Cultural Ground & Waters:
Recharging Community Space & Groundwater in San Francisco's Third Chinatown

By

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Committee in charge:

Professor Kristina Hill, chair
Professor Anna Brand
Professor Renee Chow

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Abstract

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This thesis explores the process of adding socio-cultural goals, values, and considerations for community needs into green infrastructure design to create multifunctional landscapes. Currently, much of green infrastructure is spearheaded by engineers who often prioritize performance goals for stormwater treatment. This tends to create non-specific landscapes that lack social values and benefits for the community it's designed into, potentially affecting existing spatial uses. By engaging with the community, landscape architects can add a level of specificity into green infrastructure design that allows it to respond to community needs and create usable public space while still managing runoff.

This project focuses on the predominant Chinese community in the Sunset District that sits above the Westside Groundwater Basin, and explores community engagement at three scales: city-scale to understand the context and history of the community, neighborhood-scale to understand memories and experiences of public spaces in the Sunset through interviews and surveys, and site-scale to understand spatial uses and preferences with relation to the built form of the streets through site observation and surveys.

Irving Street was ultimately selected for site design based on meeting performance criteria for groundwater recharge and for its socio-cultural importance to the Chinese community. Its design was built to respond to the experiences and needs of the community while using community improvement preferences as a starting point for creating socio-culturally responsive green infrastructure as public space.

Dedication

This is dedicated to my mom and dad,
A daughter and a son of 中國,
Who were born and raised in Việt Nam;
Who fled their adopted land in the aftermath of War and turmoil;
Whose own parents had fled our Motherland,
themselves in search of a better life;
Who sojourned for land they could call home;
Who finally arrived in the Richmond in San Francisco.

No longer running, searching, or dreaming.
爸爸媽媽, you are home.

Acknowledgements

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I would like to extend my sincere thanks to Palma You of the Chinese Historical Society of America for access to transcripts of interviews conducted for the “Chinese in the Sunset” exhibit; Ben Wong of the Wah Mei School for his time to share preliminary results of the Sunset Forward community assessment conducted in conjunction with the SF Planning Department and various local non-profit organizations; Sarah Minick and Will Logsdon of the San Francisco Public Utilities Commission for their correspondences in providing me with information and data from SFPUC’s green infrastructure assessments; and Scott Durbin, Amy Kam, Rachel Kraai, and Kristen Matsumura of Lotus Water for their support of my thesis work while interning with them, for connecting me to SFPUC, and for their engineering guidance in the design proposal.

I am also grateful for the assistance of friends and family who either participated in my surveys and interviews or connected me with residents and community organizations in the Sunset District in San Francisco interviews as part of my community outreach.

Lastly, I am eternally grateful to my spouse, Patrick King, for his continued support throughout the thesis process, from sacrificing a few weekends to tag along with me to Irving Street for site observations, to feeding me and reminding me to take breaks to stay sane while working on my thesis during the pandemic quarantined at home.

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Chapter 1
Introduction

1.1 Research Statement

Streets—by definition as a public right-of-way—is a public space, yet we rarely consider it as one accessible by all since it's been designed primarily for vehicular occupation to the point that pedestrians are deemed as obstructions. Instead, streets have become infrastructural networks for traffic flow efficiency and other systems like stormwater management, rather than places of social interaction as was a major historical street usage prior to the rise of private vehicles. The design of these streets and infrastructural systems are often technocratic and monofunctional, dictated by engineering standards prioritizing efficiency, and giving engineers immense influence in indirectly planning cities and shaping social interactions, or lack thereof.

Green infrastructure marks a transition from such monofunctional infrastructure approaches by incorporating ecologically-based processes to manage runoff. Increasingly, cities throughout California require green infrastructure as a conditional of approval for development projects greater than 5,000 square feet (SFPUC 2010), but this process of implementing green infrastructure as an urban-scale network through new development is slow and unevenly distributed across the city.

The most effective implementation would be to incorporate green infrastructure into public right-of-ways, especially since streets account for nearly half of urban land use and roughly two-thirds of runoff generated in cities. Green infrastructure requires sizable space to properly function, and the act of designing it into streets directly challenges existing street usage dominated by cars by literally reclaiming streetspace. This act of space reclamation presents an opportunity to rethink green infrastructure as a catalyst to transform streets back into public spaces for people and for landscape architects to begin partnering with communities to add social and cultural value specific to these neighborhoods.

Too often green infrastructure lacks this social value, rendering them as culturally-dead greenspaces without practical usability or importance to the community. This can create conflict within communities who become resistant to green infrastructure adoption, especially if its implementation feels imposed and impinging on existing values of space usage. Partnering with the community through outreach can help designers understand existing spatial usages and incorporate specific socio-cultural values into green infrastructure. The process can allow residents to voice their opinions for design decisions—whether it's in the design or selected location that facilitates community usage—and this act of partnership is a potentially potent way that residents can feel empowered, especially if trust is established and

iteration processes demonstrate incorporating their suggestions into the design. This process of green infrastructure development can lead to widespread adoption of an operative landscape that simultaneously manages runoff and cultural usages of space, while the community partnership can ensure investment of an infrastructural system that requires long-term maintenance for maximal performance.

This thesis intends to explore the design of community-based approaches to green infrastructure within the Sunset District of San Francisco as simultaneous opportunity for increased street public space in the neighborhood and as groundwater recharge within the Westside Groundwater Basin. The Sunset neighborhood is an ideal site for design research as it is built above historic sand dunes that contributed to the productivity of the groundwater aquifer, and the neighborhood itself has a history as a refuge for immigrant communities in San Francisco seeking their American dream.

The Sunset began as a vast, untouched sand dune until single-family housing tract development took off in the 1920s (Kraai 2010). These homes represented an opportunity of upward mobility for recent immigrant communities of the Irish and Italians, who remained as the dominant presence in the area until the 1970s (Laguerre 2005). By the 1970s even cheaper, suburban housing in the Peninsula spurred a wave of white flight and migration from the children of these original homeowners. Dwindling housing occupancy coupled with the Immigration Act and Federal Housing Act led to an abundance of single-family housing supply spurred many Chinese to migrate into the Sunset for their own opportunity for upward social mobility.

Chinese migration to the Sunset throughout the 1970s with warming relations between China and President Nixon's administration, and the Fall of Saigon in 1975 that brought the Vietnamese and Hoa Chinese diaspora—Vietnamese of ethnic Chinese descent—to San Francisco (Laguerre 2005). By the 1990s, the Chinese American community cemented themselves as the majority in the Sunset, with commercial streets like Irving and Noriega dubbed as the "New Chinatown" to differentiate a new suburbanized and assimilated cultural experience compared to the historic Chinatown characterized by recent immigrant generations. The suburban density with sparser homes and public parks along with multi-national Chinese experiences created a different spatial neighborhood usage and means of maintaining community connection. This thesis seeks to understand the history of Chinese Americans in San Francisco, how their identity and experience has shaped spatial usage in the Sunset by appropriating existing space to fit their needs, and how they desire public space to reflect their spatial needs.

The Westside of San Francisco is also ideal for an operative green infrastructure landscape because of the location of the North Westside Groundwater Basin. The westside was formerly sand dunes, and thus comprises most of the region's geology, with the sandy soil's granular

texture and porosity contributing to high infiltration rates to naturally absorb much of the rainfall that the region would receive. This groundwater aquifer, one of seven within the city, is the largest at approximately 14 square miles, or 8,960 acres, and extends well into neighboring Daly City and the greater San Mateo County (SFPUC 2005). With an average annual precipitation of approximately 22 inches per year (SFPUC 2010), this area receives nearly 16,500 acre-feet of water, the equivalent to 8,150 Olympic-sized swimming pools. Typically, rainfall is the source for groundwater recharge, where runoff infiltrates into the soils and replenishes the groundwater aquifer volume. However, in urban environments, the high percentage of impervious surfaces restricts groundwater recharge. The North Westside Groundwater Basin has an estimated recharge rate of 4,846 acre-feet/year, which is especially abysmal when considering the fact that this rate includes both rainwater recharge and recharge due to leaking water from the City's water supply and irrigation pipe infrastructure (SFPUC 2005).Given the average rainfall and the volume of water produced within the Westside, this amounts to a huge potential for recharge to the local emergency water supply as outlined by the North Westside Groundwater Basin Management Plan (SFPUC 2005).

By combining with community partnerships to include socio-cultural values, adoption of the groundwater management plan may be more effective through mutually beneficial designs that benefit the immediate community neighborhood and the larger region that the groundwater basin serves. These socio-cultural uses and green infrastructure performance goals may oftentimes conflict spatially with one another. Thus, this thesis explored how these conflicting considerations can be balanced in a design approach to create green infrastructure as public spaces that benefit the community it is designed into.

1.2 Research Questions

- How can green infrastructure be a catalyst for public space to reclaim streets from cars?
- How can green infrastructure be designed through long-term community partnerships?
- How can green infrastructure be designed to reflect the cultural history and usage of a neighborhood?
- How do (Chinese) Asian-Americans currently use and desire to use public space in the Sunset, and how has this been shaped by Chinese American history in San Francisco?

1.3 Research Methods

Green infrastructure design, from site analysis to location selection and sizing, is an objective and methodical process relying heavily on quantitative data to inform decisions; these methods borrow heavily from the sciences and ecological factors to analyze site conditions. My thesis seeks to infuse more socio-cultural values and analysis to inform more human-centered green infrastructure design exploration in my project outcomes. Therefore, my research methods were guided by a framework of humanizing data—or providing qualitative personal experiences to the site analysis process—to base design on a human-centered approach that provides equal weight to community considerations of their use of their neighborhood space.

My research methods included a mix of both quantitative and qualitative data divided into two parts: site analysis focusing on the Sunset's site conditions with respect to infiltration and groundwater management, and community analysis that draws on mixed methods and ethnographic methods to understand the built environment experiences that shape the residents' use of space. Due to the pandemic, approaches may change and need to be adapted to public health recommendations, but the overall methods are intended to be the framework that guides the research.

1.3.1 Site Analysis Research

This part focused on understanding which parts of Sunset are most ideal for green infrastructure implementation through quantitative analysis of ground conditions. I used data and existing green infrastructure assessment studies conducted by the San Francisco Public Utilities Commission (SFPUC) to guide my site analysis as the SFPUC has already conducted extensive high-level planning analysis. Quantitative data collection consisted of understanding the main criteria for SFPUC's evaluation for green infrastructure suitability for implementation on public streets and understanding the data behind those decisions.

I also followed up the quantitative analysis with qualitative site observation as field verification to understand potential utility conflicts for green infrastructure development during the decision process, including observations for:

- Manholes signifying utility locations for sewer, gas, water
- Bus stops
- Parks, trees, lamps and overhead electric wires
- Street crowning

1.3.2 Community Analysis Research

This part focused on understanding the history of the built environment of the Sunset through the lens of Chinese American history and drew from mixed methods and ethnographic methods to understand community space use. The purpose of the community analysis was to engage with the neighborhood-built environment and their social values to begin incorporating human-centered design into green infrastructure analysis. Community engagement analysis consisted of three parts at three different scales:

1. City-scale to understand the context and history of the Chinese community in San Francisco.
2. Neighborhood-scale to understand the memories, experiences, desires, and needs for public space.
3. Site-scale to understand spatial uses and preferences with relation to the built form of the streets.

The first part of community analysis focused on historical research through census data, archival research through literature, and contacting historical societies. The historical research provided the context of Chinese American history, events that brought them to the Sunset, and how the neighborhood has changed over time in the built environment and demographics.

This context allowed me to engage with the neighborhood through the lens of historical and cultural specificity unique to the Sunset in the second part of analysis to understand the community's existing and desired uses of space. Within neighborhood-scale analysis, I used a mix of online surveying and phone interviews, primary source research of interview transcripts, and literature reviews to public space uses and desires. I contacted individuals and community organizations to collect both quantitative and qualitative data on uses and needs, and also used data collected from a concurrent study conducted by the SF Planning Department in conjunction with multiple local non-profit organizations.

Finally, I selected Irving Street as the focus for site-scale engagement and design proposal based on site and community assessment. Within site-scale engagement, I used behavioral observation of the physical space to understand the built environment. The site observation drew from both non-participant observation and structured observation to collect quantitative data on who visits Irving Street and qualitatively what activities they partake in or how they interact with the environment. I also drew on results from community outreach conducted by SF Public Works (SFPW) for a prior Irving Street improvement project as a proxy for face-to-face interaction to understand visitors' perceptions and desired improvements for the street. With all these gathered quantitative and qualitative data from site and community analysis, I

can balance through the different considerations for green infrastructure design for a proposal for Irving Street.

1.4 Theoretical Framework

1.4.1 Landscape as Infrastructure

Landscape as infrastructure critically examines the history of infrastructure and its centralized and often capitalist approaches to implementation that have radically altered city design in the United States. Infrastructure delivers the necessary services for a city to operate, yet for all its scale and monumental consequences of shaping the modern city, it remains an afterthought to the average citizen through carefully concealed design literally buried in the ground of public right-of-ways (Strang 1996).

The history of infrastructure in the United States is largely connected with the Industrial Revolution and military planning through brash beginnings of controlling nature to maximize profits and minimize capital flow disruption (Jauslin et al. 2015). Quite literally, our modern infrastructural system is a response borne from capitalism. Since then, the management of infrastructural design has solely fallen to the purview of civil engineers who take on a top-down, centralized, and technocratic approach to implement infrastructural systems hidden below streets to maximize surface land for capital development. Traditional infrastructure is static and unyielding to change, yet requires heavy maintenance to retain the structural integrity to withstand degradation from nature. Traditional infrastructure is also monofunctional and disruptive due to the desired goal of controlling and subduing nature, which results in disrupted landscapes that can erase landscapes of cultural and ecological value (Jauslin et al. 2015).

The theory of landscape as infrastructure seeks to design operative landscapes that are multifunctional to restore the social and ecological values of the landscape (Belanger 2017). The space of this operative landscape can be divided into the space of flows and functionality—in this case, treating runoff flows through infiltration for groundwater recharge—and the space of place for engaging with relationships with society and nature (Jauslin et al. 2015)—in this case, responding to public space uses and community needs. Landscape as infrastructure stresses the importance of dynamic systems that work with nature and can respond to natural changes. Above all, this critical approach to infrastructural design emphasizes complex relationships to create operative landscapes that engage with people and nature to move beyond the purely functional and become more integrated into our everyday landscapes (Belanger 2017).

1.4.2 Right to the City & Everyday Urbanism

The right to the city is a critique of how Henri Lefebvre perceives the city as an object for consumption. He postulates that there are two parts to the "city": the city as a capitalist machine that commodifies interaction for capital gain, and the urban as a realm of social interaction untainted by capitalist intentions. Lefebvre argues that citizens have a right to the city to freely interact and socialize through self-management and bottom-up mobilization to take control over their city in their terms (Purcell 2014).
As part of reclaiming the streets from cars, the right to the city's framework theory is crucial to understanding how design can be built around and accommodate existing uses of space on the neighborhood's terms (Purcell 2014) rather than impose intended uses that may conflict with how residents actually participate in their own space. Reclaiming space can occur through both participatory design and in community control of the streets in post-design for local needs and use as they arise (Layard 2012). This framework can carry into the design to create programming that is open ended and allowed to evolve with the local community to continue asserting their right to the street. Lastly, the right to street and reclamation can also take place through obstructions implemented by the community (Layard 2012) by deprioritizing the street as space for cars. Through local consensus and self-management in the decision-making of obstructions, there can be stronger support and organized claim to the street.

Connected with the right to the city is everyday urbanism in understanding from a bottom-up perspective on the daily life and realities of how spaces are used by the community, rather than a top-down approach of designing programming into a space that may never be used as intended. Everyday urbanism is connected to neighborhood and place identity, and Margaret Crawford argues that assertion of the identity within an everyday space is a political act to reclaim space to and reappropriate underutilized spaces on their terms (Crawford 1999). This produces ephemeral spaces that change with time and disrupts preconceptions of use of spaces to fit the local neighborhood's needs and uses. By understanding the local needs and reappropriation of everyday spaces, design can bolster support from the community to reclaim the streets.

1.5 Site Visualization

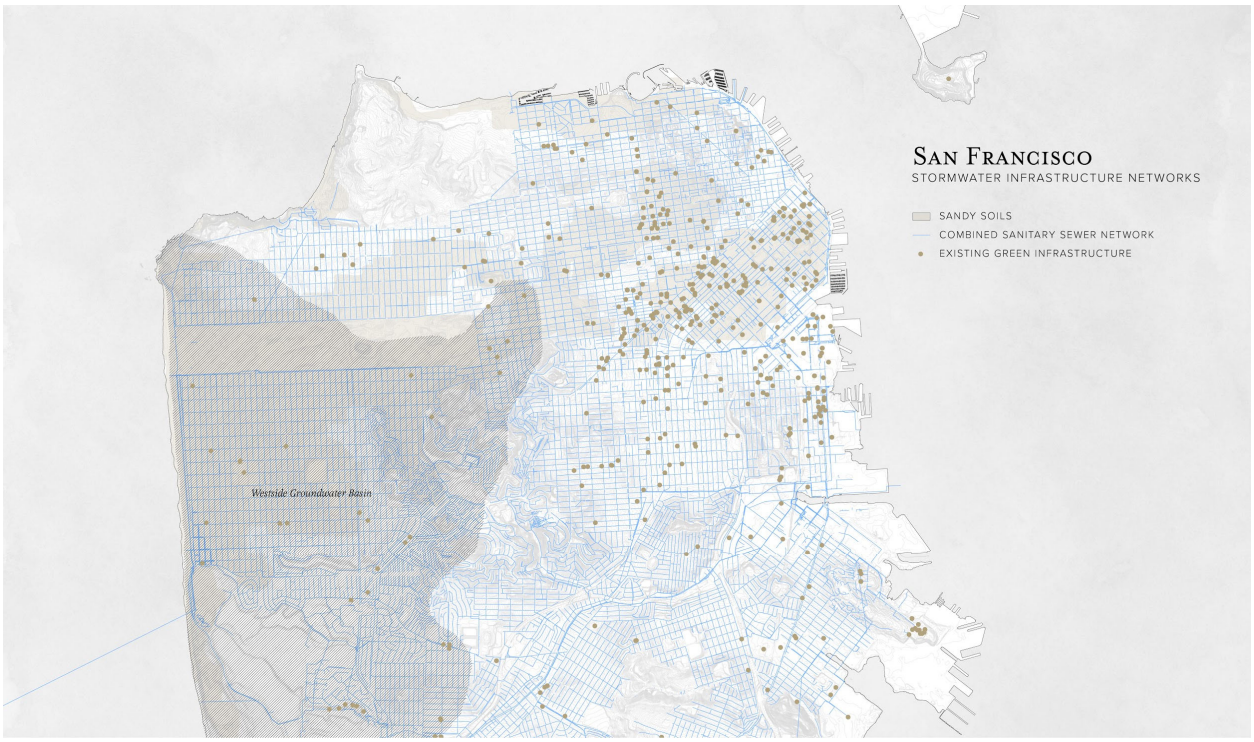


Figure 1.1 *Locations of implemented green infrastructure since 2012 through qualifying development.*

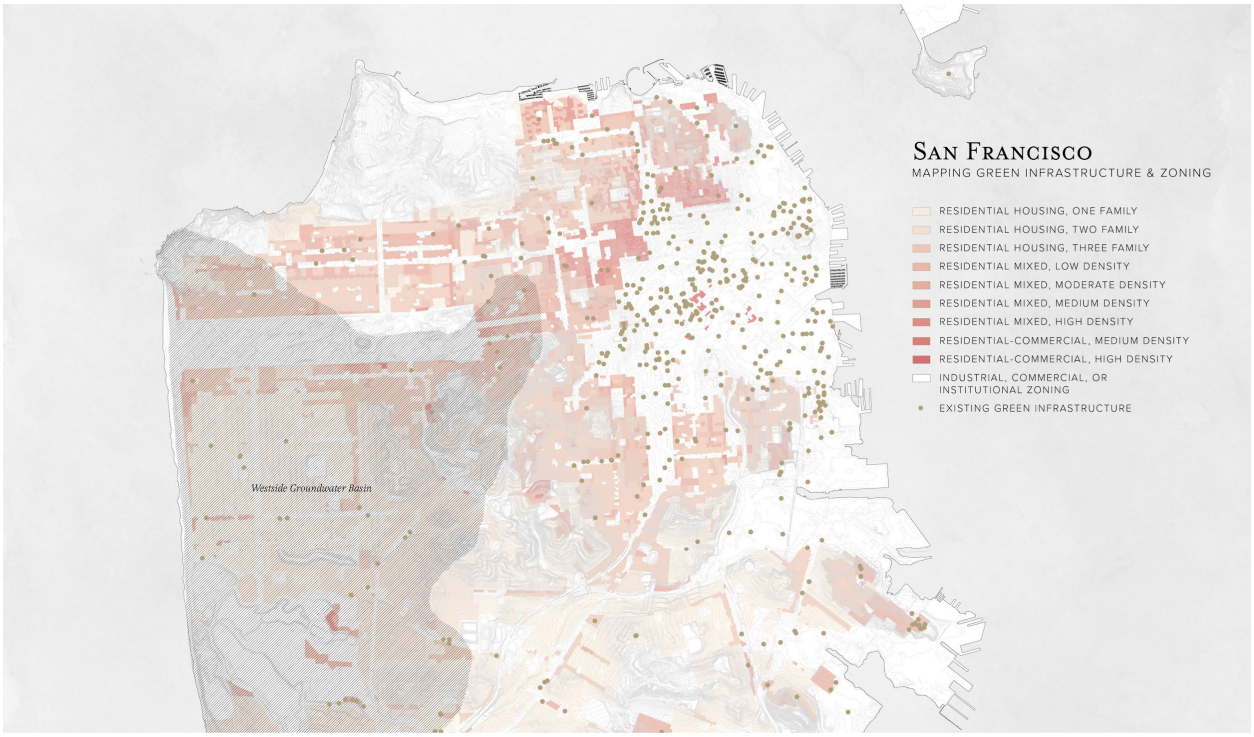


Figure 1.2 *Illustrating the correlation between qualifying developments for green infrastructure and zoning, with more implementation occurring in non-residential and higher-residential zones.*

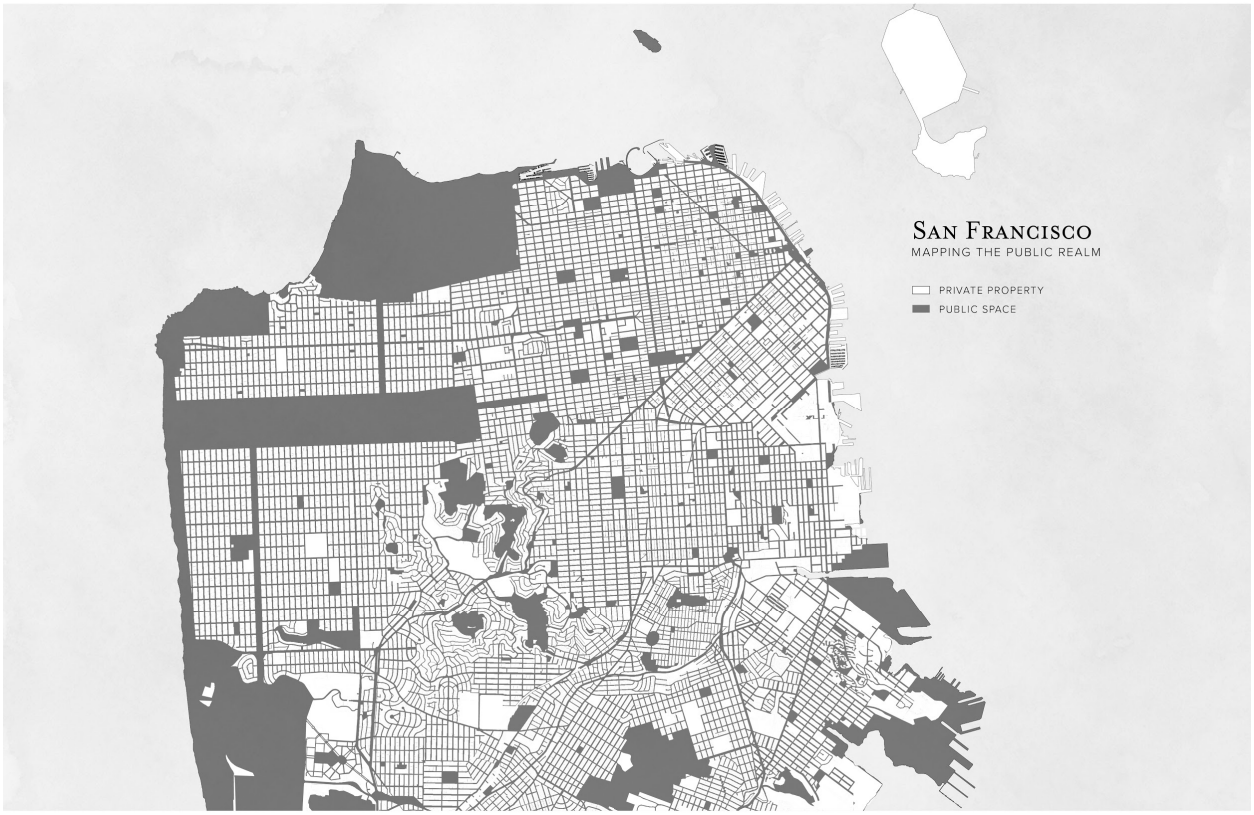


Figure 1.3 *The public space realm in San Francisco and potential spaces to implement green infrastructure without qualifying development.*

The Westside Groundwater Basin is a deep groundwater aquifer that stretches from western San Francisco to the northeastern portion of San Mateo County. The Basin was formerly a major source of water for that region prior to San Francisco's construction of the Hetch Hetchy Dam that now supplies water to the city, in addition to various other municipalities throughout the Bay Area. Years of prolonged water withdrawal, however, has left the Basin depleted and led to a water supply agreement between San Francisco and San Mateo County, wherein Hetch Hetchy will supply most of the water to San Mateo County in an effort to replenish the Westside Groundwater Basin as an emergency water source supply (SFPUC 2005).

With climate change abound bringing unpredictable rains that will likely be less frequent and more intense, replenishing the Westside Groundwater Basin is crucial to securing this emergency water supply (SFPUC 2005). While green infrastructure in the United States has traditionally been designed for water quality pollutant treatment or runoff volume reduction to mitigate combined sewer overflows (Li et a. 2015), there is growing urgency to design green infrastructure as part of our water supply infrastructure—especially since the Basin sits below sandy soils prime for infiltration and groundwater recharge.

Since 2010, California requires green infrastructure for all approved (re)development projects greater than 5,000 square feet as part of conditions of approval for construction (SFPUC 2010). The process for green infrastructure development, however, is fragmented and unevenly distributed. Implementing green infrastructure via new construction will be a slow process before an effective infrastructural network can develop, and therefore, treatment is currently only effective at the parcel level and not at a city or regional scale. Furthermore, this implementation process does not account for site conditions that maximize green infrastructure effectiveness for water quality treatment and runoff volume reduction, much less as water capture.

Within San Francisco, most green infrastructure is in the downtown area zoned for commercial, industrial, mixed use, or high density residential that attract more development and larger-scale projects qualifying for green infrastructure requirements. While sandy soils characterize much of downtown, the aquifer below is shallower with lower storage capacity and the groundwater table sits above the sewer system, leading to potential water quality contamination that renders the aquifer unusable as a water supply (CA Dept of Water Resources 2004). Conversely, the Westside Groundwater Basin has significantly fewer green infrastructure, correlating with the highly single-family residential zoning and established homes where construction projects are often below the 5,000 square foot threshold (Figures 1.1-2).

Rethinking green infrastructure as a water source in the Westside requires larger-scale planning to maximize rainwater capture, yet conditions are unideal for green infrastructure design in the Sunset due to majority zoning for single-family residential. The Sunset is essentially a highly privatized realm consisting of individual private homeowners for whom the costs far outweigh any individual incentives for implementation.

Thus, green infrastructure needs to be developed within the public space to achieve functionality at a larger scale and would require community support to embrace such radical change in their neighborhood. The challenge is that currently, the public space in the Sunset consists of mostly residential streets that have been privatized exclusively for car use as conveyance and a parking lot. SFPUC has begun to assess opportunities to implement green infrastructure in public streets, and further design potential can allow these implementation opportunities to reclaim the public space by engaging with local communities to define how they choose to use space.

1.6 Case Study

Montréal: Ruelle Verte


Montreal's Rosemont-La Petite-Patrie neighborhood consists of many alleyways between homes and has been the site of successful bottom-up, community based green streets to reduce imperviousness. The process of designing the streets has been grassroots-oriented with neighbors working together to plant vegetation or partnering with local design firms to create larger-scaled projects. These streets have also been critical spaces for community gatherings, often the sites for neighborhood block parties or daily conversations and represent a possibility of community-oriented multifunctional operative landscapes.

San Francisco: Winter Walk


San Francisco's Union Square is the site of an annual winter walk that closes a section of busy downtown streets as a pop-up plaza for visitors. This originally began as a partnership between the business improvement district and non-profit organization during a moratorium on subway construction during the holiday season and has continued since as a space for pedestrian-based gatherings. While the green "lawn" here is artificial turf rug, this represents

the visual possibilities of the functional green infrastructure, and the focus is on the partnership between community and businesses to create a dedicated space for streets as public space.

New York: 42nd Green Street

New York's 42nd Green Street is a proposed design from a competition to create more pedestrian-oriented streets and represents the traditional top-down approach of design intervention based on a firm's vision of street use. The focus of the design is a literal greenway with a tramline through to encourage greener spaces and modes of transportation, with the remaining street functioning as public space and gathering with various programmed activities and elements to create a community-based gathering hub.

1.7 Significance and Contribution

My thesis project on reclaiming streets as public space for people is relevant to human-centered design and focuses on a public realm that is often forgotten by the public as a space for them. By definition as a public right-of-way, streets are public space and property, but we rarely view it as such since streets have been designed primarily for vehicular occupation to the point that pedestrians are seen as obstructions. My project focused on this reclamation through community engagement in my research to understand existing and desired uses of space that will then inform my design. Specifically, I focused on Chinese Americans in the Sunset, who have been the predominant ethnic group in the neighborhood since the 1980s. My research focused on the history of Chinese Americans in the Sunset, how their presence has shaped what many have dubbed as the "New Chinatown" with an environment considerably different from Chinatown, and how they've created new space or had to appropriate existing spaces to fit their everyday needs. I explored social uses of space informed by both cultural heritage and American upbringing, and the goal through this research is to design human-centered green streets as public space with social and cultural values relevant to the Sunset neighborhood, thus creating truly multifunctional green infrastructure with usability for the community.

While green infrastructure begins to restore ecological value by designing infrastructure as operative landscapes to naturally manage runoff, this operative landscape often lacks social or cultural value for existing communities where it's implemented. Coupled with a heavily technocratic approach that mirrors traditional grey infrastructure design, green infrastructure can create conflict within communities who become resistant to its adoption—despite associated ecological benefits—because its implementation feels imposed and impinging on existing values of space usage without offering sufficient benefits to justify replacement.

Educating the community on the ecological benefits of green infrastructure has proven beneficial to wider acceptance, but still fails to address how communities can directly benefit from its adoption in everyday life. Without creating social value in green infrastructure, these operative landscapes remain as culturally-dead greenspace without practical usability for the community, no different than a parking lot—arguably worse, due to an inherent inability to appropriate highly function-specific infrastructure for creative public space use, unlike parking lots that exist as an open surface.

