AD-A130 962 HELICOPTER NOISE SURVEY PERFORMED AT PARKER CENTER PASADENA AND ANAHEIM C..(U) FEDERAL AVIATION ADMINISTRATION WASHINGTON DC OFFICE OF ENVIR.. 1/1

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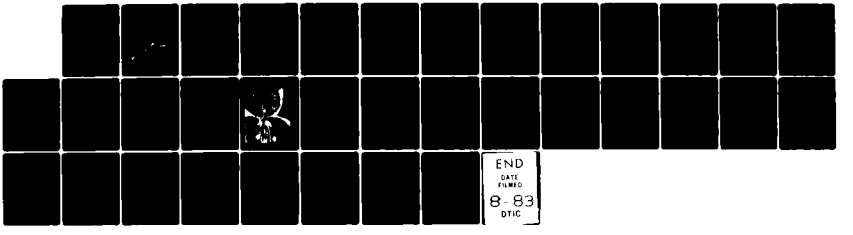

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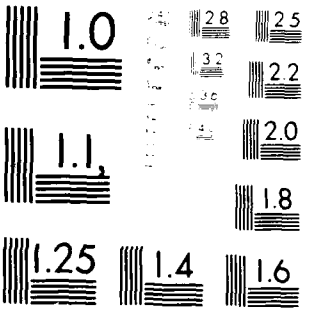

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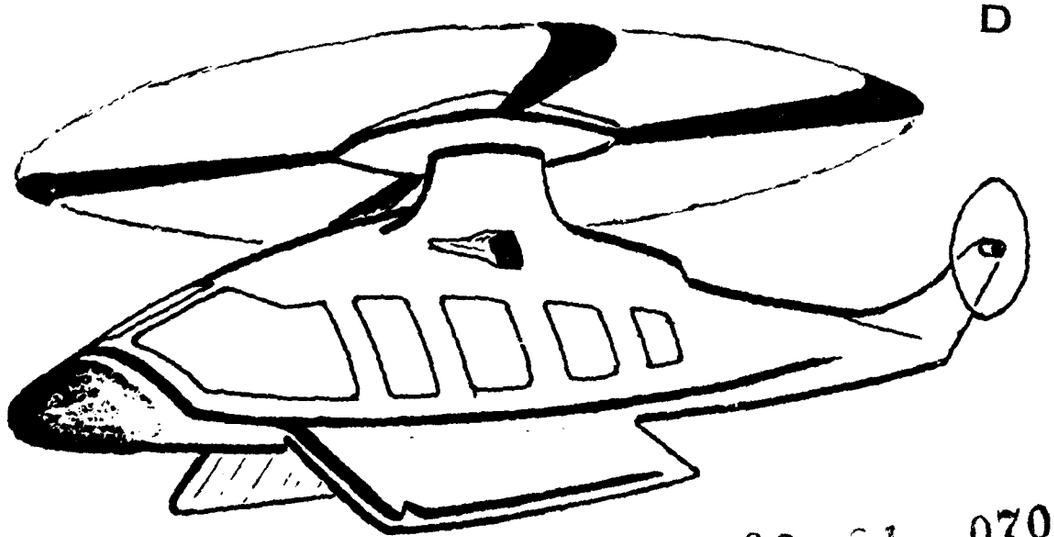
Helicopter Noise Survey Performed at Parker Center, Pasadena, and Anaheim California on February 10-14, 1983

by Steven R Albersheim



U.S. Department of Transportation

Federal Aviation Administration

Office of Environment and Energy

Washington D.C. 20591

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
[illegible]	AD-A130962	

4. Title and Subtitle	5. Report Date
Helicopter Noise Survey Performed at Parker Center, Pasadena, and Anaheim California on February 10-14, 1983	June 1983
	6. Performing Organization Code
	8. Performing Organization Report No.
7. Author(s) Steven R. Albersheim	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration, Office of Environment and Energy, AEE-110, Washington, D.C. 20591	10. Work Unit No. (TRAIS)
	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, AEE-110, Washington, D.C. 20591	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

The FAA conducted a noise measurement survey of helicopter operations at three different helipads in the Los Angeles metropolitan area during the period of February 10-14, 1983. The purpose was to gather needed information for dealing with noise problems with in-service helicopter operations in a suburban and urban [illegible]

Noise level data were sampled for a variety of helicopters for different operating conditions and land use characteristics. The data collected reflect noise levels at these sites from all local sources of noise during that particular sampling period. These data from helicopter "targets of opportunity" are termed "[illegible] data" as opposed to "controlled test data" in order to reflect the limited control over factors which contribute to the variability of the measured noise level.

17. Key Words	18. Distribution Statement
Helicopters, L_{MAX}, L_{eq}, Environmental Noise Impact	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified		

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TERMINOLOGY

L_{eq} - The A-weighted sound level that is "equivalent" to an actual time varying sound level in the sense that it has the same total energy for the duration of the sound.

L_{ASm} - The maximum A-weighted sound level for a given time interval or event.

A-Weighted Sound Level - The momentary magnitude of sound weighted to approximate the ear's frequency sensitivity.

1. Introduction

The FAA is in the process of [illegible] helicopter operations in urban areas [illegible]. [illegible] purpose is to gather needed information for heli[illegible] in-[illegible] noise helicopter operations within urban areas.

On February [illegible], 19[illegible], the FAA [illegible] heliports in the Los Angeles metropolitan area. [illegible] selected based on different criteria with each having unique [illegible] operating conditions and surroundings. This affords the opportunity to assess and evaluate noise levels from helicopters [illegible] variety of [illegible] characteristics.

Noise level data, acquired for statistically valid sample [illegible] each selected site, reflect the noise levels at the sites from [illegible] sources during that particular day. Noise data from individual helicopter operations are also provided. These data from helicopter "targets of opportunity" are termed "survey data" as opposed to "controlled test data," in order to reflect the limited control over factors which contribute to the variability of the measured noise levels.

1.1. Selection Criteria

In selecting heliports to perform a noise monitoring program, the following criteria were used:

. location of people near the heliport who could be impacted by . . . operations

. sufficient number of operations (landings and takeoffs) to justify a potential noise problem

. [illegible] ground access encouraging use and growth of helicopter operations

. [illegible] for future growth and expansion of operations

. availability of monitoring locations to obtain reasonable community noise levels with respect to helicopter operations

Evaluation of the criteria is more or less a subjective analysis for selecting a heliport for monitoring. Location of people relative to the heliport is considered the most important factor and therefore has greater impact than any other factor for including that heliport in the survey.

During the period of February 10-14, 1983, a noise survey was performed at the Parker Center, Pasadena, and Anaheim Stadium heliports. The surveys completed for Pasadena and Parker Center were performed with respect to the above criteria. However, the selection of Anaheim was for a special case study.

2.0 Site Description

2.1 Downtown Los Angeles: Parker Center

The area is highly commercialized with local government services being predominant. Automobile traffic is quite heavy in this area with buses observed on all the major arterials. There are three helipo ts, all

rooftop, within a block of each other. During the ongoing period [illegible] the heliport on top of the [illegible] East [illegible] City Hall were actively being used. The principal source of noise in the [illegible] were automobiles with buses being the most intrusive source of noise [illegible] ground sources.

