N-96-01

RAIL YARD NOISE MEASUREMENT DATA

II-A-89

APPENDIX B
BACKGROUND DOCUMENT FOR PROPOSED REVISION TO RAIL CARRIER NOISE EMISSION REGULATION

EPA 550/9-79-207

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APPENDIX B TO BACKGROUND DOCUMENT FOR PROPOSED

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EPA 550/9-79-207

NTIS - PB82-145-715

U. S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF NOISE ABATEMENT AND CONTROL
WASHINGTON, D.C. 20460

The rail yard noise data presented in this appendix are derived from three sources. They are:

*Noise measurements of performed by EPA regions as part of an earlier study are contained in a separate volume (Ref. <u>Preliminary Report Interstate Rail Carrier Monitoring by EPA Regions II, IV, VI, and VII</u>). The yard measurement data used from that study include: Denver, Burlington, Centennial, E. Dallas, Tilford and Inman.

Rail Yard Noise Measurements

In order to document the noise exposure in the vicinity of a variety of rail yards, noise measurements were obtained at each of the yards listed in Table 1. The measurements were conducted over a period of one to two days at each of three locations at each yard.

Measurement locations were selected so that the noise of rail yard activities would dominate the noise environment at one or more of the locations for each yard. The remaining locations were selected where the noise of mainline operations, and/or the noise of other noise sources within the community combines with the noise of rail yard activities; the noise measurements at these locations provide information on the difficulty of segregating the noise of rail yard activities from other noise sources at a community measurement location.

Wherever possible, measurement locations were selected to lie on property lines surrounding the rail yards. Site specific conditions, however, often required the location of measurement positions within the property line; such conditions include shielding of major noise sources at the property line, the presence of major non-rail sources at the property line, or local terrain, access, or safety conditions which restrict property line measurements.

All measurements were performed with an automatic monitoring unit, and simultaneously a continuous tracing of the noise level with time was obtained on a graphic level recorder. The instrumentation is illustrated schematically in Figure 1. The signal measured with the monitoring unit was A-weighted and automatically processed to provide the equivalent level and various percentile levels over hourly periods. Each major noise event occurring at a particular location was identified and noted on the level record by an attendant who continuously monitored the recordings.

The measurement results are provided in an attachment to this appendix. For each yard, a general description of the major activities at the yard is provided, as well as a description of the measurement locations selected. A map of the yard indicating the measurement locations is also provided. For each measurement location, the measured noise levels are listed on one or more noise data tabulation forms (one form for each day of measurements). On each form for each hour is listed the equivalent level, the maximum level, and the following percentile levels: L_1, L_{10}, L_{50}, L_{90}, and L_{99}. Also listed are the daytime, nighttime, and day-night sound levels computed from the equivalent levels measured during the appropriate hours of the day (Reference B-2).

TABLE 1

RAIL YARDS INCLUDED IN STUDY

Site No.	Yard	RR	Location
31	Roseville	SP	Roseville, CA
32	Richmond	ATSF	Richmond, CA
33	Barstow	ATSF	Barstow, CA
41	Brosnan	AR	Macon, GA
42	Mays	ICG	Harahan, LA
43	Settegast	MP	Houston, TX
51	Dillard	SR	Savannah, GA
52	Johnston	ICG	Memphis, TN
34	Eureka	MKT	Houston, TX
35	Morman	ATSF	Stockton, CA
36	Balmer	BN	Seattle, WA
37	Enola	Conrail	Enola, PA
38	Allentown	Conrail	Allentown, PA
53	Argentine	ATSF	Argentine, KA
54	Cumberland	CHESSIE	Cumberland, MD
55	Western Ave.	MILW	Chicago, IL
56	Frontier	Conrail	Buffalo, NY
57	Blue Island	RI	Blue Isl, IL
58	Boyles	LN	Tarrant City, AL
59	Crest	MP	N. Little Rock, AR

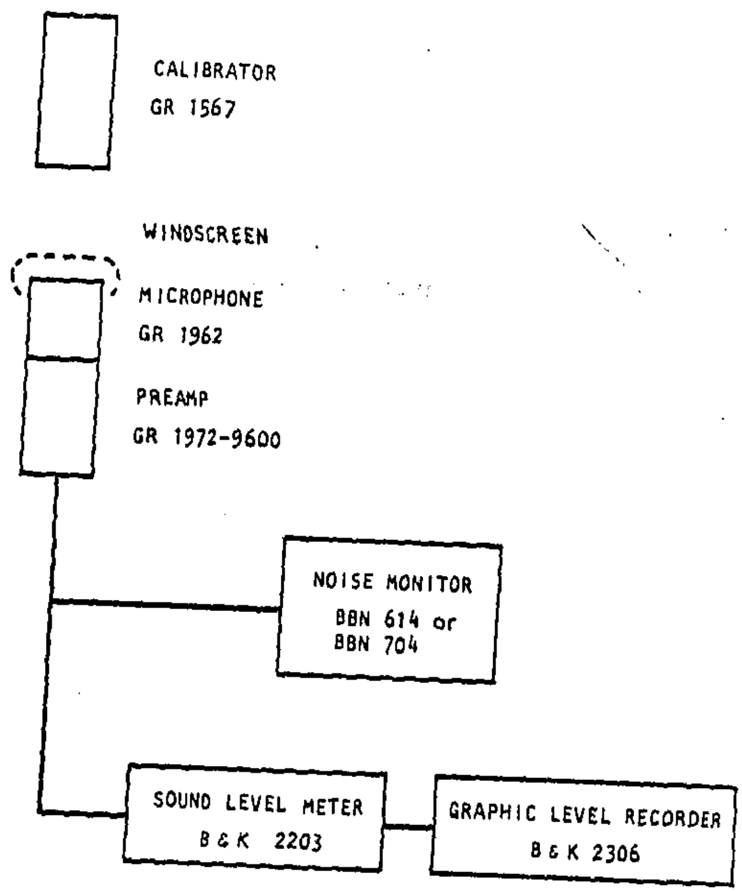


FIGURE 1 Schematic of Instrumentation for Rail Yard Noise Monitoring.

Attachment

Rail Yard Information and Noise Data

Roseville Yard
Southern Pacific Transportation Company
Roseville, California
(Site No. 31)

GENERAL DESCRIPTION

The Roseville Yard is composed of a receiving yard, a hump classification yard and a departure yard, plus locomotive servicing/test areas and repair facilities. A separate Pacific Fruit Express Company Yard is located adjacent to the Roseville Yard, and mainline tracks skirt the north boundaries of the two yards.

Eastbound and westbound trains arrive at the Roseville Yard via the mainline tracks and are switched to the eastward or westward receiving yard. Noise sources in this area are limited to trains moving at slow speed (maximum yard speed is 8mph), either entering or leaving. Much of the time there is little activity with rail cars being stored until ready for classification.

Rail cars are transferred to the classification yard using locomotives to push them over the hump. Approximately 2000 cars/day are currently being humped in each direction (i.e. 4000 cars total). Cars are pushed by locomotives moving at approximately 2mph. At this rate roughly 4 cars/min. can be transferred to the classification yard. The speed of these cars may be controlled first by either of two master retarders, and then by a series of group retarders. All of these retarders are pneumatically activated and manually controlled by yard personnel in the various towers around the hump area. Cars then roll into the bowl area, and are directed to the appropriate tracks via manually activated switches. Cars are assembled into blocks in the bowl area, with a maximum coupling speed of 4 mph. Inert retarders are located at the outbound end of the classification yard. These retarders are always operational and serve to keep cars from leaving this part of the yard without being pulled or pushed by locomotives. Major noise sources in the classification yard include retarders, rail car impacts, and some locomotives.

Blocks of rail cars are transferred to the eastward or westward departure yard where they are assembled into trains and returned to the mainline. Some flat switching does occur in this area. Major noise sources include locomotives, train movement and some car impacts. Much of the time, however, rail cars are idle, being stored until ready for departure.

Yard service and repair facilities include a locomotive servicing area and a rip-track repair facility. Major noise sources in these areas include locomotives under idling, moving or loadtest conditions, bells and various shop noises. Diesel operated refrigeration cars are additional noise sources in various areas of the Pacific Fruit Express and Roseville Yards.

Mainline operations include 2 Amtrak through trains per day plus 6-8 freight trains which bypass the yard. These freight trains do stop at the yard, however.

MEASUREMENT LOCATIONS

Site 31-1

This 48-hour measurement site was located on the yard boundary near the inert retarders. The site was in an open dirt and grass field with direct line-of-sight to the inert retarders and classification yard. The site was shielded from the departure yard and county road by the terrain. Major noise sources at this site included retarders, car impacts and moving cars and locomotives.

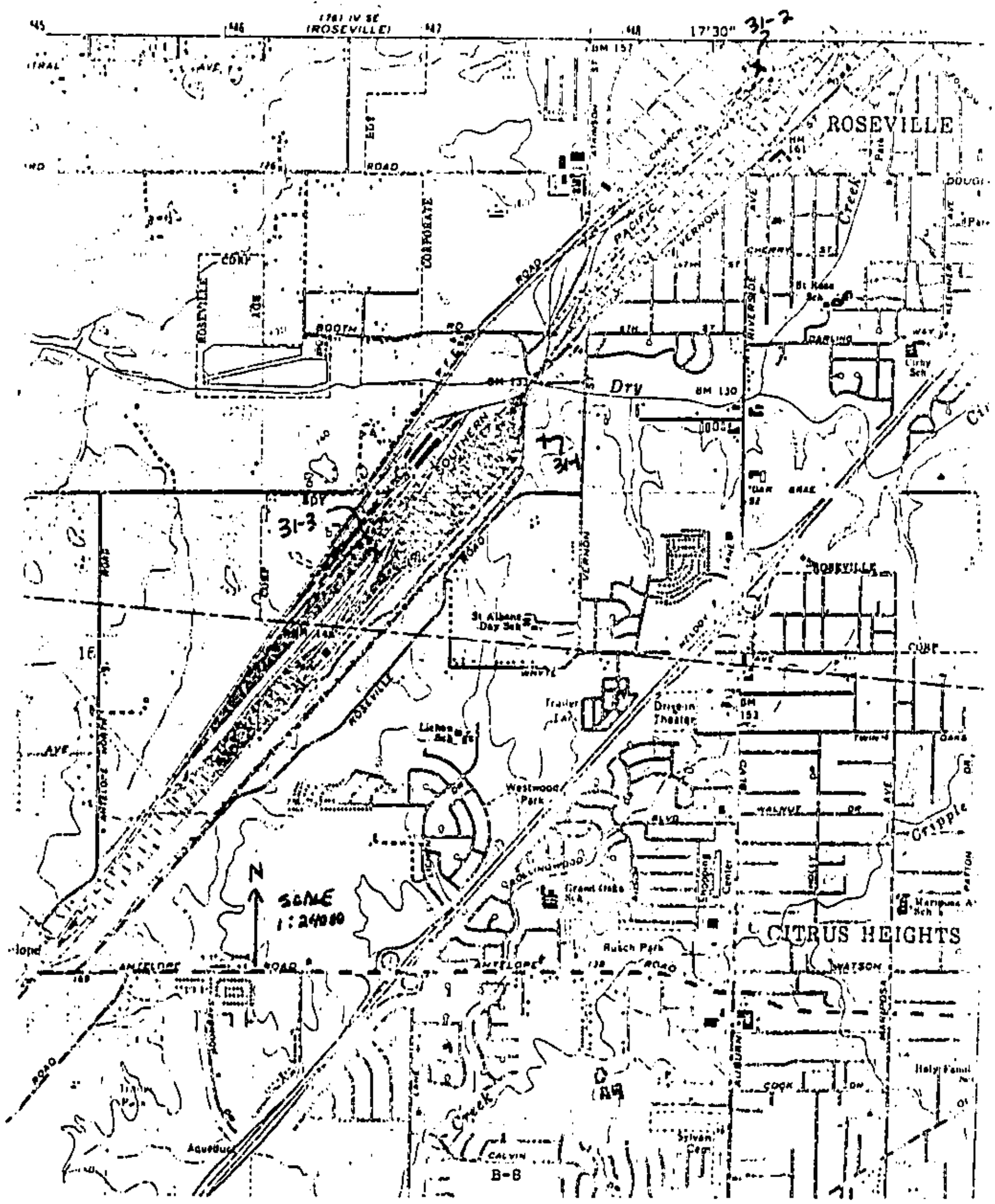
Site 31-2

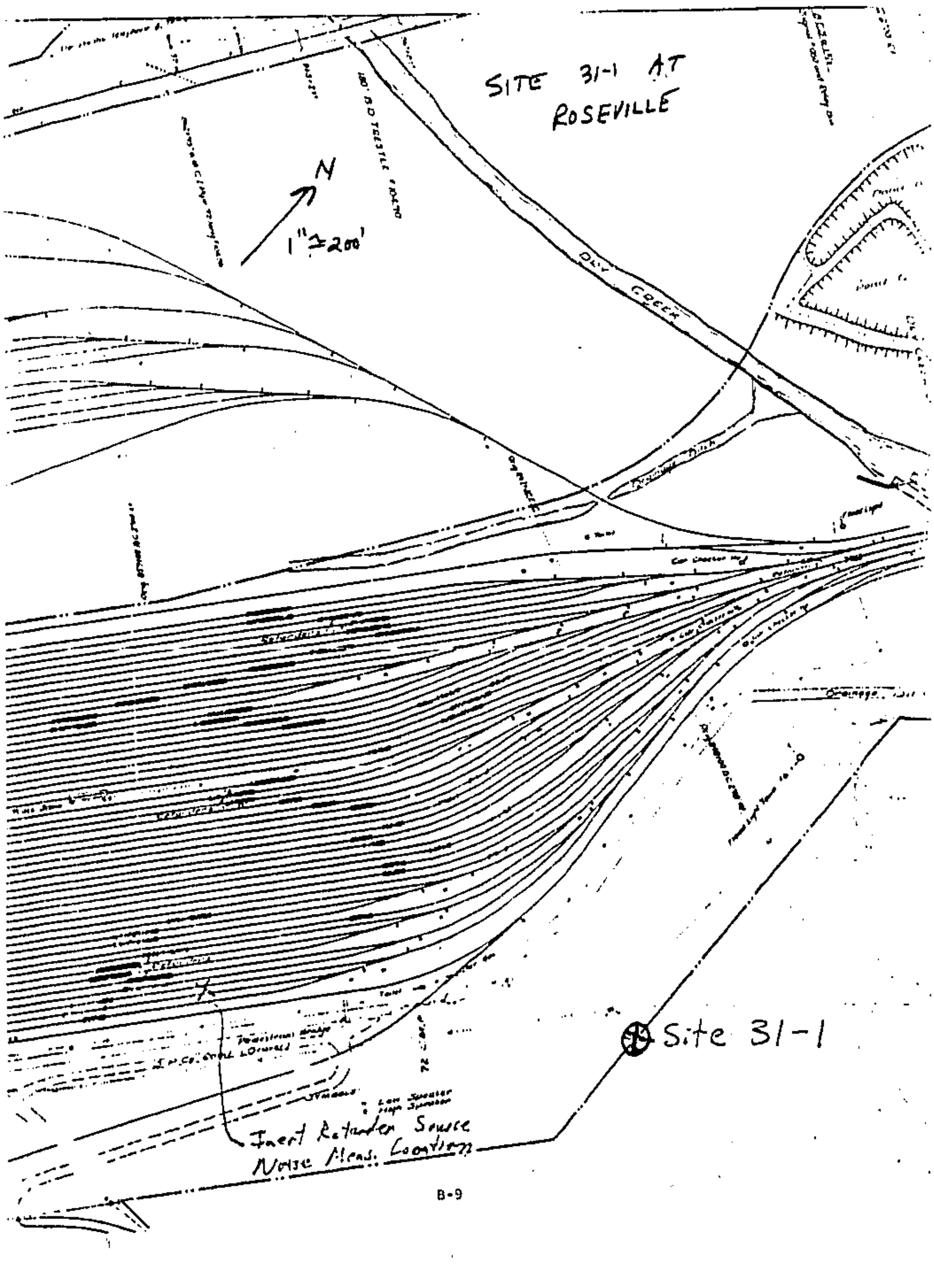
This 24-hour measurement site was located along the Church Street Yard boundary line, at Ash Street. Rail yard noise sources near this site included mainline through trains, idling and moving locomotives, locomotives under load or search tests and various shop noises (i.e. bells, cranes, air exhaust, grinding, hammering, air compressors, and steam venting). In the absence of these noise events, however, Church Street traffic dominated the noise environment at this location. In addition, trains stopped along the mainline tracks sometimes shielded this position from yard operations.

Site 31-3

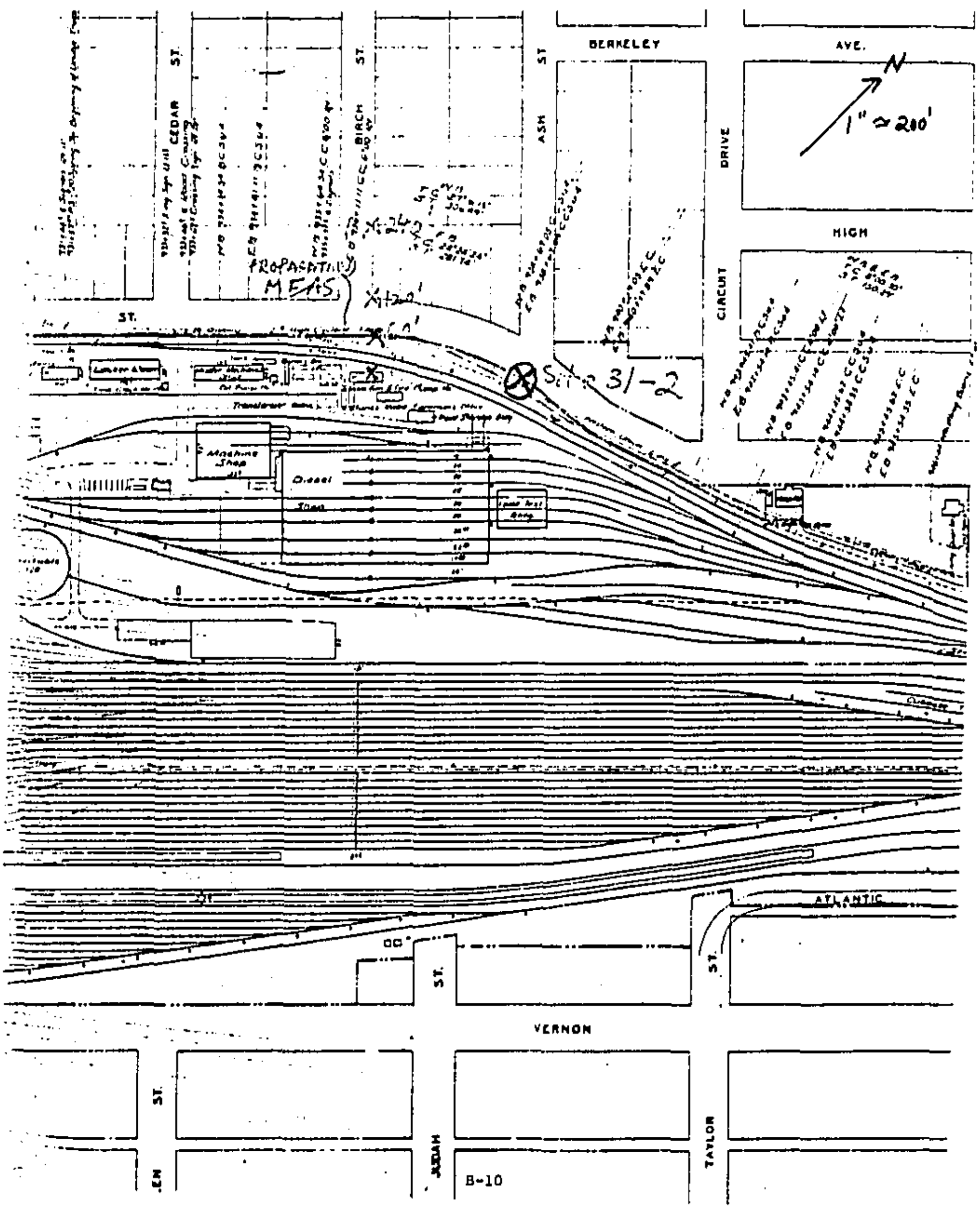
This 24-hour measurement site was located on the boundary between the Southern Pacific and Pacific Fruit Express Yards, within view of the hump. Noise sources at this location included moving cars and locomotives, manual retarders, car impacts and refrigeration cars. Rail cars were parked behind the measurement site for periods of time, shielding the site from Pacific Fruit Express Yard noise.

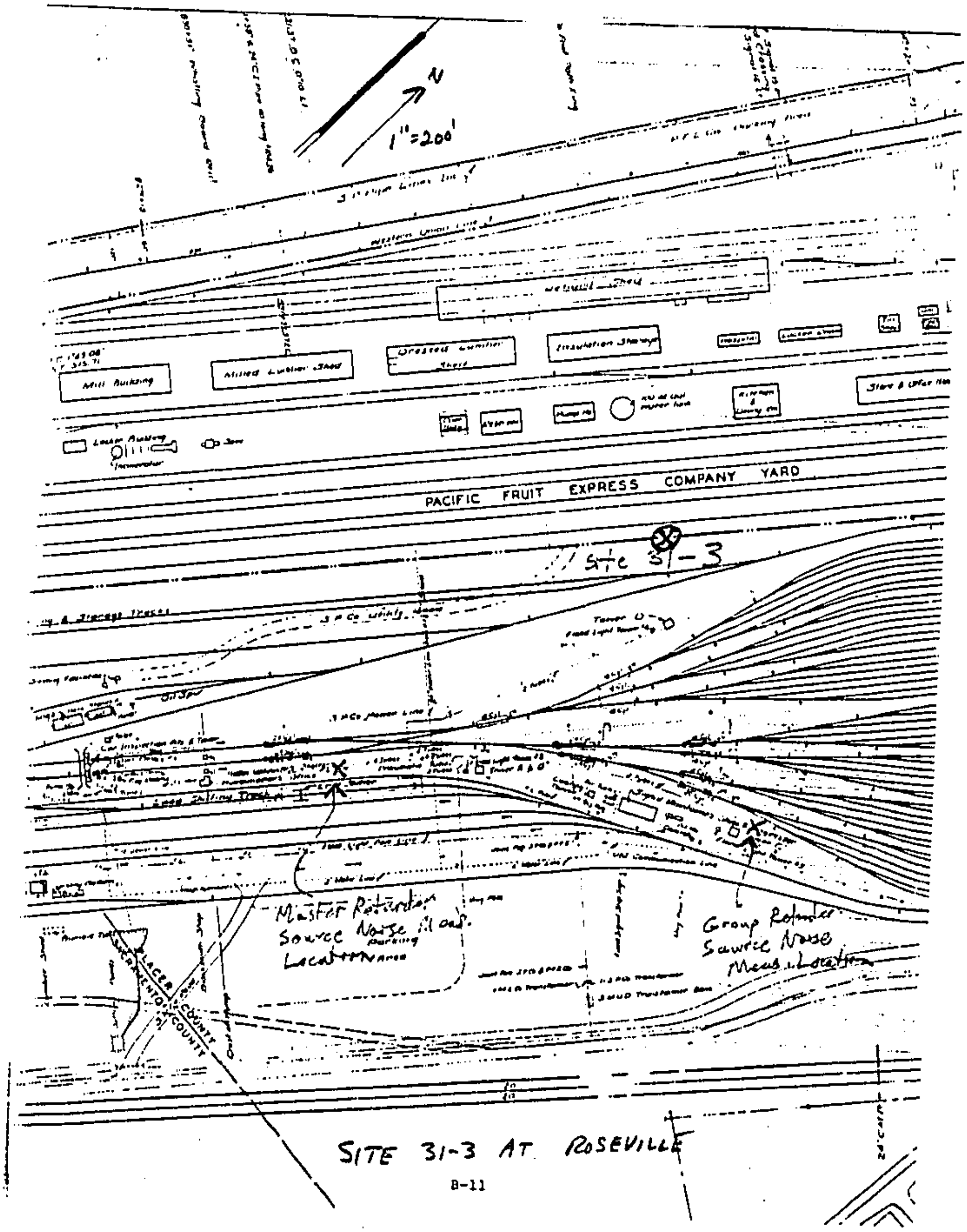
MAP OF ROSEVILLE YARD




SITE 31-1 AT ROSEVILLE
N
1" = 200'
DRY CREEK
Site 31-1
Inert Retarder Source Noise Meas. Location

SITE 31-2 AT ROSEVILLE





SITE 31-3 AT ROSEVILLE

NOISE DATA

YARD: Roseville   LOCATION: 31-1

DATE: 1 February 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10	52.8	78.8	60.1	55.9	50.6	48.0	46.5
10-11	51.0	71.3	59.0	53.5	49.1	47.0	45.7
11-12	57.6	88.8	69.2	56.9	50.4	47.5	45.8
12-13	58.6	91.3	70.9	58.8	51.8	49.0	47.3
13-14	53.2	72.5	63.6	55.3	50.3	47.8	46.3
14-15	55.1	78.8	64.5	57.4	50.7	47.1	45.3
15-16	55.1	77.5	65.0	57.4	51.8	48.1	45.8
16-17	58.7	95.0	63.3	57.6	51.9	48.9	47.2
17-18	55.4	70.0	63.6	59.3	52.3	49.0	46.7
18-19	54.1	75.0	64.1	55.9	50.8	48.1	46.6
19-20	58.6	83.8	71.9	59.5	52.7	48.0	46.3
20-21	52.9	67.5	62.1	56.6	49.3	46.6	45.2
21-22	50.3	66.3	58.4	53.1	48.3	45.7	44.2
22-23	49.0	67.5	55.1	51.8	47.2	44.5	42.8
23-24	54.7	77.5	67.2	55.8	46.9	43.8	41.7

DATE: 2 February 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	53.6	75.0	62.4	56.1	51.1	46.1	42.9
01-02	53.1	83.8	60.4	54.9	49.0	44.4	41.3
02-03	50.3	67.5	59.6	53.2	47.8	42.9	40.4
03-04	57.5	78.8	72.6	55.2	45.4	42.0	40.0
04-05	46.8	67.5	55.3	49.2	44.7	41.9	40.1
05-06	55.7	81.3	66.9	58.1	50.5	44.4	42.2
06-07	53.3	72.5	62.3	56.0	50.5	47.6	45.5
07-08	53.1	66.3	61.2	55.8	51.5	49.0	47.5
08-09	54.0	75.0	63.2	56.9	51.5	48.4	46.7
09-10							
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

L_n: 53.7 dB
L_d: 55.5
L_{dn}: 60.4

NOTE: Levels measured with FAST meter dynamics.

NOISE DATA

YARD: Roseville LOCATION: 31-1

DATE: 2 February 1978 — DATE: 3 February 1978

HOUR OF DAY	2 February 1978: NOISE LEVEL in dBA								3 February 1978: NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}		L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01									51.8	77.5	60.5	53.6	49.2	45.8	44.2
01-02									53.8	76.3	61.3	56.3	51.5	48.0	45.8
02-03									51.1	81.3	57.8	53.3	48.8	45.8	43.9
03-04									54.4	72.5	64.1	57.0	51.4	48.2	46.4
04-05									57.1	85.0	62.4	57.8	51.9	49.0	47.2
05-06									55.6	75.0	64.2	58.4	52.9	49.6	47.6
06-07									58.1	78.8	67.1	59.1	55.9	52.9	51.4
07-08									57.2	73.8	62.4	59.1	56.3	54.4	53.1
08-09									57.8	80.0	67.0	60.0	55.5	52.0	50.3
09-10	58.1	90.0	65.0	58.1	51.1	47.7	46.1	*	59.9	83.8	72.1	60.2	53.6	49.8	46.3
10-11	59.7	78.8	73.3	60.7	53.4	48.1	45.0								
11-12	59.8	83.8	73.0	60.4	52.6	47.7	45.7	*	54.7	75.0	64.2	57.5	51.7	47.1	45.1
12-13	57.5	83.8	68.3	59.8	52.4	48.6	46.5	*	55.8	80.0	66.2	57.9	51.0	47.6	45.4
13-14	55.4	76.3	64.6	58.6	52.0	46.4	42.5								
14-15	52.9	73.8	64.9	55.1	47.8	44.2	42.0								
15-16	54.9	81.3	65.0	56.5	49.1	45.2	42.9								
16-17	57.6	83.8	69.3	57.6	50.5	45.9	43.4								
17-18	54.2	71.3	65.7	56.3	50.1	46.8	45.1								
18-19	54.3	76.3	66.5	55.3	49.6	45.7	43.2								
19-20	56.1	93.8	64.9	57.9	50.8	46.4	44.2								
20-21	54.5	76.3	65.2	57.3	49.7	46.1	44.2								
21-22	53.7	73.8	62.7	56.1	51.1	48.1	46.4								
22-23	55.0	76.3	64.3	57.4	51.4	47.9	46.3								
23-24	51.3	73.8	59.4	53.5	49.3	46.6	45.1								

L_n: 54.9 dB
L_d: 56.8
L_{dn}: 61.6

* These data not included in L_{dn} calculation.

NOTE: Levels measured with FAST meter dynamics.

NOISE DATA

YARD: Roseville LOCATION: 31-2

HOUR OF DAY	DATE: 1 February 1978 — NOISE LEVEL in dBA							DATE: 2 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								63.9	85.0	78.2	63.7	57.1	51.4	50.1
01-02								72.2	97.5	83.1	75.9	55.9	51.5	48.8
02-03								68.0	91.3	82.8	61.6	54.2	50.0	47.7
03-04								70.5	91.3	83.0	73.4	53.8	51.0	49.7
04-05								65.0	96.3	78.9	59.3	51.8	50.0	47.7
05-06								61.1	81.3	73.5	62.6	52.9	48.9	47.5
06-07								61.2	80.0	70.7	63.7	58.0	55.5	52.7
07-08								63.3	85.0	73.5	66.6	58.4	53.6	52.5
08-09								61.8	83.8	71.3	64.9	57.5	53.4	51.5
09-10								62.9	87.5	72.7	65.6	58.7	55.1	53.0
10-11								61.9	83.8	71.0	64.8	58.8	56.5	55.2
11-12	* 63.1	83.8	76.6	64.3	55.6	52.0	50.8	69.1	98.8	80.5	67.0	60.1	56.9	55.4
12-13	64.3	88.8	74.3	65.4	57.4	53.1	51.4							
13-14	66.2	100.0	79.1	67.6	60.8	56.6	54.6							
14-15	67.8	81.3	74.7	71.9	64.4	57.2	54.2							
15-16	70.9	86.3	79.8	74.5	68.2	57.1	54.2							
16-17	64.4	85.0	73.6	68.7	59.1	54.1	52.5							
17-18														
18-19	63.6	87.5	72.2	66.0	59.9	57.6	56.3							
19-20	71.4	106.3	82.8	70.8	58.1	54.6	52.9							
20-21	63.8	85.0	74.0	66.3	59.8	57.7	56.3							
21-22	62.1	80.0	70.4	65.2	59.6	56.8	53.9							
22-23	69.1	88.8	81.5	70.2	58.5	54.5	52.7							
23-24	63.2	87.5	73.2	64.7	58.4	54.1	51.4							

L_n: 67.7 dB
L_d: 66.4
L_{dn}: 73.9

* These data not included in L_{dn} calculation.

NOTE: Levels measured with FAST meter dynamics.

YARD: Roseville LOCATION: 31-3

NOISE LEVEL in dBA

HOUR OF DAY	2 February 1978 L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	3 February 1978 L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								75.0	102.5	89.1	65.8	56.0	50.2	47.4
01-02								78.0	106.3	91.8	76.5	61.4	56.4	53.8
02-03								75.7	103.8	89.2	64.5	57.8	53.1	49.9
03-04								74.4	102.5	86.1	73.2	61.1	54.5	50.9
04-05								69.8	100.0	79.4	69.6	58.5	51.6	47.8
05-06								79.1	103.8	93.6	73.5	56.9	51.6	49.0
06-07								73.9	102.5	87.9	70.0	57.6	52.6	50.2
07-08								74.7	102.5	88.0	69.2	58.9	55.1	53.6
08-09								79.4	101.3	93.6	73.7	60.1	54.2	51.5
09-10								66.2	96.3	77.2	64.5	55.5	50.3	48.5
10-11								68.9	96.3	80.9	68.6	57.3	51.1	47.5
11-12								61.6	92.5	73.9	59.2	51.9	46.3	44.1
12-13								65.1	98.8	74.6	62.7	52.7	48.2	44.9
13-14	74.6	100.0	88.1	73.4	58.4	54.1	51.8							
14-15	60.7	103.8	79.0	64.0	55.5	51.0	47.5							
15-16	79.4	108.8	92.6	73.2	54.3	49.5	47.6							
16-17	79.2	108.8	91.0	74.5	60.2	48.6	45.4							
17-18	72.9	102.5	81.8	63.0	55.3	49.3	46.7							
18-19	75.8	105.0	89.0	69.6	56.7	50.2	45.9							
19-20	75.7	102.5	89.1	73.0	62.1	48.7	46.8							
20-21	69.2	102.5	75.3	65.8	53.5	48.3	50.3							
21-22	67.3	92.5	79.8	68.1	59.5	53.0	49.0							
22-23	76.4	106.3	88.5	72.1	59.4	50.8	48.9							
23-24	75.7	103.8	89.5	70.6	55.7	50.5	46.7							

NOTE: Levels measured with FAST meter dynamics.

L_n: 76.0 dB
L_d: 74.8
L_{dn}: 82.2

Richmond Yard
Atchison, Topeka and Sante Fe Railway Co.
Richmond, California
(Site No. 32)

GENERAL DESCRIPTION

The Richmond Yard assembles trains by flat switching; there are no mainline through trains. In addition to the east and west end switching areas, the yard also includes a diesel locomotive servicing area and mechanical repair shops. A Southern Pacific switch yard and a Standard Oil refinery are adjacent to the Roseville Yard, along the north boundary. Finally, the Yard also includes separate TOFC and rail barge facilities, located 1-2 miles from the yard proper.

The major noise sources in the yard area proper are associated with the flat switching activities. During these operations, locomotives accelerate, pushing a line of cars. The locomotive then decelerates as the end car is manually uncoupled, thus "kicking" the car into an appropriate classification track, determined by manual switching. Thus, noise sources include moving locomotives and rail cars, as well as car impacts.

Mechanical department operations include diesel locomotive servicing and repair shop activities, located north of the switch area. Major noise sources from these areas include moving and idling locomotives, diesel operated refrigeration cars and miscellaneous shop noise.

Activities at the TOFC facility consist of the loading and unloading of trailers and containers on or off of flat cars. Major noise sources are the various mechanical equipment and vehicles associated with the operation. These include 43 street tractors plus additional outside carriers (most are dispatched in the early morning), 7 yard hostling tractors, 2 Drott travel lift cranes and 1 Hyster fork lift. The travel lift cranes are diesel operated and are particularly noisy.

Activities at the barge facility consist of the loading and unloading of rail car barges. The major noise sources at this location are the movement of locomotives and cars; the tug which moves the barge is not very noisy. Current operations at this facility are minimal and infrequent.

MEASUREMENT LOCATIONS

Site 32-1

This 48-hour measurement site was located along the Garrard Boulevard property line boundary, approximately 130 feet northeast of Barret Avenue and 15 feet from the edge of Garrard. Major rail yard noise sources at this location were associated with flat switching (i.e. moving cars, locomotives and car impacts). Traffic noise from Garrard Boulevard was a significant contaminant to noise measurements at this location.

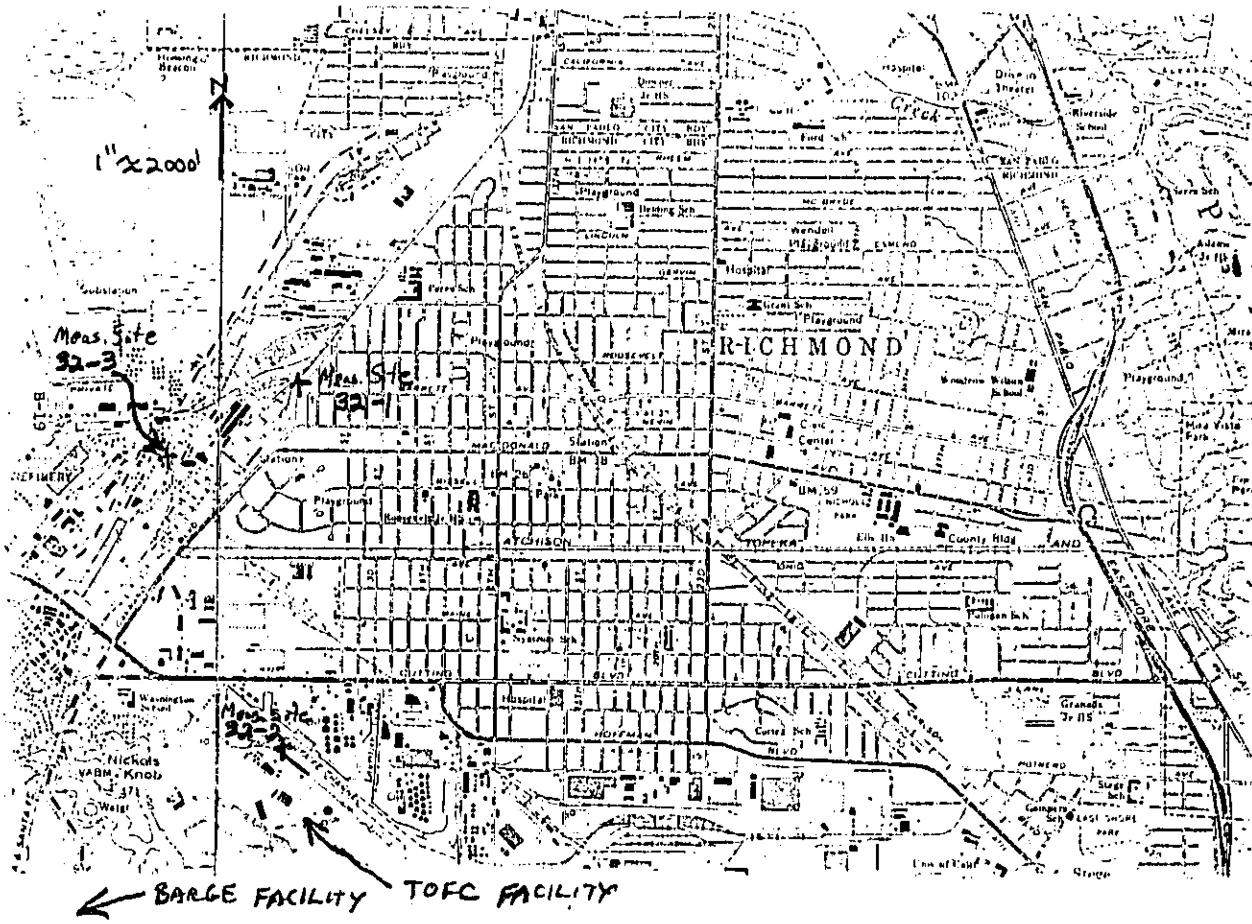
Site 32-2

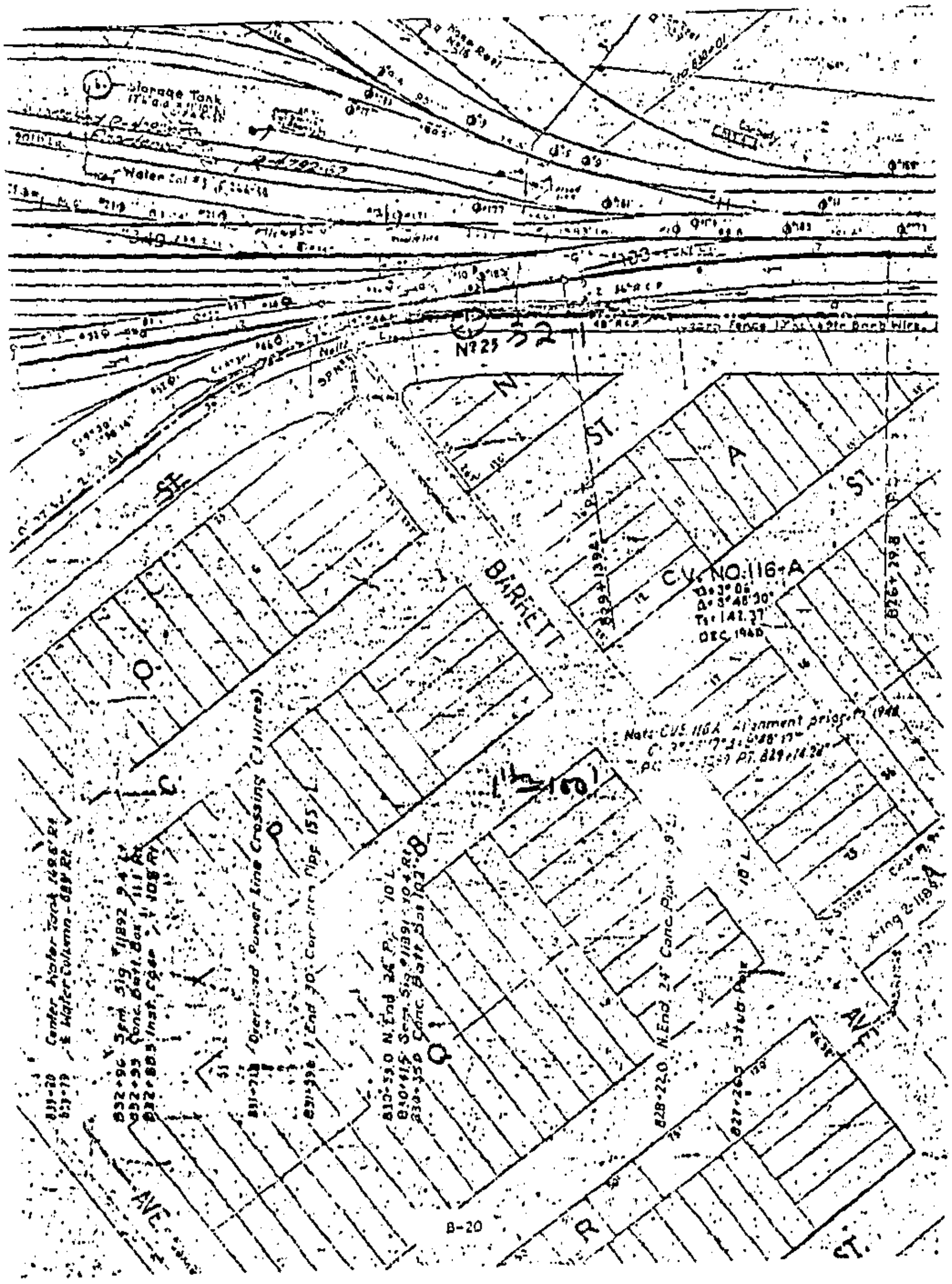
This 24-hour measurement site was located along the Santa Fe Channel at the TOFC facility, approximately 30 feet from the nearest track and 30 feet north of the northernmost switch on that track. Major noise sources at this location include trucks, travel lift cranes and locomotives.

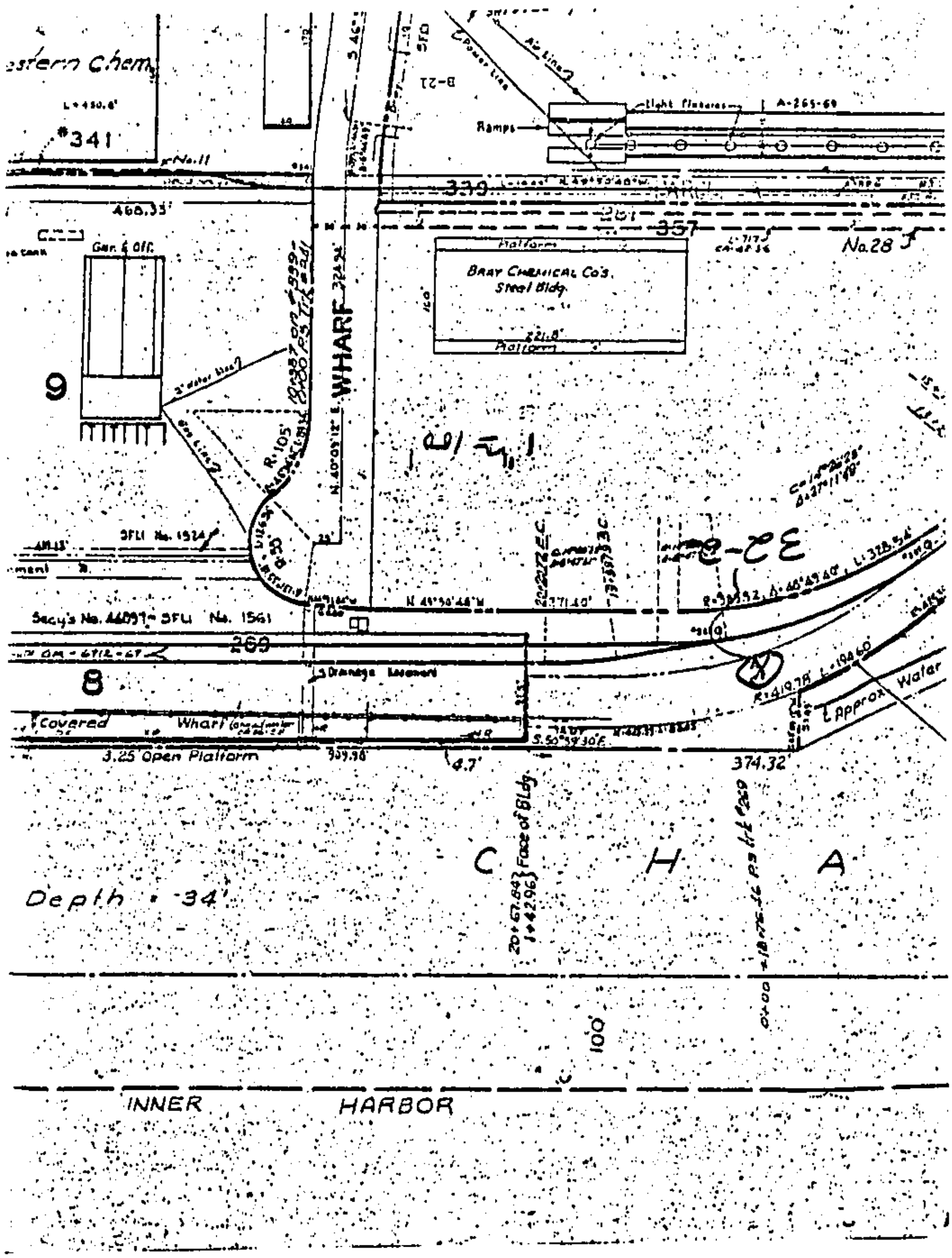
Site 32-3

This 24-hour measurement site was located on the property line boundary separating the Richmond Yard from the Standard Oil facility, approximately 230 feet from the northwest corner of the locomotive roundhouse. Rail yard noise sources at this location included idling and moving locomotives, plus maintenance crew operations. Switching-related noise from the nearby Southern Pacific facility could also be heard at times. Noise measurements were contaminated for certain periods by various refinery noise sources from the Standard Oil facility.

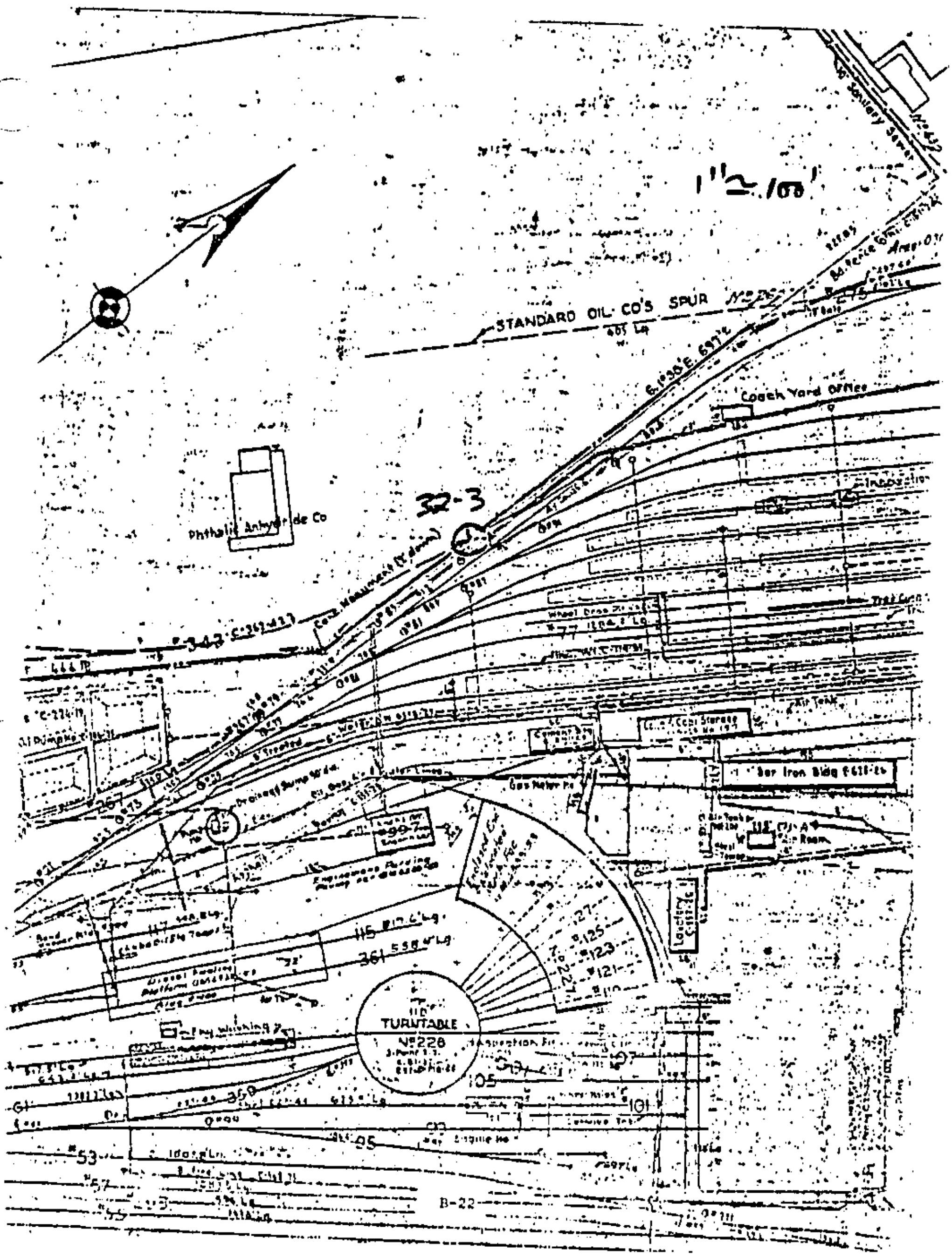
MAP OF RICHMOND RAIL YARD




Storage Tank
Nº 25
BARRETT
ST.
ST.
ST.
AVE.
AVE.
ST.
C.V. NO. 116-A
DEC. 1960
Stub Pole
Overhead Power Line Crossing



Bray Chemical Co's. Steel Bldg.
Platform
WHARF
Ramps
Light Fixtures
Power Line
Air Line
#341
339
357
No. 28
9
8
269
Covered Wharf
3.25 Open Platform
Drainage Easement
Gen. & Off.
466.35'
374.32'
Face of Bldg.
Depth = 34'
C H A
INNER HARBOR
100'



STANDARD OIL CO'S SPUR
Coach Yard Office
32-3
Phthalic Anhydride Co
TURNTABLE
No 228
B-22

NOISE DATA

YARD: RICHMOND LOCATION: 32-1

HOUR OF DAY	DATE: 8 February 1978 — NOISE LEVEL in dBA							DATE: 9 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								67.3	92.5	78.3	70.8	60.7	55.7	52.8
01-02								68.4	93.8	79.6	71.1	58.3	54.5	51.6
02-03								67.5	103.8	79.1	68.9	55.9	53.8	52.1
03-04								68.0	91.3	79.8	71.3	57.0	53.4	50.0
04-05														
05-06								66.7	87.5	78.3	70.6	56.5	53.4	51.4
06-07								69.9	90.0	79.8	73.3	64.8	56.0	54.0
07-08								71.9	92.5	82.0	74.6	69.2	60.6	56.6
08-09								72.0	92.5	83.0	75.6	65.9	57.7	54.7
09-10								69.6	88.8	81.2	72.5	62.2	55.2	52.8
10-11								69.9	100.0	81.9	72.5	61.5	55.0	52.9
11-12	71.4	91.3	82.6	74.7	65.7	57.2	53.8							
12-13	70.7	90.0	83.0	73.4	64.0	55.7	52.6							
13-14	73.1	92.5	84.3	75.9	67.9	61.8	57.6							
14-15	72.8	91.3	83.6	76.0	67.7	59.2	54.1							
15-16	73.4	95.0	83.3	76.5	70.3	60.3	54.4							
16-17	74.5	90.0	83.2	77.3	72.7	66.0	61.0							
17-18	73.1	93.8	82.9	76.1	70.3	63.4	60.1							
18-19	72.0	102.5	82.7	74.7	66.7	57.9	53.5							
19-20	70.7	98.8	81.2	73.7	64.0	54.8	51.8							
20-21	69.9	92.5	80.8	72.8	64.7	58.3	55.1							
21-22	70.8	90.0	81.4	74.5	64.3	56.2	53.9							
22-23	68.8	86.3	79.6	72.7	62.2	55.6	53.6							
23-24	69.2	92.5	80.1	73.1	60.4	54.0	52.5							

NOTE: Levels measured with FAST meter dynamics.

L_n: 67.8 dB
L_d: 72.0
L_{dn}: 75.1

NOISE DATA

YARD: RICHMOND LOCATION: 32-1

HOUR OF DAY	DATE: 9 February 1978 — NOISE LEVEL in dBA							DATE: 10 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								68.5	90.0	79.7	72.3	60.8	54.9	53.1
01-02								69.5	90.0	80.8	72.9	60.6	55.5	53.0
02-03								63.8	85.0	76.6	63.8	56.1	53.8	52.5
03-04								67.6	91.3	78.3	71.5	56.7	53.0	49.6
04-05								69.1	91.3	80.2	71.1	65.5	53.4	51.8
05-06								65.7	86.3	77.6	69.1	58.0	54.0	52.5
06-07								68.8	100.0	78.7	71.9	61.8	55.4	53.2
07-08								71.3	92.5	80.9	73.8	68.0	58.8	55.3
08-09								73.7	98.8	85.7	76.6	67.5	59.1	55.0
09-10								72.9	93.8	84.4	76.3	64.3	56.1	53.9
10-11								69.8	96.3	82.1	71.3	59.6	54.3	52.7
11-12														
12-13	71.7	100.0	82.8	73.4	63.2	53.4	50.0							
13-14	72.1	92.5	83.6	75.0	67.5	56.3	52.5							
14-15	70.5	88.8	82.1	73.3	64.5	55.2	52.4							
15-16	70.5	95.0	81.6	73.5	65.6	55.6	52.1							
16-17	72.8	92.5	82.1	75.9	70.1	61.8	54.8							
17-18	73.1	103.8	82.5	75.5	68.5	60.4	55.0							
18-19	68.9	93.8	78.2	72.2	64.2	59.1	55.1							
19-20	72.6	93.8	84.9	75.1	65.5	56.8	54.7							
20-21	70.4	93.8	80.8	74.1	64.0	57.8	55.7							
21-22	70.1	91.3	79.7	74.3	64.4	57.0	55.1							
22-23	71.3	93.8	83.3	73.0	62.0	55.9	54.1							
23-24	68.9	88.8	80.3	72.0	61.2	55.3	53.8							

NOTE: Levels measured with FAST meter dynamics.

L_n: 68.6 dB
L_d: 71.4
L_{dn}: 75.5

NOISE DATA

YARD: RICHMOND LOCATION: 32-2

HOUR OF DAY	8 February 1978: L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}		9 February 1978: L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01									61.5	78.	74.	63.	57.	48.	46.
01-02									64.5	88.	77.	63.	56.	53.	51.
02-03									62.6	78.	74.	64.	56.	53.	49.
03-04									70.1	79.	78.	76.	63.	54.	48.
04-05									51.0	62	57	53	49	46.	47.
05-06									56.8	70	63	60	54	50	48.
06-07									58.8	82	66	60	54	51	50
07-08									61.5	83	69	63	59	54	51
08-09									69.9	79.	78.	75.	61.	56.	57.
09-10									69.3	78.	77.	75.	60.	55.	52.
10-11	67.5	92.	81.	67.	58.	54.	53.								
11-12	70.3	86.	78.	76.	62.	54.	52.	*	63.1	84.	73.	66.	52.	37.	35.
12-13	58.1	75.	66.	59.	56.	53.	52.	*	57.7	83.	69.	58.	49.	39.	35.
13-14	69.7	79.	77.	74.	64.	59.	57.	*	60.9	83.	72.	63.	50.	39.	35.
14-15	67.3	79.	77.	69.	61.	58.	57.								
15-16	65.4	79.	77.	63.	56.	48.	40.								
16-17															
17-18															
18-19															
19-20	60.5	80.	65.	63.	39.	49.	35.								
20-21	66.0	79.	76.	69.	60.	57.	56.								
21-22	70.5	78.	77.	75.	63.	57.	55.								
22-23	62.6	81.	69.	65.	60.	55.	48.								
23-24	62.0	84.	73.	60.	54	47	45								

L_n: 63.7 dB
L_d: 66.8
L_{dn}: 70.7

* These data not included in L_{dn} calculation.

NOTE: Levels measured with SLOW meter dynamics.

NOISE DATA

YARD: RICHMOND   LOCATION: 32-3

B-26

HOUR OF DAY	DATE: 9 February 1978 — NOISE LEVEL in dBA							DATE: 10 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								60.3	83.	68.	59.	57.	56.	55.
01-02								63.5	87.	71.	65.	59.	57.	56.
02-03								62.4	76.	67.	56.	58.	56.	55.
03-04								61.1	87.	66.	60.	58.	57.	56.
04-05								57.3	72.	64.	58.	56.	54.	54.
05-06								61.1	72.	69.	65.	56.	54.	54.
06-07								61.3	91.	64.	59.	56.	55.	54.
07-08								61.5	85.	70.	62.	58.	56.	55.
08-09								66.3	92.	76.	66.	60.	57.	56.
09-10								70.1	90.	81.	71.	65.	60.	58.
10-11								69.3	87.	78.	72.	65.	57.	54.
11-12								69.3	79.	76.	72.	67.	58.	54.
12-13								78.7	111.	79.	71.	67.	56.	54.
13-14								67.5	83.	76.	71.	63.	58.	56.
14-15	66.3	83.	77.	68.	61.	58.	57.							
15-16	66.1	85.	76.	70.	58.	55.	54.							
16-17	61.3	85.	66.	57.	55.	54.	53.							
17-18	60.9	72.	67.	64.	59.	54.	54.							
18-19	64.8	88.	75.	65.	59.	57.	56.							
19-20	63.9	90.	70.	63.	58.	57.	56.							
20-21	61.8	81.	73.	61.	58.	56.	55.							
21-22	69.0	87.	82.	71.	59.	56.	55.							
22-23	61.6	87.	67.	62.	57.	55.	54.							
23-24	63.5	86.	68.	67.	57.	56.	55.							

NOTE: Levels measured with SLOW meter dynamics.

L_n: 61.7 dB
L_d: 69.7
L_{dn}: 70.5

Barstow Yard
Atchison, Topeka and Sante Fe Railway Co.
Barstow, California
(Site No. 33)

GENERAL DESCRIPTION

The Barstow Yard consists of a 10 track receiving yard, a 48 track classification yard, a 9 track departure yard, a 3 track inspection yard, plus a diesel locomotive servicing area and machanical repair area. There is also a diesel locomotive shop, located offsite. Two mainline through tracks skirt the north boundary of the yard.

Trains enter the receiving tracks from the mainline, and locomotives are used to push the cars over the hump. The locomotives used for this purpose are often connected to a low rectangular car used for extra weight (called a "cow and calf" arrangement). Cars are weighed before crossing the hump, and this information plus speed measurements from track mounted radar units are fed into a computer system. The computer system is used to activate retarders and switches for proper speed control and classification. Thus the system is entirely automated, although there are manual overrides.

Rail cars moving at 9-14mph are first slowed by the master retarder. They then pass through the group retarders at roughly 7-9mph and finally pass through the tangent point retarders at approximately 4mph. Once in the bowl area, the cars couple by impact and are thus assembled into blocks. The far end of the classification yard includes retarders which may be either full open or full closed; these are kept open when blocks of cars are being pulled through to the departure yard and otherwise remain closed to prevent cars from inadvertently rolling out of the bowl area. All retarders are hydraulically or pneumatically operated.

Approximately 1500 cars per day are currently classified, with a through-put of 4000 cars per day. There are also bypass tracks and a "mini-hump" located south of the hump.

The locomotive service area does not contain a load cell; checking is performed only up to the throttle 4 position. The off-site locomotive shop contains 2 load cells; one is manually operated and one is computer controlled.

MEASUREMENT LOCATIONS

Site 33-1

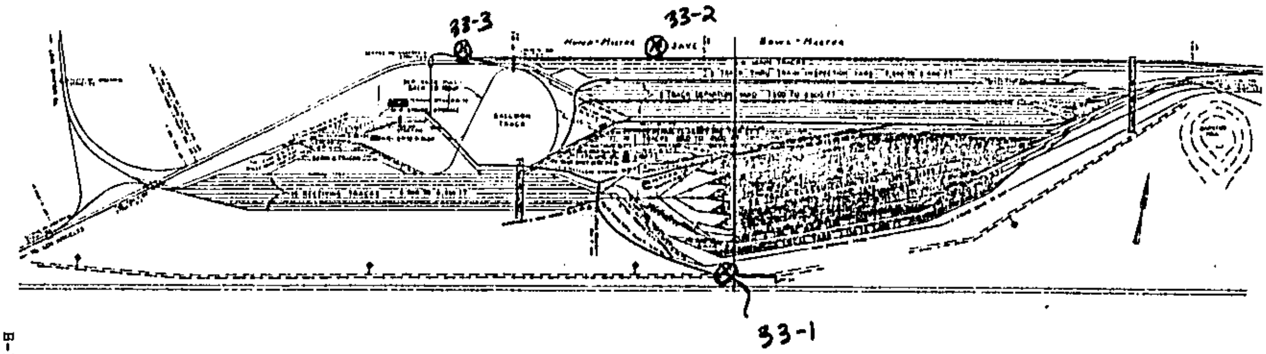
This 48-hour measurement site was located near the group retarders, approximately 70 feet inside of the south yard property line. The site was in an open dirt and grass field with direct line-of-site to the group retarders, tangent point retarders, hump and bowl area. The master retarder, however, was shielded from this location. Major noise sources at this site included retarders, car impacts, rolling cars and locomotives.

Site 33-2

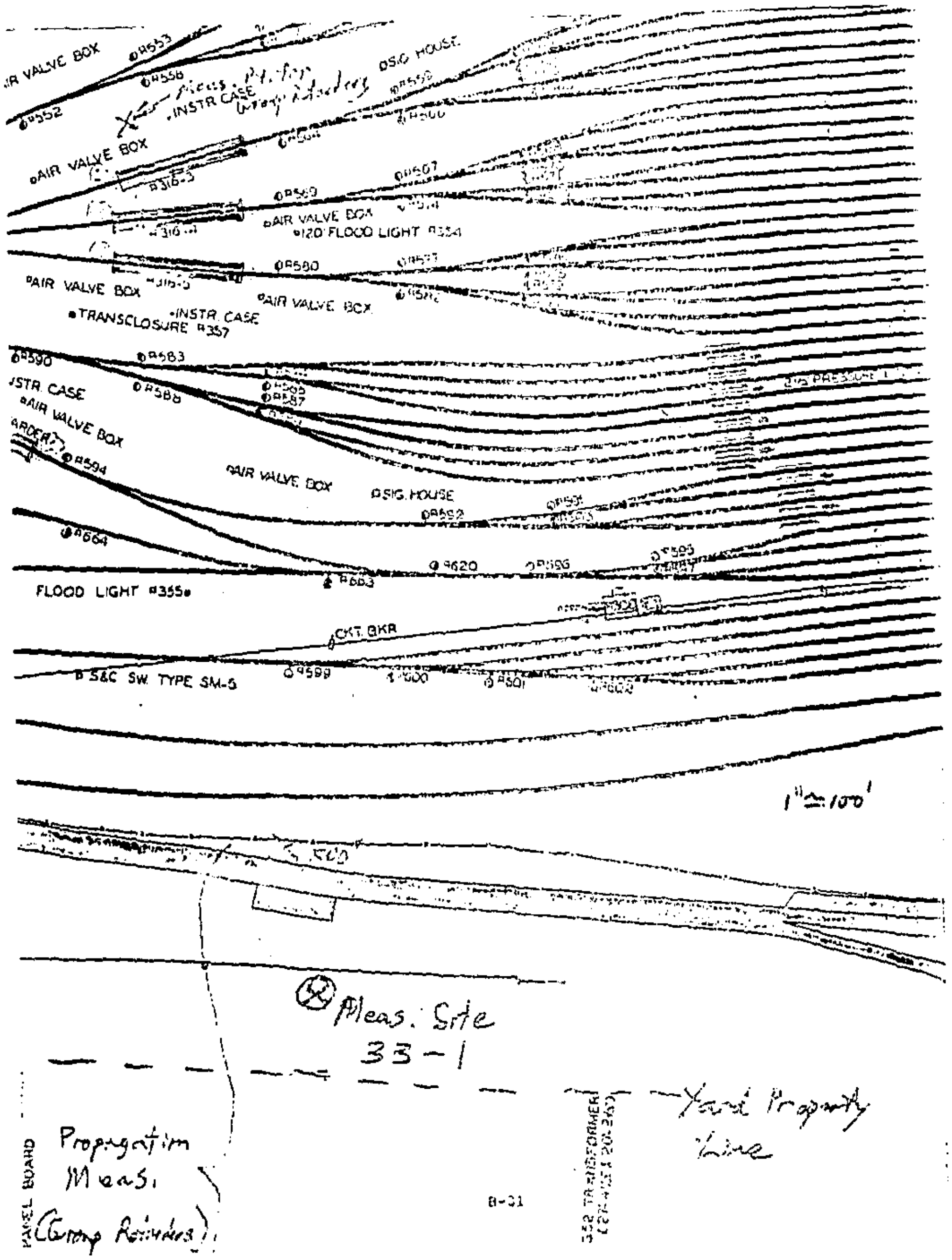
This 24-hour measurement site was located near the hump area, a few hundred feet inside of the north yard boundary and approximately 45 feet north of the nearest mainline track. The microphone was located on top of an earth berm, at a height of approximately 20 feet about the adjacent service road. Major noise sources at this site included retarders, locomotives, refrigeration cars and mainline through trains. Some contamination by road traffic noise was also experienced.

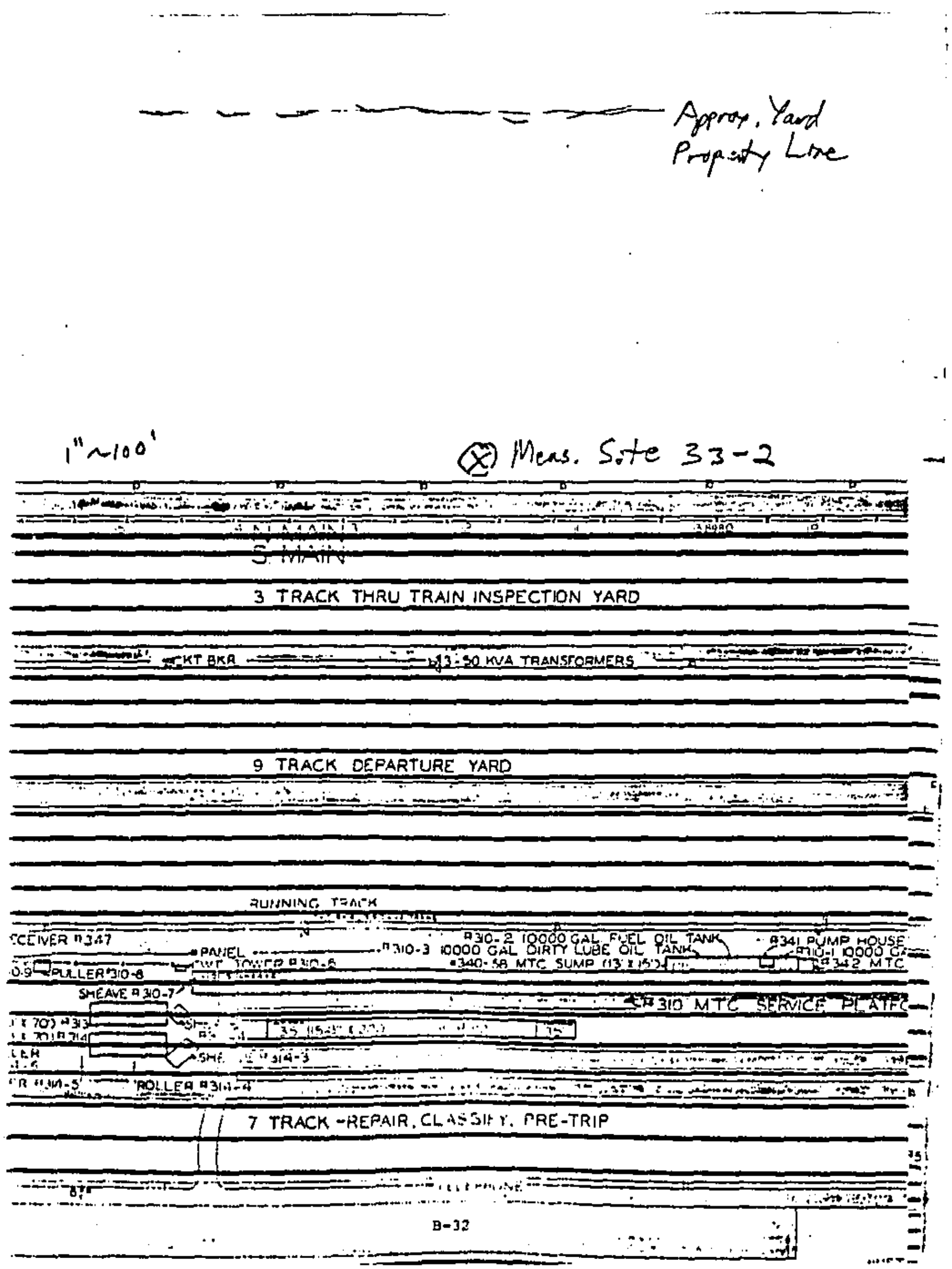
Site 33-3

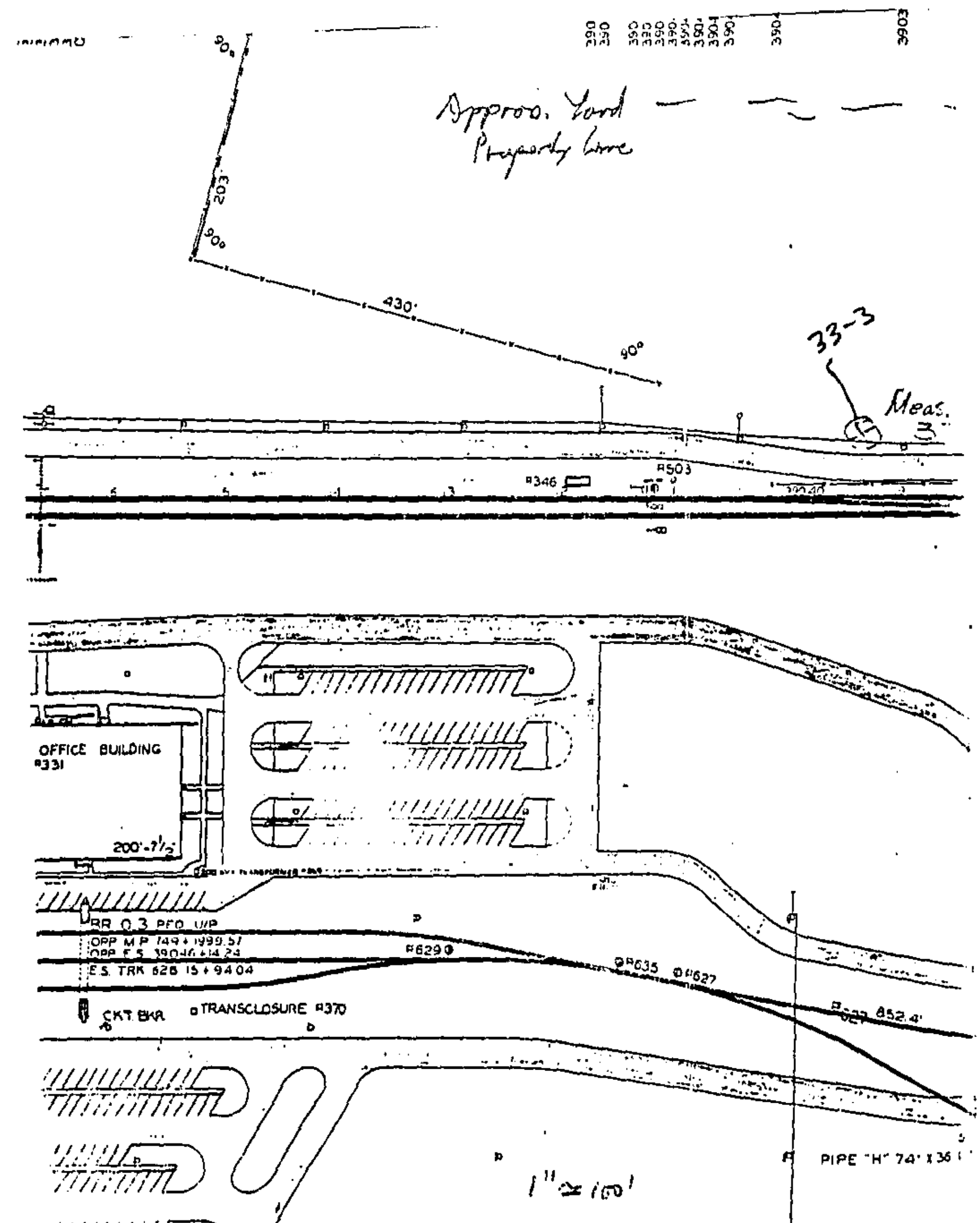
This 24-hour measurement site was located near the engine service area, a few hundred feet inside of the north yard boundary and approximately 55 feet north of the nearest mainline track. The microphone was located on top of an earth berm, at a height of approximately 15 feet about the adjacent service road. Major noise sources at this site included idling and moving locomotives and through trains. Some contamination by road traffic noise was also experienced.



MAP OF BOSTON YARD


AIR VALVE BOX
INSTR CASE
SIG HOUSE
AIR VALVE BOX
AIR VALVE BOX
120' FLOOD LIGHT #354
AIR VALVE BOX
AIR VALVE BOX
TRANSCLOSURE #357
INSTR CASE
INSTR CASE
AIR VALVE BOX
AIR VALVE BOX
SIG HOUSE
FLOOD LIGHT #355
CKT BKR
S&C SW TYPE SM-5
1" ≙ 100'
Meas. Site 33-1
Yard Property Line
Propagation Meas. (Group Recorders)
PANEL BOARD
352 TRANSFORMER


Approx. Yard Property Line
1"~100'
Meas. Site 33-2
S. MAIN
3 TRACK THRU TRAIN INSPECTION YARD
CKT BKR
3-50 KVA TRANSFORMERS
9 TRACK DEPARTURE YARD
RUNNING TRACK
PANEL
SHEAVE #310-7
#341 PUMP HOUSE
#342 MTC
#310 MTC SERVICE
ROLLER
7 TRACK -REPAIR, CLASSIFY, PRE-TRIP
TELEPHONE


Approx. Yard Property Line
203'
430'
90°
33-3
Meas. 3
#346
#503
OFFICE BUILDING #331
200'-7½
RR 0.3 PFD U/P
OPP M.P. 749+1999.57
OPP E.S. 39046+14.24
E.S. TRK 628 15+94.04
#629
#635
#627
852.4'
CKT BKR
TRANSCLOSURE #370
PIPE "H" 74' X 36
1" = 100'

NOISE DATA

YARD: BARSTOW LOCATION: 33-1

HOUR OF DAY	DATE: 16 February 1978 NOISE LEVEL in dBA							DATE: 17 February 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								66.3	92.5	80.4	62.9	54.7	50.1	46.1
01-02								62.9	88.8	76.0	60.7	52.2	47.5	45.3
02-03								62.9	88.8	77.2	58.4	50.5	46.6	45.0
03-04								63.0	91.3	75.8	58.9	54.8	50.6	47.0
04-05								63.1	90.0	75.1	64.3	54.1	49.4	47.6
05-06								67.9	95.0	81.7	62.2	55.5	52.4	50.1
06-07								68.1	95.0	81.5	66.7	60.3	54.4	52.1
07-08								70.0	98.8	82.6	67.4	60.4	57.4	54.1
08-09								66.4	95.0	80.5	62.1	53.4	50.1	47.6
09-10								69.1	96.3	82.7	64.9	51.7	46.9	45.1
10-11								57.4	82.5	68.7	58.8	49.7	46.6	45.1
11-12								62.6	90.0	74.8	60.6	50.1	46.6	44.8
12-13	55.4	81.3	65.5	57.3	50.1	46.8	45.1							
13-14	62.2	90.0	75.3	59.8	51.1	46.4	44.3							
14-15	64.2	88.8	77.0	63.6	53.9	48.0	45.1							
15-16	57.2	75.0	66.7	61.1	52.9	47.6	45.3							
16-17	52.2	72.5	62.1	55.4	48.3	44.9	43.4							
17-18	60.1	88.8	71.7	59.7	51.4	46.8	43.9							
18-19	58.6	85.0	68.5	58.8	52.4	49.2	47.1							
19-20	62.2	91.3	72.3	59.8	55.0	50.4	48.4							
20-21														
21-22	66.9	92.5	80.9	63.8	54.0	50.8	49.0							
22-23	60.9	87.5	71.6	62.9	55.3	51.1	48.8							
23-24	65.9	100.0	74.2	63.2	54.3	51.0	49.2							

NOTE: Levels measured with FAST meter dynamics.

L_n: 65.2 dB
L_d: 64.1
L_{dn}: 71.5

NOISE DATA

YARD: BARSTOW LOCATION: 33-1

DATE: 17 February 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12							
12-13	62.5	90.0	74.9	59.1	49.9	46.8	44.8
13-14	61.8	86.3	76.2	60.8	47.8	44.0	42.5
14-15	60.2	86.3	73.2	59.5	51.3	46.7	44.0
15-16	61.1	88.8	72.4	61.7	52.8	46.8	44.2
16-17	64.7	87.5	78.6	63.2	51.1	45.4	42.9
17-18	66.8	91.3	80.0	63.5	51.9	47.3	45.1
18-19	61.9	87.5	75.2	59.6	53.1	48.3	45.5
19-20	63.4	91.3	75.3	62.2	55.1	49.4	46.0
20-21	63.1	90.0	75.6	61.8	55.8	49.7	46.5
21-22	71.2	96.3	85.5	66.1	51.3	47.7	45.6
22-23	67.3	91.3	80.7	65.8	55.5	51.0	48.2
23-24	57.0	73.8	68.1	59.2	53.7	50.6	48.8

DATE: 18 February 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	66.0	95.0	78.5	61.0	56.0	52.1	49.9
01-02	67.8	95.0	81.0	61.2	53.2	49.5	46.8
02-03	69.5	95.0	83.6	65.1	52.9	49.7	47.7
03-04	71.3	100.0	83.5	61.4	51.0	48.0	46.5
04-05	67.1	93.8	81.3	61.4	52.0	48.1	46.4
05-06	58.7	88.8	70.6	54.8	49.9	47.4	46.3
06-07	70.8	95.0	84.9	67.2	55.1	50.5	48.8
07-08	60.2	95.0	70.3	60.8	53.4	50.4	48.4
08-09	60.8	83.8	72.5	61.6	51.6	48.6	46.9
09-10	60.3	86.3	73.1	60.4	50.4	47.0	45.1
10-11	56.1	77.5	66.3	55.5	50.2	45.5	43.9
11-12	59.4	85.0	67.5	61.6	55.9	53.1	51.4
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

NOTE: Levels measured with FAST meter dynamics.

L_n: 68.0 dB
L_d: 63.9
L_{dn}: 74.0

NOISE DATA

YARD: BARSTOW LOCATION: 33-2

HOUR OF DAY	16 February 1978							17 February 1978						
	NOISE LEVEL in dBA							NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								72.9	98.	82.	72.	56.	53.	52.
01-02								68.4	89.	82.	67.	63.	55.	55.
02-03								72.7	94.	86.	65.	54.	50.	47.
03-04								66.3	93.	68.	59.	49.	46.	45.
04-05								63.1	83.	71.	64.	61.	59.	55.
05-06								61.5	81.	67.	62.	60.	59.	58.
06-07								69.5	90.	84.	67.	60.	53.	51.
07-08								63.9	88.	74.	64.	60.	56.	53.
08-09								67.5	89.	81.	62.	54.	52.	51.
09-10								64.3	87.	76.	63.	51.	47.	46.
10-11								65.2	90.	71.	57.	45.	41.	40.
11-12								54.7	77.	67.	53.	46.	43.	41.
12-13	67.3	92	75	60.	50.	45.	44.							
13-14	67.3	89.	81.	68.	48.	45.	43							
14-15	61.6	85.	73.	65.	47.	42.	39.							
15-16	60.9	81.	74.	61.	46.	43.	41.							
16-17	64.5	86.	80.	55.	45.	42.	40.							
17-18	65.6	87.	77.	62.	50.	47.	45.							
18-19	71.8	98.	85.	63.	56.	50.	49.							
19-20	66.5	84.	78.	68.	62.	58.	55.							
20-21	66.0	96.	74.	67.	57.	55.	52.							
21-22	68.6	88.	82.	67.	58.	54.	51.							
22-23	62.6	81.	76.	63.	54.	52.	51.							
23-24	68.2	91.	80.	60.	54.	52.	51.							

NOTE: Levels measured with SLOW meter dynamics.

L_n: 68.9 dB
L_d: 66.4
L_{dn}: 75.0

YARD: BARSTOW LOCATION: 33-3

HOUR OF DAY	DATE: 17 February 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	DATE: 18 February 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								76.6	97.	88.	77.	62.	57.	54.
01-02								74.2	93.	88.	70.	56.	53.	52.
02-03								70.8	93.	84.	63.	58.	55.	52.
03-04								66.0	96.	68.	60.	57.	56.	53.
04-05								70.6	94.	81.	66.	57.	54.	52.
05-06								64.8	83.	76.	65.	60.	55.	51.
06-07								73.1	96.	87.	70.	57.	52.	51.
07-08								60.9	84.	70.	62.	57.	52.	51.
08-09								73.3	96.	86.	70.	57.	50.	49.
09-10								72.7						
10-11														
11-12														
12-13	57.3	78.	69.	56.	50.	47.	45.							
13-14	68.8	88.	82.	70.	52.	48.	46.							
14-15	75.7	96.	90.	68.	54.	48.	45.							
15-16	69.3	96.	82.	61.	53.	48.	45.							
16-17	60.5	84.	69.	61.	56.	52.	51.							
17-18	73.5	96.	86.	68.	61.	57.	53.							
18-19	70.3	89.	81.	74.	54.	51.	49.							
19-20	73.3	94.	34.	71.	59.	56.	54.							
20-21	60.7	79.	68.	62.	57.	54.	53.							
21-22	60.7	78.	69.	62.	57.	53.	52.							
22-23	64.6	84.	72.	66.	61.	59.	58.							
23-24	69.7	88.	83.	65.	61.	39.	57.							

NOTE: Levels measured with SLOW meter dynamics.

L_n: 71.8 dB
L_d: 70.1
L_{dn}: 78.0

Brosnan Yard
Southern Railway System
Macon, Georgia
(Site No. 41)

GENERAL DESCRIPTION

The Brosnan Yard is large yard on the southern outskirts of Macon, Georgia. The yard is built in the middle of a swamp and must be continually pumped dry. The surrounding area is tree-covered swamp and is unpopulated. The nearest industrial site is a paper mill several miles south of the yard.

Switching operations at the Brosnan Yard are as follows. Incoming trains arrive on the mainlines at the east and west boundries of the yard and are stored in the receiving area. The cars are hump-switched into the large classification yards. The cars are brought over the crest of the hump at about 4mph. The master and group retarders are computer controlled. Cuts of cars are assembled into trains in the forwarding area. Completed trains then leave the yard on the main lines. There are no through trains.

A very small TOFC operation is carried out at the extreme north end of the yard.

No diesel repairs are made at this yard. A large fueling station is located on the southeast side of the yard. Light repairs are made to freight cars on the service track. Approximately 20 hopper car and 50 box cars are washed at the cleaning station. Here the hopper cars are emptied by use of a vibrator. The inside of the car is washed by a water spray tower.

MEASUREMENT LOCATIONS

Site 41-1

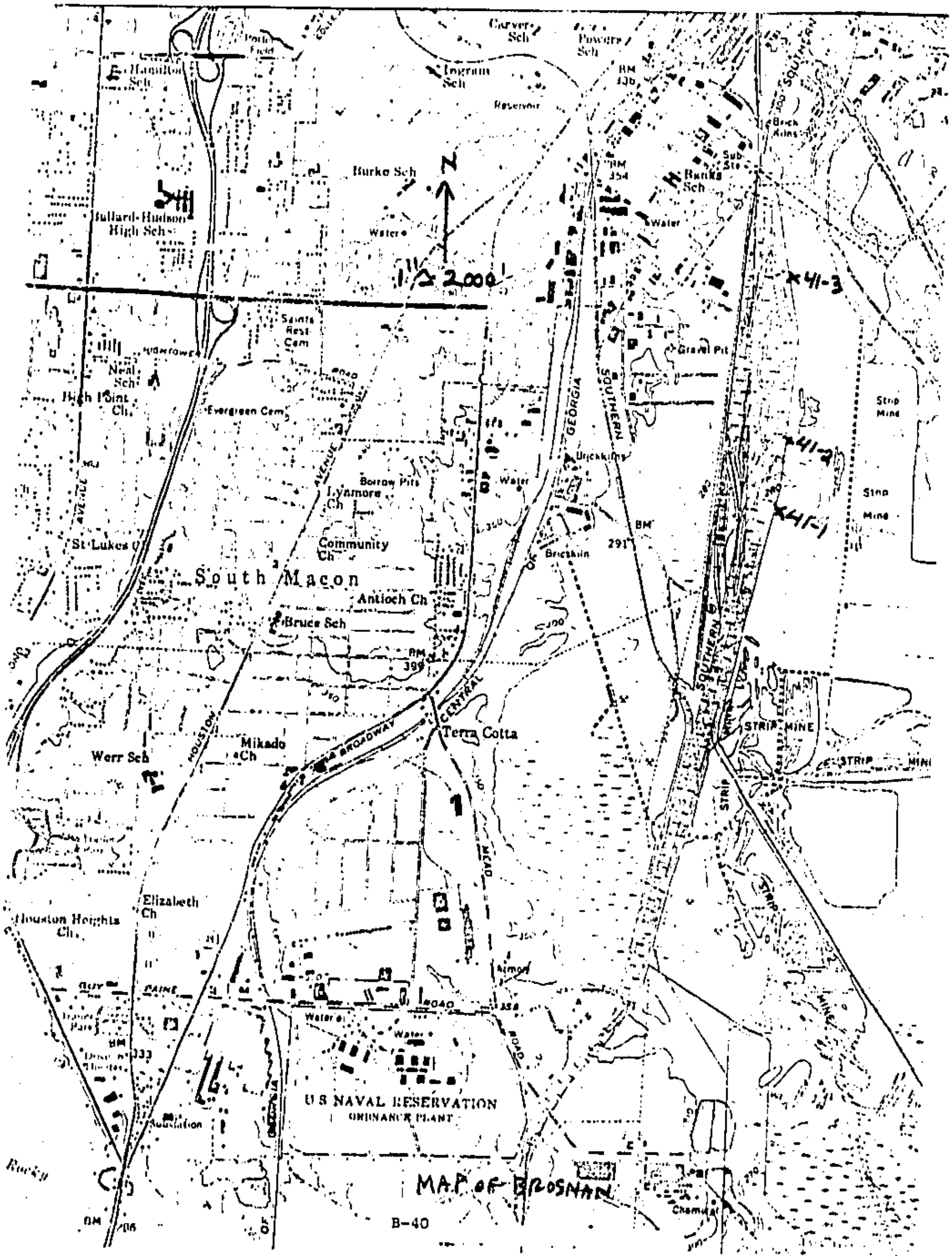
This 48-hour site was located near the yard boundary east of the main retarder. Prime noise sources at this location were the main and group retarders, switching impacts, train movements in the forwarding area, and braking squeals.

Site 41-2

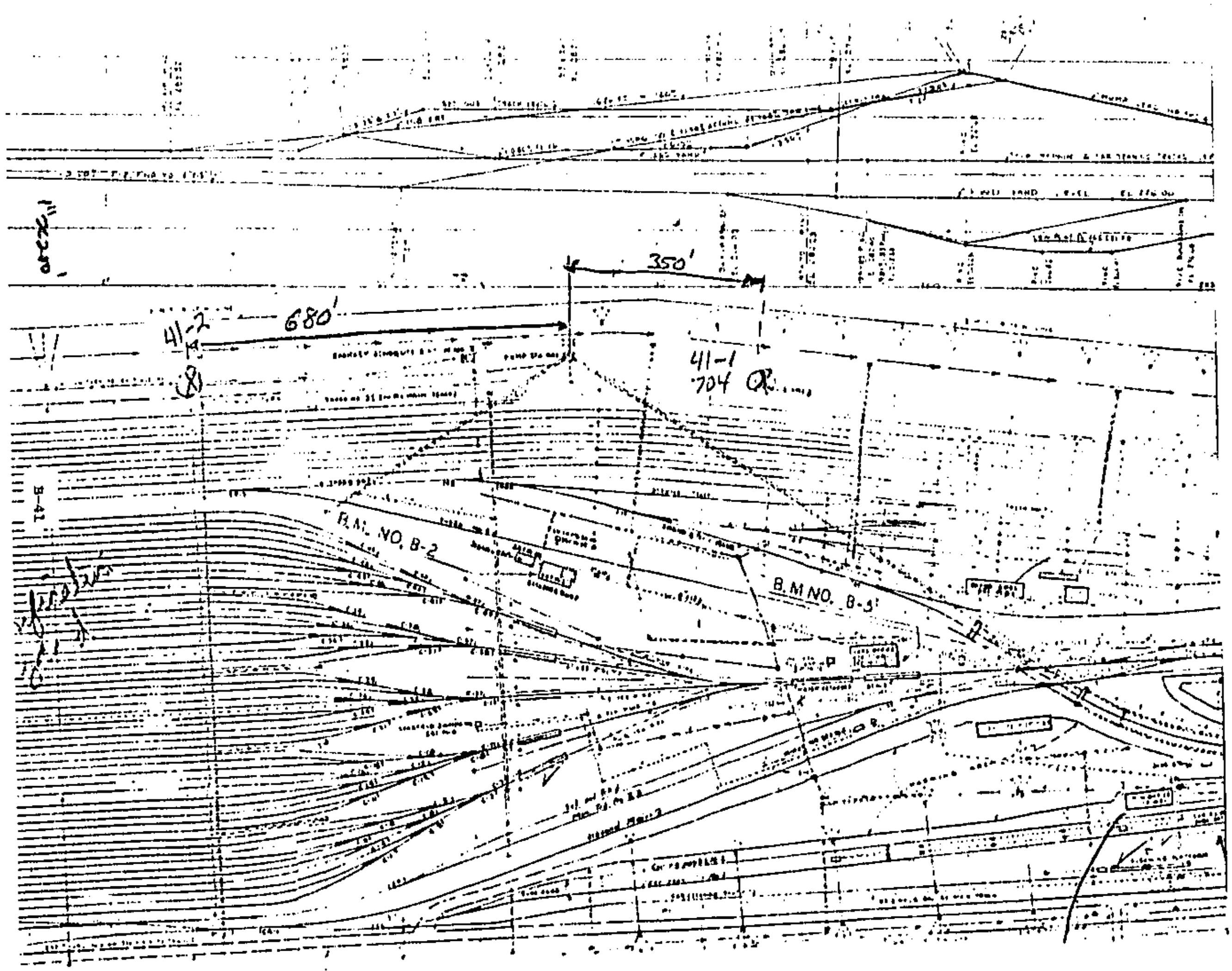
This 24-hour site was located on the east yard boundary across from the diesel fueling track. Prime noise sources for this location were idling diesels, diesel movements, and train movements in the forwarding area.

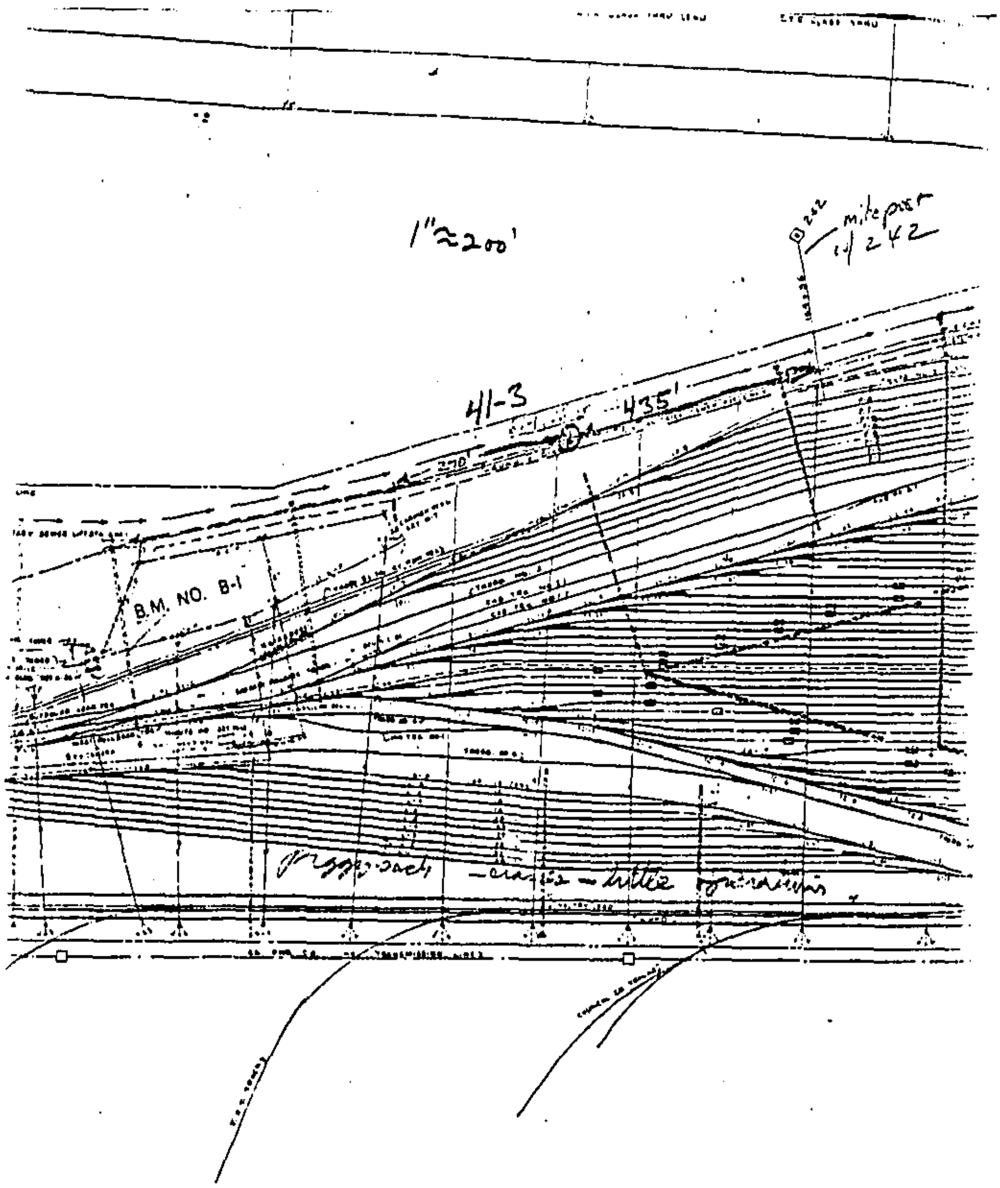
Site 41-3

This 24-hour site was located at the east yard boundary toward the north end of the yard. Prime noise sources for this location were train movements in the forwarding area, brake squeals, the inert retarders, and switching impacts.



