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CALIFORNIA



ERIC GARCETTI

MAYOR

September 19, 2017

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1149 SOUTH BROADWAY, 5TH FLOOR  
LOS ANGELES, CA 90015  
PHONE: (213) 485-3825

Ms. Leah Alfaro  
South Coast AQMD/MSRC  
21865 Copley Drive  
Diamond Bar, CA 91765

Dear Ms. Alfaro:

### **MSRC CONTRACT #AB2766/ML14013 FINAL REPORT**

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Enclosed, please find the quarterly report for the MSRC contract #AB2766/ML14013. The report was prepared in accordance with the requirements outlined in the contract between the South Coast Air Quality Management District and the City of Los Angeles Bureau of Sanitation (LASAN) dated October 7, 2016.

Per the contract instructions, the report has been uploaded in the MSRC website at [www.cleantransportationfunding.org](http://www.cleantransportationfunding.org). If you have any questions, please contact Ish Lontok at (213) 485-3607.

Sincerely,

Charlotte R. Tan, P.E.  
Environmental Supervisor II  
Solid Resources Support Services Division

Enclosure

*zero waste • one water*

AN EQUAL EMPLOYMENT OPPORTUNITY - AFFIRMATIVE ACTION EMPLOYER

Recyclable and made from recycled waste





# FINAL REPORT

PREPARED FOR THE  
MOBILE SOURCE AIR POLLUTION REDUCTION REVIEW COMMITTEE (MSRC)  
UNDER THE AB 2766 DISCRETIONARY FUND WORK PROGRAM



## Acknowledgements

This report was submitted in fulfillment of MSRC Contract #AB2766/ML14013 and the Purchase of 14 New Natural Gas Heavy-Duty Solid Waste Collection Vehicles by the City of Los Angeles, Bureau of Sanitation (LASAN) under the partial sponsorship of the Mobile Source Air Pollution Reduction Review Committee (MSRC).



Work was completed as of July 2017.

## 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) or the South Coast Air Quality Management District (SCAQMD). The mention of commercial products, their sources or their uses in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products.

September 2017



**MSRC Contract #:** AB2766/ML14013

**Purchase of 14 New Natural Gas Heavy-Duty Solid Waste Collection Vehicles**

**Contractor:**

City of Los Angeles, Bureau of Sanitation  
1149 South Broadway, MS 521  
Los Angeles, CA 90015  
Contact: Charlotte R. Tan, P.E.  
(213) 847-3466  
[charlotte.tan@lacity.org](mailto:charlotte.tan@lacity.org)

**MSRC Award Value:**

\$400,000.00

**Background:**

This project provided a partial funding support for the purchase of 14 new natural gas heavy-duty solid waste collection vehicles (SWCV) for deployment in the City of Los Angeles. Vehicle deployment throughout the City varies as determined by operational needs.

**Project Objective:**

The project purpose was to replace diesel heavy-duty SWCV with alternative fuel SWCV. With the support of MSRC Clean Transportation Funding, the City of Los Angeles was able to purchase 14 new natural gas heavy-duty SWCV.

**Implementation:**

The purchase order was issued in September 2015. All 14 vehicles were delivered and deployed into service by December 2016.

**Status:**

All 14 vehicles continue to operate in the City of Los Angeles and the South Coast Air Basin.

**Project Costs:**

The total purchase cost of 14 new natural gas heavy-duty SWCV was \$4,878,561.80. The MSRC funding support was \$400,000 which amounted to 8.2% of the total project cost.

**Results:**

Vehicles replaced by these new natural gas heavy-duty SWCV were equipped with 2001 to 2006 diesel engines. With retirement of the diesel vehicles, the estimated 7-year emission reductions from this project are 0.10 tons of PM and 21.99 tons of NOx.

To date, cumulative mileage for the 14 new trucks is 118,961 miles with actual emission reductions of 0.01 tons of PM and 3.34 tons of NOx.

**Project Expansion & Replication Potential**

The City of Los Angeles continues to replace its remaining fleet of diesel and dual-fuel SWCV with natural gas SWCV. Full conversion to a clean fuel fleet will shortly be attained.



2017 Peterbilt 320 (CNG ASL) with 2015 Cummins ISL G 320 Engine

## 1. Background

This project provided a partial funding support for the purchase of 14 new natural gas heavy-duty solid waste collection vehicles (SWCV) for deployment in the City of Los Angeles. Vehicle deployment throughout the City varies as determined by operational needs.

