PRELIMINARY ENGINEERING REPORT

INTERSTATE 4 IMPROVEMENTS

50TH STREET TO THE POLK COUNTY LINE

State Project Number: 10190-1402
W.P.I. Number: 7143194
F.A.P. Number: DPI-0043(1)

FLORIDA DEPARTMENT OF TRANSPORTATION

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I. ABSTRACT

The Florida Department of Transportation (FDOT) retained Greiner, Inc. to develop an in-depth master plan for the Tampa Interstate System (T.I.S.) in 1987 which includes I-275, I-75 and I-4 in and around the Tampa Bay area. At the same time BHA/Michael Baker Inc. was retained to develop a master plan for I-4 from the T.I.S. terminus at I-75 east to the Polk County Line. The overall objective of these efforts was to improve traffic operations and safety and to upgrade the interstate to handle future traffic demands. The following services were included in these efforts:

- A Master Plan of improvements to I-4, I-75, and I-275 to accommodate transportation needs through the year 2010.
- Justification Report(s) for critical recommended new interchange locations sufficient to obtain Federal interstate funding.
- Conceptual designs of the recommended improvements in sufficient detail to identify structural, environmental, and right-of-way impacts.
- Conceptual right-of-way requirements.
- Development and consensus of a multi-modal transportation system to accommodate year 2010 needs.
- Preliminary cost estimates of all improvements, time-phased in accordance with the Master Plan.

This Master plan was approved by the Federal Highway Administration in 1989.

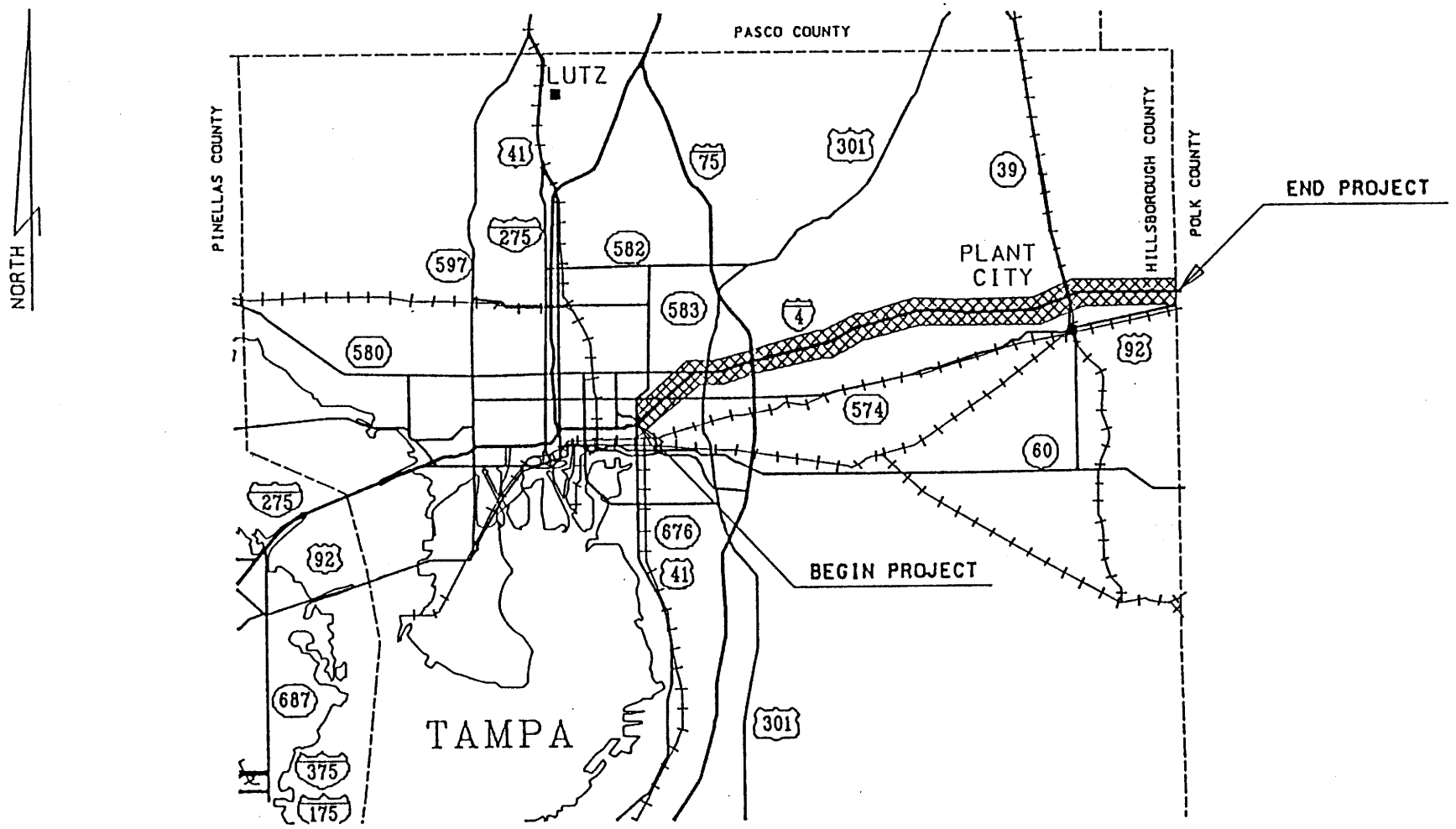
This report was prepared by the Florida Department of Transportation (FDOT) for the purpose of documenting the development and analysis of the preferred alternative for the Interstate 4 (I-4) project in Hillsborough County, Florida (Exhibit 1) as shown in the Master Plan. The preliminary engineering and environmental evaluations conducted to identify the need, type, design and location of the improvements are summarized herein. The project limits extend from 50th Street on the west to the Hillsborough/Polk County Line on the east.

The preliminary engineering elements addressed in this document include an evaluation of existing conditions, need for improvements, forecast traffic demand, construction, right-of-way and relocation costs and an analysis of the recommended alternative. The categorical exclusion environmental document for this project is published separately.

II. INTRODUCTION

2.1 Purpose

Existing I-4 accommodates east-west regional travel between the downtown Tampa area and the areas of eastern Hillsborough County, Brandon, Plant City, Lakeland and Polk County.



LOCATION MAP

STATE OF FLORIDA

DEPT. OF TRANSPORTATION

I-4 (S.R. 400) FROM 50th ST. (U.S. 41) TO THE POLK/HILLSBOROUGH COUNTY LINE

S.P.N. 10190-1402

W.P.I. 7143194

F.A.P. DPI-0043(1)

EXHIBIT 1 - 2

On a statewide level, I-4 accommodates travel between the Tampa/St. Petersburg/Clearwater metropolitan area and the Orlando Metropolitan area, eventually terminating in Daytona Beach.

Having been designed and constructed in the 1950's and 1960's, I-4 is inadequate by today's design standards, particularly in the areas of vertical alignment, clear recovery areas, safety and capacity. This report documents existing characteristics and conditions of the roadway along with the need for an improved facility. The preferred alternative as defined by the approved Master Plan is identified, described and evaluated.

2.2 Project Description

Existing Interstate 4 (I-4) from 50th Street (US 41) to the Hillsborough/Polk County Line is a 4 lane divided rural freeway. This facility consists of four 12 foot travel lanes divided by a depressed median with 10 foot (8 foot paved) shoulders on the outside and either 8 or 10 foot (4 foot paved) shoulders in the median. From 50th Street to Hillsborough Avenue (US 92), the existing median is 64 feet wide and from Hillsborough Avenue to the Hillsborough/Polk County Line the existing median is 40 feet wide. Access to the facility is possible at 12 interchanges with various County and State Highways. The posted speed from 50th Street to Mango Road (CR 579) is 55 mph while it is 65 mph east of Mango Road. The existing right-of-way width is 300 feet between 50th Street (US 41) and Hillsborough Avenue and 200 feet between Hillsborough Avenue and the Hillsborough/Polk County Line. The need for the project is based on satisfying existing and projected traffic demands as well as levels of service, safety and geometric deficiencies.

The Department of Transportation is proposing improvements to I-4 from 50th Street to th Hillsborough/Polk County Line. The project length is approximately 23 miles (See Exhibit 1) Segment I from 50th Street to I-75 consists of adding six (6) through lanes and two (2) HO lanes to the existing four (4) lanes. Segment II from I-75 to Thonotosassa Road (SR 56 consists of adding six (6) through lanes to the existing four (4) lanes. Segment III fro Thonotosassa Road to S.R. 39 consists of adding four (4) through lanes to the existing four (lanes. Segment IV from S.R. 39 to the Hillsborough/Polk County Line adds 4 through lanes t the existing 4 lanes while maintaining frontage roads. A median barrier wall will also b constructed through the project.

Segment I improvements would replace the existing depressed grass median with a 10 foot wide paved inside shoulder and a 12 foot wide HOV lane in each direction. Segments II, III and IV improvements would replace the existing depressed grass median with a 10 foot wide paved inside shoulder and a 12 foot wide travel lane in each direction.

Segments I and II improvements will also add two (2) 12 foot travel lanes and a 12 foot outside shoulder (10 foot paved) in each direction. Approximately 197 acres of additional right-of-way will be required to construct these improvements.

The existing crossroad structures will be improved to accommodate the improvements to I-4. The proposed improvements would improve I-4's level of service to acceptable levels. Table 1 shows the existing (1991) Levels of Service and 2010 Levels of Service with and without the proposed improvements.

The proposed improvements are consistent with the FHWA approved I-4 Corridor and Master Plan Study, Tampa Interstate Study Master Plan, and the Hillsborough County Metropolitan Planning Organization's Adopted 2010 Long Range Transportation Plan (LRTP).

III. EXISTING CONDITIONS

3.1 Roadway Characteristics

3.1.1 Functional Classifications

The roadway in the study area is classified as either "Urban Interstate" highway or "Rural Interstate" highway on the Federal Aid Primary System as follows:

Segment Description	Functional Classification
50th Street (US 41) to Grade Separation (Seffner Rd.)	Urban Interstate
Grade Separation through Weigh Station	Rural Interstate
Weigh Station through SR 566	Urban Interstate
SR 566 to East of SR 553 (Park Rd.)	Urban Interstate
SR 553 (Park Rd.) to Hillsborough/Polk Co. Line	Rural Interstate

The I-4 corridor is a major evacuation route and serves as the major connector between the tourist attractions, business centers and ports in the Orlando and Tampa Bay areas. No feasible alternate route exists a this time and the likelihood of a parallel route being developed in the future for this corridor is slim. (See Section VI of this report).

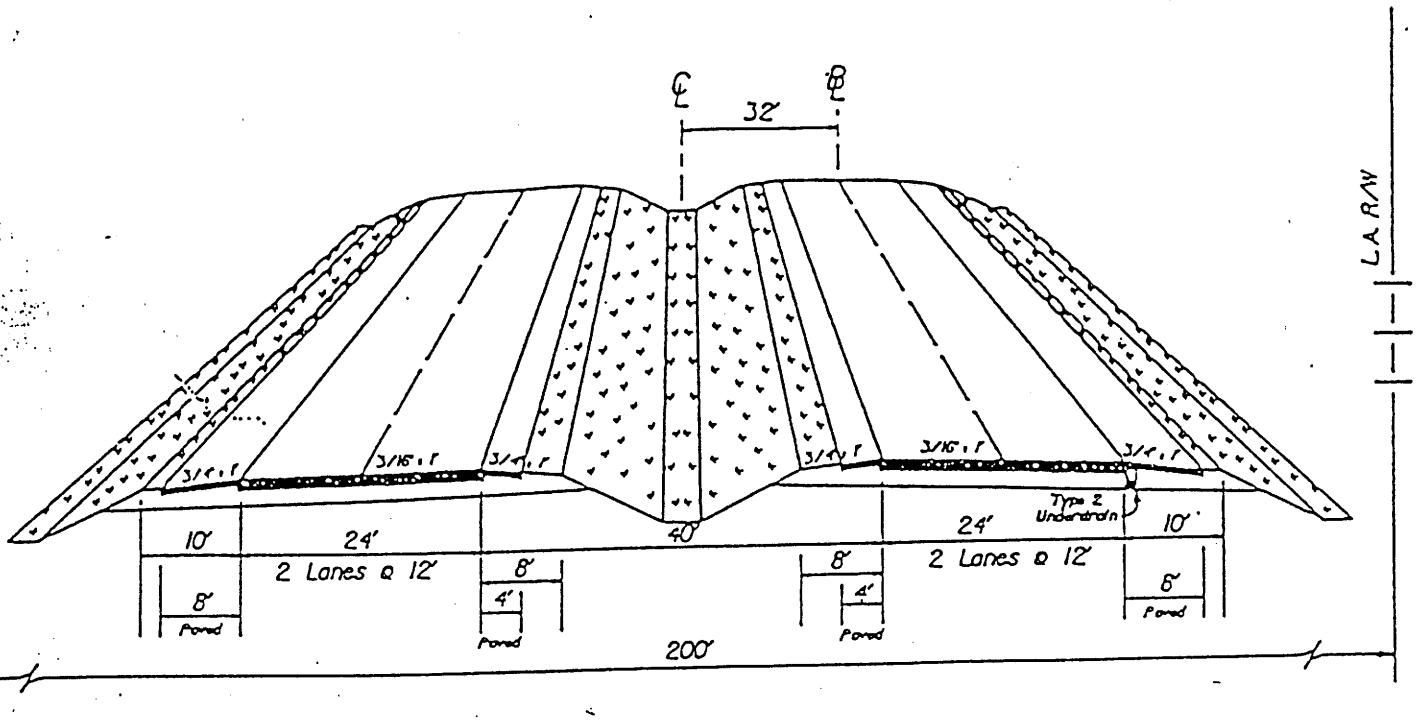
3.1.2 Typical Sections

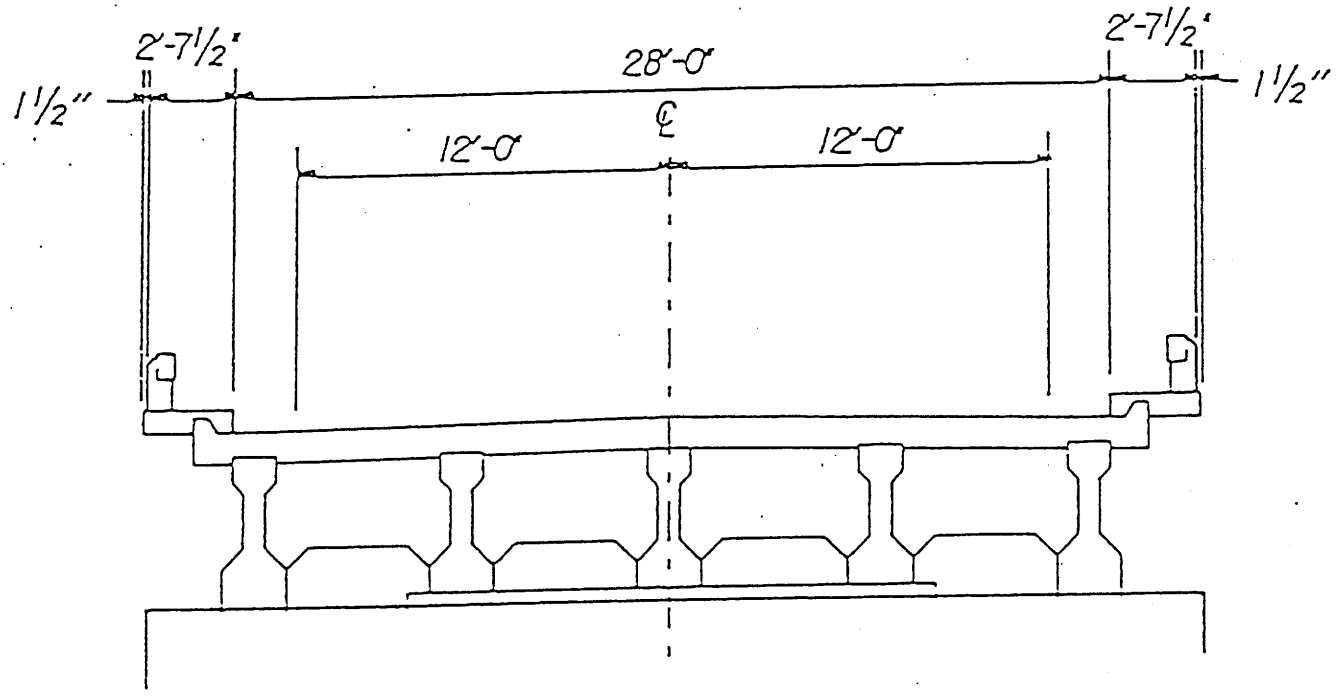
The existing I-4 roadway within the study limits was constructed as a four lane divided rural freeway from 1958 to 1964. This facility consists of four 12-foot travel lanes divided by a depressed median with 10 foot (8 foot paved) shoulders on the outside and either 8 or 10 foot (4 foot paved) shoulders in the median. From 50th Street (US 41) to US 92 the existing median is 64 feet wide. From US 92 to the Hillsborough/Polk County Line the existing median is 40 feet wide. Access to the facility is possible at 12 interchanges with county and state highways.

Exhibit 2 depicts the various existing typical sections found within the study limits. The most prevalent deficiencies found in the cross section were width of shoulders and clear zones. The posted speed from 50th Street (US 41) to CR 579 (Mango Road) is 55 mph while it is 65 mph east of CR 579.

3.1.3 Pedestrian and Bicycle Facilities

Very little pedestrian or bicycle traffic was noted on the cross streets by engineering technicians during the two weeks of manual traffic counts accomplished during November 1991. The lack of such activity in the urban areas of the study may be more of an indicator of the lack of available facilities rather than the demand for such facilities.





EXISTING TYPICAL CROSS SECTIONS

EXHIBIT 2

The I-4 corridor (a limited access facility), on which State Statue prohibits bicycle and pedestrian traffic, bisects the Hillsborough and Polk County rural roadway system. These rural roadway systems support significant bicycle and pedestrian use in both counties. In accordance with Federal, State and Local requirements, appropriate attention will be given to the requirement for these facilities in making recommendations for improvements.

3.1.4 Right of Way

The existing right of way width is 300 feet between 50th Street (US 41) and US 92 and 200 feet between US 92 and the Hillsborough/Polk County Line.

Added widths of right of way and easements are provided at grade separations, interchanges, rest areas, weight stations and for drainage channels.

3.1.5 Horizontal Alignment

The existing horizontal alignment for I-4 Mainline was rated "Good" for 70 mph Design Speed.

The horizontal distance between existing interchanges on I-4 from 50th (US 41) Hillsborough/Polk County line are depicted in Table 2.

The horizontal curves found in the study portion of I-4 as per initial construction drawings are tabulated in Table 3.

3.1.6 Vertical Alignment

The finished profile grade of I-4 between 50th Street (US 41) and the Hillsborough/Polk County Line is relatively flat and has an average evaluation of approximately 30 feet above MSL with a low of approximately 20 and a high of approximately 150.

Maximum grades within Study Segments are all no greater than 3.00%. The maximum grades and vertical curve lengths were apparently set in the initial design for 60 mph for crests and 50-60 mph for sags (1954 AASHO Blue book - A Policy of Geometric Design of Rural Highways, 1954.)

Table 4 presents a tabulation of all grades in excess of 1.00% with accompanying vertical curve lengths and design speed based on current design standards.

3.1.7 Drainage

The project study area includes portions of the Hillsborough River,Peace River and Green Swamp Basins and are all within the Southwest Florida Water Management District.

The Interstate 4 corridor utilizes FDOT standard flat-bottomed ditches, intercepting flow from median inlets and cross-drains and sheet flow from the mainlanes and outside shoulders, to carry stormwater flow to drainage outfalls. Curb and gutter sections are limited to interchanges and grade separations. (See Exhibit 2, Typical Existing Sections).

Table 1

Interstate 4 Relationship Between
Existing Interchanges

Location		Length (Miles)
From	To	
US 41 (SR 599)	MLK (SR 574)	1.43
MLK (SR 574)	Orient Road	0.89
Orient Road	US 92 (SR 600)	0.58
US 92 (SR 600)	US 301 (SR 41)	0.50
US 301 (SR 41)	US 92 (SR 600)	0.63
US 92 (SR 600)	I-75 (SR 93A)	1.32
I-75 (SR 93A)	CR 579	1.53
CR 579	McIntosh Road	3.74
McIntosh Road	Branch Forbes Road	3.56
Branch Forbes Road	SR 566	2.06
SR 566	Alexander Street	1.24
Alexander Street	SR 39	0.53
SR 39	Park Road (SR 533)	1.28
Park Road (SR 533)	County Line Road	2.97

Table 2

Tabulation of Horizontal Curves Along I-4

Milepost	Delta Angle	Degree of Curvature	Length (Ft)
13.563	50°15'40"RT	2°00'	2510
14.185	14°18'40"LT	0°53'37"	1600
14.442	15°00'00"LT	1°20'36"	1100
15.640	11°20'00"RT	1°10'	975
16.642	3°34'LT	0°20'	1070
18.585	12°00'LT	1°00'	1200
20.417	11°39'RT	1°00'	1165
22.598	12°12'RT	1°00'	1220
23.507	4°04'RT	0°20'	1220
24.201	3°48'LT	0°20'	1140
24.706	0°08'30"LT	0°00'51"	1000
25.208	0°10'LT	0°01'	1000
25.718	0°31'RT	0°03'06"	1000
26.220	1°27'LT	0°10'	870
28.830	21°58'RT	1°30'	1464.44
28.836	1°12'LT	0°15'	480
31.831	1°36'15"RT	0°15'	642
32.335	1°20'30"LT	0°15'	537

A summary tabulation of the hydraulic evaluation of major stream crossing is included as Table 5. More detailed data can be found in the I-4 Location Hydraulic Report.

The Interstate 4 corridor has been relatively free from significant flooding in recent history with one notable exception in the area of the Baker Canal crossing of I-4 approximately one mile west of McIntosh Road which was inundated by the storm of September 5th to 9th in 1988. (FDOT Report - Preliminary Report - Interstate Flooding Near McIntosh Road) (Appendix 1).
Median inlets and side drain outlets are in need of repair. The roadside ditches and the outlet channels are in need of maintenance (removal of silt, debris and vegetation).

3.1.8 Geotechnical Data

The in-situ materials in this corridor generally consist of sands and clayey sands with several areas having 10 feet of organic soils (Green Swamp) and occasional deposits of organic twenty to thirty feet (20'-30') deep limestone formations lie at an elevation of +7 feet on the east end of the corridor to -35 feet near County Line Road.

Extensive areas of organic or plastic soil occur within the project, particularly along the south side of Pemberton Creek approximately between milepost 20 and milepost 29 in the east central part of the project. These organic/plastic soils are typically within 2-3 feet of the surface and are 1-5 feet thick. In a few places near the east end of the project, thickness is in excess of 10 feet and depths in excess of 10 feet are described.

3.1.9 Accident Data

The number of crashes, deaths, and injuries have increased at a rate of approximately 8% per year over the last six years (1984 through 1989). More detailed data can be found in the I-4 Traffic Statistics (Appendix 2).

The crashes being reported can be broken down into various types. Rear end crashes were by far the most common, which is to be expected for a freeway with frequent congestion. the second largest group of crashes were those in which a vehicle left the roadway and hit fixed objects, such as guardrail, median wall, fencing and signposts, or ran into a ditch or culvert.

When compared to similar roadways in the state (I-75 through Alachua County), the crash rate for Interstate 4 through Hillsborough County (.904 crashes per million vehicle-mile) is almost twice as high.

3.1.10 Traffic Signal Locations

There are no signalized intersections along the study corridor.

3.1.11 Lighting

High-mast lighting is utilized at I-75 and US 301/US 92 interchanges. There are 24 high-masts at I-75 approximately 120 feet high with four luminaries on each. The US 301/US 92 interchange has 8-120' masts with (4) four luminaries on each.

Table 3

Tabulations of Grades in Excess of One Percent (1%)

M.P. Station	g1 (%)	g2 (%)	g1-g2	C/S	V.C. Length	Design Speed
11.764	+0.16	+3.0	-2.84	S	400'	65
11.953	+3.00	-3.00	+6.00	C	1600'	65
12.143	-3.00	-0.10	-2.90	S	400'	65
12.654	-0.10	+3.00	-3.10	S	400'	60
12.844	+3.00	-3.00	+6.00	C	1600'	65
13.033	-3.00	-0.16	-2.84	S	500'	70
16.870	0.00	+2.15	-2.15	S	400'	70
17.116	+2.15	+0.40	+1.75	C	500'	65
17.305	+0.40	+2.27	-1.87	S	400'	70
17.585	+2.27	-0.2360	+2.51	C	600'	65
18.532	+0.19	+1.00	-0.81	S	400'	70
18.684	+1.00	-0.92	+1.92	C	500'	65
19.100	-0.92	-2.10	+1.18	C	400'	70
19.252	-2.10	-0.54	-1.56	S	500'	70
19.536	-0.54	-1.09	+0.55	C	400'	70
19.763	-1.09	+1.11	-2.20	S	600'	70
20.92	+1.11	-0.67	+1.77	C	400'	60
21.10	+0.60	+2.75	-2.15	S	400'	70
21.27	+2.75	-2.75	+5.50	C	1350'	65
24.15	-2.75	+0.35	-3.10	S	400'	60
24.30	0.00	+1.00	-1.00	S	400'	70
24.30	+1.00	-1.00	+2.00	C	500'	65
26.02	-1.00	+0.42	-1.42	S	400'	70
26.21	-0.71	+3.00	-3.71	S	544'	65
26.41	+3.00	-3.00	+6.00	C	1500'	65
27.36	-3.00	-0.09	-2.90	S	400'	65
27.45	0.00	+4.00	-4.00	S	608'	70

Based on 1984 AASHTO Green Book (A Policy on Geometric Design of Highways and Streets, 1984)

Table 4
Summary Tabulation of
Hydraulic Evaluations of Major Stream Crossings

Number	Milepost	Existing Structure	Drain Area (Acres)	Recommendation
1	11.295	36"RCP	100	B
2	12.341	48"RCP	64.1	B
3	12.688	10'x6' CBC	888.6	B
4	14.365	525' Bridges	---	B
5	15.545	2-48" RCP	145	A
6	15.993	10'x5' CBC	211	A
7	16.752	3-10'x9' CBC	692	B
8	17.231	42" RCP	23	B
9	19.580	2-30" RCP	143	B
10	20.195	4-10'x7' CBC	36.8 mi 2	-
11	20.702	10'x4' CBC	278	B
12	21.673	24"&26" RCP	42.1	B
13	21.913	5.5'x4.1' CBC	197	C
14	22.609	36" RCP	40.4	B
15	23.084	36" RCP	37.6	B
16	23.493	2-8'x7' CBC	1290	B
17	24.068	48" RCP	125.7	B
18	24.453	3-8'x7' CBC	5100	B
19	25.640	36" RCP	28.7	A
20	27.568	2-8'x5' CBC	1150	B
21	27.641	30" RCP	---	B
22	29.05	16'x4&12'x4' CBC	---	B
23	30.150	24" RCP	11.6	B
24	30.988	30" RCP	28.5	B
25	31.468 31.530	24" RCP 24" RCP	31.4 31.4	B B
26	32.300	24" RCP	25.1	B

Notes: Recommendation Codes

A Extend Existing or Replace with Hydraulically Equivalent Structure
B Replace with Hydraulically Superior Structure or Enlarge Culvert
C Replacement Decision to be made during Design

In addition, the US 301/US 92 interchange has cobra head lamps on 75' poles. Conventional street lights on 25' poles are utilized from just east of Orient Road to US 92.

3.1.12 Utilities

Utilities cross the I-4 corridor at several interchanges. All utilities relocations are associated with crossings and are considered minor.

3.1.13 Structural and Operational Conditions

An evaluation of the surface and base condition of the roadway within the corridor indicates that the roadway is suitable for use as part of the proposed facility. The pavement is rated for structural and operation condition and overall engineering. The ratings have been obtained from the December 1986 consolidated report which is available through the State of Florida Department of Transportation computer resources. Ratings range from 0 - 100 with a rating of 60 or below considered critical. The average ratings for the corridor are as follows:

Hillsborough County	Structural	Operational	Engineering
50th St. to Polk Co. Line	L85/R79	L54/R54	L62/R65

3.2 Bridges

Thirty-one existing bridges are located within the study limits. These include interchanges and cross-street overpasses, as well as structures over Six-Mile Creek (Tampa Bypass Canal). All bridges consist of prestressed concrete beams on multi-column piers or pile bents. Table 6 Existing Bridge Data, summarizes each structure's description, including Operating and Inventory Ratings, typical section data, span arrangement, clearances and year built.

More detail data can be found with the Structures Report. The structures that make up the I-4/I-75 interchange will not require any modifications and, therefore, are not included in this report.

Fourteen concrete box culverts have also been identified in this section of I-4. These existing culverts are discussed in greater detail in the Location Hydraulic Report, published separately.

Of the thirty-one existing bridges within the study area, only one (Williams Road over I-4) is scheduled to remain. The rest will be demolished to make way for new structures that would be required to accommodate the new typical sections with improved geometrics and clearances.

The fourteen concrete box culverts within the study limits (most of which are approximately 32 years old) exhibit varying degrees of structural deterioration. Generally, the bottom slabs and portion of the side walls have experienced concrete loss of matrix as a result of chemical contaminates in the water. Based on structural consideration only and the data available at this time, it appears the culverts at Mileposts 15.995, 22.049 and 22.941 could be extended with only minor repairs to the existing sections. Some of the boxes that could be extended, however, may still need replacement due to hydraulic considerations. The feasibility of rehabilitation versus new construction should be evaluated further during design. Refer to the Structures Report for correspondence related to the structure condition of these box culverts.

3.3 Environmental Characteristics

The I-4 Environmental Determination presents an evaluation of existing land uses, cultural features and community services, natural and biological features and hazardous waste sites for the I-4 Study Corridor. This report also includes a preliminary evaluation of environmental impacts due to the proposed improvements.

IV. NEED FOR IMPROVEMENT

4.1 Deficiencies

The following table summarizes the capacity deficiencies which exist on I-4 currently and those that are projected for the 2010 design year. As indicated, all segments of I-4 will be operating at Level of Service F if no capacity improvements are made.

TABLE 5

LEVEL-OF-SERVICE

EAST OF	1991 EXISTING	2010 NO BUILD/BUILD
50TH STREET	D	F/C
ORIENT ROAD	D	F/C
US 92 / US 301	D	F/B
I-75	E	F/C
CR 579	D	F/C
MCINTOSH	C	F/C
BRANCH FORBES	C	F/C
SR 699	B	F/B
ALEXANDER ROAD	C	F/B
SR 39	B	F/B
SR 533	C	F/B

4.1.2 Structural Conditions

Of the thirty-one existing bridges within the study area, only one (Williams Road over I-4) is scheduled to remain. The rest will be demolished to make way for new structures that would be required to accommodate the new typical sections with improved geometrics and clearances. The Williams Road structure (built in 1984) currently has a sufficiency rating of 97.5 and an estimated remaining life of 48 years.

The fourteen concrete box culverts within the study limits (most of which are approximately 32 years old) exhibit varying degrees of structural deterioration.

Generally, the bottom slabs and a portion of the side walls have experienced concrete loss of matrix as a result of chemical contaminants in the water. The Department's District Office of Structures and Facilities has estimated a remaining life of 20-25 years for five of the major culverts (Structure Nos. 100111, 100176, 100179, 100184, and 100257).

Based on structural considerations only and the data available at this time, it appears the culverts at Mileposts 15.995, 22.049, and 22.941 could be extended with only minor repairs to the existing sections. Some of the boxes that could be extended, however, may still need replacement due to hydraulic considerations. The feasibility of rehabilitation versus new construction should be evaluated further during design. Refer to the Appendix for correspondence related to the structural condition of these box culverts.

4.2 Safety

Traffic congestions during peak periods of highway use restricts emergency and law enforcement vehicles from performing their duties effectively. The proposed improvement will assure less delay time due to the increased highway capacity and improve level of service.

I-4 is an evacuation route for the Tampa Bay Region (Hillsborough, Manatee, Pasco and Pinellas Counties) and the Central Florida Region (Desoto, Hardee, Highlands, Okeechobee and Polk Counties). The Central Florida Regional plan indicates a need to evacuate a total of 82,264 vehicles to I-4 via I-75 for the worst case Regional Evacuation Scenario 12 (1983).

The number and severity of accidents occurring in the study corridor continued to grow at a rate of approximately 8% per year over the last five years. Accidents cost the motoring public approximately $1 million per mile per year in Hillsborough County.

Vertical alignment deficiencies, acceleration/deceleration lane lengths, decision and stopping sight distances and other major causes of these accidents are addressed by the proposed improvements.

4.3 Consistency with Transportation Plans

This study has been coordinated with Hillsborough County City-County Planning Commission and the Polk County Planning Commission to assure consistency between the transportation plans of these governing bodies and the master plan previously approved for this project.

4.4 Social/Economic Demands

The character of the study corridor is changing from one of predominantly agricultural and residential to one of mixed residential communities and commercial/industrial ares. See Section 1 of Appendix 5, Environmental Study -Corridor Engineering Report Supplement prepared for the I-4 Master Plan for additional detail.

V. CORRIDOR ANALYSIS

The corridor which is the subject of this study follows I-4 from 50th Street in Hillsborough County to the Hillsborough/Polk County line.

The only existing corridor which more or less parallels the study corridor is U.S. 92 (an urban principal arterial) which lies a distance of 0.5 to 8.0 miles south of I-4. U.S. 92 parallels the CSX railroad for most of its length.

Any major realignment to the study corridor would have a major impact on the environment (Green Swamp, strip mining areas, natural lakes and streams) and right of way and business damage costs (high level of development throughout). For these reasons, the specific alignments and alternatives for the project are limited to a corridor that encompasses the existing facility.

VI. TRAFFIC

6.1 Existing Conditions

Extensive machine and manual traffic counts were conducted in the corridor in November 1991. Based on these studies and prior studies for the corridor, the Design Hour to Daily (K), Direction (D) and Truck (T) factors were determined to be as follows:

K = .08
D = .55
T = .14 (Daily), .07 (Design Hour)

6.2 Multimodal Transportation System

Hillsborough Area Regional Transit Administration (HART) presently provides express bus service down the I-4 corridor from the Seffner/Dover area to downtown Tampa. HART's future plans include service as far east as the Plant City area. No park and ride facilities presently exist within the corridor.

