



Greenhouse Gas Reduction Fund for Low Carbon Transportation Investments

AGRICULTURAL WORKER VANPOOLS PILOT PROJECT FINAL REPORT

May 1, 2022

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**Greenhouse Gas Reduction Fund for Low Carbon Transportation Investments
Agricultural Worker Vanpools Pilot Project in the San Joaquin Valley**

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Prepared by the California Vanpool Authority



The statements and conclusions in this report are those of the Grantee and not necessarily those of the California Air Resources Board.

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EXECUTIVE SUMMARY

The goals of the Agricultural Worker Vanpools Pilot Project are to provide safe, convenient and reliable transportation for agricultural workers living in disadvantaged and low-income communities, while also achieving emission reduction benefits through shared transportation and the deployment of lower-emission, hybrid technology vans.

The California Vanpool Authority (CalVans) was competitively selected by the California Air Resources Board (CARB) as the project grantee for a \$6 million grant. Funding was provided from the State's Cap-and-Trade auction proceeds in the Greenhouse Gas Reduction Fund (GGRF) as part of California Climate Investments (CCI) for Low Carbon Transportation. The grant combined \$3 million allocated by CARB for the project in Fiscal Year (FY) 2016-17, and \$3 million allocated by CARB for the project in FY 2017-18.

CalVans' \$1.5 million cash match combined with CARB's grant funding supported the purchase and outfitting of 154, 15-passenger vans fitted with XL Hybrid Electric Powertrain Conversion systems. Vans were fully deployed for the spring 2019 harvest season, with approximately 75 percent of the fleet serving agricultural workers in the San Joaquin Valley and the remaining vans serving workers in the Coachella, Imperial and Salinas Valleys and other disadvantaged and low-income agricultural communities statewide.

This pilot project provided a test of XL hybrid conversion technology. The expected outcomes included a reduction in Greenhouse Gas (GHG) by 20 percent as a result of fuel savings. Based on actual operation of the vans, results from the GHG emissions analysis support a conclusion that nearly all the emission benefits realized from the project (97 percent) can be attributed to replacing the transportation option for agricultural workers from traveling by single passenger gasoline automobiles with 15-passenger vans, rather than from the XL Hybrid Electric Powertrain Conversion system. CalVans reported no fuel costs savings in the hybrid van fleet compared to its gasoline fleet, which contradicts the anticipated 20 percent emission reduction benefits expected from the XL hybrid conversion system going into the project.

The hybrid conversion vans were also not well suited for the bumpy, uneven terrain required to reach agricultural field sites. The hybrid conversion system is an after-market device attached to the underside of the van. These devices loosened over time, adversely affecting vehicle performance and requiring increased and ongoing maintenance to re-secure the system to the van. The manufacturer warranty also did not cover off road use. Battery electric technology was investigated as an alternative, but commercially available products did not meet range and performance requirements needed for off road, agricultural field applications.

Demand for agricultural worker vanpool services in California's disadvantaged and low-income agricultural communities remain high. CalVans conducted a funding analysis in March 2019 and concluded that between 600 and 900 additional vans are needed to meet forecasted demand through 2022. It is hoped that clean technology vans capable

of off-road agricultural roads will become commercialized sometime in the future.

BACKGROUND

In 2014, Governor Brown and the Legislature appropriated GGRF monies to CARB for Low Carbon Transportation investments. These investments are administered through the framework of annual funding plans. The FY 2016-17 Funding Plan for Low Carbon Transportation and Fuels Investments and the Air Quality Improvement Program (FY 2016-17 Funding Plan)¹ and the FY 2017-18 Funding Plan for Clean Transportation Incentives² include several pilot projects for light-duty vehicles, including the Agricultural Vanpools Pilot Project, which are focused on the deployment of advanced technologies that provide immediate benefits in disadvantaged communities.