2.2 Pasadena Heliport

The Pasadena Heliport is owned and operated by the City of Pasadena and is located in the northwest sector of the city off I-[illegible]. The heliport is located in a suburban area surrounded by residential neighborhoods and a golf course. The only helicopters permitted to use the heliport are those owned and operated by the Pasadena Police Department and medivac units transporting victims to the nearest hospital. Ingress to the heliport is usually from the north to north-west sectors over the freeway. Egress is to the southwest over the freeway and the golf course away from the residential area immediately to the east of the heliport.

2.3 Anaheim Stadium

A temporary heliport was established at the Anaheim Stadium during the annual Helicopter Association International (HAI) Convention at Anaheim, California. It is customary for the HAI to provide a flight line at the annual convention so manufacturers can demonstrate the capability of their helicopters. In establishing the flight-line, the HAI marked off a parking area with a space reserved for each helicopter, landing and departing areas, taxiway, and approved ingress and egress routes to the heliport.

Even though this was a temporary facility the nature of operations provides an opportunity to monitor noise levels from an extremely busy urban heliport.

The heliport was located on the stadium grounds away from residential areas. Public access to the facility was restricted for safety reasons. The land-use characteristics in the immediate vicinity of the helipad are commercial and industrial. Helicopters operating out of this facility followed the primary highways. Ingress into the heliport was over Route 5 which is adjacent to the stadium and egress was directly over the industrial/commercial area just west of the stadium. During departure, helicopters were instructed to turn to the north or south before reaching Lewis Street in order to avoid the residential neighborhoods west of the Santa Ana Freeway. The helicopters then followed the normal designated VFR routes to their demonstration areas.

3.0 Noise Survey

3.1 Test Approach

Precision integration sound level meters (GEN RAD 1988s) were used during the period of February 10-14, 1983, at selected sites to monitor noise levels near the helipads at Parker Center, Pasadena, and Anaheim. These systems computed the L_{eq} for a given sample period and recorded the maximum noise level (L_{ASm})on the A-weighted scale. Graphic-level time-history recordings were also produced at selected sites during the monitoring. The graphic level recorders (GLR) provided a hard copy record of the temporal changes of noise levels observed during the monitoring periods. Operators noted the local intrusive sounds in a log and on the GLR record.

The noise surveys were conducted during light wind conditions with ambient temperature in the 60°F's.

3.2 Noise Measurement Equipment

Each of the two noise measurement systems used in the survey consisted of a GEN RAD 1988 Precision Integrating Sound Level Meter (PISLM) with DC output to a Metrosonics 404 Graphic Level Recorder. Each system powered a P-42 microphone preamplifier driving a GEN RAD, 1/2 inch electret microphone. The microphone-preamplifier assembly was mounted four (4) feet above ground level with the microphone oriented perpendicular to the ground at Anaheim and at five (5) feet straight-up at Pasadena for community noise monitoring. At Parker Center the 1988s were hand held at a 45° angle away from the body at waist height. The GLR operated at a paper transport speed of 5 centimeters per minute (300 cm/hr). Each instrument was calibrated before and after each survey measurement period. During the measurements at Anaheim additional calibrations were taken between the initial and final calibration to check for drift in the system.

Each system deployed was capable of collecting maximum A-weighted sound level, integration time, and equivalent sound level. The data presented in this report are a compilation of these acoustical measurements. A schematic of the acoustical measurement system is shown in Figure 1.

4.0 Monitoring Sites

4.1 Parker Center

A noise survey was performed between 1 pm and 3 pm in the area of the Parker Center complex. Figure 2 shows the sampling locations

