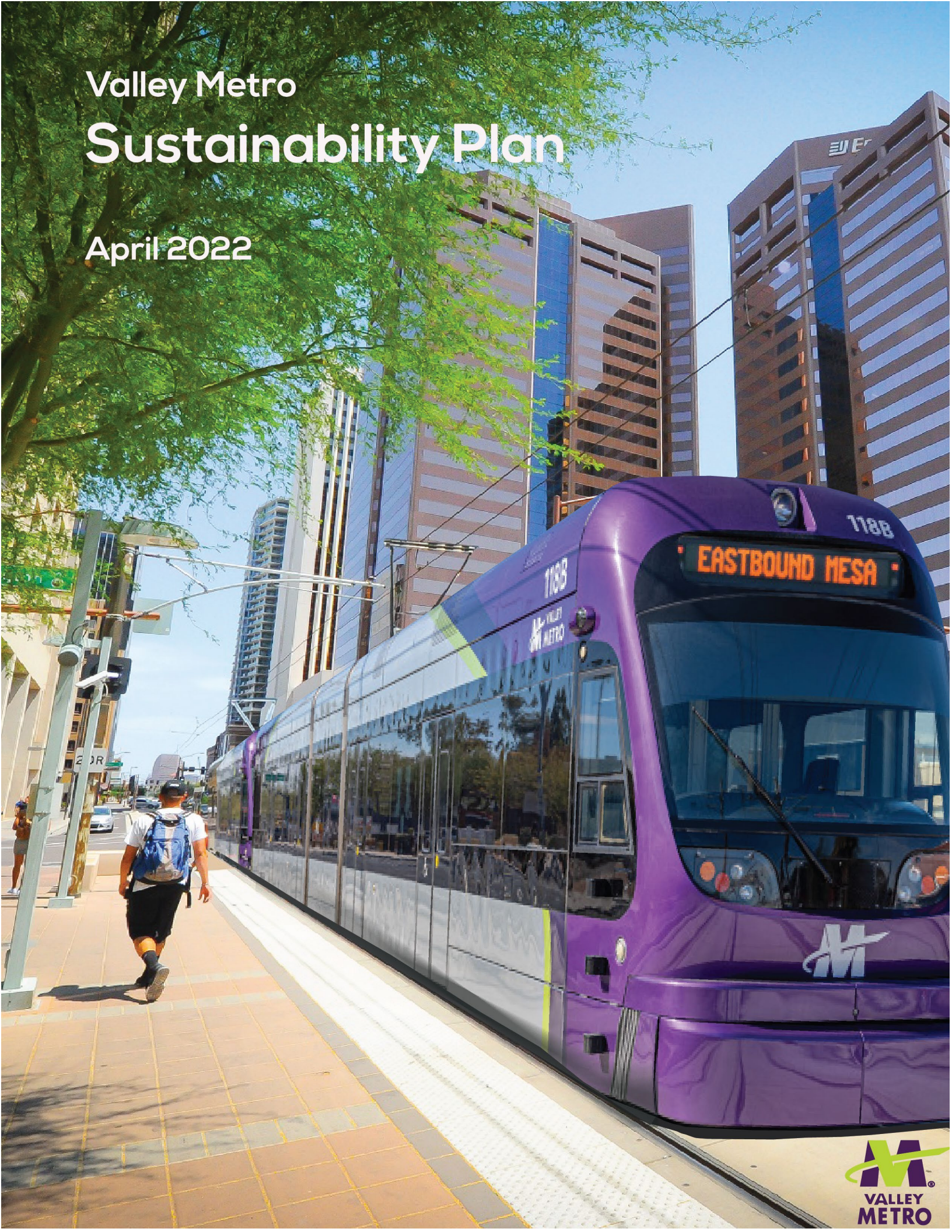


Valley Metro Sustainability Plan

April 2022



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List of Acronyms

ADA – Americans with Disabilities Act

ADOT – Arizona Department of Transportation

APTA – American Public Transportation Association

ASU – Arizona State University

DCM – Design Criteria Manual

EV- Electric Vehicle

FTA – Federal Transit Administration

GHGs – Greenhouse gases

ICV – Internal combustion vehicles

IPCC – Intergovernmental Panel on Climate Change

KPI- Key Performance Indicators

KwH- Kilowatt hour of electricity

LRT – Light Rail Transit

MAG – Maricopa County of Governments

MBOM – Mesa Bus Operations and Maintenance Center

OMC – Rail Operations and Maintenance Center

PMT – Passenger miles traveled

RPTA – Regional Public Transportation Authority

TOD – Transit Oriented Development

Tons/CO₂e – Tons of carbon dioxide equivalent

TCRP – Transit Cooperative Research Program

UHI – Urban heat island effect

VM – Valley Metro

VMT – Vehicle miles traveled

Executive Summary

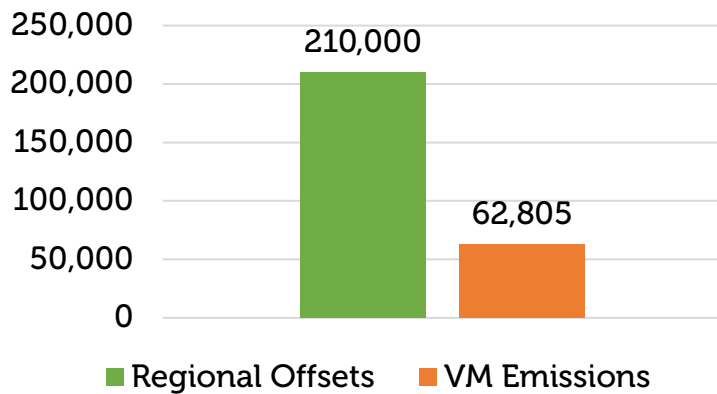
PURPOSE

Valley Metro (VM) is committed to connecting communities and enhancing lives throughout the Valley. As the regional public transportation provider, Valley Metro operates a multi-modal transit system which allows people to share the ride and reduce greenhouse gas (GHG) emissions in the region. A typical trip on public transit emits 55% fewer GHG emissions than driving or ride-hailing alone, and in 2018, public transit in the United States saved 69 million tons of GHG emissions ([Transportation Research Board](#), 2020). While public transit inherently helps to reduce GHG emissions, transit can strategically plan to bring further climate benefits to the communities in which they serve. To do this, Valley Metro signed on to the Federal Transit Administration (FTA) Sustainable Transit for a Healthy Planet Challenge as a way to strategize and plan future sustainability efforts.

BASELINE ANALYSIS

In FY19, Valley Metro emitted 62,805 tons of GHG emissions (in tons/CO₂e) and saved the region 210,000 tons/CO₂e by operating public transit service. By analyzing this baseline, Valley Metro identified opportunities to lower GHGs within operations and regionally. In addition to GHGs, Valley Metro assessed climate risks relevant to transit and its users to formulate goals and strategies for this Sustainability Plan.