The goals of the Agricultural Worker Vanpools Pilot Project are to provide safe, convenient and reliable transportation for agricultural workers living in disadvantaged and low-income communities, while also achieving emission reduction benefits through shared transportation and the deployment of lower-emission, hybrid technology vans. The project meets a basic transportation need of agricultural workers and reduces Vehicle Miles Traveled (VMT) by single occupancy passenger vehicles to job sites. The use of shared mobility transportation combined with clean technology vehicle deployment results in immediate emission reduction benefits in areas disproportionately burdened by poor air quality. This project also promotes increased acceptance and understanding of clean, advanced technology vehicles, and tests the range and performance of hybrid technology vehicles in off-road settings.

California Vanpool Authority. As a Joint Powers Transit Authority (JPA), the California Vanpool Authority, CalVans, provides vanpools to farmworkers across the state. CalVans received a grant for deployment of hybrid technology vans to expand its agricultural fleet. For over 20 years, CalVans has made a difference in people's lives providing non-traditional public transit while reducing the carbon footprint in the communities served. CalVans helps reduce the need to operate single occupancy vehicles in rural, low-income and disadvantaged communities by providing workers with safe, affordable and flexible shared transportation to work sites and employment centers. Metropolitan areas are served by larger transit agencies that provide support to their community and population, but these agencies are often not able to serve rural communities. In order to be issued an agricultural vanpool by CalVans, a driver or an employer must meet a minimum distance requirement of at least 40-miles round trip and transport a minimum of eight passengers.

CalVans is 100 percent self-funded, receiving no state or federal funding. Revenue for the

¹ The approved FY 2016-17 Funding Plan is available at:
[Proposed FY 2016-17 Funding Plan for Low Carbon Transportation and Fuels Investments and AQIP - With Appendices](#)

² The approved FY 2017-18 Funding Plan is available at:
[Proposed 2017-18 Funding Plan Clean Transportation \(ca.gov\)](#)

operation of CalVans comes from rider fares. CalVans reports ridership on vehicle miles travelled using real-time telematics data to the National Transit Database (NTD). Every billable mile in a CalVans vanpool vehicle generates revenue for municipalities in the regions CalVans serves.

CalVans provides access to public transit, not only to low-income and disadvantaged populations, but also as an alternative for those that do not have access to private rideshare options. Individuals who do not have a credit card or the ability to open a bank account for use with private operators have access to CalVans.

Agricultural vanpools are seasonal in nature and mileage (fares) drops in winter months, resulting in decreased revenue for CalVans operations. Fares cannot be raised further as the program would not be feasible or cost-effective for program users. Historically, the winter and early spring months resulted in vans being parked.

In 2013, CalVans introduced the benefits of Section 132 (f) of the IRS code allowing employers to sponsor their employees' transportation costs. This changed winter operations and resulted in vanpools migrating to the Imperial Valley region. As most vanpools in the Monterey and Central Valley shut down in the winter, travelling to the southern regions allows CalVans to capture some of the previously lost revenue. And, what started as three vanpools in Imperial County, is now several hundred vanpools for the winter and spring season.

CalVans diligently monitors mileage and revenue in addition to reducing staffing as active vanpools decrease. This is necessary to manage operations across all regions and for the overall success of the program.

PROJECT IMPLEMENTATION

This section describes implementation of the project from launch through the required performance period (one year post-launch), and includes information on the vehicles, vanpool drivers and passengers, employer subsidies, and CalVans outreach activities.

Vehicles

Using the CARB grant funds and CalVans cash match, CalVans purchased 154 Model Year 2018 Chevrolet Express 3500, 15-passenger gasoline vans. Before delivery to the dealership, Keller Motors in Hanford, each van was fitted with an XL Hybrid Electric Powertrain Conversion system.

The hybrid system is an after-market technology that transforms a factory original equipment manufacturer (OEM) vehicle into a more fuel-efficient hybrid by adding an electric motor, an advanced lithium-ion battery pack, and control software. No other significant modifications to the vehicle are required, and no changes are made to the internal combustion engine or transmission. The hybrid system uses regenerative braking, helping to slow down and propel the vehicle during normal drive cycles. Product testing was conducted for CARB's after-market part certification, and for incentive eligibility through CARB's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP). One of the HVIP requirements for conversions is achieving at least a 20 percent fuel economy benefit relative to its equivalent baseline vehicle, as determined in accordance with the Internal Revenue Bulletin 2007-23, City Fuel Economy³ or other CARB approved procedure. Product testing demonstrated up to a 20 percent decrease in CO₂ emissions and up to a 20 percent improvement in miles per gallon of gasoline use. The hybrid system requires no driver training and there are no range concerns, operational changes or unusual service requirements. The cost of a 15-passenger gasoline van was approximately \$30,000 and the hybrid conversion unit was an additional \$9,340 installed. CalVans investigated other clean vehicle technologies, such as battery electric shuttles, but this was the only commercially available technology that could meet the range demands of the project.

