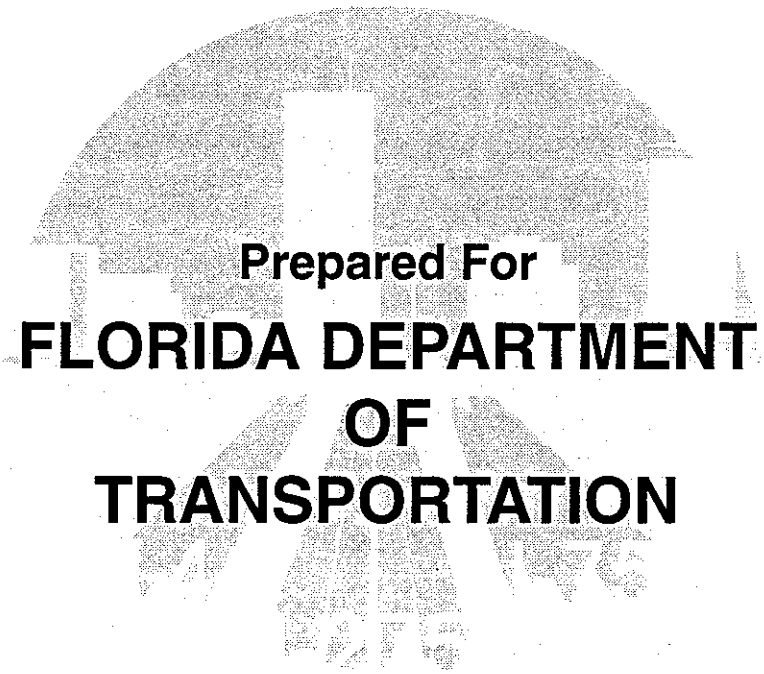
Engineering Summary

TAMPA INTERSTATE STUDY

(the I-275/I-4 Downtown Interchange Operational Improvement)

WPI No. 7140004, State Project No. 99007-1402, FAP No. IR-9999(43)

Interstate 275 (I-275) from the Hillsborough River to Floribraska Avenue and Interstate 4 (I-4) from the I-275/I-4 merge to east of 22nd Street (Section 10320-MP 0.0 to MP 0.7 and Section 10190-MP 6.389 to MP 8.49) approximately 4.5 kilometers (2.8 miles) in length.



Prepared For

FLORIDA DEPARTMENT OF TRANSPORTATION

Prepared By

GREINER, INC.

In Association With

KNIGHT APPRAISAL SERVICES, INC.

JANUS RESEARCH

AUGUST 1996

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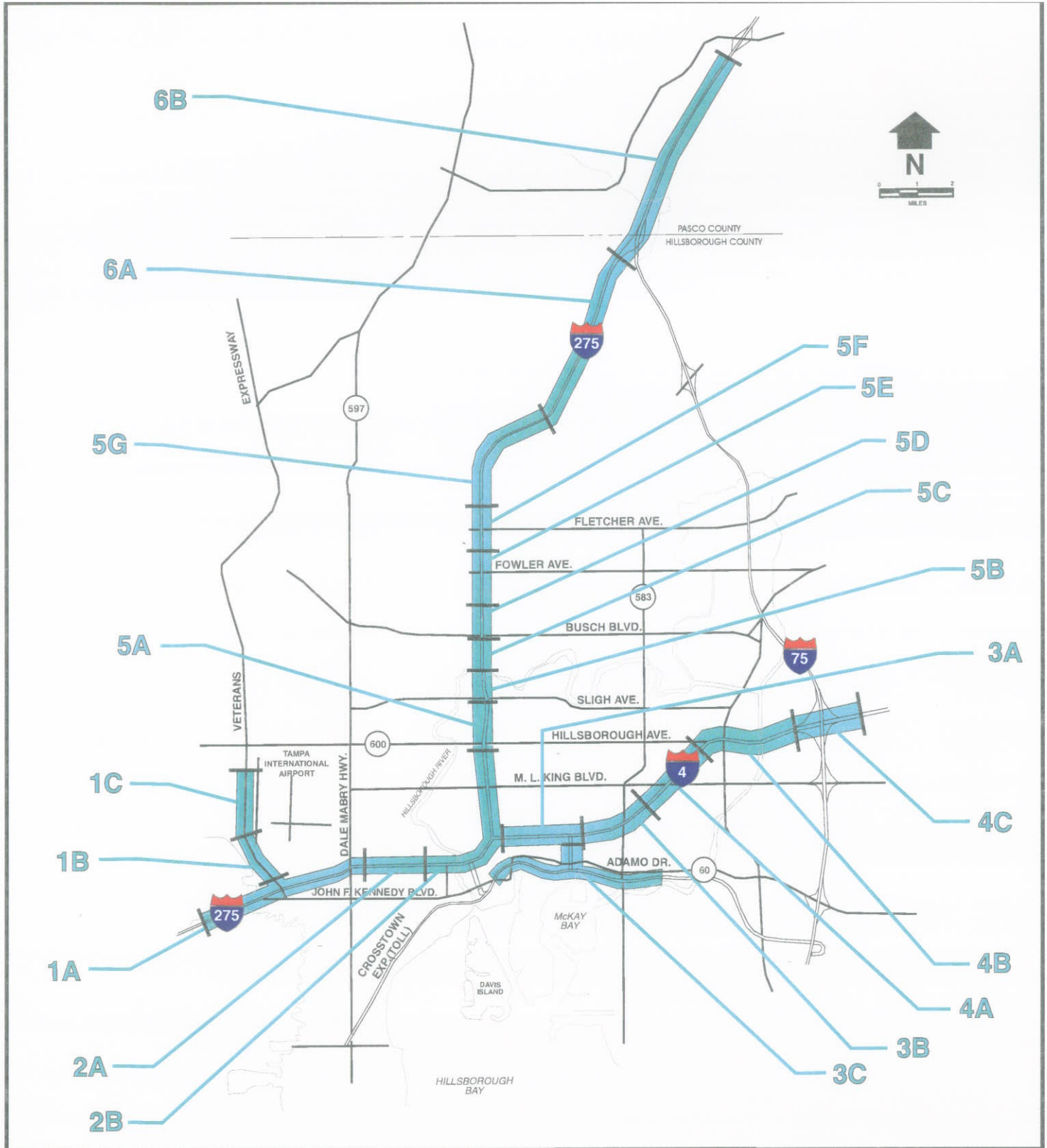
ABSTRACT

The Tampa interstate is the cornerstone of the Tampa Bay area's surface transportation system. A Master Plan for the Tampa interstate system was approved by the Federal Highway Administration (FHWA) in August 1989 and adopted by the Hillsborough County Metropolitan Planning Organization (MPO) in November 1989. The Tampa Interstate Study (TIS) Master Plan design segments are shown on Exhibit 1.1.

Because of the complexity of the Master Plan preferred alternative, financial considerations, and changes in local transportation priorities, a staged construction plan has been developed to transition from the existing geometry to the ultimate improvements. As part of this plan, the Florida Department of Transportation (FDOT) has targeted funds to enhance the existing I-275/I-4 downtown interchange to provide safety and operational improvements to this important link in the Tampa interstate system. The I-275/I-4 downtown interchange, predominantly Design Segment 2B, has been identified by the MPO, the FDOT, and the FHWA as a vital link to other staged improvements contained within the Master Plan and currently under design and construction.

This document summarizes the engineering analyses conducted for the I-275/I-4 downtown interchange operational improvements. Existing conditions in the project area are analyzed to identify problem areas. Alternatives are evaluated to determine a preferred alternative, and a preliminary design analysis is presented. The environmental analysis for this project is published separately.



LEGEND

Study Limits

1A Design Study Segment

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida

TIS MASTER PLAN DESIGN SEGMENTS

EXHIBIT 1.1

SECTION 2.0

INTRODUCTION

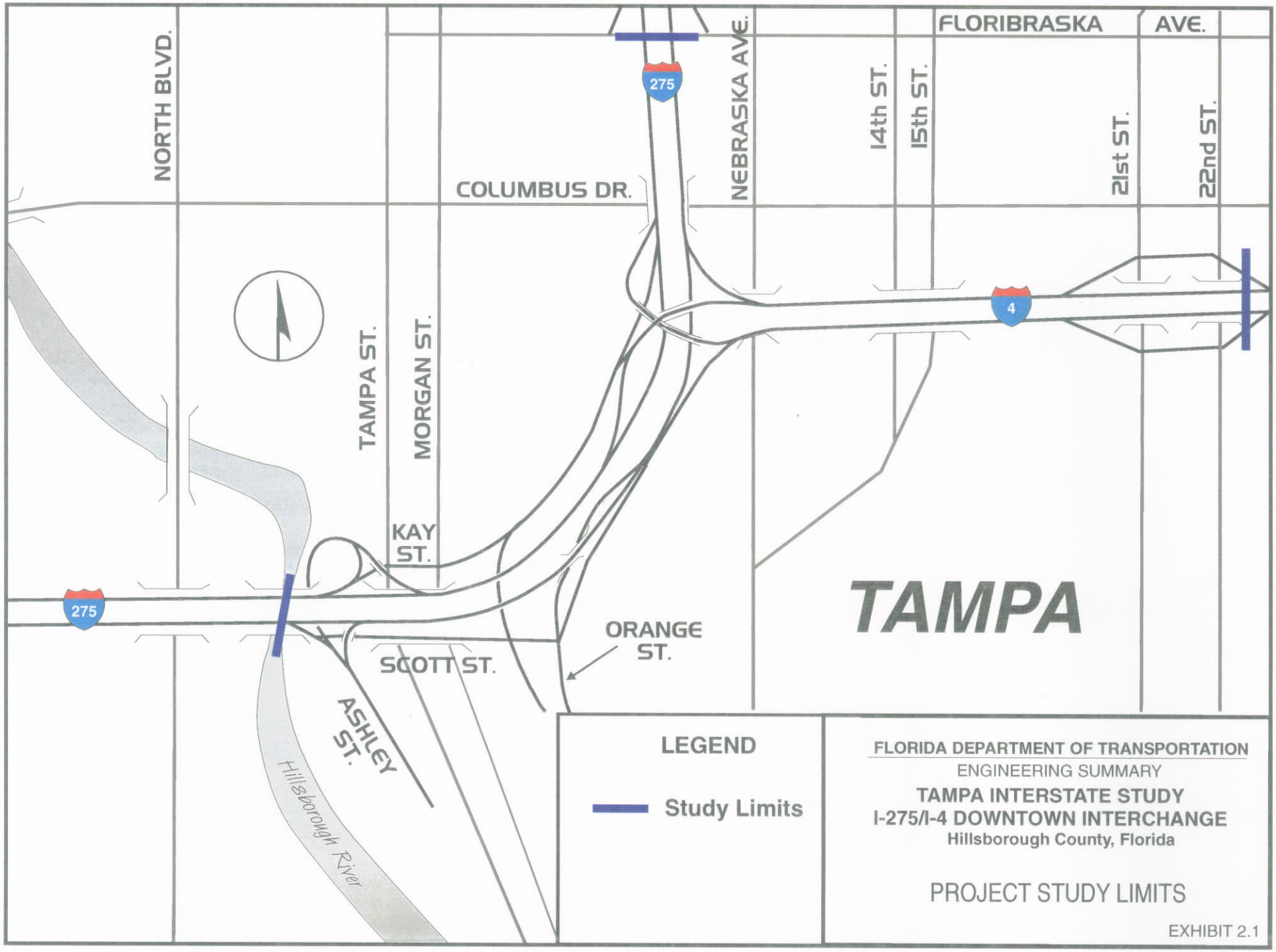
This section discusses the purpose of the proposed improvements and describes the project limits. Section 3.0 discusses the need for improvements, while Sections 4.0 and 5.0 provide a discussion of the existing conditions and alternatives analysis. Section 6.0 discusses the preliminary design analysis relative to the proposed Preferred Alternative.

2.1 PURPOSE

The I-275/I-4 downtown interchange was designed in the early 1960's and is a complex arrangement of overpasses and weaving areas that handle large volumes of traffic. Originally designed to handle 40,000 to 60,000 vehicles per day (vpd), traffic volumes in 1995 ranged as high as 182,000 vpd, over three times the amount of traffic intended to travel this section of roadway. With such high volumes of traffic on the interstate, the issue of safety in the I-275/I-4 downtown interchange has become a great concern to the Tampa Bay community. This staged improvement project is intended to improve conflicting merge/diverge areas that currently contribute to congestion in the downtown interchange area; increase sight distance to reduce accidents; provide a pull off area when accidents occur by providing shoulders where economically and physically possible; and identify any further safety improvements for the downtown interchange.

2.2 PROJECT DESCRIPTION

The study limits for the proposed downtown interchange improvements are I-275 from the Hillsborough River north to Floribraska Avenue and I-4 from the I-275/I-4 merge to east of 22nd Street, approximately 4.5 kilometers (2.8 miles) in length. The project study limits are shown on Exhibit 2.1.


NORTH BLVD.
TAMPA ST.
MORGAN ST.
COLUMBUS DR.
NEBRASKA AVE.
14th ST.
15th ST.
FLORIBRASKA AVE.
21st ST.
22nd ST.
275
4
KAY ST.
ORANGE ST.
SCOTT ST.
ASHLEY ST.
Hillsborough River
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PROJECT STUDY LIMITS
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SECTION 3.0
NEED FOR IMPROVEMENTS

The proposed project is needed to improve two areas of concern: transportation deficiencies and safety. In addition, the proposed improvements are consistent with local long-range transportation plans. The following provides further discussion of these areas.

