

NOISE ANALYSIS AND  
NOISE ABATEMENT PROPOSALS

INTERSTATE HIGHWAY I 696 FROM  
LAHSEY RD EASTERLY TO I 75, OAKLAND COUNTY

G. H. Grove

Research Laboratory Section  
Testing and Research Division  
Research Project 71 TI-40  
Research Report No. R-966R

Prepared for Inclusion in the  
Final Environmental/Section 4(f) Statement  
As a Type II Project Under  
Proposed FHPM 773, Dated September 10, 1974

Michigan State Highway Commission  
Peter B. Fletcher, Chairman; Charles H. Hewitt,  
Vice-Chairman, Carl V. Pellonpaa, Hannes Meyers, Jr.  
John P. Woodford, Director  
Lansing, November 1975

## INTRODUCTION

The Federal Highway Noise Standards were first promulgated as Federal Highway Administration Policy and Procedure Memorandum 90-2 on February 8, 1973; and more recently in a draft expanded revision as FHPM 773 in September, 1974. With the establishment of any such standards it is inevitable that certain of the affected projects be in-process at the time of promulgation and, thereby, not necessarily be in compliance with those standards. To overcome this problem it is customary to waive application of the rules for in-process projects. Such was the procedure in the case of the Federal Highway Noise Standards.

Interstate Highway I 696 from Lahser Rd easterly to I 75, Oakland County, is such a project. The location phase had been completed and the proposed route preliminarily designed many years before the existence of any highway noise standards. Thus, traffic noise radiation was not a significant consideration in its location or preliminary design. Moreover, it is not mandatory that noise be brought into the design at this time because of the project's exemption as an in-process case.

The Michigan Department of State Highways and Transportation, however, believes the potential impact of I 696 traffic noise to be of sufficient magnitude as to require that the Department make every reasonable effort to reduce or eliminate that impact. It is a detailed proposal for such noise attenuation action that constitutes the subject of this report; and, as is appropriate in such voluntary applications of the noise standards, FHWA approval and financial participation are also requested.

A re-evaluation of the noise data included in the Final Environmental/Section 4(f) Statement has been completed at the request of the Department's Environmental and Community Factors Division. Portions of the alignment have been changed since the 1972 route location, and there has been an updating of the 1990 design year traffic estimates. This, along with the FHWA disallowance of the -5 dbA bituminous surface correction factor, resulted in a revision of the noise analysis. Since the time of this revision, the grades have been altered to further lower the noise levels along the route. This has resulted in this second revision of the noise analysis.

## DISCUSSION

Noise Level Tables 17, 22, and 23 in the original environmental statement have been replaced by Table 1, which was developed from current data. The most recent computer simulation of NCHRP 117/144 for noise

TABLE 1  
 PREDICTED DESIGN YEAR 1990 L10 NOISE LEVELS AT INDICATED STATIONING  
 AT THE POINT OF NEAREST PERMANENT NON-ROADWAY LAND USE,  
 EITHER FREEWAY R-O-W, OR OUTSIDE SERVICE ROAD R-O-W, IF PROVIDED

Sites	Station	Distance to Center of Near Lane, ft		Distance to Cut, ft		Roadway Elevation, ft	L10 NOISE LEVELS, dbA						Distance to Center of Near Lane for L10 = 70 dbA (No Barrier) (ft)	
		South	North	South	North		No Barrier		With Barrier		South	North		
							Height	North	Height	South			Height	North
1	12+00	210	110	145	20	-19	70	82	--	--	10	70	195	229
2	18+50	110	100	50	35	-17	82	82	11	11	70	70	233	225
3	40+00	90	150	70	115	-16	78	76	9	70	5	70	186	207
4	63+00	85	120	68	100	-22	74	71	6	3	70	70	135	139
5	77+00	85	112	50	85	-16	80	78	12	8	70	70	212	201
6	90+00	110	85	85	55	-20	73	79	6	70	10	70	160	166
7	103+00	92	110	80	90	-14	79	78	9	70	8	70	205	220
8	111+00	92	110	78	90	-21	73	72	5	70	4	70	136	148
9	127+50	120	120	65	105	-17	78	73	9	70	4	70	230	170
10	136+00	130	155	90	85	-20	73	73	5	70	5	70	177	211
11	150+00	110	146	40	80	-20	82	76	10	70	6	70	214	220
12	165+00	135	95	75	35	-19.5	77	83	7	70	10	70	204	204
13	181+00	95	95	40	40	-20	80	80	10	70	10	70	195	195
14	193+00	80	150	62	130	-21.5	75	70	8	70	--	--	139	150
15	201+00	87	145	25	65	-19.5	83	77	12	70	7	70	207	225
16	218+00	97	100	40	42	-20	79	79	10	70	10	70	197	197
17	226+00	130	175	80	130	-14.5	78	75	8	70	4	70	243	238
18	236+00	105	150	87	130	-15.5	78	72	7	70	3	70	193	194
19	247+00	110	110	90	92	-20	73	73	4	70	4	70	154	151
20	258+00	100	100	85	85	-20	73	73	5	70	5	70	148	148
21	270+00	75	65	45	45	-20	79	79	11	70	13	70	169	153
22	285+00	105	70	80	50	-20	74	79	5	70	10	70	161	154
23	296+00	70	70	50	50	-20	79	79	11	70	11	70	158	154
24	307+00	90	95	65	70	-20	78	77	8	70	8	70	164	159
25	318+00	120	100	97	50	-20	72	78	4	70	10	70	161	188
26	331+00	130	120	110	55	-8	80	82	10	70	13	70	593	608
27	340+00	150	138	100	115	-20	72	71	3	70	2	70	191	157
28	359+00	130	120	110	92	-14	77	78	6	70	8	70	218	230
29	368+00	220	135	190	40	-25	66	78	--	--	7	70	136	204
30	382+00	120	150	45	85	-23	78	72	8	70	3	70	194	184
31	389+00	125	155	65	100	-20	77	72	7	70	3	70	200	193
32	405+00	105	100	50	40	-20	78	82	9	70	10	70	193	200
33	415+00	95	125	60	80	-8	82	80	13	70	11	70	595	600

prediction was used. The basic data inputs to the noise prediction model were based upon the following criteria and assumptions:

1. Dual 3, 4, or 5-lane pavement with 26-ft median,
2. Depressed roadway with retaining walls or back slopes,
3. Observer height of 5 ft,
4. No grade, surface, or structure shielding corrections,
5. Infinite roadway elements,
6. Free flowing, level of Service C volumes and speeds taken from the updated traffic of Appendix A, and
7. Observer to center of near lane, cut, and observer to barrier distances as stated in Table 1.

The relationships of the 14 selected noise sensitive sites to freeway stationing have been made in Table 2. Major cross streets with freeway stationing have been identified in Table 3. This stationing runs from the lower numbers at the west toward larger numbers at the east.

Table 1 indicates that noise levels predicted for design year 1990 freeway traffic will exceed  $L_{10} = 70$  dbA (Category B land use) at all but two of the 66 locations tabulated. Without considering existing or proposed adjacent land uses, it is evident that nearly the entire length (7.5 miles) along both sides will require some type of noise attenuation consideration if the Department elects to voluntarily apply the Federal Standards.

These noise barriers should be constructed within the existing right-of-way as part of the project construction and at project cost. Since the entire freeway is depressed, these barriers would be constructed at the top of slope, generally where the limited access right-of-way fence would be installed. In sections having retaining walls, the retaining wall should be used as a base for the vertical wall-type noise barriers. In sections without retaining walls, properly landscaped earth mounds can be utilized wherever sufficient right-of-way exists.

The  $L_{10} = 70$  dbA noise contours for design year 1990 are presented graphically on the project's eight (scale 1 in. - 200 ft) plan sheets. This eight-sheet exhibit also shows the location of previously selected noise sensitive sites.

In areas where there will be a service drive or local street between the freeway and adjacent land use, the more complete solution to the vehicle noise problem is to construct a barrier (if required) between the local street and the land use facility. However, this is not a feasible or prudent solution as it prevents access to the land uses and prevents other local

TABLE 2  
NOISE SENSITIVE SITE LOCATIONS

The specific location of these 14 "noise sensitive sites" is as follows, referenced to Sheets 1 through 9.

Site No.	Description	Stationing
1	Knob in the Woods Apartments S Side 11 Mile Rd, opposite Bradford Dr	46+50
2	Alice M. Birney Junior High School N Side 11 Mile Rd, opposite Meadowlark Way	59+00
3	Glenn Schenhals School Area N Side 10-1/2 Mile Rd, opposite Southwood St	159+00
4	Fontaine Garden Apartments E Side Greenfield Rd at Montmartre St	194+00
5	Jewish Community Center and United Hewbrew School N Side 10 Mile Rd, W of Church St	206+00
6	Temple Emanu-El and School N Side 10 Mile Rd, W of Church St	214+50
7	Victoria Park E Side Church St, S of Winchester St	220+50
8	Congregation Bnai Moshe N Side 10 Mile Rd, E of Church St	220+50
9	Huntington Woods Manor Subdivision N Side 10 Mile Rd at Morton St	263+00
10	Rackham Municipal Golf Course N Side 10 Mile Rd opposite Seneca St	280+50
11	Detroit Zoological Park N Side 10 Mile Rd at Administration Bldg	312+00
12	Pleasant Ridge Recreation Area S Side 10 Mile Rd, W of Ridge St	336+00
13	Church of the Nazarene S Side 10 Mile Rd, E of Horton St	387+50
14	Harding Park S Side 10 Mile Rd opposite Hoffman St	395+00

TABLE 3  
APPROXIMATE STATIONING OF MAJOR CROSS-STREETS

Street	Stationing	Street	Stationing
Lahser	6+50	Coolidge	244+50
Evergreen	61+50	Scotia	271+00
Santa Barbara	87+50	Woodward	345+00
Southfield	114+00	Mohawk	378+50
Greenfield	190+50	Campbell	399+00

streets from intersecting with the street paralleling the freeway. These service roadways have many private driveway entrances and street intersections which prevents the construction of continuous noise barriers.

Taking of access rights plus street closure actions would greatly restrict local traffic movement, substantially reduce the development potential of adjacent lands, and, in general, negate locational advantages anticipated by commercial properties adjacent to the service roads. It also might require significant additional property acquisition and resident relocations.

Noise attenuation barriers between the service road and adjacent land uses would thus eliminate many of the benefits of the service roads for the single purpose benefit of noise attenuation. It is, therefore, recommended that noise barriers be constructed as indicated in Table 1 between the freeway and the service drives.

It is intended that these noise barriers be constructed to limit the design year 1990 freeway traffic noise levels to an  $L_{10} = 70$  dbA, either at the freeway R-O-W or at the outside R-O-W of local streets paralleling the freeway property. It is possible due to local traffic usage of these streets that by the year 1990 the adjoining land uses may be subjected to noise levels above current Federal Highway Administration standards. However, those levels will not be a result of the freeway traffic at locations where noise mitigation is installed. The service drives to be built with this facility are provided for local traffic and for expressway traffic collection and distribution of the community. Though constructed at project cost, service drives will be under local jurisdiction and responsibility. Adjacent areas requiring protection have been determined and are presented in the following discussion.

Approximate barrier heights are noted in Table 1. The actual barrier, where recommended, when designed and constructed may be of a greater height than indicated. The foundation cost for barriers has proven to be

such a high percentage of the total barrier cost that the additional height can be provided relatively inexpensively, while providing increased noise protection. Some form of access from the adjacent local streets will be required through the noise barrier for maintenance purposes (mowing, trash pickup, barrier repair).

The barrier provided to attenuate noise may have additional beneficial and detrimental effects on the adjacent land uses. The barrier may totally or partially shield the vehicles on the roadway from sight of the adjacent land thereby screening this new land use (freeway) from its neighbors. To adjacent residents the barrier might be a factor of entrapment, confining the view from these land uses. Where installed, it will prevent a side view from the freeway of adjacent lands. It will not collect debris or wind blown trash any more than would the R-O-W fence.

A discussion now follows concerning the installation of noise barriers where indicated and the intended course of action to be taken in conjunction with the Federal Highway Administration to protect adjacent properties from year 1990 freeway traffic noise levels above  $L_{10} = 70$  dbA.

Two types of barriers will be recommended in this project based upon the amount of available right-of-way and presently designed retaining walls. If a barrier is required in a section having retaining walls, the retaining walls should be used as a base and be extended to the heights indicated in Table 1 (height being measured relative to the top of the cut). In a few other areas having sufficient right-of-way, an earthberm-wall combination will be used. The actual design of these barriers will be completed by the Department's Design Division.

Segment 1: Lahser Rd to Evergreen (6+50 to 61+50, Sheets 1 and 2)

The existing zoning on the north consists of single family residential and approximately one block of commercial and low rise offices next to Lahser. On the south; the land is zoned single and multiple family residential except for the commercial corner at Lahser.

Land uses to be protected include previously identified noise sensitive sites 1 and 2. Present ambient noise measurements at Knob-In-The-Woods Apartments and Alice M. Birney Junior High School (Figs. 1 and 2) resulted in 58 and 65 dbA  $L_{10}$  levels, respectively.

It is suggested that an earthberm from stationing 12+00 to 31+00 and an extended height retaining (EHR) wall from 31+00 to 61+50 be made part of the design on the south side. An earthmound from 29+00 to 36+00 and an

EHR wall from 36+00 to 61+50 should be included on the north. The heights of these berms and walls are variable along the route and are given at selected stationings along the proposed route in Table 1.

Segment 2: Evergreen to Southfield (61+50 to 114+00, Sheet 2)

The existing zoning on both sides consists of single family residential except for the commercial corner at Southfield Rd.

This entire section is presently scheduled to have retaining walls, thus the EHR wall concept should be applied on both sides from stationing 61+50 to 114+00 of heights per Table 1.

Segment 3: Southfield to Greenfield (114+00 to 190+50, Sheets 3 and 4)

This section is presently zoned single family residential except for the commercial corners at Southfield Rd, the low rise office parcel north of Lincoln Dr, and the multiple family residential and high rise office at Greenfield.

Land uses to be protected include noise sensitive site 3, Southfield School District's Glenn Schenhals Area (Fig. 3). A present ambient noise  $L_{10}$  of 54 dbA was recorded.

EHR walls from 119+50 to 135+00 and 182+00 to 190+00 on the north and from 118+00 to 138+00 and 182+00 to 190+00 on the south are recommended. Earthberms from 134+00 to 158+00 and 169+50 to 182+50 on the north and from 138+00 to 182+50 on the south are also proposed.

Segment 4: Greenfield to Coolidge (190+50 to 244+50, Sheets 4 and 5)

Both sides are presently zoned commercial at the corner of Greenfield and multiple family residential for the rest of Royal Oak Township. The remainder of this section is zoned single family residential except the low rise office on the north and commercial on the south corners at Coolidge.

Land uses to be protected include noise sensitive sites 4, 5, 6, 7, and 8. Ambient noise levels (Figs. 4 through 8) of 53, 48, 50, 52.5, and 52.5 dbA  $L_{10}$  levels were determined from field data, respectively.

In order to meet the  $L_{10} = 70$  dbA criteria at the nearest non-highway property line, EHR walls from 233+00 to 244+00 on the north, and from 194+00 to 198+00 and 231+00 to 244+00 on the south are required. In addition, earthmounds from 193+00 to 231+00 on the north and from 197+50 to 230+00 on the south should be made part of the design.



Segment 5: Coolidge to Scotia (244+50 to 271+00, Sheet 5)

This section is zoned single family residential except the southeast commercial corner at Coolidge. Previously selected noise sensitive site 9 (Fig. 9) is included and exhibited a 59 dbA  $L_{10}$  ambient noise level. The  $L_{10} = 70$  dbA contour lies at the outer edge of the proposed linear park area on this northwest portion and does not significantly affect the residential properties beyond it. Thus, EHR walls are required from 261+00 to 271+00 on the north and from 249+00 to 271+00 on the south. Approximate barrier heights are indicated for selected stationings in Table 1.

Segment 6: Scotia to Lafayette (271+00 to 337+00, Sheets 5 and 6)

The entire northern side is zoned single family residential and includes the Rackham Municipal Golf Course and the Detroit Zoological Park. The south side is single family residential except for the commercial corner at Scotia, the adjoining multiple family residential, and the park and recreation area at the southwest corner at Lafayette.