In June 2000, the Los Angeles City Council adopted the Clean Fuel Policy as part of its efforts to reduce toxic air pollutant emissions from heavy-duty vehicles within the city's fleet. Within the same month, the South Coast Air Quality Management District (SCAQMD) adopted Fleet Rule 1193, the Clean On-Road Residential and Commercial Refuse Collection Vehicles Regulation, which requires public and private solid waste collection fleet operators with 15 or more collection vehicles to acquire alternative-fuel collection vehicle when purchasing or leasing vehicles. In compliance with both the City policy and the SCAQMD rule, the City of Los Angeles, Bureau of Sanitation (LASAN) deployed alternative-fuel vehicles within LASAN's fleet in late 2000. These vehicles called "dual-fuel" operate mainly on liquefied natural gas (LNG) with a small quantity of ultra-low sulfur diesel as pilot ignition. Previous funding awards from the Mobile Source Air Pollution Reduction Review Committee (MSRC) were secured to offset the purchase cost of about 120 dual-fuel SWCV (Contract #s AB2766/02011 and AB2766/S0112). Beginning in late 2005, LASAN began acquiring collection vehicles operating on 100% natural gas. Additional MSRC grant funding was secured for 50 LNG SWCV (Contract #AB2766/ML06022), 35 natural gas SWCV (Contract #AB2766/ML09041), 36 LNG SWCV (Contract #AB2766/ML11033) and 32 CNG SWCV (Contract #AB2766/ML12017).

As of 2000, LASAN did not own any permanent natural gas refueling infrastructure. Over the years, the City of Los Angeles received grant awards from various external agencies to partially support the construction of LNG/LCNG refueling facilities in LASAN's Solid Resources Collection District Yards in East Valley, South Los Angeles, as well as in West Valley and North Central with funding support from the MSRC, contract numbers AB2766/02011 and AB2766/MS08053, respectively.

A CNG fueling station was also constructed at the West Los Angeles District Yard with an MSRC award under contract #MS12082.

## **2. Project Description**

The objective of this project was the continued support for the City's commitment in providing its residents with clean air by reducing criteria air pollutants and toxic air emissions from its fleet of heavy-duty SWCV. Contract agreement number AB2766/ML14013 from the Mobile Source Air Pollution Reduction Review Committee (MSRC) Clean Transportation provided a maximum funding award of \$400,000 for the purchase of fourteen SWCV equipped with natural gas engines to the City of Los Angeles, Bureau of Sanitation (LASAN). This covered 8.2% of the total purchase cost of \$4,878,561.80 for the 14 SWCVs.

The City of Los Angeles issued the purchase orders for the fourteen SWCV under the contract agreement in September 2015. All fourteen SWCV are automated side loaders (ASL) equipped with 2015 Cummins ISL G 320 natural gas engines (Engine Family Name: FCEXH0540LBH) with 2017 Peterbilt 320 vehicle models. All vehicles are fueled with compressed natural gas (CNG) and have been deployed in the LASAN fleet between November 2016 and December 2016. All vehicles are operated within the City of Los Angeles limits and the South Coast Air Basin.

All pertinent information related to the MSRC funded vehicles are listed in Table 1.

Table 1: Vehicle and Mileage Information from In-Service Date to July 2017

Count	City Vehicle ID	New Vehicle Information	Fuel Type	New Engine Information	CARB Executive Order	Engine Family Name	Engine Serial Number	In-Service Date	Terminal Assignment**	Fuel Usage* (gge)	Odometer Reading (Miles)
									As of July 31, 2017		
1	36314	2017 Peterbilt 320 Automated Side Loader (ASL)	Compressed Natural Gas (CNG)	2015 Cummins ISL G 320	A-021-0615-1	FCEXH0540LBH	73978902	11/2/2016	East Valley	5,021	9,844
2	36319						73982587	11/2/2016	South L.A.	4,431	8,499
3	36321						73983899	11/11/2016	East Valley	4,464	8,323
4	36322						73983911	11/26/2016	West L.A.	862	7,057
5	36323						73986156	12/21/2016	West L.A.	387	11,162
6	36324						73986435	11/11/2016	West Valley	4,494	13,739
7	36326						73987512	12/23/2016	West L.A.	226	5,974
8	36327						73988233	12/23/2016	West L.A.	405	6,545
9	36328						73989526	12/21/2016	West L.A.	161	5,918
10	36329						73990254	12/13/2016	Harbor	33	6,125
11	36333						73992882	12/21/2016	West L.A.	277	7,654
12	36334						73993329	12/13/2016	West L.A.	126	9,083
13	36337						73993351	11/26/2016	West L.A.	2,768	6,299
14	36346						73993352	11/26/2016	South L.A.	1,518	12,739
<b>TOTAL</b>										118,961	

\* Fuel usage data may be incomplete due to time-fill fueling occurrences at West L.A. (Fast-fill & Time-fill) CNG station. Its time-fill dispensers do not have individual metering devices to capture volume of time-fill CNG dispensed.

