Appendix M FIRE PROTECTION DESIGN BASIS PLAN

Glendale Fire Department
Fire Engineering Unit
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Glendale, CA 91206-4390
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"We Help People"

General Permit

Permit No.: **FGP1805630**
Site/Event: SCHOLL CANYON BIOGAS RENEWABLE GENERATIC
Site Address: 3001 SCHOLL CANYON RD
GLENDALE CA 91206

Plan Check Engineer: Jeffrey Halpert
Entered By: Jeffrey Halpert
Applied: 07/24/2016
Issued: 03/02/2018

Description: GWP PROPOSING TO REMOVE THE EXISTING LANDFILL GAS PROCESSING PLANT AND CONSTRUCT A NEW ON-SITE POWER GENERATING PLANT USING THE LANDFILL GAS. A FIRE PROTECTION DESIGN BASIS DOCUMENT WAS PREPARED, AS REQUIRED BY THE GLENDALE FIRE DEPARTMENT, TO ESTABLISH THE FIRE / LIFE SAFETY DESIGN EXPECTATIONS AND CONDITIONS BEFORE PROJECT IS LET FOR BIDDING.

People Manager

Ind./Comp.	Name	Full Address	Phone Number	City / State Lic.
Applicant	CARL HAASE	199 S. LOS ROBLES, SUITE 810 PASADENA, CA 91101	661-478-3400	
Owner	CITY OF GLENDALE	141 N GLENDALE AVE 4TH FLOOR GLENDALE, CA 91206		

Clearance Agencies

Plan Check Status	Completion Date	Reviewed By	Department
PC Approved	03/02/2018	Jeffrey Halpert	Fire Department

Fees Balance

Account #	Units	Amount	Fees Paid
	Total fees:		
	Total fees paid:		
	Total fees due:		

Conditions

- FIRE: PLANS TO BE SUBMITTED FOR REVIEW / APPROVAL. THIRD PARTY ACCEPTABLE TO GFD TO REVIEW ALL SUBMITTALS AND MAKE RECOMMENDATION FOR APPROVAL TO ENSURE COMPLIANCE WITH THE APPROVED FIRE PROTECTION DESIGN BASIS DOCUMENT.

Signature(s)

Jeffrey Halpert
Plan Check Engineer, City of Glendale CA

March 2, 2018
Date

This permit is issued and accepted on condition that all provisions of the Glendale Fire Code and any other regulations of the City of Glendale shall be complied with. Any violation of these provisions may be grounds for revocation of this permit.

JENSEN HUGHES

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FGP 1805630
3001 SCHOLL CANYON ROAD

BIOGAS RENEWABLE GENERATION PROJECT FIRE PROTECTION DESIGN BASIS

GLENDALE FIRE PREVENTION BUREAU
(818) 548-4810

MAR 02 2018

APPROVED BY
SUBJECT TO FIELD INSPECTION

Prepared For

Stantec

Contractor: Stantec, Inc.
199 So. Los Robles Ave.
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Pasadena, CA

City of Glendale Water & Power
Your Trusted Community Utility

Client: City of Glendale Water & Power
141 N. Glendale Ave.
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Revision: 4
Project #: 1DEK2D001.000
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	Name and Date
Preparer:	David Kipley 2018.02.07 15:55:22 -06'00'
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REVISION RECORD SUMMARY

Revision	Revision Summary
0	ORIGINAL ISSUE
1	Updated the document to reflect the recent facility configuration revision
2	Updated document to eliminate potable water service from fire water storage
3	Updated the document to incorporate Glendale Fire Department Comments
4	Updated the document to incorporate Glendale Fire Department Comments

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1.0 INTRODUCTION

This Design Basis Document (DBD) has been developed for the Biogas Renewable Generation project located in Glendale, CA to define the fire protection systems and features and guidance to be applied during the facility design and construction, and the existing facility demolition. JENSEN HUGHES has developed the DBD using National Fire Protection Association (NFPA) 850- 2015, *Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Converter Stations*,as a primary input, in addition to other applicable NFPA standards and the Glendale, CA adopted building code requirements.

The DBD is organized as follows:

- Scope and Purpose
- Project Goals
- Methodology
- Assumptions and Limitations
- Analysis
- Conclusions & Recommendations
- References
- Appendix A - Code Applicability Matrix
- Appendix B - Fire Risk Assessment
- Appendix C – Biogas Renewable Generation Project Conceptual Fire Protection Plan
- Appendix D – Biogas Renewable Generation Project Overall Site Plan
- Appendix E - Biogas Renewable Generation Project Water Storage Tanks Refill System Diagram

1.1 Scope & Purpose

The DBD defines the fire protection systems and features to be provided for the Biogas Renewable Generation Plant buildings/facilities. The plant areas include those systems/buildings installed within the Owners Controlled Area (OCA) as follows:

- Four simple cycle reciprocating engine units with associated generators and lube oil skids within individual unit enclosures;
- Existing Fuel Gas Flare Stack Yard Area;
- Fuel Gas Conditioning Yard Area
- Existing Switchgear Yard Area
- Office Building
- Power Distribution Center Skid
- Plant Fire Water Supply System

The DBD provides the recommended active and passive fire protection systems and features, building construction limitations, and Life Safety requirements. Alternatives to prescriptive code requirements are provided as part of the design basis and documented via the methodology cited in NFPA 850-2015, Section 4.4 and NFPA 551-2016, *Evaluation of Fire Risk Assessments* as applicable, in lieu of performance based methodology cited in the California Building Standards.

1.2 Project Goals

The goal of this project is to minimize the potential of a fire occurring at the Biogas Renewable Generation plant during demolition, construction and operation. Should a fire occur, the mitigating strategies include:

- Meet Life Safety egress requirements for plant personnel;
- Provide fire protection systems and features and processes to minimize the effects of fire exposures on critical plant structures, systems, components (SSC);
- Ensure the existing landfill gas (LFG) flare stack system remains operable during the demolition of the existing gas cleanup facility and construction of the new simple cycle unit facility.
- Ensure the existing L.A. County Sanitation District buildings remain operable and accessible during the demolition of existing gas cleanup facility and construction of the new power plant equipment.
- Ensure the required fire department access roads for the Biogas Renewable Generation plant are maintained and unobstructed during the demolition and construction phases.

2.0 METHODOLOGY AND CRITERIA

The design basis philosophy for the Biogas Renewable Generation Project fire protection systems and features and program development is detailed in Section 2.1. In order to meet this design basis, the following methodology was used:

- The applicable criteria for the fire protections systems and features, the fire protection program, and buildings were collected from NFPA code requirements, industry standards, and California Building Standards criteria. These are listed in Sections 2.2 through 2.7.
- Based on these criteria, Section 4.0 of the DBD provides the design guidance requirements.
- Section 5.0 provides the conclusions and recommendations of the assessment.

2.1 Design Basis Statement and Approach

The guidance provided in this DBD defines the minimum fire protection systems and features and programmatic requirements for minimizing the effects of a fire originating within the plant buildings/equipment on plant personnel, the public and critical plant systems. The approach for mitigating the effects of a fire within the plant include providing passive fire protection features, active fire suppression/detection systems, and the implementation of fire protection programmatic processes. An adequate balance of each of the following items should reduce the potential for affecting plant personnel, plant critical equipment, and the public.

- Ensure the required fire protection program processes are provided to prevent fires from occurring, and when required include processes to respond to an emergency.
- Provide fire suppression and detection systems where required, to rapidly detect and control/extinguish those fires that do occur and limit the damage to critical plant equipment/structures and plant personnel.
- Provide fire protection features required to protect plant personnel, critical plant equipment and the public from fires that cannot be promptly extinguished.

This approach is carried throughout this document.

2.2 Codes and Standards of Record (NFPA & Adopted 2016 California Bldg. STDs)

The general site fire water system, fire protection systems, along with the site buildings/structures should be designed, procured, and constructed in accordance with, but not limited to, the codes and standards cited below. It should be noted that the current adopted edition of the building code for Glendale is 2016 edition of the CBC, however the City of Glendale will be adopting the 2016 edition of the CBC in January, 2017. Therefore the 2016 edition of the California Building Standards has been applied for this design and the assumption that changes applied in Resolution 5892 for the 2016 edition of the CBC, will also apply for the 2016 edition of the CBC. All applicable additions of codes and standards referred to by the 2016 building code are cited below.

A. National Fire Protection Association (NFPA)10-2013, Standard for Portable Fire Extin5uishers

B. NFPA 12-2015, Standard on Carbon Dioxide Extinguishment Systems

C. NFPA 13-2016, Standard for Installation of Sprinkler Systems

D. NFPA 14-2016, Standard for Installation of Standpipe and Hose Systems

E. NFPA 22-2013, Standard for Water Tanks for Private Fire Protection

F. NFPA 24–2016, Standard for the installation of Private Fire Service Mains and their Appurtenances

G. NFPA 30-2015, Flammable and Combustible Liquids Code

H. NFPA 37-2015, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

I. NFPA 51B-2014, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work

J. NFPA 70-2014, National Electrical Code

K. NFPA 72-2016, National Fire Alarm Signaling Systems

L. NFPA 80-2016, Standard for Fire Doors and Other Opening Protectives

M. NFPA 90A-2015, Standard for the Installation of Air-Conditioning and Ventilating Equipment

N. NFPA 551-2016, Guide for the Evaluation of Fire Risk Assessments

O. NFPA 600- 2015, Standard on Facility Fire Brigades

P. NFPA 780-2014, Standard for the Installation of Lightning Protection Systems

Q. NFPA 850-2015, Recommended Practices for Fire Protection for Electric Generating Plants and HVDC Stations.

R. NFPA 2001-2015, Standard on Clean Agent Fire Extinguishment Systems

S. Glendale Resolution 5892 Adopting California 2016 Building Standards (CBC).

   1) 2016 California Green Building Standards Code
   2) 2016 California Building Code (CBC)
   3) 2016 California Mechanical Code (CMC
   4) 2016 California Electrical Code (CEC
   5) 2016 California Plumbing Code (CPC)
   6) 2016 California Energy Code
   7) 2016 California Fire Code (CFC)

T. Institute of Electrical and Electronics Engineers (IEEE), ANSI C2-2012, National Electric Safety Code

U. Institute of Electrical and Electronics Engineers, Standard 979-2012, Guide for Substation Fire Protection

V. Underwriters Laboratory (UL) Fire Protection Equipment and Fire Resistance Directories, Latest Edition

W. Factory Mutual Research (FM) Approval Guide, Latest Edition

X. Glendale Water & Power Drawing SCPP-00-M-601, Dated 01-11-2018, Biogas Renewable Generation Conceptual Fire Protection Plan

Y. Institute of Electrical and Electronics Engineers, Standard 980-2013, Guide for Containment and Control of Spills in Substations

2.3 Fire Protection Systems (NFPA & Adopted 2016 CBC)

The codes and standards applicable to the design, procurement and installation of fire protection equipment and systems includes but is not limited to:

A. The applicable portions of the NFPA standards cited in Section 2.2.A through 2.2.H, 2.2.J thru 2.2.M, 2.2.P & 2.2.R.

B. The applicable portions of the Glendale, CA Adopted California 2016 Building Standards cited in Sections 2.2.S.2 thru 2.2.S.5 & S.7.

C. The applicable portions of the IEEE Standards cited in Sections 2.2.T & 2.2.U.

D. The applicable portions of the listing/approval guidance documents cited in Sections 2.2.V & 2.2.W.

2.4 Building Exterior Exposure Evaluation (NFPA & Adopted 2016 CBC)

The codes and standards applicable to the design, procurement and installation of fire barriers/walls/protective opening components, assemblies and systems includes but is not limited to:

A. The applicable portions of NFPA standards cited in Sections 2.2.I, 2.2.N & 2.2.Q.

B. The applicable portions of the Glendale, CA Adopted California 2016 Building Standards cited in Sections 2.2.S.2 & 2.2.S.7.

C. The applicable portions of the IEEE Standards cited in Section 2.2.U.

D. The applicable portions of the listing/approval guidance documents cited in Sections 2.2.V & 2.2.W.

2.5 Fire Protection Program and Emergency Response (NFPA & Adopted 2016 CFC)

The codes and standards applicable to the development and implementation of fire protection program and emergency response process includes but is not limited to:

A. The applicable portions of NFPA standards cited in Sections 2.2.I, 2.2.N 2.2.O & 2.2.Q.

B. The applicable portions of the Glendale, CA Adopted California 2016 Building Standards cited in Section 2.2.S.7.

C. The applicable portions of the IEEE Standards cited in Section 2.2.U.

2.6 Life Safety Evaluation (Adopted 2016 CBC)

The codes and standards applicable to the design and installation of building/structure life safety egress facilities and limitations includes but is not limited to:

A. The applicable portions of NFPA standards cited in Section 2.2.Q, however the requirements for the means of egress should apply the CBC and CFC standards requirements.

