APPENDIX P LIQUEFACTION FACILITY ENVIRONMENTAL SOUND LEVEL ASSESSMENT REPORT

Alaska LNG™

LIQUEFACTION FACILITY
ENVIRONMENTAL SOUND LEVEL ASSESSMENT REPORT

USAL-P2-SRVIB-00-000001-000

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 REPORT SUMMARY

This report presents the results of the study of the acoustic emissions from the operation and construction of the Liquefaction Facility that is proposed to be built as part of the Alaska LNG Project (Project). The operational sound levels presented in this report show that, with the application of proven noise mitigation technology, the Facility at full load operation would be able to comply with Federal Energy Regulatory Commission (FERC) environmental sound level criterion at the existing noise sensitive areas (NSAs) with a reasonable degree of certainty. The estimated construction sound levels are also presented at the NSAs.

2.0 INTRODUCTION

In this report Hoover & Keith Inc. provides the results of an environmental sound level assessment study for a proposed Liquefaction Facility as a part of the Project. The Facility consists of the following major units:

- Three LNG trains (6 million tonnes per annum (MTPA) each): Each train having 2 x 50 percent configuration with two gas turbine drivers for refrigerant compressor installed in parallel. Process cooling is accomplished using Air Cooled Heat Exchangers (ACHE).

- Power generation: Four gas turbines operating in combined cycle. Other major equipment in power generation area includes: heat recovery steam generators (HRSGs), steam turbine generators (STGs) and air-cooled condensers (ACCs).

- Auxiliary equipment such as boil-off gas (BOG) compressors and process pumps in the utility area, truck loading, fractionation, other process areas, flare pilots, and docked LNG carriers (LNGCs).

2.1 STUDY PURPOSE

This study provides an environmental sound level assessment for the Facility which includes the following:

- Developing a model to estimate the sound level contribution level from the facility at the nearest existing NSAs in the vicinity of the Facility;

- Assessing the far-field community sound levels at the identified NSAs for Facility construction and normal full load operation; and

- Identifying the noise mitigation measures required to comply with the environmental sound level criterion stipulated by the Federal Energy Regulatory Commission (FERC).

2.2 SITE DESCRIPTION

The Project Liquefaction Facility would be located around the Kenai Peninsula Borough in the Nikiski area. Four nearby residential NSAs were identified near the project site. Table 1 provides a brief description of these locations based on the background ambient sound level survey report. Land use around the site is a mix of residential and industrial. Terrain around the Project site is generally flat. The shoreline is located approximately 2,500 feet west from Train #2 center with the topography sloping down towards Cook Inlet. Figure A-1, provided in Attachment 1, shows an aerial view of the proposed Liquefaction Facility site and the location of nearby NSAs.

TABLE 1

Description of NSA Locations

Location (NSA)	Description	Approximate Distance from Train #2 Center (feet)	Direction
LT[1]-1 (NSA_01215)	Located on the northwest corner of Malaitna Road and Tarawa Street, and approximately 6,160 feet north of the proposed LNG liquefaction facility footprint boundary	10,500	Northwest
LT-2 (NSA_01533)	Located on the north side of Ray Court east of Top Gun Street (Jody Street on Google Maps), and less than 300 feet east of the proposed LNG liquefaction facility footprint boundary	3700	East
LT-3 (NSA_01555)	Located on the north side of Spruce Place north of South Miller Loop Road, and approximately 300 feet southeast of the proposed LNG liquefaction facility footprint boundary	6600	South
ST[2]-4 (NSA_01486)	Located at the northern terminus of Redoubt Drive off of Birch Lane, and less than 300 feet east of the proposed LNG liquefaction facility footprint boundary	5700	Southeast

[1] NSA Naming Terminology based on Baseline Noise Survey Report provided by the Client. Refer USAL-UR-SRVIB-00-000001-000. LT – Long Term Measurement; ST-Short Term Measurement.

3.0 PROJECT NOISE CRITERIA

FERC regulation 18 C.F.R. § 157.206 sets the maximum A-weighted day-night equivalent sound level (L_{dn}), of 55 dBA, which applies to the nearby NSAs. NSAs include residences, schools, hospitals, churches, playgrounds, and camping facilities. In accordance with the FERC criterion, the following formula is used to calculate the L_{dn}:

$$L_{dn} = 10\log_{10}\left[\frac{15\times10^{Leq(day)/10} + 9\times10^{(Leq(night)+10)/10}}{24}\right]$$

where $L_{eq(day)}$ is the continuous equivalent daytime level over the daytime period, 7:00 a.m. to 10:00 p.m., and the $L_{eq(night)}$ is the continuous equivalent night-time level over the night-time period, 10:00 p.m. to 7:00 a.m. This calculation penalizes noise during the night-time period by 10 dB. Thus, for continuous noise emissions, the maximum permissible equivalent continuous sound level at nearby NSAs is 48.6 dBA throughout the daytime and night-time periods.

The FERC sound level limit is applicable to the normal full load operation of the Facility and is also used to assess the sound levels during the construction phase of the Facility.

Note that FERC sound level limit is not applicable to the intermittent short-duration process related upset scenarios such as start-up, shutdown, discharge of safety relief valves and flaring scenarios. Sound levels during these scenarios may exceed the FERC stipulated limits.

No applicable local or state environmental sound regulations or ordinances have been identified.