Figure 1: FY19 GHG Emissions & Regional Savings
(tons/CO₂e)



GOALS & STRATEGIES

Reduce GHGs from Transit

- Explore and prepare for zero-emission vehicles
- Create zero-emission vehicle infrastructure

Reduce Regional GHGs

- Improve the rider experience
- Expand transit options

Increase Heat Resiliency

- Prioritize and improve shade in transit system
- Communicate heat resources to riders

Introduction

PURPOSE

The purpose of this Sustainability Plan is to define a vision, goals and strategies for Valley Metro to support the global aspiration of a net-zero world by 2050. The Intergovernmental Panel on Climate Change (IPCC) has shown that achieving net-zero GHG emissions globally by 2050 is essential to stabilizing global temperatures at 1.5 degrees Celsius above preindustrial levels and reducing the health and economic impacts of the climate crisis. In response to IPCC guidance and the Biden Administration's climate goals, the Federal Transit Administration created a voluntary climate initiative which called on transit agencies to create climate action, sustainability or zero-emission transition plans. Valley Metro signed on to this FTA initiative and strives to support national climate goals with this Sustainability Plan.

SCOPE

Public transportation in the Phoenix Metropolitan Area is operated by multiple entities (Valley Metro RPTA, Valley Metro Rail and numerous city governments) but is regionally branded as Valley Metro. This Sustainability Plan assesses only Valley Metro Regional Public Transportation Authority (RPTA) and Valley Metro Rail. These two entities will be referred to as "Valley Metro" throughout this plan. This Sustainability Plan will include Valley Metro fleet and maintenance activities. The fleet includes revenue and non-revenue vehicles owned and/or operated by Valley Metro. Fleet vehicles include buses, light rail transit (LRT) vehicles, vans, trucks, SUVs and sedans. Future Sustainability Plans will include streetcar. Valley Metro does not own all transit vehicles in Maricopa County and vehicles not owned by Valley Metro are not included in this Sustainability Plan. Some examples of vehicles not included are transit vehicles owned by Valley Metro member agencies, vehicles owned by Valley Metro contractors and vehicles owned by Valley Metro employees.

Maintenance activities at Valley Metro's Rail Operations and Maintenance Center (OMC) and Mesa Bus Operations and Maintenance Center (MBOM) are included in this Sustainability Plan. The majority of Valley Metro's vehicles are maintained at these two locations and Valley Metro has operational control over these facilities. There are a few other city-owned locations where some Valley Metro vehicles are stored and maintained. These sites are not included in the Sustainability Plan because Valley Metro does not have operational control over these facilities and Valley Metro vehicles make up only a portion of the vehicles serviced at these locations.

PLAN DEVELOPMENT

This Sustainability Plan was developed by Valley Metro staff and approved by Valley Metro Executive Leadership. Tasks completed to create this plan include:

- Conducting an organizational GHG inventory
- Completing informational interviews with Valley Metro member agencies
- Conducting national research on climate action planning for transit
- Working with internal staff to develop sustainability projects (commonly referred to throughout this plan as "Action Items")
- Engaging Valley Metro Leadership to create the vision and goals for the Sustainability Plan
- Identifying existing funding mechanisms and new funding opportunities for Action Items

HOW THIS PLAN WILL BE USED

Valley Metro intends to use this plan to identify an agency vision, set sustainability goals and commit to action items that will move the agency toward the vision and goals. The plan will be updated every five years and is to be shared with the Federal Transit Administration, American Public Transportation Association (APTA), Valley Metro member agencies and the public.

Agency Overview

Valley Metro is the regional public transportation agency providing coordinated, multi-modal transit options to residents of the Greater Phoenix Region. With a core mission of connecting communities and enhancing lives, Valley Metro plans, builds, operates and maintains a bus, vanpool and light rail transit (LRT) systems and alternative transportation programs for commuters, seniors and people with disabilities.

HISTORY

In 1993, the name Valley Metro was adopted as the identity for the regional transit system in the metropolitan Phoenix region. Under this brand name, local governments set the policy for the regional system that operates throughout the Valley.

Valley Metro is governed by two boards of directors. The Regional Public Transportation Authority Board consists of 19 public agencies that set the policy direction for all modes of transit except light rail. The Valley Metro Rail Board consists of four cities that set the policy direction for rail transit. The boards and the agency work to improve and regionalize the public transit system.

The COVID-19 pandemic has impacted Valley Metro's service, ridership and fare revenue since 2020. Bus, rail and paratransit frontline staff continued to serve communities throughout the pandemic, providing transportation to the Valley's essential workforce. More stringent safety measures were implemented to protect riders and staff.

REGIONAL FUNDING

Maricopa County voters approved Proposition 400 in 2004 extending the 1983 county-wide transportation tax and increasing the portion of the tax that was dedicated to public transportation. The half-cent tax on every dollar of goods purchased funds the Regional Transportation Plan, which includes basic regional transit services. Since 2004, transit receives one-third of the half-cent tax, which is used for regional bus services and paratransit, and funds capital investments in high-capacity transit services such as light rail and streetcar; the remaining two-thirds goes toward freeways and streets. The half-cent sales tax, along with federal funds and other sources, is projected to provide \$6.7 billion in public transportation improvements through 2025. Fixed-route bus, light rail and alternative transportation programs also receive funding from the FTA and member agencies.

VALLEY METRO SERVICES

- Bus Service: Local, Express, Rural and Neighborhood Circulators
- Light Rail
- Streetcar (to open in 2022)
- ADA/Paratransit and RideChoice
- Commuter Vanpools
- Online Commute Matching System
- Employer assistance in creating and implementing travel reduction plans