3.1 TRANSPORTATION DEFICIENCIES

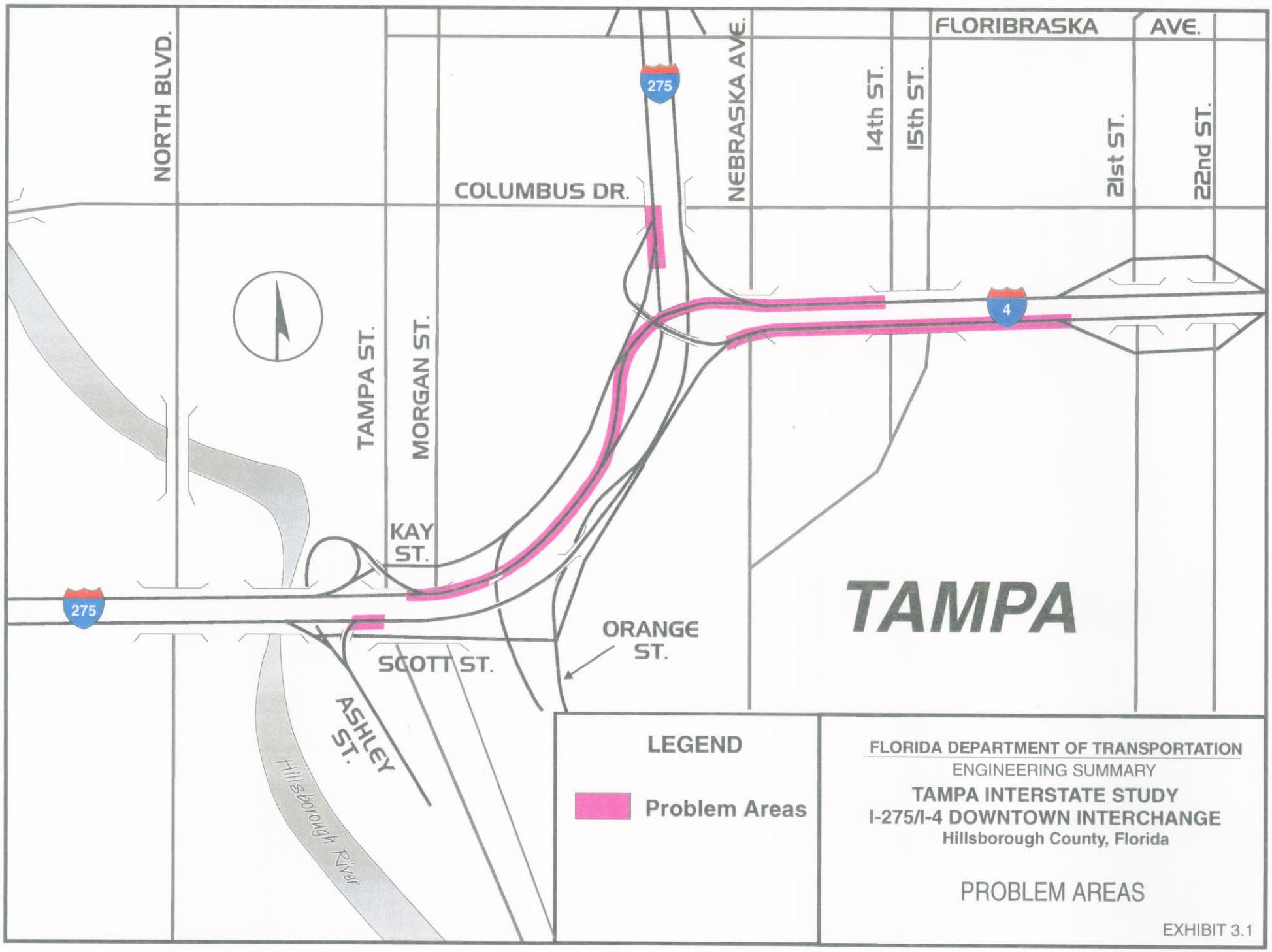
To evaluate the need for improvements, transportation deficiencies were identified within the study limits of the downtown interchange. The following sections briefly describe problem areas in terms of traffic operations as well as summarize existing traffic conditions in the project area.

3.1.1 Operational Problem Areas

With the use of existing and forecast traffic volumes and vehicle surveillance of the interchange, the following four basic problem areas were identified as discussed in the following paragraphs. Exhibit 3.1 displays these four areas.

3.1.1.1 Northbound I-275 On-ramp from Ashley Street

Vehicles using the Ashley Street on-ramp to access northbound I-275 must travel on a sharp curve [(which currently has a design speed of 40 km/h (25 mph)] and merge with mainline vehicles in a distance of less than 152m (500 ft.). Vehicles that are unable to find a gap in traffic in the outside (right) lane must stop on the ramp due to the short length of the acceleration lane and the lack of adequate full-width shoulder. The limited number of vehicular gaps present in the outside lane is the result of this being the only mainline lane continuing from I-275 northbound east to I-4.


NORTH BLVD.
TAMPA ST.
MORGAN ST.
COLUMBUS DR.
NEBRASKA AVE.
14th ST.
15th ST.
FLORIBRASKA AVE.
21st ST.
22nd ST.
275
4
KAY ST.
SCOTT ST.
ORANGE ST.
ASHLEY ST.
Hillsborough River
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Problem Areas
FLORIDA DEPARTMENT OF TRANSPORTATION
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I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida
PROBLEM AREAS
EXHIBIT 3.1

The primary causes of this problem are both insufficient acceleration lane length and the limited number of through lanes destined for I-4. In addition, lack of shoulders in the merge area becomes a problem when breakdowns occur.

3.1.1.2 Eastbound I-4 from the Southbound I-275 On-ramp to the 21st Street Off-ramp

A majority of the vehicles traveling on the two eastbound I-4 lanes upstream of the southbound I-275 flyover ramp are destined for locations east of 21st Street. However, the outside (right) lane terminates at 21st Street. This results in a highly skewed distribution of vehicles in the two lanes with over 2,000 vehicles per hour traveling in the inside (left) lane to avoid the lane drop at the 21st Street ramp.

A secondary problem is caused by the vehicles on the southbound I-275 flyover ramp that exit at 21st Street. This maneuver requires these vehicles to change two lanes and weave across the entire I-4 roadway from left to right within an inadequate distance to attain a satisfactory level of service. This weaving movement tends to occur prior to the 14th/15th Street overpass. In addition, the presence of trucks (in the two eastbound I-4 lanes, as well as on the southbound I-275 flyover ramp) also tends to increase the frequency of lane changing maneuvers since passenger vehicles change lanes to pass these slower moving vehicles.

The primary causes of this problem are that only one basic (through) lane is provided for the northbound I-275 to eastbound I-4 movement and the presence of both a left-side on-ramp and a right-side off-ramp resulting in a complex weaving maneuver within a short distance.

3.1.1.3 Southbound I-275 Between the Off-ramp to Eastbound I-4 and the Off-ramp to Orange/Kay Street

Three lanes are provided on southbound I-275 north of the Dr. Martin Luther King, Jr. Boulevard on-ramp. A fourth (auxiliary) lane is provided between this on-ramp and the east ramp to eastbound I-4. Three lanes are provided south of the I-4 off-ramp; however, one I-275 mainline lane is terminated 168m (550 ft.) south of this location at the Orange/Kay Street off-ramp gore area.

Vehicles from the Dr. Martin Luther King, Jr. Boulevard on-ramp must weave to the left across two lanes to continue traveling southbound on I-275 south of the Orange/Kay Street off-ramp. Due to the short distance between the I-4 off-ramp and the Orange/Kay Street off-ramp, almost all of this weaving occurs between the Dr. Martin Luther King, Jr. Boulevard on-ramp and the eastbound I-4 off-ramp. The southbound I-275 vehicles exiting at Floribraska Avenue must change one lane to the right to access this off-ramp via the auxiliary lane which further increases the problems in this area.

The primary cause of this problem is insufficient weaving distance between the termination of the auxiliary lane (at the off-ramp to eastbound I-4) and the reduction in the basic number of through lanes (at the off-ramp to Orange/Kay Street).

3.1.1.4 Southbound I-275 from the I-4/I-275 Merge to the Ashley Street Off-ramp

Vehicles traveling in the outside (right) lane of westbound I-4 must merge into the adjacent left lane in a distance of approximately 396m (1,300 ft.) (in the vicinity of 7th Avenue) since the outside lane is tapered out after joining southbound I-275. Vehicles traveling in the outside (right) lane of southbound I-275 must change one lane to the right to exit at the Ashley Street off-ramp. All vehicles from westbound I-4 exiting at Ashley Street remain in the inside lane. (This lane becomes the outside lane of southbound I-275 after the merge with I-4). The high concentration of vehicles in the outside lane of southbound I-275 (downstream from the I-4 merge) tends to reduce the operating speed of vehicles in this lane. Since the operating speeds of vehicles in the outside lane are lower than the operating speeds of vehicles in the center and inside lanes, some of the vehicles from I-4 that are not destined for Ashley Street weave from the outside lane to the center lane in an attempt to increase their speed and avoid the problems. Consequently, weaving maneuvers are made from both sides of the roadway into or across the lane carrying the Ashley Street off-ramp traffic. A significant portion of this weaving occurs in a curved section of the roadway with only 0.6m (2 ft.) shoulders.

An additional problem is also caused by the merging of the outside lane of westbound I-4. Long vehicle queues often occur in the inside and center lanes of westbound I-4, east of the

northbound/southbound I-275 diverge area. These queues extend back beyond 14th/15th Street and result in some southbound I-275 vehicles using the outside (auxiliary) lane to bypass a portion of the queued vehicles. These vehicles "force" their way into the immediately adjacent lane (the outside lane of the two lanes that join southbound I-275) in the vicinity of the northbound I-275 exit gore.

The primary cause of these problems is that only one basic (through) lane is provided for the westbound I-4 to southbound I-275 movement. The outside lane from westbound I-4 is tapered out over a distance slightly less than 0.4 km (0.25 mi.), immediately prior to a curve and less than 609m (2,000 ft.) upstream of a major off-ramp to downtown Tampa.

The interim concept involves improving the existing operations and safety problems of the interchange by providing lane additions, transferring critical weave movements to other facilities or changing weaving patterns, and providing full shoulders where possible.

3.1.2 Existing Traffic

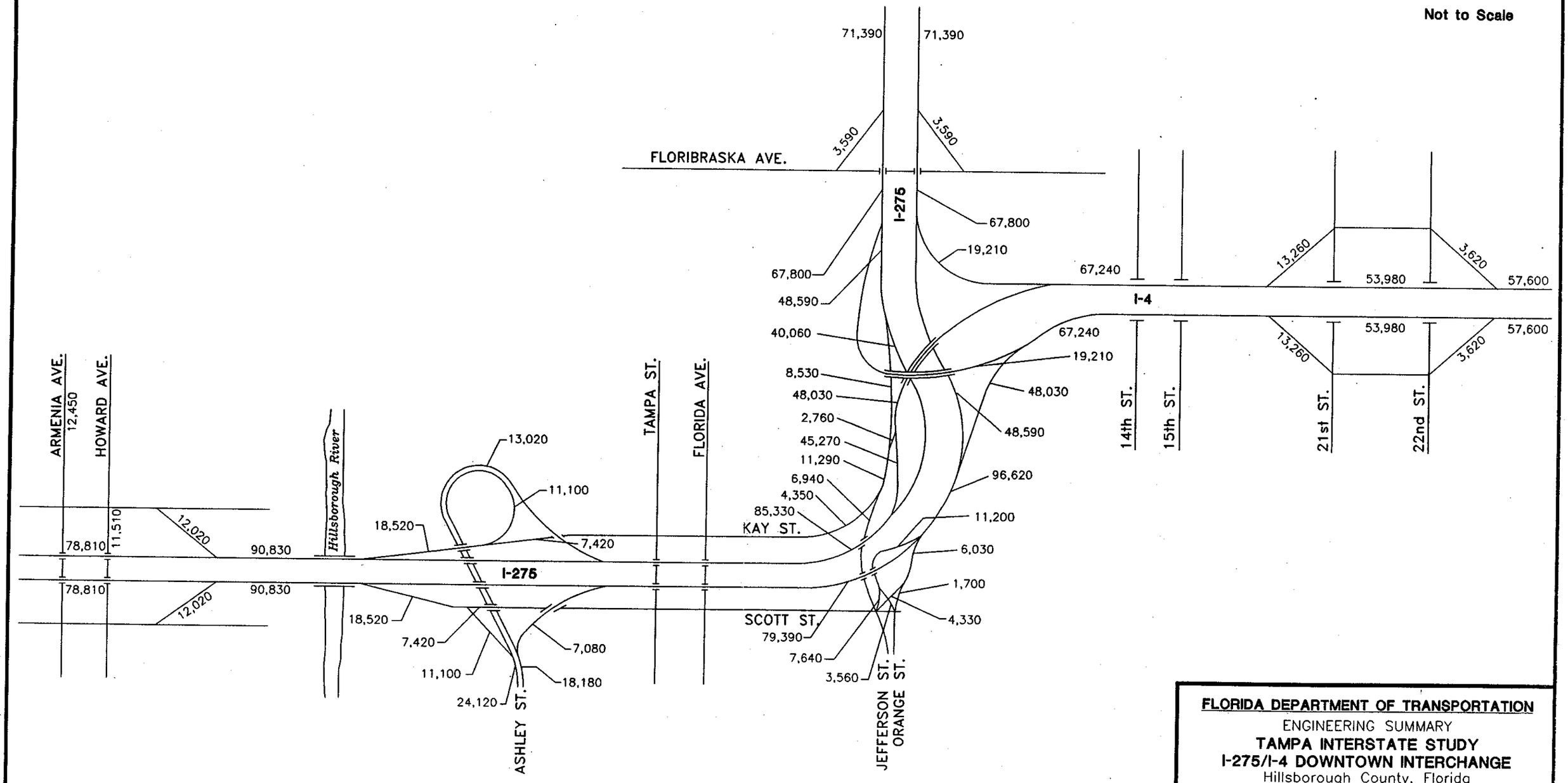
To evaluate existing traffic conditions, traffic counts were conducted between July 18, 1995 and August 3, 1995. The traffic counts included 24-hour machine counts (directional volumes in 15-minute increments) on selected mainline I-275 and I-4 locations as well as on all on-/off-ramps within the project study limits. Since the 24-hour machine counts were conducted in 15-minute increments, the peak hour volumes could be identified through review of the machine count data. In general, the morning peak hour occurs between 7:00 a.m. and 8:00 a.m. while the evening peak hour occurs between 4:30 p.m. and 5:30 p.m. The traffic counts were adjusted using weekly adjustment factors provided by the FDOT. Existing daily traffic volumes for I-275 and I-4 are shown on Exhibit 3.2 and the peak hour volumes are provided on Exhibit 3.3.