4.0 NOISE MODELING METHODOLOGY

The procedure for estimating the total (or overall) sound pressure level at any given location is as follows:

a. The octave band sound levels for a specific in-plant source or equipment item at a specific receiver location is calculated using the octave band sound power emission levels of a sound source and applying the octave band environmental correction factors as determined by the environmental conditions (e.g. atmospheric, topographical, foliage, etc.) between that source and the receiver.

b. This calculation is repeated for each source resulting in multiple octave band sound pressure level spectra at the receiver location.

c. The individual octave band sound pressure spectra for each source are then summed logarithmically on an energy basis (within each octave band) resulting is a total octave band sound pressure level spectrum accounting for the influence of all of the sound sources at the receiver location.

d. The total sound pressure level spectrum is then A-weighted and the resulting A-weighted octave band sound levels summed on an energy or logarithmic basis to obtain the final overall A-weighted sound level that can be compared to the project criteria.

Items a. through d. above repeat for each individual receiver location. Therefore, due to the complexity of determining the sound level at multiple receiver locations from multiple sound sources, it is advantageous to use a computer program incorporating standard algorithms that:

- Determines the sound level from each individual source, based on the environmental factors that separate the source from a receiver, and

- Then combines the resulting individual sound levels from many sources into a total or cumulative sound level at that receiver.

The computer program used for this environmental sound level assessment is SoundPLAN Version 7.4 as distributed by Braunstein + Berndt GmbH. This program calculates the sound pressure level at a location using the sound emission properties of the source(s) and environmental propagation factors. This program also includes a number of standardized methodologies that quantifies the acoustic effect of these environmental factors. The specific standard employed by this program is that described in the ISO standard 9613 “Acoustics - Attenuation of sound during propagation outdoors,” part 1 and 2. This standard accounts for sound spreading due to distance, ground affects, barriers, as well as, atmospheric attenuation. This program also assumes a favourable downwind propagation condition (wind speed 1 to 5 meters per second at a height of 3 to 11 meters) as recommended in ISO standard 1996 “Acoustics - Description and measurement of environmental noise” part 2. The assumed ambient temperature was 2.5 °C and the assumed relative humidity (RH) was 70 percent. And all receiver heights were 1.5 meters above the ground.

Terrain effects are determined by using the elevation information contained in the Project GIS library to create a topological digital ground model. The ground absorption values in the model were 0.04 in the units, trains, power generation area, and utilities area; 0.01 for water; and 0.65

elsewhere, representing hard ground, water, and grasslands respectively No sound attenuation due to foliage was included in the assessment.

Equipment sound power levels are based on library data of similar capacity/type equipment or information from suppliers on their equipment similar to that proposed for this facility. The sound power levels used for each piece of equipment in the model included the designed in noise reduction. Note that only the equipment/sources operating under normal full load conditions were included in the noise model. FERC noise criterion is not applicable to intermittent/upset scenarios and therefore, equipment operating under non-routine or emergency conditions was not included in the noise predictions, unless otherwise stated.

5.0 CONSTRUCTION NOISE ASSESSMENT

Construction activities at the Liquefaction Facility would vary across the facility site and take place in phases. This study presents the estimated sound levels for construction of the facility with construction activity at different phases at different locations on the site. Train 1 is at the equipment installation phase, Train 2 and the Power Generation Facility are at the foundation preparation phase, Train 3 is at the site grading phase, and the common process area (Outside Battery Limit (OSBL) is at the equipment installing and finishing phase.

To model the construction sound levels, the typical construction equipment for each phase was identified along with the maximum sound level at 50 feet for each item. The maximum equipment sound power level was then calculated. Table 8, provided in Attachment 2, presents the maximum equipment sound level at 50 feet for each equipment item, and the number and type of equipment items in each area under construction.

Equipment sound levels at 50 feet were identified from the FHWA Roadway Construction Noise Model User's Guide (FWHA-HEP-05-054 or DOT-VNTSC-FHWA-05-01) dated January 2006. The sound levels were modeled in SoundPlan using the same environmental conditions as the operating facility SoundPlan model and the attenuation factors at 500 Hz. Table 2 summarizes the construction model input data.

TABLE 2

Construction Site Modelling

Location	Maximum Source Sound Power Level (dBA)	Utilization Rate, Percent	Modelled Source PWL (dBA)	Number of sources in Model	Height (feet)	Source Type
Train 1	135	60	132.8	1	20	Point
Train 2	127.0/pile driver	50	124.0/pile driver	3	20	Point
Train 3	133	60	130.8	1	10	Point
Power Block	127.0/pile driver	50	12.0 / pile driver	2	20	Point
General Area	129	60	126.8	1	10	Point

Most of the construction equipment operates at the maximum sound level for only a percentage of the entire 24-hour period. This is identified as the utilization rate. The duration of equipment operation and the time of day the equipment operates are factors included in the calculation of the estimated L_{dn} sound levels at the NSAs which are provided in Table 3.

TABLE 3

Estimated Sound Levels at NSAs Construction

Location	L_{dn}, dBA
LT-1 (NSA_01215)	53.5
LT-2 (NSA_01533)	67.1
LT-3 (NSA_01555)	63.6
ST-4 (NSA_01486)	65.5

6.0 OPERATIONAL NOISE ASSESSMENT

This section presents the operational environmental sound level assessment for the normal full load operation of the Facility. The facility's major areas include:

- LNG process areas – Trains 1, 2 and 3;
- Power generation facility;
- Inlet facilities for dehydration and mercury removal;
- Common process area
  - Utility area
  - Fractionation area
  - BOG area
  - Condensate storage and loading
  - LNG storage and loading
- LNGC; and
- Flare pilots.

Sound power levels for all equipment associated with different process areas are presented below.

6.1 EQUIPMENT SOUND EMISSION CHARACTERISTICS

This section presents the major equipment with a description of the included noise mitigation. The sound emission levels used in the environmental sound level modeling are presented in Tables 5-10. The sound power levels identified in these tables include the proposed noise mitigation.

Universal

- All ACHE – Sound power level per fan assembly is L_w = 85 dBA or less. Each fan was modeled as a point source with hemispherical spreading.
- Pumps and Motors skids – sound pressure level is L_p = 83 dBA or less at 3 feet.

