APPENDIX D. NOISE TECHNICAL APPENDIX

LODI GAS STORAGE PROJECT
(LODI, CALIFORNIA)

NOISE IMPACT ANALYSES OF THE PROPOSED

GAS STORAGE FACILITY AND SEPARATION STATION

H&K Report No. 1431

H&K Job No. 2760

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LODI GAS STORAGE PROJECT

NOISE IMPACT ANALYSES OF THE PROPOSED GAS STORAGE FACILITY AND SEPARATOR STATION

REPORT SUMMARY

The following report presents the results of noise impact analyses for the **Lodi Gas Storage Facility** and the **Lodi Separator Station**, grass roots facilities associated with the proposed **Lodi Gas Storage Project** that will be located near Lodi, CA.

The following tables summarize the estimated noise level impact of the gas storage facility (i.e., 4 units operating) and the separation station at the closest property line of each facility and at the closest noise-sensitive area (NSA) located around each facility.

Noise Quality Analysis for the Proposed Lodi Gas Storage Facility

Location and Direction	Distance of Compr. Bldg. to Location	Meas'd Ambient Daytime Leq	Est'd Sound Contribution of Facility	Sound Level Criteria
West Property Line	350 ft.	44-46 dBA *	53-54 dBA	55 dBA
Closest NSA (house NW of site)	1500 ft.	36 dBA *	40 dBA	45 dBA

* Re: H&K Report No. 1422 documents the pre-construction ambient sound levels.

Noise Quality Analysis for the Proposed Lodi Separation Station

Location and Direction	Distance of Site Center to Location	Meas'd Ambient Daytime Leq	Est'd Sound Contribution of Facility	Sound Level Criteria
West Property Line	120 ft.	45-55 dBA *	48 dBA	55 dBA
Closest NSA (house NW of site)	450 ft.	45-55 dBA *	37 dBA	45 dBA

The results of the noise impact analyses indicates that if the noise mitigation measures designated and/or recommended in this report are implemented successfully, the sound contribution of the **Lodi Gas Storage Facility** and **Lodi Separation Station** will be lower than **55 dBA** at the property line of each facility and will be lower than **45 dBA** at the nearby houses. Consequently, it is expected that the gas storage facility and the separation station should have minimum noise impact on the surrounding environment.

"Minimum noise impact" implies that the noise should not interfere with public activity or be an annoyance outdoors in the nearby residential areas although the noise associated with each facility may be audible outdoors at the houses located around each respective facility. The noise associated with each facility is not expected to be audible inside the houses located near the facilities.

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1.0 INTRODUCTION

In this report, we present the results of noise impact analyses for the **Lodi Gas Storage Facility** and the **Lodi Separator Station**, both grass roots facilities associated with the **Lodi Gas Storage Project** that will be located near Lodi, CA and will be owned/operated by **Lodi Gas Storage** (LGS). The purpose of this noise impact analysis is two-fold:

1) Project the sound level contribution of the proposed gas storage facility and the proposed separation station.

2) Determine noise mitigation measures required to meet a sound level of **55 dBA** at the property line for both facilities and to meet a sound level of **45 dBA** at the nearby noise-sensitive areas (NSAs) located around the gas storage facility and separation station.

RE: H&K Report No. 1422 to WHP, dated 7/14/99, entitled "Lodi Gas Storage Project: Pre-Construction Ambient Sound Levels...Gas Storage Facility and Separation Station"

2.0 SITE/FACILITY DESCRIPTION

2.1 Description of the Sites

An area layout showing the general location of the gas storage facility and separation station is provided in **Figure 1** (p. 11). **Figure 2** (p. 12) shows the area around the gas storage facility, and this drawing indicates the closest NSAs surrounding the site.

The gas storage facility is to be located on the West Side of State Highway 99, approx. 5 miles north of Lodi, CA. The area around the site is sparsely populated, and the Lodi Airport is located on the North Side of the proposed site. The immediate area around the site is used primarily as vineyards. The closest NSA is a house located approx. 1500 feet NW of the site center.

The separation station is to be located on the South Side of Jahant Road (i.e., site center is approx. 400-450 ft. from Jahant Road) and approx. 2-3 miles east of the gas storage facility. The closest NSA is a house located approx. 450 feet NW of the site center.

2.2 Description of the Gas Storage Facility

Figure 3 (p. 13) shows a layout of the anticipated location of buildings and equipment for the facility. The gas storage facility, which compress gas into storage caverns, will initially include 2 engine-driven reciprocating gas compressor units with expansion capability with 2 additional units. Each unit will consist of a Caterpillar Model 3616 engine (4450 HP,

1000 rpm) driving a Cooper Superior reciprocating compressor. The engine-driven compressors are to be installed inside a single insulated metal building although a type of insulated pre-cast concrete building could also be employed as an alternative to an insulated metal building.

The following describes the expected engine-driven compressors, auxiliary equipment and other notable items associated with the proposed facility:

- A combination gas and jacket-water cooler for each unit
- A dual exhaust system for each engine exhaust
- Aboveground suction/discharge piping and piping system components (valves, suction scrubber) that is primarily located in the area of the "pipe rack"
- A dual air intake filter system for each unit
- Outdoor glycol reboiler (includes a 50 HP pump and burner)
- Outdoor air compressor skid
- Miscellaneous equipment (i.e., motor-driven pumps, transformers, etc.)

2.3 Description of the Separation Station

Figure 4 (p. 14) shows a layout of the anticipated location of equipment/piping for the proposed facility. In general, natural gas that is pumped into storage or released from storage passes through the separation station. As gas is released from storage (i.e., "free flow"), the high-pressure gas is typically regulated by pressure regulators (i.e., control valves). The following describes the equipment and other notable items associated with the proposed facility:

- Bi-directional pressure regulator valves and associated aboveground piping
- Water injection pump skid (75 HP motor-driven pumps that operate intermittently)
- On-site I/E building with two (2) HVAC units
- Other miscellaneous small motor-driven pumps (e.g., methanol injection pumps)

3.0 NOISE IMPACT ANALYSES

Our noise impact analysis considers the noise produced by all equipment of the gas storage facility and separation station that could impact the sound contribution at the property line and at the nearby NSAs. A description of our analysis methodology and source of sound data are provided at the end of the report (pp. 20-21).

The predicted sound contribution of both facilities was performed only for the closest NSA and only for the West Side property line for each facility because the sound contribution at other NSAs or other facility property lines should be less than the sound contribution at the closest NSA and at the West Side property line.

3.1 Significant Sound Sources for the Gas Storage Facility

The estimated noise impact assumes four (4) engine-driven gas compressor units operating at full load conditions and all auxiliary equipment operating. For the noise impact analysis, the following sound sources associated with the operation of the gas storage facility were considered significant:

- Noise associated with exhaust system of each unit, which includes exhaust noise radiated from the stack opening and from exhaust ductwork outside the building.
- Noise generated by the air intake system of each unit.
- Noise generated by the engine-compressors that penetrate the building.
- Noise radiated from outdoor aboveground gas piping and associated components, including any aboveground valves and suction separators.
- Noise of the outdoor jacket-water/gas cooler associated with each unit.
- Noise of the outdoor reboiler and other miscellaneous equipment.

3.2 Significant Sound Sources for the Separation Station

For the noise impact analysis of the proposed separation station, the following sound sources associated with the operation of the facility were considered significant:

- Noise associated with the pressure regulator valves and noise generated by the regulator valves that radiate from the aboveground gas piping.
- Noise of the water injection pump skid (i.e., includes 2 motor-driven pumps).
- Noise associated with the two (2) HVAC units on the I/E building.

3.3 Sound Level Contribution of the Gas Storage Facility

Table A1 (p. 15-16) shows the calculation of the A-wt. sound level and the octave-band sound pressure levels (SPLs) at the West Side property line contributed by the gas storage facility (i.e., 4 units operating) for standard day propagating conditions. This spreadsheet analysis includes the estimated noise reduction associated with any anticipated and/or recommended noise mitigation measures. A summary of the significant sound source contributions associated with **Table A1** is tabulated in **Table A2** (p. 16).

Table B (p. 17-18) shows the calculation of the A-wt. sound level and the octave-band SPLs at the closest NSA (i.e., NSA #1) contributed by the proposed gas storage facility (i.e., 4 units operating). **Table C** (p. 18) shows the estimated total sound level at NSA #1 (i.e., facility sound level plus the measured ambient L_d—re: H&K Report No. 1422, dated 7/14/99) along with the potential noise level increase above the ambient sound level.

The following summarizes the estimated A-wt. sound level contribution at the closest NSA and at the closest property line of the facility (i.e., west property line) with 4 units operating at full load.

Location	Est'd A-Wt. Sound Level
West property line of facility (350 ft. from compressor bldg.)	53.0-54.0 dBA
Closest NSA (approx. 1500 ft. NW of the site center)	40.0 dBA

3.4 Sound Level Contribution of the Separation Station

Table D (p. 19) shows the calculation of the A-wt. sound level and octave-band SPLs at the West Side property line contributed by the separation station (i.e., during discharge of gas from storage) for standard day propagating conditions. This spreadsheet analysis includes the estimated noise reduction associated with any anticipated and/or recommended noise mitigation measures.

Table E (p. 19) shows the calculation of the estimated A-wt. sound level and octave-band SPLs at the closest NSA contributed by the proposed separation station (i.e., during discharge of gas from storage).

The following summarizes the estimated A-wt. sound contribution of the separation station at the closest NSA and at the closest property line of the station (i.e., west property line) during release of gas from storage, which is considered the process that generates the loudest noise.

Location	Est'd A-Wt. Sound Level
West property line of facility (approx. 120 ft. from site center)	48.0 dBA
Closest NSA (approx. 450 ft. NW from site center)	36.6 dBA

4.0 NOISE CONTROL FOR THE GAS STORAGE FACILITY

The following section provides a summary of the anticipated and/or recommended noise control measures for the gas storage facility along with other assumptions that may affect the noise of the facility. The information presented can be considered a **"check list"** of noise-related requirements for the facility.

4.1 Building Enclosing the Engines, Compressors, Other Equipment

Noise control measures shall be applied to the building enclosing the engines and compressors rather than to the equipment themselves. The following describes specific requirements and other items related to the components of the compressor building.

Building Structure

The A-wt. sound level contribution of the compressor building should not exceed **43 dBA** at a distance of **350 feet** from the any one side of the building during full-load operation of the equipment. This sound level requirement includes, but not limited to, the following noise sources associated with the building:

- Noise associated with the equipment inside the building (e.g., noise of four engine-compressor and components) that penetrates the building walls, roof and doors.
- Noise generated by forced-air ventilation fans for the building.
- Noise of interior equipment emanating through vents openings.

The following unweighted sound power levels (PWL) in dB per octave-band frequency can be assumed for the interior equipment associated with the four (4) compressor units during full-load operating conditions:

PWL of Inside Equipment in dB per Octave-Band Center Frequency (in Hz)

31.5	63	125	250	500	1000	2000	4000	8000	A-Wt.
124	126	124	126	124	122	122	120	115	128 dBA

The following describes specific recommendations and requirements for the construction components of the compressor building:

- If an all-metal building is employed, as a minimum, the walls and roof should be constructed with an exterior steel of 18 gauge, an intermediate solid sheet (septum) of 22 gauge steel (minimum) with a 2-inch thick layer of mineral wool (e.g., 6.0-8.0 pcf

uniform density) between the exterior steel and septum, and an interior layer of 4-inch thick unfaced mineral wool (e.g., 6.0-8.0 pcf uniform density) covered with minimum 26-gauge perforated metal liner. Typical thermal insulation, such as type "R-19", should **not** be used as a substitute for the 6.0-8.0 pcf density material.

A type of pre-cast concrete building constructed with 4-6 in. thick interior insulation and an insulated metal roof (i.e., constructed of minimum 18-ga. exterior steel) could be employed as an alternative to the recommended all-metal building.

- Personnel entry doors should have a min. STC-36 sound rating and should not include door glazing although a 1'x1' view port could be employed (e.g., ½-in. thk. laminated glazing), if required. Doors should seal well with the door frame and be self-closing.

- No windows or louvers should be installed in the building. A minimum number of skylights could be installed in the building roof although this should be fully evaluated.

- All voids and openings in the walls and roof of the building resulting from penetrations of ducts, piping, etc. should be patched and well sealed.

- The roll-up door should be a minimum 20-ga. insulated-type design (e.g., 20-ga. exterior, 24-ga. backskin with insulation core).

Building Ventilation

- Air-supply fans used for forced-air ventilation should include a metal boot enclosing the fan, a minimum 36-inch length exterior silencer (i.e., parallel baffle-type design) and a weather hood lined with acoustical insulation.

  The sound level for each air-supply fan (with noise control) should not exceed **50 dBA** at a distance of **50 feet** from the fan hood, including the noise radiated through the fan opening. The following table lists the estimated octave-band sound pressure levels (SPLs) and A-wt. sound level at the interior wall of the building.

