NFEnergía LLC

San Juan Micro-Fuel Handling Facility

Resource Report 9
Air and Noise Quality

Docket No.
CP21-___-000

September 15, 2021

NFEnergía LLC
SAN JUAN MICRO-FUEL HANDLING FACILITY
RESOURCE REPORT 9—AIR AND NOISE QUALITY

Minimum Filing Requirements for Environmental Reports:	Addressed in Section:
1. Describe the existing air quality, including background levels of nitrogen dioxide and other criteria pollutants which may be emitted above United States Environmental Protection Agency-identified significance levels.	Section 9.2.2
2. Quantitatively describe existing noise levels at noise sensitive areas, such as schools, hospitals, or residences and include any areas covered by relevant state or local noise ordinances. (i) Report existing noise levels as the equivalent sound level (day), equivalent sound level (night), and day-night sound level and include the basis for the data or estimates. (ii) For existing compressor stations, include the results of a sound level survey at the site property line and nearby noise sensitive areas while the compressors are operated at full load. (iii) For proposed new compressor station sites, measure or estimate the existing ambient sound environment based on current land uses and activities. (iv) Include a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement.	Section 9.3.2 and 9.3.3
3. Estimate the impact of the project on air quality, including how existing regulatory standards would be met. (i) Provide the emission rate of nitrogen oxides from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, include supporting calculations, emission factors, fuel consumption rates, and annual hours of operation. (ii) For major sources of air emissions (as defined by the United States Environmental Protection Agency), provide copies of applications for permits to construct (and operate, if applicable) or for applicability determinations under regulations for the prevention of significant air quality deterioration and subsequent determinations.	Section 9.2.3, 9.2.4, and 9.2.5
4. Provide a quantitative estimate of the impact of the project on noise levels at noise-sensitive areas, such as schools, hospitals, or residences. (i) Include step-by-step supporting calculations or identify the computer program used to model the noise levels, the input and raw output data and all assumptions made when running the model, far-field sound level data for maximum facility operation, and the source of the data. (ii) Include sound pressure levels for unmuffled engine inlets and exhausts, engine casings, and cooling equipment; dynamic insertion loss for all mufflers; sound transmission loss for all compressor building components, including walls, roof, doors, windows, and ventilation openings; sound attenuation from the station to nearby noise-sensitive areas; the manufacturer's name, the model number, and the performance rating; and a description of each noise source and noise control component to be employed at the proposed compressor station. For proposed compressors, the initial filing must include at least the proposed horsepower, type of compression, and energy source for the compressor. (iii) Far-field sound level data measured from similar units in service elsewhere, when available, may be substituted for manufacturer's far-field sound level data. (iv) If specific noise control equipment has not been chosen, include a schedule for submitting the data prior to certification. (v) The estimate must demonstrate that the project will comply with applicable noise regulations and show how the facility will meet the following requirements: (A) The noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed a day-night sound level of 55 decibels on the A-weighted scale at any pre-existing noise-sensitive area (such as schools, hospitals, or residences). (B) New compressor stations or modifications of existing stations shall not result in a perceptible increase in vibration at any noise-sensitive area.	Section 9.3.4
5. Describe measures and manufacturer's specifications for equipment proposed to mitigate impact to air and noise quality, including emission control systems, installation of filters, mufflers, or insulation of piping and buildings, and orientation of equipment away from noise-sensitive areas.	Section 9.2.4

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ACRONYMS AND ABBREVIATIONS

AQCR	air quality control region
Btu	British Thermal Units
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
dB	decibel
dBA	decibel level using A-weighted scale
DRNA	Departamento De Recursos Naturales Y Ambientales (Department of Natural and Environmental Resources)
EQB	Junta de Calidad Ambiental de Puerto Rico (Puerto Rico Environmental Quality Board)
FERC	Federal Energy Regulatory Commission
FSU	floating storage unit
GHG	greenhouse gas
GHGRP	Greenhouse Gas Reporting Program
HAP	hazardous air pollutant
L_{10}	sound level that is exceeded 10 percent of the time
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
LNG	liquefied natural gas
$\mu g/m^3$	micrograms per cubic meter
MFH Facility	San Juan Micro-Fuel Handling Facility
MMBtu/hr	million British thermal units per hour
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutant
NFEnergía	NFEnergía LLC
NO_X	nitrogen oxides
NO_2	nitrogen dioxide
NSA	noise sensitive area
NSPS	New Source Performance Standards
$PM_{2.5}$	particulate matter 2.5 microns
PM_{10}	particulate matter 10 microns
ppb	parts per billion
ppm	parts per million

PREPA	Puerto Rico Electric Power Authority
PSD	Prevention of Significant Deterioration
SO_2	sulfur dioxide
tpy	tons per year
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

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9.0 RESOURCE REPORT 9—AIR AND NOISE QUALITY

9.1 Introduction

NFEnergía LLC ("NFEnergía") is seeking authorization from the Federal Energy Regulatory Commission ("FERC") under Section 3 of the Natural Gas Act to continue operating the San Juan Micro-Fuel Handling Facility ("MFH Facility"), a liquefied natural gas ("LNG") import and regasification facility. The MFH Facility is located on approximately 6.1 paved and fenced acres of an industrial area at Wharves A and B of the Puerto de San Juan ("Port of San Juan"), Puerto Rico, which is situated among existing industrial uses in the north of Puerto Rico where it can supply power generation sources serving nearby load centers using minimal additional infrastructure. To operate the MFH Facility, "pocket-sized" LNG vessels (also called "shuttle vessels") bring LNG into the San Juan Harbor where the LNG is transferred from the shuttle vessel to a non-jurisdictional floating storage unit ("FSU") vessel that is semi-permanently moored adjacent to the MFH Facility site. The FSU transfers LNG onshore where certain quantities remain liquefied and are transloaded onto trucks for over-the-road delivery to end users and certain quantities are regasified and made available to Units 5 and 6 of the adjacent San Juan Power Plant via a 75-foot long, 10-inch diameter segment of power plant piping. The MFH Facility has a regasification capacity of 130 million standard cubic feet per day and a truck loading capacity of 87.52 million standard cubic feet per day.

NFEnergía initially developed the MFH Facility to serve its commercial customers via a truck loading operation for distribution of LNG for regasification and use at behind-the-fence power generation facilities across Puerto Rico—typically multinational companies with manufacturing operations. In July 2018, Puerto Rico Electric Power Authority ("PREPA") issued a request for proposals to retrofit Units 5 and 6 of the San Juan Power Plant to enable dual-fuel capability and to supply PREPA with natural gas. NFEnergía participated in that competitive process and was chosen as the successful bidder. PREPA and NFEnergía entered into a contract to effectuate the award in March 2019 and the MFH Facility began operating in March 2020 and became fully operational in May 2020.

FERC's National Environmental Policy Act review process requires that an applicant submit an Environmental Report consisting of up to 13 individual resource reports. This resource report is consistent with and meets or exceeds all applicable FERC filing requirements. A checklist showing the status of FERC's filing requirements for Resource Report 9 (18 Code of Federal Regulations ["CFR"] § 380.12) is included before the table of contents.

Resource Report 9 describes the MFH Facility's direct and indirect impacts on existing air quality and noise conditions. This report characterizes and quantifies existing air quality and noise, identifies potential noise sensitive areas ("NSA"), and includes discussions of potential impacts on air quality and noise from operation of the MFH Facility. This report also summarizes federal, state, and local air quality and noise regulations applicable to the MFH Facility and, as appropriate, discusses forms of mitigation that may be used to reduce impacts during MFH Facility operation. Information contained in this resource report was obtained from federal, state, and

local regulations, equipment vendor data sheets, desktop analysis, and review of available literature.

9.2 Air Quality

Operation of the MFH Facility could affect air quality in the vicinity of the MFH Facility. Aboveground facilities associated with the MFH Facility that will generate emissions include onshore facilities and non-jurisdictional near-shore FSU and support vessels.

9.2.1 Regional Climate

NFEnergía accessed information from the nearest National Weather Service meteorological station to the MFH Facility to determine representative climate information.

The MFH Facility is located in the Gobernador Pinero Barrio of the San Juan Municipio, San Juan, Puerto Rico, where the climate is tropical, with a hurricane season from June to November. The humidity in the vicinity of the MFH Facility is relatively high year round due to the proximity to the Atlantic Ocean. According to climate data (1981–2010) obtained from the National Oceanic and Atmospheric Administration climate station at the San Juan Airport (RQW00011641), the annual average precipitation in San Juan is 56.4 inches of rain. The average temperatures are relatively consistent year round, with average maximum temperatures of 89.2 degrees Fahrenheit in July/August and average minimum temperatures of 72.0 degrees Fahrenheit in January/February (NOAA, 2021). Along the northern coast of Puerto Rico, prevailing winds are from the northeast (USGS, 2021).

9.2.2 Existing Air Quality

9.2.2.1 Ambient Air Quality Standards

The United States Environmental Protection Agency (“USEPA”), as required by the Clean Air Act (“CAA”) of 1970, has established National Ambient Air Quality Standards (“NAAQS”) to protect public health and welfare, referred to as primary standards, and to protect plant and animal life, buildings, and other features in the public interest, referred to as secondary standards. States have the authority to adopt ambient air quality standards if they are more stringent than the NAAQS. Puerto Rico has not adopted more stringent criteria for ambient air quality standards and has adopted the federal primary and secondary NAAQS.

Standards have been set for six principal pollutants, called “criteria pollutants.” These criteria pollutants are ground-level ozone, carbon monoxide (“CO”), nitrogen dioxide (“NO_2”), sulfur dioxide (“SO_2”), respirable and fine particulate matter (inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns [“PM_{10}”] and less than or equal to 2.5 microns [“$PM_{2.5}$”]), and airborne lead.

Ozone develops as a result of a chemical reaction between nitrogen oxides (“NO_X”) and volatile organic compounds (“VOC”) in the presence of sunlight. Accordingly, NO_X and VOCs are often referred to as ozone precursors. $PM_{2.5}$ may be directly emitted and can also be secondarily formed in the atmosphere as a result of SO_2 and NO_X emissions. SO_2 and NO_X are also referred to as $PM_{2.5}$ precursors. Table 9-1 lists the NAAQS for the six criteria pollutants.

Table 9-1: National Ambient Air Quality Standards.

Criteria Pollutant	Primary/ Secondary	Averaging Time	Level	Form of Air Quality Standard
CO	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
	Primary	1 hour	35 ppm	Not to be exceeded more than once per year
Lead	Primary and Secondary	Rolling 3-month average	0.15 µg/m^3 [a]	Not to be exceeded
NO_2	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and Secondary	1 year	53 ppb [b]	Annual mean
Ozone	Primary and Secondary	8 hours	0.070 ppm [c]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution				
$PM_{2.5}$	Primary	1 year	12 µg/m^3	Annual mean, averaged over 3 years
	Secondary	1 year	15 µg/m^3	Annual mean, averaged over 3 years
	Primary and Secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and Secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
SO_2	Primary	1 hour	75 ppb [d]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source: USEPA, 2021
Notes: µg/m^3 = micrograms per cubic meter; ppb = parts per billion; ppm = parts per million.
[a] In areas designated nonattainment for the lead standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m^3 as a calendar quarter average) also remain in effect.
[b] The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of parts per billion for the purposes of clearer comparison to the 1-hour standard level.
[c] Final rule published October 1, 2015, and effective December 28, 2015. The previous (2008) Ozone standards additionally remain in effect in some areas. Revocation of the previous (2008) Ozone standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.
[d] The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards; and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a State Implementation Plan call under the previous SO_2 standards (Title 40 of the CFR Part 50.4(3)). A State Implementation Plan call is a USEPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

9.2.2.2 Air Quality Control Region and Attainment Status

An air quality control region ("AQCR") is defined under 42 United State Code § 7407(c) as "any interstate area or major intrastate area which the Administrator of the USEPA deems necessary or appropriate for the attainment and maintenance of ambient air quality standards." Each AQCR, or portion(s) of an AQCR, is classified as "attainment," "nonattainment," "unclassifiable," or "maintenance" with respect to the NAAQS for each criteria pollutant.

Areas where ambient air concentrations of the criteria pollutants are below the levels listed in the NAAQS are considered in attainment. If ambient air concentration of a criteria pollutant exceeds the NAAQS, then the area is considered to be nonattainment for that pollutant. Areas

that have been designated nonattainment but have since demonstrated compliance with the NAAQS are designated maintenance for that pollutant. Maintenance areas are treated similarly to attainment areas for permitting stationary sources; however, specific provisions may be incorporated through the state's approved maintenance plan to ensure that air quality remains in compliance with the NAAQS for that pollutant. Maintenance areas retain the classification for 20 years before being reclassified as attainment areas. Areas where air quality data are not available are considered to be unclassifiable and are treated as attainment areas.

The MFH Facility is located in the San Juan, PR AQCR, which is currently designated as nonattainment for the 2010 SO_2 NAAQS. The MFH Facility area is designated as attainment or unclassifiable for all other criteria pollutants.

9.2.2.3 Greenhouse Gases

In April 2007, the United States Supreme Court ruled that greenhouse gases ("GHG") fall within the CAA's definition of "air pollutant." The USEPA identified the following six well-mixed GHGs in the atmosphere:

- carbon dioxide ("CO_2");
- methane;
- nitrous oxide;
- Hydrofluorocarbons;
- Perfluorocarbons; and
- sulfur hexafluoride.

The USEPA has expanded its regulations to include the emission of GHGs from major stationary sources under the Prevention of Significant Deterioration ("PSD") program. The USEPA's current rules require that a stationary source that is a major source for a non-GHG regulated New Source Review pollutant must also obtain a GHG PSD permit prior to beginning construction of a new or modified major source with mass-based GHG emissions equal to or greater than zero tons per year ("tpy") and significant net emission increases of carbon dioxide equivalent ("CO_2e") equal to or greater than 75,000 tpy. There is no NAAQS for GHGs.

GHG concentrations are often represented by an aggregate number expressed in units of CO_2e. For each GHG, the USEPA has determined a global warming potential factor, which is a relative measure of a GHG's ability to absorb solar radiation and its residence time in the atmosphere compared to that of CO_2. According to Title 40 of the CFR Part 98, Subpart A, Table A-1, CO_2 has a global warming potential of 1, whereas methane has a global warming potential of 25 and nitrous oxide has a global warming potential of 298.

9.2.3 Applicable Regulations and Permitting

This section summarizes the federal regulatory requirements for PSD, New Source Performance Standards ("NSPS"), National Emission Standards for Hazardous Air Pollutants

("NESHAP"), and Title V Operating Permits. Applicable Puerto Rico air quality regulations are also summarized.

For purposes of air permitting and air regulatory compliance, the MFH Facility is a stationary source as defined under air quality regulations and includes the following equipment:

- two 60 million British thermal units per hour ("MMBtu/hr") natural gas vaporizers;
- two 463 horsepower emergency diesel generators; and
- one 107 MMBtu/hr flare.

The MFH Facility received a construction air permit from the Puerto Rico Departamento De Recursos Naturales Y Ambientales ("DRNA" [Department of Natural and Environmental Resources]) on February 25, 2019 (amended on October 30, 2020) and is currently permitted as a PSD minor source of air emissions. The MFH Facility received an operational air permit on December 8, 2020.

9.2.3.1 Federal Regulations

New Source Review—Prevention of Significant Deterioration

The MFH Facility is a minor source with respect to PSD. The total annual MFH Facility emissions as compared to PSD thresholds is included in section 9.2.4.

New Source Performance Standards

Section 111 of the CAA authorized the USEPA to develop technology-based standards that apply to specific categories of stationary sources. These standards, referred to as NSPS, are found in 40 CFR 60. The NSPS applies to new, modified, and reconstructed affected facilities in specific source categories. NSPS regulations are issued for categories of sources causing or contributing significantly to air pollution that may reasonably be anticipated to endanger public health or welfare.

The following NSPS apply to emission units at the MFH Facility:

- 40 CFR Part 60 Subpart IIII—Standards of Performance for Stationary Compression Ignition Internal Combustion Engines: the emergency generators comply with this NSPS.
- 40 CFR Part 60 Subpart Dc—Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units: the natural gas-fired LNG vaporizers comply with this NSPS.

National Emission Standards for Hazardous Air Pollutants

The NESHAPs, codified in 40 CFR 61 and 63, regulate the emissions of hazardous air pollutants ("HAP") from new and existing sources. The 1990 CAA Amendments established a list of 189 HAPs, resulting in the promulgation of Part 63, also known as the Maximum Achievable Control Technology standards. Part 63 regulates HAPs from major sources of HAPs and specific

source categories emitting HAPs. Some NESHAPs may apply to non-major sources (area sources) of HAPs. Major source thresholds for NESHAPs are 10 tpy of any single HAP or 25 tpy of total HAPs. As described in section 9.2.4 below, the MFH Facility is below both thresholds and is not considered to be a major source with respect to NESHAPs.

40 CFR Part 63 Subpart ZZZZ—National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines applies to the two 463 horsepower emergency diesel generators at the MFH Facility. Both emergency generators comply with this NESHAP.

Title V Operating Permits

In Puerto Rico, the USEPA has delegated its 40 CFR 70 Operating Permit Program authority to issue Title V permits to the DRNA. The threshold levels for determining the applicability for a Title V permit are:

- 100 tpy of any criteria air pollutant;
- 10 tpy of any individual HAP; and
- 25 tpy of any combination of HAPs.

Because the MFH Facility's emissions are below the Title V permit thresholds, the MFH Facility is not subject to Title V permitting requirements. The total annual MFH Facility emissions as compared to Title V thresholds is included in section 9.2.4.

General Conformity

Section 176(c) of the CAA requires federal agencies to ensure that federally approved or funded projects conform to the applicable approved State Implementation Plan. A General Conformity applicability analysis is required for any part of the MFH Facility occurring in nonattainment or maintenance areas for criteria pollutants. The MFH Facility must not:

- cause or contribute to any new violation of any standard in any area;
- increase the frequency or severity of any existing violation of any standard in any area; or
- delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

MFH Facility emissions covered under the operational air permit have been excluded from the General Conformity applicability analysis. The non-jurisdictional marine vessel emissions are not covered under an air permit and are considered an indirect emission subject to review under General Conformity. The General Conformity de minimis threshold for SO_2 is 100 tpy. As presented in section 9.2.4.1, the annual SO_2 emissions from operation of the FSU, shuttle vessel, and tug support vessel while unloading is 24.3 tpy. Therefore, a General Conformity review is not required for the MFH Facility.

Greenhouse Gas Reporting Rule

The USEPA's Mandatory Reporting of GHGs Rule and related regulations for the GHG Reporting Program ("GHGRP"), codified in 40 CFR 98, govern the collection of GHG emissions data. The rule requires large sources and suppliers in the United States to report GHG data, including information on how emissions are to be monitored, calculated, and quality assured for each source category applicable to each facility.

A facility is required to report GHG emissions under the GHGRP if the aggregated maximum rated heat input from all combustion sources is greater than 30 MMBtu/hr and the facility emits more than 25,000 metric tons of CO_2e in a calendar year. Based on current estimates, the MFH Facility will be subject to the GHGRP.

Class I Areas

The CAA designated certain areas (e.g., wilderness areas, national parks) of the United States as Mandatory Federal Class I areas, based on their air quality being considered a special feature. Class I areas are protected against several types of pollution, including elevated levels of criteria pollutant concentrations, visibility degradation, and acid deposition. If a PSD facility is within 62 miles (100 kilometers) of a Class I area, the facility is required to notify the appropriate federal land manager and to assess potential impacts of that project on the nearby Class I area.