Previously selected noise sensitive sites, 10, 11, and 12 lie in this portion. Ambient measurements (Figs. 10 through 12) resulted in 59, 71, and 63 dbA  $L_{10}$  levels, respectively.

EHR walls should be designed and constructed for the entire length.

Segment 7: Woodward-GT&W Railroad Area (345+00 to 369+50, Sheet 7)

This area is zoned commercial and industrial for the most part with several blocks of residential and low rise offices.

EHR walls should be designed and constructed from 350+50 to 364+00 on both sides to shield the Category B land use areas.

Segment 8: Mohawk to I 75 (378+50 to 417+00, Sheets 7 and 9)\*

The zoning in this section is single family residential except the southeast and southwest corners at Hilton.

Noise sensitive sites 13, Church of the Nazarene, and 14, Harding Park are in this segment. Ambient levels exhibited  $L_{10}$  levels of 65.5 and 58 dbA, respectively (Figs. 13 and 14).

If sufficient right-of-way exists after the design of the on-off ramps, earthberms for the entire length should be used. If retaining walls are designed for this area, EHR walls should be used per the heights of Table 1.

\* Plan Sheet 8 is not part of the mainline roadway route location.

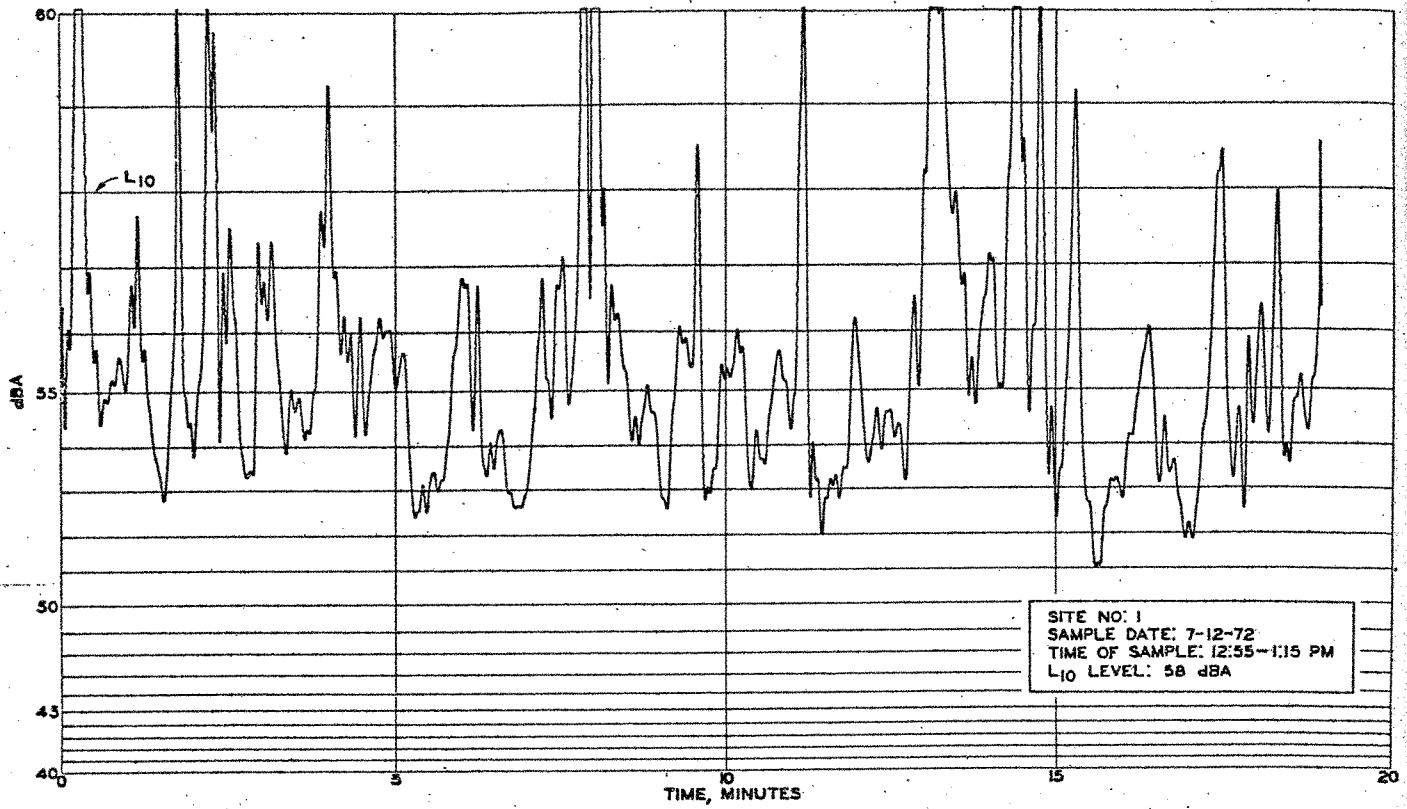


Figure 1. Microphone located 50 ft due N of NE corner of northern most apartment building (Knob-In-The-Woods), observer looking SW. Sta. 47.

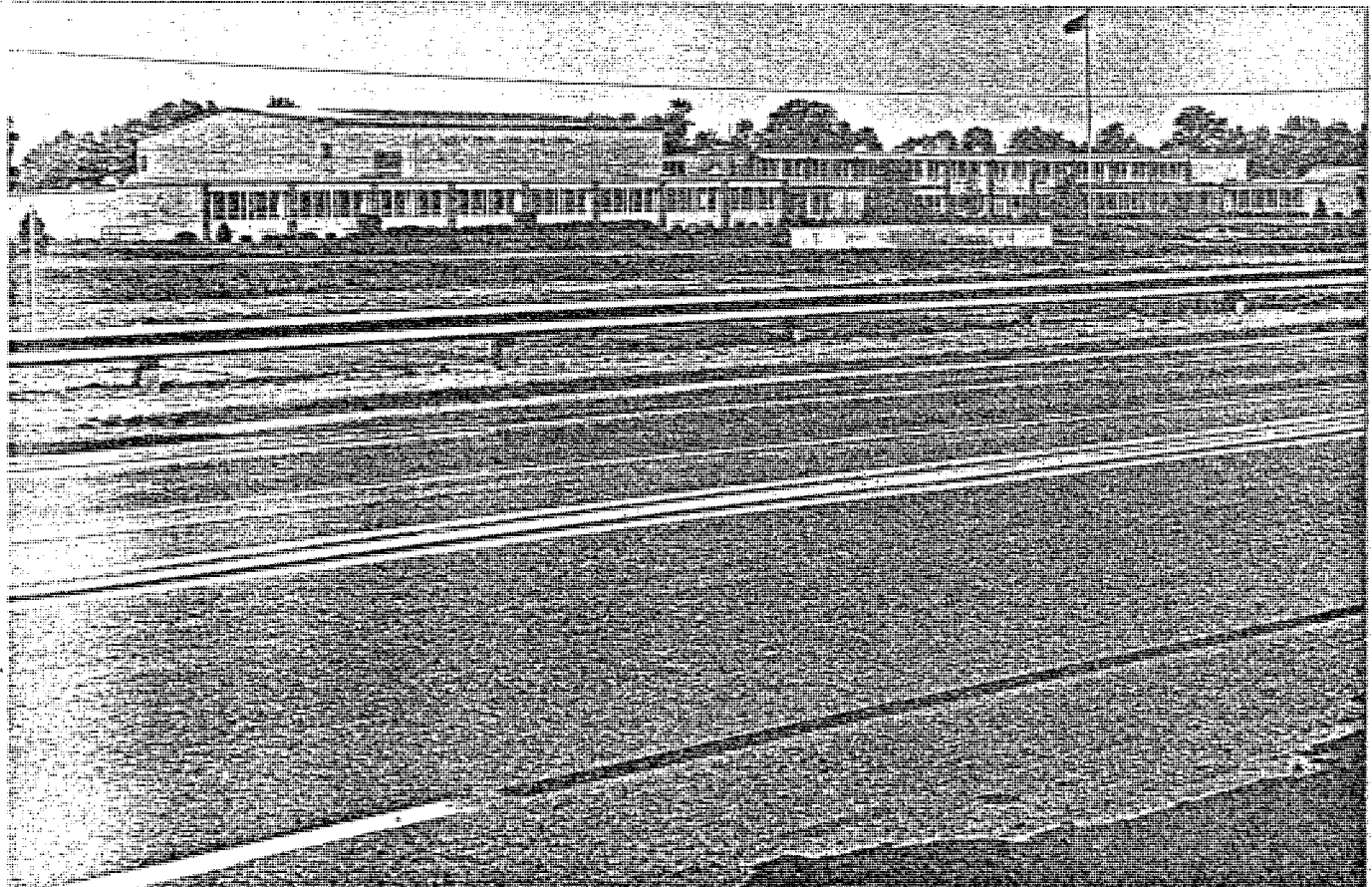
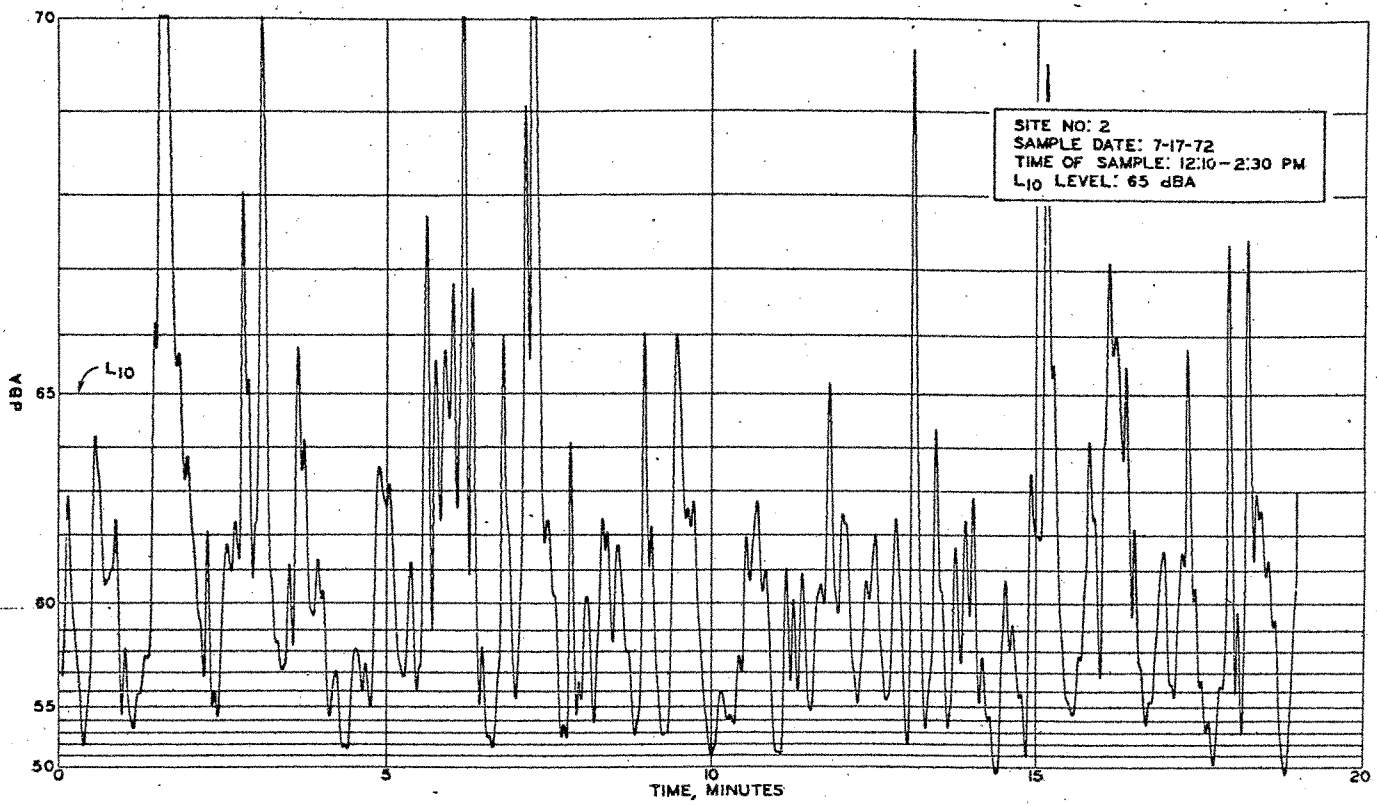


Figure 2. Microphone located 100 ft due N of drain on 11 Mile Rd, observer looking NW toward Alice M. Birney Junior High. Sta. 58.

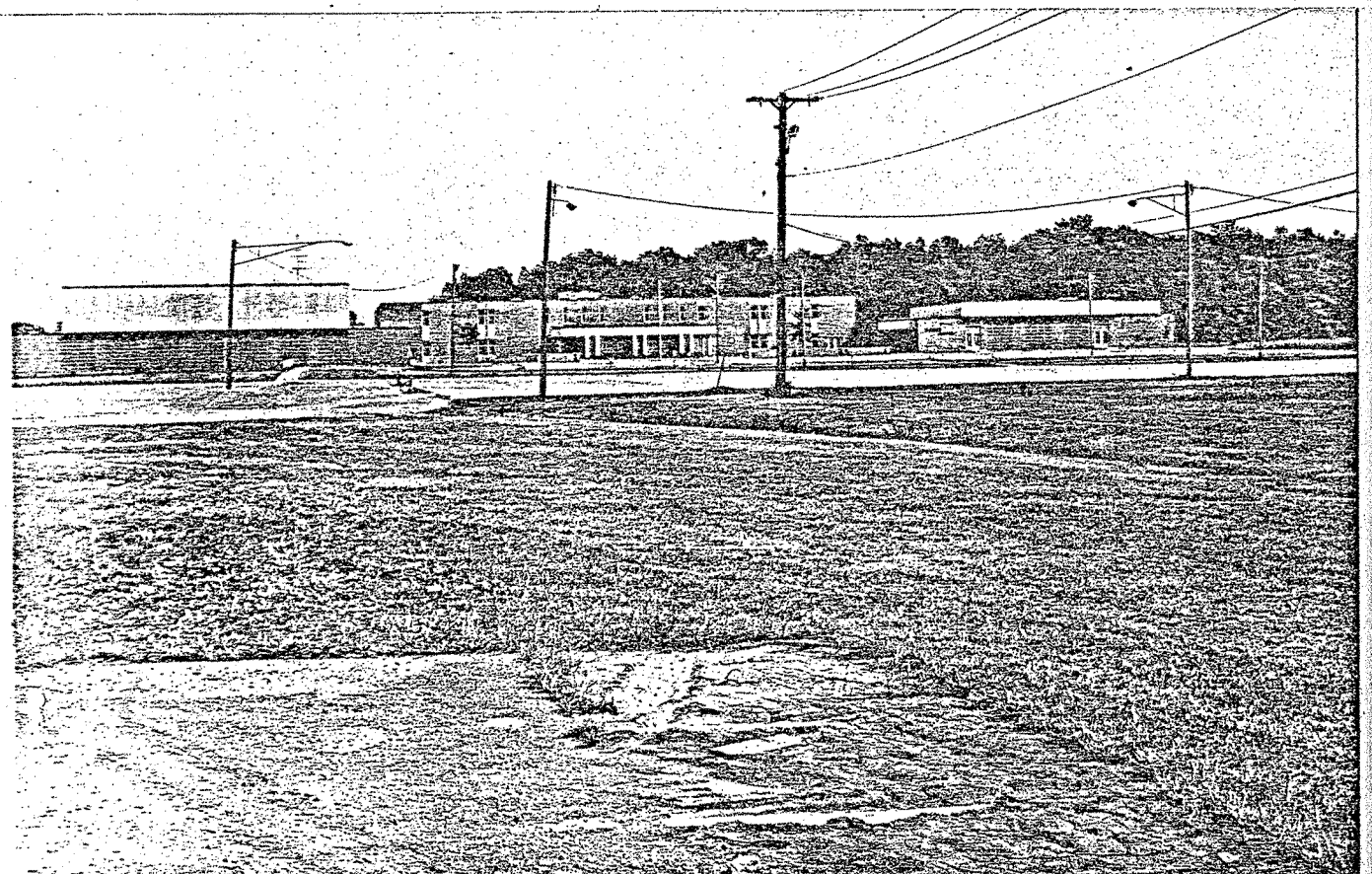
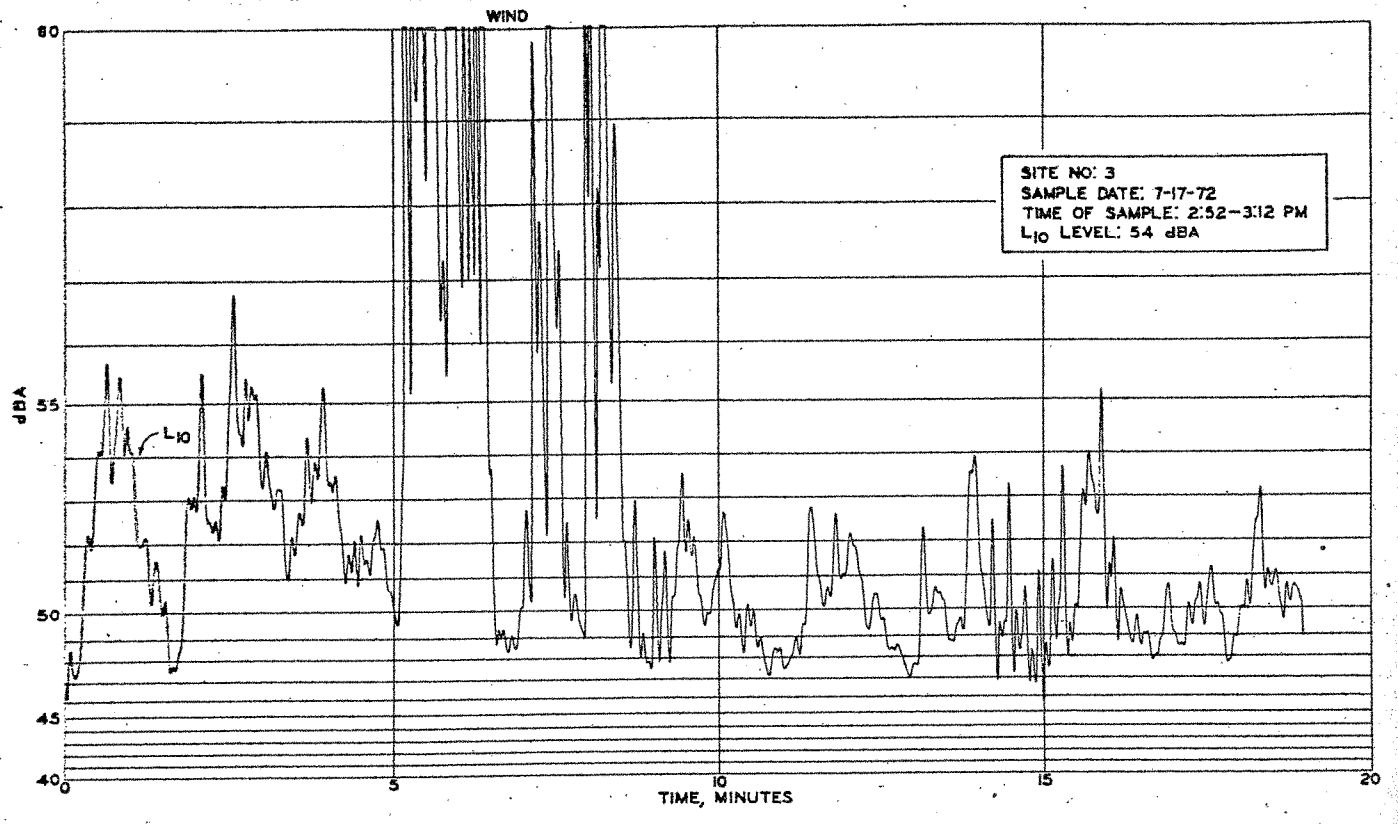


