

# —Shadow Study Report

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## 1 Project Description

The project would demolish all existing buildings on the six project parcels. The existing uses on the project site are primarily auto sales and repair, and warehouse space, including one multi-tenant residential building owned by the City of Redwood City, and a former indoor roller rink. The existing street network would be largely maintained. Shasta Street between Main Street and Chestnut Street would be closed to create additional green space. Additionally, Beech Street would be reconfigured to align with Lincoln Street to the west, while a portion of Cedar Street east of Main Street would become a private street. As part of the public open space element of the project, the existing Perry's Feed Shed, located at Shasta and Chestnut Streets on Parcel E, would be demolished; and a replicate structure would be rebuilt on the original site for public commercial use.

The proposed project would include one building each on Parcels A and F, developed with primarily residential uses; and five additional buildings on Parcels B through E, where the primary use would be commercial office. The proposed project would develop 291 multi-family residential units, including 252 units on Parcel A, and 39 units on Parcel F. The project would also include approximately 550,000 square feet of office uses, an 8,500-square-foot childcare facility (not including 5,800 square feet of dedicated outdoor space), and 28,000 square feet of retail uses, including 19,000 square feet of ground-floor space on Parcel B designed to accommodate retail-entertainment uses. The approximately 40,000 square feet of public open space proposed throughout the site would include a public creek walk, and a privately-owned park at Shasta Street and Chestnut Street. Existing use of the project site is primarily auto sales, repair, and warehouse space, including one multi-tenant residential building owned by the City of Redwood City, a restaurant, and a former indoor roller rink. Uses surrounding the site include auto repair shops, small commercial buildings, large multi-tenant residential developments, some retail, and a proposed 109,000-square foot office building.

## 2 Project Shade and Shadow Analysis

### 2.1 Study Introduction

Shadows are an inescapable aspect of the built environment. As cities develop, and redevelop, new buildings alter the dynamics of urban shade by casting shadows where they may not have occurred before. It is therefore important to evaluate the impact of proposed projects and, if needed, mitigate significant impacts upon adjacent buildings, open space, and streetscapes.

The Redwood City General Plan defines significant shade and shadow as:

- Introducing landscaping that would now or in the future cast substantial shadows on existing solar collectors;
- Casting shadows that substantially impair the beneficial use of shadow-sensitive public open space;
- Casting shadows that materially impair the historic significance of a historic resource;

- Casting shadows from parcels within a major transportation corridor onto adjacent Low, Medium, Medium-High, and High-Density residential parcels that substantially impair the beneficial use of residential parcels.

This section identifies the potentially impacted adjacent properties and their respective land uses resulting from proposed project.

## 2.2 Project Existing Setting

The five parcels making up the project site are located within the Stambaugh-Heller neighborhood. The project site is bounded by Pennsylvania Avenue to the northeast, Chestnut and Cedar Streets to the southeast, El Camino Real to the southwest, and Maple and Elm Streets to the northwest. Within the project boundary, there are interior streets including the north-south running Main Street and Lathrop Street, Beech Street and the portion of Cedar Street within Parcel E, which both run west-east direction.

Currently, the project area features several commercial retail stores and warehouse buildings surrounded by surface parking areas. Of the 21 existing buildings within the project area, 20 are single story structures, and one building is a 3-story structure with approximately 30 feet in height (1306 Main Street). Due to the height and density of the existing buildings, the existing shading impact on the project's adjacency is very minimum.