Rather than working to convince communities to adopt green infrastructure, adding neighborhood-specific social values embedded within the infrastructure could lead to more widespread embrace of green infrastructure through mutual multifunctional benefitting both the city and community. Additionally, the process of developing green infrastructure presents an opportunity for communities to re-envision streets as public space built for their needs. Green infrastructure requires sizable space to properly function, and therefore disruptive by

challenging existing patterns of development and space usage, like public streetscape dominated by private vehicles. Partnering with communities to harness this disruptive nature has the potential to reclaim streets for people through a bottom-up approach towards green infrastructure design that gives them a sense of ownership and agency over their neighborhood to shape and maintain this space as their own, especially for communities who have traditionally been neglected or marginalized in public space design and use.

The Sunset was not built for Chinese Americans; the neighborhood was constructed as suburban-style single-family homes for white American families in the 1920s, and Chinese Americans moved here through alignment of opportune conditions in the latter half of the twentieth century. Over the years, as they settled into the neighborhood, the Chinese Americans have had to appropriate the space for their needs, and much of the existing public spaces like parks were not designed around their needs due to a lack of community outreach and planning participation until recent years. This research thesis therefore seeks to explore more bottom-up community-based public space design by using green infrastructure as the opportunity to reimagine streets as public spaces of multifunctional goals for ecological resilience and socio-cultural values reflective of the Sunset's predominant Chinese American community who have been marginalized from city planning.

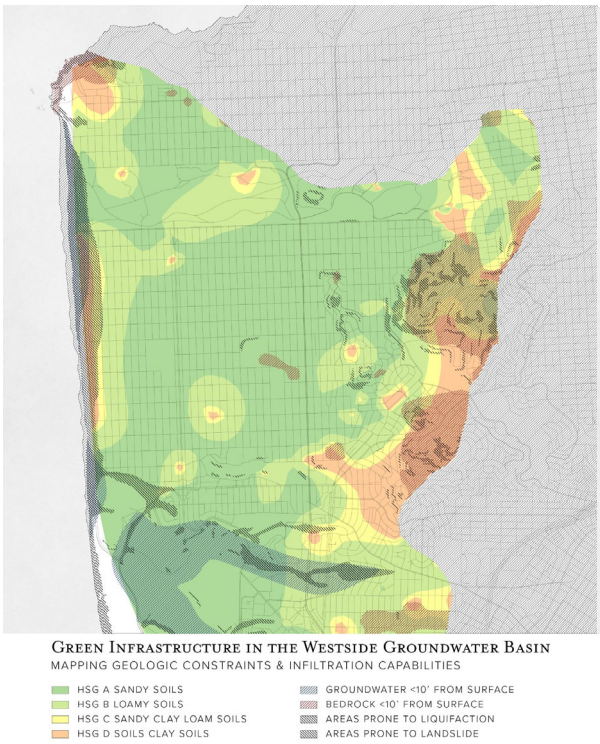
Chapter 2
Understanding Existing Green Infrastructure Efforts in the Westside

2.1 Green Infrastructure Analysis

Before proposing green infrastructure, the first step is to understand existing efforts for green infrastructure implementation in the Westside Groundwater Basin. The San Francisco Public Utilities Commission (SFPUC) has already published findings of its watershed suitability assessments in 2015 to identify opportunities for stormwater and combined sewer system management via green infrastructure. Suitable site selection for green infrastructure implementation in public streets is based on hydrogeological constraints, while the main identified opportunities for implementation are to mitigate combined sewer discharges, reduce flooding, and community benefits synergies such as benefiting economically disadvantaged communities (SFPUC 2015). Understanding these constraints and opportunities allowed me to narrow down focus sites for implementation to fulfill functional goals of groundwater recharge.

2.1.1 Hydrogeological Constraints

Site constraints based on regulatory requirements and geologic limitations for green infrastructure feasibility need to be mapped to understand the extents of green infrastructure implementation. Per regulation from San Francisco's Stormwater Design Guidelines, siting for infiltration-based green infrastructure to recharge the groundwater aquifer must meet the following conditions for slope and soil (SFPUC 2010).



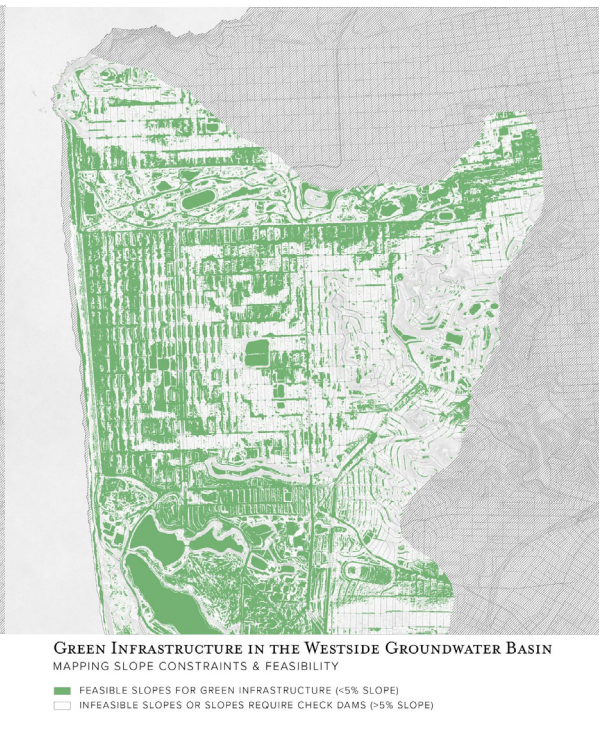


Figure 2.1, left *Suitability map depicting overlapping soil, groundwater, bedrock, landslide, and liquefaction constraints. Data source: SFPUC.*
Figure 2.2, right *Suitability map depicting suitable slopes for green infrastructure implementation. Data source: SFPUC.*

Soils

The selected site's native soils must demonstrate a minimum infiltration rate of 0.5 in/hr to feasibly manage, treat, and filter runoff without clogging.

Groundwater

The bottom of the proposed infrastructure should maintain at minimum a 4 ft clearance to the top of the seasonally high groundwater table to minimize groundwater intrusion into the infrastructure. For infrastructure with infiltration and recharge as treatment, the minimum clearance should be 10 ft to provide adequate runoff treatment through percolation and to minimize pollutant contamination with the groundwater aquifer.

Bedrock

The bottom of the proposed infrastructure should maintain at minimum a 4 ft clearance to bedrock to mitigate ponding of infiltrated runoff below ground.

Landslide and Liquefaction

Green infrastructure should not be sited in areas prone to landslide or liquefaction to avoid contributing to ground failure.

Slope

The Design Guidelines recommend slopes less than 5%. Any greater slopes will require check dams to slow flows for adequate treatment, thus incurring greater design and construction costs and may require larger footprints to account for volume differences. Additionally, on slopes greater than 15%, proposed infrastructure needs to have a 150 ft setback from the downslope foot to mitigate high flow rates entering the infrastructure system and mitigate potential for slope instability or failure.

SFPUC Suitable Streets for Green Infrastructure

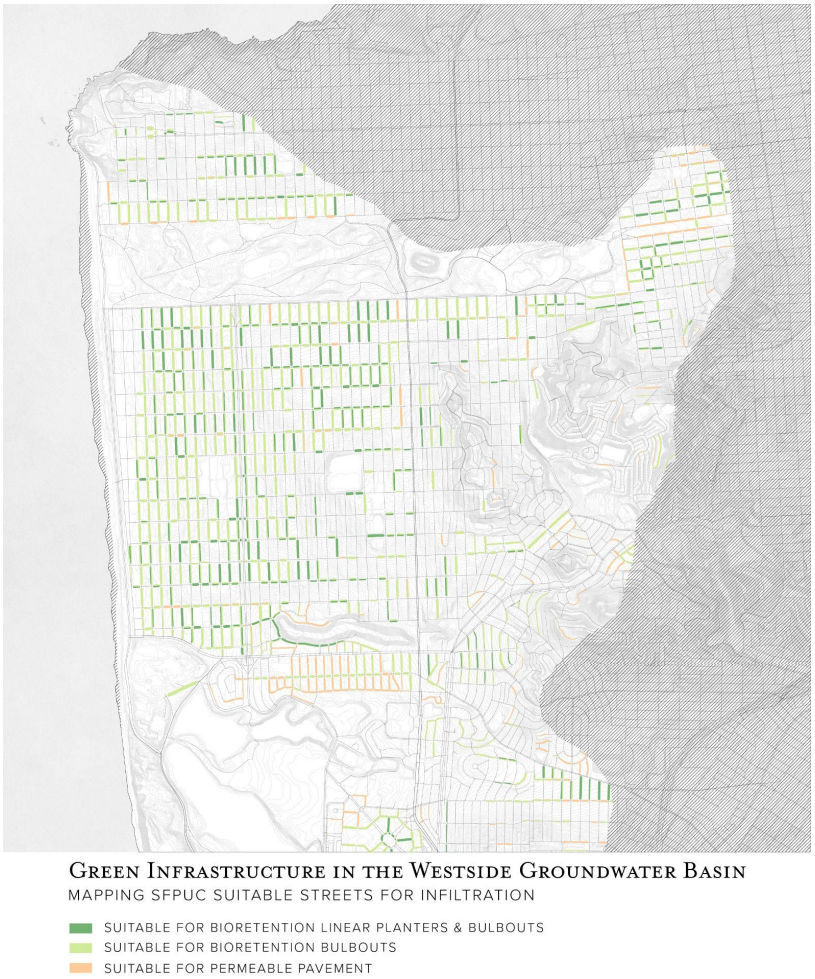
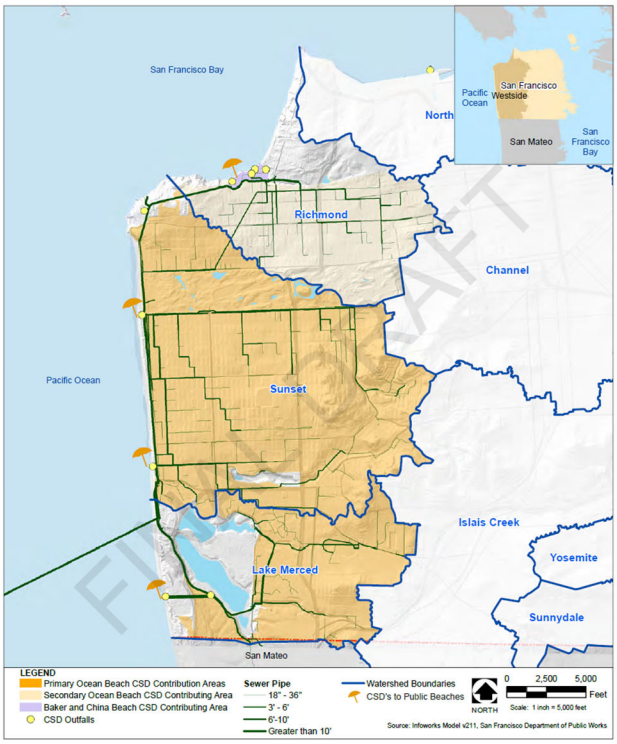


Figure 2.3 *Mapping all streets within the Westside that are capable of green infrastructure implementation. Data source: SFPUC.*

These overlapping conditions then determine areas within the Westside Groundwater Basin that would meet all criteria necessary for groundwater recharge. Figure 2.3 shows the breakdown of capable areas for types of green infrastructure implementation based on whether streets can accommodate bioretention planters, bioretention curb bulbouts and/or permeable pavement. Based on metadata of street capabilities obtained from SFPUC, these

feasibility constraints are based on existing street and sidewalk profiles without drastically altering street layout.

2.1.2 Combined Sewer Discharge Reduction



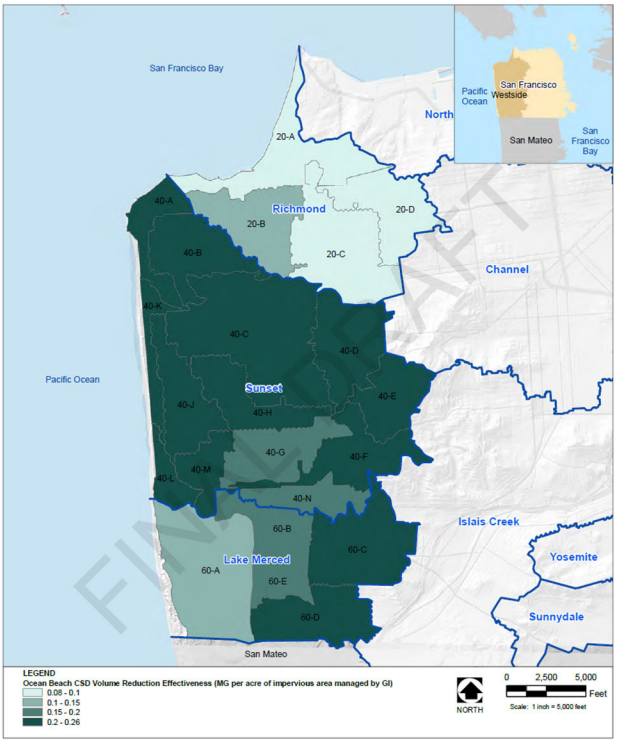
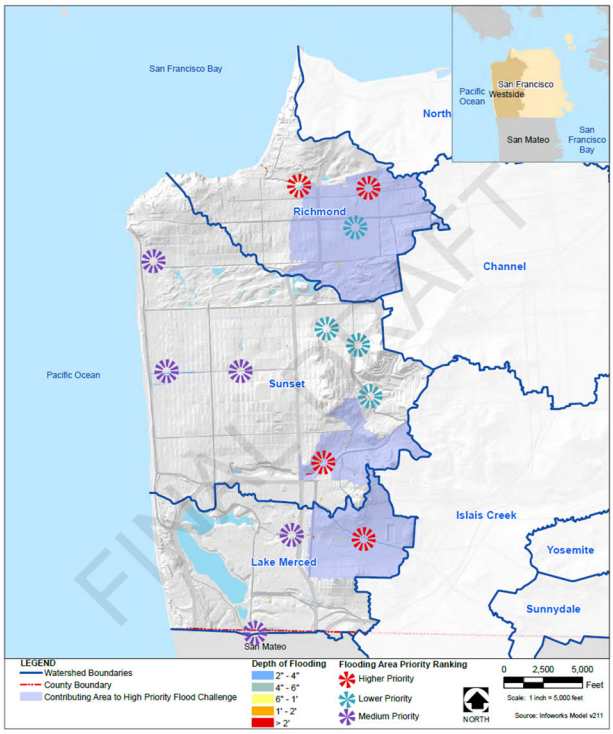


Figure 2.4, left *Combined Sewer Discharge Needs and Areas of Influence. Image source: SFPUC*
Figure 2.5, right *Ocean Beach CSD Volume Reduction: GI Effectiveness by Minor Watershed. Image source: SFPUC*

Due to San Francisco's combined sewer system (CSS), excess rainfall from high storm events risk overwhelming the system and releasing sewage discharge into public beaches. Therefore, proposed green infrastructure locations should maximize combined sewer discharge (CSD) reductions. While the overall CSS currently meets or exceeds wet-weather regulatory requirements, the SFPUC has recommended increasing the performance to reduce CSDs at the outfall points in Figure 2.4 since they discharge into public beaches: Ocean Beach, China Beach, and Baker Beach (SFPUC 2015).

SFPUC performed a high-level assessment of effectiveness for CSD reduction for the Ocean Beach outfall, the largest CSS system of the three public beach outfalls. Assessments concluded that CSD volume reduction per impervious acreage is most effective within the majority of subwatersheds within the Sunset, as shown in the dark green in Figure 2.5.

2.1.3 Flood Reduction



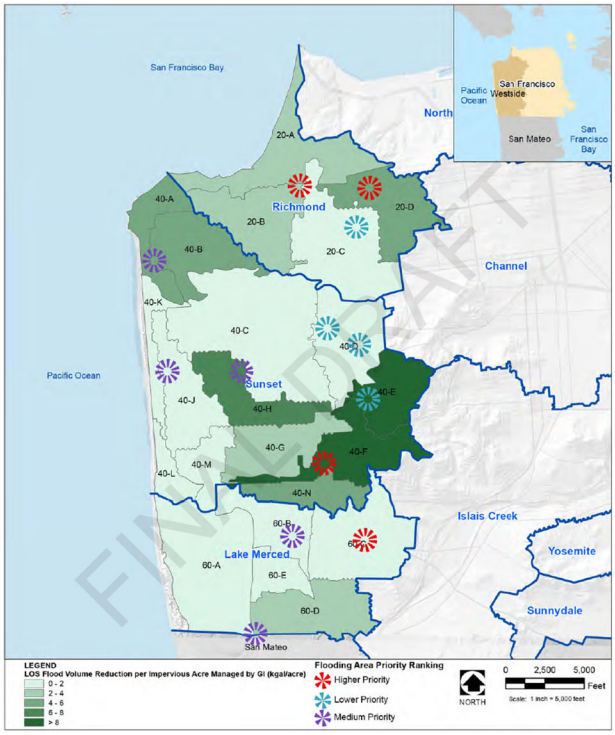
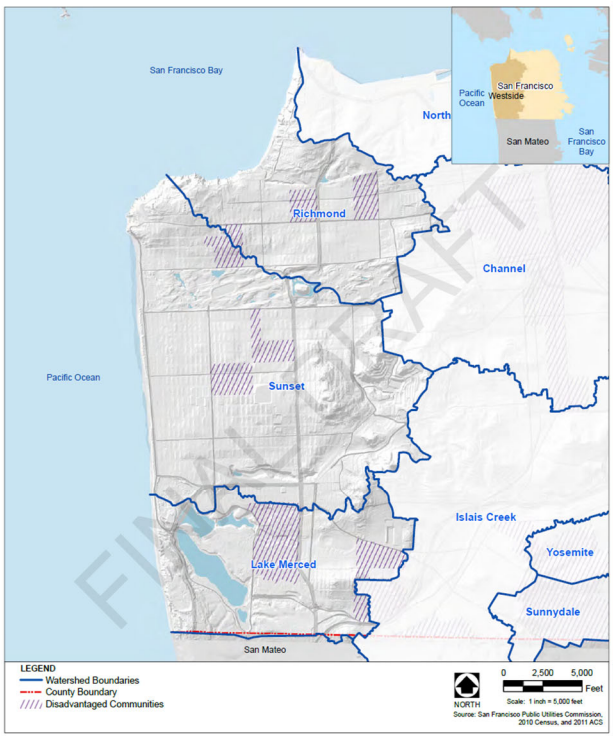


Figure 2.6, left *Flood Reduction Needs and Areas of Influence. Image source: SFPUC*
Figure 2.7, right *Flooding Reduction: GI Spatial Effectiveness by Minor Watershed. Image source: SFPUC*

Based on assessment of flood impacts on personal injury and property damage, the majority of high-risk flooding is within the hillside regions of the Westside. Within Outer Sunset, the main flood issue is along Noriega Street, which has been assigned a medium priority for mitigation. Other areas with minor incidents of flooding include Irving Street, Kirkham Street, Lawton Street, 20th Avenue, and 30th Avenue (SFPUC 2015).

With a high-level assessment to determine the impact of green infrastructure for flood mitigation, the most effective implementation on volume reduction per acreage managed would be within the Golden Gate Heights neighborhood. Within the Outer Sunset, the subwater near the Parkside neighborhood bordering is most effective and would also address the designated medium priority for Noriega street.

2.1.4 Community Benefits



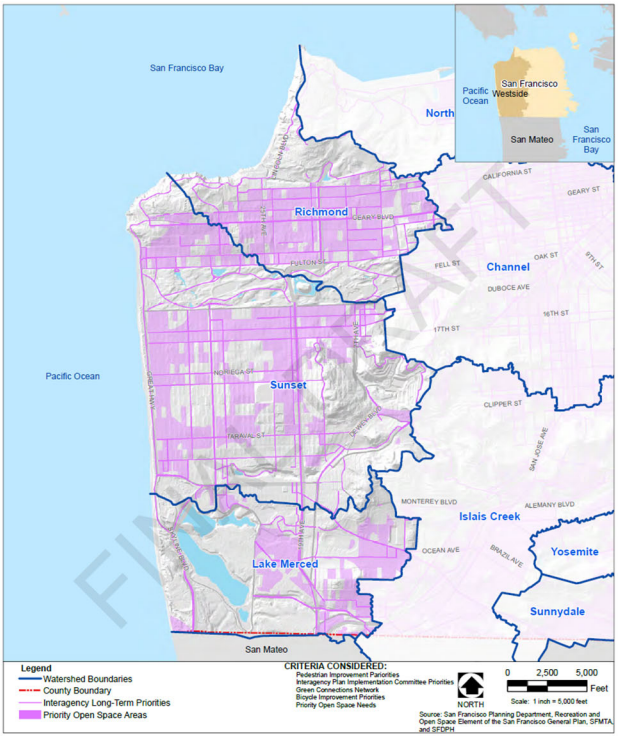


Figure 2.8, left *Potential Locations to Provide Community Benefits, Tier 1. Image source: SFPUC*
Figure 2.9, right *Potential Locations to Provide Community Benefits, Tier 2. Image source: SFPUC*

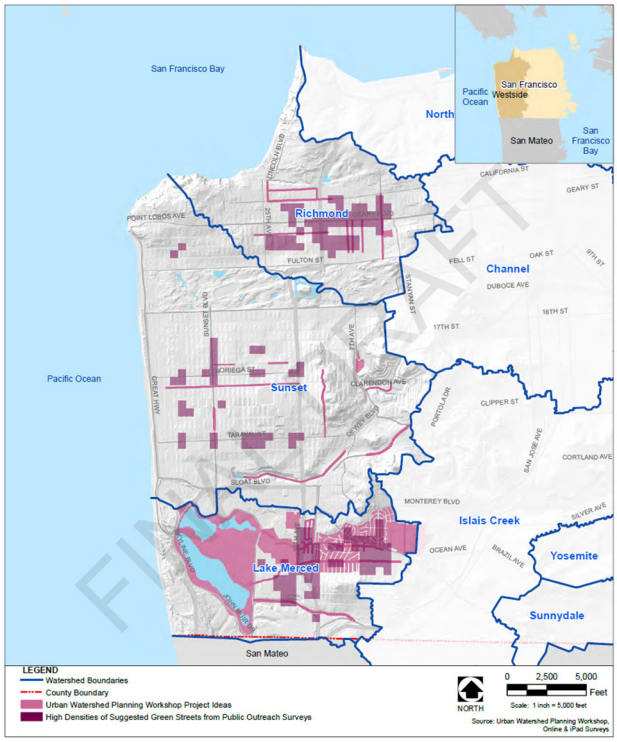


Figure 2.10 *Potential Locations to Provide Community Benefits, Tier 3. Image source: SFPUC*

The final category for assessment is for considerations for engaging with residents and opportunities for community benefits to locate potential areas for green infrastructure implementation. The assessment is performed at a high-level overview using GIS data and SFPUC has defined analysis of these community benefits into three tiers. Tier 1 includes considerations for environmental justice and disadvantaged communities; environmental justice neighborhoods are zip codes with documented adverse environmental impacts while disadvantaged communities are census tracts with 150% higher unemployment or 80% lower median income compared to the City averages. Tier 2 consists of opportunities for interagency coordination to achieve citywide goals such as improved streets for biking, pedestrian safety, green connection networks and open space priority areas. Tier 3 consists of considerations for feedback for location implementation based on public workshops focused on green infrastructure technologies and preferences (SFPUC 2015).

Within the Westside for Tier 1, there are no identified environmental justice areas. Within the Sunset, the census tracts near Noriega Street and Lawton Street are identified as disadvantaged communities. For Tier 2, much of the Sunset are within the priority open space areas or as one of several streets identified for pedestrian safety, biking, and green connection networks. For Tier 3, the majority of identified locations from workshops are located in the central Sunset near Noriega Street, Ortega Street, and Taraval Street.

2.2 Conclusion

SFPUC has performed extensive analysis into green infrastructure suitability in the Westside based on four criteria: hydrogeological constraints, combined sewer discharge reduction, flood reduction, and community benefits (which also includes some community engagement workshops). Much of this assessment is at a preliminary and high-level planning stage but provides an overview of functional and performance goals that green infrastructure can address.

Based on the SFPUC assessments, Noriega Street appears to be the most ideal as it has overlaps with all four criteria, is an identified medium priority for flood reduction, is within a disadvantaged community, and identified as part of streetscape improvements. Irving Street, Kirkham Street, and Lawton Street are other potential locations as they overlap with at least three of the four criteria and are within proximity to the identified disadvantaged communities. With the functional assessment and overview of SFPUC's analysis, I can now move forward with community engagement and begin zooming in to the different scales of outreach to select a final site for design proposal.

Chapter 3
City-Scale: Chinese in San Francisco

The story of Chinese in America and San Francisco can be framed in two parts with the Immigration Act of 1965 as the defining point: pre-1965 defined by an era of exclusion, exploitation, and systemic discrimination, and post-1965 in finding their place and asserting their identity within American society. As the port of entry for most of the Chinese sailing or flying over to the United States, San Francisco has grown as a magnet for the immigrant community because of economic opportunities and long-standing community presence over the years.

3.1 Arriving to Gold Mountain

The Chinese were first drawn to America through stories of unimaginable wealth from California's Gold Rush. Gum Shan, or Gold Mountain as they referred to America in Chinese, represented economic opportunity. Hoping to strike wealth, many young Chinese men set forth for Gum Shan to partake in gold mining and return home with untold riches for their family. These sojourners—whom the majority hailed from the Taishan region of the Guangdong province—were impoverished, illiterate villagers searching for financial stability for their families, and willing to traverse oceans to support them back home.

Most of the Chinese arrived in San Francisco—the port of call for ships arriving from Asia— in the 1850s, well beyond the heyday of the Gold Rush (Wong 1998). Despite losing opportunities to partake in the Gold Rush, the arrivers were keen on seizing any available work opportunities to send money back home to their families. Many Chinese eventually found work as laborers in jobs that other white Americans refused, most notably as a laborer for the Transcontinental Railroad project. The work was dangerous and exploitative, and the pay was a measly $1 a day (Center for Asian American Media 2020), but it was enough to support their families back home. Over time, the high demand for cheap laborers to build out the Railroad became the new calling opportunity for their compatriots to leave for Gum Shan, and the completion of the Railroad's western stretch was due in large part to the effort of the Chinese.

3.2 Racist Legislation

The influx of foreign immigrants from China, however, incensed many white Americans who began to fear that the newcomers would supplant their jobs. Progressively, cities with large Chinese populations like San Francisco responded to residents' fears by passing overtly racist legislation that specifically targeted the Chinese. Such legislation in San Francisco included targeting their way of life by prohibiting fireworks or gongs that were commonly used in celebrations and restricting their social mobility by prohibiting Chinese children from receiving

public education (Wong 1998). The series of local regulations eventually culminated in the federal Chinese Exclusion Act of 1882 which required all Chinese men to carry verified documentation—thus creating the first phenomena of "undocumented citizens" in America (Center for Asian American Media 2020)—banned women from immigrating to stymie their population in America (Wong 1998), and banned the Chinese from labor markets like construction and manufacturing to prevent labor competition with white Americans (Center for Asian American Media 2020).

The labor restrictions proved to be the most impactful in shaping structures of Chinese communities. Yet despite these labor restrictions, the Chinese persevered to make a living for themselves and to support each other. They founded Chinese restaurants and laundry services, enterprises that were not directly competing with white Americans. They created an "ethnic economy" through induced supply and demand for ethnic businesses among themselves (Wong 1998). They moved back to major cities with large preexisting Chinese communities to easily cater their businesses for survival. The years after 1882 saw the creation of Chinatowns as a result of the Chinese Exclusion Act's impact, and none was larger than that of San Francisco that still remained as the entry point for many Chinese into America. The restricted labor market throughout America coupled the relative ease of access to their own community to start their own enterprises led many to stay in San Francisco.

Between 1882 and 1965, San Francisco's Chinatown and its residents survived through the market of their ethic economy and the social support of associations through kinship and ethnic ties. But while Chinatown proved to be a successful strategy to adapt and survive in America, it belied the fact that its very creation stemmed from a racist history (Wong 1998). Restrictive legislation in San Francisco and covenants among realtors all but ensured the Chinese would stay in Chinatown (Center for Asian American Media 2020).

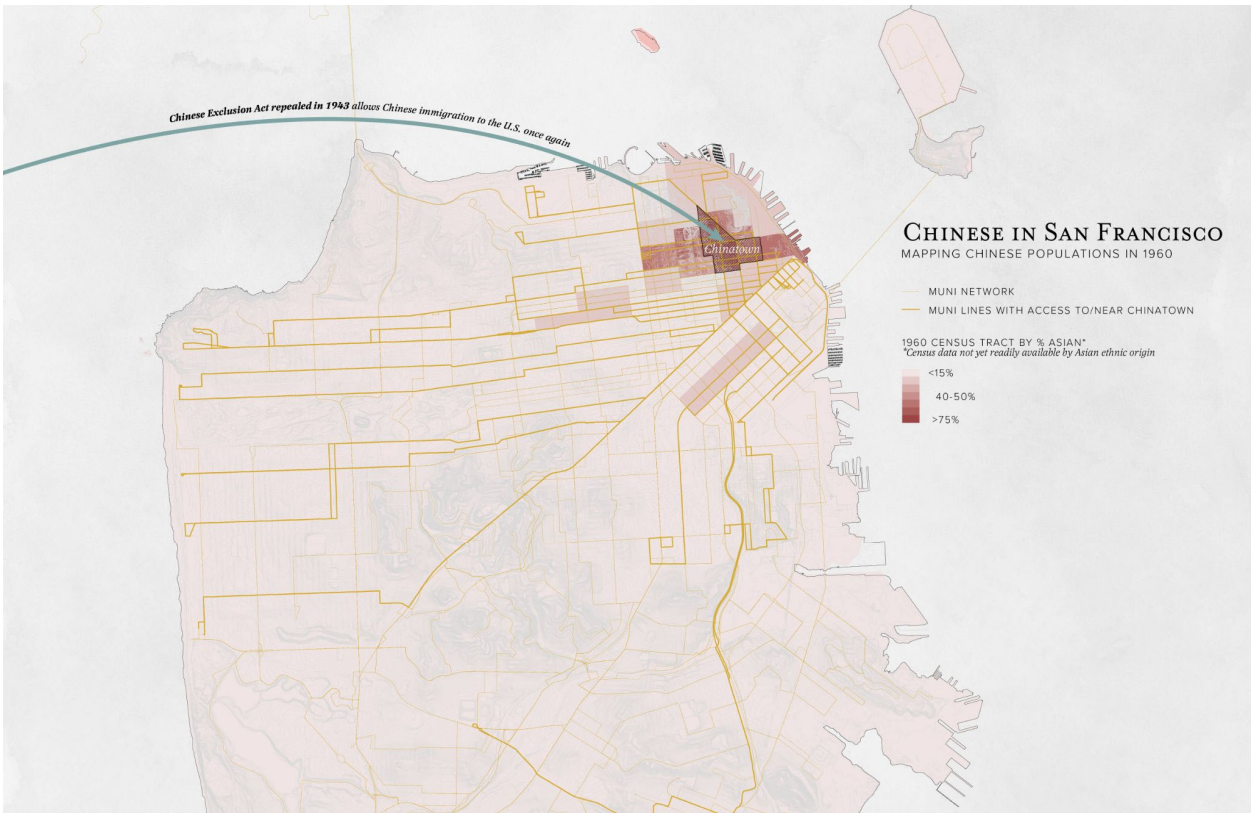


Figure 3.1 *Mapping Chinese Populations in 1960. The Chinese Exclusion Act was repealed in 1943, allowing Chinese to immigrate to the U.S. once again. The reality, however, was that immigration caps were still in place and few were able to legally arrive. Upon arriving in San Francisco, many were restricted to Chinatown due to racial covenants.*

By the mid-twentieth century, the United States began rolling back these restrictive, racist laws, beginning with the repeal of the Chinese Exclusion Act in 1943 as a gesture of goodwill and alliance with China during World War II (Laguerre 2005, Hall-Lewis 2014). While the number of immigrants were still regulated, the Chinese could once again immigrate to the United States or sponsor qualified family members. Still, however, most Chinese resided in Chinatown with a small contingency community in Richmond and less than 5% within the Sunset, owing to racial covenants still enforced by realtors and housing tracts, many of whom refused to sell to the Chinese (LaBounty & Gallagher 2017).

