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San Diego State University

Evolve Student Housing, University Towers East Component

San Diego, California

DAYLIGHT SHADING STUDY

Prepared for: Dudek

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1. INTRODUCTION

This San Diego State University (SDSU) University Towers East Component Daylight Shading Study (Study) is prepared by Francis Krahe & Associates Inc. to analyze the potential impacts to adjacent shade-sensitive use properties from the new buildings proposed for the redevelopment of the SDSU University Towers East Component located at 5527-5573 Montezuma Road in San Diego, California (Project). San Diego State University, proposes to demolish the existing surface parking lot and site elements to allow for redevelopment with a new nine story student housing apartment building with approximately 720 beds and associated site landscaping, pedestrian pathways, and seating areas.

This Study reviews the parameters that affect Daylight Shading, reviews relevant lighting and shading metrics and regulations pertaining to Daylight Shading, examines the existing conditions within and surrounding the Project site, and calculates and evaluates the Project's potential Daylight Shading on adjacent properties to identify the potential environmental impacts.

The methods of analysis utilized for this Study are based upon the recommended practices established by the Illuminating Engineering Society of North America (IESNA) and reference standards discussed below in Section 4. The Project building massing is analyzed to determine the impact of daylight shading onto adjacent shade-sensitive properties.

2. PROJECT DESCRIPTION

The Proposed Project is the construction and development of new student housing, dining, and auxiliary uses on and adjacent to SDSU's main campus. The Proposed Project is comprised of two components -- the Peninsula Component, which would be located adjacent to the main SDSU campus at the northern terminus of 55th Street; and the University Towers East Component, which would be located east and immediately adjacent to the existing University Towers on Montezuma Road. This Study examines the Daylight Shading created by the University Towers East Component.

The proposed University Towers East Component would be developed on an approximately 1.1-acre site located immediately east of the existing University Towers Building, south of Montezuma Road. The existing parking lot would be demolished to allow for redevelopment of the site to include a new 9-story student housing building that would accommodate approximately 720 students.

This Study examines the Daylight Shading created by the University Towers East Component.

The Project includes the proposed building massing illustrated in the the Project Concept Design (Appendix A). The Project Site is located in a relatively topographically flat area at the southern edge of the exisitng SDSU Campus. SDSU campus housing buildings exist to the west and north of the Project site. Residential properties exist to the south and east of the Project site. Figure 1 below illustrates the Project site and surrounding context. The Project site is shaded in blue, while adjacent residential properties are shaded in red.

Figure 1: Project Site Diagram

3. SUMMARY OF DAYLIGHT SHADING

Daylight Shading occures when a landform or building mass prevents direct sunlight from falling onto a nearby property. This shading condition would lead to adverse effects if the shading prevents the enjoyment of such locations by people inhabiting the affected areas. The extent of Daylight Shading impact is dependent on several factors including daylight intensity, duration of shading, and time of year. Daylight Shading impacts may be caused by one landform or building building mass or cumulatively from multiple sources.

Over the course of any given day, shadows are extensive in the morning and evening hours when the sun rises or sets and sun light is incident at low angles. At mid day, the longest shadows are created during the winter months when the sun is low in the sky, and the shortest shadows are cast during the summer months when the sun is high in the sky. During the Winter Solstice, December 21st, the sun reaches its most southerly apex relative to the Equator, directly above the Tropic of Capricorn in the Southern Hemisphere. This lowest sun angle relative to properties in the northern hemisphere, such as the Project site, results in long shadows over

the course of the entire day, extending from south to north for any above grade structure. The Winter Solstice is also the shortest duration of sun light over any given day. During the Summer Solstice on June 21st, the sun reaches the most northerly apex relative to the Equator, directly above the Tropic of Cancer in the Northern Hemisphere. This highest sun angle relative to properties in the northern hemisphere, such as the Project site, results in short shadows over the course of the entire day, extending generally from south to north for any above grade structure, with portions of the morning and evening hours from north to south. The Summer Solstice is also the longest duration of sun light on any day. The path of the sun is aligned with the Equator at the Spring Equinox, March 19th, and the Autumnal Equinox September 22nd. On these two dates the altitude of the sun in the sky and the length of the day is midway between the minimum altitude and duration on December 21st, and the maximum altitude and duration on June 21st. Shadows created on these two dates represent the mean of the range of both length of the shadows and the time duration of the shadow. Solar data for Winter Solstice, Summer Solstice, and the Spring and Autumnal Equinox are included in Appendix B, including the average illuminance from the sun, the solar angle (vertical angle above the horizon line), and the solar azimuth (position relative to due north). This study reviews relevant regulations and guidelines regarding Daylight Shading found within the State of California and other technical resources to provide context for the evaluation of the extent and duration of Daylight Shading, and any potential adverse environmental impacts. The California Environmental Quality Act (CEQA) Guidelines require evaluation of Daylight Shading relative to the potential for adverse effects to occupants of adjacent properties or environmentally sensitive habitats. There are no regulations within the California Building Code or other State regulations that stipulate limits on Daylight Shading that specifically apply to the Project site. Other jurisdictions in California (Los Angeles and San Franciso to name two) include referance to methods of evaluating Daylight Shading.

The Illuminating Engineering Society of North America (IESNA) includes general narratives regarding the potential for adverse effects of shading without stipulated metrics or defined parameters guiding the extent or duration and any potential adverse effects. Many of the guidelines and restrictions are focused on mitigating Daylight Shading in highly urbanized areas where extensive high rise structures create continued shading over the majority of the year and prevent access to day light for occupants and users of outdoor spaces within the shaded areas. One guidance example used to inform the present analysis though it is not applicable to SDSU as s state entity is found within the Los Angeles CEQA Guideline, which stipulates an impact would occur if "Shadow-sensitive uses would be shaded by Proposed Project-related structures for more than 3 hours between the hours of 9:00 AM and 3:00 PM Pacific Standard Time (between late October and early April), or more than four hours between the hours of 9:00 AM and 5:00 PM Pacific Daylight Time (between early April and late October)." Oddly, the Los Angeles CEQA standard applies differerant metrics for evaluation in April versus August, when the solar angles and shading extent and duration are identical. Other factors (i.e., atmospheric conditions, temperature, etc.) were applied to this standard, although none are related to the lighting effects of shading.

The Project site is within an area with limited land form topography with few naturally occuring shadows over the course of any day. The Project site is level with adjacent residential use properties and the proposed Project structure is tall in comparison to existing buildings which causes an increased extent of Daylight Shading in the summer months that shades the adjacent property to the east of the Project site. While the extent and duration of Daylight Shading is present from May to September, the effects of any shading are not significant. There are no existing outdoor activity spaces that would be affected by Daylight Shading.

Therefore, this Study confirms the Project will not create extensive Daylight Shading, extending more than four hours per day between 9:00 AM to 5:00 PM from March to September, and extending for three hours per day from October to February, at any sensitive use property, including residential use properties. Therefore, potential impacts within the meaning of CEQA from the Project regarding Daylight Shading would be less than significant.

4. REVIEW OF LIGHTING REGULATIONS AND REFERENCE STANDARDS

Daylight Shading and the effect on land uses are not statutorily regulated by the State of California, and no other regulations governing shade or shadows are applicable to the proposed Project site. Examples of evaluating Daylight Shading impacts are included in the Los Angeles CEQA Thresholds and the City and County of San Francisco CEQA Guidelines; These guidelines are used as reference in this Study to establish shading thresholds where no state or local guidance exists.

4.1 Other Reference Regulations

The Planning Departments of cities within California may elect to publish documents to guide production and review of CEQA analysis for properties within their jurisdiction. The City of San Diego Planning Department offers guidance for CEQA studies for projects within the Significance Determination Thresholds document, most recently published in September of 2022. However, there is no definition of the appropriate CEQA threshold for Daylight Shading within the City of San Diego Planning Deparment Guidelines.

Other pertinant CEQA guidelines are summarized below for reference. These regulations do not apply to the Project but are included in this Study as examples of methods used to quantify and evaluate Daylight Shading.

a. City of San Francisco Planning Department Shadow Analysis Requirements

The City and County of San Francisco Planning Department requires shadow studies to be performed for all new buildings that include paremeters defined below. Projects which do not fit either of the requirements below are assumed not to create substantial Daylight Shading and do not require Shading studies. In the City and County of San Francisco, there are two circumstances which would trigger the need for a shadow analysis:

1) If the proposed project would be over 40 feet tall, and could potentially cast new shadow on a property under the jurisdiction of the Recreation and Parks Department, per San Francisco Planning Code Section 295; and/or

2) If the proposed project is subject to review under the California Environmental Quality Act (CEQA) and would potentially cast new shadow on a park or open space such that the use or enjoyment of that park or open space could be adversely affected.

The City of San Francisco Planning Department Shadow Analysis requirements listed above do not apply to the Project site specifically, and would not apply even in San Francisco since the Project is not adjacent to any existing park or open space that would be adversely affected. Furthermore, there is no defined standard as to the extent of shading duration that would define an impact or adverse effect.

b. Los Angeles CEQA Thresholds Guide

The Planning Department of the City of Los Angeles published CEQA Guidelines specifically for the purpose of establishing significance thresholds to be referenced in CEQA analysis for projects within Los Angeles, including a threshold for Daylight Shading. The City of Los Angeles Planning Department adopted the standards of Appendix G of the CEQA Guidelines in 2019 as the thresholds of significance for impacts pursuant to CEQA, including referances to the 2006 Los Angeles City CEQA Thresholds Guide, which includes Daylight Shading impact definitions as noted below:

The 2006 Los Angeles City CEQA Thresholds Guide indicates project Daylight Shading impact would normally be considered significant if:

A.3.2.A:

> Shadow-sensitive uses would be shaded by Proposed Project-related structures for more than 3 hours between the hours of 9:00 AM and 3:00 PM Pacific Standard Time (between late October and early April), or more than four hours between the hours of 9:00 AM and 5:00 PM Pacific Daylight Time (between early April and late October).

The Los Angeles standard above has been widely utilized in to evaluate the impact of project shading in Los Angeles. The Los Angeles standard evaluates identical of shading effects with different impacts. Daylight Shading conditions in March are identical to September, and April conditions are identical to August. Yet time durations vary in these months under this Los Angeles standard. The City of Los Angeles has relatively similar sun angle and duration of shadows as the Project site in San Diego. The Los Angeles CEQA threshold is used as reference for the definition of the time durations utilized in the Thresholds defined below in this Study. However, the Thresholds are modified to present a uniform standard for both spring and fall months in this Study.

c. IESNA Recommended Practices

The Illuminating Engineering Society of North America (IESNA) recommends illumination standards for a wide range of building and development types. These recommendations are widely recognized and accepted as best practices and are therefore a consistent predictor of the type and direction of illumination for any given building type. For all areas not stipulated by the regulatory building code, municipal code or specifically defined requirements, the IESNA standards are typically used as the basis for establishing the amount and direction of light.

The IESNA LP-3-20 defines best practices for the calculation of daylight illuminance from the sun, and methods of analysis for solar shading calculations. These standards form the basis of the calculation algorithms which generate the illuminance data and the shading patterns included within this Study.

The IESNA does not provide any recommendations for extent, duration, or significance of shading.

5. SIGNIFICANCE THRESHOLD

Appendix G of the California Environmental Quality Act (CEQA) Guidelines (14 California Code of Regulations, Sections 15000–15387) provides a set of sample questions to evaluate impacts with regard to daylight shading. The evaluation of the impact of daylight shading affects the visual quality of the sensitive site, and the question that pertains to daylight shading is as follows:

> "Would the project: ..Substantially degrade the existing visual character or quality of the site and its surroundings?
>
> or: Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

In the context of this question from the CEQA Guidelines, the determination of significance in this Study takes into account the following factors:

> The change in daylight shading as a result of the Project; and
>
> The extent to which shade from the Project would affect adjacent light-sensitive use properties.

Based on these questions within the CEQA Thresholds Guide and the absence of state and local regulations to establish a specific significance threshold for this Study, the following parameters are utilized as the basis of

the evaluation. Specifically, the Project would have a significant shade impact on a nearby residential properties if:

> Project building mass creates shadow conditions for more than three hours between the hours of 9:00 AM and 3:00 PM Pacific Standard Time from October 21st to February 21st.
>
> or more than four hours between the hours of 9:00 AM and 5:00 PM Pacific Daylight Time between March 19th and September 22nd.

6. METHODOLOGY

6.1 Existing Conditions Procedures

Existing conditions are evaluated by on site field survey and computer modeling of the exisitng site and building conditions to determine and document the extent of existing Daylight Shading at the Project site and surrounding adjacent residential properties.

The existing Daylight Shading conditions data is presented below in Section 7, Project Existing Conditions Analysis.

a. Existing Conditions Monitoring Sites

Monitoring Sites are utilized to describe and evaluate the existing conditions at and surrounding the Project site to determine the maximum potential impacts that would result from Daylight Shading onto adjacent sensitive use properties surrounding the Project. All Monitoring Site locations are within proximity of the Project, and do not have existing structures or topography between the Project site and the Monitoring Site which would shade the Monitoring Site.

The following criteria were used to select the Monitoring Site locations:

Potential for Shade – Monitoring Sites were analyzed that provide direct view of the Project and are at a lower elevation than the top of the Project massing. Locations must have a view of the Project and be below the top elevation of the Project's massing to receive shade.

Proximity – Monitoring Sites at the least distance to the Project are analyzed. These locations are selected because the extent of shade and duration is reduced with distance. Locations at a greater distance will receive less shade from the Project than those that are near.

Figure 3 shows the Project Site, the Monitoring Site locations and properties surrounding the Project. The Project site is shaded blue, while residential properties are shaded red. The Monitoring Sites are within the public right of way, adjacent to residences or at the Project site boundary. The Monitoring Site locations are representative of the view to the Project from the vicinity of the sensitive use properties surrounding the Project to the south and east.

Monitoring Site M-E1: Monitoring Site M-E1 is at the east Project property line to evaluate the Project east elevation from residential properties to the east.

Monitoring Site M-S1: Monitoring Site M-S1. is south of the Project property line, to evaluate the Project south elevation from residential properties to the south

Monitoring Site M-S2: Monitoring Site M-S2. is south of the Project property line, to evaluate the Project south elevation from residential properties to the south.

Monitoring Site M-S3: Monitoring Site M-S3. is south of the Project property line, to evaluate the Project south elevations from residential properties to the south.

Existing Daylight Shading conditions at each Monitoring Site are evaluated for each sensitive use site. At each Monitoring Site the view to the Project site is described by photographs and field notes. The view is also evaluated to determine if there is existing topography, structures or landscape that would shade the sensitive use properties.

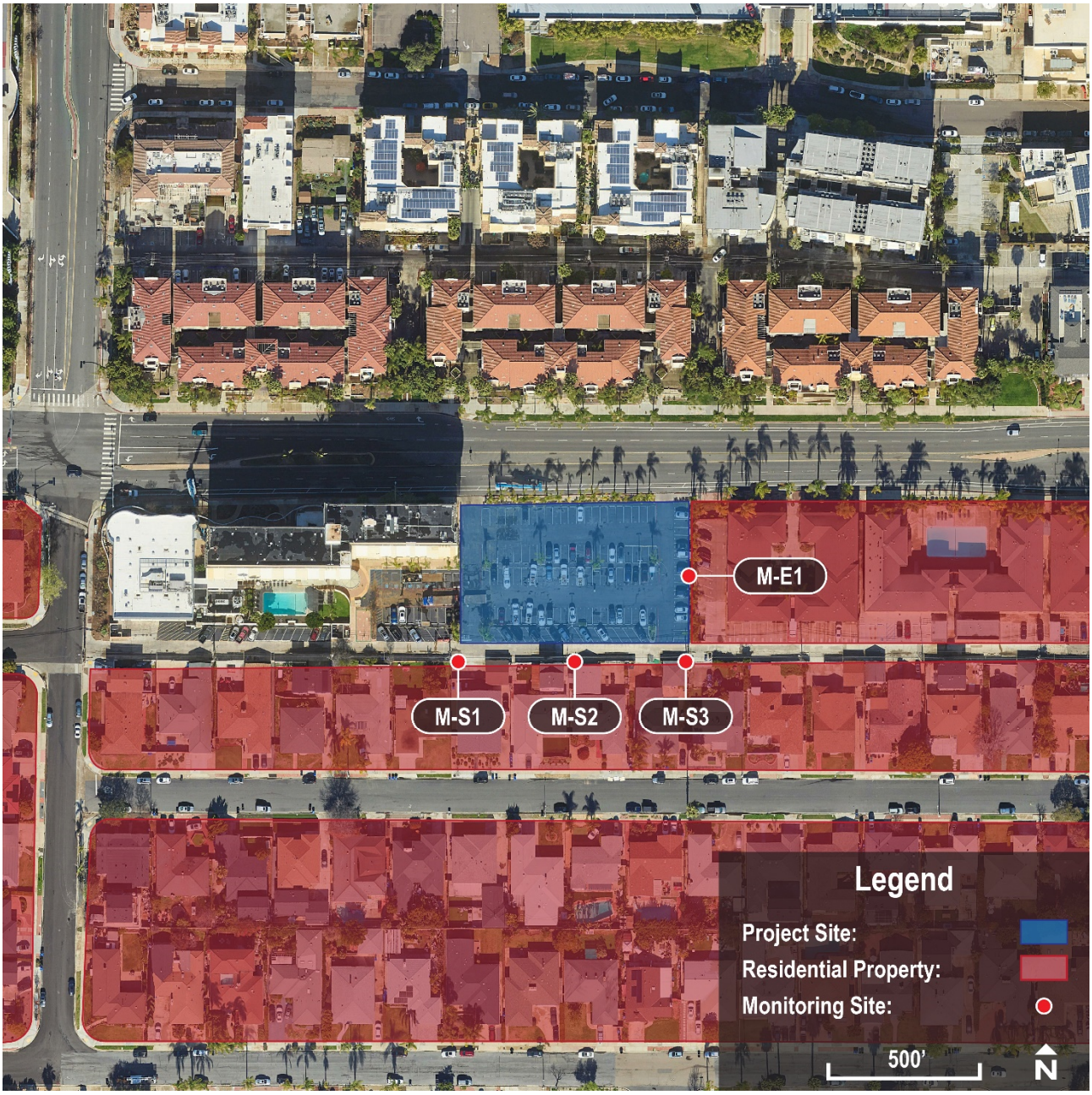


Figure 2: Monitoring Site Locations

a. Existing Conditions Field Survey

Lighting observations were conducted following recommended practice procedures defined by the IESNA in LP-3-20 Designing and Specifying Daylighting for Buildings. Existing conditions lighting observations were

conducted following recommended practice procedures defined by the IESNA in RP-33-00 Lighting for Outdoor Environments. Field observations are conducted to accurately document all existing incident sun light conditions at each Monitoring Site location. Furthermore, calculations are presented to model the existing site topography and buildings to create an accurate assesment of the annual pattern of existing Daylight Shading conditions at the Project site and adjacent residential properties. Incident sun light can be understood as a vector of luminous flux moving through space. As the vector (light) is incident upon a surface, the intensity of the resulting illuminance will vary depending upon the relative orientation of the vector to the surface. The greatest illuminance will result when the surface and vector are perpendicular. The least illuminance will result when the surface and vector are parallel.

b. Existing Daylight Shading Analysis Method

The existing Daylight Shading conditions are further defined over the calendar year by the calculated annual Daylight Shading conditions created by the existing building structures within the Project site. The existing Daylight Shading conditions are calculated in this Study to establish a baseline shading condition at shade-sensitive properties surrounding the Project Site. The analysis of the existing Daylight Shading includes evaluation of the extent and duration of shadows from the existing site at the nearest sensitive use properties to the existing Project site, over the course of the year, from December 21st to June 21st. Sunlight data from June 21st to December 21st is symmetrical with the December to June data. This Study presents a conservative analysis with respect to the existing Daylight Shading. The Project is evaluated with the existing building massing dimensions and site topography as presented in Appendix A.

The existing Project site and surrounding topography and existing buildings within and surrounding the Project site are analyzed in a three dimensional computer model which simulates the effects of incident sun light, including accurate solar angle and intensity for each day of the year and hour of the day analyzed. Results of this computer model calculation are presented graphically as three dimensional rendered views depicting the angle and length of Daylight Shading from the existing site conditions onto adjacent properties.

The calculated Existing Daylight Shading conditions are summarized for each day analyzed in this Study. Calculations of Existing Daylight Shading are performed at each hour on the analysis dates listed above, and the resulting Daylight Shading results are tabulated within Section 7 tables 2, 3, and 4 for the Winter Solstice, Spring and Autumnal Equinox, and Summer Solstice, respectively. Calculations indicating Daylight Shading at the Monitoring Sites during any analyzed time period are indicated in the table as "1" for one for full hour of Daylight Shading, or a decimal for a portion of an hour. When the calculations indicate no Daylight Shading the table indicates "0" for no Daylight Shading.

The existing Daylight Shading conditions are utlized in the Project Daylight Shading analysis (Section 9 below) to define the potential extent of change created by the Project.

6.2 Project Daylight Shading Analysis Method

The analysis of the Project Daylight Shading includes evaluation of the extent and duration of shadows from the Project at the nearest sensitive use properties, over the course of the year. The progression of Solar altitude and time data from December 21st to June 21st (minimum to maximum altitude and time) is symmetrical with the inverse progression from June 21st to December 21st (maximum to minimum altitude and time). Therefore, the data from December to June is utilized to evaluate June to December. The extent of the calculated Project Daylight Shading created by the Project is then compared to the existing conditions Daylight Shading, and the next increas (where occurs) to the Significance Threshold established in Section 5 above to determine if the Project would create a new significant impact with respect to Daylight Shading.

The Project is evaluated with the Project dimensions and site topography as presented in Appendix A. This Study presents a conservative analysis with respect to Project Daylight Shading. The Project size and shape,

Project site, and surrounding topography and existing buildings are analyzed in a three dimensional computer model which simulates the effects of incident sun light, including accurate solar angle and intensity for each day of the year. Results of this computer model calculation are presented graphically as three dimensional rendered views depicting the angle and length of Daylight Shading from the Project onto adjacent properties.

The calculated Project Daylight Shading conditions are summarized for each day analyzed in this Study. Calculations of Daylight Shading are performed at each hour on the analysis dates listed above, and the resulting Daylight Shading results are tabulated within Section 8 tables 5, 6, and 7 for the Winter Solstice, Spring and Autumnal Equinox, and Summer Solstice, respectively. Calculations indicating Daylight Shading at the Monitoring Sites during any analyzed time period are indicated in the table as "1" for one for full hour of Daylight Shading, or a decimal for a portion of an hour. When the calculations indicate no Daylight Shading the table indicates "0" for no Daylight Shading.

The time of day for the analysis is adjusted consistent with the Thresholds defined above to evaluate Daylight Shading from October 21st to February 21st from 9:00 AM until 3:00 PM, and from March 19th to September 22nd from 9:00 AM until 5:00 PM. These periods represent the times of day where Daylight Shading may create an adverse effect,

Finally, the duration of Daylight Shading at the Monitoring Sites under the Existing Conditions is compared to the amount of Daylight Shading created by the Project to quantify the increase, if any, in Daylight Shading.

Monitoring Sites receiving more than three hours of Daylight Shading from the Project per day from October 21st to February 21st, or four hours of Daylight Shading from March 19th to September 22nd indicate an impact.

Daylight Shading extent and duration is reduced with distance due to the geometry of shadows cast by the sun. Therefore, all sensitive use properties farther than the locations evaluated would receive less Daylight Shading from the Project.

7. EXISTING CONDITIONS ANALYSIS

The existing Daylight Shading conditions within the Project site and at surrounding properties are defined by the observed existing conditions summarized below and the calculated model of the annual Daylight Shading conditions created by the existing building structures within the Project site. The Project Existing Conditions Analysis includes the evaluation of the the visibility of the Project from each Monitoring Site, with photographs of the view from the Monitoring Sites to the Project during the day, and an evaluation of the existing topography, bulding structures, and landscape that may create Daylight Shading. These existing Daylight Shading conditions are utlized in the Project Daylight Shading analysis (Section 8 below) to define the potential extent of change created by the Project.

The Project Site is currently used as a surface parking lot with existing trees, light poles, and signage on the site. Immediately adjacent to the Project Site to the west is an exsiting nine story tall SDSU housing building at 5505 Montezuma Road. The Project is bounded by Montezuma Road to the north. Several 3 story SDSU housing buildings extend along the north side of the Montezuma Road right of way. To the south of the Project Site is a public alley and single story residential buildings to the south. A three story apartment building (garden level + 2 dwelling levels) abuts the Project Site to the east.

7.1 Visibility Analysis

The visibility of the Project at each Monitoring Site is evaluated during field surveys during the day to determine the extent of existing topography, buildings, and landscape that may provide existing Daylight Shading at the sensitive use properties adjacent to the Project site. Visibility of the Project from the each Monitoring Site is analyzed in Table 1 below.

Table 1: Project Site Visibility from Monitoring Sites

Monitoring Site	M-Site Location	Distance to Project Site	Visibility from Monitoring Site
M-E1	Within Project Site, adjacent to the west property line of 5667 Montezuma Road	0 ft	Project Site is fully visible from the Monitoring Site. No existing Daylight Shading from the Project site.
M-S1	Within alley, adjacent to the north property line of 5578 Mary Lane Drive	20 ft	Project Site is fully visible from the Monitoring Site. No existing Daylight Shading from the Project site.
M-S2	Within alley, adjacent to the north property line of 5606 Mary Lane Drive	20 ft	Project Site is fully visible from the Monitoring Site. No existing Daylight Shading from the Project site.
M-S3	Within alley, adjacent to the north property line of 5634 Mary Lane Drive	20 ft	Project Site is fully visible from the Monitoring Site. No existing Daylight Shading from the Project site.

The distance from the Project site to adjacent sensitive use properties is 0 feet at M-E1 and 20 feet at Monitoring Sites M-S1, M-S2, and M-S3 directly south of the Project site. All Monitoring Sites have complete direct visibility toward the Project with no intervening topography, building structures or landscape.

a. Monitoring Site M-E1:

Figure 3: M-E1 – 08/20/2024, 3:56 pm

b. Monitoring Site M-S1:

Figure 4: M-S1 – 08/20/2024, 4:00 pm

c. Monitoring Site M-S2:

Figure 5: M-S2 – 08/20/2024, 3:58 pm

d. Monitoring Site M-S3:

Figure 6: M-S3 – 08/20/2024, 3:57 pm

7.2 Existing Daylight Shading Analysis

The existing Daylight Shading conditions are further evaluated as per the methodology defined in Section 6 to define the extent of existing Daylight Shading from the Project site at adjacent properties. The analysis of the existing Daylight Shading utilizes a three-dimensional model of the existing site topography, existing buildings on the Project site, and existing adjacent residential properties.

The existing Project site is relatively flat with no structures greater than three stories. Therefore the existing condition Project Site does not have an ability to create daylight shading at adjacent properties, which is reflected in the analysis below. All existing Daylight Shade analysis diagams are included in this Study as Appendix C.

a. Existing Daylight Shading, Winter Solstice

Winter Solstice, December 21st, is the shortest duration day when the sun is lowest in the sky and casts the longest shadows in the calendar year.

Table 2 summarizes the existing Daylight Shading condition at each Monitoring Site at each hour of the day from 9:00 AM until 3:00 PM on December 21st. Calculations indicating Daylight Shading at the Monitoring Sites during any analyzed time period are indicated in the table as "1" for one for full hour of Daylight Shading, or a decimal for a portion of an hour. When the calculations indicate no Daylight Shading the table indicates "0" for no Daylight Shading.