As discussed in section 9.2.3, the MFH Facility is not subject to PSD permitting; therefore, a Class I area analysis is not required. The nearest Class I area is the Virgin Islands National Park located approximately 89 miles east of the MFH Facility. To assess potential impacts on the nearest Class I area, a Q/d analysis was completed to determine if the ratio of emissions of SO_2, $PM_{2.5}$, NO_X, or sulfuric acid (Q) to the distance in kilometers (d) of the MFH Facility to the Class I area is greater than 10 (Q/d > 10). The results of the Q/d analysis is presented in table 9-2. None of the calculated ratios of Q/d were greater than 10, so no impacts on Class I area as a result of the MFH Facility's operations would occur.

Table 9-2: Q/d Analysis of Class I Area.

Pollutant	Emissions (tpy)	Distance to Nearest Class I Area (kilometers)	Q/d ration
SO_2	0.3	89	<0.1
$PM_{2.5}$	4.1	89	<0.1
NO_X	8.6	89	0.1

Source: 40 CFR 52.21
E = east

9.2.3.2 Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and to minimize potential impacts if a release does occur. The regulations contain a list of substances (including methane, propane, and ethylene) and threshold quantities for determining applicability to stationary sources. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than the amount specified in the

regulation, the facility must prepare and submit a risk management plan. A risk management plan is not required to be submitted to the USEPA until the chemicals are stored on-site at the facility.

If a facility does not have a listed substance on-site or the quantity of a listed substance is below the applicability threshold, the facility does not have to prepare a risk management plan. However, if there is any regulated substance or other extremely hazardous substance on-site, the facility must still comply with the requirements of the General Duty Clause in Section 112(r)(1) of the CAA.

Stationary sources are defined in 40 CFR 68 as any buildings, structures, equipment, installations, or substance-emitting stationary activities that belong to the same industrial group, that are on one or more contiguous properties, that are under control of the same person (or persons under common control), and from which an accidental release may occur. However, the definition also states that the term "stationary source" does not apply to transportation, including storage incidental to transportation, of any regulated substance or any other extremely hazardous substance. The MFH Facility includes one propane storage tank and two emergency diesel generators. Diesel is not one of the listed substances regulated under 40 CFR 68. The propane storage tank has a capacity of 500 gallons (2,435 pounds). The regulatory threshold for propane is 10,000 pounds. The quantity stored at the MFH Facility is below the regulatory threshold and therefore the MFH Facility is not required to prepare a risk management plan.

9.2.3.3 Territory of Puerto Rico Permitting

The DRNA is the lead air permitting authority for the MFH Facility. NFEnergía obtained a construction air permit from the DRNA on February 25, 2019 (modified October 30, 2020). NFEnergía obtained an operational air permit from the DRNA on December 8, 2020. The construction and operational permits incorporate Puerto Rico air quality regulations applicable to the MFH Facility.

9.2.4 Air Quality Analysis—Operation

NFEnergía operates the following equipment at the MFH Facility to support the FERC-jurisdictional portion of the LNG transfer and liquefaction:

- two 60 MMBtu/hr natural gas vaporizers;
- two 463 horsepower emergency diesel generators; and
- one 107 MMBtu/hr flare.

The permitted operational emissions are presented in table 9-3. Additional details regarding calculation methodologies and assumptions are included in appendix 9A.

Table 9-3: MFH Facility Annual Operational Emissions.

Emission Unit	NO_X (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)	SO_2 (tpy)	CO_2e (tpy)	Largest Individual HAP (n-Hexane) (tpy) [b]	Total HAPs (tpy) [b]
Natural Gas Vaporizers (2)	5.7	19.4	2.9	4.0 / 4.0	0.3	61,547	1.0	1.0
Emergency Generators (2)	2.6	1.6	0.4	0.1 / 0.1	<0.1	326	--	<0.1
Flare	0.3	2.8	1.7	<0.1 / <0.1	<0.1	598	<0.01	<0.1
Marine LNG Unloading Fugitive Emissions [b, c]	--	--	--	--	--	1,035	--	--
Truck LNG Loading Fugitive Emissions [b, d]	--	--	--	--	--	421	--	--
Total Potential to Emit	8.6	23.8	5.0	4.1/4.1	0.3	63,927	1.0	1.0
Potential to Emit Subject to Title V and PSD Major Source Thresholds [b]	8.6	23.8	5.0	4.1/4.1	0.3	62,471	1.0	1.0
Title V Threshold	100	100	100	100	100	N/A	10	25
PSD Major Source Threshold	250	250	250	250	250	100,000	N/A	N/A

Source: Facility Operational Emission Calculations (appendix 9A).

[a] HAP Total emissions are aggregated for all air emission sources.

[b] Marine LNG unloading and truck LNG loading fugitive emissions are not included in the Title V and PSD Major Source threshold determinations.

[c] Based on up to 120 shuttle vessel deliveries per year, 30,000 cubic meters per vessel.

[d] Based on up to 100 trucks per day of LNG loading, 7 days per week.

Note: Short tons (2,000 pounds), not long or metric tons, are used in PSD applicability calculations. Metric tons are used in the GHG reporting rule.

9.2.4.1 Marine Vessel and Trucking Operations

Mobile sources do not require air permits from USEPA or DRNA. Mobile sources associated with the MFH Facility include:

- semi-permanently moored FSU;
- shuttle vessels to resupply the FSU (an average of 10 trips per month);
- tug support for shuttle vessels; and
- LNG trucking (up to 100 trucks per day, 7 days per week).

The emissions are calculated in conformance with applicable International Maritime Organization emission standards and fuel sulfur restrictions applicable to marine vessels in Puerto Rico. The summary of the marine vessels operation emissions within state waters are presented in table 9-4. Additional details regarding calculation methodologies and assumptions are included in appendix 9B. The main propulsion engine of the shuttle vessel can operate using either marine diesel fuel or LNG. The emission estimates in table 9-4 have been prepared assuming the use of marine diesel fuel; however, if LNG is used, the emissions from shuttle vessel operation would be lower.

A small amount of additional emissions are generated by LNG trucks entering the MFH Facility, driving to the loading station, and exiting the MFH Facility. Due to the short distance from the MFH Facility boundary to the LNG truck loading station, the emissions associated with truck LNG loading are negligible.

Table 9-4: Marine Vessel Operation Emissions.

Emission Unit	NO_X (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)	SO_2 (tpy)	CO_2e (tpy)
FSU	38.4	1.5	1.1	1.4/1.2	11.7	1,751
Shuttle Vessels	38.7	3.2	1.3	1.4/1.3	11.7	1,748
Tug Support Vessel	2.9	0.2	0.1	0.1/0.1	0.9	129
Total	**80.0**	**4.9**	**2.5**	**2.9/2.6**	**24.3**	**3,628**

Source: Marine Vessel Operational Emission Calculations (appendix 9B).

9.2.4.2 Project Induced Air Quality Impacts

As presented in tables 9-3 and 9-4, operation of the MFH Facility generates some air emissions. However, as noted in Resource Report 1, the purpose of the MFH Facility is to import LNG to San Juan, Puerto Rico for regasification and use at the adjacent PREPA power generation facility and for truck loading and distribution to commercial customers around Puerto Rico. Both at the PREPA power generation facility and with commercial customers, the natural gas provided by the MFH Facility is used to replace the historic use of diesel fuel.

NFEnergía has quantified the air quality emission benefits that occur as a result of the substitution of cleaner burning natural gas for diesel fuel.

PREPA Power Generation Facility

A portion of the LNG imported by the MFH Facility is regasified by two natural gas-fired LNG vaporizers and delivered to the adjacent PREPA power generation facility for use in two power generation units capable of firing both natural gas and diesel fuel.[1] NFEnergía's contract with PREPA currently allows it to supply up to 25 trillion British thermal units ("Btu") per year of natural gas to PREPA's facility, which is used to offset the historic use of diesel fuel for electric power generation.

NFEnergía completed air quality calculations to assess the potential air emission reductions that can be realized by substituting cleaner burning natural gas for diesel fuel at the PREPA power generation facility. The estimated air quality emission reductions are presented in table 9-5. Additional details regarding calculation methodologies and assumptions are included in appendix 9C.

[1] PREPA recently replaced existing Units 5 and 6 with new units capable of dual fuel operations to allow for natural gas fuel use.

Table 9-5: Air Emission Reductions at PREPA Facility.

Pollutant	Diesel Fuel Combustion (tpy) [a]	Natural Gas/Diesel Fuel Combustion (tpy) [b]	Emission Reduction
NO_X	1,664.4	1,174.2	-490.2
CO	1,778.7	308.1	-1,470.6
VOC	169.0	162.4	-6.6
PM_{10}	520.9	125.9	-395.0
$PM_{2.5}$	660.7	128.2	-532.5
SO_2	641.6	17.9	-623.7
CO_2e	2,078,706	1,497,264	-581,442
sulfuric acid	103.5	10.9	-92.6

Source: Air Emission Reduction Calculations (appendix 9C).
Notes:
[a] Based on maximum permitted annual operation of 15,000 hours (7,500 hours per year) using permitted emission rates and/or published emissions rates. See appendix 9C for additional calculation details.
[b] Based on 14,758 hours per year of turbine operation using natural gas (equal to 25 trillion Btu/year, which is the current rate that the MFH Facility is contracted to provide to PREPA) and 242 hours per year of turbine operation using fuel oil for a total of 15,000 hours per year of total turbine operation. Emissions for natural gas use were calculated using manufacturer specifications for the new units installed at the PREPA facility and/or publically available emission rates for similar units. See appendix 9C for additional calculation details.

As presented in table 9-5, the combustion of natural gas supplied by the MFH Facility at the PREPA power generation facility can result in significant air quality emission reductions, including up to 623.7 tpy of SO_2, which will assist in improving the air quality in the San Juan area. As previously noted, San Juan is currently classified as nonattainment for the SO_2 NAAQS.

Commercial Customers

A portion of the LNG imported by the MFH Facility is available for truck loading and delivery to commercial facilities. The LNG is used by these facilities to offset diesel fuel combustion for boilers and other energy generating units. In general, additional GHG and other criteria pollutant reductions will occur from this additional fuel switching. NFEnergía is in the process of assessing the potential air emission reductions that can be realized by substituting cleaner burning natural gas for diesel fuel at these commercial facilities and will provide additional information, if available, as a supplemental filing.

The delivery of LNG to commercial customers results in transportation emissions associated with LNG trucking. However, as previously noted, the LNG delivered to these facilities is used to replace a portion of the diesel fuel currently used by the facilities. The diesel fuel historically used by these facilities was delivered via truck from a location near the MFH Facility in the Port of San Juan; therefore, the delivery of LNG to these commercial customers will result in no incremental increase in air emissions.

9.2.5 Climate Change

GHG emissions associated with operation of the FERC-jurisdictional MFH Facility generates 63,927 tpy of CO_2e, and operation of the non-jurisdictional aspects generate 3,628 tpy of CO_2e, for a total of 67,555 tpy of GHG emissions.

However, as noted in section 9.2.4.2, the LNG imported by the MFH Facility is used to offset the historic use of diesel fuel. As presented in table 9-5, the MFH Facility at current contracted capacity of 25 trillion Btu per year to PREPA has the potential to reduce GHG emissions by 581,442 tpy. The GHG emission offset associated with natural gas usage at PREPA, when combined with the operational GHG emissions associated with the MFH Facility (67,555 tpy), will result in potential GHG reductions of 513,887 tpy. Additional GHG reductions associated with the offset of diesel fuel for LNG at commercial facilities (LNG trucking customers) has not been quantified, but will result in additional GHG emission reductions. Therefore, the MFH Facility results in a substantial net reduction of GHG emissions, with commensurate reductions in potential for impacts associated with climate change, which will be discussed in greater depth in a supplemental filing addressing cumulative impacts.

9.3 Noise Quality

Operation of the MFH Facility generates noise, which could affect sensitive noise receptors near the MFH Facility. Aboveground facilities associated with the MFH Facility that will generate noise include the onshore facilities and the non-jurisdictional near-shore FSU and shuttle vessels.

9.3.1 Principles of Noise

Sound is a sequence of waves of pressure that propagates through compressible media such as air or water. When sound becomes excessive, annoying, or unwanted, it is often referred to as noise. The MFH Facility has the potential to affect existing ambient noise conditions in surrounding areas during operation.

The ambient sound level of a region is defined by the total noise generated within the specific environment and usually comprises natural and anthropogenic sounds. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week. This variation may be caused in part by changing weather conditions and the effect of seasonal changes in vegetative cover.

Two measurements used by some federal agencies to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level ("L_{eq}") and the day-night sound level ("L_{dn}"). The L_{eq} is a sound level over a specific period corresponding to the same sound energy as measured for an instantaneous sound level, assuming it is a constant noise source. Sound levels, measured in decibels ("dB"), are perceived differently, depending on the length of exposure and time of day. The L_{dn} takes into account the duration and time the noise is encountered. Specifically, in the calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 dB to account for people's greater sensitivity to sound during nighttime hours. The sound level that is exceeded 10 percent of the time ("L_{10}") is also used to regulate noise in Puerto Rico. To account for the human ear's sensitivity to low-level noises, dB levels are corrected using the A-weighted scale ("dBA"). The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies.

Table 9-6 demonstrates the relative dBA levels of common sounds measured in the environment and industry. A 3 dB change of sound level is considered to be barely perceivable by the human ear. A 5 dB change of sound level is considered clearly noticeable, and a 10 dB increase is perceived as if the sound level intensity doubled (WHO, 1995).

Table 9-6: Sound Levels and Relative Loudness.

Description of Sound	Sound Level (dBA)	Relative Loudness (dBA) [a]
Threshold of Pain	140	256
Jet Taking Off (200 feet away)	130	128
Operating Heavy Equipment	120	64
Night Club (with music)	110	32
Construction Facilities	100	16
Boiler Room	90	8
Freight Train (100 feet away)	80	4
Classroom Chatter	70	2
Conversation (3 feet away)	60	1
Urban Residence	50	1/2
Soft Whisper (5 feet away)	40	1/4
North Rim of Grand Canyon	30	1/8
Silent Study Room	20	1/16
Threshold of Human Hearing (1,000 Hertz)	0	1/64

Source: Adapted from United States Department of Labor, 2016.
[a] Relative loudness is how the sound is perceived by the human ear. Higher dBs are perceived as louder.

9.3.2 Applicable Regulations

9.3.2.1 Federal Regulations

In 1974, the USEPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety* (USEPA, 1974), which evaluated the effects of environmental noise with respect to health and safety. As set forth in this publication, the USEPA determined that noise levels should not exceed an L_{dn} of 55 dBA, which is the level that protects the public from indoor and outdoor activity interference. This noise level has been used by state and federal agencies to establish noise limitations for various noise sources. A 55 dBA L_{dn} noise level equates to an L_{eq} of 48.6 dBA (i.e., a facility that does not exceed a continuous noise impact of 48.6 dBA will not exceed 55 dBA L_{dn}).

FERC has adopted the following criterion described in 18 CFR 380.12(k) for new LNG facilities. Therefore, it was used to assess the potential noise impact from the operation of the MFH Facility:

> *The noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed an L_{dn} of 55 dBA at any pre-existing NSAs such as schools, hospitals, or residences.*

A comparison of the operation of the jurisdictional portions of the MFH Facility to the FERC noise criterion is presented in section 9.3.4.

9.3.2.2 Territory and Local Regulations

The Territory of Puerto Rico has established noise regulations applicable to the operation of the MFH Facility, as found in the Junta de Calidad Ambiental de Puerto Rico ("EQB" [Puerto Rico Environmental Quality Board]) Regulation of the EQB for the Control of Noise Pollution, Regulation No. 8019 (EQB, 2011). Table 9-7 summarizes the EQB noise limits.

Table 9-7: Puerto Rico EQB Noise Limits.

Emitting Source Zone	Receiving Zones							
	Zone I (Residential)		Zone II (Commercial)		Zone III (Industrial)		Zone IV (Quiet)	
	Daytime (dBA L_{10})	Nighttime (dBA L_{10})	Daytime (dBA L_{10})	Nighttime (dBA L_{10})	Daytime (dBA L_{10})	Nighttime (dBA L_{10})	Daytime (dBA L_{10})	Nighttime (dBA L_{10})
Zone I (Residential)	60	50	65	55	70	60	55	50
Zone II (Commercial)	65	50	70	60	75	65	55	50
Zone III (Industrial)	65	50	70	65	75	75	55	50
Zone IV (Quiet)	65	50	70	65	75	75	55	50

Source: EQB, 2011
Notes: Daytime is defined as 7:00 am to 10:00 pm, and nighttime is defined as 10:01 pm to 6:59 am.

The maximum permissible sound level (L_{10}) at NSAs during daytime hours is 65 dBA and during nighttime hours is 50 dBA. The maximum permissible sound level (L_{10}) for industrial areas at all times is 75 dBA. Therefore, the noise levels prescribed by FERC are more restrictive.

9.3.3 Noise Sensitive Areas and Existing Ambient Noise Levels

The MFH Facility is located in a largely industrial area; however, various NSAs are located within 1 mile of the MFH Facility. As shown on figure 1 in appendix 9E, the closest NSAs are residences west of the MFH Facility. NFEnergía conducted a pre-construction ambient (baseline) noise survey, which is included in appendix 9D. Table 9-8 provides a summary of the nearest NSAs in each cardinal direction, their proximity to the MFH Facility, and the results of the baseline noise survey.

Table 9-8: NSA Locations and Baseline Noise Survey Results.

Noise Sensitive Area	Distance and Direction to NSA from the MFH Facility	Surveyed Daytime Ambient Noise Level (L_{eq}) dBA	Surveyed Nighttime Ambient Noise Level (L_{eq}) dBA	Surveyed Ambient Noise Level (L_{dn}) dBA
NSA 1	1,844 feet west	70	53	68
NSA 2	2,288 feet southwest	60	53	61
NSA 3	3,128 feet northwest	61	56	64
NSA 4	6,197 feet southeast	61	65	71
NSA 5	10,837 feet northeast	66	54	65

Source: Baseline Sound Survey, March 2018 (appendix 9D). Distances have been updated based on the nearest noise generating source at the Facility.

9.3.4 Noise Quality Analysis—Operation

Operation of the MFH Facility produces noise on a continuous basis. The primary continuous noise generating sources are the following:

- LNG vaporizers;
- boil-off gas compressor;
- LNG pump skid; and
- air compressor (operates during LNG truck loading).

To assess compliance with FERC's noise criterion, NFEnergía completed an operational noise survey. Table 9-9 presents the results of the operational noise survey and the operational noise impacts on nearby NSAs.

Table 9-9: MFH Facility Operational Noise Impacts.

Noise Sensitive Area	Distance and Direction to NSA from the MFH Facility	Estimated Ambient L_{dn} without MFH Facility Operation (dBA)	Noise Attributable to MFH Facility at Full Load (L_{dn}) (dBA)	Ambient Noise + MFH Facility at Full Load (L_{dn}) (dBA)	Estimated Noise Increase (dBA)
NSA 1	1,844 feet west	68.0	55.9	68.3	0.3
NSA 2	2,288 feet southwest	70.5	54.3	70.6	0.1
NSA 3	3,128 feet northwest	67.8	52.8	68.0	0.2
NSA 4	6,197 feet southeast	66.2	47.1	66.2	<0.1
NSA 5	10,837 feet northeast	69.7	42.2	69.7	<0.1

Source: Operational Noise Report, August 2021 (appendix 9E).