3.3 The Immigration Act of 1965 and Fair Housing Act of 1968

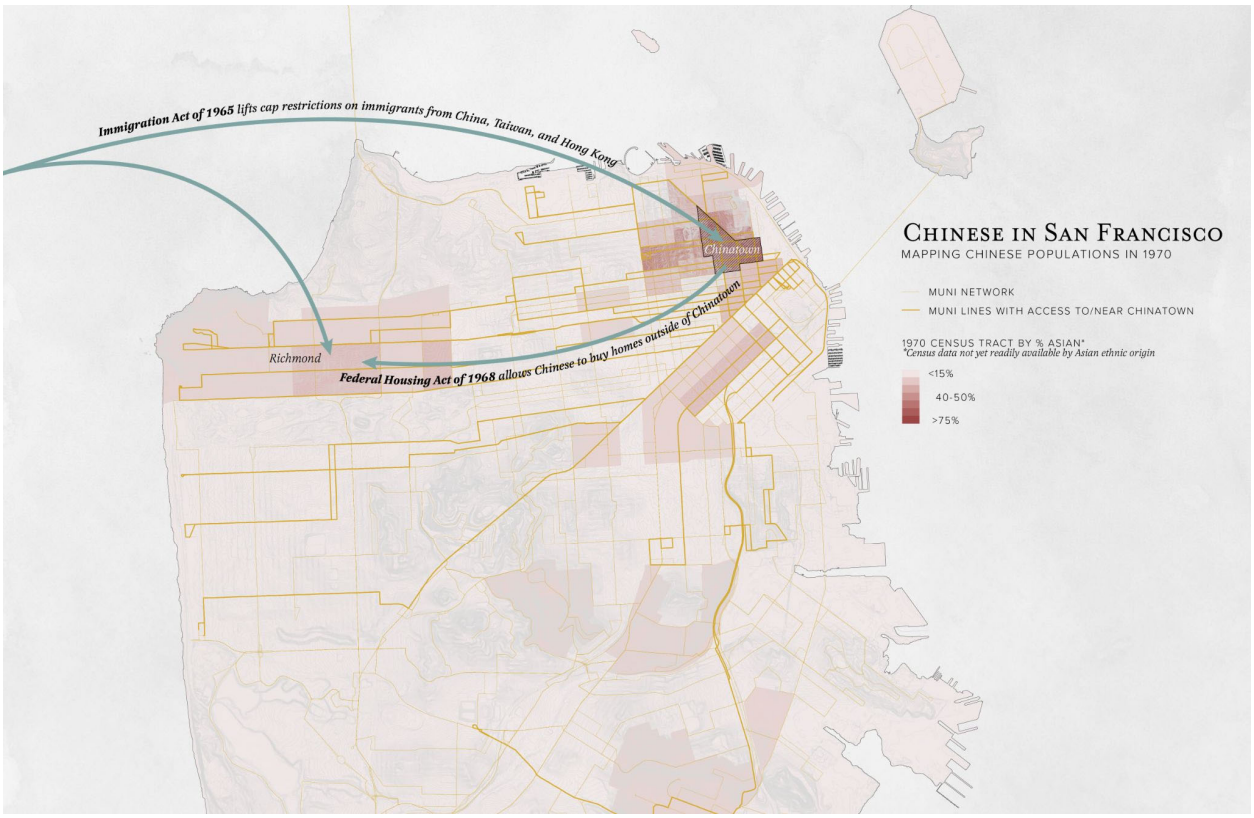


Figure 3.2 *Mapping Chinese Populations in 1970. The passing of the Immigration Act of 1965 sparked a new wave of Chinese immigrants to the U.S. and the Federal Housing Act of 1968 allowed residents in Chinatown to move out into other neighborhoods in San Francisco, many of whom decided to settle in the Richmond District.*

The de facto segregation of an ethnic neighborhood remained in place until the 1960s, a monumental era that marked the emancipation of Chinese from nearly a century's worth of legislation designed to strip them of their humanity and restrict their livelihoods to the confines of Chinatown. This era saw the passing of the Immigration Act of 1965 that lifted many restrictions and caps on immigration quotas from "third world" countries—including many of those in Asia—while the Civil Rights Act and Fair Housing Act of 1968 prohibited the racial discrimination of non-whites in housing (Laguerre 2005). Together, these two laws allowed both international migration of Chinese into San Francisco and domestic migration of Chinese Americans out of cramped conditions in Chinatown into other, sparser neighborhoods in San Francisco. In the initial years after the two Acts, much of the migration consisted of the later; immigration from China was still sparse, owing to tense relations between China and the U.S. during the height of the Cold War, and did not take off until 1972 after President Nixon's visit signaled relaxed diplomatic relations between the two countries (Laguerre 2005).

The Immigration Act encouraged visa applicants from high-skilled fields in science, technology, arts, and professional degrees like medicine (Wong 1998), and thus shifted the

demographics of the Chinese immigrating to the U.S. Whereas immigration prior to 1965 primarily originated from the rural Chinese of Taishan roots seeking economic opportunity to improve impoverished conditions back home in China, immigrants after 1965 were often middle-class who sought political freedom and intentionally decided to make the United States their new home. The new arrivals largely hailed from urban centers like Guangzhou, Taipei, and Hong Kong (though the majority were Cantonese speakers from Hong Kong and Guangzhou) that afforded the education opportunities in high-skilled fields and were already exposed to Western influences like the political freedoms in democracy that became a motivating factor to leave (Wong 1998).

Many new immigrants settled in San Francisco, owing to the history of a long-standing Chinese community and the economic opportunities to find the high-skilled jobs they immigrated for. Rather than settling in the cramped neighborhood of Chinatown, however, they chose the more suburbanized neighborhoods of the Richmond and Sunset Districts in San Francisco for its stock of single-family homes and ample space to raise their future families.

3.4 Moving to the Richmond and Sunset Districts

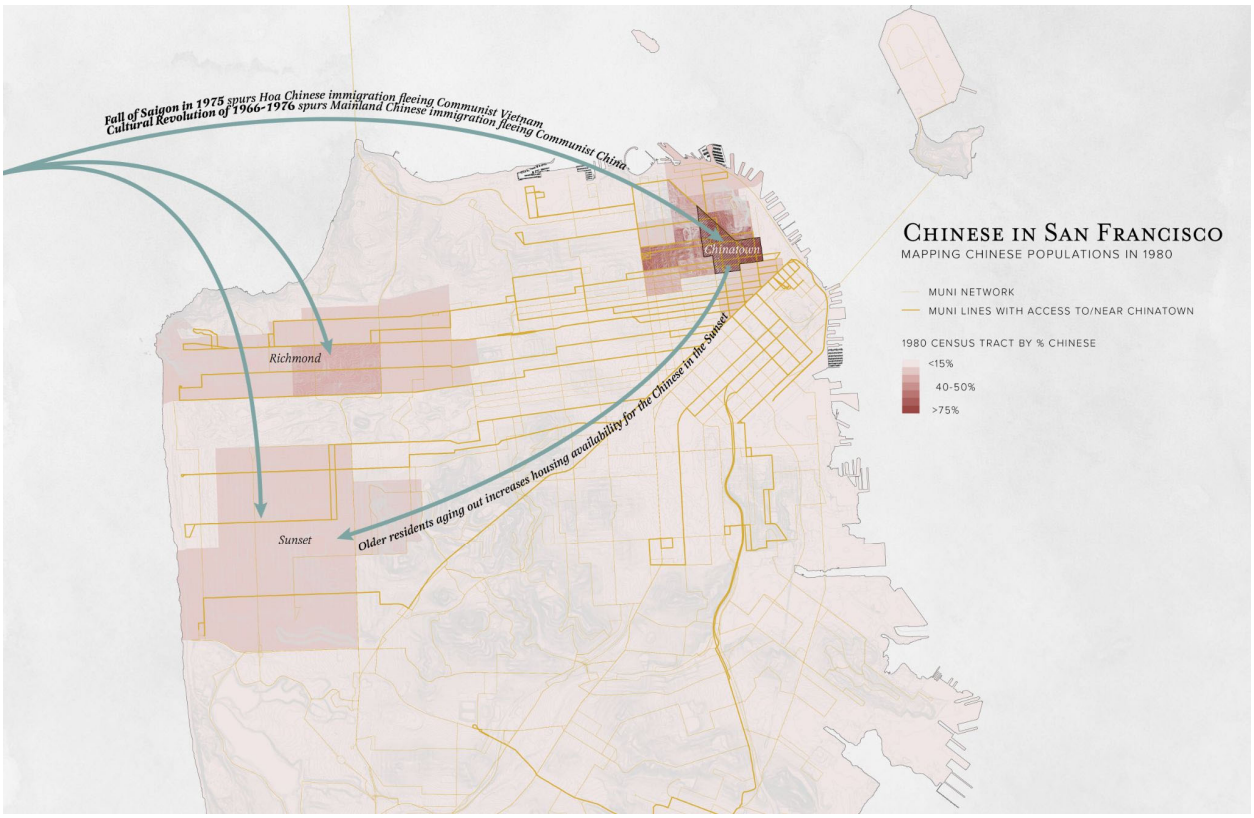


Figure 3.3 *Mapping Chinese Populations in 1980. Many immigrants moved to San Francisco in response to political events in their homeland, including the Cultural Revolution and the Fall of Saigon. The Chinese continued to move to the Richmond and Sunset, where there were newly available stock of residential homes for sale*

Like the new immigrants, many longtime residents in Chinatown who could afford to move also settled in the western districts in San Francisco for similar reasons to escape crowded conditions in Chinatown, but also as a social marker of upward mobility in achieving the American Dream and shedding markers that labeled them as immigrants (Hall-Lew 2014). The resettlers were likewise often of the newly middle class, having saved enough money or prospered in entrepreneurship in Chinatown to afford the move, yet still desired the connection to Chinatown. The choice for both longtime residents and new arrivals to settle in the Western districts arose from the alignment of multiple opportune conditions. While many desired to escape the density of Chinatown, they still valued the cultural connection and their established social communities; these families still desired to be within direct access to Chinatown, and often still visited for "work, church, family obligations, leisure, and social events" (Laguerre 2005). The Richmond experienced much of the initial growth in Chinese residents, owing to direct service from multiple Muni lines[1] (Laguerre 2005), while the Sunset

[1] *Clement Street became the commercial hub of the New Chinatown because many of the Muni lines stopped by or passed through on the way to Chinatown (Laguerre 2005)*

District experienced slower growth as Muni lines were fewer, less frequent, and less direct than those in the Richmond (LaBounty & Gallagher 2017).

While the Muni lines servicing the two neighborhoods attracted the new families, the availability of single-family homes also proved to be a draw. The early residents were primarily Anglo and Irish, many of whom also moved from other neighborhoods in San Francisco to escape crowded conditions and settled here in the boom after World War II in the late 1940s (Laguerre 2005). By the 70s and 80s with the influx of new Chinese residents, many of the original white residents were beginning to "age out"; their children had grown up and moved out to suburbs throughout the San Francisco Bay Area and the owners themselves were no longer able to care for their property (Laguerre 2005).

This situation became the opportunity for the Chinese to purchase single family homes, thus gradually supplanting the aging-out of former residents. Like their predecessors, the single-family homes with ample space were a major draw as it allowed their families to grow, especially as many were intergenerational families who appreciated the opportunities to physically expand and grow their homes without the restrictions of space constraints in Chinatown (Wong 1998).

Many of the resettlers from Chinatown were among the first to establish businesses and cater to the needs of an expanding community, primarily starting with restaurants and groceries (Laguerre 2005) that likely provided familiarity and cultural connections. Like Chinatown, many of these were ethnic businesses catering directly to the Chinese and began to proliferate in a wider range of retail and services like "music, jewelry, clothing, books, and herbal medicines… massage, acupuncture, hair, dentistry, travel, and banking" (Lung-Amam 2017) as more Chinese immigrated—whether from Asia or from Chinatown— into the Richmond and Sunset. The strongest contrast between the built environment of Chinatown and the New Chinatown, though, lies in the facade. The Richmond and Sunset remain largely residential and reminiscent of suburbs, where businesses are concentrated in select streets zoned for commercial businesses.

Rather than rebuilding or retrofitting the commercial corridors, they simply adapted to the existing space, as a curator from the Chinese Historical Society in Chinatown conjectured, that they were "unconcerned with vernacular or the built environment unless a building or space impinges on their opportunities to provide for themselves and family". Decisions to adapt to existing built environment may have been driven by financial calculations to maintain financial security for the business owners' families, but it also became a physical manifestation of many who at that time had moved to socially blend into American society and shed markers of immigrant status (Hall-Lew 2014). Yet the expanding Chinese community has still made their mark through their physical presence that transformed the character of the neighborhoods. While the residential zones of the Richmond and Sunset may resemble a typical American

neighborhood, this transformation is most visible in the commercial corridors with prevalent bilingual signs on storefronts. Even institutions and services like libraries, churches, and public community spaces have adapted bilingual signage to cater to the predominant community (Hall-Lew 2014), showing the extent of the influence they have had on the neighborhood.

3.5 Conclusion: A Glocal Panethnopolis Today

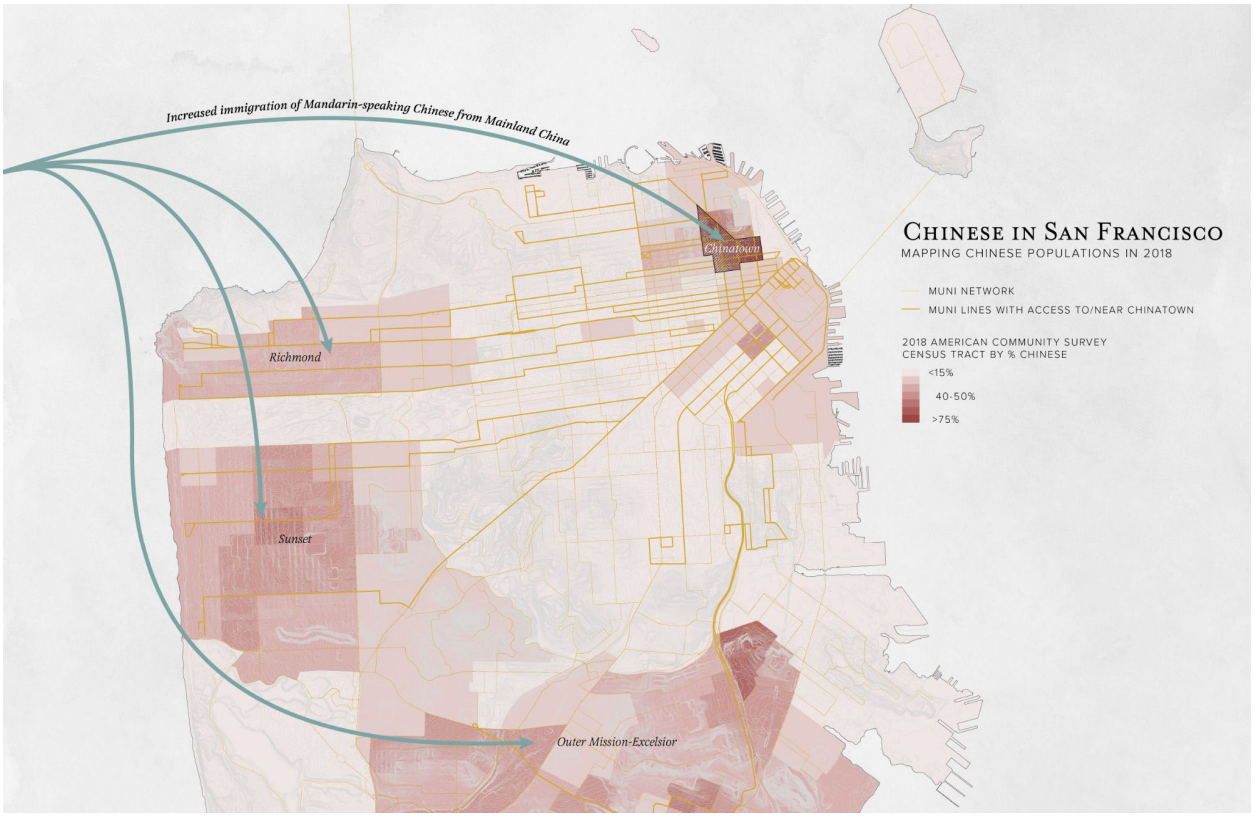


Figure 3.4 *Mapping Chinese Populations in 2018. The Chinese population and presence have increased in neighborhoods like the Richmond, the Sunset, and Outer MIssion-Excelsior. While Cantonese remains as the lingua franca of the community in San Francisco today, many of the more recent immigrants are Mandarin speakers from Mainland China.*

Since the movement of Chinese into the Richmond and the Sunset and the influx of migration from East Asia who often chose to settle there over Chinatown, the Chinese community has formed a unique “glocal panethnopolis”, a difference that set it apart from Chinatown beyond the superficially visible built form. The “glocal panethnopolis” is a neighborhood that is simultaneously locally unique yet still draws from many cultural and national connections (Laguerre 2005), and the Sunset owes this multicultural influence to the patterns of immigration since the 1960s with political events like the Cultural Revolution, the Fall of Saigon, and the handover of Hong Kong spurring an influx of Cantonese-speaking, non-Mainland Chinese. While all ethnically Chinese, these immigrants brought new cultural experiences to integrate into the Chinese community and their presence established

Cantonese as the lingua franca of the community, a stark contrast to the relatively homogenous and formerly dominant Taishan language in Chinatown prior to the 1960s.

Understanding the history of the Chinese in San Francisco and the events that ultimately shaped their community reveals the complexities of culture and identity within a seemingly monolithic ethnicity. Their community and perception of their neighborhood space are shaped by the collective history and experience of the Chinese. Context and history are influential in shaping the experience of place, as demonstrated by the Chinese transforming the Sunset to fit their needs. With an understanding of the history and why they chose to settle in the Sunset, I can engage with the community to learn how they use the spaces within Sunset and whether they fully meet their needs.

Chapter 4
Neighborhood-Scale: Memories & Experiences in the Sunset

4.1 Introduction

In this chapter, I intend to explore the patterns and uses of public space by the Chinese community in the Sunset, which will then form the basis and guidelines for designing green infrastructure placement that fully treats runoff as required by San Francisco's Stormwater Design Guidelines while maximizing social benefits for users. Underlining the study of public space usage is observation and understanding of neighborhood space through the cultural lens of the Chinese. How people use space is highly dependent on cultural upbringing, as observed by Willow Lung-Amam in her studies on suburban Asian-American malls in Silicon Valley (Lung-Amam, 2017), where the community adapted the suburban plazas to fit their needs.

This chapter uses community engagement to explore the public spaces in the Sunset and how the Chinese community have adapted these spaces to fit their needs. Studying existing uses of space provides an understanding of the community's memories and experiences of public spaces in the Sunset, how users interact with their built environment, whether the existing spaces fit their pattern on uses and needs, and what they feel are priority needs for their neighborhood.

4.2 Methods for Community Engagement

Due to the limitations of in-person interaction during the COVID-19 pandemic and shelter-in-place restrictions, modifications were required to acquire information on individuals' habits of public space usage without relying on traditional canvassing techniques and face-to-face interviews. This research drew from a variety of methods and sources to establish a representative survey of uses and experiences of public spaces in the Sunset: online surveying and phone interviews, primary source research of interview transcripts and questionnaires, and literature reviews.

<u>Online Surveying and Phone Interviews</u>
I contacted individuals directly to share their experiences of living in the Sunset. Individuals were provided an option to respond via online survey or phone interview to maximize response rate by offering multiple methods to share their experiences with whichever they felt most comfortable with. As an alternative to canvassing for responses, both individuals from my personal network who lived in the Sunset and individuals from community organizations were

contacted. The majority of personal contacts preferred the online survey that required less overall time to complete, while individuals within community organizations typically opted for phone interviews. This response bias may have also been affected by the method of contact outreach as I contacted personal connections primarily through informal communication such as social messaging apps and short message service (SMS) texting, while contacting community organizations occurred via more formal methods of communication through direct calls and emailing. Finally, the method of outreach to personal contacts skewed such that respondents and results were primarily from the perspective of second-generation Chinese Americans between the age range of 18-35, the same demographic that I identify with.

Questions include public space experiences in the Sunset, spaces for public events and gatherings, perceptions of green infrastructure and green space, and experiences with community engagement. (See Appendix A for a full list of questions and survey responses).

Primary Source Research

To offset the bias towards second-generation experiences in the age range of 18-35 and in the limits during COVID-19, I used interview transcripts provided by the Chinese Historical Society of America (CHSA), who had conducted interviews as part of their "Chinese in the Sunset" exhibit in 2018 that focused on Chinese residents' lived experiences growing up in the Sunset. Of the 23 respondents to the CHSA interviews, the majority were primarily the older generation with approximately 8 between the ages of 35-60, and 9 were 60+.

CHSA conducted semi-structured interviews that generally focused on how they moved to the Sunset, their experiences growing up there, and significant memories they have in the Sunset. Similar to my online surveys, where questions were tailored to representatives of community organizations, some CHSA interviews were also tailored to their professional experiences, such as District 4 supervisor, assessor, or board members of community organizations. This likewise provided broader insight into community uses and needs for services that could inform the ultimate design proposal. Finally, while the interview questions were not necessarily specific to their experiences of uses of space in the Sunset, many provided responses.

Literature Review

Given potential limitations of obtaining sufficient responses during a global pandemic to draw representative results and conclusions, the use of case studies helped to both strengthen conclusions drawn from the previous methods and to determine which responses were representative generalizations with those that were more individual anecdotal experiences. Four research studies were selected, based on their focus in leisure and recreation of various generations of Chinese Americans in public spaces. The three studies include:

- Leisure Preferences and Open Space Needs in an Urban Chinese American Community (Tingwei Zhang, et al. 2020), which found that the most popular form of leisure was “relaxing” and that these everyday activities were closely correlated with nearby neighborhood spaces while further parks and playgrounds were more associated with active recreation or organized activities.
- Nature of Leisure Activities among the Chinese American Elderly (Maria T. Allison et al. 1993), which found that Chinese-American seniors engaged in similar categories of leisure activities as their American counterparts, with the difference that the types of leisure among Chinese-American seniors often associated with maintaining cultural ties.

- Mainstreaming the Asian Mall (Willow Lung-Amam 2017), which was a study on the phenomenon of suburban Asian mall plazas as community centers for Asian-Americans.

4.3 Results

4.3.1 Memories and Experiences of Public Space in the Sunset

Qualitative and quantitative data were used to map out the extents of public space usage by the Chinese community in the Sunset, shown in Figure XX that combines total mentions of public spaces and quotes of memories and experiences from respondents. A total of 93 mentions of specific public spaces were mentioned by the 40 respondents (14 online survey responses, 3 phone interviews, and 23 transcripts of CHSA-conducted interviews). An additional 7 generic mentions of parks, church, playgrounds, or stores were provided, but not counted as part of the 93 specific mentions. This data will be used to quantify the popularity of types of public spaces and which places are most frequented, based on my sample size. Of the 93 specific public spaces, 40 were for parks and playgrounds, while 33 were for commercial street corridors.

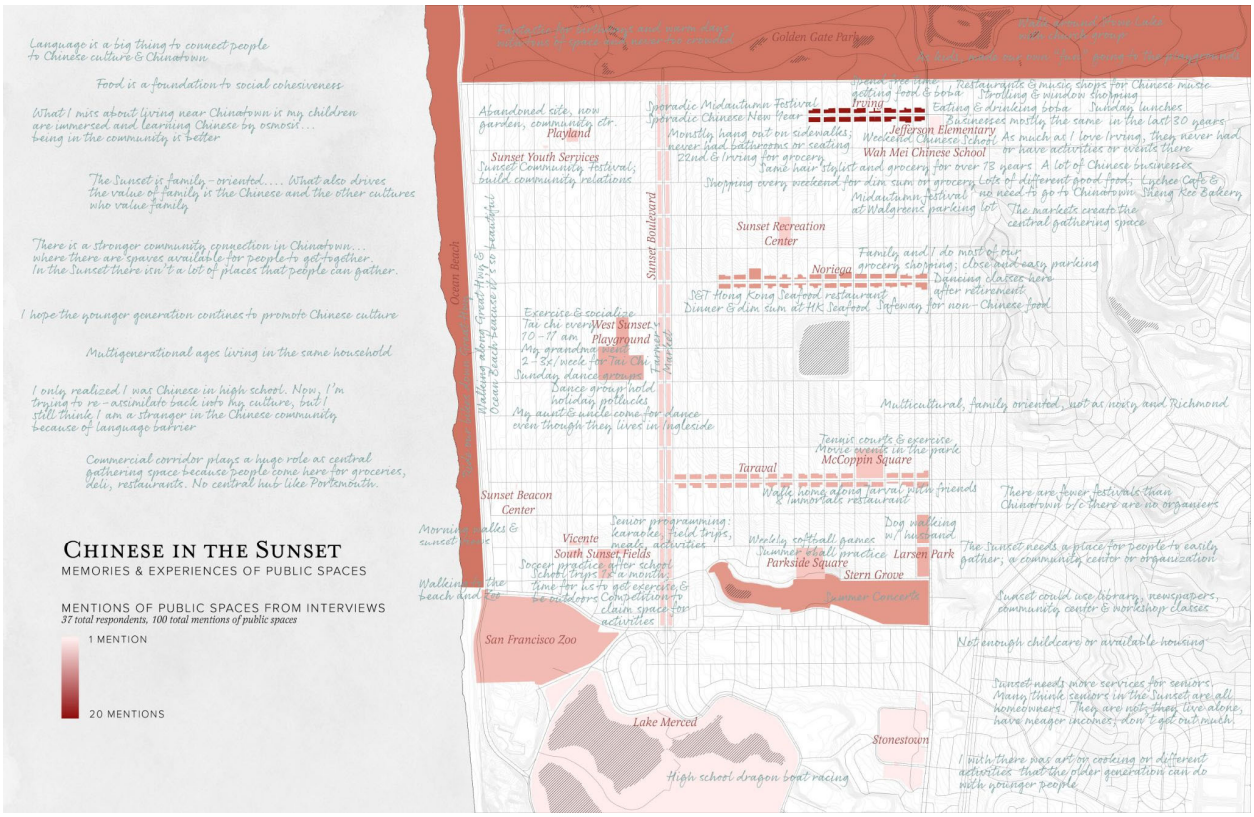


Figure 4.1 *Various quotes of memories and experiences associated with respective public spaces and quantification of frequency of mentions per public space.*

These two categories of public spaces were the most popular as additionally evidenced in Figure 4.1 that isolates for only parks, playgrounds, and commercial corridors. Of the total mentions, Irving Street stood out as the most popular with 19 total mentions and the most amount of qualitative quotes. Golden Gate Park and Ocean Beach were second in terms of quantitative mentions at 10 each, but West Sunset Playground and South Sunset Fields were second in terms of associated memories to a place. This discrepancy may be because Golden Gate Park and Ocean Beach are significant landmarks that geographically define the Sunset District, thus potentially the most prominently obvious association of public space. However, the associated quotes for West Sunset Playground and South Sunset Fields show that these two spaces are more frequently visited on a routine basis and potentially hold more cultural and communal significance for its visitors.

4.3.2 Activities within Public Spaces in the Sunset

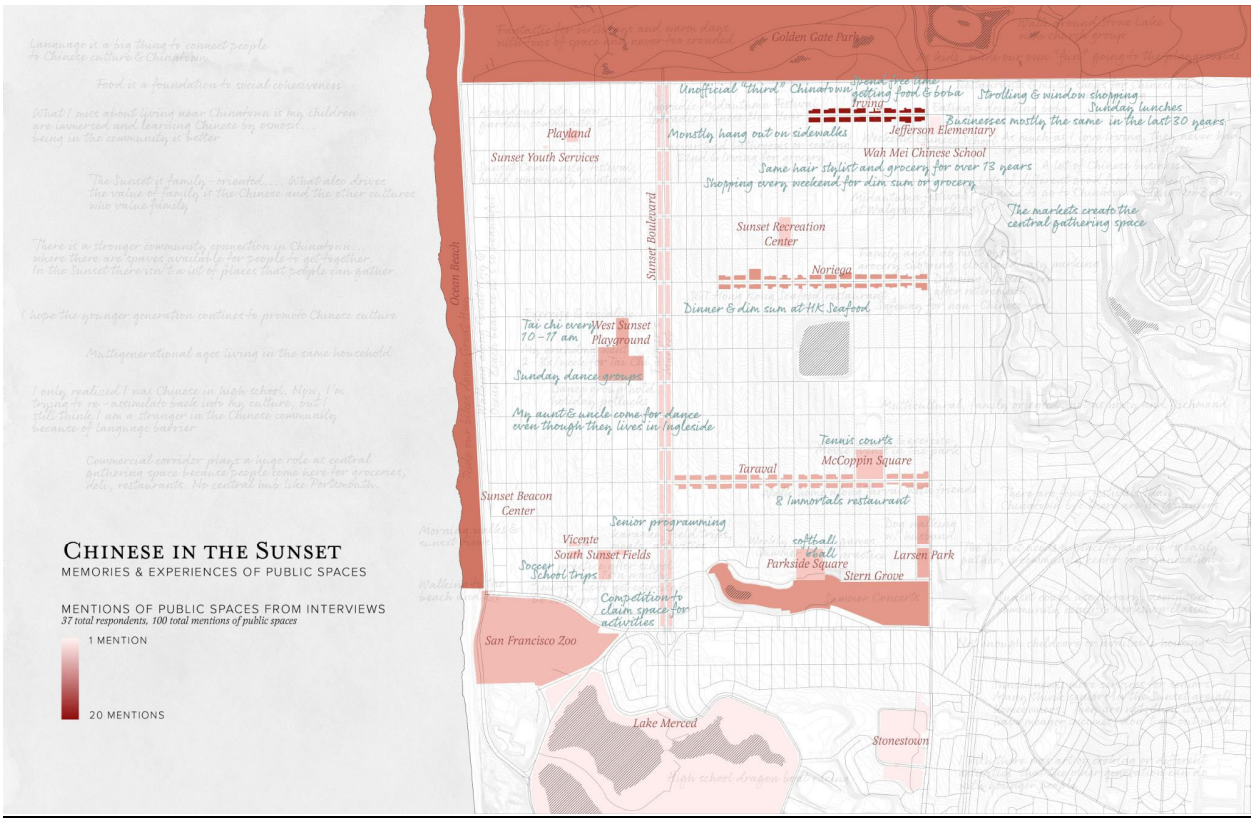


Figure 4.2 *Selected quotes highlighting associated memories from commercial corridors and parts & playgrounds.*

Based on the associated memories of respondents from Figure 4.2, the usages of commercial corridors and parks & playgrounds differed significantly. The four most popular activities among respondents were what Zhang classified as "relaxing" and passive recreation—errands/shopping, walking, hanging out, and eating—which were most often associated with memories of commercial corridors. The next four most popular activities—sports, tai chi, dancing, and dog walking—were typically more active and organized recreational activities more associated with parks. These results are consistent with research that found that parks were most of the site of organized and active recreation, while streets tended to favor more hyperlocal, passive everyday activities (Zhang 2020).