LNG Process Areas

- GT combustion turbine Inlet duct lagged with insulation 12.

  (Insulation 12 design – 1-inch fiber material; limp barrier of mass loaded material, 7.8 kilograms per square meter; 1-inch fiber material; and weather jacket)
- GT combustion exhaust exit sound power levels reduced with a special acoustic designed silencer. The silencer minimum Dynamic Insertion Loss (DIL) is identified in Table 4.

TABLE 4

Gas Turbine Exhaust Silencer, DIL, dB

	Octave Band, Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
DIL, dB	15	19	27	39	46	46	39	32	24

- GT combustion turbine enclosed with off-skid metal acoustic walls.

- Process Compressors enclosed with 4-inch thick off-skid metal acoustic enclosure.
- Process Compressor Platform Area enclosed under the platform with walls (Sound Transmission Class (STC) 48 dBA and (Noise Reduction Coefficient (NRC) of 0.9)).
- Process Compressor Piping insulated with Class D insulation and a silencer in each process line.

  Piping emission levels are per meter length and are constant for the first 50 pipe diameters from the source. After that, the piping emission levels decrease linearly at 3 dB per 50 pipe diameters until the piping reaches the next major vessel or cooler. (Class D insulation design – 50 millimeters thick insulation with 1.0 x 10^6 nanometer (N)/meter $(m)^3$ stiffness; limp barrier layer of mass loaded material, 7.8 kilograms per square meter; 50-millimeter insulation, 1.0 x 10^6 nanometer (N)/meter $(m)^3$ stiffness, and outer weather proof layer, 7.8 kilograms per square meter {e.g. 1 millimeter steel}). The minimum dynamic insertion loss of the silencer is provided in Table 5.

TABLE 5

Piping Silencer, DIL, dB

	Octave Bands, Hz							
	63	125	250	500	1000	2000	4000	8000
DIL, dB	0	9	16	17	19	18	0	0

Power Generation Area

- ACC sound power levels per fan assembly is L_w = 95 dBA or less. Each fan was modeled as a point source with hemispherical spreading.
- Install the HP and LP boiler feedwater (BFW) pumps in a building built of walls with STC of 48 dBA and NRC of 0.9.
- HRSG inlet duct lagged with insulation 22

  (Insulation 22 design – 1-inch fiber material; limp barrier of mass loaded material, 7.8 kilograms per square meter; and weather jacket).
- Power Generation Gas Turbine Inlet duct lagged with insulation 12.
- Install the Power Generation GTG in a building built of walls with STC of 48 dBA and NRC of 0.9.
- Install the Steam Turbine in a building built of walls with STC of 48 dBA and NRC of 0.9.
- Steam Condensate Pump Skid sound level is L_p= 83 dBA or less at 3 feet (may require a noise insulation blanket).
- HRSG vacuum unit sound level is L_p= 78 dBA or less at 3 feet.

Utilities and Other Areas

- Install the BOG and BOG recycle compressors in a building comprised of walls with STC of 48 dBA and NRC of 0.9.
- Air Compressor enclosed with 4-inch thick acoustic metal off-skid enclosure
- Air dryer package is a pressure swing absorber with a silencer; sound level is L_p =83 dBA at 3 feet.
- Flare pilots
- LNGC at dock

6.2 RESULTS – COMMUNITY NOISE

When the identified and recommended noise abatement listed in Section 6.1 above are included in the facility design, the far-field sound levels at the nearby NSAs caused by the Liquefaction Facility are estimated to be less than the FERC sound level limit (55 dBA, L_{dn}).

The estimated sound levels at the identified NSAs are presented in Table 6.

TABLE 6

Estimated Sound Levels Noise Sensitive Areas

Location	Estimated Sound Level, L_{dn}, dBA
LT-1 (NSA_01215)	39.0
LT-2 (NSA_01533)	54.8
LT-3 (NSA_01555)	47.6
ST-4 (NSA_01486)	53.5

7.0 CONCLUSION

Our analysis, as presented above, indicates that with the application of proven noise mitigation technology the proposed Liquefaction Facility, at full load operation, would be able to comply with the FERC environmental sound level criterion with a reasonable degree of certainty.

8.0 ACRONYMS AND TERMS

Term	Definition
L_{eq}	The A-weighted equivalent continuous sound pressure level
L_{dn}	Day and night sound pressure level, in dBA with 10 dB penalty at the defined night time from 22:00 to 7:00.
$L_{d,}$ or $L_{eq(day)}$	Continuous equivalent daytime sound level over the daytime period, 7:00 am to 10:00 pm
$L_{n,}$ or $L_{eq(night)}$	Continuous equivalent nighttime sound level over the nighttime period, 10:00 pm to 7:00 am.
ACC	Air Cooling Condensers
ACHE	Air Cooled Heat Exchanger
BFW	boiler feedwater
FERC	Federal Energy Regulatory Commission
LNG	liquefied natural gas
LNGC	LNG Carrier
MTPA	Million Tonnes Per Annum
NSA	noise sensitive area
Project	Alaska LNG Project
PWL or L_w	sound power level
SPL	sound pressure level
STC	sound transmission class

9.0 REFERENCES

ID Number	Reference Title
18 CFR 157.206	FERC Regulations on Noise (L_{dn} 55 dB(A) at the nearest NSA's)
FWHA-HEP-05-054	FWHA Roadway Construction Noise Model User's Guide
ISO 9613-2	Acoustics-Attenuation of Sound During Propagation Outdoors-Part 2
USAL-UR-SRVIB-00-000001-000	Baseline Noise Level Report – Nikiski, AK (March 2015 Noise Survey Report)
USAL-CB-LDLAY-00-000003-000	LNG Liquefaction Facility Overall Complex Site Plan
USAL-CB-MLMEL-00-000001-000	Master Equipment List

