



**CALIFORNIA
ENERGY COMMISSION**



California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

Foreign Oil Reduction - Transportation Resources Investment in Infrastructure, Informatics and Power Systems

**Prepared for: California Energy Commission
Prepared by: Fontana Unified School District**

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PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation 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-14-608 to fund projects that establish infrastructure necessary to store, distribute and dispense compressed or liquefied natural gas. In response to PON-14-608, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards August 12, 2015 and the agreement was executed as ARV-15-014 on December 8, 2015.

ABSTRACT

Fontana Unified School District is a Kindergarten-to-12th grade school system that serves students from Southern California. Fontana Unified School District is the 2nd largest employer in the City of Fontana employing approximately 5,500 staff members and has a student population of about 41,000.

Fontana Unified School District operates a school bus fleet of 47 vehicles, with 29 compressed natural gas buses, 2 electric-powered buses, and 18 diesel-powered buses with diesel particulate filters to meet the California Air Resources Board's Truck and Bus Regulation.

Fontana Unified School District's current infrastructure only features two, 75 standard cubic feet per minute compressed natural gas compressors which is insufficient to fuel our ever-growing fleet. This project enables the expansion of our fueling infrastructure by installing a 225 standard cubic feet per minute natural gas compressor, 13 additional time-fill posts, and a meter set assembly gas supply.

Fontana Unified is proud to continually expand strategic partnerships locally and globally, providing opportunities for students to develop future-focused skills to lead in a changing world.

Keywords: Fontana Unified School District, Southern California, School bus fleet, Compressed Natural Gas, diesel particulate, California Air Resources Board, standard cubic feet per minute, Natural Gas Compressor, time-fill post, meter set assembly

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EXECUTIVE SUMMARY

The Fontana Unified School District continues to work toward the reduction of pollution in the San Bernardino County. The district has spearheaded these efforts through the replacement of diesel-powered buses with compressed natural gas buses and electric vehicles using engines that produce less pollution. The District operates a school bus fleet of 49 vehicles, with 29 compressed natural gas buses, 2 electric-powered buses, and 18 diesel-powered buses.

The California Energy Commission's "Natural Gas Fueling Infrastructure" Program opportunity will allow the expansion of compressed natural gas school bus usage at Fontana Unified School District in Fontana, CA. This program opportunity clearly exhibits the California Energy Commission's dedication to reducing regulated emissions in the Inland Empire, reducing dependence on foreign oil and lowering statewide modal transportation costs.

Fontana Unified School District's Foreign Oil Reduction - Transportation Resources Investment in Infrastructure, Informatics and Power Systems will: (1) allow the expansion of compressed natural gas vehicles (e.g. school buses) usage at Fontana Unified School District's compressed natural gas refueling station; (2) greatly reduce regulated emissions in the Inland Empire; (3) reduce dependence on foreign petroleum fuel oil, (4) lower the district's overall modal transportation costs (i.e. reduced CA tax-payer burden), and (5) improve the efficacy, performance and market viability of Fontana Unified School District's clean compressed natural gas school bus fleet to the local community. Prior to the California Energy Commission's grant funding, Fontana Unified School District had a very limited fueling capacity for its current compressed natural gas bus fleet with only two 75 standard cubic feet per minute compressed natural gas supply compressors. These two compressors were originally designed to only serve as a supplementary supply source; the funding in 2007, however, was not sufficient to purchase the designed primary 225 standard cubic feet per minute compressed natural gas compressor. The compressors for the last eight years have been running in excess of 12 hours per day per compressor to fulfill the compressed natural gas demand of Fontana Unified School District's current compressed natural gas bus fleet (29 compressed natural gas buses). Since 2010, Fontana Unified School District has spent over \$75,000 in emergency repair services for these two compressors. The project features the installation of a meter set assembly designed for 300 standard cubic feet per minute compression, 400 amperage electrical system for the refueling of 30 buses, and one automatic single tower natural gas dryer. The project also features the installation of 1 225 standard cubic feet per minute compressors and 13 additional time-fill posts.

The design, application, study, and social consequences of developing Fontana Unified School District's compressed natural gas bus transportation system will have profound effects on the district and the local community for many years to come. The ultimate purpose of PON-14-608, however, goes much further as school districts, staff, maintenance operators, bus drivers, parents and students alike all play a role in supporting the California Energy Commission's mission in reducing greenhouse gas emissions and to do so collectively such that the community as a whole prospers.

CHAPTER 1:

Project Background and Objectives

1.1 About the District

Fontana Unified School District (FUSD) is a Kindergarten through 12th grade public school system located in Southern California, a fast-growing community 50 miles east of Los Angeles and is the eighteenth largest school district in California based on enrollment. The District employs approximately 5,500 staff members and has a student population of about 41,000.

FUSD operates 45 school campuses in configurations that include Kindergarten-to-5th-grade, Kindergarten-to-8th-grade, middle school, high school and adult education. FUSD offers a robust selection of programs that include preschool education, adult education, alternative education, vocational education, and special education. Fontana's schools are recognized nationwide for their fast growth in student achievement.

29 Elementary Schools, 1 Elementary Magnet School, 7 Middle Schools, 5 High Schools, 2 Continuation High Schools, 1 Adult School, 27 Preschools, 1 Head Start site, and 2 Infant/Toddler sites. Fontana Unified is a community united to ensure that every student is prepared for success in college, career, and life. The District's Transforming Together Strategic Framework shared vision three cornerstones of success are: 1) Every Student Successful, 2) Engaging Schools, and 3) Empowered Communities.

Approximately 84 percent of all students received free/reduced price meals (2018-19). The district is the second largest employer in Fontana with over 3,948 employees: 1,904 certificated, 1,769 support staff, and 275 administrators.

CalEPA's list of disadvantaged communities, for the purpose of Senate Bill 535, as assessed by CalEnviroScreen 2.0, has identified the City of Fontana as an area that is disproportionately burdened by and vulnerable to multiple sources of pollution. FUSD's ZIP code census tract data has a CalEnviroScreen 2.0 Percentile Range score that tops out at 96-100 percent, a Pollution Burden Percentile of 99, and an overall CalEnviroScreen 2.0 Score of 62.72.

1.2 Current Fleet

The FUSD school bus fleet currently consists of 47 vehicles, which includes 29 compressed natural gas (CNG) powered buses and 18 diesel powered buses equipped with diesel particulate filters to meet the California Air Resources Board's Truck and Bus Regulation. A complete list of the FUSD fleet is shown in Table 1. Figure 1 shows a list of all FUSD diesel buses to be replaced. The FUSD school bus fleet runs cleanly and meets all strict California emissions standards. FUSD buses travel approximately 2,340 miles daily to transport an average of 4,924 students. In the 2017-18 school year, buses transported students to 1,170 field trips, covering 97,915 miles.

Table 1: List of FUSD Fleet

Bus #	Year	Passenger Capacity	DMV License #	Accumulated Milage	Average Annual Milage	Average Miles/Day
6	2006	84	1189302	192221	19194	106.6
3	2006	84	1189304	156099	16267	90.4
8	2006	84	1189303	159210	15414	85.6
34	2008	20+4 W/C	1303065	177967	20195	112.2
33	2008	20+4 W/C	1303066	143485	17828	99.0
32	2008	20+4 W/C	1300447	157164	16786	93.3
17	2008	65	1300447	162966	17726	98.5
31	2008	20+4 W/C	1303064	139467	18744	104.1
36	2008	20+4 W/C	1302562	147901	18043	100.2
30	2008	20+4 W/C	1300449	127835	14742	81.9
35	2008	20+4 W/C	1303286	134235	17451	97.0
10	2006	62	1189280	132563	12835	71.3
48	2009	65	1292333	123593	15501	86.1
16	2008	65	1302561	141741	17526	97.4
38	2008	20+4 W/C	1303287	134169	15174	84.3
40	2008	65	1293329	114545	16026	89.0
37	2008	20+4 W/C	1303289	116607	12510	69.5
21	2006	62	1282591	122133	14841	82.5
29	2008	65	1268578	107209	13690	76.1
4	2006	62	1282592	100568	14018	77.9
46	2008	65	1292331	107526	8732	48.5
41	2008	65	1268579	93510	12931	71.8
47	2009	65	1292332	90394	13994	77.7
42	2008	65	1292330	89421	12345	68.6
7	2008	65	1292327	79601	6515	36.2
26	2008	65	1292328	88041	7453	41.4
45	2008	65	1303063	80556	8274	46.0
1	2007	62	1282593	66760	3075	17.1
14	2007	62	1282597	64550	8066	44.8

