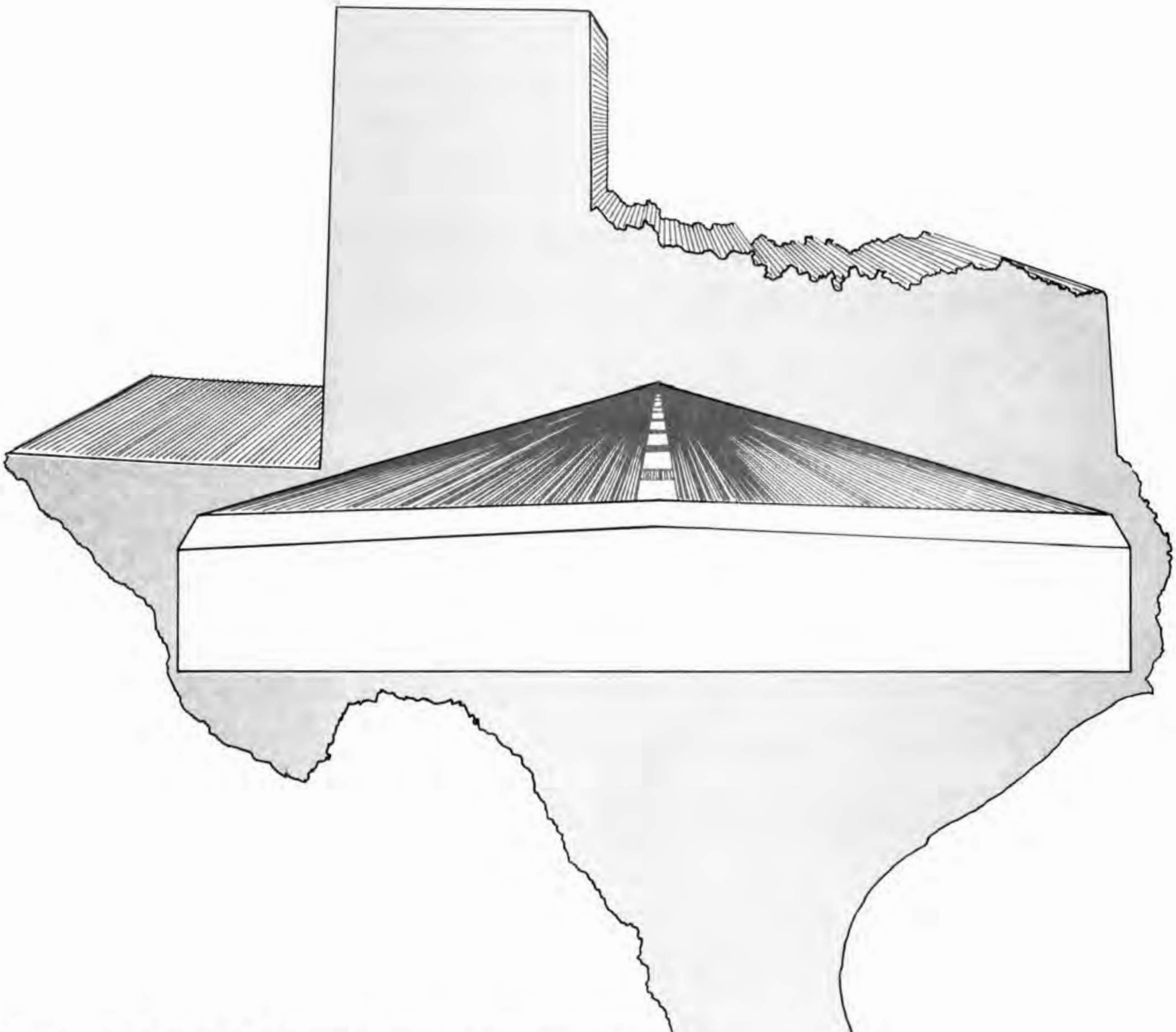
WALTON

EFFECTS OF OVERHEIGHT AND HEAVY LOADS ON TEXAS HIGHWAYS



STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

July 1978

EFFECTS OF OVERHEIGHT AND HEAVY LOADS
ON TEXAS HIGHWAYS

Prepared by the

State Department of Highways and Public Transportation

Austin, Texas

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SUMMARY & CONCLUSIONS

In recent years, damage to the state highway system by overheight and/or overweight trucks has been of increasing concern to the State Department of Highways and Public Transportation. Highway damages are not localized, but occur to various degrees statewide. In order to evaluate the magnitude of the heavy load problem, selected highways in the area west of Houston were analyzed in July, 1978, since pavement deterioration in that region was a good example of statewide problems. Data on damage caused by overheight loads in the Houston Metropolitan area was also obtained.

Although the damage identified by this study can generally be attributed to a predominance of gravel trucks, other heavy vehicles carrying grain, brick, lumber and specialized equipment cause similar problems in this area as well as other areas of the state.

Based on the findings of this study, it is apparent that overheight and heavy loads are resulting in costly repairs and inconvenience to the public at an increasing rate. Hazards resulting from damages to the highway system present continuing potential threats to life and health. It is apparent that some action must be taken to reduce these damages and hazards.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. Introduction

This report is divided into two parts. The first part is related to the damage and associated costs to Texas Highways which are caused by heavily loaded vehicles. The second part focuses on the problem of overheight loads and the damage and costs caused by these vehicles. An introduction to the damages caused by these vehicles may be found in newspaper articles by the Houston Post and the Houston Chronicle located in Appendix A.

II. Heavy Loads

Pavement distress was studied on ten highways in Austin, Colorado, Fort Bend, Matagorda, and Wharton Counties. The highways were specially selected to show the damage caused by heavily loaded trucks. The types of distress shown are typical of the damage caused by all types of heavy truck loads found throughout the state. This type of damage can be expected on highways as cumulative truck loading accrues or as individual truck weights increase. The trucks using the selected highways are generally loaded with sand and gravel. Aggregate sources are dominant in the area as shown on the map of Figure 1. Aggregate from any given source may be shipped in any direction from that source. However, the majority of material is shipped to Houston with some sources providing aggregate to a large construction project near Bay City. Therefore, the study was composed of a comparison of the lanes carrying the loaded trucks to Houston or Bay City-with the lanes carrying the returning empty trucks. Additionally, the costs of maintaining a functional highway and the cost of upgrading a damaged highway with an asphaltic concrete overlay were studied. Note Figure 1 also shows the locations of the highway segments studied and reported herein.

A. Results of Study

Table I shows the ratios of distress of loaded lanes compared with the return lanes.

1. The study indicated the lanes which carry the loaded trucks have rut depths 2.34 times greater than the lanes carrying the returning empty trucks. Rut depths from 3/4-inch to 1-inch can easily be found on the loaded lanes of most of the highways studied as shown in Pictures 5,8, and 11. Shear failures (where the pavement material is shoved vertically each side of the wheel path) occur frequently on the loaded lanes particularly on the Farm-to-Market roads (see Pictures 5,8, and 9). Some shear failures were noted on US-90A near the center line and it is estimated that over one mile (of a 7.6 mile study length) has previously been repaired because of this shear type failure.

TABLE I

Loaded Lanes/Return Lanes = Ratio of Distress

Location	Rut Depth (inches)	Visible Repair Areas (feet/mi)	Pavement Roughness (inches/mi) *
FM-109 Colorado Co.	.31/.21 = 1.48	277/106 = 2.61	95/83 = 1.14
FM-2614 Colorado Co.	.145/.05 = 2.90	359/59 = 6.08	180/101 = 1.78
FM-2614 Wharton Co.	.215/.08 = 2.69	1526/675 = 2.26	126/95 = 1.33
US-90A Colorado and Wharton Co.	.665/.22 = 3.02	49/43 = 1.14	78/52 = 1.50
FM 3013 Colorado Co.	.70/.225 = 3.11	None	57/37 = 1.54
SH-159 Austin Co.	.28/.13 = 2.15	645/423 = 1.52	73/85 = 0.86
FM-109 Austin Co.	.17/.10 = 1.70	27/16 = 1.69	112/104 = 1.08
FM-2977 Ft. Bend Co.	1.23/.65 = 1.89	151/181 = 0.83	91/84 = 1.08
SH-60 Matagorda Co.	.10/.05 = 2.00	32/13 = 2.42	35/33 = 1.06
FM-2668 Matagorda Co.	.39/.16 = 2.44	9/2 = 4.50	149/136 = 1.10
SH-71 Matagorda Co.	N/A	2713/1797 = 1.51	478/256 = 1.87
Average	2.34	2.46	1.30

* A smooth surface generally ranges from 20 to 40 inches/mile.

2. Pavement repairs required on the lanes carrying the loaded trucks are 2.46 times greater on the average as compared to the lanes carrying the empty trucks. Examples of pavement repair are the patches shown in Pictures 1,5, and 9.

3. The lanes carrying loaded trucks have a measured roughness of about 1.30 times greater than the lanes carrying empty trucks. On some highway sections excessive rutting was found although the roughness values showed a relatively smooth longitudinal profile.

4. Truck traffic on the highways studied was found to be as much as three times the usual volume with a high of 33.8 percent of the total traffic. The truck stops and intersections along the highways have an appearance similar to a beehive, particularly during the "first load" period in the morning hours.