VALLEY METRO RPTA

MEMBER AGENCIES

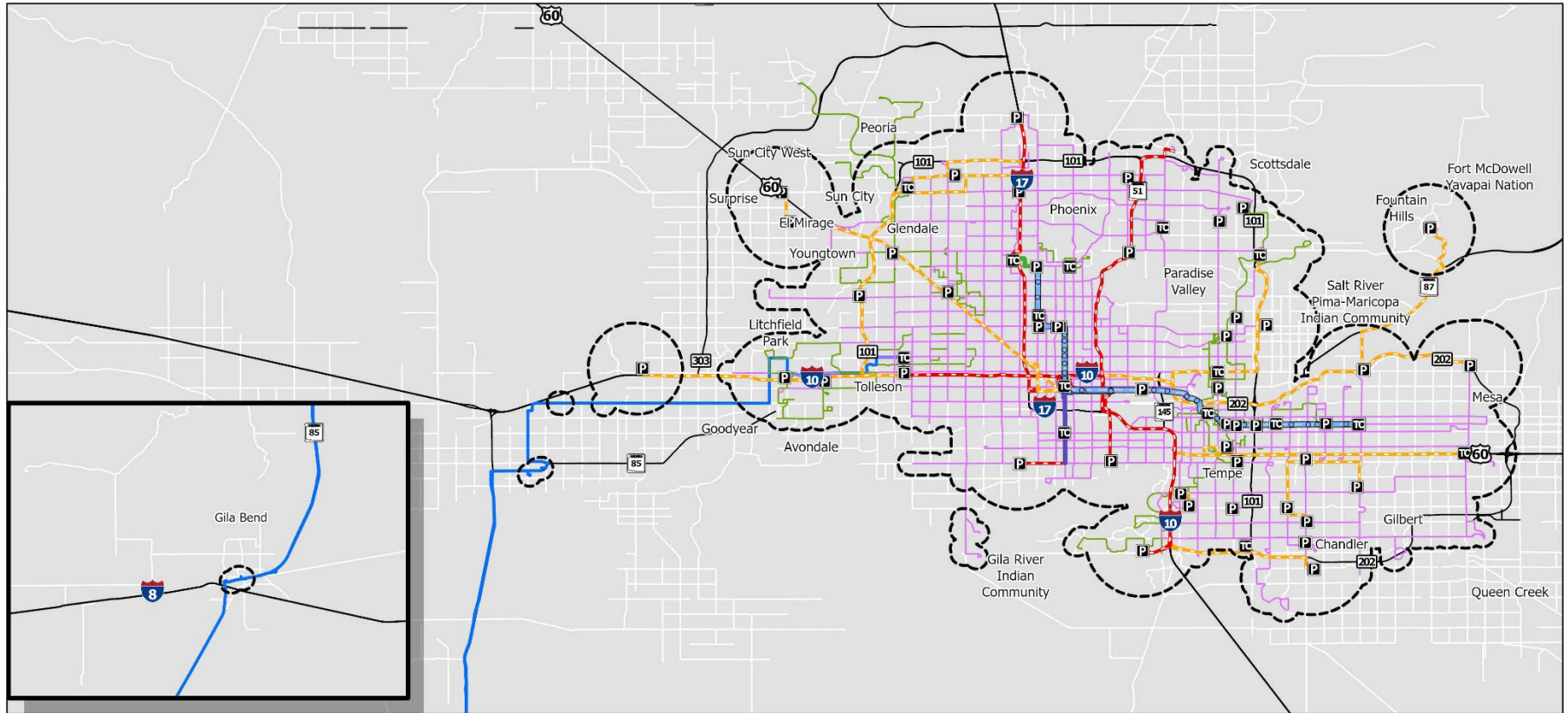
Avondale
Buckeye
Chandler
El Mirage
Fountain Hills
Gilbert
Glendale
Goodyear
Maricopa County
Mesa
Peoria
Phoenix
Queen Creek
Scottsdale
Surprise
Tempe
Tolleson
Wickenburg
Youngtown

VALLEY METRO RAIL

MEMBER AGENCIES

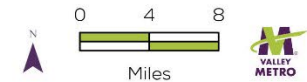
Chandler
Mesa
Phoenix
Tempe

Figure 2: Regional Services and Facilities Map



LEGEND

- | | | |
|-------------------------|-----------------|---------------------------|
| Transit Centers | Tempe Streetcar | Local Routes |
| Park and Rides | Express | Rural Route |
| Light Rail Stations | Light Rail | Freeway and Interstates |
| Northwest Extension | RAPID | Valley Metro Service Area |
| South Central Extension | Circulators | |



Anticipated Climate Impacts in the Phoenix Metropolitan Area

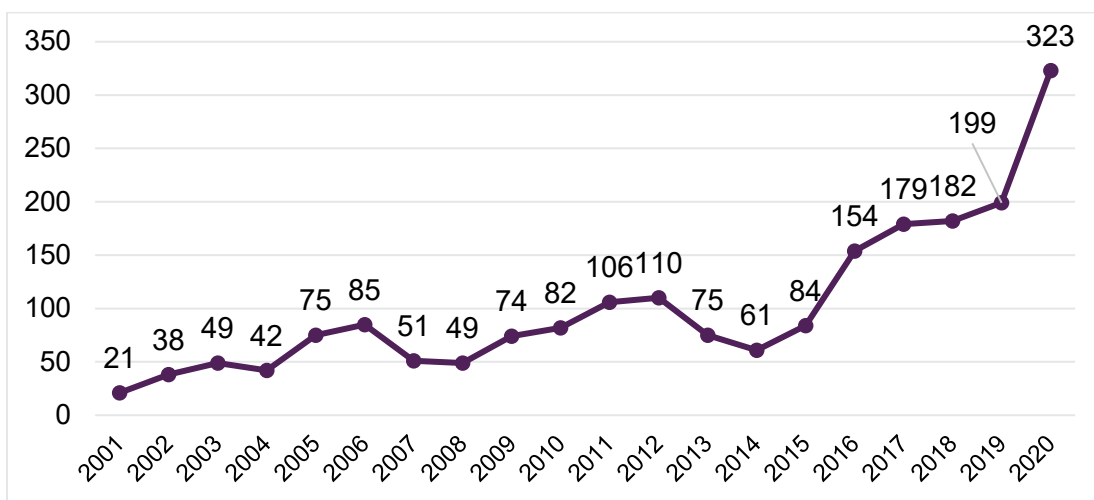
Temperatures in the Phoenix Metropolitan Area have and will continue to increase as a result of climate change and the urban heat island (UHI) effect. According to the IPCC, global surface temperature will continue to increase until at least the mid-century even if the world became carbon free immediately. The IPCC projects with high confidence that extreme heat events will intensify in magnitude and duration over the Western United States. The IPCC also predicts that by 2050, year-round North American temperatures will be approximately two to eight degrees Fahrenheit warmer (IPCC, 2021). Additionally, the UHI effect plays a role in increasing heat for the Greater Phoenix Area. The UHI effect describes the warming of urban areas caused by concrete and blacktop roads, the low ventilation ability of the urban “canyons” created by tall buildings and “point-source” heat emitted from vehicles and air conditioners. The UHI effect magnifies temperature increases created by climate change (EPA, 2021).

Phoenix-specific research indicates that the Greater Phoenix Area is expected to increase 6.5 degrees Fahrenheit in the summer by 2070, assuming the continuation of rapid urbanization and increasing demand for energy with high GHG emissions (Tewari et al., 2017). Another study shows that Arizona is the fourth fastest-warming state in the US and notes that record highs have been on the rise since the 1970s (Climate Central, 2019). It is difficult to predict exactly what future conditions will be, but there is consensus that the Phoenix Area of the future will be warmer than it is today.

HEALTH IMPACTS OF HEAT

Extreme heat events, or heatwaves, are the most prominent cause of weather-related human mortality in the US and are responsible for more deaths annually than hurricanes, lightning, tornadoes, floods and earthquakes combined (Arizona State Climate Office, 2021). Maricopa County Public Health Department reports that heat-associated deaths are increasing (MCPH, 2020). Figure 3 shows heat-associated deaths by year with the most recent year, 2020, accounting for 323 heat-associated fatalities.

