SCRTD TERMINAL 4

ENVIRONMENTAL NOISE IMPACT

Analysis and Mitigation

July 15, 1988

Prepared for

Southern California Rapid Transit District

by

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1.0 Introduction

The purpose of this study was to determine the existing noise levels and predict the possible increase in levels due to a proposed expansion of the Terminal 4 Bus Facility. The project site is located in the City of Downey, bordered on the northeast by Telegraph Road, on the northwest by the Rio Hondo Channel, on the southwest by the Santa Ana freeway (Interstate 5), and on the southeast by single family residences (See SK-1). This study predicts the noise impact of the proposed expansion on the residences to the southeast.

Terminal 4 is a small automobile maintenance and bus dispatch facility which does not undertake any bus maintenance, bus washing or bus fueling operations. Currently, the terminal dispatches 12 buses daily. The proposed expansion would increase the weekday level to 26 buses and extend service to include weekends. Automobile maintenance at the facility would typically continue to occur on weekdays between the hours of 6 a.m and 4 p.m.

A previous noise survey was conducted at Terminal 4 in 1982 for environmental impact by the SCRTD. This survey was conducted during planning for higher levels of activity, and for a different proposed scope of expansion. Although some useful information has been extracted from this previous study, it does not directly apply to the proposed expansion.

2.0 Urban Mass Transit Authority (UMTA) Noise Impact Guidelines

The RTD has specified that the Noise Impact Assessment be carried out under the guidelines specified by UMTA Circular 5620.1 dated October 1979. These guidelines have been reproduced in Appendix A. The guidelines offer a general assessment of the significance of any noise impact based on an increase of the noise levels in dBA.

The UMTA guidelines suggest in Section D.2 that the hourly Leq is the appropriate noise impact descriptor. In addition, the SCRTD requested the CNEL for the site as an additional descriptor.

The hourly equivalent sound level (Leq) is defined as the A-weighted level of a continuous steady sound which contains the same total acoustic energy integrated over a one hour period as the actual time varying sound of interest. Community Noise Equivalent Level (CNEL) is a composite noise index derived from a 24 hour average noise Level (Leq) with selective weighting for the evening (7:00 p.m. to 10:00 p.m.) and night time (10:00 p.m. to 7:00 a.m.) periods of 5 and 10 dB, respectively. These time of day adjustments are included to account for the apparent increased sensitivity and annoyance to noise during the evening and night time hours.

3.0 Noise Measurement Methodology

Our analysis is based upon two types of measurements: continuous and event specific. Monitors were set up in three locations to record the overall noise levels on a 24 hour basis and recordings of specific noise events were made to assess their individual impact.

3.1 CNEL and Leq Measurements

From June 15 to 20, 1988 continuous monitoring equipment was installed at the Terminal site and on residential property to the southeast of the terminal. This equipment was used to capture the environmental noise data needed to generate the CNEL and hourly Leq's present at the site.

The measurement equipment consisted of a B&K 4155 microphone, powered by a Larson Davis Model 2200 microphone power supply and preamplifier, feeding a Larson Davis Model 700 Dosimeter. The dosimeter calculated all the required environmental noise descriptors. This data was transferred on an hourly basis to an Epson HX 20 computer for storage. All equipment was calibrated in the field prior to use.

The positions of the environmental measurement locations are shown in SK-2. Measurement locations 1 and 2 were located in the backyards of 8403 and 8435 Rives Avenue respectively. Measurement location 3 was situated above the barrier wall, in line with measurement location 2.

The measurement locations were chosen to gather as much information as possible and to document the most likely areas to be affected by the expanded operations. Location 1 was chosen to measure a worst case example of exposure from buses pulling out of the terminal and accelerating on Telegraph Road. Location 1 also represents the effect due to traffic on Telegraph Road on the area's ambient noise level. Locations 2 and 3 represent lower ambient noise levels (located away from Telegraph Road and Interstate 5) and maximum exposure to the maintenance facilities. Measurement Location 3 does not, however, present a true picture of the noise environment for the residences. Therefore, at this measurement location, no prediction has been made of the impact to Leq and CNEL due to the expansion. Location 3 was compared to the data gathered at Location 2 to provide a description of the effectiveness of the sound barrier wall.

The noise levels of the residential area nearest the freeway were measured in the 1982 study, but were not included in our study because our on-site evaluation and the previous noise survey indicated that the noise due to the freeway would effectively mask any noise produced by the Terminal expansion at that location.

Measurement Locations 1 and 2 were located at ear level, approximately 4 feet from the residence wall nearest the property line of the terminal rather than at the property line itself. This is because the noise attenuation due to the wall is more effective when observed at the property line rather than adjacent to the residences. We believe our measurement locations represent the most appropriate measurement of the noise environment impacting the residences and the most realistic test of the effectiveness of the barrier wall.