Using the existing peak hour volumes, traffic operations analyses were conducted for those portions of I-275 and I-4 that are currently experiencing operational problems. The existing laneage on I-275 and I-4 and the configuration of the ramps are illustrated schematically on Exhibit 3.4.

LEGEND

79,390 Average Daily Traffic Volume

Not to Scale



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

EXISTING 1995 DAILY TRAFFIC VOLUMES

EXHIBIT 3.2

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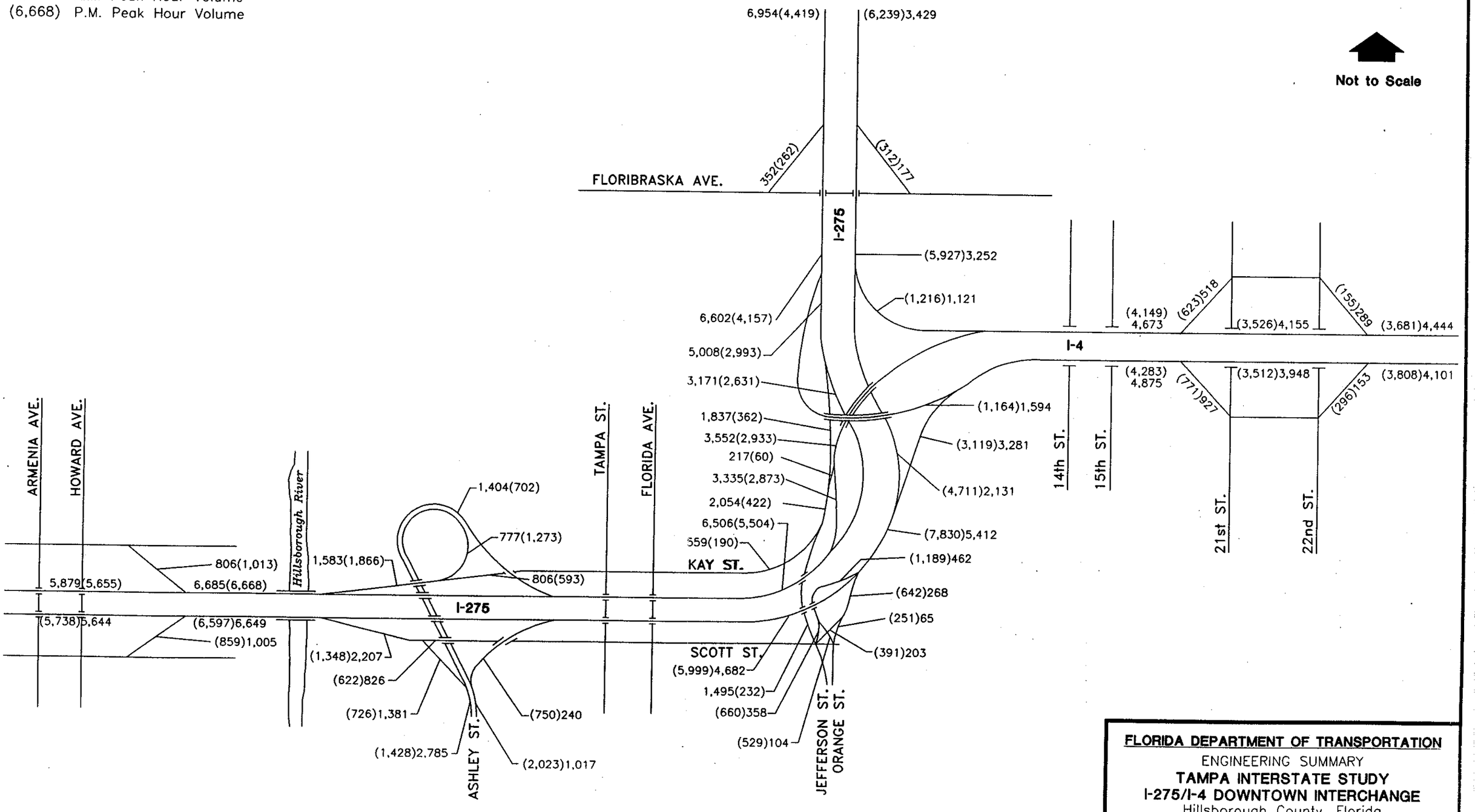
LEGEND

6,685 A.M. Peak Hour Volume
(6,668) P.M. Peak Hour Volume



Greiner, Inc.

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

EXISTING 1995 PEAK HOUR TRAFFIC VOLUMES

EXHIBIT 3.3

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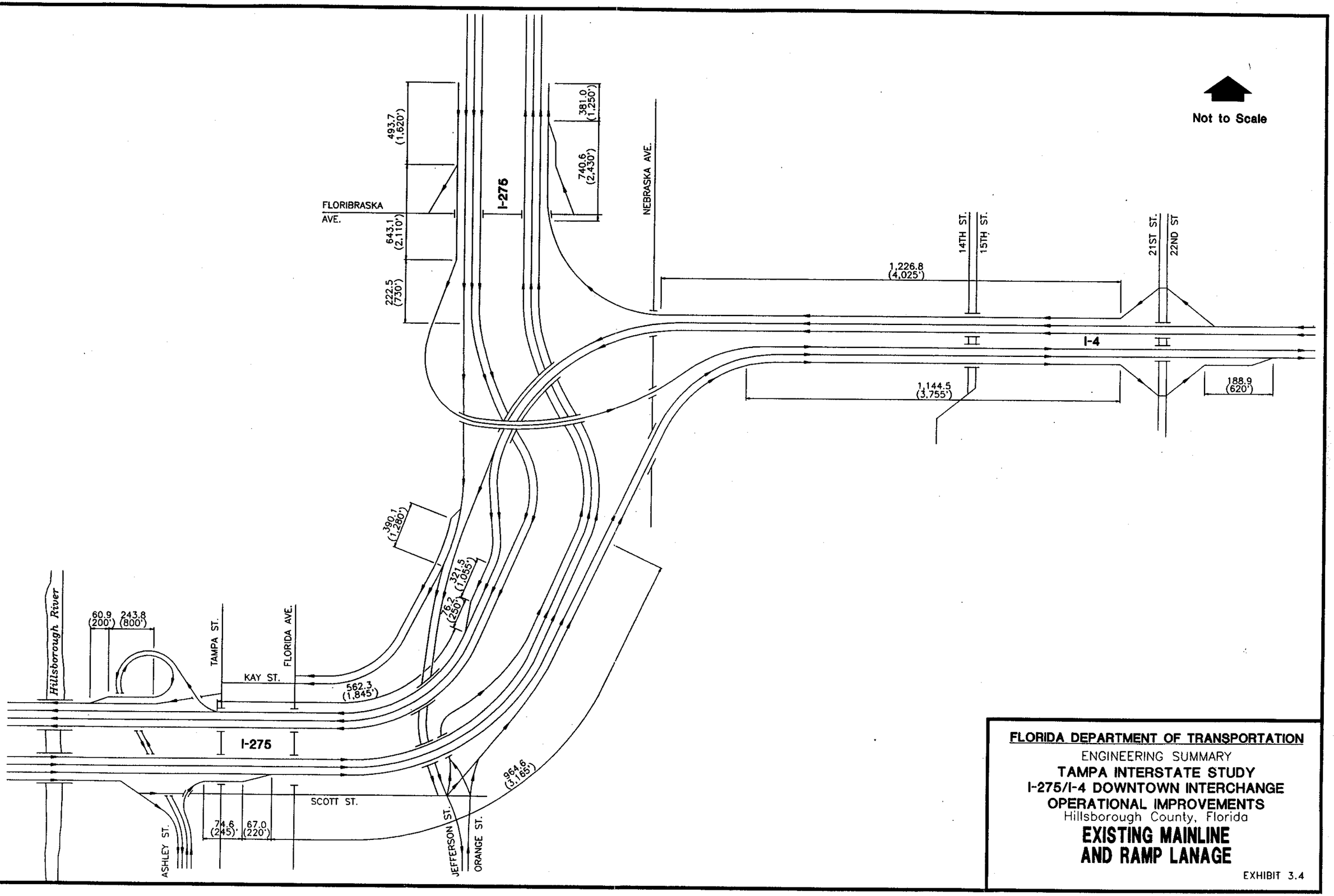

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FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
OPERATIONAL IMPROVEMENTS
Hillsborough County, Florida

EXISTING MAINLINE AND RAMP LANAGE

EXHIBIT 3.4

The freeway segments, weaving areas and ramp junction merge/diverge areas were analyzed using the methodologies and criteria described in Chapter 3 - Basic Freeway Segments, Chapter 4 - Weaving Areas and Chapter 5 - Ramps and Ramp Junctions of the 1994 Highway Capacity Manual (HCM). The existing conditions analyses were conducted using the peak hour factors (PHF's) and peak hour heavy vehicle percentages calculated from the traffic count data. These analyses were also conducted assuming level terrain, a driver population factor of 1.0 and a design speed of 90 km/h (55 mph).

Table 3.1 summarizes the results of the p.m. peak hour analysis conducted for the merge area at the Ashley Street on-ramp to northbound I-275. As indicated in the table, although the volume on northbound I-275 upstream (south) of the Ashley Street on-ramp is less than the capacity of freeway [as evidenced by the volume-to-capacity (v/c) ratio of 0.84], the volume on northbound I-275 immediately downstream of the on-ramp merge influence area exceeds the available capacity. The merge influence area for an on-ramp is defined to be the lane closest to the ramp (lane 1) along with the immediately adjacent lane (lane 2) and the ramp acceleration lane [for a distance of 457.2m (1,500 ft.)]. Therefore, the merge volume that is used to evaluate the operations of a merge area is the sum of the volume in lanes 1 and 2 of the freeway immediately upstream of the on-ramp and the on-ramp volume. Table 3.1 indicates that the merge area volume exceeds the merge area capacity by approximately 4 percent (as illustrated by the merge area v/c ratio of 1.04) and results in a merge area density of 39.6 passenger cars per mile per lane (pc/mi/ln). According to the 1994 Highway Capacity Manual, merge area densities in excess of 35 pc/mi/ln represent unstable, or breakdown, operations. Once the merge area volume exceeds the capacity, small fluctuations in demand or disruptions with the traffic stream cause vehicle queues to form and stop-and-go vehicle operations to occur.

The actual operations in the Ashley Street on-ramp merge area are significantly worse than the operations that would be expected in an area characterized by a v/c ratio of 1.04. This is because the v/c ratio included in Table 3.1 reflects the total volume and capacity in the two lanes immediately downstream of the on-ramp and does not take into account the imbalance in the volumes in lanes 1 and 2. The total volume in lane 1 immediately downstream of the Ashley Street on-ramp is 2,856

TABLE 3.1

EXISTING P.M. PEAK HOUR MERGE AREA OPERATIONS ANALYSIS SUMMARY
NORTHBOUND I-275 ON-RAMP FROM ASHLEY STREET
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Upstream Freeway Volume[1] (in pcph)	Upstream Freeway Capacity[1] (in pcph)	Upstream Freeway V/C Ratio[1]	On-Ramp Volume (in pcph)	Merge Area Volume[2] (in pcph)	Merge Area Capacity (in pcph)	Merge Area V/C Ratio	Merge Area Density (in pc/mi/ln)
5,819	6,900	0.84	831	4,795	4,600	1.04	39.6

[1] Upstream freeway refers to I-275 south of the Ashley Street on-ramp.
[2] The merge area volume is the volume in Lanes 1 and 2 of the freeway immediately north of the Ashley Street on-ramp.

passenger cars. This volume exceeds the capacity of a single freeway lane by approximately 25 percent. The extremely high volume traveling in lane 1 is due to the fact that this is the only one of the three lanes that continues northward and eastward to I-4.

Table 3.2 summarizes the results of the a.m. and p.m. peak hour analyses conducted for the weaving area on eastbound I-4 between the southbound I-275 on-ramp and the 21st Street off-ramp. As indicated in Table 3.2, the average speed of the weaving and non-weaving vehicles in the a.m. peak hour is 56.3 km/h (35.0 mph) and 48.2 km/h (30.0 mph), respectively. In the p.m. peak hour, the average weaving and non-weaving vehicle speeds are 56.3 km/h (35.0 mph) and 49.8 km/h (31.0 mph). The overall average vehicle speeds in this weaving area are 52.7 km/h (32.8 mph) and 53.9 km/h (33.5 mph) in the a.m. and p.m. peak hour, respectively.