After delivery, CalVans Hanford office staff installed the following equipment on each vehicle:

- Toolbox
- Water Jug
- Hitch
- Rhino Vertex Floor Liner
- First Aid Kit
- Fire Extinguisher
- Triangle Warning Kit
- Decals (Vanpool, CalVans Logo, CCI Logo)
- Global Positioning System (GPS) Device/FMI cable/Fob reader (associated with monthly vehicle tracking subscription)

The GPS tracking system allowed tracking of who was driving and where the vehicle was traveling, and was managed through the cloud-based system "Silent Passenger." Silent Passenger provides real-time information on the vehicle, providing the ability to schedule maintenance, track engine trouble codes, monitor speeds and prepare weekly billing

³ [Internal Revenue Bulletin: 2007-23 | Internal Revenue Service \(irs.gov\)](#)

based on the miles traveled. Speed regulators were installed on all vehicles to prohibit speeds over 70 miles per hour.

Volunteer Vanpool Drivers

The vanpool must have at least one volunteer to be the vanpool driver. Vanpool drivers are agricultural workers that apply through CalVans to become authorized volunteer drivers. CalVans eligibility requirements for van assignment is a minimum of eight passengers traveling to the same worksite and a roundtrip distance of at least 40 miles per trip.

Depending on the number of riders, drivers are assigned an 8 or 15passenger van. A benefit of being a driver is having free access to a CalVans van for off-hours personal use that does not cost the driver anything to maintain or insure. CalVans allows drivers to keep the vans at their homes and use them for personal family needs, such as driving children to school or childcare, grocery shopping and running errands.

Individuals applied through CalVans to become volunteer vanpool drivers. To be eligible, individuals must be at least 25 years old and have a current, Class C driver's license and clean driving record, and pass a Class B health exam. Potential volunteer drivers were excluded if they had a DUI, hit and run, reckless driving or more than 2 DMV points in the last five years. Credit is not a factor in the decision process.

CalVans performed marketing and outreach and noticed increases in female applicants applying to drive, based on survey results. Female drivers reported they knew about CalVans, but did not think they could qualify to drive a vehicle. They were not aware they could use and keep the vans to help them, and their coworkers get to work. These new drivers found that the most difficult part of the process was the wait time for their license to clear and getting their physical.

CalVans works closely using the U.S. Department of Transportation Federal Motor Carrier Safety Administration medical providers' database to assist drivers in selecting the medical provider of their choice. CalVans establishes accounts for drivers to reduce the time necessary for issuance of vehicles.

Vanpool Riders

Riders keep the vanpool running because without riders/coworkers to support the driver the vanpool collapses. The driver and riders work alongside each other. Very often, the driver and the rider have a common workplace and work route. With agricultural vanpools, the rider is part of a larger group that work alongside each other to plant, prune, harvest and perform the functions necessary for the crops grown in California. Riders pay a modest fee to ride in a CalVans vanpool; cost varies, but most riders pay a little over \$2.00 per ride. This fee covers CalVans' cost of maintaining and insuring the vans, and the cost of replacement when vans wear out.

Farmworkers tend to be the lowest paid employees nationwide, often lacking

transportation and other important resources necessary for work. Employers who lack a reliable workforce have found it necessary to cover various benefits including paying the cost of the vanpool fare for workers to get to the worksite.

Transit Pass

Employers participating in the CalVans program have been generous in sponsoring transit related costs. From no employer-sponsored vanpools in 2013 to 89 percent in 2019, CalVans has come a long way. Nearly 90 percent of the active CalVans vanpools receive employer qualified transportation fringe assistance, eliminating or reducing fare costs for riders. As a transit agency, CalVans can assist by providing transit passes to employers who can then provide their employees with a free ride in a CalVans vehicle.

