# I. NOISE

# I.1. CONSTRUCTION NOISE

## 1. INITIAL STUDY SCREENING PROCESS

### A. Initial Study Checklist Questions

XI.a): Would the project 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?

XI.b): Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

XI.d): Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

XI.e): For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

XI.f): For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

### B. Introduction

Construction of facilities and structures requires the use of equipment, which may generate high noise levels and adversely affect noise sensitive uses.[1] In assessing the impact of construction noise upon the environment, the nature and level of activities that generate the noise, the pathway through which the noise travels, the sensitivity of the receptor, and the period of exposure are all considered.

Environmental noise is measured in decibels (dB). To better approximate the range of sensitivity of the human ear to sounds of different frequencies, the A-weighted decibel scale (dBA) was devised. Because the human ear is less sensitive to low frequency sounds, the A-scale de-emphasizes these frequencies by incorporating frequency weighting of the sound signal. When the A-scale is used, the decibel levels are represented by dBA. On this scale, the range of human

[1] *For impacts during operation, see I.2 OPERATIONAL NOISE, I.3. RAILROAD NOISE, and I.4. AIRPORT NOISE, as appropriate.*

hearing extends from about 3 dBA to about 140 dBA. A 10-dBA increase is judged by most people as a doubling of the sound level.

To account for the fluctuation in noise levels over time, noise impacts are commonly evaluated using time-averaged noise levels. The Community Noise Equivalent Level (CNEL) represents an energy average of the A-weighted noise levels over a 24-hour period with 5 dBA and 10 dBA increases added for nighttime noise between the hours of 7:00 p.m. and 10:00 p.m. and 10:00 p.m. to 7:00 a.m., respectively. The increases were selected to account for reduced ambient noise levels during these time periods and increased human sensitivity to noise during the quieter periods of the day.

Typical construction equipment types are presented in Exhibit I.1-1. Noise levels from these equipment types ranges from 76 to 91 dBA for equipment powered by internal combustion engines, saws, and vibrators and from the mid-80s to more than 100 dBA for impact equipment. Exhibit I.1-2 provides typical noise levels for each construction phase. The excavation and finishing phases include the noisiest construction activities.

The Environmental Protection Agency (EPA), establishes emission standards for construction equipment according to the provisions of the Noise Control Act of 1972, set forth in 40 CFR, Part 204. In addition, the City of Los Angeles Noise Ordinance addresses noise generated at construction sites, including permissible hours of construction, increases in ambient noise levels, and the technical feasibility of reducing noise from certain construction equipment. The Los Angeles Police Department (LAPD) enforces the provisions of the Noise Ordinance.[2]

## C. Screening Criteria

- Would construction activities occur within 500 feet of a noise sensitive use?

- For projects located within the City of Los Angeles, would construction occur between the hours of 9:00 p.m. and 7:00 a.m. Monday through Friday, before 8:00 a.m. or after 6:00 p.m. on Saturday, or at anytime on Sunday?

A "yes" response to any of the preceding questions indicates further study in an expanded Initial Study, Negative Declaration, Mitigated Negative Declaration, or EIR may be required. Refer

2 *Refer to Sections 41.40, 112.02, and 112.05 of the Los Angeles Municipal Code (LAMC). Technical infeasibility means that specified noise limitations cannot be achieved despite the use of mufflers, shields, sound barriers and/or any other noise reduction devices or techniques during operation of the equipment.*

to the Significance Threshold for Construction Noise and review the associated Methodology to Determine Significance, as appropriate.

A "no" response to all of the preceding questions indicates that there would normally be no significant impact from the proposed project.

### D. Evaluation of Screening Criteria

Review the description of the proposed project, including information on construction activities. Consult a map showing the location of noise sensitive uses within 500 feet of the project site. Noise sensitive uses include residences, transient lodgings, schools, libraries, churches, hospitals, nursing homes, auditoriums, concert halls, amphitheaters, playgrounds, and parks. Determine whether construction activities would occur within 500 feet of a noise sensitive use or during the hours specified in the Screening Criteria.

## 2. DETERMINATION OF SIGNIFICANCE

### A. Significance Threshold

A project would normally have a significant impact on noise levels from construction if:

- Construction activities lasting more than one day would exceed existing ambient exterior noise levels by 10 dBA or more at a noise sensitive use;

- Construction activities lasting more than 10 days in a three month period would exceed existing ambient exterior noise levels by 5 dBA or more at a noise sensitive use; or

- Construction activities would exceed the ambient noise level by 5 dBA at a noise sensitive use between the hours of 9:00 p.m. and 7:00 a.m. Monday through Friday, before 8:00 a.m. or after 6:00 p.m. on Saturday, or at anytime on Sunday.

### B. Methodology to Determine Significance

<u>Environmental Setting</u>

In a description of the environmental setting, include the following information:

- Identification of noise sensitive land uses within 500 feet of the project site, including description, location, and distance from the project; and

- Quantification of ambient noise levels (existing and projected at the time of construction) measured in CNEL.

One of the following methodologies can be used to determine ambient noise levels:

- Field measurements involving the use of a noise meter at and surrounding the project site;

- "Presumed Ambient Noise Levels," as set forth in the LAMC, Section 111.03 (see Exhibit I.1-3); or

- A noise monitoring program performed according to the procedures set forth in the LAMC, Sections 111.02 and 112.05. This involves taking measurements at selected locations to establish ambient background noise levels.

<u>Project Impacts</u>

Review the description of the proposed project, including the duration of construction activities. Identify the type, amount, and scheduling of construction equipment to be used during each construction phase, and the distance from construction activities to noise sensitive uses.

Calculate the noise emissions from individual equipment by using the noise levels shown in Exhibits I.1-1 and I.1-2, or other applicable references, the distance to the noise sensitive uses, and noise attenuation standards. Noise models may be used, as appropriate. Noise levels 50 feet from a source decrease by approximately 3 dBA over a hard, unobstructed surface, such as asphalt, and by approximately 4.5 dBA over a soft surface, such as vegetation. For every doubling of distance thereafter, noise levels drop another 3 dBA over a hard surface and 4.5 dBA over a soft surface. Machinery equipped with noise control devices or other noise-reducing design features does not generate the same level of emissions as that shown in Exhibit I.1-1.

Determine the combined noise levels from equipment that will be operated simultaneously. Noise levels measured in decibels increase logarithmically and cannot be added arithmetically. When transmission path topography between the construction noise source and the receptor location is complex, consult an experienced noise specialist, as necessary.

Establish the change in noise level from construction activities at the location of sensitive receptors. Subtract the projected noise level without construction equipment from the projected noise level during construction activities. Considering the number of days various noise levels are projected, determine whether construction activities would exceed both the number of days, times of day, and dBA increases in the Significance Threshold.

Cumulative Impacts

As feasible, identify construction activities for related projects that would coincide with the project's construction operations. Calculate noise levels using the methodology in Project Impacts and logarithmically add the noise from these construction activities to the project-related construction noise to determine the cumulative effect of the construction activities. Consult a noise specialist, or use a noise model, as needed.

Sample Mitigation Measures

Potential mitigation measures include the following:

- Use noise control devices, such as equipment mufflers, enclosures, and barriers. Natural and artificial barriers such as ground elevation changes and existing buildings can shield construction noise. Stage construction operations as far from noise sensitive uses as possible;

- Avoid residential areas when planning haul truck routes;

- Maintain all sound-reducing devices and restrictions throughout the construction period;

- Replace noisy equipment with quieter equipment (for example, a vibratory pile driver instead of a conventional pile driver and rubber-tired equipment rather than track equipment); and

- Change the timing and/or sequence of the noisiest construction operations to avoid sensitive times of the day.