MAP OF BROSNAN


350'
41-2
680'
41-1
704
B.M. NO. B-2
B.M NO. B-3


1" ≈ 200'
41-3
270'
435'
B.M. NO. B-I

NOISE DATA

YARD: BROSNAN   LOCATION: 41-1

HOUR OF DAY	DATE: 2 February 1978 — NOISE LEVEL in dBA							DATE: 3 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								61.0	91.3	71.7	62.1	56.9	53.9	52.4
01-02								61.9	85.0	70.8	65.2	59.3	54.7	52.8
02-03								58.4	87.5	66.7	60.5	55.4	51.8	50.1
03-04								56.0	75.0	66.2	58.3	53.2	50.9	49.3
04-05								53.0	81.3	58.8	54.7	51.6	49.6	48.6
05-06								52.8	73.8	57.4	54.8	52.0	50.1	48.3
06-07								54.1	75.0	62.9	55.9	52.0	50.0	48.8
07-08								54.8	77.5	64.2	55.6	51.5	49.0	47.6
08-09														
09-10	60.9	80.0	70.8	62.7	56.0	55.8	54.5							
10-11	58.2	83.8	66.5	59.4	56.1	54.4	53.6							
11-12	59.5	87.5	68.8	61.3	56.0	52.2	50.4							
12-13	60.7	83.8	69.4	63.3	57.7	53.9	51.8							
13-14	64.7	91.3	77.7	62.0	57.3	55.0	53.8							
14-15	64.0	92.5	75.6	63.9	56.5	51.2	49.6							
15-16	62.5	85.0	75.4	62.9	55.0	51.3	48.8							
16-17	62.4	85.0	74.5	64.3	56.8	52.7	50.5							
17-18	62.0	90.0	72.2	64.3	57.4	54.2	51.9							
18-19	63.9	91.3	75.3	63.1	58.0	54.6	51.7							
19-20	60.7	87.5	66.7	61.4	58.1	54.8	52.6							
20-21														
21-22	63.0	90.0	73.5	64.2	60.1	57.5	55.5							
22-23	61.3	82.5	68.6	62.9	59.9	56.6	53.9							
23-24	62.0	86.3	72.3	63.0	59.3	54.8	52.6							

NOTE: Levels measured with FAST meter dynamics.

L_n: 59.2 dB
L_d: 61.4
L_{dn}: 66.0

YARD: BROSNAN LOCATION: 41-1

HOUR OF DAY	DATE: 3 February 1978 — NOISE LEVEL in dBA							DATE: 4 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								57.0	87.5	64.5	56.4	52.0	48.9	46.3
01-02								58.7	83.8	68.0	59.8	55.3	52.5	50.7
02-03								58.6	82.5	67.3	60.6	55.2	51.3	48.0
03-04								56.6	83.8	65.3	58.1	52.1	48.8	46.8
04-05								60.1	98.8	66.8	58.7	53.7	50.5	48.9
05-06								50.9	75.0	60.6	52.1	48.0	44.7	43.0
06-07								53.0	80.0	61.9	54.7	49.8	47.0	45.3
07-08								52.3	70.0	62.8	54.1	49.3	47.0	45.9
08-09								55.3	78.8	67.2	55.0	49.4	46.9	45.5
09-10	52.5	67.5	57.1	54.5	51.8	49.9	48.8	* 51.3	75.0	61.5	52.2	48.7	46.0	44.8
10-11	53.9	77.5	62.7	55.1	51.4	49.0	47.5	* 51.7	73.8	62.0	52.2	47.9	45.1	43.8
11-12	64.4	92.5	72.9	62.0	52.6	48.9	47.1							
12-13	56.5	83.8	65.7	57.5	53.1	50.4	48.9							
13-14	55.1	80.0	63.8	55.8	52.8	50.5	49.0							
14-15	62.5	85.0	77.1	60.9	54.1	51.3	49.2							
15-16	60.0	88.8	68.2	59.7	55.1	51.5	50.1							
16-17	60.4	83.8	71.1	60.7	58.1	55.5	54.1							
17-18	59.1	82.5	69.9	58.7	56.4	55.1	54.0							
18-19	60.2	86.3	69.6	60.8	57.0	55.4	54.4							
19-20	56.9	81.3	64.7	58.7	54.2	51.6	50.1							
20-21	61.8	85.0	75.2	60.0	55.2	51.4	49.7							
21-22														
22-23	56.5	81.3	66.0	58.6	53.4	49.2	47.2							
23-24	59.2	85.0	72.4	57.1	51.9	49.3	47.8							

L_n: 57.5 dB
L_d: 59.1
L_{dn}: 64.2

* These data not included in L_{dn} calculation.

NOTE: Levels measured with FAST meter dynamics.

NOISE DATA

YARD: BROSNAN LOCATION: 41-2

DATE: 2 February 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12	49.3	68.	60.	51.	45.	40.	39.
12-13	48.1	66.	59.	49.	44.	41.	39.
13-14	60.9	84.	72.	52.	45.	42.	41.
14-15	52.8	72.	65.	54.	45.	43.	41.
15-16	51.9	69.	63.	53.	46.	42.	41.
16-17	50.0	68.	62.	52.	44.	41.	39.
17-18	52.5	73.	65.	52.	45.	38.	36.
18-19	57.9	78.	70.	57.	48.	45.	43.
19-20	51.0	71.	60.	51.	48.	45.	44.
20-21	55.6	76.	66.	57.	50.	48.	46.
21-22	56.0	76.	66.	57.	49.	45.	43.
22-23	52.8	72.	63.	54.	49.	47.	45.
23-24	51.0	71.	61.	52.	47.	43.	42.

DATE: 3 February 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	54.1	74.	65.	54.	49.	46.	44.
01-02	52.6	69.	61.	56.	49.	45.	43.
02-03	59.6	86.	67.	60.	48.	44.	42.
03-04	48.3	67.	59.	43.	44.	42.	41.
04-05	47.8	70.	56.	49.	42.	40.	38.
05-06	44.4	65.	54.	45.	41.	38.	37.
06-07	50.0	76.	58.	51.	47.	39.	38.
07-08	48.9	69.	58.	50.	44.	42.	40.
08-09	53.2	71.	66.	52.	46.	44.	43.
09-10	50.6	67.	61.	52.	46.	44.	43.
10-11	49.6	69.	61.	49.	45.	43.	42.
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

L_n: 53.3 dB
L_d: 54.3
L_{dn}: 59.9

NOTE: Levels measured with SLOW meter dynamics.

NOISE DATA

YARD: BROSNAN LOCATION: 41-3

HOUR OF DAY	DATE: 3 February 1978 — NOISE LEVEL in dBA							DATE: 4 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								70.1	90.	84.	68.	57.	50.	47.
01-02								67.5	88.	77.	69.	59.	51.	43.
02-03								66.5	89.	77.	68.	59.	45.	42.
03-04								66.7	84.	77.	69.	60.	48.	42.
04-05								73.1	92.	85.	75.	60.	49.	42.
05-06								69.0	91.	83.	64.	52.	44.	39.
06-07								63.7	85.	77.	62.	52.	46.	43.
07-08								66.5	94.	76.	68.	59.	50.	48.
08-09								66.7	90.	74.	70.	60.	52.	48.
09-10								65.2	82.	80.	64.	51.	42.	39.
10-11								61.3	81.	71.	65.	56.	45.	39.
11-12 *	71.0	86.	79.	75.	61.	50.	46.	63.0	78.	73.	66.	56.	45.	42.
12-13	66.3	83.	79.	67.	54.	46.	44.							
13-14	66.7	90.	78.	69.	56.	49.	46.							
14-15	68.0	90.	81.	69.	58.	48.	45.							
15-16	67.1	83.	79.	70.	60.	49.	47.							
16-17	72.1	91.	84.	73.	62.	52.	43.							
17-18	65.2	85.	76.	67.	57.	45.	41.							
18-19	67.1	88.	78.	68.	59.	51.	47.							
19-20	66.9	87.	79.	70.	57.	46.	44.							
20-21	67.8	90.	78.	69.	59.	50.	48.							
21-22	69.9	96.	81.	51.	57.	49.	44.							
22-23	67.1	87.	78.	71.	56.	49.	42.							
23-24	67.8	90.	81.	67.	56.	46.	44.							

L_n: 68.7 dB
L_d: 67.4
L_{dn}: 74.9

* These data not included in L_{dn} calculation.

NOTE: Levels measured with SLOW meter dynamics.

Mays Yard
Illinois Central Gulf Railroad
Harahan, Louisiana
(Site No. 42)

GENREAL DESCRIPTION

The Mays Yard is a medium-sized flat yard located west of New Orleans. Highways are located at the west and south boundaries of the yard. The land surrounding the yard is tree-covered and used for light commercial and industrial purposes. Several residences are located within about 200 feet of the tracks.

Switching operations at the Mays Yard are as follows. Incoming trains arrive on the mainlines at the north side of the yard and are stored on the north side of the switchyard. The main switching operation is performed from the west side of the yard using two switch engines. Additional switching is performed on the east side of the yard. Switching is accomplished at a nominal speed of 4mph. Outgoing trains are assembled and exit the yard at either the east or west end of the yard. No freight trains pass through the yard without stopping. Two Amtrak passenger trains pass through the yard per day. These trains travel at high speed along the main lines. Some small cuts of freight cars are delivered to local industrial plants by use of the track leaving the yard to the south.

No TOFC/COFC operations are performed at this yard. (The designation of the map is obsoleted).

Repair operations are carried out at two locations. Locomotives are serviced and repaired at the diesel shop on the south side of the yard. Full throttle load tests are carried out south of the diesel shop. The fueling track is also south of the terminal. Light car repairs are made along a service track at the south side of the yard, east of the diesel terminal.

MEASUREMENT LOCATIONS

Site 42-1

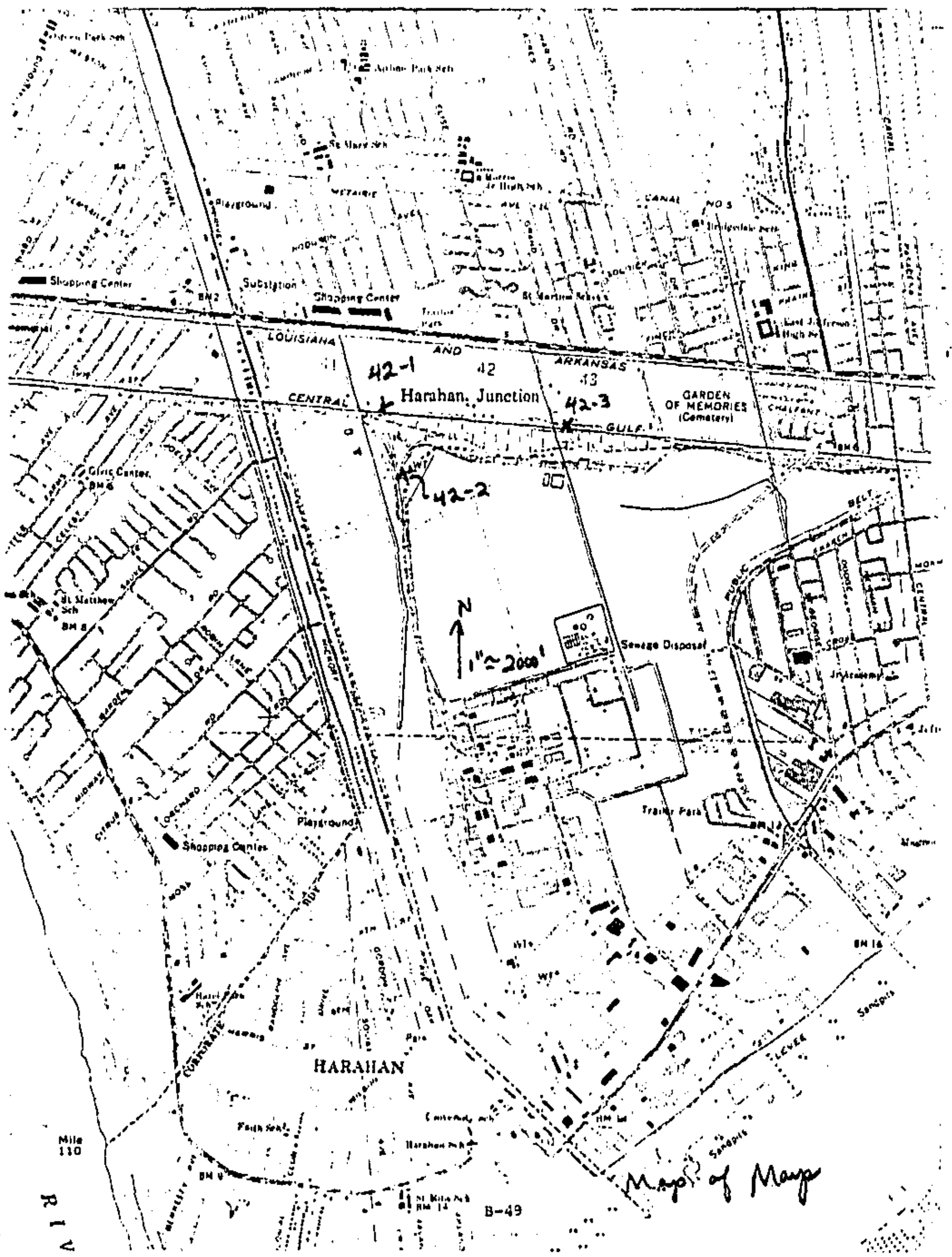
This 48-hour site was located about 180 feet north of the main switching activities at the west end of the yard. Prime noise sources for this location were switching impacts, brake squeals, incoming and outgoing freight trains, traffic on the two-lane road north of the yard, and the through passenger trains. The boundary of railroad property is located about 1500-1800 feet north of site 42-1.

Site 42-2

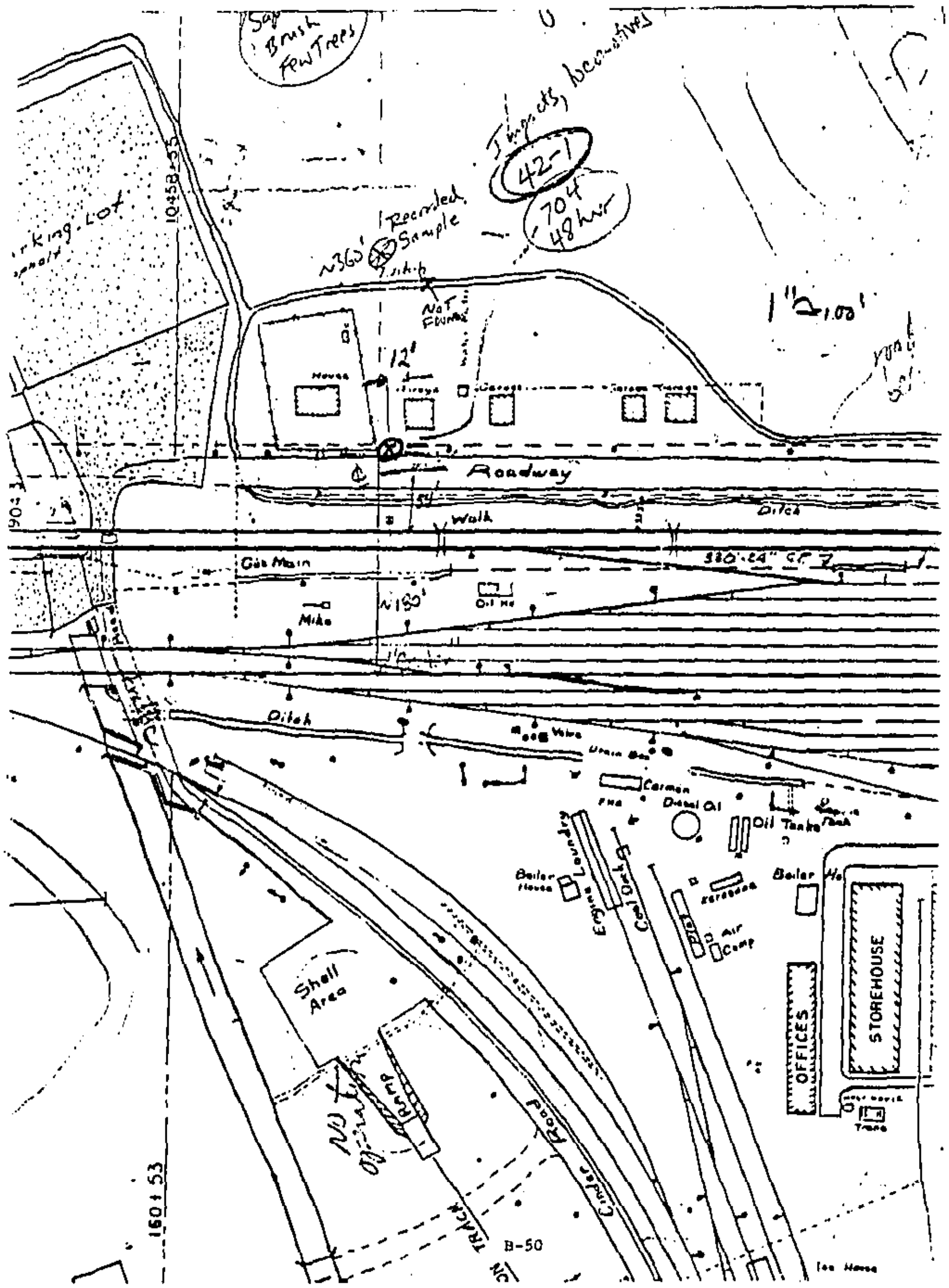
This 24-hour site was located about 500 feet south of the diesel repair shop, near the tracks that lead to the repair shop, the oil storage tank, the engine laundry and the sand tower. Major noise sources at this site are operations at the sand tower and engine laundry and locomotive and rail car traffic.

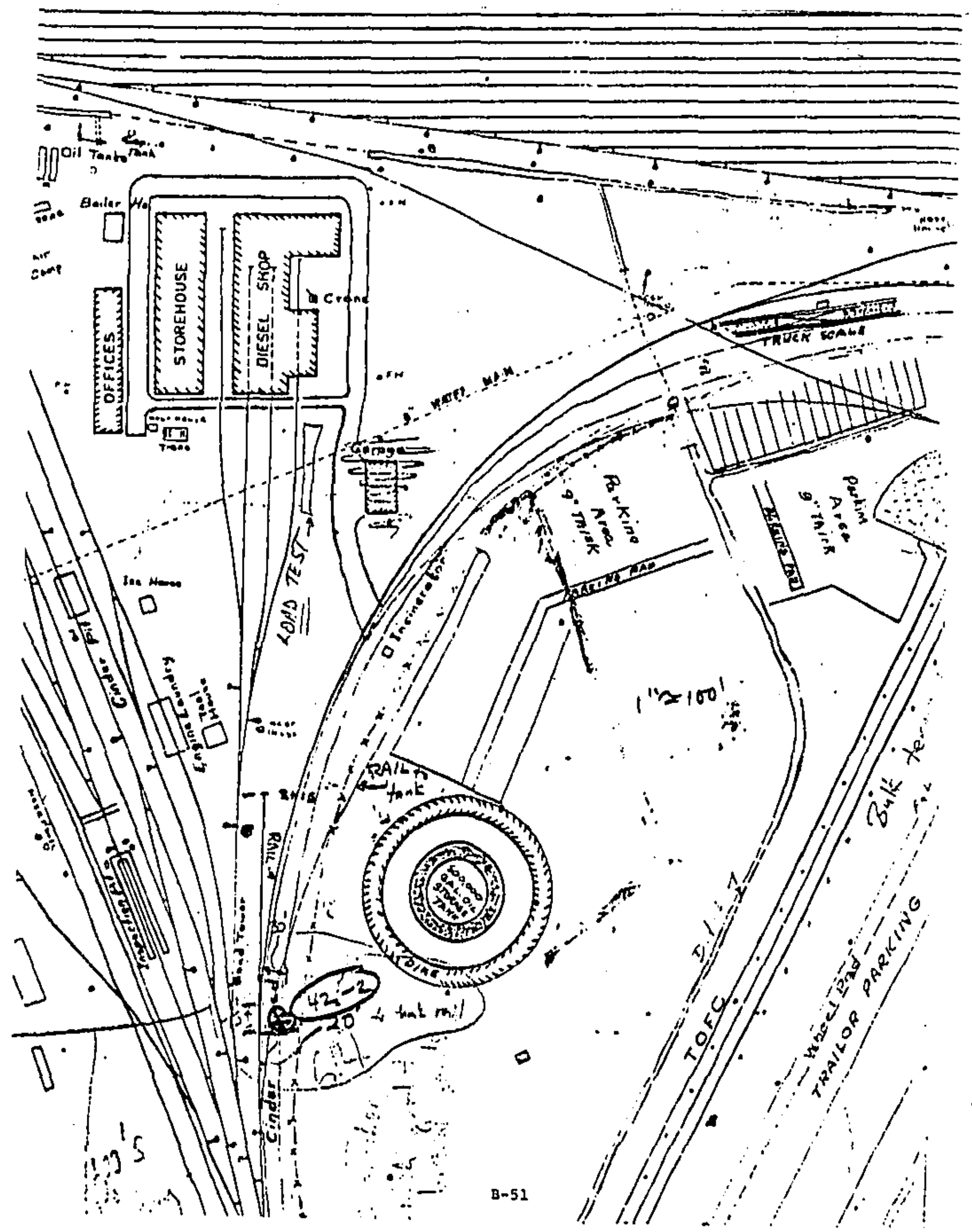
Site 42-3

This 24-hour site was located north of yard and toward the eastern boundary of the yard. Private property was located within about 200 feet of the mainlines at this site. Primary noise sources at this site were incoming/outgoing trains, some switching impacts from the east end of the yard, traffic on the road north of the yard, and the through passenger trains.



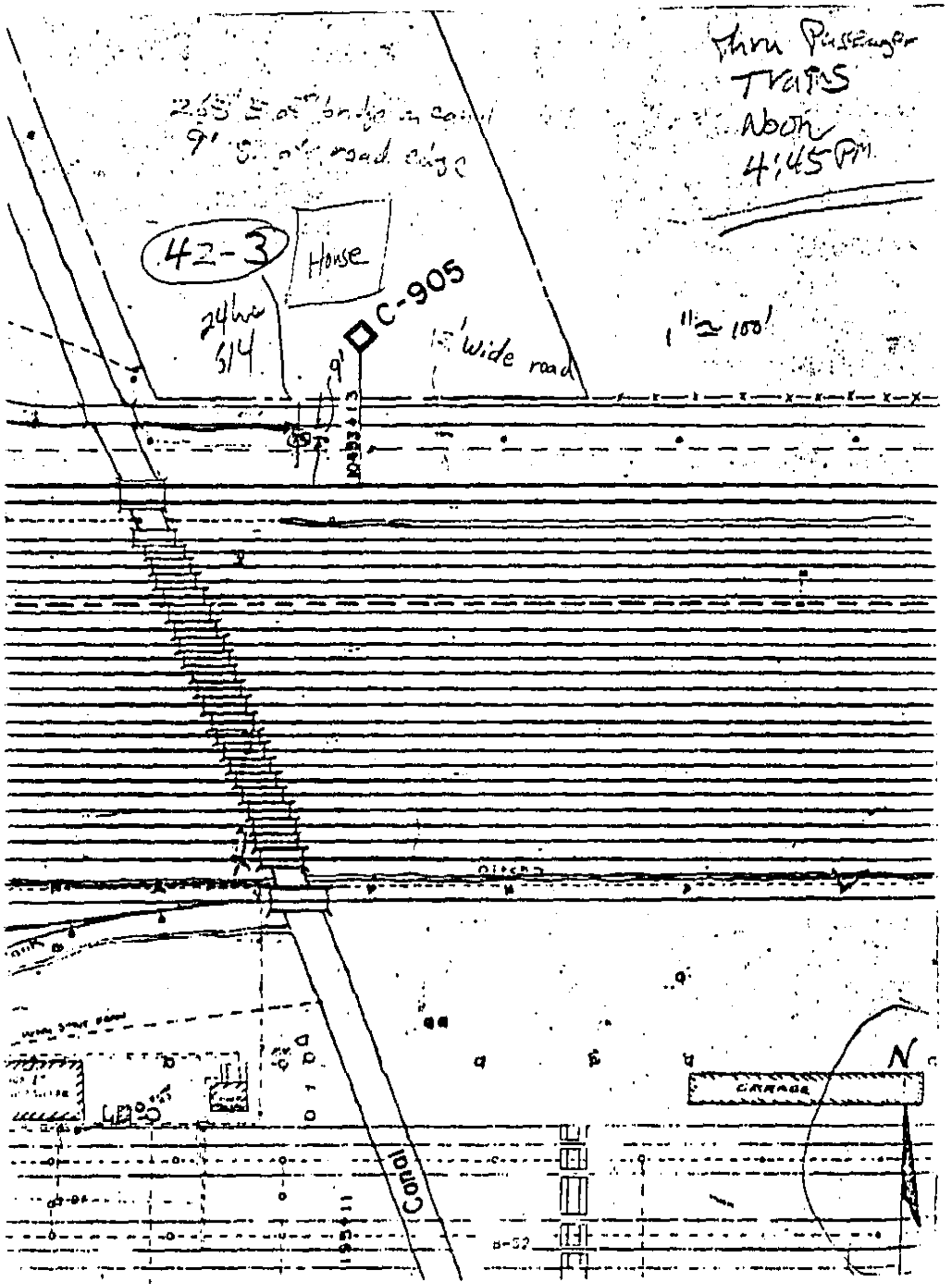
Shopping Center
Substation
Shopping Center
St Mary Sch
St Martins Sch
Playground
Trailer Park
LOUISIANA
AND
ARKANSAS
CENTRAL
GULF
42-1
42
43
Harahan Junction
42-3
42-2
GARDEN OF MEMORIES (Cemetery)
Civic Center
St Matthew Sch
N
1" ≈ 2000'
Sewage Disposal
Jr Academy
Trailer Park
Playground
Shopping Center
HARAHAN
Mile 110
Faith Sch
Harahan Sch
St Rita Sch
B-49
Sandpits
LEVEE
Maps of Maps


Brush
Few Trees
42-1
704
48 hr
Recorded
Sample
N360'
Not Found
12'
1" = 100'
House
Roadway
Walk
Ditch
Gas Main
N180'
Mike
Oil Ho
Ditch
Valve
Drain Box
Carmen
Diesel Oil
Oil Tanks
Boiler House
Laundry
Engines
Coal Dock
Air Comp
Boiler Ho
STOREHOUSE
OFFICES
Shell Area
Ramp
Cinder Road
TRACK
B-50
160+53
Ice House



Oil Tanks
Boiler Ho
OFFICES
STOREHOUSE
DIESEL SHOP
Crane
TRUCK SCALE
Garage
LOAD TEST
Parking Area 9" THICK
Parkin Area 9" THICK
Ice House
Cinder Pit
Engine Laundry
Incinerator
1" = 100'
RAIL tank
Sand Tower
Cinder
Inspection Pit
TOFC
Wheel Pad
TRAILOR PARKING
Bulk
42-2
20

B-51


Thru Passenger Trains About 4:45 PM
9' S of road edge
42-3
House
C-905
24hr 5/14
9'
15' wide road
1" = 100'
Canal
GARAGE
N

NOISE DATA

YARD: MAYS LOCATION: 42-1

DATE: 8 February 1978 | DATE: 9 February 1978

HOUR OF DAY	8 Feb 1978 NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	9 Feb 1978 NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01														
01-02								62.6	80.0	73.7	66.5	55.6	48.7	46.6
02-03								61.0	86.3	71.9	61.3	53.3	49.5	47.9
03-04								65.5	91.3	73.3	65.8	57.3	50.4	48.9
04-05								59.7	81.3	72.6	59.8	51.5	49.6	48.6
05-06								56.6	92.5	65.7	57.1	52.1	50.2	48.9
06-07								64.4	96.3	71.8	62.2	54.9	50.9	49.5
07-08								62.3	93.8	72.6	63.6	57.0	53.4	51.6
08-09								61.1	91.3	72.2	62.6	56.2	53.6	51.8
09-10								63.7	103.8	72.4	62.7	57.2	54.1	52.6
10-11								61.6	87.5	71.6	64.0	58.0	53.7	51.5
11-12								68.9	95.0	80.3	65.0	57.1	53.1	51.6
12-13	66.4	92.5	78.7	65.5	57.3	53.0	51.2							
13-14	65.5	92.5	74.0	63.3	56.6	52.6	50.3							
14-15	56.1	76.3	66.5	56.9	53.5	51.4	50.1							
15-16	61.6	86.3	72.1	63.5	57.7	54.8	52.9							
16-17														
17-18	61.0	80.0	72.7	63.0	56.5	53.0	51.4							
18-19	68.7	100.0	73.2	67.3	62.6	54.5	51.4							
19-20	59.3	87.3	69.8	62.2	54.8	51.6	50.1							
20-21	62.5	86.3	74.4	60.4	53.2	50.2	48.0							
21-22	55.7	75.0	67.5	57.5	50.8	48.0	45.6							
22-23	55.4	76.3	66.0	57.0	50.8	46.8	45.1							
23-24	56.0	80.0	67.3	58.4	48.8	45.9	44.5							

NOTE: Levels measured with FAST meter dynamics.

L_n: 61.1 dB
L_d: 63.8
L_{dn}: 68.0

NOISE DATA

YARD: MAYS LOCATION: 42-1

HOUR OF DAY	DATE: 9 February 1978 NOISE LEVEL in dBA							DATE: 10 February 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								57.0	77.5	67.1	60.6	52.2	48.8	46.7
01-02								73.7	95.0	80.0	66.6	55.9	48.3	46.1
02-03								58.8	78.8	69.7	61.1	55.5	46.7	45.3
03-04								59.7	80.0	69.6	62.9	56.3	48.7	46.8
04-05								63.6	92.5	71.8	57.0	49.9	47.2	45.9
05-06								58.9	78.8	68.3	61.9	55.2	51.7	49.4
06-07								62.5	85.0	75.0	64.7	56.6	53.0	51.0
07-08								65.6	96.3	73.6	61.8	56.5	53.0	51.3
08-09								60.4	88.8	71.0	62.1	56.1	53.0	51.3
09-10								62.6	87.5	73.8	64.2	55.7	52.4	50.4
10-11								59.4	85.0	69.6	62.1	55.8	51.6	49.2
11-12								71.6	98.8	71.6	64.2	55.4	51.6	49.0
12-13	65.1	97.5	72.7	64.9	60.5	55.9	54.1							
13-14	64.6	93.8	74.9	63.2	54.9	51.5	50.0							
14-15	57.5	86.3	68.4	57.6	52.8	50.2	48.8							
15-16	62.3	87.3	73.6	64.1	56.1	52.0	50.1							
16-17														
17-18	62.8	83.8	72.7	65.9	58.7	53.9	51.9							
18-19														
19-20	60.4	92.5	71.0	61.9	55.8	52.3	50.4							
20-21	65.2	95.0	75.0	64.6	56.9	52.5	50.4							
21-22	69.3	97.5	84.1	64.2	56.5	51.6	49.6							
22-23	71.7	103.8	80.1	65.2	52.3	49.9	48.2							
23-24	63.4	92.5	74.5	63.1	51.9	49.1	47.6							

NOTE: Levels measured with FAST meter dynamics.

L_n: 67.2 dB
L_d: 64.8
L_{dn}: 73.4

NOISE DATA

YARD: MAYS   LOCATION: 42-2

HOUR OF DAY	DATE: 8 February 1978 — NOISE LEVEL in dBA							DATE: 9 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								66.7	85.	78.	68.	61.	60.	58.
01-02								67.6	90.	77.	70.	63.	59.	58.
02-03								66.9	87.	78.	69.	61.	61.	57.
03-04								60.5	80.	71.	60.	58.	57.	57.
04-05								63.3	85.	75.	59.	58.	57.	57.
05-06								68.8	89.	79.	70.	63.	61.	61.
06-07								65.0	82.	75.	65.	62.	62.	62.
07-08								67.6	86.	78.	69.	63.	60.	58.
08-09								70.1	89.	81.	73.	62.	58.	57.
09-10								67.1	87.	73.	69.	66.	62.	60.
10-11								67.8	84.	80.	70.	61.	58.	57.
11-12 *	67.8	84.	78.	71.	61.	60.	59.	65.8	88.	75.	67.	63.	58.	58.
12-13	67.8	86.	80.	68.	61.	60.	59.							
13-14	69.9	81.	76.	72.	68.	60.	60.							
14-15	66.0	89.	76.	67.	62.	60.	59.							
15-16	66.1	87.	75.	67.	61.	59.								
16-17	66.9	89.	80.	65.	59.	57.								
17-18	72.0	100.	82.	68.	65.	64.	58.							
18-19	62.8	81.	70.	64.	61.	58.	57.							
19-20	71.2	97.	92.	80.	68.	66.	66.							
20-21	62.6	81.	74.	62.	58.	54.								
21-22	69.0	95.	78.	68.	60.	54.	53.							
22-23	67.3	84.	79.	68.	61.	60.	59.							
23-24	67.8	87.	76.	71.	64.	63.	63.							

* These data not included in L_{dn} calculation.

NOTE: Levels measured with SLOW meter dynamics.

L_n: 66.6 dB
L_d: 68.2
L_{dn}: 73.2

NOISE DATA

YARD: MAYS LOCATION: 42-3

HOUR OF DAY	DATE: 9 February 1978 — NOISE LEVEL in dBA							DATE: 10 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								47.2	75.	54.	46.	43.	41.	40.
01-02								53.8	74.	68.	50.	42.	40.	39.
02-03								52.5	81.	62.	49.	43.	40.	39.
03-04								45.7	70.	52.	47.	43.	40.	39.
04-05								62.6	90.	65.	47.	43.	41.	40.
05-06								53.6	78.	65.	54.	48.	43.	41.
06-07								54.9	78.	65.	53.	50.	47.	45.
07-08								53.3	77.	66.	55.	52.	49.	48.
08-09								57.3	79.	70.	54.	51.	49.	48.
09-10								60.7	96.	66.	55.	50.	47.	45.
10-11								54.0	77.	64.	55.	48.	46.	44.
11-12								54.7	80.	67.	52.	47.	44.	42.
12-13	57.3	77.	70.	56	51	48	47							
13-14	58.5	79.	73.	54	50	47	46							
14-15	59.0	81.	70.	56	51.	48.	47.							
15-16	57.7	81.	70.	55.	49.	47	46							
16-17	63.3	90.	69.	56.	50.	48.	46.							
17-18	56.4	82.	68.	55.	50.	47.	46							
18-19	52.8	79.	62.	51.	48.	46.	45.							
19-20	52.5	81.	56.	52.	49.	47.	46							
20-21	54.0	76.	65.	54.	48.	46.	45.							
21-22	54.0	81.	59.	51.	48.	45.	43.							
22-23	63.0	79.	77.	52.	47.	45.	44.							
23-24	68.8	96.	80.	62.	49.	45.	42.							

NOTE: Levels measured with SLOW meter dynamics.

L_n: 61.4 dB
L_d: 57.6
L_{dn}: 67.4

Settegast Yard
Missouri-Pacific Railroad
Houston, Texas
(Site No. 43)

GENERAL DESCRIPTION

The Settegast Yard is a medium-sized flat yard located just north of the I-610 loop in Houston, Texas. The land surrounding the yard is essentially a treeless plain which is used for light commercial and residential purposes. The city of Houston has no zoning regulations.

Switching operations at the Settegast Yard are as follows. Incoming trains arrive on the Y-shaped mainlines located between the switchyard proper and I-610. The arriving trains are pulled into the receiving area at the extreme east side of the yard. The yard is broken into three switching areas labeled Yards A through C. Six switch engines (one at each end of each subyard) are used to reassemble the "cuts". Switching is accomplished at a nominal speed of 4mph. Trains are assembled in the forwarding area at the extreme west side of the yard. Outgoing trains are again pulled onto to Y-shaped mainlines south of theyard. These trains round the curve at very low speed.

A significant percentage of the cars switched at the Settegast Yard are trailers on-flat-cars or containers-on-flat-cars. The TOFC/COFC loading area is located on the southwest side of the yard. An electric and a diesel crane are available for COFC loading. Loading ramps are used for trailers. A large parking area for the trailers and a warehouse/dock building complete the facilities.

Repair operations are carried out at two locations. Locomotives are serviced and repaired at the large diesel terminal on the northeast edge of the yard. Full throttle load tests of the locomotives are carried just west of the terminal. A fueling track is located just west of the terminal. Car repairs are made on a service track and in a repair building south of "Yard B". Only light repairs, sandblasting, and painting are performed in this area.

MEASUREMENT LOCATIONS

Site 43-1

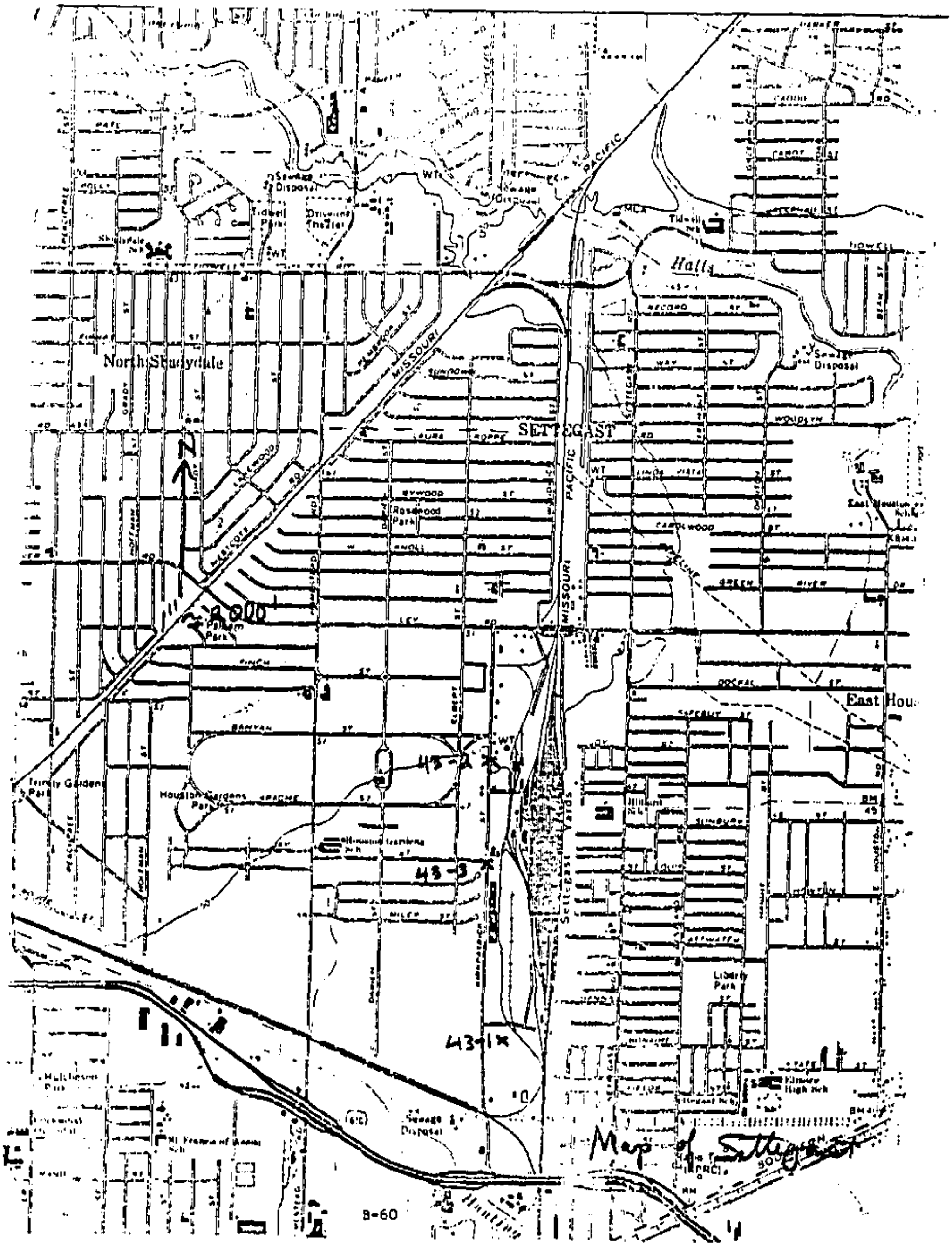
This 48-hour site was located on railroad property at the south end of the yard. Primary noise sources at this site included switching impacts from all three subyards plus the TOFC/COFC area, pass-by traffic on Kirkpatrick Boulevard (two lane road), plus truck noise from the TOFC/COFC parking area. Essentially, all tractor-trailers arriving and departing the TOFC/COFC passed by the site along Kirkpatrick Boulevard.

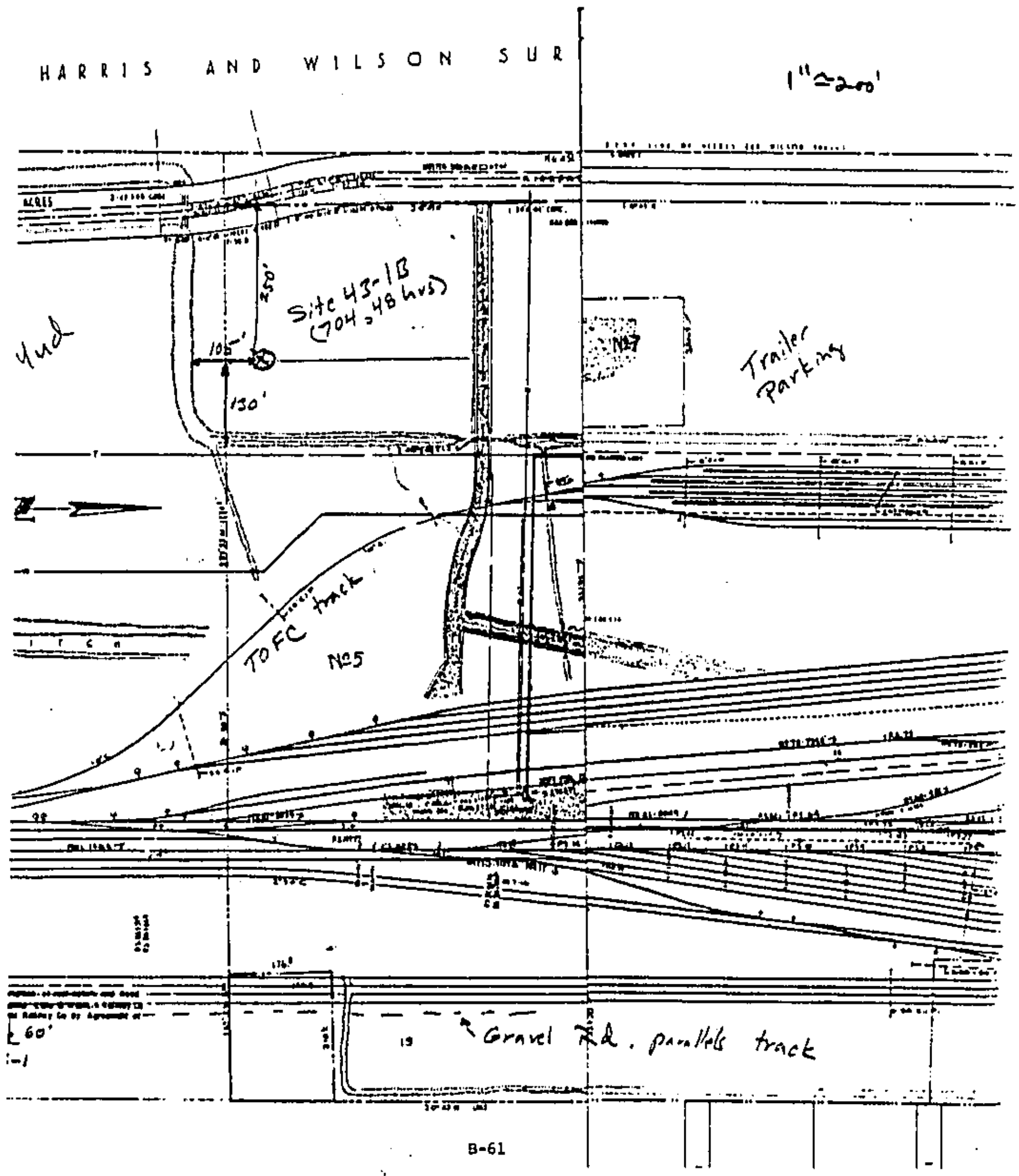
Site 43-2

This 24-hour site was located just inside railroad property across from the diesel terminal. Primary noise sources at this location were idling and moving locomotives on the diesel service track and traffic on Kirkpatrick Bouldevard.

Site 43-3

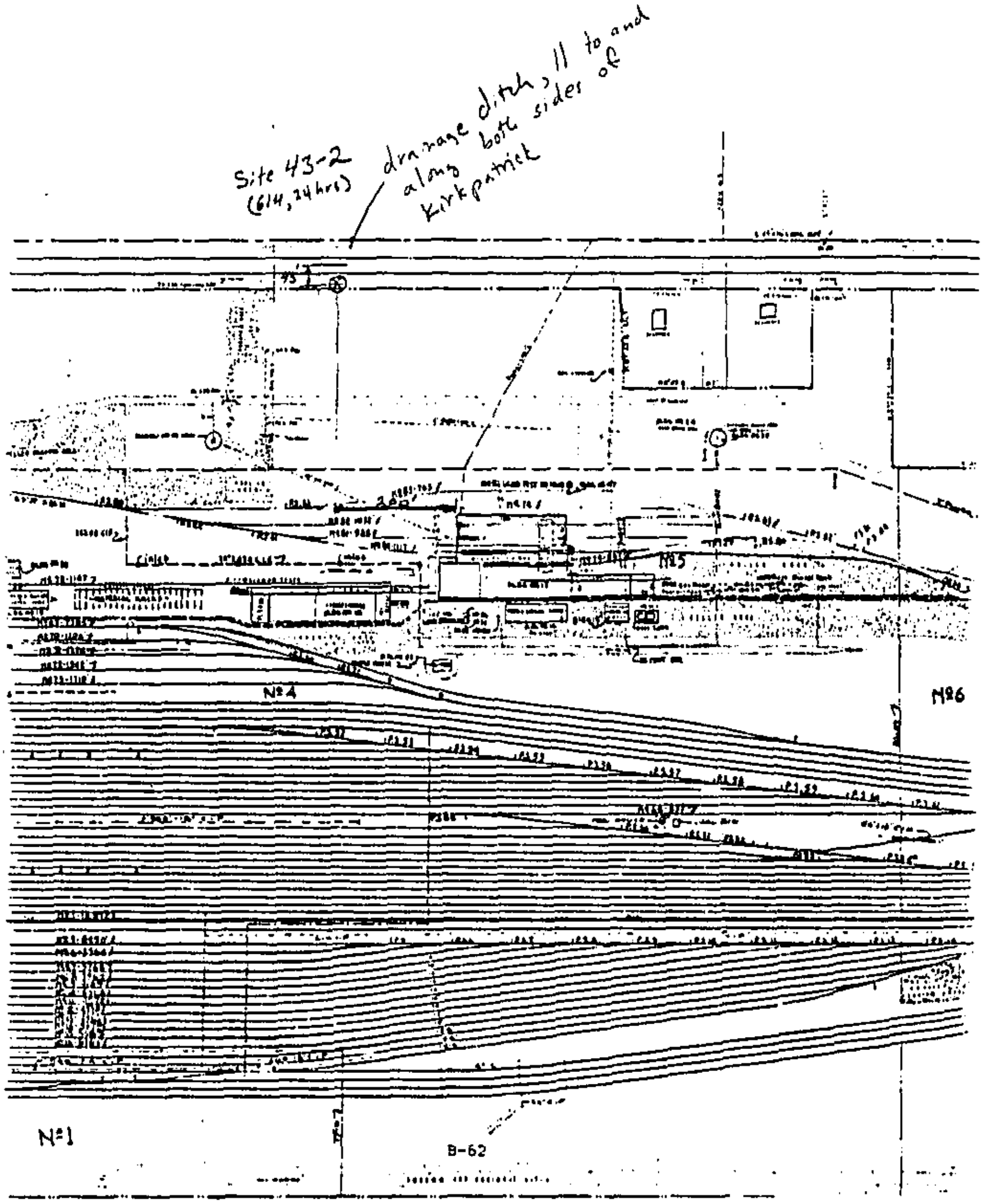
This 24-hour site was located just west of the TOFC/COFC area across Kirkpatrick Boulevard. Primary noise sources at this site were truck traffic to and from the truck terminal, truck movements within the parking area, and switching impacts.


North Shadydale
SETTEGAST
MISSOURI
PACIFIC
East Hou
Halls
Houston Gardens Park
Liberty Park
Settegast Yards
Sewage Disposal
Tidwell Park
43-2x
43-3x
43-1x
B-60
Map of Settegast



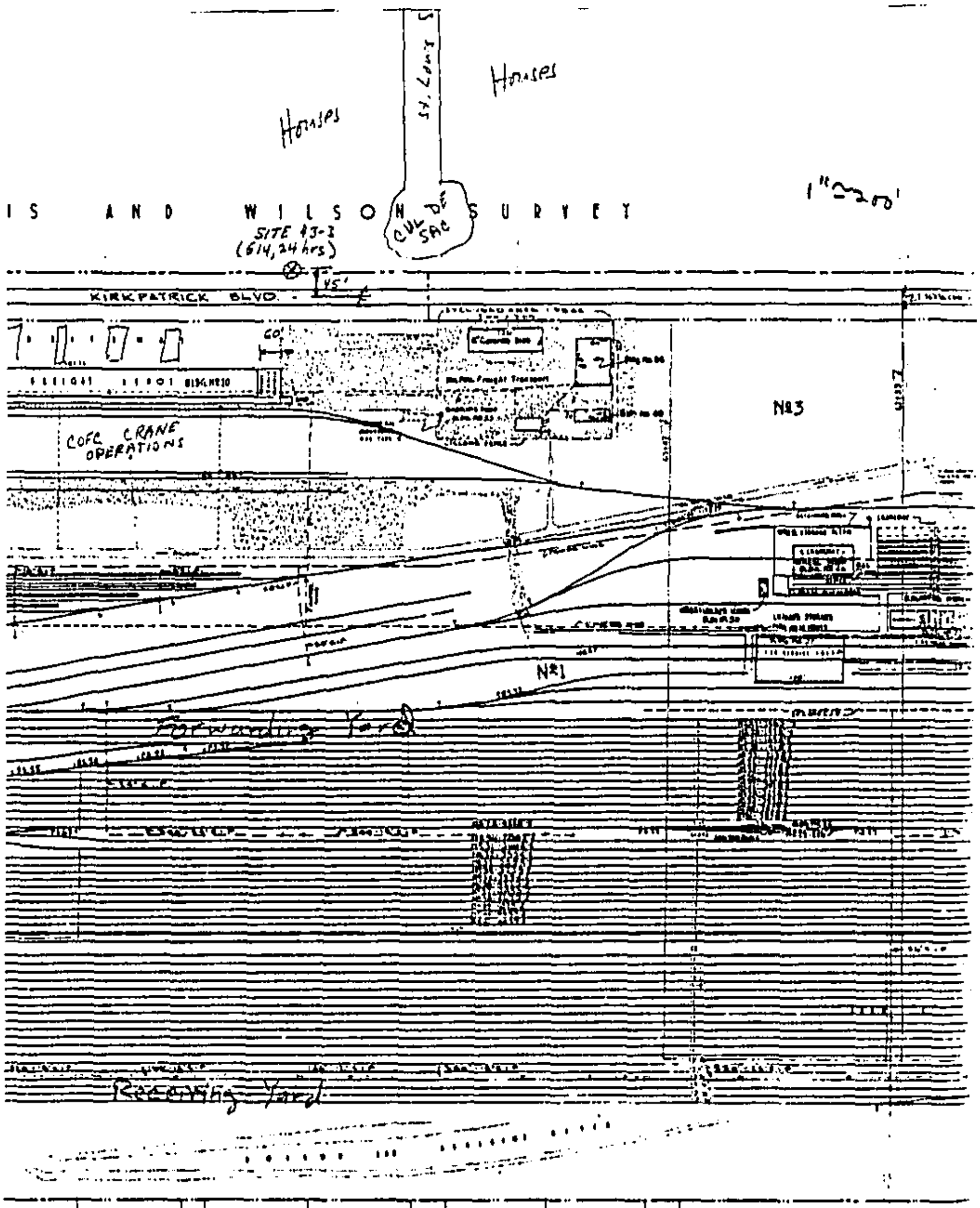
HARRIS AND WILSON SUR
1"≃200'
Site 43-1B
(704, 48 hrs)
250'
105'
130'
Trailer
Parking
N°7
N°5
TOFC track
60'
19
Gravel Rd. parallels track

1" = 200'



Site 43-2
(614, 24 hrs)
drainage ditch, ‖ to and along both sides of Kirkpatrick
No 5
No 4
No 6
No 1

B-62


Houses
St. Louis St
Houses
IS AND WILSON SURVEY
CUL DE SAC
1"≈200'
SITE 43-3
(614, 24 hrs)
45'
KIRKPATRICK BLVD.
60'
COFC CRANE OPERATIONS
No3
No1
Forwarding Yard
Receiving Yard

NOISE DATA

YARD: SETTEGAST LOCATION: 43-1

HOUR OF DAY	DATE: 15 February 1978 — NOISE LEVEL in dBA							DATE: 16 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								58.8	76.3	68.3	60.9	56.4	53.5	51.7
01-02								59.4	77.5	67.6	61.3	57.9	55.2	53.3
02-03								60.2	77.5	69.6	63.2	57.4	54.5	52.9
03-04								60.0	77.5	66.9	63.1	57.3	55.0	53.5
04-05								60.0	75.0	67.4	62.3	58.7	56.3	54.3
05-06								60.8	75.0	68.2	63.0	59.5	57.7	56.4
06-07								63.1	88.8	69.4	64.0	60.9	58.8	56.6
07-08								65.1	85.0	74.9	67.5	62.0	59.6	55.0
08-09								64.5	85.0	73.5	67.5	62.1	59.0	57.6
09-10								63.7	81.3	72.2	66.6	61.5	58.2	56.4
10-11								63.8	85.0	72.2	67.2	61.1	57.1	55.3
11-12														
12-13														
13-14														
14-15														
15-16														
16-17														
17-18														
18-19	62.8	75.0	71.0	66.1	60.2	56.6	54.4							
19-20	59.6	77.5	68.3	62.5	57.3	54.1	52.5							
20-21	62.2	82.5	73.0	64.7	58.3	53.9	51.6							
21-22	59.0	80.0	68.6	61.7	56.1	52.7	50.9							
22-23	59.4	82.5	67.5	61.2	57.3	54.3	52.6							
23-24	58.7	76.3	67.7	60.6	57.1	54.6	52.8							

NOTE: Levels measured with FAST meter dynamics.

L_n: 60.2 dB
L_d: 60.4
L_{dn}: 66.6

NOISE DATA

YARD: SETTEGAST LOCATION: 43-1

DATE: 16 February 1978

HOUR OF DAY	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
	NOISE LEVEL in dBA						
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24	62.0	81.3	70.5	63.9	59.8	57.3	55.4

DATE: 17 February 1978

HOUR OF DAY	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
	NOISE LEVEL in dBA						
00-01	62.8	80.0	71.5	64.9	61.0	58.2	56.5
01-02	63.7	78.8	70.0	66.3	61.7	58.2	56.0
02-03	60.0	76.3	66.1	62.5	59.0	56.3	54.5
03-04	58.7	76.3	67.0	61.1	56.9	54.4	52.6
04-05	60.3	73.8	68.1	62.4	58.9	56.6	54.9
05-06	60.6	76.3	67.5	63.2	59.1	57.1	56.3
06-07	62.0	77.5	69.0	64.3	60.8	58.3	56.7
07-08	62.8	78.8	71.0	65.3	60.9	58.7	57.1
08-09							
09-10							
10-11							
11-12	66.9	97.5	76.2	68.0	62.1	58.6	56.4
12-13	63.4	86.3	71.5	66.0	61.0	57.8	56.3
13-14	64.3	88.8	72.5	66.9	62.2	58.9	56.5
14-15	65.0	86.3	74.2	68.0	62.1	58.2	55.7
15-16	64.7	85.0	74.3	67.4	61.5	57.7	55.4
16-17	64.3	83.8	74.1	67.1	60.9	57.4	55.4
17-18	62.9	80.0	70.8	66.0	60.8	57.3	54.7
18-19	62.3	82.5	71.1	65.5	59.6	56.0	53.9
19-20							
20-21							
21-22							
22-23							
23-24							

L_n: 61.0 dB
L_d: 62.1
L_{dn}: 67.6

NOTE: Levels measured with FAST meter dynamics.

YARD: SETTEGAST LOCATION: 43-2

HOUR OF DAY	15 February 1978: NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	16 February 1978: NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								64.6	75.	70.	66.	63.	62.	61.
01-02								64.5	75.	69.	65.	64.	63.	63.
02-03								64.5	81	67.	64.	64	63	63.
03-04								65.8	87.	73.	64.	63.	63.	62.
04-05								63.9	77.	70.	65.	62.	61.	61.
05-06								61.5	75.	70.	62.	59.	57.	57.
06-07								65.4	81.	73.	69.	61.	59.	57.
07-08								65.7	89.	75.	70.	62.	59.	58.
08-09								64.5	87.	73.	67.	60.	57.	55.
09-10								65.8	85.	73.	66.	63.	62.	62.
10-11								66.7	83.	74.	67.	64.	63.	62.
11-12								67.1	82.	72.	67.	66.	65.	65.
12-13 *	66.7	88.	78.	72.	67	66.	65	67.3	84	73	68.	66	65.	64.
13-14	66.0	86.	76.	71	66	65.	65.							
14-15	65.0	86.	76.	70.	65.	64.	64.							
15-16	64.8	84.	76.	71.	65.	63.	63.							
16-17	68.2	81.	75.	71.	65.	62.	60.							
17-18	69.0	83.	75.	72.	66.	63.	63.							
18-19	66.9	81.	74.	69.	65.	64.	63.							
19-20	67.3	89.	74	68	65	64.	64.							
20-21	66.9	89.	72.	67.	65.	64.	63.							
21-22	66.0	81.	72.	66.	65.	63.	63.							
22-23	66.3	79.	72.	67.	65.	63.	63.							
23-24	66.0	83.	72.	67.	65.	63.	63.							

L_n: 64.9 dB

L_d: 66.7

L_{dn}: 71.6

* These data not included in L_{dn} calculation.

NOTE: Levels measured with SLOW meter dynamics.

NOISE DATA

YARD: SETTEGAST LOCATION: 43-3

HOUR OF DAY	DATE: 16 February 1978 — NOISE LEVEL in dBA							DATE: 17 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								59.4	81.	67.	63.	56.		
01-02								59.6	78.	68.	61.	57.	54.	53.
02-03								57.1	70.	65.	58.	55.	53.	52.
03-04								55.5	78.	63.	56.	53.	50.	48.
04-05								54.9	69.	61.	55.	54.	51.	51.
05-06								58.5	77.	68.	61.	56.	54.	52.
06-07								63.9	77.	71.	67.	61.	57.	56.
07-08								64.8	81.	73.	68.	62.	58.	57.
08-09								63.5	77.	71.	66.	60.	57.	57.
09-10								63.7	81.	72.	65.	61.	58.	57.
10-11								62.4	78.	72.	65.	58.	55.	53.
11-12								67.6	97.	74.	68.	62.	54.	52.
12-13								61.6	78.	71.	66.	54.	51.	49.
13-14														
14-15	61.6	79.	71.	66.	55.	49.	47.							
15-16	62.8	76.	71.	66.	58.	51.	48.							
16-17	63.7	78.	71.	67.	60.	52.	50.							
17-18	63.9	78.	72.	67.	60.	54.	51.							
18-19	61.1	78.	71.	64.	55.	52.	50.							
19-20	60.1	77.	69.	64.	55.	52.	51.							
20-21	58.8	74.	67.	62.	54.	51.	49.							
21-22	58.3	75.	71.	67.	61.	58.	57.							
22-23	58.8	75.	71.	65.	60.	57.	57.							
23-24	58.3	73.	69.	65.	59.	55.	55.							

L_n: 59.2 dB
L_d: 62.8
L_{dn}: 66.4

NOTE: Levels measured with SLOW meter dynamics.

Dillard Yard
Southern Railway System
Savannah, Georgia
(Site No. 51)

GENERAL DESCRIPTION

The Dillard yard is a busy flat yard with 37 classification tracks. These are divided into two units consisting of 16 south class tracks and 21 north class tracks. Switching takes place from either end of both sets of tracks. The yard has facilities for only minor car and engine work. The locomotive repair is just south of the fuel rack (on the west end of the yard). Car repair work is performed in a rip shed on the south side of the class tracks. There are 3 storage tracks on both the northern and southern sides of the facility. There are no through trains here. The schedule calls for 3 trains terminating and 3 originating at this yard in addition to 3 inbound interchanges. A containerized trailer facility exists just south of the locomotive repair area and trailers are brought into this piggyback facility near the paved road paralleling the southern part of the yard. There are no discernable continuous community noise making processes in the yard vicinity with the exception of the traffic acitivity (State 80) which crosses the mainline tracks to the east of the yard. Aircraft flying to or from the Savannah airport do contribute to the noise environment at the yard however, and sounds from a (distant) artillary range are also heard occasionally. Railroad mainline tracks parallel the yard contours to the north and south but are well shielded from the yard proper.

The yard is completely surrounded by dense vegetation which extends a minimum of 300 yards away from the service roads paralleling and close to the track contours. This is true except at the east end, considerably distant from yard track activity, where the nearest residences are located. The presence of this vegetation precluded noise measurements from being made at the property line, and also precluded propagation measurements from being conducted.

The predominant noise making activities at the Dillard yard include:

- switch engine noise, which is the rev-shore-push cycle.
- rail car impact noise - which occurs as part of switching.
- idling engine noise - which occurs mainly at or near the fuel rack and includes standby locomotive engines.
- piggyback operation noise, which includes operation of the container crane and trailer truck noise.
- rip shed operations, which include operation of a fork truck, some pneumatic equipment, and hand hammering activities.
- loudspeaders, which are scattered throughout the yard.

The last two activities are minor in comparison to the first four. There have been no community noise complaints from yard operations as far as yard personnel are aware. The yard handles no more than 3 refrigeration cars per month as a rule. Switching leads are made of continuous welded rail; the rest of the tracks are jointed. All engines are diesel-electric.

MEASUREMENT LOCATIONS

Site 51-1

This 48 hour site was selected near the yard office. This site receives noise mainly from the switching operations on the west end of the class tracks and from crane operations in the piggyback yard. In addition, there is some noise from idling locomotives near the fuel rack.

Site 51-1 is located 25' west of the catenary line on the west side of the yard office and 45' from the nearest track (the spur feeding the piggyback yard).

Site 51-2

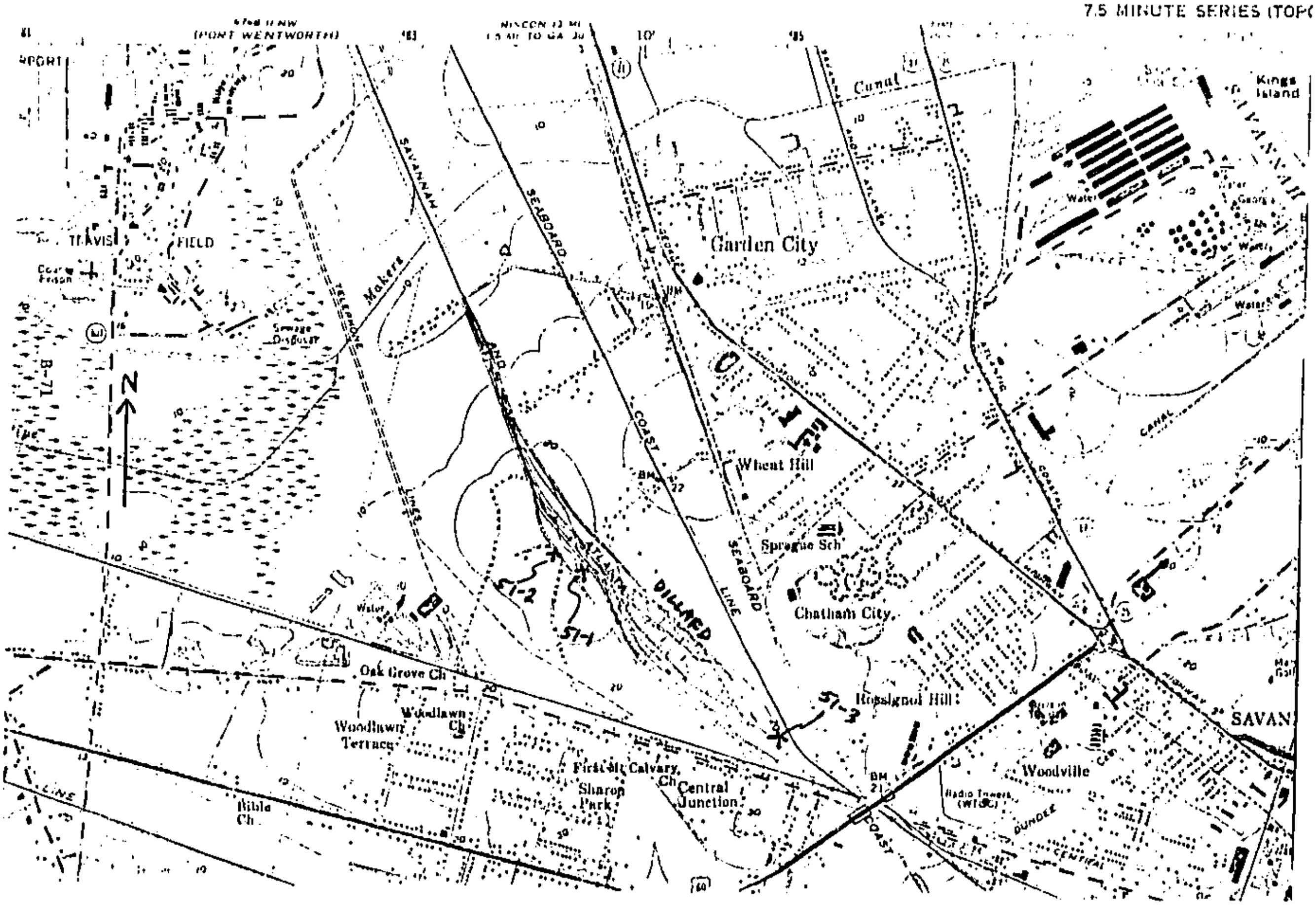
Site 51-2 was positioned on the southern shoulder of the paved road, south of the eastern terminous of the fuel rack. The site was 10 feet west of the catenary line just east of the fuel rack. Noise here is dominated by diesel engine operations - principally the diesel for the piggyback crane and secondarily the engines on locomotives idling at the fuel rack and switch engines serving the western switching levels.

Site 51-3

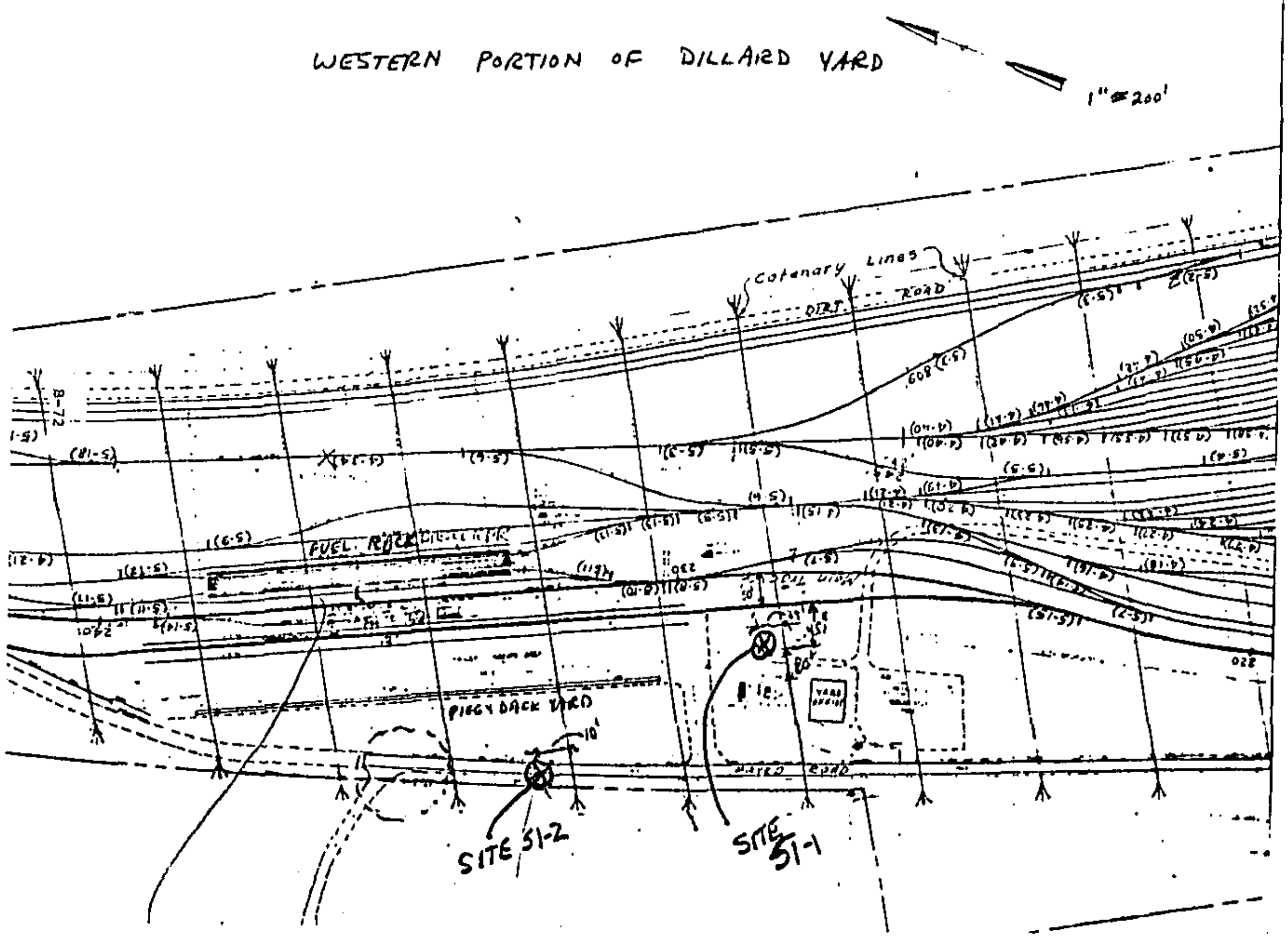
The third site was selected at the eastern end of the yard, where there was a mixture of noise due to switch engine movement (switchers serving the east ends of the class tracks) and distant traffic noise from State 80. Site 51-3 was positioned on the northern shoulder of the dirt service road, 22 feet from the centerline of the closest track and 210 feet east of the first switch to the class tracks.

MAP OF DILLARD YARD

SCALE 1:24000



WESTERN PORTION OF DILLARD YARD



NOISE DATA

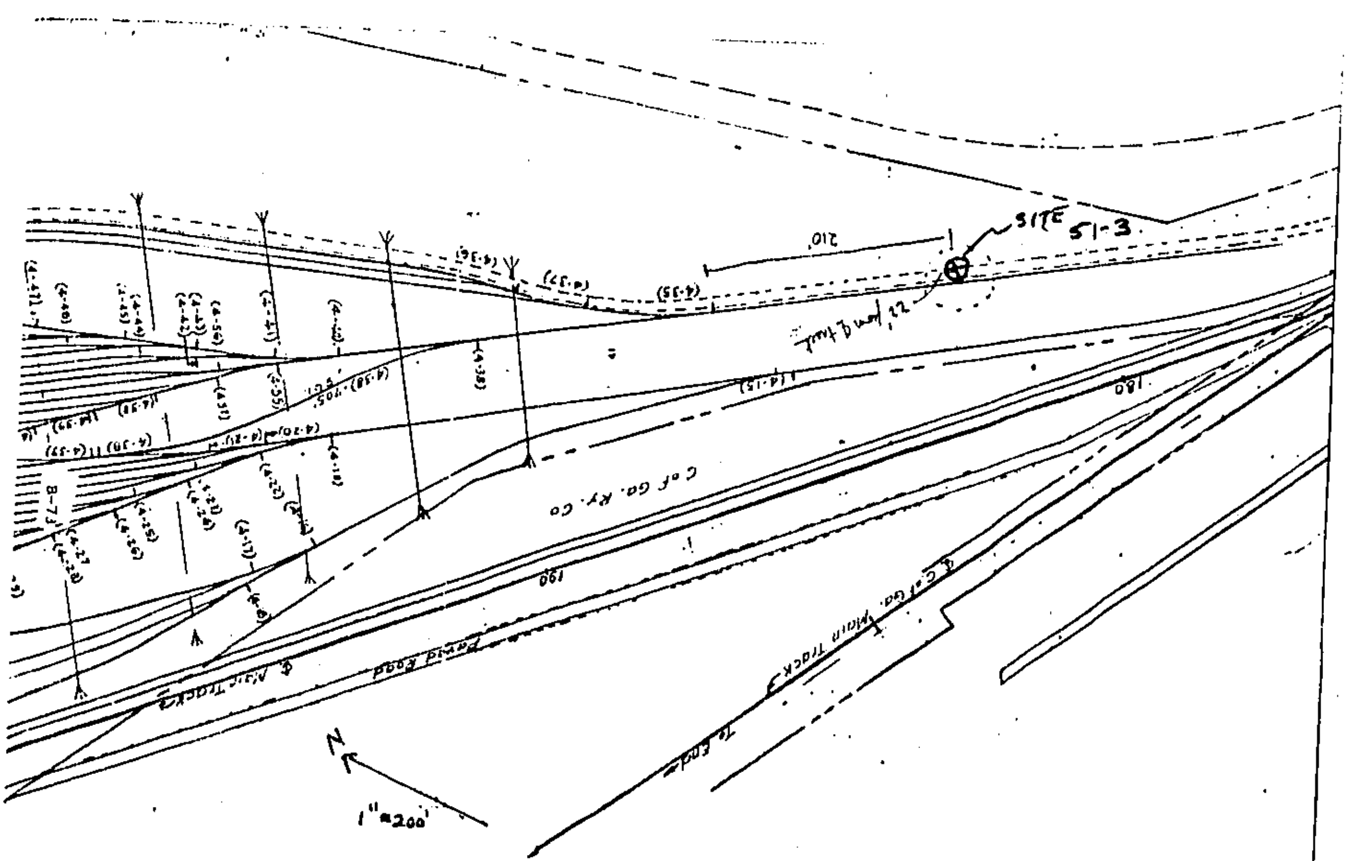
YARD: DILLARD LOCATION: 51-1

DATE: 3 February 1978 — DATE: 4 February 1978

HOUR OF DAY	3 Feb 1978 NOISE LEVEL in dBA							4 Feb 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								70.5	85.	81.	73.	63.	56.	54.
01-02								66.3	83.	77.	68.	60.	57.	56.
02-03								66.1	80.	77.	68.	60.	57.	56.
03-04								67.8	81.	80.	70.	58.	55.	54.
04-05								58.1	72.	67.	60.	55.	54.	53.
05-06								60.0	74.	69.	64.	54.	53.	53.
06-07								54.7	60.	57.	55.	54.	53.	53.
07-08								60.0	80.	69.	61.	56.	55.	54.
08-09								64.6	77.	73.	68.	60.	56.	54.
09-10								69.9	80.	77.	73.	66.	58.	54.
10-11								69.5	83.	77.	73.	67.	60.	57.
11-12								69.3	86.	79.	72.	62.	57.	
12-13								65.0	78.	74.	68.	60.	58.	57.
13-14								65.8	77.	74.	69.	59.	56.	56.
14-15	69.9	80.	78.	73.	67.	60.	59.							
15-16	71.4	80.	79.	75.	68.	64.	62.							
16-17	71.2	94.	84.	69.	62.	60.	60.							
17-18														
18-19														
19-20	63.9	78.	71.	68.	60.	59.	58.							
20-21	64.5	80.	72.	68.	60.	59.	59.							
21-22	67.6	79.	77.	71.	63.	60.	59.							
22-23	70.1	89.	80.	73.	62.	59.	58.							
23-24	62.2	70.	63.	62.	61.	60.	60.							

L_n: 66.4
L_d: 67.6
L_{dn}: 73.0

NOTE: Levels measured with SLOW meter dynamics.



EASTERN PORTION OF DILLARD YARD

NOISE DATA

YARD: DILLARD LOCATION: 51-2

HOUR OF DAY	DATE: 2 February 1978 — NOISE LEVEL in dBA							DATE: 3 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								56.6	75.	65.	58.	54.	52.	52.
01-02								56.4	68.	64.	57.	54.	52.	52.
02-03								60.0	77	69.	62.	56.	53.	52.
03-04								59.8	78.	70.	62.	55.	53.	52.
04-05								58.6	73.	67.	62.	55.	53.	52.
05-06								59.2	75.	67.	61.	56.	53.	53.
06-07								56.8	69	65.	58.	54.	53.	53.
07-08								60.5	81	69.	62.	57.	54.	53.
08-09								67.3	86.	75.	70.	64.	59.	58.
09-10								66.9	82.	75.	68.	65.	61.	58.
10-11	* 63.7	77.	71.	67.	61.	58.	51.	64.1	78	72.	66.	62.	57.	54.
11-12	60.0	79.	70.	62.	54.	49.	48.							
12-13	61.8	84.	71.	63.	58.	48.	47.							
13-14	63.9	81.	71.	66.	60.	57.	55.							
14-15	62.8	87.	72.	64.	56.	52.	50.							
15-16	60.3	83.	70.	61.	55.	51.	50.							
16-17	59.2	78.	69.	61.	55.	52.	50.							
17-18	60.3	72.	69.	63.	55.	52.	52.							
18-19	59.2	80.	69.	57.	53.	51.	51.							
19-20	58.6	81.	68.	60.	54.	51.	50.							
20-21	65.4	89.	76.	62.	54.	53.	52.							
21-22	60.7	85.	70.	60.	53.	51.	51.							
22-23	58.6	80.	69.	60.	53.	51.	49.							
23-24	58.3	79.	67.	60.	55.	52.	49.							

* These data not included in L_{dn} calculation.

NOTE: Levels measured with SLOW meter dynamics.

L_n: 58.4 dB
L_d: 63.0
L_{dn}: 65.9

NOISE DATA

YARD: DILLARD LOCATION: 51-3

DATE: 3 February 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12							
12-13	67.1	84.	80.	70.	54.	49.	46.
13-14	66.9	85.	79.	69.	53.	48.	47.
14-15	70.8	101.	78.	67.	54.	49.	47.
15-16	69.9	87.	82.	72.	57.	42.	45.
16-17	64.6	94.	65.	54.	50.	47.	45.
17-18	66.3	91.	77.	70.	54.	46.	45.
18-19	62.0	82.	74.	65.	56.	46.	44.
19-20	65.0	87.	77.	62.	51.	47.	45.
20-21	64.1	81.	75.	67.	53.	44.	42.
21-22	75.3	101.	85.	70.	54.	44.	42.
22-23							
23-24	75.9	98.	88.	71.	52.	46.	44.

DATE: 4 Februray 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	57.7	82.	71.	53.	47.	45.	44.
01-02	67.5	87.	81.	66.	52.	47.	45.
02-03	72.7	90.	85.	75.	61.	51.	50.
03-04	70.8	89.	83.	73.	54.	51.	50.
04-05	72.7	90.	85.	74.	59.	50.	48.
05-06							
06-07	65.8	86.	79.	65.	50.	48.	45.
07-08	61.1	78.	74.	61.	49.	48.	46.
08-09	63.1	87.	72.	62.	49.	46.	45.
09-10	64.6	80.	77.	68.	52.	47.	45.
10-11	69.9	100.	81.	67.	55.	47.	45.
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

NOTE: Levels measured with SLOW meter dynamics.

L_n: 70.4 dB
L_d: 68.1
L_{dn}: 76.5

Johnston Yard
Illinois Central Gulf Railroad
Memphis, Tennessee
(Site No. 52)

GENERAL DESCRIPTION

This is an established, busy flat yard with complete facilities for maintaining or repairing locomotives and rail cars. The yard is physically subdivided into 5 operating units: 3 sets of classification tracks, a TOFC facility, and a maintenance facility. The easternmost set of 32 classification tracks form the "A" yard and switching and northbound train building takes place on the 4 leads at the ends of the "A" yard. The western side of Johnston yard is divided into the "C" yard and the "short C". Switching and southbound train building takes place on the 32 tracks fed by the 4 leads at the ends of the "C" yard. The "short C" is mainly used to make up locals and to switch shop cuts, but only the 2 western leads of the "short C" are used, and then only during first and third shifts. All other switching leads are in use 24 hours per day. All together, some 1500 to 1600 cars are switched per day throughout the yard.

The maintenance facilities in the yard consist of the following:

a round house, which operates continuously and which services locomotives;

a truck shop, which repairs locomotive wheel carriages and operates during the first 2 shifts;

a car repair shop, which only operates during the first shift and outputs some 115-130 cars per day;

a load cell and search area, which operates mainly during the first shift and sometimes during the second. An average 98 locomotives are processed on the load cell per month and some 56 locomotives are put through the search process per month;

a wheel shop, which operates around the clock servicing car wheels;

a fueling station, which processes about 60 engines per day.

The TOFC facility operates from 5 AM to 9:30 PM during the week and from 7 AM to 3 PM on weekends. About 165 trailers per day are processed at this station.

The predominant noise making activities in and around the Johnston Yard appear to involve locomotives, some 90 of which are at the yard during any one day (including through trains). Locomotive noise is concentrated at the centrally located fueling area, which is in close proximity to the round house and search and load test area. Locomotive noise is also distributed around the facility (working switching locomotives). All engines at the yard are diesel-electirc. The only noise complaint yard management was aware of involved now discontinued operations of the load cell during the graveyard shift.

The second most significant noise source appears to involve sounds from the TOFC yard, which includes operation of the diesel driven cranes along the length of the 4 tracks serving the TOFC yard, as well as idling trucks in the yard, and moving trucks along the service road feeding the TOFC yard.

Other noises which can be heard at property lines (but which appear to be less consequential) include:

- rail car noise, which includes movement of individual cars during switching and movement of trains into or out of or through the complex. However, the continuously welded yard tracks are class 1 and therefore train movement in the yard is slow and noise output due to train movement low.
- rail car impact noise during switching.
- car repair shed noise. Noise output here consists mainly of continuous furnace noise, with occasional sounds from a small forging hammer, forklift truck movements or hand hammering operations.

Such noises escape mainly from the easternmost open end of the shed (the side of the shed where the work is actually performed).

Sounds of operations within the wheel trueing shop and the truck shop are contained within those fully enclosed facilities. Work done on the locomotives inside the roundhouse also remains inside or is masked by outside locomotive noise emissions. No sounds could be associated with the powerhouse. Although the yard does normally process refrigerator cars, none were observed during our visit.

MEASUREMENT LOCATIONS

Site 52-1

The northern side property line along the length of the Johnston yard passes through a floodplain and thus is below grade across the length of the yard. One measurement location was selected on the northern side of the yard, on grade level and near the center of the yard, however, in order to pick up the yard sound associated with switching activities and TOFC associated noises. This measurement site is closer to the yard activities than the property line and is only impacted by yard sounds; nearest public roads and industrial operators are at considerable distances to the north and are both distant and well shielded to the south.

The microphone at this site was set up 50 feet from (and at the same elevation as) the centerline of the closest yard track (track 32) and 26 feet from the centerline of the spur from "A" yard feeding the TOFC facility. The microphone was thus on the southern shoulder of the service road paralleling the northern side of "A" yard.

Because this site is so close to the north side switching lead of "A" track and to the service road, the noise measurements here are dominated by the noise of switching engines, trailor truck passby noise and noise of on-track moving stock. Whistle noise also contributes to the noise environment here, as there is a grade crossing nearby for the TOFC spur; there is also occasional loudspeaker noise from the public address speaker located 135' away.

Noise from other activities is considerably attenuated by distance and/or shielding effects. In particular, the only visable parts of the maintenance area, the car shed are the tops of storage tanks; the rest of the facility was always well shielded by parked rail cars or the terrain. The classification tracks and switching loads of "C" yard are distant from and depressed in elevation from the microphone position.

Site 52-3

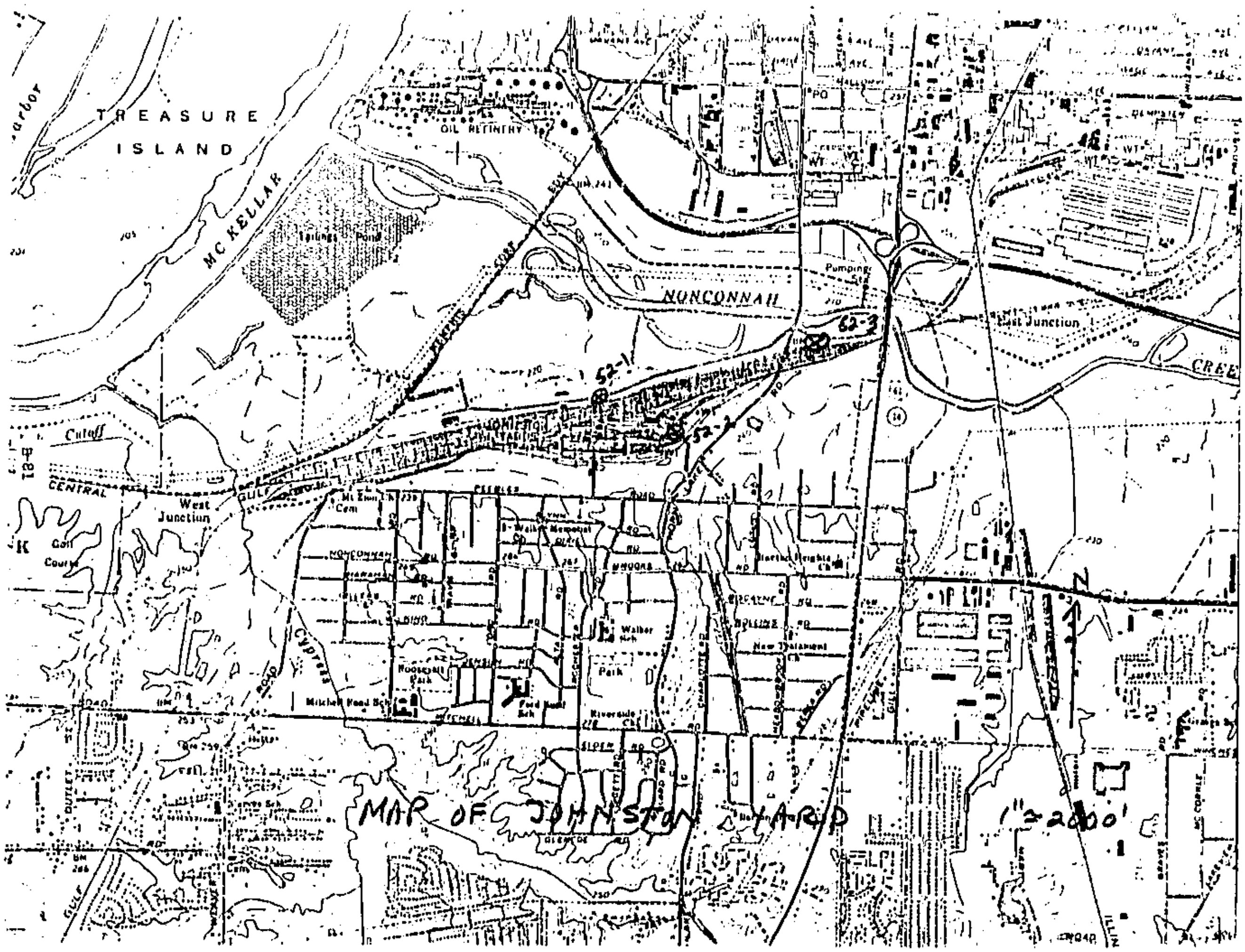
A second site was also used along the northern side of the yard. Site 52-3 at the eastern end of "A" yard was chosen because it represents a position impacted by community noise (Highway 61 and the interstate north of Nonconnah creek) as well as yard noise. Here the only yard noise was that associated with switching activity. The site was located 95' from the northernmost switching lead of "A" yard. The microphone was attached 16' up a 20' high boom and tied to a corner of a scale shed. The boom was necessary because a train is usually parked along the sidetrack in front of the scale shed, and along most of the length of track where switch engines operate.

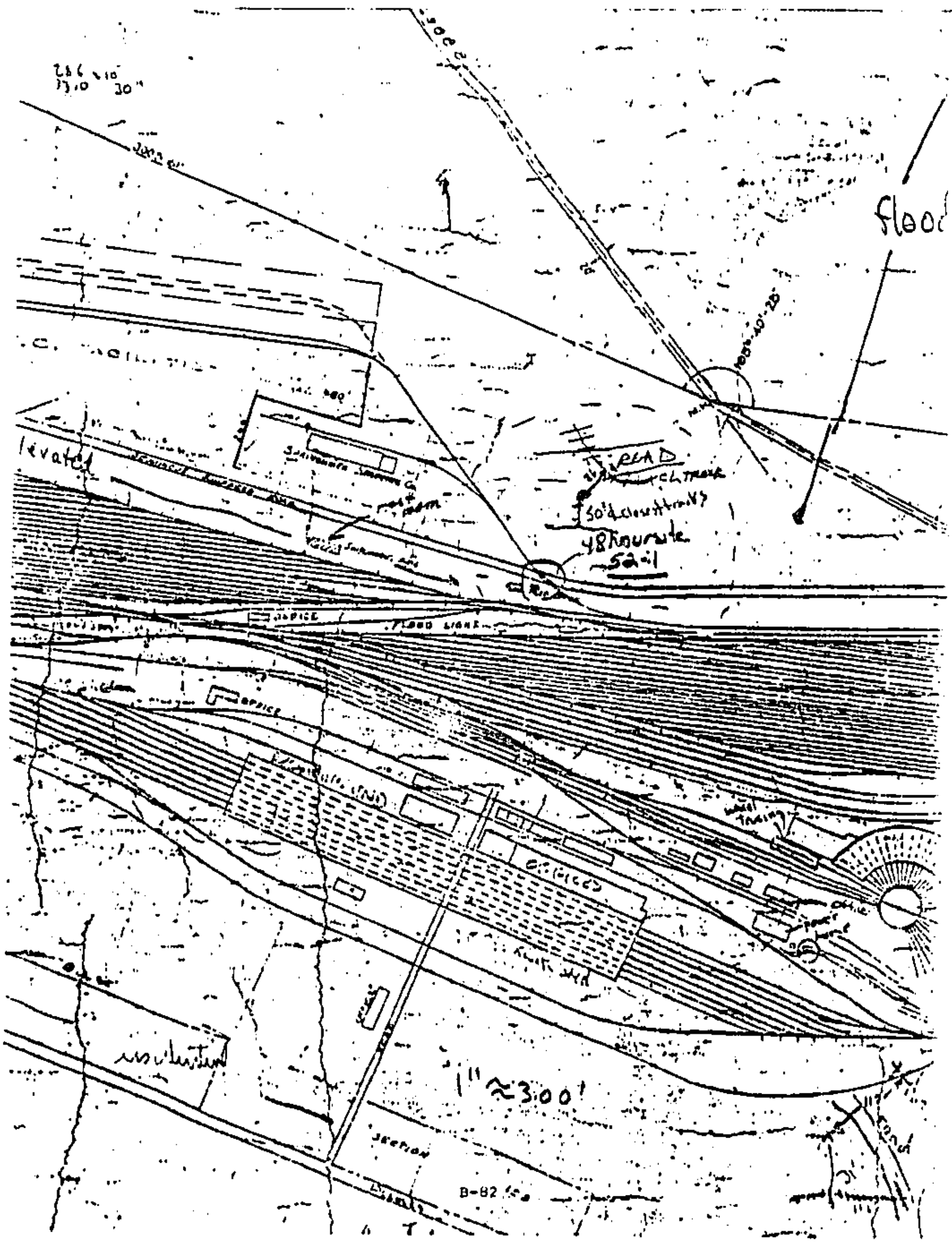
Site 52-2

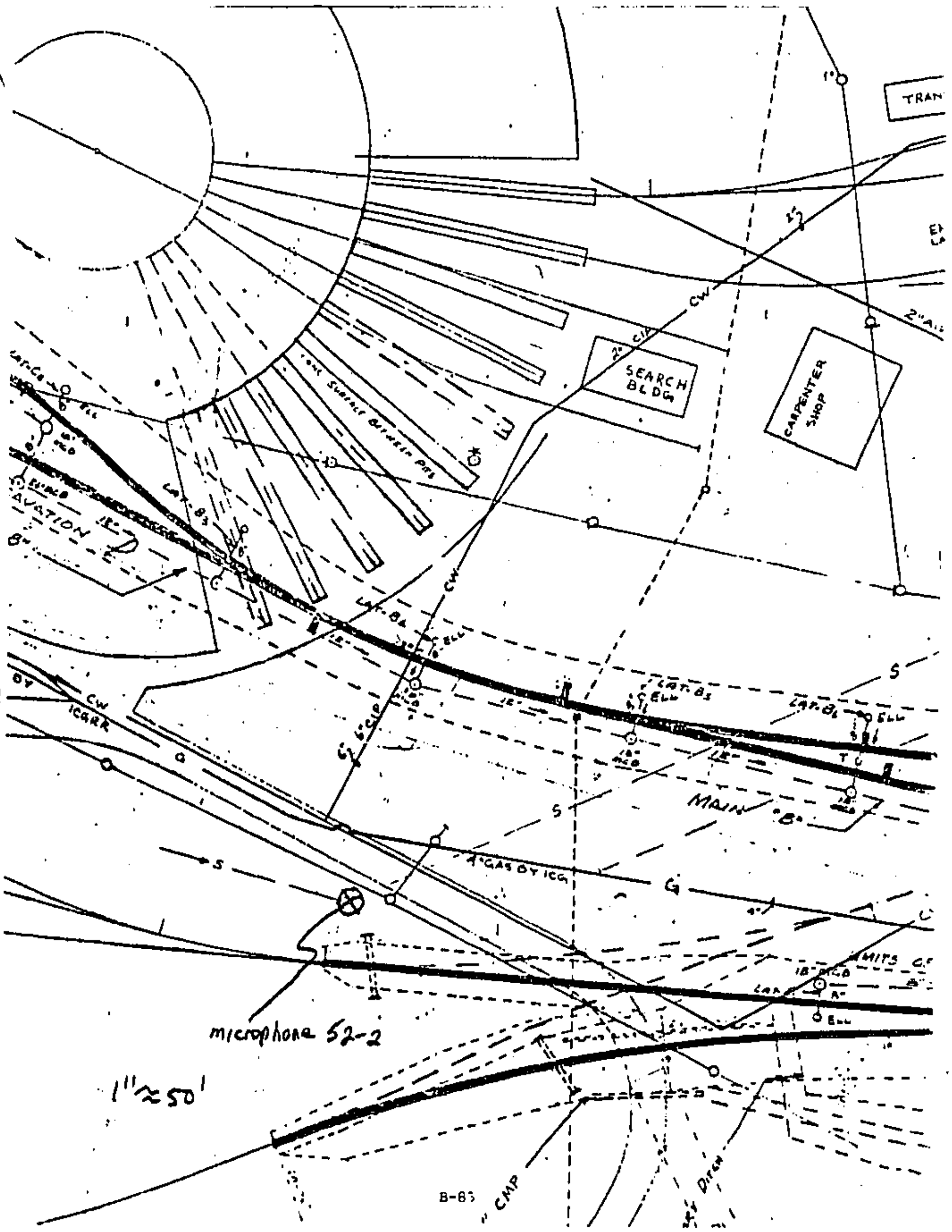
The southern side property line roughly parallels the yard and borders residential property and light industrial property along all but the eastern end. At the eastern end of the yard the property line passes through a depressed floodplain. No suitable measurement sites were found along the southern side; dense trees and land contours shielded those potential sites near yard noise sources and traffic noise predominated at potential sites where the yard was visible from the property line.

The third measurement location was therefore made closer-in to the yard tracks, at a location near the roundhouse, search and load test area, and fuel depot. The site was on the shoulder of the service road serving the central part of the yard, 31 feet from the centerline of the track leading to the car servicing area and 110 feet from the centerline of the track leading to the truck shop.

Noise at this site was predominantly idling or tested locomotives and vehicular traffic passing by the microphone.