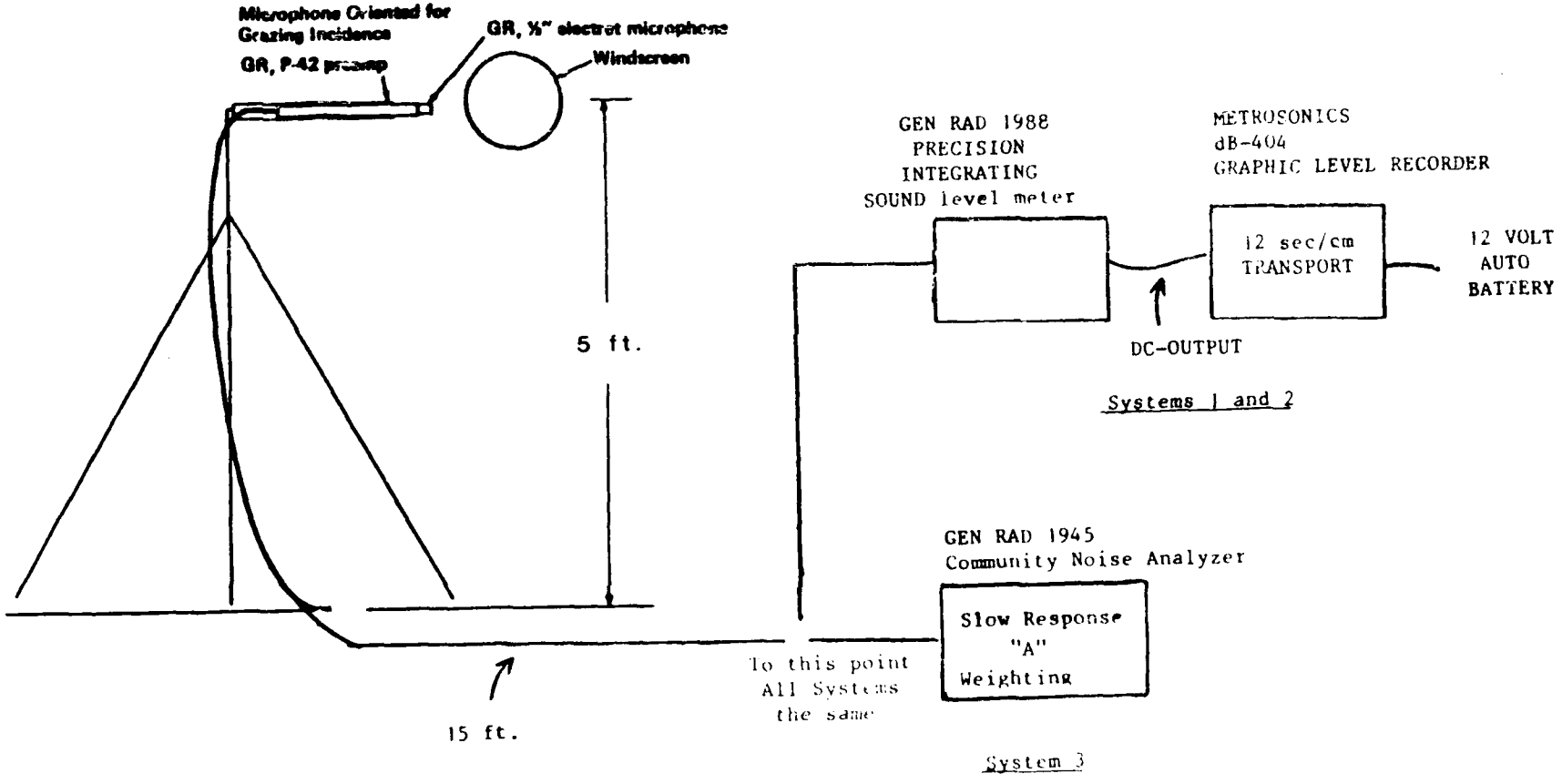


Figure 1 Noise Measurement System

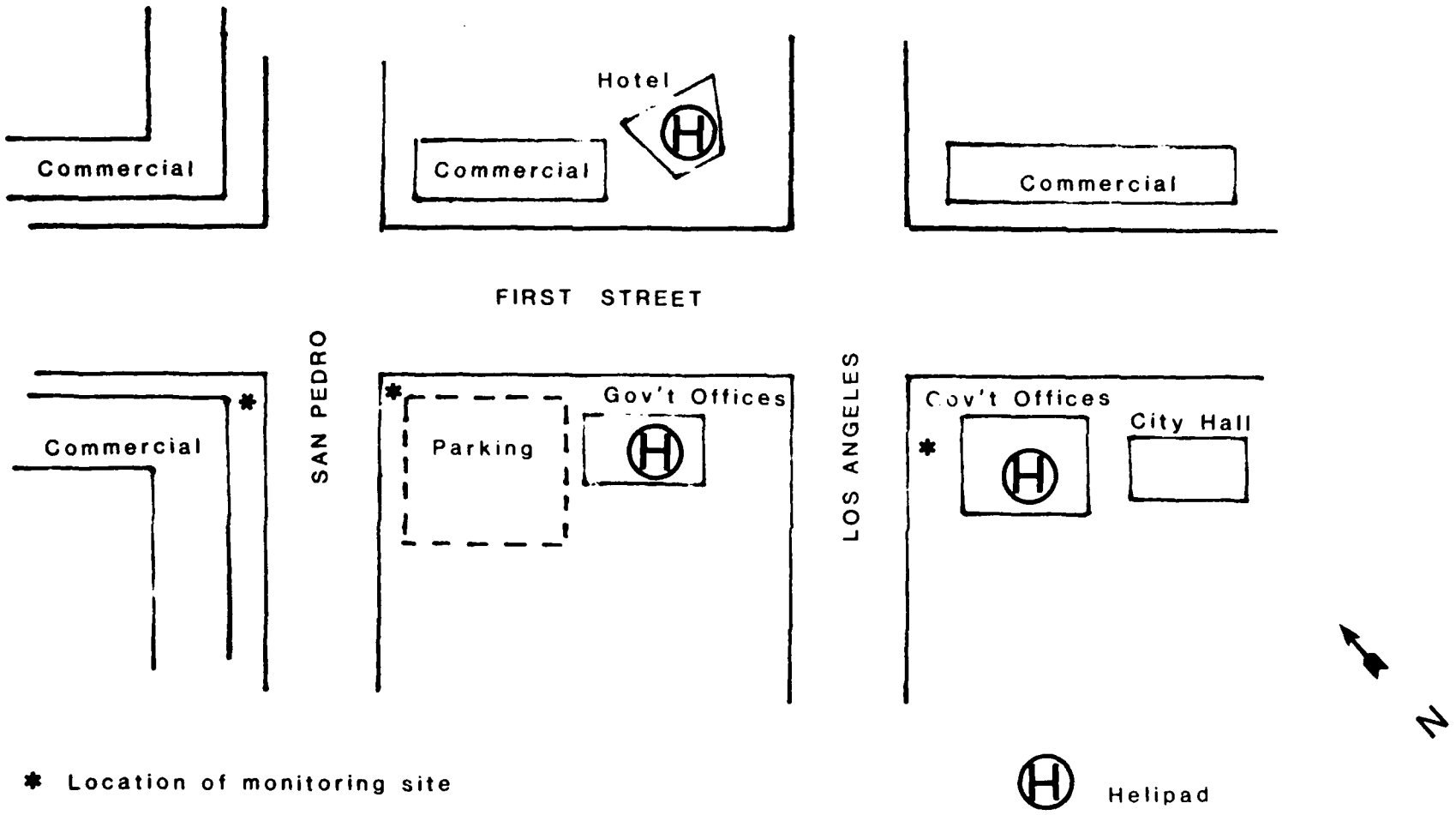


Figure 2

Noise Monitoring Sites for the Parker Center

[illegible] characteristics in the immediate [illegible]. [illegible] in order to allow the operation [illegible]. The measurements represent typical [illegible] the Parker Center heliports. The [illegible] communities." The samples collected were [illegible].

[illegible]

[illegible] was performed on February 11, 1983. Two [illegible] were set up at the locations shown in Figure 3. The [illegible] to monitor the noise levels in neighborhoods near the [illegible] would be affected by the normal approach and departure [illegible] the helicopters. Site 1 was located near the curb on a local [illegible] a residential neighborhood at a distance of approximately [illegible] to the northeast of the helipad. The site was also approximately [illegible]. Site 2 was located adjacent to the Brookside Golf [illegible] Crescent Avenue. Because of the nature of the terrain, the golf [illegible] a ravine which places the monitoring site approximately [illegible] the helipad during departures. Both sites were situated so the [illegible] was located over a grass or dirt surface.

[illegible] Analysis

A noise survey was performed on February 13 and 14, 1983, at the [illegible] facility to monitor noise levels associated with routine departures and approaches from the temporary heliport facility (Figure 4). Site 1, the primary monitoring site, sampled noise levels from helicopters during [illegible] the helicopter passed directly over the microphone. Site 2 [illegible] baseline noise levels located on a small grass plot between the