3.2 Specific Noise Event Measurement

On June 15, 1988 SCRTD personnel conducted a series of bus activities that were predicted to occur regularly under the proposed expansion. In addition, a number of events were conducted which are typical of the automobile maintenance operations at the terminal. All of these activities were recorded at Locations 2 and 3, as described above, and these recordings were later analyzed at our laboratory. By measuring at both Locations 2 and 3, an assessment of the effectiveness of the noise barrier wall can be obtained.

In addition, several bus pull-outs were recorded on the morning of June 16, 1988. The measurement location for these pull-outs is shown as position 4 in SK-2.

The equipment used for the event measurements consisted of a B&K 2215 Sound Level Meter (SLM) and a Sony TC-05M Cassette Recorder. All equipment was calibrated in the field prior to use.

4.0 Measurement Results

The measurement techniques outlined above were used to obtain the data necessary to describe the current noise environment and project the change in that environment due to the expansion of Terminal 4. The continuous data allowed us to generate the current CNEL and Leq levels. The specific measurements of terminal-related activities and an estimation of the increase of each activity as a result of the expansion allowed us estimate the future CNEL and Leq levels under the terminal expansion.

4.1 Current CNEL and Leq Levels

The continuous monitors recorded the hourly Leq at each measurement location. The Leq's at each location for each hour of the measurement period are presented in Tables 1 through 3. The daily CNEL's for every complete day in the measurement period are listed in Table 4.

4.2 Specific Noise Source Levels

Events relating to both the bus and automobile maintenance facility operations occuring regularly at the terminal were recorded and analyzed to determine their impact on the current noise environment and to gauge the increase in the anticipated environmental noise due to increased operations at the terminal. RTD staff targeted specific events as potential noise problems and conducted these events for the measurements.

The bus operations targeted were:

high RPM operation to build up air pressure
pull-out
pull-in and drive by noise barrier wall.

Automobile maintenance operations identified were:

backup warning device
air impact tool
public address system
high pressure air hose
dropping of metal parts in the tire changing area.

The maximum sound pressure levels generated by these events are presented in Tables 5 and 6. It should be pointed out that the Terminal expansion will not increase the number of the automobile maintenance events.

Table 5 shows the noise levels recorded at Locations 2 and 3 on June 15, 1988. In addition to the maximum levels for these events, the maximum and average ambient levels present at the site and an example of the maximum noise level generated by a commercial aircraft flying over the area are included for comparison.

The difference in levels for these two locations represents the effect of the barrier wall in reducing the noise at the residences. The eight bus drive bys allow the barrier's effectiveness to be measured. The average attenuation due to the wall is 16 dBA.

Several events from the above lists are not represented in Table 5. This is because their noise levels at the residences were so low that they could not be reliably discerned from the ambient levels present. This infers that these events do not significantly impact the noise environment and will not be considered further.

Recordings were made on June 16, 1988 at location 4 in order to estimate the noise exposure experienced by the residences near Telegraph Road due to bus pull-outs.

Table 6 lists the maximum noise levels of the bus pull-outs recorded at location 4. The maximum noise levels occur when the bus is beyond the noise barrier wall and is accelerating after turning south on Telegraph Road. The residences near Telegraph Road will be affected by the bus pullouts.

5.0 Projected CNEL and Leq Levels After Expansion

The projected CNEL and Leq levels after expansion are determined by adjusting the present levels according to the number, level, and duration of noise events caused by the expansion. The proposed expansion will increase the number of bus operations per day, but will not alter the automobile maintenance operations. Therefore, the only expected increase in the environmental noise level will come from the additional bus operations. The additional bus pull-outs will potentially impact only those residences nearest Telegraph Road (measurement Location 1). The additional bus pull-ins will potentially impact all of the residences along the southeast property boundary, except those closest to Interstate 5 (measurement locations 1 and 2). Since these events are well defined by RTD scheduling, it is possible to assess the change in hourly Leq's due to the expansion.

To determine the projected Leq's, the average Single Event Level (total acoustical energy) of the bus pull-ins and pull-outs was calculated from our measurements. This energy was added to the present average hourly acoustical energy levels (obtained from the measured Leq's) for each additional bus pull-in or pull-out due to the resulting expansion. This new energy level was then used to compute the projected Leq's

The acoustical energy due to additional pull-ins was applied to the Leq's for measurement locations 1 and 2. However, because of the effectiveness of the noise barrier wall, the calculations indicate that there will be no increase in the hourly Leq's due to the additional bus pull-ins.

The acoustical energy due to the additional pull-outs was applied to the Leq's at measurement location 1. A comparison of the measured and predicted Leq's for location 1 is shown in Table 7.

The projected CNEL's were calculated from the projected average hourly Leq's. A comparison of the measured and predicted average CNEL's for Locations 1 and 2 are shown in Table 8.