Table 2: Existing Daylight Shading, Winter Solstice

Monitoring Site	Existing Daylight Shading Winter Solstice Pacific Standard Time						Analysis
	9:00 to 10:00	10:00 to 11:00	11:00 to 12:00	12:00 to 1:00	1:00 to 2:00	2:00 to 3:00	
M-E1	0	0	0	0	0	0	No existing Daylight Shading
M-S1	0	0	0	0	0	0	No existing Daylight Shading
M-S2	0	0	0	0	0	0	No existing Daylight Shading
M-S3	0	0	0	0	0	0	No existing Daylight Shading

The sun rises on December 21st at 6:47 AM and by 9:00 AM daylight falls onto much of the Project Site from the south with minimal Daylight Shading from surrounding properties. The sun shifts north until approximately noon, when the sun reaches its highest point in the sky. After noon, the sun begins to fall to the west until sunset at 4:47 PM. The the Project Site receives direct daylight from the south for much of the day. The existing buildings to the west cast shadows to the north, but do not shade the Project site or the Monitoring Sites to the south and east of the Project site. No Daylight Shading is cast from the existing Project site to the Monitoring Sites, as indicated by Table 4.

The existing Daylight Shading from the Project site from 9:00 AM to 3:00 PM is illustrated within the site plan diagrams in Appendix C. The Monitoring Site locations are overlayed on each Figure.

b. Existing Daylight Shading, Equinox

Spring Equinox, March 19th, and the Autumnal Equinox, September 22nd, is the mean duration day when the sun is perpendicular to the earth's Equator.

Table 3 summarizes the Existing Daylight Shading condition at each Monitoring Site at each hour of the day from 9:00 AM until 5:00 PM on March 19th. Calculations indicating Daylight Shading at the Monitoring Sites during any analyzed time period are indicated in the table as "1" for one for full hour of Daylight Shading, or a decimal for a portion of an hour. When the calculations indicate no Daylight Shading the table indicates "0" for no Daylight Shading.

Table 3: Existing Daylight Shading, Equinox

Monitoring Site	Existing Daylight Shading Equinox Pacific Standard Time								Analysis
	9:00 to 10:00	10:00 to 11:00	11:00 to 12:00	12:00 to 1:00	1:00 to 2:00	2:00 to 3:00	3:00 to 4:00	4:00 to 5:00	
M-E1	0	0	0	0	0	0	0	0	No existing Daylight Shading
M-S1	0	0	0	0	0	0	0	0	No existing Daylight Shading
M-S2	0	0	0	0	0	0	0	0	No existing Daylight Shading
M-S3	0	0	0	0	0	0	0	0	No existing Daylight Shading

The sun rises on March 19th at 6:53 AM and by 9:00 AM daylight falls onto much of the Project Site with minimal Daylight Shading from surrounding properties. The sun shifts north until approximately noon, when the sun reaches its highest point in the sky. After noon, the sun begins to fall to the west until sunset at 7:00 PM. The the Project site receives direct daylight for much of the day. As the sun moves to the west in the afternoon the existing building to the west of the Project site creates a shadow to the northeast which covers a portion of the Project site.

The existing Daylight Shading from the Project site from 9:00 AM to 3:00 PM is illustrated within the site plan diagrams in Appendix C. The Monitoring Site locations are overlayed on each Figure.

c. Existing Daylight Shading, Summer Solstice

The summer solstice occures on June 21st. During the Summer Solstice, the sun's path in the sky will be at its most northern location, casting shadows further to the south than any other time of year. Therefore the Summer Solstice represents the greatest extent of shading that will occur to the south during the calendar year.

Table 4 summarizes the shading condition at each Monitoring Site at each hour of the day from 9:00 AM until 5:00 PM on June 20th. Calculations indicating Daylight Shading at the Monitoring Sites during any analyzed time period are indicated in the table as "1" for one for full hour of Daylight Shading, or a decimal for a portion of an hour. When the calculations indicate no Daylight Shading the table indicates "0" for no Daylight Shading.

The sun rises on June 20th at 5:41 AM and by 9:00 AM falls onto much of the Project Site with minimal shading from surrounding properties. The sun shifts north until approximately noon, when the sun reaches its highest point in the sky. After noon, the sun begins to fall to the west until sunset at 8:00 PM. The the Project site

receives direct daylight for much of the day, however due to the flat topography of the site and no building massing, no shade is cast from the existing Project Site to the Monitoring Sites, as indicated by Table 1.

The shadows cast on and around the Project site from 9:00 AM to 5:00 PM are illustrated within Appendix C. The Monitoring Site locations are overlayed on each Figure.

Table 4: Existing Daylight Shading, Summer Solstice

Monitoring Site	Existing Daylight Shading Summer Solstice Pacific Standard Time								Analysis
	9:00 to 10:00	10:00 to 11:00	11:00 to 12:00	12:00 to 1:00	1:00 to 2:00	2:00 to 3:00	3:00 to 4:00	4:00 to 5:00	
M-E1	0	0	0	0	0	0	0	0	No existing Daylight Shading
M-S1	0	0	0	0	0	0	0	0	No existing Daylight Shading
M-S2	0	0	0	0	0	0	0	0	No existing Daylight Shading
M-S3	0	0	0	0	0	0	0	0	No existing Daylight Shading

8. PROJECT DAYLIGHT SHADING ANALYSIS

The Project Daylight Shading is evaluated by way of the methodology defined above in Section 6 with the calculated shadow pattern illustrated at each hour for the Winter Solstice, Spring and Autumnal Equinox, and Summer Solstice at the Monitoring Sites. Daylight Shading created by the Project building mass or topography may cast shading onto adjacent properties surounding the Project Site. The Monitoring Sites are located to evaluate the extent and duration of shadows from the Project over the course of the day. Daylight Shading created by the Project is summarized in Tables 5, 6 and 7 below.

The Project would introduce one new building structure on the Project site as described in Section 2 and depicted in Appendix A. This Study evaluates the Project dimensions as the most conservative evaluation of the maximum potential Daylight Shading impact for this Project.

The Project's Daylight Shading impacts are evaluated relative to the Thresholds identified within Section 5. Significance Threshold above with respect to Daylight Shading:

> The Project creates shadow conditions for more than 3 hours between the hours of 9:00 AM and 3:00 PM Pacific Standard Time from October 21st to February 21st.
>
> or more than four hours between the hours of 9:00 AM and 5:00 PM Pacific Daylight Time between March 19th and September 22nd.

8.1 Project Daylight Shading, Winter Solstice

Winter Solstice, December 21st, is the shortest duration day when the sun is lowest in the sky and casts the longest shadows in the calendar year.

Table 5 summarizes the Project Daylight Shading condition at each Monitoring Site at each hour of the day from 9:00 AM until 3:00 PM on December 21st. Calculations indicating Daylight Shading at the Monitoring Sites

during any analyzed time period are indicated in the table as "1" for one for full hour of Daylight Shading, or a decimal for a portion of an hour. When the calculations indicate no Daylight Shading the table indicates "0" for no Daylight Shading. Red colored cells indicate increased Daylight Shading hours as compared to the existing Daylight Shading conditions on December 21st as noted in Table 2 above.

Table 5 and Appendix D indicate the increased Project Daylight Shading at Receptor Sites M-E1 beginning 1:00 pm to 3:00 pm. The duration of increased Daylight Shading between 9:00 AM to 3:00 PM is total 2 hours which is less than the Threshold of three hours during the months of October to February. Receptor Sites to the south of the Project site (M-S1, M-S2, M-S3) experience no Project Daylight Shading.

The Project Shading at all Monitoring Sites is less than the Significance Threshold of three hours between 9:00 AM to 3:00 PM from October to February. Therefore the Project will not create a significant Daylight Shading impact during the Winter Solstice.

Table 5: Project Daylight Shading, Winter Solstice

Monitoring Site	Project Daylight Shading Winter Solstice Pacific Standard Time						Analysis
	9:00 to 10:00	10:00 to 11:00	11:00 to 12:00	12:00 to 1:00	1:00 to 2:00	2:00 to 3:00	
M-E1	0	0	0	0	1	1	Daylight Shading from 1:00 PM to 3:00 PM
M-S1	0	0	0	0	0	0	No shading from Project
M-S2	0	0	0	0	0	0	No shading from Project
M-S3	0	0	0	0	0	0	No shading from Project

The shadow patterns illustrated in Appendix D. These illustrations render the extent of shadows within and surrounding the Project Site. The Monitoring Site locations are overlayed on each Figure.

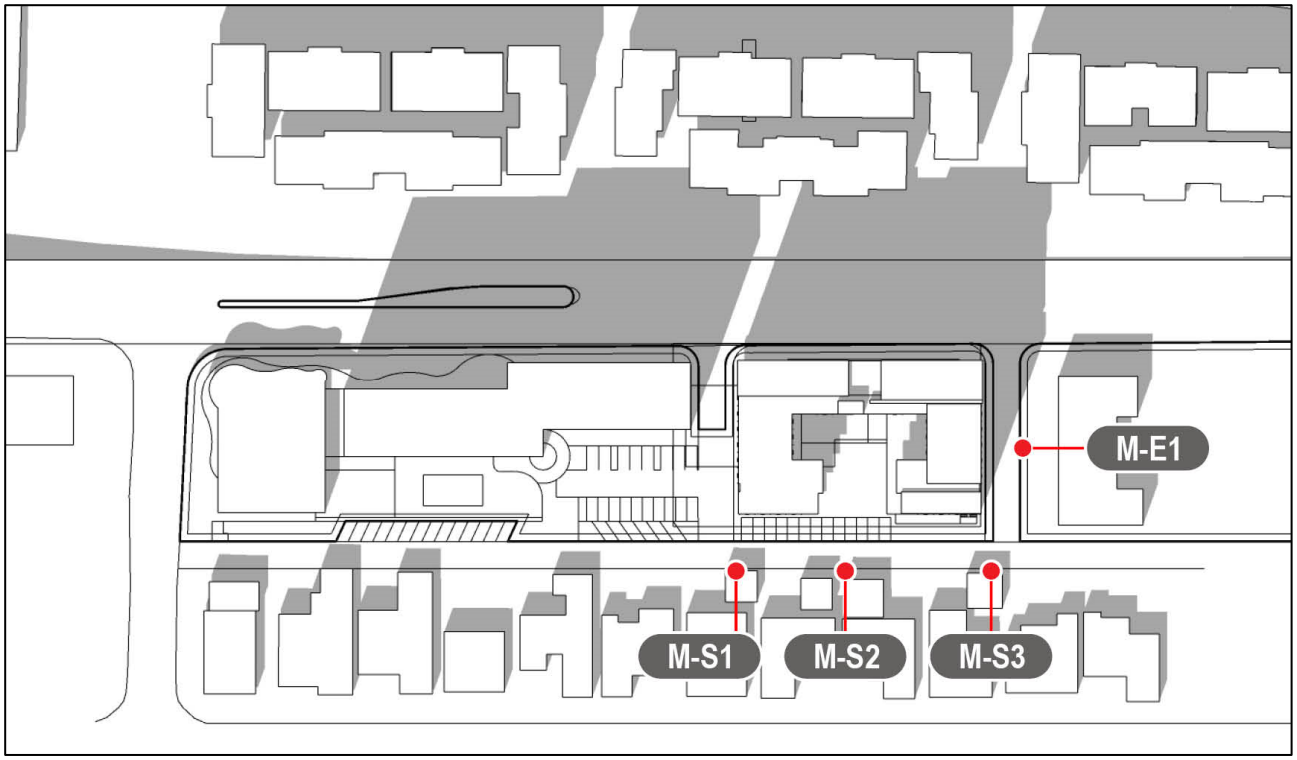


Figure 7: Project Daylight Shading December 21st , 1:00 pm.

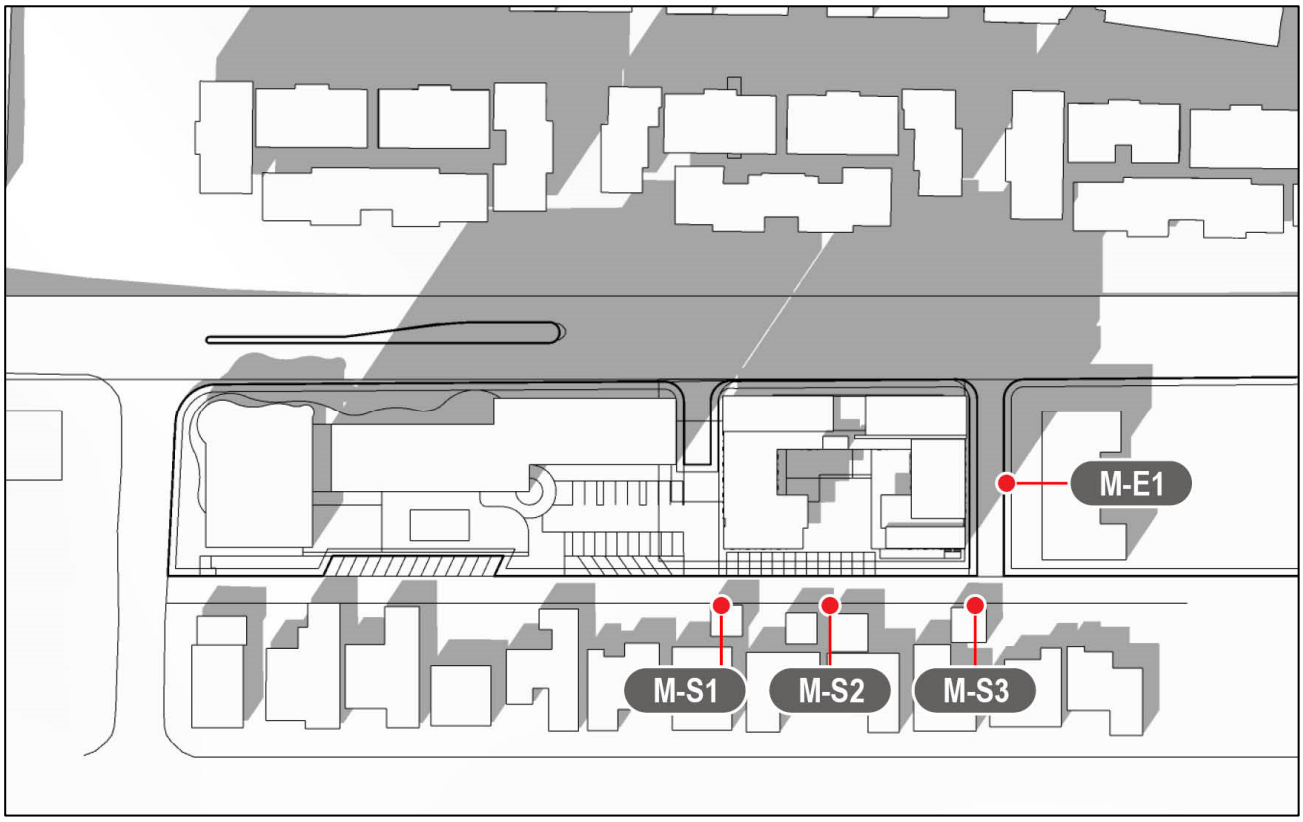


Figure 8: Project Daylight Shading December 21st, 2:00 pm

8.2 Project Daylight Shading, Equinox

Spring Equinox, March 19th, is the mean duration day when the sun is perpendicular to the earth's Equator. The sun's elevation in the sky is identical during Autumnal Equinox, September 22nd.

Table 6 summarizes the Daylight Shading condition at each Monitoring Site at each hour of the day from 9:00 AM until 5:00 PM on March 19th and September 22nd. Calculations indicating Daylight Shading at the Monitoring Sites during any analyzed time period are indicated in the table as "1" for one for full hour of Daylight Shading, or a decimal for a portion of an hour. When the calculations indicate no Daylight Shading the table indicates "0" for no Daylight Shading. Red colored cells indicate increased Daylight Shading hours as compared to the existing Daylight Shading conditions on March 19th as noted in Table 3 above.

Table 6 and Appendix D indicate the increased Project Daylight Shading at Receptor Sites M-E1 from 1:10 PM to 5:00 PM. The duration of increased Daylight Shading between 9:00 AM to 3:00 PM total 3 hours 50 minutes, which is less than the Threshold of four hours during the months of March to September. Receptor Sites to the south of the Project site (M-S1, M-S2, M-S3) experience no Project Daylight Shading.

The Project Shading at all Monitoring Sites is less than the Significance Threshold of 4 hours between 9:00 AM to 5:00 PM during March and September. Therefore, the Project will not create a significant Daylight Shading impact during the Spring and Autumnal Equinox.

The shadow patterns illustrated in Appendix D. These illustrations render the extent of shadows within and surrounding the Project Site. The Monitoring Site locations are overlayed on each Figure.

Table 6: Project Daylight Shading, Equinox

Monitoring Site	Project Daylight Shading Equinox Pacific Standard Time								Analysis
	9:00 to 10:00	10:00 to 11:00	11:00 to 12:00	12:00 to 1:00	1:00 to 2:00	2:00 to 3:00	3:00 to 4:00	4:00 to 5:00	
M-E1	0	0	0	0	0.83	1	1	1	Daylight Shading from 1:10 pm to 5:00 pm
M-S1	0	0	0	0	0	0	0	0	No shading from Project
M-S2	0	0	0	0	0	0	0	0	No shading from Project
M-S3	0	0	0	0	0	0	0	0	No shading from Project

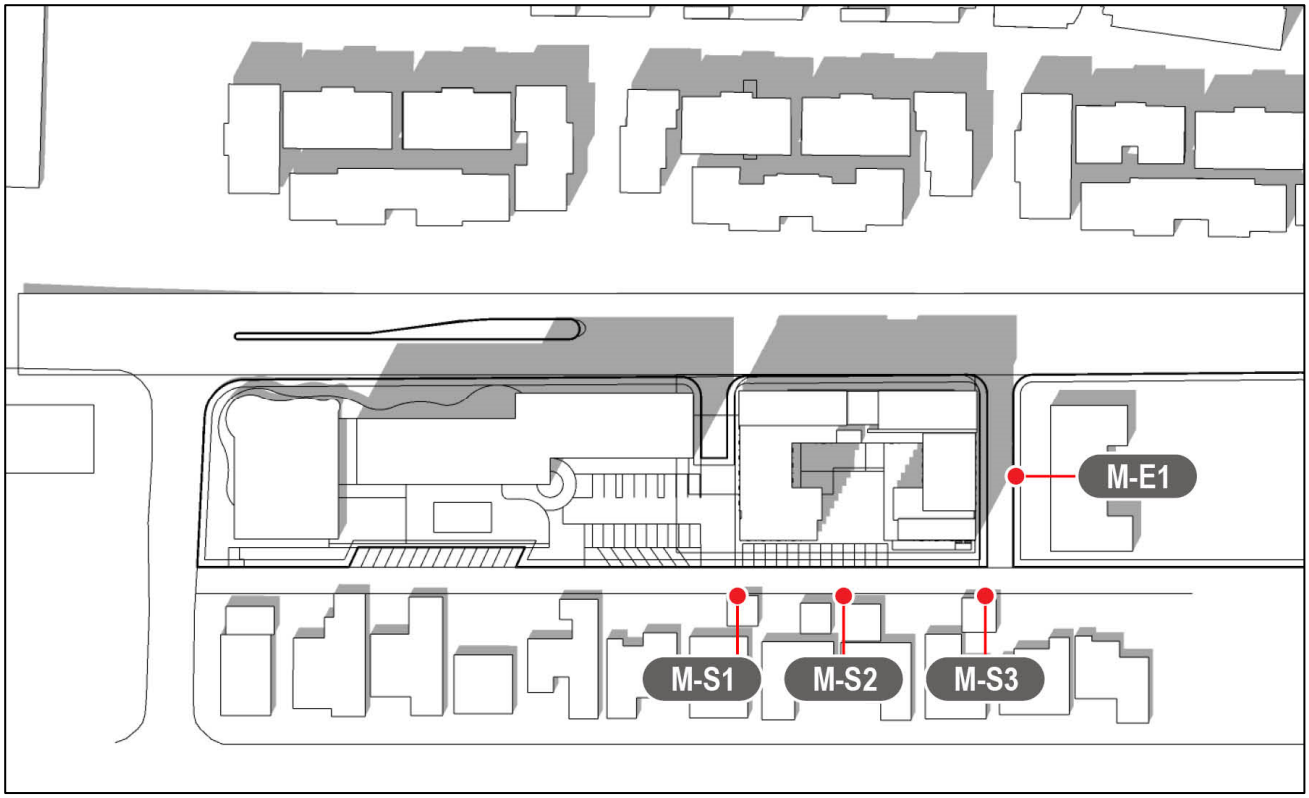


Figure 9: Project Daylight Shading March 19th 1:00 pm

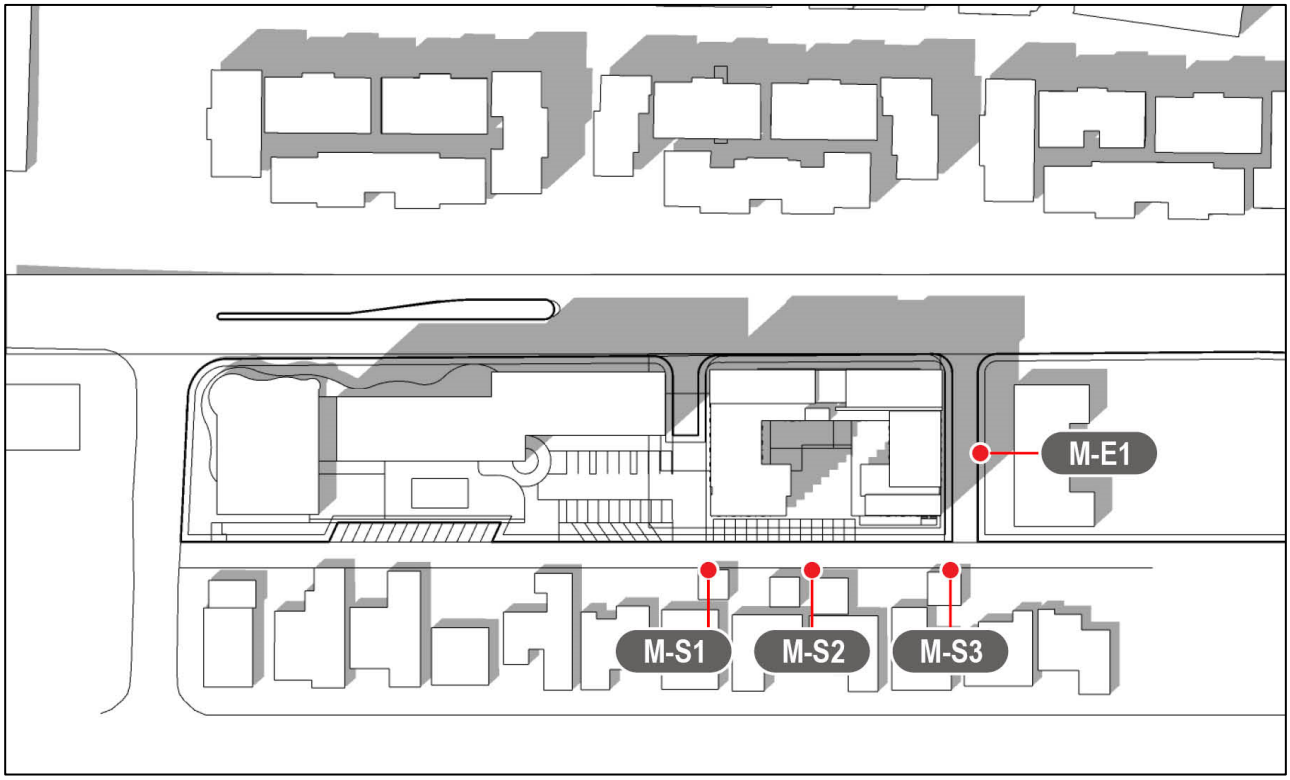


Figure 10: Project Daylight Shading March 19th 2:00 pm

8.3 Project Daylight Shading, Summer Solstice

Summer Solstice, June 21st, is the longest duration day when the sun altitude is greatest in the sky and casts the shortest shadows in the calendar year. During the Summer Solstice, the sun's path in the sky will be at its most northern location, casting shadows further to the south than any other time of year. Therefore the Summer Solstice represents the greatest extent of shading that will occur to the south during the calendar year.

Table 7 summarizes the calculated data for June 21st. Calculations indicating Daylight Shading at the Monitoring Sites during any analyzed time period are indicated in the table as "1" for one for full hour of Daylight Shading, or a decimal for a portion of an hour. When the calculations indicate no Daylight Shading the table indicates "0" for no Daylight Shading. Red colored cells indicate increased Daylight Shading hours as compared to the existing Daylight Shading conditions on June 21st as noted in Table 4 above.

Table 7 and Appendix D indicate the increased Project Daylight Shading at Receptor Sites M-E1 from 1:15 pm to 5:00 pm. The duration of increased Daylight Shading between 9:00 am to 5:00 pm is 3.75 hours, which is less than the Threshold of four hours during the months of March to September. Receptor Sites to the south of the Project site (M-S1, M-S2, M-S3) experience no Project Daylight Shading. The sun rise on June 21st occurs at 5:41 AM. At 9:00 AM sunlight covers the majority of the Project Site with minimal Daylight Shading from or onto surrounding properties. Incident sunlight shifts north until approximately noon, when the sun reaches its highest altitude in the sky. After noon, the sun altitude begins to fall to the west until sunset at 8:00 PM.

The Project Daylight Shading at all Monitoring Sites is less than the Significance Threshold of four hours between 9:00 AM to 5:00 PM from March to February. Therefore the Project will not create a significant Daylight Shading impact during the Summer Solstice.

Table 7: Project Daylight Shading, Summer Solstice

Monitoring Site	Project Daylight Shading Summer Solstice Pacific Standard Time								Analysis
	9:00 to 10:00	10:00 to 11:00	11:00 to 12:00	12:00 to 1:00	1:00 to 2:00	2:00 to 3:00	3:00 to 4:00	4:00 to 5:00	
M-E1	0	0	0	0	0.75	1	1	1	Daylight Shading from 1:15 pm to 5:00 pm
M-S1	0	0	0	0	0	0	0	0	No shading from Project
M-S2	0	0	0	0	0	0	0	0	No shading from Project
M-S3	0	0	0	0	0	0	0	0	No shading from Project

The shadow patterns illustrated in Appendix D. These illustrations render the extent of shadows within and surrounding the Project Site. The Monitoring Site locations are overlayed on each Figure.

