

Petaluma Transit

Zero-Emission Fleet Transition Plan



August 2023

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Executive Summary

The City of Petaluma is proud to issue its first ever Zero-Emission Bus (ZEB) Rollout Plan. This plan helps to set a course towards achieving a zero-emission bus fleet. The plan helps to fulfill goals outlined by Petaluma City Council and the Climate Emergency Framework and requirements outlined in the California Innovative Clean Transit (ICT) regulation (13 CCR § 2023.1) and Federal Transit Administration's (FTA) amended requirement for agencies seeking federal grants. This plan reflects the vision set forth by the residents of and City Council of Petaluma in striving to achieve climate neutrality (i.e. zero net emissions) by 2030 including the transition to a zero-emission bus fleet.

By enacting the ICT regulation, which became effective October 1, 2019, the California Air Resources Board (CARB) has mandated all California public transit agencies to transition bus fleets to zero-emission technologies by 2040. The ICT regulation requires agencies operating buses with a gross vehicle weight rating (GVWR) greater than 14,000 lbs. to adopt Zero-Emission Bus Rollout Plans as a means to work through the potential challenges associated with the transition to zero-emissions bus fleets. The ZEB Rollout Plan is intended to be a living document and will be updated as needed in the future to reflect changing conditions and plans. As outlined in the ICT guidance, the ZEB Rollout Plan following sections addressing the following topics:

- A) Transit Agency Information
- B) Rollout Plan General Information
- C) Technology Portfolio
- D) Current Bus Fleet Composition and Future Bus Purchases
- E) Facilities and Infrastructure Modifications
- F) Service in Disadvantaged Communities
- G) Workforce Training
- H) Potential Funding Sources
- I) Start-up and Scale-up Challenges

In addition to ICT regulations, the signing of the Federal Bipartisan Infrastructure Law (Pub. L. 117-58) on November 15, 2021, amended the statutory provisions for the 5339 Grants for Buses and Bus Facilities Competitive Program and Low or No Emission Program to require that any applicant for projects related to zero-emission vehicles have a Zero-Emission Transition Plan. In order to fulfill these statutory requirements the ZEB Rollout Plan includes a long-term fleet plan (Section D); resources needed to meet the cost of a transition to an all battery electric fleet (Sections D,E, and H); policy and legislative impacts (Sections A, B, and C); evaluation of existing and future facilities (Sections C and E); relationship with utility (Sections B, E and H); and impacts to workforce (Section G).

As outlined in this plan, the City of Petaluma will continue to pursue funding opportunities at the federal, state, and local levels to support the transition to a ZEB fleet and ensure that appropriate staff training and workforce development is provided in order to support it. This Rollout Plan provides estimated timelines based on information regarding bus and cutaway purchasing options, infrastructure upgrades, workforce training, and other developments and expenses that are available at the time of writing.

Section A: Transit Agency Information

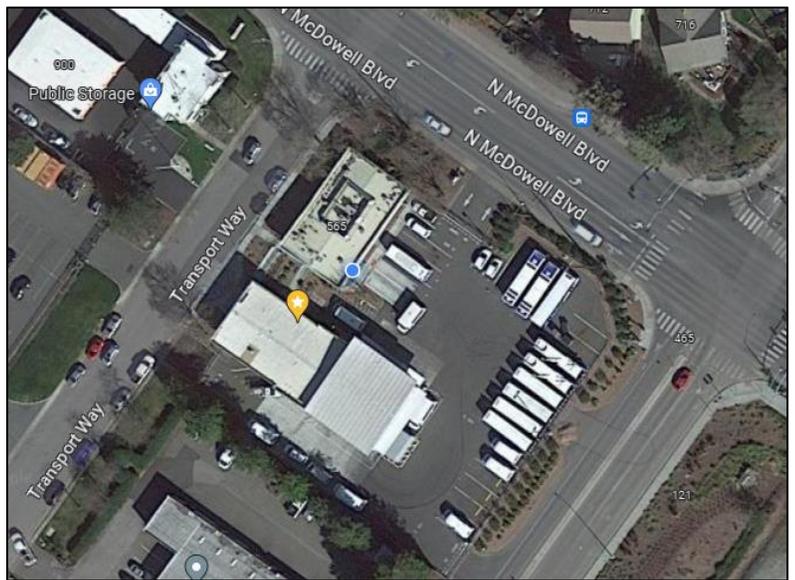
Petaluma Transit Profile

Petaluma Transit provides fixed route and paratransit service within City of Petaluma boundaries (additional service offerings such as microtransit will be offered in the future). The Petaluma City Council has supported several actions to accelerate the transition of Petaluma Transit's fleet entirely to Battery Electric Buses (BEBs) ahead of ICT mandates. This includes the Climate Emergency Framework¹, the adopted and updated FY21-23 City Council Goals², and the Measure U local sales tax initiative³. The City of Petaluma anticipates reaching full electrification of its 25-vehicle fleet by 2030 (not accounting for service expansion vehicles which aren't assumed through this plan), 10 years in advance of the ICT requirement. Currently, the City of Petaluma intends to procure only zero-emission vehicles going forward for all of its transit, paratransit and transit support vehicle fleet.

All of Petaluma Transit's vehicles operate out of its lone Transit operations depot located at 555 N. McDowell Blvd Petaluma, 94954. This site is shared between City and contracted transit staff with all vehicles being stored and maintained at this location.