TREASURE
ISLAND
MC KELLAR
Tailings Pond
OIL REFINERY
NONCONNAH
CREEK
Pumping Sta
East Junction
West Junction
Cutoff
CENTRAL
PEERLESS
52-1
52-2
52-3
Walker Hgh
New Testament
Roosevelt Park
Mitchell Road Sch
Riverside
MAP OF JOHNSTON YARD
(1"=2000')


flood
ROAD
48 Rounsite
52-1
OFFICE
FLOOD LIGHT
OFFICES
insulation
1'' ≈ 300'
SECTION
B-82


SEARCH BLDG.
CARPENTER SHOP
TRAN
CW
ICGRR
MAIN "B"
4" GAS BY ICG
LAT. B3
LAT. B6
LAT. B5
S
G
CMP
microphone 52-2
1" ≈ 50'

NOISE DATA

YARD: JOHNSTON LOCATION: 52-1

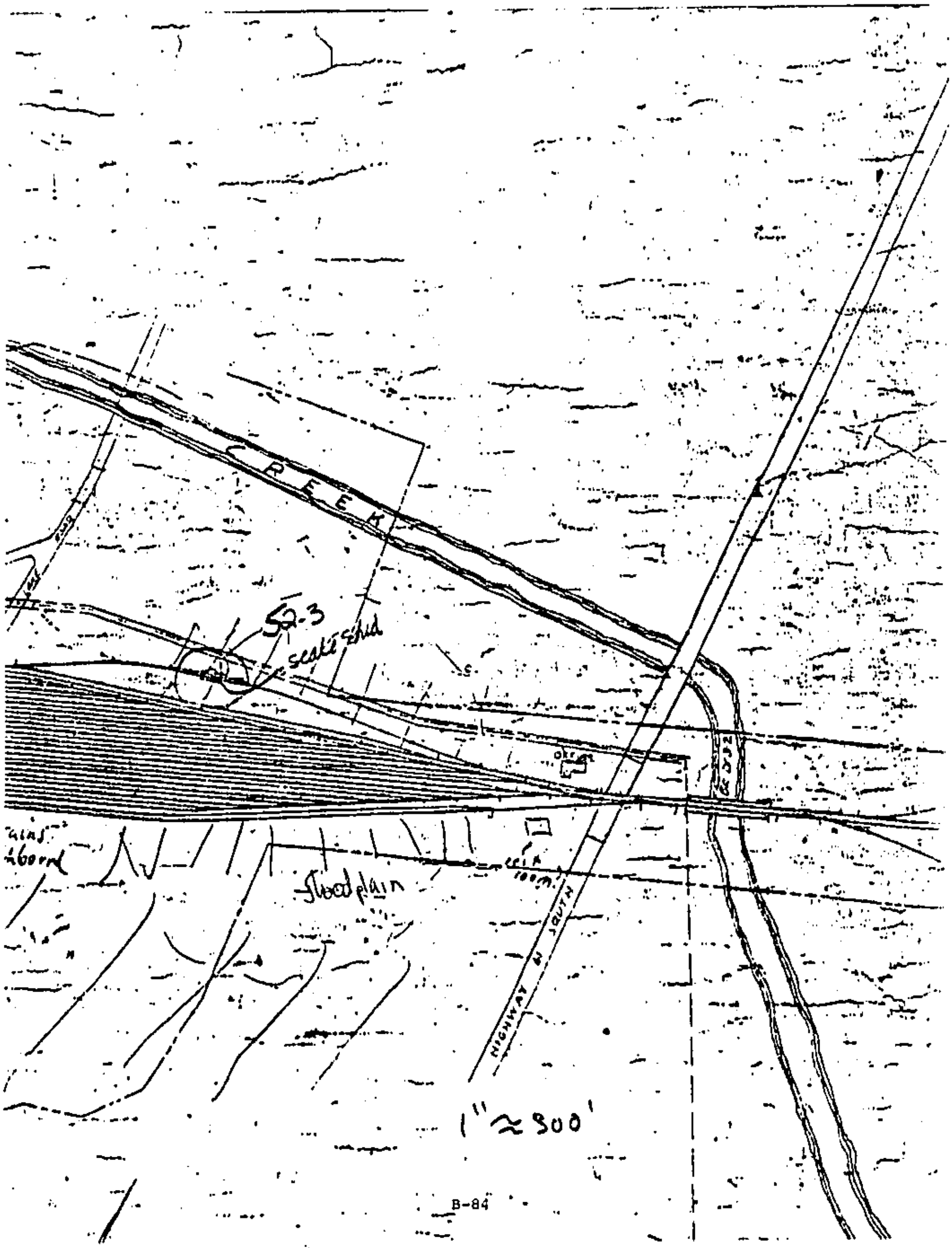
DATE: 16 February 1978 DATE: 17 February 1978

HOUR OF DAY	NOISE LEVEL in dBA (16 February 1978)							NOISE LEVEL in dBA (17 February 1978)						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								77.4	92.	87.	81.	71.	65.	61.
01-02								76.9	92.	88.	80.	65.	55.	53.
02-03								73.8	89.	85.	75.	69.	55.	55.
03-04								75.1	91.	86.	78.	67.	62.	57.
04-05								74.6	90.	85.	78.	64.	57.	55.
05-06								71.0	89.	83.	73.	59.	56.	56.
06-07								75.0	90.	87.	78.	68.	60.	56.
07-08								74.2	93.	87.	75.	60.	55.	55.
08-09								75.3	87.	85.	79.	68.	58.	56.
09-10								76.5	93.	86.	80.	71.	61.	56.
10-11								76.3	93.	87.	79.	67.	60.	57.
11-12								75.9	89.	87.	78.	71.	63.	62.
12-13	72.3	88.	84.	76.	63.	56.	55.	* 69.0	86.	81.	71.	58.	56.	55.
13-14	80.1													
14-15	74.8	96.	82.	77.	68.	60.	54.							
15-16	72.4	88.	84.	75.	64.	58.	57.							
16-17	74.6	89.	85.	77.	68.	59.	57.							
17-18	76.1	88.	86.	80.	70.	58.	56.							
18-19	86.6	110.	98.	81.	72.	62.	57.							
19-20	74.6	91.	85.	77.	67.	56.	54.							
20-21	73.3	90.	83.	76.	64.	55.	54.							
21-22	73.8	88.	85.	78.	57.	54.	54.							
22-23	82.6	104.	95.	82.	70.	58.	57.							
23-24	77.6	91.	89.	80.	72.	60.	56.							

* These data not included in L_{dn} calculation.

NOTE: Levels measured with SLOW meter dynamics.

L_n: 77.2
L_d: 78.0
L_{dn}: 83.7


CREEK
52-3
scale shed
flood plain
HIGHWAY 41 SOUTH
1" ≈ 300'

NOISE DATA

YARD: JOHNSTON LOCATION: 52-2

HOUR OF DAY	DATE: 16 February 1978 — NOISE LEVEL in dBA							DATE: 17 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								88.1	122.	77.	67.	66.	66.	66.
01-02								67.8	87.	72.	68.	67.	66.	66.
02-03								68.0	90.	73.	68.	66.	66.	65.
03-04								68.2	88.	75.	68.	66.	66.	65.
04-05								68.0	83.	76.	68.	66.	66.	65.
05-06								69.0	90.	77.	68.	66.	66.	65.
06-07								67.8	85.	74.	68.	66.	66.	65.
07-08								87.5	122.	79.	69.	67.	66.	65.
08-09								70.5	92.	79.	71.	66.	64.	64.
09-10								67.1	86.	74.	67.	65.	64.	64.
10-11								69.1	92.	78.	68.	66.	65.	64.
11-12	71.2	85.	79.	75.	68.	67.	66.							
12-13	69.0	84.	75.	69.	68.	67.	66.							
13-14	69.7	88.	77.	70.	67.	65.	64.							
14-15	67.8	92.	75.	69.	65.	64.	63.							
15-16	70.3	92.	80.	70.	67.	65.	64.							
16-17	80.0	102.	83.	82.	80.	68.	67.							
17-18	74.0	87.	84.	78.	68.	67.	66.							
18-19	75.5	103.	81.	72.	67.	66.	66.							
19-20	84.3	111.	96.	77.	68.	66.	66.							
20-21	69.3	86.	78.	69.	67.	66.	66.							
21-22	70.1	88.	78.	73.	67.	66.	66.							
22-23	72.9	90.	83.	74.	67.	66.	66.							
23-24	67.3	75.	71.	67.	66.	66.	66.							

NOTE: Levels measured with SLOW meter dynamics.

L_n: 79.0 dB
L_d: 78.6
L_{dn}: 85.3

YARD: JOHNSTON LOCATION: 52-3

HOUR OF DAY	DATE: 17 February 1978 — NOISE LEVEL in dBA							DATE: 18 February 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								75.7	84.	83.	81.	69.	63.	58.
01-02								65.4	86.	77.	65.	68.	58.	51.
02-03								62.8	87.	75.	63.	53.	48.	47.
03-04								63.5	88.	75.	63.	53.	47.	44.
04-05														
05-06								53.0	64.	61.	55.	50.	48.	47.
06-07								66.9	92.	80.	64.	55.	49.	47.
07-08								53.4	71.	60.	55.	51.	49.	47.
08-09								69.1	95.	80.	66.	58.	52.	49.
09-10								66.7	83.	78.	70.	58.	53.	51.
10-11								65.4	86.	76.	67.	57.	52.	50.
11-12	68.8	90.	79.	70.	62.	59.	56.							
12-13	69.9	93.	81.	69.	61.	57.	56.							
13-14	69.9	93.	82.	69.	61.	58.	56.							
14-15	62.0	82.	70.	63.	59.	57.	56.							
15-16	65.0	85.	75.	66.	61.	59.	57.							
16-17	62.4	78.	70.	64.	60.	58.	57.							
17-18	70.3	98.	80.	70.	61.	58.	57.							
18-19	66.1	89.	78.	66.	59.	56.	54.							
19-20	67.1	86.	77.	69.	61.	55.	53.							
20-21	66.9	81.	78.	69.	62.	56.	53.							
21-22	62.8	79.	71.	67.	58.	55.	52.							
22-23	68.4	75.	71.	68.	68.	67.	67.							
23-24	69.5	88.	76.	69.	67.	67.	62.							

NOTE: Levels measured with SLOW meter dynamics.

L_n: 68.6 dB
L_d: 67.1
L_{dn}: 74.9

Eureka Rail Yard
Missouri, Kansas, Texas Railroad
Houston, Texas
(Site No. 34)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The Eureka Rail Yard is a flat industrial/classification yard. The following activities were observed to occur at the yard:

1. Flat switching: the several tracks on each side of the mainline are used for flat switching, in which incoming trains are dissassembled, the various rail cars are sorted, and then re-assembled to form outgoing trains. Major noise sources from the switching activity include the diesel noise from the switch engine moving back and forth, the impact noise which occurs when individual rail cars are kicked from a train during decoupling, and then again when these cars collide with stationary rail cars. Also present is the wheel/rail noise as partial trains are moving back and forth along the switch tracks.

2. Loading and unloading of stone: The Eureka Rail Yard serves the Texas Stone Crushing Corporation, located within the yard (the exact delineation of the railroad property as distinct from the stone crushing property could not be determined from visual observation). Incoming shipments of stone are transported in hopper cars to a small bridge. Trucks from the Texas Stone Crushing Corporation drive into individual

bays underneath the bridge, whereupon the bottom of the hopper car is opened and the stones fall through an opening in the bridge into the waiting trucks which then transport it to the crushing facilities. After the stone has been crushed and processed appropriately, it is loaded on outgoing rail cars with a conveyer belt. The major noise sources from this activity include the emptying of the rail hopper cars, and the noise of the trucks transporting uncrushed and crushed stone to and from the loading facilities. It should be noted that some of these noise generating acitivities are not under the control of the railroad.

3. Piggy-back operations: the south portion of the yard contains a trailer-on-flat-car (TOFC), or piggy-back, facility. Here, trailers are loaded on a string of 5 or more flat cars on one or more of the TOFC tracks. Major noise sources include the diesel noise of tractors loading and unloading the trailers on the flat cars, the wheel/rail noise of flat cars moving to and from the TOFC tracks, and various banging noises which occur during the process of loading and securing the trailers onto the flat cars.

In addition to these activities, we were told that a diesel repair facility is located somewhere in the center of the yard. Major noise sources from such a facility would include the noise of idling diesel locomotives in the vicinity of the facility, as well as the noise of the repair work being done on the locomotives. During our survey, we did not observe this facility, nor did we observe the noise exposure that one might expect from such a facility. It is also unknown whether or not diesel repair would be performed in an enclosed or an open repair shop.

We were told by community residents that activities occur 24 hours a day, throughout the year. There is apparently no seasonal variation that has been observed to date.

We did not observe any activities occurring at the rail yard which we believe could be related to the production or transportation of products relating to the energy production industry.

1.2 Land Use Surrounding Yard

North of the yard is residential community of Timbergrove Manor, with closest residences about 600 to 700 feet from the northernmost yard tracks (see attached map). Residents of this community have complained in the past about the noise from yard activities. Separating the backyards of the southernmost residences from the yard is about 300 feet of fairly dense vegetation, which provides complete visual shielding of the yard. Just west of this community is an area devoted to light industry.

South of the yard is a mixed area consisting of residences and light industry interspersed with some commercial activity as well. The closest residences in this area are 30 to 35 feet from the southernmost piggyback track, and on the east end of the area are 20 to 25 feet from the southernmost switch track.

1.3 Noise Control Through Source Relocation

As noted above, along the length of the yard there are residences on both the north and south side. Some relief to the residents on the south might be accomplished by relocating the piggyback operations further north, since this area is several hundred feet away from the residences on the north. However, there are currently no TOFC tracks in this area so that such relocation would involve construction of new tracks. It is also unknown whether the space is available for this relocation, since the Texas Stone Crushing Corporation conducts its operations in this general area as well.

Relocation of the piggyback operations to the north of the switch tracks would increase the exposure in the community areas north of the yard. Although current noise levels in this area are not very high (see next section), the residents here currently complain about the yard noise.

2. SITE DATA

2.1 Site Characteristics

Three locations (34-1, 2 and 3) were chosen as sites for 24-hour monitoring (see attached map). The sites were chosen on the basis of proximity to different noise sources, as well as being representative of other residences in the area with similar exposures. In addition, at the selected sites the noise exposure due to rail yard sources was the clearly dominant exposure, for at least major portions of the day.

South of the yard, sites 34-1 and 34-3 were located on the property line separating the rail yard from the adjoining residences. Site 34-1, in the backyard of 5620 Kansas Street, was directly exposed to the noise of the piggyback operations. Site 34-3, in the backyard of 5316 Egbert Street, was exposed to the noise of flat switching at the eastern end of the yard.

Most of the homes located just south of the rail yard are single-family wood-frame homes, many with window air-conditioners. These homes are on the order of 40 to 50 years old, and many are in a state of disrepair. (However, the home at 5316 Egbert Street where site 34-3 was located is conspicuous in this neighborhood in that it was built approximately 10 years ago and is considerably better constructed and maintained.)

North of the yard, site 34-2 located in the backyard of 6107 Queenswood Lane, was chosen as being representative of the exposure of all of the homes that are located at the south side of Queenswood Lane. These homes are exposed to the noise of flat switching, as well as the noise of the loading and unloading operations associated with the Texas Stone Crushing Corporation (including the noise of diesel trucks). These homes are one-story single-family homes of frame construction, with central air-conditioning in most.

2.2 Site Noise Environment

Site 34-1

For residents along Kansas Street, the noise environment is a combination of the noise from the rail yard and the noise of activities performed at small industrial plants which are interspersed with the residences. For the most part, the industrial noise occurs only during daytime hours. At site 34-1, located in the backyard of the residence close to the tracks and away from industrial sources, the noise environment even during daytime hours is dominated by activities from the rail yard. This is probably true of many of the areas, even though the front portions of residences along Kansas Street receive significant exposure during the daytime from the industrial operations.

The major source of noise from rail yard operations results from the piggyback operations immediately adjacent to the measurement site (the closest piggyback track was 33 feet from the measurement microphone). The major noise components of the piggyback operations were the noise of tractors loading and unloading trailers onto flat cars, the noise of flat cars moving to and from the piggyback tracks, and the banging noise resulting from a variety of manual activities related to the loading and unloading of trailers (including the raising and lowering of guard flaps which secure the trailors onto the flat cars, and occasional hammering). These banging noises intrude on the rest of the noise environment, by virture of their impact characteristics.

In addition, the noise of idling and moving switch engines (diesel noise and whistle blowing), rail cars (especially the release of air from the air brakes) and trucks were important contributors to the noise environment.

Measurements at site 34-1 were obtained over a 1½ day period. During the last complete 24 hours rail yard noise occured during every hour; piggyback operations occured during six hours while the noise of trucks and switch engines moving about the yard was evident during every hour of the day.

Site 34-2

There are 4 components to the noise environment in the residential community north of the rail yard:

1. The noise of the light industry west of the Timbergrove Community. This consists of the noise from heavy diesel trucks, electric power saws, banging operations, etc.

2. The noise of construction activities associated with building the bridge for T. C. Jester Blvd. southward. Currently this includes the noise of tractors, pile drivers, and drills.

3. The noise of occasional aircraft overflights from Houston Intercontinental Airport.

4. The noise from the Eureka Rail Yard.

From approximately 7:30 in the morning til 5:30 in the evening, the light industry noise and the construction noise are major contributors to the noise environment in the community. The light industry noise dominates the noise environment during daytime hours for those residences towards the west of the community, while the construction noise dominates the environment during the daytime hours for those residences on the east side of the community. Aircraft overflights, while observable, do not represent a significant contributor to the noise environment.

During evening and nighttime hours, the noise exposure from the rail yard activities dominates the noise environment when rail yard activities are underway. When rail yard activities are not in operation, the community is a relatively quiet one.

At measurement site 34-2, the noise from the construction activities is often the dominant source during the daytime hours; the noise of light industry is not detectable at this location.

The major rail noise sources observed at site 34-2 are the noise of heavy diesel trucks transporting stone to and from loading docks, and the noise of switching operations. These activities can occur any time of the day on an intermittent basis.

The major source of annoyance and complaints is the impulsive type of noise associated with rail cars colliding with one another during switching operations. Against a relatively quiet background at night, this car coupling noise is observed to be very intrusive, sometimes causing sleep disruption. Every 2 to 3 days, we were told, cars will be coupled at an excessive speed causing an extremely loud impact noise which startles the entire community. When this occurs, some residents have indicated that they are awakened, and their houses rattle. The switching operations occur at a distance of 600 feet or more from the closest residences which are located on the south side of Queenswood Lane.

Measurements at site 34-2 were obtained for a 48-hour period.

Site 34-3

There are 3 major noise sources in the vicinity of site 34-3: the noise of construction activities associated with the extension of T. C. Jester Blvd. northward along Leroy Street between Kansas and Egbert, the noise of heavy trucks making deliveries to some of the industrial firms that are intermixed with the residences in this area, and the noise of rail yard activities. At measurement Site 34-3, located on the property line between the rail yard and the residence, the noise of industrial activities at the facility next door was important only during occasional portions of the day when rail activities at that location were minimal. The noise of flat switching operations at the east end of the yard dominate the noise environment at this site. Specific sources include the noise of switch engines moving back and forth along the tracks, as well as the noise of rail cars coupling.

Although the noise of these activities generally go unnoticed by the local residents, they do report that these activities frequently cause their houses to rattle and shake. In addition, the car coupling noise results in impacts which are intrusive on the background environment.

During the one day of measurements at this site, the noise of switch engines idling and moving back and forth occured every hour. (The measurement microphone was located 18 feet from the nearest switch track.) Coupling activities were observed for two thirds of the day, with rail car noise (wheel/rail), whistles, and car impacts contributing to the noise environment.

Additional Measurements Sites

Short samples of the noise exposure were obtained for two locations (34-4 and 5) in the community north of the rail yard in order to examine any variation in the noise exposure throughout the community. The locations of these measurements are shown on the attached map. The measurements were obtained on 10 August during periods when car coupling activities, with the associated loud impacts that were the source of complaints, were occuring at the yard. Results of the measurements are as follows:

Site	Time	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99} (dB)
34-4	1750	53.6	69.3	60.0	58.0	51.0	47.0	46.0
34.5	1920	54.5	66.5	60.0	57.0	53.0	51.0	50.0

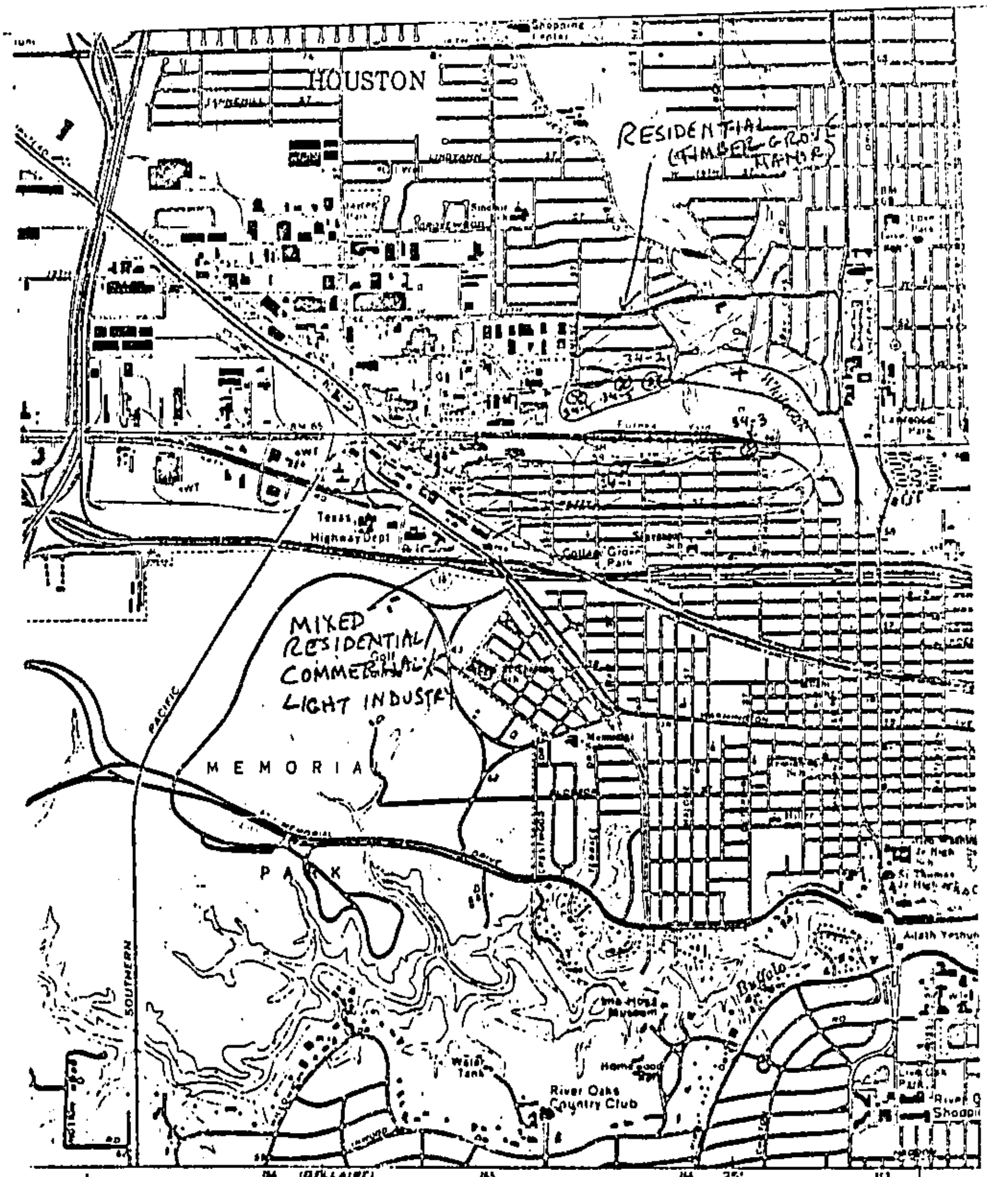
2.3 Subjective Impressions

The subjective response of residents north of the rail yard is distinctly different from the residents south of the yard. North of the yard where ambient levels at night are low and the rail noise exposure is moderate, the residents are more apt to be annoyed and to indicate sleep disruptions than south of the yard where nighttime noise exposure is much higher.

Several similarities were noted, however. Many residents both north and south indicated that they have become accustomed to the noise from the rail yard, and that they rarely noticed it except when levels were particularly intrusive (such as when unusually loud car impact noise would occur), or when they would be visited by guests from out of the neighborhood who would bring the noise from the rail yard to their attention. In addition, even though rail activities can occur over any period of the day, residents are more aware of and are bothered by rail noise exposure during evening and nighttime periods. This is not surprising, since in both areas there are other sources of noise which can frequently exceed the rail noise levels during daytime hours.

North of the yard, only the west end area is exposed to a continuing non-rail noise source, namely the industry west of the community. Much of the community east of this area experiences the noise of construction but this is a relatively recent occurance and is expected to be temporary. When asked about other problems in the neighborhood, the only item cited was the dust problem caused by the stone crushing operation. Except for construction at T. C. Jester Blvd. and additional construction of apartment houses just east of there, this is a relatively stable neighborhood. South of the yard, however, over the past few years, the residential neighborhood has decayed as many of the residential lots have been converted to commercial or industrial land use. This is the major cause of concern for many of the inhabitants, particularly those who have lived in the neighborhood for a considerable time.

Residents north of the yard have been known to complain about the noise of yard activity, while none of the residents south of the yard who were contacted had any complaints. Rather, the thought of complaining was totally foreign to them, and in their opinions, futile. In this regard, they were pleasantly surprised to learn about the measurement survey and EPA's regulatory activities concerning rail yards.



B- 99

SCALE 1:24000

CONTOUR INTERVAL 5 FEET
DATUM IS MEAN SEA LEVEL

MAP OF EUREKA RAIL YARD

+ CONSTRUCTION SITES

⊗ NOISE MEASUREMENT SITES

NOISE DATA

YARD: EUREKA LOCATION: 34-1

HOUR OF DAY	DATE: 08 AUG 1978 — NOISE LEVEL in dBA							DATE: 09 AUG 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								53.1	66.3	58.5	54.5	52.4	51.4	50.3
01-02								53.9	80.0	62.4	54.8	52.3	50.5	48.8
02-03								50.4	66.3	55.0	51.6	49.9	48.9	47.7
03-04								51.8	85.0	60.0	50.9	48.6	46.7	45.5
04-05								48.9	78.8	56.1	49.6	47.1	46.3	45.2
05-06								50.0	68.8	58.8	50.9	48.3	46.8	46.3
06-07								52.9	82.5	58.6	53.1	51.4	50.1	48.9
07-08								54.3	71.3	63.9	54.9	52.5	51.4	50.3
08-09								55.1	78.8	63.0	57.1	53.1	51.4	50.2
09-10														
10-11														
11-12														
12-13														
13-14														
14-15														
15-16														
16-17														
17-18														
18-19														
19-20														
20-21														
21-22														
22-23	49.4	62.5	56.8	50.6	48.5	47.5	46.4							
23-24	50.6	73.8	56.8	51.8	50.1	46.9	45.9							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: ______ dB
L_n : 51.5
L_d : ______
L_{dn}: ______

NOISE DATA

YARD: EUREKA LOCATION: 34-1

HOUR OF DAY	L_{eq} (9 AUG 1978)	L_{max} (9 AUG 1978)	L_1 (9 AUG 1978)	L_{10} (9 AUG 1978)	L_{50} (9 AUG 1978)	L_{90} (9 AUG 1978)	L_{99} (9 AUG 1978)	L_{eq} (10 AUG 1978)	L_{max} (10 AUG 1978)	L_1 (10 AUG 1978)	L_{10} (10 AUG 1978)	L_{50} (10 AUG 1978)	L_{90} (10 AUG 1978)	L_{99} (10 AUG 1978)
00-01								49.2	78.8	55.8	48.9	46.6	45.1	43.9
01-02								54.0	78.8	68.1	50.0	47.2	45.8	45.0
02-03								48.4	75.0	54.8	48.7	46.4	45.1	43.9
03-04								49.8	72.5	58.3	50.8	47.8	45.5	44.6
04-05								53.7	77.5	63.2	54.5	51.8	47.2	46.3
05-06								53.5	78.8	57.8	54.7	52.9	51.5	50.5
06-07								56.0	80.0	65.0	55.6	53.9	52.6	51.6
07-08								59.8	97.5	68.6	57.7	53.9	52.7	51.5
08-09								61.1	88.8	71.5	60.0	54.0	52.6	51.4
09-10	61.9	93.8	70.9	62.7	53.1	49.5	48.0							
10-11	59.0	96.3	69.5	55.3	50.1	47.4	45.9							
11-12	53.5	76.3	65.2	54.4	48.9	46.4	45.1							
12-13	53.1	76.3	64.2	53.9	50.0	47.2	45.7							
13-14	57.9	86.3	69.5	58.3	52.6	49.9	48.0							
14-15	60.3	87.5	70.2	58.7	55.6	53.4	51.7							
15-16	60.6	85.0	70.6	58.5	55.3	53.0	51.5							
16-17	67.4	107.5	66.7	58.5	55.2	52.8	51.4							
17-18	70.8	101.3	83.2	67.3	57.2	54.4	52.8							
18-19	62.8	100.0	70.1	62.1	55.4	52.6	51.2							
19-20	65.9	100.0	70.6	56.8	52.8	51.3	50.2							
20-21														
21-22	55.1	88.8	62.1	54.8	52.2	51.4	48.6							
22-23	61.1	98.8	64.5	52.1	48.4	46.6	45.3							
23-24	61.2	97.5	67.8	52.4	47.9	45.8	45.0							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 61.9 dB
L_n : 56.4
L_d : 63.5
L_{dn}: 64.8

NOISE DATA

YARD: EUREKA LOCATION: 34-2

DATE: 09 AUG 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10	53.7	75.0	63.3	55.6	50.8	47.4	45.7
10-11	51.5	68.8	59.7	54.4	49.2	45.5	43.1
11-12	52.1	72.5	63.4	53.9	48.2	44.9	42.8
12-13	51.3	73.8	61.0	53.4	48.1	44.8	42.9
13-14	48.7	62.5	56.1	51.2	47.1	44.3	42.7
14-15	50.3	70.0	59.0	53.0	47.8	44.0	41.6
15-16	51.4	71.3	58.7	54.5	48.5	44.3	42.3
16-17	50.6	66.3	57.9	53.7	48.9	44.7	42.3
17-18	51.8	73.8	63.1	53.5	47.2	44.6	43.8
18-19	51.9	75.0	62.1	53.4	49.1	46.8	45.5
19-20	49.9	67.5	57.3	50.9	46.9	45.3	44.5
20-21	49.6	68.8	59.1	51.1	47.5	46.4	45.2
21-22	49.1	66.3	53.1	50.1	48.6	47.3	46.3
22-23	49.6	63.8	57.9	50.6	48.5	47.6	46.4
23-24	48.9	63.8	54.5	50.1	48.3	46.9	46.3

DATE: 10 AUG 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	47.7	65.0	52.6	48.7	47.2	46.3	45.2
01-02	48.0	61.3	53.4	48.7	47.6	46.5	46.3
02-03	50.0	65.0	52.9	51.0	49.7	48.8	46.8
03-04	49.6	67.5	54.0	50.7	49.3	48.0	47.5
04-05	50.1	66.3	56.2	51.1	49.5	48.2	47.6
05-06	50.5	62.5	52.7	51.5	50.4	49.2	48.8
06-07	52.7	70.0	57.4	54.8	51.9	50.5	49.4
07-08	53.8	70.0	60.0	55.0	53.2	51.2	50.1
08-09	52.4	68.8	57.8	54.8	51.4	49.4	48.2
09-10							
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 50.9 dB

L_n: 49.9

L_d: 51.4

L_{dn}: 56.6

NOISE DATA

YARD: EUREKA LOCATION: 34-2

HOUR OF DAY	DATE: 10 AUG 1978 NOISE LEVEL in dBA							DATE: 11 AUG 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								48.5	66.3	57.9	48.7	47.2	46.1	45.1
01-02								47.5	65.0	53.3	48.5	47.0	45.8	45.1
02-03								48.1	67.5	53.3	49.2	47.4	46.3	45.1
03-04								48.2	58.8	51.7	49.5	48.0	46.6	45.6
04-05								48.5	61.3	52.0	50.2	48.2	46.8	46.3
05-06								50.0	65.0	52.4	51.1	49.9	48.5	47.6
06-07								50.9	66.3	56.5	52.1	50.4	49.1	48.8
07-08								54.3	71.3	62.4	54.9	53.0	51.4	50.1
08-09								53.1	76.3	60.5	53.4	50.9	49.0	47.6
09-10	50.7	71.3	56.1	53.5	49.3	46.9	45.7							
10-11	52.4	66.3	58.2	55.2	51.3	48.1	46.4							
11-12	50.9	73.8	60.5	53.3	47.9	44.9	43.8							
12-13	52.7	68.8	59.8	56.1	50.5	45.8	43.3							
13-14	52.6	75.0	61.5	55.8	49.7	45.4	43.1							
14-15	50.5	72.5	58.7	53.4	47.9	44.9	42.8							
15-16	50.2	71.3	56.3	51.8	48.2	45.4	43.9							
16-17	49.4	70.0	57.3	52.4	47.2	44.5	43.3							
17-18	50.6	72.5	61.7	52.6	46.9	44.9	43.8							
18-19	49.9	67.5	58.1	52.2	48.1	45.5	44.2							
19-20	52.8	68.8	60.1	55.7	51.2	48.1	46.5							
20-21	49.8	66.3	57.6	52.3	47.8	45.6	45.0							
21-22	49.4	71.3	58.3	50.8	47.4	46.1	45.1							
22-23	47.9	67.5	53.9	49.3	47.1	45.8	45.1							
23-24	47.1	58.8	52.2	48.1	46.7	45.4	45.0							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 50.7 dB
L_n : 48.7
L_d : 51.5
L_{dn}: 55.6

NOISE DATA

YARD: EUREKA LOCATION: 34-3

HOUR OF DAY	10 AUG 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	11 AUG 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								64.9	92.5	77.3	66.6	56.0	48.2	46.5
01-02								70.7	97.5	82.1	71.9	57.8	46.9	43.8
02-03								60.3	82.5	72.1	62.4	53.8	46.6	45.0
03-04								68.0	95.0	79.1	71.6	54.2	50.5	49.1
04-05								66.7	93.8	78.7	70.1	53.2	51.0	50.1
05-06								67.9	88.8	78.5	72.4	59.7	52.2	50.4
06-07								65.3	97.5	77.4	66.4	57.4	52.7	51.1
07-08								68.9	95.0	81.3	71.9	58.9	55.0	53.8
08-09								70.8	100.0	80.3	75.1	60.8	55.8	53.0
09-10	73.4	101.3	82.5	74.8	69.6	57.5	51.6							
10-11	69.8	93.8	79.7	72.6	61.1	53.0	50.2							
11-12	66.0	97.5	77.6	67.7	60.2	54.0	50.6							
12-13	67.9	95.0	81.1	67.3	60.9	53.3	50.5							
13-14	68.8	95.0	81.6	70.9	58.6	52.5	50.0							
14-15	65.4	93.8	78.2	66.1	55.4	51.0	49.7							
15-16	68.0	95.0	81.6	69.4	57.1	53.0	51.7							
16-17	69.9	90.0	81.5	74.0	58.0	52.5	50.2							
17-18	68.6	101.3	80.5	70.4	56.0	50.5	49.0							
18-19	69.4	98.8	81.7	69.3	55.6	51.9	50.3							
19-20	65.2	92.5	76.6	68.6	56.7	53.5	51.6							
20-21	67.6	96.3	80.1	69.0	57.9	53.8	52.0							
21-22	69.8	92.5	82.4	72.7	56.0	51.8	50.5							
22-23	68.5	105.0	78.1	68.4	56.0	51.6	50.3							
23-24	66.3	93.8	78.3	66.7	59.3	52.2	50.6							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 68.5 dB
L_n : 67.2
L_d : 69.1
L_{dn}: 74.0

Mormon Rail Yard
Atchison, Topeka and Santa Fe Railway Company
Stockton, California
(Site No. 35)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

Morman Yard operations are interdependent upon local rail links with Western Pacific and the Southern Pacific railroad operations. Here, an average of 15 to 17 trains are involved in setting out, picking up, or interchanging about 1,000 cars per day. Also, two scheduled AMTRAK trains utilize the main through line near the northern yard boundary.

This flat yard stretches roughly east and west with switching operations originating from both ends onto the classification tracks located south of the main line. Here incoming trains are disassembled and various rail cars sorted, then reassembled to form outgoing trains. Major noise sources from the switching activities include the diesel engines moving back and forth, the impact noise that occurs when individual rail cars are kicked from a train during decoupling, and then again when these cars collide with stationary rail cars. Also present is wheel/rail and brake noise as partial trains are moving back and forth along the switch tracks.

Refrigerator cars are interspersed among incoming and outgoing trains which are positioned on the classification tracks. These refrigerator units operate, often for hours, at all times during the day.

The south central portion of the yard contains an engine maintenance facility, for several diesel locomotives. Here engines idle continuously. A piggyback loading facility (TOFC) is located in the southwestern corner of the yard. Here truck trailers are loaded on strings of flat cars on one of the TOFC tracks. Major noise sources would include diesel noise of tractors unloading and loading the trailers on the flatcars, the wheel/rail noise of flat cars moving to and from the TOFC tracks, and various banging noises which occur during the process of loading and securing the trailers onto the flat cars. None of these operations was observed during our sound level measurement program here.

We were told by ATSF railroad personnel and by community residents that yard activities occur 24 hours a day throughout the year. There is apparently little seasonal variation that has been observed to date.

We did not observe any activities occurring at the rail yard which we believe could be related to the production or transportation of products relating to the energy production industry.

1.2 Land Use Surrounding the Yard

The land uses surrounding the yard include residential mixed with light industry and ATSF company offices along the northern boundary and, west to east, residential, vacant land, and industrial processing (primarily Diamond Walnut) along the southern boundary. The yard is elevated approximately 4 to 6 feet above the surrounding areas along the northern boundary and slopes to about ground level on the southern boundary. The residential property lines along the northern boundary are approximately 27 feet from the main railroad line and have clear line of site to most yard operations. Also, the Southern Pacific through railroad line is several blocks north of these residences. Residential property lines at the southwest corner are as close as 30 feet from the nearest spur on which refrigerator cars are sometimes left idling.

1.3 Noise Control through Source Relocation

As noted above, there are residences along both the north and southwest yard boundaries. Some reduction in noise might be accomplished by concentrating switching operations and location of operating refrigerator cars in the southern portion of the yard. Noise level reductions would be achieved due to the increased distances as well as shielding provided by intervening strings of railroad cars.

Also noise levels from piggyback operations would be reduced if the location were moved further east.

2. SITE DATA

2.1 Site Characteristics

Site 35-1 was chosen for 48-hour monitoring and Site 35-2 and 3 for 24-hour monitoring (see attached map). These sites were chosen to represent other residences in nearby areas with similar noise exposures. These positions were also located according to existing noise contour information provided by the San Joaquin Valley planning office which indicated that these sites were dominated by rail yard noise.

Sites 35-1 at 1027 Filbert Street and 3 at 2420 Worth Street were located at property lines along the northern boundary, approximately 27 feet from the main line. Both sites have clear line of site to rail yard switching operations as well as through train activities. Site 35-2 on E. Worth Street had direct line of site to switching and through train operations at the western end of the yard.

The residential structures surrounding the yard are wood frame construction with either exterior stucco or wood siding. The newer constructions probably include insulation in the exterior wall airspace while others may not. Most houses include air conditioning, some central and some individual through-the-wall units. However, in most cases residents still keep certain windows open at night when temperatures cool considerably. Generally windows are either poorly fitted double-hung wood units, or aluminum sliding-glass units in newer homes.

2.2 Site Noise Environment

Site 35-1

This position has clear line of sight to switching operations originating at the eastern end of the yard. Diesel engines move back and forth, and idle while awaiting clearance for switching. Also, refrigerator cars are often positioned nearby and idle for hours.

Flat switching occurred almost continuously during our two days of measurements. In addition, a string of idling refrigerator cars was parked very near the microphone for several nighttime hours on 16 August.

Site 35-2

Site 35-2 has clear line of sight to through yard operations and switching originating at the western part of the yard. Major noise exposure is from coupling cars and refrigeration units. Additional sources include through trains, and probably TOFC activities although we did not observe any.

Site 35-3

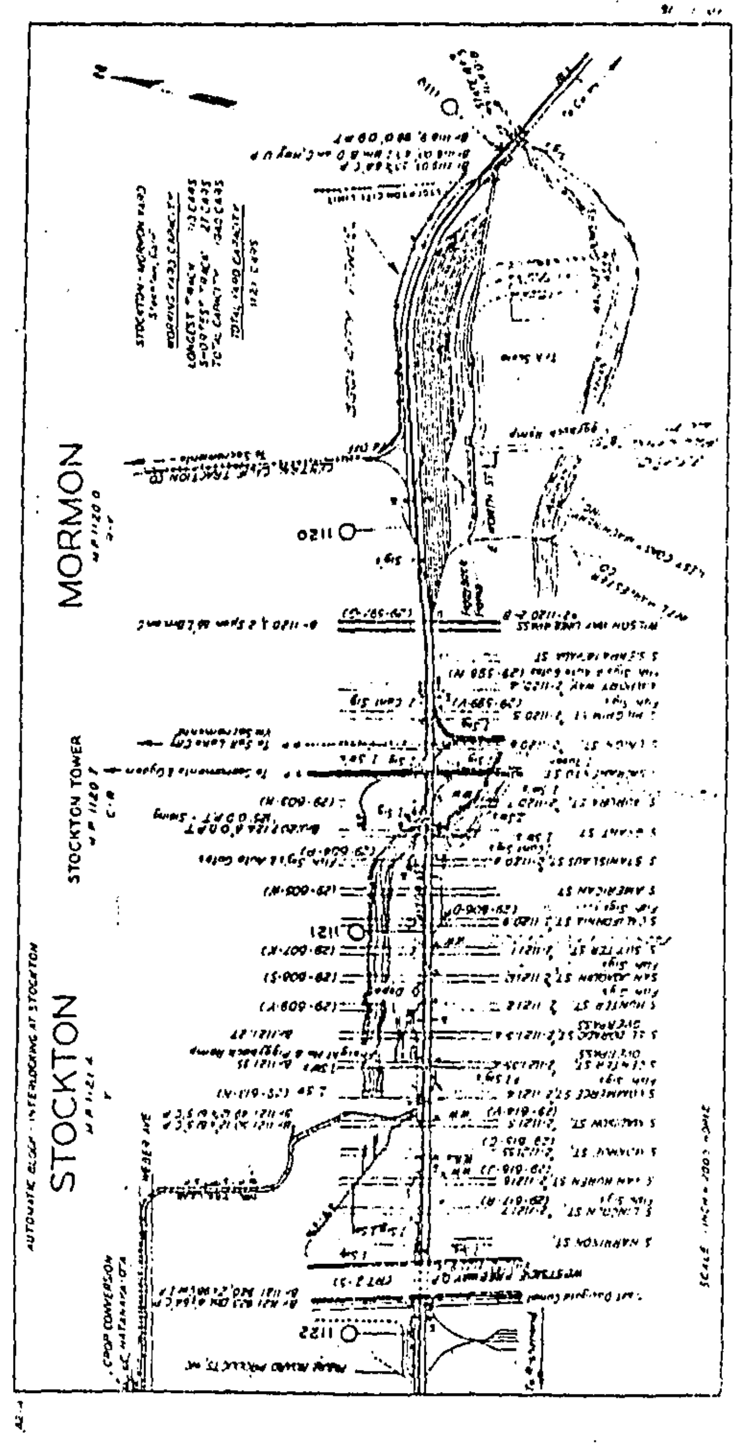
This position has a noise expsoure similar to that at 35-1 although it is farther west and away from most engine noise associated with the switching operations. Here loud impulses associated with car coupling are evident. The residence at this site is about ten years old, which is much newer than most in the neighborhood. The exterior construction is stucco and windows are sliding aluminum units. Contributions from through trains were separated from our data for this site as well as the concurrent measurement at Site 35-1 to exclude the contribution of through train noise.

2.3 Subjective Impressions

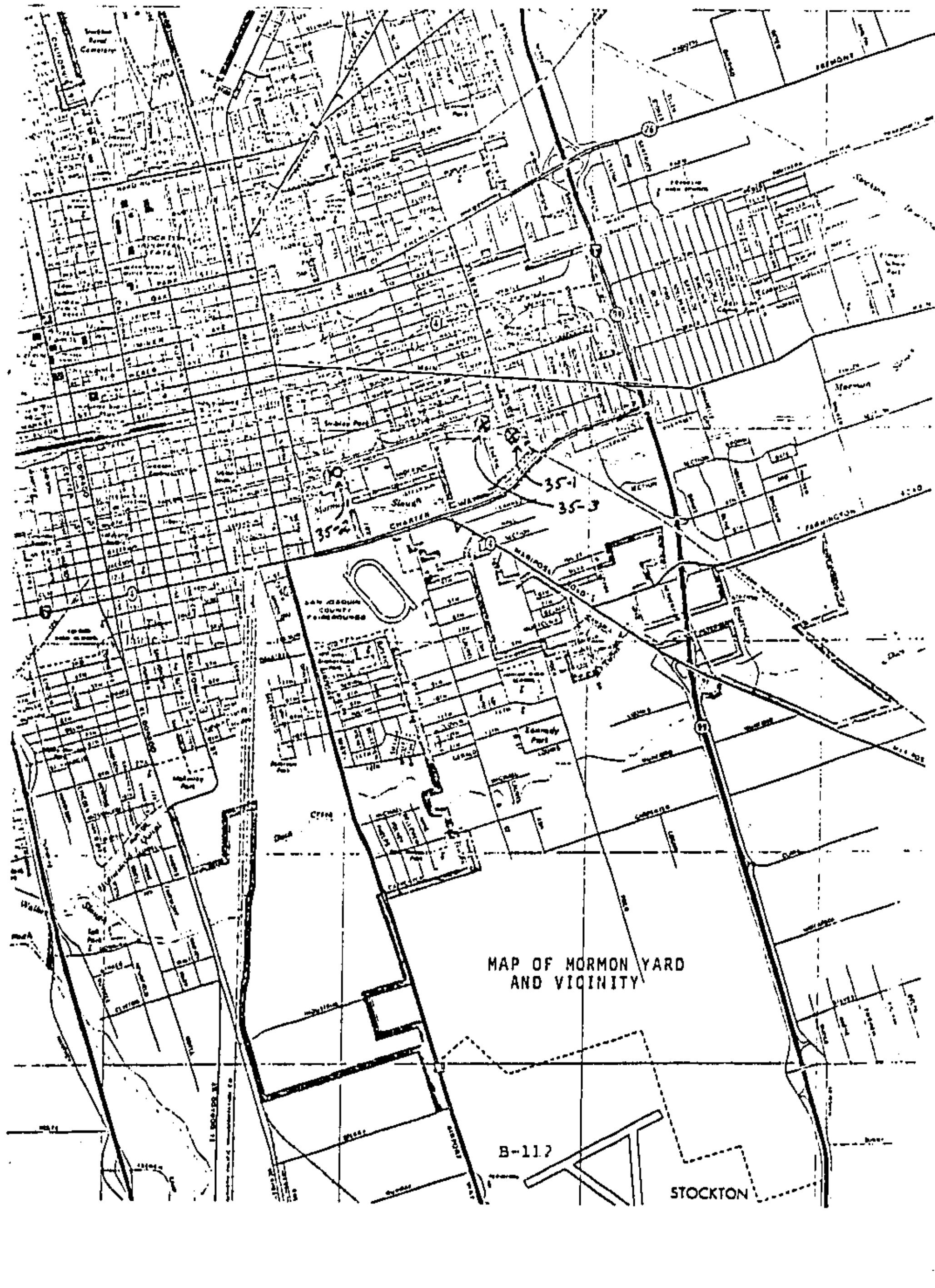
We talked to five residents in the vicinity of the rail yard. Of these, four were very annoyed by rail noise, and by car coupling noise in particular. They indicated that the coupling noise occurred all year, and that it interruped TV watching and their sleep. They are annoyed by its impulsive nature, and because it occurs without warning.

One resident had complained once, but about a refrigerator car parked close to his home. The car was quickly moved elsewhere.

The one resident who did not express annoyance had previously been employed by Western Pacific for 20 years. He indicated that he had been exposed to worse noise exposure conditions while working for the railroad than he now experiences in his neighborhood.



MORMON RAIL YARD



MAP OF MORMON YARD
AND VICINITY
STOCKTON
35-1
35-3
CHARTER
FARMINGTON
MARIPOSA
FREMONT
MINER
MAIN

B-117

NOISE DATA

YARD: MORMON LOCATION: 35-1

HOUR OF DAY	DATE: 15 August 1978 — NOISE LEVEL in dBA							DATE: 16 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								71.2	88.8	77.6	74.8	68.9	51.7	46.6
01-02								74.4	83.8	76.8	74.9	74.3	73.4	72.6
02-03								74.1	77.5	75.0	74.8	74.2	73.0	72.5
03-04								75.1	97.5	76.2	74.8	74.0	72.8	72.5
04-05								74.0	81.3	75.0	74.8	74.0	72.8	72.5
05-06								73.7	101.3	83.3	74.5	50.4	46.7	45.3
06-07								63.8	93.8	74.9	67.8	52.5	49.2	47.5
07-08								63.6	92.5	76.2	63.2	50.8	48.8	47.6
08-09								64.2	96.3	73.3	56.1	49.9	45.9	43.0
09-10								69.1	92.3	84.6	50.9	47.4	45.2	43.7
10-11								63.6	95.0	75.3	65.2	48.5	45.4	44.0
11-12								65.1	91.3	79.4	61.2	48.5	45.1	43.7
12-13								61.8	81.3	72.9	65.7	50.7	45.6	44.0
13-14														
14-15														
15-16														
16-17								62.5	87.5	75.5	65.1	49.4	43.9	41.9
17-18								66.8	87.5	79.2	70.1	56.0	48.9	46.0
18-19								66.0	97.5	75.5	66.5	40.7	46.5	44.8
19-20	61.0	80.0	73.5	64.0	50.6	45.1	43.0							
20-21	51.1	75.0	64.0	49.4	46.5	44.0	42.7							
21-22	61.9	87.5	74.3	62.9	48.5	46.6	45.3							
22-23	71.7	97.5	85.7	68.7	54.4	48.9	47.6							
23-24	64.0	98.8	73.4	63.5	60.9	52.6	48.8							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 69.4 dB
L_n: 72.7
L_d: 64.5
L_{dn}: 78.5

NOISE DATA

YARD: MORMON LOCATION: 35-1

HOUR OF DAY	DATE: 16 August 1978 — NOISE LEVEL in dBA							DATE: 17 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								66.6	98.8	76.9	64.7	49.6	46.8	45.1
01-02								62.7	82.5	76.4	62.5	51.1	47.8	46.3
02-03								65.6	95.0	77.1	67.9	55.3	47.4	45.3
03-04								47.5	67.5	54.1	49.4	46.4	44.4	43.5
04-05								65.1	87.5	77.0	68.5	54.3	47.5	45.3
05-06								67.0	91.3	80.6	65.4	51.3	46.5	44.7
06-07								62.7	96.3	73.7	61.8	52.0	48.0	46.4
07-08								69.6	96.3	82.6	68.2	53.8	47.8	46.4
08-09								51.3	80.0	58.3	50.4	47.4	45.7	45.0
09-10								64.9	91.3	77.0	68.1	60.0	45.0	43.8
10-11								61.5	88.8	76.1	53.7	46.0	44.0	42.7
11-12								59.6	93.8	69.7	61.6	47.4	44.4	43.1
12-13								62.1	93.8	74.3	56.6	45.8	43.3	42.2
13-14														
14-15														
15-16														
16-17														
17-18								65.1	95.0	77.0	68.6	56.2	48.7	44.1
18-19								62.4	88.8	75.6	62.8	48.3	45.2	43.8
19-20	55.3	90.0	67.7	54.4	49.1	47.1	45.9							
20-21	51.3	72.5	59.4	52.5	49.3	47.7	46.5							
21-22	62.7	96.3	72.5	60.5	50.6	48.3	46.8							
22-23	63.9	87.5	75.0	62.7	52.5	50.0	48.8							
23-24	52.4	71.3	62.7	53.7	50.2	47.9	46.4							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 63.7 dB

L_n : 64.0

L_d : 63.3

L_{dn}: 70.3

NOISE DATA

YARD: MORMON LOCATION: 35-2

HOUR OF DAY	DATE: 15 August 1978 — NOISE LEVEL in dBA							DATE: 16 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								63.8	90.0	78.1	64.9	50.1	46.5	45.1
01-02								59.2	81.3	71.5	61.5	49.0	46.3	45.1
02-03								63.1	90.0	75.2	67.1	49.6	45.6	44.1
03-04								66.7	85.0	78.0	70.8	55.7	47.1	45.1
04-05								62.7	82.5	75.6	66.2	49.9	45.7	43.9
05-06								59.2	86.3	71.3	53.6	47.8	45.8	44.5
06-07								69.1	91.3	79.6	71.5	65.8	48.8	46.9
07-08								61.9	91.3	74.1	63.9	51.4	48.9	47.6
08-09								63.3	82.5	74.9	66.4	54.0	50.5	48.9
09-10								64.3	93.8	75.4	67.1	55.9	49.4	47.6
10-11								63.4	97.5	74.0	64.8	53.4	48.0	46.4
11-12								62.4	86.3	74.4	65.5	52.1	48.0	46.4
12-13								57.8	80.0	69.6	60.9	51.4	48.0	45.9
13-14								63.0	88.8	73.6	64.1	51.9	48.0	45.7
14-15								62.6	91.3	75.6	62.5	52.2	48.6	46.7
15-16								64.9	87.5	78.6	64.2	51.3	48.7	47.5
16-17								60.0	82.5	73.2	57.5	52.6	49.7	47.6
17-18								59.6	90.0	71.5	61.7	52.2	49.1	46.8
18-19	60.8	80.0	72.6	62.4	49.5	47.0	45.6							
19-20	58.6	88.8	69.8	58.3	51.1	47.7	46.3							
20-21	61.4	83.8	72.7	65.3	51.3	47.1	45.3							
21-22	67.4	92.5	79.9	66.4	49.4	46.8	45.4							
22-23	64.3	81.3	76.4	68.8	50.6	46.7	45.1							
23-24	63.5	85.0	74.8	66.8	55.0	47.8	46.0							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 63.5 dB
L_n : 64.5
L_d : 62.8
L_{dn}: 70.7

NOISE DATA

YARD: MORMON LOCATION: 35-3

HOUR OF DAY	DATE: 16 August 1978 — NOISE LEVEL in dBA							DATE: 17 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								64.0	97.5	75.4	56.9	47.2	44.9	43.3
01-02								60.5	93.8	65.3	56.6	50.5	45.9	44.2
02-03								57.6	82.5	70.2	59.0	48.7	45.9	44.5
03-04								48.4	77.5	55.1	49.6	47.1	45.5	44.2
04-05								66.1	102.5	72.9	60.0	49.2	46.0	45.0
05-06								59.9	87.5	73.3	58.3	46.8	44.0	42.6
06-07								62.7	91.3	73.7	61.3	49.9	45.6	44.1
07-08								67.4	95.0	82.0	62.3	52.0	48.3	46.7
08-09								52.5	81.3	58.0	50.5	47.9	46.3	45.1
09-10								63.6	96.3	76.9	61.5	48.7	44.3	43.2
10-11								61.6	90.0	75.9	53.7	45.8	44.0	42.7
11-12								56.4	85.0	67.8	59.2	47.1	44.5	43.1
12-13								63.2	93.8	71.4	53.6	45.3	43.0	41.6
13-14								55.0	82.5	68.0	50.0	45.9	44.2	43.0
14-15								53.5	88.8	62.6	52.5	47.4	45.1	43.8
15-16								56.3	86.3	69.9	54.1	47.8	45.5	44.0
16-17								55.9	80.0	68.0	54.4	46.5	44.3	43.2
17-18								63.1	90.0	76.0	62.7	49.3	45.7	43.9
18-19								58.9	83.8	72.4	55.9	47.0	44.7	43.8
19-20								57.9	96.3	64.5	56.3	48.4	45.9	44.2
20-21	52.3	72.5	62.9	55.4	47.5	45.1	43.9							
21-22	62.5	92.5	75.1	59.2	49.2	46.1	44.5							
22-23	59.3	95.0	66.1	56.4	50.7	47.9	46.3							
23-24	50.0	73.8	60.4	52.1	48.4	45.9	45.0							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 61.1 dB
L_n : 61.2
L_d : 60.9
L_{dn}: 67.6

Balmer Rail Yard (Interbay)
Burlington Northern Railroad
Seattle, washington
(Site No. 36)

1.0 GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

Major noise generating activities at the Balmer Yard include humping and classification of freight trains and engine maintenance. The car humping and classification process, which is located at the southern end of the yard, generates retarder screech and car impacts which prevade the hillside residential areas west of the yard boundary. At the northern end of the yard idling and accelerating diesel engines in the vicinity of the maintenance facilities produce noise levels clearly audible in the hillside residential area to the west.

Other noise sources associated with Balmer yard operations include moving and idling locomotives and refrigerator cars. Moving trains and locomotives generate noise in the receiving yard areas and on various receiving and departure tracks. Refrigerator cars are interspersed throughout the receiving and classification areas and are noticeable only when idling close to tye yard boundary.

The Balmer yard operates on a 24-hour per day, 7-day per week basis. No activities associated with energy production or transportation were observed.

1.2 Land Use Surrounding Yard

In general, the land to the north and east of Balmer yard is used for recreational and industrial activities. Surrounding the southern portion of the yard is a military reservation, with some light industry (including several warehouses) as well. Residential areas are located west of the yard.

The residential areas are elevated above the railroad yard and those east of Thorndike Avenue have clear line of sight to operations below. Residential areas north of Dravus Street have direct line of sight to certain operations but are separated from the railroad yard by Gilman Avenue, which is a busy local street. Most residential units in this area are single family units, approxumately 20-40 years old. Residential units south of Dravus Street include detached units as well as many new 4-5 story apartment or condominium units.

1.3 Noise Control Through Source Relocation

The only feasible noise source relocation would be to locate idling engines and refrigerator cars behind buildings or strings of cars to increase their distance from neighboring residential areas as well as add shielding attenuation.

2.0 SITE DATA

2.1 Site Characteristics and Noise Environment

The noise monitoring locations are shown on the attached map and are described below. At all locations the noise of rail activities dominated the noise environment.

Site 36-1

Site 36-1 was chosen as a 48-hour monitoring position. This position receives exposure from retarder and car impact noise, moving and idling switch engines, and refrigerator cars. The nearest track is almost 250 feet away.

During humping, retarder screech dominates the noise environment in this area. The master retarder is almost 800 feet from this site.

Homes in this area are generally well maintained, wood frame structures, but most are not air conditioned.

Site 36-2

Site 36-2 was chosen as a 24-hour monitoring position to represent noise exposure from the engine and car maintenance facilities. The monitoring unit was located on railroad property, shielded from Gilmore Avenue traffic noise. At this location the railroad yard elevation is approximately 20 feet below that of Gilmore Avenue. Here diesel engines are operating continuously and during periods of major activity, engines are operating at all throttle seetings and perform accelerating and braking. The site is about 350 feet from the diesel service facility.

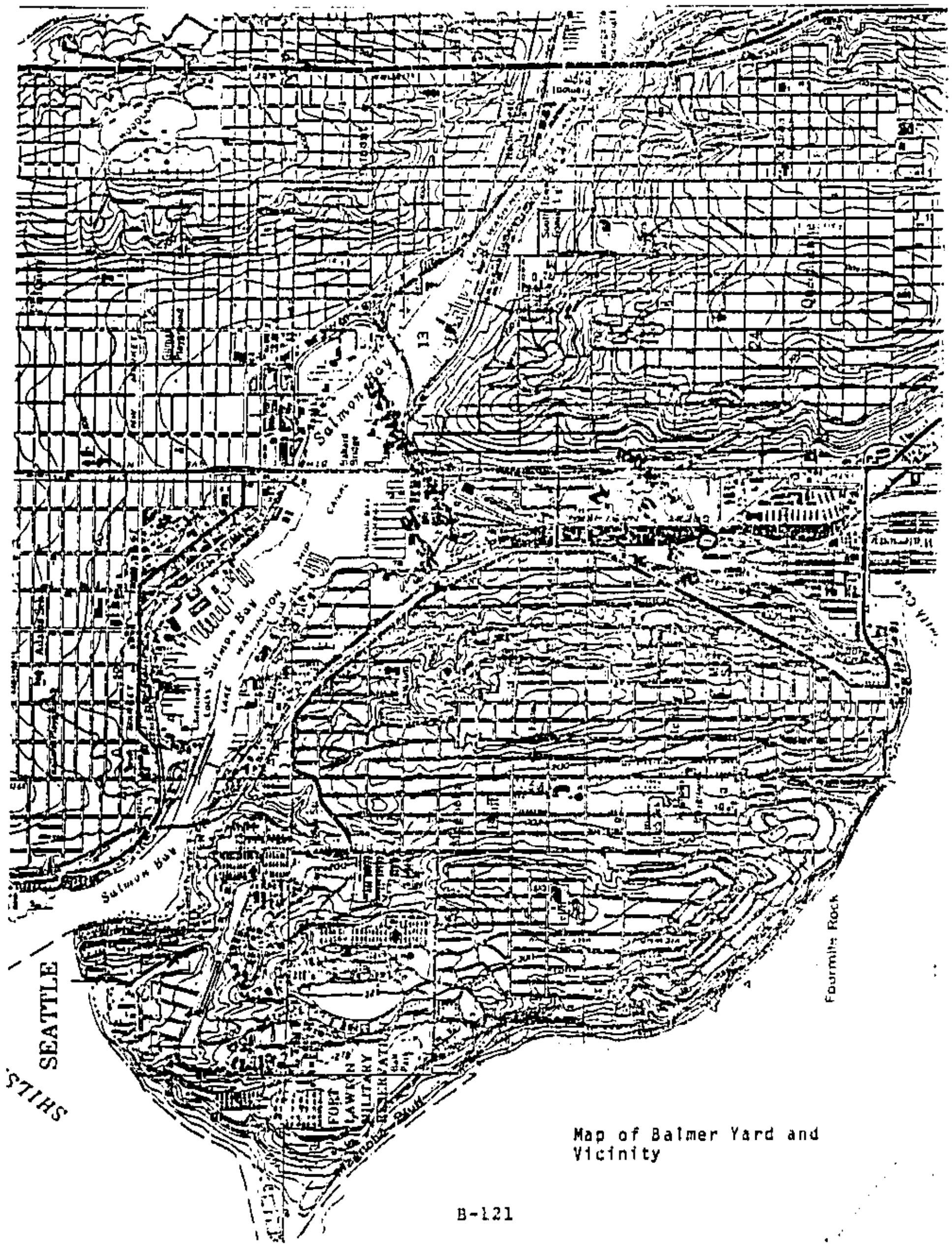
Most detached residences in this area are wood frame units approxumately 20-40 years old and are well maintained.

Site 36-3

Site 36-3 was chosen as a 24-hour monitoring position to represent the detached homes and 4-5 story high-rise apartment and condominium units which have clear line of sight to retarder operations about 750 feet away. Measurements at this site, as well as Site 36-2, were made on the weekend due to inclement weather during the week. This time period allowed for separation of railroad yard sources from weekday industrial sources.

2.2 Subjective Impressions

The noise of retarder squeals were identified by all of the residents that we talked with as the primary source of rail noise annoyance. Some residents also mentioned the noise of car impacts as being annoying. These sound are most annoying during nighttime hours. However, no residents have complained, including apartment renters who said they know what they were getting into before moving here. Many residents indicated that they had adjusted to the rail noise. One resident also mentioned "wild" drivers on Thorndike Avenue as a problem.



Map of Balmer Yard and Vicinity

NOISE DATA

YARD: BALMER LOCATION: 36-1

DATE: 25 AUGUST 1978 — DATE: 26 AUGUST 1978

HOUR OF DAY	25 Aug: L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	26 Aug: L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
	NOISE LEVEL in dBA							NOISE LEVEL in dBA						
00-01								54.5	80.0	61.8	55.4	52.9	51.4	50.2
01-02								58.6	78.8	64.2	59.4	57.3	55.7	51.0
02-03								59.3	78.8	67.7	59.6	57.7	56.5	55.4
03-04								59.8	78.8	64.7	60.4	59.2	57.6	56.3
04-05								59.6	80.0	67.0	60.1	58.3	56.5	55.4
05-06								58.6	78.8	64.7	58.7	57.4	56.4	55.2
06-07								59.7	85.0	68.8	60.2	58.0	55.4	54.0
07-08								57.5	76.3	66.7	58.6	55.7	54.3	53.7
08-09								56.8	78.8	68.1	57.3	53.6	51.4	50.1
09-10								53.2	73.8	64.2	55.3	48.5	45.7	44.6
10-11								56.7	81.3	65.7	57.1	51.2	47.5	44.5
11-12								57.7	78.8	70.4	57.8	52.7	50.3	49.0
12-13								55.9	81.3	68.9	55.5	50.4	45.0	43.7
13-14								53.2	72.5	65.8	54.6	47.9	44.3	42.8
14-15								55.7	81.3	63.2	56.9	54.8	51.9	50.1
15-16	60.1	80.1	70.7	61.3	57.2	55.1	53.4							
16-17	61.9	98.8	69.2	60.2	53.6	48.6	46.8							
17-18	53.1	73.8	63.6	54.6	49.4	46.7	45.2							
18-19														
19-20	55.1	77.5	68.3	54.5	50.3	48.1	46.8							
20-21	53.8	76.3	63.6	55.3	51.2	49.1	47.8							
21-22	53.7	77.5	63.4	55.0	50.9	48.8	47.6							
22-23	55.2	82.5	60.4	55.9	53.4	50.9	47.0							
23-24	54.7	75.0	61.7	55.8	53.5	51.9	51.3							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 57.5 dB
L_n : 58.2
L_d : 56.9
L_{dn}: 64.5

NOISE DATA

YARD: BALMER LOCATION: 36-1

HOUR OF DAY	DATE: 26 AUGUST 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	DATE: 27 AUGUST 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								57.1	75.0	67.3	58.0	54.7	53.8	52.7
01-02								55.5	70.0	62.7	56.2	54.7	53.8	52.7
02-03								58.5	80.0	66.5	59.2	57.5	54.3	53.8
03-04								57.9	78.8	65.5	59.0	56.2	54.3	53.8
04-05								58.3	82.5	63.7	59.1	57.5	54.2	53.7
05-06														
06-07								59.3	88.8	64.6	60.0	58.3	54.7	53.7
07-08								61.3	78.8	67.9	63.2	59.7	58.2	57.6
08-09								57.9	78.8	64.9	60.3	57.2	42.8	39.6
09-10								51.8	71.3	63.8	53.5	45.9	43.1	41.1
10-11								54.3	75.0	64.3	57.2	50.6	43.6	41.8
11-12								56.3	78.8	68.4	58.3	51.4	49.4	46.3
12-13								53.8	75.0	63.5	54.6	51.3	48.9	44.6
13-14								55.9	78.8	67.2	57.0	51.4	47.8	45.7
14-15								55.0	75.0	63.5	56.1	53.5	52.0	51.3
15-16	58.3	80.0	57.4	58.4	54.8	52.8	51.5							
16-17	55.2	75.0	63.7	56.0	53.3	51.4	50.1							
17-18	56.7	81.3	65.8	55.1	52.1	50.4	49.5							
18-19	59.5	87.5	71.6	55.9	52.2	50.4	49.1							
19-20	52.5	70.0	58.9	53.6	51.7	50.2	49.0							
20-21	54.6	73.8	61.9	56.3	53.4	51.1	50.0							
21-22	58.4	75.0	68.9	59.1	56.6	54.4	52.7							
22-23	57.7	80.0	68.0	57.3	54.9	53.8	52.6							
23-24	56.6	73.8	63.7	58.2	55.5	54.0	52.9							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 57.2 dB

L_n : 57.8

L_d : 56.9

L_{dn}: 64.0

NOISE DATA

YARD: BALMER LOCATION: 36-2

HOUR OF DAY	DATE: 25 AUGUST 1978 — NOISE LEVEL in dBA							DATE: 26 AUGUST 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								60.9	81.3	71.1	64.9	54.2	51.1	50.0
01-02								61.8	83.8	71.9	64.2	58.3	54.0	52.0
02-03								61.2	80.0	72.3	63.4	58.1	52.9	51.5
03-04								60.5	82.5	68.6	63.5	58.2	56.5	55.2
04-05								60.2	83.8	72.1	60.8	56.8	50.7	47.6
05-06								60.7	83.8	71.4	63.1	56.9	51.9	48.0
06-07								57.5	83.8	66.2	59.8	54.1	52.2	51.3
07-08								60.9	77.5	71.6	63.8	57.0	52.7	51.3
08-09	65.6	87.5	76.7	68.4	61.1	57.0	55.2							
09-10	64.9	85.0	74.1	66.9	62.9	59.3	56.6							
10-11	68.6	92.5	79.9	71.1	63.7	58.6	54.1							
11-12	67.7	88.8	79.2	70.4	62.8	57.1	54.3							
12-13	63.1	81.3	73.8	65.0	59.6	56.7	55.2							
13-14	64.8	88.8	75.4	66.4	61.4	56.7	54.7							
14-15	65.9	85.0	79.0	66.7	58.4	55.8	55.0							
15-16	62.4	86.3	72.0	63.4	58.9	56.1	54.1							
16-17	65.9	96.3	75.8	68.4	61.8	57.2	54.0							
17-18	61.7	82.5	72.6	63.5	58.2	54.9	51.6							
18-19	60.6	72.5	70.4	62.6	58.2	56.4	55.2							
19-20	61.1	86.3	70.1	62.9	57.3	55.2	54.0							
20-21	59.6	76.3	67.9	62.0	57.7	55.0	53.1							
21-22	62.0	86.3	69.7	64.1	59.4	55.5	53.1							
22-23	69.8	98.8	82.1	72.2	58.2	55.0	53.8							
23-24	57.9	76.3	66.6	59.1	56.5	54.5	53.0							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 64.0 dB

L_n : 63.0

L_d : 64.5

L_{dn}: 69.7

NOISE DATA

YARD: BALMER LOCATION: 36-3

HOUR OF DAY	DATE: 26 AUGUST 1978 — NOISE LEVEL in dBA							DATE: 27 AUGUST 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								57.2	81.3	68.5	59.1	50.6	45.8	44.5
01-02								53.5	72.5	65.6	55.5	47.7	43.8	41.7
02-03								53.7	78.8	64.6	56.5	46.8	43.0	41.4
03-04								52.1	80.0	63.6	52.1	47.5	45.4	44.0
04-05								48.2	65.0	56.1	50.7	46.4	43.9	41.6
05-06								54.1	81.3	67.2	53.5	44.6	42.5	41.3
06-07								53.4	78.8	63.6	55.9	49.8	46.3	43.2
07-08								56.6	75.0	66.7	61.1	50.7	46.7	45.2
08-09								54.8	71.3	65.8	58.0	50.2	44.4	42.2
09-10								55.3	77.5	66.9	58.2	49.5	46.5	44.3
10-11	56.3	76.3	67.2	59.3	50.3	46.9	45.2							
11-12	64.1	96.3	76.4	61.1	51.0	47.6	45.7							
12-13	53.6	86.3	61.5	55.5	50.4	47.1	44.7							
13-14	59.0	83.8	70.6	60.8	54.6	52.1	48.1							
14-15	56.0	80.0	65.3	57.3	54.5	52.5	50.2							
15-16	59.4	77.5	71.2	62.4	52.8	50.2	48.9							
16-17														
17-18	59.7	92.5	67.3	57.4	52.2	50.0	48.8							
18-19	56.4	77.5	69.6	56.4	50.9	48.5	47.5							
19-20	51.9	70.0	61.0	53.6	50.2	48.3	47.1							
20-21	58.9	92.5	66.1	56.9	51.8	49.5	48.1							
21-22	60.4	93.8	67.5	59.9	52.7	49.9	48.1							
22-23	55.1	82.5	65.9	56.1	51.1	49.2	48.0							
23-24	55.7	78.8	66.4	57.7	51.7	49.5	48.1							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 57.3 dB
L_n : 54.2
L_d : 58.4
L_{dn}: 61.6

Enola Rail Yard
Consolidated Rail Corporation
Enola, Pennsylvania
(Site No. 37)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The Enola Yard is a major classification facility for the Conrail system. It extends nearly two miles in length and includes two humps for classification of (east bound and west bound) freight. There is also a major engine maintenance facility for diesel as well as electric engines, as this is the western terminus for overhead electric power in this region.

Retarder noise is the most outstanding noise source from this yard. Both humps are located in the central area, and each classifies up to ten cars per minute during busy times. The noise levels are dependent upon the type and weight of car being classified.

At the engine maintenance facility many diesel engines and five or six electric engines idle continuously. The diesel engines are characterized by low frequency rumble while the electric locomotives are dominated by higher frequency fans which cool the engine transformers.

This yard operates on a 24-hour, 7-day-per-week basis. Operatons during our measurement period averaged about 1600 cars per day per hump. The above numbers are representative for this time of year but are below the yearly average of 4000 operations per day. Also, weekend operations are usually heavier than weekday and the west hump is usually busier than the east.

Other noise sources associated with yard operations include moving trains and locomotives, idling locomotives, and idling refrigerator cars. Moving trains and locomotives generate noise in the classification yards, on the various receiving and departure tracks and along the mainline tracks. Idling refrigerator cars are located at various points along the storage tracks of each receiving yard, and are not noticeable outside the yard boundary.

1.2 Land Use Surrounding Yard

In general, the eastern boundary of the yard is separated from the Susquehanna River by a narrow strip of land except at the southeast corner, where the community of West Fairview is situated (see attached maps). The western boundary of the yard is separated from residential, commercial, wholesale, and public land use areas by U. S. Highway 11/15, a major truck route which serves local areas and connects with Interstate 81 near the northern boundary of Enola Yard.

The borough of West Fairview is exposed primarily to through train activities and receives little exposure from retarder or idling engine operations. Also many of the residents here are either past or present railroad employees and seem well adjusted to this noise environment. Most structures here are wood frame with wood exterior siding, and many have direct line of sight to railroad operations.

However, residential areas in Enola are directly located opposite retarder operations and receive noise from the railroad yard as well as from heavy trucks -- many accelerating on the inclined sections of Highway 11/15. Homes here are also primarily wood frame. Some have storm windows and are air conditioned.

1.3 Noise Control Through Source Relocation

Given the existing location and network of classification tracks in this yard, there appears to be no practical way of relocating the retarders to reduce noise exposure. The other noise sources do not control the noise environment outside of the railroad yard.

2. SITE DATA

2.1 Site Characteristics and Noise Environment

The noise measurement locations are shown on the attached map and are described below.

Due to Highway 11/15, there were no residential property line positions available for continuous monitoring which would allow the separation of noise exposure due to yard activities from that due to the highway. Thus the monitor sites chosen were all located on railroad property, where there was shielding of roadway sources.

Because of inclement weather during the measurement period, noise levels were monitored at only two sites. Short term samples of the noise exposure were obtained at two additional sites.

Site 37-1

This site was chosen as a 48-hour monitoring position to represent noise exposure from a variety of yard operations other than retarder or engine maintenance facility sources. This site is exposed to diesel engines, moving cars, refrigerator car noise and wheel/rail noise in the eastbound receiving yard, but is shielded from retarder and repair noise by the rail cars in this yard. The site is shielded from Highway 11/15 and is on railroad property, approximately 65 feet west of the nearest track and 8 feet above it.

Site 37-2

This site was chosen as a 24-hour monitoring site, located to document exposure due to the engine maintenance facility. Like Site 37-1, it is located on the bank at the western yard boundary and is shielded from Highway 11/15 truck noise. Because both diesel and electric locomotives were idling continuously at this site, there was little change in level over the 24-hour period. The site is about 35 feet from the nearest receiving yard track, but is about 300 feet from the main noise sources here, i.e. the maintenance facility and associated tracks.

Site 37-3

This site was chosen to document retarder noise from the western hump. It was on railroad property at a distance of 45 ft. from the nearest track. Within this area there are several distinct retarder operations. Noise levels measured during heavy classification operations are:

L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	
79.0	99.6	91	79	65	58	56	dB

Site 37-4

This site, on Dauphin Street about 50 ft. west of Highway 11/15 is exposed to the noise of highway traffic (especially trucks) and retarders at the eastbound classification yard. Noise levels measured during classification operations are:

L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	
71.3	87.1	82	74	67	64	62	dB

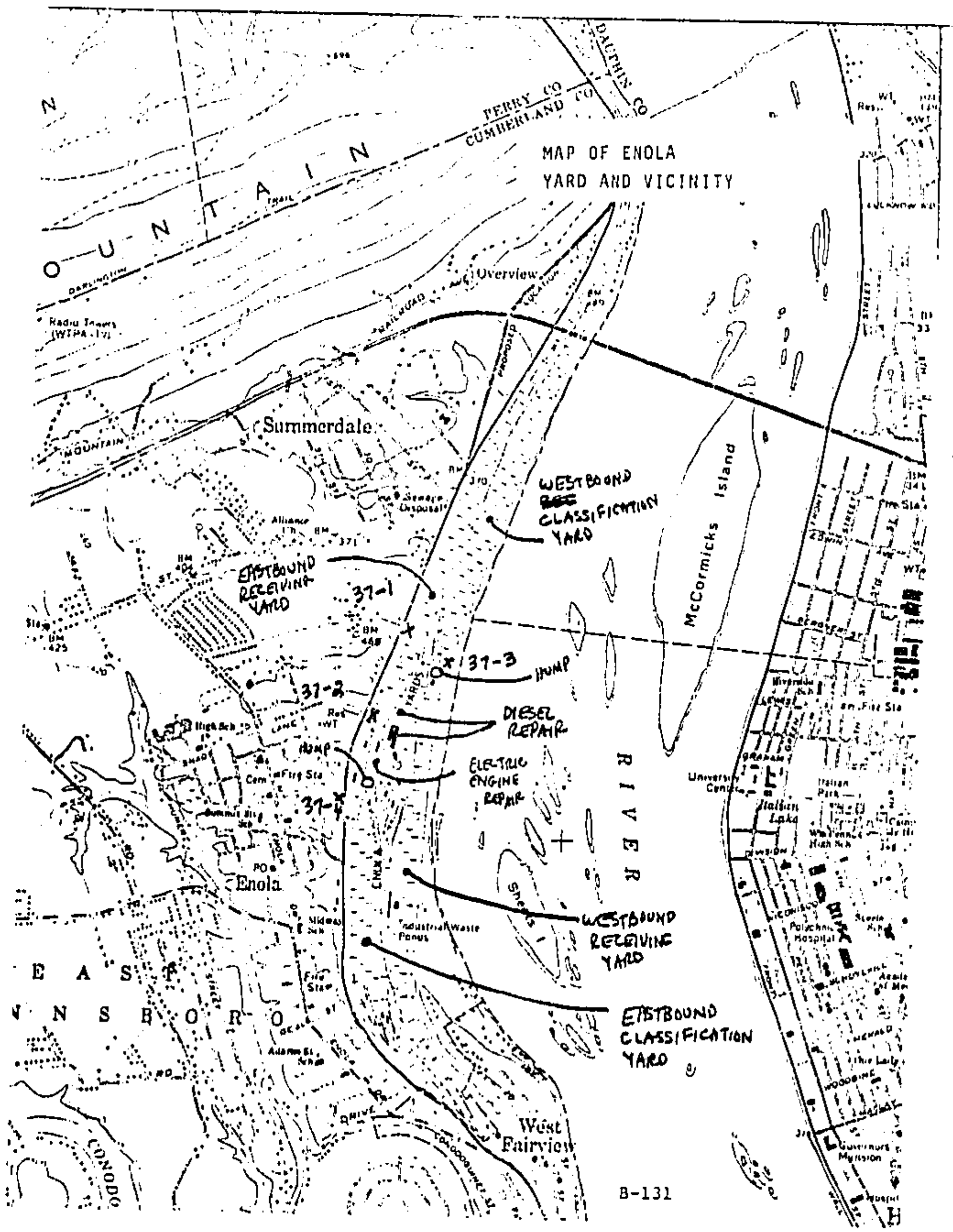
2.2 Subjective Impressions

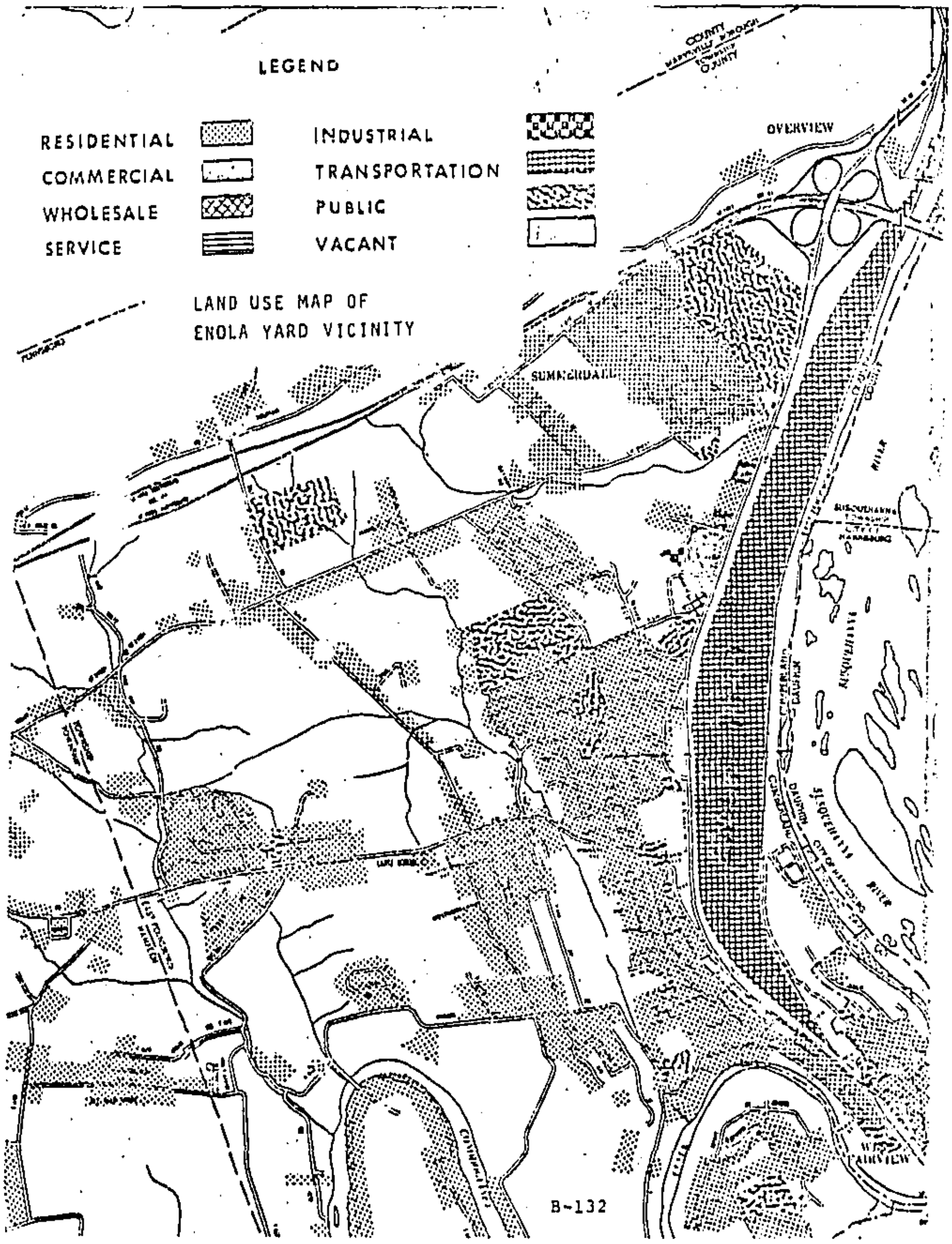
Most of the residents who live near the Enola Yard have become accustomed to the noise from yard activities, and are unaware of it until a visitor from out of the area brings it to their attention.

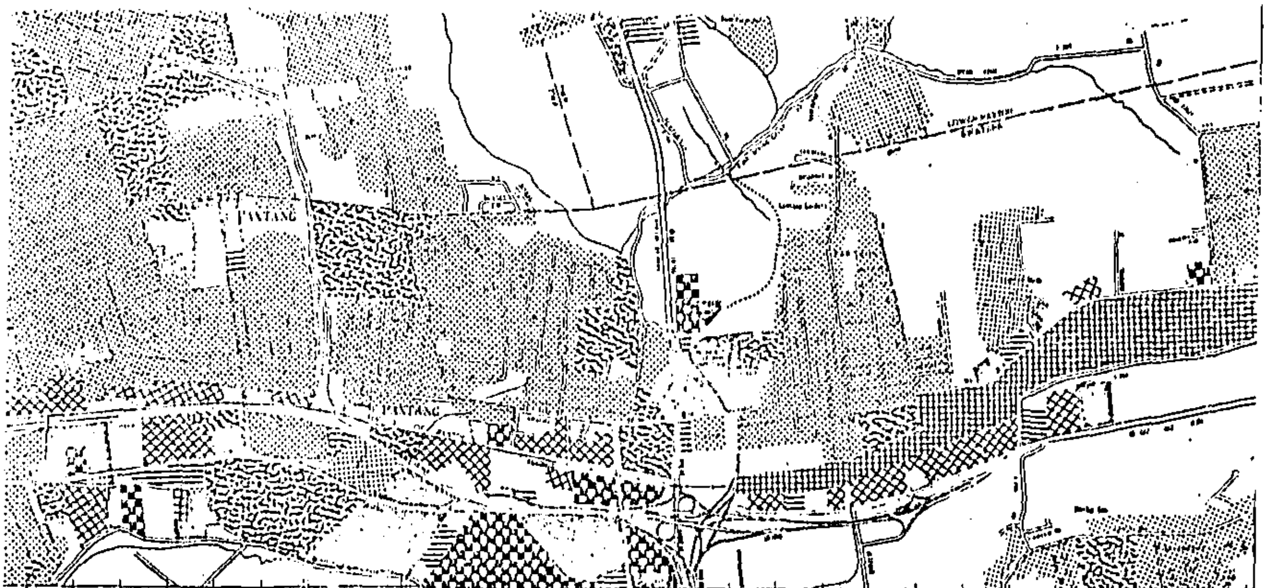
In West Fairview, many of the residents are former railroad employees who are completely unaware of the railroad noise.

In Enola, most residents are annoyed by the truck traffic on Highway 11/15. For those residents who are annoyed by rail activities, retarder noise is cited as the primary rail source. However, the retarder noise is viewed as less annoying than the truck noise on the highway. Many residents also expressed fear of possible accidents from the highway trucks.

The people we talked with had never complained about the rail noise, nor were they awakened by it. However, we were told that there had been complaints about retarder noise and the noise of the P.A. system in the past, but these have not occurred for years.


MAP OF ENOLA
YARD AND VICINITY
PERRY CO
CUMBERLAND CO
DAUPHIN CO
MOUNTAIN
Overview
Radio Tower (WTPA-TV)
Summerdale
WESTBOUND CLASSIFICATION YARD
EASTBOUND RECEIVING YARD
37-1
37-2
37-3
37-4
HUMP
DIESEL REPAIR
ELECTRIC ENGINE REPAIR
McCormicks Island
RIVER
Enola
Industrial Waste Ponds
WESTBOUND RECEIVING YARD
EASTBOUND CLASSIFICATION YARD
EAST PENNSBORO
West Fairview
Italian Lake
Polyclinic Hospital
University Center
Governors Mansion


LEGEND
RESIDENTIAL
COMMERCIAL
WHOLESALE
SERVICE
INDUSTRIAL
TRANSPORTATION
PUBLIC
VACANT
LAND USE MAP OF
ENOLA YARD VICINITY
OVERVIEW
SUMMERDALE
RIVER



LEGEND

RESIDENTIAL		INDUSTRIAL	
COMMERCIAL		TRANSPORTATION	
WHOLESALE		PUBLIC	
SERVICE		VACANT	

SCALES

1000 0 1000 2000 4000 6000

1/2 0

NOISE DATA

YARD: ENOLA LOCATION: 37-1

HOUR OF DAY	DATE: 29 August 1978 — NOISE LEVEL in dBA							DATE: 30 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								61.5	76.3	70.3	64.7	58.0	53.0	51.5
01-02								61.5	90.0	74.7	59.9	53.4	51.5	50.1
02-03								58.2	78.8	69.0	60.8	53.7	51.6	50.3
03-04								59.5	78.8	69.1	63.3	55.3	52.7	51.4
04-05								59.6	80.0	70.6	63.4	53.7	52.1	51.3
05-06								64.3	83.8	74.7	67.9	56.2	51.3	47.9
06-07								60.2	77.5	72.8	62.1	56.0	51.9	50.3
07-08								58.8	78.8	70.8	59.9	54.8	51.8	50.3
08-09								70.5	95.0	82.9	72.3	64.9	52.7	49.0
09-10								66.5	88.8	79.3	69.4	54.9	48.4	45.2
10-11								61.6	85.0	72.0	65.1	56.2	52.9	50.3
11-12								60.3	76.3	70.5	63.6	55.6	51.9	47.0
12-13								57.3	76.3	69.2	60.2	51.8	46.7	43.8
13-14								70.0	92.5	83.9	71.2	61.8	47.8	44.5
14-15								59.3	81.3	69.8	62.5	54.1	49.1	46.4
15-16								57.1	87.5	65.3	54.5	49.6	46.7	45.0
16-17								55.2	78.8	66.8	57.1	50.7	47.8	46.0
17-18	70.1	88.8	83.7	71.7	59.7	52.5	48.9							
18-19	66.6	91.3	79.9	67.5	58.2	51.3	48.6							
19-20	62.6	87.5	75.7	60.6	54.8	51.5	50.2							
20-21	64.8	93.8	78.4	65.9	56.5	52.6	51.4							
21-22	57.4	85.0	68.3	59.1	53.6	51.8	51.3							
22-23	56.8	76.3	67.4	58.3	53.8	51.8	50.6							
23-24	53.2	66.3	58.9	54.7	52.4	51.2	49.9							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 64.1 dB
L_n : 60.3
L_d : 65.3

NOISE DATA

YARD: ENOLA LOCATION: 37-1

HOUR OF DAY	DATE: 30 August 1978 — NOISE LEVEL in dBA							DATE: 31 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								53.7	73.8	64.3	57.0	48.9	45.8	44.2
01-02								57.8	81.3	69.3	60.8	51.6	46.5	44.3
02-03								64.4	85.0	76.0	67.4	59.0	48.8	45.2
03-04								59.2	82.5	70.7	62.0	52.0	45.8	44.0
04-05								55.2	82.5	63.0	56.8	51.1	46.8	44.9
05-06								60.1	82.5	67.7	62.8	58.2	54.6	50.8
06-07								56.4	75.0	65.2	59.6	53.5	49.8	47.7
07-08								59.6	82.5	72.4	59.1	52.8	50.1	47.1
08-09								55.7	75.0	63.5	58.7	53.6	51.3	50.1
09-10														
10-11								63.7	86.3	77.4	63.4	54.3	51.6	50.2
11-12								70.5	97.5	85.3	67.9	59.6	53.6	51.3
12-13								59.8	81.3	70.4	61.8	57.1	55.6	55.1
13-14								67.7	90.0	81.1	69.3	60.5	51.7	49.0
14-15								68.4	95.0	81.7	69.3	58.8	50.2	48.0
15-16								64.8	90.0	76.4	66.2	61.0	52.1	48.4
16-17								62.1	77.5	68.5	64.4	60.7	59.0	57.8
17-18	66.3	90.0	80.1	65.9	52.5	47.8	45.5							
18-19	52.2	67.5	60.4	55.4	49.8	46.0	43.8							
19-20	58.2	72.5	68.9	61.7	52.9	48.2	46.1							
20-21	56.6	86.3	68.0	59.2	50.9	48.2	46.8							
21-22	63.9	96.3	75.7	65.8	52.3	48.9	46.8							
22-23	53.5	76.3	64.0	54.6	50.5	47.9	46.4							
23-24	53.9	75.0	66.0	55.6	48.7	45.9	44.4							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 63.3 dB
L_n: 58.7
L_d: 64.7

NOISE DATA

YARD: ENOLA LOCATION: 37-2

HOUR OF DAY	DATE: 29 August 1978 — NOISE LEVEL in dBA							DATE: 30 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								69.7	77.5	73.4	72.0	69.9	63.0	61.5
01-02								67.9	82.5	78.7	68.7	66.2	64.2	63.0
02-03								66.5	85.0	75.2	68.4	64.7	62.6	61.4
03-04								69.0	81.3	72.7	71.5	68.6	63.8	62.4
04-05								70.1	86.3	76.7	72.9	68.6	66.8	65.4
05-06								72.2	98.8	82.2	74.6	69.1	65.7	64.1
06-07								68.8	91.3	77.7	70.5	67.6	65.4	64.1
07-08								70.8	86.3	78.4	72.3	69.7	68.1	66.9
08-09								70.6	91.3	75.6	73.1	69.7	67.1	65.4
09-10								71.2	87.5	80.3	73.7	69.2	65.8	63.8
10-11								72.5	93.8	80.4	74.7	70.6	69.0	67.7
11-12								71.6	91.3	78.2	73.2	70.8	68.7	66.9
12-13								73.3	90.0	82.1	75.9	71.4	68.1	66.3
13-14								70.9	91.3	80.7	72.8	68.5	65.9	64.1
14-15								71.4	90.0	82.9	73.0	68.1	65.9	64.7
15-16								68.0	90.0	74.3	69.6	67.9	66.6	66.3
16-17								68.8	82.5	74.6	71.4	67.8	63.9	61.5
17-18	71.9	88.8	83.4	72.7	69.7	66.8	65.2							
18-19	69.8	92.5	76.1	71.4	68.8	66.8	65.4							
19-20	72.6	92.5	82.1	75.2	70.4	67.9	66.4							
20-21	72.8	96.3	81.5	74.2	71.7	68.1	[illegible]6.3							
21-22	71.4	80.0	74.4	72.7	71.4	70.1	61.5							
22-23	71.5	81.3	73.6	72.4	71.4	70.2	69.4							
23-24	71.0	81.3	73.5	72.2	70.9	69.9	68.8							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 70.9 dB
L_n : 70.0
L_d : 71.4

Allentown Rail Yard
Consolidated Rail Corporation
Allentown, Pennsylvania
(Site No. 38)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The Allentown Yard is a long hump classification yard, stretching approximately 3 miles along the northern border of the Lehigh River between Allentown and Bethlehem, Pennsylvania. Major facilities include two humps and classification tracks, a car repair facility, and a round house.

Thus far in 1978, there has been an average of 1275 cars classified per day. The heaviest activity occurs on the west hump and classification tracks. On 31 August, during our measurements, the classification activity was slightly below average with 724 cars classified through the west hump and 490 cars through the east hump.

The car repair facility north of the classification tracks performs only light maintenance. Locomotive maintenance is performed at the round house, located about 1 mile northeast of the classification areas.

At the eastern end of the yard is a set of tracks on which we observed no activities during our survey at this yard. Despite the use of coal in many of the nearby industrial facilities, we did not observe any coal cars passing through the Allentown yard. None of the activities observed at the yard were related to the energy transportation or production industry.

1.2 Land Use Surrounding Yard

Along the entire southern boundary of the yard is the Lehigh Coal and Navigation Canal. This canal and the adjoining strip of land now function as a recreational area for boating and bicycling enthusiasts. Immediately south of this area is the Lehigh River.

The land at the western end of the yard is used for industrial purposes. Along the northern boundary of the yard in Allentown is an area of dense vegetation which slopes upward, in some locations very abruptly, between 100 and 300 feet above the yard level. The western end of this area is Keck Park, a former quarry. Extending to the east, this land is primarily undeveloped. This land forms a natural buffer between the rail yard and the residential areas north of the yard, with closest residences about 800 feet from the yard. The vegetation, as well as the sloping terrain, helps to reduce rail noise levels in the residential areas. Also located in this area is the Allentown State Hospital.

Within Bethlehem, residences north of the yard are much closer to the yard boundary, particularly in the area of the round house. Further east, residences abutt the rail yard, but in this area no yard activities were observed to occur with the exception of arriving and departing trains.

1.3 Noise Control Through Source Relocation

Relocation of the round house and associated tracks on which locomotives idle to an area further west would reduce the noise exposure of nearby residences in Bethlehem. Although this is reasonable from a noise control point of view, we suspect that such a relocation would be quite costly.

2. SITE DATA

2.1 Site Characteristics and Noise Environment

The residences in Allentown and Bethlehem, in the immediate vicinity of the Allentown yard, are mostly older homes constructed primarily of brick and occasionally wood frame. Single and multi-family construction are mixed throughout the area, except for some relatively new apartment complexes of brick construction in west Bethlehem near the round house.

The noise of activities at the rail yard does not dominate the noise environment for most of the residences in Allentown because of the distance from the residences to the yard as well as the terrain and vegetation features of the buffer zone between the residences and the yard. In Bethlehem, only those residences in the immediate vicinity of the round house are exposed to the noise of rail activities that has been judged to be annoying. Even at these locations, the noise of rail activities is probably not dominant.

Due to inclement weather during the measurement period, and malfunctioning equipment, 24-hour noise monitoring was performed at only one measurement site. Short samples of the noise environment were obtained at three additional sites as described in the following.

Site 38-1

This site was located on the Allentown State Hospital property. The microphone was placed on the edge of the ridge overlooking the yard, however visual observation of much of the yard was blocked by the trees and vegetation.