5. The large number of pavement repairs in the lanes carrying loaded trucks indicates about 71 percent of the pavement repair maintenance funds are used on the loaded lanes. The percentage values are based on the measured repair areas reported above. The pavement maintenance costs were found to range from $295 to $23,540 per mile each year. By comparison, the pavement maintenance cost of a typical low volume highway carrying normal truck traffic will be about $200 per mile per year. The detailed costs for each highway studied may be found in Appendix B.

With pavement repairs required on the loaded lanes in the range of 2 to 3 times the amount required on the return lanes, a similar relationship may be expected with major reconstruction of the roadways. It may be reasoned that the loaded lanes are failing 2 or 3 times faster than the return lanes. It follows that highways carrying large volumes of heavy loads will fail and need reconstruction 2 to 3 times more frequently than those highways carrying the normal traffic load. Or, the highways having the large volumes of heavy loads will need an improved pavement structure requiring considerable additional funding.

B. Example of Resurfacing Costs

FM-3013 was one of the highways analyzed in this study. The section of highway from Eagle Lake to the San Bernard River was orginally constructed in 1975. Presently, the pavement carries about 2500 vehicles per day with approximately 33 percent trucks. The majority of trucks contain aggregate material. The trucks are loaded in the northbound lanes and return empty in the southbound lanes. The major pavement distress is extreme rutting in the northbound lanes. The possibility of a safety hazard exists because of hydroplaning during periods of rainfall. Also standing water can migrate through the asphaltic surface, softening the subbase and subgrade leading to rapid deterioration of the pavement structure. Because of these conditions the pavement requires a level-up and resurfacing after only three years of service. The cost for this resurfacing is estimated to be $262,936.55 (a 7.2 mile length or $36,518.97/mile).

C. Study Locations

The highways selected for study were as follows:

District 12

US-71, Matagorda County, From SH-35 to Wharton County Line

SH-60, Matagorda County, From FM-2668 to FM-521

SH-159, Austin County, From Fayette County Line to FM-109 in Industry

FM-109, Austin County, From Colorado County Line to SH-159 in Industry

FM-2668, Matagorda County, From FM-3057 to FM-521

FM-2977, Fort Bend County, From FM-762 to FM 361

District 13

US-90A, Colorado and Wharton County, From Eagle Lake to the West San Bernard River

FM-109, Colorado County, From 5 miles north of SH-71 to SH-71

FM-2614, Colorado County, From FM-950 to FM-102

FM-3013, Colorado County, From US-90A at Eagle Lake to the San Bernard River

FM-2614 was divided into two study sections since an aggregate source was found near the county line and about midway between the limits noted above. Visible distress was noted in the westbound lanes from the aggregate source west (to FM-950). However, the pavement damage was more pronounced in the eastbound lanes from the aggregate source east (to FM-102).

Figure 1 shows the highways studied and Appendix B offers a summary of data collected along with pictures of the present condition.

D. Overweight Loads

The maximum legal gross load is 80,000 pounds with up to 20,000 pounds permitted on a single axle and 34,000 pounds on a tandem axle. Overweight loads are common in Texas and based upon the information in Appendix A, overloads are common in other states also. Typical overweight loads contain green or wet grain, brick, gravel and lumber as well as specialized equipment. The timber industry ships logs which cantilever over the end of a trailer causing heavy loads on the rear axle.

The Department of Public Safety indicates some 33,600 citations were issued in 1977 for gross weight overloads. Among these but possibly in addition were 1,022 citations for weights exceeding 20,000 pounds on a single axle

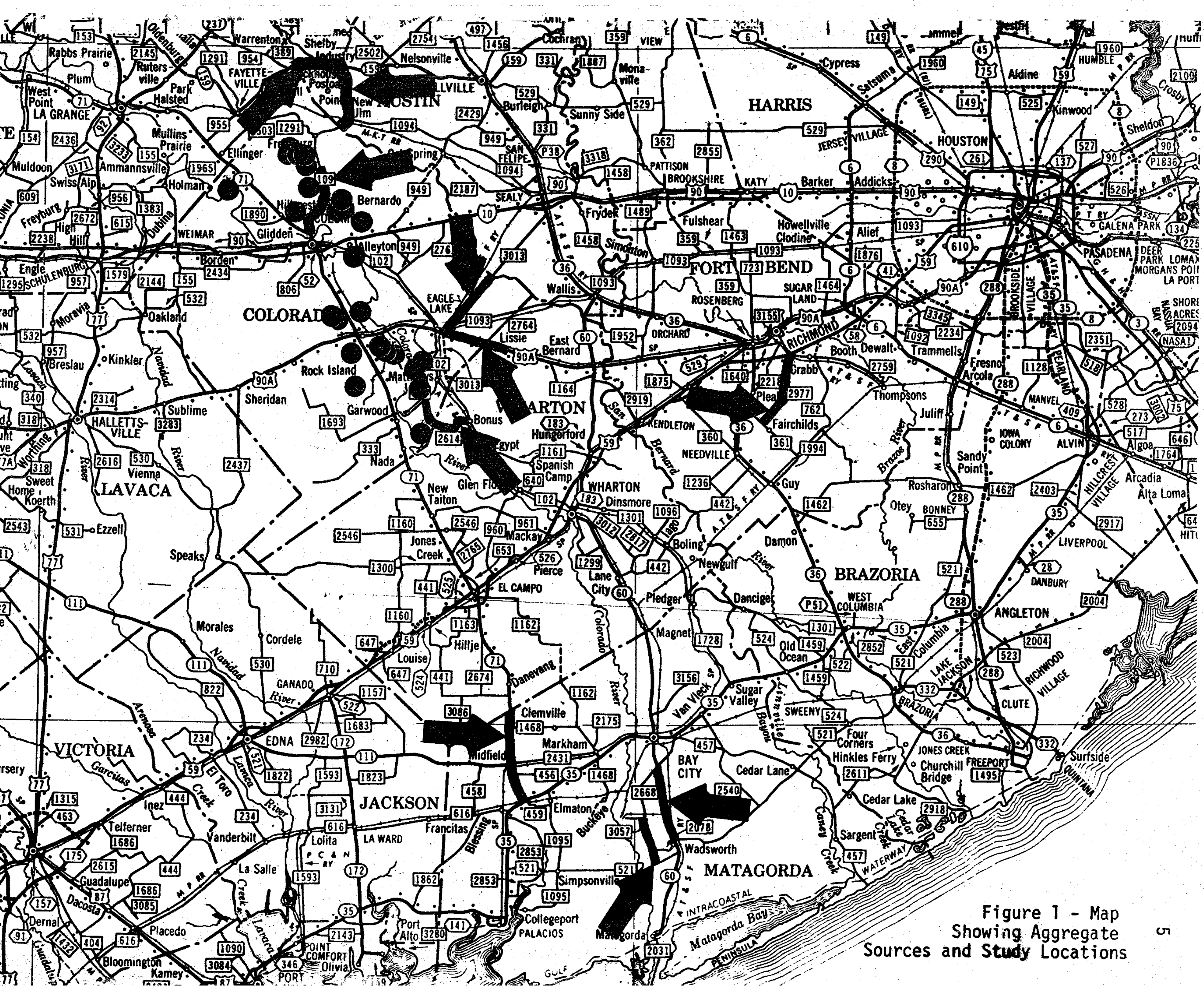


Figure 1 - Map Showing Aggregate Sources and Study Locations

and 5,988 citations for weights exceeding 34,000 on a dual axle. Also 66,611 warning tickets were given for overload violations. Thus a total of over 100,000 overloads were recognized by the Department of Public Safety. No overweight information is readily available for the loads in the study area.

III. Overheight Loads

While pavement distress due to heavy loads is most readily observable in suburban and rural areas, structural damage to bridge and overhead sign structures is a common occurrence in urban areas such as Houston. The degree of the problem is shown in Tables II and III. The severity of the damage is illustrated by the photographs in Appendix D. The concern felt by the community is illustrated by the newspaper articles found in Appendix A. The legal height without permit is 13'-6". However, clearance signs have been posted because of overheight loads. Also the photographs illustrate that measures have been employed in an attempt to reduce damage to bridges--but without success. Picture 12 shows warning tattle-tales at one location which have been struck. Picture 13 shows warning lights which are activated by high loads-and still the bridge has been struck. Such bridge damage usually results from overheight loads carried without a permit. In some cases, loads which have passed under a given clearance at low speed have damaged succeeding structures with the same or higher clearance when passage was attempted at high speeds. This occurrence probably results from greater vertical oscillation (bounce) at higher speeds. Pictures 14 and 15 show heavy damage to a structure with the load bearing reinforcing steel exposed. Picture 16 shows a bridge with a clearance of almost 15-feet which has been struck about ten times. Picture 17 shows damage to a steel girder which has been hit after the load passed under similar preceding girders.

Damage to overhead sign structures recently is almost solely due to dump trucks whose beds have sprung-up while the truck was in motion. Table III lists only those overhead sign structures which currently are down in the Houston area. Picture 18 shows a catwalk and lighting dangling in a position which is hazardous to following traffic. Picture 19 reveals damage to both overhead sign and the truck which struck the sign.

Some of the structures with the higher clearances are the pedestrian crossings. Though by no means a weak structure, they are weaker than a vehicular bridge when impact loaded from the side. Pictures 20 and 21 show pedestrian crossing structures with well over a 1[illegible]-foot clearance. Both have been hit with overheight loads.

While compensation for repairs is usually obtained from those responsible for damage to overhead signs and bridges, the cost is not the primary consideration. Lives are at stake. It is only through the greatest good fortune that the incidents cataloged in Tables II and III have not resulted in death or serious injury. Nearly all of the sites listed are on Houston freeways which carry from 100,000 to 225,000 vehicles per day.

