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SACRAMENTO VALLEY STATION MASTER PLAN
SUSTAINABILITY PATH

FEBRUARY 27, 2018

City of
SACRAMENTO



Image credit: Tim Griffith Photography



SACRAMENTO VALLEY STATION MASTER PLAN SUSTAINABILITY PATH

TABLE OF CONTENTS

01 EXECUTIVE SUMMARY	5
Principles and Targets	6
Rating Systems	12
Sustainability Performance	18
02 LIVABILITY AND MOBILITY	21
Infill and Compact Development	22
Reduce Automobile Use and Fuel Consumption	26
Revitalize Community Center	30
03 RESOURCES	35
Energy	36
Water	40
Materials and Waste	42
04 SOCIAL AND ECOLOGICAL	49
Ecosystem and Ecology	50
Resilience	54
Wellness and Wellbeing	58

GUIDE TO THIS DOCUMENT

This report creates a sustainability framework for the Sacramento Valley Station Master Plan. It identifies high level sustainability priorities, minimum and reach standards and opportunities unique to the site, offering feedback on the pros and cons of those opportunities. Where options are conflicting or mutually exclusive, we have provided feedback on relative benefits of each choice. This creates a jumping-off point for the next stage of design, in which selections will be made, a preferred Masterplan option will be designed in more detail, and clear developer guidelines and requirements will be adopted. This document is intended to set forth a robust menu of options to achieve high sustainability performance, and facilitate decisionmaking by project leadership on what requirements and commitments should be adopted in the next stage.

ANNOTATED TABLE OF CONTENTS

SECTION 1 - EXECUTIVE SUMMARY – SUSTAINABILITY PRIORITIES AND SUSTAINABILITY PERFORMANCE

The Sustainability Priorities section of the Executive Summary provides an overview of the 9 proposed sustainability focus areas for the Master Plan. They fall under three headings:

- ▶ Livability and Mobility, covering urban revitalization, density and reduced car dependence, and aligned with the commitments made for the Sustainable Communities Grant and Incentive Program
- ▶ Resources, covering reduction of environmental impacts and costs associated with use of energy, water and materials), and
- ▶ Social and Ecological, covering human and ecological wellness and resilience

The Sustainability Performance section of the Executive Summary begins by reviewing applicable rating systems for the Masterplan. It then summarizes in a graphic the range of performance levels the project could achieve for each Sustainability Priority, and how commitments to the various rating systems would drive performance.

SECTIONS 2-4 – DETAILED DISCUSSION OF EACH SUSTAINABILITY PRIORITY

Sections 2-4 discuss the following for each of the 9 Masterplan Sustainability Priorities:

- ▶ In introduction to the Priority, including discussion of the minimum to transformational performance range graphic
- ▶ Elements common to both Masterplan options that demonstrate alignment with the Priority, and set forth opportunity for the detailed design to achieve even higher performance
- ▶ Evaluation of the differences between and relative benefits of the two Masterplan Options for the Priority
- ▶ More detailed strategies and commitments for the Masterplan to achieve high performance in the Priority
- ▶ Metrics and monitoring approaches that allow stakeholders to gauge and track performance of the project in the Priority through detailed design, construction and operation



1

EXECUTIVE SUMMARY

1.1 Sustainability Priorities

1.2 Rating Systems

1.3 Sustainability Performance

1.1 SUSTAINABILITY PRIORITIES

Sustainability is embedded in the Sacramento Valley Station Master Plan. At its core, the project centers around goals of revitalizing downtown, reducing carbon emissions from transportation and buildings, and preserving or enhancing the ecology of Sacramento. As the bridge between the historic city center and the new Railyards development, the Sacramento Valley Station Master Plan is an opportunity to showcase best practices in compact development, transportation, energy and water conservation, resilient design, and ecological restoration.

Achieving a high standard of sustainability for the Sacramento Valley Station Master Plan is consistent with the measures already being pursued by the City of Sacramento. The sustainability priorities, specific strategies, and performance metrics proposed for the Sacramento Valley Station Master Plan are informed by and consistent with:

- ▶ Sacramento's Climate Action Plan, which targets an 83% reduction in greenhouse gas emissions by 2050
- ▶ Grid 3.0, which prioritizes walking, biking, and transit over vehicle trips
- ▶ Sacramento's General Plan, which prioritizes infill development, sustainability, green infrastructure, placemaking, and vibrant growth
- ▶ Sacramento Area Council of Governments (SACOG) Metropolitan Transportation Plan/Sustainable Community Strategy 2035, which identifies greenhouse gas reductions goals from transportation and buildings
- ▶ Sacramento's stated goal of becoming the most livable city in America
- ▶ Sacramento's leadership as the city with the greatest number of trees per capita

Building on the goals set out in these precedent plans, and to ensure that sustainability is prioritized throughout all phases of the Sacramento Valley Station Master Plan development, nine sustainability priorities have been identified in three categories. For each priority, appropriate strategies and metrics have been developed to help track progress toward the goals of the project and the city. These three areas are:

- ▶ Livability and Mobility
- ▶ Resources
- ▶ Social and Ecological



The Sacramento Riverfront, Image Credit: Devin Cook

LIVABILITY AND MOBILITY

Phase 3 of the Sacramento Valley Station redevelopment is supported by a State of California Sustainable Communities Grant. For this grant, city staff selected goals of livability and mobility goals most applicable to the project scope. Additionally, the grant commits to a reduction in greenhouse gas emissions consistent with California's AB32 and SB375 policies. The three commitments from the Sustainable Communities Grant are identified as sustainability priorities in the Sacramento Valley Station Master Plan:

- ▶ Infill and Compact Development
- ▶ Reduce Automobile Use and Fuel Consumption
- ▶ Revitalize Community Center



Energy efficient building with shading and facade-mounted solar panels

RESOURCES

Meeting Sacramento's goals under the Climate Action Plan while enabling a thriving, livable city requires a focus on resource consumption. Energy is directly tied to carbon, with 41% of the Sacramento Municipal Utility District power provided by coal and natural gas in 2016. Beyond energy, materials for construction, water, and waste management impact the embodied carbon, health and wellness, and long-term viability of the Sacramento Valley Station Master Plan. In recognition of the importance of resource management, the three resources priorities developed are:

- › Energy
- › Water
- › Materials and Waste



Great Egret in the Sacramento River, Image Credit: U.S. Fish and Wildlife Service

SOCIAL AND ECOLOGICAL

Sustainability goes beyond resource management and carbon emissions to include social and economic sustainability. Increasing resident satisfaction and economic revitalization are essential to the Sustainable Communities Grant, Sacramento's General Plan, and the city's Livability Index. Additionally, the proximity of the Sacramento Valley Station Master Plan Area to the Sacramento River offers opportunities to connect the site with the river ecosystem through habitat restoration and native landscaping. In alignment with these goals, three social and ecological sustainability priorities were developed:

- › Wellness
- › Resilience
- › Ecosystems

PRIORITY OVERVIEW

This section provides an overview of the nine sustainability priority areas, shown in Figure 1.1.1, and an overview of the anticipated performance of the Sacramento Valley Station Master Plan within each priority. Each priority area is discussed further in subsequent sections, including suggested strategies, performance metrics, and a discussion of anticipated performance of each of the Master Plan options.

The nine sustainability priorities are intended to provide a framework within which the Sacramento Valley Station Master Plan can grow and develop. Furthermore, while this document provides suggested approaches for meeting the sustainability priorities, it is not intended to set firm targets or commit to specific strategies. Those presented will help the Sacramento Valley Station Master Plan meet the city's sustainability policy goals, but after selection of a final master plan option and further development of the concept design it will be important to revisit and refine the strategies for each priority. Additionally, it is important to allow flexibility as the development proceeds in phases to ensure that changes in design, new regulations and codes, and improvements in technology can be incorporated.

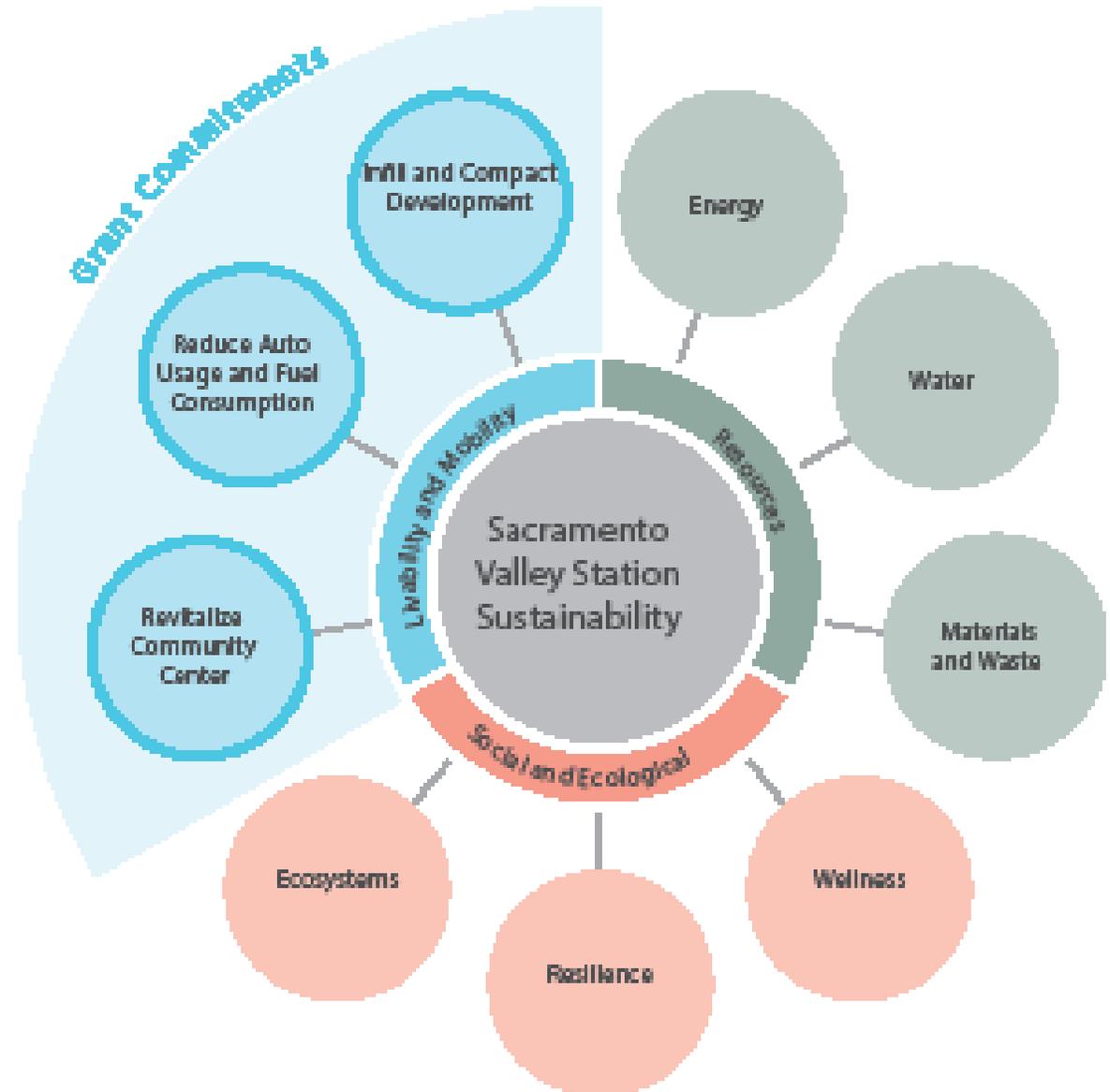


Figure 1.1.1 The nine sustainability objectives including the three grant commitments for the Sacramento Valley Station Master Plan.

LIVABILITY AND MOBILITY



Dense, walkable neighborhood concept of Mission Rock, San Francisco, CA

INFILL AND COMPACT DEVELOPMENT

Provide a higher density model of development than the surrounding area, featuring new housing, mixed uses and open space.

Aspiration: Achieve the maximum density economically supportable on the site, while promoting livability goals.



Cycleways in London, UK, Image credit: Thomas Graham

REDUCE AUTOMOBILE AND FUEL CONSUMPTION

Shift from the dominant car-centered paradigm to a transit-oriented, walkable development.

Aspiration: Approach elimination of single-occupancy vehicle trips through a combination of transit and transportation demand management and minimized on-site parking.



Community-oriented market and retail, Image credit: Robert Couse-Baker

REVITALIZE COMMUNITY CENTER

Create a new nexus of urban life around the train tracks and a revitalized station area.

Aspiration: Create a vibrant center with a fully public, active ground floor with a diversity of events, spaces, and users to stay active through the entire day and evening.

RESOURCES



Green roofs and passive design, Image Credit: Perkins+Will

ENERGY

Prioritize energy efficiency in buildings and on-site renewable generation on roofs. Consider off-site renewable energy generation and elimination of fossil fuels for buildings on-site (e.g. natural gas).

Aspiration: Reduce building energy use significantly below Title 24 and aim for a net-zero development powered by 100% renewable energy.



Constructed wetland water treatment and community amenity, Image credit: University of British Columbia

WATER

Reduce water consumption on-site and incorporate stormwater catchment and drought tolerant landscaping.

Aspiration: Create a net-zero water ready development through water efficiency and on-site reuse.



Sustainably harvested timber, Image credit: Julia Gotthold

MATERIALS + WASTE

Prioritize use of healthy, sustainable materials and showcase green alternatives to traditional materials. Provide opportunities for waste reduction through Sacramento's existing recycling programs.

Aspiration: Target LEED and WELL requirements for healthy materials and position for a zero waste development.

SOCIAL AND ECOLOGICAL



Monarch butterfly, Image credit: Mike Bessler

ECOSYSTEM

Maximize preservation and restoration of natural open space and utilize native landscaping and connections to the river to enhance the local environment. Minimize runoff and pollution from the site.

Aspiration: Create functioning ecosystem seamlessly connected to the Sacramento River. Increase restored area by integrating planting on structures - target 50% or greater planted space including structure planting.



Elevated structure for flood resilience, Image credit: Eddie Berman

RESILIENCE

Provide backup power for critical functions and a central space for gathering in the event of a disaster. Use passive strategies to maximize comfort if the station is operating in island mode.

Aspiration: Achieve Resilience-Based Earthquake Design Initiative (REDi) certification and/or strive for continuous operation in station and buildings after a major earthquake or flood.



Cycling and walking maintain a healthy lifestyle, Image credit: Robert Couse-Baker

WELLNESS

Create a walkable neighborhood that supports health, wellbeing, and connection to the local river ecology for people of all abilities and backgrounds.

Aspiration: Create a WELL Certified Community

1.2 RATING SYSTEMS

Sustainability and wellness rating systems can help the Sacramento Valley Station Master Plan meet the nine priorities by offering metrics and performance benchmarks. However none of the rating systems currently active in the marketplace comprehensively cover the social, ecological, wellness, and resilience goals of the Sacramento Valley Station Master Plan. Therefore, the metrics and goals set by the City for the Master Plan can be benchmarked against rating systems, and if appropriate, can be used to apply for one or more certifications for the Master Plan. They cannot replace development of project-specific goals and strategies in the next phase of the project.

This section introduces six applicable rating systems against which the projected performance of the Sacramento Valley Station Master Plan is measured in the remainder of this document. These six rating systems are:

- ▶ LEED for Neighborhood Development (LEED-ND): Green community rating system focused on site selection and resource efficiency
- ▶ Living Community Challenge (LCC): Outgrowth of the Living Building Challenge that presents a pathway to net-zero resource use and a vibrant social community
- ▶ EcoDistricts: Governance-focused protocol encouraging project-specific target setting for resource efficiency and placemaking
- ▶ WELL Community Standard: Health and wellness focused rating system emphasizing air, water, food, and environment quality for residents
- ▶ REDi: Resilience rating system addressing earthquake and flooding performance and response
- ▶ Envision: Sustainable infrastructure rating system emphasizing impacts during construction

Figure 1.2.1 maps these rating systems relative to their primary priority areas.