Source: Fontana Unified School District

Figure 1: List of FUSD Future Diesel Bus Replacements

FONTANA UNIFIED SCHOOL DISTRICT
EXISTING DIESEL SCHOOL BUS FLEET TO BE REPLACED

BUS ID No.	MAKE	MODEL	YEAR	FUEL TYPE	VIN #	AVERAGE ANNUAL MILEAGE*	ANNUAL FUEL COST (CNG)	ANNUAL FUEL COST (DIESEL)
T001	BLUE BIRD	AARE	1990	DIESEL	1BABMB7A7 LF035640	17837	\$2,216.88	\$5,249.17
T003	BLUE BIRD	AARE	1990	DIESEL	1BABMB7A0 LF035639	17802	\$2,212.53	\$5,238.87
T002	BLUE BIRD	AARE	1990	DIESEL	1BABMB7A2 LF035643	14165	\$1,760.51	\$4,168.56
11	BLUE BIRD	AARE	1988	DIESEL	1BABMB7A5 JF081187	9808	\$1,218.99	\$2,886.35
T003	BLUE BIRD	AARE	1990	DIESEL	1BABMB7A0 LF035642	15814	\$1,965.45	\$4,653.83
19	BLUE BIRD	AARE	1989	DIESEL	1BABLXA4 KF081220	14184	\$1,762.87	\$4,174.15
1015	BLUE BIRD	IHC 3800	1990	DIESEL	1HVBBNEM3 MH307546	5121	\$636.47	\$1,507.04
18	BLUE BIRD	AARE	1988	DIESEL	1BABLXAXJF081205	14134	\$1,756.65	\$4,159.43
5	BLUE BIRD	AARE	1988	DIESEL	1BABMB7A3 JF08118	7656	\$951.53	\$2,253.05
23	BLUE BIRD	AARE	1990	DIESEL	1BABMB7A3LF036123	17264	\$2,145.67	\$5,080.55
1013	BLUE BIRD	IHC 3800	1990	DIESEL	1HVBBNEM6 MH307556	13191	\$1,639.45	\$3,881.92
44	BLUE BIRD	AARE	1988	DIESEL	1BABLXA0 JF080256	14225	\$1,767.96	\$4,186.21
43	BLUE BIRD	AARE	1988	DIESEL	1BABLXA9 JF080255	12535	\$1,557.92	\$3,688.87
20	BLUE BIRD	AARE	1989	DIESEL	1BABLXA8 KF081219	14842	\$1,844.65	\$4,367.79
1014	BLUE BIRD	IHC 3800	1990	DIESEL	1HVBBNEM8 MH307557	2196	\$272.93	\$646.25
22	BLUE BIRD	AARE	1990	DIESEL	1BABMB7A4LF036129	15732	\$1,955.26	\$4,629.70
1003	BLUE BIRD	TC2000	1993	DIESEL	1BAADCSA2 NF050204	7386	\$917.97	\$2,173.59
1004	BLUE BIRD	TC2000	1993	DIESEL	1BAADCSA8 NF050207	6570	\$816.56	\$1,933.46
TOTAL							\$27,400.28	\$64,878.82

ESTIMATED ANNUAL FUEL SAVINGS \$37,478.54

Source: Fontana Unified School District

Currently, FUSD has a very limited fueling capacity for its current CNG bus fleet with only two 75 standard cubic feet per minute CNG supply compressors (ANGI Energy Systems). These two compressors were originally designed to only serve as a supplementary supply source; the funding in 2007, however, was not sufficient to purchase the designed primary 225 CNG standard cubic feet per minute compressor. Consequently, the compressors currently supplying FUSD’s CNG fueling station, which were originally engineered to operate for no more than 6 hours per day have been running, for the last eight years, on average, in excess of 12 hours per day per compressor to fulfill the CNG demand of FUSD’s current CNG bus fleet (29 Blue Bird CNG Buses). Since 2010, FUSD has spent over \$75,000 in emergency repair services for these two ANGI compressors. Finally, in May of this year, FUSD applied for South Coast Air Quality Management District’s “Lower-Emission School Bus Replacement Program” (LESBRP-#PA2015-06) to replace 18 currently operated diesel buses with clean CNG buses. This modernization bus replacement program is designed to help disadvantaged communities, like Fontana, CA; by significantly reducing the harmful pollution emitted by FUSD's numerous and aging (pre-1994) diesel school buses.

The existing FUSD CNG fueling station is located at 9820 Citrus Avenue in Fontana, CA. In its current configuration it is capable of providing the refueling needs of 29 school buses (approx. 67 diesel gallon equivalents daily demand) with time-filling of compressed natural gas at 3600 pounds per square inch. (without exceeding the compressor manufacturer’s recommendations). The existing equipment is as follows:

- 1 ea. Xebec STR24NGX-2-Autodew gas dryer
- 2 ea. ANGI International CNG-75 compressors
- 1 ea. time-fill panel & buffer bottle
- 8 ea. k-rail mounted dual hose time-fill posts

The natural gas dryer is a skid mounted automatic regenerative single tower dehydrator specifically designed for drying pipeline natural gas before being processed for use as a motor fuel. The dryer was sized for a flow rate of 300 standard cubic feet per minute which is adequately designed for the future expansion of the facility. The 50 HP electric drive compressors have an output of 75 standard cubic feet per minute to provide a combined output of approximately 70 diesel gallon equivalents per hour. The current throughput of the facility is approximately 7,100 diesel gallon equivalent's per month. The compressors and controls are contained inside a weatherproof enclosure which limits the maximum noise to 75 decibels at 10' from the equipment. The time-fill posts are k-rail mounted and consist of 15' long, 3/8" diameter 5000 pounds per square inch American Gas Association certified hoses each with a 3600 pounds per square inch Sherex NGV-1, type 2 nozzle and appropriate breakaways and retractors. In 2007, the on-site construction consisted of the installation of a new gas Meter Set Assembly by Sempra Utilities which provided regulated 16 pounds per square inch natural gas to the gas dryer and compressors by way of an above ground 2" schedule 40 steel supply line. The compressed natural gas is then delivered to the time-fill posts (via the time-fill panel) by the use of 1/2" and 3/8" stainless steel tubing. A 400 Amperage/480 Volt electrical service was installed by Southern California Edison which also has been sized for the future expansion of the CNG facility. For safety purposes the equipment area for the CNG equipment was enclosed with 8' high masonry block wall on two sides and chain link fence and lockable gates on the other two. Fire extinguishers and signage, approved by the County Fire Marshall, are installed throughout the facility with special attention paid to the location of the Emergency Shut Down devices. The facility is serviced daily by a district mechanic to monitor operations and there are plans for a more comprehensive service contract in the near future to perform routine maintenance.

1.3 Project Approach

FUSD has prepared for the expansion of its current CNG school bus refueling station. During the initial construction phase of FUSD's CNG fueling facility, the development team in 2008 had the foresight to design for not only the current CNG school bus diesel gallon equivalents of CNG at that time, but also for the continued expansion of FUSD's CNG school bus fleet. FUSD is currently in the process of replacing its pre-1994 diesel bus fleet with new CNG/Electric Vehicle buses. The current plan is to replace the oldest diesel buses annually with new, equivalently sized, CNG/Electric Vehicle buses. The timing and coordination of which is largely dependent on funding opportunities and the tenure of the existing diesel buses based on their reliability, performance and operating cost. The existing private access CNG refueling station is only capable of fueling 12 school buses (1 75 standard cubic feet per minute compressor running at 10 hrs. per night or 2 ea. 75 standard cubic feet per minute compressors running together at 5 hrs. per night). In anticipation of an increased number (18 ea.) of CNG school buses at some time in the near future, the facility has been designed to accommodate the expansion, without interruption, in the following manner:

- 2 Angi International CNG-75 compressors
- 1 Xebec STR24NGX-2-Autodew gas dryer

- 1 time-fill panel & buffer bottle
- 400 Amperage electrical service
- 8 k-rail mounted dual hose time-fill posts

The expanded facility will necessitate the addition of the following items:

- 1 225 standard cubic feet per minute natural gas compressor and electrical panel.
- 13 k-rail mounted dual hose time-fill posts.
- 1 gas supply (MSA- Meter Set Assembly) designed for 300 standard cubic feet per minute of compression.