The sound sources at this site were car couplings, retarders, and train movement from the yard below. The site is located 700 feet from the east hump, and somewhat further from the classification tracks. There were also some sounds from the hospital steam plant, such as steam being vented for 12 to 15 minutes every four hours. This venting was cycled one minute on and one minute off. There was no local traffic near the site. During times of yard activity, the rail sources dominated the environment at this site; at other times, the site was relatively quiet.

Site 38-2

This site was located at the western end of Calypso Avenue, just west of the round house (approximately 400 feet away). Major noise sources observed here were locomotives idling, air releases and buzzers. Two samples were obtained at 19:28 hours on 30 August and 16:40 hours on 31 August. The noise levels measured are listed below for these two periods respectively:

L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	
59.1	61.5	60.	60.	59.	58.	57.	dB
56.3	74.3	66.	56.	53.	52.	52.	

Site 38-3

This site was located just south of River Drive, approximately 1000 feet east of Carlisle Street. The site overlooks the west hump and classification tracks. Major noise sources from yard activities here are cars coupling and retarders. Some local traffic was observed as well. Following are the noise levels measured at 11:52 on 1 September:

L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	
56.5	78.2	67.	56.	50.	48.	47.	dB

Site 38-4

This site was located at the eastern end of Keck Park at the west end of River Drive. This site also looks down on the rail yard, and is exposed to the noise of cars coupling and retarders at the west classification area, as well as the noise of locomotives idling. Noise levels measured at 19:03 at 30 August are as follows:

L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	
59.3	79.1	72.	56.	53.	50.	48.	dB

2.2 Subjective Impressions

None of the residents of Allentown that we talked to indicated that they were bothered by the noise of rail yard activities, although the noises of cars coupling were cited as a source of annoyance. None had ever been awakened by rail noise, nor had anyone ever complained. Local truck traffic was cited as another noise source creating annoyance.

In western Bethlehem, near the round house, residents cited idling locomotives and the "growl" from the turntable as a source of annoyance. None had complained, although the turntable noise had on occasion kept people awake or had awakened them. (Note that the noise of the turntable was not observed during our survey at this yard.)

Map of Allentown Yard and Vicinity

NOISE DATA

YARD: ALLENTOWN LOCATION: 38-1

DATE: 31 August 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17	56.3	71.3	66.0	61.7	48.8	45.9	44.4
17-18	57.3	72.5	66.9	62.5	50.5	46.1	44.7
18-19	54.2	70.0	64.1	57.1	51.6	48.0	45.6
19-20	62.5	76.3	69.9	66.6	57.6	48.6	46.4
20-21	59.4	67.5	62.6	61.6	59.1	55.8	52.1
21-22	60.2	66.3	63.2	61.6	60.0	58.8	57.6
22-23	59.5	65.0	62.3	61.1	59.3	57.4	56.3
23-24	57.9	61.3	60.0	59.0	57.9	56.5	55.6

DATE: 1 September 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	58.5	70.0	60.8	58.4	57.2	57.2	56.3
01-02	56.2	68.8	59.5	57.5	55.8	54.3	53.8
02-03	55.6	65.0	59.3	57.0	55.4	54.0	52.9
03-04	57.7	67.5	64.8	62.9	54.7	53.0	51.9
04-05	53.5	73.8	57.7	54.9	53.0	51.6	50.3
05-06	54.4	71.3	63.3	57.0	52.1	50.4	49.1
06-07	51.3	68.8	56.1	53.6	50.2	48.9	47.7
07-08							
08-09	52.6	75.0	60.9	53.7	50.6	48.9	47.7
09-10	58.3	90.0	60.1	54.0	50.0	47.9	46.4
10-11	53.5	77.5	60.3	54.7	50.1	45.9	44.3
11-12	59.8	87.5	69.5	63.3	49.6	46.6	44.1
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 57.8 dB

L_n : 56.7

L_d : 58.4

L_{dn}: 63.4

Argentine Freight Yard
Athchison, Topeka and Santa Fe Railroad
Kansas City, Kansas
(Site No. 53).

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The most noticeable noise generating activity at the Argentine Yard is the rail car humping process, resulting in retarder screech, and car impacts which pervade the surrounding community. This activity is concentrated in the eastbound and westbound classification yards. During active periods, roughly two to three cars per minute are pushed over the hump, with only occasional noticeable car impacts. Retarders are the major source of noise during the classification process, with approximately seven screeches per minute during continuous operation. Observations, however, indicated that car humping occured only about 25 percent of the time during the measurement period.

Other noise sources associated with yard operations include moving trains and locomotives, idling locomotives and idling refrigerator cars. Moving trains and locomotives generate noise in the classification yards, on the various receiving and departure tracks, and along the mainline tracks. Observations suggest that these events occur only about 25 percent of the time. Noise from idling locomotives is centered near the diesel repair facility, but is not very noticeable outside the yard boundaries. Idling refrigerator cars are located at various points along the storage tracks and are noticeable outside only when idling close to the yard boundary.

The Argentine Yard operates on a 24-hr, 7 day per week basis. Past data indicate that the yard has a throughput of approximately 100,000 freight cars per month. However, observations during the monitoring period suggest a much lower activity level, perhaps about 25 percent of the above number. Furthermore, no particular activities related to energy production or transport were observed during the monitoring period.

1.2 Land Use Surrounding Yard

In general, the land use to the north of the Argentine Yard is zoned industrial, while that to the south is zoned residential, (see attached map).

Noise sensitive community land use areas are located south of the yard boundary. To the far west end of the yard is the Turner residential area, consisting of fairly well-maintained, wood-frame houses. Another area of similar homes is located to the east of the Turner area. These homes are closest to the east hump yard, and a major rail yard noise complainant resides in this vicinity. To the far east end of the yard is the Argentine area, consisting of poorly maintained, old wood-frame houses, many of which are occupied by railroad employees. Several old churches and schools, as well as a park and a high-rise retirement apartment building are located in the Argentine area.

Finally, note that tracks from the Argentine Yard serve some of the industrial concerns in the Turner industrial area to the north of the yard.

1.3 Noise Control Through Source Relocation

The only feasible noise source relocation scheme would be to avoid the placement of idling locomotives and refrigerator cars near the Argentine residential area yard boundary. However, since these items are not the dominant yard noise sources, this action would likely have little effect on noise exposure in the areas surrounding the Argentine Yard.

2. SITE DATA

2.1 Site Characteristics

The noise monitoring site locations are shown on the attached map, and are described below.

Site 53-1

Site 53-1 was chosen as a 24-hr monitoring site. The monitoring unit was located in the backyard of the residence at 1021 48th Terrace. This site is exposed to retarder and car impact noise from the east hump yard. During humping, retarder screech dominates the noise environment in the area which is elevated and not well shielded with respect to the yard. Homes in this area are generally well-maintained, wood structures and most are air-conditioned.

Site 53-2

Site 53-2 was chosen as a 48-hr monitoring site due to its close promimity to the east hump. The monitoring unit was located in the backyard of the residence at 5100 Clark Street. This site is exposed to master and group retarder noise from the east hump area although there is some terrain shielding between this neighborhood and the yard. Homes in this area are reasonably well-maintained and many are air-conditioned.

Site 53-3

Site 53-3 was chosen as a 24-hr monitoring site due to its close proximity (200 ft) to the yard boundary. A 10 minute noise sample was also taken at this location, in the backyard of the residence at 1106 So. 36th Street. This site is exposed to retarder noise from the west hump yard, as well as noise from mainline traffic and idling refrigerator cars. Homes in this area are poorly-maintained and few are air-conditioned.

Site 53-4

Site 53-4 was chosen for a 10-min. noise monitor sample during the continuous humping operating in the east yard. The sample was recorded in the backyard of the residence at 4930 August Lane. The resident at this address is a major complainant regarding retarder noise from the yard. This site has the same general characteristics as described for Site 53-1.

2.2 Site Noise Environment

Site 53-1

Rail noise exposure at Site 53-1 was dominated by retarder screech. Occasional car impacts were also noticed at this location. Non-rail noise exposure included local road traffic, particularly truck traffic on Swactz Road, plus occasional aircraft noise and noise from neighborhood backyard activities. Rail noise is dominant in the area during humping operations at the eastbound classification yard.

Observations during the measurement period suggest that humping operations occured only about 25 percent of the time. Approximately seven retarder screeches per minute were noted, with each event lasting several seconds. A pure tone screech of varying intensity characterized the retarder noise, which dominated the noise from the rail yard. Noise from occasional car impacts was noted to be of an impulsive nature, but not as loud as the retarder events. Measurement Site 53-1 was located about 1500 feet from the group retarders in the eastbound hump yard.

Site 53-2

Rail noise exposure at Site 53-2 was dominated by retarder screech. Some locomotive noise from the hump engine was also noted at this location. Non-rail noise exposure included local road traffic, particularly truck traffic in and out of the nearby truck terminal, as well as noise from aircraft and local neighborhood activity. Rail noise is dominant in the area during humping operations at the eastbound classification yard.

The operational characteristics of humping and the observed characteristics of retarder noise are the same as described for Site 53-1. In addition, locomotive noise from the hump engine was noticeable as the engine approached the hump. This noise was low frequency in character, and of low intensity. Measurement Site 53-2 was located about 1000 ft from the hump and master retarder, and about 1500 ft from the group retarders. Some terrain shielding was interposed between this site and the yard noise sources.

Site 53-3

Rail noise exposure at Site 53-3 included retarder noise from the west hump yard, locomotive and train movement in the adjacent yard areas and idling refrigerator cars. Railroad sources not strictly part of yard operations, such as mainline through-trains and switcher noise on the nearby spur of the

General American Transportation Company (GATX), also contributed to the noise environment at Site 53-3. Non-railroad sources included light road traffic, a nearby cabinet shop and local resident activity. The rail noise was generally dominant during close train or locomotive passages and during humping operations at the west hump yard.

Railroad activity levels were observed to be fairly low near this site, since the nearby yard area was utilized primarily for car storage. Retarder screech could be heard during humping periods at the west hump yard, occuring roughly 25 percent of the time. The active retarders at this yard are located about 1500 ft from Site 53-3, but were sheilded during the measurements by several lines of stationary rail cars. Some of these cars were idling refrigerator cars which could be just barely heard at the measurement site. The highest noise levels at Site 53-3 are generated by switcher movements on the GATX spur, located 80 ft from the site and by through-train traffic on the mainline, located 200 ft from the site. These activities each occur approximately twice per day and result in high train and whistle noise, and ground vibration.

A noise sample at Site 53-3 of approximately 10 min. duration, including GATX locomotive and whistle noise plus retarder noise, yielded the following results:

L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
58.8	76.0	69.0	60.0	55.0	54.0	54.0

Site 53-4

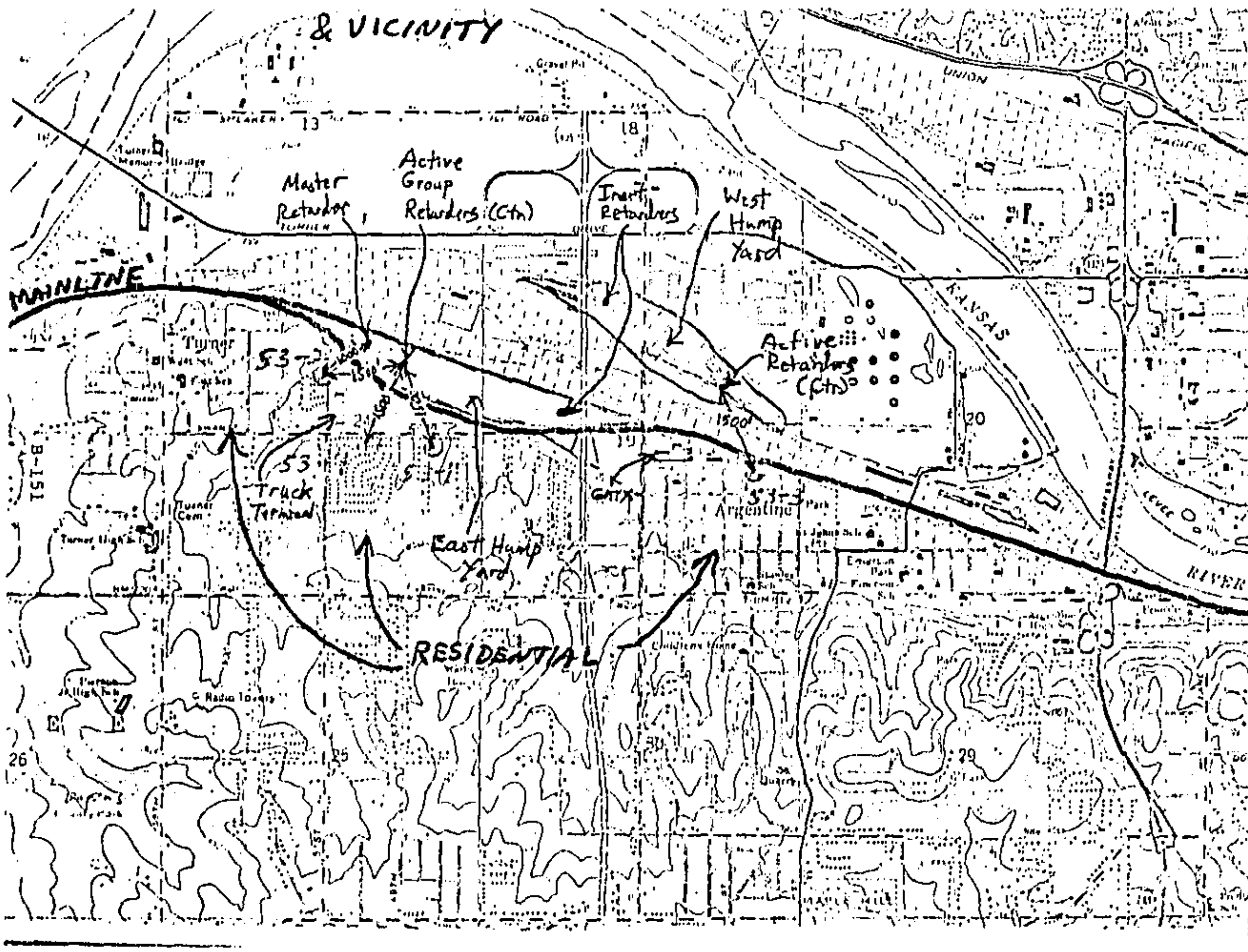
A noise sample was taken at Site 53-4 for a period of approximately 10 min. during which retarders, located at roughly 1500 ft dominated the noise environment. The results are as follows:

L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
64.6	81.0	75.0	67.0	59.0	58.0	58.0

2.3 Subjective Impressions

The sources of annoyance or complaints from rail yard noise include retarder screech, car impacts, and moving trains. In terms of sleep disruption, some residents indicated that car impact noise or through-train noise and vibration occasionally wake them up, while one resident indicated that retarder noise sometimes makes it difficult to fall asleep.

In general, it was found that railroad noise is viewed to be of relatively minor importance in the residential communities surrounding the Argentine Railroad Yard.. Only one resident out of 11 questioned found yard noise highly annoying, while a few others found it only mildly annoying. Most of the people questioned said that they are used to the railroad noise and don't notice it anymore. The fact that many people in the area are associated with the railroad in some way may have something to do with this tolerance. However, conversations with many residents also indicated that they did not find the characteristics of railraod noise as annoying as other community noise sources such as motorcycles and aircraft.


& VICINITY
MAINLINE
Master Retarder
Active Group Retarders (Ctn)
Inert Retarders
West Hump Yard
Active Retarders (Ctn)
53
53
Truck Terminal
GATX
1500'
East Hump Yard
RESIDENTIAL
Turner
Argentine
UNION
PACIFIC
KANSAS
RIVER
B-151
13
18
20
25
26
29
30

B-152

NOISE DATA

YARD: ARGENTINE LOCATION: 53-1

HOUR OF DAY	DATE: 09 AUG 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	DATE: 10 AUG 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								55.4	72.5	63.3	56.8	54.3	52.9	52.5
01-02								59.1	82.5	71.7	59.1	53.2	49.2	47.6
02-03								55.4	81.3	66.7	55.7	51.4	47.7	45.5
03-04								55.3	75.0	64.2	56.1	53.6	52.1	51.3
04-05								58.9	80.0	70.2	59.4	55.0	53.4	52.6
05-06								57.0	76.3	66.7	58.1	54.8	53.4	52.6
06-07								57.4	77.5	68.5	58.3	53.6	52.4	51.4
07-08								55.9	78.8	64.6	57.1	54.2	52.6	51.4
08-09								54.9	75.0	64.6	56.8	52.4	49.8	48.1
09-10								56.1	81.3	68.4	57.9	49.4	46.1	43.9
10-11								52.1	72.5	61.3	53.7	49.8	47.6	46.3
11-12								55.1	80.0	65.6	55.7	51.5	49.1	47.1
12-13	57.0	83.8	69.7	58.5	47.4	44.2	42.6							
13-14	52.1	81.3	62.1	52.6	46.6	43.9	42.0							
14-15	51.2	70.0	58.7	53.4	49.5	46.2	44.7							
15-16	51.4	67.5	60.3	53.5	49.4	47.0	45.4							
16-17	59.3	87.5	70.0	57.6	50.6	48.1	46.5							
17-18	55.7	85.0	66.6	54.8	50.4	48.2	46.7							
18-19	53.9	80.0	63.9	54.5	50.8	48.5	47.0							
19-20	57.0	81.3	66.7	58.5	53.0	49.7	48.2							
20-21	55.2	80.0	64.8	55.7	52.1	50.1	48.9							
21-22	56.9	75.0	65.6	58.2	55.3	53.8	52.6							
22-23	54.9	67.5	58.9	56.5	54.5	53.0	52.5							
23-24	56.1	73.8	63.5	57.3	54.7	53.1	52.5							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 56.1 dB

L_n : 56.9

L_d : 55.5

NOISE DATA

YARD: ARGENTINE LOCATION: 53-2

HOUR OF DAY	DATE: 9 AUG 1978 — NOISE LEVEL in dBA							DATE: 10 AUG 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								57.9	83.8	69.7	56.5	53.6	51.8	51.3
01-02								60.0	93.8	70.8	57.0	53.4	48.3	46.8
02-03								58.6	85.0	70.7	57.3	51.4	47.9	46.4
03-04								64.7	96.3	76.9	59.5	52.6	50.6	50.0
04-05								62.9	92.5	74.7	60.8	52.9	51.1	50.1
05-06								65.5	88.8	79.1	64.1	51.8	49.6	48.8
06-07								60.9	90.0	73.2	60.2	51.0	49.1	48.0
07-08								61.5	90.0	74.3	57.1	51.4	49.2	47.9
08-09								58.9	85.0	71.4	58.6	50.9	47.4	46.3
09-10								60.1	87.5	72.7	57.6	48.9	45.3	43.4
10-11								52.7	78.8	63.6	54.2	48.2	45.5	44.1
11-12								63.6	91.3	75.3	58.5	49.7	46.9	45.3
12-13								61.6	87.5	74.3	60.8	48.8	45.2	43.0
13-14	49.0	66.3	59.0	52.2	46.0	43.0	41.5							
14-15	47.2	65.0	57.2	49.8	44.2	41.9	40.8							
15-16	52.0	78.8	64.0	53.1	47.1	43.9	42.0							
16-17	60.4	88.8	73.0	57.0	48.2	45.4	43.4							
17-18	58.9	90.0	71.3	55.9	48.0	45.1	42.9							
18-19	53.4	75.0	64.2	56.1	48.1	45.7	44.1							
19-20	66.5	98.8	78.4	64.1	51.9	46.9	45.3							
20-21	57.4	86.3	65.0	54.6	49.5	47.5	46.4							
21-22														
22-23	54.7	75.0	58.6	55.3	54.3	53.5	52.6							
23-24	63.6	92.5	75.5	51.9	54.1	52.7	51.5							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 61.0 dB
L_n : 62.1
L : 60.2

NOISE DATA

YARD: ARGENTINE LOCATION: 53-2

DATE: 10 AUG 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12							
12-13							
13-14	49.7	70.0	59.5	51.4	46.5	44.3	43.0
14-15							
15-16							
16-17	65.3	93.8	75.9	66.3	60.5	53.8	49.9
17-18	58.1	81.3	69.2	59.9	53.3	49.8	47.7
18-19	59.6	92.5	70.7	56.6	50.3	48.2	46.7
19-20	60.6	97.5	69.8	59.1	50.8	48.4	46.5
20-21	62.9	92.5	74.8	60.7	53.1	50.0	48.6
21-22	63.5	86.3	76.0	65.4	55.9	54.1	52.9
22-23	55.9	70.0	61.2	58.4	54.7	53.0	52.2
23-24	64.4	91.3	77.0	63.0	54.1	52.4	51.4

DATE: 11 AUG 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	64.3	87.5	77.8	64.2	54.2	51.8	51.3
01-02	63.2	87.5	76.2	62.9	52.3	50.1	48.9
02-03	57.8	83.8	70.3	56.7	52.1	50.1	48.9
03-04	56.1	82.5	66.6	56.6	52.2	50.5	49.9
04-05	52.5	80.0	59.0	52.4	50.3	48.5	47.6
05-06	49.2	66.3	54.3	51.0	48.6	46.9	46.3
06-07	53.0	70.0	62.1	54.4	51.1	49.4	47.8
07-08	62.2	90.0	75.2	57.3	50.6	48.4	47.3
08-09	60.0	85.0	73.0	59.2	50.3	47.7	46.4
09-10	61.1	83.8	73.6	62.1	51.8	48.3	45.7
10-11	57.1	78.8	67.9	62.1	49.5	45.7	43.8
11-12	74.9	95.0	88.6	76.5	55.7	49.3	46.6
12-13	63.1	90.0	75.9	59.3	51.6	47.7	46.3
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 64.3 dB
L_n : 60.2
L. : 65.7

NOISE DATA

YARD: ARGENTINE LOCATION: 53-3

DATE: 10 AUG 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12							
12-13	63.4	86.3	72.9	65.5	58.6	54.1	50.3
13-14	55.5	80.0	64.9	56.5	53.1	50.7	50.0
14-15	56.9	81.3	67.1	60.3	53.2	50.6	49.3
15-16	64.5	93.8	74.9	65.8	57.8	51.7	49.4
16-17	70.6	105.0	77.2	69.6	66.4	63.1	61.8
17-18	61.4	88.8	70.4	64.8	55.9	52.4	49.2
18-19	57.4	78.8	66.5	59.9	55.7	50.2	47.6
19-20	65.0	90.0	75.4	68.8	59.4	53.2	50.4
20-21	67.4	95.0	75.8	71.1	61.5	54.4	50.0
21-22	68.1	93.8	76.2	70.1	66.1	62.4	58.8
22-23	69.4	97.5	78.8	70.8	65.4	60.1	58.5
23-24	67.5	101.3	76.3	67.1	59.5	55.4	52.6

DATE: 11 AUG 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	62.4	80.0	70.5	65.9	60.0	55.8	52.6
01-02	61.0	77.5	69.5	64.0	59.1	54.3	52.6
02-03	58.0	77.5	63.9	60.7	55.6	51.7	50.2
03-04	59.7	73.8	69.9	62.8	56.6	52.9	51.4
04-05	56.4	71.3	62.3	59.6	54.8	51.7	49.4
05-06	51.7	80.0	56.2	54.1	49.2	47.0	46.3
06-07	56.3	78.8	66.8	57.1	52.2	49.4	48.0
07-08	52.8	67.5	59.6	54.1	52.2	49.6	47.9
08-09	57.4	82.5	68.2	57.7	53.2	51.2	50.3
09-10	59.5	82.5	69.6	62.2	54.1	52.2	51.3
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 64.1 dB
L_n : 63.5
L[illegible] : 64.4

Cumberland Rail Yard
Chessie Rail System
Cumberland, Maryland
(Site No. 54)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The Cumberland Railroad Yard is operated by the Chessie System which includes the Baltimore & Ohio, Chesapeake & Ohio, and Western Maryland Railroads. This railroad yard consists basically of eastbound and westbound receiving yards, humps, classification yards, and a locomotive repair shop. The following activities were observed to occur at the yard during the noise measurements on 15 to 18 August 1978.

(a) Rail car classification: the mainline tracks arriving at the yard from both the east and west are connected to receiving yards of about 8 tracks each that are sized to contain as many as 1600 forty foot rail cars. The rail cars are pushed over the humps and coast down through the main retarders and then are switched to the various tracks of the classification yards. Secondary retarders slow the cars down to a speed somewhat over 4 mph to ensure coupling. The main retarder automotically slows the cars to 18 mph whether empty or full while the secondary retarders are manually controlled.

Major noise sources from the humping activity include the engine noise from the switching locomotive moving back and forth, the retarder noise from the rail cars after passing over the humps, air release noise and the impact noise that occurs when the moving rail cars hit stationary cars in the classification yards. Also, some wheel squeal is noticeable from the rail cars turning from the humps onto the various class tracks.

(b) Locomotive Repair Shop: A diesel repair facility is located in the southwest corner of the railroad yard. The large overhead garage type doors of the main shop building were always open; however, no audible noise appeared to propagate from inside. The major noise sources from this repair facility include the noise from full-power testing of locomotives to ensure that they can attain and hold a full-power status, and whistles that are used to clear the track prior to locomotive acceleration testing.

In addition to these activities, a public address system is utilized to announce the arrival and departure of trains and any change of job assignments. Also, the noise of train crossing bells occurred almost continuously at one community location.

An Amtrak train passes by the yard approximately 3 to 4 times a week either around 7 am or 11 pm. This train while passing the yard continuously blows its whistle.

This railroad yard operates 24 hours a day, seven days a week without any seasonal variation. On the average, about 1100 rail cars per day are humped in each direction with Monday and Tuesday being somewhat lower (approximately 900 each direction) and the rest of the week being between 1100 and 1300 each direction. Locomotive testing at the repair facility occurs continuously with at least one locomotive running at full power at most times.

The only observed activity at the yard related to energy transportation was the coal cars which were stopped in areas waiting to be made into trains. These cars are brought into the yard in a string and then are connected to outbound trains. We were told that fewer coal cars presently go through this yard than did a few years ago.

1.2 Land Use Surrounding the Yard

The land uses surrounding the Cumberland Railroad Yard in South Cumberland are generally residential and business to the north and southwest and conservation to the southeast (see attached map). Brief explanations of the land uses follows:

(a) The land located at the east-northeast boundary of the railyard has been zoned for highway business; however, there are many residential dwellings in this area that were constructed before the new zoning laws were passed in 1974. These homes are well-maintained, ond and two-story frame buildings, many of which have additional structures for storage and garage space.

(b) Outside of the city limits to the east, high upon a hill overlooking the railyard, are fairly modern one-story frame houses. These houses are mentioned because they are impacted by railyard noise; however negotiations will begin in June 1979 for the purchase of these homes for construction of a new highway.

(c) The land to the north of the railyard is zoned low-density urban residential. The residences in this area are predominantly two-story frame homes, fairly well maintained, and house many of the railroad employees.

(d) To the west and southwest, the land is zoned medium density urban residential, or local business with one small area adjacent to the main line tracks being zoned general industrial. Most of this area is covered with fairly maintained one and two-story frame homes, where a majority of present or retired railroad employees live.

(e) Located to the south and southeast of the railyard is the City of Cumberland Sewage Treatment Plant, and a state reservation along the Chesapeake and Ohio Canal. These sections are zoned conservation.

1.3 Noise Control Through Source Relocation

Several possibilities appear to exist at the Cumberland Railroad Yard for noise control through noise source relocation.

(a) Idling locomotives parked just south of Industrial Boulevard in the area of Day Street to Pennsylvania Avenue are a dominant noise source at the houses between Virginia and Seymour Avenues. Some reduction in noise could be achieved at these homes if the idling locomotives were located in the area east of Vancouver Avenue along the business zoned section where a shopping center is located. These locomotives were not being used to pump up a train since no rail cars were attached.

(b) At the end of Vine Street near the east end of the yard, there is a crossing bell which rang almost continuously while we were at this location. This bell seemed to ring if trains were anywhere near this crossing. Since this crossing is used only as access to the railyard, it seems that some other arrangement besides this bell could be utilized. In fact, people ignored this bell because it seldom meant that a train was coming and they always stopped, looked and usually continued on.

(c) The only trains that did not stop at this railroad yard were Amtrak trains passing through on the main lines. However, these Amtrak trains would blow their whistles continuously as they passed through the yard. The necessity for blowing these whistles for such a long amount of time should be investigated.

(d) The residential area along East Offutt Street southwest of the yard is subjected to noise from the stationary locomotives being tested at full power. Some reduction in community noise could be achieved if the locomotives were tested to the east of the main shop building instead of at the west end. The east end of the shop is located somewhat further from the homes and some smaller railroad buildings would act as partial barriers between the locomotives and the homes. About five to six years ago, a petition was signed by the neighbors and the railroad moved this testing operation to the east end of the main shop building but after a two to three week period, testing was resumed at the west end without explanation to the neighbors.

2. SITE DATA

2.1 Site Characteristics

The noise monitoring site locations are shown on the attached map and are described below.

Site 54-1

Site 54-1 was chosen as the 48-hour monitoring site (actual measurements extended over nearly 3 days). The monitoring unit was located near the railroad property line across the road from 304 Industrial Boulevard. This site was exposed to retarder and car impact noise from the eastbound hump yard, idling locomotive noise on the closer westbound tracks, crossing bell noise, P. A. noise, work train noise, and noise from locomotive acceleration testing on the tracks near the main shop building. The homes in this area are fairly well maintained two-story frame houses without air conditioning. The foundations of these houses are located about 20 feet higher in elevation than the railroad yard.

Site 54-2

Site 54-2 was chosen as a 24-hour site at the closest home to the west end of the main locomotive shop building. This location was in the yard to the west side of the house at 43 East Offutt Street and was at about 245 feet from the nearest locomotive being run at full power. The dominant noise at this site was locomotive noise with a small amount of noise from very light local traffic. Homes in this area are fairly maintained houses of one and two-story frame construction. A few of the homes had window air conditioners but most did not.

Site 54-3

Site 54-3 was chosen as a 24-hour monitoring site due to its close promixity to the westbound hump which is located near the east end of the yard. (Actual measurements extended over nearly 2 days.) The monitoring unit was located near the rear property line of One Oldtown Road. This location was approximately 150 feet north of the hump with the hump being about 50 feet higher in elevation than the monitor. The dominant noises at this site were locomotive noise as it traveled over the hump, the railroad public address system, retarder squeals and rail car impacts. The four homes in this area look up to the hump. These homes are well maintained, one and two-story frame or stucco buildings without air conditioning.

2.2 Site Noise Environment

Site 54-1

Rail noise exposure at this site was dominated by idling locomotives and the crossing bell at the end of Vine Street. Other rail noises were retarder squels from the eastbound hump, the railroad P.A. system, impacts, locomotive noise during acceleration testing, the work train and train noise from railroad cars being assembled into westbound trains.

Also, the Amtrak Train's whistle when passing by the yard was an annoying sound since it occurred either around 7 a.m. or 11 p.m. One time during the measurements that it appeared to have passed was between 11 p.m. and midnight on Thursday, 17 August when the maximum sound level at the monitoring unit was 114 dB.

Nonrail sources of noise at this location were traffic along Industrial Boulevard, insect noise and small propeller aircraft.

Rail noises were dominant at this site at all observed times. Railroad yard activities were sufficiently continuous so that the longest periods of time without audible noise were around two to three minutes.

Site 54-2

Rail noise at this site was dominated by locomotives being tested at full power outside the west end of the main repair shop building. Other rail noise sources were whistles and moving locomotives.

Nonrail sources of noise at this location were local traffic, children playing, birds, and dogs barking. The local traffic on East Offutt Street was very minimal.

The noise of full power testing of locomotives was audible at this site at all times except when a car or truck was passing directly by the measurement location. This noise was low frequency with most of the energy in the 63 and 124 Hz octave bands. These two octave bands controlled the A-weighted sound level. No ground vibrations were observed but neighbors mentioned their windows rattling.

Site 51-3

Rail noise at this location was dominated by locomotive noise while pulling or pushing cars over the westbound hump, the railroad P.A. system, retarder squeals, whistles, rail car impacts, air release noise, and idling locomotives.

Nonrail sources of noise are local traffic, birds, insects, and small propeller aircraft.

Rail noise at this site occurs 24 hours per day; however, there are periods of about a half hour when no humping occurs and the area is pretty quiet (residual sound levels are about 40 to 45 dBA). When a locomotive goes over the hump, the sound level at the monitoring site is increased to about 70 to 75 dBA. Retarder squeals and rail car impacts are somewhat higher in sound level than the locomotive noise.

2.3 Subjective Impressions

The subjective impressions of the neighbors of the Cumberland Railroad Yard are summarized below for each of the three measurement sites.

Site 51-1

At this site, only three out of the six neighbors that were talked to were annoyed about the railroad yard noise. Two were very annoyed and one was only sometimes annoyed (basically due to the Amtrak train's whistle). Only two of the six neighbors claimed to be awakened by railroad yard noise. The others said that they were used to the noise. None of the neighbors had ever complained about the noise. The main sources of annoyance seemed to be car impacts, whistles, the crossing bell, and the low frequency locomotive noise.

Other problems in this neighborhood that were mentioned are speeding cars and bad drainage during and after heavy rains.

Site 54-2

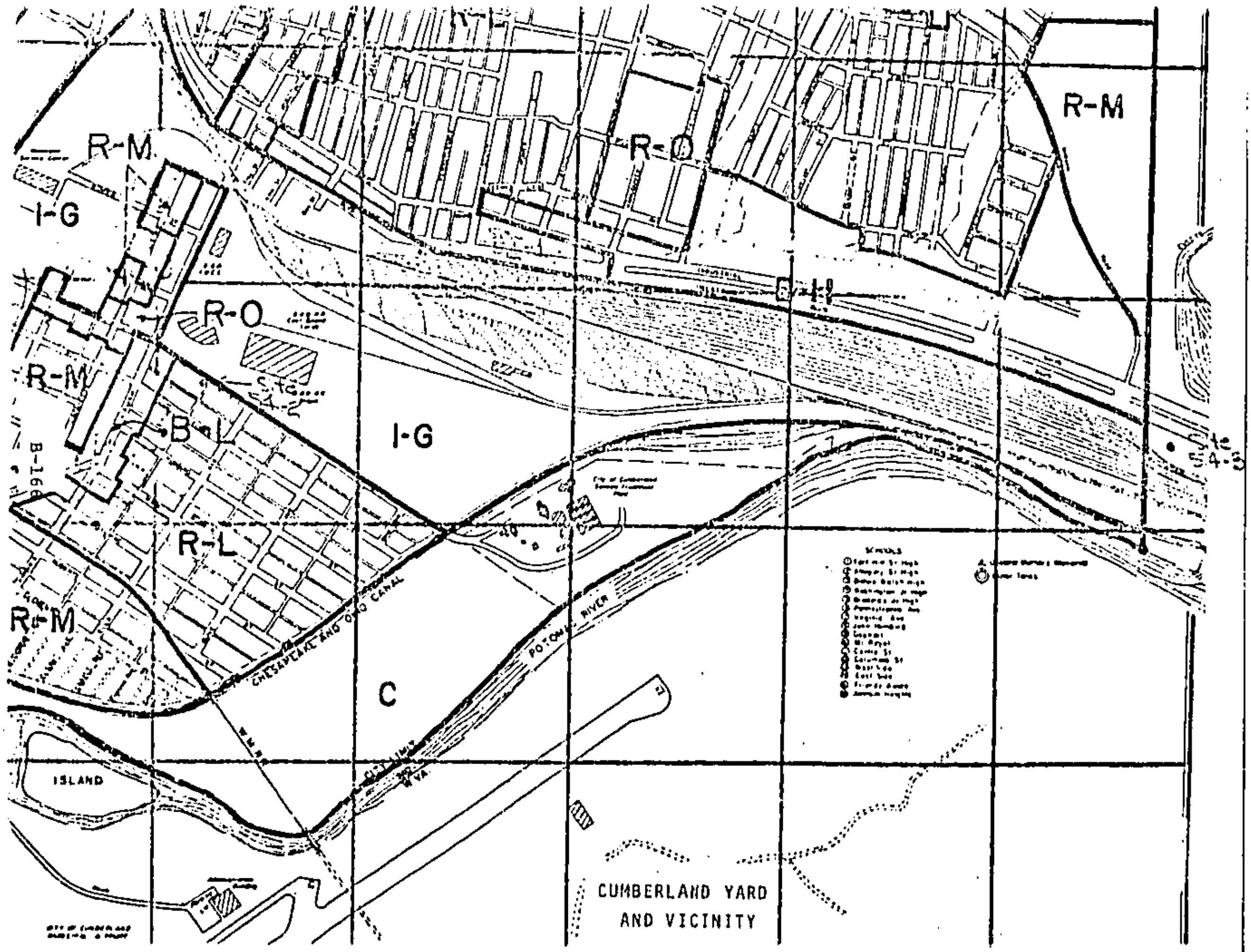
Two neighbors at this site said that they were very annoyed; three were slightly annoyed, and two claimed to be immune to the noise. Only two neighbors presently claimed to be awakened by the noise. Only one of the neighbors had complained and when he did the railroad stopped full power locomotive testing from 11 p.m. to 7 a.m. for a few nights and then resumed as usual. Some of these neighbors had worked for the railroad and seemed to be hard of hearing. The main source of annoyance is the low frequency noise caused by the full-power locomotive testing. One neighbor claims to have had to re-plaster his house after the railroad switched from steam engines to diesel-electric about 20 years ago. Approximately 5 to 6 years ago, the neighbors signed a petition to have the railroad test locomotives at the east end of the main shop building. The railroad made this change for a short period of time and then resumed testing at the west end as before.

Other problems in this neighborhood that were mentioned are speeding cars and motorcycles, smoke and odor from the diesel locomotives, barking dogs, and mosquitoes from the old Chesapeake and Ohio Canal.

Site 54-3

All four of the neighbors in this area are annoyed about the railroad yard noise: three are very annoyed, and one is slightly annoyed and claims to be used to the noise. All of these neighbors are awakened by the noise. Two of these neighbors had complained but the railroad did not do anything. This hump was built about 20 years ago and the land was bought from these people. The main sources of annoyance are locomotives, retarder squeals, impacts, whistles, and the railroad yard P.A. system.

Other problems in this neighborhood that were mentioned are speeding cars and trucks and water drainage.


R-M
R-O
R-M
I-G
R-O
R-M
B-1
I-G
R-L
R-M
CHESAPEAKE AND OHIO CANAL
POTOMAC RIVER
C
ISLAND
CUMBERLAND YARD
AND VICINITY

NOISE DATA

YARD: Cumberland LOCATION: 54-1

HOUR OF DAY	DATE: 15 August 1978 NOISE LEVEL in dBA							DATE: 16 August 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								65.4	90.	74.	68.	60.	54.	52.
01-02								67.9	93.	79.	68.	56.	52.	51.
02-03								70.7	93.	80.	70.	61.	53.	51.
03-04								60.5	82.	71.	62.	56.	52.	49.
04-05								64.3	86.	75.	64.	56.	51.	50.
05-06								70.1	87.	84.	72.	58.	52.	50.
06-07								72.7	99.	82.	73.	64.	60.	55.
07-08								70.6	95.	80.	71.	65.	61.	59.
08-09								66.6	85.	74.	68.	63.	56.	54.
09-10								72.7	111.	81.	71.	61.	58.	57.
10-11								59.3	62.	61.	60.	59.	58.	57.
11-12								61.8	78.	73.	65.	55.	51.	49.
12-13								65.4	95.	73.	66.	56.	52.	49.
13-14								63.5	86.	74.	66.	58.	53.	51.
14-15								63.7	86.	72.	66.	57.	53.	51.
15-16	65.2	90.	76.	68.	57.	54.	53.							
16-17	70.5	93.	82.	68.	61.	55.	53.							
17-18	69.5	92.	81.	69.	60.	54.	53.							
18-19	74.2	99.	80.	71.	59.	55.	53.							
19-20	67.5	81.	72.	68.	67.	58.	55.							
20-21	68.6	92.	73.	69.	67.	66.	66.							
21-22	69.1	91.	73.	69.	68.	67.	67.							
22-23	70.3	91.	78.	71.	69.	61.	57.							
23-24	70.8	101.	72.	65.	57.	53.	51.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 69.0 dB
L_n : 69.3
L_d : 68.8
L_{dn}: 75.7

NOISE DATA

YARD: Cumberland LOCATION: 54-1

HOUR OF DAY	DATE: 16 August 1978 NOISE LEVEL in dBA							DATE: 17 August 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								64.8	85.	70.	67.	62.	54.	52.
01-02								67.3	87.	81.	68.	57.	54.	53.
02-03								72.7	102.	76.	70.	62.	55.	52.
03-04								67.3	87.	78.	68.	61.	59.	58.
04-05								68.6	92.	79.	70.	63.	53.	52.
05-06								66.0	87.	75.	70.	55.	50.	49.
06-07								74.4	102.	80.	71.	69.	57.	53.
07-08								71.6	93.	81.	72.	69.	58.	54.
08-09								66.5	88.	77.	70.	59.	53.	51.
09-10								65.6	88.	74.	66.	62.	57.	55.
10-11								70.8	90.	83.	71.	61.	58.	56.
11-12								66.9	97.	75.	69.	59.	52.	49.
12-13								69.1	93.	78.	70.	62.	50.	47.
13-14								69.7	90.	83.	67.	60.	50.	48.
14-15								66.9	88.	78.	70.	58.	53.	52.
15-16	70.0	99.	77.	67.	55.	52.	50.							
16-17	71.5	99.	83.	66.	60.	54.	51.							
17-18	70.1	91.	84.	66.	60.	55.	51.							
18-19	70.3	100.	77.	70.	56.	53.	51.							
19-20	64.5	86.	75.	67.	58.	54.	53.							
20-21	67.8	91.	78.	65.	55.	54.	52.							
21-22	71.3	94.	83.	72.	60.	55.	53.							
22-23	75.9	105.	73.	66.	60.	54.	53.							
23-24	66.7	86.	79.	66.	62.	53.	52.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 70.1 dB
L_n : 71.1
L_d : 69.4
L_{dn}: 77.3

NOISE DATA

YARD: Cumberland LOCATION: 54-1

DATE: 17 August 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12							
12-13							
13-14							
14-15	66.9	88.	78.	70.	58.	53.	52.
15-16	72.9	90.	81.	72.	71.	70.	70.
16-17	74.9	95.	88.	73.	64.	57.	53.
17-18	63.9	85.	74.	67.	57.	50.	48.
18-19	66.3	87.	76.	66.	55.	51.	49.
19-20	60.7	85.	72.	60.	54.	51.	50.
20-21	76.3	102.	83.	72.	58.	54.	52.
21-22	67.8	89.	77.	70.	62.	56.	55.
22-23	65.2	86.	75.	68.	58.	54.	54.
23-24	80.0	114.	74.	69.	60.	54.	53.

DATE: 18 August 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	70.3	100.	76.	68.	55.	53.	52.
01-02	66.5	89.	76.	69.	59.	53.	50.
02-03	65.4	90.	78.	66.	55.	51.	49.
03-04	58.5	86.	67.	61.	54.	51.	49.
04-05	63.5	90.	70.	66.	59.	54.	52.
05-06	69.7	90.	81.	72.	64.	56.	51.
06-07	68.3	99.	75.	69.	64.	62.	52.
07-08	70.7	103.	75.	67.	59.	52.	50.
08-09	71.4	89.	86.	69.	62.	59.	58.
09-10							
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: ______ dB

L_n : 71.9

L_d : 71.4

L_{dn}: ______

NOISE DATA

YARD: Cumberland Yard LOCATION: 54-2

HOUR OF DAY	DATE: 15 August 1978 — NOISE LEVEL in dBA							DATE: 16 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								57.7	75.	65.	58.	56.	55.	54.
01-02								59.8	77.	66.	61.	58.	57.	56.
02-03								63.3	70.	69.	68.	59.	56.	55.
03-04								59.0	67.	62.	60.	58.	57.	56.
04-05								58.8	75.	66.	60.	58.	56.	55.
05-06								59.8	79.	69.	60.	58.	56.	55.
06-07								59.6	74.	65.	61.	58.	57.	56.
07-08								61.1	79.	72.	62.	58.	55.	54.
08-09								59.2	80.	69.	60.	55.	53.	52.
09-10								60.5	79.	71.	61.	57.	54.	53.
10-11								60.0	81.	70.	61.	56.	54.	53.
11-12								58.5	75.	66.	60.	55.	54.	52.
12-13								60.0	81.	71.	61.	56.	54.	53.
13-14								58.6	80.	69.	60.	54.	51.	49.
14-15								68.2	102.	70.	66.	56.	52.	49.
15-16	61.1	76.	69.	63.	59.	57.	55.							
16-17	61.1	86.	69.	64.	58.	54.	52.							
17-18	58.8	77.	66.	61.	57.	54.	51.							
18-19	59.6	84.	65.	60.	57.	54.	53.							
19-20	58.6	82.	66.	59.	56.	54.	53.							
20-21	60.1	78.	68.	63.	57.	54.	53.							
21-22	58.6	80.	65.	60.	57.	56.	55.							
22-23	57.5	70.	62.	59.	56.	55.	54.							
23-24	57.9	73.	[illegible]	59.	56.	55.	54.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 60.7 dB
L_n : 59.6
L_d : 61.2
L_{dn}: 66.3

NOISE DATA

YARD: Cumberland Yard LOCATION: 54-3

HOUR OF DAY	DATE: 16 August 1978 — NOISE LEVEL in dBA							DATE: 17 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								57.7	79.	67.	58.	52.	50.	49.
01-02								65.0	94.	69.	60.	51.	50.	49.
02-03								59.8	75.	68.	63.	55.	52.	50.
03-04								54.7	76.	62.	56.	52.	50.	49.
04-05								54.7	73.	66.	56.	49.	48.	47.
05-06								60.7	84.	70.	65.	54.	49.	47.
06-07								66.0	89.	76.	65.	56.	49.	48.
07-08								67.1	89.	81.	64.	54.	48.	46.
08-09								60.5	83.	71.	62.	54.	48.	47.
09-10								57.9	75.	69.	61.	53.	47.	45.
10-11								61.1	83.	73.	63.	54.	49.	46.
11-12								60.0	85.	72.	61.	53.	46.	43.
12-13								58.1	81.	69.	60.	51.	45.	41.
13-14								55.1	69.	65.	57.	51.	46.	43.
14-15								64.1	90.	73.	65.	55.	48.	46.
15-16								63.1	84.	74.	64.	50.	46.	44.
16-17	63.9	84.	77.	65.	51.	45.	43.							
17-18	56.6	79.	66.	57.	52.	45.	41.							
18-19	58.5	81.	65.	62.	48.	43.	41.							
19-20	54.9	80.	64.	55.	48.	43.	41.							
20-21	58.6	79.	69.	61.	53.	50.	48.							
21-22	64.5	82.	75.	68.	53.	51.	51.							
22-23	60.0	85.	69.	60.	53.	51.	51.							
23-24	56.2	74.	67.	58.	52.	51.	50.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 61.5 dB
L_n : 61.2
L_d : 61.7
L_{dn}: 67.7

NOISE DATA

YARD: Cumberland Yard LOCATION: 54-3

HOUR OF DAY	DATE: 17 August 1978 — NOISE LEVEL in dBA							DATE: 18 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								59.0	82.	68.	62.	54.	48.	46.
01-02								55.6	75.	67.	57.	48.	45.	45.
02-03								52.1	75.	60.	52.	49.	46.	45.
03-04								60.9	77.	74.	61.	50.	43.	42.
04-05								59.4	80.	70.	60.	51.	45.	43.
05-06								63.3	84.	77.	64.	49.	46.	44.
06-07								58.5	82.	69.	60.	49.	47.	45.
07-08								58.1	86.	68.	57.	48.	45.	44.
08-09								54.9	75.	67.	56.	49.	45.	43.
09-10														
10-11														
11-12														
12-13														
13-14														
14-15														
15-16	63.1	84.	74.	64.	50.	46.	44.							
16-17	59.0	78.	71.	60.	50.	45.	43.							
17-18	59.0	76.	68.	62.	55.	46.	44.							
18-19	57.1	82.	67.	58.	51.	46.	43.							
19-20	57.9	78.	68.	60.	52.	46.	43.							
20-21	66.5	86.	79.	59.	53.	48.	46.							
21-22	59.2	80.	68.	62.	54.	51.	49.							
22-23	57.7	78.	67.	60.	52.	49.	48.							
23-24	59.8	87.	69.	60.	51.	49.	48.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: ______ dB

L_n : 59.4

L_d : 60.9

L_{dn}: ______

Western Avenue Yard
Chicago, Milwaukee, St. Paul and Pacific Railroad
Chicago, Illinois
(Site No. 55)

1.0 GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The Western Ave. yard is a large flat yard with extensive repair and service facilities for locomotives and passenger coaches. All freight switching operations at the yard have been curtailed. One-half of the yard is now used for storage of bad order freight cars. The remaining active portion of the yard handles only commuter and Amtrak passenger trains.

The yard is located between W. Grand and W. Kinzie Avenues in central Chicago. The diesel repair facilities are located at 2933 W. Chicago.

The yard handles a fairly high level of commuter train traffic. Commuter trains pass through the yard approximately four times per hour, on the average, during the business day. Eight Amtrak Turboliner through-trains pass the yard per day. The yard is approximately 8 minutes from Union Station which is the main passenger terminal in Chicago.

Commuter and Amtrak trains are assembled in the yard. Approximately 30 diesels are regularly serviced and repaired at the yard. Stationary load tests are performed. The activity level decreases drastically after 10 p.m. when all but two diesels leave the yard for the outskirts of the suburbs in preparation for the first inbound runs of the day. Thus, two diesels idle all night at the yard. The loudspeaker system at the yard is not used at night. One or two trains are washed at night.

Because no freight is handled at the yard, the yard impacts energy production/transport only in so far as mass transit reduces the demand for energy relative to personal transportation.

1.2 Land Use Surrounding Yard

The yard is surrounded by light to medium industrial and commercial installations. The yard abuts a railyard to the south owned by the Chicago and Northwestern RR. Some residences are located several blocks to the north of the yard. Because of the industrial location, there is a large volume of heavy truck traffic on all streets surrounding the yard. The traffic noise generally masks all noise from the yard, and thus there are no community hot spots caused by the yard. The yard presumably serviced the adjoining industry before freight operations were curtailed.

1.3 Noise Control Through Source Relocation

Possible actions to reduce radiated noise are limited at the Western Ave. Yard. The diesel service area could be moved toward the southern section of the yard, however, the effect of the move would be minimal because of the dominance of traffic noise in the area.

2.0 SITE DATA

2.1 Site Characteristics

See the enclosed site map showing the two sites selected for monitoring. One noise monitor was placed at Site 55-1 for 48 hours to measure noise from the diesel service area and the diesel repair shed. The microphone was located 19 ft. from the nearest diesel wash rack.

A second monitor was placed at Site 55-2 for 24 hours to measure the noise from through-trains; switching operations, and air conditioners on the parked cars. The microphone was located 50 ft. from the nearest track.

These two sites were just within the railroad property line. Other sites could not guarantee the safety of the equipment nor offer improved acoustical conditions. The buildings near these sites are industrial/commercial consisting of brick with moveable and fixed windows. Their state of repair ranges from good to poor.

Additional short-term recordings were obtained at selected sites where it was not possible to station a permanent monitor. However, since the noise exposure in all cases was dominated by traffic on nearby streets, the measured levels are not reported herein.

2.2 Noise Exposure Components

The noise in the area surrounding the Western Ave. Yard consists of two main components: (1) The dominant source is traffic on the surrounding streets. The vehicles consist of heavy to light trucks with some passenger cars. Traffic lights in the area require heavily laden trucks to accelerate from rest. (2) Noise sources from the railyard consisted largely of idling diesels, horns, and bells. The rail noise was audible only during rare lulls in the street traffic or when through Amtrak trains blew their horns.

The characteristics of the rail sources are as follows:

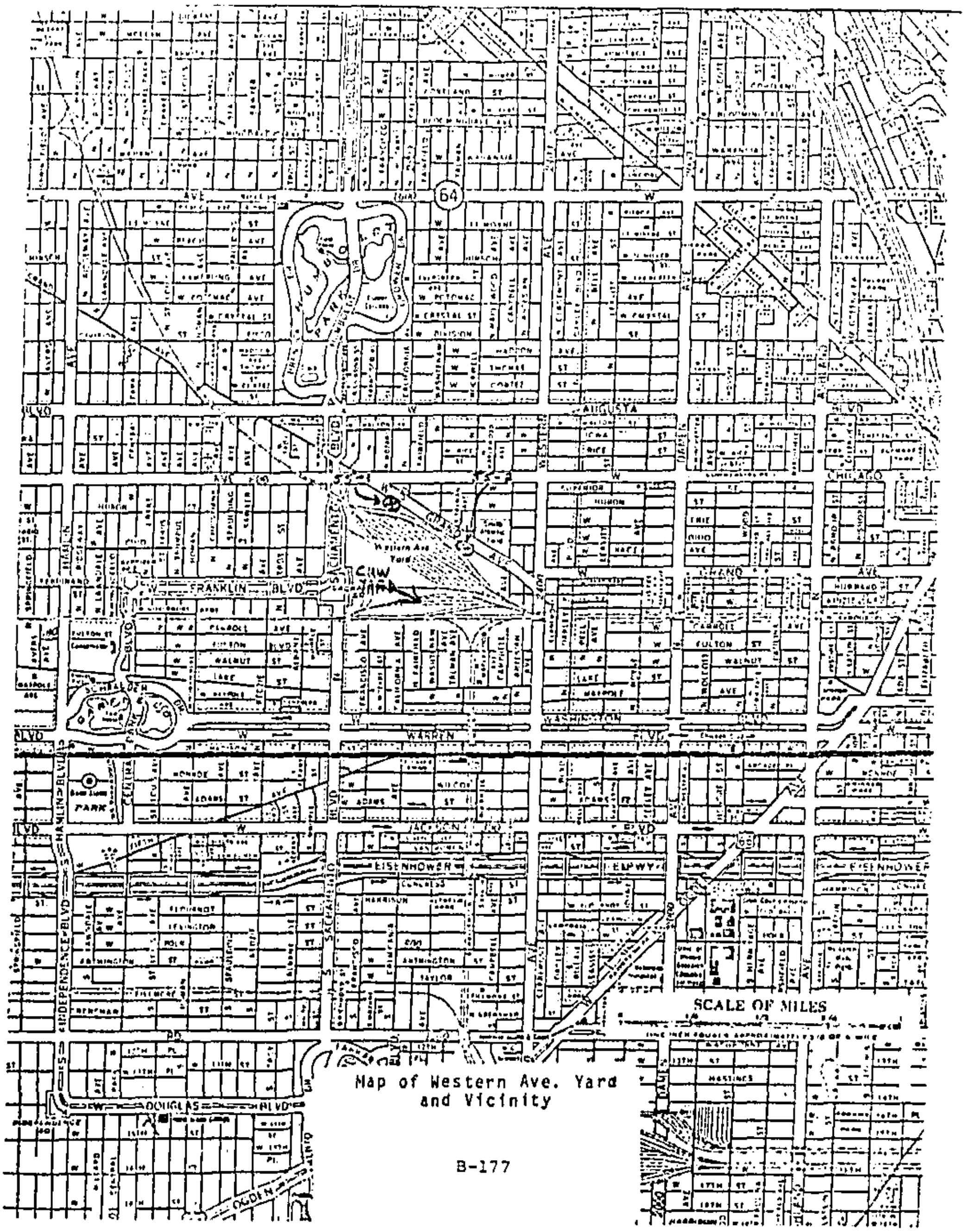
(1) Idling diesels and stationary load tests. The diesels idle on several service tracks east of the diesel service house. Load tests are performed on the south side of the service house and thus are largely blocked from the

community. Five to ten diesels idle continuously during the daylight hours. Two diesels idle through the night. Load tests are performed during the day.

(2) Incoming, outgoing, and through-trains produce noise by blowing whistles, ringing bells and causing some wheel squeal. These sources are intermittent and do not occur at night.

(3) Air conditioning compressors on the parked commuter cars run continuously during the summer. This noise is fairly broadband and was not audible off of the yard property.

(4) It is notable that no impact noise was observed for the duration of our visit. No disturbing ground vibrations were detected. Switching, when it does occur, is accomplished at a nominal speed of 3-4 mph. The light, sealed passenger cars seem to radiate less noise than freight cars under the same conditions.



Map of Western Ave. Yard
and Vicinity

NOISE DATA

YARD: Western Avenue LOCATION: 55-1

HOUR OF DAY	DATE: 16 August 1978 NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	DATE: 17 August 1978 NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								72.1	101.3	81.5	72.1	67.3	65.7	65.1
01-02								70.5	86.3	77.0	72.4	69.8	66.6	65.4
02-03								70.1	97.5	76.4	71.2	68.9	66.8	65.4
03-04								67.4	82.5	74.1	68.2	66.7	65.4	65.0
04-05								67.6	83.8	74.8	68.6	66.7	65.4	65.0
05-06								69.4	90.0	77.9	71.3	67.2	65.8	65.1
06-07								72.4	91.3	82.1	74.3	69.7	66.9	66.3
07-08								75.2	105.0	84.2	76.3	71.2	68.0	66.6
08-09								77.5	107.5	87.2	77.9	72.4	69.2	67.6
09-10								76.7	107.5	84.1	77.8	72.7	70.4	69.0
10-11								79.0	110.0	85.8	77.1	72.4	70.4	69.2
11-12								74.8	97.5	83.3	76.6	72.3	70.5	69.6
12-13								74.5	98.8	83.3	75.9	72.1	70.3	69.1
13-14	73.5	95.0	83.2	75.4	70.7	67.7	66.3							
14-15	73.6	92.5	83.0	75.7	71.3	69.1	67.8							
15-16	73.9	95.0	82.8	76.1	71.4	68.8	67.3							
16-17	73.4	98.8	83.4	75.8	69.9	65.7	62.3							
17-18	71.4	88.8	80.0	74.0	69.4	66.1	65.0							
18-19	70.2	88.8	78.9	72.5	67.6	65.4	64.2							
19-20	68.5	90.0	76.4	71.0	66.5	64.2	63.4							
20-21	69.1	91.3	78.1	71.1	66.3	64.2	63.8							
21-22	69.0	97.5	75.8	70.6	66.7	65.3	64.4							
22-23	69.3	92.5	75.8	71.2	68.1	66.5	65.2							
23-24	69.1	90.0	76.8	70.9	67.2	65.6	65.0							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 73.2 dB
L_n : 70.1
L_d : 74.4
L_{dn}: 77.4

NOISE DATA

YARD: Western Avenue LOCATION: 55-1

HOUR OF DAY	DATE: 17 August 1978 — NOISE LEVEL in dBA							DATE: 18 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								68.2	85.0	75.9	69.8	67.0	65.5	65.0
01-02								72.4	92.5	84.0	72.4	68.4	66.3	65.1
02-03								68.3	85.0	75.8	69.6	67.3	66.3	65.2
03-04								67.9	83.8	74.0	68.8	67.1	66.1	65.1
04-05								68.4	88.8	74.1	69.2	67.2	66.3	65.2
05-06								69.4	85.0	75.7	71.5	68.3	66.7	65.8
06-07								73.7	101.3	80.7	74.3	70.2	67.8	66.7
07-08								77.1	110.0	85.6	77.2	71.7	68.3	66.6
08-09								78.1	110.0	85.5	79.8	72.0	68.3	66.7
09-10								73.8	91.3	82.4	75.9	71.8	70.1	68.9
10-11								77.1	91.3	84.5	79.8	75.3	71.5	70.1
11-12								75.6	93.8	83.7	78.3	73.6	71.2	70.1
12-13														
13-14	75.1	101.3	84.2	76.0	71.2	69.3	68.8							
14-15	73.9	97.5	82.9	76.1	71.4	69.2	68.5							
15-16	73.4	93.8	82.9	75.8	71.1	67.9	66.4							
16-17	73.2	96.3	82.7	75.4	70.9	67.7	65.7							
17-18	73.1	91.3	82.1	75.9	70.5	67.6	66.3							
18-19	71.4	96.3	80.3	72.9	68.3	65.5	64.3							
19-20	69.8	97.5	77.8	72.2	67.5	64.9	63.8							
20-21	75.4	110.0	78.2	71.0	66.2	64.3	63.8							
21-22	69.0	96.3	75.8	70.7	67.1	64.7	63.6							
22-23	70.1	95.0	77.3	71.5	68.3	66.7	65.8							
23-24	68.7	92.5	76.9	70.2	67.2	65.8	65.1							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 73.4 dB
L_n: 70.2
L_d: 74.7
L_{dn}: 77.6

NOISE DATA

YARD: Western Avenue LOCATION: 55-2

HOUR OF DAY	DATE: 17 August 1978 NOISE LEVEL in dBA							DATE: 18 August 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								60.2	83.8	71.9	62.4	53.9	51.3	50.1
01-02								55.7	75.0	64.8	58.6	52.7	50.4	49.3
02-03								55.8	76.3	66.1	58.0	51.9	50.1	48.9
03-04								55.4	75.0	65.6	57.8	52.1	50.2	49.0
04-05								55.2	81.3	64.9	56.4	51.4	49.8	48.8
05-06								56.1	83.8	66.4	57.5	52.5	50.7	49.4
06-07								62.2	81.3	74.3	63.8	57.1	53.1	51.4
07-08								65.1	82.5	76.7	67.4	59.7	55.4	53.8
08-09								65.7	93.8	76.1	69.0	61.2	57.5	54.3
09-10								63.9	96.3	73.4	64.6	58.2	55.8	54.5
10-11	62.2	91.3	71.7	62.8	58.9	56.9	55.6							
11-12	64.1	81.3	74.2	67.3	59.7	57.9	56.8							
12-13	64.6	86.3	76.0	66.2	60.6	58.5	57.1							
13-14	63.9	90.0	74.9	64.9	60.0	57.8	56.5							
14-15	61.2	80.0	73.6	61.6	57.6	55.6	54.6							
15-16	61.8	83.8	72.9	62.7	58.8	56.3	55.1							
16-17	71.0	88.8	82.4	72.5	68.2	56.5	53.3							
17-18	65.6	83.8	78.3	67.5	57.3	52.5	50.3							
18-19	64.1	82.5	76.8	65.9	57.0	52.6	50.7							
19-20	66.8	86.3	78.0	68.7	57.3	52.6	50.5							
20-21	64.9	95.0	75.7	61.7	54.6	51.7	50.3							
21-22	58.8	83.8	70.9	58.1	54.0	51.7	50.4							
22-23	60.1	81.3	73.3	58.8	54.0	51.7	50.4							
23-24	57.1	83.8	67.1	58.4	53.2	50.7	50.0							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 63.6 dB
L_n: 58.3
L_d: 65.1
L_{dn}: 66.6

Frontier Rail Yard
Conrail
Buffalo/Cheetowago, New York
(Site No. 56)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The Frontier railroad yard consists of north and south receiving and departure yards, one hump at the east end of the yard, one classification yard, a car repair shed, and a small locomotive repair facility. The following activities were observed to occur at the yard during the noise measurements on 23 to 25 August 1978.

(a) Rail car classification: The mainline tracks arrive from the north and south into this railyard which is situated on an east/west axis. The mainline tracks are connected to receiving and departure yards at the south and north sides. Approximately 2100 rail cars per day are pushed over the one hump and are then switched to one of the 63 tracks in the classification yard. One master retarder and seven group retarders slow the rail cars prior to their reaching the classification yard. Major noise sources from the humping activity include the locomotives moving back and forth, the retarders, the air releases, and the impacts when moving rail cars hit stationary cars in the classification yard.

(b) Making up trains: Strings of rail cars are pulled out of the classification yard and are parked in the south and north departure yards. In the departure yards, these rail cars are coupled together, the air hoses are connected, cabooses and locomotives are added, and the trains are pumped up. Then these trains are switched onto the mainline tracks and proceed to their next destination. Major sources of noise associated with these activities are idling and moving locomotives, moving trains, air releases, and whistles. Also, some wheel squeal is noticeable from the rail cars turning at curves and switches.

(c) Locomotive and car repair shop: Locomotive and car repair shops are located near the center of the railyard. The repair work that is conducted at this yard appears to be minor. The buildings housing the locomotive shop and the car repair shop are only large enough for two locomotives and seven rail cars. A fueling station is located adjacent to the locomotive shop. The major source of noise associated with these activities is idling locomotives. No full-power testing of locomotives was observed. Noise from these activities was identifiable only near site 56-3 and only during otherwise quiet periods.

In addition to these above activities, a public address system was utilized and was audible at the industrial property line near the hump (Site 56-1) and along the north railyard boundary near Site 56-3.

The Frontier Yard operates on a 24-hour, seven-day-a-week basis without any seasonal variation. On the average, about 2,100 rail cars per day are humped with each of the three shifts being about equal. On 23 August, 2106 cars were humped. Six hundred fifty-five cars were humped during during first shift (6 a.m. to 2 p.m.); 730 during second shift (2 to 10 p.m.); and 721 during third shift (10 p.m. to 6 a.m.). Two thousand two hundred ninety-seven cars were received at the yard on 23 August and 1,831 departed. We were told that the work crew was typical during the measurement period.

No particular activities related to energy production or transport were observed during the measurement period.

1.2 Land Use Surrounding the Yard

The land uses surrounding the Frontier Railroad Yard are residential, business, and light industrial as explained below.

(a) The land located between the north boundary of the yard to within about 100 feet of Walden Avenue is zoned light industrial and is presently not utilized except for a baseball field owned by the City of B ffalo.

(b) At the northwest corner of the yard is an area zoned and utilized for single family housing. These homes are well-maintained one and two-story frame houses, with additional structures for garage space.

(c) West of the yard the land is zoned and utilized for multi-family dwellings. At the southwest corner of the yard, the land east of Bailey Avenue is used as a warehouse.

(d) South of the railyard is Broadway Road which parallels the mainline. The traffic is heavy along this road. South of Broadway Road are areas zoned for residential and business use in both the City of Buffalo and the Town of Cheektowaga. The Village of Sloan is also south of Broadway and is mostly zoned for residential and business use with one lot for light industry. Most of the building along Broadway are two-story frame buildings.

(e) At the east end of the yard there are two industrial buildings at the west side of Harlem Road. One the east side of the Harlem Road overpass is a large shopping center.

1.3 Noise Control Through Source Relocation

Two alternate possibilities for noise control through noise source relocation appear to exist at the Frontier Yard.

(a) An area of the north receiving and departure yard along West Shore Avenue from about Summer Avenue to Wex Street is used for making up outbound trains. Idling and moving locomotives are a significant noise source in the adjacent residential area. It might be possible to conduct this operation in the area east of the railroad bridge overpass. This move would increase the distance between the closest locomotives and the houses to about 600 feet instead of about 50 feet.

(b) If the above relocation of the making up train operation cannot be moved, some noise control could be achieved by first utilizing the tracks that are furthest away from the houses since all the eight tracks in this area may not be used. The eighth track from the yard boundary is roughly 100 feet further from the homes than the first track. Also, some amount of reduction was noticed at site 56-1 when a line of box cars was parked on the first track. Our railroad contact mentioned that it might be possible to position a row of cars on this track to provide a barrier and hopefully arrange to not move these cars during the nighttime.

2. SITE DATA

2.1 Site Characteristics

The noise monitoring site locations are shown on the attached map and are described below. The approximate railroad property line is also shown on the map. No monitoring sites were chosen along the south side of the railyard since the noise in this area was controlled by traffic on Broadway Road. However, retarder squeals and rail car impacts were audible in the business and residential areas south of Broadway Road.

Site 56-1

Site 56-1 was chosen as the 48-hour monitoring site. The monitoring unit was located at the railroad property line near the corner of West Shore Avenue and Wex Street. This site was exposed to noise from idling and moving locomotives, moving trains, air releases, wheel squeals, whistles, and car impacts when strings of cars were moved forward and backward. During the periods of time when no outbound trains were being made up,distant retarder squeals and rail car impacts could be heard from the humping operation about 4,000 feet to the east. The homes in the area are well-maintained one and two-story frame houses with additional structures for garages. Some of these homes have window air conditioners but most do not.

Site 56-2

Site 56-2 was chosen as a 24-hour site at the industrial property line to the rear of the Hubbs and Howe buildings. The monitoring unit was located at about 175 feet from the hump. The dominant noises at this site were locomotive noise, retarder squeal, rail car impacts, whistles, and air releases. During the morning of 23 August, a grader and a crew of men were working on the tracks for a short period of time. The two industrial type buildings in this area appear to be used as warehouses and are of brick construction.

Site 56-3

Site 56-3 was chosen as a 24-hour monitoring site at the north property line along the undeveloped area zoned for light industry. It appeared that this land might have previously been owned by the railroad. The monitoring unit was located near an access road to the railyard approximately 2000 feet east of Site 56-1. The railroad noise sources at this location were rail car impacts, wheel squeal, trucks on railroad property, air releases, retarder squeals, moving trains, whistles, and locomotives idling at the locomotive shop and refueling station.

2.2 Site Noise Environment

Site 56-1

Rail noise exposure at this site was dominated by idling and moving locomotives. Other observed railroad noise sources were moving trains, whistles, wheel squeals, air releases, rail car impacts, and distant retarder squeals and impacts form the humping operation.

Nonrail sources of noise at this location were jet aircraft taking off from the Greater Buffalo International Airport, very minimal local traffic, dogs barking, birds, insects, the breeze in trees, and children playing. The maximum sound levels of jet aircraft flyovers were usually 60 to 69 dBA. Sometimes an aircraft would appear to be turning to the northwest and would fly nearly over the monitor. In these cases, which occurred only a few times per day, the maximum flyover sound levels were 80 to 88 dBA.

Rail noises with the exception of the audible distant retarder squeals and rail car impacts from the humping operation occurred intermittently at this site. Two to three hours might pass without any nearby activity and then the activity would be fairly heavy for the next couple of hours. Sometimes idling locomotives continuously controlled the noise at the homes. Some neighbors mentioned that they had problems with vibrations that were strong enough to break their windows.

Site 56-2

Rail noise at this site was dominated by the humping activity. Moving locomotives, retarder squeal, and rail car impacts, controlled the noise environment. Other railroad noise sources were the grader and men at work for a short period of time on Wednesday morning, idling locomotives, whistles, the railroad P.A. System and air releases.

Nonrail sources of noise at this location were jet aircraft from the Buffalo Airport, insects, traffic on the railroad yard access road, and the breeze in the trees on the Hubbs and Howe property.

The railroad humping noise of this site was virtually continuous with the exception of some short periods during breaks and shift changes. Retarder squeals as high as 100 dBA were measured at this location. The maximum hourly sound levels were generally higher than 88 dBA with the residual levels being 50 to 55 dBA.

Site 56-3

Rail noise at this location was dominated by moving trains, rail car impacts in the classification yard, and trucks on railroad property. Other sources of railroad noise were wheel squeals, air releases, whistles, locomotives idling at the locomotive shop and refueling station, a tractor on railroad property and the railyard P.A. system.

Nonrail sources of noise at this site were jet aircraft, the breeze in trees, and insects.

Rail noise at this location was intermittent with the exception of the locomotive noise from the shop and refueling station. This idling locomotive noise was only audible during quiet periods.

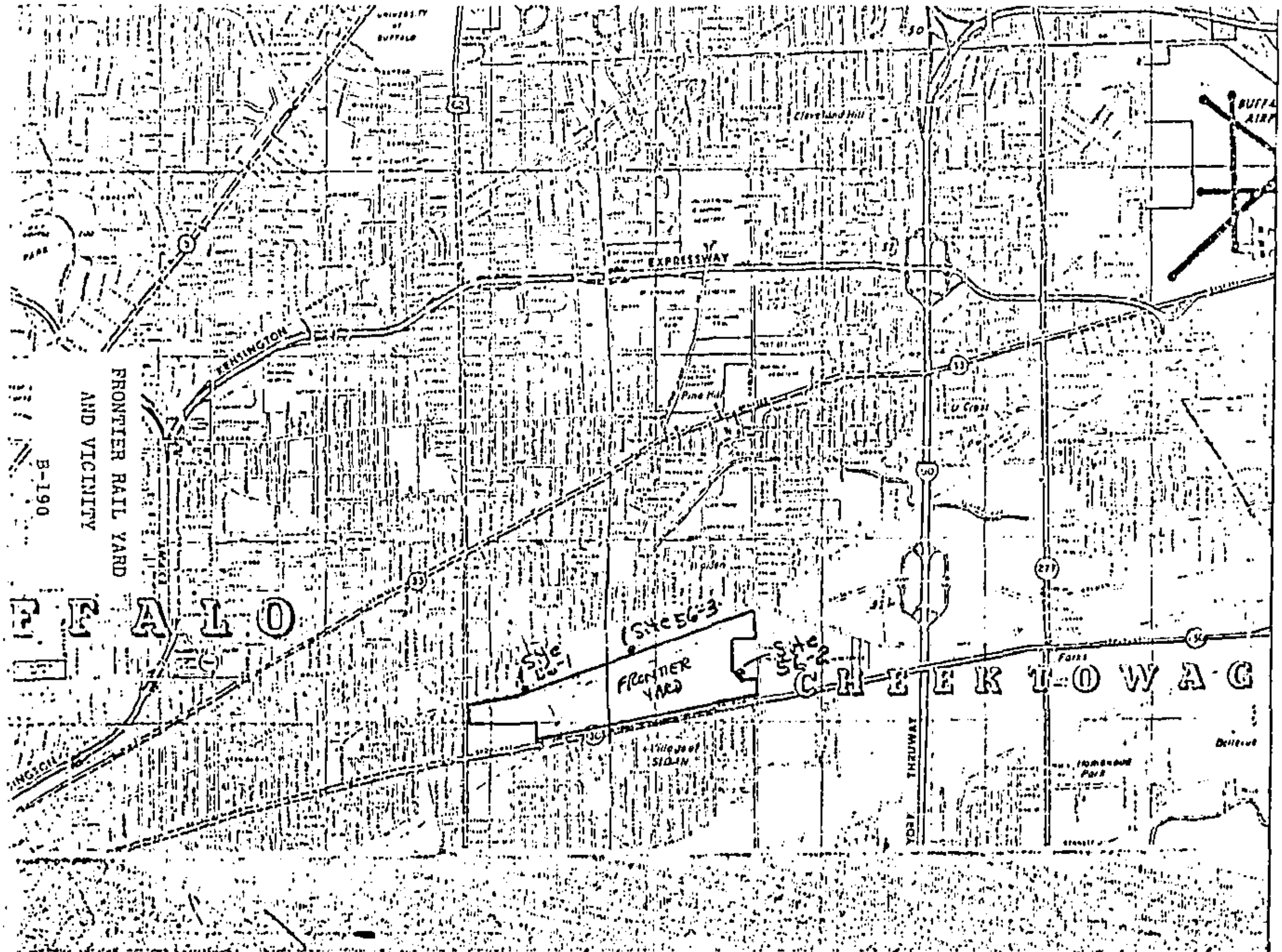
2.3 Subjective Impressions

The only residential neighbors of the Frontier Railroad Yard which are subjected to dominant railroad noise are located to the northwest of the yard near our Site 56-1.

In this area, we spoke with six families. All six of these families found the noise very annoying, especially during the nighttime. All six claimed to be awakened by railroad noise. Most said that they were often awakened. Two of these neighbors had complained in the past. No beneficial results came of these complaints and one family was told that the railroad was located there first. Others mentioned that they did not complain since they felt that people would lose their jobs.

The main sources of annoyance mentioned were loud banging of rail cars (both from impacts and moving cars swaying and hitting stationary cars on the next track), derailments, idling locomotives, the railroad P. A. system, and men yelling. Also, people mentioned the fact that windows rattle and sometimes break, plaster cracks, and dishes shake off the countertops and table.

Other neighborhood problems mentioned were speeding cars and trucks, tall brush along the side of the road that the city does not cut, smoke from the locomotives, water from the ditch at the edge of the road floods basements, mosquitoes, no fence between the road and railyard, and rats which live in the area because they feed on grain that drops from railcars.



purple line is approximate railroad yard boundary

NOISE DATA

YARD: FRONTIER LOCATION: 56-1

DATE: 23 AUGUST 1978 | DATE: 24 AUGUST 1978

HOUR OF DAY	NOISE LEVEL in dBA (23 August 1978)							NOISE LEVEL in dBA (24 August 1978)						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								68.6	96.	82.	61.	52.	51.	50.
01-02								65.0	84.	77.	67.	53.	51.	50.
02-03								68.2	95.	80.	70.	51.	50.	49.
03-04								54.7	68.	63.	55.	52.	51.	50.
04-05								66.3	96.	80.	55.	53.	51.	50.
05-06								60.5	89.	71.	61.	55.	52.	52.
06-07								52.5	71.	57.	53.	51.	50.	49.
07-08								61.1	87.	69.	55.	50.	49.	48.
08-09								59.0	97.	63.	55.	51.	49.	48.
09-10								62.6	88.	76.	58.	51.	49.	47.
10-11	57.1	78.	69.	58.	47.	43.	42.							
11-12	54.7	87.	58.	52.	46.	43.	42.							
12-13	64.3	89.	75.	64.	48.	44.	42.							
13-14	65.3	91.	79.	68.	48.	43.	41.							
14-15	62.4	86.	74.	62.	47.	43.	41.							
15-16	61.5	88.	74.	62.	48.	45.	44.							
16-17	58.8	78.	70.	61.	51.	47.	45.							
17-18	60.0	81.	71.	63.	48.	45.	43.							
18-19	64.3	86.	73.	69.	55.	45.	43.							
19-20	63.1	99.	72.	64.	51.	45.	43.							
20-21	61.1	80.	75.	58.	52.	50.	50.							
21-22	58.8	76.	71.	60.	53.	51.	50.							
22-23	57.1	79.	66.	54.	51.	50.	50.							
23-24	53.8	75.	59.	53.	52.	51.	50.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 62.8 dB
L_n : 64.1
L_d : 61.9
L_{dn}: 70.2

NOISE DATA

YARD: FRONTIER LOCATION: 56-1

HOUR OF DAY	DATE: 24 AUGUST 1978 — NOISE LEVEL in dBA							DATE: 25 AUGUST 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								56.0	68.	60.	58.	55.	52.	51.
01-02								58.8	79.	69.	62.	53.	52.	51.
02-03								55.3	66.	59.	57.	54.	53.	52.
03-04								67.3	94.	79.	67.	56.	53.	51.
04-05								58.6	79.	69.	61.	53.	52.	52.
05-06								67.3	98.	79.	63.	54.	53.	52.
06-07								66.0	97.	79.	54.	53.	50.	48.
07-08								53.0	80.	58.	55.	51.	49.	47.
08-09								52.1	86.	57.	51.	49.	48.	47.
09-10								55.1	88.	63.	54.	49.	48.	47.
10-11	60.7	85.	71.	60.	52.	49.	48.							
11-12	62.8	96.	73.	60.	53.	49.	47.							
12-13	67.5	108.	75.	63.	51.	47.	45.							
13-14	54.3	84.	64.	55.	50.	46.	45.							
14-15	55.6	75.	68.	57.	48.	45.	43.							
15-16	52.3	73.	62.	54.	48.	44.	42.							
16-17	59.6	90.	68.	61.	50.	45.	43.							
17-18	61.1	90.	69.	62.	50.	46.	44.							
18-19	57.5	91.	66.	60.	49.	46.	45.							
19-20	59.2	80.	69.	61.	56.	54.	54.							
20-21	64.1	87.	76.	65.	57.	55.	54.							
21-22	55.3	72.	62.	57.	53.	50.	49.							
22-23	55.6	80.	65.	57.	51.	50.	49.							
23-24	55.3	75.	60.	57.	54.	51.	49.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 61.6 dB
L_n : 62.9
L_d : 60.5
L_{dn}: 69.1

NOISE DATA

YARD: FRONTIER LOCATION: 56-2

HOUR OF DAY	DATE: 23 AUGUST 1978 — NOISE LEVEL in dBA							DATE: 24 AUGUST 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								69.3	97.	78.	71.	60.	56.	54.
01-02								70.3	98.	80.	68.	58.	55.	54.
02-03								69.7	97.	81.	68.	59.	56.	55.
03-04								71.2	96.	84.	68.	59.	56.	55.
04-05								64.1	82.	74.	68.	58.	56.	54.
05-06								62.2	88.	70.	65.	58.	55.	54.
06-07								63.9	91.	72.	66.	59.	57.	56.
07-08								69.7	91.	81.	72.	60.	57.	55.
08-09								65.0	87.	77.	65.	59.	56.	55.
09-10								69.9	99.	80.	69.	61.	57.	56.
10-11	71.2	99.	82.	73.	65.	57.	53.							
11-12	66.0	88.	77.	68.	60.	55.	54.							
12-13	71.6	91.	83.	73.	62.	55.	54.							
13-14	68.2	94.	81.	67.	58.	53.	50.							
14-15	70.5	92.	81.	74.	63.	52.	50.							
15-16	70.3	92.	83.	70.	58.	54.	53.							
16-17	70.8	98.	84.	69.	59.	55.	53.							
17-18	69.5	94.	82.	69.	60.	54.	53.							
18-19	69.1	94.	81.	69.	62.	56.	53.							
19-20	71.0	95.	82.	68.	58.	54.	53.							
20-21	70.3	92.	83.	70.	63.	56.	54.							
21-22	70.8	100.	82.	69.	59.	57.	55.							
22-23	63.7	88.	73.	65.	59.	57.	56.							
23-24	65.8	95.	71.	65.	61.	58.	58.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 69.2 dB
L_n : 67.8
L_d : 69.9
L_{dn}: 74.6

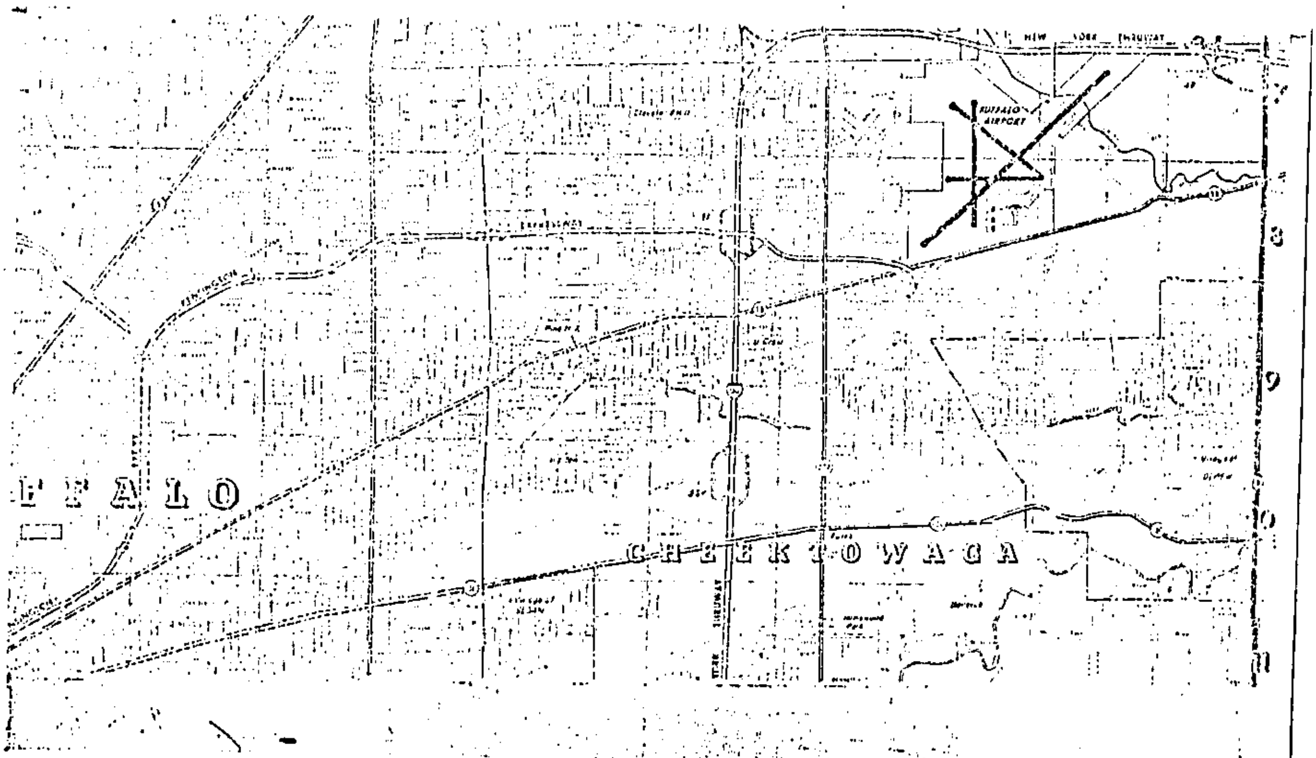
NOISE DATA

YARD: FRONTIER LOCATION: 56-3

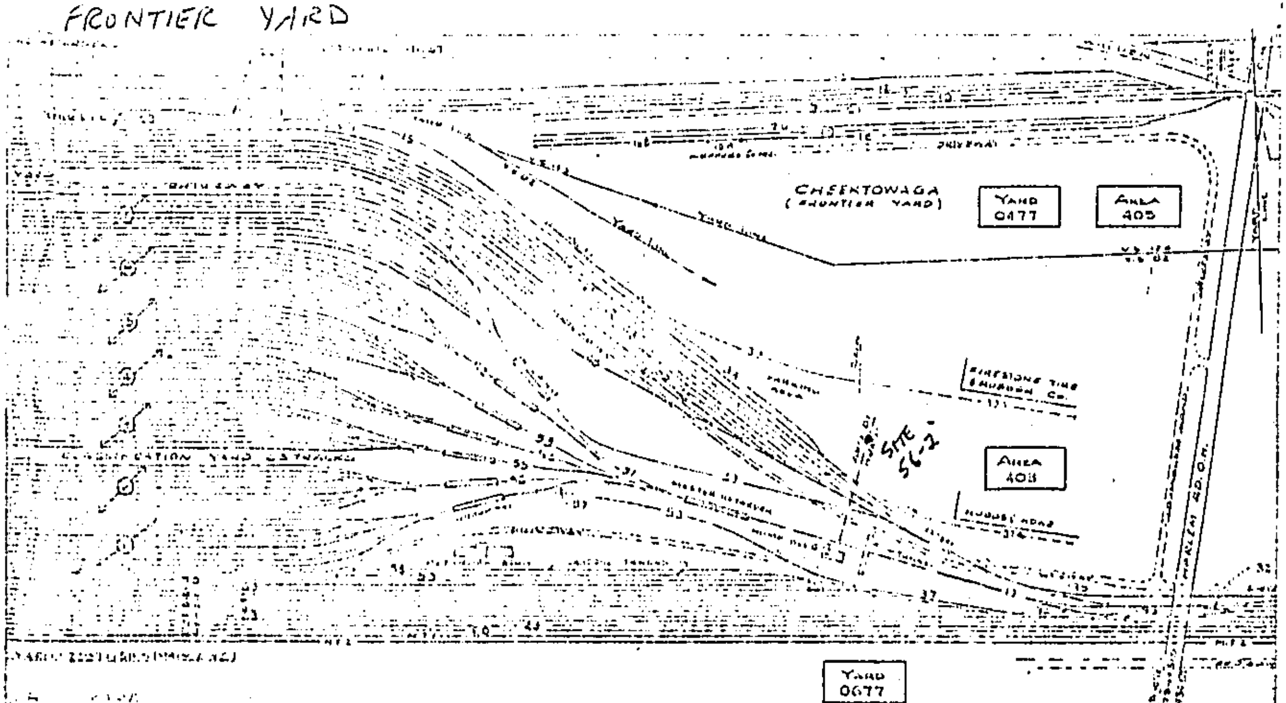
HOUR OF DAY	DATE: 24 AUGUST 1978 — NOISE LEVEL in dBA							DATE: 25 AUGUST 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								54.9	68.	61.	56.	52.	50.	50.
01-02								57.9	81.	69.	58.	54.	53.	52.
02-03								54.5	68.	58.	55.	53.	52.	51.
03-04								57.2	96.	62.	55.	53.	53.	51.
04-05								59.4	74.	67.	57.	53.	52.	51.
05-06								53.6	63.	56.	54.	53.	52.	51.
06-07														
07-08														
08-09														
09-10														
10-11	64.6	88.	76.	66.	57.	55.	53.							
11-12	61.3	78.	72.	63.	57.	54.	52.							
12-13	63.7	91.	75.	61.	56.	54.	52.							
13-14	59.8	81.	69.	59.	55.	53.	52.							
14-15	60.9	85.	73.	58.	54.	49.	48.							
15-16	60.9	85.	73.	61.	50.	47.	45.							
16-17	57.3	79.	65.	61.	51.	45.	44.							
17-18	55.3	82.	66.	57.	48.	45.	43.							
18-19	54.3	77.	67.	50.	44.	41.	40.							
19-20	55.8	72.	66.	60.	49.	45.	43.							
20-21	62.6	82.	73.	64.	55.	52.	50.							
21-22	61.3	101.	63.	56.	54.	53.	52.							
22-23	55.5	76.	64.	56.	53.	52.	51.							
23-24	54.3	96.	57.	54.	52.	51.	50.							

Note: Levels measured with FAST meter dynamics.

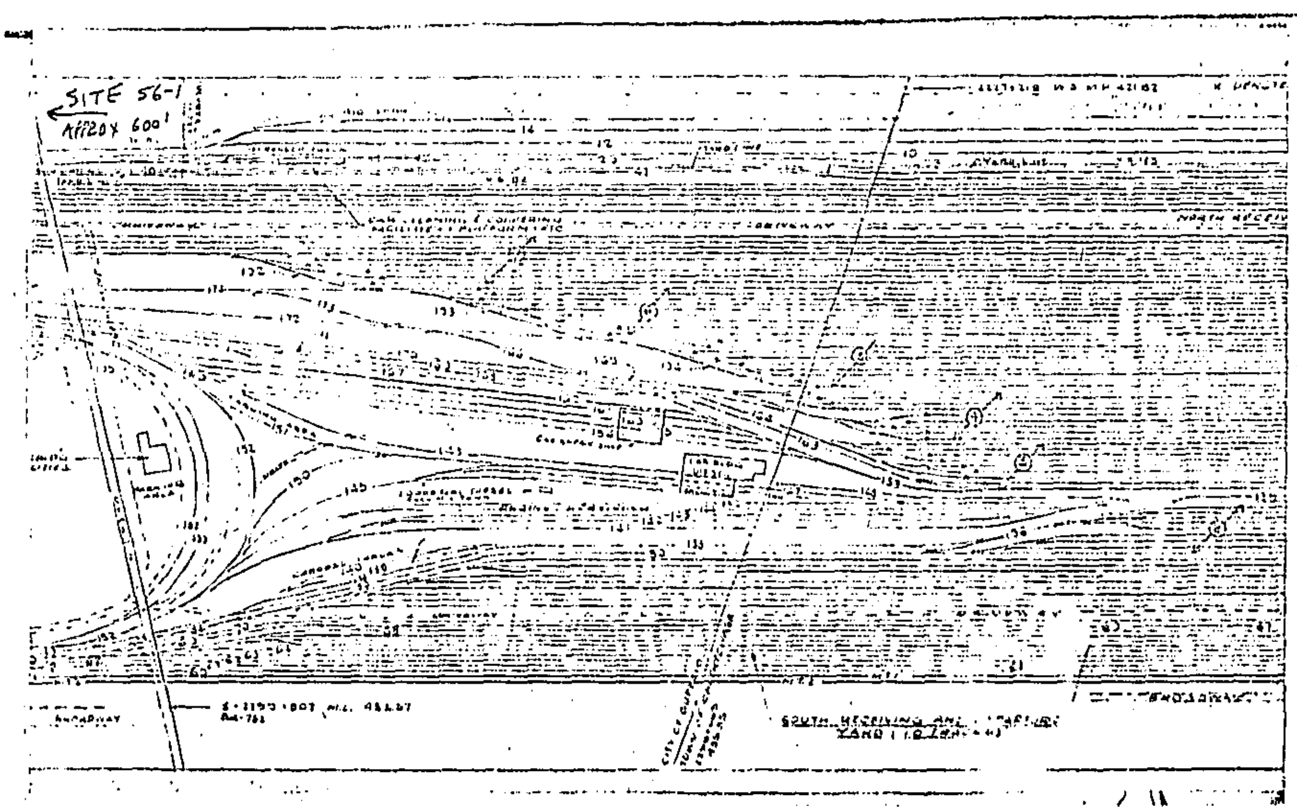
$L_{eq}(24)$: 59.6 dB
L_n : 56.4
L_d : 60.8
L_{dn}: 63.8


NEW YORK THRUWAY
BUFFALO AIRPORT
FFALO
CHEEKTOWAGA
8
9
10
11

FRONTIER YARD



* NOTE THAT A MIDDLE SECTION OF TRACK IS LEFT OUT.


SITE 56-1
APPROX 600'
NORTH RECEIV
SOUTH RECEIVING AND

Blue Island Rail Yard
Chicago, Rock Island and Pacific Railroad
Blue Island, Illinois
(Site No. 57)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The Blue Island Rail Yard is a flat classification yard which also serves 3 commuter lines in suburban Chicago. Only relatively moderate repair work is performed at the rail yard.

Flat switching is performed from both the north and south ends of the yard. Typically, between 600 and 800 cars pass through the yard daily (including 15 to 25 refrigerator cars). Noise sources associated with the switching activity include the moving and idling diesel switch engines, moving rail cars, and the coupling and uncoupling of rail cars which create impact noises. In addition during switching activities at the south end of the yard, there is frequent whistle blowing as the switch engines repeatedly cross Vermont Street. Switching operations occur all day and part of the night.

Located at the south end of the yard is the commuter depot which serves three suburban lines as follows:

1. Illinois Central Gulf operates electric commuter trains which originate at the Blue Island Yard (Vermont Street Station) and travel northeast towards Chicago. Twelve of these trains operate each day between 5 am and midnight.

2. Rock Island operates a local commuter line which originates at Blue Island (Vermont Street Station), and travels north along the west boundary of the yard towards Chicago. Twenty trains per day operate on this line in each direction, between 5 am and midnight. Each train stops at the Prairie Street and 123rd Street Stations on their way to or from Chicago; both of these

stations are located along the west boundary of the yard. There is considerable whistle blowing at each station with each arriving and departing train.

3. Rock Island operates express service between Joliet and Chicago with a stop at Blue Island (Vermont Street Station). There are approximately ten trains per day in each direction. The rail line between Blue Island and Chicago borders the yard along the eastern boundary.

No activities related to energy production or transportation were observed during the noise survey at this yard.

1.2 Land Use Surrounding Yard

South of Burr Oak/127th Street, the predominant land use surrounding the yard is residential. Interspersed are occasional commercial and industrial activities, and the Saint Francis Hospital near the southwest corner of the yard. (Note that cooling towers on the Hospital grounds contribute to the noise environment in this area.)

North of Burr Oak, the area surrounding the yard is predominantly industrial and vacant, with an occasional apartment house.

1.3 Noise Control Through Source Relocation

Relocation of idling trains from the southwest corner of the yard to an area further north would provide some benefit to residents of that area. The major noise source, however, will continue to be whistle blowing for that area.

2. SITE DATA

2.1 Site Characteristics

Three locations were selected for noise monitoring in residential areas around the southern portion of the yard (see attached map). Residential structures here are almost entirely of brick construction. No air conditioning units were observed.

At each monitor location, the noise from rail activities dominated the noise environment.

2.2 Site Noise Environment

Site 57-1

The noise monitor at this 48-hour site was located approximately 270 feet southeast of the commuter depot at the south end of the yard. The monitor was placed in the backyard of a two story brick building that offered a clear field of view from the microphone to the depot area.

The sound sources in the area consisted of commuter trains arriving and departing the depot, switch locomotives shunting cars, an occasional track service car, and three trains.

Everytime a switch locomotive crossed Vermont Street, the operator would sound the whistle two or three times. There is also a crossing gate that would close; when this occured, the bell on the gate would ring all the time the gate was in the lowered position. The intersection of the switching tracks and Vermont Street is about 450 feet from this site.

In addition, commuters would park their autos helter-skelter all around the area, so when rush hour came (4:00 to 6:00 pm), the vehicle traffic was very heavy.

Site 57-2

This 24-hour monitor was located on the west side of the yard at the end of Prairie Street. The monitor was placed behind the last home on the south side of the street.

The sound sources in this location were mostly commuter trains stopping and starting at the Prairie commuter station on the north side of the street, about 250 feet away. Whistle blowing accompanied each arrival and departure. The closest tracks were about 70 feet away.

There was a work crew repairing the tracks near the entrance to the yard when the monitor was installed but the repairs were completed soon afterwards. Occasional car coupling noise from the switching operations in the yard was also observed.