A transit pass is a pass, token, fare card, voucher, or similar item entitling a person to ride, free of charge or at a reduced rate, on mass transit and/or in a vehicle that seats at least six adults (not including the driver). Mass transit may be publicly or privately operated and includes bus, rail, ferry or vanpool⁴. In 2017, the IRS rules changed and employers were no longer able to deduct their costs for providing free transportation for their employees for tax purposes. Luckily, this did not keep employers from providing this invaluable benefit that keeps resources with farmworkers and their families. According to AAA's 2019 "Your Driving Costs" that amount is \$774 a month or \$9,282 annually.⁵

General Outreach

CalVans conducted project outreach and education at various employer workshops, agricultural conferences, and resource fairs. CalVans staff provided a better understanding of the agricultural vanpool program to various employer groups alongside both state and Federal Department of Labor, Agricultural Associations and Farm Labor Contractors. Vehicles were demonstrated, including the XL Hybrid Conversion system technology, and the telematics systems and their benefits were presented. Some employers applauded CalVans' effort to reduce emissions in their communities and requested all hybrid conversion fleets starting in the 2020 field season.

CalVans sponsored four Driver Appreciation/Resource Fairs at these locations on these dates:

- Modesto – January 20, 2019
- Orosi – February 24, 2019
- Los Banos – March 16, 2019
- Delano – March 24, 2019

Photos, event flyers, and participating community resource organizations are listed in

⁴ https://www.irs.gov/irb/2014-50_IRB#RR-2014-32

⁵ <https://media.acg.aaa.com/aaa-true-cost-annual-vehicle-ownership-rises-to-9282-1.htm>

Appendix A: Workshops, Meetings and Events.

Vanpool formation has always been about viral marketing, and the experiences a driver and group has with our program helps to sway a new vanpool driver to make an informed decision regarding using CalVans' program. Staff found that word of mouth and user experience are the most valuable marketing tools. A monthly newsletter is also used to provide program changes to both employers and volunteer drivers.

CalVans maintains a website for the Agricultural Vanpool project, including a blog containing user testimonials at the following link: <https://calvans.org/blog>.

CalVans also maintains an active Instagram and Facebook account for disseminating information, posting photos, and sharing testimonials. The links are:

- https://instagram.com/calvans_ag_vanpools
- <https://www.facebook.com/CalVansAgVanpools>

Additionally, CalVans staff presented workshops, attended employer onboarding events across the state, and attended conferences to promote the program. Staff set up booths and promoted the program at least twice a month, including city and county board meetings.

Website and Targeted Outreach

CalVans undertook administrative efficiencies and upgrades related to its website in order to support the growth in ridership, payment of fares, driver education and overall fleet expansion. CalVans staff updated the website, <https://calvans.org>, to allow for a simple, electronic application process as opposed to the paper-driven process drivers and employers previously used.

Agricultural employers may now upload information for new applicants, to request vehicles and to report changes directly to CalVans' website. CalVans staff contacts the employer to set-up the employer account for Qualified Transportation Benefits and creates the Transit Voucher their employees will use. Employers can also share what the tentative commute is forecasted to be to eliminate the formation of a vanpool that does not meet the 40-mile round trip and the 8-passenger minimum required for a CalVans vanpool.

The website upgrades allow trained CalVans staff to more efficiently update both the public-facing website and back-end structure. Staff also updated the vanpool cost calculator to facilitate in the determination of costs.

CalVans also conducts targeted to CalVans drivers and agricultural employers. Future website developments will include step-by-step instructions and video tutorials for common driver activities such as proper van washing, completion of weekly passenger and payment forms, fuel card usage, incident and accident reporting, and other routine tasks. Outreach and presentation events will also be uploaded to recognize volunteer vanpool drivers for various accomplishments such as safe driving, accident avoidance, etc.

Walking an employer through the process of securing a CalVans vehicle and navigating Federal and state Departments of Labor helps aid employers, specifically Farm Labor Contractors, in calculating costs and strengthening their knowledge and understanding of the program. This process provides greater acceptance of the CalVans transportation service and its benefits to growers.