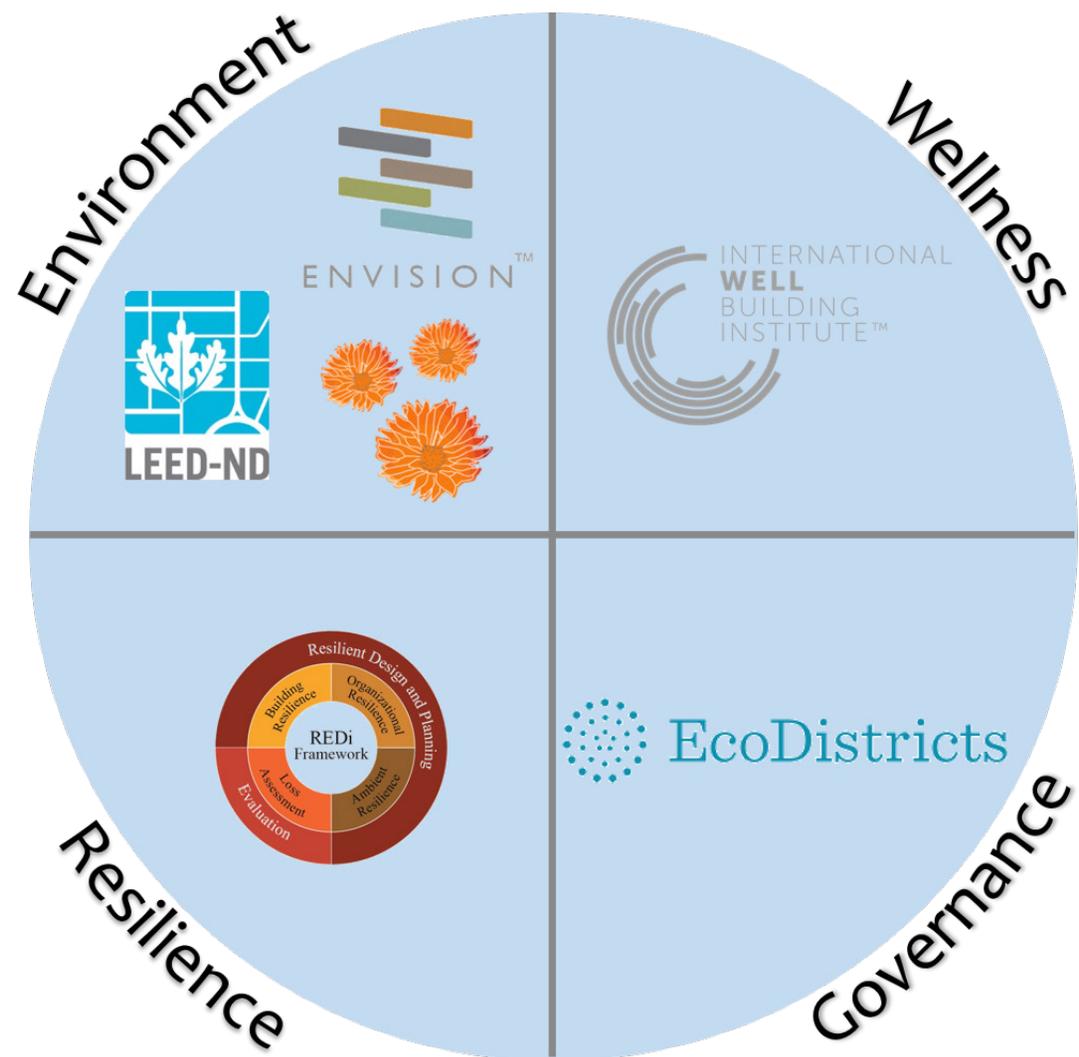


Figure 1.2.1 Priorities of the rating systems against which the Sacramento Valley Station Master Plan can be benchmarked.

LEED-ND



LEED-ND

LEED for Neighborhood Development (LEED-ND) encourages smart master plans that minimize impacts on local ecology, reduce demand for personal vehicles, encourage walking and bicycling, promote social interaction, and reduce resource demand through quantitative performance criteria. These goals are manifested through two main categories: Smart Location and Linkage, and Neighborhood Pattern and Design. Smart Location and Linkage focuses on the “selection of sites that minimize the adverse environmental effects of new development and avoid contributing to sprawl and its consequences.” Neighborhood Pattern and Design emphasizes the “creation of compact, walkable, mixed-use neighborhoods with good connections to nearby communities.”

Individual buildings can also be rated under LEED-BD+C. LEED certified buildings within a LEED-ND certified neighborhood automatically receive points in the Location and Transportation category (LEED v4).

LIVING COMMUNITY CHALLENGE

The Living Community Challenge was inspired by a philosophy of regeneration and developed into a framework to guide the design and construction of buildings and neighborhoods to be “socially just, culturally rich, and ecologically restorative.” The Challenge is comprised of seven categories, or “Petals:” Place, Water, Energy, Health & Happiness, Materials, Equity, and Beauty. Petals are divided into twenty imperatives, each with a set of options for incorporation into a neighborhood design. Among these are requirements for Net Positive Water and Net Positive Energy, though these can be achieved with solutions beyond the footprint of the project. While LEED awards points for theoretical performance, the Living Community Challenge requires performance data from one year of operation to confirm design intent.

An additional requirement of the Living Community Challenge is that a majority of buildings developed or renovated by the community achieve Living Building Certification.



ECODISTRICTS

The EcoDistricts Protocol encourages “people-centered, economically vibrant, and planet-loving” neighborhoods and districts. It is based on a belief that everyone deserves access to healthy, safe, and connected neighborhoods characterized by economic opportunity and ecological health. The Protocol has three core areas: Imperatives, Priorities, and Implementation Phases. The Imperatives – Equity, Resilience, and Climate Protection – are drivers for design and planning decisions. The Priorities – Place, Prosperity, Health and Wellbeing, Connectivity, Living Infrastructure, and Resource Restoration – contain specific objectives for a district’s sustainability program. The implementation schedule, divided into Formation, Roadmap, and Performance, tracks actions through the project. While each Priority is mandatory, the Protocol offers several options for compliance.

EcoDistricts does not provide certification for buildings, but instead views rating systems such as LEED and Living Building Challenge as complementary to the EcoDistrict certification.

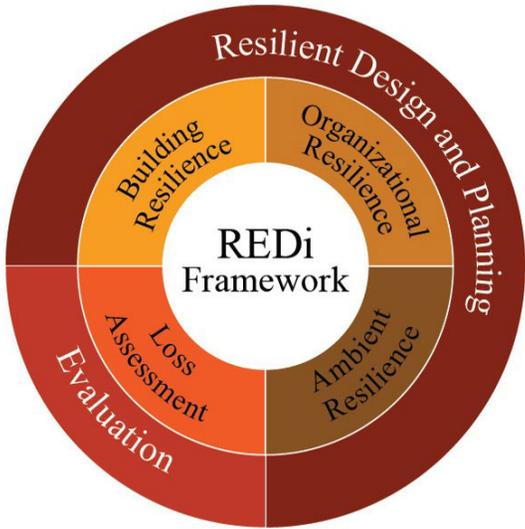


WELL COMMUNITY STANDARD

The WELL Standard was established to “offer a framework to help improve health and well-being for everyone that visits, works in, or experiences your building.” The standard is an expanded form of the WELL Building Standard to address public spaces around living and work spaces. The standard is comprised of ten categories: Air, Water, Nourishment, Light, Fitness, Temperature, Sound, Materials, Mind, and Community. These are further divided into specific credits, and rating is based on adding up points attained in each category. Whereas other rating systems are focused on sustainability, WELL emphasizes health and wellbeing and requires testing, certification, and re-certification.

Projects certified under the WELL Community Standard can earn points by having individual buildings certified under the WELL Building Standard.





REDi rates building structural performance and recovery during and after an earthquake. Specifically, REDi is designed “to provide owners and other stakeholders a framework for implementing “resilience-based earthquake design”, and a holistic “beyond-code” design, planning and assessment.” There are four categories of credits under REDi in which points can be earned to achieve either a silver, gold, or platinum rating. These four areas are organizational resilience, building resilience, ambient resilience, and loss assessment. All contribute to understanding the robustness of a building to an earthquake, the impact of surrounding site and building conditions, and the response of the organization after an earthquake.

REDi does not intersect with any other rating systems, and does not apply to the community scale. It is only applicable to individual buildings.



ENVISION™

ENVISION

Envision is designed to promote sustainable design in civil infrastructure, with a goal “to foster a dramatic and necessary improvement in the sustainability performance and resiliency of physical infrastructure.” Projects are rated on criteria of leadership, quality of life, natural world, climate and risk, and resource allocation. The rating system aims to achieve for infrastructure what LEED has for buildings by emphasizing holistic design, procurement, and construction of infrastructure. Projects achieve credits and across 60 categories with required point totals to achieve different levels of certification.

Envision applies only to infrastructure and not to buildings, and it is not meant as a rating system for an entire development.

1.3 SUSTAINABILITY PERFORMANCE

Many factors contributing to the sustainability performance of Sacramento Valley Station Master Plan will not be determined until more detailed designs are produced. However, the concepts studied in creating the concept-level master plans offer some insight into the anticipated performance of the Master Plan. Figure 1.2.1 shows a range of performance levels available to the project for each Sustainability Priority, from minimum to transformational. It uses pegs to show what level of performance each applicable rating system would drive the project to achieve if the team were to choose to commit to it. The hatch marks assess the range of possible performance that the current Master Plan options are capable of achieving. There is a range because detailed design and developer requirement decisions yet to be made will influence how high performing the resulting project is. We encourage the City to aim for the transformational end of the spectrum.

The lower end of each range assumes the worst case without further development of sustainability strategies and code minimum building and landscaping approaches. At an absolute minimum, the project must comply with all applicable state and local codes.

The upper end of each range is based on the best case where sustainability measures are continuously developed and the Sacramento Valley Station Master Plan development pursues best-in-class building technology and landscape approaches.

As shown in the graphic, the proposed concepts for the Sacramento Valley Station Master Plan can exceed code minimum, and both have charted a course for transformative sustainability performance across all nine priorities. Achieving this high potential will require further development of sustainability strategies and priorities as design progresses to capture innovation at the building and system scale.

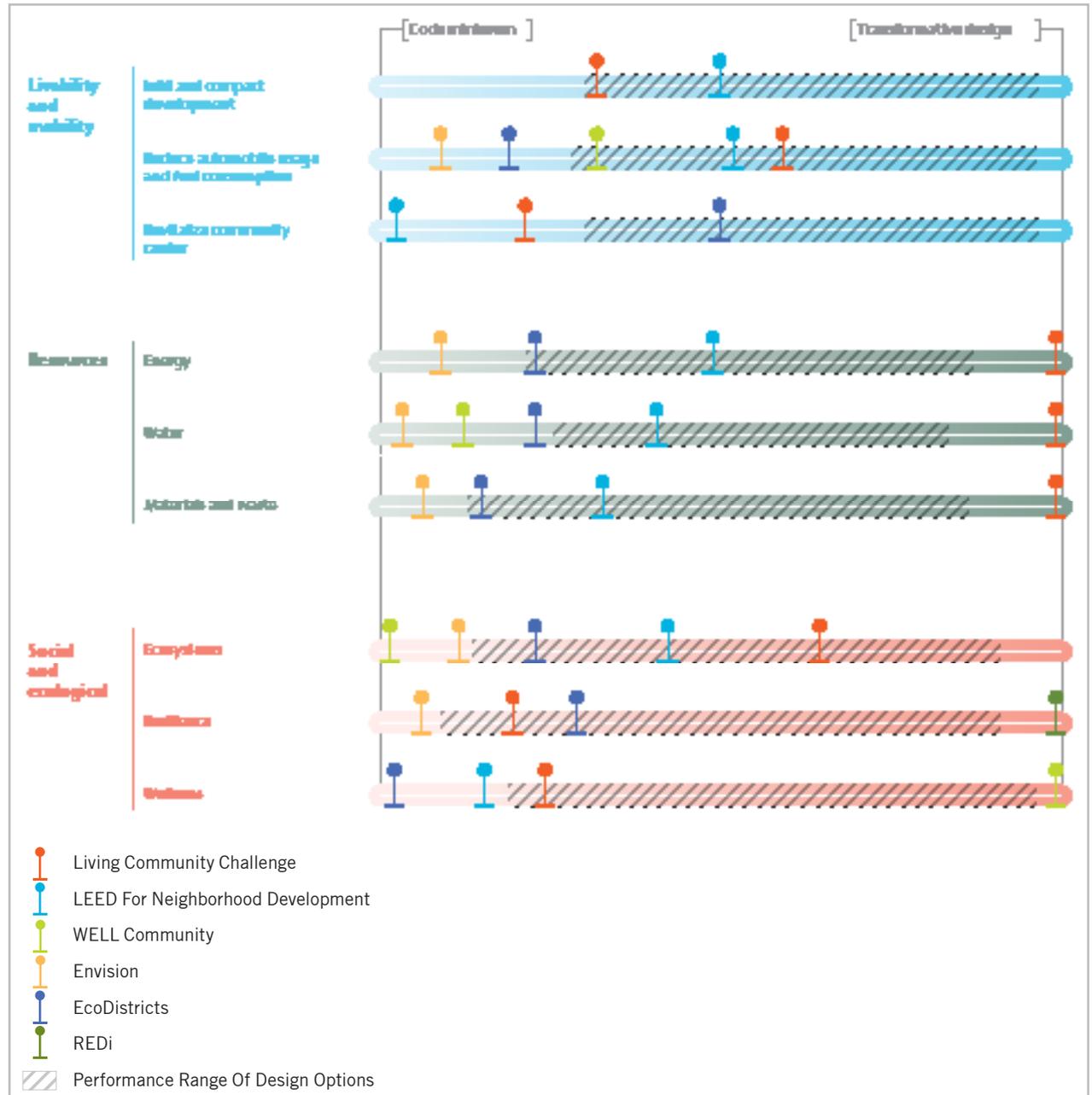


Figure 1.2.1 Performance ranges of the Sacramento Valley Station masterplan based on the current design, with certification benchmarks

Rating systems can help the Sacramento Valley Station Master Plan track progress toward the nine sustainability priorities and achieve recognition for sustainable features. Several rating systems exist for community and building-scale sustainability, resilience, and wellness. The rating systems differ in how certification is granted, the required targets, and their focus on environment, wellness, and resilience. While no rating systems is a perfect fit for the sustainability priorities of Sacramento Valley Station Master Plan, pursuing one or more, or following the guidelines of those that most closely align can be helpful in tracking sustainability performance. Figure 1.2.2 highlights six rating systems that may be relevant to the Sacramento Valley Station Master Plan. Performance in the nine priorities is benchmarked in Figure 1.2.1 as well, and each rating is described in Appendix A.

		Focus Area	Intent	Infill and Compact Development	Reduce Automobile and Fuel Consumption	Revitalize Community Center	Energy	Water	Materials and Waste	Ecosystem	Resilience	Wellness and Wellbeing
LEED for Neighborhood Development		Environment	Minimize impacts on local ecology, reduce demand for personal vehicles, encourage walking and bicycling, promote social interaction, and reduce resource demand	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	White	Light Green
Living Community Challenge		Environment + Community Wellbeing	Guide the design and construction of buildings and neighborhoods into becoming "socially just, culturally rich, and ecologically restorative"	Light Green	Light Green	Light Green	Dark Green	Dark Green	Dark Green	Light Green	Light Green	Light Green
EcoDistricts		Environment + Community Governance	Foster the design of "people-centered, economically vibrant, and planet-loving" neighborhoods and districts	White	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
WELL Community Standard		Community Wellbeing	"Improve health and well-being for everyone that visits, works in, or experiences the community"	White	Light Green	White	White	Light Green	Light Green	Light Green	White	Dark Green
REDi		Resilience	"To provide owners and other stakeholders a framework for implementing "resilience-based earthquake design", a holistic "beyond-code" design, planning and assessment"	White	White	White	White	White	White	White	Dark Green	White
Envision		Infrastructure Sustainability	"To foster a dramatic and necessary improvement in the sustainability performance and resiliency of physical infrastructure"	White	Light Green	White	Light Green	Light Green	Light Green	Light Green	Light Green	White

Figure 1.2.2 Comparison of rating systems and their relative applicability to the nine sustainability priorities of the Sacramento Valley Station Master Plan. White implies that the rating system does not address the priority. Light to dark green represents the degree to which the rating system addresses the priority: light = minimal, dark = comprehensive.



Image credit: Orin Zebest



2

LIVABILITY AND MOBILITY

2.1 Infill and Compact Development

2.2 Reduce Automobile Use and
Fuel Consumption

2.3 Revitalize Community Center

2.1 INFILL AND COMPACT DEVELOPMENT

Under the 2035 General Plan, the City of Sacramento is emphasizing development within the city center as a sustainable strategy for adding housing and providing economic opportunity. This program of infill helps protect the surrounding agricultural land and ecological sensitive wetlands around the city, while allowing Sacramento to continue its growth.

The Sacramento Valley Station Master Plan Area lies within the Railyards Special Planning District as identified under the 2035 General Plan. It straddles the border between areas designated as "Urban Center High" and "Central Business District." Both of these areas are targeted for greater density development than much of Sacramento in keeping with the creation of a transit-focused urban core. Respectively, these two designations have FAR limits of:

- Urban Center High: 0.5 to 8.0
- Central Business District: 3.0 to 15.0

These FAR limits form the upper and lower bounds for infill. Mixed development is another important component of creating compact communities. A combination of housing, retail, and job centers reduces car trips and creates a more active neighborhood around the clock. No minimum or maximum requirements for use types are placed on the parcels by the Sacramento zoning code, though 468 units of new housing are anticipated for the site under the specific plan.