Pavement distress due to heavy loads is very costly to the public and presents a marked degree of hazard and inconvenience. Overheight damage is less costly, but inconveniences far more people and could easily result in a calamity, particularly at a pedestrian crossing which serves school children or at a major directional interchange traversed by nearly 500,000 vehicles per day.

TABLE II

BRIDGES DAMAGED BY OVERHEIGHT TRUCKS; 1976 TO DATE

July, 1978
District 12

DATE	LOCATION	COST	REMARKS
2-23-76	IH 610 at Ella Blvd	$ 11,200	Payment Received
3-1-76	IH 10 at Sjolander	11,600	Payment Received
4-17-76	IH 10 at Meadow St.	18,000	Payment Received
6-24-76	IH 10 at Meadow St.	1,700	Unknown
6-28-76	IH 10 at Federal Rd.	750	Unknown
8-16-76	US 59 at FM 1960	31,000	Payment Received
9-8-76	IH 45 at Quitman	12,500	Payment Received
9-16-76	US 59 at Hazard	12,500	Payment Pending
10-14-76	US 59 at Hazard	1,970	Unknown
3-5-77	IH 45 at Quitman	12,965	Unknown
6-2-77	IH 45 at Almeda Genoa Rd.	40,900	Payment Received
Unknown	IH 45 at FM 1488	27,900	Unknown
6-26-77	IH 10 at Hogan	19,580	Payment Received
6-30-77	US 59 at Lyons Ave	11,430	Payment Pending
7-9-77	IH 10 at Houston Ave.	1,200	Unknown
2-28-78	IH 610 at IH 10	63,350	Payment Pending
3-8-78	IH 45 at IH 610	6,500	Payment Pending
3-12-78	IH 10 at Houston Ave.	70,000	Payment Pending
4-18-78	IH 10 at Meadow St.	64,250	Payment Pending
4-18-78	US 59 at Hazard	16,900	Payment Pending
	Total	$436,195	

TABLE III

OVERHEAD SIGN STRUCTURES DAMAGED BY TRUCKS

July, 1978
District 12

DATE	LOCATION	COST	REMARKS
6-13-77	IH 45 at SH 6	35,000	concrete truck hit column
9-16-77	IH 610 at US 290	40,000	dump truck came up and hit sign
3-24-78	IH 610 at IH 10	40,000	bed on dump truck came up and hit sign
4-4-78	IH 610 at Irvington	40,000	bed on dump truck came up and hit sign
7-7-78	IH 610 at Gellhorn	45,000	bed on dump truck came up and hit sign
	Total	$232,994	

APPENDIX A

Newspaper Articles

The following articles were excluded from digitization, pending copyright clearance:

- Post/commentary: Roadruiners. (1978, April 14). Houston Post, p. 2D.
- Moran, T. (1978, April 17). Hazard overpass name apt: Hit by oversize trucks 14 times since ‘73. Houston Chronicle, p. 14.

--Center for Transportation Research (CTR) Library, Digitization Team, 2020.

APPENDIX B

Pictures and Data of the Study Locations Related to Heavy Loads

Picture 1.

SH-71	Matagorda County	From:	SH-35
	9.43 Miles, Control 266-7	To:	Wharton County Line

History

Concrete pavement originally placed in 1931. A small section has been overlaid with asphaltic concrete.

Traffic

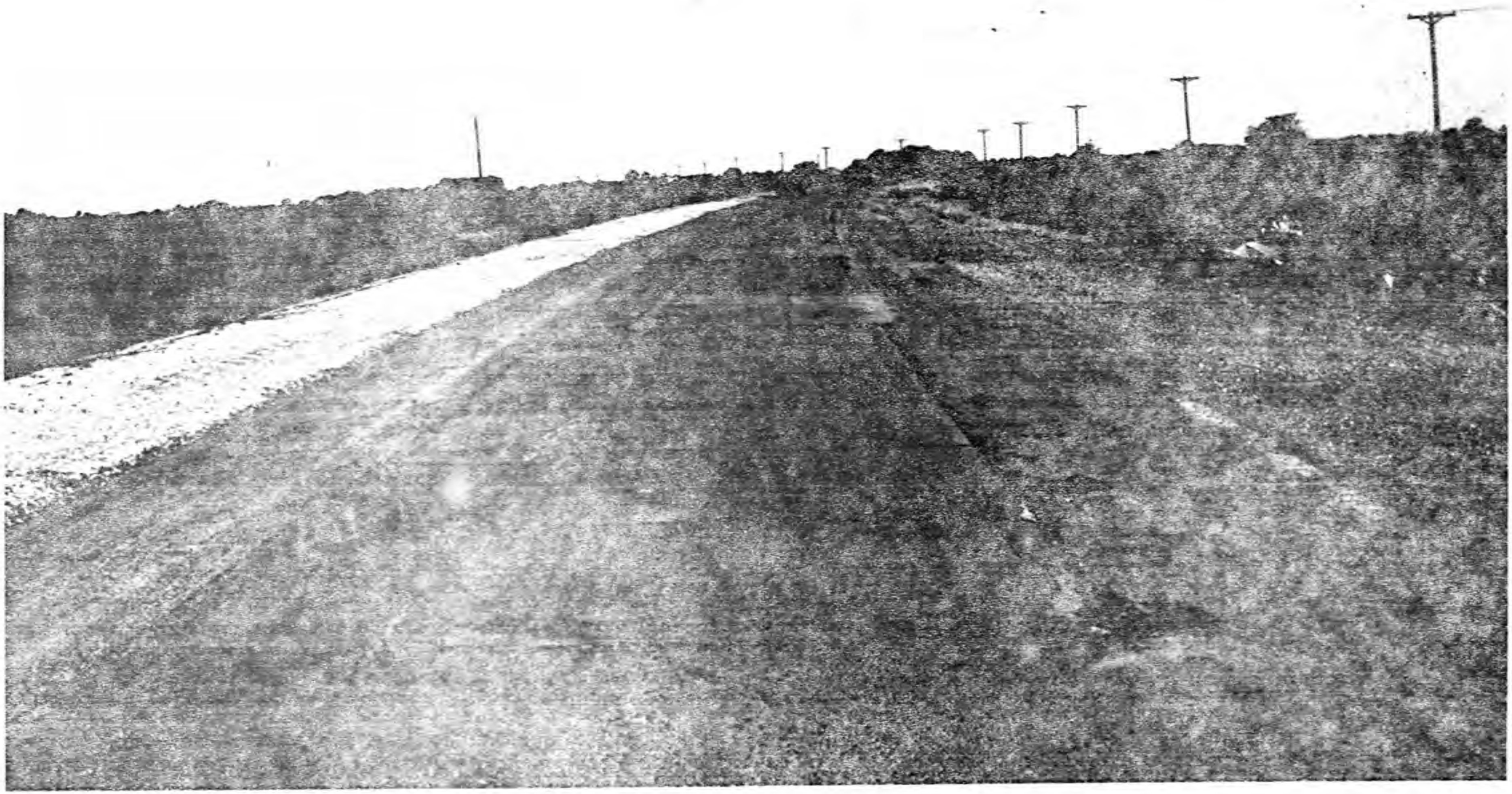
Average Daily Traffic	= 2520
13 hour count July, 1978	= 1899
Truck count July, 1978	= 482
% Trucks July, 1978	= 25.3

Present Condition			Ratio
Rut Depth, Not Applicable			
Repair Areas,	Loaded Lanes	- 2713 ft/mi	1.51
	Return Lanes	- 1797 ft/mi	
Roughness,	Loaded Lanes	- 478 in/mi	1.87
	Return Lanes	- 256 in/mi	

Pavement Repair Costs

1975-76	=	$ 3,095.43/mi
1976-77	=	15,685.22/mi
1977-78 (9 months)	=	23,540.61/mi

Picture shows some of the repair areas which are dominant on the Southbound or loaded lane. The concrete slabs have faulted. The surface is uneven and rough. Traffic must slow down and trucks are straddling the centerline or traveling with the right wheels on the shoulder as shown in Picture 2. Maintenance costs have increased by a factor of seven in three years.



Picture 1

Picture 2

Section 3.

SH-60	Matagorda County,	From:	FM 2668
	7.55 Miles, Control 241-4	To:	FM 521

History

Concrete pavement originally placed in 1932. Widened from 18-feet to 24-feet and resurfaced with asphalt in 1967. Overlaid with 1-inch asphalt in 1970.

Traffic

Average Daily Traffic	=	3280
13 hour count July, 1978	=	3082
Truck count July, 1978	=	79
% Trucks July, 1978	=	2.6

Present Condition

			Ratio
Rut Depth,	Loaded Lanes -	0.10 inches	2.0
	Return Lanes -	0.05 inches	
Repair Areas,	Loaded Lanes -	32 ft/mi	2.42
	Return Lanes -	13 ft/mi	
Roughness,	Loaded Lanes -	35 in/mi	1.06
	Return Lanes -	33 in/mi	

Pavement Repair Costs

1975-76	=	$ 2,252.76/mi
1976-77	=	1,744.80/mi
1977-78 (9 months)	=	1,567.44/mi

Picture not available

Picture 4

FM-2668	Matagorda County, 5.15 Miles, Control 2697-1	From: To:	FM-3057 FM 521

History

Flexible pavement and asphaltic surface originally placed in 1964. Resurfaced in 1968 and 1977.