Given the timing of the bus replacement and phase-outs, the necessity for a higher throughput compressor cannot be overstated. FUSD has planned the phased construction of the CNG refueling facility in two phases. As may be evident in the accompanying photos, Phase 1 is already complete. Phase 2 required adding the aforementioned 225 standard cubic feet per minute compressor (to be located on the empty concrete pad as depicted) and an additional 13 ea. dual-hose time-fill posts (as required). The total capacity of the facility after Phase 2 will be 300 standard cubic feet per minute (i.e. 1 ea. 225 standard cubic feet per minute compressor and 1 ea. 75 standard cubic feet per minute compressor running simultaneously). The minimum expected life cycle of the newly acquired CNG school buses will be no less than 15 years. The expanded facility will be designed to operate via a computerized control panel in a mode consistent with the fueling demands but in general will be operating at 300 standard cubic feet per minute capacity (1 ea. 75 standard cubic feet per minute compressor (switching between both of them as needed) and the new 225 standard cubic feet per minute compressor) for approximately 8hrs. per night. Site Plan, shown in Appendix A, is attached showing the expanded facility to meet the District's transportation needs. It should be noted that since 2010, \$77,864 has been spent for emergency repairs for the District's current 75 standard cubic feet per minute CNG compressors which are undersized for the size of the District's current CNG bus fleet. The CNG fueling station shall be constructed in accordance with all local, state and federal codes as they are presently adopted by the FUSD. Equipment and assemblies shall comply with all relevant provisions of the latest revisions of approved codes and standards and current industry practices.

1.4 Pre-Construction, Public Contract Code and Applicable Code Standards

The natural gas dryer is a skid mounted automatic regenerative single tower dehydrator specifically designed for drying pipeline natural gas before being processed for use as a motor fuel. The dryer was sized for a flow rate of 300 standard cubic feet per minute which is adequately designed for the future expansion of the facility. The 50 horsepower electric drive compressors have an output of 75 standard cubic feet per minute to give a combined output of approximately 70 diesel gallon equivalents per hour. The compressors and controls are contained inside a weatherproof enclosure which limits the maximum noise to 75 decibels at 10' from the equipment. The time-fill posts are k-rail mounted and consist of 15' long, 3/8" diameter 5000 pounds per square inch American Gas Association certified hoses each with a 3600 pounds per square inch Sherex NGV-1, type 2 nozzle and appropriate breakaways and retractors. The on-site construction consisted of the installation of a new gas Meter Set Assembly by Sempra Utilities which provided regulated 16 pounds per square inch natural gas to the gas dryer and compressors by way of an above ground 2" schedule 40 steel supply line. The compressed natural gas was then delivered to the time-fill posts (via the time-fill panel)

by the use of 1/2" and 3/8" stainless steel tubing. A new 400 Amperage/480 Volt electrical service was installed by Southern California Edison which had been sized for the future expansion. For safety purposes the equipment area for the CNG equipment was enclosed with 8' high masonry block wall on two sides and chain link fence and lockable gates on the other two. Fire extinguishers and signage approved by the County Fire Marshall was installed throughout the facility with special attention paid to the location of the Emergency Shut Down devices. The facility is serviced daily by a district mechanic to monitor operations and there are plans for a more comprehensive service contract in the near future to perform routine maintenance.

In accordance with Public Contract Code Section 22003, the District is required to request formal bids for public works projects costing \$175,000 or more. The District was awarded a grant, in the amount of \$500,000, from the California Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program under grant solicitation PON-14-608 entitled "Natural Gas Fueling Infrastructure" to upgrade and expand the District's compressed natural gas fueling station. Bids for the upgrade and expansion of the District's existing compressed natural gas fueling station were opened on January 10, 2017. Bids were received from six bidders. After review by District personnel, it was recommended that Bid No. 16/171456 for Board of Education approval on February 01, 2015. CNG Fueling Facility Expansion Project was awarded to Allsup Corporation, the lowest responsible, responding bidder. FUSD hired Allsup Inc. station for its school bus fleet. Reb Guthrie of Fuel Solutions, Inc., the engineering consultant, drew up the CNG portion of the drawings and gave the district a cost estimate for the construction of this project.

FUSD partnered with Allsup, Inc. to help with the engineering design, construction inspection and technical expertise in the area of CNG and CNG facilities. The project was formally bid for installation and procurement of new compressors and fast-fill dispenser. Bid opening was October 14, 2015 and awarded to EFS West. EFS West used Jimco Sales and Manufacturing Lane Supply Inc. for the Canopy, Revolution CNG, Inc. for the CNG Mechanical and Equipment and Verduzco Electric as the Electrical Consultant.

The work to be performed under this contract included, in general, to provide and install mechanical equipment and their required functions for a complete CNG vehicle-fueling system. The CNG fueling station shall be constructed in accordance with all local, state and federal codes as they are presently adopted by the FUSD. Equipment and assemblies shall comply with all relevant provisions of the latest revisions of approved codes and standards and current industry practices including the following:

A. American Petroleum Institute

1. American Petroleum Institute Recommended Practice 52 - Sizing, Selection and Installation of Pressure Relieving Devices in Refineries.

B. American Society of Mechanical Engineers

1. American Society of Mechanical Engineers Section VIII, Division I - Boiler and Pressure Vessel Code-Pressure Vessels.
2. American Society of Mechanical Engineers Section V - Boiler and Pressure Vessel Code - Nondestructive Examination.
3. American Society of Mechanical Engineers Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

4. American Society of Mechanical Engineers B31.3 - Chemical and Petroleum Plant Piping.
 5. American Society of Mechanical Engineers B31.3 - Power Piping.
- C. American Welding Society (AWS)
1. American Welding Society A5. 1 – Covered Carbon Steel Arc Welding Electrodes.
 2. American Welding Society A5. 5 – Low Alloy Steel Covered Arc Welding Electrodes.
- D. National Fire Protection Association:
1. National Fire Protection Association 52 – Compressed Natural Gas Vehicular Fuel Systems.
 2. National Fire Protection Association 54 – Natural Gas Fuel Code.
 3. National Fire Protection Association 70 – National Electrical Code.
- E. Occupational Safety and Health Administration:
1. Title 29 – Code of Federal Regulations.
- F. Department of Industrial Relations – California Code of Regulations:
1. California Code of Regulations – Title 8, Industrial Relations.
- G. Uniform Building Codes
- H. California Building Code
- I. California Fire Code
- J. California Electrical Code
- K. American Gas Association

1.5 Project Readiness and California Environmental Quality Act Compliance

The existing FUSD CNG fueling station is located at the eastern end of FUSD’s maintenance and operations Complex. The current system has undergone California Environmental Quality Act review, and FUSD is currently in communication with our local lead agency for California Environmental Quality Act compliance with the possibility that FUSD may be awarded the CEC’s PON-14-608 CNG infrastructure grant award. The Fire Department fees for the expansion have been paid for by FUSD and no other fees are required. Design plans for Phase 2 of CNG fueling station expansion have been completed and are included with this report. Successful operation of the new time-fill posts, the 225 standard cubic feet per minute compressor, and the expanded Emergency Shut Down system must be completed prior to final Fire Department inspection and approval.

Reasons why project is exempt:

This project involves installation of functional, state-of-the-art CNG equipment at an existing CNG fueling station. The equipment to be installed will be located on the same site and will have the same purpose as the existing facility. Cal. Code Regs., tit. 14, sec. 15301 provides that projects which consist of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which involve negligible or no expansion of use beyond that existing at the time of the lead agency’s determination, are categorically exempt from the provisions of the California Environmental Quality Act. The square footage of the

equipment to be installed is analogous to a specified example provided in the Regulations (i.e., 14 C.C.R. § 15301(e)) of a minor addition to existing structures. The equipment will not significantly expand the use beyond that already existing and the square footage of equipment installation is relatively small. Therefore, the project falls within section 15301 and will not have a significant effect on the environment.

Cal. Code Regs., tit. 14, sec. 15303 provides that projects which consist of construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure, are categorically exempt from the provisions of the California Environmental Quality Act. This project consists of installation of small new equipment to supplement existing compressors and allow for the planned expansion of the number of CNG vehicles in the recipient's fleet. Therefore, the project falls within section 15303 and will not have a significant effect on the environment.

CHAPTER 2:

Project Design

2.1 Pre-Construction

After FUSD completed the design plan, the district finalized the specifications for the construction of a new fueling station and prepared bid documents. FUSD took an approach to find out how much gas flow would be needed for the new fueling station. FUSD consulted Allsup Engineering and Southern California Gas Company to ensure the project would have the necessary amount of gas flow needed for the equipment. After requests were granted, FUSD then made the requests to build and obtain permits from Southern California Gas Company and the City of Fontana, which were granted. Receiving notification from both Southern California Gas Company and the City of Fontana, construction drawings were completed, approved, and finalized.

2.2 Engineering

After receiving approval from Southern California Gas Company and the City of Fontana for gas flow needed, drawings and permits to construct to begin construction was approved. FUSD bid the project out. The equipment specified in the bid documents was ANGI compressor equipment. FUSD found ANGI products to meet expectations and were comfortable listing the equipment as the basis to award. Not only does FUSD feel the compressor exceeds the needs of the district, it also proved to be the most cost-efficient option.