In the context of rating systems, infill and compact development are assessed under the Living Community Challenge and LEED-ND. The Living Community Challenge requires brownfield redevelopment, which is a precondition for this site by virtue of its location. LEED-ND also has brownfield redevelopment as one of four possible prerequisites. Points are also assessed for mix of uses, increasing density, reducing parking counts, and redevelopment of priority brownfield areas. However these bonuses are capped below the maximum FAR limits of Sacramento's zoning code.

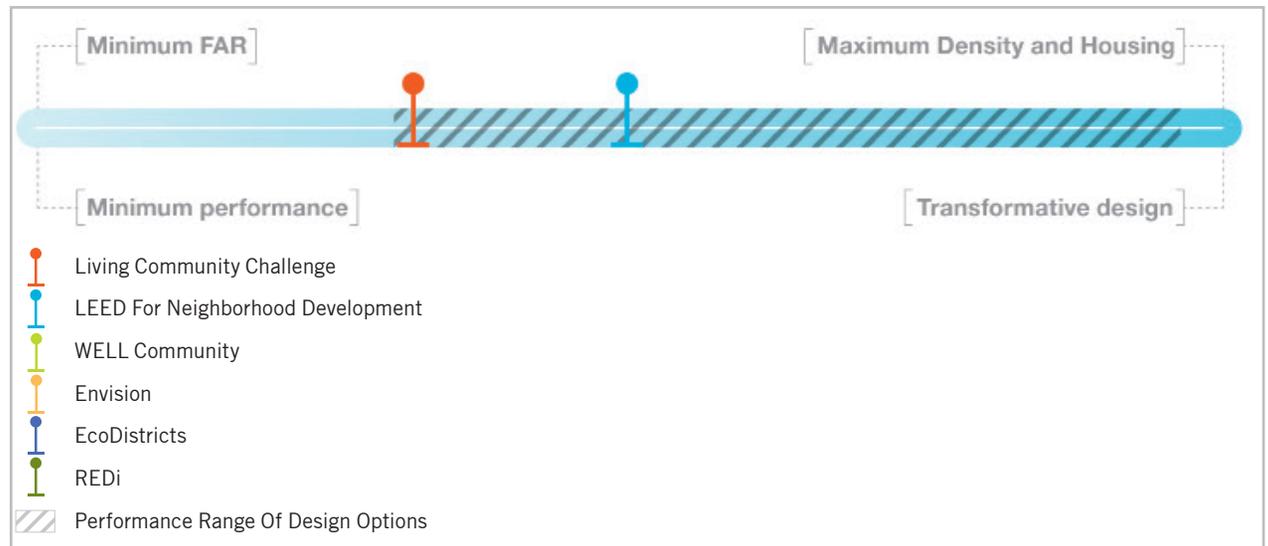


Figure 2.1.1 Qualitative assessment of the masterplan performance relative to the infill and compact development goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

Both options for the Sacramento Valley Station Master Plan will achieve good performance in infill and compact development through:

- Brownfield redevelopment across the entire site
- Higher density than historic use on the station, and higher density than other redevelopment in the Railyards area
- Higher FAR than minimum in both schemes
- Mixed use development including retail, offices, and residential, which promote extended use and reduce need for additional development
- Protection of the sensitive ecological river corridor through green space leading to the waterfront
- Both options are transit-focused, leading to a significant reduction in parking counts

In the next phases of design, both master plan options provide opportunities for additional contributions to infill and compact development through targets set to impact the entire development ensuring:

- Dynamic plaza and street elements that will draw additional occupants and contribute to 24-hour activation
- Retail frontage on the first floor to create an active space with live/work/shop amenities for residents
- Creating spaces for temporary retail, festivals, and other activities that can promote dense use especially during weekends
- Minimizing parking and identifying transit demand management strategies targeted to each building and use to further reduce parking counts

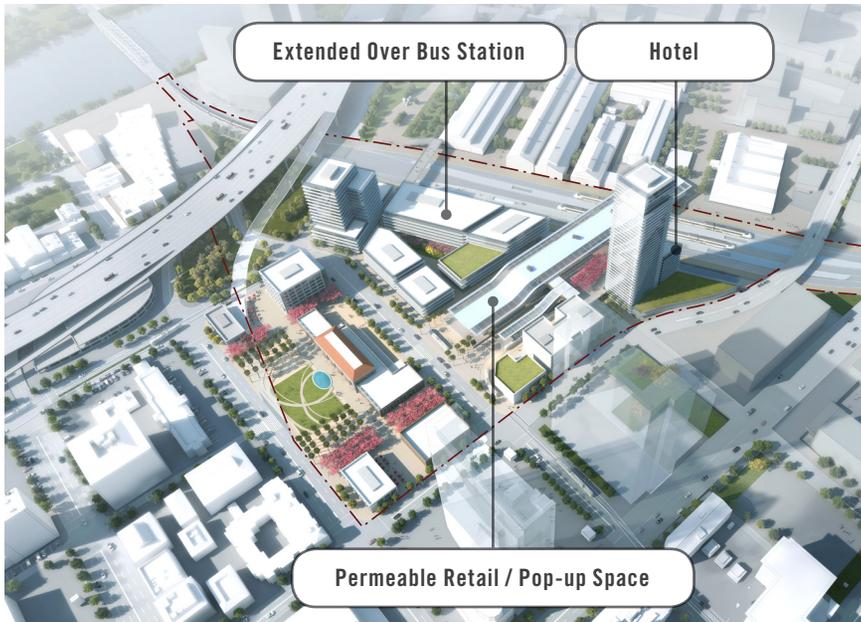


Figure 2.1.2 Characteristics of Option 1 related to infill and compact development

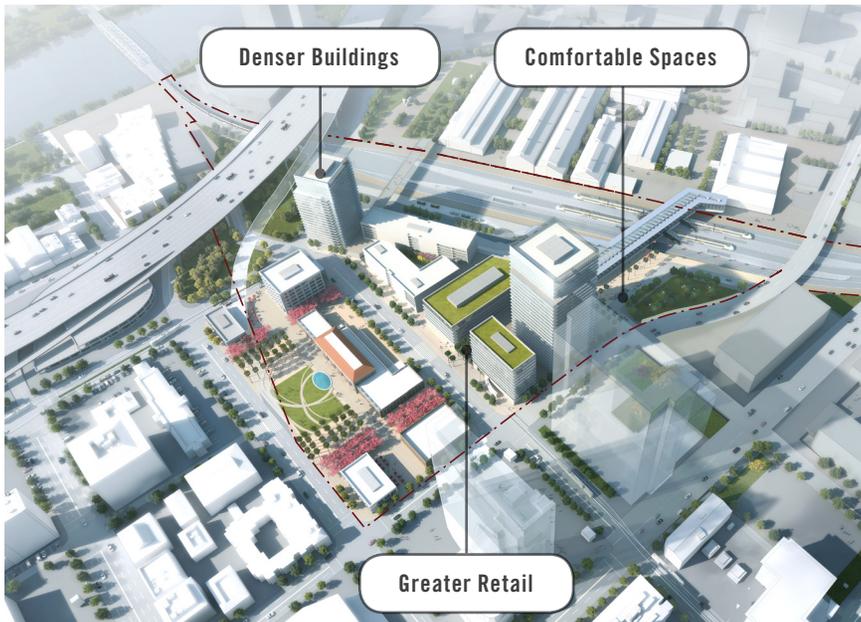


Figure 2.1.3 Characteristics of Option 2 related to infill and compact development

CONCEPT EVALUATION: OPTION 1

Attributes of infill and compact development unique to Option 1 include:

- › Hotel incorporated on the east side of the site, allowing for greater activation of the site during the evening and introducing an additional population to the area
- › Large plazas with opportunities for pop-up retail and development that are visible to connecting neighborhoods
- › Sheltered plazas likely to offer comfortable spaces and promote dense activity
- › Permeable retail opportunities within the station building to promote use
- › Extension of the office building mass over the bus bay to add additional square footage while preserving the transit use of the site

CONCEPT EVALUATION: OPTION 2

Attributes of infill and compact development unique to Option 2 include:

- › Increased density in the northwestern portion of the site through taller residential and office buildings, and more mass near the corner of downtown, matching the height profile of the central business district
- › Significant opportunities for retail in the podium and station, which increase the possibility of 24-hour activation and promotion of density in the surrounding neighborhoods
- › Comfortable plazas shaded in the summer which promote comfortable spaces and mixed use

STRATEGIES

Site selection is half the battle in achieving infill and compact development. Given the brownfield redevelopment situated between the historic core of Sacramento and the Railyards, this has already been achieved. In addition, the project is a brownfield, thereby preventing additional unnecessary destruction of ecologically sensitive land or agricultural area.

Beyond site selection, the Sacramento Valley Station Master Plan should catalyze additional infill and compact development throughout the central business district and Railyards district. To achieve this, during detailed design several strategies should be adopted:

- ▶ Diversify ground floor uses, and prioritize a combination of retail targeting transient shoppers and residents. If necessary, set leasing targets or identify specific retailers to open space within the development. Aim for the mix of uses and amenities to produce 24-hour activation to ensure safety and vibrancy.
- ▶ Create opportunities for temporary retail that densifies use and creates market pull for additional residential and commercial development in downtown Sacramento
- ▶ Promote outdoor cafe and seating opportunities to attract additional foot traffic and increase use in open spaces
- ▶ Minimize parking available on the site to emphasize transit-orientation, and provide parking as required in subterranean structures or above-grade structures surrounded by active first-floor uses. Use transit demand management strategies and consider paid parking or monthly space rentals to help reduce parking counts.
- ▶ Where outdoor plazas are created, ensure that these are comfortable for occupants, ensuring additional use throughout the year. Provide opportunities for multiple use. Attention to adjacencies in the final design should strive for outdoor public spaces that receive sun in winter and shade in summer, without substantial wind acceleration.
- ▶ Provide opportunities for housing across the affordability spectrum



Residences and plazas provide dense development and green space, Image credit: John



Retail streets provide amenities for residents and office workers



Active office plazas provide nature and respite in a dense community, Image credit: John Sturrock



Mixed use allows residents to reduce transportation needs, Image credit: Perkins+Will

METRICS

Metrics for infill and compact development are provided within the Sustainable Communities Grant. These are presented below, along with additional metrics for infill and compact development. Together these include:

- › Dwelling units constructed in the Railyards area relative to the SACOG 2012 Base Year Estimates at a parcel level (should show an upward trend)
- › Acres of non-residential uses constructed in the Railyards area relative to the SACOG 2012 Base Year Estimates
- › Dwelling units counted through the Community Development Department data should increase within 1/4 mile of the light rail station relative to 2013 Base Year Counts
- › Parking ratios per gross square foot of development should decline for all development types relative to 2014 Base Year Counts
- › Build at higher density than surrounding blocks and at an FAR and minimum dwelling count exceeding the minimum in the General Plan
- › Address at least 75% of the metrics in the City of Sacramento Livability Index
- › Exceed required affordable housing percentage

MONITORING

DESIGN

Metrics should be tracked during design through a reassessment of estimated square footage, parking ratios, and affordability metrics. Relative to the current options, density indicators such as FAR and dwelling units should not decrease. As stated in the Sustainable Communities Grants, baselines should be reassessed during design to ensure that the project is reinforcing the ultimate goals of density in downtown. Increasing unit counts and density may be possible as design progresses to improve the compactness of the central business district.

OPERATIONS

The City of Sacramento updates annually records of development, dwelling units, tax revenue from retail, and parking ratios by development. These metrics should be tracked during construction of the Sacramento Valley Station Master Plan and after operation. While the master plan will not add units and retail space beyond its initial construction, it may act as a catalyst for increased compact development downtown. Using the annual survey of development and the four-year SACOG estimates of developed land uses, additional development can be tracked and paired with tax revenue data from the Sacramento Valley Station Master Plan to understand the impact of the project on downtown.

2.2 REDUCE AUTOMOBILE USE AND FUEL CONSUMPTION

In Sacramento, single-occupant vehicle use remains a primary mode of transportation; in 2012, the SACOG Metropolitan Transportation Plan identified that:

- › 75% of commuters travel alone, while of all trips
- › Non-vehicular modes comprised less than 20% of all trips
- › Public transit trips were only 1.2% of total trips

However the city has set out to change this. The 2035 General Plan and the Grid 3.0 Mobility Plan both recognize the need for investment in public transit and prioritization of non-vehicular modes of transportation. Sacramento's Climate Action Plan reinforces the need to reduce car trips. Currently, on-road transportation comprises 48% of Sacramento's greenhouse gas emissions. Reducing automobile travel and fuel use is a significant in curbing the city's overall emissions.

The current vehicle mode share can be treated as the baseline performance for the development. By virtue of the location, the Sacramento Valley Station Master Plan Area should exceed this baseline. For the plan to be truly transformative, it would eliminate single occupancy vehicle trips generated in the Master Plan Area. Realistically, a combination of transit, transportation demand management, shared mobility services, walking and biking, and limited on-site parking can significantly reduce single occupancy vehicle trips. Regionally, the station will also serve to reduce single occupancy trips through provision of efficient, dense transit services and mixed-use amenities surrounding the station.

By virtue of its location, the Sacramento Valley Station Master Plan Area exceeds the pathway to carbon neutrality required by EcoDistricts and the construction phase transportation reduction of Envision. The proposed high density of walking and biking connections meets the goals identified in the WELL Community Standard for healthy transportation. Benchmarks provided by LEED-ND include providing access to quality transit, bicycle facilities, and proximity of neighborhood services. The Living Community Challenge limits single occupancy vehicle transit to 40%. Incorporating these metrics would help the Sacramento Valley Station Master Plan Area achieve high automotive use reduction.

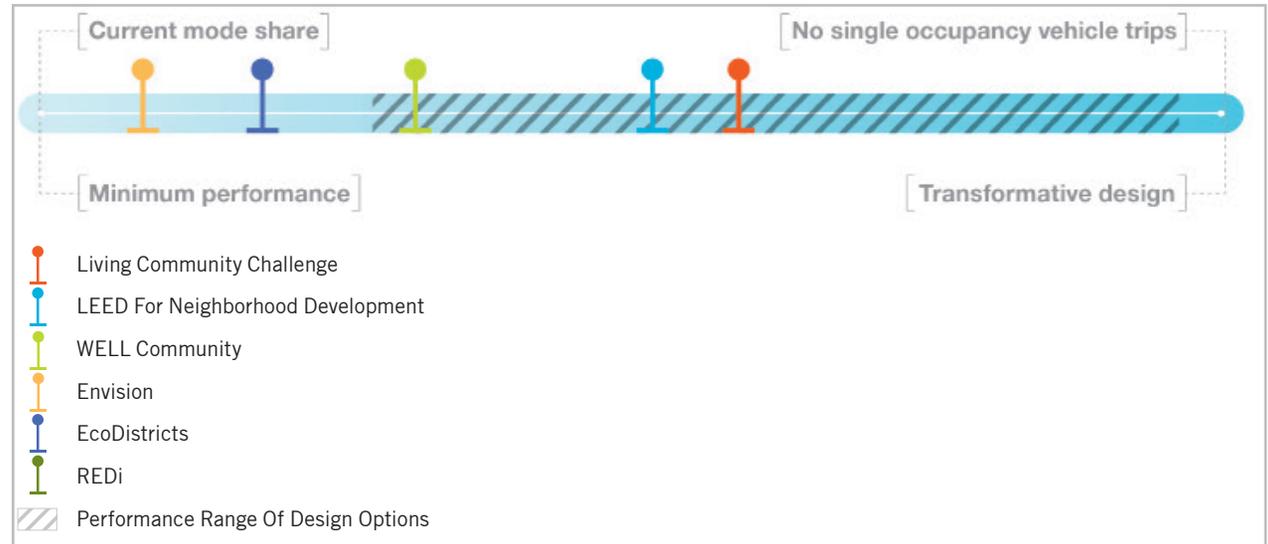


Figure 2.2.1 Qualitative assessment of the masterplan performance relative to the automobile use and fuel consumption goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

The Sacramento Valley Station Master Plan is located at the intersection of numerous light rail, train, and bus lines, and offers additional fuel reduction advantages through:

- › A high density, mixed-use core that encourages walking trips for short errands rather than driving
- › Provision of mixed use amenities at the ground plane that can attract nearby downtown residents and workers, who can walk or bike
- › Connection to walking and biking trails along the Sacramento River
- › Improved connections between regional travel services and local transit, helping reduce automobile dependence for last mile travel
- › Reduced parking provision discourages driving to and from the Sacramento Valley Station Master Plan

- › Creating a strong connection to the Railyards in the north, linking with an attractive walking path across a traditional barrier to non-vehicular transit