## 3. DATA, RESOURCES, AND REFERENCES

Noise Ordinance No. 161,574, LAMC Section 112.05 and No. 166,170, LAMC Section 41.40 provide construction hours and construction equipment noise thresholds.

Noise Ordinance No. 156,363, LAMC Section 111.02 provides sound level measurement procedures.

Noise Ordinance No. 156,363, LAMC Section 111.03 provides ambient noise levels.

Los Angeles Association of Environmental Professionals (AEP), Thresholds of Significance, Construction noise threshold used by Port of Long Beach, 1992.

EPA, Noise from Construction Equipment and Operations, Building Equipment and Home Appliances, Prepared by Bolt, Beranek and Newman, 1971.

**Categories of Construction Equipment**

1. Impact equipment and tools: This group includes pile drivers, pavement breakers, tampers, rock drills, and small; hand-held pneumatically, hydraulically, or electrically powered tools. In the case of conventional pile drivers, whether steam-powered or diesel-powered, the impact of the hammer dropping onto the pile is the dominant noise-generating component. However, sonic or vibratory pile drivers do not produce impact noise as it vibrates the pile at resonance, rather than using a drop hammer.

2. Equipment powered by internal combustion engines: The internal combustion engine, usually of the diesel type, is used to provide motive and/or operating power. Engine powered equipment can be divided into categories according to its mobility and operating characteristics as earthmoving equipment (highly mobile), materials handling equipment (semi-mobile), and stationary equipment.

3. Other equipment: Certain types of construction equipment, such as power saws or concrete vibrators do not fall under either of the two categories above.

**Selected Legislation**

Federal

Federal Noise Control Act of 1972 (40 CFR Sec. 204)

Public Law 92-574. Regulates noise emissions from operation of all construction equipment and facilities; establishes noise emission standards for construction equipment and other categories of equipment; and provides standards for the testing, inspection, and monitoring of such equipment. Gives states and municipalities primary responsibility for noise control.

State

California Noise Control Act of 1973 (Health and Safety Code, Division 28)

Declares that excessive noise is a serious hazard to the public health and welfare; establishes the Office of Noise Control with the responsibility to set standards for noise exposure in cooperation with local governments or the state legislature.

**Exhibit I.1-1**
**NOISE LEVEL RANGES OF TYPICAL CONSTRUCTION EQUIPMENT**

| Equipment | Levels in dBA at 50 feet[a] |
|---|---|
| Front Loader | 73-86 |
| Trucks | 82-95 |
| Cranes (moveable) | 75-88 |
| Cranes (derrick) | 86-89 |
| Vibrator | 68-82 |
| Saws | 72-82 |
| Pneumatic Impact Equipment | 83-88 |
| Jackhammers | 81-98 |
| Pumps | 68-72 |
| Generators | 71-83 |
| Compressors | 75-87 |
| Concrete Mixers | 75-88 |
| Concrete Pumps | 81-85 |
| Back Hoe | 73-95 |
| Pile Driving (peaks) | 95-107 |
| Tractor | 77-98 |
| Scraper/Grader | 80-93 |
| Paver | 85-88 |

[a] Machinery equipped with noise control devices or other noise-reducing design features does not generate the same level of emissions as that shown in this table.

Source: EPA, Noise from Construction Equipment and Operations, Building Equipment and Home Appliances, PB 206717, 1971.

## Exhibit I.1-2
## OUTDOOR CONSTRUCTION NOISE LEVELS

| Construction Phase | Noise Level (dBA Leq) | |
|---|---|---|
| | 50 feet | Noise Levels at 50 feet with Mufflers (dBA) |
| Ground Clearing | 84 | 82 |
| Excavation, Grading | 89 | 86 |
| Foundations | 78 | 77 |
| Structural | 85 | 83 |
| Finishing | 89 | 86 |

Source: EPA, Noise from Construction Equipment and Operations, Building Equipment and Home Appliances, PB 206717, 1971.

## Exhibit I.1-3
## PRESUMED AMBIENT NOISE LEVELS (dBA)

| Zone | | Day | Night |
|---|---|---|---|
| Residential: | A1, A2, RA, RE, RS, RD, RW1, RW2, R1, R2, R3, R4, R5 | 50 | 40 |
| Commercial: | P, PB, CR, C1, C1.5, C2, C4, C5, CM | 60 | 55 |
| Manufacturing: | M1, MR1, MR2 | 60 | 55 |
| Heavy Manufacturing: | M2, M3 | 65 | 65 |

Source: LAMC, Section 111.03.

# I.2. OPERATIONAL NOISE

## 1. INITIAL STUDY SCREENING PROCESS

### A. Initial Study Checklist Questions

XI.a): Would the project 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?

XI.b): Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

XI.c): Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

XI.d): A substantial temporary or periodic increase in ambient noise levels in the project vicinity above the existing without the project?

XI.e): For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

XI.f): For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

### B. Introduction

Stationary and mobile vehicular noise sources associated with the operation of a project may increase existing noise levels and/or adversely expose people to severe noise levels.[1]

Environmental noise is measured in decibels (dB). To better approximate the range of sensitivity of the human ear to sounds of different frequencies, the A-weighted decibel scale (dBA) was devised. Because the human ear is less sensitive to low frequency sounds, the A-scale de-emphasizes these frequencies by incorporating frequency weighting of the sound signal. When the A-scale is used, the decibel levels are represented by dBA. On this scale, the range of human hearing extends from about 3 dBA to about 140 dBA. A 10-dBA increase is judged by most people as a doubling of the sound level.

1 *For other noise impacts, see I.1. CONSTRUCTION NOISE, I.3. RAILROAD NOISE, and I.4. AIRPORT NOISE, as appropriate.*

To account for the fluctuation in noise levels over time, noise impacts are commonly evaluated using time-averaged noise levels. The Community Noise Equivalent Level (CNEL) represents an energy average of the A-weighted noise levels over a 24-hour period with 5 dBA and 10 dBA increases added for nighttime noise between the hours of 7:00 p.m. and 10:00 p.m. and 10:00 p.m. to 7:00 a.m., respectively. The increases were selected to account for reduced ambient noise levels during these time periods and increased human sensitivity to noise during the quieter periods of the day.

Because stationary noise sources include a wide range of noise-generating equipment and processes, which come from an equally wide range of uses, noise levels generated by stationary sources can vary substantially (for examples and descriptions, see 3. Data, Resources, and References). The effects of stationary noise depend on factors such as characteristics of the equipment and operations, distance and pathway between the generator and receptor, and weather. Stationary noise sources may be regulated at the point of manufacture (e.g., equipment or engines) or as a part of local codes and requirements (e.g., noise ordinance or zoning).

The predominant noise source within the City of Los Angeles is transportation, including railroad, airport and motor vehicle sources. Traffic volume, average speed, vehicular fleet mix (i.e., combination of automobiles, motorcycles, buses, and trucks), roadway steepness, distance and characteristics of the pathway between generator and receptor, and weather all influence the level of noise near roadways. For example, as the roadway traffic volume, speed, proportion of fleet mix represented by trucks, and roadway grade increase, so do the composite noise levels at the locations affected by the traffic noise. However, as the roadway volume increases beyond a certain point, congestion increases, in turn causing reduced traffic speeds, which would to some extent offset noise from the traffic volume increase. Dense urban areas within the City of Los Angeles may experience noise levels ranging from the low- to high-70 decibel range. The California Department of Motor Vehicles (DMV) has jurisdiction over noise emissions from individual vehicles (Motor Vehicle Code Section 23130).

## C. Screening Criteria

- Would the proposed project introduce a stationary noise source[2] likely to be audible beyond the property line of the project site?