As presented in table 9-9, the noise attributable to the operation of the MFH Facility is less than 55 dBA L_{dn} at NSAs 2 to 5. Noise attributable to operational of the MFH Facility at NSA 1 is 55.9 dBA $L_{dn,}$ which is less than 1 dB above FERC's noise criterion. Based on the elevated background sound levels at NSA 1 and observations during the operational noise survey, the noise attributable to the MFH Facility operation is not the dominant noise source at NSA 1, and is only periodically audible at NSA 1. NFEnergía believes that operation of the MFH Facility is not impacting the nearby NSAs, and is not proposing any additional noise mitigation measures.

Additional details regarding the operational noise survey and calculation methodologies are presented in appendix 9E. Based on this survey, operational noise from the MFH Facility has been adequately assessed and no additional operational noise surveys are required.

Additional intermittent noise is generated by the flare, which operates only when the MFH Facility is shut down. Noise associated with flare operation is 34.5 dBA L_{dn} at the nearest NSA. Therefore, noise associated with flare operation will be lower than existing ambient noise levels at the nearby NSAs and is not anticipated to be significant.

9.4 References:

Puerto Rico Environmental Quality Board (EQB). 2011. Regulation of the EQB for the Control of Noise Pollution, Regulation No. 8019. Amended January 2011.

United States Environmental Protection Agency (USEPA). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. EPA/550/9-74-004. 242 pp.

USEPA. 2021. National Ambient Air Quality Standards Table. Available online at: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed: June 2021.

United States Geological Survey (USGS). 2021. Caribbean-Florida Water Science Center—Climate of Puerto Rico. Available online at: https://www.usgs.gov/centers/car-fl-water/science/climate-puerto-rico?qt-science_center_objects=0#qt-science_center_objects. Accessed: June 2021.

World Health Organization (WHO). 1995. Occupational Exposure to Noise Evaluation, Prevention and Control. Available online at: https://www.who.int/occupational_health/publications/noise.pdf. Accessed: June 2021.

APPENDIX 9A FACILITY OPERATIONAL EMISSION CALCULATIONS

New Fortress Energy
Puerto Rico
MFH Facility

Emissions Overview

Emissions Summary

Emissions Overview									
CAS Number	Pollutant	FGH [1] (tpy)	Flare [2] (tpy)	DG [3] (tpy)	Project Total (tpy)	Title V Threshold (tpy)	Exceed Title V (Yes/No)	Major PSD Threshold (tpy)	Exceed Major? (Yes/No)
Criteria Pollutants									
630-08-0	Carbon Monoxide (CO)	19.45	2.807	1.59	23.85	100	No	250	No
--	Nitrogen Oxides (NO_x)	5.73	0.327	2.55	8.61	100	No	250	No
--	Particulate Matter (PM)	3.99	0.039	0.09	4.12	100	No	250	No
--	PM < 10 microns (PM_{10})	3.99	0.039	0.09	4.12	100	No	250	No
--	PM < 2.5 microns ($PM_{2.5}$)	3.99	0.039	0.09	4.12	100	No	250	No
7446-09-5	Sulfur Dioxide (SO_2)	0.30	0.0029	0.003	0.31	100	No	250	No
--	Volatile Organic Compounds (VOC)	2.89	1.695	0.36	4.95	100	No	250	No
7439-92-1	Lead (Pb)	0.26	--	--	0.26	100	No	250	No
7664-93-9	Sulfuric Acid Mist (H_2SO_4)	0.05	0.00045	0.0005	0.05	100	No	250	No
16984-48-8	Fluorides	--	--	--	0	100	No	250	No
7783-06-4	Hydrogen Sulfide (H_2S)	--	--	--	0	100	No	250	No
--	Reduced Sulfur Compounds	--	--	--	0	100	No	250	No
--	Total Reduced Sulfur	--	--	--	0	100	No	250	No
7439-97-6	Mercury	--	--	--	0	--	--	--	--
--	Greenhouse Gas (Mass Basis)	61,484.53	597.40	325.0	62,406.92	--	--	--	No
--	Greenhouse Gas (CO_2e Basis)	61,546.76	598.01	326.1	62,470.85	75,000	No	100,000	No
Hazardous Air Pollutants (HAPs)									
75-07-0	Acetaldehyde	--	2.20E-04	5.02E-05	2.70E-04	10	No	--	--
107-02-8	Acrolein	--	5.11E-05	1.57E-05	6.68E-05	10	No	--	--
71-43-2	Benzene	1.10E-03	8.12E-04	1.55E-03	3.46E-03	10	No	--	--
106-46-7	1,4-Dichlorobenzene	6.31E-04	--	--	6.31E-04	10	No	--	--
100-41-4	Ethyl Benzene	--	7.37E-03	--	7.37E-03	10	No	--	--
50-00-0	Formaldehyde	3.94E-02	5.97E-03	1.57E-04	4.55E-02	10	No	--	--
110-54-3	Hexane	9.46E-01	1.48E-04	--	9.46E-01	10	No	--	--
91-20-3	Naphthalene	3.21E-04	5.62E-05	2.59E-04	6.36E-04	10	No	--	--
--	Polycyclic Organic Matter	4.64E-05	1.53E-05	1.62E-04	2.24E-04	10	No	--	--
75-56-9	Propylene Oxide	--	1.25E-02	--	1.25E-02	10	No	--	--
108-88-3	Toluene	1.79E-03	2.96E-04	5.60E-04	2.64E-03	10	No	--	--
1330-20-7	Xylenes	--	1.48E-04	3.85E-04	5.33E-04	10	No	--	--
7440-38-2	Arsenic	1.05E-04	--	8.72E-06	1.14E-04	10	No	--	--
7440-41-7	Beryllium	6.31E-06	--	5.13E-06	1.14E-05	10	No	--	--
7440-43-9	Cadmium	5.78E-04	--	2.15E-05	6.00E-04	10	No	--	--

CAS Number	Pollutant	FGH [1] (tpy)	Flare [2] (tpy)	DG [3] (tpy)	Project Total (tpy)	Title V Threshold (tpy)	Exceed Title V (Yes/No)	Major PSD Threshold (tpy)	Exceed Major? (Yes/No)
7440-47-3	Chromium	7.36E-04	--	9.74E-05	8.33E-04	10	No	--	--
7440-48-4	Cobalt	4.42E-05	--	--	4.42E-05	10	No	--	--
7439-92-1	Lead	2.63E-04	--	--	2.63E-04	10	No	--	--
7439-96-5	Manganese	2.00E-04	--	2.15E-05	2.21E-04	10	No	--	--
7439-97-6	Mercury	1.37E-04	--	4.10E-05	1.78E-04	10	No	--	--
7440-02-0	Nickel	1.10E-03	--	3.47E-04	1.45E-03	10	No	--	--
7782-49-2	Selenium	1.26E-05	--	--	1.26E-05	10	No	--	--
--	Total HAPs	--	--	--	1.02E+00	25	No	--	--

Notes [ ]:

1. See section "Potential to Emit (PTE): Fuel Gas Heater" of this appendix for detailed calculations.
2. See section "Potential to Emit (PTE): Flare" of this appendix for detailed calculations.
3. See section "Potential to Emit (PTE): Emergency Diesel Generator" of this appendix for detailed calculations.

New Fortress Energy
Puerto Rico
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Potential to Emit (PTE): Fuel Gas Heater

Basis/Inputs

Heater Data (per source)			
Number of Heaters	number	**2**	
Fuel	type	**Natural Gas**	
Heat Input	mmBtu/hr	60.00	
Heating Value of Fuel (HHV basis)	Btu/scf	**1,000**	[1]
Fuel Burn Rate	scf/hr	**60,000**	[1]
	scf/yr	525,600,000	
Annual Operating Hours	hr/yr	**8,760**	

Micellaneous Data			
Sulfur Concentration in Fuel	gr/100-scf	**0.2**	[1]
SO_2 to SO_3 Conversion Rate	%(vol.)	**10**	[2]
Molecular Weights			
Hydrogen (H)	lb/lbmol	**1.008**	[3]
Oxygen (O)	lb/lbmol	**15.999**	[3]
Sulfer (S)	lb/lbmol	**32.06**	[3]
Global Warming Potential			
Carbon Dioxide (CO_2)	--	**1**	[4]
Methane (CH_4)	--	**25**	[4]
Nitrous Oxide (N_2O)	--	**298**	[4]

Emissions Summary

PTE: Fuel Gas Heater

CAS Number	Pollutant	Per Heater				Project Total PTE (tpy)
		Emission Factor		Em. Rate (lb/hr)	PTE (tpy)	
Criteria Pollutants						
630-08-0	Carbon Monoxide (CO)	lb/mmBtu	**0.0370** [1]	2.22	9.72	19.45
--	Nitrogen Oxides (NO_X)	lb/mmBtu	**0.0109** [1]	0.65	2.86	5.73
--	Particulate Matter (PM)	lb/mmBtu	**0.0076** [1]	0.46	2.00	3.99
--	PM < 10 microns (PM_{10})	lb/mmBtu	**0.0076** [1]	0.46	2.00	3.99
--	PM < 2.5 microns ($PM_{2.5}$)	lb/mmBtu	**0.0076** [1]	0.46	2.00	3.99
7446-09-5	Sulfur Dioxide (SO_2)	lb/mmscf	0.57 [5]	0.03	0.15	0.30
--	Volatile Organic Compounds (VOC)	lb/mmBtu	**0.0055** [1]	0.33	1.45	2.89
7439-92-1	Lead (Pb)	lb/mmscf	**5.00E-04** [9]	0.03	0.13	0.26
7664-93-9	Sulfuric Acid Mist (H_2SO_4)	lb/mmscf	0.09 [11]	0.01	0.02	0.05
16984-48-8	Fluorides	lb/mmscf	-- --	--	--	--
7783-06-4	Hydrogen Sulfide (H_2S)	lb/mmscf	-- --	--	--	--
--	Reduced Sulfur Compounds	lb/mmscf	-- --	--	--	--
--	Total Reduced Sulfur	lb/mmscf	-- --	--	--	--
7439-97-6	Mercury	lb/mmscf	-- --	--	--	--
--	Greenhouse Gas (Mass Basis)	--	-- [6]	7,018.78	30,742.27	61,484.53

CAS Number	Pollutant	Per Heater					Project
		Emission Factor			Em. Rate	PTE	Total PTE
					(lb/hr)	(tpy)	(tpy)
124-38-9	Carbon Dioxide (CO_2)	kg/mmBtu	**53.06**	[7]	7,018.64	30,741.63	61,483.26
74-82-8	Methane (CH_4)	kg/mmBtu	**0.0010**	[7]	0.13	0.58	1.16
10024-97-2	Nitrous Oxide (N_2O)	kg/mmBtu	**0.00010**	[7]	0.01	0.06	0.12
--	Greenhouse Gas (CO_2e Basis)	--	--	[6]	7,025.89	30,773.38	61,546.76
124-38-9	Carbon Dioxide (CO_2)	--	--	[4]	7,018.64	30,741.63	61,483.26
74-82-8	Methane (CH_4)	--	--	[4]	3.31	14.48	28.97
10024-97-2	Nitrous Oxide (N_2O)	--	--	[4]	3.94	17.27	34.53
Hazardous Air Pollutants (HAPs)							
71-43-2	Benzene	lb/mmscf	**2.10E-03**	[8]	1.26E-04	5.52E-04	1.10E-03
106-46-7	1,4-Dichlorobenzene	lb/mmscf	**1.20E-03**	[8]	7.20E-05	3.15E-04	6.31E-04
50-00-0	Formaldehyde	lb/mmscf	**7.50E-02**	[8]	4.50E-03	1.97E-02	3.94E-02
110-54-3	Hexane	lb/mmscf	**1.80E+00**	[8]	1.08E-01	4.73E-01	9.46E-01
91-20-3	Naphthalene	lb/mmscf	**6.10E-04**	[8]	3.66E-05	1.60E-04	3.21E-04
	Polycyclic Organic Matter	lb/mmscf	8.82E-05	[6]	5.29E-06	2.32E-05	4.64E-05
91-57-6	2-Methylnaphthalene	lb/mmscf	**2.40E-05**	[8]	--	--	--
56-49-5	3-Methylchloranthrene	lb/mmscf	**1.80E-06**	[8]	--	--	--
57-97-6	7,12-Dimethylbenz(a)anthracene	lb/mmscf	**1.60E-05**	[8]	--	--	--
83-32-9	Acenaphthene	lb/mmscf	**1.80E-06**	[8]	--	--	--
208-96-8	Acenaphthylene	lb/mmscf	**1.80E-06**	[8]	--	--	--
120-12-7	Anthracene	lb/mmscf	**2.40E-06**	[8]	--	--	--
56-55-3	Benz(a)anthracene	lb/mmscf	**1.80E-06**	[8]	--	--	--
50-32-8	Benzo(a)pyrene	lb/mmscf	**1.20E-06**	[8]	--	--	--
205-99-2	Benzo(b)fluoranthene	lb/mmscf	**1.80E-06**	[8]	--	--	--
191-24-2	Benzo(g,h,i)perylene	lb/mmscf	**1.20E-06**	[8]	--	--	--
207-08-9	Benzo(k)fluoranthene	lb/mmscf	**1.80E-06**	[8]	--	--	--
218-01-9	Chrysene	lb/mmscf	**1.80E-06**	[8]	--	--	--
53-70-3	Dibenz(a,h)anthracene	lb/mmscf	**1.20E-06**	[8]	--	--	--
206-44-0	Fluoranthene	lb/mmscf	**3.00E-06**	[8]	--	--	--
86-73-7	Fluorene	lb/mmscf	**2.80E-06**	[8]	--	--	--
193-39-5	Indeno(1,2,3-cd)pyrene	lb/mmscf	**1.80E-06**	[8]	--	--	--
85-01-8	Phenanathrene	lb/mmscf	**1.70E-05**	[8]	--	--	--
129-00-0	Pyrene	lb/mmscf	**5.00E-06**	[8]	--	--	--
108-88-3	Toluene	lb/mmscf	**3.40E-03**	[8]	2.04E-04	8.94E-04	1.79E-03
7439-92-1	Lead	lb/mmscf	**5.00E-04**	[9]	3.00E-05	1.31E-04	2.63E-04
7440-38-2	Arsenic	lb/mmscf	**2.00E-04**	[10]	1.20E-05	5.26E-05	1.05E-04
7440-41-7	Beryllium	lb/mmscf	**1.20E-05**	[10]	7.20E-07	3.15E-06	6.31E-06
7440-43-9	Cadmium	lb/mmscf	**1.10E-03**	[10]	6.60E-05	2.89E-04	5.78E-04
7440-47-3	Chromium	lb/mmscf	**1.40E-03**	[10]	8.40E-05	3.68E-04	7.36E-04
7440-48-4	Cobalt	lb/mmscf	**8.40E-05**	[10]	5.04E-06	2.21E-05	4.42E-05
7439-96-5	Manganese	lb/mmscf	**3.80E-04**	[10]	2.28E-05	9.99E-05	2.00E-04
7439-97-6	Mercury	lb/mmscf	**2.60E-04**	[10]	1.56E-05	6.83E-05	1.37E-04
7440-02-0	Nickel	lb/mmscf	**2.10E-03**	[10]	1.26E-04	5.52E-04	1.10E-03
7782-49-2	Selenium	lb/mmscf	**2.40E-05**	[10]	1.44E-06	6.31E-06	1.26E-05
	Total HAPs	--	--	[6]	--	4.96E-01	9.93E-01
Other Pollutants							
106-97-8	Butane	lb/mmscf	**2.10E+00**	[8]	1.26E-01	5.52E-01	1.10E+00
74-84-0	Ethane	lb/mmscf	**3.10E+00**	[8]	1.86E-01	8.15E-01	1.63E+00
109-66-0	Pentane	lb/mmscf	**2.60E+00**	[8]	1.56E-01	6.83E-01	1.37E+00
74-98-6	Propane	lb/mmscf	**1.60E+00**	[8]	9.60E-02	4.20E-01	8.41E-01
7440-39-3	Barium	lb/mmscf	**4.40E-03**	[10]	2.64E-04	1.16E-03	2.31E-03

CAS Number	Pollutant	Per Heater					Project Total PTE (tpy)
		Emission Factor			Em. Rate (lb/hr)	PTE (tpy)	
7440-50-8	Copper	lb/mmscf	**8.50E-04**	[10]	5.10E-05	2.23E-04	4.47E-04
7439-98-7	Molybdenum	lb/mmscf	**1.10E-03**	[10]	6.60E-05	2.89E-04	5.78E-04
7440-62-2	Vanadium	lb/mmscf	**2.30E-02**	[10]	1.38E-03	6.04E-03	1.21E-02
7440-66-6	Zinc	lb/mmscf	**2.90E-02**	[10]	1.74E-03	7.62E-03	1.52E-02

Notes [ ]:

1. Based on preliminary vendor information or site specific data.
2. Assumed.
3. Data obtained from Reference 1.
4. CO_2 equivalents (CO_2e) based on the global warming potential for applicable pollutant as listed in Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials [10/2018].
5. Assumed all sulfur in the fuel is converted to SO_2.
6. Summation of individual applicable pollutants.
7. Data obtained from Tables C-1 and C-2 of 40 CFR Part 98 (October 2018).
8. Emission factor obtained from AP-42 (Reference 2b).
9. Emission factor obtained from AP-42 (Reference 2a).
10. Emission factor obtained from AP-42 (Reference 2c).
11. Assumed 10% (by volume) of SO_2 is converted to SO_3 and 100% (by volume) of SO_3 is converted H_2SO_4.