Figure 3: Heat Associated Deaths in Maricopa County by Year



A study on [Transit System Design and Vulnerability of Riders to Heat](#) highlighted LA Metro and Valley Metro as agencies that are particularly vulnerable to increasing heat. The study indicated that transit users from areas with low residential density and limited high-capacity roadways who are located along non-direct paths between major activity centers are likely to experience prolonged access or waiting times. This exposure to extreme heat may result in negative health outcomes.

This study, in combination with climate change forecasts listed in the previous section, shows the importance for Valley Metro to consider how extreme heat will affect the transit system.

LIGHT RAIL THERMAL COMFORT STUDY

In the summer of 2020, Valley Metro conducted the Light Rail Thermal Comfort Study to assess existing stations' shade and thermal comfort conditions to determine the effectiveness of current shading and identify potential improvements. The study revealed that stations oriented east/west receive more overhead shade throughout the day than stations oriented north/south or northwest/southeast. This is because light rail stations are designed to provide primarily overhead shade with some vertical shading elements; overhead shade is more effective at east/west stations because the sun is moving overhead all day, while in comparison, north/west and northwest/southeast stations only experience the sun overhead for a portion of the day. Table 1 shows the average shade coverage at light rail stations between 10:00 a.m. and 2:00 p.m.

Table 1: Shade Coverage from 10 a.m. to 2 p.m. at North/South, East/West and Northwest/Southeast Oriented Stations

North/South Platforms		
Date	Time	Percent Shaded
June 21	10:00 AM	37
June 21	12:00 PM	55
June 21	2:00 PM	36
East/West Platforms		
Date	Time	Percent Shaded
June 21	10:00 AM	53
June 21	12:00 PM	45
June 21	2:00 PM	51
Northwest/Southeast Platforms		
Date	Time	Percent Shaded
June 21	10:00 AM	43
June 21	12:00 PM	41
June 21	2:00 PM	38

The study also identified an opportunity to better shade the walkways leading up to station platforms. These walkways have generally been used as areas for public art or landscaping, which sometimes bring an added benefit of shade. In the future, these areas could be used to provide extra shading to riders by installing art installations that intentionally provide shade, constructing shade canopies or planting trees. Figure 4 highlights stations with enhanced shading features in the form of public art or landscaping.

Figure 4: Light Rail Station Walkway Shade Examples



This study, in combination with climate change research, demonstrates a need for the regional transit system to design future infrastructure with strong consideration towards extreme heat and look for ways to improve existing infrastructure to be more resilient to extreme heat.

BUS STOP SHADE

Fiscal Year 2020 bus stop data maintained by Valley Metro shows that shade conditions at bus stops are directly correlated with the number of daily boardings at each bus stop. Table 2 depicts the presence of a bus shelter, which is intended to provide shade, at bus stops based on the bus stop average daily ridership. This table includes all bus stops within the Valley Metro service area.

55% of bus stops have bus shelters. This percentage increases when focusing on higher ridership bus stops. On average, 94% of “Moderate to High Ridership” bus stops (which are defined as having 36-71 daily riders) have shelters and 100% of “High Ridership” bus stops (which is defined as more than 71 daily riders) have shelters. There is a large opportunity to improve shade conditions for bus stops which serve fewer than 36 daily riders.

Table 2: Bus Stop Shelters & Daily Ridership

Bus Stop: Average Daily Ridership	Stops with Shelters
71+	100%
36-70	97%
10-35	87%
<10	49%

Current Best Practices for Climate Adaptation and Mitigation

Valley Metro has multiple existing programs and operational practices that lessen impacts of extreme heat and reduce GHG emissions for the region. Listed in this section are existing best practices for adapting to and preventing climate change. These strategies were implemented for reasons outside of climate but ultimately benefit sustainability efforts.

CLIMATE RESILIENCY

Shading the Transit System

- Valley Metro provides overhead shade and some vertical shade at all light rail and streetcar station waiting areas.
- Some stations have enhanced shading features, such as those shown in Figure 4.
- Valley Metro's most recent [Design Criteria Manual](#) (DCM) update includes more rigorous shading standards and more ambitious design goals.
 - Previously, the DCM recommended shade in walkways and now the DCM states a design goal of shading 50% of walkway areas either by architectural or vegetative shade.
 - Previously, LRT station shading efforts focused on providing shade from 10:00 a.m. to 2:00 p.m. The updated DCM defines an importance to provide shade during all daylight hours.
- The agency is designing and constructing the first fully shaded station at Metrocenter as part of the Northwest Phase II Light Rail Extension (station set to open in 2024).
- Valley Metro's urban design guidelines provide general parameters for local jurisdictions for designing and placing transit facilities. Many of these guidelines include recommendations to assist pedestrian routes with shade trees/plant materials to provide a shade canopy for transit users. Recommendations also include shade for all seating areas (both vertical shade and overhead shade).

Heat and Air Quality Research Collaboration

- Valley Metro worked with Arizona State University (ASU) post-doctoral researchers to install air quality and temperature sensors on light rail vehicles. Sensors helped improve ground level air quality and temperature monitoring in the Valley. ([Source](#))

REDUCING GREENHOUSE GAS EMISSIONS

Alternative Fuels

- 73% of Valley Metro's bus fleet is fueled with natural gas. The rest of the fleet is fueled by unleaded gasoline, ultra-low sulfur diesel or diesel-hybrid engines.
- All diesel buses are equipped with particulate filters.
- Light rail and streetcar are both powered by electricity, which is becoming increasingly cleaner with local utility sustainability commitments.
- Valley Metro is actively pursuing the addition of battery electric buses to the fleet.

Commute Solutions

- Valley Metro's Commute Solutions department connects residents and employers to alternatives to driving alone.
- Commute Solutions operates SharetheRide.com, distributes transportation coordinator kits for employers and hosts transportation demand management webinars.

Rider Experience Plan

- Attracting riders to transit and reducing regional VMT are foundations of Mesa, Phoenix and Tempe CAPs, and increased use of active and public transportation are vital in reducing GHGs from the regional transportation sector.
- In 2019, Valley Metro conducted a study that produced more than 20 recommendations to improve the rider experience. Actions were prioritized with leadership and the agency began planning pilots for prioritized actions and looking at how to measure success.
- This effort was halted with the onset of COVID-19. The agency plans to restart this effort in 2022 with a focus on ridership recovery due to the pandemic.

Transit Expansions

- Valley Metro is actively working to expand local, express and high capacity transit options throughout the Valley. The high capacity transit projects are outlined in Figure 5 below.
- The transit projects under construction are the South Central Extension/Downtown Hub, the Northwest Extension Phase II and the Tempe Streetcar.
- Expanding transit will provide more options for the community, and higher transit utilization will have a positive impact on regional emissions.

