Section 3.9
Noise

This section describes local noise standards that are applicable to the proposed project and examines whether the project would result in exceedance of those standards or would otherwise result in noise impacts as defined by CEQA. All facets of the project are analyzed for noise concerns, with particular concentration on the components that make the most noise, such as the compressor station. Key issues include examining the distance between noise-making components and the nearest place where people live or work, and discussing measures that can reduce noise to acceptable levels.

Lodi Gas Storage retained the acoustical consulting firm of Hoover & Keith to evaluate noise impacts associated with the proposed project. The results of the Hoover & Keith analysis are provided in the report entitled "Kirby Hill Gas Storage Project – Results of Noise Impact Analysis for a Proposed New Natural Gas Storage Project," dated June 24, 2005 (Hoover & Keith 2005). This report is included in the CPUC application and will be available and on-file with the CPUC.

Terminology

Below are brief definitions of acoustical terms used in this section.

- **Sound.** A vibratory disturbance created by a vibrating object, which—when transmitted by pressure waves through a medium such as air—is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-Pascals.
- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- **Equivalent Sound Level (Leq).** The average of sound energy occurring over a specified period. In effect, Leq is the steady-state sound level that

in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period.

- **Day-Night Level (Ldn).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m.
- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the A-weighted sound levels occurring between 7:00 p.m. and 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m.

Ldn and CNEL values rarely differ by more than 1 dB. As a matter of practice, Ldn and CNEL values are considered to be equivalent and are treated as such in this assessment. In general, human sound perception is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving sound level.

Environmental Setting

Land Uses and Receptors Sensitive to Noise in the Project Vicinity

Sensitive receptors are individuals or groups of individuals who are sensitive to high noise levels, such as individuals associated with residences, schools, playgrounds, and hospitals. The analysis focuses on noise associated with construction and operation of the project. The primary construction noise sources include general construction activity and well drilling. Primary operational noise sources include the permanent compressor station and the temporary compressor. The areas surrounding the project site are generally agricultural with limited rural residential land uses. A duck club also is located in the area. Figure 3.9-1 shows the location of the duck club and residences in the area. The proposed locations of the permanent and temporary compressors also are shown. Table 3.9-1 summarizes the distance between the primary noise sources (compressors and well-drilling sites) and the noise-sensitive uses. In addition, several residences are located within about 300 feet of the pipeline alignment.

Existing Noise Conditions

The project area is rural; it supports grazing and dryland farming and a few associated residences. The noise environment is defined mainly by noises generated by distant transportation, local traffic, and wind—including wind

Temporary Compressor

Duck Club

Proposed Compressor Station

LT-5

R1

R2

R3

R4

R5

R6

R7

No Access

LT-1

LT-4

Bradmoor Island

Little Honker Bay

Montezuma

Shiloh Church

Garfield

Shiloh Road

Olsen Road

Birds Landing Road

State Route 12

Lingos Landing

Meins Landing

Thompson Ranch

Hansford Ranch

LEGEND

0 0.5 1.0 Miles

0 1:30,000 0.5 1.0 1.5 Kilometers

N

USGS Quadrangles: 7.5-minute series
Bird's Landing, Antioch North, Denverton, and Honker Bay, California quadrangles

- R1 Residence
- R2 Residence
- R3 Residence
- R4 Residence
- R5 Residence
- R6 Residence
- R7 Residence

- LT-1 Long-Term Measuring Position
- LT-4 Long-Term Measuring Position
- LT-5 Long-Term Measuring Position

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Figure 3.9-1
Project Components and Noise Sensitive Uses in the Project Area

turbine generators. The windy conditions in the project area and vicinity produce a somewhat elevated ambient noise condition that increases with wind speed.

Table 3.9-1. Distances to Noise-Sensitive Uses

Use	Distance to Permanent Compressor (feet)	Distance to Temporary Compressor (feet)	Distance to Nearest Well Drilling Site (feet)
Duck club	2,020	6,850	7,050
Residence 1	7,660	9,070	8,560
Residence 2	6,650	10,480	9,670
Residence 3	5,640	10,080	8,870
Residence 4	4,640	9,270	8,060
Residence 5	4,230	9,070	7,560

Note:

Residences 6 and 7 are more than 5 miles from the compressor site; however, they are located adjacent to the pipeline alignment.