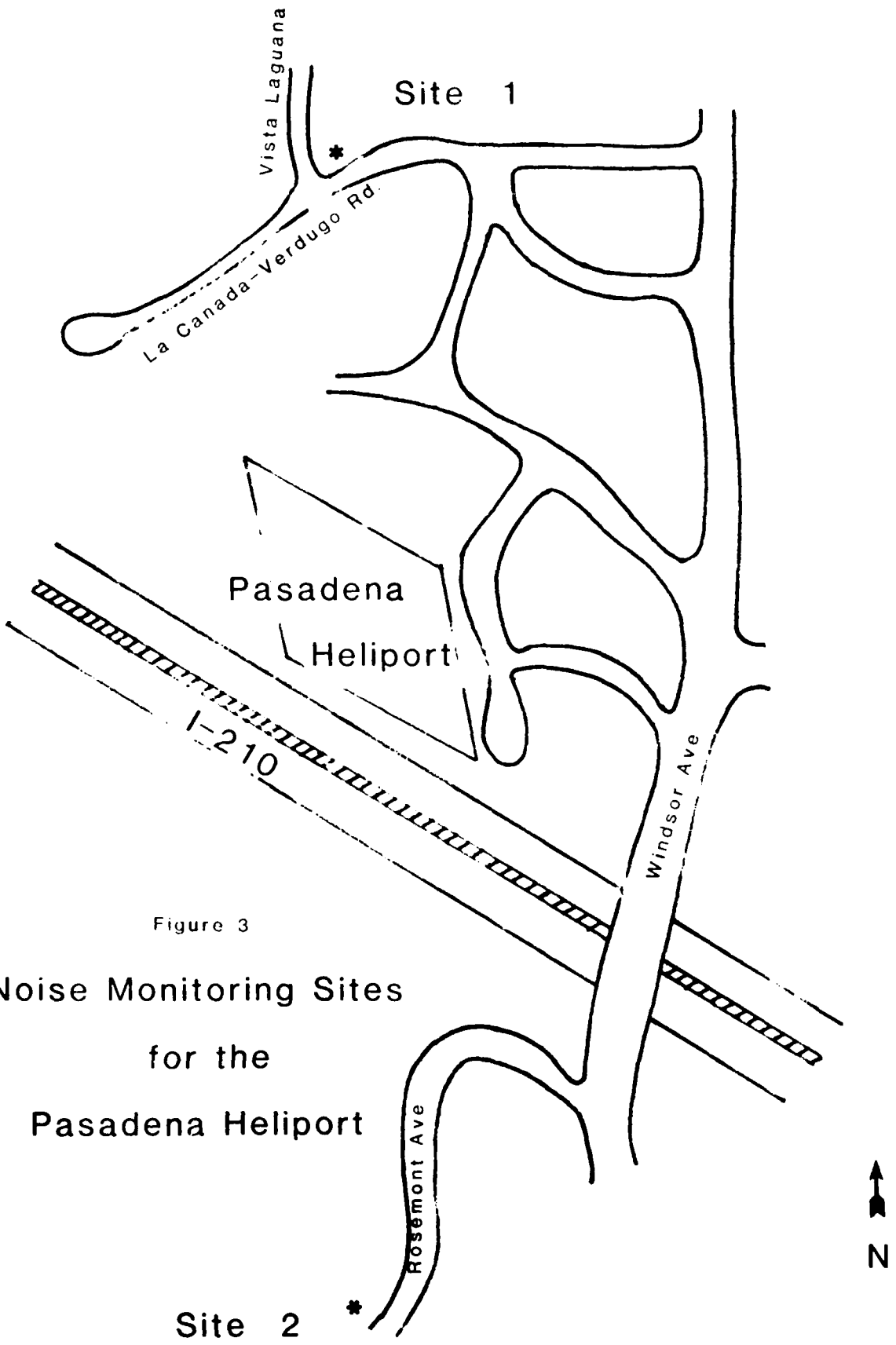


Figure 3

Noise Monitoring Sites

for the

Pasadena Heliport

(Not drawn to scale)

sidewa[illegible] the parking lot. The [illegible] holding the microphone was located [illegible] brassy [illegible] a [illegible] story building. The [illegible] locations of the [illegible] are depicted in Figure [illegible]. The primary [illegible] located directly across [illegible] the helipad on State College [illegible] distance [illegible] approximately [illegible]00 ft from the heliport. Site [illegible] directly [illegible] the [illegible] primary site [illegible] only [illegible] were [illegible]red.

[illegible] primary site for monitoring arrivals was located [illegible] [illegible] east-northeast of the heli[illegible] on the stadium [illegible] lot. [illegible] the [illegible] placed the microphone [illegible] the approach path. Site 2 was [illegible] ft directly to the north. Both sites were on an [illegible] parking lot. A camera was used to photograph the helicopters as they passed over the primary site for both arrivals and departures in order to determine the helicopters' altitudes.

5.[illegible] Discussion of the Data

5.1 Parker Center

The most intrusive sources of noise in the immediate area of the Parker Center complex were helicopters and city transit buses. Table 1 summarizes the noise levels associated with intrusive noise events. The highest reading recorded for helicopter operations was 89 dB(A) associated with the approach of a Bell 212 to the top of a 17-story building adjacent to city hall. This maximum reading was [illegible] dB(A) lower