Installed equipment consists of the following:

- Meter Set Assembly designed for 300 standard cubic feet per minute of compression.
- 400 Amperage electrical service designed for the refueling of 30 CNG buses simultaneously.
- One automatic single tower natural gas dryer designed for 300 standard cubic feet per minute of compression.

The expanded facility will necessitate the addition of the following items:

- 1 225 standard cubic feet per minute natural gas compressor and electrical panel.
- 13 k-rail mounted dual hose time-fill posts.

Once installation of CNG was complete, a startup and commission phase was conducted to test the functionality of the CNG fueling station in place. The goal was to prepare the site for the new CNG fueling station while bus activity was low in a time frame of roughly 80 days. The district operated the bus fleet during construction with no downtime occurring.

The new CNG fueling station installed 13 dual hose time-fill poles. The time-fill fueling poles are used to fuel the buses typically when not in use over a five to 14-hour period. The fueling dispensers automatically shut off when the buses are full. For safety precautions, operators can also manually stop the dispensers with manual shutoff valves installed at the dispensers. Portable fire extinguishers are also located near the dispensers if needed in case of emergency. Bollards were also installed around the new fueling poles to provide protection.

2.3 Design Specifications

FUSD will add an additional 225 standard cubic feet per minute compressor and additional 20 ea. time-fill posts as required. The total capacity of the of the facility after 'Stage 2' will be 300 standard cubic feet per minute i.e. 1 ea. 225 standard cubic feet per minute compressor and 1 ea. 75 standard cubic feet per minute compressor running together. The ANGI has the capability to handle a total capacity of 350 standard cubic feet per minute each, nearly doubling our output from the old location from 14,500 to 33,000 pounds per square inch. We are producing more standard cubic feet per minute utilizing two (2) 150 horsepower compressors.

- Number of vehicles fueled per day per station
 - 29 vehicles
- Number of days or hours per year that each station was inoperative
 - No days in the last six months

Natural Gas

1. Specific Gravity : 0.6
2. Temperature : 4-60 degrees F.
3. Heating Value : 900-925 British Thermal Unit/Standard Cubic Foot
4. Moisture Content : 7 Pound/Million Standard Cubic Feet
5. Available Gas Pressure at Meter : 18-45 pounds per square inch gauge
6. Ambient Air Temp. : 25-120 degrees F. (Fontana, Ca)

Electrical power supplied to the system will be 480 Volts Alternating Current \pm 10 percent, 3-phase, 60 hertz, unless noted otherwise. Primary power will be provided from an Edison vault located at the S/W corner of the adjacent 'Maintenance Building', approx. 350 linear feet from the proposed CNG facility (see attached Southern California Edison drawing 3072004, sheets 1 & 2) and brought into a Southern California Edison supplied transformer. All work on the Southern California Edison drawings is to be performed by the 'Contractor' using Southern California Edison approved contractors as required.

Maximum capacity of the new fueling system:

- 120 inlet pressure of gas line to system
- 1 ANGI CNG Compressor producing 225 standard cubic feet per minute each

Gallons of diesel fuel displaced by using natural gas:

- 94,026.69 gallons of diesel fuel displaced at approximately 334,800 miles driven

Expected air emissions reduction

- Non-methane hydrocarbons—Reduction of 55 percent
- Oxides of nitrogen
- Non-methane hydrocarbons plus oxides of nitrogen
- Particulate Matter
- Formaldehyde

Duty cycle of the current fleet and the expected duty cycle of future vehicle acquisitions:

- 10 more CNG buses and electric/hybrid vehicles are estimated for purchase over the next two years.

Specific jobs and economic development resulting from this project

- None at this time

Identify any current and planned use of renewable energy at the facility:

- Continued use of CNG
- Electric Vehicle infrastructure
 - Clipper Creek Chargers—Level 2

Identify the source of the alternative fuel:

- Natural gas

Describe any energy efficiency measures used in the facility that may exceed Title 24 standards in Part 6 of the California Code Regulations

- None at this time

Provide data on potential job creation, economic development, and increased state revenue as a result of expected future expansion:

- Deduction in diesel use and reduced fuel costs
- The District has finished its mechanics expansion housing all the bus and white fleet mechanics in one large shop where they were separated prior providing better efficiency. District mechanics service 47 buses and 100 vehicles.
- District has plans to build additional buildings such as training classrooms that the city and district can use for trainings. No green jobs at this time. Possibly in the future.

Provide a quantified estimate of the project's carbon intensity values for life-cycle greenhouse gas emissions:

- Fossil-based North American Natural Gas to California CNG with 97 percent compression efficiency, CNGF205, 79.46 gallons carbon dioxide equivalent per megajoule.
- Displacement of Ultra-Low-Sulfur Diesel, ULSD001, 102.01 gallons carbon dioxide equivalent per megajoule.
- 22 percent reduction in carbon intensity by using CNG over diesel

2.4 Site Location

Figures 2 through Figure 6 depict project progress of the FUSD CNG station construction from beginning to end.

Figure 2: Concrete Slab and 2 75 standard cubic feet per minute Compressors



Source: Fontana Unified School District

Figure 3: Existing CNG Dryer and Electrical Switchgear



Source: Fontana Unified School District

Figure 4: CNG Time-fill Posts and Meter



Source: Fontana Unified School District

Figure 5: Front of Existing CNG Dryer and New Electrical Panel



Source: Fontana Unified School District

Figure 6: 75 standard cubic feet per minute Compressors and ANGI 225 standard cubic feet per minute Compressor



Source: Fontana Unified School District

2.5 Fuel Throughput

There are 29 FUSD school buses currently utilizing the CNG station. The station has been operational since October 2017. Annual fuel usage from October 1, 2017, to October 1, 2018, was approximately 4159 CNG Therms, or 3034 diesel gallon equivalents. As shown in Table 2, average monthly throughput is approximately 346 CNG Therms, or 252 diesel gallon equivalents. With the CEC's grant funding, annual CNG usage has increased by over 51 percent. Figure 6 shows total CNG Therms used between October 2017 and August 2019.

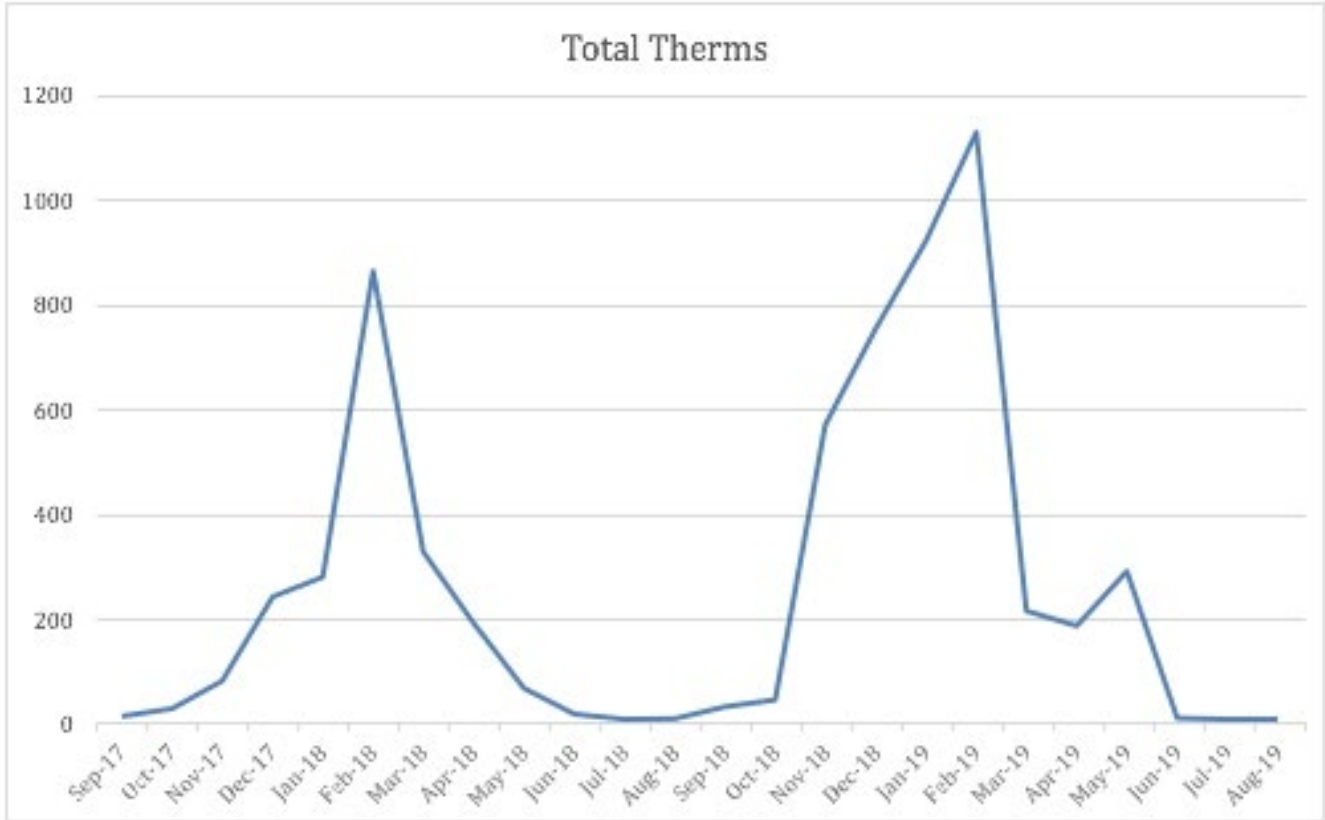
Figure 7 shows the total billing and amounts of CNG Therms for FUSD between September 2017 and September 2019.