B. The applicable portions of the Glendale, CA Adopted California 2016 Building Standards cited in Section 2.2.S.2 & 2.2.S.7.

C. The applicable portions of the IEEE Standards cited in Section 2.2.U.

2.7 Demolition and Construction Fire Protection Feature Impacts (NFPA & Adopted 2016 CFC)

The codes and standards applicable to the design and support of building/structures and site required systems during the demolition of existing buildings/structures and construction of new buildings/structures includes but is not limited to:

A. The applicable portions of NFPA standards cited in Sections 2.2.F thru 2.2.H, 2.2.J, 2.2.O & 2.2.Q.

B. The applicable portions of the Glendale, CA Adopted California 2016 Building Standards cited in Section 2.2.S.2 & 2.2.S.7.

C. The applicable portions of the IEEE Standards cited in Section 2.2.T & 2.2.U.

3.0 ASSUMPTIONS

The following assumptions were used in developing the design basis:

A. The insurance broker is aware of the project and has been consulted regarding the DBD as indicated in the email message between C. Haase (Stantec) and A. Tyler (Tyler Ins.), dated 1/24/2017.

B. Loss of power generation due to a fire event at the Biogas Renewable Generation plant is not a significant concern to the City of Glendale Water & Power and the Fire Department. Fire risks are however, to be mitigated and protection of operating personnel should be provided from fire and explosion exposures (Ref. 6.0.A).

C. The design of the power plant facility is in the early stages of development with building and equipment locations to be verified. Although the generating equipment, etc., has been procured at the time of this document development, the building sizes and equipment locations are based information reflected on the Glendale Water & Power, Biogas Renewable Generation Project Conceptual Fire Protection drawing (Ref. 6.0.DD) provided in Appendix C.

D. Component cooling water should not be required for any of the reciprocating engine components since the engines use closed loop air cooled water heat exchanger systems (Ref. 6.0.B).

E. The Power Island and Major Equipment (PIME) (reciprocating engines with generators, emissions control systems, and continuous emissions monitoring systems) has been procured as one PIME contract. The reciprocating engine units will be furnished with equipment specific fire suppression/detection systems only (Ref. 6.0.CC). The suppression/detection systems should be monitored for fire alarm and trouble conditions by the plant fire alarm system. The balance of plant (BOP) equipment (e.g. power distribution center and switchgear, fuel gas compressor equipment, etc.) will be purchased by the engineering, procurement and construction (EPC) contractor. The BOP fire protection systems will be supplied by the EPC contractor

F. The California Building & Fire Code requirements will take precedence over the recommendations of NFPA 850 unless the recommended practice document provides specific hazard protection recommendations that are warranted and do not reduce the minimum requirements cited in the CBC/CFC.

G. If the implementation of passive barriers or spatial separation recommendations cannot be provided (e.g., engine units), then fire suppression system alternatives should be provided as recommended by CBC/CFC and NFPA 850-2015. If these systems are provided, the fire water supply system should be upsized to meet the requirements cited in section 4.2.1 of this document accordingly.

H. The existing 20,000 gallon storage tank currently in use will be remain in service for the domestic water service and will not interface with the new fire water system. The adjacent empty 20,000 gallon storage tank will remain but will not be used. Therefore, the domestic water system will not be addressed in this document. A new 60,000 gallon water storage tank dedicated solely for fire protection purposes will be provided and installed at an elevation of approximately 1485 ft. elevation with the plant grade elevation at approximately 1425.ft.

I. The Aqueous Ammonia tank is not located within a building.

J. JENSEN HUGHES will support Glendale Water & Power Department with the review of the facility fire protection features design for meeting this project's design basis recommendations where requested.

4.0 ANALYSIS RESULTS

This section defines the applicable fire protection system/feature/program requirements and defines how the project goals cited in Section 1.2 are being met and the design approach in Section 2.1 is being implemented.

4.1 Facility Occupancy Types

In order to ensure the new facilities and systems meet the Glendale Building Department's requirements as adopted in Resolution 5892, the occupancy classification of the individual buildings and structures needs to be defined. The following defines the occupancy classification for the new buildings, and structures associated with the Biogas Renewable Generation plant.

Building/Structure	Occupancy Classification
Individual Engine Enclosure and Cooler Units	Factory, Group F-1
Office Building	Business, Group B
LFG Compressor/Conditioning Yard Area	Miscellaneous, Group U for the yard area
Power Distribution Center (PDC) Skid	Factory, Group F-1
Aqueous Ammonia Tank Skid	Miscellaneous, Group U for the yard area
Flare Stack System and Existing Switchgear Yard Area	Miscellaneous, Group U for the yard area, (Not being modified)
LA County Sanitation District Office Bldgs.	Business, Group B (Not being modified)

4.2 Fire Protection Systems

4.2.1 Plant Fire Water Supply System

A. Fire & General Plant Water Source

1) Existing Water Storage System

An existing 20,000 gallon service water storage tank located at the top of the hill near the plant site at the approximate elevation 1440ft, currently supplies fire water and general service water to Sanitation District of Los Angeles County yard lawn sprinklers and a single bathroom service for the plant. An abandoned water tank is also located next to the functional 20,000 gallon tank however, the abandoned tank is in disrepair and is no longer functional due to leaking issues and is currently isolated from service. The existing general service water volume usage for this facility is estimated to be approximately 20 cubic feet of water per day (Ref. 6.0.B). This usage is equivalent to 150 gallons per day for non-fire water service and should be included in determining the future water supply needs. The only current fire suppression system demand consists of the two yard hydrants that would be used by the fire department and is not currently not considered in the plant water supply capacity requirements. The Sanitation District of Los Angeles County facility will remain on site however the potable water service for the site will continue to be furnished from the existing 20,000 gallon storage tank system. Therefore this demand will not be included in the site fire water volume requirements.

The existing service water storage tank receives automatic refill makeup water from a Glendale transfer pump station located at elevation 1275ft on the landfill site. The pump is rated at 200 gpm, 40 HP and supplies the makeup water from the pump to the tank via an 8 inch carbon steel pipe line (Ref. 6.0.B).

2) Fire Water Storage Recommendation

The new water storage system for meeting the demands cited in Section 4.2.2.A below, will require the following:

- Isolation of the two existing 20,000 gallon service water storage tanks for supporting service water demands only and the installation of a new Factory Mutual (FM) Approved water storage tank with a minimum capacity of 60, 000 gallons that will be dedicated to fire water service.

The existing usable 20,000 gallon service water storage tank will remain for supporting the existing the Sanitation District of Los Angeles County facility potable water service and any new potable water service required for the new Biogas Renewable Generation office facility. The existing service water storage tank will not be connected to the new fire water system.

The new fire water storage tank should have a minimum capacity of 60, 000 gallons to support the largest fire flow volume demand for a minimum of 120 minutes as discussed by CFC, Appendix B103.3 (Ref. 6.0.X.7) and NFPA 1142-2012, Chapter 4 (Ref.6.0.FF). The 2 hour duration is being applied IAW NFPA 850-2015 Section 6.2.1 (Ref. 6.0.V) and CFC Appendix B, Table B105.1 (2) for Type IIA construction under 12, 700 ft^2 area. The volume of 500 gym fire flow volume is based on NFPA 1142-2012, calculation for worst case building requirement (PDC skid) with three exposures within 50 ft. Given that the Office building on site is being provided with sprinkler protection, the building suppression/hose system demands are bounded by the 500 GPM fire flow volume required by NFPA 1142. With the code required minimum flow of 500 gpm (Ref. 6.0.FF) for a duration of 120 minutes (Ref. 6.0.X.7), the minimum tank capacity of 60,000 gallons would be needed for the fire flow water demands. Therefore, a new Factory Mutual Approved fire water tank should be provided that has a minimum water storage capacity of 60, 000 gallons. The discharge piping from the tank to the new fire hydrants should be a minimum pipe size of 8" ductile iron, cement lined, and encased pipe per NFPA 24-2016 (Ref. 6.0.I).

Reusing the existing 200 gpm refill supply system should provide the capacity to refill the new fire water storage tank within the maximum 8 hours while also simultaneously filling the existing service water tank, thus meeting the refill requirement from NFPA 850-2015, Section 6.2.6.2 (Ref. 6.0.V). The existing 8" fill line would need to be routed to the new fire water storage tank from the feed pipe for the existing service water tank. The new fire water storage tank would be designed, installed and monitored for meeting the requirements of NFPA 22-2013 (Ref.6.0.H). See the fire water tank flow diagram in Appendix E to this document.

B. Plant Fire Main System

1) Existing System Conditions

The existing fire main system primarily consists of an 8 inch OD HDPE pipe routed from the existing service water storage tank and is connected two single 2½" outlet hydrants that are installed at the site, one near the base of the hill of the service water storage tank and the other adjacent to the road near the entrance to the LFG facility (Ref. 6.0.B). The service water main piping also supplies general service water to the existing Sanitation District of Los Angeles County office buildings on site. The existing Sanitation District of Los Angeles County building service water supply will be retained as this

system is the responsibility of the county. The existing system will not interface with the new site facility fire water system discussed below.

2) New Fire Main System Configuration

A new 8 inch ductile iron, cement lined and encased fire main piping system will be routed from the new fire water storage tank discharge nozzle to the new fire main piping designed and installed at the new plant site for replacing the existing plant fire main piping system. New fire hydrants should be provided with a minimum of one 2 ½" gate valve outlet and two 4" pumper nozzle outlets each, provided with a maximum spacing of 300 ft. between hydrants. The piping should also have sectionalizing valves provided to minimize the loss of no more than one half of the yard hydrants should the piping system be damaged as required by NFPA 850-2015 and NFPA 24 (Ref.6.0.V & I).The sectional valves should be indicating type while each hydrant can be provided with an individual non-indicating type isolation valve.

4.2.2 Fire Suppression Systems

A. Building Fire Suppression Systems

The Glendale, CA. adopted version of the CBC (Ref. 6.0.X) with Section 903.2.20.1 generally indicating that all new occupancies should be provided with sprinkler protection with some exceptions. The exceptions that would not require sprinkler protection include Group B; F1 & F2; M, S1 & S2 (without motor vehicle storage or parking) and are less than 1000 ft² in total area. The selection of the occupancy type is discussed in Section 4.3.4.A below. The estimated fire suppression system types and demands are listed Table 4.2.2.A below and the basis is discussed in detail in this document.

TABLE 4.2.2.A – Estimated Suppression System Demands

Protected Area/Building	Recommended Demand (1)	Section Reference
Reciprocating Engine & CEMS Equipment Enclosures	Each engine enclosure (with CEMS) will be protected with a clean agent system designed per NFPA 2001 in lieu of a sprinkler system.	4.2.2.B
Power Distribution Center (PDC)	This building will be protected with a clean agent system designed per NFPA 2001 in lieu of a building sprinkler system.	4.2.2.A.3)
Office Building	0.15 gpm/ft2 over 1500 ft2 (in this case entire bldg. of 800 ft2) plus 250 gpm hose or approx. 410 gpm	4.2.2.A.1)

Notes: (1) Demands assume a 10% added volume for excess sprinkler discharge.

1) Office Building

The new Office Building is a Group B occupancy with a combined area of approximately 800 ft² building (See Section 4.2.4.A) and based on Section 903.2.20.1, Exception 1 automatic sprinkler protection is not required for this building. Although sprinkler system protection is not required, the Glendale Fire Department has requested that an

automatic sprinkler system be provided due to the plant being remote for fire department response and includes added risks for the responding fire fighters. Therefore, the Office Building shall be provided with a wet pipe type sprinkler system that delivers a design density of 0.15 over the entire building for meeting an Ordinary Group 1 Hazard Occupancy type per NFPA 13-2016 (Ref. 6.0.E).

Although the plant is not critical to power operations (Ref. 6.0.A), it is recommended that a building fire alarm system also be provided as discussed in Section 4.2.3.A of this document.

2) Power Distribution Center (PDC) Skid

A new PDC Skid will be provided for powering the respective reciprocating engine power plant equipment, fuel gas conditioning and the fuel gas compressors. The building would be a single story Group F-1 occupancy with the buildings having an area of approximately 400 ft^2. The PDC building will house electrical switchgear power panels for powering the unit's electrical systems, motor control centers, plant and engine control system panels, generator breakers, and misc. relay panels for the associated equipment. This equipment will control/distribute power with voltages greater than 480VAC which raise a concern of safety to operating and emergency responders to a fire within this building should sprinkler protection be provided. NFPA 13-2016 Section 22.31.2 recommends that direction spray, and/or spray impingement shielding be provided to prevent direct spray impingement on the energized equipment, which in this case would be the majority of the floor area of the building. Given the presence of electrical switchgear within this building, Glendale adopted CBC section 903.2.20, Exception 1 indicates that a sprinkler system could be substituted for a building with a building wide fire alarm system that reports alarm signals to the plant site wide fire alarm system. This detection scheme is also supported by recommendations of NFPA 850-2015, Section 8.6 as well as the provision of an automatic suppression system (e.g., clean agent, CO2 system, etc.). A clean agent suppression system designed and installed to meet NFPA 2001-2015 (Ref. 6.0.W) however, shall provide suppression protection for the equipment in this building as it is critical to the operation of the plant and the loss would cause an extended outage for returning the plant to operation as discussed by NFPA 850-2015, Section 4.3.2.