Because parks are so far and few in the Sunset as they were in Zhang's study, and thus require deliberate planning to visit the spaces, they become sites for specific planned activities like the organized team sports and tai chi mentioned. Additionally, park usage also exhibits a generational divide. The younger generations more frequently participated in team sports owing to their ease and comfortability in Americanized society and in communicating with non-Chinese peers (Zhang 2020), thus spaces like parks for the younger generation could be associated with

childhood. Meanwhile, the older generation more frequently participated in cultural-based recreation like tai chi or fan dancing. The study by Allison on leisure activities among the Chinese American elderly points out that while they tend to participate in similar categories of activities compared to their American peers, these recreational activities tend to have cultural connections and are a primary means for them to retain their cultural identity, especially for many who may feel less comfortable or acculturated to American society (Allison 1993). Despite the generational differences in recreational preferences, the park has become an integral space for engaging with their peers and forming community ties.

Conversely, the most popular forms of activities among respondents were shopping, walking, hanging out, and eating, which tend to be more associated with the commercial corridors. Zhang categorized these as passive activities and grouped them into a singular label of "relaxing", noting in his study results that people tended to simultaneously engage in a combination of these four activities together. Rather than thinking of each activity as a separate leisure, they were part of a routine ritual of equal parts leisure and running errands (Zhang 2020). One respondent and community leader, notes that many families come to the commercial corridors on weekends as part of a family outing, which consists of walking around, doing grocery shopping for the week, and then spending time together eating at a restaurant or dim sum.

Similar findings from the Sunset Forward community plan also reveal the most popular neighborhood services were grocery and shopping that take place in commercial corridors. The Sunset Forward community plan is a community-based needs assessment in partnership with various City of San Francisco departments and local neighborhood organizations, including Wah Mei School with whom I had reached out for preliminary results from the assessment.

4.3.3 Desires and Needs for Neighborhood Services in the Sunset

While some parks and commercial corridors have functioned as gathering spaces for the Chinese community, many lament that these spaces are far and few compared to Chinatown. As a result, respondents—especially from the older generation who have emphasized their values of cultural connections—feel that there is a weaker sense of community in the Sunset compared to Chinatown and attribute this to both the lack of physical gathering spaces and the lack of neighborhood organization resources to host events or services.

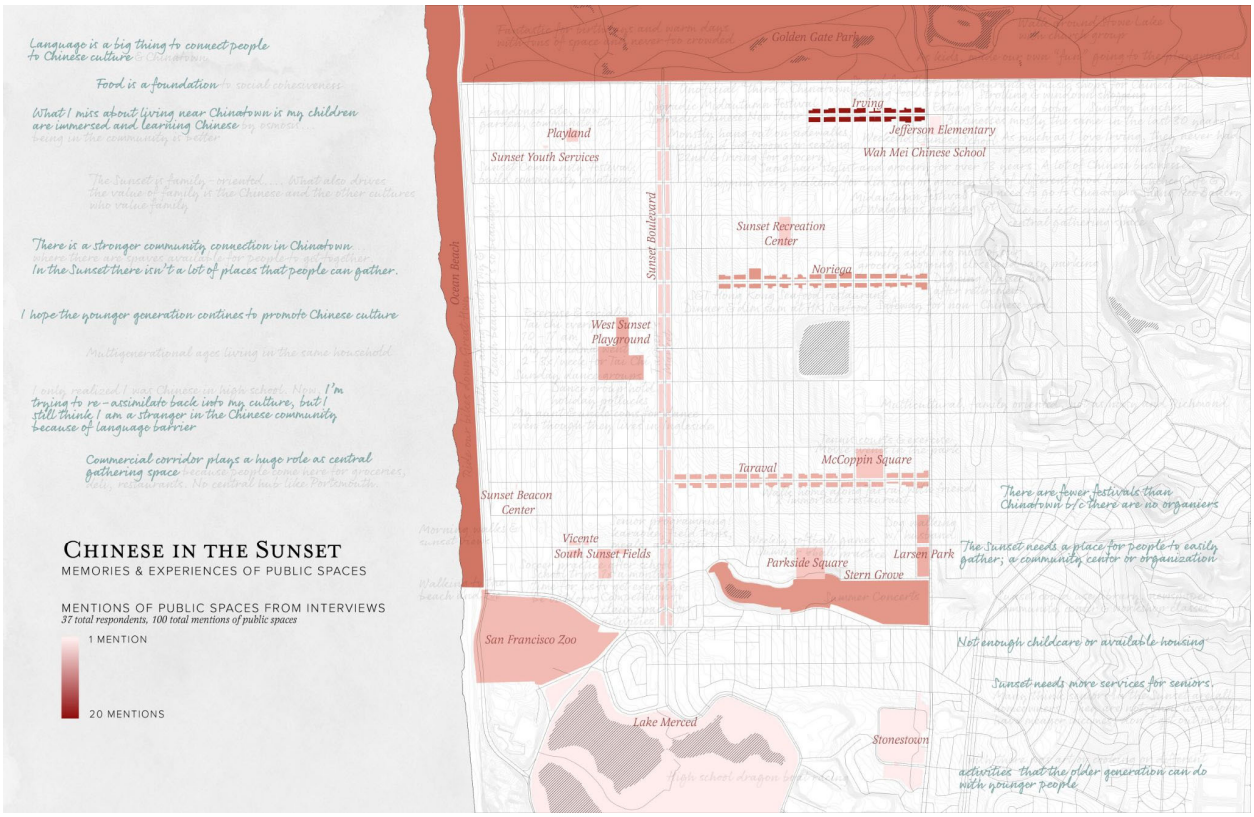


Figure 4.3 *Selected quotes on desires and needs from respondents.*

Respondents from the older generations additionally mention that they miss the ease of opportunity to be engaged with Chinese culture—especially through language exposure—in Chinatown and how it was harder for their children to maintain cultural ties while growing up in the Sunset. These respondents emphasized the importance of language because they felt that it strengthened and provided a tangible connection to the Chinese community. Thus, the consensus among respondents in my research were to provide more frequent public gathering spaces, more opportunities for cultural connection through language exposure and cultural events, and more resources for organizations to host programs or events for the community.

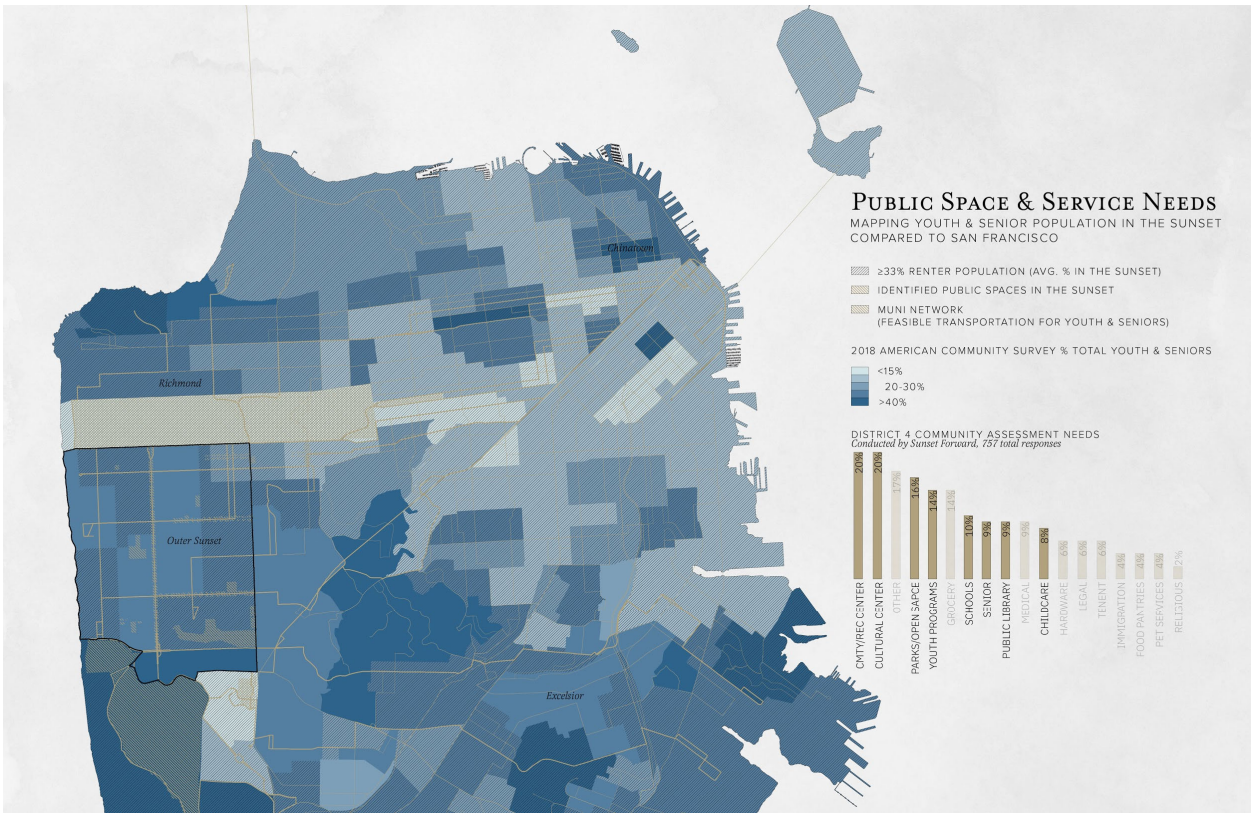


Figure 4.4 *Percentage of total seniors and youth in San Francisco census tracts along with results of neighborhood service desires from the Sunset Forward community plan.*

Overall, these desires fall in line with results from the Sunset Forward community plan. The community-based assessment received 757 responses from residents throughout the Sunset District and found that a community center and a cultural center were the two most-desired services among respondents, receiving 20% support each from all respondents. From my surveys and interviews, some identified services associated with community centers centered around services for the youth, such as afterschool programs, meals and programming for seniors, and helping recent immigrants adjust and navigate American society. Within cultural services, respondent desires included increasing cultural events and spaces to host them, and opportunities to engage in language to retain cultural ties.

Following community and cultural services, the third most-desired services was additional parks and open spaces with 16% of support likely due to the lack of park space with existing parks sparsely spread throughout the Sunset. As these spaces are sites for recreational activities based on survey respondents, ease of access to these spaces is critical yet unevenly distributed due to varying proximities to these spaces. From my survey that included the 14 online respondents for preferred locations for green spaces, the nearly half preferred spaces to be located near commercial corridors followed then by nearly one-third to be near residential spaces that lack park access (Appendix A).

Other desired services include programming and spaces for youth and seniors, who account for nearly 35% of the population in the Sunset (Figure 4.4). Despite the higher population of these groups, survey respondents have noted a lack of sufficient services for them, and results from the Sunset Forward community plan confirm the need for these services.

In my conversations with the director from the Wah Mei School, he felt that the Westside often got ignored in terms of city services, likely owing to the misconception that residents are primarily homeowners and self-sufficient in caring for their families or meeting their own needs. This misconception translates into the disparity of number of non-profit organizations between Chinatown and the Sunset, which the director estimates there are maybe 25 organizations within the southern half of Chinatown compared to approximately 15 organizations total for the Sunset. The director conjectures that this lack of organizations and community centers translates into relying on commercial corridors to fill the role as the central gathering space with neighborhood services, which could explain the importance and frequency in mentions for commercial corridors among many demographic groups.

4.4 Conclusion

The neighborhood-scale community engagement process focused on understanding memories, experiences, desires, and needs of public spaces in the Sunset. The majority of respondents visited parks and playgrounds for active recreation while commercial corridors were spaces for everyday life and activities. The most frequented of these was Irving Street, which was unofficially called the Third Chinatown with its concentration of Chinese businesses and residential visitors to frequent it for grocery shopping, hanging out, walking, and eating. These commercial corridors, and especially Irving Street, also functioned as an important gathering space due to the frequency of routine visits and a lack of central community spaces.

Respondents from surveys that I've conducted as well as from the Sunset Forward community plan both expressed desires for increased gathering spaces to strengthen community ties in the Sunset. The main community needs identified for the Sunset include increased community spaces, cultural spaces, and parks/open spaces. Based on these responses, selecting a commercial corridor for green infrastructural improvements to address community needs appeared to be the most ideal. Given the strong usage and concentration of visitors to the commercial streets, it presents an opportunity to provide for the two most-desired services: community and cultural centers. Additionally, third most-desired service is park/open space, to which most respondents also preferred within commercial corridors.

Chapter 5
Site-Scale: A Proposed Design for Irving Street

5.1 Introduction

After conducting neighborhood-scale community engagement to understand the general socio-cultural uses and desires of public space by the Chinese community, the analysis can then inform site selection for green infrastructure implementation. While the initial feasibility for green infrastructure implementation has already been determined by analysis of physical constraints the optimal site and final design will be informed by community engagement and using the community's input of socio-cultural uses and needs. Here, site-level community engagement focuses on understanding existing patterns of usage specific to the site and the desired design preferences to ultimately guide the green infrastructure design.

Understanding the community uses of space can help identify opportunities for addressing community needs and the conflicts that may arise in balancing between social needs and green infrastructure functionality. This chapter will explore the process of site selection based on functional and socio-cultural analysis from Chapters 2-4 for the ideal location to test a proposal design. It will then describe the process and results of community outreach through behavioral observation and referencing outreach efforts from SF Public Works (SFPW). Once an understanding of usage patterns is established, social opportunities for meeting community needs, functional opportunities for implementing green infrastructure, and conflicts between the two can be identified and balanced in decision-making. Finally, the community input and balancing of multiple opportunities will guide the proposed design.

5.2 Site Selection

Based on responses from the neighborhood-scale community engagement process, selecting a commercial corridor for green infrastructural improvements to address community needs appeared to be the most ideal, which narrows site selection to three commercial streets: Irving Street, Noriega Street, and Taraval Street. These streets were then assessed based on the site suitability and the 3 level-of-service needs identified by the SFPUC in Chapter 2 and on opportunities for socio-cultural uses based on community engagement in Chapter 3.

<u>Site suitability</u>
The majority of Irving is deemed feasible for green infrastructure, particularly between 19th Avenue and 26th Avenue where most Chinese businesses are concentrated. Parts of Noriega meet the physical constraints, while only two blocks—between 30th Avenue and 32nd

Avenue—are within the main concentration of Chinese businesses. Taraval also exhibits lower feasibility, due to steeper street slopes, with stretches between 20th Avenue and 23rd Avenue near McCoppin Square as ideal for implementation based on proximity to other public spaces identified from community engagement.

Flood Reduction

Noriega was identified as a medium priority for hydrologic and hydraulic needs to address flooding on stretches between 30th Avenue and 33rd Avenue where Chinese businesses are concentrated. Irving had some minor flooding between 2 to 4 inches on certain stretches from 19th Avenue to 25th Avenue where Chinese businesses are concentrated, though it was not identified as a street priority. Taraval had no observed issues of flooding.

Combined Sewer Discharge Reduction

All three commercial corridors are within discharges to Ocean Beach and would contribute to reducing combined sewer discharge

Environmental and Social Sustainability Needs

Noriega is within a designated disadvantaged community while Irving is within proximity to and bordering a designated disadvantaged community. All three streets are identified as opportunities for interagency long-term priorities for pedestrian safety improvements, while no street is identified as part of the proposed City bike network or green connection network.

Socio-Cultural Uses and Needs

Of the three streets, Irving was the most referenced and visited corridor of the three and identified as the de facto cultural center for the Chinese community in the Sunset due to the strong concentration of grocery stores and restaurants as well as occasional organized cultural events.

Final Site Selection

Ultimately, Irving Street was selected as it was within green infrastructure-feasible areas and had the highest opportunity to address socio-cultural needs while still addressing some level-of-service needs identified by the SFPUC. Furthermore, proposed socio-cultural-based green infrastructure improvements on Irving Street could provide the greatest visibility to the infrastructural improvements and the greatest impact to meet the desires and needs of the community.

Specifically, the two blocks between 21st and 23rd Avenues were selected as the focus of the green infrastructure proposal. Based on neighborhood-scale community feedback, the Walgreens parking lot occasionally hosts cultural events like Mid-Autumn Festival and

potentially Chinese New Year celebrations, and thus this site has potential to address desires for a cultural center by becoming an outdoor cultural gathering space. Secondly based on my site observations and on research from SFPW's own community outreach for Irving Street improvements, the 22nd & Irving Market is the most frequented.

5.3 Site-Scale Community Engagement

5.3.1 Methods

With a site identified, the next step is to understand existing patterns of spatial usages and preferences for site design through community engagement. Due to limitations of engaging in face-to-face interviews with patrons during a pandemic, behavioral observation methods were used to understand spatial usage patterns while street improvement surveys conducted by SFPW in 2013 were used in lieu to understand the community preferences on Irving Street.

Behavioral Observations

Behavioral observations were conducted to record demographics of visitors on Irving Street and the main nodes of social activity within the street to see if there were correlations between patrons and businesses. I conducted two site visits for recorded observations, both on a sunny weekend. An initial visit was conducted in the afternoon to familiarize myself with the businesses present and to record qualitative observations of how visitors engaged with the space.

A second visit was conducted in the morning, noon, and afternoon to collect quantitative and qualitative data. I observed each block in 35-minute intervals, and each interval consisted of 4 rounds of observation on each side of the street: 5 minutes to count and record stationary versus transient activities, 5 minutes to record perceived age, 5 minutes to record perceived race, and 20 minutes to record qualitative observations. I attempted to maintain a consistent walking speed for each round of quantitative observations and only counted individuals within my immediate line of sight as I passed them. The purpose of recording perceived age and race for demographics was to respectively understand if demographic patterns existed throughout the day and if Irving Street visitors were representative of the Chinese population in the Sunset, while qualitative observations helped understand the types of activities that occurred.

SFPW Community Outreach

SFPW conducted their own surveys and outreach in 2013 for a streetscape improvement project. The department hosted four community meetings, including one to survey the

community on Irving Street between 19th and 26th Avenue to understand likes and dislikes, transportation method of arrival, time of day to visit, preferred activities, and preferred improvements (SFPW 2013). While no specifics in the metadata were provided for who was surveyed, how many were surveyed, or whether respondents were representative of the Chinese community in the Sunset, the conducted surveys provided a range of survey responses to the survey questions. Additionally, the community meetings were hosted over a course of five months between July and November 2013 with feedback responses from the community (SFPW 2013). Therefore, with a lack of opportunities for self-conducted surveys by interviewing visitors and business owners during the pandemic, the efforts from the SFPW outreach served as a proxy for direct engagement as it also covered the two blocks of my site design.

5.3.2 Results

Morning Site Observations

Figure 5.1 *Morning stationary and transient activity*

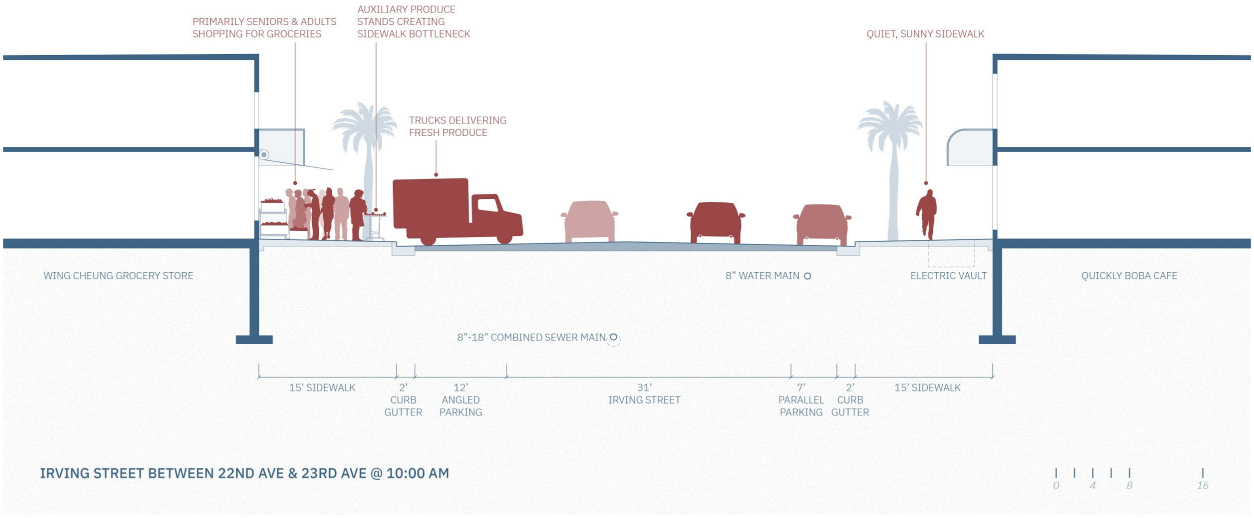


Figure 5.2 *Section illustrating morning activities.*

During the morning, visitors were predominantly seniors and perceived East-Asian-presenting and particularly concentrated between 22nd & 23rd Avenue. Additionally, most stationary activities were concentrated on the southern side of Irving Street around the grocery businesses and delis that were typically the only few businesses open before 11 AM. From observations, all grocery businesses displayed fresh produce on the outside walls within the sidewalks, and these businesses were all located on the southern side of the street to protect from direct sunlight exposure. Sometimes these businesses also set up temporary tables as makeshift produce stands at the curb edge to display.

The northern side had one seafood market and remaining businesses were primarily restaurants or boba shops closed at this hour, and thus had fewer activities aside from the seafood market. Additionally, delivery trucks supplied fresh produce for the grocery and seafood markets were parked in spots in front of those businesses. See Appendix C for breakdown of quantitative statistics.

Noon Site Observations

Figure 5.3 *Noon stationary and transient activity.*

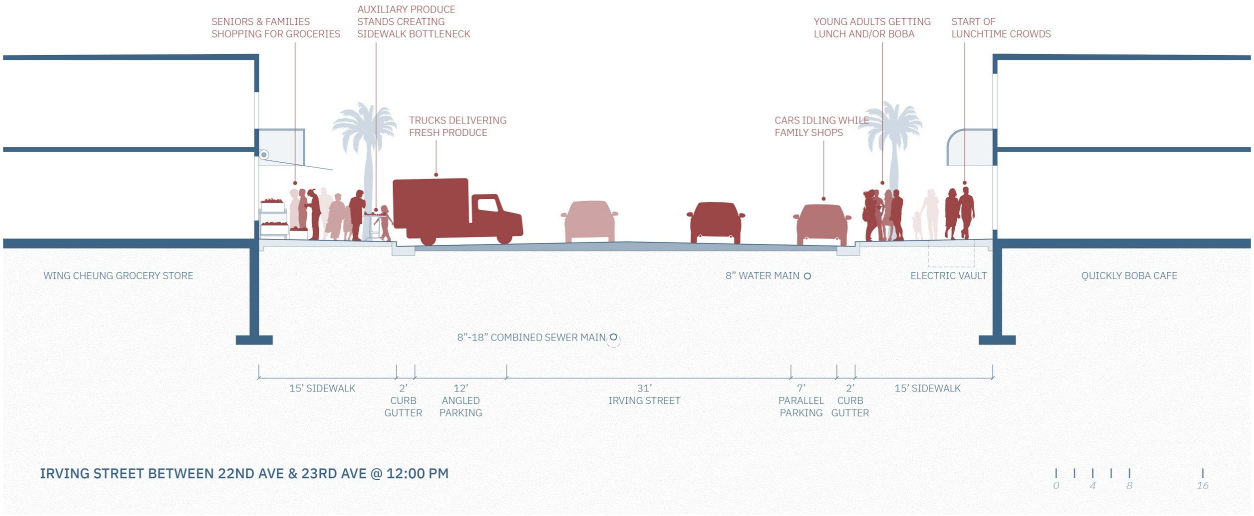


Figure 5.4 *Section illustrating noon activities.*

Towards noon, there were more younger visitors and families compared to the morning. This also appeared to be the busiest time on the weekends as there was potential overlap of visit purposes: some seniors and older individuals were still grocery shopping, some families were starting their day with a grocery visit, and some young adults were arriving to hang out. This also overlaps with lunchtime as restaurants began opening for business and some morning visitors remained to eat lunch with friends or family. Overall, traffic is more distributed on both sides, though the majority of observed stationary activity is still around the grocery stores. The small delivery trucks were still present at the grocery stores. See Appendix C for breakdown of quantitative statistics.

Afternoon Site Observations

Figure 5.5 *Afternoon stationary and transient activity*

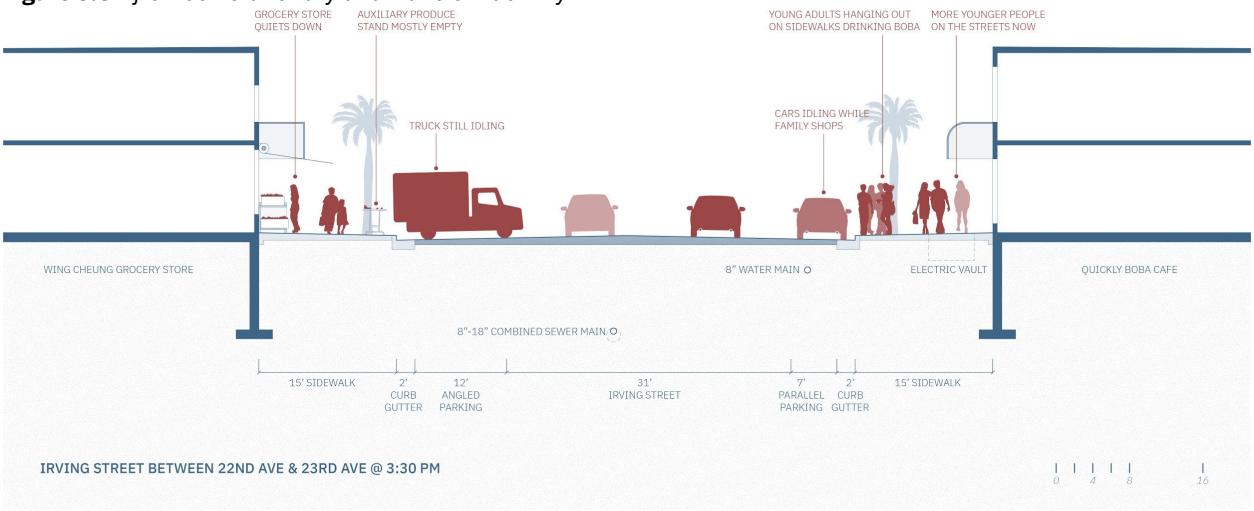


Figure 5.6 *Section illustrating afternoon activities.*

By the afternoon, there were still clusters of activities around grocery stores, but much of it tended to shift towards the northern side of the street where the majority of restaurants, boba shops, and south-facing sun exposure were located. The demographics in the afternoon were predominantly adults and young adults who congregated around the boba shops. Some delivery trucks in front of the grocery stores were still present. See Appendix C for breakdown of quantitative statistics.

Site Observation Patterns

Overall, general usage patterns for the weekend showed that more older users were present in the morning, and progressively shifted to a younger demographic by the afternoon. Generally, the majority of businesses within the two blocks of Irving Street consisted of restaurants, boba shops, and grocery stores, and the primary nodes of social activity revolved around these businesses; mornings were centered around grocery stores on the southern side, and began to shift towards the restaurants and boba shops by the afternoon, which were distributed predominantly on the northern side of the street. My behavioral observations indicated that noon was the busiest time with overlapping uses and that by afternoon, this began to slow down.

SFPW Survey Results

It is important to note that these findings may not be representative of daily routines as they were studied on a sunny weekend during pandemic conditions. From SFPW's outreach, the majority of respondents visited during evening and business hours, with mornings as the next-busiest time, while noon was the least popular (SFPW 2013). Again, while no information on the data sample were provided from SFPW and while these results contradicted my findings, the general pattern of older users in the mornings and around grocery stores and progressively younger users throughout the day who tended to congregate around boba shops is consistent with research from Lung-Amam.

SFPW's outreach also provided information on desired improvements for Irving Street, with the main community desires focused on cleaner streets, increased vegetation, and more landscaping and vegetation that complied with principles of feng shui. Feng shui is a Chinese philosophy of unity between humans and nature connected by the concept of qi, a cosmic life-force, (Mak and Thomas 2005) and that practitioners can essentially manipulate the physical environment to increase a flow of qi to alter the auspiciousness of a site. In feng shui, qi also flows through the world via the underground (Yoon 2017), which symbolically likens it to groundwater.

Today, feng shui is especially popular among Hong Kong Chinese and overseas, non-Mainland Chinese communities as the cultural belief was banned until recently by the Chinese Community Party (CCP) for being "backwards and superstitious". (Madeddu and Manuela 2017). From Chapter 3, many Hong Kong immigrants and Chinese immigrants who left mainland China for political reasons were largely influential in shaping the Chinese community in San Francisco and they would have likely retained their knowledge of—or at least a familiarity with—feng shui practices. Because feng shui is deeply rooted in traditional Chinese

culture (Madeddu and Manuela 2017) and provides a cultural connection for the Chinese diaspora, it would have likely motivated respondents to desire feng shui compliant practices to reflect their community and commercial space.