- Would the project include 75 or more dwelling units, 100,000 square feet (sf) or greater of

2 *Stationary noise sources may include, but are not limited to, machinery, engines, energy production, and other mechanical or powered equipment and activities such as loading and unloading or public assembly that may occur at commercial, industrial, manufacturing, or institutional facilities. Stationary noise sources do not include vehicles entering or exiting the property.*

nonresidential development or have the potential to generate 1,000 or more average daily vehicle trips?

A "yes" response to any of the preceding questions indicates further study in an expanded Initial Study, Negative Declaration, Mitigated Negative Declaration, or EIR may be required. Refer to the Significance Threshold for Operational Noise, and review the associated Methodology to Determine Significance, as appropriate.

A "no" response to all of the preceding questions indicates that there would normally be no significant impact from Operational Noise from the proposed project.

### D. Evaluation of Screening Criteria

Review the description of the proposed project and the project traffic study to determine the size of each land use involved, information on stationary noise sources such as machinery or motorized equipment, and the vehicle trips that would be generated by the project. L.1. INTERSECTION CAPACITY explains how to calculate the number of average daily vehicle trips.

Determine the noise level from stationary sources at the property line by evaluating the decibel output of each source, the distance to the property line and the path over which the sound travels. Use an applicable noise model, as needed. In general, at a distance of 50 feet from the source over a hard surface, the decibel level decreases by 3 dBA, and over a soft surface (such as grass) the decibel level decreases by 4.5 dBA. For every doubling of distance thereafter, noise levels drop another 3 dBA over a hard surface and 4.5 dBA over a soft surface.[3]

Compare this information to the Screening Criteria.

## 2. DETERMINATION OF SIGNIFICANCE

### A. Significance Threshold

A project would normally have a significant impact on noise levels from project operations if the project causes the ambient noise level measured at the property line of affected uses to increase by 3 dBA in CNEL to or within the "normally unacceptable" or "clearly unacceptable" category, or any 5 dBA or greater noise increase (see the chart below).

3 *Federal Highway Administration (FHWA), Highway Traffic Noise Prediction Model (FHWA R77-108), 1978.*

| Land Use | | Community Noise Exposure CNEL, db | | |
|---|---|---|---|---|
| | Normally Acceptable | Conditionally Acceptable | Normally Unacceptable | Clearly Unacceptable |
| Single Family, Duplex, Mobile Homes | 50 - 60 | 55 - 70 | 70 - 75 | above 70 |
| Multi-Family Homes | 50 - 65 | 60 - 70 | 70 - 75 | above 70 |
| Schools, Libraries, Churches, Hospitals, Nursing Homes | 50 - 70 | 60 - 70 | 70 - 80 | above 80 |
| Transient Lodging - Motels, Hotels | 50 - 65 | 60 - 70 | 70 - 80 | above 80 |
| Auditoriums, Concert Halls, Amphitheaters | - | 50 - 70 | - | above 65 |
| Sports Arena, Outdoor Spectator Sports | - | 50 - 75 | - | above 70 |
| Playgrounds, Neighborhood Parks | 50 - 70 | - | 67 - 75 | above 72 |
| Golf Courses, Riding Stables, Water Recreation, Cemeteries | 50 - 75 | - | 70 - 80 | above 80 |
| Office Buildings, Business and Professional Commercial | 50 - 70 | 67 - 77 | above 75 | - |
| Industrial, Manufacturing, Utilities, Agriculture | 50 - 75 | 70 - 80 | above 75 | - |

Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.
Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
Clearly Unacceptable: New construction or development should generally not be undertaken.

Source: California Department of Health Services (DHS).

## B. Methodology to Determine Significance

Environmental Setting

In a description of the environmental setting, include the following information:

- Identification of surrounding land uses, including description, location and distance from the project; and

- Quantification of ambient noise levels (existing and projected at the time of project occupancy) measured in CNEL.

One of the following methodologies can be used to determine ambient noise levels:

- Field measurements involving the use of a noise meter at and surrounding the project site;

- "Presumed Ambient Noise Levels," as set forth in the Los Angeles Municipal Code (LAMC), Section 111.03 (see Exhibit I.1-1[4]); or

- A noise-monitoring program performed according to the procedures set forth in LAMC, Section 111.02 and 112.05. This involves taking measurements at selected locations to establish ambient background noise levels.

Project Impacts

The change in ambient noise levels is measured by adding project-generated operational noise to the projected future ambient noise level at the time of project occupancy. The incremental increase in noise generated by the project is the project impact. Calculate the future exterior ambient noise level according to the procedure outlined above, under Environmental Setting.

**Stationary Sources**

Review the project description and identify the type, amount, noise impact, and operating characteristics of proposed equipment on the project site (e.g., 24-hour function, sporadic use expected). Identify the distance and the characteristics of the pathway between the noise source and the nearby land uses that would receive the noise. Noise models may be used, as appropriate.

Noise levels 50 feet from a source decrease by approximately 3 dBA over a hard, unobstructed surface, such as asphalt, and by approximately 4.5 dBA over a soft surface, such as a vegetated area. For every doubling of distance thereafter, noise levels drop another 3 dBA over a hard surface and 4.5 dBA over a soft surface. These reduction rates can be used to adjust noise levels at the noise receptor locations, based on their relative distances from the project equipment.

4 *See I.1. CONSTRUCTION NOISE.*

Once noise levels from individual pieces of equipment on the project site have been calculated, logarithmically add together the noise levels from all equipment operating simultaneously. (Noise levels measured in decibels increase logarithmically and cannot be added arithmetically.) Where the noise transmission path between the source and the receptor is complex, consult a noise specialist as necessary.

To determine the change in noise level, subtract the projected ambient noise level without the project's stationary noise from the projected noise level during project operation. Use the chart in the Significance Threshold to determine the significance of the difference.

**Mobile Vehicular Sources**

Review the project description, determine the number of vehicle trips to be generated by the project, and distribute the trips on the street system (use the traffic study or methodology described in L.1. INTERSECTION CAPACITY). Determine the characteristics of the noise transmission pathway. Using a mobile noise prediction model, project the future exterior ambient noise levels for these streets with and without the proposed project. Base the selected noise model on the Federal Highway Administration (FHWA) highway noise prediction procedures described in FHWA-77-108 or the most recent revision. The City of Los Angeles recommends the use of either LEQV2 or SOUND32 prediction models as developed by California Department of Transportation (Caltrans). LEQV2 requires the following information: (a) traffic volumes, (b) roadway, barrier and receiver geometry, (c) vehicle speed, (d) number of lanes, (e) fleet mix, and (f) drop-off rates. It uses angles, distances and elevations to define source-receptor spatial relationships. SOUND32 requires the following information: (a) traffic volumes, (b) roadway, barrier and receiver geometry, and (c) drop-off rates. This model uses a three dimensional coordinate system to define source-receptor spatial relationships.

If monitoring was used to quantify existing noise levels, use existing traffic conditions (volumes, roadway geometry, etc.) to model the existing noise levels. A comparison of monitored existing noise levels and modeled existing noise levels can be used to calibrate the modeling resulting.

To determine the change in noise level, subtract the projected noise level on the selected roadways without the project's traffic-generated noise from the projected noise level, including the project's traffic-generated noise. Use the chart in the Significance Threshold to determine the significance of the difference.

Noise levels increase approximately 3 dBA for each doubling of roadway traffic volume, assuming that the speed and fleet mix remain constant. A change in vehicle speed can also change noise levels. If vehicle speed and fleet mix can be assumed to remain constant after project implementation, and the project would result in traffic that is less than double the existing traffic, then the project's mobile noise impacts can be assumed to be less than significant.

For a program-level analysis where project details are unknown, assume the full build out of allowable land use and density. Use the methodology above to determine program-generated noise increases.

Cumulative Impacts

For impacts from stationary sources, as feasible, identify the type and amount of equipment to be used by the related projects. Determine whether noise from these sources would impact the same land uses impacted by the proposed project. For those, calculate and logarithmetically add the related project noise to project-generated noise to determine the cumulative effect of the activities.