Est'd SPL in dB per Oct-Band Frequency & A-Wt. Level at Interior Wall

31.5	63	125	250	500	1000	2000	4000	8000	A-Wt.
92	93	91	95	93	90	90	90	85	97 dBA

- As a minimum, each roof ridge vent or wall vent used for ventilation exhaust should include a 36-inch length (i.e., parallel baffle-type design) silencer mounted between the building surface and vent.

4.2 Engine Exhausts

The dual exhaust system for each engine should include a muffler system that provides the following dynamic sound insertion loss (DIL) values at the rated operating conditions (i.e., DIL values if a single muffler is employed):

DIL Values in dB per Octave-Band Center Frequency (in Hz) for Each Exhaust

31.5	63	125	250	500	1000	2000	4000	8000
24	35	45	48	50	50	45	40	30

We believe that the most effective method of achieving the recommended DIL values for the exhaust muffler for each new engine is to employ a double-muffler system design consisting of two types of mufflers described below:

(1) Install an outdoor reactive-type exhaust muffler (e.g., "critical" or "super critical" type muffler) that meets the following recommended DIL values:

DIL Values in dB per Octave-Band Center Frequency for the Reactive Muffler

31.5	63	125	250	500	1000	2000	4000	8000
20	34	38	36	30	30	28	28	25

(2) Install an absorptive-type muffler in-line with each engine exhaust piping (inside the building). The following are the recommended DIL values for the "in-line" exhaust muffler.

DIL Values in dB per Octave-Band Center Frequency for the "In-Line" Muffler

31.5	63	125	250	500	1000	2000	4000	8000
2	4	10	14	22	24	22	15	10

In addition, the exhaust piping located outside the building (i.e., between the building and muffler) should be completely covered with an acoustical lagging consisting of a heavy-gauge steel jacketing (min. 20-ga.) along with a 3-inch thick inner layer of insulation.

4.3 Aboveground Gas Piping and Associated Components

Acoustical type of insulation should cover the outdoor aboveground suction and discharge gas piping (including the suction separator and associated piping). More specifically, the piping and piping components should be lagged with a minimum 3-inch thick fiberglass or mineral wool (e.g., minimum 6.0-8.0 pcf uniform density) that is covered with a mass-filled vinyl jacket (e.g., composite of 1.0 psf mass-filled vinyl laminated to 0.020-inch thick aluminum). The following describes other related items to be addressed:

- Gas piping should be completely separated from other metal structures such as metal gratings, walkways and stairs located around the piping.

- Aboveground valves and associated flanges do not need to be covered.

- Site inspector should verify the proper application of acoustical insulation.

4.4 Engine Air Intakes

The dual air intake system of each engine should include a filter-silencer system that provides the following recommended DIL values at the rated operating conditions (i.e., combination of both the intake filter and silencer):

DIL Values in dB per Octave-Band Center Frequency (in Hz) for Intake System

31.5	63	125	250	500	1000	2000	4000	8000
5	10	20	30	40	45	45	45	40

The preferred method of achieving the above DIL values is to employ an absorptive-type muffler in-line with each engine air intake piping (inside the building). The following are the recommended DIL values for the "in-line" air intake muffler:

DIL Values in dB per Octave-Band Center Frequency for the In-Line Silencer

31.5	63	125	250	500	1000	2000	4000	8000
3	6	12	18	25	30	30	25	20

The air intake filter should be capable of meeting the following DIL values:

DIL Values in dB per Octave-Band Center Frequency for the Air Intake Filter

31.5	63	125	250	500	1000	2000	4000	8000
2	4	8	12	15	20	20	20	15

Note: These DIL values are assumed to be typical for an air intake filter.

4.5 Combination Jacket-Water/Gas Coolers

The A-wt. sound level of the combination jacket-water/gas cooler associated with each engine-compressor unit should not exceed **62 dBA** at a distance of **50 feet** from the cooler perimeter at the rated operating conditions (i.e., equivalent to a PWL of approx. **94 dBA**). This may require that the JW/gas coolers are designed with relatively low fan tip speeds (e.g., less than 6000 fpm).

4.6 Miscellaneous Equipment

Reboiler: As a minimum, the reboiler should be designed to meet an A-wt. sound level of **55 dBA** at 50 feet from the perimeter of the reboiler at the rated operating conditions.

Motor-Driven Pumps: As a minimum, motor-driven pumps that will be located outdoors should be designed to meet an A-wt. sound level of **75 dBA** at 3 feet from the unit at the rated maximum operating conditions.

Air Compressor: The air compressor, if located outdoors, should be designed to meet an A-wt. sound level of **45 dBA** at 50 feet from the unit at the rated maximum operating conditions. To meet this noise goal, the unit will probably have to be designed with an acoustical enclosure and a "low-noise" enclosure ventilation system.

5.0 NOISE CONTROL FOR THE SEPARATION STATION

The following section provides a summary of the anticipated and/or recommended noise control measures for the separation station.

5.1 Aboveground Gas Piping

Even though "low-noise" regulator valves will be employed, it appears that additional noise control will be necessary to reduce the radiated noise from gas piping to meet the noise goal at the property line. Consequently, aboveground piping between the regulators and separators should be covered with acoustical insulation or should be buried (i.e., if feasible). It may also be possible to achieve the noise goal by only increasing the pipe wall thickness although further evaluation of this measure is required.

5.2 Water Injection Pumps and other Miscellaneous Pumps

The A-wt. sound level of the water injection pump skid (i.e., consisting of two motor-driven pumps) and other small pumps at the facility should not exceed **45 dBA** at **50 feet** or **65 dBA** at **3 feet**. This will probably require that the water injection pump skid be covered with an enclosure.

5.3 HVAC Units for the I/E Building

The A-wt. sound level of the HVAC units located on the I/E Building should not exceed **40 dBA** at a distance of **50 feet** from the side of the room at the typical operating conditions.

6.0 FINAL COMMENT

The results of the noise impact analyses indicate that the resulting sound contribution from the proposed **Lodi Gas Storage Facility** and the **Lodi Separation Station** is estimated to be lower than an A-wt. sound level of **55 dBA** at the property line of each facility and an A-wt. sound level of **45 dBA** at the nearby houses if anticipated and/or recommended noise control measures detailed in this report are implemented successfully. Consequently, it is expected that the gas storage facility and the separation station should have minimum noise impact on the surrounding environment.

"Minimum noise impact" implies that the noise should not interfere with public activity or be an annoyance outdoors in the nearby residential areas although the noise associated with each facility may be audible outdoors at the houses surrounding the respective facility. As an illustration, if the noise of the gas storage facility during operation was audible at a nearby house, the noise generated by the facility would probably be similar to the noise of a distant farm tractor that was plowing or harvesting a field. Note that the noise associated with each facility is not expected to be audible inside the houses located around each facility.

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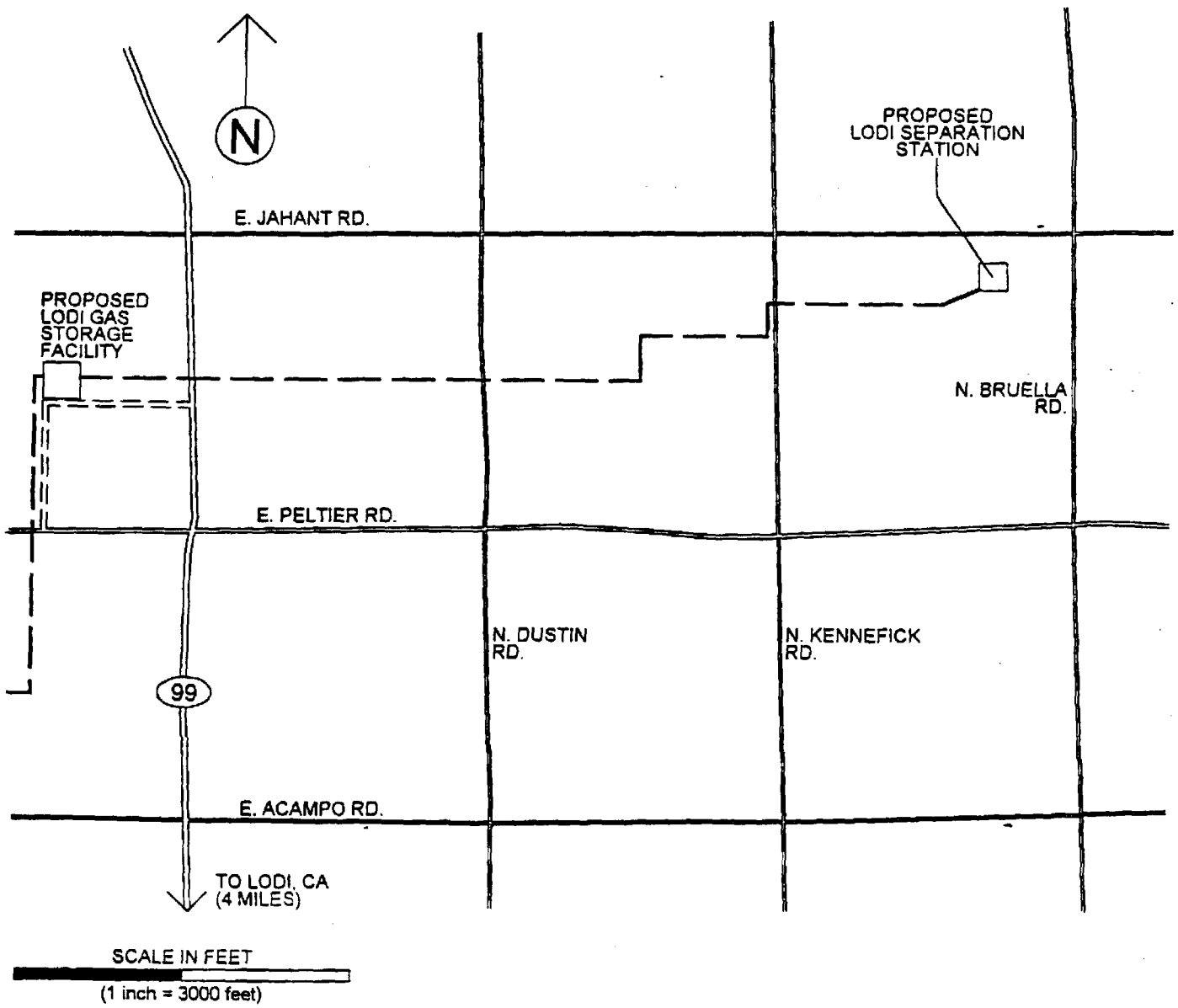

Figure 1: General Area Layout Showing the Location of the Gas Storage Facility and the Separation Station.

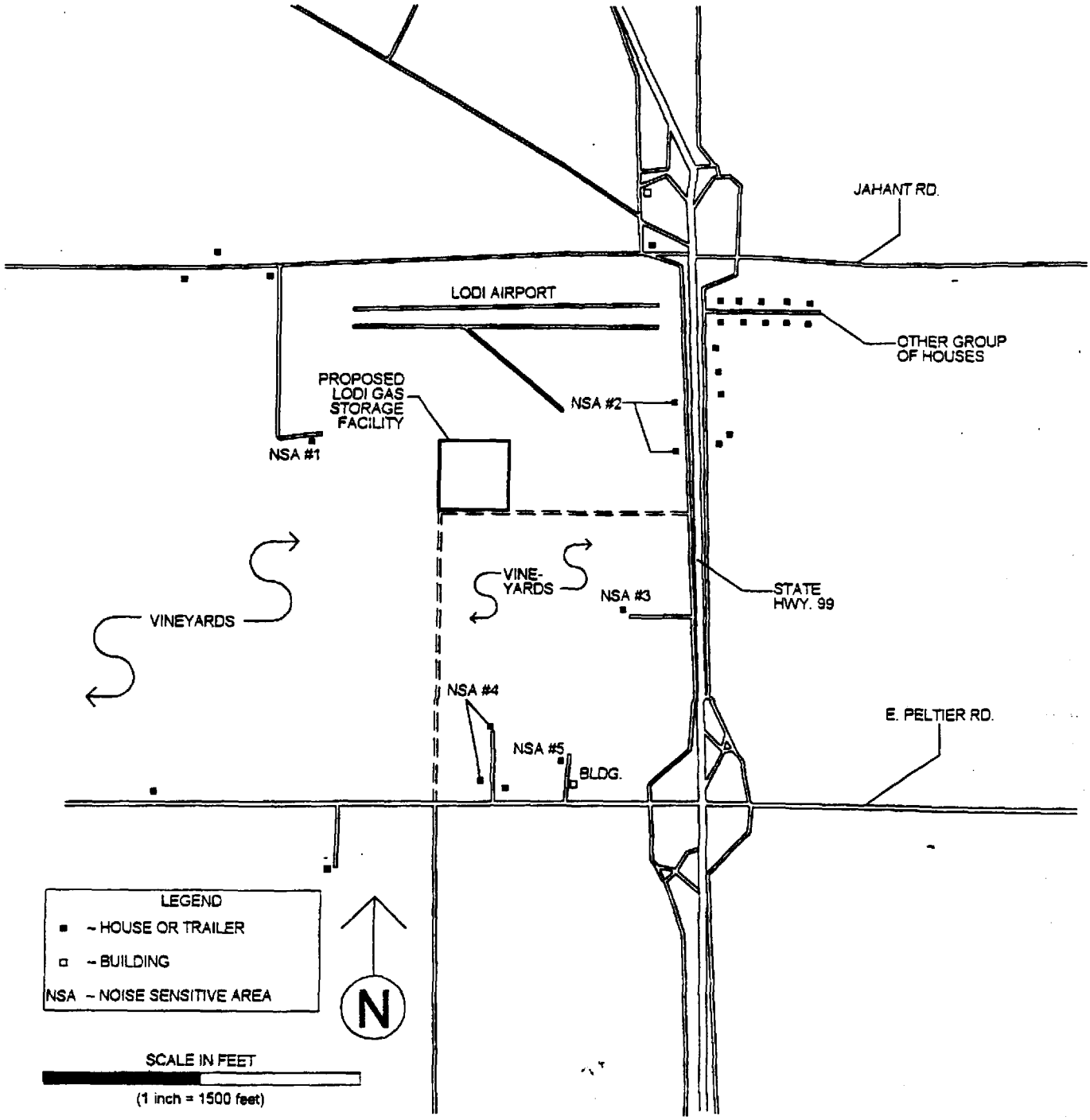

Figure 2: Lodi Gas Storage Facility: Area/Site Layout Showing the Location of the Facility along with the Nearby NSAs (i.e., Closest Houses).