Figure 3. Microphone located 50 ft E of NE corner of Southfield School District's Junior High, north of 10-1/2 Mile Rd, observer looking N. Sta. 158.

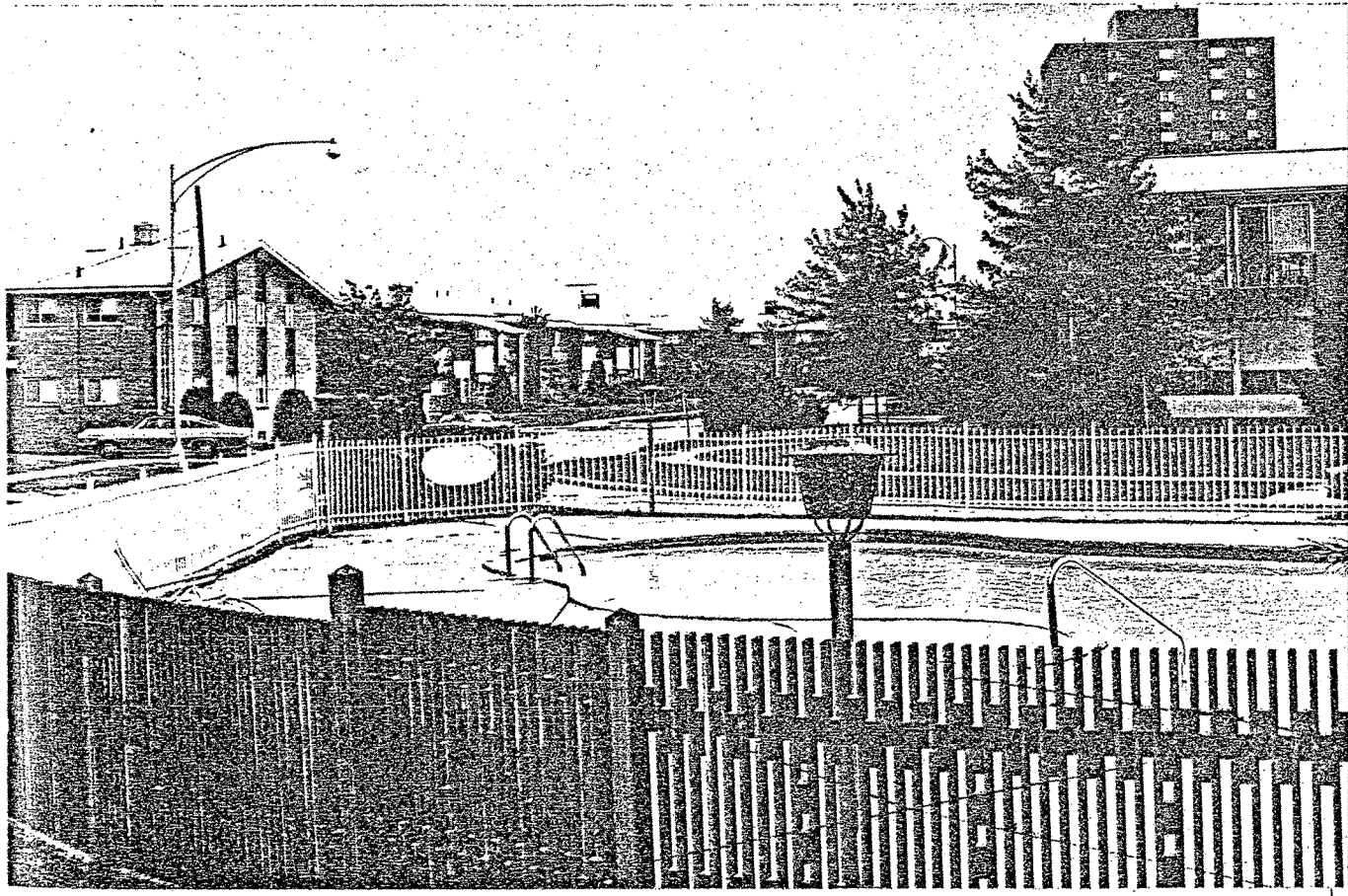
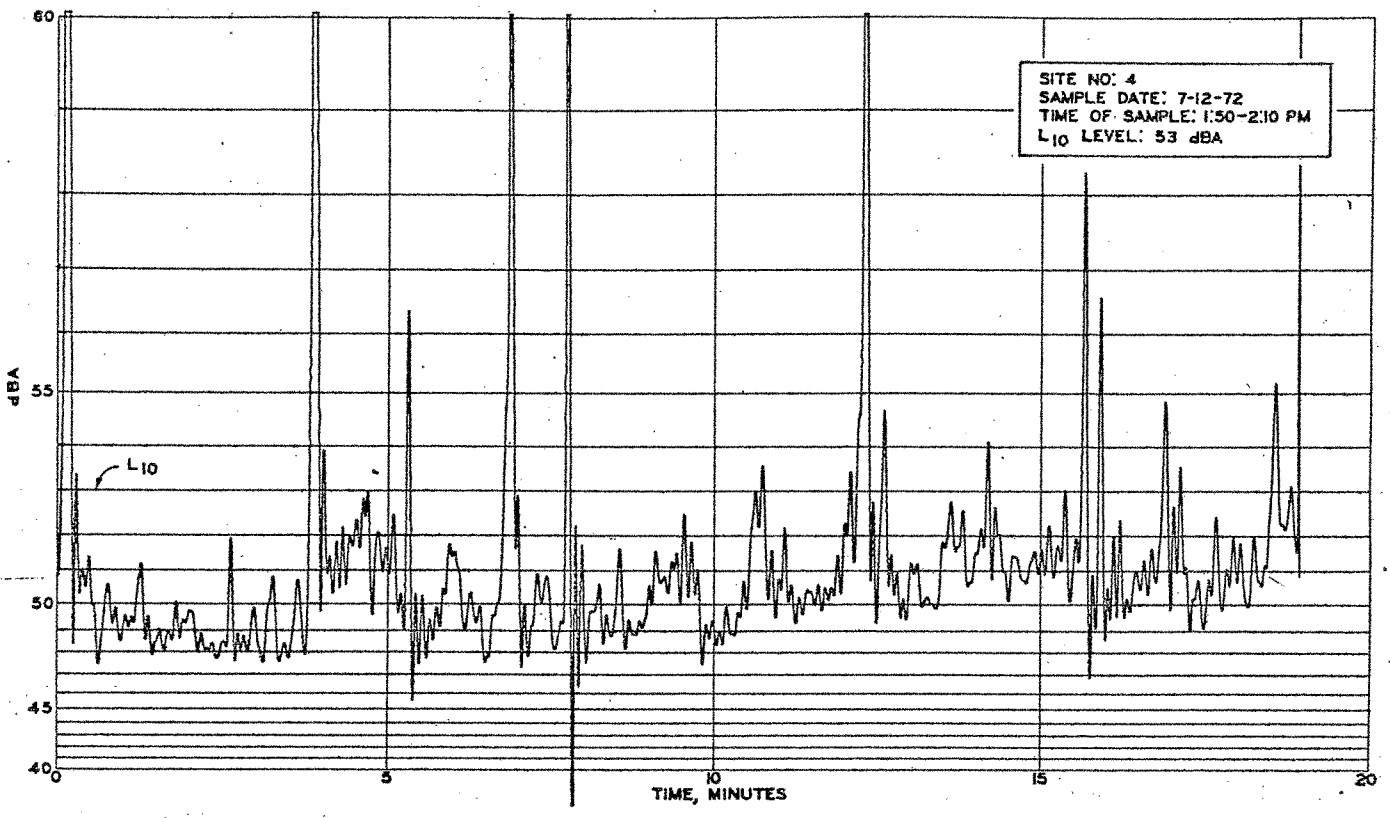


Figure 4. Microphone located 50 ft E of NE corner of swimming pool near Fontaine Gardens Apartments, observer looking E. Sta. 193.

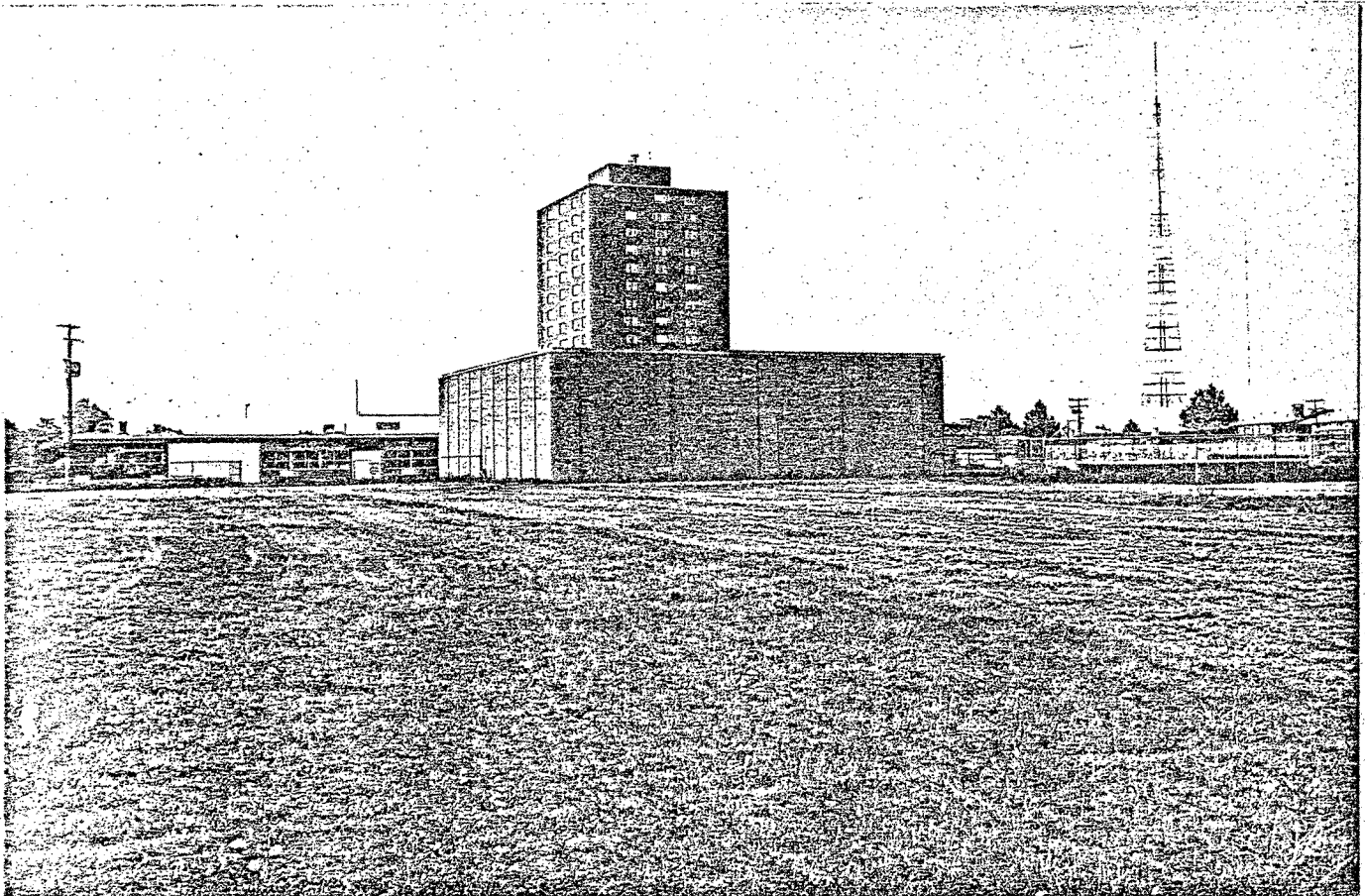
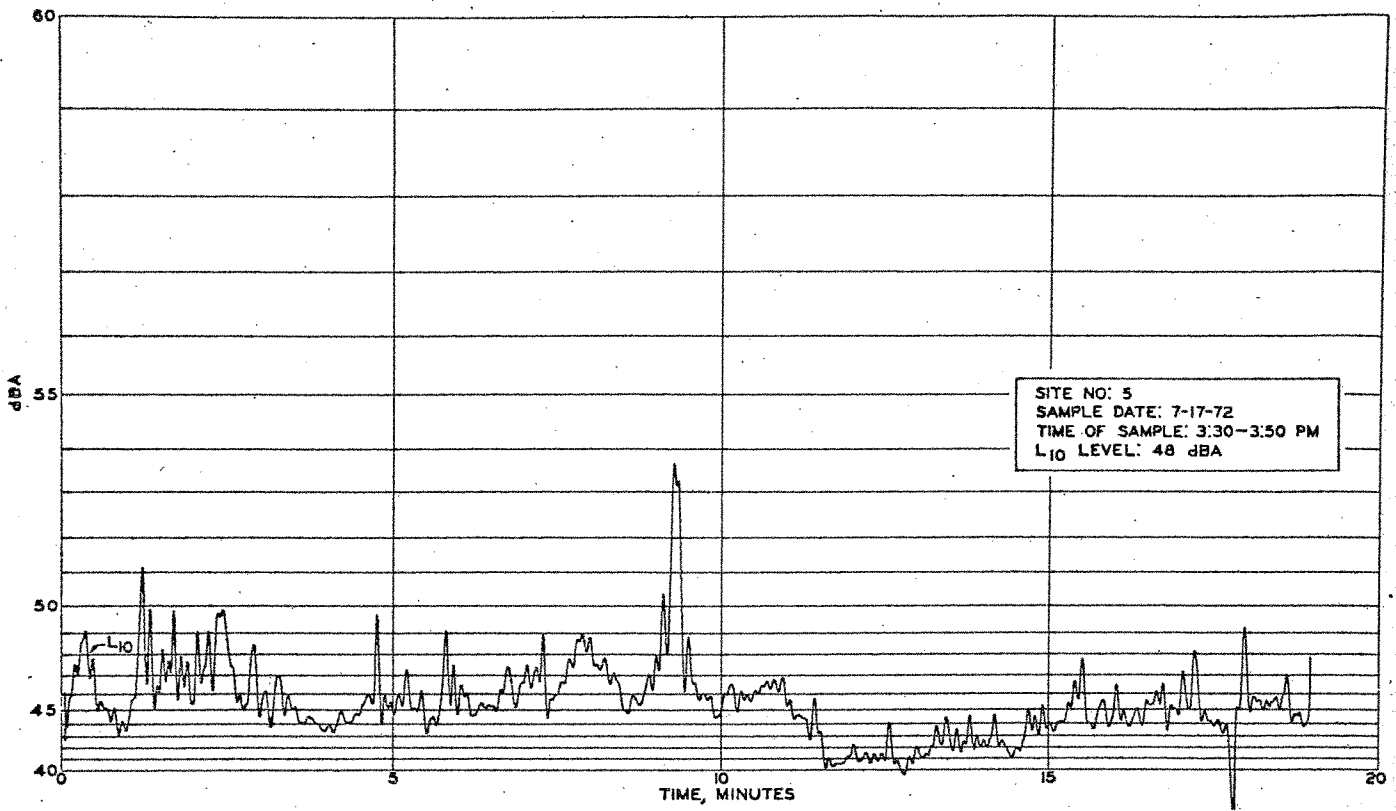


Figure 5. Microphone located 100 ft due N of NE corner of United Hebrew School, observer looking SW. Sta. 207.