The low vehicle speeds in this segment of I-4 are due to the large number of weaving vehicles present in this roadway segment. In the a.m. peak hour, the weaving volume is 2,736 vehicles while in the p.m. peak hour, the weaving volume is 2,698 vehicles. These weaving volumes represent approximately 56 percent and 63 percent of the total volume present in this segment in the a.m. and p.m. peak hours, respectively. The high weaving volumes in this area are due to the fact that this is a left-side/right-side Type C weaving area. With this type of weaving area, the through volume is one of the two weaving volumes and usually the highest volume in the weaving area.

Table 3.3 summarizes the results of the a.m. and p.m. peak hour analyses conducted for the weaving area on southbound I-275 between the I-275/I-4 junction and the Ashley Street off-ramp. As indicated in the Table, the average weaving vehicle speeds are 49.8 km/h (31.0 mph) and 51.4 km/h (32.0 mph) in the a.m. and p.m. peak hours, respectively. The average non-weaving vehicle speeds in the a.m. and p.m. peak hours are 59.5 km/h (37.0 mph) and 61.1 km/h (38.0 mph), respectively. This section of I-275 is also characterized as having high weaving volumes with 3,079 vehicles in the p.m. peak hour and 3,521 vehicles in the a.m. peak hour. These weaving volumes represent approximately 56 percent and 54 percent of the total p.m. and a.m. peak hour volumes in this section, respectively.

TABLE 3.2

EXISTING A.M. AND P.M. PEAK HOUR WEAVING AREA OPERATIONS ANALYSIS SUMMARY
EASTBOUND I-4 BETWEEN SOUTHBOUND I-275 ON-RAMP AND 21ST STREET OFF-RAMP
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
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Peak Hour	Total Volume (in vph)	Weaving Volume (in vph)	Volume Ratio[1]	Number of Lanes	Average Per Lane Volume (pcphpl)	Average Weaving Speed km/h (in mph)	Average Non-Weaving Speed km/h (in mph)	Average Overall Speed km/h (in mph)
A.M.	4,875	2,736	0.56	3	1,936	56.3 (35.0)	48.2 (30.0)	52.7 (32.8)
P.M.	4,283	2,698	0.63	3	1,701	56.3 (35.0)	49.8 (31.0)	53.9 (33.5)

[1] Volume Ratio = Weaving Volume/Total Volume

[2] Average Overall Speed is the weighted average travel speed and was calculated as follows:
[(Average weaving speed x weaving volume) + (Average non-weaving speed x non-weaving volume)]/(Total Volume)

TABLE 3.3

EXISTING A.M. AND P.M. PEAK HOUR WEAVING AREA OPERATIONS ANALYSIS SUMMARY SOUTHBOUND I-275 BETWEEN WESTBOUND I-4 MERGE AND ASHLEY STREET OFF-RAMP

Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Peak Hour	Total Volume (in vph)	Weaving Volume (in vph)	Volume Ratio[1]	Number of Lanes	Average Per Lane Volume (pcphpl)	Average Weaving Speed km/h (in mph)	Average Non-Weaving Speed km/h (in mph)	Average Overall Speed km/h (in mph)
A.M.	6,506	3,521	0.54	3	2,619[3]	49.8 (31.0)	59.5 (37.0)	54.3 (33.8)
P.M.	5,504	3,079	0.56	3	2,186[3]	51.4 (32.0)	61.1 (38.0)	55.6 (34.6)

[1] Volume Ratio = Weaving Volume/Total Volume
[2] Average Overall Speed is the weighted average travel speed and was calculated as follows:
[(Average weaving speed x weaving volume) + (Average non-weaving speed x non-weaving volume)]/(Total Volume)
[3] These per lane volumes exceed the capacity of the weaving area (1,900 pcphpl).

It should also be noted that the average-per-lane volumes in this weaving area are 2,619 passenger cars per hour per lane (pcphpl) and 2,186 pcphpl in the a.m. and p.m. peak hours, respectively. These volumes exceed the capacity of a weaving area (1,900 pcphpl) by approximately 38 percent and 15 percent, respectively. In addition, the a.m. peak hour per lane volume of 2,619 pcphpl is so high that it actually exceeds the capacity of a basic freeway lane. The extremely high volumes in this section of I-275, coupled with the large proportion of weaving vehicles, results in a large amount of congestion and vehicular turbulence. This vehicular turbulence is exacerbated by the rapid termination of the outside lane after westbound I-4 joins southbound I-275. This congestion causes vehicular queues to form in the vicinity of the taper of the outside lane. These queues continue to propagate back past the I-4/I-275 gore and onto westbound I-4.

3.2 SAFETY

Safety is quantified by calculating a safety ratio, which is a ratio of the actual numbers of crashes to the critical crash rate. The critical crash rate is the statewide average crash rate for a similar type of road. A safety ratio greater than 1.0 indicates that the roadway is experiencing more crashes than would be anticipated on this type of roadway.

The safety ratio for I-275 through the CBD averages 1.36. The high safety ratios on this section of roadway are due to several factors which increase the potential for crashes, such as heavy traffic volumes, substandard horizontal and vertical alignments, and multiple weaving movements. In addition, the lack of adequate shoulders on which to pull off the road after an crash occurs results in hazardous conditions and major travel delays. Crashes at this interchange have caused mile-long back-ups in several directions and delays of several hours for some motorists. In severe situations, this section of the interstate has remained closed for over four hours, shutting down the entire interstate system through Tampa.

With the proposed staged construction plan, operational conditions will be improved and the crash rate will be reduced. Both of these factors will improve safety and help to decrease the delay times

associated with complex merge/diverge sections, crashes, and inadequate shoulders. A detailed analysis of crash data is discussed in Section 4.1.10.

3.3 CONSISTENCY WITH TRANSPORTATION PLAN

The Hillsborough County MPO is the governmental agency within the state of Florida responsible for establishing a continuing, cooperative, and comprehensive transportation process for Hillsborough County and the cities of Tampa, Plant City, and Temple Terrace. The Hillsborough County MPO functions as the transportation planning group of the Hillsborough County City-County Planning Commission (HCC-CPC). The MPO 2015 Long Range Transportation Plan defines the region's major thoroughfares needed to provide acceptable levels of service to the area. The proposed improvements to I-275 and I-4 are included in the MPO 2015 Long Range Transportation Plan adopted on December 5, 1995.

The I-275/I-4 downtown interchange operational improvements are consistent with the MPO Adopted 2015 Interim Projects (2001-2005) portion of the Long Range Plan. The operational improvements are planned for construction during the years 2003-2005.

SECTION 4.0

EXISTING CONDITIONS

4.1 EXISTING ROADWAY CHARACTERISTICS

To provide a baseline analysis, an evaluation of existing conditions on I-275 from the Hillsborough River to Floribraska Avenue and on I-4 from the I-275 interchange to east of 22nd Street was conducted. The following provides a discussion of typical sections, functional classification, pedestrian and bicycle facilities, right-of-way, horizontal and vertical geometries, drainage, geotechnical data, accident statistics, lighting, utilities, structural, and roadway pavement conditions, and navigation.

4.1.1 Functional Classification

The Tampa interstate system provides key links to the entire Tampa urban area and is recognized as the most important regional highway system in Hillsborough County. The Federal Aid Classification system designates I-275 and I-4 as interstate facilities. The February 1989 white paper entitled Future Of Hillsborough Transportation Concepts, prepared for the Florida House of Representatives Public Transportation Committee, stated the significant role played by the interstate system in the region's transportation system and identified the Tampa Interstate Study's proposed reconstruction of I-275, I-4, and I-75 as a "priority project."

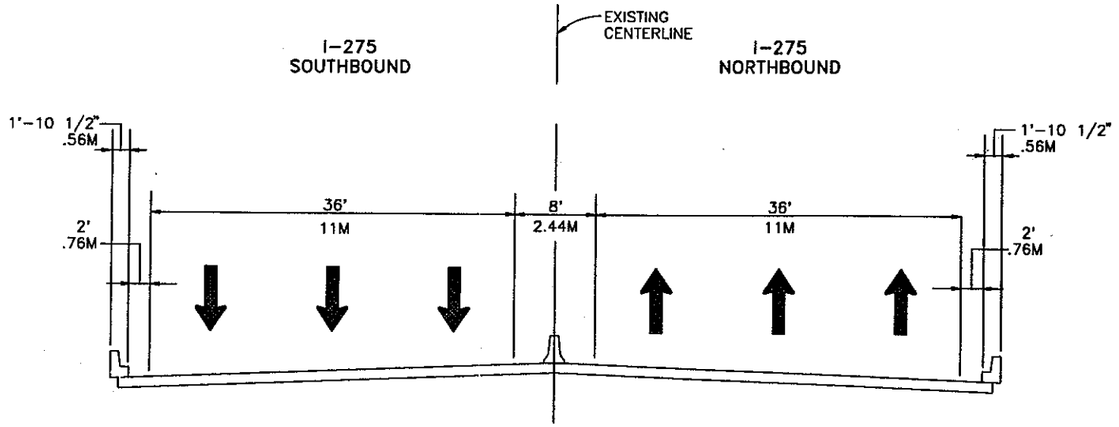
Similar official recognition for a major reconstruction of the interstate system is found in the MPO 2015 Long Range Transportation Plan (December 5, 1995). Future planning efforts, relating to the adopted MPO 2015 Long Range Transportation Plan, clearly indicate that the reconstruction of the interstate system is a basic component of their plan. Without safety improvements to the downtown interchange, the interstate system, and the other associated freeways, expressways, and arterials, will fail to provide the necessary system connectivity.

4.1.2 Existing Typical Sections

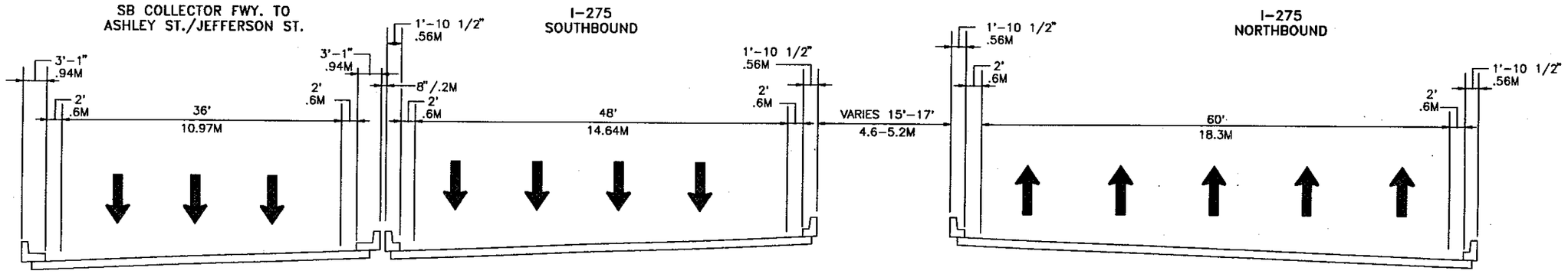
Varying lane configurations exist within the project study limits. Interchange movements on I-275 are located at Ashley/Scott Street, Scott/Kay Street, Jefferson/Orange Street, I-4/I-275, and Floribraska Avenue. On I-4, an existing interchange is located at 21st/22nd Street. The posted speed throughout the study limits is 80.5 km/h (50 mph). The existing typical sections for I-275 and I-4 are shown in Exhibits 4.1 and 4.2. The existing lane geometry is graphically shown on the lane line diagram on Exhibit 3.4 and briefly described in the following paragraphs.

Beginning with the eastbound lanes at North Boulevard, a four-lane (three through lanes and one auxiliary lane) section extends to the Hillsborough River where the fourth lane is dropped at the Ashley/Scott Street exit as the alignment crosses over the Hillsborough River and Doyle Carlton Drive. Continuing eastbound, the Ashley Street on-ramp merges with the three through lanes on I-275 in the vicinity of the Tampa Street overpass. Three through lanes continue eastbound over Franklin Street, Florida Avenue, Marion Street, Morgan Street, and Jefferson Street. East of Jefferson Street, the I-275 alignment heads in a northbound direction. A single lane on-ramp from Jefferson/Orange Street adds one lane to the left side of I-275 providing a short four-lane section before the two-lane exit for eastbound I-4 diverges just north of the Palm Avenue overpass. Three lanes continue northbound on I-275 passing under the I-4/I-275 westbound flyover ramp and the I-275/I-4 southbound to eastbound flyover ramp. A fourth northbound lane is added to I-275 as the westbound to northbound on-ramp from I-4 joins the alignment in the vicinity of the Columbus Drive overpass. Four lanes (three through lanes and one auxiliary lane) continue northbound on I-275 overpassing Floribraska Avenue.

The southbound I-275 corridor, beginning at Floribraska Avenue, provides a four-lane (three through lanes and one auxiliary lane) section, and a single lane off-ramp for the southbound to eastbound flyover ramp to I-4 drops the auxiliary lane. As the three southbound I-275 through lanes cross over Columbus Drive, a single lane exit drops a lane at the Jefferson Street (CBD) off-ramp. Two through lanes continue over Palm Avenue followed by the I-4 westbound on-ramp in the vicinity of the 7th Avenue/Henderson Street overpasses. This ramp adds one lane to I-275. Three lanes



BRIDGE SECTION
BETWEEN FLORIDA AVE. AND MARION ST.