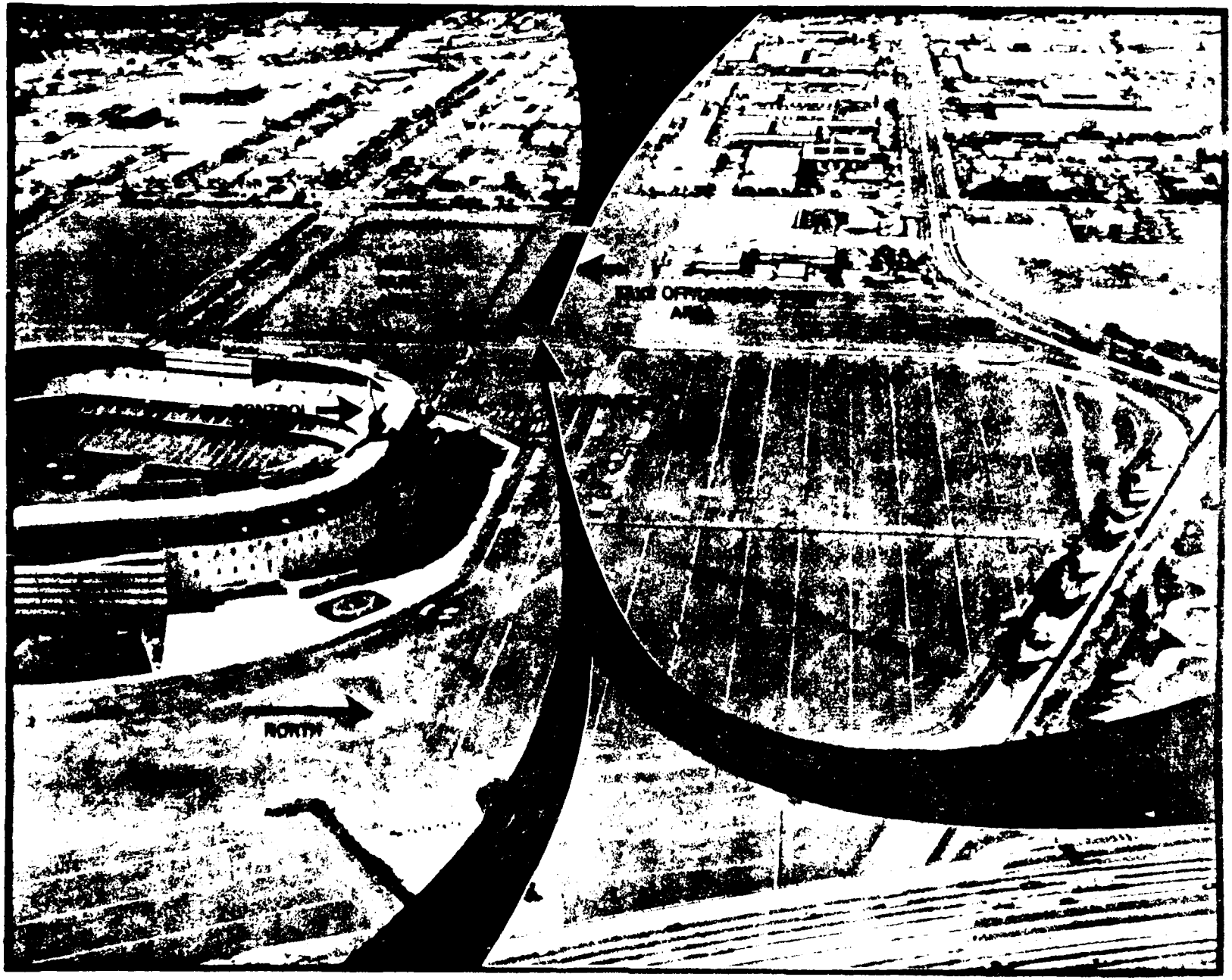


Figure 4 Approach and Departure Routes at Anaheim

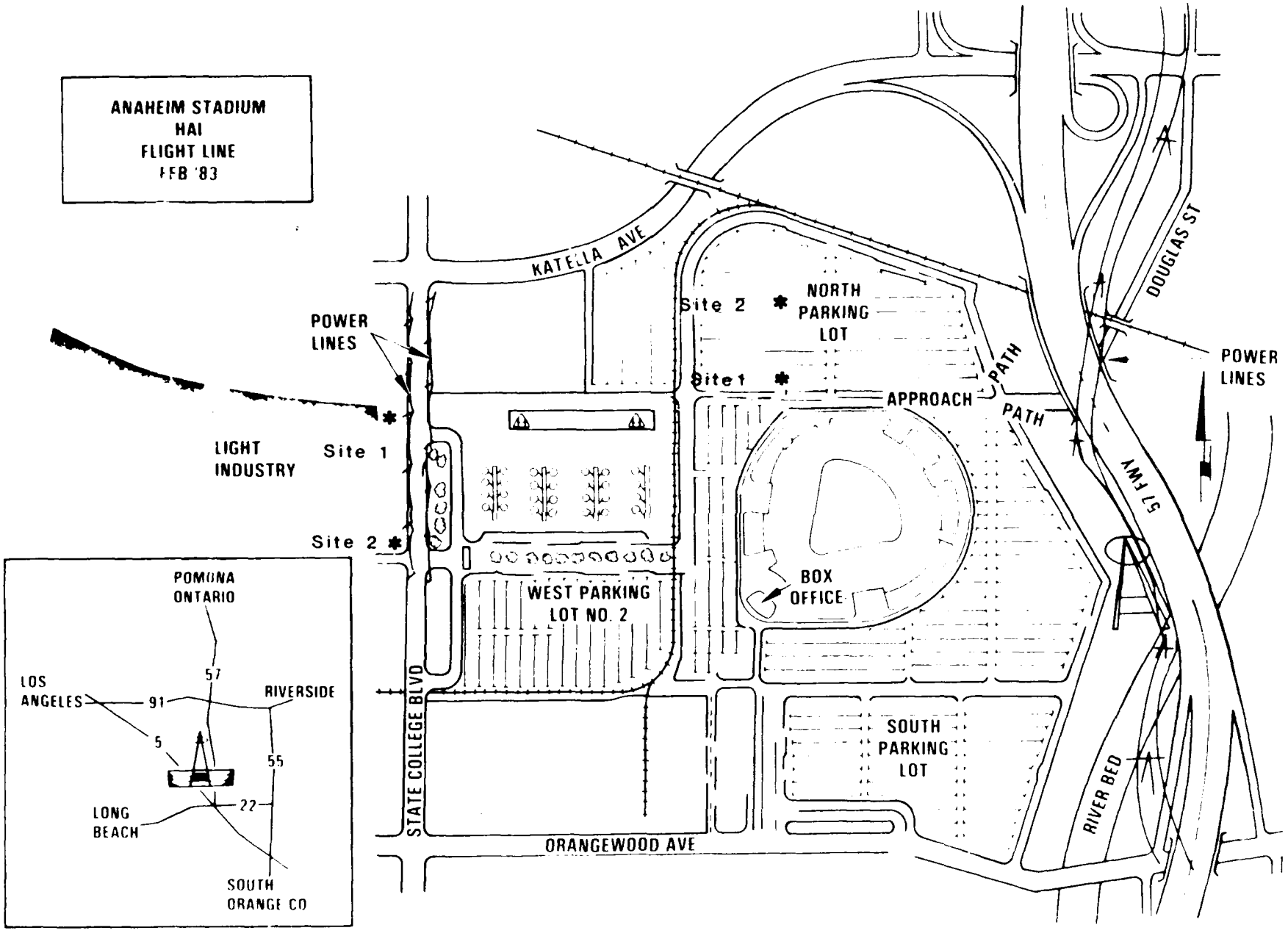
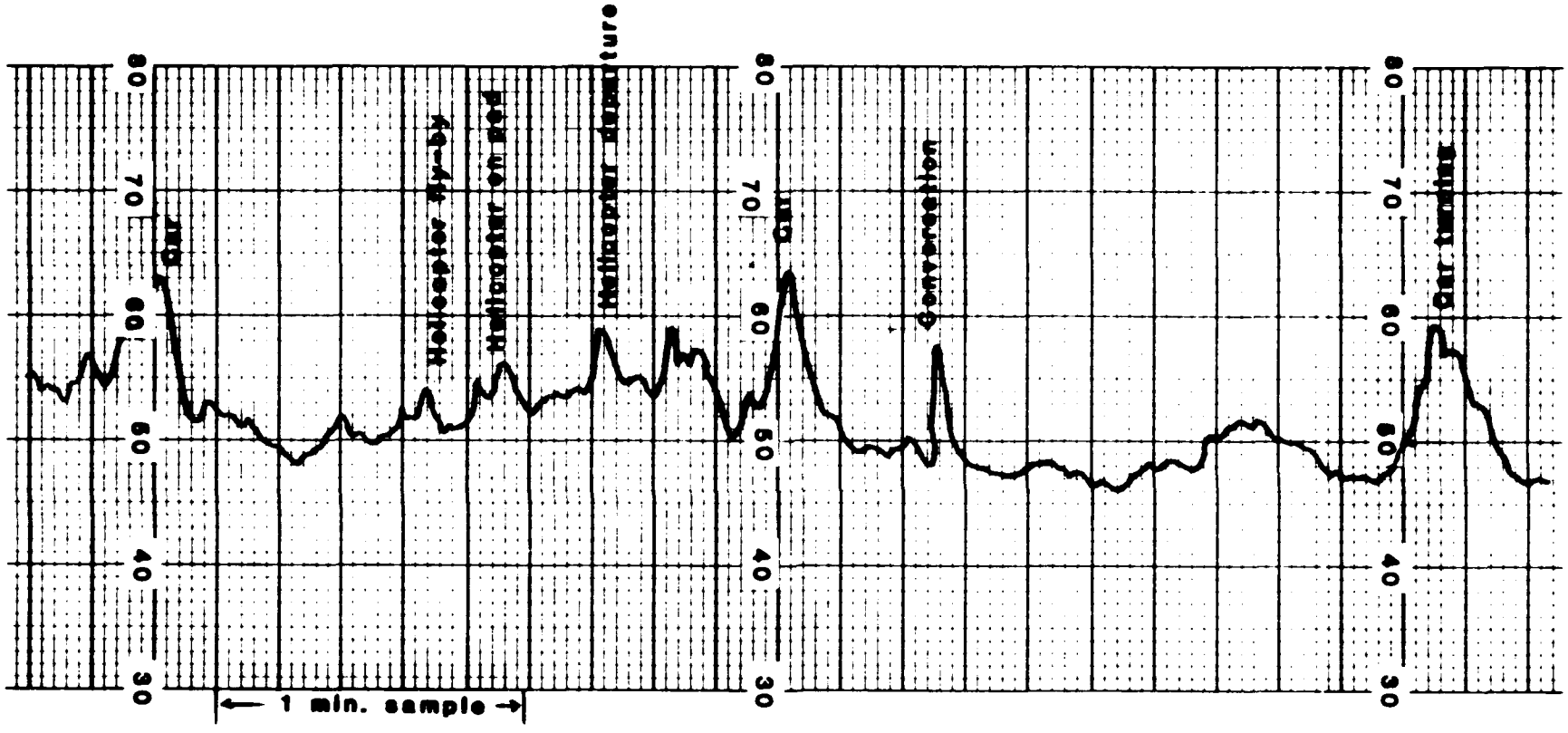


Figure 5 Noise Monitoring Sites at Anaheim

these the maximum readings associated with [illegible] monitoring sites. Another distinguishable characteristic noted about the helicopters observed at Parker Center as they approached from the northwest down First Street was the blade slap which was quite [illegible] approximately three blocks away. Operating technique and [illegible] this distinctive characteristic can be used to identify the blade slap.