\*\* Terminal Assignment Addresses:

East Valley: 11050 Pendleton Street, Sun Valley, CA 91352

Harbor: 1400 North Gaffey Street, Los Angeles, CA 90731

South L.A.: 786 South Mission Road, Los Angeles, CA 90023

West L.A.: 2027 Stoner Avenue, Los Angeles, CA 90025

West Valley: 8840 Vanalden Avenue, Northridge, CA 91324

### 3. Emissions Benefits

Table 2 provides a comparison of emission factors between the 14 replaced 2001-2006 diesel SWCV and the 14 new natural gas SWCV with the difference providing the emission reduction factors of criteria air pollutants. Table 3 accounts for the total emission reductions for the fourteen SWCV for the 7 year project life at the projected

annual operation of 8,000 miles per vehicle. Based on these, the projected emission reductions for this project are 0.10 tons of PM and 21.99 tons of NOx (See Table 3).

Table 2: NOx and PM Emission Factors

	NOx	PM
1998-02 MY Diesel Refuse Truck Emission Factors (g/mile)*, A	31.25	0.144
2003-06 MY Diesel Refuse Truck Emission Factors (g/mile)*, B	21.39	0.086
2010+ MY Alternative Fuel Refuse Truck Emission Factors (g/mile)**, C	0.88	0.004

\*: Diesel Refuse Trucks Emission Factors, Table D-5, Page D-5, Appendix D: "Tables for Emission Reduction and Cost-Effectiveness Calculations" (Updated June 20, 2017), [https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017\\_gl\\_appendix\\_d.pdf](https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_gl_appendix_d.pdf)  
 \*\*: Alternative Fuel Refuse Trucks Emission Factors, Table D-6, Page D-6, Appendix D: "Tables for Emission Reduction and Cost-Effectiveness Calculations" (Updated June 20, 2017), [https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017\\_gl\\_appendix\\_d.pdf](https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_gl_appendix_d.pdf)

Table 3: Projected Emission Reductions from Replacement of 14 Diesel SWCV with 14 Alternative Fuel SWCV

		NOx	PM
Project Life (Years), D	7		
Number of Replaced 1998-02 MY Diesel SWCV, E1	7		
Number of Replaced 2003-06 MY Diesel SWCV, E2	7		
Projected Annual Operation Per Vehicle (miles/year), F	8,000		
Emission Reductions from Replacement of 7-1998-02MY Diesel SWCV (g), ((A-C)xDxE1xF = G)		11,905,040	54,880
Emission Reductions from Replacement of 7-2003-06 MY Diesel SWCV (g), ((B-C)xDxE2xF = H)		8,039,920	32,144
<b>Projected Total Emission Reductions for the 14 Natural Gas Vehicles for 7 Years (tons), ((G+H)/907,200 = I)</b>		<b>21.99</b>	<b>0.10</b>

Table 4 provides the actual emission reductions of 0.01 tons of PM and 3.34 tons of NOx using the cumulative vehicle miles traveled of 118,961 miles for all 14 new natural gas SWCV from each in-service date thru July 2017.

Table 4: Actual Emission Reductions Attributable to the Operation of 14 Natural Gas SWCV from In-Service Dates thru July 2017

		NOx	PM
Total Mileage To date for the 14 New Natural Gas SWCV (miles), J	118,961		
Emission Reductions from Replacement of 7-1998-02MY SWCV (g), ((J/2)x(A-C) = K)		1,806,423	8,327
Emission Reductions from Replacement of 7-2010+ MY Alternative Fuel SWCV (g), ((J/2)x(B-C) = L)		1,219,945	4,877
<b>Total Emission Reductions for the 14 Natural Gas Vehicles Thru July 2017 (tons), (O/907,200 = M)</b>		<b>3.34</b>	<b>0.01</b>

#### 4. Public Outreach

The City of Los Angeles is committed to the successful implementation of the Clean Fuel Program, adopted in June 2000 by the Los Angeles City Council, for its fleet of SWCV.

To aid in advancing milestones, an informational brochure about the Clean Fuel Program was developed and continuously updated and distributed in outreach events to educate the public on the City's work in providing City services while reducing air pollutant emissions in their neighborhoods. The brochure includes environmental benefits & regulatory background as well as continued program achievements in fleet additions of natural gas SWCV. It also highlights funding support from the MSRC and other agencies for the LASAN's Clean Fuel Program.

Outreach events are ongoing and listed below are recent events where the Clean Fuel Program brochures were distributed and MSRC-supported natural gas powered SWCV were made available.