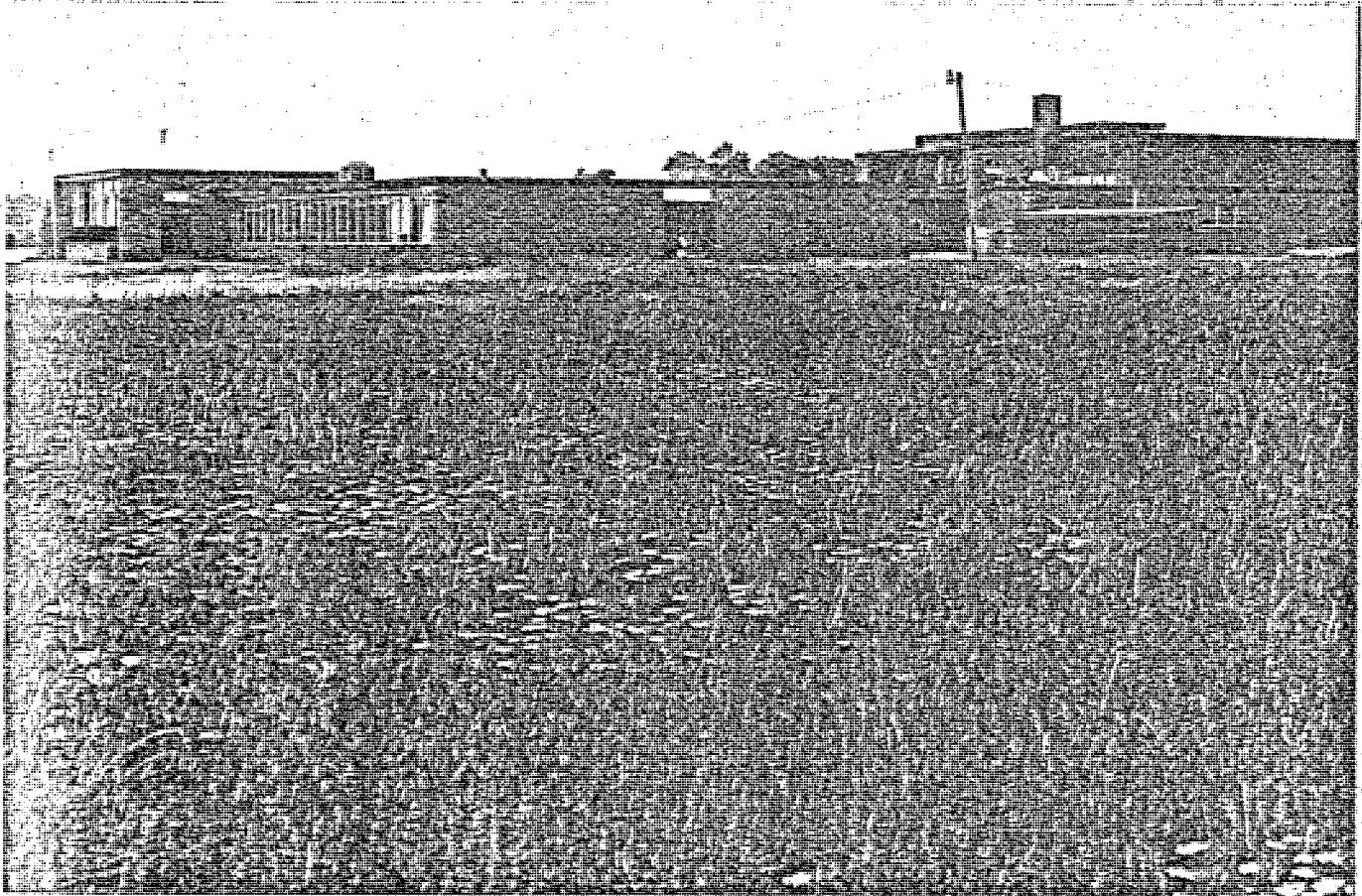
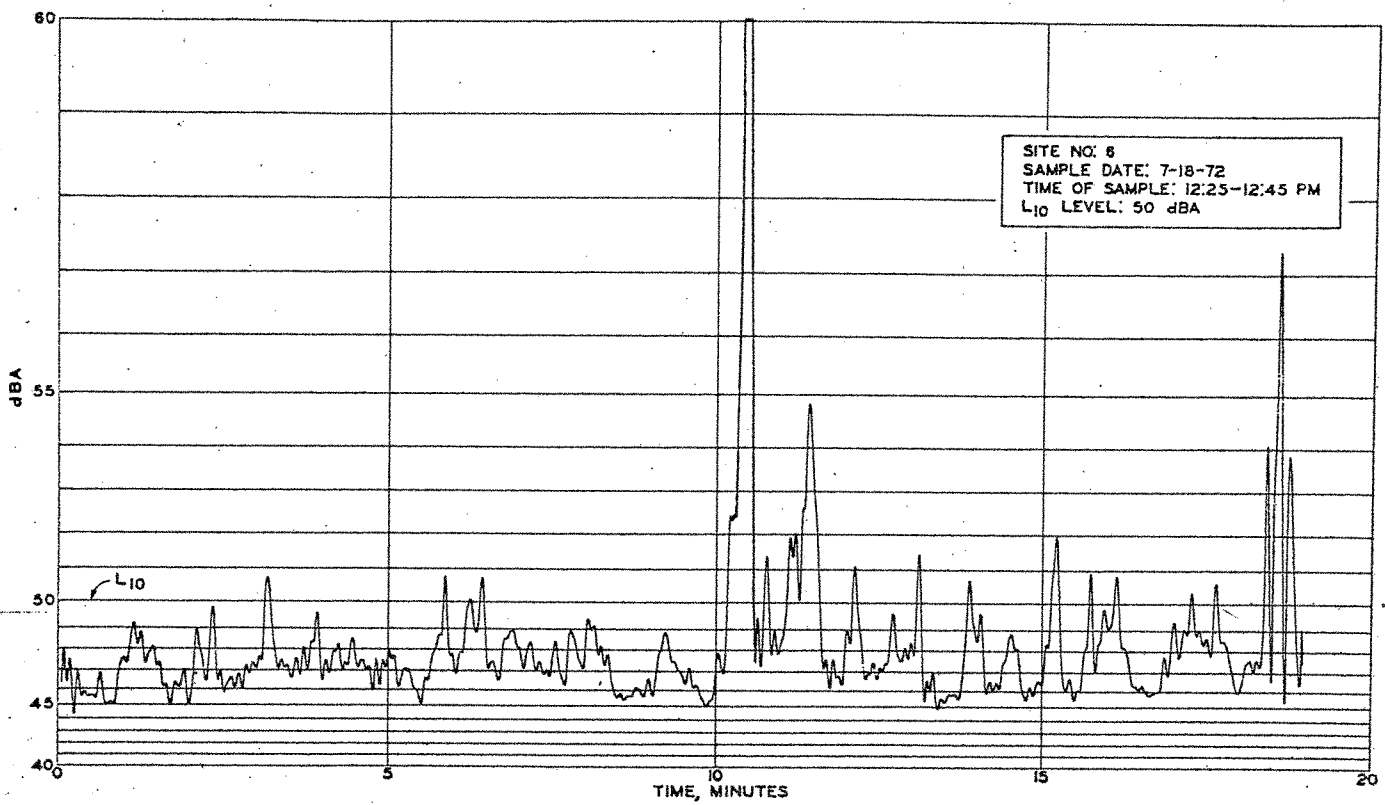


Figure 6. Microphone located 50 ft E of NE corner of Temple Emanu-El, observer looking SW. Sta. 215.

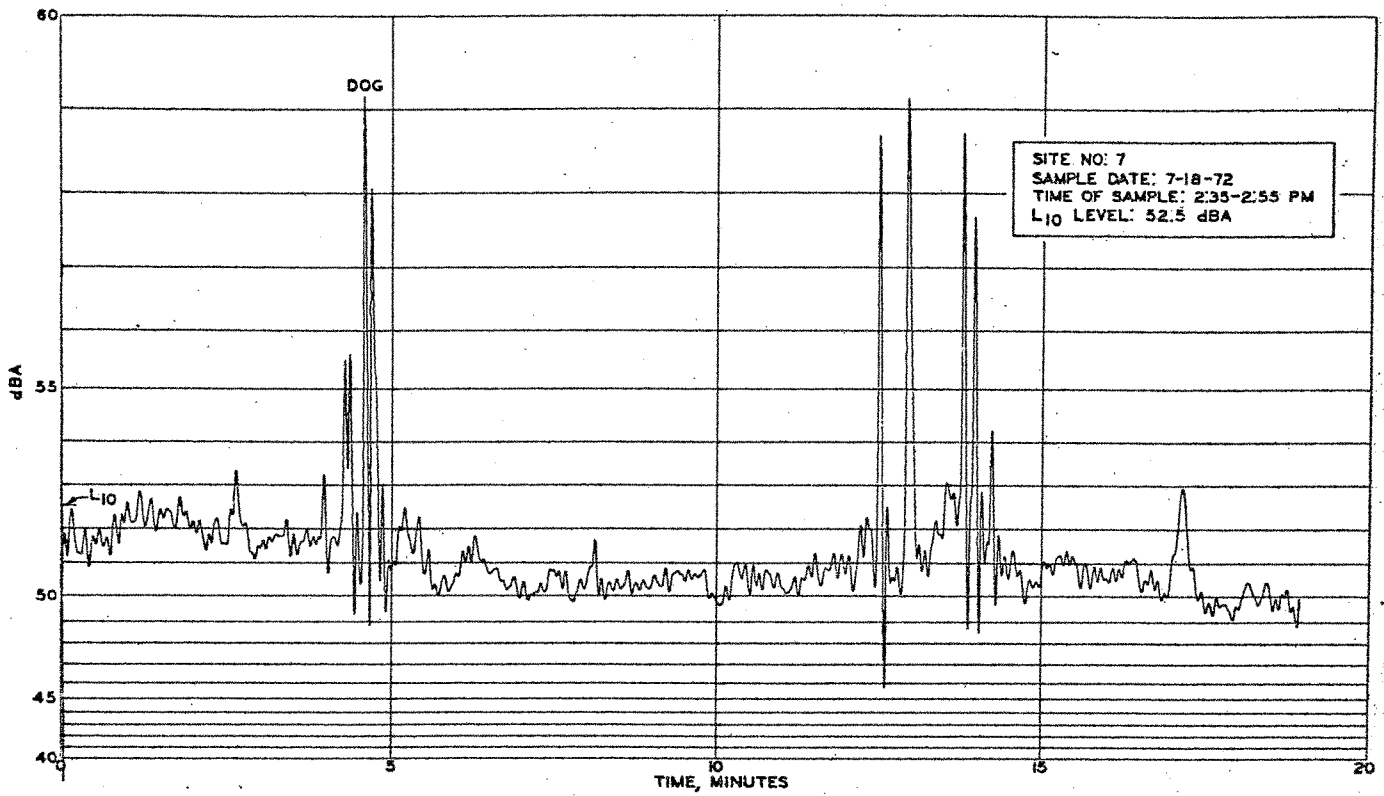


Figure 7. Microphone located 100 ft S of 225 ft W of NE corner of Victoria Park, observer looking SE. Sta. 221.



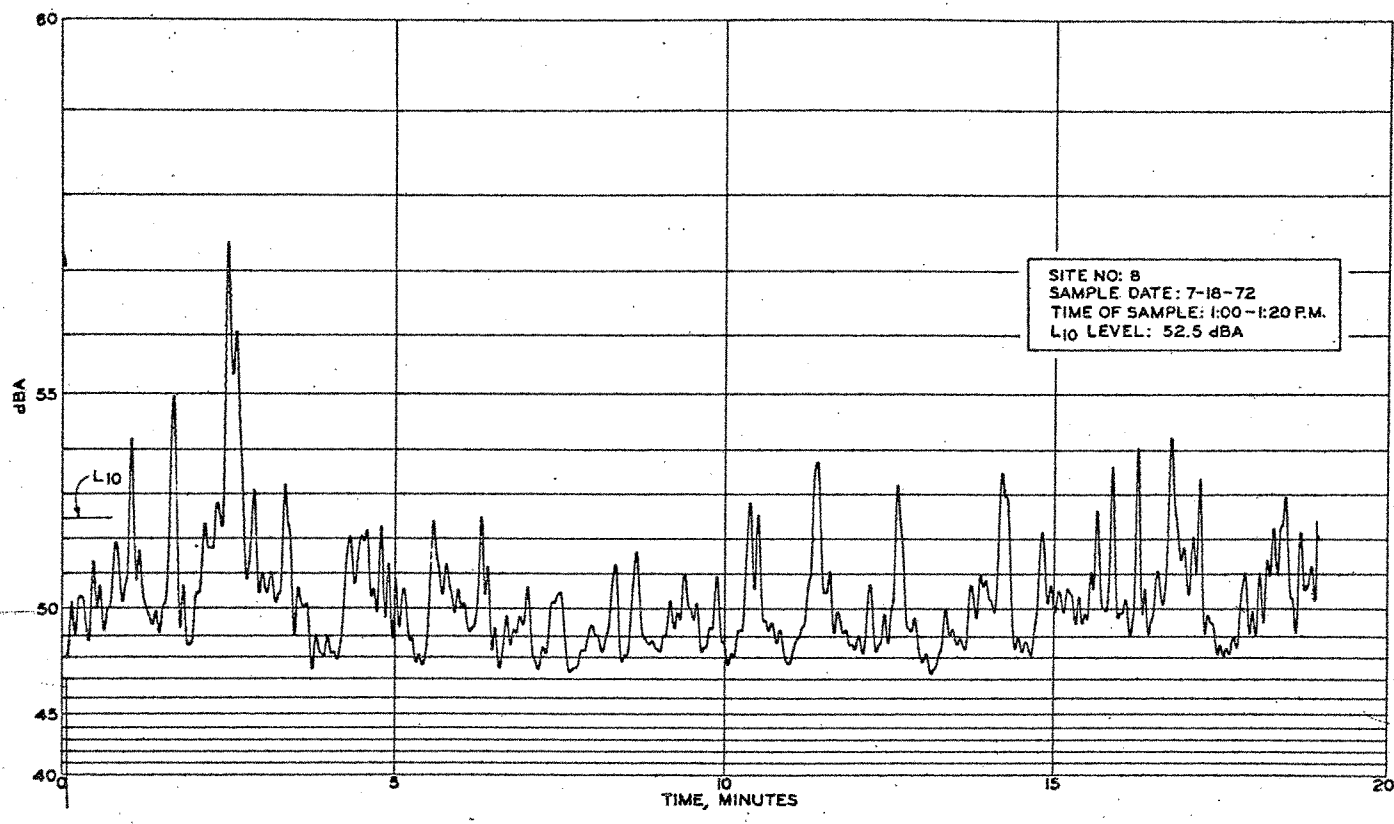


Figure 8. Microphone located 50 ft N of NE corner of Congregation B'nai Moshe on NE corner of Church and 10 Mile Rd, observer looking SW. Sta. 222.