Noise monitoring was not conducted for the proposed project; however, monitoring was conducted for the Shiloh I Wind Plant Project (CPUC 2005), which is located in the same general area as the proposed project. The results of existing ambient noise measurements conducted for the Shiloh Project in 2001 and 2004 are provided below to characterize existing noise levels in the proposed project area. Figure 3.9-1 shows the location of two long-term measurement positions in the project area.

Measurements at Position LT-1 were conducted on July 30 and 31, 2001. The sound meter was located 144 feet from the centerline of Birds Landing Road. Additional measurements were taken at Positions LT-4 and LT-5 between July 30 and August 3, 2004. Measurement position LT-4 was located near position LT-1 but was located 300 feet from Birds Landing Road. Position LT-5 was located 50 feet from Shiloh Road at the intersection of Shiloh Road and Little Honker Bay Road. Figures 3.9-2, 3.9-3, and 3.9-4 depict measured long-term sound levels at each of these positions.

At Site LT-1, the CNEL for the 24-hour period was 58 dBA. For the daytime hours, the average hourly Leq was 54 dBA, the evening was 56 dBA, and the nighttime was 49 dBA. Maximum daytime levels ranged from 65 to 85 dBA.

At Site LT-4, the CNEL for the 24-hour period ranged from 69 to 74 dBA. For the daytime hours, the hourly Leq ranged from 56 to 67 dBA, and the nighttime ranged from 61 to 70 dBA.

At Site LT-5, the CNEL for the 24-hour period ranged from 65 to 70 dBA. For the daytime hours, the hourly Leq ranged from 56 to 67 dBA, and the nighttime ranged from 61 to 70 dBA.

The wind farm noise assessment (CPUC 2005) concludes that the ambient noise levels were higher than expected, possibly due to self-generated noise caused by wind blowing across the noise meter microphone windscreen.

Regulatory Setting

No federal or state noise standards are applicable to the project.

Solano County

Policy 4 in the Solano County Noise Element relates to the proposed project and states the following:

> The introduction of any fixed point, permanent, non-residential, noise-emitting land use (industrial, commercial, public, etc.) shall be prohibited if the projected noise emission level will exceed one or more of the following:
>
> a. 50 dBA CNEL as measured at the boundary of a nearby residential zone.
>
> b. 60 dBA CNEL as measured at the boundary of a nearby commericial zone, business zone (personal service, offices), or noise-sensitive industrial or manufacturing zone (research, communications, etc). (San Joaquin County 1992.)

The Noise Element also identifies maximum allowable noise levels from construction equipment. The maximum allowable noise levels vary by equipment type; they are in the range of 75 to 80 dBA for most equipment and as high as 95 dB for pile-driving equipment.