Traffic

Average Daily Traffic	=	1310
13 hour count July, 1978	=	1224
Truck count July, 1978	=	81
% Trucks July, 1978	=	6.6

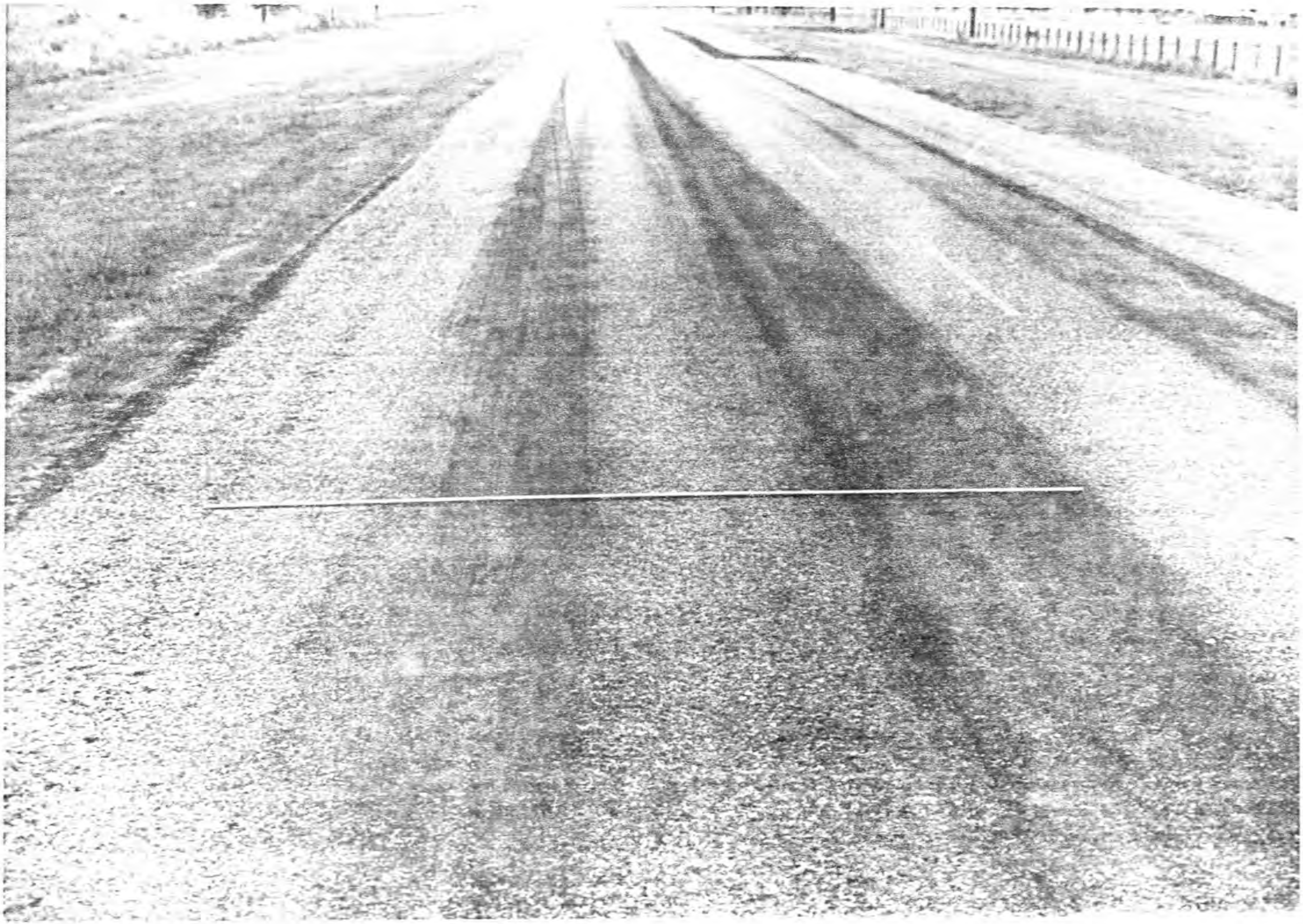
Present Condition			Ratio
Rut Depth,	Loaded Lanes	- 0.39 inches	2.44
	Return Lanes	- 0.16 inches	
Repair Areas,	Loaded Lanes	- 9 ft/mi	4.50
	Return Lanes	- 2 ft/mi	
Roughness,	Loaded Lanes	- 149 in/mi	1.10
	Return Lanes	- 136 in/mi	

Pavement Repair Costs

1974-75	=	$ 3,525.23
1975-76	=	2,984.18 *
1976-77	=	4,423.37

*Resurfacing Contract Completed in 1976 = $157,793.90

The picture shows a surface which is flushed in the loaded lanes. The return lanes have minor flushing. The surface was sealed in 1976. This seal hides much of the prior distress.



Picture 4

Picture 5

FM-2977	Fort Bend County 7.89 Miles, Control 3048-1	From: To:	FM-762 FM-361

History

Flexible base with asphalt surface originally placed in 1968 (additional 2 miles placed in 1971). Resurfaced in 1975.

Traffic

Average Daily Traffic	= 840
13 hour count July, 1978	= 932
Truck count July, 1978	= 48
% Trucks July, 1978	= 5.2

Present Condition

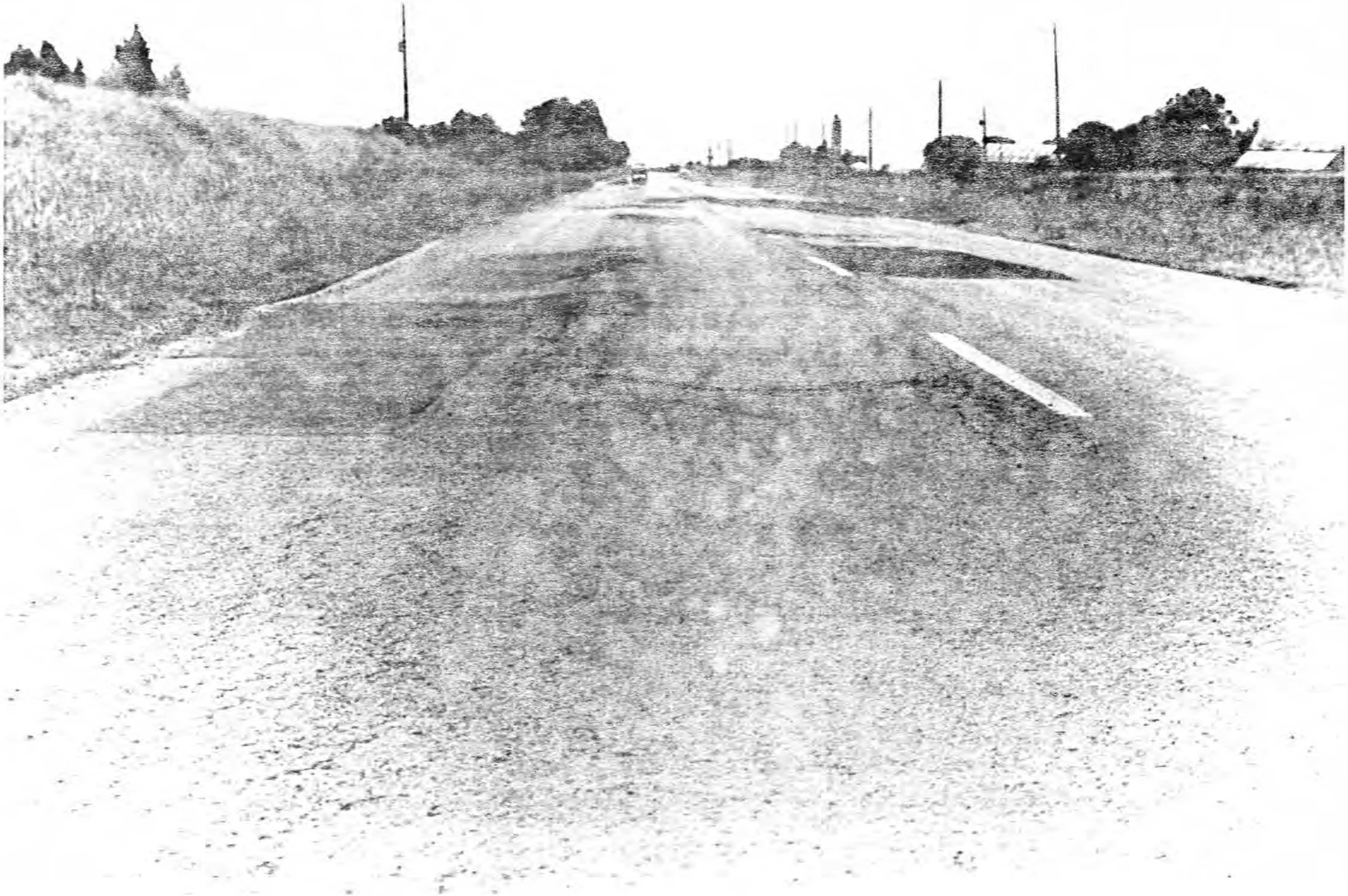
			Ratio
Rut Depth,	Loaded Lanes	- 1.23 inches	1.89
	Return Lanes	- 0.65 inches	
Repair Areas,	Loaded Lanes	- 151 ft/mi	0.83
	Return Lanes	- 181 ft/mi	
Roughness,	Loaded Lanes	- 91 in/mi	1.08
	Return Lanes	- 84 in/mi	

Pavement Repair Costs

1974-75	=	$ 1,068.81 *
1975-76	=	1,716.44
1976-77	=	10,768.13

* Resurfacing Contract Completed in 1975 $127,085.46

Picture shows loss of original cross-section particularly on loaded lanes. On this roadway almost every conceivable type of distress may be noted - patches, rutting, shear failures, extensive alligator cracking and excessive roughness. These types of failure are associated with heavy loads. Note the resurfacing in 1975 has helped to reduce repair costs in 1975-76 but the repair costs are increasing in 1976-77.