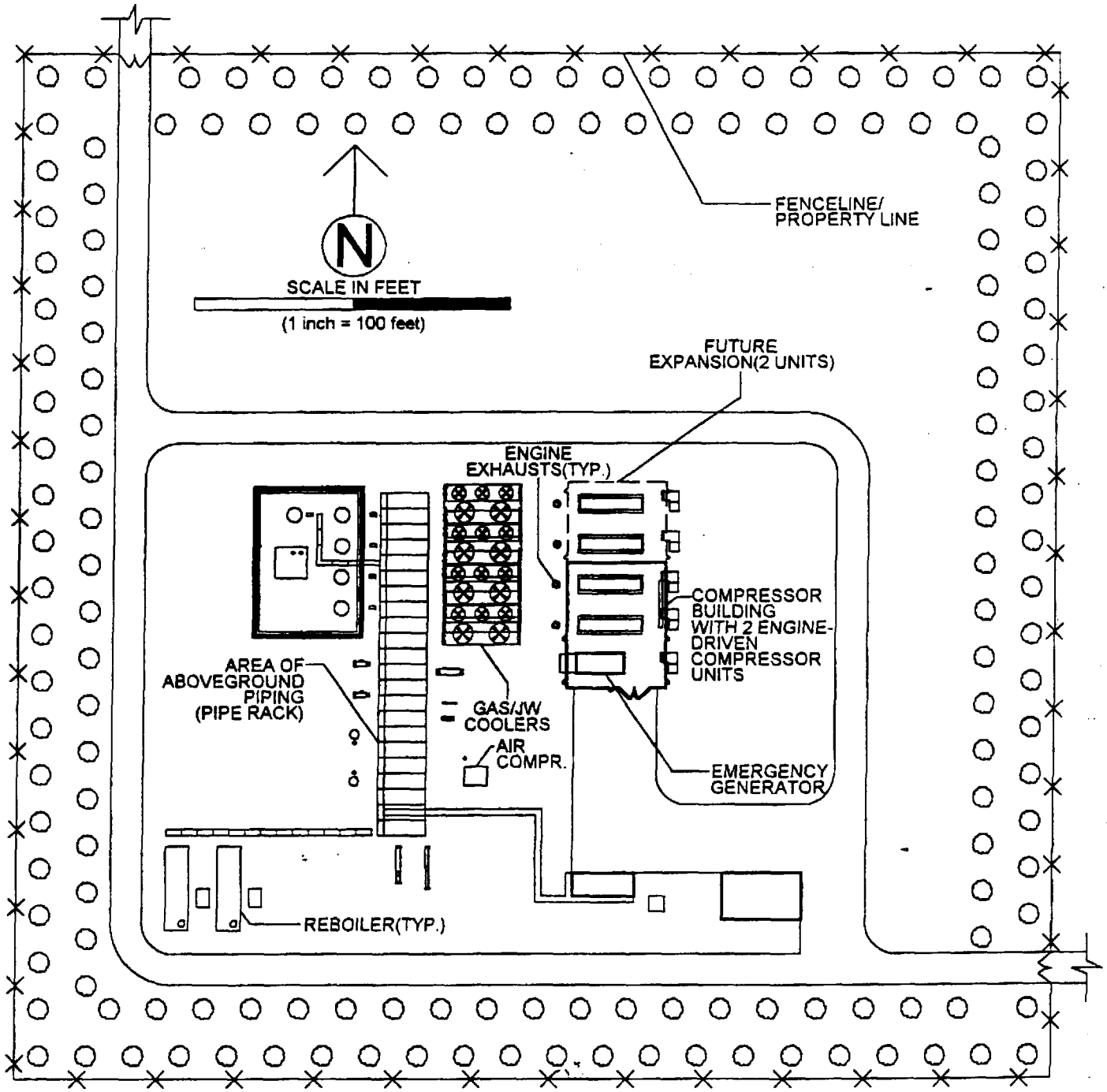

Figure 3: Lodi Gas Storage Facility: Anticipated Buildings, Equipment and Property Line associated with the Proposed Facility.

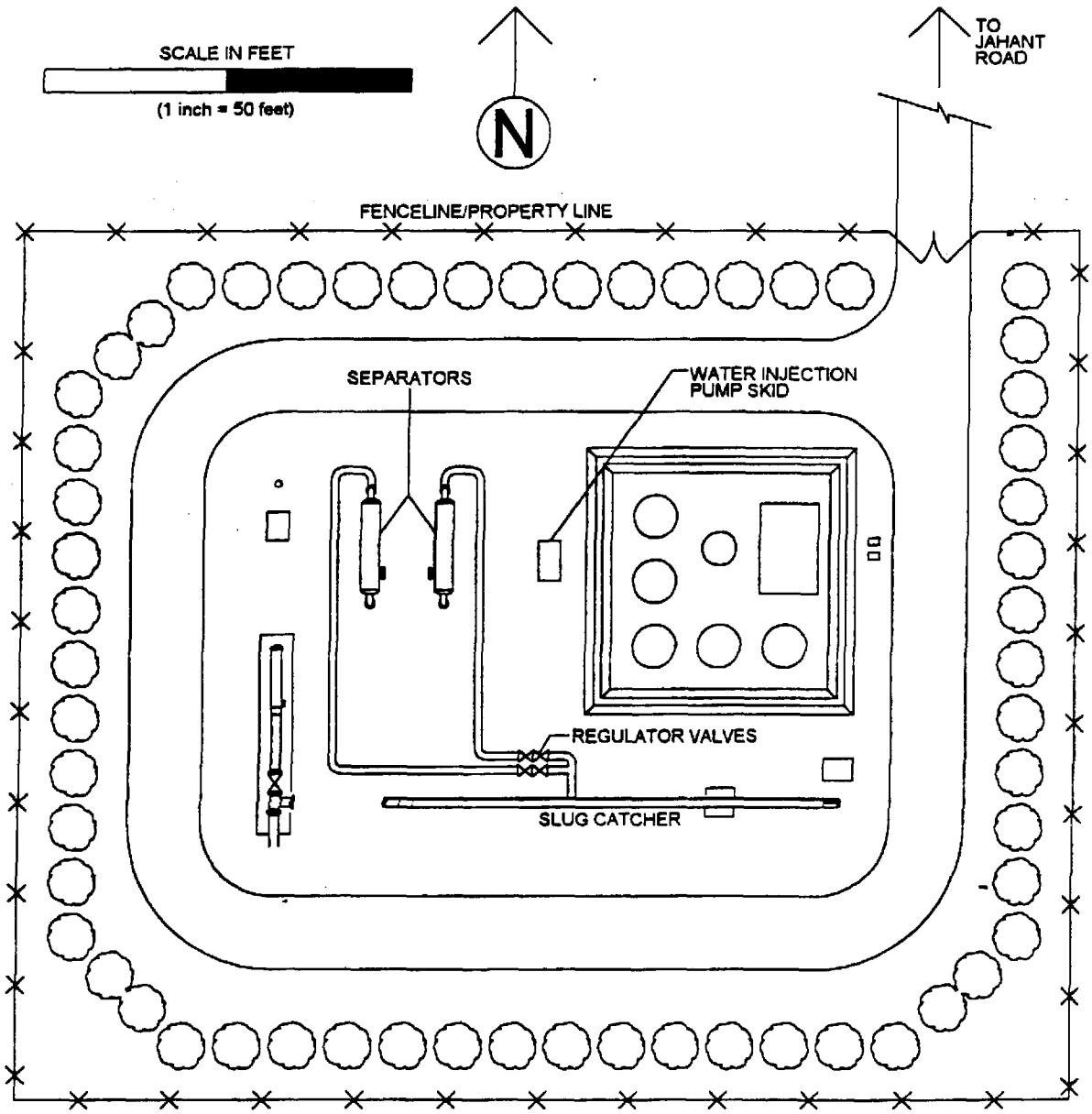

Figure 4: Lodi Separation Station: Anticipated Buildings, Equipment, Some of the Piping and the Property Line associated with the Proposed Facility.

Source No. & Dist (Ft)	SOURCE PWL & ESTIMATED SOUND LEVEL CONTRIBUTIONS AT SPECIFIED DISTANCE	SPL in dB Per Octave-Band Center Frequency (Hz)									A-Wt.
		31.5	63	125	250	500	1000	2000	4000	8000	Level
1)	PWL of Engine-Compr. Noise radiated thru Bldg.	123	125	123	124	123	121	121	120	116	128
	Atten. of Building (includes ventilation noise)	-12	-16	-22	-28	-36	-42	-46	-46	-46	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
350	Hemispherical Radiation	-49	-49	-49	-49	-49	-49	-49	-49	-49	
350	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
350	Source Sound Level Contribution	62	60	52	47	38	30	25	23	17	43
2)	PWL of Piping (between Bldg. & Gas Coolers)	100	98	94	92	90	90	88	86	78	95
	Atten. of Noise Control (Acs. Lagging)	0	0	0	-2	-6	-12	-15	-18	-18	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
350	Hemispherical Radiation	-49	-49	-49	-49	-49	-49	-49	-49	-49	
350	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
350	Source Sound Level Contribution	51	49	45	41	35	29	23	17	7	37
3)	PWL of Aboveground Piping (area of Pipe Rack)	95	96	92	88	86	85	85	82	78	91
	Atten. of Noise Control (Acs. Lagging)	0	0	0	-2	-6	-12	-15	-18	-18	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
250	Hemispherical Radiation	-46	-46	-46	-46	-46	-46	-46	-46	-46	
250	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	-1	-2	-3	
250	Source Sound Level Contribution	49	50	46	40	34	27	24	16	11	37
4)	PWL of Unsilenced Dual Exhaust (1 Engine)	132	138	140	134	126	125	126	116	105	132
	PWL of Unsilenced Exhaust (4 Engines)	138	144	146	140	132	131	132	122	111	138
	Atten. of Noise Control (Dual Muffler System)	-20	-28	-40	-42	-44	-44	-42	-35	-30	
	Misc. Atten. (Some Directivity)	0	0	0	0	-1	-1	-2	-3	-4	
350	Hemispherical Radiation	-49	-49	-49	-49	-49	-49	-49	-49	-49	
350	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-2	0	-1	-1	-3	-5	
350	Source Sound Level Contribution	69	67	57	47	38	37	38	33	24	47
5)	PWL of Exhaust Piping & Muffler Body (1 Engine)	95	92	88	85	80	76	75	70	65	84
	PWL of Exh Piping & Muffler Body (4 Engines)	101	98	94	91	86	84	81	76	71	90
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
350	Hemispherical Radiation	-49	-49	-49	-49	-49	-49	-49	-49	-49	
350	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
350	Source Sound Level Contribution	52	49	45	42	37	35	31	25	18	40
6)	PWL of Dual Air Intake w/Filter only (1 Engine)	96	98	98	98	92	96	105	108	100	111
	PWL of Dual Air Intake w/Filter (4 Engines)	102	102	104	102	98	102	111	114	106	117
	NR of Noise Control (In-Line Silencer & Filter)	-6	-10	-16	-22	-28	-35	-40	-40	-40	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
350	Hemispherical Radiation	-49	-49	-49	-49	-49	-49	-49	-49	-49	
350	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
350	Source Sound Level Contribution	47	43	39	31	21	18	21	23	13	30
7)	PWL of One (1) the 5-Fan Gas/JW Cooler	102	101	98	95	91	86	82	78	75	93
	NR of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
320	Hemispherical Radiation	-48	-48	-48	-48	-48	-48	-48	-48	-48	
320	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	-1	-2	-4	
320	Source Sound Level Contribution	54	53	50	47	43	38	33	28	23	45
8)	PWL of One (1) the 5-Fan Gas/JW Cooler	102	101	98	95	91	86	82	78	75	93
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
320	Hemispherical Radiation	-48	-48	-48	-48	-48	-48	-48	-48	-48	
320	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	-1	-2	-4	
320	Source Sound Level Contribution	54	53	50	47	43	38	33	28	23	45