Figure 5: Valley Metro's Planned HCT Transit Expansions Through 2030¹

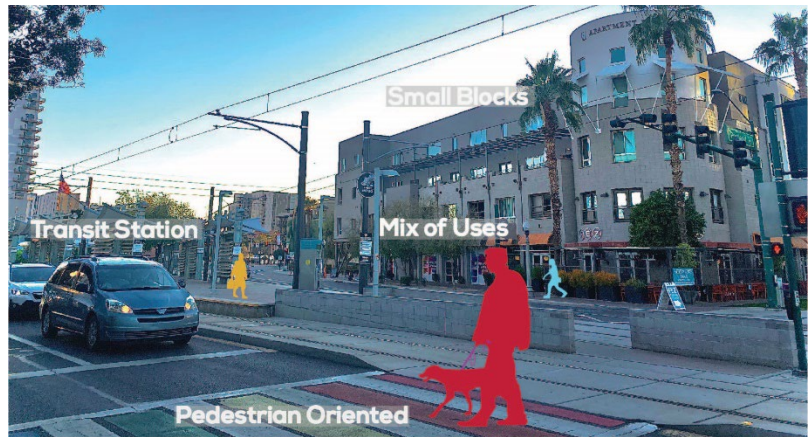


¹ The Regional Transportation Plan currently identifies 2024 as the opening year for the Capitol Extension. However, Valley Metro expects to update the opening year in 2022 to reflect a new project development schedule.

Transit Oriented Development

- Transit-Oriented Development (TOD) is a pattern of development characterized by a mix of uses surrounding a transit station where streets have a high level of connectivity, blocks are small, and buildings and uses cater to pedestrians which can be observed in Figure 6 to the right.
- The purpose is to make access to and from the transit station walkable and accessible in an environment that is human-scaled and provides for a mix of compatible and complementary land uses which facilitate transit ridership.

Figure 6: Local Transit Oriented Development Example



- TOD is a climate solution because it improves walkability and decreases dependence on a personal vehicle for travel.
- Valley Metro assists member agencies in developing the policy framework and implementation strategies necessary to successfully build community support for TOD projects that: (1) improve access to public transportation, (2) make communities more pedestrian- and bicycle-friendly and (3) create living spaces that better serve the daily activities of the region by interfacing with a more diversified set of mobility options.

Solar

- All Valley Metro maintenance facilities are equipped with solar canopies, which generate clean and renewable energy for the facilities.
- In Fiscal Year 2020, Valley Metro solar canopies generated 2 million kWh of solar power.



Baseline Emissions Inventory & Sustainability Key Performance Indicators

In Fiscal Year 2019, Valley Metro emitted an estimated 62,508 tons/CO₂e and saved the region 218,030 tons/CO₂e. The majority of emissions come from the bus fleet.

Table 3 shows Valley Metro’s Sustainability Key Performance Indicators (KPI) that will be used as the baseline to measure future reductions.

Table 3: Sustainability Key Performance Indicators Baseline (FY19)

KPI	Value
Net GHG Emissions (tons/CO ₂ e)	(155,522)
GHG Emissions (tons/CO ₂ e)	62,508
GHG Emissions Saved (tons/CO ₂ e)	218,030
Water Consumption (gallons)	39,296,785
Waste Landfilled (short tons)	152
Waste Recycled (short tons)	70

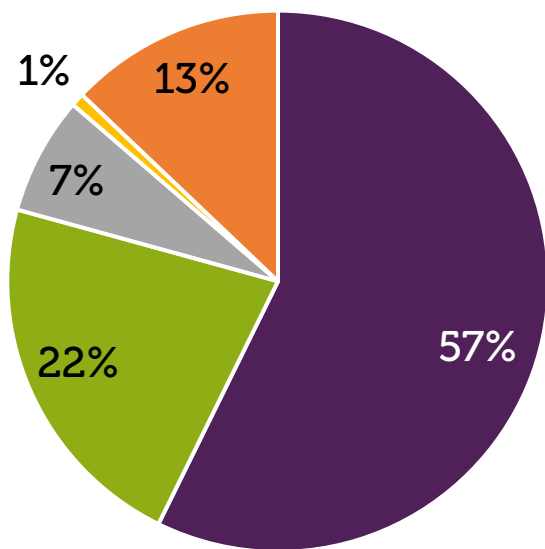


Figure 7: FY19 GHG Emissions by Source

- Bus
- Light Rail
- Vanpool
- Non-Revenue
- Facilities

Figure 7 shows Valley Metro’s Fiscal Year 2019 GHG emissions, Fiscal Year 2019 estimated GHG savings (regionally) and the net GHG impact of Valley Metro’s transit operations. Scope 1 emissions include fuel consumed to operate bus, vanpool and non-revenue fleets. Both upstream and downstream GHG emissions from fuel consumption are considered². Scope 2 emissions includes electricity purchased to operate light rail, OMC and MBOM. Both upstream and downstream GHG emissions from electricity consumption are considered. Scope 3 includes emissions from employee commutes to and from the administrative office, OMC and Mobility Center. Valley Metro's administrative office and Valley Metro's Mobility Center were not included in Scope 2 reporting. This is because the offices are part of a larger building; data on the whole building is available but data on Valley Metro's office space is not available.

² Upstream emissions refer to the extraction process (extraction, processing, handling, transportation), while downstream emissions refer to what happens after the oil has left the pipeline and is consumed by its end-users



Table 4: Valley Metro's FY19 GHG Emissions, Regional Offsets and Net GHG Impact

Valley Metro FY19 Emissions		Regional Offsets		Net GHG Impact
Category	Tons/CO ₂ e	Mode	Tons/CO ₂ e	
Scope 1	40,495	Bus	68,031.17	(155,522)
Scope 2	21,690	Light Rail	110,706.79	
Scope 3	620	Vanpool	39,292	
Total	62,805	Total	218,030	

Table 4 shows a comparison between Valley Metro’s Fiscal Year 2019 emissions and Fiscal Year 2019 regional offsets (or avoided emissions). A side by side comparison of Valley Metro’s emissions and avoided emissions can be seen in Figure 8. Avoided emissions were calculated using the [Transit Cooperative Research Program \(TCRP\) Framework](#). The offsets per mode are estimated offsets based on Valley Metro's transit operations as reported to the National Transit Database. The framework takes into account regional emission reductions by using transit in place of single occupancy vehicles (also called mode shift). The tradeoff between passenger miles and private automobile miles is not a 1-to-1 replacement. The national average mode shift factor (0.329) was used to calculate avoided emissions from mode shift. The framework also accounts for "land use efficiency", which explains how urban areas become denser as we build more high-capacity transit. The framework does not consider the facilities used to maintain transit, administrative offices or employee commutes. Valley Metro has an estimated net negative emissions of 155,000 tons/CO₂e. This was calculated by subtracting the avoided emissions from Valley Metro's Scope 1, 2 and 3 emissions.