All Petaluma Transit vehicles are currently fueled off-site at the Petaluma City School Transit Yard (491 Kenilworth Drive, Petaluma 94954). As the Petaluma Transit fleet transitions to a zero-emission fleet, the vehicles are anticipated to be battery electric buses and charged at the Transit operations depot using on-site charging.

- Transit Agency's Name: Petaluma Transit
- Mailing Address: 555 N McDowell Blvd, Petaluma, CA 94954
- Transit Agency's Air Districts: San Francisco Bay Area
- Transit Agency's Air Basin: San Francisco Bay Area
- Total Number of Vehicles in Annual Maximum Service: 20
- Current fleet make up:
 - Fixed-route – 14 diesel buses
 - Paratransit – 11 gas cutaways
- Service Area:
 - Size: 14.5 sq mi
 - Population: 59,403
- Contact Information of transit general manager:
 - Jared Hall, Transit Manager, jhall@cityofpetaluma.org, 707-778-4421
- Is your transit agency part of a Joint Group? No



The Petaluma Transit Operations Depot – located at 555 N. McDowell Blvd in Petaluma

¹ https://storage.googleapis.com/proudcity/petalumaca/uploads/2021/02/Climate-Action-Framework_Final.pdf

² <https://cityofpetaluma.org/city-goals-and-priorities/>

³ <https://cityofpetaluma.org/information-about-measure-u/>

Service Area

Petaluma Transit operates a network of fixed route and paratransit services. Service is operated daily, 7 days per week 361 days per year (No service is provided on major holidays). Petaluma Transit contracts with MV Transportation for the operation and maintenance of all services. All services operate within the City of Petaluma limits (approx. 14 sq miles). Additional services and operating types are anticipated to be added in the future including microtransit/shuttle service.



The Petaluma Transit fixed route bus network

Petaluma Transit currently has a fleet of 25 revenue vehicles (14 fixed route, 11 paratransit) operating six fixed routes, three school tripper routes, and on-demand paratransit service. A total of approx. 215,000 passenger trips were provided by these services in FY 2022.

Services Provided

The following core services are currently being provided by Petaluma Transit.

Fixed Route

Petaluma Transit offers six fixed routes and three school tripper routes that generally operate from 6:30 a.m. to 8:00 p.m. on weekdays, from 7:30 a.m. to 7:30 p.m. on Saturdays, and from 8:30 a.m. to 4:30 p.m. on Sundays.

Paratransit

The Petaluma Paratransit service is available during the below hours, which vary for Monday-Friday, Saturday, and Sunday. Paratransit service is available only to people who meet one of the following criteria:

- Be unable to get to and from a bus stop or on and off a lift-equipped bus by yourself
- Have a cognitive disability that prohibits your understanding of how to complete bus trips

Petaluma Paratransit Hours*					
	Monday -Friday	Saturday	Sunday	Holiday Sunday Service	Holiday No Service
Service Hours	6:15 AM- 8:25 PM	7:30 AM- 8:25 PM	8:30 AM- 5:25 PM	8:30 AM- 5:25 PM	CLOSED
Reservation Hours	8:00 AM- 5:00 PM	9:00 AM- 5:00 PM	9:00 AM- 3:00 PM	9:00 AM- 3:00 PM	CLOSED
Cancellation Hours	Open 24 hours a day, 7 days a week. Please leave a message.				

*Valid as of 3/23/18.

Section B: Rollout Plan General Information

Petaluma Transit's Rollout Plan achieves a zero-emission fleet by 2030, ahead of the ICT's 2040 required target date. Rollout Plan's Board Approval Date:

- Expected August 2023
- Resolution No. (optional): TBD
- Is a copy of the Board-approved resolution attached to the Rollout Plan?
 - A copy of the City Council approved resolution will be included as Appendix A
- Contact Information:
 - Jared Hall, Transit Manager, jhall@cityofpetaluma.org, 707-778-4421
 - Ray Atkinson, Senior Transit Planner, ratkinson@cityofpetaluma.org, 707-776-3711
- Who created the Rollout Plan?
 - Petaluma Transit staff working in conjunction with other City of Petaluma staff drafted the Zero-Emission Bus Rollout Plan; the plan was informed by the Battery Electric Bus Planning and Engineering Study for Petaluma Transit sponsored by Sonoma Clean Power and prepared by The Cadmus Group in December 2019.
- Cost of creating the Rollout Plan.
 - The cost of creating the Rollout Plan is approx. \$20,000 in City staff time. Staff time includes applying for grants, coordinating regional discussions, working with Sonoma Clean Power to develop the Engineering Study, applying for PG&E's EV Fleet program, meeting with PG&E on site, working through PG&E contracting, developing Phase I project plans, working through the purchasing of the first four BEB vehicles, plus the general management of the electrification process that has enabled the City staff to become knowledgeable enough to produce this plan.

The following policies have impacted and will continue to influence decisions over the coming years.

California Air Resource Board's Innovative Clean Transit Regulation⁴

In December 2018, the California Air Resources Board (CARB) passed the Innovative Clean Transit (ICT) regulation which is designed to transition all public transit agencies in the State of California from conventional internal combustion engine powered buses (compressed natural gas, diesel, etc.) to zero-emission buses (battery-electric or hydrogen fuel cell electric) by 2040. The regulation requires a progressive increase of an agency's new bus purchases to ZEBs based on their fleet size. Under the ICT regulation, each agency's purchase requirements are based on its classification as either a "Large Transit Agency" or a "Small Transit Agency". As a small agency, beginning January 1, 2026, 25% of all Petaluma Transit bus orders must be ZEBs until January 1, 2029, when 100% of all buses ordered must be ZEBs. Note, these requirements are only applicable to the fixed route bus fleet; although the

⁴ <https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit/ict-regulation>

Petaluma Transit ZEB Plan accounts for conversion of the paratransit vehicle fleet to ZEB by 2030, the ICT does not currently have any requirements for conversion of paratransit vehicles to ZEBs.