Table 2: Monthly and Annual Fuel Use Throughput

	CNG Therms	Diesel Gallon Equivalents
Monthly Average	346	252
Annual Average	4159	3034

Source: Fontana Unified School District

Figure 7: FUSD Total Therms, October 2017 – August 2019



Source: Fontana Unified School District

Figure 8: FUSD CNG Billing, September 2017 – September 2019

Billing Period	Billing Period	Total Therms.	Total Amount Due	Billed Days	Therms/Day
08/15/2019 - 09/15/2019	Aug-19	8	\$23.94	32	0.3
07/17/2019 - 08/15/2019	Jul-19	8	\$22.55	29	0.3
06/17/2019 - 07/17/2019	Jun-19	10	\$25.01	30	0.3
05/16/2019 - 06/17/2019	May-19	290	\$294.39	32	9.1
04/17/2019 - 05/16/2019	Apr-19	186	\$203.52	29	6.4
03/19/2019 - 04/17/2019	Mar-19	214	\$246.40	29	7.4
02/15/2019 - 03/19/2019	Feb-19	1,126	\$1,036.29	32	35.2
01/17/2019 - 02/15/2019	Jan-19	919	\$854.19	29	31.7
12/17/2018 - 01/17/2019	Dec-18	752	\$737.30	31	24.3
11/14/2018 - 12/17/2018	Nov-18	569	\$535.39	33	17.2
10/15/2018 - 11/14/2018	Oct-18	45	\$56.74	30	1.5
09/13/2018 - 10/15/2018	Sep-18	32	\$45.75	32	1.0
08/14/2018 - 09/13/2018	Aug-18	9	\$24.63	30	0.3
07/16/2018 - 08/14/2018	Jul-18	8	\$22.88	29	0.3
06/14/2018 - 07/16/2018	Jun-18	18	\$32.63	32	0.6
05/15/2018 - 06/14/2018	May-18	67	\$73.87	30	2.2
04/16/2018 - 05/15/2018	Apr-18	191	\$176.09	29	6.6
03/16/2018 - 04/16/2018	Mar-18	327	\$279.01	31	10.5
02/14/2018 - 03/16/2018	Feb-18	862	\$662.73	30	28.7
01/16/2018 - 02/14/2018	Jan-18	279	\$266.61	29	9.6
12/14/2017 - 01/16/2018	Dec-17	241	\$238.27	33	7.3
11/14/2017 - 12/14/2017	Nov-17	81	\$88.97	30	2.7
10/12/2017 - 11/14/2017	Oct-17	28	\$41.49	33	0.8
09/22/2017 - 10/12/2017	Sep-17	14	\$22.58	20	0.7

Source: Fontana Unified School District

CHAPTER 3:

Conclusions

FUSD has been aggressive in working to reduce air pollution in the central valley by replacing diesel powered buses with buses and support vehicles that are powered by engines that produce less pollution. This Energy Commission funding will make it possible to continue providing CNG for the District's transportation fleet and the various community organizations that utilize the fueling station.

By reviewing the districts problem statement, the district has addressed previous statements of building a new natural gas fueling infrastructure. This in turn encourages the expansion of CNG use by making the facility more accessible, thereby reducing emissions by replacing diesel buses with CNG buses and increasing local knowledge of availability of facility to public.

FUSD has also increased its CNG bus fleet. The current fleet now stands at 37 CNG buses in use. In the last two years, the District has decommissioned 10 gross polluting diesel buses. Emission reductions of the 10 gross polluting diesel buses equate to about 192,000 diesel miles that the district has converted to CNG. On average, the district CNG fleet of 37 buses travels 481,000 miles per year. With diesel buses running at about seven miles to the gallon, FUSD estimates avoiding 68,700 gallons of diesel fuel consumption due to the 37-bus fleet. The district has plans to purchase more buses in the 2017-2018 school year and now with the added facility and additional fueling capacity, the district can consider additional CNG fueled buses for further expansion. The district could not previously consider this option as slow fill lines were at capacity.

Also, with new technologies, rapid communication in the event of various issues or power outages is possible. This allows for rapid notification when problems arise; aids the district in the prompt handling of issues as they arise; and prevents the likelihood of employees arriving at the yard to find that no buses filled overnight.

As of October 2018, FUSD is out to bid for two more CNG buses, which will increase the CNG bus fleet to 39 total. The district will save an additional 26,000 diesel miles approximately, while avoiding around 3,700 gallons of diesel fuel as the number of field trips increases 20 percent over the 2017-2018 school year. FUSD's alternative fuel bus fleet will be increased to 58 percent (10 electric, 29 CNG buses out of the 47 total bus fleet).

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.

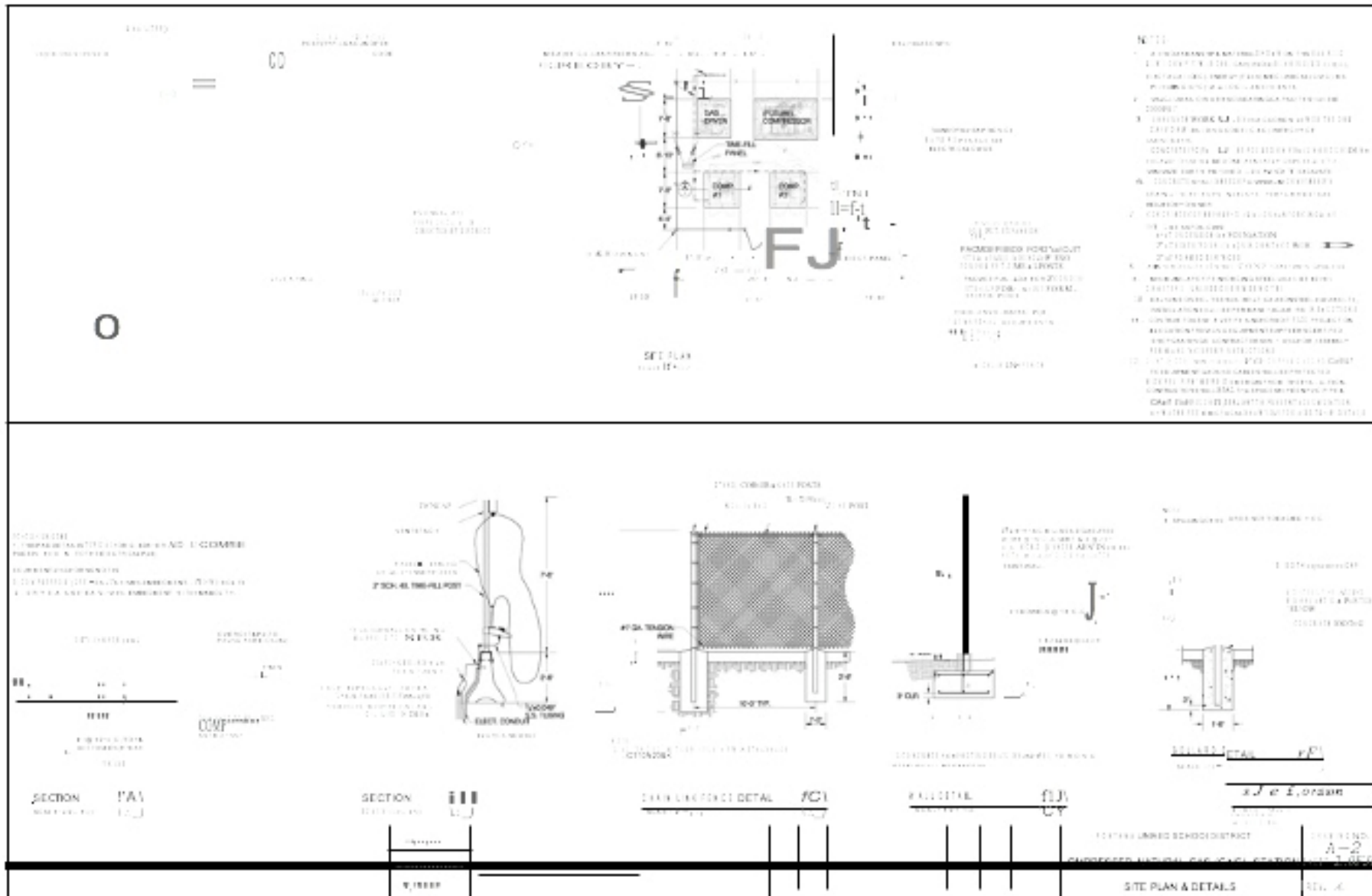
COMPRESSED NATURAL GAS (CNG)—Natural gas that has been compressed under high pressure, typically between 2,000 and 3,600 pounds per square inch, held in a container. The gas expands when released for use as a fuel.

