CALIFORNIA
High-Speed Rail Authority

2024
SUSTAINABILITY REPORT

CONNECTING COMMUNITIES ACROSS CALIFORNIA

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High-Speed Rail Authority

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Governor Newsom tours a high-speed rail construction site

Introduction

Our journey toward customer service on the nation's first high-speed rail system is at a critical point. This program is grounded in sustainability, a driving force behind every decision we have made — from the initial planning and design phases to the ongoing construction of the system, stations and facilities and eventual operation of the zero-emission high-speed rail system.

The California high-speed rail project is a promise to Californians who committed funding to a transportation project that was not just fast but honored the concept of environmental justice and economic equity for a sustainable future. By implementing strategies targeting planet-warming pollution, reducing harmful particulates, and transforming our transportation system into a community and economy connector, we are aligning our goals with California's signature climate objectives.

We are already seeing positive outcomes:

Construction emissions from Construction Package 4 in the Central Valley were 86 percent less than projections, resulting in a net positive. Our construction fleet emissions are 72 percent less than the typical California fleet, respecting the need to protect vulnerable airsheds during construction.

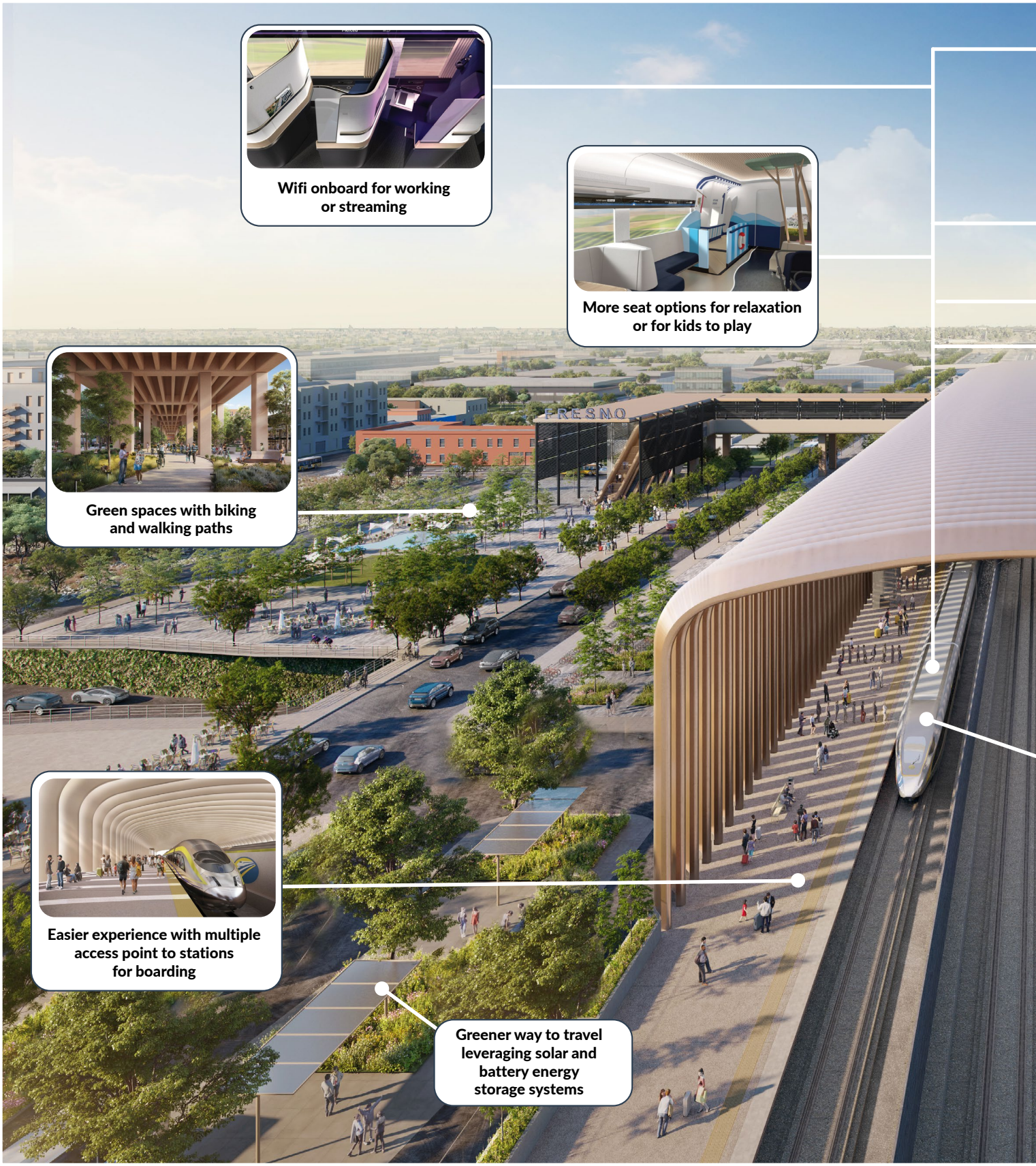
Our economic benefit is felt throughout California and our supply chains reach across the US and the world. Every day, targeted workers, living in disadvantaged communities are earning paychecks that help themselves and their families create better lives.

We are investing in safety improvements ahead of high-speed rail construction by addressing dangerous grade separations, not only improving air quality, but also reducing emissions by decreasing vehicle idling.

We are positioning California to be a leader in modern, high-speed rail systems, and the source for innovation. This project has created more than 13,930 good-paying construction jobs in the Central Valley. Small business involvement in the project has increased 196 percent since 2015, showcasing our efforts to provide access to state procurement and contracting opportunities for under-utilized and under-represented populations. By supporting small, micro, disadvantaged, disabled veteran, minority, and women-owned businesses, we are bolstering the economic sustainability of California.

This is the largest infrastructure project underway in the nation. This project is a once-in-a-generation investment that proves that big projects can be built with sustainability as a core mission.

High Speed Rail Customer Experience and Benefits



Wifi onboard for working or streaming

More seat options for relaxation or for kids to play

Green spaces with biking and walking paths

Easier experience with multiple access point to stations for boarding

Greener way to travel leveraging solar and battery energy storage systems

Access to café on board or bring your own snacks

Bike storage on board

Variety of seating options for those with accessibility needs

Take in the California scenery

- Enjoy travel speeds of upwards of 220 mph
- Arrive at your destination in half the time compared to driving

San Joaquin Viaduct in Fresno County

Executive Summary

The California High-Speed Rail Authority is delivering a rail system to transform travel for millions. It is also the largest and greenest infrastructure project in the nation. Project construction has been underway for nearly a decade across 119 miles of the first segment of the system and completed elements are already improving the lives of Californians. The system is a keystone of the "state's strategy" to curb greenhouse gas emissions. Program funding reflects this grounding in sustainability with the California Air Resources Board (CARB) Cap-and-Trade program as a primary source, alongside Proposition 1A and federal grants.

We are a creating a system with the capacity to serve and enable economic growth in California over the next century. We have created more than 13,930 good-paying construction jobs, mostly for workers from disadvantaged communities. We have rebuilt dangerous traffic intersections, making them safer, and we have planted thousands of trees to sequester carbon in some of the most polluted areas of the state.

The system is proof that we can deliver complex, transformative projects in the United States. As we continue the project, including delivery of trainsets and advancing station design and construction, we are creating even more future economic and employment sectors, spurring economic growth, connecting communities, and protecting agricultural and conservation areas. We are laying the foundation for a more prosperous and sustainable California while serving as a model of sustainability for the infrastructure industry worldwide.

Finally, when trains start running, the process of replacing air-polluting car and plane travel on congested roads and in overtaxed airports with zero-emissions high-speed train travel begins. Our first passengers will launch a new, revolutionary era in California by starting the cycle of travel that delivers environmental quality.

> **"This project in California is the most ambitious rail project in the entire Western Hemisphere."**
>
> – President Joe Biden

Progress Snapshot

In the Central Valley, we are actively working to construct 171 miles of electrified high-speed rail from Merced to Bakersfield. Construction Package 4 was substantially completed in summer 2023, and two more construction packages are expected to be completed in 2026. Since the previous Sustainability Report, we environmentally cleared the Palmdale to Burbank project section, received $3.5 billion in federal funding, finalized the pre-design and concept development of four stations in the Central Valley, selected two bidders for the high-speed trainsets and executed an agreement for design services for track and overhead contact systems. Throughout this report more details can be found about these efforts and key milestones the Authority is preparing to achieve in the near future.

Economic Development and Governance

The California high-speed rail project is a fundamental driver of economic growth and job creation, with 99 percent of expenditures in the Fiscal Year 2022 to 2023 going to California businesses and workers, two-thirds of which are benefiting disadvantaged communities. In the Central Valley, an average of 1,600 construction workers are employed daily, and more than 200 individuals have graduated from the Central Valley Training Center.

Once high-speed rail is operational, it will continue to be a job creator, with thousands of new high-skilled jobs in rail operations and maintenance, as well as, in the renewable energy sector. Across the system, we will need to hire hundreds of people to help maintain and operate our stations and trains. To help ensure these jobs provide a high quality of life for workers, we entered into an agreement in November 2023 with labor unions. As high-speed rail expands, the agreement will cover around 3,000 workers.

The Authority is dedicated to ensuring that small businesses and disadvantaged communities across California not only benefit from but actively participate in the development of the project, as part of our efforts to create equitable economic growth through contracts and procurements. These commitments include optimizing economic opportunities, bolstering environmental protections, creating well-paying jobs, and offering training initiatives. Recent changes to our contract goals were made to not only ensure compliance with state and federal regulations for business certifications but also to make sure we can apply our policy fairly and consistently to achieve meaningful outcomes. As of April 2024, 847 certified small businesses, 292 certified disadvantaged business enterprises (DBE), and 105 certified disabled veteran business enterprises (DVBE) were working on the project.

For more information about economic development in local communities and specifically our commitments to small businesses and disadvantaged communities, see **Chapter 2**.

Environmental Justice

In California, minority and low-income communities have been disproportionately impacted by pollution. Our commitment to environmental justice (EJ) addresses this disparity by focusing on equitable treatment for individuals of all races, cultures, and income levels in the development, execution, and enforcement of environmental regulations and policies.

Across all stages of the project, EJ measures are incorporated and thoroughly assessed during the environmental approval process for each project segment. The project's final environmental documentation specifies the actions the Authority will implement to alleviate the negative impacts on low-income and minority communities. These

efforts include initiatives such as constructing sidewalks, curbs, bikeways, and enhancing street lighting.

For more information about our environmental justice mitigation measures, see **Chapter 2**.

Station Communities and Ridership

High-speed rail stations are magnets for sustainable development, transforming station areas into vibrant, mixed-use communities that feed the system with customers. We are working with local agencies and community-based organizations to gather feedback on the station designs and create long-term station area plans that create value for the rail enterprise.

The Authority is committed to the following objectives for station planning and design:

- **Implementing Sustainable Development Patterns in Station Areas:** We are working with each local city to develop station area plans. These long-term plans govern land use and infrastructure around the stations.
- **Reinforcing Infill Development and Affordable Housing:** High-speed rail stations can attract much-needed housing development. We are dedicated to constructing stations in strategic locations that promote affordable housing.
- **Providing Convenient Station Access**: Transit stops, and pickup/drop-off curbs will be located within a 5-minute walk of the stations, and parking will be located within a 10– to 15-minute walk.
- **Connecting Local and Regional Transit:** We are committed to integrating high-speed rail stations with other transit systems to create regional, intermodal hubs. If possible, the stations will connect to existing or planned rail networks. Each station will include bus transfer hubs for local and regional transit providers.
- **Implementing Active Transportation Facilities for Station Access:** The station design process follows a modal hierarchy that prioritizes pedestrians first, followed by bicycles, transit, and then personal vehicles. We will consider state-of-the-art active transportation facilities, including curb-protected bike lanes, traffic calming measures, sidewalks, street trees, and raised crosswalks.
- **Designing Sustainable Community Strategies:** We are committed to meeting California's climate goals through coordinated land use and transportation planning. We are working with regional agencies to plan for sustainable land uses near high-speed rail stations.

The stations focus on comfortable, safe customer journeys and streamlined operations and functionality. To maintain system speeds, each station has two run-through tracks for top-speed express trains and two outer tracks for trains stopping at the station. Each station will have a canopy protecting the passenger platforms from heat, sun exposure, and rain. Stations can accommodate amenities such as restaurants, shops, and cafés.

In May 2023, the Authority conducted its largest station-focused outreach effort by hosting open houses in the Central Valley station cities of Bakersfield, Hanford, Fresno, and Merced. These events were an opportunity to share the draft station designs, foster dialogue with residents, and collect feedback for station planning.

Collectively, more than 550 Central Valley community members attended the events. From these conversations, three main themes emerged across all the open houses:

- Prioritizing station outdoor spaces for gatherings, events, and active recreation.
- Improving multi-modal connectivity to the stations, including transit, bike, and pedestrian access.
- Celebrating and enhancing the local identity and economy.

More information on the high-speed rail stations, including renderings, can be found in **Chapter 3**.

Energy and Emissions

Throughout the development of the high-speed rail system, the Authority continuously seeks opportunities to reduce emissions. This approach includes prioritizing sustainable design decisions, requiring environmentally preferable construction materials, and incorporating zero-emission and fuel-efficient equipment mandates in our construction contracts. We have also planted thousands of trees and donated cleaner vehicles to the communities where we are building to offset the emissions we produce.

To avoid emitting significant quantities of criteria air pollutants, the Authority mandates that contractors use construction equipment meeting Tier 4 standards, the highest emission standards for equipment set by the U.S. Environmental Protection Agency. Construction activity increased 26 percent in 2023, while emissions rose by only 17 percent, highlighting our increasingly greener construction practices.

By March 2024, the Authority had more than 2,000 pieces of construction equipment registered across active construction packages. Converting all these vehicles to zero-emission vehicles (ZEVs) in the upcoming years will reduce emissions, enhance local air quality, and create healthier environments for onsite workers and nearby residents. In the future, construction packages will mandate contractors to use ZEVs on construction sites, marking a pioneering step for an infrastructure project of this magnitude.

For more on high-speed rail energy and emissions, see **Chapter 4**.

Natural Resources

As careful stewards of our natural resources, we have preserved and restored more than 4,400 acres of open land to mitigate the impacts of building our system. These mitigation projects are primarily located near the Central Valley alignment and were selected to maximize their benefit to endangered species. In addition, the Authority has protected a total of 3,190 acres of farmland through conservation easements.

To minimize the impacts to important wildlife linkages, a substantial amount of the Central Valley rail alignment was designed and built on elevated viaducts and bridges. This allows for unobstructed passage across the alignment by animals and waterways. In areas along the alignment that do not have viaducts or bridges, we have planned and constructed dedicated wildlife crossings. These are concrete tunnels located under the tracks provide animals of all sizes a safe crossing site from one side of the alignment to the other.

We seek every opportunity to conserve water resources and our water use for the project has grown more efficient even as construction activity increased. Our construction water use increased by just over 10 percent in 2023 compared to 2022 while construction activity levels increased by more than 25 percent. These water uses are temporary; once operational the system will not require large volumes of water or threaten water security for the region.

For more details, see **Chapter 5**.

Sustainable Infrastructure

High-speed rail serves as a transformative model for sustainable infrastructure worldwide. Through a collaborative, cross-functional process we established principles specific to the Authority and its delivery in 2016 founded on global best practices, stakeholder priorities, and California state regulations that commit the design, construction, and operation of the system to a comprehensive, sustainable approach. To this end, we have been recognized with the highest rating in the industry, the Envision Platinum Award. This award acknowledges our ambition and execution in meeting environmental and social sustainability commitments in both our planning and design efforts.

Sustainable infrastructure also relies on the procurement of materials from a low-emissions supply chain. Opportunities to lower emissions stems from both production and transportation of the materials required for the system. For example, our Design Criteria Manual includes maximum limits on global warming potential for our concrete mixes, and our current design contractors analyze embodied carbon within their design development.

One area of significant success has been the diversion of useful construction materials from landfills. We track the amount of waste produced and diverted from landfills for each construction package and contractor. In 2023, 3,198 tons of waste, including more than 1,000 tons of concrete, 935 tons of metals, and 145 tons of wood, were saved from landfills. The total amount of waste handled in 2023 was significantly lower than in previous years as we transition from material-intensive site preparation work, with extensive earth-moving and demolition, to more focused construction activity.

The Authority continues to prioritize safe, equitable, and accessible environments for its employees, contractors, first responders, future riders, surrounding communities and the public. On construction sites, worker safety is our highest concern; our rates of injury and lost days continue to be lower than California benchmarks and are much lower than comparable metrics for the construction industry statewide.

As climate hazards become a known, daily reality, we are working proactively to ensure our infrastructure is prepared to serve Californians. This year, with updated data from the latest climate science, we completed multiple risk assessments and incorporated resilience-based design practices into our design efforts to ensure our system can handle hazards including floods, wildfire, and extreme heat.

For more details on our approach to sustainable infrastructure, see **Chapter 6**.

Sustainability Management and Policy

The Authority is committed to accountable governance and transparency. This report follows the rigorous standards in the Global Reporting Initiative (GRI), a widely adopted framework for sustainability reporting. It covers the activities of the Authority from January 1, 2023, to December 31, 2023, and focuses on the Authority's consolidated financial documents. The report is updated annually.

More about our sustainability management and policy can be found in **Chapter 7.**


San Francisco
Millbrae-SFO
San José
Gilroy
Merced
Madera
Fresno
Kings/ Tulare
Poplar Ave
Bakersfield
Palmdale
Burbank
Los Angeles
Anaheim
LEGEND
MERCED AND BAKERSFIELD EXTENSIONS
UNDER CONSTRUCTION
SUBSTANTIALLY COMPLETE
CALTRAIN ELECTRIFICATION
AWAITING ENVIRONMENTAL CLEARANCE
PLANNED STATIONS/STOPS
PLANNED STATIONS (UNDER DESIGN)
PAID FOR BY OTHERS

Chapter 1:
Progress Snapshot

The California High-Speed Rail Authority (Authority) is delivering a transformational transportation infrastructure project. We are designing and building this mega-project that connects the largest economies in the state to each other with public-policy leading commitments at the core of delivery. This groundbreaking transportation system will connect key regions within the state, spur economic development, reduce carbon emissions, create job opportunities, and safeguard California's vital agricultural lands and natural resources. When Phase 1 of the system begins passenger service connecting San Francisco, the Central Valley, Los Angeles, and Anaheim, over 20 million people, more than half the population of California, will be within 30-minute access of a high-speed rail station.

The Authority has begun work to extend the 119 miles currently under construction in the Central Valley to 171 miles of future electrified high-speed rail from Merced to Bakersfield. The high-speed rail guideway is completely grade-separated in the Central Valley to allow for safe operating speeds of up to 220 miles per hour. Currently, we are operating more than 25 active construction sites simultaneously, with 1,600 workers dispatched daily to job sites. This massive project has produced more than 13,930 construction jobs to date, of which more than 60 percent have gone to local and disadvantaged workers. Our project also employs more than 847 California small businesses.

We have environmentally cleared 463 miles from San Francisco to Los Angeles, with plans to clear the remaining project section, Los Angeles to Anaheim, in 2025. With restored federal interest, we are in the process of advancing several procurement opportunities, including trainsets for future testing and our recently awarded agreement for design services for track and overhead contact systems. Our goal remains to initiate passenger service from Merced to Bakersfield between 2030 and 2033. See **Exhibit 1.0** for more current and future benefits of the high-speed rail project.

Sustainability Foundation

Transportation generates more than half of California's greenhouse gas (GHG) emissions. High-speed rail, in addition to connecting key regions of the state, will save hundreds of millions of tons of GHG emissions by shifting people out of cars and airplanes and onto our trains, which will be powered with 100 percent renewable energy.

Sustainability, functionality, and best practices are fundamental to our station development efforts, with a focus on seamless integration with different transportation modes, net-zero energy performance, and facilitating development around stations. These values drive our ongoing station design efforts in the Central Valley, which includes four new designs unveiled earlier this year. In addition, the Authority is collaborating with local cities to develop station area plans that envision high-speed rail stations as regional multimodal transportation hubs. Our stations will be the anchor for transit-oriented development such as high-density housing, walkable communities and more.

Another pillar of our sustainability plan includes supporting the beauty and vitality of California's living systems. We have built more than 250 wildlife crossings in addition to the bridges, overpasses, and viaducts that allow wildlife to pass under and through our tracks. A project of this size will have environmental impacts; to mitigate and balance out these impacts, we have restored thousands of acres of natural habitat areas and protected agricultural lands from development.

Our construction process includes a net-zero approach in which we take across-the-program steps to reduce our air emissions and GHG to offset out construction fleet emissions. The Authority has the highest standards for waste diversion with a 90 percent diversion target. Since 2015, we have been able to divert 95 percent of all waste from landfills through recycling, reusing and composting of non-hazardous materials. All these measures contribute to our rating as the largest and highest-scoring infrastructure project according to the Envision rating system from the Institute for Sustainable Infrastructure.

We are dedicated to the highest standards of ethics, accountability, and transparency. Our progress in acquiring funding is grounded in performance measurement, risk management, and continuous improvement. Full data to accompany the narrative report can be found in the appendix, which is organized according to the international sustainability standard of the Global Reporting Initiative.

Authority's Sustainability Framework

1. Economic development and governance: responsible leadership and management, transparent practices, and sound business planning.
2. Energy and emissions: conserving resources and tracking and minimizing emissions.
3. Station communities and ridership: collaborative planning activities. Natural resources: minimal impacts to the environment and implementing safeguards of the state's ecological systems.
4. Natural resources: minimal impacts to the environment and implementing safeguards of the state's ecological systems.
5. Sustainable infrastructure: principles of planning, siting, design, construction, mitigation, operation, maintenance, and management of infrastructure that reflect a balance of social, environmental, and economic concerns.

Exhibit 1.0: Current High-Speed Rail Benefits and Investments

	Current Benefits	Future Benefits
ECONOMY	**13,930 jobs**[1] **66% spending** in disadvantaged communities[3]	**3,000+ jobs**[2] **$203.6 billion** economic output[4]
COMMUNITIES	**4 stations under design** connecting 3 million Californians	**20 million people** within 30 minutes access of HSR stations[2]
EMISSIONS	**7,100 trees** planted **1,800 acres** forest planted[5] **Zero Net** construction emissions	**143,000 MTCO$_2$e** sequestered[5] **142 million MTCO$_2$e** avoided
ENVIRONMENT	**3,190 acres** agricultural land conserved **4,490 acres** habitat preserved	**349,000 MTCO$_2$e** avoided[5]
INFRASTRUCTURE	**Highest-rated** Envision Plantium certification **100% completion** Construction Package 4[6]	**100% renewable energy** **496 miles** electrified high-speed rail

1. As of July 2024
2. Operation of Phase 1 system
3. As of June 2023
4. Through completion of the Phase 1 system
5. 2015-2079
6. 400-foot section left to resolve

Major Milestones

Since the 2023 Sustainability Report, the Authority has made strides across several program areas including funding, construction, environmental clearance, procurement, and risk management. These achievements illustrate our dedication to building a sustainable, fair, and transformative project for California and its residents.

Significant achievements include:

- $3.3 billion in federal grant awards to advance the project, signaling a renewed partnership and a strong commitment at the federal level.
- A $20 million Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant award to help fund early activation efforts to promote environmental justice at the Fresno Station site.
- Substantial completion of Construction Package 4 (CP 4), which includes 22.5 miles of guideway, seven underpasses, two overpasses, a pedestrian structure, and a large viaduct.
- Completing environmental review of the San Francisco to Los Angeles portion of Phase 1 of the system with only the Los Angeles to Anaheim section remaining in Phase 1.
- Creation of station pre-design and concept development for four Central Valley stations, demonstrating how our stations will link communities and provide for transit-oriented development.
- Release of Request for Proposals to procure the first state-of-the-art electrified high-speed trainsets capable of operating at speeds of 220 miles per hour.
- Issued an agreement for Design Services for Track and Overhead Contact Systems (OCS) for the Central Valley.
- Implementation of a robust Enterprise Risk Management program to identify, assess, and mitigate risks at all levels of the organization. By actively managing risks, we are able to make informed decisions that support the achievement of our strategic objectives and the success of the high-speed rail project.