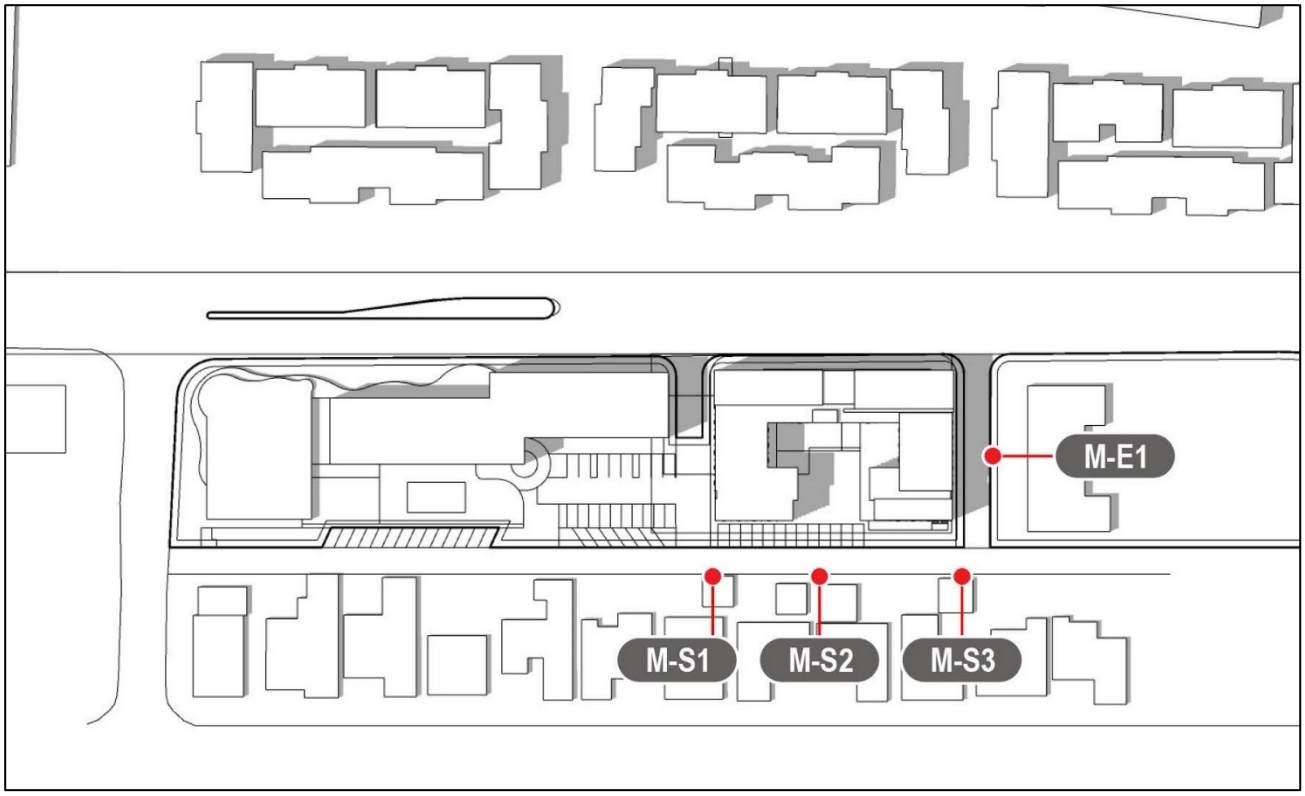


Figure 11: Project Daylight Shading June 21st 1:15 pm

9. CONCLUSIONS

This Study reviews the parameters that affect Daylight Shading, reviews relevant lighting and shading metrics and regulations pertaining to Daylight Shading, examines the existing conditions within and surrounding the Project site, and calculates and evaluates the Project's potential Daylight Shading on adjacent properties to identify the potential environmental impacts. The Project's potential to create Daylight Shading is calculated by comparing the amount of existing Daylight Shading that occures from the Project site to the amount of Daylight Shading which would occur from the proposed Project's new building mass at adjacent sensitive use properties.

This Study evaluates the Project dimensions as the most conservative evaluation of the maximum potential Daylight Shading impact for this Project.

The Project's Daylight Shading impacts are evaluated relative to the Significance Thresholds identified within Section 5 above as follows:

> The Project creates shadow conditions for more than 3 hours between the hours of 9:00 AM and 3:00 PM Pacific Standard Time from October 21st to February 21st.
>
> or more than four hours between the hours of 9:00 AM and 5:00 PM Pacific Daylight Time between March 19th and September 22nd.

The proposed Project would introduce 2 hours of Daylight Shading during the winter solstice, 3 hours and 50 minutes of Daylight Shading during the Equinoxes, and 3 hours and 45 minutes during the Summer Solstice at the existing residential property line immediately to the east of the Project Site. Existing residential properties to the south of the Project site will not receive Daylight Shading from the Proposed Project at any of the times studied. Daylight Shading created by the Project will be less than three hours per day during the period from October 21st to February 21st and less than four hours per day from March 19th through September 22nd at sensitive use properties adjacent to the Project site. More distant properties receive much less Daylight Shading than the properties adjacent to the Project site. Therefore, the Project impacts relating to Daylight Shading would be less than significant at sensitive use properties.

10. LIGHTING GLOSSARY

Discussions of daylight shading include precise definitions, descriptions or terminology of the specific lighting technical parameters. The following glossary summarizes explanations of the technical lighting terms utilized in this Study and the related practice standards. The following technical terms are used in this Study:

Brightness: The magnitude of sensation that results from viewing surfaces from which light comes to the eye. This sensation is determined partly by the measurable luminance of the source and partly by the conditions of observation (Context), such as the state of adaptation of the eye. For example, very bright lamps at night appear dim during the day, because the eye adapts to the higher brightness of daylight.

Candela: Measure of light energy from a source at a specific standard angle and distance. Candela (cd) is a convenient measure to evaluate output of light from a lamp or light fixture in terms of both the intensity of light and the direction of travel of the light energy away from the source.

Contrast: Calculated evaluation of high, medium and low contrast of visible light sources or surfaces within the Property by a ratio of luminance. Contrast is the ratio of one surface luminance to a second surface luminance or to the field of view. Contrast exceeding 30 to 1 are usually deemed uncomfortable; 10 to 1 are clearly visible; and less than 3 to 1 appear to be equal.

Glare: The sensation produced by luminances within the visual field that are sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort, or loss in visual performance or visibility.

For exterior environments at night, glare occurs when the range of luminance in a visual field is too large. The light energy incident at a point is measured by a scale of footcandles or lux and is described in the technical term Illuminance. This incident light is not visible to the eye until it is reflected from a surface, such as pavement, wall, dust in the atmosphere or the surface of a light bulb. The visible brightness of a surface is measured in footlamberts (or metric equivalent candelas per square meter) and is described by the term Luminance.

The human eye processes brightness variations across a very broad spectrum of intensities. The range of brightness generated by direct noon sun versus a moonlight evening is over 5000 to 1. Human eyes are capable of accommodating to this range of intensities given adequate time to adjust. However, the eye cannot process brightness ratios of more than 30 to 1 within a view without discomfort. See IESNA 10th Edition Handbook, Section 4.10.1, Discomfort Glare and Section 10.9.2 Calculating Glare.

Also see definitions for "Disability Glare", "Blinding Glare", "Discomfort Glare", "Discomfort Glare Rating", "Direct Glare", "Reflected Glare".

Illuminance: Illuminance is the means of evaluating the density of Luminous Flux. Illuminance indicates the amount of Luminous Flux from a light source falling on a given area. Illuminance is measured in footcandles (fc) which is the lumens per square foot, or Lux (lumens per square meter). Illuminance need not necessarily be related to a real surface since it may be measured at any point

within a space. Illuminance is determined from the Luminous intensity of the light source. Illuminance of a point source decreases with the square of the distance from the light source (see Inverse Square Law definition).

Horizontal Illuminance: Illuminance incident upon a horizontal plane. The orientation of the illuminance meter or calculation point will be 180° from Nadir.

Vertical Illuminance: Illuminance incident upon a vertical plane. The orientation of the illuminance meter or calculation point will be 90° from Nadir.

Inverse Square Law: In physics, an inverse-square law is any physical law stating that a specified physical quantity or intensity is inversely proportional to the square of the distance from the source of that physical quantity. The fundamental cause for this relationship can be understood as geometric dilution corresponding to point-source radiation into three-dimensional space (see Figure 12). The divergence of a vector field which is the resultant of radial inverse-square law fields with respect to one or more sources is everywhere proportional to the strength of the local sources, and hence zero outside sources. Newton's law of universal gravitation follows an inverse-square law, as do the effects of electric, magnetic, light, sound, and radiation phenomena. Thus, Illuminance decreases with the square of the distance from the light source.

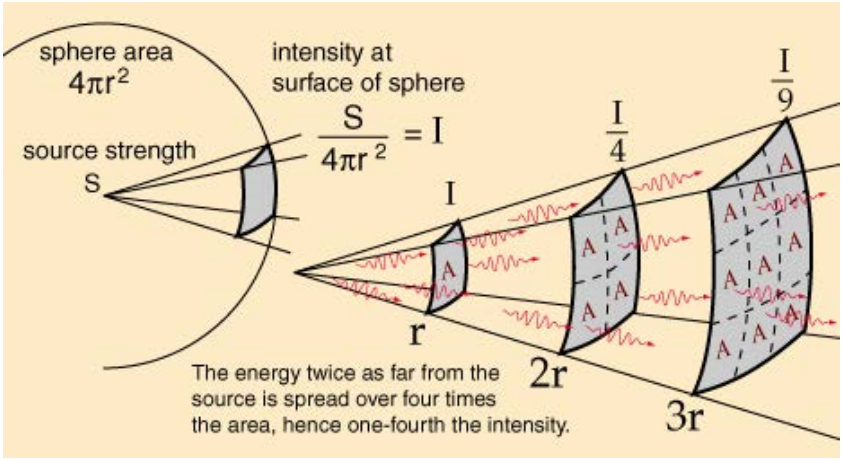


Figure 12: Inverse square law diagram (hyperphysics.phy-ast.gsu.edu)

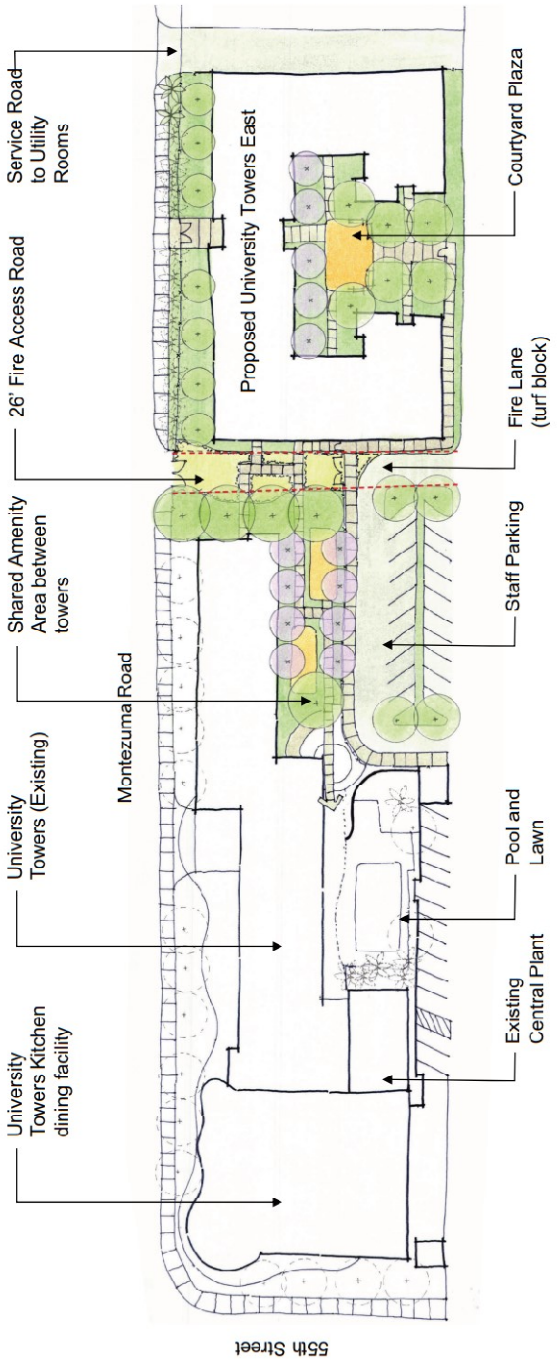
Luminance: Luminance is a measure of emissive or reflected light from a specific surface in a specific direction over a standard area. Luminance is measured in footlamberts (fL) (1/ π Candela per square foot) or cd/m^2 (Candela per square meter). 1fL = 3.43 cd/m^2.

Whereas Illuminance indicates the amount of Luminous Flux falling on a given surface, Luminance describes the brightness of an illuminated or luminous surface. Luminance is defined as the ratio of luminous intensity of a surface (Candela) to the projected area of this surface (m^2 or ft^2).

Monitoring Sites: Monitoring Sites are locations selected for observation and field measurement to evaluate the Project Site from and to determine the existing extent of shading surrounding the Project Site. The Monitoring Sites are within the

public right of way, and may be adjacent to sensitive use sites. These locations are representative of the sensitive sites surrounding the Project Site to the north, south, east and west. Figure 2 of this study illustrates the Monitoring Site locations.

APPENDIX A: PROJECT CONCEPT DESIGN



APPENDIX B: SOLAR DATA AT SOLSTICES AND EQUINOXES

Solar data for Winter Solstice, Summer Solstice, and the Equinox are included below, including the energy from the sun, the solar azimuth (position relative to due south) and the solar angle (vertical angle above the horizon line).

Table 8: Solar Altitude and Azimuth of the Sun, San Diego, California

Altitude and Azimuth of the Sun

SAN DIEGO, CALIFORNIA

W117 08, N32 45

Pacific Daylight Time

Time	21-Dec		21-Mar		21-Jun	
	Altitude	Azimuth (East of North)	Altitude	Azimuth (East of North)	Altitude	Azimuth (East of North)
5 am					-8.2	55.2
6 am	-9.8	111.6	-11.4	82.0	2.9	63.7
7 am	1.9	119.4	1.5	90.2	14.4	71.1
8 am	12.1	128.4	13.8	98.5	26.5	78.0
9 am	21.2	139.1	26.1	107.6	39.0	84.9
10 am	28.3	152.1	37.7	118.9	51.6	92.6
11 am	32.7	167.2	47.8	134.0	64.0	103.9
12 pm	33.8	183.6	55.2	155.1	75.5	126.8
1 pm	31.2	199.6	57.8	182.1	80.5	193.3
2 pm	25.5	213.9	54.4	208.5	72.1	243.1
3 pm	17.4	225.8	46.5	228.7	60.1	260.2
4 pm	7.7	235.7	36.1	243.1	47.5	269.9
5 pm	-3.3	244.1	24.2	153.9	35.0	277.3
6 pm			12.1	262.9	22.6	284.2
7 pm			0.0	271.2	10.6	291.2
8 pm					-0.9	298.9

Astronomical Applications Dept.

U.S. Naval Observatory

Washington, DC 20392-5420

Table 9: Sunrise and Sunset for San Diego, California

2017		Sunrise/Sunset		Day	Astronomical Twilight		Nautical Twilight		Civil Twilight		Solar Noon	
		Sunrise	Sunset	Length	Start	End	Start	End	Start	End	Time	Mil. mi
Dec	21	6:47 am ↑ (118°)	4:46 pm ↑ (242°)	9:59:50	5:18 AM	6:15 PM	5:48 AM	5:45 PM	6:19 AM	5:14 PM	11:46 am (33.9°)	91.445
Mar/ Sep	21	6:36 am ↑ (89°)	6:46 pm ↑ (271°)	12:09:44	5:14 AM	8:08 PM	5:43 AM	7:39 PM	6:11 AM	7:10 PM	12:41 pm (57.7°)	93.313
Jun	21	5:41 am ↑ (61°)	7:59 pm ↑ (299°)	14:18:24	3:59 AM	9:41 PM	4:37 AM	9:03 PM	5:12 AM	8:28 PM	12:50 pm (80.7°)	94.472

* All times are local time for San Diego.

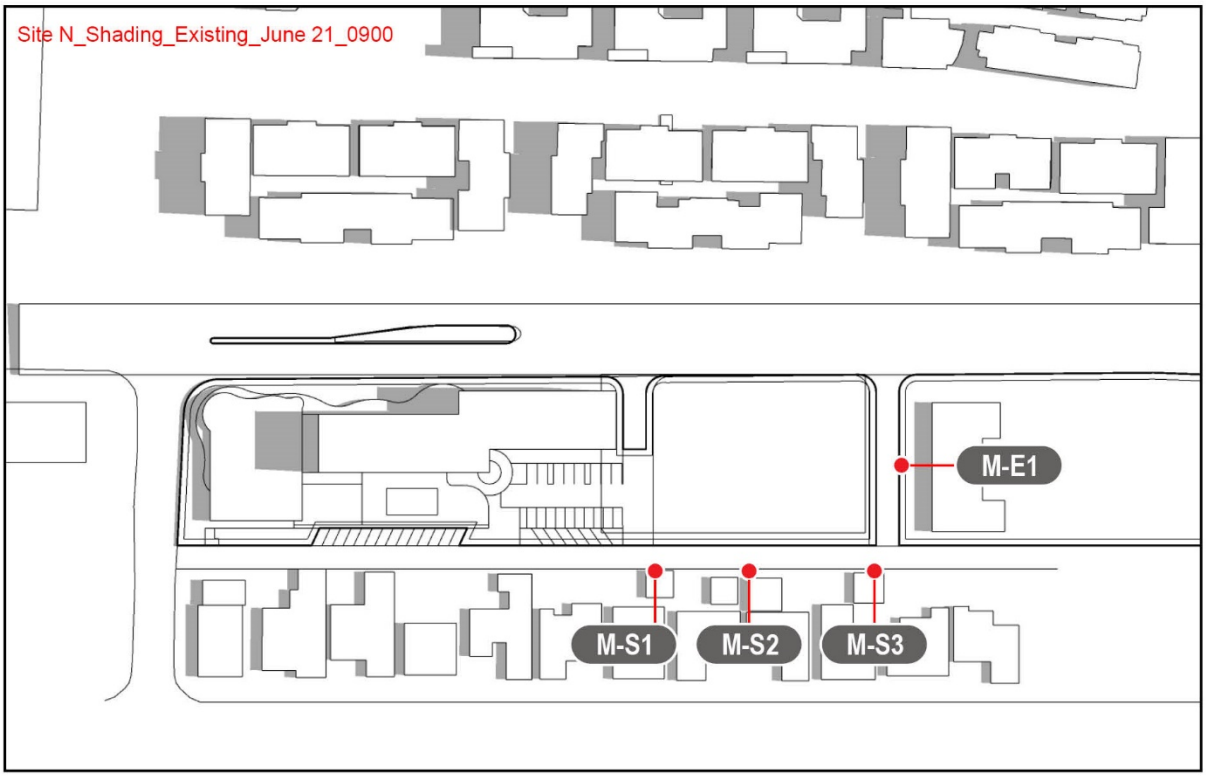
Table 10: Average Daylight Illuminance

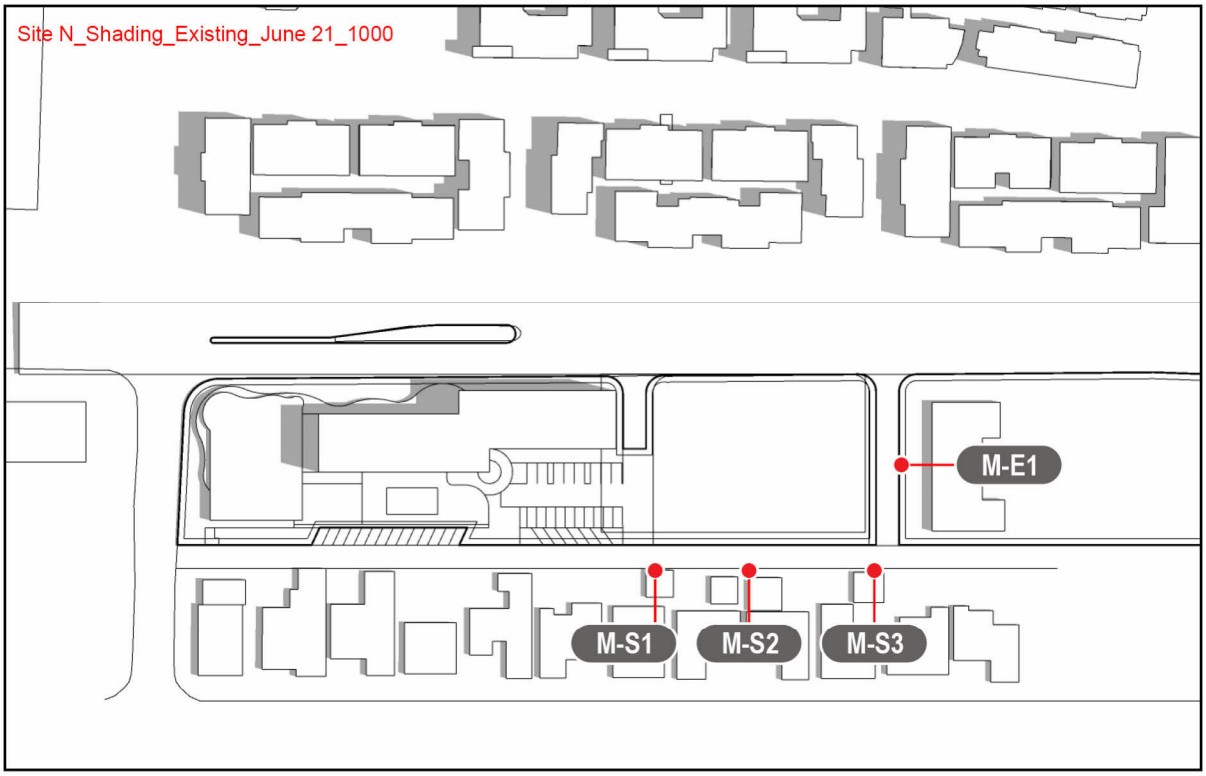
Average Incident Illuminance (klux-hr) for Mostly Clear Conditions																				
	March					June					September					December				
Orientation	9 am	1 am	1 pm	3 pm	5 pm	9 am	1 am	1 pm	3 pm	5 pm	9 am	1 am	1 pm	3 pm	5 pm	9 am	1 am	1 pm	3 pm	5 pm
Horizontal	50	83	91	69	25	52	90	107	99	67	37	78	96	85	48	27	56	59	36	3
North	11	15	16	14	8	22	16	16	17	18	10	15	16	16	12	8	12	12	9	2
East	79	54	16	14	8	80	70	25	17	14	8	83	10	15	16	56	39	12	9	2
South	42	69	75	57	21	12	24	35	29	14	24	55	69	60	32	54	87	91	65	8
West	11	15	31	74	65	12	16	16	58	83	10	15	16	61	80	8	12	30	58	12
M. Clr (%hrs)	38	43	45	45	45	17	42	55	60	56	39	56	65	69	66	50	51	53	52	53

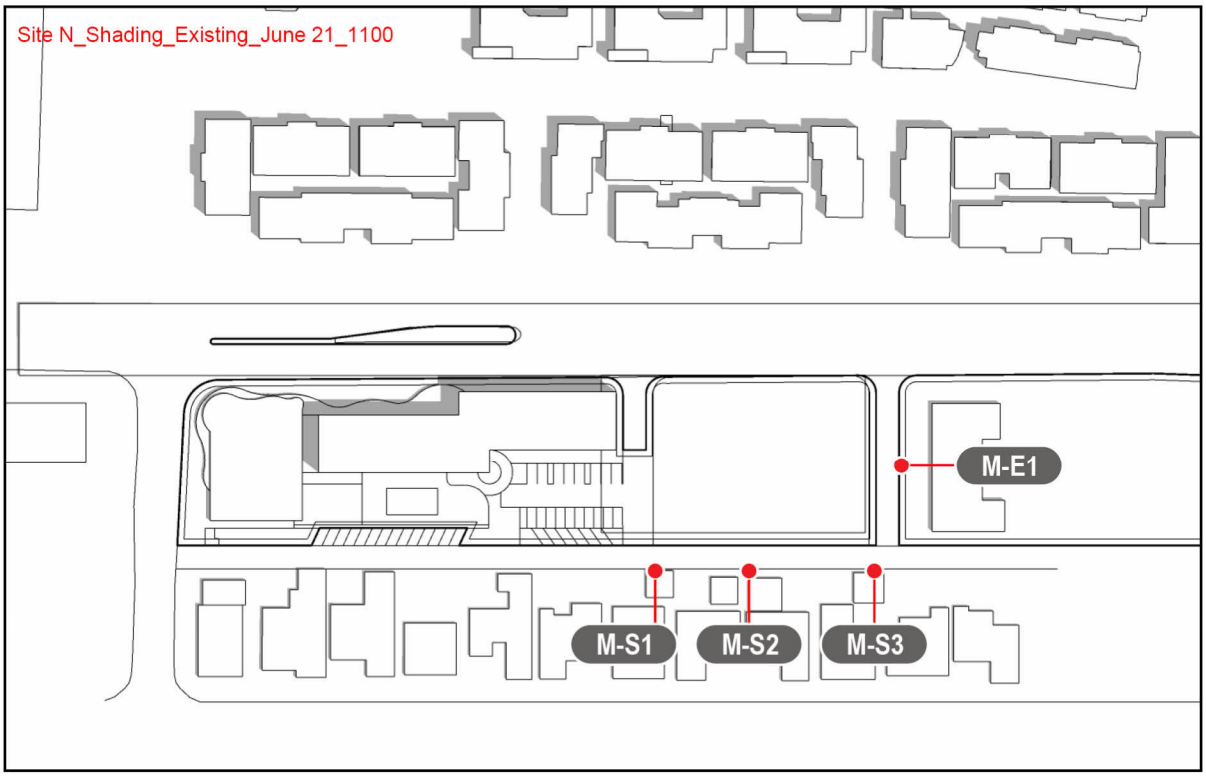
APPENDIX C: EXISTING DAYLIGHT SHADING STUDIES