6.0 Analysis of the Noise Projection

The overall conclusion is that the terminal expansion will have an insignificant noise impact on the residences. This is primarily due to two major factors. First, the noise barrier wall is very effective in shielding the residences from the noise produced by the terminal operations. Secondly, the ambient noise levels in this area are high due to the close proximity of Telegraph Road and Interstate 5.

Our calculations indicate that the expansion of Terminal 4 will produce no increase in the Leq's at location 2 which represents all of the residences located away from Telegraph Road.

Examination of Table 7 indicates an increase in hourly Leq at location 1 during 3 hourly periods on weekdays and 5 hourly periods on weekends. The increase ranges from 0.1 dBA to a maximum of 1.8 dBA and is due solely to the bus pull-outs after the bus has exited the SCRTD property and entered Telegraph Road. The increase in operations will have no effect on the hourly Leq at location 2.

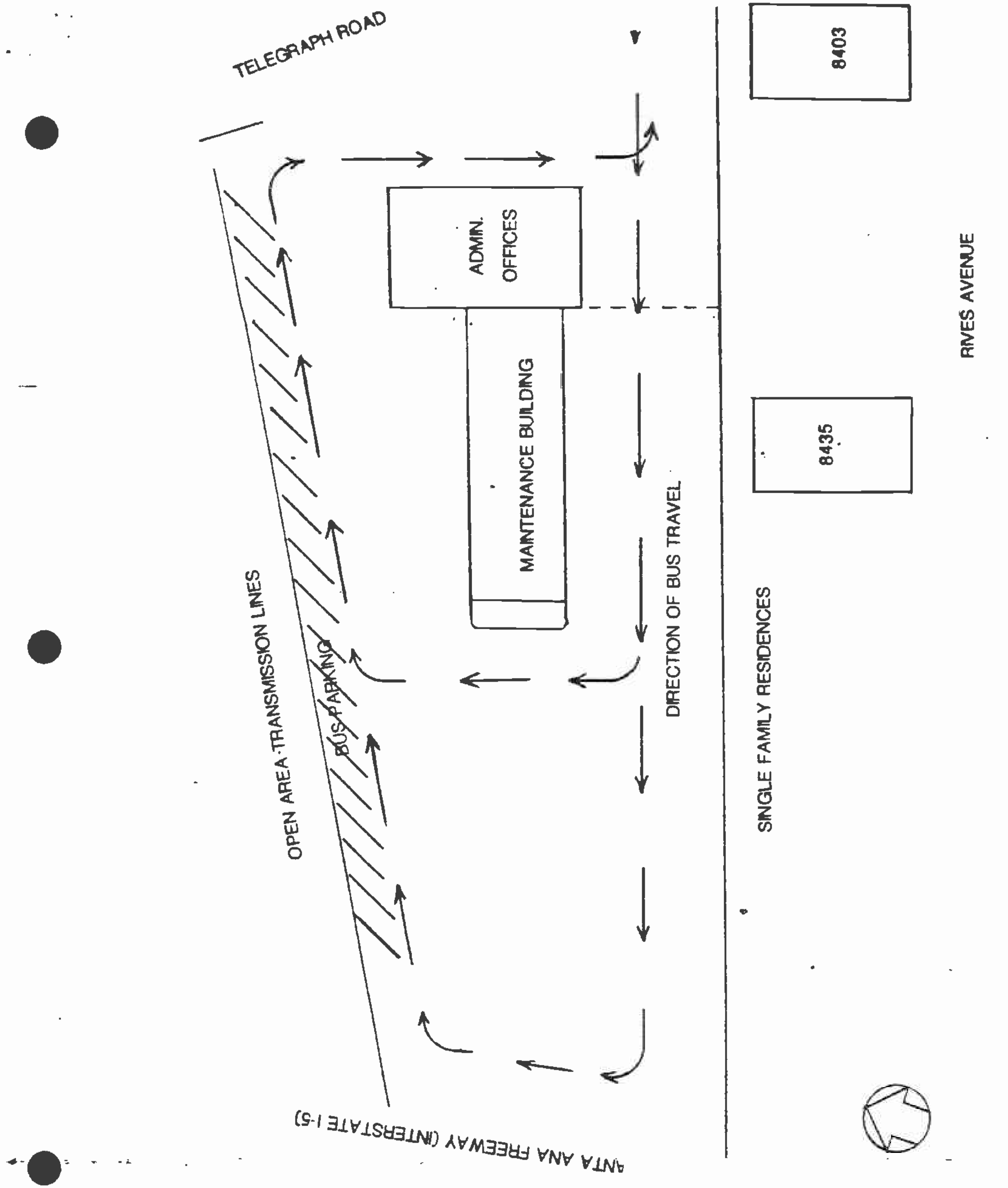
According to the UMTA guidelines, this increase has an insignificant noise impact on the residences (See Appendix A, Table D).

Examination of Table 8 indicates that there is only a 0.2 dBA increase in the average CNEL at location 1. This increase is insignificant. There is no increase in CNEL at location 2.