AMTRAK passenger service virtually parallels the corridor (0.5 to 7.0 miles south) which provides service to 11:00 AM and 7:58 PM) and from (2:13 PM) Lakeland, Florida each day. The two rail crossing which occur within the project limits are as follows:

Sta. 244+19.86 at S.R. 39 (South Frontage Road) - At grade crossing with two (2) tracks and three (3) train movements per day transporting general freight at a maximum speed of 20 mph. The existing railroad signal protection is flashing lights, gates and bells, with advance signing and pavement markings.

Sta. 244+19.86 at S.R. 39 (Mainline) - Grade Separation Crossing (railroad under roadway) with two (2) tracks and three (3) train movements per day transporting general freight at a maximum speed of 20 mph.

Sta. 726+00.12 near Kathleen Road (Mainline) - Grade Separation Crossing (railroad over roadway) with 1 track and 13 train movements per day transporting general freight at a maximum speed of 79 mph.

TABLE 6 - EXISTING BRIDGE DATA

I-4 FROM 50TH STREET TO POLK COUNTY LINE
STATE PROJECT NO. 10190-1402
EXISTING BRIDGE DATA (SHEET 1 OF 2)

Description	Existing Bridge No.	Struct. Rating		Lanes	Shldrs. (FT)	Clear Width (FT)	Spans (FT)	Skew (DEG)	Vert CL (FT/IN)	Horiz. CL.(FT)	Year Built
		Operat.	Invent.								
I-4 WB OVER DR. MLK JR BLVD.	100169	HS20T60	HS20T53	2	2.0,2.0	28.0	4@64	41	14-8	7.0,6.7	1961
I-4 EB OVER DR. MLK JR BLVD.	100170	HS20T60	HS20T53	2	2.0,2.0	28.0	4@64	41	15-0	7.0,6.7	1961
CHELSEA OVER I-4	100171	HS20T60	HS20T49	2	2.0,2.0	28.0	52,103.5,103.5,52	49	15-11	30.5,10.0	1961
I-4 WB OVER ORIENT RD.	100172	HS20T53	HS20T47	2	2.2,2.2	28.4	4@55	41	14-8	7.0,6.3	1961
I-4 EB OVER ORIENT RD.	100173	HS20T53	HS20T47	2	2.2,2.2	28.4	4@55	41	15-0	7.0,6.3	1961
U.S. 92 EB OVER I-4	100022	HS20T62	HS20T54	2	2.2,2.2	28.4	37.5,105,105,78	48	16-4	29.0,8.0	1961
U.S. 301 SB OVER I-4	100078	HS20T58	HS20T48	2	2.1,2.1	28.2	37,42,55,55,42,37	0	15-9	6.9,7.9	1960
U.S. 301 NB OVER I-4	100114	HS20T71	HS20T43	2	2.1,2.1	28.2	37,42,55,55,42,37	0	16-1	6.9,7.9	1954
I-4 EB OVER SIX-MILE CREEK	100293	HS20T58	HS20T51	2	6.4,10.4	40.8	12@43.75	7	----	----	1977
I-4 WB OVER SIX-MILE CREEK	100292	HS20T59	HS20T53	2	6.1,10.1	40.2	12@43.75	7	----	----	1977
U.S. 92 EB OVER SIX-MILE CREEK	100370	HS20T54	HS20T48	2	6.8,10.0	47.0min	12@43.75	0	----	----	1977
U.S.92 WB OVER I-4	100023	HS20T60	HS20T42	2	2.0,2.0	28.0	45.92,2@64.52,45.92	30	16-4	13.0,9.0	1961
WILLIAMS RD. OVER I-4	100429	HS20T61	HS20T53	2	8.0,8.1	40.1	27.5,108.5,93,29.75	0	16-6	13.4,43.6	1984
C.R. 579 OVER I-4	100177	HS20T47	HS20T40	2	2.0,2.0	28.0	40.83,2@57,40.83	12	15-5	17.4,9.5	1959
SEFFNER LAKE RD. OVER I-4	100178	HS20T56	HS20T49	2	2.0,2.0	28.0	42.58,2@60.83,42.58	23	15-5	18.3,10.0	1959
I-4 WB OVER MCINTOSH RD.	100180	HS20T68	HS20T63	2	2.0,2.0	28.0	4@38	13	14-6	5.6,7.8	1958
I-4 EB OVER MCINTOSH RD.	100181	HS20T64	HS20T59	2	2.0,2.0	28.0	4@38	13	14-7	5.6,7.8	1958
FRITZKE RD. OVER I-4	100182	HS20T55	HS20T47	2	2.0,2.0	28.0	38,2@56,38	0	15-7	18.2,10.2	1958
BETHLEHEM RD. OVER I-4	100183	HS20T49	HS20T42	2	2.0,2.0	28.0	38,2@56,38	5	14-11	18.4,10.9	1958
I-4 WB OVER BRANCH FORBES RD.	100185	HS20T71	HS20T64	2	2.0,2.0	28.0	4@38	0	14-5	8.5,12.0	1959
I-4 EB OVER BRANCH FORBES RD.	100186	HS20T71	HS20T64	2	2.0,2.0	28.0	4@38	0	14-5	8.5,12.0	1959
I-4 WB OVER S.R. 566 (THON. RD.)	100187	HS20T51	HS20T45	2	2.0,2.0	28.0	4@67.5	59	14-4	9.2,12.0	1959
I-4 EB OVER S.R. 566 (THON. RD.)	100188	HS20T51	HS20T45	2	2.0,2.0	28.0	4@67.5	59	14-4	9.2,12.0	1959

TABLE 6 (CONT.) - EXISTING BRIDGE DATA

I-4 FROM 50TH STREET TO POLK COUNTY LINE
STATE PROJECT NO. 10190-1402 WPI NO. 7143194
EXISTING BRIDGE DATA (SHEET 2 0F 2)

Description	Existing Bridge No.	Struct. Rating		Lanes	Shldrs. (FT)	Clear Width (FT)	Spans (FT)	Skew (DEG)	Vert CL (FT/IN)	Horiz. CL.(FT)	Year Built
		Operat.	Invent.								
I-4 WB OVER ALEXANDER ST.	100189	HS20T61	HS20T58	2	2.0,2.0	28.0	4@43	22	15-9	7.2,12.1	1958
I-4 EB OVER ALEXANDER ST.	100190	HS20T61	HS20T58	2	2.0,2.0	28.0	4@43	22	14-4	7.2,12.1	1958
I-4 WB OVER S.R. 39 & CSXRR	100191	HS20T53	HS20T46	2	2.0,2.0	28.0	55,78,59.5,76,2@55	19	22-8	7.7,20.9	1959
I-4 EB OVER S.R. 39 & CSXRR	100192	HS20T63	HS20T54	3	2.0,2.0	40.0	2@55,74,76,2@55	19	22-8	5.5,30.0	1959
I-4 WB OVER PARK RD.	100193	HS20T71	HS20T62	2	2.0,2.0	28.0	43,78,72,43	0	15-5	22.4,14.5	1958
I-4 EB OVER PARK RD.	100194	HS20T59	HS20T52	2	2.0,2.0	28.0	43,78,2@55,43	0	15-3	8.7,17.2	1959
I-4 WB OVER TAYLOR RD.	100195	HS20T76	HS20T67	2	2.0,2.0	28.0	3@40	0	15-0	---,7.0	1958
I-4 EB OVER TAYLOR RD.	100196	HS20T76	HS20T67	2	2.0,2.0	28.0	3@40	0	15-11	---,7.0	1958

A proposal for construction and operation of "High Speed Rail" between Tampa and Orlando have been made to the State of Florida. This proposal follows the existing rail south of the study corridor. The present right-of-way width precludes the placement of High Speed Rail within the right-of-way and special consideration will be required to protect automobiles operating in close proximity to a high speed rail line.

The transportation corridor addressed in this study is included in Transportation plans for both the Tampa Urban Area and Polk County Municipal Planning Organizations (MPOs).

6.3 Traffic Analysis Assumptions

The Saturation Flow Rates from the Tampa Interstate Study (2200 passenger cars per hour per lane) were to used in the corridor to reflect the urban character of the traffic flow in the Tampa area.

6.4 Existing Traffic Volumes

The Daily Volumes (1991) range from a high of 87,600 east of I-75 to 66,200 at the Hillsborough/Polk County Line.

6.5 Traffic Volume Projection

2010 Traffic Volumes were projected to increase approximately 75% along the corridor. The Daily Volumes (2010) range from a high of 161,500 east of I-75 to 114,000 at the Hillsborough/Polk County Line. 2010 Traffic Projections were based on T.I.S., I-4 Master Plan Study, and recent traffic modeling associated with on going projects (US 92).

6.6 Level of Service

Existing Levels of Service range from B to E. The 2010 No-Build Level of Service will be F for all segments. The 2010 Build Level of Service will result in an acceptable Level of Service for all segments. For more detailed information see section 4.1 deficiencies.

VII. ALTERNATIVE ALIGNMENT ANALYSIS

7.1 No-Project Alternative

This alternative examines the possibility of leaving I-4 in its current condition while allowing for routine maintenance. The pavement structure and bridges included in the portion of I-4 under study, 50th Street to the Hillsborough/Polk County line, are currently thirty years of age and the pavement is showing signs of cracking and vertical displacement. Major maintenance or replacement costs are imminent simply to maintain the existing facility which is rapidly reaching an unacceptable level of service and includes numerous locations with deficient horizontal and vertical clearances.

There are distinct advantages and disadvantages associated with the No-Project Alternative. These are as follows:

Advantages

1. There will be no inconvenience to traffic flow or development due to construction operations.

2. No business or residential relocation or right of way acquisition would be necessary.

3. There would be no expenditure of funds for right of way acquisition or construction.

Disadvantages

1. Increase in traffic congestion and road user cost, lower Level of Service and an increase in accidents as traffic volumes increase on this congested facility.

2. Continued rise in maintenance cost due to a structurally undesirable roadway.

3. The roadway will not be compatible with the future transportation network defined by the MPO's and, therefore, require improvements to other facilities.

4. Increase in carbon monoxide air pollution due to increased traffic congestion.

Based upon these considerations, the proposed action has been developed as a design alternative. The "No-Project Alternative" will continue to be a valid alternate until after the public hearing, when a final recommendation can be made.

7.2 Transportation System Management

District 7 has given consideration to adding traffic lanes and widening sub-standard bridges to help improve the deteriorating Level of Service being experienced in the Study Corridor. The existing 40 foot median (US 92 to County Line Road) precludes widening only in the median to obtain additional capacity without a reduced shoulder width or narrow travel lane. Widening on both sides requires added overlay material on the existing pavement to keep the cross slope breakover from occurring in the wheel path of the new travel lane.

The bridges are presently 30 years old and all of these were found to be deficient when evaluated for vertical alignment, vertical clearance and horizontal clearance for existing conditions. (See Appendix 1 of the Corridor Engineering Report), except Williams Road.

Most of the high accident locations were found to be the result of stopping or decision sight distances which require extensive profile revisions to correct these deficiencies.

The Department, through it's traffic operations section, continues to identify and correct problems related to high accident locations, extensive delays at intersections and safety problems in general.

7.3 Preferred Conceptual Design Alternative

The following preferred conceptual design alternative was developed because the "No-Project" alternative fails to meet the projected transportation needs of the area. The discussion of this alternative is presented by Study Segments and depicted in Exhibit 3.

Generally, the preferred alternative is divided into four typical sections as follows:

1. 50th Street to I-75: 10 lane typical section with high occupancy vehicle (HOV).

2. I-75 to Thonotossassa Road (SR 566): 10 lane typical section.

3. Thonotossassa Road (SR 566) to SR 39: 8 lane typical section.

4. SR 39 to County Line Road: 8 lane typical section with frontage roads.

Applicable AASHTO and FDOT standards were used in developing this alternative.

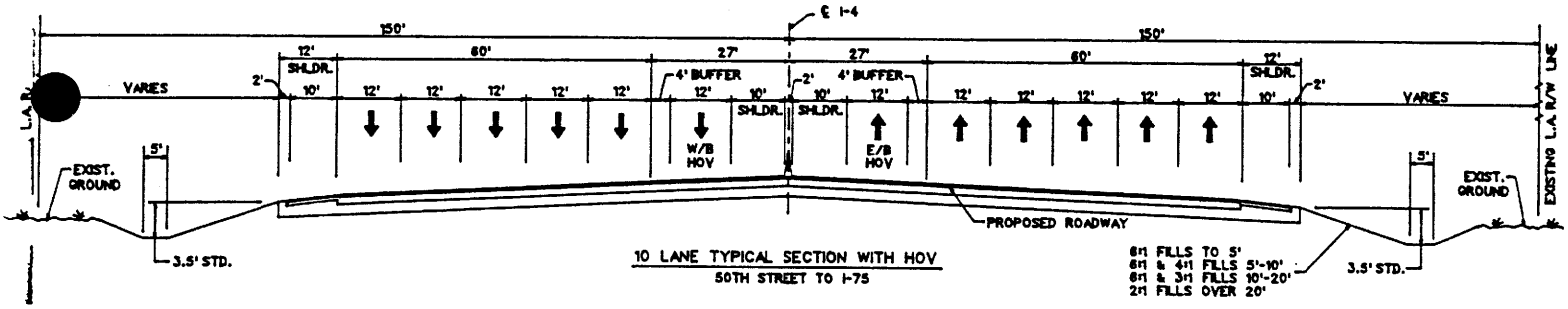
7.4 Required Right of Way and Costs

This project is approximately 23 miles in length and requires the purchase of 1,210 individual parcels of property (197 acres) at an estimated cost of $61.2 million. 25 Single family residences, 27 mobile home tenants and 6 businesses are anticipated relocations. No hospitals, nursing homes, civic associations or schools will be displaced.

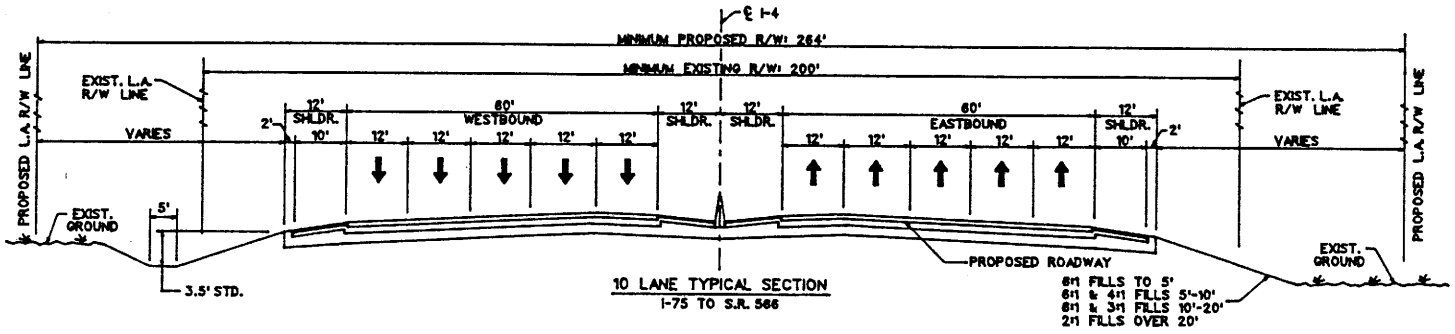
The construction cost and preliminary engineering cost are $299.7 million and $34.1 million, respectively, for a total estimated project cost of $395 million.

VIII. RECOMMENDATIONS

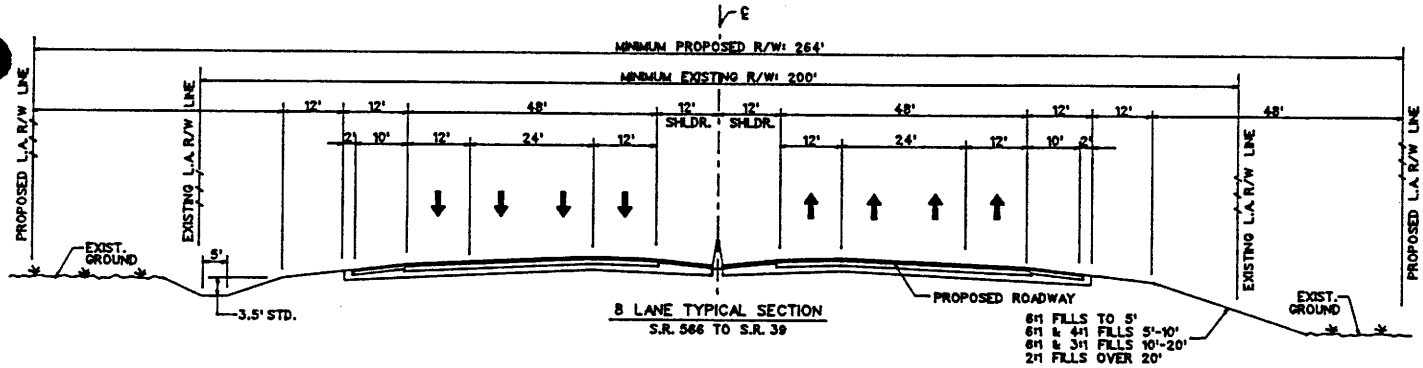
The preferred alternative described on the preceding pages is needed to improve I-4's level of service to acceptable levels for the 2010 design year as well as improving safety and geometric design deficiencies. Because the no-project alternative would not address these needs, the preferred alternative is recommended.



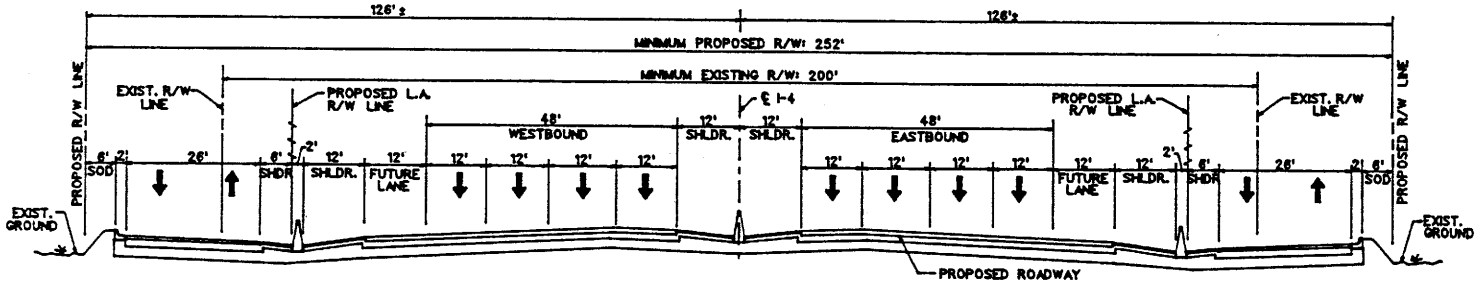
10 LANE TYPICAL SECTION WITH HOV
50TH STREET TO I-75



10 LANE TYPICAL SECTION
I-75 TO S.R. 566



8 LANE TYPICAL SECTION
S.R. 566 TO S.R. 39



8 LANE TYPICAL SECTION WITH FRONTAGE ROADS
S.R. 39 TO COUNTY LINE RD.

PROPOSED TYPICAL ROADWAY SECTIONS

EXHIBIT 3

APPENDIX I

INTERSTATE FLOODING NEAR McINTOSH ROAD

PRELIMINARY REPORT

Date: October 17, 1988

By: Florida Department of Transportation
Larry J. Gaddy, P.E., District Design Engineer, District VII
Mark E. Hoskins, P.E., Asst. Drainage Engineer, District VII

PRELIMINARY REPORT

INTRODUCTION

Recently Interstate 4 (I-4) was overtopped by flood waters in a 1,000' stretch located between the interchanges at McIntosh Road and CR 579. As might be expected, the event attracted much public and media attention, not only due to the flooding of that important highway but also because of extensive flooding of a nearby subdivision.

This preliminary report describes the event; The Florida Department of Transportation's (Department) reaction to it; possible causes; and a recommended plan of action. The reader is cautioned that it is preliminary and that an accurate assessment is not possible until much more information is available.

DESCRIPTION OF FLOODING EVENT

From the afternoon of September 7, 1988 to the morning of September 13, I-4 was closed due to flooding. For some of this period, large trucks with high road clearances were allowed passage but automobiles were diverted to US 92 between McIntosh Road and CR 579. The flooding followed several days of unusually heavy rainfall (See appendix) which was preceded by above average monthly rainfall in August.

Interstate 4 was inundated at Baker Canal, approximately one (1) mile West of McIntosh Road. For several days the water elevation was at or near 44.8' (M.S.L.), representing a depth of 1.7' at the inside edge of pavement. This flood also heavily impacted other areas including Pemberton Creek Subdivision lying one (1) mile North of I-4, which experienced severe water damage in several homes.

I-4 and Pemberton Creek Subdivision were not alone in their plight. Many areas were flooded throughout District VII which included not only local roads and streets, but state roads as well. Several homes were also flooded throughout the District, reminiscent of the floods of 1960 and 1979. Public and media attention focused on I-4 and Pemberton Creek Subdivision for obvious reasons; i.e., it was unexpected, caused much suffering and didn't subside as quickly as expected.

Many local residents, as well as the media, were quick to blame the flooding on the actions of Southwest Florida Water Management District (SWFWMD) in their operation of lake level controls at Lake Thonotosassa. They believed the high lake levels reflected back to Pemberton Creek Subdivision and as far back as I-4. Interstate 4 is over two (2) miles upstream and Pemberton Creek Subdivision is approximately one (1) mile from the lake. Attached to this report is a report issued by SWFWMD which describes in greater detail the operation of the lake control structure and resulting lake levels.

The public and news media were also critical of the Department's seeming lack of response to the need to reopen I-4 in a timely manner. There was concern that Hurricane Gilbert, located in the western Gulf of Mexico, might turn eastward and demand evacuation of low areas. Many were dismayed to find that our most important highway system could break down when most needed. Gilbert did not turn eastward, however, the point had been made!

DEPARTMENT REACTIONS

The Department began an investigation immediately to determine the cause of the flood. Data gathering included: field observations which included reconnaissance by boat and aircraft; surveying present water elevations and high waters during the flood; cross sectioning a few high energy loss areas after flood waters had subsided; and obtaining gage records from the Thonotosassa gage.

The Department has been working closely with SWFWMD and Hillsborough County during the investigation and will continue to do so. This cooperation includes assistance in funding a consultant study to determine feasible outfall improvements. The Department will pay $10,000 (Ten Thousand Dollars) and the remainder of the $50,000 (Fifty Thousand Dollars) will be shared between SWFWMD and the County.

The Department was criticized for delaying the reopening of I-4 and many people expressed concern that I-4 could not serve as an evacuation route if Hurricane Gilbert, then active off the Youcatan coast, should threaten the area. The Department could have built small dikes along the shoulders and pumped water off the roadway to open I-4. However,

if they had done so, there is a good possibility that they would have been blamed for exacerbating the damage upstream by restricting flow across I-4. The dike was finally placed on September 14 after it became apparent that it would be several more days before the lowering waters exposed the pavement and by this time the flow rate over the roadway was too insignificant to be concerned with. No one could have foreseen the long slow receding process and, in retrospect, perhaps the Department could have diked and opened I-4 one to two days sooner, but hindsight is always better than foresight.

POSSIBLE CAUSES

Invariably, when one seeks to analyze large scale flooding, a complex myriad of subtly interrelated factors emerge. It is rare that a single clearly defined cause can be identified, instead we must attempt to somehow prioritize or weigh the various factors which, in aggregate, created the event. Following, in no order of weight, are our very preliminary opinions of the several reasons for the I-4 flood. No opinions regarding the flooding of Pemberton Creek Subdivision will be offered since that is outside the purview of this report. It should be noted that the high lake levels at Thonotosassa is not on the list of factors which contributed to I-4's flooding.

1. Obviously, I-4's grade is too low by today's standards. If I-4 was designed today, the base would clear the 50 year frequency high water by 3.0'. Not-withstanding the alterability of that high water as described below, the design high water would probably be set at 44.0 (M.S.L.), thus requiring a profile elevation around 49.0 (M.S.L.) if it were being constructed on new alignment.

2. The high water elevations obtained by our survey revealed a 1000' reach of channel approximately 1.3 miles north of I-4 which displayed an undue head loss (See Appendix). Field observations and cross sections suggest three possible reasons for that loss of energy - a large fallen tree blocking the channel, reduced cross sectional area; and the presence of a berm of unknown history which may have prevented overbank flow, thus confining the flow to the channel in an unnatural manner.

3. Certainly the unusual rainfall was a causative factor. Various gages in the area strongly suggest rainfall frequencies for two (2) day durations at twenty (20) years and for four (4) days at twenty-five (25) years (See Appendex). These amounts, following above average rates in August, could possibly result in flood frequencies more rare than the rainfall frequencies. The Pemberton Creek and Baker Canal basins have unusually high storage volumes. This serves to complicate the relationship between rainfall frequency and flood frequency. If the massive storage reserves had been depleted by antecedent conditions, it is quite possible to create a less frequent flood event than the rainfall frequency.

The only way to accurately assign a frequency to high water elevations in the low reaches of this basin would be to analyze at least twenty (20) years of gage data, which of course we do not have. As a matter of interest, the two (2) previous overtoppings in 1958 and 1960 would have been 1.0' to 1.5' lower than the subject flood. In thirty (30) years, we have had these three unusual high waters, so statistically speaking, the elevations recently experienced could very well be as rare as, or more rare than a fifty (50) year event.

RECOMMENDATIONS

The Department is essentially faced with two questions: 1) Can I-4 be protected by improvements to the outfall? 2) If not, when should a project be funded to raise the grade?

The first question cannot be answered without a thorough study which will determine the cause and the cost to cure it. At first glance, it would seem that Hillsborough County and SWFWMD would be compelled to solve the problem, considering the damages sustained in the Pemberton Creek Subdivision. Interstate 4 would gain protection as a secondary effect. But when the consequences of, in effect, moving this flood downstream are weighed, it becomes apparent that the cost could be very high.

The second question is predicated on the answer to the first. It does not become an issue unless the Department's fair share of outfall improvement cost are greater than the cost to raise I-4. If the outfall improvements prove unfeasible, I-4 must be raised, but when?

A Project Development and Environmental (PD&E) study was recently begun to examine what improvements should be made to I-4 between its junction with I-75 and the Polk/Osceola County line. The study is scheduled for completion by July 1, 1989. Parallel and separate will be a study by Hillsborough County to determine what should be done about the flood. That study will be funded by Hillsborough County, SWFWMD and the Department.

Our recommendation is to await the results of those two studies and if the outfall improvements are not feasible and if additional lanes are not warranted within ten (10) years, then go ahead and raise the road. Otherwise, raise the grade in concert with those improvements recommended by the PD&E study. If the latter strategy is adopted, a contingency plan to dike and pump should be developed and be put in effect during emergencies. Statistics indicate another severe flooding occurrence is not probable during that period.

In addition to the above recommendations, we encourage the County to aggressively maintain the channel downstream of the confluence of Baker Canal and Pemberton Creek. Only debris and vegetation can be removed and the benefits are not measurable, but it will certainly help to some degree.

LG:sk:005

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT REPORTS

The first report is the operation of the Lake Thonotosassa outfall structure. This report confirms that the opening of the structure was on Thursday September 8th at 10:40 am.

The second SWFWMD document was passed out to all interested people on October 13, 1988. This meeting was held to outline preliminary causes and recommendations regarding the flooding. Only portions of this report have been copied.

The third document is a letter from the Executive Director of SWFWMD, Peter Hubbell outlining the future $50,000 drainage study. This study will be joint funded by SWFWMD, the Department, and Hillsborough County.

LAKE THONOTOSASSA/FLINT CREEK STRUCTURE OPERATION FROM AUGUST 29, 1988 TO SEPTEMBER 21, 1988

The structure is a four bay concrete structure: The two center bays are each 12 feet wide with a 12 ft. by 4 ft. 9 1/8" lift gate. The two outer bay are split into two 4 foot wide stop log bays. The invert of the structure is 32.9 ft. M.S.L. (both log bays and gate bays). The bottom logs are not removed to prevent the slots on the bottom from becoming silted in.

The opening of the gate is determined by the top of the gate in relation to a scale on the side of the structure. This scale can only be seen from the walk way over the structure.

The regulatory stages for Lake Thonotosassa:

Maximum Operating	37.0
Maximum Desirable	36.5
Minimum Desirable	34.5
Minimum Operating	33.0

August 26, 1988 Friday late afternoon 3:30 p.m.
Lake Level 36.69

Tim Bailey
One log was removed from each log bay (log bay overflow elevation 36.0 ft.)

One gate was closed one gate was opened .3 ft. (elevation of bottom of open gate would be 33.2 ft. MSL).

Structure settings were not changed until September 1, 1988.

September 1, 1988 Thursday afternoon
Lake Level 36.62 (lake rising)

Robert Gregg
Due to lake level being above the Max Desirable of 36.5 ft. and the lake was rising, the closed gate was opened to .3 ft. (bottom of gate 33.2 ft. MSL).

Stop log bay sill at 36.0 ft. over flow level.

September 2, 1988 Friday afternoon
Lake Level 36.77 (lake falling)

Robert Gregg
One gate was closed, the other gate was left at .3 ft.

Stop log bay no change (over flow at 36.0 ft.)

September 5, 1988 Monday (Labor Day) 7:30 a.m. -- 8:30 a.m.
Lake Level 35.72 ft.

Paul Hites inspected structure found all the logs had been removed from the bays (over flow elevation would be 33.2 ft., bottom log remains in).

Mark Allen instructed Paul Hites to close the gate which was .3 ft. open and leave the logs out of the structure.

This was all completed before 10:00 a.m. Monday morning.

September 6, 1988 Tuesday 7:50 a.m. to 8:20 a.m.
Lake Level 36.22 ft. (rising)

Robert Gregg instructed Tim Bailey who sent Dan Roche and Dave Chapman to open both gates 1.5 feet logs were still removed. Elevation of gate between would be 32.9 + 1.5 = 34.4 ft.

The water level at the structure was 36.22 ft. upstream and 36.22 ft. down stream with the gate open 1.5 ft. the bottom of gate at 34.4 ft. would be 1.82 ft. below the water surface.

September 7, 1988 Wednesday 6:25 a.m. to 7:00 a.m.
Lake Level 37.20 ft. (rising)

Dan Roche and Dave Chapman
The lake level was 37.20 ft. the downstream side of structure was 37.00 ft. Gates were to be open completely approximately another 1.5 ft. for a total gate opening of 3.0 ft.

Robert Gregg notify Mr. Izzo by telephone as to probable flood. 7:00 a.m.

Gates were not opened at this time. Gates remained at 1.5 ft. opening (gate bottom elevation 34.4 ft.)

September 8, 1988 Thursday 2:30 p.m.
Lake Level 38.05 ft. (rising) at 10:40 a.m.

Paul Hites sent to open gates completely 3.0 ft. opening. Paul did not read the gage at this time. Bottom of gate would be at elevation 35.9 ft. water level was at 38.05 ft. bottom of gate would be 2.15 ft. below the surface of water.

September 18, 1988 Sunday 10:00 a.m.
Lake Level 36.39 (lake falling)

Mark Allen instructed Dan Roche to close the gates and leave all the logs out.

September 21, 1988 Wednesday afternoon
Lake Level 36.41 (steady)

Mark Allen instructed Tim Bailey to open the gates to full open.

September 28, 1988 Wednesday 10:00 a.m.
Lake Level 34.65 ft.

Mark Allen instructed Tim Bailey to have Dan Roche and Dave Chapman to close both gates and replace all logs to overflow elevation 36.0 ft.

These events were taken from the structure operations log book and discussion with Tim Bailey and Mark Allen by Tom Harrison on September 30, 1988.

PUBLIC INFORMATION MEETING
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
TAMPA SERVICE OFFICE
OCTOBER 13, 1988, 7:00 P.M.