Picture 5

Picture 6

SH-159, Austin County, From: Fayette County Line
To: FM 109 in Industry
4.85 miles Control 408-2

History

Flexible base with asphalt surface originally placed in 1936. Approximately 2.4 miles reconstructed in 1941. Reconstructed in 1949. Resurfaced in 1954 and 1961.

Traffic

Average Daily Traffic	=	870
13 hour count July, 1978	=	674
Truck count July, 1978	=	19
% Trucks July, 1978	=	2.8

Present Condition

				Ratio
Rut Depth,	Loaded Lanes	=	0.28 inches	2.15
	Return Lanes	=	0.13 inches	
Repair Areas,	Loaded Lanes	=	645 ft/mi	1.52
	Return Lanes	=	423 ft/mi	
Roughness,	Loaded Lanes	=	73 in/mi	0.86
	Return Lanes	=	85 in/mi	

Pavement Repair Costs

1975-76	=	$7,042.21
1976-77	=	9,758.64
1977-78 (9 months)	=	7,854.54

Picture shows a load oriented longitudinal crack in right wheel path of loaded lanes along with spalling and minor pot holes. Typically a longitudinal crack will occur in the left wheel path; ladder or block cracking will occur; and the blocks will loosen and be whipped out by traffic.

Picture 6

Picture 7

FM-109, Austin County, From: Colorado County Line
To: SH 159 in Industry
6.96 miles Control 716-1

History

Flexible base with base preservative originally placed in 1948. Another base preservative placed in 1953. Resurfaced in 1953, 1960, 1966 and 1972.

Traffic

Average Daily Traffic	=	860
13 hour count July, 1978	=	769
Truck count July, 1978	=	142
% Trucks July, 1978	=	18.5

Present Condition

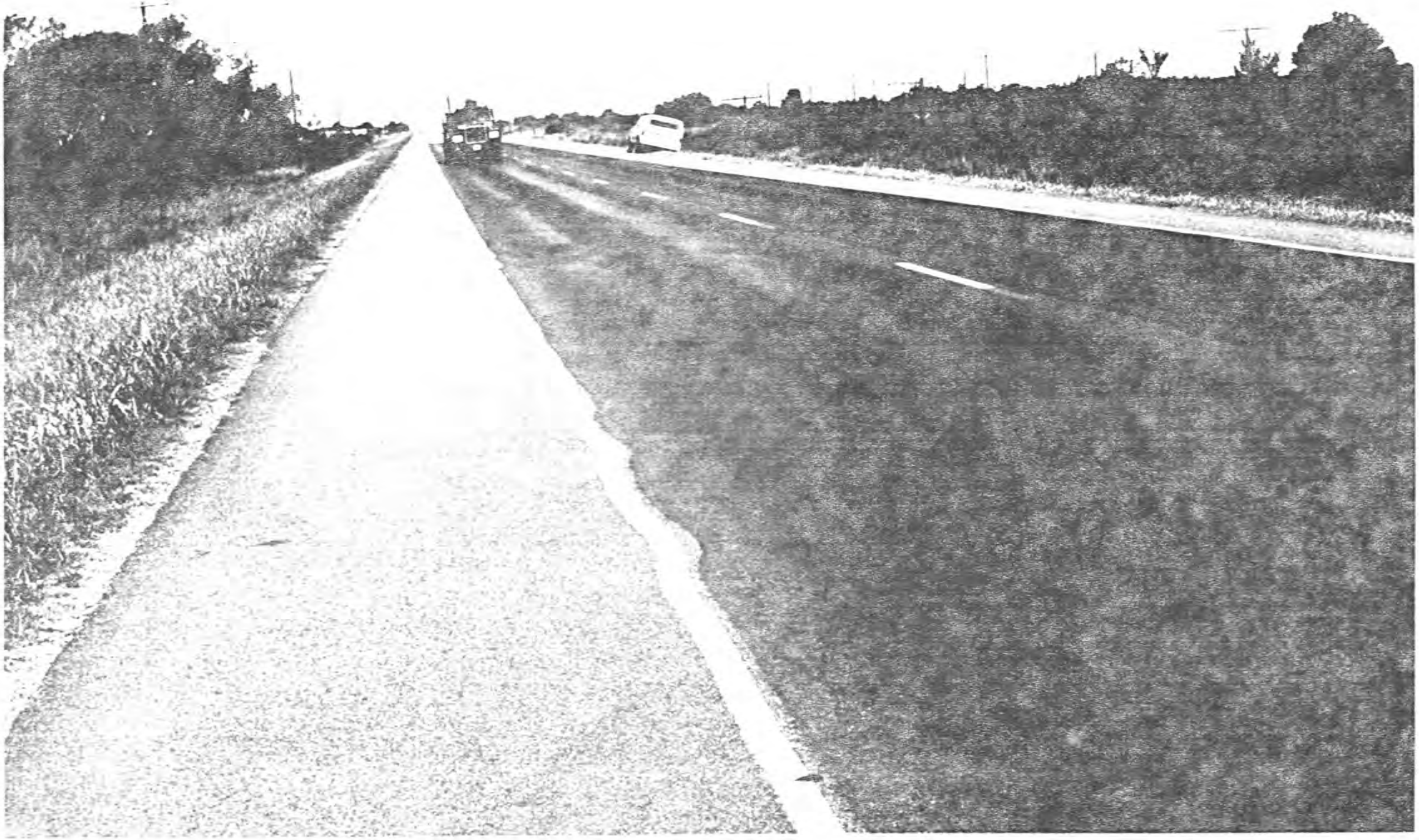
				Ratio
Rut Depth,	Loaded Lanes	=	0.17 inches	1.70
	Return Lanes	=	0.10 inches	
Repair Areas,	Loaded Lanes	=	27 ft/mi	1.69
	Return Lanes	=	16 ft/mi	
Roughness,	Loaded Lanes	=	112 in/mi	1.08
	Return Lanes	=	104 in/mi	

Pavement Repair Costs

1975-76	=	$3,492.78
1976-77	=	2,500.20
1977-78 (9 months)	=	1,994.13

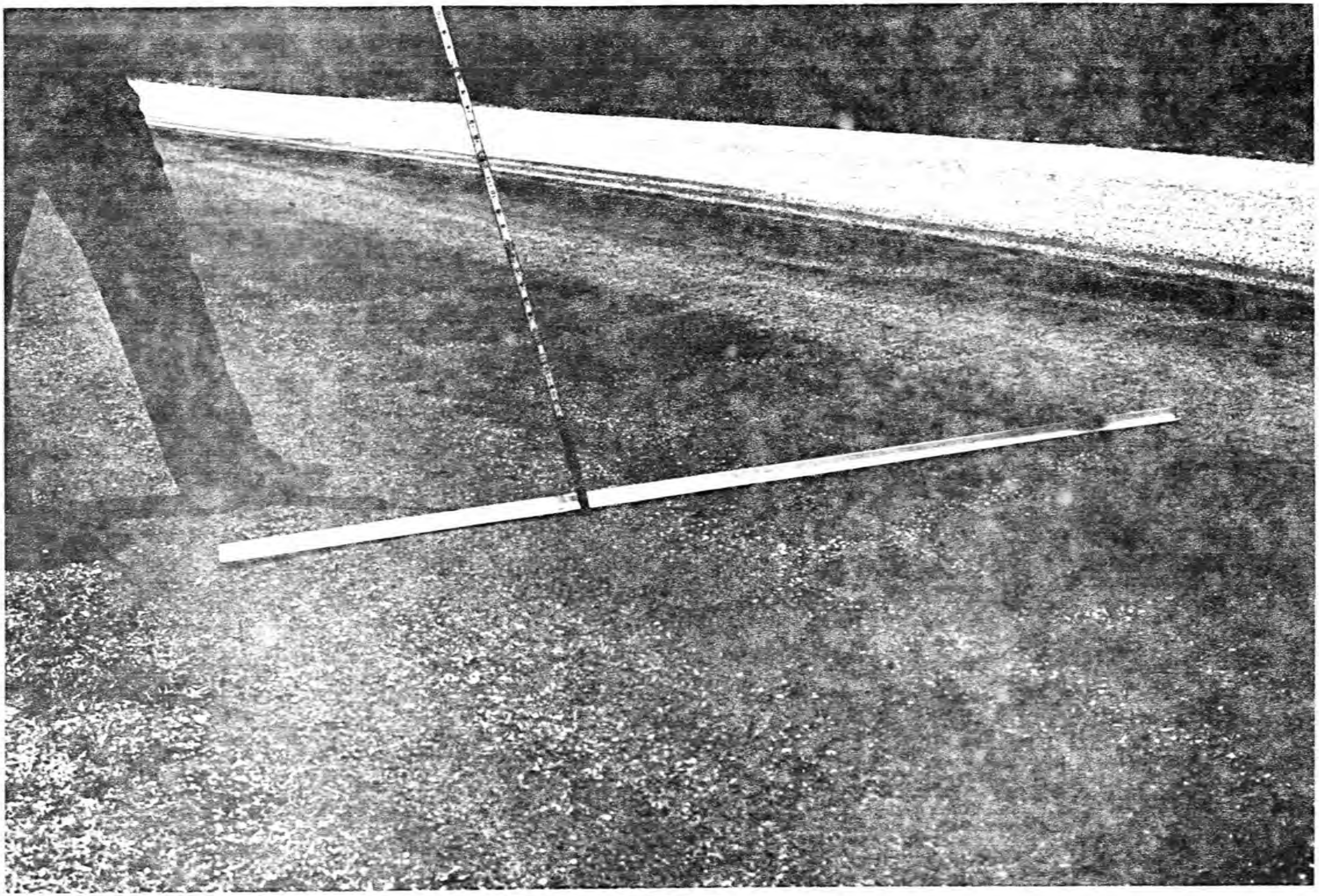
Picture shows excessive rutting and alligator cracking typical of the loaded lanes. This type of distress is associated with heavy loads.