4) Yard Area Equipment

The yard area equipment should not require any automatic fire suppression/detection systems as these areas do not contain buildings or large volumes of oil. Also it is not expected that fuel gas conditioning system will generate large quantities flammable material during the conditioning process. Any unused gases will be piped to the flare stack for burning. Additional features for mitigating a fuels gas fire at the compressor units should include an approved automatic fire safe valve (via local fusible link) with remote closure actuator that can be operated remotely from the control room. The valves should be provided on the fuel supply side to each compressor as a minimum. The control and power circuits for each valve actuator should be hardened from fire exposure via the installation of 2 hour fire rated cabling in conduit or protected by embedding the control circuit conduit in concrete. If the valve actuator is pneumatically operated, the valve solenoid and associated control circuits should be remotely located from the valve location and the valve actuator should be provided as a failsafe type actuator that closes either upon loss of air or upon the fusible link operating. Manual fire protection from nearby manual suppression equipment will also be provided as discussed in Section 4.2.2.C below.

B. Equipment Specific Fire Suppression Systems

Active clean agent fire suppression and detection systems will be provided for the individual engines, generators, the Continuous Emissions Monitoring System (CEMS) equipment and lube oil pumps that will be located within a common engine enclosure. Each of the four engine enclosures will be provided with an automatic clean agent extinguishment system designed in accordance with NFPA 2001-2015. The fire panels for each engine extinguishment system should report alarms signals to the plant fire alarm system as recommended in Section 4.2.3.A of this document. Additionally, the PDC skid buildings will also be provided with clean agent suppression systems as discussed in Section 4.2.2.A.3) above.

The Engine Cooler Fans are of noncombustible construction outside in the yard and do not contain combustible fluids, so will not require sprinkler protection be installed as recommended by NFPA 850 -2015, Section 7.9.5 (Ref. 6.0.V). The potential for ethylene glycol & water solution spill and containment is addressed in Section 4.2.4.D of this document.

C. Manual Fire Fighting Systems

The Glendale, CA. adopted version of the CBC (Ref. 6.0.X) in Section 905 & 906 generally indicates that all new buildings should be provided with a manual means of protection depending on the limitations cited in the CBC/CFC sections. The occupancy type would determine whether manual hose and extinguishers are needed. The Building/Yard area manual suppression system requirements include the following:

1) Portable Fire Extinguishers

   Portable fire extinguishers should be required to be provided within each building/area as follows:

   - Engine Enclosures - 20lbs dry chemical fire extinguishers rated for Class 20A:80B: C type fires should be sized and located throughout each turbine enclosure for Extra Hazard type fires in accordance with CBC/CFC Section 906. Additionally, 20lbs CO2 extinguishers should be located near the generator end of each turbine unit. These extinguishers should be rated to 10B:C. NFPA 850-2015, Section 6.5 invokes NFPA 10 (Ref. 6.0.C) requirements and should be followed with the exception of sizing and placement of the units within the enclosure as CBC/CFC Section 906 should be followed for this criteria.
   - Office Building - 5lbs dry chemical fire extinguishers rated for Class 2A:10B: C type fires should be sized and located throughout the office area for the building for Light Hazard type fires in accordance with CBC/CFC Section 906. NFPA 850-2015, Section 6.5 invokes NFPA 10 (Ref.6.0.C) requirements and should be followed with the exception of sizing and placement of the units within the building as CBC/CFC Section 906 should be followed for this criteria.
   - Power Distribution Center Skid - 10lbs dry chemical fire extinguishers rated for Class 4A:80B: C type fires should be sized and located throughout each building for Ordinary Hazard type fires in accordance with CBC/CFC Section 906. NFPA 850-2015, Section 6.5 invokes NFPA 10 (Ref.6.0.C) and should be followed with the exception of sizing and placement of the units within the building as CBC/CFC Section 906 should be followed for this criteria. 15lbs clean agent type

extinguishers rated as 2A:10B: C in lieu of dry chemical agent for ABC type extinguishers which may impact sensitive electrical equipment as recommended by NFPA 10-2013, Section 5.5.6.

- Yard Area - Although yard areas (e.g., Electrical switchgear area, LFG compressor/conditioning area) are not specifically addressed in the CBC/CFC or NFPA 850, 20lbs dry chemical fire extinguishers rated for 20A:80B:C, Extra Hazard type fires in accordance with CBC/CFC Section 906 should be provided. NFPA 850-2015, Section 6.5 invokes NFPA 10 (Ref.6.0.C) and IEEE NESC Section 11 (Ref. 6.0.Y) should be followed where guidance by CBC/CFC is not provided.

The portable fire extinguishers shall be located within recessed or semi-recessed cabinets in accordance with Glendale Ordinance 5892, Section IA-38. Surface mounted extinguisher cabinets can be provided where building structure materials are not practical for recessed installations.

2) Hose Stations

Standpipe hose stations should be provided within each building or yard area where required as follows:

- Engine Enclosures – Class III type hose stations for this occupancy would only be required if there is a floor elevation that exceeds 30 ft. above or below the lowest level of access to the enclosure as discussed in CBC/CFC Section 905.3.1 (Ref. 6.0.X.1 & X.7). Given this is an equipment enclosure that is only one story that does not have any additional floor elevations, a standpipe hose system would not be required. CBC/CFC Section 905.2 invokes NFPA 14-2013 (Ref. 6.0.Q) for spacing and location, etc. and would not provide added provision requirements. Therefore the conclusion to not provide a standpipe system is supported by NFPA 850-2015, Section 6.4.2.1 based on the results of this DBD.
- Office Building – Class III type hose stations for this building occupancy would only be required if there is a floor elevation that exceeds 30 ft. above or below the lowest level of access to the building as discussed in CBC/CFC Section 905.3.1 (Ref. 6.0.X.1 & X.7). Given that the building should be one story and should not have and additional floor elevations, a standpipe hose system is not required. This conclusion is supported by NFPA 850-2015, Section 6.4.2.1 based on the results of this DBD.
- Power Distribution Center Skid – Class III type hose stations for this building occupancy would only be required if there is a floor elevation that exceeds 30 ft. above or below the lowest level of the fire department equipment access to the building as discussed in CBC/CFC Section 905.3.1 (Ref. 6.0.X.1 & X.7). Given the building criteria is only one story that does not have any additional floor elevations, a standpipe hose system would not be required. CBC/CFC Section 905.2 invokes NFPA 14-2016 (Ref. 6.0.H) for spacing and location, etc. and would not require the added feature.
- Yard Area – Neither the CBC nor the CFC provide guidance associated yard fire mains, hydrants, hose stations and fire extinguishers. NFPA 850-2015, Section 6.4.1.1 invokes NFPA 24 -2013 (Ref. 6.0.I) which addresses the provision of hose systems for hydrants. NFPA 24-2013, Section 8.1.1 indicates that hose should be provided if plant personnel or a fire brigade are trained to applying this equipment during a fire. Based on input from the project team (Ref. 6.0.CC), plant personnel will not be trained to perform structural or incipient firefighting

services. Therefore it is not recommended that the hose station equipment be provided at the hydrant locations.

4.2.3 Plant Fire Alarm System

A. Building Fire Alarm Systems

In reviewing CBC/CFC Section 907.2, the Office building, and the PDC Skid should not require a local fire alarm/detection system to be installed since these occupancy types do not exceed the limitations that would require detection to be added for the specific occupancy. However, due to this plant possibly being limited in staff and unattended during periods when the units are not required to operate, the Office building, PDC Skid, and the Engine Enclosure suppression systems should have the installed fire alarm systems report to a plant fire alarm system for annunciating alarm signals in the Office Building and to an offsite to a Underwriters Laboratory (UL) listed central station, in addition to transmitting signals to the Grayson Plant Control Room as directed by GWP.. The provision of the plant fire alarm system is being recommended to provide alarm signaling that would alert plant personnel and reduce the response time for the Glendale Fire Department as recommended by NFPA 850-2015, Sections 6.7.1 and 8.4. To facilitate this recommendation, local fire alarm panels for each building or enclosure would be provided for notification of plant personnel as well as releasing or monitoring a local suppression system (e.g., Engine Enclosures, etc.). The fire panels should also supervise the suppression system releasing panels (if a separate panel is provided in lieu of the building panel) as required by CBC/CFC Section 904.3.5. As requested by the Glendale Fire Department, smoke detection shall be provided with "Alarm Verification" features where allowed by NFPA 72- 2016, Section 23.8.5.4.1. Additionally, each building or equipment enclosure that contains a fire alarm panel shall be provided with a visual notification appliance device located outside the building/enclosure and located as to ensure the emergency response equipment can readily identify the building or enclosure from where the fire alarm condition is originating. Each building shall also be provided with a sign near the exterior visual notification device that identifies the building/structure easily by the GFD responding apparatus.

The new fire alarm system should be designed and installed in accordance with NFPA 72-2016 (Ref. 6.0.N) per CBC 907.2.(Ref 6.0.X. 2). The following systems should be provided for each building/area.

- Engine Enclosures – Although detection is not required for this occupancy, a local fire panel will be provided as part of the equipment supply for monitoring and actuating the clean agent system being provide with each enclosure. The suppression system fire alarm panel should transmit signals to a plant fire alarm annunciation system to be located in the Office Building. The local enclosure fire alarm panel should perform the following.
  1) Manual fire alarm service should be provided as required by CBC/CFC 907.4.2 (Ref. 6.0.X.2 & X.7).
  2) Occupant Notification should be provided as required by CBC/CFC 907.5 (Ref. 6.0.X.2 & X.7).
  3) Suppression system monitoring should be provided as required by CBC/CFC 903.4 (Ref. 6.0.X.2 & X.7).
  4) Monitor area wide detection devices to automatically alert personnel to a fire within the enclosure. The system should be provided as required by CBC/CFC 907.4 (Ref. 6.0.X.2 & X.7).

- Office Building – The fire alarm system for the building should be monitored for alarm and trouble conditions per CBC/CFC Section 904.3.5. This fire alarm panel could also act as the plant fire alarm system to annunciate alarm signals in the Office Building from other area local fire alarm panels and perform the function of the head end for the plant fire alarm system as discussed in Section 4.2.3.B below. The local building fire alarm panel functions should perform the following.
  1) Manual fire alarm service should be provided as required by CBC/CFC 907.4.2 (Ref. 6.0.X.2 & X.7).
  2) Occupant Notification should be provided as required by CBC/CFC 907.5 (Ref. 6.0.X.2 & X.7).
  3) Suppression system monitoring should be provided as required by CBC/CFC 903.4 (Ref. 6.0.X.2 & X.7).

  Also, the Office building will monitor the fire water system for the following.
  1) The fire water storage tank status required by NFPA 22-2013 (Ref. 6.0.H) should be monitored per CBC/CFC 903.4 (Ref. 6.0.X.2 & X.7).
- Power Distribution Center Skid - This skid will be provided with a local fire panel that would transmit alarms to the plant fire alarm system to be located in the control room. Spot type smoke detection system should be provided throughout each building. This protection scheme is also supported by recommendations of NFPA 850-2015, Section 8.6. A clean agent extinguishment system will be provided to mitigate the risk plant outage durations as discussed in Section 4.2.2.A.3, the extinguishment system releasing panel should be monitored by the building fire alarm panel to report alarm signals to the plant fire alarm system in the Office Building. The PDC Skid fire alarm panels should perform the following:
  1) Manual fire alarm service should be provided as required by CBC/CFC 907.4.2 (Ref. 6.0.X.2 & X.7).
  2) Occupant Notification should be provided as required by CBC/CFC 907.5 (Ref. 6.0.X.2 & X.7).
  3) Detection/suppression system monitoring should be provided as required by CBC/CFC 903.4 (Ref. 6.0.X.2 & X.7).
  4) Suppression system monitoring should be provided as required by CBC/CFC 903.4 (Ref. 6.0.X.2 & X.7).

B. Plant Fire Alarm System Network

CBC/CFC Section 907.2, indicates that certain key functions should occur for fire alarm systems required by this section. A common plant fire alarm annunciator should be provided in the Office Building to alert the plant operators to a fire event at the plant. The annunciator should be networked together with all of the local building fire alarm panels on a communication network that should allow for the annunciator to receive the all of the alarm, trouble and supervisory signals in the Office Building. The new plant fire alarm system should be designed and installed to meet NFPA 72-2016 (Ref. 6.0.N) and CBC/CFC Section 907 (Ref. 6.0.X.2 & X.7). Additionally, NFPA 850-2015, Section 6.7 recommends the following systems be provided for reporting signals to the Office Building, notifying plant personnel and alerting the Glendale Fire Department.

