



California Energy Commission Clean Transportation Program

# FINAL PROJECT REPORT

# CR&R Perris CNG Fueling Station

Prepared for: California Energy Commission Prepared by: CR&R Perris

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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-11-602 to provide funding opportunities under the Clean Transportation Program for alternative fueling infrastructure. In response to PON-12-005, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards on April 24, 2012. The agreement was executed as ARV-12-005 on October 25, 2012 in the amount of \$300,000.

## ABSTRACT

CR&R Waste and Recycling Services won a grant from the California Energy Commission to develop a compressed natural gas fueling station to support its existing and rapidly expanding private fleet of natural gas-powered solid waste collection vehicles and sweepers. CR&R Waste and Recycling Services constructed and now operates a slow-fill compressed natural gas fueling station at its Material Recovery and Transfer Station in Perris, California. CR&R Waste and Recycling Services' Perris fleet of 150 vehicles serves the communities of Perris, Temecula, San Jacinto, Canyon Lake, Lake Elsinore, Hemet, Murrieta, and Riverside. CR&R Waste and Recycling Services currently operates 25 natural gas heavy-duty vehicles at the Perris site, fueling them at natural gas fueling stations throughout Riverside County. The company required a dedicated fueling station where its vehicles are domiciled to convert its remaining 125 diesel-fueled truck fleet to natural gas.

The new natural gas fueling station project enables CR&R Waste and Recycling Services' largest Southern California fleet operation to adopt natural gas fueling and transition to a lower emission and lower carbon alternative fuel, including the potential future use of renewable natural gas by late 2014 or early 2015. The new station will allow CR&R Waste and Recycling Services to use renewable natural gas in the near future from its planned anaerobic digester facility that will generate renewable natural gas from municipal waste at its Perris facility. The California Energy Commission is supporting this groundbreaking project - one of the first in the nation - with a \$4.52 million grant. The anaerobic digester facility is anticipated to be online in 2014, at which point it will produce enough fuel to supply low-carbon renewable natural gas for 60 to 100 trucks daily.

The refueling station is located at 1706 Goetz Road in the City of Perris, California on land owned by CR&R Waste and Recycling Services. It is adjacent to the existing landfill and transfer station and has the capacity to slow fill 50 refuse hauling trucks.

**Keywords**: CR&R, natural gas, CNG, fueling station, refuse haul trucks, renewable natural gas, RNG, City of Perris.

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## **EXECUTIVE SUMMARY**

CR&R Waste and Recycling Services won a grant from the California Energy Commission (CEC) to develop a compressed natural gas fueling station to support its existing and rapidly expanding private fleet of natural gas-powered solid waste collection vehicles and sweepers. CR&R Waste and Recycling Services constructed and now operates a slow-fill compressed natural gas fueling station at its Material Recovery and Transfer Station in Perris, California. CR&R Waste and Recycling Services' Perris fleet of 150 vehicles serves the communities of Perris, Temecula, San Jacinto, Canyon Lake, Lake Elsinore, Hemet, Murrieta, and Riverside. CR&R Waste and Recycling Services currently operates 25 natural gas heavy-duty vehicles at the Perris site, fueling them at natural gas fueling stations throughout Riverside County. The company required a dedicated fueling station where its vehicles are domiciled to convert its remaining 125 diesel-fueled truck fleet to natural gas. CR&R Waste and Recycling Services plans to steadily expand this initial compressed natural gas fueling capacity from 50 to 150 trucks by 2020. CR&R's entire Southern California fleet totals over 700 trucks and sweepers.

The new natural gas fueling station project enables CR&R Waste and Recycling Services' largest Southern California fleet operation to adopt natural gas fueling and transition to a lower emission and lower carbon alternative fuel, including the potential use of renewable natural gas by late 2014 or early 2015. The new station will allow CR&R Waste and Recycling Services to use renewable natural gas in the near future from its planned anaerobic digester facility that will generate renewable natural gas from municipal waste at its Perris facility. The California Energy Commission is supporting this groundbreaking project - one of the first in the nation - with a \$4.52 million grant. The anaerobic digester facility is anticipated to be online in 2014, at which point it will produce enough renewable natural gas fuel to supply low-carbon renewable natural gas for 60 to 100 trucks daily.