CONCERNING SEPTEMBER 1988 FLOODING PROBLEMS
IN
LAKE THONOTOSASSA AREA
BAKER CANAL/PEMBERTON CREEK AREAS

PUBLIC INFORMATION MEETING
OCTOBER 13, 1988

AGENDA

I. Introduction

II. Hydrologic Conditions Report

III. Function of Tampa Bypass Canal

IV. Lake Thonotosassa

V. Baker Creek/Pemberton Creek

VI. Public Comments

CONTENTS

Introduction i

Agenda ii

Total Rainfall - September 5th to 9th, 1988 1

Return Period (frequency of occurrence). 2

District-wide Recorded Floods - September 1988 3

Vicinity Map 4

Recorded High Water Marks - September 1988 5

Problems, Lake Thonotosassa 6

Recommendations, Lake Thonotosassa 7

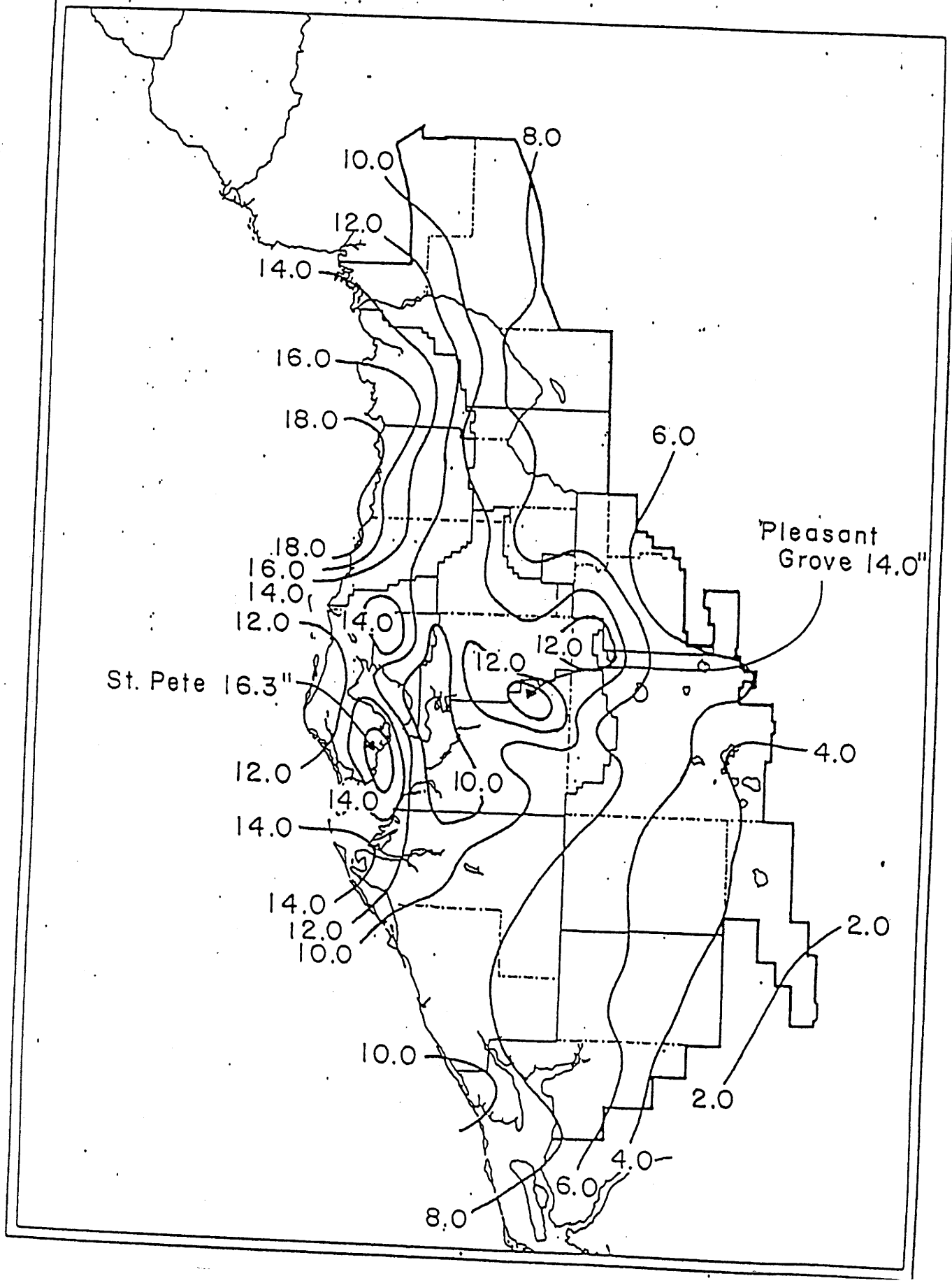
Problems, Baker Canal/Pemberton Creek 8

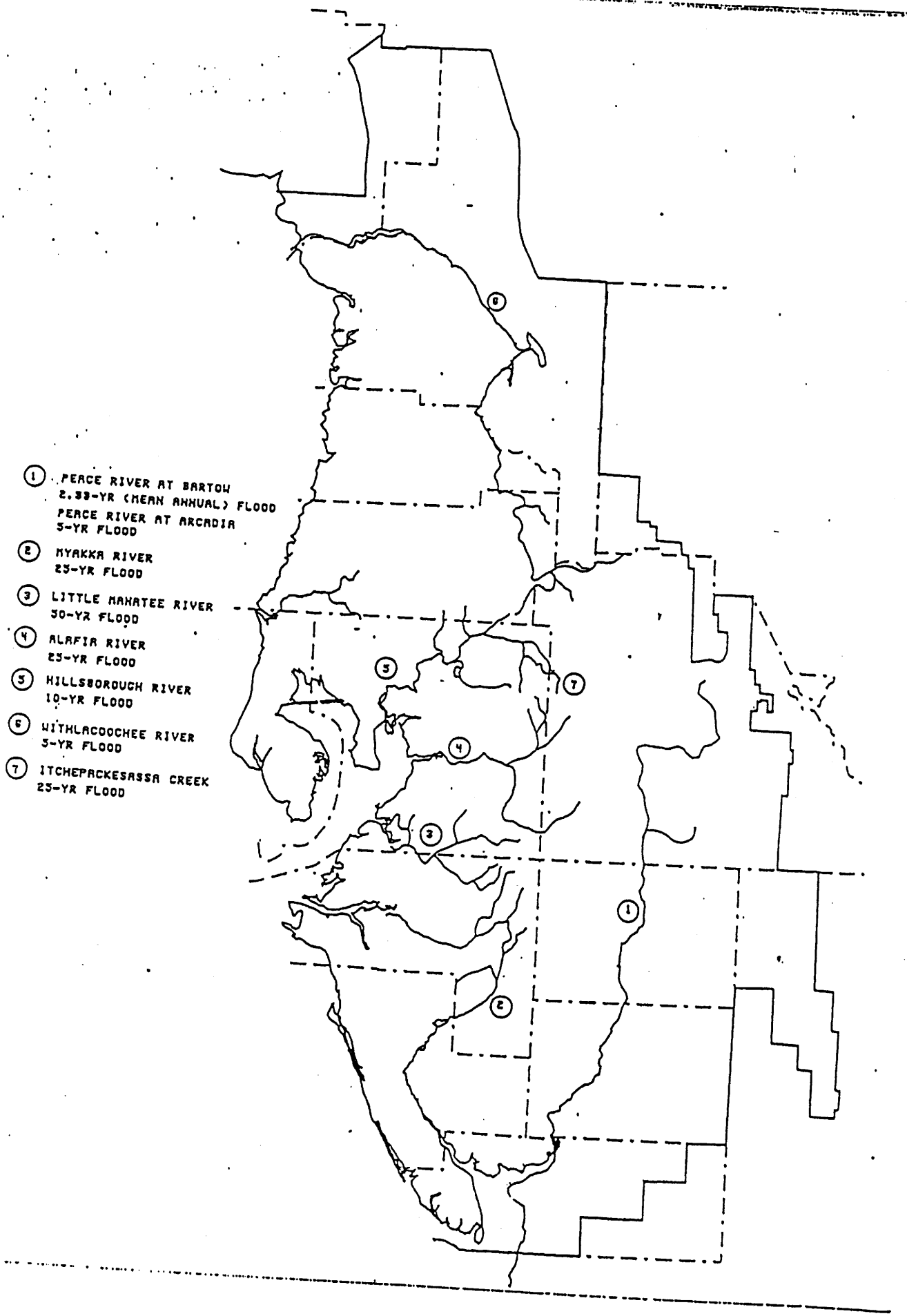
Recommendations, Baker Canal/Pemberton Creek 9

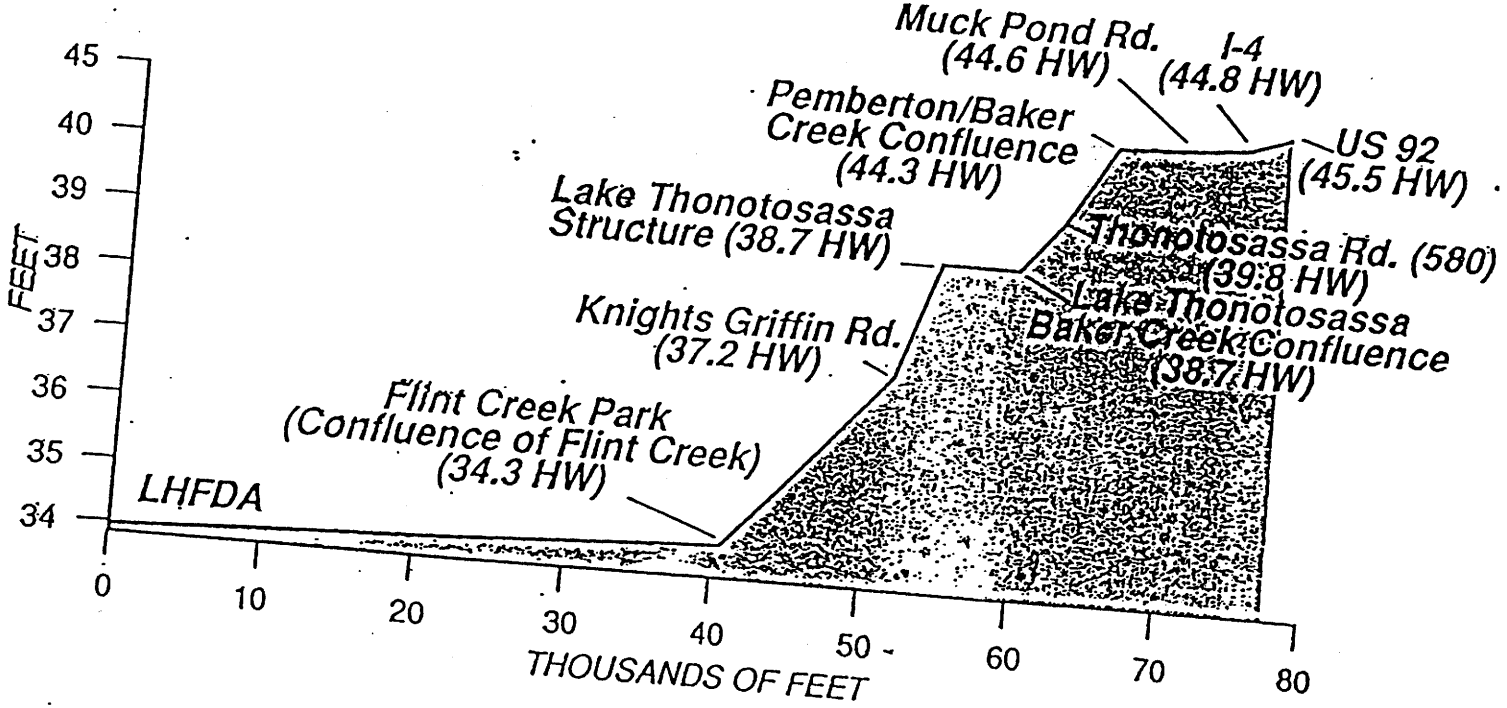
Flood Maps 10

FOUR DAY STORM EVENT

SEPTEMBER 5th to 9th, 1988




1 PEACE RIVER AT BARTOW
2.33-YR (MEAN ANNUAL) FLOOD
PEACE RIVER AT ARCADIA
5-YR FLOOD
2 MYAKKA RIVER
25-YR FLOOD
3 LITTLE MANATEE RIVER
50-YR FLOOD
4 ALAFIA RIVER
25-YR FLOOD
5 HILLSBOROUGH RIVER
10-YR FLOOD
6 WITHLACOOCHEE RIVER
5-YR FLOOD
7 ITCHEPACKESASSA CREEK
25-YR FLOOD


Muck Pond Rd.
(44.6 HW)
I-4
(44.8 HW)
Pemberton/Baker
Creek Confluence
(44.3 HW)
US 92
(45.5 HW)
Lake Thonotosassa
Structure (38.7 HW)
Thonotosassa Rd. (580)
(39.8 HW)
Lake Thonotosassa
Baker Creek Confluence
(38.7 HW)
Knights Griffin Rd.
(37.2 HW)
Flint Creek Park
(Confluence of Flint Creek)
(34.3 HW)
LHFDA
FEET
45
40
39
38
37
36
35
34
0
10
20
30
40
50
60
70
80
THOUSANDS OF FEET

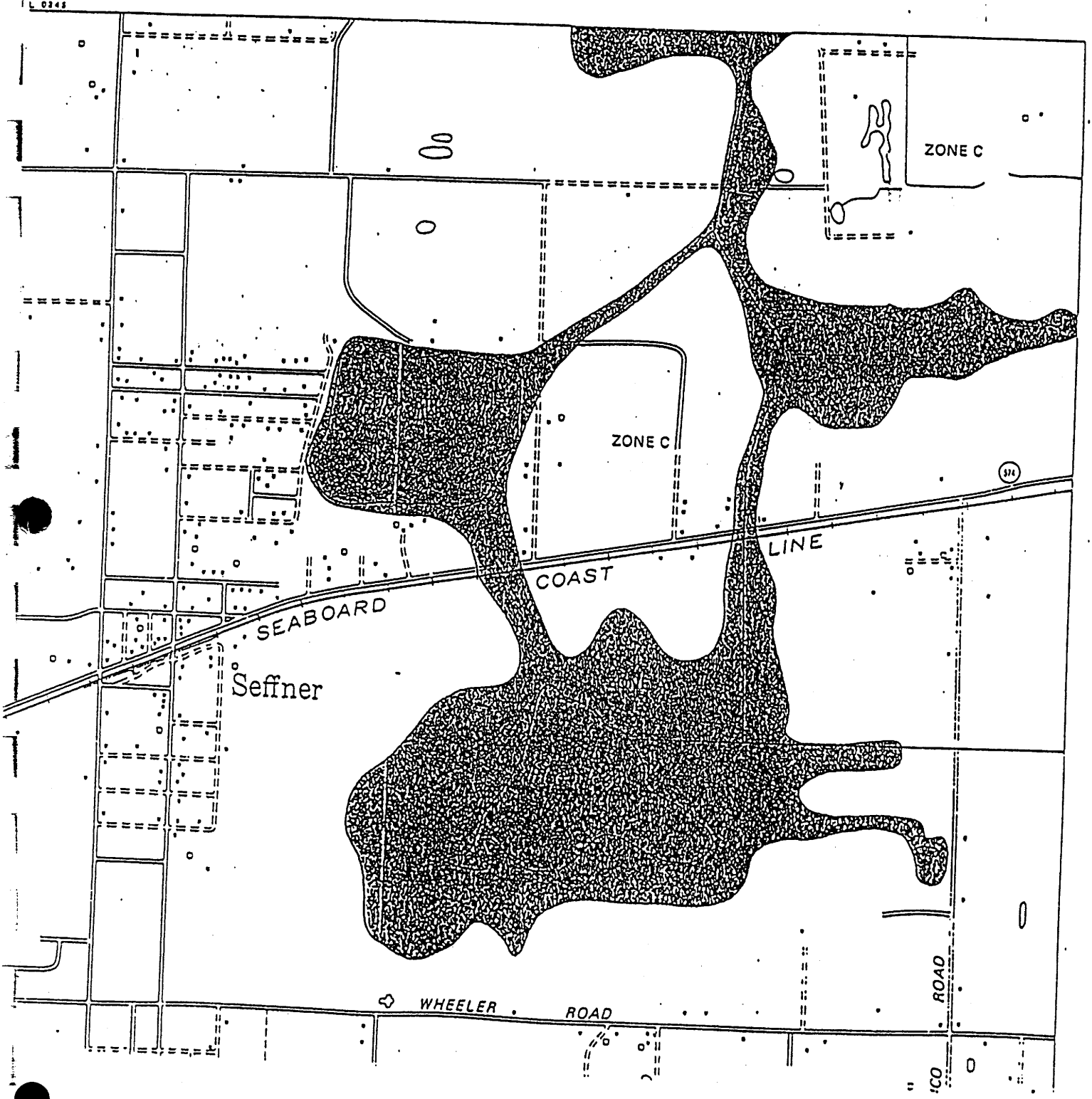
LAKE THONOTOSASSA RECOMMENDATION

Short Term

1. *Operating Schedule*

Long Term

1. *Adopted Lake Levels*
2. *SWIM Priority*


ZONE C
ZONE C
574
SEABOARD COAST LINE
Seffner
WHEELER ROAD
ROAD

Southwest Florida Water Management District
2379 Broad Street (U.S.41 South) Brooksville, Florida 34609-6899
Phone (904) 796-7211 or 1-800-423-1476 SUNCOM 628-4097

October 14, 1988

Mr. Mike McCarthy
Hillsborough County
P.O. Box 1110
Tampa, Florida 33601

Subject: Baker Creek/Pemberton Creek Flooding

Dear Mike:

The Southwest Florida Water Management District is in agreement that the most reasonable approach to resolve the Baker Creek/Pemberton Creek flooding problem would be to perform a hydrologic analysis of the area including such items as expected peak flows and channel capacity. This basic analysis will then allow us to make further decisions regarding such options as the appropriate channel maintenance, altering flood level elevations, etc.

District staff will recommend to the Hillsborough River Basin Board at their October 20, 1988 meeting to jointly fund with Hillsborough County and the Department of Transportation an analysis of the Baker Creek/Pemberton Creek area. Hillsborough County would administer the contract for this analysis. It is our understanding that the amount of the contract will not exceed $50,000.00.

The specific scope of work will need to be agreed upon among the three parties to insure each will receive the information needed. Should you desire additional information or clarification at this time, please do not hesitate to call.

Sincerely,

Peter G. Hubbell
Executive Director

PGH:TJH:csl
L08-1011.C
cc: Tom Harrison, Manager, Engineering Section
Larry Gaddy, Dept. of Transportation, Tampa

APPENDIX TABLE OF CONTENTS

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2	RAINFALL ANALYSIS
3	DRAINAGE BASIN CHARACTERISTICS
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	MAPS
5	U.S.G.S. LOCATION MAP
6	PEMBERTON CREEK WATERSHED
7	BAKER CREEK WATERSHED
8	CHANNEL SECTION ALONG BAKER CREEK
	CHARTS AND GRAPHS
9	HIGH WATER ELEVATIONS ON BAKER CREEK
10	DETAILED BAKER CREEK SURVEY- PROFILE VIEW
11	DETAILED BAKER CREEK SURVEY- CROSS-SECTION VIEW
12	PRELIMINARY WSPRO BACKWATER CALCULATIONS
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14	BAKER CHANNEL BRIDGES
15	FALLEN TREE AND BERM

INTRODUCTION

The maintenance history, rainfall, and physical geometry of the basin before and after the 4-day storm caused the flooding of I-4. The August rainfall, before the storm, had partially filled available wetlands storage, causing more rainfall runoff. Both Baker and Pemberton Creek watershed basins are capable of storing large amounts of runoff. This has buffered past storms from significant flooding.

AREA DRAINAGE HISTORY

CANAL MAINTENANCE

From 4-6 years ago, according to FDOT maintenance employees, the I-4 culvert was flowing full in heavy rainfall events. Their concern was voiced to SWFWMD and Hillsborough County.

Both in 1982 and 1986, the County reacted by "maintenance" cleaning (not any bottom excavation, as not allowed by a DER permit) Baker Creek from I-4 to Thonotosassa Bridge. The cleaning was permitted in 1986 through the Department of Environmental Regulation. This permit was for only maintenamce cleaning, the bottom of the channel was not allowed to be dredged. The 1986 cleaning was verified by Ron Michelis (2908 Pemberton Creek Drive), as he recalled the County cleaning out the channel.

According to the County, in 1987 the channel section from US 92 to I-4 was also cleaned out.

LAKE THONOTOSASSA WATER LEVELS & OUTFALL STRUCTURE

Looking at the past lake levels from the U.S.G.S. Water Resources Data texts for 1981 and 1986, the lake has been held at 36.5 NOS, as the rainfall amounts allowed. The highest previous recorded lake level was in August 18, 1967 at an elevation of 38.55 NOS. The peak level for this storm was 38.62 on September 9th at 11:55 am (SWFWMD).

In 1975 the outfall structure was installed to maintain the lake level at 36.50 NOS. There were two public meetings, one in 1973 and the other in 1980, that set the 36.50 elevation as the maximum desirable water elevation.

The outfall structure was not designed to be a flood control structure. Flood waters may pass through two 3' X 12'sluice gates and two 8' long weirs set at elevation 33.2 NOS. (There are stop logs that can be installed to raise the weir elevations several feet.) Flood waters are also designed to flow around the structure, overtopping the access road starting at elevation 37.5 +/-. This is what happened during the peak flows of this storm event.

RAINFALL ANALYSIS

Below is a chart of the adjacent cities rainfall amounts within or near the Baker and Pemberton Creek basins for this storm.

AGENCY	RAINFALL LOCATION	SEPTEMBER 1988 4	5	6	7	8	9	10
N WEATHER SERV.	TAMPA AIR	0.38	.67	3.6	1.9	1.73	.81	0
CHANN 8	TAMPA	0	1.9	3.60	3.15	2.24	.30	.39
N.WEATHER SERV.	RUSKIN	.13	1.41	3.89	4.11	.73	.67	???
FORESTRY SERV.	PLANT CTY	.12	3.72	4.40	2.72	.90	.02	.08
FORESTRY SERV.	LAKELAND	0	2.9	3.46	.76	.18	.15	0.0
FORESTRY SERV.	VALRICO	0	4.50	6.00	.80	.90	0	.50
	AVERAGE	.10	2.51	4.16	2.24	1.11	.32	.16

Unofficial rainfall tallies include only total rainfall amounts:
Brandon 4-9th 13.6 inches
Parrish 4-9th 14.1 inches

Other extreme 24 hour rainfall events include: 12.11...July 1960, 11.84...May 1979, 5.53...June 1974, 5.37...August 1949, and an event that cause extensive damage to this basin (as noted in the Pemberton creek report) 5.20...March 1960. Further rainfall information can be obtained by visiting the Ruskin weather service office.

Event Comparisons:		5 year	10 year	25 year
	1 day	7.0	8.1	9.4
	2 day	8.0	9.1	11.5
	4 day	9.2	10.5	14.0

	STORM DURATION	YEAR EVENT
Plant City	2	5
	4	15
Valrico	2	19
	4	17
Tampa	2	4
	4	10

The rainfall pattern was heavy rainfall then a steady lighter rainfall. This would rapidly fill the wetlands storage areas, then the a higher percentage of the remaining lighter rainfall would become flooding runoff.

DRAINAGE BASIN CHARACTERISTICS

BASIN GEOMETRY

Two basins totaling about 45 square miles (SM) converge at Baker and Pemberton Creeks. Pemberton Creek flows from Plant City into Baker Creek draining about 24 SM. Baker Creek drains about 21 SM from the south of the Interstate (see appendix).

Baker Creek then flows into Lake Thonotosassa. Lake Thonotosassa then outfalls through a SWFWMD controlled drainage structure into Flint Creek. Flint Creek flows into the Hillsborough River, and the Hillsborough River then either directly flows into Hillsborough Bay, or the Tampa By-Pass Canal.

BASIN STORAGE VOLUMES

Taken from U.S.G.S. 2000 scale quadrangle maps, listed below are flood storage volume rough estimates. This volume of water ponded around the Pemberton Creek subdivision, flooded I-4, and flooded an area just around US 92 southward past SR 574 (see Baker Creek Watershed map).

The volume estimates are:

		elevation (NOS)	volume (AF)
A) South of SR 574	=	42.0	43.2 (Lake Hooker)
		45.0	287.4
		48.0	12.8
		50.0	225.9
B) South of I-4 and US 92	=	38.0	151.8
		40.0	120.3
		45.0	431.6
		48.0	99.2
		50.0	522.5
C) South of Lake Thonotosassa	=	36.0	6.4
		38.0	197.4
		39.0	72.5
		40.0	370.0
		45.0	505.9

To add the areas from elevation 36.0 to 45.0:

36.0	6.4	40.0	490.3
38.0	349.2	45.0	1224.9
42.0	43.2		

This storage within the Baker Creek basin is important to the residents around Lake Thonotosassa, since if all this water was conveyed into the lake, the lake level could have raised about 3 feet. So the flooding of I-4 actually helped the homeowners around Lake Thonotosassa by attenuating the storm surge.

Within the Pemberton Creek basin there are three main storage areas: Mud Lake, Cork Pairie, and the Moore Lake area. There is also a large wetlands area just to the north of Plant City that could have drained to the normal limits of the Pemberton Creek basin. This extra runoff could have maintained flow in Pemberton Creek for several days.

CHANNEL FLOOD STAGES AND FLOWS

Surveyed cross sections taken by the Department show that a 1000 LF section of Baker Creek located about a mile north of Muck Pond road had about 2.5 feet of headloss. Within this section there was a narrowing of the channel and a large tree had fallen into the channel restricting the flow.

High water marks indicate that a fallen tree (station 4630) limited the flow and raised the flood stage. This was the most restrictive blockage in the outfall channel. The flow was also constrained by a 6-8 foot high berm on the east side of the channel. Heavy sediment deposition also occured just upstream of this blockage.

Three driveway bridges recently constructed across the channel just south of this area probably had little significant flow restriction.

The need to dredge Baker Creek to increase flow capacity must be balanced with the environmental concerns of the area, and with the protection of downstream areas against increased flooding.

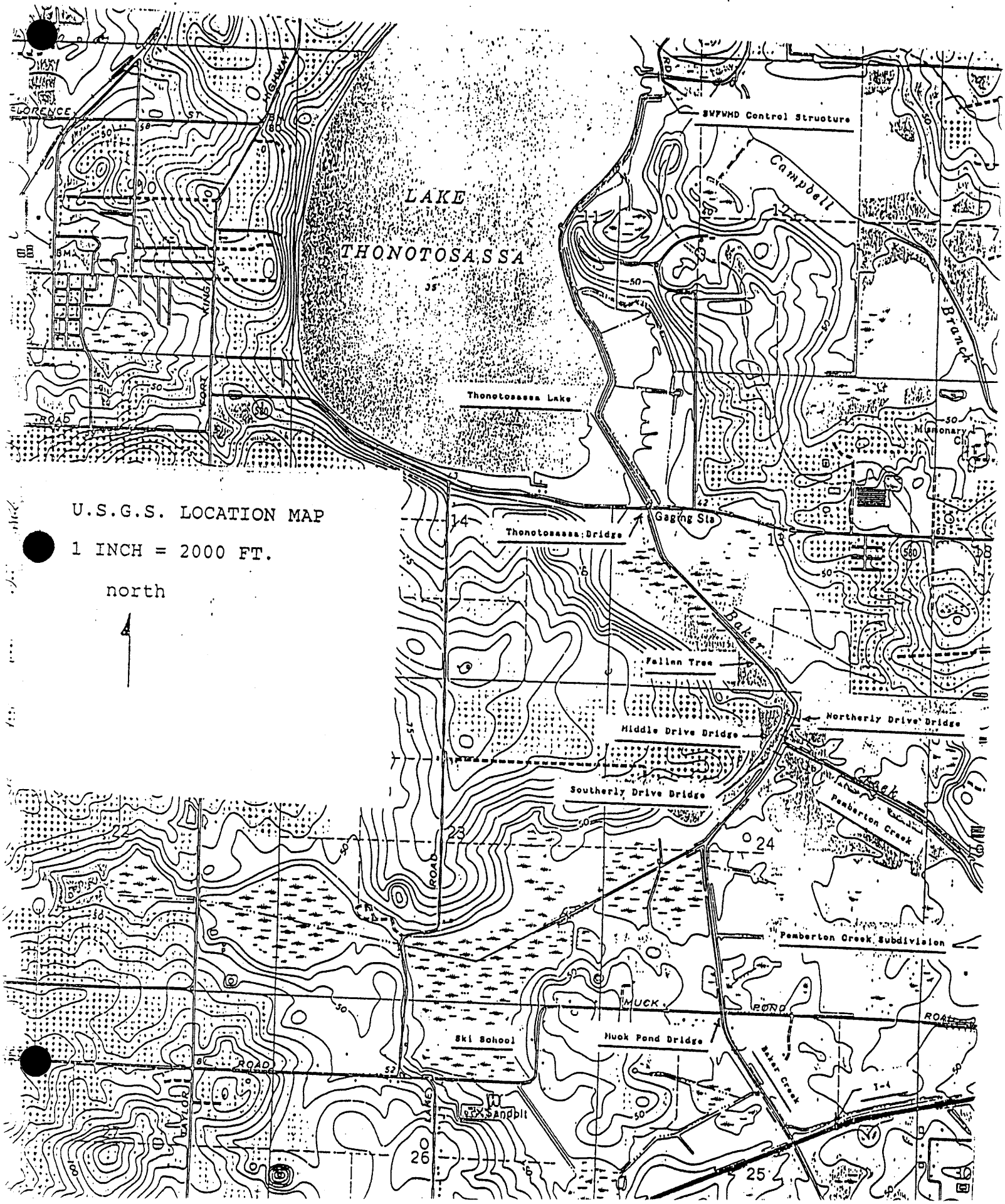
MAJOR FLOODING CAUSES

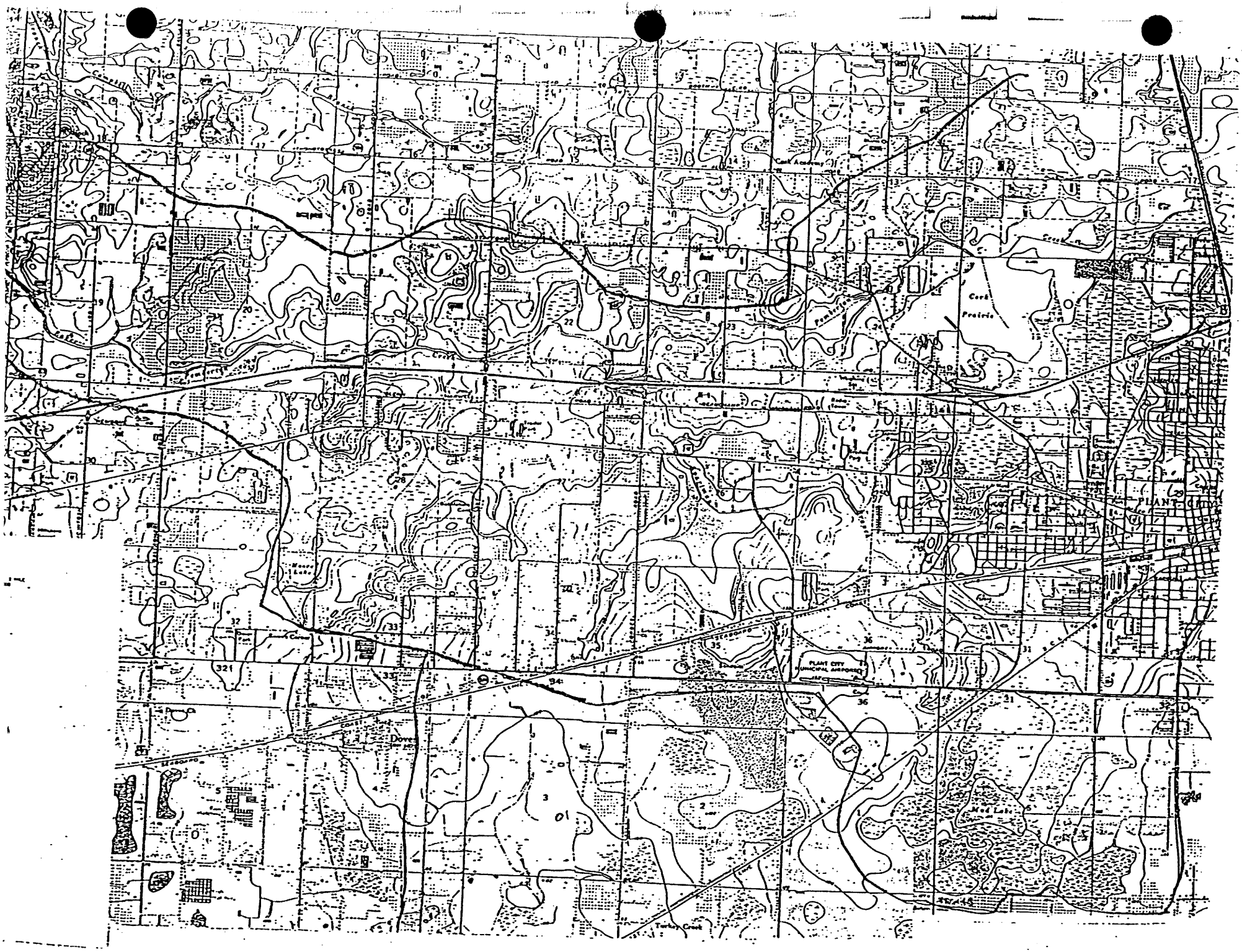
1. TOO MUCH RAINFALL: This storm event allowed all the storage areas to fill, converting more rainfall directly into runoff. The prior August rainfall partially filled the wetland storage areas.

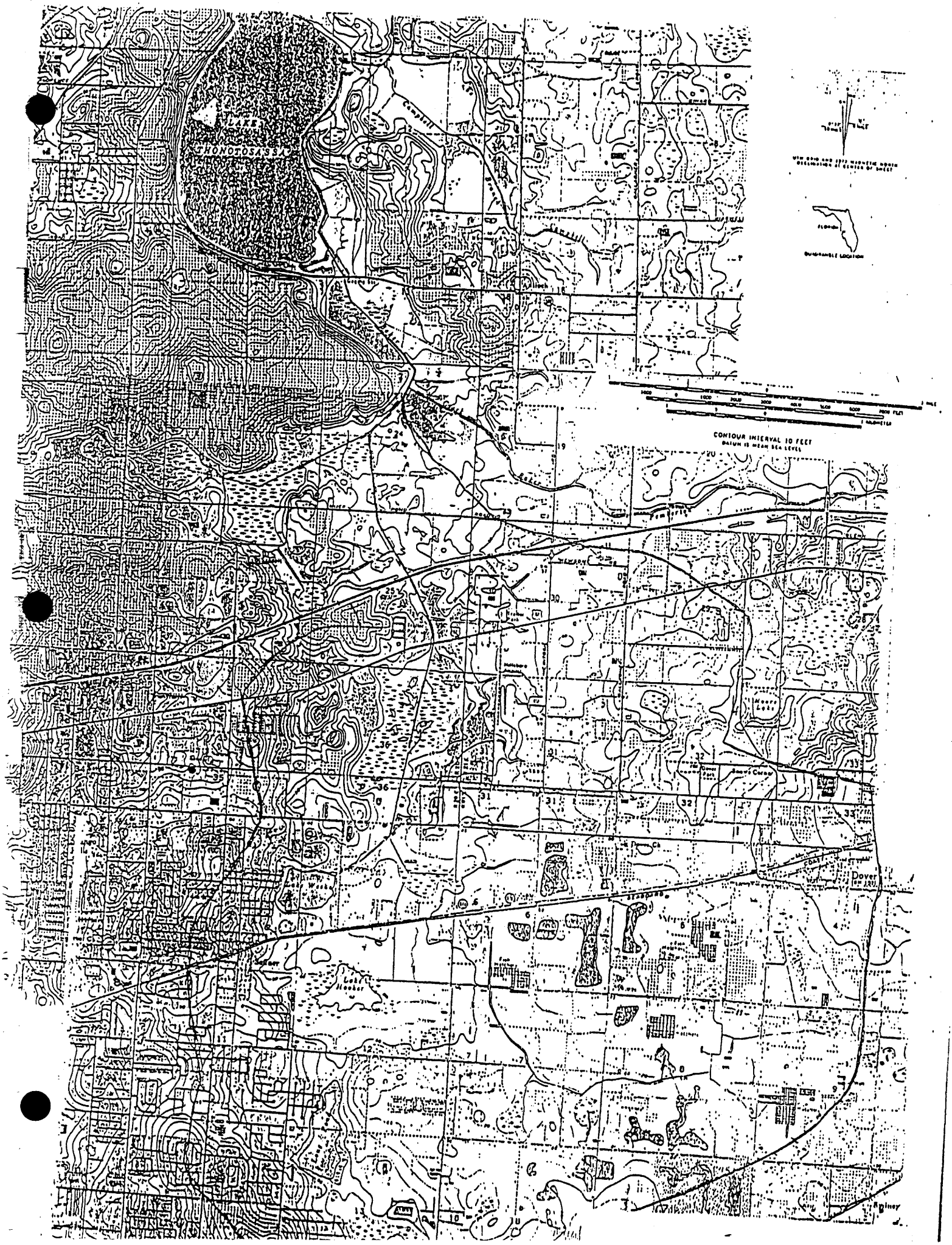
2. NOT ENOUGH CHANNEL CONVEYANCE: Over a decade the channel has filled-in due to sediment transport. Some residents have attributed the high water in the Baker Creek channel over the last 10 years as causing the channel banks to slough-in, thus decreasing critical flood flow capacity.