Figure 8: FY19 Greenhouse Gas Emissions & Regional Savings (tons)

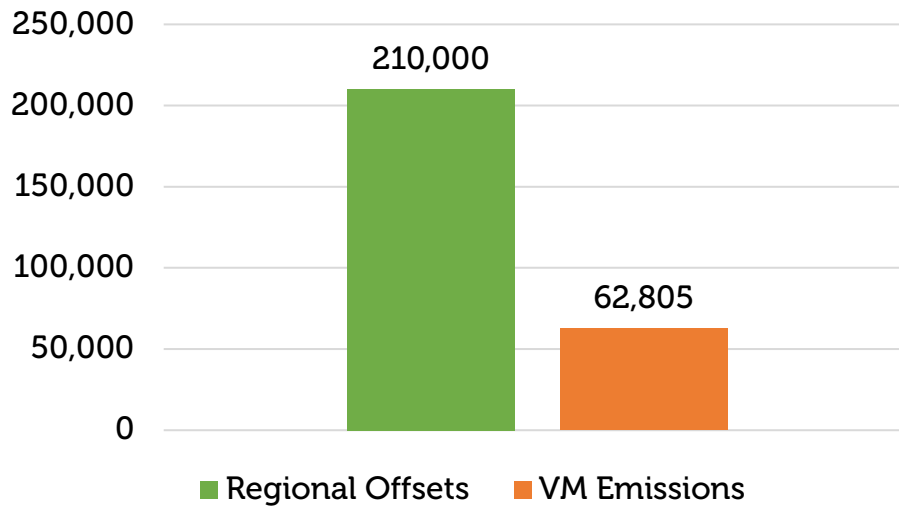


Table 5 shows the global warming emissions generated from the fuel consumption of the revenue and non-revenue fleet. The revenue bus fleet consists of 359 buses (71 diesel, 255 compressed natural gas, 7 liquified natural gas, 9 gasoline buses and 17 diesel-electric hybrid) and 416 gasoline vans. The non-revenue fleet consists of 95 vehicles. Emissions from the revenue fleet were calculated using the TCRP Framework and emissions from the non-revenue fleet were calculated using the [EPA Greenhouse Gas Equivalencies](#). Scope 1 emissions account for 40,495 tons of carbon dioxide equivalents and make up the largest portion of emissions reported in this inventory.

Table 5: Valley Metro FY19 Scope 1 Emissions

Source	Tons/CO ₂ e
Bus - Diesel	6,914
Bus - CNG	27,112
Bus - LNG	959
Bus - Gasoline	636
Vanpool - Gasoline	4,383
Non-Revenue - Gasoline	491
Total	40,495

Table 6 displays the GHG emissions associated with energy consumption, also known as Scope 2 emissions. Valley Metro’s Scope 2 emissions come from the electricity needed to operate light rail, the Rail Operations and Maintenance Center and Mesa Bus Operations and Maintenance Center. Emissions in this scope are estimated to be 21,690 tons of carbon dioxide equivalent. Emissions were calculated using the TCRP Framework and energy data was sourced from the National Transit Database and Valley Metro’s internal utility dashboard.

Table 6: Valley Metro FY19 Scope 2 Emissions

Source	Tons/CO2e
Light Rail Operations Energy Consumption	13,673
Rail Operations and Maintenance Center Energy Consumption	4,066
Mesa Bus Operations and Maintenance Center Energy Consumption	3,951
Total	21,690

Table 7 shows Valley Metro’s Fiscal Year 2019 Scope 3 emissions. Scope 3 includes employee commutes to and from one of the following locations: administrative office, Mobility Center or OMC. Data was not available for MBOM. Employee commutes are tracked by the annual Commute Solutions Survey and emissions were calculated using the TCRP Framework.

Table 7: Valley Metro FY19 Scope 3 Emissions

Employee Commutes	Miles traveled	Tons/CO2e by Mode
LRT miles traveled	50,856	5
SOV miles traveled	218,452	413
SOV EV miles traveled	32,487	4
Bicycle/walk miles traveled	1,404	0
Bus miles traveled	242,736	171
Carpool miles traveled	77,480	26
Telework miles traveled	16,796	0
Total		620

Table 8 shows Valley Metro’s Fiscal Year 2019 water consumption. Valley Metro Rail accounts for more than half of Valley Metro’s water usage; water is used along the light rail line for landscaping and public drinking fountains. Water at the maintenance facilities (OMC and MBOM) are used to wash vehicles, provide water to landscaping and for regular building use. Bus does not include water at stops and park and rides because Valley Metro does not maintain bus infrastructure.

Table 8: FY19 Water Consumption

Source	Gallons
Light Rail	35,329,785
• Operations and Maintenance Center	12,747,327
• Stations & Park and Rides	22,582,458
Bus	3,967,000
• Mesa Bus Operations and Maintenance Center	3,967,000
Total	39,296,785

Table 9 shows Valley Metro’s Fiscal Year 2019 waste and recycling totals. In Fiscal Year 2019, Valley Metro sent 152 tons of waste to the landfill and 70 tons of waste to be recycled. The OMC and light rail are combined because waste from the light rail stations is taken to the OMC for disposal. Light rail waste includes the waste that is generated at passenger stations and park-and-rides. Light rail waste does not include construction waste.

Table 9: FY19 Waste: Landfilled and Recycled

Waste	Landfilled (short tons)	Recycled (short tons)
OMC/LRT	64	9
MBOM	87	54
101 Building and OMC E-Waste	-	7
Total	152	70





Vision, Goals and Strategies

Valley Metro supports a sustainable future by striving to:



1. Reduce carbon emissions from transit



2. Improve the regional transit system to displace emissions from single occupancy trips



3. Create a transit system resilient to extreme heat

Strategies to Meet the Vision and Goals



Action Items

Goal #1: Decrease greenhouse gas emissions from transit fleet				
Strategy	Action Items	Metric to track progress	Timeframe	Responsible Division
Explore and Prepare for Zero-Emission Transit Vehicles	Electric Bus Initial Investment	# electric buses deployed	2025	Planning
	Zero-Emission Fleet Transition Plan	Y/N plan developed	2023	Planning/Operations
Create EV Charging Infrastructure	EV Charging Stations at Operations Facilities	Y/N installed	2030	Operations
	EV Ready Design Criteria	Y/N included in Valley Metro DCM	2024	Design

Frequently Asked Question: Do electric vehicles (EV) actually emit fewer GHGs when you consider powerplant emissions and battery production?

Answer: Yes! According to the [US EPA](#), [Congressional Research Service](#) and [UCS](#), electric vehicles typically have a smaller carbon footprint than gasoline cars through vehicle lifecycles.