- 👍 **Earth Day LA 2017** (Figure 1A to 1B) was held by LASAN at Exposition Park (700 Exposition Park Drive, Los Angeles, CA 90037) from 10:00 a.m. to 2:00 p.m. on Saturday, April 22, 2017.
- 👍 **East Valley District Yard Open House** (Figure 2) was held at 11050 Pendleton Street in Sun Valley on April 29, 2017.
- 👍 **West Valley District Yard Open House** (Figure 3A & 3B) was held at 8840 Vanalden Avenue in Northridge on May 6, 2017.
- 👍 **North Central District Yard Open House** was held on May 20, 2017, at 452 North San Fernando Road in Los Angeles.
- 👍 **South Los Angeles District Yard Open House** (Figure 4A & 4B) was held on June 3, 2017, at 786 South Mission Road in Los Angeles.
- 👍 **Harbor District Yard Open House** was held on June 10, 2017, at 1400 North Gaffey Street in San Pedro.
- 👍 **West Los Angeles District Yard Open House** (Figure 5A & 5B) was held on June 24, 2017, at 2027 Stoner Avenue in Los Angeles.

## 5. Summary and Conclusions

LASAN procured fourteen natural gas heavy-duty SWCV with funding support from the MSRC Clean Transportation under the grant agreement number AB2766/ML14013. The

grant fund awarded by the MSRC was \$400,000 and the total cost of the fourteen natural gas SWCV was 4,878,561.80. The MSRC support for this project was 8.2% towards the total procurement cost.

All fourteen natural gas SWCV were acquired and deployed in the LASAN fleet between November 2016 and December 2016. These vehicles are currently assigned in various collection district yards of the LASAN as indicated in Table 1 and are continually operated 100% of each vehicle's annual mileage within the South Coast Air Basin.

With the use of the fourteen natural gas SWCV for the 7 year projected life, it is estimated that this project will result in emission reductions of 0.10 tons of PM and 21.99 tons of NOx. To date, cumulative mileage for the fourteen new SWCV is 118,961 miles with actual emission reductions of 0.01 tons of PM and 3.34 tons of NOx.

The City of Los Angeles continues its efforts of improving its air quality. The funding from the MSRC provided assistance in offsetting the incremental cost in procuring clean fuel vehicles. The City of Los Angeles is committed in providing clean air for its citizens with the complete conversion of its fleet of SWCV to alternative fuel, natural gas, and/or equipping them with CARB-verified exhaust after-treatment devices.

## **6. Recommendations**

With the higher cost of acquiring alternative fuel engines in comparison to diesel engines, funding assistance will help offset this additional cost. Additional funding assistance may encourage more fleet operators and owners to incorporate alternative fuel engines in their fleet as it lessens the incremental costs of clean fuel engines versus diesel engines. Additionally, funding assistance may promote early removal of older and more polluting engines from the active fleet and likewise result in further emission reduction benefits.

## Appendix



Figure 1A: Earth Day LA 2017 event on April 22, 2017, was held at the Exposition Park with over 50 exhibitors present. LASAN's clean fuel SWCV, including those funded by MSRC, were showcased at this event.



Figure 1B: At the Earth Day LA 2017 event on April 22, 2017, an MSRC-supported natural gas heavy-duty SWCV was available on site along with a Clean Fuel Program Poster and Brochures.



Figure 2: Annual East Valley Open House event was held on April 29, 2017, where residents were able to learn more of LASAN's positive environmental contributions, such as the use of MSRC-supported natural gas heavy-duty SWCV to save fuel cost and maintain healthy air quality in the City.



Figure 3A: The annual West Valley Open House event was held on May 6, 2017, where residents were able to visit the municipal yard and learn of the various services that LASAN provides to the residents.



Figure 3B: Parents and children alike participated in the annual West Valley Open House event, where residents were able to touch and ride in the cab of an MSRC-supported natural gas powered SWCV.



Figure 4A: The annual South Los Angeles Open House event was held on June 3, 2017, where residents were able to visit the municipal yard to see the various natural gas heavy-duty SWCV servicing their neighborhood and learn air quality benefits from its use.



Figure 4B: Parents and children alike participated in the annual South Los Angeles Open House event, where residents were able to sit in the cab of natural gas heavy-duty SWCV and operate the side loading arm.



Figure 5A: The annual West Los Angeles Open House event was held on June 24, 2017, where residents were able to visit the municipal yard and see various natural gas heavy-duty SWCV that service their neighborhood.



Figure 5B: Parents and children alike participated in the annual West Los Angeles Open House event, where residents were able to sit in the cab of a natural gas powered SWCV. The MSRC-supported SWCV #36346 was exhibited at the event.