3. POOR CHANNEL SMOOTHNESS (n-value): Throughout the Baker Creek channel debris increased energy losses, decreasing the peak flow.

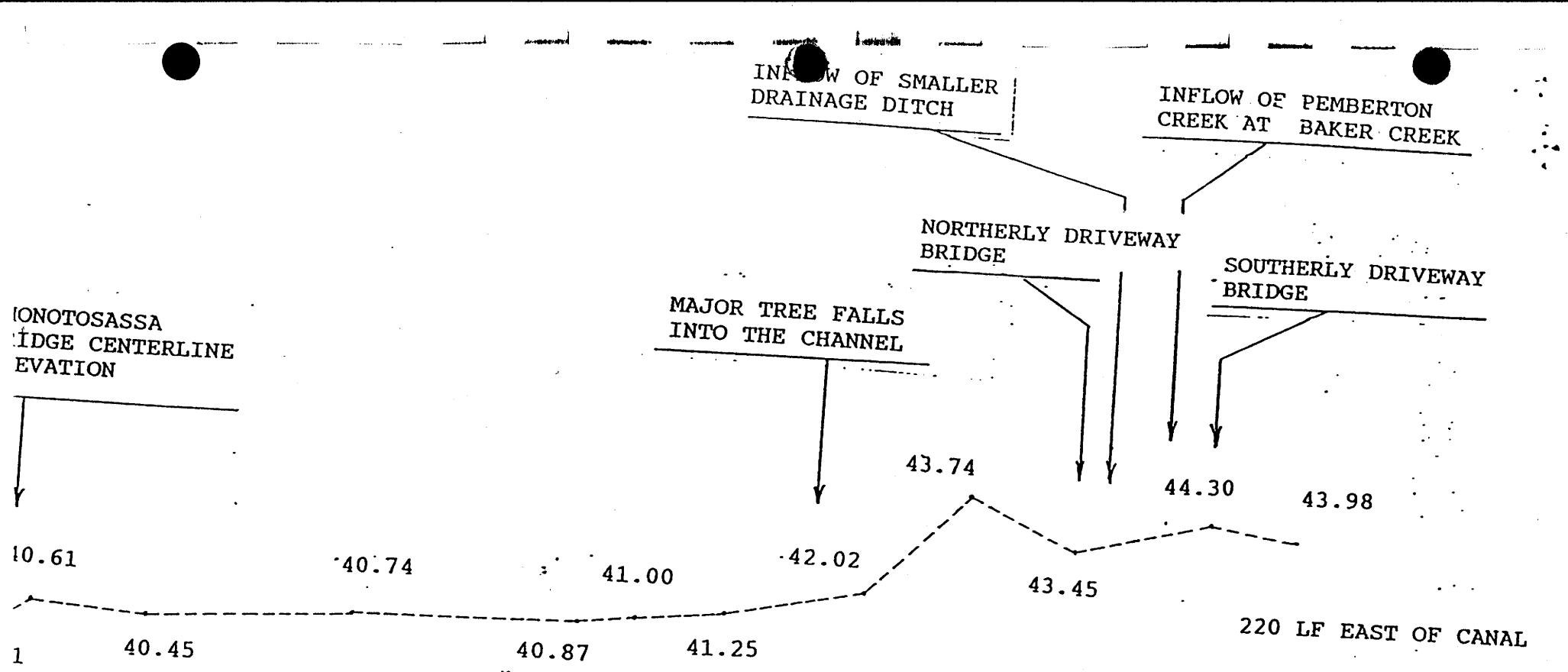
4. The highest flood level of Lake Thonotosassa, at 38.7 did not effect the flooding upstream at Pemberton Creek Subdivision. Note the rapids shown in the photographs indicating potential available hydraulic fall.


LAKE
THONOTOSASSA
SWFWMD Control Structure
Campbell
Branch
Thonotosassa Lake
Gaging Sta
Thonotosassa Bridge
Baker
Fallen Tree
Northerly Drive Bridge
Middle Drive Bridge
Southerly Drive Bridge
Pemberton Creek
Pemberton Creek Subdivision
MUCK
POND
ROAD
Ski School
Muck Pond Bridge
Baker Creek
Sandpit
HIGHWAY
FLORENCE
KING
FORT
TAYLOR
LAKE
ROAD
U.S.G.S. LOCATION MAP
1 INCH = 2000 FT.
north


Coral Academy
Coral Prairie
PLANT
PLANT CITY MUNICIPAL AIRPORT
Dover
Turkey Creek


LAKE
THONOTOSASSA
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
Dover


LAKE
THONOTOSASSA
STA 0
STA 1000
STA 2000
STA 3000
STA 4000
STA 5000
STA 6000
STA 7000
STA 8000
Gaging Sta
Baker
Creek
Campbell
FLORENCE
KING
FORT
ROAD
MUCK
POND
ROETT
TAYLOR
Sandpit
Trailer
Park



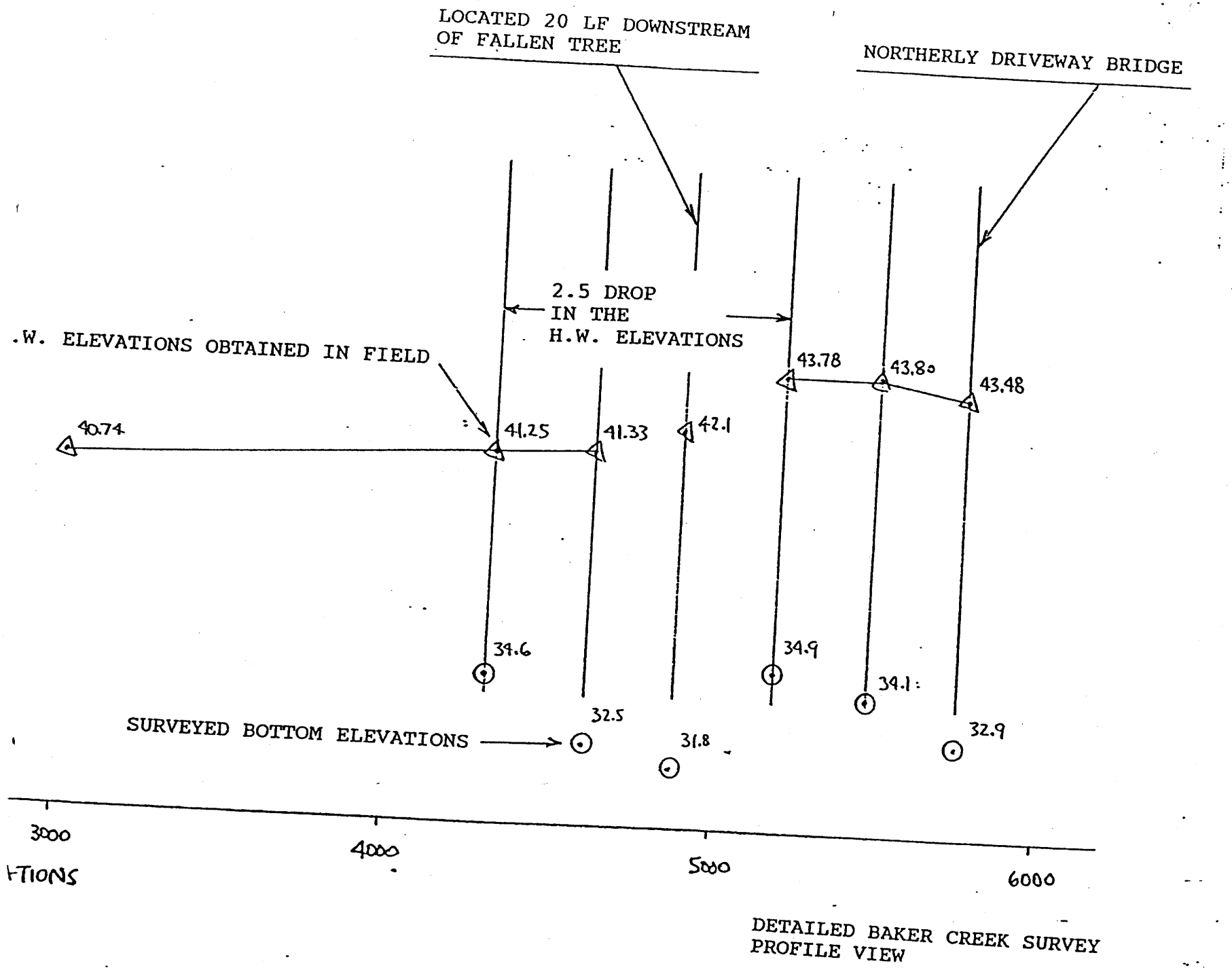
HIGH WATER ELEVATIONS
OCCURRED ON 9/8/88 NEAR MIDNIGHT
(per local residents)

H.W. elevations were determined by marks and debris after the flood event. The dashed lines interconnecting these elevations are assumed and may NOT represent the actual profile.

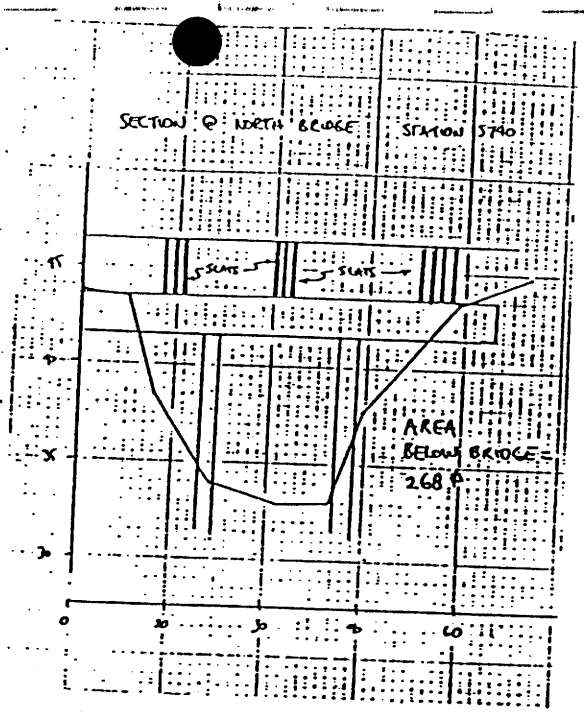
2000 3000 4000 5000 6000 7000

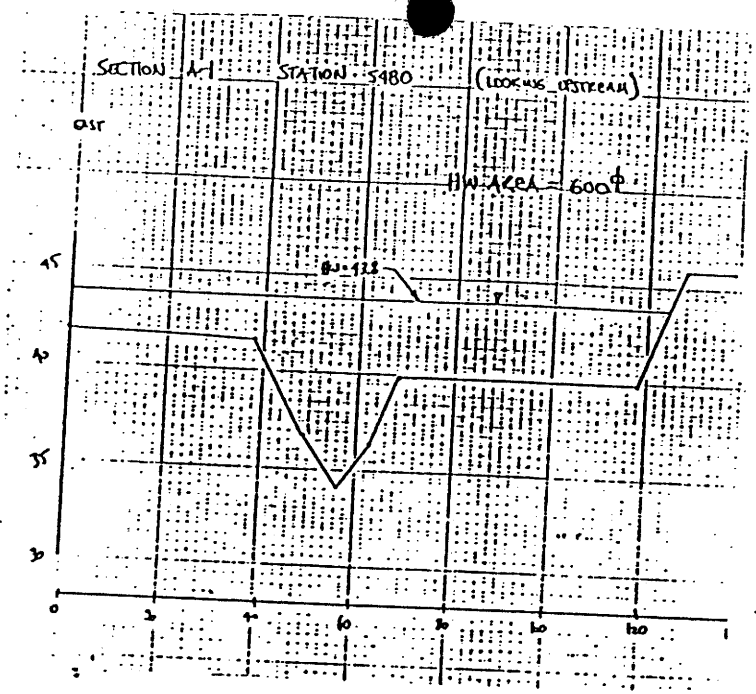
HIGH WATER ELEVATIONS ON BAKER CREEK

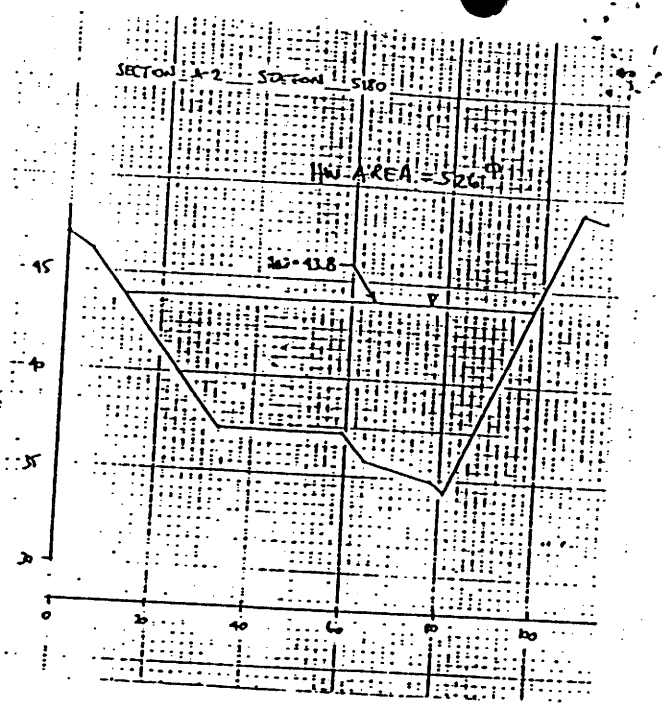
From Thonotosassa Bridge to the Northerly Driveway Bridge

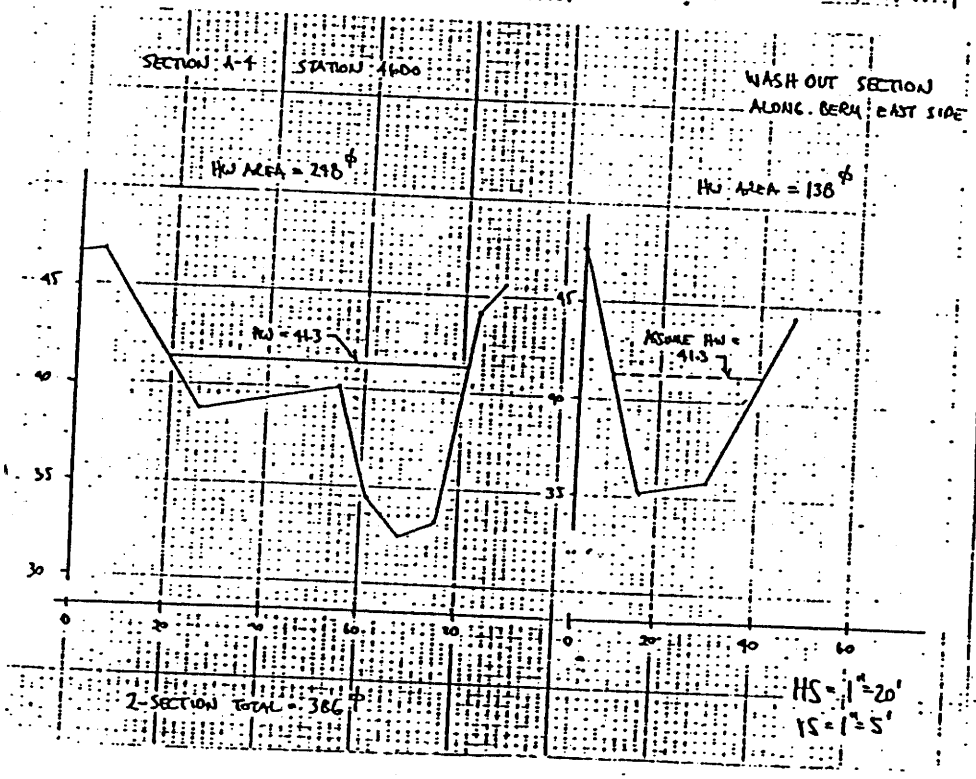


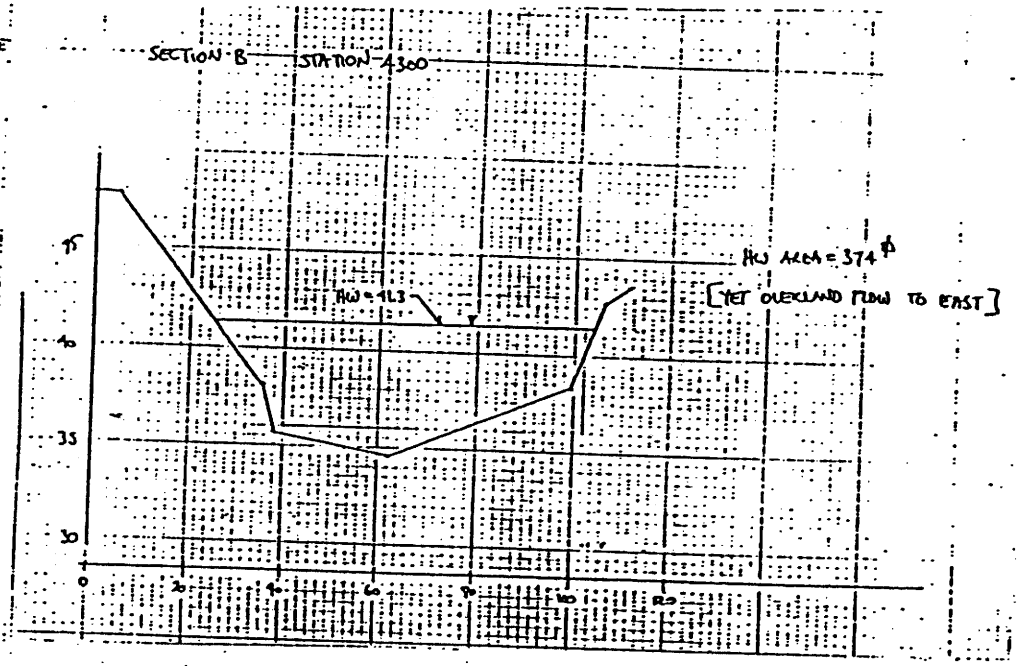
DETAILED BAKER CREEK SURVEY
PROFILE VIEW







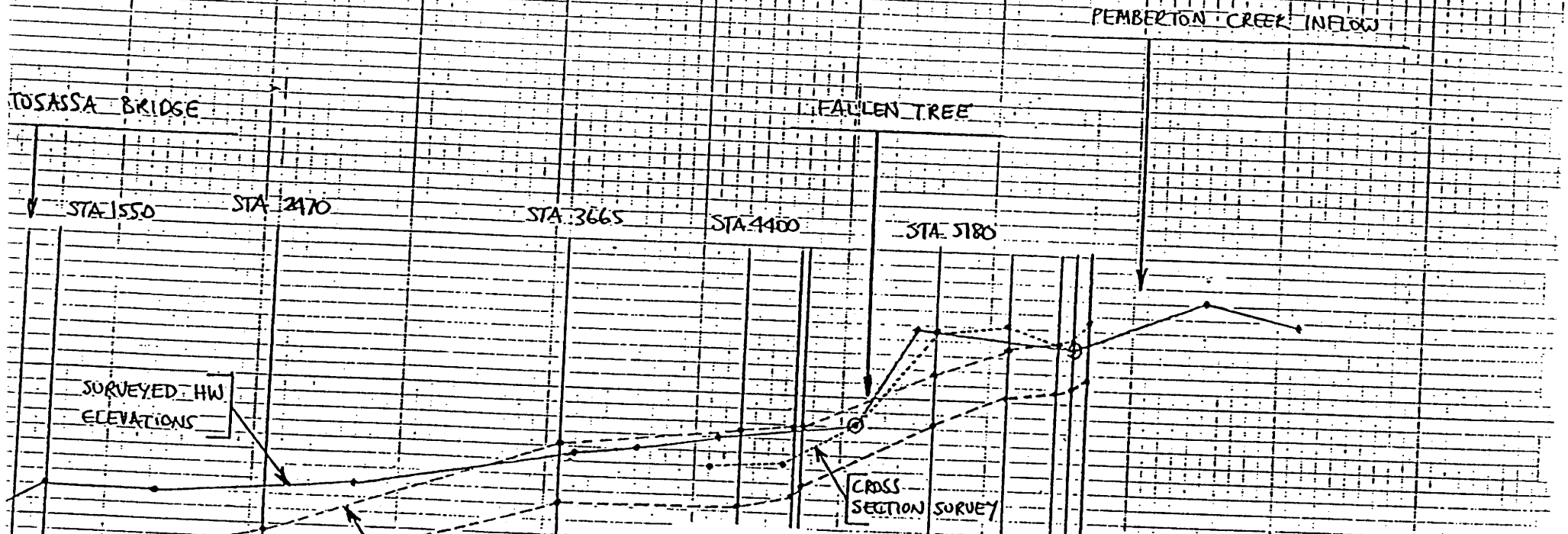




DETAILED BAKER CREEK SURVEY

CROSS SECTION VIEW

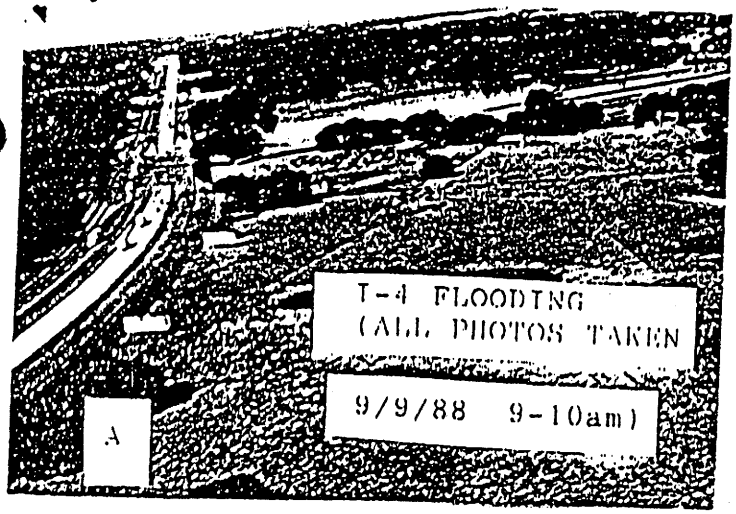
WATER CALCULATIONS



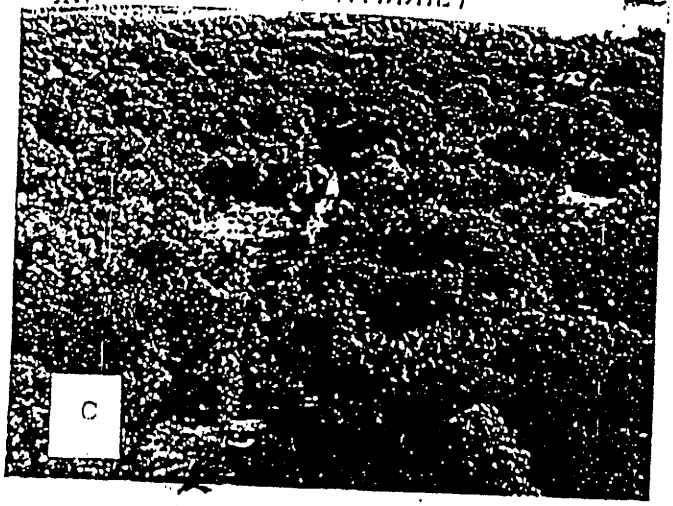
WSPRO is a Federal Highway Administration developed water-surface profile computation model. This program calculates the waterlevels within a river reach given the river flow. In this case two separate flows were run: 600 CFS and 1000 CFS. This section of Baker Creek was surveyed for high water (HW) elevations and plotted on this graph as the solid line. Notice that the HW marks remain rather flat until the section between STA 4400 and 5180.

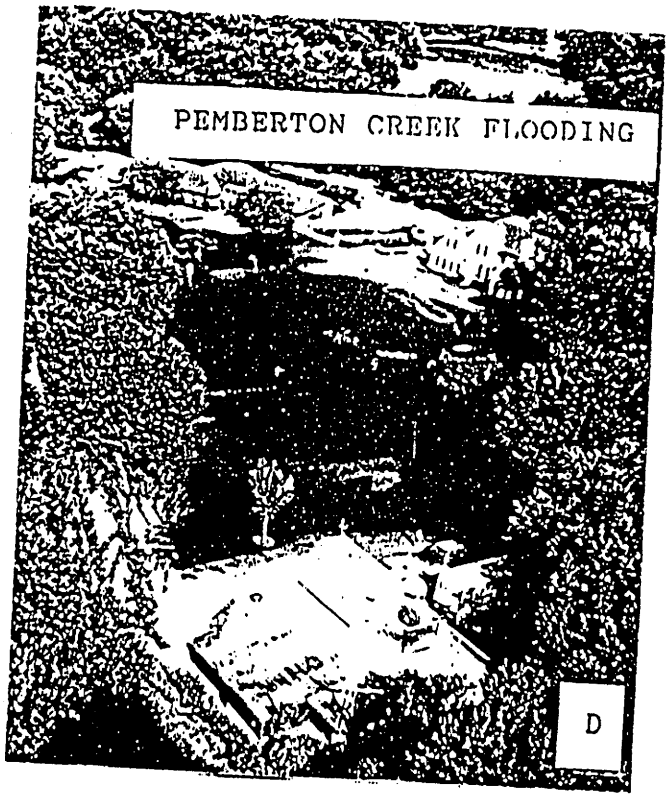
More survey is needed for channel bottom elevations between STA 920 and STA 4400. The WSPRO elevations do not correlate well in this section. The hydaulic losses across the fallen tree are also very difficult to model with WSPRO.

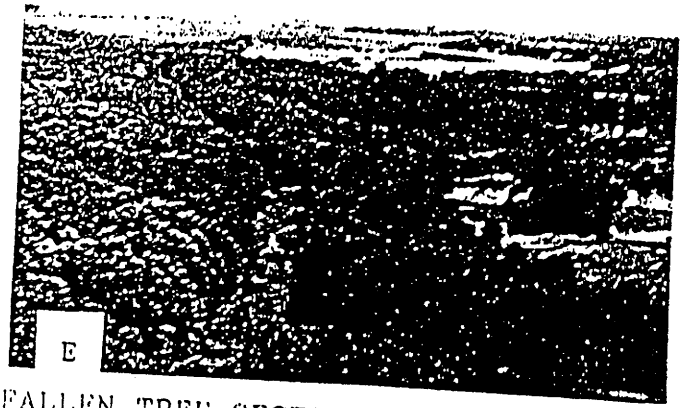
The WSPRO information is only speculative at this stage of analysis as more channel sections are needed. The 1000 CFS flow approaches the surveyed HW marks taken along the channel, but this flow estimate could vary by +/- 200 CFS.



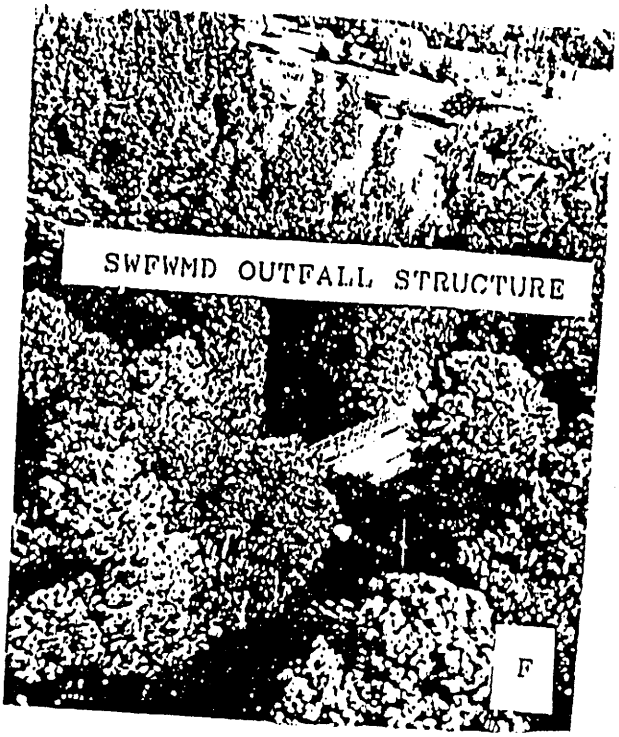
BAKER CREEK DRIVE BRIDGES
(SOUTH AND MIDDLE)

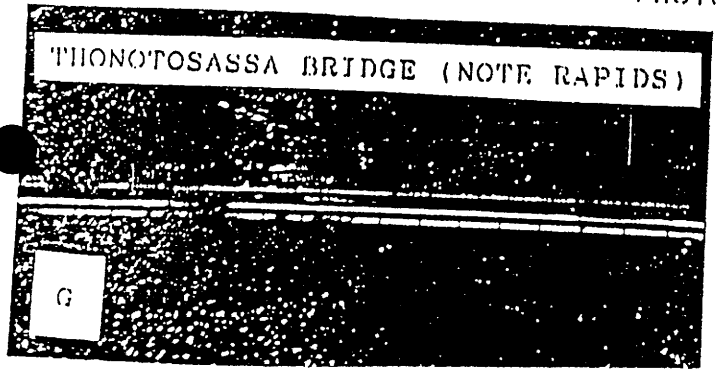






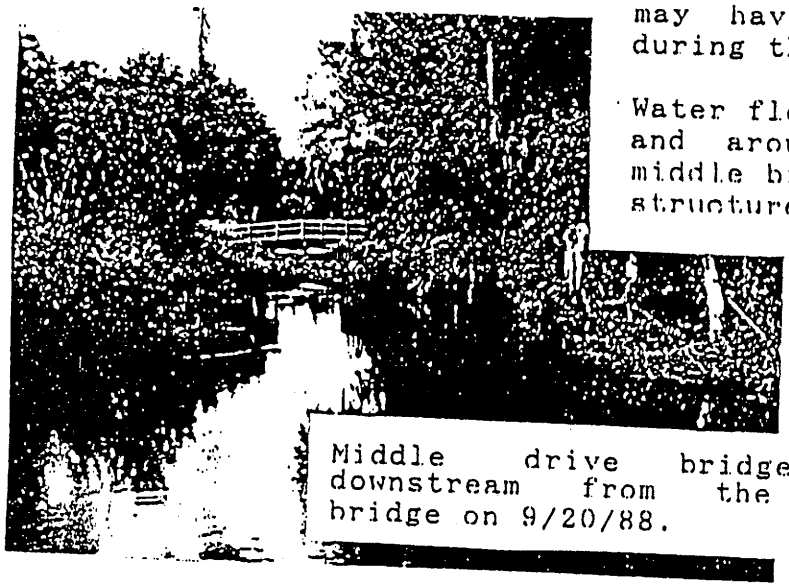
FALLEN TREE SECTION (MIDDLE OF PHOTO)



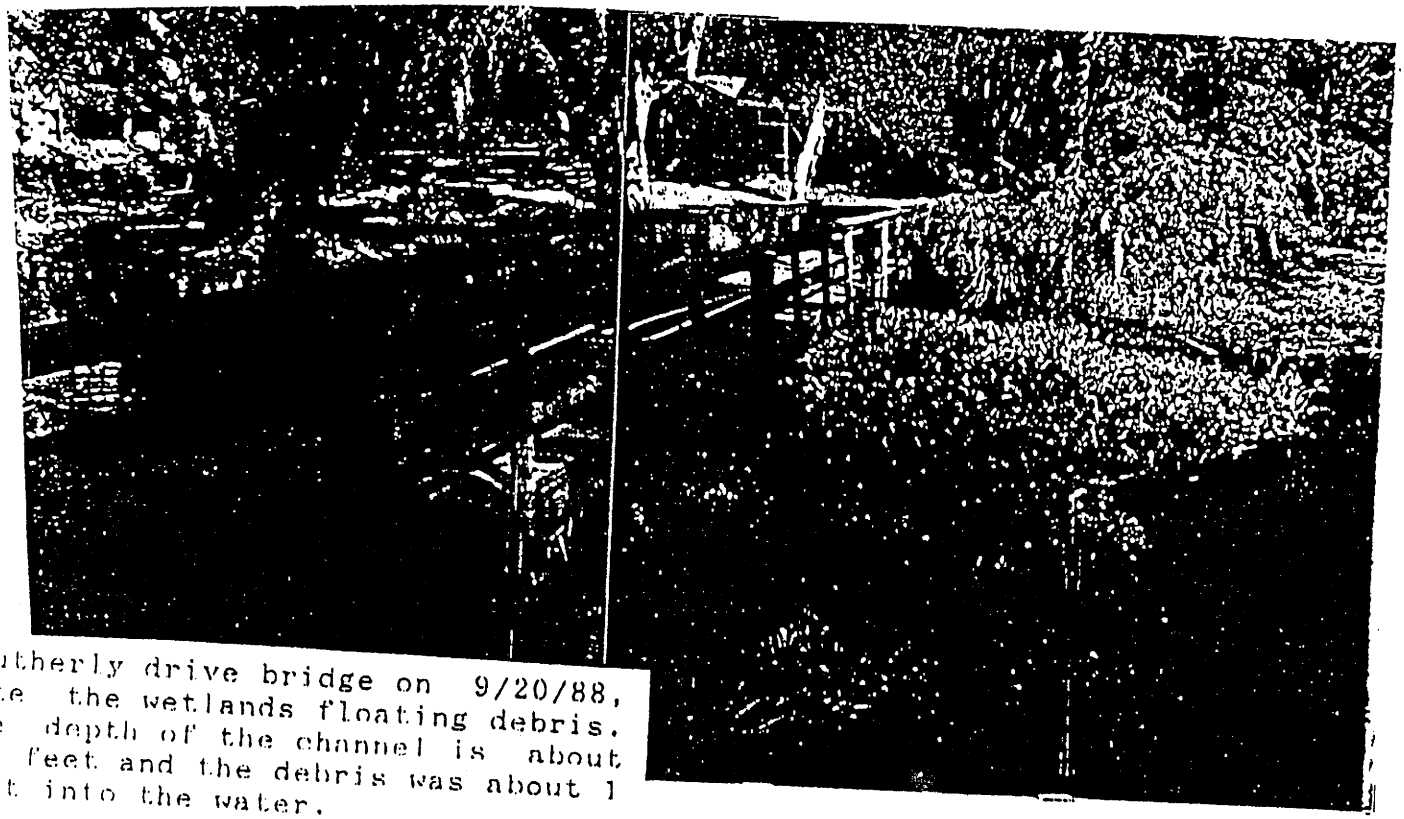


It is doubtful that these three bridges caused significant headloss within Baker Creek. Possibly the northerly bridge may have caused 0.5 ft. of headloss during the height of the storm.