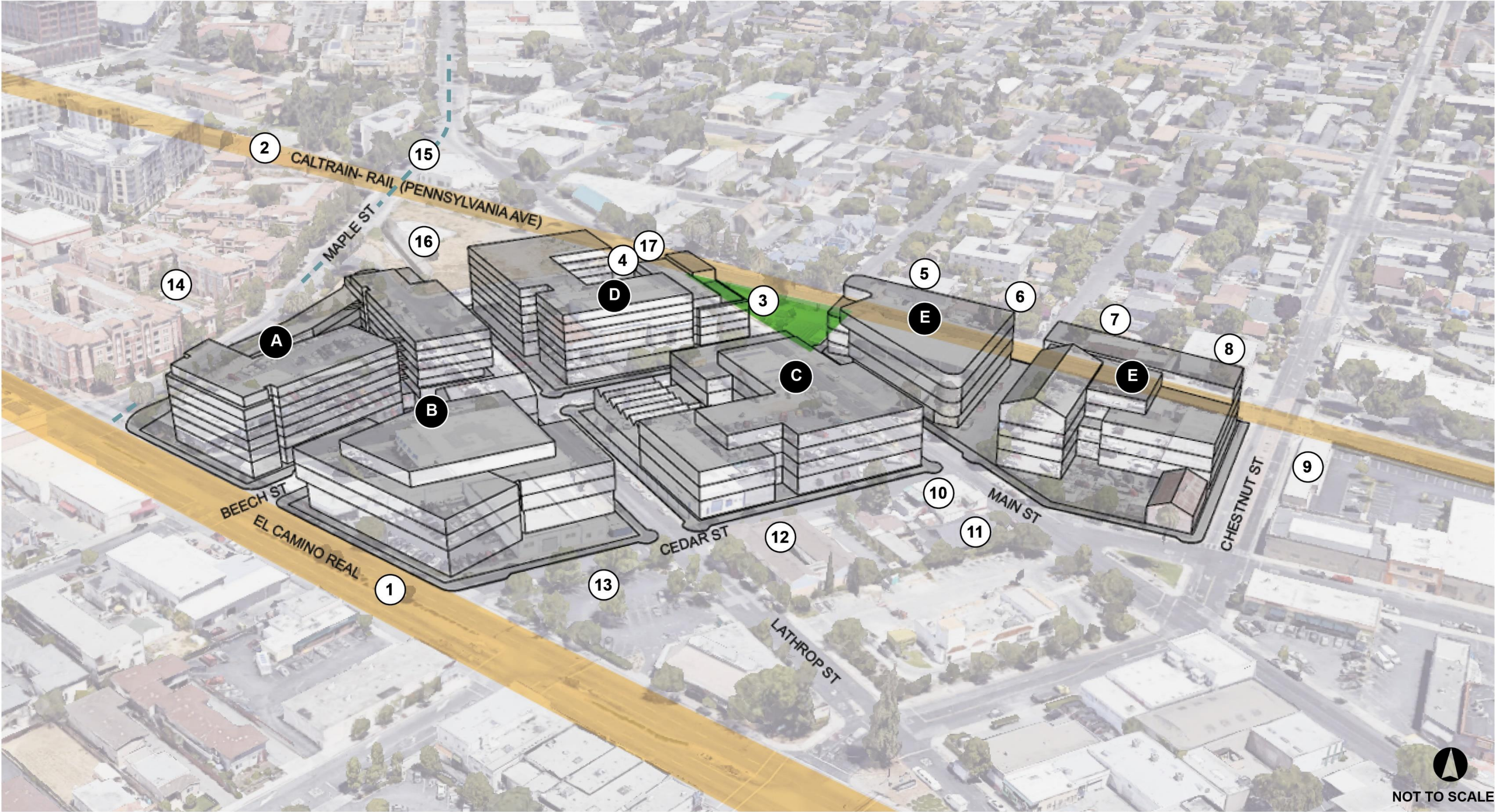
The areas surrounding the proposed project site feature several different zoning designations, including Downtown Precise Plan, Mixed Use Corridor - El Camino Real (MUC-ECR), Mixed-use Live/Work (MULW), and Multifamily - Medium Density (R-4). The project site is surrounded by commercial and residential uses, and adjacent to the Caltrain tracks to the northeast, channelized Redwood Creek to the northwest (Figure 1). Main Street Dog Agility Park is located to the east of Parcel D and northwest of the Parcel E. There are no existing solar collectors documented within project vicinity context. San Jose Obrero Catholic Church, a Historic Designated property, is outside the project impact area. There are two Non-Designated Historic Resources building (see Table 1, No. 10 & 11) within project impact area. The following shadow impact study will include the estimate of significance of the impact on these two properties.

Table 1 below lists the properties adjacent to the project site and their zoning classification, 2010 General Plan designation, if applicable, building height, and additional comments.