FONTANA UNIFIED SCHOOL DISTRICT (FUSD)—Fontana Unified School District is located in Southern California in what is known as the Inland Empire, a fast-growing community 50 miles east of Los Angeles. Our 45 schools serve students from preschool through adult education in a diverse urban/suburban environment. Fontana's schools are recognized nationwide for their fast growth in student achievement.

APPENDIX A: CNG Construction Plans

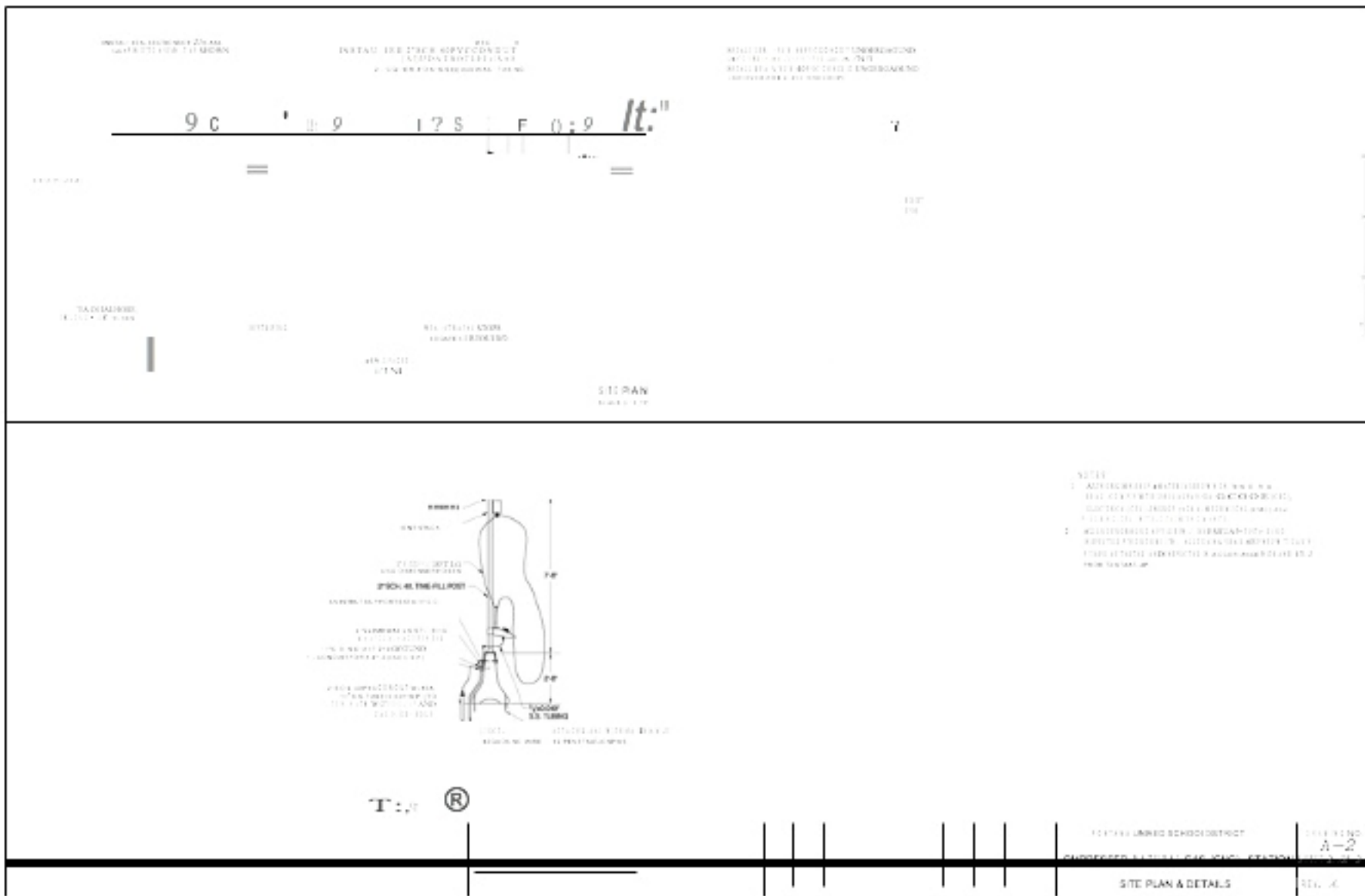
Figures 9 through 17 show construction plans for the CNG station at FUSD.