Site 57-3

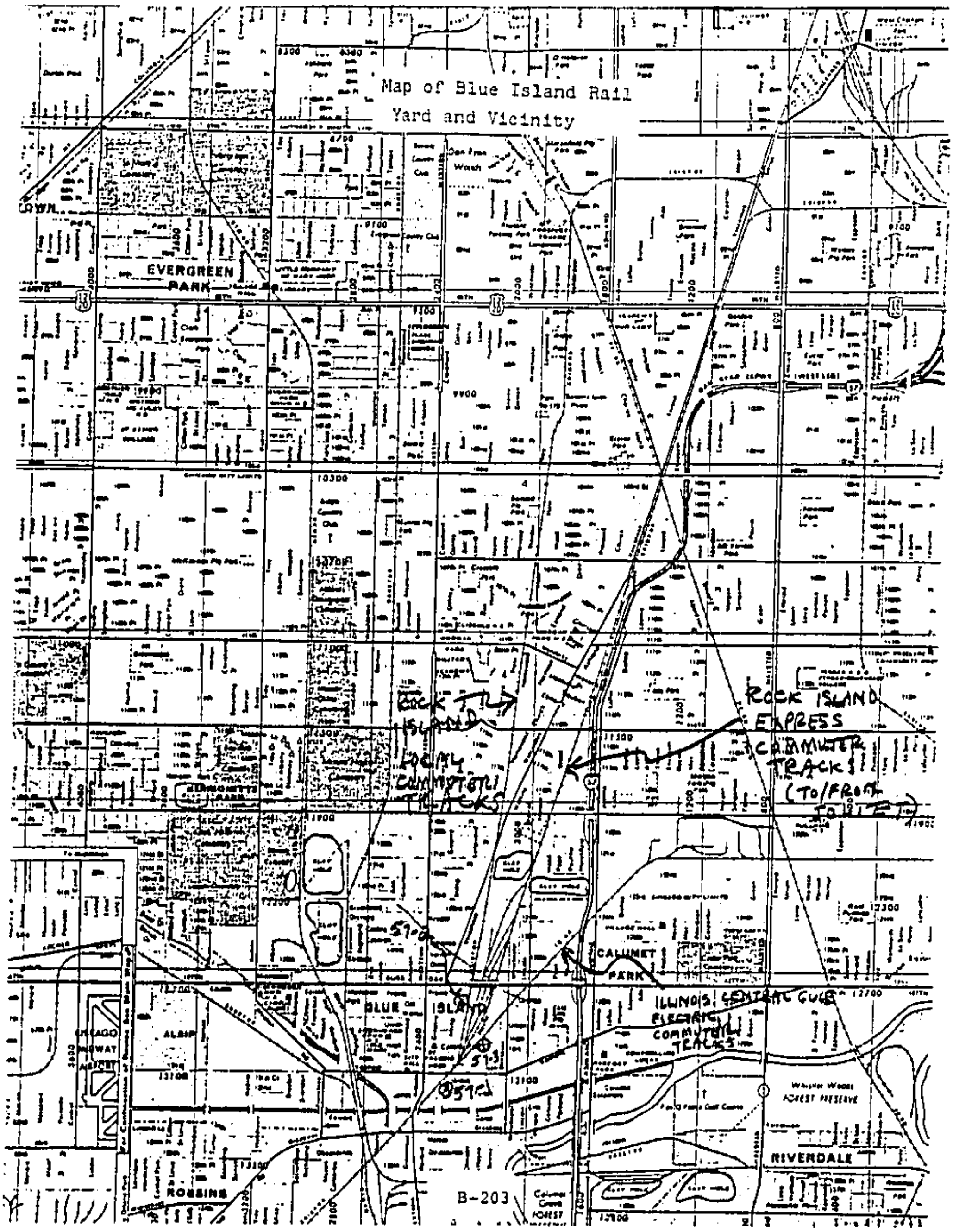
This site was located on the east side of the yard at the west end of York Street. The monitor was placed in the rear yard of the last home on the north side of the street, approximately 10 feet from the property line fence, 20 feet from Illinois Central (electric) tracks.

The sound sources that were observed in this area were the switching locomotives, commuter trains approaching and departing the depot, and the electric commuter train. During the slow hours, the commuter trains would park on the west side of the yard opposite this site and sit at a high idle rate to maintain hotel power in the commuter cars. There was very little auto influence at this site.

2.3 Subjective Impressions

The primary source of annoyance mentioned by nearby residents was whistle blowing, both by commuter trains at the commuter stations and by the switching locomotives crossing Vermont Street. In addition, the crossing gaté at Vermont Street would often be lowered for 15 minutes at a time; bells ringing continuously during this period was also an annoyance.

Although these sources sometimes woke people up and startled them, no one had ever complained. Most people indicated that they had become accustomed to the rail-related noises.


Map of Blue Island Rail
Yard and Vicinity
EVERGREEN
PARK
ROCK ISLAND EXPRESS COMMUTER TRACK (TO/FROM JOLIET)
ROCK ISLAND LOCAL COMMUTER TRACKS
51-2
CALUMET
PARK
BLUE ISLAND
ILLINOIS CENTRAL GULF ELECTRIC COMMUTER TRACKS
51-3
ALSIP
RIVERDALE
ROBBINS

NOISE DATA

YARD: BLUE ISLAND LOCATION: 57-1

HOUR OF DAY	DATE: 22 AUGUST 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	DATE: 23 AUGUST 1978 — NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								64.3	95.0	71.7	64.9	60.9	56.4	54.
01-02								70.7	87.5	75.0	74.2	69.3	59.1	50.
02-03								65.9	77.5	73.6	71.7	58.8	53.0	50.
03-04								67.8	78.8	73.7	72.5	65.1	53.1	49.
04-05								65.1	92.5	73.0	70.0	56.2	52.8	51.
05-06								67.6	96.3	75.6	70.2	64.5	58.3	55.
06-07								71.2	95.0	80.0	71.2	67.5	56.4	54.
07-08								69.7	98.8	76.8	71.9	61.8	54.2	52.
08-09								69.0	100.0	78.6	68.3	59.0	54.5	52.
09-10								65.0	93.8	75.7	63.8	59.6	54.3	52.
10-11								63.1	95.0	73.1	59.7	54.2	51.2	49.
11-12								60.6	91.3	68.3	61.4	54.8	52.2	50.4
12-13								63.7	92.5	72.9	64.2	54.0	50.2	48.
13-14								61.1	90.0	69.0	52.5	56.8	52.9	50.
14-15								62.7	93.8	69.3	64.5	58.4	54.3	51.
15-16								63.9	88.8	69.5	65.8	62.5	56.4	53.
16-17								65.9	100.0	76.3	62.1	52.6	49.5	47.
17-18								71.8	98.8	82.3	67.7	55.8	50.9	49.
18-19								68.6	97.5	78.4	68.1	57.7	51.9	49.
19-20	65.1	92.5	75.8	64.2	55.6	51.6	49.6							
20-21	66.5	96.3	73.0	68.2	54.8	52.2	50.6							
21-22	62.2	86.3	70.5	.65.3	57.8	53.0	51.5							
22-23	64.2	85.0	69.7	67.1	62.7	58.5	55.8							
23-24	63.0	88.8	69.6	64.9	61.6	57.0	54.4							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 66.9 dB

L_n : 67.5

L_d : 66.5

L_{dn}: 73.8

NOISE DATA

YARD: BLUE ISLAND LOCATION: 57-1

DATE: 23 AUGUST 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20	63.3	91.3	73.2	64.9	55.9	51.6	49.6
20-21	64.6	91.3	71.6	65.3	58.5	54.6	52.8
21-22	61.4	90.0	68.7	63.1	57.8	54.2	52.5
22-23	64.2	88.8	76.7	63.1	59.8	56.0	54.3
23-24	63.1	91.3	69.1	64.7	60.8	56.3	51.2

DATE: 24 AUGUST 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	60.0	80.0	67.1	63.8	57.4	52.7	50.3
01-02	60.9	86.3	67.3	63.4	59.1	53.7	49.3
02-03	62.3	91.3	67.6	64.7	60.9	56.4	53.9
03-04	62.2	72.5	69.9	64.8	60.7	55.7	50.7
04-05	67.3	81.3	72.4	71.0	65.8	54.6	51.1
05-06	67.3	90.0	75.8	69.7	65.3	58.1	55.0
06-07	68.3	95.0	76.9	69.9	66.7	52.8	50.2
07-08	74.5	108.8	83.8	74.4	65.2	59.6	55.8
08-09	68.9	95.0	74.2	68.1	64.4	57.5	55.3
09-10	67.2	93.8	75.9	67.3	59.3	55.1	53.0
10-11	67.2	97.5	76.5	62.5	57.4	54.8	53.0
11-12	60.9	87.5	70.0	61.8	56.1	54.0	52.7
12-13	58.6	75.0	66.0	63.6	55.3	52.6	51.3
13-14	62.3	93.8	71.9	63.0	57.6	54.4	52.6
14-15	66.3	95.0	73.7	68.5	59.6	54.9	51.9
15-16	65.0	96.3	71.9	64.0	57.7	53.6	51.6
16-17	65.9	96.3	75.9	64.8	54.5	51.4	50.1
17-18	70.0	95.0	80.6	69.4	54.7	50.5	48.8
18-19	70.3	95.0	83.0	69.7	59.1	51.8	50.2
19-20							
20-21							
21-22							
22-23							
23-24							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 66.8 dB
L_n : 64.9
L_d : 67.7
L_{dn}: 71.8

NOISE DATA

YARD: BLUE ISLAND LOCATION: 57-3

HOUR OF DAY	DATE: 24 AUGUST 1978 NOISE LEVEL in dBA							DATE: 25 AUGUST 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								66.2	85.0	75.0	71.8	62.7	56.4	54.4
01-02								58.7	81.3	65.0	60.8	56.3	54.3	53.7
02-03								63.8	90.0	77.0	58.7	56.6	54.6	52.9
03-04								69.3	102.5	79.8	68.9	55.0	52.9	51.8
04-05								68.2	100.0	81.9	64.0	56.0	52.7	51.4
05-06								63.7	87.5	78.4	59.5	53.8	51.7	50.7
06-07								70.5	97.5	82.7	64.0	58.6	54.0	51.4
07-08								77.6	108.8	87.5	63.1	53.7	51.5	50.1
08-09								66.0	96.3	80.2	60.5	53.6	51.6	50.7
09-10								66.4	87.5	79.4	65.8	61.6	52.8	51.3
10-11								64.0	88.8	74.0	66.8	61.1	55.3	52.9
11-12														
12-13	58.7	82.5	67.3	58.5	56.2	54.7	53.8							
13-14	63.4	86.3	74.4	64.1	60.5	57.6	55.1							
14-15	62.9	91.3	75.1	63.7	56.8	54.5	53.1							
15-16	63.2	91.3	72.9	64.3	58.1	55.7	54.2							
16-17	66.6	100.0	74.7	61.1	56.3	54.4	53.2							
17-18	69.0	96.3	81.1	65.1	55.6	52.8	51.3							
18-19	68.8	101.3	75.6	63.9	57.5	54.3	53.0							
19-20	63.3	92.5	73.5	64.9	58.8	54.6	52.8							
20-21	61.1	82.5	74.8	60.5	55.9	54.2	53.3							
21-22	58.5	81.3	64.8	59.5	56.5	54.6	53.3							
22-23	59.8	87.5	66.1	57.4	55.3	54.0	52.9							
23-24	60.1	81.3	69.0	61.3	56.9	54.3	53.1							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 67.8 dB
L_n : 66.3
L_d : 68.5
L_{dn}: 73.1

NOISE DATA

YARD: BLUE ISLAND LOCATION: 57-2

DATE: 23 AUGUST 1978

HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09							
09-10							
10-11	66.4	100.0	74.7	68.9	62.1	54.4	52.8
11-12	69.3	97.5	82.5	62.9	57.2	53.0	50.8
12-13	66.0	92.5	75.4	62.3	55.5	51.0	48.9
13-14	64.6	96.3	73.0	63.9	58.9	53.6	50.7
14-15	69.7	101.3	82.7	60.0	53.9	50.6	48.9
15-16	65.1	98.8	74.6	60.4	55.7	51.2	48.8
16-17	71.0	102.5	83.7	60.2	53.3	49.9	48.0
17-18	73.2	102.5	86.5	72.0	55.2	50.6	48.2
18-19	71.1	102.5	82.4	65.4	58.8	52.7	49.7
19-20	71.4	101.3	75.4	62.6	59.8	57.9	56.4
20-21	68.1	90.0	84.1	62.2	60.0	58.6	56.5
21-22	72.3	102.5	83.8	61.7	60.0	58.3	57.5
22-23	71.0	101.3	85.0	62.2	60.0	58.4	57.5
23-24	65.9	88.3	74.3	61.2	59.2	57.4	56.4

Note: Levels measured with FAST meter dynamics.

DATE: 24 AUGUST 1978

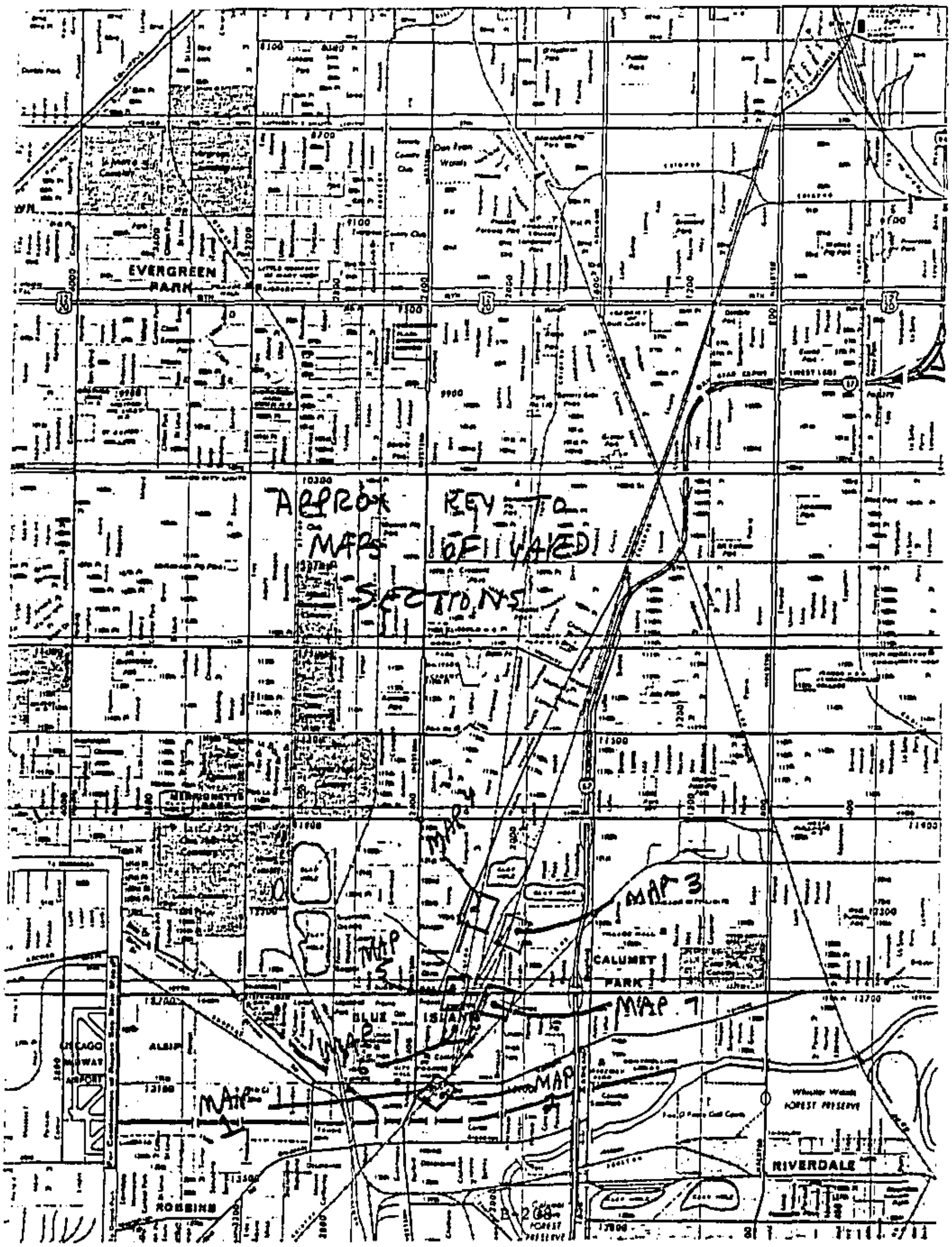
HOUR OF DAY	NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	59.0	75.0	70.5	59.9	57.1	55.5	55.
01-02	63.9	97.5	73.9	60.9	58.3	56.3	55.
02-03	62.5	71.3	67.3	65.9	60.8	57.5	55.
03-04	62.6	71.3	67.2	65.7	61.5	57.8	55.
04-05	62.1	72.5	66.2	65.5	60.8	56.7	54.
05-06	63.0	91.3	77.7	58.8	54.9	52.7	50.
06-07							
07-08							
08-09	69.6	102.5	78.3	65.3	56.3	54.1	51.
09-10	69.5	100.0	79.9	63.1	56.1	54.4	52.
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

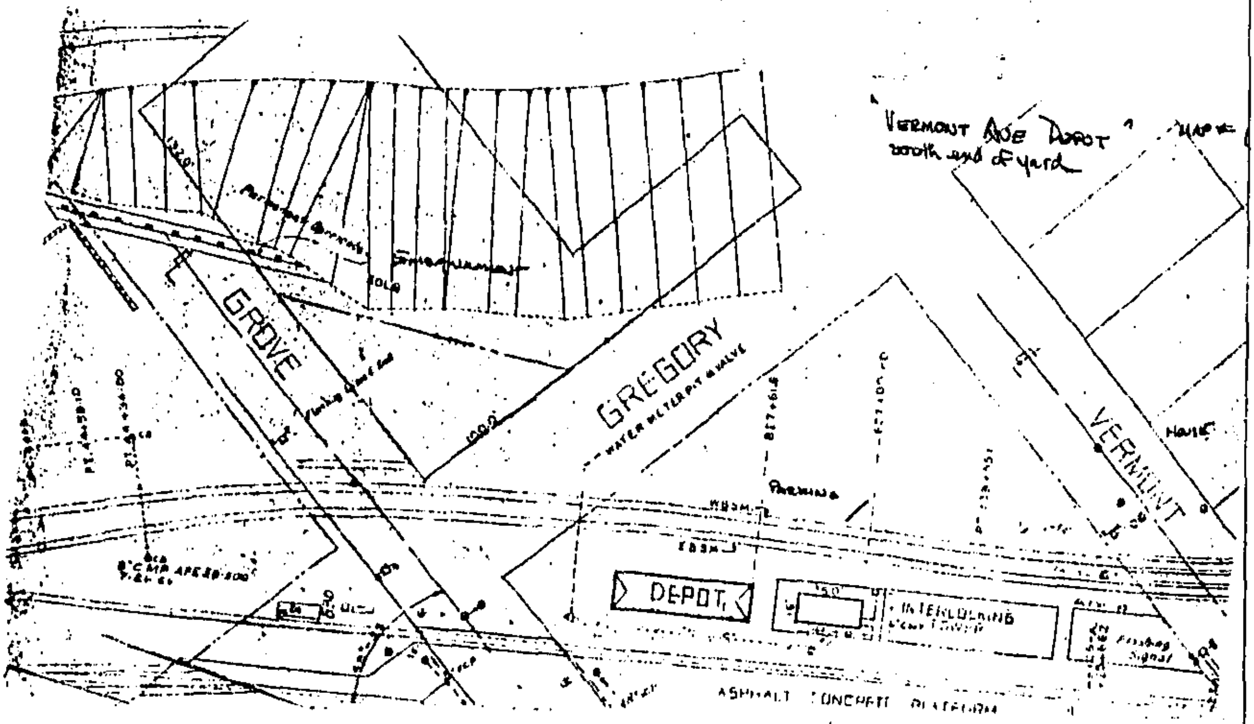
$L_{eq}(24)$: 68.6 dB

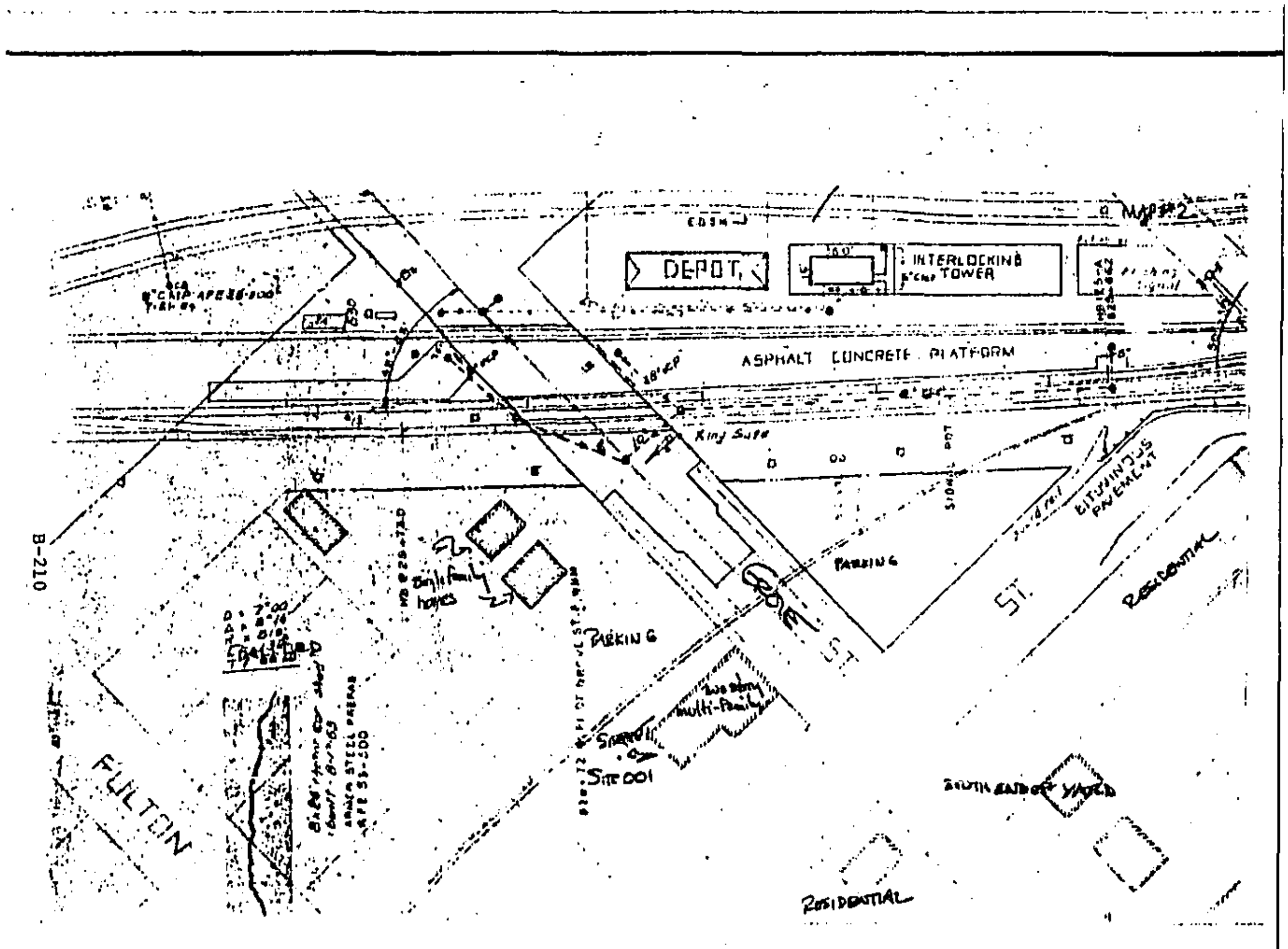
L_n : 65.3

L_d : 69.8

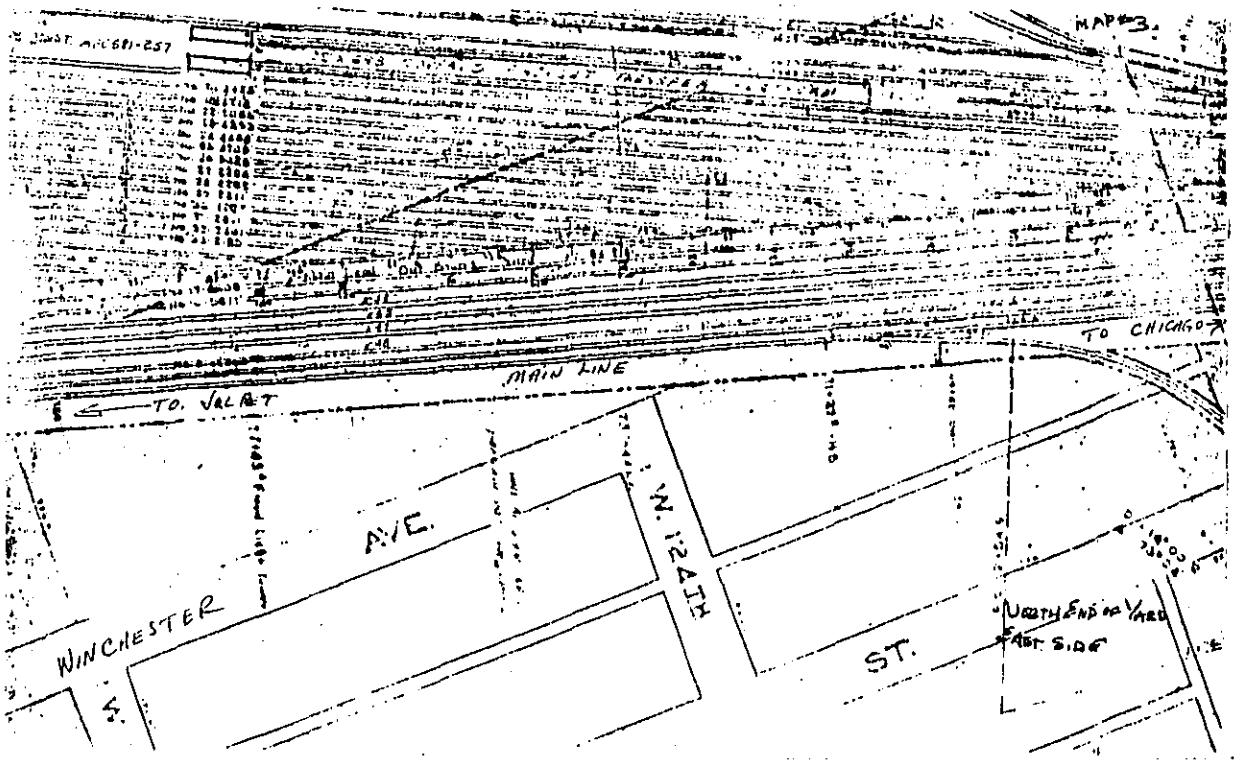
L_{dn}: 72.7


APPROX KEY TO
MAPS
SECTIONS
EVERGREEN PARK
MAP 3
CALUMET PARK
BLUE ISLAND
MAP 7
ALSIP
ROBBINS
RIVERDALE


Vermont Ave Depot
south end of yard
GROVE
GREGORY
WATER METER PIT & VALVE
Parking
VERMONT
House
DEPOT
INTERLOCKING
ASPHALT CONCRETE PLATFORM

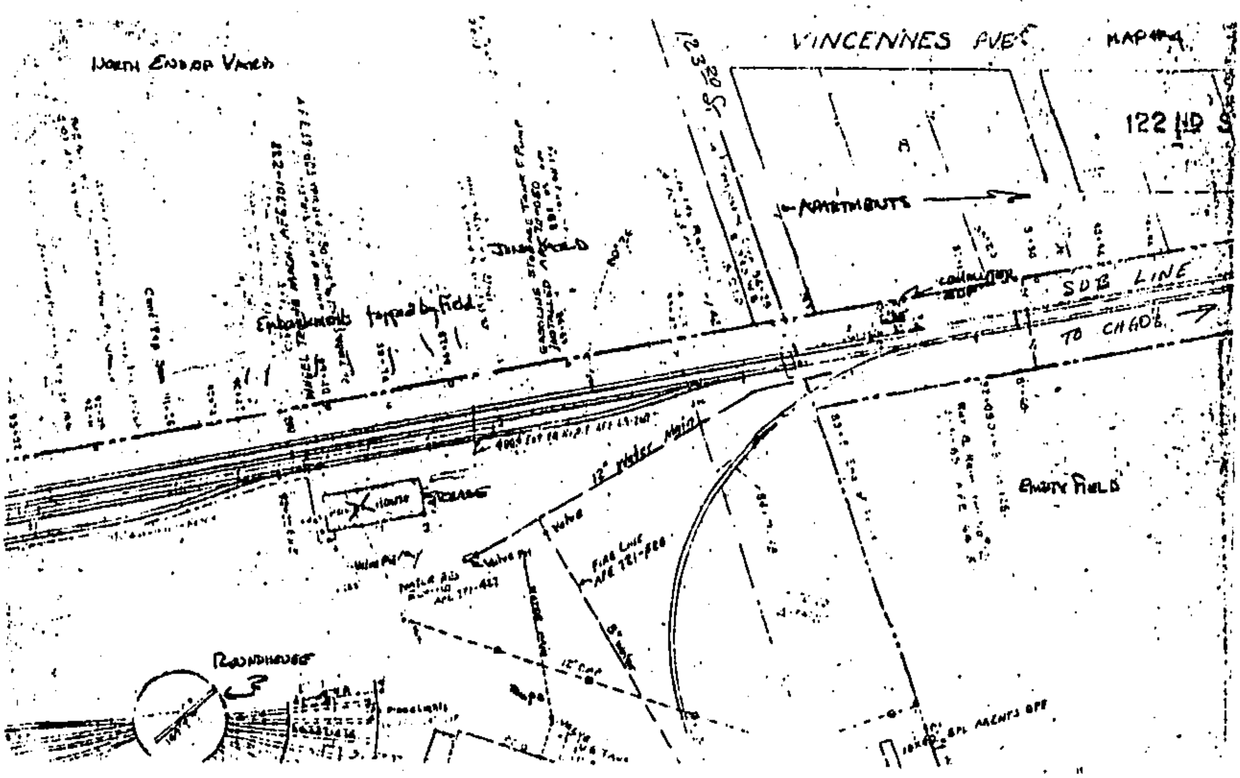


MAP #2
DEPOT
INTERLOCKING TOWER
ASPHALT CONCRETE PLATFORM
King Sale
PARKING
Single family homes
PARKING
two story multi-family
Site 001
ST.
FULTON
B-210
BITUMINOUS PAVEMENT
RESIDENTIAL
RESIDENTIAL
YARD

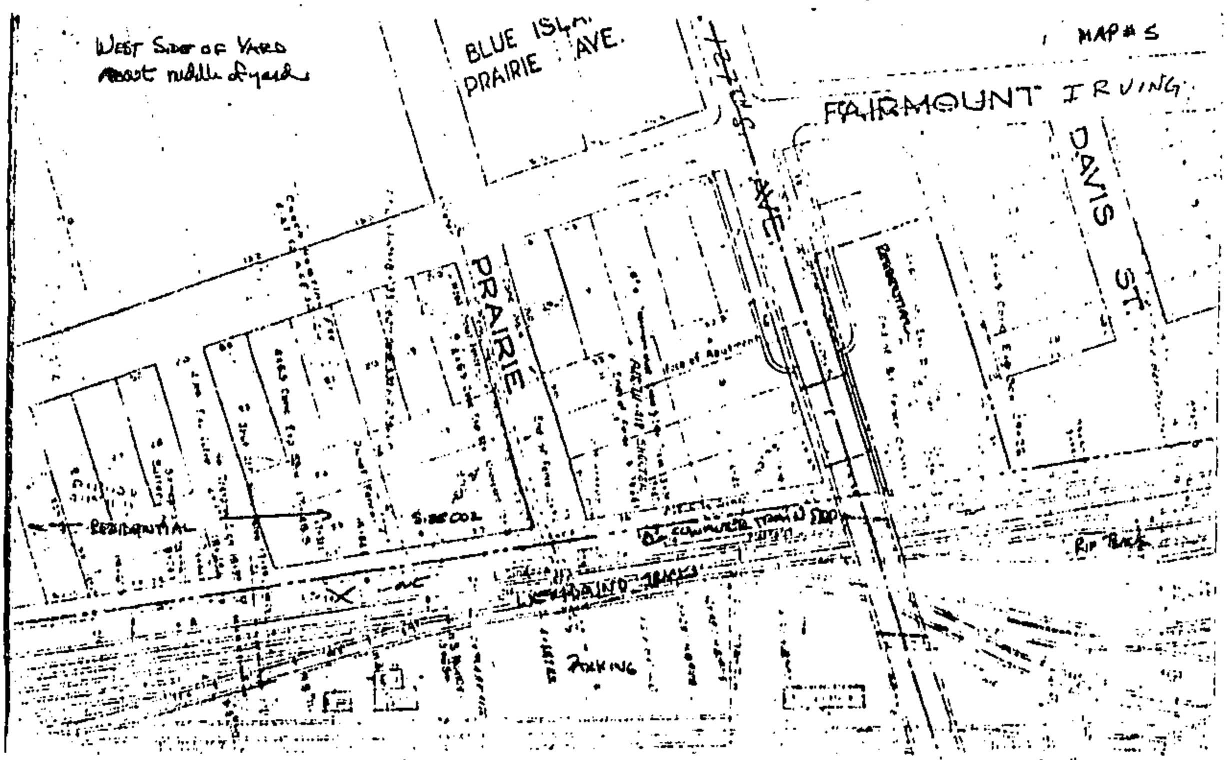

MAP #3.
MAIN LINE
TO CHICAGO
TO JOLIET
WINCHESTER
AVE.
W. 124TH
ST.
NORTH END OF YARD
EAST SIDE

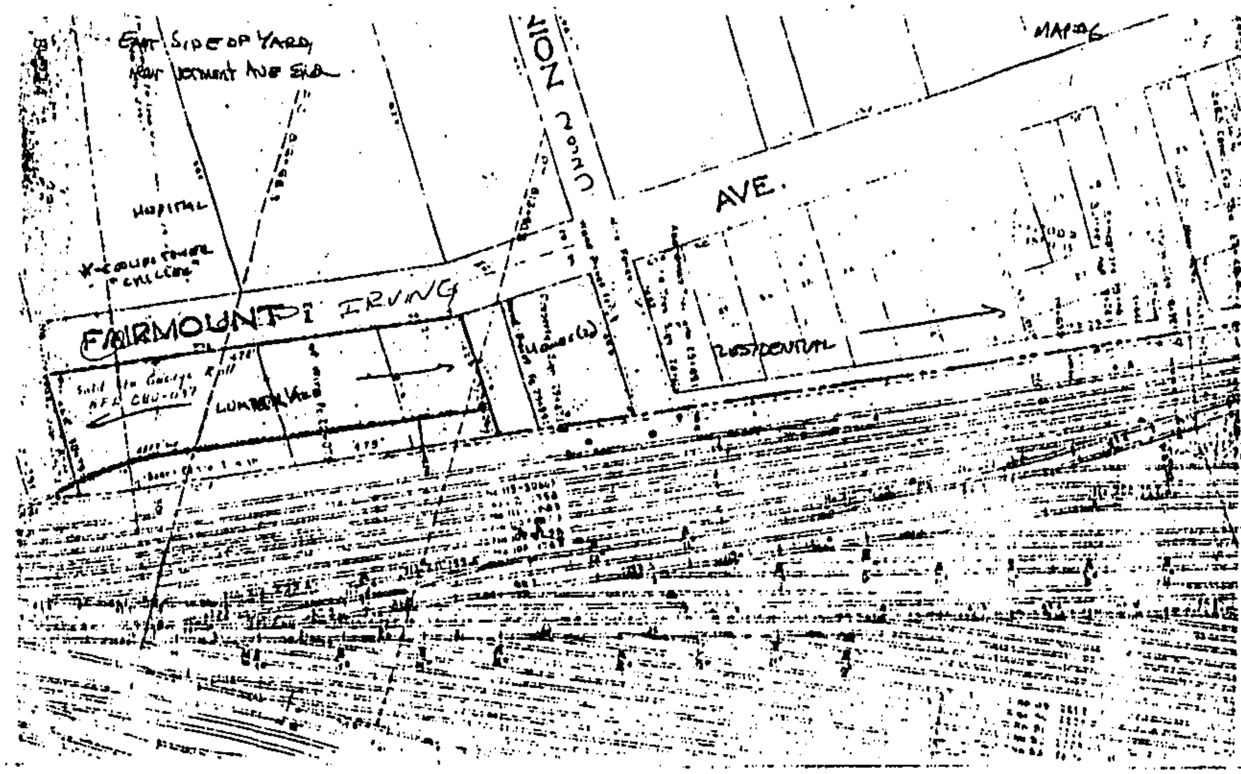
B-211

POOR COPY

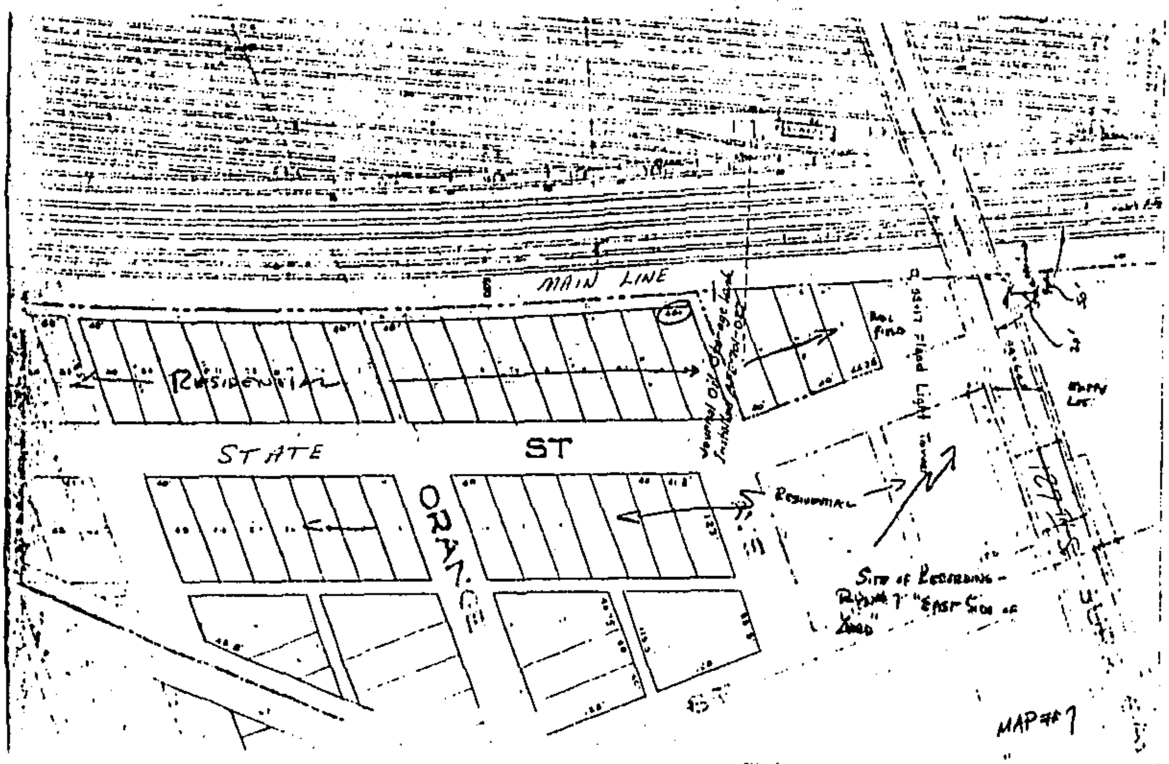


VINCENNES AVE
122 ND S
123 RD St
APARTMENTS
SUB LINE
TO CHGO'S
EMPTY FIELD
ROUNDHOUSE
12" Water Main
FIRE LINE


West Side of Yard
MAP # 5
BLUE ISLA.
PRAIRIE AVE.
FAIRMOUNT
IRVING
DAVIS ST.
PRAIRIE
AVE.
RESIDENTIAL
PARKING
RIP TRACK


East Side of Yard
Near Vermont Ave Side
MAP #6
UNION
AVE.
IRVING
FAIRMOUNT
HOSPITAL
RESIDENTIAL

B-215



Boyles Rail Yard
Louisville and Nashville Railroad
Tarrant City, Alabama
(Site No. 58)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The Boyles Railroad Yard consists of two areas which are connected by nine tracks. The north area consists of one hump, one classification yard, receiving and departure yards, and a car repair shop. The south area consists of a locomotive repair area with a round house, a locomotive refueling area, a piggyback facility, rail cars, and some classification tracks where a small amount of flat switching occurrs. The following activities were observed to occur at the yard during the noise measurements on 28 to 31 August 1978.

(a) Rail Car Classification: The mainline tracks arriving from the north and south are connected to receiving and departure yards located at the north and south ends of the north yard section. Approximately 2100 rail cars per day are pushed over the one hump and are then switched to one of the tracks in the classification yard. One master retarder and five group retarders are used to slow the rail cars prior to their reaching the classification yard. Major noise sources from the humping activity include the locomotives moving back and forth, the retarders, the air releases, and the impacts that occur when moving rail cars hit stationary cars in the classification yard.

(b) Making-up trains: The Bowl Office is located at the north end of the classification yard. Between this office and the very north end of the yard trains are made-up. Strings of rail cars are pulled out of the classification yard and are parked on about eight of the ten tracks in this area. They are then coupled together, air hoses attached, cabooses and locomotives are added, and the trains are pumped up. These trains then proceed on to the mainline tracks and then to their next destination. Major sources of noise associated with these activities are idling and moving locomotives, moving trains, air releases, impacts between rail cars, and wheel squeal at curves and switches.

(c) Locomotive repair shop: A locomotive repair shop is located at the north end of the south yard section. The repair shop consists of a round house with about eleven stalls. There did not appear to be much activity going on during our measurements although about three locomotives were in the round house. A refueling station is located directly west of the round house. The major noise source associated with these activities is idling and moving locomotives. No full-power testing of locomotives was observed.

(d) Car repair shop: No observations were made about the activity level at this repair shop. It is located in the center of the south end of the north yard section and any noise from its operation was masked by noise from the nearby humping activity.

(e) Piggback facility: South of the locomotive round house is an area used for the loading of trailers onto flat cars. This operation is undertaken utilizing ramps on which the trailers are backed onto the rail cars. Noise sources associated with this activity are the on-road trucks delivering and picking up trailers, the yard trucks loading and unloading the rail cars, and the locomotives which move the rail cars into position. Approximately 50 trailers are loaded per day at this facility. Rail car impacts, air releases, bells, and whistles are also heard.

(f) Automobile loading facility: South of the piggyback facility is an area used for the loading of automobiles onto rail cars. Observations of the activities in this area were not made since this facility is adjacent to a railroad office building and industry.

In addition to these above activities, P. A. systems were utilized and one was audible along the property line at the piggyback area and one was audible at the humping operation.

The Boyles Yard operates on a 24-hour, seven-day-a-week basis without any seasonal variation. On the average, about 2100 rail cars per day are humped with each of the three shifts being about equal.

The only observed activity at the yard related to energy transportation was the coal cars which were stopped in areas waiting to be made into trains and those which were moving into and out of the yard. No coal cars appeared to be humped. They are just connected to outbound trains in a string of cars.

1.2 Land Use Surrounding the Yard

The land uses surrounding the Boyles Yard are mostly industrial around the south yard section and either residential or undeveloped around the north yard section. Brief explanation of these land uses follows:

(a) The land located to the east of the locomotive shop, piggyback facility and automobile loading facilities is utilized for industrial uses mixed with poorly maintained one-story frame homes.

(b) Along the southeast side of the north yard section from the hump up to the north end of the departure yard, the land use consists of an abandoned quarry and a steep hill rising from the yard.

(c) At the southeast side of the departure yard along Black Creek Road located at the very north of the yard, is an area of homes. These houses are one-story concrete block or frame houses which are located from 70 to 500 feet from the nearest track.

(d) There is also a housing development of 37 new homes presently under construction just south of the intersection of Black Creek Road and the road that parallels the classificaiton yard. These homes are shielded from most of the railroad noise by a high hill. Some locomotive noise was audible during the evening hours at this location.

(e) Northeast of the classification yard, there is a large development of homes built around 20 years ago. These well-maintained homes are of one-story brick veneer or frame construction.

1.3 Noise Control Through Source Relocation

The only possibility for noise control through source relocation at the Boyles Yard that appears to exist is as follows. At the very north end of the departure yard, idling locomotives sometimes are parked directly behind the homes in this area. These locomotives are used to pump-up outbound trains and continuously idle for up to two to three hours. Since these tracks are only 70 feet from the nearest houses, a significant amount of noise reduction could be achieved by locating these locomotives a few hundred feet further south along the tracks.

2. SITE DATA

2.1 Site Characteristics

The noise monitoring site locations are described and shown on the attached map.

Site 58-1

Site 58-1 was chosen as the 48-hour monitoring site. The monitoring unit was located at the railroad property line approximately 250 feet south of the intersection of Main Street and Center Avenue. This site was located in the piggyback yard approximately 100 feet from the nearest parked trailer and about 250 feet from the nearest loading ramp. The round house was about 250 feet away and the refueling area was about 300 feet away.

This site was exposed to noise from idling and moving locomotives, moving trains, air releases, whistles, rail car impacts and bells. The homes in this area are poorly-maintained one-story frame houses located in an area of mixed residential and industrial use.

Site 58-2

Site 58-2 was chosen as a 24-hour site on the railroad property just south of the homes located on Black Creek Road. The monitoring unit was about 70 feet from the nearest track. This distance corresponds to the location of the closest house in this area. This site was exposed to the noises associated with making-up trains. These noises were idling locomotives, moving trains, air releases, and whistles. Some distant retarder squeals and impacts from the humping operation were also audible at this site.

Site 58-3

Site 58-3 was chosen as a 24-hour monitoring site at the railroad property line to the north of the classification yard. The monitoring unit was located in the backyard of 509 Park Lane. This location was about 175 feet from the nearest track and was about 1500 feet away from the hump. The dominant railroad noises at this site were retarder squeals and rail car impacts. Other railroad noises were moving trains, whistles, bells, air releases, and idling locomotives. The homes in this area are well-maintained one-story houses of brick veneer or frame construction. Most of these houses have central or window air conditioners.

2.2 Site Noise Environment

Site 58-1

Rail noise exposure at this site was dominated by idling and moving locomotives and moving trains. Other observed railroad noise sources were air releases, whistles, rail car impacts, bells, the railroad yard P. A. system, and truck noises from the piggyback operation.

Non-rail sources of noise at this location were small propeller and jet aircraft, and cranes moving scrap iron at an industry directly east of the piggyback backyard.

The residual sound levels were controlled by the noise of idling locomotives at the refueling area. These residual levels were generally 55 to 58 dBA. The noise of idling locomotives was continuous at this site and the other railroad noises were intermittent but occurred at all hours of the day or night.

Site 58-2

Rail noise exposure at this site was dominated during periods of the day and night by idling locomotives pumping-up outbound trains and by these trains moving out of the yard. Other observed railroad noise sources were air releases and whistles. Also audible were distant retarder squeals, rail car impacts, and the P. A. system from the humping operation.

Non-rail sources of noise were insects, distant traffic and jet aircraft.

Rail noises with the exception of the audible distant retarder squeals and rail car impacts from the humping operation occurred intermittently at this site. Two to four hours might pass without any nearby activity and then nearby activity might be heavy for the next one to three hours. Idling locomotives sometimes controlled the noise at these homes.

Site 58-3

Rail noise at this site was dominated by the retarder squeals and rail car impacts of the humping operation. Other railroad noise sources were moving trains, whistles, bells, air releases, and idling locomotives.

Non-rail sources of noise were insects, light aircraft, jet aircraft and a gas lawnmower at about 150 feet for a short amount of time around 18:40 on 30 August.

The railroad humping noise at this site was virtually continuous with the exception of some short periods during breaks and shift changes. The background sound levels controlled by insect noise were generally in the range of 40 to 55 dBA. Retarder squeals ranged from about 65 to 70 dBA with rail car impacts ranging generally from 65 to 70 dBA.

2.3 Subjective Impressions

The subjective impressions of the neighbors of the Boyles Railroad Yard are summarized for Sites 58-2 and 3. No discussions were held with residents in the community area adjacent to Site 58-1.

Site 58-2

At this site, only one of the four neighbors that we talked to said that she was annoyed with the railroad noise. Of the other three neighbors, two had worked for the railroad, one retired after 43 years, and one had lived there 15 years and said that he was used to the noise. Only the woman that was annoyed said that she was awakened. The main source of annoyance was idling locomotives. It should be noted that the woman who was awakened lives in the closest house to the tracks. None of the neighbors had ever complained about the railroad noise.

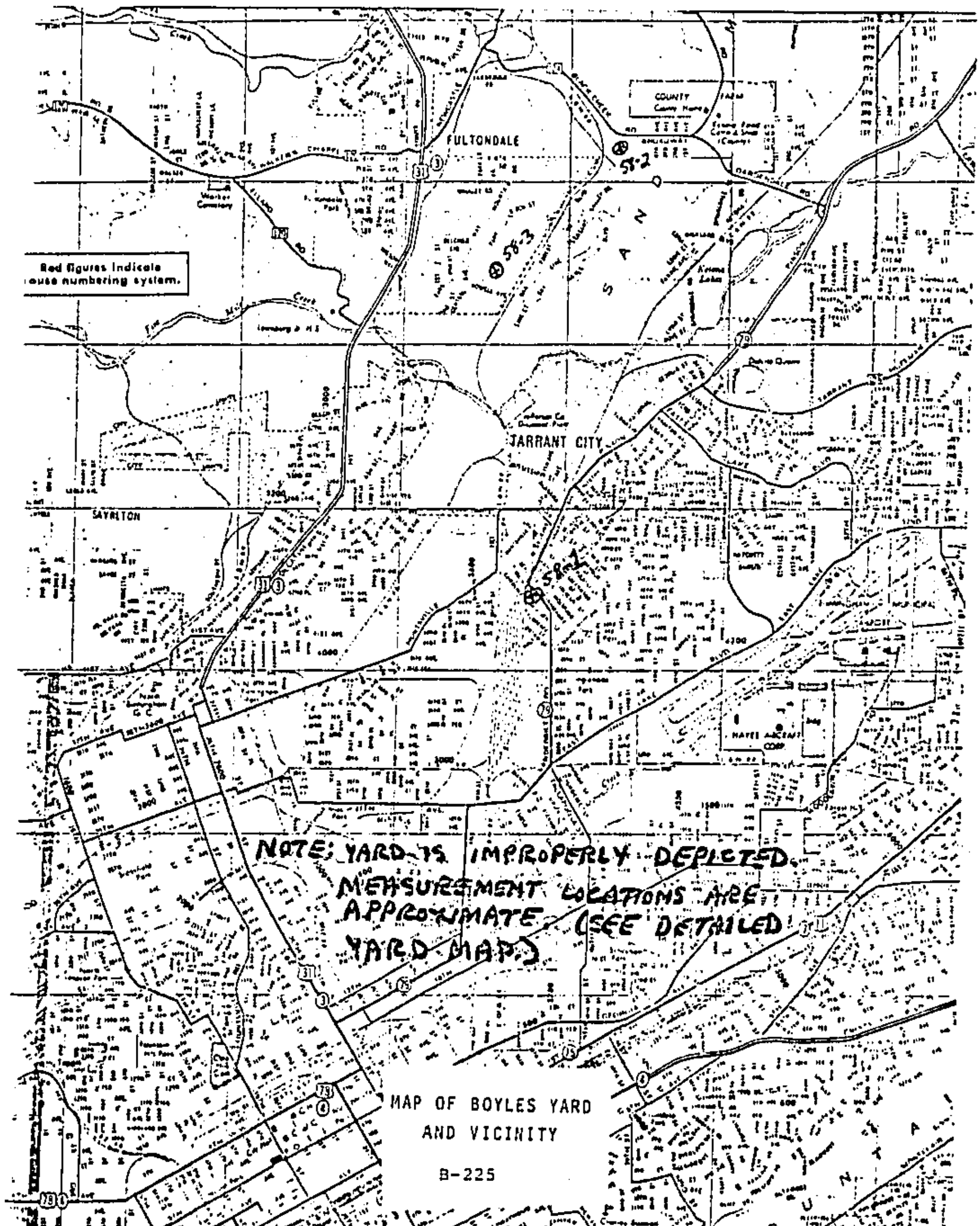
Only one other neighborhood problem was mentioned. It was the trucks that use Black Creek Road as a shortcut between Highways 31 and 79. Two neighbors have had a total of 15 mailboxes knocked down in 3 years.

Site 58-3

In this neighborhood, we talked with nine families. Eight of these families lived on Park Lane and one lived on Central Avenue which is about 300 feet further away from the railroad yard than Park Lane. Only one of the neighbors was very annoyed with the noise. Two were only annoyed when their babies were awakened. The other neighbors claimed to be used to the noise. It should be noted that these people use air conditioners to mask the noise, in fact, some mentioned that the air conditioners were used even during the spring and fall when the weather is cool. Some people have added storm windows to help keep the noise out.

Only one of the neighbors had complained and this was due to some blasting that occurred during the daytime. Most of the other neighbors are not home during the daytime. One neighbor claimed to have almost written the EPA to complain since she though that nothing would be done locally. The main sources of annoyance were the retarder squeals and rail car impacts.

Other neighborhood problems mentioned were mosquitoes and that ceiling lights vibrated.


FULTONDALE
COUNTY FARM
58-2
58-3
Red figures indicate house numbering system.
TARRANT CITY
SAYRETON
58-1
HAYES AIRCRAFT CORP
NOTE: YARD IS IMPROPERLY DEPICTED. MEASUREMENT LOCATIONS ARE APPROXIMATE. (SEE DETAILED YARD MAP)
MAP OF BOYLES YARD AND VICINITY
B-225

NOISE DATA

YARD: BOYLES LOCATION: 58-1

HOUR OF DAY	DATE: 28 August 1978 — NOISE LEVEL in dBA							DATE: 29 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								58.1	73.	61.	59.	57.	56.	54.
01-02								62.4	83.	70.	66.	59.	56.	55.
02-03								61.8	86.	70.	63.	59.	58.	58.
03-04								62.2	86.	69.	62.	60.	59.	59.
04-05								62.0	85.	70.	62.	60.	60.	59.
05-06								65.6	92.	73.	67.	61.	59.	58.
06-07								65.4	90.	72.	66.	60.	59.	59.
07-08								66.1	94.	78.	66.	60.	59.	58.
08-09								62.2	81.	71.	63.	60.	58.	57.
09-10								63.5	97.	69.	64.	59.	57.	57.
10-11								64.6	82.	74.	68.	60.	56.	55.
11-12								59.4	83.	68.	60.	57.	55.	54.
12-13								60.1	82.	70.	62.	57.	55.	54.
13-14								62.8	85.	74.	63.	57.	54.	53.
14-15								62.2	89.	72.	64.	58.	55.	54.
15-16								64.1	81.	73.	68.	58.	54.	53.
16-17								62.8	91.	70.	63.	58.	56.	54.
17-18								63.9	85.	73.	68.	58.	55.	54.
18-19								58.3	76.	65.	59.	57.	55.	54.
19-20								59.6	74.	65.	60.	58.	57.	56.
20-21	62.2	73.	64.	62.	61.	60.	59.							
21-22	63.7	83.	70.	66.	60.	59.	57.							
22-23	59.4	77.	68.	61.	57.	55.	53.							
23-24	57.5	75.	61.	57.	56.	55.	53.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 62.7 dB
L_n : 62.4
L_d : 62.8
L_{dn}: 68.9

NOISE DATA

YARD: BOYLES LOCATION: 58-1

HOUR OF DAY	DATE: 29 AUGUST 1978 NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	DATE: 30 AUGUST 1978 NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								58.3	75.	66.	69.	57.	55.	54.
01-02								60.3	86.	64.	60.	58.	57.	55.
02-03								68.2	93.	80.	64.	58.	57.	55.
03-04								59.6	79.	66.	61.	58.	56.	55.
04-05								63.9	92.	71.	61.	60.	58.	56.
05-06														
06-07														
07-08														
08-09														
09-10														
10-11														
11-12														
12-13														
13-14														
14-15														
15-16														
16-17														
17-18														
18-19														
19-20														
20-21	63.0	78.	72.	65.	60.	59.	57.							
21-22	66.5	87.	74.	69.	64.	57.	56.							
22-23	59.2	79.	67.	60.	57.	56.	55.							
23-24	58.5	79.	62.	59.	57.	56.	55.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: ______ dB
L_n : 62.8
L_d : ______
L_{dn}: ______

NOISE DATA

YARD: BOYLES   LOCATION: 58-1

DATE: 30 AUGUST 1978 / DATE: 31 AUGUST 1978

HOUR OF DAY	30 AUG: NOISE LEVEL in dBA							31 AUG: NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								60.9	77.	64.	61.	60.	59.	58.
01-02								60.9	71.	63.	61.	60.	59.	58.
02-03								60.7	83.	67.	60.	59.	58.	56.
03-04								66.1	89.	77.	68.	59.	56.	55.
04-05								60.9	83.	65.	61.	60.	59.	58.
05-06								64.1	81.	73.	67.	60.	59.	58.
06-07								63.5	84.	73.	64.	60.	59.	58.
07-08								62.6	83.	71.	63.	60.	59.	58.
08-09								62.8	79.	72.	64.	60.	59.	58.
09-10								62.0	82.	71.	63.	60.	59.	58.
10-11								62.4	84.	69.	64.	60.	59.	58.
11-12								63.1	89.	70.	63.	60.	58.	57.
12-13	66.5	87.	76.	69.	62.	59.	58.							
13-14	68.2	96.	77.	65.	60.	58.	57.							
14-15	64.3	87.	73.	64.	61.	59.	57.							
15-16	69.7	99.	79.	64.	60.	58.	57.							
16-17	60.9	82.	70.	61.	58.	57.	57.							
17-18	68.8	97.	75.	63.	59.	57.	55.							
18-19	63.9	85.	72.	67.	60.	57.	55.							
19-20	63.0	84.	71.	65.	58.	58.	56.							
20-21	63.0	82.	69.	65.	61.	59.	58.							
21-22	63.7	85.	72.	67.	60.	58.	57.							
22-23	61.3	76.	67.	62.	60.	58.	57.							
23-24	61.3	81.	63.	62.	61.	59.	57.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 64.4 dB
L_n : 62.6
L_d : 65.2
L_{dn}: 69.5

NOISE DATA

YARD: BOYLES LOCATION: 58-2

HOUR OF DAY	DATE: 28 AUGUST 1978 — NOISE LEVEL in dBA							DATE: 29 AUGUST 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								56.2	81.	60.	56.	55.	54.	54.
01-02								56.4	85.	63.	56.	54.	53.	52.
02-03								65.6	90.	77.	68.	55.	53.	53.
03-04								54.9	74.	66.	53.	48.	47.	46.
04-05								49.1	63.	53.	50.	48.	47.	47.
05-06								59.2	82.	74.	58.	50.	48.	47.
06-07								52.1	71.	61.	55.	49.	47.	46.
07-08								58.6	79.	72.	59.	50.	48.	47.
08-09								55.8	72.	66.	59.	50.	49.	48.
09-10								61.8	84.	67.	62.	59.	55.	52.
10-11								60.1	73.	67.	62.	59.	55.	53.
11-12								63.0	85.	73.	63.	58.	55.	52.
12-13								57.0	72.	63.	59.	56.	52.	48.
13-14								60.9	80.	75.	61.	51.	42.	40.
14-15								57.9	80.	66.	59.	55.	50.	44.
15-16								56.6	80.	64.	58.	53.	48.	44.
16-17								57.9	81.	70.	60.	46.	42.	40.
17-18								50.0	66.	58.	53.	47.	42.	40.
18-19								51.0	66.	58.	53.	48.	46.	44.
19-20								61.1	81.	75.	60.	54.	50.	47.
20-21	61.8	74.	71.	64.	60.	57.	56.							
21-22	59.2	75.	64.	60.	58.	57.	56.							
22-23	58.3	66.	60.	59.	58.	56.	55.							
23-24	59.2	80.	68.	60.	57.	54.	54.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 59.3 dB
L_n : 59.1
L_d : 59.4
L_{dn}: 65.6

NOISE DATA

YARD: BOYLES LOCATION: 58-3

HOUR OF DAY	DATE: 29 AUGUST 1978 NOISE LEVEL in dBA							DATE: 30 AUGUST 1978 NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								57.1	81.	67.	56.	54.	53.	52.
01-02								56.8	80.	66.	56.	54.	53.	52.
02-03								55.5	78.	62.	55.	53.	52.	51.
03-04								55.8	76.	67.	55.	52.	51.	51.
04-05								56.0	78.	63.	57.	54.	52.	51.
05-06								56.2	75.	64.	57.	54.	52.	50.
06-07								53.6	76.	60.	54.	51.	48.	47.
07-08								56.0	76.	67.	56.	51.	49.	48.
08-09								57.5	80.	68.	57.	52.	51.	49.
09-10								57.7	83.	67.	56.	52.	50.	49.
10-11								59.6	82.	72.	60.	52.	48.	47.
11-12								60.9	93.	70.	59.	52.	48.	46.
12-13								60.9	80.	74.	60.	51.	49.	46.
13-14								57.9	80.	69.	59.	52.	50.	48.
14-15								60.0	87.	69.	56.	51.	49.	48.
15-16								60.0	86.	70.	58.	53.	49.	48.
16-17								56.6	77.	68.	56.	52.	49.	48.
17-18								56.9	82.	68.	57.	52.	49.	48.
18-19								57.3	78.	69.	56.	51.	49.	47.
19-20								60.1	80.	71.	61.	55.	53.	51.
20-21								59.0	79.	70.	59.	55.	54.	53.
21-22	61.1	90.	71.	60.	56.	55.	54.							
22-23	57.9	79.	67.	57.	55.	54.	53.							
23-24	59.0	80.	70.	59.	54.	53.	52.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: 58.3 dB

L_n : 56.7

L_d : 59.1

L_{dn}: 63.5

NOISE DATA

YARD: BOYLES LOCATION: 58-3

HOUR OF DAY	DATE: 30 AUGUST 1978 NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	DATE: 31 AUGUST 1978 NOISE LEVEL in dBA L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								55.8	82.	65.	54.	52.	51.	51.
01-02								54.7	81.	63.	52.	51.	50.	49.
02-03								57.1	80.	69.	58.	51.	49.	47.
03-04								55.5	84.	67.	53.	49.	47.	46.
04-05								56.6	81.	69.	54.	48.	47.	46.
05-06								53.2	76.	65.	53.	48.	47.	46.
06-07								52.6	74.	63.	54.	48.	46.	45.
07-08								51.9	72.	62.	54.	48.	46.	45.
08-09								54.9	76.	66.	56.	47.	44.	42.
09-10								52.3	74.	63.	53.	47.	44.	43.
10-11								53.4	76.	63.	55.	48.	44.	43.
11-12								54.0	75.	64.	56.	50.	47.	44.
12-13														
13-14														
14-15														
15-16														
16-17														
17-18														
18-19														
19-20														
20-21	59.0	79.	70.	59.	55.	54.	53.							
21-22	57.7	80.	69.	56.	54.	53.	52.							
22-23	58.3	79.	70.	58.	54.	52.	52.							
23-24	54.7	74.	64.	53.	52.	52.	51.							

Note: Levels measured with FAST meter dynamics.

$L_{eq}(24)$: ______ dB

L_n : 55.7

L_d : ______

L_{dn}: ______

North Little Rock Rail Yard (Crest)
Missouri Pacific Railroad
North Little Rock, Arkansas
(Site No. 59)

1. GENERAL DESCRIPTION OF YARD ACTIVITIES AND IMPACT

1.1 Major Noise Generating Activities

The North Little Rock Yard is a large, very busy hump yard with repair and service facilities for locomotives and freight cars. Flat switching is performed into the city yard for local deliveries. A piggyback ramp is located at the extreme eastern end of the yard.

The yard is located within an area roughly outlined by Highways I-30, I-40, and Broadway Street in North Little Rock, Arkansas.

The yard is reportedly operating at well above its design capacity. Twenty-four-hundred cars are humped per day. Operations are split nearly evenly at 800/shift (3 shifts/day). Car speed at the crest of the hump is 4 mph or less.

Eighteeen trains per day stop at the yard to change crews without switching cars. Many trains arrive between midnight and 2 a.m. from Chicago. No trains pull through the yard without stopping.

Each day 6200 cars are "handled." A car is "handled" when it is broken off of an incoming train, attached to an outgoing train, or merely passes through the yard. Thus, the number of cars handled roughly equals twice the number of throughput cars. Business is reportedly down somewhat from the January-May 1978 volume of 6700 cars/day.

One hundred engines per day are serviced at the diesel facilities. Another 50 engines per day bypass the service area on trains that only change crews at the yard. Ten to twelve switch engines operate in the yard simultaneously.

Three-hundred-fifty local industries are serviced by deliveries from the city yard. The piggyback operation loads about 30 semi-trailers per day and unloads about an equal number.

One coal unit train passes through the yard per day. (Most utilities in the area burn natural gas.) Main products hauled through the yard include lumber and wood chips, paper, cotton, rice, and chemicals.

1.2 Land Use Surrounding Yard

The yard is approximately 1.5 miles long running east to west, and the surrounding land has a variety of uses. Highway I-30 crosses the yard at the extreme western end. Single-story wood frame and brick houses are also located in this area. Small factories and two-story apartments are built up to the railroad property line to the southwest of the yard. To the south of the yard are cultivated fields with some additional single-story homes at a distance of about 1000 feet from the hump. North of the yard are grain elevators, light industry, and open fields. Commercial and light industrial properties border the yard on the southeast end.

1.3 Noise Control through Source Relocation and Modifications

This extremely busy yard has apparently expanded to fill all the available land in a narrow strip between two industrial/community areas. Possibilities for relocating sources appear to be slim. Much depends on the eventual uses of the undeveloped land bordering the yard. For example, the flat switching operations into the city yard could be very objectionable if nearby property is developed. Some minimal improvements could be made by erecting barriers around the main and group retarders. Very large barriers might be required because of the elevated position of the community 1000 feet south of the hump. The windows of the two-story apartments south of the receiving yard look out onto the yard. Very large and long barriers would again be needed to reduce the annoyance. The track over the hump and main retarder seems to have very uneven joints. Some reduction in noise radiated from the cars might be attained by improving this track. The diesel shop is enclosed by a metal building. The fueling track is semi-enclosed by a metal building with partial walls. Thus, little reduction of noise from idling diesels appears possible. Annoyance in the community might be reduced slightly by relying on 2-way radios rather than the present P.A./talkback communication system.

2. SITE DATA

2.1 Site Characteristics and Noise Environment

See the attached map for measurement locations. Because the yard is very long, four measurement locations were used, with noise levels monitored for one day at each location. The sites are described in numerical order below.

Site 69-1

This site is located south of the master and group retarders on railroad property (approximately 210 feet from the master regarder). The property line is approximately 300 feet further south of this measurement site, so that property-line levels would be roughly 7 to 8 dB lower than the measured levels at this site.

The noise sources at this location (in approximate order of importance) are:

1. Master retarder - intermittent squeals and chatter.
2. Group retarders - intermittent squeals.

3. Idling diesels south of the hump control tower - continuous rumble.

4. Flat switching operations into the city yard - impact, impulse, wheel squeal.

5. Impacts of cars in classification yard - impact noise.

6. Traffic in parking lot at control tower - intermittent and infrequent.

No significant background noise from non-railroad sources was present at this site.

Site 59-2

This site is located south of the center of the classification yard, west of the city yard, approximately 150 feet within the yard. The nearest residences are approximately 825 feet south of this location, so that noise levels would be roughly 10-15 dB lower than those measured at this site.

The noise sources at this location (in approximate order of importance) are:

1. Flat switching into the city yard - impact, impulse, wheel squeal, brake squeal,

2. Impacts of cars in classification yard - impact noise.

3. Noise from main line - diesels, whistles, wheel noise.

4. Compressors in parked refrigeration cars - continuous noise.

5. Carmen and P.A. system.

No significant noise from non-railroad sources was present at this site.

Site 59-3

This site is located 75 feet south of the receiving yard, just west of the diesel repair shops, in a residential community. The homes in this area are two-story frame/brick apartments.

The ranked noise sources at this location are:

1. Train movements in the receiving yard - impulse, impact, squeals.

2. Idling diesels at the diesel shop - continuous noise.

3. Compressors on parked refrigerator cars - continuous noise.

4. Traffic and noise in the community - this source was not very significant.

Site 59-4

This site is located about 1000 feet south of the hump, on land with an elevation about equal to that of the hump. Homes in this area are single-story frame buildings without air conditioning. The ranked noise sources at this location are:

1. Humping operations - intermittent squeals.

2. Incoming and outbound trains - squeals, impulse, impact noise.

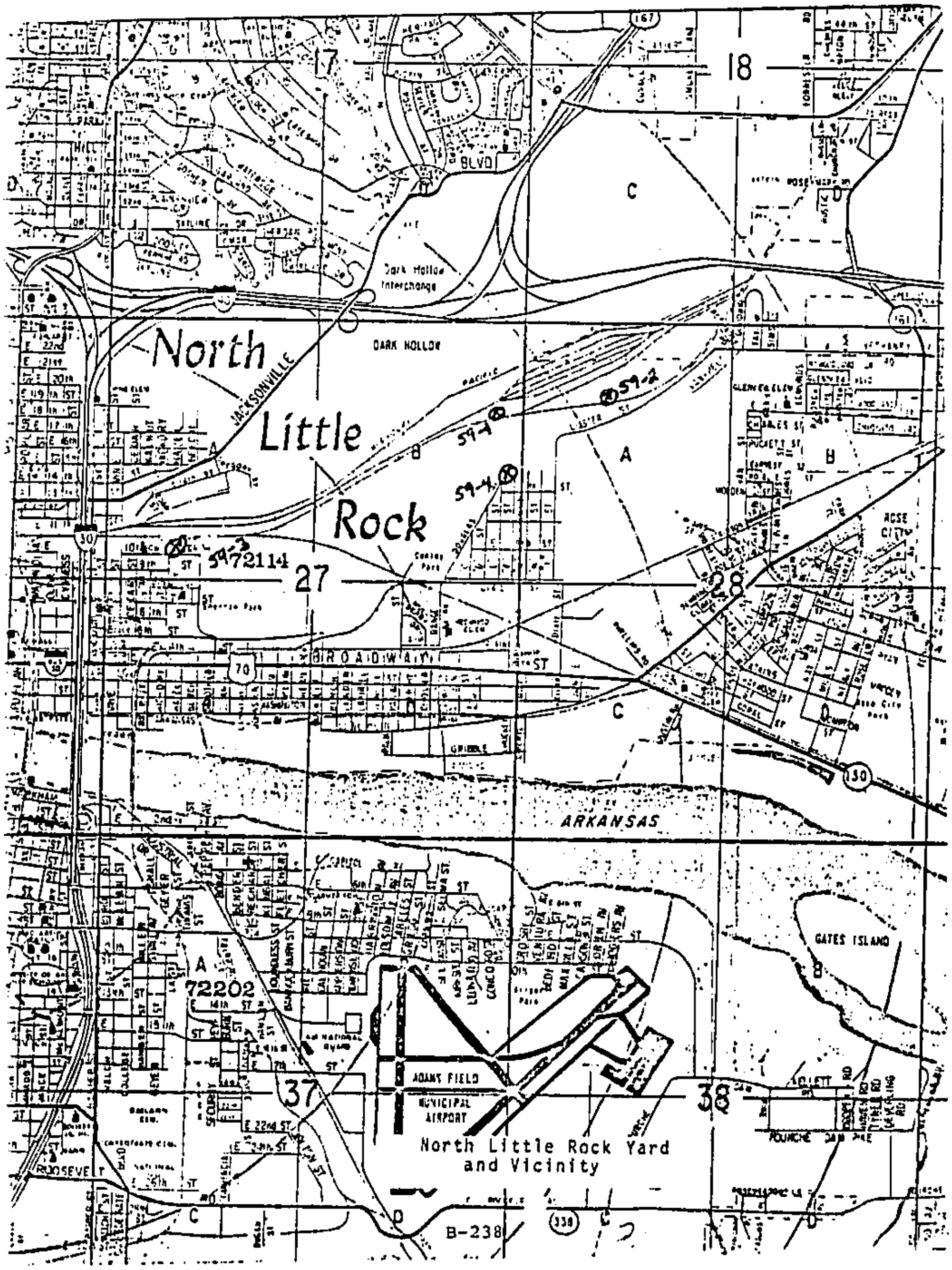
3. Impacts in classification yard.

4. Traffic and noise in community - not very significant.

5. P.A. speakers in yard.

2.2 Subjective Data

Some community residents at the south edge of the yard registered discontent with noise radiated from the receiving yard. No complaints were voiced in the community 1000 feet south of the hump although humping operations were clearly audible and visible.



North Little Rock Yard and Vicinity

NOISE DATA

YARD: NORTH LITTLE ROCK LOCATION: 59-1

HOUR OF DAY	DATE: 30 August 1978 — NOISE LEVEL in dBA							DATE: 31 August 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								70.6	94.	81.	73.	64.	62.	61.
01-02								74.8	102.	84.	72.	65.	62.	61.
02-03								85.1	107.	99.	77.	65.	62.	61.
03-04								85.3	109.	99.	75.	66.	63.	62.
04-05								85.5	112.	97.	72.	64.	62.	62.
05-06								76.1	102.	84.	73.	67.	62.	62.
06-07								68.2	95.	75.	67.	63.	62.	61.
07-08								77.2	102.	89.	72.	65.	61.	59.
08-09	75.3	104.	84.	74.	65.	60.	59.							
09-10	82.1	107.	95.	76.	66.	61.	60.							
10-11	78.0	103.	86.	75.	68.	63.	61.							
11-12	73.3	97.	81.	74.	66.	62.	61.							
12-13	81.7	107.	94.	76.	67.	61.	59.							
13-14	72.7	101.	84.	72.	63.	60.	59.							
14-15	71.4	95.	80.	73.	66.	60.	60.							
15-16	83.0	109.	96.	75.	65.	60.	58.							
16-17	80.4	105.	94.	75.	66.	59.	57.							
17-18	72.0	97.	83.	71.	60.	59.	58.							
18-19	82.3	105.	96.	76.	65.	60.	59.							
19-20	82.6	106.	96.	75.	65.	61.	60.							
20-21	81.5	107.	95.	73.	65.	62.	59.							
21-22	81.0	105.	93.	73.	64.	62.	61.							
22-23	82.1	110.	92.	73.	66.	63.	62.							
23-24	84.1	107.	98.	75.	67.	63.	62.							

Note: Levels measured with SLOW meter dynamics.

$L_{eq}(24)$: 80.9 dB
L_n : 82.3
L_d : 79.9
L_{dn}: 88.4

NOISE DATA

YARD: NORTH LITTLE ROCK LOCATION: 59-2

DATE: 30 AUGUST 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01							
01-02							
02-03							
03-04							
04-05							
05-06							
06-07							
07-08							
08-09	74.4	93.	85.	76.	68.	62.	60.
09-10	66.1	84.	79.	66.	59.	57.	55.
10-11	69.7	97.	79.	69.	64.	62.	61.
11-12	69.0	91.	80.	69.	63.	57.	55.
12-13	70.5	94.	81.	72.	58.	55.	54.
13-14	69.7	92.	82.	70.	61.	56.	54.
14-15	70.3	91.	83.	72.	62.	58.	55.
15-16	72.7	99.	84.	72.	62.	59.	57.
16-17	70.3	90.	83.	69.	61.	59.	58.
17-18	73.1	89.	85.	75.	61.	59.	56.
18-19	70.6	92.	83.	71.	61.	59.	56.
19-20	69.9	90.	82.	71.	60.	59.	58.
20-21	65.6	87.	75.	65.	60.	58.	58.
21-22	67.6	95.	77.	67.	62.	60.	59.
22-23	72.4	90.	83.	75.	64.	59.	56.
23-24	71.4	98.	82.	72.	60.	56.	55.

DATE: 31 AUGUST 1978

HOUR OF DAY	NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01	75.1	93.	87.	78.	67.	58.	54.
01-02	65.6	91.	77.	66.	59.	56.	54.
02-03	73.3	96.	84.	75.	63.	58.	56.
03-04	65.4	85.	78.	64.	58.	56.	55.
04-05	67.5	90.	77.	66.	60.	57.	56.
05-06	69.3	98.	80.	68.	58.	55.	53.
06-07	73.3	103.	81.	67.	56.	54.	53.
07-08	72.5	91.	84.	75.	58.	55.	54.
08-09							
09-10							
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							

Note: Levels measured with SLOWmeter dynamics.

$L_{eq}(24)$: 71.1 dB
L_n : 71.5
L_d : 70.8
L_{dn}: 77.8

NOISE DATA

YARD: NORTH LITTLE ROCK LOCATION: 59-3

HOUR OF DAY	DATE: 31 AUGUST 1978 — NOISE LEVEL in dBA							DATE: 1 SEPTEMBER 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								61.3	79.	72.	63.	55.	53.	52.
01-02								58.8	80.	69.	59.	54.	53.	52.
02-03								67.8	94.	76.	58.	54.	51.	50.
03-04								64.1	88.	74.	62.	54.	51.	50.
04-05								67.1	90.	78.	66.	55.	52.	50.
05-06								69.7	92.	83.	65.	56.	54.	52.
06-07								63.0	86.	74.	59.	57.	55.	54.
07-08								56.4	67.	63.	58.	55.	53.	52.
08-09	62.2	79.	73.	61.	60.	58.	57.							
09-10	65.0	87.	75.	64.	61.	60.	58.							
10-11	63.3	79.	72.	65.	60.	58.	57.							
11-12	68.2	88.	79.	68.	63.	58.	56.							
12-13	69.1	87.	78.	71.	66.	61.	57.							
13-14	66.9	84.	75.	69.	64.	59.	56.							
14-15	63.5	80.	74.	66.	57.	55.	53.							
15-16	69.1	87.	81.	71.	62.	57.	56.							
16-17	66.1	87.	78.	67.	61.	56.	52.							
17-18	71.2	89.	87.	67.	60.	56.	54.							
18-19	65.6	87.	75.	65.	58.	54.	53.							
19-20	71.2	96.	80.	68.	64.	56.	54.							
20-21	63.9	86.	75.	62.	56.	55.	54.							
21-22	70.6	94.	83.	66.	56.	55.	54.							
22-23	66.7	90.	80.	63.	56.	54.	52.							
23-24	58.5	82.	63.	58.	54.	52.	52.							

Note: Levels measured with slow meter dynamics.

$L_{eq}(24)$: 66.9 dB
L_n : 65.6
L_d : 67.6
L_{dn}: 72.3

NOISE DATA

YARD: NORTH LITTLE ROCK LOCATION: 59-4

HOUR OF DAY	DATE: 31 AUGUST 1978 — NOISE LEVEL in dBA							DATE: 1 SEPTEMBER 1978 — NOISE LEVEL in dBA						
	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}	L_{max}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
00-01								59.2	75.	69.	61.	55.	52.	50.
01-02								57.5	75.	68.	58.	54.	51.	50.
02-03								61.1	75.	73.	60.	55.	53.	52.
03-04								60.5	81.	69.	63.	56.	53.	52.
04-05								60.0	75.	69.	62.	57.	55.	54.
05-06								59.6	72.	67.	62.	57.	54.	53.
06-07								60.0	78.	69.	60.	57.	55.	54.
07-08								59.4	82.	67.	60.	57.	55.	54.
08-09														
09-10														
10-11														
11-12														
12-13	65.4	92.	71.	60.	55.	54.	53.							
13-14	55.5	71.	63.	57.	53.	51.	50.							
14-15	55.3	74.	63.	56.	53.	52.	50.							
15-16	56.4	73.	65.	58.	53.	52.	51.							
16-17	57.7	76.	66.	59.	54.	53.	52.							
17-18	59.0	80.	68.	61.	54.	51.	50.							
18-19	60.5	80.	72.	60.	54.	52.	51.							
19-20	60.1	75.	72.	60.	56.	53.	52.							
20-21	58.3	75.	69.	59.	54.	53.	52.							
21-22	63.9	87.	72.	62.	55.	53.	52.							
22-23	59.2	70.	67.	63.	56.	55.	53.							
23-24	59.6	80.	69.	61.	56.	55.	54.							

Note: Levels measured with slow meter dynamics.

$L_{eq}(24)$: 60.0 dB
L_n : 59.2
L_d : 60.4
L_{dn}: 65.8

Summary - Three Sites - Region IV

Fort Lauderdale Fla

Measured Ldn all sources 69.08 dBA

RR Component Ldn 67.35 dBA

Distance from microphone to RR property line

(1) 63 feet to trailer parking area

(2) 175 feet to nearest track

(3) 260 feet to nearest piggy back track

Jacksonville, Fla (Bowden Yd)

Measured Ldn all sources 67.24 dBA

RR Component Ldn 67.24 dBA

Clean yard - no through trains - no other sources

Distance from microphone to RR property line

(1) 10 feet to RR ROW

Summary Region IV Cont'd

Memphis, Tenn (Forrest Yard)

Two twenty four hour sites

865 Goodwyn

Measured Ldn all sources 66.26 dBA

RR Component Ldn 60.80 dBA

Distance from microphone to RR property line

320-330 feet (not direct line of sight)

867 Goodwyn Cove

Measured Ldn all sources 69.51 dBA

RR Component Ldn 67.0 dBA

Distance from microphone to RR property line

120-130 feet

Fort Lauderdale

L_{dn} = 69.08 dBA (all sources) $L_{eq(24)}$ = 63.4 dBA (all sources) $L_{eq(night)}$ = 62.2 dBA (all sources) $L_{eq(day)}$ = 64.2 dBA (all sources)	Active Railroad hours (corrected for non RR sources by omission - some through trains omitted if they were obvious)
RR component L_{dn} computed from active RR hours identified L_{dn} = 67.35 dBA	8/9/78

8/9/78		$L_{eq(1)}$
	1-2 AM	60.3 dBA
	2-3	65.1 dBA
	3-4	62.0 "
	4-5	62.5 "
	5-6	60.6 "
	6-7	65.2 "
	10-11 AM	65.5 dBA
	4-5 pm	60.6 "
	7-8 pm	66.4 "

Summary

Measured L_{dn} (all sources) = 69.08 dBA

R R Component L_{dn} (active RR hours) = 67.35 dBA

Distance from Microphone location to RR property for extrapolation to a fixed distance:

63 feet from trailer parking area

260 feet from nearest piggy back loading track

175 feet from nearest track

Extracts from Activity Log

8/8-8/9

Time	Activity
11-12 am	incoming piggy back train (loco ~85dBA)
12-1 am	incoming train 55 cars - 2 locomotives
1-2 am	light piggy back activity
2-3 am	heavy loading & unloading - impacts & hydraulic run ups
3-4 am	incoming train 53 cars - warning devices to 93dBA and higher locomotive ~83-88dBA
4-5 am	two locomotive - 63 car train; levels to 95dBA on warning devices
5-6 am	light piggy back activity - loading & unloading - tractor noise - incoming train warning devices & locomotive to 93dBA
6-7 am	Heavy activity - piggy back loading & unloading - train movement to 95dBA on warning devices - idling tractors & diesel runups
7-8 am	No data - system problem with WANG
8-9 am	Little piggy back actitivy - idling - locomotives ~60dBA
9-10 am	One through train, idling locomotives ~60dBA for approximately 1/4 of the hour
10-11 am	Idling locomotives, train forming & train movements - warning devices & locomotives to mid 90's
11-12 pm	Very little activity
12-1 pm	Little RR activity - some aircraft

Time	Activity
1-2 pm	incoming piggy back train - horns 93dBA, locomotive 85dBA, traincars 71-73 dBA, some piggy back activity (1:40 pm) Some aircraft activity during hour as well
2-3 pm	One through train - little piggy back actions
3-4 pm	Through train using warning devices heavily (3 locomotives) warning devices to 97dBA
4-5 pm	Piggy back operations during first 1/2 of hour - little activity from 4:30 - 5:00
5-6 pm	Little activity
6-7 pm	No RR activity to note - tractor "rev up" 61-65 dBA early in hour - Aircraft noise a dominant source Incoming train - horns to 95dBA, car passby ~ 71dBA; second train passby to 96dBA with horn - Car impacts to 75dBA in piggy back operations, Diesel run up to 76dBA when picking up trailer
8-9 pm	Virtually no RR activity - mostly dominated by aircraft noise
9-10 pm	Light piggy back activity - incoming trains to 91dBA horn, 85dBA locomotive, car noise 68-70dBA
10-11 pm	Piggyback train moving out - warning device 91dBA, locomotives 84dBA; Police helicopter flyovers 67-73dBA

Fort Lauderdale

$$L(eq)_{day} = 64.19 = 10 \log_{10} \sum_{i=1}^{14} 10^{\frac{L_i}{10}}$$

$$L_{eq\ night} = 62.70 = 10 \log_{10} \sum_{i=1}^{9} 10^{\frac{L_i}{10}}$$

$L_{dn} = 69.08$ dBA

$$L_{dn} = 10 \log_{10} \left[\frac{14}{23} 10^{\frac{L_d}{10}} + \frac{9}{23} 10^{\frac{L_n+10}{10}} \right]$$

Mobile Site monitoring ② on aerial photos

Site #2	Time	L_{eq}	L_{max}	L_1	L_{90}
	1445-1515	58	86	67	50
9/1/78	1515-1545	66	91	79	[illegible]
	1545-1615	56	73	65	49

225 Park Lane ① on aerial photos

Site #1	Time	L_{eq}	L_{max}	L_1	L_{90}
	1930-2000	62	86	73	46
9/78	2000-2030	[illegible]	[illegible]	[illegible]	[illegible]
	2030-2100	56	72	[illegible]	[illegible]
	2100-2130	62	83	73	49
	2150-2200	57	85	66	48
	2200-2230	61	87	71	47
	2230-2300	56	77	67	45

(58) [illegible] 8/4/78

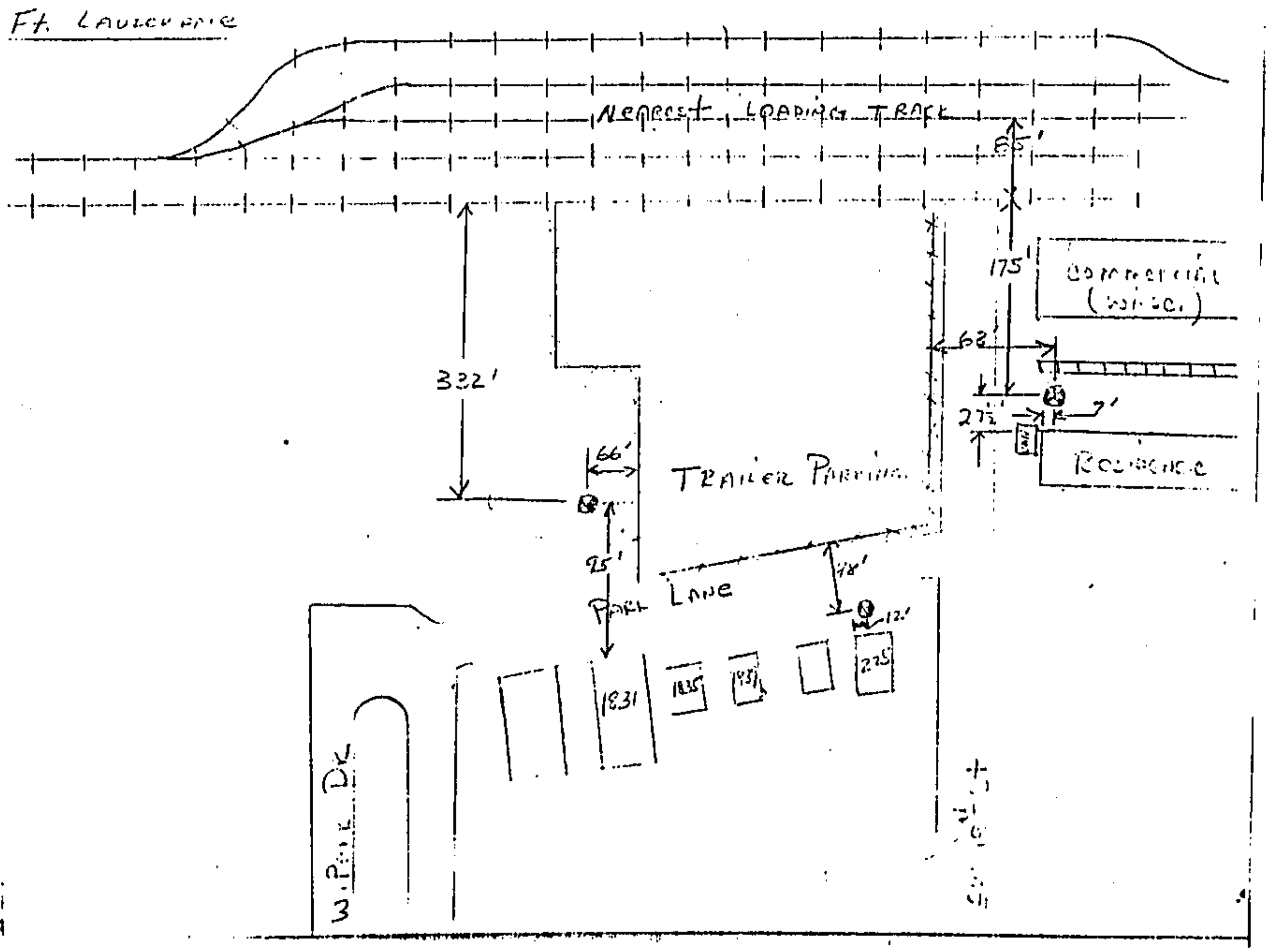
[illegible]

8/3/78	L_{eq}	L_{max}	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11:00 - 11:30 PM	63	88	87	85	76	50	47	45	44	54.9
11:30 - 12:00 AM	48	66	65	63	57	49	47	45	44	
8/4/78										
12:00 - 12:30 AM	52	72	72	[illegible]	64	53	47	45	44	53.3
12:30 - 1:00 AM	54	76	[illegible]	72	66	[illegible]	47	44	43	
1:00 - 1:30 AM	58	[illegible]	88	[illegible]	67	[illegible]	[illegible]	44	[illegible]	[illegible]
1:30 - 2:00 AM	62	91	90	82	72	53	[illegible]	49	[illegible]	
2:00 - 2:30 AM	67	96	[illegible]	[illegible]	76	64	[illegible]	[illegible]	47	[illegible]
2:30 - 3:00 AM	60	88	87	80	[illegible]	61	57	[illegible]	45	
3:00 - 3:30 AM	59	78	78	73	70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3:30 - 4:00 AM	64	92	91	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4:00 - 4:30 AM	[illegible]	81	81	[illegible]	71	66	52	[illegible]	[illegible]	62.5
4:30 - 5:00 AM	[illegible]	92	91	[illegible]	[illegible]	65	[illegible]	[illegible]	[illegible]	
5:00 - 5:30 AM	61	[illegible]	[illegible]	81	[illegible]	[illegible]	52	47	[illegible]	[illegible]
5:30 - 6:00 AM	60	[illegible]	82	[illegible]	72	[illegible]	[illegible]	[illegible]	47	
6:00 - 6:30 AM	68	95	95	87	77	69	56	50	43	65.2
6:30 - 7:00 AM	59	78	77	75	70	61	54	49	46	
7:00 - 7:30 AM										
7:30 - 8:00 AM										
8:00 - 8:30 AM	58	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8:30 - 9:00 AM	57	[illegible]	73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
9:00 - 9:30 AM	57	79	79	78	[illegible]	[illegible]	53	[illegible]	[illegible]	67.0
9:30 - 10:00 AM	70	97	97	96	76	60	54	[illegible]	49	

[illegible]	L_{eq}	L_{max}	$L_{.01}$	$L_{0.1}$	L_1	L_{10}	L_{50}	L_{90}	L_{99}	[illegible]
[illegible] AM	65	69	99	[illegible]	76	65	61	[illegible]	[illegible]	65.[illegible]
[illegible] AM	66	95	90	[illegible]	73	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible] PM	54	69	64	67	67	[illegible]	[illegible]	69	[illegible]	[illegible]
[illegible] PM	61	82	82	79	73	52	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] PM	67	73	72	70	67	[illegible]	54	[illegible]	[illegible]	64.6
[illegible] PM	57	[illegible]	[illegible]	[illegible]	76	57	[illegible]	[illegible]	[illegible]	
[illegible] PM	[illegible]	[illegible]	[illegible]	[illegible]	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] PM	[illegible]	78	78	77	76	[illegible]	57	[illegible]	[illegible]	
[illegible] PM	69	[illegible]	97	[illegible]	76	[illegible]	[illegible]	[illegible]	[illegible]	69
[illegible] PM	MISSING DUE TO [illegible] FAILURE									
[illegible] PM	[illegible]	[illegible]	[illegible]	76	70	63	[illegible]	[illegible]	[illegible]	60.0
[illegible] PM	59	73	77	73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible] PM	[illegible]	86	83	73	68	[illegible]	[illegible]	[illegible]	[illegible]	57.7
[illegible] PM	[illegible]	77	76	75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible] PM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	77	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] PM	[illegible]	[illegible]	75	73	69	61	[illegible]	[illegible]	[illegible]	
[illegible] PM	67	[illegible]	[illegible]	[illegible]	80	66	52	69	[illegible]	[illegible]
[illegible] PM	62	91	91	84	11	59	50	47	[illegible]	

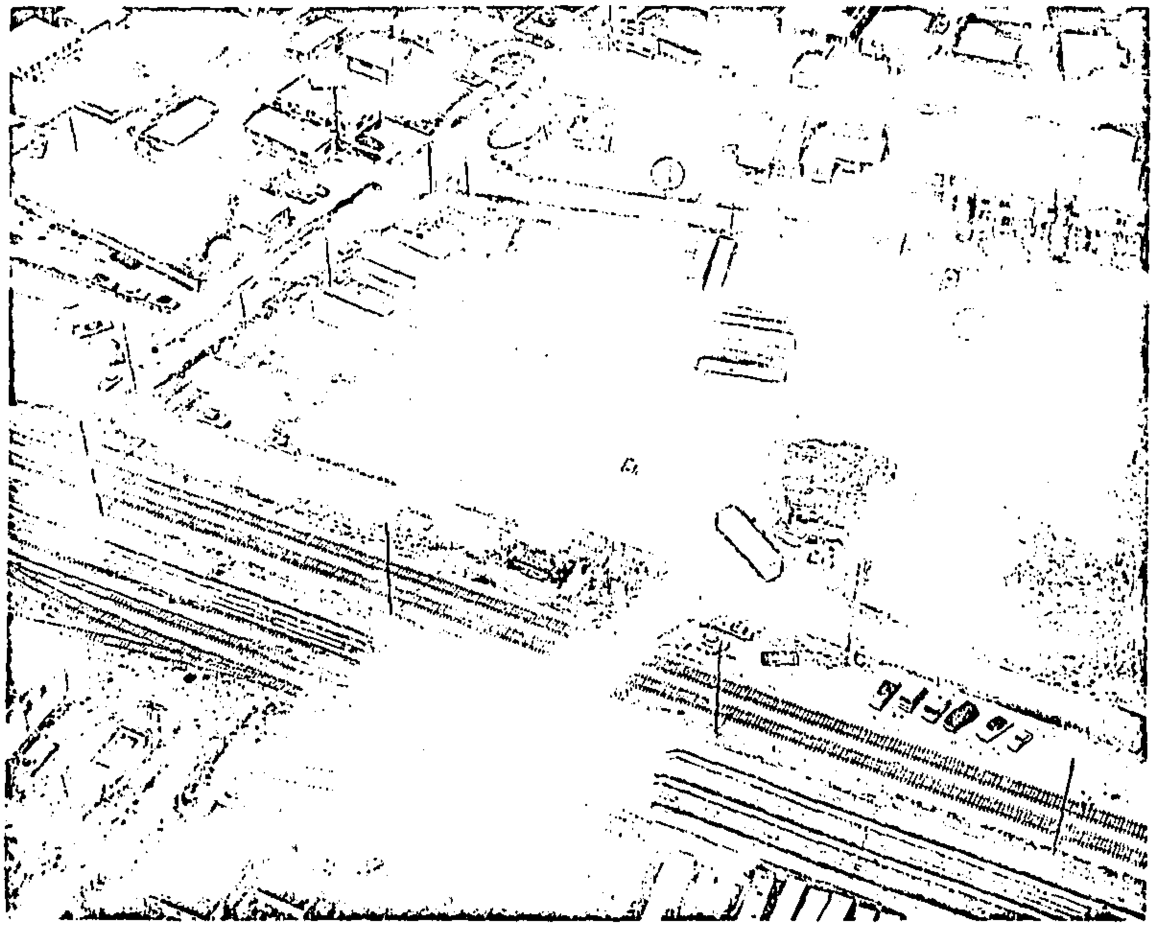
3/1/78	L_{eq}	L_{max}	L_{01}	$L_{0.1}$	L_{1}	L_{10}	L_{50}	L_{90}	L_{99}	$L_{eq(24)}$
[illegible] PM	65	97	97	85	76	61	[illegible]	[illegible]	67	62.1
[illegible] PM	58	70	[illegible]	75	64	61	[illegible]	47	[illegible]	

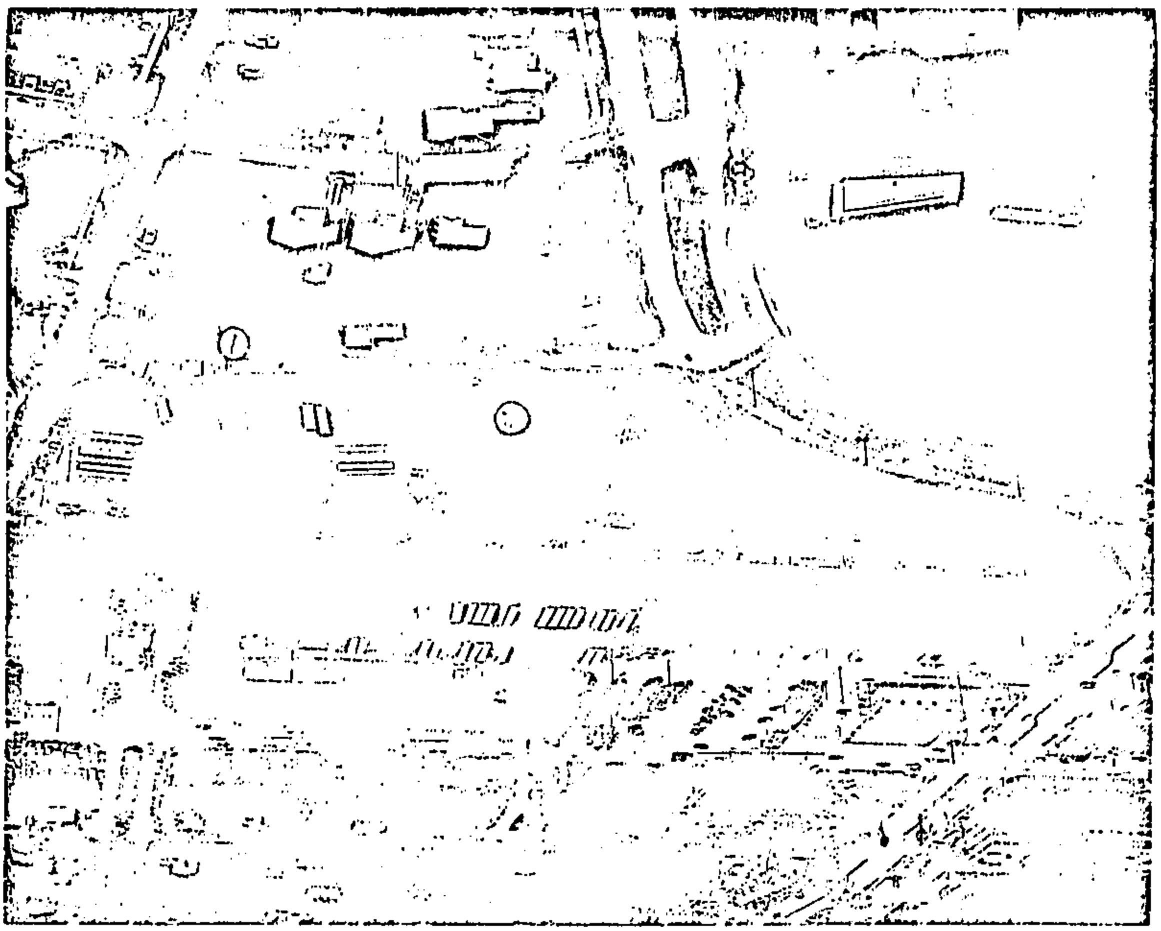
END


Ft. Lauderdale
Nearest Loading Track
85'
175'
Commercial
332'
62'
27½'
7'
66'
Trailer Parking
Residence
95'
48'
12'
Park Lane
1831
1835
W. Park Dr.