In addition to the ICT regulation, California has also implemented the Low Carbon Fuel Standard to provide credits to those that utilize clean fuels and funding to help support GHG reducing activities. These are just two of the programs that play a part in California's broader climate change strategy that affect Petaluma Transit. The foundation of these programs is the California Global Warming Solutions Act of 2006 and Senate Bill (SB 32) in 2016 that set the goal of reducing GHG emission to 40% below 1990 levels by 2030.

Petaluma Climate Emergency Framework⁵

The Petaluma City Council adopted the Climate Emergency Framework at its January 11, 2021, special meeting, directing staff to incorporate the Framework's goals into future planning, policy, and action to help Petaluma be carbon neutral by 2030. Converting the City of Petaluma vehicle fleet (including the Petaluma Transit fleet) to electric vehicles is one action included within the plan. The California Air Resources Board (CARB) also passed an ICT regulation, which requires that all public transit agencies gradually transition to a 100% zero-emission fleet with a statewide goal for full transition of 2040 (fixed route buses only).

⁵ https://storage.googleapis.com/proudcity/petalumaca/uploads/2021/02/Climate-Action-Framework_Final.pdf

Section C: Technology Portfolio

Petaluma Transit is pursuing a battery-electric bus (BEB) only fleet. The City of Petaluma is projected to operate a zero-emission bus fleet comprised of 14 Battery electric fixed route buses and 11 battery electric cutaway vans by 2030 (not accounting for potential future fleet expansion). Petaluma Transit staff researched the deployment of fuel-cell technology, but a few factors guided the determination that deployment of battery electric vehicles is the best choice for the fixed-route fleet. Most notably, the Petaluma Transit Operation Depot does not have sufficient space for hydrogen fuel cell technology requiring the vehicles to continue off-site fueling with added time, expense and wear-and-tear compared to a battery electric fleet that can be powered all on-site at the operations depot. Second, the City of Petaluma currently utilizes the Sonoma County Evergreen Energy Program⁶ which provides all 100% renewable energy sources for its bus fleet with power largely derived from the nearby Sonoma County geothermal geyser field⁷ as the world's largest geothermal geyser field a local source for 100% local renewable power. Since Petaluma Transit operates exclusively local service within City limits, route blocking distance per vehicle is a maximum of 220 miles/day and service hours (6:20am – 8:30pm) enabling Petaluma Transit to utilize depot charging for about 8 hours each evening. With a small fleet and limited mechanical staff, Petaluma Transit will not pursue a mixed ZEB fleet. Petaluma Transit's investment in BEBs builds on a history of working with Sonoma Clean Power.



⁶ <https://sonomacleanpower.org/programs/evergreen>

⁷ <https://geysers.com/history11>

Section D: Current Bus Fleet

Composition and Future Bus Purchases

Description of Petaluma Transit’s Current Fleet

Petaluma Transit’s fourteen vehicle fixed route bus fleet is currently composed of 29’, 35’, and 40’ buses (11 diesel, and 3 diesel-electric hybrid). The paratransit fleet is comprised of 11 gasoline cutaways ranging from 22-24’ in length. Fixed route buses typically run a block of work that is composed of multiple routes throughout the City, ranging between 120-170 miles. Paratransit vehicles typically operate 50-100 miles per day. The maintenance for the vehicle fleet is completed at the City of Petaluma operations depot/maintenance facility. Table 1 details the fixed route and paratransit fleets as they exist in May 2023. Petaluma Transit’s fuel consumption and mileage are tracked for billing and benchmarking purposes. Thus, as the fleet is converted to BEBs the mileage and operations costs can be compared with those of diesel-powered vehicles.

Although these vehicles noted below comprise the current Petaluma Transit vehicle fleet composition as of 2023, the vehicle mix in the future will potentially be modified to account for use of different vehicle types, sizes and purposes.

Table 1: Current Bus and Paratransit Fleets

Fixed Route Fleet

# of vehicles	Company	Year (Bus/Engine)	Bus Type	Fuel Type	Vehicle Length	Seating Capacity	Useful Life Benchmark
4	Gillig Corporation	2011	Standard	Diesel	29’	23	12-15 years
4	Gillig Corporation	2007	Standard	Diesel	35’	31	12-15 years
3	New Flyer	1999	Standard	Diesel	40’	38	12-15 years
2	Gillig Corporation	2016	Standard	Hybrid Diesel	35’	34	12-15 years
1	Gillig Corporation	2016	Standard	Hybrid Diesel	40’	40	12-15 years

Paratransit Fleet

# of vehicles	Company	Year (bus/engine)	Bus Type	Fuel Type	Vehicle Length	Seating Capacity	Useful Life Benchmark
2	Elkhart Coach	2012	Cutaway	Gasoline	22	8	5-8 years
1	Elkhart Coach	2013	Cutaway	Gasoline	24	12	5-8 years
1	Elkhart Coach	2015	Cutaway	Gasoline	24	12	5-8 years
1	Elkhart Coach	2015	Cutaway	Gasoline	22	8	5-8 years

2	Glaval Bus	2017	Cutaway	Gasoline	22	11	5-8 years
1	Glaval Bus	2019	Cutaway	Gasoline	24	13	5-8 years
2	Glaval Bus	2019	Cutaway	Gasoline	23	11	5-8 years

Long-Term Fleet Management Plan

Petaluma Transit’s goal is to maintain a modern reliable fleet appropriately sized for the services provided. Petaluma Transit plans to transition and replace each all gas and diesel vehicles with battery-electric vehicles when they reach the end of their useful life. The City of Petaluma does not plan to retrofit any existing vehicles to zero-emission vehicles.