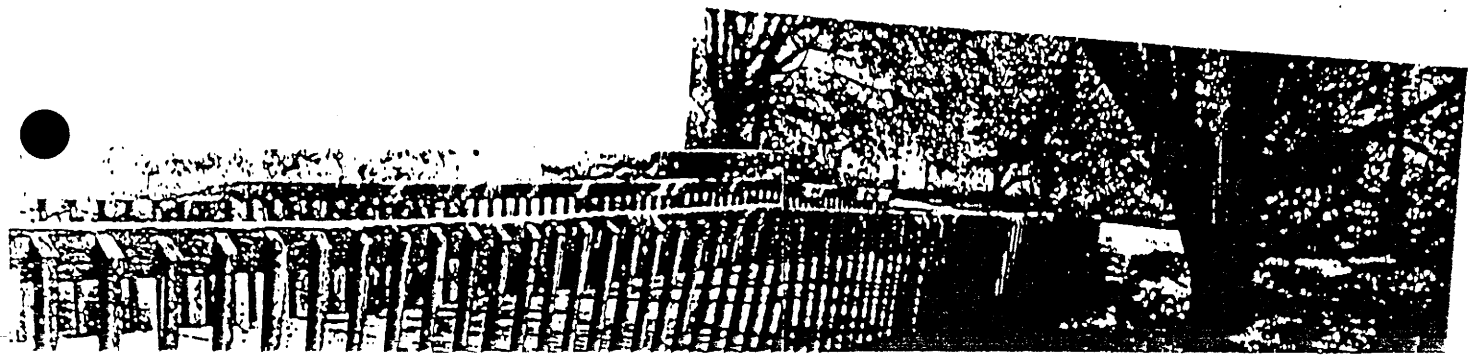
Water flowed around the southerly bridge and around the northerly bridge. The middle bridge was not a flow restricting structure.

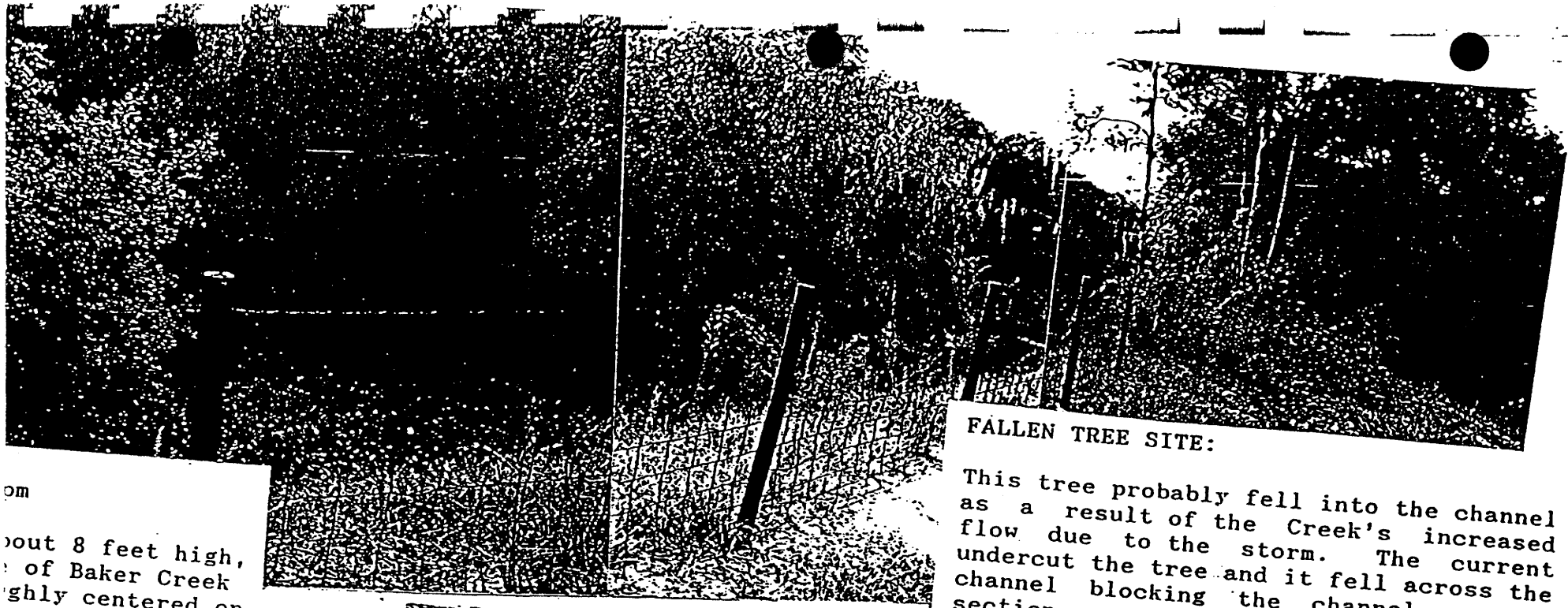


Middle drive bridge looking downstream from the southerly bridge on 9/20/88.



Southerly drive bridge on 9/20/88, note the wetlands floating debris. The depth of the channel is about 7.5 feet and the debris was about 1 foot into the water.





om

out 8 feet high,
of Baker Creek
ghly centered on
e fell into the
probably built

FALLEN TREE SITE:

This tree probably fell into the channel as a result of the Creek's increased flow due to the storm. The current undercut the tree and it fell across the channel blocking the channel cross-section.

APPENDIX II

INTERSTATE 4

Section 10190 -- State Road 400

Traffic Statistics

Prepared By
Florida Department of Transportation
District Seven
Traffic Operations -- Safety

July, 1991

EXECUTIVE SUMMARY

Interstate 4 in Hillsborough County, an aging, major commuter, commerce, and tourist route, is subject to daily traffic volumes well in excess of its intended capacity. Recurring congestion and a high traffic crash rate has brought this roadway into the public eye, with demands for improvements being voiced almost daily. Extremely high estimated construction costs for needed improvements have postponed potential widening and reconstruction projects to a point well beyond the District's Five Year Plan.

This report documents the capacity and safety problems currently being experienced on the 25 miles of Interstate 4 in Hillsborough County. It also compares Interstate 4 with a 165 mile section of Interstate 75, from the Georgia state line to Sumter County, which the Department has identified as having a high priority for widening.

Key points of the comparison are:

- Interstate 4 in Hillsborough County experienced almost five times as many crashes per mile as the portion of Interstate 75 to be widened.
- The crash rate for Interstate 4, in crashes per million vehicle-miles, was almost twice the rate for the highest section of Interstate 75 (the 35 mile section through Alachua County).
- The section Average Daily Traffic (ADT) along Interstate 4 is more than twice the ADT for any section of Interstate 75.
- The highest spot ADT along Interstate 75 is less than the lowest spot ADT along Interstate 4.

The reassignment of Interstate construction priorities is the remaining option for the acceleration of Interstate 4's reconstruction schedule. It is hoped that this report prompts further review of the Department's priorities for project funding.

1. INTRODUCTION

Interstate 4 through Hillsborough County, as shown in Figure 1, is a four lane limited access highway designed and built during the late 1950s and early 1960s. The interstate serves as the major east-west arterial between Tampa and Lakeland, carrying significant commuter traffic every weekday morning and evening. During the winter months, it also serves as a tourist pipeline between the Florida Suncoast and Disney World and its surrounding attractions.

Between the Interstate 275 interchange in downtown Tampa and the Hillsborough / Polk County line, the 25 miles of Interstate 4 assume both urban and rural characteristics. West of Interstate 75, Tampa's urban sprawl surrounds the corridor, and speed limits range from 50 to 55 miles per hour. To the east, the roadway opens up, at 65 miles per hour, past Tampa's outlying suburban communities, through Plant City, to the county line.

The state of the art of freeway design has changed significantly since Interstate 4 was conceived in the late 1950s. Several roadway design elements, obsolete by today's standards, are now appearing as operational deficiencies along the corridor; primary examples include bridge structures with no shoulders, short acceleration lanes for on-ramps, a median width of 40 feet, and a "roller-coaster" vertical alignment.

Concurrently, the rapid growth of the Tampa Bay area has placed a traffic demand on Interstate 4 that far exceeds its intended design capacity. "Rush hour" conditions occur throughout most of the day, and extremely heavy congestion regularly clogs the west end during the peak commuter hours.

The combination of the obsolete design features and the continually increasing traffic demands has resulted in a significant increase in the number and the severity of traffic

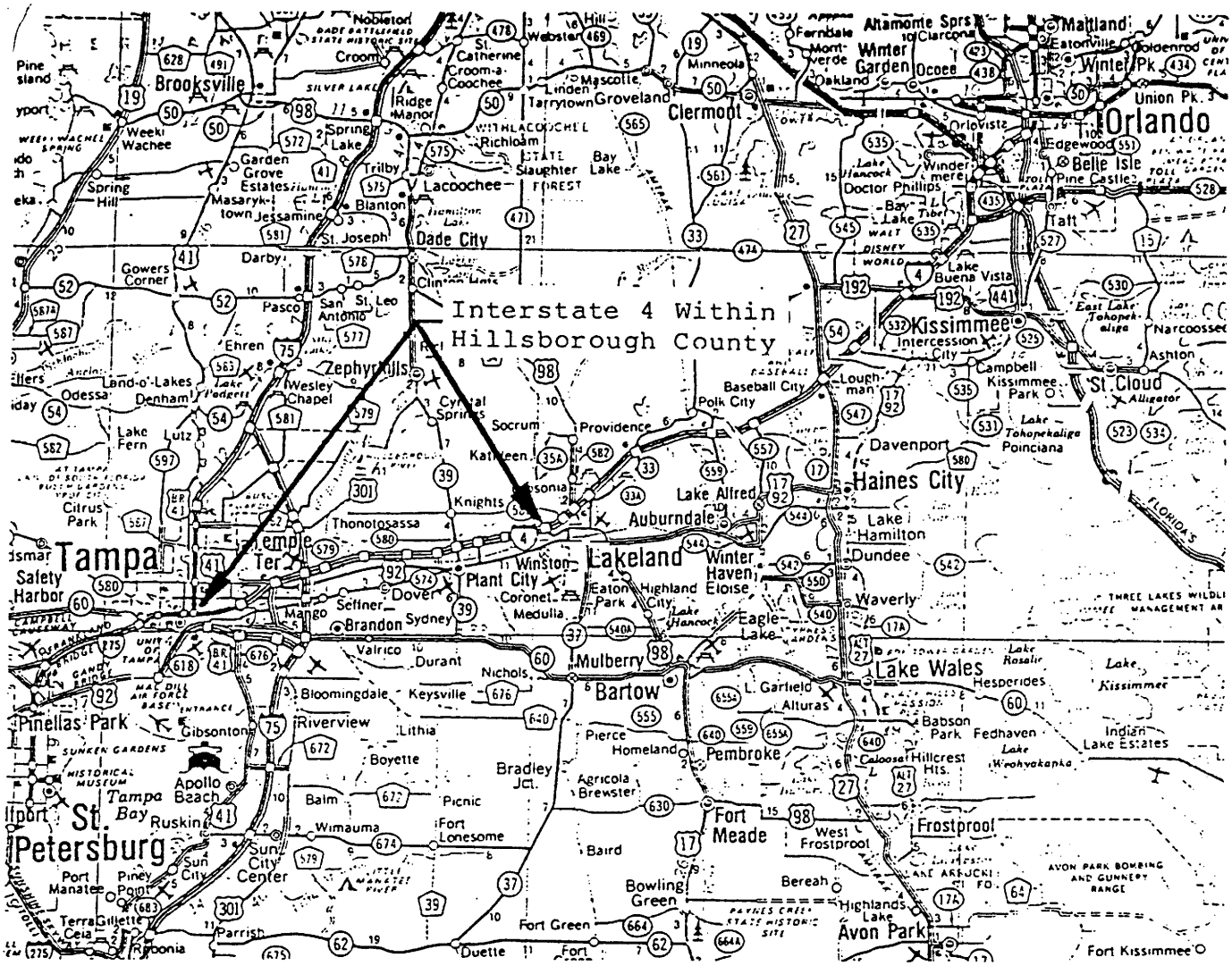


FIGURE 1
INTERSTATE 4 STUDY AREA

crashes. Lane changes, traffic merging from on-ramps, and "shock-waves" (the braking of faster moving vehicles as they approach an area of congested traffic) can all result in crashes. When coupled with the relatively "unforgiving" 1950s design elements, a minor "fender-bender" can quickly escalate into a serious situation.

The Tampa Interstate Study, completed in 1989 by a consultant team headed by Greiner, Inc., for the Florida Department of Transportation, recommended the complete reconstruction of Interstate 4 between the downtown Interstate 275 interchange and Interstate 75. Other studies have acknowledged the need to perform major improvements, including the addition of lanes and the replacement of overpasses, along Interstate 4 from Interstate 75 to the Polk County line and beyond. Because of budgetary constraints, these massive projects are not programmed before the turn of the century.

An interim project to improve safety along Interstate 4, from 50th Street to the Polk County line, is currently entering the construction phase. This project will update overpass bridge rails and improve guardrail installations on the approaches to structures. In addition, a median guardrail will be installed between U.S. 92 and County Road 579. As funding for subsequent projects becomes available, the median guardrail will be extended toward the Polk County line.

2. ROADWAY CHARACTERISTICS

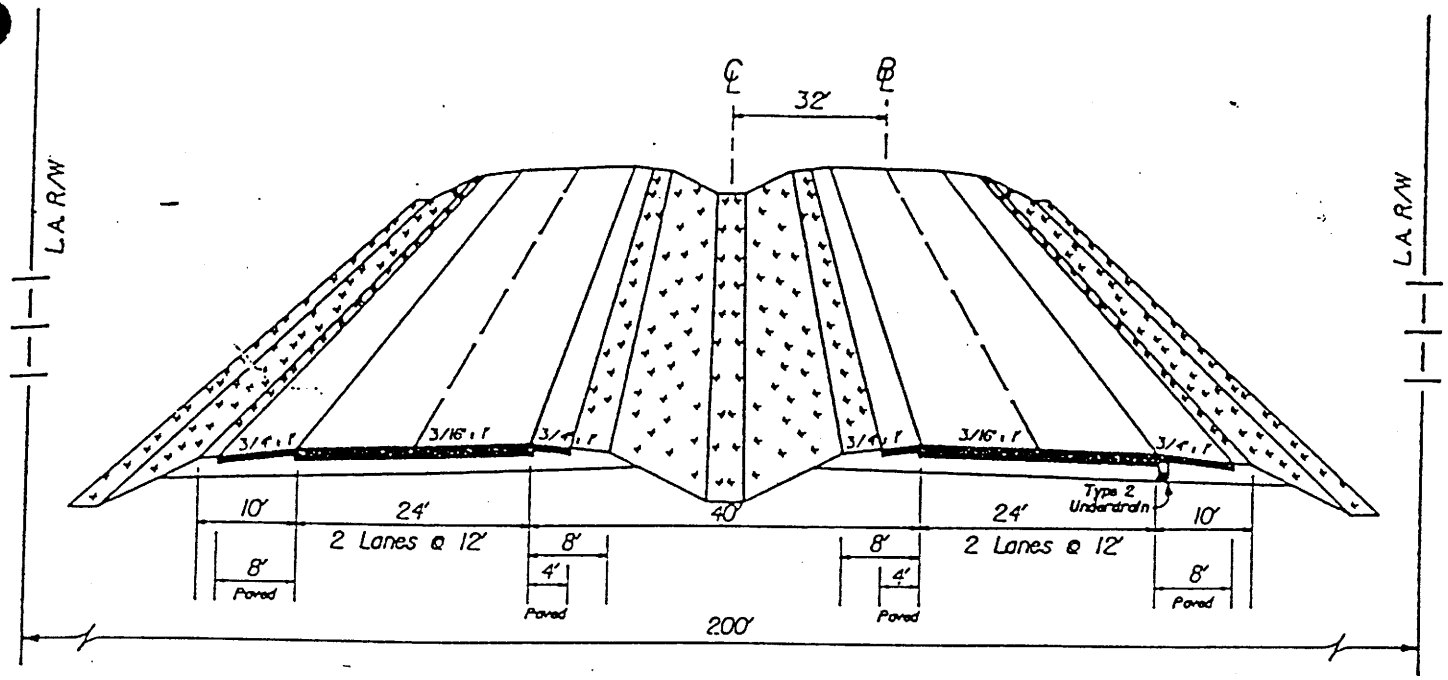
Interstate 4 is a four lane freeway built to the design standards of the late 1950s. Some of these design standards, now obsolete, appear to be contributing to the capacity and safety issues now facing the Interstate.

Typical cross sections for the roadway and overpass structures are shown in Figure 2. Travel lanes have the standard width of 12 feet. Inside (left side) paved shoulders are four feet wide, narrowing to a two foot wide shoulder across bridges. Outside (right side) shoulders are typically eight to nine feet wide, but also narrow to a two foot width across bridges.

The majority of the bridge structures utilize a bridge rail design incorporating a "safety walk", or a two foot wide raised curb in front of the bridge rail. This type of design has been shown to contribute to vaulting actions at some locations.

For the majority of the section, the grass median is 38 to 40 feet in width. Approximately two miles of the section has a 44 foot wide median, and about four miles have a 64 foot wide median. Only a very small percentage of the section has a barrier wall or guide rail along the median.

The alignment of the freeway includes vertical curves that are greater than desired in current freeway design criteria. Particularly evident in the urbanized areas on the west end, the freeway rises to pass over cross streets, then returns to close to the natural grade level. This creates a roller coaster effect, often hiding vehicles stopped due to congestion from the sight of fast moving oncoming traffic. In the outlying areas, some of the vertical curves impact the speeds of the heavier trucks, disrupting smooth traffic flow.



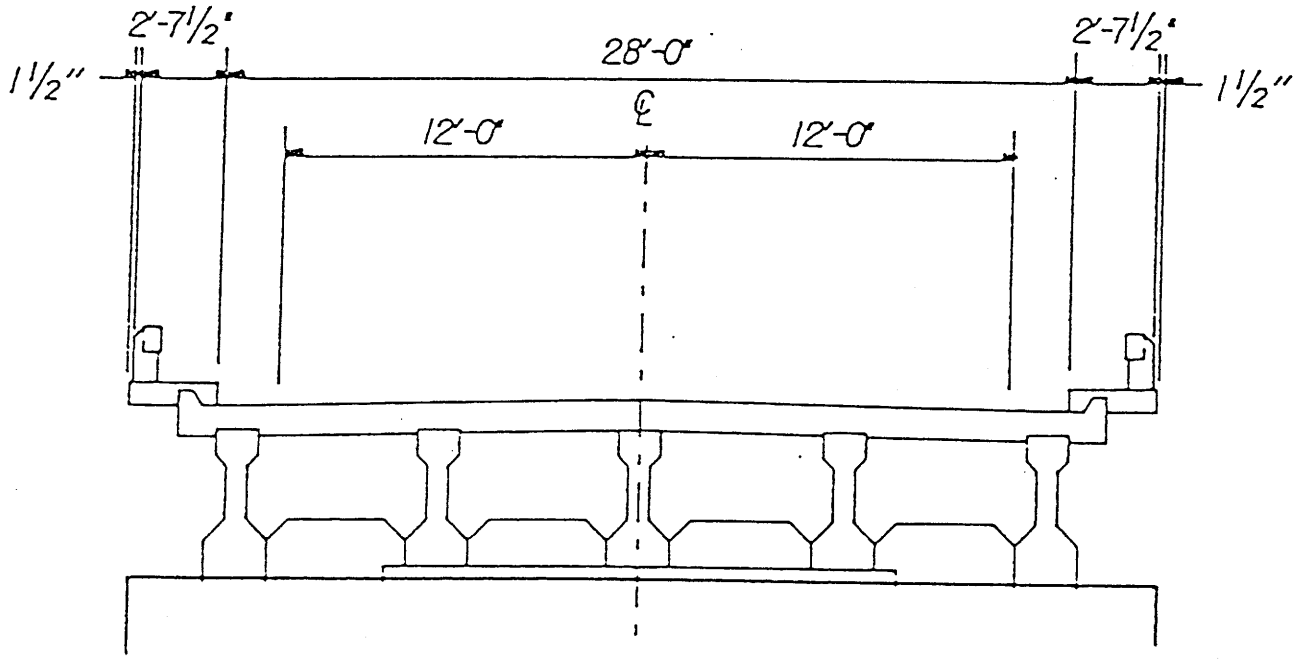


FIGURE 2
TYPICAL CROSS SECTIONS

Fifteen interchanges are located along the 25 mile section of Interstate 4. Eight of these are located in the eight mile section between 21st Street and County Road 579. The close spacing of these interchanges, coupled with short ramps without adequate acceleration lanes, creates weaving actions that cause significant disruption to the main line traffic flow, and contributes to the numbers of rear end and sideswipe crashes occurring along the section.

3. TRAFFIC CHARACTERISTICS

Interstate 4 is the most significant highway connecting Tampa with points to the east. It is a major commuter route, serving Tampa workers living in north Brandon, Plant City, and the numerous smaller communities in eastern Hillsborough County, as well as Lakeland and surrounding Polk County. It is a major tourist route, carrying visitors from the Florida Suncoast to Disney World and other attractions in the Orlando area. And, it is a major trucking and commerce route, connecting the Tampa Bay metropolitan area with Orlando and the east coast of Florida.

TRAFFIC VOLUMES

When highway planners estimate the capacity of a four lane freeway such as Interstate 4, a general rule of thumb is that an Average Daily Traffic (ADT) of 75,000 vehicles per day can be accommodated. This assumes a Level Of Service (LOS) "F" during peak periods, and represents the forced flow of congested traffic. For the more desirable LOS "C", during which traffic flow is stable but still somewhat restricted as to travel speeds, an ADT of 55,000 vehicles per day can be accommodated.

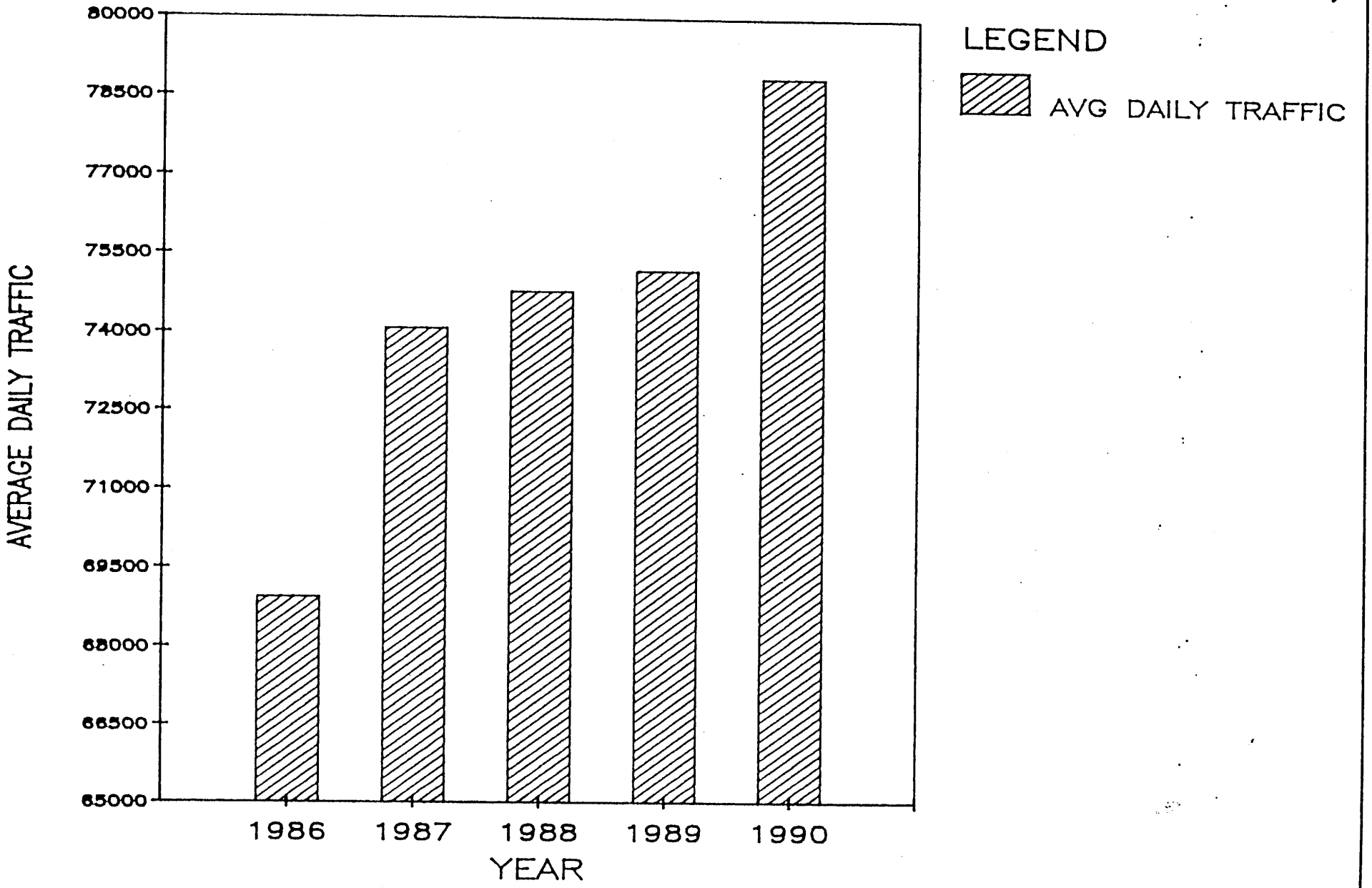
In 1990, the Average Daily Traffic for Interstate 4 ranged from over 128,000 vehicles per day, near downtown Tampa, to approximately 52,000 vehicles per day near the Polk County line. The average traffic for the entire segment is about 79,000 vehicles per day, representing a 14 percent increase since 1986, as shown in Figure 3.

Seasonal impacts on traffic volumes are significant. Volumes increase dramatically during the peak travel months of March and April. Much of this travel can be attributed to the winter tourist population.

FIGURE 3

I-4 AVERAGE DAILY TRAFFIC

(AVERAGE ADT FOR ENTIRE SEGMENT FROM I-275 TO COUNTY LINE)



4. TRAFFIC CRASH HISTORY

During the calendar year 1989, a total of 573 crashes were reported along the Interstate 4 corridor[1]. Twelve persons died in ten fatal crashes, and 490 persons were injured as a result of 277 of the crashes.

Statistics for 1990 show only 516 crashes along the same corridor. This is not believed to reflect a decrease in the number of crashes occurring, however; a change in reporting requirements may have tainted the 1990 data[2]. Supporting this belief is the fact that, during 1990, 20 persons died in fifteen fatal crashes, up significantly from the previous year.

A continuing increase in the number of crashes, deaths, and injuries has been observed over the past several years. Figure 4 shows the number of crashes and injuries, by year, for the past five years. Figure 5 shows the number of deaths for the same time period. These trends tend to reflect the increases in Average Daily Traffic shown previously in Figure 3.

The crashes being reported can be broken down into various types. Rear end crashes were by far the most common, which is to be expected for a freeway with frequent congestion. The second

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[1] A significant percentage of all crashes are never reported to law enforcement authorities, typically when damages are minimal and drivers settle between themselves to avoid the resulting negative impacts on driving records and insurance premiums. These accidents would be particularly common along a congested commuter route. However, because their numbers can not be estimated, they are not included in the analyses in this report.

[2] In addition, the 1990 data was based on a review of crash reports retrieved from local law enforcement agencies, whereas 1989 data came from the Department's RCI database.

FIGURE 4

I-4 TRAFFIC CRASH STATISTICS
(5-YEAR STUDY)

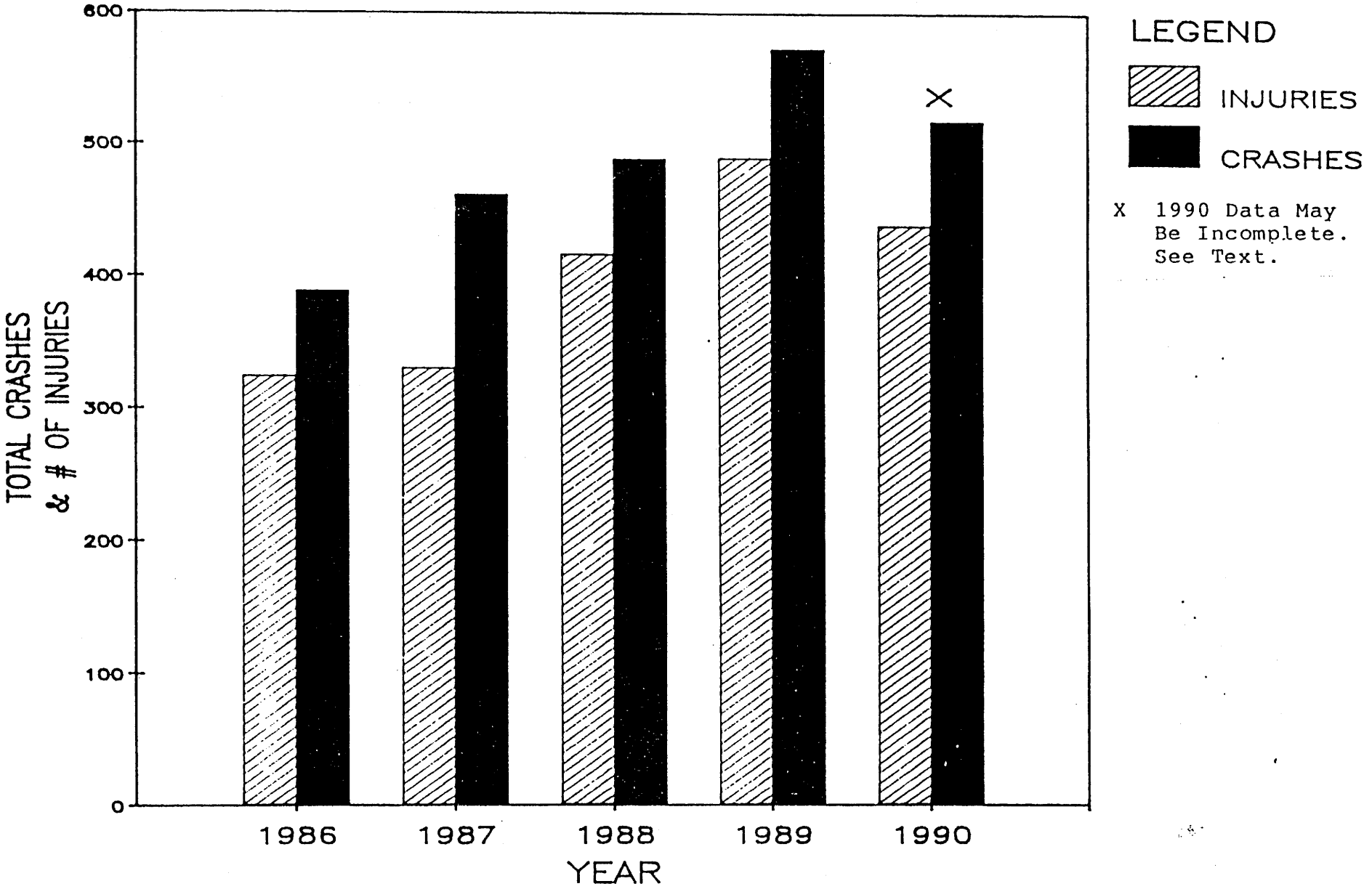
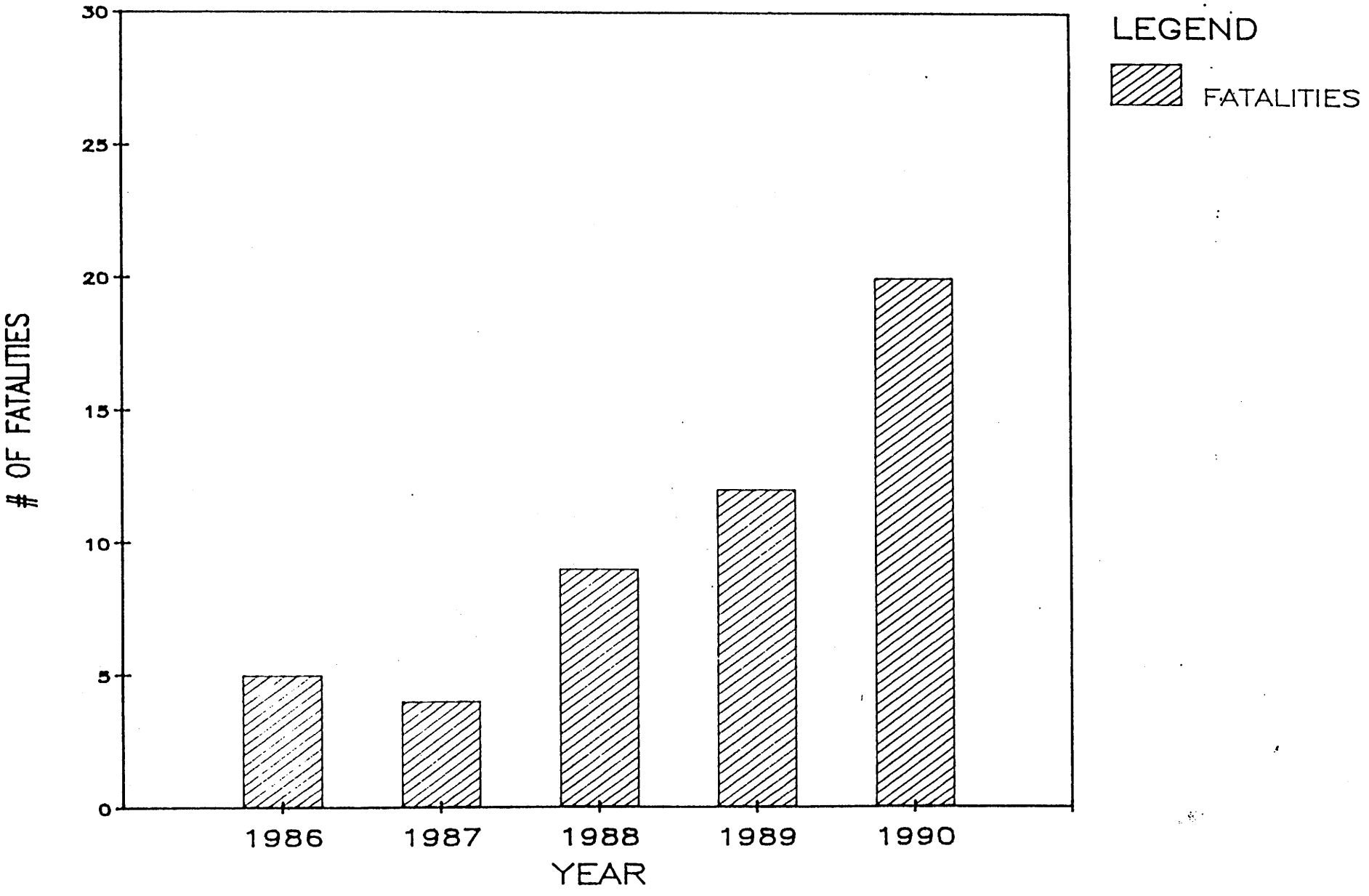


FIGURE 5

I-4 TRAFFIC CRASH FATALITIES

(5-YEAR STUDY)



largest group of crashes were those in which a vehicle left the roadway and hit fixed objects, such as guardrail, median wall, fencing, and signposts, or ran into a ditch or culvert.