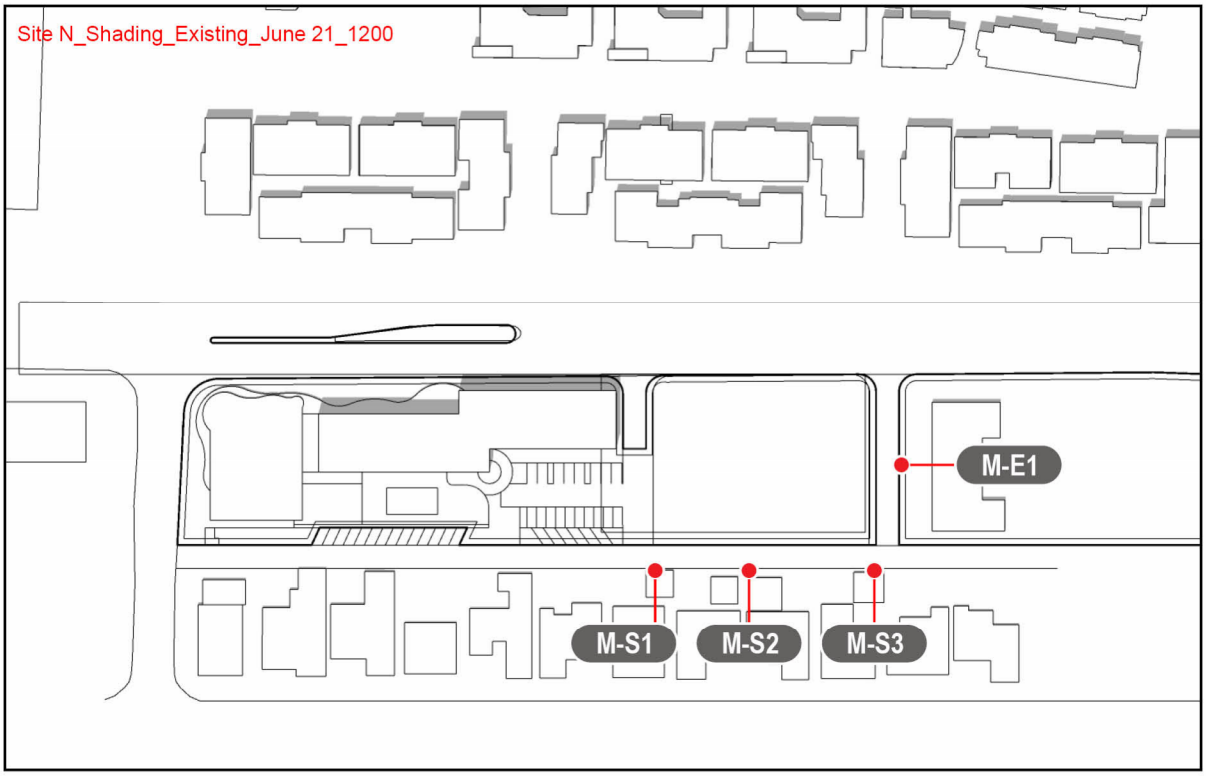
Site N
Existing Shading

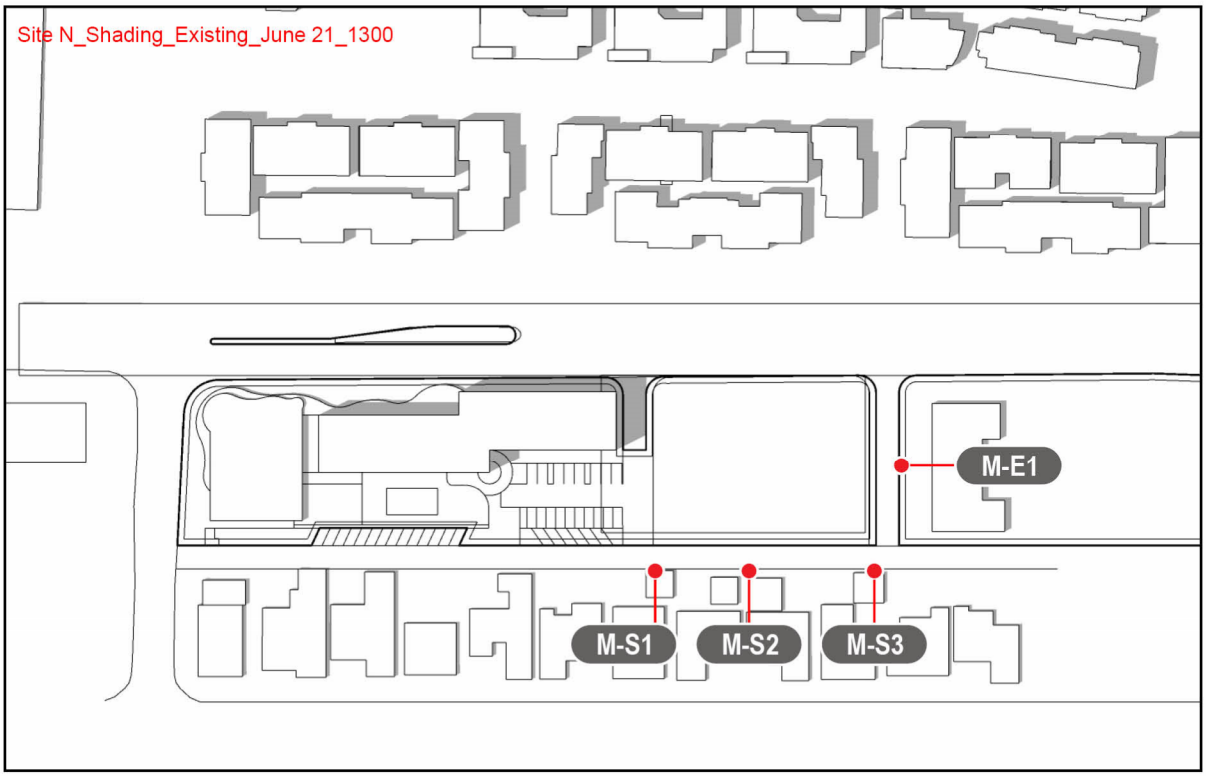
Summer Solstice - June 21, 2024




Site N_Shading_Existing_June 21_1000
M-E1
M-S1
M-S2
M-S3


Site N_Shading_Existing_June 21_1100
M-E1
M-S1
M-S2
M-S3


Site N_Shading_Existing_June 21_1200
M-E1
M-S1
M-S2
M-S3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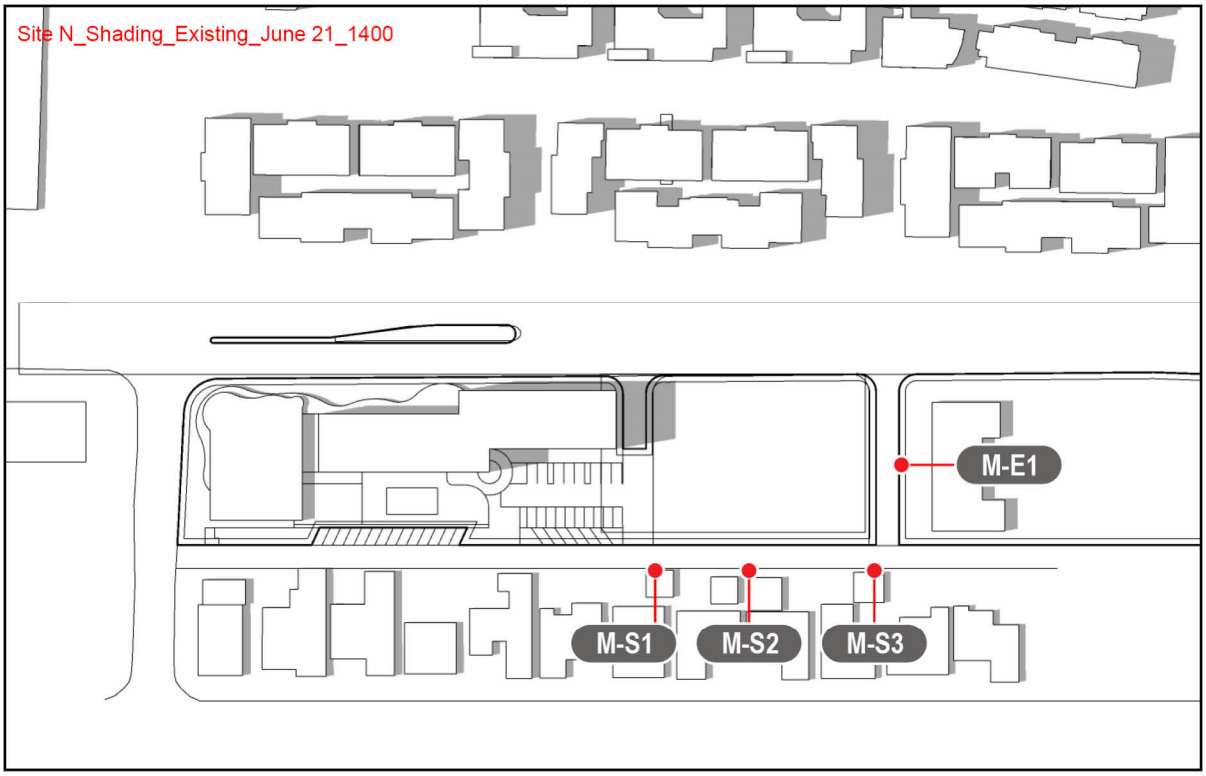
M-E1
M-S1
M-S2
M-S3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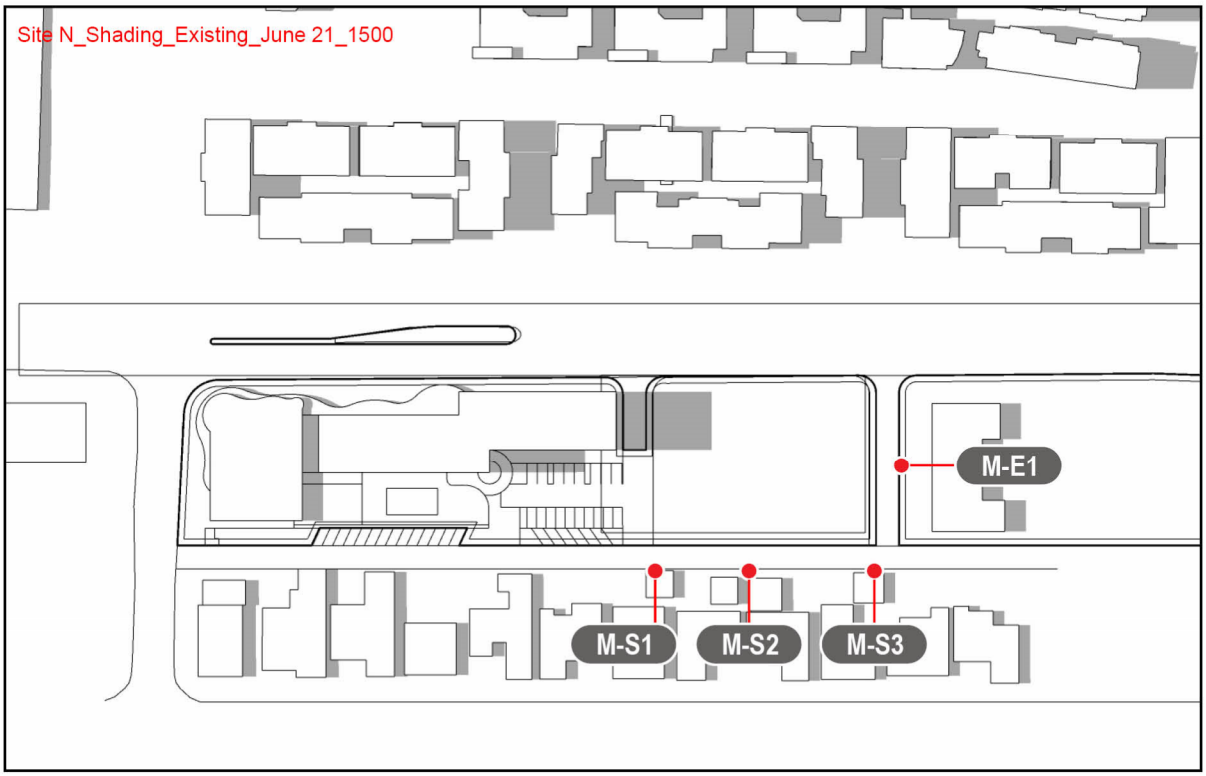
M-S1
M-S2
M-S3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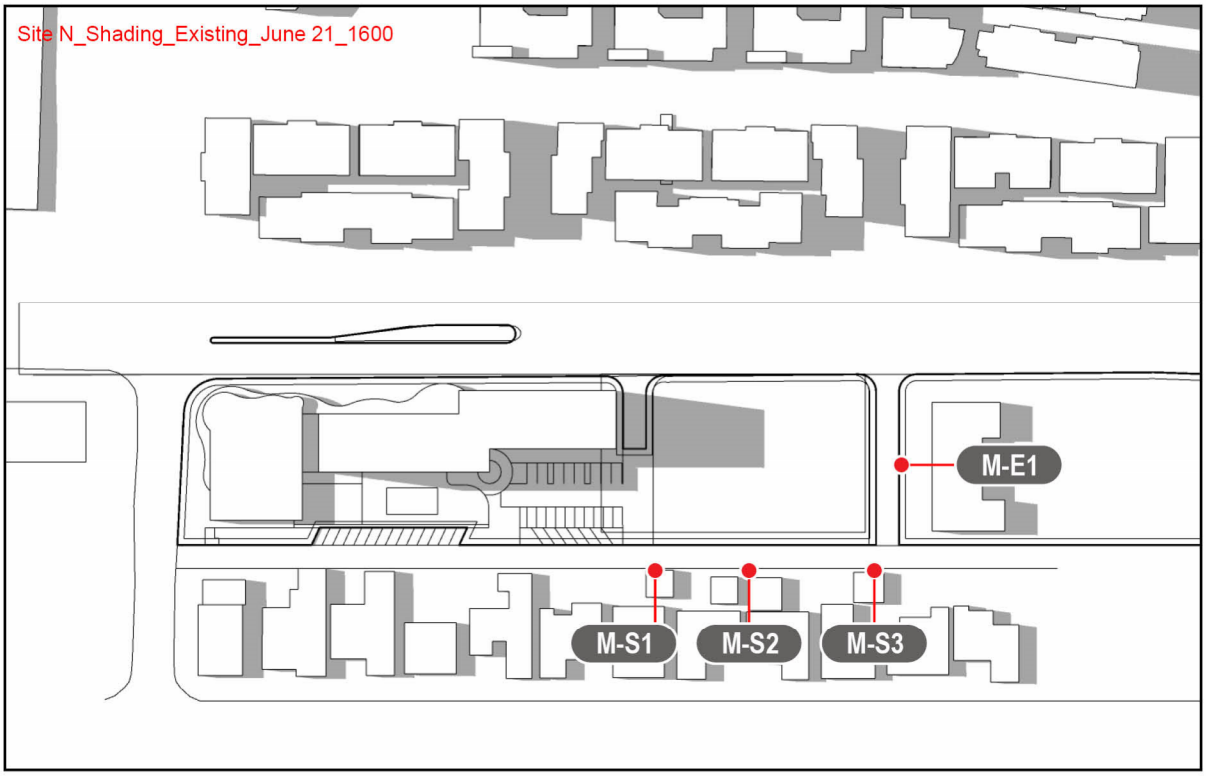
M-E1
M-S1
M-S2
M-S3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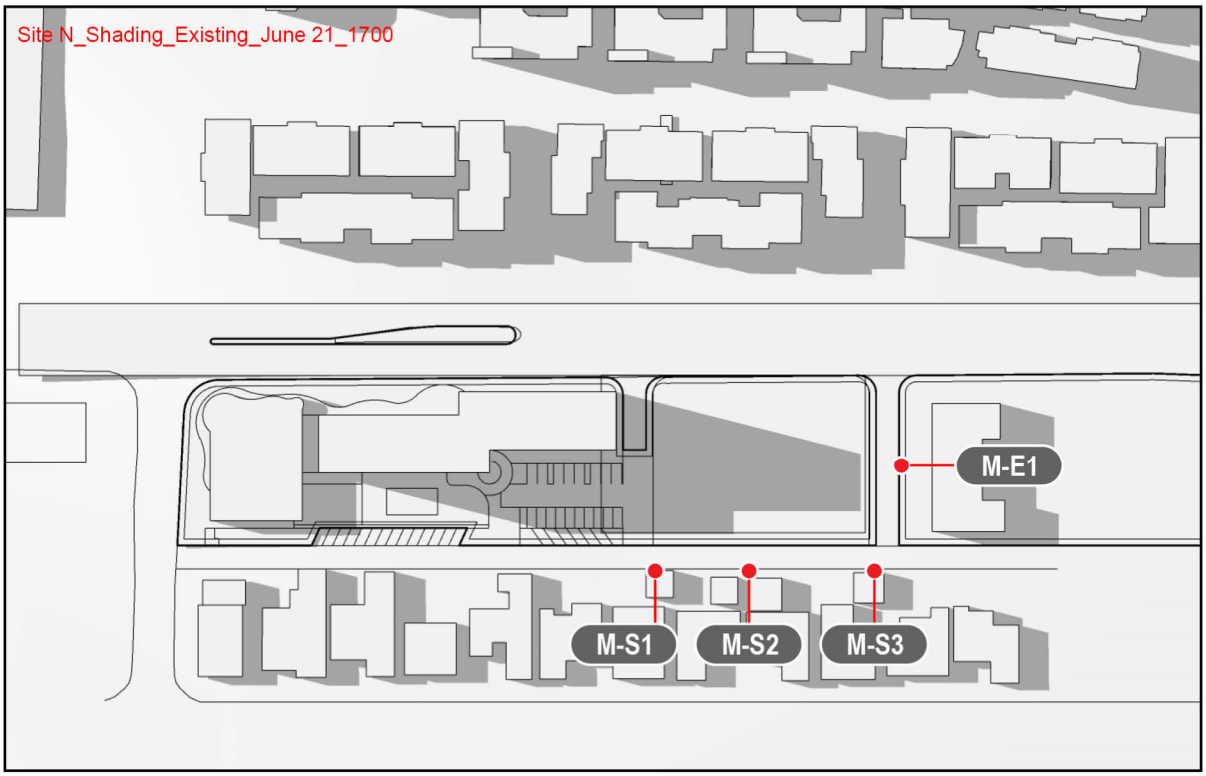
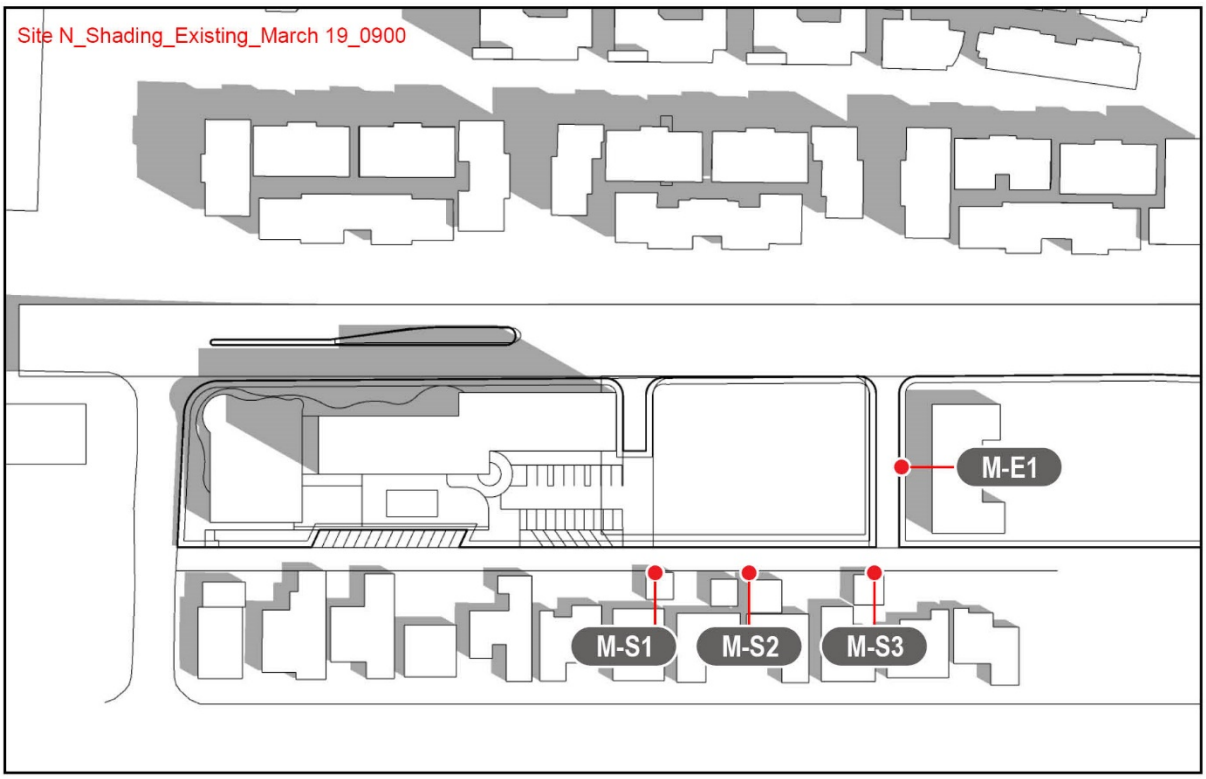
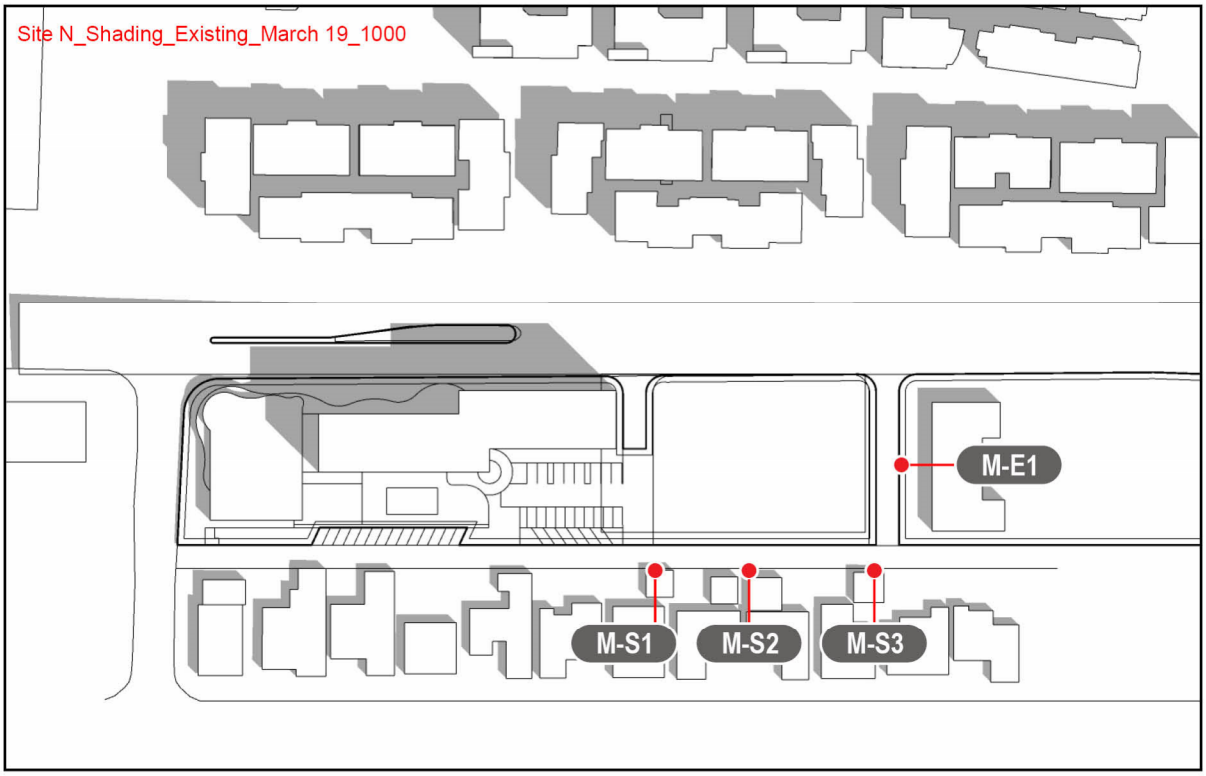
M-E1
M-S1
M-S2
M-S3