5.1 Pasadena

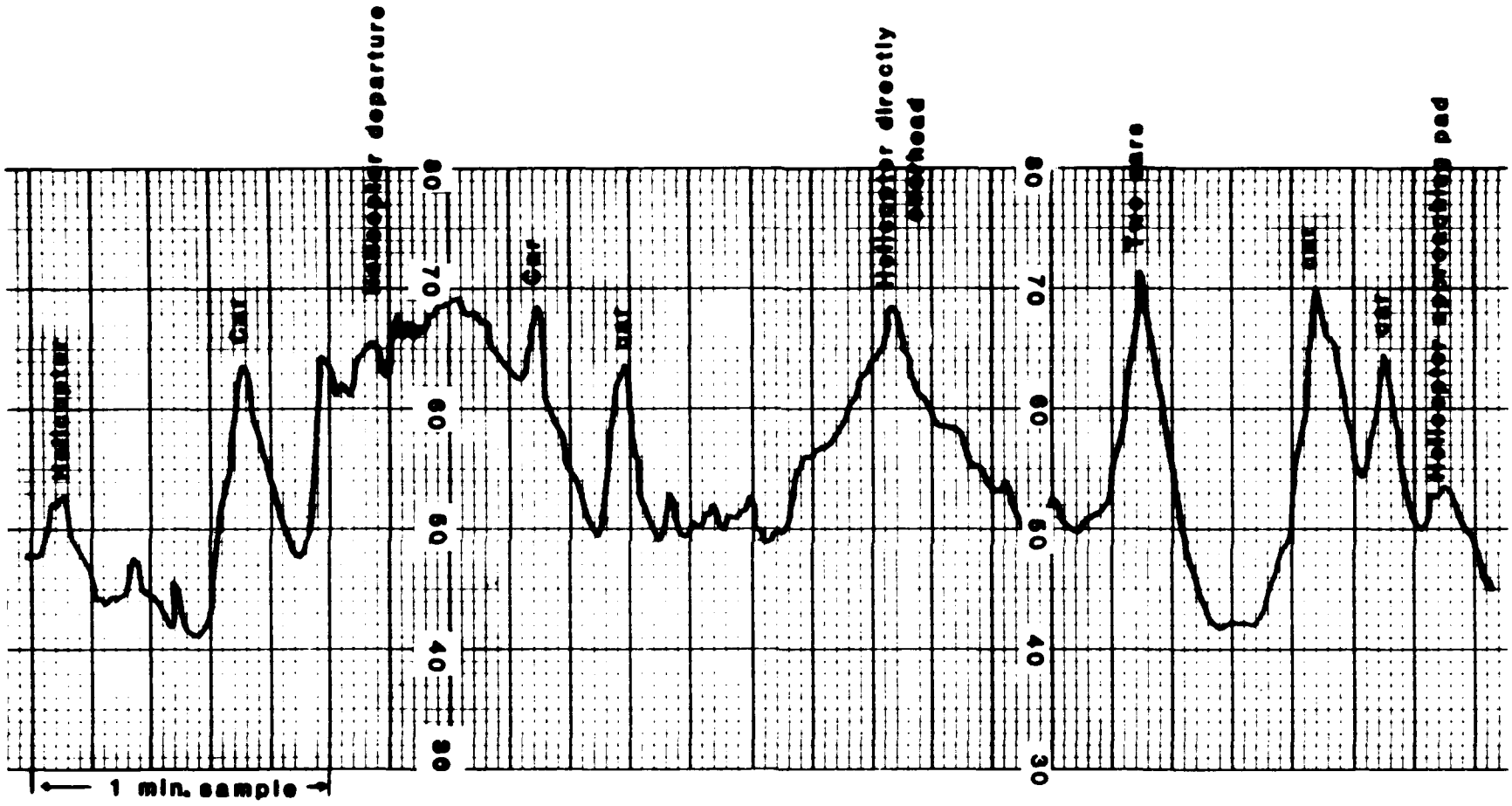
Table 2 summarizes the L_{MAX} and L_{eq} values observed during the survey at the two Pasadena sites. Several short (approximately 10-15 min each) were made at Site 1 with and without helicopter operations. Two samples each approximately 15 minutes in duration with and without helicopter activity were made at site 2. Noise levels associated with routine departures and approaches to the heliport were recorded at each site. Examination of these data indicates that operation of an Kastron F-28C turbine powered helicopter did not change the L_{eq} values in the residential areas during normal routine operations. A maximum level of 86 dB(A) was recorded at Site 1 while the helicopter was on the pad preparing for departure. This compares to a maximum level of 84 dB(A) associated with a car passing by the monitoring site or the loudest noise event recorded during the entire sampling period of 70 dB(A) which was from a car horn. Figure 6 present a graphical picture of the recorded data at Sites 1 and 2 and a comparison of maximum levels of noise associated with routine approaches and departures of the Kastron F-28, relative to other sources of noise in the residential area.



SITE 1 - Residential

dB(A)

Figure 6(a) Time History of Selected Noise Events at Pasadena



SITE 2 - Gulf Course

dB(A)

Figure 6(b) Time History of Selected Noise Events at Pasadena

TABLE 1

Maximum A-weighted Slow Response Sound Level Observed at Parker Center, Los Angeles February 14, 1983

LOCATION	MAX SOUND LEVEL dB(A)	REMARKS
First and San Pedro	93	Transit Bus at 5 feet
	73	ambient for moving traffic
	69	ambient for stopped traffic
	88	truck pass-by
First and Los Angeles	76	Transit Bus pass-by
	78	Light duty truck
	74	Tire screech
	74	Accelerating car
	80	Car with bad muffler
	84	Transit bus pass-by
	75	motorcycle

TABLE 2

Maximum A-weighted Slow Response Sound Level With and Without Helicopter Operations at Pasadena Heliport
February 11, 1983

Sample	Location	Maximum dB(A)	Leq	Noise Event
No. 1	Residential	56		Loud radio
	La Canada Verdugo	63		Car pass-by
	and	51		F-28 Helicopter fly by
	Vista Laguna	59		F-28 Helicopter on pad preparing for departure
		59		F-28 Helicopter departure toward Golf Course
		58		Conversation
		64		Car pass-by
			53.5	5 Min. sample with above observations
No. 2	Residential	63		Car turning
	La Canada Verdugo	62		F-28 helicopter departing
	and			
	Vista Laguna	56		GA fly by
		58		F-28 making approach to pad
		66		F-28 on pad
		52		F-28 departing
			55.1	11 min. sample with helicopter operations
No. 4	Residential	63		Two cars pass-by
	La Canada Verdugo	58		G.A. fly-by
	and	76		Car Horn
	Vista Laguna	55		Highway traffic on I-210
			55.8	5 min. sample without helicopter operations

TABLE 2 (cont'd)