The analysis for project impacts from mobile vehicular sources uses future traffic levels to establish future ambient noise levels. As these traffic levels include trips from the related projects, additional evaluation is not required.

Sample Mitigation Measures

Potential mitigation measures include the following:

**Stationary Sources**

- Redesign the source to radiate less noise (e.g., substitute a quieter equipment type process or enclose the source with sound absorbent material);

- Use insulation or construct solid barriers between noise sources and noise receivers;

- Separate noise sources from noise receivers by distances sufficient to attenuate the noise to acceptable levels;

- Insulate structures;

- Limit the hours of use for the equipment;

- Prepare an acoustical analysis and adopt the resulting insulation and attenuation measures; and

- Conduct inspections of the equipment prior to issuance of the occupancy permit to verify on-site containment of noise emissions.

**Mobile Vehicular Sources**

- Attenuate the sound by using barriers, or redirect sound transmission paths;

- Reduce vehicle trip generation, or reduce speed limits on roadways; and

- Locate any delivery, truck loading, or trash pickup areas as far from noise sensitive land uses as possible. Limit designated hours for deliveries.

## 3. DATA, RESOURCES, AND REFERENCES

Noise Element, 1999. Available from the City Planning Department's Central Publications Unit at 200 N. Spring St., 5th Floor, Los Angeles, California 90012; Telephone: (213) 978-1255.

Noise Ordinance No. 156,363, LAMC Section 111.02 provides sound level measurement procedures.

Noise Ordinance No. 156,363, LAMC Section 111.03 provides ambient noise levels.

Noise Control Act of 1972.

Association of Environmental Professionals (AEP), Thresholds of Significance, Noise Thresholds, 1992.

FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108), 1978.

LEQV2 and SOUND32 sound prediction models, developed by Caltrans.

California Noise Insulation Standards, CAC, Title 25, Housing and Community Development.

California Motor Vehicle Code, Section 23130.

**Stationary Source Categories**

Agricultural operations: Agricultural noise is generated by a host of soil preparation and crop harvesting equipment, pesticide applicators, and conveying and elevating equipment.

Commercial/Institutional: Building service equipment is generally considered a stationary noise source. Building service equipment includes heating, ventilating, and air conditioning facilities, water and waste water systems elevators, and escalators. The most common urban noise source in the air conditioning category is the modern high efficiency-cooling tower, which contains two noise sources - fans and water spray. The increasing use of window or through the wall packaged air conditioning units leads to the generation of noise outside. In addition to their inherent noise characteristics, as these units age, loose metal parts and window frames may rattle.

Home workshops and gardening tools: Noise from these sources includes various motors that operate power mowers, power trimmers, edgers and leaf blowers, and power operated saws and drills.

Industrial: Much of the equipment used in industry and many industrial processes and operations generate noise. The intakes and discharges from fans, compressors, and engines often penetrate the walls of industrial buildings. Even a wholly enclosed industrial plant can generate noise because ducts and piping outside buildings radiate the noises generated from the inside. Inadequately insulated walls and roofs transmit noise. Sheet metal walls, for example, vibrate in response to inside noise and become effective noise radiators. Outdoor industrial operations also constitute sources of noise, including storage operations, steel and scrap yards, and truck and rail freight handling yards.

Lumbering operations: These operations involve the use of diesel powered equipment, chain saws, and hoisting and conveying equipment. Sawmill noise is produced by saws and planers and other lumber shaping equipment, the operation of hoisting and conveying equipment, and the operation of yard and loading equipment.

Mineral production: Mineral production includes both surface and underground mining; sand and gravel pit operations, and crushed rock operations. Noises generated from these sources include sounds emanating from rock crushers, screens, conveyor belts, diesel engines, electric motors, dump trucks, power shovels, rock drills, and blasting.

Petroleum production and refining: Principal sources of noise from petroleum production operations include pressure-reducing valves in pipes, steam turbines, derricks, gear boxes, compressors, electric motors, diesel engines, and maintenance equipment.

Port Operations: Primary noise sources from port activities include bulk-loading facilities, shipping container-handling equipment, truck traffic, and train movements. The sound of ship engines and trains running contribute to the low steady-state noise emanating from a port, which is punctuated by ship whistles and train horns.

Public and private utilities: Public and private utilities engage in construction activities producing the same kind of noises discussed in I.1 CONSTRUCTION NOISE. They also operate hydroelectric, steam and diesel electric generation plants, compressors, pumps and pipelines, all of which generate noises similar to those discussed above as industrial noise sources.

Public services: Sources of noise from public services include sirens on emergency vehicles, truck and loading noise from rubbish collection and disposal, and equipment noise generated through the maintenance of streets, sewers and water systems.

**Mobile Source Categories**

Automobiles: The passenger automobile usually makes much less noise than other types of motor vehicles. They produce little exhaust noise except at low frequencies. The combination of wind, gearing, and tire noises produces an identifiable spectrum of noise at speeds over 40 mph and at distances over 100 feet. At higher speeds, this combination of sounds is identifiable at distances up to one mile under quiet ambient conditions. The loudest element of automobile noise at a long distance is the sound of tires.

Buses: Buses tend to radiate less noise than other heavy vehicles because their engine compartments are sealed. Bus noise, however, usually increases with use because of damage to these seals.

Motorcycles: Motorcycle noise is distinctive because, in addition to noise from intake, exhaust, and gearing systems, motorcycles radiate considerable noise directly through the engine walls.

Trucks: Trucks make more noise than other motor vehicles. Diesel trucks are generally the most significant motor vehicle noise source. A single, large diesel truck may produce noise levels equal to noise generated by 30 passenger cars. Under most conditions of operation, exhaust noise predominates. At low speeds, under heavy acceleration, engine and transmission noise may be louder. At high speeds on level roadways, tire noise predominates. Other sources of noise from trucks include the chassis, brakes, sheet metal parts, loose pins, and cargo.

# I.3. RAILROAD NOISE

## 1. INITIAL STUDY SCREENING PROCESS

### A. Initial Study Checklist Questions

XI.a): Would the project 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?

XI.b): Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

XI.c): A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

XI.d): A substantial temporary or periodic increase in ambient noise levels in the project vicinity above the existing without the project?

### B. Introduction

Railroad operations may increase existing noise levels and/or adversely affect noise-sensitive land uses. The effects of railroad noise depend on factors such as characteristics of the equipment and operations; distance and characteristics of the pathway between the generator and receptor; and weather. Section 17 of the Federal Noise Control Act, rather than state or local regulations, establishes controls and limits on railroad operations, through the United States Environmental Protection Agency (EPA) and United States Department of Transportation (U.S. DOT).

Environmental noise is measured in decibels (dB). To better approximate the range of sensitivity of the human ear to sounds of different frequencies, the A-weighted decibel scale (dBA) was devised. Because the human ear is less sensitive to low frequency sounds, the A-scale de-emphasizes these frequencies by incorporating frequency weighting of the sound signal. When the A-scale is used, the decibel levels are represented by dBA. On this scale, the range of human hearing extends from about 3 dBA to about 140 dBA. A 10-dBA increase is judged by most people as a doubling of the sound level.

To account for the fluctuation in noise levels over time, noise impacts are commonly evaluated using time-averaged noise levels. The Community Noise Equivalent Level (CNEL) represents an energy average of the A-weighted noise levels over a 24-hour period with 5 dBA and 10 dBA penalties added for nighttime noise between the hours of 7:00 p.m. and 10:00 p.m. and 10:00 p.m. to

7:00 a.m., respectively. The penalties were selected to account for reduced ambient noise levels during these time periods and increased human sensitivity to noise during the quieter periods of the day. The Day-Night Sound Level (Ldn), like CNEL, measures noise exposure over a 24-hour period and adds a penalty based on the time of day, although only for late night/early morning hours (10 dBA penalty from 10:00 p.m. to 7:00 a.m.). Thus, the Ldn measurement is slightly less sensitive than CNEL, but it results in very similar noise ratings for most community settings, usually differing by less than 1 dBA.