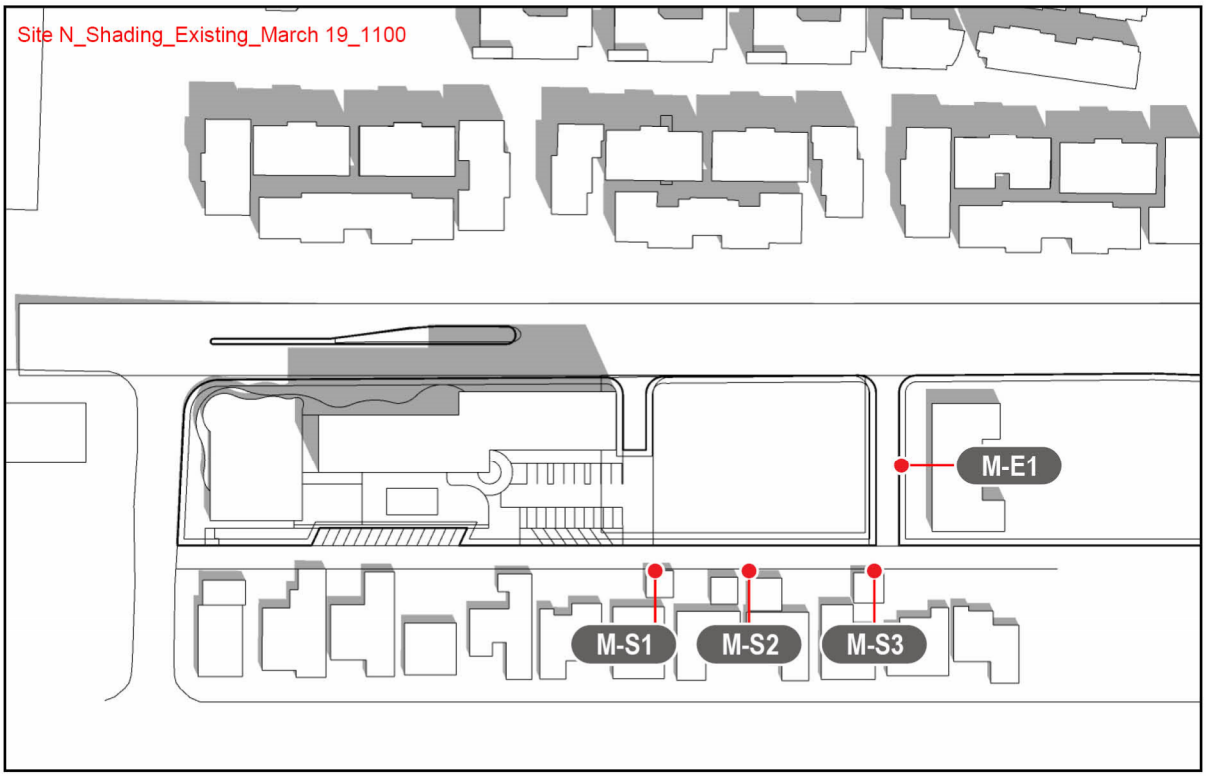

Site N_Shading_Existing_June 21_1700
M-E1
M-S1
M-S2
M-S3

Site N
Existing Shading

Equinox - March 19, 2024




Site N_Shading_Existing_March 19_1000
M-E1
M-S1
M-S2
M-S3


Site N_Shading_Existing_March 19_1100
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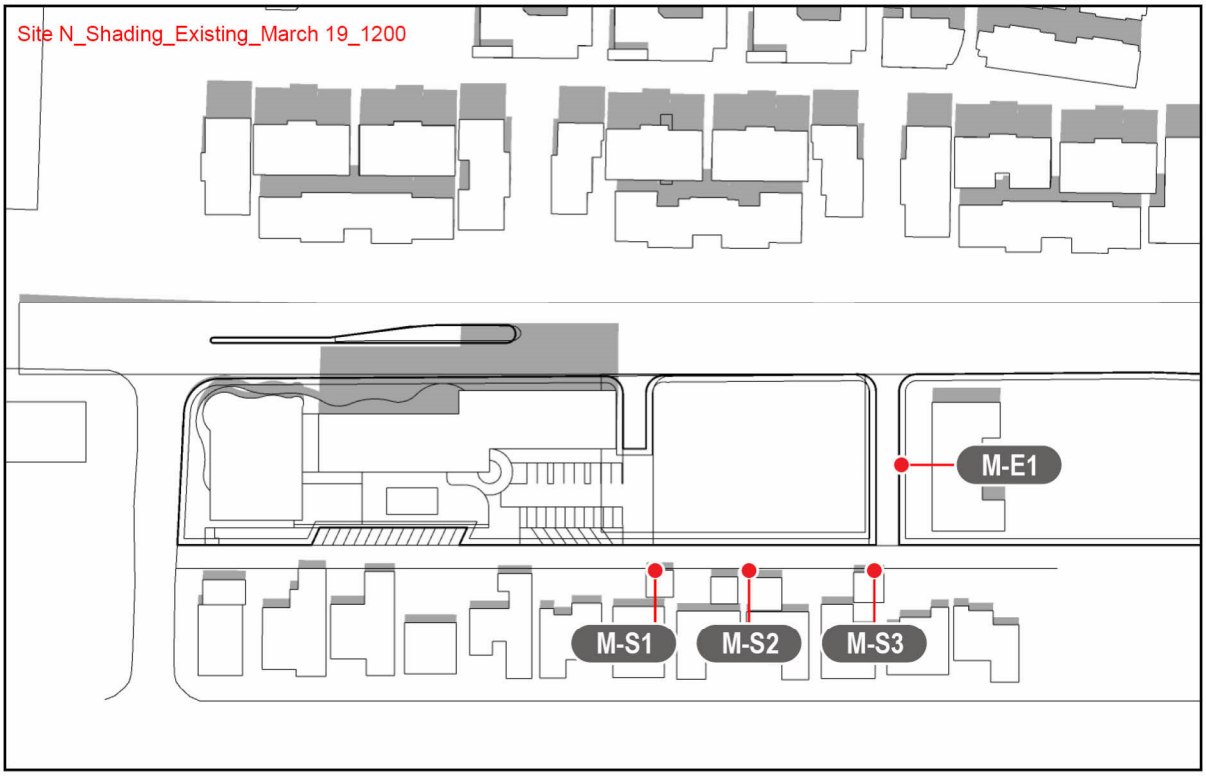
M-S3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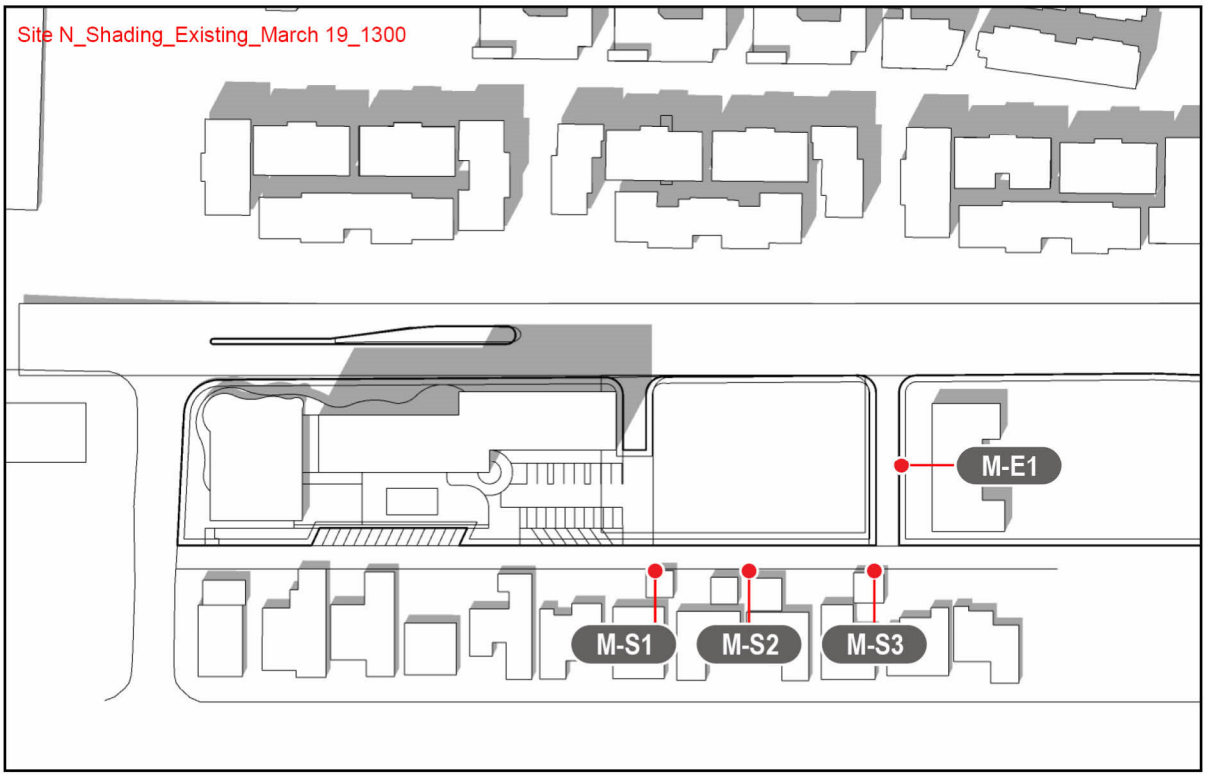
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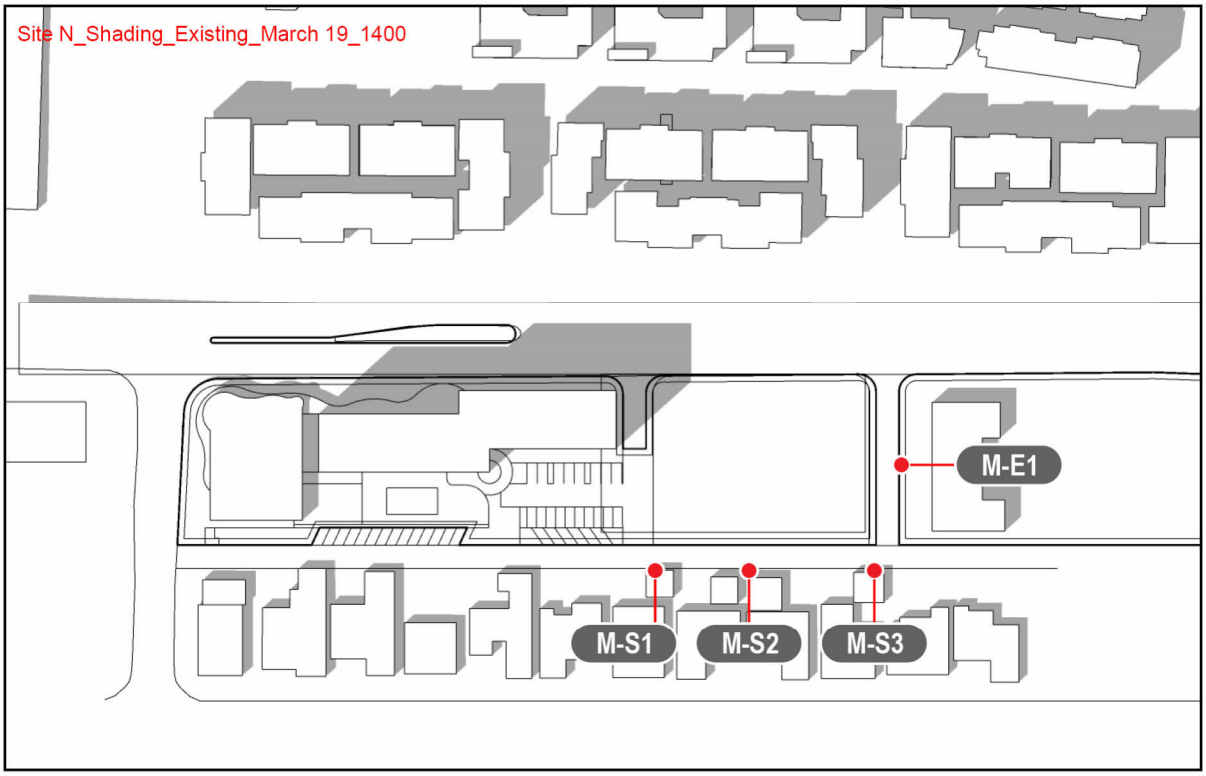
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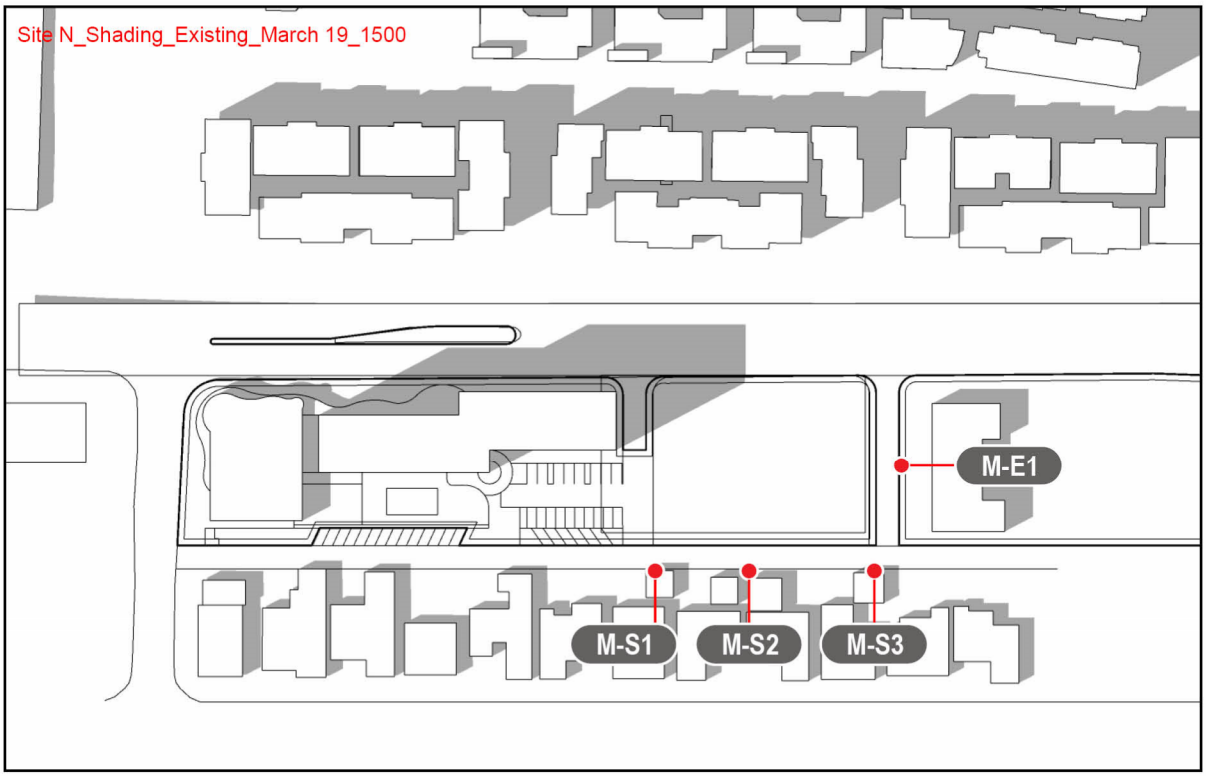
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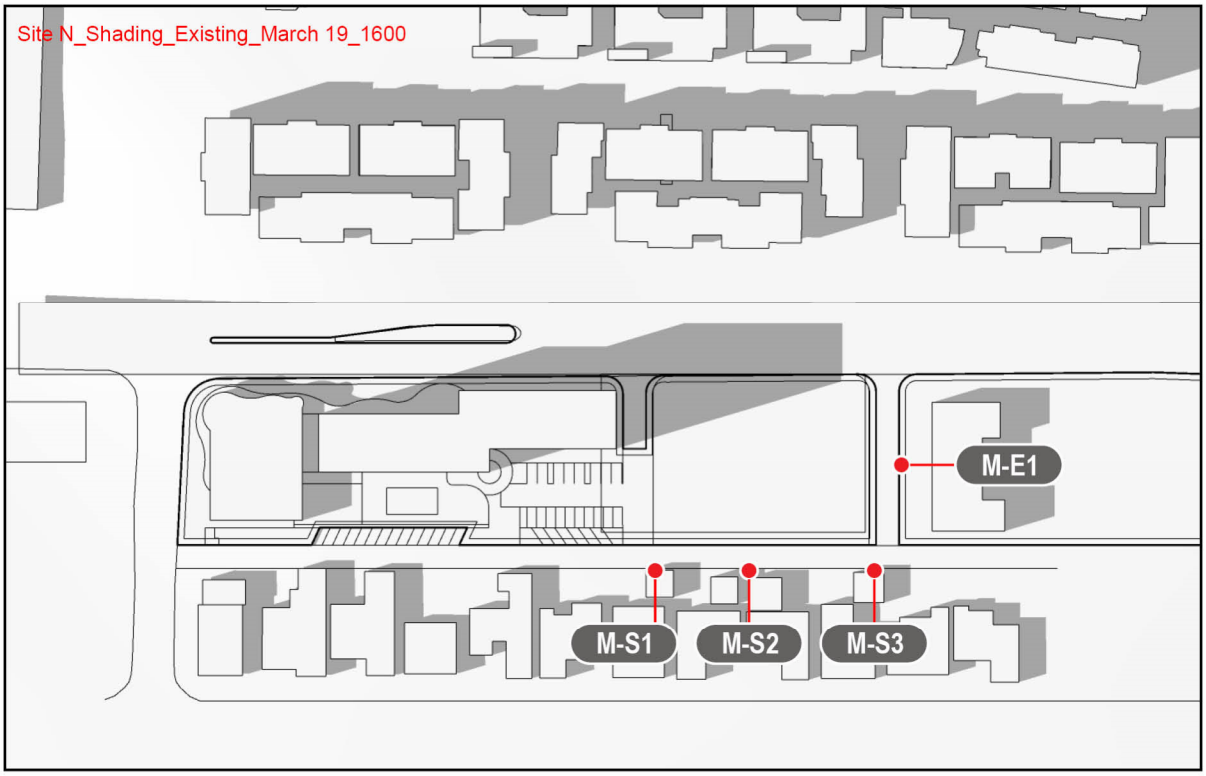
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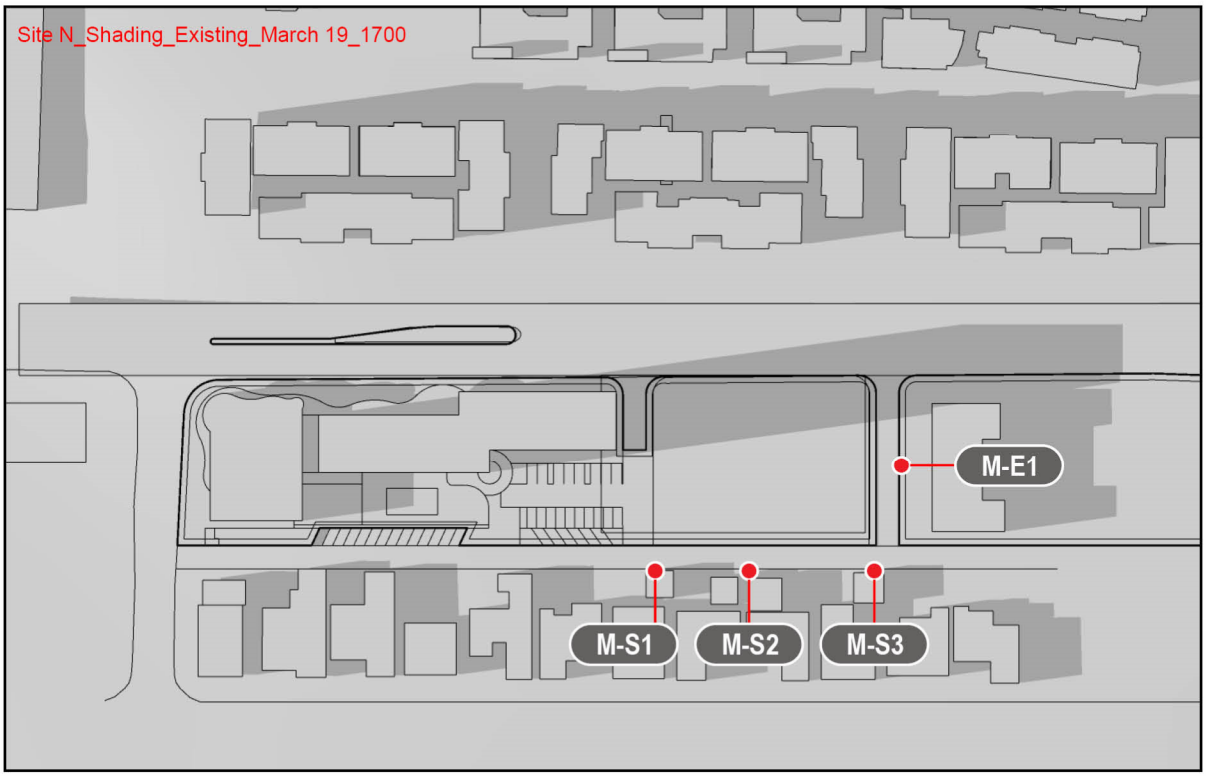
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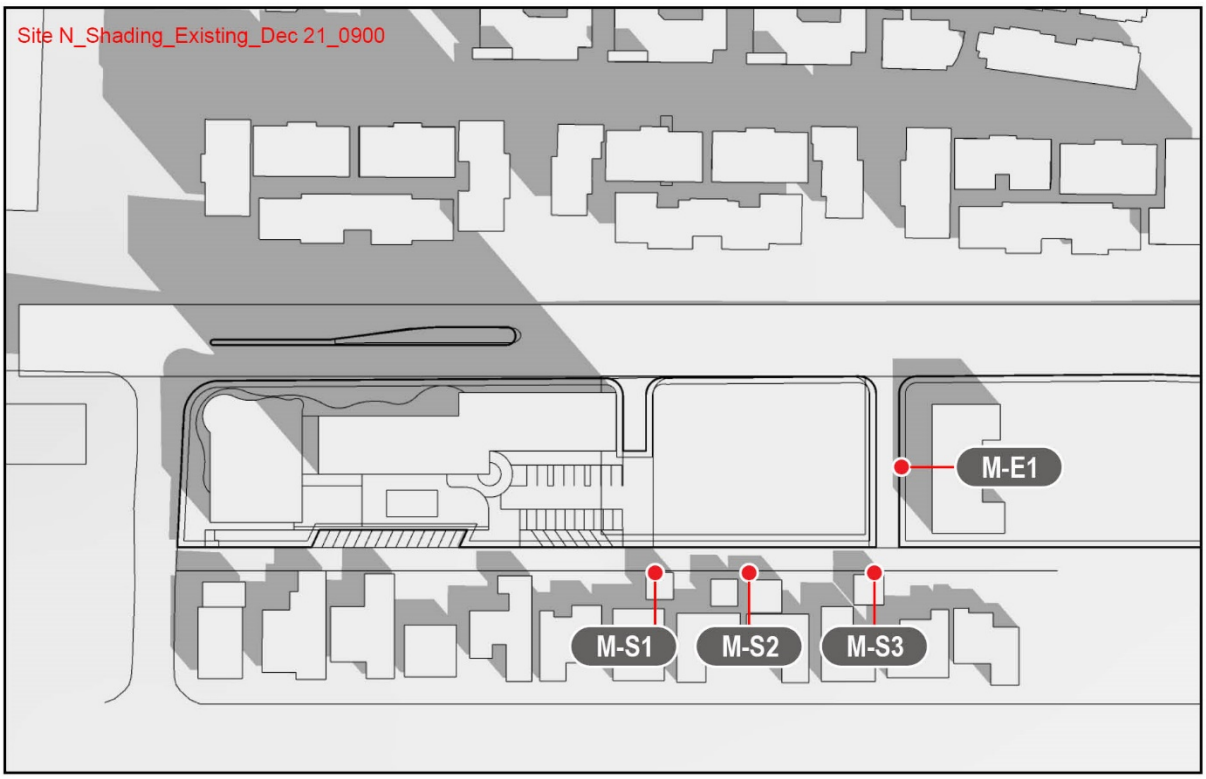
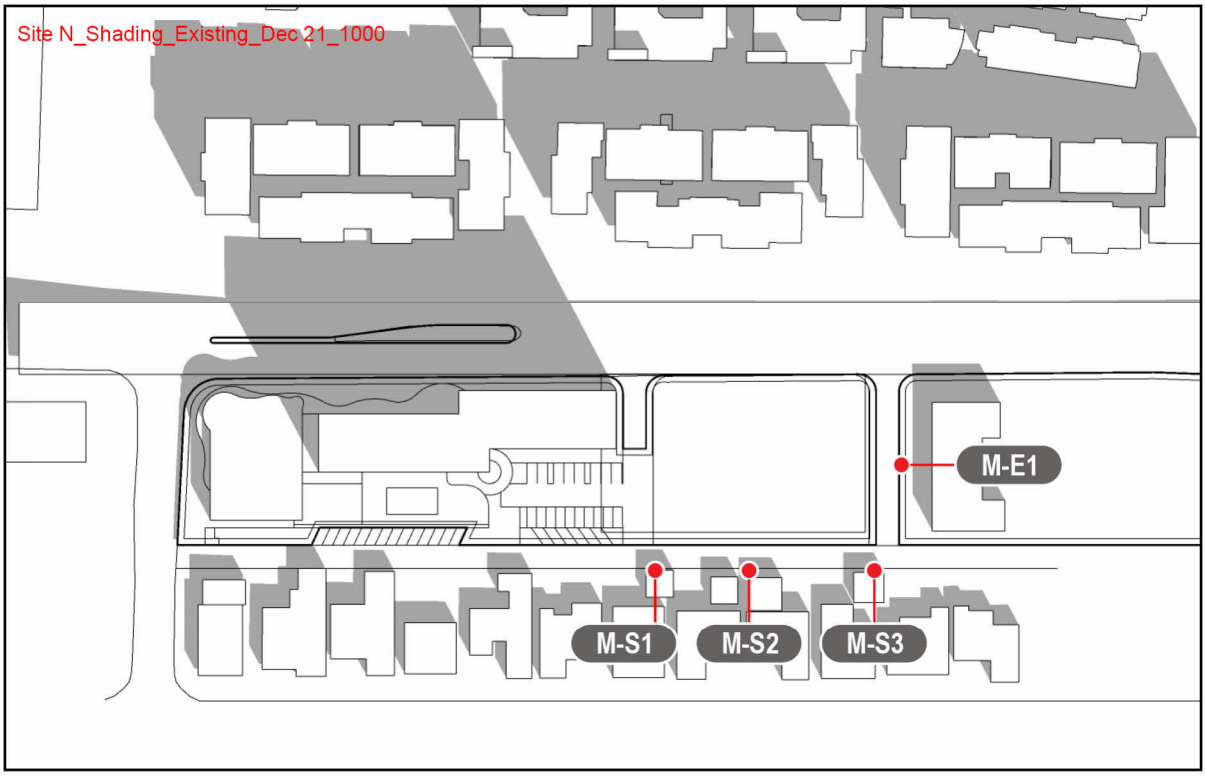
Site N
Existing Shading