10.0 ATTACHMENT 1

Figure A-1: Aerial View of the Project Site

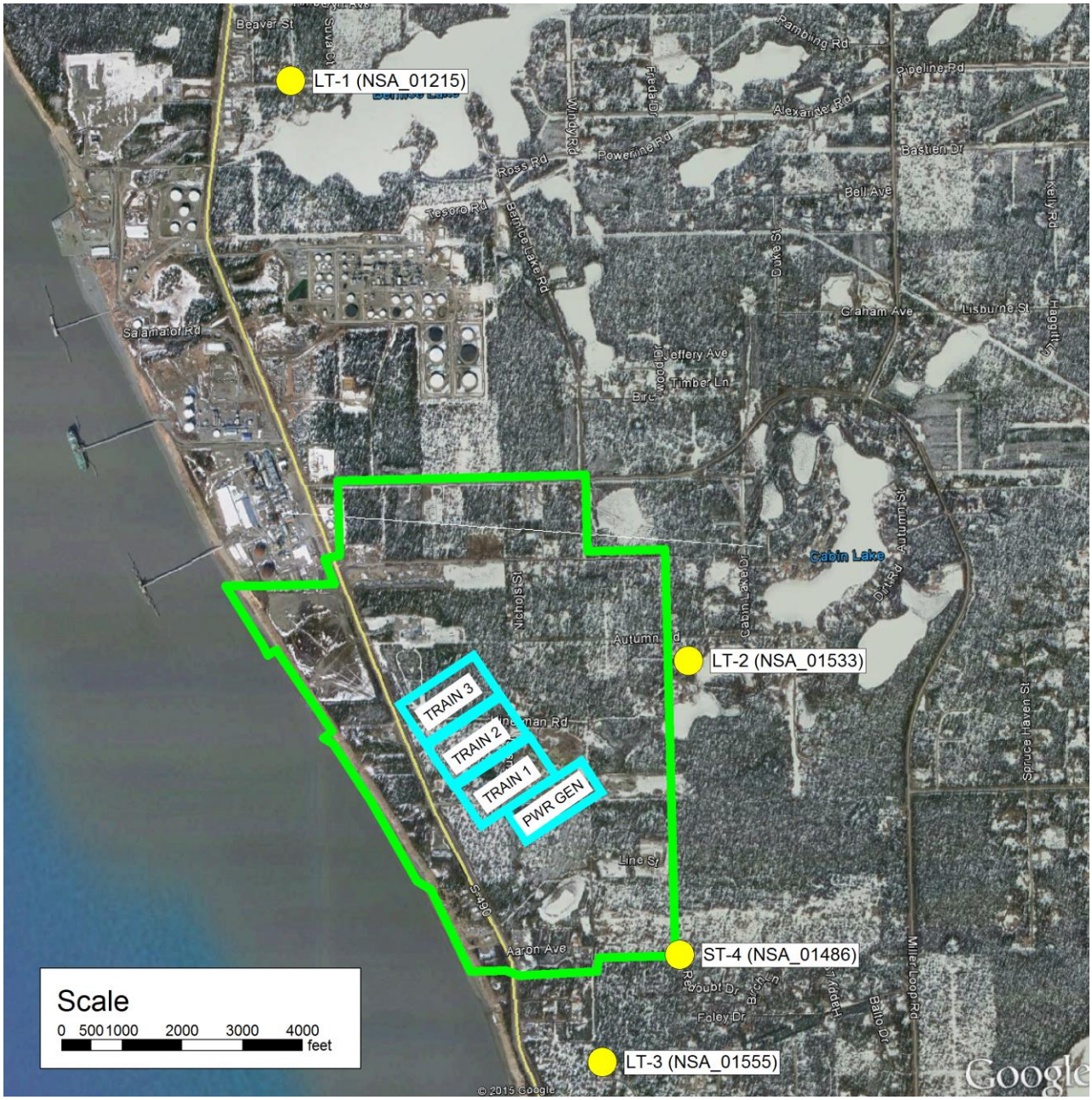


Figure A2: Overall Plot Plan –Liquefaction Facility

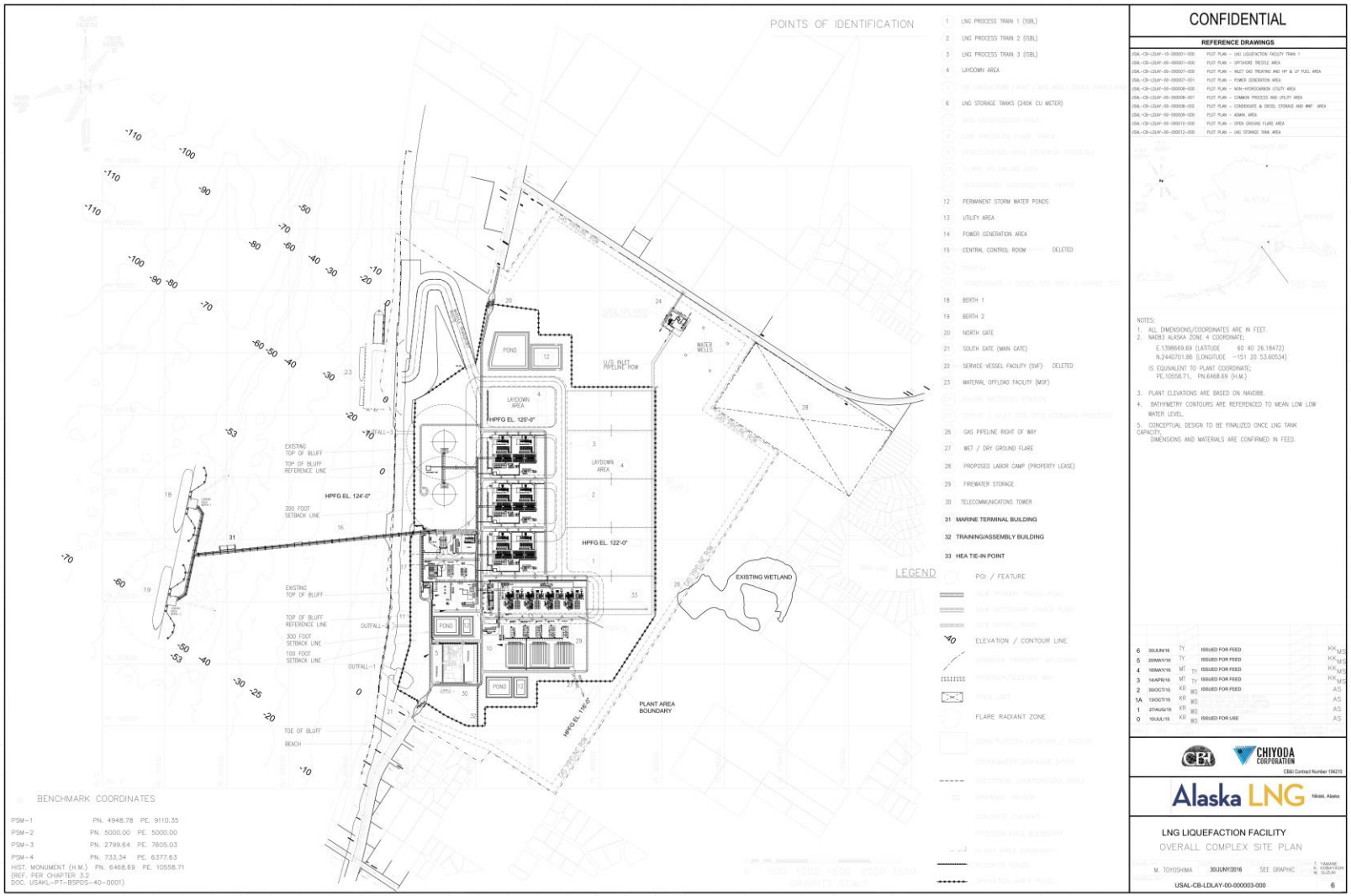


Figure A3: LNG Train Layout

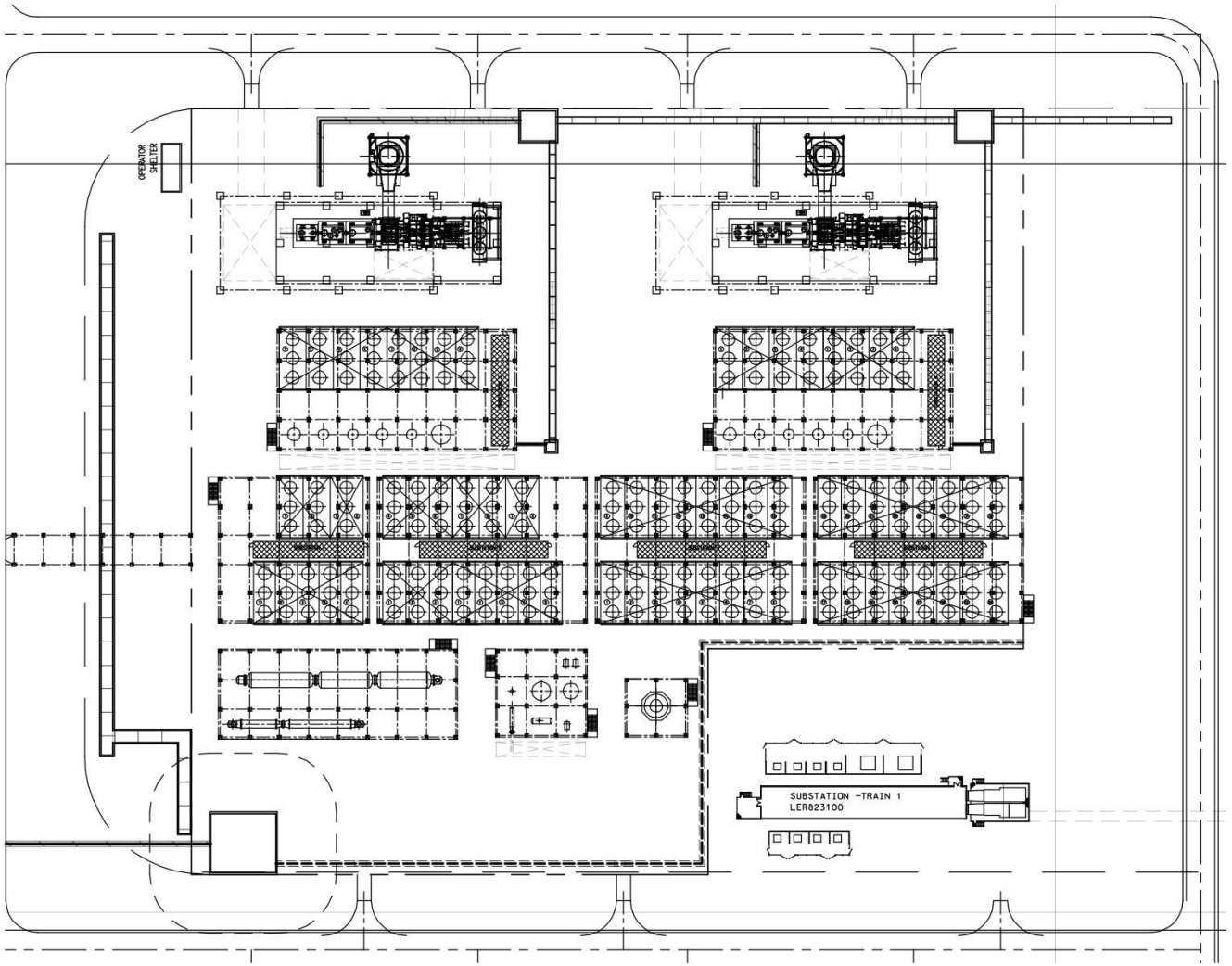
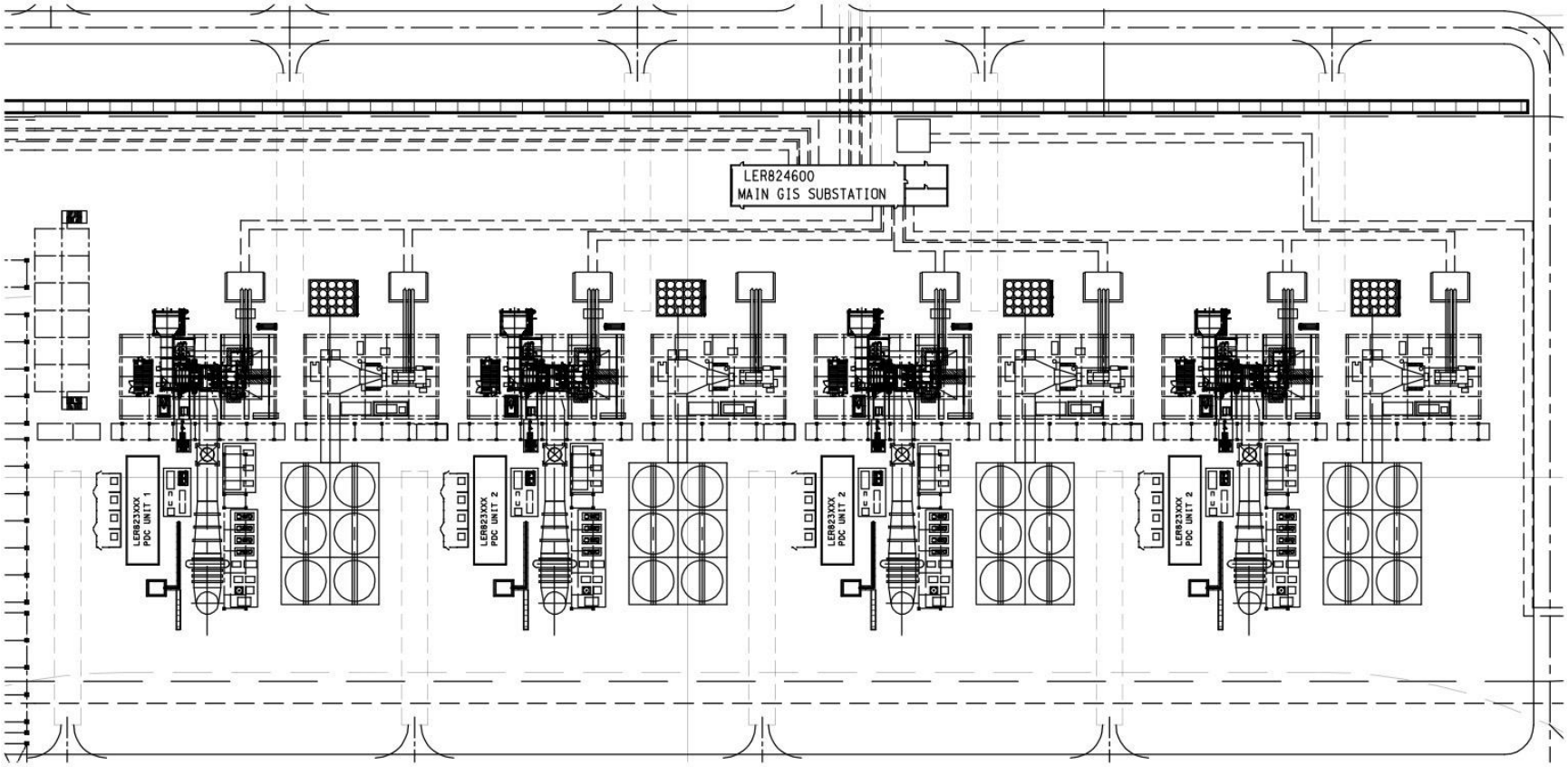


Figure A4: Power Generation Layout



11.0 ATTACHMENT 2

TABLE 7

SOUND EMISSION LEVEL TABLE -CONSTRUCTION EQUIPMENT

Source	SPL at 50 feet	PWL	Quantity in area				
	dBA	dBA	Train 1	Train 2	Train 3	Power Block	General Area
Auger drill rig	85.0	116.7			1		
Backhoe	80.0	111.7			2		
Air compressor	80.0	111.7			5		
Concrete batch plant	83.0	114.7					2
Concrete mixer truck	85.0	116.7	10				5
Concrete pump truck	82.0	113.7	2				
Concrete saw	90.0	121.7	4				
Crane	85.0	116.7	4	4	4	4.0	
Dozer	85.0	116.7			5		
Drill rig truck	84.0	115.7			2		
Dump truck	84.0	115.7			20		5
Excavator	85.0	116.7			5		
Flat bed truck	84.0	115.7					3
Front end loader	80.0	111.7			4		2
Generator	82.0	113.7	8				
Grader	85.0	116.7			2		2
Grinder	65.0	96.7	120				
Jackhammer	85.0	116.7	2				
Man lift	85.0	116.7	15				
Pickup truck	55.0	86.7	10				10
Pumps	77.0	108.7	5				
Roller	85.0	116.7			2		
Tractor	84.0	115.7	4				
Vibratory pile driver	95.0	126.7		3		2	
Welder	73.0	104.7	120				