BRIDGE SECTION OVER 7TH STREET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

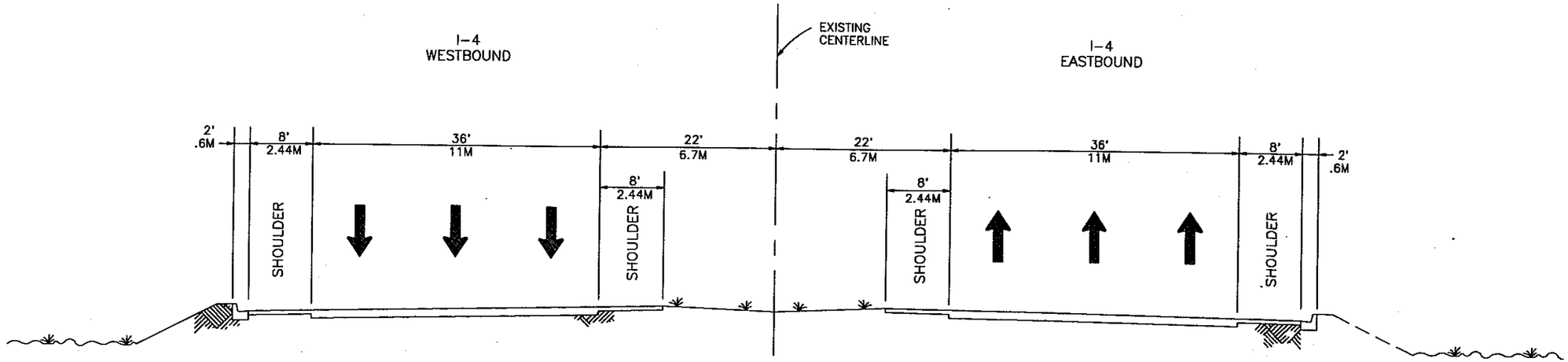
Hillsborough County, Florida

EXISTING TYPICAL SECTIONS FOR I-275

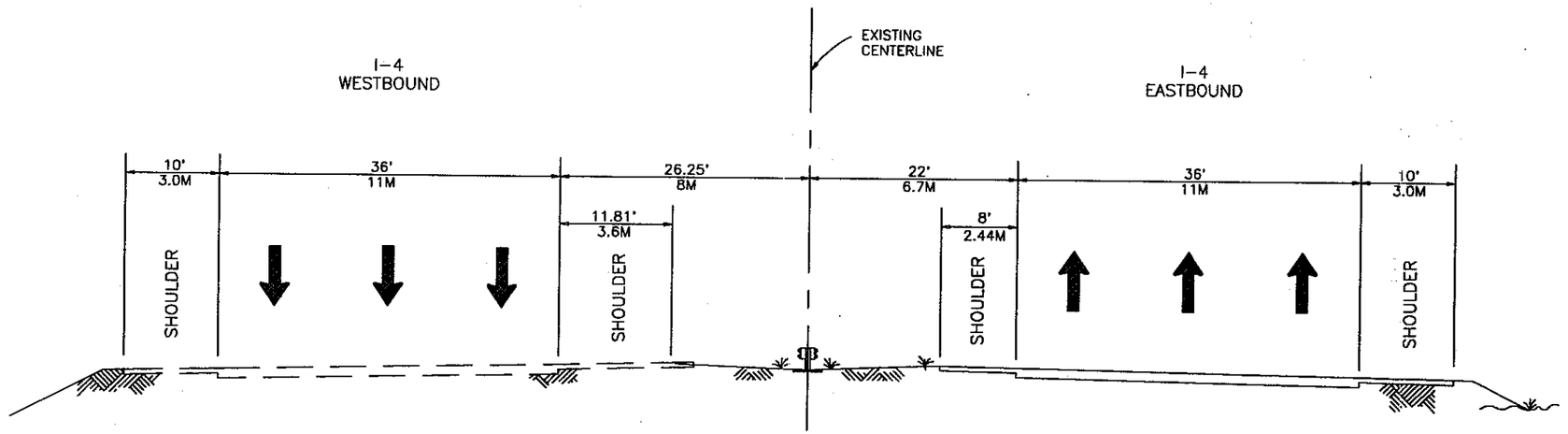
EXHIBIT 4.1

Greiner, Inc.

TIS/ENG_SUM/17_4_1.DWG/12.04.95



ROADWAY SECTION AT 17TH STREET



ROADWAY SECTION
BETWEEN 10TH STREET AND 12TH STREET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

EXISTING TYPICAL SECTIONS FOR I-4

EXHIBIT 4.2

Greiner, Inc.

TIS/ENG_SUM/17_4_2.DWG/12.04.95

continue as the alignment changes to a westerly direction through the CBD overpassing Jefferson Street, Morgan Street, Marion Street, Florida Avenue, Franklin Street, Tampa Street, and Ashley Street. As westbound I-275 approaches the Doyle Carlton Drive overpass and the Hillsborough River bridge, the ramp at Ashley/Tampa/Scott Street provides a two-lane entrance to the freeway. The outside ramp lane merges, and the inside ramp lane continues westbound as an auxiliary lane, providing a four-lane section over North Boulevard.

Eastbound lane alignment on I-4, beginning east of the I-275/I-4 interchange, provides three lanes bordering Ybor City carrying traffic over 14th Street and 15th Street. The outside lane is dropped at the 21st/22nd Street interchange. Two lanes continue eastbound over the 21st/22nd Street interchange.

Westbound on I-4, beginning just east of 22nd Street, two lanes cross over 22nd Street and 21st Street followed by a single lane on-ramp from 21st Street. The single lane entrance ramp from 21st Street adds one auxiliary lane to I-4, providing a short three-lane section over 14th and 15th Streets. A two-lane exit for I-275 southbound and a one-lane exit for I-275 northbound diverge just east of Nebraska Avenue. West of Nebraska Avenue, the two I-4 lanes to southbound I-275 merge into one lane which is added to I-275 just north of 7th Avenue.

4.1.3 Pedestrian and Bicycle Facilities

Due to the nature of travel on interstate facilities, bicycle and pedestrian traffic is prohibited on I-275 and I-4. However, sidewalks are provided on the majority of cross streets under I-275 and I-4. Currently, no marked bicycle lanes or routes are designated on the cross streets.

4.1.4 Right-of-Way

Based on a review of existing mapping, right-of-way widths vary significantly within the project study limits. Existing right-of-way is shown on the alternative concept plans provided in Section 5.5.

Beginning at the west end of the project, the existing right-of-way expands to an approximate width of 100.5m (330 ft.) as I-275 approaches the Hillsborough River. In the CBD east of the Ashley/Scott Street interchange, I-275 has a right-of-way width ranging from 57.9m (190 ft.) to 60.9m (200 ft.). From Tampa Street to Morgan Street, the interstate right-of-way also includes Scott Street which runs parallel to the interstate through this area.

Continuing northeastward through the CBD beyond the Orange/Jefferson Street interchange, right-of-way ranges from 91.4m (300 ft.) to 106.6m (350 ft.) from Henderson Street to Palm Avenue. North of the I-275/I-4 interchange, right-of-way on I-275 ranges from 76.2 m (250 ft.) to 80.7 m (265 ft.) from Columbus Drive to Floribraska Avenue.

On I-4, in the vicinity of 12th Street eastward to 15th Street, the existing right-of-way ranges from 65.5 m (215 ft.) to 74.1 m (240 ft.). Between 15th and 21st Streets, excluding interchange ramping, existing right-of-way ranges from 60.9 m (200 ft.) to 70.1 m (230 ft.).

4.1.5 Horizontal Alignment

The horizontal alignment of the mainline lanes of the interstate through the CBD and the I-4/I-275 interchange does not meet current design criteria. Currently, the horizontal alignment of I-275 through this area accommodates an 80.5 km/h (50 mph) posted speed with up to 6-degree curves in certain segments. The general horizontal alignment of the mainline segments of I-275 and I-4 is summarized in the following paragraphs.

Beginning with I-275 northbound, the alignment is tangent from Rome Avenue to just west of North Boulevard. A 3-degree curve carries the alignment to just west of the Hillsborough River. A tangent section continues over the river followed by a 1-degree, 30-minute curve prior to the Ashley Street entrance ramp. Between the Florida Avenue bridge to just south of the Central Avenue overpass, a compound curve section of 4 degrees followed by 6 degrees carries I-275 northbound approaching the I-4 interchange. From Henderson Avenue to Palm Avenue, 1-degree, 30-minute and 1-degree curves are provided. The I-275 northbound to I-4 ramp alignment is in a compound curve section

of 5 degrees followed by a 3-degree curve over Nebraska Avenue and 10th Street. Continuing eastward on I-4, a series of 2-degree reverse curves with tangent sections are provided between 13th and 16th Streets. The alignment is in a tangent section from 16th Street to east of 22nd Street.

On I-275 northbound at the I-4 interchange, a curve of approximately 5 degrees, 42 minutes carries the alignment under the I-4 westbound to I-275 southbound and I-275 southbound to I-4 eastbound flyover ramps. Continuing northward, a 6-degree curve is located in the section over Columbus Drive. North of this area, the alignment continues tangent to north of Floribraska Avenue.

For the westbound I-4 alignment, the segment of I-4 west from 22nd Street to approximately 10th Street is the same as the eastbound I-4 alignment. West of 10th Street, the I-4 ramp to I-275 northbound is provided with a three-centered curve of 1 degree followed by 4 degrees, 30 minutes and 8 degrees, 15 minutes. The I-4 ramp to I-275 southbound is in an 8-degree, 15-minute curve as it crosses over I-275 northbound and crosses under the I-275 southbound to I-4 flyover ramp.

From the northern project limits on I-275 southbound, the alignment is tangent from Floribraska Avenue to just north of the Columbus Drive bridge where a 5-degree, 53-minute curve crosses over the bridge followed by a tangent that matches the same alignment as the I-275 northbound lanes. The I-275 southbound to I-4 flyover ramp alignment begins with a 1-degree, 30-minute curve followed by a tangent section and an 8-degree, 15-minute curve before tieing into I-4 with a tangent alignment.

Continuing southward, a 0-degree, 30-minute curve is provided in the section between 7th Avenue to north of Henderson Avenue. In the segment between the Central Avenue bridge and the Marion Street bridge, a compound curve section of 6 degrees followed by 3 degrees routes traffic in a westerly direction. The west alignment between the Ashley Street exit and the Hillsborough River is in a 2-degree curve followed by a tangent section and a 3-degree curve west of the river to east of North Boulevard. Continuing westward, I-275 is tangent to west of Rome Avenue.

4.1.6 Vertical Alignment

To evaluate the existing vertical alignment of I-4 and I-275, the existing profiles were evaluated. The existing K value for each vertical curve was determined, and the maximum and minimum design speeds associated with each K value were noted. Calculated design speeds were based on values listed in A Policy on Geometric Design of Highways and Streets, (The "Green Book"), American Association of State Highway and Transportation Officials (AASHTO), 1995.

As shown in Table 4.1, design speeds for the downtown interchange area range from a minimum of 64.0 km/h (40 mph) to in excess of 108 km/h (67 mph). Most sag curves in the area are in the 86.9-km/h (54-mph) to 101.4-km/h (63-mph) range, and most crest curves are in the 66.0-km/h (41-mph) to 74.0-km/h (46-mph) range.

4.1.7 Shoulders

To evaluate existing shoulder widths, as-built plans were reviewed and then field verified. Exhibit 4.3 indicates the existing shoulder widths throughout the project area. None of these widths on the mainline meet current design standards. Only 0.6m (2ft.) shoulders are provided on many of the bridge structures, and safety barriers meeting current design standards are not in place.