- A plant wide public address system should be provided for manually alerting plant personnel of an emergency. The system should include priority distinctive signally to alert the personnel of fire event as well as other emergency events.

- Two way communication between the Office Building and emergency response personnel during emergency operations.
- A means to automatically transmit a fire alarm signal to an Underwriters Laboratory (UL) listed central station, in addition to transmitting signals to the Grayson Plant Control Room as directed by GWP.

4.2.4 Passive Fire Protection Features

A. General Building Construction Based on Occupancy

The new buildings to be constructed as part of the Biogas Renewable Generation project include the Office Building, Power Distribution Center Skid. The construction requirements for each building is partially dependent on the building occupancy. In addition to the building construction requirements cited in this section, these buildings whether built onsite or prefabricated shall also meet or exceed the applicable requirements of CBC, Chapter 7A. Other issues such as building external exposures will be address as part of Section 4.3 below. The building construction for these buildings should include:

1) Office Building

This building is estimated to be a one story structure that is approximately 20ft wide by 40 ft. long, and less than 30 ft. high with a total estimated area of 800 ft^2. The building should be classified as a Group B occupancy due to this building housing the plant main control room and limited plant operating personnel offices. The building construction type assigned should be Type IIA as discussed in CBC section 602 for this building. Additionally, CBC Table 601 defines if the structure of the building should be fire rated or not. In the case of Type IIA construction, a minimum fire rating of one hour for all load bearing structural components, walls and roof systems is required for this building structure as long as CBC Table 602 Exterior Wall Separation Fire Ratings separation criteria are being met. Based on the Biogas Renewable Generation Conceptual Fire Protection Plan drawing SCPP-00-M-601 (Ref.6.0.DD), the required separation criteria between other buildings on the plant site should meet or exceed the minimum separation distance of 10 ft. Therefore the minimum one hour fire rating for all load bearing structural components, walls and roof systems will be required for this building. Additionally, this building should not house any incidental uses or other occupancies beyond Group B.

2) Power Distribution Center (PDC) Skid

This building skid is estimated to be a one story structure with an area of approximately 20 ft. wide by 40 ft. long, and less than 30 ft. high, with a total estimated area of 800 ft^2 which is acceptable with CBC Tables 504.3, 504.4 and 506.2 (Ref. 6.0.X.2). The building should be classified as a Group F-1 occupancy due to this building housing electrical switchgear equipment needed for operating the PDC plant systems. The building construction type assigned should be Type IIB as discussed in CBC section 602 for this building. Additionally, CBC Table 601 defines if the structure of the building/skid should be fire rated or not. In the case of Type IIB construction, a fire rating is not required for the building structure as long as CBC Table 602 Exterior Wall Separation Fire Ratings, Section 508.4 required Occupancy Separation criteria and Section 509 Incidental Use separation criteria are being met. Based on the Biogas Renewable Generation Conceptual Fire Protection Plan drawing SCPP-00-M-601 (Ref.6.0.DD), the required separation criteria between other buildings on the plant site should meet or exceed the minimum separation

distance of 10ft. Therefore fire rated barriers or walls should not be required for this building.

3) Yard Area Equipment Separation

Several large plant components which are needed for power generation, such as the Reciprocating Engine/Generator Enclosures, fuel gas compressor/conditioning equipment area, engine cooler fans, and the existing Flare Stack area for the plant, are located throughout the yard area and should generally maintain the minimum spatial separation from the plant buildings by 30ft indicated by CBC Table 602(Ref. 6.0.X.2). This equipment and any associated enclosures will constructed of non-combustible materials. The Biogas Renewable Generation Conceptual Fire Protection Plan drawing SCPP-00-M-601 (Ref. 6.0.DD) should provide spatial separation distances between the system components (e.g., engine enclosures, the conditioning /compressor area and the flare stack area) and the plant buildings to meet or exceed the minimum separation criteria.

B. Building Fire Area/Egress Separation

In general all of the new buildings to be constructed at the Biogas Renewable Generation plant shall meet the Means of Egress requirements of the CBC/CFC Chapter 10. (Ref. 6.0.X.2 & X.7). Based on the discussion in Section 4.2.4.A above, the occupant loading and the physical size of these buildings, they should not require more than two exits per building as outlined in CBC Table 1016.2 and Table 1021.1. Travel distances however may be affected based on equipment obstructions, etc. and would need to be addressed during the design of the buildings. As for Fire Area separation requirements, all of the other buildings should not require room/area separation. Emergency lighting and exit signage shall also be provided for egress path illumination per CBC Section 1006, 1011 respectively (Ref. 6.0.X.2) and where critical plant actions may be required as recommended by NFPA 850-2015, Section 5.6 (Ref. 6.0.V).

C. Building/Equipment Drainage and Containment

Buildings/enclosures that should require added containment and drainage systems include the Engine enclosures. Based on input from the Engine Enclosure vendor, the lube oil system will be provided with double wall containment tank and all piping will have welded connections mitigate leakage potential. Therefore, leaking of the contents from the piping systems or components will be controlled to prevent the potential for propagating a fire to adjacent equipment or contaminating the ground area outside of the enclosure. Any floor drains provided for the enclosure/buildings will meet CBC/CFC Chapter 57 (Ref. 6.0.X.2 & X.7) which addresses the control and drainage of combustible liquids and contaminants from the enclosure/building.

NFPA 850-2015, Section 5.5 also provides guidance for drainage within buildings. The building drainage systems should, in addition to having the capacity to remove the entire volume of liquid within the component or piping system, should also have the capacity to contain/drain the volume of water discharging of 500gpm flow volume from system hose lines. The drainage of water and oil will be piped to an oil/water separation system for removal manually in accordance with Title 14, Chapter 8, Used oil Recycling Program (Ref. 6.0GG).

D. Specific Equipment Separation, Containment and Drainage

There could be electrical equipment and process equipment located in the yard area that may require separation and containment criteria be defined due to inherent hazards contained within the component (e.g., fuel gas compressors, engine coolers, aqueous ammonia tank, etc.). The drainage system design and installation should meet the applicable requirements of the CPC (Ref. 6.0.X.5). The location and containment of the contents of the material within the components should be discussed further below.

1) Combustible Liquid Applications – This includes the lube oil system connected to the engines and located within each Engine Enclosure. The components should contain the oil used to lubricate the engine/generator units. This liquid should be classified as Class IIIA or IIIB type liquids as defined by NFPA 30-2012 (Ref. 6.0.J). The lubricating oil piping system is to be welded piping from each engine to the oil reservoir within the respective enclosures. The lube oil tank will be a UL Listed double wall containment tank to that can be visually inspected within each engine enclosure. Any drainage from the engine enclosures should meet Section 4.2.4.C above and route to the oil/water separator system discussed below.

   NFPA 850-2015, Section 5.5 provides guidance for drainage for the engine cooler fan containment area. The drainage system should, in addition to having the capacity to contain and remove the entire volume of the ethylene glycol & water coolant solution within the cooler fan units, should also have the capacity to drain the volume of water discharging from the 500 gpm hose lines, discharging for 10 minutes and should compensate for the largest documented 24 hour rainfall over 25 year period.

   The plant should also be provided with an oil/water separator system that may be impacted by California Health and Safety Code (HSC), Division 20, Chapter 6.11, for Certified Unified Program Agencies (CUPA) (Ref.6.0.GG) regulations as invoked by Glendale Ordinance Section 104.1.1 (Ref. 6.0.X). The drainage system should be a closed system that collects oil and water from the containment areas are proposed to have the liquids manually removed from the oil/water separation system by pumping the system contents for offsite removal as required by the HSC. The building/area containment/drainage systems should, in addition to having the capacity to contain and remove the entire volume of liquid within the component or piping system, it should also have as a minimum, the capacity to contain/drain the volume of water discharging 500 gpm flow volume from system hose lines for a minimum period of 10 minutes (per NFPA 850-2015, Section 5.5.2). Each containment should also be sized to contain not only the largest documented 24 hour rainfall over a 25 year period for drainage from yard area containments. Per the recommendation in NFPA 850-2015 Section 5.1.4.3 and CBC Table 602, the containment curb should maintain a minimum of 30ft from an adjacent building, or system structure and should be pitched away from the adjacent exposure to the containment drain sump area and piped to the site oil/water separation system.

2) Flammable Gas Applications – This area includes the LFG Compressor and Conditioning System area. This compressor area is not within an enclosure and is greater than 30 ft. from the nearest structure, the Engine Cooler Fans, or PDC Skid. The equipment in this area does not contain significant amounts of combustible materials except for limited amounts of lubricating oil within the compressors and methane LFG. Should a LFG leak occur at the piping or instruments at the compressor equipment, an automatic and remote manual shutoff system should be provided to isolate LFG to the compressor system thus reducing the risk of a significant fire or explosion per NFPA 850-2015, Section 7.2.2. All electrical equipment within the Compressor/Conditioning System area should be designed to

meet the applicable requirements of CEC (Ref. 6.0.X.4) and IEEE NESC (Ref.6.0.Y) for a potentially hazardous environment. Containment and drainage for this area should consist of standard storm drainage system would be routed to the oil/water separator system that should compensate for the largest documented 24 hour rainfall over 25 year period.

3) Hazardous Material Applications

This application includes the Aqueous Ammonia storage tank near the engine coolers. CFC Section 5001 should be applied in furnishing a hazardous material management program for the hazardous toxic/corrosive material systems in the yard area.

- Aqueous Ammonia is a toxic material for use in exhaust emissions controls process. This material will be contained within a storage tank that is proposed to be located near the plant coolers per the Biogas Renewable Generation Project plan (Ref. 6.0.EE). Given the storage tank is being proposed to be 12,000 gallons, this quantity would exceed the Maximum Allowable Quantities (MAQ) of less than 1000 pounds (approximately 7,700 gallons) limitation cited in CBC/CFC Table 5003.1.1(2). The tank will, however, follow the applicable portions of CBC/CFC Sections 5003, 5004, and 5005 shall be applied to the design and installation of the ammonia system as follows.

  a) CFC Section 5003.2 provides guidance for the design/construction of the storage tank and piping systems that should be applied. Note that CFC Section 5003.2.4.2 requires above-ground tanks to be separated from adjacent structures/systems per 6003.2 except when the tanks are located within the vaults per CFC Section 5303.16 or 5704.2.8.
  b) CFC Section 5004 provides guidance for the application of storage tanks and the design/construction requirements for spill and secondary containment control of materials stored outside within the containment system.
  c) CFC Section 5005 should be applied for the ammonia closed piping system requirements.

4.3 Exterior Exposure Evaluation

4.3.1 Existing L.A. County Sanitation Buildings/Flare Stack System Protection

The existing facilities to remain operational during construction and after the beginning of plant operation includes the L.A. County Sanitation office buildings and the Flare Stack equipment area. These facilities are generally located at the northwest corner of the plant site and should not be modified as part of this plant construction. The buildings and equipment exposure assessments include the following:

A. L.A. County Sanitation Buildings – These buildings appear to primarily be Type VB wood frame combustible construction (essentially double wide trailers as permanent buildings). The buildings will be retained onsite and used by the L.A. County staff as an assumed Group B occupancy. The majority of the buildings should be greater than the minimum distance of 30ft from any new facilities or buildings as well as the existing Flare Stack equipment area. Therefore, modifications to minimize fire exposures between the new and existing buildings and equipment is being accomplished by meeting or exceeding the separation criteria in CBC Table 602 (Ref 6.0.X.2).

No additional protection upgrades to improve the existing L.A. County structures for fire exposures are being addressed by this project as these buildings are not being altered for this project. It should be noted however, that the Glendale Fire Department has recommended that all existing structures be retrofitted with fire sprinkler systems to maximize the benefits afforded to protecting lives, property, equipment, operational continuity, and responding firefighters. This recommendation will be addressed separately from the Biogas Renewal Generation project and will need to be discussed with the L.A. County Sanitation District.

B. Flare Stack Equipment Area – This area includes primarily steel piping and components for the operation of an automatically operated landfill gas (LFG or methane gas) flare system that currently operates if the LFG demand is reduced. The flare system automatically diverts the flow of LFG from the existing facility LFG conditioning system to the flare stacks to burn the excess gas off. This automated system will remain in place during construction and after the Biogas Renewable Generation plant begins operation. The landfill site processes enough methane gas that the LFG is being developed as the primary fuel for powering the new Biogas Renewable Generation plant. The piping and flare stacks are not housed within any building and should maintain a spatial separation >30ft from the nearest building (PDC skid) and therefore would not present a structural fire exposure the adjacent buildings.