Railroad operations are generally classified into either line operations or yard operations. Line operations consist of the movements of trains of various types over the main line and local tracks; yard operations are the various activities concentrated in a railway terminal. Yard operations generate noise through the disassembling and recoupling of cars to form new trains, and the maintenance and repair of cars and locomotives. For analytical purposes these may be considered as complex sources of stationary noise. Railroad operations are a much more common source of railroad noise than yard operations. The noise generated by train pass-bys is based on the type of vehicle in use, how it is operated, and the configuration of the track-bed relative to the surrounding terrain. The Federal Transit Authority (FTA) regulates noise generated by moving trains (e.g. whistles, warning signals, wheels on rails), rail maintenance yards, and activity associated with rail facilities.

The Department of Housing and Urban Development (HUD) prepared a Noise Guidebook, which addresses railroad noise, provides guidance on calculating noise levels from railroad operations, and includes a threshold of 3,000 feet between a railroad line and a noise-sensitive land use.

## C. Screening Criteria

- Would project development result in a noise-sensitive land use being located within 3,000 feet of a railroad line?

- Would the project result in an increase in the number or length of non-commuter trains operating on existing tracks within 3,000 feet of a noise-sensitive land use?

A "yes" response to any of the preceding questions indicates further study in an expanded Initial Study, Negative Declaration, Mitigated Negative Declaration, or EIR may be required. Refer to the Significance Threshold for Railroad Noise and review the associated Methodology to Determine Significance, as appropriate.

A "no" response to all of the preceding questions indicates that there would normally be no significant impact from Railroad Noise from the proposed project.

### D. Evaluation of Screening Criteria

Review the description of the proposed project, including information on railroad activities. Consult a map showing the location of noise-sensitive land uses within 3,000 feet of the project site. Noise-sensitive land uses include residences, schools, libraries, hospitals, day-care facilities, convalescent/retirement homes, and parks. Determine whether the project would result in railroad noise being generated within 3,000 feet of a noise-sensitive land use.

## 2. DETERMINATION OF SIGNIFICANCE

### A. Significance Threshold

A project would normally have a significant impact with regard to exterior noise levels resulting from railroad operations if the project causes noise measured at the property line of a noise sensitive receptor to increase by 3 dBA in CNEL, to or within the "normally unacceptable" or “clearly unacceptable” category, or any 5 dBA or greater noise increase (see the chart below).

| **Land Use** | **Community Noise Exposure CNEL, db** | | | |
|---|---|---|---|---|
| | **Normally Acceptable** | **Conditionally Acceptable** | **Normally Unacceptable** | **Clearly Unacceptable** |
| Single Family, Duplex, Mobile Homes | 50 - 60 | 55 - 70 | 70 - 75 | above 70 |
| Multi-Family Homes | 50 - 65 | 60 - 70 | 70 - 75 | above 70 |
| Schools, Libraries, Churches, Hospitals, Nursing Homes | 50 - 70 | 60 - 70 | 70 - 80 | above 80 |
| Playgrounds, Neighborhood Parks | 50 - 70 | --- | 67 - 75 | above 72 |

Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable: New construction or development should generally not be undertaken.

Source: California Department of Health Services (DHS).

## B. Methodology to Determine Significance

Environmental Setting

In a description of the environmental setting, include the following information:

- Identification of noise-sensitive land uses within 3,000 feet of the project site, including description, location and distance from the site; and

- Ambient noise levels (existing and future) measured in CNEL.

One of the following methodologies can be used to determine ambient noise levels:

- Field measurements involving the use of a noise meter at and surrounding the project site;

- "Presumed Ambient Noise Levels", as set forth in the Los Angeles Municipal Code (LAMC), Section 111.03 (see Exhibit I.1-1[1]); and

- A noise measurement program performed according to the procedures in the LAMC, Section 111.02 and 112.05. This involves taking measurements at selected locations to establish ambient background noise levels.

Project Impacts

Review the project description and identify the proposed number and type of rail operations per day. Use a map showing existing land uses to determine the location of, and distance between, sensitive receptors and railroad noise sources.

Guidance in the HUD Noise Guidebook can be used to calculate the resulting Ldn and, thus, CNEL levels. Using Exhibits I.3-1 and I.3-2, and based on the receptor distance from the railroad track, locate the appropriate distance on the horizontal axis (Effective Distance) and vertical axis (Average Daily Number of Operations). At the point of intersection of these two measurements, the diagonal axis will show the Ldn level.

HUD Methodology Assumptions:

- A clear line of sight exists between the railway track and the sensitive receptor;

1 *See I.1. CONSTRUCTION NOISE.*

- There are 50 cars per train;

- The average train speed is 30 miles per hour; and

- Nighttime operations represent 15 percent of the 24-hour total.

With diesel locomotives:

- There are two locomotives per train; and

- The site is not near a grade crossing requiring prolonged use of the train's horn or whistle.

With rapid transit and passenger trains:

- Rails are welded together.

If the project characteristics vary substantially from the HUD methodology assumptions, consult a qualified noise specialist for a more detailed analysis, as necessary. For diesel locomotives, the model described in *Assessment of Noise Environment Around Railroad Operations* may be utilized.[2] It includes variables not included in the HUD model, such as attenuation due to barrier shielding, duration in time of a train pass-by, correction for the presence of additional helper locomotives on an upgrade, and accounting for welded rails, bridges, and grade crossings. In addition, this model has several graphs for use in conjunction with the formula. These graphs include the decibel volume for the duration of a train pass-by depending on distance from the source, the noise level of rail cars based on the speed they are traveling, and the attenuation of sound levels due to a shielding barrier.

Establish the change in noise level from the project. Subtract the projected noise level without the project's railroad operations from the projected noise level with the project's railroad operations. Compare this information to the Significance Threshold.

<u>Cumulative Impacts</u>

As feasible, identify the type and amount of railroad activity expected as a result of related projects. Consider noise-sensitive land uses within 3,000 feet of the proposed and related projects(s). Add the increase in noise at the sensitive receptors from the related projects to that from the proposed project to determine the cumulative impact.

[2] *Wyle Laboratories, Assessment of Noise Environments Around Railroad Operations, pages 3-24 - 3-37, 1973.*

Sample Mitigation Measures

Potential mitigation measures include the following:

**Railroad Lines and Vehicles**

- Use continuous welded rail instead of jointed rail on the steel wheel/rail interface;
- Utilize lightweight trucks to minimize unsprung weight;
- Use special grinding (truing) equipment to ensure smooth wheel/rail interaction;
- Use resilient rail fasteners instead of fixed rail fasteners for track fixation;
- Utilize resiliently supported ties where resilient rail fasteners are inadequate; and
- Provide sound barrier walls or insulation.

**Rail Yards**

- Enclose rail yards with solid fencing or walls;
- Insulate buildings; and
- Include sound attenuators on fans and ducts.

## 3. DATA, RESOURCES, AND REFERENCES

American Public Transit Association, Guidelines and Principles for Design of Rapid Transit Facilities, 1983.

T.J. Schultz, W.J. Galloway, Office of Policy Development and Research, HUD, Noise Assessment Guidelines - Technical Background, 1980.

U.S. DOT, Los Angeles Rail Rapid Transit Project Final Environmental Impact Statement (EIS), 1983.

EPA, Background Document for Railroad Noise Emission Standards, 1975.

HUD, Noise Guidebook.