Figure 9: FUSD Site Plan



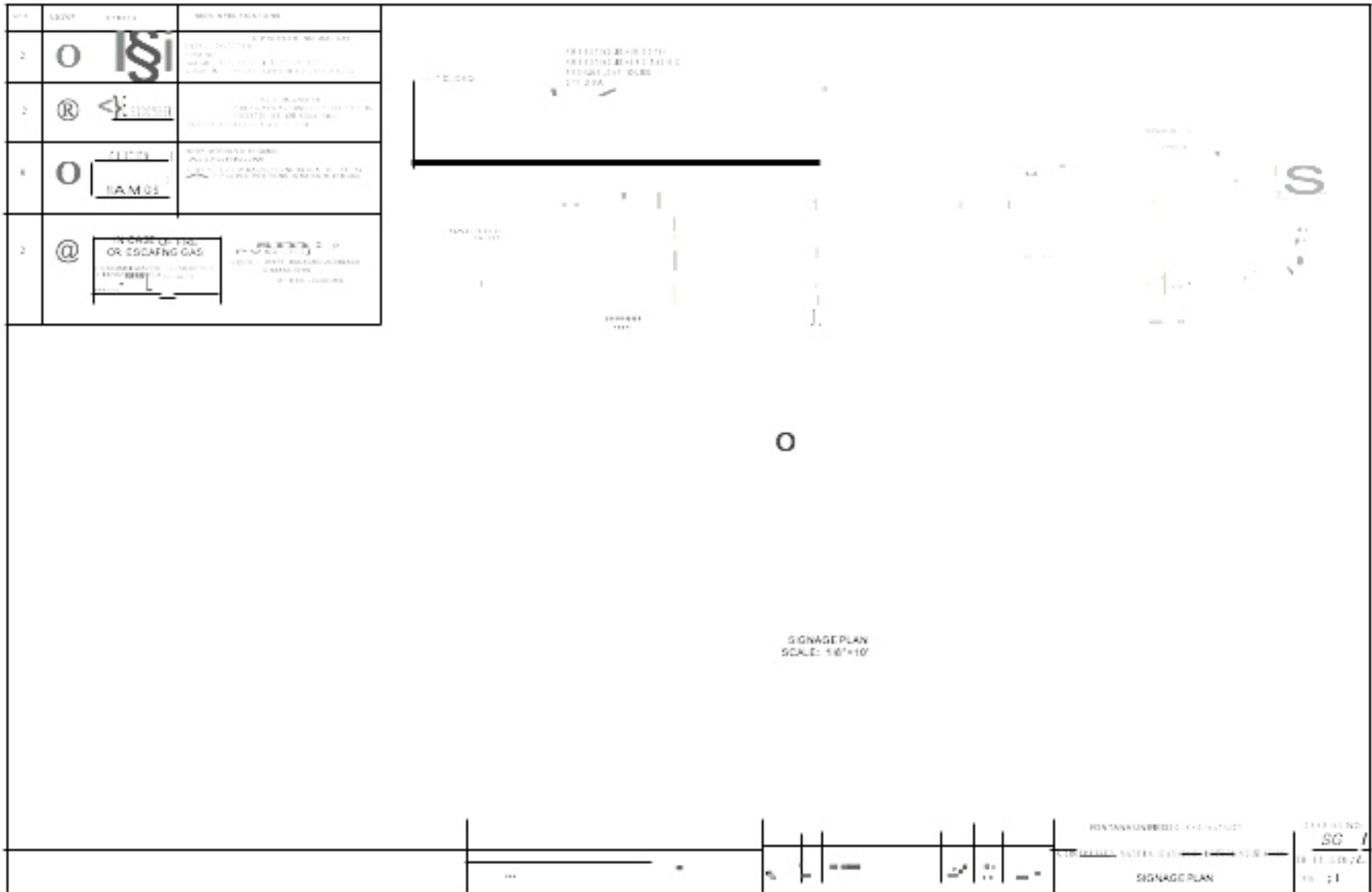
Source: Fontana Unified School District

Figure 10: FUSD Site Plan



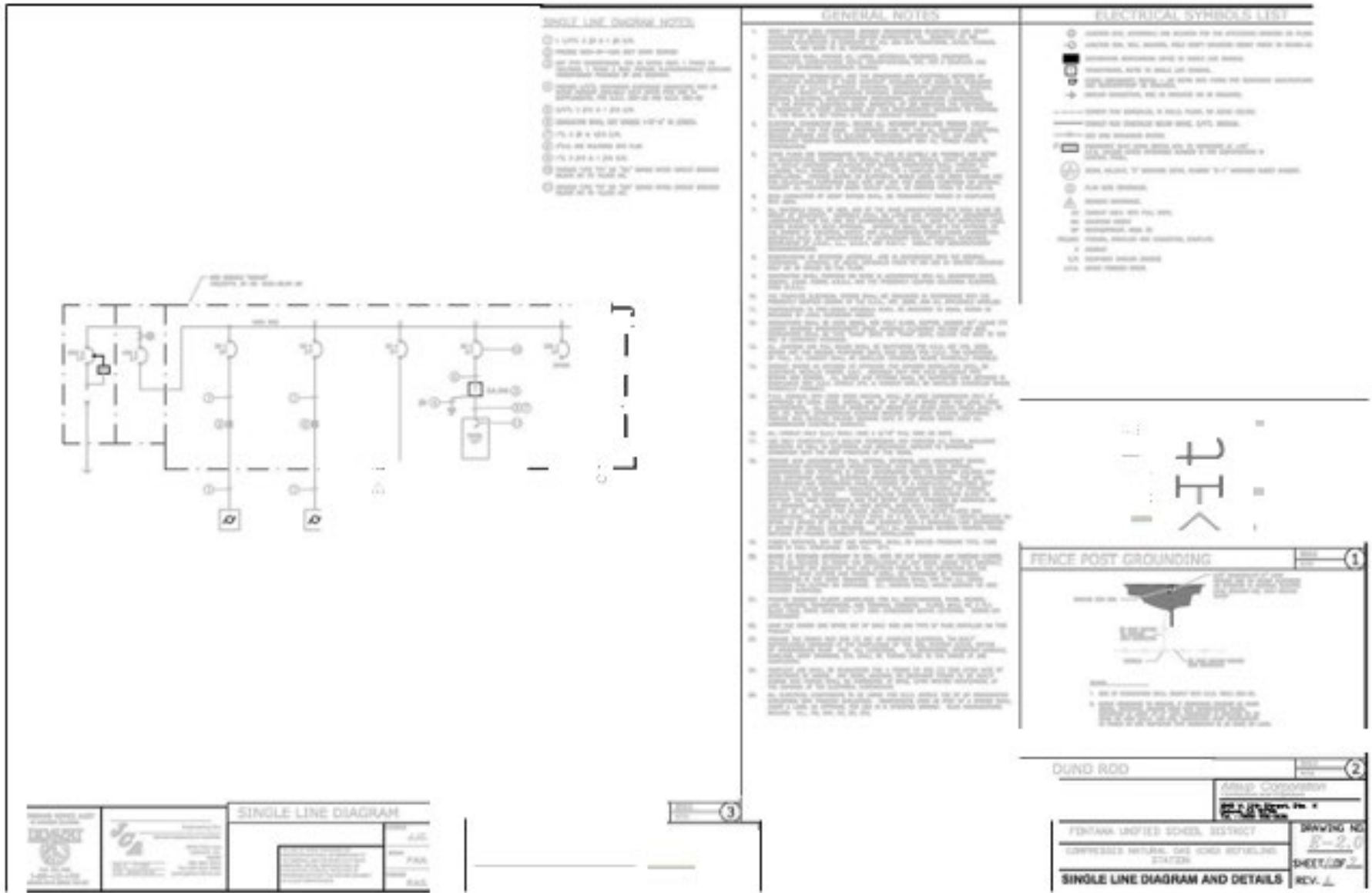
Source: Fontana Unified School District

Figure 13: FUSD Signage Plan



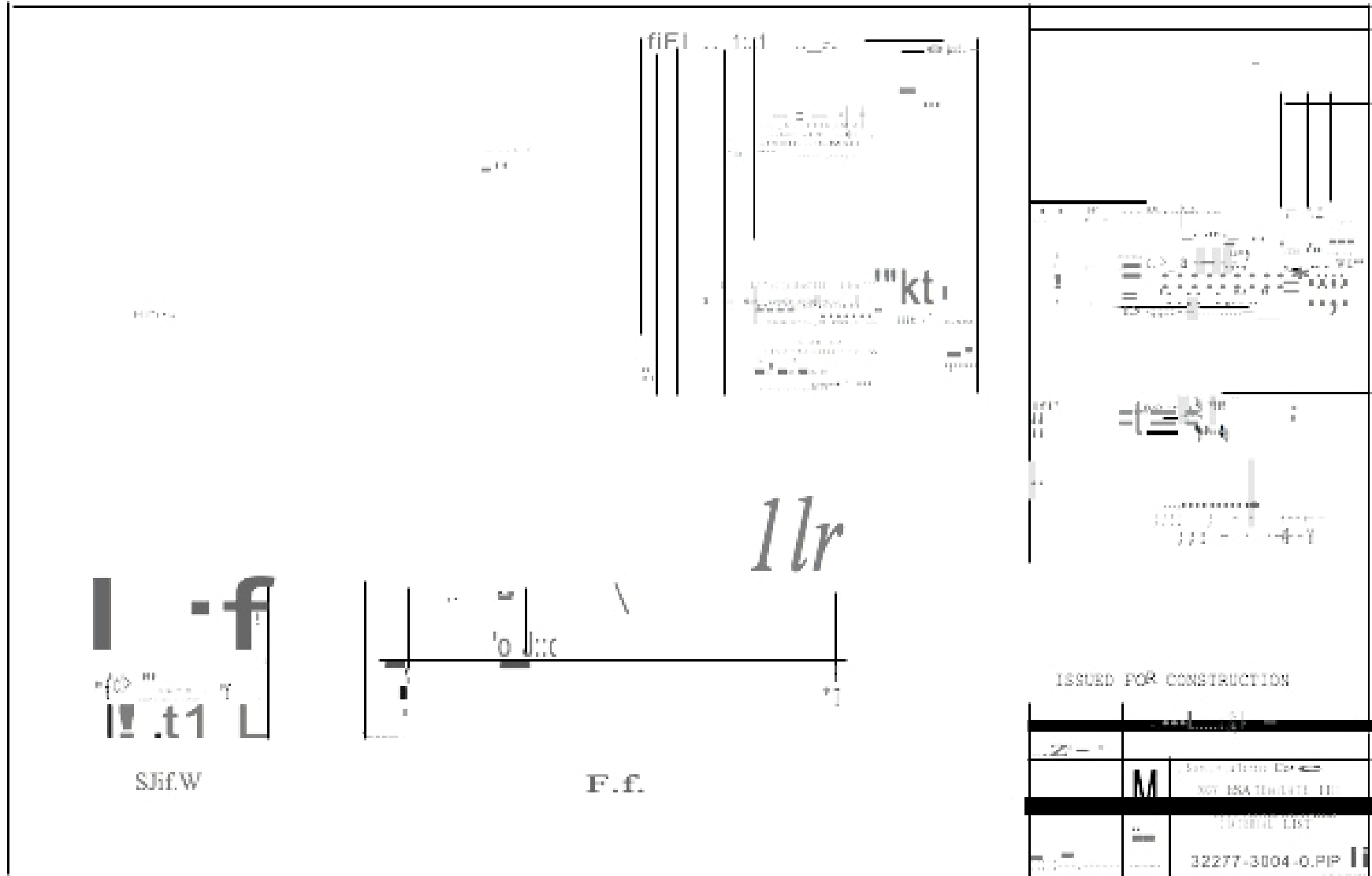
Source: Fontana Unified School District

Figure 14: FUSD Single Line Diagram and Details



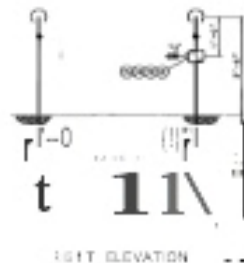
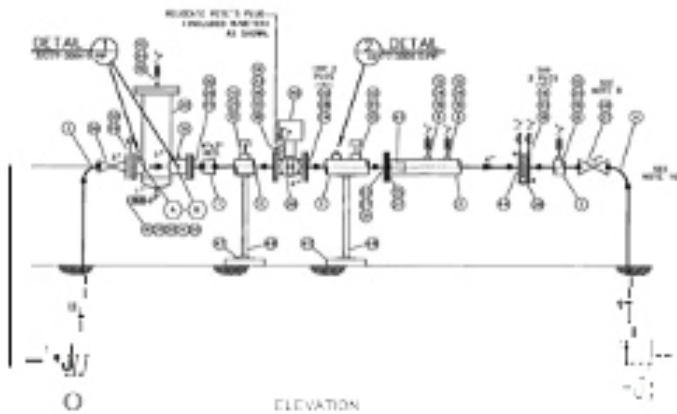
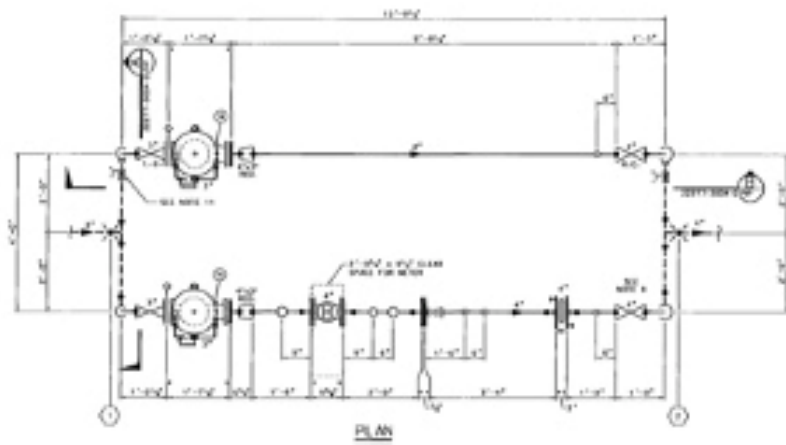
Source: Fontana Unified School District

Figure 15: FUSD Site Plan



Source: Fontana Unified School District

Figure 16: FUSD Site Plan



GENERAL NOTES

1. REFER TO SHEET 32277-3003-0.PIP FOR GENERAL NOTES.
2. ALL PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE 2019 CALIFORNIA GAS CODE (C.G.C.) AND THE 2019 CALIFORNIA PLUMBING CODE (C.P.C.).
3. ALL PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE 2019 CALIFORNIA GAS CODE (C.G.C.) AND THE 2019 CALIFORNIA PLUMBING CODE (C.P.C.).
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LEGEND

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ISSUED FOR CONSTRUCTION

PROJECT INFORMATION		DATE	
PROJECT NO.	32277-3003-0.PIP	DATE	11/11/2020
Southern California Gas Company Gas Infrastructure Unit			
NGV MSA TEMPLATE 11M PLAN, ELEVATIONS NOTES & LEGEND			
PROJECT NO.		32277-3003-0.PIP	
DATE		11/11/2020	
DRAWN BY		[Redacted]	
CHECKED BY		[Redacted]	
APPROVED BY		[Redacted]	
SCALE		AS SHOWN	
SHEET NO.		1	

1.0
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Source: Fontana Unified School District

Figure 17: Strength Test Assemblies Documentation

STRENGTH TEST ASSEMBLIES AND SUPPORTING DOCUMENTATION	STRENGTH TEST RESULTS	TEST DATE	TESTER	TEST TYPE	TEST LOCATION	TEST RESULTS	TEST COMMENTS	TEST STATUS	TEST NOTES