- Powerplant Emissions:** In the past ten years, the US energy grid has become cleaner and this improvement makes EVs the more sustainable option throughout the nation. Figure 9 shows a simplified fueling process for internal combustion vehicles (ICV) and electric vehicles. ICVs rely on solely fossil fuels while electric uses a mixture of energy sources.
- Battery Impacts:** During production, EVs have between 1.3 and 2 times greater GHG emissions because of the energy-intensive process of battery manufacturing. Even with this higher initial impact, EVs produce fewer GHGs through the life of the vehicles. Industry experts are working to improve the efficiency of battery production to further reduce lifecycle emissions.

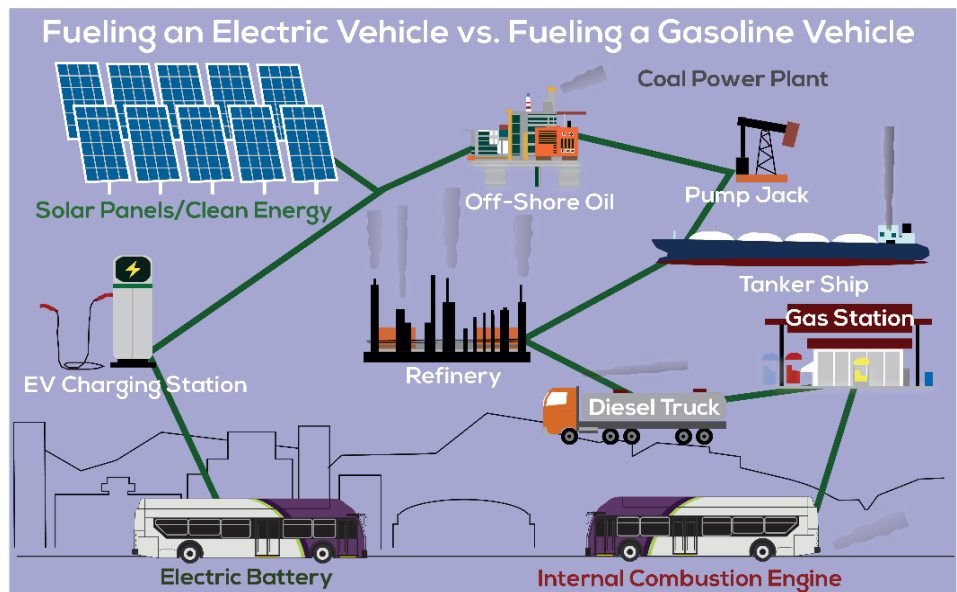


Figure 9: Electric Vehicle Fueling vs. Gasoline Vehicle

Goal #2: Increase regional greenhouse gas savings from transit

Strategy	Action Items	Metric to track progress	Timeframe	Responsible Division
Expand High Capacity Transit Options	Tempe Streetcar	Streetcar offering service	2022	Construction
	South Central Extension/Downtown Hub	LRT extension offering service	2024	Construction
	Northwest Extension Phase II	LRT extension offering service	2024	Construction
	Capitol Extension	LRT extension offering service	2024*	Construction
	I-10 West Extension	LRT extension offering service	2030	Planning
Improve Rider Experience	Ridership Experience Plan	Y/N plan developed	2024	Planning
	Shade Improvements	# shade projects	2035	Planning
	Expand transit options	Opening of new LRT extensions; Improve service frequency; Expand bus service	2035	Planning

*The Regional Transportation Plan currently identifies 2024 as the opening year for the Capitol Extension. However, Valley Metro expects to update the opening year in 2022 to reflect a new project development schedule.

Goal #3: Increase resiliency to extreme heat

Strategy	Action Items	Metric to track progress	Timeframe	Responsible Division
Create infrastructure that protects against extreme heat	Shade Improvements	# shade projects	2035	Planning
	Provide drinking water at all light rail stations	# drinking fountains	2024	Operations
	Research cooling strategies for future developments	Y/N report complete	2025	Planning
Rider Communication	Heat advisory outreach	Y/N completion of annual heat safety campaign	Ongoing	Communications



Implementation and Monitoring

Below are the processes Valley Metro will follow to track implementation of actions items and monitor progress towards meeting the sustainability goals.

Adoption: The Sustainability Plan (this version and future iterations) will be approved and adopted by the Valley Metro Executive Leadership Team.

Implementation: Valley Metro’s Senior Sustainability Specialist will be responsible for leading the implementation of the Sustainability Plan. All departments will assist in implementing the Sustainability Plan where relevant.

Anticipated Challenges: Funding is expected to be the biggest challenge to implementing the Sustainability Plan. Valley Metro aims to address this challenge by seeking grant opportunities for sustainability projects, adding sustainability elements to existing projects, and opting to execute projects with existing staff (rather than contractors) whenever possible.

Partnerships: Valley Metro will seek to partner with other organizations to deliver sustainability projects or coordinate efforts on separate sustainability projects. Some partner organizations could include city governments, local utility providers and non-profits.

Plan Updates: The Sustainability Plan will be updated at least every five years. The Executive Leadership Team will review the Plan annually to determine progress and any necessary adjustments. Valley Metro will consider member city sustainability goals and initiatives when updating the Sustainability Plan

Conclusion

Valley Metro's Sustainability Plan does not only respond to the Biden Administration's climate goals and the Federal Transit Administration's voluntary initiative for transit agencies to create climate action plans. This Plan also documents the regional transit system's impact on heat related health outcomes and the role that transit can play in the mitigation of climate impacts in the Phoenix Metropolitan area. As temperatures in the Valley continue to affect the lives of our riders, Valley Metro will support national and local climate goals through the vision and strategies identified in this Plan. Through the adoption of this Sustainability Plan, Valley Metro will develop, track and monitor the implementation of Action Items aimed at reducing GHG emissions from transit, reducing regional GHG emissions and increasing heat resiliency. Each goal has been expanded to include action items to be supported, a metric to track progress, a timeframe to hold accountability and identifies the office responsible for carrying out these actions for transparency. Valley Metro looks forward to sharing our growth and achievements with the community in our next Sustainability Plan.



Appendix A: Predicted Transit Growth & Climate Action Opportunities Analysis

Predicted Transit Growth

As the region grows, transportation demand will increase, which is why it is important for Valley Metro to monitor and manage how the agency accommodates this growth. Understanding the expected growth of Valley Metro and the agency's services, fleet size and stock helped to determine the climate actions laid out in this plan. Growth of Valley Metro's services directly impacts the agency's GHG emissions; however this change presents opportunities for the agency to integrate climate action.