Wilson, Ihrig and Associates, Inc., Noise and Vibration Study for the Metro Rail Project, Final Report, 1982.

Wyle Laboratories, Assessment of Noise Environments Around Railroad Operations, 1973 (prepared for Southern Pacific Transportation Co., Union Pacific Railroad, the Atchison, Topeka and Santa Fe Railway Company, the Association of American Railroads.)

See also I.2. OERATIONAL NOISE.

**Railroad Operations and Characteristics**

There are three major railroad companies with regular freight traffic operating in the City of Los Angeles: Southern Pacific, Santa Fe, and Union Pacific. The Southern Pacific has an active rail yard in the Boyle Heights area within the City of Los Angeles. The Santa Fe and Union Pacific rail yards are located outside the City of Los Angeles, in the cities of Vernon and Commerce, respectively. In addition, such rapid transit systems as Amtrak, light rail trains (Blue Line), and commuter trains (MetroLink) serve the City of Los Angeles.

There are three general types of railroad vehicles: locomotives, rail cars, and rapid transit vehicles. These vehicles, either in combination with one of the other types or by themselves, form three general train categories. These are freight trains, conventional passenger trains, and rapid transit trains. A freight train consists of one or more locomotives, usually diesel, pulling a combination of various types of freight cars. A conventional passenger train is similar to a freight train in that it consists of one or more locomotives pulling several coaches, but one important difference is that the locomotive may either be diesel-electric or all electric (there are also gas turbine locomotives, but these are few in numbers). The third type, rapid transit trains, differs from the others in that there is not a centralized source of propulsion pulling a series of cars, but rather electric motors on the axles of each car.

A diesel locomotive utilizes a diesel engine driving an electrical alternator or generator, which in turn drives electric traction motors on the wheels. An all-electric locomotive, on the other hand, obtains its electrical power from an external source; normally an overhead line or third rail, to drive its traction motors. Having no propulsion system, freight cars and passenger coaches generate noise mainly by the rolling of the wheels on the rails. The magnitude of the noise depends heavily on the condition of the wheels and track, and on the type of vehicle suspension. In regards to rail cars, modern passenger coaches with auxiliary hydraulic suspension systems in addition to normal springs can be about 10 dBA quieter than older passenger coaches or freight cars which have only springs. The noise of rapid transit trains, even though there are electric motors on each axle that are sources of noise, is also predominantly generated by the interaction of the wheels upon the rails. In fact, because rapid transit vehicles are usually newer and have better suspension systems, they are generally quieter than freight cars or passenger coaches. Exhibit I.3-4 shows average noise levels for locomotives, locomotives with mufflers and railcars.

Evidence indicates that jointed tracks exceed noise levels produced by welded tracks by up to 8 dBA. Railway traffic noise can be affected by several other sources, including jointed tracks, as indicated in Exhibit I.3-5. Rail yard noise is usually not an issue due to the size of rail yards and their location in less noise sensitive industrial areas. However, Exhibit I.3-6 includes some average noise levels for different sources of rail yard noise.

**Selected Legislation**

Federal

Section 17 of the Federal Noise Control Act requires that the EPA set noise emission standards for the equipment and facilities of interstate railroad carriers and establishes that the Secretary of Transportation will enforce them. In order to ensure safety considerations and technological availability, any standard or revision to a standard may be issued only after consulting with the Secretary of Transportation. These standards apply to the equipment's use and maintenance. On December 31, 1975, the EPA issued its first railroad noise regulation. This regulation set noise emission standards for locomotives and rail cars operated by interstate rail carriers. The regulation, which became effective December 31, 1976, set the following noise emission standards for locomotives measured from a distance of 100 feet:

73 dBA at idle;
93 dBA stationary at all other throttle settings; and
96 dBA moving at any speed.

The standards established for rail cars were:

88 dBA up to 46 miles per hour; and
93 dBA greater than 45 miles per hour.

For new locomotives in service after December 31, 1979, the standards set were:

70 dBA at idle;
87 dBA stationary at all other throttle settings; and
90 dBA moving.

In January 1980, the EPA published final noise emission regulations for four railroad noise sources. The regulations, which took effect in January 1984, set additional noise emission standards for rail yard operations and equipment, such as switcher locomotives, retarders, and car coupling.

Local

The Noise Element includes the following guidelines:

- Ensure that any steel track rapid transit system serving the City considers the use of welded rails in preference to jointed rails in order to reduce track vibration noise; and

- Develop a program to encourage railroads to provide noise-attenuating buffers along railroad rights-of-way (ROW) in residential areas.

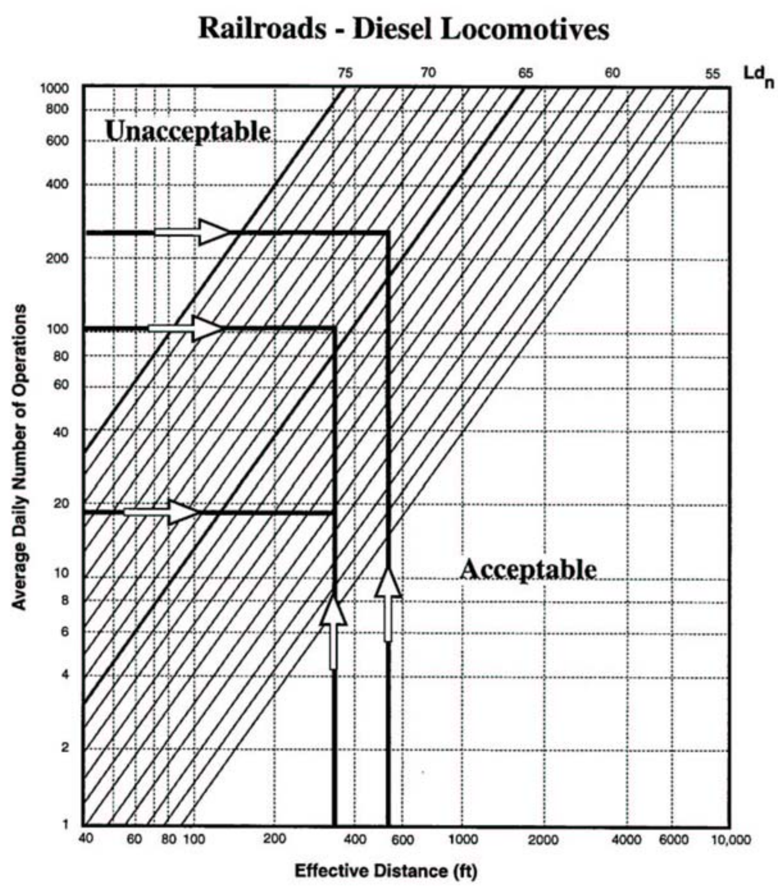


Exhibit I.3-1

Planning
Consultants
Research

FIGURE 1
**DIESEL LOCOMOTIVES NOISE**
Source: U.S. Department of Housing and Urban Development