4.1.8 Drainage

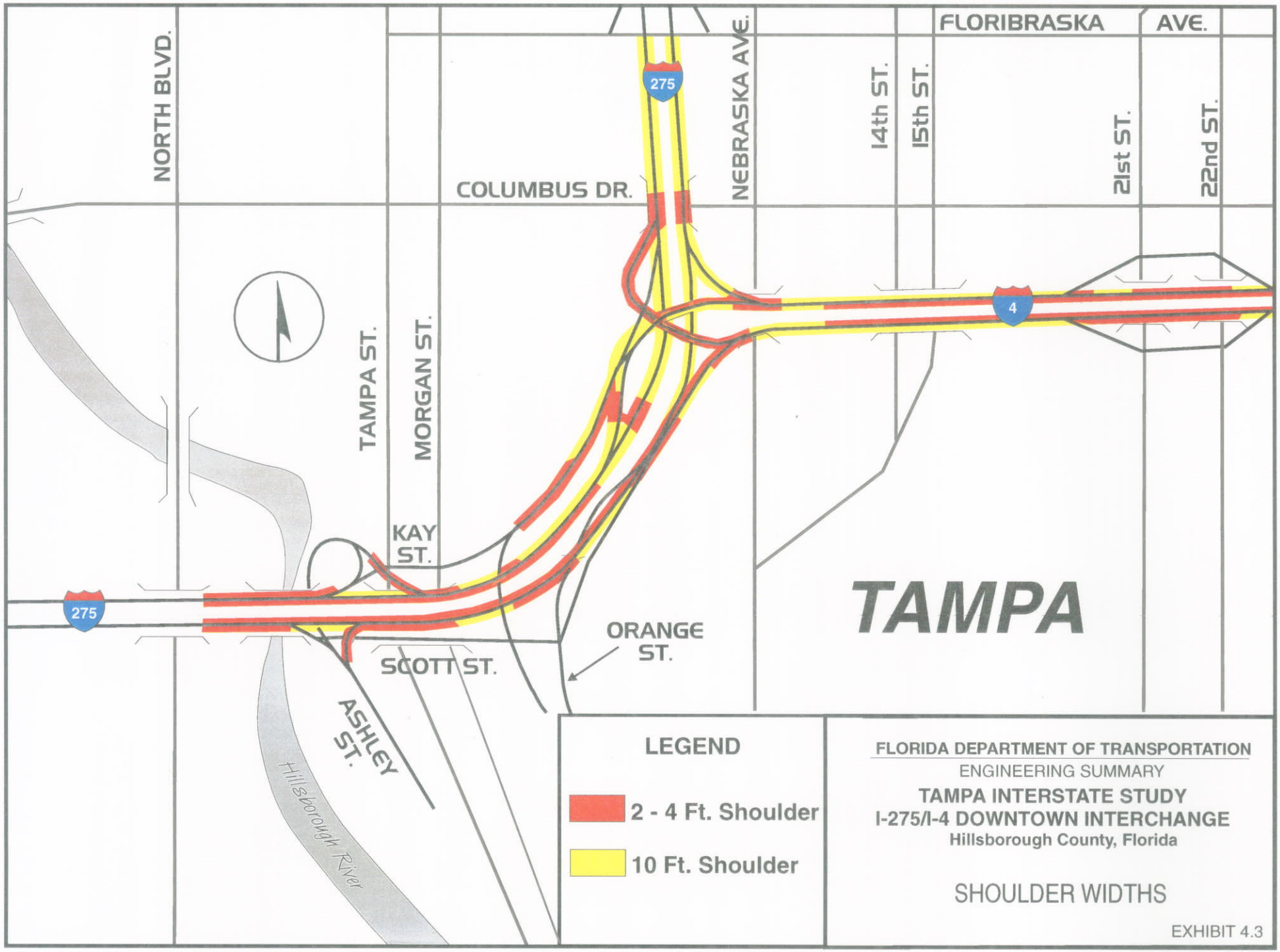
The project is located in an area which is characterized by heavily urbanized development. The majority of the existing stormwater systems within the project area outfall to the Hillsborough River.

The existing drainage system within the project area consists of enclosed storm sewer systems. The majority of the stormwater outfall systems for the existing interstate system were constructed in the early 1960s and are considered to be undersized or overloaded.

TABLE 4.1

EXISTING DESIGN SPEEDS
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Location	Sag Curves			Crest Curves		
		Design Speed			Design Speed	
	K Value Range	Lowest	Highest	K Value Range	Lowest	Highest
I-275 from North Boulevard to Hillsborough River	76 to 84	69 km/h (43 mph)	71 km/h (44 mph)	90	68 km/h (42 mph)	68 km/h (42 mph)
I-275 from Hillsborough River to Morgan Street	70 to 74	64 km/h (40 mph)	66 km/h (41 mph)	152 to 179	77 km/h (48 mph)	82 km/h (51 mph)
I-275 from Morgan Street to Nebraska Avenue (I-4), Columbus Drive (I-275)	70 to 199	64 km/h (40 mph)	108 km/h (67 mph)	83 to 169	66 km/h (41 mph)	80 km/h (50 mph)
I-275 from Columbus Drive to Floribraska Avenue	75	68 km/h (42 mph)	68 km/h (42 mph)	92 to 95	68 km/h (42 mph)	68 km/h (42 mph)
I-4 from Nebraska Avenue to 22nd Street	84 to 180	71 km/h (44 mph)	105 km/h (65 mph)	84 to 104	66 km/h (41 mph)	69 km/h (43 mph)


NORTH BLVD.
NEBRASKA AVE.
FLORIBRASKA AVE.
14th ST.
15th ST.
21st ST.
22nd ST.
COLUMBUS DR.
275
4
TAMPA ST.
MORGAN ST.
KAY ST.
ORANGE ST.
SCOTT ST.
ASHLEY ST.
Hillsborough River
TAMPA
LEGEND
2 - 4 Ft. Shoulder
10 Ft. Shoulder
FLORIDA DEPARTMENT OF TRANSPORTATION
ENGINEERING SUMMARY
TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida
SHOULDER WIDTHS
EXHIBIT 4.3

Various drainage basin studies within the project limits have been supplied to the study team by the City of Tampa for the Nuccio Parkway Basin and Ybor City Basin. These studies document existing drainage problem areas, structures and outfalls, and recommend improvements.

Existing cross-drain structures and outfalls were located using City of Tampa drainage maps, basin studies, other similar sources, and field verification. Approximately 11 cross-drain structures were identified within the project limits, as listed in Table 4.2. The cross-drain structures range in size from a 457mm (18-in.) reinforced concrete pipe (RCP) to a 2.1-m (7.0-ft.) x 1.5-m (5-ft.) box culvert (BC). Cross drain structure improvements and impacts to the floodplain associated with this project are addressed in the TIS I-275/I-4 Interim Downtown Interchange Improvements Drainage Memorandum (April 1996), which is published separately. Correspondence and meeting minutes pertaining to drainage issues are contained in Appendix A.

4.1.9 Geotechnical Data

The soils within the project area are typically sandy soils at the ground surface, based on as-built interstate plans and the U.S. Soil Conservation Service, Soil Survey of Hillsborough County, Florida. These sources indicate that clayey sands may be located within 1.5 m (5 ft.) of the ground surface. FDOT as-built bridge plans for I-275 from North Boulevard to Floribraska Avenue and I-4 from the I-275 interchange to 22nd Street indicate that deep-foundation bearing soils generally range from elevation +6.4 m (+21 ft.) to -8.8 m (-29 ft.) with an average elevation of +2.7 m (+9 ft.) on I-275 and from elevation +3.6 m (+12 ft.) to -1.5 m (-5 ft.), with an average elevation of -1.5 m (-5 ft.) on I-4. However, some borings did not encounter refusal material until elevation -32.9 m (-108 ft.). Soil survey mapping for this area is provided on Exhibit 4.4.

Groundwater is typically encountered within 1.5 m (5 ft.) of the ground surface, although according to FDOT bridge plans, groundwater in some areas is encountered at depths greater than 3.0 m (10 ft.). Soil survey data indicates that the majority of the surficial soils in this area generally have a pH of less than 6.0, which is based on FDOT criteria would classify these soils as "extremely aggressive." Typical subgrade limerock bearing ratios (LBR) values between 10 and 20 might be

TABLE 4.2

DRAINAGE STRUCTURE LOCATION SUMMARY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Structure I.D.	Location	Size/Type	Length	Invert el. (HW) (m/ft. NGVD)	Invert el. (TW) (m/ft. NGVD)	Drainage Basin
CD14	Franklin St.	914 mm RCP (36 in.)	91.4 m (300 ft.)	3.7 m (12.4 ft.)	2.1 m (7.1 ft.)	W. to Hillsborough River
CD15	Morgan St.	1524 mm RCP (60 in.)	60.9 m (200 ft.)	3.2 m (10.6 ft.)	3.1 m (10.3 ft.)	W. to Hillsborough River
CD16	Henderson Ave.	457 mm RCP (18 in.)	82.2 m (270 ft.)	13.2 m (43.4 ft.)	11.2 m (37.0 ft.)	W. to Hillsborough River
CD17	Palm St.	609 mm RCP (24 in.)	134.1 m (440 ft.)	12.1 m (40.0 ft.)	10.9 m (36.0 ft.)	Nuccio Pkwy.
CD18	10th St.	1.5 m x 1.5 m BC (5 ft. x 5 ft.)	70.7 m (232 ft.)	8.5 m (28.6 ft.)	8.5 m (28.0 ft.)	Nuccio Pkwy.
CD19	13th St.	2.1 m x 1.5 m BC (7 ft. x 5 ft.)	304.8 m (1,000 ft.)	11.7 m (38.5 ft.)	--	Ybor City
CD20	14th St.	457 mm RCP (18 in.)	76.2 m (250 ft.)	10.8 m (35.7 ft.)	9.5 m (31.2 ft.)	Ybor City
CD21	15th St.	1006 mm RCP (42 in.)	60.9 m (200 ft.)	--	8.8 m (29.0 ft.)	Ybor City
CD22	22nd St.	762 mm RCP (30 in.)	--	--	5.3 m (17.4 ft.)	29th Street
CD-100	Columbus Dr.	457 mm RCP (18 in.)	79.2 m (260 ft.)	N/A	N/A	Nuccio Parkway
CD-101	Floribraska Ave.	609 mm RCP (24 in.)	N/A	N/A	N/A	Robles Park/Hillsborough River

BC = Box Culvert
RCP = Reinforced Concrete Pipe
CBC = Concrete Box Culvert
N/A = Not Available
NGVD = National Geodetic Vertical Datum
HW = Headwater
TW = Tailwater

representative, although site-specific LBR testing is recommended to determine any design LBR values.

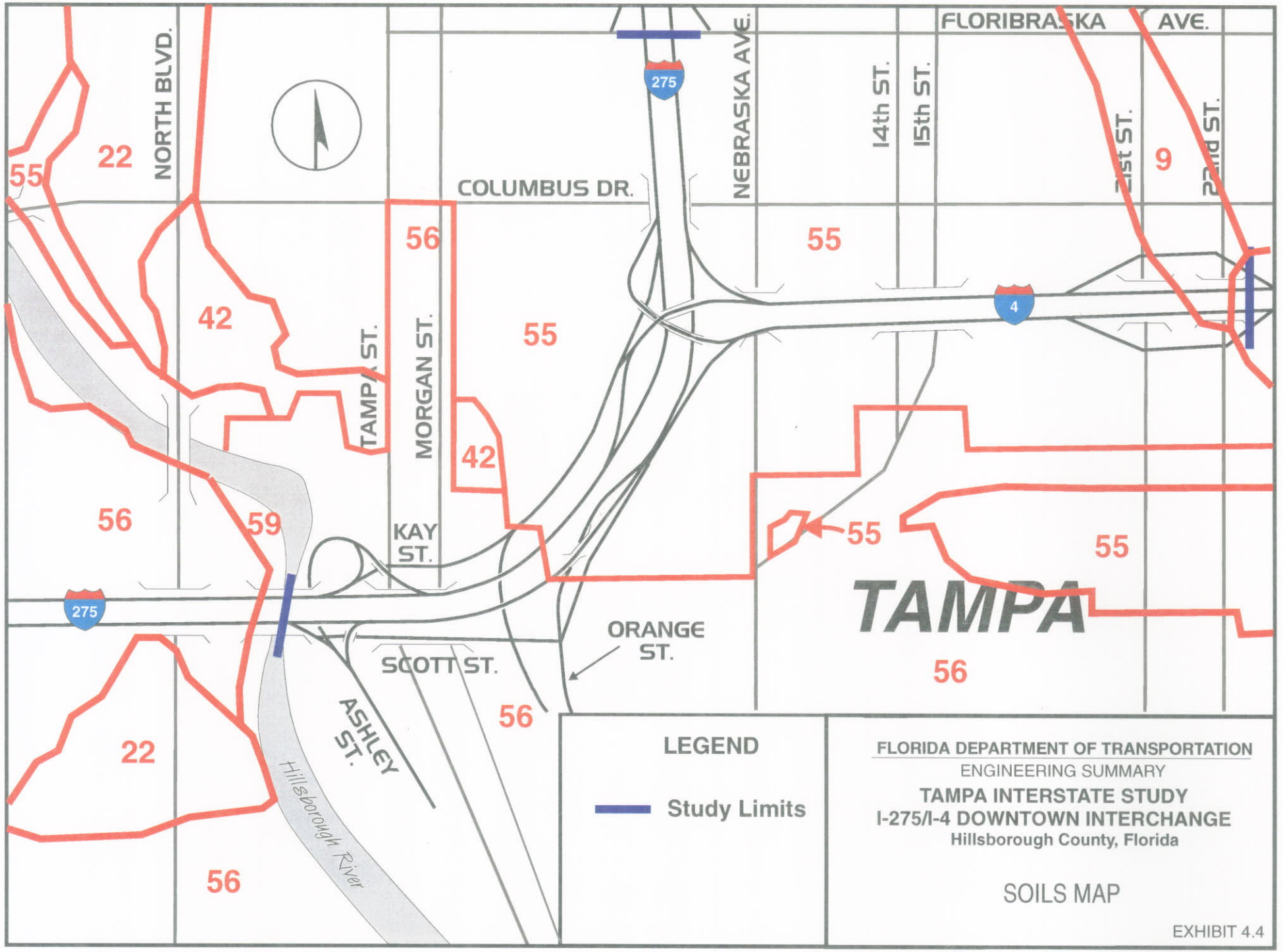
In general, these soils appear suitable for the proposed improvements. However, surficial organics should be anticipated at random locations because up to 1.5m (5 ft.) of muck was encountered in some soil borings performed for the original interstate construction in the I-4 area. A detailed discussion of soils within the project limits is provided in the TIS I-275/I-4 Interim Downtown Interchange Improvements Soils Memorandum (March 1996).