<b>Table 1. Project Site-Adjacent Properties</b>					
<b>No.</b>	<b>Name / Address</b>	<b>Zoning</b>	<b>2010 General Plan</b>	<b>Height (ft)</b>	<b>Comments</b>
1	El Camino Real Streetscape	-	Mixed Use Corridor - El Camino Real	-	
2	Caltrain Rail	-	-	-	

3	Main Street Dog Agility Park	Public Facilities	Park	-	Public Open Space
4	1202 Main Street	Mix-Use Live Work	Mix-Use Live Work	27	
5	306 Beech Street	Multi-Family Residential Medium Density	Residential High Density	20	
6	303 Cedar Street	Multi-Family Residential Medium Density	Residential High Density	23	
7	304 Cedar Street	Multi-Family Residential Medium Density	Residential High Density	19	
8	305 Chestnut Street	Multi-Family Residential Medium Density	Residential High Density	28	
9	725 Shasta Street	Mixed Use Live/Work - Shelter	Mix-Use Live Work	26	
10	1402,1406 Main Street	Mixed Use Live/Work - Shelter	Mix-Use Live Work	23	Non-Designated Historic Resource
11	1414 Main Street	Mixed Use Live/Work - Shelter	Mix-Use Live Work	22	Non-Designated Historic Resource
12	104 Cedar Street	Mixed Use Live/Work - Shelter	Mix-Use Live Work	23	
13	1745 El Camino Real	Mixed Use Corridor - El Camino Real	Mixed Use Corridor - El Camino Real	32	
14	Irvine Apartments 1 Maple Street	Planned Community	Mixed Use-Downtown	73	
15	Maple Street Bike Route	-	-	-	
16	118—0 Main St	Mix-Use Live Work	Mix-Use Live Work	3 stories	City Approved New Development
17	Caltrain Grade Crossing Improvement	-	-	-	

18	Elm Street	-	-	-	
19	Beech Street	-	-	-	
20	Cedar Street	-	-	-	
21	Chestnut Street	-	-	-	
22	Lathrop Street	-	-	-	
23	Main Street	-	-	-	



- A** Proposed Parcel
- 1** Existing Properties in the Project Vicinity

**Figure 1 Project Vicinity Map**  
 South Main Mixed-Use Project  
 Redwood City, California

## 3 Project Shade and Shadow Impacts

### 3.1 Analysis and Evaluation Method

This shade study assesses the potential shadow impacts of the proposed project on adjacent existing shadow-sensitive land uses. Using a digital 3D model of the proposed project and the surrounding context, the analysis simulates the sun's position and resulting shadows on the Summer and Winter solstices (June 21st and December 21st) and the Vernal and Autumnal equinox (March 20th and September 23rd). These solar positions are commonly used as the basis for shadows studies because they represent the full range of shade throughout the year. For each of the representative days, shadow positions are modeled in three-hour increments: 9:00 am, noon, 3:00 pm and 6:00 pm. The resulting diagrams depict how the proposed buildings' shadows move throughout the day on each of the representative days.

This section assesses the shadow impacts based on the method stated above of the proposed project on the identified adjacent properties and land uses in the previous section. And the shade impacts are evaluated based on the impacts to the surrounding context reflected in the shade and shadow simulations. Shadows affecting only a small portion of an adjacent property, on a seasonal rather than daily basis, are considered low impact. Shadows impacting a sensitive use area of an adjacent property, shading areas for an hour or more per day during multiple seasons or may potentially impair the beneficial use of the existing properties during certain times of day are considered to be medium impact. Shadows affecting an adjacent property year-round, covering a large portion of an adjacent property, or impairing a beneficial use are classified as high impact.

### 3.2 Project Shadow Impacts

Due to the project site's northwest orientation, the proposed project will cast shade along El Camino Real to the west, Maple and Elm Streets to the northwest, and Pennsylvania Avenue to the northeast. The interior streets within the project site are also affected by shade from the proposed buildings.

The impacts to each adjacent property are listed in Table 2 below, and a series of plan view shade studies are shown in Figure 2.1, 2.2, and 2.3. The Shadow Overlay Diagram (Figure 3) also demonstrates the overall shadow impacts on the surrounding area.