Picture 7

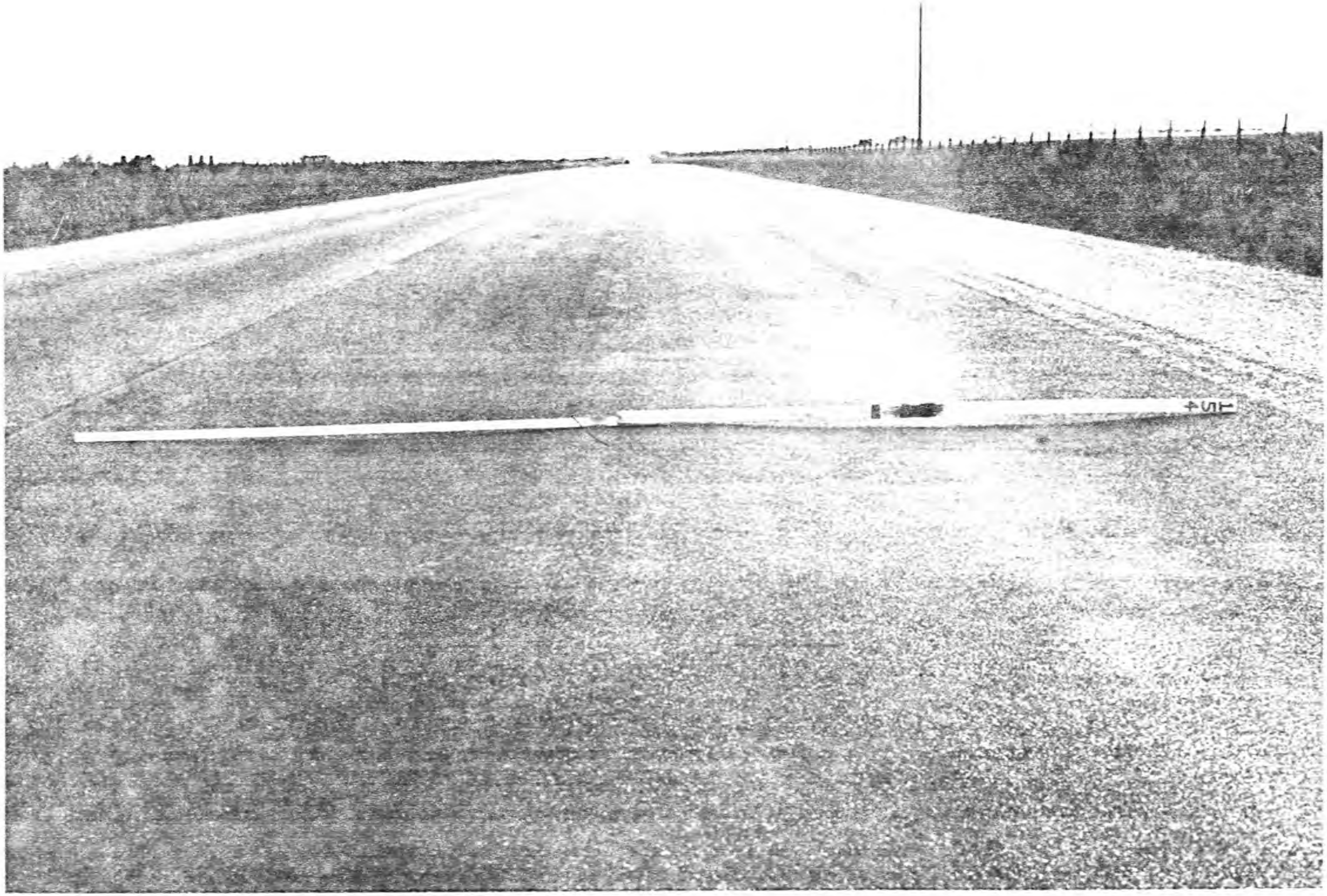


Picture 8

Picture 9



Picture 10



Picture 11

Picture 8

US-90A, Colorado and Wharton Counties
From: FM 3013 in Eagle Lake
To: West San Bernard River
7.60 miles Control 27-3 and 27-4

History

Flexible base and asphalt surface originally placed in 1923 (Wharton Co.) and 1928 (Colorado Co.). Reconstructed in 1953 (Colorado Co.) and 1955 (Wharton Co.). Colorado Co. resurfaced in 1957, 1969. Wharton Co. resurfaced in 1958, 1961, 1971. Total length resurfaced in 1975-76.

Traffic

Average Daily Tarffic	=	4020
13 hour count July, 1978	=	4232
Truck county July, 1978	=	792
% Trucks July, 1978	=	18.7

Present Condition				Ratio
Rut Depth,	Loaded Lanes	=	0.665 inches	3.02
	Return Lanes	=	0.22 inches	
Repair Areas,	Loaded Lanes	=	49 ft/mi	1.14
	Return Lanes	=	43 ft/mi	
Roughness,	Loaded Lanes	=	78 in/mi	1.50
	Return Lanes	=	52 in/mi	

Pavement Repair Costs

1975-76	=	$1,582.00 *
1976-77	=	944.00
1977-78	=	534.00 (9 months)

* Major rehabilitation in 1974-75 - $76,476/mi

Picture shows misalignment of edgeline on the loaded Eastbound lane toward Houston. Misalignment has been caused by pavement material shoved out by the shearing action of heavy loads. Rutting in the wheel paths may also be noted. Note major rehabilitation in 1974-75 has helped reduce repair costs in 1976-78.

Picture 9

FM-2614 - Colorado and Wharton Counties, From: FM 950
To: FM 102
6.61 miles Control 2599-1 and 2599-2.

History

Flexible base and asphalt surface originally placed in 1962. Aside from minor maintenance reconstruction, the highway was resurfaced in 1974.

Traffic	Wharton County	Colorado County
Average Daily Traffic	980	1,450
13 Hour Count, July, 1978	726	581
Truck Count, July, 1978	104	72
% Trucks, July, 1978	14.3	12.4

Present Condition	Eastbound Wharton County		Westbound Colorado County	
Rut Depth - Loaded Lanes	.215 in.	2.69	.145 in.	2.90
Return Lanes	.08. in.		.05 in.	
Repair Areas-Loaded Lanes	1526 ft/mi	2.26	359 ft/mi	6.08
Return Lanes	675 ft/mi		59 ft/mi	
Roughness - Loaded Lanes	126 in/mi	1.33	180 in/mi	1.78
Return Lanes	95 in/mi		101 in/mi	

Pavement Repair Costs 1975-76 = $6,923.00
1976-77 = 693.00
1977-78 = 507.00 (9 months)

Picture shows shear failures, cracking and repair areas typical of the loaded lanes. The condition of this pavement is a good example of damage caused by loading. An aggregate source is located near the county line of Colorado and Wharton Counties. The loaded lanes eastbound in Wharton County show more distress than the return lanes. However, the westbound lanes carry the loaded trucks in Colorado County and the westbound lanes have more distressed areas than the eastbound lanes. Note major maintenance occurred during 1975-76 which reduced repair costs in following years.

Picture 10

FM 109 - Colorado County, From: 5 miles north SH-71
To: SH-71
5.0 Miles, Control 716-2

History

Flexible base and asphalt surface originally placed in 1938. A 2.8 mile length from Brushy Creek South was reconstructed in 1959. Resurfaced in 1972.

Traffic

Average Daily Traffic	=	1210
13 Hour Count, July, 1978	=	1612
Truck Count, July, 1978	=	172
% Trucks, July, 1978	=	10.7

Present Condition

			Ratio
Rut Depth,	Loaded Lanes =	.31 in.	1.48
	Return Lanes =	.21 in.	
Repair Areas,	Loaded Lanes =	277 ft/mi	2.61
	Return Lanes =	106 ft/mi	
Roughness,	Loaded Lanes =	95 in/mi	1.14
	Return Lanes =	83 in/mi	

Pavement Repair Costs

1975-76	=	$5,151.00
1976=77	=	417.00
1977-78	=	293.00 (9 months)

Picture shows load oriented alligator and ladder cracking with the surface broken into small blocks. The blocks have vaulted and the surface has become misshapen. A seal coat or crack sealing has been placed over the cracked area in an attempt to hold the blocks in place and prevent the entry of rain water which would soften the base and subgrade. The cracks are beginning to open again. There is little or no distress on the northbound return lanes in this area. Note major maintenance occurred during 1975-76 which reduced repair costs in the following years.