In the next phases of design, both master plan options provide opportunities for additional contributions to reducing automobile use and fuel consumption through targets set to impact the entire development ensuring:

- › Opportunities for expanded ground floor retail meeting the needs of the working and living population, reducing trips required to and from the development
- › Providing high quality connections to the Sacramento River, downtown, and the Railyards through human-scale design



Figure 2.2.2 Characteristics of Option 1 related to reducing automobile use and fuel consumption

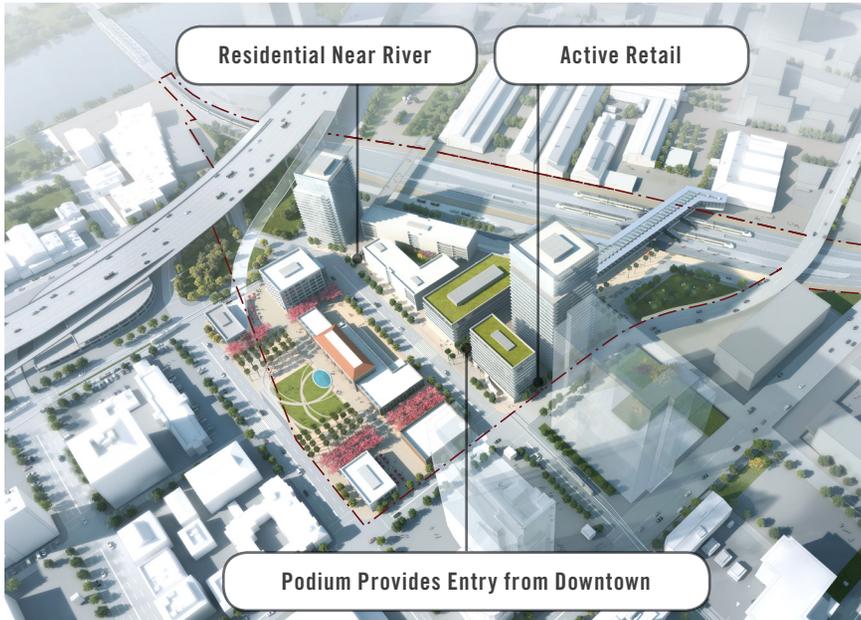


Figure 2.2.3 Characteristics of Option 2 related to reducing automobile use and fuel consumption

CONCEPT EVALUATION: OPTION 1

Attributes of reduced automobile transportation unique to Option 1 include:

- › A highly permeable ground plane throughout the station and the development, promoting walking and creating strong visual connections to downtown and the Railyards in the north
- › Homes near downtown and the crossing to the Railyards, which incentivize walking and biking to other downtown destinations
- › The central plaza in front of the station creates a pedestrian friendly entry point to the development, rather than emphasizing entry through a parking garage

CONCEPT EVALUATION: OPTION 2

Attributes of reduced automobile transportation unique to Option 2 include:

- › Increased retail space on the ground floor offers increased opportunity for community-oriented retail and providing a wide variety of services to meet the needs of residents and workers
- › Relocating the residential component of the master plan near the river promotes a visual connection to river trails and creates an easy walking and biking connection to other districts of Sacramento
- › The retail podium near downtown is likely to attract occupants of other downtown buildings for shopping and dining

STRATEGIES

Achieving this switch from car-dependent transportation to transit, walking, and biking will require several approaches and a shift in mindset that likely will occur over time. While the collocation of multiple transit nodes within the Sacramento Valley Station Master Plan Area provides excellent opportunity for non-automobile transportation, additional strategies in the next phase of design and development can help drive down single occupancy vehicle trips even further:

- ▶ Minimizing available parking on the site, and creating disincentives for residents and workers to park at the site through pricing or monthly rentals will help encourage non-vehicular modes of transit
- ▶ Employers should be encouraged or required to adopt transportation-demand management strategies, potentially including subsidizing transit passes, providing facilities for bicycle storage, pre-tax transit spending accounts, or incentives for ride shares and public transit use
- ▶ High quality wayfinding should be developed to encourage walking and biking access within the Sacramento Valley Station Master Plan Area and to the Sacramento River, attractions in historic Sacramento, downtown, and the Railyards. This is especially important for visitors arriving via regional transit to encourage walking and transit as opposed to single occupancy vehicles for last mile travel.
- ▶ The expanding bike share program and the soon-to-arrive JUMP electric bicycle share program in Sacramento should provide stations within the Sacramento Valley Station Master Plan Area to encourage residents and visitors to bike
- ▶ Prioritize retailers in the Sacramento Valley Station Master Plan Area that provide a balance of services for residents and workers, and that provide services not currently available within a half-mile of the Sacramento Valley Station Master Plan Area



Light rail access can reduce vehicle trips throughout Sacramento, Image credit: El Cobrador



Biking, especially along the river, offers a carbon-free mode of transportation

METRICS



Proximity to downtown will encourage walking, Image Credit: Daniel Imade



Buses provide another option for non-car trips throughout Sacramento, Image Credit: Griffin5/Wikipedia

Metrics for transportation targets are provided within the Sustainable Communities Grant. These are presented below, along with additional metrics, which should be measured relative to studies from the Grid 3.0 Mobility Plan and the SACOG regional travel model:

- ▶ Greenhouse Gas Emissions per Capita: Reduce GHG emissions per capita by 68% for residents in the Railyards Area (long-term) from the SB 375 baseline
- ▶ Vehicle Miles Traveled: Reduce VMT per capita for future residents by 68% relative to 2008
- ▶ Transit Ridership: Relative to 2012 station boardings, aim to increase community-wide Capital Corridor intercity transit ridership and Sacramento Regional transit ridership based
- ▶ Car Trips: Aim for an increase in number of trips via car sharing and an overall decrease in number of trips (Grid 3.0 Mobility target: 16% increase in shared trips; 20% overall decrease)
- ▶ Walking Trips: Aim for an increase in walking trips (Grid 3.0 Mobility Target: 77% increase)
- ▶ Cycling Trips: Aim for an increase in cycling trips (Grid 3.0 Mobility Target: 98% increase)
- ▶ Mode Share: Using data for all trips, calculate the mode share, and aim for an increase in pedestrian and bike mode shares for trips generated within the site

MONITORING

DESIGN

Trip generation and mode should be estimated at each stage of design, including the projected impact of all transportation demand management (TDM) measures proposed. Baseline figures for downtown transportation should be updated through the SACOG reporting process, and any changes to baselines prior to opening of the Sacramento Valley Station Master Plan should be noted.

OPERATIONS

The SACOG periodic transportation surveys will help identify trip mode improvements. Where this data can be isolated to the Sacramento Valley Station Master Plan Area and Railyards regions, improvements in these specific developments should be noted.

The City of Sacramento should work with employers and landlords to assess their employees' and occupants' transit habits and identify additional Transportation Demand Management measures that can be implemented to meet goals. The city may be able to assist in providing transit incentives or adapting transit schedules to better serve the regional and local transit connections.

2.3 REVITALIZE COMMUNITY CENTER

The Sacramento Valley Station Master Plan seeks to create a new nexus of urban life around the historic railway station by developing a mixed-use center on a historically underutilized parcel of land. The goal is to create a destination and community center within the Sacramento Valley Station Master Plan Area that encourages 24 hour activation, promotes residents and workers staying local, and provides spaces for all individuals to live, work, and enjoy. The Sacramento Valley Station Master Plan aims to be a catalyst for expanded new development downtown, helping spur new development, job growth, and retail sales.

Historically, the area of the Sacramento Valley Station Master Plan Area has been single-use, underutilized land that divides rather than connects downtown with the historic core of Sacramento to the west and the Railyards to the north. Providing density to this parcel will be a step in the right direction toward revitalizing the downtown city center. However density is not enough. Fully active spaces with events and a mix of uses that attracts and retains a diversity of workers and residents and activates the space through the day and evening would provide a truly transformative development for downtown. The proposed options for the Sacramento Valley Station Master Plan both provide a pathway to this transformative future, far exceeding a single use baseline or the current performance of the area.

In addition to the historic land use and 2035 General Plan use and density requirements, revitalization of the city center can be informed by three rating systems. Of these voluntary ratings, LEED-ND provides the least guidance through credits for mixed use neighborhoods. However since LEED-ND does not require community vitality or on-site amenities, it falls below the expected performance of the Sacramento Valley Station Master Plan. The Living Community Challenge goes a step further by requiring community amenities and universal access. The most progressive system is EcoDistricts, which requires community target-setting and planning of amenities desired by the community, leading to greater engagement and the right mix of uses to serve community needs.

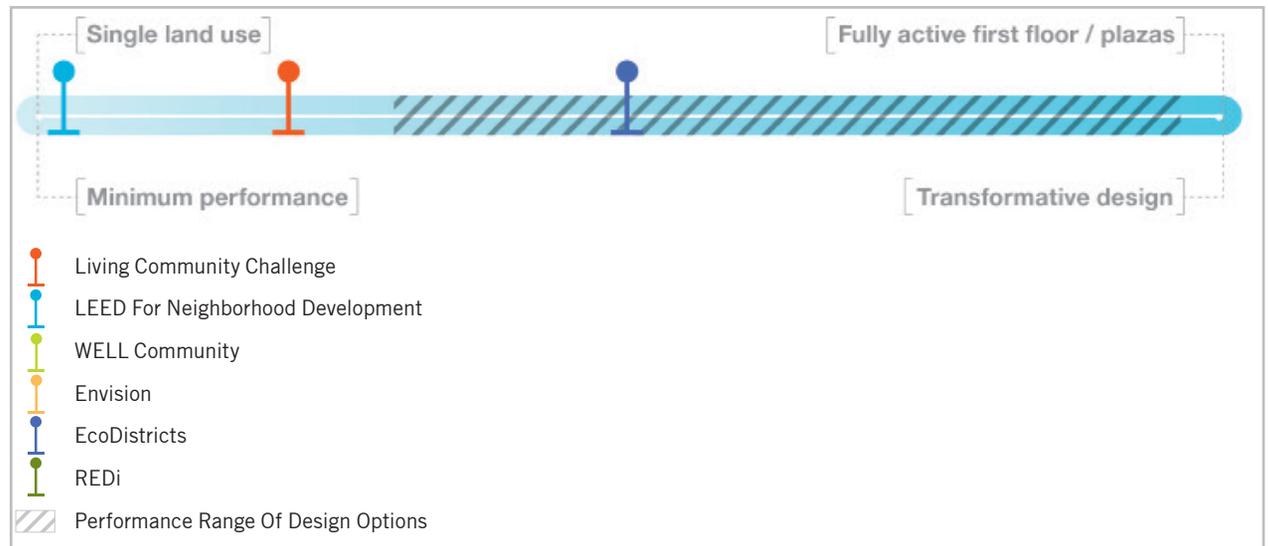


Figure 2.3.1 Qualitative assessment of the masterplan performance relative to the revitalize community center goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

The Sacramento Valley Station Master Plan is already well positioned to catalyze downtown development by connecting several districts via a single hub. Other features that enhance community revitalization include:

- ▶ Large open plazas within the development surrounded by offices and residential units create an active space with opportunities for community events and public art that can make the station a destination unto itself
- ▶ Connections to the river, north Railyards development, and historic station offer opportunities for a broader network of amenities anchored by the Sacramento Valley Station
- ▶ By removing the railway services from the historic station, this particular building can also experience a change in use, creating a vibrant center of activity

- ▶ Increased transit connectivity to the bus and light rail network promotes visiting the site and provides incentive for future development in the area

In the next phases of design, both master plan options provide opportunities for additional community center improvements through targets set to impact the entire development ensuring:

- ▶ Identifying opportunities for age-appropriate design, and creating ground-floor experiences that suit and attract all ages
- ▶ Providing wayfinding and visual connectivity to other destinations in Sacramento to help promote the Sacramento Valley Station Master Plan as a hub
- ▶ Identifying spaces for events, a farmer's market, festivals, and other temporary activity

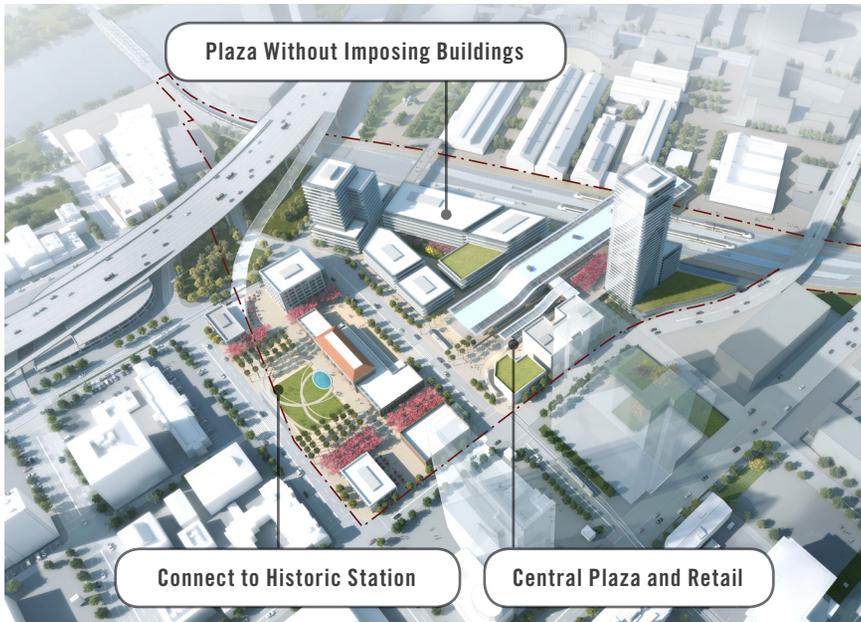


Figure 2.3.2 Characteristics of Option 1 related to revitalizing the community center

CONCEPT EVALUATION: OPTION 1

Attributes of Option 1 that will help revitalize the community center include:

- The open plaza directly across from the historic station and the highly permeable station building create a natural gathering point with opportunities for public art and community events
- Relatively low office buildings near the historic station create an unimposing space which can be seen from the station and all of the surrounding buildings, drawing in residents and occupants to events occurring throughout the station
- The station offers opportunities for permanent and pop-up retail, creating a destination surrounding the transit experience
- The highly permeable site allows easy connection to other parts of downtown and invites residents and workers into the site, creating a hub and offering opportunities for various experiences



Figure 2.3.3 Characteristics of Option 2 related to revitalizing the community center

CONCEPT EVALUATION: OPTION 2

Attributes of Option 2 that will help revitalize the community center include:

- Increased active retail along H St will help provide amenities to residents and workers, and drive increased use of the Sacramento Valley Station by office workers in the central business district
- The diversity of plaza spaces creates opportunities for different experiences, event spaces, public art, performances, and other amenities
- The higher density of the site may promote larger developments in the surrounding downtown area, creating greater activity throughout the region

STRATEGIES

The current dense, mixed-use plan for the Sacramento Valley Station Master Plan offers a solid foundation for the final development to become a strong community center. As design of the Sacramento Valley Station Master Plan progresses, several strategies can be incorporated to help realize the site's full potential:

- ▶ Plaza spaces and station building should incorporate flexibility in use that preserve station access while also creating areas for markets and other events
- ▶ Uses for the historic station should be considered, and may follow the trend of the Ferry Building in San Francisco and the Public Market in Seattle in becoming a mixed-use retail and active space with the capability of housing events as well
- ▶ A location for a farmer's market could be identified as a recurring event to attract visitors to the site and promote use by residents
- ▶ Public art should feature prominently in all spaces of the station and public realm. Sculpture, painting, dance, and kinetic or digital pieces should be considered, and a variety of artistic elements used to create an interactive space attractive to all.
- ▶ Promotion of other downtown attractions and wayfinding should be used to create the sense that the station is the center of the downtown region
- ▶ Prioritize retailers in the Sacramento Valley Station Master Plan Area that provide a balance of services for residents and workers, and that provide services not currently available within a half-mile of the Sacramento Valley Station Master Plan Area
- ▶ In operation, a regular calendar of events should be maintained, and permitting or application for use of the plazas and open space should be readily available for any interested in hosting an event



A farmer's market can create regular community activity, Image credit: Visitor7, Wikipedia



Public art will bring a help define the community and engage local artist

METRICS



The open station will build a market hall feel full of activity, Image credit: Paul Carstairs

Metrics for urban revitalization are provided in the Sustainable Communities Grant, and reproduced here along with additional metrics for community revitalization:

- › Job Growth in the Sacramento Valley Station Master Plan Area: Using the City of Sacramento Livability Index, job growth relative to 2014 base year estimates should be tracked
- › Restaurant and Retail Sales Tax Revenue: Using the revenue figures in the City of Sacramento Livability Index, tax revenue relative 2014 base year estimates should be tracked
- › Development Applications: Use the Community Development Department database to track the number of permit applications around the Sacramento Valley Station Master Plan Area
- › Public Art Installations: The number of public art installations and art events per year should be counted
- › Community Events: The number of community events and their attendance should be tracked
- › Ridership: Count the number of individuals traveling to the site for non-regional transit needs through the SACOG periodic surveys as compared to a 2012 baseline

MONITORING



Outdoor plazas provide gathering spaces and opportunities for sculpture and art, Image credit: Paul Carstairs

DESIGN

During design, funds should be set aside for spending on public art, and locations should be identified and maintained throughout the design. Community spaces likely to serve as event spaces should also be identified and maintained as a priority. Trip generation estimates can be used to estimate the attraction of different retail mixes for the site, and the impact of additional development can be predicted using similar estimates. As baselines change pursuant to updated survey data, these should be incorporated and updated prior to the opening of the Sacramento Valley Station Master Plan.