References:

1. IUPAC Periodic Table of the Elements. 28 November 2016. https://iupac.org/what-we-do/periodic-table-of-elements/
2. USEPA, AP-42, Fifth Edition, Vol. I. Chapter 1 "External Combustion Sources", Section 1.4 "Natural Gas Combustion". July 1998.
   a. Table 1.4-2 "Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion"
   b. Table 1.4-3 "Emission Factors for Speciated Organic Compounds from Natural Gas Combustion"
   c. Table 1.4-4 "Emission Factors for Metals from Natural Gas Combustion"

New Fortress Energy
Puerto Rico
MFH Facility

Potential to Emit (PTE): Flare

Basis/Inputs

Flare Data			
Number of Flares	number	1	
Fuel	type	Natural Gas	
Heating Value of Fuel (HHV basis)	Btu/scf	1,000	[1]
Operational Data (per unit)			
Normal Operation			
Fuel Burn Rate	cf/hr	84,990	[1]
Annual Operating Hours	hr/yr	120	[12]
Pilot Operation			
Fuel Burn Rate	cf/hr	125	[1]
Annual Operating Hours	hr/yr	120	[15]
Total	cf/yr	10,213,804	

Micellaneous Data			
Sulfur Concentration in Fuel	gr/100-scf	0.2	[1]
Density of Fuel	lb/ft^3	0.042	[13]
SO_2 to SO_3 Conversion Rate	%(vol.)	10	[2]
Molecular Weights			
Hydrogen (H)	lb/lbmol	1.008	[3]
Oxygen (O)	lb/lbmol	15.999	[3]
Sulfer (S)	lb/lbmol	32.06	[3]
Global Warming Potential			
Carbon Dioxide (CO_2)	--	1	[4]
Methane (CH_4)	--	25	[4]
Nitrous Oxide (N_2O)	--	298	[4]

Emissions Summary

PTE: Flare

CAS Number	Pollutant	Per Flare				Project Total PTE
		Emission Factor		Em. Rate (lb/hr)	PTE (tpy)	(tpy)
Criteria Pollutants						
630-08-0	Carbon Monoxide (CO)	lb/mmBtu	0.5496 [5]	46.78	2.81	2.81
--	Nitrogen Oxides (NO_X)	lb/mmBtu	0.0641 [5]	5.46	0.33	0.33
--	Particulate Matter (PM)	lb/mmscf	7.6 [6]	0.65	0.04	0.04
--	PM < 10 microns (PM_{10})	lb/mmscf	7.6 [6]	0.65	0.04	0.04
--	PM < 2.5 microns ($PM_{2.5}$)	lb/mmscf	7.6 [6]	0.65	0.04	0.04
7446-09-5	Sulfur Dioxide (SO_2)	lb/mmscf	0.6 [7]	0.05	0.00	0.00
--	Volatile Organic Compounds (VOC)	lb/mmscf	332.0 [8]	28.26	1.70	1.70
7439-92-1	Lead (Pb)	lb/mmscf	-- --	--	--	--
7664-93-9	Sulfuric Acid Mist (H_2SO_4)	lb/mmscf	-- [14]	0.01	0.000	0.000
16984-48-8	Fluorides	lb/mmscf	-- --	--	--	--
7783-06-4	Hydrogen Sulfide (H_2S)	lb/mmscf	-- --	--	--	--
--	Reduced Sulfur Compounds	lb/mmscf	-- --	--	--	--

CAS Number	Pollutant	Per Flare					Project Total PTE
		Emission Factor			Em. Rate (lb/hr)	PTE (tpy)	(tpy)
--	Total Reduced Sulfur	lb/mmscf	--	--	--	--	--
7439-97-6	Mercury	lb/mmscf	--	--	--	--	--
--	Greenhouse Gas (Mass Basis)	--	--	[9]	9,956.73	597.40	597.40
124-38-9	Carbon Dioxide (CO_2)	kg/mmBtu	**53.06**	[10]	9,956.52	597.39	597.39
74-82-8	Methane (CH_4)	kg/mmBtu	**0.0010**	[10]	0.19	0.01	0.01
10024-97-2	Nitrous Oxide (N_2O)	kg/mmBtu	**0.00010**	[10]	0.02	0.00	0.00
--	Greenhouse Gas (CO_2e Basis)	--	--	[9]	9,966.81	598.01	598.01
124-38-9	Carbon Dioxide (CO_2)	--	--	[4]	9,956.52	597.39	597.39
74-82-8	Methane (CH_4)	--	--	[4]	4.69	0.28	0.28
10024-97-2	Nitrous Oxide (N_2O)	--	--	[4]	5.59	0.34	0.34
Hazardous Air Pollutants (HAPs)							
75-07-0	Acetaldehyde	lb/mmscf	**4.30E-02**	[11]	3.66E-03	2.20E-04	2.20E-04
107-02-8	Acrolein	lb/mmscf	**1.00E-02**	[11]	8.51E-04	5.11E-05	5.11E-05
71-43-2	Benzene	lb/mmscf	**1.59E-01**	[11]	1.35E-02	8.12E-04	8.12E-04
100-41-4	Ethyl Benzene	lb/mmscf	**1.44E+00**	[11]	1.23E-01	7.37E-03	7.37E-03
50-00-0	Formaldehyde	lb/mmscf	**1.17E+00**	[11]	9.95E-02	5.97E-03	5.97E-03
110-54-3	Hexane	lb/mmscf	**2.90E-02**	[11]	2.47E-03	1.48E-04	1.48E-04
91-20-3	Naphthalene	lb/mmscf	**1.10E-02**	[11]	9.36E-04	5.62E-05	5.62E-05
	Polycyclic Organic Matter	lb/mmscf	**3.00E-03**	[11]	2.55E-04	1.53E-05	1.53E-05
75-56-9	Propylene Oxide	lb/mmscf	**2.44E+00**	[11]	2.08E-01	1.25E-02	1.25E-02
108-88-3	Toluene	lb/mmscf	**5.80E-02**	[11]	4.94E-03	2.96E-04	2.96E-04
1330-20-7	Xylene (isomers)	lb/mmscf	**2.90E-02**	[11]	2.47E-03	1.48E-04	1.48E-04
--	Total HAPs	--	--	[9]	--	2.76E-02	2.76E-02

Notes [ ]:

1. Based on preliminary vendor information or site specific data.
2. Assumed.
3. Data obtained from Reference 1.
4. CO_2 equivalents (CO_2e) based on the global warming potential for applicable pollutant as listed in Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials [10/2018].
5. Emission factor obtained from TCEQ (Reference 2).
6. Emission factor obtained from AP-42 (Reference 3a).
7. Assumed all sulfur in the fuel is converted to SO_2.
8. Emission factor obtained from AP-42 (Reference 4a).
9. Summation of individual applicable pollutants.
10. Data obtained from Tables C-1 and C-2 of 40 CFR Part 98 (October 2018).
11. Emission factor obtained from Ventura County APCD (Reference 5).
12. Assumed the flare will only operate 5 days per year.
13. Data obtained from AP-42 (Reference 6).
14. Assumed 10% (by volume) of SO_2 is converted to SO_3 and 100% (by volume) of SO_3 is converted H_2SO_4.
15. The flare has an automatic ignition; therefore, the pilot only operates when the flare is in operation.

References:

1. IUPAC Periodic Table of the Elements. 28 November 2016. https://iupac.org/what-we-do/periodic-table-of-elements/
2. TCEQ, "2017 Emission Inventory Guidelines", Table 1-7 Flare Emission Factors. January 2018.
3. USEPA, AP-42, Fifth Edition, Vol. I. Chapter 1 "External Combustion Sources", Section 1.4 "Natural Gas Combustion". July 1998.
   a. Table 1.4-2 "Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion"
4. USEPA, AP-42, Fifth Edition, Vol. I. Chapter 13 "Miscellaneous Sources", Section 13.5 "Industrial Flares". February 2018.
   a. Table 13.5-3 "THC Emissions Factor for Enclosed Ground Flares at Natural Gas Production Sites"
5. Ventura County Air Pollution Control District, "AB2588 Combustion Emission Factors". May 17, 2001.
6. USEPA, AP-42, Fifth Edition, Vol. I. Appendix A "Miscellaneous Data and Conversion Factors". September 1995.

New Fortress Energy
Puerto Rico
MFH Facility

Potential to Emit (PTE): Emergency Diesel Generator

Basis/Inputs

Emergency Engine Data (per engine)			
Number of Engines	number	1	
Fuel	type	Diesel	
Power Rating Capacity	kW	750	[1]
	HP	1,006	
Heat Input	mmBtu/hr	7.25	
Heating Value of Fuel (HHV basis)	Btu/gal	137,000	[4]
Fuel Burn Rate	gal/hr	52.9	[1]
	gal/yr	29,095	
Annual Operating Hours	hr/yr	550	[3]

Micellaneous Data			
SO_2 to SO_3 Conversion Rate	%(vol.)	10	[3]
Density of Fuel	lb/gal	7.05	[4]
Sulfur Concentration in Fuel	%(wt.)	0.0015	[2]
Molecular Weights			
Hydrogen (H)	lb/lbmol	1.008	[5]
Oxygen (O)	lb/lbmol	15.999	[5]
Sulfer (S)	lb/lbmol	32.06	[5]
Global Warming Potential			
Carbon Dioxide (CO_2)	--	1	[6]
Methane (CH_4)	--	25	[6]
Nitrous Oxide (N_2O)	--	298	[6]
Metal Composition of Diesel Fuel Oil			
Arsenic	%(wt.)	8.50E-06	[7]
Beryllium	%(wt.)	5.00E-06	[7]
Cadmium	%(wt.)	2.10E-05	[7]
Chromium	%(wt.)	9.50E-05	[7]
Manganese	%(wt.)	2.10E-05	[7]
Mercury	%(wt.)	4.00E-05	[7]
Nickel	%(wt.)	3.38E-04	[7]

Emissions Summary

PTE: Emergency Generator

CAS Number	Pollutant	Per Engine				Project Total PTE (tpy)
		Emission Factor		Em. Rate (lb/hr)	PTE (tpy)	
Criteria Pollutants						
630-08-0	Carbon Monoxide (CO)	g/kW-hr	3.5 [8]	5.79	1.59E+00	1.59E+00
--	Nitrogen Oxides (NO_X)	g/kW-hr	5.61 [8, 9]	9.27	2.55E+00	2.55E+00
--	Particulate Matter (PM)	g/kW-hr	0.20 [8]	0.33	9.09E-02	9.09E-02
--	PM < 10 microns (PM_{10})	g/kW-hr	0.20 [8]	0.33	9.09E-02	9.09E-02
--	PM < 2.5 microns ($PM_{2.5}$)	g/kW-hr	0.20 [8]	0.33	9.09E-02	9.09E-02
7446-09-5	Sulfur Dioxide (SO_2)	g/kW-hr	6.76E-03 [10]	0.01	3.07E-03	3.07E-03
--	Volatile Organic Compounds (VOC)	g/kW-hr	0.79 [8, 9]	1.31	3.60E-01	3.60E-01

CAS Number	Pollutant	Per Engine					Project
		Emission Factor			Em. Rate	PTE	Total PTE
					(lb/hr)	(tpy)	(tpy)
7439-92-1	Lead (Pb)	--	--	--	--	--	--
7664-93-9	Sulfuric Acid Mist (H_2SO_4)	g/kW-hr	1.03E-03	[11]	0.0017	4.71E-04	4.71E-04
--	Greenhouse Gas (Mass Basis)	--	--	[12]	1,182	3.25E+02	3.25E+02
124-38-9	Carbon Dioxide (CO_2)	kg/mmBtu	**73.96**	[13]	1,182	3.25E+02	--
74-82-8	Methane (CH_4)	kg/mmBtu	**3.0E-03**	[13]	0.05	1.32E-02	--
10024-97-2	Nitrous Oxide (N_2O)	kg/mmBtu	**6.0E-04**	[13]	0.01	2.64E-03	--
--	Greenhouse Gas (CO_2e Basis)	--	--	[12]	1,186	3.26E+02	3.26E+02
124-38-9	Carbon Dioxide (CO_2)	--	--	[6]	1,182	3.25E+02	--
74-82-8	Methane (CH_4)	--	--	[6]	1.20	3.30E-01	--
10024-97-2	Nitrous Oxide (N_2O)	--	--	[6]	2.86	7.86E-01	--
Hazardous Air Pollutants (HAPs)							
75-07-0	Acetaldehyde	lb/mmBtu	**2.52E-05**	[14]	1.83E-04	5.02E-05	5.02E-05
107-02-8	Acrolein	lb/mmBtu	**7.88E-06**	[14]	5.71E-05	1.57E-05	1.57E-05
71-43-2	Benzene	lb/mmBtu	**7.76E-04**	[14]	5.62E-03	1.55E-03	1.55E-03
50-00-0	Formaldehyde	lb/mmBtu	**7.89E-05**	[14]	5.72E-04	1.57E-04	1.57E-04
91-20-3	Naphthalene	lb/mmBtu	**1.30E-04**	[15]	9.42E-04	2.59E-04	2.59E-04
--	Polycyclic Organic Matter	lb/mmBtu	8.15E-05	[12]	5.91E-04	1.62E-04	1.62E-04
83-32-9	Acenaphthene	lb/mmBtu	**4.68E-06**	[15]	--	--	--
208-96-8	Acenaphthylene	lb/mmBtu	**9.23E-06**	[15]	--	--	--
120-12-7	Anthracene	lb/mmBtu	**1.23E-06**	[15]	--	--	--
56-55-3	Benz(a)anthracene	lb/mmBtu	**6.22E-07**	[15]	--	--	--
50-32-8	Benzo(a)pyrene	lb/mmBtu	**2.57E-07**	[15]	--	--	--
205-99-2	Benzo(b)fluoranthene	lb/mmBtu	**1.11E-06**	[15]	--	--	--
191-24-2	Benzo(g,h,i)perylene	lb/mmBtu	**5.56E-07**	[15]	--	--	--
207-08-9	Benzo(k)fluoranthene	lb/mmBtu	**2.18E-07**	[15]	--	--	--
218-01-9	Chrysene	lb/mmBtu	**1.53E-06**	[15]	--	--	--
53-70-3	Dibenzo(a,h)anthracene	lb/mmBtu	**3.46E-07**	[15]	--	--	--
206-44-0	Fluoranthene	lb/mmBtu	**4.03E-06**	[15]	--	--	--
86-73-7	Fluorene	lb/mmBtu	**1.28E-05**	[15]	--	--	--
193-39-5	Indeno(1,2,3-cd)pyrene	lb/mmBtu	**4.14E-07**	[15]	--	--	--
85-01-8	Phenanthrene	lb/mmBtu	**4.08E-05**	[15]	--	--	--
129-00-0	Pyrene	lb/mmBtu	**3.71E-06**	[15]	--	--	--
108-88-3	Toluene	lb/mmBtu	**2.81E-04**	[14]	2.04E-03	5.60E-04	5.60E-04
1330-20-7	Xylenes	lb/mmBtu	**1.93E-04**	[14]	1.40E-03	3.85E-04	3.85E-04
7440-38-2	Arsenic	--	--	[16]	3.17E-05	8.72E-06	8.72E-06
7440-41-7	Beryllium	--	--	[16]	1.86E-05	5.13E-06	5.13E-06
7440-43-9	Cadmium	--	--	[16]	7.83E-05	2.15E-05	2.15E-05
7440-47-3	Chromium	--	--	[16]	3.54E-04	9.74E-05	9.74E-05
7439-96-5	Manganese	--	--	[16]	7.83E-05	2.15E-05	2.15E-05
7439-97-6	Mercury	--	--	[16]	1.49E-04	4.10E-05	4.10E-05
7440-02-0	Nickel	--	--	[16]	1.26E-03	3.47E-04	3.47E-04
--	Total HAPs	--	--	[12]	--	3.68E-03	3.68E-03
Other Pollutants							
115-07-1	Propylene	lb/mmBtu	**2.79E-03**	[14]	2.02E-02	5.56E-03	5.56E-03

Notes [ ]:

1. Based on preliminary vendor information.
2. Based on site specific information.
3. Assumed.
4. Data obtained from AP-42 (Reference 1).
5. Data obtained from Reference 2.
6. CO_2 equivalents (CO_2e) based on the global warming potential for applicable pollutant as listed in Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials [10/2018].
7. Data obtained from Reference 3a.

8. Values are set equal to the applicable limits found in 40 CFR Part 60 Subpart IIII (§89.112 Table 1).
9. Assumed ratio of either NO_X or VOC to the NO_X/VOC total based on emission rates for Tier 1 (2000 Model Year) engines in §89.112 Table 1.
10. Assumed all sulfur in the fuel is converted to SO_2.
11. Assumed 10% (by volume) of SO_2 is converted to SO_3 and 100% (by volume) of SO_3 is converted H_2SO_4.
12. Summation of individual applicable pollutants.
13. Data obtained from Tables C-1 and C-2 of 40 CFR Part 98 (July 1, 2017).
14. Data obtained from AP-42 (Reference 4a).
15. Data obtained from AP-42 (Reference 4b).
16. Assumed all metals in the fuel is emitted.

References:

1. USEPA, AP-42, Fifth Edition, Vol. I. Appendix A "Miscellaneous Data and Conversion Factors". September 1995.
2. IUPAC Periodic Table of the Elements. 28 November 2016. https://iupac.org/what-we-do/periodic-table-of-elements/
3. USEPA, EPCRA Section 313: Industry Guidance: Electricity Generating Facilities. EPA-745-B-00-004. February 2000.
   a. Table 3-4 "Estimated Concentration Values of EPCRA Section 313 Constituents in Crude Oil and Petroleum Products (Weight Percent)"
4. USEPA, AP-42, Fifth Edition, Vol. I. Chapter 3 "Stationary Internal Combustion Sources", Section 3.4 "Large Stationary Diesel and All Stationary Dual-Fuel Engines". October 1996.
   a. Table 3.4-3 "Speciated Organic Compound Emission Factors for Large Uncontrolled Stationary Diesel Engines"
   b. Table 3.4-4 "PAH Emission Factors for Large Uncontrolled Stationary Diesel Engines"

Description: LNG Loading Losses

These calculations represent emissions from the LNG Vessel loading losses

Operating Data

Description	Value	Units
Vapor Pressure (P) of LNG at -260°F	0.145038	psia
Vapor Pressure (P) of LNG at -260°F	1	kPa
Temperature (T)	-260	^{o}F
Temperature (T)	199.7	^{o}R
Molecular Weight (M)	16.04	lb/lb-mol
Saturation Factor (S) [1]	0.60	

Loading Data

Description	Value	Units
Vessel Capacity	30,000	m^3
Vessel Capacity	7,925,162	gallons
Event Frequency	120	vessels/yr
Annual Throughput	951,019,388	gal/yr

Emissions Summary:

Pollutant	Average Hourly Emissions	Annual Emissions
	lbs/hr	tpy
CO_2e [2]	236.41	1035.48
Methane	9.46	41.42

Loading Loss Equation [3]	**$L_L = 12.46 * S * P * M / T$**	
Loading Loss	0.087	$lb/10^3$ gal

Emission Calculations:

Pollutant	Average Hourly Emissions	Annual Emissions
	lbs/hr	tpy
Methane	9.46	41.42

Notes:
1) Saturation Factor is from EPA's AP-42 Section 5.2, Table 5.2-1 (6/08), Submerged Loading: Dedicated Normal Service
2) GWP of 25 for Methane
3) Based on EPA's AP-42 Section 5.2 (6/08), Equation (1): LL = 12.46 * S * M * P / T

Description: LNG Loading Losses

These calculations represent emissions from the LNG truck loading losses

Operating Data

Description	Value	Units
Vapor Pressure (P) of LNG at -260°F	0.145038	psia
Vapor Pressure (P) of LNG at -260°F	1	kPa
Temperature (T)	-260	^{o}F
Temperature (T)	199.7	^{o}R
Molecular Weight (M)	16.04	lb/lb-mol
Saturation Factor (S) [1]	0.60	

Loading Data

Description	Value	Units
Truck Volume	10,600	gal/truck
Event Frequency	100	trucks/day
Annual Throughput	386,900,000	gal/yr

Emissions Summary:

Pollutant	Average Hourly Emissions	Annual Emissions
	lbs/hr	tpy
CO_2e [2]	96.18	421.26
Methane	3.85	16.85

Loading Loss Equation [3]	**L_L = 12.46 * S * P * M / T**	
Loading Loss	0.087	lb/10^3 gal

Emission Calculations:

Pollutant	Average Hourly Emissions	Annual Emissions
	lbs/hr	tpy
Methane	3.85	16.85

Notes:
1) Saturation Factor is from EPA's AP-42 Section 5.2, Table 5.2-1 (6/08), Submerged Loading: Dedicated Normal Service
2) GWP of 25 for Methane
3) Based on EPA's AP-42 Section 5.2 (6/08), Equation (1): LL = 12.46 * S * M * P / T

APPENDIX 9B MARINE VESSEL OPERATIONAL EMISSION CALCULATIONS

New Fortress Energy Emission Calculations

		Criteria Pollutant Emissions (tons)						Greenhouse Gas Emissions (MT)			
Vessel	**Make/Model**	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**CO2**	**CH4**	**N2O**	**CO2e**
FSU	INEOS Independence	1.1	1.5	38.4	1.4	1.2	11.7	1730.5	0.0	0.1	1751.3
Shuttle Vessel	Coral Encanto	1.3	3.2	38.7	1.4	1.3	11.7	1726.7	0.0	0.1	1748.4
Tug Support Vessel	Diane Moran	0.1	0.2	2.9	0.1	0.1	0.9	127.4	0.0	0.0	129.1
Total		2.5	4.9	79.9	2.8	2.6	24.3	3584.6	0.0	0.2	3628.8