*Table 2: Future Bus and Paratransit Purchases**

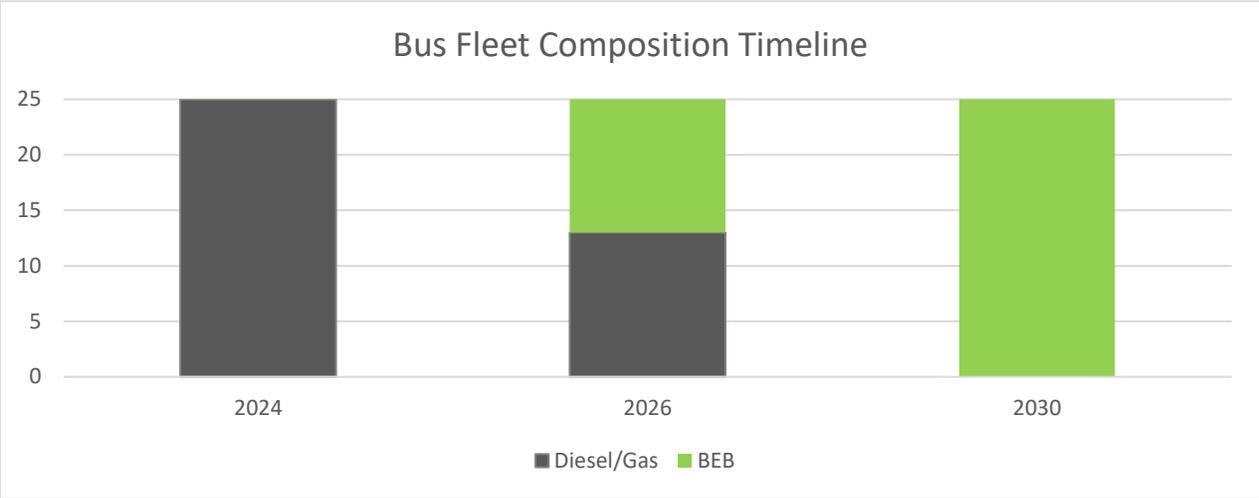
Year of Purchase	# of vehicles purchased	% of ZEVs purchased	Service	Vehicle Type	Propulsion Type	Charging type
2024	4	100%	Fixed Route	Standard	Battery-Electric	Depot
2026	1	100%	Fixed Route	Standard	Battery-Electric	Depot
2026	4	100%	Fixed Route	Standard	Battery-Electric	Depot
2026	2	100%	Fixed Route	Standard	Battery-Electric	Depot
2029	2	100%	Fixed Route	Standard	Battery-Electric	Depot
2029	1	100%	Fixed Route	Standard	Battery-Electric	Depot
2024	3	100%	Paratransit	Cutaway	Battery-Electric	Depot
2025	3	100%	Paratransit	Cutaway	Battery-Electric	Depot
2026	2	100%	Paratransit	Cutaway	Battery-Electric	Depot
2028	2	100%	Paratransit	Cutaway	Battery-Electric	Depot

Figure 2 Graph showing potential ZEB conversion if sufficient funding can be obtained.

**Additional vehicles may be purchased or vehicles may be different vehicle types used for microtransit service*

Petaluma Transit will purchase BEBs exclusively starting in FY 2024 and beyond. This is based on the rate of technological advancement, costs, and availability of BEBs of the type and size needed. Preliminary analysis shows that buses currently available can operate the Petaluma Transit system based on climate, terrain, daily mileage, and hours of daily operation. Paratransit buses that are battery electric are minimally available at this time (especially vehicles eligible for federal funding) and currently have more limited ranges of 100-130 miles.

Table 3: Schedule of converting conventional buses and paratransit vans to zero-emission vehicles



Section E: Facilities and Infrastructure Modifications

Facility Assessment Methodology

A Battery Electric Bus Planning and Engineering Study for Petaluma was conducted in December 2019 to assess the current capacity of the Petaluma Transit Operations Depot and set the stage for creating this ZEB rollout plan and the infrastructure improvements needed to the site in order to ensure it is available to adequately charge a zero-emission bus fleet as the fleet transitions over from its carbon-fuel based fleet.

BEB deployment will require electrical infrastructure upgrades, including upgrades to the transformer, switchgear, and utility service connections. Phase 1 of improvements to the Petaluma Operations Depot are in progress through the City’s participation in the PG&E Fleet Ready Program, which was initiated in February 2023. The Fleet Ready program⁸ supports project planning and design work including the detailed electrical and construction drawings required for permitting resulting in ten dual port chargers. This phase will install 10 dual port chargers. This plan assumes that infrastructure projects will be completed prior to each bus delivery to minimize any potential delays of putting the buses in service upon arrival. The City is currently finalizing specifications for improvements needed under this phase including transformer upgrades, electronic switch gear, electric cabling, and vehicle charger purchase and installation. A second project phase is anticipated for approx. 2027 in order to make additional facility upgrades needed to service full conversion of the City bus fleet to battery-electric buses; this will include a second phase for the project that will install an additional five dual port chargers.

