



**City of Moreno Valley
Department of Public Works**

FINAL REPORT

**One HD Natural Gas Vehicle, EV Charging Station, Bicycle
Facilities, and Bicycle Racks**

Contract Number ML14049

January 24, 2019

Prepared for the Mobile Source Air Pollution Review Committee (MSRC) under the
AB 2766 Local Government Match Program

Acknowledgements

Mobile Source Air Pollution Review Committee (MSRC)

South Coast Air Quality Management District (SCAQMD)

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This report was submitted in fulfillment of Contract No. ML14049 by the City of Moreno Valley under the partial sponsorship of the Mobile Source Air Pollution Reduction Review Committee (MSRC). Work was completed as of January 15, 2019.

Disclaimer

The statement and conclusions in this report are those of the contractor and not necessarily those of the Mobile Source Air Pollution Reduction Review Committee (MSRC) of the South Coast Air Quality Management District (SCAQMD). The mention of commercial products, their sources or their uses in connection with material reported is not to be construed as either an actual or implied endorsement of such products.

With the assistance of funding from the MSRC, the City of Moreno Valley completed four major project elements that align with Moreno Valley's General Plan goals and objectives to support clean air policies and infrastructure that fosters reduced greenhouse gas emissions:

1. Purchase of Compressed Natural Gas (CNG)- fueled vehicle

MSRC provided \$30,000 in funding to offset the cost of purchasing and deploying one CNG street sweeper truck. City funding provided the remaining monies for this purchase totaling \$339,806. The City purchased a 2015 Elgin Broombear CNG street sweeper and put into operation in October 2014. The vehicle replaced an existing 2000 Athey diesel powered street sweeper. The street sweeper is conspicuously labeled with a decal noting the use of CNG and the support of the MSRC. To date, the vehicle has been continuously operated and it provides sweeping for approximately 17,500 miles of city streets annually.

Problems Encountered / lessons learned

The City did not experience any significant problems in the procurement of this piece of equipment. The vehicle has provided reliable performance and the required maintenance is in-line of similar diesel powered vehicles. There was a small learning curve for staff to perform required maintenance of the CNG powered engine. One challenge that City staff encounters is refueling of the vehicle. There are two refueling sites in the City and both are located outside of the Corporate Yard. This does add a slight inconvenience when refueling the vehicles.

Emissions Benefits

Natural gas is the cleanest choice of fuel available today for this market. Studies have shown that natural gas powered vehicles produce up to 23% fewer greenhouse gas emissions than comparable diesel models. This vehicle is driven approximately 17,500 miles annually. Using the calculation for On-Road Cleaner Vehicle Purchases and Repowering: <https://www.arb.ca.gov/planning/tsaq/eval/eval.htm> total emission reductions (ROG, NOx, PM10, and CO) will amount to 315 pounds annually or 3150 pounds reduced over the expected 10-year life of the project. Calculations are shown on the following sheets.

On-Road Cleaner Vehicle Purchases and Repowering

Definition:

The purchase of a vehicle that is certified to be less polluting than a typical new vehicle (cleaner purchase) or an engine replacement that transforms a vehicle into a less polluting one (cleaner repower). For heavy-duty on-road vehicles, these projects are usually the purchase of a cleaner, alternative-fueled engine or vehicle instead of a new conventional diesel-fueled engine or vehicle. THIS METHOD CAN ALSO BE USED FOR BICYCLE PURCHASES.

Need to know:

Funding dollars
 Annual vehicle miles traveled (VMT)
 Heavy-duty engine certification rates or light- or medium-duty vehicle classification

Note: Since natural replacement of older vehicles or engines with newer, cleaner ones (fleet turnover) is accounted for in clean air plans, in order to claim emission reductions from the project, the vehicles purchased must emit less pollution than conventional new vehicles meeting current emission standards.

Local Government Name:	SC Moreno Valley	Use pull down menus.
Project Name:	CNG Street Sweeper Purchase	

Please use descriptive project name that fits in box. Include number of vehicles.

Number of category must match number of subcategory.