Table A1: Lodi Gas Storage Facility: Est. Sound Contribution at the West Property Line (350 Ft. West of the Compr. Bldg.) with Four (4) Engine-Driven Compr. Units Operating **(Cont. Next Page)**

Source No. & Dist (Ft)	SOURCE PWL & ESTIMATED SOUND LEVEL CONTRIBUTIONS AT SPECIFIED DISTANCE	SPL in dB Per Octave-Band Center Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level
9)	PWL of One (1) the 5-Fan Gas/JW Cooler	102	101	98	95	91	86	82	78	75	93
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
320	Hemispherical Radiation	-48	-48	-48	-48	-48	-48	-48	-48	-48	
320	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	-1	-2	-4	
320	Source Sound Level Contribution	54	53	50	47	43	38	33	28	23	45
10)	PWL of One (1) the 5-Fan Gas/JW Cooler	102	101	98	95	91	86	82	78	75	93
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
320	Hemispherical Radiation	-48	-48	-48	-48	-48	-48	-48	-48	-48	
320	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	-1	-2	-4	
320	Source Sound Level Contribution	54	53	50	47	43	38	33	28	23	45
11)	PWL of Reboiler (ZZZ-3300)	96	95	90	88	82	80	78	72	70	86
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
350	Hemispherical Radiation	-49	-49	-49	-49	-49	-49	-49	-49	-49	
350	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
350	Source Sound Level Contribution	47	46	41	39	33	31	28	21	17	37
12)	PWL of Outdoor Air Compressor (ZZZ-7100)	92	90	88	84	80	78	75	72	70	84
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
320	Hemispherical Radiation	-48	-48	-48	-48	-48	-48	-48	-48	-48	
320	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	-1	-2	-4	
320	Source Sound Level Contribution	44	42	40	36	32	30	26	22	18	35
13)	PWL of Misc. Sources (e.g., Pumps PBA, Etc.)	90	90	86	86	82	80	78	72	70	85
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
220	Hemispherical Radiation	-45	-45	-45	-45	-45	-45	-45	-45	-45	
220	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	-1	-2	-3	
220	Source Sound Level Contribution	45	45	41	41	37	35	33	26	22	40
EST. TOTAL SOUND CONTRIBUTION:	350 Ft.	71	69	61	56	51	46	43	38	32	53.6

Table A1: Lodi Gas Storage Facility: Est. Sound Contribution at the West Property Line (350 Ft. West of the Compr. Bldg.) with Four (4) Engine-Driven Compressor Units Operating

file: c:\lotus-x\proj\whp\anal-1.xls

SUMMARY OF ESTIMATED SOUND SOURCE SPL CONTRIBUTIONS AT SPECIFIED DISTANCE	SPL in dB Per Octave-Band Center Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level
Contribution for Source 1 (Noise thru Building)	62	60	52	47	38	30	25	23	17	43
Contribution for Sources 2-3 (Aboveground Piping)	53	53	49	44	38	31	26	20	12	40
Contribution for Source 4 (Engine Exhausts w/Mufflers)	69	67	57	47	38	37	38	33	24	47
Contribution for Source 5 (Exh Muffler Body & Exh Piping)	52	49	45	42	37	35	31	25	18	40
Contribution for Source 6 (Engine Air Intakes w/Silencers)	47	43	39	31	21	18	21	23	13	30
Contribution for Sources 7-10 (JW/Gas Coolers)	60	59	56	53	49	44	39	34	29	51
Contribution for Sources 11-13 (Misc. Sources)	51	50	46	44	40	37	35	28	24	43
CUMMULATIVE SOUND CONTRIBUTION 350 Ft.	71	69	61	56	51	46	43	38	32	53.6

Table A2: Lodi Gas Storage Facility: Summary of the Sound Contribution of Noise Sources at the West Property Line (Located approx. 350 Ft. West of the Compressor Building)

Source No. & Dist (Ft)	SOURCE PWL & ESTIMATED SOUND LEVEL CONTRIBUTIONS AT SPECIFIED DISTANCE	SPL in dB Per Octave-Band Center Frequency (Hz)								A-Wt. Level
		31.5	63	125	250	500	1000	2000	4000	8000	
1)	PWL of Engine-Compr. Noise radiated thru Bldg.	123	125	123	124	123	121	121	120	116	128
	Atten. of Building (includes ventilation noise)	-12	-16	-22	-28	-36	-42	-46	-46	-46	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	50	48	39	34	25	16	9	1	0	30
2)	PWL of Piping (between Bldg. & Gas Coolers)	100	98	94	92	90	90	88	86	78	95
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	39	37	32	30	28	27	22	13	0	31
3)	PWL of Aboveground Piping (area of Pipe Rack)	95	96	92	88	86	85	85	82	78	91
	NR of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	34	35	30	26	24	22	19	9	0	27
4)	PWL of Unsilenced Dual Exhaust (1 Engine)	132	136	140	134	126	125	126	116	105	132
	PWL of Unsilenced Exhaust (4 Engines)	138	144	146	140	132	131	132	122	111	138
	Atten. of Noise Control (Dual Muffler System)	-20	-28	-40	-42	-44	-44	-42	-35	-30	
	Misc. Atten. (Some Directivity)	0	0	0	0	-1	-1	-2	-3	-4	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	57	55	44	36	25	23	22	11	0	34
5)	PWL of Exhaust Piping & Muffler Body (1 Engine)	95	92	88	85	80	78	75	70	65	84
	PWL of Exh Piping & Muffler Body (4 Engines)	101	98	94	91	86	84	81	76	71	90
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	40	37	32	29	24	21	15	3	0	28
6)	PWL of Dual Air Intake w/Filter only (1 Engine)	96	96	98	96	92	96	105	108	100	111
	PWL of Dual Air Intake w/Filter (4 Engines)	102	102	104	102	98	102	111	114	106	117
	NR of Noise Control (In-Line Silencer & Filter)	-6	-10	-16	-22	-28	-35	-40	-40	-40	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	35	31	26	18	8	4	5	1	0	15
7)	PWL of One (1) the 5-Fan Gas/JW Cooler	102	101	98	95	91	86	82	78	75	93
	NR of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	41	40	36	33	29	23	16	5	0	30
8)	PWL of One (1) the 5-Fan Gas/JW Cooler	102	101	98	95	91	86	82	78	75	93
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	41	40	36	33	29	23	16	5	0	30

Table B: Lodi Gas Storage Facility: Est'd Sound Contribution at the Closest NSA (1500 Ft. NW of the Compr. Bldg.) with Four (4) Engine-Driven Units Operating **(Cont. Next Page)**

Source No. & Dist (Ft)	SOURCE PWL & ESTIMATED SOUND LEVEL CONTRIBUTIONS AT SPECIFIED DISTANCE	SPL in dB Per Octave-Band Center Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level
9)	PWL of One (1) the 5-Fan Gas/JW Cooler	102	101	98	95	91	88	82	78	75	93
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	41	40	36	33	29	23	16	6	0	30
10)	PWL of One (1) the 5-Fan Gas/JW Cooler	102	101	98	95	91	88	82	78	75	93
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	41	40	36	33	29	23	16	6	0	30
11)	PWL of Reboiler (ZZZ-3300)	96	95	90	88	82	80	78	72	70	86
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	35	34	28	26	20	17	12	0	0	23
12)	PWL of Outdoor Air Compressor (ZZZ-7100)	92	90	88	84	80	78	75	72	70	84
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	31	29	26	22	18	15	9	0	0	20
13)	PWL of Misc. Sources (e.g., Pumps PBA, Etc.)	90	90	86	86	82	80	78	72	70	85
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten. (Shielding)	0	0	0	0	0	0	0	0	0	
1500	Hemispherical Radiation	-61	-61	-61	-61	-61	-61	-61	-61	-61	
1500	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-1	-1	-2	-5	-11	-21	
1500	Source Sound Level Contribution	29	29	24	24	20	17	12	0	0	22
EST. TOTAL SOUND CONTRIBUTION: 1500 Ft.		58	56	48	43	37	32	28	18	0	40.0

Table B: Lodi Gas Storage Facility: Est'd Sound Contribution at the Closest NSA (1500 Ft. NW of the Compr. Bldg.) with Four (4) Engine-Driven Compressor Units Operating

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SUMMARY OF ESTIMATED SOUND SOURCE SPL CONTRIBUTIONS AT SPECIFIED DISTANCE	SPL in dB Per Octave-Band Center Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level
Sound Contribution of All Four Units at Full Load	58	56	48	43	37	32	28	18	0	40
Meas'd Typical Ambient Sound Level at the Closest NSA	52	47	43	33	30	28	27	26	26	36
CUMMULATIVE SOUND CONTRIBUTION 350 Ft.	59	57	49	43	38	34	31	27	26	41.4
						Est. Potential Noise Increase:				5.8

Table C: Lodi Gas Storage Facility: Est'd Station Sound Contribution at the Closest NSA *during Operation of All Four Units + Typical Ambient Sound Level*

SOURCE PWL AND SPL CONTRIBUTIONS AT CLOSEST PROPERTY LINE OF THE SEPATION STATION		SPL or PWL in dB Per Octave-Band Center Frequency									A-Wt.
		31.5	63	125	250	500	1000	2000	4000	8000	Level
Source 1	PWL of Piping/Valves during Gas Discharge	70	70	70	75	80	88	88	86	80	93
	Atten. of Noise Control (Acs. Lagging or Buried)	0	0	0	-2	-6	-12	-15	-18	-18	
	Hemispherical Radiation (100 Ft.)	-38	-38	-38	-38	-38	-38	-38	-38	-38	
	Attn. Due to Atm. Absorption (59 Deg, 70% RH)	0	0	0	0	0	0	0	-1	-4	
	Sound Level Contribution at 100 Ft.	32	32	32	35	36	38	35	29	20	41
Source 2	PWL of Two (2) Produced Water Pumps	92	95	95	95	94	92	92	90	85	98
	Atten. of Noise Control (Enclosure or Bldg.)	-2	-5	-10	-15	-18	-20	-22	-25	-25	
	Misc. Attenuation	0	0	0	0	0	0	0	0	0	
	Hemispherical Radiation (120 Ft.)	-39	-39	-39	-39	-39	-39	-39	-39	-39	
	Attn. Due to Atm. Absorption (59 Deg, 70% RH)	0	0	0	0	0	0	0	-1	-4	
	Sound Level Contribution at 120 Ft.	51	51	46	41	37	33	31	25	17	40
Source 3	PWL of AC Units for I/E Building	70	72	72	72	70	68	62	58	55	72
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Attenuation	0	0	0	0	0	0	0	0	0	
	Hemispherical Radiation (150 Ft.)	-41	-41	-41	-41	-41	-41	-41	-41	-41	
	Attn. Due to Atm. Absorption (59 Deg, 70% RH)	0	0	0	0	0	0	0	-1	-4	
	Sound Level Contribution at 150 Ft.	29	31	31	31	29	27	21	16	10	31
Source 4	PWL of Miscellaneous Equipment (i.e., Pumps)	80	83	82	82	81	78	77	74	69	84
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Attenuation (Shielding)	0	0	0	0	0	0	0	0	0	
	Hemispherical Radiation (100 Ft.)	-38	-38	-38	-38	-38	-38	-38	-38	-38	
	Attn. Due to Atm. Absorption (59 Deg, 70% RH)	0	0	0	0	0	0	0	-1	-4	
	Sound Level Contribution at 100 Ft.	42	45	44	44	43	40	39	35	27	46
Est. Sound Contribution at West Side Property Line		52	52	48	46	45	43	41	36	28	48.0

Table 1: Lodi Separation Station: Est. Sound Contribution of the Station during Maximum Flow Conditions (i.e., during "Free Flow" from Storage) at the West Side Property Line of the Facility

NOTE: DIL, NR and/or PWL values on this spreadsheet should not be used as the specified values. Refer to the "Noise Control Measures" section in the report or other company specifications for the actual specified PWL of equipment and noise reduction (NR) of pipe lagging for facility.

