



**CALIFORNIA  
ENERGY COMMISSION**



California Energy Commission  
Clean Transportation Program

## **FINAL PROJECT REPORT**

# **Garden City Sanitation, Inc.: Compressed Natural Gas Fueling Station Project**

**Prepared for: California Energy Commission**

**Prepared by: Clean Energy Fuels**



**Gavin Newsom, Governor  
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# California Energy Commission

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## **PREFACE**

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to \$20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued PON-12-605 to provide funding opportunities under the Clean Transportation Program for projects to support installation of new natural gas fueling infrastructure or upgrades to existing natural gas fueling facilities. In response to PON-12-605, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards March 18, 2013, and the agreement was executed as ARV-12-055 on August 12, 2013.

## ABSTRACT

A significant barrier to converting diesel refuse truck fleets to natural gas is the initial cost of onsite fueling infrastructure. The CEC grant ARV-12-055 to Garden City Sanitation, Inc. in Santa Clara for \$300,000 provided public incentive co-funding to construct a compressed natural gas fueling station at the company's service yard. By installing the compressed natural gas fueling station, Garden City Sanitation, Inc. was able to expand its natural gas refuse truck fleet to 47 vehicles. Clean Energy Fuels served as the primary contractor in constructing the station.

**Keywords:** California Energy Commission, Garden City Sanitation, Clean Energy Fuels, compressed natural gas, natural gas refuse trucks.

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## **EXECUTIVE SUMMARY**

CEC grant ARV-12-055 provided \$300,000 in incentive grant funding to Garden City Sanitation, Inc. to construct a new compressed natural gas fueling station at its facility in Santa Clara, California. GCS contributed \$750,552 in private match funding. The total project cost was \$1,050,552.

Garden City Sanitation ordered two new compressed natural gas refuse trucks in 2013 and developed plans to repower and convert 45 of its existing diesel collection trucks to compressed natural gas. The local area did not have a compressed natural gas station capable of fueling 47 compressed natural gas trucks and Garden City Sanitation, Inc. determined that it needed an onsite compressed natural gas station to accommodate its large-scale compressed natural gas conversion plan. This compressed natural gas station project made it possible for Garden City to move forward with the 45 repowers, bringing their compressed natural gas refuse fleet to 47 trucks. To support Garden City's rapid compressed natural gas fleet expansion plans, a time-fill compressed natural gas station was constructed to fuel the truck fleet onsite.

The new CNG fueling equipment was installed at the Garden City Sanitation, Inc. service yard at 1080 Walsh Avenue in Santa Clara in June 2014, and the station was commissioned for full operations in September 2014. Clean Energy Fuels served as the primary contractor for the compressed natural gas fueling station project.

During the first six months of project operations, the station dispensed 67,653 gasoline gallon equivalents of compressed natural gas fuel, displacing 67,653 gallons of diesel fuel. This reduced greenhouse gas and criteria pollutants by an estimated 46,147 pounds during the same six-month period.



# **CHAPTER 1:**

## **Project Background and Objectives**

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The goal of this agreement was to invest in alternative fuel infrastructure to support a growing compressed natural gas (CNG) truck fleet in Santa Clara, California. Garden City Sanitation, Inc.'s (GCS) objective was to remove the financial barriers to CNG fleet conversion by funding CNG infrastructure, increasing CNG use in a California refuse fleet, promoting CNG adoption in the refuse industry, and providing a model that other refuse hauling companies can replicate to accommodate fleet conversions to CNG.

The new station is located at 1080 Walsh Avenue in Santa Clara, California on Garden City Sanitation Property. GCS had repowered 45 existing diesel collection trucks to CNG and purchased two new CNG refuse trucks that were delivered in 2013. With a fleet this large, GCS utilizes enough fuel volume to justify a designated CNG fueling station to fuel their fleet of trucks on-site. This station was designed to fuel 47 CNG trucks each night after business hours.

The GCS CNG station project fully supports the funding goals of the CEC and the Natural Gas Infrastructure program. The project has advanced alternative energy development, reduced greenhouse gas (GHG) and criteria pollutant emissions, and reduced petroleum usage in the transportation sector while increasing the use of clean fuels. The program's objectives have been accomplished by constructing a new CNG station at GCS's fleet base to support GCS's sustainable transportation initiatives, which involve deploying new CNG trucks and repowering existing diesel trucks to run on CNG.

# CHAPTER 2:

## Project Planning and Construction

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### Project Planning

GCS's scope of work under ARV-12-055 included grant administration, site preparations, equipment installation, commission and operations of natural gas fueling infrastructure, and data collection and analysis of this CNG fueling station. Clean Energy was responsible for the tasks listed in Table 1, below, to complete the CNG station project.