Various fliers were also developed to illustrate the benefits of using CalVans vehicles, as presented in Figure 1 and Figure 2.



Figure 1: CalVans Employer Website Updates

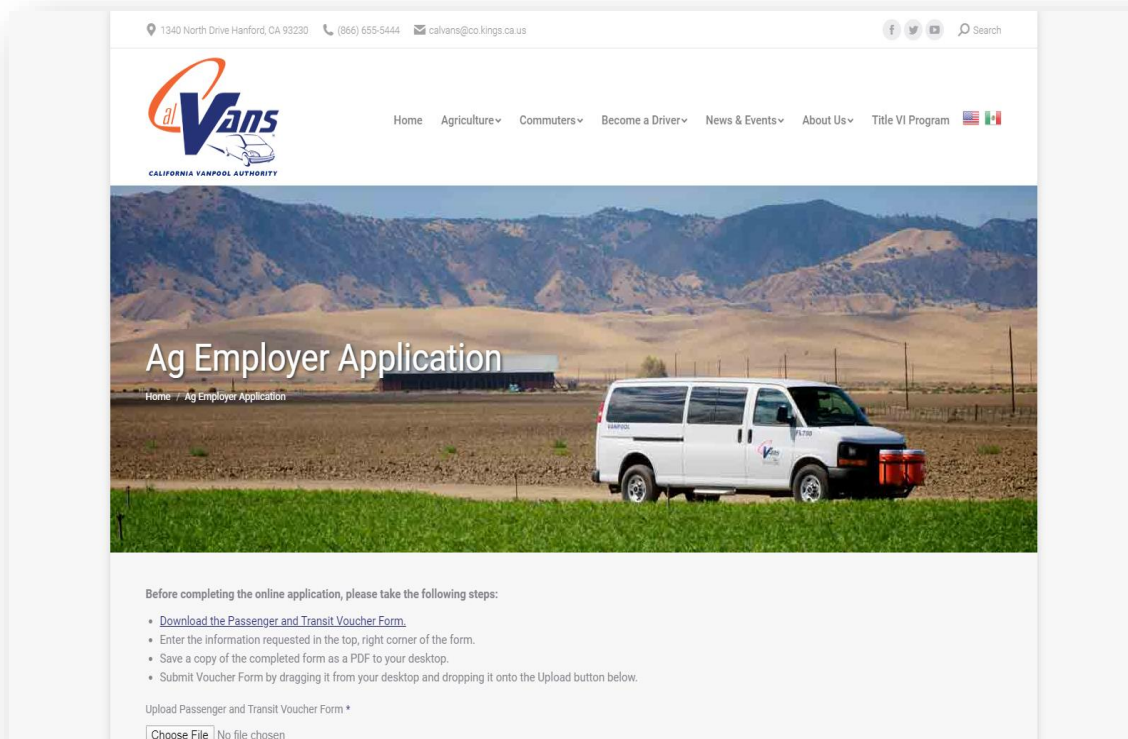


Figure 2: Website employee and cost calculator updates.

PROJECT RESULTS

This section contains a summary of results from user surveys and data on ridership and vanpool usage over the course of the project implementation period. The project goals were to provide safe, convenient and reliable transportation for agricultural workers living in disadvantaged and low-income communities, while also achieving emission reduction benefits through shared transportation and the deployment of lower-emission, hybrid technology vans.

User Surveys

A survey of 143 vanpool users was conducted in November 2019, at the largest Farmworker Women's Health and Safety Conference held in Visalia in Tulare county. Results of the survey are reported in Appendix B: Survey Results. The survey covered user demographics, transportation access, and knowledge of advance technology vehicles. Below is a summary of findings:

- Riders are predominantly female (74 percent female versus 26 percent male)
- The age of riders was highest between 45 and 54 years of age (30 percent)
- The majority of riders have an education level of high school or below (50 percent)
- Most riders earn an income of \$19,000 or less a year (58 percent)
- The majority of survey responders were drivers (61 percent versus 29 percent passengers)
- The majority of riders have access to a vehicle (84 percent)
- The majority of riders work at least 6 days a week (60 percent)
- Commute distance is highest between 10 and 24 miles (28 percent) and second highest between 25 and 39 miles (27 percent)
- Most riders are not aware of other programs or clean vehicle incentives in the San Joaquin Valley that reduce greenhouse gas emissions (92 percent)