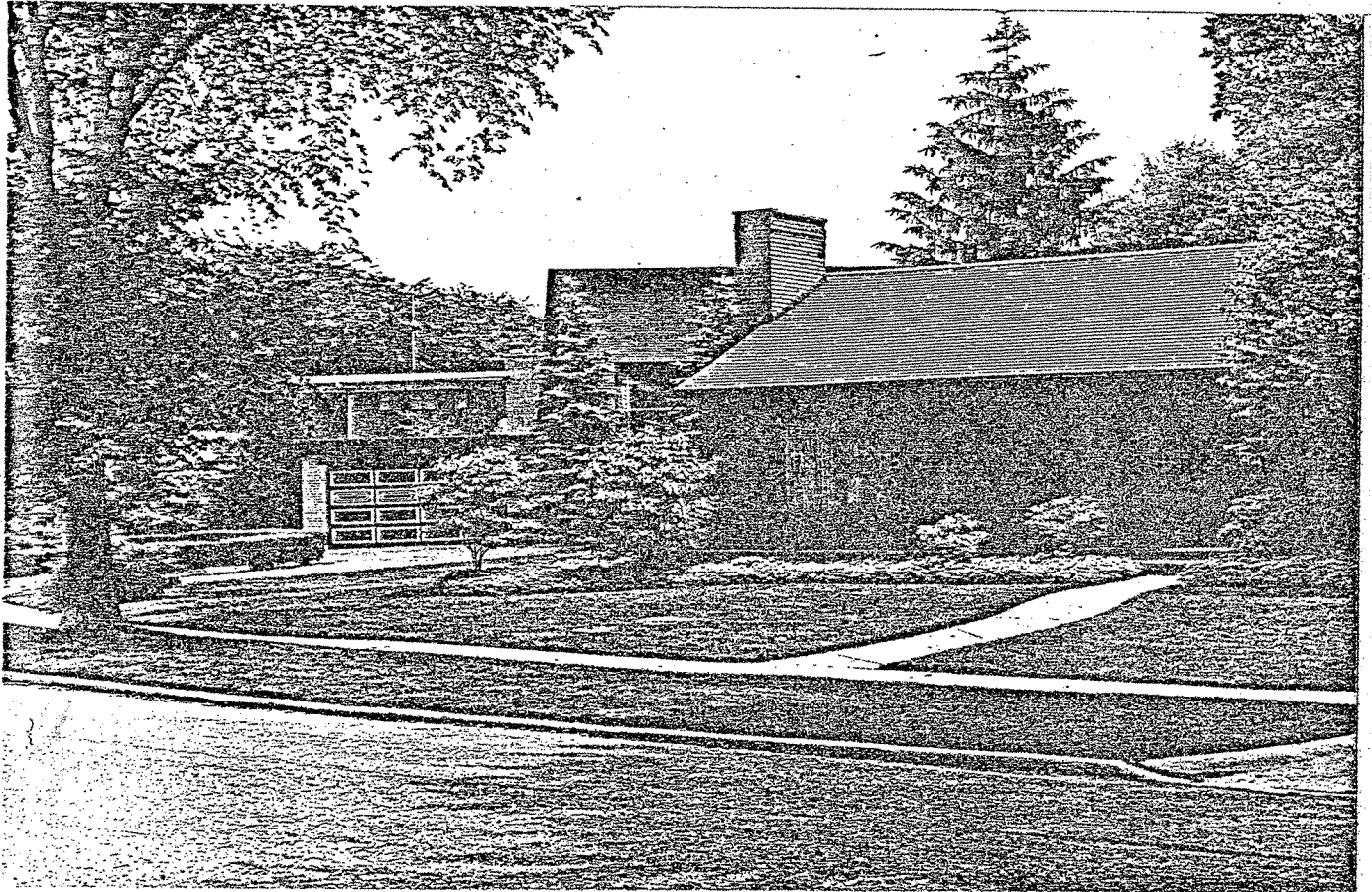
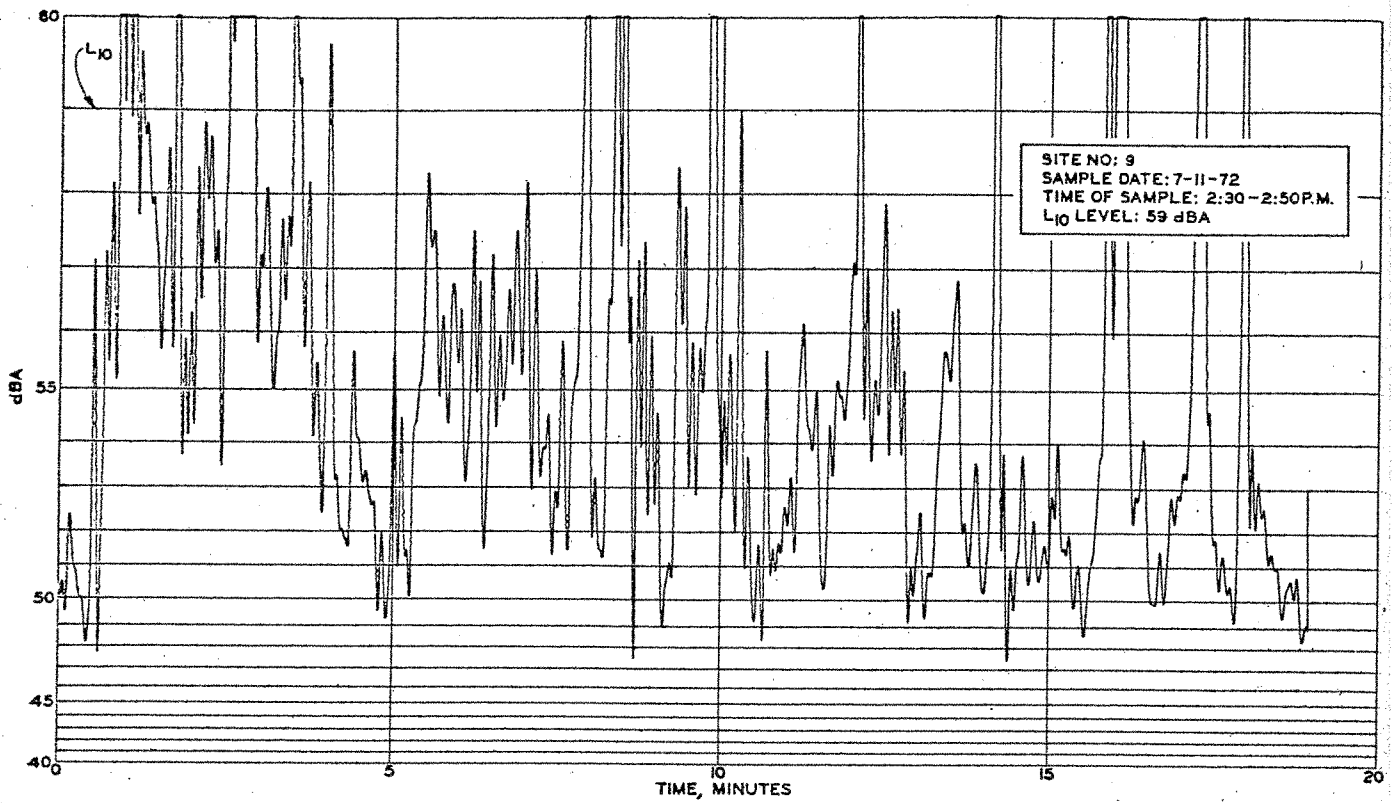


Figure 9. Microphone located at SW corner of Morton and Wales St, observer looking E. Sta. 263.

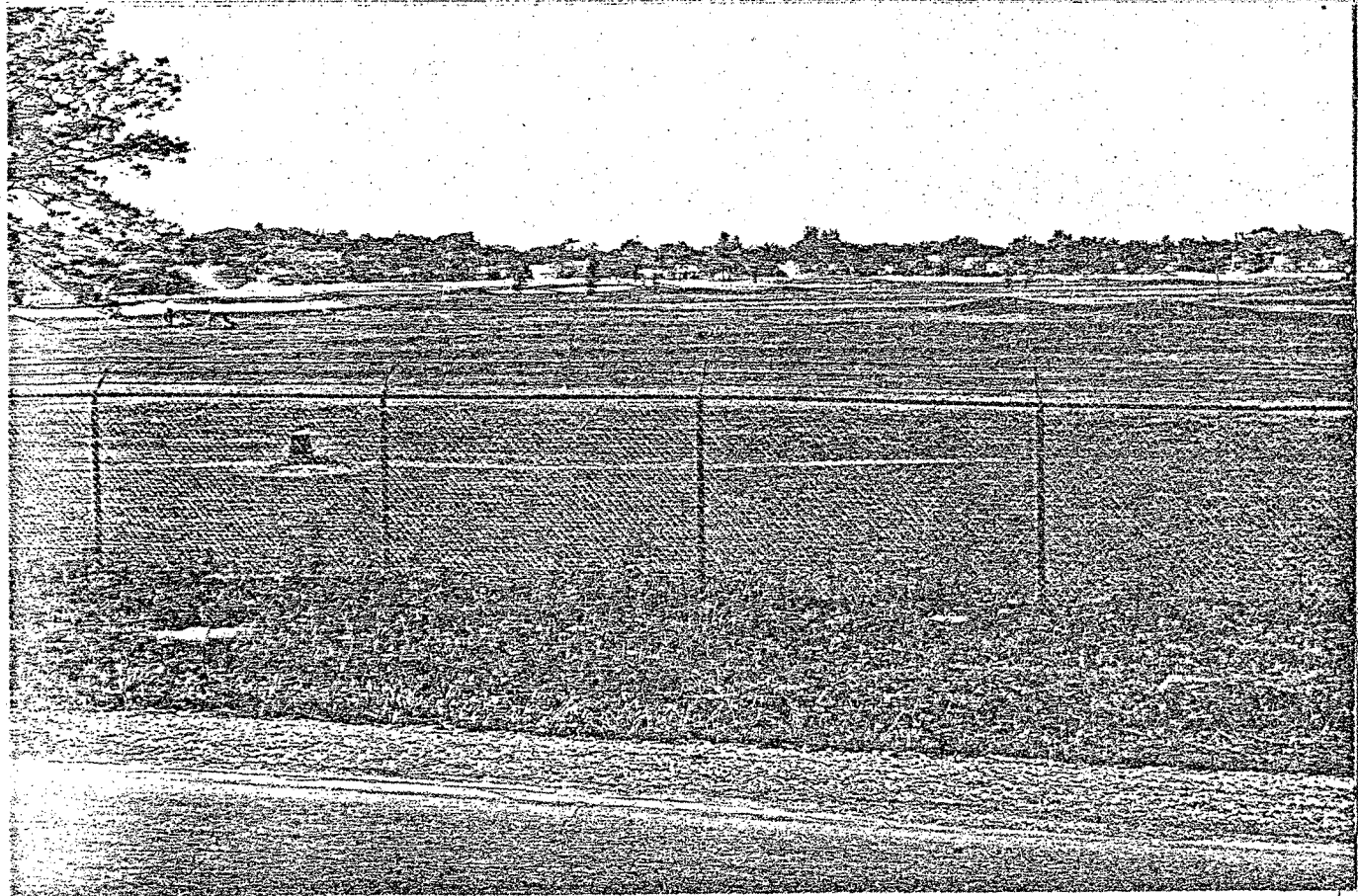
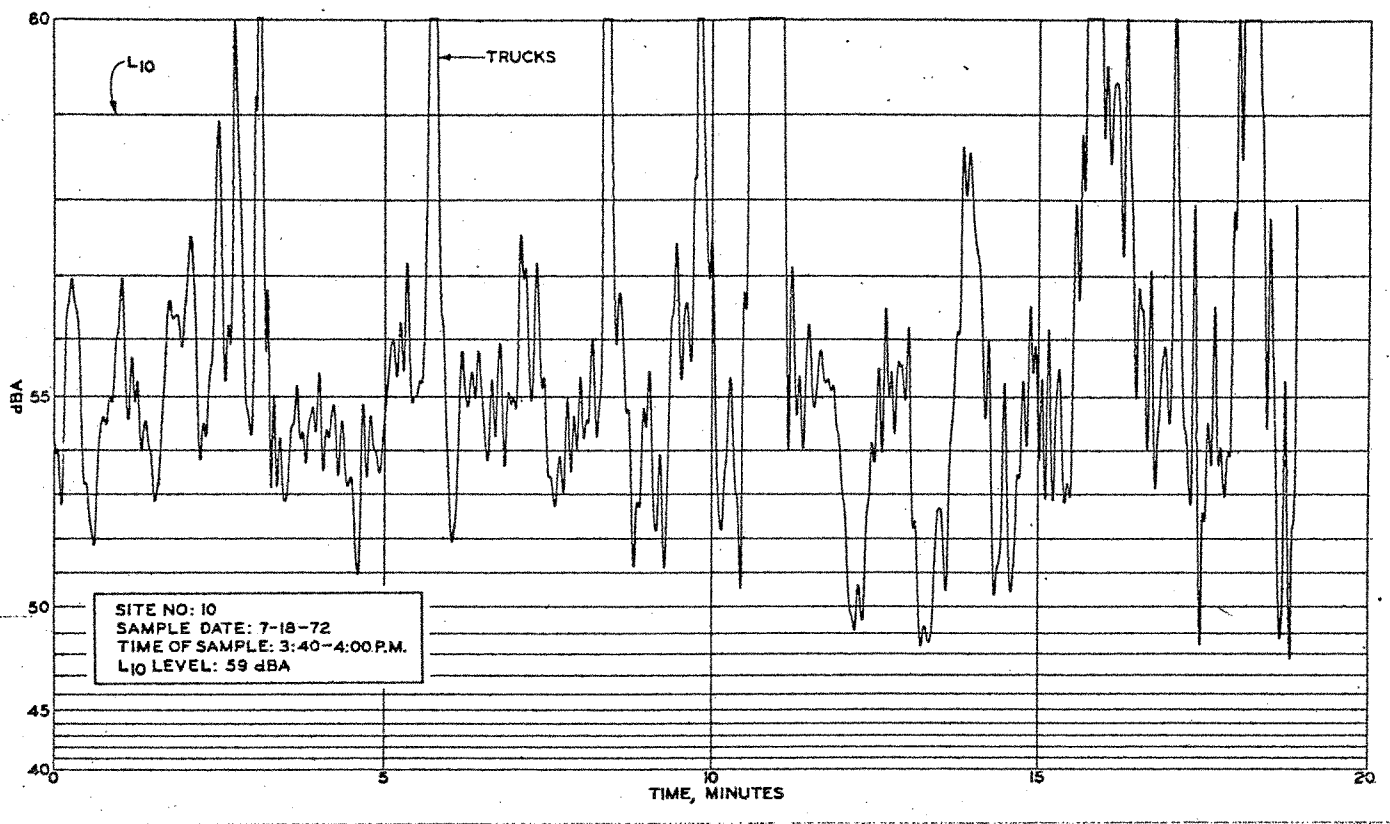


Figure 10. Microphone located 250 ft N of 10 Mile Rd in Rackham Municipal Golf Course, observer looking N from 10 Mile Rd. Sta. 281.

