

December 2025



Cool Roof Feasibility and Site Analysis for Public Sector Facilities

FINAL COOL ROOF FEASIBILITY REPORT

PREPARED FOR
South Bay Cities Council of Governments (SBCCOG)

SUBMITTED BY

AESC, a Franklin Energy Company

Table of Contents

1. Introduction	1
2. Methodology Overview	2
2.1 Gather Site Information	2
2.2 Evaluation Criteria for Site Suitability	2
2.3 SBCCOG Review and Site Visits	3
3. Findings and Site Plans	5
3.1 City of Carson – Veterans Park and Sports Complex	6
3.2 City of Gardena – Police Department	11
3.3 City of Gardena – Rush Gymnasium and Human Services	16
3.4 City of Inglewood – Darby Park Sports Building	21
3.5 City of Inglewood – Library (Crenshaw Imperial Branch)	27
3.6 City of Inglewood – Rogers Park Community Center	33
3.7 City of Inglewood – Civic Center Police Station	38
3.8 City of Lomita – City Hall	44
3.9 City of Redondo Beach – City Hall	50
3.10 City of Redondo Beach – Civic Center Library	56
3.11 City of Redondo Beach – Civic Center Police Department	61
3.12 City of Torrance – City Hall	67
3.13 City of Torrance – Cultural Recreation Center	72
3.14 City of Torrance – Police Department	77
4. Summary of Findings	83
5. Next Steps	85
6. Appendix A	86
6.1 Map of SBCCOG Territory	86
6.2 Site Data Collection Template	87

7. Appendix B - Research and Literature Review Report.....88

8. Appendix C - Site Identification and Selection Methodology for Cool Roof Implementation Memorandum89

9. References.....90

Figures

Figure 1 Aerial View of Carson Veterans Park and Sports Complex 6

Figure 2 Existing Green Metal Roof 7

Figure 3 Proposed Solar PV – Carson Veterans Park and Sports Complex 11

Figure 4 Aerial View of Gardena Police Department 12

Figure 5 Existing Modified Bitumen Roof..... 12

Figure 6 Aerial View of Gardena Rush Gymnasium and Human Services..... 16

Figure 7 Existing Concrete Roof with Gravel Coating..... 17

Figure 8 Proposed Solar PV – Gardena Rush Gymnasium and Human Services 21

Figure 9 Aerial View of Inglewood Darby Park Sports Building..... 22

Figure 10 Existing Mix of Roof- White Roof, Built up with Gravel and Asphalt Shingles 23

Figure 11 Proposed Solar PV – Inglewood Darby Park Sports Building 27

Figure 12 Aerial View of Inglewood Library 28

Figure 13 Existing Built up Roof with Gravel Coating on Top 28

Figure 14 Proposed Solar PV – Inglewood Library..... 32

Figure 15 Aerial View of Inglewood Rogers Park Community Center 33

Figure 16 Existing Built up Roof with Gravel Coating on Top 34

Figure 17 Proposed Solar PV – Inglewood Rogers Park Community Center..... 38

Figure 18 Aerial View of Inglewood Civic Center Police Station 39

Figure 19 Existing Built up Roof with Gravel Coating on Top 39

Figure 20 Proposed Solar PV – Inglewood Civic Center Police Station..... 43

Figure 21 Aerial View of Lomita City Hall 44

Figure 22 Existing Built-Up Roof with Gravels..... 45

Figure 23 Proposed Solar PV – Lomita City Hall 49

Figure 24 Aerial View of Redondo Beach City Hall..... 50

Figure 25 Existing Asphalt (left) and Built-Up Roof with Gravel (Right) 51

Figure 26 Existing Roof Condition 51

Figure 27 Proposed Solar PV – City of Redondo Beach City Hall 55

Figure 28 Aerial View of Redondo Beach Civic Center Library..... 56

Figure 29 Existing Asphalt and Metal Roof..... 57

Figure 30 Proposed Solar PV – City of Redondo Civic Center Beach Library 61

Figure 31 Aerial View of Redondo Beach Civic Center Police Department..... 62

Figure 32 Existing Built-Up Roof with Gravel..... 62

Figure 33 Proposed Solar PV – City of Redondo Beach Civic Center Police Department 66

Figure 34 Aerial View of Torrance City Hall.....67
 Figure 35 Existing Asphalt Membrane Roof68
 Figure 36 Proposed Solar PV – Torrance City Hall72
 Figure 37 Aerial View of Torrance Cultural Rec Center73
 Figure 38 Existing Built up Roof with Gravel Coating on Top73
 Figure 39 Proposed Solar PV – Torrance Cultural Recreation Center.....77
 Figure 40 Aerial View of Torrance Police Department.....78
 Figure 41 Existing Asphalt Membrane Roof79
 Figure 42 Proposed Solar PV – Torrance Police Department.....82

Tables

Table 1 Evaluation Criteria for Site Cool Roof Suitability 2
 Table 2 List of Sites Suitable for Cool Roof 3
 Table 3 Energy Savings and Cost Summary- Carson Veterans Park and Sports Complex 9
 Table 4 List of Potential Incentive and Financing Program- Carson Veterans Park and Sports Complex..... 9
 Table 5 Energy Savings and Cost Summary- Gardena Police Department14
 Table 6 List of Potential Incentive and Financing Program- Gardena Police Department15
 Table 7 Energy Savings and Cost Summary- Gardena Rush Gymnasium and Human Services19
 Table 8 List of Potential Incentive and Financing Program- Gardena Rush Gymnasium and Human Services.....19
 Table 9 Energy Savings and Cost Summary- Inglewood Darby Park Sports Building25
 Table 10 List of Potential Incentive and Financing Program- Inglewood Darby Park Sports Building25
 Table 11 Energy Savings and Cost Summary- Inglewood Library31
 Table 12 List of Potential and Financing Incentive Program- Inglewood Library31
 Table 13 Energy Savings and Cost Summary- Inglewood Rogers Park Community Center.....36
 Table 14 List of Potential Incentive and Financing Program- Inglewood Rogers Park Community Center.....37
 Table 15 Energy Savings and Cost Summary- Inglewood Civic Center Police Station41
 Table 16 List of Potential and Financing Incentive Program- Inglewood Civic Center Police Station42
 Table 17 Energy Savings and Cost Summary- Lomita City Hall47
 Table 18 List of Potential Incentive and Financing Program- Lomita City Hall48
 Table 19 Energy Savings and Cost Summary- City of Redondo Beach City Hall54
 Table 20 List of Potential Incentive and Financing Program- City of Redondo Beach - City Hall54
 Table 21 Energy Savings and Cost Summary- City of Redondo Beach Civic Center Library.....59
 Table 22 List of Potential Incentive and Financing Program- City of Redondo Beach – Civic Center Library59

Table 23 Energy Savings and Cost Summary- City of Redondo Beach Civic Center Police Department	64
Table 24 List of Potential Incentive and Financing Program- City of Redondo Beach - Civic Center Police Department	65
Table 25 Energy Savings and Cost Summary- Torrance City Hall.....	70
Table 26 List of Potential Incentive and Financing Program- Torrance City Hall.....	71
Table 27 Energy Savings and Cost Summary- Torrance Cultural Rec Center.....	75
Table 28 List of Potential Incentive and Financing Program- Torrance Cultural Rec Center.....	76
Table 29 Energy Savings and Cost Summary- Torrance Police Department.....	81
Table 30 List of Potential Incentive and Financing Program- Torrance Police Department.....	81
Table 31 Summary Table - All Sites	84

1. Introduction

This report outlines a comprehensive methodology for identifying, evaluating, and prioritizing suitable sites for cool roof implementation within the South Bay Cities Council of Governments (SBCCOG) region. A regional map and a list of cities are provided in Appendix A. The report also compiles site specific recommendations that can be used by each city as standalone reports. The goal of this project is to bolster regional resilience and sustainability by leveraging cool roof technologies to mitigate extreme heat, decrease energy use, and support the development of community resiliency hubs.

An evaluation criterion was established to screen and identify sites feasible for cool roof technology. Following this site identification and preliminary site recommendations, detailed feasibility studies and tailored implementation plans were developed for a select number of approved sites. These site-specific analyses assessed key factors including expected energy savings, installation costs and timelines, operational impact if any, cost-effectiveness, payback periods, potential funding sources, and suitable cool roof coating systems.

The strategic deployment of cool roofs offers substantial co-benefits. These include significant mitigation of the urban heat island (UHI) effect, reductions in greenhouse gas (GHG) emissions, enhanced indoor comfort, and an extended lifespan for both the roof and HVAC systems. Critically, these installations are identified as a foundational step for future rooftop solar photovoltaic (PV) systems, further enhancing building performance and long-term energy resiliency. This report concludes with preliminary recommendations for the most feasible locations for immediate cool roof deployment, providing a clear path forward for the SBCCOG’s member agencies.

At the outset of the project, 28 sites were initially shortlisted as potential candidates for cool roof retrofits. This preliminary selection was based on available building data and general suitability criteria. Following further consultation and input from participating cities within the region, the list was refined to 15 priority sites deemed most viable for detailed evaluation.

Subsequently, site visits were conducted at each of the 15 locations to gather essential data required for a comprehensive cool roof feasibility analysis. Following the completion of the site inspections, one location was excluded from further consideration due to conditions that rendered a cool roof retrofit impractical. As a result, detailed analysis was performed on the remaining 14 sites. The findings from this analysis—including estimated energy savings and cost-effectiveness—are presented in “Table 31 Summary Table - All Sites”.

2. Methodology Overview

SBCCOG provided AESC with the “South Bay Facilities” spreadsheet, which included details such as the city name, property name, annual electricity usage, and annual natural gas usage for each site, as pulled from Energy Star Portfolio Manager. A few sites were already marked as “interested,” based on specific interest expressed by the respective cities in this spreadsheet. The site selection process is structured around the two steps outlined below.

2.1 Gather Site Information

Using the data provided by SBCCOG, AESC conducted a preliminary assessment of each building via Google Maps to gather additional information and choose sites that could be good candidates for cool roof upgrades. The team aimed to identify the building type, roof type, roof slope, roof color, presence of existing solar PV systems, extent of roof shading, climate zone (CZ), and whether the building is air conditioned. All the collected information was compiled and organized within the spreadsheet. The method supports regional goals for sustainability and resilience and offers a clear and consistent way to evaluate each site.

2.2 Evaluation Criteria for Site Suitability

Each site was categorized into one of the following three annual electricity usage levels:

- Low electricity usage - below 75,000 kWh
- Medium electricity usage - between 75,000 kWh and 250,000 kWh
- High electricity usage - more than 250,000 kWh

With all the information gathered and organized in the spreadsheet, each site was then assessed based on the following criteria listed in Table 1.

Table 1 Evaluation Criteria for Site Cool Roof Suitability

Evaluation Criteria	Description
Roof Condition	Several sites were observed to have aging roofs with potential imminent leaks, faded colors and visibly poor aesthetics. For these locations, if roof replacement is already planned or necessary, installing a cool roof is considered a smart and beneficial choice—regardless of the building’s energy usage, size, or presence of rooftop air conditioning equipment.
Energy Usage	Medium- and high-usage sites were considered for cool roof suitability since they offer greater potential for energy savings. Low-usage sites were excluded due to limited impact.
HVAC System Presence	Sites that are fully conditioned were identified as strong candidates for cool roof installation.
Roof Type and Color	Low-slope or flat roofs with darker colors (e.g., brown, grey or tan) were considered suitable for cool roof retrofits.
Roof Size and Orientation	Larger, flatter roofs with maximum solar exposure were prioritized for evaluation due to their higher potential for energy savings.

Evaluation Criteria	Description
Climate Zone	Sites in CZ08 experience significantly higher cooling loads, making them ideal candidates for cool roof retrofits. Additional information on climate zones and corresponding temperatures can be found in the Appendix B - Research and Literature Review Report
Building Type	Facilities that serve critical community functions such as libraries and community centers, particularly those that remain operational during extreme heat events, power outages, or other climate-related emergencies were prioritized. These building types were selected due to their role in providing essential services and shelter during times of environmental stress, making them ideal candidates for climate-resilient upgrades.

Refer to the Appendix C - Site Identification and Selection Methodology for Cool Roof Implementation Memorandum for an initial list of potential sites identified as suitable for a cool roof retrofit. These locations were pinpointed through a preliminary assessment using Google Maps observations and the above defined set of evaluation criteria.

2.3 SBCCOG Review and Site Visits

Once the information was submitted, SBCCOG initiated the discussion with all the participating cities and the following tasks were completed:

- AESC presented the methodology overview and evaluation criteria for cool roof suitability during an SBCCOG stakeholder meeting with all the cities. The cities were given an opportunity to provide feedback on the selection criteria, and no objections were raised.
- Following the meeting, AESC identified and requested additional data to verify and clarify site eligibility, particularly for those sites listed in the “maybe” category.
- Based on the response received from the cities, AESC compiled a list of 15 suitable sites listed in Table 2. The City of Gardena requested that only their Police Department be considered and to exclude their City Hall and Fire Station. These buildings share the same campus as the Police Department, but they were excluded because their roofs had been recently replaced.

Table 2 List of Sites Suitable for Cool Roof

City- Property Name	Address	Building Type
Carson - Veterans Park and Sports Complex	22400 Moneta Ave Carson, CA 90745	Sport Complex
Gardena – Police Department	1718 W 162nd St Gardena, CA, 90247	Police Station
Gardena - Rush Gym & Human Services & Rush Pool	1651 W 162nd St Gardena, CA 90247	Gym

City- Property Name	Address	Building Type
Inglewood - Civic Center Police Station	1 W. Manchester Blvd Inglewood, CA 90301	Police Station
Inglewood - Darby Park	3400 W Arbor Vitae St Inglewood, CA 90305	Park Buildings
Inglewood - Library Branch - Crenshaw Imperial	11141 Crenshaw Blvd Inglewood, CA 90303	Library
Inglewood - Rogers Park - Community Center	400 W Beach Ave Inglewood, CA 90302	Senior Center
Lomita - City Hall	24300 Narbonne Ave Lomita, CA 90717	Office
Redondo Beach - Aviation Gymnasium	1935 Manhattan Beach Blvd Redondo Beach, CA 90278	Gym
Redondo Beach - City Hall	415 Diamond St Redondo Beach, CA 90277	City hall - Office
Redondo Beach - Civic Center Main Library	303 N Pacific Coast Hwy Redondo Beach, CA 90277	Library
Redondo Beach - Civic Center PD	401 Diamond St Redondo Beach, CA 90277	Police Station
Torrance - City Hall	3031 Torrance Blvd Torrance, CA 90503	Large Office
Torrance - Cultural Ctr Rec Bldg.	3330 Civic Center Dr Suite N Torrance, CA 90503	Assembly/Community Center
Torrance - Police Department HQ	3300 Civic Center Dr N Torrance, CA 90503	Police Station

- AESC developed a site data collection spreadsheet, which is included in the Appendix A of the report. SBCCOG shared this spreadsheet with relevant city representatives, requesting as much detail as possible prior to conducting detailed feasibility assessments.
- SBCCOG coordinated the site visits, grouping multiple sites within the same city on a single day. AESC conducted the visits in three rounds, gathering as much data as possible. To support data collection, SBCCOG followed up with cities by requesting as-built drawings and utility data. *Despite these efforts, several data gaps persisted due to the unavailability of as-built documentation and utility data.*
- AESC used the available site visit data along with any supplemental information provided by the cities to perform savings and financial analyses for each site. Due to gaps in the data, several assumptions were made, which are documented in the findings and site plans section for each location.

3. Findings and Site Plans

AESC's recommendations for cool roof retrofits were developed based on on-site field observations and direct input from facility personnel at each location. Each site was thoroughly evaluated to determine the most appropriate implementation strategy.

The core recommendation strategy was contingent on the existing roof's condition.

- **Cool Roof Coating:** If the existing roof had sufficient remaining useful life, a cost-effective cool roof coating application was recommended.
- **New Roof Installation:** If the roof had passed its effective useful life, the recommendation was for a full roof replacement incorporating a cool roof coating. If no information on roof replacement was available, we assumed the roof had not been replaced since the building's original construction. This assumption is standard practice in facility assessments because roof replacements are major capital projects that are typically documented in maintenance logs or asset management systems. The absence of such records generally indicates that no replacement has occurred.

Potential energy savings were calculated using an online tool developed by the U.S. Department of Energy's (USDOE) Oak Ridge National Laboratory (<https://coolroof.ornl.gov/>). Inputs to the calculator included building location, insulation R-value, solar reflectance (SR) and thermal emittance (TE) of the roof covering, and HVAC system efficiency. The tool provided outputs such as estimated energy and cost savings from the cool roof retrofit, as well as cooling and heating loads expressed in BTU per sq. ft. per year which were converted to kWh to calculate the savings. Two scenarios were analyzed for each site: the baseline (existing roof condition) and the proposed cool roof condition. Savings were estimated using the formula:

$$\begin{aligned} & \text{Annual Electricity Savings (kWh)} \\ & = (\text{Baseline load} - \text{Proposed load}) \times \text{conditioned roof surface area} \end{aligned}$$

Of the 15 assessed sites in Table 2, the Redondo Beach Aviation Gymnasium was excluded from further analysis. This decision was made because the building's HVAC system has been disabled for over a year. Without an active mechanical conditioning system, the expected energy and cost savings typically associated with a cool roof retrofit would be negligible, resulting in poor project cost-effectiveness. However, should there be plans to install air conditioning in the future, implementing a cool roof beforehand should be considered as a passive, zero-energy strategy to help reduce indoor temperatures.

The following section outlines site-specific information, encompassing data collection efforts, energy and financial analyses, and tailored recommendations for cool roof retrofits. The sequence of sites presented in this section does not reflect their ranking. Instead, sites located within the same city are grouped together, with cities listed in alphabetical order to facilitate SBCCOG's efficient distribution of findings and site plans to the respective municipalities.

3.1 City of Carson – Veterans Park and Sports Complex

Site Visit

A site visit was conducted on October 2, 2025. During the initial visit, Scott Lin of AESC met with Reata Kulcsar, Energy and Sustainability Officer from the City of Carson, to collect building data, including building area, roof area, roof type, roof color, roof insulation, and HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Carson Veterans Sports Complex is in Climate Zone 08 (CZ08) at 22400 Montera Avenue in Carson, California. It is a one-story building constructed in 1990, with an approximate sq.ft. age of 32,983, based on data provided by SBCCOG through Energy Star Portfolio Manager (ESPM). The roof area considered for the savings estimate was approximately 20,980 sq.ft. outlined in red in Figure 1, excluding the gymnasium area, which was unconditioned at the time of the site visit.



Figure 1 Aerial View of Carson Veterans Park and Sports Complex

The building has a steep-sloped metal roof with a green finish. Information regarding the most recent roof replacement or retrofit, as well as roof insulation type and thickness, was not available. Therefore, for the purpose of analysis, the roof was assumed to be original to the building’s construction, making it approximately 35 years old, with an estimated remaining useful life of 20 years. Metal roofing systems typically have an average lifespan ranging from 40 to 70 years (Roof Life Span, 2025).



Figure 2 Existing Green Metal Roof

During the site visit, the main gymnasium area was observed to be unconditioned and under renovation. According to site personnel, the renovation will include the installation of a dedicated HVAC system for the gym. Additionally, the City is planning to replace all existing HVAC units and considering installing a solar PV system. The roof was noted to have large skylights.

The building is conditioned by a combination of split systems and rooftop units (RTUs) with natural gas heating. HVAC system efficiency ranged from 10 to 13 SEER for cooling and approximately 80% for heating.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 394,091 kWh of electricity and 771 therms of natural gas annually. Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has an estimated remaining useful life of approximately 20 years, it is recommended to apply a white silicone cool roof coating to enhance energy efficiency and extend roof performance. Silicone coatings offer numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. These features make them a preferred solution for both commercial and residential buildings. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Before the cool roof application, a thorough roof inspection by a qualified roofing contractor is advised. This should include patching any minor leaks, sealing cracks, prepping penetrations, and thoroughly cleaning the roof surface. Once the roof is properly prepared, the cool roof coating can be applied.

The estimated installation time is approximately eight days: two days for inspection, minor repairs, and cleaning, followed by six days for coating application.

Cool roof coating applications generally result in minimal disruption to building operations and can typically be carried out without affecting daily activities. Because the coatings are applied externally and do not require entry into interior spaces, facilities can remain fully operational throughout the process. Temporary noise from equipment and mild odors from coating materials may occur, but these effects are usually brief and manageable. If there are concerns about indoor odor sensitivity, ensuring adequate ventilation is recommended.

Once a cool roof coating has been applied, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance, periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.39 and 0.82, respectively, were replaced with 0.74 and 0.84 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 20,980 sq.ft., excluding the gymnasium area, which was unconditioned at the time of the site visit.

Costs and Potential Incentives

The material cost for the white silicone cool roof coating is estimated at \$3.00 per sq.ft. of roof area, based on Appendix B - Research and Literature Review Report - Table 5. Based on data provided by a contractor, labor costs are estimated at \$3.10 per sq.ft. Additionally, roof cleaning is projected to cost \$0.40 per sq.ft. (Roof Cleaning Cost, 2025), and roof inspection along with minor repairs are included as a lump sum of \$1,000. Based on total roof area of 32,983 sq.ft. the estimated cost for applying the silicone cool roof coating is approximately \$215,390.

Although the gym is currently unconditioned, it is recommended to apply the cool roof coating to its roof as well. This will allow the facility to benefit from improved thermal performance and energy efficiency, especially since the gym is expected to receive its own HVAC system in the near future.

Energy Savings and Cost Summary Table

Table 3 outlines the energy savings and cost summary associated with the cool roof coating at this site. The simple payback period is currently higher due to the gym area being unconditioned, which limits the building’s overall energy savings. Additionally, the cost estimate includes the cool roof coating for the entire roof—gym included—which increases the total project cost and, consequently, extends the payback period.

Table 3 Energy Savings and Cost Summary- Carson Veterans Park and Sports Complex

Carson - Veterans Park - Sports Complex	
Estimated Annual Electricity Savings (kWh)	5,973
Estimated Annual Electricity Cost Savings	\$3,227
Estimated Cool Roof Coating Cost	\$215,390
Incremental Cost	NA
Simple Payback (years)	66.7
Estimated Implementation Timeline (days)	8
GHG Emission Reduction (Metric Tons of CO ₂)	1.16
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 4 List of Potential Incentive and Financing Program- Carson Veterans Park and Sports Complex

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify.

Incentive and Financing Program	Description
(SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

Based on discussions with site personnel, the city is considering the installation of a solar photovoltaic (PV) system at this location. The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed solar array is expected to have a total capacity of approximately 156 kW (DC rating) for the rooftop installation. The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof coating by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$279,679. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.

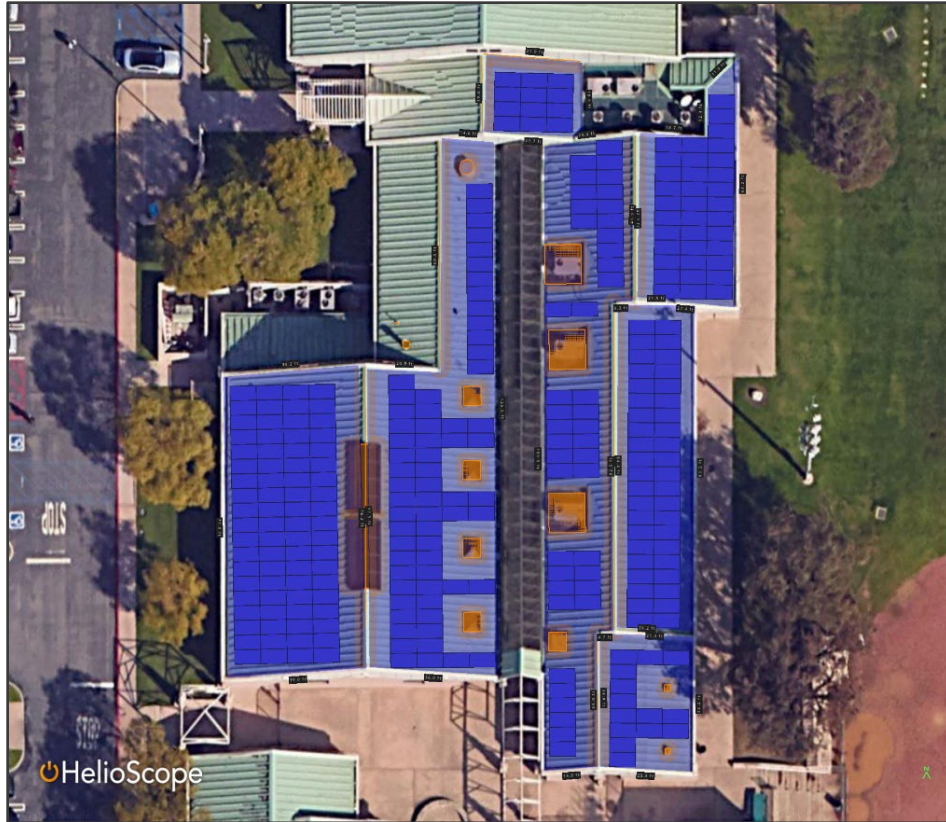


Figure 3 Proposed Solar PV – Carson Veterans Park and Sports Complex

3.2 City of Gardena – Police Department

Site Visit

A site visit was conducted on October 2, 2025. During the initial visit, Scott Lin of AESC met with Anthony Crow, a representative from the City of Gardena to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Gardena Police Department is in Climate Zone 08 (CZ08) at 1718 W 162nd Street, in Gardena, California. It consists of a one-story building with a basement constructed in the 1960s and a trailer addition added in 2010. The main building has an approximate sq. ft. of 23,147 per city representatives and a roof sq. ft. of 16,239 per the building’s as-built drawings. The trailer building is not considered relevant to the study as city representatives confirmed that its roof was re-rolled in the past year.