Looking forward, the Authority is preparing to:

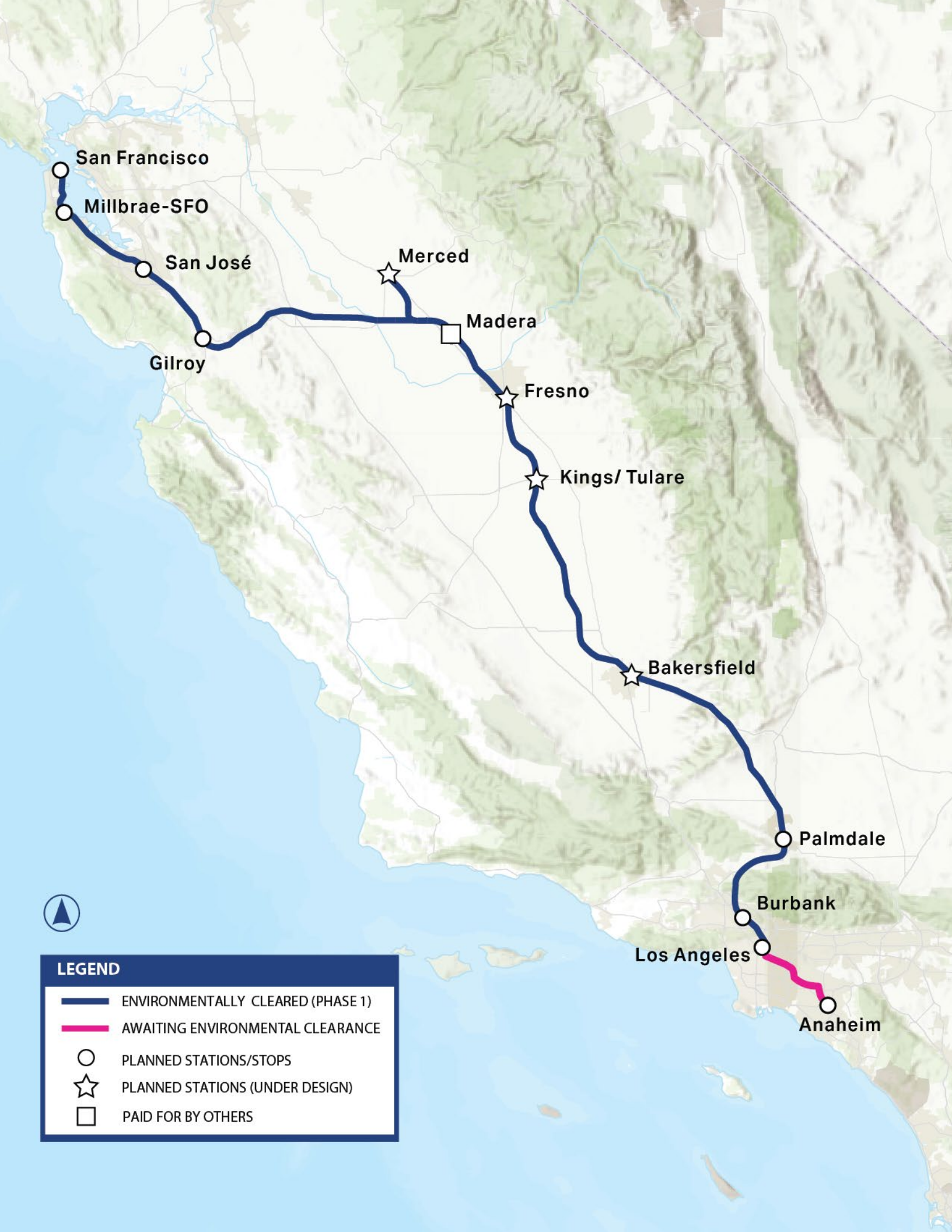
- Complete Construction Packages 1 and 2-3 in 2026.
- Expand the civil and track and systems construction activities to Merced and Bakersfield for a total of 171 miles.
- Complete environmental review of the Los Angeles to Anaheim project section, marking environmental clearance of Phase 1 from San Francisco to Anaheim.
- Move forward with geotechnical and design work where environmental work is complete.
- Complete the procurement process for the high-speed trainsets, signaling systems, and operations and maintenance contracts, leveraging the best practices and innovations from the global high-speed rail industry. The procurement process will meet the highest standards of safety, performance, and customer service.
- Continue to engage with stakeholders, communities, and businesses to ensure the project delivers social, economic, and environmental benefits for all Californians. The project will create opportunities for transit-oriented development, affordable housing, land use planning, and community revitalization.
- Contribute to the state's efforts to reduce greenhouse gas emissions, improve air quality, and combat climate change by providing a clean and efficient alternative to driving and flying.

Addressing Risk and Ensuring Transparency

The California High-Speed Rail Authority is dedicated to building a sustainable high-speed rail system in California while upholding the highest standards of ethics, accountability, and transparency. In line with our commitment to sustainability, the Authority has established principles that guide our decision-making process to mitigate risks and guarantee the long-term success of the high-speed rail project.

- **Transparency and engagement:** We believe in engaging with the public and stakeholders, fostering dialogue in an open and transparent manner, and sharing information on program achievements, milestones, and challenges. This transparency promotes accountability and strengthens trust in the project.
- **Stewardship:** We are committed to the responsible stewardship of public and environmental resources allocated to the high-speed rail project. By protecting and conserving these resources, we aim to build a sustainable infrastructure that benefits future generations.
- **Performance:** To measure our progress and uphold accountability, we employ specific performance measures that track our achievements and guide program delivery. This focus on performance helps us continually improve and achieve our strategic objectives.
- **Diversity:** We recognize the importance of a diverse and inclusive workforce in building a sustainable high-speed rail system. By developing and supporting a fully capable and diverse workforce, we strive to foster innovation and excellence in our operations.
- **Safety:** The safety and security of our workers, employees, and customers are paramount. We prioritize safety in all aspects of the project to ensure a secure and reliable transportation system for all.
- **Sustainability:** Our goal is to deliver a high-speed rail system that maximizes benefits to priority communities, protects natural resources, and contributes to the transition to a low-carbon economy. We are committed to sustainability practices that minimize environmental impact and promote long-term sustainability.

As the project progresses, we remain vigilant in monitoring and addressing emerging risks while continuously improving our risk management strategies. By fostering a culture of continuous improvement and transparency, we strive to inspire trust among stakeholders and the public as we navigate potential challenges and opportunities in building a sustainable high-speed rail system in California.


San Francisco
Millbrae-SFO
San José
Gilroy
Merced
Madera
Fresno
Kings/ Tulare
Bakersfield
Palmdale
Burbank
Los Angeles
Anaheim
LEGEND
ENVIRONMENTALLY CLEARED (PHASE 1)
AWAITING ENVIRONMENTAL CLEARANCE
PLANNED STATIONS/STOPS
PLANNED STATIONS (UNDER DESIGN)
PAID FOR BY OTHERS

Building Responsibly Through Environmental Clearance

Environmental clearance plays a crucial role in securing funding and refining the scope of the high-speed rail project in California. It demonstrates compliance with environmental regulations and assures potential funders the project has undergone a comprehensive assessment of its environmental impact and has addressed any and all potential risks and mitigations.

Since the 2023 Sustainability Report, the Authority has achieved the following environmental clearance milestones, which reflect the project's proactive approach to securing funding and paving the way for the successful completion of the high-speed rail system in California:

- The Palmdale to Burbank project section was environmentally cleared by the Authority's Board of Directors in June 2024.
- The Supplemental Alternatives Analysis (SAA) for the Los Angeles to Anaheim project section was released in May 2024.
- The Merced Station Relocation Environmental Reexamination was completed.
- Environmental and preliminary engineering development was initiated for a Central Valley heavy maintenance facility.

The environmental clearance process allows for a thorough evaluation of the project's scope, identifying any potential environmental challenges or constraints that may impact the project's design and implementation. This evaluation helps in refining the scope by ensuring that the project meets environmental standards and minimizes any negative impacts on the surrounding ecosystem.

The Authority is poised to accelerate delivery now that the system is environmentally cleared from San Francisco to Los Angeles.

At a Glance: Chapter 2

- **Economic Growth**: The California high-speed rail project is a key driver of economic growth and job creation, benefiting disadvantaged communities and small businesses.
- **Investment Impact**: From July 2006 to June 2023, the Authority invested $11.2 billion in planning and construction, generating significant economic activity, particularly in California's Central Valley.
- **Job Creation**: The project has created more than 13,500 construction jobs, with 70 percent of these positions filled by Central Valley residents, and over 10,000 jobs created in the last five years.
- **Labor Income and Economic Output**: In Fiscal Year 2022-2023, the project generated $940 million in labor income and $3 billion in economic impact. Long-term projections estimate nearly $79 billion in labor income and $203.6 billion in total economic output.
- **Green Jobs**: The high-speed rail system will be solar-powered, creating job opportunities in solar power installation, maintenance, and management, as well as permanent positions in system operations and maintenance.
- **Disadvantaged Communities**: The Authority focuses on enhancing communities, particularly disadvantaged ones by providing job training and supporting small businesses. We have expended $6.4 billion in disadvantaged communities to date.
- **Diversity and Inclusion**: Promoting diversity and equal opportunity is a core principle, with 847 small businesses, 292 Disabled Business Enterprises, and 105 Disabled Veterans Business Enterprise working on the project. Over 200 of those small businesses are owned by minorities.

Chapter 2:
Economic Development and Governance

High-speed rail creates new industries and future jobs in California and the nation. California's high-speed rail project is more than a revolutionary transit system — it is also a fundamental driver of economic growth and job creation. Our infrastructure investments have already made a significant impact on the state's economy, notably for disadvantaged communities and small businesses. By creating employment opportunities, increasing labor income, and facilitating economic activity through procurement, the high-speed rail project helps circulate earnings within local and regional economies. Economic benefits will continue once the project is operational, providing green jobs and laying the foundation for a more prosperous and sustainable California.

> **"High-speed rail construction has continued to flourish, creating good paying construction jobs for men and women across the Valley. As the number of construction sites continues to grow, so does the need of a growing workforce to bring the nation's first high-speed rail system to California. When construction grows, these workers and their families thrive, and we couldn't build this system without them."** – Chuck Riojas, Executive Director, Fresno, Madera, Kings and Tulare Counties Building and Construction Trades Council

Investing in California's Economy

From July 2006 through June 2023, the Authority invested about $11.2 billion in planning and constructing the nation's first high-speed rail system. These investments continue to be a proven job creator that bolsters the local economy of California's Central Valley, and particularly benefits disadvantaged communities. In Fiscal Year 2022 to 2023, 99 percent of the project's expenditures went to California businesses and workers, with two-thirds going to disadvantaged communities. Project investments also generate economic activity in other ways as high-speed rail contractors hire workers and pay businesses who in turn spend their earnings throughout the economy. These direct and indirect impacts induce statewide economic activity by pumping money back into our local and regional economies. Our expenditures to minority-owned small businesses help address the longstanding inequity in wealth creation by growing the assets held by people of minority status. In 2023, the Authority's investments in the California economy in Fiscal Year 2022 to 2023 yielded $940 million in labor income, and $3 billion in economic impact from direct, indirect, and induced effects. In total, the project has generated an estimated $7 billion in total labor income by workers and $18 billion in activity, as shown in **Exhibit 2.0**. Long-term, the Authority's expenditures through completion of the Phase 1 system from San Francisco to Anaheim are expected to produce nearly $79 billion in labor income and $203.6 billion in total economic output.

> **Before working high-speed rail, I worked other jobs maybe 80 miles away from home. This job keeps me close to home. It has helped me save money, buy my first house, and support my family."** – Jesse Lopez, Carpenter

Photo: The Wasco Viaduct in Kern County will take high-speed trains over the existing BNSF freight tracks.

Exhibit 2.0: Economic Benefits by Region Map (2015-2023)

Central Valley Regional Impacts

In 2024, the Authority hit a milestone of more than 13,930 construction jobs, with 70 percent of those going to Central Valley residents. Construction activities have increased exponentially in recent years, with more than 10,000 of those jobs created in the last five years. **Exhibits 2.1 and 2.2** break down the number of construction jobs filled in the Central Valley across three construction packages, as well as the total construction hours worked as of July 31, 2024. In addition to construction workers, we are also hiring thousands of other workers for positions such as planning, engineering, and environmental assessments.

Exhibit 2.1: Construction Jobs Created as of July 31, 2024

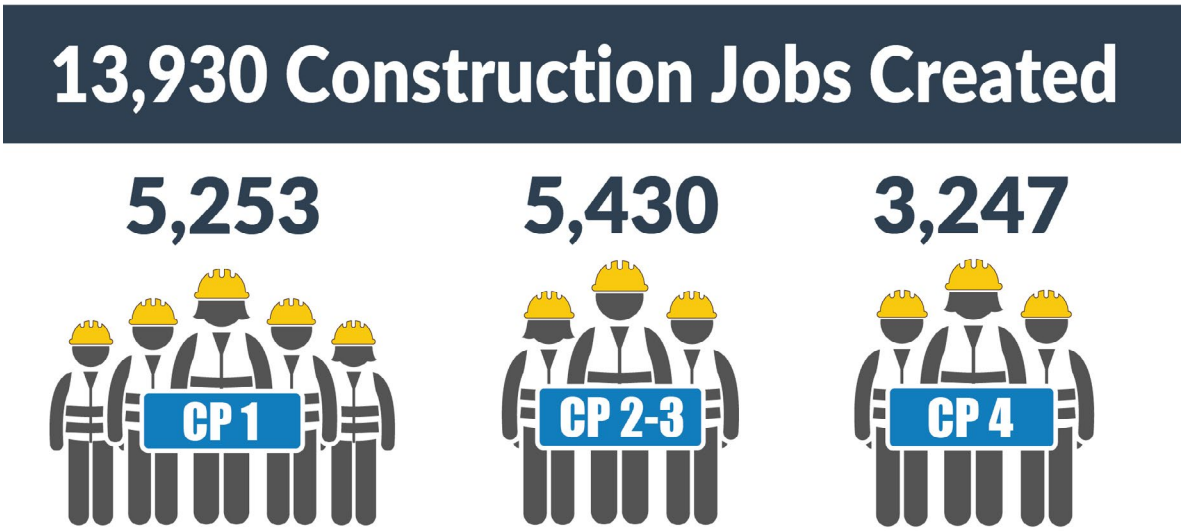
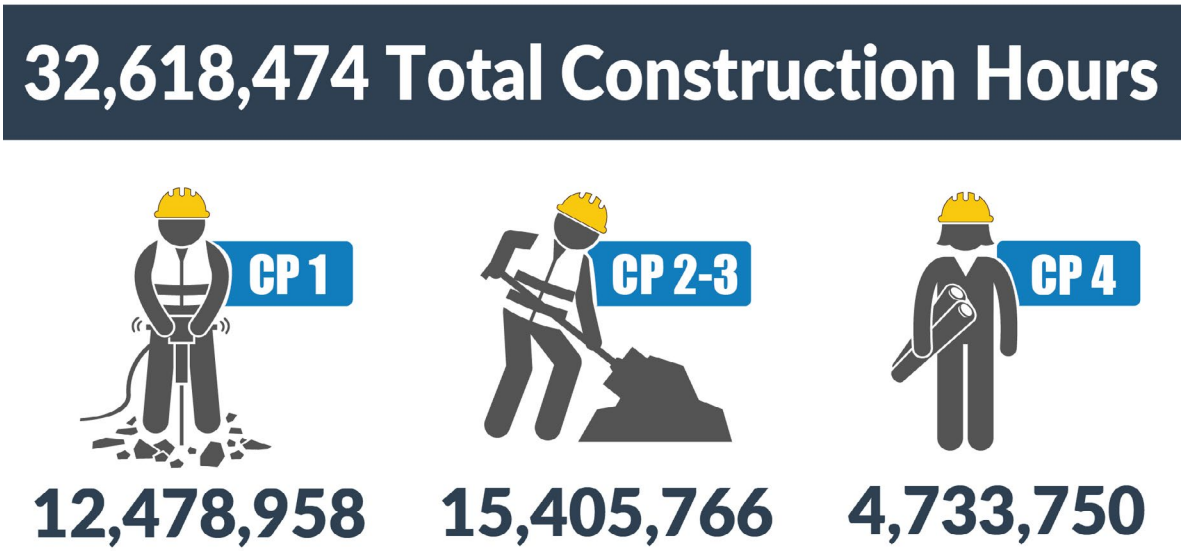


Exhibit 2.2: Total Construction Hours as of July 31, 2024



In addition to good-paying jobs, the Authority, in partnership with the City of Selma, Fresno County Development Corporation, the Fresno, Madera, Kings, Tulare Building Trades Council, and the Fresno Economic Opportunities Commission created the Central Valley Training Center. The center offers a pre-apprenticeship training program for veterans, at-risk young adults, and minority and low-income populations in the Central Valley. To date, more than 200 participants have graduated from the 12-week program, which is led by journeyman-level professionals who introduce various construction trades. Following graduation, several high-speed rail contractors, including Tutor-Perini/Zachry/Parsons and Dragados-Flatiron Joint Venture, along with various subcontractors, hired graduates to join their workforce.

Creating Good-Paying Green Jobs

While design and buildout of the full system has provided thousands of jobs, high-speed rail will continue to be a catalyst for broader employment opportunities and wealth generation once operational. The project will be fully solar-powered, with plans to install approximately 540 acres of solar panels to generate about 35 megawatts of electricity for traction power. This will create job openings in the renewable energy sector, specifically in solar power installation, maintenance, and management. Additionally, hundreds of permanent positions will be needed to maintain and operate the high-speed rail system across the state including its trains, stations, heavy and light maintenance facilities, and other facilities in various capacities, including operating, engineering, maintenance of equipment, dispatch, on-board service, and clerical work.

Photo: Fourteen students graduated from the 12-week Central Valley Training Center in June, bringing the total number of graduates to 206.

High-speed rail operations will require five different facility types:

- **Maintenance of way facilities**: Between 400 to 500 jobs will be located at these facilities, including warehouse staff, welders, machinists, signaling and communications technicians, electricians/linemen for the overhead catenary system, and electricians for traction power facilities.
- **Operations control center**: This center will be for operations control and train dispatching, including coordinating high-speed train movements with others such as Metrolink and Caltrain in blended corridors. This will require 24/7 staffing with 40 jobs initially and may be co-located with the headquarters facility.
- **Heavy maintenance facility (HMF)**: A HMF will provide in-depth maintenance and overhaul, including periodic major inspections and major component replacement. Initially, the HMF will receive trains and ready them for passenger service, which includes testing, commissioning, and acceptance. The HMF will require 150 to 160 staff, including machinists and electronic technicians and welders.
- **Operations management headquarters facility**: This will be an office facility used for managing the operations business by the train operator, with an initial staffing of 80 to 90 people.
- **Light maintenance facilities (LMFs)**: Three LMFs will be located along the system to provide regular maintenance and operations for high-speed trains. Between 125 to 150 jobs will be located at these three facilities, including mechanical technicians, cleaners, and inspectors.

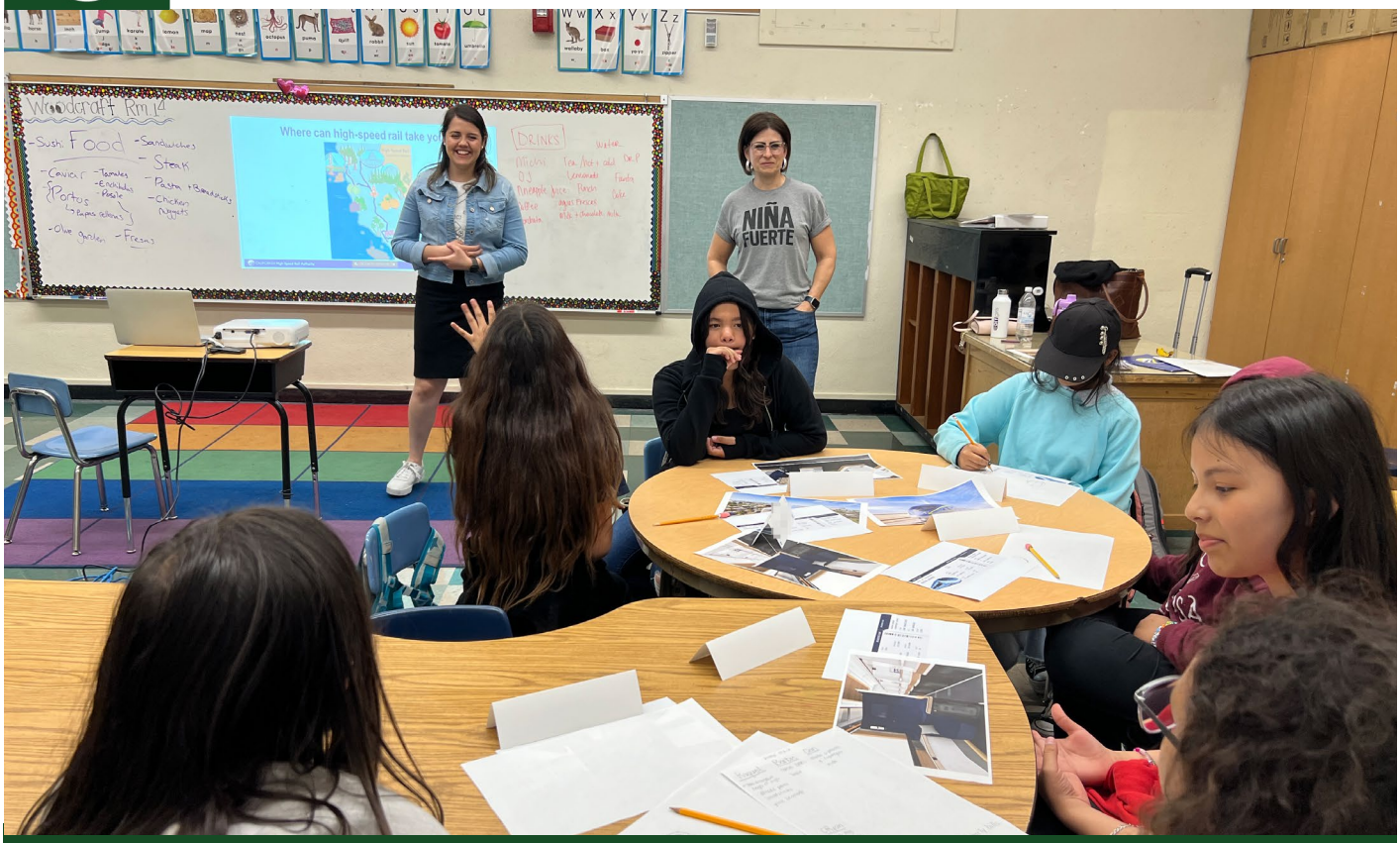
The projected economic impacts and job-years generated by staffing these facilities during the first 10 years of operations is estimated to be $1.6 billion in economic output and 7,200 job-years. See **Table 2.0** for more details of how each facility type factors into these totals.

In November 2023, the Authority entered into an agreement with 13 rail labor unions for the operation and maintenance of the high-speed trains, facilities, and stations to ensure these will be jobs that provide a high quality of life for workers. The initial operation of the 171-mile Merced to Bakersfield section alone will create nearly 400 operating jobs. As the system grows, the agreement will cover an estimated 3,000 workers.

Table 2.0: High-Speed Rail Facilities and Their Economic Impacts Over a 10-Year Period

Facility Type	Labor Income	Output	Job-Years
Maintenance of Way Facilities	$180 M	$510 M	2,300
Operations Control Center	$70 M	$210 M	900
Heavy Maintenance Facility	$110 M	$340 M	1,500
Operations Headquarters	$160 M	$380 M	1,700
Light Maintenance Facilities	$60 M	$180 M	800
Total	**$580 M**	**$1.6 B**	**7,200**

EMPOWERING FUTURE INNOVATORS



Less than 15 percent of girls show an interest in STEM during the critical ages between the 4th and 8th grade. Recognizing this gap, DIY Girls, a nonprofit organization founded by Assemblywoman Luz Rivas (43rd District), aims to ignite the interest and long-term success of girls and gender-expansive youth in technology, engineering, and making through innovative educational experiences and mentor relationships. DIY Girls serves under-resourced communities in Los Angeles through programs catering to 5th-grade through 12th-grade students.

High-speed rail staff have been supporting DIY Girls' mission by participating in workshops and providing interactive activities that encourage creativity and critical thinking among the young participants. Activities highlighted how STEM concepts can be applied in real-world scenarios. Through such collaborations, DIY Girls and the California High-Speed Rail Authority are collectively making a positive impact by fostering interest and involvement in STEM fields among youth in underprivileged communities.

Maximizing Benefits to Disadvantaged Communities

From the inception of the high-speed rail program, the Authority has focused on enhancing the communities in which high-speed rail is being built and will eventually operate, with a special focus on communities identified as disadvantaged. This commitment involves strategies to optimize economic opportunities, bolster environmental protections, create well-paying jobs, offer training initiatives, and more. The Authority is dedicated to making sure small businesses and disadvantaged communities across California not only benefit from but actively participate in the development of the program.

California defines disadvantaged communities based on a blend of environmental and socioeconomic criteria, defined by the California Environmental Protection Agency (CalEPA) using the CalEnviroScreen tool. These communities are identified as those ranking in the top 25 percent of the most impacted areas, determined by a composite index of four components divided into two groups. The Pollution Burden group consists of Exposure and Environmental Effects components, while the Population Characteristics group comprises Sensitive Populations and Socioeconomic Factors.

The Authority's Community Benefits Policy and Community Benefits Agreement (CBA) are structured to provide support to small businesses and job seekers interested in engaging with the high-speed rail program. This policy aims to remove obstacles and help small businesses and potential employees secure construction contracts, jobs, and training opportunities. As part of its initiatives, the CBA Targeted Worker Program mandates 30 percent of all project work hours be completed by National Targeted Workers — residents in disadvantaged communities with annual household incomes ranging from $32,000 to $40,000. At least 10 percent of these work hours must be fulfilled by disadvantaged workers, such as low-income individuals facing challenges like homelessness, chronic unemployment, or lack of a GED.

Since the project's inception, 466 disadvantaged workers have been deployed to worksites. In 2023, 73 percent of the project work hours were completed by 6,510 targeted workers. Approximately 66 percent of the program's investments from July 2022 to June 2023 were made in designated disadvantaged communities across California, fostering economic growth in these regions. Since 2006, about 57 percent of the total program investment has been directed toward these designated disadvantaged communities. See **Exhibit 2.3** on how the Authority is creating opportunities for disadvantaged workers and fostering diversity.