One of the smaller groups of crashes, but one that created the most severe consequences, involved those where vehicles crossed the median and struck oncoming traffic. A majority of these crashes were caused by the errant vehicle simply losing control and entering the median; however, a significant number were the result of an initial, less severe impact, as shown in Figure 6. At highway speeds the out-of-control vehicle can cross the median in less than one second.

During 1989, 15 crashes resulted in vehicles crossing the median and entering the opposing lanes, frequently striking oncoming traffic. One of these crashes resulted in death. However, during 1990, the frequency of this type of crash more than doubled; 39 median crossing crashes were reported, resulting in a total of 13 deaths.

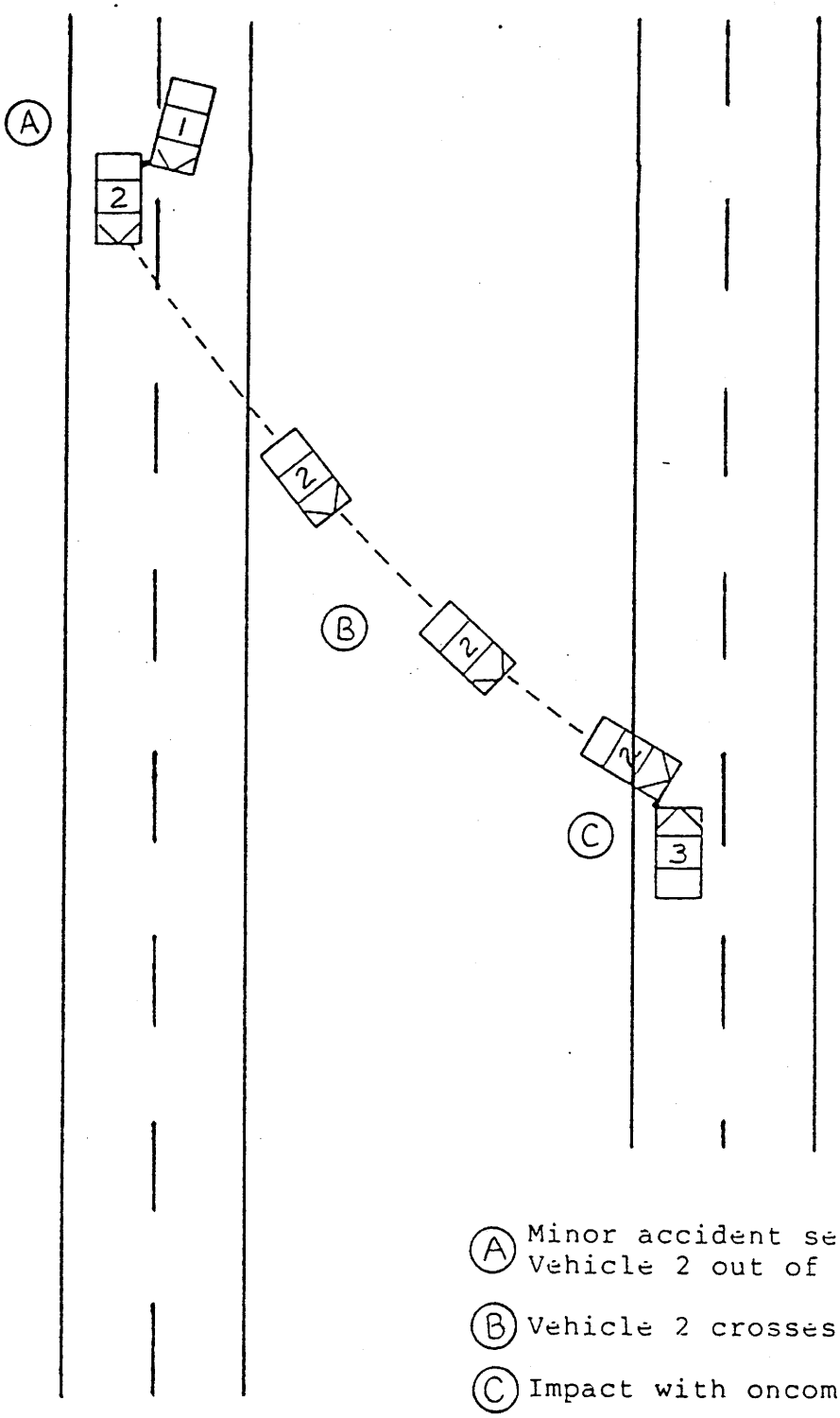
There does not appear to be a discernible pattern of where these "cross-the-median" crashes have been occurring. However, when the total number of crashes where vehicles entered the median (either coming to a rest in the median or continuing across into oncoming traffic) are plotted on one mile segments of the highway, the section between US 301 and McIntosh Road has the highest frequencies, as shown in Figure 7.

A similar plot, showing all crashes during 1989 and 1990, by 0.1 mile segments along the highway, is shown in Appendix A.

Heavy trucks were shown to contribute significantly to the total number of crashes along Interstate 4. However, a recent

FIGURE 6

CROSS-THE-MEDIAN AFTER INITIAL MINOR IMPACT



(A) Minor accident sends Vehicle 2 out of control

(B) Vehicle 2 crosses median

(C) Impact with oncoming traffic

FIGURE 7
PLOT OF CROSS-THE-MEDIAN ACCIDENTS
BY MILEPOST

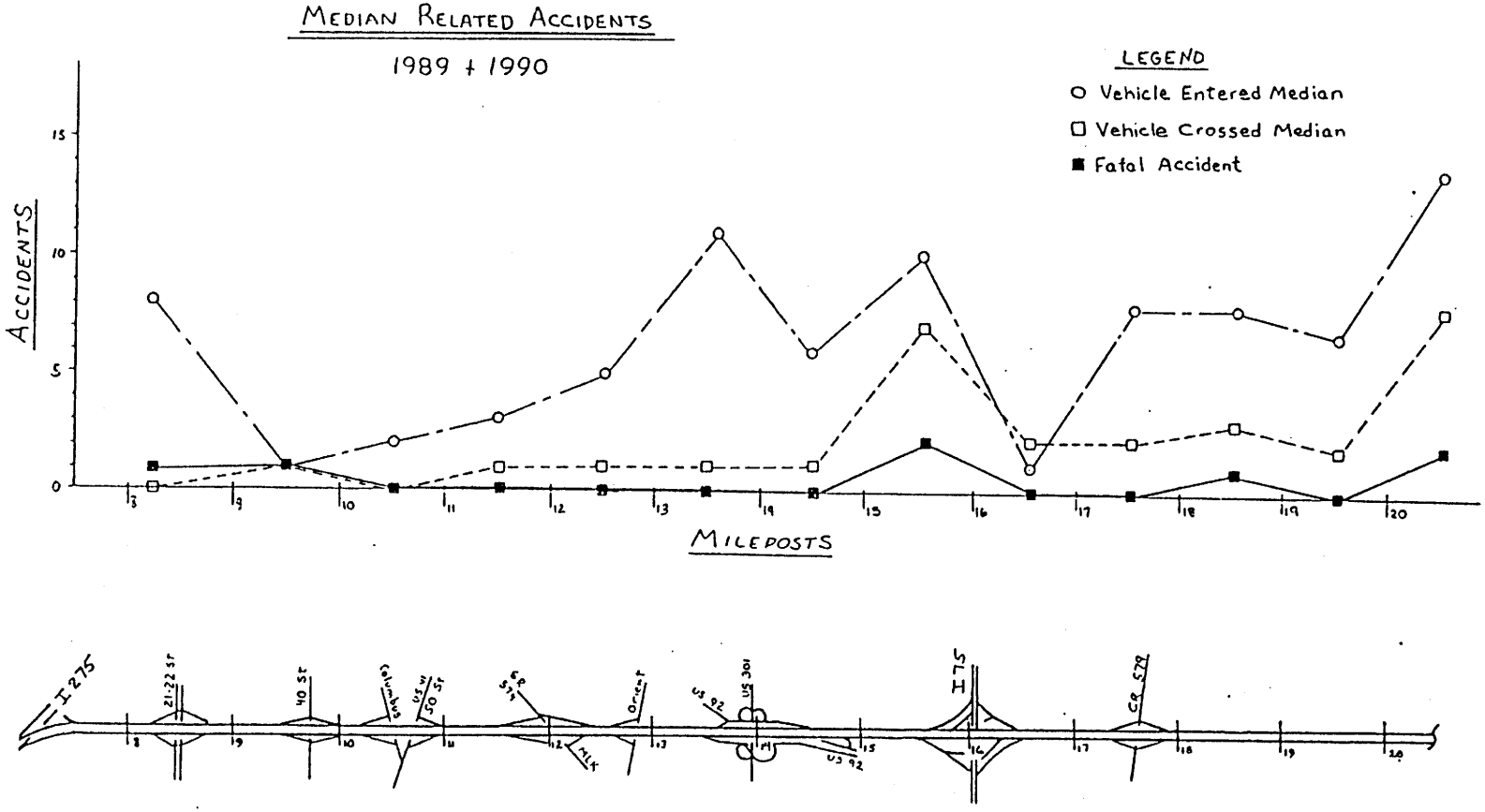
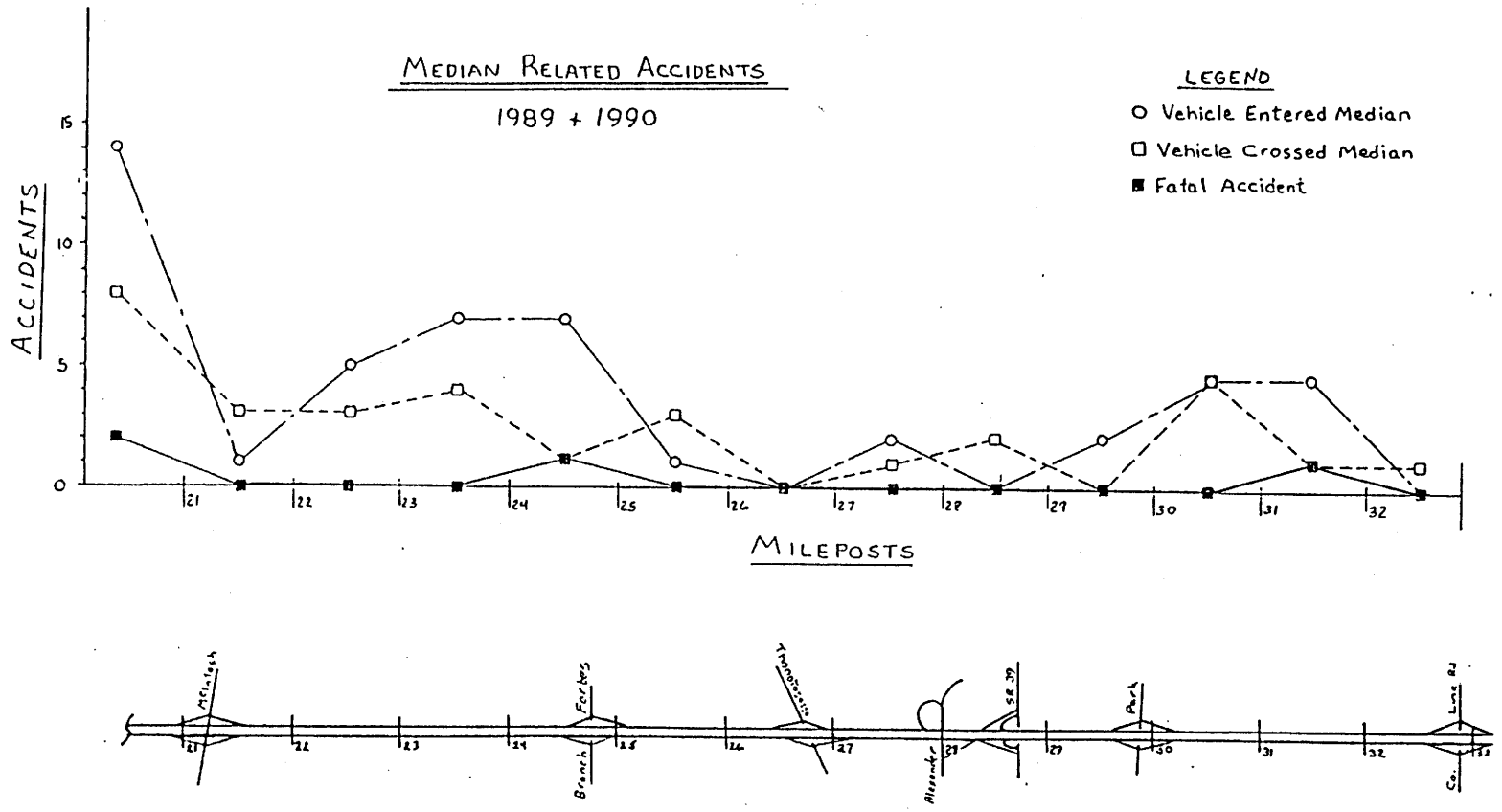


FIGURE 7
PLOT OF CROSS-THE-MEDIAN ACCIDENTS
BY MILEPOST
(continued)



report prepared by the Department's Safety Office[3] showed that, while the actual number of crashes involving trucks is high, the rate for Interstate 4 was significantly less than average. Heavy trucks were shown to figure prominently in some of the more serious crashes along the Interstate.

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[3] Identification of High Accident Locations Involving Heavy Trucks, FDOT State Safety Office, February, 1991.

5. BENEFIT-COST ANALYSES

An interim roadway improvement project, which would add one lane in each direction, widen bridges to provide full shoulder widths, install a continuous median barrier wall, and provide highway lighting, has been proposed by the District. This project has been estimated to cost about 95.5 million dollars -- an annual cost over the 20 year projected life of the improvements of about nine million dollars.

A preliminary benefit-cost analysis, to determine the probable cost effectiveness of proposed interim improvements, was prepared by the District Seven safety office. As the name implies, the benefit-cost technique allows the comparison of the project benefits to project expenses. A high benefit-cost ratio indicates an effective project expenditure.

The proposed improvements could be projected to reduce crashes along the facility by a factor of 25 percent[4]. This reduction would result in annual benefits of approximately 8.7 million dollars, with a benefit-cost ratio, based on accidents alone, approaching the break-even level of 1.00. Adding the benefits due to reduced congestion (time and fuel savings, for example) would result in a much higher benefit-cost ratio.

However, the severity of crashes along Interstate 4 is higher than average. The addition of a barrier wall has been estimated to reduce fatal accidents by a factor of 61 percent; 35 percent of the remaining fatal accidents could be eliminated

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[4]Based upon data provided in the "Missouri Manual" (Manual on Identification, Analysis and Correction of High Accident Locations, sponsored by the Missouri State Highway Commission and distributed by the Federal Highway Administration) for the projected accident reduction due to roadway reconstruction.

through roadway reconstruction. Using the Department's estimated cost per fatal accident of $ 1,700,000, the annual benefits from fatal accidents alone approach 13.6 million dollars. Under this approach, the benefit-cost ratio, based on fatal accidents alone, is approximately 1.5. Again, the benefits from reduced congestion -- as well as those from non-fatal accident reductions -- could be added to result in a much higher benefit-cost ratio.

6. COMPARISON WITH INTERSTATE 75

Interstate 75 is a major north-south corridor through the center of the state between Tampa and the Georgia state line. The addition of a lane in each direction has been scheduled for a 165 mile long section between the state line and Sumter County. With the lack of funding for improvements to Interstate 4 a major concern, it was determined that a comparison with Interstate 75 might better identify the Department's priorities.

Five areas of operating characteristics were compared between the two highways. Appendix B provides detailed data for each of the comparisons. In each case, Interstate 4 appears that it should have a higher priority for reconstruction.

TRAFFIC CRASH STATISTICS

In 1989, there were 573 crashes along the 25 mile section of Interstate 4 in Hillsborough County. During the same period, there were 757 crashes along the 165 mile section of Interstate 75 being considered for widening. This represents an average of 22.6 crashes per mile on Interstate 4, and 4.6 crashes per mile on Interstate 75. Interstate 4 experienced almost five times as many crashes per mile as Interstate 75.

The section of Interstate 75 with the highest crash rate was a 35 mile section through Alachua County (Gainesville area). Interstate 75 experienced a rate of 0.491 crashes per million vehicle-miles. The rate for Interstate 4 through Hillsborough County was 0.904 crashes per million vehicle-miles -- almost twice the rate as the highest rate section of Interstate 75.

The Alachua County section of Interstate 75 experienced 256 injuries and five deaths. Interstate 4 through Hillsborough

County experienced 490 injuries and 12 deaths. This equates to about 7.3 injuries per mile and 0.14 deaths per mile on Interstate 75, and 19.0 injuries per mile and 0.49 deaths per mile on Interstate 4. These rates on Interstate 4 are about three times those on the highest rate section of Interstate 75.

AVERAGE DAILY TRAFFIC

The Average Daily Traffic (ADT) for the heaviest travelled section of Interstate 75 (a 38 mile section in Marion County / Ocala) is 36,168 vehicles per day. The ADT for the section of Interstate 4 in Hillsborough County is 75,211 vehicles per day -- more than twice the highest section ADT along Interstate 75.

In addition to section averages, ADTs can also be identified at various points along the roadway system. Along the entire portion of Interstate 75 to be widened, the ADTs range between 21,852 and 49,871 vehicles per day. Along Interstate 4 in Hillsborough County, ADTs range between 51,230 and 128,285 vehicles per day.

The highest spot ADT on Interstate 4 is more than 2 1/2 times the highest spot ADT on Interstate 75. In addition, the lowest spot ADT on Interstate 4 is still greater than the highest spot ADT on Interstate 75.

ROADWAY GEOMETRICS

The roadway cross sections reflect additional differences between the two Interstate highways. Median widths, shoulder widths, and shoulder widths on bridge structures were all compared.

The median widths along the sections of Interstate 75 being proposed for widening ranged from 64 to 156 feet. Along Interstate 4, about 19 miles have a width of 38 to 40 feet; two miles have a width of 44 feet, and four miles have a width of 64 feet. Neither roadway has a continuous median barrier.

The paved shoulders along Interstate 75 are typically ten feet in width on the outside shoulder and four feet in width on the inside shoulder. Along Interstate 4, the outside shoulders range from eight to nine feet in width, and the inside shoulders are typically four feet in width.

The shoulder width differences become critical across the numerous bridge structures. Along Interstate 75, the majority of bridges carry full width shoulders across the structure. However, along Interstate 4, only a two foot wide shoulder is provided on bridge structures, for either the inside or the outside shoulders.

PAVEMENT CONDITIONS

The Department assigns a "roughness index" to sections of roadway as a guide to prioritizing reconstruction due to pavement conditions. Higher values represent a rougher section of roadway.

The most critical section of Interstate 75 is a 30 mile section in Columbia County (Lake City), which has an average roughness index of 147. Interstate 4 in Hillsborough County has an average index of 151.

Roughness indexes along the entire section of Interstate 75 to be widened range between 156 and 70; along Interstate 4, indexes range between 210 and 117.

None of these values indicate that either roadway could be considered "rough". Most sections fall within the "smooth" or "medium" categories.

AGE OF ROADWAY FACILITIES

In general, Interstate 4 is slightly older than Interstate 75. Opening dates for Interstate 4 ranged from 1958 to 1964; for Interstate 75, 1963 to 1966.

These dates indicate that roadway design standards were probably of similar vintage for both facilities. However, Interstate 4 is a much more urban facility, with limited right of ways and frequent interchanges. The obsolescence of design standards is much more apparent on Interstate 4.

7. CONCLUSIONS AND RECOMMENDATIONS

Interstate 4 through Hillsborough County is in need of major reconstruction. Its four lane design does not provide the capacity needed to accommodate current traffic demands without recurring congestion and major delays.

The high volume-to-capacity ratio contributes significantly to a traffic crash history that has increased steadily over the past several years. The severity of the crashes is often heightened because of the unforgiving nature of many of Interstate 4's obsolete design features.

The increasing levels of congestion and steady upward trend in crash related injuries and fatalities along Interstate 4 have attracted the public's eye, and demands for improvements to the roadway are voiced daily.

The Department's placement of a higher priority on the widening of a 165 mile section of Interstate 75 prompted the development of this report. A comparison of the two Interstates shows that Interstate 4 carries far more traffic and experiences significantly higher traffic crash, injury, and fatality rates than Interstate 75.

It is recommended that further review and consideration on the Department's priorities be made to ensure the optimal use of funds for the public good.

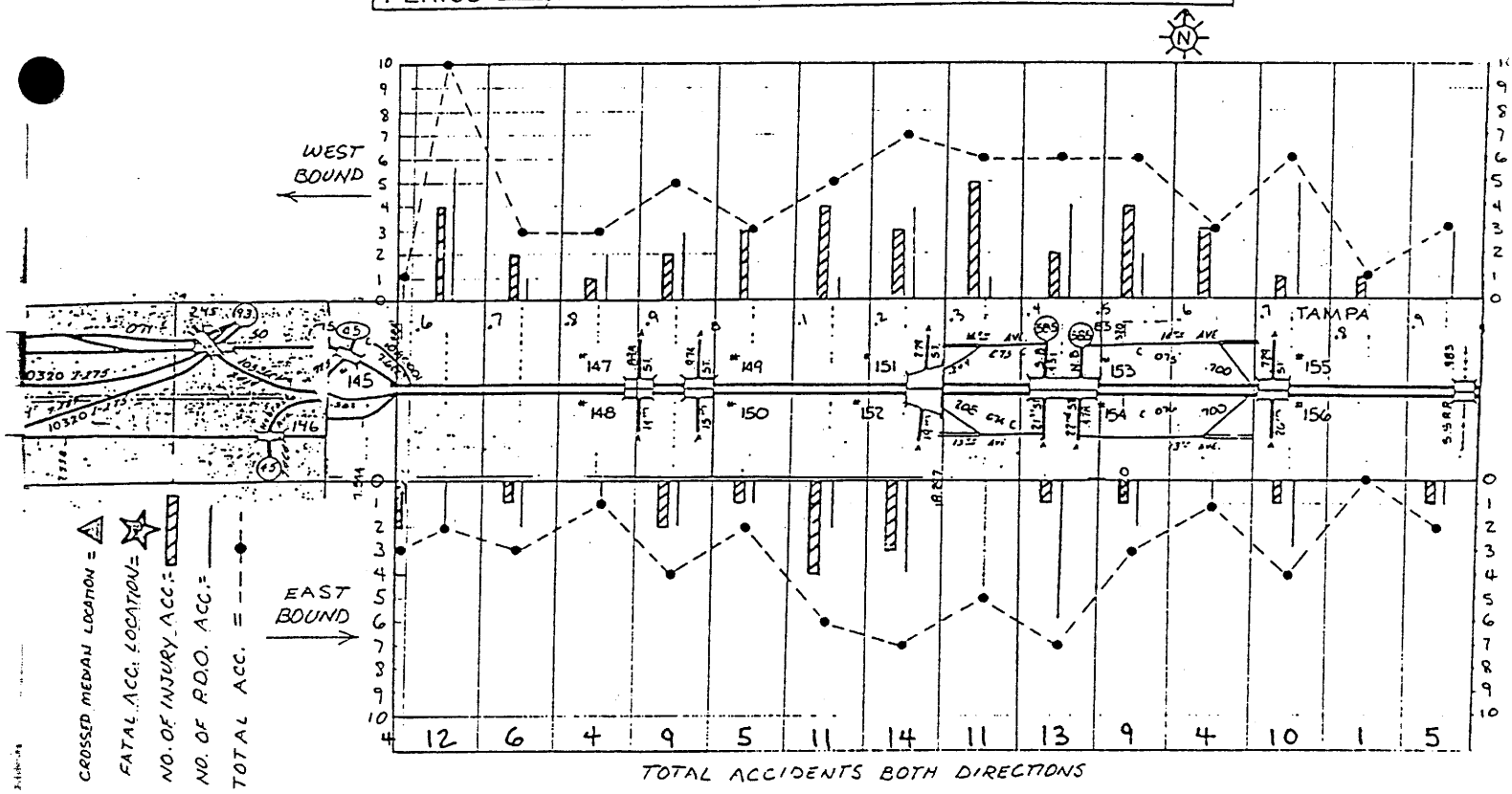
APPENDIX A

Interstate 4

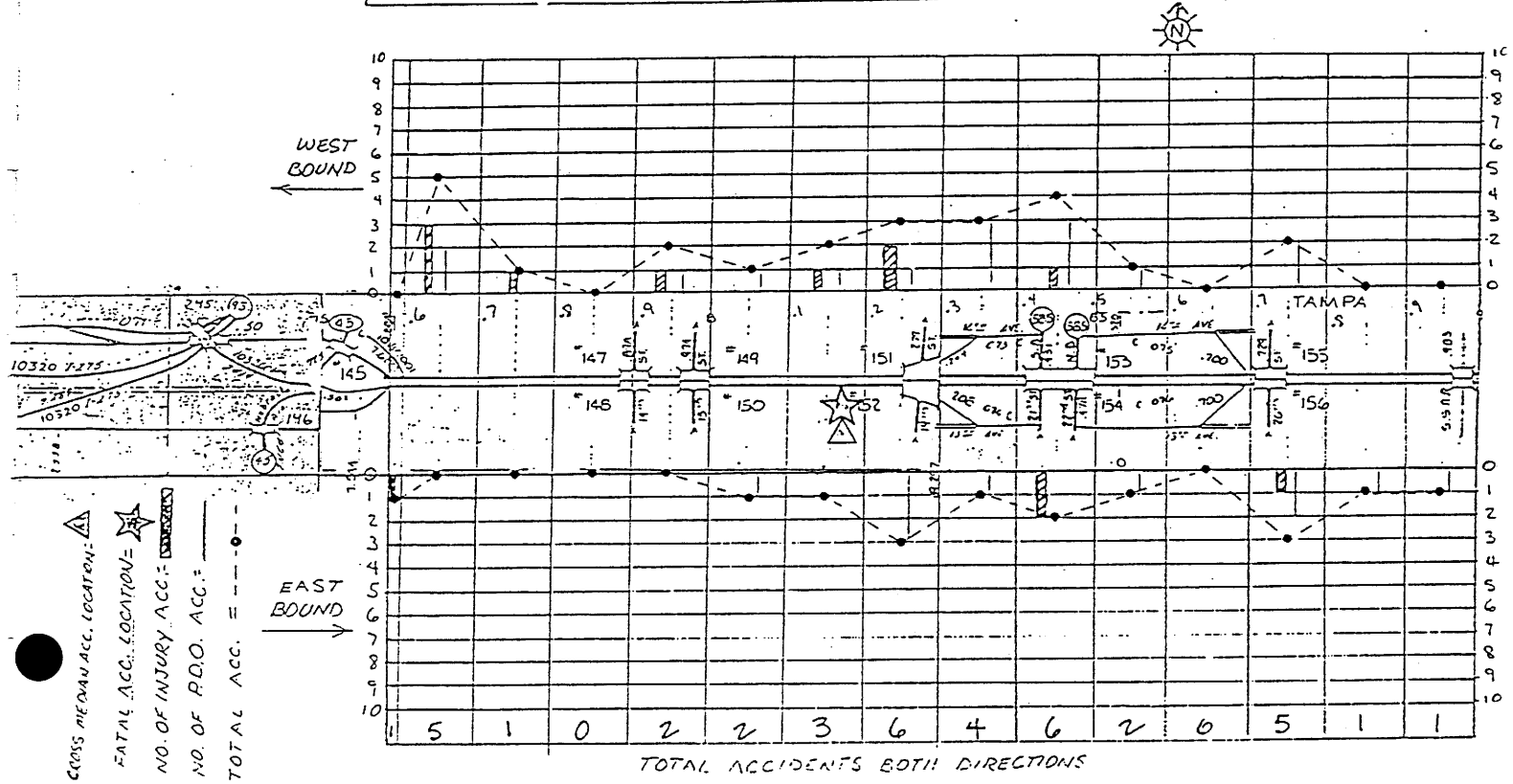
Plot of Traffic Crashes

By 0.1 Mile Increments

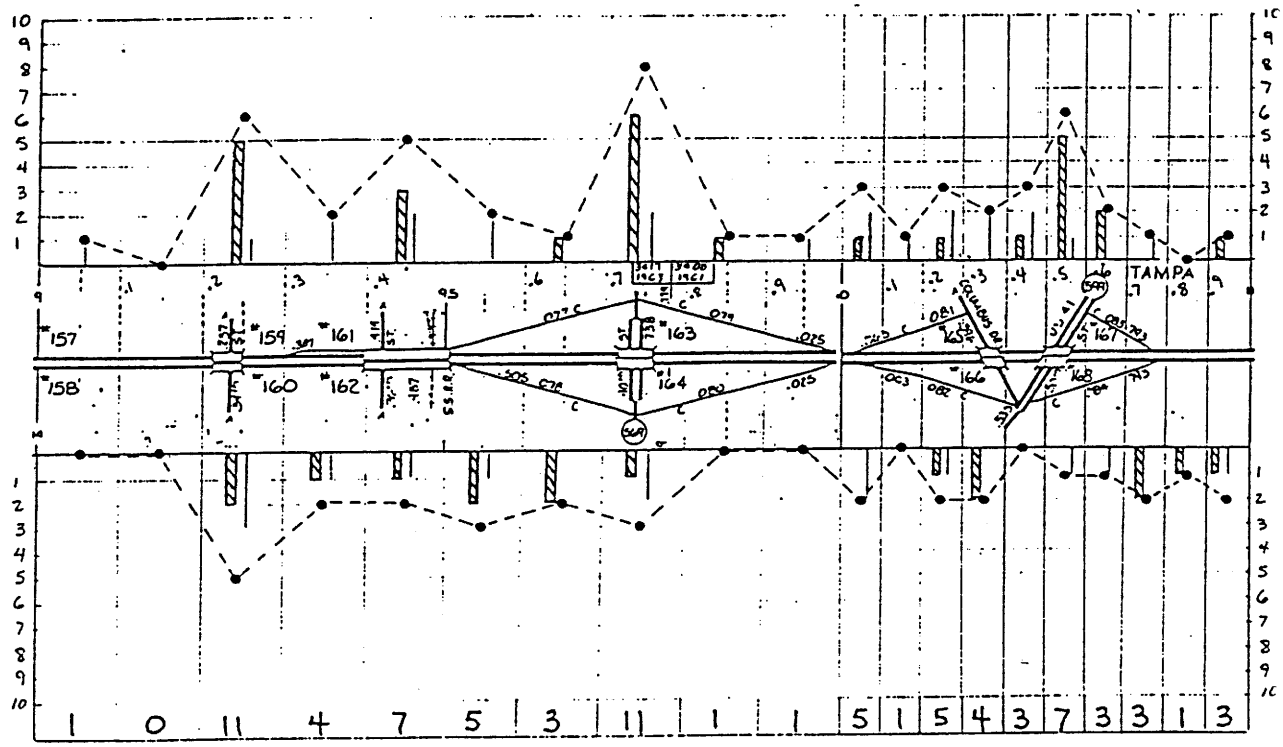
LOCATION I.D. S.R. 400 (I-4) At Palm Ave. to 26th St.
COUNTY Hillsborough CITY TAMPA
PERIOD JAN-1, 1989 to DEC-31, 1989 PREPARED BY GARY AMIG



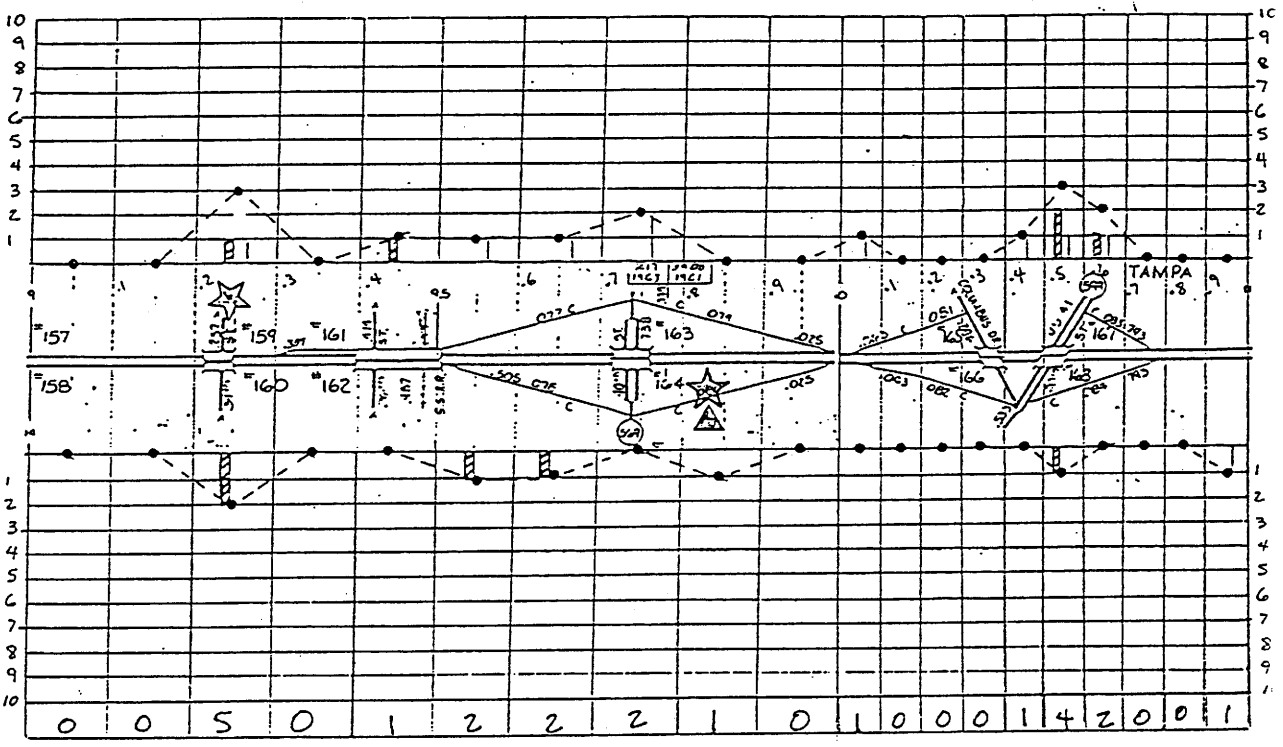
LOCATION I.D. S.R. 400 (I-4) At Palm Ave. to 26th St.
COUNTY Hillsborough CITY TAMPA
PERIOD JAN-1-1990 to DEC 31, 1990 PREPARED BY GARY AMIG