OPERATIONS

Public art should be maintained by facility staff, and opportunities for new installations or art events should be tracked and incorporated where appropriate to the station area. Community events hosted in the space should be tracked, and attendance should be counted or reported where possible to measure use of the space. Ridership should be tracked through the existing periodic SACOG survey updates. Metrics around tax, revenue, and development applications will be tracked through city inventories. Additional incentives for surrounding development could be used to achieve community revitalization goals if needed.





3

RESOURCES

3.1 Energy

3.2 Water

3.3 Materials and Waste

3.1 ENERGY

Consumption and generation of energy directly impacts carbon emissions attributable to the Sacramento Valley Station Master Plan Area. Buildings contribute 42% of all greenhouse gas emissions within the City of Sacramento, divided between commercial and residential as:

- ▶ Commercial and Industrial: 58%
- ▶ Residential Energy: 42%

Reducing these percentages will require significant reductions in energy use in new development, especially in order to meet the City of Sacramento’s aggressive 41% greenhouse gas reduction target.

State policy is helping drive energy efficiency in new buildings. Currently, all new buildings must comply with the Title 24 Energy Code, which is reviewed every three years and has steadily advanced energy efficiency throughout the state. Additionally, by 2020 all new residential development will be required to be net-zero energy through a combination of on-site and off-site renewables. By 2030, new commercial development must also be net-zero. For the Sacramento Valley Station to be truly transformative, it would achieve these goals through 100% on-site renewables. However the climate of Sacramento and the high density development of the site limit the potential for 100% on-site renewable generation. Net-zero could still be achieved by supplementing on-site generation with off-site sources.

Energy efficiency and renewable energy are covered in several voluntary standards. The Envision rating covers reducing energy use in infrastructure creation and operation, but does not address building energy use. EcoDistricts requires that new developments set a target for carbon neutrality, which will likely be achieved for the site’s buildings in the long run due to changes in the energy grid. LEED-ND offers of credits for energy efficiency and renewable energy, all of which could help guide the Sacramento Valley Station Master Plan to greater energy efficiency. However a truly transformative standard would be the Living Community Challenge, which requires that the site be net-zero energy using a combination of on-site and off-site renewables.

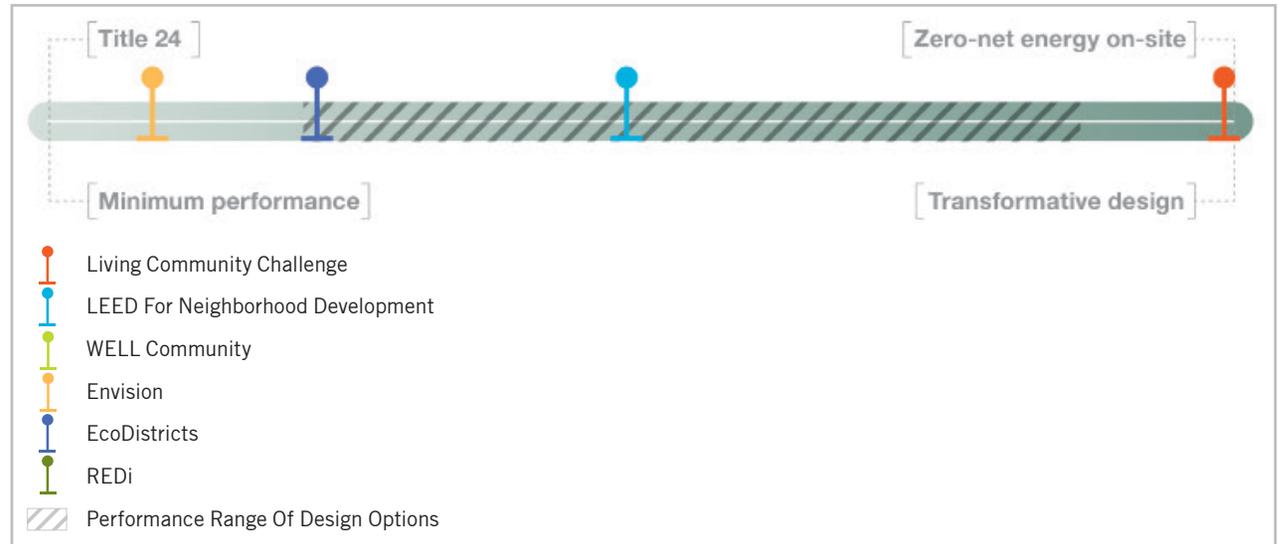


Figure 3.1.1 Qualitative assessment of the masterplan performance relative to the energy goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

At this stage of design, the building massing and layout for the Sacramento Valley Station have the greatest impact on energy efficiency, and set a good foundation for energy efficiency through:

- ▶ Predominant east-west layouts which maximize diffuse light from the north and opportunity for daylighting on the south
- ▶ Good light access for residential and office towers, allowing reduction in electric lighting through daylighting
- ▶ Plazas which promote shading and shelter from the summer sun, while also calming wind movement in the winter and creating more comfortable spaces, enabling year-round outdoor use
- ▶ Large expanses of roof space (relative to density) for incorporating photovoltaic panels, solar thermal hot

water heating, and green roofs

- ▶ Close proximity of buildings helps provide shading for adjacent structures, reducing direct solar gain while still allowing diffuse daylight

In the next phases of design, energy performance should be further specified through targets set to impact the entire development ensuring:

- ▶ Target energy consumption for each use within the site
- ▶ Evaluate opportunities to further tune the massing of buildings through microclimate studies to enhance daylight and natural ventilation
- ▶ Target a high percentage of on-site renewable generation
- ▶ Investigate potential to centralize heating and cooling, gaining efficiency and freeing up usable floor area



Figure 3.1.2 Characteristics of Option 1 related to energy performance

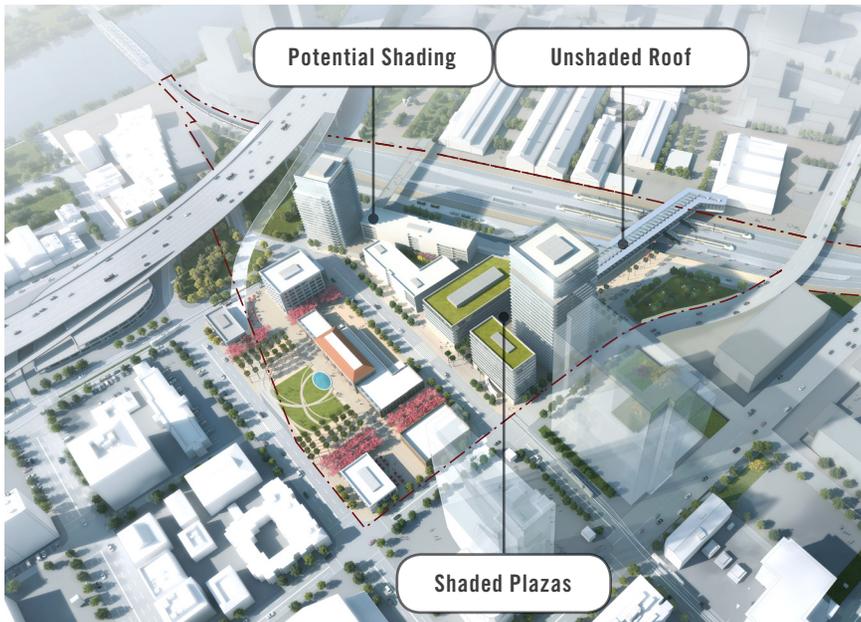


Figure 3.1.3 Characteristics of Option 2 related to energy performance

CONCEPT EVALUATION: OPTION 1

Attributes of Option 1 that impact energy performance include:

- › Unshaded roofs on the southern buildings, the large station roof, and the wider northern office buildings extending over the bus station provide excellent opportunities for solar
- › The residential and hotel tower on the eastern portion of the site have limited solar exposure to the east and west
- › Office block massing limits western exposure, helping to limit energy consumption in the hottest portion of the day
- › The large station roof directly below the residential buildings and the relatively unshaded entrance plaza could create a localized warm spot that may help mitigate heating demand in winter but could increase cooling in the summer

CONCEPT EVALUATION: OPTION 2

Attributes of Option 2 that impact energy performance include:

- › Residential units on the western end of the site have greater northern and southern exposure, reducing energy use. The narrower floor plates offer opportunity for natural ventilation.
- › Sheltered plazas provide comfortable spaces and limit direct solar gain and localized wind for occupants
- › The taller, more dense massing of the site provides greater self-shading on walls and windows, decreasing solar gain. These may also limit solar potential on individual roofs.
- › Narrower office buildings on the west side provide greater potential for natural ventilation

STRATEGIES

The dense plan for the Sacramento Valley Station inherently provides advantages for energy performance. The project can become an exemplar of low energy urban design by incorporating several additional strategies in the next phase of design:

- ▶ Shading should be studied for each use facade based on use type. Specific interventions including fixed shading, vertical fins, dynamic glass, movable exterior shades, blinds, curtains, and automated shading should be considered to optimize thermal gain and loss in accordance with space demands and orientation.
- ▶ High-performance glazing and insulation in alignment or exceedance of Title 24 should be implemented on all buildings. Life Cycle Cost Assessment should be used to identify the optimal insulation thickness.
- ▶ High efficiency lighting (LEDs) with circadian controls, automated daylight dimming, and occupancy sensors should be required in all spaces. In hotel and residential spaces, personal controls should be used.
- ▶ Personal thermal control can help reduce energy use for HVAC consumption by reducing overheating and cooling. Additionally, low-energy HVAC strategies such as radiant heating and cooling, displacement ventilation, variable refrigerant volume, and heat pumps should be studied.
- ▶ Shading elements should be introduced in open spaces to reduce localized heat island impacts and provide comfortable outdoor spaces
- ▶ District thermal energy should be further evaluated as an option to achieve substantial energy and cost savings through equipment consolidation, streamlined operations and maintenance, and site-wide heat recovery
- ▶ Geothermal heat pumps for heat rejection can also reduce energy and water use substantially
- ▶ On-site energy generation through photovoltaics and solar thermal should be implemented. Facades can offer opportunities for additional solar capacity given the limited roof space available
- ▶ Directed biogas should be investigated to offset any gas consumption on-site for heating or process loads
- ▶ Require beyond-code levels of EV readiness, and investigate opportunities to use EVs and on-site storage to help achieve net-zero energy and reduction of site greenhouse gas emissions



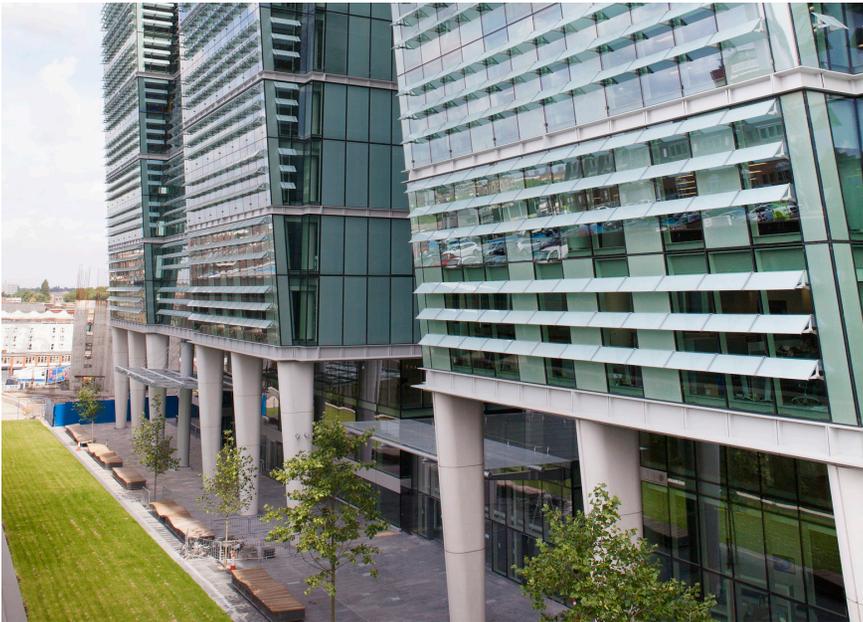
Passive design, such as shading and natural ventilation, will reduce energy demand



District energy improves heating and cooling efficiency, lowering energy demand, Image credit: Cody Andresen



Solar panels can help push Sacramento Valley Station toward zero net energy



Shading reduces heating and cooling demand of the buildings

METRICS

The Sacramento Valley Station Master Plan should measure performance toward its energy targets through:

- › Energy Use Intensity (EUI): Measure the energy performance over the year per square foot and compare to Title 24 2016 baselines to ensure performance improvement. This can be achieved through site-wide metering or instituting a benchmarking and disclosure requirement. Baseline EUI performance is available through the Commercial and Residential Building Energy Consumption Surveys.
- › Energy Balance: Calculate total energy consumption for the Station Area using a site-wide meter or benchmarking ordinance, and compare to purchased energy to move closer to net-zero energy. This can be assessed from utility bills for the site and commitments under renewable energy purchasing contracts.
- › Submetering: If possible, requiring tenants to submeter uses and report will allow owners to identify potential for specific energy reductions. Comparing to baseline performance from the Commercial and Residential Building Energy Consumption Surveys will allow targeted energy efficiency measures.

MONITORING

DESIGN

Throughout design, energy modeling should be performed by each building development team and kept current with design changes. Energy models should inform the design and ensure that efficiency and passive strategies are integrated early to cost-effectively meet target reductions in energy consumption. The City of Sacramento should review and approve predicted energy performance to ensure conformance. Operating procedures to achieve low energy performance should be clearly documented and shared with the operations and maintenance team.

OPERATIONS

Energy performance over the first year of occupancy should be compared to the final energy model to ensure that performance is aligned with expectation and identify opportunities for improvement through continuous commissioning. Consumption should also be evaluated against generation. The same evaluation should be performed after each year of operation. Electricity and gas metering is required for all buildings. Beyond this, Sacramento Valley Station should seek to meter energy consumption at a higher resolution. At a minimum, residential units and offices should include submeters for electricity, gas, and, if applicable, hot and chilled water. Submetering office spaces and residential units can engage and provide insight to residents, tenants, and owners regarding energy consumption and opportunities for future improvement.

3.2 WATER

The threat of drought in California is only likely to worsen as the climate changes. Despite Sacramento's significant water rights allocation, water conservation should be an important goal for the Sacramento Valley Station Master Plan to set an example of proper water stewardship throughout the region. From a greenhouse gas perspective, one-fifth of energy in California is used to treat and move water, so reducing water use has an indirect impact on industrial greenhouse gas emissions.

In California, water use for new construction is governed by CalGREEN, which sets limits on water intensity of fixtures and systems within the building. The General Plan 2035 requires that new development follow low-impact practices and manage stormwater to have no impact on surface water resources and ecological areas. Ideally, new developments should aim to be zero-net water on-site. This would require reusing graywater, treating blackwater, and capturing stormwater for use on the property. Under current regulations, this is very challenging to achieve, but the Sacramento Valley Station Master Plan is well-positioned to significantly reduce water use, and can take steps to be zero-net water ready, especially if the recycled water network expands to downtown Sacramento or if a new network is put in place for the Railyards and downtown.

The Living Community Challenge sets zero-net water as the goal for communities to aspire to. For an urban area, this can include off-site recycled water sources. At present these are unavailable to the Sacramento Valley Station Master Plan, but they may be developed in the future. Other rating systems offer benchmarks for the project to meet or exceed. Envision requires water reduction during infrastructure construction, while the WELL Community standard address drinking water quality, but not water use efficiency. EcoDistricts has water as a priority area in which communities must specify metrics developed by the community, however no level of saving is required. LEED-ND has credits for indoor water use reduction, outdoor water use reduction, and rainwater management which provide reduction targets that the Sacramento Valley Station Master Plan can achieve.