For more detailed information on targeted workers and disadvantaged workers, see the Authority's Community Benefits Agreement Fact Sheet.

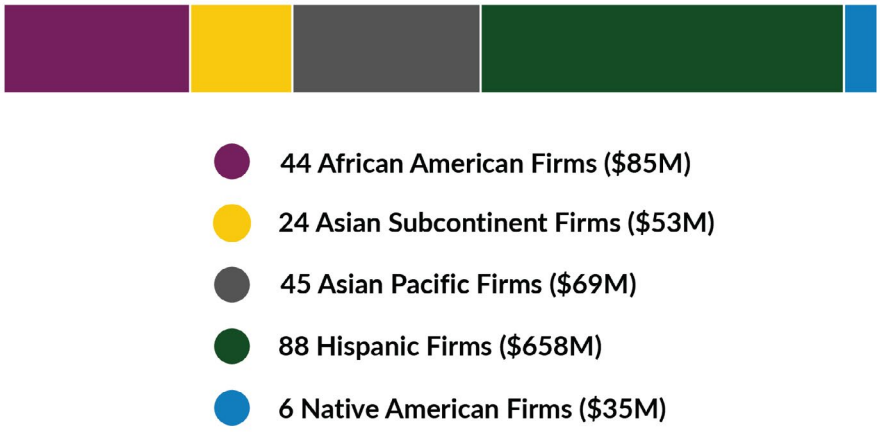
Exhibit 2.3: Creating Opportunities for Disadvantaged Workers and Fostering Diversity

1. Fiscal Year 2022-2023
2. As of April 2024
3. As of July 2024
4. As of May 2024

Fostering Diversity and Equal Opportunity

Promoting diversity is one of the fundamental principles that shape our comprehensive, integrated strategy for introducing high-speed rail to California. The Authority places a strong emphasis on equal opportunities for all and recognizes the value of diversity. We are committed to making sure every individual has access to and can participate in every program or activity related to the design, construction, and operation of the high-speed rail system. As of April 2024, 847 certified small businesses, 292 certified DBEs and 105 certified DVBEs were working on the project with 240 located in a disadvantaged area. Of the 292 DBEs supporting high-speed rail, 207 are minority-owned and account for $900 million of the Authority's expenditures. **Exhibit 2.4** provides a breakdown of the number of minority-owned firms and dollars expended.

Exhibit 2.4: Minority-Owned Firms Working on High-Speed Rail



Environmental Justice

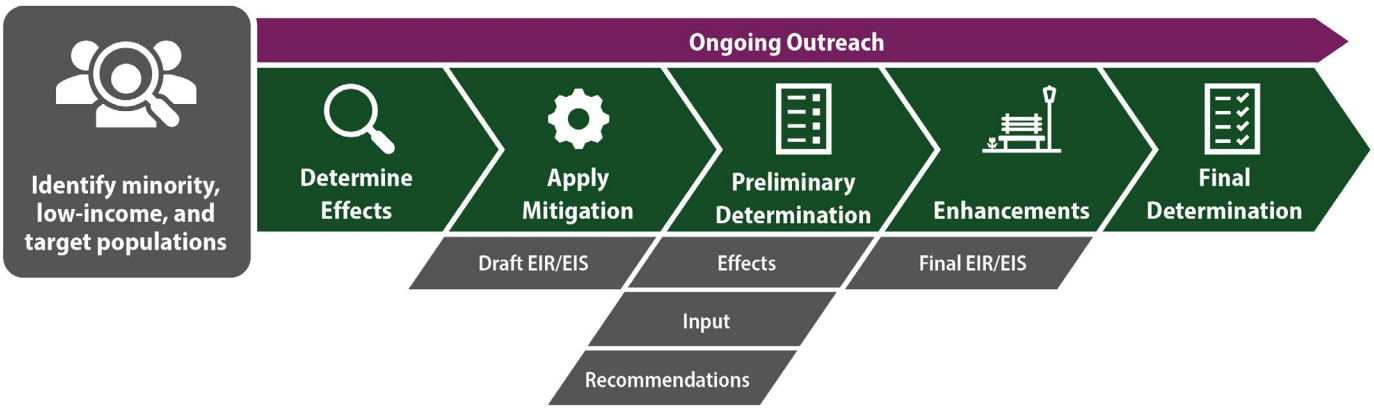
Minority and low-income communities in California disproportionately suffer from the impacts of pollution. We are committed to rectifying this inequity through following the principals of environmental justice (EJ). EJ entails working toward fair treatment for people of all races, cultures, and income levels, including minority and low-income populations, in the formulation, implementation, and enforcement of environmental laws and policies.

The Authority considers and integrates EJ mitigations throughout the project life cycle and extensively analyzes mitigation measures during the environmental clearance process for each project section. The first action we take is to identify minority, low-income and reference populations in the project area. Using this information, we can determine effects, which on a project of this scale are unavoidable. Once we understand the effects, we prepare draft and final documents outlining measures we will take to mitigate the adverse effects of the project on low-income and minority populations. This entire process requires continuous and ongoing outreach as demonstrated in **Exhibit 2.5**.

Collaboration with stakeholders is a key aspect of the Authority's approach to construction of the high-speed rail system. For example, in planning the San Jose and Merced project section, which was environmentally cleared in 2022, the Authority actively engaged with EJ communities to identify opportunities to offset project-related impacts. Northern California staff hosted more than 200 events, of which 58 were community improvement planning meetings that helped identify 25 community enhancements across eight affected communities. In Gilroy, for example, these included sidewalk, curb, and bikeway improvements, a bicycle/pedestrian overcrossing for primary school students and improved street lighting. These enhancements will lower the potential for accidents and injuries in neighborhoods along the project corridor.

These efforts were recognized by the American Planning Association's California Northern Section in October 2023 when staff in Authority's Northern Region received the Excellence Award for Advancing Diversity and Social Change.

Exhibit 2.5.: Mitigation and Enhancement Process



Investing in California's Small Businesses

The Authority engages small and diverse businesses to guarantee they have a major role in building the high-speed rail project, spurring business growth, job creation, and workforce development opportunities. Reflecting our commitment to continuous improvement, the Authority's Board of Directors in November 2023 unanimously voted to pass Resolution #HSRA 23-07 to enhance accountability when meeting the Authority's small business program objectives. Previously, our small business program goal was a single combined percentage. The updated goals are specified to match federal or state rules and designations based on funding source, with new rules for "blended" funding sources. Each type has specific percentage requirements for the following business certifications: Disabled Veteran Business Enterprise (DVBE), Disadvantaged Business Enterprise (DBE), Certified Small Business (SB, small business for the purport of public works (SB-PWs) and a microbusiness (MB) carve-out.

These updates safeguard compliance with state and federal regulations for business certifications and allow us to apply our policy fairly and consistently to achieve meaningful outcomes. These changes will grow small business participation on the project, particularly of those owned by women, minorities, veterans, and disabled individuals.

The new goal structure will apply as follows:

Blended State and Federal Contracts

- 3 percent DVBE
- 10 percent DBE
- 25 percent SB, SB-PWs with a 3 percent MB carve-out

100 Percent State Funded

- 3 percent DVBE
- 25 percent SB, SB-PWs with 3 percent MB carve-out

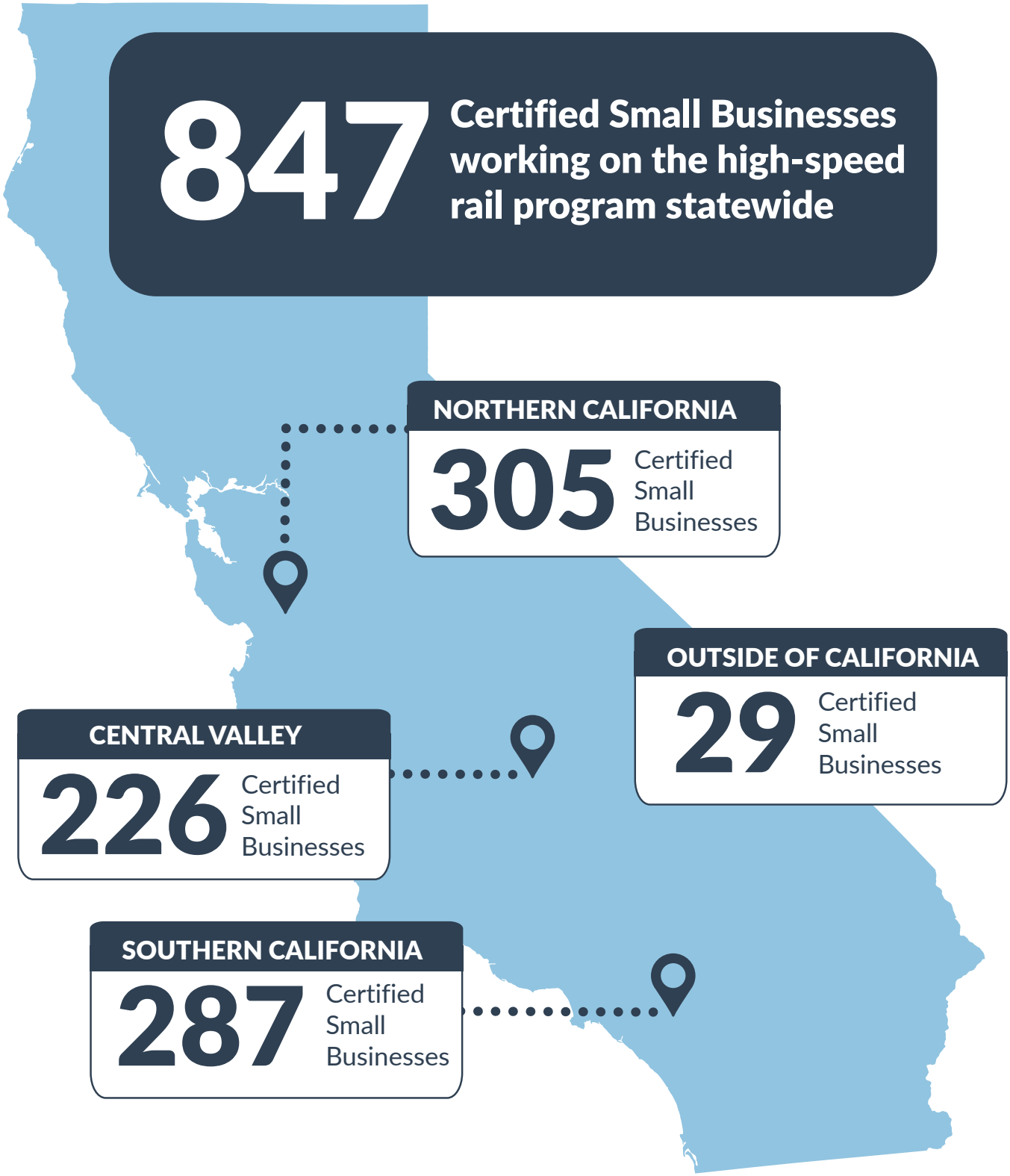
100 Percent Federal Funded

- 17 percent DBE

As of April 2024, 847 certified small businesses were working on the project, as shown in **Exhibit 2.6.** These small businesses are located across the future high-speed rail corridor, providing an economic boost to areas both including and beyond the Central Valley. At our most recent events, our team focused on ensuring interested parties are aware of upcoming procurement packages that will be released in the coming years to increase the number of small businesses working on high-speed rail.

Photo: High-speed rail staff members participate in the Small Business Fast-Track Networking Fair and Industry Update held in May 2024.

Exhibit 2.6: Small Business Participation Map as of April 2024



SMALL BUSINESS LEADS COMMUNITY ENGAGEMENT FOR CENTRAL VALLEY STATIONS

Urban Diversity Design, one of the local small businesses working on the project, has taken a prominent role in community engagement efforts for the development of high-speed rail stations in the Central Valley. Founded by Sheila Hakimipour, the firm has a strong background in urban design, planning, and community engagement. The company has collaborated with the Authority's larger planning team to plan and support meetings with various community-based organizations (CBOs) in cities such as Merced, Fresno, Hanford, and Bakersfield, ensuring diverse and representative input in the station development process. These efforts have garnered feedback from numerous Fresno organizations, highlighting the essential role of community engagement in creating thriving station areas for all communities. Urban Diversity Design's proactive involvement is crucial in ensuring the high-speed rail stations reflect the needs and visions of the diverse communities in the Central Valley.

Suppliers and Procurement

Our philosophy of supporting small businesses also applies to our supply chain, which includes companies that provide construction work, construction management, professional services like surveying and design, and administrative support. Initiatives within our supply chain extend the benefits of the program to local businesses and suppliers, and we have specific procurement policies and practices such as outreach and training events designed to benefit local, small, diverse, and disadvantaged businesses. Our Small Business Program supports under-utilized and under-represented populations, including small, micro, disadvantaged, disabled veteran, minority (inclusive of African American, Asian, Hispanic, Tribal and Native American, and LGBTQ+), and women-owned businesses. Supply chain diversity strengthens all communities and the economic sustainability of the state.

The Authority's sustainable procurement working group guides new suppliers through our procedures, specifications, and contract documents so procurements meet our sustainability criteria and minimize negative environmental impacts. In June 2023, we finalized a Sustainable Procurement Policy (POLI-1101) to ensure the alignment of our procurement practices with our environmental, social, and governance priorities. The scope of the policy applies to all procurement activities within the planning, design, construction, operations, maintenance, administration, and management of the system.

Our Governance Structure

The Authority's Board of Directors was established in 2003 by California Public Utilities Code 185020 to oversee the planning, construction, and operation of the high-speed rail system. The Board of Directors consists of nine voting members: five appointed by the governor, two appointed by the Senate Committee on Rules, and two appointed by the speaker of the Assembly.

Each board member represents the entire state and serves at least a four-year term. There is a Board Chair (Tom Richards) and a Vice Chair (Nancy Miller). During 2023, the Board included five men and four women.

The Board of Directors is responsible for setting policy directives and for developing and approving the Authority's key policy documents. These policy documents include business plans, financial plans, and strategic plans, such as those related to sustainability and environmental, social, and governance issues. The Authority produces two statutorily mandated reports to the Legislature: a Business Plan, which is submitted in even-numbered years, and a Project Update Report, which is submitted in odd-numbered years.

The Authority's Chief Executive Officer (CEO) and Authority staff designated by the CEO report directly to the Board of Directors on ongoing program issues.

The California State Legislature provides oversight and monitoring of the program through the annual budget cycle and through committees specifically tasked with reviewing and monitoring the Authority and progress on the project.

The legislative oversight committees include:

- Senate Committee on Transportation
- Assembly Committee on Transportation
- Senate Committee on Budget and Fiscal Review
- Assembly Committee on Budget

Our Governance Committee Structure

Executive Committee

- Advises the CEO, who chairs the committee, on the Authority's governance and organizational structure as well as on key agency decisions and recommendations to the Board
- Oversees corrective action implementation from internal and external audits
- Oversees the Business Oversight Committee (BOC), Program Delivery Committee (PDC), and Enterprise Risk Committee (ERC)

Change Control Committee

- Reviews and recommends approval or disapproval of construction contract change orders equal to or greater than $1 million
- Develops process forms and reference materials and oversees training for change order documentation

Photo: The February 2024 Board meeting was held at Cal Expo in Sacramento, giving Board members and attendees the opportunity to tour the preliminary trainset white mockups.

Program Delivery Committee (PDC)

- Provides governance and oversight of the Authority's programmatic execution and performance
- Surveils the program baseline threats and opportunities and assesses trends and risk impacts on the program

Business Oversight Committee (BOC)

- Provides programmatic acquisition strategy, procurement governance, and commercial oversight.
- Assesses all changes to scope, schedule, and budget

Enterprise Risk Committee

- Evaluates and prioritizes emerging risks, reviews management risk responses, and provides transparent reporting
- Reports to the Finance and Audit Committee, which is a subcommittee of the Board of Directors

Development Review Committee

- Applies commercial revenue development principles to the development of land owned by the Authority.
- Reviews both Authority-led and unsolicited development proposals to determine their viability and their consistency with our goals
- Reviews advertisements, concessions, and other non-development, revenue-generating opportunities

In addition, state law established an independent Peer Review Group (PRG) responsible for reviewing the planning, engineering, financing, and other elements of the Authority's plans. The PRG analyzes the appropriateness and accuracy of the Authority's assumptions, as well as the viability of our financing plan, including the funding plan for each corridor as required by California law. The PRG reports its findings and conclusions to the Legislature.

State law also established a High-Speed Rail Authority Office of the Inspector General. The duties of this office include:

- Conducting independent fiscal estimates and reviews of the Authority's plans and estimates for project advancement and making findings of the reasonableness of those plans and estimates
- Monitoring progress toward the successful completion of the initial Merced to Bakersfield segment of the high-speed rail project
- Conducting audits and investigations relating to delivery of the high-speed rail project
- Identifying best practices in the delivery of capital projects and recommending policies to enable the Authority to adopt these practices when practicable
- Recommending policies promoting efficiency in the administration of programs and operations as part of any audit findings
- Reviewing the Authority's process for considering proposed and executed change orders and making any recommendations to ensure the process is appropriate for determining the merit and reasonableness of change orders
- Reviewing the Authority's contracts and contracting practices to determine whether they are executed consistent with state and federal laws and policies and are conducted in a fair and reasonable manner

- The Authority enforces requirements on contractors, subcontractors, and suppliers for effective governance and transparency. In 2023, we did not identify any noncompliance with environmental laws or regulations, nor have we received any fines related to these laws and regulations.

Our oversight philosophy emphasizes stewardship, transparency, and accountability. Our internal governance is comprehensive and structured; it is designed to enhance interdepartmental interaction through a streamlined process to identify issues, resolve problems, and make decisions. Under our governance system, we fully vet all implications and trade-offs of a potential action in order to make fully informed decisions.

The Authority maintains its ISO 9001:2015 Quality Management System (QMS) certification by consistently providing a high level of services that meet customer needs and regulatory requirements. The Authority is only the second state agency to become ISO-certified.

We also require achievement of ISO 55001:2014 standards in our track and systems procurement documents so both assets and organization practices are effectively managed throughout the contract duration.

For a list of our governing directives, see **Chapter 7**.

At a Glance: Chapter 3

- **High-Speed Rail Stations**: The project will include 16 stations connecting major population centers from the Bay Area to Anaheim. Currently, the Authority is is working to design and build the four stations in the Central Valley as part of the initial operating system.
- **Station Design**: The Authority has completed pre-design of its four Central Valley stations and is working toward delivery of schematic designs by fall 2024. Designs prioritize pedestrian access and ensure transit stops are within a short walking distance.
- **Community Engagement**: The Authority hosted four open house events in May 2024 to gather feedback on station designs to meet the needs of residents and businesses. In 2023, the Authority engaged with more than 33,000 individuals, including 4,000 students.
- **Station Sustainability**: Station designs prioritize net-zero energy performance, integration with various transportation modes, and opportunities for development around stations.
- **Station Area Plans**: The Authority is working with local cities to develop station area plans that govern land use and infrastructure, ensuring stations reflect and complement existing communities while driving economic growth.

Chapter 3:
Station Communities and Ridership

The Authority is focused on a rail system for customers and creating passenger journeys that maximize the value of the high-speed rail investment. A vital component of this system will be the 16 stations connecting major population centers from the Bay Area through the Central Valley to Anaheim. These high-speed rail stations will serve as transformative hubs enhancing cities, fostering community connections, and becoming iconic symbols of the state.

Sustainability, functionality, and best practices are integral to our station development efforts. Our core values prioritize seamless integration with various transportation modes and maintenance, achieving net-zero energy performance, and maximizing opportunities for development around stations. These values guide our current station design efforts in the Central Valley.

> **I'm super excited about the high-speed rail station and its integration to our downtown core, where we want more people to live, work, and play. This high-speed rail station will add connectivity to the rest of California, which will make downtown not only an amenity for our city but for the whole state."**
>
> – Andrae Gonzales, Bakersfield City Councilmember

Maximizing a Railway For Customers

Private vehicles are the largest source of pollution and greenhouse gas emissions in the state, which is largely due to the dominance of low-density car-dependent development patterns known as suburban sprawl. Several state laws, including Assembly Bill 32, the California Global Warming Solutions Act; and Senate Bill 375, the Sustainable Communities and Climate Protection Act, have required state and local agencies to curb suburban sprawl by planning for sustainable infill development near jobs, services, and transit. This type of development allows more people to complete more trips by walking, biking, or transit.

High-speed rail stations can act as magnets for sustainable development, transforming station areas into vibrant, mixed-use communities. We are working with local agencies and community-based organizations to create long-term station area plans for development around the stations. We are committed to the following objectives for station planning and design:

1. **Implementing Sustainable Development Patterns in Station Areas**: The Authority is working with each local city to develop station area plans. These long-term plans govern land use and infrastructure around the high-speed rail stations. The Fresno Station District Master Plan is an example of a station area plan that envisions the downtown and Chinatown neighborhoods revitalized by the new high-speed rail station and home to new hotels, offices, shops, restaurants, and thousands of new residents. This coordination is vital to ensure the stations reflect and complement the existing community while also serving as an engine of economic growth and development for decades to come.
2. **Reinforcing Infill Development and Affordable Housing**: High-speed rail stations can be a magnet for much-needed housing development, especially infill housing, which our station sites support due to their proximity to existing jobs, housing, education, healthcare, dining, and shopping. We are committed to studying and planning for affordable housing development in station areas and to avoid or mitigate displacement and gentrification.
3. **Providing Convenient Station Access**: At the start and end of every trip, every high-speed rail passenger will be a pedestrian. The Authority will prioritize pedestrian access in station designs so passengers have convenient access to other modes of transportation and the surrounding community. Transit stops and pickup/drop-off curbs will be located within a 5-minute walk of the stations, and parking will be within a 10- to 15-minute walk.
4. **Connecting Local and Regional Transit**: The Authority is committed to integrating high-speed rail stations with other transit systems to create regional, intermodal hubs. Each of the stations will include bus transfer hubs for both local and regional transit providers including buses and trains. The Authority is working with transit providers in each station region to study transit needs at the site and plan for improved or overhauled bus networks that can utilize the high-speed rail station as a hub.

5. **Implementing Active Transportation Facilities for Station Access**: The station design process prioritizes pedestrians first, followed by bicycles, transit, and then personal vehicles. The Authority will consider state-of-the-art active transportation facilities, including curb-protected bike lanes, traffic calming, sidewalks, street trees, and raised crosswalks. Beyond the station site boundaries, we are also working with local governments to develop and implement active transportation plans and deliver high-priority projects.

6. **Designing Sustainable Community Strategies**: The Authority is committed to meeting California's climate goals through coordinated land use and transportation planning. State law requires metropolitan planning organizations to develop long-term land use plans called Sustainable Communities Strategies (SCS) that comply with GHG emission reduction goals. The Authority is working with these regional agencies to plan for sustainable land uses near high-speed rail stations.

Designing and Planning High-Speed Rail Stations

The planning and design of high-speed rail stations plays a pivotal role in establishing a modern and efficient transportation system in California. Our approach is designed to be flexible and adaptable to accommodate the expansion of the high-speed rail system. Moreover, the staged delivery process will guarantee scalability to meet varying levels of ridership and future demands, while aligning with California's net-zero future and serving as a model for sustainable infrastructure.

Through engagement with community-based organizations, valuable insights have been gathered to enhance the functionality and distinctive features of the stations, making them easily recognizable as high-speed rail stations.

Station Area Planning

The planning efforts of the Authority go beyond designing the physical stations. The Authority is coordinating with local cities to develop station area plans that envision the high-speed rail stations as regional multimodal transportation hubs that support Transit Oriented Development (TOD). This involves identifying how the station sites can support TOD and what infrastructure investments may be needed, such as sidewalks, storm drains, parks, and more. The Authority's long-term goal is for each station to be surrounded by vibrant neighborhoods with mixed-use, pedestrian-friendly development.

We partnered with the cities of Gilroy, Merced, Fresno, Bakersfield, Palmdale, and Burbank to develop station area plans. In many of these cities, the Authority is also partnering with the local and regional bus providers to plan for improved or overhauled bus networks that serve the high-speed rail station.

Early Site Activation

The Authority is focused on building ridership by increasing activity at the stations before service. By introducing physical amenities or activities at the station sites we can generate interest in the high-speed rail system, boost future ridership, and attract foot traffic for commercial development. Critical factors for the success of site activation include accessibility improvements, programmed activities like farmers markets, and provided a comfortable, clean, and safe environment.

In Fresno, early site activation initiatives have secured substantial funding, including the $20 million federal RAISE grant for projects like the Historic Depot, downtown plaza, and Chinatown's zero-emission vehicle plaza. Collaborations with local jurisdictions, transit providers, and community-based organizations are key in planning efforts. This project is crucial for revitalizing the historic depot and establishing a park and plaza during early site activation. By revitalizing neglected spaces in the future Fresno high-speed rail station area and Chinatown district, economic development can be encouraged ahead of the station's full operation later in the decade. Through federal-state partnerships and substantial funding, this project signifies progress in modernizing rail infrastructure and fostering community development in historically disadvantaged areas.