5.3.3 Site Constraints for Green Infrastructure

Drainage Area Boundaries

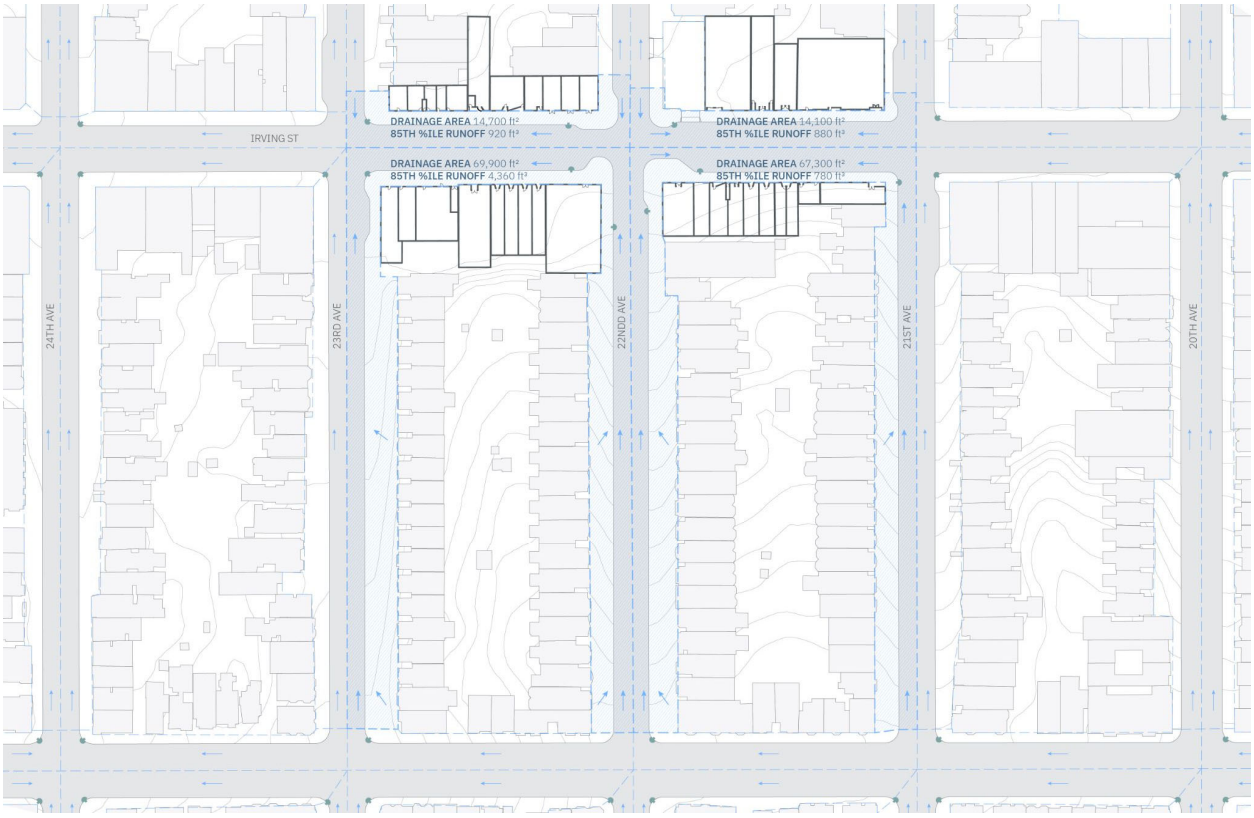


Figure 5.7 *Drainage areas and runoff flows.*

Analyzing topography provides an understanding of runoff flow patterns, while catch basin locations provide the boundaries and low points for sub-catchment areas, i.e., the drainage areas of the street where runoff would accumulate and therefore be ideal for green infrastructure implementation. From Figure 5.7, runoff typically flows from east to west and south to north, while catch basins on the western side of each block along Irving Street creates a collection low point that dictates the boundaries of the drainage area and the ideal location for green infrastructure for groundwater recharge. The drainage areas on the southern side of Irving Street are larger as they receive runoff from the north-south Avenues and would require increased green infrastructure footprint.

Green Infrastructure Footprints and Setback Requirements

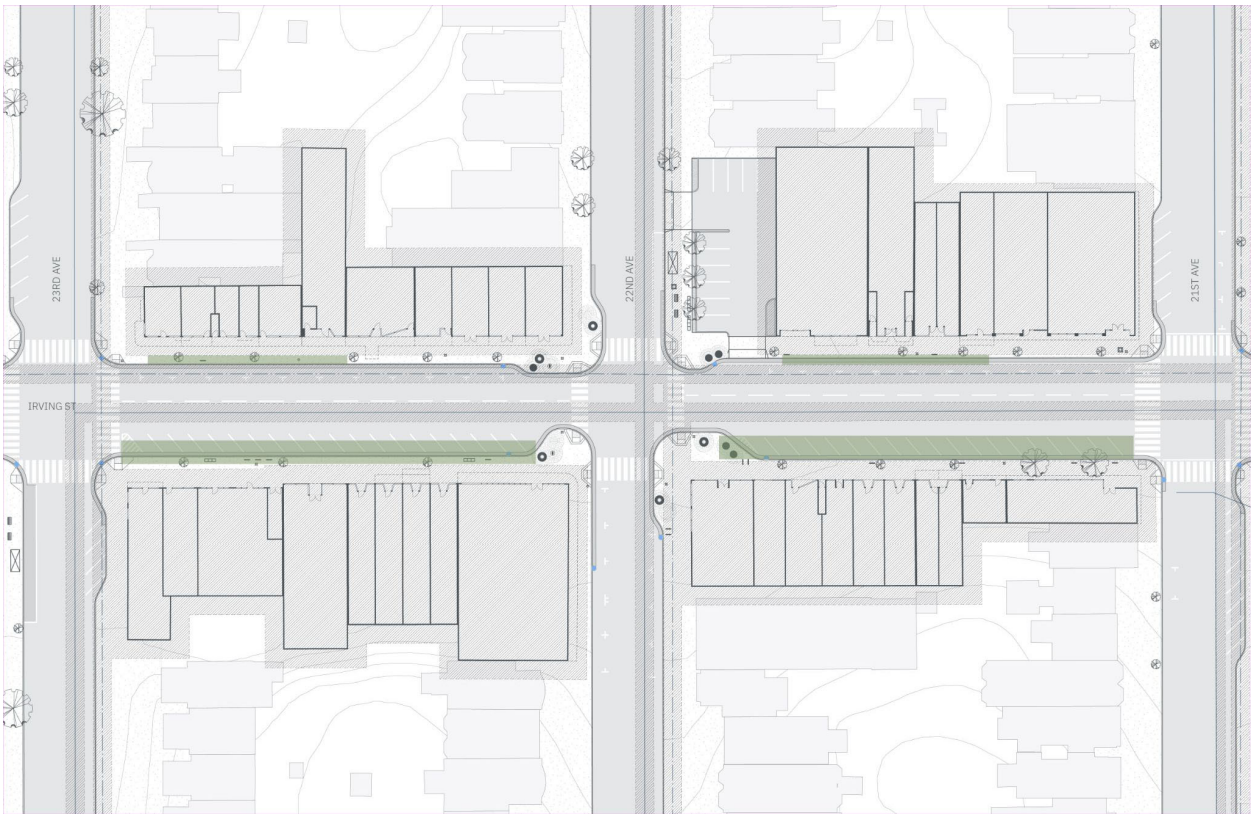


Figure 5.8 *Green infrastructure footprints and setback constraints.*

Additional constraints for green infrastructure placement are also dictated by setbacks from building foundations and utility pipes. The City of San Francisco requires a minimum 10 foot setback from buildings for infiltration-based runoff treatment for groundwater recharge, and consultation with engineers at Lotus Water recommend a typical 5 foot setback from utility pipes to maintain easement access by respective utility owners for maintenance without concerns of ripping up and replacing the green infrastructure. Figure 5.8 demonstrates these setback requirements and potential green infrastructure footprint placement based on worksheet calculations from the City of San Francisco (see Appendix D). The northern side of Irving Street is highly constrained by building and pipe setbacks, leaving a narrow strip for feasible green infrastructure implementation, while the southern side has ample space for implementation but may conflict with existing parking spaces.

Parking

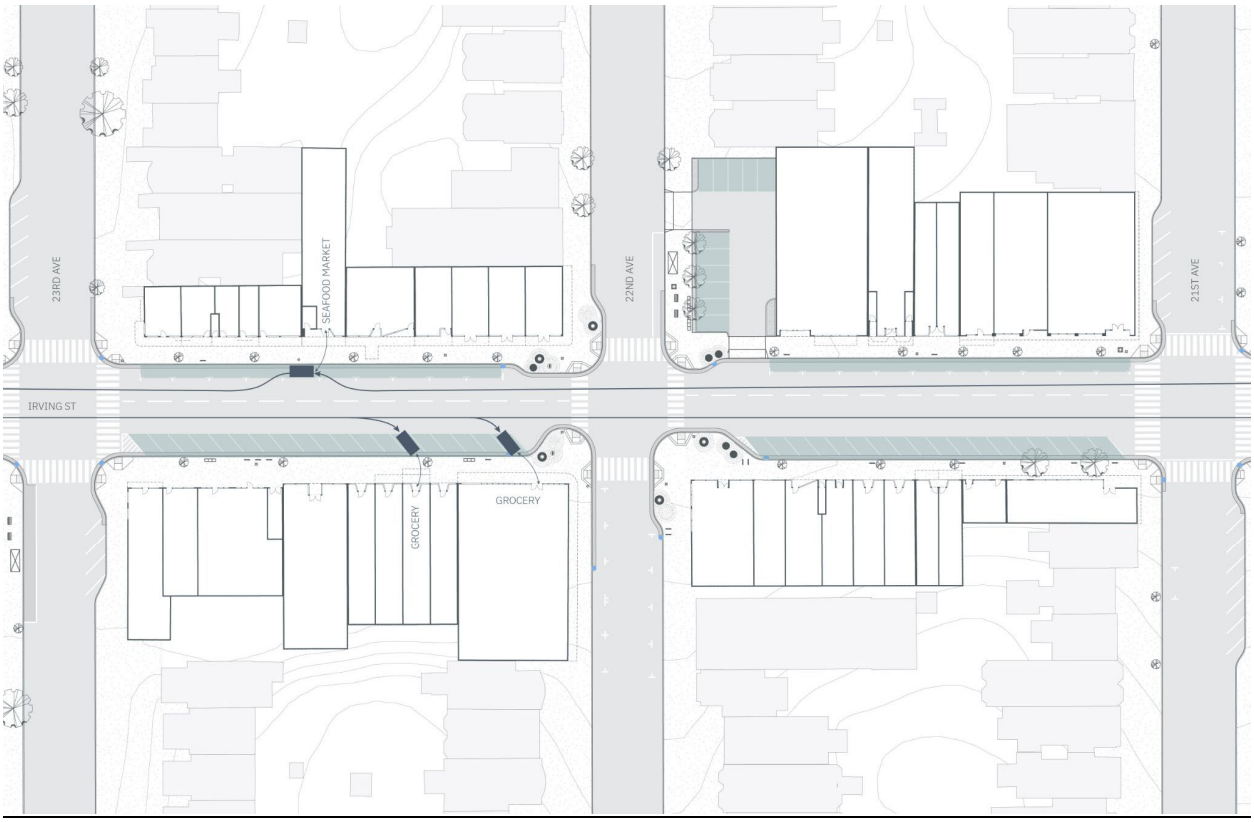


Figure 5.9 *Locations of parking spots and delivery truck loading along Irving Street.*

Once I established location feasibility, I then assessed for potential conflicts that may arise in implementation between the proposed functional goals and existing spatial uses for parking, social activities, and cultural activities. Figure 5.XX marks the main delivery truck parking in front of grocery stores, which remained as a fixture in the street landscape and importance as the most frequented businesses along Irving Street (SFPW 2013). Further survey results from SFPW show that roughly half of visitors arrived by foot, while a quarter arrived by car and occupied many of the parking spaces along the street.

Social & Cultural Nodes of Activity

Figure 5.10 *Social nodes of activities*

Figure 5.10 above shows maps out the main nodes of social activities as analyzed from behavioral observations, many of which are near groceries and restaurants.

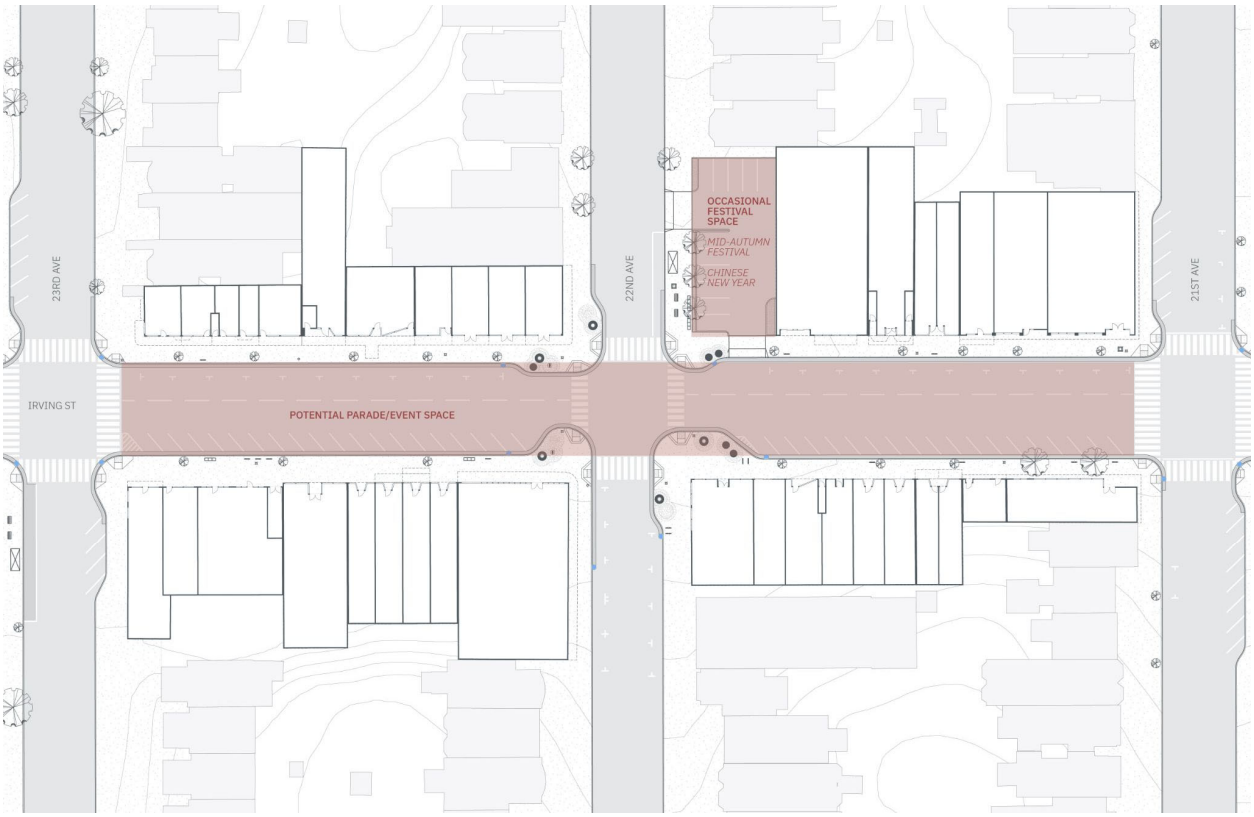


Figure 5.11 *Cultural notes of activity*

Figure 5.11 above shows the potential cultural spaces for events and celebrations, which already host occasional festivals such as Mid-Autumn Festival and Chinese New Year, though not to the extent and frequency as those in Chinatown.

Overlapping Constraints

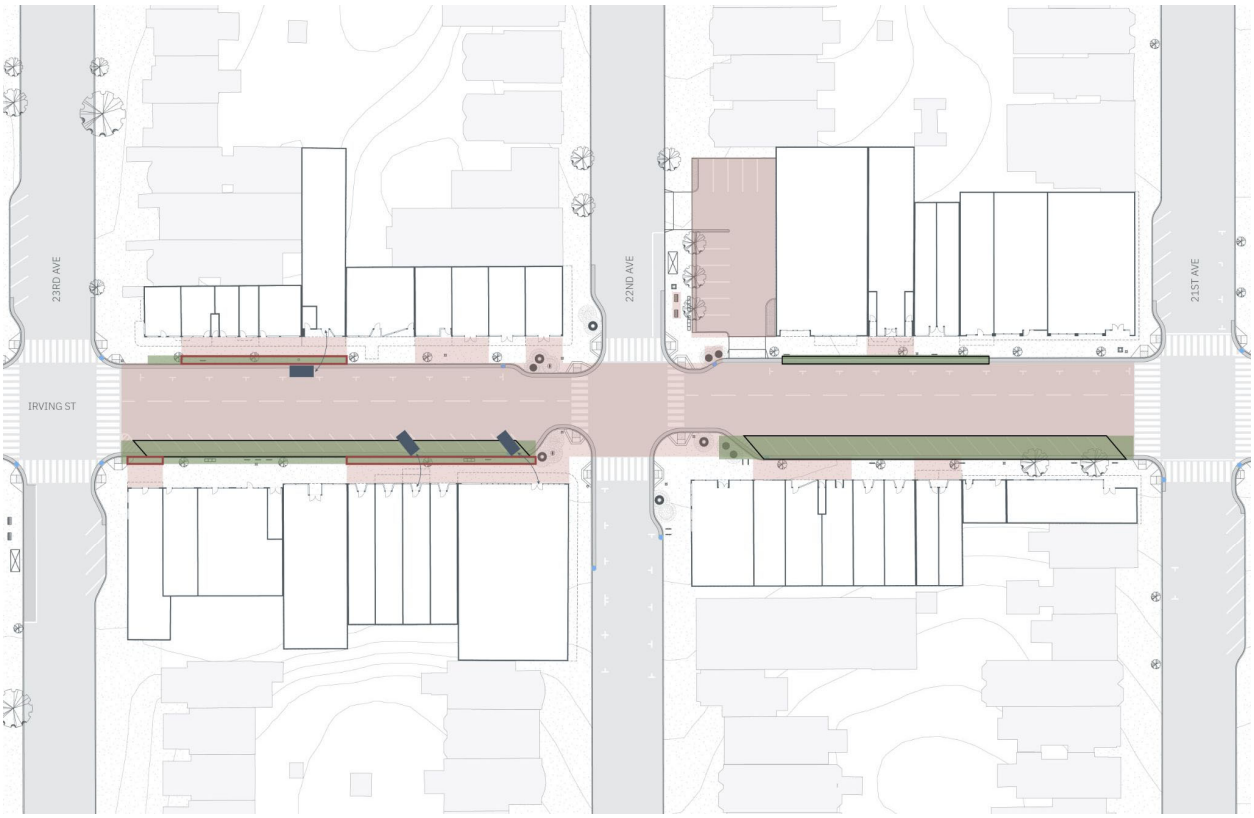


Figure 5.12 *Overlapping constraints and areas of conflict in balancing green infrastructure footprints, social and cultural nodes of activity, and parking delivery.*

Overlaying the functional uses for green infrastructure and social uses of Irving Street as demonstrated in Figures 5.8-11 highlights the conflicts that arise in designing for public space-oriented green infrastructure. Physical constraints limit where green infrastructure can be functionally placed, yet placing them without further considerations can undercut important uses that define the space as uniquely part of the community's environment.

As illustrated in Figure 5.12, the preliminary green infrastructure footprints would conflict with parking spaces to the north and south sides of the street and cause difficulties in delivery for crucial grocery businesses for the community. The footprints would also impact crucial social spaces on both sides of Irving Street between 22nd and 23rd Avenue. To the north, the existing boba shops and restaurants are already space-constrained with many visitors hanging out on the sidewalk; removal of this space would undercut these already-limited gathering spaces and would contribute to bottlenecks as stationary hangout activity would conflict with passers-by walking along Irving Street. To the south, the sidewalk space again is already constrained with the concentration of visitors to the grocery stores whose produce also expands into the sidewalk space. These businesses also occasionally use the curb space, as

depicted in Figure 5.13 of a busy weekend in preparation for Chinese New Year, and any green infrastructure proposed within the conflict space would undercut an important socio-cultural function as well as contribute to already-existing bottleneck issues along the sidewalk.

Figure 5.13 *The busiest section of Irving Street with two of the most-frequented grocery stores. Shoppers are buying pomelo in preparation for Chinese New Year, and the grocery stores have placed the surplus produce within the sidewalk zone.*

5.4 Design Proposal

5.4.1 Balancing Opportunities & Conflicts

Given the identified conflicts, the approach to a proposed design was to assess each conflict and determine whether it impacted the top three identified community needs from Chapter 4: community space, cultural space, and park/open space. Assessment included identifying the opportunities within the conflict space to contribute to the three community needs, whether green infrastructural functionality outweighed this social opportunity, and whether footprints could be shifted to maximize both functional and social opportunities.

Parking and Delivery

The parking accounts for a significant amount of street space and converting it to green infrastructure could contribute to park/open space needs and desire for increased vegetation along Irving Street. Because the green infrastructure functionality itself is the contribution to park/open space, there are no conflicts with community needs, but its placement would impact parking and delivery spaces.

Given that nearly half of the visitors arrive by foot and only a quarter arrive by car (SFPW 2013), a decision to prioritize a community benefit to be experienced by pedestrians rather than vehicles feels justified. Furthermore, some respondents from surveys in Chapter 4 mentioned that there were sufficient parking spaces in residential areas adjacent to the commercial corridor which could accommodate the lost parking spaces, albeit less convenient direct parking access. Direct parking spaces could still be recouped by implementing angled parking on side streets closest to the Irving Street intersection, as there is sufficient space and already precedent on other streets crossing Irving Street. Finally, delivery loading zones and through access could still be accommodated by shifting the green infrastructure footprint into spaces that don't conflict with the existing identified social and cultural spaces.

Social

The social conflicts on both sides of Irving Street have opportunities as community space. The northern side receives more sun exposure and would be ideal for increased seating to accommodate hangout space and restaurants, as were some suggestions from survey respondents in Chapter 4. Food represents a connection to culture and community for many Chinese (Lung-Amam, 2017), a sentiment echoed by some respondents, and an expansion into the parallel parking would further increase the opportunity to strengthen community connections. Conversely, prioritizing the social opportunities within the conflict space would

remove a feasible opportunity for groundwater recharge, therefore providing no functionality opportunities on the northern side between 22nd and 23rd Avenue. To maximize both opportunities, the proposed green infrastructure could be designed as an infiltration trench with a boardwalk over the trench. This would still provide the functionality without sacrificing social space, and could furthermore be a flexible addition for cultural space and events.

On the southern side, the cluster of grocery stores near 22nd Avenue from Figure 5.12 is one of the busiest sections of Irving Street with the two grocery stores accounting for more than one-third of all visitors to the commercial corridor (SFPW 2013). Many supermarkets in more suburban Chinese communities hold significance as de facto gathering spaces since these suburban communities may lack dedicated cultural or community centers. Supermarkets therefore can transform into spaces of political, cultural, and social engagement for the Chinese community (Lung-Amam 2017).

These spaces are especially important to seniors and families in the Sunset as there are fewer gathering spaces and neighborhood services that cater to their needs, and is evident by the presence of seniors and families within this cluster. While a redesigned sidewalk space cannot replace a physical community center, it can still provide that community connection by formalizing a de facto gathering space. As many families visit grocery stores for everyday needs, the space can transform into a hub of interaction between families and for youth to be immersed in the Chinese language and culture, as some respondents desired. For seniors, the formalized gathering space allows for simultaneity in activities of “relaxing” that Zhang had described, and could also be a space for local community organizations to directly connect with seniors for their needs through mobile outreach efforts.

Expanding a redesigned space into the parking could also optimize the social opportunities for community space on the southern side, but would conflict with the required footprint for green infrastructure. Both opportunities are important, and providing the sufficient footprint is critical to ensure the infrastructural system is not overwhelmed by an excess volume of water it wasn’t designed to receive. By redistributing the footprint, however, to occupy spaces outside the identified social and cultural nodes, the sidewalk could potentially accommodate both social and functional opportunities. Redistribution could also allow for less imposing visuals from a monolithic footprint of green infrastructure. Designing to the minimum required footprint may still be challenging as it is still a large area and may undercut some of the social opportunities, but providing a balance for the two is important as the existing space does not currently have a formalized community space and providing visuals of green infrastructure could increase the public’s awareness for groundwater recharge.

5.4.2 Design Proposal with Cultural Meaning

Given the mentions of feng shui in SFPW's community outreach and the potential importance it has for the specific Chinese diaspora San Francisco and the Sunset, incorporating its philosophy into the design could add cultural meaning to the green infrastructure and proposed space. This also adds a further level of specificity to the green infrastructure design beyond the functional and social goals to create a visual design that appeals to the community. Feng shui is an intricate philosophy derived from millennia of traditions that likely requires years of mastery to understand the complexity of such a system. By continuing to engage with the community for further input, their voices and expertise can be amplified to shape spaces for their own community. Therefore, the proposed design is not meant to be a final design imposed by the landscape architect, but a continuation of discussion for community engagement to finalize a design together with expertise from professional designers and community members.

Two Schools of Feng Shui

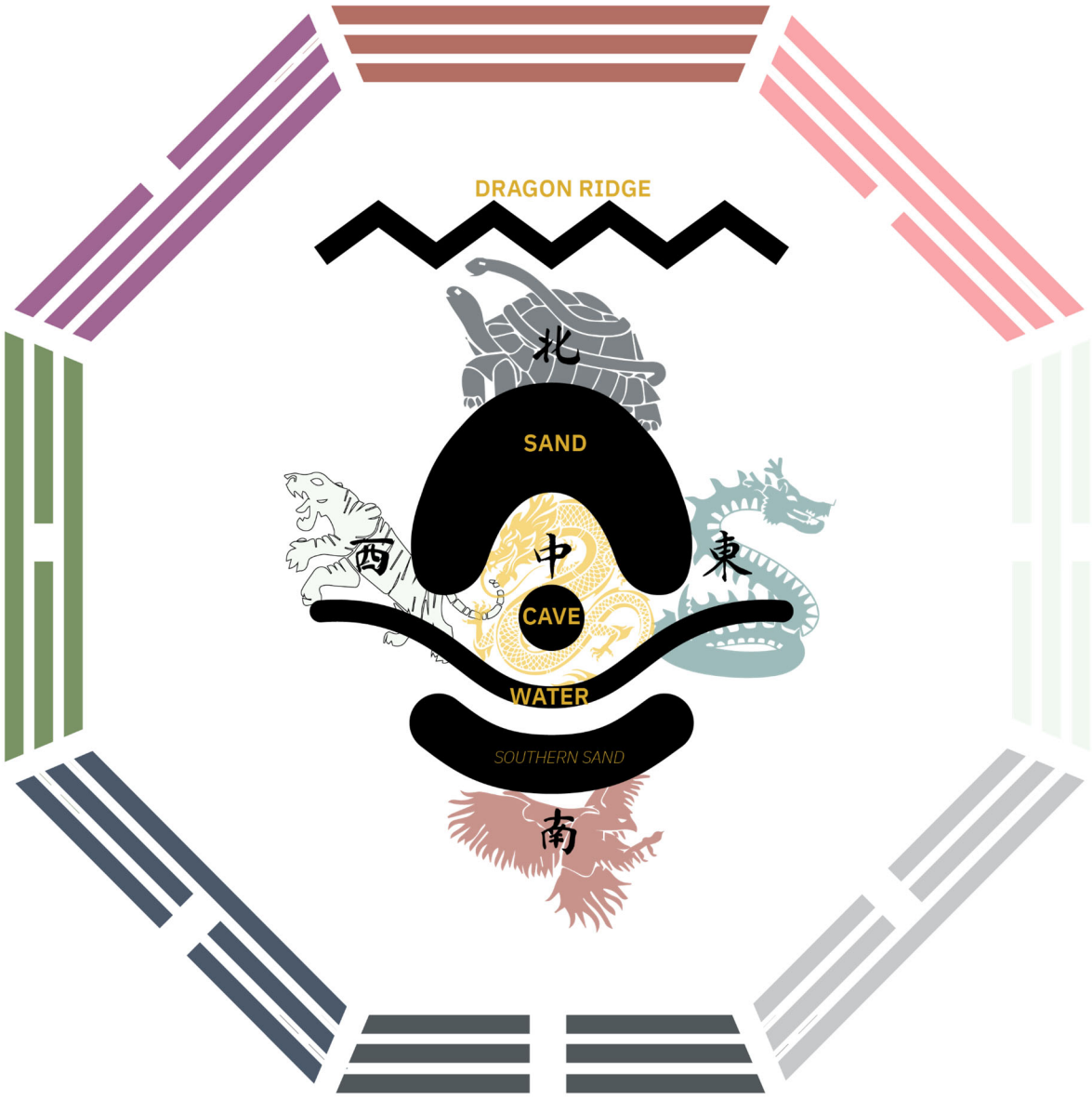


Figure 5.14 *Diagram of the two schools of feng shui: outer octagon represents the compass school while inner diagram represents the form school*

Feng shui consists of two main schools of approach: form school and compass school that most people are familiar with when they think of feng shui. Compass school is based on the direction, color, and element based on the five heavenly deities and is represented by the bagua, or the eight trigrams arranged in an octagon in Figure 5.13. Because much of the compass school is tied with interior, architectural, and landscape design today (Madeddu and

Manuela 2017), the compass school can guide the detailed design of materials and planting choice through community input at later stages of detailed design.

The second school is form school. While also steeped in Chinese folklore, the form school is also rooted in responding to environmental factors by manipulating landforms, and has been influential in siting ancient Chinese cities and forms for Chinese architecture. The five main principles of form school are:

- **Dragon Ridge**
    - **Environmental factor:** mountain range protection against harsh northern winds in China
    - **Chinese symbolic connection**: ancestral connection
- **Sand**
    - **Environmental factor:** hills or forests in 4 directions to protect against weather
    - **Chinese symbolic connection:** guided by the 4 heavenly deities:
        - Black Tortoise in the northern sky
        - Azure Dragon in the eastern sky
        - Vermillion Bird of the southern sky
        - White Tiger of the western sky
- **Cave**
    - **Environmental factor:** south-facing sun exposure to build cities or social life
    - **Chinese symbolic connection**: the most auspicious space where qi collects
- **Water**
    - **Environmental factor:** always on southern side; curved form slows rapid water flow
    - **Chinese symbolic connection:** source of chi; inner curve is the calmest and auspicious
- **Direction**
    - **Environmental factor:** south-facing cave & north-facing water
    - **Chinese symbolic connection** Directions & colors governed by the 5 heavenly deities

Because of many conditions along Irving Street aligned with principles of feng shui, the form school was selected to guide the form, function, and social programming of the proposed design. Symbolically, the connection of qi flowing in the underground also provides a cultural and metaphorical connection to groundwater recharge.

5.4.3 The Proposed Design

Figure 5.15 *Proposed site plan for Irving Street*

Feng Shui Principles and the Design

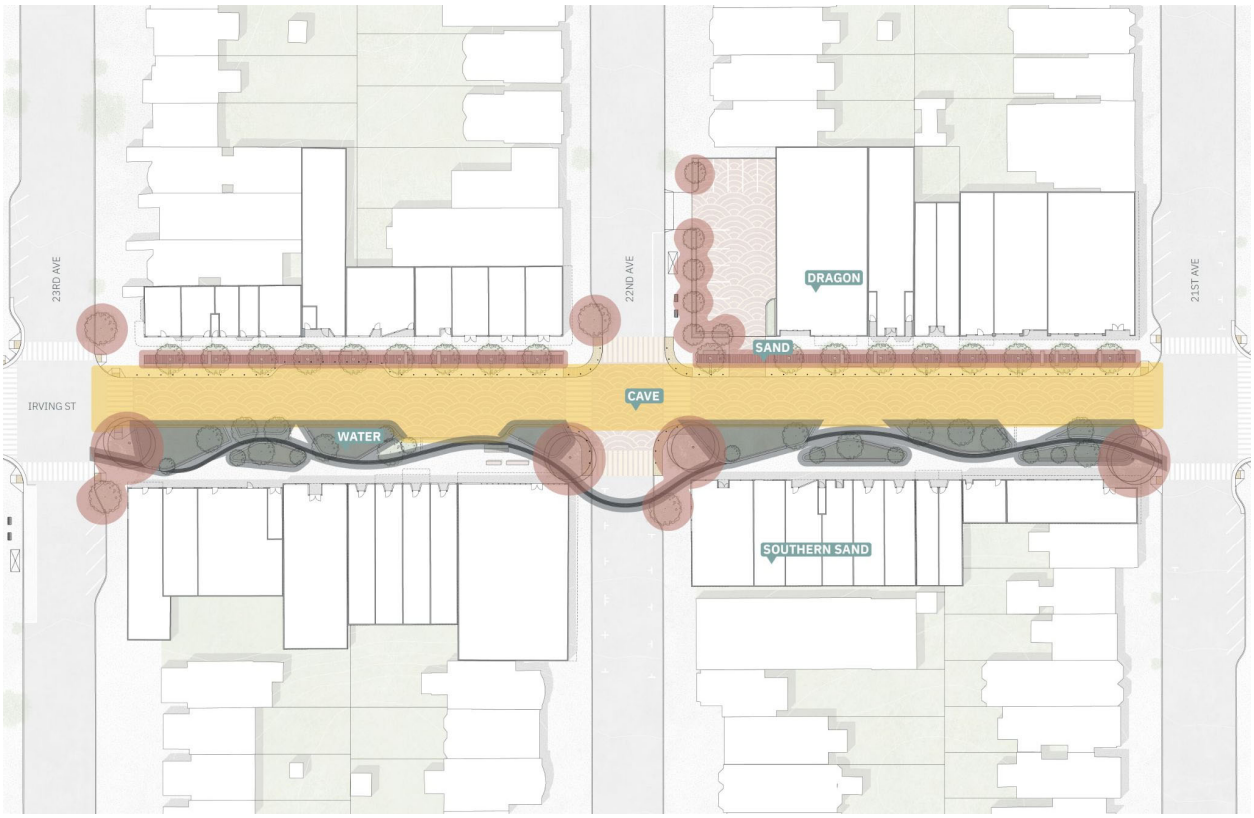


Figure 5.16 *Proposed site plan illustrating the different feng shui principles in the design decision.*

Balancing between social and functional goals and adding cultural meaning to green infrastructure generates the proposed design in Figure 5.15, while Figure 5.16 illustrates how the different principles of feng shui guided forms and placement for the proposed design. The building, as the most prominent feature of the street becomes the Dragon Ridge as it imitated the function of enclosing and protecting the space. The cluster of trees become the Sand principle to protect the space from westerly winds from the Pacific Ocean. The proposed street with parking removed to maximize space for pedestrians and social goals becomes the Cave principle. This space will be painted with a design to be chosen by the community, with the intent to provide a space for artistic expression for them. The painted street also functions to mark the street as a community space for pedestrians and as a visual cue for cars to slow down. Finally, the collection and treatment of runoff on the southern side of Irving Street become the Water principle of the design.