New Fortress Energy: 1 FSU, 1 Shuttle Vessel, 1 Tug Support Vessel

Schedule:

FSU (moored: auxiliary engines only):	**365 days per year**
Shuttle Vessel:	**120 trips per year**
Tug Support Vessel:	**120 trips per year**

Operational Hours:	Average Speed (knots)	Distance in State Waters (nautical miles)	Distance in Harbor (nautical miles)	Hours of Operation Per Trip
Shuttle Vessel (transit)	**10**	**47.63**	**--**	**4.76**
Shuttle Vessel (at port)	**--**	**--**	**--**	**24**
Shuttle Vessel (harbor)	**5**	**--**	**4**	**0.80**
Tug Support Vessel (transit)	**10**	**4**	**--**	**0.4**
Tug Support Vessel (harbor)	**5**	**--**	**4**	**0.80**

Marine Equipment List

Equipment Type / Operational Mode	Engine	Make/Model	Fuel Type	kW	Hours of Operation/Trip	Trips/Year	Total Hours of Operation (annual)	Load Factor
FSU / Idle at Port	Main	INEOS Independence	Marine Diesel Oil	11700	N/A	N/A	N/A	N/A
FSU / Idle at Port	Auxiliary	INEOS Independence	Marine Diesel Oil	1100	N/A	N/A	4380	0.26
FSU / Idle at Port	Auxiliary	INEOS Independence	Marine Diesel Oil	1100	N/A	N/A	4380	0.26
Shuttle Vessel / In Transit State Waters	Main	Coral Encanto	Marine Diesel Oil	8775	4.76	120	571.6	0.33
Shuttle Vessel / In Transit Harbor Waters	Main	Coral Encanto	Marine Diesel Oil	8775	0.8	120	96	0.04
Shuttle Vessel / Idle at Port	Main	Coral Encanto	Marine Diesel Oil	8775	N/A	120	N/A	N/A
Shuttle Vessel / In Transit State Waters	Auxiliary	Coral Encanto	Marine Diesel Oil	1200	4.76	120	572	0.17
Shuttle Vessel / In Transit Harbor Waters	Auxiliary	Coral Encanto	Marine Diesel Oil	1200	0.8	120	96	0.45
Shuttle Vessel / Idle at Port	Auxiliary	Coral Encanto	Marine Diesel Oil	1200	24	120	2880	0.22
Tug Support Vessel / In Transit State Waters	Main	Diane Moran	Marine Diesel Oil	3805	0.4	120	48	0.86
Tug Support Vessel / In Transit Harbor Waters	Main	Diane Moran	Marine Diesel Oil	3805	0.80	120	96	0.11

(1) Load Factors from USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, April 2009.
(2) Ocean Going Hotel Tanker Auxiliary Engine Load factor used for FSU
(3) Calculated Ocean Going Load factor used for Shuttle Vessel Main Engine when in transit in state and harbor waters
(4) Ocean Going Cruise Load Factor used for Shuttle Vessel Auxiliary Engine when in transit in state waters
(5) Ocean Going Maneuvering Load factor (5-8 knots within a port) used for Shuttle Vessel Auxiliary Engine when in transit in harbor waters
(6) Ocean Going Hotel Load Factor used for Shuttle Vessel Auxiliary Engine when idle at port
(7) Calculated Ocean Going Load factor used for tug when in transit in state waters and harbor waters

Vessel Emission Factors

			Criteria Pollutant Emission Factors						Greenhouse Gas Emissions		
Vessel Type	Engine	Fuel Type	VOC (g/kW-hr)	CO (g/kW-hr)	NOx (g/kW-hr)	PM10 (g/kW-hr)	PM2.5 (g/kW-hr)	SO2 (g/kW-hr)	CO2 (g/kW-hr)	CH4 (g/kW-hr)	N2O (g/kW-hr)
Ocean Going Slow-Speed Diesel	Main	Marine Diesel Oil	0.6	1.4	17.0	0.5	0.4	3.6	588.8	0.006	0.03
Ocean Going Medium-Speed Diesel	Main	Marine Diesel Oil	0.5	1.1	13.2	0.5	0.4	4.0	646.1	0.004	0.03
Ocean Going Diesel	Auxiliary	Marine Diesel Oil	0.4	1.1	13.9	0.5	0.5	4	691	0.004	0.03
Harbor Crafts	Main	Marine Diesel Oil	0.5	5.0	9.8	0.7	0.7	1.3	690	0.09	0.02

Notes:
(1) Emission Factors from USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, April 2009
(2) Slow-speed diesel engines are assumed to be 2-stroke engines < 130 RPM, Medium-speed diesel engines are assumed to be 4-stroke engines between 130 to 1,400 RPM

Project Total

			Criteria Pollutant Emissions (tons)						Greenhouse Gas Emissions (MT)			
Equipment Type	Engine	Make/Model	VOC	CO	NOx	PM10	PM2.5	SO2	CO2	CH4	N2O	CO2e
FSU / Idle at Port	Main	INEOS Independence	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FSU / Idle at Port	Auxiliary	INEOS Independence	0.55	N/A	19.19	0.68	0.62	5.85	865.24	0.01	0.04	875.7
FSU / Idle at Port	Auxiliary	INEOS Independence	0.55	1.52	19.19	0.68	0.62	5.85	865.24	0.01	0.04	875.7
Shuttle Vessel / In Transit State Waters	Main	Coral Encanto	0.91	1.99	23.94	0.85	0.78	7.20	1062.90	0.01	0.05	1076.6
Shuttle Vessel / In Transit Harbor Waters	Main	Coral Encanto	0.02	0.04	0.50	0.02	0.02	0.15	22.32	0.00	0.00	22.6
Shuttle Vessel / Idle at Port	Main	Coral Encanto	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Shuttle Vessel / In Transit State Waters	Auxiliary	Coral Encanto	0.05	0.14	1.79	0.06	0.06	0.54	80.54	0.00	0.00	81.5
Shuttle Vessel / In Transit Harbor Waters	Auxiliary	Coral Encanto	0.02	0.06	0.79	0.03	0.03	0.24	35.81	0.00	0.00	36.2
Shuttle Vessel / Idle at Port	Auxiliary	Coral Encanto	0.34	0.92	11.65	0.41	0.38	3.55	525.16	0.00	0.02	531.5
Tug Support Vessel / In Transit State Waters	Main	Diane Moran	0.09	0.19	2.30	0.08	0.07	0.69	101.93	0.00	0.00	103.2
Tug Support Vessel / In Transit Harbor Waters	Main	Diane Moran	0.02	0.05	0.57	0.02	0.02	0.17	25.48	0.00	0.00	25.8
Notes:		Total	2.5	4.9	79.9	2.8	2.6	24.3	3584.6	0.0	0.2	3628.8

(1) Shuttle vessels and tug main engines were assumed to be medium-speed diesel vessels when in transit in State and Harbor Waters
(2) Global Warming Potentials for CH4 and N2O from IPCC Fifth Assessment Report, 2014

Equation:
E= Power x Activity x LF X EF
E = Emissions
P= Power (kW)
LF = Load Factor (percent of vessel's total power)
A = Activity (hours)
EF = Emission Factor

1,000,000 grams/metric ton
907,185 grams/ton

APPENDIX 9C AIR EMISSION REDUCTION CALCULATIONS

New Fortress Energy

PREPA Past Emissions vs Current Emissions Summary

Pollutant	Past Emissions[1] PTE Annual Emissions (both CTs) tons/yr	Current Emissions[2] PTE Annual Emissions (both CTs) tons/yr	Offset PTE Annual Emissions (both CTs) tons/yr
NOx	1,664	1,174	-490
CO	1,779	308	-1,471
VOC	169	162	-7
PM10	521	126	-395
PM2.5	661	128	-533
SO2	642	18	-624
Pb	0	0	0
CO2	2,071,597	1,495,639	-575,958
CH4	84	29	-55
N2O	17	3	-14
CO2e	2,078,706	1,497,264	-581,442
H2SO4	104	11	-93

[1] Assumes 15,000 hrs of total turbine operation per year using fuel oil (PSD permit limit)

[2] Assumes 14,758 hrs per year of turbines operation using natural gas (equivalent to 25 trillion Btu/yr) and 242 hrs per year of turbine operation using fuel oil

New Fortress Energy

PREPA Past Potential Emission Estimates - Fuel Oil

	Permit Limits	
	ppm	**lb/MMBtu**
NOx fuel oil	34.2	0.131
CO Fuel Oil	60	0.140
VOC Fuel Oil	10	0.013

Constants:

1.190E-07 ppm to lb/dscf @ 0% O2

8710 dscf/MMBtu

15 %O2

46 NO2 lb/lb-mol

28 CO lb/lb-mol

16 VOC (as CH4) lb/lb-mol

Turbines

Make and Model	Westinghouse - 501	
Number of Turbines	2	
Heat Input on Fuel Oil (per CT)	1,694	MMBtu/hr
Annual Heat Input on Fuel Oil (both CTs)	25,410,000	MMBtu/yr
Annual Fuel Usage Fuel Oil (both CTs)	188,201,000	gal/yr
Fuel Oil HHV	135,000	Btu/gal
PTE Operating Hours Fuel Oil (both CTs)	15,000	hr/yr
Fuel Oil Sulfur Content	0.05	wt. %
Molecular Wt. SO_2	64	lb/lb-mol
Molecular Wt. S	32	lb/lb-mol
Molecular Wt. SO_3	80	lb/lb-mol
Molecular Wt. H_2SO_4	98	lb/lb-mol
Conversion Factor SO_2 to SO_3	100%	%
Conversion Factor SO_3 to H_2SO_4	100%	%
Fuel Oil Density	7.05	lb/gal

	FUEL OIL				
Pollutant	**Emission Factor lb/MMBtu**	**Units, Source**	**Emission Factor lb/MMBtu**	**Maxmium Hourly Emissions (per CT) lb/hr**	**PTE Annual Emissions (both CTs) tons/yr**
NOx	34.2	ppmvd@15%O2, permit limit (60% to base load)	0.131	221.9	1,664
CO	60	ppmvd@15%O2, permit limit (60% to base load)	0.14	237.2	1,779
VOC	10	ppmvd@15%O2, permit limit (60% to base load)	0.0133	22.5	169.0
PM10	0.041	lb/MMBtu, permit limit	0.041	69.5	520.9
PM2.5	0.052	lb/MMBtu, permit limit	0.052	88.1	660.7
SO_2	0.051	lb/MMBtu, AP-42, Table 3.1-2a, with 0.05% S content	0.051	85.5	641.6
Pb	1.40E-05	lb/MMBtu, AP-42, Table 3.1-2a	1.40E-05	0.024	0.18
CO2	163.05	lb/MMBtu, 40 CFR 98, Subpart C, Table C-1 for oil firing	163.05	276,213	2,071,597
CH4	0.007	lb/MMBtu, 40 CFR 98, Subpart C, Table C-2 for oil firing	0.007	11.2	84.0
N2O	0.0013	lb/MMBtu, 40 CFR 98, Subpart C, Table C-2 for oil firing	0.0013	2.2	16.8
CO2e	163.61	lb/MMBtu, 40 CFR 98	163.61	277,161	2,078,706
H2SO4	13.8	lb/hr, permit limit	0.0081	13.8	103.5

GWPs:

CO2	1
CH4	25
N2O	298

Conversion Factors:

lb per ton	2,000
lb per kg	2.20462
grams to lb	453.59
hours in a year	8,760

New Fortress Energy

PREPA Current Potential Emission Estimates - Natural Gas and Fuel Oil

Turbines

Make and Model	Westinghouse - 501	
Number of Turbines	2	
Heat Input on Natural Gas (per CT)	1,694	MMBtu/hr
Heat Input on Fuel Oil (per CT)	1,694	MMBtu/hr
Annual Heat Input on Natural Gas (both CTs)	25,000,052	MMBtu/yr
Annual Heat Input on Fuel Oil (both CTs)	409,948	MMBtu/yr
Annual Fuel Usage Fuel Oil (both CTs)	188,201,000	gal/yr
Natural Gas HHV	1,020	Btu/scf
Fuel Oil HHV	135,000	Btu/gal
PTE Operating Hours Natural Gas (both CTs)	14,758	hr/yr
PTE Operating Hours Fuel Oil (both CTs)	242	hr/yr
Fuel Oil Sulfur Content	0.05	wt. %
Molecular Wt. SO_2	64	lb/lb-mol
Molecular Wt. S	32	lb/lb-mol
Molecular Wt. SO_3	80	lb/lb-mol
Molecular Wt. H_2SO_4	98	lb/lb-mol
Conversion Factor SC_2 to SO_3	100%	%
Conversion Factor SO_3 to H_2SO_4	100%	%
Fuel Oil Density	7.05	lb/gal

Manufacturer Specifications

	ppm	lb/MMBtu
NOx Natural Gas	25	0.092
CO Natural Gas	10	0.022
VOC Natural Gas	10	0.013

Permit Limits

NOx fuel oil	34.2	0.131
CO Fuel Oil	60	0.140
VOC Fuel Oil	10	0.013

Constants:

1.190E-07 ppm to lb/dscf @ 0% O2

8710 dscf/MMBtu

15 %O2

46 NO2 lb/lb-mol

28 CO lb/lb-mol

16 VOC (as CH4) lb/lb-mol

	NATURAL GAS					FUEL OIL					TOTAL
Pollutant	Emission Factor	Units, Source	Emission Factor lb/MMBtu	Maxmium Hourly Emissions (per CT) lb/hr	PTE Annual Emissions (both CTs) tons/yr	Emission Factor lb/MMBtu	Units, Source	Emission Factor lb/MMBtu	Maxmium Hourly Emissions (per CT) lb/hr	PTE Annual Emissions (both CTs) tons/yr	PTE Annual Emissions (both CTs) tons/yr
NOx	25	ppmvd@15%O2, Manufacturer spec[1]	0.092	155.5	1,147	34.2	ppmvd@15%O2, permit limit (60% to base load)	0.131	221.9	27	**1,174**
CO	10	ppmvd@15%O2, Manufacturer spec[1]	0.022	37.9	279.4	60	ppmvd@15%O2, permit limit (60% to base load)	0.14	237.2	29	**308**
VOC	10	ppmvd@15%O2, Manufacturer spec[1]	0.013	21.6	159.6	10	ppmvd@15%O2, permit limit (60% to base load)	0.0133	22.5	2.7	**162**
PM10	0.0094	lb/MMBtu, from Ironwood permit[2]	0.0094	15.92	117.5	0.041	lb/MMBtu, permit limit	0.041	69.5	8.4	**126**
PM2.5	0.0094	lb/MMBtu, from Ironwood permit[2]	0.0094	15.92	117.5	0.052	lb/MMBtu, permit limit	0.052	88.1	10.7	**128**
SO_2	0.0006	lb/MMBtu, 40 CFR 75 default for pipeline natural gas	0.0006	1.02	7.5	0.051	lb/MMBtu, AP-42, Table 3.1-2a, with 0.05% S content	0.051	85.5	10.4	**18**
Pb	0	No AP-42 Table 3.1-2a Pb factor for gas firing	0	0	0	1.40E-05	lb/MMBtu, AP-42, Table 3.1-2a	1.40E-05	0.024	0.00	**0**
CO2	116.98	lb/MMBtu, 40 CFR 98, Subpart C, Table C-1 for gas firing	116.98	198,159	1,462,217	163.05	lb/MMBtu, 40 CFR 98, Subpart C, Table C-1 for oil firing	163.05	276,213	33,422	**1,495,639**
CH4	0.002	lb/MMBtu, 40 CFR 98, Subpart C, Table C-2 for gas firing	0.002	3.73	27.6	0.007	lb/MMBtu, 40 CFR 98, Subpart C, Table C-2 for oil firing	0.007	11.2	1.4	**29**
N2O	0.0002	lb/MMBtu, 40 CFR 98, Subpart C, Table C-2 for gas firing	0.0002	0.37	2.8	0.0013	lb/MMBtu, 40 CFR 98, Subpart C, Table C-2 for oil firing	0.0013	2.2	0.3	**3**
CO2e	117.10	lb/MMBtu, 40 CFR 98	117.10	198,364	1,463,727	163.61	lb/MMBtu, 40 CFR 98	163.61	277,161	33,536	**1,497,264**
H2SO4	0.00074	lb/MMBtu, estimated conversion of SC_2 to SO_3 to H_2SO_4	0.00074	1.25	9.2	13.8	lb/hr, permit limit	0.0081	13.8	1.7	**11**

[1] Westinghouse 501 Turbine manufacturer emission factor guarantee in ppm.

[2] Based on an emission factor for a Westinghouse 501 turbine permitted by the Commonwealth of Pennsylvania Department of Environmental Protection, Helix Ironwood LLC, permit # 38-05019, located in Lebanon, PA, issued September 24, 2018.

GWPs:

CO2	1
CH4	25
N2O	298

Conversion Factors:

lb per ton	2,000
lb per kg	2.20462
grams to lb	453.59
hours in a year	8,760

APPENDIX 9D BASELINE SOUND SURVEY (MARCH 2018)

TETRA TECH

MEMO

To:	Capt. Mark Lane – NFEnergía
Cc:	Lee Evans – NFEnergía Fernando Pagés, P.E., Tetra Tech, Inc.
From:	Eric Kalapinski, Tetra Tech, Inc. Antonio Fernandez, Tetra Tech, Inc.
Date:	March 16, 2018
Subject:	Baseline Sound Survey Results

Tetra Tech Inc. (Tetra Tech) conducted an ambient sound level survey in the areas surrounding the proposed Micro Fuel Handling (MFH) Facility project located in San Juan, Puerto Rico. The objective of this analysis was to establish the existing baseline sound levels for the local acoustic environment and to support permitting for the proposed facility. A continuous sound level measurement was taken onsite and six short-term measurements were taken in the surrounding community at discrete offsite locations. This memo summarizes the methodologies used by Tetra Tech to conduct the sound survey, describes the measurement locations, and presents the results of the ambient sound levels. The survey approach and measurement locations presented in this document are consistent with protocols established by the Regulation of the Environmental Quality Board (EQB) for the Control of Noise Pollution[1].

These measurement results are used to establish baseline conditions as well as provide a basic understanding of existing noise levels in the project area for planning and facility design purposes. The noise limits established under the EQB Noise Regulation are absolute, however adjustments to the noise limits are allowable dependent on the levels of existing background noise, i.e., in high noise areas. Measurement results may be used to help establish acceptability limits under the EQB Noise Regulation and also provide a basic understanding of existing noise levels in the Project area for planning and design purposes.

Sound Survey Description

The measurement program was completed on March 5 and 6, 2018, to document the existing acoustic environment. The EQB recommends that baseline sound levels be measured during both the daytime and nighttime periods. The measurement locations were selected to be representative of the surroundings community and potential noise-sensitive areas near the

[1] Puerto Rico Environmental Quality Board (2011). Regulation of the Environmental Quality Board for the Control of Noise Pollution, Regulation No. 8019, May 9, 2011.

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proposed MFH facility. Monitoring was conducted at sensitive land use sites such as residences, public use areas such as parks, as well as in proximity to commercial and other use areas including the Federal Detention Center. The EQB Noise Regulation defines daytime from 7:00 a.m. to 10:00 p.m. and nighttime from 10:01 p.m. of one day to 6:59 a.m. of the next day. Short-term monitoring was conducted outside of peak hour commuter periods (10:00 a.m. to 4:00 p.m. and 10:00 p.m. to 4:00 p.m.) to avoid high vehicular traffic time periods.