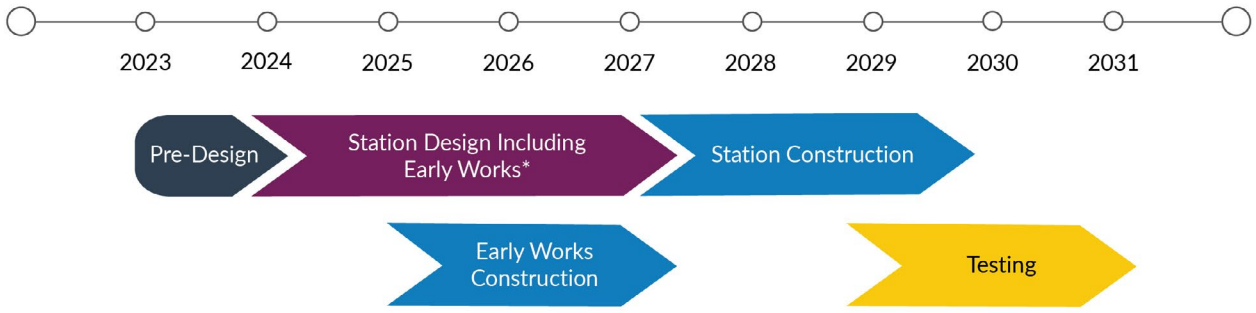
Station Design

In October 2022, the Authority awarded the design contract for the four Central Valley stations to the joint venture of Foster + Partners/Arup. This selection plays a critical role in defining the scope and design specifics of the stations. The contract encompasses design services from the initial concept phase to final design and commissioning. It requires that stations meet high-performance and climate-resilient standards, with the overarching goal of achieving net-zero energy and LEED platinum certification.

The vision is to transform the stations into sustainable districts that align with the Authority's target of attaining an Envision platinum rating.

Since the appointment of Foster + Partners/ Arup, they have conducted evaluations of the four station sites to assess spatial requirements and existing conditions for planning passenger facilities. They have also collaborated with other design and construction projects to understand future facility needs and create seamless design integration. As part of the pre-design phase, they created detailed drawings, reports, renderings, and illustrations outlining the stations' layouts, proportions, relationships, and spatial necessities.

Exhibit 3.0: Station Timeline



*includes RAISE grant plazas and historic depot

The pre-designs highlight our commitment to building high-speed rail stations to be durable, universally accessible, and seamlessly integrated with various transportation modes, catering to buses, cars, bicycles, and scooters. Central Valley station designs depict four tracks, with two run-through tracks for top-speed express trains and two outer tracks for trains stopping at the station. Each station will have a metal canopy protecting the passenger platforms from heat, sun exposure, and rain. Stations will also have room for amenities such as restaurants, shops, and cafes. More details and renderings of the each of the Central Valley stations can be found later in this chapter.

We have government coming out, providing a lot of information and engaging in a very direct, informational, transparent way with the citizens. This is how it's supposed to be. There's obviously a lot of interest and a lot of people coming out to hear what this is about because they know how important this is for the future of Merced."

– Matthew Serratto, Mayor of Merced

Following feedback from the Authority, the design team will take these layouts to the schematic design phase, which is slated to be complete by fall 2024. After the design phase is complete, the Authority will work with the Board to procure a separate contract for construction of the stations utilizing a "design-bid-build" approach consistent with the staged delivery process. This method involves using the available budget and building a site showcasing our investment in, and commitment to, the city and community. The site plan will include areas reserved for future development and additional facilities to accommodate the expansion of the system and the growth in ridership. We are aiming to break ground on the stations in early 2027. **Exhibit 3.0** provides a general timeline of our station design and construction schedule.

ZERO-EMISSION CONSTRUCTION

The Fresno Station will be one of the first places where people experience the full benefits of high-speed rail. Besides reduced travel times and greater travel convenience through the Central Valley, the new station will feature public plazas with shaded green spaces. The public areas will provide a pedestrian connection between the downtown and Chinatown sides of the tracks, reconnecting neighborhoods that have long been severed by freight rail tracks.

As part of a $20 million RAISE grant awarded to the Authority in 2023, construction of the Fresno plazas will be a pilot project, with a goal of zero-emission construction, to develop practices and procedures we will implement on larger-scale projects in the coming years. During the building process, the Authority intends to maximize the use of zero-emission construction equipment, resulting in better air quality and less noise than what is generally produced during a traditional construction project. The plazas will also feature public charging infrastructure for electric vehicles.

Merced Station

The Merced Station will be an intermodal transfer station. The station site is between R Street, O Street, 15th Street, and 16th Street in downtown Merced. The station will connect high-speed rail service to conventional trains serving the Amtrak San Joaquins and Altamont Corridor Express (ACE) services, which will connect to Sacramento, Stockton, Oakland, and San Jose.

The design incorporates a pedestrian bridge crossing for passengers and locals to safely cross the Union Pacific freight tracks. Facilities for local and regional bus stops will be located to ensure connections are as seamless and direct as possible. At full buildout, the station will have ample parking for 1,000 bicycles.

Fresno Station

The Fresno Station is located between Downtown and Chinatown at the site of the historic Southern Pacific Railroad Depot. The station site is between H Street, G Street, Fresno Street, and Tulare Street and will be a connecting feature between downtown Fresno and Chinatown, with two pedestrian bridges crossing over the adjacent streets. The Authority is coordinating with the City of Fresno and community-based organizations to design the station site and early activation activities as part of the $20 million RAISE grant.

At full buildout, the Fresno Station will feature more than 2,500 bicycle parking locations.

Kings/Tulare Station

The Kings/Tulare Station will be located approximately 3 miles east of downtown Hanford. The station will be built on the Hanford viaduct, which carries the high-speed rail system over State Route 198 and the San Joaquin Valley Railroad freight rail spur. This regional station will serve the growing cities of Hanford, Visalia, Porterville, Tulare, and Lemoore, as well as surrounding communities. Long-term plans call for a new Cross Valley Corridor passenger rail service connecting regional cities to the high-speed rail station.

A new street with facilities for biking and walking will connect the station to the roundabout at SR-43 and Lacey Boulevard. The City of Hanford is also studying bicycle and active transportation connections along the Lacey Boulevard corridor to connect to downtown Hanford. The site plan includes parking nearly 300 bicycles, with transit bus bays and pick-up spaces adjacent to a park surrounding the station.

Bakersfield Station

The Bakersfield Station will be located at the intersection of F Street and State Route 204 near Garces Circle. This site is at the edge of the historic downtown and reflects the local preference for a station location. High-speed rail will reach Bakersfield from the north on a viaduct crossing the Kern River and State Route 99. The station design will use the viaduct to provide a shaded path for biking and walking, connecting the station to the Kern River Parkway. Upon full buildout, the station will include space for nearly 600 bicycles.

The Authority has been working with the City of Bakersfield to plan for new development in the area. Additionally, we are working with local agencies and Caltrans to identify solutions for station access to accommodate all modes of travel and promote economic development. Before high-speed rail connects to Los Angeles and Anaheim, the Bakersfield station will be an important transfer point for bus connections throughout Southern California.

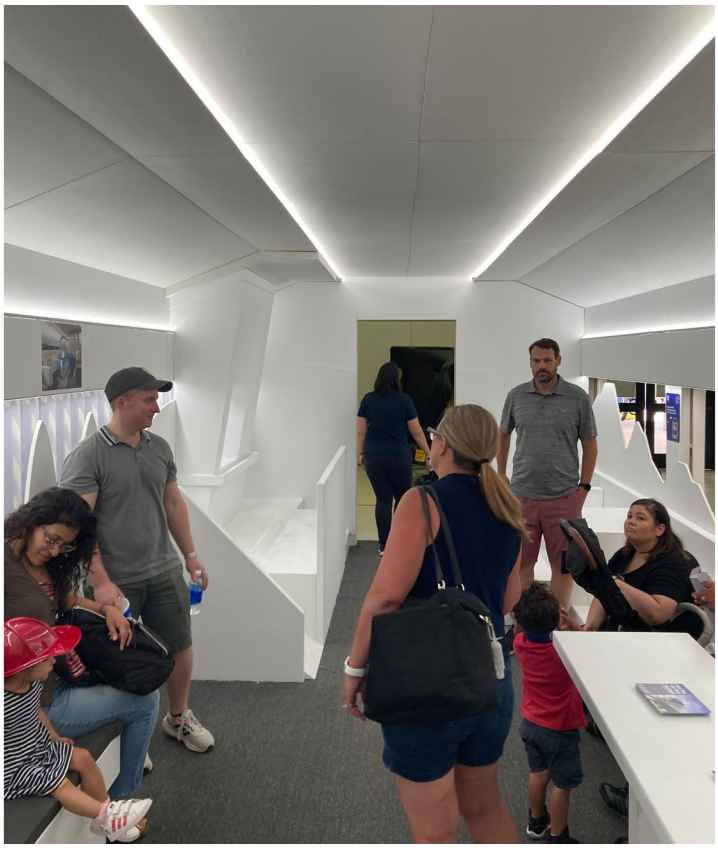
Working with Station Communities

Station areas and surrounding communities can only be successful if they have been developed alongside residents, business owners, and local government. Throughout the pre-design phase, the Authority leveraged multiple outreach methods and channels to engage with stakeholders in each station community, involving discussions with various local and regional entities. In May 2023, the Authority conducted its largest station-focused outreach effort to date by hosting four open houses in the Central Valley — in Bakersfield, Hanford, Fresno, and Merced. These events were an opportunity to update the public on system-wide alignment and station design, talk with residents, and collect feedback for station planning. Each event featured a presentation highlighting station designs, including the surrounding areas, followed by small-group discussions on different topics. During these workshops the public was able to see, for the first time, renderings featured in this chapter and 3-D models of the stations.

The Authority and its local partners were able to hear from more than 550 Central Valley community members and now have a better understanding of what residents want from future high speed rail stations and for their individual communities. From these conversations, three main themes emerged across all the open houses:

- Prioritizing station outdoor spaces for gatherings, events, and active recreation
- Improving multi-modal connectivity to the stations, including transit, bike, and pedestrian access
- Celebrating and enhancing local identity and economy.

Photos: In May 2024, the Authority held several open house events in the Central Valley to receive public input on station plans.



Photos: At the 2024 California State Fair, more than 50,000 people visited the high-speed rail exhibit, which featured a mockup of a train car, kids' activities, and a virtual reality station tour.

Ongoing Outreach and Education

Since breaking ground in 2015, the Authority has actively engaged with residents, stakeholders, business leaders, local government, and transit partners. These efforts have resulted in more than 150,000 touchpoints through various outreach programs. In 2023, staff members from across the state organized 346 different types of events, ranging from tabling at transit centers and farmers markets to attending conferences and fairs, and presenting to various audiences, reaching more than 33,000 individuals. The Authority also reached thousands more through digital newsletters and social media. In 2023, the Authority published our quarterly small business newsletter, our fall and spring construction updates, and our monthly "I Will Ride" and "Happenings" e-newsletters.

One of the most exciting outreach endeavors took place in July 2024 at the California State Fair, where the Authority hosted an exhibit showcasing the high-speed rail project. The exhibit featured a near-to-size mockup of the interior of the train, where visitors could explore different seat options and experience a future station using virtual reality. The exhibit also included background about the project, major milestones, and station renderings including 3-D models. The three-week exhibit attracted more than 50,000 visitors.

Creating a Sustainable Transit Network

High-speed rail stations are poised to serve as key anchor points for a broader intermodal transportation network, enhancing services in less densely populated areas and boosting ridership across all systems, including local and regional transit networks linked to high-speed rail. We are working on creating seamless access to other rail services and bus stops with frequent service, all within a five-minute walk from the high-speed rail platform.

In the 2023 draft of the California State Rail Plan, high-speed rail is acknowledged as the foundational element in the construction of a zero-emission rail network in California. This network will play a crucial role in helping the state achieve its climate goals. The plan also emphasizes the importance of connecting transit systems throughout the state, promoting long-term integration and collaboration to establish a comprehensive and sustainable transport network.

Integration of Regional and Local Transit

By collaborating with local and regional transit providers and city officials, we are working to integrate transit agencies of all sizes into the future high-speed rail system. Partnerships with transit providers like Golden Empire Transit in Bakersfield and Fresno Area Express are focused on aligning networks with the new high-speed rail system. Additionally, initial discussions are taking place with Merced to incorporate its consolidated bus service into the future Merced Station. Ensuring accessibility for northern and southern riders, the Authority is leveraging existing rail lines such as Amtrak and the Altamont Corridor Express to expand the high-speed rail system's reach across the state to the future Central Valley stations.

Rendering: This is a concept of an at-grade alternative for the Diridon Station. *Courtesy of the JPAB.*

Advancing Station Planning in the Regions

Projects related to high-speed rail in northern and southern California are making significant progress. In northern California, station planning is progressing at Diridon Station in San José, poised to become one of the busiest intermodal hubs on the West Coast by integrating high-speed rail with existing transit services and future BART connections. The ongoing collaborative effort at Diridon, known as the Diridon Integrated Station Concept (DISC), involves the Authority, the City of San José, VTA, Caltrain, and the Metropolitan Transportation Commission. This initiative aims to create a top-tier transportation hub seamlessly integrated into downtown San José, including the planned Google transit village, for regional and statewide transportation connections. Current efforts are focused on refining design work, assessing costs, benefits, and community impacts. In spring 2024, the Diridon Station Joint Policy Advisory Board (JPAB) was presented with three design alternatives to consider: elevated, at-grade, and stacked. The JPAB will review the three design options and narrow the selection to two refined alternatives by end of summer 2024.

In San Francisco, the Caltrain Electrification Project launched its electric train service, replacing diesel trains with an electric system. This project, to which the Authority has contributed $714 million, aims to improve air quality, reduce greenhouse gas emissions, and align with California's climate targets. Meanwhile, the Transbay Joint Power Authority Portal Project has secured $3.38 billion in federal funding to extend the Caltrain commuter rail line to the Salesforce Transit Center, serving as a high-speed rail stop.

In Los Angeles, the LinkUS project aims to revolutionize rail travel. It proposes new run-through tracks on an elevated railyard to improve operations, expand capacity, and allow for the arrival of high-speed rail at LA Union Station. The project also envisions a new concourse to enhance train transfer experiences. The Authority committed $423 million to upgrade tracks leading into Union Station in partnership with LA Metro. However, in June 2023, LA Metro informed the Authority of a budget shortfall. Pursuant to the funding agreement executed in 2022, LA Metro and the Authority are working to identify opportunities to optimize the design and construction process for the LA Union Station project and later in 2024 will consider how to proceed.

These projects in both Northern and Southern California demonstrate the commitment and progress in advancing a sustainable high-speed rail network through coordinated planning and implementation efforts.

At a Glance: Chapter 4

- **Net-Zero Construction Emissions**: Our board-level commitment is for net-zero construction. We start by reducing the emissions produced by maximizing the use of efficient equipment.
- **Annual Emissions Tracking**: The Authority tracks the emissions it generates, aiming to achieve net-zero emissions by creating more offsets than emissions during during construction. To date, the Authority has emitted 94,000 $MTCO_2e$ through construction and electricity use. This number is significantly below the 143,000 $MTCO_2e$ sequestered by our tree-planting efforts.
- **GHG Emissions**: The high-speed rail system will operate on 100% renewable energy, reducing California's greenhouse gas emissions by 0.6 to 3 million $MTCO_2e$ annually – this is the equivalent of removing 142,000 to 700,000 cars off the road.
- **Additional Carbon Avoided**: Since the start of construction, the Authority has diverted about 95% of all waste and avoided nearly 128,000 $MTCO_2e$ of emissions in the process. Additionally, the Authority has avoided 348,000 $MTCO_2e$ through its habitat and agricultural conservation efforts.
- **Renewable Energy**: Stations and facilities will be zero-emission and net-positive energy buildings, generating more power than they consume.
- **Operational Energy Costs**: The system's solar and battery storage setup will allow the Authority to minimize energy costs and support grid stability, saving 50 to 75 percent of energy costs.

Chapter 4:
Energy and Emissions

The Authority's mission is to deliver a cost-effective system in operation that is itself carbon neutral and provides essential travel benefit to millions of Californians. The California high-speed rail project is already achieving net-zero emissions in construction and will help clean our air and protect our climate in operation. Before we even began most of our construction work, we gave back to the communities that will be impacted by the construction activity by planting trees and donating cleaner vehicles to offset both climate-warming and air-polluting emissions. Now that we are well into construction, we are zeroing out our emissions through making sustainable design decisions, using environmentally preferable construction materials, and enforcing zero-emission equipment mandates in our construction contracts, and offsetting the remainder.

The Authority's construction fleet is our biggest source of GHG and air quality emissions. While it is among the most advanced for air pollution emissions and fuel efficiency, it still burns diesel fuel and creates emissions, so we have identified pilot opportunities for true zero-emission construction equipment for our next set of construction projects.

In the same spirit, we are committed to zero-emission operation of our trains, and we are advancing the design of the world's first solar- and battery-powered system for high-speed rail. As soon as the first passenger steps on board, high-speed rail operations will begin to reduce California's greenhouse gas emissions by providing a convenient, fast, and zero-emission alternative to driving and intra-state flights.

Our stations and other facilities will be zero-emission, net-positive energy buildings, generating more power than they consume and supporting sustainable development and high-quality jobs in the Central Valley. In addition, as described in **Chapter 3**, our stations will catalyze low-emissions development in communities across the Central Valley.

Greenhouse Gas and Air Polllution Emissions

When we talk about emissions, we are referring separately to GHG emissions and air pollution emissions, although both primarily come from burning fossil fuels.

GHG emissions, which cause climate change at the global scale, consist primarily of carbon dioxide (CO_2). GHG emissions are measured in metric tons of carbon dioxide equivalents ($MTCO_2e$). We offset GHG emissions by planting trees and other methods that pull CO_2 from the air.

Air pollution emissions, which cause asthma and other respiratory illnesses at the local scale, include particulates, sulfur oxides (SOx), and nitrogen oxides (NOx). Air pollutiare measured in tons (1 ton equals 2,000 pounds). We offset air pollution emissions by providing zero-emission vehicles to remove the sources of pollution in local communities. The source of the air pollution emissions we are offsetting is the same as the source of GHG emissions: burning fossil fuels for construction equipment and supplying power to construction and Authority offices. The Authority's construction fleet is our biggest source of both GHG and air pollution emissions. While the construction fleet is among the most advanced for air pollution emissions and fuel efficiency, it still burns diesel fuel and creates emissions. For this reason, we have identified pilot opportunities for true zero-emission construction equipment for our next set of construction projects.

Reporting on Annual Scope 1, 2, and 3 Emissions

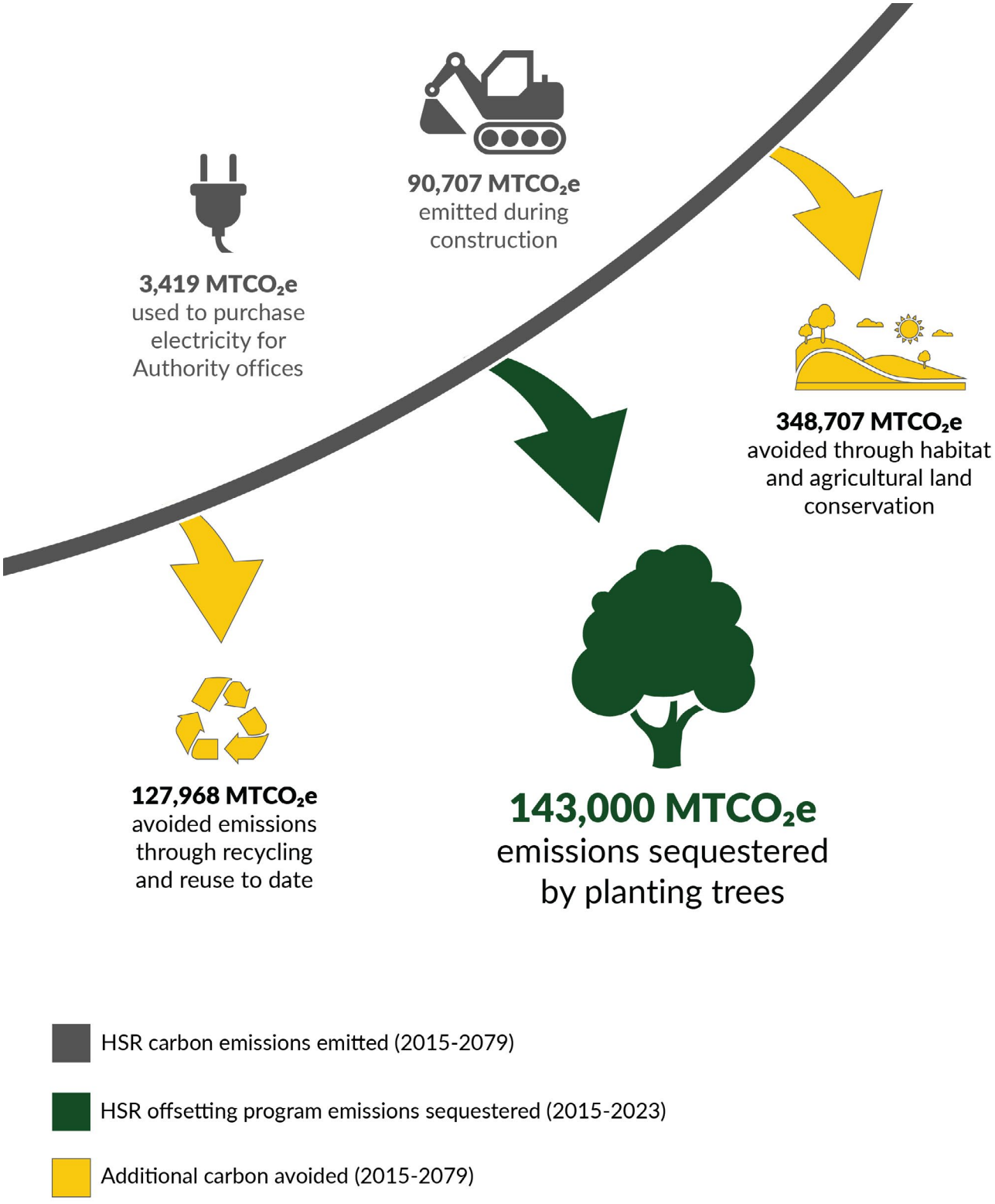
The Authority tracks GHG emissions across three scope areas, in accordance with the Greenhouse Gas Protocol and with reference to ISO 14064 (frameworks to quantify and report GHG emissions):

- Scope 1 are direct emissions from sources owned by the Authority.
- Scope 2 are emissions associated with electricity purchased for Authority activities, such as office electricity.
- Scope 3 are indirect emissions that the Authority has control or influence over, such as emissions from contractor vehicles and contractor office energy use.

The Authority's goal is to achieve net-zero emissions during the construction of the 119 miles of the project by generating more tons of offsets than there are tons of emissions associated with construction activity. Accordingly, at the start of the project, the Authority planted more than 7,100 urban trees and completed more than 1,800 acres of forest replanting, a visionary effort that will sequester more than 143,000 $MTCO_2e$ over the trees' life cycles. This is a first-of-its-kind practice for a statewide infrastructure project of this scale.

Our latest data for emissions were 0 $MTCO_2e$ for Scope 1, 321 $MTCO_2e$ for Scope 2, and 16,085 $MTCO_2e$ for Scope 3. Since the start of construction, when adding together construction-related emissions, our total emissions are 90,707 $MTCO_2e$. This is well below the amount of emissions sequestered through our tree-planting efforts, as depicted in **Exhibit 4.0**.

Exhibit 4.0: California High-Speed Rail GHG Emissions and Carbon-Capture Activities



$MTCO_2e$ = Metric tons of carbon dioxide equivalent

In addition to these offsets, the Authority has conserved thousands of acres of habitat and agricultural land to mitigate environmental impacts, resulting in 348,707 $MTCO_2e$ sequestered and avoided as an additional benefit. Similarly, our construction waste recycling requirements are among the highest for any state infrastructure project and have avoided 127,968 $MTCO_2e$ since 2015. Our 2023 totals include, 4,809 $MTCO_2e$ of avoided emissions from recycling.

Our Sustainability Policy emphasizes other critical measures the Authority takes to decrease our indirect emissions associated with construction, which include:

- Minimizing GHG emissions through design requirements.
- Requiring environmental product declarations (EPD) for construction materials, including steel products and concrete mix designs, to improve transparency and inform the selection of sustainable products.
- Requiring performance thresholds for global warming potential for major materials while maintaining durability and quality requirements.
- Adapting existing structures and facilities for reuse whenever feasible.

We continue to develop embodied carbon emissions requirements for future construction contracts, including aligning with the Buy Clean California Act limits for steel, mineral wool, and flat glass in the construction of the high-speed rail system. Additionally, we continue to update the project's embodied carbon assessment. This process supports our understanding of the relative GHG emissions impact of major project materials and focuses our efforts to lower the embodied carbon emissions of the high-speed rail system.

Reducing Emissions from Vehicle Miles Traveled

Every mile traveled on high-speed rail is a mile of avoided travel by car or airplane, moving California toward its goals of carbon neutrality to avoid the worst impacts of climate change. California's statewide goals include reducing air pollution by 71 percent, GHG emissions by 85 percent and gas consumption by 94 percent. These actions also call for 4 million new jobs to support the state's climate plan.