VALLEY METRO BUS SERVICES

Business as Usual

Currently, Valley Metro manages a portion of the region's bus services and fleet. According to the Short Range Transit Program, the agency originally planned to keep the fuel composition of the fleet the same through 2030. This focus has been shifted as low/no vehicles have improved, regional priorities have shifted and federal direction has changed. Major factors that influence the size or the quantity of buses in the fleet are the peak hour geographic coverage and schedule, frequency, miles and interlining during peak hours. When purchasing fleet vehicles, the agency maintains a list of factors that are considered which includes A/C system requirements, climate requirements and duty cycle (how many miles it runs daily/length of routes). Transit agencies purchasing vehicles using federal capital funds are required to keep these vehicles in service for a minimum number of years and/or the number of miles prior to a vehicle's retirement. The Federal Transit Administration provides guidance on when bus fleet vehicles should be retired based on the category of the vehicle. Other factors that Valley Metro uses to determine when bus vehicles are replaced includes the cost of maintenance and the cost/availability of parts. Valley Metro maintains a list of bus vehicles to be replaced. Typically the replacement cycle is 12 to 13 years for full-sized heavy-duty buses and is planned before the buses are purchased. Replacement of buses occurs annually and before purchasing new buses the agency looks at ridership numbers, size of buses and the conditions of operation.

Opportunity – Zero-Emission Transition Plan

Planned fleet replacements present an opportunity to steadily change the fuel composition of the fleet to be partially or fully low/no emissions. Amendments could be made to the Short Range Transit Program and Valley Metro Fleet Plan to alter the fuel composition of the fleet over a specified period of time.

VALLEY METRO LIGHT RAIL SERVICES

Business as Usual

Valley Metro operates 28 miles of Light Rail Transit service, and plans to increase the miles of service by 18.3 miles with the Capitol Extension, South Central Extension/Downtown Hub, Northwest Phase II and Tempe Streetcar Projects. Valley Metro currently has a fleet of 50 rail cars that operate the existing LRT line. There are 3 LRT vehicles on order/being delivered that would be utilized for the Gilbert Road Extension, 8 LRT vehicles reserved for overlays and future extensions like the Northwest Phase II and 6 streetcar vehicles for Tempe Streetcar. The new extension projects will require additional vehicles bringing the system total to 61 LRT vehicles and 6 streetcars. An additional 14 LRT vehicles will be needed for the South Central Extension/Downtown Hub extending light rail south to Baseline Road, and it is projected that the Capitol Extension would require 5 additional(?) LRVs. The Maricopa Association of

Governments Regional Transportation Plan, which helps guide future projects, predicts that the region will see 208.2 million Vehicle Miles Traveled (VMT) in 2050³. It is assumed that Valley Metro’s LRT system including the current extension projects will produce approximately 31,500 VMT per year. Valley Metro’s Capitol Extension projects are also predicted to have an annual total of 301,882 daily PMT as observed in Table 10.

Growing the rail system will result in higher electricity consumption for the agency, which could ultimately increase the agency’s carbon emissions. The rate at which local utility providers transition to clean and renewable energy will directly affect the emissions associated with rail expansions. While it is difficult to estimate exactly what future emissions will be, it is safe to assume that emissions associated with rail electricity use will stay the same or increase.

Table 10: Light Rail Extension PMT Breakdown

Project	Average Trip Length (miles)	Daily Passenger Miles Traveled (PMT)
Capitol Extension	6.3	228,481
Northwest Phase II	6.5	26,179
South Central Extension/Downtown Hub	5.5	47,222
Total	18.3	301,882

Opportunity – Ridership Experience Plan

The greatest opportunity to increase the sustainability of the rail system is to attract new riders thus making the system more efficient. Many factors influence transit ridership and some of these factors are out of Valley Metro’s control.

Many factors influence transit ridership. While many of these factors are out of Valley Metro’s control, improving the rider experience could help attract new riders. The Ridership Experience Plan is a new effort to improve the rider experience as the system expands. Continuing and prioritizing this effort would support climate action and Valley Metro’s mission of connecting communities and enhancing lives.

VALLEY METRO FACILITIES

Business as Usual

Valley Metro plans to add two operations facilities over the next 10 to 20 years: a paratransit facility and a secondary LRT operations and maintenance facility. While no sites have been officially selected at this time, both facilities would likely be leased with one being in the East Valley and another located in the West Valley. The LRT facility is predicted to be added between 2030 and 2035, but timing is currently stalled for the paratransit facility. Typical factors that influence the need for new facilities are current versus future fleet needs, cost savings, staffing requirements and facility needs. Routine projects are completed to upgrade current facilities, including the addition of shade canopies, solar panels, building out office space and adding parking.

³ AZMAG. “Draft Regional Transportation Plan - Momentum 2050,” 2021, 83.

Opportunity – Green Building Prioritization

When looking for new facilities, Valley Metro could prioritize various green building elements, such as renewable energy generation, Energy Star Certification, LEED Certification or other elements.

VALLEY METRO VANPOOL

Business as Usual

Valley Metro's transportation services include a vanpool program, which provides eligible groups of 6-15 people with service to vans that are insured and maintained through the agency. Due to the COVID-19 pandemic and the increase in telework, Valley Metro's fleet went from 416 to 284 vanpool vehicles. However, the program is expected to expand as riders return from at-home work to the office. Valley Metro has 80 vans on standby for service for any new customers but is planning on reducing this to 20 stand-by vans. The factors that influence the size of the fleet are influenced by each group's specific needs which ranges from 9-15 seats. The fleet is reviewed every 6 months on milage, age and customers terming/new starts. Vans are typically replaced at 130,000-150,000 miles. The purchase of new or future fleet vehicles depends on what vans are the most popular in size. Lastly, fuel composition for the fleet is currently expected to remain the same due to range of the vehicle being a factor in fuel type consideration.

Opportunity – Electric Vanpool Survey and Pilot

Vanpool customer surveys could determine customer appetite for electric vanpool vehicles and the kind of charging infrastructure that would be required to maintain the fleet. In addition to a survey, Valley Metro could begin testing various electric vans to identify potential vanpool routes and better understand range capabilities. Valley Metro upfits vanpool vehicles for custom flooring and seats, which may limit options for electric vehicles. After surveys and analysis, Valley Metro could identify potential vanpools to pilot electric vans.

VALLEY METRO PARATRANSIT

Business as Usual

Paratransit is shared-ride, door-to-door or curb-to-curb transportation (provided in vans and/or taxicabs) that is provided to people with disabilities who are unable, or have limited ability because of their disability, to use fixed-route buses or trains. All public transit agencies that provide fixed-route bus and rail service are required by the Americans with Disabilities Act (ADA) to provide this service. Valley Metro is in the process of acquiring 105 paratransit vehicles. These vehicles were previously owned by a contractor but the agency is transitioning to owning and operating this service.

Opportunity – Electric Paratransit Vehicle Study

With Valley Metro transitioning to owning the paratransit fleet, there is an opportunity to consider more sustainable fuel types. One way that Valley Metro could do this is by researching and testing electric paratransit vehicles in the same way that the agency studied electric buses. This would entail general research, informational interviews with transit agencies that have electric paratransit service, gathering vehicle information from paratransit vehicle manufacturers, demonstrating potential vehicles and developing cost estimates to bring the vehicles into the fleet. This study could be performed as part of the Zero-Emission Transition Plan, and findings could be used to form recommendations on how to proceed with electric paratransit vehicles today and in the near future.