TABLE 8

SOUND EMISSION LEVEL TABLE - LNG TRAINS (TYP. OF THREE)

Equipment Identification	Equipment Description	Octave Band Center Frequency, Hz									Lw, dBA	Source type
		31.5 dBA	63 dBA	125 dBA	250 dBA	500 dBA	1000 dBA	2000 dBA	4000 dBA	8000 dBA		
CGT666111/151	GT Exhaust stack exit (2/train)		66	77	81	85	90	104	103	103	108	Point
CGT666111/151	GT ACC Enclosure (2/train)		80	86	102	99	100	99	92	81	107	Point
CGT666111/151	GT Enclosure (2/train)		80	89	91	97	104	103	97	84	108	Point
CGT666111/151	GT Enclosure inlet house (2/train)		84	92	98	99	106	109	100	89	112	Point
CGT666111/151	GT Enclosure inlet duct (2/train)		85	88	84	85	54	78	60	33	92	Point
CGT666111/151	GT Exhaust stack duct (2/train)		84	82	87	81	93	85	79	67	95	Point
CGT666111/151	GT Load Compartment (2/train)		70	80	82	90	100	97	93	79	103	Point
CAE666113/153	LP MR Comp (2/train)		89	87	91	93	97	94	87	79	101	Point
CAE666114/154	MP/HP MR Comp (2/train)		89	94	86	88	91	88	81	73	98	Point
CAE666112/152	Propane Comp (2/train)		88	86	90	92	96	93	86	78	100	Point
PBA695106A/B	Scrub column reflux pump (2/train)	44	57	68	78	86	92	97	90	86	99	Point
ACHE	ACHE (210/train)	56	66	73	77	78	80	75	77	59	85	Point
ACHE	GT lube oil cooler (4/train)		73	78	83	96	93	85	80	71	98	Point
Piping (PWL per meter)	Propane suction (2/train)	22	86	89	86	78	78	85	78	71	76	Line
Piping (PWL per meter)	Propane discharge (2/train)	16	85	88	84	77	77	84	77	70	76	Line
Piping (PWL per meter)	MP Propane injection (2/train)	15	82	94	87	77	77	82	75	68	77	Line
Piping (PWL per meter)	MP MR suction (2/train)	23	87	91	87	79	80	87	80	73	76	Line
Piping (PWL per meter)	MP MR discharge (2/train)	17	85	88	84	77	77	84	77	70	76	Line

TABLE 8

SOUND EMISSION LEVEL TABLE - LNG TRAINS (TYP. OF THREE)

Equipment Identification	Equipment Description	Octave Band Center Frequency, Hz									Lw, dBA	Source type
		31.5 dBA	63 dBA	125 dBA	250 dBA	500 dBA	1000 dBA	2000 dBA	4000 dBA	8000 dBA		
Piping (PWL per meter)	LP Propane injection (2/train)	19	87	90	86	79	79	86	79	72	76	Line
Piping (PWL per meter)	LP MR suction (2/train)	22	87	90	86	79	79	86	79	72	76	Line
Piping (PWL per meter)	LP MR discharge (2/train)	17	85	88	85	77	77	84	77	70	76	Line
Piping (PWL per meter)	HP Propane injection (2/train)	16	83	94	87	78	77	82	75	68	77	Line
Piping (PWL per meter)	HP MR suction (2/train)	22	86	89	86	78	78	85	78	71	76	Line
Piping (PWL per meter)	HP MR discharge (2/train)	16	84	88	84	76	77	84	77	70	76	Line

TABLE 9

SOUND EMISSION LEVEL TABLE FOR THE POWER GENERATION UNITS (TYP. OF FOUR)

Equipment Identification	Equipment Description	Octave Band Center Frequency, Hz									Lw, dBA	Source Type
		31.5 dBA	63 dBA	125 dBA	250 dBA	500 dBA	1000 dBA	2000 dBA	4000 dBA	8000 dBA		
HFF983103	ACC (24/facility)		76	84	88	90	90	83	79	73	95	Point
RST983102_AFC	ACHE CCW fin fan cooler (4/facility)	56	66	73	77	78	80	75	77	59	85	Point
PBE833610A/B/C	BFW pump building (4/facility)		83	90	89	75	67	63	56	48	93	Point
	Gas Turbine exhaust bellows (4/facility)	70	77	81	87	88	86	84	85	80	94	Point
	Gas Turbine gear enclosure (4/facility)	60	61	69	60	56	44	37	36	34	71	Point
	Gas Turbine generator enclosure (4/facility)		61	72	60	53	43	42	31	24	73	Point
	Gas Turbine enclosure and skid (4/facility)	67	66	72	65	61	49	42	42	44	75	Point
	Gas Turbine Air Intake filter house (4/facility)	77	82	93	93	97	94	93	99	89	104	Point
	Gas Turbine LO cooler (4/facility)	68	75	79	83	87	87	85	82	74	93	Point
	Gas Turbine oil mist outlet (4/facility)	46	60	70	80	86	84	78	72	63	89	Point
	Gas Turbine ventilation outlet (4/facility)	71	75	84	85	89	86	85	91	82	96	Point
	HRSG Breach (4/facility)	39	40	47	35	24	21	14	17	23	49	Point
	HRSG Duct B (4/facility)	48	52	60	58	55	58	53	41	30	65	Point
	HRSG Duct C (4/facility)	48	52	61	59	56	59	54	42	31	66	Point
	HRSG Duct D (4/facility)	46	50	58	56	53	56	51	39	28	63	Point
	HRSG Duct E (4/facility)	47	51	59	57	54	57	52	40	29	64	Point
	HRSG Module 1 (4/facility)	48	56	73	76	74	80	80	76	68	85	Point
	HRSG Module 2 (4/facility)	41	49	65	68	65	69	66	61	51	74	Point