   Should a methane LFG leak occur at the piping or instruments in the Flare Stack equipment area, the flare system is provided with an automatic trip system that should isolate LFG to the flare system thus reducing the risk of a significant fire or explosion per NFPA 850-2015, Section 7.2.2. However, should a fire originate in this area occur, the nearest site building (PDC skid) exposure should be minimized given the building is greater than 30ft from the stack equipment. The electrical equipment within the flare stack area is assumed to currently meet the applicable requirements of CEC (Ref. 6.0.X.4) and IEEE NESC (ref.6.0.Y) for a potentially hazardous environment and will not require further modification. This assumption is based on the existing equipment being in place and operating for years without an issue. Since this equipment is existing and will not be impacted by this project, any improvements that may be needed for this equipment will be the responsibility of the L.A. County Sanitation District.

   Therefore no additional protection upgrades are required to improve this facilities equipment for fire exposures.

C. Yard Area Wild land Exposure Mitigation – The area surrounding the plant includes open areas that have vegetation that could present a fire exposure to the plant as well as plant operations inadvertently initiating a fire event. Although the plant site should meet the requirements of CBC/CFC Chapter 49, but as a minimum should maintain a 30ft clear area of brush/shrubs etc. beyond all plant structures, systems and buildings per IEEE 979-2012, section 5.2.1 (Ref. 6.0.Z), the Glendale Fire Department, however, has requested the site maintain a minimum clear area of brush/shrubs, etc. of 100ft.

4.3.2 New Building Separation Requirements

See section 4.2.4.A above for the minimum separation criteria and application fire rated barriers/walls needed if separation criteria is not met.

4.3.3 New Equipment Separation Requirements

See section 4.2.4.A.4) above for the minimum separation criteria and application fire rated barriers/walls needed if separation criteria is not met.

4.4 Fire Protection Emergency Response

4.4.1 Demolition Emergency Response

Planning for the demolition of the existing LFG conditioning facility will be critical in order to ensure that the appropriate electrical systems/circuits are de-energized and the associated processes are properly isolated and purged of flammable gas prior to the demolition work being implemented per CFC Chapter 33 (Ref. 6.0.X.7). Prior to the initiation of demolition, a means of communication should be established between the project supervision and fire watch personnel when hot work is being performed, along with a means of communication available between the Glendale Fire Department to ensure prompt response as required per CFC Section 3309 (Ref. 6.0.X.7). Fire watch personnel are required per CFC Section 3304.5 (Ref. 6.0.X.7) and should be trained to perform incipient brigade functions. The existing plant access roads should maintained as a minimum for the response by fire department should the need arise and should be maintained per CFC Section 3310 (Ref 6.0.X.7).

As a minimum firefighting equipment should include fire extinguisher units sized and located per CFC Section 3315. The existing service water tank could also provide temporary fire water service during the demolition and construction process until the new fire water system discussed in Section 4.2.1 of this document can be constructed and placed in service per CFC Section 3312. The upgraded fire water system should be made operational as soon as possible.

Additionally, NFPA 51B-2009 (Ref. 6.0.L) and the recommendations of NFPA 850-2015 Chapter 16 (Ref. 6.0.V) should be incorporated into the demolition fire protection program planning and implementation.

The demolition contractor shall develop a fire protection systems outage and plant access plan for submittal to the Glendale Fire Department for their review and approval, with the approval received by GWP within two weeks of issuance of the submittal, in order to the start the demolition work.

4.4.2 Construction Emergency Response

The fire protection system program, access requirements and system availability should continue once the demolition work is completed as discussed in Section 4.4.1 above and continued to be available during the construction effort through to completion in accordance with CFC Chapter 33.

The EPC contractor shall develop fire protection systems outage and plant access plan for submittal to the Glendale Fire Department for their review and approval , with the approval received by GWP within two weeks of issuance of the submittal, in order to the start the construction work.

4.4.3 Fire Department Site Access

Access to the plant for offsite fire department response is very important and is required by CFC Section 503 and Appendix D (Ref. 6.0.X.7). There should be two roadways for access to the plant site, however if two access roads cannot be provided, the required equipment turning area should be provided for the fire department equipment. The access road within the plant shall meet CFC Section 503 and shall be designed to be a minimum width of 20ft, capable of supporting the load of the heaviest fire apparatus provided by the Glendale Fire Department and routed within 150ft of all portions of the plant facilities, and shall not have approach angles greater than those required by Glendale Fire Department. The access roadway within the plant should be capable of supporting a minimum gross weight of 77,000lbs and meet AASHTO Roadside Design Guide standard, 4th Edition (Ref. 6.0.F) for heavy roadway design. The road(s)

should be unobstructed at all times during the demolition and construction phases of this project or coordination should be made with the fire department when minimal periods are needed to obstruct the plant access. Where the roadway is adjacent to fire hydrant locations. The roadway shall be expanded to a minimum of 26ft wide per CFC Appendix D, Section D103.1. The roadway shall be marked to prohibit parking or standing of vehicles as required by CFC, Appendix D, Section D103.6. A fire department turnaround road shall also be provided and shall meet CFC, Appendix D, Section D103.1, for the alternative turnaround to the Hammerhead design. Refer to Drawing SCPP-00-M601 in Appendix C to this document.

The existing road way to the north of the plant will be improved, however will have design limitations imposed due proximity of the existing landfill site that includes the limited road width of 18ft and the road will not support the minimum gross weight of 77,000lbs. Additionally no hydrants will be located outside of the new plant site. Therefore, in order to provide the required dead end access for the emergency response equipment, a new turn around road will be provided at the north end of the plant that will meet CFC Appendix D requirements.

The access gates to the plant OCA will be normally closed and secured, so the main gate on the plant west and the alternate gate at the north sides of the plant will be identified as the access points for emergency equipment if needed. All OCA perimeter access gates shall be provided with a Knox Box for GFD emergency access to the plant site. Additionally, since the site may normally not be manned, a Knox Box shall be provided for each building, enclosure and fenced area within the OCA. Knox Boxes on buildings/enclosures shall be located near the associated building signage and notification appliance provided as part of the Section 4.2.3.A of this document to help direct the GFD responding personnel to box location

Additionally, overhead power lines should not be routed over the access roads or access gates, the fuel gas system component areas, or over site buildings where possible. Where power lines must cross access roadways, IEEE NESC C2-2012, Section 23 (ref. 6.0.Y) clearance requirements, should be applied.

4.5 Life Safety Evaluation

4.5.1 Existing Building/Equipment Area Egress

The existing Flare Stack/Switchgear area and the Sanitation District of Los Angeles County office buildings shall remain accessible during the entire period of the demolition, construction and operation of the new power plant. The existing Flare Stack/Switchgear yard fence Means of Egress will not change the existing fence gates and exit discharge paths for the Flare stack/switchgear area. These exits shall remain accessible for egress from the Flare Stack area at all times during the demolition/construction period.

4.5.2 New Control Room/Office Building and PDC Skid Egress

In general all of the new buildings to be constructed at the Biogas Renewable Generation plant should meet the Means of Egress requirements of the CBC/CFC Chapter 10. (Ref. 6.0.X.2 & X.7). Based on the discussion in Section 4.2.4.A & B above, this criteria should be met.

4.5.3 Owner Controlled Area & Electrical Switchgear/ Flare Stack Area Egress

A metal fence system should be provided for the plant site areas to prevent unauthorized access. The fencing system installation should include the recommendations cited in IEEE NESC C2-2012 Sections 11 & 92; CBC/CFC Section 1023.2; and IEEE Std 979-2012, Section 5.7 as follows:

A. New Owner Controlled Area Fencing and Access

The plant site should be provided with an Owners Controlled Area (OCA) fencing system to prevent unauthorized/untrained personnel or public from entering the plant site without being escorted. Two separate access entrance access gates that are a minimum of 26ft wide for the fire department equipment access should be provided at the two plant access road entrances as recommended by IEEE Std 979-2012, Section 5.7 (Ref. 6.0.Z). Additional fenced area personnel egress gates should be provided to ensure personnel can exit areas where equipment might obstruct egress paths. As discussed in Section 4.4.3 of this report, a Knox Box shall be provided at each entrance gate to the OCA, buildings and equipment fenced areas.

The new LFG compressor/conditioning and Cooler/Emissions equipment areas will not be enclosed within a fenced area so egress from these areas will not be an issue. Equipment placement should consider clearances for equipment aisles to allow for personnel egress per IEEE NESC C2-2012, Sections 112 & 113 (minimum of 7ft headroom) and CBC/CFC Section 1023.2 (minimum of 3ft width) as well as electrical hazard clearances. Lighting in the area should also meet IEEE NESC, C2-2012, Section 11 for normal and emergency lighting requirements.

B. Existing Electrical Switchgear/Flare Stack Area Fencing and Access

A metal fence system is currently provided around the existing Electrical Switchgear and Flare Stack equipment area to prevent unwanted safety exposures to plant personnel and prevent unauthorized/untrained personnel from entering the equipment area and inadvertently operating critical equipment. The existing Flare Stack/Switchgear yard fence Means of Egress will not be changed for the existing fence gates and exit discharge paths for the Flare stack/Switchgear area. These area exits shall remain accessible for egress from the Flare Stack/Switchgear areas at all times during the demolition/construction period.

4.6 Plant Demolition and Construction Impact on Fire Protection Program

In general, the demolition of the existing LFG facility and the construction of the new power plant should require the development of administrative procedures for the fire protection/safety requirements to be implemented during the performance of the work. The procedures/program should define the responsibilities of developing the program, the training of the construction personnel in the implementation of procedures/policies, and staffing and training for personnel performing emergency response functions. As a minimum, the applicable requirements of CBC/CFC Chapter 33 (Ref. 6.0.X.2 &X.7) and the recommendations of NFPA 850-2015, Chapter 16 (Ref. 6.0.V) should be used for the development, training and implementation of a fire protection/safety program prior to start of any demolition/construction work. Also see Section 4.4 of this document for additional requirements and recommendations.

Also, coordination with the LA County site personnel shall be performed to ensure the personnel are aware of the actions needed during a site emergency and when demolition/construction activities may affect the LA County staff normal operations.

4.6.1 Sequence for Removal of Existing Fire Protection Systems

Although the schedule for the demolition of components/systems/structures has yet to be defined, a key system that should be upgraded prior at the start of the majority of the plant demolition and construction should be the site fire water supply system discussed in Section 4.2.1.A of this document. A new fire water storage tank will be installed to replace the service existing tanks. The existing yard fire main system will be replaced as part of the new fire water supply system installation. The new fire water system should be installed as early as possible in the construction process and remain in service during construction and plant operation to

provide fire water to the plant site. The existing service water tank will remain to support the existing L.A. County buildings and new office building potable water requirements. Therefore coordination for the removal for the fire water service from the existing tank will be required to ensure fire water service is provided during demolition, construction and operation. The new fire water system shall be verified operable via flow inspections and functional testing per NFPA 25-2014, Chapters 7 & 9 (Ref. 6.0.G).

All work should be performed safely in accordance with the site procedures and safety program along with maintaining the required emergency response access to all areas of the plant including equipment laydown areas, etc. As existing structures/systems/components are being demolished, the minimum type and quantity of fire extinguishers should also be located as required by NFPA 10-2013 and required hot work procedures implemented per NFPA 51B-2014 (Ref. 6.0.L).

4.6.2 Sequence for Placing New Fire Protection Systems into Service

As discussed in Section 4.6.1 above, the new fire water supply system should replace the existing fire water system early in the project. The new fire main system should be provided with required fire hydrants with isolation valves. Should new building(s) require water based suppression systems to be installed, the water storage capacity and the supply pressure would need to be evaluated for meeting the demand(s). Indicating type isolation valves should be provided for every building being provided with a water based suppression system. The building isolation points should tie in to the fire water supply piping for the associated building water based suppression system(s) and should be located no closer than 40 ft. from the building being supplied per NFPA 24-2013, Section 6.2.11 (Ref. 6.0.I). As new buildings are constructed, the minimum type and quantity of fire extinguishers should also be located as required by NFPA 10-2013 and required fire barriers/walls should be installed as a priority.

Once the building is constructed, the required automatic fire suppression and detection systems should be installed and tested in accordance with the applicable NFPA standard and prepared for turnover to GWP for operation.

4.6.3 Communication during Demolition, Construction and Turnover

Communication during the construction process should include onsite two way radio communication, an onsite paging system for the construction area to alert site personnel of fire or personnel injury emergencies and a means (i.e., telephone service) to report emergency to the Glendale Fire Department.

4.6.4 Existing Facility and Personnel Egress Protection during Demolition & Construction

The minimum egress exits and exit discharge pathways should remain unobstructed during demolition & construction. If there are periods when exits would be blocked, planning for alternative exits should be provided and all applicable personnel should be trained on the change in exits. Exits from the existing Flare Stack area should remain operable at all times. If exits need to be obstructed, the plant personnel should be trained on the change in exits, and alternative actions that would need to be taken to exit the area safely.