Figure 4 Aerial View of Gardena Police Department

The main building features a flat, gray modified bitumen roof with 1.5 inches of rigid insulation, as noted in the building drawings. City personnel indicated that information regarding the most recent roof replacement or retrofit was unavailable. Therefore, for the purpose of this analysis, the roof is assumed to be original to the building’s construction, making it approximately 55 to 65 years old. The roof is past its useful life, as modified bitumen roofs have an average lifespan ranging from 15 to 30 years (Roof Life Span, 2025). During the site visit, significant shading was observed on the roof.



Figure 5 Existing Modified Bitumen Roof

The building is conditioned using a combination of rooftop units (RTUs) equipped with heat pump heating and an air-cooled chiller, serving both the Police Department and City Hall. The average cooling efficiency of the HVAC system was estimated at a coefficient of performance (COP) of 3, based on assumed values of 13 SEER for the RTUs, 9 EER for the chiller, and 3.6 COP for heating.

Based on data provided by SBCCOG through ESPM, the site consumed approximately 1,151,643 kWh of electricity and 27,963 therms of natural gas in 2024. These figures represent the combined usage of both the City Hall and Police Department, as they share utility meters.

Based on the 2024 billing data, AESC calculated the blended electricity rate by dividing the annual costs by annual electricity consumption (kWh). The estimated rate of \$0.58/kWh was used for the analysis. This rate accounts for an assumed 4% annual increase in utility rates over the projected 20-year project life. *It is important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has passed its effective useful life of 30 years, it is recommended to replace it with a new one featuring a cool roof coating. The proposed new cool roof will have a silicon coating that offers numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. These features make them a preferred solution for both commercial and residential buildings. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Depending on the crew size and the contractor's experience, the installation timeline may vary from 12 to 22 days. The estimated duration for the full roof replacement is approximately 20 days, which includes:

- Three days for removing the existing roof
- Installation of the new roof at a rate of 3,500 sq.ft. per day
- Five days for applying the cool roof coating
- Seven days allocated for permitting and inspection processes

As this project involves roof replacement, some impact to building operations is expected. Potential disruptions include noise and vibration from construction equipment, temporary shutdown of rooftop HVAC units, safety risks from falling debris and dust, and limited access to certain areas of the building.

Once the cool roof has been installed, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam

separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. The roof’s thermal resistance (R-value) was calculated to be approximately 7.65 hr·ft²·°F/Btu. The baseline roof’s solar reflectance (SR) and infrared emittance (IE) values of 0.258 and 0.92, respectively, were replaced with 0.84 and 0.90 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 16,239 sq.ft.

Costs and Potential Incentives

The cost to replace existing modified bitumen with same type is estimated at \$5.75 per sq.ft. of roof area (Roof Replacement Cost, n.d.) with an additional \$4.50 per sq.ft. for applying a cool roof coating (Cool Roof Coating Cost, 2024).

Based on the total roof area of 16,239 sq.ft., the estimated cost to replace the existing roof with a new roof featuring cool roof coating is approximately \$166,450.

Since the existing roof has exceeded its effective useful life of 30 years, the analysis focuses on the incremental cost—the additional expense incurred to upgrade from a standard roof to a cool roof. This approach excludes the full replacement cost and considers only the price difference between conventional and cool roofing systems. The estimated incremental cost is \$73,076.

Energy Savings and Cost Summary Table

Table 5 outlines the energy savings and cost summary associated with the new cool roof installation at this site. The simple payback period is currently estimated using the incremental cost.

Table 5 Energy Savings and Cost Summary- Gardena Police Department

Gardena – Police Department	
Estimated Annual Electricity Savings (kWh)	8,369
Estimated Annual Electricity Cost Savings	\$4,850
Estimated New Cool Roof Installation Cost	\$166,450
Incremental Cost	\$73,076
Simple Payback (years)	15.07

Estimated Implementation Timeline (days)	17
GHG Emission Reduction (Metric Tons of CO ₂)	1.63
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 6 List of Potential Incentive and Financing Program- Gardena Police Department

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The west-facing portion of the building’s roof offers a potential site for solar PV installation, given its relatively clear surface and limited shading. However, the remainder of the roof is heavily obstructed by rooftop units (RTUs) and experiences substantial shading throughout the day. As a result, the feasible system size is limited to approximately 30 kW, which significantly reduces the economic viability of the investment.

3.3 City of Gardena – Rush Gymnasium and Human Services

Site Visit

A site visit was conducted on October 2, 2025. During the initial visit, Scott Lin of AESC met with a representative from the City of Gardena to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Gardena Rush Gymnasium and Human Services building is in Climate Zone 08 (CZ08) at 1651 W 162nd Street in Gardena, California. It consists of a one-story building constructed in 1979. The building has an approximate sq. ft. of 20,559 per building as-built drawings. The roof area is same as the building footprint.

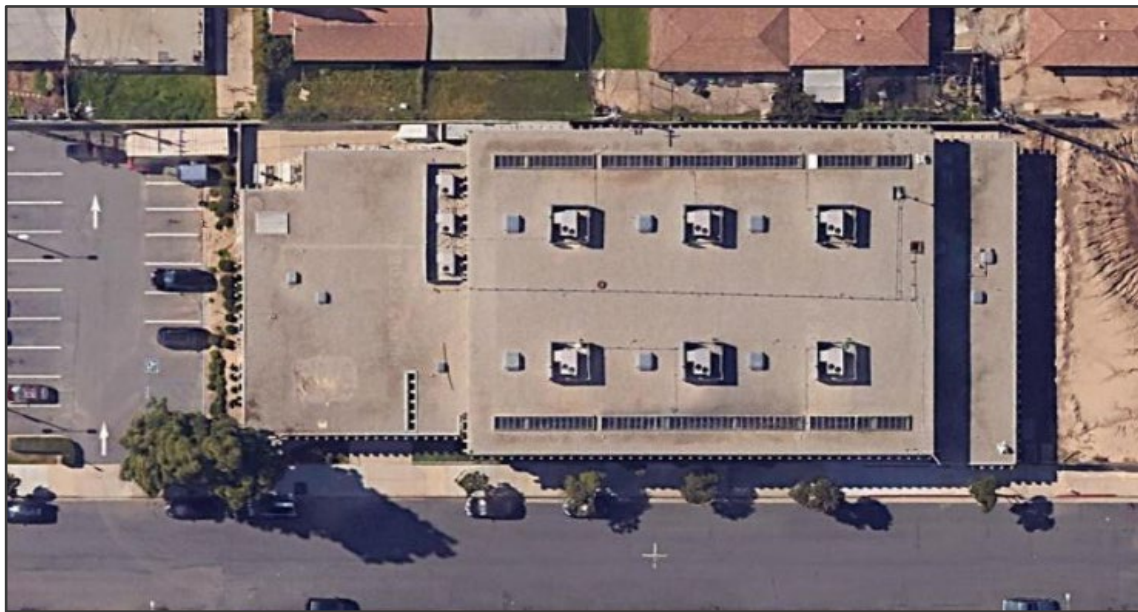


Figure 6 Aerial View of Gardena Rush Gymnasium and Human Services

The main building has a flat, concrete roof with a gravel coating. The roof has 1” insulation per the building as-built drawings. The city confirmed that the roof is original to the building, making it 46 years old with a remaining useful life of 29 years. Concrete roofing systems have an average lifespan ranging from 60 to 75 years (Roof Life Span, 2025). During the site visit, it was observed that the roof contains two levels due to the gymnasium having a higher ceiling. The upper roof level gives slight shading to the lower level.



Figure 7 Existing Concrete Roof with Gravel Coating

The building is conditioned by nine rooftop units (RTUs) with natural gas heating. Six of the units serve the gym while the remaining three serve the Human Services offices. HVAC efficiency was averaged to coefficient of performance of 3.2 for cooling and 81.5% for heating.

Based on utility bills provided by the City, the site consumed approximately 166,340 kWh of electricity and 5,096 therms of natural gas in 2024. AESC calculated the blended electricity rate by dividing the annual costs by annual electricity consumption (kWh). The estimated rate of \$0.54/kWh was used for the analysis. This rate accounts for an assumed 4% annual increase in utility rates over the projected 20-year project life. *It is important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has an estimated remaining useful life of approximately 29 years, it is recommended to apply a white silicone cool roof coating to enhance energy efficiency and extend roof performance. Silicone coatings offer numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. These features make them a preferred solution for both commercial and residential buildings. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Before the cool roof application, a thorough roof inspection by a qualified roofing contractor is advised. Following steps shall be performed for the cool roof coating at this site.

1. Carefully remove all loose gravel without damaging the roof membrane
 - Use a push broom and coal shovel to remove free gravel
 - The loose gravel can be disposed of or can be spread around the property
2. Pressure Wash the roof membrane and repair any problems
 - Check all lap seam and repair as necessary

- Caulk all roof penetrations with crack and joint sealant
3. Apply two thick coats of asphalt emulsion and allow a week or more to cure
 - Asphalt emulsion is an inexpensive way to fill in the many stone pits on the roof's surface while also resealing the membrane
 4. Apply silicon white coating

The estimated installation time is approximately 18 days, which includes:

- Two days to remove existing gravel coating from the roof
- Two days for inspection, minor repairs, and cleaning
- Two days for application of 2 thick coats of asphalt emulsion
- Seven days for asphalt emulsion to cure
- Five days for coating application

Cool roof coating applications generally result in minimal disruption to building operations and can typically be carried out without affecting daily activities. Because the coatings are applied externally and do not require entry into interior spaces, facilities can remain fully operational throughout the process. Temporary noise from equipment and mild odors from coating materials may occur, but these effects are usually brief and manageable. If there are concerns about indoor odor sensitivity, ensuring adequate ventilation is recommended.

Once a cool roof coating has been applied, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. The roof's thermal resistance (R-value) was calculated to be approximately 5 hr·ft²·°F/Btu. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.30 and 0.90, respectively, were replaced with 0.84 and 0.90 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 20,559 sq.ft.

Costs and Potential Incentives

The material cost for the white silicone cool roof coating is estimated at \$3.00 per sq.ft. of roof area, based on Table 5 of "Research and Literature Review" report in Appendix B. Based on data provided by a contractor, labor costs are estimated at \$3.10 per sq.ft. Additional costs include roof cleaning at \$0.40 per sq.ft. (Roof Cleaning Cost, 2025), gravel removal at \$1.50 per sq.ft. (Gravel Removal Cost, n.d.) and asphalt emulsion coating at \$1.75 per sq.ft. (Emulsion Coating

Cost, n.d.) of roof area and roof inspection along with minor repairs are included as a lump sum of \$1,000. Based on total roof area of 20,559 sq.ft. the estimated cost for applying the silicone cool roof coating is approximately \$201,450.

Energy Savings and Cost Summary Table

Table 7 outlines the energy savings and cost summary associated with cool roof coating at this site.

Table 7 Energy Savings and Cost Summary- Gardena Rush Gymnasium and Human Services

Gardena – Rush Gym and HS	
Estimated Annual Electricity Savings (kWh)	14,184
Estimated Annual Electricity Cost Savings	\$7,653
Estimated Cool Roof Coating Cost	\$201,450
Incremental Cost	NA
Simple Payback (years)	26.32
Estimated Implementation Timeline (days)	18
GHG Emission Reduction (Metric Tons of CO ₂)	2.75
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 8 List of Potential Incentive and Financing Program- Gardena Rush Gymnasium and Human Services

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings

Incentive and Financing Program	Description
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof present ideal location for solar PV due to their relatively unobstructed surface and minimal shading.

The proposed roof solar array is expected to have a capacity of approximately 70.31 kW (DC rating). The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof coating by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$129,933. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. Additionally, tax-exempt agencies may be eligible for an extra 10% incentive for using domestically sourced materials or a 10% credit for this site due to its location in a low-income area, further reducing overall implementation costs.

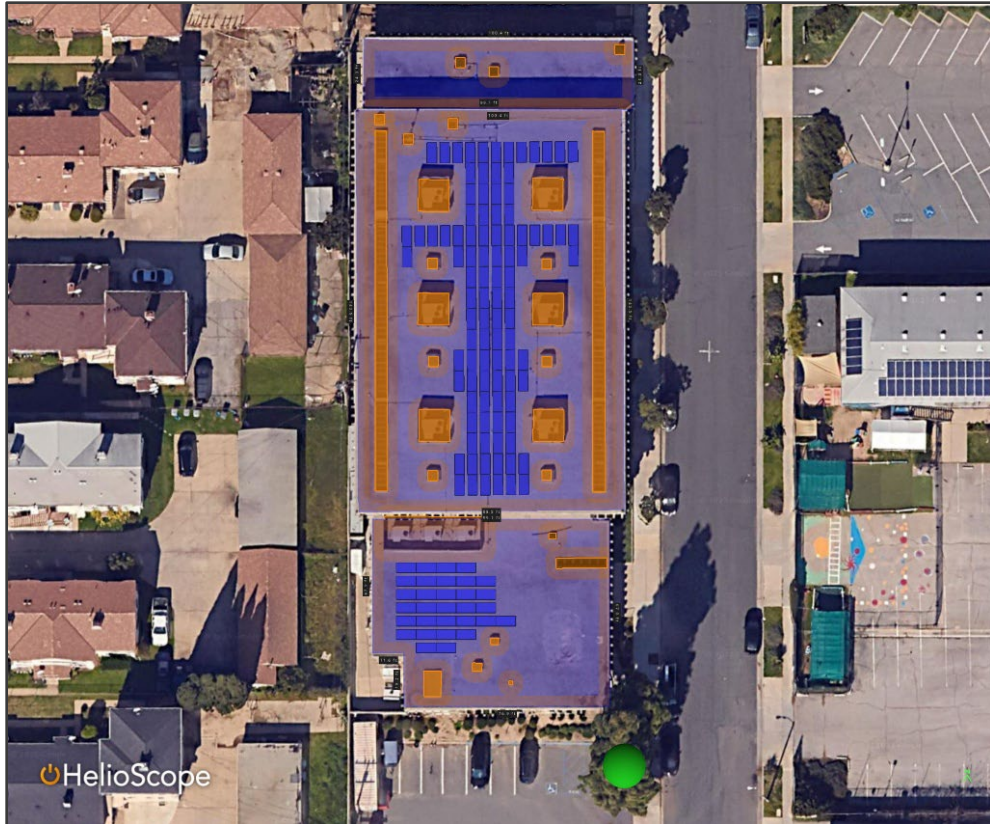


Figure 8 Proposed Solar PV – Gardena Rush Gymnasium and Human Services

3.4 City of Inglewood – Darby Park Sports Building

Site Visit

A site visit was conducted on October 8, 2025. During the initial visit, Kevin Cruz of AESC met with Brett Wegner, Supervisor/Lead Facility Technician for Public Works at the City of Inglewood, to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Darby Park sports building is in Climate Zone 08 (CZ08) at 3400 West Arbor Vitae Street in Inglewood, California. It is a one-story building constructed in 1957, with an approximate area of 20,900 sq.ft., based on data provided by SBCCOG through Energy Star Portfolio Manager (ESPM).

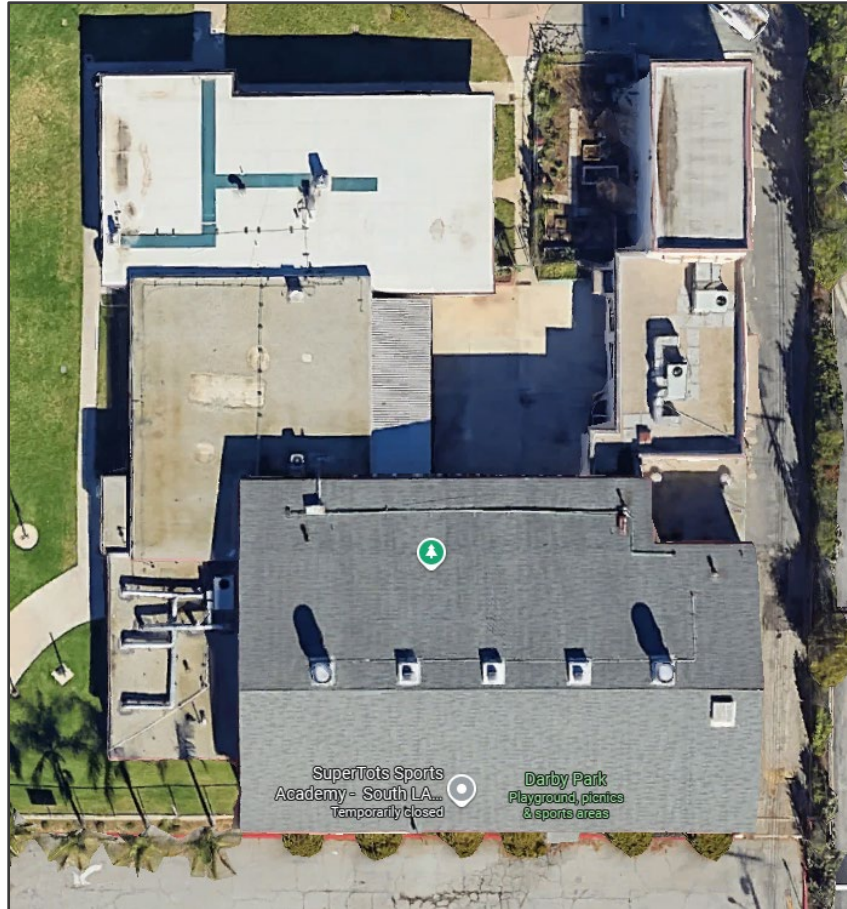


Figure 9 Aerial View of Ingleswood Darby Park Sports Building

The building features a combination of roof types with a staggered layout. Most areas have flat roofs, while the basketball court is covered by a sloped asphalt shingle roof in dark grey. The remaining sections appear to be built-up roofs topped with gravel, and a small portion has a white-colored surface. Due to the lack of available information regarding the most recent roof replacement or retrofit, as well as the type and thickness of roof insulation, the analysis assumes the roof is original to the building’s construction — making it approximately 68 years old and well beyond its effective useful life. Typically, built-up roofs and asphalt shingles have an average lifespan of 20 to 30 years (Roof Life Span, 2025). Based on measurements from Google Maps, the estimated area of the built-up roof with gravel is approximately 7,530 sq.ft., while the asphalt shingle roof covers about 9,562 sq.ft.



Figure 10 Existing Mix of Roof- White Roof, Built up with Gravel and Asphalt Shingles

The building is conditioned by a combination of split systems and rooftop units (RTUs) with natural gas heating. HVAC system efficiency ranged from 12.5 to 13 EER for cooling (averaged to 3.8 coefficient of performance) and approximately 80% for heating.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 87,565 kWh of electricity and 592 therms of natural gas annually. Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has passed its effective useful life of 30 years, it is recommended to replace it with a new one featuring a cool roof coating. The proposed new cool roof will have a silicon coating that offers numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation. The coating system

Depending on the crew size and the contractor's experience, the installation timeline may vary from 15 to 25 days. The estimated duration for the full roof replacement is approximately 20 days, which includes:

- Three days for removing the existing roof
- Installation of the new roof at a rate of 3,500 sq. ft. per day
- Four days for applying the cool roof coating
- Seven days allocated for permitting and inspection processes

As this project involves roof replacement, some impact to building operations is expected. Potential disruptions include noise and vibration from construction equipment, temporary shutdown of rooftop HVAC units, safety risks from falling debris and dust, and limited access to certain areas of the building. However, with thoughtful planning—such as scheduling work during off-hours or seasonal downtime—these impacts can be effectively minimized.

Once the cool roof coating has been installed, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.164 and 0.905, respectively, were replaced with 0.84 and 0.90 for the proposed cool roof condition. The roof area used for the savings estimate was approximately 17,092 sq.ft., comprising 7,530 sq.ft. of built-up roof with gravel and 9,562 sq.ft. of asphalt shingle roofing, as measured using Google Maps.

Costs and Potential Incentives

The estimated cost to replace the existing built-up roof and asphalt shingles with the same materials is \$13.00 per sq. ft. and \$5.25 per sq. ft., respectively, based on roof area (Roof Replacement Cost, n.d.) with an additional \$4.50 per sq.ft. for applying a cool roof coating (Cool Roof Coating Cost, 2024). Accordingly, the total estimated cost to replace the entire existing roof with new roof featuring cool roof coating is approximately \$298,159.

Since the existing roof has exceeded its effective useful life of 30 years, the analysis focuses on the incremental cost—the additional expense incurred to upgrade from a standard roof to a cool

roof. This approach excludes the full replacement cost and considers only the price difference between conventional and cool roofing systems. The estimated incremental cost is \$94,050.

Energy Savings and Cost Summary Table

Table 9 outlines the energy savings and cost summary associated with the new cool roof installation at this site. The simple payback period is currently estimated using the incremental cost.

Table 9 Energy Savings and Cost Summary- Inglewood Darby Park Sports Building

Inglewood Darby Park Sports Building	
Estimated Annual Electricity Savings (kWh)	7,037
Estimated Annual Electricity Cost Savings	\$3,802
Estimated New Cool Roof Installation Cost	\$298,159
Incremental Cost	\$94,050
Simple Payback (years)	24.74
Estimated Implementation Timeline (days)	20
GHG Emission Reduction (Metric Tons of CO ₂)	1.37
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 10 List of Potential Incentive and Financing Program- Inglewood Darby Park Sports Building

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings

Incentive and Financing Program	Description
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed roof solar array is expected to have a capacity of approximately 150 kW (DC rating). The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof installation by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$267,985. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.



Figure 11 Proposed Solar PV – Ingewood Darby Park Sports Building

3.5 City of Inglewood – Library (Crenshaw Imperial Branch)

Site Visit

A site visit was conducted on October 8, 2025. During the initial visit, Kevin Cruz of AESC met with Brett Wegner, Supervisor/Lead Facility Technician for Public Works at the City of Inglewood, to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Inglewood Library is in Climate Zone 08 (CZ08) at 11141 Crenshaw Boulevard, in Inglewood, California. This one-story building was constructed in 1965, and the building has an approximate area of 8,284 sq.ft., based on information provided by SBCCOG through Energy Star Portfolio Manager (ESPM). The estimated roof area is approximately 8,908 sq. ft. based on the Google Maps measurement tool. This is slightly larger than the building’s footprint due to the overhang around the structure.



Figure 12 Aerial View of Inglewood Library

The roof is a flat, built-up type with a gravel coating. According to the city, it was renovated in 2021; however, specific details regarding the insulation type and thickness were not provided. Based on the city's information, the roof is considered to be 4 years old with an estimated remaining useful life of 26 years. Built-up roofs typically have an average lifespan ranging from 20 to 30 years (Roof Life Span, 2025).



Figure 13 Existing Built up Roof with Gravel Coating on Top

The building is cooled by five packaged rooftop units (RTUs) equipped with gas heating. Most of the nameplates were worn and unreadable, but the units are estimated to be 5 tons each, with a cooling coefficient of performance (COP) of 3.8 and heating efficiency of approximately 80%.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 78,645 kWh of electricity and 372 therms of natural gas annually. Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has an estimated remaining useful life of approximately 26 years, it is recommended to apply a white silicone cool roof coating to enhance energy efficiency and extend roof performance. Silicone coatings offer numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. These features make them a preferred solution for both commercial and residential buildings. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Before the cool roof application, a thorough roof inspection by a qualified roofing contractor is advised. Following steps shall be performed for the cool roof coating at this site.

1. Carefully remove all loose gravel without damaging the roof membrane
 - Use a push broom and coal shovel to remove free gravel
 - The loose gravel can be disposed of or can be spread around the property
2. Pressure Wash the roof membrane and repair any problems
 - Check all lap seam and repair as necessary
 - Caulk all roof penetrations with crack and joint sealant
3. Apply two thick coats of asphalt emulsion and allow a week or more to cure
 - Asphalt emulsion is an inexpensive way to fill in the many stone pits on the roof's surface while also resealing the membrane
4. Apply silicon white coating

The estimated installation time is approximately 15 days: two days for gravel removal, two days for inspection, minor repairs, and cleaning, followed by two days for applying the asphalt emulsion coating, seven days for curing, and finally two days for the application of the white silicone coating.

Cool roof coating applications generally result in minimal disruption to building operations and can typically be carried out without affecting daily activities. Because the coatings are applied

externally and do not require entry into interior spaces, facilities can remain fully operational throughout the process. Temporary noise from equipment and mild odors from coating materials may occur, but these effects are usually brief and manageable. If there are concerns about indoor odor sensitivity, ensuring adequate ventilation is recommended.

Once a cool roof coating has been applied, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.15 and 0.9, respectively, were replaced with 0.84 and 0.9 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 8,284 sq.ft., excluding the overhang area around the building.

Costs and Potential Incentives

The material cost for the white silicone cool roof coating is estimated at \$3.00 per sq.ft. of roof area, based on Table 5 of "Research and Literature Review" report in Appendix B. Based on data provided by a contractor, labor costs are estimated at \$3.10 per sq.ft. Additional costs include roof cleaning at \$0.40 per sq.ft. (Roof Cleaning Cost, 2025), gravel removal at \$1.50 per sq.ft. (Gravel Removal Cost, n.d.) and asphalt emulsion coating at \$1.75 per sq.ft. (Emulsion Coating Cost, n.d.) of roof area and roof inspection along with minor repairs are included as a lump sum of \$1,000. For a total roof area of 8,908 sq. ft., including the overhang, the estimated cost to apply the silicone cool roof coating is approximately \$87,853.

Energy Savings and Cost Summary Table

Table 11 outlines the energy savings and cost summary associated with the cool roof coating at this site.