Table 4: Facility Information and Construction Timeline

Division Facility	Address	Main Function	Type(s) of Infrastructure	Service Capacity	Needs Upgrade?	Estimated Construction
Transit Operations Depot	555 N McDowell Blvd, Petaluma, CA 94954	Operations, maintenance, administration	Depot charging	25 vehicles - 15 200kW – Dual Port	Yes – needs transformer, switch gear, cabling, chargers	Phase 1- FY 2025 Phase 2- FY2027

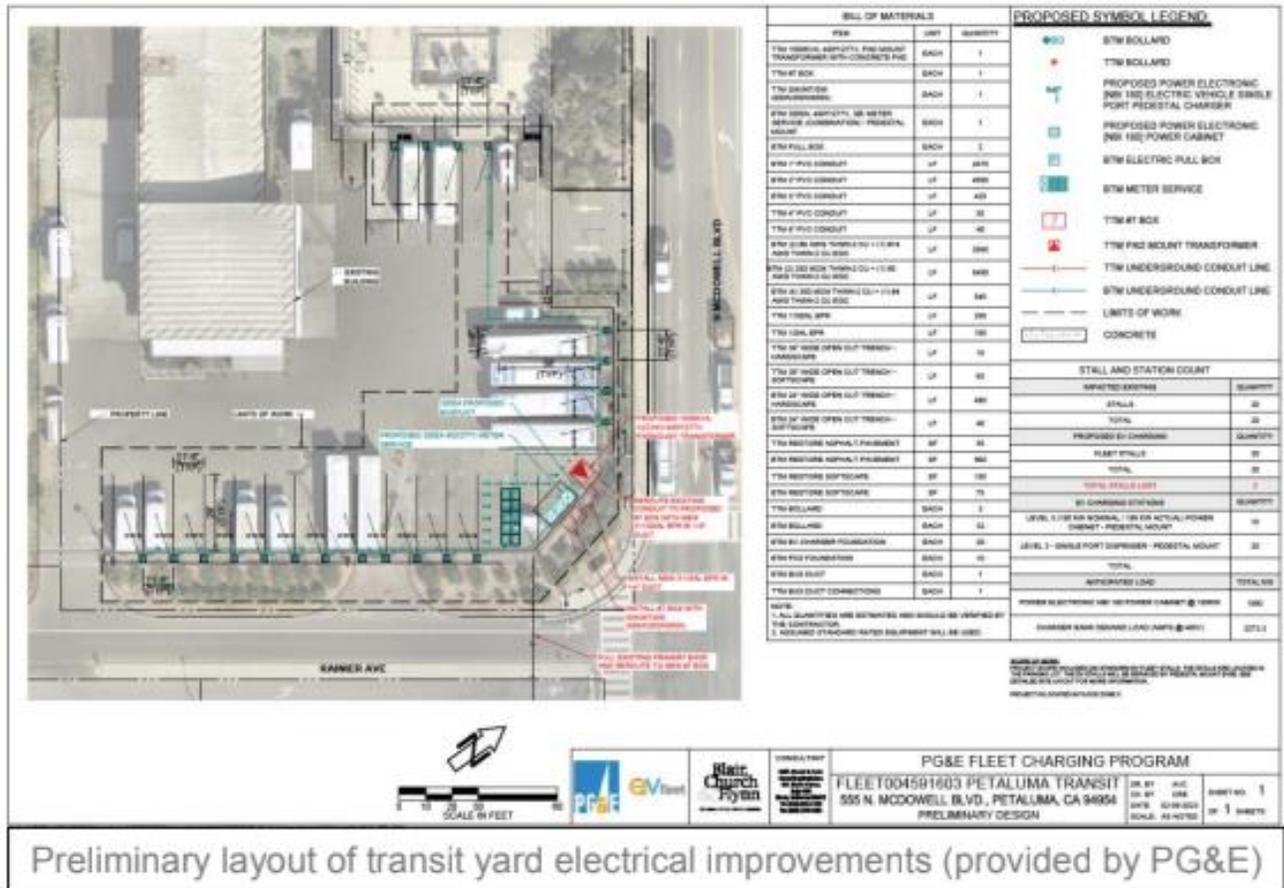
This plan assumes that not all chargers will be operating at all times (due to planned and unplanned needs for charger maintenance and downtime). For this reason, the City has deployed added charging capacity to ensure the charging infrastructure can reliably support the BEB fleet. With the City fleet size of 25 vehicles, 15 dual-port chargers are anticipated to be needed.

An intelligent electric-load management system is required for the site due to current grid capacity limitations. Although PG&E will install equipment on-site capable of providing enough power for the maximum EV charging load requested, the customer is required to limit their EV charging load to 0 kW during the hours of 6:00 to 21:00 and 1,800 kW during the hours of 21:00 to 6:00. The City anticipates that plug-based depot charging will be sufficient without need or use for wireless or on-route charging.