LOCATION I.D. S.R. 400 (I-4) at 34th St. to 50th St.
COUNTY Hillsborough CITY TAMPA
PERIOD JAN-1 1989 to DEC-31, 1989 PREPARED BY GARY AMIG

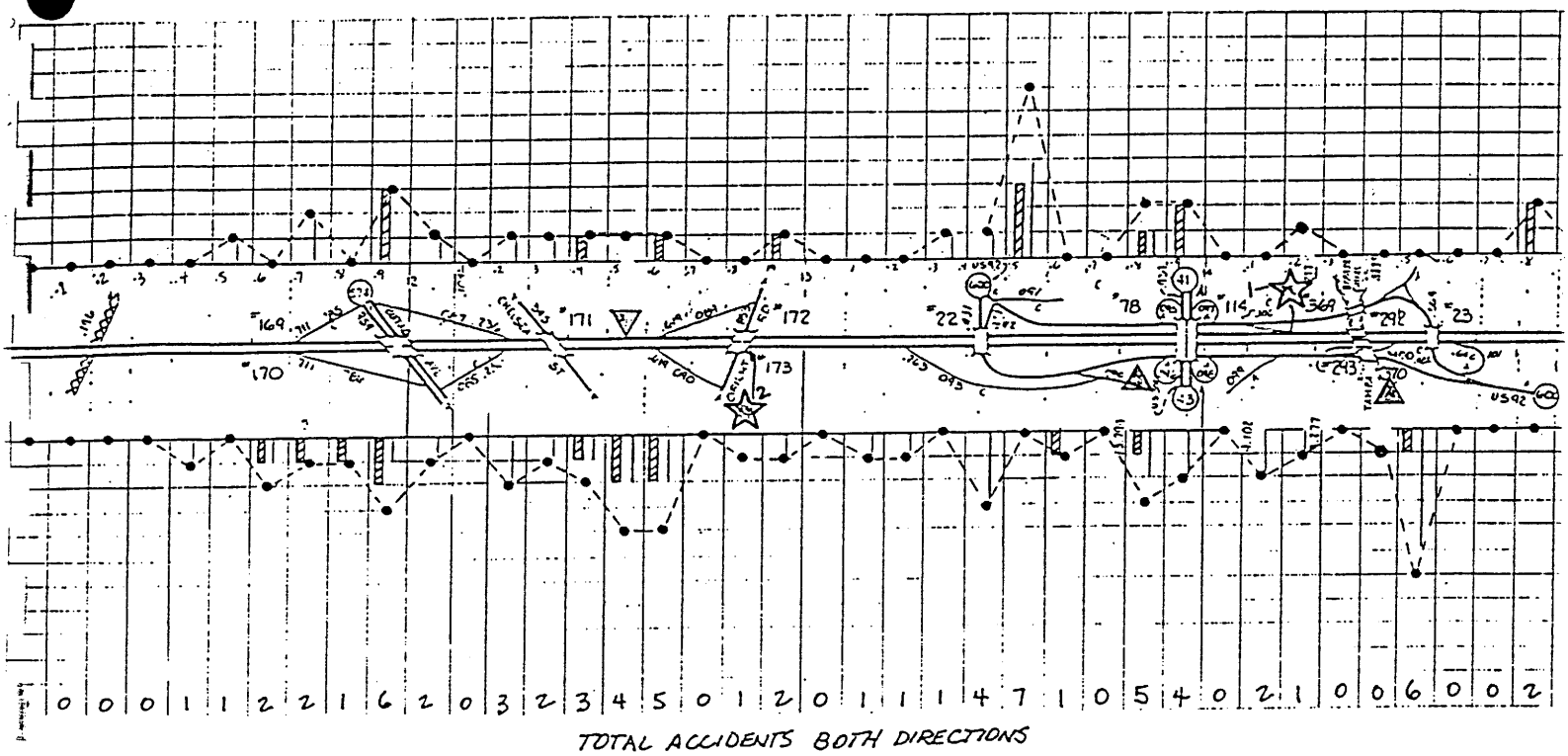


LOCATION I.D. S.R. 400 (I-4) at 34th St. to 50th St.
COUNTY Hillsborough CITY TAMPA
PERIOD JAN-1, 1990 to DEC-31, 1990 PREPARED BY GARY AMIG



TOTAL ACCIDENTS BOTH DIRECTIONS

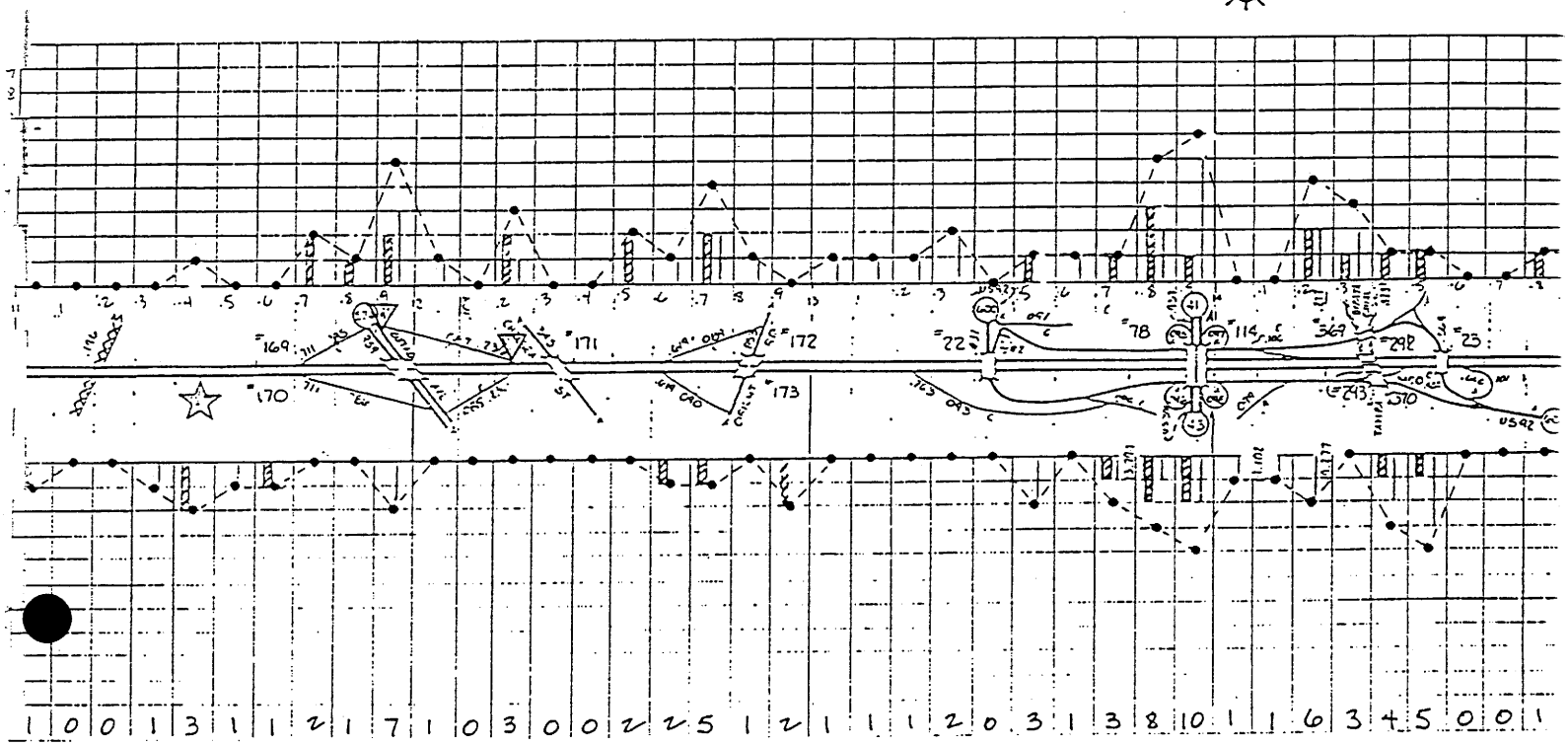
LOCATION I.D. S.R. 400(I-4) At Buffalo to US 92
COUNTY Hillsborough CITY TAMPA
PERIOD JAN-1-1989 to DEC-31 1989 PREPARED BY GARY AMIG



0 0 0 1 1 2 2 1 6 2 0 3 2 3 4 5 0 1 2 0 1 1 1 4 7 1 0 5 4 0 2 1 0 0 6 0 0 2

TOTAL ACCIDENTS BOTH DIRECTIONS

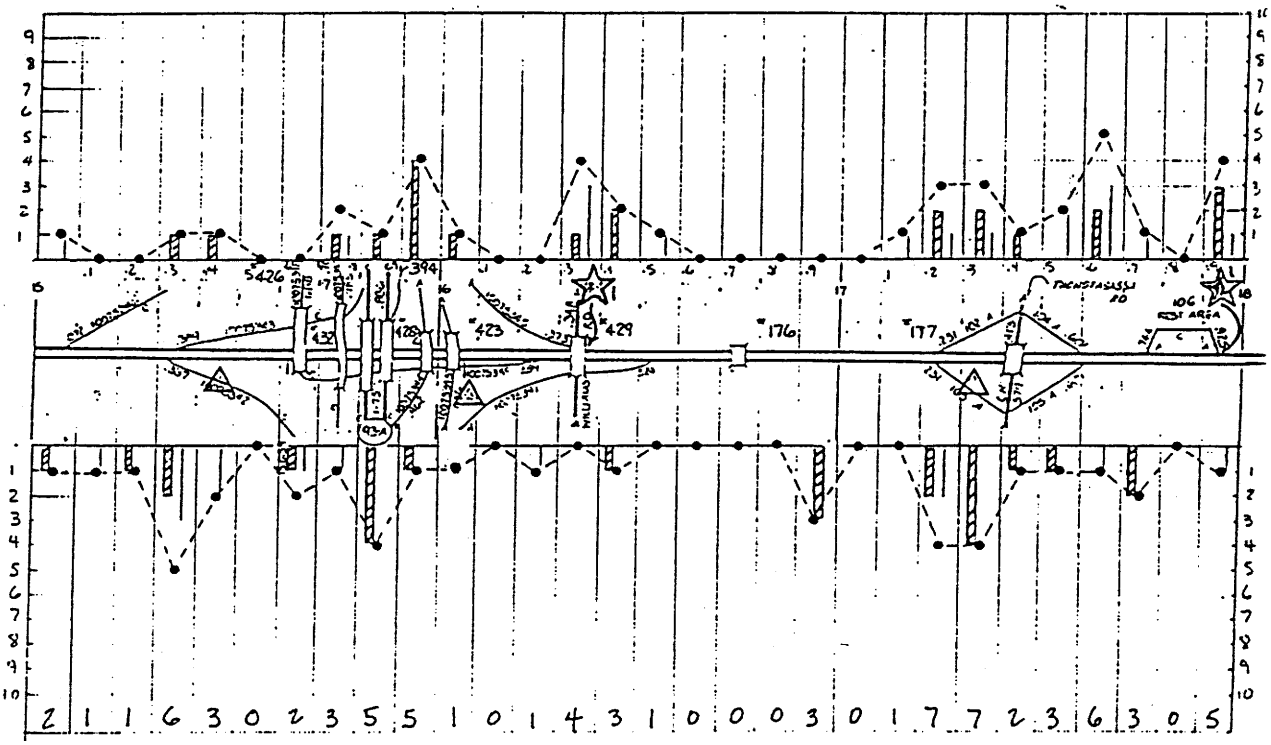
LOCATION I.D. S.R. 400(I-4) At Buffalo to US 92
COUNTY Hillsborough CITY TAMPA
PERIOD JAN-1-1990 to DEC-31-1990 PREPARED BY GARY AMIG



1 0 0 1 3 1 1 2 1 7 1 0 3 0 0 2 2 5 1 2 1 1 1 2 0 3 1 3 8 10 1 1 6 3 4 5 0 0 1

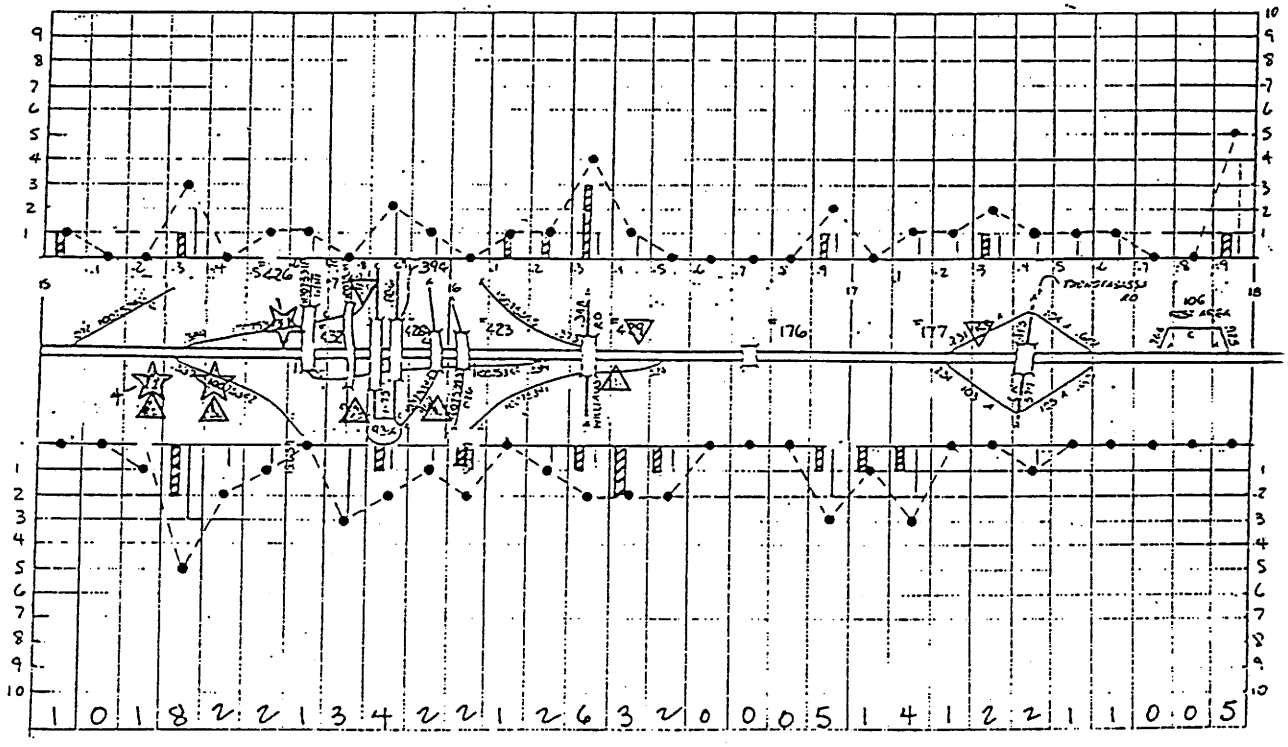
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At 93-A to Rest Area
COUNTY Hillsborough CITY HILLS. CO.
PERIOD JAN-1, 1989 to DEC-31, 1989 PREPARED BY GARY AMIG



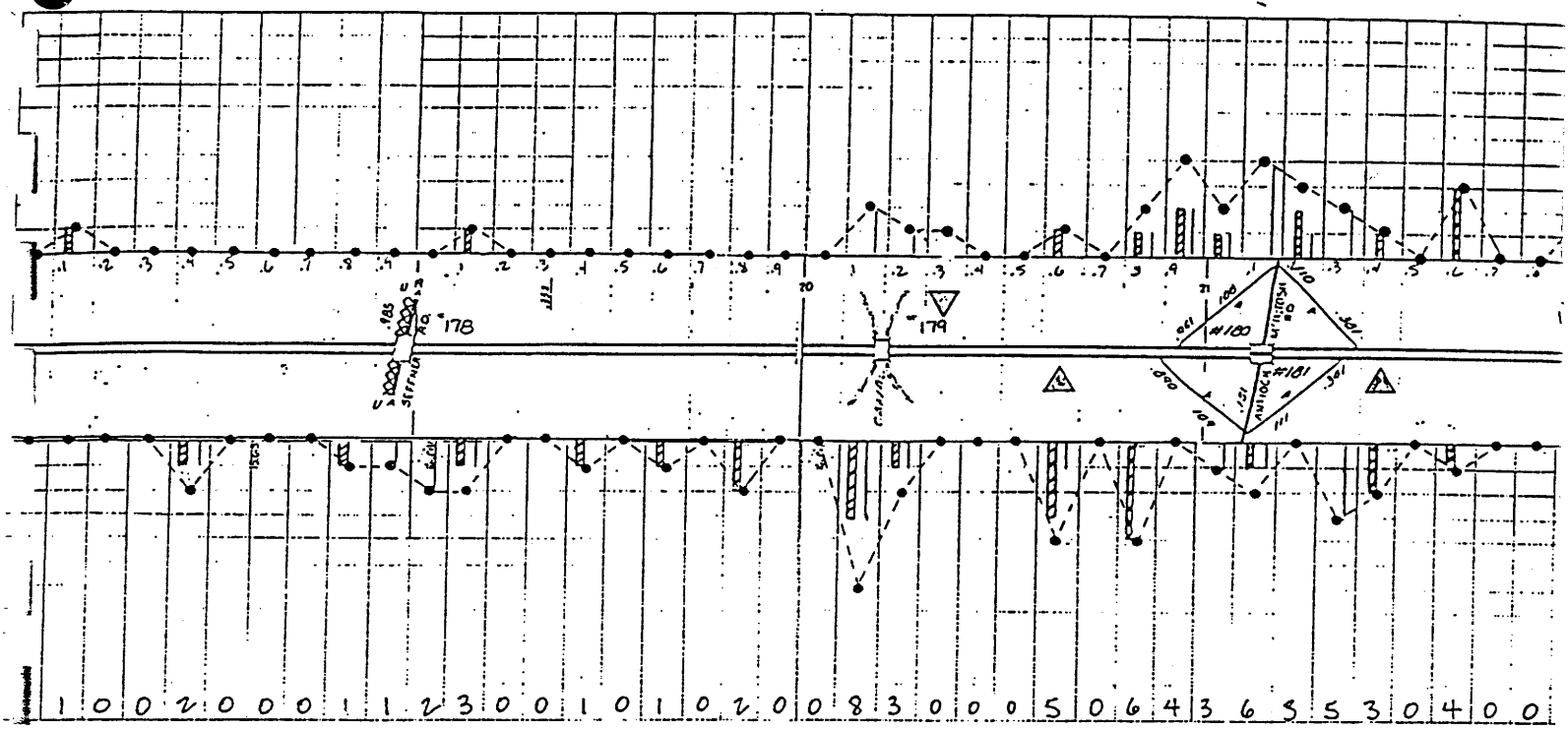
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At 93-A to Rest Area
COUNTY Hillsborough CITY
PERIOD JAN-1, 1990 to DEC-31, 1990 PREPARED BY GARY AMIG



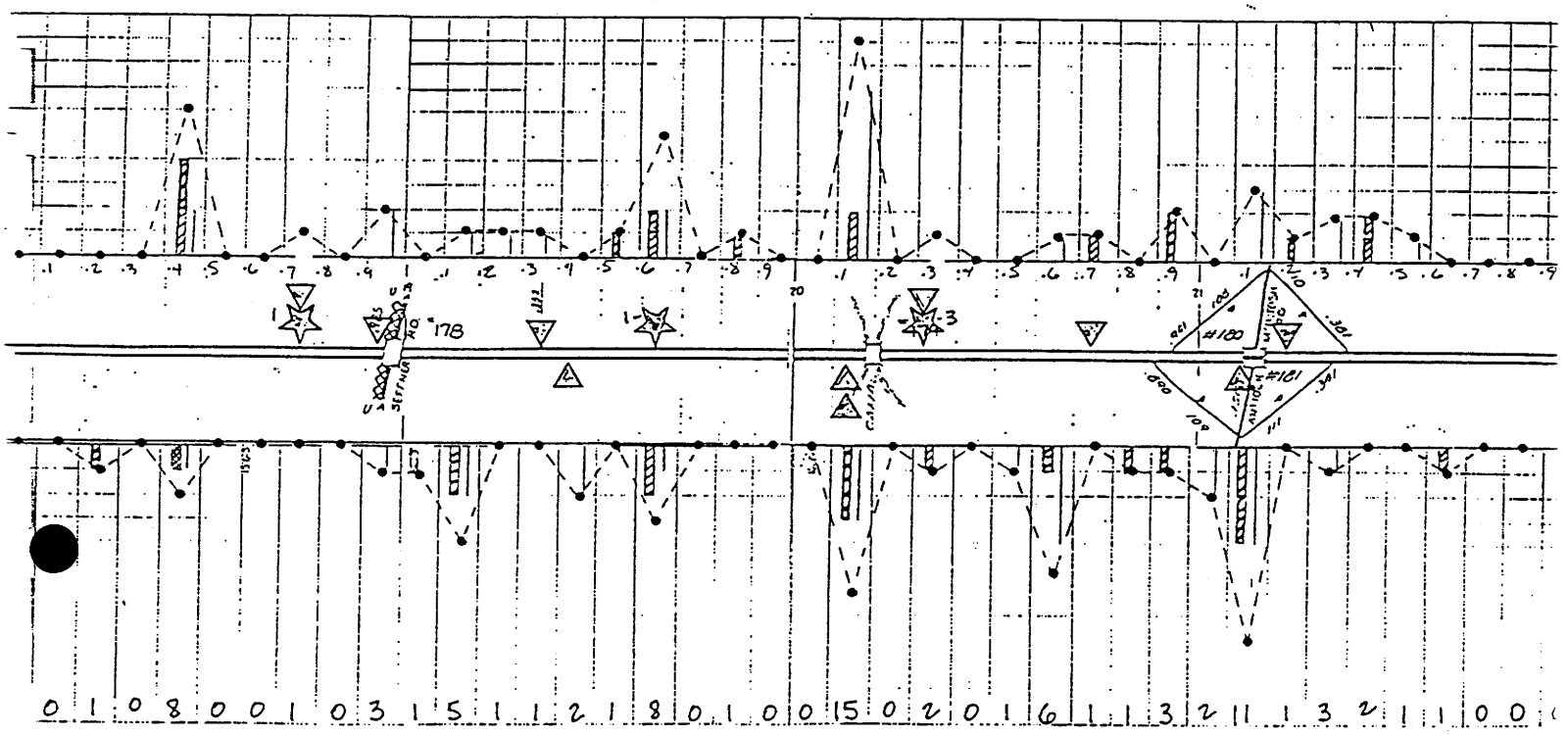
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At 93-A to Rest Area
COUNTY Hillsborough CITY
PERIOD JAN-1, 1989 to DEC-31, 1989 PREPARED BY Gary Amig



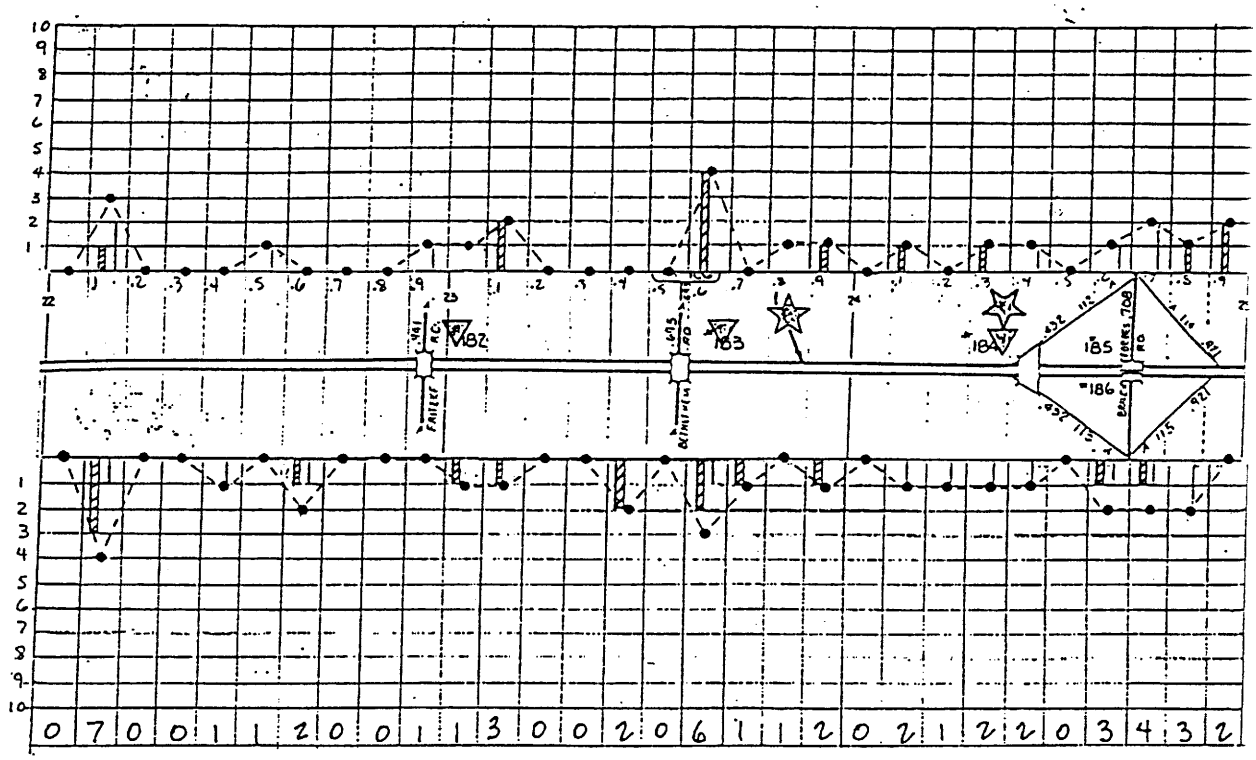
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At 93-A to Rest Area
COUNTY Hillsborough CITY
PERIOD JAN-1, 1990 to DEC-31, 1990 PREPARED BY Gary Amig



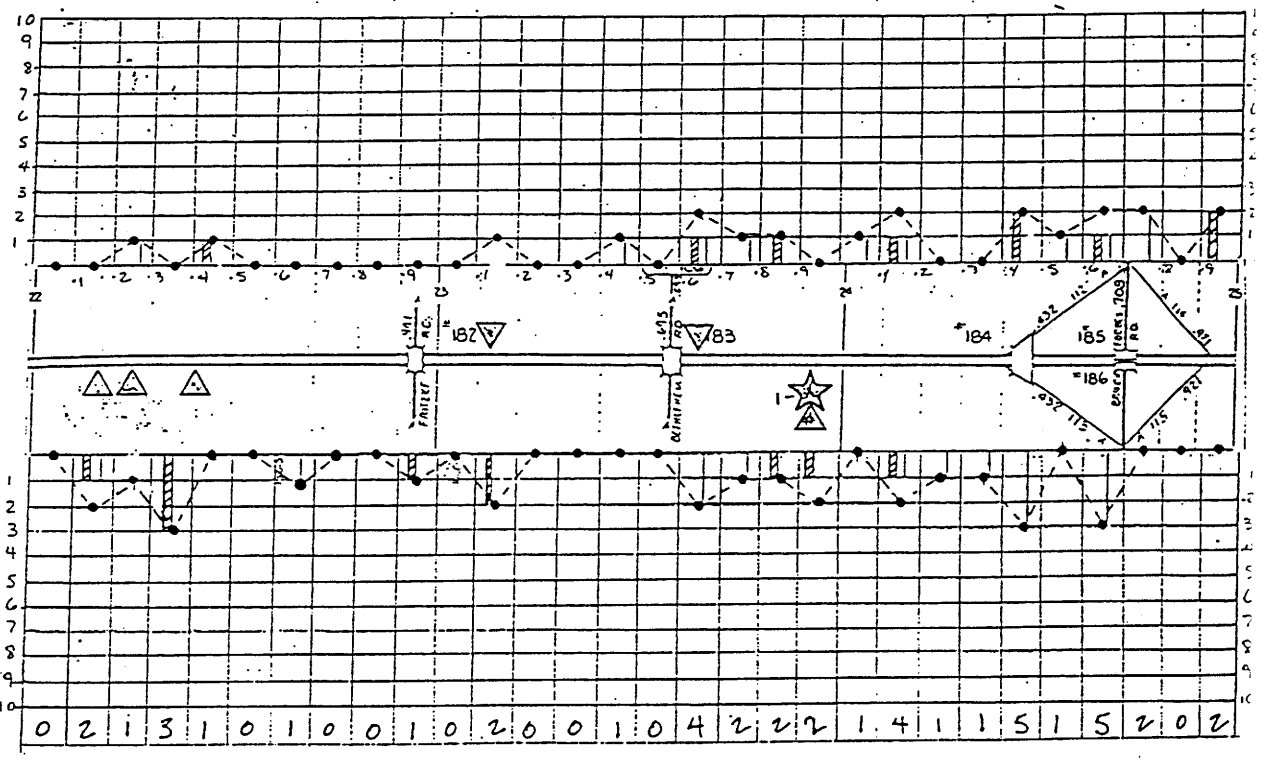
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At Fritzke to Branch Forbes Rd.
COUNTY Hillsborough CITY
PERIOD JAN-1, 1989 to DEC-31, 1989 PREPARED BY GARY AMIG



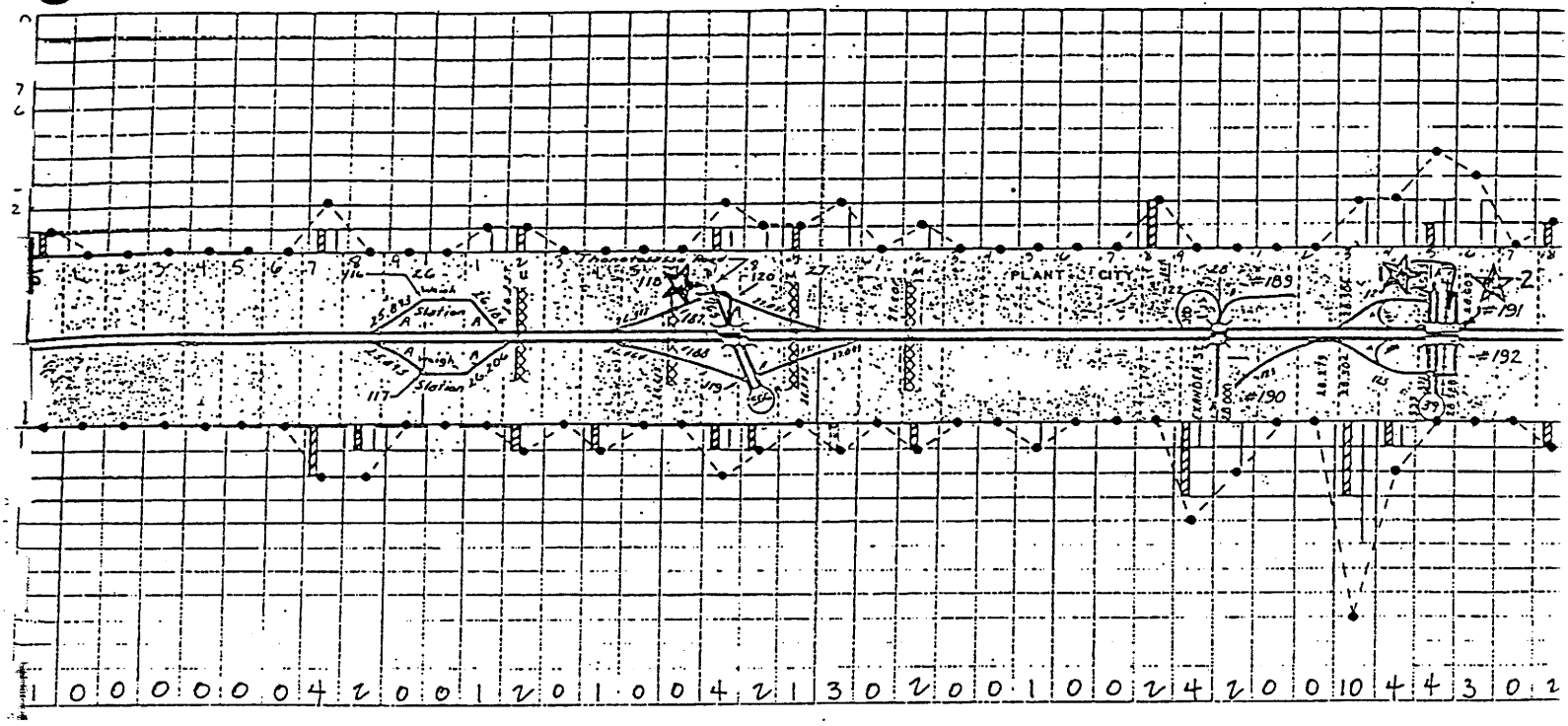
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At Fritzke to Branch Forbes Rd.
COUNTY Hillsborough CITY
PERIOD JAN-1, 1990 to DEC-31, 1990 PREPARED BY GARY AMIG