Category:	(1) Alternative Fuels/Electric Vehicles	Use pull down menus.
Subcategory:	(1a) Alternative Fuel Vehicle Purchases	Vehicle projects must include number of vehicles, fuel type, engine type, HD certification rates, LD or MD classification.
Description: (Issues/Comments)	Purchase of one CNG Street Sweeper	

Implementing Agency: City of Moreno Valley

Is the agency private?:

Motor Vehicle Funding (MV Fees):	\$0	dollars	(Subvention Funds)	Suggested Life Default Values Heavy-duty transit bus - 12 Electric bus - 18 School bus - 20 Heavy-duty trucks - 10 Medium-duty vehicles - 10 Light-duty vehicles - 8 Light-duty electric vehicles - 10
M\$RC Funding (M\$RC):	\$30,000	dollars	(Discretionary Funds)	
Moyer Funding (Moyer):	\$0	dollars		
CMAQ Funding (CMAQ):	\$0	dollars		
Other CoFunding (CoFund):	\$311,000	dollars		
Project Life (Life):	10	years		
Capital Recovery Factor (CRF):	0.12			

Annual vehicle miles traveled (VMT): 17,500 miles For multiple vehicles, VMT equals the sum of miles for all vehicles.

Emission Factors

	Before Emission Factor		After Emission Factor	
ROG Factor:	0.2	grams per mile	0.0	grams per mile
NOx Factor:	8.3		0.4	
PM10 Factor:	0.1		0.0	
CO Factor:	0.6		0.2	

On-Road Cleaner Vehicle Purchases and Repowering

For heavy-duty emission factors, see Emission Factors Menu, Table 5. For medium-duty vehicle and light-duty emission factors, see Table 2 and Table 7.

For electric buses use 0 as default value.

Emission Reductions

	pounds per year	kilograms per day
Reductions in Reactive Organic Gases (ROG):	7	0
Reductions in Nitrogen Oxides (NOx):	302	0
Reductions in Particulates (PM10):	2	0
Reductions in Carbon Monoxide (CO/7):	3	0
TOTAL EMISSION REDUCTIONS:	315	0

Annual Emission Reductions in pounds per year (ROG, NOx, PM10, and CO/7) =
 $(VMT) * [(Before\ Emission\ Factor) - (After\ Emission\ Factor)]/454$

Daily Emission Reductions in kilograms per day (ROG, NOx, PM10, and CO/7) =
 $Annual\ Emission\ Reductions\ in\ pounds\ per\ year / (2.2 * 365)$

Optional Method:

Emissions can also be calculated using emission factors in units of g/bhp-hr multiplied by annual fuel consumption and an energy consumption factor. The default for the energy consumption factor is 18.5 hp-hr/gal. Substitute annual gallons of fuel in place of VMT. Substitute emission rates in units of g/bhp-hr multiplied by 18.5 in place of the Before Emission Factor and the After Emission Factor.

Cost-Effectiveness

	Based on ROG + NOx + PM10	Based on ROG + NOx + PM10 + CO/7
MVFees Cost-Effectiveness:	\$11.27 dollars per lb.	\$11.17 dollars per lb.
MVFees CE = ((MVFees + MSRC + Mayer) * CRF)/(ROG + NOx + PM10)		
CMAQ Cost-Effectiveness:	\$0.00 dollars per lb.	\$0.00 dollars per lb.
CMAQ CE = (CMAQ * CRF)/(ROG + NOx + PM10)		
Total Cost-Effectiveness:	\$128.05 dollars per lb.	\$126.99 dollars per lb.
Total CE = ((MVFees + MSRC + Mayer + CMAQ + CaFund) * CRF)/(ROG + NOx + PM10)		

2. Electric Vehicle (EV) Charging Station

The City Hall Electric Vehicle Charging Stations component installed one direct current (DC) fast charger or Level 3 charger, and two Level 2 chargers in the City Hall parking lot. The Level 2 chargers were funded by the MSRC Grant. There was a change in project location from the project's original proposed location within the City Hall parking lot at existing accessible parking stalls to another location within the same parking lot but closer to the existing street access. Additional work to ensure compliance with Americans with Disabilities Act (ADA) requirements at the new location was completed including construction of a new sidewalk access ramp and truncated domes.

The project was reviewed by various City divisions as part of City's Project Review Staff Committee during the Planning Phase of the project. The Planning Division also conducted the project's environmental review and ultimately issued Conditions of Approval for the project on January 15, 2016.

The project was designed by Clean Fuel Connection, Inc. who also performed the EV Charging Equipment installation. The design plans were reviewed and ultimately approved by the City's Building & Safety Division on October 7, 2016 and by the Planning Division on October 12, 2016.

A construction kick off meeting was held on December 13, 2016 which was attended by Clean Fuel Connection, Inc. and various City divisions. The hardscape improvements consisting of curb, sidewalk, truncated domes, pavement trenching, trench backfill and repair, and pavement restoration including asphalt overlay and slurry seal was performed by the City's Operations and Maintenance Division. Conduit, equipment installation including the charging units as well as the metering unit, transformer and meter panel, pull boxes, bollards, and pavement striping was performed by the contractor, Clean Fuel Connection, Inc.