Sample	Location	Maximum dB(A)	Leq	Noise Event
No. 5	Residential La Canada Verdugo and Vista Laguna	53		Truck on freeway in distance
		58		Motorcycle on freeway
		61		Car pass-by
		58		Car pass-by
		66		General Aviation fly-by
		52		Motorcycle on freeway and traffic
			50.7	10 minute sample without helicopter operations
No. 6	Golf Course off	70		Car pass-by
		71		F-28 helicopter fly-by
	Rosemont Blvd.	68		Car pass-by
		44		Crickets
		72		Car and truck pass-by
		69		F-28 Helicopter fly-by
		54		F-28 Helicopter turning in distance to return to pad
		76		Mobile home pass-by
		68		Car pass-by
		68		F-28 Helicopter departing pad
		62		Twin-engine turbo-prop fly-by
		53		F-28 Helicopter fly-by
		69		Car pass-by
		69		F-28 Helicopter directly over-head during fly-by with a car pass-by
		54		F-28 Helicopter approaching pad from northwest
			60.7	18 minute sample period with helicopter operations

TABLE 2 (Cont'd)

Sample	Location	Maximum dB(A)	Leq	Noise Event
No. 7	Golf Course off Rosemont Blvd.		56.1	19 minute sample without helicopter operations

5.3 Anaheim

Tables 3 and 4 present the maximum recorded noise levels for departures and arrivals at the Anaheim Stadium. On February 13, 1983, between the hours of 1300 to 1700 routine departures of helicopters from the Anaheim stadium were monitored (Table 3). In total there were 96 events; however, only 82 were considered valid. The highest noise level recorded was 92.4 dB(A) associated with the Augusta A-109 which passed over Site 1 at an altitude of 159 feet. The lowest noise level recorded during departures at Site 1 was 77.4 dB(A) for the Hiller FH-1100 which passed over this site at an altitude of 167 feet. In general the majority of the helicopters passed over Site 1 during departure at an average altitude of 218 feet with an average A-weighted maximum level of 86.4 dB(A). The average difference between the maximum levels recorded at Site 2 was 6 dB(A), resulting in average weighted maximum sideline dB(A) of 77.9.

On February 14, 1983, arrivals were monitored at Anaheim (Table 4). During the sample period 1000 to 1300 hours there were 69 events. Of these events only 55 were used. Helicopter events were not used when the helicopter did not pass directly over Site 1. The highest value recorded was 97.9 dB(A) and was associated with the Augusta A-109 which passed over Site 1 at 325 feet. The lowest reading of 77.4 dB(A) was associated with a Hiller FH-1100 which passed over Site 1 at 306 feet. The average weighted maximum level recorded at the Site 1 was 85.9 dB(A) and for Site 2 the average weighted maximum level was 78.2 dB(A).

TABLE 3

Maximum A-Weighted Slow Response Sound Level for Helicopter Departure at Anaheim, February 13, 1968

Helicopter	Event No.	Maximum Noise Levels dB(A) Site 1	Site 2	Altitude[1] (ft)	Slant[2] Range (ft)
Hughes 500-E[3]					
Location #1	31	82.7	81.3	304	573
	38	81.3	74.3	296	564
	48	79.9	77.0	340	593
	60	80.3	78.1	255	546
Location #2	27	80.4	75.3	296	569
	37	79.9	74.0	274	558
	42	83.3	77.7	201	529
	55	83.5	79.3	187	525
	68	84.1	79.1	161	486
	70	82.3	76.0	224	535
Location #3	50	79.7	74.6	312	577
	60	79.8	77.8	313	579
	71	81.6	77.6	323	584
	103	79.6	75.7	343	595
Hughes 500-D	13	80.2	78.2	296	569
	25	84.9	77.7	152	539
	46	86.1	80.6	140	503
	85	81.0	81.1	274	558
	95	81.0	78.3	238	541
Sikorsky S-76	44	85.7	80.2	186	52
	79	85.8	81.6	214	533
	88	86.8	82.9	156	517
Westland WG-30	54	87.6	82.1	256	549
	91	86.3	83.2	341	595
	98	86.5	83.4	241	542
Enstrom F-280C	61	82.6	77.7	197	524
Boelkow BO-105LS	14	84.8	75.6	193	523
	24	84.1	77.4	186	520
	36	84.0	75.6	205	527
	43	83.7	75.6	219	533
	62	84.1	78.6	242	543
	93	83.5	75.9	219	533
	102	81.9	76.0	252	547

Table 3 (cont'd)

Helicopter	Event No.	Maximum Noise Levels dB(A) [illegible]		Altitude (ft)	
		[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	39	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]	192	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Location #1	[illegible]	[illegible]	[illegible]	[illegible]	
Location #2	11	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]	204	
	82	[illegible]	[illegible]	238	[illegible]
	[illegible]	[illegible]	81.1	179	
Agusta A-109	[illegible]	[illegible]	[illegible]	-	-
	[illegible]	92.4	[illegible]	159	[illegible]
	[illegible]	[illegible]	84.6	156	[illegible]
Bell [illegible]	[illegible]	[illegible]	[illegible]	158	[illegible]
	[illegible]	81.7	74.8	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	212	[illegible]
	[illegible]	81.6	[illegible]	287	[illegible]
[illegible]	[illegible]	[illegible]	76.3	148	[illegible]
(SPENA)	69	80.9	75.9	263	[illegible]
	89	[illegible]	78.9	236	[illegible]
Aerospatiale SA-350C	7	86.2	76.8	116	[illegible]
	16	86.3	79.2	144	[illegible]
	34	88.5	78.0	269	[illegible]
	41	87.6	76.8	136	[illegible]
	67	88.0	79.0	117	[illegible]
	78	86.2	78.0	141	[illegible]
	83	85.1	79.0	[illegible]	[illegible]

Table 3 (Cont'd)

Helicopter	Event No.	Maximum Noise Levels dB(A)		Altitude (ft)	Slant Range (ft)
		Site 1	Site 2		
Aerospatiale					
AS-355F	12	88.7	79.3	124	502
	18	90.7	80.3	104	497
	29	90.6	77.6	214	531
	77	91.2	80.4	113	499
	90	89.9	80.5	131	503
SA-365C	8	86.4	77.1	216	533
	15	87.3	79.4	299	571
	33	85.6	77.9	293	56[illegible]
	40	85.8	79.1	246	545
	76	88.4	81.5	210	529
	84	89.6	80.1	204	527
	92	82.1	77.5	537	724
	99	83.9	78.9	464	671
Hiller FH-1100	19	81.3	77.0	118	504
	32	78.6	73.2	146	507
	81	81.8	75.1	166	514
	100	77.5	71.6	187	521
Robinson R-22	105	80.3	74.7	152	509

(1) The altitude of the helicopter as it passed directly overhead at Site 1.

(2) The slant range distance of the helicopter to Site 2 as it passed directly over Site 1.

(3) Hughes Helicopter had 3 (three) 500-E's available for demonstration flights. The helicopters were stationed at parking locations 1, 2, and 3 on the flight-line.