Feng Shui Principles and Functionality

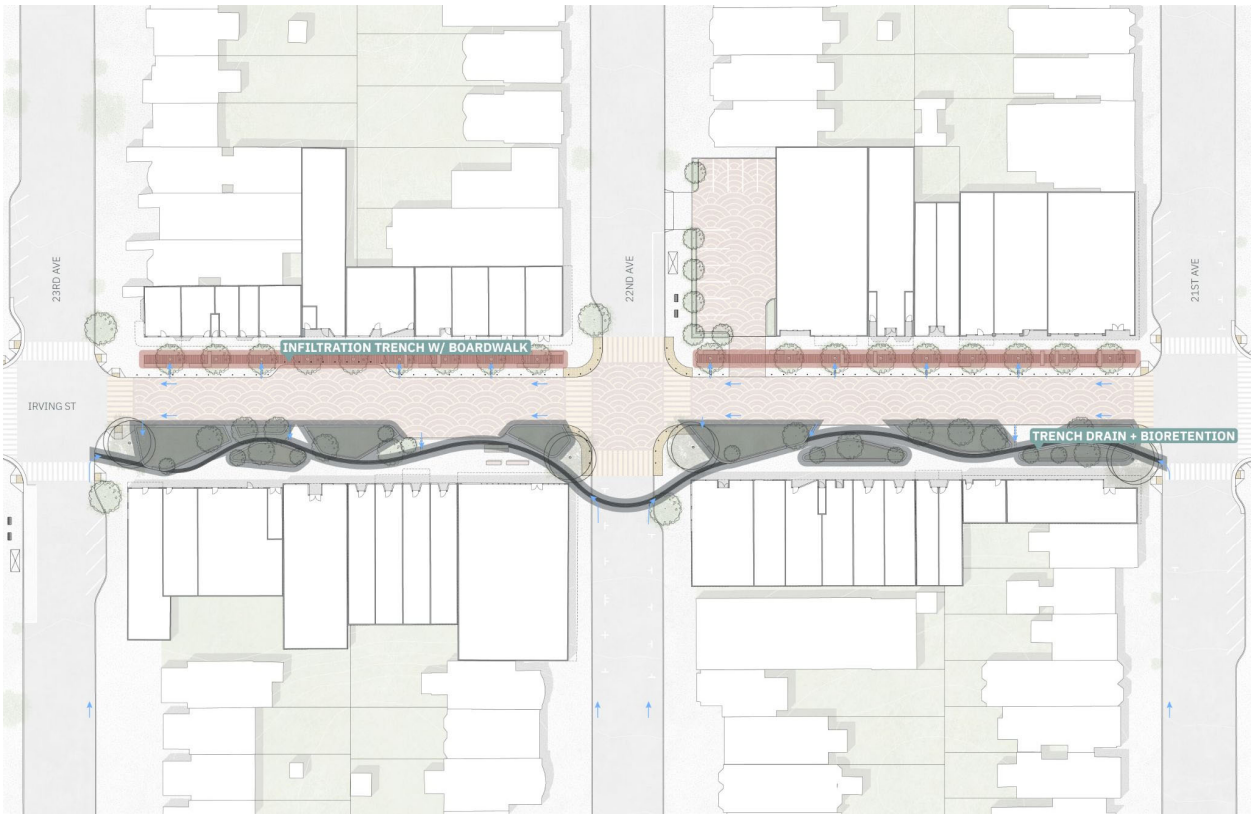


Figure 5.17 *Proposed site plan illustrating functionality derived from feng shui principles.*

Feng shui principles also inform the functionality for green infrastructure. To the north, an infiltration trench with boardwalk is proposed to maximize social usage in the constrained space while the trench includes a soil media layer to support trees for runoff treatment prior to infiltration. The soil media also allows trees to grow to support the allée of trees that acted as a windbreak.

To the south, runoff flows into a curving trench drain before collecting into a series of bioretention planters along the sidewalk zone. Initial runoff first flows into the bottom-most planter, while excess runoff will then be forced into subsequent upstream planters through controlled weirs and restricted orifices. The idea behind this is to allow visitors to visualize the intensity of a rain event and also runoff flows to conform to principles of feng shui where a consistent flow of water is more auspicious as it represents an uninterrupted collection of qi. Therefore, socio-cultural values can also inform the expression and experience of water within a green infrastructure system. Finally, in feng shui, water gates taking form as either bridges or trees may be built to retain water—and thereby qi—on site to maximize auspiciousness. Therefore, camphor trees are proposed where runoff will enter and leave the bioretention

system as they are fast-growing trees with lush crowns that take advantage of the water flow (Chen 2008).

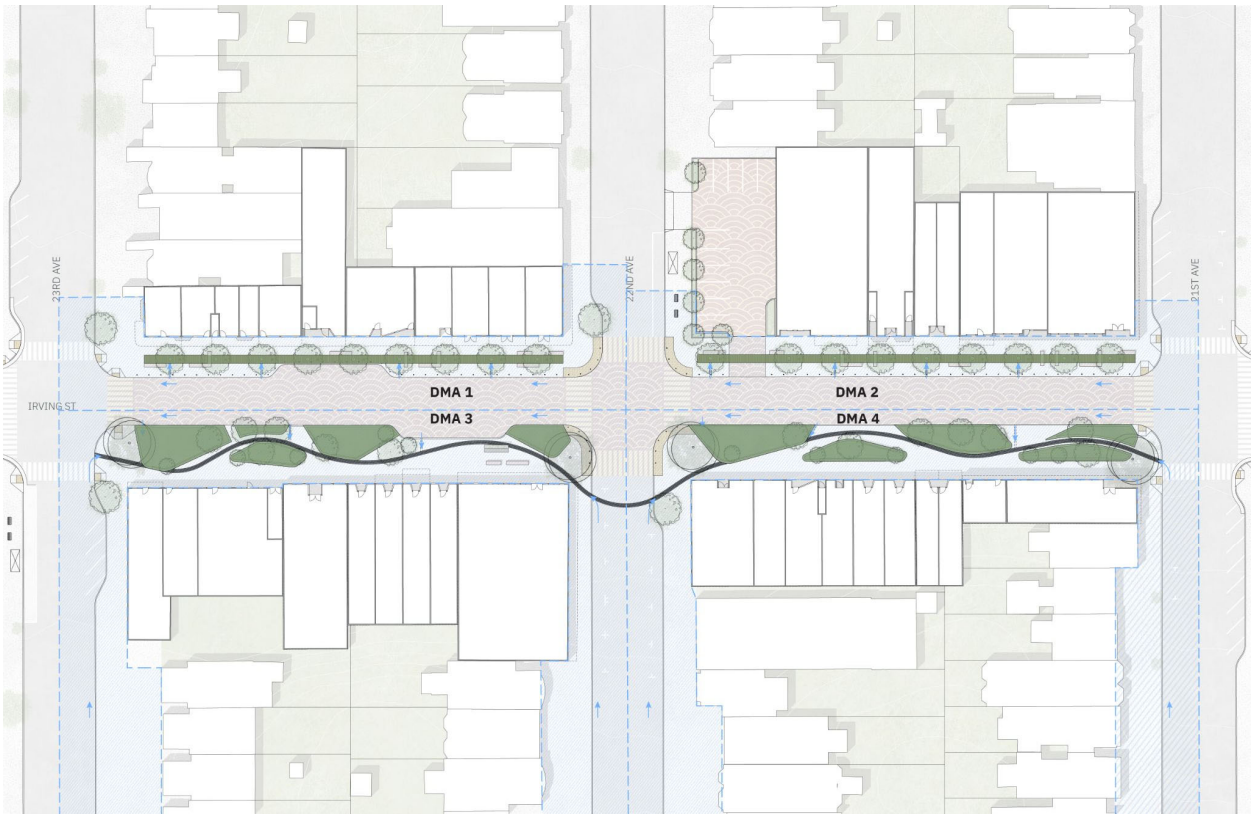


Figure 5.18 *Drainage management areas (DMA) to show runoff collection into respective green infrastructure systems.*

Calculations were also performed to ensure that the green infrastructure system met San Francisco requirements for stormwater treatment to reduce peak flows and runoff volumes of the 2-year, 24-hour storm event by 25%. Tables 5.1-2 below shows the effectiveness of the proposed system, while further details in the calculation worksheets can be found in Appendix D.

Table 5.1 *Proposed Green Infrastructure Peak Flow Reductions*

DMA	Area	Proposed GI	Proposed GI Footprint	Existing 2-Yr, 24-Hr Peak Flow	Proposed 2-Yr, 24-Hr Peak Flow	% Reduction	Requirement Met?[1]
1	14,700 ft^2	Infiltration Trench	1,025 ft^2	0.641 cfs	0.059 cfs	91%	Yes
2	14,100 ft^2	Infiltration Trench	1,070 ft^2	0.615 cfs	0.037 cfs	94%	Yes
3	69,900 ft^2	Bioretention	2,400 ft^2	3.049 cfs	2.299 cfs	25%	Yes
4	67,300 ft^2	Bioretention	2,800 ft^2	2.936 cfs	1.717 cfs	42%	Yes

[1] *Peak flows must be reduced by minimum 25% in proposed condition (SFPUC 2010)*

Table 5.2 *Proposed Green Infrastructure Runoff Volume Reductions*

DMA	Area	Proposed GI	Proposed GI Footprint	Existing 2-Yr, 24-Hr Runoff Volume	Proposed 2-Yr, 24-Hr Runoff Volume	% Reduction	Requirement Met?[1]
1	14,700 ft^2	Infiltration Trench	1,025 ft^2	3,211 ft^3	884 ft^3	72%	Yes
2	14,100 ft^2	Infiltration Trench	1,070 ft^2	3,070 ft^3	652 ft^3	79%	Yes
3	69,900 ft^2	Bioretention	2,400 ft^2	15,268 ft^3	7,406 ft^3	51%	Yes
4	67,300 ft^2	Bioretention	2,800 ft^2	14,700 ft^3	5,920 ft^3	60%	Yes

[1] *Runoff volumes must be reduced by minimum 25% in proposed condition (SFPUC 2010)*

Feng Shui and Social Programming

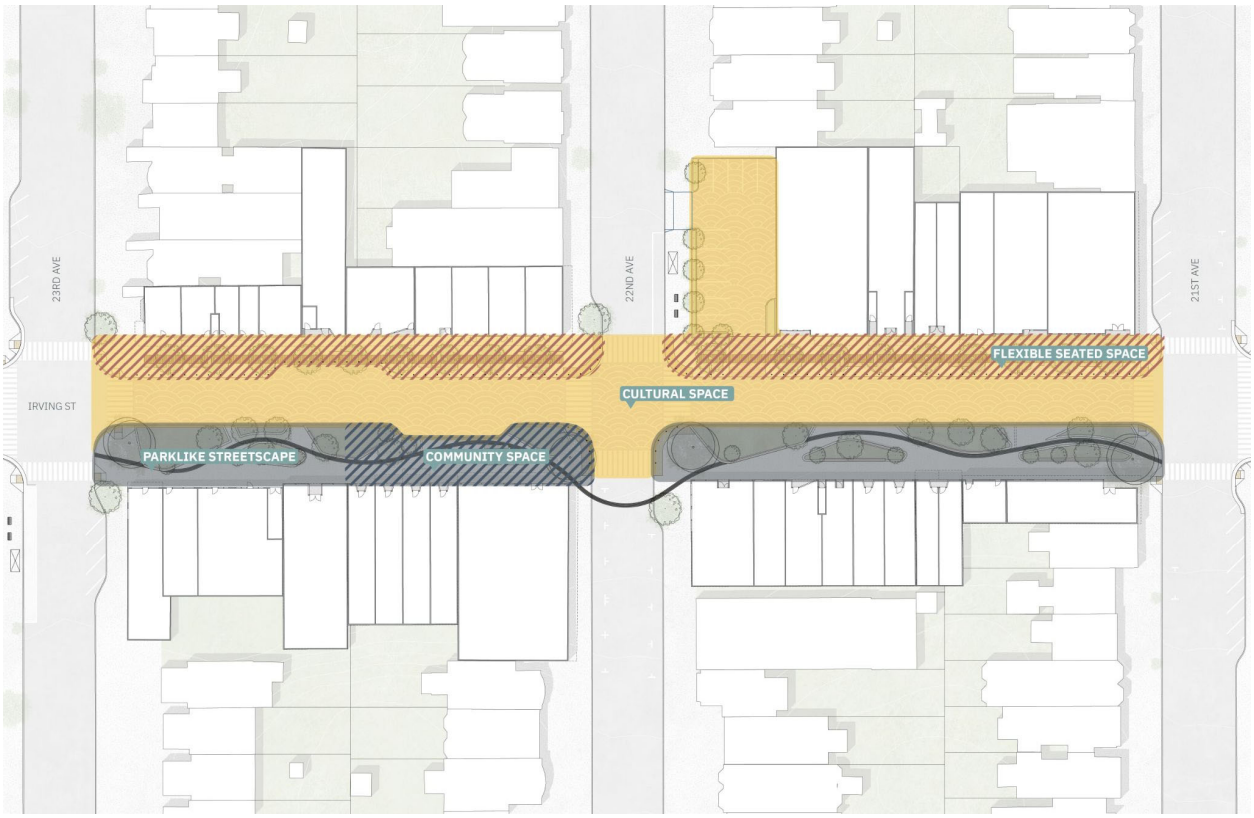


Figure 5.19 *Proposed site plan illustrating social spaces to meet community needs*

Feng shui principles also informed programming of the space to potentially address the three identified community needs for the Chinese community in the Sunset. The sheltered sand element becomes a flexible seated space that is sheltered from the wind and ideal as outdoor seating for the restaurants and businesses on the northern side of Irving Street (Figure 5.20). This space also features a curbless sidewalk design so it can also be expanded as part of the cultural space—the cave element—for events, celebrations, and festivals that the community may host, such as Chinese New Year (Figure 5.21). To the south, the water element with the proposed bioretention planters with increased vegetation becomes a park-like streetscape for pedestrians (Figure 5.22), while the space adjacent to the grocery stores on Irving Street and 22nd Avenue becomes the community space (Figure 5.23).

While the space is small, the formalized space can facilitate adjacent activities for the shifting demographics throughout the day. In the morning, this can be a space for seniors to gather, relax, chat, or participate in small-group tai chi as they do their grocery shopping. As families filter in throughout the day, the space can shift to become a gathering point for them. From observation, usually one family member does the grocery shopping as the stores are relatively small. The remaining family usually waits outside, and with the formalized space, they can

interact with other families to foster intergenerational interaction and provide a chance for their children to be engaged with the Chinese language.

Finally, the community space will also feature a community bulletin board board as depicted in Figure 5.23. In some suburban supermarkets, bulletin boards can be an important channel of self-expression and of communication for political, social, cultural, and community engagement (Lung-Amam, 2017), and thus the design will open up space for such communication to potentially strengthen connections for the community.

Figure 5.20 *Sand element as the flexible seated space.*

Figure 5.21 *Cave element as the cultural space for celebrations like Chinese New Year.*

Figure 5.22 *Water element as the park-like streetspace, with planters at capacity during an intense storm.*

Figure 5.23 *Water element as the community space in front of the grocery stores with seating, flexible space, and community bulletin board.*

5.5 Conclusion

Understanding the patterns of usage at a site level—in this case, Irving Street—and desires for specific improvements allows the designer to create green infrastructure that responds to community needs. While an additional level of analysis layers on more constraints, especially in trying to balance social and functional goals, this process has an opportunity to allow for community input to shape a designed space that they feel they have ownership in. Incorporating their values, whether in usage or visual aesthetic, can create a meaningful experience in green infrastructure.

Through the outreach, I found that specific patterns of commercial businesses and visitor activities that I would not have otherwise known if engagement and outreach had not occurred. Within Irving Street, the majority of the businesses revolve around food or groceries, and they play a fundamental role in providing a gathering space and community connection for various demographics throughout the day. In the morning, the space is dominated by seniors while families and young adults are more present in the later parts of the day. Understanding this spatial usage allowed green infrastructure to be designed around these demographic patterns and incorporate them so that existing activities would not be disrupted.

Reaching out to the community to understand how they envision their space and what they want to see improved also allows them to be involved in the design or planning process. These individuals are experts in what happens in their neighborhood, and their input is invaluable in guiding a proposed design. Through the outreach, I learned that visitors wanted more vegetation that conformed to feng shui and learned about the historical connection of feng shui to the Chinese diaspora who immigrated after the 1960s. Feng shui then became incorporated as a guiding concept for the design that may not have arisen had the community not been involved. Rather than imposing usages, visual facade, or concept based on presumed cultural values, allowing a more bottom-up approach to design with community input brought a design in which socio-cultural values tied the form, function, and programming were interconnected. Together, these interconnections could create a public space that embraced both specific social uses by the Chinese community and functional goals of groundwater recharge through green infrastructure.

Chapter 6
Conclusion & Next Steps

6.1 Conclusion

Green infrastructure has traditionally been spearheaded by engineers, as exemplified by the process in San Francisco where engineers at SFPUC have led the assessment for green infrastructure implementation in public streets above the Westside Groundwater Basin. These efforts have typically been focused on meeting stormwater performance and functionality goals. While SFPUC has begun to incorporate social considerations into green infrastructure location suitability analysis, this is still at a preliminary, high-level planning stage that hasn't yet incorporated site specificity into the design process yet.

Through this research thesis, I explored how the socio-cultural considerations could become part of the green infrastructure design process through community engagement at three scales—the city scale, the neighborhood scale, and the site scale. I then used the results from the engagement process to test how community input could inform the design for a predominant Chinese community in the Sunset. From this, the goal was to create a design for public space-based green infrastructure to meet social goals of address community needs and functional goals of managing runoff to San Francisco standards to increase groundwater recharge.

The first part of community engagement focused on the city scale to understand the context and history of the Chinese community. Here, I researched the beginnings and formation of the Chinese community in San Francisco, who moved over for financial opportunities yet subsequently restricted to living in Chinatown for over 80 years because of the Chinese Exclusion Act and racial covenants. The passing of federal legislation in the 1960s brought over a new wave of immigrants seeking political freedoms, many of whom opted to move into more suburbanized neighborhoods of the Richmond and the Sunset.

The second part focused on the neighborhood scale to understand the memories and experiences of the Chinese community in the Sunset. In a more suburbanized neighborhood, public spaces were less centralized, and some felt it contributed to weaker community connections and cultural ties than those living in Chinatown. For many, the commercial corridors became important gathering spaces to retain those connections as they were the few spaces, and residents of all generations had many memories growing up here. Yet the desire for those connections remains and was evident from community surveys that found that the

main services needs in the Sunset were for community spaces, cultural spaces, and park/open spaces.

The final part of engagement focused on the site scale to understand specific patterns of spatial usage along Irving Street, the selected site for testing a design proposal. Through observations, I found that most of the businesses revolve around food or groceries, and they play a fundamental role in providing a gathering space and community connection for shifting demographics throughout the day. Outreach surveys showed that the community desired increased vegetation, and wanted feng shui compliant landscapes which then guided the form, functionality for groundwater recharge, and programming for meet community needs in the proposed design.

While there were difficulties in conducting community engagement during the COVID-19 pandemic, specifically in face-to-face interactions to conduct interviews, the ability to reach out to other organizations proved invaluable. These organizations are already involved in their community, some of whom have already conducted similar outreach efforts, and working with multiple local organizations can minimize duplicated efforts. Partnering with community organizations could also strengthen outreach by connecting with more individuals that I may not have otherwise been able to contact, and this opportunity gave me more representative results to guide my design. Finally, the design has demonstrated meeting the social goals of addressing outreach-identified community needs and satisfying functional runoff goals to manage the 2-year, 24-hour peak flows and runoff volumes through the proposed green infrastructure system.

6.2 Next Steps

The design proposal is not meant to be the final iteration and should undergo feedback from from different stakeholders involved: individuals and organizations of the Chinese community, and the SFPUC that oversees green infrastructure development in San Francisco. I have scheduled to meet with and present to the SFPUC on the preliminary design and community engagement process. I intend to use this meeting to receive their professional input for feasibility and suggestions for other functional considerations to include in a design based on engineering expertise to ensure proposed technical elements perform as intended in my design.

As I have been in contact with local Sunset organizations like the Wah Mei School that runs community outreach services, I intend to reach out to them with my design to get initial feedback and reaction from residents' perspective. Community input is valuable to assess the effectiveness of my proposed design in meeting social goals. This input can ascertain whether

proposed design features would be used by the visitors or if they would avoid certain areas or design features. Additionally, this is an opportunity to receive input from the community for specific services or programming that cater to the identified community needs, and how they could be integrated into the spatial design within the proposal. Rounds of iteration and feedback would strengthen the proposal and potentially bring in wider community support as more are exposed and aware of the design.

Finally, due to an inability to fully engage with the community during the COVID-19 pandemic, the next steps could also focus on exploring the types of community engagement methods to specifically engage residents in conversations regarding public spaces and their desires for design preferences. Within this outreach, research can focus on location and design preferences for green infrastructure, with community and designers working together to explore how socio-cultural values can shape the physical design and experience of the green infrastructure treatment. While I've been able to start that process in my survey to understand the extent of exposure to green infrastructure concepts and preferences for incorporation into public spaces, the limitations in outreach produced a small and insufficient data sample to draw conclusions from. Ultimately, producing representative data and outreach methods will simultaneously increase the community's understanding of the concept of green infrastructure and the designer's ability to properly incorporate socio-cultural values into multifunctional green infrastructure as public spaces for the community.

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Appendix A
Neighborhood-Scale Community Survey Data Results

	Background Information on Living in San Francisco				
Timestamp	How old are you?	How do you identify yourself ethnically. What generation American are you?	How long have you lived in San Francisco?	When did you/your family first come to San Francisco and why?	If you are still in SF, what led you to stay? If not, why did you move away?
1/24/2021 12:48:12	28	Chinese. 2nd generation American.	28 years.	In the late 70's as it seemed to be a good location.	Accustomed to the area and no real reason to leave.
1/24/2021 15:02:48	59	Chinese	42	1979 have relatives living in SF	Study & work in SF
1/26/2021 20:33:47	22	1st generation	22 years	My family came to San Francisco around the late 1980s to early 1990s	My family decided to stay and live here
1/27/2021 11:02:28	72 years old	2nd	72 years	1944 looking for a better life.	S.F. is my hometown, education, worked and retired here in S.F.
1/28/2021 16:11:46	27	Chinese American , 2.5 generation	27	1900s	All my family is here and I wanted to serve the community that raised me.
1/28/2021 16:56:27	29	Chinese	29 years	1920s	My family being in sf led me to stay
1/28/2021 17:31:41	31	Chinese, 2.5 generations	2 years	I moved here when I got married. My husband's family owns a home here.	We love SF, and because my in-laws own the home we're in, we can't be the rent, ironically.
1/29/2021 22:36:21	28	1.5 gen Chinese American	16 years	2005 for my mother's job	Parents are still at the same job and I want to be close to them
1/30/2021 0:37:20	23	first generation	20 years	parents first came for career reasons and then brought me here consequently after they had a stable job.	i stayed because i enjoy the variety of culture celebrated here through many areas such as food, businesses, festivities, etc. everyone is welcomed everywhere here and appreciated.
2/3/2021 18:23:15	64	1st generation Chinese	27 years	Came to live in San Francisco in 1993 after getting married	Still living in SF because we have family who also live in SF
2/3/2021 23:07:09	28	2nd generation taiwanese american	2 and a half	2018; for grad school	husband and family, personal preference
2/7/2021 23:20:56	37	Second	26 years	I was born in SF	When we tried to purchase a home in SF, the only houses in our price range were near the beach, with old bathrooms and kitchens. They were small and needed a lot of work to be done. I would prefer to live in SF.
2/10/2021 15:07:02	29	1st	23	1980s for family and education	No, had to leave for school
2/13/2021 19:38:32	29	First (immigrant)	4 years (1997-2001)	1997	No, too expensive for my family to buy a house

		Public Space Experience in the Sunset	
Timestamp	Which neighborhoods in SF did you live in and what changes have you observed over time, such as in neighbors, businesses, look & feel, etc.?	How and where did you spend your free time outside? Any other friends, family, or neighbors involved? Why is this space significant to you?	Were there significant public spaces for activities and events for you, your family, or your community? If so, what events, where, and how often did they happen? Why is this space significant to you?
1/24/2021 12:48:12	In the Sunset. More stores and restaurants.	Mainly stores and restaurants in the business zones. Eating with family and friends on special occasion.	There are park and playground areas. Visited these during school and church outings when younger a few times a month. Now walk dog along park areas.
1/24/2021 15:02:48	Live in Parside area in Sunset. There are more small grocery stores & restaurants now & that make it convenience to shop & eat	There's a small park on Vicente street where I can walk with my dog with my husband or walk at Stow Lake with friends. On sunny day can go & enjoy the nature & do exercise.	On some holiday, my church has group walking gathering at Stow Lake.
1/26/2021 20:33:47	Sunset district. I've noticed how many families are moving into the sunset area and settling down and also people moving out of the city due to the costly housing prices	I spend my free time going to Irving street and getting food & boba. I like how everything is very convenient and easy to get to	I like to stay at home with my family, we enjoy just relaxing in our own space
1/27/2021 11:02:28	Chinatown, North Beach, last 20 years in the Sunset District. Changes observed, businesses closing and leaving. City has too many fees and regulations to make things difficult for property owners.	Sidewalk walking.	Daily exercise hiking and fast walking on neighborhood sidwalks.
1/28/2021 16:11:46	Westward Park/Ingleside/Oceanview. The most dramatic change was Ocean Ave. Over the years a lot of businesses and large apartment buildings took over Ocean Ave. A lot of small produce stores and shops were replaced by Target and Whole Foods.	Looking specifically in the Sunset, we used to spend time at South Sunset Fields. It was just a large open place to play various sports. We also spent a lot of time hanging out on Irving eating and drinking boba. We would also ride our bikes down Great Highway.	Not really in the Sunset.
1/28/2021 16:56:27	Grew up in the sunset. It's become more crowded (more cars parked on residential streets) and there are more Caucasians in pockets of the neighborhood	I played a lot of softball and basketball at many different parks/rec centers/schools throughout the sunset. This was a big part of my life growing up. I was able to hang out with friends and have a good time and my family was able to be very involved and watch me play sports.	Weekly softball games at Vicente and 28th, shooting around almost every day in the summers to get better at basketball. I ended up getting a scholarship to play basketball in college so that was very significant
1/28/2021 17:31:41	We live in the inner sunset. In only living here for the past 2 years, I haven't seen too much change.	We have a park a couple blocks away from our house that we frequent daily because of our dog. He loves playing there! We also spend a good amount of time in Golden Gate Park celebrating birthdays or just doing hang outs with friends!	
1/29/2021 22:36:21	I've always been in the Sunset. It's a slow and quiet residential neighborhood so there hasn't been drastic changes but since the tech boom, small businesses have popped up frequently in commercialized areas like parts of Irvin/Noriega/Taraval Street, and 9th Ave. There are more young professionals and college students in the neighborhood.	I enjoy walking on the Great Highway by Ocean Beach because it's peaceful and the view is so beautiful. I usually take the walk by myself but have also enjoyed walking here with family and friends. My family and I do most of our grocery shopping on Irvin and Noriega Street and Sunset Supermarket on Ulloa St. because they're all very close and has easy parking.	When my grandma used to lived with us, she would go to the West Sunset Playground 2-3 times a week to practice Tai Chi and dance with a group of people. My mom went inconsistently on Sundays for the dance. My aunt and uncle were heavily involved in the Tai Chi and dance groups even though they live in the Ingleside neighborhood. For holidays, the groups would have potluck by the playground. It was a place for connection and socialization.
1/30/2021 0:37:20	sunset; most neighbors are very polite, understanding when it's needed (such as parking spaces, blocked driveways etc) and most neighbors near me are very friendly. many small businesses are appreciated and supported by the people living nearby and we really value these mom and pop shops and small businesses.	ever since i was young, ive always enjoyed all the playgrounds and public recreation areas such as tennis courts, basketball courts, bike paths etc. i believe these are key to all growing children and how they spend a majority of their free time as i did when i was young.	
2/3/2021 18:23:15	I live in the Outer Sunset neighborhood. Changes that I have seen are less parking spots available within the vicinity of my home, more break-ins/attempted break-ins in the Sunset, more homeless,	Tai Chi in the parks on weekends to spend time outside with friends. I am able to exercise and socialize in this space.	Concerts every summer at Stern Grove Park, events and museums in Golden Gate Park, Ocean Beach
2/3/2021 23:07:09	Soma grand, Western Addition, Glen park. Definitely a lot of gentrification towards downtown. we saw a whole foods and a whole new apartment complex built among a large homeless community within the year we were in SOMA. The farther away from downtown, the more charming the neighborhoods are. Downtown was fun, exciting, and convenient, but definitely not somewhere we wanted to live long-term.	Areas where there were restaurants, coffee shops, or boba shops. Both friends and family liked to hang out there. It was just a nice opportunity to explore the neighborhood, more affordable food and groceries, and nostalgic snacks.	I have not had those kinds of events in Sunset specifically.
2/7/2021 23:20:56	Sunset. The businesses along Irving Street and 19th Avenue are mostly the same (some of the same businesses from when I lived there and some that replaced similar businesses), there have always been many businesses. Some chain stores have disappeared (Radio Shack, KFC, Taco Bell). There were also toy/stationary stores that are no longer there. I feel like the neighborhood has more white families now and that many families rent, but I'm not sure. I would say the neighborhood looks and feels the same for the most part. There have been updates, but isn't modern. In recent years, there has been a lot of homeless people in the area. I don't feel as safe as I used to.	At Jefferson Elementary where I attended after school and weekend Chinese school. My mom would take me to the playground at Mothers Meadow. After middle school, I would walk along Taraval with my friends to go home. After middle school or high school, we would go to stores and the mall, rather than being outside. I didn't spend much time outside. Maybe that contributed to why I don't prefer the outdoors.	My family always went to Japantown for the Cherry Blossom Festival. My mom always took me to Chinatown to shop for specific things, but also because things are cheaper than Irving or Clement Street. We would go to Clement Street also. I can't think of any spaces I went to for activities and events in the Sunset.
2/10/2021 15:07:02	Outer Richmond district. The neighborhood didn't change that much compared to other neighborhoods but it has also recently looked more run down.	Usually hanging out with friends outside of my own neighborhood. As a child, I would go to local playgrounds frequently with my siblings and cousins. This space provides many memories of growing up in San Francisco which I still reminisce about with my family. Playgrounds in particular was also a place where I cultivated my imagination, where imagination was brought to a semi-reality.	As above. In addition, locations where I hung out the most as an adult such as little local stores and shops helped me connect to get to know not only the person was spending time with but also the character of San Francisco as a city.
2/13/2021 19:38:32	I used to live in outer mission in late 90s and it used to be lots of mom&pop shops. The shop vibes were more utilitarian back then, but now they are more decorative/aesthetically focused.	At school, sometimes our teacher will take us out to play at South Sunset Fields. I also had my soccer practice there after school. With my family, we didn' t spend time outside except strolling and window shopping on Irving St	South Sunset Fields was probably the most significant because my school was nearby so our teachers were able to take us there to play. I always enjoyed those trips because it was a time for us to get exercise and be outdoors. It probably happened at least once a month. I also had soccer practice there so much of my physical fitness came from this green space.