Short-term (ST) sound level measurements were completed during the daytime (10:00 a.m. to 4:00 p.m.) and the nighttime (10:00 p.m. to 4:00 a.m.). To avoid high vehicular traffic times, short-term monitoring was conducted outside of peak hour commuter periods. Measurements were completed during meteorological conditions conducive to the collection of measurement data (i.e., no rain or high wind). In accordance with EQB recommendations, noise monitoring at one unattended long-term (LT) location on the MFH facility site was included to determine diurnal variation.

The measurements were conducted using Larson Davis Model 831 precision integrating sound level analyzers that meet the American National Standards Institute (ANSI) Standards for Type 1 precision instrumentation. This sound analyzer has an operating range of 5 to 140 decibels (dB), and an overall frequency range of 8 to 20,000 hertz (Hz). Microphones, fitted with a windscreen, were secured to a tripod at a height of approximately 1.5 meters (5 feet) above the ground for the ST measurements and approximately 2 meters (6.56 feet) for the LT measurement, and located out of the influence of any vertical reflecting surfaces. The sound analyzer was calibrated at the beginning and at the end of each measurement session using a Larson Davis Model CAL200 acoustic calibrator. All sound analyzers were programmed to measure full-octave and 1/3-octave band frequency (Hz) levels to document and further describe the quality and character of the existing ambient soundscape. Data were collected for 1/1 and 1/3 octave band data spanning 6.3 Hz to 20 kilohertz (kHz). Short-term baseline sound monitoring data were measured and logged at 1-minute intervals for a minimum total duration of 30 minutes. The 24-hour sound monitoring station continuously monitored and logged data in 1-hour intervals, consisting of 10-minute time histories.

Table 1 lists the measurement equipment employed during the survey. All instrumentation has current laboratory certified calibration certificates traceable to the National Institute of Standards Technology (NIST) which are provided in Appendix A.

Table 1. Measurement Equipment

Description	Manufacturer	Type	Serial Number(s)
Signal Analyzer	Larson Davis	831	3847, 4001
Preamplifier	Larson Davis	PRM831	036755, 036754
Microphone	PCB	377B02	150728, 150589
Calibrator	Larson Davis	CAL200	5229
Windscreen	ACO-Pacific	4-inch	WA-4

Terminology and Metrics

Airborne sound is described as the rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, creating a sound wave. Sound is characterized by properties of the sound waves, which are frequency, wavelength, period, amplitude, and velocity. Sound energy travels in the form of a wave, a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure. Sound levels are presented on a logarithmic scale to account for the large range of acoustic pressures that the human ear is exposed to and is expressed in units of dB. A dB is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (µPa). Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system and sound exposure in acoustic assessments is designated in dBA. Unweighted sound levels are referred to as linear.

Several metrics describing the ambient conditions were measured including the time-averaged equivalent sound pressure levels, or the L_{eq}, and several statistical parameters including the L_{10}, L_{50}, and L_{90} that can be used to distinguish long-term baseline sound levels from transitory events. The unit of frequency is hertz (Hz) which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency analysis examines 11 octave (or 33 1/3 octave) bands ranging from 16 Hz (low) to 16,000 Hz (high). This range encompasses the entire human audible frequency range.

Sound levels can be measured and presented in various formats. The sound metrics that were employed in the survey have the following definitions:

- L_{eq}: the L_{eq} is the energy-averaged, A-weighted sound level for the complete time period. It is defined as the steady, continuous sound level over a specified time that has the same acoustic energy as the actual varying sound levels over the specified period.
- L_{max}: The maximum A-weighted sound level as determined during a specified measurement period. It can also be described as the maximum instantaneous sound pressure level generated by a piece of equipment.
- L_n: This descriptor identifies the sound level that is exceeded "n" percent of the time over a measurement period (e.g., L_{90} = sound level exceeded 90 percent of the time). The sound level exceeded for a small percent of the time, L_{10}, closely corresponds to short-term, higher-level, intrusive noises (such as vehicle pass-by noise near a roadway). The sound level exceeded for a large percent of the time, L_{90}, closely corresponds to continuous, lower-level background noise (such as continuous noise from a distant industrial facility). L_{50} is the level exceeded 50 percent of the time and is typically referred to the median sound level.

Measurement Locations

Seven monitoring locations were identified for baseline sound measurements (Figure 1). Table 3-1 lists the corresponding map identifier for Figure 1, the Universal Transverse Mercator (UTM) coordinates, address, existing land uses, and a description of each location surveyed. The approximate linear distances are given to the acoustic centroid of the proposed facility. A description of the monitoring location with photographs and field observations is provided as Appendix B.

Table 2 Monitoring Locations

Monitoring ID	Coordinates (UTM Zone 20N)		Location	Description	Approximate Distance to Project Feet (meters)
	Easting (m)	Northing (m)			
LT-1	172030	2040516	Project Site	Industrial	N/A
ST-2	171390	2041237	B Street	Residential / Industrial	3,191 ft (972 m)
ST-3	171284	2040503	Desembarcadero Street	Residential / Commercial / Industrial	2,217 ft (676 m)
ST-4	171423	2039901	El Caño Avenue	Industrial / Fed Detention Center	2,504 ft (763 m)
ST-5	173285	2039116	Puerto Nuevo Neighborhood	Residential	6,174 ft (1,882 m)
ST-6	174283	2042825	Las Palmas Street	Residential / Tourist-Commercial	10,901 ft (3,322 m)
ST-PARK	174457	2042104	Central Park	Municipal / Recreational	9,843 ft (3000 m)

Survey Results and Field Observations

Noise measurements were taken to establish baseline conditions. The goal was to identify the regularly occurring baseline sound at monitoring positions near the MFH proposed facility site. Weather conditions were conducive to the collection of accurate sound measurement data. There was no precipitation during the short-term surveys and area roadways were dry. Temperatures ranged from 68 to 80 degrees Fahrenheit (^{o}F) during the daytime, and 70 to 75^{o}F during the nighttime. Wind speeds were generally low level and variable, averaging from 5 to 10 miles per hour (mph) during both the daytime and nighttime measurement periods. The following survey results and measurement data are intended to support the technical analysis as may be required as part of the permitting process for the Project.


ST-6
ST-Park
ST-2
ST-3
LT-1
100m
ST-4
ST-5
Puerto Rico
Legend
Short-term Monitoring Location
Long-term Monitoring Location
Project Site
N
0
362.5
725
Meters
NFEnergía
PUERTO RICO
Micro Fuel Handling Facility
Figure 1
Baseline Noise Monitoring Locations
TETRA TECH
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Upon completion of the baseline sound survey, the results were tabulated into relevant time periods. The monitoring included the collection and reporting of the following data:

- The range of sound pressure level data present during daytime and nighttime test periods.
- For each time period, the following sound measurement descriptors were compiled:
    - Spectral octave-band analysis (31.5, 63, 125, 250, 500, 1K, 2K, 4K, and 8K Hz);
    - One hour statistical values including L_{eq}, L_{10}, L_{50}, and L_{90} for the LT measurement and 30 minute duration for the ST measurement;
    - A description of sounds audible during testing and a discussion of any anomalous or regularly occurring sounds identified during the monitoring program; and
    - Documentation of existing land uses in proximity near the measurement location.

The degree of audibility of a new or modified sound source is dependent in large part on the relative level of the ambient noise. A wide range of noise settings occurs in and around the Project area. Variations in acoustic environment are due in part to surrounding land uses, population density, and proximity to transportation corridors.

The sound level measurements collected during the survey include the ambient/background sound level from traffic and other environmental and industrial sources including the noise contribution of the San Juan power plant. Elevated background sound levels were documented at the majority of monitoring locations, including onsite. The pertinent results of the sound survey are summarized in the following tables.

Results of the ambient baseline measurements are shown in Table 3 for various metrics (L_{eq}, L_{10}, L_{50} and L_{90}) for both daytime and nighttime periods. Measured ambient sound levels exhibited typical diurnal patterns, with higher ambient sound levels during the daytime than nighttime at all monitoring locations with the exception of ST-5 which logged higher ambient noise levels during the overnight period attributable to a temporary generator operating at the nearby pump station.

The EQB noise emission limits are given in terms of the noise level exceeded during 10% of the measurement period (L_{10}). As shown in Table 3, the daytime L_{10} sound levels at the measurement locations ranged from 61 dBA at ST-4 to 74 dBA at LT-1. Similarly, nighttime sound levels ranged from 53 dBA at ST-4 to 74 dBA at LT-1. The long-term monitoring location (LT-1) is located near the northern property line. Table 4 presents the time history of the long-term measurement results.

Table 3. Summary of Baseline Noise Measurement Data

Monitoring ID	Time Period	Sound Level Metrics (dBA)			
		L_{eq}	L_{10}[1]	L_{50}	L_{90}
LT-1	Day	73	74	73	71
	Night	69	71	69	68
ST-2	Day	61	63	56	53
	Night	56	55	54	52
ST-3	Day	70	71	59	55
	Night	53	53	53	52
ST-4	Day	60	61	58	57
	Night	53	54	52	50
ST-5	Day	61	62	59	58
	Night	65	66	65	65
ST-6	Day	66	69	64	61
	Night	54	56	51	49
ST-PARK	Day	62	63	60	58

[1] Designated metrics for assessing baseline under EQB Noise Regulations

According to the EQB Noise Regulation, adjustments to the regulatory noise limits are allowable depending on the levels of existing background noise as further described below:

- If existing (ambient) sound levels are less than the EQB noise level limits by more (>) than 10 dBA, then no adjustment to the limits are made;
- If the difference between the EQB noise level limits and the existing (ambient) sound levels is between 6 and 10 dBA, then 1 dBA is added to the noise levels limits;
- If the difference between the EQB noise level limits and the existing (ambient) sound levels is between 3 and 6 dBA, then 2 dBA are added to the noise levels limits; and
- If the difference between the EQB noise level limits and the existing (ambient) sound levels is between 0 and 6 dBA, then 3 dBA are added to the noise levels limits.

Upwards adjustments to the EQB noise limits will be permitted under the EQB Noise Regulations at several of the offsite locations due to the documented elevated background sound levels, depending on receiving land use classification. In areas with the measured background L_{10} are

currently above the ESB permissible limits, there is no formal guidance. However, considering 50 dBA nighttime permissible noise limit as the controlling criterion used to assess compliance status for a Zone 1 (residential) receiver from a Zone III (industrial) source, precedence indicates a 5 dBA adjustment to 55 dBA would likely be deemed appropriate.

Table 4. Onsite Long-Term (24-Hour) Sound Monitoring Results (dBA)

Date	Time	L_{eq}	L_{10}	L_{50}	L_{90}
3/5/2018	9:00 a.m.	71	72	71	70
	10:00 a.m.	71	72	70	69
	11:00 a.m.	71	72	70	69
	12:00 p.m.	72	73	70	69
	1:00 p.m.	75	74	72	71
	2:00 p.m.	78	76	75	73
	3:00 p.m.	78	79	77	76
	4:00 p.m.	78	82	79	78
	5:00 p.m.	78	79	78	77
	6:00 p.m.	77	78	78	77
	7:00 p.m.	69	78	78	77
	8:00 p.m.	69	80	78	68
	9:00 p.m.	69	70	69	67
	10:00 p.m.	69	71	69	68
	11:00 p.m.	69	71	69	68
3/6/2018	12:00 a.m.	69	71	69	68
	1:00 a.m.	69	71	69	68
	2:00 a.m.	69	70	68	67
	3:00 a.m.	69	70	69	67
	4:00 a.m.	69	71	69	68
	5:00 a.m.	69	70	69	68
	6:00 a.m.	68	71	69	67
	7:00 a.m.	68	70	68	67
	8:00 a.m.	68	70	68	66
	9:00 a.m.	69	70	68	66
	10:00 a.m.	78	70	68	66
	11:00 a.m.	78	71	68	66

APPENDIX A

MEASUREMENT EQUIPMENT & NIST LABORATORY CALIBRATION CERTIFICATIONS

Calibration Certificate

Certificate Number 2016008844

Customer:
Tetra Tech Inc
3rd Floor
160 Federal Street
Boston, MA 02110, United States

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	5229	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	3 Oct 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	3 Oct 2018		
		Temperature	24	°C	± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	30	%RH	± 3 %RH
		Static Pressure	100.9	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	09/07/2016	09/07/2017	001021
Sound Level Meter / Real Time Analyzer	04/07/2016	04/07/2017	001051
Microphone Calibration System	08/17/2016	08/17/2017	005446
1/2" Preamplifier	10/09/2015	10/09/2016	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/22/2016	08/22/2017	006507
1/2 inch Microphone - RI - 200V	03/15/2016	03/15/2017	006510
Pressure Transducer	10/12/2015	10/12/2016	007204

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.2	114.00	113.80	114.20	0.13	Pass
94	100.9	94.01	93.80	94.20	0.14	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
94	100.9	999.94	990.00	1,010.00	0.20	Pass
114	101.2	999.94	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
94	100.9	0.43	0.00	2.00	0.25	Pass
114	101.2	0.35	0.00	2.00	0.25	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 24 °C, 30 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
101.3	101.3	0.00	-0.30	0.30	0.04 ‡	Pass
108.0	107.7	-0.03	-0.30	0.30	0.04 ‡	Pass
92.0	92.0	0.03	-0.30	0.30	0.04 ‡	Pass
83.0	83.0	0.05	-0.30	0.30	0.04 ‡	Pass
74.0	74.0	0.03	-0.30	0.30	0.04 ‡	Pass
65.0	64.9	-0.03	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 24 °C, 30 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	107.7	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.3	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	92.0	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	83.0	0.00	-10.00	10.00	0.20 ‡	Pass
74.0	74.0	0.00	-10.00	10.00	0.20 ‡	Pass
65.0	64.9	0.00	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 24 °C, 30 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	107.7	0.37	0.00	2.00	0.25 ‡	Pass
101.3	101.3	0.35	0.00	2.00	0.25 ‡	Pass
92.0	92.0	0.32	0.00	2.00	0.25 ‡	Pass
83.0	83.0	0.31	0.00	2.00	0.25 ‡	Pass
74.0	74.0	0.29	0.00	2.00	0.25 ‡	Pass
65.0	64.9	0.29	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2017003283

Customer:

Tetra Tech Inc
3rd Floor
160 Federal Street
Boston, MA 02110, United States

Model Number	831	***Procedure Number***	D0001.8384		
Serial Number	0003847	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	30 Mar 2017		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	30 Mar 2018		
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.311	***Temperature***	23.4	°C	± 0.25 °C
		Humidity	51.1	%RH	± 2.0 %RH
		Static Pressure	85.39	kPa	± 0.13 kPa

Evaluation Method ***Tested with:***

Larson Davis PRM831. S/N 036754
PCB 377B02. S/N 150589
Larson Davis CAL200. S/N 9079
Larson Davis CAL291. S/N 0203

Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to

1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	2016-06-21	2017-06-21	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	2016-06-17	2017-06-17	006946
Larson Davis CAL200 Acoustic Calibrator	2016-07-26	2017-07-26	007027
Larson Davis Model 831	2017-03-01	2018-03-01	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2017-03-08	2018-03-08	007185
Larson Davis CAL291 Residual Intensity Calibrator	2016-09-22	2017-09-22	007287

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.00	113.80	114.20	0.14	Pass

As Received Level: 114.11
Adjusted Level: 114.00

-- End of measurement results--

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.21	-0.20	-1.20	0.80	0.23	Pass
1000	0.05	0.00	-0.70	0.70	0.23	Pass
8000	-2.31	-3.00	-5.50	-1.50	0.32	Pass

-- End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted, 20 dB gain	37.86

-- End of measurement results--

-- End of Report--

Signatory: *Ron Harris*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3822.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2017004944

Customer:

Tetra Tech Inc
3rd Floor
160 Federal Street
Boston, MA 02110, United States

Model Number	831	***Procedure Number***	D0001.8384		
Serial Number	0004001	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	11 May 2017		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	11 May 2019		
		Temperature	23.71	°C	± 0.25 °C
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.313	***Humidity***	49.5	%RH	± 2.0 %RH
		Static Pressure	86.48	kPa	± 0.13 kPa

Evaluation Method ***Tested with:*** ***Data reported in dB re 20 µPa.***

Larson Davis PRM831. S/N 036849
PCB 377B02. S/N 156091
Larson Davis CAL200. S/N 9079
Larson Davis CAL291. S/N 0203

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to

1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	2016-06-21	2017-06-21	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	2016-06-17	2017-06-17	006946
Larson Davis CAL200 Acoustic Calibrator	2016-07-26	2017-07-26	007027
Larson Davis Model 831	2017-03-01	2018-03-01	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2017-03-08	2018-03-08	007185
Larson Davis CAL291 Residual Intensity Calibrator	2016-09-22	2017-09-22	007287

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.01	113.80	114.20	0.14	Pass

As Received Level: 114.33
Adjusted Level: 114.01

-- End of measurement results--

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.20	-0.20	-1.20	0.80	0.23	Pass
1000	0.19	0.00	-0.70	0.70	0.23	Pass
8000	-2.58	-3.00	-5.50	-1.50	0.32	Pass

-- End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted, 20 dB gain	37.91

-- End of measurement results--

-- End of Report--

Signatory: Ron Harris

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Capt. Mark Lane
March 16, 2018

APPENDIX B

PHOTO LOG OF BASELINE NOISE MEASUREMENT LOCATIONS

Appendix B: Noise Study Photo Log

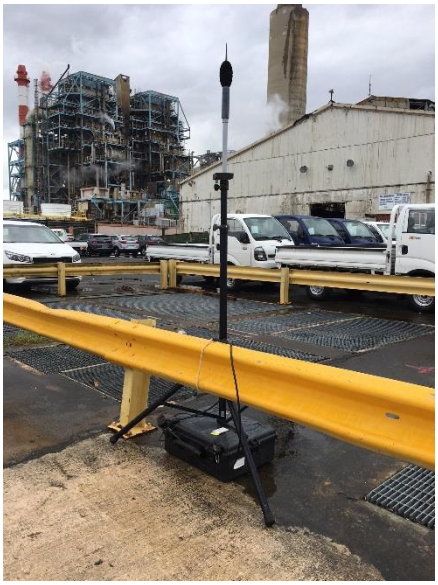
Photo No.:	Date:	
1	3/5/2018	
Direction Photo Taken: Facing South		
Description: **LT-1** Long-term monitoring station 1 (LT-1) on the Project proposed site. The station is located in the Wharf C area. The existing Wharf B warehouse and PREPA's San Juan Power Plant are seen in the background.		

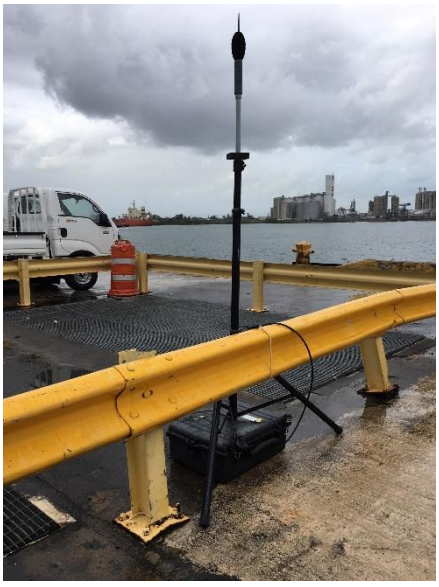
Photo No.:	Date:	
2	3/5/2018	
Direction Photo Taken: Facing North-west		
Description: **LT-1** LT-1 viewing the Pan-American Grain site and Sabana Community in the Municipality of Guaynabo on the other side of the San Juan Bay.		