7.0 Noise Mitigation

Based upon Section 6.0 above, there will be no significant increase in noise level due to an increase in bus operations at Terminal 4. Therefore, no noise mitigation is required.

Bus pull-out noise, however, might be further minimized by instructing the drivers to reduce acceleration as they enter Telegraph Road, if this change does not create a safety hazard.



LAYOUT OF SCRTD DIVISION 4 DOWNEY FACILITY

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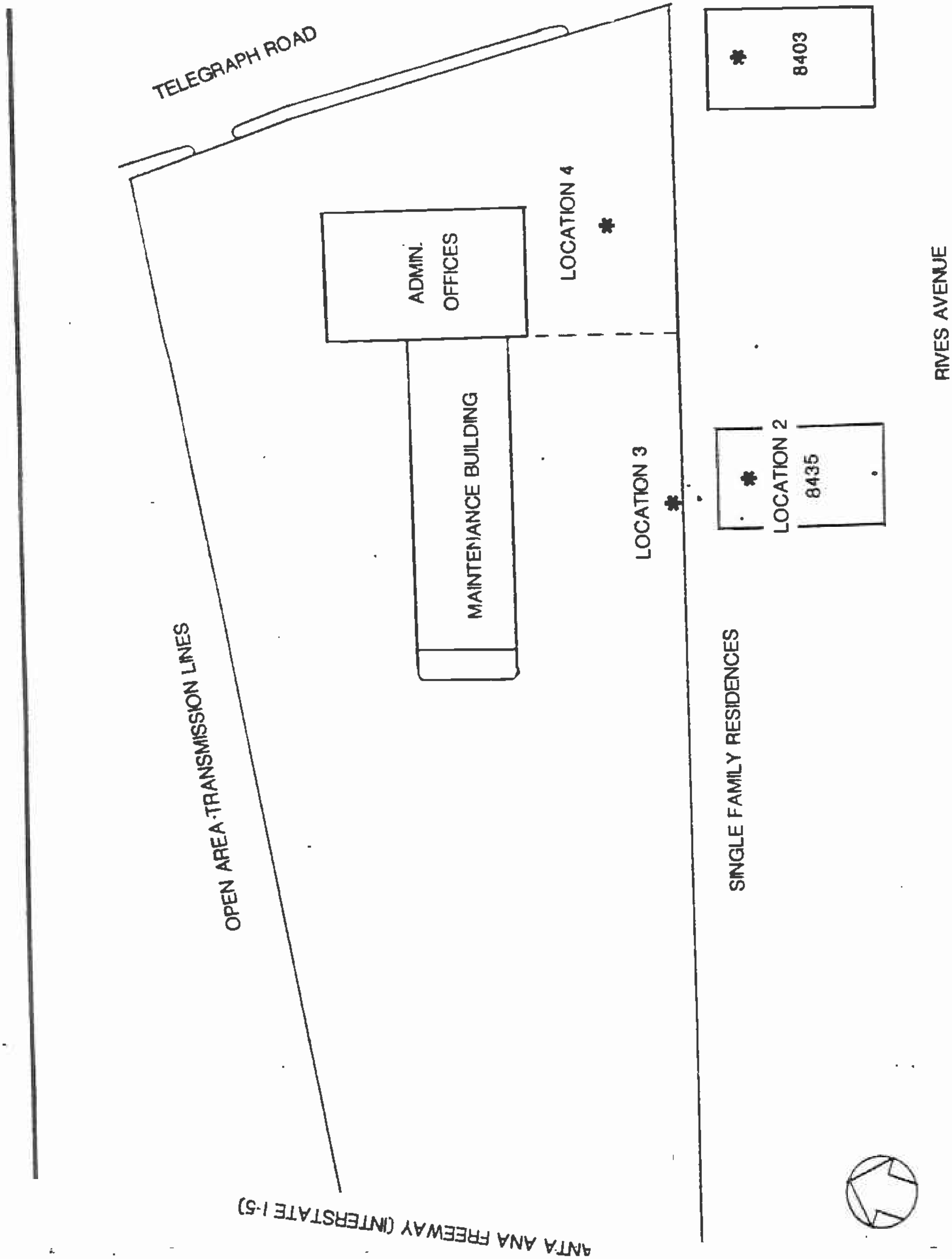
NO SCALE DRH 28 JUN SK-1