Timestamp	Do you feel these spaces met your needs as a hangout space, gathering space, or event space? If so, how? If not, what would you change?	Growing up, did you or your children play in the street? Why or why not? Do you wish children could play in the streets if it were completely safe?
1/24/2021 12:48:12	Yes, these meet my personal needs as the public space I use are primarily the business zones of which there are plenty.	No, we did not really play on the street due to safety concerns. If it was completely safe, then yes it would be good to have the option.
1/24/2021 15:02:48	Very satisfied with both hang out places for group & personal use.	No, they can play in their back yard.no
1/26/2021 20:33:47	Yes I feel very comfortable around my area	Yes I used to play in the driveway and backyard all the time when the weather is good since it quite cloudy where I am located
1/27/2021 11:02:28	Sunset residential sidewalks are gear for exercise because they are not crowded.	Growing up in San Francisco we used public playgrounds and parks.
1/28/2021 16:11:46	We used to hang out on the sidewalks on Irving, we would just stand around which was fine. We never had seats or bathrooms for most of the years, but it was fine.	Sometimes. We did not play in the street by my house because we lived on a giant hill. Occasionally we did at friends houses, but we typically didn't. If we wanted to hangout outside we would go to a park or local school and hang out in the school yard.
1/28/2021 16:56:27	Yes. I loved being able to play sports outside and am very grateful for all the hoops that were relatively close by	I played catch with my dad in the street occasionally but it was not ideal. We lived on a hill and always had to watch out for cars
1/28/2021 17:31:41	They did! For birthdays and warm days in SF, Golden Gate Park is a fantastic place to be because it's open, tons of space, never too overly crowded, and there's a variety of places to explore (not just open green grass). The only downside is on nice days, parking is pretty rough. For the park near us, our needs are simple: open space for our dog to run around in. We like the landscaping of the park though with a small trail loop and with landscaping that gives a feel of hiking to some view points, even though the park so quite small.	N/A
1/29/2021 22:36:21	Yes. West Sunset Playground is spacious, has plenty of seating, plenty of trees for shade. It's situated next to a library, a block away from Polly Ann ice cream and Eggetts and close to major bus lines so it's a convenient place for anyone to gather.	I didn't play in the streets because it wasn't safe to do so. I wish kids can play in the streets if they were safe.
1/30/2021 0:37:20		no, there are too many cars and traffic, with some areas having very few drivers who are respectful. however, i do value the current "slow-streets" initiative with the current pandemic because there are definitely more opportunities for children to play in the streets and places for people to walk.
2/3/2021 18:23:15	Yes, these outdoor spaces are great for a hangout/gathering space. But a lot of these places are not well kept and can be very dirty at times.	No playing on the street because there would be cars on and off. We also had a backyard space big enough to play in and had parks walking distance from our house. I don't think kids should be playing on the street
2/3/2021 23:07:09		
2/7/2021 23:20:56	Now that I'm thinking about this, I was thinking that there wasn't many outdoor spaces available, but that's not true. Maybe I wasn't drawn to those spaces. As much as I love Irving Street, they never had or have activities or events there. Maybe it's too busy, however, Clement Street is just as busy and I've been to a couple street fairs there.	I didn't play in the street because I lived on 19th Avenue. My mom probably taught me at a young age that it wasn't safe to play in the streets. Of course I wish children could play in the streets. Note: the neighborhood I live in now is more suburban and doesn't have too much people or traffic, but I still wouldn't let my son play in the streets because some drivers think because it can be empty, they can drive however they want. Also, some delivery vehicles don't drive responsibility.
2/10/2021 15:07:02	I believe it did meet my needs. There are many different activities in San Francisco and there is bound to be an area that suites anyone regardless of age, ethnicity, gender/sex, personal hobbies, etc.	I did play out in the streets. I believe my neighborhood is incredibly safe and do wish that other parts of San Francisco can be just as safe if not more to allow children to play outside.
2/13/2021 19:38:32	It met my needs during my elementary years but not sure about now	No, we didn't because cars would drive by. It would be nice to have certain streets blocked off for community/play

Timestamp	How often do you use street and for what activities, e.g., walking, hangout, etc.?	Did public events take place on the streets? What events and which streets?
1/24/2021 12:48:12	Not often. Streets are mainly used to go from point A to B rather than the activity itself.	I cannot recall any public events on the streets.
1/24/2021 15:02:48	Maybe once a week for walking exercise. No, like quiet neighberhood	Not in my area
1/26/2021 20:33:47	I used to walk to Irving and 20th all the time and they would usually have yearly Chinese New Year festivals and it was nice to see everyone come and enjoy what was there	Chinese New Year Festival
1/27/2021 11:02:28	Daily use sidewalks for daily walking exercises.	2 times a years streets are closed for street fairs before Covid 19.
1/28/2021 16:11:46	As mentioned earlier we would hang out on Irving a lot on the street.	
1/28/2021 16:56:27	I've used the sidewalk/front yard to hang out with friends more since covid because we've limited our indoor hangouts. We also go on more walks through the neighborhood and I've been running through the streets 4-5 times a week	Not that I remember
1/28/2021 17:31:41	Especially during the pandemic, we've taken the 3 mile trek on the streets from our house to Ocean Beach, and have frequented the streets near us because of our dog.	N/A
1/29/2021 22:36:21	I walk on Great Highway 2-4 times a week. I walk to nearby coffee shops on Noriega at least once a week.	There's a farmers market every Sunday on 37th Ave between Ortega & Quintara St. and 9th and Irving. Other street events: https://sunsetmercantilesf.com/about/
1/30/2021 0:37:20	quite frequently for walking the dog, going on a walk etc.	
2/3/2021 18:23:15	Only recently started walking on the street because of COVID to practice social distancing.	Farmer's market on the street. About three blocks would be closed down in front of St. Ignatius School.
2/3/2021 23:07:09	Whenever I'm in the area, we walk around the streets.	
2/7/2021 23:20:56	What does this question mean?	Not that I can remember. More recently, there has been a flea market around Irving and 9th to 11th(?). There are some farmers markets that have popped up, too. On Noriega, near the beach, they've had some events.
2/10/2021 15:07:02	As a child, I would use the streets to bike, help my family wash their car, hangout. As an adult, its mainly used for errands and walks.	No public event that I know of. Outside Lands is hosted in the Golden Gate Park which is the only public event closest to my home.
2/13/2021 19:38:32	Walking, drinking boba while hanging out on the street	There are some farmer markets, but not sure where.

		Green Infrastructure
Timestamp	Do you want events to take place in the streets? If so, what improvements would you like to see to make this possible? If not, why not?	When it rains, are there flooding issues on the street. If so, what is it like and does it affect you?
1/24/2021 12:48:12	Yes, assuming it is well planned and organized. Would be good to have option to participate in any interesting events.	There are no noticeable flooding issues.
1/24/2021 15:02:48	No, noisy & dirty street with trash	So far no
1/26/2021 20:33:47	No because it causes traffic which happens too often in the city of San Francisco	It does not flood very often or at all but when it does it is not really an issue
1/27/2021 11:02:28	Yes, enjoy street closure for community fairs. Make sure events have city permits to keep things legal and orderly.	Golden Gate Park has flooding during heavy rains. The streets seldom have flooding in the Sunset District, so no flooding issues.
1/28/2021 16:11:46		So far of the family and friends I have in the Sunset, I have not heard of this.
1/28/2021 16:56:27	I enjoy the farmers markets/fairs	I haven’t been affected
1/28/2021 17:31:41		We’re on a hill, so the rains don’t effect our area too much.
1/29/2021 22:36:21	Yes, I think using slow streets for events would be great. As long as the streets being used don't make for inconvenient/unsafe detours that cause traffic or accidents on the surrounding streets.	Not that I'm aware of.
1/30/2021 0:37:20		the flooding makes it very difficult to walk as we have had to find ways around it. it’s also more difficult for our fur friends as very few of them enjoy walking through pools a few inches deep.
2/3/2021 18:23:15	would only like to see events take place on the street if it doesn't inconvenience busy streets	No
2/3/2021 23:07:09		In Glen park, no.
2/7/2021 23:20:56	Yes, but where I grew up (Irving and 19th) that would mean that the streets would be closed to traffic and that would probably be hard. Other streets in the Sunset could be closed to traffic and probably wouldn’t be as inconvenient.	The drains flood making it hard to cross streets.
2/10/2021 15:07:02	My neighborhood is relatively quiet compared to others and I believe most residents like it that way. It would be a great idea for community bonding but I'm not sure if my neighbors would take it well.	not particularly. Maybe small puddles but the street I live on typically drains well.
2/13/2021 19:38:32	Yes I think have certain streets blocked off for events are nice. But it would increase traffic	Puddles between the sidewalks & street

Timestamp	How do you feel about adding green space into your neighborhood?	Where would you want increased green spaces in your neighborhood or in the Sunset?
1/24/2021 12:48:12	I think it is a great idea to make the space more colorful and natural.	Around the business zones.
1/24/2021 15:02:48	Would be nice	On commercial street
1/26/2021 20:33:47	I love the green space because it shows a sign of taking care of our planet	Front yards or places on sunset blvd
1/27/2021 11:02:28	If each house or building plant a sidewalk tree would be good for everyone in the Sunset District.	Sidewalk curbside, vacant unused lots.
1/28/2021 16:11:46	It would be nice.	More green spaces in streets that are larger that can actually be enjoyed rather than it being a single tree surrounded by concrete.
1/28/2021 16:56:27	I would enjoy more green space/hangout space	Maybe nearby heavy restaurant areas (like Noriega and Irving) so people can get takeout and enjoy their food at a green space
1/28/2021 17:31:41	Always for it!	It would be nice if they were close to areas with restaurants so that you could always grab takeout and eat outside!
1/29/2021 22:36:21	It would be amazing!	I'd love to see more green spaces in all the commercialized areas in the Sunset like Irving (25th-19th and 12th-5th ave), Noriega (47th-45th, 39th-37th, 33rd-30th, 25th-19th ave), Taraval (34-19th ave). Also by all the schools.
1/30/2021 0:37:20	it would be very beneficial to the neighborhood	
2/3/2021 18:23:15		Would like to see more green spaces in residential areas. A lot of these public spaces are near areas with high traffic of people and cars.
2/3/2021 23:07:09	More green is always good!	anywhere that needs it. Even if it's a random area of the street, it would be a pleasant surprise to walk through.
2/7/2021 23:20:56	I would love it! It's so funny being right next to Golden Gate Park, feeling like it needs more green space, but if it were available, people could use more of those spaces and not have to go all the way to GGP. I think it would make it look better.	Closer to Jefferson Elementary. Spaces where it would break up the view of the taller buildings.
2/10/2021 15:07:02	That would be a nice addition	Not too sure. We can't tear down houses so whatever public area is left? It will be difficult to find space since the Richmond and Sunset are residential areas.
2/13/2021 19:38:32	I think it would be lowly	Near schools and public libraries

Timestamp	If you had green spaces like the images above, would you visit them. Why or why not? What do you like or dislike about them?	How do you feel about green space that functions as green infrastructure to also manage rainfall and reduce flooding throughout the City?
1/24/2021 12:48:12	I would visit them occasionally if I happen to be in the area. It would be good for events and gatherings but would not spend much time there otherwise.	
1/24/2021 15:02:48	Yes but most Sunset street is not wide enough to build resting benches & greens	
1/26/2021 20:33:47	Yes because green makes the environment looks healthy and clean	
1/27/2021 11:02:28	Yes, I would visit, for the fresh air, green environment.	
1/28/2021 16:11:46	I would, but the city has a hard time upkeeping things. It the green area becomes overgrown or has trash all over the places then I would not visit them.	
1/28/2021 16:56:27	I would visit them and maybe hangout with friends with food/coffee	
1/28/2021 17:31:41	Yes, I love being able to find comfortable places outside to sip a coffee, meet a friend, or bring future kids to to enjoy the outdoors.	
1/29/2021 22:36:21	I'd definitely visit. They look beautiful and inviting. Especially the Portland and NY ones.	It would be amazing!
1/30/2021 0:37:20	i would visit them if they were on my way, just hope they won't be costly on our part	it would be very beneficial to the neighborhood though maybe costly?
2/3/2021 18:23:15	If it is clean and well-maintained, then I wouldn't mind visiting these spaces.	I like the idea
2/3/2021 23:07:09	yes, somewhere nice to hang out.	I don't a reason not to do it!
2/7/2021 23:20:56	Yes, I think it would be a nice place to hang out, have a snack/meal, relax. I do wonder if how they would be taken care of and what happens if the homeless take over.	It makes sense to create these spaces that have multi purposes. The city could use more green space and it would be helpful to manage rainfall and reduce flooding.
2/10/2021 15:07:02	I would visit them. I like how welcoming it looks and provides a space for adults to hangout and children to play. Seems like a family friendly idea.	Sounds like a good idea and is water efficient
2/13/2021 19:38:32	Yes, it would be nice to visit / sit outside for lunch if it's near a community building (school, library, market)	It would be great to manage rainfall and reuse it to water the plants, adding green space

Timestamp	Have you heard of green infrastructure before this?
1/24/2021 12:48:12	
1/24/2021 15:02:48	
1/26/2021 20:33:47	
1/27/2021 11:02:28	
1/28/2021 16:11:46	
1/28/2021 16:56:27	
1/28/2021 17:31:41	
1/29/2021 22:36:21	No
1/30/2021 0:37:20	Yes
2/3/2021 18:23:15	No
2/3/2021 23:07:09	No
2/7/2021 23:20:56	No
2/10/2021 15:07:02	No
2/13/2021 19:38:32	No

Appendix B
Neighborhood-Scale Community Survey and Interview Compiled Data

Generation	Age Group	How long SF	Why SF	How Sunset has changed	Places Mentioned	Activities	Events	Things to change	What like/WHy here	Public events?	Flooding	Green Space?	Where	Visit them?	GI concerns
2nd	18-35	28	Family/opportunity	More businesses	Parks/playground	Eating out			Convenient	Yes	No	Yes	Commercial	Occasionally	
					Local stores				Community						
1st	35-60	42	Family/opportunity	More businesses	Larsen Park	Dog walking			Convenient	No; noisy	No	Yes	Commercial	Yes	Streets not wide enough
					GGP	Walking			Community						
						Errands									
1st	18-35	22	Family/opportunity	More families	Irving	Eating Out	CNY Irving		Comfortable	No; traffic	No	Yes	Residential	Yes	
				Expensive					Community						
				Moving out											
2nd	60+	72	Family/opportunity	Businesses closing	Parks/Playground	Walking			Convenient	Yes, traffic	No	Yes	Residential	Yes	
									Community						
3rd	18-35	27	Family/opportunity	More businesses	South Sunset Fields	Eating out		Seating on Irving	Community	--	No	Yes	Large Streets	Yes	Maintenance
				Gentrification	Ocean Beach	Sports									
					Irving	Biking									
						Hang out									
3rd	18-35	29	Family/opportunity	More people	Parkside Square	Sports	Farmers Market	More hangout space	Convenient	Yes					
				More white											
					Parks/Playground	Walking		More greenspace	Community		No	Yes	Commercial	Yes	
3rd	18-35	2	Family/opportunity		GGP	Hang out			Community	--			Commercial		
					Ocean Beach	Dog Walking					No	Yes		Yes	
					Parks/Playground										
1.5	18-35	16	Family/opportunity	More businesses	Irving	Walking	Farmers Market	Safe Streets	Convenient	Yes, traffic	No	Yes	Commercial	Yes	
				Younger	Noriega	Errands	Family potluck		Community				Schools		
					Taraval	Tai Chi									
					Inner Sunset	Dancing									
					Ocean Beach	Hang Out									
					Ulloa										
					West Sunset Playground										
1st	18-35	20	Family/opportunity	More businesses	Parks/Playground	Sports		Slow Streets	Culture	--	Yes	Yes	--	Yes	Cost
						Dog Walking			Welcoming						
						Walking									
2st	60+	27	Family/opportunity	More traffic	West Sunset Playground	Tai Chi	Stern Grove Festival	Cleaner Streets	Community	Yes, traffic	No	--	Residential	Yes	Maintenance
				More crime	Stern Grove	Hang out	Farmers Market								
				More homeless	GGP	Walking									
					Ocean Beach										
2nd	18-35	3	Family/opportunity	Gentrification		Hang out	--	--	Community	--	No	Yes	Anywhere	Yes	
						Eat Out									
						Errands									
						Walking									
2nd	35-60	26	Family/opportunity	Businesses on Irving same	Irving	Walking	Farmers Market	More community events			Yes	Yes	Schools	Yes	
				More white	Jefferson Elementary	Hang Out									
				More renting	Stonestown	Eat out									
				More homeless											
2nd	18-35	23	Family/opportunity	More run-down	Parks/playground	Play in streets	Outside Lands	More community events	Welcoming	Yes; noisy	No	Yes	Unsure	Yes	Limited space
					Local stores	Bike			Safe						
						Hang Out									
						Walking									
						Errands									
1st	35-60	35	Family/opportunity		Noriega	Programming		Services for seniors	Quiet	--	--	--	--	--	--
					Irving	Karaoke		Services for community	Convenient						
					Taraval	Field Trips			Multicultural						
					Ocean Beach	Meals			Multigenerational						
					GGP										
					Sunset Blvd										
2nd	35-60	10+	--		GGP	Tai chi	Mid Autumn Festival	Services for language	Convenient						
					Ocen Beach	Dancing			Welcoming						
					Stern Grove				Community						
					Parks/playgrounds										
					Local stores										
2nd	35-60	59	--				Chinese New Year	Maintain Culture							
2nd	60+	59			Irving		Chinese New Year	Newcomers acclimate to American culture							
							Mid Autumn Festival								
2nd	60+	27			Irving	Play in streets	Thanksgiving								

Generation	Age Group	How long SF	Why SF	How Sunset has changed	Places Mentioned	Activities	Events	Things to change	What like/WHy here	Public events?	Flooding	Green Space?	Where	Visit them?	GI concerns
3rd	60+	20+	Family		Irving	Eating Out	Chinese New Yar		Convenient						
					Noriega	Errands	Christmas								
					Taraval										
					Vicente										
1st	35-60	34+	Graduate School		Irving	Errands		Maintain Culture	Convenient						
						Hang Out		Increase language exposure							
								Services for language							
								Services for community							
2nd	60+	33+			GGP			Maintain Culture	Convenient						
					Stern Grove			Increase civic engagement	Community						
					Ocean Beach										
					Irving										
					Noriega										
--	60+	46+			Church	Eating Out			Multicultural						
					Stern Grove				Community						
--	60+	46+						Increase civic engagement	Covenient						
									Community						
2nd	35-60	43	Family/Opportunity		Irving	Hang Out		More community events	Convenient						
								Services for community	Community						
								Space to gather	Multigenerational						
								Increase language exposure							
								Multigenerational connection							
2nd	35-65				Irving	Errands			Convenient						
					GGP	Hang out									
					SF Zoo										
					South Sunset Fields										
					Ocean Beach										
--	60+			Younger	SF Zoo	Sports									
				Multigenerational	Lake Merced										
				More traffic	Ocean Beach										
					Stonestown										
					GGP										
					Sunset Blvd										
					Church										
2nd	35-60	54+		More Asian	Irving	Errands		More greenspace	Multicultural						
				Expensive											
1st		20				Eating Out			Access to Chinatown						
						Errands									
						Read Newspaper									
2nd	60+				Church										
2nd	60+			Expensive	Irving	Errands	Chinese New Year		Safe						
				More Asian	Noriega	Hang Out			Community						
				More Traffic	SF Zoo										
				More developed	Ocean Beach										
2nd			Better Living Condition		Church	Errands			Convenient						
					Irving	Eating Out									
2nd	35-60			Younger	Church		Mid-Autumn Festival	Services for seniors	Community						
					Irving		Sunset Community Festival	Services for language	Convenient						
					Playland				Welcoming						
					West Sunset Playground				Multicultural						
					McCoppin Square										
					Parkside Square										
					Parks/Playground										
					South Sunset Fields										
					Stern Grove										
					GGP										
					Larsen Park										
					Taraval										
					Ocean Beach										
					Sava Pool										
					Taraval										
					Noriega										
					Irving										

Generation	Age Group	How long SF	Why SF	How Sunset has changed	Places Mentioned	Activities	Events	Things to change	What like/WHy here	Public events?	Flooding	Green Space?	Where	Visit them?	GI concerns
					Irving										
					GGP										
					SF Zoo										
					West Sunset Playground										
1st	18-35	4			Irving	Eating Out	Farmer's Market			Yes; traffic	Yes	Yes	School, commercial, community		
					South Sunset Fields	Sports									
						Walking									

Appendix C
Site-Scale Behavioral Observation Data

Main Notes

- Groceries with produce usually on north side to avoid sun
- Many activity around bank in morning, likely as customers getting cash for errands at many cash-only stores
- Loading trucks with produce present at all markets most parts of the day
- Produce outside, sometimes spilling over to the public streets, causing bottlenecks especially around lunch when there are more people present on streets
- Typically more non-Asian the further east you go towards 19th, and the later it is in the day. Non-Asian typically visit the Western restaurants, some boba, which tend to be closer to 19th
- Smoke breaks near some restaurants, mostly near markets
- Seniors earlier in the day, younger crowds later in the day
- People tend to visit multiple stores for errands, some go from grocery to restaurant or vice versa
- Primarily Cantonese, some Mandarin, 1 instance each of Taishan and Teochow
- Usually 1 person grocery shopping likely cause cramped inside or quicker? People waiting outside grocery for cars to pick them up. Rest of family usually in car or outside waiting on phone etc.
- Main nodes are popular restaurants/dessert, grocery stores, and Salon HK

Irving Sat 2/6 Morning

Irving between 19-20 Ave

- Time & Weather
  - 11:00, sunny
- Age
  - <18 2 11%
  - 18-35 3 17%
  - 35-60 11 61%
  - 60+ 2 11%
  - Total 18
- Perceived race
  - (East) Asian 11 79%
  - Non Asian 3 21%
  - Total 14
- Main Nodes
  - None present
  - Most gathering at curbs for crossing

- Notes
    - Setting up restaurants
    - SFPW street cleaning crew

Irving between 20-21 Ave

- Time & Weather
    - 10:40, sunny
- Age
    - <18 2 5%
    - 18-35 4 9%
    - 35-60 19 43%
    - 60+ 19 43%
    - Total 44
- Perceived race
    - (East) Asian 33 80%
    - Non Asian 8 20%
    - Total 14
- Main Nodes
    - Pineapple Bun
    - 6 cluster groups walking together
- Notes
    - Groups tend to keep to each other and talk while walking
    - Guard and customer? chatting outside smoke shop
    - Loading
    - Seniors with grocery carts
    - Increased bank activity, some seemed to know guard
    - Group of 3 coworkers (?) chatting and drinking coffee outside Saigon BBQ
    - Unhoused arranging clothes outside Lucky Spot
    - Some customers waiting outside car at sidewalk after groceries; waiting for car and pickup?

Irving between 21-22 Ave

- Time & Weather
  - 10:20, sunny
- Age
  - <18 0 0%
  - 18-35 5 19%
  - 35-60 7 26%
  - 60+ 15 56%
  - Total 27
- Perceived race
  - (East) Asian 25 83%
  - Non Asian 5 17%
  - Total 30
- Main Nodes
  - Revolving activities at bus stop
  - Dimsum attracted most foot traffic and movement
  - 6 clusters of people walking together
- Notes
  - 2 were dropped off for groceries
  - 1 looking at newspaper stand
  - 2 seniors sitting at bus bench, 1 on each bench
  - 2 girls from car to Walgreens and back. Quick visits to Walgreens
  - High car traffic into Walgreens lot
  - People eating and waiting in cars
  - Dog walking
  - Elderly man playing erhu at Uncle Benny again

Irving between 22-23 Ave

- Time & Weather
  - 10:20, sunny
- Age*
  - <18 1 0%
  - 18-60 25 47%
  - 60+ 28 53%
  - Total 53
- Perceived race
  - (East) Asian 57 86%
  - Non Asian 9 14%
  - Total 66

- Main Nodes
    - 22nd Market
    - Wing Cheung
    - Guangdong BBQ
- Notes
    - Majority doing grocery shopping, some chatting and shopping
    - Loading truck present at all 3 markets
    - Jaywalking between seafood market and produce market
    - Unload and smoke break at seafood market
    - Eating at bulbout
    - Typically make multiple trips to visit each market and BBQ
    - First count thus didn't break down between 18-35 and 35-60, but likely 10% 18-35 and 37% 35-65
    - Produce stands spill over to sidewalk, currently selling oranges and pomelo in preparation for CNY

Irving Sat 2/6 Noon

Irving between 19-20 Ave

- Time & Weather
  - 12:30, sunny
- Age
  - <18 0 0%
  - 18-35 8 32%
  - 35-60 16 64%
  - 60+ 1 4%
  - Total 25
- Perceived race
  - (East) Asian 20 54%
  - Non Asian 17 46%
  - Total 37
- Main Nodes
  - Pho shop
  - Pho shop
- Notes
  - SFPW street crew
  - Smoker outside Crab Hut
  - 4 diners at pho
  - Gathering outside deli
  - 12 outside pho near pizza

Irving between 20-21 Ave

- Time & Weather
  - 12:00, sunny
- Age
  - <18 4 14%
  - 18-35 4 14%
  - 35-60 15 54%
  - 60+ 9 32%
  - Total 32
- Perceived race
  - (East) Asian 35 81%
  - Non Asian 8 19%
  - Total 43

- Main Nodes
    - BofA
    - Sheng Kee + Sunset Market
    - Pineapple Bun
- Notes
    - Node at BofA because of social distancing. Likely high activity since many stores around here are cash only
    - 1 instance of Mandarin
    - People in car waiting while some family members go grocery shopping
    - Eating food (bun, boba) in car
    - Crowd die down around lunch time
    - Teen outside Sunset Market on phone
    - Man on phone leaning on bike rack

Irving between 21-22 Ave

- Time & Weather
    - 10:20, sunny
- Age
    - <18 0 0%
    - 18-35 5 19%
    - 35-60 7 26%
    - 60+ 15 56%
    - Total 27
- Perceived race
    - (East) Asian 25 83%
    - Non Asian 5 17%
    - Total 30
- Main Nodes
    - Revolving activities at bus stop
- Notes
    - Traffic around dimsum died down
    - 10 people waiting in car
    - Walgreen bus corner is a place for people to eat regardless of ethnicity
    - Family walking with stroller
    - Elderly man fall and paramedic come

Irving between 22-23 Ave

- Time & Weather
  - 11:45, sunny
- Age
  - <18 11 10%
  - 18-35 10 9%
  - 35-60 47 43%
  - 60+ 41 38%
  - Total 109
- Perceived race
  - (East) Asian 71 89%
  - Non Asian 9 11%
  - Total 80
- Main Nodes
  - BBQ
  - Wing Cheung + 22nd Market blend together
  - Itea
  - Yuanbao
  - Bulbout outside Salon HK
- Notes
  - May have been an overcount in ages due to heavy activity and difficulty classifying many in a short period of time
  - 1 instance of Taishan (?)
  - 1 instance of Teochow
  - Newspaper reading at corner of Wok Station
  - Son + dad waiting outside salon
  - Some went from salon to grocery
  - All produce on north facing side to avoid sun
  - Employee at Wing Cheung returned from buying lunch on Noriega for coworkers
  - Chance encounter and catching up outside 22nd Market
  - 1 man outside waiting as wife finished shopping and joins him
  - Children playing with produce and around market as mom shops
  - Table of produce outside cause bottleneck
  - Many lined up at Guangdong BBQ likely seeing more activity for lunch and buying hot meat for the week
  - Another family mom + 2 kids waiting at Salon HK bulbout in separate instance
  - Another instance teen outside, maybe parent inside?

Irving Sat 2/6 Afternoon

Irving between 19-20 Ave

- Pho Huynh Hiep 2 still popular for afternoon meal
- Pizza quiet today, primarily non-Asian clientele
- Eating snack at deli bulbout

Irving between 20-21 Ave

- Longer line than morning and noon for Pineapple Bun (23)
    - Mix of young and family
    - People in cars parked outside waiting as family gets order, then drive off
- Market quieter, loading van still present
    - Market has produce, frozen meat
- Newspapers: Sunset Beacon, SF Weekly, Chinese realty ads
- Fewer people at Lucky Spot today
- (7) Cars waiting idle
- T Pumps predominantly <18 and non asian (13 vs 2)
- Silver Spur primarily non asian (9 vs 2) primarily chatting and drinking

Irving between 21-22 Ave

- Main activity is AT&T for tech support or payment
- (4) idle in car
- Erhu still here
- 2 instances of Mandarin
- Son and dad outside walking, but son got tired and went back into car
- This block mostly pass-through area, idle car waiting, or parking spot for street goers

Irving between 22-23 Ave

- Waiting at bulbout with groceries, taking a break before walking again
- 22nd market quieter but still people present
- (9) waiting at Siptea Boba, primarily Asian
- Wing Cheung produce and grocery expanded to where space is available, i.e., Chabaa where its currently closed
- Same lady as last week same time come to Wing Cheung. Van still parked there
- 4:30 start packing in produce
- More whites this time of day than before
- Car drop off wife to go grocery shopping
- People waiting at Salon HK reading or on phone

- (9) idle in car
- One instance of grocer to boba after

Irving between 23-24 Ave

- Time & Weather
  - 4:30, sunny
- Age
  - <18 2 3%
  - 18-35 11 18%
  - 35-60 26 43%
  - 60+ 22 36%
  - Total 61
- Perceived race
  - (East) Asian 68 87%
  - Non Asian 10 13%
  - Total 78
- Main Nodes
  - S+B Supermarket
  - Happy Bakery (lunchtime)
  - TC Pastry Dimsum
- Notes
  - Loading truck at S+B
  - Produce packing up at S+B around this time
  - Socialize in small cluster groups
  - (4) elderly women waiting at bus stop
  - Tangerine and pomelo at S+B

Appendix D
Green Infrastructure Performance Calculations

SAN FRANCISCO PUBLIC UTILITIES COMMISSION - URBAN WATERSHED MANAGEMENT PROGRAM

COMBINED SEWER SYSTEM BMP SIZING CALCULATOR for QUANTITY CONTROL

525 Golden Gate, 11th Floor
San Francisco, CA 94102

CSS BMP SIZING CALCULATOR - *Only use for subwatersheds less than 2 acres, and sites less than 5 acres.*

Project Address:	Irving Street DMA 1	Applicant Name:	
Project Name (Alias):		Company:	
Total Project Site Area (ft^2):		Date:	
Subwatershed Name (if applicable):			

Modified Compliance Application

Modified Compliance approved?	
N/A	
N/A	
Project Requirement:	*Select Yes or No above*

LEGEND:

User Input
Default Value
Locked
Comment

STEP 1 - Enter the site's infiltration characteristics

HSG Soil Type:	A
Is Infiltration Feasible or Proposed?	Yes
Measured Infiltration Rate (in/hr):	0.6
Infiltration Testing Method:	Pilot Infiltration Test
Infiltration Rate Correction Factor:	0.50
Design Infiltration Rate (in/hr):	0.30

STEP 2 - Enter the site's EXISTING runoff pathway information to estimate the Time of Concentration (Tc)

Existing Means of Conveying Runoff Offsite?	Pipe
Avg. Site Slope in Direction of Flow (%):	50.0%
Maximum Flow Length (ft):	50

STEP 3a - Enter the sites EXISTING and PROPOSED areas of impervious, pervious, and BMP surfaces.