Picture 11

FM 3013, Colorado County, From: US-90A at Eagle Lake
To: San Bernard River
7.17 mile length Control 3205-2

History

Flexible base, asphalt stabilized base and a asphaltic concrete surface originally placed in 1975. No reconstruction or resurfacing since that time even though pavement revision is planned.

Traffic

Average Daily Traffic	=	2,520
13 Hour Count, July 14, 1978	=	2,763
Truck Count July 14, 1978	=	906
% Trucks July 14, 1978	=	33.8%

Present Condition			Ratio
Rut Depth, Loaded Lanes	=	0.70-in.	3.11
Return Lanes	=	0.23-in.	
Repair Areas, Loaded Lanes	=	1 ft/mi	N/A
Return Lanes	=	None	
Roughness, Loaded Lanes	=	57 in/mi	1.54
Return Lanes	=	37 in/mi	

Pavement Repair Costs			
1975-76	=	$ 402.00	
1976-77	=	958.00	
1977-78	=	36,814.00	* (9 months)

*Current contract for asphaltic concrete overlay - to be performed soon.

Picture shows extreme rut depths in loaded lanes. Since the highway is relatively new, the repair areas are few and the surface is smooth. The highway is nice with an excellent geometric layout - dark surface and contrasting white shoulders. The highway will carry high speed traffic and hydroplaning will be a problem during periods of rainfall because of the excessive water depths in the rutted wheel paths.

APPENDIX C

Description of Measurements and Traffic Counts

Description of Measurements and Traffic Counts

Measurements

The measurements obtained were of three types as follows:

1. Pavement Roughness - Obtained with a Mays Road Meter (MRM)

   The resulting values are given in terms of roughness in inches per mile. This measurement is obtained with a calibrated trailer towed by an automobile at 50 mph. The measurement collected is the cumulative bounce or vertical movement between the axle and body of the trailer. A zero value would be extremely smooth and values of 100 to 200 inches per mile are found on very rough pavements.

2. Visible Repair Areas - A Manual Count and an Estimated Length of Pavement Repair which is 12-foot in Width

   Repair areas less than 12-feet in width were extrapolated to an equivalent 12-foot width. The repairs included were made since the last surfacing. Some repairs made prior to the last surfacing were visible but were not included. Generally, repairs appeared to be patches made by sealing or light overlays. Pot holes up to 2-feet in diameter were counted separately but not used in the report.

3. Rut Depth

   Obtained by using a straight edge placed transversely to the pavement and measuring a vertical (rut) depth in the wheel path area. Measurements were collected in both the left and right wheel paths and averaged for final summaries.

Traffic Counts

Traffic counts were obtained during the period of July 14, 1978, through July 26, 1978. The counts were obtained visually throughout a 13-hour period (generally during daylight hours). A summary of the counts may be found in Appendix B. Note the "ADT" column may be considered an annual average daily traffic but the "13 hour" column is the count during this time period (the count was not extrapolated to a 24 hour basis).

APPENDIX D

Pictures Showing the Damage of Overheight Loads

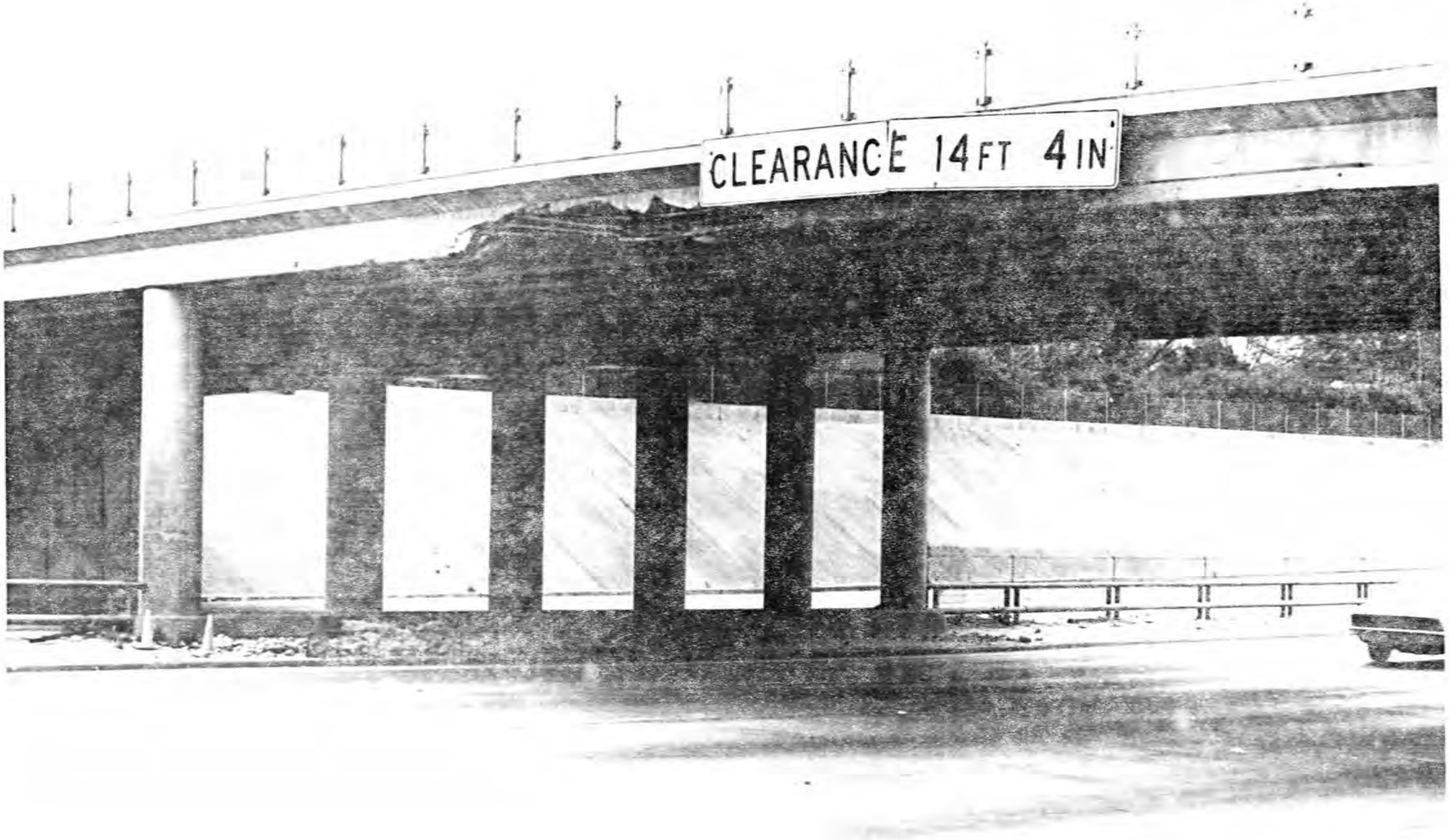

EAST
mont
MILES
10
90
WEST
San Antonio
1 1/4 MILES
EXIT 49A
Quitman St
1 MILE
Hous
Gulf
North Texas Equipment Co. Inc.
HOUSTON & DALLAS, TEXAS