Table 11 Energy Savings and Cost Summary- Inglewood Library

Inglewood Library	
Estimated Annual Electricity Savings (kWh)	3,497
Estimated Annual Electricity Cost Savings	\$1,890
Estimated Cool Roof Coating Cost	\$87,853
Incremental Cost	NA
Simple Payback (years)	46.49
Estimated Implementation Timeline (days)	15
GHG Emission Reduction (Metric Tons of CO ₂)	0.68
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 12 List of Potential and Financing Incentive Program- Inglewood Library

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed solar array is expected to have a capacity of approximately 57 kW (DC rating), installed on the roof. The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site’s energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof coating by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$127,050. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. Additionally, tax-exempt agencies may be eligible for an extra 10% incentive for using domestically sourced materials or a 10% credit for this site due to its location in a low-income area, further reducing overall implementation costs.



Figure 14 Proposed Solar PV – Ingleswood Library

3.6 City of Inglewood – Rogers Park Community Center

Site Visit

A site visit was conducted on October 8, 2025. During the initial visit, Kevin Cruz of AESC met with Brett Wegner, Supervisor/Lead Facility Technician for Public Works at the City of Inglewood, to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Inglewood Rogers park community center is in Climate Zone 08 (CZ08) at 400 W Beach Ave, in Inglewood, California. This one-story building was constructed in 1973, and the building has an approximate area of 33,978 sq.ft., based on information provided by SBCCOG through Energy Star Portfolio Manager (ESPM). The roof area is same as building footprint.



Figure 15 Aerial View of Inglewood Rogers Park Community Center

The building features a staggered roof design, with each level appearing to be a flat, built-up type finished with a gravel coating. According to the city, the roof was renovated sometime between 2008 and 2010; however, specific details regarding insulation type and thickness were not provided. Based on this input, the roof is considered to be approximately 15 years old, with an estimated remaining useful life of another 15 years. Built-up roofs typically have a lifespan of 20 to 30 years (Roof Life Span, 2025). A few solar panels are installed on the highest roof level, while the lower roof sections are covered with debris from nearby trees.



Figure 16 Existing Built up Roof with Gravel Coating on Top

The building is served by multiple packaged rooftop units (RTUs) that provide cooling and gas-fired heating. These units vary in capacity but collectively deliver a total cooling capacity of 80 tons. The average cooling coefficient of performance (COP) is 3.08, while the heating systems operate at approximately 80% efficiency.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 224,062 kWh of electricity and 4,932 therms of natural gas annually. Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has an estimated remaining useful life of approximately 26 years, it is recommended to apply a white silicone cool roof coating to enhance energy efficiency and extend roof performance. Silicone coatings offer numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. These features make them a preferred solution for both commercial and residential buildings. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Before the cool roof application, a thorough roof inspection by a qualified roofing contractor is advised. Following steps shall be performed for the cool roof coating at this site.

1. Carefully remove all loose gravel without damaging the roof membrane
 - Use a push broom and coal shovel to remove free gravel
 - The loose gravel can be disposed off or can be spread around the property
2. Pressure Wash the roof membrane and repair any problems
 - Check all lap seam and repair as necessary
 - Caulk all roof penetrations with crack and joint sealant
3. Apply two thick coats of asphalt emulsion and allow a week or more to cure
 - Asphalt emulsion is an inexpensive way to fill in the many stone pits on the roof's surface while also resealing the membrane
4. Apply silicon white coating

The estimated installation time is approximately 20 days: two days for gravel removal, two days for inspection, minor repairs, and cleaning, followed by two days for applying the asphalt emulsion coating, seven days for curing, and finally seven days for the application of the white silicone coating.

Cool roof coating applications generally result in minimal disruption to building operations and can typically be carried out without affecting daily activities. Because the coatings are applied externally and do not require entry into interior spaces, facilities can remain fully operational throughout the process. Temporary noise from equipment and mild odors from coating materials may occur, but these effects are usually brief and manageable. If there are concerns about indoor odor sensitivity, ensuring adequate ventilation is recommended.

Once a cool roof coating has been applied, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.15 and 0.9, respectively, were replaced with 0.84 and 0.9 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 32,178 sq.ft., excluding the roof area covered under solar panels.

Costs and Potential Incentives

The material cost for the white silicone cool roof coating is estimated at \$3.00 per sq.ft. of roof area, based on Table 5 of “Research and Literature Review” report in Appendix B. Based on data provided by a contractor, labor costs are estimated at \$3.10 per sq.ft. Additional costs include roof cleaning at \$0.40 per sq.ft. (Roof Cleaning Cost, 2025), gravel removal at \$1.50 per sq.ft. (Gravel Removal Cost, n.d.) and asphalt emulsion coating at \$1.75 per sq.ft. (Emulsion Coating Cost, n.d.) of roof area and roof inspection along with minor repairs are included as a lump sum of \$1,000. An additional cost of \$10,533—representing 10% of the labor cost for the silicone coating—was included to account for extra work required around the solar panel installations. For a total roof area of 33,978 sq.ft., the estimated cost to apply the silicone cool roof coating is approximately \$342,819.

Energy Savings and Cost Summary Table

Table 13 outlines the energy savings and cost summary associated with the cool roof coating at this site.

Table 13 Energy Savings and Cost Summary- Inglewood Rogers Park Community Center

Inglewood Rogers Park Community Center	
Estimated Annual Electricity Savings (kWh)	16,775
Estimated Annual Electricity Cost Savings	\$9,063
Estimated Cool Roof Coating Cost	\$342,819
Incremental Cost	NA
Simple Payback (years)	37.82
Estimated Implementation Timeline (days)	20
GHG Emission Reduction (Metric Tons of CO ₂)	3.26
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 14 List of Potential Incentive and Financing Program- Inglewood Rogers Park Community Center

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socialren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

A small solar PV system is already installed on the highest roof of the facility. The roof of the lower building offers a promising opportunity for expanding solar PV capacity.

The proposed roof solar array is expected to have a capacity of approximately 60.5 kW (DC rating). The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof coating by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$127,050. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. Additionally, tax-exempt agencies may be eligible for an extra 10% incentive for using domestically sourced materials or a 10% credit for this site due to its location in a low-income area, further reducing overall implementation costs.



Figure 17 Proposed Solar PV – Ingewood Rogers Park Community Center

3.7 City of Inglewood – Civic Center Police Station

Site Visit

A site visit was conducted on October 8, 2025. During the initial visit, Kevin Cruz of AESC met with Brett Wegner, Supervisor/Lead Facility Technician for Public Works at the City of Inglewood, to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Inglewood Civic Center Police Station is in Climate Zone 08 (CZ08) at 1 West Manchester Boulevard, Inglewood, California. This two-story building, which includes an underground level, was constructed in 1976, according to data from the Energy Star Portfolio Manager (ESPM). The building has an approximate area of 35,240 sq.ft., based on information provided by SBCCOG through ESPM. The estimated roof area is 26,759 sq.ft., as determined using Google Maps measurement tool.

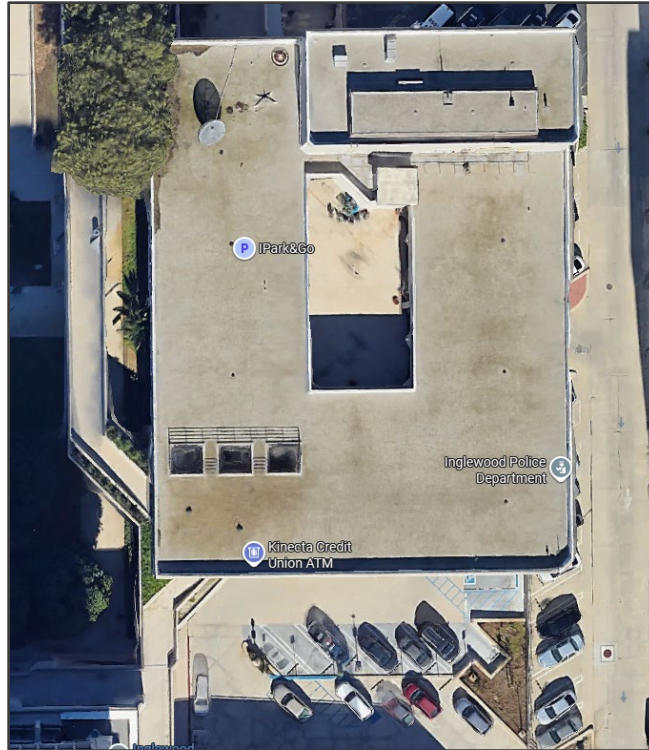


Figure 18 Aerial View of Ingleswood Civic Center Police Station

The roof is a flat, built-up type with a gravel coating. The city confirmed that there is no available information regarding the most recent roof replacement or retrofit. Additionally, details about the roof insulation type and thickness were not provided. For the purpose of this analysis, it is assumed that the roof is original to the building’s construction, making it approximately 49 years old and beyond its effective useful life. Built-up roofs typically have an average lifespan of 20 to 30 years (Roof Life Span, 2025).



Figure 19 Existing Built up Roof with Gravel Coating on Top

The building is cooled by central plant chillers and pumps located at the Civic Center City Hall. These chillers appear to serve both the City Hall and the Police Station by supplying chilled water

to the air handling units (AHUs) housed in the mechanical room of the Police Station. The chillers have a coefficient of performance (COP) ranging from 4.93 to 6.3. It is assumed that heating is provided by a natural gas boiler onsite that has an efficiency of 85%.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 535,489 kWh of electricity and 1,786 therms of natural gas annually. Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has passed its effective useful life of 30 years, it is recommended to replace it with a new one featuring a cool roof coating. The proposed new cool roof will have a silicon coating that offers numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Depending on the crew size and the contractor's experience, the installation timeline may vary from 18 to 28 days. The estimated duration for the full roof replacement is approximately 23 days, which includes:

- Three days for removing the existing roof
- Installation of the new roof at a rate of 3,500 sq. ft. per day
- Five days for applying the cool roof coating
- Seven days allocated for permitting and inspection processes

As this project involves roof replacement, some impact to building operations is expected. Potential disruptions include noise and vibration from construction equipment, temporary shutdown of rooftop HVAC units, safety risks from falling debris and dust, and limited access to certain areas of the building.

Once the cool roof has been installed, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof’s solar reflectance (SR) and infrared emittance (IE) values of 0.15 and 0.9, respectively, were replaced with 0.84 and 0.9 for the proposed cool roof condition. The estimated savings were based on a roof area of approximately 26,759 sq.ft., as determined using Google Maps measurement tool.

Costs and Potential Incentives

The cost to replace existing built-up roof with same type is estimated at \$13 per sq.ft. of roof area (Roof Replacement Cost, n.d.) with an additional \$4.50 per sq.ft. for applying a cool roof coating (Cool Roof Coating Cost, 2024). Based on total roof area of 26,759 sq.ft. the estimated cost to replace the existing roof with new roof featuring cool roof coating is approximately \$508,421.

Since the existing roof has exceeded its effective useful life of 30 years, the analysis focuses on the incremental cost—the additional expense incurred to upgrade from a standard roof to a cool roof. This approach excludes the full replacement cost and considers only the price difference between conventional and cool roofing systems. The estimated incremental cost is \$120,416.

Energy Savings and Cost Summary Table

Table 15 outlines the energy savings and cost summary associated with the new cool roof installation at this site. The simple payback period is currently estimated using the incremental cost.

Table 15 Energy Savings and Cost Summary- Inglewood Civic Center Police Station

Inglewood- Civic Center Police Station	
Estimated Annual Electricity Savings (kWh)	7,646
Estimated Annual Electricity Cost Savings	\$4,131
Estimated New Cool Roof Installation Cost	\$508,421
Incremental Cost	\$120,416
Simple Payback (years)	29.15
Estimated Implementation Timeline (days)	23
GHG Emission Reduction (Metric Tons of CO ₂)	1.48
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 16 List of Potential and Financing Incentive Program- Inglewood Civic Center Police Station

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof has lot of shading due to the high-rise City Hall building in the west and the immediate building to the east, making a large PV installation ineffective. A small portion of the roof is available where there is no shading and is presented here in case city wishes to install small sized solar PV.

The proposed solar array is expected to have a capacity of approximately 51 kW (DC rating), installed on the roof. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof installation by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$107,583. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its

location within an “Energy community”. Additionally, tax-exempt agencies may be eligible for an extra 10% incentive for using domestically sourced materials or a 10% credit for this site due to its location in a low-income area, further reducing overall implementation costs.

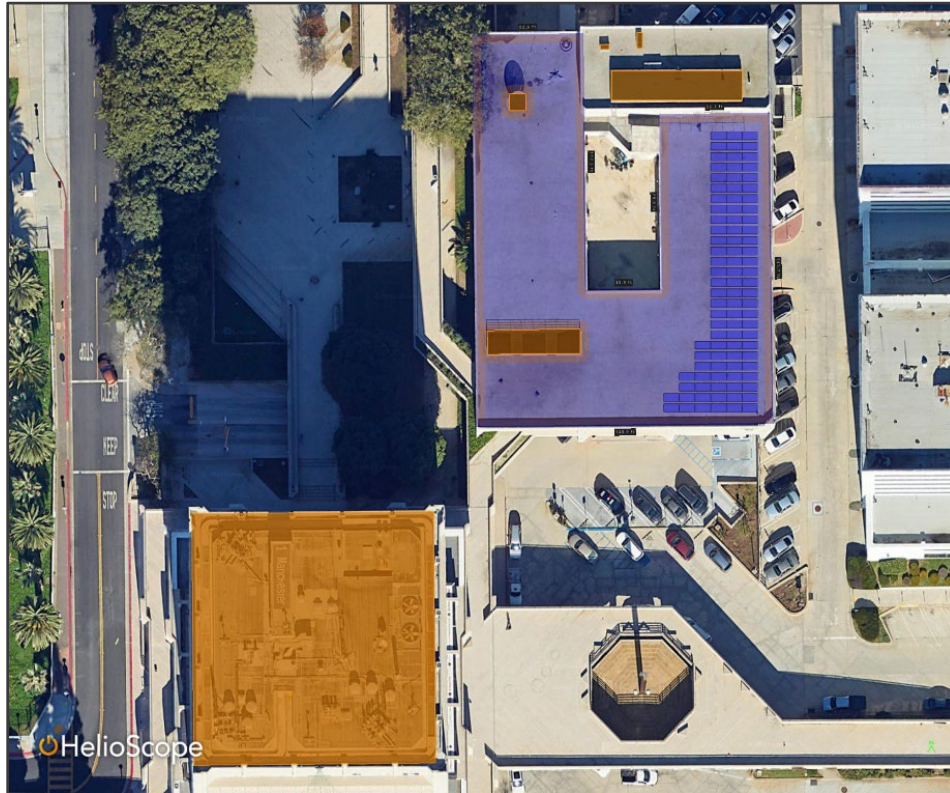


Figure 20 Proposed Solar PV – Inglewood Civic Center Police Station

3.8 City of Lomita – City Hall

Site Visit

A site visit was conducted on October 8, 2025. During the initial visit, Kevin Cruz of AESC met with Ross Lopez, facilities Lead for the City of Lomita, to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Lomita City Hall building is in Climate Zone 06 (CZ06) at 24300 Narbonne Avenue in Lomita, California. It is a two-story building constructed in 1975, with an approximate sq.ft. of 20,000, based on data provided by SBCCOG through Energy Star Portfolio Manager (ESPM). The estimated roof area using google maps measurement tool is approximately 12,533 sq.ft.



Figure 21 Aerial View of Lomita City Hall

The building features a flat built-up roof with gravel surfacing. According to city personnel, the most recent roof repair was completed in 2007. However, details regarding the insulation type and thickness were not available. For the purpose of this analysis, the roof is assumed to be consistent with the building's original construction. Based on this assumption, the roof is approximately 18 years old and has an estimated remaining useful life of about 12 years. Built-up roofing systems typically have an average lifespan of 20 to 30 years (Roof Life Span, 2025).



Figure 22 Existing Built-Up Roof with Gravels

The building is conditioned by a 50-ton condenser unit along with several split systems. Air distribution is handled by an air-handling unit equipped with natural gas heating. The HVAC system's efficiency is estimated at an average cooling coefficient of performance (COP) of 2.99 and a heating efficiency of approximately 80%

Based on information provided by SBCCOG through ESPM, the site consumed approximately 251,862 kWh of electricity and 6,847 therms of natural gas annually. Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has an estimated remaining useful life of approximately 12 years, it is recommended to apply a white silicone cool roof coating to enhance energy efficiency and extend

roof performance. Silicone coatings offer numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. These features make them a preferred solution for both commercial and residential buildings. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Before the cool roof application, a thorough roof inspection by a qualified roofing contractor is advised. Following steps shall be performed for the cool roof coating at this site.

1. Carefully remove all loose gravel without damaging the roof membrane
 - Use a push broom and coal shovel to remove free gravel
 - The loose gravel can be disposed off or can be spread around the property
2. Pressure Wash the roof membrane and repair any problems
 - Check all lap seam and repair as necessary
 - Caulk all roof penetrations with crack and joint sealant
3. Apply two thick coats of asphalt emulsion and allow a week or more to cure
 - Asphalt emulsion is an inexpensive way to fill in the many stone pits on the roof's surface while also resealing the membrane
4. Apply silicon white coating

The estimated installation time is approximately 18 days, which includes:

- Two days to remove existing gravel coating from the roof
- Two days for inspection, minor repairs, and cleaning
- Two days for application of 2 thick coats of asphalt emulsion
- Seven days for asphalt emulsion to cure
- Four days for coating application

Cool roof coating applications generally result in minimal disruption to building operations and can typically be carried out without affecting daily activities. Because the coatings are applied externally and do not require entry into interior spaces, facilities can remain fully operational throughout the process. Temporary noise from equipment and mild odors from coating materials may occur, but these effects are usually brief and manageable. If there are concerns about indoor odor sensitivity, ensuring adequate ventilation is recommended.

Once a cool roof coating has been applied, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof’s solar reflectance (SR) and infrared emittance (IE) values of 0.15 and 0.9, respectively, were replaced with 0.84 and 0.94 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 12,533 sq.ft.

Costs and Potential Incentives

The material cost for the white silicone cool roof coating is estimated at \$3.00 per sq.ft. of roof area, based on Table 5 of “Research and Literature Review” report in Appendix B. Based on data provided by a contractor, labor costs are estimated at \$3.10 per sq.ft. Additional costs include roof cleaning at \$0.40 per sq.ft. (Roof Cleaning Cost, 2025), gravel removal at \$1.50 per sq.ft. (Gravel Removal Cost, n.d.) and asphalt emulsion coating at \$1.75 per sq.ft. (Emulsion Coating Cost, n.d.) of roof area and roof inspection along with minor repairs are included as a lump sum of \$1,000. Based on total roof area of 12,533 sq.ft. the estimated cost for applying the silicone cool roof coating is approximately \$123,197.

Energy Savings and Cost Summary Table

Table 17 outlines the energy savings and cost summary associated with the cool roof coating at this site.

Table 17 Energy Savings and Cost Summary- Lomita City Hall

Lomita - City Hall	
Estimated Annual Electricity Savings (kWh)	6,725
Estimated Annual Electricity Cost Savings	\$3,633
Estimated Cool Roof Coating Cost	\$123,197
Incremental Cost	NA
Simple Payback (years)	33.91
Estimated Implementation Timeline (days)	17
GHG Emission Reduction (Metric Tons of CO ₂)	1.31
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 18 List of Potential Incentive and Financing Program- Lomita City Hall

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal site for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed roof solar array is expected to have a capacity of approximately 82 kW (DC rating). The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof coating by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$154,082. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within

an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.

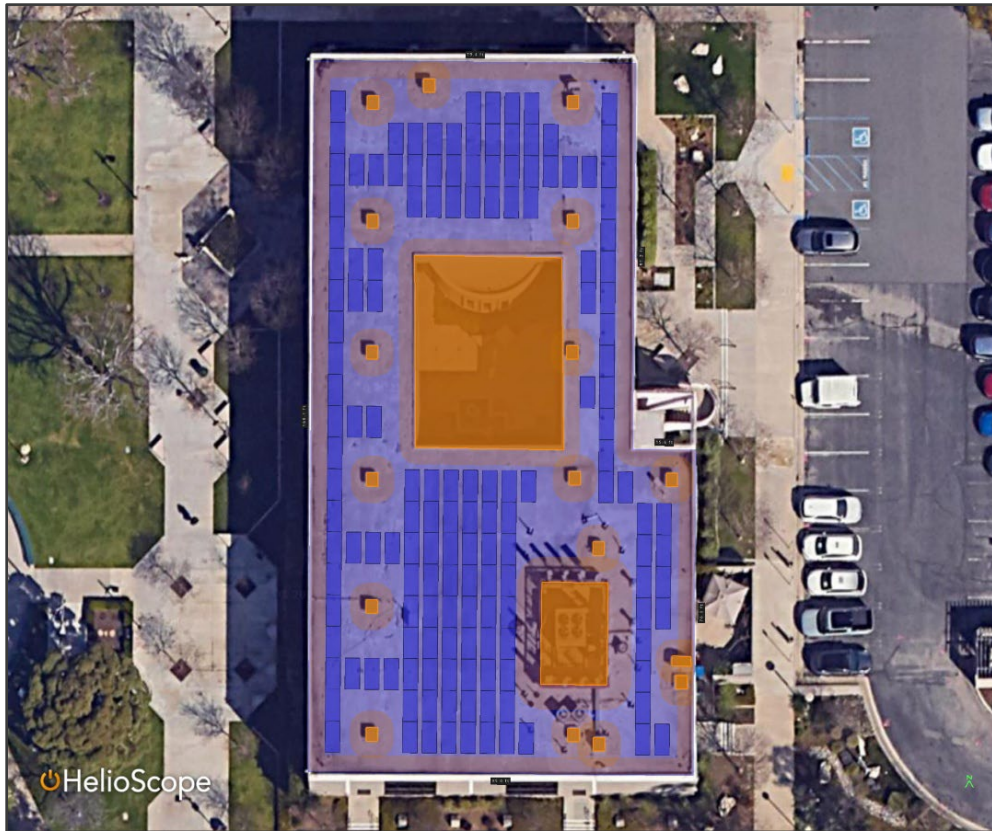


Figure 23 Proposed Solar PV – Lomita City Hall

3.9 City of Redondo Beach – City Hall

Site Visit

A site visit was conducted on October 9, 2025. During the initial visit, Kevin Cruz of AESC met with Gary Laolagi, Public Works Facilities Manager for the City of Redondo Beach, to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Redondo Beach City Hall is in Climate Zone 06 (CZ06) at 415 Diamond Street, in Redondo Beach, California. It is a combination of a one-story and two-story building constructed in 1962, with an approximate area of 42,000 sq.ft., based on data provided by SBCCOG through Energy Star Portfolio Manager (ESPM). The estimated roof area is 34,701 sq.ft. based on the Google Maps measurement tool.

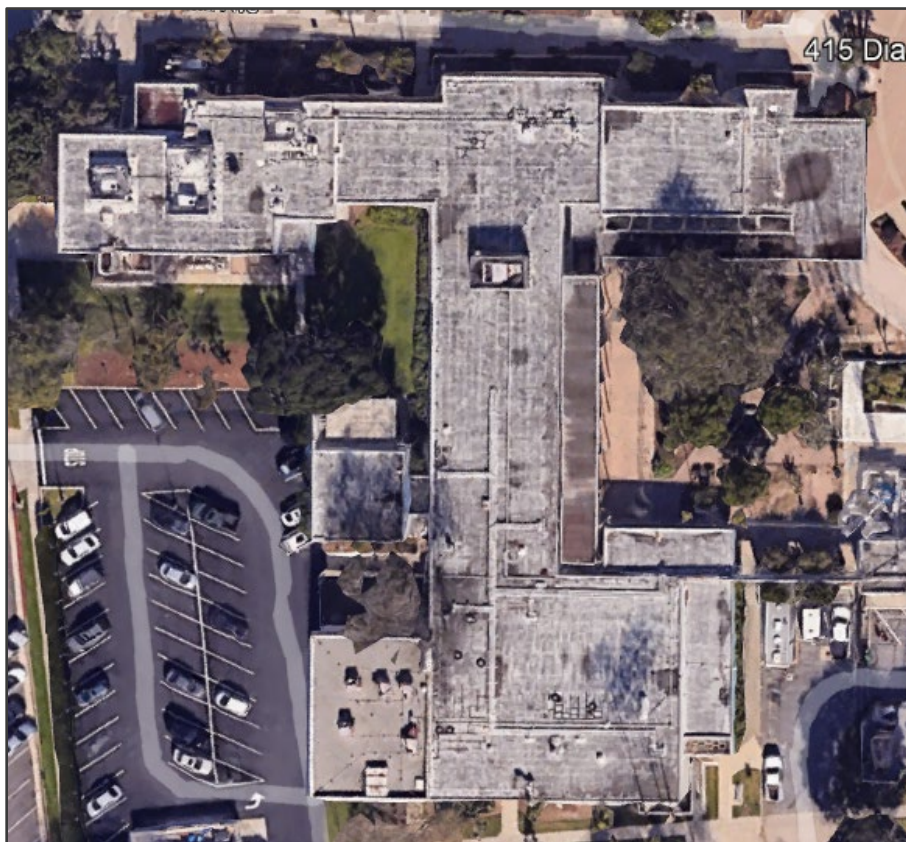


Figure 24 Aerial View of Redondo Beach City Hall

The building features two types of roofing: a smaller flat built-up roof with a gravel finish, estimated at approximately 2,900 sq.ft., and a larger flat asphalt roof covering around 31,801 sq. ft.. These measurements were obtained using Google Maps measurement tools. Information regarding the

most recent roof replacement or retrofit, as well as roof insulation type and thickness, was not available. Therefore, for the purpose of analysis, the roof was assumed to be original to the building's construction, making it approximately 63 years old and beyond its effective useful life. Built-up roofing and asphalt roofing systems typically have an average lifespan ranging from 20 to 30 years (Roof Life Span, 2025). Additionally, sections of the roofing material appeared to be deteriorating or lifting, suggesting that the roof is aged and likely due for replacement. Several pipes and conduits run across the roof surface, contributing to a cluttered appearance.