## Railroads - Rapid Transit and Railway Cars

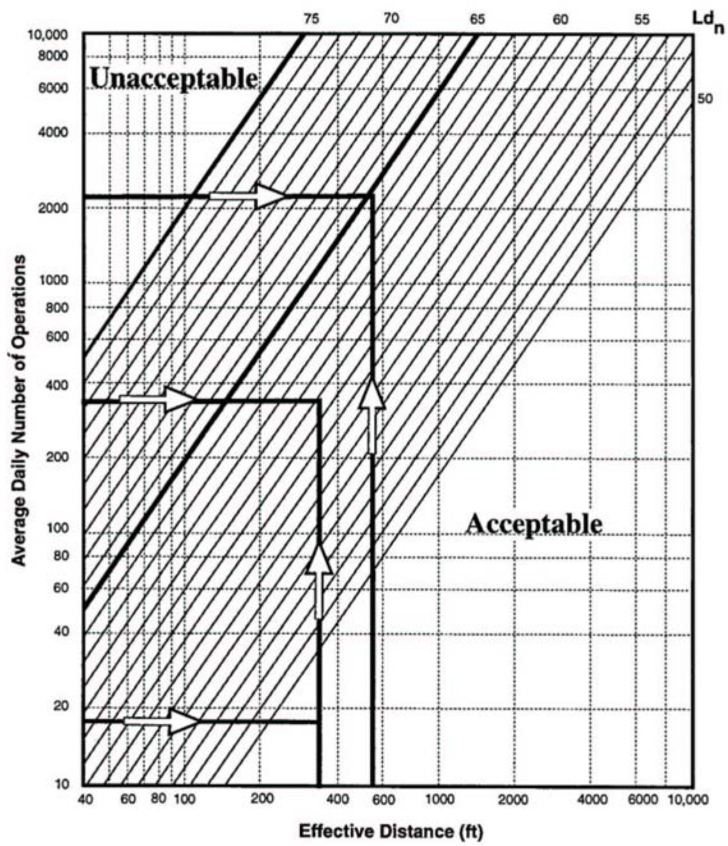


Exhibit I.3-2

Planning
Consultants
Research

FIGURE 2
**ELECTRIC RAPID TRANSIT NOISE**

Source: U.S. Department of Housing and Urban Development

## Exhibit I.3-3
## AVERAGE LOCOMOTIVE, RAILCAR, AND RAPID TRANSIT NOISE LEVELS

| Type | Overall Maximum[a] (dBA) |
|---|---|
| Locomotive | 93 |
| Locomotive with Exhaust Muffler | 87 |
| Railcar -less than 45 miles per hour (mph) | 88 |
| Railcar - over 45 mph | 93 |
| Rapid Transit | 85 |

[a] At a distance of 100 feet

Source: EPA, Background Document for Railroad Noise Emission Standards, pages 2-2 to 2-4.

## Exhibit I.3-4
## VARIABLES AFFECTING RAILCAR WHEEL/RAIL NOISE EMISSION

| Variable | Noise Emission[a] |
|---|---|
| Jointed Rails (vs. Welded) | 4 to 8 dBA |
| Grade Crossings | 6 to 8 dBA |
| Wheel Irregularities – Flat Spots or Built-up Tread | Up to 15 dBA |
| Bridges | |
| a. Light Steel Structure | Up to 30 dBA |
| b. Heavy Steel Structure | Up to 15 dBA |
| c. Concrete Structure | 0 to 12 dBA |
| Short Radius Curves | |
| a. Less than 600 foot radius | 15 to 25 dBA |
| b. 600 to 900 foot radius | 5 to 15 dBA |

[a] These factors are assumed to act individually. When in combinations of two or more, the net increase will not be equal to the sum of each component, but most likely the largest individual factor.

Source: Wyle Laboratories, Assessment of Noise Environments Around Railroad Operations, page 2-3.

**Exhibit I.3-5**
**AVERAGE RAIL YARD NOISE LEVELS**

| Noise Source | Level (dBA)[a] |
|---|---|
| Switcher Movement | 76 - 80 |
| Car Impact | 91 |
| Retarder | 94 - 109 |
| Public Address Systems | 90 - 95 |
| Engine Load Tests | 92 |
| Locomotive Service Racks | 79.5 |
| Mechanical Refrigerator Car - Engine Side | 71 |
| Mechanical Refrigerator Car - Condenser Side | 64 |
| Idling Locomotive | 73 |
| Idling Locomotive with Exhaust Muffler | 70 |

[a] At a distance of 100 feet

Source: Wyle Laboratories, Assessment of Noise Environments Around Railroad Operations, pages 4-1 to 4-29.

# I.4. AIRPORT NOISE

## 1. INITIAL STUDY SCREENING PROCESS

### A. Initial Study Checklist Questions

XI.a): 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?

XI.b): Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

XI.c): A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

XI.d): A substantial temporary or periodic increase in ambient noise levels in the project vicinity above the existing without the project?

XI.e): For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

XI.f): For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

### B. Introduction

New or modified airport and heliport operations and associated aircraft activities may increase existing noise levels and may adversely affect noise-sensitive land uses. The California Department of Transportation's (Caltrans) Division of Aeronautics has developed a set of noise regulations, based on the Federal Aviation Administration's (FAA) Federal Aviation Regulations (FAR), which set noise limits for specific aircraft and provide guidance for land-use compatibility around airports. The effects of airport noise depends on factors such as characteristics of the equipment and operations; distance and pathway between the generator and receptor; and weather. Noise generated due to aircraft flyovers depends upon such variables as type and size of the aircraft (e.g. 2- or 3-engine turbofan versus 4-engine widebody turbofan) and its operating characteristics (primarily its thrust level).

The four airports operated by the City of Los Angeles include Los Angeles International (LAX), Van Nuys, Palmdale, and Ontario. The Burbank-Pasadena-Glendale Airport, due to its proximity to the City, influences the noise environment in some areas of Los Angeles. Noise levels generated by the operation of two other airports within or near the City of Los Angeles, Santa

Monica Municipal Airport and Whiteman Airport, generally do not exceed 65 decibels within the Community Noise Equivalency Level (CNEL) contours, and as such do not strongly influence the City's noise environment.

Environmental noise is measured in decibels (dB). To better approximate the range of sensitivity of the human ear to sounds of different frequencies, the A-weighted decibel scale (dBA) was devised. Because the human ear is less sensitive to low frequency sounds, the A-scale de-emphasizes these frequencies by incorporating frequency weighting of the sound signal. When the A-scale is used, the decibel levels are represented by dBA. On this scale, the range of human hearing extends from about 3 dBA to about 140 dBA. A 10-dBA increase is judged by most people as a doubling of the sound level.

To account for the fluctuation in noise levels over time, noise impacts are commonly evaluated using time-averaged noise levels. CNEL represents an energy average of the A-weighted noise levels over a 24-hour period with 5dBA and 10 dBA penalties added for nighttime noise between the hours of 7:00 p.m. and 10:00 p.m. and 10:00 p.m. to 7:00 a.m., respectively. The penalties were selected to account for reduced ambient noise levels during these time periods and increased human sensitivity to noise during the quieter periods of the day. The Day-Night Sound Level (Ldn), like CNEL, measures noise exposure over a 24-hour period and adds a penalty based on the time or day, although only for late night/early morning hours (10 dBA penalty). Thus, the Ldn measurement is slightly less sensitive than CNEL, but it results in very similar noise ratings for most community settings, usually differing by less than 1 dBA.

For the purpose of airport noise impact analyses, CNEL levels are described as contours. A contour is an interpolation of noise levels drawn to connect all points of a similar level. These contours are displayed on maps and appear similar to topographical contours, forming "footprints" surrounding a noise source.

The FAA regulates noise levels for aircraft at all United States airports. In 1969, FAR Part 36 certified noise levels for specific aircraft. FAR Part 150, Airport Noise Compatibility Planning, which became effective in 1981, provides guidance for land-use compatibility around airports. This FAR established a voluntary program, which provides that airport noise impacts are quantified and made public and that noise compatibility plans and mitigation measures are subject to public review and FAA approval. Part 150 states that in general, residential uses are not compatible within the 65 or above dBA Ldn contour and that all types of land uses are compatible in areas below 65 dBA Ldn. In addition, the FAA's Airport Environmental Handbook indicates that its threshold of significance is a 1.5 dBA Ldn increase in noise in any sensitive area located within the 65 dBA Ldn contour.