4.6.5 Emergency Plan Coordination with Glendale Fire Department during Demolition/Construction/Turnover

Emergency planning as discussed in the applicable portions of CFC Chapter 4 (Ref.6.0.X.7) should be developed prior to the start of any work. Once an approved program is in place, all personnel should be trained to understand their roles and responsibilities in the event of an emergency. This document should be a living document for use throughout the life of the

demolition/construction and during plant operation. Just as important is the means for communicating with the Glendale Fire Department, for alerting them to an emergency, and assisting them once they arrive onsite to guide them to the emergency and provide critical information outlining the stability of buildings/structures being demolished/constructed. Additionally, ongoing construction status meetings/conference calls should be performed on a weekly basis with designated fire department representative(s) to help fire department plan for a fire or personnel injury emergency response to the site during the construction phase.

5.0 CONCLUSIONS & RECOMMENDATIONS

Results of the analysis provided in Section 4.0 provides the design basis for the Biogas Renewable Generation Plant project fire protection program and systems and features. Section 5.1 discusses the general fire protection features guidance cited in Section 4.0 while Section 5.2 through 5.4 discusses the key issues that should need attention during the project design and implementation phases include:

5.1 General Guidance Conclusions Cited in Section 4.0

The general guidance discussed in Section 4.0 includes the following:

A. Fire Water System
   A new fire water system will need to replace the existing system for the plant site in order to meet the CBC/CFC requirements for site fire flow and hydrant placement. The existing fire water storage will need to be increased in volume in order to meet the minimum fire flow water demands.
B. Fire Protection Systems
   The new buildings to be constructed on site will not be required to have an automatic sprinkler system due to area limitation as allowed by Glendale Ordinance 5892. It is recommended that the buildings and critical equipment (i.e., Engine Enclosures, PDC) be provided with specific equipment suppression systems that report to a plant wide fire alarm system. All of the site buildings should also be provided with building wide fire alarm systems that report alarm conditions to the plant control room as well as to an offsite central station, in addition to transmitting signals to the Grayson Plant Control Room as directed by GWP.
C. Exposure Protection
   Fire barriers/walls should not be required for the new buildings if the spatial separation criteria cited in CBC Table 602 are being met.
D. Emergency Response
   See discussion in Section 5.2 thru 5.4 below
E. Life Safety
   The new buildings and yard areas should meet the applicable requirements of CBC/CFC for building egress and IEEE NESC C2-2012 and CBC/CFC for yard area equipment access and fencing.

5.2 Preparation and Implementation of Demolition, Construction and Emergency Planning

The development and execution of plans for the demolition of the existing LFG facility and the construction of the new power plant buildings/equipment areas should help mitigate the potential for injury to plant and construction personnel. Additionally, planning should mitigate the potential for unwanted damage to the Flare Stack equipment. Ongoing communication with the Glendale Fire Department should also help in ensure emergency response personnel should be aware of the fire protection equipment that might be out of service and the stability of structures/equipment during demolition and construction phases. This information should be helpful in identifying a possible change in tactical approach or access to areas/hazards by the fire department due to changes in construction site status.

5.3 Fire Risks during Demolition, Construction and Operation

Key fire risks issues have been addressed in detail in Appendix B to this document. Implementation of the recommendations cited should aid in mitigating the risk from fire damage. Installation, testing and maintenance of the new systems and features should ensure that the systems operate as intended should a fire occur.

5.4 Maintain Operations and Access to the Flare Stack Equipment

The existing Flare Stack system area must remain operational and accessible throughout the demolition and construction phases of this work. Coordination, communication and planning must be implemented to ensure that a minimum of two means of egress and equipment access are available for the Flare Stack fenced area. Additionally, coordination for existing facility service outages should also need to be planned as part of the construction effort.

6.0 REFERENCES

The following references were used in the development of this document:

A. Jensen Hughes Kick off meeting agenda/notes dated 4/27/2016.

B. Biogas Renewable Generation Project Data Input dated 5/23/2016.

C. National Fire Protection Association (NFPA)10-2013, Standard for Portable Fire Extinguishers

D. NFPA 12-2011, Standard on Carbon Dioxide Extinguishment Systems

E. NFPA 13-2016, Standard for Installation of Sprinkler Systems

F. American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide, 4th Edition, Dated 2011

G. NFPA 25-2014, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

H. NFPA 22-2013, Standard for Water Tanks for Private Fire Protection

I. NFPA 24–2016, Standard for the installation of Private Fire Service Mains and their Appurtenances

J. NFPA 30-2015, Flammable and Combustible Liquids Code

K. NFPA 37-2015, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

L. NFPA 51B-2014, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work

M. NFPA 70-2014, National Electrical Code

N. NFPA 72-2016, National Fire Alarm Signaling Systems

O. NFPA 80-2018, Standard for Fire Doors and Other Opening Protectives

P. NFPA 90A-2015, Standard for the Installation of Air-Conditioning and Ventilating Equipment

Q. NFPA 14-2016, Standard for Installation of Standpipe and Hose Systems

R. Not Used

S. NFPA 551-2016, Guide for the Evaluation of Fire Risk Assessments

T. NFPA 600- 2015, Standard on Facility Fire Brigades

U. NFPA 780-2014, Standard for the Installation of Lightning Protection Systems

V. NFPA 850-2015, Recommended Practices for Fire Protection for Electric Generating Plants and HVDC Stations.

W. NFPA 2001-2015, Standard on Clean Agent Fire Extinguishment Systems

X. Glendale Resolution 5892Adopting California 2016 Building Standards (CBC).

   1) Not Used

   2) 2016 California Building Code (CBC)

   3) 2016California Mechanical Code (CMC)

4) 2016 California Electrical Code (CEC)

5) 2016 California Plumbing Code (CPC)

6) Not Used

7) 2016 California Fire Code (CFC)

Y. Institute of Electrical and Electronics Engineers (IEEE), ANSI C2-2012, National Electric Safety Code

Z. Institute of Electrical and Electronics Engineers (IEEE), Standard 979-2012, Guide for Substation Fire Protection

AA. Underwriters Laboratory (UL) Fire Protection Equipment and Fire Resistance Directories, Latest Edition

BB. Factory Mutual Research (FM) Approval Guide, Latest Edition

CC. Stantec comments on draft document 02D001-RPT-002, 6/27/2016

DD. Glendale Water & Power Drawing SCPP-00-M-601, Dated 01-11-2018 Biogas Renewable Generation Conceptual Fire Protection Plan

EE. Society of Fire Protection Engineers Handbook, 4th Edition

FF. NFPA 1142-2012, Standard on Water Supplies for Suburban and Rural Fire Fighting

GG. California EPA Unified Program (CUPA), California Health and Safety Code, Division 20, Miscellaneous Health and Safety Provisions, Chapter 6.11.

A. APPENDIX A – APPLICABILITY MATRIX

The table in this section identifies the applicable code requirements associated with each building as discussed in this document.

Applicable Code(s)	Engine Enclosure	Office Building	Water Storage Tank, Fire Main	PDC Skid	LFG Compressor/ Conditioning Yard Area	Existing Electrical Equipment Area
California Bldg. Code	X	X	X	X		
California Fire Code	X	X	X	X	X	X
California Electrical Code	X	X	X	X	X	X
California Mechanical Code	X	X		X		
California Plumbing Code	X	X	X	X	X	
California Energy Code		X		X		
NFPA 10-2013	X	X	X	X	X	X
NFPA 13-2016		X				
NFPA 22-2016			X			
NFPA 24-2016			X			
NFPA 30-2015	X					
NFPA 37-2015	X				X	
NFPA 70-2014	X	X	X	X	X	X
NFPA 72-2016	X	X	X	X		
NFPA 80-2016		X(4)		X(4)		
NFPA 90A-2015		X(4)		X(4)		
NFPA 780-2014	X	X	X	X	X	X
NFPA 850-2015	X	X	X	X	X	X
NFPA 2001-2015	X(2&3)			X(2)		
IEEE C2-2012	X			X	X	X
IEEE 979-2012				X		X

NOTES:

1) All California Building Standards- 2016 Edition as adopted by Glendale City Resolution 5892.

2) This Equipment assumed to be provided by either the PIME equipment vendor or EPC Contractor under separate contract.

3) NFPA 37, recommends either Clean Agent, CO2 or water mist type suppression systems be applied for engine enclosures.

4) Where fire walls or barriers are provided, this standard could apply. .

B. APPENDIX B – FIRE RISK ASSESSMENTS

B.1. Fire Risk Assessments

Qualitative fire risk assessments were performed for known areas of facility fire risks to analyze their potential impact and to define mitigating strategies. Five potential risks were identified as having a significant impact on plant operations and personnel safety.

Generally methods that should be considered for mitigating and dealing with risks include one or more of the following:

- Development of Pre-Fire Plans and training for both plant personnel and the Glendale Fire Department for their roles and responsibilities;
- Maintenance and testing of fire protection systems and features (systems, passive barriers, etc.) in accordance with the applicable NFPA standards to ensure the systems are available when needed;
- Maintenance and testing of plant equipment to ensure their safety functions operate when needed or testing of systems to help identify when failures are imminent (e.g., Flare Stack system automatic shutdown function).

B.2. Fuel Gas Pipeline Explosion

The source of fuel for the new Biogas Renewable Generation plant is proposed to be the landfill methane gas generated and piped from the exiting Flare Stack area to the Landfill Gas (LFG) conditioning/compressor area and ultimately to the new reciprocating engine units to be located in the new Engine Building. Landfill gas should flow from the Flare Stack area to the Compressor/Condition area at approximately 25 inches of water column (approx. 1 psi). Once the LFG is conditioned it is piped to the four reciprocating engines located in the Engine Building at the required pressure need for engine operation. This pressure should be defined once the equipment is selected. The discussion in this section is based on previous experience and not specific equipment requirements. This is due the plant equipment and design requirements not being defined at this time. This issue should be addressed once the equipment design requirements have been identified.

A methane gas pipeline explosion is the risk that would have the most severe outcome and a hydrocarbon fireball is a complex occurrence. Once the vapor cloud reaches an ignition source, the vapor cloud would ignite, followed by a sustained hydrocarbon fire until the gas supply is isolated. To calculate the size and heat output of a methane gas fireball, certain assumptions must be made. First, it is assumed that the gas release and resulting fireball is approximately spherical. Second, it is assumed that once released, it would take the vapor cloud approximately 15 seconds to contact an ignition source. This is an assumption that provides a conservative estimate on the size and impact of the fireball. After 15 seconds, the total mass of gas released would be based on the total failure of the pipe to be installed and the pressure at which the LFG needs to be delivered.

However, using the spherical fireball model described in Chapter 3-10 of the SFPE Handbook, 4th edition (Ref. 6.0.EE), a fireball containing an assumed mass of 43 kg of methane gas, based on previous plant experience, would produce a fireball of approximately 20 m in diameter. An object 10 m from the edge of the fireball (20 m from the center of the fireball) would experience a radiant heat flux of approximately 90 kW/m2.

IEEE 979, Guide for Substation Fire Protection, 2012 edition (Ref. 6.0.Z), provides information on the impacts of various levels of radiant heat exposure. The IEEE 979 Table B.3 is reproduced below as Table B-1. Using the same spherical fireball approximation described above, all equipment within 32 m would experience an assumed radiant heat flux of

approximately 35 kW/m2 would be severe enough to cause failure, and all personnel within approximately 60 m radius would be exposed to an estimated heat flux of 5 kW/m2 to cause skin burns.

Following the fireball, a large hydrocarbon fire would be expected to occur rupturing the LFG pipe until the gas flow is secured.

A methane gas pipeline explosion and resulting fire would likely result in a complete loss of the systems at the generating plant and potentially cause serious injury or death of personnel, particularly those near the fireball. Therefore the emergency planning should identify the specific actions required to minimize the effects of a methane gas leak by isolating the gas source at a key supply valve as quickly as possible. As a prevention method, proper inspections and maintenance of the Flare Stack system and the future tie in to the compressor/conditioning area equipment should be included inspection/maintenance process.

Impact of radiant heat flux	Heat flux (kW/m^2)
Sufficient to cause damage to process equipment	37.5
Equipment failure	35
Damage to unprotected metal	30
Spontaneous ignition of wood	25
Cable insulation degrades	20
Pilot ignition of wood	12.5
Plastic melts	12.5
Pain threshold reached after 8 s Second-degree burns after 20 s	9.5
Possible failure of ceramic bushings	5
Skin burns	5

Table B-1 – Impact of Radiant Heat Flux (Reproduced from IEEE 979 Table B.3)

As indicated in Section 4.2.4.D.2 of this document, if the following design features are implemented, the effects of a fuel gas system failure should be reduced.

- An automatic and remote manual shutoff system should be provided to isolate LFG to the compressor system to reducing the risk of a significant fire or explosion per NFPA 850-2015, Section 7.2.2.
- All electrical equipment within this area should be designed to meet the applicable requirements of CEC (Ref. 6.0.X.4) and IEEE NESC (ref.6.0.Y) for a potentially hazardous environment

B.3. Engine Unit Fire and Explosion

This power plant design should include potentially four LFG (methane gas) fueled reciprocation engines to drive the generator units. These units are proposed to be located side by side within individual engine enclosures.