LAYOUT OF SCRTD DIVISION 4 DOWNEY FACILITY AND NOISE SURVEY LOCATIONS

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NO SCALE | DRH, 23 JUN SK-2

TABLE 1

Current Hourly Leq by Day and Date
Location 1

Hour	6/15 Wed.	6/16 Thurs.	6/17 Fri.	6/18 Sat.	6/19 Sun.	6/20 Mon.
				Leq (dBA)		
1		53.0	54.6	53.4	62.6*	55.6
2		51.4	53.1	53.1	57.9*	53.8
3		51.4	52.4	51.1	56.6*	49.5
4		53.2	52.3	50.2	52.9	50.9
5		54.1	54.0	50.7	50.1	52.6
6		57.9	61.8	53.3	52.0	56.5
7		60.6	60.3	53.9	52.6	59.6
8		60.8	60.9	55.6	55.4	
9		60.3	60.2	55.4	52.9	
10		58.9	58.6	56.9	55.0	
11	59.5	58.7	59.5	56.4	55.4	
12	60.1	59.9	59.8	58.6	56.2	
13	61.4	59.2	59.8	57.1	55.3	
14	58.6	59.8	59.8	58.0	55.2	
15	59.3	61.7	60.6	56.4	56.2	
16	60.6	61.9	61.6	56.2	56.3	
17	61.6	61.9	61.8	56.5	57.4	
18	61.4	61.7	62.1	57.5	56.5	
19	61.1	61.1	60.6	57.7	55.8	
20	59.9	60.1	58.4	57.3	59.1	
21	58.9	60.3	58.1	58.4	59.7	
22	59.6	58.4	57.8	58.9	59.0	
23	57.1	57.6	56.7	57.3	61.0*	
24	55.0	60.2	55.7	65.6*	56.3	

* Denotes unusually high noise levels (several individual events > 80 dBA were noted at these times). These levels occured only at Location 1.

TABLE 2

Current Hourly Leq by Day and Date
Location 2

Hour	6/15 Wed.	6/16 Thurs.	6/17 Fri.	6/18 Sat.	6/19 Sun.	6/20 Mon.
			Leq (dBA)			
1		52.1	54.3	53.6	51.6	55.6
2		52.4	54.5	52.4	53.0	53.6
3		53.0	54.6	51.6	51.1	51.8
4		55.6	54.0	51.5	50.3	52.0
5		56.8	55.4	50.7	50.3	52.8
6		58.4	58.3	51.6	50.8	54.5
7		57.1	57.8	53.0	51.9	54.6
8		56.3	57.9	55.1	52.9	
9		56.2	56.9	54.5	53.4	
10		56.6	55.7	55.0	53.3	
11	58.4	57.1	58.4	55.9	54.1	
12	58.4	58.6	57.7	57.5	55.4	
13	59.1	57.1	54.8	57.7	55.0	
14	58.3	58.6	57.8	56.7	55.1	
15	57.4	60.6	57.8	55.3	56.0	
16	59.6	59.8	58.4	55.8	55.6	
17	58.7	60.3	58.4	56.4	57.7	
18	58.7	59.3	58.7	58.4	56.7	
19	60.3	61.4	59.4	58.8	56.0	
20	60.5	61.3	58.6	57.8	59.5	
21	59.5	60.1	56.8	58.4	59.0	
22	58.7	59.6	58.1	56.8	59.0	
23	57.9	57.6	57.8	55.3	56.7	
24	54.0	55.9	55.8	53.3	56.8	

TABLE 3

Current Hourly Leq by Day and Date
Location 3

Leq (dBA)

Hour	6/15 Wed.	6/16 Thurs.	6/17 Fri.	6/18 Sat.	6/19 Sun.	6/20 Mon.
1		55.3	57.8	56.4	57.0	58.4
2		54.9	57.4	55.2	56.7	55.8
3		56.1	56.8	54.2	54.9	52.9
4		57.9	56.4	53.9	51.6	54.1
5		59.3	58.3	52.3	50.8	56.5
6		62.6	52.2	54.7	52.4	59.7
7		61.3	61.6	55.6	54.3	60.0
8		60.9	61.9	58.8	55.5	
9		60.6	62.3	57.4	56.5	
10		61.2	61.1	58.8	56.6	
11	62.9	61.6	62.3	59.5	57.9	
12	63.9	62.9	62.3	60.1	59.3	
13	63.6	61.6	63.0	57.5	59.4	
14	65.8	67.8	62.4	58.2	59.1	
15	63.1	63.3	62.3	60.2	59.9	
16	67.9	62.7	62.0	59.8	59.8	
17	61.7	65.5	62.1	60.6	61.8	
18	61.6	62.1	62.2	61.8	60.8	
19	64.4	64.3	63.4	62.1	59.9	
20	63.9	64.7	63.4	61.3	63.4	
21	62.4	62.2	61.2	60.9	62.4	
22	61.3	62.3	61.3	59.5	62.0	
23	60.6	60.7	60.6	58.7	59.8	
24	57.4	59.8	58.9	58.4	59.1	

TABLE 4

Current CNEL's by Location

Date	Day	CNEL at Location 1	CNEL at Location 2	CNEL at Location 3
6/16/88	Thur.	64.4	63.6	67.1
6/17/88	Fri.	64.3	63.2	66.7
6/18/88	Sat.	64.4	60.7	63.8
6/19/88	Sun.	64.3	61.1	64.3
Weekday Average		64.0	63.4	66.9
Weekend Average		61.8	60.9	64.1