Ridership and Emission Reduction Summary

The 154 hybrid conversion vans provided 282,000 rides from project launch in approximately January of 2019 to December 31, 2019. The total VMT for project vanpools was 2,020,018 miles. Fuel consumption was not documented by CalVans as part of the data gathering, which precludes analysis of actual emissions reductions. Emission benefits were calculated using the CARB-developed quantification method for vanpool services in the Clean Mobility Options Voucher Pilot⁶. The number of passengers per van was reported as 13 by CalVans. The project resulted in 16,347,530 miles of net passenger auto VMT reductions. CalVans did not track gasoline consumption and fuel costs in the hybrid conversion van fleet, but provided anecdotal feedback that fuel usage and fuel costs in the hybrid conversion vans were the same as its all-gasoline van fleet. This

⁶ <https://www.arb.ca.gov/resources/documents/cci-quantification-benefits-and-reporting-materials>

implies that the project did not achieve the 20 percent emission reduction benefit from hybrid technology expected going into the project. One reason may be that the vans operate at relatively constant, high speeds for long periods of time getting to and from agricultural areas, with minimal opportunities to reduce fuel use through regenerative braking. Another reason not related to the hybrid technology is that agricultural vans used during harvest at night are often left in idle and used to power ancillary equipment such as flood lighting and air conditioning, which uses additional gasoline and battery power.

Table 1 shows the calculated emission benefits from pooled transportation combined with hybrid technology, versus pooled transportation alone, and the relative contribution of hybrid technology to emission reductions. Even under the assumption that a 20 percent emission reduction benefit was achieved from hybrid technology, nearly all of the quantified emission benefits were the result of shared mobility and the displacement of single occupancy gasoline vehicles with vanpools.

Table 1: Calculated Emission Benefits from Modeled Scenarios

Scenarios	Net GHG Emission Reductions (MTCO ₂ e)	NO _x Reductions (lbs)	PM _{2.5} Reductions (lbs)	ROG Reductions (lbs)	Net Fuel Use Reductions (GGE)	Net Passenger Auto VMT Reductions (miles)
Pooled Transportation Plus Hybrid Technology	7,128	4,202	658	968	580,558	16,347,530
Pooled Transportation Only	6,963	4,184	628	964	565,368	16,347,530
Contribution of Hybrid Technology to Emission Reductions	2.3%	0.4%	4.6%	0.4%	2.6%	Not Applicable

Vanpool ridership has shifted over the last three years to be predominantly guest workers as trends for farm labor are shifting to the H-2A Guest Worker Program due to a lack of domestic agricultural labor. Faced with labor shortages, growers and labor contractors have steadily increased employing guest workers to harvest, prune, and process in all agricultural occupations.

Agricultural employers are competing for a shrinking pool of workers, which has spurred wage increases, health and retirement benefits, longevity bonuses, and paying for 100 percent of workers' transportation costs.

As a condition of using H-2A, employers must provide the same benefits to guest worker

as they do for domestic workers, including prevailing wage, housing and transportation. Domestic workers who held questionable employment status compete with H-2A workers who hold a valid work visa and are vetted by the federal government. As domestic workers leave agriculture or leave the U.S., the need for H-2A increases.

Federal H-2A regulation also states that employers using the H-2A program must provide the following; “daily transportation between the workers’ living quarters and the employer’s worksite at no cost to covered workers living in employer-provided housing. Employer-provided transportation must meet all applicable safety standards, be properly insured, and be operated by licensed drivers.” (Fact Sheet #26: Section H-2A of the Immigration and Nationality Act (INA). February 2010) This rule has made CalVans the most cost-effective and safest way to provide for this federally mandated provision.

Distribution Summary

Project vans were deployed in disadvantaged communities and low-income communities in agricultural regions throughout the state. Figure 3 illustrates how location data is tracked by assigned van identification number. Approximately 75 percent of the project fleet served agricultural workers in the San Joaquin Valley, with remaining vans serving workers in the Coachella, Imperial and Salinas Valleys and other disadvantaged and low-income agricultural communities statewide.