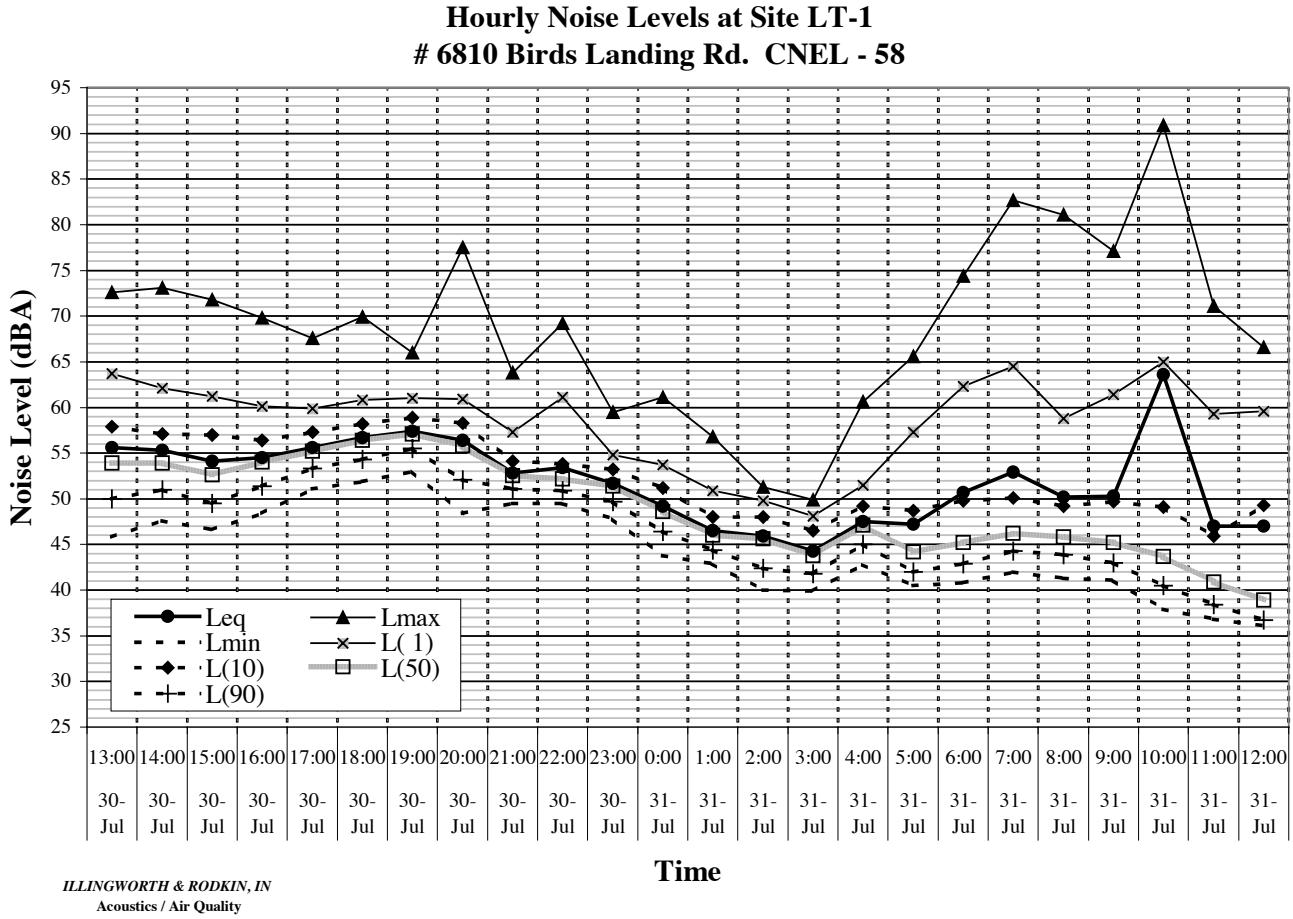

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Figure 3.9-2
Noise Measurement Position LT-1