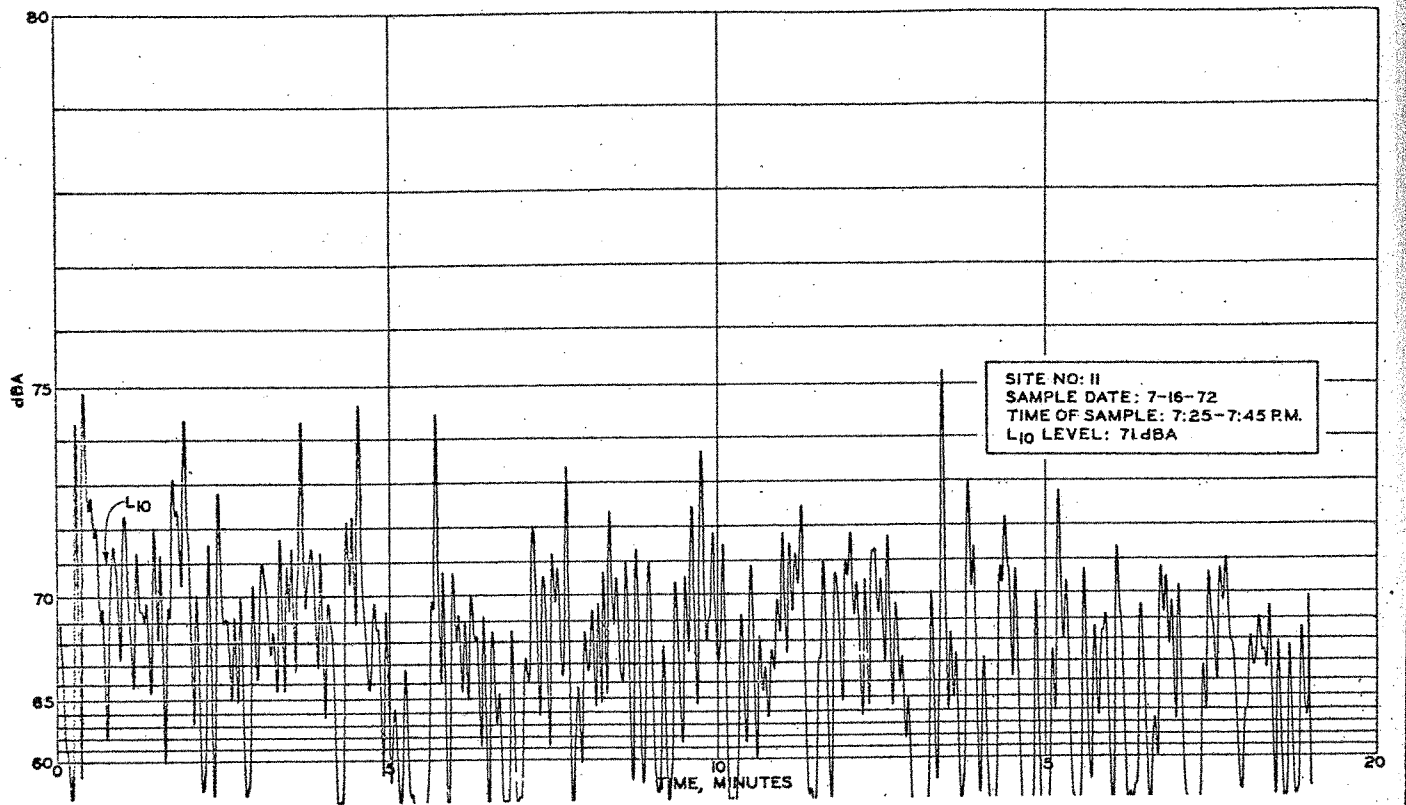


Figure 11. Microphone located 50 ft S of SW corner of Zoo Administration Building, observer looking NE. Sta. 312.

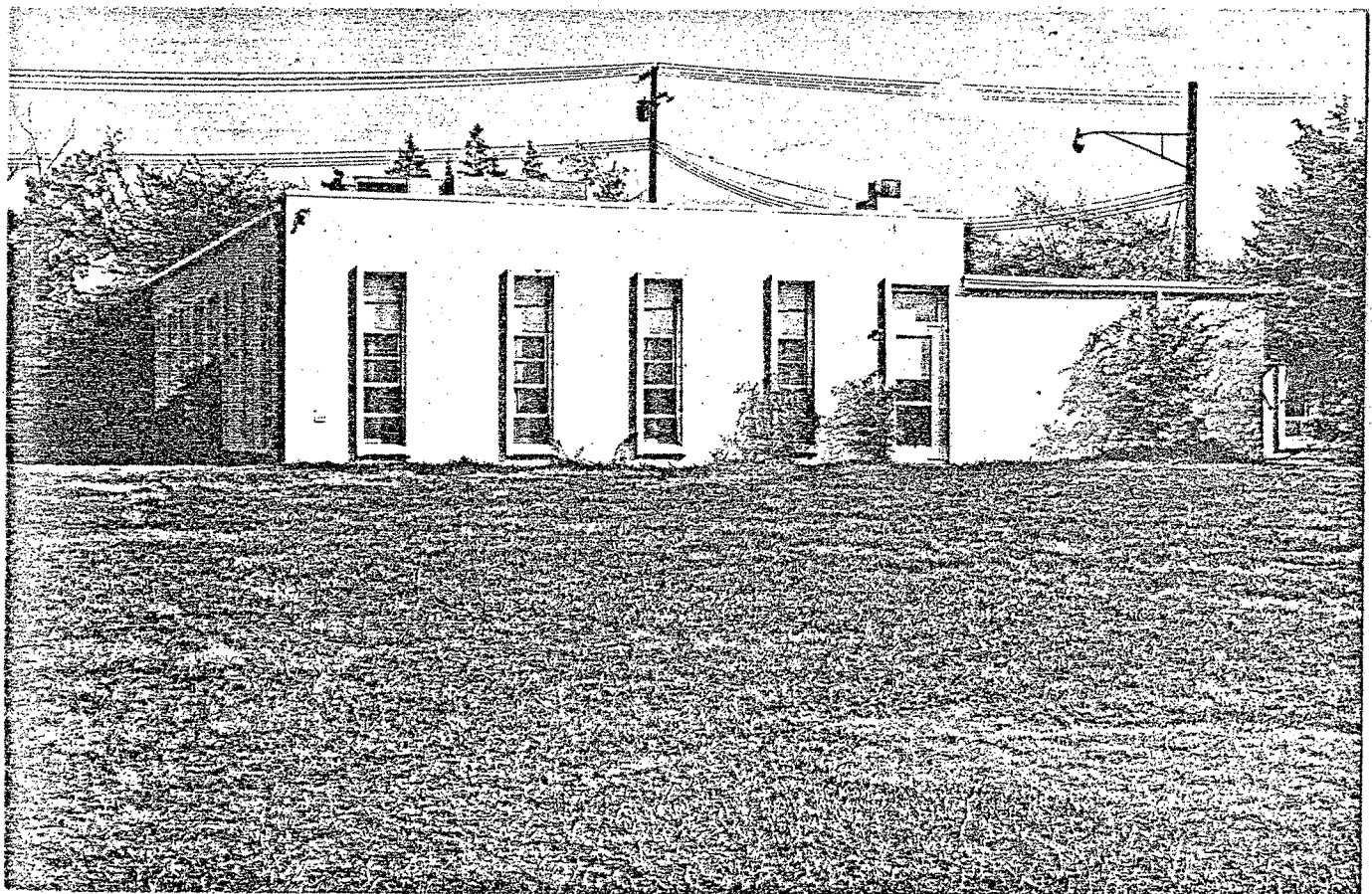
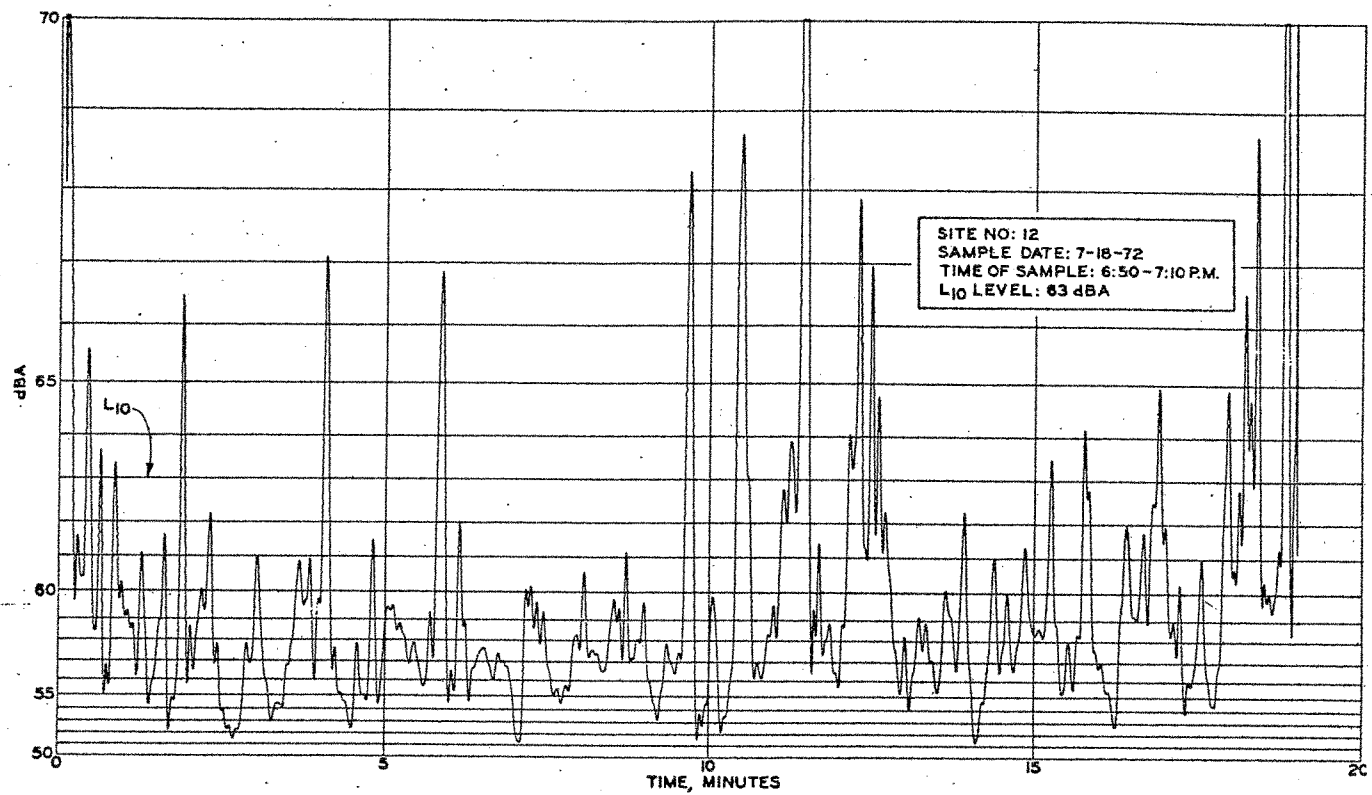


Figure 12. Microphone located 50 ft E of NE corner of Pleasant Ridge Community Building, observer looking SW. Sta. 333.

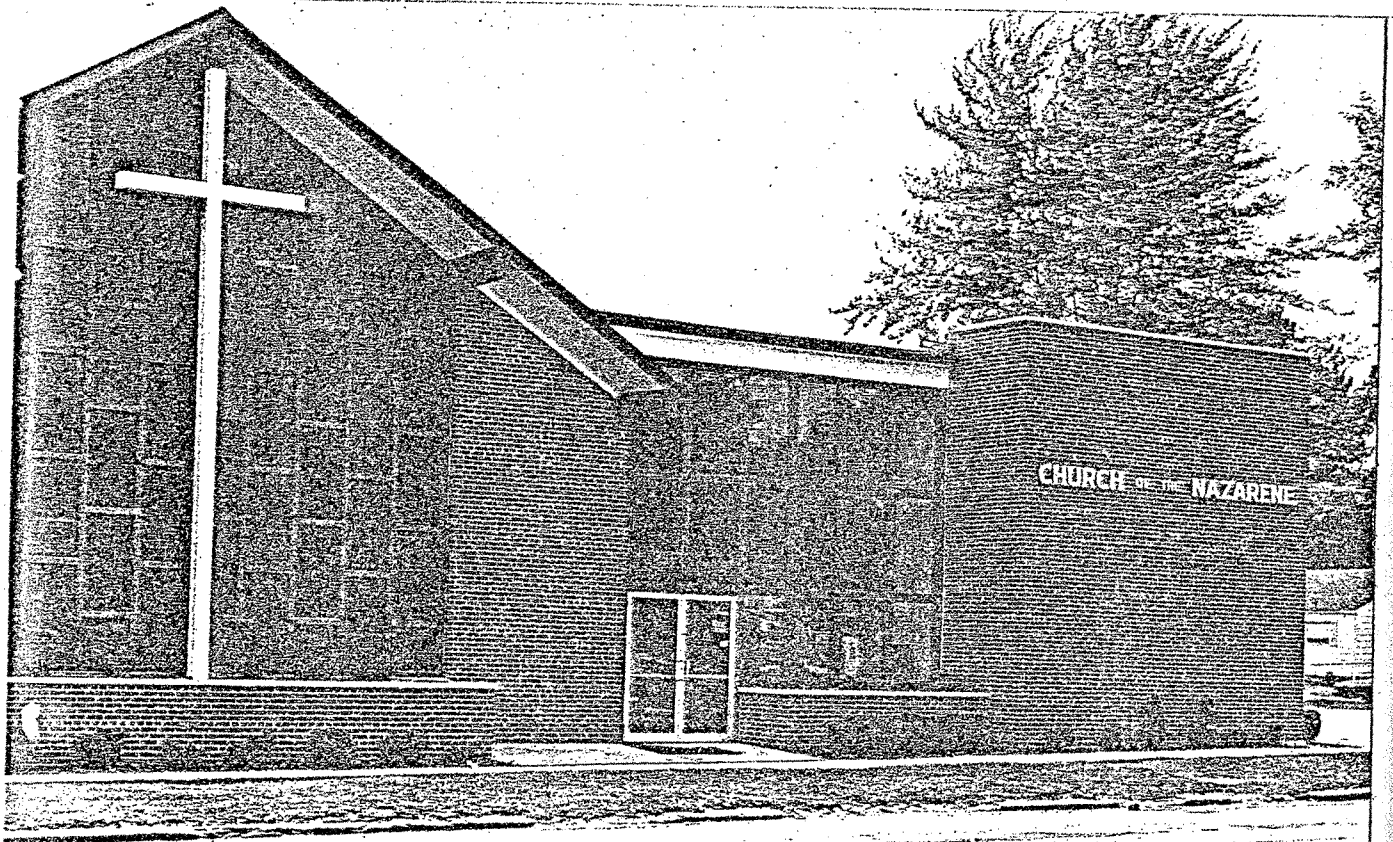
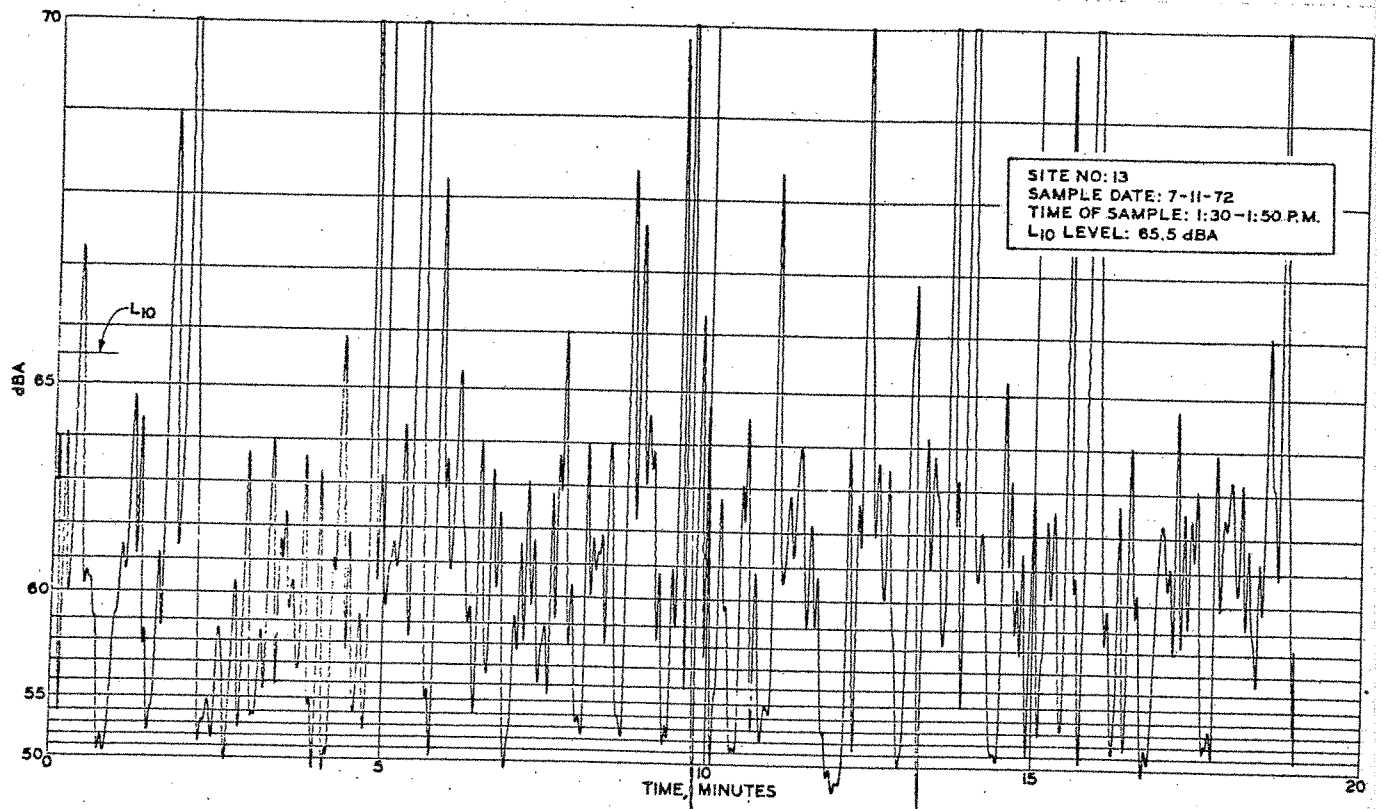


Figure 13. Microphone located in parking lot E of Church of the Nazarene, 50 ft S of the edge of 10 Mile Rd, observer looking SW. Sta. 387.