Winter Solstice - Dec 21, 2024

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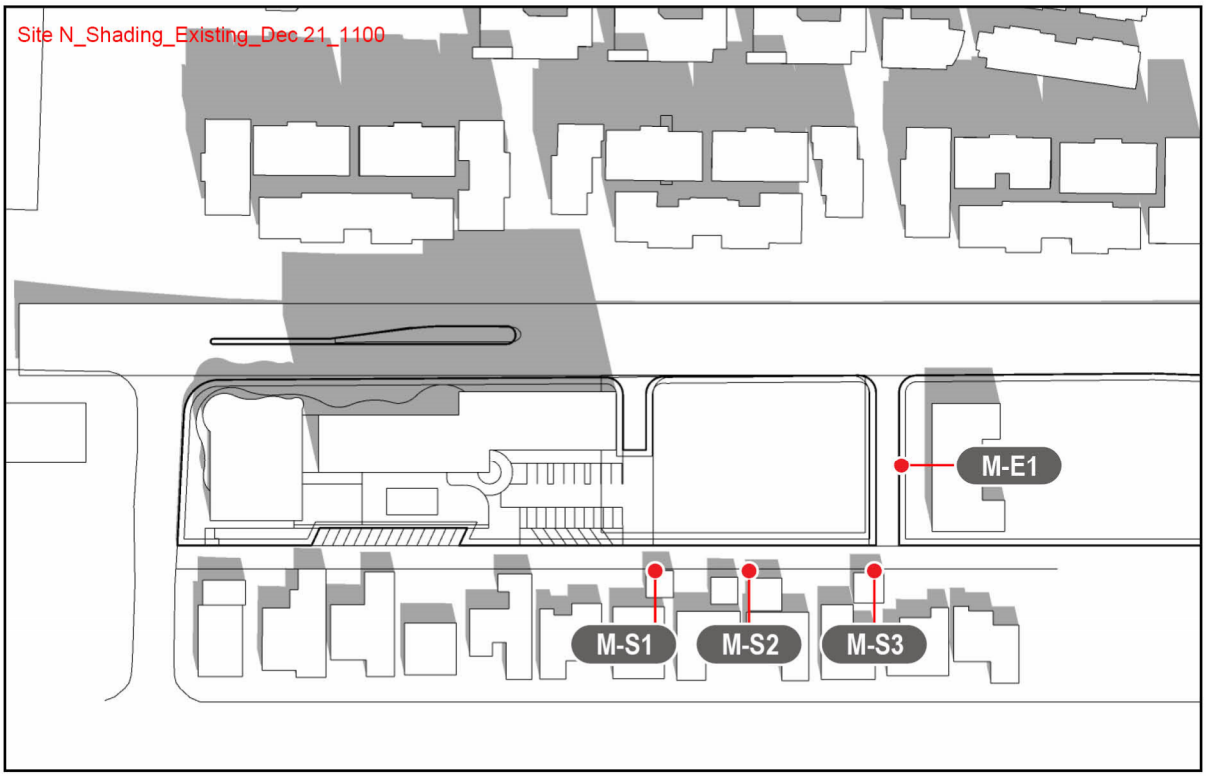
M-S3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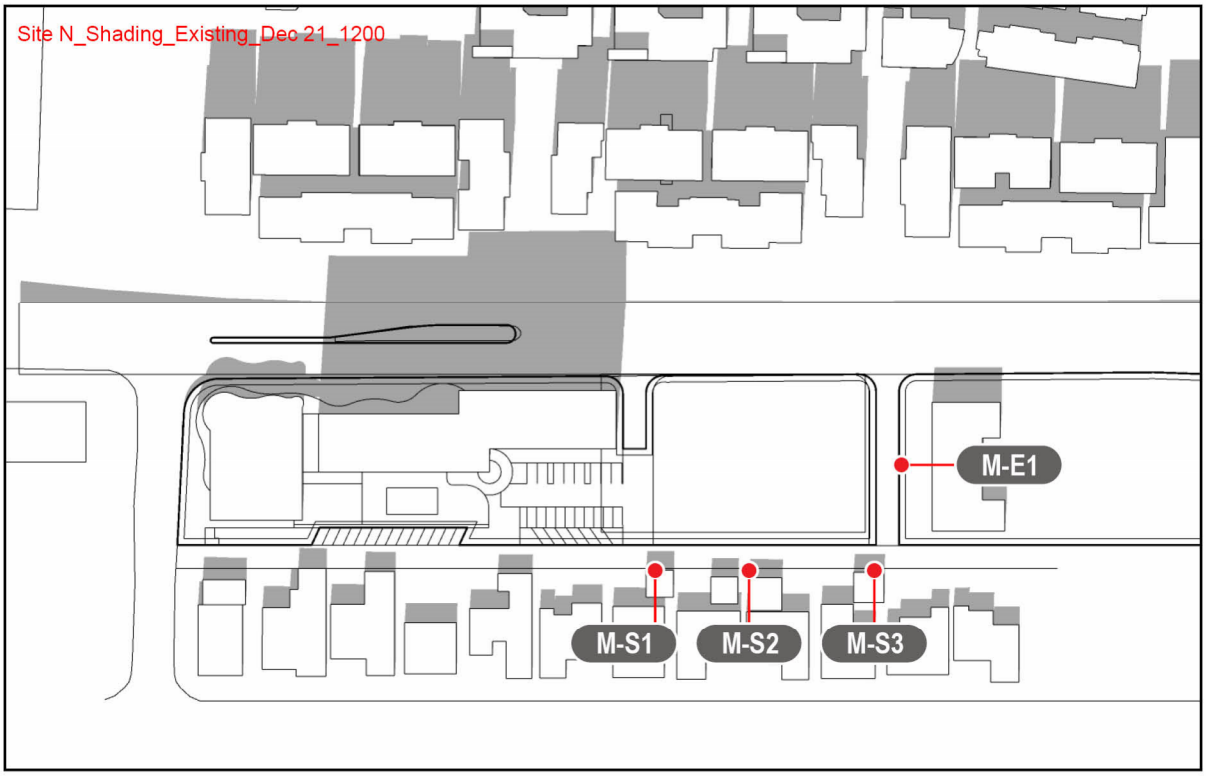
M-S3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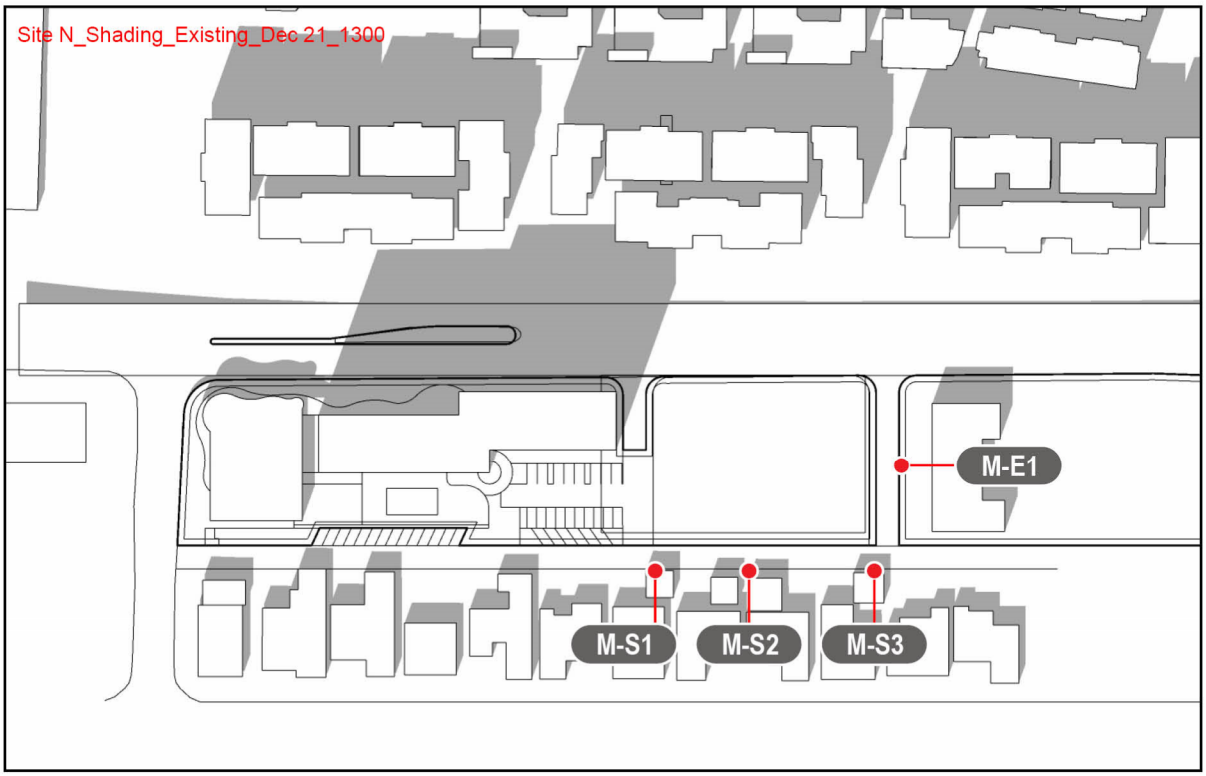
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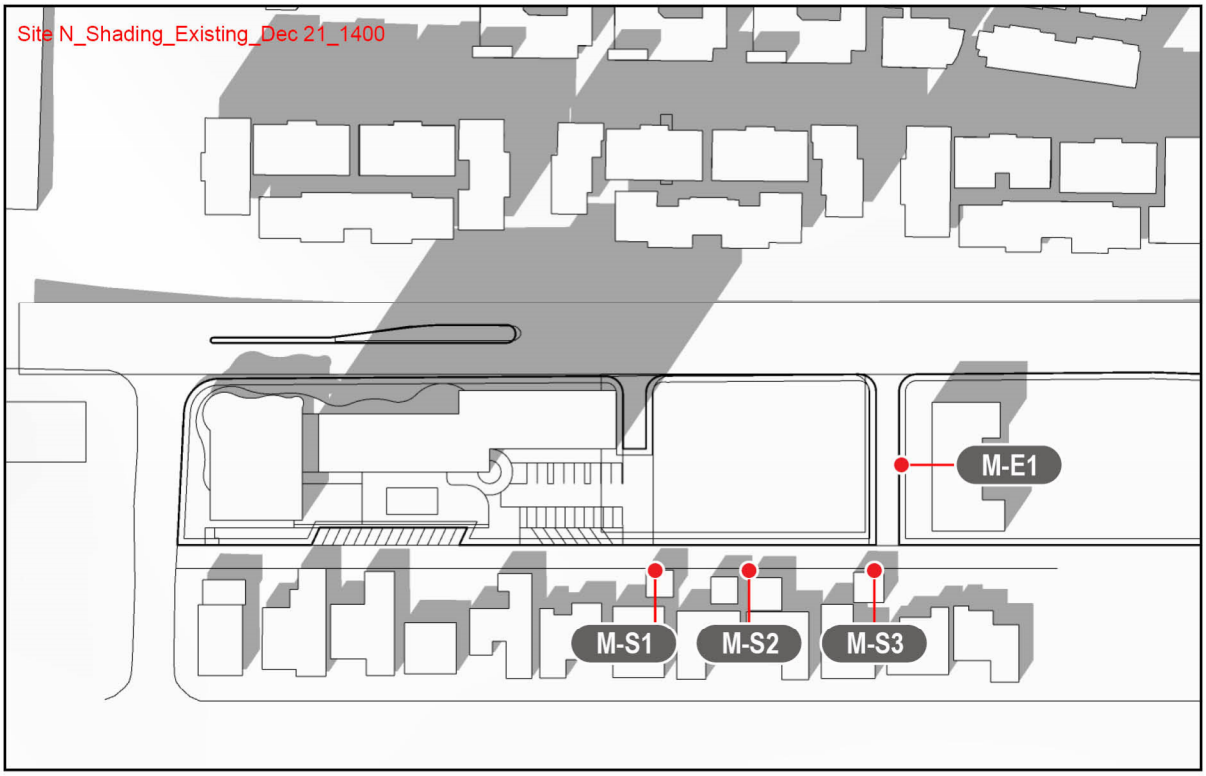
Site N_Shading_Existing_Dec 21_1400
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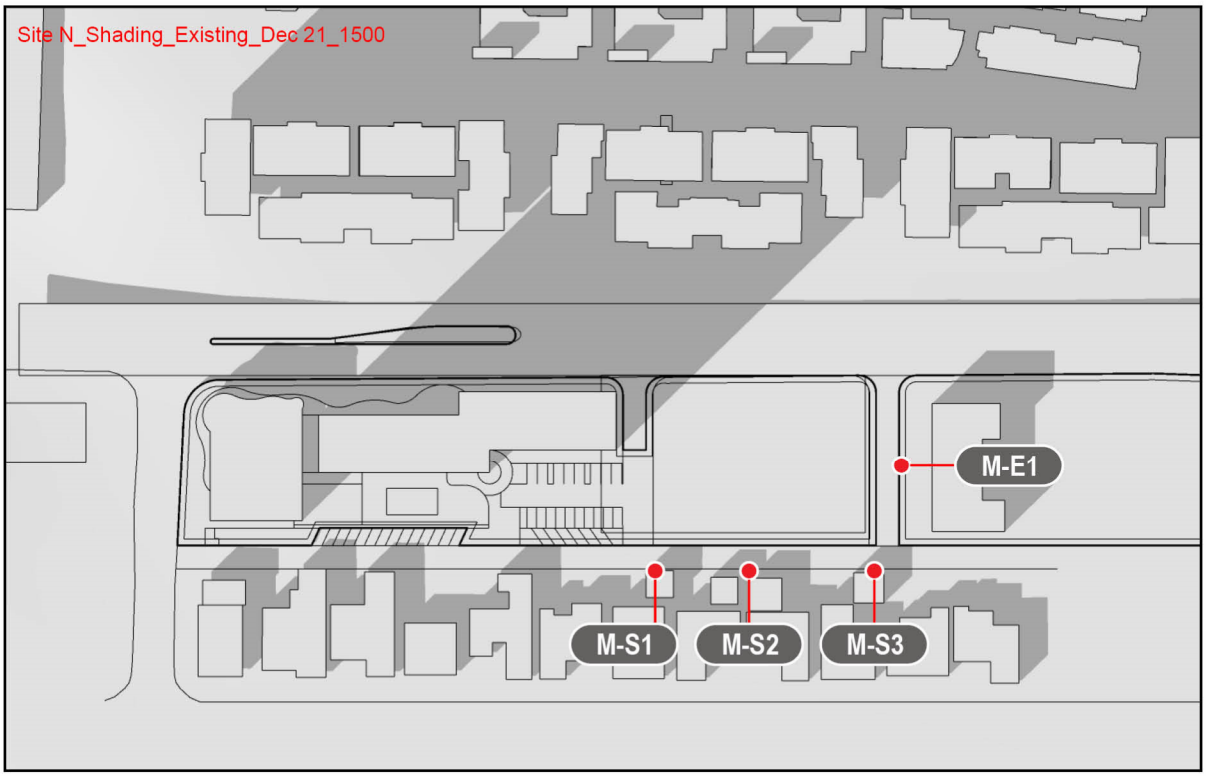
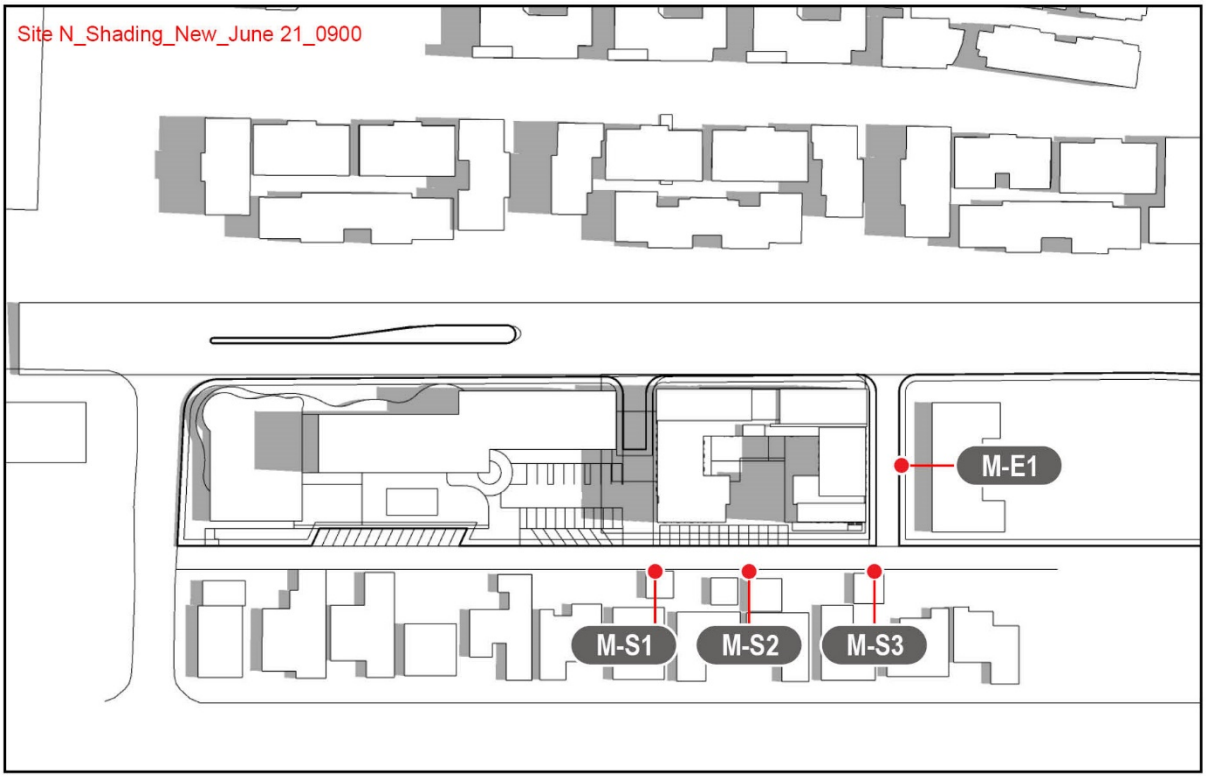
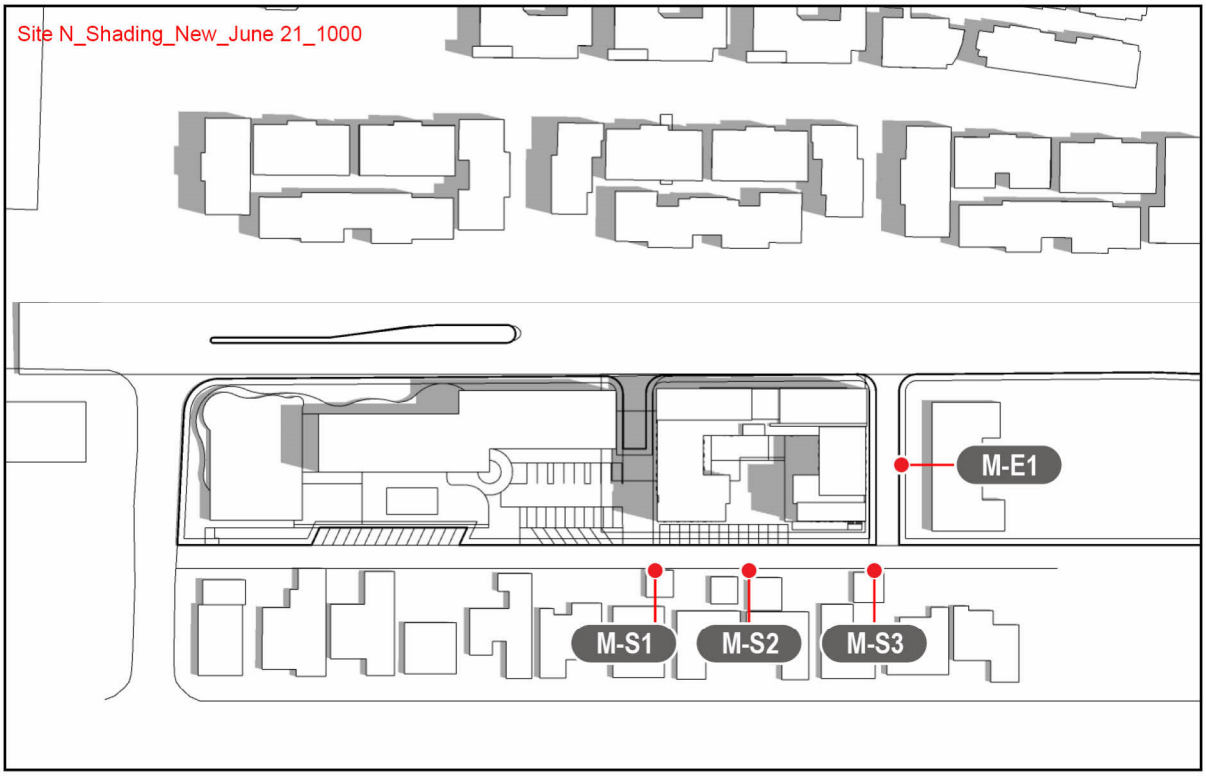

Site N_Shading_Existing_Dec 21_1500
M-E1
M-S1
M-S2
M-S3

APPENDIX D: PROJECT DAYLIGHT SHADING STUDIES

Site N
Project Shading

Summer Solstice - June 21, 2024




Site N_Shading_New_June 21_1000
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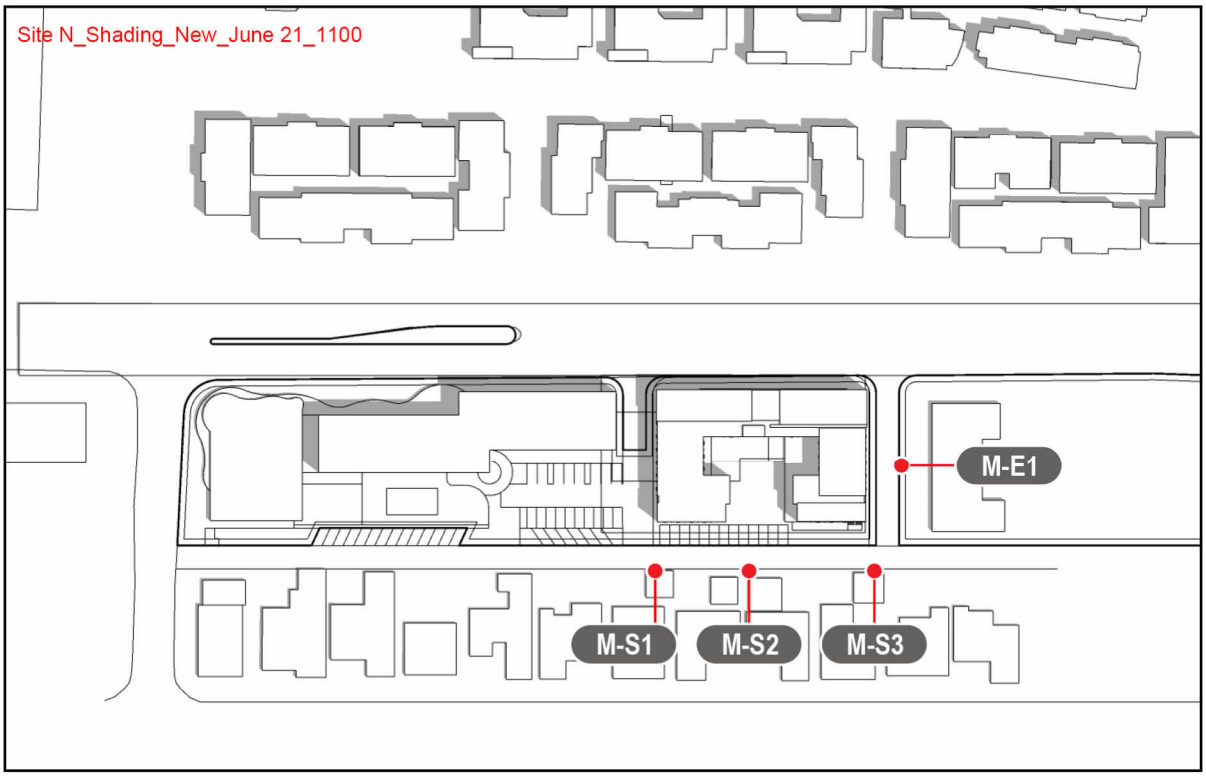
M-S1
M-S2
M-S3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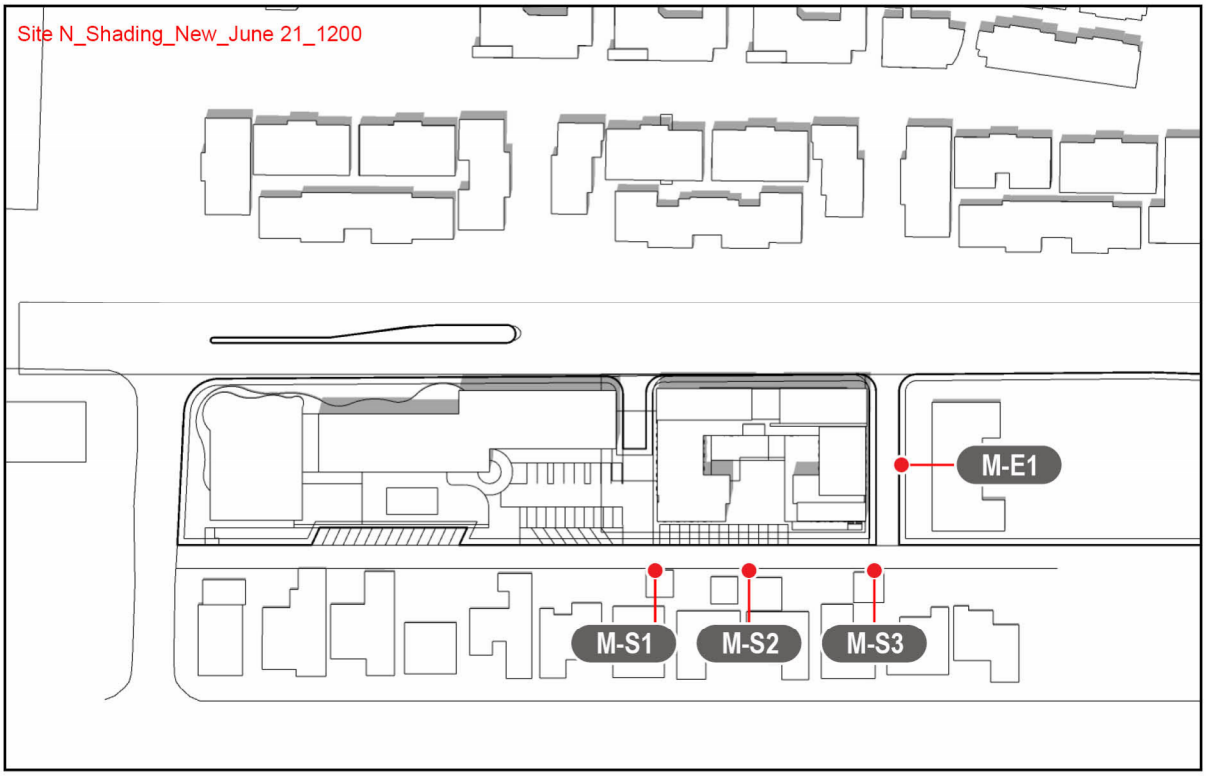
M-S2
M-S3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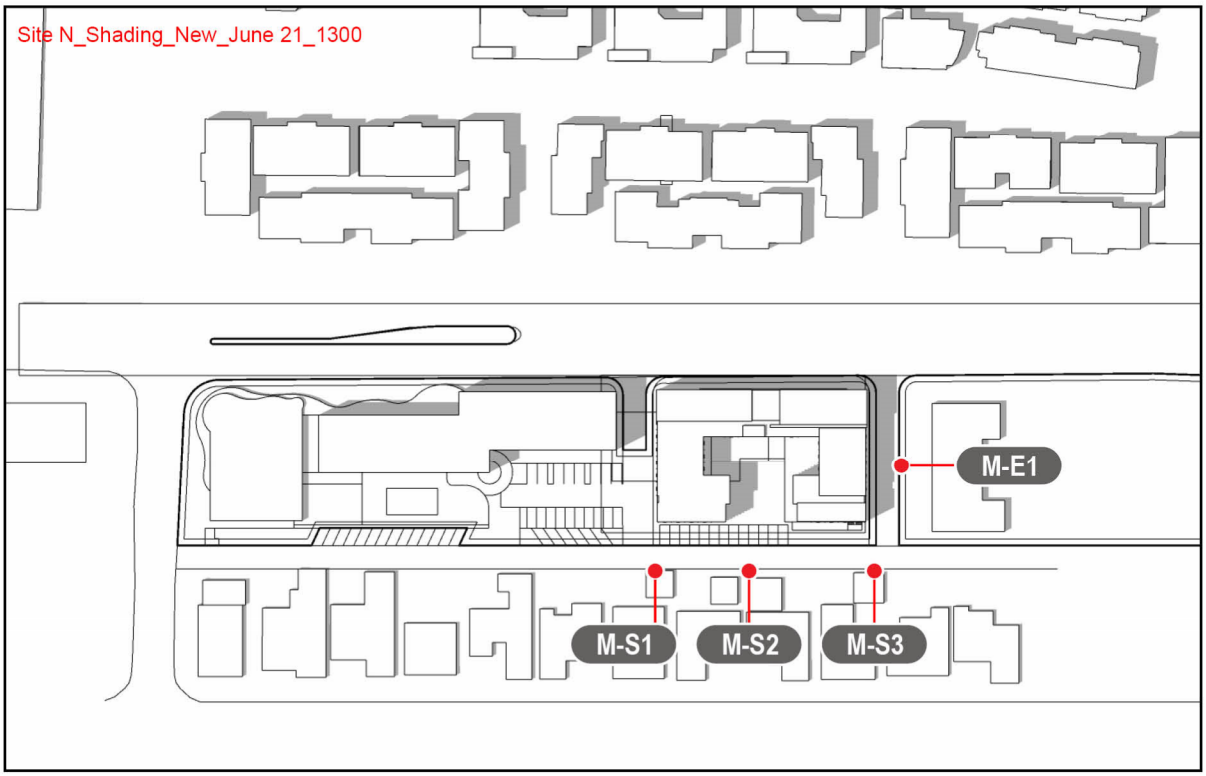
M-S3


Site N_Shading_New_June 21_1300
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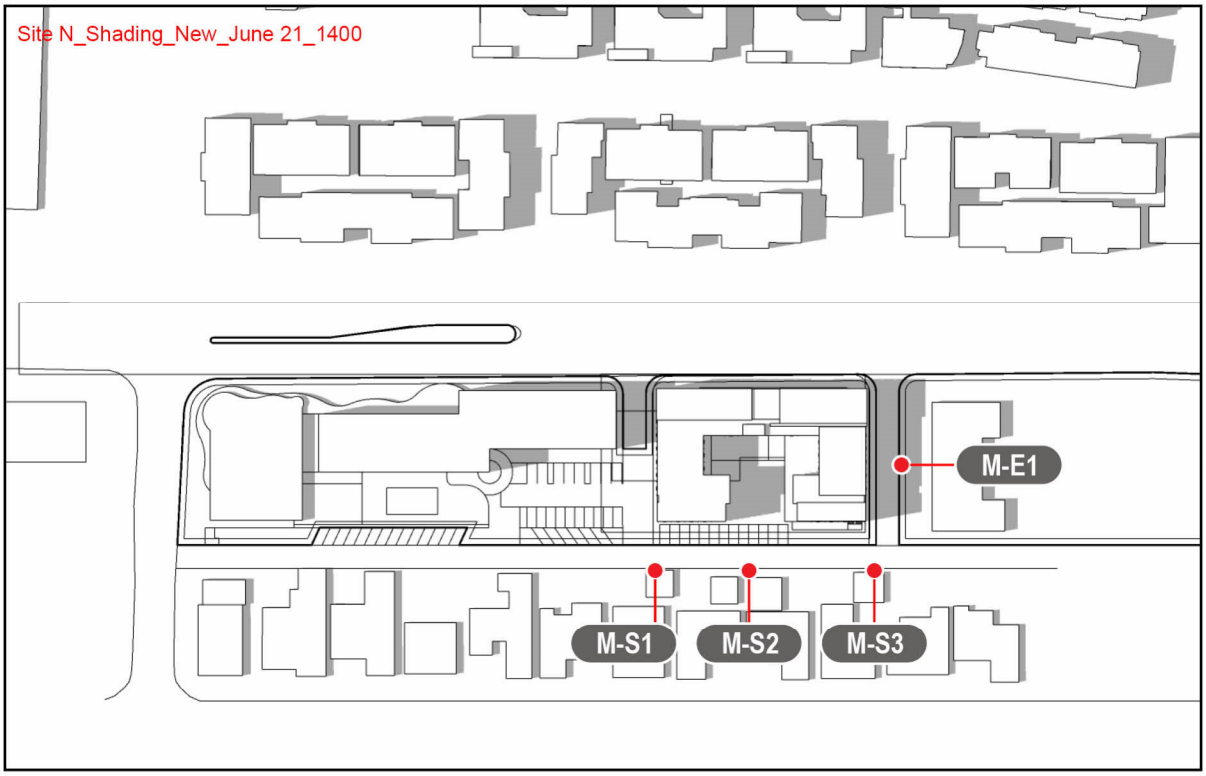
M-S3


Site N_Shading_New_June 21_1400
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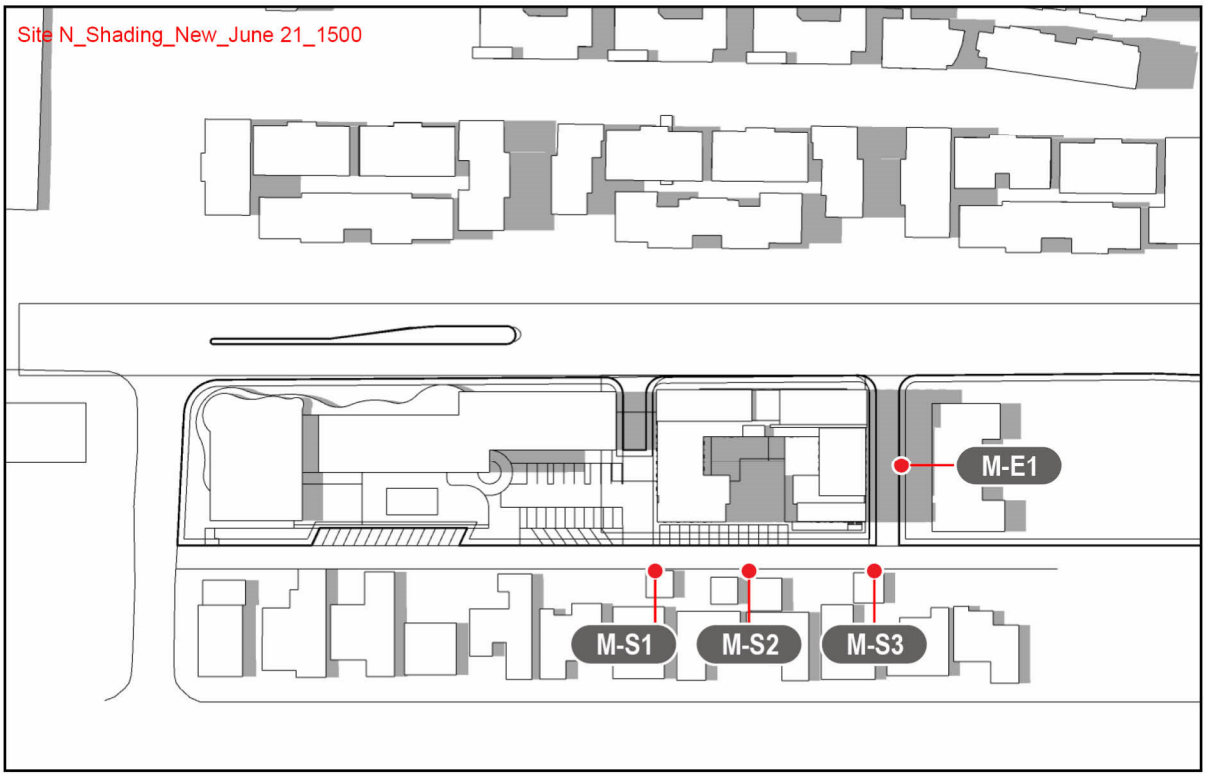
M-S2
M-S3