Figure 25 Existing Asphalt (left) and Built-Up Roof with Gravel (Right)



Figure 26 Existing Roof Condition

During the site visit, several areas of the building—such as the front structure and certain hallways—were observed to be unconditioned. The building’s HVAC system consists of a combination of rooftop units (RTUs) with natural gas heating and an air-cooled chiller located at the adjacent Police Department. Based on interviews with facility personnel, approximately half of City Hall is served by the chiller, while the remaining areas are conditioned by RTUs. Cooling efficiency for the HVAC system ranged from 10 to 14 SEER, with an average cooling coefficient of performance (COP) of 3.1 and heating efficiency estimated at 80%.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 855,909 kWh of electricity and 7,943 therms of natural gas in 2024. These figures represent the combined usage of both the City Hall and Police Department, as they share utility meters.

Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It’s important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has passed its effective useful life of 30 years, it is recommended to replace it with a new one featuring a cool roof coating. The proposed new cool roof will have silicon coating that offers numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. In addition to extending the roof’s lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Depending on the crew size and the contractor’s experience, the installation timeline may vary from 25 to 35 days. The estimated duration for the full roof replacement is approximately 30 days, which includes:

- Four days for removing the existing roof
- Installation of the new roof at a rate of 3,500 sq. ft. per day
- Nine days for applying the cool roof coating
- Seven days allocated for permitting and inspection processes

As this project involves replacing the roof, some impact to building operations is expected. Potential disruptions include noise and vibration from construction equipment, temporary shutdown of rooftop HVAC units, safety risks from falling debris and dust, and limited access to certain areas of the building. However, with thoughtful planning—such as scheduling work during off-hours or seasonal downtime—these impacts can be effectively minimized.

Once the cool roof has been installed, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.178 and 0.90, respectively, were replaced with 0.84 and 0.90 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 34,701 sq.ft.

Costs and Potential Incentives

The estimated cost to replace the existing built-up roof and asphalt roof with the same materials is \$13.00 per sq. ft. and \$5.25 per sq. ft., respectively, based on roof area (Roof Replacement Cost, n.d.) with an additional \$4.50 per sq.ft. for applying a cool roof coating (Cool Roof Coating Cost, 2024).Based on total roof area of 34,701 sq.ft. the estimated cost to replace the existing roof with a new roof featuring a cool roof coating is approximately \$349,259.

Since the existing roof has exceeded its effective useful life of 30 years, the analysis focuses on the incremental cost—the additional expense incurred to upgrade from a standard roof to a cool roof. This approach excludes the full replacement cost and considers only the price difference between conventional and cool roofing systems. The estimated incremental cost is \$156,155.

Energy Savings and Cost Summary Table

Table 19 outlines the energy savings and cost summary associated with the new cool roof installation at this site. The simple payback period is currently estimated using the incremental cost.

Table 19 Energy Savings and Cost Summary- City of Redondo Beach City Hall

City of Redondo Beach - City Hall	
Estimated Annual Electricity Savings (kWh)	17,387
Estimated Annual Electricity Cost Savings	\$9,394
Estimated Cool Roof Installation Cost	\$349,259
Incremental Cost	\$156,155
Simple Payback (years)	16.6
Estimated Implementation Timeline (days)	30
GHG Emission Reduction (Metric Tons of CO ₂)	3.38
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 20 List of Potential Incentive and Financing Program- City of Redondo Beach - City Hall

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed rooftop solar array is expected to generate approximately 150 kW (DC rating). The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof installation by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$267,002. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.



Figure 27 Proposed Solar PV – City of Redondo Beach City Hall

3.10 City of Redondo Beach – Civic Center Library

Site Visit

A site visit was conducted on October 9, 2025. During the initial visit, Kevin Cruz of AESC met with Gary Laolagi, Public Works Facilities Manager for the City of Redondo Beach, to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Redondo Beach City Hall is in Climate Zone 06 (CZ06) at 303 N Pacific Coast Highway, in Redondo Beach, California. The facility consists of a combination of one-story and two-story structures, originally constructed in 1970 according to data from Energy Star Portfolio Manager (ESPM). The total building area is approximately 36,000 sq. ft., based on information provided by SBCCOG through ESPM. The estimated roof area is 34,316 sq.ft. using Google Maps measurement tool.

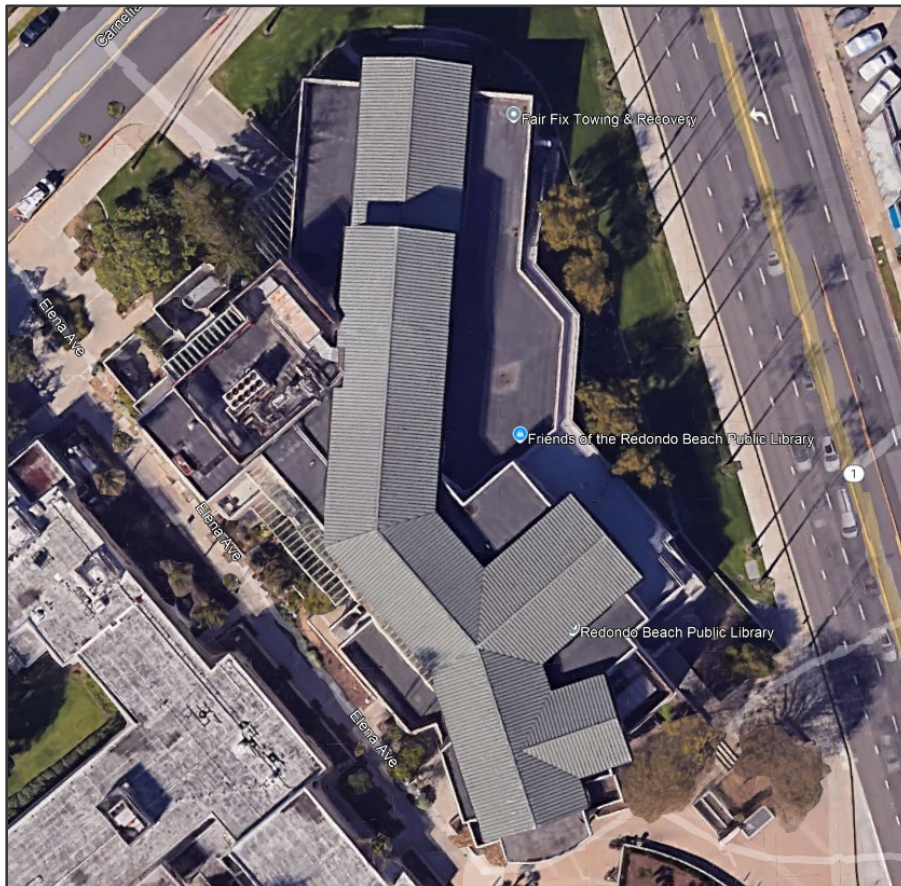


Figure 28 Aerial View of Redondo Beach Civic Center Library

The building features a combination of flat asphalt gray roofing and sloped metal gray roofing. No information was available regarding the most recent roof replacement or retrofit, nor the type or thickness of roof insulation. However, based on visual inspection, the roof appears to be in good condition. Although the exact age or maintenance history is unknown, AESC estimates that the existing roof still has a remaining useful life of 15 years. Typically, asphalt roofs have an average lifespan of 15 to 30 years, while metal roofing systems can last between 40 and 70 years (Roof Life Span, 2025).



Figure 29 Existing Asphalt and Metal Roof

The building is air-conditioned by an air-cooled chiller located on the roof and utilizes a natural gas boiler for heating. The HVAC system is assumed to operate with a cooling efficiency of 8 EER (equivalent to a coefficient of performance of 2.3) and a heating efficiency of 80%.

According to data provided by SBCCOG through ESPM, the site consumed approximately 855,767 kWh of electricity and 16,102 therms of natural gas in 2024.

Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Assuming that the existing roof has an estimated remaining useful life of approximately 15 years, it is recommended to apply a white silicone cool roof coating to enhance energy efficiency and extend roof performance. Silicone coatings offer numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. These features make them a preferred solution for both commercial and residential buildings. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Before the cool roof application, a thorough roof inspection by a qualified roofing contractor is advised. This should include patching any minor leaks, sealing cracks, prepping penetrations, and thoroughly cleaning the roof surface. Once the roof is properly prepared, the cool roof coating can be applied.

The estimated installation time is approximately ten days: two days for inspection, minor repairs, and cleaning, followed by eight days for coating application.

Cool roof coating applications generally result in minimal disruption to building operations and can typically be carried out without affecting daily activities. Because the coatings are applied externally and do not require entry into interior spaces, facilities can remain fully operational throughout the process. Temporary noise from equipment and mild odors from coating materials may occur, but these effects are usually brief and manageable. If there are concerns about indoor odor sensitivity, ensuring adequate ventilation is recommended.

Once a cool roof coating has been applied, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance, periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.15 and 0.90, respectively, were replaced with 0.79 and 0.87 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 34,316 sq.ft.

Costs and Potential Incentives

The material cost for the white silicone cool roof coating is estimated at \$3.00 per sq.ft. of roof area, based on Table 5 of the “Research and Literature Review” report in Appendix B. Based on data provided by a contractor, labor costs are estimated at \$3.10 per sq.ft. Additionally, roof cleaning is projected to cost \$0.40 per sq.ft. (Roof Cleaning Cost, 2025), and roof inspection along with minor repairs are included as a lump sum of \$1,000. Based on total roof area of 34,316 sq.ft. the estimated cost for applying the silicone cool roof coating is approximately \$224,054.

Energy Savings and Cost Summary Table

Table 21 outlines the energy savings and cost summary associated with the cool roof coating at this site.

Table 21 Energy Savings and Cost Summary- City of Redondo Beach Civic Center Library

City of Redondo Beach – Civic Center Library	
Estimated Annual Electricity Savings (kWh)	21,156
Estimated Annual Electricity Cost Savings	\$11,430
Estimated Cool Roof Coating Cost	\$224,054
Incremental Cost	NA
Simple Payback (years)	19.6
Estimated Implementation Timeline (days)	10
GHG Emission Reduction (Metric Tons of CO ₂)	4.11
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 22 List of Potential Incentive and Financing Program- City of Redondo Beach – Civic Center Library

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans

Incentive and Financing Program	Description
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed solar array is expected to have a total capacity of approximately 180 kW (DC rating) for the rooftop installation. The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof coating by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$311,860. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.

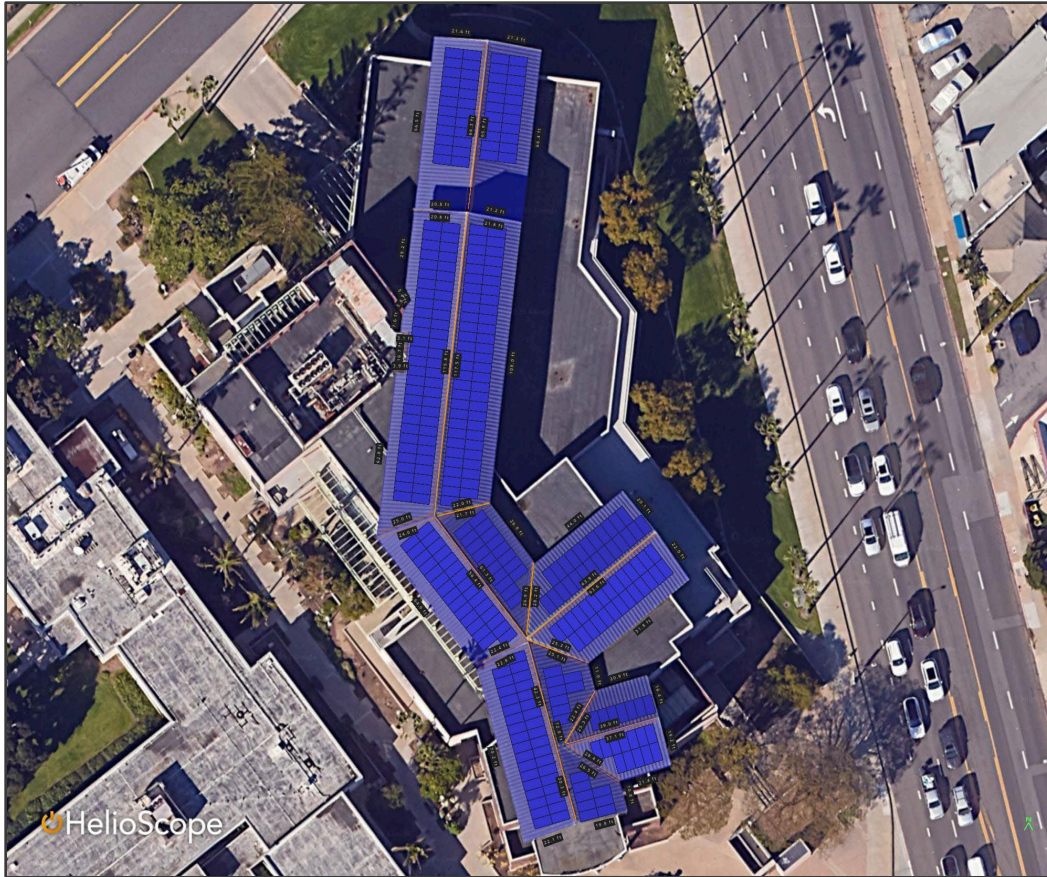


Figure 30 Proposed Solar PV – City of Redondo Civic Center Beach Library

3.11 City of Redondo Beach – Civic Center Police Department

Site Visit

A site visit was conducted on October 9, 2025. During the initial visit, Kevin Cruz of AESC met with Gary Laolagi, Public Works Facilities Manager for the City of Redondo Beach, to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Redondo Beach City Hall is in Climate Zone 06 (CZ06) at 401 Diamond Street, in Redondo Beach, California. It is a one-story building constructed in 1991 based on information retrieved from the Los Angeles County Assessor's Office website. The total building area is approximately 13,650 sq. ft., based on information provided by SBCCOG through Energy Star Portfolio Manager (ESPM). The roof area is the same as the building footprint.



Figure 31 Aerial View of Redondo Beach Civic Center Police Department

The building has a flat built-up roof with a gravel finish. Information regarding the most recent roof replacement or retrofit, as well as roof insulation type and thickness, was not available. Therefore, for the purpose of analysis, the roof was assumed to be original to the building’s construction, making it approximately 34 years old. The roof is past its useful life, as built-up roofing systems typically have an average lifespan ranging from 20 to 30 years (Roof Life Span, 2025). Additionally, several pipes and conduits were observed running across the roof surface and into the City Hall, contributing to a cluttered appearance.



Figure 32 Existing Built-Up Roof with Gravel

The building is conditioned by a combination of the air-cooled chiller with boilers for heating, and a pair of rooftop units (RTUs) with natural gas heating and an additional split system. It is assumed that the HVAC has a system efficiency of 9.58 EER for cooling (equivalent to coefficient of performance of 2.81) and 80% for heating.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 855,909 kWh of electricity and 7,943 therms of natural gas in 2024. These figures represent the combined usage of both the City Hall and Police Department, as they share utility meters.

Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has passed its effective useful life of 30 years, it is recommended to replace it with a new one featuring a cool roof coating. The proposed new cool roof will have a silicon coating that offers numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Depending on the crew size and the contractor's experience, the installation timeline may vary from 14 to 24 days. The estimated duration for the full roof replacement is approximately 19 days, which includes:

- Three days for removing the existing roof
- Installation of the new roof at a rate of 3,500 sq. ft. per day
- Five days for applying the cool roof coating
- Seven days allocated for permitting and inspection processes

As this project involves roof replacement, some impact to building operations is expected. Potential disruptions include noise and vibration from construction equipment, temporary shutdown of rooftop HVAC units, safety risks from falling debris and dust, and limited access to certain areas of the building.

Once the cool roof has been installed, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance

periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof’s solar reflectance (SR) and infrared emittance (IE) values of 0.15 and 0.90, respectively, were replaced with 0.84 and 0.90 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 13,650 sq.ft.

Costs and Potential Incentives

The cost to replace existing built-up roof with same type is estimated at \$13 per sq.ft. of roof area (Roof Replacement Cost, n.d.) with an additional \$4.50 per sq.ft. for applying a cool roof coating (Cool Roof Coating Cost, 2024). Based on total roof area of 13,650 sq.ft. the estimated cost to replace the existing roof with new roof featuring cool roof coating is approximately \$259,350.

Since the existing roof has exceeded its effective useful life of 30 years, the analysis focuses on the incremental cost—the additional expense incurred to upgrade from a standard roof to a cool roof. This approach excludes the full replacement cost and considers only the price difference between conventional and cool roofing systems. The estimated incremental cost is \$61,425.

Energy Savings and Cost Summary Table

Table 23 outlines the energy savings and cost summary associated with the new cool roof installation at this site. The simple payback period is currently estimated using the incremental cost.

Table 23 Energy Savings and Cost Summary- City of Redondo Beach Civic Center Police Department

City of Redondo Beach - Civic Center Police Department	
Estimated Annual Electricity Savings (kWh)	7,800
Estimated Annual Electricity Cost Savings	\$4,214
Estimated New Cool Roof Installation Cost	\$259,350
Incremental Cost	\$61,425
Simple Payback (years)	14.6

City of Redondo Beach - Civic Center Police Department	
Estimated Implementation Timeline (days)	19
GHG Emission Reduction (Metric Tons of CO ₂)	1.51
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 24 List of Potential Incentive and Financing Program- City of Redondo Beach - Civic Center Police Department

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed solar array is expected to have a total capacity of approximately 46 kW (DC rating) for the rooftop installation. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the

cool roof installation by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$98,427. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.



Figure 33 Proposed Solar PV – City of Redondo Beach Civic Center Police Department

3.12 City of Torrance – City Hall

Site Visit

A site visit was conducted on October 2, 2025. During the initial visit, Scott Lin of AESC met with George, a representative from the City of Torrance to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

Torrance City Hall is in Climate Zone 06 (CZ06) at 3031 Torrance Boulevard, Torrance, California. It consists of a four-story building that was dedicated in 1973. According to data provided by SBCCOG through Energy Star Portfolio Manager (ESPM), the building has an approximate area of 53,822 sq. ft.. The estimated roof area is 13,372 sq. ft., based on Google Maps measurement tool.

Based on discussions with site personnel, only the central portion of the building—outlined in red in the image below—is designated as City Hall. The West Annex, Building and Safety and the GIS Buildings are already equipped with cool roofs. Therefore, this analysis focuses exclusively on red outlined section of the facility.



Figure 34 Aerial View of Torrance City Hall

The building has a flat, asphalt membrane roof. Information regarding the most recent roof replacement or retrofit, as well as roof insulation type and thickness, was not available. Therefore, for the purpose of analysis, the roof was assumed to be original to the building's construction, making it approximately 52 years old and beyond its effective useful life. Asphalt roofs typically have an average lifespan of 15 to 30 years (Roof Life Span, 2025).



Figure 35 Existing Asphalt Membrane Roof

The building is cooled by a water-cooled chiller and pumps located on the roof which supply chilled water to two AHUs. The AHUs are located on the roof and in the basement and serve two floors each. The chillers have a coefficient of performance (COP) of 5.67. The building is heated by a natural gas-fired boiler located on the roof with an efficiency of 84%.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 1,690,806 kWh of electricity and 59,014 therms of natural gas annually. These figures represent the combined usage for the entire site including the City Hall and all additional wings.

Since cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has passed its effective useful life of 30 years, it is recommended to replace it with a new one featuring a cool roof coating. The proposed new cool roof will have a silicon coating that offers numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Depending on the crew size and the contractor's experience, the installation timeline may vary from 12 to 22 days. The estimated duration for the full roof replacement is approximately 17 days, which includes:

- Three days for removing the existing roof
- Installation of the new roof at a rate of 3,500 sq.ft. per day
- Three days for applying the cool roof coating
- Seven days allocated for permitting and inspection processes

As this project involves roof replacement, some impact to building operations is expected. Potential disruptions include noise and vibration from construction equipment, temporary shutdown of rooftop HVAC units, safety risks from falling debris and dust, and limited access to certain areas of the building. However, with thoughtful planning—such as scheduling work during off-hours or seasonal downtime—these impacts can be effectively minimized.

Once the cool roof has been installed, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.178 and 0.91, respectively, were replaced with 0.84 and 0.90 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 13,372 sq.ft.

Costs and Potential Incentives

The cost to replace an existing asphalt roof with same type is estimated at \$5.25 per sq.ft. of roof area (Roof Replacement Cost, n.d.) with an additional \$4.50 per sq.ft. for applying a cool roof coating (Cool Roof Coating Cost, 2024). Based on total roof area of 13,372 sq.ft. the estimated cost to replace the existing roof with new roof featuring cool roof coating is approximately \$130,377.

Since the existing roof has exceeded its effective useful life of 30 years, the analysis focuses on the incremental cost—the additional expense incurred to upgrade from a standard roof to a cool roof. This approach excludes the full replacement cost and considers only the price difference between conventional and cool roofing systems. The estimated incremental cost is \$60,174.

Energy Savings and Cost Summary Table

Table 25 outlines the energy savings and cost summary associated with the new cool roof installation at this site. The simple payback period is currently estimated using the incremental cost.

Table 25 Energy Savings and Cost Summary- Torrance City Hall

Torrance – City Hall	
Estimated Annual Electricity Savings (kWh)	4,087
Estimated Annual Electricity Cost Savings	\$2,208
Estimated New Cool Roof Installation Cost	\$130,377
Incremental Cost	\$60,174
Simple Payback (years)	27.25
Estimated Implementation Timeline (days)	17
GHG Emission Reduction (Metric Tons of CO ₂)	0.79
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 26 List of Potential Incentive and Financing Program- Torrance City Hall

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed roof solar array is expected to have a capacity of approximately 63 kW (DC rating). The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site’s energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof installation by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$131,628. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.



Figure 36 Proposed Solar PV – Torrance City Hall

3.13 City of Torrance – Cultural Recreation Center

Site Visit

A site visit was conducted on October 2, 2025. During the initial visit, Scott Lin of AESC met with a representative from the City of Torrance to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Torrance Cultural Recreation Center is in Climate Zone 06 (CZ06) at 3330 Civic Center Dr N, Torrance, CA 90503. It consists of a one-story building built in 1990. The estimated building area is 11,500 sq.ft. based on Google Maps measurement tools.



Figure 37 Aerial View of Torrance Cultural Rec Center

The roof is a flat, built-up type with a gravel coating. The city confirmed that there is no available information regarding the most recent roof replacement or retrofit. Additionally, details about the roof insulation type and thickness were not provided. For the purpose of this analysis, it is assumed that the roof is original to the building’s construction, making it approximately 35 years old and beyond its effective useful life. Built-up roofs typically have an average lifespan of 20 to 30 years (Roof Life Span, 2025).



Figure 38 Existing Built up Roof with Gravel Coating on Top

The building is cooled by a combination of split systems and rooftop units (RTUs). HVAC system efficiency ranged from 11 to 12 EER (equivalent to average coefficient of performance of 3.37). The building is heated by a combination of a heat pump RTU with a COP of 3.4 and a natural gas-fire boiler with an efficiency of 84%.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 979,970 kWh of electricity and 16,255 therms of natural gas annually.

Since electricity cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has passed its effective useful life of 30 years, it is recommended to replace it with a new one featuring a cool roof coating. The proposed new cool roof will have a silicon coating that offers numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Depending on the crew size and the contractor's experience, the installation timeline may vary from 12 to 22 days. The estimated duration for the full roof replacement is approximately 17 days, which includes:

- Three days for removing the existing roof
- Installation of the new roof at a rate of 3,500 sq.ft. per day
- Three days for applying the cool roof coating
- Seven days allocated for permitting and inspection processes

As this project involves roof replacement, some impact to building operations is expected. Potential disruptions include noise and vibration from construction equipment, temporary shutdown of rooftop HVAC units, safety risks from falling debris and dust, and limited access to certain areas of the building. However, with thoughtful planning—such as scheduling work during off-hours or seasonal downtime—these impacts can be effectively minimized.

Once the cool roof has been installed, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance

periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof’s solar reflectance (SR) and infrared emittance (IE) values of 0.15 and 0.90, respectively, were replaced with 0.84 and 0.90 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 11,500 sq.ft.

Costs and Potential Incentives

The cost to replace existing built-up roof with same type is estimated at \$13 per sq.ft. of roof area (Roof Replacement Cost, n.d.) with an additional \$4.50 per sq.ft. for applying a cool roof coating (Cool Roof Coating Cost, 2024). Based on total roof area of 11,500 sq.ft. the estimated cost to replace the existing roof with new roof featuring cool roof coating is approximately \$218,500.

Since the existing roof has exceeded its effective useful life of 30 years, the analysis focuses on the incremental cost—the additional expense incurred to upgrade from a standard roof to a cool roof. This approach excludes the full replacement cost and considers only the price difference between conventional and cool roofing systems. The estimated incremental cost is \$51,750.

Energy Savings and Cost Summary Table

Table 27 outlines the energy savings and cost summary associated with the new cool roof installation at this site. The simple payback period is currently estimated using the incremental cost.

Table 27 Energy Savings and Cost Summary- Torrance Cultural Rec Center

Torrance – Cultural Rec Center	
Estimated Annual Electricity Savings (kWh)	5,474
Estimated Annual Electricity Cost Savings	\$2,958
Estimated New Cool Roof Installation Cost	\$218,500
Incremental Cost	\$51,750
Simple Payback (years)	17.5
Estimated Implementation Timeline (days)	17

GHG Emission Reduction (Metric Tons of CO ₂)	1.06
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 28 List of Potential Incentive and Financing Program- Torrance Cultural Rec Center

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed roof solar array is expected to have a capacity of approximately 54 kW (DC rating). The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof installation by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$114,450. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to

as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.



Figure 39 Proposed Solar PV – Torrance Cultural Recreation Center

3.14 City of Torrance – Police Department

Site Visit

A site visit was conducted on October 2, 2025. During the initial visit, Scott Lin of AESC met with a representative from the City of Torrance to collect building data, including building area, roof area, roof type, roof color, roof insulation, HVAC system type and efficiency, among other details. The site data collection spreadsheet, included in the Appendix A section, served as a guide during the visit.