Photo No.:	Date:
3	3/5/2018

Direction Photo Taken:

Facing South-east

Description:

ST-2

Short-term monitoring location ST-2 is located in the San Juan Bay front. Wharves A, B C (proposed site) and other wharves lying south of San Juan Bay are seen from ST-2. The facilities to the right of the photo are occupied mainly by Pan-American Grain (Sabana Industrial Park).

Photo No.:	Date:
4	3/5/2018

Direction Photo Taken:

Facing North-west

Description:

ST-2

ST-2 in the direction of residences of the Sabana Community. Photo taken on B Street.

Photo No.:	Date:
5	3/5/2018

Direction Photo Taken:

Facing South-east

Description:

ST-3

Short-term monitoring location ST-3 is located on Desembarcadero Street, Sabana Community. The Puma Dock facility is located to the right of the photo. PREPA's Power Plant can be seen on the other side of San Juan Bay, beyond Puma's dock.

Photo No.:	Date:
6	3/5/2018

Direction Photo Taken:

Facing North-west

Description:

ST-3

ST-3 in the direction of residential houses in Sabana Community. Small commercial business (local food) are also located in the area.

Photo No.:	**Date:**
7	3/5/2018

Direction Photo Taken:

Facing North-east

Description:

ST-4

Short-term monitoring location. ST-4 is located in the parking lot of commercial offices building complex. The facility also has multi story parking. PREPA' Power Plant is seen from the monitoring site.

Photo No.:	**Date:**
8	3/5/2018

Direction Photo Taken:

Facing South-west

Description:

ST-4

ST-4 view in the direction of the Federal Detention Center (building to the right) and PR-22 (highway) between the two buildings. A power sub-station is partially seen in the top left of the photo.

Photo No.:	Date:
9	3/5/2018

Direction Photo Taken:

Facing North-west

Description:

ST-5

Short-term monitoring location (ST-5) is located on 7 St NW (dead end street) in the Puerto Nuevo Community. The photo is g in the direction of the Municipality of San Juan stormwater pump station (turned off at the time of the survey), and the PR-22 (highway).

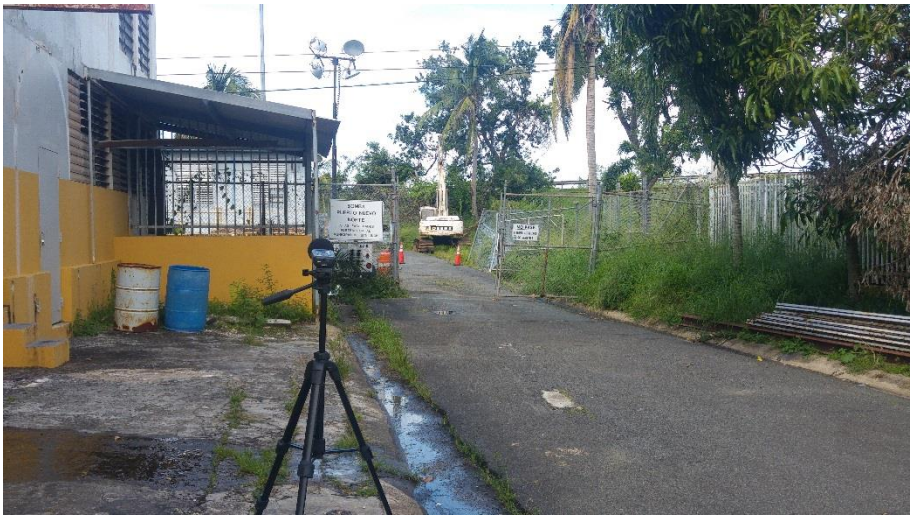


Photo No.:	Date:
10	3/5/2018

Direction Photo Taken:

Facing South-east

Description:

ST-5

ST-5 in the direction of some residential houses of Puerto Nuevo Community.

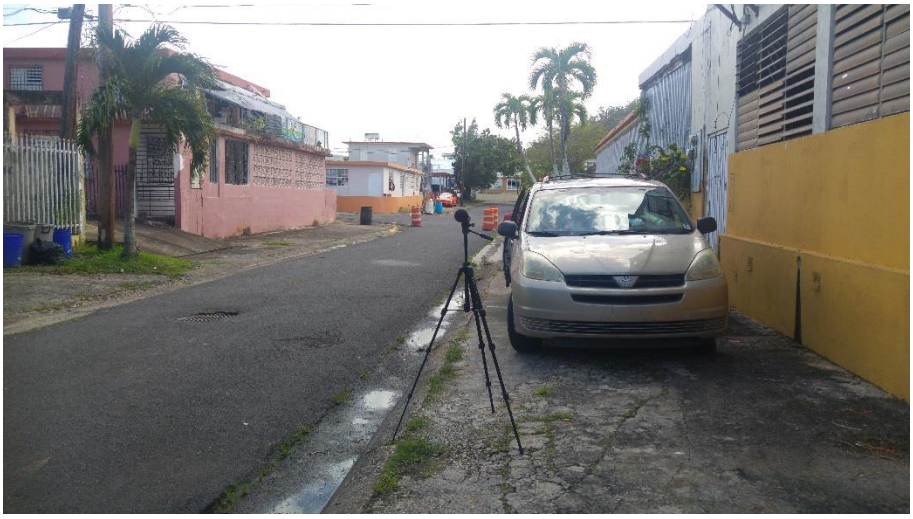


Photo No.:	Date:
11	3/5/2018

Direction Photo Taken:

Facing South-west

Description:

ST-6

ST-6 monitoring location in the direction of PR-1 and industrial facilities.

Photo No.:	Date:
12	3/5/2018

Direction Photo Taken:

Facing North-east

Description:

ST-6

ST-6 in the direction of a commercial building and residences of Miramar Community in the Municipality of San Juan. The area is zoned for mixed uses.

Photo No.:	Date:
13	3/5/2018

Direction Photo Taken:

Facing West

Description:

ST-PARK

Monitoring Station - Central Park (ST-PARK). Open space looking in the direction of the proposed Site. Vegetation is dominated by mangroves.

Photo No.:	Date:
14	3/5/2018

Direction Photo Taken:

Facing East

Description:

ST-PARK

Monitoring Station - Central Park in the direction of PR-1 and on-ramp for PR-2 (Kennedy Ave.).

APPENDIX 9E OPERATIONAL NOISE REPORT (AUGUST 2021)

NFEnergía LLC

San Juan Micro-Fuel Handling Facility

Operational Noise Report

August 17, 2021

NFENERGÍAnergía LLC
SAN JUAN MICRO-FUEL HANDLING FACILITY
OPERATIONAL NOISE REPORT

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ACRONYMS AND ABBREVIATIONS

dBA	decibel levels using the A-weighted scale
EQB	Puerto Rico Environmental Quality Board
ERM	Environmental Resources Management
FERC	Federal Energy Regulatory Commission
L_{dn}	day-night noise level
L_{eq}	equivalent sound pressure level
MFH Facility	San Juan Micro-Fuel Handling Facility
mph	miles per hour
NFEnergía	NFEnergía LLC
NSA	Noise Sensitive Area

NFENERGÍAnergía LLC
SAN JUAN MICRO-FUEL HANDLING FACILITY
OPERATIONAL NOISE REPORT

1.0 INTRODUCTION

Environmental Resources Management ("ERM") completed noise monitoring on behalf of NFEnergía LLC ("NFEnergía") to assess the noise impacts from operation of the San Juan Micro-Fuel Handling Facility ("MFH Facility"), a liquefied natural gas import and regasification facility on nearby Noise Sensitive Areas ("NSA"). ERM completed noise monitoring to evaluate the current day-night noise level ("L_{dn}") at the NSAs and operational noise generated by the MFH Facility. Noise monitoring locations are presented on figure 1.

This report summarizes the applicable noise standards, procedures used for data collection, results of the noise monitoring, and compares the results to applicable noise standards.

2.0 PROCEDURES

2.1 Setting

The MFH Facility is located in the Gobernador Pinero Barrio of the San Juan Municipio, San Juan, Puerto Rico (see figure 1). The MFH Facility is located in an industrial area and is surrounded by industrial facilities and open water. NSAs—including institutional living and residential properties, with single and multi-family residents—are located within 1 mile of the MFH Facility.

2.2 Noise Standards

2.2.1 *Federal*

To account for the human ear's sensitivity to low-level noises, noise measurements are corrected to reflect decibel levels using the A-weighted scale ("dBA"). The Federal Energy Regulatory Commission ("FERC") has adopted the following noise criterion, described in Title 18 Code of Federal Regulations § 380.12(k) for new compression and associated facilities:

> *The noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade, or update of an existing station, must not exceed an L_{dn} of 55 dBA at any pre-existing NSAs such as schools, hospitals, or residences.*

While this FERC noise criterion applies to compressor stations, it has been applied by extension to other aboveground natural gas transmission facilities (e.g., liquefied natural gas terminals, Meter and Regulating sites). Therefore, ERM recommends comparing the results of the noise survey to this criterion for assessing potential noise impacts associated with operation of the MFH Facility.

2.2.2 *Local*

The Territory of Puerto Rico has established noise regulations applicable to the operation of the MFH Facility, as found in the Puerto Rico Environmental Quality Board ("EQB") Regulation

of the EQB for the Control of Noise Pollution, Regulation No. 8019 (EQB, 2011). Table 2-1 summarizes the EQB noise limits.

Table 2-1: Puerto Rico EQB Noise Limits.

Emitting Source	Receiving Zones							
	Zone I (Residential)		Zone II (Commercial)		Zone III (Industrial)		Zone IV (Quiet)	
	Daytime (dBA L_{10})	Nighttime (dBA L_{10})	Daytime (dBA L_{10})	Nighttime (dBA L_{10})	Daytime (dBA L_{10})	Nighttime (dBA L_{10})	Daytime (dBA L_{10})	Nighttime (dBA L_{10})
Zone I (Residential)	60	50	65	55	70	60	55	50
Zone II (Commercial)	65	50	70	60	75	65	55	50
Zone III (Industrial)	65	50	70	65	75	75	55	50
Zone IV (Quiet)	65	50	70	65	75	75	55	50

Source: EQB, 2011.
Notes: Daytime is defined as 7:00 am to 10:00 pm, and nighttime is defined as 10:01 pm to 6:59 am.
L_{10} = sound level that is exceeded 10 percent of the time.

The maximum permissible sound level (L_{10}) at NSAs during daytime hours is 65 dBA and during nighttime hours is 50 dBA. The maximum permissible sound level (L_{10}) for industrial areas at all times is 75 dBA. Therefore, the noise levels prescribed by FERC are more restrictive.

2.3 Measurement Plan

2.3.1 *Operational Noise Assessment*

Near field noise data was collected at the operational units that generate noise at the MFH Facility on a continuous or semi-continuous basis, as listed below:

- pump skid;
- compressor;
- vaporizers; and
- air compressor (operates while truck loading is occurring).

Near field noise data was collected from 10 to 30 feet from the noise source. Fifteen minutes of noise data was collected from each noise-generating source.

2.3.2 *Community Noise Assessment*

Far field noise data was collected at 5 NSAs identified in the baseline noise monitoring report completed by Tetra Tech, Inc. on March 16, 2018 on behalf of NFEnergía (Tetra Tech, 2018). ERM field staff verified that no new NSAs have been constructed in proximity to the MFH Facility. Table 2-2 identifies the NSAs that were monitored; the locations of the NSAs are identified on figure 1.

Table 2-2: Noise Sensitive Areas.

NSA	NSA Type	Distance [a] (feet)	Direction
NSA 1	Residences	1,844	West
NSA 2	Correctional Facility	2,288	Southwest
NSA 3	Residences	3,128	Northwest
NSA 4	Residences	6,197	Southeast
NSA 5	Residences	10,837	Northeast

[a] Distance from nearest noise generating source at the MFH Facility.

To assess the current L_{dn}, the following noise data was collected at each NSA identified in table 2-2.

- 2 hours during daytime hours (7 am–10 pm).
- 1 hour of noise during nighttime hours (10 pm–7 am).

2.4 Equipment

Equipment used to conduct the noise monitoring included the following:

- two type 1 sound level meters with 1/3 octave band analyzer (CASELLA CEL-633);
- weather-proof windscreen;
- camera tripod;
- sound level meter calibrator (CASELLA CEL-120);
- GPS or phone capable of documenting latitude and longitude;
- camera; and
- Noise Survey Data Sheet.

2.5 Measurement Procedures

Near field noise monitoring commenced on June 7, 2021 and was completed on June 8, 2021. Far field noise monitoring commenced on June 8, 2021 and was completed on June 10, 2021.

Prior to beginning noise monitoring, the sound level meters were programmed to record at one-minute intervals for the duration of the monitoring period. The sound level meter was set to slow response and to record the following: unweighted 1/3 octave band sound pressure level;

equivalent sound pressure level (L_{eq}); minimum sound pressure level; maximum sound pressure level; and the 10, 50, and 90 percent exceedance sound pressure levels (L_{10}, L_{50}, L_{90}). The sound level meter was field-calibrated prior to commencing the noise monitoring and following the completion of the noise monitoring. The L_{dn} for NSAs was calculated using the sound data collected during the noise monitoring event.

The sound level meter was fastened to a tripod approximately 5 feet above the ground and fitted with a weather-proof windscreen. The sound level meter was placed inside the environmental enclosure. Field personnel documented auditory observations of noise sources every 5 minutes, or if an audible change in conditions occurred. Meteorological data was obtained online from www.wunderground.com using the nearest weather station to the testing location and is displayed in noise survey data sheets included in appendix A. Calibration certificates are included in appendix B.

3.0 NOISE MONITORING RESULTS

3.1 Noise Monitoring

3.1.1 *Operational Noise Assessment*

Table 3-1 presents the operation noise levels associated with the noise-generating equipment at the MFH Facility.

Table 3-1: Operational Noise Data.

Equipment	Measured Sound Pressure Level (dBA)	Distance from Source (feet)	Implied Sound Power Level (dBA)
Pump Skid	75.9	15	96.9
Compressor	84.7	15	105.7
Vaporizers	85.9	30	112.9
Air Compressor	84.6	10	102.1

3.1.2 *Community Noise Assessment*

Table 3-2 presents the results of the far field community noise assessment. Also included in table 3-2 is the results of the ambient noise data collected in 2018.

Table 3-2: Noise Levels at NSAs.

NSA	Measured Daytime Sound Level (2021) (dBA)	Measured Nighttime Sound Level (2021) (dBA)	Calculated L_{dn} (2021) (dBA)	Estimated L_{dn} without MFH Facility Noise [a] (2021) (dBA)	Calculated L_{dn} (2018) [b] (dBA)
NSA-1	68.8	57.9	68.5	68.0	68
NSA-2	68.8	62.6	70.6	70.5	61
NSA-3	66.9	59.5	68.1	67.8	64
NSA-4	64.2	58.4	66.3	66.2	71
NSA-5	69.4	60.1	69.7	69.7	65

[a] Calculated based on current measured daytime and nighttime sound levels, subtracting the operational sound level from the MFH Facility included in Table 3-1..

Based on the 2021 noise survey, the existing L_{dn} at the five NSAs ranged from 66.3 to 70.6 dBA. After calculating the noise contribution attributable to the MFH Facility at the time of the noise survey (see section 3.2 of this report), the background L_{dn} at the NSAs ranged from 66.2 to 70.5 dBA. During the 2018 background noise survey, completed prior to the construction of the MFH Facility, the background L_{dn} at the NSAs ranged from 61 to 71 dBA. Because the MFH Facility and nearby NSAs are located in an area with multiple industrial users, a port with marine traffic, and in close proximity to an airport, these different noise sources likely contributed to the variability in background noise observed between 2018 and 2021. The variability of the background noise from 2018 to 2021 appears to be unrelated to the operation of the MFH Facility.

As shown in field notes presented in appendix A, dominant noise sources during the noise monitoring event varied between the NSAs and included the following: road, air, and marine traffic noise; wind; insects; birds; frogs; noise from nearby industrial facilities; and noise from landscaping activities. Noise from the operation of the MFH Facility was audible at NSA 1 at night and was at times faintly audible at NSA 2 at night. The temperature ranged from 73 to 84 degrees Fahrenheit, humidity ranged from 74 to 100 percent, wind speed ranged from 0 to 12 miles per hour (“mph”), and atmospheric pressure ranged from 30.02 to 30.07 inches of mercury. Additional details regarding meteorological conditions are presented in appendix A. Wind speeds of less than 12 mph are optimal for noise monitoring. Because wind speeds were recorded at 12 mph for only a ½ hour period at one NSA, and for the remainder of the survey were less than 12 mph, ERM does not believe that excess wind affected noise levels during the noise monitoring event.

3.2 Estimated Noise Attributable to MFH Facility Operation

To calculate the noise attributable to MFH Facility operation at the nearby NSAs, ERM used the International Standards Organization 613-1 method for calculating the attenuation of sound outdoors as a result of atmospheric absorption and distance attenuation. Noise attributable to each piece of noise-generating equipment was based upon data summarized in table 3-1 and the distance from each noise-generating unit to the nearby NSAs. Standard temperature (20 degrees Celsius) and pressure (1 standard atmosphere) were assumed for the calculation, as specified in International Standards Organization 9613-1, and 50 percent relative humidity. The noise attributable to MFH Facility operation at the nearby NSAs is summarized in table 3-3. Noise calculations are included in appendix C.

Table 3-3: Noise Attributable to MFH Facility Operation at NSAs.

NSA	MFH Facility Noise (L_{eq}) (dBA)	MFH Facility Noise (L_{dn}) (dBA)	Estimated Increase Over Background (2021) (dBA)
NSA-1	49.5	55.9	0.3
NSA-2	47.9	54.3	0.1
NSA-3	46.4	52.8	0.2
NSA-4	40.7	47.1	<0.1
NSA-5	35.8	42.2	<0.1

4.0 CONCLUSION

As presented in table 3-3, the noise attributable to the operation of the MFH Facility is less than 55 dBA L_{dn} at NSAs 2 to 5. Noise attributable to operation of the MFH Facility at NSA 1 is 55.9 dBA L_{dn}, which is less than 1 decibel above FERC's noise criterion. Based on the elevated background sound levels at NSA 1 and observations during the operational noise survey, the noise attributable to the MFH Facility operation is not the dominant noise source at NSA 1, and is only periodically audible at NSA 1. NFEnergía believes that operation of the MFH Facility is not impacting nearby NSAs and is not proposing any additional noise mitigation measures.