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MEASURED AMBIENT SPL AT AND EST'D STATION SOUND CONTRIBUTION AT THE CLOSEST NSA	SPL in dB Per Octave-Band Center Frequency (in Hz)									A-Wt.
	31.5	63	125	250	500	1000	2000	4000	8000	Level
Est. Sound Contribution of Station at Site Property Line (120 ft.)	52	52	48	46	45	43	41	36	28	48.0
Hemispherical Radiation (120 Ft. to 450 Ft.)	-11	-11	-11	-11	-11	-11	-11	-11	-11	
Attn. Due to Atm. Absorption (59 Deg, 70% RH)	0	0	0	0	0	0	-1	-2	-5	
Est'd Sound Level Contribution of Station at Closest NSA	41	41	37	35	34	32	29	23	12	36.6

Table 2: Lodi Separation Station: Est'd Sound Contribution of Facility at the Closest NSA around the Station (approx. 450 Ft. from Site Center)

A DESCRIPTION OF THE ANALYSIS METHODOLOGY AND THE SOURCE OF SOUND DATA USED IN THE ACOUSTICAL ANALYSIS

ANALYSIS METHODOLOGY

In general, the predicted sound level contributed by the proposed gas storage facility and the separation station was calculated as a function of frequency from estimated octave-band sound power levels (PWLs) for each significant sound source. The following summarizes the analysis procedure:

- Initially, unweighted octave-band PWLs for each noise source (without noise control) were determined from actual sound measurements performed by H&K on similar equipment and/or obtained from the equipment manufacturer.

- Then, expected noise reductions in dB per octave-band frequency due to any designated noise control measures for each source were subtracted from the estimated PWL.

- Next, octave-band SPLs for each source (with noise control) were determined by compensating for sound attenuation due to propagation (hemispherical radiation) and atmospheric sound absorption.

- Since sound shielding by buildings can influence the sound level contributed at the NSAs, we also included the sound shielding due to buildings, if appropriate. Effects of vegetation or land contour were typically not considered in this analysis.

- Finally, estimated octave-band SPLs for each source (with noise control and other sound attenuation) were corrected for A-weighting and summed to provide the A-wt. sound level contributed at the NSAs by each respective facility.

SOURCE OF SOUND DATA

The following describes the source of sound data used for estimating the source sound levels and the source sound power levels for both the gas storage facility and the separation station.

(1) Engine exhaust PWL were calculated from sound data recently measured in the field by H&K on a engine-compressor unit using the same engine anticipated for the gas storage plant. The DIL values for the exhaust muffler system utilized in the acoustical analysis are generally lower than the recommended values in order that the noise design analysis incorporates an acoustical "margin of safety."

(2) The estimated PWL of equipment inside the building (i.e., engine-driven compressors and equipment inside the building) was calculated from sound data measured by H&K on a similar compressor installation used for gas storage.

(3) The estimated PWL of the outdoor aboveground gas piping of the gas storage facility were determined from sound measurements by H&K on gas piping similar to that of the proposed gas storage compressor installation.

For the separation station, as with pipeline facilities used mainly to control gas flow and/or pressure, the primary source of noise is valve-generated noise radiated from the aboveground gas piping, and the level of piping noise is directly related to the pressure drop across the control valve. Since the primary noise contributor is valve-generated noise, we used the Fisher Sizing Computer Program to assist in the estimate of the resulting piping noise level.

(4) The estimated PWL for cooler(s) were designated to meet the design noise goal. Note that the estimated PWL for the cooler utilized in the acoustical analysis includes noise associated with jacket-water piping.

The noise level for the cooler(s) used in the acoustical analysis is generally higher than the sound level requirement in order that the noise design analysis incorporates an acoustical "margin of safety." In addition, there can be other noise associated with the coolers that is not directly related to the operation of the cooler fans (e.g., noise of jacket-water piping and/or compressor noise radiated from the tubes of the gas coolers).

(5) The estimated PWL for the engine air intakes were calculated from measured sound data in the field tests by H&K on similar engine with and without in-line silencers.

(6) The estimated PWL and sound level for other miscellaneous equipment was calculated from measured sound data in the field tests by H&K on similar equipment.

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Date of Report: 07/14/99

Subject: **Lodi Gas Storage Project: "Pre-Construction" Ambient Sound Levels around the Gas Storage Facility and Separation Station**

Submitted to: ***Western Hub Properties, LLC***
14811 St. Mary's Lane, Suite 150
Houston, Texas 77079

DRAFT

H&K Report No. 1422 (Total of 14 Pages)
H&K Job No. 2760
Submitted by: Paul D. Kiteck, P.E., **Hoover & Keith Inc.**

1.0 INTRODUCTION

In this report, **Hoover & Keith Inc.** (H&K) present the results of an ambient sound survey around the site of the **Lodi Gas Storage Facility**. We also report previously measured sound level data near the site of the **Lodi Separation Station** (i.e., H&K did not perform a sound survey at this site). Both facilities are associated with the **Lodi Gas Storage Project** that will be owned and operated by **Lodi Gas Storage, Inc.** (LGS).

The purpose of this work is to document the acoustic environment around the site of the proposed facilities prior to installation and locate the nearby noise-sensitive areas (NSAs) surrounding the facilities.

2.0 DESCRIPTION OF THE SITES

An area layout showing the general location of the gas storage facility and the separation station is provided in **Figure 1** (p. 6). **Figure 2** (p. 7) shows an area layout around the gas storage facility, and this drawing shows the closest NSAs (i.e., houses) surrounding the site and the measurement positions selected during the site sound survey.

The gas storage facility is to be located on the West Side of State Highway 99, approx. 4 miles north of Lodi, CA. The Lodi Airport is located on the North Side of the proposed site, and the immediate area around the site is used primarily as vineyards. The closest NSA is a house located approx. 1500 feet NW of the site center.

Figure 3 (p. 8) shows the area around the separation station. The separation station is to be located on the South Side of E. Jahant Road (i.e., site is approx. 175 ft. south of Jahant Road) and approx. 3 miles east of the gas storage facility. The closest NSA is a house located approx. 450 feet from the site center.

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3.0 MEASUREMENT LOCATIONS AND METHODOLOGY

3.1 Data Acquisition at the Site of the Gas Storage Facility

At each sound measurement location, the A-weighted (A-wt.) equivalent sound level (L_{eq}), L_{90} (A-wt. level exceeded 90% of the time), L_{10} (A-wt. level exceeded 10% of the time) and the unweighted octave-band sound pressure levels (i.e., L_{eq} SPLs) were measured at approx. five (5) feet above the ground. Several samples of the ambient noise (e.g., 2-5 minutes in length) were typically performed at each measurement position. The measurements attempted to exclude "extraneous sound" such as a car passing immediately by the measurement location or other intermittent sources. Sound measurements were typically performed during periods of relatively low wind speed (i.e., below 8 mph) to minimize the influence of wind blowing across the microphone.

The measurement system consisted of a Larson-Davis (LD) Model 2900 Real Time Analyzer/Sound Level Meter (a Type I SLM per ANSI Standard S1.4 & S1.11) and a 1/2-inch condenser microphone with a windscreen. The analyzer/SLM-microphone system was mounted on a tripod during all of the sound measurements, and the analyzer/SLM was calibrated with a LD-CA250 calibrator that was calibrated within 1 year of the tests.

3.2 Sound Measurement Positions and Closest NSAs at the Gas Storage Facility

At the gas storage facility, five (5) locations were chosen for measuring the ambient sound levels at the closest NSAs surrounding the gas storage facility. One (1) measurement location on the station property and two (2) measurement locations, east of Hwy. 99, were selected (i.e., all other positions located west of Hwy 99). The following provides a description of the nearby NSAs and the selected sound measurement positions:

Pos. 1: Near NSA #1: A house located off of Jahant Road, approx. 1500 feet NW of the site center. Pos. 1A was used as an alternative but similar position and was located along Jahant Road at the same distance from Hwy. 99 as Pos. 1.

Pos. 2: Near NSA #2: Two (2) houses located off the West Side frontage road for State Hwy. 99, approx. 2000 feet ENE of the site center.

Pos. 3: This measurement position was approx. 600 feet west of the west side frontage road of Hwy. 99, which is approximately the same distance from State Hwy. 99 as NSA #3. A "long-term" sound monitor meter was installed near this location.

NSA #3: a house located approx. 600 feet west of the westside Feeder Road for Hwy. 99, approx. 2000 feet SE of the site center).

Pos. 4: At the SW corner of the proposed facility property line.

Pos. 5: Near NSA #4: Three (3) houses located on off of E. Peltier Road, approx. 2600 feet south of the site center.

Pos. 6: Near NSA #5: A house located on off of E. Peltier Road, approx. 3000 feet SSE of the site center.

Pos. 7: This measurement position was approximately the same distance from Hwy. 99 as Meas. Pos. #3, only East of Hwy. 99 on E. Peltier Road (approx. 600 ft. from eastside feeder for Hwy. 99).

Pos. 8: This measurement position was approximately the same distance from Hwy. 99 as Meas. Pos. #4, only East of Hwy. 99 on E. Peltier Road (approx. 0.5 mile from eastside feeder for Hwy. 99).

3.3 Sound Measurement Positions and Closest NSAs at the Separation Station

Since H&K did not perform an ambient sound survey at the site of the separation station, we are reporting the results of sound level monitoring by Dames & Moore that was conducted near the site of the separation station on August 26, 1998. Dames & Moore performed daytime and nighttime sound level tests at one (1) location near the separation station, and this sound monitor position was located approx. 40 feet from Jahant Road in the same area as the separation station.

4.0 SOUND MEASUREMENT RESULTS

4.1 Measured Sound Data at the Gas Storage Facility

Table 1 (p. 9) shows the measured daytime L_{eq} (i.e., L_d), $L_{90}(d)$ and $L_{10}(d)$ at each measurement position in the afternoon of 5/26/99 and the arithmetic average measured L_d, L_{90} and L_{10} if more than one test was performed. The meteorological conditions during the daytime testing period on 5/26/99 are summarized in **Table 2** (p. 9). The measured daytime unweighted octave-band SPLs (i.e., L_d) are provided in **Table 3** (p. 10).

Table 4 (p. 11) shows the measured nighttime L_{eq} (i.e., L_n), $L_{90}(n)$ and $L_{10}(n)$ at each measurement position on 5/26/99 and the average data if more than one test was performed. The meteorological conditions during the nighttime testing are summarized in **Table 5** (p. 11). The measured octave-band SPLs (n) are provided in **Table 6** (p. 12).

Table 7 (p. 13) shows the measured L_d, $L_{90}(d)$ and $L_{10}(d)$ at each measurement position on the morning of 5/27/99. The meteorological conditions during the daytime sound testing period on 5/27/99 are summarized in **Table 8** (p. 13).

A "long-term" sound monitor meter was installed near the proposed site of the gas storage facility (i.e., near Meas. Pos. 3) for approximately eight (8) days, from 6/16/99-6/23/99. The results of this long-term monitoring are graphically shown on **Figure 4** (p. 14). Although the sound monitor recorded the hourly L_{eq}, L_{90} and L_{10} along with Lmax and Lmin, **Figure 4** only shows the measured "long-term" hourly L_{eq} and L_{90}.

4.2 Summary of Ambient Sound Data at the Gas Storage Facility

The following table summarizes the range of measured L_d and L_n and daytime/nighttime L_{90} at the sound measurement locations that were measured by H&K on 5/26-5/27/99.

Meas. Pos.	Description of Measurement Location	Meas'd Ld (dBA)	Meas'd L90 (d)	Meas'd Ln (dBA)	Meas'd L90 (n)
Pos. 1	NSA #1 (1500 ft. NW of site center)	35.7-41.8	32.3-38.5	38.3	37.5
Pos. 2	NSA #2, 100 ft. off frontage road	67.5-69.0	58.5-62.8	68.5	60.8
Pos. 3	600 ft. west of Hwy. 99	44.7-45.6	44.0-44.3	45.3	43.3
Pos. 4	SW corner of site property line	44.0	38.8-42.0	39.4	38.0
Pos. 5	NSA #4 (2600 ft. south of site center)	41.1-44.5	41.1-43.8	38.3	37.3
Pos. 6	NSA #5 (3000 ft. SSE of site center)	41.8-44.5	40.3	41.3	38.5
Pos. 7	600 ft. E of Eastside frontage road	58.0-59.8	55.0-56.0	55.0	53.0
Pos. 8	0.5 mile E of Eastside frontage road	49.0-50.7	46.5-47.0	51.0	49.8

4.3 Observations/Discussion regarding Sound Measurements at the Gas Storage Facility

During the site sound survey on 5/26-5/27/99, at most of the NSAs located on the West Side of Hwy. 99 (NSA #1, #3, #4, #5), the noise associated with distant vehicle traffic and the noise of birds/insects were the most notable noise contributors to the measured ambient noise level although vehicle traffic noise was not a dominant source. At NSA #2 (i.e., 2 houses located relatively close to State Hwy. 99), the measured noise level was dominated by vehicle traffic noise, as would be expected.