Picture 12

Picture 13

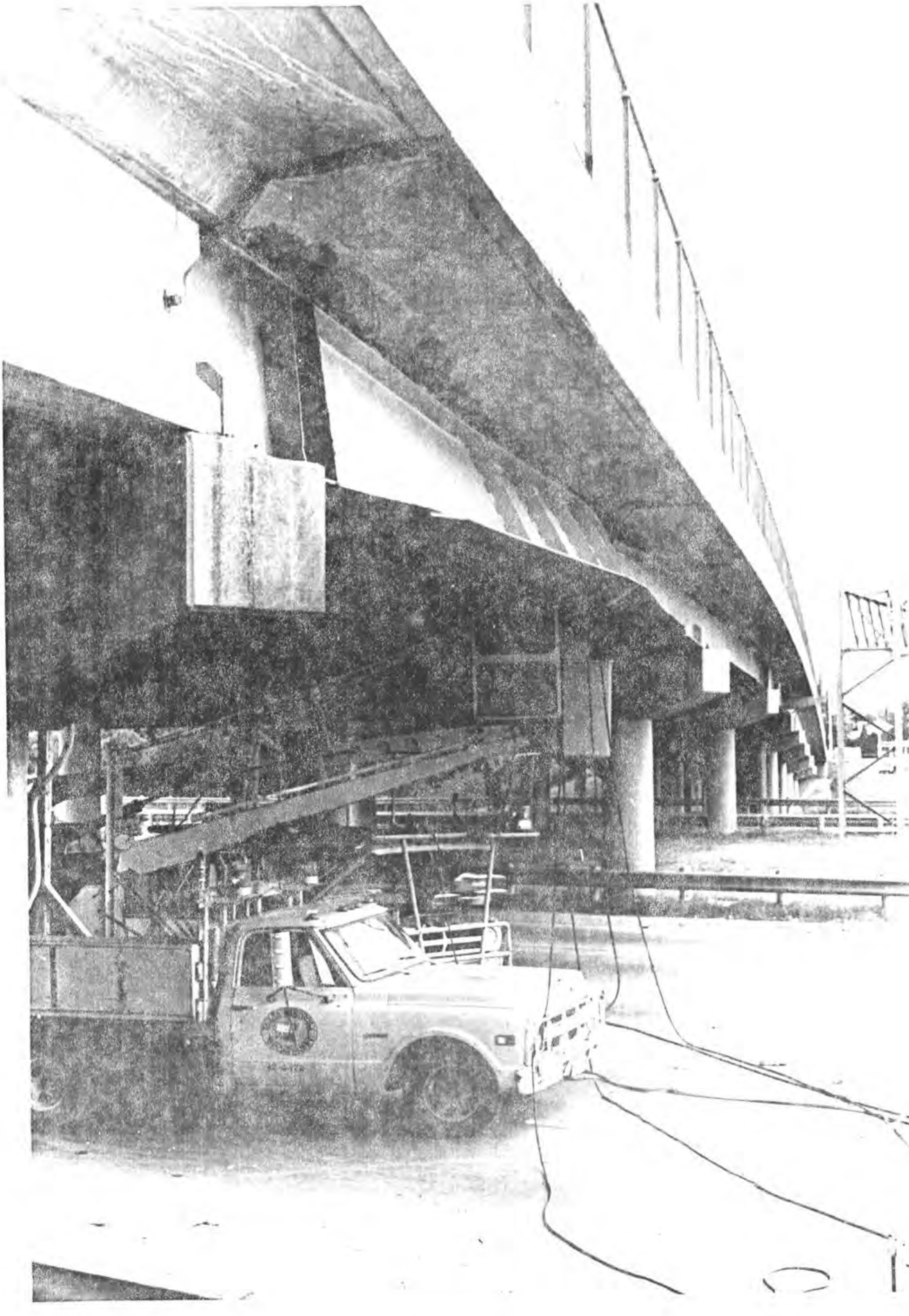

PAN-AMERICAN LIFE'S
BUSINESS
FINANCING
CLEARANCE 14FT 4IN
Hazard St

Picture 14

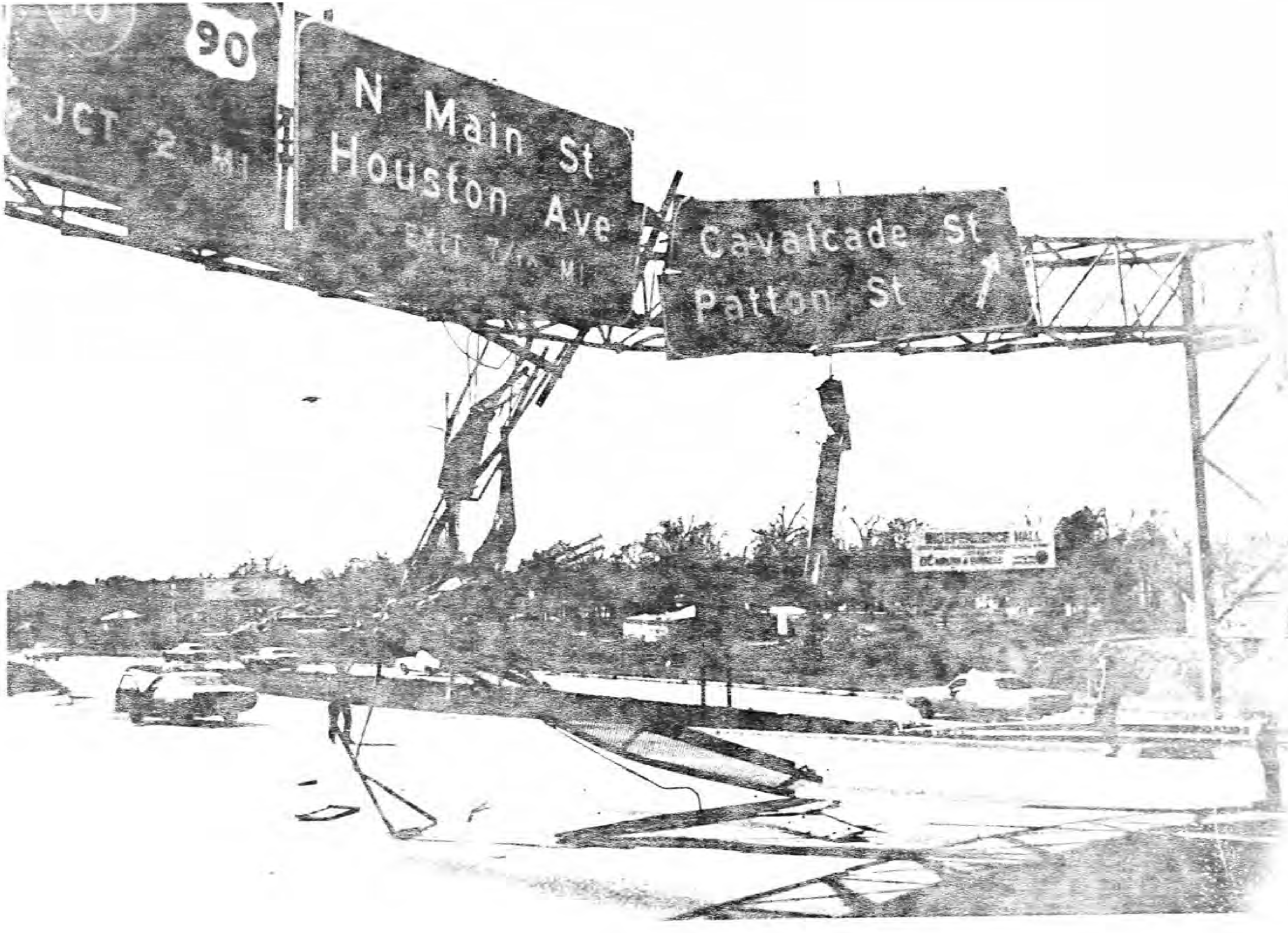


Picture 15

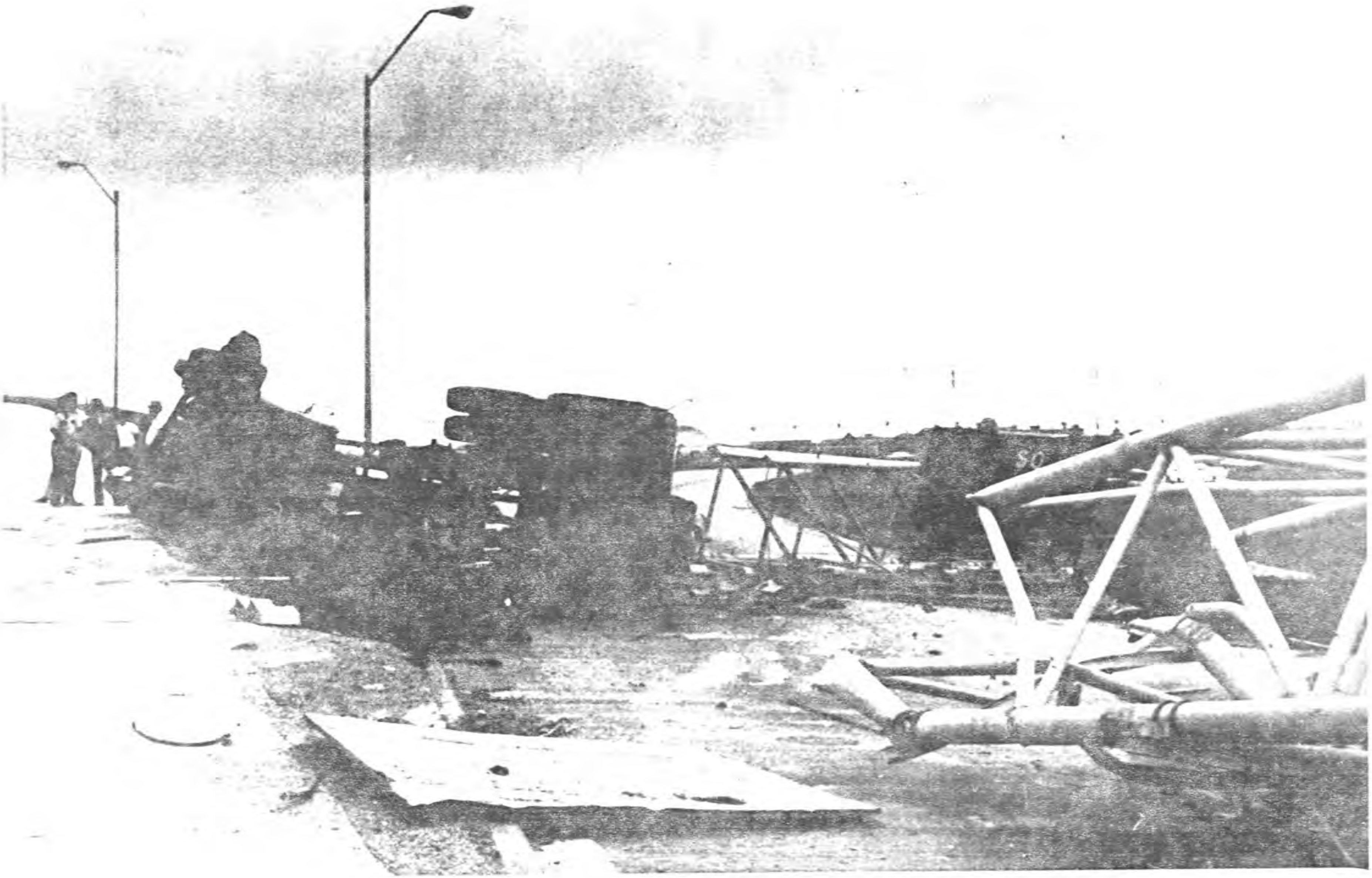
Picture 16



Picture 17



Picture 18



Picture 19

Picture 20

Picture 21