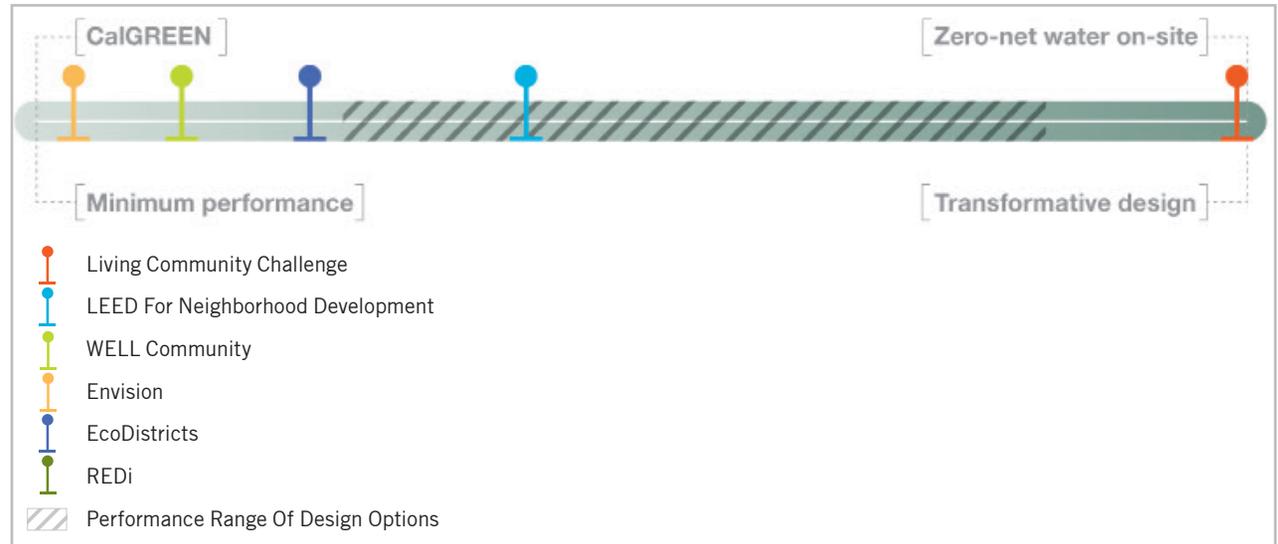


Figure 3.2.1 Qualitative assessment of the masterplan performance relative to the water goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

The Sacramento Valley Station Master Plan has several beneficial characteristics that provide a foundation for innovative water management:

- ▶ Plazas and open spaces between buildings offer opportunities for groundwater recharge, entrainment of stormwater, and reducing runoff through green infrastructure
- ▶ The large number of green roofs shown on both options will help reduce water runoff while cooling the buildings
- ▶ Self-shading and reduced direct solar gain limit cooling requirements for the buildings in the Sacramento Valley Station Master Plan, thereby reducing cooling tower water consumption
- ▶ The large buffer to the west of the site will help prevent runoff from impacting the Sacramento River

In the next phases of design, water performance should be further specified through targets set to impact the entire development ensuring:

- ▶ Identifying target water reduction goals for the building spaces. These may be specified by use type and should seek to set an example for low-water development in Sacramento by exceeding CalGreen by at least 30%.
- ▶ Incorporate native landscaping elements wherever possible to reduce irrigation water required
- ▶ Exceed stormwater management and runoff requirements by retaining more water on-site and identifying opportunities for on-site reuse and recycling of water



Figure 3.2.2 Characteristics of Option 1 related to water performance



Figure 3.2.3 Characteristics of Option 2 related to water performance

CONCEPT EVALUATION: OPTION 1

Attributes of Option 1 that impact water performance include:

- › The larger open ground plane offers greater opportunity for landscape elements which filter stormwater and allow it to slowly percolate into the ground or runoff to the river
- › The large office roofs also offer an opportunity for green roofs to trap, retain, and slowly release rainwater
- › The central plaza could provide a showcase for water treatment and reuse, along with centralized distribution to irrigated planters
- › The covered bus station will likely reduce polluted runoff from the station by preventing rain from directly hitting the ground
- › Internal water use may be higher due to the presence of the hotel, but greater washing demand will produce graywater that can be reused on-site for irrigation

CONCEPT EVALUATION: OPTION 2

Attributes of Option 2 that impact water performance include:

- › The residential towers have large roof spaces that can be used for green roofs which can entrain stormwater and double as amenity spaces
- › The higher density and taller buildings reduce cooling demand for the site significantly, thereby reducing cooling tower water demand
- › The landscaping elements near the entrance on 5th St offer an opportunity to celebrate water treatment and graywater use in a highly visible location on the site

STRATEGIES

Water efficient design should be prioritized as the Sacramento Valley Station Master Plan proceeds into more detailed design. Strategies to reduce water consumption include:

- ▶ Selection or specification of highly efficient water fixtures including ultra-low flow faucets, toilets, urinals, and shower heads
- ▶ Water metering and submetering should be installed in each building and each unit to identify water use, convey to tenants their own water demand, and identify leaks before significant amounts of water are lost
- ▶ Drought-tolerant and native plants should be used wherever possible to limit the need for irrigation
- ▶ Native bioswales and permeable surfaces help trap and filter runoff and allow it to percolate into the ground
- ▶ Green roofs should be explored as a strategy to retain, filter, and slowly release rainfall on rooftops. This can be combined with solar panels above the green roofs to create a dual use space.
- ▶ Highly efficient cooling towers should be utilized with recycled water as the condenser water source to reduce potable consumption. Ground source heat rejection or river heat rejection should be explored as an alternative to limit water use for cooling.
- ▶ Graywater and possibly blackwater should be captured, treated, and used for any irrigation needs on the site, as well as be used for toilet flushing through dedicated graywater pipes in each building
- ▶ Rainwater can be captured and used for irrigation or toilet flushing to reduce potable water demand



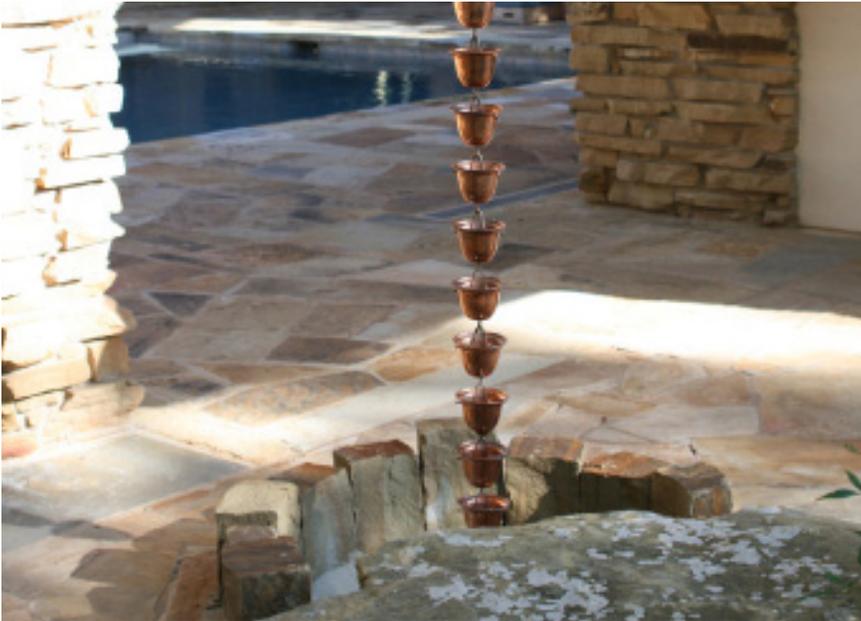
Low-flow fixtures reduce water demand, Image credit: Sinum



Bioswales and planters prevent polluted runoff and allow infiltration of stormwater, Image credit: Walkable and Livable Communities Institute



On-site water treatment and reuse would reduce demand for potable water, Image credit: Eric Allix Rogers



Cisterns can store water, limiting discharge and providing local graywater, Image credit: Gardening Solutions

METRICS

The Sacramento Valley Station Master Plan should measure performance toward its water targets through:

- › Water Consumption: Track water use by apartment, office, building, and irrigation systems and compare to typical water consumption to ensure that the development is at least 50% less than baseline water consumption, as measured from a current baseline
- › Purchased Water: Monitor water purchases and compare to on-site water production through graywater and rainwater. Aim to produce the highest possible percentage of water use.
- › Leak Detection: Aim for leak identification and shutoff within 24 hours. This can be accomplished through monitoring of pipes and automated valves connected to leak detection sensors.

MONITORING

DESIGN

Estimates should be made early in design of anticipated water performance, and benchmarks of typical water consumption for similar buildings developed. Throughout design and construction, anticipated water use should be tracked and fixture flow compared to requirements under CalGreen and typical buildings. A water balance should be created comparing anticipated purchased water and on-site water reuse.

OPERATIONS

Water consumption by space type over the first year of occupancy should be compared to estimates made during design. Furthermore, comparisons between similar space and system types in the development should be drawn to identify any buildings or occupants where abnormally high water use may indicate leaks. Submetering for each office and apartment should be considered to help track water consumption, and sensing and leak detection along pipes tied to remote monitoring systems could be used to help identify and isolate leaks. Monitoring should continue each year to ensure that the development continually exceeds typical performance and to identify any problems early. When fixture replacement is required, maintenance staff should seek to equal or reduce the flow rate of the original fixtures.

3.3 MATERIALS AND WASTE

The City of Sacramento already has a robust recycling and waste management program, and has goals of diverting 75% of its waste by 2020 and achieving zero waste to landfills by 2040. The Sacramento Valley Station Area Masterplan should accelerate these goals by creating a net-zero waste ready development and extending consideration of waste and materials into evaluating waste generated in material selection and construction.

By adopting materials and waste standards, the Sacramento Valley Station Master Plan will exceed the minimum requirement set by CalGREEN for construction waste diversion, documentation of materials with VOCs, and material recycling. Ideally, a new development would achieve zero waste to landfill today. This, however, is unrealistic given that the infrastructure is not completely in place to readily manage a zero waste development.

Materials and waste performance is also addressed in several voluntary certification standards. Envision requires construction waste minimization and diversion targets beyond the baseline requirements of CalGREEN. However it does not provide benchmarks for building development or operation. EcoDistricts additionally requires that materials and waste targets be developed, and that progress toward these goals be tracked and reported. Healthy materials and waste minimization are priority areas to consider under this system. LEED-ND offers points for using recycled materials in construction and providing facilities for recycling and reuse within the neighborhood. The most advanced rating system, the Living Community Challenge, requires nearly 100% waste diversion for common materials during construction, and dedicated infrastructure for accepting recycled materials and compostable food scraps.

For building design, the new LEED certification for buildings offers points for whole building life cycle assessment, which seeks to understand the materials implications of the building alongside operations. This should be considered for the individual buildings within the Sacramento Valley Station Master Plan Area.

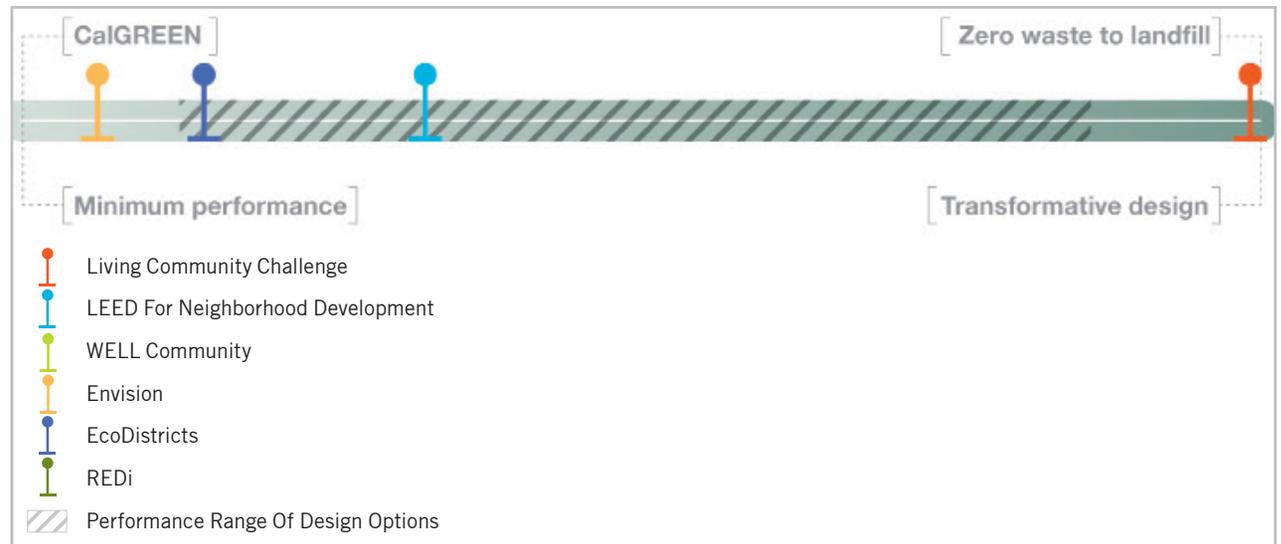


Figure 3.3.1 Qualitative assessment of the masterplan performance relative to the materials and waste goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

The Sacramento Valley Station Master Plan offers a number of opportunities for materials and waste reduction with the current planning options:

- ▶ The site's proximity to the Sacramento River and the railroad tracks offers opportunities to reduce the embodied carbon from transportation of new materials by using non-truck transport
- ▶ The compact site also allows for easier logistics management—deliveries and waste management can be centralized and easily accessed
- ▶ Open spaces at street level offer opportunities for recycled paving and lower impact materials than concrete and asphalt
- ▶ Sacramento's location may offer opportunities for use of agricultural waste or locally grown and manufactured

products within California, reducing further the embodied energy in materials. Nearby farms can also provide a location for compostable materials to be directly reused

In the next phases of design, materials and waste performance should set targets set to achieve:

- ▶ Maximum use of healthy materials in all locations on the site, and especially in office interiors and residential space
- ▶ Maximum use of recycled materials
- ▶ Local waste collection and recycling with centralized collection for special wastes (e.g., electronic waste, batteries) to prevent these from reaching landfills



Figure 3.3.2 Characteristics of Option 1 related to waste and materials



Figure 3.3.3 Characteristics of Option 2 related to waste and materials

CONCEPT EVALUATION: OPTION 1

Attributes of Option 1 that impact materials and waste include:

- › The road leading underneath the office complex to the bus bay may offer opportunities for streamlined and centralized logistics and waste management for the site
- › The open site and permeable station reduce the material quantity required for construction
- › Permeable site area reduces the concrete needed ground level infrastructure
- › Exposure of the residential and hotel tower to natural ventilation will help reduce accumulation of VOCs or other chemicals present in building materials

CONCEPT EVALUATION: OPTION 2

Attributes of Option 2 that impact materials and waste include:

- › The mezzanine level and sunken parking and drive area of Option 2 could offer a good location for centralized deliveries and waste management
- › Cross ventilation in offices can help reduce impacts of chemical pollutants from interior materials (e.g., VOCs)

STRATEGIES

Specifying healthy materials and waste minimization strategies should be prioritized at a more detailed stage of design. When specifying materials, it is important to understand the origin, potential impacts, and disposal. Materials data sheets should be collected for the project and reviewed to ensure that healthy materials with low impact are incorporated wherever possible. Specific strategies for use on the project include:

- ▶ Following guidelines for material procurement following best practices in material health, such as those provided by AIA. These guidelines should extend to fit-out projects performed by tenants or retailers and to facilities personnel maintaining the buildings after initial construction.
- ▶ Perform life cycle assessment on each building in the Sacramento Valley Station Master Plan Area to balance embodied carbon, water, and toxic chemicals with operational considerations
- ▶ Work with suppliers to identify local materials which have high recycled content
- ▶ Transportation of materials to the site should emphasize water and rail transport rather than trucking and air freight
- ▶ Identify showcase locations in lobbies and entrance plazas for healthy, recycled, local materials to be presented to the community as alternatives to traditional design
- ▶ Ensure that all timber is FSC-Certified, and other materials with environmental product declaration schemes meet the appropriate standard
- ▶ In construction, waste should be sorted and diverted from landfill through direct contracts and city programs
- ▶ Locations should be identified for collection and storage of electronics, hazardous waste, textiles, and other specialty waste streams should be established. Recycling and composting bins should be larger than landfill bins to emphasize these strategies
- ▶ Restrictions on the use of plastic bags and single-use items should be considered for retailers in the station.