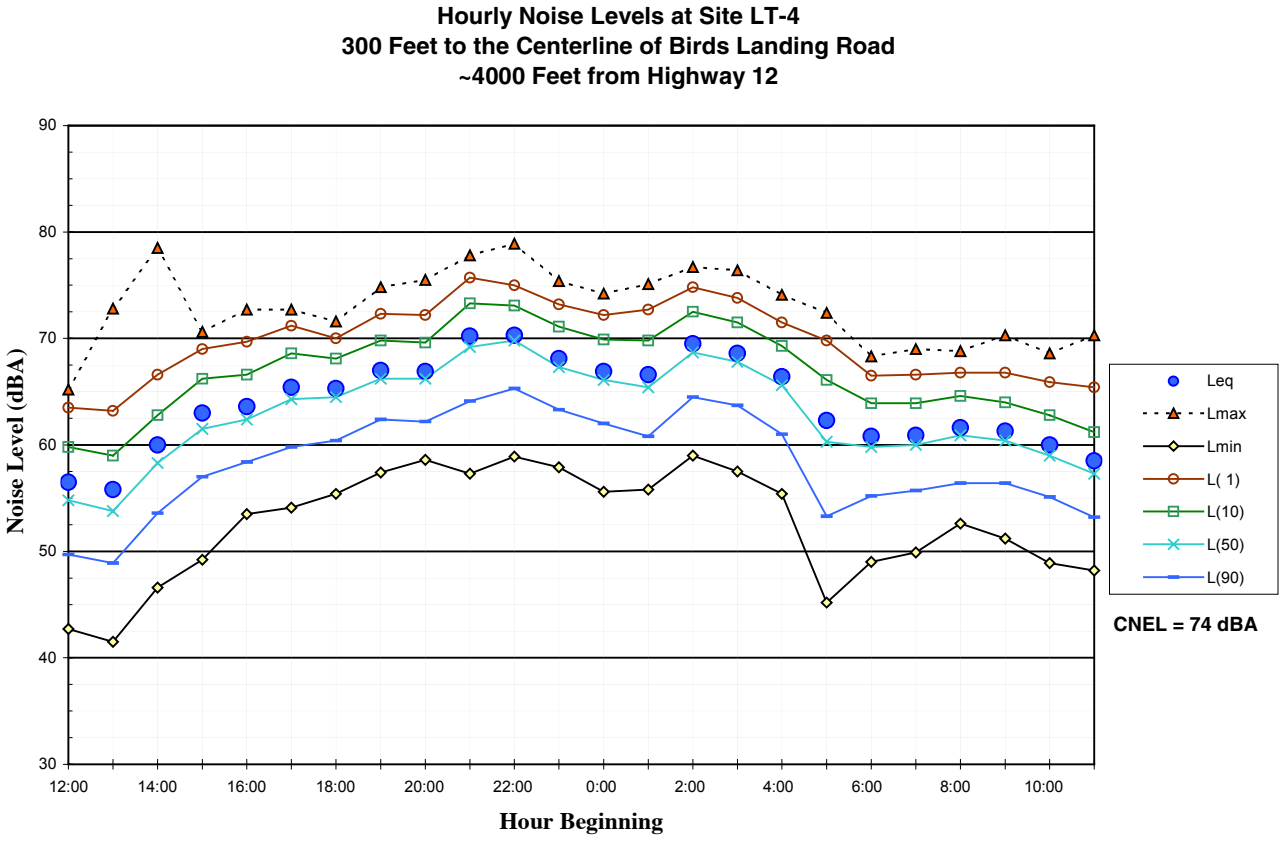

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Figure 3.9-3
Noise Measurement Position LT-4