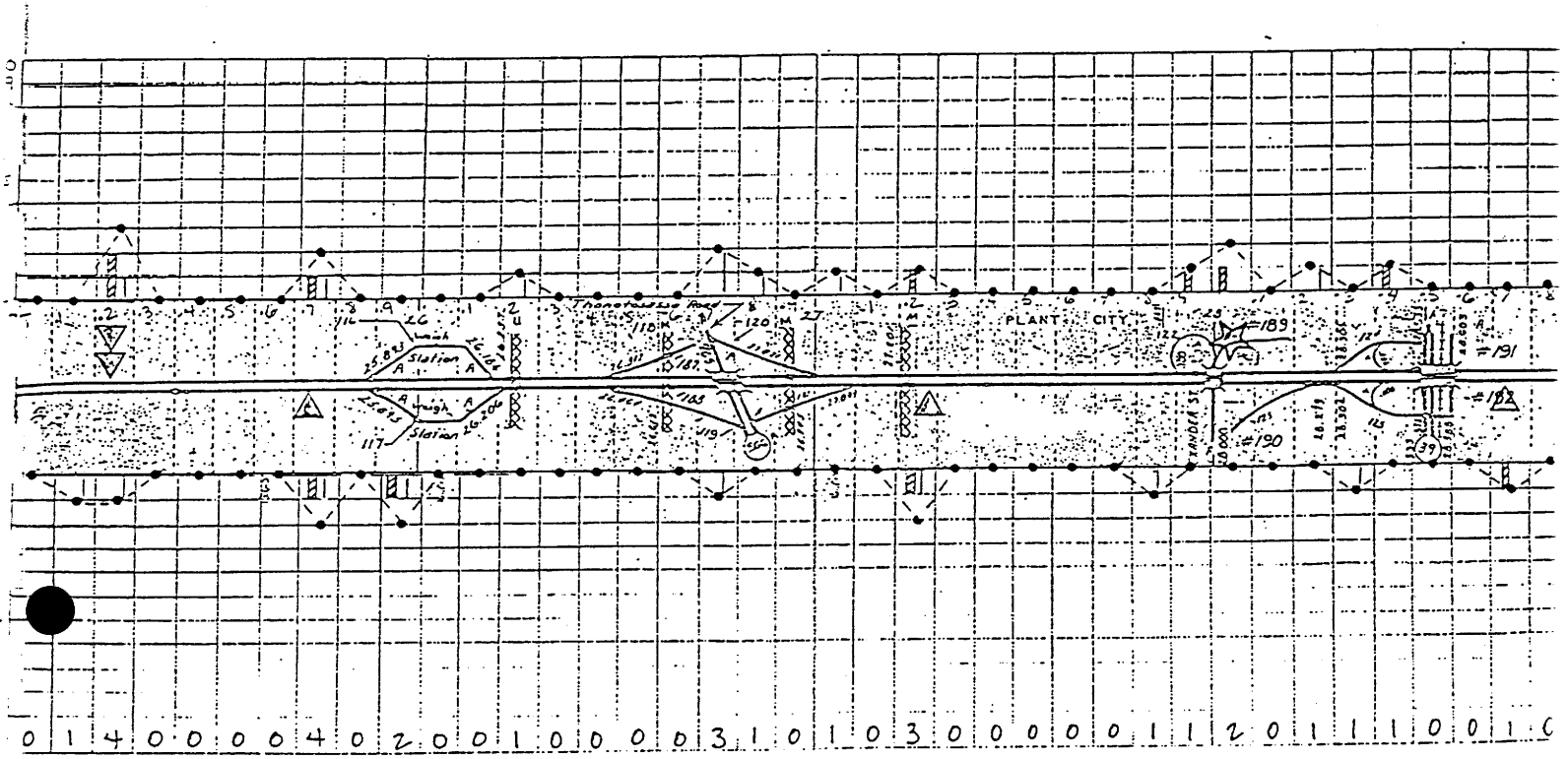
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At Wright Station to S.R. 39
COUNTY HILLSBOROUGH CITY PLANT CITY
PERIOD JAN-1,1989 to DEC-31,1989 PREPARED BY CARY AMICO



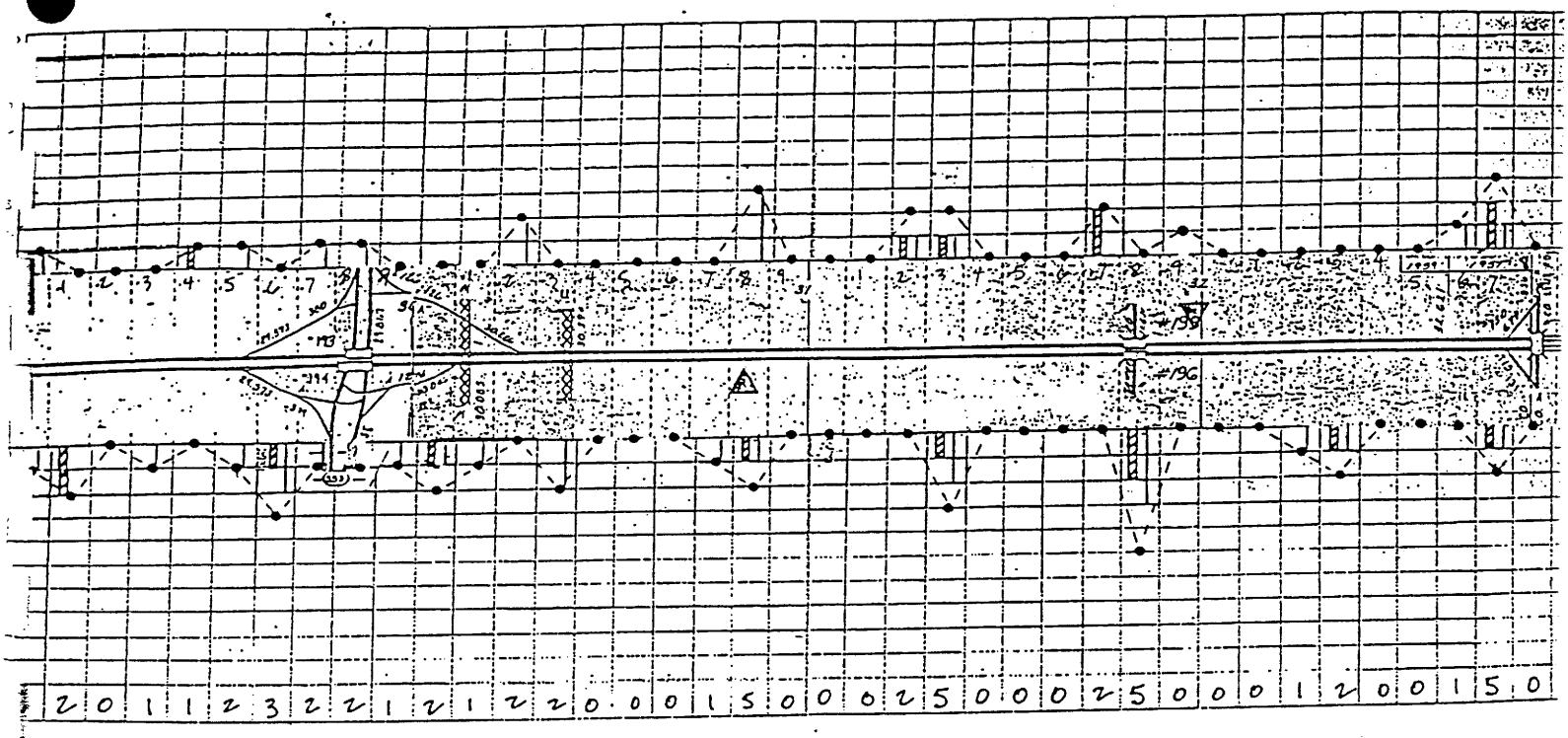
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At Wright Station to S.R. 39
COUNTY HILLSBOROUGH CITY PLANT CITY
PERIOD JAN-1,1990 to DEC-31,1990 PREPARED BY CARY AMICO



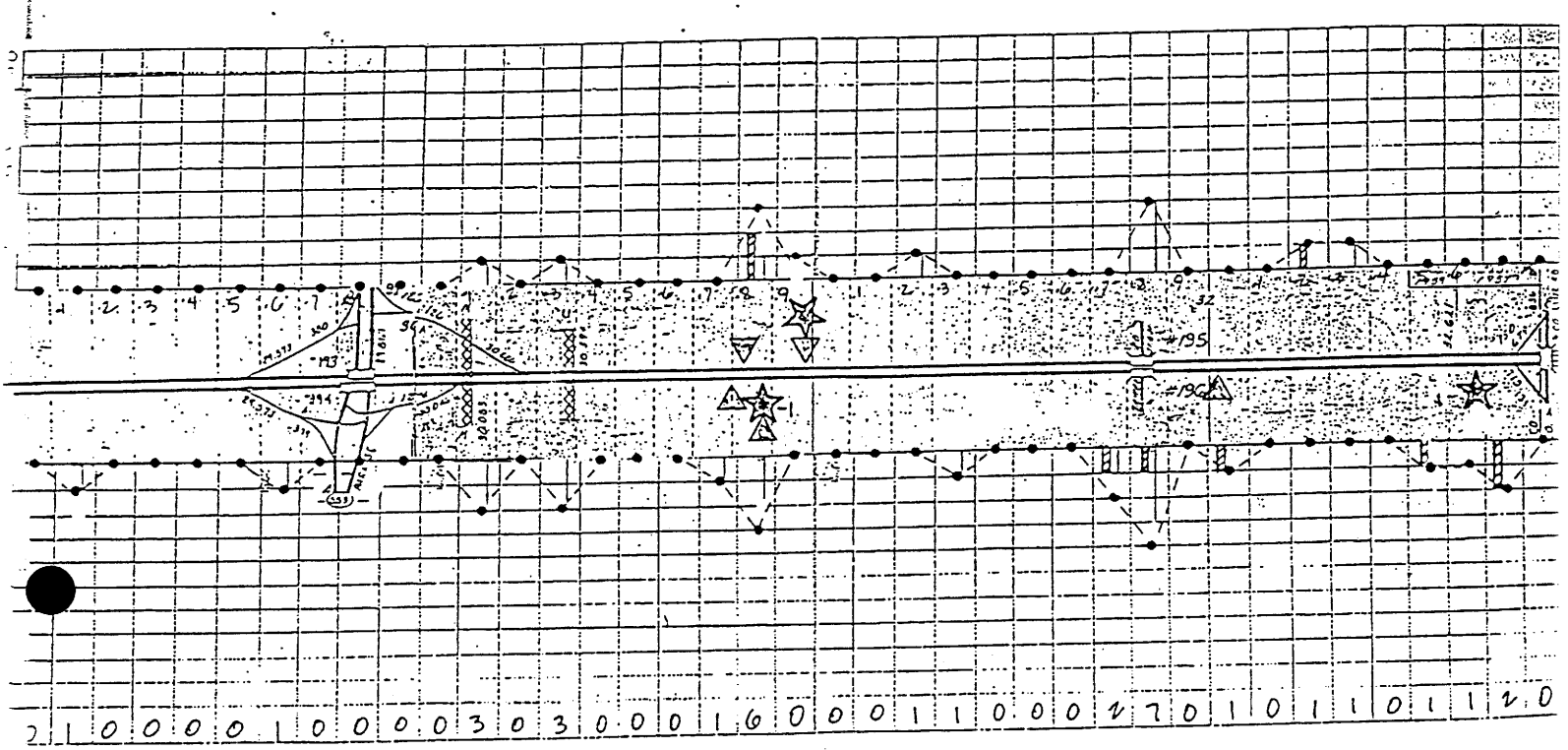
TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. _____
COUNTY Hillsborough CITY _____
PERIOD JAN-89 to DEC-31-89 PREPARED BY CoARY AM16



TOTAL ACCIDENTS BOTH DIRECTIONS

LOCATION I.D. S.R. 400 (I-4) At 553 to Co. Line Rd.
COUNTY Hillsborough CITY _____
PERIOD JAN-1, 1990 to DEC-31, 1990 PREPARED BY CoARY AM16



TOTAL ACCIDENTS BOTH DIRECTIONS

APPENDIX B

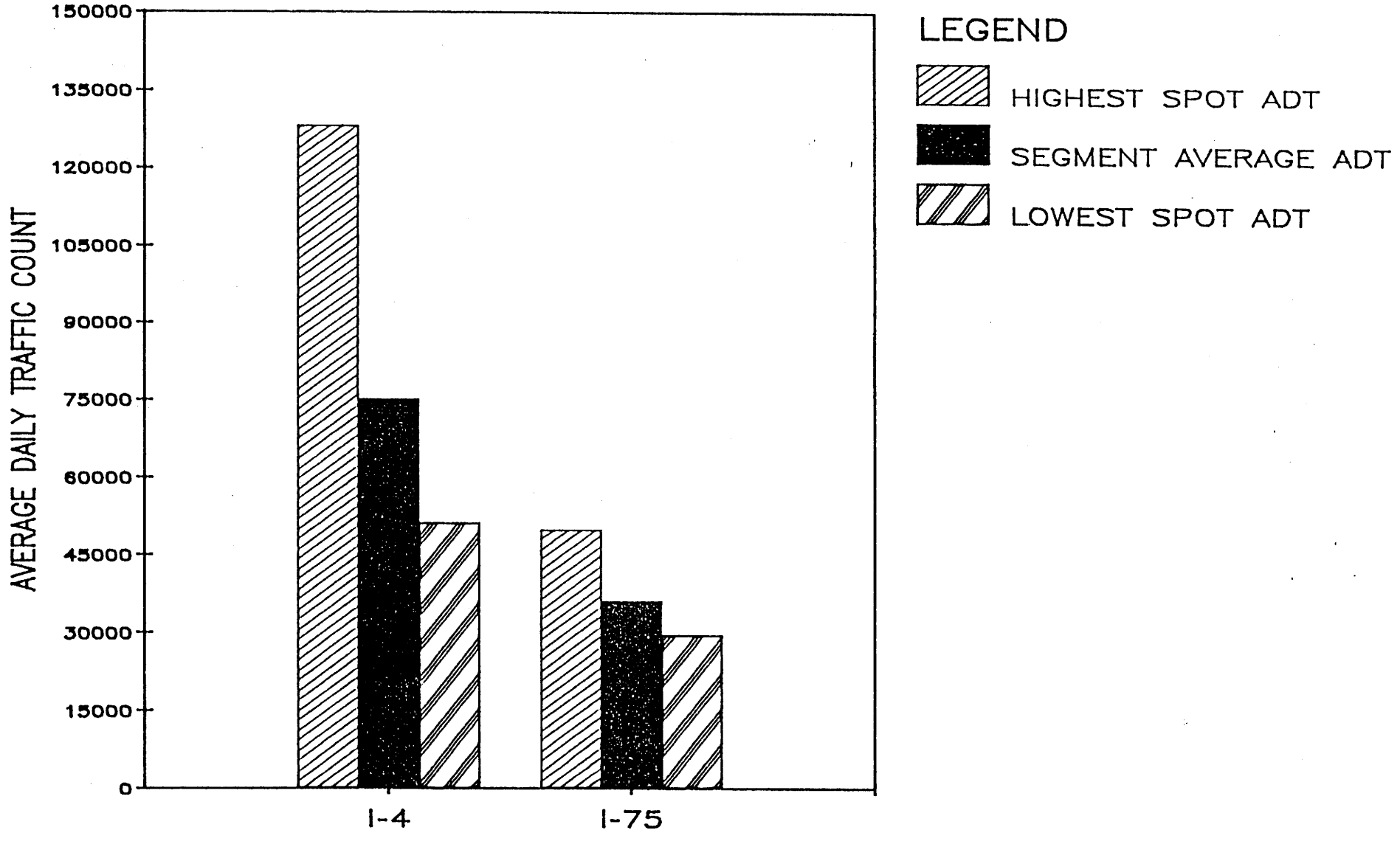
Comparison Data

Interstate 4

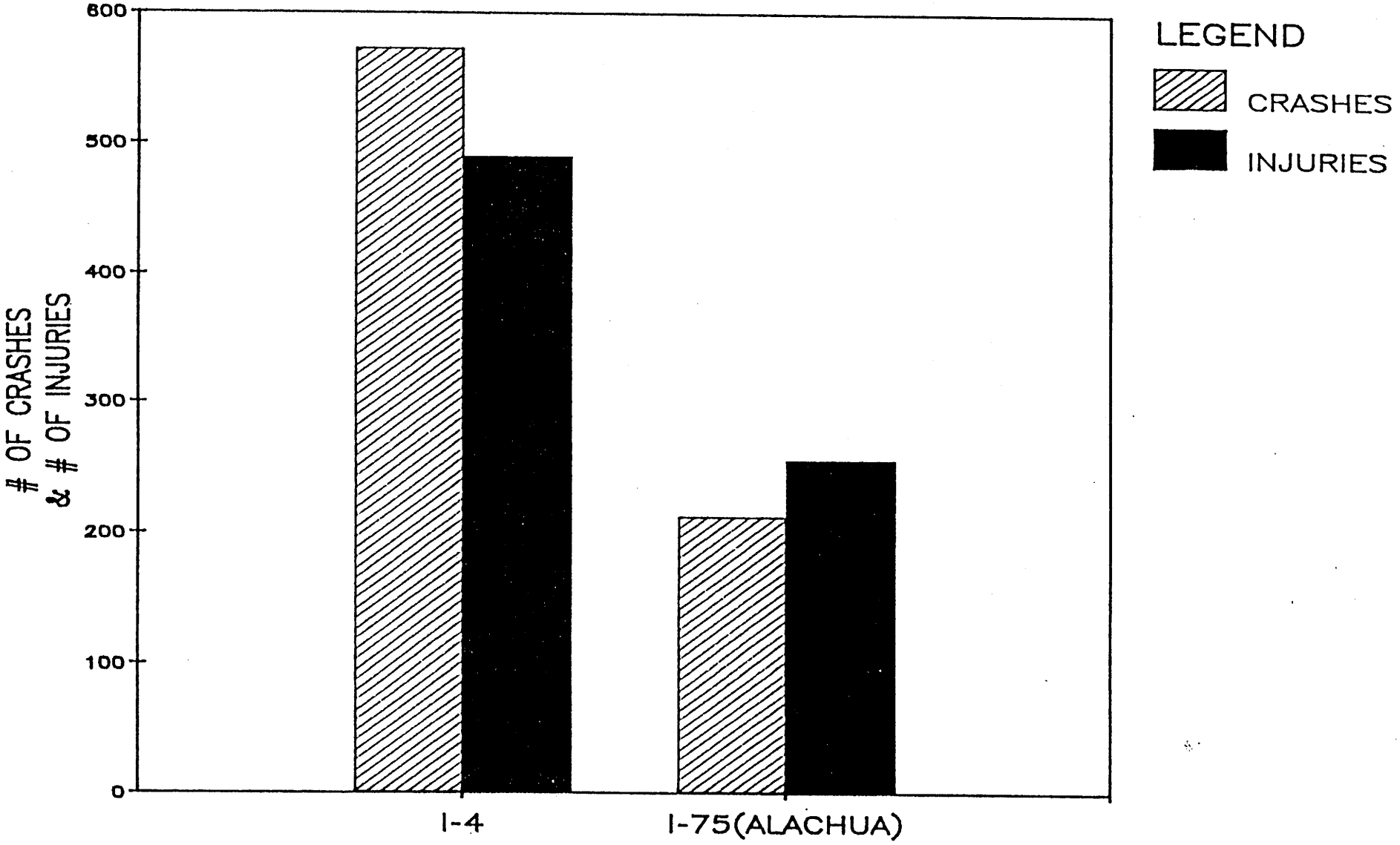
With Other Florida Interstate Highways

COMPARISON OF I-4 WITH I-75 INTERSTATE HIGHWAYS

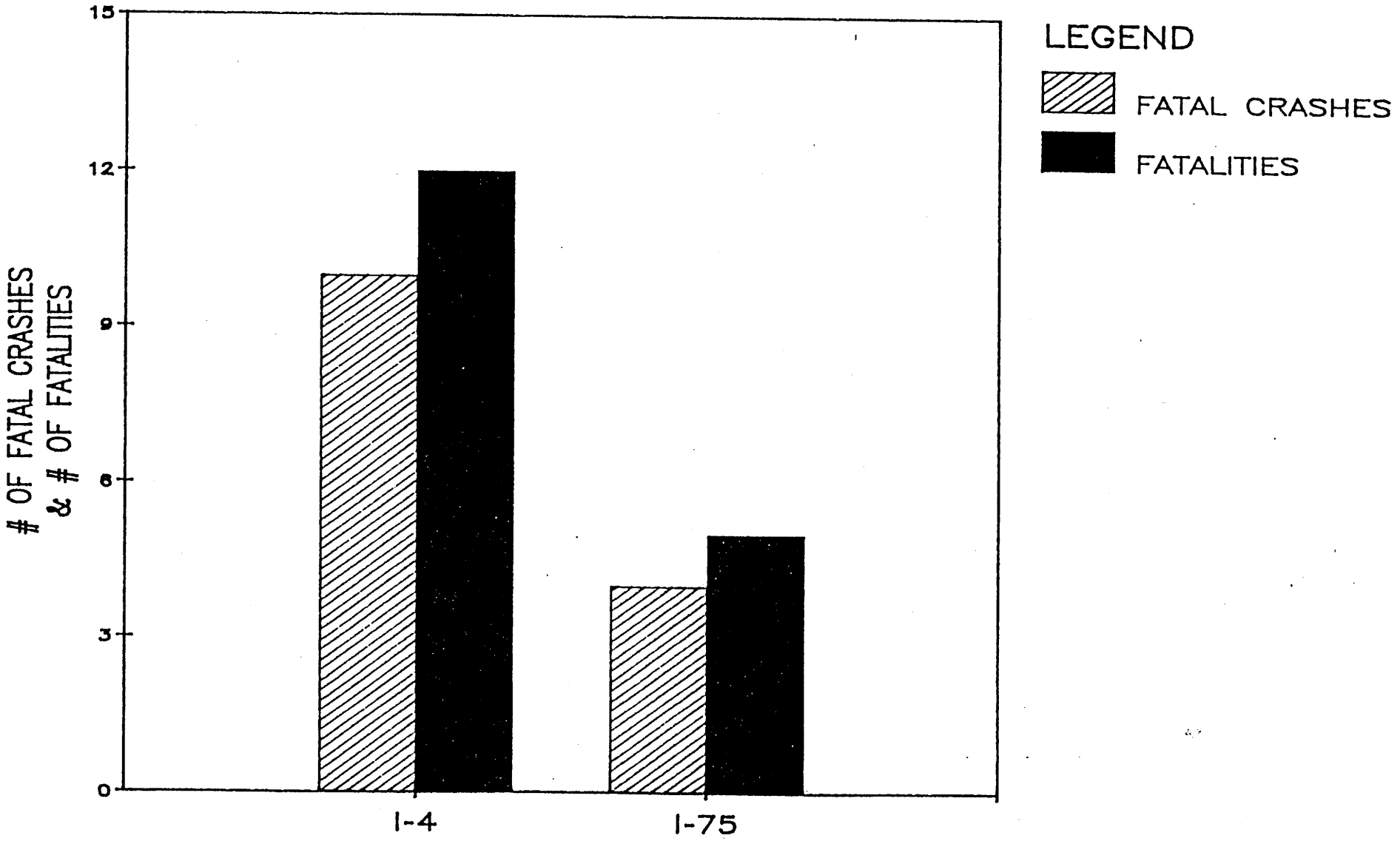
(1989 AVERAGE DAILY TRAFFIC)



COMPARISON OF I-4 WITH I-75 CRASHES AND INJURIES
(1989 STATISTICS)

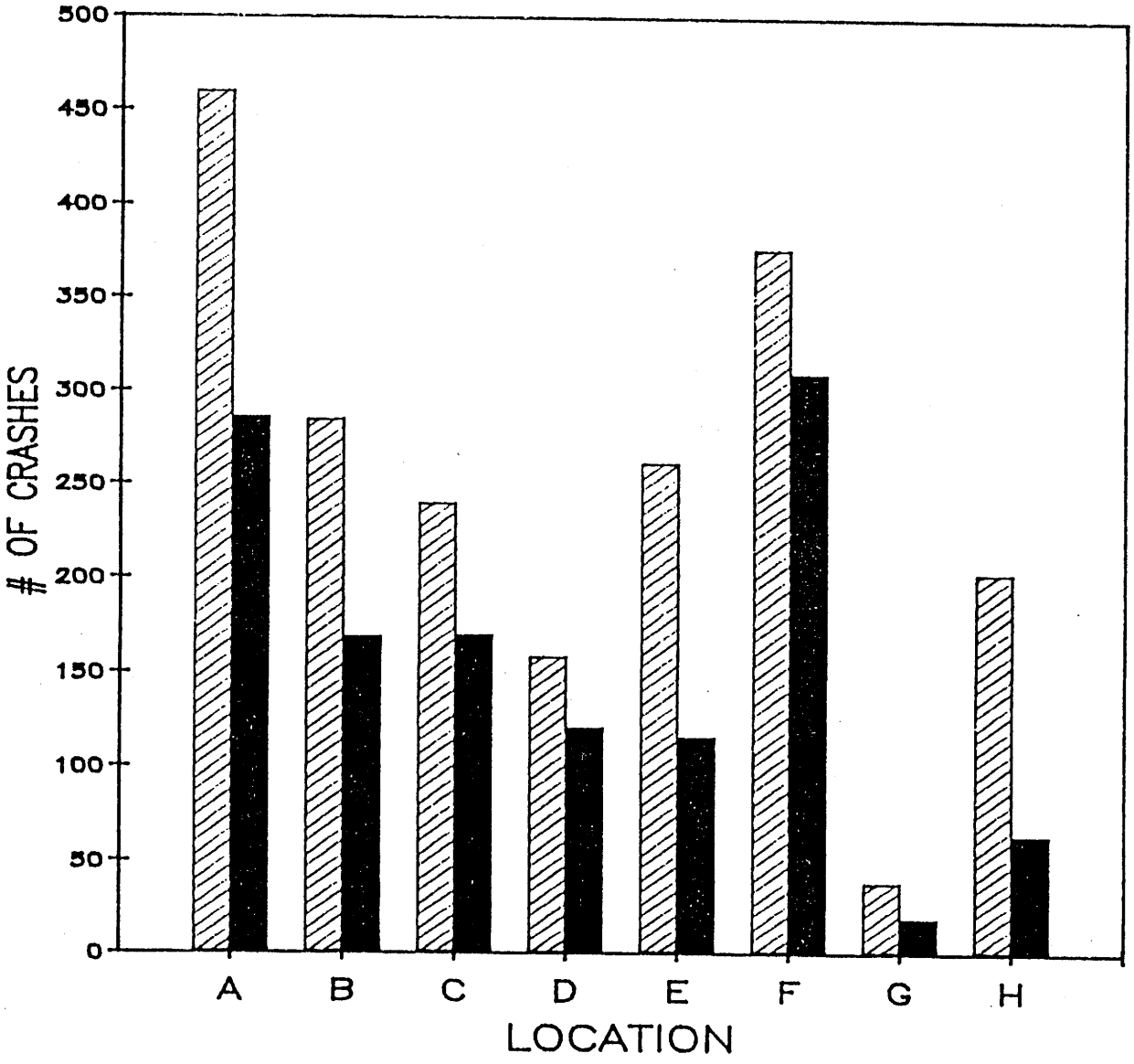


COMPARISON OF I-4 WITH I-75
FATAL CRASHES
(1989 STATISTICS)



COMPARISON OF I-4 WITH OTHER FLORIDA INTERSTATE HIGHWAYS

(1989 CRASH STATISTICS)



LEGEND

INJURY CRASHES

PROP DMG CRASHES

LOCATION

A=I-4 SEC # 10190

B=I-295 SEC # 72001

C=I-10 SEC # 72270

D=I-95 SEC # 72280

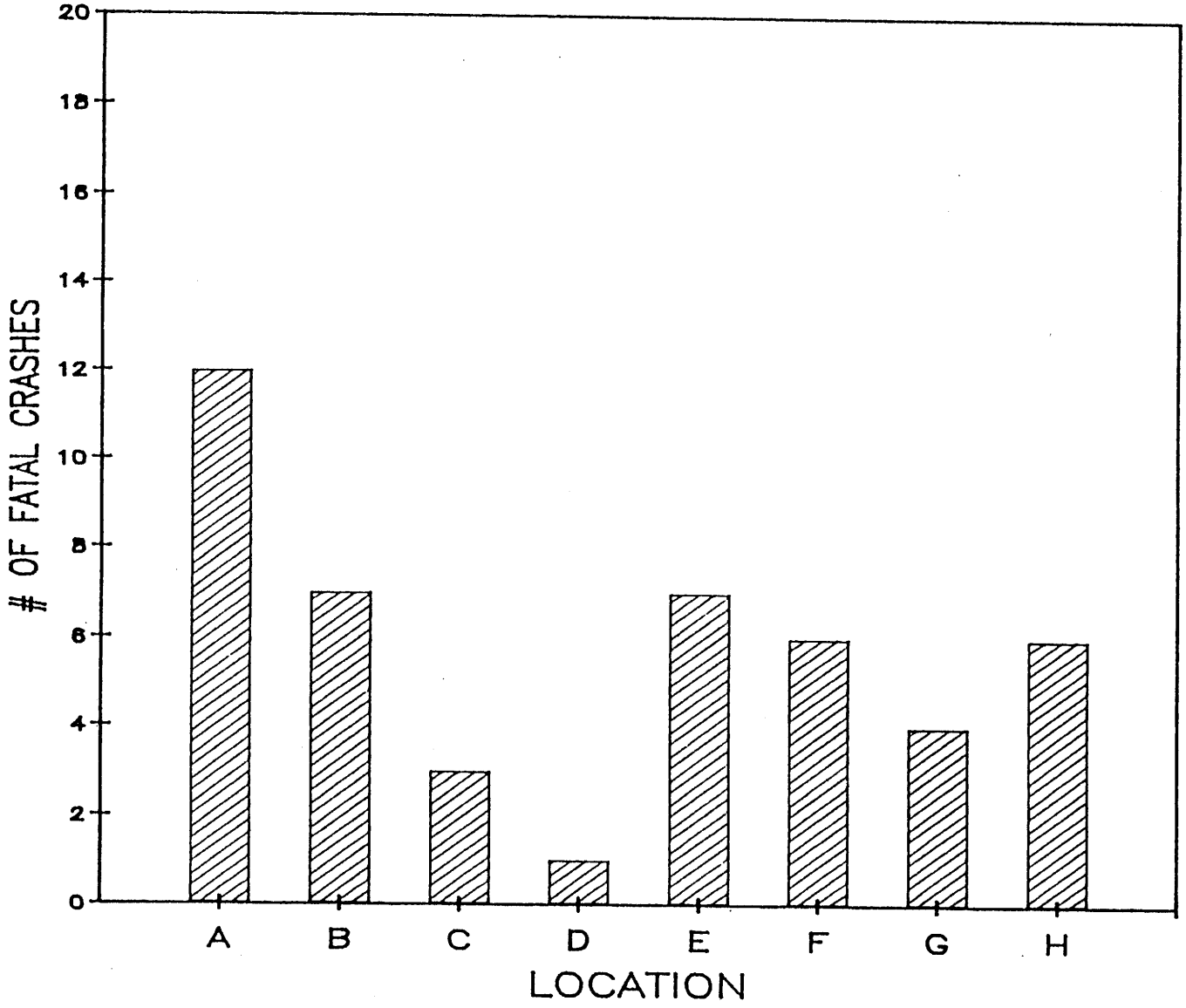
E=I-4 SEC # 75280

F=I-95 SEC # 72020

G=I-95 SEC # 72290

H=I-4 SEC # 77160

COMPARISON OF I-4 WITH OTHER FLORIDA INTERSTATE HIGHWAYS
(1989 CRASH STATISTICS)



LEGEND

FATAL CRASHES

LOCATION

A=I-4 SEC # 10190

B=I-295 SEC # 72001

C=I-10 SEC # 72270

D=I-95 SEC # 72280

E=I-4 SEC # 75280

F=I-95 SEC # 72020

G=I-95 SEC # 72290

H=I-4 SEC # 77160

The following represents direct comparisons between I-4 in Hillsborough County and I-75 (from Sumter County to the Georgia Line):

ACCIDENT STATS. (MOST CRITICAL SEGMENTS)

I-4 Hillsborough Co., D-7	I-75 Alachua Co., D-2
Section 10190, SR 400	Section 26260, SR 93,
M.P. 7.582-32.836	M.P. 0.0-35.190
Length = 25.254 miles	Length = 35.190 miles
No. of Accidents = 573	No. of Accidents = 213
No. of Injuries = 490	No. of Injuries = 256
No. of Fatalities = 12	No. of Fatalities = 5
No. of Prop. Damage = 286	No. of Prop. Damage = 87
Actual Acc. Rate = .904	Actual Acc. Rate = .491
Critical Acc. Rate = 1.330	Critical Acc. Rate =.812
Act. to Crit. Ratio = .679	Act. to Crit. Ratio =.604
22.69 Acc. Per Mile	6.05 Acc. per mile
19.41 Inj. per mile	7.27 Inj. per mile
.475 Fatal. per mile	.14 Fatal. per mile

AVERAGE DAILY TRAFFIC (HIGHEST ADT SECTION COMPARISON)

I-4 Hillsborough Co., D-7	I-75 Marion Co., D-5
Section 10190, SR 400	Section 36210, SR 93
M.P. 7.582-32.836	M.P. 0.0-38.282
Length = 25.254 miles	Length = 38.282 miles
Overall seg. Average ADT - 75,211	Overall segment average ADT - 36,168
High end ADT - 128,285	High end ADT - 49,871
Low end ADT - 51,230	Low end ADT - 29,602

GEOMETRIC COMPARISONS

I-4 Hillsborough Co, D-7 Section 10190, SR 400 M.P. 7.582-32.836 Length = 25.254 miles	Entire length of I-75 From N. of Hernando Co. to Georgia Line (165.3 miles)
Median Width - 19.042 mi @ 38' to 40' 2.197 mi @ 44' 4.015 mi @ 64'	Median width - 64' to 156'
Paved Shoulder Width Inside - 4' Outside - 9' WB 8' EB	Paved Shoulder Width Inside - 4' Outside - 10'
Shoulder Width on Bridges Inside - 2' (Predominately) Outside - 2' (Predominately)	Shoulder Width on Bridges Inside - 4' Outside - 10' (except some in Marion and Sumter @ 2')

PAVEMENT CONDITION
AVERAGE PAVEMENT ROUGHNESS INDEX (FOR MOST CRITICAL SECTION)

I-4 Hillsborough Co, D-7 Section 10190, SR 400 M.P. 7.582 to 32.836 Length = 25.254 miles	I-75 Columbia Co, D-2 Section 29180, SR 93 M.P. 0.0 to 30.447 Length = 30.447
AVG. PAVEMENT ROUGHNESS 150.875 "SMOOTH"	AVG. PAVEMENT ROUGHNESS 147.000 "SMOOTH"

AGE OF FACILITY

I-4 Hillsborough Co, D-7 Section 10190, SR 400, M.P. 7.582 to 32.836 Length = 25.254 mi.	All of I-75 from N of Hernando Co. Line to the Georgia Line (165.3 miles)
Oldest Segment Open to Traffic: Date 1958	Oldest Segment Open to Traffic: Date 1963
Newest Segment Open to Traffic: Date 1964	Newest Segment Open to Traffic: Date 1966