As mentioned above, traffic noise was not a dominant noise source at most NSAs, and this was primarily because the wind was blowing from the west (i.e., NSA test positions were downwind of the traffic noise). Consequently, to appreciate the potential sound level at the NSAs if the wind was blowing from the east, we performed tests on the East Side of State Hwy. 99 (i.e., Meas. Pos. 7 and Pos. 8). The results of this exercise point out that the ambient sound level at the NSAs could increase significantly if there was an east wind.

Regarding the "long-term" sound data measured over a period of 8 days at the gas storage facility, there is a significant variation of the sound levels during each 24-hour period, and this result would be expected near a major highway. There are also periods of relatively high sound levels (e.g., hourly L_{eq} of 60-70 dBA), and we believe that these "high" sound levels are a result of low-flying aircraft associated with the Lodi Airport (e.g., ultralight planes and other small single-engine planes).

4.4 Summary of Ambient Sound Data at the Separation Station

The following table summarizes the measured L_d and L_n and the daytime/nighttime L_{90} at the sound measurement location (i.e., "Location 1") near the proposed site of the separation station that were measured by Dames & Moore on August 26, 1998.

Meas. Pos.	Time Frame for Measurement	Meas'd Leq (dBA)	Meas'd L10 (dBA)	Meas'd L90 (dBA)
Loc. 1	12:15 a.m. to 12:30 a.m.	46.3	42.4	33.3
Loc. 1	7:30 a.m. to 7:45 a.m.	52.2	49.4	37.9
Loc. 1	1:15 p.m. to 1:30 p.m.	53.1	50.3	36.5
Loc. 1	6:00 p.m. to 6:15 p.m.	54.2	52.4	37.2

In summary, at the site of the separation station, the average daytime sound levels ranged from **45 to 55 dBA** during the daytime hours and from **35-45 dBA** during the nighttime hours. As the measured data indicates, there was a minimum amount of variation in the ambient noise levels from daytime to nighttime, which indicates the absence of significant activity in the area of the separation station.

5.0 FINAL COMMENT

It is our opinion that the measured sound data by H&K and the reported sound data by Dames & Moore adequately quantifies the existing ambient sound levels around the site of the gas storage facility and separation station for the meteorological conditions that occurred during the sound survey(s).

As expected, the measurement results indicate that measured ambient sound levels during the nighttime are typically lower than the measured daytime sound levels because there would be less noise due to vehicle traffic along the local highways and less noise due to birds.

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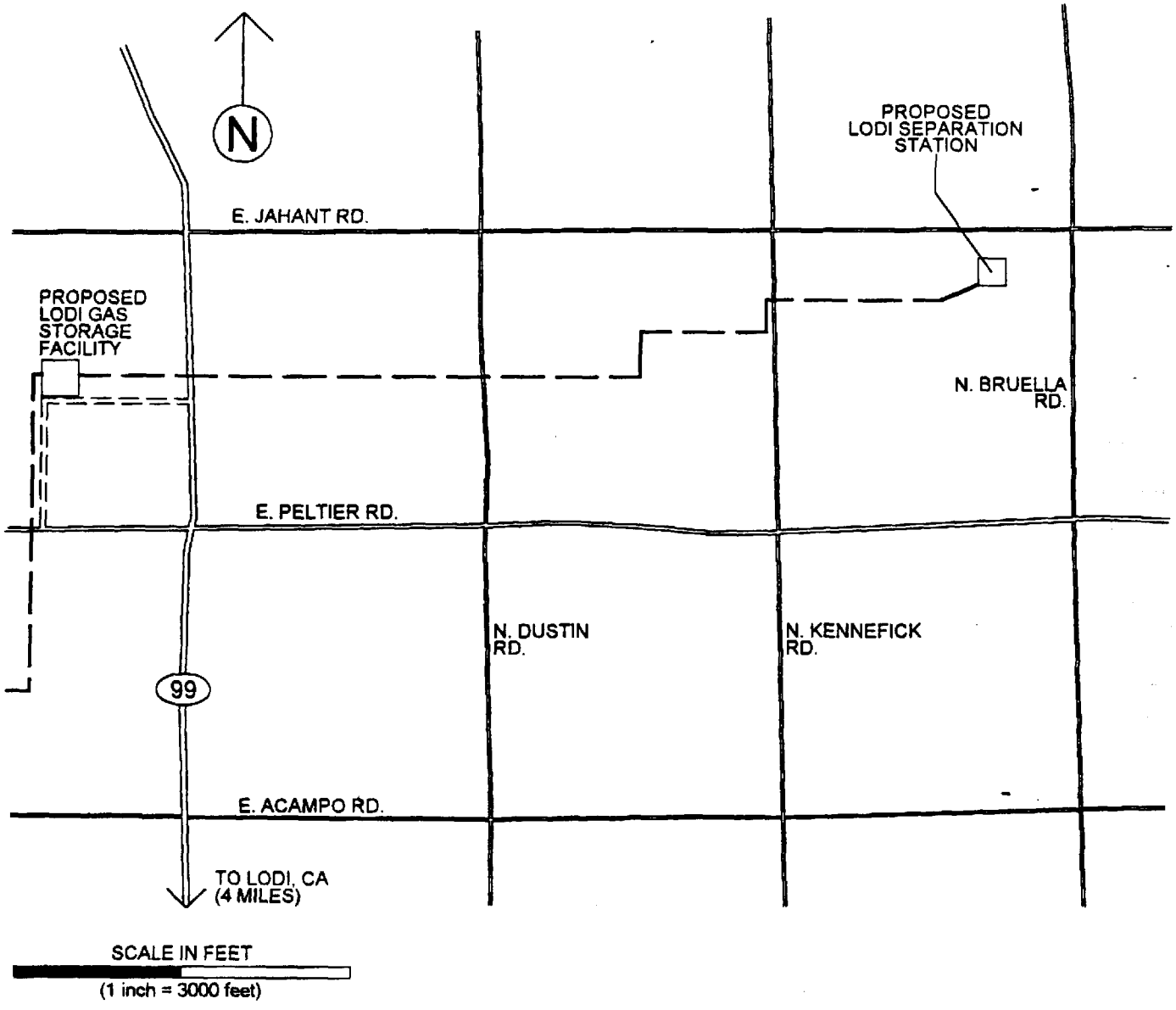

Figure 1: Area Layout Showing the General Location of the Gas Storage Facility and the Location of the Separation Station.

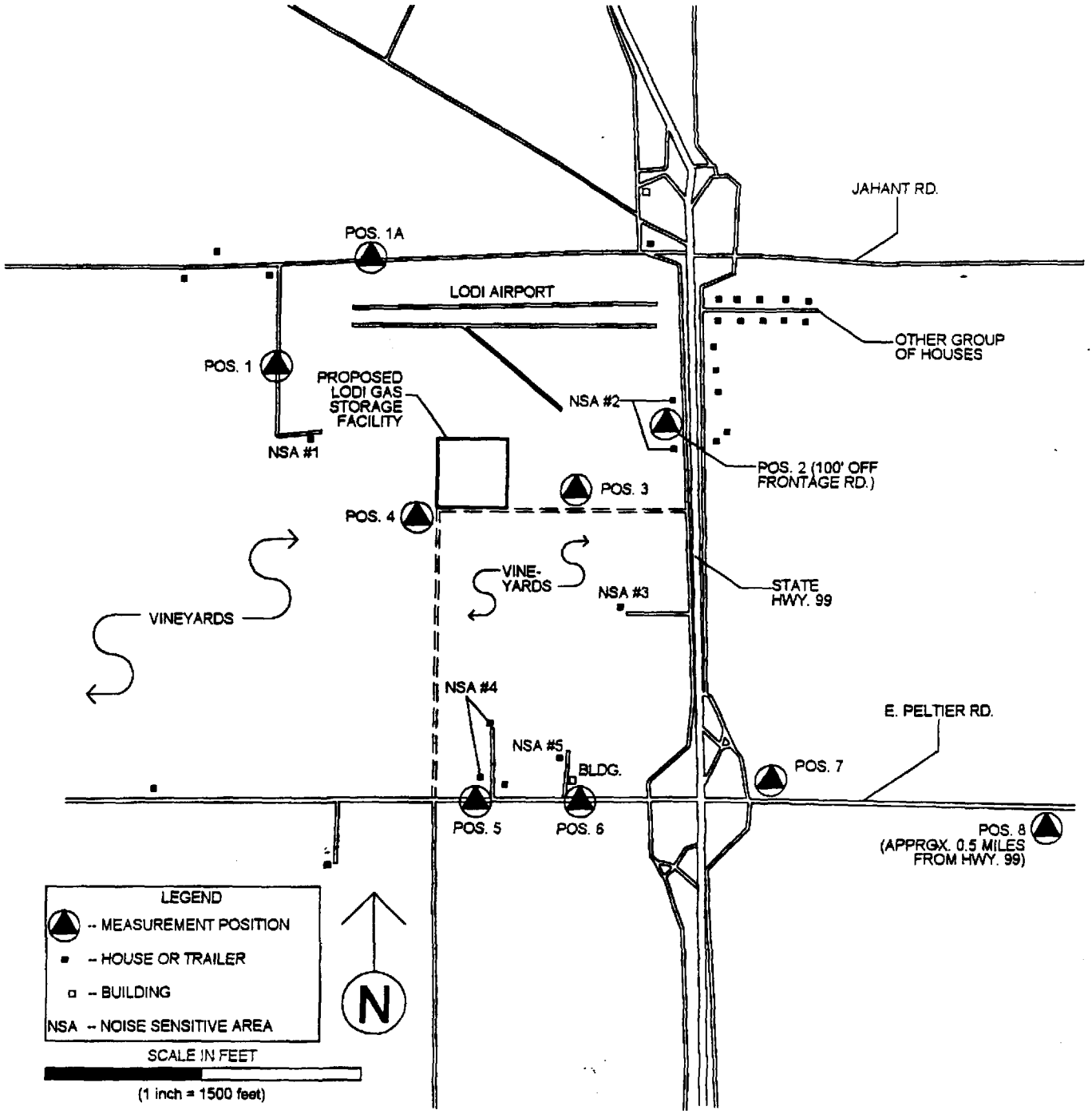

Figure 2: Lodi Gas Storage Facility: Area Layout around the Facility and the Location of the Closest NSAs around the Facility.

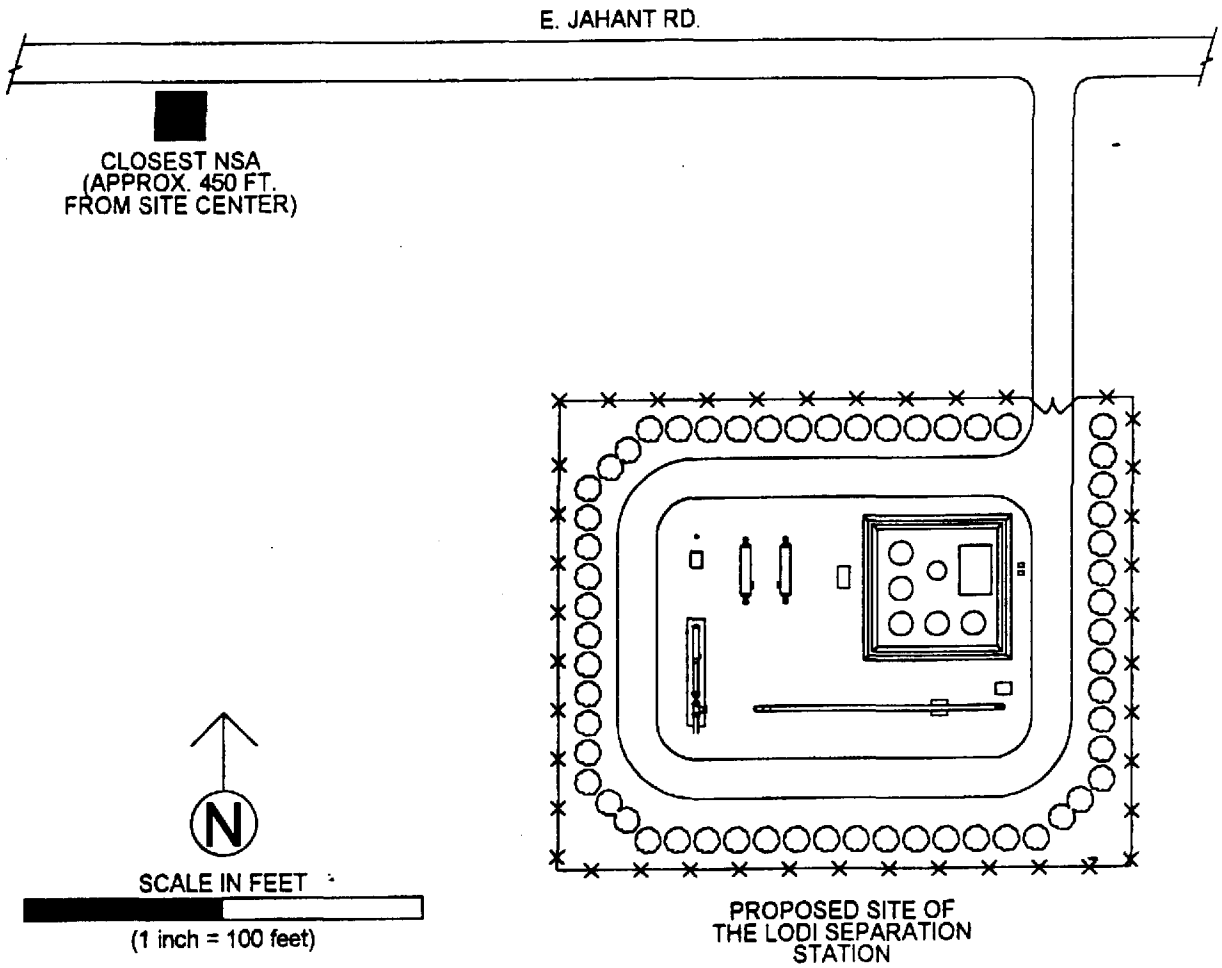

Figure 3: Lodi Separation Station: Area Layout around the Station and the Estimated Location of the Closest NSAs around the Site.