TABLE 4

Maximum A-Weighted Slow Response Sound Level for Helicopter Approaches at Anaheim, February 14, 1983

Helicopter	Event No.	Maximum Noise Level dB(A)		Altitude[1] (ft)	Slant Range[2] (ft)
		Site 1	Site 2		
Hughes 500-E[3]					
Location #1	19	84.0	76.8	244	5
	25	81.7	78.5	274	[illegible]
	32	83.3	79.0	274	5
	40	84.4	76.5	276	5
	46	85.8	76.4	173	4
	62	83.7	75.0	241	[illegible]
Location #2	26	89.5	77.1	245	5
	54	86.8	75.2	118	[illegible]
	65	86.4	77.2	179	[illegible]
Location #3	8	86.0	76.3	281	[illegible]
	13	84.1	76.1	323	[illegible]
	35	84.1	76.2	284	[illegible]
	43	84.9	76.3	213	[illegible]
	55	88.4	78.6	231	[illegible]
	61	86.5	76.7	168	[illegible]
Hughes 500-D	14	84.4	79.8	189	5
	20	87.1	77.0	171	[illegible]
Sikorsky S-76	51	90.1	83.3	183	[illegible]
Westland WG-30	41	96.9	88.7	228	5
Enstrom F-280C	16	88.8	78.5	267	[illegible]
Boelkow BO-105LS	31	83.5	78.1	228	5
	57	83.8	79.9	224	[illegible]
BK-117	50	87.2	82.4	217	511
	17	92.7	79.7	183	493
	59	85.3	82.4	214	51
Bell B-206L	23	87.5	77.2	270	536
Location #11	39	91.1	79.7	165	491
B-206L	37	79.0	78.1	327	56
Location #12	66	79.2	78.2	285	544

TABLE 4 (Cont'd)

Helicopter	Event No.	Maximum Noise Level dB(A)		Altitude (ft)	Slant Range (ft)
		Site 1	Site 2		
B-222	6	89.3	83.7	190	50
	22	86.4	82.7	213	50
	28	88.9	80.9	196	50
	50	87.5	81.6	218	51
	64	91.0	78.9	181	49
Augusta A-109	30	98.4	81.9	142	45
	53	97.9	83.1	325	56
Bell B-206A	24	80.5	75.7	210	50
	33	79.1	75.5	254	52
Aerospatiale					
SA-350C	7	81.6	73.2	262	53
	27	84.2	72.8	271	53
	34	80.8	74.0	247	52
	48	80.0	72.1	274	53
AS-355F	21	85.3	74.8	300	55
	36	88.2	75.4	256	52
	58	82.7	72.9	213	51
	63	93.3	83.5	192	50
SA-365	18	93.2	80.8	263	53
	44	90.5	76.6	206	50
	60	93.3	79.6	256	52
Hiller FH-1100	9	79.7	76.4	344	57
	29	82.6	79.4	307	55
	42	77.4	75.4	306	50
	47	78.1	77.7	281	54
	56	78.9	77.0	264	53
Bell B-206 (NITE SIGN)	52	89.0	81.5	449	64

(1) The altitude of the helicopter as it passed directly overhead at Site 1.

(2) The slant range distance of the helicopter to Site 2 as it passed directly over Site 1.

(3) Hughes Helicopter had 3 (three) 500-E's available for demonstration flights. The helicopter were stationed at parking locations 1, 2, and 3 on the flight-line.

5. Perspective on the Data

In reviewing the noise data collected during the survey period, the noise levels from helicopter operations at the three heliports should be placed in perspective with other sources of noise in an urban environment. Table 5 presents a list of noise levels typically encountered in the urban environment. The purpose of performing this noise survey was to gain additional information with regard to helicopter operations in an urban area in relation to other sources of noise. However, it must be noted that this survey only represents noise levels measured for helicopter and other sources of noise for a specific sample period and may not be representative of typical conditions of the area. In any event, the data provide at least a perspective.

At the Parker Center complex the noise associated with the two helicopters observed during the sampling period was quite noticeable when compared to other sources of noise in the area. However, the frequency of occurrence of helicopters is quite small when compared to the operation of transit buses which were about as noisy as the helicopter. The frequency of helicopters operating at this location would not significantly change the L_{eq} for this area. The major sources of noise which have the greatest contributing factors to the cumulative noise level are buses and automobiles.

As to the Pasadena heliport, helicopter operations do not significantly affect the L_{eq} values in the residential areas at the monitoring sites. The helicopter operations are noticeable, but the L_{ASm} as monitored is not any greater than an automobile or truck passing by.

TABLE 5

Noise Levels Typically Encountered
in an Urban Environment

Source	L_{ASm} *
Rustling leaves	20
Room in a quiet dwelling at midnight	32
Soft whispers at 5 feet	34
Men's clothing department of large store	53
Window air conditioner	55
Conversational speech	60
Household department of large store	62
Busy restaurant	65
Typing pool (9 typewriters in use)	65
Vacuum cleaner in private residence (at 10 feet)	69
Ringing alarm clock (at 2 feet)	80
Loudly reproduced orchestral music in large room	82
Printing press plant (medium size automatic)	86
Heavy city traffic	92
Heavy diesel-propelled vehicle (about 25 ft. away)	92
Air grinder	95
Cut-off saw	97
Home lawnmower	98
Turbine condenser	98
150 cubic foot air compressor	100
Banging of steel plate	104
Air hammer	107
Jet airliner (500 feet overhead)	115

* Maximum A-weighted slow response sound level

Because of the nature of operations and the location of the Anaheim heliport, there were no noise impacts on the immediate area adjacent to the stadium. However, if this heliport were a prototype of a [illegible] heliport, noise impacts could be expected in the areas in the [illegible] vicinity (i.e., on the order of approximately 1000 ft.) of the [illegible] path.

7.0 Test Participants

7.1 Noise Test Field Team

The noise survey was conducted by personnel from the FAA Headquarters, Office of Environment and Energy, Noise Abatement Division, AEE-100, Washington, D.C. 20591.

The field team consisted of the following individuals:

Steve Albersheim

Steve Newman

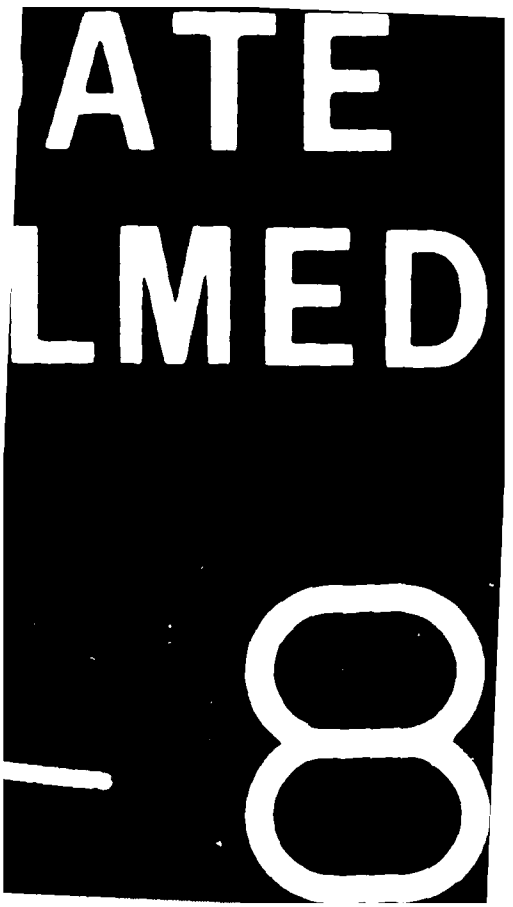
Sharon Daboin

Donna Warren

The cooperation of the following other people is greatly appreciated in coordinating the operations of helicopter operations at Pasadena and Anaheim:

Lt. N.J. Agusta, Pasadena Police Department
Nelson, Chief Pilot, Pasadena Police Department

Donald L. Litvak, Manager, Air Traffic Control Tower, Fullerton Municipal Airport
William D. Jones, Director of Safety Helicopter Association Int'l.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