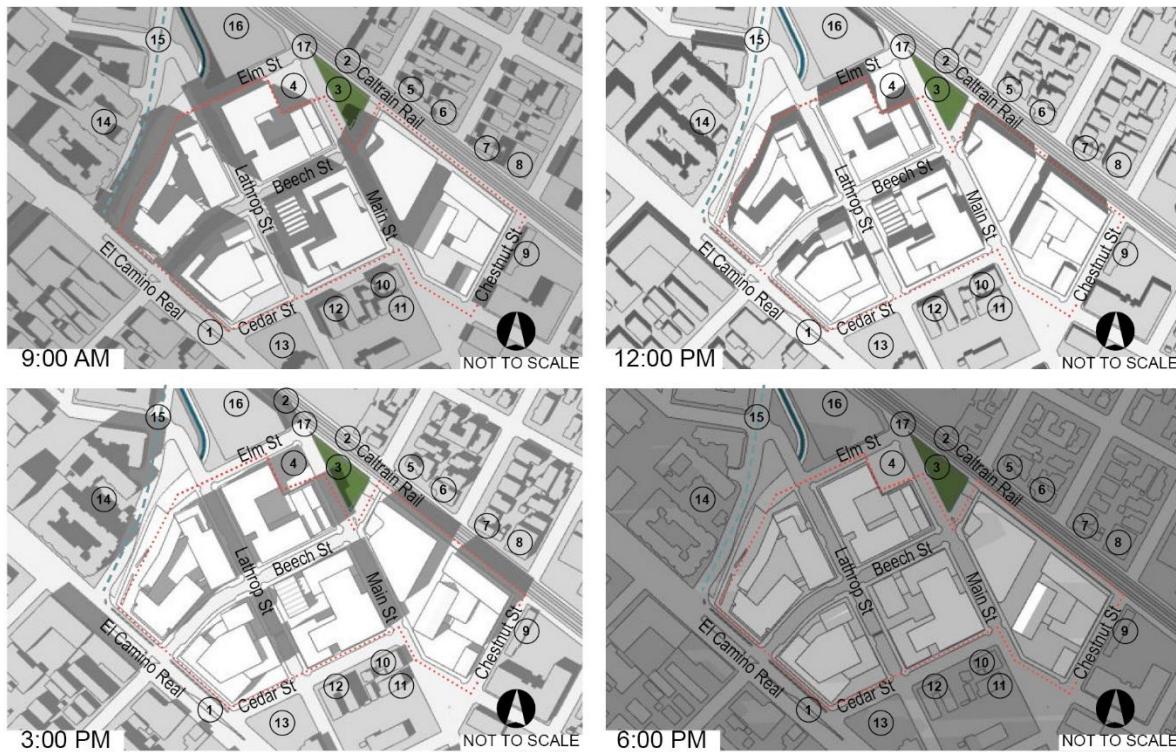
<b>Table 2. Shadow Impact Analysis Results</b>			
<b>No.</b>	<b>Address</b>	<b>Shadow Impact</b>	<b>Impact Evaluation</b>
1	El Camino Real	The northeast side of the sidewalk adjacent to Parcel A and Parcel B will be partially in shade during morning hours.	Medium
2	Caltrain Rail	The portion of tracks adjacent to Parcel D and Parcel E are shaded in the afternoon hours.	Medium

3	Main Street Dog Agility Park	In spring and fall season, a small portion of the park adjacent to Beech Street will be in shade in the early morning hours, and a small portion adjacent to Main Street will be shaded in the afternoon hours. In winter season, the park will be mostly shaded during early morning and afternoon hours.	Medium
4	1202 Main Street	Except for summer, buildings will be partially in shade during a day, and mostly in shade in winter. In summer season, the building will be shaded in the afternoon.	Medium
5	306 Beech Street	Only in winter season, the facade facing Pennsylvania Avenue will be in shade in the afternoon hours.	Low
6	303 Cedar Street	Only in winter season, the facade facing Pennsylvania Avenue will be in shade in the afternoon hours.	Low
7	304 Cedar Street	Only in winter season, the facade facing Pennsylvania Avenue will be in shade in the afternoon hours.	Low
8	305 Chestnut Street	Only in winter season, the facade facing Pennsylvania Avenue will be in shade in the afternoon hours.	Low
9	725 Shasta Street	The daylight during summer season will be slightly shortened due to the shadow cast by building at Parcel E in the late afternoon hours.	Low
10	1402,1406 Main Street	The daylight during spring, summer and fall season will be slightly shortened due to the shadow cast from buildings at Parcel B and Parcel C in the late afternoon hours.	Low
11	1414 Main Street	The daylight during spring, summer and fall season will be slightly shortened due to the shadow cast from buildings at Parcel C in the late afternoon hours.	Low
12	104 Cedar Street	The daylight during spring, summer and fall will be slightly shortened due to the shadow cast by building at Parcel C in the late afternoon hours.	Low
13	1745 El Camino Real	The existing building will not be impacted by the shadow cast from the project, but the surface parking lot will partially be in shade in summer season during late afternoon hours.	Low
14	Irvine Apartments 1 Maple Street	Only the Southeast facing facade will be impacted in winter in the morning by the shadow cast from Parcel A.	Low
15	Maple Street Bike Route	The southeast side of the bike route adjacent to Parcel A will be in shade during morning hours year-round.	Medium