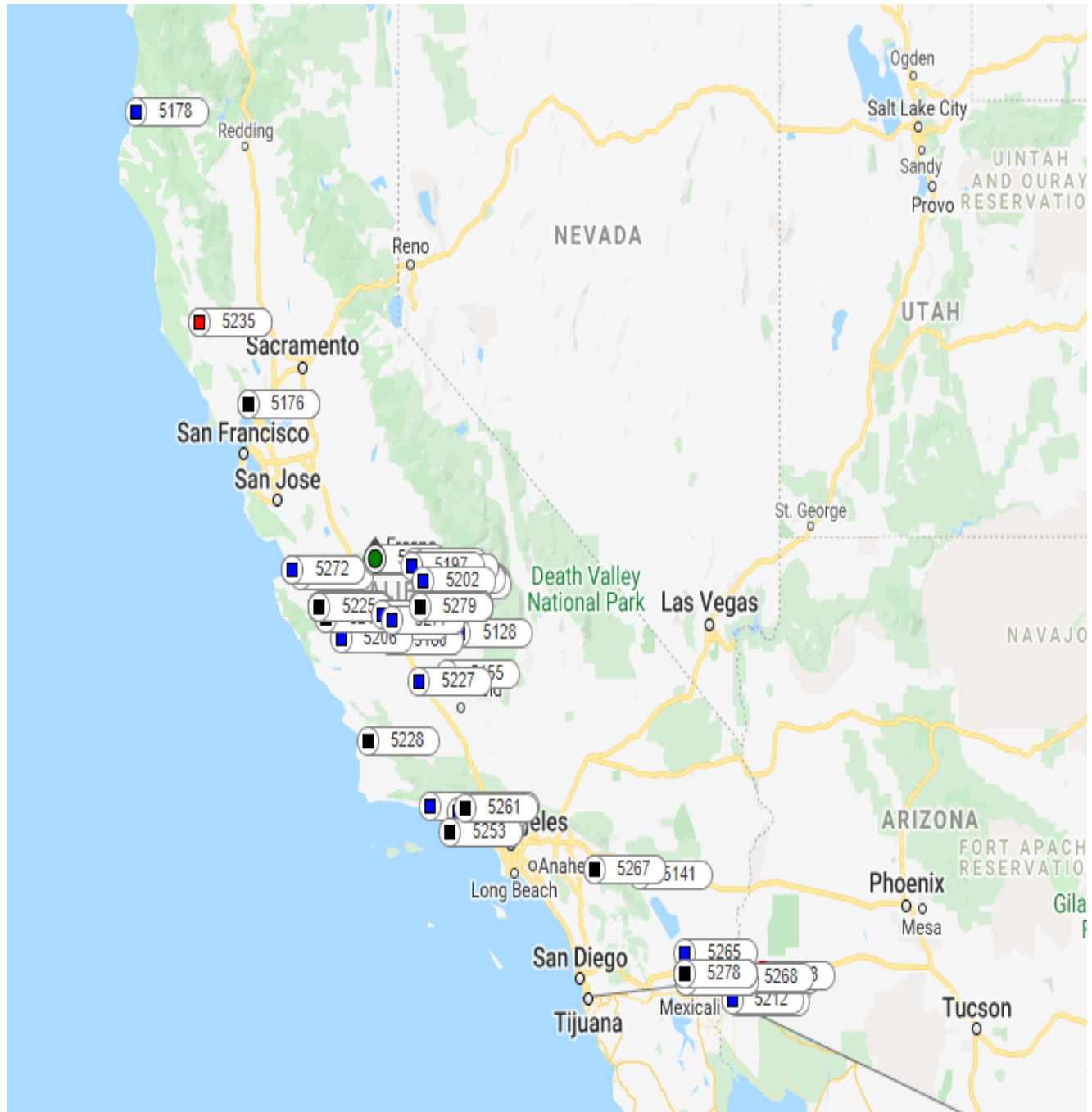


Figure 3: Distribution of agricultural vans based on van identification number.