The refueling station is located at 1706 Goetz Road in the City of Perris, California on land owned by CR&R Waste and Recycling Services. It is adjacent to the existing landfill and transfer station and has the capacity to slow-fill 50 refuse hauling trucks. By the end of 2015, CR&R plans to have 70 compressed natural gas vehicles on the road in Perris so, conservatively assuming the initial renewable natural gas production volume will support 60 vehicles, CR&R Waste and Recycling Services will be able to fuel at least 85 percent of its Perris fleet on renewable natural gas by the end of 2015. Assuming that the first anaerobic digester plant is successful, CR&R Waste and Recycling Services plans to grow its anaerobic digestion facility in increments of about 50,000 tons per day through 2020, producing enough renewable natural gas to fuel most of its 700 heavy-duty vehicles in California.

CR&R Waste and Recycling Services contracted with Vocational Energy to construct the compressed natural gas station. Vocational Energy installed, tested and commissioned the primary equipment for the station, including a 490 standard cubic feet per minute capacity compressor, a gas dryer, and 25 dual-hose, time-fill posts that provide 50 slow-fill fueling nozzles. CR&R Waste and Recycling Services constructed a new parking area for the compressed natural gas station and fuel hoses.

## CHAPTER 1: Introduction and Project Overview

#### Introduction

CR&R Waste and Recycling Services (CR&R) is one of the largest landfill and transfer station operators in Southern California, serving three million customers in Orange, Los Angeles, Riverside, Imperial and San Bernardino counties. CR&R operates a large fleet of over 700 refuse hauling trucks and street sweepers, most of which are diesel-fueled. CR&R has been converting its heavy-duty truck fleet to natural gas to reduce criteria and particulates emissions.

CR&R's facility in Perris, California has a fleet of 150 vehicles serving the communities of Perris, Temecula, San Jacinto, Canyon Lake, Lake Elsinore, Hemet, Murrieta, and Riverside. CR&R currently operates 25 natural gas heavy-duty vehicles at the Perris site, fueling them at natural gas fueling stations throughout Riverside County. The company required a dedicated fueling station where its vehicles are domiciled to convert the remaining 125 diesel-fueled truck fleet to natural gas. The CEC grant is funding the initial installation of 50 slow-fill compressed natural gas (CNG) fueling ports. CR&R plans to steadily expand this initial CNG fueling capacity from 50 to 150 trucks by 2020.

The new natural gas fueling station project enables CR&R's largest Southern California fleet operation to adopt natural gas fueling and transition to a lower emission and lower carbon alternative fuel, including the potential use of renewable natural gas (RNG) by late 2014 or early 2015. The new station will allow CR&R to use RNG in the near future from its planned anaerobic digester facility that will generate renewable natural gas from municipal waste at its Perris facility. The California Energy Commission is supporting this groundbreaking project - one of the first in the nation - with a \$4.52 million grant. The anaerobic digester facility is anticipated to be online in 2014, at which point it will produce enough RNG fuel to supply low-carbon RNG for 60 to 100 trucks daily.

CR&R's goal for the project is to displace over 500,000 of diesel fuel in the first year of operation in 2013, increasing to nearly 2,000,000 gallons of diesel fuel by 2015. Assuming displacement of two million gallons of diesel through 2015, total greenhouse gas emissions would be reduced by nearly 10,000 metric tonnes.

### **CNG Fueling Station Complements Air Quality Guidelines**

The CR&R CNG Infrastructure Project is being developed specifically in response to federal, state and local agency demands for improved air quality and a reduction in carbon intensive conventional fuels. The CNG dispensed at this station will be used in heavy-duty trucks that would otherwise use diesel fuel. Transitioning from diesel to natural gas for transportation fuel is a low emissions strategy that has been approved by the Energy Commission as a technologically simple approach for near-term, cost-effective air quality benefits.