City staff and Clean Fuel Connection performed all tasks required to complete installation of the stations, including:

- Obtaining all required permits for the work and follow-up maintenance, including building, electrical, planning, and ADA compliance permits;
- Ensuring site design was specific to charger hardware and met necessary codes;
- Evaluating sufficient capacity from the existing electrical system, meter location, completing site work, and installing meters and other necessary hardware;
- Ensuring proper safety and ADA compliance measures were in place;
- Repairing landscaping following station installation;
- Inspecting and maintaining charging station sites; and

Construction was completed on March 31, 2017. Clean Fuel Connection, Inc. performed the testing and commissioning on April 4, 2017.

Outreach

Information about the available charging stations is published in the City's local newsletter and on the Moreno Valley Utility's website. The location of the charging stations is also provided via the ChargePoint mobile application.

The Level 2 chargers are part of the ChargePoint network. By downloading the mobile app from ChargePoint's website, customers can 1) see which stations are available for charging, 2) start charging by holding the phone up to the card reader at the station, 3) receive notifications when the car is finished charging or when a station becomes available, 4) schedule charging, set reminders, get notifications and track usage, and 5) alert ChargePoint when issues are encountered.

Problems Encountered / lessons learned

Additional costs were encountered due to the project relocation. The new location required new improvements in order to comply with ADA requirements. Also, the metering unit base was different and larger than anticipated which required a larger foundation to be poured.

3. Install Bicycle Infrastructure

Construction of Class II bicycle lanes on the following roadways:

- a. Alessandro Boulevard (west city limit to Indian Street)
- b. Cactus Avenue (Heacock Street to Lasselle Street)
- c. Heacock Street (Alessandro Boulevard to John F. Kennedy Drive)
- d. Heacock Street (Ironwood Avenue to Sunnymead Ranch Parkway)
- e. Ironwood Avenue (Barclay Drive to Pigeon Pass Road)
- f. Sunnymead Boulevard (Frederick Street to Perris Boulevard)
- g. Kitching Street (Iris Avenue to Krameria Avenue)
- h. Krameria Avenue (Kitching Street to Moreno Valley Community College)
- i. Towngate Boulevard (Frederick Street to Memorial Way)
- j. Eucalyptus Avenue (Memorial Way to Day Street)

Utilizing in-house staff and an outside contractor, the City installed the bike infrastructure. The installation involved complete removal of the existing striping and restriping the roadway with new striping that included 6-8 foot standard bike lanes. When street width allowed, buffering was added to the bike lanes for increased benefit. This addition to the City's bicycle network totaled approximately 11.1 miles in length.

All of the roadways are designated as a Class II bike facility in the City's Bicycle Master Plan and provide good connections for both recreational and commuter cyclists. Attractions within the surrounding community include schools, commercial retail centers, and multiple restaurants, parks, and Moreno Valley College. Input from local bicycle club members and local commuters indicated the changes were positive for the community.

Construction of bicycle shared lane markings on the following roadways:

- a. Bay Avenue (Frederick Street to Graham Street)
- b. Indian Street (Cottonwood Avenue to Sunnymead Boulevard)

These roadways are designated as Class III bike facilities in the City's Bicycle Master Plan and primarily connect residential communities to surrounding commercial centers and employment centers. Utilizing in-house staff, the City installed the shared lane markings. The installation involved laying down hot thermoplastic markings in the middle of the existing lanes and complementing the work with "Bicycles May Use Full Lane" signs for added benefit.

Problems Encountered / lessons learned

The City did not experience significant issues with the installation of the Class II bike lanes / shared lane markings. During construction, motorists experienced only minimal traffic congestion /delay and the public provided very little negative feedback. A couple of residents called to inquire what the new bike

markings were for and how to interpret them. Staff explained the intent of the project and answered their questions. Staff did note a couple of areas of rough pavement within the bicycle lane areas. City maintenance staff made minor asphalt repairs within the identified areas to improve the condition. It is important to verify the condition of the pavement when installing bike lanes and make repairs to provide a smooth riding surface.

A review of “Heat Maps” (<https://www.strava.com/heatmap>) available through the popular Strava fitness-tracking program, indicate moderate increases of bicycle usage for the newly installed infrastructure. Staff annually reviews these indicators for the best opportunities to enhance the City’s overall bicycle network.