TABLE 5

Maximum Sound Pressure Levels
for Specific Noise Elements
(Recorded 15 June 1988)

Event	Maximum Noise Level (dBA) Location 3	Maximum Noise Level (dBA) Location 2
Ambient Noise (Maximum)	65.0	57.5
Ambient Noise (Average)	6[illegible].5	54.0
High RPM Operation (Parking Slot 10)	61.5	NA
High RPM Operation (Parking Slot 27)	NA	NA
Air Pressure Runup	65.5	NA
Backup Warning Device	75.0	55.0
Impact Tool 1	71.5	61.0
Impact Tool 2	74.0	62.0
Dropped Metal Object	69.0	58.0
Public Address System	65.5	NA
High Pressure Air Hose	71.0	56.0
Bus drive by 1	72.0	63.0
Bus drive by 2	74.0	61.5
Bus drive by 3 (8 mph)	77.0	55.0
Bus drive by 4 (8 mph)	78.5	60.0
Bus drive by 5 (12-15 mph)	82.5	65.0
Bus drive by 6 (12-15 mph	76.0	60.0
Bus drive by 7	75.0	57.0
Bus drive by 8	83.0	63.5
Aircraft Flyover	74.0	77.0

Bus pullouts from west gate (measured at Location 4).

	Maximum Level
Pullout 1	72.0
Pullout 2	71.0

TABLE 6

Maximum Sound Pressure Level
of Bus Pullouts
(Recorded 16 June 1988)

Event	Maximum Noise Level (dBA) Location 4
Pull-out 1	76.5
Pull-out 2	74.5
Pull-out 3	77.5
Pull-out 4	77.5
Pull-out 5	77.5
Pull-out 6	76.0
Pull-out 7	75.5
Pull-out 8	78.0
Pull-out 9	74.0
Average Level	76.3

TABLE 7

Comparison of Existing and
Projected Houly Leq
Location 1

Hour	Weekday Average Existing	Weekday Average Projected	Weekend Average Existing	Weekend Average Projected
1	54.4	54.4	53.4	53.4
2	52.8	52.8	53.1	53.1
3	51.1	51.1	51.1	51.1
4	52.1	52.1	51.6	52.0*
5	53.6	55.3*	50.4	52.2*
6	59.7	60.0*	52.6	54.0*
7	60.2	60.2	53.2	53.7*
8	60.8	60.8	55.5	55.5
9	60.2	60.2	54.1	54.3*
10	58.8	58.8	56.0	56.0
11	59.2	59.2	55.9	55.9
12	59.9	59.9	57.4	57.4
13	60.1	60.1	56.2	56.2
14	59.4	59.5*	56.6	56.6
15	60.5	60.5	56.3	56.3
16	61.4	61.4	56.2	56.2
17	61.8	61.8	57.0	57.0
18	61.7	61.7	57.0	57.0
19	60.9	60.9	56.8	56.8
20	59.5	59.5	58.2	58.2
21	59.1	59.1	59.0	59.0
22	58.6	58.6	59.0	59.0
23	57.1	57.1	59.2	59.2
24	57.0	57.0	56.3	56.3

* Denotes a change in the Hourly Leq as a result of the Expansion

TABLE 8

Comparison of Existing and Projected Average CNEL's Locations 1 and 2

Location	Weekday Average Existing	Weekday Average Projected	Weekend Average Existing	Weekend Average Projected
1	64.0	64.2	61.8	62.0
2	63.4	63.4	60.9	60.9

APPENDIX A

UMTA NOISE IMPACT GUIDELINES

Table C can be used to evaluate the significance of potential air quality impacts.

TABLE C

SIGNIFICANCE OF AIR QUALITY IMPACTS

Generally Not Significant	Possibly Significant	Generally Significant
1. Local and/or state air pollution control agency determines that the proposed project is compatible with existing air quality planning and management. 2. Proposed project would not violate national ambient air quality standards or other applicable standards. 3. Proposed project is consistent with the State Implementation Plan for air quality. 4. Proposed project is consistent with the Transportation Control Plan.	1. Proposed project would result in increased pollutant levels, but would not exceed local, state, or federal standards for mobile source pollutants. 2. Proposed project is located in an EPA-designated nonattainment area for any mobile source pollutants and would increase auto and/or bus traffic at specific locations.	1. Project would result in violation of local, state, and/or federal air quality standards for any mobile source pollutant. 2. Project is opposed by local air pollution control agency. 3. Project is not consistent with the State Implementation Plan and/or, if applicable, the Transportation Control Plan.