Existing Condition

The Torrance Cultural Rec Center is in Climate Zone 06 (CZ06) at 3300 Torrance Blvd, in Torrance, CA. It consists of a three-story building including basement built in 1980. The building has an approximate sq. ft. of 74,183 based on data provided by SBCCOG through Energy Star Portfolio Manager (ESPM). The estimated roof area is 31,000 sq.ft. based on Google Maps measurement tool.

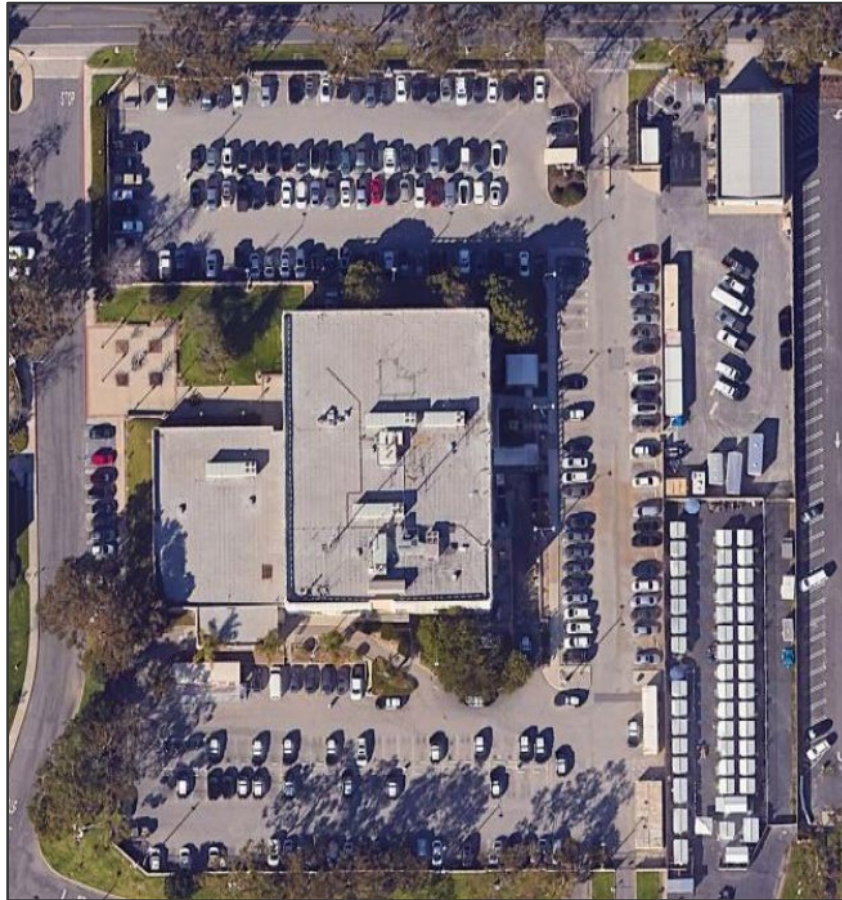


Figure 40 Aerial View of Torrance Police Department

The roof is a flat, asphalt membrane type. The city confirmed that there is no available information regarding the most recent roof replacement or retrofit. Additionally, details about the roof insulation type and thickness were not provided. For the purpose of this analysis, it is assumed that the roof is original to the building’s construction, making it approximately 45 years old and beyond its effective useful life. Asphalt membrane roofs typically have an average lifespan of 15 to 30 years (Roof Life Span, 2025).



Figure 41 Existing Asphalt Membrane Roof

The building is cooled by multiple cooling-only rooftop units (RTUs). As the nameplate data was not visible during the assessment, a cooling efficiency of 2.6 coefficient of performance (COP) was assumed for analysis purposes. The building is heated by a natural gas-fire boiler with an efficiency of 84%.

Based on information provided by SBCCOG through ESPM, the site consumed approximately 1,707,682 kWh of electricity and 28,191 therms of natural gas annually. Since electricity cost data was not available, AESC applied a blended electricity rate of \$0.54/kWh to estimate annual energy savings for the analysis. This figure was derived from a base rate of \$0.30/kWh, observed at comparable sites within the same region. A projected 4% annual increase in utility rates was applied over the projected 20-year project life. *It's important to note that a lower blended electricity rate would result in a longer payback period, while a higher rate would shorten it.*

Cool Roof Implementation Plan

Given that the existing roof has passed its effective useful life of 30 years, it is recommended to replace it with a new one featuring a cool roof coating. The proposed new cool roof will have a silicon coating that offers numerous advantages, including waterproofing, high solar reflectivity, UV resistance, and durability against ponding water. In addition to extending the roof's lifespan—potentially up to 20 years (Coatings Lifespan, 2025)—silicone coatings help reduce cooling loads, improve indoor comfort, mitigate the urban heat island effect, and contribute to lower greenhouse gas emissions. Cooler urban temperatures also support better air quality by reducing smog formation.

Depending on the crew size and the contractor's experience, the installation timeline may vary from 21 to 31 days. The estimated duration for the full roof replacement is approximately 26 days, which includes:

- Three days for removing the existing roof
- Installation of the new roof at a rate of 3,500 sq.ft. per day
- Seven days for applying the cool roof coating
- Seven days allocated for permitting and inspection processes

As this project involves roof replacement, some impact to building operations is expected. Potential disruptions include noise and vibration from construction equipment, temporary shutdown of rooftop HVAC units, safety risks from falling debris and dust, and limited access to certain areas of the building.

Once the cool roof has been installed, regular maintenance is essential to preserve its effectiveness. Conduct annual inspections to identify any physical damage, punctures, seam separations, or signs of deterioration. To ensure optimal solar reflectance and performance periodic cleaning and washing is vital to remove dirt, debris, moss, and algae buildup. Address minor issues such as small leaks, damaged flashing, or punctures promptly using patching techniques or by applying an additional layer of reflective coating to prevent further degradation.

Energy Savings Calculation

Energy savings for this measure were calculated using the cool roof calculator developed by the Oak Ridge National Laboratory under the USDOE. Due to the lack of available data from the site, the existing and proposed roof R-values were assumed for the analysis. Since the thermal resistance (R-value) remained unchanged between the baseline and proposed conditions, it had minimal impact on the estimated energy savings. The baseline roof's solar reflectance (SR) and infrared emittance (IE) values of 0.178 and 0.91, respectively, were replaced with 0.84 and 0.90 for the proposed cool roof condition. The roof area considered for the savings estimate was approximately 31,000 sq.ft.

Costs and Potential Incentives

The cost to replace existing asphalt roof with same type is estimated at \$5.25 per sq.ft. of roof area (Roof Replacement Cost, n.d.) with an additional \$4.50 per sq.ft. for applying a cool roof coating (Cool Roof Coating Cost, 2024). Based on total roof area of 31,000 sq.ft. the estimated cost to replace the existing roof with new roof featuring cool roof coating is approximately \$302,250.

Since the existing roof has exceeded its effective useful life of 30 years, the analysis focuses on the incremental cost—the additional expense incurred to upgrade from a standard roof to a cool roof. This approach excludes the full replacement cost and considers only the price difference between conventional and cool roofing systems. The estimated incremental cost is \$139,500.

Energy Savings and Cost Summary Table

Table 29 outlines the energy savings and cost summary associated with the new cool roof installation at this site. The simple payback period is currently estimated using the incremental cost.

Table 29 Energy Savings and Cost Summary- Torrance Police Department

Torrance – Police Department	
Estimated Annual Electricity Savings (kWh)	18,011
Estimated Annual Electricity Cost Savings	\$9,731
Estimated New Cool Roof Installation Cost	\$302,250
Incremental Cost	\$139,500
Simple Payback (years)	14.34
Estimated Implementation Timeline (days)	26
GHG Emission Reduction (Metric Tons of CO ₂)	3.50
Effective Useful Life of Cool Roof (years)	20

The following incentive programs and funding sources are currently available for this site and may help lower the overall project cost while improving the payback period. While some program benefits can be combined, individual program requirements must be reviewed for confirmation. For the most current funding details, consult the program’s official website.

Table 30 List of Potential Incentive and Financing Program- Torrance Police Department

Incentive and Financing Program	Description
California Energy Commission’s Energy Conservation Assistance Act	1% interest loans up to \$3 million, loan term up to smaller of 20 years or Effective Useful Life (EUL) of Project. For details, visit: https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans
Southern California Regional Energy Network (SoCalREN): Public Agency Program	<ul style="list-style-type: none"> Metered Savings Program - Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more. For details, visit: https://socalren.org/agencies/services/streamlined-savings
Southern California Edison (SCE) Measured Savings Program	Incentive based on normalized energy savings measured at the meter and requires a minimum threshold of 10% savings to qualify. For details, visit: https://aesc-inc.com/measured-savings-program/
SCE On-Bill Financing	0% interest loan to be repaid by bill savings, loan term up to smaller of 10 years or EUL

Incentive and Financing Program	Description
	For details, visit: https://www.sce.com/business/rates-financing/energy-efficiency-financing/on-bill-financing

Solar Installation

The building’s roof presents an ideal location for solar PV due to its relatively unobstructed surface and minimal shading.

The proposed roof solar array is expected to have a capacity of approximately 198 kW (DC rating). The estimated solar system size represents the maximum capacity that can be accommodated at the site; however, the actual system size needed to meet the site's energy demand may be smaller. All energy generated will help offset the electricity that would have otherwise been purchased from the utility. Moreover, the solar PV system can complement the cool roof installation by providing additional shading across large roof areas, further reducing heat gain and enhancing overall energy efficiency. The estimated implementation cost is approximately \$343,991. This figure accounts for the 30% Federal Investment Tax Credit (commonly referred to as “Direct Pay” or Elective Pay for tax-exempt agencies) which is currently available but expected to expire by the end of 2027, along with an additional 10% incentive for this project due to its location within an “Energy community”. In addition, tax-exempt agencies that utilize domestically sourced materials may qualify for an extra 10% incentive, further reducing overall costs.

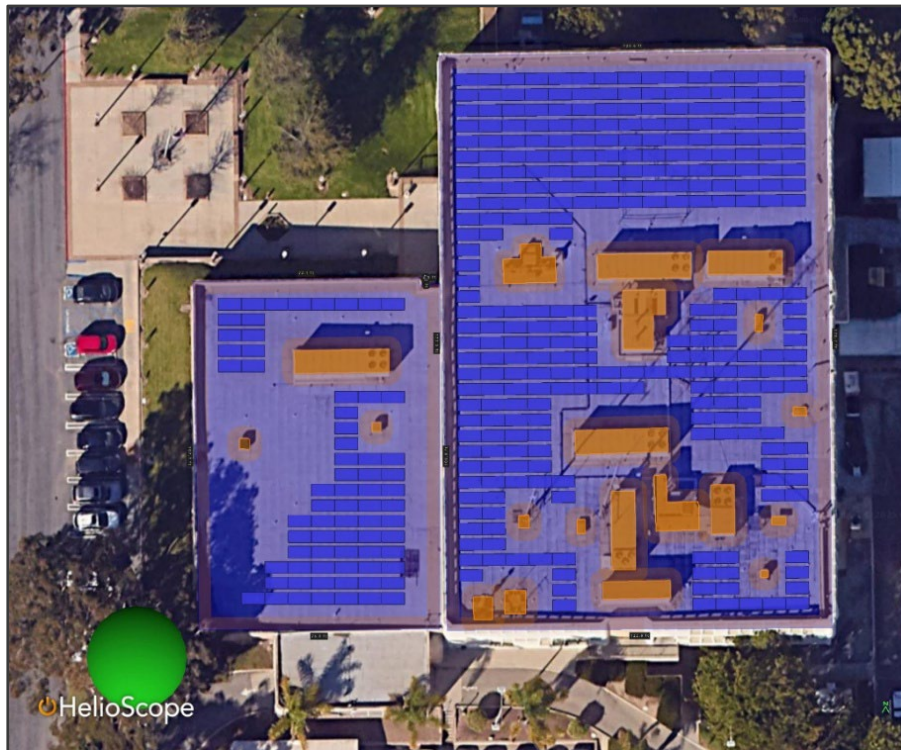


Figure 42 Proposed Solar PV – Torrance Police Department

4. Summary of Findings

The analysis reviewed 14 sites, municipal facilities such as police stations, libraries, city halls, and sports complexes. Each location was assessed based on its current roof condition, remaining useful life, proposed cool roof solution, projected energy savings, cost considerations, and environmental benefits.

Estimated annual energy savings ranged from 3,497 kWh to 21,156 kWh, reflecting significant variability driven by factors such as building size, existing roof type, and HVAC system efficiency. While cool roofs offer measurable energy and emissions reductions, the simple payback periods are generally long, with eight sites exceeding 20 years. This indicates that financial justification depends largely on non-energy benefits, including extended roof life and alignment with sustainability objectives.

Table 31 ranks all sites from most to least suitable for cool roof implementation, primarily based on their estimated simple payback period.

Table 31 Summary Table - All Sites

Order	Site Name	Building Area (sq.ft.)	Conditioned Roof Area (Sq.ft)	Age of Existing Roof (years)	Remaining Useful Life of Existing Roof (Years)	Existing Roof Description	Proposed Cool Roof Solution	Estimated Annual Electricity Savings (kWh)	Estimated Annual Electricity Cost Savings (\$)	Estimated Cool Roof Coating OR New Cool Roof Cost (\$)	Incremental Cost (\$)	Simple Payback (years)	Estimated Implementation Timeline (days)	GHG Emission Reduction (Metric Tons of CO2)	Effective Useful Life of Cool Roof (years)
1	Torrance - Police Department	74,183	31,000	45	0	Asphalt Membrane	Remove Existing Roof and Install New Roof with Cool Roof Coating	18,011	\$9,731	\$302,250	\$139,500	14.3	26	3.50	20
2	Redondo Beach - Civic Center Police Department	13,650	13,650	34	0	Built-Up Roof (BUR) with gravels on the top	Remove Existing Roof and Install New Roof with Cool Roof Coating	7,800	\$4,214	\$259,350	\$61,425	14.6	19	1.51	20
3	Gardena- Police Department	23,147 (does not include trailer)	16,239	65	0	Flat, Modified Bitumen Gray	Remove Existing Roof and Install New Roof with Cool Roof Coating	8,369	\$4,850	\$166,450	\$73,076	15.1	17	1.63	20
4	Redondo Beach- City Hall	42,000	34,701	63	0	Two types of roof- 1. Tar/Asphalt Roof (appx 92%) 2. Built-Up Roof (BUR) with gravels on the top (appx 8%)	Remove Existing Roof and Install New Roof with Cool Roof Coating	17,387	\$9,394	\$349,259	\$156,155	16.6	30	3.38	20
5	Torrance- Cultural Recreation Center	11,500	11,500	35	0	Built-Up Roof (BUR) with gravels on the top	Remove Existing Roof and Install New Roof with Cool Roof Coating	5,474	\$2,958	\$218,500	\$51,750	17.5	17	1.06	20
6	Redondo Beach- Civic Center Library	36,000	34,316	55	15	Two Types- 1. Grey colored Metal sloped roof and 2. Flat Tar/asphalt grey roof	Apply silicone white coating on existing roofs	21,156	\$11,430	\$224,054	NA	19.6	10	4.11	20
7	Inglewood- Darby Park	20,900	17,092	68	0	Two types of roof- 1. Built-Up Roof (BUR) with gravels on the top 2. Asphalt Shingles	Remove Existing Roof and Install New Roof with Cool Roof Coating	7,037	\$3,802	\$298,159	\$94,050	24.7	20	1.37	20
8	Gardena- Rush Gymnasium and Human Services	20,559	20,559	46	29	Concrete with gravel on the top	Apply silicone white coating on existing roof	14,184	\$7,653	\$201,450	NA	26.3	18	2.75	20
9	Torrance City Hall	53,822	13,372	52	0	Asphalt Membrane	Remove Existing Roof and Install New Roof with Cool Roof Coating	4,087	\$2,208	\$130,377	\$60,174	27.3	17	0.79	20
10	Inglewood- Civic Center Police Department (PD)	35,240	26,759	49	0	Built-Up Roof (BUR) with gravel on the top	Remove Existing Roof and Install New Roof with Cool Roof Coating	7,646	\$4,131	\$508,421	\$120,416	29.2	23	1.48	20
11	Lomita - City Hall	20,000	12,533	18	12	Built-Up Roof (BUR) with gravels on the top	Apply silicone white coating on existing roof	6,725	\$3,633	\$123,197	NA	33.9	17	1.31	20
12	Inglewood- Rogers Park Community Center	33,978	33,978	15	15	Built-Up Roof (BUR) with gravels on the top	Apply silicone white coating on existing roof	16,775	\$9,063	\$342,819	NA	37.8	20	3.26	20
13	Inglewood- Library	8,284	8,284	4	26	Built-Up Roof (BUR) with gravels on the top	Apply silicone white coating on existing roof	3,497	\$1,890	\$87,853	NA	46.5	15	0.68	20
14	Carson- Veterans Sports Complex	32,983	20,980	35	20	Steep Slope Green Metal Roof	Apply silicone white coating on existing roof	5,973	\$3,227	\$215,390	NA	66.7	8	1.16	20

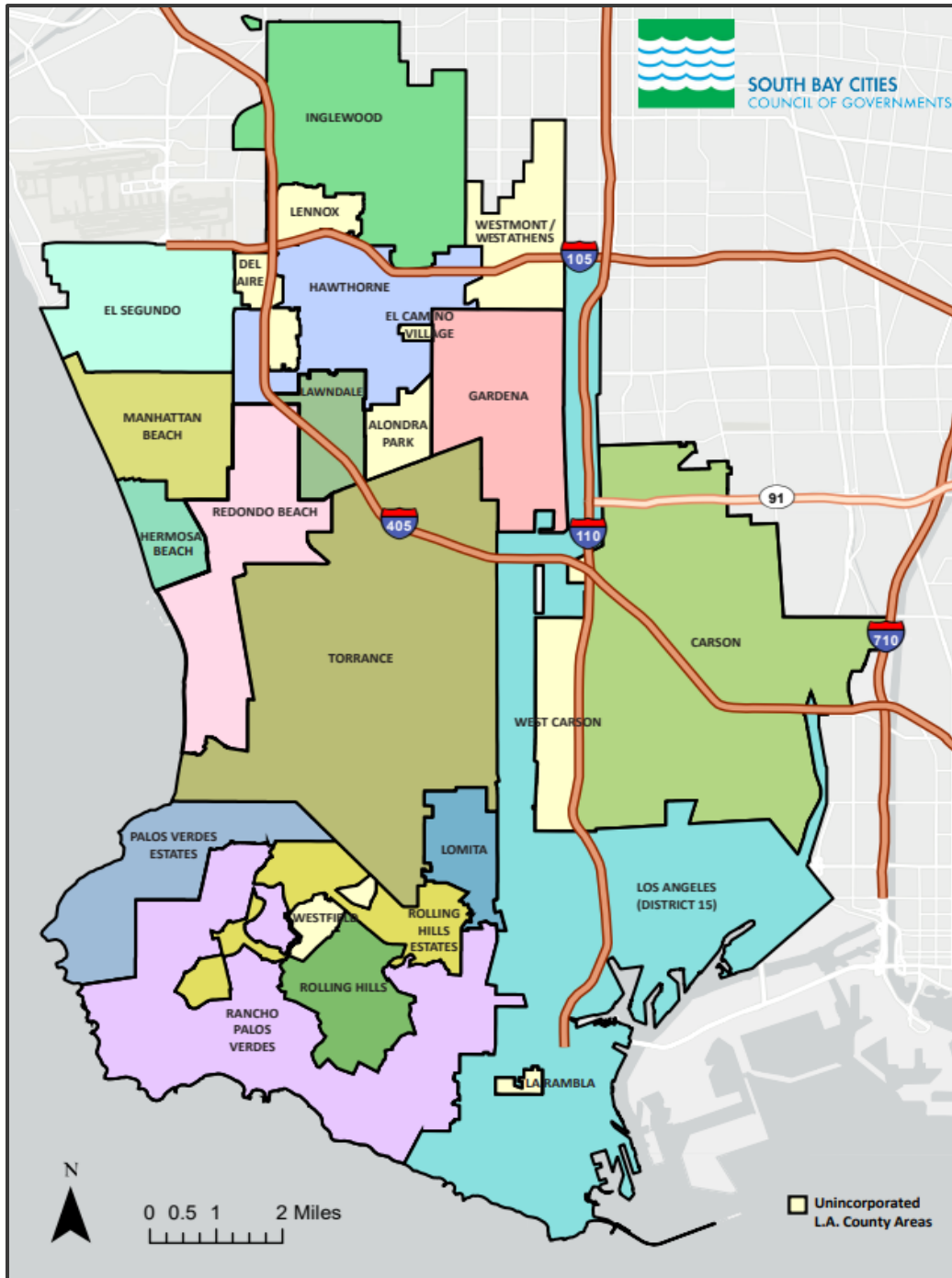
5. Next Steps

After receiving the cool roof feasibility study report, the SBCCOG and member cities should focus on the following key steps to move toward implementation:

- **Cities: Planning:** Prioritize adoption of cool roofs during routine roof upgrades and replacements, using incremental costs and payback periods to guide projects. Where feasible, align cool roof installations with future rooftop solar PV plans to enhance energy efficiency and long-term value.
- **Cities: Securing funding and financial support for cool roofs:** Utilize the report's List of Potential Incentives and Financing Program Table to identify viable financing options. Explore low-interest loans, on-bill financing, and incentive programs offered by SCE and SoCalREN to help offset initial costs.
- **SBCCOG: Sub-regional funding:** Look for funding to support sub-regional projects to reduce financial burden on cities and decrease payback periods. Consider launching one or two pilot projects to showcase benefits, gather performance data, and build momentum.

6. Appendix A

6.1 Map of SBCCOG Territory



The South Bay Cities Council of Governments (SBCCOG) is a joint powers authority of 16 cities and the County of Los Angeles that share the goal of maximizing the quality of life and productivity of the South Bay region. Our members are Carson, El Segundo, Gardena, Hawthorne, Hermosa Beach, Inglewood, Lawndale, Lomita, Manhattan Beach, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, Torrance, and the Harbor City/San Pedro/Wilmington communities of the City of Los Angeles, along with the unincorporated areas of the County of Los Angeles District 2 and 4.

6.2 Site Data Collection Template

Agency Name	
Site Name	
Site Address	
Number of Buildings On Site?	
Building Area sq.ft. (For sites with multiple buildings, please provide the area for each building separately)	
Year of Construction	
Typical Operating Schedule (e.g. Mon-Fri, 8AM-5PM)	
Primary use type (office, warehouse, etc)	
Approximate conditioned square footage (enter each building separate if multiple)	
Approximate Roof Surface Area (sq.ft.) (enter each building separate if multiple)	
Year of most recent Roof replacement or Roof coating	
Roof Slope Type (Low-slope or steep-slope)	
Roof Type	
Roof Color (e.g. Gray, White, Black, Brown etc.)	
Is there any roof Insulation?	
If yes, specify type and thickness	
Annual Electricity Consumption (kWh)	
Annual Max Peak Demand (kW)	
Annual Electricity Cost (\$)	
Annual Natural Gas Usage (therms)	
Annual Natural Gas Cost (\$)	
Cooling System Type	
Cooling System Capacity (approx Tons)	
Specify Cooling efficiency of HVAC Unit (specify unit - EER, SEER, kW/ton etc.)	
Heating System Fuel Type (electric, gas)	
Existing Heating system efficiency (specify unit- percentage, HSPF, COP etc.)	
Where is the electrical room located?	

7. Appendix B - Research and Literature Review Report

December
2025



Cool Roof Feasibility and Site Analysis for Public Sector Facilities

RESEARCH AND LITERATURE REVIEW

PREPARED FOR
South Bay Cities Council of Governments (SBCCOG)

SUBMITTED BY

AESC, a Franklin Energy Company

Table of Contents

1. Executive Summary	1
2. Introduction	2
2.1 Cool Roof Definition	2
2.2 Benefits of Cool Roofs.....	3
3. Available Cool Roof Technologies	4
3.1 Rating Cool Roof Products	4
3.2 Relevant Codes and Standards.....	5
3.2.1 <i>Overview</i>	5
3.2.2 <i>California Title 24, Part 6: Building Energy Efficiency Standards, 2022</i>	5
3.2.3 <i>Los Angeles County Title 31: Green Building Standards Code</i>	6
3.2.4 <i>Municipal Codes</i>	7
3.3 Technologies Available for Different Roof Types	7
3.3.1 <i>Roof Coverings</i>	7
3.3.2 <i>Initial Recommendations Based on Roof Covering</i>	10
3.3.3 <i>Impact of Building Insulation</i>	10
3.4 Comparison with Alternatives	11
4. The South Bay Approach	13
4.1 Description of South Bay Sub-Region	13
4.2 Expected Energy Savings	14
4.2.1 <i>Buildings Without HVAC</i>	14
4.2.2 <i>Buildings with HVAC</i>	14
4.2.3 <i>Relevant Case Studies</i>	14
4.3 Potential Funding Sources for Public Agencies	16
5. References	18
6. Appendix	22
6.1 Map of SBCCOG Territory	22

Figures

Figure 1: Material properties that define cool roofs.....	2
Figure 2: SRI Values.....	3
Figure 3: Screenshot of CRRC Rated Roof Products Directory.....	4

Tables

Table 1: Prescriptive Roofing Material Requirements for Nonresidential Building Alterations – California Energy Code.....	6
Table 2: Prescriptive Roofing Material Requirements for Nonresidential Building Alterations – County of Los Angeles.....	6
Table 3: Common Roof Covering Types for Steep-Sloped Roofs.....	7
Table 4: Common Roof Covering Types for Low-Sloped Roofs.....	8
Table 5: Cool Roof Product Options for Different Roof Covering Types.....	9
Table 6: Weather Data Summary for CZ 6 and CZ 8.....	13

1. Executive Summary

This report provides a comprehensive overview of cool roof technologies, examining their functionality, benefits, and applicability, particularly within the territory of the South Bay Cities Council of Governments (SBCCOG) in the Southern California region. Cool roofs are designed to reflect more sunlight and absorb less heat than standard roofs, which lowers roof temperatures and reduces energy consumption for cooling. Beyond direct building-level advantages such as improved indoor comfort and energy savings, cool roofs also contribute to broader environmental benefits, including mitigation of the Urban Heat Island (UHI) effect.