⁸ https://www.pge.com/en_US/large-business/solar-and-vehicles/clean-vehicles/ev-fleet-program/ev-fleet-program.page

Description of changes to Transit Facilities

PG&E determined that Petaluma Transit is eligible for the Make-Ready Incentive Option. PG&E will design, construct, own, and maintain the EV supply infrastructure at the Transit Yard to the meter only. Petaluma Transit will design, build, own, operate, and maintain the EV supply infrastructure behind the meter at the Transit Yard. The details of this infrastructure are shown in the below preliminary layout, which was provided by PG&E.



Section F: Providing Service in Disadvantaged Communities

CARB defines disadvantaged communities (DACs) as areas throughout California that most suffer from a combination of economic, health, and environmental burdens, as defined by SB 535 and CARB. The state identifies DAC areas by collecting and analyzing information from communities. CalEnviroScreen (<https://oehha.ca.gov/calenviroscreen/sb535>) displays an analytical tool created by the California Environmental Protection Agency (CalEPA) that shows a census tract score and identifies communities that are considered DACs. As the below map shows, none of Petaluma's census tracts have DACs.

CalEPA
California Environmental Protection Agency

SB 535 Disadvantaged Communities (2022 Update)

CalEPA SB 535 Page CalEnviroScreen 4.0 About

California Climate Investments are funds (Greenhouse Gas Reduction Fund and appropriated by the Legislature) from the proceeds of the State's Cap-and-Trade Program specifically targeted for investment in disadvantaged communities in California. These funds must be used for programs that further reduce emissions of greenhouse gases.

Senate Bill 535 (De León, Statutes of 2012) directed that at least a quarter of the proceeds go to projects that provide a benefit to disadvantaged communities and at least 10 percent of the funds go to projects located within those communities. The legislation gives CalEPA the responsibility for identifying those communities.

How to use this map

- Use your mouse or touchpad to pan around.
- Zoom in/out with a mouse wheel or the +/- icons.
- Search by location or census tract number with the search icon.
- Click on a census tract to view additional information in the pop-up window.
- Dock the pop-up window to the side of the screen by clicking the dock icon.
- Export a map view that includes the legend and popup using the screenshot widget.
- Click the links in the header to view additional resources related to SB 535 Disadvantaged Communities

SB 535 Disadvantaged Communities 2022 (Census Tracts and Tribal Areas)

The map shows the Petaluma area with various census tracts highlighted in different colors. A legend on the left explains the map's purpose and provides instructions on how to use it. The map interface includes a search bar, zoom controls, and a legend.

The State of California's transition to zero-emission buses will benefit the Bay Area region by reducing fine particulate pollution and improving air quality particularly at the locations where the polluting industries are located. Petaluma Transit's current vehicle fleet consumes an annual average of 50,000 gallons of diesel and 6,500 gallons of gasoline. This fuel when burnt, exposes those who are reliant on this transportation option to fuel exhaust, a classified carcinogen linked to asthma and other lung health issues. Transitioning Petaluma Transit's fleet to BEBs will help alleviate this pollution and improve the health of our community. Replacing our existing vehicles with BEBs will also increase the profile of Petaluma Transit as a solution to climate change.

Section G: Workforce Training

Petaluma Transit understands that all operating and maintenance personnel will need some level of training to seamlessly transition to a ZEB fleet. Staff must develop new routines and procedures to handle all aspects of owning, fueling, maintaining, and operating ZEBs. At a minimum, the following positions with the current number of personnel will need sufficient training to safely and efficiently achieve this.

- a. Drivers (22)
- b. Dispatchers (4)
- c. Maintenance (2)
- d. Utility (1)
- e. Other support staff as needed

On- and Off-Site Training

Petaluma Transit will work with its transit operations contractor (MV) to ensure the necessary training is received. There are a few ways in which this will be achieved. MV provides regular updates to its training curriculum as a major national operator who regularly hires and/or trains thousands of operators nationally per year and regularly update training materials including for electric buses. Petaluma Transit will work to partner with other Transit agencies throughout the region when possible on training. For example, AC Transit has developed a full curriculum for EV bus training for mechanics which they have offered to allow Petaluma Transit staff to attend in the future. Additionally, there are opportunities through the Federal Technical Assistance and Workforce Development program that will provide technical assistance in training staff. Lastly, anytime that ZEBs are procured, all of the contracts will include language and costs for receiving training from the product manufacturer. This approach will also be taken with chargers, repair equipment and the operation of ZEBs.

It is anticipated that the largest need for training will be upon the initial delivery of the first wave of electric buses planned for FY24 as this will be needed for all staff that will potentially be operating, servicing or maintaining but vehicles. Subsequent trainings will be needed for new staff, as new vehicle and charger technology is received and for regular refresher trainings.

Table 5: Workforce Training Schedule

Year	Class	Purpose of Training	Provider	# of Trainees	Training Freq	Cost
2024	Mechanic / Utility	Provide training for maintaining BEBs	Vehicle manufacturer, operations contractor	3	Once	\$10,000
2024	Safety Manager and GM	Ensure management can train drivers	TBD Vehicle manufacturer, operations contractor	2	Once	\$5,000
2024	Driver / Supervisor	Ensure drivers and	Vehicle manufacturer,	27	Once	\$10,000

		Supervisor have training	operations contractor			
2024	Chargers	Ensure electrical staff understand chargers	Charger manufacturer, operations contractor	2	Once	\$10,00
Annual after 2024	All	Refresher training and training for new employees	Vehicle/ charger manufacturer, operations contractor	5-10	As Needed	\$20,000 Annual

Sample curriculum will include:

- Zero-Emission Bus Operations
 - Introduction to zero-emission bus technology
 - Differences between ZEBs and incumbent technologies
 - Dashboard familiarization
 - ZEB fueling training
 - Preventing road calls
- Zero-Emission Bus Maintenance
 - Introduction to ZEB technology
 - Differences between ZEBs and incumbent technologies
 - Preventative maintenance practices for ZEBs
 - Unscheduled maintenance practices for ZEBs
 - General and high-voltage safety training
 - Basic diagnostics and troubleshooting

Section H: Potential Funding Sources

The Petaluma City Council has made a commitment towards being 100% carbon neutral (i.e. zero emission) by 2030. Following the awarded and projected funding that is shown in Table 7, this goal would be achieved by as early as 2030 for the Petaluma Transit fleet. Based on 2023 prices, about \$17 million is needed to purchase 14 battery-electric buses and 10 battery-electric paratransit vans. Due to the Federal Transit Administration (FTA) defining the bus service life as 15 years and paratransit van service life as 8 years until federal funds can be used to replace the vehicle, it is not feasible to use federal funds to reach the 100% zero-emission goal by 2030. About \$9 million would be needed from non-federal funding sources to reach this goal by 2030.

Table 6: Estimated Cost of 100% fleet conversation to ZEB

AWARDED FUNDS				
Fiscal Year Timeline	Name of Funding Source	How Each Fund is Planned to be Used	Estimated Amount of Each Funding Source	Number of ZEBs to Purchase or Maintain, or Type(s) of Infrastructure to Install or Upgrade
2024	FTA 5307/TCP Formula	Buy Buses	\$3,136,200	4 – BEB’s
	TFCA		\$85,343	
	LCTOP		\$510,244	
	TIRCP		\$691,200	
	HVIP		\$480,000	
	Measure M		Local match	
	TDA		As needed	
2024	PG&E EV Fleet	Install Chargers	\$90,000	Infrastructure to support 10 - Dual Port Electric Chargers
	TDA		As needed	
2024	TIRCP	Transit Depot Infrastructure Upgrades & Purchase/ Install Chargers	\$940,000	10 – Dual Port Electric Chargers
2024	FTA 5307/TCP Formula	Buy Paratransit Vans	\$252,000	3 – Paratransit Vans
	Measure M		Local match	
	TDA		As needed	
2025	FTA 5307/TCP Formula	Buy Paratransit Vans	\$261,600	3 – Paratransit Vans
	Measure DD / Measure M		Local match	
	TDA		As needed	
2026	FTA 5307 TCP Formula	Buy Buses	\$2,645,600	3 – BEB's
	TFCA		\$85,343	
	LCTOP		\$348,332	
	TIRCP		\$518,400	
	HVIP		\$360,000	
	Measure DD / Measure M		Local match	
	TDA		As needed	

2026	FTA 5307/TCP Formula	Buy Paratransit Van	\$87,200	1 – Paratransit Van
	Measure DD / Measure M		Local match	
	TDA		As needed	

UNFUNDED PROJECTS				
Fiscal Year Timeline	Name of Funding Source	How Each Fund is Planned to be Used	Estimated Amount of Each Funding Source	Number of ZEBs to Purchase or Maintain, or Type(s) of Infrastructure to Install or Upgrade
2026	Any in above fund listing	Buy Buses	\$4,484,000	4 – BEB's
2026		Buy Paratransit Vans	\$225,000	1 – Paratransit Vans
2028		Buy Paratransit Vans	\$450,000	3 – Paratransit Vans
2030		Buy Buses	\$3,963,000	3 – BEB's
2030+		Replace Above BEB's and Paratransit Vans		

Table 7: Estimated Cost of 100% fleet conversation to ZEB

Year	Number of ZEB Purchased	Percentage ZEB	Facility/ZEB Bus Types	ZEB Bus Fuel Types	Required ZEB Range	Estimated Cost Per ZEB	Total Cost
2024	4	100%	Bus	Battery Electric	200	\$1,021,000	\$4,084,000
2024	3	100%	Paratransit Van	Battery Electric	150	\$215,000	\$645,000
2025	3	100%	Paratransit Van	Battery Electric	150	\$215,000	\$645,000
2026	7	100%	Bus	Battery Electric	200	\$1,121,000	\$7,847,000
2026	2	100%	Paratransit Van	Battery Electric	150	\$220,000	\$440,000
2028	3	100%	Paratransit Van	Battery Electric	150	\$225,000	\$675,000
2030	3	100%	Bus	Battery Electric	200	\$1,221,000	\$3,963,000
Total	24	100%					\$18,299,000

To achieve this level of funding, capital from multiple funding sources will be required, including: federal formula and discretionary funds, state funds, local funds, and special grant funding. The table below lists the existing funding sources that can potentially fund this transition, but additional funding sources will be needed. Petaluma Transit has designated a significant amount of discretionary funds for investments in BEBs. In recent years, there has been increased funding at the state and federal level as well as development of new programs specifically to aid agencies in ZEB fleet and facility planning, construction and operation. This trend will need to continue in addition to the projected stagnation or reduction in ZEB prices that is expected to come from economies of scale as increased quantities are purchased over time. Additionally, the projected fuel and maintenance savings from BEB operation will need to be realized in real world operations to free up funds for the purchase of still more ZEBs.