16	1180 Main St (City Approved New Development)	A small portion of the building facing Elm Street will be in shade only in the early morning of spring and fall season. In winter season, a small portion of the southeast facing facade will be in shade during most hours in a day.	Medium
17	Caltrain Grade Crossing Improvement	Only in winter season the west side of the crossing will be in shade in the afternoon hours.	Low
18	Elm Street	Part of the street adjacent to Parcel D is shaded in the morning year-round. In winter afternoon, the entire section of the street in front of Parcel D will be shaded.	High
19	Beech Street	The southeast side of the street adjacent to Parcel B, Parcel C and Parcel E is partially shaded in the morning year-round. Except in the summer, the section in front of Parcel B will be entirely shaded in the early morning hours. In winter the street will mostly be in shade.	High
20	Cedar Street	The daylight during summer season will be slightly shortened due to the shadow cast from buildings at Parcel B and Parcel C in the late afternoon hours. The section of the street between 2 buildings at Parcel E will be mostly shaded year-round, except for the noon time in spring, summer and fall season.	Medium
21	Chestnut Street	The daylight during summer season will be slightly shortened due to the shadow cast from buildings at Parcel B and Parcel C in the late afternoon hours. Part of the northwest side of the street will be shaded in the afternoon year-round.	Medium
22	Lathrop Street	The proposed buildings will cast heavy shadows over the entire section of the street between Elm Street and Cedar Street in the afternoon hours year-round as well as the northeast side of the street adjacent to Parcel D in the morning hours.	High
23	Main Street	The northeast side of the street adjacent to Parcel E will be shaded during early morning year-round. The southwest side of the street adjacent to Parcel C will be shaded in the afternoon year-round.	High

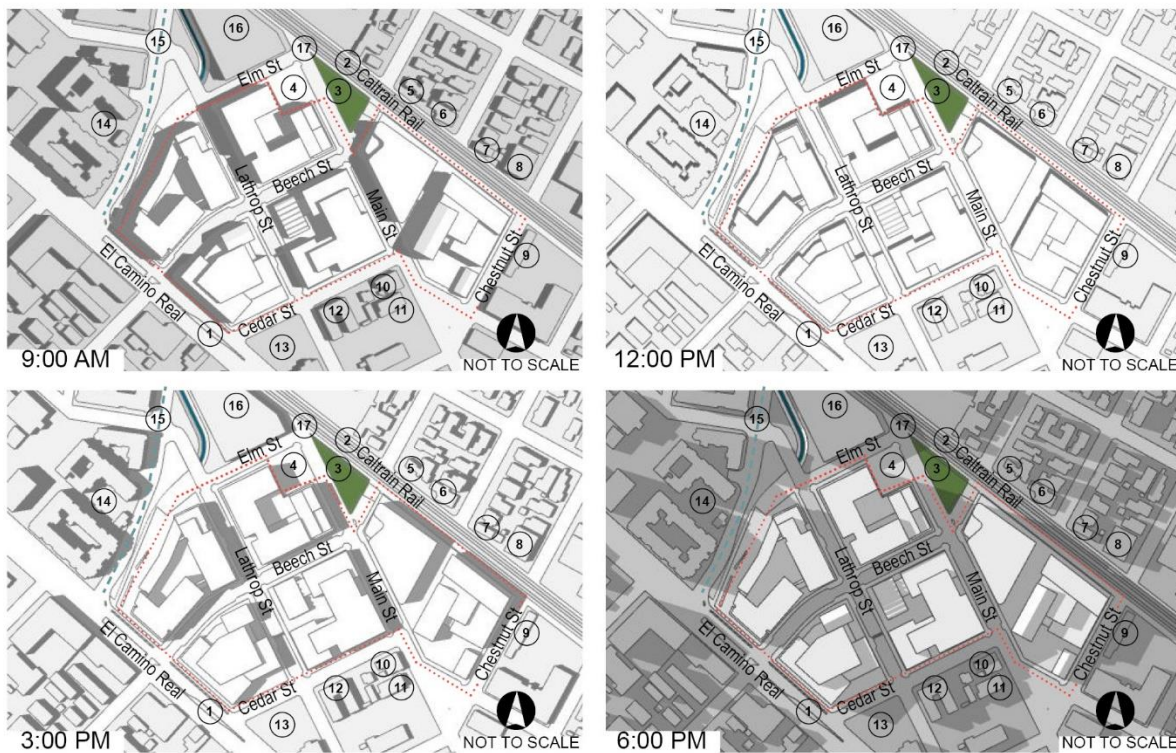
**SHADOW DIAGRAM - EQUINOX (March 21 / September 21)**