B-252

1A





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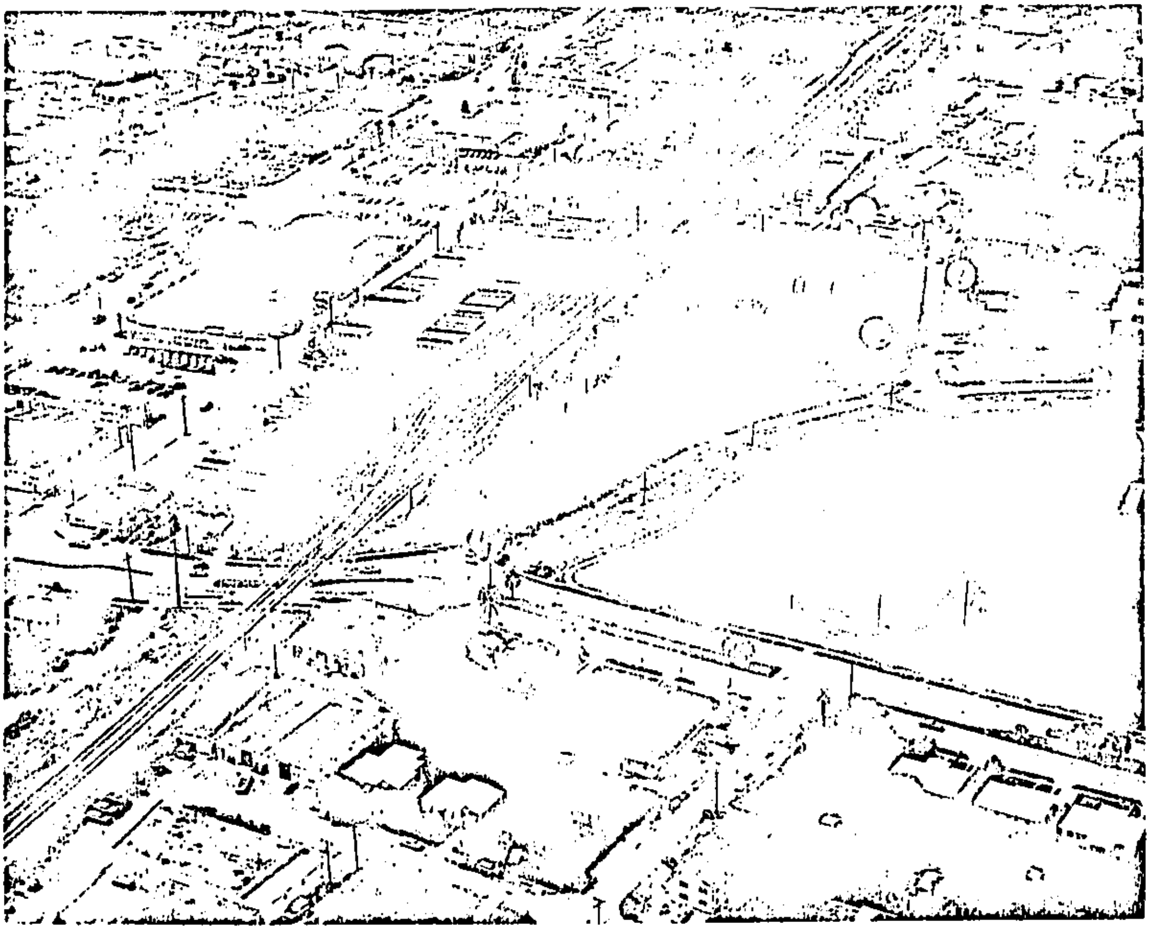
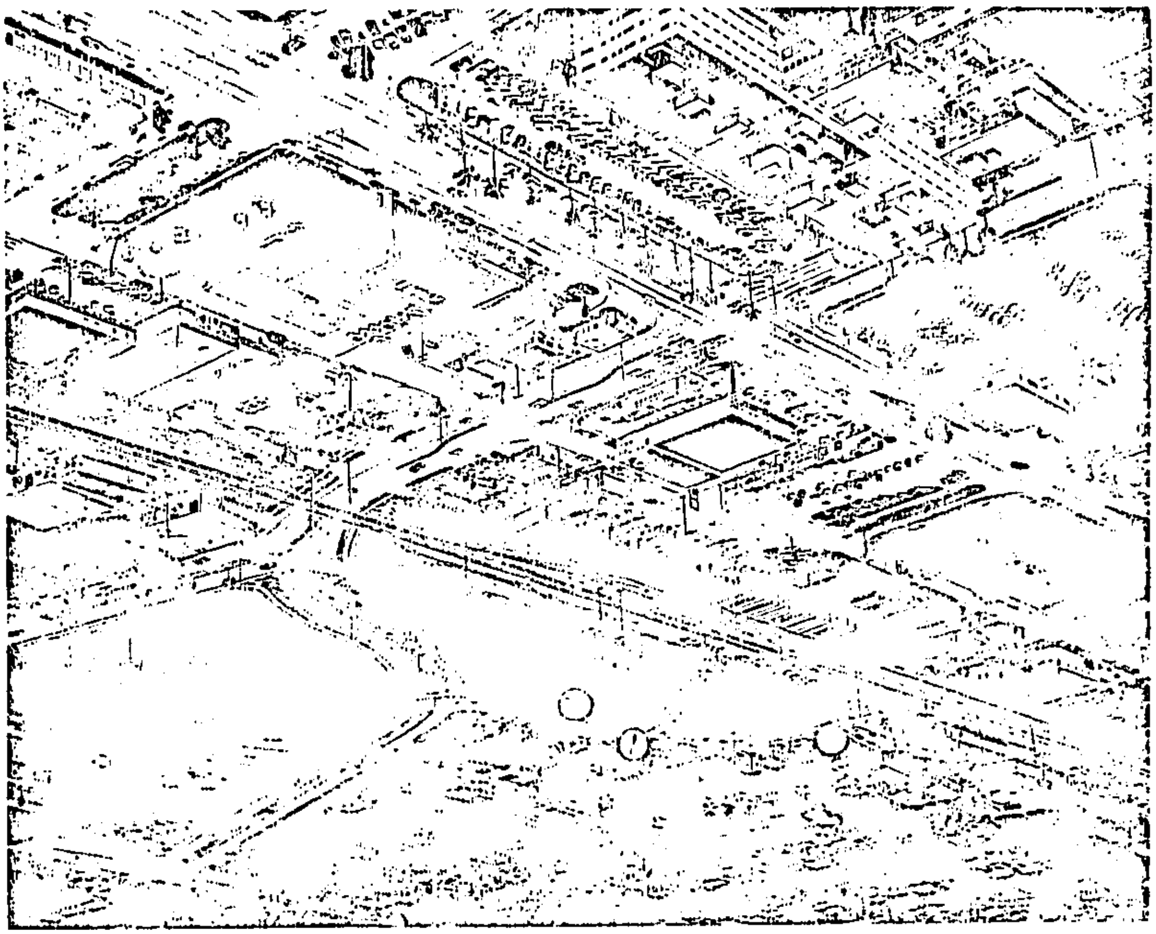
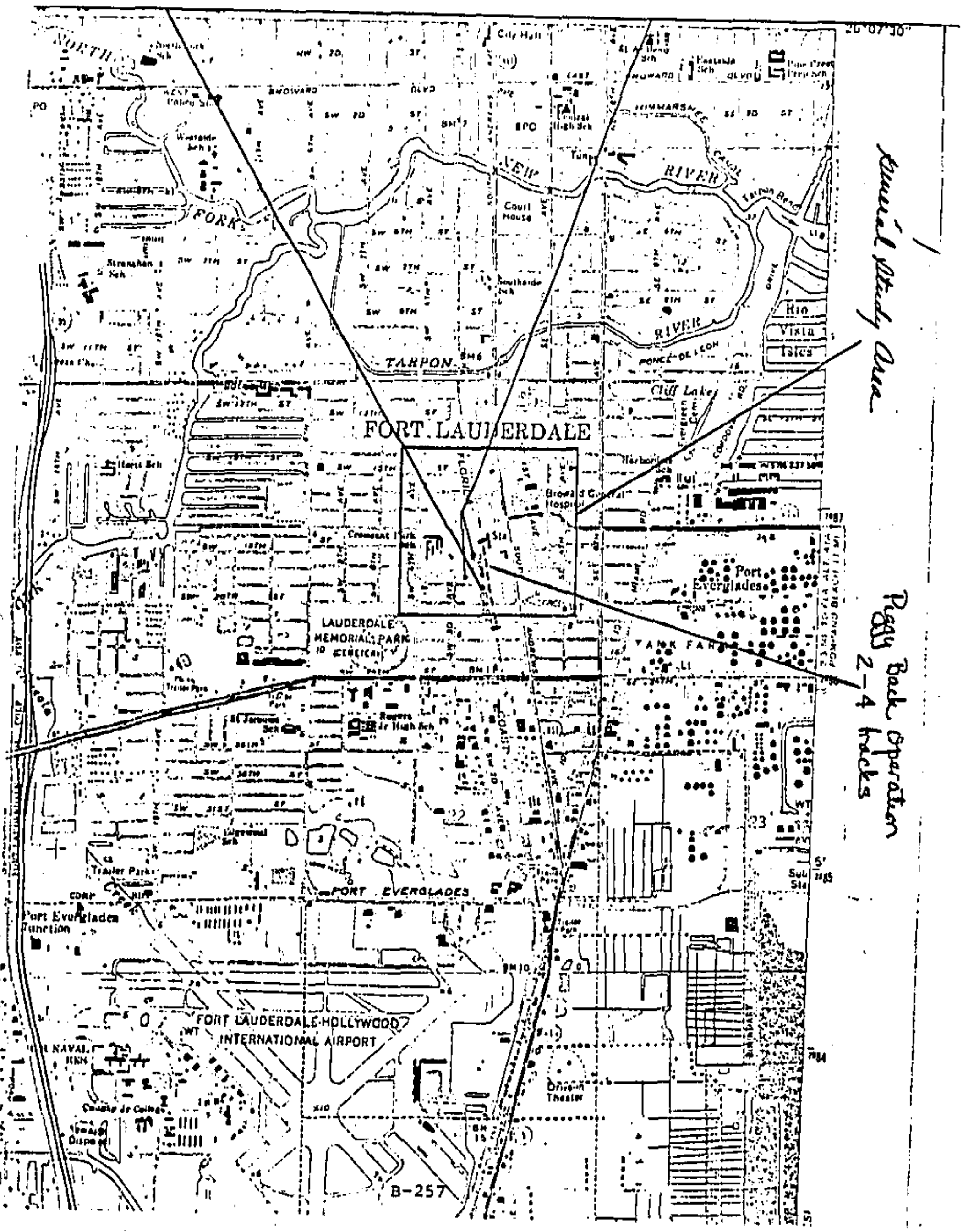
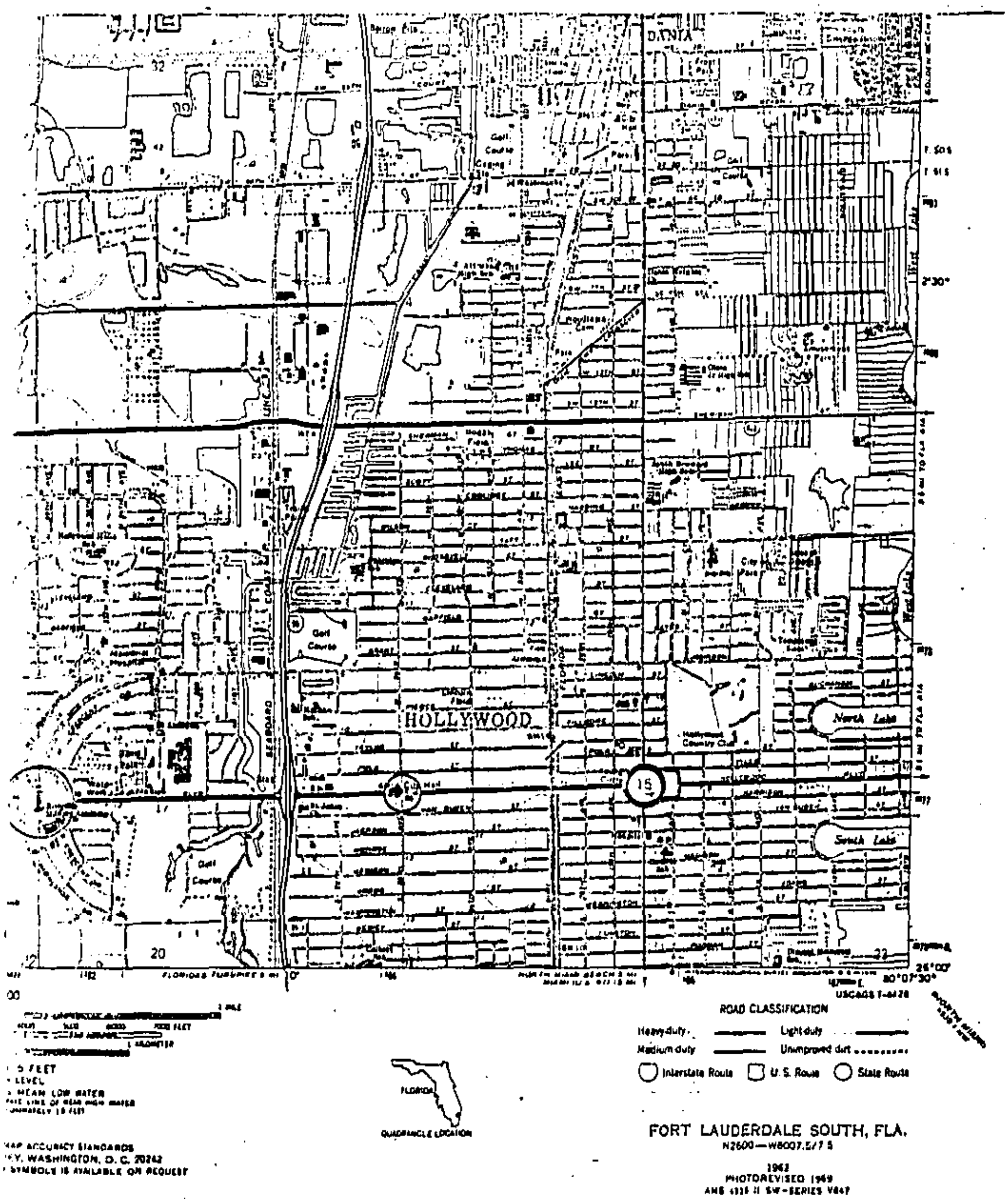






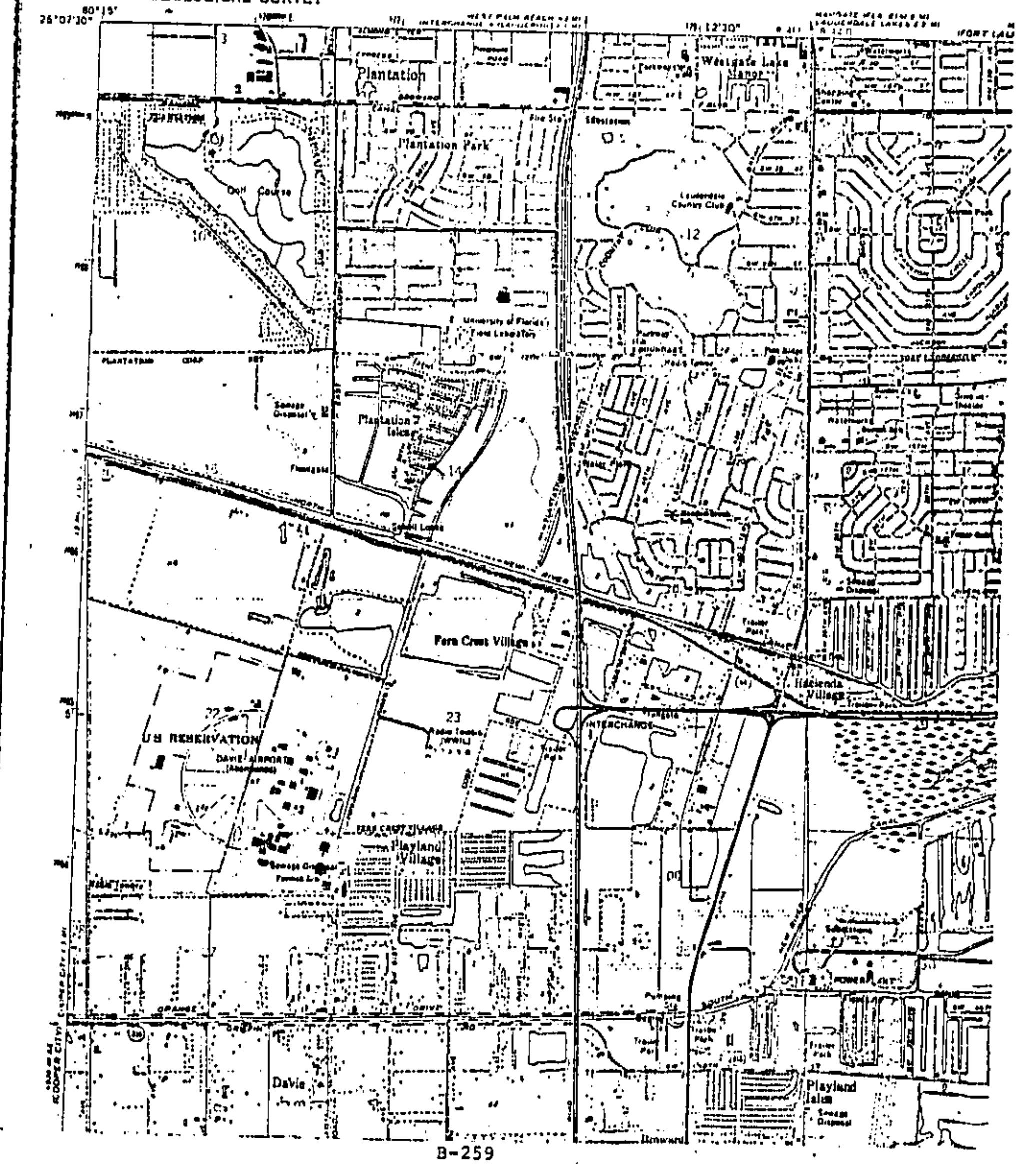
General Study Area

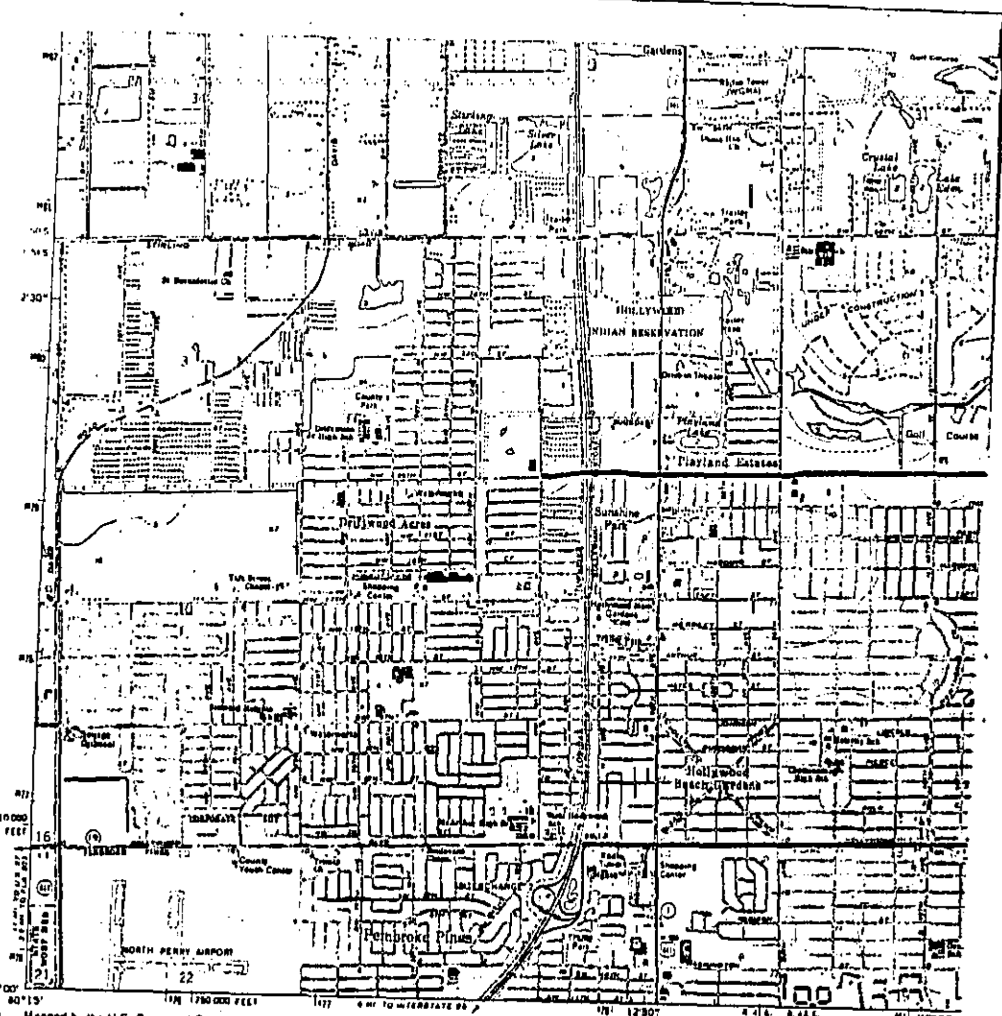
Piggy Back Operation 2-4 tracks



DANIA
HOLLYWOOD
North Lake
South Lake
Golf Course
SEABOARD
25°00'
80°07'30"
ROAD CLASSIFICATION
Heavy duty
Light duty
Medium duty
Unimproved dirt
Interstate Route
U. S. Route
State Route
FLORIDA
QUADRANGLE LOCATION
FORT LAUDERDALE SOUTH, FLA.
N2600—W8007.5/7.5
PHOTOREVISED 1969

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY





Mapped by the U.S. Coast and Geodetic Survey
Edited and published by the Geological Survey

Control by USGS, USC&GS, and Florida Geodetic Survey

Planimetry by photogrammetric methods from aerial photographs taken 1942. Topography by planetable surveys 1945
Revised by the Geological Survey from aerial photographs taken 1961
Field checked 1962

Selected hydrographic data compiled from USC&GS Chart 546 (1963)
This information is not intended for navigational purposes

Polyconic projection. 1927 North American datum
10,000-foot grid based on Florida coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks, zone 17, shown in blue

Red tint indicates areas in which only landmark buildings are shown

Dotted land lines established by State of Florida

Revisions shown in purple compiled by the Geological Survey in cooperation with State of Florida agencies from aerial photographs taken 1969. This information not field checked.

Purple tint indicates extension of urban areas

THIS MAP COMPLIES WITH NATIC
FOR SALE BY U.S. GEOLOGICAL
A FOLDER DESCRIBING TOPOGRAPHIC MAPS

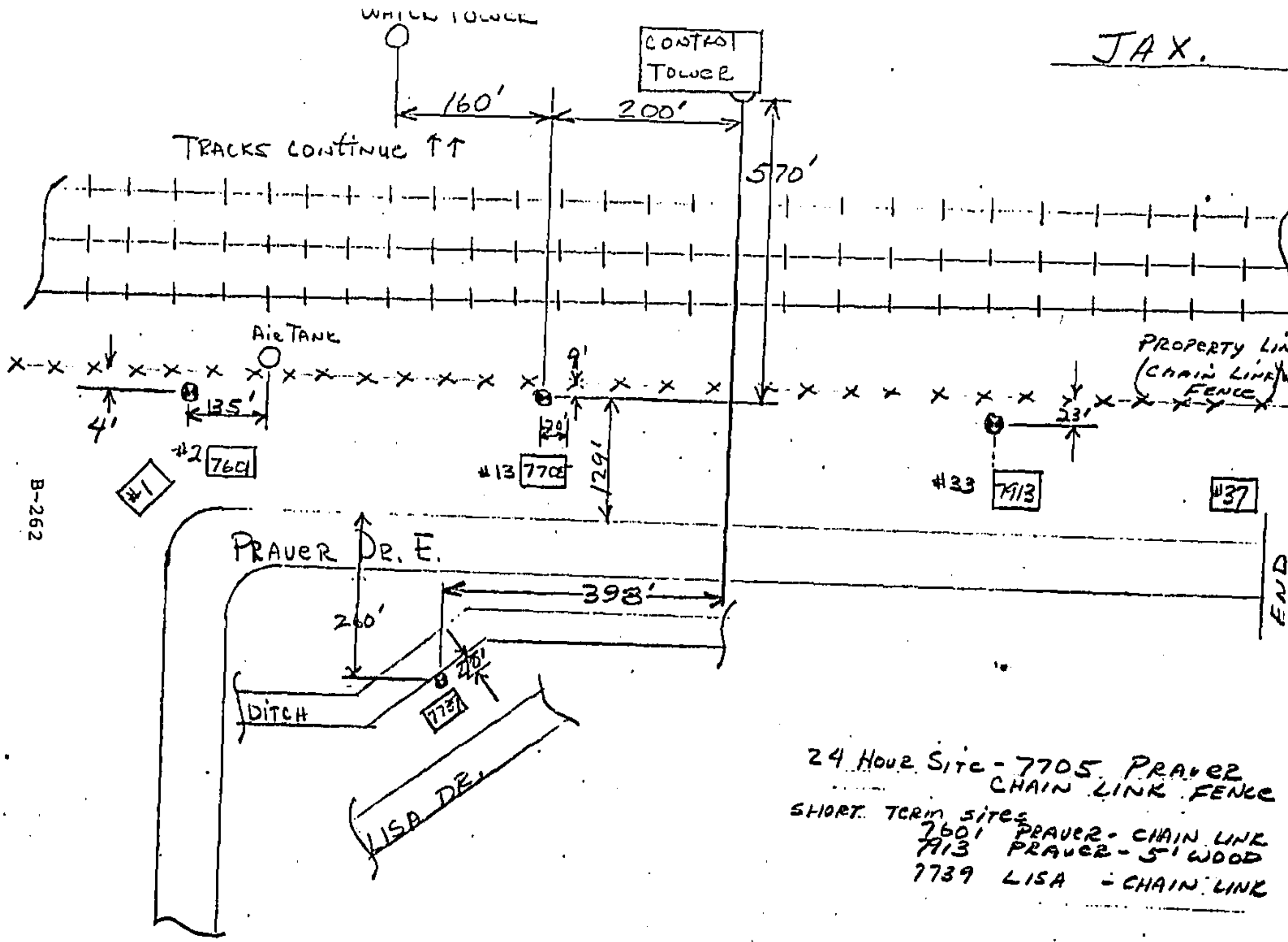
Jacksonville, Fla – Bowden Yards

This is a "clean" yard from the point of view of the RR methodology. The measured Ldn represents the RR activity at the 24 hour site.

L_{dn} = 67.24 dBA measured about 10 feet from the RR property line @ 7705 Praver

Twenty four hour site identified on aerial photo (white dot) 7705

JAX.


WATER TOWER
CONTROL TOWER
160'
200'
570'
TRACKS CONTINUE ↑↑
AIR TANK
PROPERTY LIN
(CHAIN LINK FENCE)
4'
135'
9'
20'
129'
23'
#1
#2 7601
#13 7705
#33 7913
#37
PRAVER DR. E.
398'
260'
20'
END
DITCH
7739
LISA DR.
24 HOUR SITE - 7705 PRAVER
CHAIN LINK FENCE
SHORT TERM SITES
7601 PRAVER - CHAIN LINK
7913 PRAVER - 5' WOOD
7739 LISA - CHAIN LINK

B-262

Twenty four hour site 7705 Praver
Microphone location 9 feet from RR property line

MONTH	DATE	TIME	STD DEV	L EQ	L 99	L 90	L 50	L 10	L 01	L .1	L 00
AUG.	15	1110	3.55	67.3	58	60	62	69	75	90	95
AUG.	15	1200	3.82	65.7	58	60	62	69	76	80	84
AUG.	15	1300	5.13	67.0	56	57	61	70	78	83	86
AUG.	15	1400	4.30	65.6	55	58	62	69	75	79	84
AUG.	15	1500	4.73	66.4	56	58	62	70	76	80	83
AUG.	15	1600	4.42	64.8	56	57	60	68	76	79	80
AUG.	15	1700	4.75	62.7	53	54	58	66	73	78	79
AUG.	15	1800	4.90	64.3	54	56	59	68	73	78	89
AUG.	15	1900	4.55	65.5	56	58	60	69	75	81	84
AUG.	15	2000	4.71	64.4	56	56	57	66	76	82	84
AUG.	15	2100	3.12	61.1	56	57	58	64	70	74	76
AUG.	15	2200	3.61	59.7	53	54	56	63	69	76	79
AUG.	15	2300	3.44	60.7	54	56	57	64	70	72	74
AUG.	16	0000	4.29	64.8	56	57	61	68	74	80	81
AUG.	16	0100	3.59	60.8	55	56	57	64	70	76	77
AUG.	16	0200	2.04	56.3	53	54	55	56	66	70	72
AUG.	16	0300	3.34	59.4	54	54	55	61	71	76	76
AUG.	16	0400	1.31	54.5	51	53	55	55	56	56	58
AUG.	16	0500	3.27	55.4	41	50	54	58	62	70	71
AUG.	16	0600	4.28	56.9	40	50	55	59	64	70	78
AUG.	16	0700	7.60	55.4	40	40	54	59	64	70	80

Jacksonville

Site 7913 Praver

ate & time	$L_{eq(1)}$	dB 602 L_{max}	L_1	L_{90}
8/15/78				
7:15-8 pm	58			
8-9 pm	59	76	68	48
9-10 pm	61	83	71	46
10-11 pm	52	65	60	45
11-12 pm	54	70	65	44
12-1 Am	55	75	67	44

Site 7739 Lisa

/78	$L_{eq(1)}$	B&K
12:21-1pm	56.5	
1-2	58.0	
2-3	55.7	See other data sheet for
3-4	56.9	all other L_n's
4-5 pm	59.4	

Site 7601 Praver

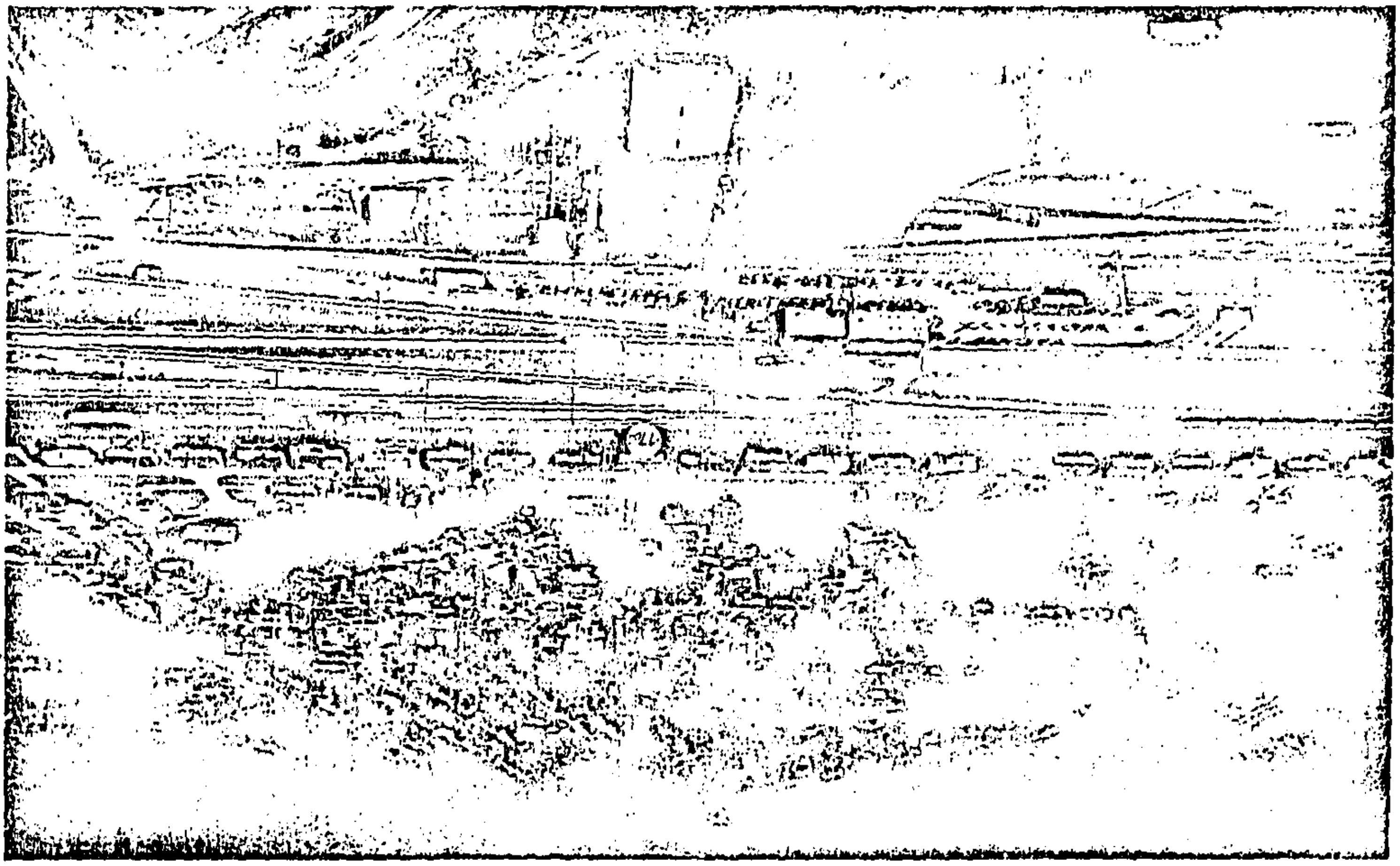
/78	$L_{eq(1)}$	dB-602 L_{max}	L_1	L_{90}
10 AM	51	67	59	47
11	58	79	68	49
12 pm	58	78	68	49
1 pm	61	75	71	48
2 pm	61	85	66	48
3 pm	60	82	70	47

7705 Praver

MONTH	DATE	TIME	STD DEV	L EQ	L 99	L 90	L 50	L 10	L 01	L .1	L 00
AUG.	16	0800	8.81	60.8	40	40	56	63	73	77	79
AUG.	16	0900	4.85	63.3	53	55	58	67	74	76	78
AUG.	16	1000	3.62	64.9	56	58	63	67	74	78	84
AUG.	16	1100	4.00	64.6	57	58	60	68	74	81	82

7739 Lisa

AUG.	16	1221	2.58	56.5	52	53	54	58	65	71	76
AUG.	16	1300	2.76	58.0	53	53	55	58	68	76	80
AUG.	16	1400	2.08	55.7	53	53	54	58	63	67	68
AUG.	16	1500	2.09	56.9	52	54	56	57	64	73	76
AUG.	16	1600	2.52	59.4	54	55	56	59	69	79	81
AUG.	16	1700	4.41	67.7	54	55	58	64	74	90	91



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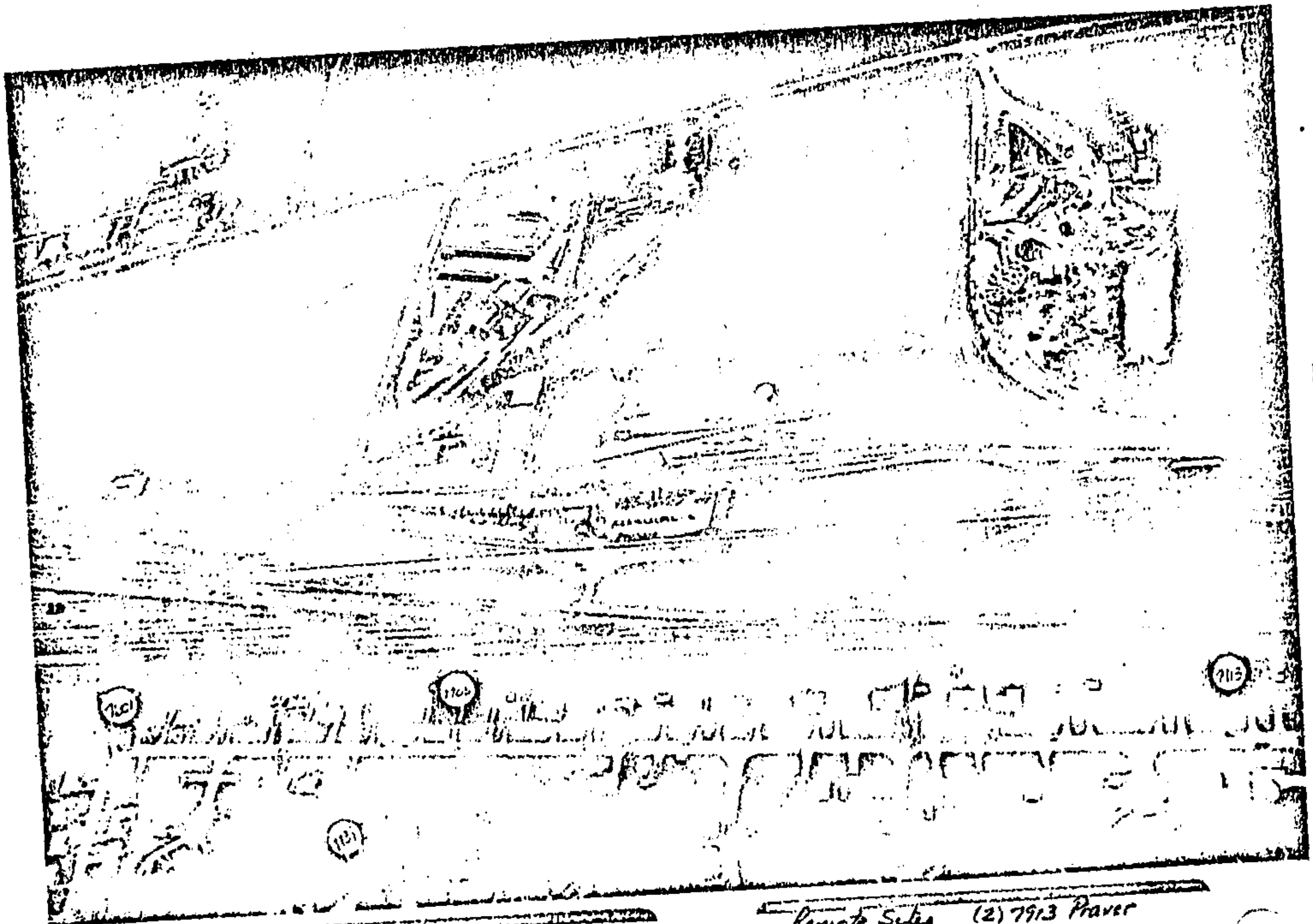
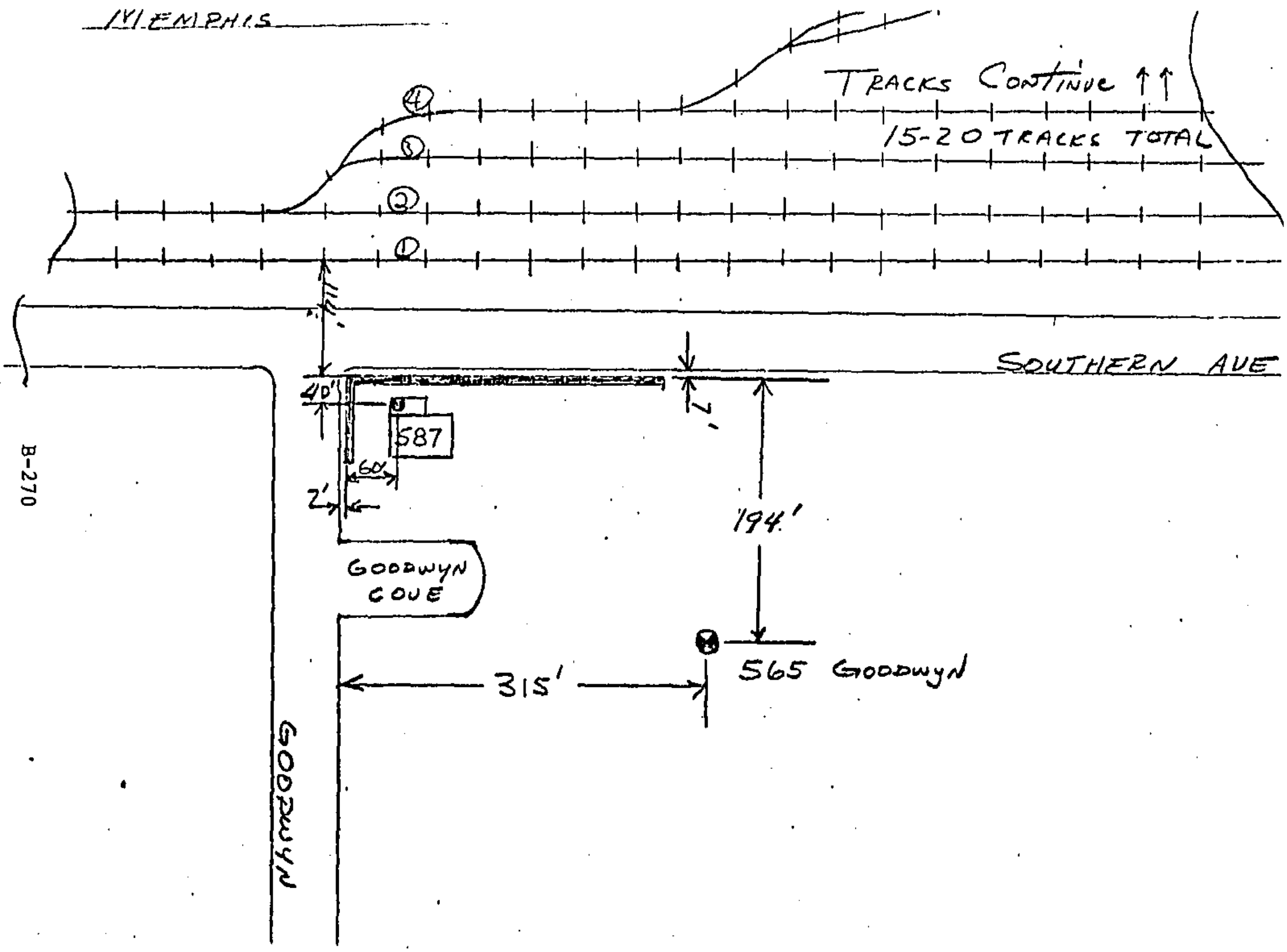


Jacksonville - Bowden Yard
Twenty four hour site (7705 Praver)

Remote Sites
(1) 7601 Praver
(2) 7913 Praver
(3) 7739 Lisa

Forrest Yard - Memphis
567 Goodwyn Cove
8/29/78 - 8/31/78
Activity Log

Time	Activity
10:00 - 11:00 am	Significant Switching Activities Little or no RR Activity
2:00 - 3:00 pm	Some Aircraft
3:00 - 4:00 pm	Some Aircraft
5:00 - 6:00 pm	Aircraft & Fire truck sirens
6:00 - 7:00 pm	no RR Activity
7:00 - 8:00 pm	no RR Activity
8:00 - 9:00 pm	Trains entering yard from east
9:00 - 10:00 pm	Heavy Switching
10:00 - 11:00 pm	Heavy Switching
11:00 - 12:00 am	Heavy Switching
12:00 - 1:00 am	No Switching
2:00 - 3:00 am	No Aircraft
4:00 - 5:00 am	Little Traffic
7:00 - 8:00 am	Begin morning traffic/Southern & Goodwyn
8:00 - 9:00 am	Switching Activities
9:00 - 10:00 am	Aircraft dominated


MEMPHIS
TRACKS CONTINUE ↑↑
15-20 TRACKS TOTAL
4
3
2
1
SOUTHERN AVE
40'
587
60'
2'
7'
194'
GOODWYN COVE
315'
565 GOODWYN
GOODWYN

B-270

567 Goodwyn Cove

Front Yard - Memphis

7/78	L_{eq}	L_{max}	$L_{.01}$	$L_{.1}$	L_{1}	L_{10}	L_{50}	L_{90}	L_{99}
2 pm	63.2	88	87	85	70	62	58	54	51
3 pm	64.9	86	85	83	75	67	61	57	53
4 pm	63.4	84	84	81	73	65	60	56	53
5 pm	66.7	89	89	85	77	68	63	60	58
7-8/31									
10-11 AM	59.6	79	76	70	67	63	58	53	50
-12	68.9	97	94	92	76	67	61	55	50
12-1 pm	58.8	80	77	71	66	61	57	53	49
1-2	59.0	74	74	71	65	61	58	54	50
2-3	64.7	92	92	89	66	62	58	54	50
3-4	61.6	82	81	79	73	62	58	54	50
4-5 pm									
5-6	70.8	91	90	89	85	69	62	58	54
6-7	62.5	85	85	83	69	64	60	55	50
7-8 pm	60.5	76	76	78	68	63	59	53	49
8-9	65.5	84	84	82	77	67	61	54	51
9-10	68.5	93	93	91	75	65	59	55	54
10-11	64.6	89	88	80	76	67	60	56	54
11-12	68.6	97	94	93	76	67	59	55	55
12-1	57.9	75	74	72	67	59	56	55	55
1-2	56.3	63	63	62	60	57	56	55	55
2-3	56.0	64	64	63	60	56	56	55	55
3-4	58.2	73	73	72	70	57	56	55	55
4-5	58.8	79	79	75	66	61	57	56	55
5-6	57.5	70	70	65	61	58	57	57	56
6-7	59.2	76	75	74	66	61	58	56	54
7-8	65.6	86	86	84	79	66	61	57	55
8-9	70.1	97	95	92	79	67	62	58	55
9-10	68.0	90	89	86	81	69	59	53	49
10-11	62.7	89	89	85	72	63	58	52	48
11-12	70.8	97	97	94	78	67	59	53	49
12-1	66.4	91	90	88	77	67	60	55	51

Forrest Yard - Memphis

567 Boodcoya Cove (L_{dn} = 69.51 all sources)
($L_{eq(18)}$ = 65.20 all sources)
($L_{night(9)}$ = 62.03 all sources)
($L_{day(14)}$ = 66.45 all sources)

Hours of High RR activity

11:00 AM – Noon	68.9 dBA	L_{eq} = 67.84
8:00 pm – 9:00 pm	65.5 dBA	
9:00 pm – 10:00 pm	68.4 dBA	
10 pm – 11 pm	64.6 dBA	L_{eq} = 67.05
11 – 12 midnight	68.6 dBA	

Component L_{dn} from RR Hours = 67.0 dBA
RR clearly not dominant

Microphone location relative to RR property line
120-130 feet

565 Goodwyn
Forest Yard - Memphis

8/30 - 8/31/78

Time	L_{eq}	L_{max}	L_1	L_{90}
10-11AM	58	74	64	55
11-12	60	82	66	55
12-1	57	75	63	55
1-2pm	57	70	61	55
2-3	57	78	61	55
3-4	61	84	72	55
4-5pm	63	84	74	55
5-6	66	88	78	55
6-7	60	84	68	55
7-8 pm	58	78	66	54
8-9	61	87	71	55
9-10	59	81	65	56
10-11	60	78	69	56
11-12pm	62	87	69	56
12-1	59	77	66	57
1-2AM	58	67	59	57
2-3	58	70	58	57
3-4	59	74	65	57
4-5	59	71	61	57
5-6AM	59	68	59	57
6-7	58	80	62	56
7-8	65	86	78	56
8-9	64	89	75	55
9-10	67	92	79	55
10-11AM	—			

L_{dn} = 66.26 all sources

L_{dn} = 60.80 RR Component

2

565 Boxdwyn

L_{dn} = 66.26 all sources
$L_{eq(24)}$ = 61.32 all sources
$L_{night(9)}$ = 59.30 all sources
$L_{day(15)}$ = 62.2 all sources

11:00 - 12 noon	60.0	L_{eq} = 60.08
8 - 9 pm	61.0	
9 - 10 pm	59.0	
10 pm - 11 pm	60.0	L_{eq} = 61.11
11 pm - 12 midnight	62.0	

Component L_{dn} from RR Hours = 60.80 dBA
RR Noise clearly not dominant

Microphone location relative to RR property line 320 - 330 feet (Not direct line of sight)

565 Bordwyn L_{dn} = 66.26 all sources

$L_{eq(24)}$ = 61.32 all sources

$L_{night(9)}$ = 59.30 all sources

$L_{day(15)}$ = 62.2 all sources

11:00 - 12 noon	60.0	L_{eq} = 60.08
8 - 9 pm	61.0	
9 - 10 pm	59.0	
10pm - 11 pm	60.0	L_{eq} = 61.11
11pm - 12 midnight	62.0	

Component L_{dn} from RR Hours = 60.80 dBA
RR Noise clearly not dominant

Microphone location relative to RR property line 320 - 330 feet (Not direct line of sight).

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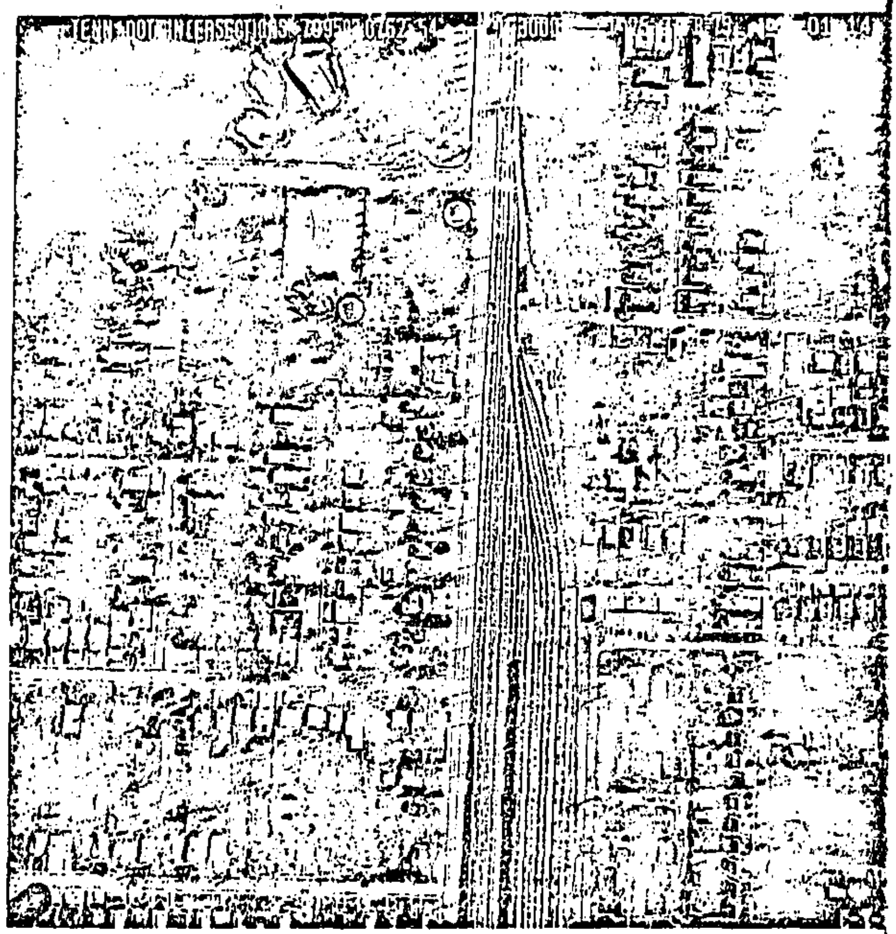


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: September 18, 1978

SUBJECT: Railroad yard noise measurements made at Potomac railyard in Alexandria, Virginia

FROM: Alan J. Hicks, Engineer
Region I Noise Program

TO: William Roper, Chief
Surface Transportation Branch
Office of Noise Abatement & Control (AW-471)

A series of noise measurements were made near the Potomac Railyard in Arlington, Virginia by the writer and Mr.James Orban of Region 4. In general, the area of the yard is heavily impacted by noise from highways such as U. S. Route 1 and, to a lesser degree by Washington National Airport. A residential/educational site was located, however, that was sufficiently far from major roadways and air traffic to be dominated by railyard noise during part of the day.

Yard Description and Measurement Location

The Potomac yards extend from the area of National Airport in Arlington, Virginia southward into Alexandria, Va. as shown on the USGS map excerpt in Figure 1.

Although the yard contains a hump and retarders, very little noise impact was noticed at that area of the yard due to high existing background levels.

The site selected for 24-hour measurement was the yard of the George Washington High School in Alexandria. The site is adjacent to and representative of a group of multifamily residences. Major railyard sources noted in a preliminary investigation were switching locomotives, moving railcars and coupling impacts. Aircraft and occasional automobile passbys constituted the major non-rail sources. A rough sketch of site relationships is included in Figure 2.

Measurement Procedure

Preliminary measurements were made on August 24, 1978 from 01:00 to 06:00 with a Metrosonics dB-602 Noise Level Analyzer. These measurements are recorded in Figure 3.

Detailed measurements were made for the period from 14:00 on August 24, 1978 to 14:00 on August 25, 1978. Again, a dB-602 unit was used. Statistical descriptors were read from the unit during the last minute of each hour. These measurements are recorded in Figure 4. Samples were taken sixteen times per second. Noise events were noted and recorded in the log (Appendix A).

Results

The computed Ldn for this yard is 68 dB. Corrections were made to hourly

EPA Form 1320-6 (Rev. 3-76)

Leq's to eliminate effects of through trains and other sources. These non-railyard sources, however, did not contribute substantively to the hourly Leq values.

The most annoying aspects of the noise from this yard were not reflected in the Leq or Ldn values. Neither the coupling impacts nor the low-frequency rumble are picked up in the hourly Leq.

Noise Abatement Measures

Subjective noise impacts could be substantially reduced at this yard by restricting activities to areas where distance and masking from other sources exist. Alternatively, restrictions on yard operations (at least at the southernmost end of the yard) to daytime hours would minimize the sleep disturbance caused by high-level coupling impacts.

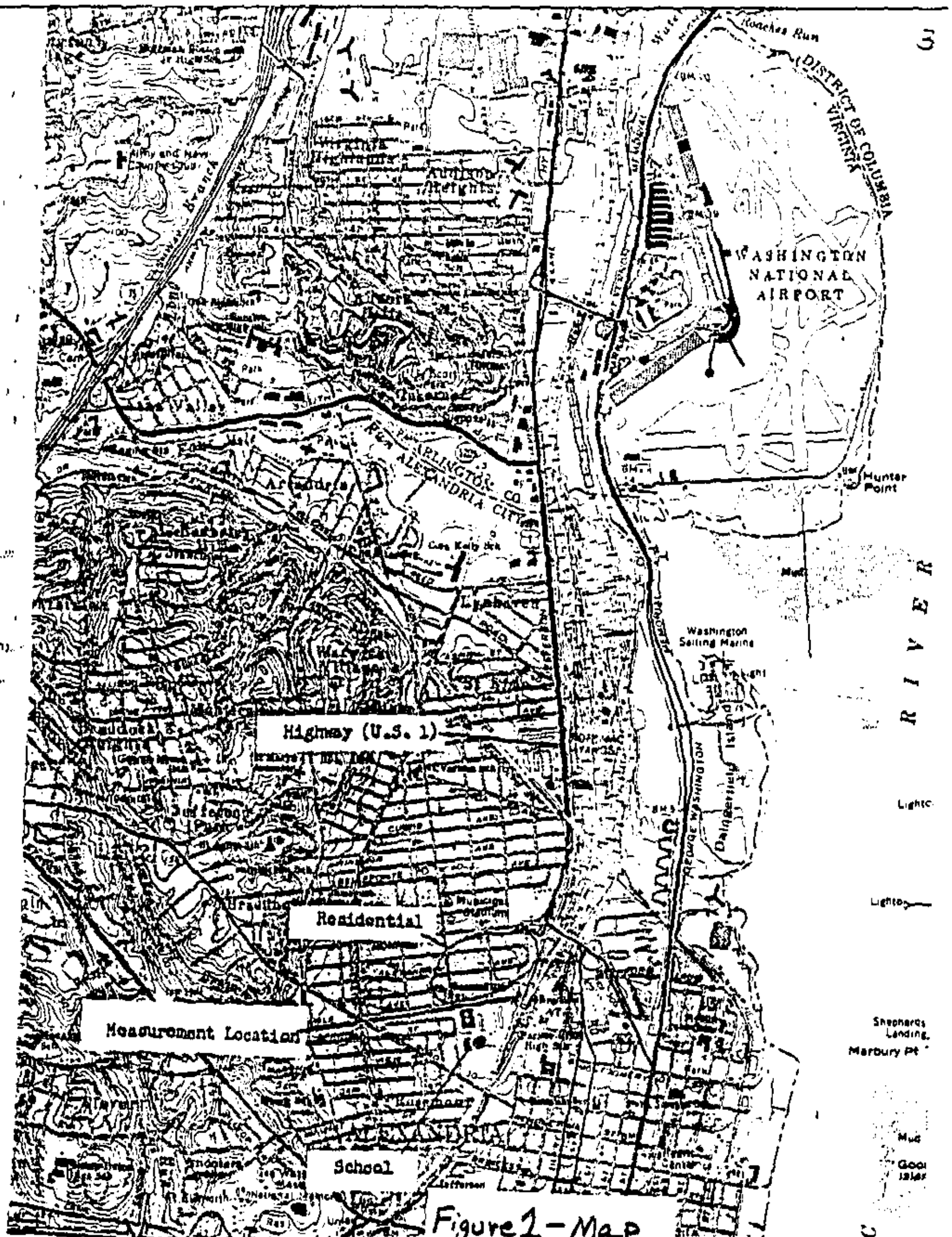

WASHINGTON
NATIONAL
AIRPORT
DISTRICT OF COLUMBIA
VIRGINIA
Hunter Point
Washington Sailing Marina
RIVER
Highway (U.S. 1)
Residential
Measurement Location
School
ALEXANDRIA
ARLINGTON CO
ALEXANDRIA CITY
Shepherds Landing
Marbury Pt

Figure 1 - Map

FIGURE 2 – Preliminary Measurements

SITE LOCATION: George Washington High School Yard, Alexandria, VA

START TIME: 01:00 8/24/78 STOP TIME: 06:00 8/24/78

METER TYPE: metrosonics dB-602 SERIAL NO. 1120 MIC GR-1972 SERIAL NO. 4144

OBSERVERS: A. Hicks, J. Orban CALIBRATION: 114 dB @ 1KHz, GR-1562A, S/N 4768

WEATHER: Clear, humid, no wind, see log

REMARKS: Locomotives, car impacts, see log.
Low frequency noise generated by locomotives.
Linear measurements on Quest 215 SLM read 20dB higher than "A".

Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}		Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	
01:00	60	63	60	56	79	53								
02:00	59	65	61	50	72	49								
03:00	59	65	60	47	86	45								
04:00	63	71	64	50	81	48								
05:00	65	70	63	53	95	50								

FIGURE 3 - Site

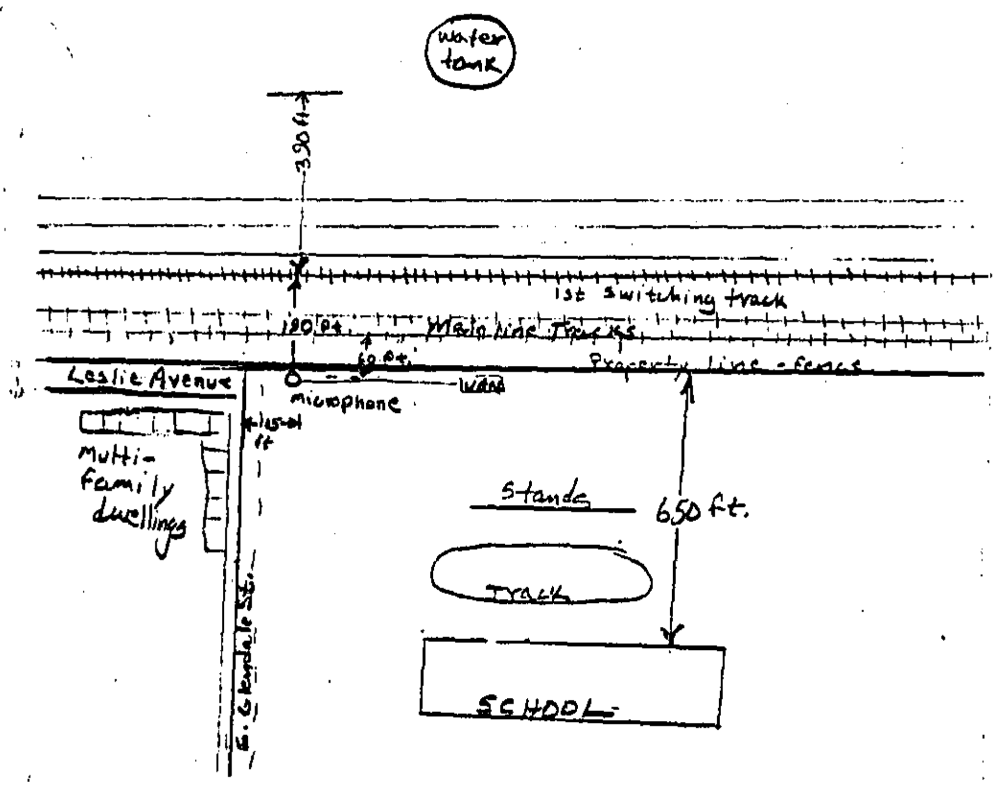


FIGURE 4

SITE LOCATION George Washington High School Yard, Alexandria, VA

START TIME: 14:00 8/24/78 STOP TIME: 14:00 8/25/78

METER TYPE: Metrosonics dB-602 SERIAL NO. 1120 MIC GR-1972 SERIAL NO. 4144

OBSERVERS: J. Orban, A. Hicks CALIBRATION: 114 dB, 1 KHz, GR 1562A S/N 4768 @ 13:30 8/24 and 14:10 8/25.

WEATHER: Clear, warm, low wind, no rain, see log

REMARKS: dB-602 operating @ 16 samples/second. 59 1/2-minute hours. Data readout in last 1/2-minute.

Ldn = 68.

Corrections for non railyard noise do not significantly affect hourly Leq's at this site.

Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}		Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}
14:00	64	68	59	47	91	45		02:00	64	76	63	51	91	50
15:00	56	65	60	43	81	40		03:00	62	70	65	53	86	51
16:00	52	60	54	43	70	40		04:00	59	67	64	52	77	51
17:00	59	69	62	44	78	41		05:00	60	67	62	54	84	53
18:00	64	73	65	44	90	42		06:00	65	76	60	54	96	53
19:00	68	82	64	48	91	43		07:00	65	77	68	53	96	51
20:00	61	68	62	48	88	44		08:00	68	75	65	54	95	51
21:00	62	68	63	50	88	50		09:00	61	76	61	50	95	47
22:00	64	76	59	52	90	51		10:00	60	64	61	49	89	47
23:00	56	64	57	51	73	59		11:00	60	64	61	49	75	46
00:00	57	64	58	51	73	50		12:00	54	64	60	46	76	43
01:00	61	73	63	50	77	47		13:00	58	68	61	47	76	44

Appendix: Log

Potomac Yard

Set up Region I db602 w/
GR Mike #125 feet of cable
at 12:52 AM.
16 samples/sec.
fast response setting
Start at 1:00 AM 8/24/78
Calibrated system - OK

Setup Quest type II w/remote mike for
single event identification.

0100 - 0153 Idling locos, occasional coupling impacts
0135 - weather: 78°F, RH 77%, Wind 0, P=759 mm
0153 - Reset
0225 - Nearby diesel removed. Levels dropped to ca. 53 dBA
0240 - Horn, 1/2 sec 58 dBA
0253-0259 Engine + cars leaving area ca. 65 dBA, 82 dBC
0259 - Reset
0357 - 0359 Thru freight - inhibited data 65 dBA
0359 - Reset
0411 - cars moving in yard 59-60 dBA not thru

0413 Thru freight 67dBA, duration: 2min 5sec.
0424 Engine 4 cars not sure if thru 68-70dBA
40 seconds.
Retarder squeal faintly audible. Does not affect meter.
0431 Engine stopped near site, idling @ 63dBA
84 dBC.
0459 - Reset
0512 - Short horn blast.
0521 - Idling Loco. moved down - car noises
- some 'slack take-up' impacts
0531 - continued 'slack' impacts
0552 - thru train ≅ 67dbA for 30sec.
0533 - Activity - Low
0604 - Idling Sou. R.R. p/u ≅ 56-58dbA
0605 - p/u off - Level same - idling loco.
0615 - p/u restarted & left. did not
Affect Level on meter,
0622 - dismantled site

8/25/78

14:02 Started Measurement Again
using Reg. I Metrosonics w/ ½" GR microphone

on 100' Cable, Have set up Quest #215 slm w/ Remote microphone to help identify ~~single~~ single events. Both systems calibrated ok. Weather - Clear

16 samples/sec. fast   Wind - 3-4 mph

14:20 Idling locos in background
14:26 Loco passing (slow) 68dBA 84dbC
14:28 Train pull out - slow
14:49 pretty quiet - Asked some kids who who were about to play baseball nearby to go elsewhere. They did.
14:53 Thru train 84-86dBA for 12sec.
15:10 Another train pulls out ≅64-66dbA, 86dbC
— Rumbling car noise, not locomotive —
15:16 Rail crane went by 66-68dBA
15:48 " " " " 56 dBA
15:20 Loco in yard
16:31 Rail crane 56-58 dBA, Barking dog @ 200 ft., 54 to 61 dBA, intermittent
16:48 Loco and cars return. North of site. low 50's
16:49 " " " leave to north

1652 - 4 locos @ 150 ft. 56 dBA max

1703 - Small twin-engine ac overflight @ 72 dBA max - approx 1.0 min

1710 - Jet overflight 60-72 dBA, approx 40 seconds bird quiet.

1723 - Engine + cars 68-74 dBA

1724 - Jet A/C overflight 65-68 dBA

1726 - Engine 68 dBA, car impacts > 70 dBA

1730 Observation: this hour, aircraft noise dominates although yard is active.

1806 - Amtrak thru train 6 seconds 2 Engines 84 dBA, cars 76 dBA

1809 - Amtrak thru train 6 seconds duration, Max 85 dBA

1849 - locomotive pulling out a train. some squealing as they go across switches

1915 - Thru freight 83-85 dBA for 40 sec.

1932 - Train being pulled out - south - on 4th track in

1950 - Loco on 8th track 63 dBA
Amtrak thru, Max 90 dBA, 13 seconds.

2117 4 locos & cars moving slowly on 6th track over 67-68 dbA

2159 Amtrak Thru 87 dBA max shown 7 sec.

22:00 - 22:21 Ice cream vendor w/ bell 56-58 dBA occasional aircraft; ~~[illegible]~~ dBA

22:24 Three locos + railcars entering from south 7th track 59-60 dBA

22:25 Amtrak thru, 85 dBA max, 10 seconds

22:51 Amtrak thru 85 dBA max, 8 seconds

23:02 Locos + railcars entering yard from south, 6th or 7th ~~[illegible]~~ tracks. 52-56 dBA, loco idling to north of site.

23:09 train stops in yard.

0043 Switching activity - locomotive noise

0100 " " " "

0200 " " " " intermittent

0351 " " " " regular, idling

0353 Locos & cars leaving area headed north.

0459 Switching activity - Locos, car impacts

0604 - Thru Amtrak, Max 86dBA, duration 22 seconds.
0637 - Ditto 84dBA, 12 seconds
0704 - Passenger train passing 18 sec.
loco 84dbA cars 72-74dbA
0705 - First jet of the day
0807 - Amtrak thru, max 85dBA, duration 12 seconds.
0819 Southern Crescent 88dbA engine 77-78dbA cars, 18 sec. duration
0831 4 idling Southern Locomotives then slow passing
Note: Very Little Horn Blowing by the Railroad here.
0800 3 idling locos. at ≅240'
58dbA 80dbC
0909 Thru Train 5 sec. Max 86dbA
0941 No Railroad Activity nearby
winds gusting 4-7 mph 83°F, RH 63 %
P = 758 mm
1020 no rail activity
1021 Amtrak thru, near track 88 dBA max, 18 seconds

1051 - Three RF&P Locos in yard lined with cars on 4th track

1052 - Loco on 5th track pulling cars southbound. Combined level 60-63dB

1200 Very little activity here at this time.

1225 Idling Loco about 8 tracks over ≅ 54dBA - also shielded by cars

1227 gone - dropped to 46-48

1235 3 RFP locos on ≅ 7th track. Slow speed cruise by 62-63dBA

1358 Slight activity

1450 Packed it in.

M E M O R A N D U M

FROM: G.A. Russell
Noise Consultant

DATE: August 23, 1978

TO: A. Hicks
Noise Representative
EPA Region I

SUBJECT: West Springfield, Massachusetts Railroad yard noise measurement.

INTRODUCTION

This memo describes the results of a series of noise measurements carried out at several locations adjacent to the railroad yard facility in West Springfield, Massachusetts. The measurements were made by the writer, the addressee, and Mr. Tom O'Hare (U.S. EPA Region II Noise Representative) on August 15 and 16, 1978. The purpose of the measurement program was to determine representative railroad yard noise emission data to be used by EPA-ONAC in setting a railroad yard noise regulation.

YARD DESCRIPTION AND MEASUREMENT LOCATIONS

The location of the West Springfield yard is shown on the USGS map of Figure 1. Land usage around the railyard and the three measurement locations are indicated on Figure 2. The railyard is a flat (classification) yard handling essentially only freight cars and has no locomotive test stands or major repair facilities. In particular, there are no retarders in this yard. Major yard noise sources are summarized in Table 1:

TABLE 1 MAJOR IDENTIFIABLE YARD NOISE SOURCES

SOURCE	DESCRIPTION
Car impacts	Coupling of cars, particularly "coasting" couplings. As loud as 98 dBA at about 200 ft, significant startle effect.
Switcher locos	80 to 85 dBA at about 150 ft on driveby, less when idling.
Wheel Squeal	75-80 dBA at about 200 ft. Mostly at switches.
Reefer car	About 60 dBA at 150 ft, easily attenuated by blocking cars.

Three measurement locations were employed. Two of these were located at the Cashman residence on Lowell Avenue, property which abutted the railyard, and the third was located approximately at the intersection of Cold Spring Avenue and Windsor Street. Sketches of these locations are shown on Figures 3 and 4. The microphone location in the side yard of the Cashman residence (Location 1) was used for continuous monitoring while the remaining two locations (mobile sites) were monitored intermittently. Location 1 provided an ideal measurement site in that it gave an unobstructed view of a large portion of the railyard and was controlled almost exclusively by railyard noise. Location 2 (mobile site on Lowell Avenue in front of the Cashman residence) was dominated at times by automobile traffic. Location 3 (Cold Spring Avenue) was adjacent to a relatively inactive portion of the railyard and not particularly noisy.

MEASUREMENT PROCEDURE

After an initial survey of the railyard, Location 1 was selected as the site to be continuously monitored for 24 hours. A Metrosonics 602 Noise Analyzer was set up and calibrated and data logging initiated at 11:00 a.m. of 15 August 1978. Results were recorded every hour and an inhibit switch (manually activated) was used to exclude unwanted noise events from the record. Serial number and calibration information for this 24 hour run are given on the attached data sheet. In addition to recording the output of the Metrosonics at 60 minute intervals, a comment log was also maintained (attached) to document the various railyard activities.

Locations 2 and 3 were monitored at various times during the 24 hour period beginning at 78:08:15:11:00. These intermittent measurements were of short duration (usually 15 minutes) and made with a second Metrosonics 602 instrument. Strip chart recordings of the A-weighted SPL were also taken at Locations 2 and 3 during several of these short duration measurement periods.

Weather conditions during the 24 hour monitoring period were seasonal, if somewhat hot and humid. No major difficulties with the equipment or the measurement procedures used were encountered during the survey.

RESULTS

Hourly results from the 24 hour duration measurement at Location 1 are tabulated on the attached data sheet and plotted on Figure 5. Note that the graphical representation of Figure 5 does not follow the usual diurnal variation of residential area noise climates. That is, the noise climate at this site is dominated by railyard activities, a conclusion which is substantiated by the comment log maintained during the measurement period. Composite noise levels based on the 24 hourly read-outs are summarized in Table 2 below:

TABLE 2 LOCATION 1 COMPOSITE NOISE LEVELS

INDICATOR	dBA LEVEL
LEQ(24)	64.5
LDN	69.1
Peak hour L10	68

Results from the intermittent measurements taken at Location 2 are summarized in Table 3 below:

TABLE 3 LOCATION 2 NOISE LEVELS

SAMPLE TIME	NOISE LEVEL INDICATOR, dBA				
	LMAX	L1	L10	L90	LEQ
8:15:11:05 - 11:20	77	73	65	50	63
8:15:13:00 - 13:12	86	76	70	50	67
8:15:15:50 - 16:20	76	65	57	51	56
8:16:09:08 - 09:23	83	70	63	51	61

Results from the intermittent measurements taken at Location 3 are given in Table 4.

TABLE 4 LOCATION 3 NOISE LEVELS

SAMPLE TIME	NOISE LEVEL INDICATOR, dBA				
	LMAX	L1	L10	L90	LEQ
8:15:21:00 - 21:15	59	57	54	52	54
8:16:03:30 - 04:00	73	65	53	51	56

In general, the LEQ values measured at Location 2 agree relatively closely with the hourly LEQ values recorded at Location 1. The LEQ values measured at Location 3 appear to be somewhat lower although the limited number of readings taken makes any interpretation questionable.

Actually the LEQ levels, whether hourly 24 hour composite, do not adequately indicate either the nature or the extent of the noise impact at these locations. The very loud "bangs" and "crashes" due to the car couplings (at any and all hours of the day and night) can be startling and annoying. But because of the very brief duration of these loud impact noises (of the order of milli-seconds), they increase the LEQ values only slightly.

The above remarks together with the attached sketches, data sheets, and graphs should constitute an adequate record of the noise measurements which were made. If additional information or commentary is needed, please contact me at 413-545-0949.

G.A. Russell

G.A. Russell

GAR:njp

Attached: Figures 1 - 5
Location 1 data sheet
Location 1 comment log

cc: Tom O'Hare, Region II
Donna Williamson, ONAC
Byron Keene, Region I

FIGURE 1 USGS map of West Springfield railyard area

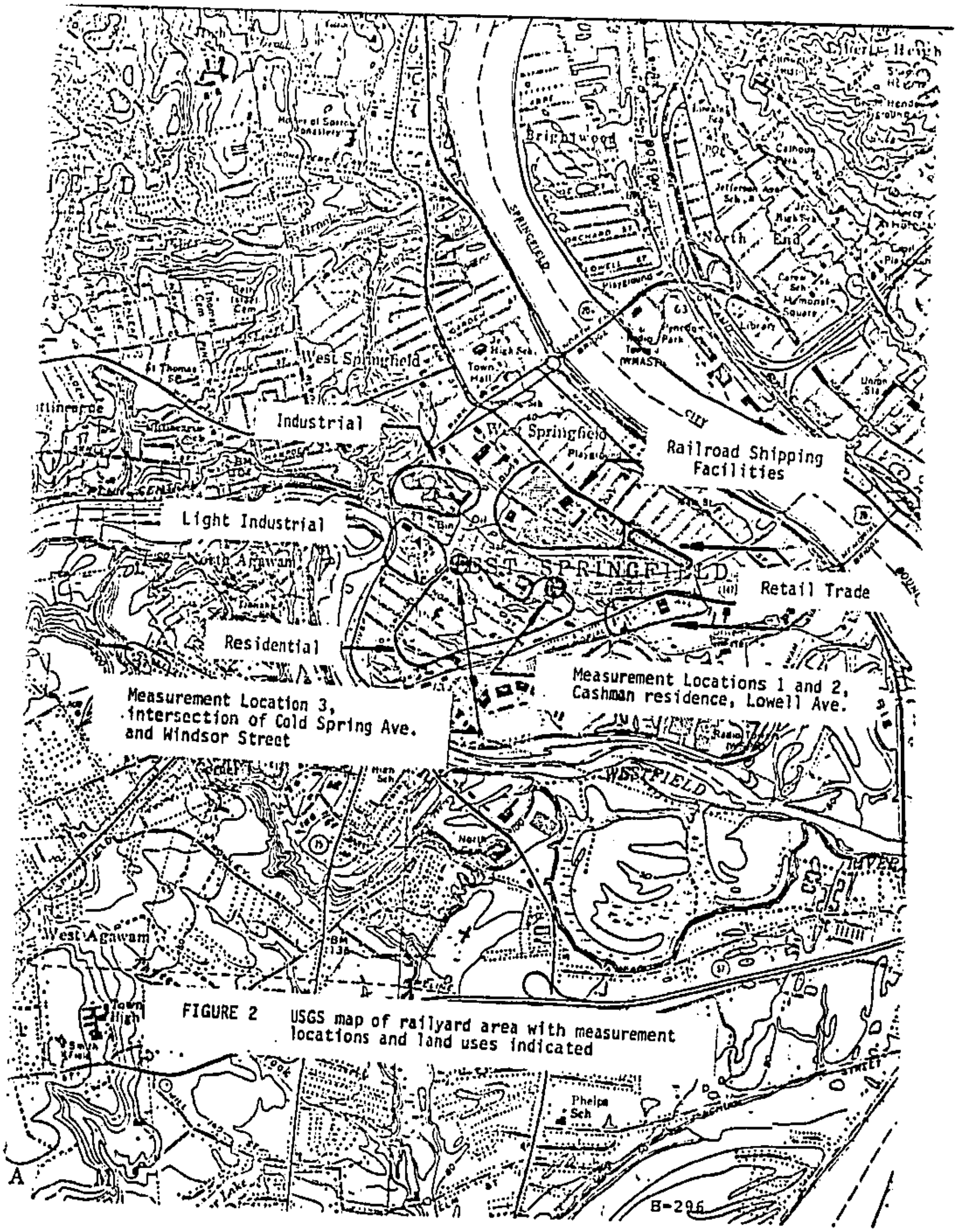


FIGURE 2 USGS map of railyard area with measurement locations and land uses indicated

FIGURE 3 Sketch of measurement locations 1 and 2, Cashman residence, Lowell Ave.

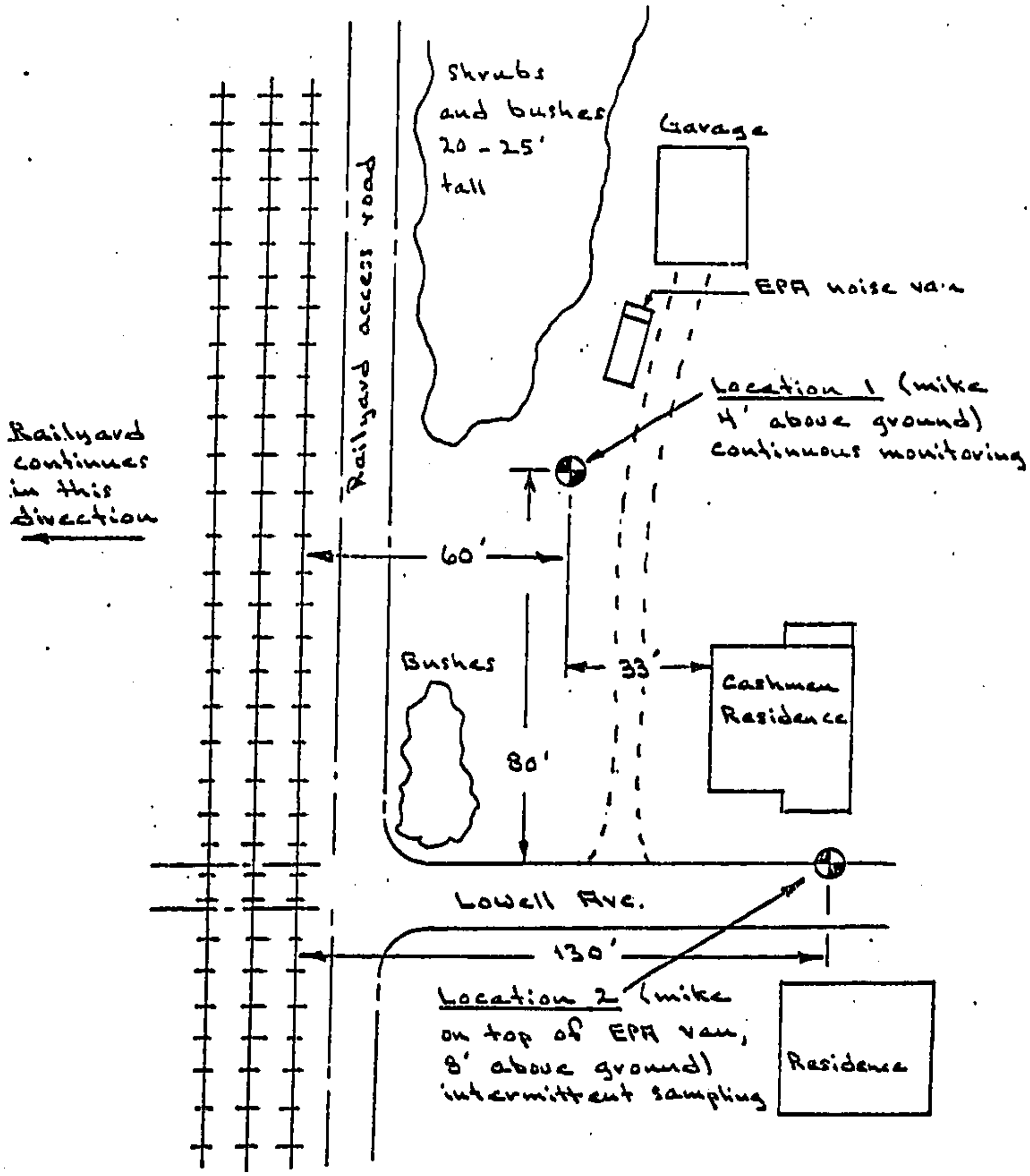
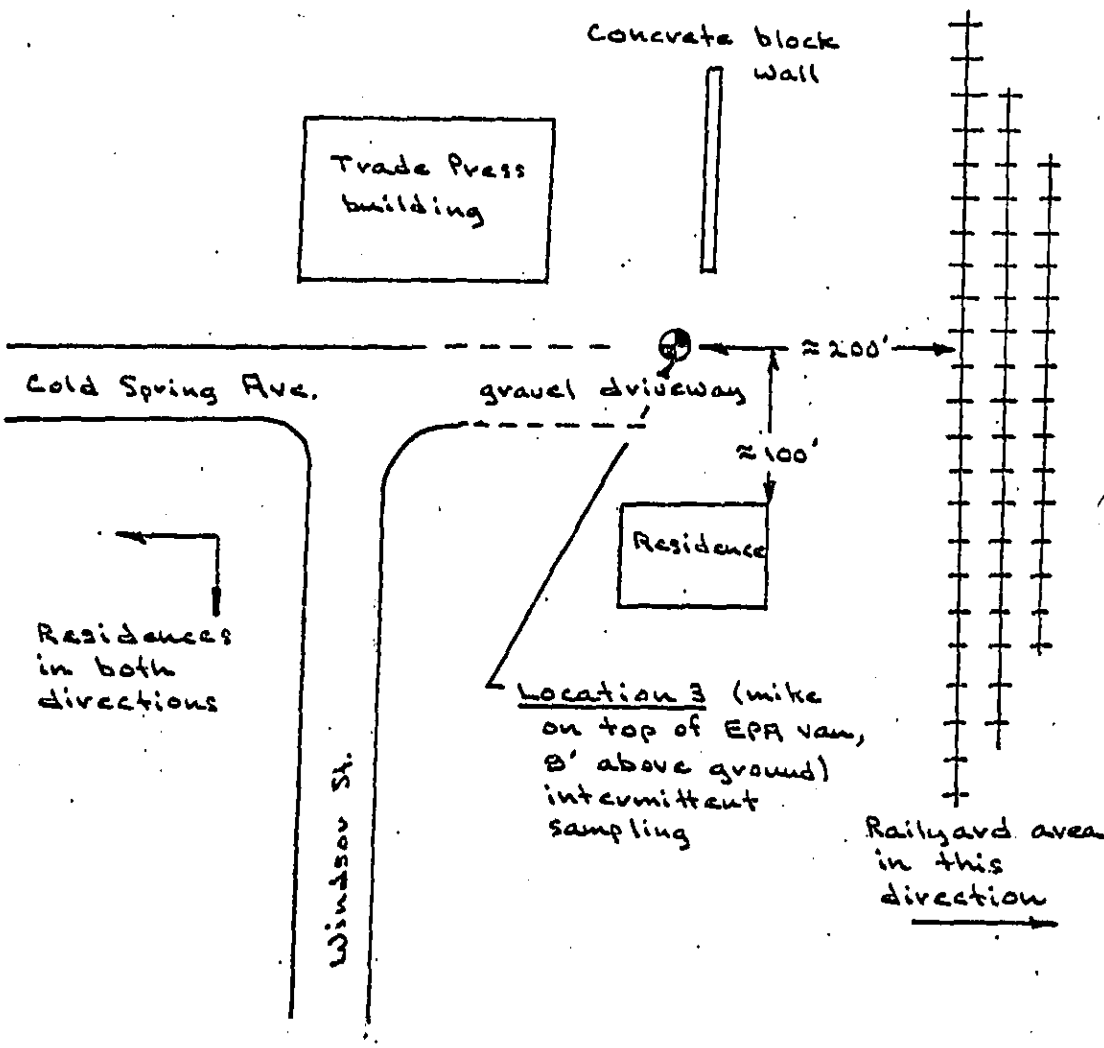
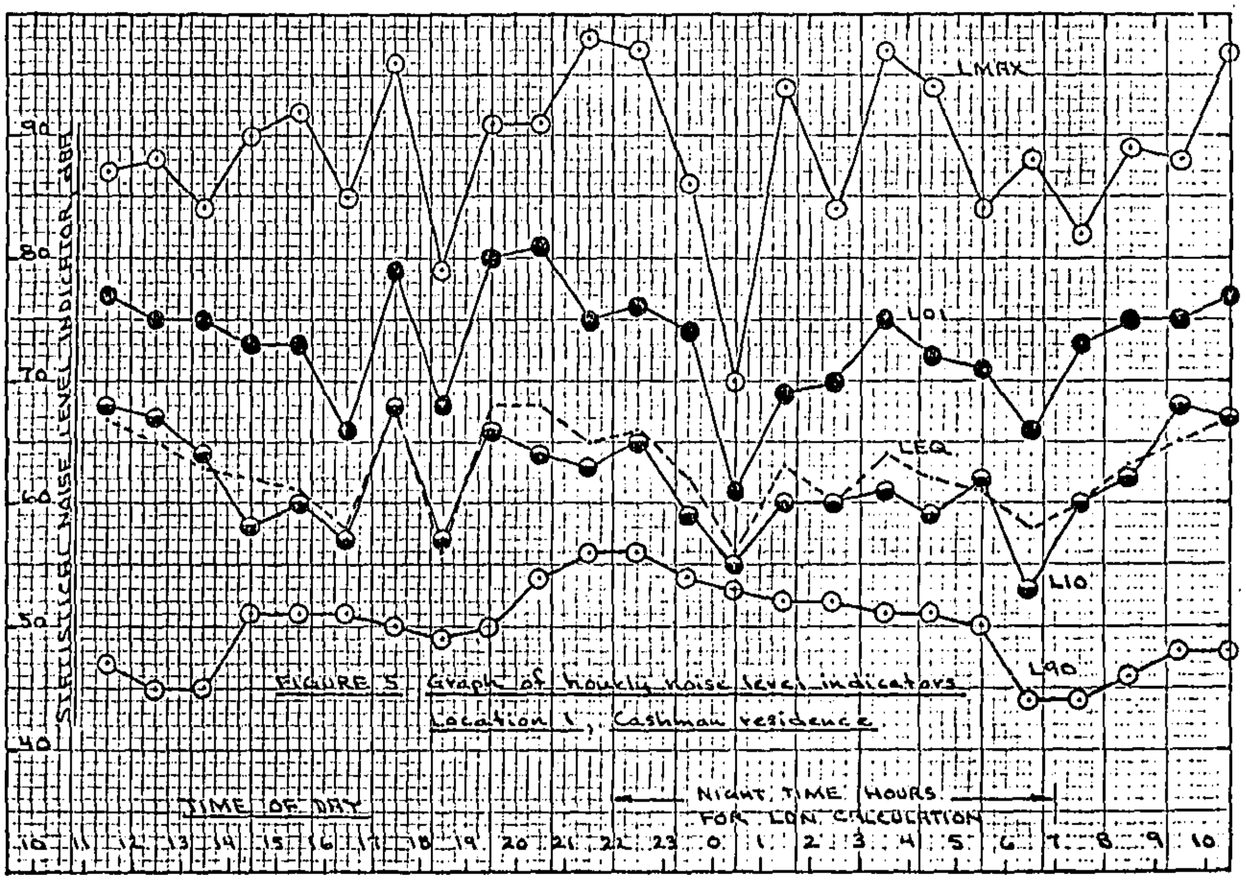


FIGURE 4 Sketch of measurement location 3., Cold Spring Ave. & Windsor St.





STATISTICAL NOISE LEVEL INDICATOR dBA
90
80
70
60
50
40
LMAX
L01
LEQ
L10
L90
FIGURE 5 Graph of hourly noise level indicators
Location 1, Cashman residence
TIME OF DAY
NIGHT TIME HOURS
FOR LDN CALCULATION
10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 2 3 4 5 6 7 8 9 10

B-299

SITE LOCATION Location 1, Cashman residence

START TIME: 78-08-15-11-00 STOP TIME: 78-08-16-11-00

METER TYPE: Met. 602 SERIAL NO. 1120 MIC GR-1972 SERIAL NO. 4144

OBSERVERS: RH, TOH, GBR CALIBRATION: 114 dB at start, 115 dB at stop, GR 1562A calibrator

WEATHER: 85°F, hazy, no wind, 67% RH, 761 mm Hg at start

REMARKS: 82°F, clear, no wind, 79% RH, 759 mm Hg at stop. Using data inhibit switch to exclude non-RR major noise sources. Running 59 min hours (w/o inhibit) Ms. Cashman comments: Neighbors bothered by noise; she has complained; State personnel (Springfld. office) have taken data.

About 46 dBA background without RR yard activity.

Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}	Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}
08-15 11-00	67	77	68	47	87	45	23-00	62	74	59	54	86	53
12-00	65	75	67	45	88	44	08-16 00-00	56	61	55	53	70	53
13-00	63	75	64	45	84	44	01-00	63	69	60	52	94	51
14-00	62	73	58	51	90	47	02-00	60	70	60	52	84	51
15-00	61	73	60	51	92	50	03-00	64	75	61	51	97	50
16-00	58	66	57	51	85	48	04-00	62	72	59	51	94	49
17-00	68	79	68	50	96	47	05-00	61	71	62	50	84	48
18-00	56	68	57	49	79	47	06-00	58	66	53	44	88	43
19-00	68	80	66	50	91	49	07-00	60	73	60	44	82	43
20-00	68	81	64	54	91	53	08-00	63	75	62	46	89	45
21-00	65	75	63	56	98	55	09-00	65	75	68	48	88	46
22-00	66	76	65	56	97	55	10-00	67	77	67	48	97	46

LOCATION 1 (Cashman residence) 24 hour comment log

TIME	COMMENTS
15-11-00	Start up Metrosonics
11-01	Aircraft overflight, inhibit for ≈ 2 min
11-05	Distant yard activity, distant lawnmower
11-07	Close-by: switcher, cars, bell
11-12	Coupling, bangs
11-14	Switcher, coupling
11-20	Crane truck on access road
11-23	Close-by switcher, 80 dBA
11-25 to 11-45	Intermittent yard activity
11-52 to 11-59	Relatively quiet, 47-48 dBA
11-59	Reset 602
15:12:00, to 12-10	Still quiet, lunch break?
12-10	Bird close to mike, no inhibit
12-10	Cars moving in yard, moderate
12-16	Moderate coupling noise
12-18	Close-by cars
12-20	Coupling
12-23	Coupling, close-by
12-24	Moderate activity
12-29	Several "coasting" couples
12-56	Switch engine & coupling on near track
12-59	Reset Met-602

Comment log, cont'd

13-01 to 13-11	Switch engine and coupling impacts, nearest track
13-11 to 13-15	Several "coasting" couples
~~13-11 to 13-15~~ 13-20 to 13-22	Quiet
13-23	Amtrak thru passenger train, inhibit
13-24 to 13-26	Quiet
13-27	Switch engine
13-28 to 13-32	Quiet
13-32	Conrail service truck on access road
13-33 to 13-59	Relatively quiet, reset 602 at 13-59
14-00	Switcher & cars
14-01	Normal yd activity
14-03 to 14-05	Quiet
14-05	Coupling
14-08 to 14-21	Reefer car several tracks over, about 56 dBA
14-23	Wheel squeaks, switcher
14-26 to 14-45	Reefer audible, also moderate activity
14-45 to 14-55	" " , plus coasting couples.
14-56 to 14-59	" " , coupling, switcher
15-00	Reset 602
15-25	Wheel squeal
15-32 to 15-38	Car movement, squeal & impacts
15-39	Car movement
15-40 to 15-50	Lotsa coupling close by, making up a train

omment log, cont'd

15-50 to 15-59 Nominal yard activity, reset 602 at 15-59

16-01	Reefer humming at 55 dBA, same one
16-33 to 16-34	Switcher removes reefer car
16-43	Thru-freight, inhibit mode
16-45	Idling switcher, reefer cars
16-49 to 16-50	Reefers moved out via switcher & other cars
16-56	Air brake release, coasting coupler
16-57 to 16-58	Coupling impacts; Reset at 16-59
17-01	Slow moving cars, wheel screech 75-78 dBA
17-09 to 17-15	Coasting car impacts, 80's
17-15	Reefer car coupled, close-by
17-15	Coasting couplings, switcher
17-19 to 17-25	Switcher, cars, reefer on 2nd closest track
17-35	Reefer on 3rd track, ≈ 60 dBA, trains moving
17-50	Moving trains back & forth continues, reefer gone
17-59	Quiet, Reset 602
18-06	Prop aircraft overflight, inhibit
18-37	Calibration check, AOK, inhibited for this
18-44	Activity picking up
18-56	Locos, train passing, squeals
18-59	Distant train movement, reset

Comment log cont'd

19-07	Loco + car movement nearby
19-12	Impact coupling, car movement
19-35	Loco movement nearby
19-40 to 19-42	Aircraft (4 engine jet) overflight, inhibit
19-45	Wheel squeals, 85 dBA
19-58	Prop aircraft overflight, inhibit. Reset at 19-59
20-00	Crickets setting background level
20-30	Long train, not a thru train, stopped
20-33 to 20-36	Close-by switcher, > 80 dBA
20-37 to 20-59	More switcher activity. Reset at 20-59.
21-00	Switching activity. Weather: 83°F, no wind, 78% R press = 759 mm Hg
21-04	Impact coupling
21-13	Wheel squeal, 75-80 dBA, 92 dBA impacts
21-14 to 21-16	Idling engine, 58 dBA
21-17 to 21-35	Switching activity
21-36 to 21-59	Intermittent activity
22-00	Reset 602. Freight leaving yard
22-25	Switcher close by
22-32 to 22-40	Coupling bangs, very loud, close to 100 dBA
22-42 to 22-54	Intermittent switching. Reset 602 at 22-59
23-00	Switching continues, loud couplings

Comment log, cont'd

23-17	Visited by Kitty
23-18 to 23-59	Relatively quiet, low activity level in yard
78:08:16:00:00	Reset, still quiet, ≈ 55 dBA
00-00 to 00-59	Relatively quiet thru-out entire hour, yard operating but not near-by
01-00	Reset, moderate yard activity
01-01 to 01-36	Making up a string on near-by track
01-38 to 01-59	Occasional loud couplings, train being made up on near-by tracks
02-00	Reset, train still being made up
03-00	Reset, relatively quiet
03-06	Switcher & cars; not sure if this is a thru train
03-30 to 03-59	Making up a string nearby, lot of startling couplings
04-00	Reset, still making up string
04-06	Coupling impact
04-30	Weather: 78°F, no wind, 82% RH, 758 mm Hg
04-30 to 04-59	Intermittent coupling at west end of yard. Reset
05-04 to 05-10	Couplings, slow movement of cars
05-15 to 05-30	Switching, cars, impacts, wheel squeals. Weather: 73°F, no wind, 86% RH, 759 mm Hg
05-32	Switching; classification continuing

Comment log, cont'd

06-00	Reset, idling switcher, moderate to lite activity
06-26	Moderate activity
06-48	Truck driving over tracks. Reset at 06-59
07-09	Train going thru yard (freight)
07-12	Quiet
07-28	Freight train thru yard
07-32	Switcher loco
07-47	Loco moving cars on near-by tracks
07-59	Convail tank truck. Reset
08-26	Series of cars moved, near tracks (8 AM shift change?)
08-34	Car movements on far tracks
08-40	Car couplings
08-50	Loco moving cars, near tracks
08-59	Reset, couplings, car movement
09-26	Quiet
09-32	Four locos on 3rd track, 68 dBA
09-35	Locos moving train out
09-38 to 09-59	Car movements, couplings, Reset
10-00	Moderate switching noise
10-00 to 10-30	Occasional loud "flying" couplings
10-59	Read 602 Terminate

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: Septmeber 6, 1978

SUBJECT: Railroad yard noise measurements at Readville yard, Hyde Park (Boston) Ma.

FROM: Alan J. Hicks, Engineer
Region I Noise Program

TO: William Roper, Chief
Surface Transportation Branch
Office of Noise Abatement & Control, U. S. E.P.A.
Washington, D. C.

A series of noise measurements were made near the Readville Railyard by the writer with the assistance of Mr. David Nathans, A Senior Environmental Employee assigned to the Region I Noise Program. These measurements were made in support of forthcoming proposed EPA railyard noise regulations. The Readville yard was selected, in part, because of recent complaints made to this office about noise caused by a loading operation.

Inquiries made of residents on West Milton Street near the loading area indicated that a noise problem was caused by the loading of concrete railroad ties from trucks onto flat cars. The ties were to be used by Amtrak to make repairs on its Northeast Corridor. Residents queried on August 9, 1978 indicated that the activity had ceased on the previous day and that loading operations were, according to yard personnel, being transferred to another location. Subsequent observations by the writer have confirmed this. Measurements were made, however, on flat classification activities in the vicinity of the railyard.

Yard Description and Measurement Locations

The location of the Readville yard is shown on the USGS map excerpt of Figure 1, taken from the Norwood, Massachusetts Quadrangle (7.5 minute series). Measurement locations were as follows:

A - Residence at 25 West Milton Street, Hyde Park, Ma. on property line of railyard adjacent to loading area. An automated digital data tape was made unattended at this site from 21:00 h on August 9, 1978 to 09:00 h on August 10, 1978. No loading activities occurred during this time. Results of this measurement are given in Figure 2.

B- Residence at south end of Prescott Street, Hyde Park, Ma. This site is 280 feet from the nearest of ten tracks used for rail car classification. The railyard property line is 62 feet from the residence across Prescott Street. A 24-hour noise survey was made at this site. The results are given in Figure 3. One major noise source near this site was a Stop and Shop supermarket warehouse with trucks (cryogenic, without powered refrigeration units) and stationary compressors and fan. Although other sites existed

EPA Form 1320-6 (Rev. 3-76)

along Prescott Street which had less impact from non-rail sources, a strict interpretation of the measurement site requirements eliminated those sites from consideration.

C - Residence at end of Lakeside Road, Hyde Park, Ma. This site is located across Sprague Pond from the railyard at a distance of approximately 400 feet from the nearest rails. Three short series of measurements were made at this site. Results are given in Figure 4.

Measurement Procedure

Preliminary measurements at Location A were made with an unattended Digital Acoustics DA-603A noise data acquisition unit which samples noise levels and records them on a digital tape cassette which may subsequently be processed by a DA604A playback unit and programmable calculator. Samples were taken every 1/2 second. All readings were "A"-weighted.

The DA-603A unit was also used at Location B where samples were taken every 1/4 second. At this location, a log was kept of noise events. This log is given in Appendix A. A flag was manually recorded on the digital tape unit for each 1/2 minute data block which contained non-yard data such as through freight and passenger operations for future automatic analysis. Since the soft-ware necessary to separate this data is under development, these events have been manually deleted from the "corrected" Leq values given in Figure 5.

Measurements at Location C were made with a Metrosonics dB-602 Sound Level Analyzer sampling every 1/16th second. The dB-602 was operated for three varying periods during times of railyard activity.

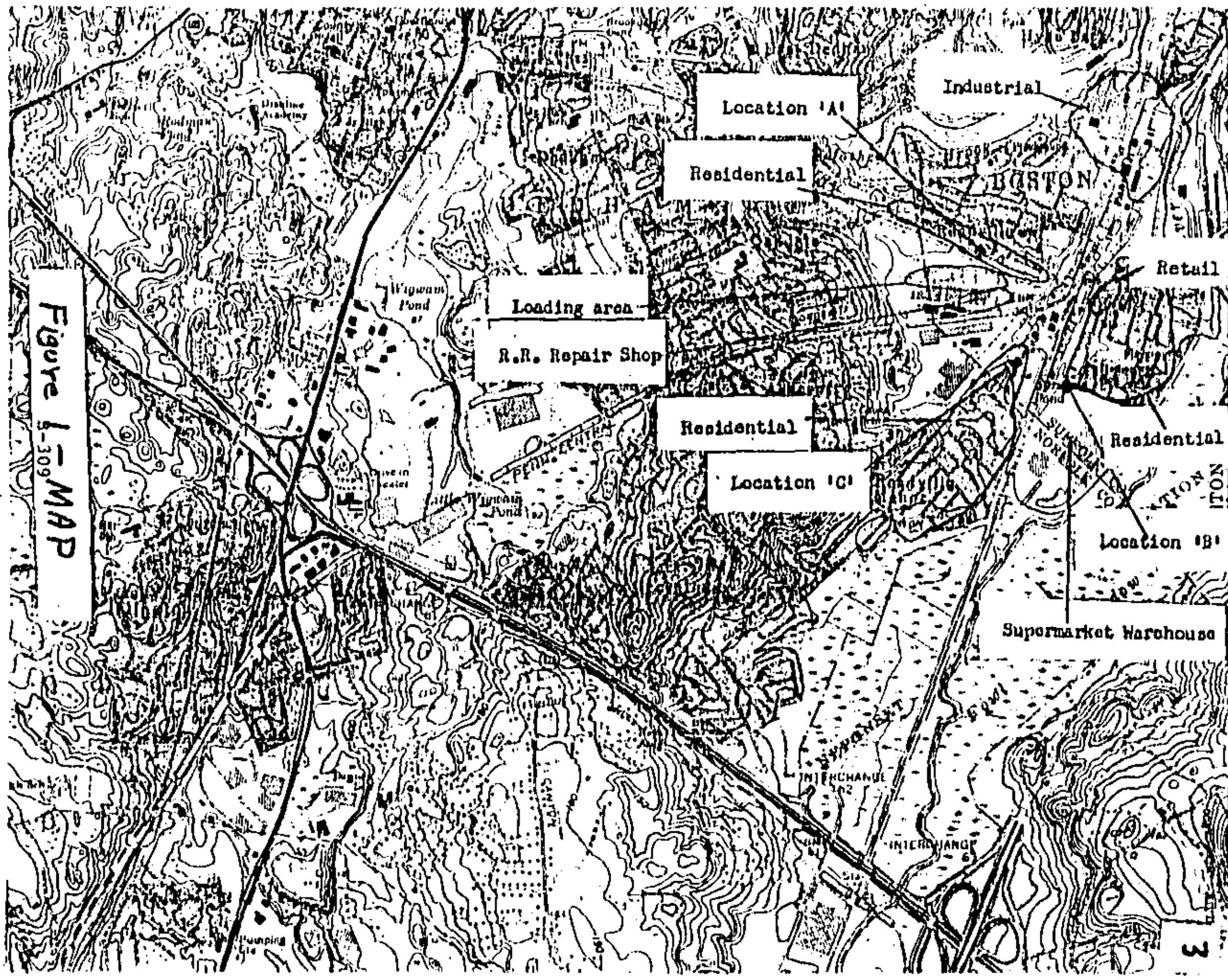

Location 'A'
Industrial
Residential
Retail
Loading area
R.R. Repair Shop
Residential
Location 'C'
Residential
Location 'B'
Supermarket Warehouse

Figure 1 — MAP

Figure 2 - Location A 4

SITE LOCATION Residence at 25 W. Milton St, Hyde Park, MA

START TIME: 8/9/78 21:00 STOP TIME: 8/10/78 09:00

METER TYPE: DA-603A SERIAL NO. 0138 MIC GR-1962 SERIAL NO. 4144

OBSERVERS: Unattended CALIBRATION: 114 dB @ 1KHz, GR-1562A, S/N 4768 @ 20:42 and 09:04

WEATHER: Clear, 65-78°F

REMARKS: Major source: rail activities, street traffic shielded by house. DA-603A at railyard property line.

Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}		Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax
8/9/78 21:00	50	56	50	46	63	45							
22:00	50	59	51	44	69	43							
23:00	47	52	48	43	67	42							
00:00	45	51	46	41	62	40							
01:00	45	55	47	39	60	39							
02:00	52	63	53	39	69	38							
03:00	47	59	43	37	69	37							
04:00	44	55	44	38	64	37							
05:00	44	52	44	39	60	38							
06:00	49	57	50	42	69	40							
07:00	58	67	62	44	75	43							
08:00	56	62	57	45	81	43							

Figure 3 - Location B

SITE LOCATION Residence, South end of Prescott Street

START TIME: 8/10/78 14:00 STOP TIME: 8/11/78 14:00

METER TYPE: DA-603A SERIAL NO. 0138 MIC GR-1962 SERIAL NO. 4144

OBSERVERS: A. Hicks, D. Nathans CALIBRATION: 114 dB @ 1KHz, GR-1562-A, S/N 4768 @ 13:30, 8/10/78, 00:00, 14:02, 8/11/78

WEATHER: Clear, light breeze, See log.

REMARKS: Residential Area. Nearest rail activity at 280 feet, Yard property line at 62 feet. Other sources: Supermarket warehouse. Through passenger trains. See log.
Ldn = 60. Estimated Ldn without railyard: 58
Yard is not significantly dominant.

Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}	Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}
8/10/78 14:00	55	64	55	51	74	50	02:00	51	60	52	46	67	45
15:00	57	67	59	51	71	50	03:00	56	70	51	47	79	46
16:00	59	68	61	51	76	50	04:00	49	56	50	47	65	47
17:00	63	71	60	50	95	49	05:00	52	69	51	45	72	44
18:00	56	66	56	50	73	49	06:00	55	66	55	50	77	49
19:00	54	62	54	49	74	48	07:00	54	65	55	50	74	49
20:00	55	63	56	50	76	49	08:00	55	63	56	52	72	51
21:00	54	64	54	49	76	48	09:00	55	65	56	48	74	47
22:00	53	61	53	49	67	48	10:00	52	61	59	50	67	47
23:00	53	61	55	48	67	48	11:00	54	63	56	48	76	47
8/11/78 00:00	52	60	53	48	66	47	12:00	55	65	56	49	70	47
01:00	55	64	57	49	72	48	13:00	55	65	57	49	70	47

Figure 4- Location C

SITE LOCATION End of Lakeside Rd., Hyde Park, MA

START TIME: Various 8/10/78 STOP TIME: 8/11/78

METER TYPE: dB-602 SERIAL NO. 1120 MIC GR-1961 SERIAL NO. 1586

OBSERVERS: A. Hicks CALIBRATION: 114 dB @ 1KHz, GR-1562A, S/N 4768, each test

WEATHER: Clear, wind 0-7 mph; 18:00: 85°F, RH 66%, P 754 mm; 11:32: 77°F, RH 52%, P 762 mm

REMARKS: Through passenger trains produce 72-80 dBA at site. Through train data excised from computation.

18:00 → quiet, street traffic, occasional aircraft < 60 dBA;

20:10 → classification; switcher engine, data invalidated by nearby backhoe and lawn mower.

11:32 → Classification, switcher engine and railcars; coupling impacts are 82-86 dBA @ 600 feet, shielded by parked railcars. Through trains (excised) @ 85 dBA max.

Time of Sample	Leq	L_1	L_{10}	L_{90}	Lmax	L_{99}		Start of HOUR	Leq	L_1	L_{10}	L_{90}	Lmax	
1800-1815	53	61	53	46	74	45								
11:32-12:00	58	66	60	49	84	47								
12:00-12:42	60	68	61	51	86	47								

Results

Data taken at this yard indicates that the yard would not severely impact the areas of locations A and B, based on the Ldn. Inquiries made of residents, however, indicate that coupling impacts and vibration from switching locomotives cause annoyance and, occasionally, sleep interference. The coupling impacts are of such a duration as to not noticeably affect the Ldn. The vibration is apparently of a low-frequency nature and does not contribute significantly to the A-weighted level.

Noise impacts could be reduced by limiting coupling activities during late-night hours. Relocation of operations within the yard, however, would most likely impact other residences.

APPENDIX

Readville, Prescott St. Notes

1. Switcher @ 1500 hrs. otherwise major source is Stop 'n' shop warehouse at about 52dBA.
2. 1505 h Buddliner simultaneous w/ switcher
3. 1506 h switcher w/ cars
4. 1507 Thru freight inhibited.
5. 1508 Switcher & cars

Other sites for short-term data
Viscardi Residence 25 W. Milton St Hyde Park, and end of Lakeview St. off of Sprague St.

6. 1554 h SWITCHER W/CARS
7. 1600 h SWITCHER ONLY
8. 1603 h SWITCHER W/CARS
9. 1607 h SWITCHER W/CARS AND BUDDLINER
10. 1610 h SWITCHER W/CARS
11. 1611 h FREIGHT CARS COUPLED
12. 1613 h SWITCHER W/CARS
13. 1614 h FREIGHT CARS COUPLED
14. 1615 h SWITCHER /W CARS AND FREIGHT CARS COUPLED
15. 1617 h SWITCHER W/ CARS
16. Amtrak thru train 1618 } coupling also
17. Amtrak thru train 1619 }
18. 1632 h SWITCHER W/ CARS
19. 1715 h SWITCHER ONLY
20. 1719 h SWITCHER W/CARS
21. 1721 h SWITCHER W/CARS AND COUPLING
22. 1723 h COUPLING
23.

P.2A

REDVILLE, PRESCOTT ST. NOTES

23. 1725 h SWITCHER W/CARS + COUPLING (OFF-STREET MOTORCYCLES FOR FEW SECONDS)
24. 1728 h SWITCHER W/CARS + COUPLING
25. 1730 h SWITCHER W/CARS + COUPLING
26. 1732 h SWITCHER W/CARS
27. 1734 h COUPLING + SWITCHER W/CARS
28. 1735 h SWITCHER W/CARS
29. 1736 h SWITCHER W/CARS + COUPLING AND BUDDLINER
30. 1737 h SWITCHER W/CARS
31. 1740 h SWITCHER + COUPLING
32. 1742 h SWITCHER W/CARS
33. 1749 h SWITCHER W/CARS
34. 1823 h SWITCHER
35. 1826 h POWER MOWER NEARBY
36. 1925 h DOUBLE LOC. WITH CARS (WITH CONCRETE?)
37. 2000 h SWITCHER
38. 2004 h SWITCHER W/CARS
39. 2050 h SWITCHER W/CARS
40. 2155 h SWITCHER W/CARS
41. 22.52 h* Thru passenger train Real Time ⇒ 21:52 h
42. 22.56 h* " " " Clock off by 21:52 h
43. 23.36 h* " " " one hour ahead 22:36 h
44. 0002 h* Switcher 2302 h

* Recheck Hours in readout. Clock may have been started one hour ahead

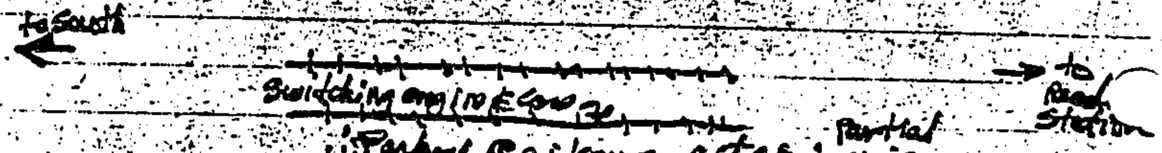
Readville, Prescott St. Notes P. 5A

→ Tape changed @ 0000 New Tape #17B, ID No. 17

45. 0002 No apparent railyard activity. Dominant source is supermarket warehouse and trucks operating on warehouse property.

46. 0042 Switch engine operating in yard. (no cars)
a) 0048 " " " " hauling about 16 cars to South then back on a different parallel track. (closer)

47. 0057 Repeat of 46 a) with fewer cars.



48. 0120 Switching still continuing. Some coupling crashes (Operations continuing in warehouse area are dominant except when engine and cars pass by measurement point
0130 No railyard activity audible.

49. 0143 Thru passenger train (inhibited)

50. 0203 Thru Frain "

51. 0333 ~~Thru freight~~ Freight in. Piggy back cars parked on track nearest to site.

52. 0636 Thru passenger (Amtrak) I

53. 0649 " " (T) I

54. 0706 " " " I

55. 0719 Two " (T) I

56. 0735 Thru passenger (T) I

57. 0750 " " (T) I two-engine

58. 0757 Two Amtrak passenger trains I
59. 0802 ~~CB&Q~~ Buddliner outbound followed by Diesel passenger T in I
60. 0839 Buddliner
61 0904 approx Thru passenger train T not I
62 0926 " " " Amtrak I
63. 0927 Switch engine w/ cars
64. 0931 SWITCHER w/CARS + coupling
65. 0933 SWITCHER + CABOOSE
66. 0935 SWITCHER, CABOOSE w/CARS
67. 1013 SWITCHER + CABOOSE
67. 1017 SWITCHER
68. 1112 SWITCHER
69. 1119 SWITCHER w/CARS
70. 1123 SWITCHER w/CARS + COUPLING
71. 1125 SWITCHER w/CARS + COUPLING
72. 1128 SWITCHER w/CARS + COUPLING
73. 1129 SWITCHER w/CARS
74. 1131 SWITCHER
75. 1141 SWITCHER w/CARS
76. 1144 SWITCHER w/CARS + COUPLING
77. 1147 SWITCHER w/CARS ~~w/~~ + COUPLING
78. 1148 SWITCHER w/CARS
79. 11 49 SWITCHER w/CARS + COUPLING
80. 11 49 SWITCHER w/CARS (FORWARD)
81. 1150 SWITCHER w/CARS + COUPLING
82. 1151 SWITCHER w/CARS (BACKING UP) + COUPLING
83. 1154 SWITCHER
84. 1203 SWITCHER w/CARS (THROUGH AMTRAK TRAIN)

85. 1205 SWITCHER W/CARS + COUPLING (BUDD-LINER THROUGH) (5A)
86. 1209 SWITCHER W/CARS + COUPLING
87. 1211 SWITCHER W/CARS + COUPLING
88. 1213 SWITCHER W/CARS + COUPLING
89. 1216 SWITCHER + HOOK-UP OF CARS
90. 1218 SWITCHER W/CARS
91. 1221 SWITCHER W/CARS + COUPLING
92. 1222 SWITCHER W/CARS + COUPLING
93. 1224 SWITCHER W/CARS
94. 1225 SWITCHER W/CARS + COUPLING
95. 1226 SWITCHER W/CARS
96. 1227 SWITCHER W/CARS + COUPLING
98. 1227 SWITCHER W/CARS (AMTRAK THROUGH)
99. 1228 SWITCHER W/CARS + COUPLING
100. 1228 SWITCHER W/CARS + COUPLING
101. 1229 SWITCHER W/CARS
102. 1230 SWITCHER W/CARS + COUPLING
103. 1231 SWITCHER
104. 1232 SWITCHER W/CARS
105. 1233 SWITCHER W/CARS + COUPLING
106. 1235 SWITCHER W/CARS + COUPLING
107. 1237 SWITCHER HOOKING UP WITH CARS
108. 1240 SWITCHER
109. 1251 SWITCHER W/CARS (BUDDLINER THROUGH)
110. 1252 SWITCHER W/CARS + COUPLING
111. 1257 SWITCHER W/CARS

M E M O R A N D U M

FROM: G.A. Russell
Noise Consultant

DATE: 9/14/78

TO: A. Hicks
Region I Noise Representative

SUBJECT: 24 hour noise survey, East Deerfield, Massachusetts Railyard.

INTRODUCTION

This memo describes the procedures used and results obtained during a 24 hour noise survey of the railroad switchyard in East Deerfield, Massachusetts. The measurements reported here were taken by the writer and addressee on 31 August and 1 September, 1978. This survey was carried out as part of a larger study of railyard noise emissions conducted by ONAC-EPA.

1.0 YARD DESCRIPTION AND MEASUREMENT LOCATIONS

The railyard is situated just west of the Connecticut River in the community of East Deerfield, Massachusetts. East Deerfield is located to the southeast of Greenfield in the western portion of the state. The location of the yard is shown on the USGS map of Figure 1, and land useage in areas adjacent to the yard is shown on Figure 2.

The yard is located at the confluence of four Boston and Maine lines and is a classification yard. An informal conversation with a local resident (and employee at the yard) indicated that the yard was a humping facility. We could not see any humping inclines or retarders, however, from a visual inspection of the yard, nor was any retarder noise audible. The yard does have a locomotive repair facility which was not audible. As many as 20 locomotives were counted in the yard at one time. Major noise sources and approximate levels are summarized in Table 1 below:

TABLES 1 NOISE SOURCES AND APPROXIMATE LEVELS

SOURCE	LEVEL
Coupling cars	Impulsive noise, peaks of 85 to 95 dBA at 200 to 400 ft.
Idling locomotives	About 60 dBA at 1,000 ft.
Moving locos pulling a string of cars	50 to 60 dBA at a distance of 500 ft.
Loco bells, PA system	Short duration, 50 to 60 dBA.

Two measurement locations were used. Location 1, sketched on Figure 3, was in the backyard of 179 River Road and was used for continuous monitoring. The additional measurement location was used for short duration, intermittent noise samples during the 24 hour period. A sketch of this mobile measurement site is shown on Figure 4. Both locations are indicated on the USGS map of Figure 2.

2.0 MEASUREMENT PROCEDURE

After an initial survey of the railyard area, Location 1 was selected as the site to be continuously monitored for 24 hours. A Digital Acoustics DA603A data logger and microphone were set up and calibrated at 09:00 on 31 August but a light rainfall prevented initiation of data collection. At 20:00 hours the rain ended and we were able to set up the DA603A again and initiate the 24 hour survey. An inhibit switch (manually activated) was used to flag any major noises not from legitimate railyard activites so that these noises could be excluded from the data reduction process. The inhibit switch was used so seldom however, that no modification to the normal data reduction procedure was necessary. That is, the recorded data was essentially "clean" as recorded. Serial number and calibration data for this 24 hour run are given on the attached data sheet.

To supplement the DA603A data, a comment log was also maintained to document the various railyard activities. A copy of this comment log is attached.

Location 2 was monitored ar various times during the 24 hour period beginning at 78:08:31:20:00. These intermittent measurements were of short duration and were taken with a Metrosonics 602 Noise Analyzer instrument.

Weather conditions during the 24 hour monitoring period were seasonal, if somewhat humid due to the passing rain shower. No major difficulties with the equipment or the measurement procedures used were encountered during the survey.

3.0 RESULTS

The field data recorded by the DA603A was subsequently processed using a Digital Acoustics DA604 noise data retrieval unit and Wang 600-14TP programmable calculator. Hourly results from this data reduction procedure are listed in Table 2 and plotted on Figure 5. Note that the graphical representation of Figure 5 does not follow the normal diurnal variation of residential area noise climates. That is, the noise climate at this site is dominated by railyard activities, a conclusion which is substantiated by the comment log maintained during the measurement period. Composite noise levels based on the 24 hour levels recorded at this location are summarized in Table 3 below:

TABLE 3 LOCATION 1 COMPOSITE NOISE LEVELS (dBA)

INDICATOR	dBA LEVEL
LEQ (DAY)	57.5
LEQ (NIGHT)	53.8
LEQ (24)	56.4
LDN	61.0
Peak Hour Leq	61
Peak Hour L10	61

Results from the intermittent measurements taken at Location 2 are summarized in Table 4 below:

TABLE 4 LOCATION 2 NOISE LEVELS (dBA)

SAMPLE TIME	LEQ	L01	L10	L90	LMAX
22:25 to 22:31	50	61	51	43	67
00:10 to 01:10	59	69	61	44	77
09:34 to 09:44	62	69	64	46	73

In general, the noise levels recorded at Location 2 agree with those measured at Location 1. The limited number of samples taken at Location 2 however, does not allow the composite noise levels at this measurement site to be estimated with any accuracy.

Actually, the LEQ levels, whether hourly or 24 hour composite, do not adequately indicate either the nature or the extent of the noise impact at either location. The very loud "bangs" and "crashes" due to the car couplings are both startling and annoying. Because of their short duration, these impact noises do not influence the hourly LEQ to any significant degree.

The above remarks together with the attached data and Figures should constitute an adequate record of the noise measurements which were made. If additional information or commentary is needed, please contact me at 413-545-0949.

G. A. Russell

GAR:njp

Attached: Figures 1-5, Data Sheet, Comment Log

cc: Donna Williamson, ONAC
Byron Keene, Region I

TABLE 2 HOURLY NOISE LEVEL INDICATORS, LOCATION 1, 179 RIVER ROAD (dBA)

START TIME	LEQ	L01	L10	L90	LMAX
20:00	56	65	58	46	85
21:00	54	64	57	48	78
22:00	54	61	54	49	81
23:00	54	63	55	50	84
00:00	56	66	56	51	86
01:00	53	59	53	50	76
02:00	54	62	55	50	77
03:00	51	57	51	49	68
04:00	52	61	53	49	69
05:00	53	62	53	49	73
06:00	55	64	57	46	83
07:00	55	63	57	47	79
08:00	56	67	57	47	76
09:00	57	65	59	47	84
10:00	61	66	59	50	96
11:00	58	66	59	47	88
12:00	60	68	60	47	91
13:00	60	67	61	46	89
14:00	57	64	57	48	84
15:00	56	65	59	47	80
16:00	57	64	57	47	87
17:00	56	66	55	47	87
18:00	56	65	57	48	80
19:00	57	63	58	50	84

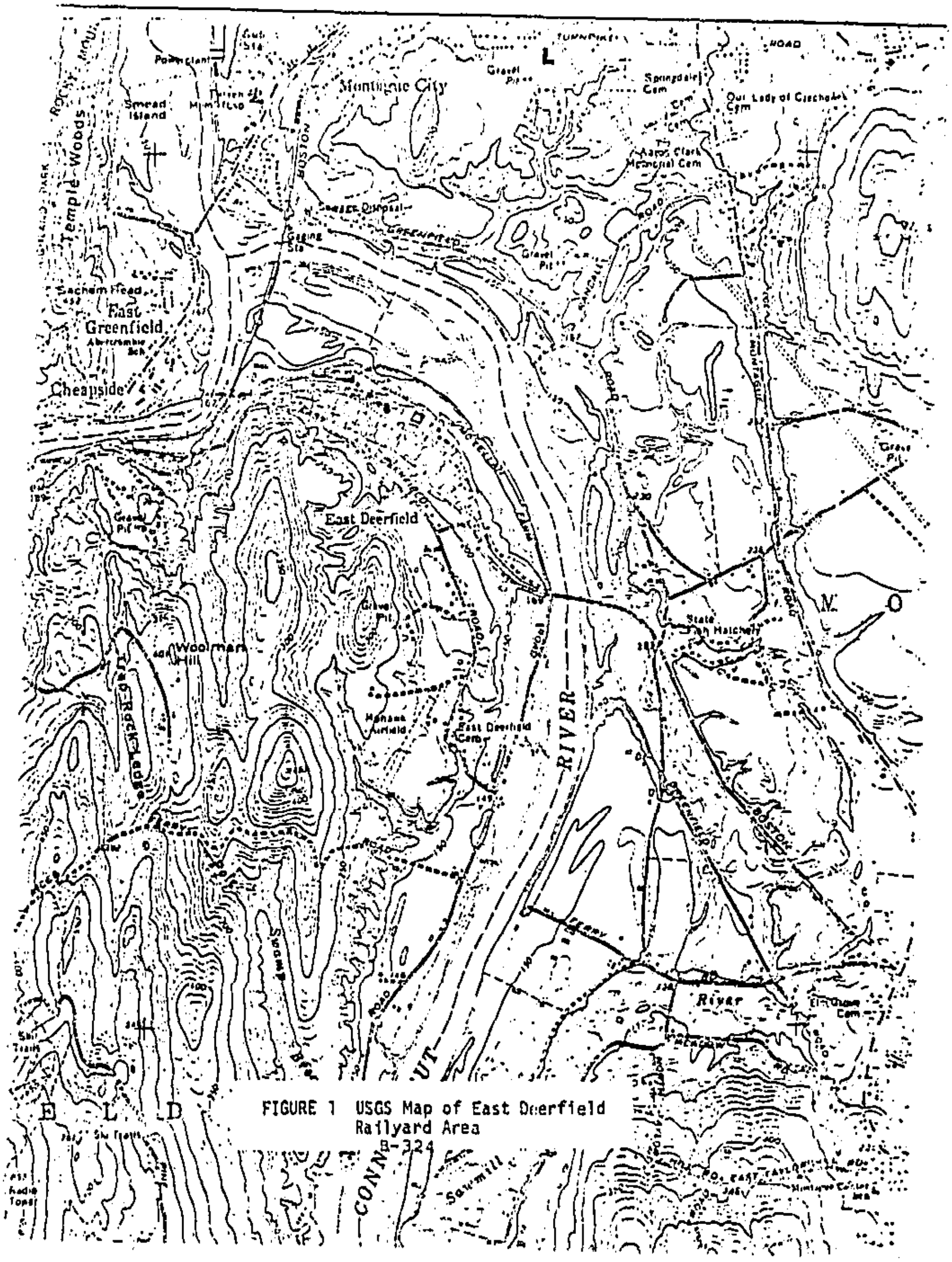


FIGURE 1 USGS Map of East Deerfield Railyard Area

B-324

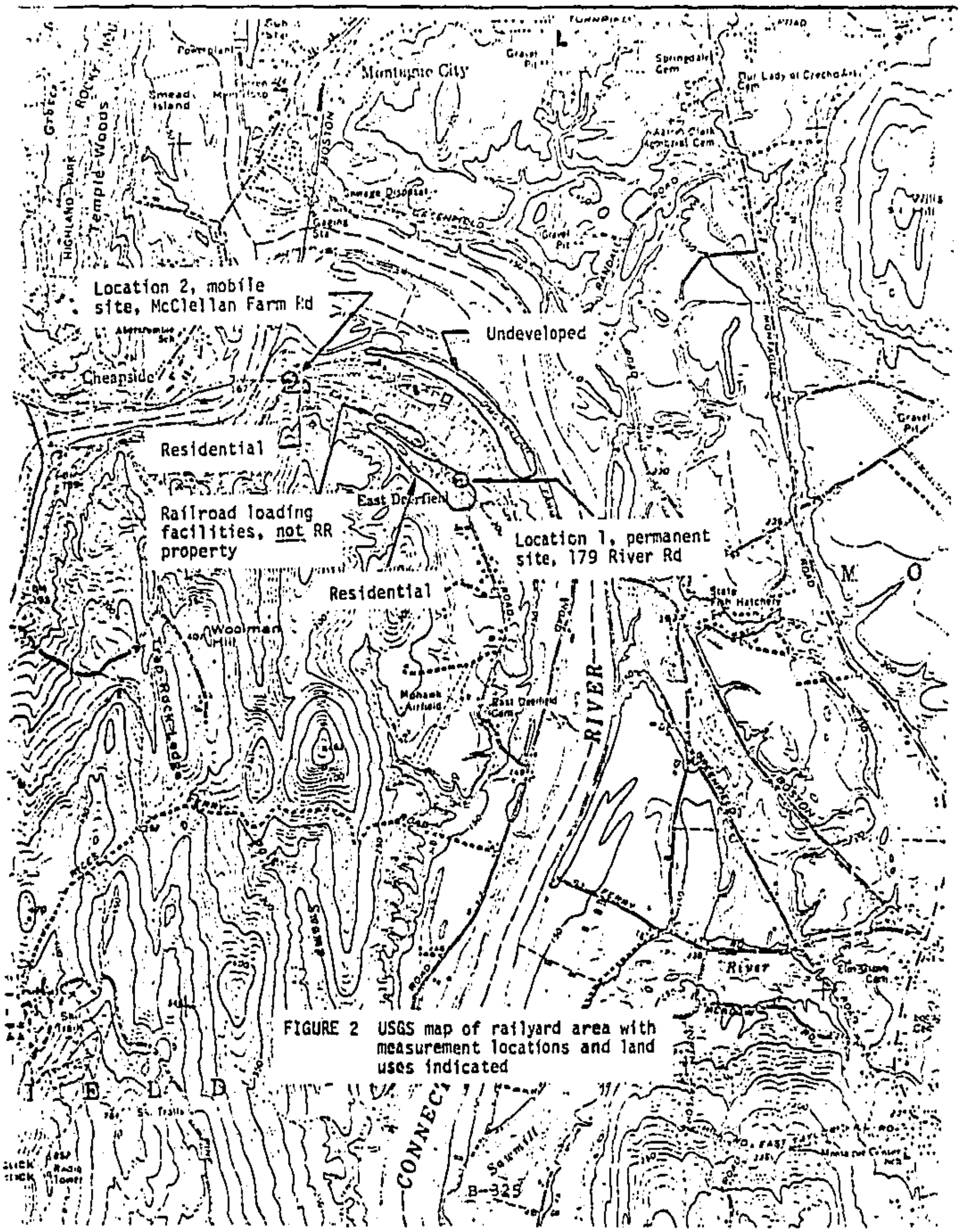


FIGURE 2 USGS map of railyard area with measurement locations and land uses indicated

FIGURE 3

SKETCH OF MEASUREMENT LOCATION 1, 179 RIVER ROAD. (24 HOUR CONTINUOUS MONITORING SITE.)

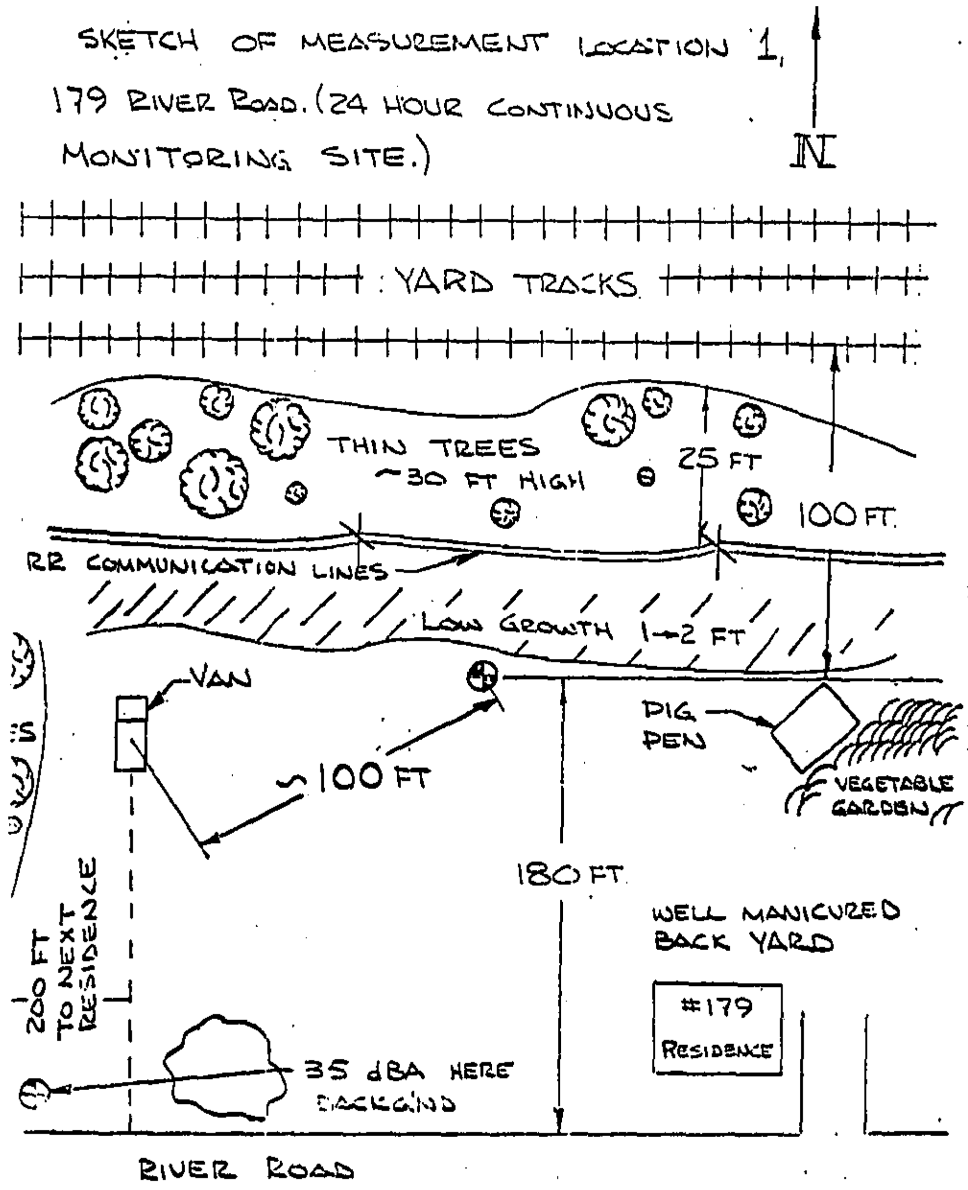
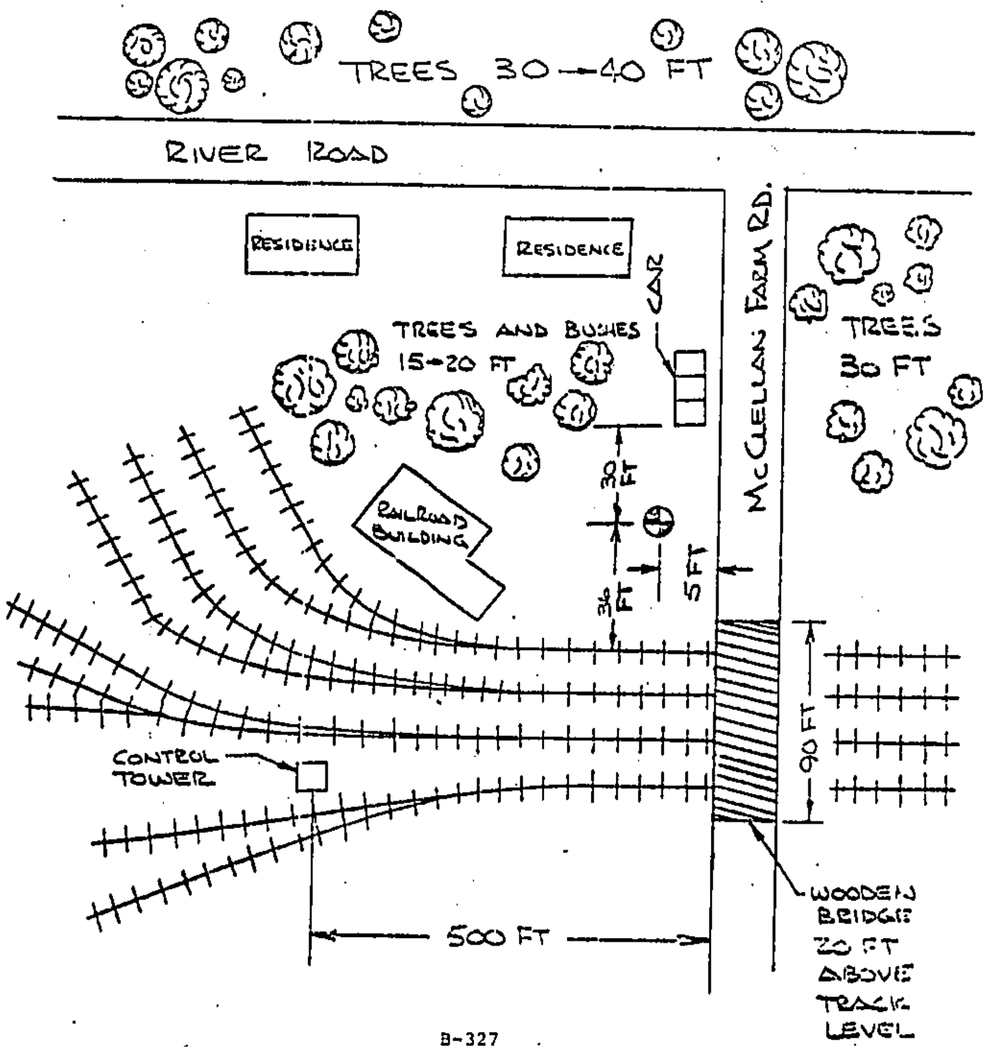


FIGURE 4

SKETCH OF MEASUREMENT LOCATION 2, INTERMITTENT MEASUREMENT SITE



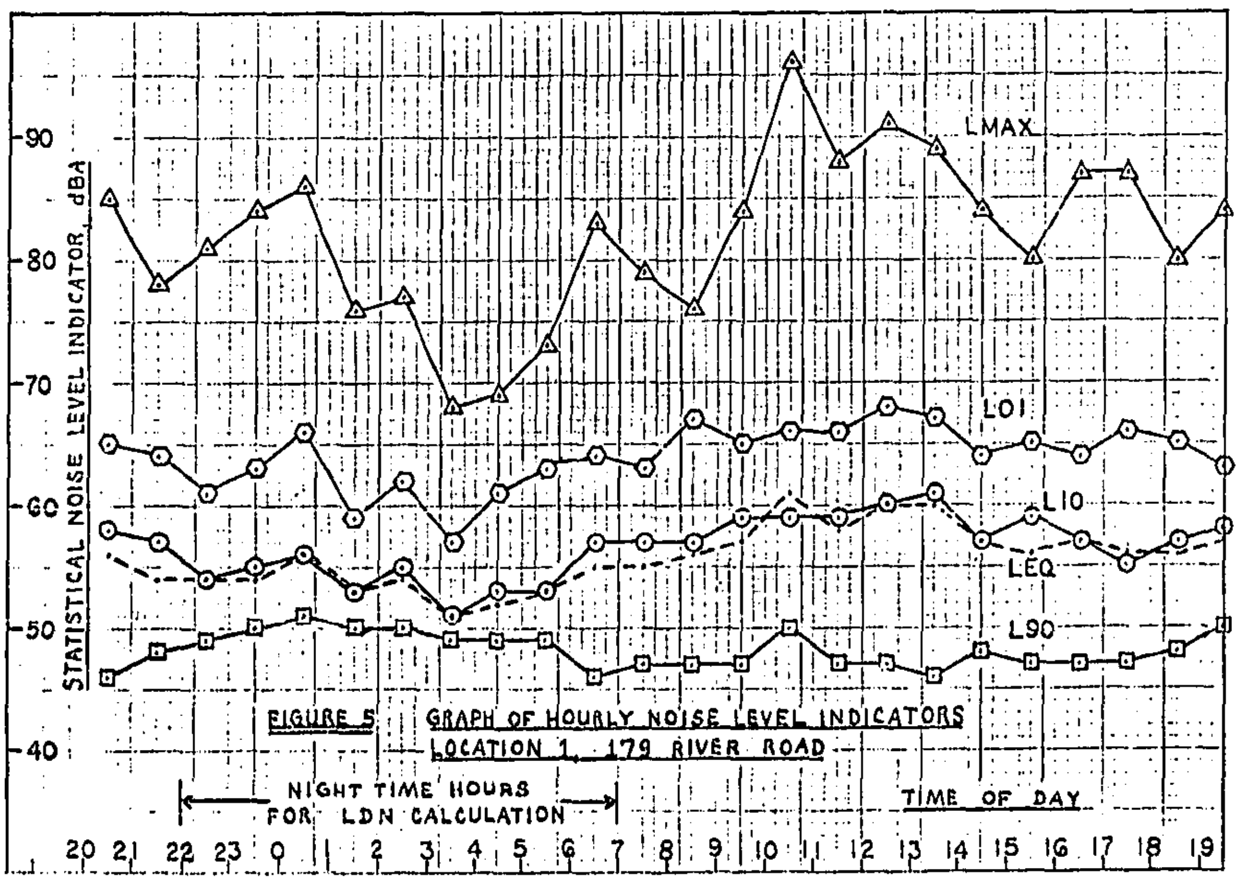


FIGURE 5 GRAPH OF HOURLY NOISE LEVEL INDICATORS
LOCATION 1, 179 RIVER ROAD

B-328

FIELD RECORDING DATA SHEET

JOB:	East Deerfield, Massachusetts RR yard
LOCATION:	#1, 179 River Road, 24 hour continuous monitoring site (backyard of residence)
OBSERVERS:	GAR & AH
DATE:	78-08-31 and 78-09-01 (24 hour survey)
DATA LOGGER:	Digital Acoustics DA603A, Model 201 s/n 2357 (A weighting, 0.5 sec/sample)
MICROPHONE:	GR-1972, s/n 4144 (windscreen, tripod, 100 ft cable)
CALIBRATION:	114 dB, GR 1562 A calibrator
WEATHER:	Moderate rain before starting, 63 degrees F, no wind, cloudy, 94% relative humidity, 757 mm H.g
COMMENTS:	About 35 dBA background at road, 180 ft. from microphone, away from yard.

LOCATION 1, PERMANENT SITE, 179 RIVER ROAD COMMENT LOG

TIME	COMMENTS
78:08:31:20:00	Start up DA for 24 hour survey. We have returned after being rained out after 09:00 start.
20:00 to 20:00	Making up (some loud couplings) on a nearby track. Ambient level of about 45 dBA.
20:20 to 20:30	Sporadic couplings; moving loco noise of 55 to 65 dBA. Distant yard activity.
20:30	Weather conditions: 63 degrees F, no wind, cloudy, 94% relative humidity, 757 mm Hg.
20:30 to 21:00	Occasional couplings.
21:00 to 21:03	Quiet, 45-50 dBA, no audible RR noise.
21:03 to 22:00	Switcher making up a string: coupling, some squeal noise. Moderate activity.
22:45	Return from location 2 (bridge location).
23:00 to 00:00	Occasional coupling noise, idling and moving locos.
78:09:01:00:00	Midnight of August 31, September 1.
01:30	Return from location 2.
01:30 to 06:30	Occasional coupling noise, moderate activity in yard. Shift change, or coffee break at 06:00; quiet.
06:30 to 08:00	Sporadic activity continues.
08:45	Weather: 67 degrees F, no wind, cloudy, 84% relative humidity, 759 mm Hg.
08:45	Visited by resident of 179 River Road.
11:00	Return from Location 2 and lunch. Sun is trying to break through. Still the same level of activity in railyard.
11:00 to 13:00	Coupling bangs at varying distances from microphone. General activity in yard.

Comment Log (Continued)

TIME	COMMENTS
13:30	Weather conditions: 76 degrees F, no wind, sunny, 62% relative humidity, 754 mm Hg.
13:50	Two very loud couplings, about 100 dBA. Noticeable vibration at edge of River Road, about one second after impact.
14:00 to 16:00	Coupling bangs, several close to microphone. Sounds like one string coupling with another string. Ten minute traffic count on River Road: 5 autos, 3 pickups, 0 trucks.
16:00 to 18:00	Yard activity continuing. Coupling impacts are still major source. Can definitely feel ground shake after big bangs.
19:00	Weather conditions: 70 degrees F, no wind, partly cloudy, 68% relative humidity, 758 mm Hg.
19:00 to 20:00	Coupling activity continuing. Terminate at 20:00.

ASSOCIATION OF
AMERICAN RAILROADS
RESEARCH AND TEST DEPARTMENT · AMERICAN RAILROADS BUILDING
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March 27, 1978

Dr. William E. Roper
Chief
Surface Transportation Noise
Regulation Group
Environmental Protection Agency
Crystal Mall, Building 2
1921 Jefferson Davis Highway
Arlington, Virginia 20460

Dear Bill:

Enclosed is a copy of Wyle Laboratories' report on noise measurements at the ATSF's Barstow, California classification yards, and a copy of a comparison between Wyle's measurement apparatus and BB&N's equipment. I hope this data will be of use to you.

Please let me know when you have the data summaries with measurement location maps of the remaining seven sites. Thank you.

Sincerely,

Peter Conlon

Peter C. L. Conlon
Environmental Specialist

Enclosure

ACOUSTIC MEASUREMENT PROGRAM
FEBRUARY 16-18, 1978
A.T. & S.F. BARSTOW YARDS
BARSTOW, CALIFORNIA

Introduction

In order to broaden the data base that will be available for assessing EPA's proposed regulatory standards for railroad noise, the Association of American Railroads contracted with Wyle Laboratories to undertake a series of acoustic measurements at selected railroad facilities. As part of this program, measurements were carried out between February 16 and February 18, 1978, at the Atchison, Topeka, and Santa Fe Barstow Yards in Barstow, California.

During this time period acoustic measurements were also being done at these yards by the firm of Bolt, Beranek and Newman, Inc., which was under contract to the EPA. Wyle's measurement sites were planned so that one site would correspond to the principle measurement site of the BBN team while the other sites would be independent of their test program. This procedure would allow measurements of the two firms to be compared, while at the same time adding significant new information to the overall data base.

Procedure

Seven fixed measurement sites were chosen on the boundaries and within both the newly built A.T. & S.F. Barstow Classification Yard and the older A.T. & S.F. Barstow Diesel Repair Facility. At these sites continuous samples of the A-weighted, fast response, sound pressure level were digitally recorded for periods ranging from approximately 1 hour to 48 hours. From these digital recordings equivalent sound levels and percentile-exceeded sound levels were computed. In addition, at 2 of the sites, where the measurement period exceeded 24 hours, daily equivalent sound levels and day-night sound levels were also calculated. At one site a strip chart was made of the A-weighted sound pressure level over a continuous period of 48 hours.

In addition to these measurements, analog tape recordings were made at standard distances from selected individual noise sources on the railroad property. These recordings were used to determine estimates of the mean value and range of the instantaneous A-weighted sound pressure levels from these sources.

Table 1 identifies the 7 fixed measurement locations while Figure 1 shows their location relative to the yard facilities. Figure 2 identifies the acoustic instrumentation that was used at each of the measurement sites as well as the equipment that was used to record the sound pressure at standard distances from individual noise sources.

Site 1 was chosen, in agreement with the BBN measurement team, as the principle measurement site. At this location the major noise sources are the group retarders in the A.T. & S.F. Hump Yard, which are approximately 800 feet distant, and vehicular traffic on a local service road, about 130 feet from the microphone position. The microphone was located approximately 20 feet above the level of the retarders and approximately 4 feet above the level of the nearby roadway. Although this measurement site did not lie on the actual boundary line of the yard, both Wyle and BBN measurement teams felt that it was representative of where the boundary would have been at a more typical railroad yard. At the actual south boundary line of the Barstow Yard, which was located behind a ridge about 60 feet from Site 1, little railroad noise could be heard. No railroad facilities were located between Site 1 and the actual boundary line.

At Site 1, digital tape recordings were made of the A-weighted, fast response, sound pressure level for a period of 48 hours. These recordings were later processed to provide hourly and daily L_{eq} values, daily L_{dn} values, and hourly values of the percentile-exceeded sound levels L_1, L_{10}, L_{50}, L_{90}, and L_{99}. A strip chart was also made of the A-weighted sound level at this site during the entire 48-hour period. A second instrumentation system at this site provided real-time measurements of the hourly L_{eq}, L_1, L_{50}, and L_{90}. These two systems, along with the BBN measurement system that was also located at this site, provided 3 independent measurements of the hourly L_{eq}, L_1, L_{50}, and L_{90} noise levels.

Table 1

Acoustic Measurement Sites
A.T. & S.F. Barstow Yards
Barstow, California

SITE 1 -	At simulated boundary of Classification Yard, 130 feet south of H Street access road south of the group retarders.
SITE 2 -	Near boundary line of diesel repair area at A.T. & S.F. signal building, Hutchison and Sixth Streets.
SITE 3 -	Near Diesel Repair Building, approximately 200 feet south of load test cell.
SITE 4 -	In Classification Yard 100 feet north of group retarder No. 1.
SITE 5 -	At northern boundary of Classification Yard, 50 feet from mainline tracks north of M.T.C. building No. 12.
SITE 6 -	Approximately 300 feet north of engine servicing facilities in Classification Yard just south of mainline tracks.
SITE 7 -	Approximately 300 feet south of mini-hump area in Classification Yard.

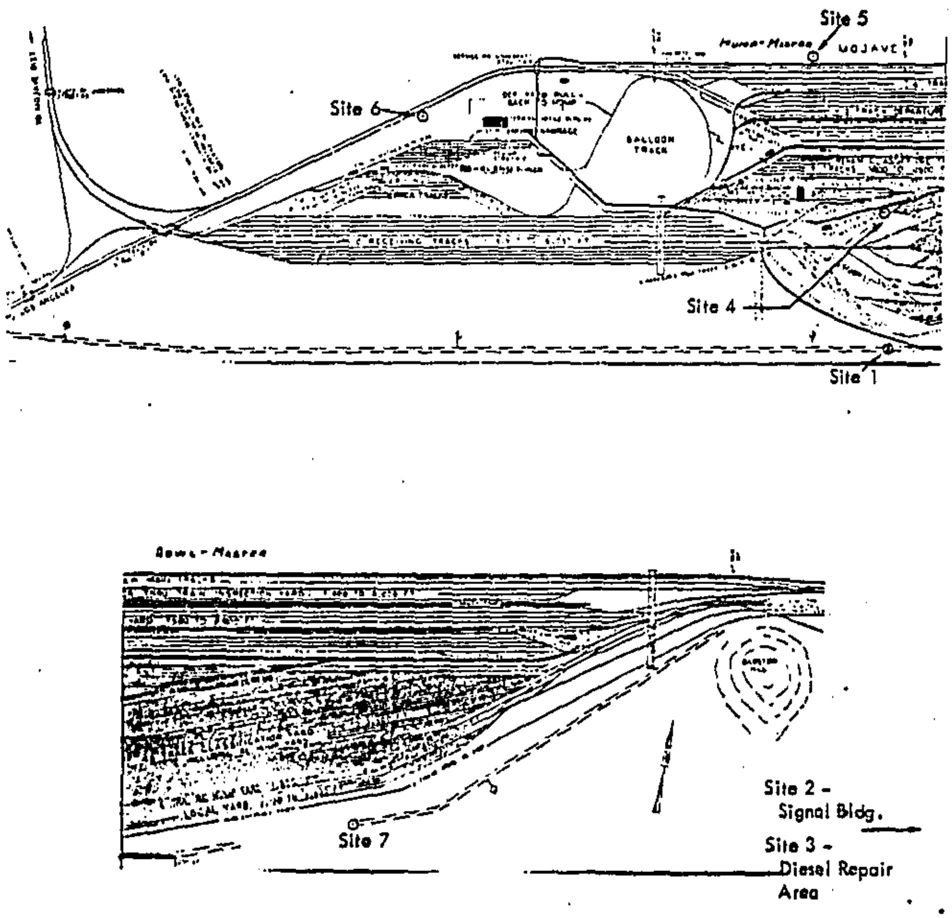

Figure 1. Acoustic Measurement Sites, A.T. & S.F. Barstow Yards, Barstow, California

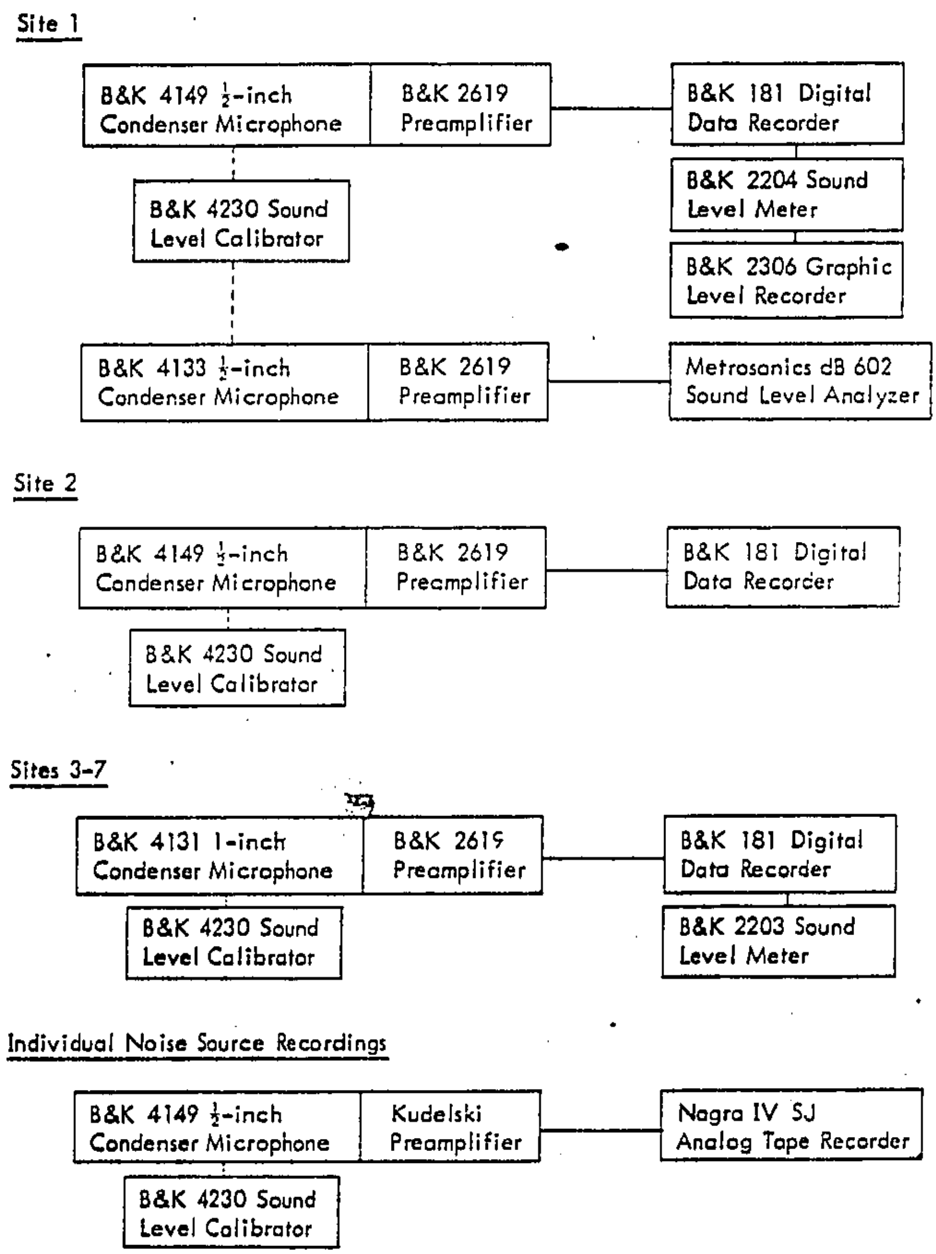

Figure 2. Acoustic Instrumentation

At Site 2, near the A.T. & S.F. Signal Building at Hutchison and Sixth Streets, the major sources of noise are diesel locomotives entering and leaving the nearby Diesel Repair Building, diesel locomotives being load tested at one of the 2 outdoor load cells near this site, and vehicular traffic on the local roads. At this site, digital recordings were made of the A-weighted, fast response, sound pressure level for a period in excess of 30 hours. These recordings were processed to provide hourly values of L_{eq}, L_1, L_{50}, and L_{90}, and the 24-hour L_{eq} and L_{dn}.

Site 3 was located several hundred feet to the east of Site 2 near the Diesel Engine Repair Building. It lies about 220 feet south of an outdoor engine load test cell. The microphone position was on a ridge about 15 feet above the track level. At this site, digital tape recordings of the A-weighted, fast response, sound pressure level were made for a period of 95 minutes during which a 3600 hp. EMD SD 45-2 diesel locomotive was being load tested. Other noise sources during this period were movement of strings of locomotives into and out of the repair building and around the yard area.

At Site 4, which was 100 feet north of group retarder No. 1 in the classification yard, the major noise source was the humping operation. A digital recording of the A-weighted, fast response, sound pressure level was made for a 68-minute period during which 85 cars were classified. The primary noise source during this period at this site was wheel squeal in the master, group, and tangent retarders.

At Site 5, located on a 12-foot-high dike at the northern boundary line of the Classification Yard, the principle noise sources were vehicular traffic on the nearby railroad access road and train movements both on the nearby mainline tracks and within the yard area. Digital recordings of the A-weighted, fast response, sound pressure level were made at this site for 58 minutes. In addition, the sound level was continuously monitored and the peak levels and durations of individual noise events were noted.

Site 6 was located approximately 300 feet north of the engine servicing facilities in the western portion of the Classification Yard. It was located at the edge of a gravel road 25 feet south of the mainline tracks, which at this point lie on top of a 20-foot embankment. The major noise sources were engines idling at the service facility, local locomotive movements, car impacts, and through-train movements. Digital recordings were made at this site during 3 separate periods of duration 47 minutes, 59 minutes, and 59 minutes. During 2 of these periods peak levels and durations of individual noise events were noted.

Site 7 was located at the east end of the Classification Yard about 300 feet south of the mini-hump area. At this location car impacts and wheel squeal at the main and mini-hump retarders were the principle sources of noise. A 57-minute digital recording of the A-weighted, fast response, sound pressure level was made at this site and peak levels and duration of individual noise events were noted.

In addition to the measurements described above, analog tape recordings were made of the acoustic signal 100 feet away from each side of a 3600 hp. EMD SP 45-2 diesel locomotive undergoing load tests and 100 feet away from retarder No. 3 during humping operations in the Classification Yard. The first of these recordings was analyzed in the laboratory to determine A-weighted sound pressure levels for each of the 8 locomotive throttle positions during the load test. The second recording was used to determine the peak levels of wheel squeal noises in the retarders.

Results

Table 2 shows the hourly equivalent sound level, L_{eq}, and the percentile-exceeded sound levels, L_1, L_{10}, L_{50}, L_{90}, and L_{99} as measured at Site 1 using the output tape from the B&K 181 Digital Data Recorder located at that site. Also indicated are the daytime equivalent sound levels, L_d; the nighttime equivalent sound levels, L_n; the 24-hour equivalent sound levels, L_{eq}; and the day-night sound levels, L_{dn}, for the 2 periods 1300 on February 16 to 1200 on February 17 and 1200 on February 17 to 1200 on February 18.

In Table 3 is the output of the Metrosonics Sound Level Analyzer located at Site 1. As in the previous table, hourly values of L_{eq}, L_1, L_{50}, and L_{90} are indicated. Also shown are the daytime, nighttime, and 24-hour equivalent sound levels and the day-night sound levels for the 2 periods 1200 on February 16 to 1200 on February 17 and 1200 on February 17 to 1200 on February 18.

One of the purposes of using both the B&K and the Metrosonics instrumentation systems at Site 1 is to compare the output of the 2 devices for the type of acoustic signal

Table 2

Analysis of Output Tape From B&K Digital Data Recorder at Site 1

Date	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}	L_{99}	
16 Feb 78	1300	62.7	74	59	51	47	45	
	1400	62.9	75	63	53	48	46	
	1500	56.6	66	60	53	48	47	
	1600	52.8	62	56	50	47	46	
	1700	60.1	71	59	53	49	47	
	1800	58.6	69	59	53	51	49	
	1900	61.3	72	60	55	51	50	
	2000	58.4	66	61	55	53	51	
	2100	66.9	81	64	54	51	50	
	2200	60.9	72	63	56	52	50	
	2300	65.2	74	63	56	52	51	
17 Feb 78	0	67.3	81	64	56	51	48	
	0100	64.2	77	62	53	49	47	
	0200	63.8	78	59	52	49	46	
	0300	64.7	78	60	55	52	48	
	0400	65.6	77	69	60	52	51	
	0500	67.9	82	69	61	57	54	L_d = 64.2
	0600	69.4	82	[illegible]	[illegible]	[illegible]	[illegible]	L_n = 65.9
	0700	67.5	82	69	60	57	52	L_{eq} = 64.9
	0800*	65.6	78	62	54	53	48	L_{dn} = 72.1
	[illegible]	67.3	[illegible]	[illegible]	51	47	[illegible]	
	1000	57.8	69	59	56	47	45	
	1100	64.7	78	61	50	47	45	
	1200	63.7	76	59	50	48	44	
	1300	62.2	76	61	49	46	45	
	1400	60.5	74	60	52	48	46	
	1500	62.6	73	62	53	48	46	
	1600	66.8	80	65	52	47	46	
	1700	67.1	83	64	53	49	47	
	1800	64.1	77	64	55	51	48	
	1900	65.0	78	65	57	53	50	
	2000	70.7	79	64	59	54	51	
	2100	74.1	83	68	54	50	48	
	2200	70.0	84	69	59	54	51	
	2300	62.8	71	66	59	54	51	
18 Feb 78	0	67.6	81	64	58	55	53	
	0100	70.4	84	64	56	53	51	
	0200	72.2	86	68	56	53	51	
	0300	72.8	85	64	55	51	49	
	0400	68.9	83	64	53	50	48	
	0500	61.6	72	58	52	49	48	
	0600	73.7	88	70	57	52	50	
	0700	59.6	70	61	55	51	49	L_d = 66.6
	0800	62.4	79	61	52	49	48	L_n = 70.3
	0900	59.9	74	60	50	47	46	L_{eq} = 68.4
	1000	55.7	65	56	51	47	45	L_{dn} = 76.3
	1100	60.1	68	62	56	54	52	

*Values for this hour based on the first 50 minutes only.

Table 3

Output of Metrosonics Sound Level Analyzer at Site 1

Date	Time	L_{eq}	L_1	L_{50}	L_{90}	
16 Feb 78	1100*	61	71	49	45	
	1200*	54	63	47	44	
	1300	59	70	48	43	
	1400	63	74	51	45	
	1500	55	63	49	44	
	1600	51	60	45	42	
	1700	59	70	50	45	
	1800	58	66	50	47	
	1900	60	69	53	49	
	2000	56	63	52	50	
	2100	66	78	52	49	
	2200	60	70	53	49	
	2300	64	72	52	49	
17 Feb 78	0	64	79	53	49	
	0100	63	74	50	45	
	0200	63	76	49	44	
	0300	61	75	52	43	
	0400	60	74	52	[illegible]	
	0500	69	[illegible]	54	51	
	0600	[illegible]	77	[illegible]	[illegible]	L_d = 62.6
	0700	[illegible]	77	55	[illegible]	L_n = 64.8
	0800**	[illegible]	[illegible]	[illegible]	[illegible]	
	0900	63	81	49	44	L_{eq} = 63.6
	1000	57	67	42	44	
	1100	62	74	45	44	L_{dn} = 71.0
	1200	63	73	48	44	
	1300	61	74	46	41	
	1400	59	71	49	44	
	1500	61	70	51	45	
	1600	65	78	49	43	
	1700	68	80	51	45	
	1800	62	75	52	47	
	1900	63	74	54	43	
	2000	65	75	54	47	
	2100	72	85	50	47	
	2200	68	81	54	58	
	2300	57	67	52	49	
18 Feb 78	0	66	77	55	51	
	0100	69	81	52	49	
	0200	70	82	52	47	
	0300	72	83	50	47	
	0400	68	81	51	47	
	0500	60	70	47	46	
	0600	72	85	54	50	L_d = 64.4
	0700	58	69	52	49	
	0800	69	70	50	47	L_n = 68.8
	0900	59	71	48	45	L_{eq} = 66.6
	1000	55	63	48	44	
	1100	59	66	54	51	L_{dn} = 74.8

*Sampling rate for these two hours was 1 SPS. All other hours were 16 SPS.

**Values for this hour based on the first 50 minutes only.

present at this site. The 2 systems use radically different methods to determine L_{eq} and the percentile-exceeded sound levels. Thus one might expect considerable differences between the outputs of the 2 systems when impulsive noises, such as the wheel squeal from the retarder system, are measured. Comparing Tables 2 and 3, however, one finds that the agreement is generally quite good. The hourly L_{eq} levels differ on the average by 1.5 dB with the Metrosonics data being consistently lower than the B&K data. The day-night levels differ by 1.1 dB for the first time period and by 1.5 dB for the second time period.

The analysis of the output tape from the B&K Digital Data Recorder at Site 2 is shown in Table 4. Also shown are the daytime, nighttime, and 24-hour equivalent sound levels and the day-night sound level for the 24-hour period from 1200 on February 16 to 1200 on February 17.

In Table 5 are shown the equivalent sound level and the percentile-exceeded sound levels for the (approximately) hourly measurements made at Sites 3 through 7. Table 6 shows the duration and peak levels of the individual noise events that occurred at these sites during their respective measurement periods. These peak levels can be compared with the corresponding L_{90} levels in the previous table, which represent the residual noise level at each site, to estimate the intrusiveness of the individual noise events.

In Table 7 are listed the average noise levels at each throttle setting of a 3600 hp. EMD SP 45-2 diesel locomotive for 3 separate load tests. In runups #1 and #2, the locomotive was connected to an external load cell, in runup #3 the locomotive was self-loaded.

Figure 3 is a histogram showing the number of noise events versus peak sound level from wheel squeal in Group Retarder No. 3 as measured 100 feet from the track centerline. During the 70-minute measurement period, 85 cars were humped, and 15 individual wheel squeals occurred in Retarder No. 3.

Table 4

Analysis of Output Tape
From B&K Digital Data Recorder at Site 2

Date	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
16 Feb 78	0700*	57.3	69	59	51	48	47
	1000	59.3	70	62	53	47	46
	1100	58.6	67	63	52	47	46
	1200	61.1	57	65	59	50	48
	1300	61.7	70	65	60	52	50
	1400	66.9	74	70	62	55	52
	1500	65.4	78	68	60	50	49
	1600	58.3	68	59	49	47	45
	1700	62.0	81	59	50	47	47
	1800	59.5	72	63	51	47	46
	1900	52.8	62	54	50	49	45
	2000	56.5	67	58	51	49	48
	2100	63.9	70	65	54	50	49
	2200	65.1	77	65	62	60	60
	2300	64.0	74	64	61	60	60
17 Feb 78	0	61.8	69	63	61	60	60
	0100	61.3	67	62	61	60	59
	0200	62.4	71	63	61	60	60
	0300	61.3	65	62	61	60	59
	0400	63.6	74	63	61	60	60
	0500	63.1	72	63	62	61	60
	0600	68.5	75	65	62	61	60
	0700	60.8	74	63	55	51	49
	0800	62.7	77	63	55	49	47
	0900	57.5	67	59	54	49	47
	1000	59.5	71	62	52	48	46
	1100	56.2	68	60	49	47	47
	1200	65.5	75	70	57	48	47
	1300	67.6	77	71	65	62	61
	1400	66.7	76	69	63	62	61
	1500	63.7	80	63	62	60	52
	1600**	61.6	66	63	61	60	59

$L_d = 62.8$
$L_n = 64.1$
$L_{eq} = 63.3$
$L_{dn} = 70.4$

*Values for this hour based on the last 40 minutes only.

**Values for this hour based on the first 15 minutes only.

Table 5

Analysis of Output Tape
From B&K Digital Data Recorder at Sites 3-7

Site #	Date	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}	L_{99}
3	2/16/78	1415 to 1550	71.3	81	76	65	62	60
4	2/16/78	1635 to 1743	81.7	92	64	58	56	55
5	2/17/78	1005 to 1103	64.4	68	54	45	43	42
6	2/17/78	1115 to 1202	67.5	77	70	63	61	59
7	2/17/78	1300 to 1357	59.7	73	58	50	46	44
6	2/17/78	1700 to 1759	70.8	64	67	63	62	61
6	2/18/78	0700 to 0759	71.6	85	72	64	63	62

Table 6

Duration and Peak Level of
Individual Noise Events at Sites 5-7

Site	Date	Time	Source	Duration (Sec.)	Peak Levels (dBA)
5	2/17/78	1005 to 1103	Train Movement	1	61, 73
			Through Train	29	90
			Locomotive Horn	1	67, 67
			Motor Vehicle	1	65, 67, 67, 70
				2	65, 66, 67, 67, 68, 68, 69, 72, 73
				3	62, 65, 70, 72, 74, 74, 74
				4	71, 78
				6	67, 67
				7	72
6	2/17/78	1115 to 1202	Locomotive Idling	4	67
				85	70
				120	66
			Locomotive Moving	1	66
				2	66
				4	67
			Through Train	47	72
				51	80
				52	81
				140	83
			Locomotive Horn	1	>90, >90
			Car Impacts	1	67, 72, 74, 78
7	2/17/78	1300 to 1357	Train Movement	204	72
			Car Impacts	1	61, 62, 63, 65, 65, 65, 66, 66, 67, 67, 68, 68, 69, 74, 75, 76, 77, 77, >80

Table 6 (Cont'd)

Site	Date	Time	Source	Duration (Sec.)	Peak Levels (dBA)
7 cont'd	2/17/78 cont'd	1300 to 1357 cont'd	Retarder (Main Hump)	1	62, 62, 64, 64, 65, 65, 65, 65, 66, 67, 68, 68, 69, 70, 70, 72, 73
			Retarder (Mini Hump)	1	69, 70, 70, 71, 72, 79, 80, >80, >80
6	2/18/78	0900 to 0959	Locomotive Idling	3	70
				10	67
				15	68
				175	70
			Locomotive Moving	5	68
				25	69
			Train Moving	30	76
				40	72
				50	>90
				70	88
				80	87
				120	84
			Air Release	1	66, 66, 66, 66, 67, 67, 67, 68, 68, 68, 68, 68, 69, 70, 71
				2	66, 66, 67, 67, 67, 67, 68, 69, 70, 70, 74
			Locomotive Horn	1	70, 71, >80, >80, >80, >80

Table 7

Noise Measurements of Locomotive No. 5683
During Load Test - February 17, 1978

Throttle Position	Average A-weighted Noise Level (dBA)		
	Runup #1	Runup #2	Runup #3
1	73	68	71
2	75.5	74	72.5
3	77	80	75.5
4	79	83	79
5	82.5	85	83.5
6	83	88	85
7	85.5	89	[illegible]
8	88	89.5	92

Runup #1 — Measurement 100 feet from locomotive right side with microphone approximately 10 feet above track level. Locomotive connected to the load cell on the right side.

Runup #2 — Measurement 100 feet from locomotive left side with microphone approximately 4 feet above track level. Locomotive connected to the load cell on the right side.

Runup #3 — Measurement 100 feet from locomotive right side with microphone approximately 4 feet above track level.. Locomotive self-loaded.

Digital recording was made at Site 3 (220 feet from the left side of the locomotive) during these tests. See Table 5.

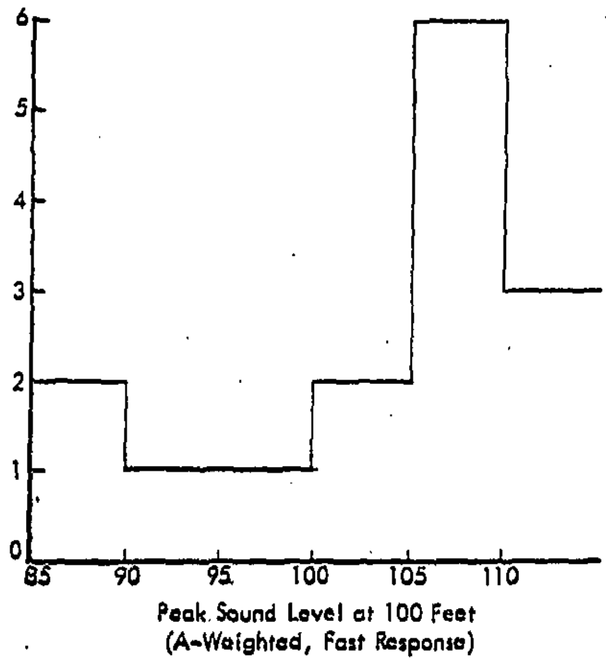

Figure 3. Histogram of Peak Noise Levels From Group Retarder No. 3 — 1635 to 1745 on February 16, 1978

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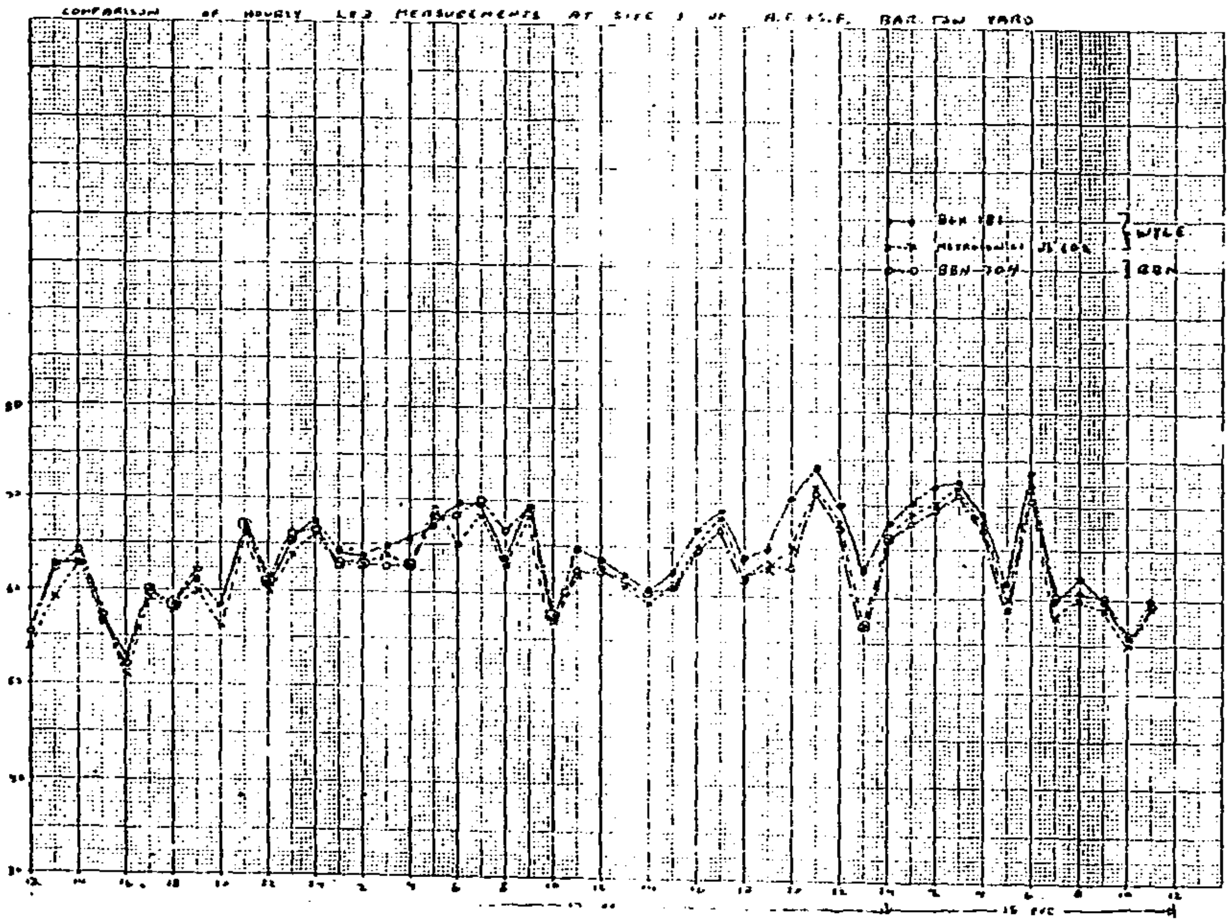
Prepared by: E. STUSNICK Date: 3/20/78 Subject: COMPARISON OF HOURLY Leq MEASUREMENTS AT SITE 1 OF A.T. + S.F. BARSTOW YARD.

	2/11/78 - 2/12/78						2/17/78 - 2/18/78					
TIME	WYLE B&K	WYLE METROSONICS	BBN	B&K - METRO	B&K - BBN	METRO - BBN	WYLE B&K	WYLE METROSONICS	BBN	B&K - METRO	B&K - BBN	METRO - BBN
12	—	54	55.4	—	—	-1.4	63.7	63	62.5	0.7	1.2	0.5
13	62.7	59	62.2	3.7	0.5	-3.2	62.2	61	61.8	1.2	0.4	-0.1
14	62.9	63	64.2	-0.1	-1.3	-1.2	60.5	59	60.2	1.5	0.3	-1.2
15	56.6	55	57.2	1.6	-0.6	-2.2	62.6	61	61.1	1.6	1.5	-0.1
16	52.8	51	52.2	1.8	0.6	-1.2	66.8	65	64.7	1.8	2.1	0.3
17	60.1	59	60.1	1.1	0.0	-1.1	69.2	68	66.8	1.1	2.3	1.2
18	58.6	58	58.6	0.6	0.0	-0.6	64.1	62	61.9	2.1	2.2	0.1
19	61.3	60	62.2	1.3	-0.9	-2.2	65.0	63	63.4	2.0	1.6	-0.4
20	58.4	56	—	2.4	—	—	70.7	65	63.1	5.7	7.6✓	1.9
21	66.9	66	66.9	0.9	0.0	-0.9	74.1	72	71.2	2.1	2.9	0.8
22	60.9	60	60.9	0.9	0.0	-0.9	70.0	68	67.3	2.0	2.7	0.7
23	65.2	64	65.9	1.2	-0.7	-1.9	62.8	57	57.0	5.8	5.8✓	0.0
0	67.3	66	66.3	1.3	1.0	-0.3	67.6	66	66.0	1.6	1.6	0.0
1	64.2	63	62.9	1.2	1.3	0.1	70.4	69	67.8	1.4	2.6	1.2
2	63.8	63	62.9	0.8	0.9	0.1	72.2	70	69.5	2.2	2.7	0.5
3	64.7	64	63.0	0.7	1.7	1.0	72.8	72	71.3	0.8	1.5	0.7
4	65.6	63	63.1	2.6	2.5	-0.1	68.9	68	67.1	0.9	1.8	0.9
5	66.9	69	67.9	-2.1	-1.0	1.1	61.6	60	58.7	1.6	2.9	1.3
6	69.4	65	68.1	4.4	1.3	-3.1	73.7	72	70.8	1.7	2.9	1.2
7	69.5	68	70.0	1.5	-0.5	-2.0	59.6	58	60.2	1.6	-0.6	-2.2
8	63.6	63	66.4	0.6	-2.8	-3.4	62.4	60	60.8	2.4	1.6	-0.8
9	69.3	68	69.1	1.3	0.2	-1.1	59.9	59	60.3	0.9	-0.4	-1.3
10	57.6	57	57.4	0.6	0.2	-0.4	55.7	55	56.1	0.7	-0.4	-1.1
11	64.7	62	62.6	2.7	2.1	-0.6	60.1	59	59.4	1.1	0.7	-0.4
			μ	1.4	0.2	-1.1			μ	1.6	2.0	0.1
			σ	1.3	1.2	1.2			σ	1.3	1.8	1.0
L_d	64.2	62.6	64.4	1.6	-0.2	-1.8	66.6	64.4	63.9	2.2	2.7✓	0.5
L_n	65.9	64.8	65.2	1.1	0.7	-0.4	70.3	68.8	68.0	1.5	2.3	0.8
L_{eq}	64.9	63.6	64.7	1.3	0.2	-1.1	68.4	66.6	65.9	1.8	2.5	0.7
L_{dn}	72.1	71.0	71.5	1.1	0.6	-0.5	76.3	74.8	74.0	1.5	2.3	0.8

46 1513



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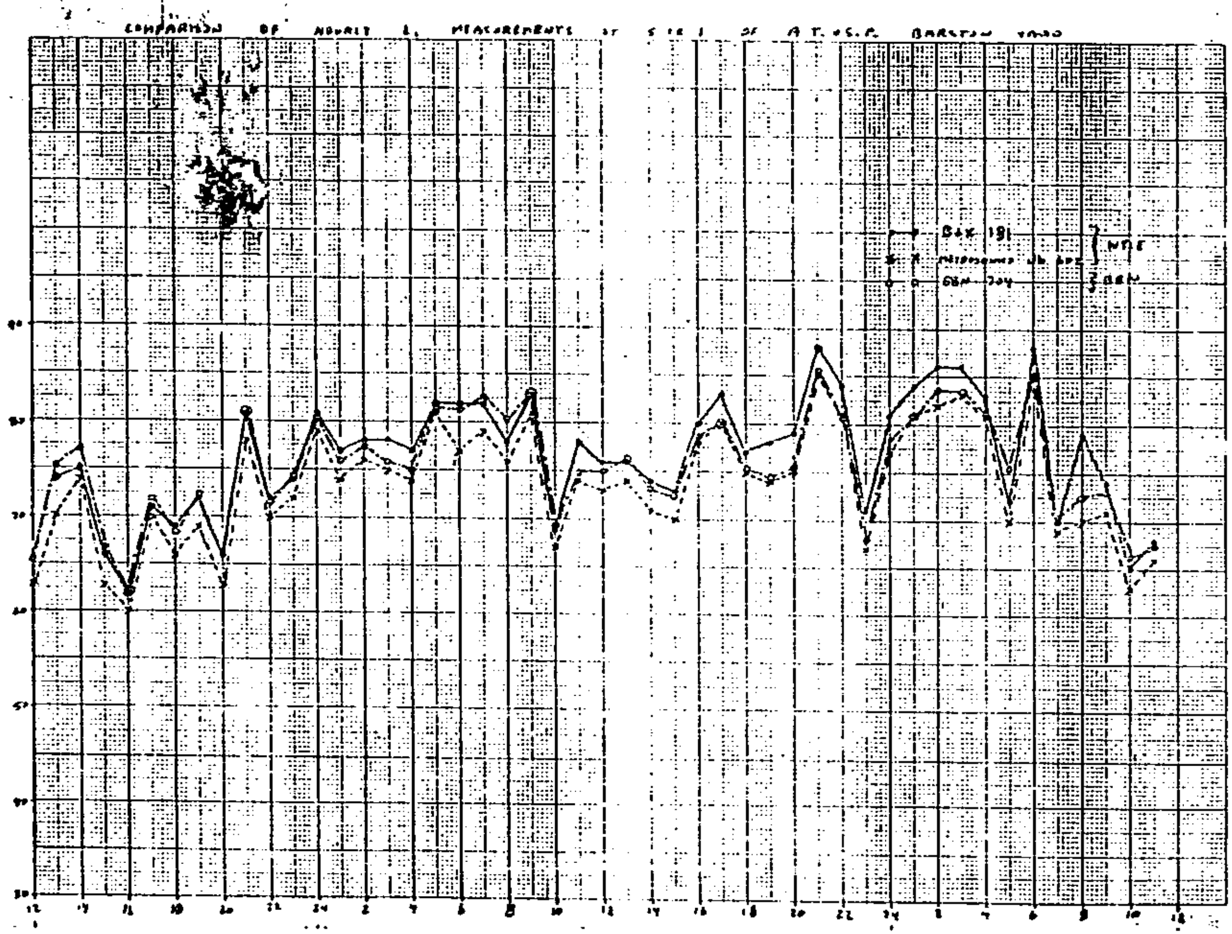
Prepared by: E. STUSNICK   Date: 3/20/78   Subject: COMPARISON OF HOURLY L, MEASUREMENTS AT SITE 1 OF A.T. + S.F. BARSTOW YARD

	2/11/78 – 2/12/78						2/17/78 – 2/18/78					
	WYLE		BBN	B&K –	B&K –	METRO –	WYLE		BBN	B&K –	B&K –	METRO –
TIME	B&K	METROSONICS	BBN	METRO	BBN	BBN	B&K	METROSONICS	BBN	METRO	BBN	BBN
12	–	63	65.5	–	–	-2.5	76	73	74.9	3	1.1	-1.9
13	74	70	75.3	4	-1.3	-5.3	76	74	76.2	2	-0.2	-2.2
14	75	74	77.0	1	-2.0	-3.0	74	71	73.2	3	0.8	-2.2
15	66	63	66.7	3	-0.7	-3.7	73	70	72.4	3	0.6	-2.4
16	62	60	62.1	2	-0.1	-2.1	80	78	78.6	2	1.4	-0.6
17	71	70	71.7	1	-0.7	-1.7	83	80	80.0	3	3.0	0.0
18	69	66	68.5	3	0.5	-2.5	77	75	75.2	2	1.8	-0.2
19	72	69	72.3	3	-0.3	-3.3	78	74	74.3	4	2.7	-1.3
20	66	63	–	3	–	–	79	75	75.6	4	3.4	-0.6
21	81	78	80.9	3	0.1	-2.9	88	85	85.5	3	2.5	-0.5
22	72	70	71.6	2	0.4	-1.6	84	81	80.7	3	3.3	0.3
23	74	72	74.2	2	-0.2	-2.2	71	67	68.1	4	2.9	-1.1
0	81	79	80.4	2	0.6	-1.4	81	77	78.5	4	2.5	-1.5
1	77	74	76.0	3	1.0	-2.0	84	81	81.0	3	3.0	0.0
2	78	76	77.2	2	0.8	-1.2	86	82	83.6	4	2.4	-1.6
3	78	75	75.8	3	2.2	-0.8	86	83	83.5	3	2.5	-0.5
4	77	74	75.1	3	1.9	-1.1	83	81	81.3	2	1.7	-0.3
5	82	81	81.7	1	0.3	-0.7	72	70	70.6	2	1.4	-0.6
6	82	77	81.5	5	0.5	-4.5	88	85	84.9	3	3.1	0.1
7	82	79	82.6	3	-0.6	-3.6	70	69	70.3	1	-0.3	-1.3
8	78	76	80.5	2	-2.5	-4.5	79	70	72.5	9	6.5	-2.5
9	83	81	82.7	2	0.3	-1.7	74	71	73.1	3	0.9	-2.1
10	69	67	68.7	2	0.3	-1.7	65	63	66.3	2	-1.3	-3.3
11	78	74	74.8	4	3.2	-0.8	68	66	67.5	2	0.5	-1.5
			μ	2.6	0.2	-2.4			μ	3.4	1.9	-1.2
			σ	1.0	1.3	1.3			σ	1.4	1.6	1.0

46 1513



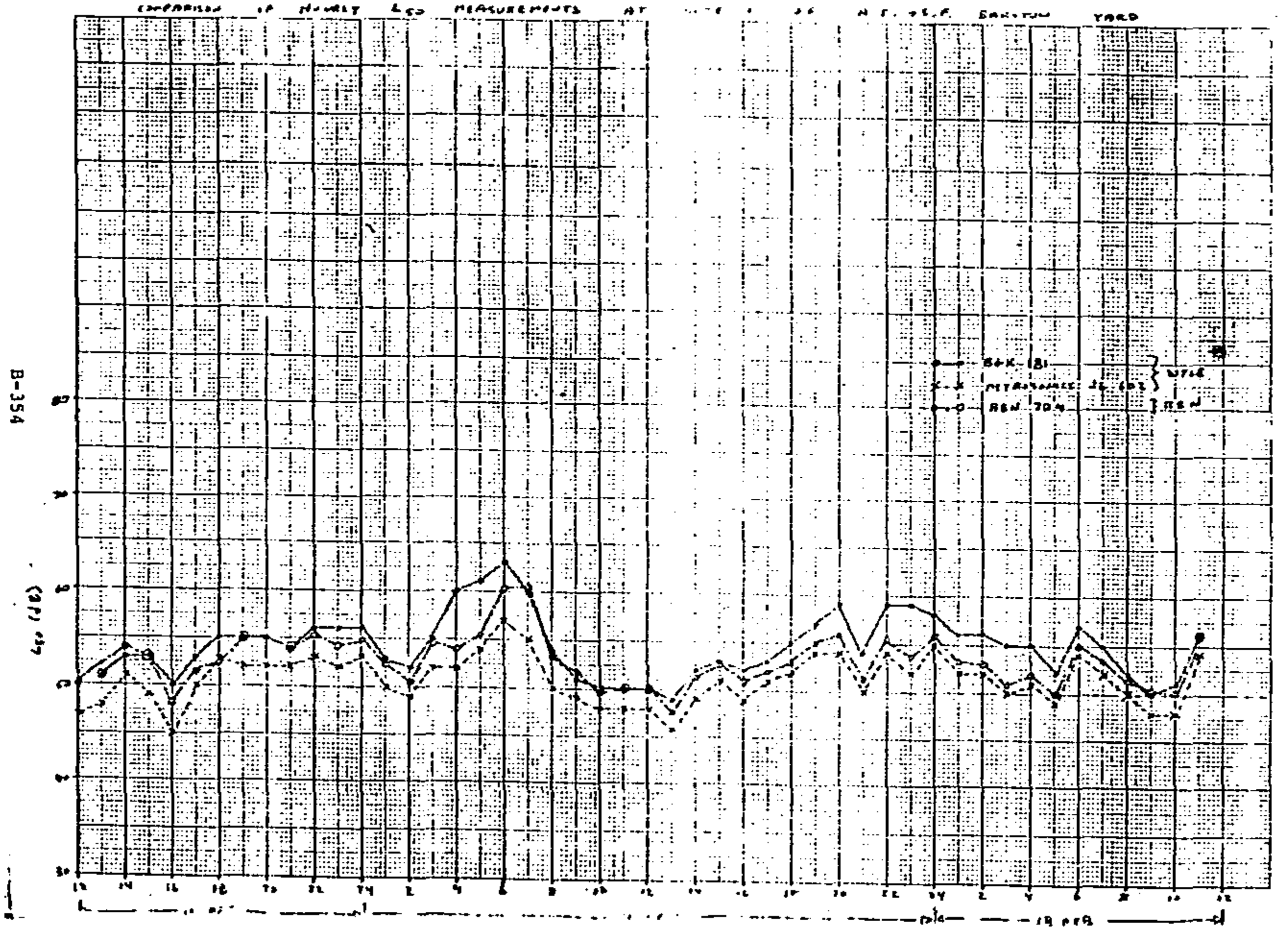
COMPARISON OF HOURLY L₁ MEASUREMENTS AT SITE 1 OF A.T.&S.F. BARSTOW YARD

B-352

WYLE LABORATORIES - Wyle Research - Washington, D. C.

Prepared by: E. STUSNICK Date: 7/21/78 Subject: COMPARISON OF HOURLY L_{50} MEASUREMENTS AT SITE 1 OF A.T. + S.F. BARSTOW YARD.