High-speed rail will contribute to reducing GHG emissions in the state as soon as it starts operating. In the absence of high-speed passenger rail service, vehicle miles traveled for long-distance trips in California are projected to increase between approximately 1.9 billion and 8.5 billion miles per year, for a total of 16 billion and 74 billion miles between 2030 and 2040. With high-speed rail, the annual GHG emissions reductions are projected to be 0.6 to 3 million $MTCO_2e$. based on 2024 Business Plan ridership models. This reduction is equivalent to the annual carbon emissions associated with the energy use of between 77,000 and 372,000 homes – more than the housing stock of San Jose. The cumulative reductions in well-to-wheels emissions over the first 50 years of operations are projected to be between 29 million and 142 million $MTCO_2e$.

The ridership ranges used to develop GHG emission reduction estimates reflect an evolving understanding of potential future scenarios. **Table 4.0** provides GHG reductions based on ridership estimates from the 2024 Business Plan with an additional scenario that reflects the potential GHG emission reductions achieved from the high-speed rail operating at 70 percent of its estimated maximum capacity over the first 50 years of operation (see "Full Capacity" column of **Table 4.0**). This estimate was developed based on the 2019 Equivalent Capacity Analysis Report and additional supporting information.

Table 4.0: Projected Cumulative GHG Well-to-Wheels Emissions Avoided (million $MTCO_2e$)

Years of Operation	2024 Business Plan: Medium	2024 Business Plan: High	Full Capacity
10	5.3	5.7	26.4
20	11.4	12.2	56.3
50	29.4	31.8	142.6

Our methodology to calculate projected GHG emissions was updated in 2024 in coordination with the California Air Resources Board (CARB). This methodology uses the projected mode shift to high-speed rail service in combination with emissions factors that reflect the full lifecycle impacts for gasoline, diesel, and jet fuel tailpipe emissions. Using this analytic technique enables all fuel types to be evaluated on equal terms. Well-to-wheels emissions factors were obtained from the Argonne National Laboratory GREET (Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation) model and applied to the fossil fuel auto and air fleet.

Renewable Energy for Operations

The Authority is focused on delivering a system than can operate cost-effectively. In a world-leading commitment, the Authority will operate its high-speed rail system on 100 percent renewable energy and a net-zero energy basis to maximize energy cost savings. Delivering on this commitment is possible through unprecedented innovation and continuous collaboration across engineering teams to ensure technical reliability and financial savings.

A critical step for the renewable energy commitment has been robust modeling of high-speed rail energy demand. Our train power model considers the dynamic physical implications of the roughly 30-mile stretches of track between traction power substations, each of which have generally independent electrical operations. We modeled train schedules, passenger count, and the varying gradients throughout the train route (i.e., up-and-down slopes) for each section down to the minute to understand the energy demand.

We then integrated energy use with a cost model that includes a multitude of parameters, such as land availability for solar power and battery space, electrical distribution from sites of generation to consumption, battery round-trip efficiency, and solar power decay over time. Financial factors include purchase and installation costs, maintenance costs, and energy value throughout the day.

The final model output helps determine the economically optimal amount of solar power and batteries, and also addresses the Authority's resilience goal of providing power to sustain operations during an outage.

As another risk mitigation measure, the Authority will install cable underground, where possible, to protect the system against the increasing instances and intensity of California wildfires and winds.

Reducing Operational Energy Costs

The Authority's energy use is represented by both the amount of energy we use (measured in kilowatt-hours) and the intensity of our power draw in every 15-minute period (measured in kilowatts). High-speed trains traveling 220 miles per hour demand a lot of power, which would be very expensive if drawn from the California utility grid.

Our renewables and battery systems are designed and sized to provide this amount of power for the train to run on our own power, with enough power banked for a blackout of about six hours.

As sunshine fluctuates throughout each day, our solar power and battery storage system will leverage our connection to the grid by allowing us to purchase energy from the grid only when it is readily available and inexpensive. This minimizes any added strain to the existing utility grid and allows us to capture large savings on electricity costs, as the price of electricity in California continues to rise.

Our innovative energy system will allow us to avoid unnecessary costs by integrating solar power and battery storage. Low-cost solar energy generated through the middle of the day will be stored in batteries and used during afternoon peaks. We anticipate that the system will save between 50 and 75 percent of our energy cost. In addition, by managing our power loads in harmony with California's public utility grids, we will help balance large-scale energy demand and reduce grid outage potential. We may also be able to receive payment for grid services. In the coming year, we plan to explore the feasibility of including additional controllable loads into our energy system such as electric vehicle charging and powering the station buildings to enable further flexibility and system optimization.

Designing Net-Positive Energy and LEED Platinum Facilities

The Authority is working to ensure that our buildings and facilities, like our train operations, help California meet its GHG and air pollution reduction goals. Driven by leading design standards for green buildings, the Central Valley stations will be pillars of connectivity, comfort, and conscious resource use for the communities they serve. Critically, they are designed to be net-positive energy: More than 100 percent of the station's annual energy needs will be supplied by the Authority's own renewable energy sources.

As a first step, we are designing for overall energy load reduction. We have strategically kept air-conditioned areas to the minimum amount necessary to meet passengers' thermal comfort needs, both for the present and for the hotter future driven by climate change. We also included passive design strategies such as controls that dim lights when the level of sunlight is sufficient, and natural ventilation for cooling when exterior temperatures allow. Our systems for lighting, heating, ventilation, and air conditioning are energy-efficient and all electric, so there will be no greenhouse gas emissions from the burning of fossil fuels. For the remaining electricity our stations demand, our renewable energy systems will supply more than the annual amount needed.

Each station will be individually certified under the LEED™ green building rating system for Building Design and Construction, targeting the Platinum level, which is the highest. Building operations will be certified under LEED for Transit Operations and Maintenance after a full year of operations, and our project team is designing to enable achievement of all the LEED Transit operations and maintenance prerequisites. These certifications will show our stations are models for health, comfort, and sustainability for generations to come.

Our current office facilities are also in alignment with our sustainability efforts. The Authority occupies office space in Sacramento in a building that is LEED for Existing Buildings Gold Certified and uses metered lighting and automatic shut-off of computer monitors to minimize energy use.

Achieving Net-Zero GHG Emissions in Construction

The Authority continues to deliver on its trailblazing commitment to achieve net-zero emissions on the construction of the first 119 miles

of the project. Simply put, we have generated more emission reduction through planting trees than we have emitted by burning fuel in our construction fleet. Total construction emissions from 2016 to 2023 were **90,707** $MTCO_2e$, significantly below the 143,000 $MTCO_2e$ of emissions sequestered by our tree-planting efforts as outlined in the beginning of this chapter (see **Exhibit 4.0**). From an efficiency point of view, while our construction activity increased 26 percent in 2023 over the previous year, vehicle fuel energy consumption increased only 17 percent, to 15,863 $MTCO_2e$, including both diesel and gasoline. We are producing 8 percent fewer emissions per gallon than we did last year, and we intend to transition to a zero-emission construction fleet over time, starting with a first-of-its kind pilot project in Fresno.

Electricity consumption for both construction and Authority staff office work was 2,835 MWh. When added to the consumption of 2,635 therms of natural gas for space heating, the combined GHG emissions are 543 $MTCO_2e$. In 2023, contractors reported that approximately 35 percent of their total electricity consumption was sourced from renewable energy. This represents an increase from 32 percent compared to 2022, continuing the trend toward greater use of renewables.

Table 4.1 shows the energy consumed in high-speed rail construction and the associated emissions.

Table 4.1: Energy Consumption and Associated Emissions in 2023

Consumption Type	Energy Unit	Quantity	Emissions ($MTCO_2e$)
Contractor Vehicle Fuel			
Off-Road Diesel	Gallons	724,954	7,380 [1]
On-Road Diesel	Gallons	541,170	5,509 [1]
On-Road Gasoline	Gallons	334,700	2,974
	Total Contractor Vehicle Fuel Emissions		**15,863**
Electricity and Natural Gas			
Construction Office Natural Gas	Therms	2,635[5]	14 [1]
Construction Electricity	MWh	1,415	208 [2,3]
Authority and RDP Office Electricity	MWh	1,420 [4]	321 [2]
	Total Electricity and Natural Gas Emissions		**543**
	Total Emissions Associated with Energy Consumption		**16,406**

1. The Authority reports all greenhouse gas emissions in metric tons of CO_2 equivalent ($MTCO_2e$).

2. Greenhouse Gas Equivalencies Calculator, U.S. Environmental Protection Agency. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

3. eGRID Data Explorer, U.S. Environmental Protection Agency. https://www.epa.gov/egrid/data-explorer

4. Emissions reported include the reduction attributed to the use of 35% renewable electricity for construction.

5. Not all construction office natural gas data available from office management in 2023.

6. Authority Office electricity consumption is estimated based on the number of Authority and Rail Delivery Partner (RDP) staff working on the project in 2023. An estimate is used because RDP staff are dispersed across many firms nationally and internationally; therefore, an actual measurement of the office electricity consumed by RDPs is not possible to obtain.

Protecting Air Quality

California suffers from some of the worst air pollution in the country, and the high-speed rail construction area is in the midst of this crisis. (See "Delivering Clean Transportation in the Central Valley.") The Authority started to clean the air before even starting construction by providing 85 zero-emission tractors, 161 trucks, and a school bus for use in local communities near our alignment. These reductions were developed in conjunction with representatives of local constituencies and executed in a series of Voluntary Emissions Reduction Agreements (VERA) with the San Joaquin Valley Air Pollution Control District that totaled more than $13 million. These vehicles will remain in the region and are anticipated to reduce air pollution emissions by 1,358 tons over their lifetime, an amount far greater than that emitted by our construction fleet so far.

As construction reaches completion in Construction Package 4, the Authority has been able to calculate construction emissions for this 22-mile stretch of the system. From the start of 2017 to the end of 2023, a total of 40.71 tons (sum of NOx, ROG, and PM) were emitted while the total VERA contract for CP4 is 294.46 tons. This is less than 14 percent of the emissions the Authority estimated it would emit during construction of this project section. The savings will be applied to future construction.

> **High-speed rail will provide substantial reductions of air pollutants on an annual basis. Central Valley residents suffer an outsized number of cases of asthma, cardio-pulmonary disease and premature death from the high concentrations of those pollutants. High-speed rail will also help mitigate the worst impacts of climate change, which exacerbates air pollution, illness and death as well as illnesses and deaths from excessive heat. It's a solution we need toward a healthier, resilient California.**
> – Liane Reynolds, Chair of the California Air Resources Board

DELIVERING CLEAN TRANSPORTATION FOR THE CENTRAL VALLEY

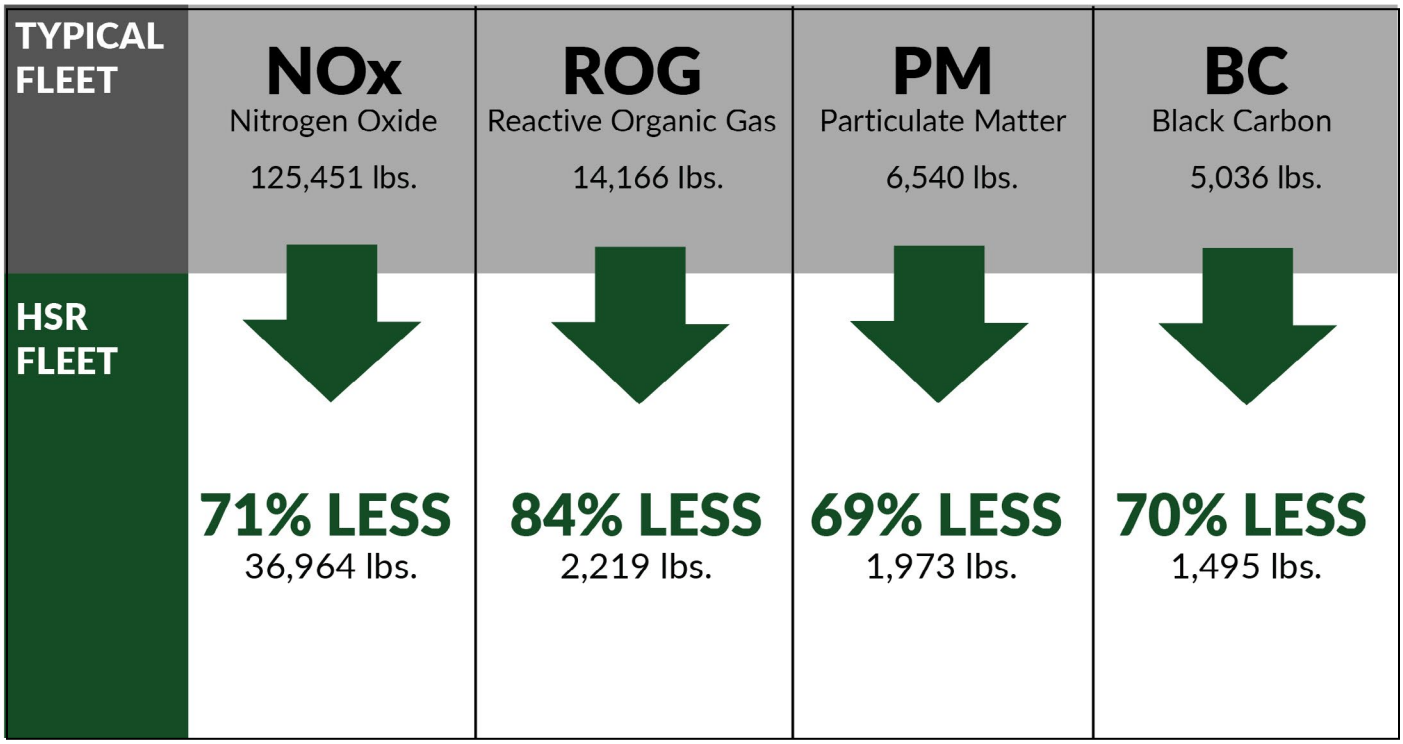
According to the American Lung Association's State of the Air 2023 Report, three California counties hold the top spots in the nation for worst year-round particle pollution: Kern County, Fresno County, and Mono County. Of the top 10 worst cities for year-round particle pollution in the nation, six are in California: the cities of Bakersfield and Visalia are tied for the worst pollution in the nation, with the Fresno-Madera-Hanford metropolitan area right behind.

Air pollution increases the incidence of chronic diseases, particularly for susceptible communities including (but not limited to) children, pregnant women, the elderly, people with underlying health conditions, and people who spend a lot of time outdoors. People of color often face the brunt of these environmental hazards, leading to an unjust distribution of the consequences of poor air quality. The environmental injustices associated with air pollution underscore the importance of delivering truly clean transportation, particularly in the Central Valley and our station communities.

The Authority avoids emitting significant quantities of criteria air pollutants by mandating that contractors use construction equipment meeting Tier 4 standards, the highest emission standards for equipment set by the U.S. Environmental Protection Agency — a requirement that is unique among major infrastructure projects. The Tier 4 mandate continues to push the adoption and use of cleaner off-road diesel engine technology in California in advance of regulatory requirements. Our upcoming zero-emissions vehicle (ZEV) standards further this commitment by requiring contractors to incorporate ZEVs into their vehicle fleets, which will take the small amount of pollution from Tier 4 equipment down to zero.

The Authority reports the emissions of criteria air pollutants including NOx, ROG, PM, and black carbon from the fleets used by our contractors. **Exhibit 4.1** shows the total criteria pollutants emitted in 2023 as compared to a typical fleet. Between 2015 and 2023, on- and off-road vehicles emitted a total of 162 tons of criteria pollutants, including NOx, ROG, PM, and black carbon, which is 72 percent less than a typical California fleet.

Exhibit 4.1: 2023 Criteria Air Pollutants Emitted and Avoided (Typical California Fleet Comparison)



Zero-Emission Construction Goal

As discussed, the Authority currently requires that all off-road construction equipment meet the highest emission standards set by the U.S. Environmental Protection Agency. Beyond those standards, future construction packages will include requirements for contractors to use zero-emission vehicles (ZEV) on construction sites, a first for an infrastructure project of this scale. In addition to reducing emissions and furthering climate goals, ZEVs reduce noise on site.

For upcoming construction work at the Fresno station location, the Authority will pilot a zero-emission work site. The scope of this renovation includes a structural retrofit of the historic depot building and the addition of a plaza connecting the station to Chinatown, downtown, and other surrounding neighborhoods. Implementing zero-emission technology at such a site, which is already integrated into the downtown fabric of the city, will help reduce emissions, noise, air pollution, and disruptions to the local community, and it will serve as a model for the future of sustainable construction.

As of March 2024, the Authority had more than 2,000 pieces of construction equipment registered across the active construction packages. The impact of converting all these vehicles to ZEVs in the coming years will be monumental for reducing emissions and improving local air quality, supporting healthier environments for workers on site and residents in surrounding communities.

For future packages, the Authority will require contractors to use only ZEVs for on-road project fleets. The Authority is also encouraging innovation in ZEV off-road and heavy-duty construction equipment by mandating that our next construction contractors use:

- 10 percent of ZEV off-road equipment by 2030
- 100 percent of ZEV off-road equipment by 2035

The Authority continues to share lessons learned with the California Governor's Office of Business and Economic Development (GO-Biz) and work with the California Air Resources Board (CARB) on understanding market readiness for a variety of ZEV off-road construction equipment to enable its integration on site. In particular, the Authority is looking to advance the use of battery-electric vehicles as well as hydrogen systems for charging construction equipment.

For more information on market readiness for on-road and off-road battery electric vehicles, see CARB's Long-Term Heavy-Duty Investment Strategy and The Beachhead Strategy: A Theory of Change for Medium- and Heavy-Duty Clean Commercial Transportation (a collaboration of CALSTART and CARB).

At a Glance: Chapter 5

- **Commitment to Natural Resources**: The California High-Speed Rail Authority prioritizes the protection of California's unique natural systems and landscapes, aiming to build a high-speed rail system with minimal environmental impact.
- **Habitat Conservation**: Large-scale projects are underway to protect and restore natural habitats affected by the construction of the high-speed rail. The Authority has restored more than 4,400 acres of degraded lands, including 151 acres of wetlands.
- **Agricultural Conservation**: We have protected 3,190 acres of agricultural land. Based on 2023 estimates, 1,654 acres would have been subject to development risk. Since 2019, the cumulative emissions avoided from extinguished development rights from the agricultural easements is 348,700 $MTCO_2e$.
- **Water Conservation**: The Authority implements measures to conserve water resources during construction and operation, ensuring sustainable use of this vital resource. The Authority's water use for construction increased by just more than 20 percent in 2023, while construction activity increased by more than 26 percent in the same period. Ninety percent of the water used was non-potable.

- **Animal Friendly Infrastructure**: The project incorporates wildlife corridors into its structure designs, allowing animals to safely cross under the rail tracks, thus preserving biodiversity. There are more than 600 wildlife crossings in the first 119 miles under construction. We are also included live loop anti-perches into our design to help larger birds perch safely.

Chapter 5:
Natural Resources

California is home to unique natural systems and landscapes that are renowned worldwide, and the Authority is committed to building a high-speed rail system with minimal impact on the environment. Our project is the first and largest infrastructure project to incorporate environmental preservation as a core part of its scope; as such, our work to preserve natural systems goes well beyond state and federal law requirements. This includes incorporating wildlife corridors into structure designs, launching large-scale habitat conservation projects, conserving water resources, planting trees, and protecting agricultural heritage. We aim to serve as an example for other infrastructure projects, as demonstrated in **Exhibit 5.0**, both statewide and globally, to inspire similar environmental outcomes while continuing to stimulate our state's economy and fulfill the needs of future generations.

Exhibit 5.0: High-Speed Rail Natural Resources Protections and Mitigation Measures

Preserved and restored more than
4,490 acres
of habitat

Conserved more than
3,190 acres
of agricultural land

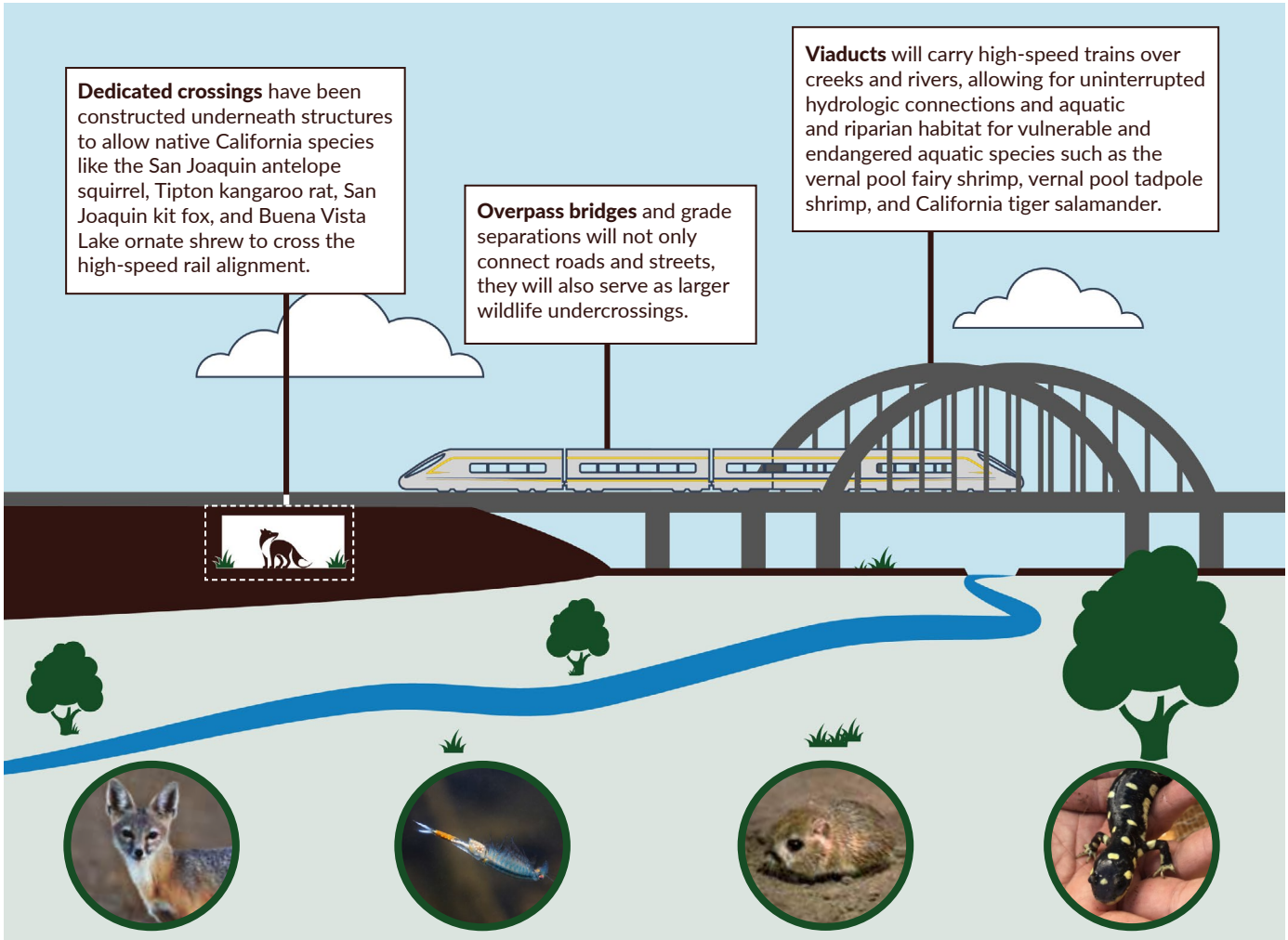
Awarded
$2.5 million
for urban tree planting in disadvantaged communities

90%
of water used for high-speed rail construction in 2023 was non-potable water

Preserving Habitat and Wildlife Corridors

California is home to great biodiversity, but many native species populations have declined in recent years. This is partly due to habitat fragmentation from human development, which limits access to resources such as food, water, and mating partners. To minimize the impacts to important wildlife linkages, a substantial amount of the Central Valley rail alignment was designed and built on elevated viaducts and bridges. This allows for unobstructed passage by animals and waterways. In areas along the alignment that do not have viaducts or bridges, we have planned and constructed dedicated wildlife crossings. These are concrete tunnels located under the tracks to provide animals of all sizes a safe crossing site from one side of the alignment to the other. See **Exhibit 5.1** for each type. There are more than 600 wildlife crossings in the first 119 miles of alignment under construction.

Exhibit 5.1: Protecting Vulnerable Wildlife Habitats



The San Joaquin kit fox is on the federally endangered and state threatened species lists. They live in arid valley and foothill grasslands, sparsely vegetated scrub habitats, and some agricultural and urban areas.

The inch-long vernal pool fairy shrimp lives only in seasonal pools that form when winter rains fill shallow depressions. It was federally listed as threatened in September 1994.