The Division of Aeronautics is responsible for granting variances from compliance with state noise laws for airports in California. The Division of Aeronautics has also developed noise regulations, adopted in 1970, which are based in part on the FAR Part 150 guidelines. These regulations state that the aircraft noise level in a residential setting should be no greater than 65 dB CNEL. One of the objectives of the Division of Aeronautics is to create an urban development pattern in which all land included within the 65 dB CNEL contour is devoted to either airport or non-sensitive land uses.

### C. Screening Criteria

- If the proposed project includes the construction or expansion of an airport or heliport and has the potential to expose noise-sensitive land uses to high noise levels (through proximity of such land uses to the flight path, etc.), would the project result in an incompatible land use existing within the 65 dB CNEL contour of an airport or heliport?

A "yes" response to the preceding question indicates further study in an expanded Initial Study, Negative Declaration, Mitigated Negative Declaration, or EIR may be required. Refer to the Significance Threshold for Airport Noise and review the associated Methodology to Determine Significance, as appropriate.

A "no" response to the preceding question indicates that there would normally be no significant impact from Airport Noise from the proposed project.

### D. Evaluation of Screening Criteria

Review the description of the proposed project, including information on airport activities. Consult a map showing the 65 dB CNEL contour and surrounding land uses. Consider whether potential incompatible land uses have acoustical insulation, an avigation agreement with the airport operator, etc. Operations at commercial airports involving turboprop or piston engine aircraft under 70,000 lbs. have reduced potential to expose sensitive land uses to high noise levels because of the quieter noise levels generated by these aircraft. Compare this information with the screening criteria to determine whether incompatible uses would be located within the 65 dB CNEL contour.

Incompatible land uses include the following[1]:

- Residences, including but not limited to, detached single-family dwellings, multi-family dwellings, high-rise apartments, condominiums and mobile homes, unless:

[1] *Division of Aeronautics, Noise Standards (Title 21, Subchapter 6, Article 1) 1990, pages 225-226.*

- An avigation easement[2] for aircraft noise, has been acquired by the airport proprietor;

- A dwelling unit which was in existence at the same location prior to January 1, 1989, and has adequate acoustic insulation to ensure an interior CNEL of 45 dB or less due to aircraft noise in all habitable rooms;

- A residence is a high rise apartment or condominium having an interior CNEL of 45 dB or less in all habitable rooms due to aircraft noise, and an air circulation or air conditioning system, as appropriate;

- A residence exposed to an exterior CNEL less than 80 dB (75 dB if the residence has an exterior normally occupiable private habitable area) where the airport proprietor has made a genuine effort to acoustically treat the residence or acquire avigation easements for the residence involved, or both, but the property owner has refused to take part in the program; or

- A residence which is owned by the airport proprietor;

- Public and private schools of standard construction for which an avigation easement for noise has not been acquired by the airport proprietor, or that do not have adequate acoustic performance to ensure an interior CNEL of 45 dB or less in all classrooms due to aircraft noise;

- Hospitals and convalescent homes for which an avigation easement for noise has not been acquired by the airport proprietor, or that do not have adequate acoustic performance to provide an interior CNEL of 45 dB or less due to aircraft noise in all rooms used for patient care; and

- Churches and other places of worship for which an avigation easement for noise has not been acquired by the airport proprietor or that do not have adequate acoustic performance to ensure an interior CNEL of 45 dB or less due to aircraft noise.

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2 *An avigation easement is a legal agreement to purchase the right to fly over a property owner's land without penalty.*

## 2 DETERMINATION OF SIGNIFICANCE

### A. Significance Threshold

A significant impact on ambient noise levels would normally occur if noise levels at a noise sensitive use attributable to airport operations exceed 65 dB CNEL and the project increases ambient noise levels by 1.5 dB CNEL or greater.

### B. Methodology to Determine Significance

Environmental Setting

In a description of the environmental setting, include the following:

- Identification of ambient noise levels (existing and future) measured in CNEL. Use the 65 dB CNEL contour map or mathematical models to assess existing (at the expected time of project implementation) noise conditions. Model future noise levels by establishing parameters and assumptions, including aircraft fleet compositions at the airport for which a project is being analyzed, fleet forecasts, appropriate aircraft substitutions, departure profiles, tracks, thrusts settings, operational time of day (day, evening, or night), airport configurations (runway length and location, departure and landing thresholds, etc), and the algorithms used to calculate individual aircraft noise profiles. Use a recognized aircraft noise model, such as one of the following:

  - The Integrated Noise Model (INM), developed by the FAA and used extensively for commercial airports, produces noise contours to geographically demonstrate the location and level of average, weighted noise impacts;

  - The Area Equivalent Method (AEM), developed by the FAA, produces the aggregate area of noise impact without demonstrating the location of specific noise levels; it can be used as a screening tool to determine whether the more sophisticated and time consuming INM is warranted;

  - The Helicopter Noise Model (HNM), developed by the FAA, is used for projects which primarily involve helicopter operations; and

  - The Noise Map, developed by the United States Air Force (USAF), is primarily used to analyze military operations.

- Characterization of noise-sensitive land uses within the 65-dBA contour of airport operations, including the description and location within the contour. Identify noise attenuation devices, avigation easements, and other relevant features of the land uses; and

Project Impacts

Use the information from the Evaluation of Screening Criteria and Environmental Setting and one of the aircraft noise models described above to develop future noise contours. Results from the INM are preferred for commercial airports because of the level of sophistication and detail provided. Identify noise sensitive uses at which noise levels exceed 65 dB CNEL as a result of airport operations. Calculate the increase in ambient noise levels due to project operations at these locations. Compare this information to the Significance Threshold.

Cumulative Impacts

The projection of future baseline ambient noise levels incorporates background increases in noise and airport-related noise from the related projects. Therefore, no new analysis is required.

Sample Mitigation Measures

Possible mitigation measures include the following:

- Redirect air traffic over the ocean (for coastal airports) or over less populated areas;*

- Acquire noise-impacted land. The FAA's Uniform Relocation Assistance and Real Property Acquisition rules and provisions govern land acquisition and relocation assistance;

- Purchase avigation easements;

- Reduce the number of flights during evening and nighttime hours;*

- Increase takeoff angles within safety parameters or reducing thrust settings, depending on proximity and configuration of surrounding land uses;*

- Plan runway utilization schedules to take into account adjacent residential areas, noise characteristics of aircraft, and noise-sensitive time periods;*

- Employ shielding to obstruct the noise path to incompatible uses, using natural terrain, buildings, and other obstructions to noise; and

- Develop compatible land uses within the noise boundary through rezoning, or application of acoustical insulation.

* ***Strategies marked with * require FAA approval***

## 3. DATA, RESOURCES, AND REFERENCES

Los Angeles World Airports, Van Nuys Airport Noise Control Regulation EIR, 1992.

Los Angeles World Airports, Draft Van Nuys Airport Master Plan, 1995.

Division of Aeronautics, Noise Standards, 1990.

FAA, Airport Environmental Handbook, 1985.

See also I.2. OPERATIONAL NOISE.

**Selected Legislation**

<u>Federal</u>

FAR, Part 36

Establishes noise standards and provisions for issuing certificates for various types of aircraft. Also, the aircraft must meet the airworthiness regulations constituting the type certification basis of the aircraft under the conditions in which compliance with this part is shown.

FAR, Part 150

Describes the procedures, standards, and methodology governing the development, submission, and review of airport noise exposure maps and airport noise compatibility programs, including the process for evaluating and approving or disapproving those programs. Makes matching funds available for abatement programs.

State

California Airport Noise Standards Act, 1970 (CAC, Title 4)

Implements the FAA airport standards, administered by the State Division of Aeronautics. Requires civilian airports to meet FAA noise standard of 65 dB CNEL at airport boundaries.

CCR, Title 21 (Business Regulations)

Requires airports to monitor noise impacts and report to the County Airport Land Use Commission and State Division of Aeronautics on a quarterly basis.

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