Heavy-duty diesel engines are a significant contributor to ground level ozone and fine particulate emissions. The California Air Resources Board (ARB) and United States Environmental Protection Agency (U.S. EPA) have adopted increasingly stringent emission standards for NOx and particulates (PM) for this source. More recently, the US EPA has also developed greenhouse gas emission requirements for heavy-duty engines and vehicles which will reduce fuel consumption and greenhouse gas emissions by an estimated 9 to 23 percent, with phase-in starting 2017. CR&R's development of a reliable source of CNG fueling will allow for expanded deployment of natural gas engines that are certified to the strict 2010 standard of 0.2 grams per brake-horsepower per hour NOx, a 20-fold decrease from the 1998 standard of 4.0 grams per brake-horsepower per hour.<sup>1</sup>

The Legislative authors of AB 118 were concerned that the public funding provided through the Clean Transportation Program would not be used to fund projects already mandated for regulatory compliance, such as the broad-ranging Airborne Toxic Control Measures being adopted under ARB's Diesel Risk Reduction Plan or South Coast Air Quality Management District fleet rules. The bulk of the regulations that would be supported by the CR&R CNG Infrastructure Project are specific to reducing emissions from the truck engine or fleet, not the specific fuel source, and therefore do not preclude this AB 118 prohibition on funding project required for regulatory compliance. The ARB and US EPA regulations for new engines, Diesel Risk Reduction Plans and South Coast fleet rules do not require CR&R to operate a CNG fueling source. Therefore, the project will function in the supporting role detailed above.

<sup>1</sup> ARB and US EPA steadily reduced the NOx emissions standards for trucks from the 1980s to 2020. NOx standards dropped from 10.0 g/bhp-hr in 1988, to 5.0 grams in 1991, and then 4.0 g/bhp-hr in 1998. The 2010 standard of 0.2 g/bhp-hr was a 20-fold decrease from the previous standard and was considered a 'strict' standard. The 2010 standard will remain in place until 2023. In 2015, ARB established an Optional Low NOx standard of 0.02 g/bhp-hr, an additional 90 percent decrease from the 2010 standard. DieselNet Website, "<u>Heavy</u> <u>Duty On-Road Engines</u>." (https://www.dieselnet.com/standards/us/hd.php)

# CHAPTER 2: CNG Station Design, Construction and Commissioning

#### **Project Location**

CR&R plans to construct its CNG station on a 52-acre solid waste facility at 1706 Goetz Road in the City of Perris in Riverside County, 2 miles from the D Street exit of Interstate-215. CR&R owns that solid waste facility that includes a material recovery facility and transfer station, mechanics bays, and a corporate office.

The proposed project location is at a private onsite fueling facility, which will provide convenient and central location for CR&R's existing and expanding CNG fleet. CR&R's existing vehicles have been refueling at Riverside Transit Authority (18 miles away), Downs Energy (22 miles away), and Riverside County's Agua Mansa Facility (22 miles away). These facilities are at locations that are generally inconvenient to CR&R's routes, and do not provide enough redundancy to support CR&R's proposed 125 vehicle CNG fleet of vehicles. Installation of a CNG fueling station at CR&R's facility will enable the company to convert its expanding fleet of CNG vehicles from 25 to 125.

#### **CEQA** Compliance

As part of its anaerobic digester facility development, CR&R obtained the necessary land use entitlement to build the CNG refueling station. The City approved the project in November of 2011 with a Major Modification to the Conditional Use Permit for the Perris MRF/Transfer Station and certified the Mitigated Negative Declaration satisfying the California Environmental Quality Act (CEQA) for both the anaerobic digester facility and the CNG fueling station. No appeal was filed challenging the CEQA certification issued by the City of Perris Planning Commission.

To obtain building permits for the CNG station, CR&R completed the facility plans, including a fire safety plan, and submitted them to the City of Perris Planning Department.