Sacramento's recycling efforts can help reduce waste on the site, Image credit: City of



Green certified materials help reduce the environmental footprint of the buildings, Image credit: Julia Gotthold



Low VOC materials protect the health of residents and workers, Image credit: Daniela Rey



Construction waste recycling helps reduce the footprint of the station development, Image credit: US Army

METRICS

The Sacramento Valley Station Master Plan should measure performance toward its materials and waste targets through:

- › Waste Diversion: Periodic monitoring of waste fraction recycled, composted, and sent to landfill should be monitored for the whole area and, if possible, for each building
- › Materials Procurement: Materials should be tracked by quantity or weight to ensure that sustainable, healthy purchasing guidelines are met
- › Construction Waste Diversion from Landfill: Offhaul trucks to landfill, recycling, and composting should be monitored and the fraction of diverted waste tracked
- › Embodied Carbon: Perform building life cycle assessment during construction to identify embodied carbon, waste, and chemicals used in production consistent with the LEED v4 Life Cycle Assessment credit

MONITORING

DESIGN

Guidelines should be established early for materials procurement that emphasize best practices in use of healthy materials. A red-list of banned materials should be explored and potentially created for the site. During construction, waste collection and disposal should be monitored to ensure that waste recycling is occurring. On-site sensing of air quality, including VOCs, may also be used to ensure that incidental use of unhealthy materials does not occur. To track embodied carbon, location and source of materials should be tracked as well as the means of transportation used. This should be compared to benchmarks of typical embodied carbon for similar construction.

OPERATIONS

Guidelines developed for construction and initial procurement should carry forward to the operations stage to ensure that subsequent material procurement meets the same standards for healthy materials. Waste diversion should be monitored through periodic assessments by waste or volume of recycled waste, collected hazardous waste, compost, and landfill waste. If possible, assessments should be requested of building tenants as well to identify opportunities for tenant reduction in waste generation and management.





4

SOCIAL AND ECOLOGICAL

4.1 Ecosystem and Ecology

4.2 Resilience

4.3 Wellness and Wellbeing

4.1 ECOSYSTEM AND ECOLOGY

The Sacramento Valley Station Master Plan Area is blessed with a location adjacent to the Sacramento River, one of the greatest ecological resources of the City. The General Plan 2035 recognizes the value of the river, and provides specific guidelines requiring low-impact development and ecological protection. Downtown development has historically utilized a large amount of hardscape with limited responsiveness to native ecology and the river ecosystem. The Sacramento Valley Station Master Plan seeks to create a new paradigm through a biophilic design rife with native plants and opportunities for extending the riparian ecology of the Sacramento River.

Traditional land use patterns with 100% hardscape provide the minimum possible performance for the site. Both master plan options already exceed this minimum performance through the provision of open space, green roofs, and landscape elements that help water percolate and provide greenery within the Sacramento Valley Station Master Plan Area. A fully biophilic design would provide restorative ecological features, dense greenery, and visual connections to nature from all enclosed spaces. While the latter of these requirements may not be possible, the Sacramento Valley Station Master Plan Area can achieve a highly biophilic design and create new habitat adjacent to the ecologically sensitive river.

The Sacramento Valley Station Master Plan can meet or exceed the requirements of several voluntary rating systems for ecology. Access to green space is addressed minimally in the WELL Community Standard, while EcoDistricts and Envision require minimal protection or extension of native ecosystems. LEED-ND and the Living Community Challenge open avenues for native planting and restorative ecology, which could be realistic targets for the Sacramento Valley Station Master Plan. Given the location near the river, the site may have potential to exceed even these requirements by providing restored habitat and significant ecological improvements.

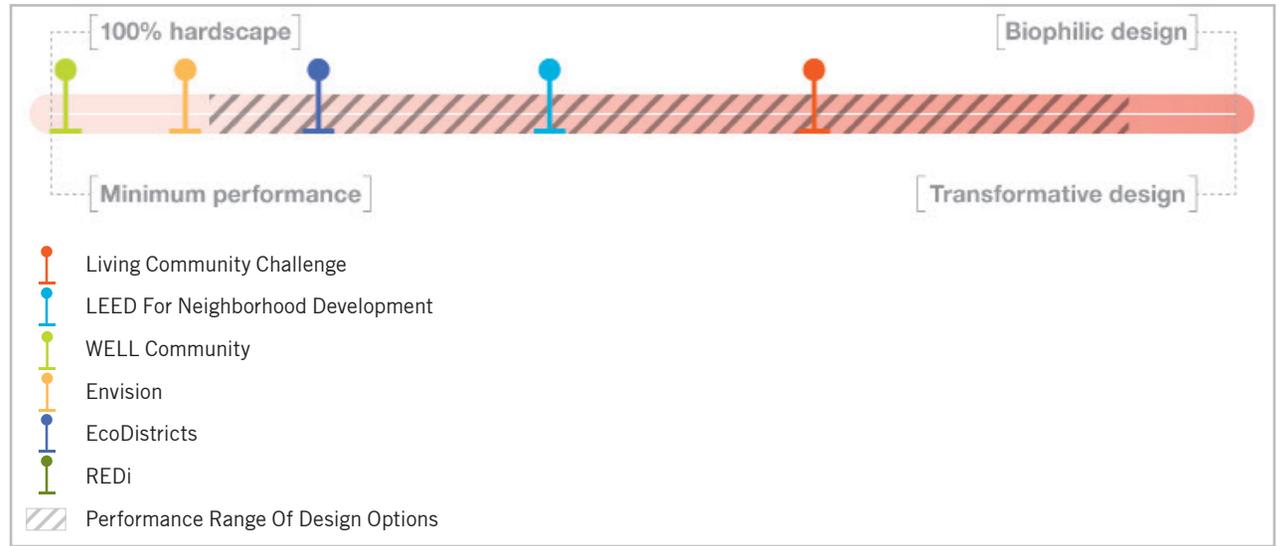


Figure 4.1.1 Qualitative assessment of the masterplan performance relative to the ecosystem and ecology goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

The Sacramento Valley Station Master Plan offers a number of opportunities for ecological restoration with the current planning options:

- The large green roof area provided in each option opens the potential to create connections for birds and butterflies at the roof level, extending their habitat into the urban fabric.
- The open ground plane allows rain water to permeate the soil and replenish ground water rather than accumulate pollutants and run off into the river
- The taller towers on both sites provide views to the river and the surrounding landscape
- The park under I-5 connects the site to the river physically and provides a buffer to prevent polluted runoff from reaching the river

- The roof of the station can be used as a safe crossing and landing spot along the railroad tracks for birds and insects
- Easy access to the river is provided by walking trails, increasing resident and worker connectedness with nature

In the next phases of design, additional targets should be set to further enhance the ecological value of the site through:

- Maximizing native landscaping, and target plants that are positive for pollinators and local birds to create extended habitat from the river
- Including bioswales and permeable pavement at any location where runoff is likely to be present

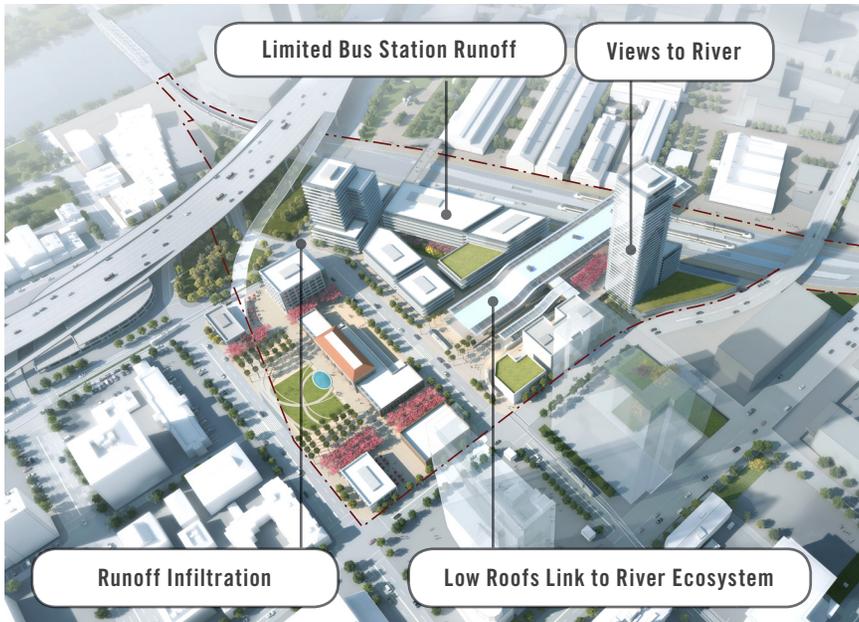


Figure 4.1.2 Characteristics of Option 1 related to ecosystems and ecology

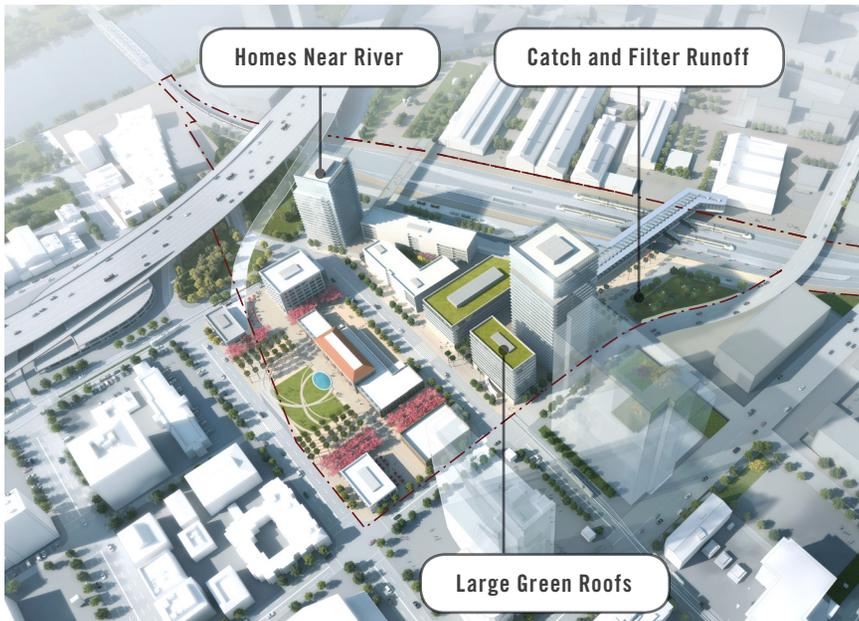


Figure 4.1.3 Characteristics of Option 2 related to ecosystems and ecology

CONCEPT EVALUATION: OPTION 1

Attributes of Option 1 that impact the ecosystem and ecology include:

- › Greater openness at ground level offers more opportunities for collection and filtration of stormwater runoff as well as opportunities for landscaping at the ground plane
- › The covered bus station will limit runoff contamination from oil, dust, and fuel deposited by the buses
- › Continuous lower rooftops along the railway tracks offer a continuation at an intermediate height of the river and park, creating an uninterrupted, accessible extension of the river ecology for insects and birds
- › The lower roof area also creates a visual connection to the river maintained for a large number of occupants of the development as the staggered residential and office towers preserve lines of sight to the river

CONCEPT EVALUATION: OPTION 2

Attributes of Option 2 that impact the ecosystem and ecology include:

- › Sunken courtyards in Option 2 that form natural catchment and filtration points for storm water, allowing centralized filtration and entrainment rather than allowing water to runoff to the river
- › The larger green roof area relative to Option 1 provides more opportunity for restoring habitat directly on the site
- › Retail along the active first floor provide a corridor connecting directly to the buffer space near I-5 for birds and insects
- › Residential is moved nearer to the river in this option, providing a more direct connection for residents to the river and easy access through walking trails

STRATEGIES

The site location and wealth of green space and ground plane despite a high density already position the Sacramento Valley Station Master Plan Area to be an additive and restorative element to the Sacramento River ecosystem rather than burdening the local ecology. As design progresses, additional strategies to improve the ecological performance include:

- ▶ Bioswales for entrainment and filtration, permeable pavement to allow percolation and filtration of rainwater, and direct rainwater capture and treatment should be used to help slow and treat runoff before it can reach the Sacramento River or impact groundwater
- ▶ Green roofs should be combined with photovoltaics to entrain, treat, and slowly discharge rainwater
- ▶ Where contamination risks occur, mechanical filtration may be required, and graywater that has been treated to remove soap and harmful chemicals can be used to irrigate plants or charge groundwater
- ▶ Native plants that provide habitat for insects, butterflies, and birds should be used throughout the development, especially along H St and on green roofs where ecological corridors can be created. Interweaving native planting with pathways can also create a connection between visitors/occupants and the local ecology
- ▶ Programming of buildings should emphasize sightlines to planting, the river, and nature from all common spaces and from as many residential and shared or private office spaces as possible
- ▶ Trees should be prioritized to help increase the urban forest canopy. This also aligns with Sacramento's ranking as the city with the most trees per capita in America.



Native plants at ground and upper levels create an inviting environment and provide habitat, Image credit: JRP



Landscaping and the park connect urban Sacramento with the Sacramento River, Image credit: Daniel Imade



Local wildlife will benefit from ecosystem protection and on-site native landscaping, Image credit: Brett Billings



Green roofs can provide habitat and opportunities for urban agriculture, image credit: Conservation Design Forum

METRICS

The Sacramento Valley Station Master Plan should measure performance toward its ecosystem and ecology targets through:

- ▶ Storm Water Discharge: Storm water discharge should be modeled and quantified in design and should be less than 50% of the allowed discharge under code.
- ▶ Permeability: The percent of the site, including roofs, which is permeable and can entrain water should be calculated in design
- ▶ Species Diversity and Native Species: Records of species planted on-site should be kept and diversity maximized provided that all species are native to Sacramento's ecology
- ▶ Trees Per Capita: Trees planted per resident should be tracked and should meet the City of Sacramento average at a minimum

MONITORING

DESIGN

Storm water discharge and retention should be calculated for varying rainfall events during design to ensure that the proposed solution will meet the requirement of no more than 50% of the allowed discharge. Percent of permeable surface should be calculated and monitored through every change of design to ensure that permeability is maximized. Lists of allowed and preferred species should be created early in the project based on site surveys and ecological information for the Sacramento River and surrounding area.

OPERATIONS

Storm water retention and discharge should be monitored where possible (such as in rainwater catchment tanks) and compared to total rainfall incident on the site during an event. Permeable surfaces should be monitored for compaction and clogging and aerated or cleaned, respectively, as required. Observation-based counts of insect, butterfly, and bird species as well as changes in populations of planted species should be recorded to identify the impact of the station on the local ecology.

4.2 RESILIENCE

The increasing prevalence and impact of natural disasters due to climate change creates an imperative for resilient design. While the Sacramento Valley Station is blessed by being near the Sacramento River, the threat of seismic activity and flooding drives a need is also very real. Natural disasters can leave developments without power, water, or safe shelter for days or weeks. Providing gathering points and shelter is essential to helping a community recover in the wake of a disaster. Designing the Sacramento Valley Station Master Plan Area's buildings to not just survive an earthquake or flood, but to be re-occupied immediately or shortly after a disaster would help provide shelter, a start at recovery, and assist in providing necessary transportation services.

Resilience is governed minimally in current policies and codes. The California Building Code requires only that structures be capable of withstanding seismic activity but not that they provide space for immediate reoccupation. Only critical loads (e.g., hospitals and life safety loads) are required to have backup power. Truly resilient buildings, on the other hand, should be continuously operational after a range of disasters, and damage should be minimal or easy to repair. This requires a radical rethinking of design and may involve additional capital cost which is repaid through savings and business continuity after a natural disaster.

Voluntary rating systems predominantly do not address resilience with the exception of REDi, which focuses on strategies for building design and organizational management to ensure resilience. While certification under REDi may not be appropriate for all buildings on the Sacramento Valley Station Master Plan Area, many of the guidelines may provide good benchmarks for resilient performance. In addition to REDi, Envision provides requirements for seismic and flooding resilience in infrastructure design, while the Living Community Challenge specifies that all occupants should be provided a safe space to congregate after a disaster. EcoDistricts takes a different approach, seeking to cultivate community resilience through community-generated support structures that help the population adapt to the shocks of natural disasters and steady change.