**FIGURE 2.1**



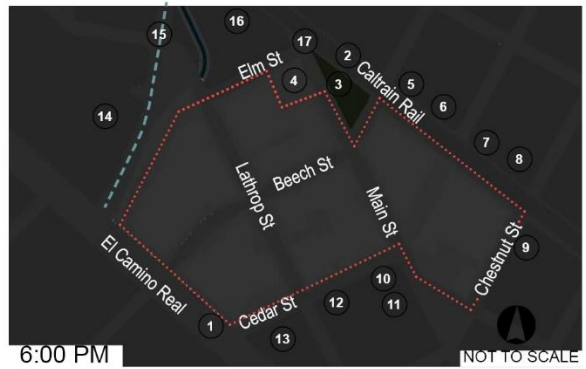
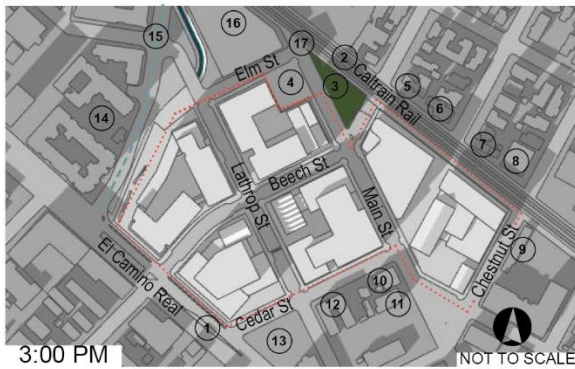
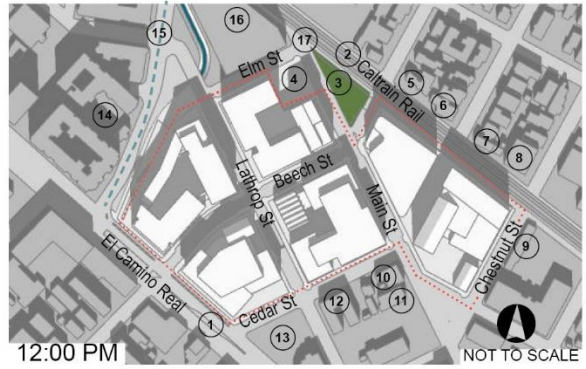
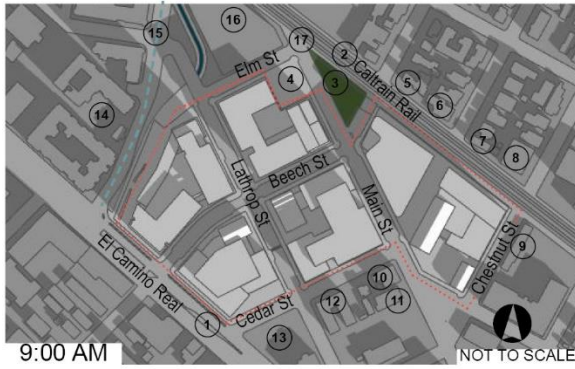
**SHADOW DIAGRAM - SUMMER SOLSTICE (JUNE 21<sup>TH</sup>)**