D. NOISE

1. Sources of Noise

Urban mass transportation projects have the potential to create three kinds of noise impacts: (1) noise associated with fixed transit facilites (e.g., maintenance and storage facility, transit terminal); (2) noise from traffic diverted due to implementation of the transit improvement (e.g., auto-restricted zone or transit mall); and (3) transit vehicle operating noise--increased noise levels due to operation of buses (e.g., on major new routes, on streets in the vicinity of new maintenance/storage facilities, on exclusive lanes, on transit malls, etc.). The potential for adverse noise impacts from mass transportation projects is greatest when noise-sensitive sites are located in the project area. Noise-sensitive sites include residences, motels, hotels, public meeting rooms, auditoriums, schools, churches, libraries, hospitals, amphitheaters, parks, and other areas where quiet is essential. "Active" parks, such as ballfields, are not generally defined as noise-sensitive areas because their use and enjoyment are not precluded by moderate noise levels. In some cases, commercial areas can be considered noise-sensitive, particularly when ambient noise levels are low and the area is located on a street which carries little traffic and is not a through street.

2. Noise Descriptors

Noise from transportation sources within a community varies in intensity and timing. Unlike highways, where noise is emitted by a continuous or nearly continuous flow of traffic, mass transit systems are characterized by intermittent occurrences of noise that vary in frequency depending on the time of day. The noise descriptor used for most mass transit projects is the equivalent sound level (L_{eq}). Use of the equivalent sound level is appropriate because this level is sensitive to the frequency of occurrence and duration of noise events, including bus transit operations which may be characterized by infrequent noise. The equivalent sound level is also widely accepted by agencies involved in regulating noise (e.g., the Environmental Protection Agency, the Federal Highway Administration, etc.).

The equivalent sound level may be given for different time periods (usually 1 hour [$L_{eq}(1)$], 8 hours [$L_{eq}(8)$], or 24 hours [$L_{eq}(24)$]), depending on the nature of the project and the period during which most transit activity takes place. For example, noise from a proposed bus storage facility should be reported in decibels as a one-hour L_{eq} for the peak hour of bus activity (i.e., when most buses leave to begin their routes). Bus noise from a proposed transit mall project might be expressed either as a one-hour L_{eq} for the morning or evening peak period or as an eight-hour L_{eq} covering the period of greatest commercial activity. If transit operates during the night when residences might be disturbed, the day-night sound level (L_{dn}) should be used. This descriptor attaches a ten-decibel penalty to noises occurring between 10 p.m. and 7 a.m. when people are most likely to be disturbed by noise.

Residences present a special case; occupants can be exposed to noise for long periods of time and the noise decriptor used must be sensitive to this. However, most noise assessments can be based on a "worst-case" approach in which the peak transit activity period is identified and the noise predicted to result from a project is expressed as a one-hour L_{eq}.

3. Assessment of Impacts

At present, there are no standards to regulate a community's exposure to noise emanating from buses or other transit vehicles. In the absence of such standards, the significance of noise impacts can be evaluated through a comparison of existing (ambient) noise levels with the noise levels projected to result from a project. Generally speaking, an increase or decrease in noise of 3 dBA (L_{eq}) or less caused by a project is considered to represent no significant change. An increase of 10 dBA (L_{eq}) or more is considered a significant impact, whose severity depends on the nearness of noise-sensitive land uses. If the increase in noise ranges between 3 and 10 dBA, its significance will depend upon the existing ambient level and the presence of noise-sensitive sites. For example, an increase of 5 dBA (L_{eq}) in noise within a community would be of greater significance in terms of its potential effects on health and the annoyance it would create in an environment of already high noise levels (70 to 80 dBA) than it would in a suburban or rural environment with lower ambient noise levels (45 to 55 dBA). In general, an increase in noise of 5 dBA due to a project is often used as the point at which the noise impact is considered significant.

By using the following guidelines as a screening technique, the persons preparing or reviewing an environmental assessment may be able to judge the significance of a proposed project's noise impacts without a detailed noise analysis.

a. Noise from Fixed Transit Facilities

To determine whether a detailed noise analysis is needed in the case of a fixed transit facility, the land uses surrounding the proposed project area should be examined to identify any noise-sensitive sites. If the surrounding land use is industrial, there is generally no need for a detailed noise analysis. A bus storage or maintenance facility in an industrial area is usually classified as a Class 2 action, requiring neither an Environmental Impact Statement nor an Environmental Assessment (see UMTA's "Environmental Impact and Related Procedures"). If residential land uses surround the project site, a detailed noise analysis should generally be undertaken. If the proposed project site is within 1,200 feet of a noise-sensitive site with no intervening buildings, it is possible that noise will be increased by at least 3 dBA (L_{eq}) and a detailed noise analysis should be undertaken. If a predominantly solid line of intervening buildings is present, the project site can be within 300 feet of a noise-sensitive site before noise would be expected to increase by more than 3 dBA (L_{eq}) and a noise analysis would be needed. Less than a solid wall of intervening buildings would have only a minimal mitigating effect.