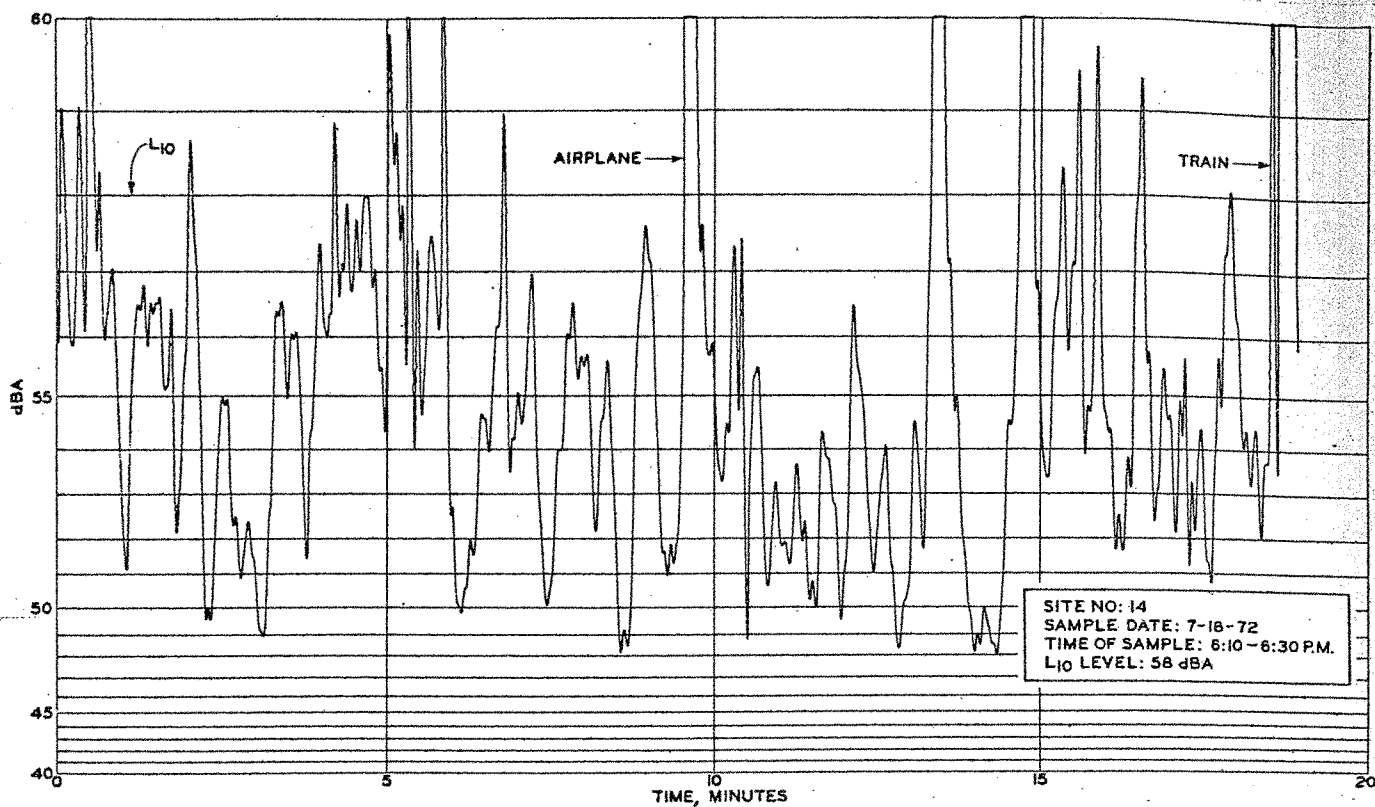
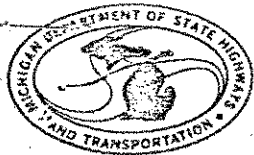


Figure 14. Microphone located 200 ft S of 10 Mile Rd in Harding Park opposite Hoffman St, observer looking SW. Sta. 395.

APPENDIX A

REQUEST FOR NOISE ANALYSIS UPDATE  
AND UPDATED TRAFFIC DATA





# OFFICE MEMORANDUM

144

May 6, 1975

TO: K. A. Allemeier Attention Leo DeFrain  
Engineer of Testing and Research

FROM: G. Robert Adams, Administrator  
Environmental and Community Factors Division

SUBJECT: Update of I-696 Noise Information

Resubmission of the Final Environmental/Section 4(f) Statement for I-696 from Lahser Road to I-75 requires an update of the noise analysis to current Federal requirements. Revisions similar to those recently completed for the I-475 freeway in Flint (see attached copy) are hereby requested. Additional information has been provided as per a telephone conversation between Leo DeFrain and Larry Alber.

This study should be coordinated with Winston Stebbins of the Environmental Liaison Section. Gerald Ritchie of the Design Division should be contacted for engineering data.

The complete study will be required by June 30, 1975.

*G. Robert Adams*  
Administrator

GRA:LEA:fs

Attachment

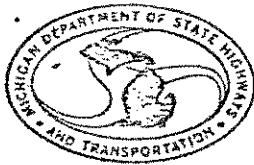
cc: G. J. McCarthy  
Gerald Ritchie  
W. L. Stebbins  
Larry E. Alber

Church	M. D. S. H. & T.	Dehler	<input checked="" type="checkbox"/>
Itsell		Cudney	
Malott		Witteveen	
Burge		Seratin	
Coleman		Sho. II	
D. Irving		Salisbury	
MAY 7 - 1975		File	
TESTING & RESEARCH DIVISION			

RECEIVED  
RESEARCH LABORATORY

MOB
FJB
5
LAN

MAY - 9 1975



# OFFICE MEMORANDUM

May 16, 1975

TO: S. F. Cryderman, Deputy Director  
Bureau of Transportation Planning

FROM: L. T. Oehler

SUBJECT: Request for I-696 (Lahser Rd. to I-75) Traffic Volumes and Speeds  
Research Project 71 TI-40

As a result of G. R. Adams May 6, 1975 request to K. A. Allemeier for an update of the I-696 (west) noise analysis and a May 15th meeting, we are requesting an update of the following traffic data for each significantly different section:

- A. Directional DHV
- B. % Commercial During DHV
- C. DHV Commercial Vehicle Speed
- D. DHV Auto Speed
- E. Level of Service C Directional Volume
- F. % Commercial During Level of Service C
- G. Service C Commercial Vehicle Speed
- H. Service C Auto Speed

Only mainline traffic for the design year 1990 is needed.

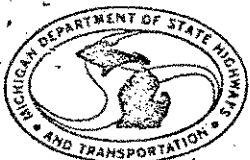
This information is required within one week in order for a noise impact report to be prepared by June 30, 1975 as requested by G. R. Adams.

TESTING AND RESEARCH DIVISION

*L. T. Oehler*  
\_\_\_\_\_  
Engineer of Research

LTO:GHG:cgc

cc: F. L. Daniels  
K. A. Allemeier



# OFFICE MEMORANDUM

May 22, 1975

TO: Kent A. Allemeier  
Engineer of Testing and Research

FROM: Robert S. Boatman, Administrator  
Metro Regional Planning Division

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Burge		Spaill	<input type="checkbox"/>
Coleman		Schisberg	<input type="checkbox"/>
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SUBJECT: Traffic Volumes and Speed on I-696 (Lasher Road to I-75) - Research Project 71 T1-40 L-70

Attached is the I-696 mainline traffic data requested. The DHV's shown are unrestrained, as are assumed volumes on the ramps and service drives leading to I-696.

Level of Service "C" volumes are taken from the Highway Capacity Manual, with adjustment for the percentage of commercial vehicles. Percent commercial data is based on classification counts taken on I-75 in 1973.

Speeds are based on speed studies done by personnel of the Bureau of Transportation Planning, and on the relationship of level of service and speed.

The total (two-way) DHV figures in Table 3 are based on the one-way peak analysis. Speeds will be as given in the "westbound" table. Volumes and speeds in the eastbound direction during the occurrence of total DHV are also given in Table 3.

*Robert S. Boatman*  
Administrator

RSB:FLD:pls

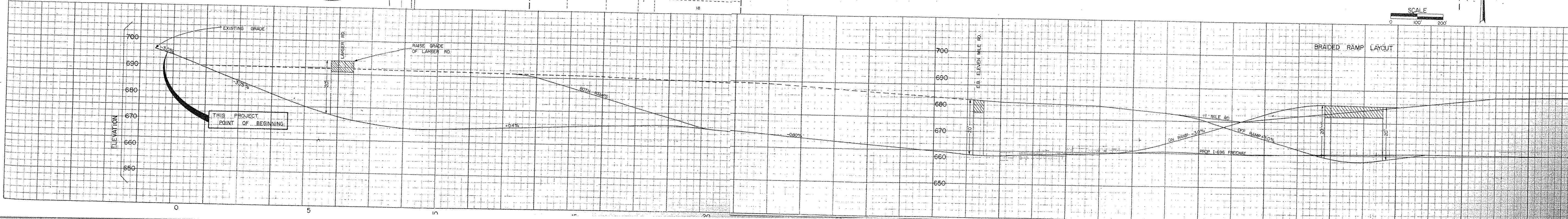
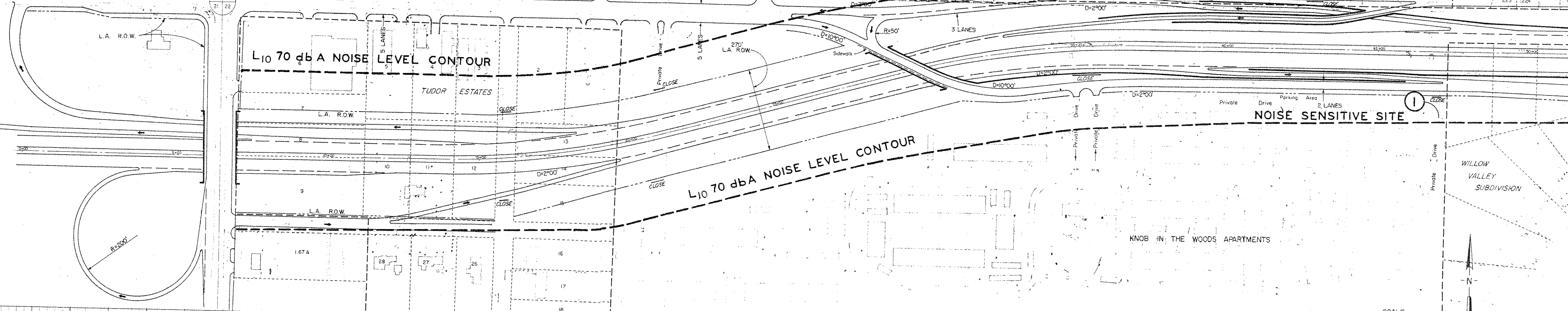
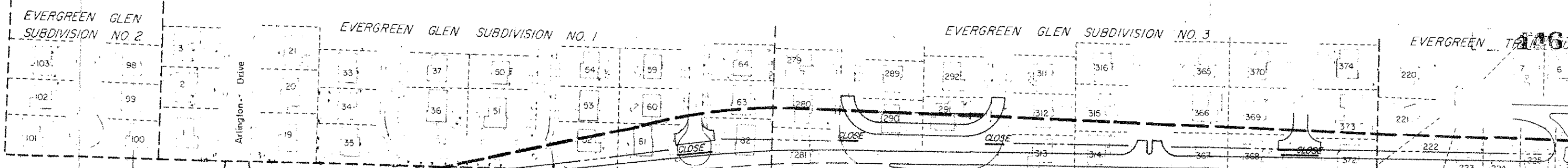
cc: BTP Files  
Metro Files