TIME	2/11/78 – 2/12/78 WYLE BCK	WYLE METRASONICS	BBN	BCK − METRO	BCK − BBN	METRO − BBN	2/12/78 – 2/13/78 WYLE BCK	WYLE METRASONICS	BBN	BCK − METRO	BCK − BBN	METRO − BB
12	—	47	50.1	—	—	-3.1	50	48	49.9	2.0	0.1	-1.9
13	51	48	51.1	3.0	-0.1	-3.1	49	46	47.8	3.0	1.2	-1.8
14	53	51	53.9	2.0	-0.9	-2.9	52	49	51.3	3.0	0.7	-2.
15	53	49	52.9	4.0	0.1	-3.9	53	51	52.8	2.0	0.2	-1.
16	50	45	48.3	5.0	1.7	-3.3	52	49	51.1	3.0	0.9	-2.
17	53	50	51.4	3.0	1.6	-1.4	53	51	51.9	2.0	1.1	-0.9
18	55	53	52.4	2.0	2.6	0.6	55	52	53.1	3.0	1.9	-1.
19	55	52	55.0	3.0	0.0	-3.0	57	54	55.1	3.0	1.5	-1.1
20	55	52	—	3.0	—	—	59	54	55.8	5.0	3.2	-1.8
21	54	52	54.0	2.0	0.0	-2.0	54	50	51.3	4.0	2.7	-1.3
22	56	53	55.3	3.0	0.7	-2.3	59	54	55.5	5.0	3.5	-1.5
23	56	52	54.3	4.0	1.7	-2.3	59	52	53.7	7.0	5.3	-1.7
0	56	53	54.7	3.0	1.3	-1.7	58	55	56.0	3.0	2.0	-1.0
1	53	50	52.2	3.0	0.8	-2.2	56	52	53.2	4.0	2.8	-1.2
2	52	49	50.5	3.0	1.5	-1.5	56	52	52.9	4.0	3.1	-0.9
3	55	52	54.8	3.0	0.2	-2.8	55	50	51.0	5.0	4.0	-1.0
4	60	52	54.1	8.0	5.9	-2.1	55	51	52.0	4.0	3.0	-1.0
5	61	54	55.5	7.0	5.5	-1.5	52	49	49.9	3.0	2.1	-0.9
6	63	57	60.3	6.0	2.7	-3.3	57	54	55.1	3.0	1.9	-1.1
7	60	55	60.4	5.0	-0.4	-5.4	55	52	53.4	3.0	1.6	-1.4
8	54	50	53.4	4.0	0.6	-3.4	52	50	51.6	2.0	0.4	-1.6
9	51	49	51.7	2.0	-0.7	-2.7	50	48	50.4	2.0	-0.4	-2.4
10	50	48	49.7	2.0	0.3	-1.7	51	48	50.2	3.0	0.8	-2.2
11	50	48	50.1	2.0	-0.1	-2.1	56	54	55.9	2.0	0.1	-1.9
			μ	3.6	1.1	-2.5			μ	3.3	1.8	-1.5
			σ	1.6	1.8	1.1			σ	1.2	1.4	0.5

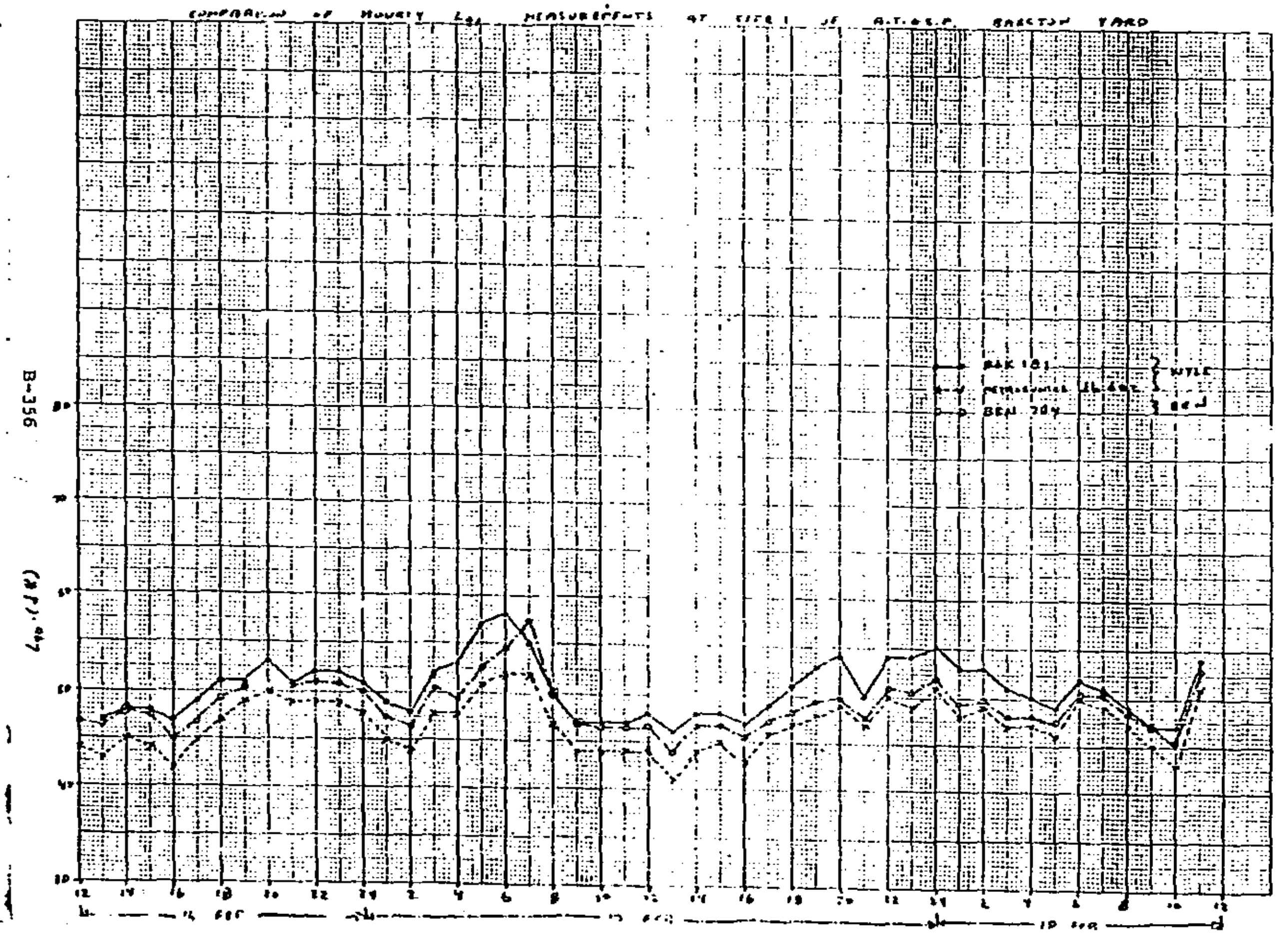

YARD

WYLE LABORATORIES - Wyle Research - Washington, D. C.

Prepared by: E. STUSNICK Date: 3/22/78 Subject: COMPARISON OF HOURLY L_{90} MEASUREMENTS AT SITE 1 OF A.T. & S.F. BARSTOW YARD.

TIME	2/11/78 – 2/17/78						2/17/78 – 2/18/78					
	WYLE B&K	WYLE METROSONICS	BBN	B&K – METRO	B&K – BBN	METRO – BBN	WYLE B&K	WYLE METROSONICS	BBN	B&K – METRO	B&K – BBN	METRO – BBN
12	—	44	46.8	—	—	-2.8	48	44	46.8	4.0	1.2	-2.8
13	47	43	46.4	4.0	0.6	-3.4	46	41	44.0	5.0	2.0	-3.[illegible]
14	48	45	48.0	3.0	0.0	-3.0	48	44	46.7	4.0	1.3	-2.[illegible]
15	48	44	47.6	4.0	0.4	-3.6	48	45	46.8	3.0	1.2	-1.8
16	47	42	44.9	5.0	2.1	-2.9	47	43	45.4	4.0	1.6	-2.[illegible]
17	49	45	46.8	4.0	2.2	-1.8	49	46	47.3	3.0	1.7	-1.[illegible]
18	51	47	49.2	4.0	1.8	-2.2	51	47	48.3	4.0	2.7	-1.[illegible]
19	51	49	50.4	2.0	0.6	-1.4	53	48	49.4	5.0	3.6	-1.[illegible]
20	53	50	—	3.0	—	—	54	49	49.7	5.0	4.3	-0.[illegible]
21	51	49	50.8	2.0	0.2	-1.8	50	47	47.7	3.0	2.3	-0.[illegible]
22	52	49	51.1	3.0	0.9	-2.1	54	50	51.0	4.0	3.0	-1.[illegible]
23	52	49	51.0	3.0	1.0	-2.0	54	49	50.6	5.0	3.4	-1.[illegible]
0	51	48	50.1	3.0	0.9	-2.1	55	51	52.1	4.0	2.9	-1.1
1	49	45	47.5	4.0	1.5	-2.5	53	48	49.5	5.0	3.5	-1.5
2	48	44	46.6	4.0	1.4	-2.6	53	49	49.7	4.0	3.3	-0.[illegible]
3	52	48	50.6	4.0	1.4	-2.6	51	47	48.0	4.0	3.0	-1.[illegible]
4	53	48	49.4	5.0	3.6	-1.4	50	47	48.1	3.0	1.9	-1.1
5	57	51	52.4	6.0	4.6	-1.4	49	46	47.4	3.0	1.6	-1.[illegible]
6	58	52	54.4	6.0	3.6	-2.4	52	50	50.5	2.0	1.5	-0.5
7	55	52	57.4	3.0	-2.4	-5.4	51	49	50.4	2.0	0.6	-1.4
8	50	47	50.1	3.0	-0.1	-3.1	49	47	48.6	2.0	0.4	-1.6
9	47	44	46.9	3.0	0.1	-2.9	47	45	47.0	2.0	0.0	-2.0
10	47	44	46.6	3.0	0.4	-2.6	47	43	45.5	4.0	1.5	-2.5
11	47	44	46.6	3.0	0.4	-2.6	54	51	53.1	3.0	0.9	-2.1
			μ	3.6	1.2	-2.6			μ	3.6	2.1	-1.6
			σ	1.1	1.5	0.9			σ	1.0	1.1	0.7

46 1513


COMPARISON OF HOURLY MEASUREMENTS AT SITE 1 OF A.T.&S.F. BARSTOW YARD
BEN 704

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RESEARCH AND TEST DEPARTMENT · AMERICAN RAILROADS BUILDING
1920 L STREET, N.W., WASHINGTON, D.C. 20036 · AREA CODE 202 · 293 · 5035

May 23, 1978

Dr. William E. Roper
Chief
Surface Transportation Noise
Environmental Protection Agency
Crystal Mall, Building 2
1921 Jefferson Davis Highway
Arlington, Virginia 20460

Dear Bill:

With this letter I transmit one copy each of Wyle/AAR noise studies of Burlington Northern's Cicero, Illinois hump classification yard and the Chessie System's Barr flat yard located in Riverdale, Illinois. In addition to the hourly equivalent sound levels, hourly percentile-exceeded sound levels, and day, night, 24-hour, and day-night sound levels at each site, an analysis of the contribution to the total acoustic energy at each site for selected time periods is included. This shows that at the Barr Yard, locomotive and moving train noise accounted for the majority of the acoustic energy measured at all sites. At Cicero, background noise was the predominant contribution at Site 1, while train and locomotive noise at sites 2, 3 and 4 was the major contributor.

Should you require further information, please feel free to contact me.

Sincerely,

Peter

Peter C. L. Conlon
Environmental Specialist

Enclosures

May 17, 1978

ACOUSTIC MEASUREMENT PROGRAM
APRIL 29 - MAY 1, 1978
CHESSIE SYSTEM BARR YARD
RIVERDALE, ILLINOIS

Introduction

In order to broaden the data base that will be available for assessing EPA's proposed regulatory standards for railroad noise, the Association of American Railroads contracted with Wyle Laboratories to undertake a series of acoustic measurements at selected railroad facilities. As part of this program, measurements were carried out between April 29 and May 1, 1978, at the Chessie System's Barr Yard in Riverdale, Illinois. This yard is a flat classification yard located in a suburb of Chicago adjacent to generally residential neighborhoods.

Procedure and Results

Three fixed measurement sites were chosen near the boundary lines of the Barr Yard property. The location of each of these sites is shown in Figures 1 to 3. In each case the site was chosen sufficiently far from adjacent highways so that traffic noise would not predominate.

At each site digital tape recordings were made of the A-weighted, fast response sound level for periods of up to 48 hours using B&K 181 Digital Data Recorders. These recordings were later analyzed in the laboratory to provide hourly values of the equivalent sound level and of selected percentile-exceeded sound levels. These data were, in turn, energy-averaged to obtain day, night, 24-hour, and day-night sound levels at each of the sites.

Site 1 was located 200 feet west of the Trainmaster's Office at the southern fence line of the railroad property. This site was intended to monitor movement of cars and locomotives within the classification area as well as car impacts. At this site the predominant noise sources were the movement of trains and locomotives. Car impacts accounted for very little of the total acoustic energy.

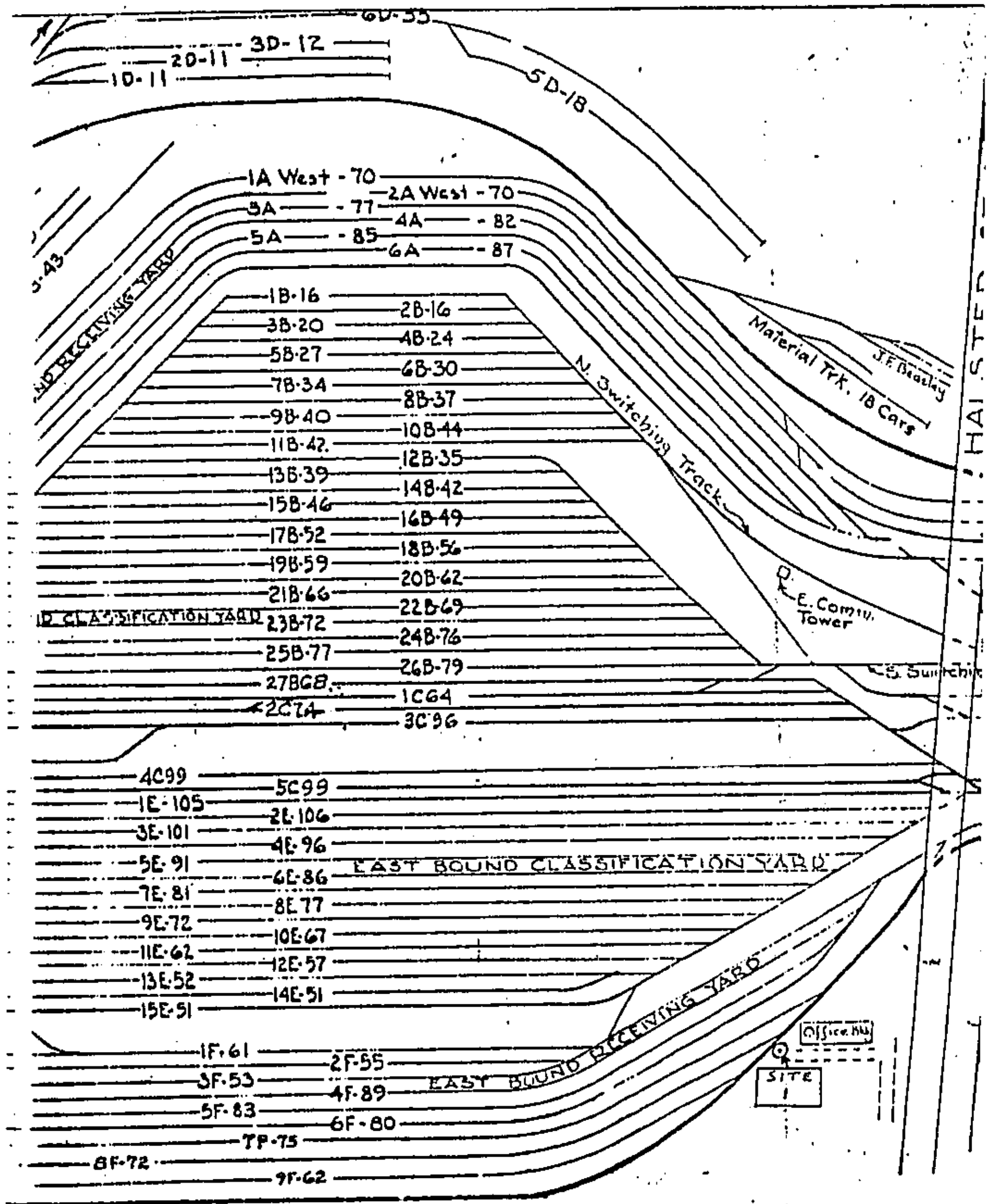

Figure 1. Location of Site 1.

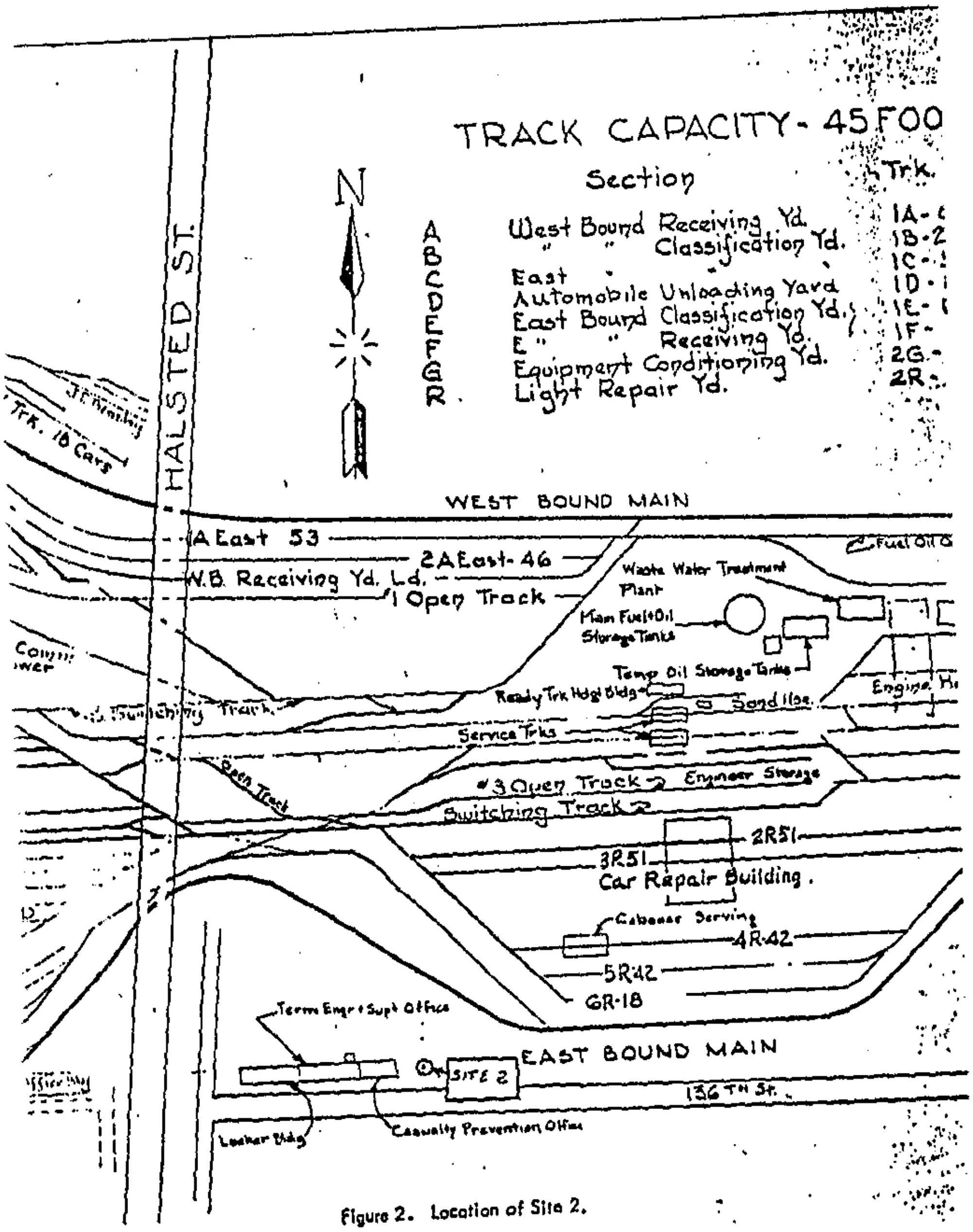

Figure 2. Location of Site 2.

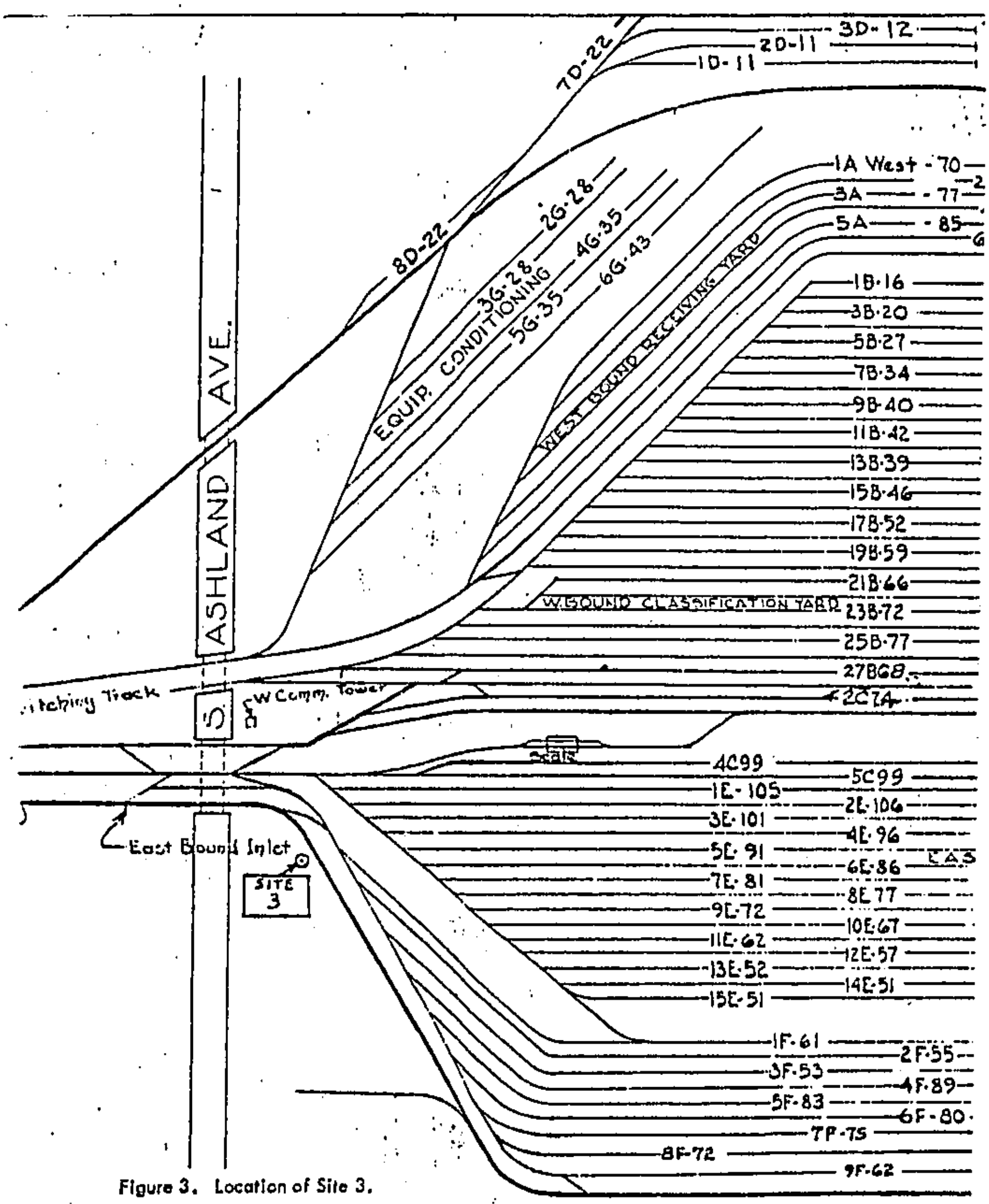

Figure 3. Location of Site 3.

Site 2 was located 130 feet east of the Superintendent's Office and 40 feet north of the southern fence line of the property. This location minimized noise from occasional traffic on 136th Street. This site was chosen so as to monitor the activity of locomotives as they pushed cars into the classification tracks from the east side of the yard. The predominant noise sources were found to be the movement of locomotives and trains.

Site 3 was located adjacent to the Car Department Building near the south boundary line of the property at the west end of the yard. It was chosen to monitor the movement of locomotives as they pushed cars into the classification tracks from the west side of the yard. As expected, the predominant noise sources at this site were the movement of locomotives and trains.

Tables 1 to 3 show the hourly values of the equivalent sound level and of selected percentile-exceeded sound levels for each of the three sites. Table 4 shows the day, night, 24-hour, and day-night sound levels for each of the sites.

Analysis of Source Contributions

In addition to the data described above, measurements were made at representative times at each site of the peak levels and durations of individual noise events occurring during periods of time up to one hour. The duration of each event was defined as the amount of time the sound level from the event was above the background level. The background level was that sound level measured when no specific source could be identified.

To approximate the acoustic energy in each noise event, the following model was used:

$$E_i \;\alpha\; \left[10^{L_i/10} - 10^{L_b/10}\right] t_i \qquad \text{for} \quad t_i \geq 10 \text{ secs}$$

$$\alpha\; \left[10^{L_i/10} - 10^{L_b/10}\right] \frac{t_i}{2} \qquad \text{for} \quad t_i < 10 \text{ secs}$$

where L_i is the A-weighted, fast response peak level of the i'th noise event;

t_i is the duration of the event; and

L_b is the background level.

Table 1(a)

Hourly Sound Levels at Site 1
April 29-30, 1978
(All Times Are Local Standard Time)

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1	L_{max}
4/29/78	1100	54.6	48	51	54	57	60	63
	1200	58.9	52	54	57	62	66	78
	1300	64.2	53	54	57	68	74	84
	1400	61.5	52	53	56	63	72	83
	1500	62.4	56	57	61	64	70	83
	1600	59.3	53	54	57	62	67	80
	1700	66.0	57	61	63	68	76	87
	1800	66.3	52	55	58	64	74	96
	1900	68.8	54	57	62	71	81	89
	2000	67.7	53	55	59	68	79	96
	2100	65.2	55	57	65	68	72	79
	2200	68.2	63	64	65	67	70	97
	2300	66.8	58	62	64	68	78	84
4/30/78	0000	61.4	57	58	60	63	70	77
	0100	63.4	51	53	58	64	71	95
	0200	62.2	50	52	55	64	72	87
	0300	64.5	50	53	57	67	75	89
	0400	60.8	51	53	58	64	71	79
	0500	67.1	53	56	60	65	74	94
	0600	61.6	52	53	56	65	72	80
	0700	66.3	51	53	59	68	77	93
	0800	64.4	52	55	61	67	74	86
	0900	67.1	52	55	62	71	76	88
	1000	63.9	53	57	62	66	73	81

Table 1(b)

Hourly Sound Levels at Site 1
April 30 - May 1, 1978
(All Times Are Local Daylight Savings Time)

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1	L_{max}
4/30/78	1300	61.0	53	55	58	63	68	85
	1400	64.3	54	56	65	67	69	79
	1500	65.5	53	55	60	68	77	86
	1600	63.9	51	54	58	66	75	87
	1700	63.8	52	55	60	66	74	83
	1800	62.5	51	53	57	67	73	78
	1900	67.0	55	59	64	70	76	83
	2000	70.7	63	64	68	74	78	92
	2100	66.6	55	56	62	71	74	85
	2200	59.5	55	56	57	61	69	77
	2300	66.9	59	60	65	70	74	81
5/1/78	0000	69.8	59	61	64	70	80	93
	0100	64.0	51	53	59	67	74	85
	0200	62.4	50	51	56	65	73	86
	0300	62.9	50	51	58	66	73	86
	0400	67.2	51	56	62	72	74	81
	0500	62.3	51	54	58	65	72	83
	0600	66.9	54	55	58	63	79	90
	0700	63.6	55	56	62	66	72	80
	0800	62.8	52	55	59	66	73	80
	0900	62.3	53	54	58	63	73	89
	1000	62.1	53	55	58	64	72	82
	1100	65.7	55	57	62	68	75	85

Table 2(a)

Hourly Sound Levels at Site 2
April 29-30, 1978
(All Times Are Local Standard Time)

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1	L_{max}
4/29/78	1300	68.7	59	59	62	68	79	91
	1400	60.2	58	59	60	61	65	71
	1500	64.0	58	60	62	66	73	84
	1600	69.6	61	64	67	72	78	87
	1700	71.5	59	60	67	73	84	91
	1800	68.8	59	60	64	72	79	84
	1900	70.2	63	64	67	73	79	86
	2000	69.1	63	64	67	72	77	87
	2100	66.1	59	60	64	68	77	81
	2200	68.3	59	60	62	70	74	100
	2300	67.8	58	60	64	72	76	86
4/30/78	0000	66.7	62	63	65	69	73	88
	0100	66.9	58	60	63	69	75	93
	0200	66.7	58	60	63	70	76	87
	0300	69.8	61	63	67	72	79	89
	0400	72.1	64	65	66	71	79	99
	0500	69.7	65	66	67	71	76	96
	0600	69.7	65	66	68	71	75	93
	0700	69.1	59	60	63	70	81	92
	0800	68.6	62	64	67	70	75	92
	0900	70.9	64	65	67	71	81	93
	1000	67.2	64	65	66	69	73	82
	1100	67.5	61	63	66	70	74	84
	1200	68.9	58	61	67	72	77	84

Table 2(b)

Hourly Sound Levels at Site 2
April 30 - May 1, 1978
(All Times Are Local Daylight Savings Time)

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1	L_{max}
4/30/78	1300	66.0	57	58	60	70	76	87
	1400	64.2	57	58	61	67	74	84
	1500	67.7	60	61	64	70	77	90
	1600	67.5	59	60	63	71	77	85
	1700	66.2	57	58	63	70	76	83
	1800	67.1	57	58	61	69	79	85
	1900	67.6	57	59	63	71	77	87
	2000	68.1	59	60	65	72	77	83
	2100	67.3	59	60	65	70	76	87
	2200	67.5	62	64	67	69	73	85
	2300	67.9	59	61	64	71	77	82
5/1/78	0000	67.4	60	62	64	68	78	89
	0100	67.0	57	59	63	69	75	96
	0200	67.8	58	61	63	69	79	91
	0300	63.9	59	60	62	66	72	77
	0400	68.2	61	63	66	71	77	87
	0500	65.4	58	59	63	68	74	86
	0600	67.4	59	61	63	68	78	87
	0700	66.9	59	60	63	70	77	88
	0800	64.7	58	59	64	67	71	82
	0900	65.1	59	60	62	66	71	91
	1000	68.0	62	63	67	71	75	86
	1100	66.4	58	60	65	69	74	79

Table 3

Hourly Sound Levels at Site 3
April 30 – May 1, 1978
(All Times Are Local Daylight Savings Time)

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1	L_{max}
4/30/78	1200	66.9	58	59	64	70	78	80
	1300	72.6	57	59	64	72	82	105
	1400	64.5	57	58	61	67	75	79
	1500	68.5	58	60	65	70	75	95
	1600	67.8	57	58	62	70	80	86
	1700	68.9	57	59	63	71	80	89
	1800	67.4	58	59	63	70	78	85
	1900	70.1	59	60	65	73	80	88
	2000	66.6	59	60	63	70	75	87
	2100	67.0	57	59	63	70	77	84
	2200	60.9	57	58	60	63	67	73
	2300	65.7	57	59	61	68	77	86
5/1/78	0000	67.2	56	58	62	71	78	84
	0100	71.2	56	59	66	75	82	90
	0200	68.7	56	59	65	72	79	86
	0300	71.3	56	58	63	72	82	97
	0400	71.8	57	59	64	75	85	90
	0500	69.6	58	60	64	72	81	88
	0600	67.7	59	60	63	70	78	86
	0700	65.6	61	62	64	68	74	83
	0800	68.0	59	60	63	69	82	86
	0900	69.8	59	60	64	73	82	87
	1000	70.2	59	61	65	73	81	88
	1100	67.6	60	61	65	70	76	87

Table 4

Day, Night, 24-Hour, and
Day-Night Sound Levels at Sites 1 to 3

Site	1	1	2	2	3
Date	4/29-30/78	4/30-5/1/78	4/29-30/78	4/30-5/1/78	4/30-5/1/78
L_d	65.0	65.2	68.7	66.8	68.6
L_n	64.8	65.7	69.0	67.1	69.2
$L_{eq(24)}$	64.9	65.4	68.8	66.9	68.8
L_{dn}	71.2	72.0	75.4	73.5	75.5

This model essentially assumes a rectangular time history for the sound energy of events longer than 10 secs and a triangular time history for the sound energy of events shorter than 10 secs.

The acoustic energy corresponding to the background for which no single source was identifiable is modeled by:

$$E_b \propto 10^{L_b/10}\, T$$

where L_b is the A-weighted, fast response background level; and

T is the total duration of the measurement period.

The percentage contribution P to the total acoustic energy during the measurement period of noise events of the same type is given by:

$$P = \frac{\sum_{1} E_i}{\sum_{2} E_i + E_b} \times 100\%$$

where Sum 1 represents events of the same type; and

Sum 2 represents all events.

The resulting percentages for each site are shown in Tables 5 to 7. At all sites railroad noise sources contribute the majority of the acoustic energy to the site. This is to be expected since the sites were chosen away from heavily trafficked roads so that railroad noise would predominate.

Table 5

Source Contributions at Site 1

Date	Time	Source	Percent of Acoustic Energy
4/30/78	1030-1130	Locomotive Moving	44
		Train Moving	31
		Locomotive Idling	20
		Background	4
		Car Impact	<1
		Air Release	<1
		Wheel Squeal	<1
		Refrigerator Car	<1
		Motor Vehicle	<1

Table 6

Source Contributions at Site 2

Date	Time	Source	Percent of Acoustic Energy
4/30/78	1400-1500	Locomotive Moving	39
		Train Moving	32
		Background	21
		Locomotive Idling	5
		Car Impact	2
		Locomotive Horn	<1
		Air Release	<1
		Wheel Squeal	<1
		Motor Vehicle	<1

Table 7

Source Contributions at Site 3

Date	Time	Source	Percent of Acoustic Energy
4/30/78	1520-1620	Train Moving	62
		Locomotive Moving	26
		Background	9
		Locomotive Horn/Bell	1
		Motor Vehicles	1
		Car Impact	<1
		Air Release	<1
		Wheel Squeal	<1
		Loudspeakers	<1
5/1/78	0900-1000	Locomotive Moving	91
		Train Moving	5
		Background	3
		Locomotive Idling	<1
		Car Impact	<1
		Locomotive Horn	<1
		Loudspeakers	<1
		Motor Vehicles	<1

Table 8

Source Contributions at Site 3

Date	Time	Source	Percent of Acoustic Energy
4/27/78	1415-1515	Through Passenger Trains	87
		Train Moving	9
		Background	2
		Locomotive Moving	1
		Car Impact	<1
		Adjacent Industrial Noise	<1

Table 9

Source Contributions at Site 4

Date	Time	Source	Percent of Acoustic Energy
4/28/78	1430-1530	Locomotive Idling	98
		Locomotive Moving	1
		Loudspeakers	<1
		Locomotive Horn/Bell	<1
		Motor Vehicles	<1

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May 23, 1978

Dr. William E. Roper, Chief
Surface Transportation Noise
Environmental Protection Agency
Crystal Mall, Building 2
1921 Jefferson Davis Highway
Arlington, Virginia 20460

Dear Bill:

Enclosed are noise data from Northtown hump classification yard, Fridley, Minnesota, as measured by Burlington Northern, Inc. personnel during the period April 27 to May 8, 1978. Included herein is 1) noise survey sheets detailing atmospheric conditions, measurement locations and instrumentation information, 2) Noise Analysis Data sheets for the three test sites measured, 3) a color photograph of the yard showing the positions of monitoring locations 1 and 3, 4) black & white photographs showing the location of all monitoring locations, 5) a scale drawing of the yard showing the locations of all monitoring locations, and 6) summaries of operational data for the measurement period.

The instrumentation was such that either 8, 16, or 24-hour L_{eq} or L_{dn} could be measured but not both, so L_{dn} was selected. The L_{dn} values as measured 900 feet from the master retarder and 600 feet from the nearest group retarder on April 28, 29 and 30 in the shadow of the noise barriers, were 74, 73, and 73 dB(A), respectively. The microphone was located such that it was below the top of the berm paralleling the yard on the near side of the yard. Other L_{dn} values measured at Northtown ranged from 65 to 68 dB(A).

I have copies of the raw operational data should you need them. If you have any questions about any of the information contained in this package, please contact me.

Sincerely,

Peter Conlon

Peter C. L. Conlon
Environmental Specialist

Attachments

FROM THE DESK OF

PETER CONLON

Bill -

I sent the blueprint out for duplication and it is not back yet. As soon as it comes in I'll send it to you.

Peter

NOISE SURVEY

Location Fridley and Minneapolis, MN (Burlington Northern Northtown Yard)

Date April 28, 1978 thru May 8, 1978

Time Continuous 24 hr. monitoring

Atmospheric Conditions

Temperature low 36^{o}F., high 55^{o} F.

Wind Speed 2 - 10 MPH Easterly Direction

Relative Humidity - %

Barometric Pressure - Inches

Measurement Locations

Address Sites 1, 2 and 3 on East side of Yard, adjacent to residential areas at property line locations. See attached plans for exact microphone locations.

Time of survey start 12:00 noon April 28, 1978

Time of survey finish 12:00 noon May 8, 1978

Instrumentation

General Radio #1945 Community Noise Analyzer, Serial No. 142

General Radio #1952, ½ inch Electret Condenser microphone, Serial #4214

General Radio #1560-P42, Pre-amplifier, Serial #3379

General Radio #1945-9640, Weatherproof enclosure

General Radio #1562-A, Sound level calibrator

Comments Battery condition checked at start and conclusion of tests at each site location. Calibration checks made at start and conclusion of tests at each site.

C. F. Mufelder
Investigator

5-10-78
Date

NOISE ANALYSIS DATA

General Radio - 1945 Community Noise Analyzer

1. Location Test Site #1, 50 ft. west of property line fence at 51st Ave. N.E. Fridley, Minnesota, Northtown Railroad Yard. Microphone located below top of berm, shielded from adjacent residence area sounds.

2. Calibration at start of test period: OK - 114 dB @ 1000 Hz

3. Calibration at end of test period: OK - 114 dB @ 1000 Hz

4. Battery check at start of test period: OK

5. Battery check at end of test period: OK

D A T A

DATA		First Run Date 4/28/78 Time Started 12:00 noon Time Completed 12:00 noon 4/29/78	Second Run Date 4/29/78 Time Started 12:00 noon Time Completed 12:00 noon, 4/30/78	Third Run Date 4/30/78 Time Started 12:00 noon Time Completed 12:00 noon, 5/1/78
L MAX		95	97	100
L 0.1		92	82	81
L 1		73	73	72
L 10		70	69	69
L 50		67	67	66
L 90		64	64	62
L 99		59	63	60
L Min.		56	60	57
HUD	.5/24	72	71	71
HUD	1/24	71	70	70
HUD	8/24	68	68	67
HUD	.5/8	70	70	70
L 2		72	71	71
L 5		71	70	70
L 20		69	69	68
L dn		74	73	73

Comments: Meter on Fast Response, A weighted. Each run for a 24 hour uninterrupted period. Wind 2 - 5 MPH, N.E. - Clear, bright sunlight days. Temperatures 40 - 55^{O}F., No precipitation

C. F. Mueller
Investigator

May 10, 1978
Date

BURLINGTON NORTHERN

NOISE ANALYSIS DATA

General Radio - 1945 Community Noise Analyzer

1. Location: Test Site No. 2, at extreme west end of 43rd Ave. N.E., approximately 400 ft. from Diesel Locomotive Shop. Microphone placed at property line inside the fence of Ajax Mfg. Co., Fridley, MN.

2. Calibration at start of test period: OK - 114 dB @ 1000 Hz
3. Calibration at end of test period: OK - 114 dB @ 1000 Hz
4. Battery check at start of test period: OK
5. Battery check at end of test period: OK

D A T A

DATA		First Run	Second Run	Third Run
		Date: 5/2/78 Time Started 7:00 AM Time Completed 7:00 AM, 5/3/78	Date 5/3/78 Time Started 7:00 AM Time Completed 7:00 AM, 5/4/78	Date 5/4/78 Time Started 7:00 AM Time Completed 7:00 AM, 5/5/78
L MAX		94	91	93
L 0.1		82	81	86
L 1		72	74	75
L 10		65	69	65
L 50		60	59	60
L 90		55	56	54
L 99		52	54	52
L Min.		50	52	50
ROD	.5/24	70	72	71
	1/24	68	69	68
	8/24	62	61	61
	.5/8	67	67	67
L 2		70	72	71
L 5		68	68	67
L 20		64	62	63
L dn		67	68	67

Comments: Meter on fast response, A weighted, each run for a 24 hour uninterrupted period. Wind N.E., 5 - 6 mph, clear, bright, sunlight days. Temperatures 36 - 55°F., no precipitation.

C. F. Mu[illegible]
Investigator

May 10, 197[illegible]
Date

BURLINGTON NORTHERN

NOISE ANALYSIS DATA

General Radio - 1945 Community Noise Analyzer

1. Location Test Site No. 3, 100 ft. west of property line fence at Main Street. Approximately 1100 ft. south of 37th Ave. N.E., Minneapolis, MN, overlooking the One-Spot car repair facility at Northtown Railroad Yard. Microphone located at top of berm, overlooking railroad yard and adjacent residential area.

2. Calibration at start of test period: OK, 114 dB @ 1000 Hz

3. Calibration at end of test period: OK, 114 dB @ 1000 Hz

4. Battery check at start of test period: OK

5. Battery check at end of test period: OK

D A T A

DATA	First Run Date May 5, 1978 Time Started 12:00 noon Time Completed 12:00 noon, 5/6/78	Second Run Date 5/6/78 Time Started 12:00 noon Time Completed 12:00 noon, 5/7/78	Third Run Date 5/8/78 Time Started 12:00 noon Time Completed 12:00 noon, 5/9/79
L MAX	86	87	88
L 0.1	76	76	83
L 1	69	70	80
L 10	62	64	70
L 50	57	57	58
L 90	53	53	52
L 99	51	51	48
L Min.	49	49	46
HUD .5/24	66	68	78
HUD 1/24	64	65	76
HUD 8/24	58	59	60
HUD .5/8	63	64	73
L 2	67	68	78
L 5	64	65	75
L 20	60	61	64
L dn	65	65	68

Comments: Microphone overlooks car repair facility and South end of Yard - Microphone located approximately 300 ft. from Car Shop on the West. Property line approximately 100 ft. east of microphone location. Meter on fast response, A weighted. Each run for a 24 hour uninterrupted period. Sky partly cloudy to cloudy. Changing weather conditions. Cloudy with light rain on May 7th & 8th. Wind N.W. 6 - 10 mph, temperature 38-55°

C. F. Mu[illegible]er
Investigator

BURLINGTON NORTHERN

5-10-78
Date

DATA SUMMARY - NORTHTOWN

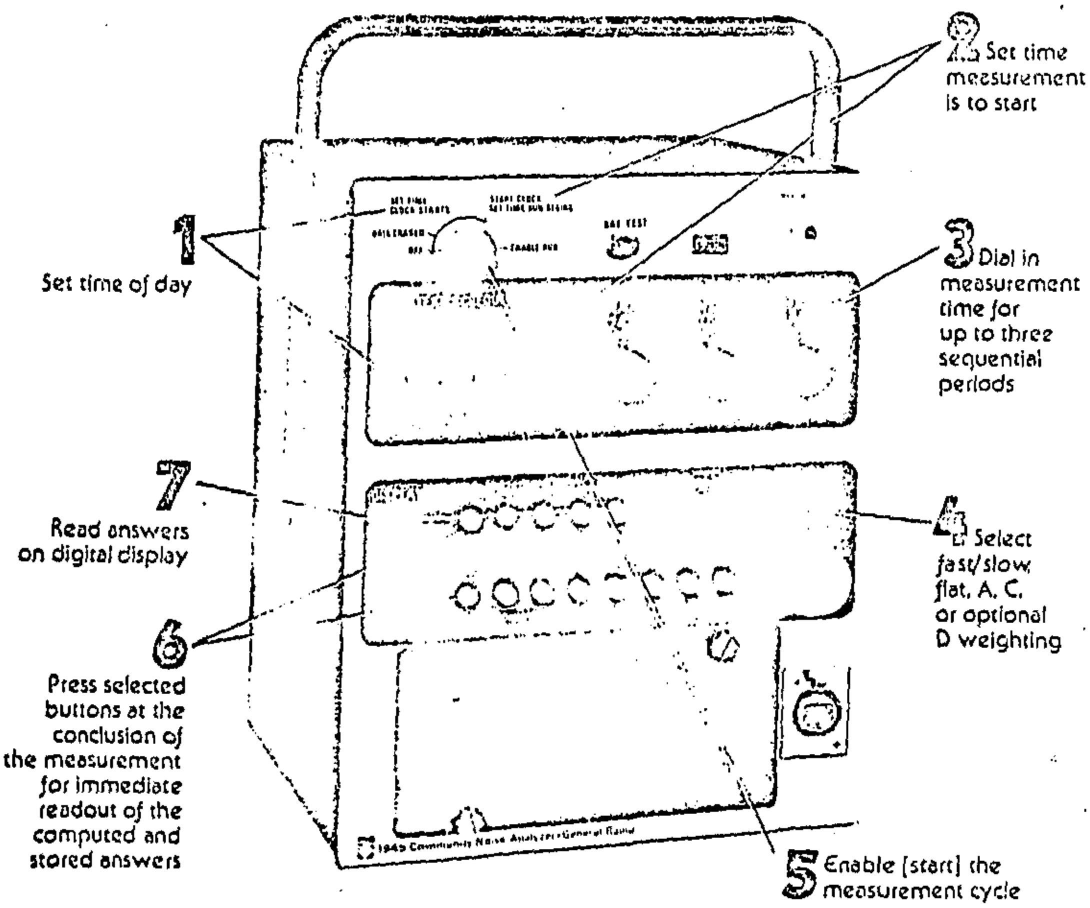
LOCOMOTIVES SERVICED

5/1/78	68 UNITS SERVICED, 1 LOAD TEST
5/2/78	73 UNITS SERVICED, 2 LOAD TESTS
5/3/78	65 UNITS SERVICED, 1 LOAD TEST
5/4/78	54 UNITS SERVICED, 1 LOAD TEST
5/5/78	66 UNITS SERVICED, 0 LOAD TEST

DATA SUMMARY - NORTHTOWN

CARS HUMPED

DATE	1ST SHIFT	2ND SHIFT	3RD SHIFT	TOTAL
4/27/78	792	823	808	2,423
4/28/78	613	814	774	2,201
4/29/78	584	902	671	2,157
4/30/78	758	785	819	2,362
5/01/78	619	797	878	2,234
5/02/78	487	605	860	1,952
5/03/78	656	718	886	2,260
5/04/78	508	743	746	1,997
5/05/78	809	802	644	2,255
5/06/78	729	792	679	2,200
5/07/78	777	746	721	2,244
AVERAGE	666	775	771	2,207



The 1945 Community Noise Analyzer.

exceedance distribution curve. For our example, L_{90} is 48 dB. The 1945 automatically forms the histogram, the exceedance distribution, and, from that, the commonly used exceedance levels that are selected on the front panel.

Determination of a set of exceedance levels provides a great deal of information about the levels of noise and their variation in a measurement interval or "run." A set of 3 (most commonly L_{90}, L_{50}, L_{10}) is considerably more informative than a single measurement, even one so carefully derived as L_{eq}, described below.

4.1.4 Equivalent Energy Levels L_{eq} and L_{dn}.

Although a set of exceedance levels are often required to describe a noise environment, there is a need for a measure that summarizes all information about absolute level and variation in a single number. The equivalent energy

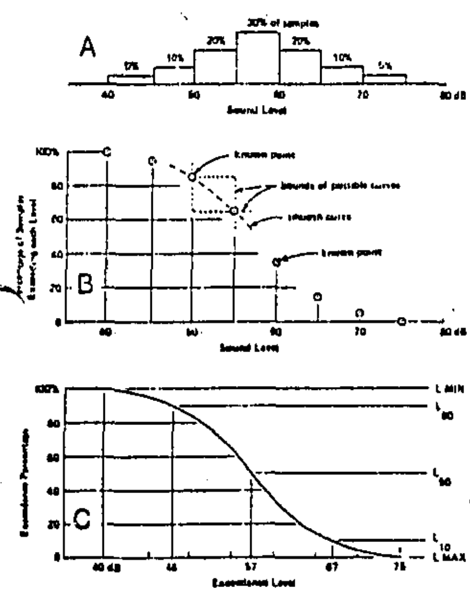


Figure 4-2. Simplified illustration of how exceedance levels are obtained from a set of measurements.

A. Histogram of data. All samples are grouped in sound-level segments.

B. Exceedance distribution curve. Each known point is at a boundary between segments. Although the exceedance function (curve) could be anywhere within stair-like bounds as shown partially, a smooth curve through the known points is the best approximation.

C. Exceedance-level readout. At each desired percentage exceedance (vertical scale) we determine from said curve the exceedance level (horizontal scale). The 1945 pushbuttons select certain percentages. However, the exceedance level of any percentage can be obtained from the distribution curve. (You can approximate the curve using data from the available displays or generate it with precision using the serial data output.)

level, L_{eq}, is regarded as the most objective single-number description. L_{eq} is the sound-level of the equivalent constant sound that (acting for the duration of the measurement run) would generate the same total energy as does the measured (varying) sound. L_{eq} is defined mathematically as:

$$L_{eq} = 10 \log_{10} \left[\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{p^2(t)}{p_0^2}\, dt \right]$$

where $p(t)$ is the time-varying sound pressure and p_0 is the reference pressure, 20 μPa. When the data for a run consists of N samples of the sound level, the equivalent definition is:

$$L_{eq} = 10 \log_{10} \left[\frac{1}{N} \sum_{i=1}^{N} 10^{L_i/10} \right]$$

where L_i is the sound level (in decibels) of the sample numbered "i".

The day-night level L_{dn} is closely related to the equivalent energy level, but is defined with a recognition that noise is more disturbing during the night than during the day (at least for the majority of people). L_{dn} is a 24-hour equivalent energy calculation with a 10-dB penalty added to every sample taken during the nine "night" hours of 10:00 P.M. to 7:00 A.M., thus:

$$L_{dn} = 10 \log_{10} \left[\frac{D}{D+N} \sum_{i=1}^{D} 10^{\frac{L_i}{10}} + \frac{N}{D+N} \sum_{j=1}^{N} 10^{\frac{L_j + 10}{10}} \right]$$

where L_i is the sound-level in dB of each daytime sample (07:00 through 22:00), L_j is the sound-level in dB of each nighttime sample (22:00 through 07:00), D = 15 k, and N = 9 k, where k is the sampling rate, in samples per hr.*

4.2 BLOCK DIAGRAM EXPLANATION. Figure 4-3.

The input signal (from MIC or AUX source) is fed to the Analog Weighting and Detector Circuit where the signal is weighted according to the selected characteristic and processed by the mean-square detector. The resultant dc signal is then digitized in 1-dB steps by the A/D Converter and fed to the Control Logic section.

The digitized information is converted by Control Logic to a time-delayed pulse where the time delay, with respect to a master reset, is proportional to that digital number and hence to the sound-level. In DISPLAY LEVEL mode, the time-delayed pulse is routed by Control Logic to the Display Logic section, converted to digital sound-level information, and transferred to the LED Display.

* *Federal Register*, Vol 39, No. 121, pages 22297...22299, June 21, 1974.

If measurement runs are in progress, the Control Logic routes the time-delayed pulse via the serial Adder into the Memory location associated with the particular run and sound-level value and into the optional L_{eq} Processor. The Memory block contains 3 memories (1 for each run); all are cleared prior to runs.

Each memory consists of a 2048-bit dynamic shift register whose bit clock is 16 times faster than the A/D converter clock. This allows the memory to be divided into 128 16-bit words, each being assigned a 1-dB window or bin. Since the memory address is synchronous with the A/D Converter, the time-delayed pulse can add a data bit representing the occurance of only one discrete sound-level measurement to only one 16-bit word per complete memory cycle. Each memory cycle begins at the master reset (GRST in Figure 2-9) and accommodates one new sound-level sample. These samples occur approximately every 0.22 seconds.

The Control Logic, programmed in part by the RUN LENGTH switches, counts the number of samples, while a histogram is created in Memory, for each run. The run lengths are internally programmed by fixing the number of samples to be taken and by allotting all or some proportion of the available incoming data samples to be actually used in the histogram. When the number of samples taken is altered, the numerical value assigned to each sample is altered in order to maintain the same full-scale histogram value. Listed in Table 4-1 are the number of samples counted and the proportion of the available ones used for each run length.

Table 4-1
SAMPLE USAGE IN HISTOGRAM

Run Length	Samples Counted	Samples Used	Weight
1/2 hour	$2^{13}-1$ (8,191)	All	8
1	$2^{14}-2$ (16,382)	All	4
2	$2^{15}-4$ (32,764)	All	2
3	$2^{15}-4$ (32,764)	2 of 3	2
4	$2^{16}-8$ (65,528)	All	1
6	$2^{16}-8$ (65,528)	2 of 3	1
8	$2^{16}-8$ (65,528)	1 of 2	1
12	$2^{16}-8$ (65,528)	1 of 3	1
24	$2^{16}-8$ (65,528)	1 of 6	1

At the conclusion of each run and prior to the beginning of the next, the Control Logic programs the Adder to sum each 16-bit word in Memory to the sum of all previous words for one complete cycle. This computation serves to integrate the histogram, yielding a cumulative distribution. Figure 4-4 illustrates, with the same simplified set of data used in Figure 4-2. The circuitry in the analyzer obtains fine resolution, with a bin (segment) size only 1 dB wide along the sound-level scale and with 65,528 samples representing 100% (for runs of 4 hr or longer). The number stored in ROM for L50 is then 32,764, for example.

The display section employs a 3-decade BCD counter with an output storage register which drives the LED display. The counter is cleared once per cycle and driven at the A/D-converter clock rate (1/16 the memory clock rate). In DISPLAY LEVEL mode, the time-delayed pulse from the Control

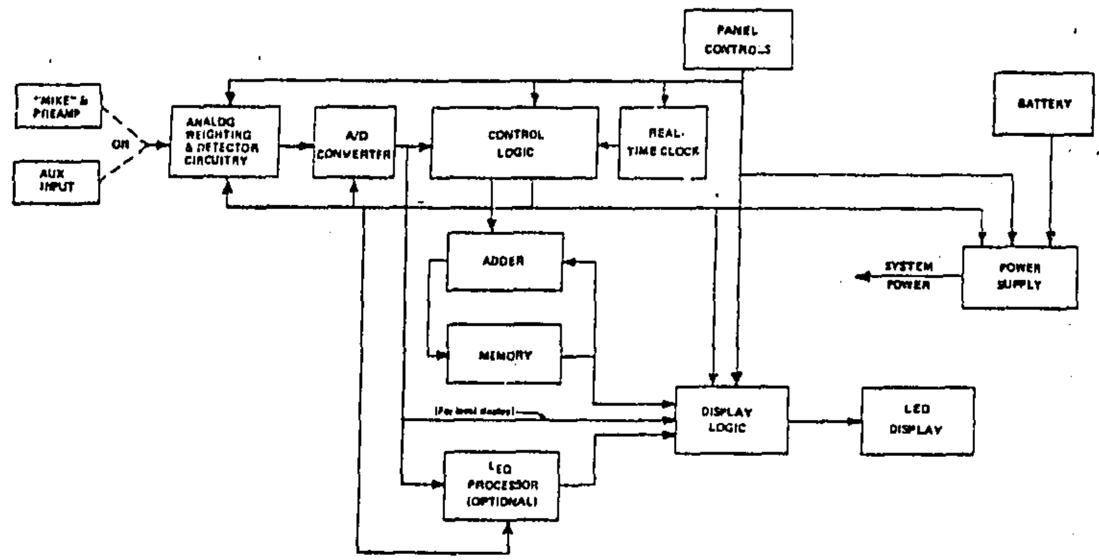


Figure 4-3. Block diagram of the analyzer.

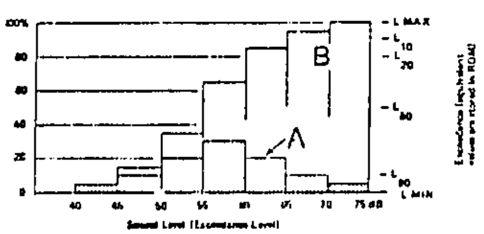


Figure 4-4. Simplified illustration of how data is combined to form a cumulative distribution.

A. Histogram of samples measured in sound-level segments (see also Figure 4-2).

B. Cumulative distribution, which is obtained by successive additions. In this example, L_{20} is 60 dB.

additions. In this example, L_{20} is 60 dB.

Logic is used to transfer the contents of the counter to the output storage register, thus producing the apparently continuous input-level display. For any exceedance-level display, the time-delayed transfer pulse is generated by comparing the selected memory contents with the contents of a read-only memory that contains the complement of the percentage full scale of the cumulative distribution for that exceedance level. (Refer to the figure.) If you have the optional L_{eq} processor, a third source of delayed transfer pulse is generated for L_{eq} (or L_{dn}) only.

The real time clock is comprised of 4 parallel-loaded BCD counters and controls *only* the time at which the first run begins. When the power switch is in the SET TIME CLOCK STARTS position, the clock is loaded from the TEST SCHEDULE thumbwheel switches but does not start until the power switch has been advanced to the START CLOCK/ SET TIME RUN BEGINS position. Finally, with the power switch in the ENABLE RUN position, the run will begin when the clock data equals the thumbwheel-switch setting. Since the analog circuitry requires some settling time, after the application of dc power at the beginning of the first run to the preamp and analog circuitry, the Control Logic, provides a delay of approx 25 seconds before enabling the measurement to begin.

Unregulated battery voltage is reduced to 5 volts by a switching regulator, which supplies power at 5 V to the display logic. The switching regulator also feeds an inverter power supply, which produces +9 volts for digital-logic and analog power, −9 volts for analog power and +18 volts for the external preamplifier.

For schematic diagrams and more details, refer to the 1945 Service Manual (see Table 1-3).

MEMORANDUM

TO: Peter Conlon/AAR DATE: May 11, 1978

FROM: Eric Stusnick E. S.

SUBJECT: Preliminary Analysis of Acoustic Data From B.N. Cicero Yard and Chessie Barr Yard

This memorandum documents the day sound levels, night sound levels, 24-hour, and day-night sound levels that were measured near the boundary line of the B.N. Cicero Yard from April 26 to April 28, 1978, and near the boundary line of the Chessie Barr Yard from April 29 to May 1, 1978. Table 1 shows the values of these acoustic metrics measured at the three sites chosen at each of these two yards.

I am currently preparing a more detailed description of the measurement program which includes hourly values of L_{eq}, L_{max}, L_1, L_{10}, L_{50}, L_{90}, and L_{99} at each of the sites along with analyses of the major noise sources contributing to the boundary line noise exposure during selected periods.

Table 1

Day, Night, 24-Hour, and Day-Night Sound Levels at B.N. Cicero Yard and at Chessie Barr Yard

	B.N. Cicero Yard, Chicago, Ill.					Chessie Barr Yard, Riverdale, Ill.			
	Site 1* 4/26-27/78	Site 2 4/26-27/78	Site 2 4/27-28/78	Site 3 4/26-27/78	Site 4 4/27-28/78	Site 1 4/29-30/78	Site 1 4/30-5/1/78	Site 2 4/29-30/78	Site 3 4/30-5/1/78
L_d	--	76.7	72.8	76.6	72.3	65.0	65.2	68.7	68.6
L_n	--	73.9	71.5	68.7	72.9	64.8	65.7	69.0	69.2
$L_{eq(24)}$	--	75.8	72.4	75.0	72.5	64.9	65.4	68.8	68.8
L_{dn}	79	80.8	78.1	77.5	79.2	71.2	72.0	75.4	75.5

* Measured by C. Muelder, Burlington Northern.

ES/agb

The Atchison, Topeka and Santa Fe Railway Company
A Santa Fe Industries Company
Motive Power Building, [illegible], Topeka, Kansas 66616, 913/235-0041

1001 N.E. Atchison Street

May 22, 1978
File: 12-36.063

Mr. Peter C. L. Conlon
Environmental Specialist
Research and Test Department
American Railroads Building
1920 L Street, N.W.
Washington, D.C. 20036

Dear Sir:

Emporia, KS (1 mile flat yard)

LDN community noise measurements were made at one Emporia Yard Location for the 24-hour period ending at 3 p.m., May 12. The community noise analyzer was on the A-scale and at fast response.

The location of the microphone was approx. 700 feet east of Mile Post 114, 50 ft south of the No. 3 main line, 75 ft north of the nearest yard track and 5.5 ft above ground level.

Microphone wind noise interference was considerable and no doubt contributed to produce a higher LDN factor by at least several decibels. Wind noise interference became apparent on the graphic sound-level recorder, and on the community analyzer sound-level readout, at about 9 a.m., with variable winds estimated at 10 to 20 mph, which produced short duration indications of up to 60 dB(A). Wind noise interference increased gradually in height and duration until, during the last half-hour of measurement, had reached peaks of 70 to 80 dB(A) covering more than 50 percent of the time scale, produced by variable wind velocities estimated up to 50 mph.

Other than the wind and some thunder, noise sources were almost exclusively from yard switching operations and main line train passby's; there was no street or other outside noise and only an occasional company car on the nearby service road.

At the end of the 24-hour period, the community analyzer readings were as follows:

LDN = 78 dB(A)fast

Lmax = 102; L0.1 = 93, L1 = 85; L2 = 80; L5 = 73; L10 = 68; L20 = 63; L50 - 54; L90 = 46; L99 = 42; Lmin = 37.

Yours very truly,

C. R. Kaelin

C. R. Kaelin, Director
Technical Research and
Development

cc - Mr. D. C. Ruegg (File 18529-17)

Topeka, May 9, 1978
File: 12-36.021

Mr. D. G. Ruegg:

Please refer to property line noise measurements at Corwith Yard (Chicago, Ill.) requested by B. J. Rust from your staff.

Representatives from this Department were at Corwith Yard May 3 to 5 to make property line measurements with a community noise analyzer over a 48-hour period. The location of the microphone, selected by your representative, was 95-feet south of the TOFC Terminal Building, 2 feet inside the property line fence and 5-1/2 feet above ground level. The analyzer was A-weighted and at fast-meter response.

During the first 24-hour period, A-weighted LEQ, L10 and L90 were measured at hourly intervals, except where readings were not available due to instrument malfunction, as shown below:

May 3	LEQ	L10	L90
2 To 3 PM	65	67	50
3 To 4	66	66	52
4 To 5	65	69	51
5 To 6	68	71	57
6 To 7	70	72	56
7 To 8	66	72	59
8 To 9	67	70	55
9 To 10	72	77	56
10 To 11	66	72	58
11 To 12	68	69	53

May 4	LEQ	L10	L90
12 To 1 AM	62	62	52
1 To 2	66	70	55
2 To 3	73	76	51
3 To 4	67	69	52
4 To 5	67	72	52
5 To 6	73	77	52
6 To 7	71	73	58
7 To 8	67	NA	56
8 To 9	70	73	59
9 To 10	66	69	57
10 To 11	66	NA	NA
11 To 12	69	71	62
12 To 1 PM	70	NA	66
1 To 2	72	NA	61

NA: Reading not available due to instrument malfunction.

The LDN was measured for the 24-hour period from 2:09 PM, May 4 to 2:09 PM, May 5, on the A-scale and at fast-meter response, with the following results:

LDN = 74 dB(A);
Lmax = 94; L0.1 = 89; L1 = 83; L2 = 78; L5 = 74; L10 = 71; L20 = 67; L50 = 62; L90 = 57; L99 = 54; Lmin = 49.

The reading of a sound level meter was recorded continuously on a strip chart for the entire 48-hour period of measurements. The sources of the

VICE PRES. OPRS
MAY 15 1978

noises contributing to the Community Analyzer factors were almost exclusively from the TOFC activities, such as truck movements, travelift crane operation, and a very small amount of car switching impacts. The nearest approach to the microphone by trucks was 25 feet, and by cranes was 35 feet. There was no noticeable participation by street traffic noises from outside the fence, by hump yard retarder noise, nor by train operating noise.

C. R. Kaelin

May 17, 1978

ACOUSTIC MEASUREMENT PROGRAM
APRIL 26-28, 1978
B.N. CICERO YARD
CICERO, ILLINOIS

Introduction

In order to broaden the data base that will be available for assessing EPA's proposed regulatory standards for railroad noise, the Association of American Railroads contracted with Wyle Laboratories to undertake a series of acoustic measurements at selected railroad facilities. As part of this program, measurements were carried out between April 26 and April 28, 1978, at the Burlington Northern Classification Yard in Cicero, Illinois. This is a crowded hump yard located in a suburb of Chicago, which abuts on industrial, commercial, and residential neighborhoods.

Procedure and Results

Four fixed measurement sites were chosen near the boundary lines of the B.N. Cicero Classification Yard. This yard is bounded primarily by the heavily travelled thoroughfares of Ogden Avenue, West 31st Street, and West 26th Street. In order to minimize the contribution of traffic noise to the measured acoustic signal, the sites were generally chosen a short distance inside the property line. Figure 1 shows the general location of the four sites relative to the yard as a whole; while Figures 2 to 5 show, in scale, the actual location of each microphone position.

Site 1 was located on the roof of a shed about 175 feet south of the T.O.F.C. loading/unloading facility and about 150 feet inside the property line from Ogden Avenue. At this site a GenRad 1945 Community Noise Analyzer, belonging to Burlington Northern Railroad, was used to obtain 24-hour percentile-exceeded sound levels and the day-night sound level for the period 0915 on April 26, 1978, to 0915 on April 27, 1978. The resultant levels are shown in Table 1.

At this site the predominant noise source is the movement of tractor-trailers to and from the loading/unloading facility. Since the majority of these vehicles are privately owned it is not clear whether or not their noise emission would be covered by the proposed standards.

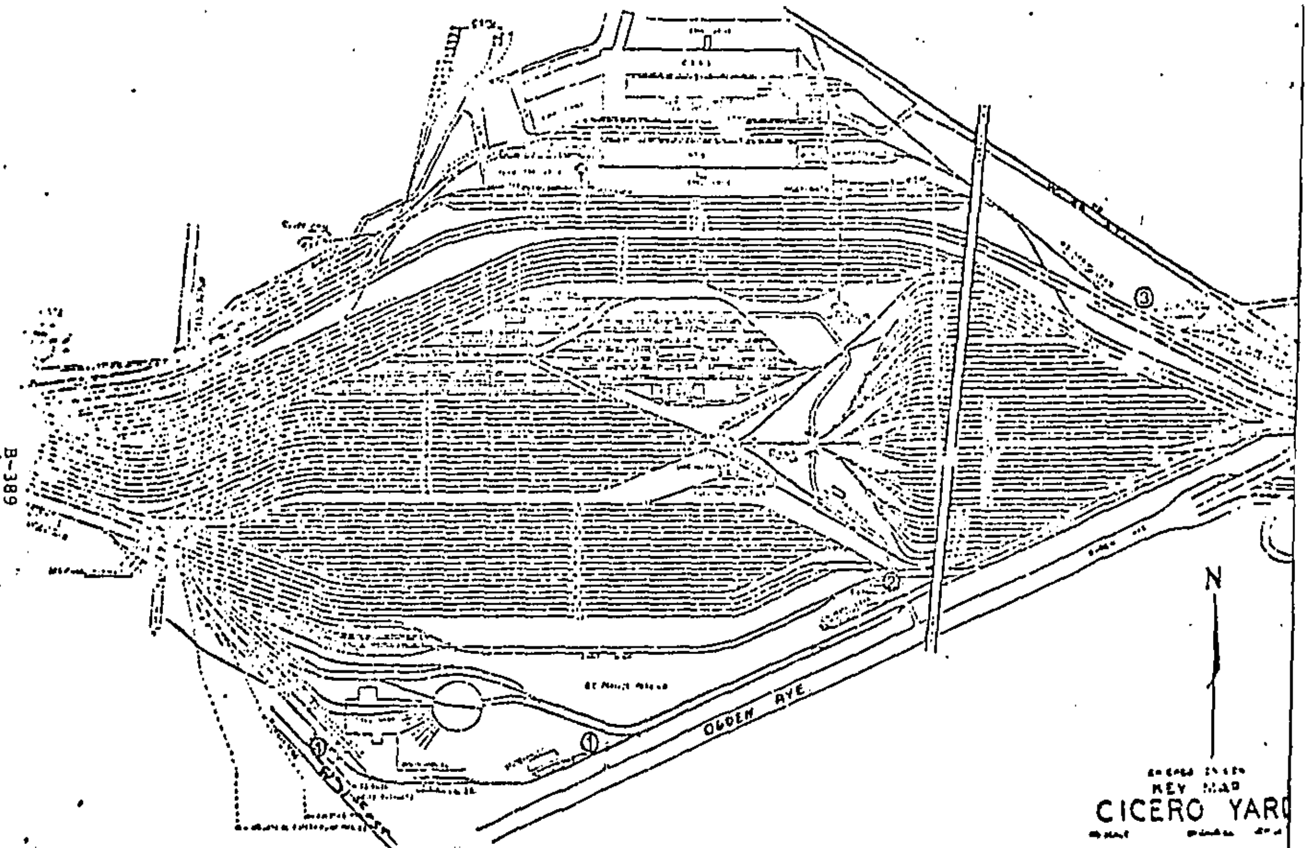


Figure 1. Acoustic Measurement Sites

Zone 1

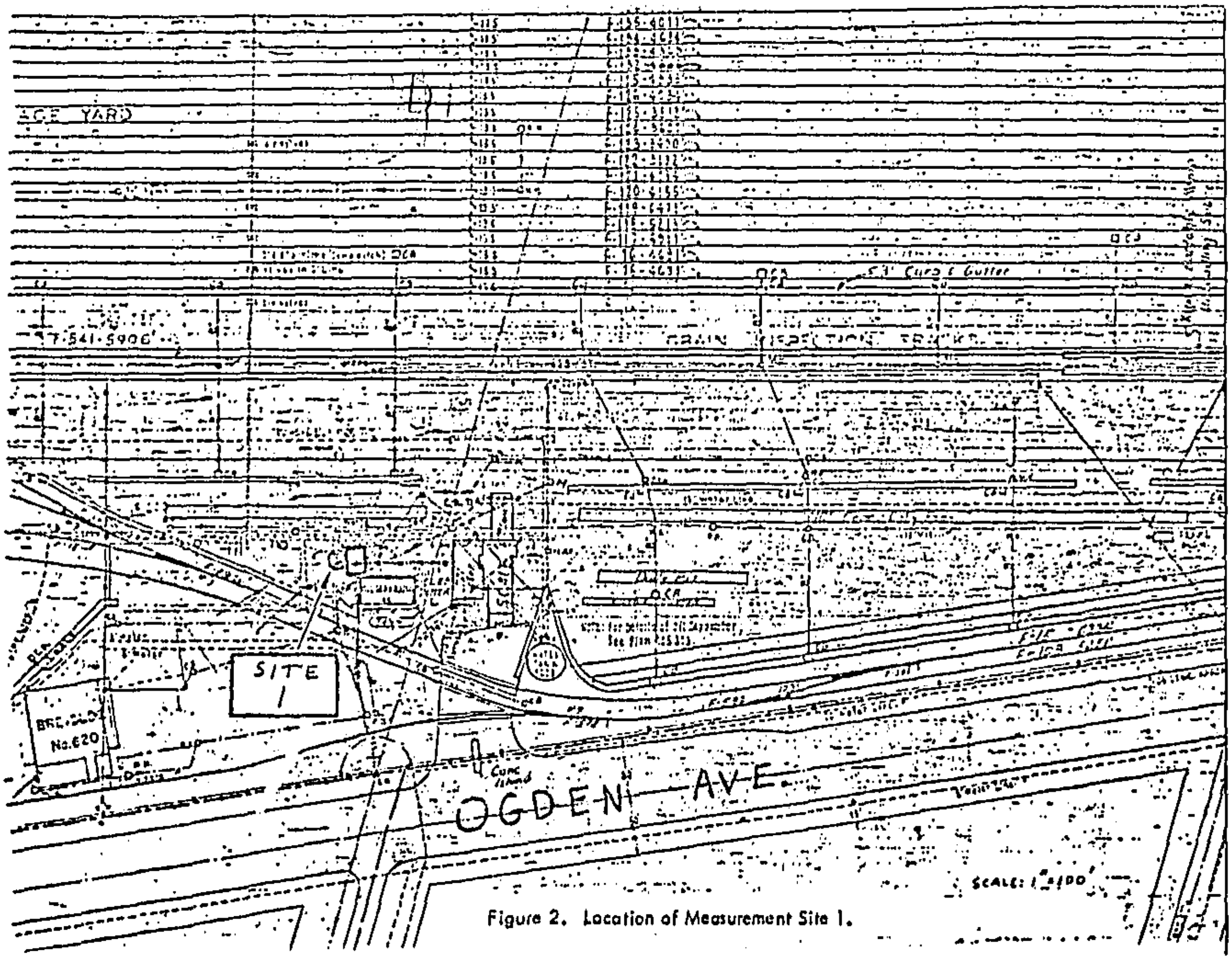


Figure 2. Location of Measurement Site 1.

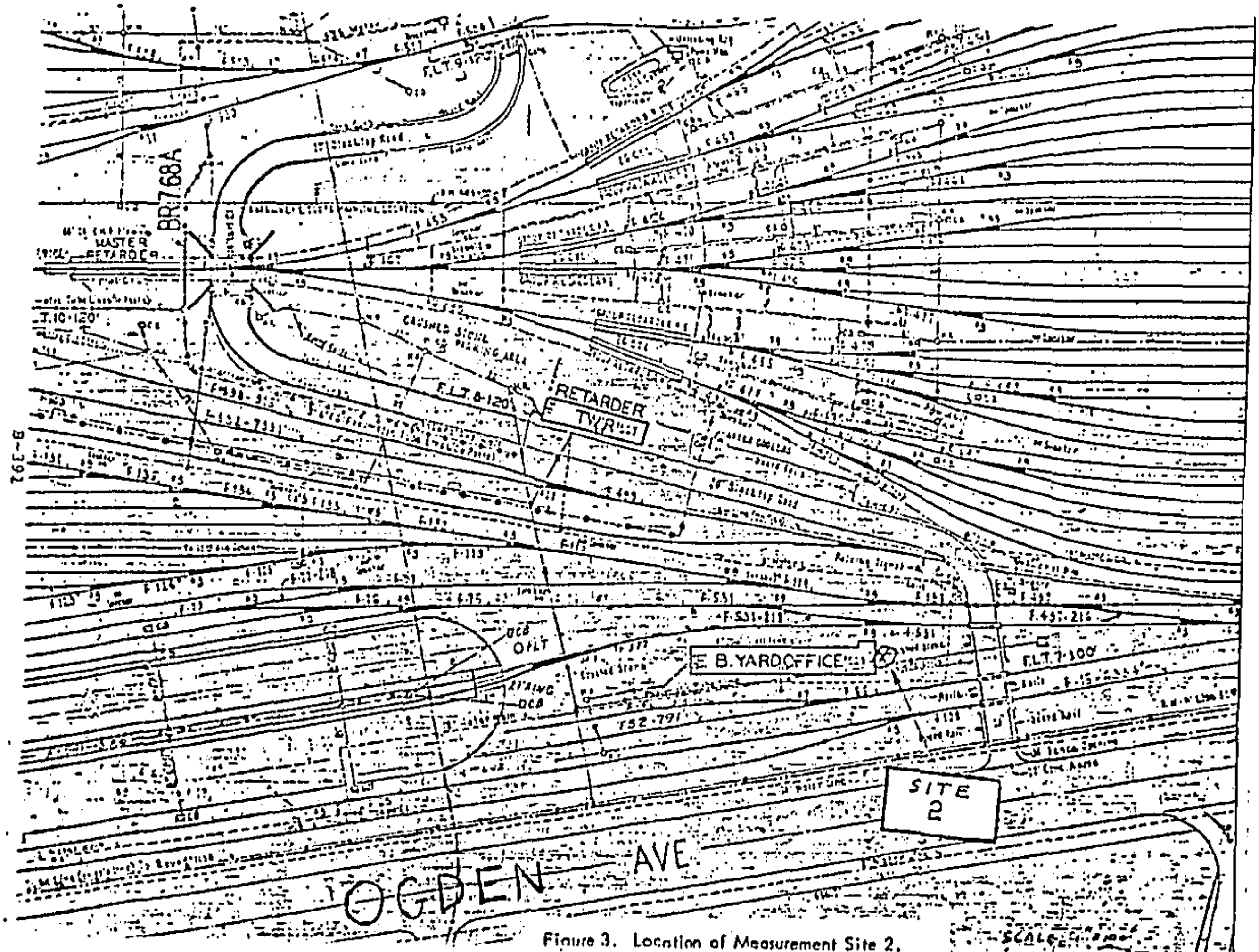


Figure 3. Location of Measurement Site 2.

B-392

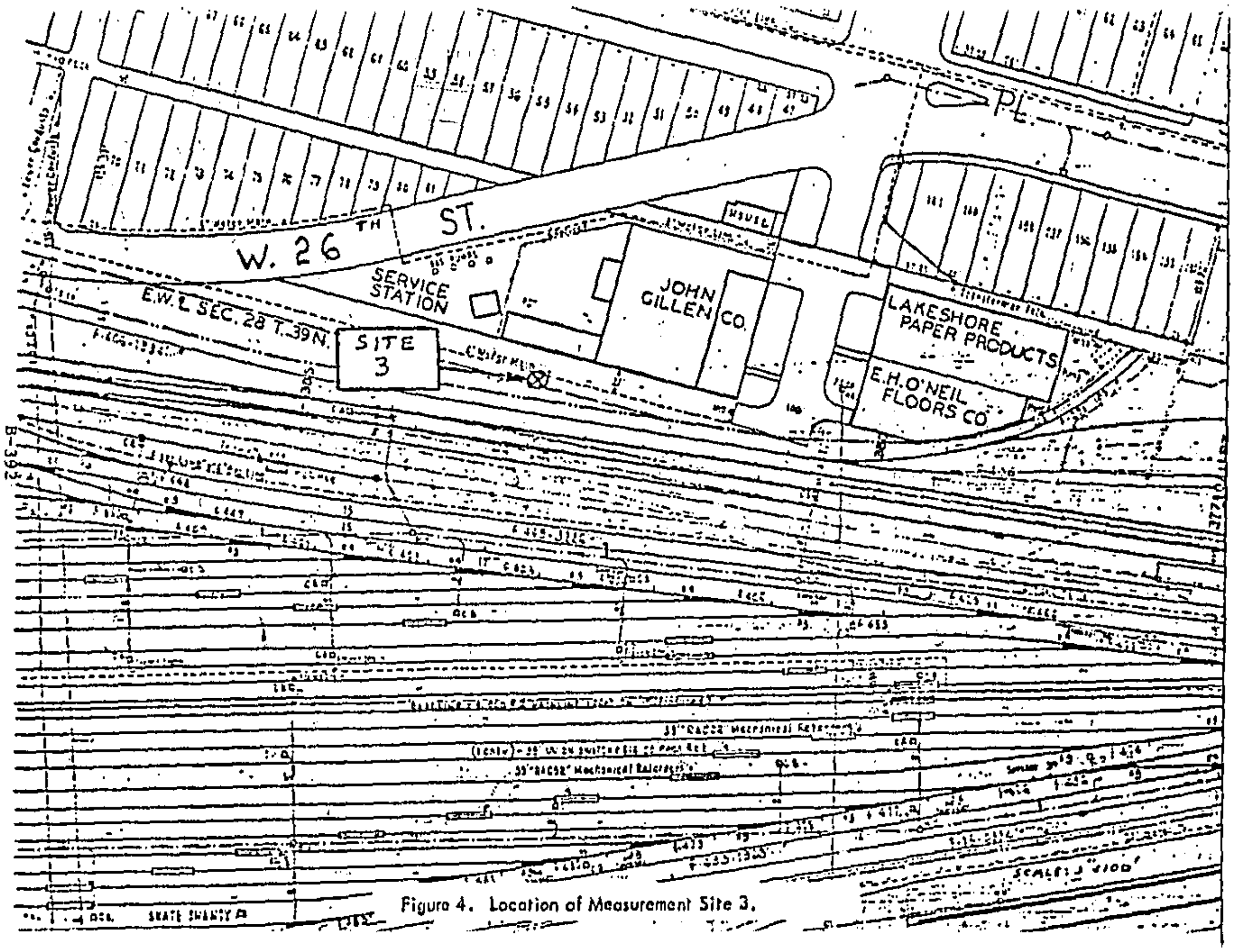


Figure 4. Location of Measurement Site 3.

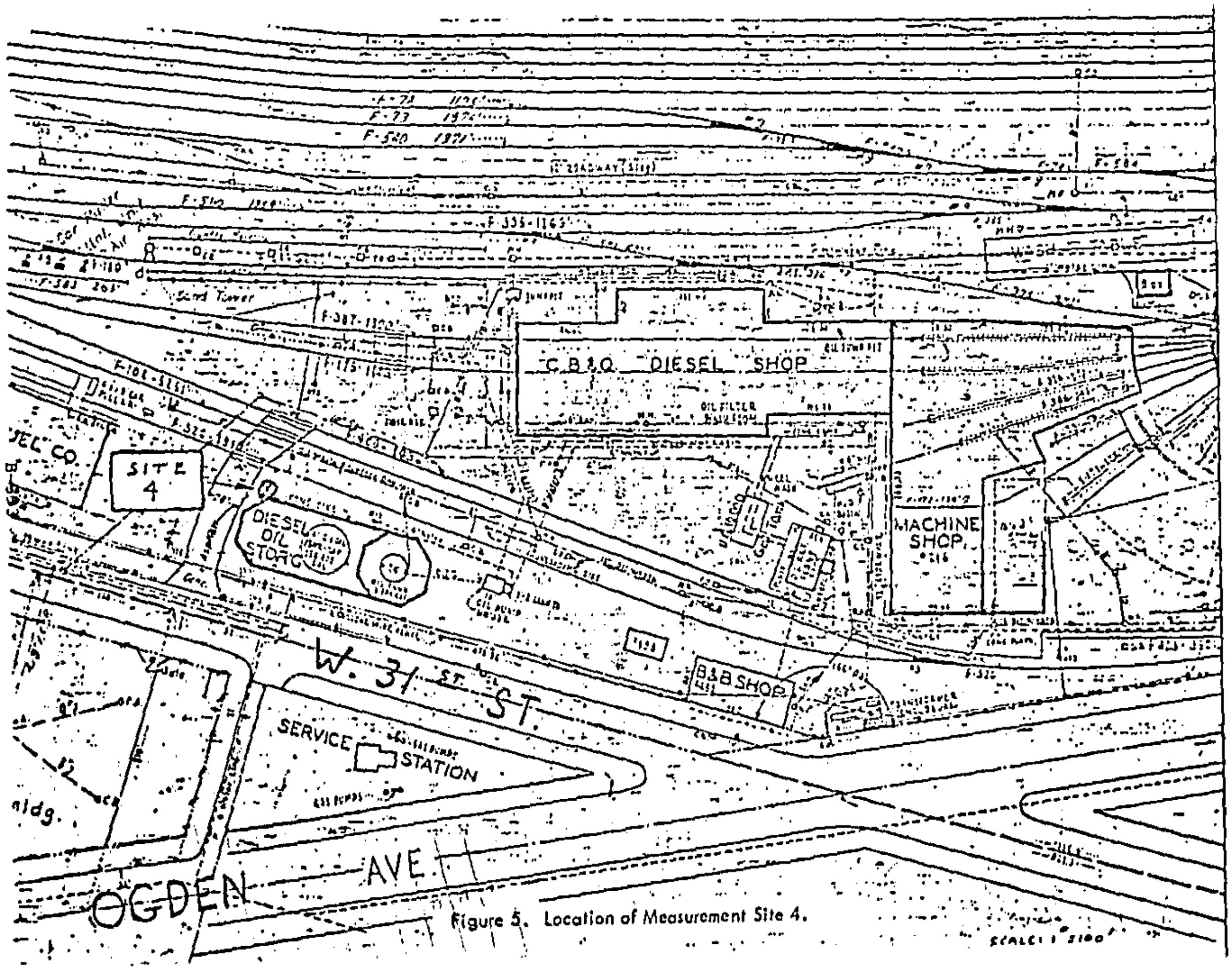


Figure 5. Location of Measurement Site 4.

Table 1

Sound Levels at Site 1
0915, April 26, 1978 – 0915, April 27, 1978

Noise Metric	Level dB
L_{dn}	79
L_{max}	116
$L_{0.1}$	89
L_2	80
L_5	78
L_{10}	76
L_{20}	74
L_{50}	70
L_{90}	66
L_{99}	64
L_{min}	61

Site 2 was located at the east end of the roof of the eastbound yard office, about 400 feet south of the group retarders and about 100 feet inside the property line from Ogden Avenue. At this site digital tape recordings were made of the A-weighted, fast response sound level for a period of 48 hours using a B&K 181 Digital Data Recorder. This tape was later replayed in the laboratory to produce the hourly equivalent sound levels and percentile-exceeded sound levels which are shown in Table 2. The day, night, 24-hour, and day-night sound levels for these two 24-hour periods are shown in Table 5.

At Site 2 the predominant sources of noise were the movement of locomotives and of trains. Wheel squeal in the retarders, air release, and car impacts all contributed little to the total acoustic energy.

Site 3 was located at the B.N. property line about 300 feet north of the inert retarders and about 600 feet west of the Cicero Depot. The site was about 50 feet from the mainline tracks on which commuter trains regularly operated. Digital tape recordings were made of the A-weighted, fast response sound level for 24 hours. The resulting hourly percentile-exceeded sound levels and equivalent sound levels are shown in Table 3 while the corresponding day, night, 24-hour, and day-night sound levels are shown in Table 5.

At this site the predominant contributor to the noise emission was the movement of through passenger trains. Car impacts and wheel squeal were negligible contributors to the overall noise dose.

Site 4 was located about 300 feet west of the diesel repair shop and about 100 feet inside the property line from West 31st Street. Digital recordings were made of the A-weighted, fast response sound level at this site for a period of 24 hours. The resultant hourly levels are presented in Table 4; the day, night, 24-hour, and day-night levels are shown in Table 5.

At Site 4 the major contributor to the noise emission was idling locomotives. Also contributing to the noise dose were load tests that were performed on several locomotives.

Analysis of Source Contributions

In addition to the digital tape recordings described above, measurements were made at representative times at each site of the peak levels and durations of individual

Table 2(a)

Hourly Sound Levels at Site 2
April 26-27, 1978

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_{1}	L_{max}
4/26/78	1800	81.0	59	64	72	83	94	99
	1900	76.6	62	64	70	79	88	98
	2000	77.2	61	63	65	75	91	97
	2100	77.5	59	63	71	79	88	99
	2200	74.6	59	63	69	77	85	100
	2300	75.7	61	63	66	75	88	98
4/27/78	0000	75.6	59	63	68	77	85	105
	0100	78.3	56	60	67	77	92	99
	0200	71.2	59	60	65	73	83	95
	0300	67.2	60	61	63	70	76	88
	0400	68.5	61	62	64	71	78	91
	0500	71.0	60	62	67	74	81	89
	0600	70.8	61	63	66	73	80	91
	0700	68.3	62	64	66	71	77	84
	0800	71.9	59	62	67	74	81	95
	0900	78.3	63	67	73	80	90	97
	1000	72.9	61	65	70	76	83	94
	1100	72.4	59	62	67	75	84	96
	1200	74.5	61	63	71	76	83	101
	1300	77.6	58	61	69	79	90	96
	1400	80.4	61	65	73	82	93	97
	1500	77.9	62	65	72	80	90	99
	1600	73.7	64	66	70	76	82	98
	1700	73.3	63	65	70	76	83	93

Table 2(b)

Hourly Sound Levels at Site 2
April 27-28, 1978

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_{1}	L_{max}
4/27/78	1900	71.9	66	67	69	75	83	88
	2000	71.1	66	67	68	74	80	88
	2100	72.4	66	67	69	76	81	87
	2200	73.1	63	64	69	76	83	94
	2300	71.1	60	63	67	74	81	86
4/28/78	0000	69.9	60	62	65	73	80	88
	0100	73.1	59	60	67	74	83	100
	0200	69.1	61	63	65	71	80	88
	0300	71.2	60	61	65	75	82	87
	0400	72.1	58	61	67	75	83	93
	0500	71.3	59	61	67	75	82	89
	0600	71.0	60	63	67	75	80	85
	0700	72.4	61	63	67	75	84	97
	0800	72.8	63	65	68	75	84	92
	0900	74.2	64	66	70	77	80	95
	1000	71.8	62	65	68	74	81	93
	1100	72.8	60	64	69	76	83	91
	1200	72.7	64	65	69	75	83	93
	1300	73.7	62	64	69	77	85	94
	1400	72.7	63	65	69	76	83	89
	1500	73.6	64	66	70	76	83	97
	1600	71.5	64	66	69	73	80	94
	1700	72.8	63	65	69	76	82	93
	1800	74.1	63	65	70	77	85	92

Table 3

Hourly Sound Levels at Site 3
April 26-27, 1978

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1	L_{max}
4/26/78	1800	76.4	54	55	58	67	92	99
	1900	70.4	54	55	57	67	79	97
	2000	70.3	53	55	57	64	75	98
	2100	72.1	51	52	55	65	82	102
	2200	71.1	51	52	55	63	77	102
	2300	72.9	53	54	57	65	86	99
4/27/78	0000	61.5	52	53	57	64	71	79
	0100	70.8	52	53	58	65	75	100
	0200	63.1	53	55	60	66	72	86
	0300	58.6	52	53	55	59	67	83
	0400	60.5	53	54	56	64	69	86
	0500	66.4	54	55	57	66	75	90
	0600	71.0	54	56	59	67	82	96
	0700	83.1	54	56	60	71	97	105
	0800	75.7	54	57	59	67	90	98
	0900	62.8	57	58	59	65	73	86
	1000	72.4	59	61	65	68	82	99
	1100	71.3	53	56	63	70	78	100
	1200	71.8	53	55	59	67	85	100
	1300	70.6	57	58	60	65	76	97
	1400	72.5	58	59	60	67	80	101
	1500	74.7	54	57	60	67	85	100
	1600	81.1	57	59	63	78	96	103
	1700	80.8	57	59	63	72	96	103

Table 4

Hourly Sound Levels at Site 4
April 27-28, 1978

Date	Start Time	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_{1}	L_{max}
4/27/78	1900	74.8	73	73	74	76	80	90
	2000	74.7	70	73	74	75	77	99
	2100	72.8	70	70	71	73	79	95
	2200	74.7	71	72	73	75	78	98
	2300	72.3	71	71	72	73	76	87
4/28/78	0000	71.9	70	70	72	73	76	85
	0100	72.5	69	69	72	73	76	95
	0200	73.1	71	71	72	74	77	96
	0300	73.9	71	71	72	74	84	94
	0400	72.6	71	72	72	73	74	76
	0500	72.3	71	71	72	73	75	78
	0600	72.1	71	71	72	73	75	80
	0700	71.2	69	70	71	72	77	85
	0800	71.6	69	70	71	73	77	84
	0900	70.2	67	68	70	71	75	83
	1000	72.0	68	69	71	74	77	92
	1100	71.8	67	68	69	71	82	90
	1200	69.6	67	68	69	70	74	93
	1300	69.7	66	67	69	71	76	87
	1400	69.5	66	67	69	71	76	84
	1500	69.4	67	67	69	70	76	88
	1600	72.3	68	69	71	73	77	96
	1700	74.5	70	71	73	75	79	99
	1800	73.7	71	72	73	75	78	94

Table 5

Day, Night, 24-Hour, and
Day-Night Sound Levels at Sites 1-4

Site	1	2	2	3	4
Date	4/26-27/78	4/26-27/78	4/27-28/78	4/26-27/78	4/27-28/78
L_d	--	76.7	72.8	76.6	72.3
L_n	--	73.9	71.5	68.7	72.9
$L_{eq(24)}$	--	75.8	72.4	75.0	72.5
L_{dn}	79	80.8	78.1	77.5	79.2

noise events occurring during periods of time up to one hour. The duration of each event was defined as the amount of time the sound level from the event was above the background level. The background level was that sound level measured when no specific source could be identified.

To approximate the acoustic energy in each noise event, the following model was used:

$$E_i \propto \left[10^{L_i/10} - 10^{L_b/10}\right] t_i \quad \text{for} \quad t_i \geq 10 \text{ secs}$$

$$\propto \left[10^{L_i/10} - 10^{L_b/10}\right] \frac{t_i}{2} \quad \text{for} \quad t_i < 10 \text{ secs}$$

where L_i is the A-weighted, fast response peak level of the i'th noise event;

t_i is the duration of the event; and

L_b is the background level.

This model essentially assumes a rectangular time history for the sound energy of events longer than 10 secs and a triangular time history for the sound energy of events shorter than 10 secs.

The acoustic energy corresponding to the background for which no single source was identifiable is modeled by:

$$E_b \propto 10^{L_b/10}\, T$$

where L_b is the A-weighted, fast response background level; and

T is the total duration of the measurement period.

The percentage contribution P to the total acoustic energy during the measurement period of noise events of the same type is given by:

$$P = \frac{\sum_1 E_i}{\sum_2 E_i + E_b} \times 100\%$$

where Sum 1 represents events of the same type; and

Sum 2 represents all events.

The resulting percentages for each of the sites are shown in Tables 6 to 9. At almost all sites the railroad noise sources contribute, by far, the majority of the acoustic energy to the site. This is not surprising when one considers that the sites were chosen away from heavily travelled roads so that railroad noise would predominate.

A series of measurements were attempted at the actual boundary line of the Cicero Yard adjacent to Ogden Avenue just south of Site 1 from 2340 to 2350 on April 27, 1978. At this location noise from traffic on Ogden Avenue predominated. When it was operating, the noise from the crane at the T.O.F.C. facility 325 feet away was barely discernible above the background from the road. The background level was 62 dB; while the total level with the crane operating was 65-66 dB. This indicates that the level of the crane noise at that site was approximately equal to the level from the traffic noise.

Table 6

Source Contributions at Site 1

Date	Time	Source	Percent of Acoustic Energy
4/27/78	2115-2145	Locomotive Bell	55
		Background	23
		Locomotive Moving	10
		B.N. Truck	9
		Crane Engine	2
		Car Impact	<1
		Wheel Squeal	<1
4/27/78	2305-2335	Background	60
		Idling Crane Engine	28
		Crane Engine	9
		Air Release	2
		Crane Hoist	<1
4/28/78	1540-1640	Background	40
		Trucks	30
		Crane Engine	20
		Locomotive Moving	7
		Locomotive Idling	2
		Crane Hoist	<1
		Air Release	<1

Table 7

Source Contributions at Site 2

Date	Time	Source	Percent of Acoustic Energy
4/27/78	1615-1715	Train Moving	43
		Locomotive Moving	31
		Background	12
		Locomotive Idling	5
		Ref. Trucks on Flat Cars	4
		Car Impact	3
		Wheel Squeal	<1
		Locomotive Horn	<1
		Motor Vehicles on Street	<1
4/27/78	2200-2300	Train Moving	49
		Locomotive Moving	41
		Refrigerator Car	6
		Background	2
		Locomotive Bell	1
		Car Impact	<1
		Group Retarder	<1
		Air Release	<1
		Wheel Squeal	<1
4/28/78	1235-1335	Maintenance Vehicles	44
		Train Moving	34
		Locomotive Moving	13
		Locomotive Idling	4
		Background	2
		Car Impact	1
		Air Release	1
		Group Retarder	<1
		Wheel Squeal	<1
		Loudspeakers/Locomotive Horn	<1

Table 8

Source Contributions at Site 3

Date	Time	Source	Percent of Acoustic Energy
4/27/78	1415-1515	Through Passenger Trains	87
		Train Moving	9
		Background	2
		Locomotive Moving	1
		Car Impact	<1
		Adjacent Industrial Noise	<1

Table 9

Source Contributions at Site 4

Date	Time	Source	Percent of Acoustic Energy
4/28/78	1430-1530	Locomotive Idling	98
		Locomotive Moving	1
		~~Loudspeakers~~	~~<1~~
		Locomotive Horn/Bell	<1
		Motor Vehicles	<1

GPO 938-898

References

B-1 Preliminary Report, Interstate Rail Carrier Monitoring by EPA Regions II, IV, VI and VII

B-2 Rail Yard Sound Levels