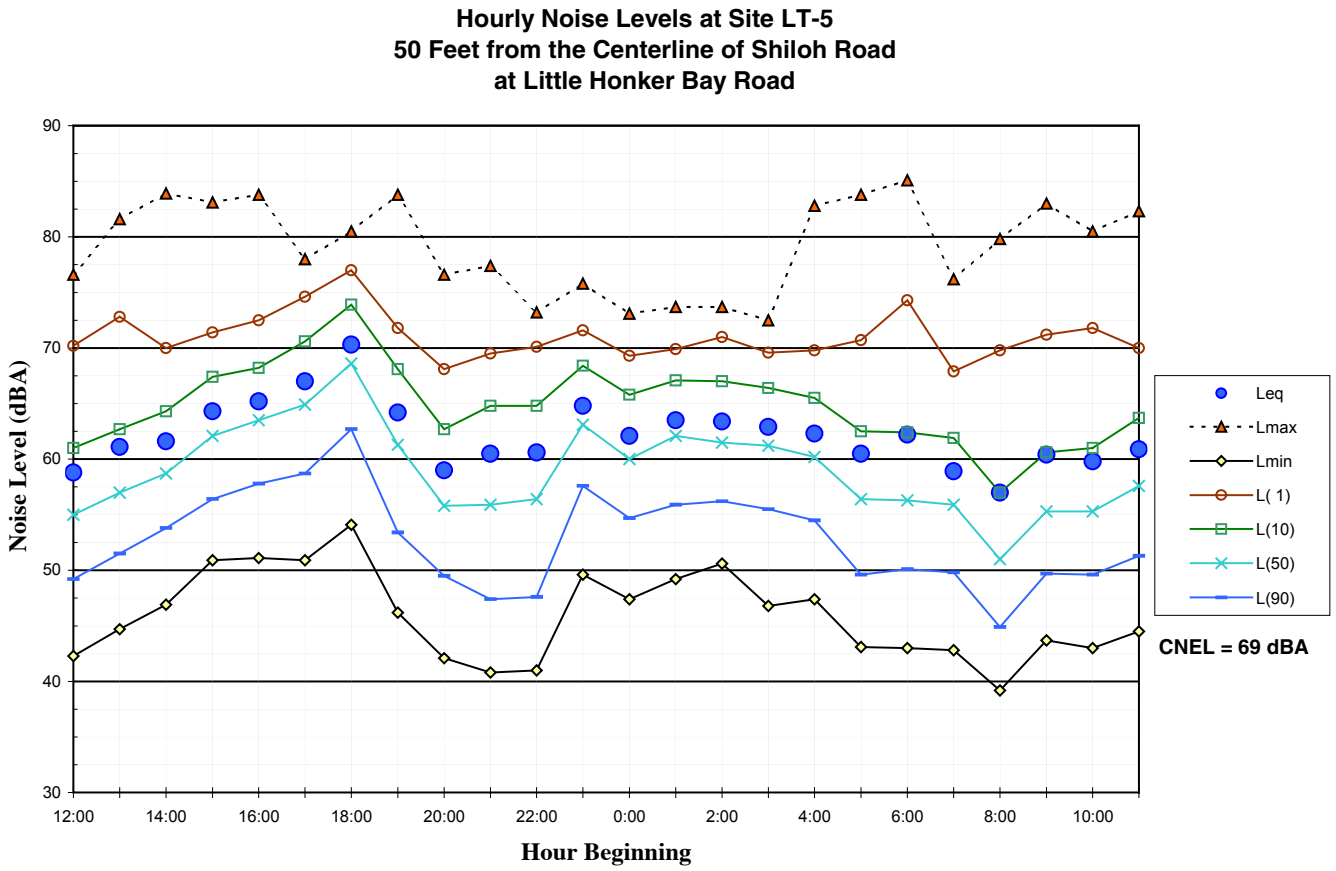

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Figure 3.9-4
Noise Measurement Position LT-5

Impact Analysis

Significance Criteria

Criteria for determining the significance of noise impacts were developed based on questions contained in the environmental checklist form in Appendix G of the State CEQA Guidelines. Based on the checklist questions, a project may have a significant effect on the environment if it would result in:

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels;
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The potential increase in noise from the project also is considered in determining significance. Research into the human perception of changes in sound level indicates the following (White 1975):

- A 3-dB change is barely perceptible,
- A 5-dB change is a noticeable difference, and
- A 10-dB change is perceived as being twice or half as loud as the original condition.

These and other factors relating to the duration, frequency, and tonal content of project-related noise are considered when evaluating the significance of changes in sound levels. Therefore, for project operations, a project-related increase of 5 dBA above the ambient sound level at nearby sensitive receptors was used as the threshold for a substantial increase.

Impacts

As noted in Chapter 2, “Project Description,” the following environmental commitments have been proposed by Lodi Gas Storage and will be incorporated into the construction contract specifications to reduce and control noise generated from construction-related activities.

- Restrict construction within 1,000 feet of occupied dwelling units to daytime hours between 7 a.m. and 7 p.m. on weekdays, Saturdays, and non-holidays, unless written approval is obtained from the resident.
- Ensure that all construction equipment has sound-control devices no less effective than those provided on the original equipment. No equipment will have an unmuffled exhaust.
- Implement appropriate additional noise-reducing measures, including but not limited to:
  - Changing the location of stationary construction equipment,
  - Shutting off idling equipment,
  - Rescheduling construction activity, and
  - Notifying nearby residents in advance of construction work.