**FIGURE 2.2**



# SHADOW DIAGRAM - WINTER SOLSTICE (DECEMBER 21<sup>TH</sup>)

FIGURE 2.3



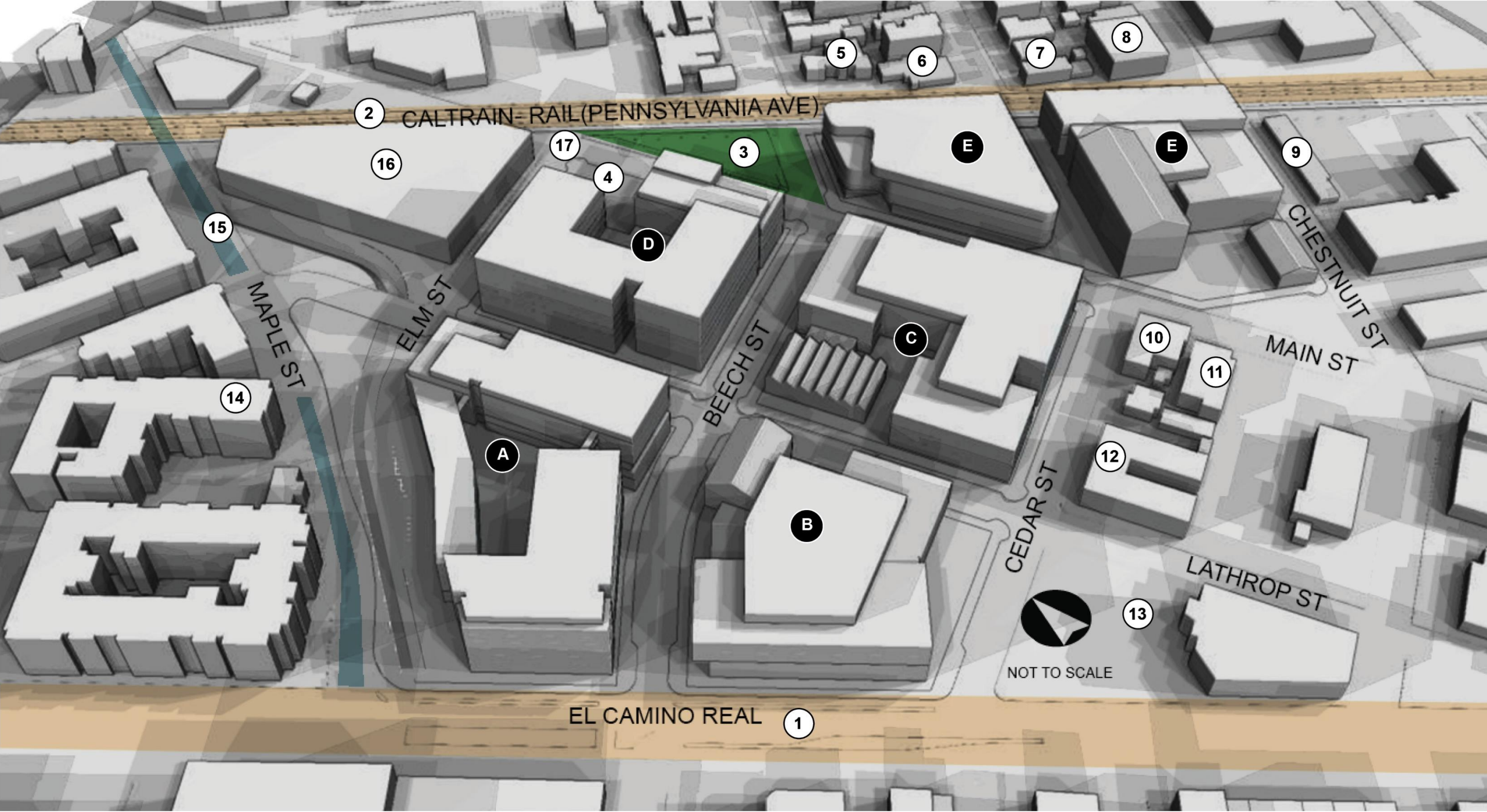


Figure 3 Shadow Overlay Diagram

South Main Mixed-Use Project  
Redwood City, California

### 3.3 Summary of Shadow Impacts

Due to the location of proposed site with wide corridors on three sides - El Camino Real to its southwest, Maple street and channelized Redwood Creek to its northwest, Caltrain tracks along Pennsylvania Avenue to its northeast, the proposed project will only impact the existing properties along the three sides in the winter giving the fact that sun is lower in winter casting longer shadows while in summer casting shallow shadows. Streets adjacent to the proposed buildings will be partially shaded in a day during different hours based on the location. Main Street Dog Agility Park will receive shade from two of the proposed buildings in the early morning year-round except for summer season, and in the afternoon hours during winter season.