Site N_Shading_New_June 21_1500
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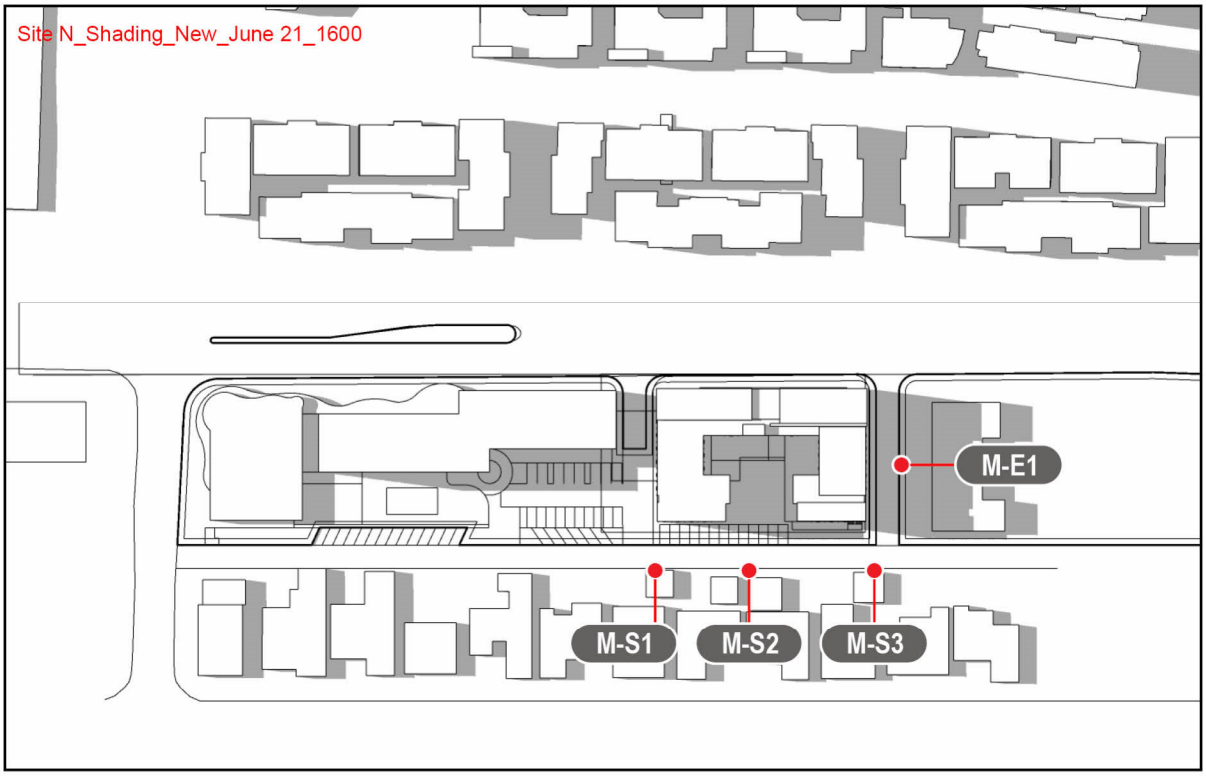
M-S2
M-S3


Site N_Shading_New_June 21_1600
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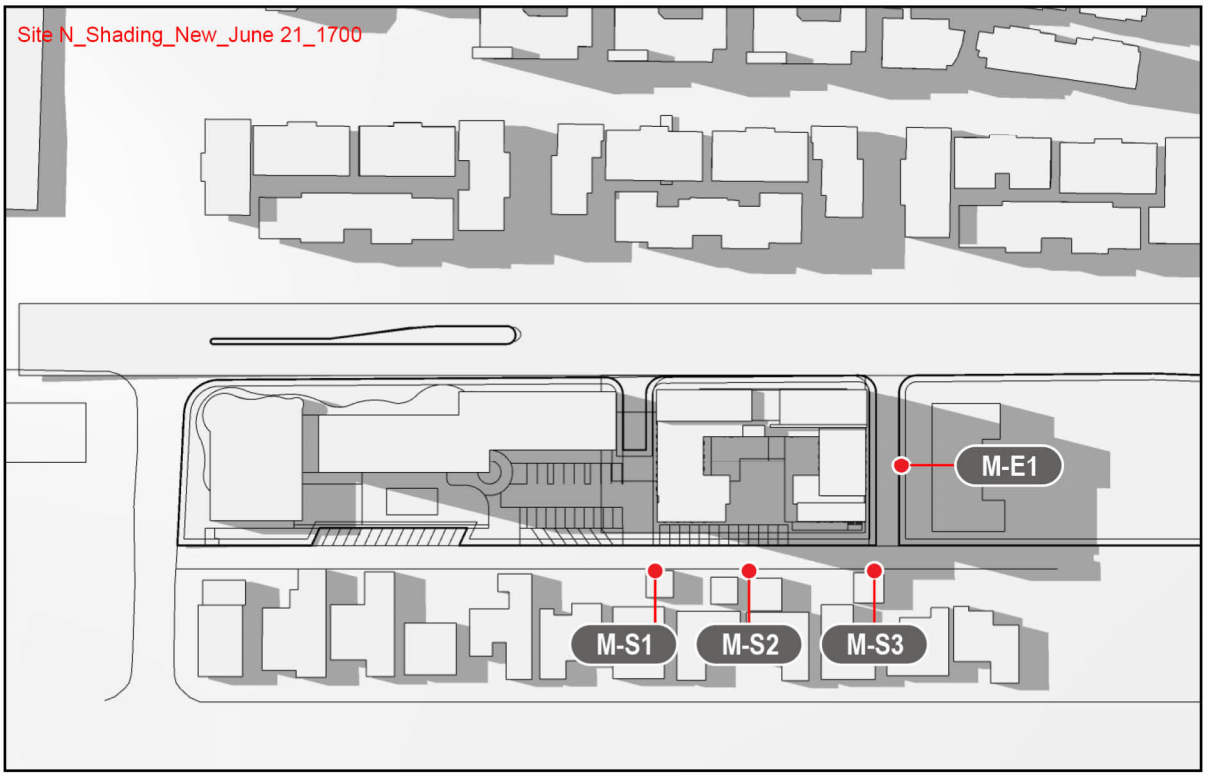
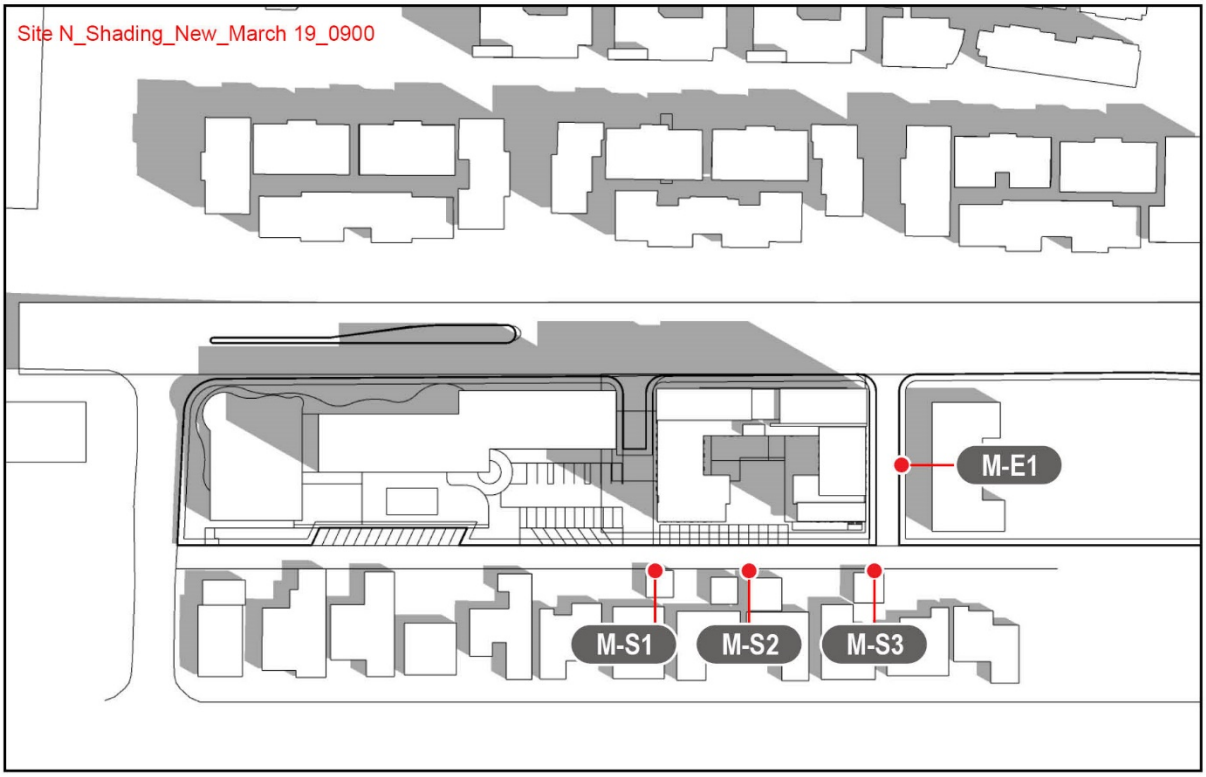
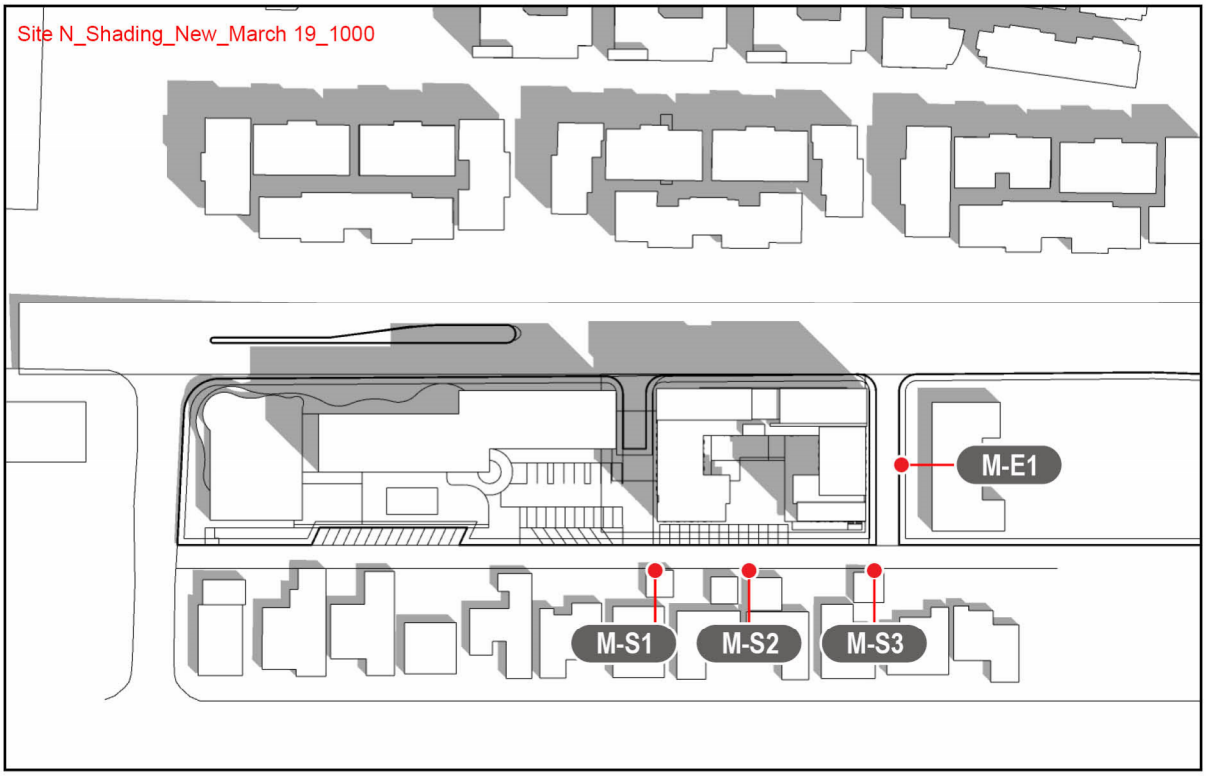

Site N_Shading_New_June 21_1700
M-E1
M-S1
M-S2
M-S3

Site N
Project Shading

Equinox - March 19, 2024

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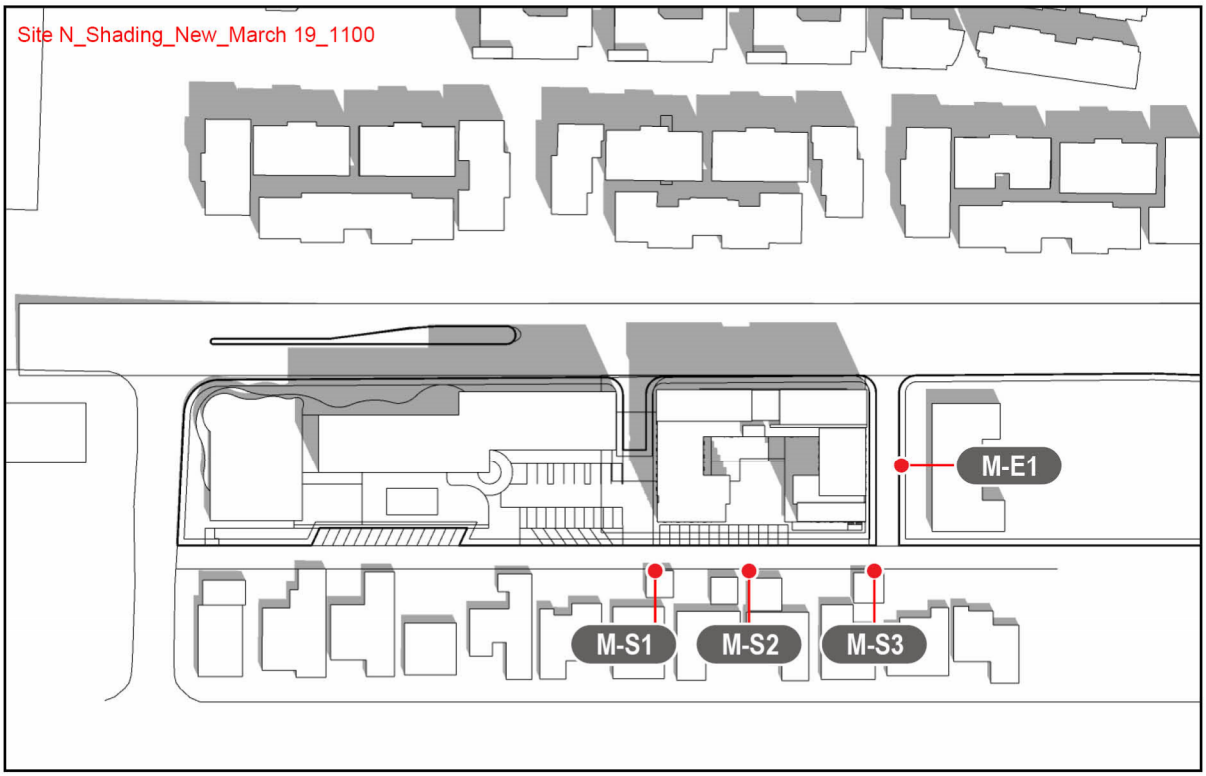
M-S2
M-S3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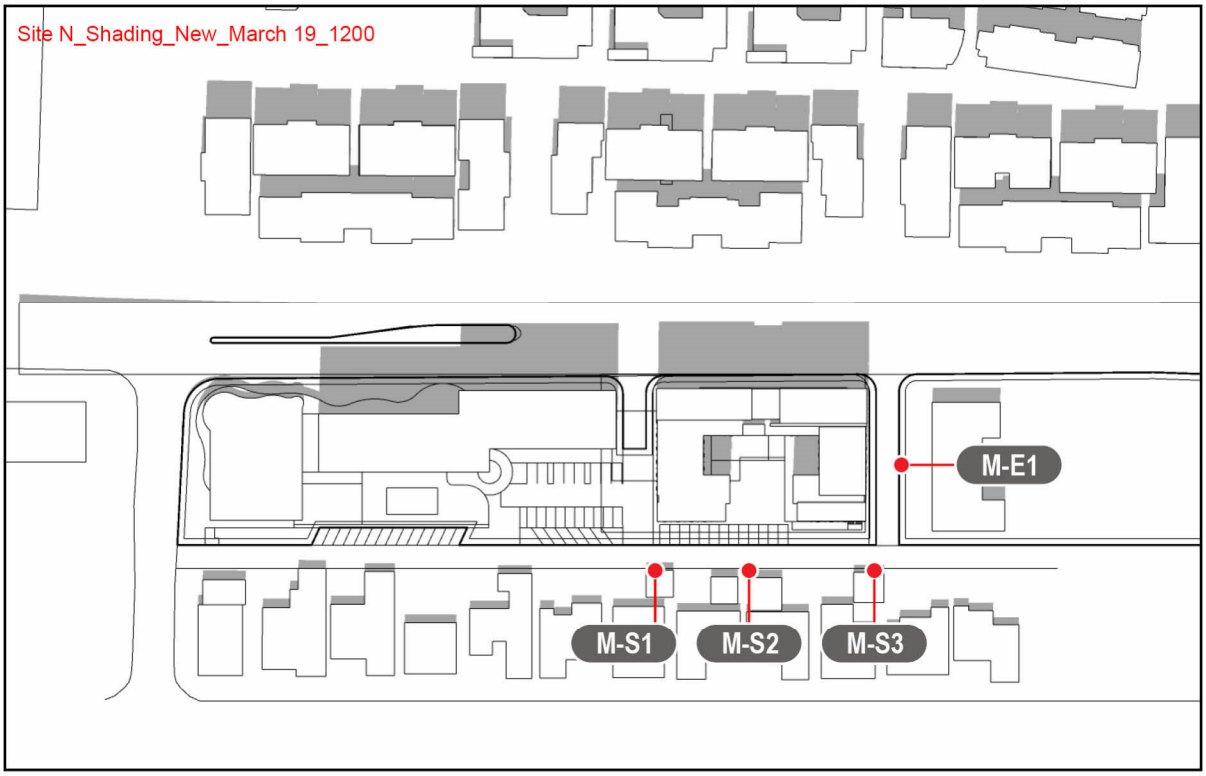
M-S3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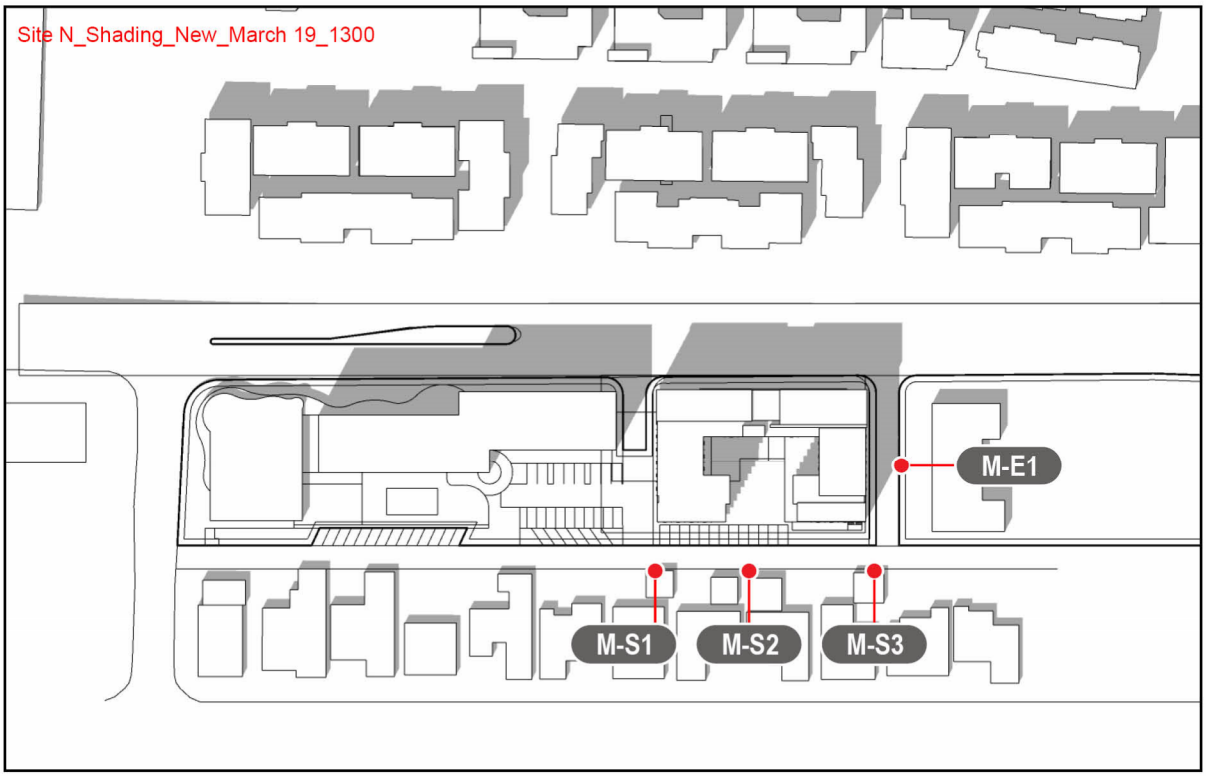
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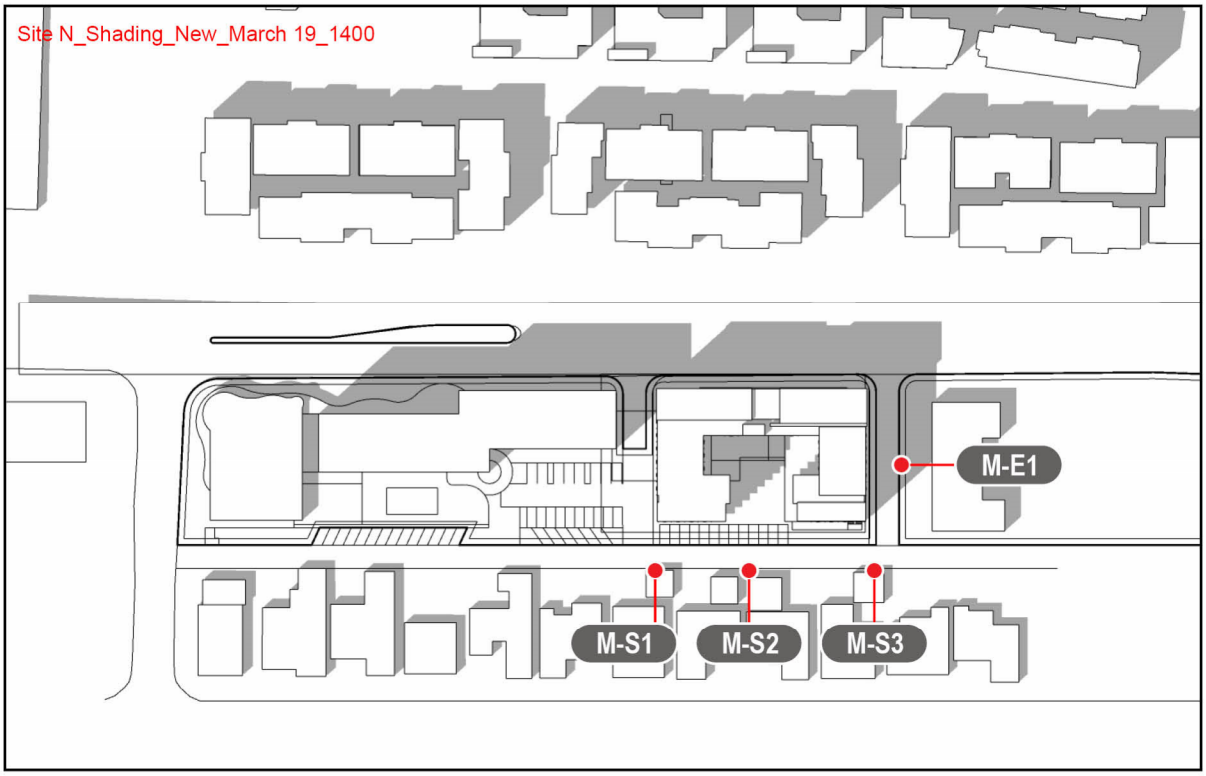
M-S3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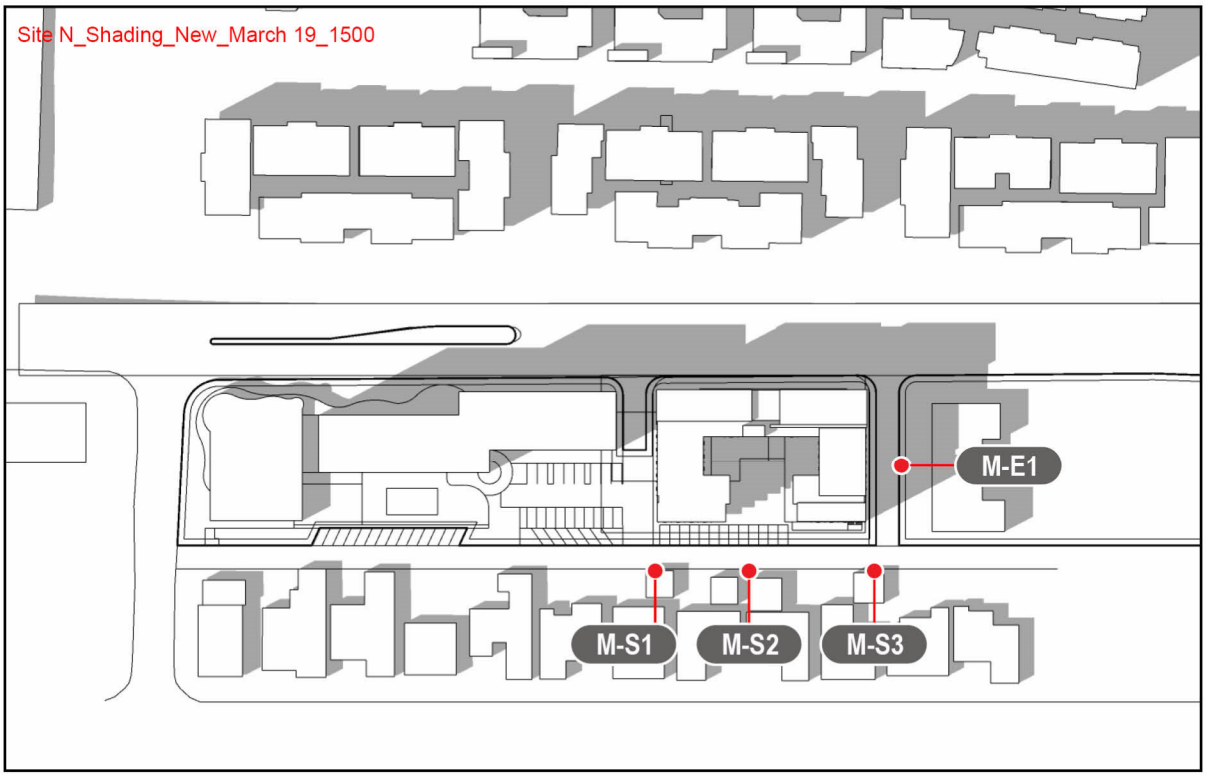
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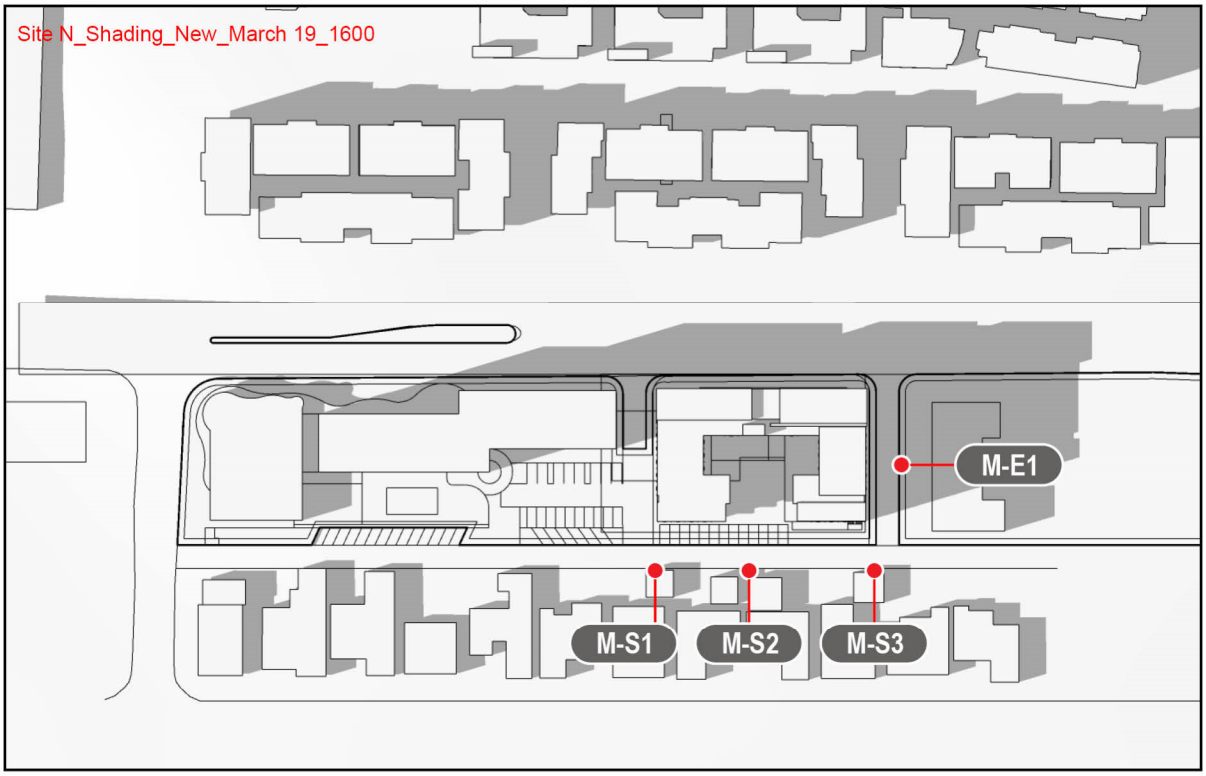
M-S3