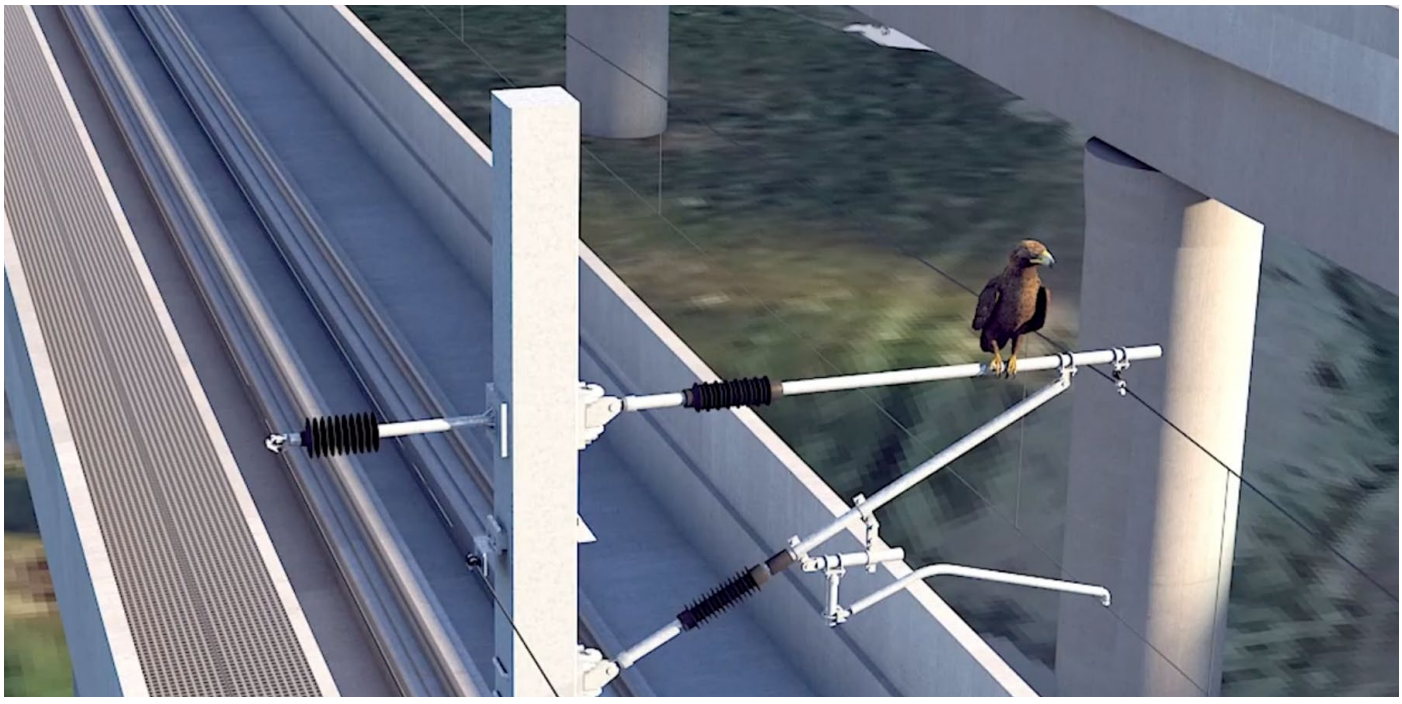
The Tipton kangaroo rat, one of three subspecies of the San Joaquin kangaroo rat, was listed as a federally endangered species in July 1998.

The California tiger salamander is a large terrestrial salamander with a distinct population in Central California. It is on the federal and state threatened species lists.

Another feature of the system is the construction of perches to protect California's large raptors like the critically endangered California condor and the golden eagle. While small birds can harmlessly perch on the overhead catenary systems (OCS), large raptors with wing spans up to 9.5 feet risk creating a lethal electric circuit by touching both the live wire and the grounded pole while perched. In response to this challenge, our engineers developed a novel design concept called "live loop anti-perching" to help large birds perch safely. An illustration of this design is below.

The high-speed rail system is being built on previously open lands. The Authority is mitigating its impact by restoring 4,490 acres of degraded land and preserving it for natural habitat, including 151 acres of wetlands. When we assign a property for mitigation, we make sure the property ultimately offers a habitat of equal or improved quality for special-status species. We achieve permanent protection through conservation easements, either placed on the properties of supportive landowners who maintain property rights, or on property purchased outright by the Authority. We also provide an endowment for long-term management activities such as fence maintenance and vegetation control. In partnership with regulatory agencies, we monitor the properties annually to verify the criteria for the restoration work are being met. These mitigation projects are primarily located near the Central Valley alignment and were selected to maximize their benefit to endangered species. For example:

- The selected sites lie in wildlife movement corridors.
- Some of the sites are adjacent to other conserved areas.
- The land contains distinctive, high-quality habitats for a variety of plants and animals, including many threatened and endangered species.
- The acreage gives the Authority the opportunity to restore additional habitats



Rendering: The live-loop anti-perching design will keep larger birds safe on the high-speed rail infrastructure.

SUPPORTING CALIFORNIA'S 30x30 EFFORTS

Governor Newsom's "30 by 30" Executive Order N-82-20, issued in October 2020, lays out the ambitious goal to conserve 30 percent of California's lands and coastal waters by 2030, with a strong focus on biodiversity conservation, expanding access to nature, and enhancing climate change resilience through collaborative action with partners statewide.

The high-speed rail project supports the state's 30x30 initiative, which is an effort to conserve 30 percent of the state's lands and coastal waters by 2030. Our mitigation projects span more than 4,490 acres and, in collaboration with California's natural resources agencies, focus on protecting and enhancing biological resources, including several protected species. This is achieved by the establishment of Permittee Responsible Mitigation (PRM) sites, ensuring the protection of habitat for listed species in perpetuity in partnership with California's natural resource agencies. Overall, this collaboration illustrates a multifaceted approach to conservation efforts in California.

Conserving Agricultural Land

The Authority collaborates with the Department of Conservation (DOC) to conserve agricultural land to mitigate impacts to farmland caused by high-speed rail construction. DOC's Agricultural Land Mitigation Program (ALMP) works with state agencies and local nonprofit land trusts and other entities to identify and permanently protect important farmland by acquiring conservation easements from supportive landowners.

The aim of the ALMP is to conserve farmland equal to the quantity and quality of farmlands converted for high-speed rail, at a replacement ratio of no less than 1:1. In other words, for every acre of farmland converted to transportation use, the ALMP will conserve at least one acre of farmland of equal quality within the same agricultural region. To date, the Authority has protected a total of 3,190 acres of farmland through conservation easements.

The DOC routinely reports on the GHG benefits of agricultural conservation projects. Specifically, the DOC quantifies the avoided future GHG emissions from vehicle miles traveled (VMT) that would result from conversion of at-risk farmland to developed land. Of the 3,190 acres protected by the ALMP on behalf of the Authority in 2023, the DOC estimates 1,654 acres would have been subject to development risk. Since 2019, the cumulative emissions avoided from extinguished development rights from the agricultural easements is 348,700 $MTCO_2e$.

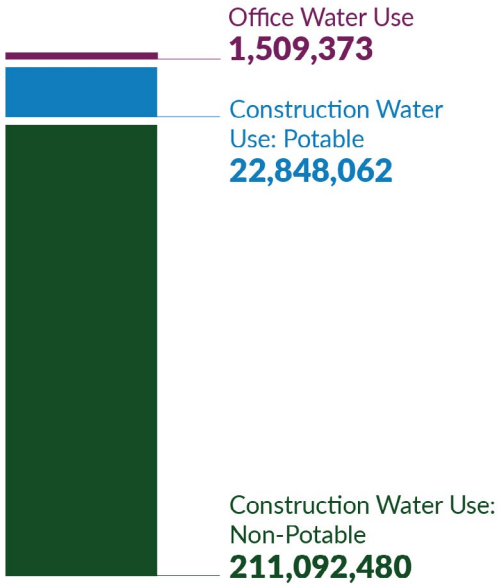
High-speed rail is a game-changer for California. It will serve as the backbone of our clean and green transportation future, providing a fast, safe, 100 percent renewable option for moving around the state. It will also help us reduce air pollution, traffic congestion, and carbon emissions. We're proud at the California Natural Resources Agency to support this vital environmental project." – Wade Crowfoot, Secretary for the California Natural Resources Agency

Water Conservation During Construction

California's water resources are fundamentally threatened by climate change. Severe weather, swinging from drought to extensive wet winters, creates a future of uncertainty that requires everyone to be responsible stewards and conserve water where possible. The Authority monitors its water usage both in the field for the construction of the high-speed rail system and in our offices. Additionally, the Authority's comprehensive Environmental Impact Reports (EIR) and Environmental Impact Statements (EIS) for each project segment include an assessment of water consumption and detailed projections of water required for construction. The Authority tracks water consumption by contractors every month and compares that consumption every quarter against the estimates developed as part of the environmental management process.

Our largest water use is in construction, primarily for dust control, and while it is growing in absolute terms, we are getting more efficient. Our construction water use increased by just over 10 percent in 2023 compared to 2022, as shown in **Exhibit 5.2**, but construction activity levels increased by more than 26 percent. Non-potable water, not meant for human consumption, accounted for 90 percent of the total water used for construction in 2023. Unfortunately, all water used for construction is being drawn from water-stressed areas, as the entire construction area is water-stressed. Currently, at our (non-construction) offices, water use is minimized with low-flow, automatic shut-off sink fixtures and low-flow toilets. Compared to last year, we have decreased our office water consumption by 19 percent.

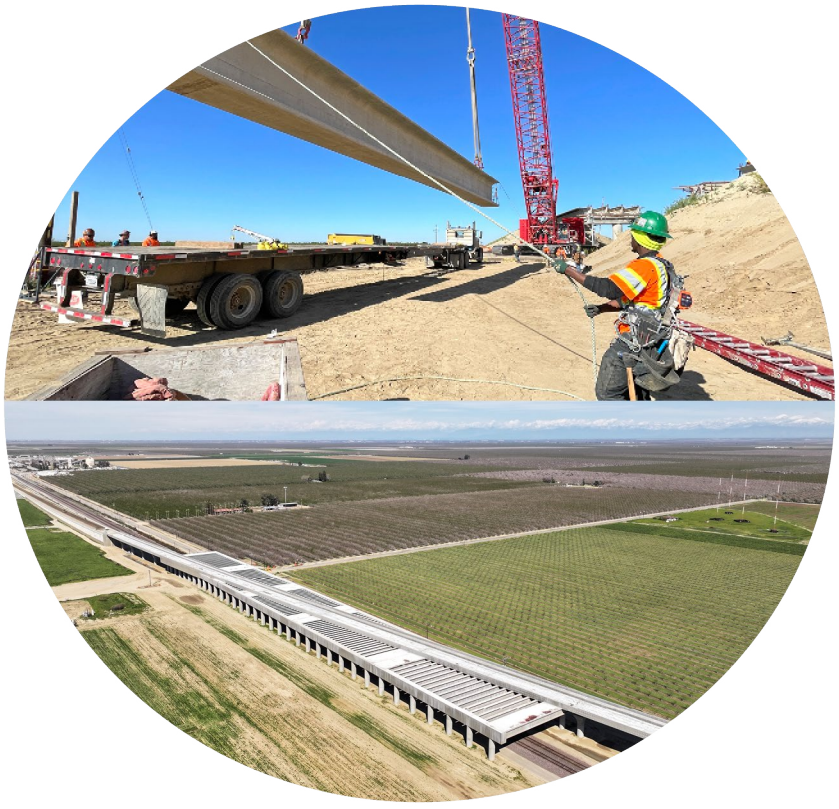
Exhibit 5.2: Water Consumption (in Gallons)



In the short-term, the Authority looks for every opportunity to conserve water resources with improved efficiencies in dust control during construction, high-efficiency fixtures in offices, and opportunities to replace potable water consumption with recycled sources. These water uses are temporary, and once operational the system will not require large volumes of water or impact water security for the region. The design requirements for Authority facilities, including maintenance facilities, require water-efficient fixtures as well as water reuse and use of gray water where available.

At a Glance: Chapter 6

- **Sustainable Infrastructure Principles**: The Authority developed a set of principles to guide the design, construction, and operation of the high-speed rail project, emphasizing sustainability and aligning with global best practices and California state regulations.
- **Envision Certification**: Phase 1 of the high-speed rail project has been awarded a Platinum rating through the Envision certification process. We continue to maintain our Platinum rating as we advance design of the Central Valley stations and Merced and Bakersfield extensions.
- **Disclosure on Major Materials**: The Authority requires Environmental Product Declarations (EPDs) for construction materials to identify and reduce the global warming potential of materials used in public works projects.
- **Climate Adaptation and Resilience**: The project integrates climate adaptation principles into its design and construction, using the latest climate data to ensure resilience against hazards like floods, wildfires, and extreme heat.
- **Worker and Community Safety**: The Authority prioritizes the safety and wellbeing of workers, contractors, and communities, achieving lower injury rates and lost days compared to state benchmarks.
- **Community Benefits**: High-speed rail stations will serve as community resources with green spaces and connectivity features, and grade separations will improve safety, reduce emissions, and enhance access to jobs and services.



Chapter 6:
Sustainable Infrastructure

The Authority is delivering the rail system as a model of sustainable infrastructure, relying on trusted methods and innovation to accomplish this once in a generation project. We are recognized as the largest and highest-rated project within the Envision rating system from the Institute for Sustainable Infrastructure. We achieved this status by constantly advancing our standards across all aspect of design, construction, and system operations. Our procurement standards for our materials supply chain demand the highest available level of environmental impact reporting and management, and we are advancing a new sustainability policy for all other procurements as well. At the other end of the supply chain, we have successfully recycled more than 95 percent of all materials that could have gone to landfill, avoiding more than 300,000 tons of waste to date.

Our forward-thinking approach literally includes the future in our plans for climate change. Through our robust climate change adaptation program, we are ensuring that our system will be able to operate even as climate change makes weather patterns more extreme and unpredictable. High-speed rail infrastructure is also an invaluable new tool for emergency response, as we saw when our alignment was used to help move emergency vehicles for flood rescue and response in early 2023. More broadly, our infrastructure is all about safety and health. We have a remarkably low rate of injuries compared to other major infrastructure projects in the United States, and shifting travelers from driving to riding high-speed rail is one of the biggest community safety measures California could implement. Even in advance of passenger service, we have built grade separations in the Central Valley and Southern California that have already improved safety for Californians in all modes of transportation.

Designing with the Authority's Principles for Sustainable Infrastructure

The Authority defines sustainable infrastructure through our principles that commit the design, construction, and operation of the system to a comprehensive sustainable approach. Our principles, adopted in 2016, are drawn from global best practices, stakeholder priorities, and California state regulations. They are:

- Use 100 percent renewable energy.
- Achieve net-zero GHG and criteria pollutant emissions in construction.
- Require Environmental Product Declarations for construction materials.
- Design net-zero energy and LEED Platinum high-performance facilities.
- Recycle all steel and concrete in construction.
- Integrate climate adaptation and resilience principles into design, construction, and operation.
- Protect air quality during construction and operations.
- Maximize station access for pedestrians, cyclists, and transit riders.

Envision

The Authority is proud that Phase 1 of the high-speed rail project has been awarded a Platinum rating, the highest level of Envision certification. Envision is a rating system for the sustainability of infrastructure projects that addresses a wide set of sustainability concerns, from environmental protection and climate change to social benefits for disadvantaged communities, good governance, and community engagement. The Platinum award acknowledges our ambition and execution in meeting the highest environmental and social sustainability standards in our work to date and what we have planned for the future.

As part of our commitment to maintain our Platinum certification, our design teams working on the Central Valley stations and the Merced and Bakersfield extensions have detailed Sustainability Management Plans and Envision Plans in place. Simultaneously, we have been incorporating lessons learned from completed construction projects to enhance our data collection processes, enabling us to manage the extensive information required to demonstrate our compliance with the Envision program.

Procurement and Supply Chains

Truly sustainable infrastructure depends on the procurement of materials from a low-emissions supply chain. A low-emissions supply chain looks at both the production and transportation of materials. For example, the production of cement involves heating limestone, clay, and other materials in a kiln. This heating process from non-renewable fuels releases carbon emissions, often called "embodied carbon." That cement is then shipped from the factory to the job site on vehicles and/or other transportation methods that burn fossil fuels, creating further carbon emissions. The opportunity to lower emissions arises from considering the entire lifecycle of the materials used in constructing infrastructure, including production and transportation.

The Buy Clean California Act (BCCA) mandates the use of Environmental Product Declarations (EPDs) to identify and lower the global warming potential of construction materials, such as steel and glass, used in public works project. The Authority has fully adopted BCCA in our Design Criteria Manual and our requirements in future contracts. The manual presents standards and guidelines for the design, construction, and operation of high-speed railways based on international best practices.

The BCCA does not place limits on greenhouse gas emissions related to concrete and cement, which are the largest sources of embodied carbon for the Authority, so our Design Criteria Manual goes beyond BCCA to include maximum limits on global warming potential for our concrete mixes. We are also researching additional methods to reduce the impact of construction with precast and cast-in-place concrete. We require our current group of design contractors to produce Embodied Carbon Plans within their broader Sustainability Management Plans to identify the most promising strategies for emission reduction.

To continuously analyze and improve our material supply chains from a lifecycle perspective, we are finalizing a new Sustainable Procurement Policy (POLI-1101) to ensure the alignment of all our procurement practices with our environmental, social, and governance (ESG) priorities. This policy will apply not only to the materials procured for construction but also to all procurement activities within the planning, design, construction, operations, maintenance, administration, and management of the high-speed rail system.

Recycling Construction Waste

Sustainable infrastructure may start at the beginning of the supply chain, but it also must account for what happens at the end of the supply chain: waste. Construction waste sent to landfills generates disposal costs, consumes valuable land, and produces GHG emissions, while diverting waste from landfills through recycling avoids those costs and land impacts and reduces those emissions.

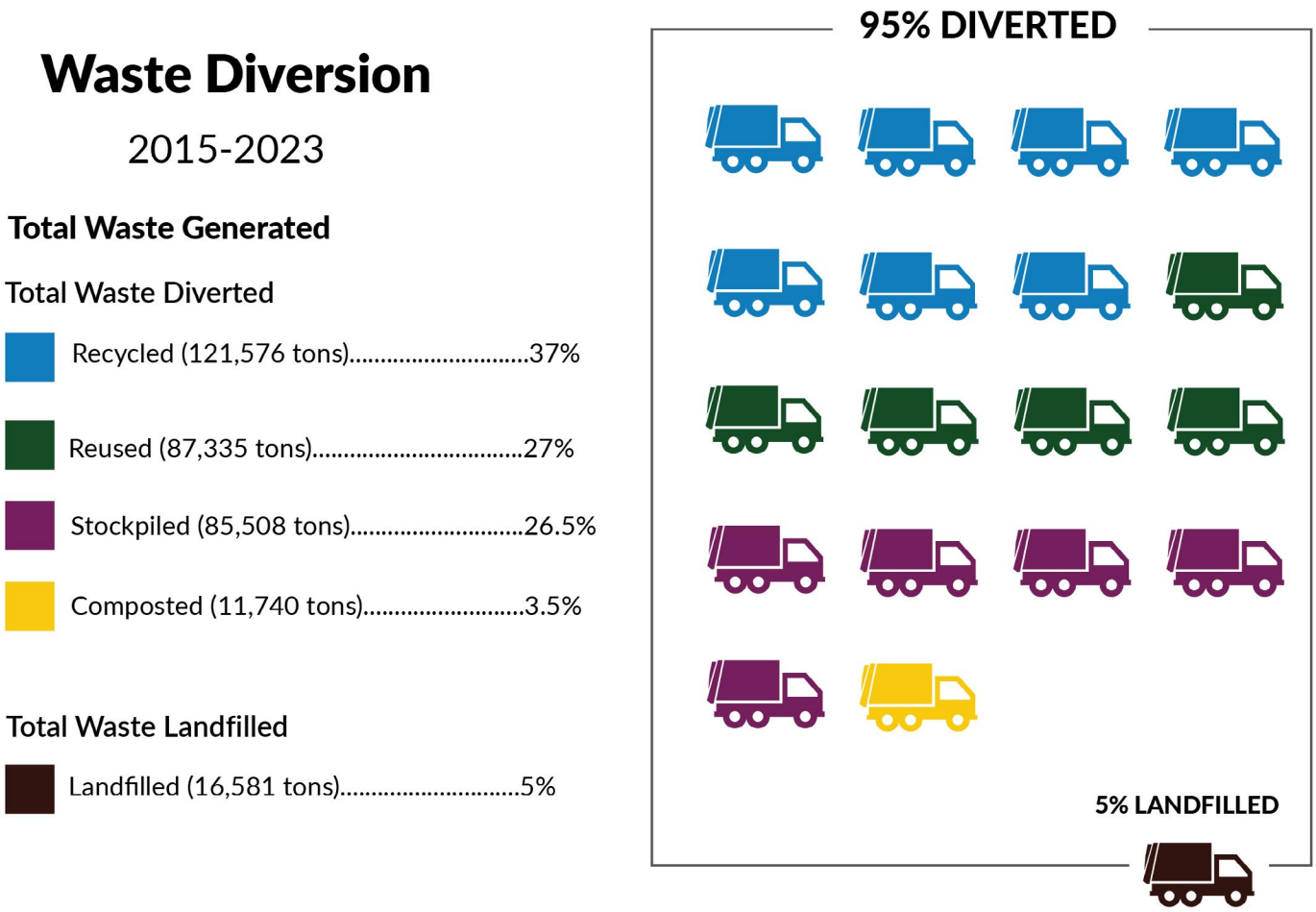
The Authority's design criteria include ambitious construction waste diversion rates, including the following requirements:

- 90 percent of overall construction and demolition waste must be diverted from landfills.
- 100 percent of concrete and steel must be diverted from landfills.

To measure progress toward our diversion commitment rates, the Authority tracks the amount of waste produced and diverted from landfills for each construction package and contractor. In 2023, the Authority diverted 72 percent of total waste from landfills, including more than 1,000 tons of concrete, 935 tons of metals, and more than 145 tons of wood that were recycled. In total, 3,198 tons of waste were diverted from landfills across the active construction sites this year, as shown in **Exhibit 6.0**. Since the start of construction activity in 2015, we have diverted about 95 percent (306,159 tons) of all waste and have sent about 5 percent (16,581 tons) to landfills.

These recycling efforts avoided the emission of 4,809 $MTCO_2e$ in 2023 and more than 127,968 $MTCO_2e$ over the entire construction time frame. The total amount of waste handled by the Authority in 2023 was much lower than in previous years (4,445 tons in 2023 vs. 74,600 tons in 2016) as we have transitioned from material-intensive site preparation work, with extensive earth-moving and demolition, to more focused construction activity in our current work areas.

Exhibit 6.0: Non-Hazardous Materials Composition (in tons), 2015-2023



Designing Our System to Adapt to Changing Climate

Climate hazards are a known and increasing reality. The Authority has proactively responded, constructing critical public infrastructure that will serve residents now and in the future. This year, we successfully incorporated updated climate data, completed multiple risk assessments, and integrated resilience-based design practices into our design efforts. These measures ensure our system can withstand climate hazards such as floods, wildfires, and extreme heat.

A key focus of our climate resilience and adaptation project involves using the best data from the latest climate science. Our Climate Adaptation Plan is based on Cal-Adapt, which offers peer-reviewed datasets that illustrate how various climate change hazards might impact infrastructure planning and design in California. In the past year, we collaborated with other state agencies, including the Office of Planning and Research, which leads California's Fifth Climate Change Assessment, to certify our data and tools are both consistent and up to date.

By applying this data to climate risk and resilience assessments for the Authority's current and future assets, we established models that others can reference and replicate. Our design efforts are guided by these findings. For example, we are using different future climate scenarios, based on global climate models, to assess the impacts of flood, wildfire and extreme heat in the track alignments currently being designed. This allows us to design and implement mitigation measures such as raising the height of bridges, track, and other foundational elements to avoid higher floods in the future, designing systems to withstand higher temperatures, to ensure the resilience of the high-speed rail.

We are also designing the first four stations in the Central Valley with end-of-century (2100) climate projections in mind. This proactive approach led designers of mechanical equipment and cooling systems to develop strategic plans for adapting to future rising temperatures. Additionally, these stations are being designed to function not only as train stations but also as part of the surrounding communities' resilience network, serving as resilience hubs. We are exploring cost-effective upgrades to enhance these hubs, ranging from serving as short-term emergency refuges with essential services to functioning as long-term, high-capacity emergency shelters for weather events like heat waves and floods, offering broad community services and extensive backup systems.

Turning ambitious goals into implementable design strategies in a project of this scale requires constant, close, and intentional collaboration. To foster cross-agency and cross-project problem-solving and share solutions, our Climate Resilience and Adaptation team convenes a quarterly Climate Adaptation and Implementation Committee (CAIC) Working Group. Attendees include members from our Planning, Engineering, Operations, Program Delivery Support, and Sustainability teams. The Authority provides this open forum to expand the understanding of climate science and policies across the organization, identify and collect common challenges early, and come up with integrative solutions.

The Authority's Climate Adaptation and Resilience team has been actively contributing to the state's Climate Adaptation Strategy, focusing on integrating climate resilience into project design and developing timely metrics to measure success. One of the key priorities is enhancing public health and safety to mitigate rising climate risks by considering future climate impacts in governmental planning and investment decisions. To measure progress, a series of metrics have been implemented, including:

- The number of climate hazard assessments conducted.
- The number of mitigation actions taken as a result of those assessments.
- Revised guidelines to improve how climate hazards are evaluated.

These metrics will serve as a benchmark to determine the performance and achievements of the project.