Based on the shade simulations above, daylight of 2 Historic Resources building (see Table 2, No. 10 & 11) will be slightly shortened during late afternoon hours in spring, summer and fall season due to the shade cast from buildings in Parcel B and Parcel C. The impact is not significant and will not impair the historic value of the buildings.

The shadow impacts on the adjacent residential properties (see Table 2, No. 5,6,7,8,14) only affect 5 properties during the winter months. Since the shadow impacts to residential properties are limited to one season and do not affect the entire property, the impact is not considered significant. During the winter months, shade cast by the building at Parcel D will potentially impact some of the southeast facing units of the future development at 1180 Main Street (see Table 2, No.16).

The shadow impacts on the adjacent mix-use properties abutting the southeast side of the project site (see Table 2, No. 9,12,13) is considered low since the existing buildings will only be shaded in the later summer hours. The mix-use buildings abutting Parcel D (see Table 2, No.4) will be entirely shaded in winter, and have a dark southwest facade in afternoon hours in spring, fall and winter season. Due to the existing building is casting shadow during same hours and the existing property uses are not considered as shadow-sensitive, the shadow impacts of the proposed project are not significant.

The proposed buildings will cast shadows on portions of El Camino Real sidewalk in the morning throughout the year (see Table 2, No.1), which will not impair the visibility from walking or driving. For the Maple Street bike route and the Caltrain Grade Crossing Improvement (see Table 2, No. 15,17), only portion of the project site will be temporarily impacted, which will not impair the safety for bike rider, pedestrian or the Caltrain operation.

The Main Street Dog Agility Park receives shadows from both existing buildings and the ones proposed for the project site. During spring and fall, the southeast side of park is slightly shaded by the building on Parcel E in the early morning, and by the building on Parcel D in the afternoon (see Table 2, No.3, and Figure 2.1, Figure 2.3). Within the shaded area by the Parcel E building, there is an existing shade structure, therefore the use of the park will not be negatively affected by the morning shade. The afternoon shadow by the Parcel D building only affects the small portion of the park abutting Main street and Beech Street which will not impair the beneficial use of the park. In the winter months, the park is partially shaded by Parcel E building during early morning hours, and by Parcel D building during afternoon hours (see Table 2, No.3, and Figure 2.4). The shadow in the winter covers more than half of the park site. There are existing shadows cast by existing buildings during the same hours, the shaded area is not significantly increased to impair the use of the park. And due to the fact that the use and planting materials within the shaded area in the park is not shadow sensitive, the shadow impacts of the proposed buildings are not considered as significant.

The proposed buildings will cast intensive shadows on interior streets (see Table 2, No.18,19, 20, 21, 22,23). A large portion of Lathrop Street, and southwest side of Main Street are shaded daily during the afternoon throughout the year. Portions of Beech street, the section of Cedar Street between the two proposed buildings at Parcel E, and a part of Elm Street are shaded in the morning hours year-round. The interior streets are not shadow-sensitive public open space, the shadow impacts will not be considered as significant.

## **4 Study Recommendations**

The General Plan acknowledges that increasing building heights along the major transpiration corridors has the potential to introduce new shadow effects that may substantially alter the existing visual character of the areas. In accordance with the Mitigation Measure in General Plan, a new development and redevelopment within Mixed Use - Corridor and Mix Use - Neighborhood land use designations shall be mitigated to the extent feasible if the shade and shadow impacts be considered significant. According to the vicinity analysis, the proposed development will not significantly impair any existing solar collectors, or historic resources. Based on the study and analysis above, the shadow cast by proposed development will not significantly impair the beneficial use of the adjacent Low Density or Medium Density residential parcels, nor the beneficial used of the adjacent shadow-sensitive public open spaces.