Emissions Benefits/Projections and Future Actions

Replacing single occupant vehicle trips with bicycle transportation is an effective way to reduce reliance on fossil fuels and reduce greenhouse gas emissions. Although vehicle emissions have steadily declined due to regulations and improved technology, they continue to impact air quality and human health. In California, the transportation sector produces approximately 40 percent of carbon dioxide (CO₂) emissions. The Environmental Protection Agency found the average vehicle emits just under a pound of CO₂ per mile. If an individual chooses to commute five miles one-way, (a typical commute distance) almost 10 pounds of carbon dioxide emissions are avoided on a daily basis.

The following table, excerpted from the City’s Bicycle Master Plan, demonstrates the Greenhouse Gas (GHG) estimated reductions at full buildout of the network:

Employing the EPA’s latest vehicle emissions data, the following table illustrates current estimated GHG reductions (pounds/year) attributable to commuter bicycling in Moreno Valley, and the potential for additional future reductions (approximately 20 percent) resulting from increased commuter bicycling to replace driving due to plan implementation:

GHG Component	Current	Future	Change
Carbon Dioxide	8,226,179	9,953,337	1,727,158
Carbon Monoxide	248,186	300,295	52,109
Hydrocarbons	27,220	32,936	5,716
Nitrous Oxide	19,014	23,006	3,992
Inhalable Particles	202	245	43

As the City expands its bicycle network through similar projects, continued air quality benefits will be realized as residents choose to replace short single occupant trips with bicycle trips.

4. Install 10 U-shaped bicycle racks on Sunnymead Boulevard, between Frederick Street and Perris Boulevard

The City employed its own staff to install 10 U-shaped, heavy-duty bike racks at local businesses and bus stops along Sunnymead Boulevard between Frederick Street and Perris Boulevard. Each rack accommodates two bikes, amounting to 20 additional bicycle parking spaces. This corridor has numerous restaurants, is in close proximity to large employment centers, and has an extensive number of bus stops.

Secure bicycle parking at probable destinations is an integral part of any bicycle network. Bicycle thefts are common and lack of secure parking is often cited as a reason people chose not to ride a bicycle. Inverted U-shaped racks in conspicuous locations make it easy to secure bicycles with a u-shaped lock through the frame and the rack. Inverted U-shaped racks afford the opportunity to support the bicycle at two points and allow for convenient locking.

Locations of the installed racks are in accordance with the *Bicycle Parking Guidelines*, as published by the Association of Pedestrian and Bicycle Professionals. This bicycle infrastructure component aligns directly with the City of Moreno Valley Bicycle Master Plan, which recommends the installation of parking in well-lit, secure locations.

Problems Encountered / lessons learned

The City did not experience any significant problems with the installation of these bicycle racks. The installation of these bicycle racks is intended to generate more bicycle parking near places of business and bus stops. The racks are comprised of galvanized steel and are powder coated for durability. This combination led to a bike rack that has held up well to the weather and minor vandalism.

Emissions Benefits/Projections and Future Actions

As part of the City's Bicycle Master Plan, secure and convenient bicycle parking is an integral end of trip facility that encourages the use of bicycles for short local trips to restaurants and other destinations. Building high quality infrastructure will assist the City in reducing harmful emissions and continue to improve air quality in the City and the region. The City will continue to install bicycle racks at existing locations and require developers to install them as part of their site improvements.

Pictures



Elgin Broom Bear CNG Vehicle



EV Charging Station – City Hall



Alessandro Boulevard (west City limit to Indian Street)



Cactus Avenue (Heacock Street to Lasselle Street)



Heacock Street (Alessandro Boulevard to John F. Kennedy Drive)



Heacock Street (Ironwood Avenue to Sunnymead Ranch Parkway)



Ironwood Avenue (Barclay Drive to Pigeon Pass Road)



Sunnymead Boulevard (Frederick Street to Perris Boulevard)



Kitching Street (Iris Avenue to Krameria Avenue)



Krameria Avenue (Kitching Street to Moreno Valley Community College)



Towngate Boulevard (Frederick Street to Memorial Way)



Eucalyptus Avenue (Memorial Way to Day Street)



Bay Avenue (Frederick Street to Graham Street)



Indian Street (Cottonwood Avenue to Sunnymead Boulevard)



Sunnymead Boulevard – typical bike rack installation

Summary and Conclusions

The City of Moreno Valley appreciates the support provided by the Mobile Source Air Pollution Review Committee and South Coast Air Quality Management District for alternative fuel projects in the South Coast Air Basin. We continue to support funding projects that provide incentives to purchase clean air vehicles and advance Active Transportation projects in the region.