		Surface Type	Existing (ft^2)	Proposed (ft^2)	Curve Number
Conventional Surfaces	Impervious	Pavement (Conventional)	14,700	13,675	98
		Roof (Conventional)			98
		Gravel on Soils			76
		Other:			
		Impervious Areas Subtotal	*14,700*	*13,675*	
	Pervious	Grass/Lawn on Grade			49
		Landscaping on Grade (Low Density)			39
		Landscaping on Grade (High Density)			35
		Tree Well (ROW Only)			35
		Traditional Planter on Structure			74
		Other:			
		Pervious Areas Subtotal	*0*	*0*	--
Stormwater BMPs	Retention	Bioretention (No Underdrain, No Liner)	--	1,025	--
		Cistern	--	0	--
		Infiltration Trench	--		--
		Dry Well/Infiltration Gallery	--	0	--
		Permeable Pavement (No Underdrain)	--		--
	Detention	Bioretention/FTP (Underdrain, No Liner)	--		--
		Bioretention/FTP (Underdrain, Liner)	--		--
		Vegetated Roof	--		--
		Permeable Pavement (Underdrain)	--		--
		Detention Vault or Tank	--	0	--
		BMP Areas Subtotals	--	*1,025*	--
		Total Project Site Areas	***14,700***	***14,700***	--

BMPs in Series

Are BMPs in Series Proposed?	No
First BMP in Series	
Receiving BMP in Series	

STEP 3b - Enter stormwater BMP design information AND the conventional areas from Step 3a that drain to each BMP measure.

		Drainage Areas		BMP Depths and Volumes					Outlet Design	
		Impervious Area Draining to BMP (ft^2)	Pervious Area Draining to BMP (ft^2)	BMP Ponding Depth (ft)	BMP Media Depth (ft)	Gravel Storage Depth (ft)	Height of Underdrain Above Base (ft)	Storage Volume (gallons)	Outlet or Orifice Diameter (in)	Approx. Drawdown Time (hrs)
Stormwater BMPs	Retention	13,675		0.5	2.0	1.50	--	13,034	--	44
		0	0	0.0	--	0.00	--	0	0.0	0 days
				--	--	5.75	--	0	--	0
				0.0	--	4.00	--		--	0
			0	--	--	1.00	--	0	--	0
	Detention			0.5	1.5		0.17	0	4.0	0
				0.5	1.5		--	0	4.0	0
				--	0.50	--	--	0	4.0	0
			0	--	--	1.00	0.17	0	4.0	0
				3.0	--	--	--		1.5	0
		13,675	*0*					*13,034*		

SAN FRANCISCO PUBLIC UTILITIES COMMISSION - URBAN WATERSHED MANAGEMENT PROGRAM

COMBINED SEWER SYSTEM BMP SIZING CALCULATOR for QUANTITY CONTROL

525 Golden Gate, 11th Floor
San Francisco, CA 94102

CSS BMP SIZING CALCULATOR - ***Only use for subwatersheds less than 2 acres, and sites less than 5 acres.***

Project Address:	Irving Street DMA 1	Applicant Name:	
Project Name (Alias):		Company:	
Total Project Site Area (ft^2):		Date:	
Subwatershed Name (if applicable):			

Modified Compliance Application

Modified Compliance approved?	
N/A	
N/A	

Project Requirement: *Select Yes or No above*

LEGEND:

User Input
Default Value
Locked
Comment

STEP 4 - Check that site and drainage management areas are entered correctly. (Note: CSS = Combined Sewer System.)

Project Site Surfaces	Existing Area (ft^2)	Proposed Area (ft^2)	CHECK OF AREAS
Impervious Area Draining to BMP	0	13,675	OK
Impervious Area Draining Directly to CSS	14,700	0	
Pervious Area Draining to BMP	0	0	OK
Pervious Area Draining Directly to CSS	0	0	
Stormwater BMP Area	0	1,025	
Total Area	14,700	14,700	OK

STEP 5 - Compare if the SMR runoff reductions to quantity control requirements are met. If not, review BMP performance output in Step 6, then return to Step 3 to adjust stormwater strategies.

Quantity Control Parameter	Existing Conditions	Proposed Conditions	% Reduction From Existing Conditions	Target % Reduction	Requirement Met?
1-yr, 24 hr: Peak Flow (cfs)	0.532	0.034	94%	N/A	N/A
1-yr, 24 hr: Runoff Volume (ft^3)	2,964	637	78%	N/A	N/A
2-yr, 24 hr: Peak Flow (cfs)	0.641	0.059	91%	25%	YES
2-yr, 24 hr: Runoff Volume (ft^3)	3,211	884	72%	25%	YES

STEP 6 - Review the summary table below to see how each BMP performs during the 2-yr 24 hr storm. The site's hydrographs are shown in the "Rainfall and Hydrographs" tab.

	Stormwater BMP Measures	Inflows	Outflows		Volume In	Volume Retained			Volume Out to CSS		For BMPs in Series Only: Volume to Receiving BMP	
		Peak Flow to BMP (cfs)	Peak Rate of Discharged Flow (cfs)	Peak Rate of Overflow (cfs)	Runoff to BMP (ft^3)	Infiltration + E/T (ft^3)	Reuse (ft^3)	Volume Remaining in Storage (ft^3)	Detained Discharge Volume (ft^3)	Overflow Volume (ft^3)	Detained Discharge Volume (ft^3)	Overflow Volume (ft^3)
Retention	Bioretention (No Underdrain, No Liner)	0.641	0.000	0.059	3211	1816	0	512	0	884	--	--
Retention	Cistern	0.000	0.000	0.000	0	0	0	0	0	0	0	0
Retention	Infiltration Trench	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Retention	Dry Well/Infiltration Gallery	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Retention	Permeable Pavement (No Underdrain)	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Detention	Bioretention/FTP (Underdrain, No Liner)	0.000	0.000	0.000	0	0	0	0	0	0	0	0
Detention	Bioretention/FTP (Underdrain, Liner)	0.000	0.000	0.000	0	0	0	0	0	0	0	0
Detention	Vegetated Roof	0.000	0.000	0.000	0	0	0	0	0	0	0	0
Detention	Permeable Pavement (Underdrain)	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Detention	Detention Vault	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Totals				***3,211***	***1,816***	***0***	***512***	***0***	***884***	***0***	***0***

*NOTE: With the exception of Cisterns, BMP measures should not have any "**Volume Remaining in Storage**". If volume is remaining in any BMP measures other than a Cistern, check and revise **STEP 3b** for the "**Outlet Design**" (outlet/orifice diameter) or underdrain such that the "**Approx. Drawdown Time**" is less than 48 hours, therefore empty for the next storm event.*

SAN FRANCISCO PUBLIC UTILITIES COMMISSION - URBAN WATERSHED MANAGEMENT PROGRAM

COMBINED SEWER SYSTEM BMP SIZING CALCULATOR for QUANTITY CONTROL

525 Golden Gate, 11th Floor
San Francisco, CA 94102

CSS BMP SIZING CALCULATOR - *Only use for subwatersheds less than 2 acres, and sites less than 5 acres.*

Project Address:	Irving Street DMA 2	Applicant Name:	
Project Name (Alias):		Company:	
Total Project Site Area (ft^2):		Date:	
Subwatershed Name (if applicable):			

Modified Compliance Application

Modified Compliance approved?	
N/A	
N/A	
Project Requirement:	*Select Yes or No above*

LEGEND:

User Input
Default Value
Locked
Comment

STEP 1 - Enter the site's infiltration characteristics

HSG Soil Type:	A
Is Infiltration Feasible or Proposed?	Yes
Measured Infiltration Rate (in/hr):	0.6
Infiltration Testing Method:	Pilot Infiltration Test
Infiltration Rate Correction Factor:	0.50
Design Infiltration Rate (in/hr):	0.30

STEP 2 - Enter the site's EXISTING runoff pathway information to estimate the Time of Concentration (Tc)

Existing Means of Conveying Runoff Offsite?	Pipe
Avg. Site Slope in Direction of Flow (%):	50.0%
Maximum Flow Length (ft):	50

STEP 3a - Enter the sites EXISTING and PROPOSED areas of impervious, pervious, and BMP surfaces.

		Surface Type	Existing (ft^2)	Proposed (ft^2)	Curve Number
Conventional Surfaces	Impervious	Pavement (Conventional)	14,100	13,030	98
		Roof (Conventional)			98
		Gravel on Soils			76
		Other:			
		Impervious Areas Subtotal	*14,100*	*13,030*	
	Pervious	Grass/Lawn on Grade			49
		Landscaping on Grade (Low Density)			39
		Landscaping on Grade (High Density)			35
		Tree Well (ROW Only)			35
		Traditional Planter on Structure			74
		Other:			
		Pervious Areas Subtotal	*0*	*0*	--
Stormwater BMPs	Retention	Bioretention (No Underdrain, No Liner)	--	1,070	--
		Cistern	--	0	--
		Infiltration Trench	--		--
		Dry Well/Infiltration Gallery	--	0	--
		Permeable Pavement (No Underdrain)	--		--
	Detention	Bioretention/FTP (Underdrain, No Liner)	--		--
		Bioretention/FTP (Underdrain, Liner)	--		--
		Vegetated Roof	--		--
		Permeable Pavement (Underdrain)	--		--
		Detention Vault or Tank	--	0	--
		BMP Areas Subtotals	--	*1,070*	--
		Total Project Site Areas	***14,100***	***14,100***	--

BMPs in Series

Are BMPs in Series Proposed?	No
First BMP in Series	
Receiving BMP in Series	

STEP 3b - Enter stormwater BMP design information AND the conventional areas from Step 3a that drain to each BMP measure.

		Drainage Areas		BMP Depths and Volumes					Outlet Design	
		Impervious Area Draining to BMP (ft^2)	Pervious Area Draining to BMP (ft^2)	BMP Ponding Depth (ft)	BMP Media Depth (ft)	Gravel Storage Depth (ft)	Height of Underdrain Above Base (ft)	Storage Volume (gallons)	Outlet or Orifice Diameter (in)	Approx. Drawdown Time (hrs)
Stormwater BMPs	Retention	13,030	0	0.5	2.0	1.50	--	13,606	--	44
		0	0	0.0	--	0.00	--	0	0.0	0 days
				--	--	3.00	--	0	--	0
				0.0	--	4.00	--		--	0
			0	--	--	1.00	--	0	--	0
	Detention			0.5	1.5		0.17	0	4.0	0
				0.5	1.5		--	0	4.0	0
				--	0.50	--	--	0	4.0	0
			0	--	--	1.00	0.17	0	4.0	0
				3.0	--	--	--		1.5	0
		13,030	*0*					*13,606*		

SAN FRANCISCO PUBLIC UTILITIES COMMISSION - URBAN WATERSHED MANAGEMENT PROGRAM

COMBINED SEWER SYSTEM BMP SIZING CALCULATOR for QUANTITY CONTROL

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CSS BMP SIZING CALCULATOR - ***Only use for subwatersheds less than 2 acres, and sites less than 5 acres.***

Project Address:	Irving Street DMA 2	Applicant Name:	
Project Name (Alias):		Company:	
Total Project Site Area (ft^2):		Date:	
Subwatershed Name (if applicable):			

Modified Compliance Application

Modified Compliance approved?	
N/A	
N/A	

Project Requirement: *Select Yes or No above*

LEGEND:

User Input
Default Value
Locked
Comment

STEP 4 - Check that site and drainage management areas are entered correctly. (Note: CSS = Combined Sewer System.)

Project Site Surfaces	Existing Area (ft^2)	Proposed Area (ft^2)	CHECK OF AREAS
Impervious Area Draining to BMP	0	13,030	OK
Impervious Area Draining Directly to CSS	14,100	0	
Pervious Area Draining to BMP	0	0	OK
Pervious Area Draining Directly to CSS	0	0	
Stormwater BMP Area	0	1,070	
Total Area	14,100	14,100	OK

STEP 5 - Compare if the SMR runoff reductions to quantity control requirements are met. If not, review BMP performance output in Step 6, then return to Step 3 to adjust stormwater strategies.

Quantity Control Parameter	Existing Conditions	Proposed Conditions	% Reduction From Existing Conditions	Target % Reduction	Requirement Met?
1-yr, 24 hr: Peak Flow (cfs)	0.510	0.022	96%	N/A	N/A
1-yr, 24 hr: Runoff Volume (ft^3)	2,843	415	85%	N/A	N/A
2-yr, 24 hr: Peak Flow (cfs)	0.615	0.037	94%	25%	YES
2-yr, 24 hr: Runoff Volume (ft^3)	3,080	652	79%	25%	YES

STEP 6 - Review the summary table below to see how each BMP performs during the 2-yr 24 hr storm. The site's hydrographs are shown in the "Rainfall and Hydrographs" tab.

Stormwater BMP Measures		Inflows	Outflows		Volume In	Volume Retained			Volume Out to CSS		For BMPs in Series Only: Volume to Receiving BMP	
		Peak Flow to BMP (cfs)	Peak Rate of Discharged Flow (cfs)	Peak Rate of Overflow (cfs)	Runoff to BMP (ft^3)	Infiltration + E/T (ft^3)	Reuse (ft^3)	Volume Remaining in Storage (ft^3)	Detained Discharge Volume (ft^3)	Overflow Volume (ft^3)	Detained Discharge Volume (ft^3)	Overflow Volume (ft^3)
Retention	Bioretention (No Underdrain, No Liner)	0.615	0.000	0.037	3080	1894	0	534	0	652	--	--
	Cistern	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Infiltration Trench	0.000	0.000	0.000	0	0	0	0	0	0	--	--
	Dry Well/Infiltration Gallery	0.000	0.000	0.000	0	0	0	0	0	0	--	--
	Permeable Pavement (No Underdrain)	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Detention	Bioretention/FTP (Underdrain, No Liner)	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Bioretention/FTP (Underdrain, Liner)	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Vegetated Roof	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Permeable Pavement (Underdrain)	0.000	0.000	0.000	0	0	0	0	0	0	--	--
	Detention Vault	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Totals				***3,080***	***1,894***	***0***	***534***	***0***	***652***	***0***	***0***

*NOTE: With the exception of Cisterns, BMP measures should not have any "**Volume Remaining in Storage**". If volume is remaining in any BMP measures other than a Cistern, check and revise **STEP 3b** for the "**Outlet Design**" (outlet/orifice diameter) or underdrain such that the "**Approx. Drawdown Time**" is less than 48 hours, therefore empty for the next storm event.*

SAN FRANCISCO PUBLIC UTILITIES COMMISSION - URBAN WATERSHED MANAGEMENT PROGRAM

COMBINED SEWER SYSTEM BMP SIZING CALCULATOR for QUANTITY CONTROL

525 Golden Gate, 11th Floor
San Francisco, CA 94102

CSS BMP SIZING CALCULATOR - *Only use for subwatersheds less than 2 acres, and sites less than 5 acres.*

Project Address:	Irving Street DMA 3	Applicant Name:	
Project Name (Alias):		Company:	
Total Project Site Area (ft^2):	47,000	Date:	
Subwatershed Name (if applicable):			

Modified Compliance Application

Modified Compliance approved?	
N/A	
N/A	
Project Requirement:	*Select Yes or No above*

LEGEND:

User Input
Default Value
Locked
Comment

STEP 1 - Enter the site's infiltration characteristics

HSG Soil Type:	A
Is Infiltration Feasible or Proposed?	Yes
Measured Infiltration Rate (in/hr):	0.6
Infiltration Testing Method:	Pilot Infiltration Test
Infiltration Rate Correction Factor:	0.50
Design Infiltration Rate (in/hr):	0.30

STEP 2 - Enter the site's EXISTING runoff pathway information to estimate the Time of Concentration (Tc)

Existing Means of Conveying Runoff Offsite?	Pipe
Avg. Site Slope in Direction of Flow (%):	1.0%
Maximum Flow Length (ft):	50

STEP 3a - Enter the sites EXISTING and PROPOSED areas of impervious, pervious, and BMP surfaces.

		Surface Type	Existing (ft^2)	Proposed (ft^2)	Curve Number
Conventional Surfaces	Impervious	Pavement (Conventional)	69,900	67,500	98
		Roof (Conventional)			98
		Gravel on Soils			76
		Other:			
		Impervious Areas Subtotal	*69,900*	*67,500*	
	Pervious	Grass/Lawn on Grade			49
		Landscaping on Grade (Low Density)			39
		Landscaping on Grade (High Density)			35
		Tree Well (ROW Only)			35
		Traditional Planter on Structure			74
		Other:			
		Pervious Areas Subtotal	*0*	*0*	--
Stormwater BMPs	Retention	Bioretention (No Underdrain, No Liner)	--	2,400	--
		Cistern	--	0	--
		Infiltration Trench	--		--
		Dry Well/Infiltration Gallery	--	0	--
		Permeable Pavement (No Underdrain)	--		--
	Detention	Bioretention/FTP (Underdrain, No Liner)	--		--
		Bioretention/FTP (Underdrain, Liner)	--		--
		Vegetated Roof	--		--
		Permeable Pavement (Underdrain)	--		--
		Detention Vault or Tank	--	0	--
		BMP Areas Subtotals	--	*2,400*	--
		Total Project Site Areas	***69,900***	***69,900***	--

BMPs in Series

Are BMPs in Series Proposed?	No
First BMP in Series	
Receiving BMP in Series	

STEP 3b - Enter stormwater BMP design information AND the conventional areas from Step 3a that drain to each BMP measure.

		Drainage Areas		BMP Depths and Volumes					Outlet Design	
		Impervious Area Draining to BMP (ft^2)	Pervious Area Draining to BMP (ft^2)	BMP Ponding Depth (ft)	BMP Media Depth (ft)	Gravel Storage Depth (ft)	Height of Underdrain Above Base (ft)	Storage Volume (gallons)	Outlet or Orifice Diameter (in)	Approx. Drawdown Time (hrs)
Stormwater BMPs	Retention	67,500	0	0.8	2.5	3.00	--	48,470	--	60
		0	0	0.0	--	0.00	--	0	0.0	0 days
				--	--	3.00	--	0	--	0
				0.0	--	4.00	--		--	0
			0	--	--	1.00	--	0	--	0
	Detention			0.5	1.5		0.17	0	4.0	0
				0.5	1.5		--	0	4.0	0
				--	0.50	--	--	0	4.0	0
			0	--	--	1.00	0.17	0	4.0	0
				3.0	--	--	--		1.5	0
		67,500	*0*					*48,470*		

SAN FRANCISCO PUBLIC UTILITIES COMMISSION - URBAN WATERSHED MANAGEMENT PROGRAM

COMBINED SEWER SYSTEM BMP SIZING CALCULATOR for QUANTITY CONTROL

525 Golden Gate, 11th Floor
San Francisco, CA 94102

CSS BMP SIZING CALCULATOR - ***Only use for subwatersheds less than 2 acres, and sites less than 5 acres.***

Project Address:	Irving Street DMA 3	Applicant Name:	
Project Name (Alias):		Company:	
Total Project Site Area (ft^2):	47,000	Date:	
Subwatershed Name (if applicable):			

Modified Compliance Application

Modified Compliance approved?	
N/A	
N/A	

Project Requirement: *Select Yes or No above*

LEGEND:

User Input
Default Value
Locked
Comment

STEP 4 - Check that site and drainage management areas are entered correctly. (Note: CSS = Combined Sewer System.)

Project Site Surfaces	Existing Area (ft^2)	Proposed Area (ft^2)	CHECK OF AREAS
Impervious Area Draining to BMP	0	67,500	OK
Impervious Area Draining Directly to CSS	69,900	0	
Pervious Area Draining to BMP	0	0	OK
Pervious Area Draining Directly to CSS	0	0	
Stormwater BMP Area	0	2,400	
Total Area	69,900	69,900	OK

STEP 5 - Compare if the SMR runoff reductions to quantity control requirements are met. If not, review BMP performance output in Step 6, then return to Step 3 to adjust stormwater strategies.

Quantity Control Parameter	Existing Conditions	Proposed Conditions	% Reduction From Existing Conditions	Target % Reduction	Requirement Met?
1-yr, 24 hr: Peak Flow (cfs)	2.528	1.326	48%	N/A	N/A
1-yr, 24 hr: Runoff Volume (ft^3)	14,093	6,232	56%	N/A	N/A
2-yr, 24 hr: Peak Flow (cfs)	3.049	2.299	25%	25%	YES
2-yr, 24 hr: Runoff Volume (ft^3)	15,268	7,406	51%	25%	YES

STEP 6 - Review the summary table below to see how each BMP performs during the 2-yr 24 hr storm. The site's hydrographs are shown in the "Rainfall and Hydrographs" tab.

	Stormwater BMP Measures	Inflows	Outflows		Volume In	Volume Retained			Volume Out to CSS		For BMPs in Series Only: Volume to Receiving BMP	
		Peak Flow to BMP (cfs)	Peak Rate of Discharged Flow (cfs)	Peak Rate of Overflow (cfs)	Runoff to BMP (ft^3)	Infiltration + E/T (ft^3)	Reuse (ft^3)	Volume Remaining in Storage (ft^3)	Detained Discharge Volume (ft^3)	Overflow Volume (ft^3)	Detained Discharge Volume (ft^3)	Overflow Volume (ft^3)
Retention	Bioretention (No Underdrain, No Liner)	3.049	0.000	2.299	15270	4264	0	3600	0	7406	--	--
Retention	Cistern	0.000	0.000	0.000	0	0	0	0	0	0	0	0
Retention	Infiltration Trench	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Retention	Dry Well/Infiltration Gallery	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Retention	Permeable Pavement (No Underdrain)	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Detention	Bioretention/FTP (Underdrain, No Liner)	0.000	0.000	0.000	0	0	0	0	0	0	0	0
Detention	Bioretention/FTP (Underdrain, Liner)	0.000	0.000	0.000	0	0	0	0	0	0	0	0
Detention	Vegetated Roof	0.000	0.000	0.000	0	0	0	0	0	0	0	0
Detention	Permeable Pavement (Underdrain)	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Detention	Detention Vault	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Totals				***15,270***	***4,264***	***0***	***3,600***	***0***	***7,406***	***0***	***0***

*NOTE: With the exception of Cisterns, BMP measures should not have any "**Volume Remaining in Storage**". If volume is remaining in any BMP measures other than a Cistern, check and revise **STEP 3b** for the "**Outlet Design**" (outlet/orifice diameter) or underdrain such that the "**Approx. Drawdown Time**" is less than 48 hours, therefore empty for the next storm event.*

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COMBINED SEWER SYSTEM BMP SIZING CALCULATOR for QUANTITY CONTROL

525 Golden Gate, 11th Floor
San Francisco, CA 94102

CSS BMP SIZING CALCULATOR - *Only use for subwatersheds less than 2 acres, and sites less than 5 acres.*

Project Address:	Irving Street DMA 4	Applicant Name:	
Project Name (Alias):		Company:	
Total Project Site Area (ft^2):	47,000	Date:	
Subwatershed Name (if applicable):			

Modified Compliance Application

Modified Compliance approved?	
N/A	
N/A	
Project Requirement:	*Select Yes or No above*

LEGEND:

User Input
Default Value
Locked
Comment

STEP 1 - Enter the site's infiltration characteristics

HSG Soil Type:	A
Is Infiltration Feasible or Proposed?	Yes
Measured Infiltration Rate (in/hr):	1.2
Infiltration Testing Method:	Pilot Infiltration Test
Infiltration Rate Correction Factor:	0.50
Design Infiltration Rate (in/hr):	0.60

STEP 2 - Enter the site's EXISTING runoff pathway information to estimate the Time of Concentration (Tc)

Existing Means of Conveying Runoff Offsite?	Pipe
Avg. Site Slope in Direction of Flow (%):	50.0%
Maximum Flow Length (ft):	50

STEP 3a - Enter the sites EXISTING and PROPOSED areas of impervious, pervious, and BMP surfaces.

		Surface Type	Existing (ft^2)	Proposed (ft^2)	Curve Number
Conventional Surfaces	Impervious	Pavement (Conventional)	67,300	64,500	98
		Roof (Conventional)			98
		Gravel on Soils			76
		Other:			
		Impervious Areas Subtotal	*67,300*	*64,500*	
	Pervious	Grass/Lawn on Grade			49
		Landscaping on Grade (Low Density)			39
		Landscaping on Grade (High Density)			35
		Tree Well (ROW Only)			35
		Traditional Planter on Structure			74
		Other:			
		Pervious Areas Subtotal	*0*	*0*	--
Stormwater BMPs	Retention	Bioretention (No Underdrain, No Liner)	--	2,800	--
		Cistern	--	0	--
		Infiltration Trench	--		--
		Dry Well/Infiltration Gallery	--	0	--
		Permeable Pavement (No Underdrain)	--		--
	Detention	Bioretention/FTP (Underdrain, No Liner)	--		--
		Bioretention/FTP (Underdrain, Liner)	--		--
		Vegetated Roof	--		--
		Permeable Pavement (Underdrain)	--		--
		Detention Vault or Tank	--	0	--
		BMP Areas Subtotals	--	*2,800*	--
		Total Project Site Areas	***67,300***	***67,300***	--

BMPs in Series

Are BMPs in Series Proposed?	No
First BMP in Series	
Receiving BMP in Series	

STEP 3b - Enter stormwater BMP design information AND the conventional areas from Step 3a that drain to each BMP measure.

		Drainage Areas		BMP Depths and Volumes					Outlet Design	
		Impervious Area Draining to BMP (ft^2)	Pervious Area Draining to BMP (ft^2)	BMP Ponding Depth (ft)	BMP Media Depth (ft)	Gravel Storage Depth (ft)	Height of Underdrain Above Base (ft)	Storage Volume (gallons)	Outlet or Orifice Diameter (in)	Approx. Drawdown Time (hrs)
Stormwater BMPs	Retention	64,500	0	0.8	2.5	3.00	--	56,549	--	30
		0	0	0.0	--	0.00	--	0	0.0	0 days
				--	--	3.00	--	0	--	0
				0.0	--	4.00	--		--	0
			0	--	--	1.00	--	0	--	0
	Detention			0.5	1.5		0.17	0	4.0	0
				0.5	1.5		--	0	4.0	0
				--	0.50	--	--	0	4.0	0
			0	--	--	1.00	0.17	0	4.0	0
				3.0	--	--	--		1.5	0
		64,500	*0*					*56,549*		

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CSS BMP SIZING CALCULATOR - ***Only use for subwatersheds less than 2 acres, and sites less than 5 acres.***

Project Address:	Irving Street DMA 4	Applicant Name:	
Project Name (Alias):		Company:	
Total Project Site Area (ft^2):	47,000	Date:	
Subwatershed Name (if applicable):			

Modified Compliance Application

Modified Compliance approved?	
N/A	
N/A	

Project Requirement: *Select Yes or No above*

LEGEND:

User Input
Default Value
Locked
Comment

STEP 4 - Check that site and drainage management areas are entered correctly. (Note: CSS = Combined Sewer System.)

Project Site Surfaces	Existing Area (ft^2)	Proposed Area (ft^2)	CHECK OF AREAS
Impervious Area Draining to BMP	0	64,500	OK
Impervious Area Draining Directly to CSS	67,300	0	
Pervious Area Draining to BMP	0	0	OK
Pervious Area Draining Directly to CSS	0	0	
Stormwater BMP Area	0	2,800	
Total Area	67,300	67,300	OK

STEP 5 - Compare if the SMR runoff reductions to quantity control requirements are met. If not, review BMP performance output in Step 6, then return to Step 3 to adjust stormwater strategies.

Quantity Control Parameter	Existing Conditions	Proposed Conditions	% Reduction From Existing Conditions	Target % Reduction	Requirement Met?
1-yr, 24 hr: Peak Flow (cfs)	2.434	0.253	90%	N/A	N/A
1-yr, 24 hr: Runoff Volume (ft^3)	13,568	2,833	79%	N/A	N/A
2-yr, 24 hr: Peak Flow (cfs)	2.936	0.916	69%	25%	YES
2-yr, 24 hr: Runoff Volume (ft^3)	14,700	3,960	73%	25%	YES

STEP 6 - Review the summary table below to see how each BMP performs during the 2-yr 24 hr storm. The site's hydrographs are shown in the "Rainfall and Hydrographs" tab.

Stormwater BMP Measures		Inflows	Outflows		Volume In	Volume Retained			Volume Out to CSS		For BMPs in Series Only: Volume to Receiving BMP	
		Peak Flow to BMP (cfs)	Peak Rate of Discharged Flow (cfs)	Peak Rate of Overflow (cfs)	Runoff to BMP (ft^3)	Infiltration + E/T (ft^3)	Reuse (ft^3)	Volume Remaining in Storage (ft^3)	Detained Discharge Volume (ft^3)	Overflow Volume (ft^3)	Detained Discharge Volume (ft^3)	Overflow Volume (ft^3)
Retention	Bioretention (No Underdrain, No Liner)	2.936	0.000	0.916	14702	9906	0	836	0	3960	--	--
	Cistern	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Infiltration Trench	0.000	0.000	0.000	0	0	0	0	0	0	--	--
	Dry Well/Infiltration Gallery	0.000	0.000	0.000	0	0	0	0	0	0	--	--
	Permeable Pavement (No Underdrain)	0.000	0.000	0.000	0	0	0	0	0	0	--	--
Detention	Bioretention/FTP (Underdrain, No Liner)	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Bioretention/FTP (Underdrain, Liner)	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Vegetated Roof	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Permeable Pavement (Underdrain)	0.000	0.000	0.000	0	0	0	0	0	0	--	--
	Detention Vault	0.000	0.000	0.000	0	0	0	0	0	0	0	0
	Totals				***14,702***	***9,906***	***0***	***836***	***0***	***3,960***	***0***	***0***

*NOTE: With the exception of Cisterns, BMP measures should not have any "**Volume Remaining in Storage**". If volume is remaining in any BMP measures other than a Cistern, check and revise **STEP 3b** for the "**Outlet Design**" (outlet/orifice diameter) or underdrain such that the "**Approx. Drawdown Time**" is less than 48 hours, therefore empty for the next storm event.*