IMPACT 3.9-1: EXPOSURE OF NOISE-SENSITIVE LAND USES TO NOISE FROM CONSTRUCTION ACTIVITIES OTHER THAN WELL DRILLING

Construction of the metering station, gas pipeline, compressor station, flow line, and injection/withdrawal wells would result in temporary increases in noise levels in the area of construction activity. Primary noise-generating activities would include excavation, grading, scraping, horizontal boring, and compaction activities. Vehicles traveling to and from construction sites also may affect noise in the area, but to a lesser degree. The magnitude of construction-noise impacts would depend on the type of construction activity, the noise level generated by various pieces of construction equipment, the duration of the activity, the distance between the activity and noise-sensitive receptors, and shielding effects from local barriers and topography. Noise increases from pipeline installation typically would last no more than a few days at any given location. Noise from construction of other facilities would occur over several weeks. Table 3.9-2 shows Leq values for various types of construction equipment that may be used during construction.

A reasonable worst-case assumption is that the three loudest pieces of equipment would operate simultaneously and continuously over at least a 1-hour period. The combined sound level of three of the loudest pieces of equipment listed in Table 3.9-2 (scraper, truck, and bulldozer) is 92 dBA, measured at a distance of 50 feet. Table 3.9-3, which assumes this combined-source noise level, summarizes predicted noise levels at various distances from an active construction site. These predicted construction noise levels include the effects of acoustical absorption by the ground but do not include the effects of shielding from structures or topography.

Table 3.9-2. Noise Emission Levels Typical for Construction Equipment

Equipment	Typical Noise Level (dBA) 50 Feet from Source
Backhoe	80
Bulldozer	85
Grader	85
Loader	85
Roller	75
Scraper	89
Truck	88

Source: Federal Transit Administration 1995.

Table 3.9-3. Estimated Construction Noise in the Vicinity of Active Construction Sites

Distance between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)
50	0	0	92
100	-6	-2	85
250	-14	-4	74
300	-16	-5	72
400	-18	-6	69
500	-20	-6	66
600	-22	-7	64
700	-23	-7	62
800	-24	-7	61
900	-25	-8	60
1,000	-26	-8	58
1,200	-28	-9	56
1,400	-29	-9	55
1,600	-30	-9	53
1,800	-31	-10	52
2,000	-32	-10	50
2,500	-34	-10	48
3,000	-36	-11	46

Notes:

Calculations are based on Federal Transit Administration 1995.

These calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.

Table 3.9-3 indicates that, under the worst-case construction noise assumption, construction noise could exceed the Solano County construction noise standard of 75 dBA within about 250 feet of an active construction site. Several residences on the east end of the pipeline alignment are located within this distance (wee Residences 6 and 7 in Figure 3.9-1). Because Lodi Gas Storage has committed to limit construction activity within 1,000 feet of dwelling units to daytime hours of 7 a.m. to 7 p.m. on weekdays, Saturday, and non-holidays; and because pipeline construction will occur in any given area for only a day or two, this impact is considered less than significant. No mitigation is required.

The Hoover & Keith evaluation uses a slightly different analysis approach for assessing construction noise impacts (Hoover & Keith 2005). The analysis concludes that construction noise at the nearest noise-sensitive area (assumed to be at a distance of 4,200 feet) would be 34.0 dBA. This is well below the County construction noise standard of 75 dBA.

IMPACT 3.9-2: EXPOSURE OF NOISE-SENSITIVE LAND USES TO NOISE FROM WELL DRILLING ACTIVITIES

Up to 10 new injection/withdrawal wells will be constructed on four existing well pads sites in the Kirby Hills. The injection/withdrawal well sites have been previously graded and contain existing wells and related facilities. The sites are not visible from surrounding areas and are located over 7,000 feet from the nearest noise-sensitive use. The wells will be directionally drilled from the well pads into the storage formation. Noise from well drilling produces a sound power level of 117 dBA which corresponds to a sound pressure level of 85 dBA at 50 feet (Hoover & Keith 2005). Table 3.9-4 summarizes predicted noise levels at various distances from active well drilling sites, based on a source level of 85 dBA at 50 feet and the same sound attenuation assumptions used for construction noise.