An engine fire and potential explosion event could result in several hazards. The first is a potential release of fuel, which could create a fireball and subsequent pressure wave. A second could include the expulsion of high velocity shrapnel from the affected engine due to the effects

of the fuel gas fireball and pressure wave. Another hazard could be a resulting fire, either from the LFG fuel, or from the release of lube oil due to damage cause to oil lines, etc.

Given the placement of the four engines, flying shrapnel from a failed engine could directly impact an adjacent engine, rendering both engines inoperable. Although not an NFPA 850-2015 or CBC/CFC requirement, the effects of an explosion could be mitigated by providing a blast resistant wall between each engine generator to block the path of the expelled shrapnel. The additional protection provided by the wall is considered an industry "best practice" that can ensure business continuity in the event of an engine failure, but is not a requirement.

B.4. Fire Inside Buildings

A fire inside a building is assumed to be the most likely of these scenarios. A fire could occur due to many possible scenarios. Ignition sources could include, but are not limited to, electrical equipment failure, electrical arcing of cabling, or hot-work performed inside a building. Combustibles could include, but are not limited to the following:

- Class A items (e.g. paper, cardboard, cable insulation, plastics, etc.) found in the Control Room/Office Building and the Power Distribution Center (PDC) Building,
- Class B flammable or combustible liquids in the engine enclosures or ancillary skid units (e.g., lube oil skid),
- Other Class C items such as electrical equipment containing plastics and cable insulation, found in the Office Building and PDC Skid.

The control of a fire within a building or structure has been addressed by installing a fixed automatic suppression system (e.g., Engine Enclosures, PDC), providing detection for early warning throughout each structure, implementing the use of automatic isolation control of the fuel gas systems and the provision of spatial separation to aid in mitigating the effects of a fire event as recommended by NFPA 850-2015 or the CBC/CFC as discussed in Section 4.0 of this document.

B.5. Fires Initiated during the Demolition/Construction Phases

The potential for a fire to occur during the demolition phase of the existing LFG conditioning facility, the Sanitation District of Los Angeles County buildings, and the construction of the new plant is likely due to the potential for hot grinding particles or welding slag inadvertently dropping into and igniting combustible materials (i.e., paper cardboard, oil soaked rags, etc.) located below or adjacent to the work area. To minimize the potential for fire propagation, project planning should include the implementation of fire watch staff for all hot work and the adherence to hot work processes per NFPA 51B-2012 and CFC, Chapter 33. Good fire safety training and meetings with the construction staff and project supervision should also help the construction team to properly prepare for hot work and what to do if a fire should occur. Additionally, certain fire protection systems and features should be available or actions taken as follows:

- Incipient firefighting equipment and staff trained in the use of the equipment should be available in the area of hot work.
- Planning and implementation should include ensuring the means of egress and fire department equipment access paths are always unobstructed.
- Proper storage, care and use of class A combustibles, combustible/flammable liquids to prevent this material from being exposed to areas implementing hot works, etc.
- Constant planning and communication with the Glendale Fire Department to alert them to access or equipment outage issues during the demolition/construction phases.

C. APPENDIX C – BIOGAS RENEWABLE GENERATION PROJECT CONCEPTUAL FIRE PROTECTION PLAN

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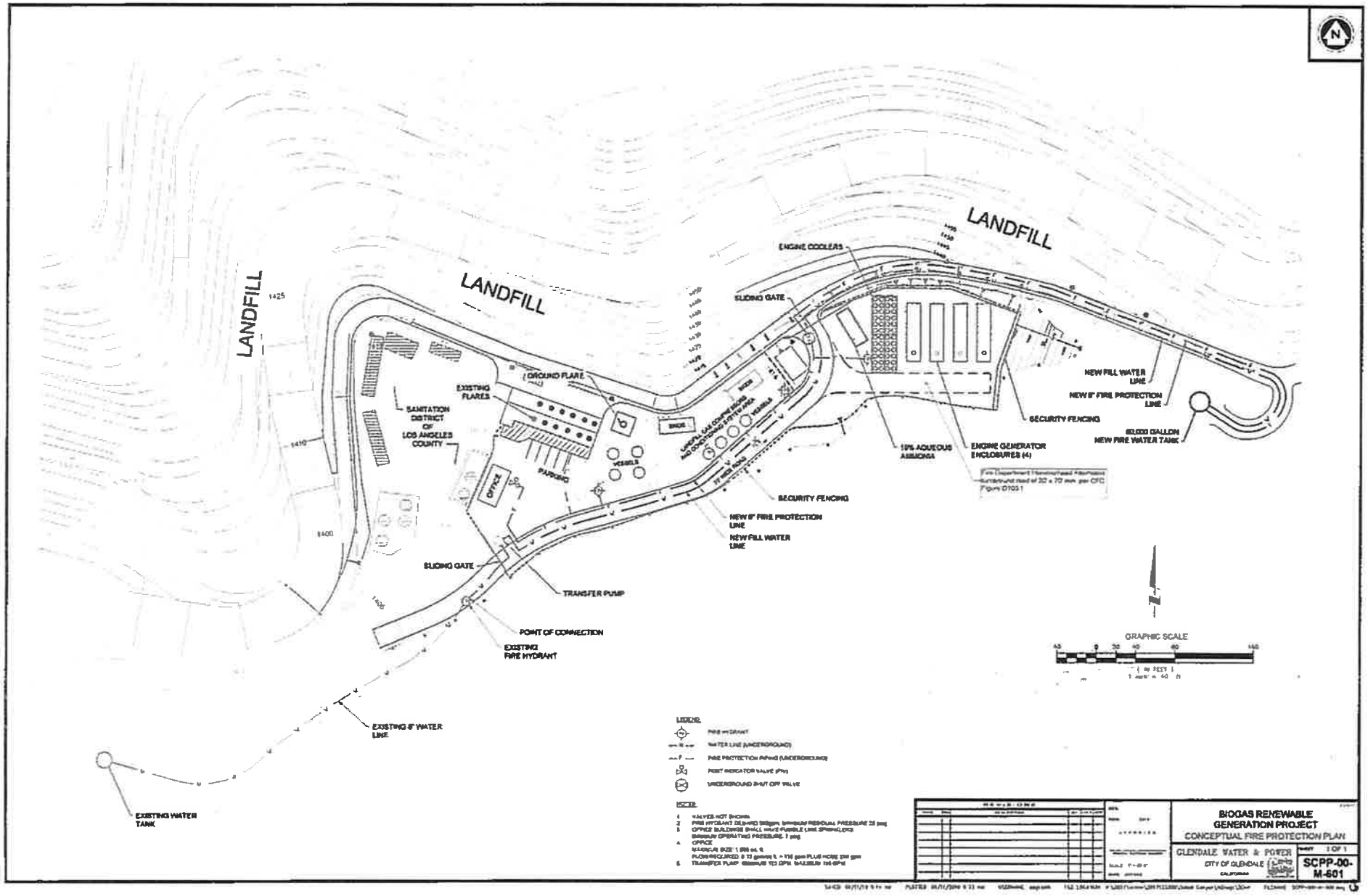
7721 N Figueroa St, Los Angeles, CA 90041


LANDFILL
LANDFILL
LANDFILL
1425
1410
1400
ENGINE COOLERS
SLIDING GATE
GROUND FLARE
EXISTING FLARES
SANITATION DISTRICT OF LOS ANGELES COUNTY
OFFICE
PARKING
VESSELS
SKIDS
LANDFILL GAS CONDENSATE AND CONDENSATE DISPOSAL AREA
75 HDPE TANKS
19% AQUEOUS AMMONIA
ENGINE GENERATOR ENCLOSURES (4)
SECURITY FENCING
NEW FILL WATER LINE
NEW 8" FIRE PROTECTION LINE
60,000 GALLON NEW FIRE WATER TANK
SECURITY FENCING
NEW 8" FIRE PROTECTION LINE
NEW FILL WATER LINE
SLIDING GATE
TRANSFER PUMP
POINT OF CONNECTION
EXISTING FIRE HYDRANT
EXISTING 8" WATER LINE
EXISTING WATER TANK
GRAPHIC SCALE
LEGEND
FIRE HYDRANT
WATER LINE (UNDERGROUND)
FIRE PROTECTION PIPING (UNDERGROUND)
POST INDICATOR VALVE (PIV)
UNDERGROUND SHUT OFF VALVE
NOTES
1 VALVES NOT SHOWN
2 FIRE HYDRANT DELIVERS 500gpm minimum RESIDUAL PRESSURE 20 psig
3 OFFICE BUILDINGS SHALL HAVE PUBLIC LINE SPRINKLERS
MINIMUM OPERATING PRESSURE 7 psig
4 OFFICE
MAXIMUM SIZE 1,000 sq. ft.
FLOW REQUIRED: 0.13 gal/min/ft. = 130 gpm PLUS HOSE 250 gpm
5 TRANSFER PUMP minimum 125 GPM SALESLINE 100 GPM
BIOGAS RENEWABLE GENERATION PROJECT
CONCEPTUAL FIRE PROTECTION PLAN
GLENDALE WATER & POWER
CITY OF GLENDALE
SCPP-00-M-601