The report evaluates various cool roof technologies, rating systems, and installation logistics across different roof types and materials, along with associated costs, maintenance needs, and payback periods. A comparative analysis with alternatives like green roofs is included to assess feasibility and cost-effectiveness. The report includes a regional assessment of SBCCOG's unique climate zones (CZ), policy landscape, and funding opportunities, offering tailored recommendations for public agencies and stakeholders aiming to implement sustainable roofing solutions in both coastal and inland communities.

The report finds that cool roof retrofits can effectively provide energy savings in buildings with HVAC systems in warm climates such as in California. Energy savings vary based on several factors including original roof reflectivity, HVAC efficiency, insulation, and climate. Summarized results of several case studies in California are included to provide examples of potential savings. There are tools available to estimate energy savings based upon the factors that can be used on a case-by-case basis. In buildings without HVAC, there cannot be measurable savings, but the thermal comfort can be improved inside the building.

2. Introduction

2.1 Cool Roof Definition

Cool roofs are named for their ability to lower rooftop temperatures and are defined by two measured material properties: solar reflectance (SR) and thermal emittance (TE). SR is the ability of the surface to reflect sunlight. TE is the ability of the surface to radiate absorbed heat from the sunlight. Both properties are measured on a scale of 0 to 1 where a higher value indicates a “cooler” roof. The Solar Reflectance Index (SRI) is a calculated metric that was created to combine SR and TE into a single parameter used to compare cool roof products. SRI values are typically from 0 to 100, where 0 is comparable to a standard black material and 100 is comparable to a standard white material (CRRC, 2024). Figure 1 shows a visualization of the important properties related to cool roofs. It is possible to have SRI values that are outside of the typical range due to how the standard black and white materials are defined. Figure 2 shows the SR and TE values that are used to calculate $SRI = 100$ and $SRI = 0$. It is possible to have a more reflective and/or higher emittance material than the standard white roof, leading to an SRI value greater than 100. It is also possible to have a less reflective and/or lower emittance material than the standard black material, leading to a negative SRI value.

Roofs consist of many layers including structural beams, decking, insulation, waterproofing layers, and roof covering/coating. This report will primarily focus on the topmost layer, the roof covering or coating. This layer has the most effect on how much solar energy is reflected or absorbed.

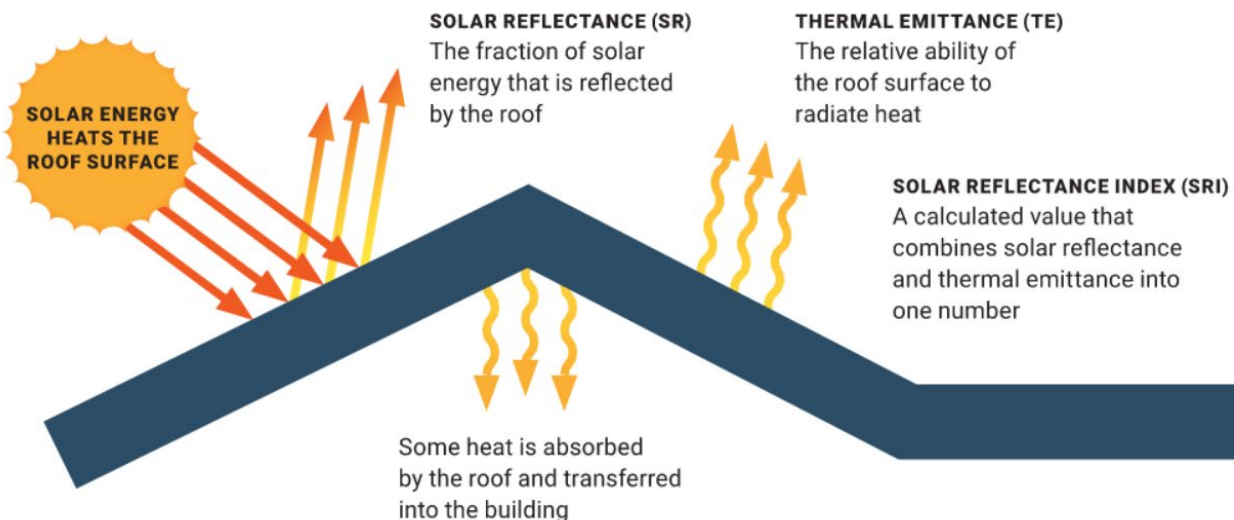


Figure 1: Material properties that define cool roofs.
Source: (CRRC, 2024)

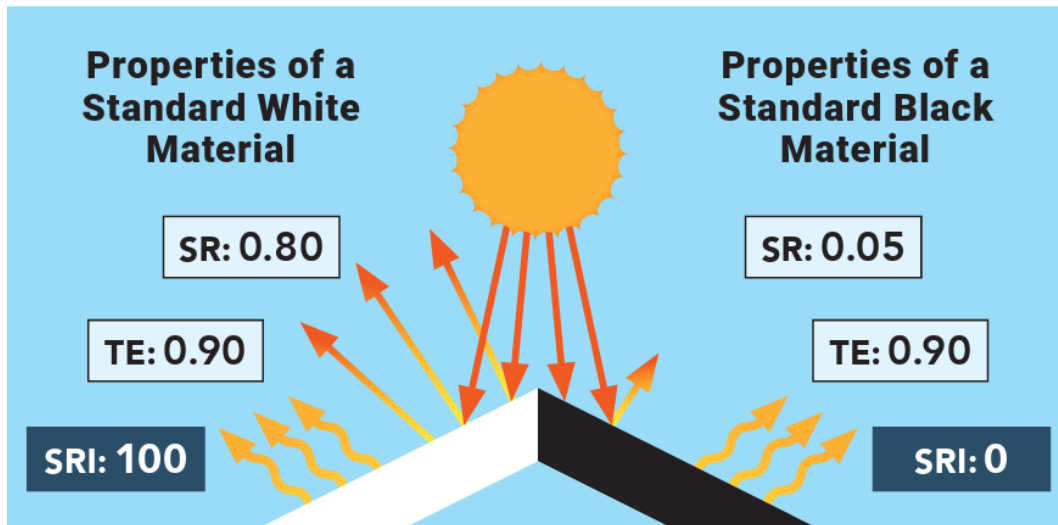


Figure 2: SRI Values
Source: (CRRC, 2024)

2.2 Benefits of Cool Roofs

Cool roofs provide benefits both to the building itself and the surrounding community. The roof is a major source of heat entering the building envelope. A roof with a higher SRI allows less heat to enter the building, which lessens the cooling load. This can create energy savings during the summer months, as heating, ventilation, and air conditioning (HVAC) equipment can run with lower energy input to cool the building. This is particularly beneficial for older or undersized HVAC units. It can also increase the thermal comfort inside buildings without HVAC systems (US DOE, n.d.). Energy savings can vary depending on many factors including building type, roof type, amount of insulation, building location, and climate. This report examined some of these factors and provided tools for estimating energy savings in Section 4.2.

Beyond individual buildings, cool roofs contribute to mitigating the UHI effect, a phenomenon where urban areas experience higher temperatures than surrounding rural regions. In the US, roofs and pavements typically make up about 60% of the surface area in a city and are often dark-colored, absorbing a lot of heat from the sun. Consequences of the UHI effect include increased energy consumption to cool buildings, air pollution, and frequency of heat-related and respiratory illnesses (Berkeley Lab, n.d.). Increasing the adoption of cool roof materials in cities will reflect more sunlight from these areas, therefore reducing urban temperatures and improving public health.

One potential drawback is the “heating penalty.” The roof will absorb less heat in the winter as well, which can increase the heating load. However, in warmer climates, the summer energy savings typically outweigh the additional winter heating costs.

3. Available Cool Roof Technologies

3.1 Rating Cool Roof Products

As discussed in Section 2.1, the criteria for comparison of cool roof products are the SR, TE, and SRI values. SRI is the easiest for comparison since it is a single metric that represents the combined effect of SR and TE.

The Cool Roof Rating Council (CRRC) is an organization that provides product rating programs for manufacturers to certify their roof and wall products and have them listed in the CRRC’s free online databases (CRRC, n.d.). The CRRC Rated Roof Products directory compiles listed products for cool roof retrofits and provides initial and 3-year values for the SR, TE, and SRI values. The 3-year values are measured after a 3-year weathering test of the product in different representative US climates: Ohio (cool/temperate), Arizona (hot/dry), and Florida (hot/humid) (CRRC, 2022). It is important to consider the 3-year SRI value because products can lose their effectiveness when exposed to the elements.

Figure 3 shows an example of using the CRRC database to select cool roof products. Information available includes Manufacturer, Brand, Model, Product Type, Color, and values for Initial and 3-Year SR, TE, and SRI. It is recommended to work with the roofing contractor to ensure a rated product is chosen. The “Sort By” button at the top right can be used to sort the list as desired, and the Filter list at the left side can be used to filter products as desired.

See database here: <https://coolroofs.org/directory/roof>

The screenshot shows the CRRC Rated Roof Products Directory interface. At the top, there is a search bar and a 'Sort by SRI 3 Year Value' button. Below the search bar, there are filter options for Product Type, Colors, Solar Reflectance, Thermal Emittance, SRI, Manufacturer, Slope, and Product Market. The main table displays product details including CRRC Prod ID, Manufacturer, Brand and Model, Product Type, Color, and Solar Reflectance (Initial and 3 Year), Thermal Emittance (Initial and 3 Year), and SRI (Initial and 3 Year).

	CRRC PROD ID.	MANUFACTURER	BRAND AND MODEL	PRODUCT TYPE	COLOR	SOLAR REFLECTANCE		THERMAL EMITTANCE		SRI	
						INITIAL	3 YEAR	INITIAL	3 YEAR	INITIAL	3 YEAR
Product Type	1358-0002 (smooth)	EA BIOS Co.,Ltd.	Klima Active Klima NanoActive	Coating	Bright White	0.91	0.87	0.88	0.88	115	110
Colors	1054-0001 (smooth)	NuTech Paint LLC	NXT Cool Coat White	Coating	Bright White	0.90	0.86	0.87	0.88	114	108
Solar Reflectance	1148-0016 (smooth)	Tex-Cote LLC	REFLECT-TEC Heat Reflective Roof Coating Bright White	Coating	Bright White	0.89	0.86	0.88	0.87	113	108
Thermal Emittance	0616-0049 (smooth)	Polyglass USA, Inc.	Polyglass PolyBrte 33 CS	Coating	Bright White	0.87	0.85*	0.90	0.89*	110	107*
SRI	0628-0030 (smooth)	Carlisle Construction Materials Incorporated	X-Tenda Coat XTRA Silicone	Coating	Bright White	0.87	0.84*	0.90	0.90*	110	106*
Manufacturer:	0612-0378 (smooth)	Tremco CPG Inc.	Alphaguard SI 100 White White	Coating	Bright White	0.87	0.84*	0.90	0.90*	110	106*
Slope:	0738-0023 (smooth)	Versico Incorporated	X-Tenda Coat XTRA Silicone	Coating	Bright White	0.87	0.84*	0.90	0.90*	110	106*
Product Market:	1090-0015 (smooth)	WeatherBond	X-Tenda Coat XTRA Silicone	Coating	Bright White	0.87	0.84*	0.90	0.90*	110	106*

Figure 3: Screenshot of CRRC Rated Roof Products Directory. Source: (CRRC, 2025)

3.2 Relevant Codes and Standards

3.2.1 Overview

There are several codes and standards with cool roof requirements that are applicable to the SBCCOG territory. See below for a summary of which codes are applicable to which cities in the region.

1. California Title 24, Part 6: Building Energy Efficiency Standards
 - Applicable to the entire SBCCOG territory.
2. Los Angeles County Title 31: Green Building Standards Code
 - Applicable to the unincorporated County of Los Angeles.
3. Municipal Codes
 - City of Los Angeles Chapter IX, Article 9: Green Building Code
 1. Applicable to Los Angeles (District 15).
 - City of Rolling Hills Title 15, Chapter 15.22: Green Building Standards Code
 1. Applicable to Rolling Hills.
 - City of Rolling Hills Estates Title 15, Chapter 15.04: Building Code
 1. Applicable to Rolling Hills Estates.

3.2.2 California Title 24, Part 6: Building Energy Efficiency Standards, 2022

Also known as the California Energy Code, this standard applies to projects in the state of California. Most Authority Having Jurisdictions (AHJs) are currently implementing the 2022 edition. The requirements vary based on whether a project is considered New Construction, Addition, or Alteration. For this report, the focus is on cool roof requirements for nonresidential buildings undergoing an Alteration (i.e., existing building retrofits that do not increase the square footage of the building).

Relevant Definitions (Ace Resources, 2024):

1. **Nonresidential Building:** defined by Occupancy Group. Includes Occupancies A (Assembly), B (Business), E (Educational Facilities), F (Factories), H (High Hazard Facilities), R-1 (Hotel & Motel), I-2 (Institutional), M (Mercantile), S (Storage), and U (Utility).
2. **Alteration:** any change to a building that does not increase the conditioned floor area and conditioned volume.
3. **Roof Recoat:** not defined in the code. In the roofing industry, typically is when a new layer is applied to the outer surface of the existing roof material for renewal or maintenance, and the existing roofing material is not replaced and recovered.
4. **Roof Recover:** installation of a roof covering over an existing roof covering without removing the existing roof covering.
5. **Roof Replacement:** removal of existing roof covering, repair of any damage, and installation of a new roof covering.

6. **Low-Sloped:** roof pitch of <2:12 (9.5 degrees).
7. **Steep-Sloped:** roof pitch of \geq 2:12 (9.5 degrees).

The California Energy Code requires the usage of CRRC rated products to meet the requirements (Ace Resources, 2024).

According to the California Energy Code, when more than 50% or 2,000 ft² of roofing material is recovered, replaced, or recoated, cool roof requirements are triggered. Table 1 can be used to determine the roofing material requirements based on whether the roof is low-sloped or steep-sloped. The selected product must either comply with both the SR and TE requirements, or only the SRI requirement. According to the Nonresidential Compliance Manual developed by the CEC, there are stricter requirements for low-sloped roofs because they receive more solar radiation during the summer than steep-sloped roofs (CEC, 2023). It is anticipated that the majority of SBCCOG cities' buildings will be required to comply with the California Energy Code if it is decided to move forward with the cool roof upgrades.

Table 1: Prescriptive Roofing Material Requirements for Nonresidential Building Alterations – California Energy Code

Roof Style	Building Type	Climate Zones	EITHER 3-Year SR	AND TE	OR SRI
Low-Sloped	Nonresidential	1-16	≥ 0.63	≥ 0.75	≥ 75
Steep-Sloped	Nonresidential	2, 4-16	≥ 0.25	≥ 0.80	≥ 23

Source: (Ace Resources, 2024)

3.2.3 Los Angeles County Title 31: Green Building Standards Code

This code applies only to the portion of SBCCOG territory that is unincorporated and falls under the jurisdiction of the County of Los Angeles. The County of Los Angeles code accepts the majority of the California Energy Code but has adopted several additional ordinances that are more stringent than California's requirements. One of these ordinances includes changes to Table 1 in Section 3.2.2.

Table 2 below shows the changes to Table 1 that are applicable in the County of Los Angeles. The required SR, TE, and SRI values are slightly increased from those in the California Energy Code.

Table 2: Prescriptive Roofing Material Requirements for Nonresidential Building Alterations – County of Los Angeles

Roof Style	EITHER 3-Year SR	AND TE	OR SRI
Low-Sloped	≥ 0.68	≥ 0.85	≥ 82
Steep-Sloped	≥ 0.28	≥ 0.85	≥ 27

Source: (County of Los Angeles, 2025)

3.2.4 Municipal Codes

Most of the cities in the SBCCOG territory adopt the California Energy Code as written, or without any changes to the cool roof requirements.

Only the cities of Los Angeles, Rolling Hills, and Rolling Hills Estates have stricter cool roof requirements. These cities adopt the same modification as the County of Los Angeles, either through an ordinance or by adopting the entire Los Angeles County Title 31. Table 2 also applies in these areas (American Legal Publishing, 2025), (Municode, 2025), (Municode, 2024).

3.3 Technologies Available for Different Roof Types

3.3.1 Roof Coverings

There are different cool roof products available based on the roof covering. Roof covering types are typically divided into Low-Sloped or Steep-Sloped (see definitions in Section 3.2.1). This is primarily because of how roof pitch affects water drainage. Steep-sloped buildings rely on gravity to shed water and do not require additional drainage. Common steep-sloped roof coverings such as shingles and tiles are layered to allow water to flow downward without obstruction. Conversely, low-sloped roofs lack sufficient pitch for gravity-based drainage alone. These roofs have drains installed with subtle pitch lines to guide water toward drainage points and prevent ponding. As a result, low-sloped roofs typically use sheet-like materials installed with uniform thickness (American Quality Remodeling, 2024).

The SBCCOG cities' building list includes both low-sloped and steep-sloped roofs. Table 3 and Table 4 below include common roof covering types for low- and steep-sloped roofs and information about the material, typical colors, and identifying features.

Table 3: Common Roof Covering Types for Steep-Sloped Roofs

Type	Material	Color	Features/Description
Asphalt/Composition Shingle	Mix of granules, tar, and fiberglass	Ranges from dark gray to light tan or white	<ul style="list-style-type: none"> • Most cost-effective for steep-sloped roofs • Wide variety of colors
Concrete Tile	Concrete	Dark to light gray	<ul style="list-style-type: none"> • Durable • Long lifetime • Different tile shapes available
Clay Tile	Clay	Red/orange	<ul style="list-style-type: none"> • Fragile and appear more decorative • More expensive than concrete tiles
Metal Roof	Metal sheets with interlocking seams to keep out water	Dark colored	<ul style="list-style-type: none"> • Durable • Long lifetime
Wood Shake	Wood	Dark colored	<ul style="list-style-type: none"> • Older roofing material • Less common

Source: (CRRC, n.d.), (CeDUR, n.d.)

Table 4: Common Roof Covering Types for Low-Sloped Roofs

Type	Sub-Type	Material	Color	Features/Description
Single-Ply Membrane	EPDM	Synthetic rubber	Black or White	<ul style="list-style-type: none"> High elasticity
Single-Ply Membrane	TPO (Thermoplastic Polyolefin)	Vinyl / thermoplastic	White	<ul style="list-style-type: none"> Highly reflective UV resistant
Single-Ply Membrane	PVC (Polyvinyl Chloride)	Vinyl / thermoplastic	White	<ul style="list-style-type: none"> Highly reflective UV resistant
Built-Up Roofing (BUR)		Multi-layer system; felt/fiberglass, tar, and top layer of gravel	Dark colored	<ul style="list-style-type: none"> One of the oldest types of roofing Durable and long-lasting Heavy because of the many layers and gravel
Modified Bitumen	APP (Atactic Polypropylene)	Asphalt membrane with plastic and fiberglass	Varies from dark to light	<ul style="list-style-type: none"> Designed to improve upon BUR Two or more layers More UV protection
Modified Bitumen	SBS (Styrene-Butadiene-Styrene)	Asphalt membrane with rubber and fiberglass	Varies from dark to light	<ul style="list-style-type: none"> Designed to improve upon BUR Two or more layers More elasticity
Metal Roof		Metal sheets with interlocking seams to keep out water	Dark colored	<ul style="list-style-type: none"> Durable Long lifetime
Spray Polyurethane Foam (SPF)		Spray Foam	White	<ul style="list-style-type: none"> Sprays onto the roof as a liquid, then expands into foam and hardens Also has insulative properties
Roof Coating	Acrylic Coating	Water-based Acrylic	White	<ul style="list-style-type: none"> Applied to top of flat roof types Can increase lifespan of roof without replacing the covering Ineffective against ponding water Highly reflective
Roof Coating	Silicone Coating	Silicone	White	<ul style="list-style-type: none"> Applied to top of flat roof types Can increase lifespan of roof without replacing the covering Highly reflective More costly than acrylic Can withstand ponding water
Roof Coating	Polyurethane Coating	Polyurethane	White	<ul style="list-style-type: none"> Applied to top of flat roof types Can increase lifespan of roof without replacing the covering Durable Can withstand ponding water Compatible with TPO, PVC, or modified bitumen
Roof Coating	Butyl Coating	Butyl	White	<ul style="list-style-type: none"> Applied to top of flat roof types Can increase lifespan of roof without replacing the covering High elasticity

				<ul style="list-style-type: none"> • Compatible with BUR and modified bitumen • Less commonly used
--	--	--	--	--

Source: (Colony Roofers, 2023), (Best Roofing, 2025), (D'Annunzio, n.d.), (Colony Roofers, 2023)

Table 3 and Table 4 are primarily intended to provide some background information on the types of roof coverings that may be encountered on existing buildings. The type of roof covering for an existing building can be determined by reviewing the record drawings or previous roof maintenance records for the building, or by working with a licensed roofing contractor. Low-sloped roofs can be more challenging to identify, as many of them have a similar appearance. During research for this section, some conflicting information was found regarding the advantages and disadvantages of different roofing types. This is likely because many available resources are written by roofing contractors who may emphasize the benefits of the products they offer.

After the type of roof covering is identified, then a compatible cool roof retrofit can be chosen. Table 5 shows examples of cool roof retrofits and expected cost. The expected cost relates to material cost only, and labor cost will need to be considered.

Table 5: Cool Roof Product Options for Different Roof Covering Types

Roof Type	Roof Slope	Conventional Roof		Cool Roof			EUL** (yrs)
		Roof Option	SR	Roof Option	SR	Material Cost*	
Asphalt Shingle	Steep	Black/dark brown with conventional pigments	0.05 – 0.15	Light gray	0.20 – 0.30	\$	15 - 30
				Medium gray/brown with cool pigments	0.20 – 0.30		
Concrete Tile	Steep	Dark color with conventional pigments	0.05 – 0.35	Color with cool pigments	0.40 – 0.60	\$ - \$\$\$	50+
				White	0.70		
Clay Tile	Steep	Terracotta (unglazed red tile)	0.40 – 0.50	Color with cool pigments	0.40 – 0.60	\$\$ - \$\$\$	50+
				White	0.70		
Wood Shake	Steep	Painted dark color with conventional pigments	0.05 – 0.35	Bare	0.40 – 0.55	\$	15 - 30
Metal Roof	Steep or Low	Unpainted, corrugated	0.30 – 0.50	Color with cool pigments	0.40 – 0.70	\$\$	20 - 50+
		Dark painted, corrugated	0.05 – 0.10	White painted	0.60 – 0.70		
Liquid Applied Coating	Steep or Low	Smooth black	0.05	Smooth white	0.60 – 0.90	\$	10
Built-Up Roof	Low	With dark gravel	0.05 – 0.15	With white gravel	0.30 – 0.50	\$ - \$\$	10 - 30
		With aluminum coating	0.10 – 0.15	Smooth with white roof coating	0.75 – 0.85		
Modified Bitumen	Low	With mineral surface capsheet (SBS, APP)	0.10 – 0.20	White coating over mineral surface	0.60 – 0.75	\$	10 – 30
Single-Ply Membrane	Low	Black (PVC or EDPM)	0.05	White (PVC or TPO)	0.70 – 0.85	\$	10 – 20
				Color with cool pigments	0.40 – 0.60		

*Material Cost: \$ = \$0 - \$2 / ft², \$\$ = \$2 - \$4 / ft², \$\$\$ = \$4 - \$6 / ft².

**EUL: Expected Useful Life

Source: (CoolCalifornia, n.d.)

Table 5 shows that the cost can vary greatly based on the type of roof covering. However, since a cool roof retrofit generates energy savings in buildings with HVAC, the cost of the retrofit can be offset within a certain number of years. One example of this is a case study done by the Southwest Energy Efficiency Project (SWEET) at the Thomas O. Price Service Center, an office building in Tucson, Arizona. The building's 28,000 ft² roof was originally a dark colored metal roof which was coated with a white elastomeric coating in 2001. The payback period for this retrofit was approximately six years with a 16% return on investment (CRRC, 2009).

Furthermore, recovering or coating the roof surface increases the longevity of the roof. It provides a new top layer that seals any damage or wear on the roof surface, and the reduced temperature at the roof surface slows future wear.

3.3.2 Initial Recommendations Based on Roof Covering

In general, low sloped roofs are more ideal candidates because there are more product options with high SRI. There are also less expensive installation options such as the application of a roof coating to the existing roof layers. Low-sloped roofs have higher cool roof requirements per the California Energy Code, most likely due to a greater availability of cool roof products.

Less Feasible for Cool Roof Retrofit

- Asphalt/Composition Shingle and Wood Shake: when reviewing available products in the CRRC Directory, the maximum values for SR and SRI are 0.30 and 33, respectively (CRRC, 2025). These roof types will likely not generate significant energy savings.
- Concrete Tile and Clay Tile: the tiles have a long lifetime (50+ years), and to replace them with cooler colored or white tiles would be more expensive comparatively. It would be considered only if the building has a significant number of cracked/damaged tiles and needs tile replacement anyway. There may be compatible coatings that can be considered instead of tile replacement.
- TPO and PVC: these roof membranes are typically already white and with high solar reflectance (CRRC, 2025). These are already considered cool roofs and could likely not achieve additional energy savings.