Well drilling is proposed to be conducted on a 24-hour basis for 12 or more weeks. As indicated in Figure 3.9-2, the minimum ambient sound level (Leq) measured between 7:00 a.m. and 7:00 p.m. in the project area was 47 dBA. With the nearest noise-sensitive use located over 7,000 feet from the well drilling sites, the results in Table 3.9-4 indicate that noise from well drilling will be well below the ambient noise level and the County's noise standard of 50 CNEL. This impact is therefore considered less than significant, and no mitigation is required.

Table 3.9-4. Estimated Well Drilling Noise

Distance between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)
50	0	0	85
100	-6	-2	77
250	-14	-4	67
300	-16	-5	65
400	-18	-6	61
500	-20	-6	59
600	-22	-7	57
700	-23	-7	55
800	-24	-7	53
900	-25	-8	52
1,000	-26	-8	51
1,200	-28	-9	49
1,400	-29	-9	47
1,600	-30	-9	46
1,800	-31	-10	44
2,000	-32	-10	43
2,500	-34	-10	41
3,000	-36	-11	38

Notes:

Calculations are based on Federal Transit Administration 1995.

These calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.

IMPACT 3.9-3: EXPOSURE OF NOISE-SENSITIVE LAND USES TO NOISE FROM OPERATION OF THE PERMANENT COMPRESSOR FACILITY

The analysis of noise from the compressor facility and associated gas blow down venting prepared by Hoover & Keith (Hoover & Keith 2005) indicates that without noise attenuation treatments, noise from the compressor facility could exceed the County's residential noise standard of 50 Ldn at the residence located 4,200 feet from the compressor and the County's property line noise standard of 60 Ldn at the nearest property line. Noise would also exceed 50 Ldn at the duck club which is located about 2,000 feet from the facility. This impact is therefore considered significant.

Implementation of noise attenuation treatments specified in the Hoover & Keith report indicate that noise from the compressor facility can be reduced to 34 dBA-Leq and 41 dBA-Ldn at a distance of 4,200 feet (the nearest residence). This

corresponds to about 40 dBA-Leq and 47 dBA-Ldn at the duck club. These values are below the County's residential standard of 50 dB-Ldn. With minimum ambient sound levels at about 47 dBA in the area the project related increase in noise would be 3 dBA, which is less than the 5-dBA significance threshold.

Treatments also would reduce noise at the nearest property line to 44 dBA-Leq and 50 dBA-Ldn, which is below the 60 dBA-Ldn property line threshold.

Implementation of Mitigation Measure N0I-1 will reduce this impact to a less-than-significant level.

IMPACT 3.9-4: EXPOSURE OF NOISE-SENSITIVE LAND USES TO NOISE FROM OPERATION OF THE TEMPORARY COMPRESSOR FACILITY

The temporary compressor facility would involve the use of a natural gas-fired reciprocating engine-driven compressor with a rating of 1,000 hp or less. This compressor will be skid mounted and will not be enclosed in any type of building. The Hoover & Keith report states that noise from the temporary compressor is expected to be less than the noise generated by well drilling. Accordingly, the impact of noise from the temporary compressor facility is considered less than significant for the same reasons stated for well drilling.

Mitigation Measures

MM NOI-1 IMPLEMENT NOISE-REDUCING TREATMENTS AT THE COMPRESSOR FACILITY

Lodi Gas Storage shall implement recommended treatments 7.1 through 7.8 in the Hoover & Keith noise report ("Kirby Hill Gas Storage Project – Results of Noise Impact Analysis for a Proposed New Natural Gas Storage Project," Hoover & Keith 2005) to ensure that noise from the compressor facility does not exceed County noise compatibility standards at the duck club or the nearest residence (50 dBA-Ldn) or at the property line (60 dBA-Ldn).