Table 8: Potential Funding Sources for Fleet Conversion to ZEB

Type	Agency	Program
Federal	United States Department of Transportation (USDOT)	Rebuilding America Infrastructure with Sustainability and Equity (RAISE) Discretionary Grant Program
		Capital Investment Grants – New Starts
		Capital Investment Grants – Small Starts
		Transit Infrastructure Project Appropriation
		Transportation Infrastructure Finance and Innovation Act (TIFIA) loan
	Federal Transportation Administration (FTA)	Bus and Bus Facilities Discretionary Grant
		Low- or No-Emission (“Low-no”) Vehicle Grant
		Metropolitan & Statewide Planning and Non Metropolitan Transportation Planning
		Urbanized Area & Rural Area Formula Grants
		State of Good Repair (SGR)
		Flexible Funding Program – Surface Transportation Block Grant Program
US Department of the Treasury	New Market Tax Credits	
	Opportunity Zones	
State	California Air Resources Board (CARB)	Low Carbon Fuel Standard Credits
		Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)
		Carl Moyer Program
		Cap-and-Trade Funding
		State Volkswagen Settlement Mitigation
		Clean Mobility Options
	California Energy Commission	California Lending for Energy and Environmental Needs (CLEEN)
		Clean Transportation Program
	California Transportation Commission (CTC)	Solution for Congested Corridor Programs (SCCP)
	California State Transportation Agency	Transit and Intercity Rail Capital Program (TIRCP)
	California Department of Transportation (Caltrans)	Low Carbon Transit Operations Program (LCTOP)
State Transit Assistance (STA) funds		
State of Good Repair (SGR)		
Local	Petaluma Transit	Advertising revenues
		Farebox revenues

Section I: Start-up and Scale-up Challenges

Cost Considerations

Making a significant industry change with a new propulsion technology, its corresponding infrastructure, and training for operators and maintenance staff poses new barriers and challenges. The most significant challenge facing transit agencies through the start-up and scale-up phases of the zero-emission transition is the financial requirement. New 40' BEBs cost between \$1,100,000 to \$1,500,000 which is about \$250,000 to \$850,000 more than diesel buses. Electric cutaways can cost from \$225,000-\$275,000 which is about \$100,00-\$150,000 more than gasoline cutaways. Additionally, the necessary infrastructure to support these buses adds to the financial burden of transitioning to a BEB fleet. The as-yet unknown costs of future fueling infrastructure and electricity are another financial consideration as the City moves into the operations of BEBs. Continued financial support at the local, state, and federal level to offset the capital cost of this new infrastructure is imperative.

Resiliency Considerations

The City of Petaluma will also need to consider resiliency as it deploys BEBs. Because BEBs are reliant on electric charging, a power outage at the depot may mean that it would not be possible to provide scheduled service for those who depend on it. In addition, in recent years, there have also been an increasing number of PSPS events (Public Safety Power Shutoffs) due to wildfire risk from high winds during the dry season and excess energy usage during heat waves. If these trends continue, as expected, this will only exacerbate the need for the City to have a strategy to charge buses during power outages. The City of Petaluma will be exploring opportunities to install on-site solar photovoltaic panels to generate on-site power, as well as battery solutions for on-site energy storage. Grant opportunities cited in the above section could potentially be used to fund such installations to augment the resiliency of Petaluma Transit operations.

Petaluma Transit will work with other agencies and resources throughout the community to create additional backup options and agreements to allow for charging at additional locations for the Petaluma Transit vehicle fleet in the event that charging at the current transit depot isn't available or accessible for any reason. This includes utilizing chargers at other City facilities (firehouses, the City Corp Yard at 840 Hopper Street, etc.), partner agencies (Petaluma City Schools, nearby Transit agencies such as Sonoma County Transit or Marin Transit) or any other public or private charging resources available throughout the community that may be available in future years (i.e. connections to a possible battery farm near the PG&E substation located at the intersection of Frates Road & Old Adobe Rd, currently in the environmental review phases).

Availability of BEV Paratransit vehicles

A challenge facing long-term transition planning is the uncertainty around the performance and availability of zero-emission paratransit cutaway vehicles. At present, zero-emission paratransit cutaway vehicles are very limited in North America. Currently the ICT regulations states that the purchase of ZEB cutaway bus will be specified on or after January 1, 2026, once cutaway models obtain Bus Testing Reports that allow transit agencies to purchase them using federal funds (described in section 2023(b)(8) of the regulation (13 CCR § 2023.1) as the "Altoona Test"). Little data is available to forecast vehicle performance or cost. Pilot scale deployment and BEBs in these transit applications would benefit the industry by providing key

insights into vehicle operation. Although this plan outlines a conversion of the paratransit vehicle fleet to BEBs by 2030, this will be largely reliant upon advances in the market between 2023 and 2030 to allow for more vehicle options that are proven/reliable, have sufficient range, and are eligible for federal funding (have passed Altoona testing, meet Buy America requirements, etc.).

Availability of Continued Funding

Despite the ICT mandates towards achieving zero emission bus fleets by 2040 for small transit operators, the mandate is not fully funded. BEBs offer significant cost increases vs internal combustion equivalent vehicles as noted throughout this report. Thus additional funding will be needed in order to bridge this need for additional funding from some combination of: federal, state, and local agencies.

CARB can support Petaluma Transit by ensuring continued funding for the incremental cost of BEBS and fueling infrastructure. Funding opportunities should emphasize proper transition and deployment planning and should not preclude hiring consultants to ensure best practices and successful deployments.