b. Noise Due to Diverted Traffic

In the case of noise due to diverted traffic, the potential for significant noise impacts is dependent upon expected changes in auto and truck volumes, travel speeds, and/or the distance from the noise source to a receptor. A detailed noise analysis is not needed unless the project is expected to modify the above factors to the extent that an increase in noise of at least 3 dBA (Leq) is anticipated. Examples of changes that would yield an increase of 3 dBA (Leq) and for which a detailed noise analysis should be made are as follows:

- A 100 percent increase in hourly auto traffic volumes on one or more streets passing a noise-sensitive site;
- A 100 percent increase in hourly truck volumes on one or more streets passing a noise-sensitive site;
- A 100 percent increase in the combination of hourly auto volumes and truck volumes on one or more streets passing a noise-sensitive site;
- An increase in vehicular speeds of 15 miles per hour on one or more streets passing a noise-sensitive site; and
- A reduction of one-third in the distance between auto or truck traffic and a noise-sensitive site.

An increase in noise due to more traffic can be offset by a reduction in speed or by an increase in the distance from the source to the receptor.

In the analysis of noise impacts due to diverted traffic, the new paths that trucks and cars are likely to follow if they are moved off a street that is given priority for transit (e.g., auto-restricted zone, transit mall) should be investigated.

c. Transit Vehicle Operating Noise

A detailed noise analysis should be carried out for all projects that would result in an increase of twelve buses or more per hour passing a noise-sensitive land use. The probable routes that transit vehicles will take to and from a proposed fixed transit facility should be reviewed with particular attention. Projects that would increase volumes by as few as twelve buses per hour have the potential to create an increase in noise of 3 dBA.

For the case in which bus volumes increase in a mixed traffic environment (autos and buses), but buses do not pass noise-sensitive areas, both the level of service of the roadway and the number of buses as a percentage of total vehicles on the roadway must be examined to determine if a detailed noise analysis is needed. Information about traffic volumes and levels of service can usually be obtained from local traffic engineering departments. In some cases, special traffic counts may be required. In general, a detailed noise analysis is required if buses constitute at least three percent of the total traffic during their peak hour of activity and the roadway is operating at level of service C or worse, or if buses constitute four or more percent of total hourly traffic.

In any event, a detailed noise analysis is required for projects including provisions for the operation of buses on transit-only malls or in other auto-restricted zones.

If a detailed noise analysis is not needed, the Environmental Assessment should provide justification that a survey of noise-sensitive sites was completed and no such sites are in the project area. If noise-sensitive sites are found in the project area, the Environmental Assessment should make the case, if possible, that because of the characteristics of the proposed project, increases in noise are not expected to be discernable at any of the noise-sensitive locations.

If a detailed noise analysis is needed, noise impacts should be analyzed and the results of the methodology employed should be summarized in the Environmental Assessment. The documentation should include:

- An identification of noise-sensitive areas within the project area;
- A description of the project's design or operational features that contribute to the potential impact (e.g., bus start-ups in the early morning, diversion of traffic, large numbers of buses operating on a transit mall);

- A determination of existing ambient noise levels (by monitoring), predicted future noise levels without the project, and predicted future noise levels with the project;

- A discussion of predicted project noise levels with reference to any local ordinance and/or applicable noise standards or guidelines. Standards and guidelines that may apply include: guidelines of the Environmental Protection Agency; guidelines of the American Public Transit Association (rail projects); standards of the Federal Highway Administration (bus projects); and regulations of the Department of Housing and Urban Development (projects affecting HUD-sponsored developments). Additional guidance on applicable standards and criteria is available from UMTA; and

- A discussion of the project's location, design, or operational features that will mitigate potential noise impacts. For many mass transportation projects, mitigation depends primarily upon the selection of an acceptable location for a transportation improvement, rather than the adoption of any specific design measures. Therefore, the documentation should include the influence of potential noise impacts in the selection of the final project site.

Table D can be used to evaluate the significance of the results of an assessment of potential noise impacts. Further guidance on assessing the noise impacts of mass transportation projects is available from UMTA.

TABLE D

SIGNIFICANCE OF NOISE IMPACTS

Generally Not Significant	Possibly Significant	Generally Significant
1. No noise-sensitive sites are located in the project area. 2. Increases in noise levels with implementation of the project are projected to be 3 dBA (Leq), or less at noise-sensitive sites and proposed project would not result in violations of noise ordinances or standards.	Increases in noise levels with implementation of the project are expected to be no greater than 5 dBA (Leq). Determination of significance must consider existing noise levels and the presence of noise-sensitive sites.	1. Proposed project would cause noise standards or ordinances to be exceeded. 2. Proposed project would cause an increase in noise levels of 6-10 dBA (Leq) in built-up areas. 3. Proposed project would cause an increase in noise levels of 10 dBA (Leq).

E. WATER QUALITY

The potential impacts on water quality that should be evaluated are the direct and indirect introduction of pollutants into surface bodies of water, the alteration of surface drainage patterns, and the involvement of the