More Feasible for Cool Roof Retrofit

- Built-Up Roof: the CRRC Directory has several options for high SRI gravel that could be used to replace the top gravel layer, or a white roof coating could be applied.
- Metal Roof: a white coating can be applied to the metal to increase reflectivity.
- Single Ply Membrane, dark colored: a white roof coating can be applied which has high reflectivity.
- Modified Bitumen: a white roof coating can be applied which has high reflectivity.

3.3.3 Impact of Building Insulation

It is important to consider building insulation when estimating the effectiveness of cool roof retrofits. There are three types of heat transfer: conduction (transfer through direct contact of materials), convection (transfer through movement of liquids and gases), and radiation (transfer through electromagnetic waves). Insulation provides a physical barrier that slows conductive and convective heat transfer through the roof (US DOE, n.d.). Cool roofs are the most beneficial for buildings with low to moderate insulation levels. In highly insulated buildings, the heat flow into the building is already limited by the insulation, so adding roof reflectivity will not generate as significant of energy savings.

Insulation is rated by R-value, which represents the material's resistance to conductive heat flow. A higher R-value indicates greater resistance to heat transfer, resulting in better insulative performance. R-value is determined by the type, thickness, and density of the insulation, and can also be affected by aging and moisture accumulation. The R-values of a multilayered system are additive, determining the overall R-value of the insulation (US DOE, n.d.).

Another important parameter is the U-factor, which represents the overall transmittance of heat through a part of the building assembly such as a roof or wall. The California Energy Code includes requirements for U-factor of the roof and attic for New Construction and Additions (Ace Resources, 2024).

The first edition of the California Energy Code came into effect in 1978. According to the California Air Resources Board, more than 75% of existing residential and nonresidential buildings were built before 1978 (CARB, n.d.). It is likely that many of the buildings in the SBCCOG territory have low or even no insulation if they have not been modified significantly since initial construction. Building record drawings can be used to determine what type and how much insulation is installed in an existing building, or a roofing contractor can determine this information through a visual inspection.

3.4 Comparison with Alternatives

There are three main options for roof alterations with the purpose of achieving energy savings: cool roofs, green roofs, and rooftop solar photovoltaic (PV). This section provides a brief overview of the other options and offers a comparison to cool roofs.

A green roof has a vegetative layer over the roof surface. Green roofs are either extensive or intensive. An extensive green roof is the simpler and more cost-effective option, featuring a minimal layer (two to four inches) of vegetation and growing medium applied to the rooftop. The goal is to achieve the benefits of roof coverage while minimizing cost, weight, and required maintenance. An intensive green roof is a more complex system, commonly designed with a focus on aesthetics to look like a rooftop garden or park. Intensive green roofs are often installed when part of the intent is to provide a rooftop space for people to enjoy. Due to their increased complexity, they tend to be more expensive, heavier, and require more maintenance.

Additional structural support may also be required for the building to support the roof (EPA, 2025).

Green roofs provide many of the same benefits as cool roofs. For example, the plants reduce the surface temperature of the roof and generate similar energy savings from reduction in HVAC activity inside the building. The difference is that the reduction in temperature comes from the evaporation of water into the air by the plants instead of from solar reflectivity like cool roofs. Green roofs also contribute to the reduction of the UHI effect. Furthermore, green roofs offer other benefits that are beyond the capability of cool roofs. Vegetation on green roofs contributes to improved air quality by sequestering atmospheric CO₂ through photosynthesis and filtering airborne pollutants. Additionally, green roofs help with regulating stormwater runoff, which is a major problem in Los Angeles County. Most land in cities is paved, which cannot soak up water when it rains. Rainfall is instead converted to runoff and swept into storm drains, picking up trash, oil, waste, bacteria, and pathogens present on the ground along the way. This is a major source of pollution for nearby lakes, rivers, and beaches where the storm drains lead to. Plants absorb rainwater, use some of it, and release the rest slowly, which reduces the chance of the water carrying debris and pollutants into the drains (Garrison, Horowitz, & Lunghino, 2012). Green roofs are a helpful increase in natural land in urban environments.

While green roofs can be very beneficial to communities, they are more expensive and require more maintenance than cool roofs. There is also the risk of roof leaks from having living plants and water on the roof surface. In Southern California, since most rainfall in the area is from November to March, the green roofs may require additional irrigation to survive during the summer (Garrison, Horowitz, & Lunghino, 2012). Additional irrigation is an important consideration, as minimizing water consumption is a consistent objective in Southern California due to water scarcity and resource management.

The third option for utilizing rooftop space is rooftop solar PV systems. Solar PV actively produces electricity from the sunlight; therefore, the energy savings for the building are more significant than either cool or green roofs. The energy produced can offset any load in the building instead of only the HVAC system. On low-sloped roofs, the solar panels are typically installed at a tilt and shade the roof, therefore providing a similar cooling effect to the building as cool roofs without having to recover the roof (Garrison, Horowitz, & Lunghino, 2012). When installed together, one study done in 2021 that modeled low-sloped roofs showed that the annual solar energy yield was increased by an average of 3.4% when installed on a cool roof, compared to a conventional roof (Cavadini & Cook, 2021). However, solar panels have the highest upfront cost and building-specific financial analysis is recommended to determine if the small increase in solar production is worth the added cost of roof recovering. Solar panels have a life expectancy of about 30 to 35 years (DOE, n.d.).

By comparison to the other two options, cool roofs are a simpler and more feasible retrofit. However, a combination of green, cool, and solar roofs in an urban environment can work together to benefit the area as a whole.

4. The South Bay Approach

4.1 Description of South Bay Sub-Region

The South Bay Sub-Region overseen by the SBCCOG includes Carson, El Segundo, Gardena, Hawthorne, Hermosa Beach, Inglewood, Lawndale, Lomita, Manhattan Beach, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, Torrance, part of the City of Los Angeles (District 15), and part of unincorporated Los Angeles County (Districts 2 & 4) (SBCCOG, 2013). The Appendix includes a map of the territory.

The region, except for the City of LA, is served by Southern California Edison (SCE) as the electric utility. The City of LA area is served by the Los Angeles Department of Water and Power (LADWP) as the electric utility (SCE, n.d.). There is also a Community Choice Aggregation (CCA) in the area, the Clean Power Alliance (CPA), that serves Carson, Hawthorne, Manhattan Beach, Hermosa Beach, Redondo Beach, and Rolling Hills Estates. CPA provides generation from clean and renewable energy sources while SCE still provides transmission and distribution (CPA, n.d.).

California has 16 CZs defined by the California Energy Commission (CEC) and are used in the California Energy Code discussed in Section 3.2.2. The SBCCOG territory falls into CZ 6 and CZ 8. The boundary between these two zones is the 405 freeway (CEC). West and south of the 405 along the coast is in CZ 6, and east and north of the 405 freeway is in CZ 8.

The CEC provides weather data files for typical weather in each zone, based on a representative city. The representative city for CZ 6 is Torrance and the representative city for CZ 8 is Fullerton. Table 6 shows a summary of the weather data for each relevant zone, based on the CZ2025 data downloaded from the California Measurement Advisory Council website (CALMAC, 2025). It can be seen from the data that CZ 8 has more hours with higher temperatures than CZ 6. This indicates that buildings in CZ 8 are likely to have higher annual cooling loads and therefore have more potential energy savings from lowering cooling equipment usage and therefore are likely to be better candidates for cool roof retrofits.

Table 6: Weather Data Summary for CZ 6 and CZ 8

Temperature Range (°F)	CZ 6: Number of Hours (Torrance Data)	CZ 8: Number of Hours (Fullerton Data)
30 – 40	30	17
40 – 50	678	617
50 – 60	2509	2100
60 – 70	3609	3491
70 – 80	1582	1597
80 – 90	314	796
90 – 100	34	116
100 – 110	4	26

Source: (CALMAC, 2025)

4.2 Expected Energy Savings

Energy savings from cool roof retrofits are primarily realized through reductions in a building's cooling equipment usage. When the cool roof reflects more solar energy on a hot summer day, which leads to less heat conduction through the roof into the building envelope, then the amount of work the air conditioning must do to cool the space is reduced. Thus, energy savings and dollar savings are measurable through the reduction in energy usage, and the resulting cheaper electricity bill.

4.2.1 *Buildings Without HVAC*

If the building does not have an HVAC system, there will not be any direct energy or dollar savings. However, there is still potential value in installing cool roof retrofits on buildings without HVAC, given that the average summer temperature in California has increased about 3°F since 1896. Temperatures will likely continue to rise by an additional 2°F by 2040 and over 4°F by 2070 (UCSD, n.d.). As temperatures rise, buildings that historically were able to maintain thermal comfort without HVAC may have to consider undergoing costly HVAC upgrades. A cool roof retrofit can lower internal building temperatures, therefore extending that timeline or potentially preventing the need for HVAC upgrades at all.

4.2.2 *Buildings with HVAC*

For buildings with HVAC, savings are impacted by several factors discussed previously in this report, including how much the roof SRI was increased, amount of roof/attic insulation, and climate. Studies on this topic vary widely, showing that the energy savings from cool roofs can range from 10% to 43% of a building's cooling load (Garrison, Horowitz, & Lunghino, 2012). Building-specific analysis should be done when considering a cool roof retrofit to achieve a more accurate estimate of energy savings. Roof space that is used for HVAC equipment takes away from available area for cool roof retrofits but is typically negligible compared to total roof area.

One tool that can be employed is an online calculator developed by the US Department of Energy's Oak Ridge National Laboratory (ORNL, n.d.). Inputs to the calculator include building location, R-value of insulation, SR and TE of the proposed roof covering, and HVAC efficiency. The outputs to the tool include the expected energy and dollar savings from the cool roof retrofit.

See calculator: <https://coolroof.ornl.gov/>

4.2.3 *Relevant Case Studies*

Several case studies were reviewed and can help inform expected energy savings for cool roof retrofits in the SBCCOG territory. However, it can be seen from the referenced studies that energy savings vary from building to building due to the factors discussed in this report. All the evaluated buildings did experience some amount of savings, suggesting that cool roof retrofits will reliably produce savings for a wide variety of building types in California.

Monitoring the energy-use effects of cool roofs on California commercial buildings (Akbari, Levinson, & Rainer, 2005)

Buildings Evaluated:

- One retail store in Sacramento
- One elementary school in San Marcos (near San Diego)
- Four cold storage buildings in Fresno

The measured data and simulations were used to estimate energy savings for similar buildings installing cool roof retrofits in the 16 California CZs.

Findings:

- Building Specific:
 - The daily maximum roof surface temperature of each building was reduced by 60 – 75°F.
 - Retail store: 52% reduction in average air conditioning energy use
 - School building: 17 – 18% reduction in average air conditioning energy use
 - Cold storage building: 3 – 4% reduction in average air conditioning energy use
- Generalized results from computer simulation:
 - Typical retail store: Estimated energy savings of 500 – 1,400 kWh/year per 1,000 ft² of conditioned area
 - Typical school building: Estimated energy savings of 300 – 600 kWh/year per 1,000 ft² of conditioned area
 - Typical cold storage building: Estimated energy savings of 400 – 700 kWh/year per 1,000 ft² of conditioned area

Measured temperature reductions and energy savings from a cool tile roof on a central California home (Rosado, Faulkner, Sullivan, & Levinson, 2014)

Buildings Evaluated:

Two single family homes adjacent to each other in Fresno, CA

- “Cool” house: reflective concrete tile roof with SR = 0.51
- “Standard” house: dark-colored asphalt shingle roof with SR = 0.07

Findings:

- Energy savings of 0.26 kWh / ft² / year
- 26% reduction in cooling energy use

Summary of Cool Roof Monitoring and Analysis at Three Sites (Architectural Energy Corporation, 2002)

Buildings Evaluated:

- Site A: manufacturing facility in El Cajon, CA.
- Site B: two office buildings in Oceanside, CA.
- Site C: retail store in La Mesa, CA.

Findings:

- Site A: Estimated energy savings of 0.415 kWh / ft² / year and cost savings of \$0.067 / ft² / year. Simple payback period of 29 years.
 - The report concludes that this site had the lowest savings due to good roof insulation.
- Site B: Estimated energy savings of 0.618 kWh / ft² / year and cost savings of \$0.071 / ft² / year. Simple payback period of 20 years.
- Site C: Estimated energy savings of 0.64 kWh / ft² / year and cost savings of \$0.10 / ft² / year. Simple payback period of 5 years.
 - The report concludes that this site had the most energy savings due to less efficient roof insulation and low cost from the contractor to do the retrofit.

4.3 Potential Funding Sources for Public Agencies

The Cool Roof Rating Council provides a list of programs that include incentives for cool roof upgrades (CRRC, n.d.). See listed below the relevant programs.

LADWP: Business Offerings for Sustainable Solutions (BOSS) (LADWP, n.d.)

Eligibility: LADWP non-residential electric customers in good standing. (This will only apply to the City of LA area)

Program Description: Provides incentives for implementing energy efficiency measures. Cool roof upgrades fall into the “Building Envelope” category, which pays \$0.30-0.65 per KWH saved from the impacted HVAC system.

CEC: Energy Conservation Assistance Act – Low Interest Loans (CEC, n.d.)

Eligibility: Cities, Counties, Special Districts, and other public sector entities in CA.

Program Description: Loans with 1% interest rates are available for projects with proven energy or demand savings. The maximum loan amount is \$3 million and must be paid back within 20 years.

SCE: Measured Savings Program (AESC, n.d.)

Eligibility: Specific NAICS Code commercial properties within the SCE service territory

Program Description: Incentives offered for savings in Total System Benefit (TSB) through energy efficiency equipment installations such as HVAC systems, lighting, and insulation. A Normalized Metered Energy Consumption (NMEC) program that provides incentives based upon actual energy savings calculated from the utility meter in relation to predetermined granular profiles for a specific energy cohort.

SoCal REN: Public Agency Program (SoCalREN, 2025)

Eligibility: Qualifying Local Government, State and Federal Agencies, and Tribal Nations within the greater Los Angeles area

Program Description: Rate-payer funded program that offers full program benefits such as on-site assessments, installation of energy-saving equipment, financial support, and more.

5. References

- Ace Resources. (2024, June 20). *Title 24, Part 6 Fact Sheet: Nonresidential Envelope*. Retrieved from Energy Code Ace: <https://energycodeace.com/resources>
- AESC. (n.d.). *Measured Savings Program*. Retrieved from AESC: <https://aesc-inc.com/measured-savings-program/>
- Akbari, H., Levinson, R., & Rainer, L. (2005, October). Monitoring the energy-use effects of cool roofs on California commercial buildings. *Energy and Buildings*, 1007-1016. doi:<https://doi.org/10.1016/j.enbuild.2004.11.013>
- American Legal Publishing. (2025, June 30). *Official City of Los Angeles Municipal Code*. Retrieved from American Legal Publishing Code Library: https://codelibrary.amlegal.com/codes/los_angeles/latest/lamc/0-0-0-422835
- American Quality Remodeling. (2024). *Choosing the Best Roofing Materials Based on Roof Pitch*. Retrieved from American Quality Remodeling: <https://americanqualityremodeling.com/blog/choosing-the-best-roofing-materials-based-on-your-roof-pitch/>
- Architectural Energy Corporation. (2002). *Summary of Cool Roof Monitoring and Analysis at Three Sites*. Boulder, CO: Architectural Energy Corporation.
- Berkeley Lab. (n.d.). *Cool Science*. Retrieved from Heat Island Group Berkeley Lab: <https://heatisland.lbl.gov/coolscience/urban-heat-islands>
- Best Roofing. (2025). *Your Ultimate Guide to Modified Bitumen Roofing Systems*. Retrieved from Best Roofing: <https://www.bestroofing.net/roofing-systems/flat-roof-systems/modified-bitumen-roofing-system>
- CALMAC. (2025). *California Weather Files*. Retrieved from California Measurement Advisory Council: <https://www.calmac.org/weather.asp>
- CARB. (n.d.). *Existing Buildings*. Retrieved from California Air Resources Board: <https://ww2.arb.ca.gov/our-work/programs/building-decarbonization/existing-buildings>
- Cavadini, G. B., & Cook, L. M. (2021, August 15). Green and cool roof choices integrated into rooftop solar energy modelling. *Applied Energy*. doi:<https://doi.org/10.1016/j.apenergy.2021.117082>
- CEC. (2023). *2022 Nonresidential and Multifamily Compliance Manual*. Retrieved from California Energy Commission.

- CEC. (2023, May 12). *2022 Nonresidential and Multifamily Compliance Manual*. Retrieved from California Energy Commission: <https://www.energy.ca.gov/publications/2022/2022-nonresidential-and-multifamily-compliance-manual-2022-building-energy>
- CEC. (n.d.). *Energy Conservation Assistance Act – Low-Interest Loans*. Retrieved from California Energy Commission: <https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans>
- CEC. (n.d.). *EZ Building Climate Zone Finder*. Retrieved from ARCGIS: <https://caenergy.maps.arcgis.com/apps/webappviewer/index.html?id=5cfefd9798214bea91cc4fddaa7e643f>
- CeDUR. (n.d.). *12 Types of Roof Materials: Choosing the Best Option*. Retrieved from CeDUR: <https://www.cedur.com/different-types-of-roof-materials-for-homes>
- Colony Roofers. (2023, January 14). *The Complete Guide to Flat Roofing Materials - 2023 Edition*. Retrieved from Colony Roofers: <https://colonyroofers.com/learningcenter/flat-roofing-materials>
- Colony Roofers. (2023, February 17). *What Are Elastomeric Roof Coatings and How Do They Work?* Retrieved from Colony Roofers: <https://colonyroofers.com/learningcenter/what-elastomeric-roof-coatings>
- CoolCalifornia. (n.d.). *Roof Product Comparison*. Retrieved from CoolCalifornia: <https://coolcalifornia.arb.ca.gov/roof-product-comparison>
- County of Los Angeles. (2025, June 24). *Los Angeles County Code of Ordinances*. Retrieved from County of Los Angeles: https://library.municode.com/ca/los_angeles_county/codes/code_of_ordinances
- CPA. (n.d.). *CPA - Frequently Asked Questions*. Retrieved from Clean Power Alliance: <https://cleanpoweralliance.org/faqs/>
- CRRC. (2009, March/April). *What's so Cool about Cool Roofs?* Retrieved from Cool Roof Rating Council.
- CRRC. (2022, January). *CRRC Rated Products Directory User Guide*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/resources/factsheets-brochures>
- CRRC. (2024, April). *Understanding the Solar Reflectance Index: A Calculated Value*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/resources/factsheets-brochures>
- CRRC. (2025). *Rated Roof Products*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/directory/roof>

- CRRRC. (n.d.). *About*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/about>
- CRRRC. (n.d.). *Looking for Cool Roof or Wall Financial Incentives?* Retrieved from Cool Roof Rating Council: <https://coolroofs.org/resources/financial-incentives>
- CRRRC. (n.d.). *Steep-Sloped Roofing Products*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/resources/steep-sloped-roofing-products>
- D'Annunzio, J. (n.d.). *4 Types of Roof Coatings: How to Pick the Best for Your Facility*. Retrieved from Facilitiesnet: <https://www.facilitiesnet.com/roofing/article/4-Types-of-Roof-Coatings-How-to-Pick-the-Best-for-Your-Facility--18945>
- DOE. (n.d.). *U.S. Department of Energy*. Retrieved from End-of-Life Management for Solar Photovoltaics: <https://www.energy.gov/eere/solar/end-life-management-solar-photovoltaics>
- EPA. (2025, April 2). *Using Green Roofs to Reduce Heat Islands*. Retrieved from EPA: <https://www.epa.gov/heatislands/using-green-roofs-reduce-heat-islands>
- Garrison, N., Horowitz, C., & Lunghino, C. A. (2012). *Looking Up: How Green Roofs and Cool Roofs Can Reduce Energy Use, Address Climate Change, and Protect Water Resources in Southern California*. Natural Resources Defense Council.
- LADWP. (n.d.). *Business Offerings for Sustainable Solutions (BOSS)*. Retrieved from Los Angeles Department of Water & Power: <https://www.ladwp.com/commercial-services/programs-and-rebates-commercial/business-offerings-sustainable-solutions-boss>
- Municode. (2024, November 26). *Rolling Hills Estates, CA Code of Ordinances*. Retrieved from Municode Codification: https://library.municode.com/ca/rolling_hills_estates/codes/code_of_ordinances
- Municode. (2025, February 6). *Rolling Hills, CA Code of Ordinances*. Retrieved from Municode Codification: https://library.municode.com/ca/rolling_hills/codes/code_of_ordinances
- ORNL. (n.d.). *Cool Roof Calculator*. Retrieved from Oak Ridge National Laboratory: <https://coolroof.ornl.gov/>
- Rosado, P. J., Faulkner, D., Sullivan, D. P., & Levinson, R. (2014, September). Measured temperature reductions and energy savings from a cool tile roof on a central California home. *Energy and Buildings*, 57-71. doi:<https://doi.org/10.1016/j.enbuild.2014.04.024>
- SBCCOG. (2013). *Maps*. Retrieved from South Bay Cities Council of Governments: <https://southbaycities.org/programs/transportation/south-bay-measure-r-hwy-program/map/>

SCE. (n.d.). *SCE Service Territory*. Retrieved from ARCGIS:
<https://hub.arcgis.com/datasets/SCE2::sce-service-territory/explore?location=34.658307%2C-117.481840%2C7.71>

SoCalREN. (2025). *SoCalREN*. Retrieved from SoCalREN Public Agency Programs:
https://socalren.org/agencies/services/local-government?_gl=1*q2cjl*_up*MQ..*_ga*MzA3MDk4MDk1LjE3NTUyOTIwMTE.*_ga_XDZJ615GJ2*czE3NTUyOTIwMTEkbzEkZzEkdDE3NTUyOTIwNzgkajYwJGwwJGgw

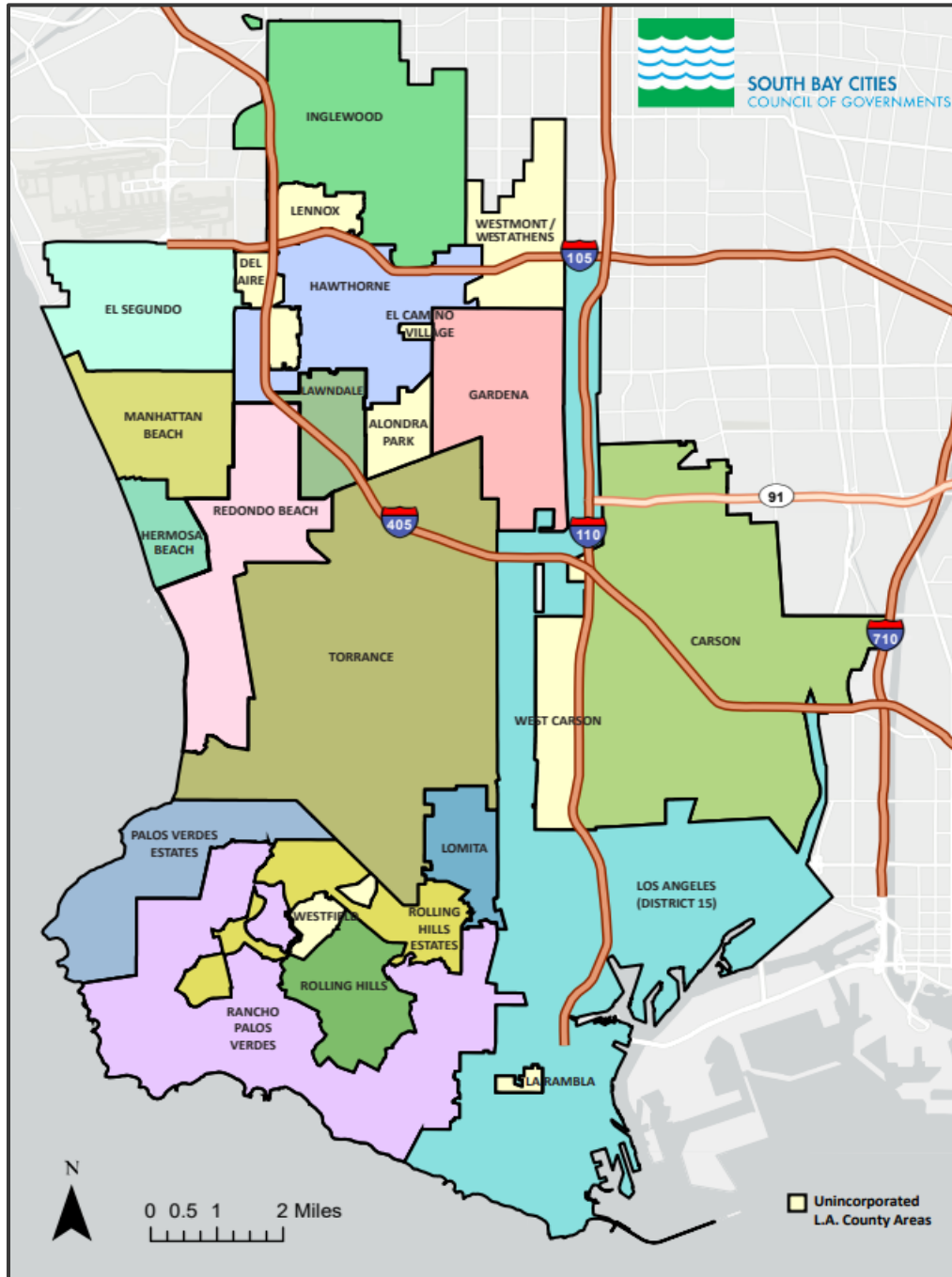
UCSD. (n.d.). *FAQ: Climate Change in California*. Retrieved from UC San Diego - Scripps Institute of Oceanography: <https://scripps.ucsd.edu/research/climate-change-resources/faq-climate-change-california>

US DOE. (n.d.). *Cool Roofs*. Retrieved from US Department of Energy:
<https://www.energy.gov/energysaver/cool-roofs>

US DOE. (n.d.). *Insulation*. Retrieved from US Department of Energy:
<https://www.energy.gov/energysaver/insulation>

6. Appendix

6.1 Map of SBCCOG Territory



The South Bay Cities Council of Governments (SBCCOG) is a joint powers authority of 16 cities and the County of Los Angeles that share the goal of maximizing the quality of life and productivity of the South Bay region. Our members are Carson, El Segundo, Gardena, Hawthorne, Hermosa Beach, Inglewood, Lawndale, Lomita, Manhattan Beach, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, Torrance, and the Harbor City/San Pedro/Wilmington communities of the City of Los Angeles, along with the unincorporated areas of the County of Los Angeles District 2 and 4.