Measurement Set		Measured A-Weighted Sound Levels (dBA)						
Position	Time/Date	Daytime Leq (Ld)	Avg. Ld	Daytime L90	Avg. L90	Daytime L10	Avg. L10	Notes and Observations
#1: Near NSA #1;	3:30 pm (5/26)	36.5						Distant vehicle traffic audible but not
a House 1500 Ft.	3:40 pm (5/26)	36.0	35.7	32.0	32.3	40.0	38.0	dominant (Meas. pos. upwind of Hwy. 99).
NW of Site Center	3:50 pm (5/26)	34.5		32.5		36.0		Some noise of distant aircraft, birds and noise of wind blowing in trees/brushes.
#2: Near NSA #2;	4:10 pm (5/26)	69.0						Meas. pos. only 100 ft. from Hwy. 99.
2 Houses 2000 Ft.	4:20 pm (5/26)	69.0	69.0	62.5	62.8	73.0	72.5	Vehicle traffic noise of Hwy. 99 dominant
ENE of Site Center	4:30 pm (5/26)	69.0		63.0		72.0		noise source (as expected).
#3: Meas. position	4:40 pm (5/26)	44.7						Mostly traffic noise of Hwy. 99 (i.e., Meas.
same distance from	4:45 pm (5/26)	47.0	45.6	45.5	44.3	48.0	47.0	position approx. 600 ft. from Highway 99).
Hwy. 99 as NSA #3	4:50 pm (5/26)	45.0		43.0		46.0		Noise of birds and wind-related noise.
(2000 Ft. SE of Site)								Wind influenced the low-freq. SPLs.
#4: SW Corner of	5:00 pm (5/26)	45.0						Distant vehicle traffic audible but not
Site Property Line	5:10 pm (5/26)	44.5	44.0	39.5	38.8	48.5	46.8	dominant. Distant aircraft, noise of birds
	5:15 pm (5/26)	42.5		38.0		45.0		and noise of wind blowing in brushes.
#5: Near NSA #4;	5:20 pm (5/26)	45.0						Vehicle traffic along Peltier and Hwy. 99.
3 Houses 2600 Ft.	5:30 pm (5/26)	43.5	43.8	40.5	39.5	46.0	46.0	Some noise of birds, distant aircraft and
S of Site Center	5:35 pm (5/26)	43.0		38.5		46.0		wind-related noise.
#6: Near NSA #5;	5:40 pm (5/26)	46.4						Vehicle traffic along Peltier and Hwy. 99.
a House 3000 Ft.	5:50 pm (5/26)	44.5	44.5	41.5	40.3	47.0	46.3	although noise of Hwy. 99 minimum.
SSE of Site Center	5:55 pm (5/26)	42.5		39.0		45.5		Some noise of birds, distant aircraft and wind-related noise.
#7: Meas. position	6:00 pm (5/26)	59.6						Vehicle traffic noise of Hwy. 99 dominant
same distance from	6:03 pm (5/26)	60.7	59.8	56.5	56.0	63.0	62.3	noise source since position located
Hwy. 99 as Pos. #3	6:05 pm (5/26)	59.0		55.5		61.5		downwind of Hwy. 99.
but East of Hwy. 99								
#8: Meas. position	6:30 pm (5/26)	50.6						Vehicle traffic noise of Hwy. 99 dominant
same distance from	6:35 pm (5/26)	50.8	50.7	47.0	47.0	52.0	52.0	noise source since position located
Hwy. 99 as Pos. #1								downwind of Hwy. 99. Some noise of birds.
but East of Hwy. 99								

Table 1: Lodi Gas Storage Facility: Measured Daytime (Afternoon) A-Wt. Sound Levels (Leq), A-Wt. L90 Levels and A-Wt. L10 Levels on 5/26/99 around the Proposed Site of the Facility

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Measurement Set		Temp.	R.H				
Position	Time Frame	(°F)	(%)	Wind Direction	Wind Speed	Peak Wind	Sky Conditions
Pos. #1 - #8	3:30 pm - 7:00 pm	84-88°	30-35%	From West & WNW	2-6 mph	6-8 mph (some gusts)	Clear

Table 2: Lodi Gas Storage Facility: Meteorological Conditions during the Daytime (Afternoon) Ambient Sound Measurements around the Site of the Proposed Faciltiy on 5/26/99

Measurement Set		-Sound Pressure Level (SPL) in dB per Octave-Band Frequency (In Hz)-									A-Wt.
Position	Time/Date	31.5	63	125	250	500	1000	2000	4000	8000	Leq
#1: Near NSA #1;	3:30 pm (5/26)	49.5	47.2	46.4	31.7	28.6	29.7	27.8	27.5	25.8	
a House 1500 Ft.	3:40 pm (5/26)	53.0	47.0	43.0	37.5	31.5	27.0	27.5	25.5	25.5	
NW of Site Center	3:50 pm (5/26)	53.5	47.0	39.0	30.5	29.0	28.0	25.5	25.5	25.5	
	Average SPL	52.0	47.1	42.8	33.2	29.7	28.2	26.9	26.2	25.6	35.7
#2: Near NSA #2;	4:10 pm (5/26)	72.9	74.3	70.8	65.4	65.9	65.3	60.9	54.7	49.1	
2 Houses 2000 Ft.	4:20 pm (5/26)	72.0	75.0	72.5	67.0	66.0	65.0	61.0	54.5	48.5	
ENE of Site Center	4:30 pm (5/26)	72.3	74.0	71.5	66.5	65.5	65.0	61.0	54.0	48.0	
	Average SPL	72.4	74.4	71.6	66.3	65.8	65.1	61.0	54.4	48.5	69.0
#3: Meas. position	4:40 pm (5/26)	69.9	62.7	55.2	42.3	36.4	38.5	34.0	27.8	24.3	
same distance from	4:45 pm (5/26)	72.5	65.0	59.0	46.0	40.0	39.5	34.0	31.0	27.5	
Hwy. 99 as NSA #3	4:50 pm (5/26)	66.5	63.0	55.0	41.0	36.5	40.0	34.5	28.0	27.0	
(2000 Ft. SE of Site)	Average SPL	69.6	63.6	56.4	43.1	37.6	39.3	34.2	28.9	26.3	45.6
#4: SW Corner of	5:00 pm (5/26)	69.2	61.7	57.3	46.8	38.4	32.1	27.9	28.1	27.8	
Site Property Line	5:10 pm (5/26)	70.0	65.5	56.5	47.5	40.0	33.0	31.5	33.5	26.5	
	5:15 pm (5/26)	70.0	62.0	54.0	44.5	36.0	32.5	29.0	27.0	26.5	
	Average SPL	69.7	63.1	55.9	46.3	38.1	32.5	29.5	29.5	26.9	44.0
#5: Near NSA #4;	5:20 pm (5/26)	70.7	62.5	54.6	45.4	38.1	37.5	30.3	32.8	32.2	
3 Houses 2600 Ft.	5:30 pm (5/26)	69.0	61.0	51.5	42.5	37.5	39.5	33.5	30.5	25.0	
S of Site Center	5:35 pm (5/26)	68.5	60.5	52.5	46.5	37.5	35.0	29.5	26.0	27.5	
	Average SPL	69.4	61.3	52.9	44.8	37.7	37.3	31.1	29.8	28.2	43.8
#6: Near NSA #5;	5:40 pm (5/26)	67.2	57.4	50.0	46.2	43.4	42.9	34.7	26.2	27.1	
a House 3000 Ft.	5:50 pm (5/26)	68.0	60.0	51.0	43.5	40.5	40.0	34.0	28.2	22.5	
SSE of Site Center	5:55 pm (5/26)	67.5	59.5	49.5	41.5	40.0	37.5	32.0	27.0	21.5	
	Average SPL	67.6	59.0	50.2	43.7	41.3	40.1	33.6	27.1	23.7	44.5
#7: Meas. position	6:00 pm (5/26)	73.6	67.1	60.6	51.1	55.1	57.0	51.7	39.7	29.1	
same distance from	6:03 pm (5/26)	67.9	65.7	62.1	48.3	56.7	58.1	52.8	40.6	26.8	
Hwy. 99 as Pos. #3	6:05 pm (5/26)	68.0	68.0	57.5	47.0	54.5	56.5	51.5	39.5	26.5	
but East of Hwy. 99	Average SPL	69.8	66.9	60.1	48.8	55.4	57.2	52.0	39.9	27.5	59.8
#8: Meas. position	6:30 pm (5/26)	65.6	57.4	51.7	45.2	47.2	47.7	41.6	31.5	23.0	
same distance from	6:35 pm (5/26)	70.6	64.8	54.1	46.1	47.9	47.5	40.0	34.9	27.3	
Hwy. 99 as Pos. #1											
but East of Hwy. 99	Average SPL	68.1	61.1	52.9	45.7	47.6	47.6	40.8	33.2	25.2	50.7

Table 3: **Lodi Gas Storage Facility: Measured Daytime (Afternoon) Unweighted Octave-Band Sound Pressure Levels (SPL Leq) on 5/26/99 around the Proposed Site of the Facility**

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Measurement Set		Measured A-Weighted Sound Levels (dBA)						
Position	Time/Date	N-time Leq (Ln)	Avg. Ln	N-time L90	Avg. L90	N-time L10	Avg. L10	Notes and Observations
#1A: Meas. position same distance from Hwy. 99 as Pos. #1 (off of Jahant Road).	9:20 pm (5/26) 9:25 pm (5/26)	39.0 37.5	38.3	38.5 36.5	37.5	39.5 38.0	38.8	Distant vehicle traffic audible but not dominant. Noise of insects and noise of wind blowing in trees/brushes.
#2: Near NSA #2; 2 Houses 2000 Ft. ENE of Site Center	9:40 pm (5/26) 9:45 pm (5/26)	68.5 68.5	68.5	59.5 62.0	60.8	72.0 71.0	71.5	Vehicle traffic noise of Hwy. 99 dominant noise source (as expected). Some noise of insects and distant dogs barking.
#3: Meas. position same distance from Hwy. 99 as NSA #3 (2000 Ft. SE of Site)	9:00 pm (5/26) 9:05 pm (5/26)	45.0 45.5	45.3	43.5 43.0	43.3	46.0 48.0	47.0	Mostly noise of distant vehicle traffic associated with Hwy. 99. Some noise of insects and wind-related noise.
#4: SW Corner of Site Property Line	9:40 pm (5/26) 9:45 pm (5/26)	39.8 39.0	39.4	38.0	38.0	40.5	40.5	Distant vehicle traffic audible but not dominant. Noise of insects and noise of wind blowing in trees/brushes.
#5: Near NSA #4; 3 Houses 2600 Ft. S of Site Center	9:50 pm (5/26) 9:55 pm (5/26)	39.5 37.0	38.3	38.5 36.0	37.3	40.5 37.5	39.0	Mostly noise of distant vehicle traffic associated with Hwy. 99. Some noise of insects and wind-related noise.
#6: Near NSA #5; a House 3000 Ft. SSE of Site Center	10:00 pm (5/26) 10:05 pm (5/26)	40.0 42.5	41.3	38.0 39.0	38.5	41.5 44.5	43.0	Mostly noise of distant vehicle traffic associated with Hwy. 99. Some noise of insects and wind-related noise. Distant noise of train on 2nd test.
#7: Meas. position same distance from Hwy. 99 as Pos. #3 but East of Hwy. 99	10:30 pm (5/26)	55.0	55.0	53.0	53.0	57.5	57.5	Vehicle traffic noise of Hwy. 99 dominant noise source since position located downwind of Hwy. 99. Some noise of insects and distant train.
#8: Meas. position same distance from Hwy. 99 as Pos. #1 but East of Hwy. 99	10:15 pm (5/26) 10:20 pm (5/26)	51.0 51.0	51.0	50.0 49.5	49.8	52.5 52.0	52.3	Vehicle traffic noise of Hwy. 99 dominant noise source since position located downwind of Hwy. 99.

