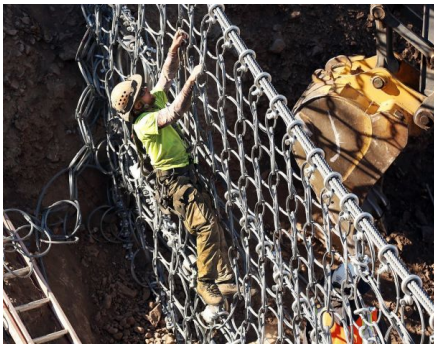


Figure 18: Debris Nets being installed in the upper canyons of drainage in the area.

Lessons Learned

Don't take anything for granted. With all of the planning, disaster prepareness, and communication about the possible impacts of the two disasters; staying aware of what is going on around you, and using your own "gut feeling" is criticle to staying safe. As responders, keeping at the front of our thinking that people will fatigue at mulitple calls to evacuate, and first responders will fatigue at prolonged disaster response. It cannot be emphasised enough about the value of mental health professionals being an early part of the reponse team. Training and education on the mryid aspected of disasters, disaster reponse, and support is key as it provides the skill-set to be able to help when called upon. AIASB now has a regular training class to certify architects, engineers and contractors in the post disaster assessement under the requirements of the California Office of Emergency Management. California is fortunate to have laws that provide some level of immunity to those who assist during disasters, and this is an important element that allows

architects, engineers, and contractors the liability shielding that enables them to help. Having a strong and mutually respectful working relationship with the planning and permitting authority is criticle to engagement early in the disaster. AIASB was fortunate to have key people, as Citizen Architects, in places where their voice at the table led to and supported its involvment in almost all aspects of the disaster. In many cases, AIASB CRt could be the voice of government, when government was restricted for expression its view on how to rebuild. The relationship between area architects and the planning departments and permitting agencies has continued to pay dividens.

Bibliography

The full bibliography can be found in the full version of this Case Study.
https://www.dropbox.com/s/hhg5es9u7rr4ypk/AIASB-CRT%20Case%20Study%20100119.pdf?dl=0

Editor Biographies

Robert L. Ooley, FAIA
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Robert is an awarding winning public-sector architect. He began his architectural career in the private sector working for various Santa Barbara based firms before moving into the public sector. With his extensive background in public sector project delivery, he is part of the professional team that manages the facilty inventory for the County of Santa Barbara.

With his almost 30-years of public sector experience, Robert was elevated into the Collage of Fellows of the American Institute of Architects, in 2015, being the only California County Architect to receive this distinction. He has served on a number of state-wide boards and is currently a director of the Califonia Counties Architects and Engineers Association. He is also a current member on the City of Santa Barbara Historic Landmarks Commission. He is the 2019 President of the AIA-Santa Barbara Chapter and active in the AIA at both the State and National levels. He is a mentor to architects seeking AIA Fellowship and a regional expert on Frank Lloyd Wright. He is a published author and playwrite. He became a three-diamond AIA Fellow in 2018.

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