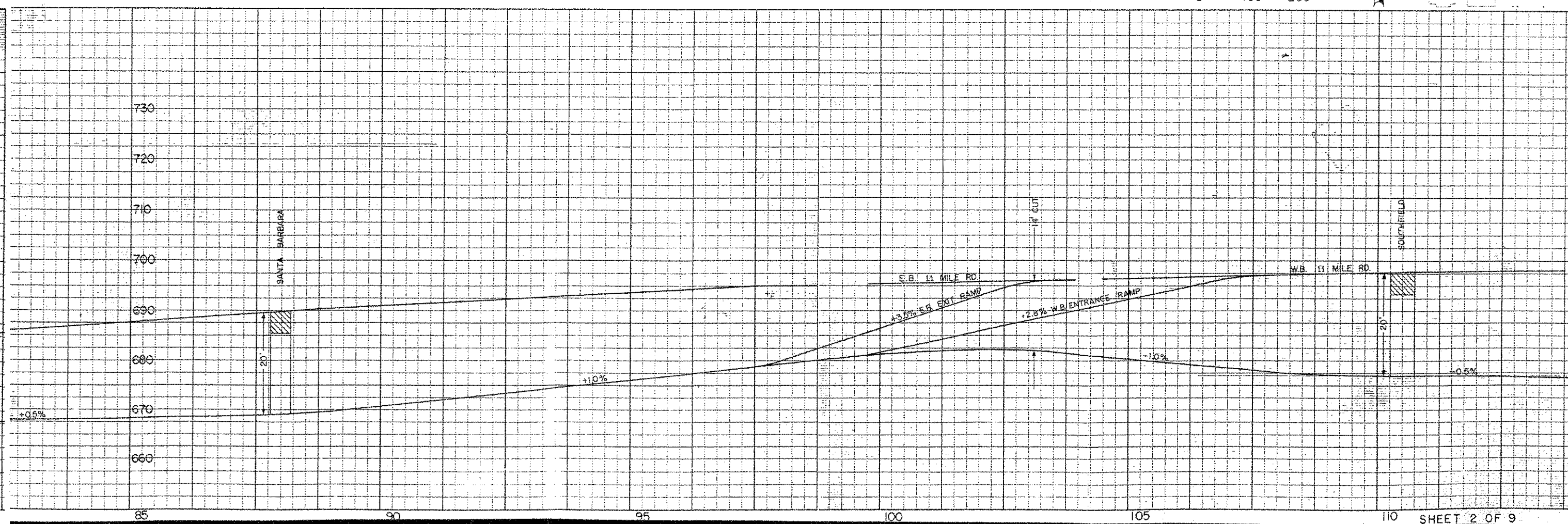
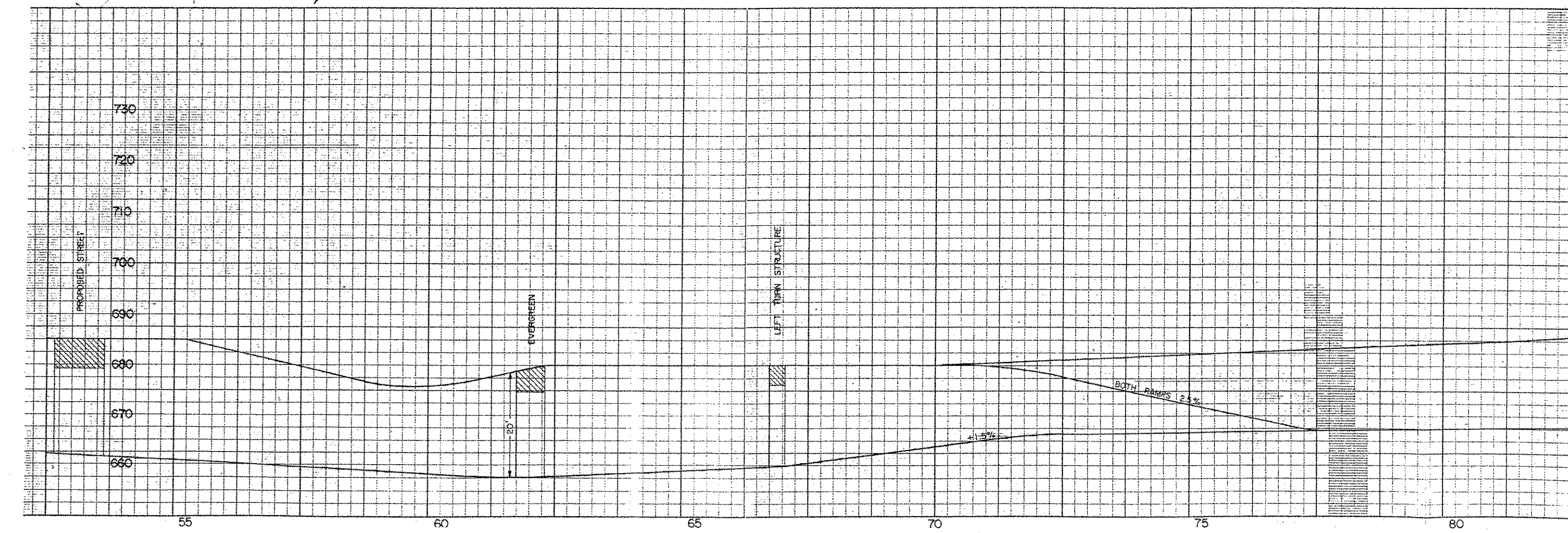
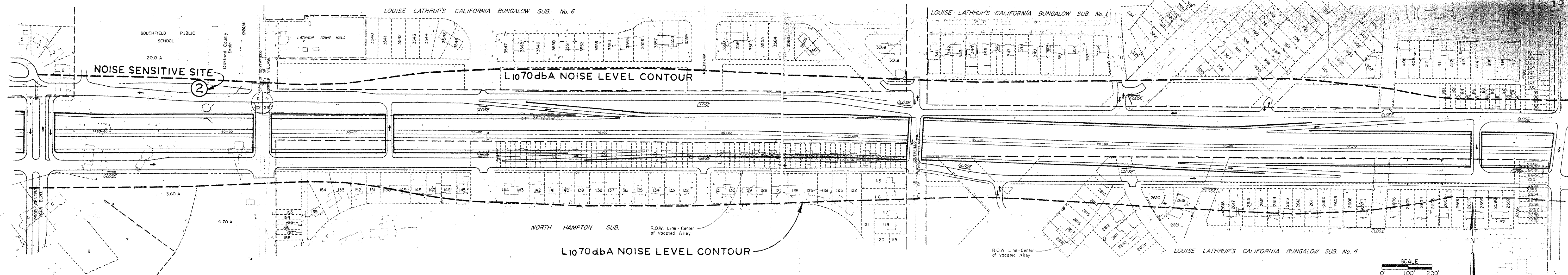
LTO	<b>RECEIVED</b> RESEARCH LABORATORY MAY 27 1975 M.D.S.H. TESTING AND RESEARCH DIVISION	MGB
GRC		FJB
AJP		CJA
PM		LFH
RCM		JBA
MHJ		ELS

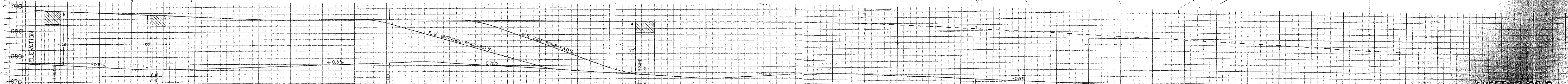
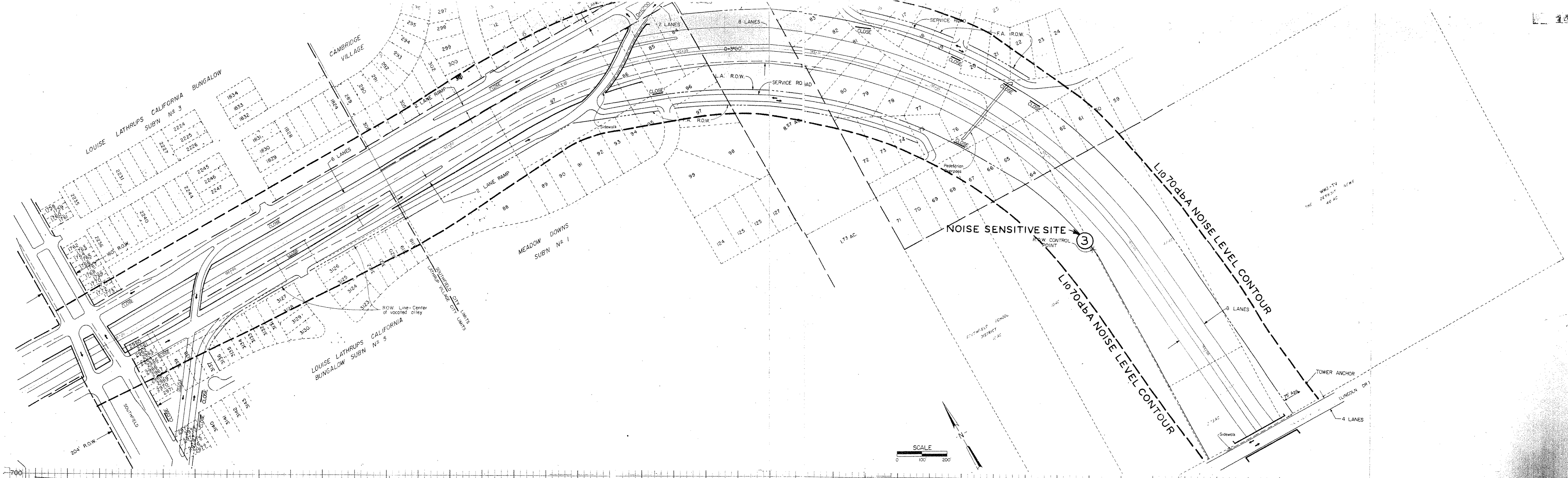
TABLES 1-3  
I 696 - 1990 ESTIMATED TRAFFIC DATA\*

Location	Design Hourly Volume Data				Level of Service "C" Data						
	Volume (veh/hr)	Time	Percent Commercial	Auto Speed (mph)	Truck Speed (mph)	Volume (veh/hr)	Time	Percent Commercial	Auto Speed (mph)	Truck Speed (mph)	
Table 1 Westbound	Lahser - Evergreen	5640	7:30-8:30 a.m.	6	35	30	5440	9:00-10:00 a.m.	8	40	35
	Evergreen - Southfield	9170	7:30-8:30 a.m.	4	20	20	5440	10:00-11:00 a.m.	10	40	35
	Southfield - Greenfield	7820	7:30-8:30 a.m.	4	30	30	5440	10:00-11:00 a.m.	10	40	35
	Greenfield - Coolidge	7750	7:30-8:30 a.m.	4	30	30	5440	10:00-11:00 a.m.	10	40	35
	Coolidge - Woodward	7950	7:30-8:30 a.m.	4	30	30	6800	10:00-11:00 a.m.	10	40	35
	Woodward - Campbell	8110	7:30-8:30 a.m.	4	20	20	5440	10:00-11:00 a.m.	10	40	35
	Campbell - I 75	8310	7:30-8:30 a.m.	4	20	20	5440	10:00-11:00 a.m.	10	40	35
Table 2 Eastbound	Lahser - Evergreen	5790	4:30-5:30 p.m.	6	35	35	5440	1:00-2:00 p.m.	10	40	35
	Evergreen - Southfield	8455	4:30-5:30 p.m.	4	25	25	5440	1:00-2:00 p.m.	10	40	35
	Southfield - Greenfield	7155	4:30-5:30 p.m.	4	30	30	5440	1:00-2:00 p.m.	10	40	35
	Greenfield - Coolidge	7085	4:30-5:30 p.m.	4	30	30	5440	1:00-2:00 p.m.	10	40	35
	Coolidge - Woodward	7285	4:30-5:30 p.m.	4	30	30	6800	2:00-3:00 p.m.	6	40	35
	Woodward - Campbell	7505	4:30-5:30 p.m.	4	30	30	5440	1:00-2:00 p.m.	10	40	35
	Campbell - I 75	7705	4:30-5:30 p.m.	4	30	30	5440	1:00-2:00 p.m.	10	40	35
Table 3 Highest Total Two Way (and EB)	Lahser - Evergreen	10600 (4960)	7:30-8:30 a.m.	6	45	40					
	Evergreen - Southfield	13200 (4030)	7:30-8:30 a.m.	6	45	40					
	Southfield - Greenfield	12255 (4435)	7:30-8:30 a.m.	6	45	40					
	Greenfield - Coolidge	12095 (4345)	7:30-8:30 a.m.	6	45	40					
	Coolidge - Woodward	12675 (4725)	7:30-8:30 a.m.	6	45	40					
	Woodward - Campbell	13015 (4905)	7:30-8:30 a.m.	6	45	40					
	Campbell - I 75	13265 (4955)	7:30-8:30 a.m.	6	45	40					

\* Rearrangement of original.



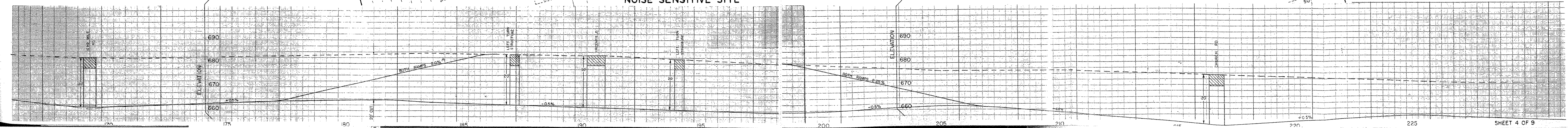
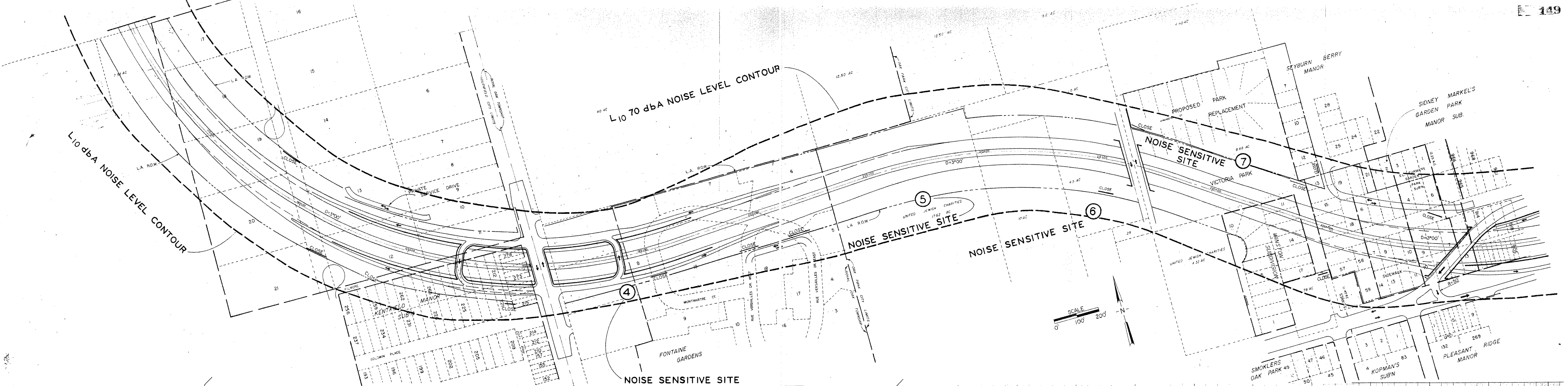




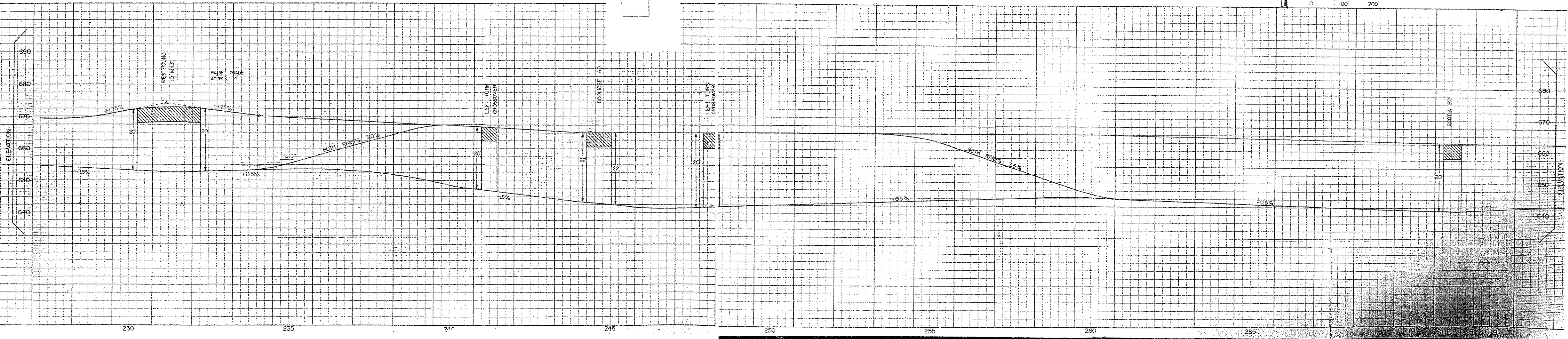
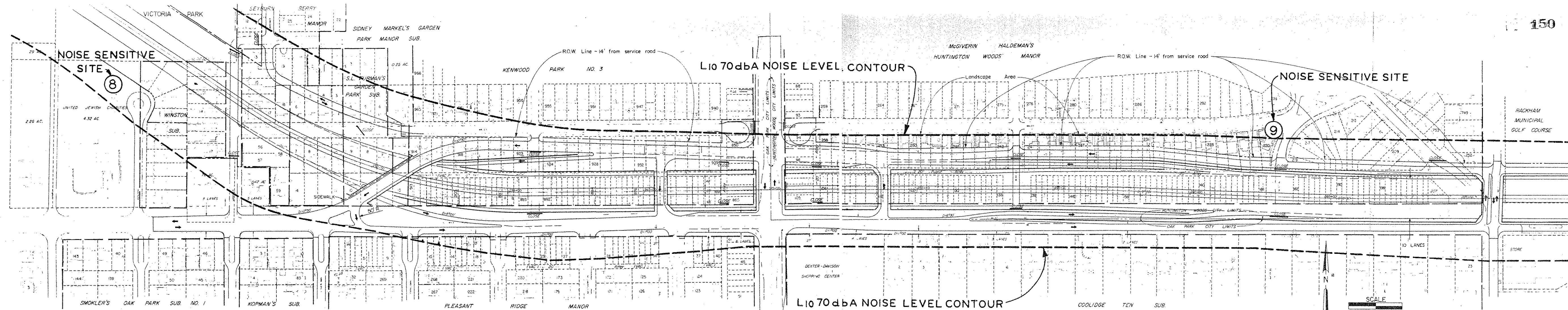
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L10 70 dBA NOISE LEVEL CONTOUR

L10 65 dBA NOISE LEVEL CONTOUR







⑩ NOISE SENSITIVE SITE

⑪ NOISE SENSITIVE SITE