D. APPENDIX D – BIOGAS RENEWABLE GENERATION PROJECT OVERALL SITE PLAN

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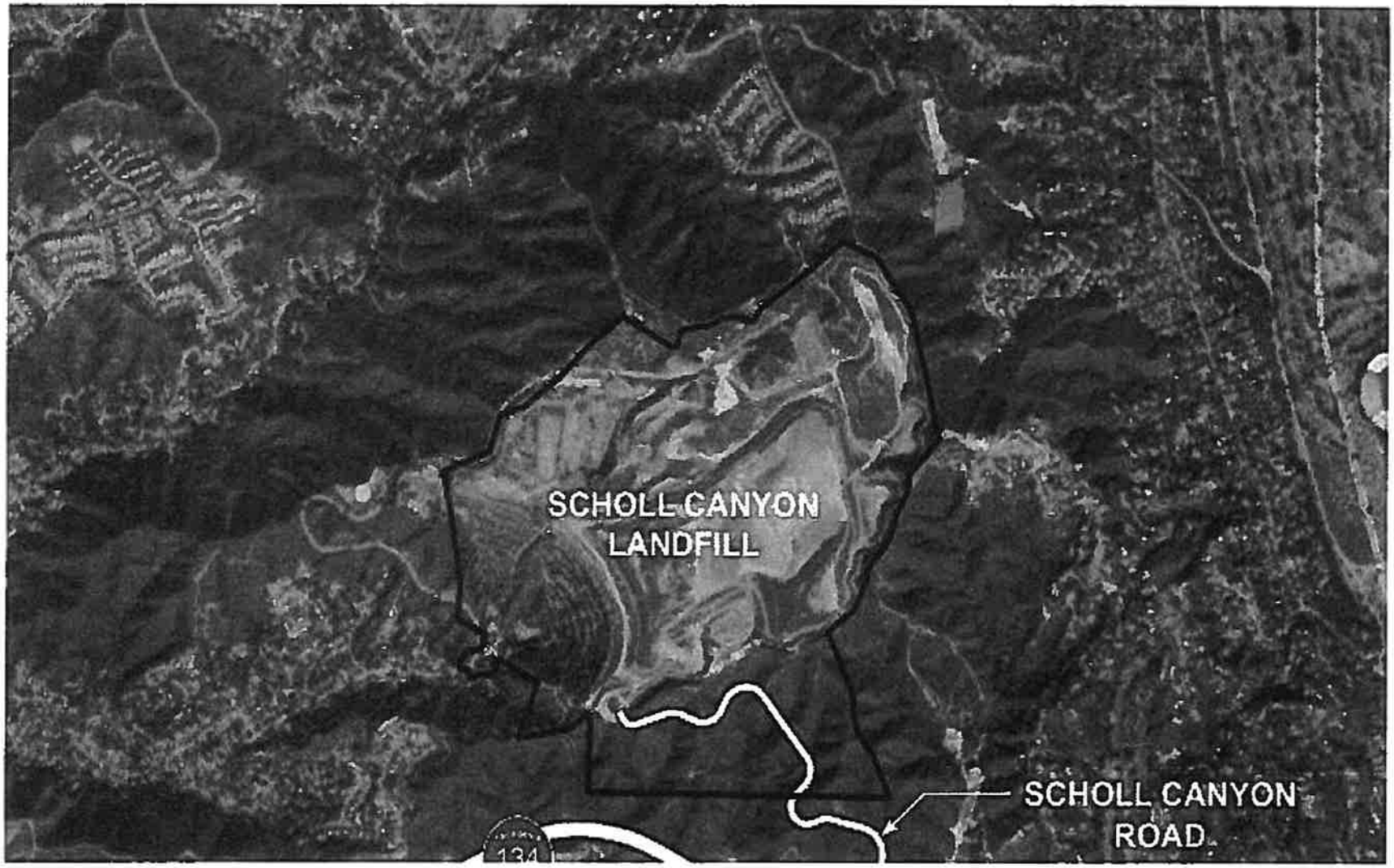
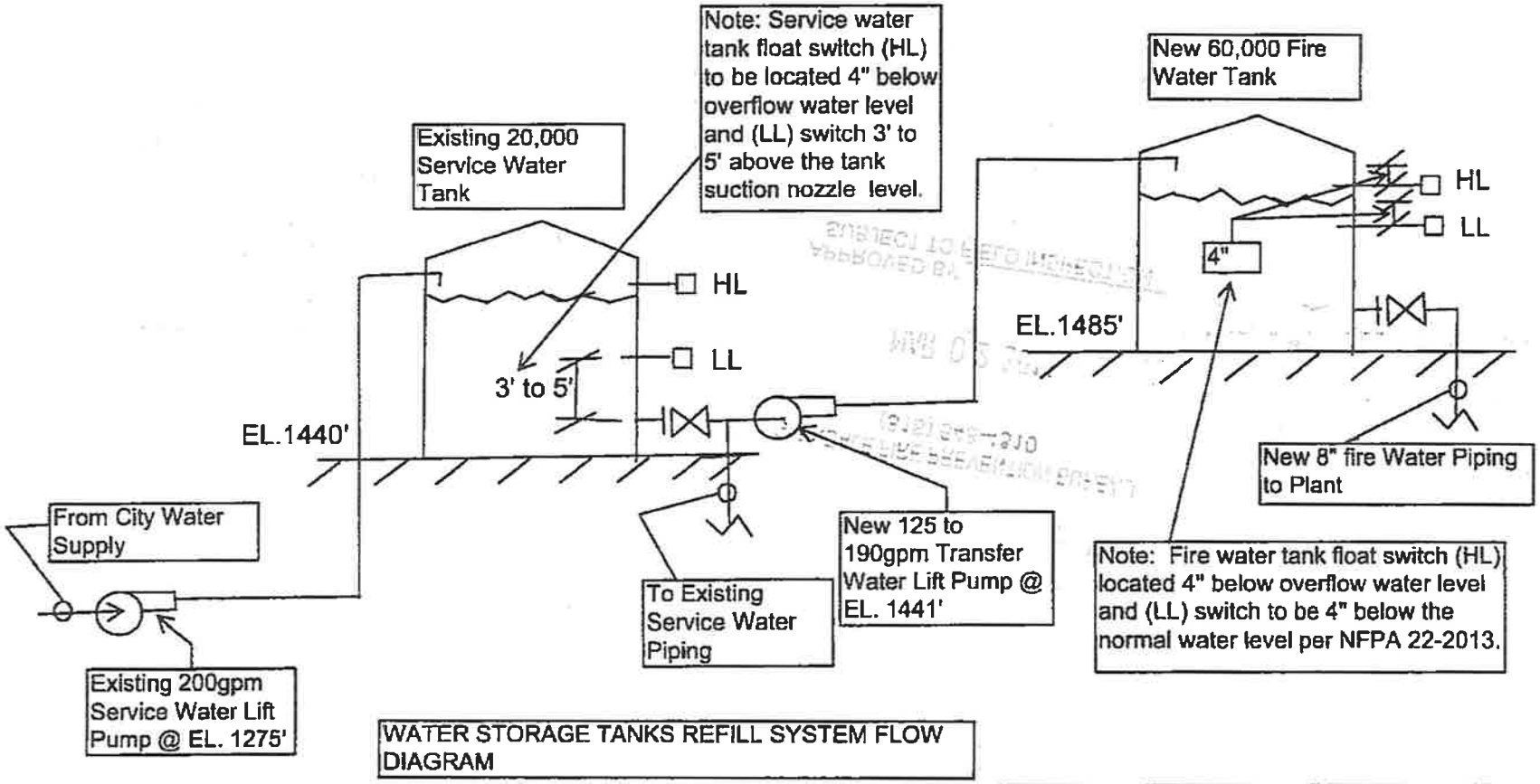
7721 N Figueroa St, Los Angeles, CA 90041


SCHOLL CANYON
LANDFILL
SCHOLL CANYON
ROAD
134

E. APPENDIX E – BIOGAS RENEWABLE GENERATION PROJECT WATER STORAGE SYSTEM DIAGRAM



WATER STORAGE TANKS REFILL SYSTEM FLOW DIAGRAM

FIRE WATER TANK REFILL LOGIC

a. Once the water tank water level in the new fire water tank falls below the tank float switch set point of 4" below normal water level (LL), the float switch will transmit a supervisory alarm sign to the plant fire alarm system indicating low water level.

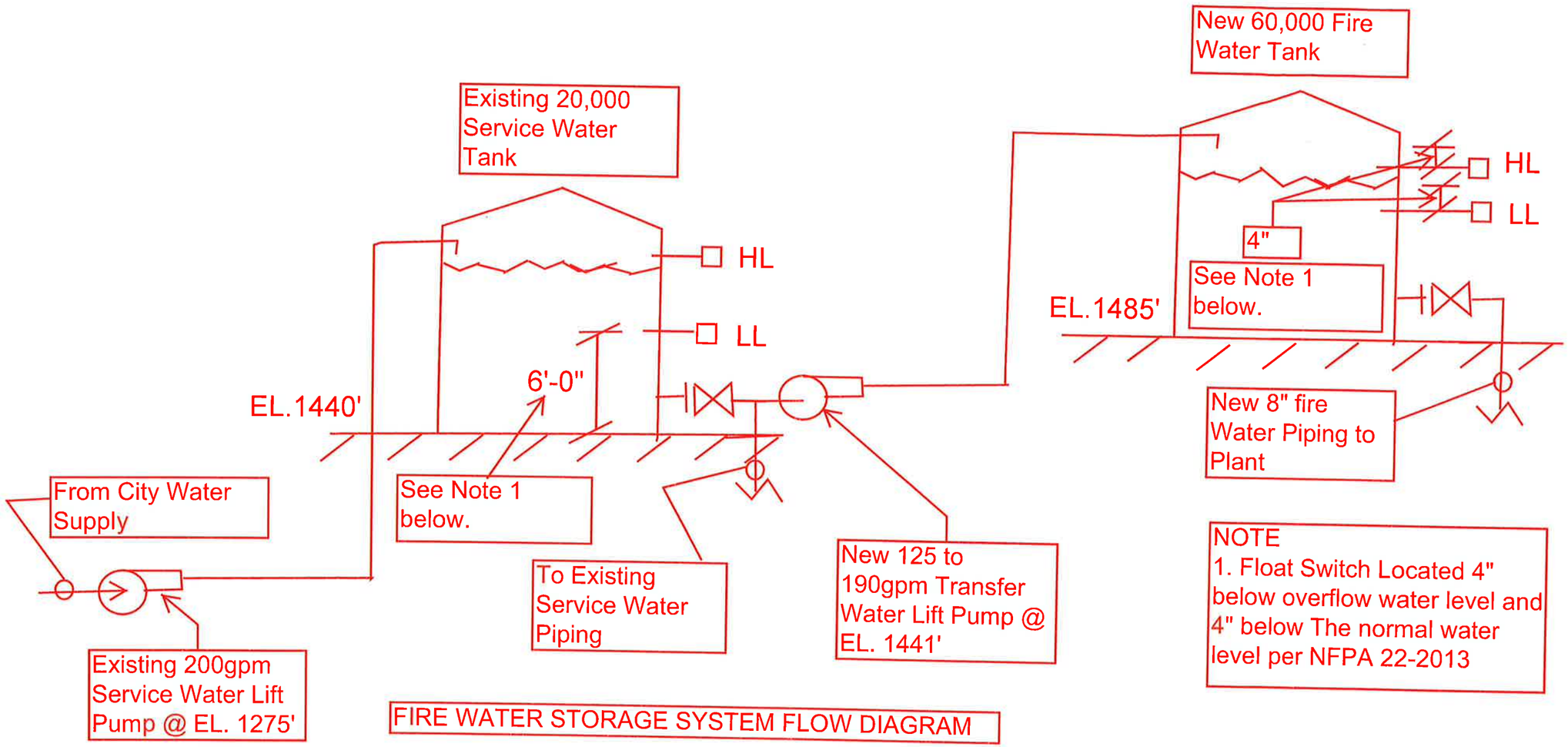
b. The fire water tank water level float switch (LL) will also transmit a signal to the new 125gpm transfer pump to start refilling the fire water tank.

c. The transfer pump will continue to operate until the water level reaches the high water level float switch (HL) just below the overflow outlet within the fire water tank.

EXISITNG SERVICE WATER TANK REFILL LOGIC

a. Once the water tank water level in the existing service water tank falls below the tank float switch set point between 3' to 5' above the tank suction nozzle level, the float switch (LL) will transmit a signal to the existing city 200gpm pump to start refilling the existing service water tank.

b. The city pump will continue to operate until the water level reaches the high water level float switch (HL) just below the overflow outlet within the service water tank.



FIRE WATER STORAGE SYSTEM FLOW DIAGRAM

1. FIRE WATER TANK REFILL LOGIC

a. Once the water tank water level in the new fire water tank falls below the tank float switch set point of 4” below normal water level, the float switch will transmit a supervisory alarm sign to the plant fire alarm system indicating low water level.

b. The fire water tank water level float switch will also transmit a signal to the new 125gpm transfer pump to start refilling the fire water tank.

c. The transfer pump will continue to operate until the water level returns to normal level within the fire water tank.

2. EXISITNG SERVICE WATER TANK REFILL LOGIC

a. Once the water tank water level in the existing service water tank falls below the tank float switch set point of 6' above the tank bottom level, the float switch will transmit a signal to the existing 200gpm transfer pump to start refilling the existing service water tank.

b. The transfer pump will continue to operate until the water level returns to normal level within the existing service water tank.

1. FIRE WATER TANK REFILL LOGIC

a. Once the water tank water level in the new fire water tank falls below the tank float switch set point of 4” below normal water level, the float switch will transmit a supervisory alarm sign to the plant fire alarm system indicating low water level.

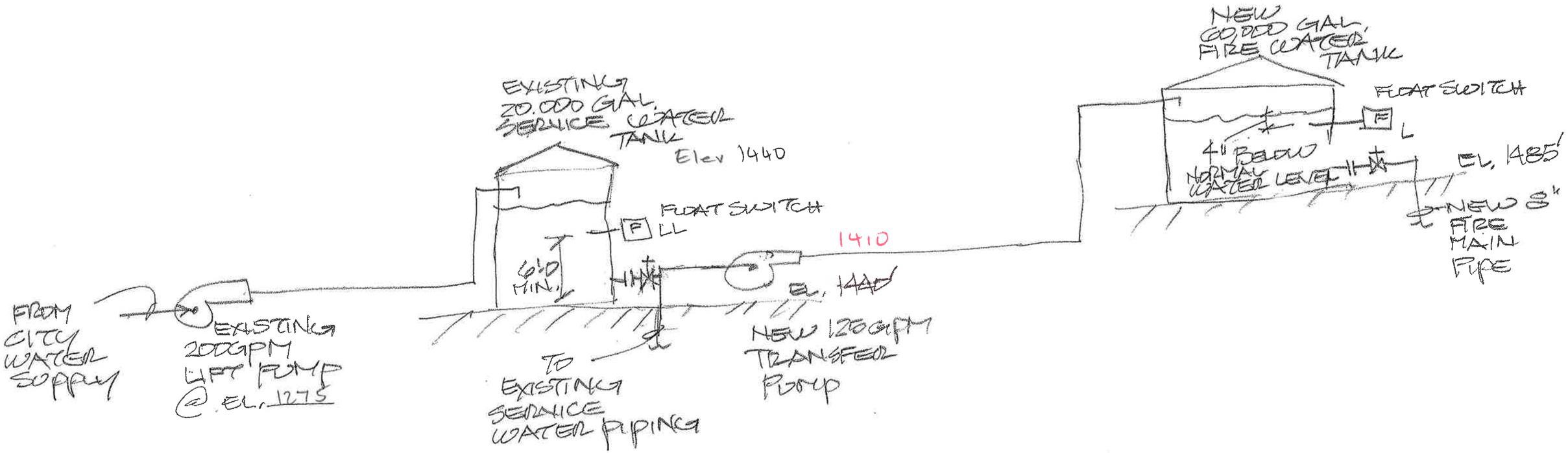
b. The fire water tank water level float switch will also transmit a signal to the new 125gpm transfer pump to start refilling the fire water tank.

c. The transfer pump will continue to operate until the water level returns to normal level within the fire water tank.

2. EXISITNG SERVICE WATER TANK REFILL LOGIC

a. Once the water tank water level in the existing service water tank falls below the tank float switch set point of 6’ above the tank bottom level, the float switch will transmit a signal to the existing 200gpm transfer pump to start refilling the existing service water tank.

b. The transfer pump will continue to operate until the water level returns to normal level within the existing service water tank.



FIRE WATER STORAGE SYSTEM DIAGRAM