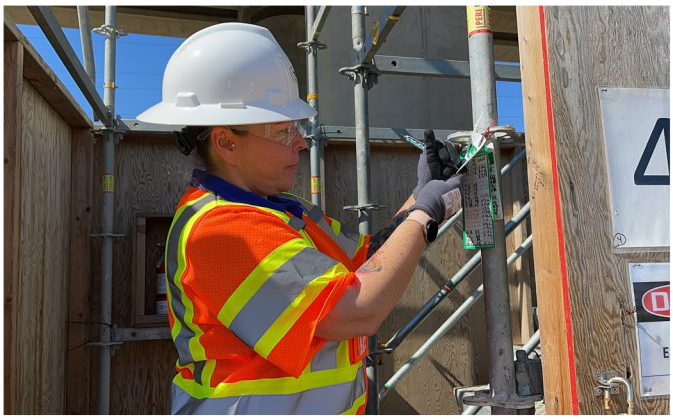
Protecting Health and Safety of Workers and Communities

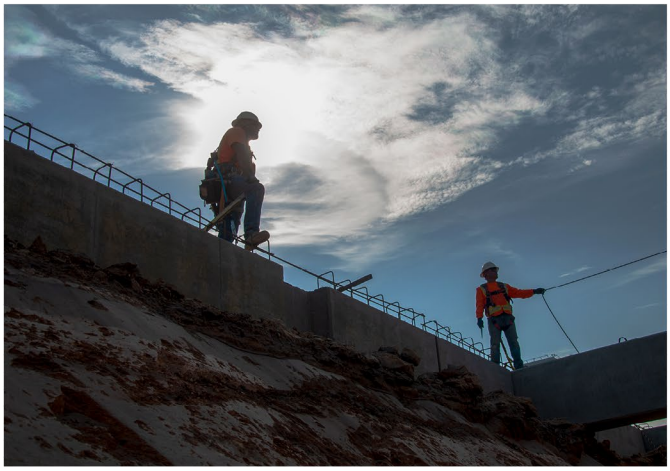
The Authority continues to prioritize the creation of safe, equitable, and accessible environments for its employees, contractors, first responders, ridership, and the public. We operationalize these commitments in part through our Safety and Security Management Plan (SSMP), which was developed through consultation with Authority staff, local communities, law enforcement, and first responders. On site, our rates of injury and lost days continue to be lower than California benchmarks. As the Authority proceeds with station design and procurement of trainsets, the well-being of workers and communities along the rail corridor continues to guide our decisions.

Safety and Well-Being in the Workplace

Protecting workers on-site is a key priority for the Authority. As shown in **Table 6.0**, we monitor injury and lost days rates, both of which in 2023 were significantly lower than comparable metrics for the construction industry statewide.

To support the well-being of workers, staff, and their families, the Authority encourages the use of Employee Assistance Programs (EAPs), which are available to all State of California employees and their dependents. Our Equal Employment Opportunity officer works to ensure no discrimination occurs based on race, age, culture, gender, ability, or any other socio-demographic factor. The officer monitors an ethics violation hotline and investigates discrimination complaints, oversees reasonable accommodation processes, and provides monthly ethics and anti-discrimination training to employees.





Photos: On high-speed rail worksites, our rates of injury and lost days continue to be lower than California benchmarks.

Table 6.0: Worker Health and Safety

	2023	State Benchmark
Injury Rate		
CP 1	2.2	-
CP 2-3	1.65	-
CP 4	0.71	-
Weighted Overall Average	1.43	1.8
Lost Days Rate		
CP 1	0.5	-
CP 2-3	7.2	-
CP 4	0.2	-
Weighted Overall Average	4.65	1.4
Fatalities		
Overall	0	-

Safety and Well-Being as a Rider

We are committed to providing a safe, comfortable, and healthy passenger experience for high-speed rail riders, setting a new standard for transit service in the United States.

Along with achieving LEED Platinum Certification, which includes extensive measures to protect occupant health and safety, the high-speed rail stations will incorporate requirements to procure healthy materials. The station designs will also incorporate Crime Prevention Through Environmental Design (CPTED) requirements, which promote well-lit spaces with good visibility to deter crime and promote positive social interaction. Fencing and signage will support easy navigation and improve accessibility while maintaining security.

During the trainset procurement process, the Authority and its operating partners have been collaborating with suppliers to explore innovations in trainsets and enhance the passenger experience. Our trainset RFP included pioneering criteria for materials and ventilation systems to ensure high indoor air quality. Additionally, we conducted extensive stakeholder outreach to gather feedback on prototype interior designs. These partnerships will enhance our ability to deliver the most comfortable rail experience.

Our trains are designed with safety as a top priority and will feature Positive Train Control, a state-of-the-art system that monitors speeds, regulates distances between trains, and can automatically slow down or stop trains to prevent collisions. Our hazard warning system addresses intrusion, high wind, high temperature, and high water. It also includes an early earthquake warning system that detects earthquakes before they happen, allowing trains to stop and safety measures to be implemented.

Safety and Well-Being in the Community

High-speed rail will make California a safer and healthier place. By encouraging a major transportation mode shift from passenger vehicles to rail, we will have less congested roads and fewer miles driven. This will reduce GHG emissions and avoid traffic fatalities associated with car travel. At the community level, high-speed rail stations will serve as community resources with green spaces, site elements for neighborhood connectivity, and design considerations to operate as potential community resilience hubs.

Renderings: Interior train illustrations depict potential seating options, on-board bicycle storage, a café, and a family area.

Grade separations are another way Authority investments are improving safety. In the Central Valley, the high-speed rail system will be fully grade-separated, which is critical to safely running the trains at more than 200 miles per hour in this region. In areas where we are located alongside existing railways, our grade separations include the existing tracks, achieving safety benefits even before high-speed trains start running. Grade separations produce practical, environmental, and economic benefits for community members and prevent the tracks from contributing to isolation of disadvantaged communities.

Benefits include:

- Improved safety for pedestrians and bicyclists, who will not interface with the rail on any pedestrian and bike routes.
- Reduced greenhouse gas emissions and air pollutants from idling vehicles.
- Reduced noise due to the decreased need for audible signals such as train horns.
- Improved train operation reliability and safety.
- Improved access to employment centers and jobs.

In Southern California, the Authority has contributed $76.7 million to Los Angeles Metro toward the Rosecrans/Marquardt grade separation project to eliminate one of the most hazardous rail crossings in the state.

Photo: The Rosecrans/Marquardt grade separation project in the Southern California city of Santa Fe Springs has improved traffic safety.

Whitley Avenue Underpass in Kings County

Chapter 7:
Sustainability Management and Policy

The Authority is responsible for planning, designing, building, and operating the first high-speed rail system in the nation which will connect the megaregions of the state boosting economic development and create a cleaner environment. When Phase 1 is complete, trains will run from San Francisco to the Los Angeles basin in less than three hours at speeds reaching 220 miles per hour. In Phase 2, we will extend the system to Sacramento and San Diego, creating an 800-mile rail network with up to 24 stations. In addition, under the direction of the California State Transportation Agency, the Authority is working with other state and regional partners to implement a statewide rail modernization plan that will invest billions of dollars in local and regional rail lines to meet the state's 21st century transportation needs.

We are headquartered in Sacramento, California, and operate in the United States of America. The Authority is a California state department established pursuant to the California High-Speed Rail Act (SB 1420, Chapter 796 of the California Statutes of 1996) to develop and implement high-speed intercity passenger rail service. It is under the California State Transportation Agency, which is under the direction of Transportation Secretary Toks Omishakin. No significant changes occurred in the Authority's structure or ownership during the reporting period.

Acknowledgments

Thanks to all our federal, state, regional, and local partners, as well as to our environmental and community nonprofit and advocacy partners who contributed to this report and with whom we are delivering California's high-speed rail system.

Our Management Approach

The Authority is committed to accountable governance, guided by effective policies, with transparent reporting to our stakeholders. This report has been prepared in accordance with the Global Reporting Initiative (GRI) Standards, the world's leading and most widely adopted sustainability reporting framework that addresses environmental, social, and governance issues.

This report covers the California High-Speed Rail Authority (Authority) and its activities from January 1, 2023, to December 31, 2023, except where indicated. The Authority is the only entity included in its consolidated financial documents. This report is updated on an annual basis; our previous report was published in 2023 and covered the 2022 calendar year.

There have been no significant changes in the reporting scope or boundaries. The scope and boundaries of all material topics are summarized in the Materiality Assessment.

The intended audience for this report includes members of the California State Legislature, station cities, and other stakeholders. The contents of this report have not been externally assured, unless otherwise noted.

This report looks backward when highlighting the progress we made in 2023 toward advancing our sustainability policies and commitments. It looks forward when discussing how our policies and practices will affect California in the future.

Our Values

We are committed to delivering high-speed rail and achieving our mission in a way that reflects our highest values:

- **Sustainability:** Deliver a system that maximizes benefits to priority communities, protects resources, and serves in the transition to a low-carbon economy.
- **Transparency and Engagement:** Engage and consider input from the public and our stakeholders in an authentic dialogue to provide information about program achievements, milestones, and challenges.
- **Diversity:** Develop and support a diverse workforce fully capable of delivering this transformative project.
- **Safety:** Prioritize the safety and security of our workers, employees, and customers.
- **Stewardship:** Protect and conserve public and environmental resources dedicated to this project.
- **Performance:** Use specific performance measures to track progress, and support the development of, a robust culture of program delivery and accountability.

Our Mission Statement

The Authority's mission is to deliver an electrified high-speed rail system, which will provide critical mobility and serve as a foundation for California's sustainable development. Our commitment is also to employ leading methods during construction to make the country's largest infrastructure program a model for sustainable delivery. A project at the scale of the California high-speed rail system — more than 500 miles and connecting more than 20 million people — provides opportunities to shape industries and set new public policy precedents.

Our Sustainability Policy Statement

The Authority will deliver a sustainable high-speed rail system for California that serves as a model for sustainable rail infrastructure. The Authority has developed and will continue to implement sustainability practices that inform and affect the planning, siting, designing, construction, mitigation, operation, and maintenance of the high-speed rail system.

Our Sustainability Policy, signed in September 2013 and last updated in 2020, summarizes our sustainability objectives, identifies specific commitments, and serves as a framework for strategically identifying directed, cost-effective approaches. The policy applies across all aspects of the design, construction, operations, and governance of the high-speed rail program.

The policy, which honors several industry sustainability and stakeholder commitments, includes the following objectives:

- Minimize impacts to the natural and built environment.
- Maximize safety and reliability.
- Encourage walkable land development around transit stations.
- Increase ridership and revenue.
- Help California reduce resource consumption, traffic and airport congestion, and energy dependency in a cost-effective manner over the entire lifecycle of the high-speed rail system

To help guide our work, the Authority conducts stakeholder materiality assessments to quantify the relative significance of environmental, social, and governance issues relevant to our project. By following the latest Global Reporting Initiative (GRI) reporting standards, we ensure this report accurately reflects our adherence to these assessments and our dedication to transparency.

Our latest materiality assessment was conducted in 2022, showcasing the Authority's focus on GHG emissions management; air, land, and water pollution; and socioeconomic equity remain essential. Actions related to economic development and employment are also among the most significant issues for stakeholders, as are transparency and accountability, and health and safety. The stakeholders involved in this assessment process encompassed executive staff, board members, external-facing staff, state agencies, non-governmental organizations, businesses, and representatives from higher education. For further details about the materiality assessment, refer to **Chapter 1** of the 2023 Sustainability Report.

Our Sustainability Priorities and Commitments

Authority staff and stakeholders have identified five sustainability priorities. Each chapter in this report represents one priority:

- **Economic Development (Chapter 2)**: This priority focuses on responsible leadership and management, transparent practices, and sound business planning.
- **Station Communities and Ridership (Chapter 3)**: This priority refers to collaborative planning activities that promote transit-oriented development and sustainable land use decisions that will help bring riders into the system, encourage and promote proximity to education, health, and business institutions, and provide ancillary consumer-concession services.
- **Energy and Emissions (Chapter 4)**: This priority addresses the conservation and type of energy resources used to construct and operate the rail systems and the tracking and minimization of emissions (both greenhouse gas and criteria air pollutant emissions) associated with both construction and operation.
- **Natural Resources (Chapter 5)**: This priority focuses on the environment and its resources, addressed in and within ecological systems.
- **Sustainable Infrastructure (Chapter 6)**: This refers to the principles and actions in planning, siting, design, construction, mitigation, operation, maintenance, and management of infrastructure that reflect a balance of social, environmental, and economic concerns.

In **Tables 7.0** through **7.4**, each priority is broken down into its commitments. Each chapter reports on our progress toward that commitment. Progress on each commitment depends on project phase, and therefore not every commitment is reported on in each annual report.

Table 7.0: Commitments for Economic Development and Governance

Economic Development
Improve the economic value of the system to Californians and maximize benefits to disadvantaged communities.
Implement 30% overall small business participation goal for Authority contracts, including 10% Disadvantaged Business Enterprises (DBE) participation and 3% Disabled Veteran Business Enterprises (DVBE).
Maximize opportunity for private investment and private-sector operations
Achieve a self-sustaining financial structure.
Govern transparently and accountably.
Continuously improve program delivery and management.

Table 7.1: Commitments for Station Communities and Ridership

Station Communities and Ridership
Implement livable development patterns in station areas and reinforce quality of life through design of the built environment.
Reinforce infill development and affordable housing through station area planning partnerships; identify a mechanism to fund two-to-one replacement of low- and moderate-income housing stock.
Provide convenient station access and appropriate station interfaces to all high-speed rail station areas.
Connect local and regional transit to high-speed rail stations.
Implement active transportation facilities for station access (walking and bicycling).
Design and construct stations and infrastructure that reinforce sustainable community strategies, as required by state law.

Table 7.2: Commitments for Energy and Emissions

Energy and Emissions
Achieve net-zero greenhouse gas and criteria air pollutant emissions in construction.
Strengthen public health by improving air quality.
Require 100% zero-emission vehicle (ZEV) fleets in future infrastructure and construction contracts.
Operate the system on 100% renewable energy.
Reduce operational energy costs.
Build net-zero energy and LEED Platinum facilities.
Reduce vehicle miles traveled.

Table 7.3: Commitments for Natural Resources

Natural Resources
Conserve, maintain, and restore habitat and wildlife corridors through landscape-scale mitigation
Retain, protect, and enhance the environmental quality and biodiversity of high-speed rail project area.
Conserve agricultural land.
Reduce the demand for virgin natural resources by using recycled materials.
Practice on-site water conservation.
Work toward net-zero water operations.

Table 7.4: Commitments for Sustainable Infrastructure

Sustainable Infrastructure
Design and construct the system in conformance with the Authority's Principles for Sustainable Infrastructure.
Consider climate change risks and vulnerabilities and proactively plan for them by incorporating climate adaptation measures into system design.
Protect the health and safety of workers and communities during construction.
Operate the system in conformance with the Authority's Principles for Sustainable Infrastructure.
Protect the health and safety of workers, customers, and communities during operation.

Our Implementation Plan

The Sustainability Implementation Plan guides us to organize how our sustainability priorities are matched with specific implementation actions. The plan translates the broader aspects of the Sustainability Policy into itemized, actionable tasks with measurable performance indicators and metrics.

Our Reporting Protocols

To communicate our work transparently to stakeholders, we regularly report on progress toward our sustainability commitments. Every quarter, we report on the status of our net-zero criteria air pollutant emissions commitment to the San Joaquin Valley Air Pollution Control District. Twice every year, we report on the status of our greenhouse gas emissions to the California Air Resources Board (CARB). Once every year, we publish our annual Sustainability Report (this document), describing the status of our sustainability commitments overall.

To achieve the Authority's transparency goal while reporting on billions of dollars of construction activity across multiple contracts, we developed a robust database called the Environmental Mitigation and Management Application (EMMA), which streamlines sustainability reporting and facilitates data quality assurance. Reported EMMA data is evaluated against supporting documentation provided by the contractor to ensure the sources align. Any reported estimates are grounded in sound methodologies and external databases, or systems are used to ensure other key data can be properly verified. For instance, the Authority uses the CARB's Diesel Off-Road Online Reporting System (DOORS) database to confirm the accuracy of off-road equipment specifications, which helps ensure contractors are using the cleanest construction fleets possible.

Contractor-supplied construction activity summaries help put data into context and can help clarify changes in data based upon season or schedule. The Authority also audits contractors and project and construction managers to verify their adherence to requirements and identify any potential data issues.

Our Team

As of December 31, 2023, the Authority had 401 state employees on staff in several regions of the state, including full-time employees, retired annuitants, part-time employees, student assistants, and employees on loan from other state agencies, as shown in **Tables 7.5** through **7.7.** In 2023, the Authority hired 116 new employees, for a new hire rate of 29 percent. There was a turnover rate of 8 percent for 2023. The Authority also includes a significant number of private-sector consultants integrated with state employees.

We provide state employees with training opportunities designed to increase job proficiency and career advancement with the goal of promoting a capable, efficient, and service-oriented workforce. This is done by developing employees' skills and abilities through training programs that meet Government Code Section 19995 and the Authority's Policy Directive POLI-HR-21, titled Employee Training Policy, signed in June 2014. Our policies are consistent with the California Department of Human Resources policies and laws.

Table 7.5: 2023 Authority Employee Numbers by Gender and Job Category

Employee Category	Male	Female
Rank and File	99	92
Managerial	51	39
Supervisory	37	53
Exempt	12	8
Total	199	192
Employees – Total (Including 9 Board Members)	**401**	

Table 7.6.: 2023 Authority Employees by Generation/Age

Age	Employees
Generation Z ((Ages 18 to 25)	21
Millennials (Ages 26 to 40)	133
Generation X (Ages 41 to 57)	190
Baby Boomers (Ages 58 to 74)	54
Traditionalists (Ages 75 to 97)	3
Total	**401**

Table 7.7: 2023 Authority Employees by Location

Region	Employees
Sacramento	310
Central Valley	59
Southern California	24
Northern California	8
Total	**401**

Our Supply Chain

We are responsible for procuring services, contractors, and materials, and for coordinating the delivery of the high-speed rail program. Our supply chain includes suppliers providing materials, as well as consultants and contractors providing management, design, and construction services to build the high-speed rail system. Many of these businesses are based in California. Details of supply chain expenditures are available online via the Finance and Audit Committee materials webpage. The outputs of this work include the physical infrastructure (e.g., rail, trains, and stations), as well as outcomes of cleaner air, transit-oriented development, and a highly connected California.

Our Governing Directives

As a public-sector entity, we are governed by statutes, regulations, and other directives that ensure the development of a system that is safe, sustainable, and compliant with applicable laws and requirements, as shown in **Table 7.8.**

Contact

We value all feedback. Please send comments and questions to info@hsr.ca.gov

Table 7.8: Our Governing Directives

Statutes
Assembly Bill 32 (Núñez, 2006) the California Global Warming Solutions Act of 2006
Senate Bill 32 (Pavley, 2016) requires the CARB, in adopting rules and regulations, to ensure statewide GHG emissions are reduced to 40% below the 1990 levels by 2030.
Senate Bill 862 (Committee on Budget and Fiscal Review, 2013 to 2014), Greenhouse gases: emissions reduction.
Assembly Bill 1550 (Gomez, 2016) prescribes GHG reduction fund investment in disadvantaged communities.
Assembly Bill 617 (Garcia, 2017), requires the CARB to establish a Community Air Protection Program to focus on reducing exposure in communities most affected by air pollution.
Assembly Bill 1279 (Muratsuchi, 2022) requires California to reach carbon neutrality and cut emissions to at least 85 percent below 1990 levels no later than 2045.
Senate Bill 1020 (Laird, 2022) establishes interim clean electricity targets, including a goal to each 90 percent by 2035.
Senate Bill 1202 (Becker, 2022) requires state agencies to aim to achieve net-zero emissions of greenhouse gases resulting from their operations no later than January 1, 2035.
The Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century (Proposition 1A, 2008)
Senate Bill 375 (Steinberg, 2008) Sustainable Communities and Climate Protection Act
Assembly Bill 75 (Strom-Martin, 1999) Waste Management for State Agencies
Senate Bill 1029 Budget Act of 2012
Senate Bill 852 Budget Act of 2014
Senate Bill 535 (De León, 2012) Global Warming Solutions Act, 2006: Greenhouse Gas Reduction Fund
Assembly Bill 1352 (Perez, 2012) Global Warming Solutions Act, 2006: Greenhouse Gas Reduction Fund
Assembly Bill 262 (Bonta, 2017) Buy Clean California Act
Senate Bill 350 (De León, 2015) Clean Energy and Pollution Reduction Act
Senate Bill 100 (De León, 2018) California Renewables Portfolio Standard Program: emissions of greenhouse gases
Senate Bill 379 (Jackson, 2015) Land Use: General Plan: Safety Element: Climate Adaptation
Assembly Bill 1550 (Gomez, 2016) Greenhouse Gases: Investment Plan: Disadvantaged Communities
Assembly Bill 398 (Garcia, 2017) Update to Global Warming Solutions Act of 2006: market-based compliance mechanisms

Executive Order
Executive Order 12898
Executive Order B-18-12
Executive Order B-30-15
Executive Order N-79-20
Executive Order N-82-20
Regulations
2008 California Long-term Energy Efficiency Strategic Plan
CARB 2008 Scoping Plan, 2013 Scoping Plan Update and 2017 Scoping Plan Update, which identifies the high-speed rail system as a measure for GHG reduction
California Green Building Standards Code (CalGreen Code Title 24 Part 11)
Greenhouse Gas Emissions Reduction Fund (Cap-and-Trade Auction Proceeds) Fourth
National Pollutant Discharge Elimination System (NPDES) water quality order no. 2013-0001-dwq
National Pollutant Discharge Elimination System (NPDES) general permit no. Cas000004
State Water Resources Control Board (SWRCB) construction general permit (order 2009-00009-dwq)
Clean Water Act of the United States
Floodplain Management and Protection and Flood Disaster Protection Act
Porter-Cologne Water Quality Control Act
California Department of Fish and Wildlife Lake and Streambed Alteration Agreement
California Extreme Heat Plan
California Climate Plan

Fowler Avenue Overcrossing in Fresno County

Appendix A:
GRI Content Index

This index allows GRI report users to quickly find the disclosure information they are seeking. The GRI indicators listed correspond to the information that the Authority's stakeholders noted was important to disclose. Consistent with the majority of GRI reports, the information presented here was not subject to third-party verification or external assurance, except for the methodology used to estimate future greenhouse gas (GHG) emissions reductions and air pollutant emissions co-benefits, which has been reviewed by the California Air Resources Board. The Authority may consider verification or external assurance of future reports as the high-speed rail program advances.

Organizational Profile Disclosures	Section	Page(s) of Associated Section
102-1 Name of the organization	Progress Snapshot	Pages 15
102-2 Activities, brands, products, and services	Sustainability Management and Policy	Page 83
102-3 Location of headquarters	Sustainability Management and Policy	Page 83
102-4 Location of operations	Sustainability Management and Policy	Page 83
102-5 Ownership and legal form	Sustainability Management and Policy	Page 83
102-6 Markets served	Sustainability Management and Policy	Page 83
102-7 Scale of the organization	Our Team	Page 89
102-8 Information on employees and other workers	Our Team	Page 89
102-9 Supply chain	Our Supply Chain	Page 90
102-10 Significant changes to the organization and its supply chain	Our Team	Page 89
102-11 Precautionary Principle or approach	Our Governance Structure; Designing Our System to Adapt to Changing Climate	Page 36-39, 76-77
102-12 External initiatives	Envision	Page 74

Ethics and Integrity	Section	Page(s) of Associated Section
102-16 Values, principles, standards, and norms of behavior	Our Values; Our Sustainability Priorities and Commitments	Page 84, 86-88

General Disclosures

Strategy	Section	Page(s) of Associated Section
102-14 Statement from senior decision-maker	Introduction	Page 5

Governance	Section	Page(s) of Associated Section
102-18 Governance structure	Our Governance Structure	Page 36-39

Stakeholder Engagement	Section	Page(s) of Associated Section
102-40 List of stakeholder groups	Sustainability Management and Policy	Page 83
102-41 Collective bargaining agreements	Safety and Well eing in the Workplace	Page 78-79
102-42 Identifying and selecting stakeholders	Working with Station Communities; Ongoing Outreach and Education	Page 50, 51
102-43 Approach to stakeholder engagement	Working with Station Communities; Ongoing Outreach and Education	Page 50, 51
102-44 Key topics and concerns raised	Working with Station Communities; Ongoing Outreach and Education	Page 50, 51

Reporting Practices	Section	Page(s) of Associated Section
102-45 Entities included in the consolidated financial statements	Sustainability Management and Policy	Page 83
102-46 Defining report content and topic boundaries	Our Management Approach	Page 84
102-47 List of material topics	Our Management Approach	Page 84
102-48 Restatements of information	Our Management Approach	Page 84
102-49 Changes in reporting	Our Management Approach	Page 84
102-50 Reporting period	Our Management Approach	Page 84
102-51 Date of most recent report	Our Management Approach	Page 84
102-52 Reporting cycle	Our Management Approach	Page 84
102-53 Contact point for questions regarding the report	Contact	Page 90
102-54 Claims of reporting in accordance with the GRI Standards	Our Management Approach	Page 84
102-55 GRI content index	GRI Content Index	Page 94-114
102-56 External assurance	GRI Content Index	Page 94-114

Specific Standard Disclosures

GRI Standard	Disclosure	Section	Page(s)	Omission
Economic Performance (2016)	201-4 Financial assistance received from government	Our Governance Structure	Page 36	NO
Indirect Economic Impacts (2016)	203-1 Infrastructure investments and services supported	Investing in California's Economy	Page 24-29	NO
	203-2 Significant indirect economic impacts	Investing in California's Economy	Page 24-29	NO
Procurement Practices (2016)	204-1 Proportion of spending on local suppliers	Maximizing Benefits to Disadvantaged Communities; Investing in California's Small Businesses	Page 30-36	NO
Energy (2016)	302-1 Energy consumption within the organization	Achieving Net-Zero GHG Emissions in Construction	Page 60-61	NO
Water and Effluents (2018)	303-3 Water withdrawal	Water Conservation During Construction	Page 71	NO
Biodiversity (2016)	304-3 Habitats protected or restored	Preserving Habitat and Wildlife Corridors	Page 68-70	NO
Emissions (2016)	305-1 Direct (Scope 1) GHG emissions	Reporting on Annual Scope 1, 2, and 3 Emissions	Page 56-58	NO
	305-2 Energy indirect (Scope 2) GHG emissions	Reporting on Annual Scope 1, 2, and 3 Emissions	Page 56-58	NO
	305-3 Other indirect (Scope 3) GHG emissions	Reporting on Annual Scope 1, 2, and 3 Emissions	Page 56-58	NO
	305-5 Reduction of GHG emissions	Energy and Emissions	Page 55-65	NO
	305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	Protecting Air Quality	Page 62-65	NO
Waste (2020)	306-3 Waste generated	Recycling Construction Waste	Page 75-76	NO
	306-4 Waste diverted from disposal	Recycling Construction Waste	Page 75-76	NO
	306-5 Waste directed to disposal	Recycling Construction Waste	Page 75-76	NO

Environmental Compliance (2016)	307-1 Non-compliance with environmental laws and regulations	Our Governance Structure	Page 39	NO
Supplier Environmental Assessment (2016)	308-1 New suppliers that were screened using environmental criteria	Procurement and Supply Chains	Page 74-75	NO
Employment (2016)	401-1 New employee hires and employee turnover	Our Team	Page 89	NO
Occupational Health and Safety (2018)	403-9 Work-related injuries	Safety and Well-Being in the Workplace	Page 78-79	NO
Occupational Health and Safety (2018)	403-10 Work-related ill health	Safety and Well-Being in the Workplace	Page 78-79	NO
Training and Education (2016)	404-1 Average hours of training per year per employee	Our Team	Page 89	YES
Diversity and Equal Opportunity (2016)	405-1 Diversity of governance bodies and employees	Our Team	Page 89	YES
Local Communities (2016)	413-1 Operations with local community engagement, impact assessments, and development programs	Working with Station Communities; Ongoing Outreach and Education	Page 50, 51	NO

Additional Disclosures

During the 2018 materiality assessment, the Authority identified a number of material topics that are not covered by available GRI Standards and disclosures. The location of this information in the report is summarized below.