TABLE 9

SOUND EMISSION LEVEL TABLE FOR THE POWER GENERATION UNITS (TYP. OF FOUR)

Equipment Identification	Equipment Description	Octave Band Center Frequency, Hz									Lw, dBA	Source Type
		31.5 dBA	63 dBA	125 dBA	250 dBA	500 dBA	1000 dBA	2000 dBA	4000 dBA	8000 dBA		
	HRSG Module 3 (4/facility)	37	45	62	65	60	63	58	51	39	69	Point
	HRSG Stack 1 (4/facility)	29	36	44	33	21	24	24	27	33	45	Point
	HRSG Stack 2 (4/facility)	26	33	42	30	19	16	16	19	24	43	Point
	HRSG Stack 3 (4/facility)	35	42	50	39	27	24	24	27	33	51	Point
	HRSG Stack Exit (4/facility)	62	68	79	71	64	64	60	61	65	80	Point
	HRSG vacuum package (4/facility)	44	57	67	77	86	91	96	89	85	98	Point
	LP condensate pump (4/facility)		64	77	87	93	94	93	90	82	99	Point
	Steam condensate tank pump (4/facility)		66	79	89	95	96	95	92	84	101	Point
	Steam turbine condensate pump (4/facility)		64	77	87	93	94	93	90	82	99	Point
	STG discharge piping (4/facility)		72	74	67	51	37	29	23	22	77	Point
	STG generator (4/facility)		77	80	71	65	55	49	37	32	82	Point
	STG suction piping (4/facility)		69	71	64	48	34	26	20	19	74	Point
	STG turbine (4/facility)		77	80	71	65	55	49	37	32	82	Point

TABLE 10

SOUND EMISSION LEVEL TABLE FOR THE UTILITIES AND OTHER AREAS

Equipment Identification	Primary Equipment Description	Octave Band Center Frequency (Hz)									Lw, dBA	Source Type
		31.5 dBA	63 dBA	125 dBA	250 dBA	500 dBA	1000 dBA	2000 dBA	4000 dBA	8000 dBA		
V955601	Air compressor package	49	62	72	82	91	96	101	94	90	103	Point
PBA631517A/B	Butane reinjection pump	44	57	68	78	86	92	97	90	86	99	Point
V976638	CIP system	49	62	72	82	91	96	101	94	90	103	Point
V976610	Clarification package	49	62	72	82	91	96	101	94	90	103	Point
PBA631516A/B	Debutanizer reflux pump	44	57	68	78	86	92	97	90	86	99	Point
PBA631505A/B	Deethanizer reflux pump	44	57	68	78	86	92	97	90	86	99	Point
PBA631510A/B	Depropanizer reflux pump	44	57	68	78	86	92	97	90	86	99	Point
V956603	Instrument Air Dryer package	49	62	72	82	91	96	101	94	90	103	Point
PBA631521A/B	LPG Reinjection Pump	44	57	68	78	86	92	97	90	86	99	Point
V961620	Nitrogen package	49	62	72	82	91	96	101	94	90	103	Point
PBA631511A/B	Propane reinjection pump	44	57	68	78	86	92	97	90	86	99	Point
CAR966605	BOG Recycle gas compressor		47	53	52	53	52	52	46	41	60	Point
CAR966605	BOG Recycle gas gear		71	79	85	89	90	89	93	74	97	Point
CAR966605	BOG Recycle gas motor		71	79	85	89	90	89	93	74	97	Point
V976631	Reverse osmosis package	49	62	72	82	91	96	101	94	90	103	Point
	Thermal oxidizer blower		82	91	96	95	80	71	61	44	100	Point
	Thermal oxidizer motor		69	80	88	91	90	86	81	78	96	Point
	Thermal oxidizer shell	64	77	86	91	94	94	92	89	84	100	Point
	Thermal oxidizer stack		96	94	91	83	74	66	56	42	99	Point
V976621	UF package	49	62	72	82	91	96	101	94	90	103	Point
V997640	DAF pump (2/facility)	44	57	68	78	86	92	97	90	86	99	Point
PBH997664	Observation basin pump (2/facility)	44	57	68	78	86	92	97	90	86	99	Point
ACHE	BOG compressor	56	66	73	77	78	80	75	77	59	85	Point

TABLE 10

SOUND EMISSION LEVEL TABLE FOR THE UTILITIES AND OTHER AREAS

Equipment Identification	Primary Equipment Description	Octave Band Center Frequency (Hz)									Lw, dBA	Source Type
		31.5 dBA	63 dBA	125 dBA	250 dBA	500 dBA	1000 dBA	2000 dBA	4000 dBA	8000 dBA		
	aftercooler (24/facility)											
	BOG compressor gear (3/facility)		47	51	48	48	43	36	29	27	55	Point
CEM691841	BOG compressor motor (3/facility)		60	67	53	46	40	41	33	32	68	Point
ACHE	BOG L/O cooler (3/facility)	56	66	73	77	78	80	75	77	59	85	Point
CAE691842	HP BOG (3/facility		49	58	55	54	50	49	44	37	62	Point
CAE691841	LP BOG (3/facility)		49	58	55	54	50	49	44	37	62	Point
PBA976641	Well pump (4/facility)	44	57	68	78	86	92	97	90	86	99	Point
PBH997601	Stormwater pump (5/facility)	44	57	68	78	86	92	97	90	86	99	Point
ACHE	Misc (5/facility)	56	66	73	77	78	80	75	77	59	85	Point
	Flare pilot light (30/facility)		54	63	76	87	78	74	73	65	88	Point
	LNG Carrier		82	91	102	108	105	105	101	95	112	Point