1									

NOV 8 SA TEMPLATE HW15

NOTE: Do not include Areas & meter to its strength ASST

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REQUIREMENTS REQUIREMENT NOTES

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Source: Fontana Unified School District

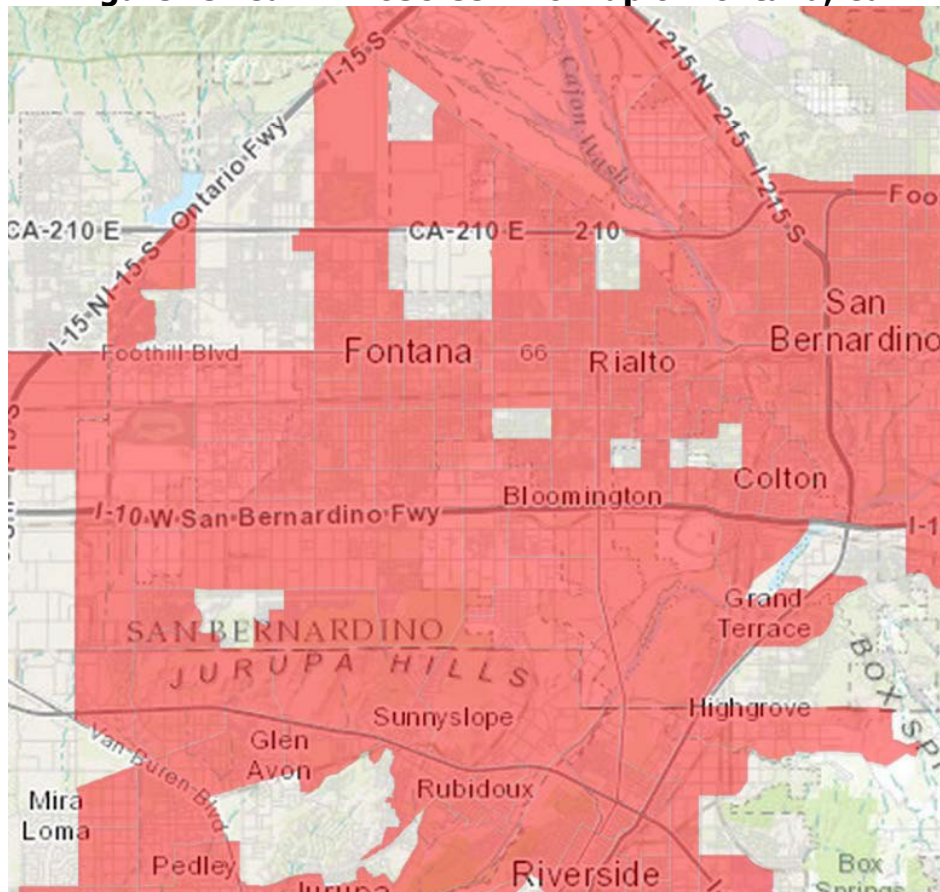
Figures 18 and 19 show the Climate Zones and the CalEnviroScreen 2.0 map for Fontana, Ca.

Figure 18: CalEnviroScreen 2.0 Ratings for Fontana, Ca

ZIP code census tract falls within	Census Tract	CalEnviroScreen 2.0 Score	CalEnviroScreen 2.0 Percentile Range	Pollution Burden Percentile	Population Characteristics Percentile	Total Population
92335	6071002204	62.72	96-100% (highest scores)	99	82	6139
92335	6071003301	62.50	96-100% (highest scores)	95	95	4841
92335	6071002501	61.42	96-100% (highest scores)	98	88	5840
92335	6071002401	58.24	96-100% (highest scores)	90	95	8946
92335	6071002502	54.71	96-100% (highest scores)	90	90	8051
92335	6071002402	53.86	96-100% (highest scores)	85	93	8434
92335	6071003000	51.25	91-95%	76	96	3120
92337	6071002601	50.91	91-95%	100	57	10799
92335	6071002803	49.28	91-95%	65	98	3982
92335	6071002901	47.92	91-95%	73	93	4446
92335	6071003200	47.44	86-90%	83	83	8005
92335	6071002804	46.29	86-90%	62	96	5417
92335	6071003102	44.57	86-90%	81	78	5466
92335	6071003101	44.42	86-90%	69	89	5040
92336	6071002301	43.67	86-90%	89	69	9721
92335	6071003405	42.67	81-85%	55	95	5109
92335	6071002902	41.88	81-85%	68	83	6584
92335	6071003401	41.51	81-85%	62	87	7502

Source: California Office of Environmental Health Hazard Assessment

Figure 19: CalEnviroScreen 2.0 Map of Fontana, Ca



Source: California Office of Environmental Health Hazard Assessment