Site N_Shading_New_March 19_1600
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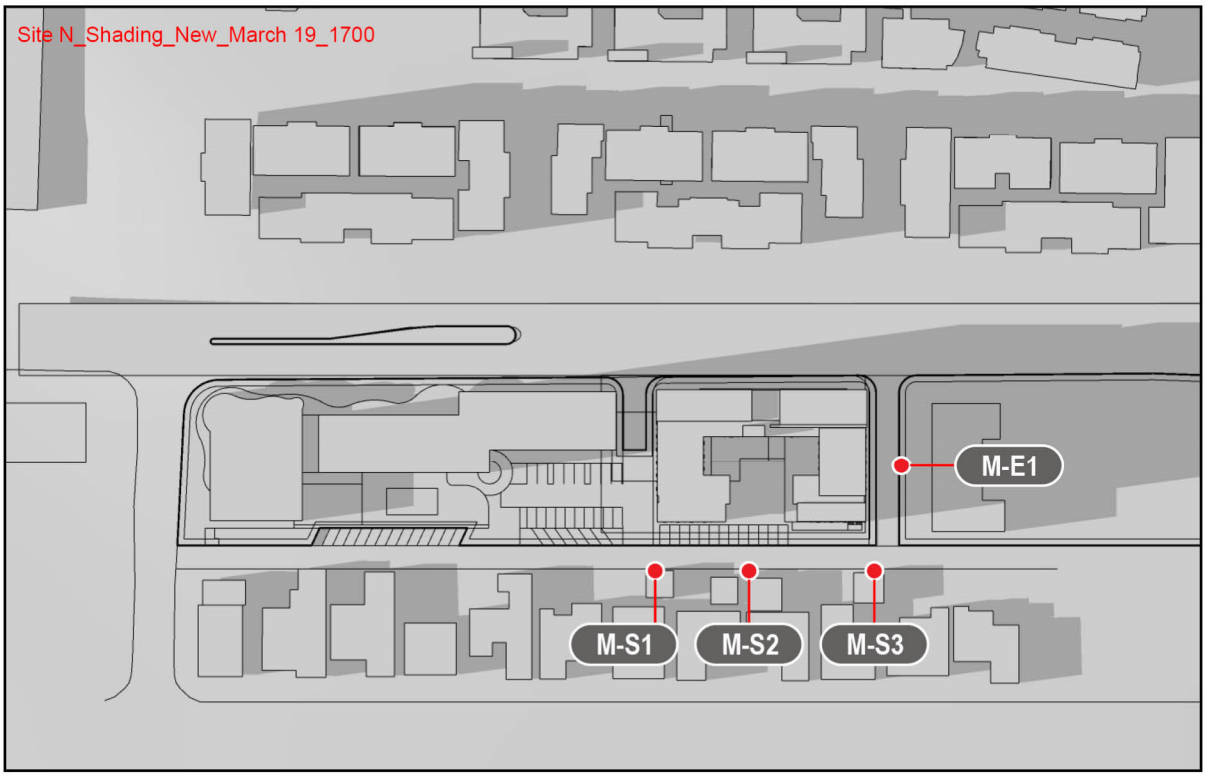
Site N_Shading_New_March 19_1700
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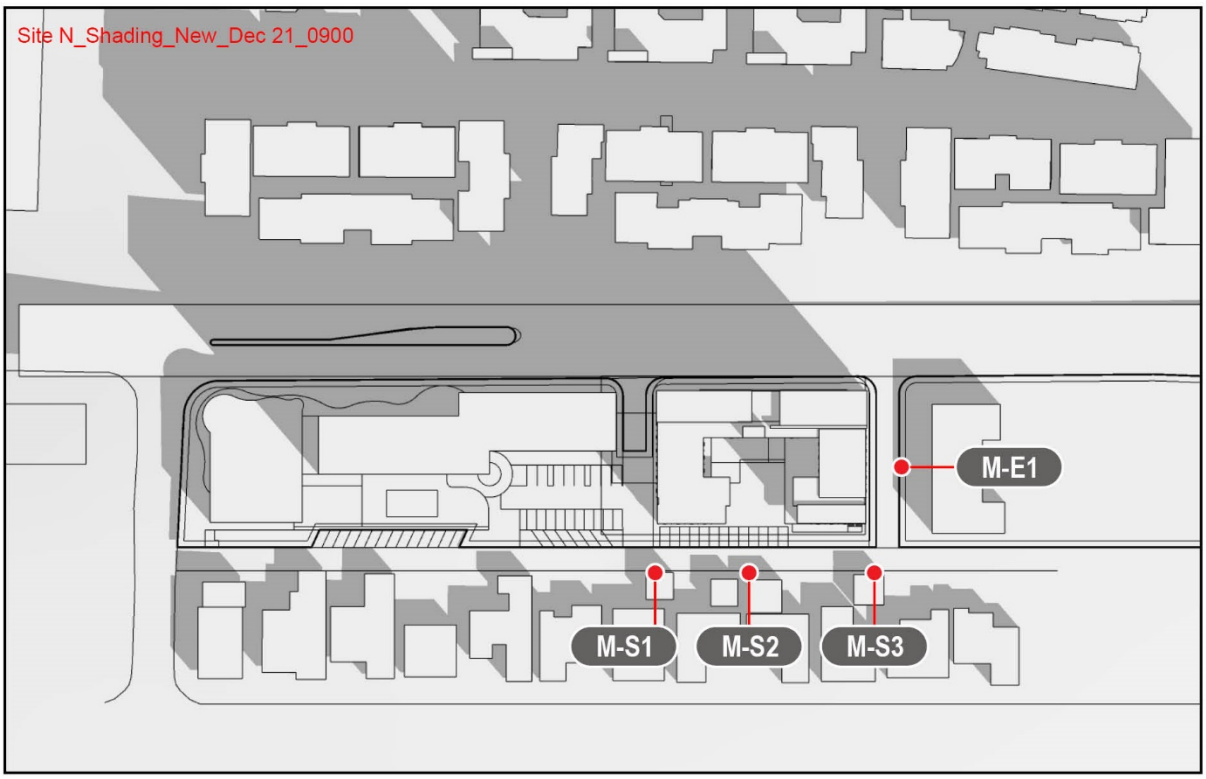
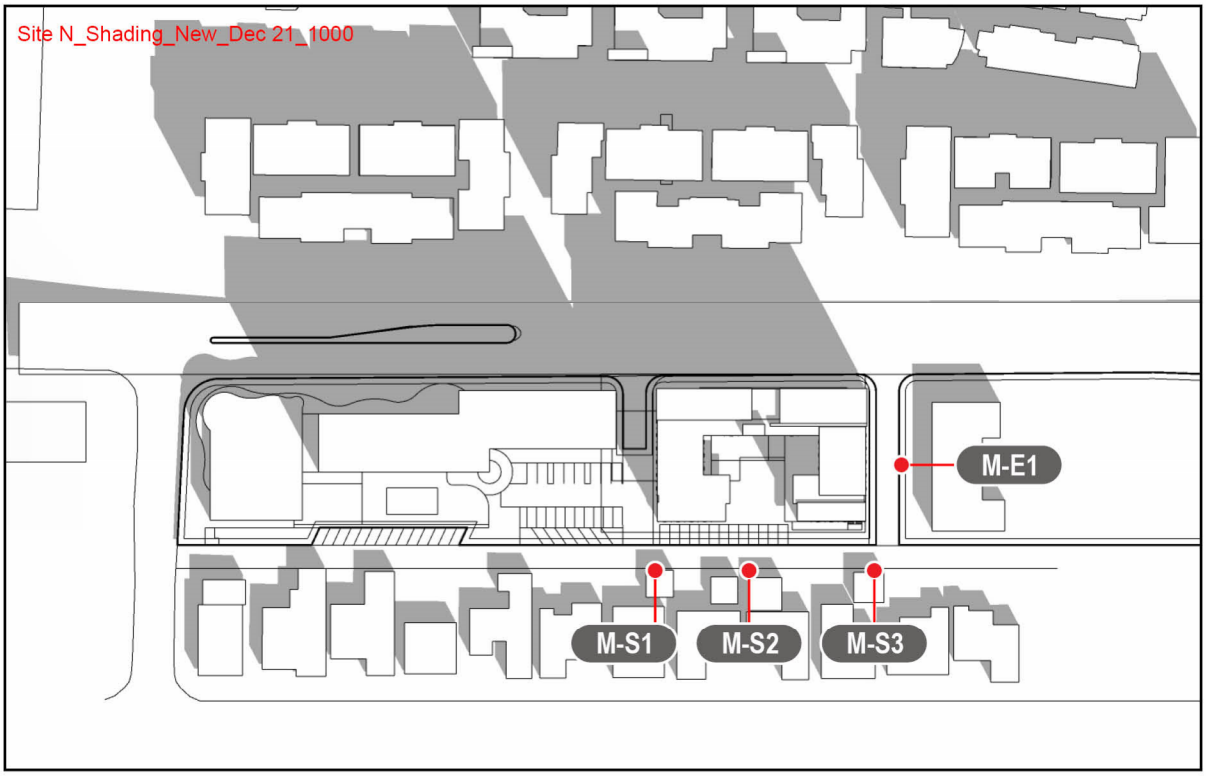
M-S3

Site N
Project Shading

Winter Solstice - Dec 21, 2024

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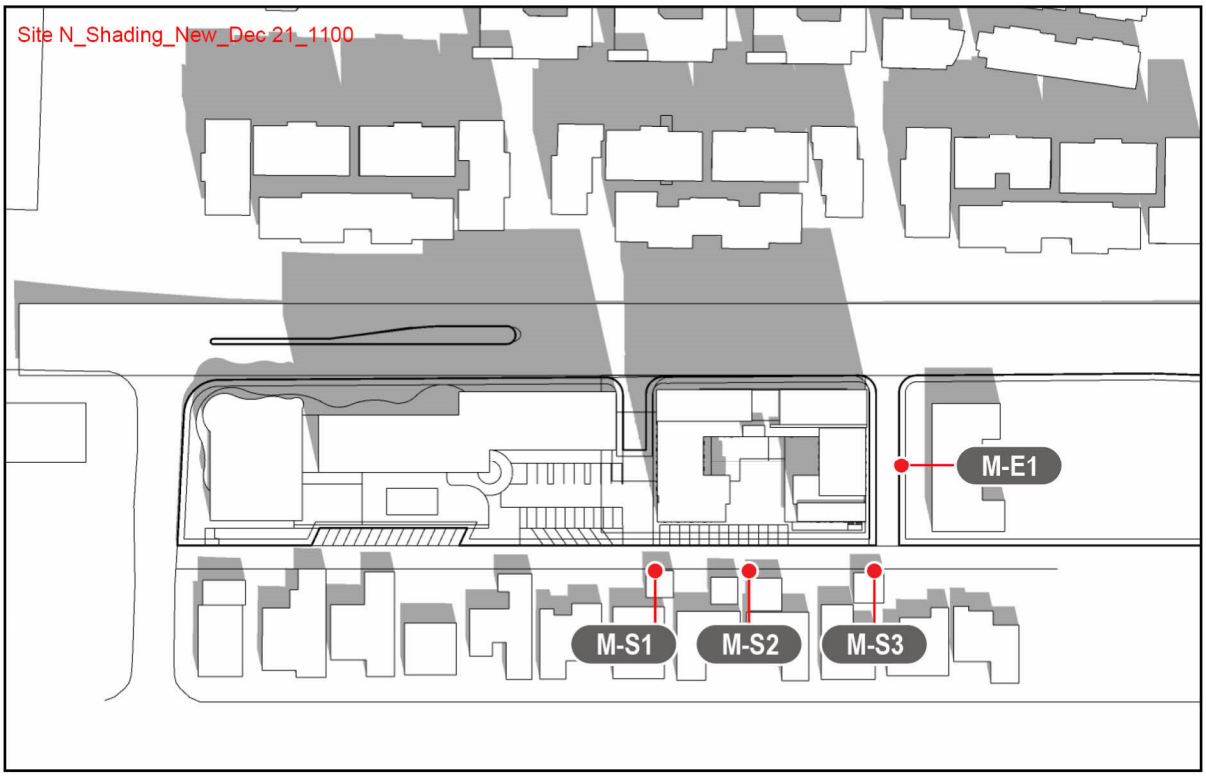
M-S3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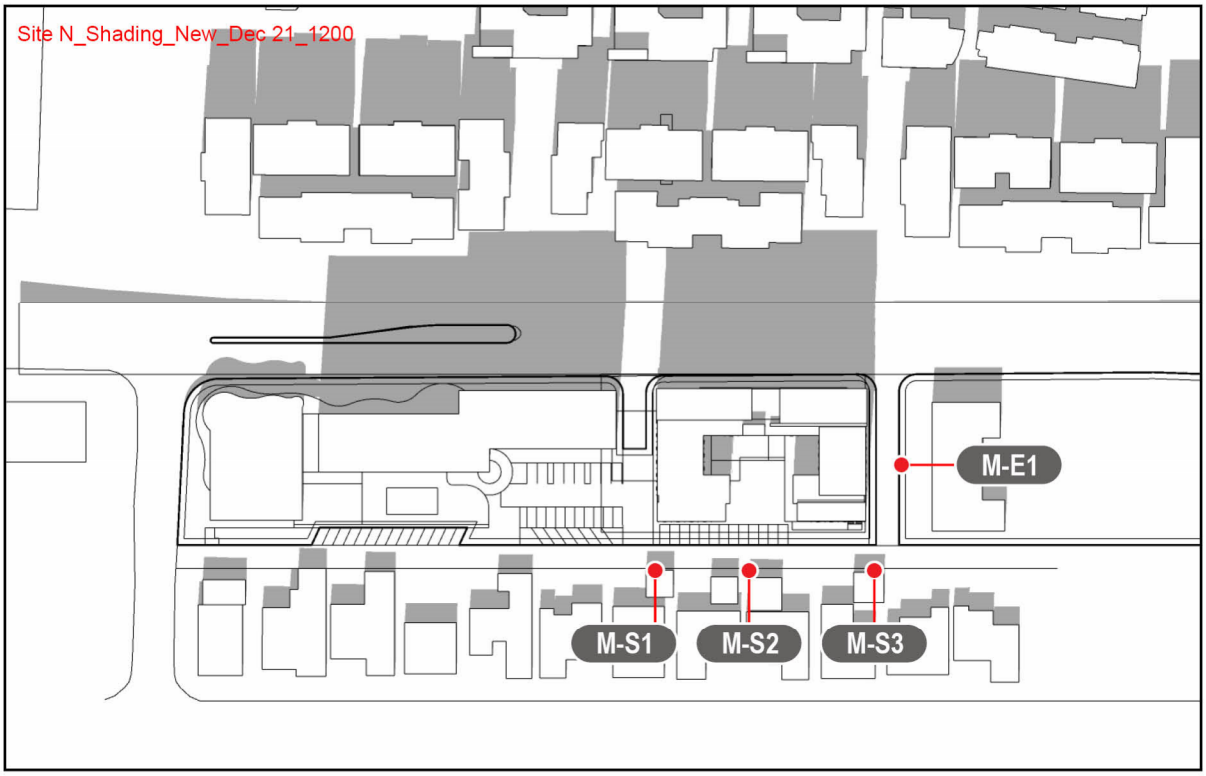
M-S3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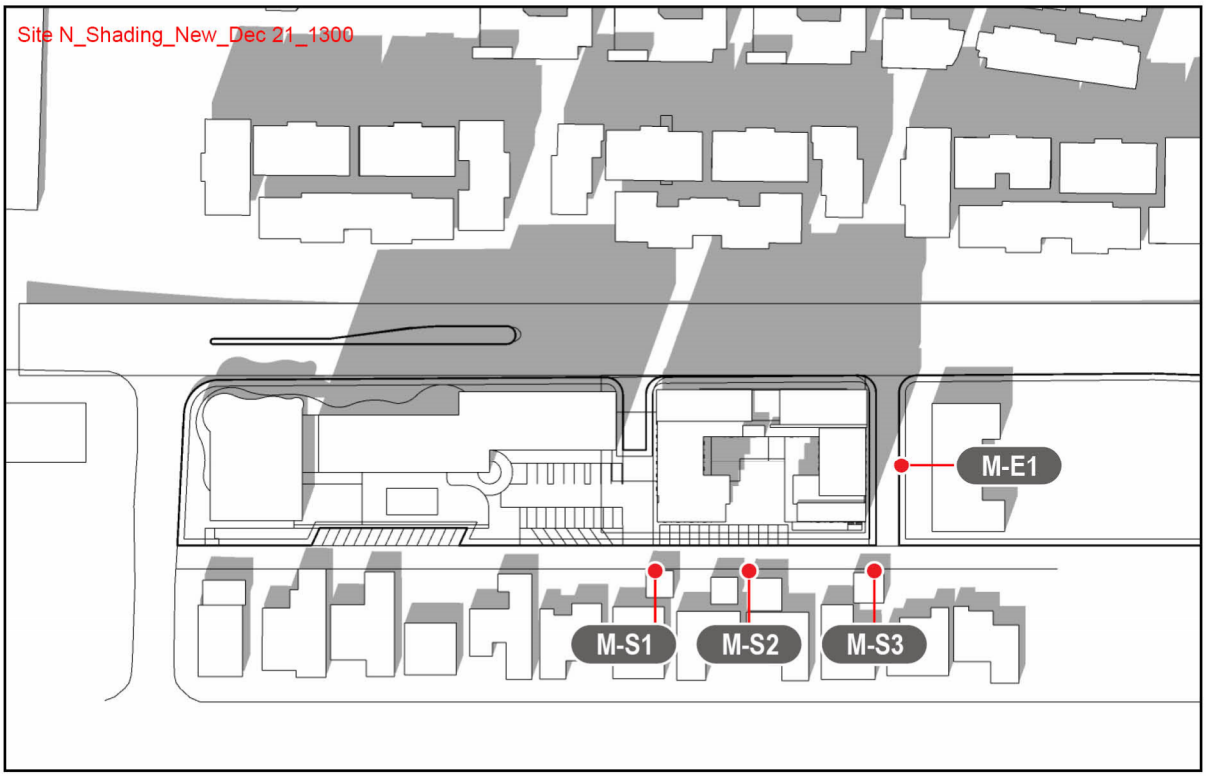
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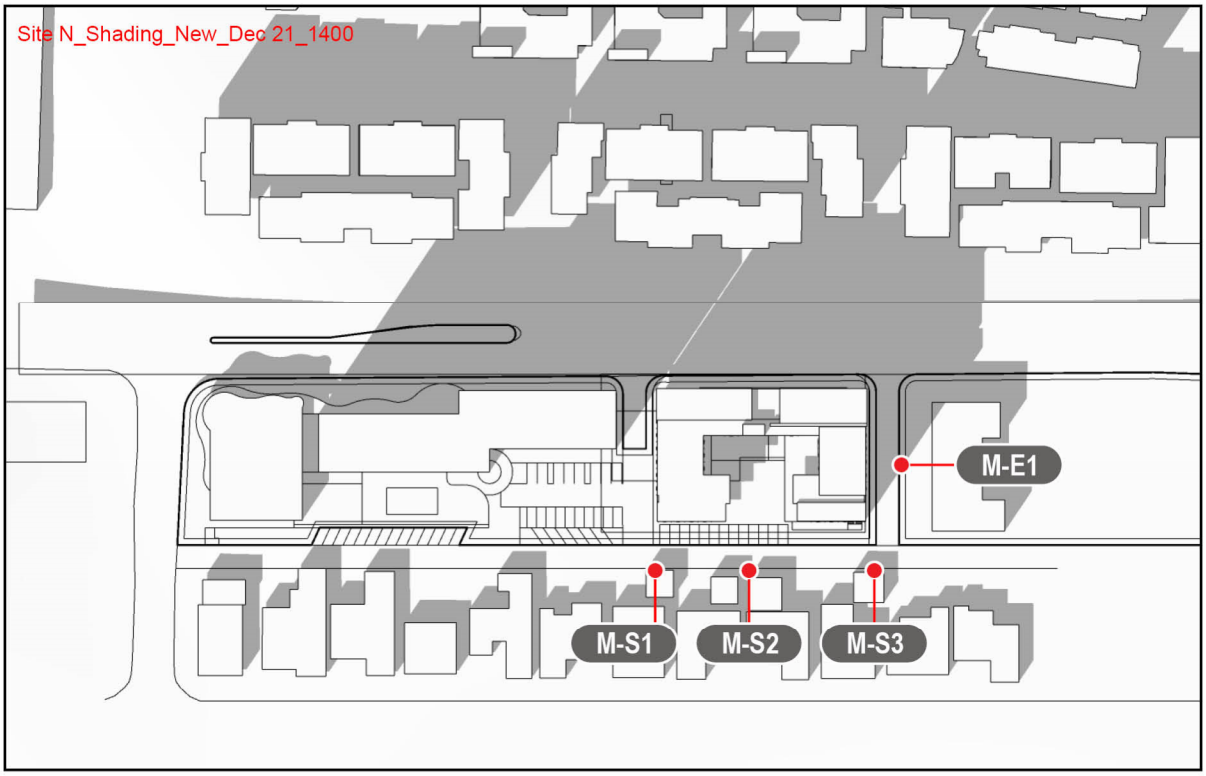
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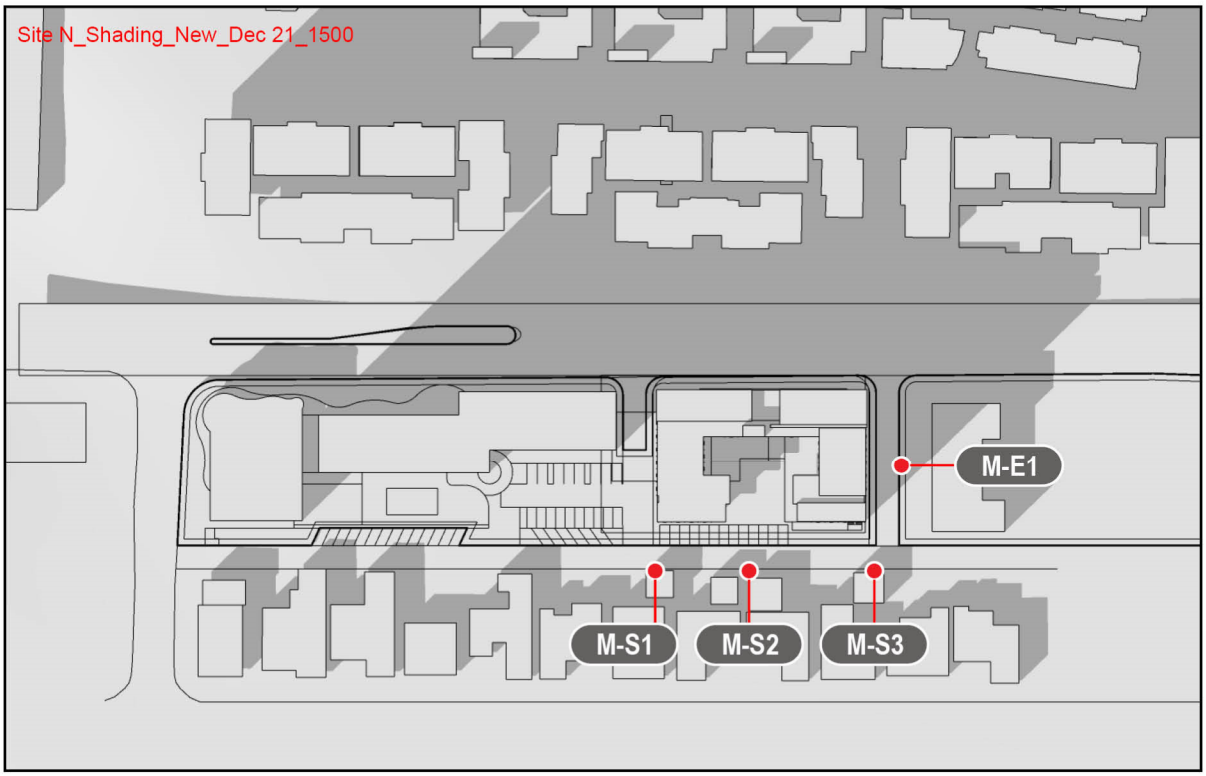
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