PROGRAM CHALLENGES

This section describes challenges CalVans faced in implementing the Agricultural Worker Vanpools Pilot Project from launch through the one-year implementation period.

1. Employer and driver apprehension of advanced technology vehicles

An early challenge centered around the fear of new technology and reluctance to use vans fitted with the XL Hybrid Electric Powertrain Conversion systems. Riders, agricultural employers and CalVans staff needed education and training to better understand the XL Hybrid Conversion System. Fears ranged from being electrocuted while fueling or washing the vans, to concerns about the vans' ability to pull equipment due to a perceived lack of power, and fears of getting stranded in remote areas. Education was conducted to dispel false and inaccurate information, and staff and drivers were trained on proper procedures for van washing and the importance of using grounding protection when working on wiring near the battery packs. The hybrid vans could not accommodate a spare tire because the spot reserved for the tire contained the battery packs. This was a drawback, but CalVans staff had roadside assistance protocols in place to address this issue.

2. Performance and warranty issues with the XL Hybrid Electric Powertrain Conversion systems

The aftermarket XL Hybrid Electric Powertrain Conversion systems attached to the underside of the vans loosened over time after repeated use on the bumpy, uneven, off-road terrain encountered on the way to agricultural work sites. Driver complaints included reports of loud grinding and banging sounds, gears not shifting properly, reduced vehicle performance, and fears of a breakdown. CalVans responded by increasing the maintenance schedule of the hybrid conversion vans in its fleet and by hiring a mechanic certified to work on the XL Hybrid Electric Powertrain Conversion systems. During conversations with the XL hybrid manufacturer, CalVans was told by the manufacturer that the hybrid conversion product warranty covered the first 30,000 miles, but the warranty would not be honored if vehicles were used on uneven, unpaved surfaces. The XL hybrid manufacturer also told CalVans that the vehicles' interiors could not be washed, which was a common and necessary practice with the agricultural vanpools. These warranty and performance limitations, combined with the inability to clean the van interior without risking damage to the hybrid conversion system, led CalVans to conclude that the technology was not an appropriate fit for agricultural vanpool applications.

CalVans will continue to use this fleet of vans for its on road vanpool fleet and for site-specific agricultural applications as appropriate. CalVans researched other commercially available clean vehicle technologies for use in expanding the agricultural worker vanpool fleet, however, none could meet the vehicle performance and distance requirements necessary for this application. Battery electric vehicles do not have adequate range for the majority of agricultural vanpool applications, and onsite charging is not available at work sites. Fuel cell passenger vans are not yet commercially available.

LESSONS LEARNED

Based on CalVans' experience implementing the Agricultural Worker Vanpools Pilot Project, staff came to the following conclusions and lessons learned.

1. Automate and streamline fleet management

A major improvement identified as a consequence of fleet expansion was the need for CalVans to automate and streamline its fleet management systems, such as tracking vehicles mileage, passenger counts, vehicle maintenance, etc. CalVans tracking and reporting processes were strained by the addition of 154 new vehicles to its agricultural fleet. Quarterly reporting of telematics and user data required as part of the CARB grant was cumbersome and labor intensive. Automation and other efficiencies will be necessary for continued fleet expansion.

2. Use of the XL Hybrid Electric Powertrain Conversion system did not appreciably reduce fuel consumption and GHG and criteria pollutant emissions

Fuel consumption in CalVans hybrid conversion vanpool fleet was roughly the same as its gasoline fleet and staff saw no major reduction in fuel costs. The 20 percent reduction in tailpipe emissions anticipated at the onset of the project was not realized based on CalVans reported fuel use.

3. XL Hybrid Electric Powertrain Conversion Technology is not suitable for off road use

The hybrid conversion technology proved unsuitable for sustained use on bumpy, unpaved roads. No clean vehicle technologies are commercially available to meet the performance and range demands of the agricultural vanpool fleets. CalVans will continue to track innovations in the clean vehicle market with the goal of incorporating near-zero and zero-emission technologies when they become viable options

APPENDIX A: WORKSHOPS, MEETINGS AND EVENTS

APPENDIX B: SURVEY RESULTS