### Site Plans

Figures 1 and 2 show site plans for the CNG fueling station, parking and fueling bays, and fuel nozzle locations.



Figure 1: Site Plan for CNG Fueling Station at CR&R Perris Facility



Figure 2: Schematic for Parking Bays and Fueling Nozzle Locations

## **Equipment** List

The new CNG filling station includes the following major components:

#### Natural Gas Compressor:

- Ariel JGQ
- 250 Hp Electric motor drive
- 490 standard cubic feet per minute (scfm) @30 psi 220 DGE per hour production.
- Equipment Enclosure.

#### Gas Dryer

XEBEC STR24NGX-3 Single Tower Inlet Gas Dryer with manual on-skid regeneration. This model dryer is rated for more than 1000 scfm at 30 psig inlet pressure.

- 25 Dual Hose Time-Fill Posts with 50 hoses for Vehicle Fueling
- Dual Hose time fill posts complete with two 25' hoses with caisson mounts.
- 3,600 psi nozzles and inline high-pressure breakaways

## **Construction and Commissioning**

CR&R selected Vocational Energy as its primary engineering and construction contractor. CR&R hired additional contractors for civil engineering, grading, paving and striping work.

Construction occurred between November 2012 and February 2013.

New electric service completed in December 2012. Gas service completed in February 2013.

Commissioning was completed in February 2013.

CNG fueling of CR&R's natural gas refuse trucks commenced February 2013.

Figures 3 to 6 show photos of the completed CNG fueling station.



Figure 3: Completed Parking and Fueling Area

Source: CR&R Perris



## Figure 4: CNG Fueling Ports and Nozzles



Source: CR&R Perris





# CHAPTER 3: Data and Results

CR&R compiled the following data from the 10-month operational period from February 1 to November 30, 2013.

Maximum Station Capacity	= 493 SCFM or 212 DGE per hour
CNG Fuel Throughput	= 1,122 DGE per day
Average Trucks per Day	= 34
Total Diesel Fuel Displacement	= 212,000 gallons
Station Down Time	= 0 Days

## GLOSSARY

CALIFORNIA AIR RESOURCES BOARD (ARB) -- The "clean air agency" in the government of California, whose main goals include attaining and maintaining healthy air quality; protecting the public from exposure to toxic air contaminants; and providing innovative approaches for complying with air pollution rules and regulations.

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:

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

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA - pronounced See' quah) Enacted in 1970 and amended through 1983, established state policy to maintain a high-quality environment in California and set up regulations to inhibit degradation of the environment.

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.

CR&R WASTE AND RECYCLING SERVICES (CR&R)- CR&R Incorporated is one of Southern California's most innovative and successful waste and recycling collection companies, serving more than 3 million people and over 25,000 businesses throughout Orange, Los Angeles, San Bernardino, Imperial and Riverside counties.<sup>2</sup>

DIESEL GALLON-EQUIVALENT (DGE) - is the amount of alternative fuel it takes to equal the energy content of one liquid gallon of diesel gasoline.

NOx -- Oxides of nitrogen that are a chief component of air pollution that can be produced by the burning of fossil fuels. Also called nitrogen oxides.

PARTICULATE MATTER (PM) -- Unburned fuel particles that form smoke or soot and stick to lung tissue when inhaled. A chief component of exhaust emissions from heavy-duty diesel engines.

<sup>2</sup> CR&R About Us web page ( http://crrwasteservices.com/about-us/history/)

RENEWABLE NATURAL GAS (RNG) - A gaseous mixture of carbon dioxide and methane produced by the anaerobic digestion of organic matter.

STANDARD CUBIC FEET PER MINUTE (SCFM) -- the molar flow rate of a gas corrected to standardized conditions of temperature and pressure thus representing a fixed number of moles of gas regardless of composition and actual flow conditions.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (U.S. EPA) -- A federal agency created in 1970 to permit coordinated governmental action for protection of the environment by systematic abatement and control of pollution through integration or research, monitoring, standards setting and enforcement activities.