4.1.10 Crash Data

Crash data was obtained from the FDOT for the years 1990 through 1994 for roadway segments I-275/Hillsborough River to Floribraska Avenue and I-4/I-275 to 22nd Street. Both detailed and summary crash data were reviewed for roadway links in the project area. Crash statistics were studied for the following roadway links:

- I-275
  - Hillsborough River to Orange/Jefferson Street
  - Orange/Jefferson Street to I-4 Junction
  - I-4 Junction to Floribraska Avenue
- I-4
  - I-275 Junction to 15th Street
  - 15th Street to East of 22nd Street

Tables 4.3 through 4.7 summarize relevant crash data for each of the above-mentioned links. The information provided includes the number of crashes (total crashes as well as fatalities, injuries, and property damage), economic loss, actual crash rate, the critical crash rate and the safety ratio for each roadway link. The critical crash rate is the statewide average crash rate for a similar facility. The safety ratio (the ratio of the actual crash rate to the critical crash rate) serves to identify safety problems and/or high accident locations. Thus, a safety ratio greater than 1.0 indicates that the roadway is experiencing more crashes than would be anticipated on this type of facility.


FLORIBRASKA AVE.
NORTH BLVD.
NEBRASKA AVE.
14th ST.
15th ST.
21st ST.
22nd ST.
COLUMBUS DR.
TAMPA ST.
MORGAN ST.
KAY ST.
ORANGE ST.
SCOTT ST.
ASHLEY ST.
Hillsborough River
TAMPA
275
4
22
55
42
56
59
9
LEGEND
Study Limits
FLORIDA DEPARTMENT OF TRANSPORTATION
ENGINEERING SUMMARY
TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida
SOILS MAP
EXHIBIT 4.4

Within the project study limits, there was an average of 217 crashes per year. Table 4.8 shows the annual crash summary for 1990 through 1994. This yearly average includes 1.6 fatalities, 148 injuries, and 121 crashes involving property damage, which corresponds to an estimated yearly economic loss of $6,390,400. However, this figure does not take into account the economic loss to other motorists delayed by an accident. For example, the serious nature of crashes at this interchange, such as vehicles falling from an overpass onto the interstate below, has caused mile-long backups in several directions and delays of several hours for some motorists.

As shown in Table 4.9, the safety ratios for I-275 through the CBD average 1.039. The segment between the Hillsborough River and Jefferson Street shows a five-year average safety ratio of 1.910, and between Jefferson Street and I-4 the safety ratio is 0.819. The segment of I-4/I-275 to 15th Street had an average safety ratio of 1.040 with one year exceeding 1.529. The segment of I-4 from 22nd Street to 34th Street experienced an average safety ratio of 0.799. High safety ratios are due to several factors which increase the potential for crashes, including traffic volumes near or exceeding capacity, substandard horizontal and vertical geometries, and multiple weaving movements.

As discussed previously in Sections 4.1.5 and 4.1.6, substandard horizontal and vertical alignments also contribute to safety problems in the project area. The horizontal alignment of I-275 through the CBD and the I-275/I-4 interchange currently accommodate only an 80.5-km/h (50-mph) posted speed with up to 6-degree curves and substandard shoulders in certain segments. In addition, substandard vertical curves in the project limits have less than desirable design speeds and provide limited sight distance for motorists, which increases the potential for rear-end crashes. Some crest curves provide design speeds as low as 60 km/h (41 mph).

The U.S. Department of Transportation publishes motor vehicle traffic fatalities and injuries statistics for urban interstates. According to these statistics, in 1993, the state of Florida had 424 miles of public urban interstate, which includes the Tampa interstate system. Approximately 12.4 billion vehicle-miles were recorded for the urban interstate system for an average of 80,363 trips per day. A total of 96 fatal injury crashes occurred in 1993 for an crash rate of 0.77. This crash rate was

TABLE 4.3

CRASH DATA SUMMARY
I-275 FROM THE HILLSBOROUGH RIVER TO ORANGE/JEFFERSON STREETS
(MILEPOSTS 6.400 TO 6.899)
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	90	76	103	76	70	415
Actual Crash Rate	3.266	2.758	4.238	3.438	2.582	N/A
Critical Crash Rate	1.925	1.634	1.713	1.690	1.554	N/A
Safety Ratio	1.696	1.687	2.474	2.034	1.661	N/A
Fatalities	0	0	0	1	1	2
Injuries	43	55	76	54	66	294
Property Damage Crashes	56	44	54	43	31	228
Economic Loss (Millions)	2.655	2.242	3.039	2.242	2.065	12.243

These meet FDOT Plan Preparation Manual (PPM) standards; therefore, no design variance or exception is needed.

TABLE 4.4

CRASH DATA SUMMARY
I-275 FROM ORANGE/JEFFERSON STREETS TO I-4 INTERCHANGE
(MILEPOSTS 6.900 TO 7.399)
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	40	34	31	31	180
Actual Crash Rate	1.683	1.532	1.323	1.296	1.162	N/A
Critical Crash Rate	1.943	1.651	1.696	1.665	1.559	N/A
Safety Ratio	0.866	0.927	0.780	0.778	0.745	N/A
Fatalities	0	2	0	0	1	3
Injuries	20	22	16	18	26	102
Property Damage Crashes	28	20	21	17	12	98
Economic Loss (Millions)	1.298	1.180	1.003	0.915	0.915	5.311

TABLE 4.5

CRASH DATA SUMMARY
I-275 FROM I-4 INTERCHANGE TO FLORIBRASKA AVENUE
(MILEPOSTS 0.00 TO 0.707)
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	24	33	20	34	155
Actual Crash Rate	1.488	0.826	1.013	0.620	1.304	N/A
Critical Crash Rate	1.903	1.619	1.626	1.577	1.566	N/A
Safety Ratio	0.781	0.510	0.623	0.393	0.832	N/A
Fatalities	0	0	0	0	1	1
Injuries	20	20	24	13	22	99
Property Damage Crashes	30	16	17	13	19	95
Economic Loss (Millions)	1.298	0.708	0.974	0.590	1.003	4.573

TABLE 4.6

CRASH DATA SUMMARY
I-4 FROM I-275 INTERCHANGE TO 15TH STREET
(MILEPOSTS 7.400 TO 7.973)
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	42	63	33	42	224
Actual Crash Rate	1.639	1.565	2.627	1.402	1.619	N/A
Critical Crash Rate	1.934	1.642	1.718	1.670	1.567	N/A
Safety Ratio	0.847	0.953	1.529	0.839	1.033	N/A
Fatalities	0	0	0	0	1	1
Injuries	29	26	39	20	46	160
Property Damage Crashes	28	22	34	22	18	124
Economic Loss (Millions)	1.298	1.239	1.859	0.974	1.239	6.609

TABLE 4.7

CRASH DATA SUMMARY
I-4 FROM 15TH STREET TO EAST OF 22ND STREET
(MILEPOSTS 7.974 TO 8.300)
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	31	30	14	17	18	110
Actual Crash Rate	2.056	1.989	1.045	1.417	1.201	N/A
Critical Crash Rate	2.157	1.842	1.935	1.923	1.753	N/A
Safety Ratio	0.953	1.079	0.540	0.736	0.685	N/A
Fatalities	1	0	0	0	0	1
Injuries	15	33	7	7	22	84
Property Damage Crashes	18	12	9	10	9	58
Economic Loss (Millions)	0.915	0.855	0.413	0.502	0.531	3.216

TABLE 4.8

ANNUAL CRASH SUMMARY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Year	Total Crashes	Fatalities	Injuries	Property	Economic Loss
1990	253	1	127	160	$7,464,000
1991	212	2	156	114	$6,224,000
1992	247	0	162	135	$7,288,000
1993	177	1	112	105	$5,223,000
1994	195	4	182	89	$5,753,000
Total	**1,084**	**8**	**739**	**603**	**$31,952,000**

TABLE 4.9

FIVE-YEAR CRASH SUMMARY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Roadway Segment	Roadway Type	Crashes	Actual Crash Rate[a]	Critical Crash Rate[a]	Safety Ratio[a]	Fatalities	Injuries	Property	Economic Loss
I-275/Hillsborough River to Jefferson St.	6-Ln Fwy.	415	3.256	1.703	1.910	2	294	228	$12,242,500
I-275/Jefferson St. to I-4	6-Ln Fwy.	180	1.399	1.703	0.819	3	102	98	$5,311,000
I-275/I-4 to Floribraska Ave.	8-Ln Fwy.	155	1.050	1.658	0.628	1	99	95	$4,573,000
I-4/I-275 to 15th St.	6-Ln Fwy.	110	1.770	1.706	1.040	1	84	58	$6,609,000
I-4/15th St. to 22nd St.	4/6-Ln Fwy.	110	1.542	1.922	0.799	1	332	205	$3,216,000

[a] Five-Year Average

double the rate for the state of Georgia, which had an crash rate of 0.37 (48 fatalities), but similar public road mileage (434), annual vehicle-miles traveled (approximately 12.8 billion) and average daily traffic of 81,138. The 1993 crash rate of 0.77 for the Florida urban interstate system was also higher than the national average of 0.55. Table 4.9 indicates that from 1990 to 1994, the Tampa urban interstate system had an average crash rate of 1.80, approximately 3.27 times higher than the national average and 2.34 times higher than the state average.

4.1.11 Lighting

Standard type power pole lighting is located throughout the project study limits. No high mast lighting poles are provided. Lighting is accommodated in the center barrier wall on I-275 from just east of the downtown viaduct at 7th Street northeastward to the I-275/I-4 flyover ramps, and from Columbus Drive north beyond the Floribraska Avenue interchange.

Lighting is provided on the outside of the mainline lanes on I-275 from the Hillsborough River to the 7th Street overpass and from the I-275/I-4 flyover ramps to the Columbus Drive overpass. On I-4, lighting is provided on the outside of the mainline lanes from the I-275/I-4 interchange eastward beyond the 21st and 22nd Street interchange. Lighting on the interstate facilities is maintained by FDOT.

4.1.12 Utilities

A variety of utilities service the urbanized area encompassed by the project limits. Companies involved with existing utilities include Tampa Electric Company (TECO), General Telephone & Electronics of Florida (GTE), Peoples Gas System, Inc. and Jones Intercable, Inc. The City of Tampa is responsible for water and sewer utilities. Existing utilities within the study limits have been located, identified, and plotted on maps published separately. These maps are available at the FDOT District VII offices.

4.1.13 Structural and Operational Conditions

A pavement conditions survey was performed for the project area. Due to heavy traffic along the interstate, the survey was performed by visually inspecting the pavement condition from the roadway shoulder or median. The condition of the existing pavement was visually inspected for the entire project roadway (excluding ramps and bridges) and ratings were developed for discrete sections based on criteria developed during the Master Plan. In instances where one direction of the roadway was rated worse than the other direction, the poorer of the two ratings was reported on the data sheets.

Table 4.10 provides a summary of existing pavement conditions for representative sections of asphalt and concrete pavements. The design and actual traffic values for the pavement sections are also provided in Table 4.10. The traffic values are expressed as 18K ESAL which is equivalent to an 18 KIP (18,000 lbs) single axle load truck trip (AASHTO method). For example, Table 4.10 refers to a 20-year design life for concrete pavement as 5,000,000 18K ESAL; this figure translates into the number of 18K ESAL truck trips that the pavement is designed to withstand before it begins to break down. Table 4.10 indicates that the pavement sections have significantly exceeded their 20-year design life axle loadings.

In general, conditions were variable over most of the study area. No single factor was determined to be responsible for some pavement being in better condition than other pavement. It is noteworthy that, in general, cut areas have performed about as well as fill areas. Similarly, areas originally containing muck have performed about as well as non-muck areas. However, some generalities can be made based on the results of this study:

- It appears that some areas of high fill (particularly approaching bridges) show more pavement distress than other pavements in the area. However, not all pavements in these high fill areas follow this pattern.
- Along I-4, it appears that some of the concrete pavement in the lowest portions of vertical curves have experienced distress. This distress likely is caused by the pavement section being partially saturated periodically. During periods of heavy

TABLE 4.10

SUMMARY OF EXISTING PAVEMENT CONDITIONS FOR REPRESENTATIVE SECTIONS
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Area	Actual 18K ESAL Through 1988	Existing Flexible (Asphalt) Pavements		Existing Rigid (Concrete) Pavements	
		Section	18K ESAL[1] Design Life	Section	18K ESAL[1] Design Life
I-4 East of I-275 Junction	41,000,000 EB[2] 40,000,000 WB[2]	--	--	228 mm (9 in.) PCC 304 mm (12 in.) stabilization	5,000,000
I-275 West of I-4 Junction	47,000,000 EB[3] 48,000,000 WB[3]	88 mm (3.5 in.) to 165 mm (6.5 in.) asphalt 266 mm (10.5 in.) limerock base 304 mm (12 in.) stabilization	8,000,000 to 50,000,000	228 mm (9 in.) PCC 304 mm (12 in.) stabilization	5,000,000
I-275 North of I-4 Junction	27,000,000 NB[4] 28,000,000 SB[4]	--	--	228 mm (9 in.) PCC 304 mm (12 in.) stabilization	5,000,000

18K ESAL = 18 KIP (KIP = 1,000 lbs.) Equivalent Single Axle Load (AASHTO Method)

EB = Eastbound
NB = Northbound
SB = Southbound
WB = Westbound

[1] Values are based on 20-year design life.
[2] Based on historical traffic on I-4 between 40th Street and 50th Street.
[3] Based on historical traffic on I-275 between Dale Mabry Highway and Howard/Armenia Avenues.
[4] Based on historical traffic on I-275 between Busch Boulevard and Fowler Avenue.

Note: This table shows 20-year design traffic values for representative pavement sections along with actual values of traffic experienced by these pavements. The pavements have significantly exceeded their design axle loadings.

rainfall or high groundwater, these low pavement sections likely are not well drained, as there are no underdrains.

- Other areas of pavement distress were discovered during this study. The distress in these areas likely can be attributed to local factors, such as poor construction, inadequate construction materials, drainage problems, etc.