8. Appendix C - Site Identification and Selection Methodology for Cool Roof Implementation Memorandum

To: SBCCOG and Agency Stakeholders

From: AESC

Date: 9/8/2025

Subject: Site Identification and Selection Methodology for Cool Roof Implementation

1. Purpose

This memorandum explains the process AESC used to find and choose sites that could be good candidates for cool roof upgrades within SBCCOG member agencies. The method supports regional goals for sustainability and resilience and offers a clear and consistent way to evaluate each site.

2. Methodology Overview

The site selection process is structured around following two steps:

A. Gather Site Information

SBCCOG provided AESC with the “South Bay Facilities” spreadsheet, which included details such as the City, Property Name, Annual Electricity Usage, and Annual Natural Gas Usage for each site. Using this data, AESC conducted a preliminary assessment of each building via Google Maps to gather additional information. The team aimed to identify the following attributes: building type, roof type, roof slope, roof color, presence of existing solar PV systems, extent of roof shading, climate zone (CZ), and whether the building is conditioned. All collected information was compiled and organized within the spreadsheet.

B. Evaluation Criteria for Site Suitability

Sites with annual electricity usage below 75,000 kWh were classified as “low-usage”. Those consuming between 75,000 kWh and 250,000 kWh annually were categorized as “medium-usage”, while sites exceeding 250,000 kWh were designated as “high-usage”.

The SBCCOG region spans CZs 6 and 8. According to CZ2025 data from the California Measurement Advisory Council, sites in CZ08 experience significantly higher heat exposure, with 938 hours above 80°F annually, compared to just 352 hours in CZ06.

With the information gathered and organized in the spreadsheet, each site was then assessed based on the following criteria listed in Table 1.

Table 1: Evaluation Criteria for Site Cool Roof Suitability

Evaluation Criteria	Description
Roof Condition	Several sites were observed to have aging roofs with faded colors and visibly poor aesthetics. For these locations, if roof replacement is already planned or necessary, installing a cool roof is considered a smart and beneficial choice—regardless of the building’s energy usage, size, or presence of air conditioning.
Energy Usage	Medium- and high-usage sites were considered for cool roof suitability since they offer greater potential for energy savings. Low-usage sites were excluded due to limited impact.
HVAC System Presence	Sites that are fully conditioned were identified as strong candidates for cool roof installation.
Roof Type and Color	Low-slope or flat roofs with darker colors (e.g., brown, grey or tan) were considered suitable for cool roof retrofits.
Roof Size and Orientation	Larger, flatter roofs with maximum solar exposure were prioritized for evaluation due to their higher potential for energy savings.
Climate Zone	Sites in CZ08 experience significantly higher cooling loads, making them ideal candidates for cool roof retrofits.
Building Type	Facilities that serve critical community functions such as libraries and community centers, particularly those that remain operational during extreme heat events, power outages, or other climate-related emergencies were prioritized. These building types were selected due to their role in providing essential services and shelter during times of environmental stress, making them ideal candidates for climate-resilient upgrades.

3. Site Identification Approach and Preliminary Recommendations

Based on the evaluation criteria outlined in Table 1, all sites were categorized as “Yes,” “Maybe,” or “Not Suitable” for cool roof installation. Sites were assigned to the “Not suitable” group if they had low electricity usage, lacked HVAC systems, had white roofs, roofs covered by solar panels, or roofs that were more than 50% shaded by trees or adjacent buildings. Additionally, sites located in CZ06 and those situated very close to the ocean were also placed in this category.

Sites that met most or all the evaluation criteria were classified as “Yes” indicating strong suitability for cool roof installation. Several sites fell into the “Maybe” category, requiring further investigation and consultation with relevant agencies to determine their final suitability.

Table 2 presents an initial list of potential sites identified as suitable for a cool roof retrofit, based on a preliminary evaluation using Google Maps observations.

Table 2: Preliminary Sites with Cool Roof Suitability

City-Property Name	Address	Building Type	Annual Electricity Use (kWh)	Features/ Description/ Evaluation Criteria
Hawthorne - Police Department	12501 Hawthorne Blvd, Hawthorne, CA 90250	Police Station	1,681,842	The site demonstrates high electricity usage and features a flat, gray roof. It is in CZ08.
Gardena - City Hall, Fire, PD	1718 W 162ND ST, Gardena, California, 90247	City Hall/ Fire Station/ Police Station	1,131,517	The site has high electricity usage and appears to serve multiple municipal functions, including a police station, fire station, and city hall connected to a single meter. The roof is flat, appears aged, and is gray and tan. The building is in CZ08.
Hawthorne - City Hall	4455 W 126th St, Hawthorne, CA 90250	City Hall-Office	546,163	The site has high electricity usage, a flat, gray roof and is in CZ08.
Inglewood - Civic Center Police Station	1 W Manchester Blvd, Inglewood, CA 90301	Police Station	535,489	The site has high electricity usage and features a flat, tan/gray roof. It is in CZ08.
Carson - Veterans Park - Sports Complex	22400 Moneta Ave, Carson, CA 90745	Sport Complex	394,091	The site has high electricity usage and a high-sloped green metal roof. It is in CZ06. The elevated energy consumption may be due to exterior flood lighting in the park.
Gardena - Nakaoka Community Center	1670 W 162nd St, Gardena, CA 90247	Community Center	278,030	The site demonstrates high electricity usage and features a flat, beige roof. The building is in CZ08.
Gardena – Rush Gym & Human Services & Rush Pool	1651 W 162nd St, Gardena, CA 90247	Gym	218,543	The site demonstrates medium electricity usage and features a flat, brown roof. It is in CZ08.
Hawthorne - Hawthorne Pool	12501 S Inglewood Ave, Hawthorne, CA 90250	Locker room	207,962	The site demonstrates medium electricity usage and features a flat, gray roof. It is in CZ08.

City-Property Name	Address	Building Type	Annual Electricity Use (kWh)	Features/ Description/ Evaluation Criteria
Inglewood - Library Branch - Crenshaw Imperial	11141 Crenshaw Blvd, Inglewood, CA 90303	Library	78,645	The site demonstrates medium electricity usage and features a flat, tan/gray roof. It is in CZ08.
Inglewood - Civic Center City Hall	1 W Manchester Blvd, Inglewood, CA 90301	City Hall-Office	3,313,030	The building is a high-rise with a square footprint, and a cool roof may not provide significant benefits. The roof appears very old and has HVAC units scattered across its surface. If roof replacement is being considered, installing a cool roof could be a viable option. The site is in CZ08.
Redondo Beach - City Hall (Interested)	415 Diamond St, Redondo Beach, CA 90277	City hall - Office	885,909	The site has high electricity usage despite its small building size. It has a flat, gray roof that appears aged and is densely packed with piping. The elevated energy usage is likely from the EV chargers and the possibility that multiple facilities—such as a police station and library—share a single electrical meter, though this requires further verification. Located in CZ06 near the ocean, the cooling benefits of a reflective roof may be limited due to the coastal climate. Nevertheless, if a roof replacement is under consideration, installing a cool roof could still be a worthwhile option.
Redondo Beach - Civic Center PD	415 Diamond St, Redondo Beach, CA 90277	Police Station	885,909	The site has high electricity consumption despite its small building size. It features a flat, gray roof that appears aged and is densely packed with piping. The elevated energy usage is likely attributed to the presence of EV chargers and the possibility that multiple facilities—such as a City hall and library—share a single electrical meter, though this requires further verification. Located in CZ06 near the ocean, the cooling benefits of a reflective roof may be limited due to the coastal climate. Nevertheless, if a roof replacement is

City-Property Name	Address	Building Type	Annual Electricity Use (kWh)	Features/ Description/ Evaluation Criteria
				under consideration, installing a cool roof could still be a worthwhile option.
Redondo Beach - Aviation Gymnasium	1935 Manhattan Beach Blvd, Redondo Beach, CA 90278	Gym	343,236	The site has high electricity usage and features a steep-sloped, gray roof. The roof appears old and curved with multiple skylights. If roof replacement is being considered, installing a cool roof could be a viable option. The site is in CZ06.
Gardena – Public Works	1717 W 162nd St, Gardena, CA 90247	Office/ Warehouse	251,855	The site has high electricity usage. Only one relatively small building on the site appears to be conditioned. The remaining unconditioned structures are primarily warehouses or storage facilities. The roofs on the office building and the adjacent structure with the curved beige roof appear to be aged. If roof replacement is being considered, installing a cool roof could be a viable option. The site is in CZ08.
Inglewood - Rogers Park - Community Center	400 W Beach Ave, Inglewood, CA 90302	Senior Center	224,062	The site has medium electricity usage and features a flat, gray roof. A small portion of the roof is covered with solar panels, and the overall roof condition appears old and dirty. If roof replacement is being considered, installing a cool roof could be a viable option. The site is in CZ08.
Hawthorne - Betty Ainsworth Center	3851 W El Segundo Blvd, Hawthorne, CA 90250	Sport Center	185,471	The site has medium electricity usage and a steep-sloped, brown roof that appears aged. If roof replacement is being considered, installing a cool roof could be a viable option. It is in CZ08.
Torrance - El Retiro Library and Park	126 Vista Del Parque, Redondo Beach, CA 90277	Library	96,439	The site has medium electricity usage and features a flat, red roof that shows signs of aging, with noticeable fading in several areas. Located in CZ06 and close to the ocean, the effectiveness of a cool roof may be limited due to the coastal climate. If roof replacement is being considered,

City-Property Name	Address	Building Type	Annual Electricity Use (kWh)	Features/ Description/ Evaluation Criteria
				installing a cool roof could be a viable option.
Hawthorne - Holly Park	Holly Park, Hawthorne, CA 90250	Park building	4,113	The site has low electricity usage and lacks HVAC systems. The roof appears very old. If roof replacement is being considered, installing a cool roof could be a viable option. The site is in CZ08.

Table 3 outlines a selection of sites that may or may not be suitable candidates for a cool roof retrofit. While preliminary observations provide insight into roof conditions, energy usage, and climate considerations, these assessments are not definitive. Several factors—such as shared electrical meters, building usage, roof age and material, and proximity to the ocean—can influence the effectiveness of a cool roof installation. To make informed decisions regarding retrofit feasibility, further investigation is necessary. This includes verifying site-specific details, confirming meter configurations, and understanding operational functions of each building. Input from city staff and facility managers will be essential to validate assumptions and guide next steps in evaluating cool roof feasibility for these sites.

Table 3: Cool Roof Retrofit – Sites That May or May Not Qualify

City-Property Name	Address	Building Type	Annual Electricity Use (kWh)	Features/Description
Torrance - City Yard	20500 Madrona Ave, Torrance, CA 90503	Warehouse	2,115,715	The site has high electricity usage, which may be influenced by the presence of multiple buildings, though this requires further verification. The rectangular structure housing Park Maintenance and the Fleet Service Department is flat with gray roof. Located in CZ06 and near the ocean, the site may not fully benefit from a cool roof due to the coastal climate.
Torrance - Police Department HQ	3300 Civic Center Dr N, Torrance, CA 90503	Police Station	1,689,629	The site has high electricity usage and features a flat roof with medium to light grey coloring. It is in CZ06, near the ocean, which may limit the effectiveness of a cool roof.

City-Property Name	Address	Building Type	Annual Electricity Use (kWh)	Features/Description
Torrance - City Hall	3031 Torrance Blvd, Torrance, CA 90503	Large Office	1,604,603	The site appears large and has high electricity usage. Approximately 40% of the roof is white, while the remaining areas are flat and gray. A portion of the roof appears aged. Located in CZ06 and close to the ocean, the potential benefits of a cool roof may be limited due to the coastal climate.
Torrance - Cultural Ctr Rec Bldg.	3330 Civic Center Dr Suite N, Torrance, CA 90503	Assembly/Community Center	932,409	The site has high electricity usage and features a flat, medium-grey roof. It's unclear whether nearby buildings—such as the Toyota Meeting Hall—are connected to the same electrical meter, though they share similar roof characteristics. Located in CZ06 and close to the ocean, the site may not fully benefit from a cool roof due to the coastal climate.
Redondo Beach - Civic Center Main Library	303 N Pacific Coast Hwy, Redondo Beach, CA 90277	Library	855,767	The site exhibits high electricity usage, which may be attributed to the presence of EV chargers and the likelihood that multiple facilities—such as a police station and city hall—share a single electrical meter though this requires further verification. The roof structure is a mix of flat and steep-sloped sections, with materials in varying shades of black and gray. It is staggered across multiple levels, where upper sections cast shade on the lower ones, effectively reducing the usable flat roof area. Located in CZ06 near the ocean, the cooling benefits of a reflective roof may be limited due to the coastal climate.
Redondo Beach - Performing Arts Center	1935 Manhattan Beach Blvd, Redondo Beach, CA 90278	Assembly	601,887	The site has high electricity usage, which may be partially attributed to the EV chargers though this requires further verification. Most of the roof is flat or low-sloped and white, with a smaller section that is tan. Located in CZ06 and close to the ocean, the site may experience limited benefits from a cool roof due to the coastal climate.

City-Property Name	Address	Building Type	Annual Electricity Use (kWh)	Features/Description
Torrance - Wilson Park	2200 Crenshaw Blvd, Torrance, CA 90501	Ice Rink Sports Center	350,252	The site has high electricity usage. The Sports Center has a grey roof, while the Ice Rink's is blue and appears to be under construction based on current mapping data. Located in CZ06 and close to the ocean, the site may not fully benefit from a cool roof due to the coastal climate. Additionally, other buildings may be connected to the same electrical meter, which could contribute to the overall energy consumption, though this requires further verification.
Lomita - City Hall	24300 Narbonne Ave, Lomita, CA 90717	Office	251,862	The site has high electricity usage and a flat, gray roof. Despite the building's relatively small size, energy consumption is notably high—possibly due to the Lomita Library and meeting room being connected to the same meter though this requires further verification. The site is in CZ06.
Gardena - ROWLEY PARK - Gymnasium and Rec Center	13220 Van Ness Ave, Gardena, CA 90249	Rec center/ Gym	96,459	The site has medium electricity usage and features a low-sloped, gray roof. The recreation center appears to be partially conditioned, though this requires further verification. The site is in CZ08.
Inglewood - Darby Park	3400 W Arbor Vitae St, Inglewood, CA 90305	Park Buildings	87,565	The site has medium electricity usage and features a mix of roof types, including composite shingle (gray), and low-sloped sections in white, gray, and tan. The buildings appear to be partially conditioned, though this requires further verification. The electricity usage may be influenced by exterior flood lighting in the park. The site is in CZ08.

4. Next Steps

A. Engage with SBCCOG

Initiate discussions with SBCCOG to review the preliminary site selection and gather their feedback.

B. Review Assessment Methodology

Present the approach used to evaluate potential sites for cool roof retrofit and solicit input from SBCCOG and relevant agency stakeholders.

C. Request Supporting Data

Identify and request additional data needed to verify and clarify site eligibility, particularly for those listed in Table 3.

D. Finalize Site List and Ranking

Confirm the list of suitable sites and establish a ranking based on their potential for cool roof implementation.

E. Conduct Feasibility Studies

Perform detailed feasibility assessments and develop customized implementation plans for each approved site.

F. Evaluate Energy and Financial Metrics

Estimate potential energy savings, assess cost-effectiveness and payback periods, and identify possible funding sources for implementation.

G. Integrate Findings into Final Report

Compile all findings into a comprehensive feasibility report, including a cost-benefit analysis to support decision-making.

Please review this methodology and provide feedback or additional considerations.

9. References

- Ace Resources. (2024, June 20). *Title 24, Part 6 Fact Sheet: Nonresidential Envelope*. Retrieved from Energy Code Ace: <https://energycodeace.com/resources>
- AESC. (n.d.). *Measured Savings Program*. Retrieved from AESC: <https://aesc-inc.com/measured-savings-program/>
- Akbari, H., Levinson, R., & Rainer, L. (2005, October). Monitoring the energy-use effects of cool roofs on California commercial buildings. *Energy and Buildings*, 1007-1016. doi:<https://doi.org/10.1016/j.enbuild.2004.11.013>
- American Legal Publishing. (2025, June 30). *Official City of Los Angeles Municipal Code*. Retrieved from American Legal Publishing Code Library: https://codelibrary.amlegal.com/codes/los_angeles/latest/lamc/0-0-0-422835
- American Quality Remodeling. (2024). *Choosing the Best Roofing Materials Based on Roof Pitch*. Retrieved from American Quality Remodeling: <https://americanqualityremodeling.com/blog/choosing-the-best-roofing-materials-based-on-your-roof-pitch/>
- Architectural Energy Corporation. (2002). *Summary of Cool Roof Monitoring and Analysis at Three Sites*. Boulder, CO: Architectural Energy Corporation.
- Berkeley Lab. (n.d.). *Cool Science*. Retrieved from Heat Island Group Berkeley Lab: <https://heatisland.lbl.gov/coolscience/urban-heat-islands>
- Best Roofing. (2025). *Your Ultimate Guide to Modified Bitumen Roofing Systems*. Retrieved from Best Roofing: <https://www.bestroofing.net/roofing-systems/flat-roof-systems/modified-bitumen-roofing-system>
- CALMAC. (2025). *California Weather Files*. Retrieved from California Measurement Advisory Council: <https://www.calmac.org/weather.asp>
- CARB. (n.d.). *Existing Buildings*. Retrieved from California Air Resources Board: <https://ww2.arb.ca.gov/our-work/programs/building-decarbonization/existing-buildings>
- Cavadini, G. B., & Cook, L. M. (2021, August 15). Green and cool roof choices integrated into rooftop solar energy modelling. *Applied Energy*. doi:<https://doi.org/10.1016/j.apenergy.2021.117082>
- CEC. (2023). *2022 Nonresidential and Multifamily Compliance Manual*. Retrieved from California Energy Commission.

- CEC. (2023, May 12). *2022 Nonresidential and Multifamily Compliance Manual*. Retrieved from California Energy Commission: <https://www.energy.ca.gov/publications/2022/2022-nonresidential-and-multifamily-compliance-manual-2022-building-energy>
- CEC. (n.d.). *Energy Conservation Assistance Act – Low-Interest Loans*. Retrieved from California Energy Commission: <https://www.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans>
- CEC. (n.d.). *EZ Building Climate Zone Finder*. Retrieved from ARCGIS: <https://caenergy.maps.arcgis.com/apps/webappviewer/index.html?id=5cfefd9798214bea91cc4fddaa7e643f>
- CeDUR. (n.d.). *12 Types of Roof Materials: Choosing the Best Option*. Retrieved from CeDUR: <https://www.cedur.com/different-types-of-roof-materials-for-homes>
- Coatings Lifespan. (2025, 10 12). Retrieved from <https://frontierfoam.com/how-long-silicone-roof-coating-lasts-factors-affecting-its/>
- Colony Roofers. (2023, January 14). *The Complete Guide to Flat Roofing Materials - 2023 Edition*. Retrieved from Colony Roofers: <https://colonyroofers.com/learningcenter/flat-roofing-materials>
- Colony Roofers. (2023, February 17). *What Are Elastomeric Roof Coatings and How Do They Work?* Retrieved from Colony Roofers: <https://colonyroofers.com/learningcenter/what-elastomeric-roof-coatings>
- Cool Roof Coating Cost. (2024, 04 19). Retrieved from <https://homeguide.com/costs/roof-coating-or-sealing-cost>
- CoolCalifornia. (n.d.). *Roof Product Comparison*. Retrieved from CoolCalifornia: <https://coolcalifornia.arb.ca.gov/roof-product-comparison>
- County of Los Angeles. (2025, June 24). *Los Angeles County Code of Ordinances*. Retrieved from County of Los Angeles: https://library.municode.com/ca/los_angeles_county/codes/code_of_ordinances
- CPA. (n.d.). *CPA - Frequently Asked Questions*. Retrieved from Clean Power Alliance: <https://cleanpoweralliance.org/faqs/>
- CRRC. (2009, March/April). *What's so Cool about Cool Roofs?* Retrieved from Cool Roof Rating Council.
- CRRC. (2022, January). *CRRC Rated Products Directory User Guide*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/resources/factsheets-brochures>

- CRRC. (2024, April). *Understanding the Solar Reflectance Index: A Calculated Value*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/resources/factsheets-brochures>
- CRRC. (2025). *Rated Roof Products*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/directory/roof>
- CRRC. (n.d.). *About*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/about>
- CRRC. (n.d.). *Looking for Cool Roof or Wall Financial Incentives?* Retrieved from Cool Roof Rating Council: <https://coolroofs.org/resources/financial-incentives>
- CRRC. (n.d.). *Steep-Sloped Roofing Products*. Retrieved from Cool Roof Rating Council: <https://coolroofs.org/resources/steep-sloped-roofing-products>
- D'Annunzio, J. (n.d.). *4 Types of Roof Coatings: How to Pick the Best for Your Facility*. Retrieved from Facilitiesnet: <https://www.facilitiesnet.com/roofing/article/4-Types-of-Roof-Coatings-How-to-Pick-the-Best-for-Your-Facility--18945>
- DOE. (n.d.). *U.S. Department of Energy*. Retrieved from End-of-Life Management for Solar Photovoltaics: <https://www.energy.gov/eere/solar/end-life-management-solar-photovoltaics>
- Emulsion Coating Cost. (n.d.). Retrieved from <https://homeguide.com/costs/roof-coating-or-sealing-cost>
- EPA. (2025, April 2). *Using Green Roofs to Reduce Heat Islands*. Retrieved from EPA: <https://www.epa.gov/heatislands/using-green-roofs-reduce-heat-islands>
- Garrison, N., Horowitz, C., & Lunghino, C. A. (2012). *Looking Up: How Green Roofs and Cool Roofs Can Reduce Energy Use, Address Climate Change, and Protect Water Resources in Southern California*. Natural Resources Defense Council.
- Gravel Removal Cost. (n.d.). Retrieved from <https://homeguide.com/costs/tar-and-gravel-roof-cost>
- LADWP. (n.d.). *Business Offerings for Sustainable Solutions (BOSS)*. Retrieved from Los Angeles Department of Water & Power: <https://www.ladwp.com/commercial-services/programs-and-rebates-commercial/business-offerings-sustainable-solutions-boss>
- Municode. (2024, November 26). *Rolling Hills Estates, CA Code of Ordinances*. Retrieved from Municode Codification: https://library.municode.com/ca/rolling_hills_estates/codes/code_of_ordinances

- Municode. (2025, February 6). *Rolling Hills, CA Code of Ordinances*. Retrieved from Municode Codification: https://library.municode.com/ca/rolling_hills/codes/code_of_ordinances
- ORNL. (n.d.). *Cool Roof Calculator*. Retrieved from Oak Ridge National Laboratory: <https://coolroof.ornl.gov/>
- Roof Cleaning Cost. (2025, 03 6). Retrieved from <https://www.angi.com/articles/how-much-does-roof-coating-cost-square-foot.htm>
- Roof Life Span. (2025, 09 30). Retrieved from <https://www.cloudroofing.com/blog/commercial-roofing-lifespan>
- Roof Replacement Cost. (n.d.). Retrieved from <https://www.gleassociates.com/commercial-roof-replacement-cost-estimate/>
- Roof Replacement Cost. (n.d.). Retrieved from <https://homeguide.com/costs/modified-bitumen-roof-cost>
- Roof?, W. I. (2025, 09 30). Retrieved from <https://www.cloudroofing.com/blog/commercial-roofing-lifespan>
- Roof?, W. I. (2025, 09 30). Retrieved from <https://www.cloudroofing.com/blog/commercial-roofing-lifespan>
- Rosado, P. J., Faulkner, D., Sullivan, D. P., & Levinson, R. (2014, September). Measured temperature reductions and energy savings from a cool tile roof on a central California home. *Energy and Buildings*, 57-71. doi:<https://doi.org/10.1016/j.enbuild.2014.04.024>
- SBCCOG. (2013). *Maps*. Retrieved from South Bay Cities Council of Governments: <https://southbaycities.org/programs/transportation/south-bay-measure-r-hwy-program/map/>
- SCE. (n.d.). *SCE Service Territory*. Retrieved from ARCGIS: <https://hub.arcgis.com/datasets/SCE2::sce-service-territory/explore?location=34.658307%2C-117.481840%2C7.71>
- SoCalREN. (2025). *SoCalREN*. Retrieved from SoCalREN Public Agency Programs: https://socalren.org/agencies/services/local-government?_gl=1*q2cjl*_up*MQ..*_ga*MzA3MDk4MDk1LjE3NTUyOTIwMTE.*_ga_XDZJ615GJ2*czE3NTUyOTIwMTEkbzEkZzEkdDE3NTUyOTIwNzgkajYwJGwwJGgw
- Span, R. L. (2025, 09 30). Retrieved from <https://www.cloudroofing.com/blog/commercial-roofing-lifespan>

UCSD. (n.d.). *FAQ: Climate Change in California*. Retrieved from UC San Diego - Scripps Institute of Oceanography: <https://scripps.ucsd.edu/research/climate-change-resources/faq-climate-change-california>

US DOE. (n.d.). *Cool Roofs*. Retrieved from US Department of Energy: <https://www.energy.gov/energysaver/cool-roofs>

US DOE. (n.d.). *Insulation*. Retrieved from US Department of Energy: <https://www.energy.gov/energysaver/insulation>