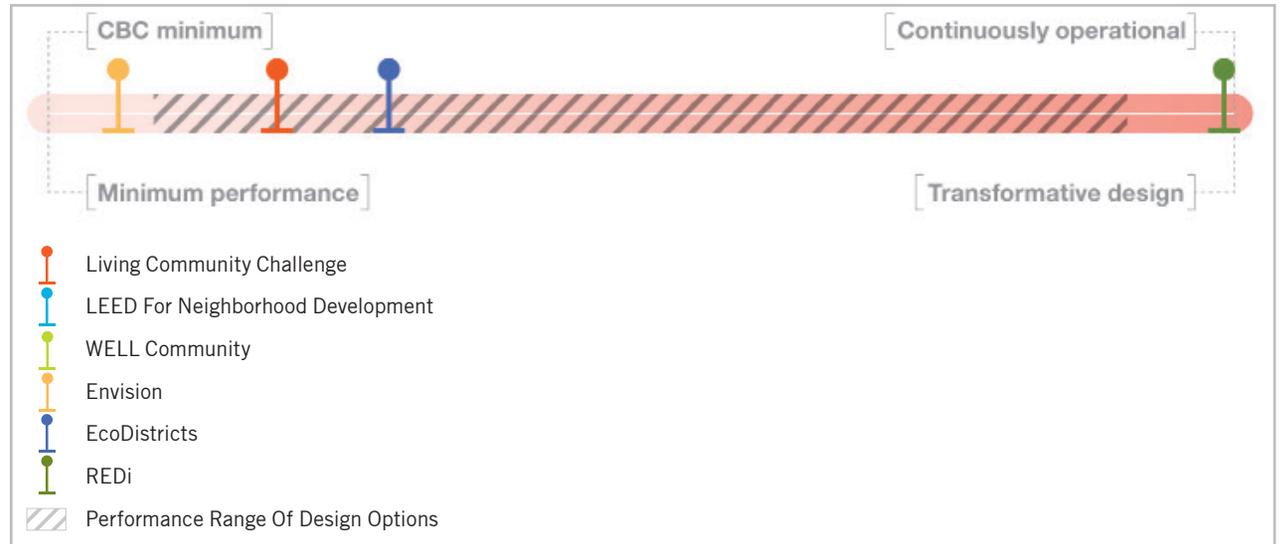


Figure 4.2.1 Qualitative assessment of the masterplan performance relative to the resilience goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

The Sacramento Valley Station Master Plan is expected to perform better than the code minimum, and has the potential to set a new standard for resilience in Sacramento due to:

- Large roof areas can be used for solar panels which provide backup power continuously in an outage. Single ownership of the entire site may allow for a microgrid to share solar resource after a natural disaster.
- The station provides a central gathering place, and the plazas between buildings offer safe spaces for post-disaster gathering
- Natural ventilation potential in the buildings can help increase passive survivability, which is the ability of the buildings to maintain a comfortable temperature without mechanical systems

- Retention of stormwater on site helps reduce the likelihood of flooding from heavy rainfall
- Prior retrofit of the historic station building to reduce damage in an earthquake

In the next phases of design, additional measures should be taken to further enhance the resilience of the site by setting targets around:

- Creation of designated gathering spaces elevated above flood within the station, and provision of emergency power services to this space as a designated shelter
- Seismic bracing of the station to ensure its operation as a shelter after an earthquake as well as a flood
- Incorporate solar panels and battery energy storage for resilient power after a disaster

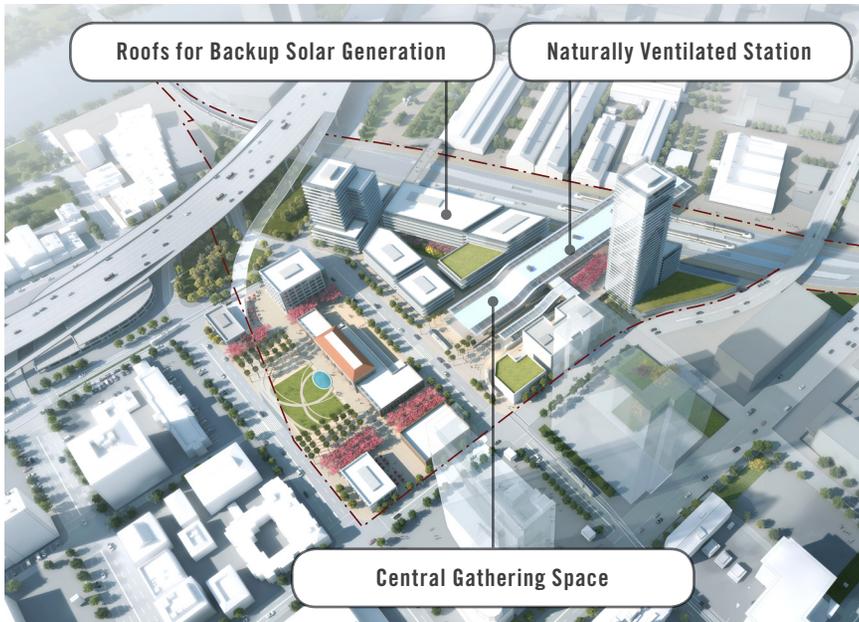


Figure 4.2.2 Characteristics of Option 1 related to resilience

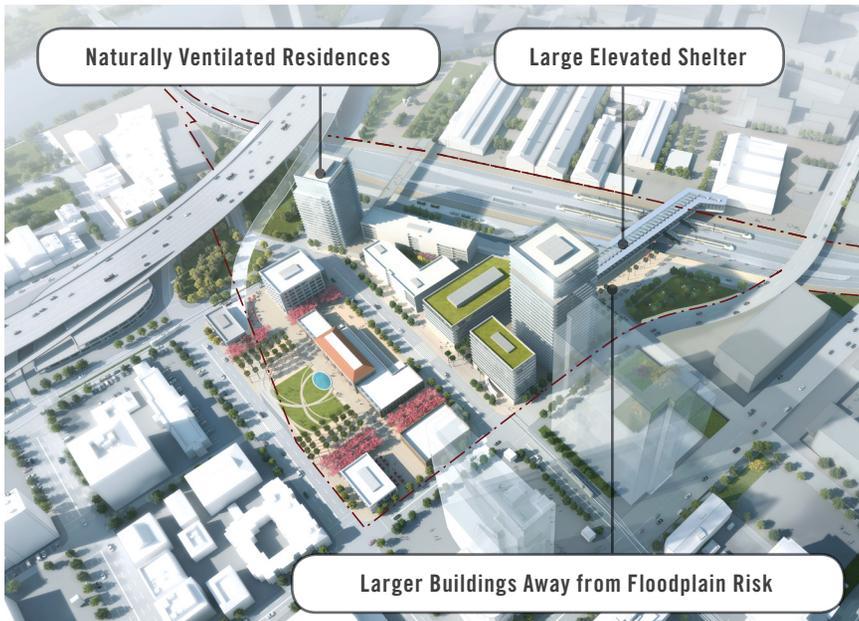


Figure 4.2.3 Characteristics of Option 2 related to resilience

CONCEPT EVALUATION: OPTION 1

Attributes of Option 1 that impact resilience include:

- › The elevated roof and open concourse provide a large sheltered space with natural ventilation likely to maintain comfortable temperatures without air conditioning in the wake of a disaster
- › The large roof of the station and projecting over the bus station allow greater solar power area for backup generation after a disaster
- › Shorter average building height may make it easier to create continuously operational buildings seismically

CONCEPT EVALUATION: OPTION 2

Attributes of Option 2 that impact resilience include:

- › More building area is elevated out of the flood plane, including the podium leading into the station area, creating an elevated shelter space shaded by surrounding buildings
- › Narrower residential buildings offer opportunities for natural ventilation and increased passive survivability within the home
- › More development area is located away from the river and therefore further from the riskiest flooding area, potentially providing greater flood resilience

The station form of Option 2 offers a larger central shelter space which extends out over the tracks and provides a very large gathering and shelter space. The large unshaded roof area offers good potential for solar power to serve this shelter space. Additionally, the elevation of the plaza leading to the station and the main structure of the station would guard against impacts of extreme flooding. One potential challenge, however, is that the structure may be more challenging to design for continuous operation after a seismic event given the projection over the tracks.

STRATEGIES

Beyond the potential for creating a post-disaster shelter in the new station building, as design progresses the Sacramento Valley Station should advance its resilience performance through the following strategies:

- ▶ Designs should use performance modeling to evaluate stability during an earthquake and identify cost-effective means of improving structural resilience early in design
- ▶ Building elements with the potential to break or dislodge should be evaluated and limited in locations where they may create life safety challenges during an earthquake
- ▶ Flood barriers should be considered for buildings on the site, and materials used in lobbies and ground floors should be less likely to be damaged by water and can be easily dried after waters have receded
- ▶ Operable windows should be investigated for use in all spaces as a means of maintaining passive survivability and non-mechanical ventilation. Designing the building envelope to limit heat gain and loss and preserve passive comfort will also improve passive survivability.
- ▶ Large open spaces that can serve as congregation points should be included, especially in the station, and power outlets for cell phone and device charging should be provided
- ▶ Electrically, buildings can identify emergency circuits, including specific outlets, ventilation, or other services that will preserve the survivability of the spaces
- ▶ Key electrical and mechanical equipment should be elevated above the flood level
- ▶ Solar panels and batteries should be used to augment or replace diesel generators for emergency power, and a microgrid should be investigated as a realistic alternative for sharing power after a disaster. Microgrids have the added benefit of providing financial benefits in normal operation through demand charge management and energy arbitrage.
- ▶ Small on-site water treatment capable of achieving potable standard may also be considered to provide fresh water after a natural disaster



Seismically resistant structural design protects residents and preserves operation



Batteries provide resilient power in the event of an outage or natural disaster



Natural ventilation allows buildings to stay occupiable if power goes out, Image credit: Cody Andresen



Elevation of shelter areas and critical infrastructure protects against flooding

METRICS

The Sacramento Valley Station Master Plan should measure performance toward its resilience targets through:

- › Structural Sufficiency: The station building should aim for continuous operation after a disaster
- › Passive Survivability: Model interior temperatures throughout the year without mechanical equipment to ensure additional stress is not induced from the building design after a disaster
- › Backup Power Availability: Provide 96 hours of continuous backup power for critical loads in the station, including cell phones and medical devices

MONITORING

DESIGN

Building design should be evaluated during design by subjecting it to simulated historic earthquakes and evaluating the sufficiency of the structure. Temperatures developed in the absence of HVAC systems should be modeled as well to determine if added stress will be incurred by residents occupying the structure after a disaster. Simulations of critical loads should also be performed, and backup power should be sized accordingly. REDi Certification may also be pursued to help track overall resilience performance.

OPERATIONS

Regular inspection of the building and backup power systems should be performed to ensure that the structure and critical equipment are available in the event of a disaster. Backup fuel storage or battery storage should be monitored to ensure readiness in the event of a natural disaster. Resilient operation plans should be created and evaluated annually with staff.

4.3 WELLNESS AND WELLBEING

An important aspect of sustainability performance is promotion of health and wellness for occupants and residents of the Sacramento Valley Station Master Plan Area. The City of Sacramento seeks to become the most livable city in America, and wellness plays a key role in meeting this goal. The Sacramento Livability Index helps measure some of the key aspects of community health and happiness, which is a good starting point for incorporating wellness into new development. The Sacramento Valley Station Master Plan seeks to improve upon the general happiness and livability of the city.

Wellbeing is not typically covered through codes and policies. Some elements of the California Building Code relate to wellness and wellbeing, specifically around windows and access to views, thermal comfort, and materials choices within buildings. The WELL rating system seeks to fill this void by offering a rigorous certification pathway for wellness-focused design. Recently, the WELL Building Institute introduced a WELL Community Standard which incorporates features of wellness centered design at the community scale as well.

With the WELL Community Standard as the most innovative performance metric available for wellness and wellbeing, the Sacramento Valley Station Master Plan should set this as a reach target. The WELL Community Standard incorporates elements of air quality, water availability, healthy food, fitness, materials health, and ambient conditions such as noise and light to cover a holistic definition of wellness. This standard exceeds the intent of the Most Livable City standard in the City of Sacramento General Plan, and could set a new standard across the city if used to showcase the area around the station. The WELL Community Standard also far exceeds the requirements of the Living Community Challenge, which only incorporates walking, biking, and healthy materials as elements, and LEED-ND which offers points for walking and biking as primary modes of transportation. EcoDistricts allows targets to be set that incorporate wellness, but this is not the focus of the certification scheme.



Figure 4.3.1 Qualitative assessment of the masterplan performance relative to the wellness and wellbeing goal. For reference, benchmarks based on applicable rating systems are shown.

CONCEPT EVALUATION: COMMON ELEMENTS

The Sacramento Valley Station Master Plan will offer excellent amenities that impact health and wellbeing by virtue of its location near the river. Other attributes that influence health and wellbeing include:

- Large open plazas and park space which promote activity and connection to the ecology of the river, especially when paired with broader walking and biking infrastructure and wayfinding
- Opportunities for a farmer’s market, increasing access to locally produced, fresh, and healthy food
- Mass transit for arriving and departing the site will also help limit air pollution
- Appropriate lighting and acoustic strategies encouraged by the cloisters of buildings will also create healthy spaces despite the prevalence of the freeway and major

streets around the site

In the next phases of design, additional measures should be taken to further enhance the wellness-focused attributes of the site through setting targets around:

- Provision of bike share stations and bike racks to promote cycling throughout the development
- Stretch goals of WELL Community Certification and incentives for WELL Building Certification within individual buildings
- Designing street level interactions that promote safety, reduce light pollution, and increase activation of the space at all hours of the day



Figure 4.3.2 Characteristics of Option 1 related to wellness and wellbeing



Figure 4.3.3 Characteristics of Option 2 related to wellness and wellbeing

CONCEPT EVALUATION: OPTION 1

Attributes of Option 1 that impact wellness and wellbeing include:

- › Siting residential buildings farther from the freeway. The freeway is a major source of pollution for the site, and Option 1 moves the residential spaces farthest from this source, which reduces impacts to occupant health, and increases connection to the rest of downtown
- › The site is highly permeable, which helps induce walking over other means of transit, and offers more visual connections to the river and park
- › The more open plane of the station creates a natural central mobility and wayfinding hub which can promote non-vehicular modes of transportation as well

CONCEPT EVALUATION: OPTION 2

Attributes of Option 1 that impact wellness and wellbeing include:

- › The closer clusters of Option 2 may reduce localized heat island effects within the major walking plane of the development, helping increase comfort
- › The closed station also is likely to create a more comfortable acoustical environment by containing station noise and reducing the volume within the outdoor plazas
- › The setback of residential and office buildings from the train tracks helps reduce noise and air quality concerns
- › Residential buildings closer to the river preserve the visual connection to nature, but may require mitigation against increased pollution from the freeway

STRATEGIES

As the design of the Sacramento Valley Station Master Plan progresses, opportunities for advancing health and wellness focused design should be incorporated. Many of these overlap with the provision of healthy materials discussed previously, but should include additional strategies:

- ▶ Appropriate and accessible wayfinding should be utilized to encourage walking and ensure that all populations have access to the amenities of the site. Design elements in plazas should ensure that all populations are encouraged to visit and stay at the site.
- ▶ Strong connections to walking and biking trails should be created, especially along the river, and where possible trails should limit crossings of major streets or roadways
- ▶ Clearly marked and accessible water fountains and bathrooms can also emphasize the pedestrian-friendly aspects of the station
- ▶ Station plazas provide opportunity for a Farmer’s Market, and selecting retailers who offer healthy and local food options
- ▶ Air quality can also be improved on the site through the expansion of trees and planting to help filter air
- ▶ Filtration on air intakes for all buildings can help reduce indoor air quality concerns
- ▶ Similarly, focusing air intakes and operable windows away from the freeway and major streets will help reduce indoor air pollution
- ▶ Providing views within the buildings to the river wherever possible should be prioritized
- ▶ To promote safe and comfortable spaces, site lighting should be used throughout the station area to create safe, well-lit zones and eliminate dark corners. Where possible, especially near residential towers, these lights should be on sensors at night.
- ▶ Soft materials including plants and trees can also help dampen sounds within the station, and an overall acoustic plan for the site potentially paired with acoustic modeling could help reduce noise impacts



Local, healthy eateries benefit residents, visitors, and workers, Image credit: Kaizer Rangwala



Good outdoor lighting provides a safe environment at all times of day, Image credit: Hargreaves Associates



Design elements can ensure accessibility and enjoyment by individuals of all ages and abilities.



The river presents an artery for connection to other parts of the city. Image credit: George Thomas Buttle

METRICS

The Sacramento Valley Station Master Plan should measure performance toward its health and wellbeing targets through:

- ▶ Air Pollution: Particulate matter should meet the WELL Community prerequisite for air quality
- ▶ Occupant and Resident Surveys: Surveys should poll residents about walking, lighting, sound, and access to healthy resources within the community. This already occurs through the Sacramento Livability Index, and results should be compared from the current index to future surveys.
- ▶ Mode Share of Trips Generated in the Sacramento Valley Station Master Plan Area: Relative to the SACOG baseline, mode share of biking and walking trips should be tracked to identify change in use relative to single occupancy vehicle trips

MONITORING

DESIGN

During design, baseline measurements of particulate matter on the site should be taken to establish changes after the development is complete. Lighting and acoustic studies may be performed to assess the impact of proposed strategies on visitors to open spaces and the residential buildings. If certification is pursued under the WELL Standard, points should be tracked to ensure that this goal is met.

OPERATIONS

Continuous air quality monitoring should be performed in plazas and buildings to ensure that air pollution limits are not exceeded throughout the community. Surveys of residents should take place twice per year to determine where improvement can be made to site amenities and safety. Noise monitoring or sampling throughout the site can also be used to identify areas which may require additional acoustic treatment.