**Table 1: Key Project Phases**

	Description	Date Completed
Task 1	Permits Issued	January 9, 2014
Task 2	Site Preparation	March 4, 2014
Task 3	Equipment Installation	June 2, 2014
Task 4	Commissioning Report	September 9, 2014
Task 5	Data Collection & Analysis	June 9—November 25, 2014

Source: Clean Energy Fuels

### Task 1: Administration/Permits Issued

- Administration
  - A "Kick Off" meeting was attended with the commission agreement manager, the grants officer, and a representative of the accounting office in order to establish the lines of communication and procedures for this project.
  - Critical project meetings were scheduled to discuss the budget.
  - Final meeting was attended to close out this project.
  - Monthly progress reports were submitted to show continued progress toward achieving the end result.
  - Final report has been submitted.
- Clean Energy Fuels obtained permits in order for the work to be completed for this project.
- Clean Energy Fuels executed and managed subcontracts in order to ensure quality products and to procure subcontractors. A draft of each subcontract was submitted to show the work under this agreement for review.

## Task 2: Site Preparation

- Clean Energy Fuels managed the design work for the proposed facility, the necessary facility modifications and construction, and prepared a site preparation report documenting the site to be ready for equipment installation.

## Task 3: Equipment Installation

- Procured and installed natural gas fueling infrastructure equipment. Prepared and submitted an Equipment Installation Report that summarizes the work performed.

## Task 4: Commission and Operate Natural Gas Fueling Infrastructure

- Conducted appropriate tests on installed equipment and troubleshoot any issues that have arisen. Began operating fueling facility for natural gas vehicles. Prepared and submitted commission report that summarizes the results of tests performed.

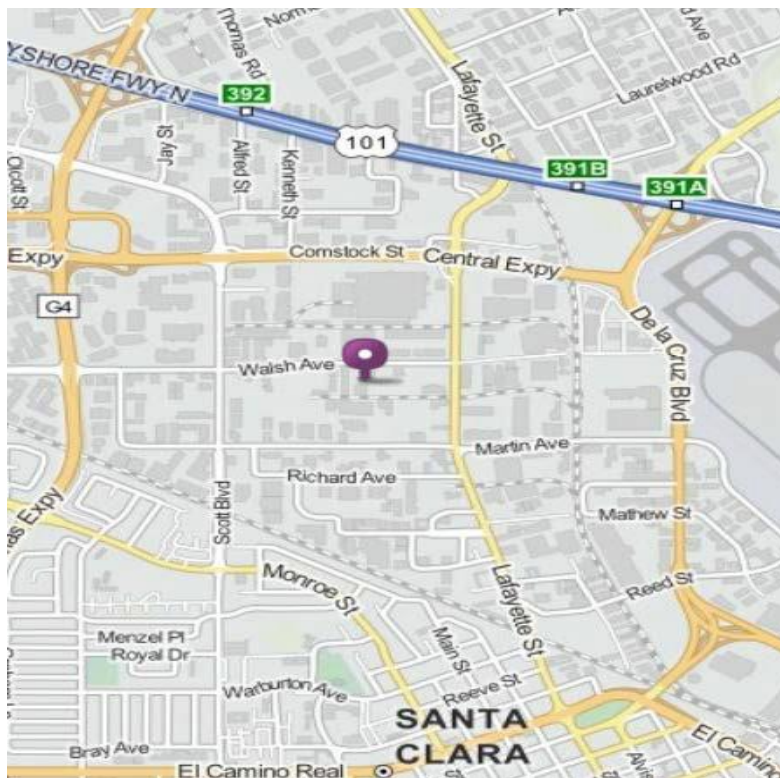
## Task 5: Data Collection and Analysis

- Monthly volume reports were prepared beginning on June 14, 2014, and GCS continues to collect and analyze data on the economic benefits and local impacts of the project, including the station throughput and associated project emission benefits.

## Site Location

The project is located at the GCS service yard at 1080 Walsh Avenue, Santa Clara, California, in the Silicon Valley area of the San Francisco bay area (Figure 1).

**Figure 1: Project Location**



Source: Clean Energy Fuels

## Project Construction

Initially, Clean Energy had expected to finish construction in April 2014. Due to subcontractor negotiations taking longer than expected, GCS requested a contract amendment for an additional 12 months to provide the time needed to construct and open the CNG station.

Clean Energy Fuels completed preconstruction activities on March 4, 2014. Clean Energy Fuels and its subcontractors completed installation of the CNG storage, compression, and dispensing equipment (Figures 2 and 3) on June 2, 2014. Facility testing and commissioning were completed on September 9, 2014.