Table 4: **Lodi Gas Storage Facility: Measured Nighttime A-Wt. Sound Levels (Leq), A-Wt. L90 Levels and A-Wt. L10 Levels on 5/26/99 around the Proposed Site of the Facility**

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Measurement Set		Temp.	R.H				
Position	Time Frame	(°F)	(%)	Wind Direction	Wind Speed	Peak Wind	Sky Conditions
Pos. #1 - #8	8:45 pm - 11:00 pm	64-72°	45-60%	From WNW	2-4 mph	5-7 mph	Clear

Table 5: **Lodi Gas Storage Facility: Meteorological Conditions during the Nighttime Ambient Sound Measurements around the Site of the Proposed Facilty on 5/26/99**

Measurement Set		-Sound Pressure Level (SPL) in dB per Octave-Band Frequency (in Hz)-									A-Wt.
Position	Time/Date	31.5	63	125	250	500	1000	2000	4000	8000	Leq
#1A: Meas. position											
same distance from	9:20 pm (5/26)	50.0	48.0	41.5	35.5	32.5	32.0	25.0	36.0	22.5	
Hwy. 99 as Pos. #1	9:25 pm (5/26)	57.0	54.0	45.5	36.5	31.5	32.0	24.5	27.5	19.5	
(off of Jahant Road).	Average SPL	53.5	51.0	43.5	36.0	32.0	32.0	24.8	31.8	21.0	38.3
#2: Near NSA #2;											
2 Houses 2000 Ft.	9:40 pm (5/26)	68.5	72.5	69.0	64.0	62.5	65.0	62.0	54.0	47.0	
ENE of Site Center	9:45 pm (5/26)	67.5	69.5	67.0	61.0	61.5	65.5	62.5	54.5	44.5	
	Average SPL	68.0	71.0	68.0	62.5	62.0	65.3	62.3	54.3	45.8	68.5
#3: Meas. position											
same distance from	9:00 pm (5/26)	65.5	62.0	54.0	41.5	39.0	40.0	35.0	27.0	21.5	
Hwy. 99 as NSA #3	9:05 pm (5/26)	61.0	62.5	54.5	40.0	38.5	40.5	36.0	29.5	20.0	
(2000 Ft. SE of Site)	Average SPL	63.3	62.3	54.3	40.8	38.8	40.3	35.5	28.3	20.8	45.3
#4: SW Corner of											
Site Property Line	9:40 pm (5/26)	57.4	50.9	43.7	43.6	42.2	34.6	25.0	21.0	19.4	
	9:45 pm (5/26)	62.1	56.4	47.9	41.4	37.9	33.0	25.3	16.8	17.8	
	Average SPL	59.8	53.7	45.8	42.5	40.1	33.8	25.2	18.9	18.6	39.4
#5: Near NSA #4;											
3 Houses 2600 Ft.	9:50 pm (5/26)	56.5	53.0	47.0	41.0	35.5	32.0	26.0	32.0	21.5	
S of Site Center	9:55 pm (5/26)	57.0	54.0	45.0	35.0	33.0	31.0	24.5	24.0	20.0	
	Average SPL	56.8	53.5	46.0	38.0	34.3	31.5	25.3	28.0	20.8	38.3
#6: Near NSA #5;											
a House 3000 Ft.	10:00 pm (5/26)	59.5	56.0	48.0	39.0	37.0	34.5	29.0	21.0	20.5	
SSE of Site Center	10:05 pm (5/26)	58.0	58.0	49.5	41.5	41.0	36.0	28.5	20.0	19.5	
	Average SPL	58.8	57.0	48.8	40.3	39.0	35.3	28.8	20.5	20.0	41.3
#7: Meas. position											
same distance from	10:30 pm (5/26)	59.5	62.0	55.5	47.0	51.5	52.5	47.0	34.5	23.5	
Hwy. 99 as Pos. #3											
but East of Hwy. 99	Average SPL	59.5	62.0	55.5	47.0	51.5	52.5	47.0	34.5	23.5	55.0
#8: Meas. position											
same distance from	10:15 pm (5/26)	59.0	57.0	53.0	47.0	48.0	49.0	39.5	23.0	19.5	
Hwy. 99 as Pos. #1	10:20 pm (5/26)	59.0	54.0	53.5	46.5	47.5	49.0	40.0	25.0	21.5	
but East of Hwy. 99	Average SPL	59.0	55.5	53.3	46.8	47.8	49.0	39.8	24.0	20.5	51.0

Table 6: **Lodi Gas Storage Facility: Measured Nighttime Unweighted Octave-Band Sound Pressure Levels (SPL Leq) on 5/26/99 around the Proposed Site of the Facility**

file: c:\lotus-xl\proj\whp\amb-data.wk1

Measurement Set		Measured A-Weighted Sound Levels (dBA)						
Position	Time/Date	Daytime Leq (Ld)	Avg. Ld	Daytime L90	Avg. L90	Daytime L10	Avg. L10	Notes and Observations
#1A: Meas. position same distance from Hwy. 99 as Pos. #1	10:15 am (5/27) 10:20 am (5/27)	39.5 44.0	41.8	38.0 39.0	38.5	41.0 47.5	44.3	Distant vehicle traffic audible. Some noise of a distant tractor. Noise of birds and noise of distant aircraft.
#2: Near NSA #2; 2 Houses 2000 Ft. ENE of Site Center	10:30 am (5/27) 10:40 am (5/27)	68.0 67.0	67.5	59.0 58.0	58.5	72.0 71.5	71.8	Vehicle traffic noise of Hwy. 99 dominant noise source (varible traffic). Some noise of birds and wind-related noise.
#3: Meas. position same distance from Hwy. 99 as NSA #3 (2000 Ft. SE of Site)	9:50 am (5/27) 10:00 am (5/27)	43.4 46.0	44.7	44.0	44.0	47.5	47.5	Mostly noise of vehicle traffic noise of Hwy. 99. Some noise of birds and wind-related noise.
#4: SW Corner of Site Property Line	9:30 am (5/27) 9:40 am (5/27)	43.5 44.5	44.0	42.0	42.0	45.5	45.5	Distant vehicle traffic audible. Some noise of a distant tractor. Noise of birds and noise of distant aircraft.
#5: Near NSA #4; 3 Houses 2600 Ft. S of Site Center	11:00 am (5/27) 11:05 am (5/27)	41.6 40.5	41.1	39.0 38.5	38.8	43.5 42.0	42.8	Noise of distant vehicle traffic (vehicle noise not very audible). Some noise of birds and noise of distant (high-altitude) aircraft.
#6: Near NSA #5; a House 3000 Ft. SSE of Site Center	11:20 am (5/27) 11:25 am (5/27)	42.0 41.5	41.8	40.5 40.0	40.3	43.5 43.0	43.3	Noise of distant vehicle traffic moderately audible. Some noise of birds and wind-related noise.
#7: Meas. position same distance from Hwy. 99 as Pos. #3 but East of Hwy. 99	12:00 pm (5/27)	58.0	58.0	55.0	55.0	59.5	59.5	Vehicle traffic noise of Hwy. 99 dominant noise source.
#8: Meas. position same distance from Hwy. 99 as Pos. #1 but East of Hwy. 99	11:35 am (5/27) 11:40 am (5/27)	48.5 49.5	49.0	46.0 47.0	46.5	49.5 51.0	50.3	Vehicle traffic noise of Hwy. 99 dominant noise source. Some noise of birds and some wind-related noise.

Table 7: **Lodi Gas Storage Facility: Measured Daytime (Morning) A-Wt. Sound Levels (Leq), A-Wt. L90 Levels and A-Wt. L10 Levels on 5/27/99 around the Proposed Site of the Facility**

file: c:\lotus-xl\proj\whp\amb-data.wk1

Measurement Set		Temp.	R.H				
Position	Time Frame	(°F)	(%)	Wind Direction	Wind Speed	Peak Wind	Sky Conditions
Pos. #1 - #8	9:30 am - 12:00 pm	70-76°	40-45%	From the West	2-5 mph	6-8 mph	Clear

Table 8: **Lodi Gas Storage Facility: Meteorological Conditions during the Daytime (Morning) Ambient Sound Measurements around the Site of the Proposed Faciltiy on 5/27/99**

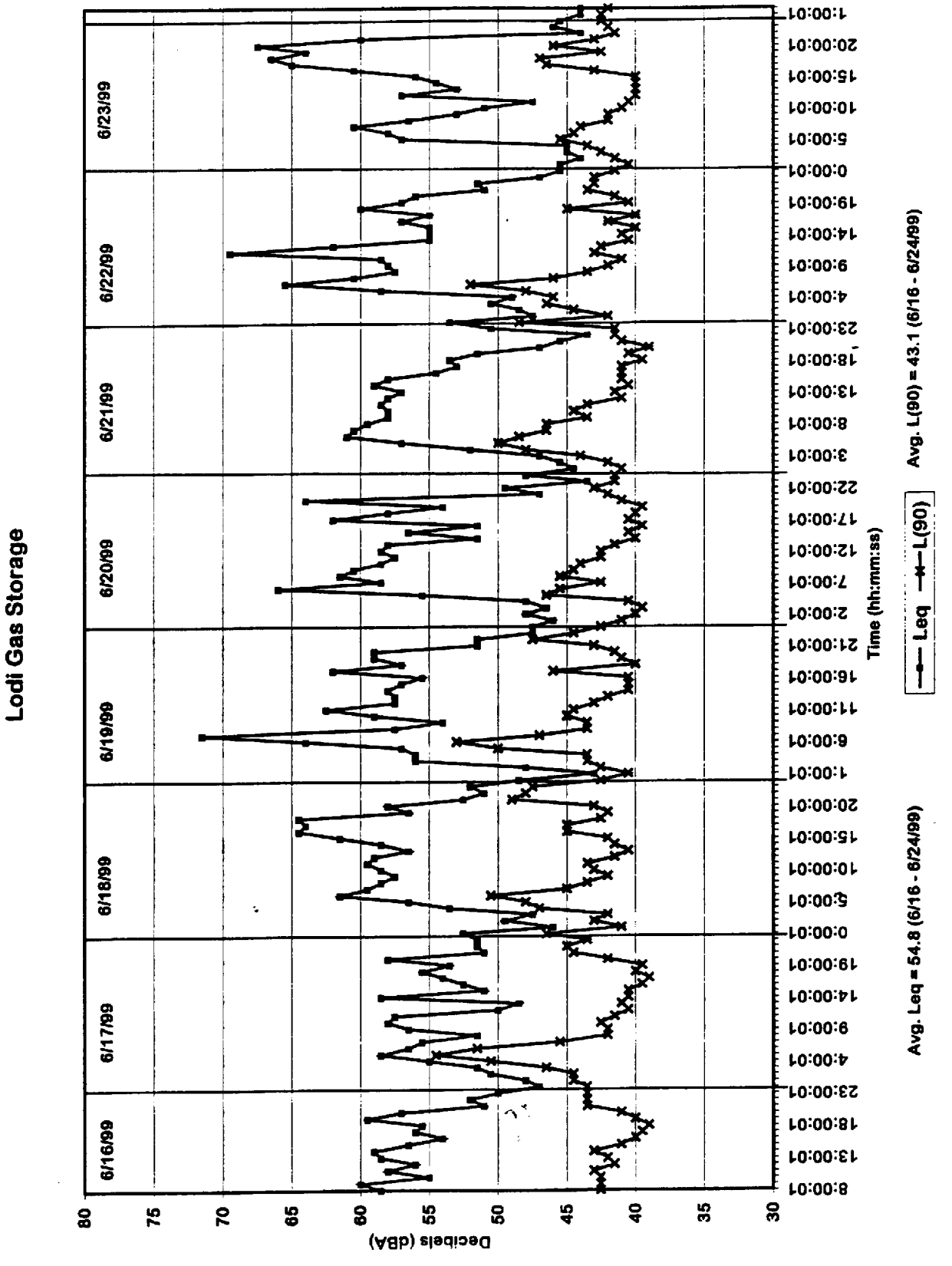

Figure 4: Graphic Display of the "long-term" Sound Monitor Results (hourly L_{eq} and L_{90} from 6/16-6/23/99) near the Site of the Gas Storage Facility (near Meas. Pos. 3)