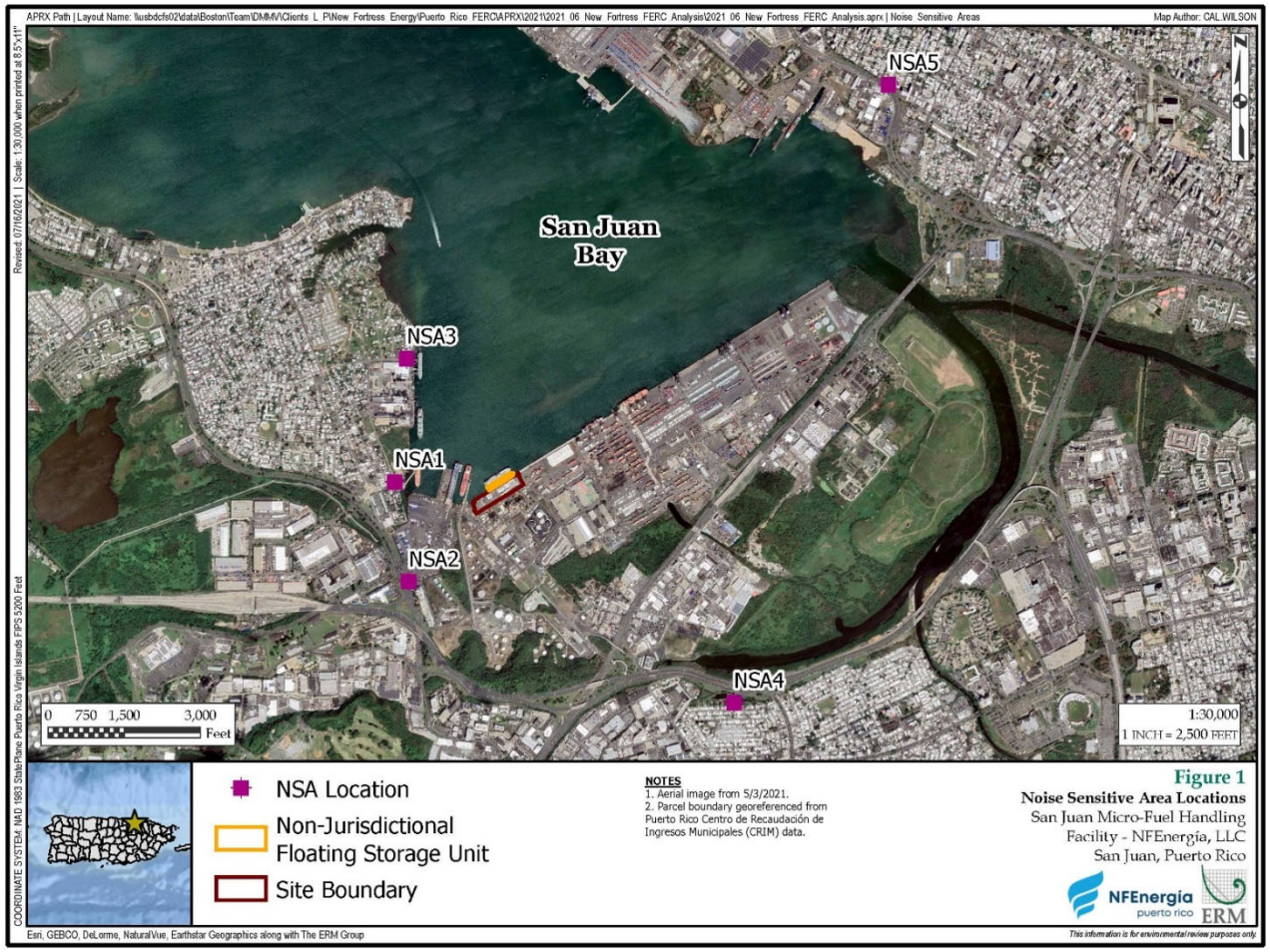

Figure 1: Noise Sensitive Area Locations

References:

Puerto Rico Environmental Quality Board (EQB). 2011. Regulation of the EQB for the Control of Noise Pollution, Regulation No. 8019. Amended January 2011.

Tetra Tech, Inc. (Tetra Tech). 2018. NFEnergía Baseline Sound Survey Results. March 16, 2018.

APPENDIX A NOISE SURVEY DATA SHEETS

Noise Survey Data Sheet

Location: NSA 1

Investigator Name: Patrick Buffington

Date: 6/8/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/8/21 12:35 PM	1-2	East	82	30.05	77	PREPA turbine noise and traffic noise	PCB
6/8/21 12:50 PM	1-2	East	82	30.05	77	PREPA turbine noise, traffic noise, low hum from bay – either FSU engines or other docked ship at adjacent facility	PCB
6/8/21 1:05 PM	3	East	83	30.04	77	Ice cream truck idling w/ music near meter ~7 mins	PCB
6/8/21 1:20 PM	3	East	83	30.04	77	PREPA turbines, less traffic, ship hum	PCB
6/8/21 1:35 PM	3	East	83	30.04	77	PREPA turbines, less traffic, ship hum	PCB
6/8/21 1:50 PM	1-2	East	83	30.04	77	Ship hum, PREPA turbines, construction noise	PCB

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/8/21 2:05 PM	1-2	East	83	30.04	78	Ship hum, PREPA turbines, light traffic, birds	PCB
6/8/21 2:20 PM	3	East	84	30.04	78	Ship hum and PREPA both fainter, increased traffic noise	PCB
6/8/21 2:35 PM	3	East	84	30.04	78	Heavy traffic	PCB

Noise Survey Data Sheet

Location: NSA 1

Investigator Name: Patrick Buffington

Date: 6/8/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/8/21 11:19 PM	None	N/A	74	30.04	94	PREPA turbine noise, NFE vaporizers, frogs, insects	PCB
6/8/21 11:34 PM	None	N/A	74	30.04	94	PREPA turbines, NFE vaporizers, insects	PCB
6/8/21 11:49 PM	None	N/A	74	30.05	94	PREPA turbines, NFE vaporizers, insects getting louder	PCB
6/9/21 12:04 AM	None	N/A	74	30.05	94	Insects, PREPA turbines, NFE vaporizers	PCB
6/9/21 12:19 AM	None	N/A	74	30.05	94	Insects, PREPA turbines, NFE vaporizers	PCB

Noise Survey Data Sheet

Location: NSA 2

Investigator Name: Patrick Buffington

Date: 6/9/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/9/21 10:10 AM	2	North	75	30.06	90	Lawn mower, traffic	PCB
6/9/21 10:25 AM	2	North	75	30.06	90	Paused due to rain	PCB
6/9/21 11:05 AM	4	Southeast	74	30.06	93	Traffic noise	PCB
6/9/21 11:05 AM	4	Southeast	74	30.06	93	Traffic noise	PCB
6/9/21 11:20 AM	6	Southeast	74	30.06	93	Traffic noise	PCB
6/9/21 11:35 AM	8	Southeast	76	30.06	93	Traffic noise	PCB

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/9/21 11:50AM	9	Southeast	78	30.06	96	Traffic noise	PCB
6/9/21 12:05 PM	9	Southeast	78	30.06	96	Traffic noise	PCB
6/9/21 12:20 PM	9	Southeast	80	30.05	93	Traffic noise	PCB
6/9/21 12:35 PM	6	Southeast	80	30.05	93	Traffic noise	PCB
6/9/21 12:50 PM	3	Southeast	82	30.04	90	Traffic noise	PCB

Noise Survey Data Sheet

Location: NSA 2

Investigator Name: Patrick Buffington

Date: 6/9/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/9/21 10:05 PM	None	N/A	73	30.06	99	Traffic noise, PREPA turbines faint	PCB
6/9/21 10:20 PM	None	N/A	73	30.06	99	NFE vaporizers faintly audible if no cars are passing	PCB
6/9/21 10:35 PM	None	N/A	73	30.06	99	Traffic, frogs, insects	PCB
6/9/21 10:50 PM	1	North	73	30.06	100	Traffic, frogs, insects	PCB
6/9/21 11:05 PM	1	North	73	30.06	100	Traffic, frogs, insects	PCB

Noise Survey Data Sheet

Location: NSA 3

Investigator Name: Patrick Buffington

Date: 6/8/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/8/21 10:25 AM	12	East	83	30.07	77	High-pitched whine from adjacent facility, frequent truck traffic	PCB
6/8/21 10:55 AM	12	East	83	30.07	77	Whine from adjacent facility, very loud trucks	PCB
6/8/21 11:10 AM	10	East	83	30.07	77	Whine from adjacent facility, less truck traffic, calmer wind	PCB
6/8/21 11:25 AM	10	East	83	30.07	74	Whine from adjacent facility, residential traffic, power tools from neighborhood	PCB
6/8/21 11:40 AM	10	East	83	30.07	74	Whine from adjacent facility, some traffic	PCB
6/8/21 11:55 AM	8	East	80	30.07	74	Whine from adjacent facility, lower wind	PCB

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/8/21 12:10 PM	8	East	84	30.06	74	Whine from adjacent facility	PCB
6/8/21 12:25 PM	8	East	84	30.06	74	Less trucks, more bird noise	PCB

Noise Survey Data Sheet

Location: NSA 3

Investigator Name: Patrick Buffington

Date: 6/8/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/8/21 10:10 PM	1	East-southeast	75	30.04	91	Many frogs, insects, adjacent facility noise	PCB
6/8/21 10:25 PM	None	N/A	74	30.04	91	Many frogs, insects, adjacent facility noise	PCB
6/8/21 10:40 PM	None	N/A	74	30.04	92	Frogs, insects, facility, some vehicles	PCB
6/8/21 10:55 PM	None	N/A	74	30.04	93	Frogs, insects, facility, no traffic	PCB
6/8/21 11:10 PM	None	N/A	74	30.04	95	Frogs, insects, facility, mechanical noises from bay (possibly from a ship)	PCB

Noise Survey Data Sheet

Location: NSA 4

Investigator Name: Patrick Buffington

Date: 6/9/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/9/21 10:30 AM	None	N/A	82	30.06	90	City water pumps, highway noise, insects	PCB
6/9/21 10:45 AM	None	N/A	82	30.06	90	Water pumps stopped, highway, insects	PCB
6/9/21 11:00 AM	None	N/A	82	30.06	90	Paused measurement due to rain	PCB
6/9/21 12:25 PM	4	North	83	30.05	76	Highway traffic	PCB
6/9/21 12:40 PM	4	North	83	30.05	76	Traffic, birds	PCB
6/9/21 12:55 PM	4	North	83	30.05	76	Traffic, birds	PCB

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/9/21 1:10 PM	4	North	83	30.05	76	Traffic, birds	PCB
6/9/21 1:25 PM	4	North	83	30.05	74	Traffic, birds	PCB
6/9/21 1:40 PM	4	North	83	30.04	74	Traffic, birds, planes	PCB

Noise Survey Data Sheet

Location: NSA 4

Investigator Name: Patrick Buffington

Date: 6/9/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/9/21 11:22 PM	None	N/A	73	30.06	94	Insects, traffic, birds	PCB
6/9/21 11:37 PM	None	N/A	73	30.06	94	Insects, traffic	PCB
6/9/21 11:52 PM	None	N/A	73	30.05	98	Insects, traffic	PCB
6/10/21 12:07 AM	None	N/A	73	30.05	98	Insects, traffic	PCB
6/10/21 12:22 AM	None	N/A	73	30.05	98	Insects, traffic	PCB

Noise Survey Data Sheet

Location: NSA 5

Investigator Name: Patrick Buffington

Date: 6/10/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/10/21 1:30 PM	6	East	84	30.02	80	Traffic noise	PCB
6/10/21 1:45 PM	6	East	84	30.02	80	Traffic noise	PCB
6/10/21 2:00 PM	2	East	82	30.02	80	Traffic noise	PCB
6/10/21 2:15 PM	2	East	82	30.02	80	Traffic noise	PCB
6/10/21 2:30 PM	4	East	81	30.02	79	Traffic noise	PCB
6/10/21 2:45 PM	4	East	81	30.02	79	Traffic noise	PCB

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/10/21 3:00 PM	4	East	81	30.02	79	Traffic noise	PCB
6/10/21 3:15 PM	4	East	81	30.02	78	Traffic noise	PCB
6/10/21 3:30 PM	3	East	81	30.02	78	Traffic noise	PCB

Noise Survey Data Sheet

Location: NSA 5

Investigator Name: Patrick Buffington

Date: 6/10/2021

Meter Manufacturer and Model Number: Casella CEL-633C

Serial Number: 1239533

Calibrator Manufacturer, Model: Casella CEL-120/1

Calibrator Serial Number: 2651624

Initial Calibration: 114.0

Final Calibration: 114.0

Meteorological Conditions

Date/ Time	Wind Speed (mph)	Wind Direction	Temperature (°F)	Barometric Pressure (in)	Relative Humidity (%)	Notes	Initial
6/10/21 12:40 AM	None	N/A	73	30.04	98	Traffic, Insects	PCB
6/10/21 12:55 AM	None	N/A	73	30.04	98	Traffic, Insects	PCB
6/10/21 1:10 AM	None	N/A	73	30.03	99	Traffic, Insects	PCB
6/10/21 1:25 AM	None	N/A	73	30.03	99	Traffic, Insects	PCB
6/10/21 1:40 AM	None	N/A	73	30.03	99	Traffic, insects, frogs	PCB

APPENDIX B CERTIFICATE OF CONFORMITY AND CALIBRATION

CASELLA

Certificate of Conformity and Calibration

Customer:	Field Environmental
Instrument:	CEL-120/1
Serial Number:	2651624
Job Number:	22153
Date of Issue:	28-Oct-2020
Engineer:	C Chesney

Traceable Equipment:		
	Reference Calibrator	EQ11084
	DVM type Fluke 45	EQ00023

Test Conditions:		
Ambient Temperature	23.0	°C
Ambient Humidity	33.0	%RH
Ambient Pressure	996	mBar

Results:	Level 1	Level 2	Frequency
Initial Reading	113.90 dB	93.86 dB	1.0000 kHz
Final Reading	114.00 dB	94.00 dB	1.0000 kHz

Uncertainty:			
Level	±	0.15	dB
Frequency	±	0.5	Hz

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications.
Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9000:2015 quality procedures.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

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CASELLA

Certificate of Conformity and Calibration

Instrument Model:- CEL-633C

Serial Number 1239533
Firmware revision V129-09

Microphone Type:- CEL-251
Serial Number 3664

Preamplifier Type:- CEL-495
Serial Number 002777

Instrument Class/Type:- 1

Applicable standards:-

IEC 61672: 2002 / EN 60651 (Electroacoustics - Sound Level Meters)
IEC 60651 1979 (Sound Level Meters), ANSI S1.4: 1983 (Specifications For Sound Level Meters)

Note:- The test sequences performed in this report are in accordance with the current Sound level meter *Standard - IEC61672. The combination of tests performed are considered to confirm the products electro-acoustic performance to all applicable standards including superceeded Sound Level Meter Standards - IEC60651 and IEC60804.*

Test Conditions:- 23 °C, 36.5 %RH, 999.8 mBar

Test Engineer:- Paul Blackwell
Date of Issue:- December 15, 2020

Declaration of conformity:-

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications. Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9001:2008 quality procedures. This product is certified as being compliant to the requirements of the CE Directive.

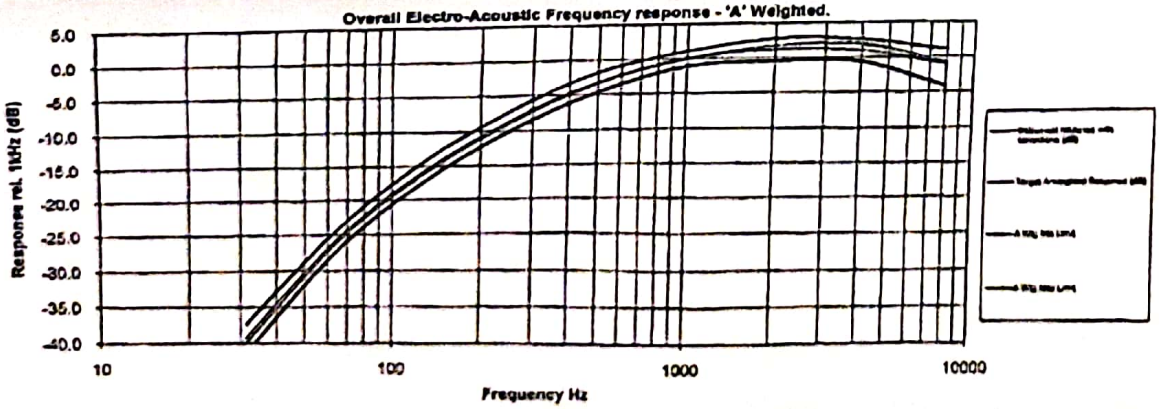
Test Summary:-

Self Generated Noise Test	All Tests Pass
Electrical Signal Test Of Frequency Weightings	All Tests Pass
Frequency & Time Weightings At 1 kHz	All Tests Pass
Level Linearity On The Reference Level Range	All Tests Pass
Toneburst Response Test	All Tests Pass
C-peak Sound Levels	All Tests Pass
Overload Indication	All Tests Pass
Acoustic Tests	All Tests Pass

Combined Electro-Acoustic Frequency Response - A Weighted

Combined Electro-Acoustic Frequency Response - A Weighted (IEC 61672-3:2006)

The following A-Weighted frequency response graph shows this instruments overall frequency response based upon the application of multi-frequency pressure field calibrations. The microphones Pressure to Free field correction coefficients are applied to pressure response. Reference level taken at 1kHz.



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APPENDIX C OPERATIONAL NOISE CALCULATIONS

NFEnergía LLC - San Juan Micro-Fuel Handling Facility

Operational Noise Calculations

Summary Equipment	Measured Sound Pressure Level (dBA)	Distance from Source (ft)	Implied Sound Power Level (dBA)	Distance (ft)					Contributed Sound Pressure Level Leq (dBA)					Contributed Sound Pressure Level Ldn (dBA)				
				NSA 1	NSA 2	NSA 3	NSA 4	NSA 5	NSA 1	NSA 2	NSA 3	NSA 4	NSA 5	NSA 1	NSA 2	NSA 3	NSA 4	NSA 5
Pump Skid	75.9	15	96.9	2,128	2,644	3,130	6,297	10,981	32.9	31.0	29.5	23.4	18.6	39.3	37.4	35.9	29.8	25.0
Compressor	84.7	15	105.7	2,209	2,717	3,165	6,235	10,906	41.3	39.5	38.2	32.3	27.5	47.7	45.9	44.6	38.7	33.9
Vaporizers	85.9	30	112.9	2,304	2,764	3,247	6,197	10,837	48.2	46.6	45.2	39.6	34.7	54.6	53.0	51.6	46.0	41.1
Air Compressor	84.6	10	102.1	1,844	2,288	3,128	6,366	11,309	39.3	37.4	34.7	28.5	23.5	45.7	43.8	41.1	34.9	29.9
Scenario 1	---	---	---	---	---	---	---	---	49.5	47.9	46.4	40.7	35.8	**55.9**	54.3	52.8	47.1	42.2
Gas Combustion Unit	78.0	10	95.5	1,966	2,444	3,114	6,342	11,165	---	---	28.1	---	---	**---**	**---**	34.5	**---**	**---**

NSA	Measured Daytime Sound Pressure Level (dBA)	Measured Nighttime Sound Level (dBA)	Calculated Ldn (dBA)
NSA 1	68.8	57.9	68.5
NSA 2	68.8	62.6	70.6
NSA 3	66.9	59.5	68.1
NSA 4	64.2	58.4	66.3
NSA 5	69.4	60.1	69.7

NSA	Implied Ambient Daytime Sound Pressure Level (dBA)	Implied Ambient Nighttime Sound Level (dBA)	Calculated Ldn (dBA)
NSA 1	68.7	56.5	68.0
NSA 2	68.7	62.3	70.5
NSA 3	66.8	59.1	67.8
NSA 4	64.1	58.3	66.2
NSA 5	69.4	60.1	69.7

NSA	Scenario 1 Increase Above Ambient (dBA)	Gas Combustion Unit Increase Above Ambient (dBA)
NSA 1	0.26	---
NSA 2	0.10	---
NSA 3	0.13	0.00
NSA 4	0.05	---
NSA 5	0.01	---