**Figure 2: CNG Equipment Installed**



Source: Clean Energy Fuels

**Figure 3: Refuse Truck Fueling**



Source: Clean Energy Fuels

# CHAPTER 3:

## Results

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### Monthly Fuel Throughput

Approximately 47 GCS refuse trucks currently utilize the GCS CNG fueling station. The station has been operational since June 2014. Total fuel usage over the period of June 2014 through November 2014 (six months) was approximately 67,653.6 gasoline gallon equivalent (GGE) gallons. On average, monthly throughput is approximately 15,612 CNG gallons (Table 2).<sup>1</sup>

**Table 2: 2014 Monthly Throughput Volumes**

Monthly CNG Volume	GGE
June	1,904.0
July	4,320.8
August	3,021.6
September	30,306.4
October	28,100.8
November	26,020.5
Total Throughput	67,653.6
Monthly Average	15,612

Source: Clean Energy Fuels

### Emission Reductions

Based on the average throughput of approximately 15,612 gallons of CNG per month consumed by the 47 CNG trucks, GCS is responsible for emission reduction benefits due to the GCS station development. Based on the U.S. Department of Energy Clean Cities Area of Interest 4: Alternative Fuel and Advanced Technology Vehicles Pilot Program Emissions Reductions Tools for calculating criteria pollutant emission reductions, GCS can expect to achieve the following criteria pollutant reduction benefits on initial deployments by using natural gas vehicles instead of diesel (Figure 4). These benefits will continue to increase over time as GCS acquires additional units.

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<sup>1</sup> Note that the monthly average for September through November is closer to the station's design capacity.

**Figure 4: Emission Reduction Calculation**

Bi-Annual Emission Reductions (Pounds)					
Carbon Monoxide (CO)	Volatile Organic Compound (VOC)	Nitrogen Oxide (NOx)	Fine Particulate Matter (PM2.5)	Greenhouse Gas (GHG)	Total Emission Reductions (Criteria Pollutants & GHG)
2,339	260	12,136	156.0	31,256	46,147

Source: Clean Energy Fuels

## Benefits

Natural gas-powered vehicles produce up to 23 percent fewer GHG emissions<sup>2</sup> than comparable diesel models.<sup>3</sup> This project will result in real, quantifiable emission reductions of pollutants that contribute to asthma and lung disease. In the first ten years of operation, this station will directly reduce over 922,944 million pounds of criteria pollutant and GHG emissions.<sup>4</sup>

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2 "Detailed California-Modified GREET Pathway for Compressed Natural Gas (CNG) from North American Natural Gas" California Air Resources Board, January 12, 2009

3 "Detailed California-Modified GREET Pathway for California Reformulated Diesel Blended with Ethanol" California Air Resources Board, January 12, 2009

4 Emissions reduction calculated using the U.S. Department of Energy Clean Cities Area of Interest 4: Alternative Fuel and Advanced Technology Vehicles Pilot Program Emissions Benefit Tool. Based on projected fuel and vehicle usage Assumptions: 47 gallons per day, 47 heavy-duty vehicles.



# CHAPTER 4:

## Conclusions

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### **Benefits**

The GCS CNG station project fully supports the funding goals of the CEC and the Natural Gas Infrastructure program. The project has advanced alternative energy development, significantly reducing GHG and criteria pollutant emissions, and reducing petroleum usage in the transportation sector while increasing the use of clean fuels. The program's objectives have been accomplished by constructing a new CNG station at GCS's fleet base to support GCS's sustainable transportation initiatives, which involve deploying new CNG trucks and repowering existing diesel trucks to run on CNG. These trucks have been deployed strategically, paving the way for future expansion of their CNG fleet.

### **Recommendations for Future Projects**

GCS appreciates the CEC's support of this natural gas project and strongly recommends the CEC continues to fund natural gas projects. We see the biggest future need for funding as natural gas vehicle funding support due to the high incremental cost of CNG vehicles. The incremental cost remains high, however the natural gas advantage has a high payoff in the environment.

# GLOSSARY

CALIFORNIA ENERGY COMMISSION (CEC) – The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are:

1. Forecasting future statewide energy needs
2. Licensing power plants sufficient to meet those needs
3. Promoting energy conservation and efficiency measures
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
5. Planning for and directing state response to energy emergencies

COMPRESSED NATURAL GAS (CNG) – Natural gas that has been compressed under high pressure, typically between 2,000 and 3,600 pounds per square inch, held in a container. The gas expands when released for use as a fuel.

GARDEN CITY SANITATION (GCS) – An independently owned and operated garbage collection company committed to protecting public health and safety while providing reliable and efficient service rendered with professionalism. Based exclusively in the San Francisco bay area.<sup>5</sup>

GASOLINE GALLON EQUIVALENT (GGE) – The amount of alternative fuel it takes to equal the energy content of one liquid gallon of gasoline. GGE allows consumers to compare the energy content of competing fuels against a commonly known fuel—gasoline. GGE also compares gasoline to fuels sold as a gas (natural gas, propane, and hydrogen) and electricity.

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<sup>5</sup> [Garden City Sanitation](https://www.gardencitysanitation.com/) (https://www.gardencitysanitation.com/)