Material Topic	Section	Page(s)
Emergency and disaster recovery planning	Designing Our System to Adapt to Changing Climate	Page 76-77
Enhancing public space and amenities	Commitments for Future Stations; Designing and Planning High-Speed Rail Stations	Page 42-43, 43-49
Land and water pollution*	Water Conservation During Construction	Page 71
Life cycle approach	Procurement and Supply Chains	Page 74-75
Noise and vibration	Safety and Well-Being in the Community	Page 79-81
Resilience and adaptation, incl. extreme weather	Designing Our System to Adapt to Changing Climate	Page 76-77
Third-party assessment	Envision	Page 74
Transportation hub activation and mass/ active transportation	Commitments for Future Stations; Creating a Sustainable Transit Network	Page 42-43, 52-53

**Note: Material topic defined as "Air, land and water pollution"; air pollution is covered by GRI indicator 305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions.*

Glossary

Black Carbon: A component of fine particulate matter. It is produced from the incomplete combustion of fossil fuels and biomass burning, particularly from older diesel engines and forest fires. Black carbon warms the atmosphere by absorbing solar radiation, influences cloud formation and darkens the surface of snow and ice, which accelerates heat absorption and melting. Diesel particulate matter emissions are a major source of black carbon and are also toxic air contaminants.

Carbon Offsets: Emissions reductions that have been made by an entity and retained or sold to a different entity that seeks to reduce its impact.

Carbon Sequestration: the process of capturing and storing atmospheric carbon.

Central Valley Segment: Current area of construction spanning 119 miles across Madera, Fresno, Kings, Tulare and Kern counties. The Authority plans to extend this 119-mile segment into Merced and Bakersfield.

Construction Package 1 (CP 1): 32-mile section of the Central Valley Segment that stretches between Avenue 19 in Madera County and East American Avenue in Fresno County.

Construction Package 2-3 (CP 2-3): 65-mile section of the Central Valley Segment that is a corridor between East American Avenue in Fresno County and one mile north of the Tulare-Kern County line.

Construction Package 4 (CP 4): 22-mile section of the Central Valley Segment that stretches between one mile north of the Tulare-Kern County line and Poplar Avenue in Kern County.

Disabled Veteran Business Enterprise: A small business owned and controlled by a veteran of the U.S. military, naval, or air service, who must have a service-connected disability of at least 10-percent or more and must reside in California.

Disadvantaged Business Enterprise: A small business owned and controlled by socially and economically disadvantaged individuals must receive DBE certification from the relevant state. To be regarded as economically disadvantaged, an individual must have a personal net worth that does not exceed $1.32 million. To be seen as a small business, a firm must meet SBA size criteria and have average annual gross receipts not to exceed $23.98 million.

Disadvantaged Community: Distinguished by higher risk of environmental hazards and/or lower socioeconomic status. Disadvantaged communities are the target of some high-speed rail programs. Criteria the California Environmental Protection Agency uses to identify disadvantaged communities include but are not limited to:

- Areas disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects, exposure or environmental degradation.
- Areas with concentrations of people that are of low income, high unemployment, low levels of home ownership, high rent burden, sensitive populations, or low levels of educational attainment.

A Disadvantaged Worker: An individual (household income less than $32,000 a year) who meets the income requirements of a Targeted Worker and faces at least one of the following barriers to employment prior to commencing work on the high-speed rail program:

- Being a veteran
- Being a custodial single parent
- Receiving public assistance-
- Lacking a GED or high school diploma
- Having a criminal record or other involvement with the criminal justice system
- Suffering from chronic unemployment
- Emancipated from the foster care system
- Being homeless
- Being an apprentice with less than 15 percent of the required graduating apprenticeship hours in a program

Environmental Product Declaration (EPD): A standardized statement summarizing environmental impacts throughout the product life cycle. EPDs may include information about global warming potential, ozone depletion, acidification, eutrophication, smog or other environmental impact areas.

Greenhouse Gas (GHG): Greenhouse gases trap energy in the atmosphere and are the primary driver of climate change and global warming. The United Nations Intergovernmental Panel on Climate Change (IPCC2) defines six gases under this category: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs – a family of gases), fluorocarbons (PFCs – another family of gases) and sulfur hexafluoride (SF6). Carbon emissions are measured in the unit "carbon dioxide equivalent" (CO2e) and expressed in metric tonnes (MTCO2e).

Job-years: The equivalent number of one-year-long, full-time jobs supported by the project. For example, if one full-time job is supported for two years, it therefore represents two job-years.

Leadership in Energy and Environmental Design (LEED®): LEED® certification provides independent, third- party verification that a building, home or community was designed and built using strategies aimed at achieving high performance in the following key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

Net-Zero Energy: Refers to a facility or system that produces as much energy as it uses over the course of a year (or other defined period).

Particulate Matter (PM): An air pollutant made up of extremely small particles and liquid droplets. Small particles 10 micrometers (PM10) in diameter or less can be inhaled into the lungs, causing serious

respiratory and circulatory health effects. Smaller particles of 2.5 micrometers (PM2.5) in diameter or less are also a significant contributor to haze. A component of particulate matter called black carbon can disrupt climate patterns.

Phase 1 System: The California High-Speed Rail will be implemented in phases. The Phase 1 system will connect San Francisco to the Los Angeles basin via the Central Valley in under three hours on trains capable of exceeding 200 miles per hour. The Phase 2 system encompasses future program extensions that will extend to Sacramento and San Diego.

Photovoltaic (PV): Technology using semiconductor material to convert sunlight into electricity. Power is produced when sunlight strikes the semiconductor material and creates an electric current.

Reactive Organic Gases: Carbon-based gases (excluding carbon monoxide and carbon dioxide) that can react with other chemicals and light to produce smog and ozone.

Renewable Energy: Energy resources such as wind power or solar energy that can be produced indefinitely without being depleted.

Sustainability: The capacity to endure. Sustainable thinking recognizes how current decisions affect the capacity of current and future generations to lead healthy and rewarding lives.

Tailpipe Emissions: The amount of pollutants in exhaust gases discharged from an internal combustion engine.

Targeted Worker: An individual whose primary place of residence is within an Economically Disadvantaged Area or an Extremely Economically Disadvantaged Area. For more information, visit the California Rail Builders' National Targeted Hiring Initiative website: https://www.californiarailbuilders.com/requirements/national-targeted-hiring-initiative/

Vehicle Miles Traveled (VMT): The total number of miles traveled by vehicles in a given geographic boundary over a specific time.

Well-to-Wheel Emissions: All emissions related to fuel production, processing, distribution, and use.

Quantification Methodologies

Values reported in this Sustainability Report are quantified according to the following methodologies:

Energy

Office energy consumption is estimated from the number of Authority employees and consultants, along with the average energy intensity and occupant density of LEED®-certified buildings. Electricity consumption is converted from kilo-BTU (kBTU) to kilowatt hours (kWh) using a conversion factor from EPA Climate Leaders GHG Inventory Protocol, Appendix 2: Unit Conversions.

Fuel consumption is tracked for construction activities and is converted from gallons to gigajoules (GJ) using conversion factors from EPA Climate Leaders GHG Inventory Protocol, Appendix 2: Unit Conversions.

GHG Emissions

We take the operational control approach to quantifying GHG emissions, and we have adopted 2015 as the baseline year for reporting on emissions changes over time. GHG emissions are quantified using methodologies consistent with the GHG Protocol Corporate Standard, ISO 14064, California Air Resources Board methodologies and U.S. Environmental Protection Agency (EPA) models.

Scope 1 emissions are direct emissions from sources owned or controlled by the Authority. Emissions associated with Authority fleet vehicles are not presently included.

Scope 2 GHG emissions are calculated from annual electricity consumption consumed by the Authority office headquarters in Sacramento, and emissions factors sourced from the U.S. EPA (2016) and eGRID for California (CAMX).

Scope 3 emissions from contractor vehicles are calculated using Emission Factors for Greenhouse Gas Inventories provided by the EPA. Scope 3 emissions also include construction electricity emissions, and emissions generated from the use of natural gas in a construction office. Fugitive emissions associated with the refrigerant equipment within the Authority's office are not presently included.

Scope 3 emissions avoided through materials recycling are calculated using the amount of construction materials recycled and the EPA Waste Reduction Model (WARM).

Anticipated GHG emissions reductions during systems operations are calculated according to the methodology available online at: www.arb.ca.gov/cci-resources. All greenhouse gases relevant to the activities are included (CO_2, CH_4, N_2O). Projected avoided emissions are reported relative to a scenario without high-speed rail, rather than relative to a baseline year. Avoided emissions occur as a result of the service provided by high-speed rail, which will displace the emissions that would have released by higher polluting transportation modes, so are classified as Scope 3 emissions reductions.

Air Pollutant Emissions

Air pollutant emissions from construction vehicles are calculated using the methodology and EMFAC2021 emissions rates from the California Air Resources Board.

Criteria pollutants are the most significant air pollutants related to human health and environmental impacts. Other categories of air emissions, such as persistent organic pollutants, volatile organic compounds and hazardous air pollutants, are not quantified.

Water

Office water consumption is estimated from the number of Authority employees and consultants, along with the average water intensity and occupant density of LEED®- certified buildings. Construction water consumption is tracked and reported.

Waste

Waste and recycling information is collected from contractors and tracked using an online data tool. Waste generation and disposal weights are recorded from records received from recycling and waste treatment facilities. Diversion rates are calculated by dividing the weight of materials diverted (through recycling, reuse and stockpiling) by the total materials weight.

Job Creation

Hours worked data come from certified payroll submissions while the number of workers is based on monthly submittals from prime contractors in compliance with the National Targeted Hiring Initiative (NTHI).

Population Served

Exhibit 1.0 reflects the number of people in Merced, Madera, Fresno, Kings and Tulare counties where future population are expected to be within 30 minutes of a Central Valley high speed rail station. This was calculated by mapping areas within the travel distance of each station using best possible travel times and then adding together the proportions of each census tract population data within that area, using population data from the 2021 American Community Survey. Overlapping access areas from close-together stations were merged to avoid double-counting.

Performance

Economic Development and Governance

Funding and Investment (Cumulative, in billions)

Fiscal Year	Total Invested	Investment in California Firms/ Workers	Percent of Authorized Federal Funds Expended
FY15-16	$2.306 B	94%	48%
FY16-17	$3.586 B	97%	73%
FY17-18	$4.766 B	97%	73%
FY18-19	$5.719 B	98%	73%
FY19-20	$7.237 B	98%	73%
FY20-21	$8.227 B	99%	73%
FY21-22	$9.782 B	99%[1]	73%
FY22-23	$11.177 B	99%	72%[2]

1. FY 21-22 was revised to reflect California spending vs national expenditures.

2. Amount of total authorized federal funds increased by $25 million due to RAISE grant, year-over-year relative to FY21-22.

Dispatched Workers by Construction Package (Cumulative)

Dispatched Workers	2015	2016	2017	2018	2019	2020	2021	2022	2023
CP 1	214	1,089	1,239	1,716	1,872	2,238	2,466	2,834	4,535
CP 2-3	-	257	318	750	1,060	1,951	2,311	3,493	4,796
CP 4	-	106	142	293	648	1,205	1,595	2,019	3,074

Construction Hours by Construction Package (Cumulative)

Construction Year	CP 1	CP 2-3	CP 4
2015	83,154	-	-
2016	666,033	59,638	8,219
2017	539,547	60,032	8,627
2018	1,538,063	297,334	47,037
2019	1,884,039	487,560	158,151
2020	2,484,311	1,213,608	496,902
2021	2,774,330	1,937,847	973,801
2022	3,259,589	3,288,148	1,330,331
2023	3,720,707	4,564,911	1,630,349

Creating Opportunities for Disadvantaged Workers and Fostering Diversity (Cumulative)

Workers	2015	2016	2017	2018	2019	2020	2021[1]	2022	2023
Construction Workers Dispatched	214	1,525	1,699	2,759	3,580	6,243	6,372	8,346	12,405
Disadvantaged Workers Dispatched	-	174	149	402	426	440	440	481	466[1]

1. The Authority updated the methodology for tracking Disadvantaged Workers in 2023. While the total is cumulative through December 31, 2023, the count appears lower in 2023 compared to 2022 because some entries were removed given the updated methodology (e.g., a PO Box as an address does not qualify)

Small and Disadvantaged Business Summary (Annual)

Small and Disadvantaged Businesses	2015	2016	2017	2018	2019	2020	2021	2022	2023[1]
Small Business Participants – Total	318	417	427	474	530	626	655	761	840
Disadvantaged Business Enterprises (DBE)	100	130	139	157	172	201	214	259	291
Disabled Veteran Business Enterprises (DVBE)	36	49	51	52	56	70	75	92	103
Small Business Located in Disadvantaged Communities	-	96	115	129	156	129	159	215	-
Local Procurement (U.S.-based businesses)	Nearly 100%	Nearly 100%	Nearly 100%	Nearly 100%	Nearly 100%	Nearly 100%	Nearly 100%	Nearly 100%	Nearly 100%
Expenditures in Disadvantaged Communities	-	52%	Nearly 60%	54%	50%	55%	56%	62%	66%

1. Through January 31, 2024

Station Communities

Community Outreach (Annual)

Event Information	2015	2016	2017	2018	2019	2020	2021[2]	2022	2023
Outreach[1]	85	85	40	377	200	340	426	68	346
Attendees	6,000	6,000	953	15,000+	55,800+	18,800	7,100+	10,100+	33,700
Events with EJ Outreach	130	130	15	238	87	12	32	59	-

1. Includes tabling, presentation, open houses, community events, workshops and other stakeholder engagement.
2.Many events took place virtually in 2020 and 2021 due to COVID-19.

Energy and Emissions

Energy Consumption

Year	Office Electricity Consumption (Megawatt hours)	Off-Road Diesel Consumption (Gallons)	On-Road Diesel Consumption (Gallons)	On-Road Gasoline Consumption (Gallons)	Total Energy Content of Fuel Consumed (Gigajoules)
2015	1,036	26,816	5,859	116,947	**37,000**
2016	1,287	172,684	26,665	203,304	**55,800**
2017	1,431	276,556	54,524	383,994	**98,846**
2018	1,908	292,662	115,495	333,317	**103,385**
2019	1,908	443,935	241,737	598,208	**178,725**
2020	1,954	694,029	342,392	556,952	**224,352**
2021	2,387	720,582	291,945	198,321	**173,979**
2022	1,823	671,504	458,780	172,577	**187,457**
2023	1,420	724,954	541,170	334,700	**228,486**

Projected Average Annual GHG Emissions Avoided for Phase 1 Well-to-Wheels (Annual, in million $MTCO_2e$)[1]

Year	Medium	High	Full Capacity Scenario
2030	0.09	0.10	0.42
2040	0.61	0.66	3.02
2050	0.61	0.66	2.98
2079	0.63	0.68	2.98

1. The greenhouse gas emissions (GHG) reduction scenarios reflect the ridership range expressed in the 2024 Business Plan. The GHG emissions medium scenario was developed based on ridership estimates from the Business Plan and a high scenario developed to align with high estimates in the same Plan. The Authority calculates emissions reductions for the initial 50-year span of operation for well-to-wheels for Phase 1 (2029-2079, per the 2020 Business Plan). These reductions are reported at intervals corresponding to state reduction milestones (2030, 2050), program milestones (2040), and at year 50 (2079).

Projected Cumulative GHG Emissions Avoided Tailpipe (Cumulative, in million $MTCO_2e$)[1]

Year	Medium	High
2030	0.07	0.08
2040	4.10	4.40
2050	8.80	9.50
2079	22.60	24.40

1. The greenhouse gas emissions (GHG) reduction scenarios reflect the ridership range expressed in the 2024 Business Plan. The GHG emissions medium scenario was developed based on ridership estimates from the Business Plan and a high scenario developed to align with high estimates in the same Plan. The Authority calculates emissions reductions for the initial 50-year span of operation for well-to-wheels for Phase 1 (2029-2079, per the 2020 Business Plan). These reductions are reported at intervals corresponding to state reduction milestones (2030, 2050), program milestones (2040), and at year 50 (2079).

2. Capacity scenario was not evaluated for tailpipe emissions, only well-to-wheels emissions.

Projected Cumulative GHG Emissions Avoided Well-to-Wheels (Cumulative, in million $MTCO_2e$)[1]

Year	Medium	High	Full Capacity Scenario
2030	0.09	0.10	0.42
2040	5.30	5.70	26.4
2050	11.40	12.30	56.3
2079	29.40	31.80	142.6

1. The greenhouse gas emissions (GHG) reduction scenarios reflect the ridership range expressed in the 2024 Business Plan. The GHG emissions medium scenario was developed based on ridership estimates from the Business Plan and a high scenario developed to align with high estimates in the same Plan. The Authority calculates emissions reductions for the initial 50-year span of operation for well-to-wheels for Phase 1 (2029-2079, per the 2020 Business Plan). These reductions are reported at intervals corresponding to state reduction milestones (2030, 2050), program milestones (2040), and at year 50 (2079).

Greenhouse Gas Emissions Emitted (Annual, (Annual, in $MTCO_2e$)

Emissions Source	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scope 1	0	0	0	0	0	0	0	0	0
Scope 2	307	381	344	459	432	404	556	440	321
Scope 3	1,400	4,282	6,795	8,063	9,197	17,458	13,690	14,371	16,085

Greenhouse Gas Emissions Avoided (in $MTCO_2e$)

Avoided Emissions Source	2015	2016	2017	2018	2019	2020	2021	2022	2023
Recycling[1]	23,165	21,125	36,009	17,579	13,028	2,450	3,292	6,711	4,809
Bookend and Connectivity[2]	142,519	142,519	142,519	142,519	142,519	142,519	142,519	142,519	142,519
Agricultural Easements[1]	-	-	-	-	36,600	115,030	120,366	76,711	0

1.Annual
2.Cumulative

Emitted and Avoided Criteria Air Pollutant Emissions of Construction Fleet (Annual, in pounds)

	NOx		ROG		PM		BC	
Reporting Year	Emissions Emitted	Emissions Avoided	Emissions Emitted	Emissions Avoided	Emissions Emitted	Emissions Avoided	Emissions Emitted	Emissions Avoided
2015	4,006	49%	549	41%	341	41%	262	42%
2016	23,024	51%	1,715	58%	1,082	60%	833	60%
2017	20,944	70%	2,441	59%	1,467	61%	1,130	61%
2018	27,190	54%	2,318	58%	1,964	43%	1,513	43%
2019	42,507	49%	2,802	65%	2,374	50%	1,869	51%
2020	50,043	67%	3,982	71%	3,775	55%	2,638	58%
2021	39,801	64%	2,669	74%	1,886	65%	1,428	66%
2022	34,671	65%	2,276	76%	1,724	67%	1,283	69%
2023	36,964	71%	2,219	84%	1,973	70%	1,495	70%

Voluntary Emissions Reduction Agreements (VERA) (Cumulative)

VERA Details	2015	2016	2017	2018	2019	2020	2021	2022	2023
Tons of VERA offsets	26	1,006	1,369	1,358	1,358	1,358	1,358	1,358	1,358
$ million VERA investment		9	13	13	13	13	13	13	13
Number of tractors	20	46	82	84	84	84	85	85	85
Number of trucks		104	161	162	162	162	161	161	161
Number of school buses			1	1	1	1	1	1	1

Natural Resources

Water Consumption (Annual, in Gallons)

Water Usage	Office	Construction
2015	1,060,560	2,517,153
2016	1,317,600	14,500,000
2017	1,464,480	31,207,986
2018	1,952,640	13,150,724 (potable) 58,927,468 (nonpotable)
2019	1,952,640	10,003,936 (potable) 105,632,701 (nonpotable)
2020	2,000,160	88,075,850 (potable) 211,509,340 (nonpotable)
2021	2,442,960	29,526,266 (potable) 218,137,740 (non-potable)
2022	1,866,240	19,440,150 (potable) 192,434,990 (non-potable)
2023	1,509,373	22,848,062 (potable) 211,092,480 (non-potable)

Habitat and Agricultural Land Preservation (Cumulative, in acres)

Land	Type of Preservation	2015	2016	2017	2018	2019	2020	2021	2022	2023
Habitat	Preserved and Restored	400	2,000	2,510	2,680	2,349	2,320	2,972	4,492	4,492
Agricultural	Conserved	-	1,200	1,200	1,200	1,200	3,096	3,190	3,190	3,190

Sustainable Infrastructure

Recycling and Reuse (Annual, in Tons)

Material	2015	2016	2017	2018	2019	2020	2021	2022	2023
Recycled/Reused Concrete	37,506	68,183	25,088	11,001	805	1,506	2,280	3,881	1,087
Recycled/Reused Asphalt	-	-	47	1,041	93	15	934	70	0
Recycled Mixed Metals	2,701	1,294	2,500	839	1,750	55	275	133	936
Recycled Wood	-	39	242	615	34	9	278	1,191	145
Recycled Organics	-	-	5,845	9,549	5,922	2,086	572	80	24
Mixed Recycling	3,661	4,649	7,714	4,459	1,314	1,270	468	3,476	2,704
Materials Landfilled	360	444	1,300	3,449	1,417	2,698	5,797	1,348	974

Recycling Rate (Annual, in percentage)

Recycling Details	2015	2016	2017	2018	2019	2020	2021	2022	2023
Recycled Concrete and Metal	100%	99.9%	100%	100%	100%	100%	99.7%	100%	100%
Recycled Other Materials	94.6%	93.1%	92.6%	87.2%	92.6%	78.8%	34.4%	100%	49%
Overall Recycling Rate	-	99.2%	99.4%	97.0%	84.1%	64.7%	45.3%	95%	72%

Worker Health and Safety, Injury Rate

	2015	2016	2017	2018	2019	2020	2021	2022	2023	State Benchmark
Injury Rate										
Construction Package 1	3.56	1.12	1.76	1.59	1.78	1.60	1.00	0.28	2.2	
Construction Package 2-3	0	0	0	0.29	1.00	2.18	1.66	2.66	1.65	
Construction Package 4	N/A	N/A	0	0	1.47	1.09	0.71	0.71	0.71	
Overall Weighted Average	2.09	0.54	1.1	0.97	1.38	1.77	1.30	1.53	1.64	1.8
Lost Days Rate										
Construction Package 1	0	0.37	0.7	0.4	0.3	0.80	0.50	0.28	0.5	
Construction Package 2-3	0	0	0	0	0	0.00	0.00	0.33	7.2	
Construction Package 4	N/A	N/A	0	0	0	0.00	0.00	0.36	0.2	
Overall Weighted Average	0	0.18	0.44	0.22	0.11	0.24	0.14	0.32	4.65	1.4
Fatalities										
Total Fatalities	0	0	0	0	0	0	0	0	0	

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