- The new pavement appears to be in better condition than the older pavement.

The pavement evaluation indicates that the majority of the existing pavement within the study limits has exceeded the pavement design life. The FDOT has initiated some maintenance activities regarding these pavements over the last several years including resealing of joints in concrete pavements and resurfacing of some asphalt pavements. These pavements will likely require additional rehabilitation and/or maintenance during the next five to ten years if they are to remain in use.

4.1.14 Navigation

The I-275/I-4 interchange includes only one bridge crossing of a navigable waterway. I-275 crosses the Hillsborough River at river-mile 1.4, in the vicinity of Scott Street in downtown Tampa. The crossing consists of twin concrete AASHTO girder spans for westbound (Bridge No. 100135) and eastbound (Bridge No. 100136) traffic. The bridges were constructed in 1964.

Flowing north to south, the Hillsborough River is approximately 84 m (275 ft.) wide at the bridge location, and is contained within concrete seawalls along the eastern and western banks. Land uses in the vicinity of the structures include multifamily residential development and vacant land in the northwest quadrant; a large public park (Riverfront Park) in the southwest quadrant; and a combination of multifamily residential, urban commercial development, and open right-of-way in the southeast and northeast quadrants. A commercial marine refurbishing and repair facility is located along the river a short distance north of the interstate bridges. Vessels navigating the river in the vicinity of the bridges include row boats, small motorboats, cabin cruisers, houseboats, sailboats, and small to medium size commercial vessels.

The existing bridges provide a fixed vertical clearance of 12.1 m (40 ft.) at mean high water and a horizontal clearance of 22.8 m (75 ft.) fender to fender. The minimum controlling depth of the river at the bridges is 1.5 m (5 ft.) at mean low water. The U.S. Army Corps of Engineers maintains a channel from the river's mouth at Hillsborough Bay north (upstream) to Columbus Drive, a distance of 4.5 km (2.8 mi.), which includes the study area. No dredging of the channel has occurred in recent years.

The Florida Marine Patrol - Office of Waterway Management was contacted for information regarding boating crashes in the vicinity of the existing bridges. They were unable to provide specific information with regard to crashes at that location but indicated that the rate of crashes or incidents is comparable to other bridges along the waterway.

4.2 EXISTING BRIDGES

Numerous bridge structures are located throughout the study limits. Roadway structures on I-275 and I-4 include interchanges, cross streets, interchange flyover ramps, the downtown viaduct, and the Hillsborough River bridge crossing. Information on structural conditions of the bridges was tabulated from the latest Structural Inventory Assessment reports. A description of each of the 33 structures within the interim interstate study area, in terms of typical section, clearances, type, condition, span arrangement, year of construction, and cross slope is provided in Table 4.11. Exhibit 4.5 shows the locations of these structures.

There is one waterway crossing within the project limits. I-275 crosses the Hillsborough River with a vertical clearance of 12.1 m (40 ft.) and a horizontal clearance of 22.8 m (75 ft.) (fender to fender). The alignment crosses the Hillsborough River at an angle of approximately 65 degrees.

Commercial boat traffic frequently uses the Hillsborough River. The U.S. Army Corps of Engineers maintains a portion of the channel from the confluence of the Hillsborough River and the Hillsborough Bay to Columbus Drive (4.5 km/2.8 mi.) which includes the study area. While

maintenance of this section is still an authorized project, no dredging of the channel has occurred recently.

The natural channel of the Hillsborough River has been designated as a floodway in the City of Tampa (Flood Insurance Study for the City of Tampa, March 1980). Encroachments into the floodway will require an impact study on the 100-year flood conveyance system.

TABLE 4.11

EXISTING STRUCTURES INVENTORY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Aerial View I.D.	Freeway/ Structure Location	No.	Type	Operational	Inventory	Typical Section Width (meters)[1]			Span Arrangement			Clearances (meters)[2]		Year of Const.	(%) Cross-Slope[1]
						Lanes	Shoulder[1]	Overall	No.	Length (meters)[1]	Angle	Vertical	Horizontal		
0	I-275/Willow Ave. (SB)	100133	AASHTO	HS32T	HS28T	4/14.6	1.8, 3.0	21.3	3	10.3, 19.5, 10.6	90.0°	4.4	18.5	1963	2.1
	I-275/Willow Ave. (NB)					4/14.6	1.8, 3.0	21.3							
1	I-275/North Blvd. (WB)	100134	AASHTO	HS38T	HS33T	4/14.6	0.6, 0.7	17.7	3	11.8, 25.6, 11.8	90.0°	4.4	20.4	1963	2.1
	I-275/North Blvd. (EB)					4/14.6	0.6, 0.7	17.7							
2	I-275/Hillsborough River (WB)	100135	AASHTO	HS33T	HS29T	5/18.2	0.6, 0.6	21.2	11	22.8, 26.8, 26.8, 26.8, 26.8, 31.6, 28.6, 24.6, 24.9, 23.4, 12.8	65.0°	12.2	22.8	1964	2.1
3	I-275/Hillsborough River (EB)	100136	AASHTO	HS34T	HS29T	4/14.6	0.6, 0.6	18.1	11	22.8, 26.8, 26.8, 26.8, 26.8, 31.6, 28.6, 24.6, 24.9, 23.4, 12.8	65.0°	12.2	22.8	1964	2.1
4	I-275/Downtown Viaduct	100110	AASHTO	HS30T	HS23T	3(EB/WB)	0.7, 0.7		15						
	- Tampa St.							45.1		13.4, 23.1, 23.1	89.5°	4.5	21.6	1964	2.1
	- Franklin St.							32.3		23.1, 25.9, 22.8	89.5°	4.7	24.4	1964	2.1
	- Florida Ave.							28.9		22.8, 22.8, 22.8	89.5°	4.9	21.6	1964	4.0
	- Marion St.							27.4		22.8, 22.8, 24.3	88.5°	4.5	21.6	1964	8.0
	- Morgan St.							32.0		24.3, 24.3, 16.4	74.2°	4.4	21.9	1964	9.2
5	I-275/Jefferson St. (WB)	100137	AASHTO	HS41T	HS36T	3/10.9	0.7, 0.6	14.0	3	10.9, 23.1, 23.1	36.5°	4.6	11.8	1963	5.5
6	I-275/Jefferson St. (EB)	100138	AASHTO	HS35T	HS30T	3/10.9	0.6, 0.7	14.0	3	28.3, 28.3, 22.8	49.0°	4.6	19.8 (N), 11.5 (S)	1963	9.2

TABLE 4.11 (Continued)

EXISTING STRUCTURES INVENTORY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Aerial View I.D.	Freeway/ Structure Location	No.	Type	Operational	Inventory	Typical Section Width (meters)[2]			Span Arrangement			Clearances (meters)[3]		Year of Const.	(%) Cross-Slope[4]
						Lanes	Shoulder[2]	Overall	No.	Length (meters)[1]	Angle	Vertical	Horizontal		
7	Jefferson St. Ramp over Central Ave.	100082	Steel	HS41T	HS24T	3/10.9	0.6, 0.6	14.0	5	10.9, 13.8, 18.4, 20.1, 16.9	Varies	4.2	11.2 (S), 11.2 (N), 15.8 (W)	1963	2.7
8	I-275/Henderson-Central (SB)	100139	AASHTO	HS34T	HS30T	4/14.6	0.6, 0.2	17.3	6	14.3, 15.5, 21.0, 17.0, 19.5, 14.3	Varies	4.3 4.3 4.3	11.2 (S), 11.2 (N), 15.8 (W)	1963[4]	5.5
9	I-275/Henderson-Central (NB)	100140	AASHTO	HS32T	HS28T	5/18.2	0.6, 0.6	21.3	8	14.3, 18.2, 16.1, 19.2, 19.8, 19.8, 19.2, 13.7	Varies	4.3 4.3 4.3	11.2 (S), 11.2 (N), 15.8 (W)	1963	2.1
10	Jefferson St. Ramp over 7th Ave.	100074	AASHTO	HS37T	HS33T	3/10.9	0.6, 0.6	14.0	3	15.5, 19.5, 14.9	60.0°	4.4	16.1	1964	2.1
11	I-275/7th Ave. (SB)	100141	AASHTO	HS37T	HS33T	3/12.1	0.6, 2.6	17.0	3	15.5, 19.5, 14.9	59.5°	4.5	16.1	1964[3]	2.1
12	I-275/7th Ave. (NB)	100142	AASHTO	HS37T	HS32T	5/18.2	0.6, 0.6	21.3	3	15.5, 19.5, 14.9	60.0°	4.5	16.1	1964	2.8
13	I-4 (WB) to I-275 over Palm Ave.	100143	AASHTO	HS37T	HS32T	1/4.3 1/4.3	0.6, 0.6 0.6, 0.6	27.0	3	11.5, 19.8, 12.4	75.5°	4.3	18.2	1963[4]	5.5
14	I-275 (SB)/Palm Ave.	100198	AASHTO	HS32T	HS29T	2/7.3	0.7, 0.6	10.3	3	11.8, 22.2, 14.0	60.8°	4.3	18.2	1963	1.6
15	I-275 (NB)/Palm Ave.	100144	AASHTO	HS33T	HS29T	5/18.3	0.7, 0.6	26.6	3	12.1, 22.7, 14.2	60.8°	4.3	18.2	1963	1.8
16	I-4 (WB) Ramp to I-275 (SB) over I-275	100050	AASHTO	HS33T	HS29T	2/7.3	0.6, 0.6	10.4	4	10.9, 20.1, 17.3, 17.1	64.0°	4.7	13.4 (S), 17.0 (N)	1963	10.0
17	I-275 (SB) Ramp to I-4 (EB)	100245	AASHTO & Steel	HS31T	HS18T	1/4.8	0.6, 1.8	9.2	12	22.6, 22.4, 22.6, 21.4, 20.5, 22.5, 21.6, 27.4, 27.4, 27.4, 26.2, 13.7	Varies	4.4	13.4 (S), 17.0 (N)	1963	10.0
18	I-4 WB Ramp to I-275 (SB) (over Nebraska Ave.)	100145	AASHTO	HS35T	HS30T	1/4.8 2/7.3	0.6, 1.8 0.7, 0.6	9.1 10.3	3	13.4, 26.2, 12.8	101.0° 89.5°	4.6	24.3	1963	10.0
19	I-275 NB Ramp to I-4 EB (over Nebraska Ave.)	100146	AASHTO	HS39T	HS34T	2/7.3	0.7, 0.6	10.3	3	16.4, 30.7, 15.2	57.0°	4.4	24.3	1963	8.2

TABLE 4.11 (Continued)

EXISTING STRUCTURES INVENTORY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Aerial View I.D.	Freeway/ Structure Location	No.	Type	Operational	Inventory	Typical Section Width (meters)[1]			Span Arrangement			Clearances (meters)[1]		Year of Const.	(%) Cross-Slope[1]
						Lanes	Shoulder[2]	Overall	No.	Length (meters)[3]	Angle	Vertical	Horizontal		
20	I-275 SB Ramp to I-4 EB (over Columbus Dr.)	100244	AASHTO	HS55T	HS48T	1/4.8	0.7, 1.8	9.1	3	15.5, 25.6, 14.3	90.0°	5.8	24.6	1963	5.0
21	I-275/Columbus Dr. (SB)	100199	AASHTO	HS38T	HS34T	3/10.9	0.7, 0.6	14.0	3	15.5, 25.9, 13.4	81.0°	4.7	24.9	1963	8.1
22	I-275/Columbus Dr. (NB)	100200	AASHTO			4/14.6	0.6, 0.6	19.2	3	15.5, 25.9, 13.4	80.0°	4.4	24.9	1963	9.2
23	I-275/Floribraska Ave. (SB)	100062	AASHTO	HS34T	HS31T	4/14.6	1.8, 2.8	20.4	3	11.5, 19.5, 11.5	84.5°	4.4	18.5	1966	2.1
24	I-275/Floribraska Ave. (NB)	100201	AASHTO	HS44T	HS37T	4/14.6	1.8, 2.8	20.4	3	11.5, 19.5, 11.5	84.5°	4.4	18.5	1966	2.1
25	I-4/14th St. (WB)	100147	AASHTO	HS36T	HS32T	3/10.9	1.2, 3.0	17.0	3	11.8, 15.5, 13.7	87.0°	4.6	14.3	1963	3.7
26	I-4/14th St. (EB)	100148	AASHTO	HS36T	HS32T	3/10.9	1.2, 3.0	17.0	3	11.8, 15.5, 13.7	87.0°	4.6	14.3	1963	3.7
27	I-4/15th St. (WB)	100149	AASHTO	HS35T	HS32T	3/10.9	1.2, 3.0	17.0	3	13.7, 15.5, 11.6	85.0°	4.5	14.3	1963	2.5
28	I-4/15th St. (EB)	100150	AASHTO	HS35T	HS32T	3/10.9	1.2, 3.0	17.0	3	13.7, 15.5, 11.6	85.0°	4.5	14.3	1963	2.5
29	I-4/19th St. (WB)	100151	AASHTO	HS39T	HS34T	3/10.9	1.2, 0.6	17.6	3	12.1, 19.5, 12.1	90.0°	4.4	18.5	1962	2.1
30	I-4/19th St. (EB)	100152	AASHTO	HS35T	HS31T	3/10.9	1.2, 0.6	22.8	3	12.1, 19.5, 12.1	90.0°	4.5	18.5	1962	2.1
31	I-4/21st-22nd Sts. (WB)	100153	AASHTO	HS34T	HS30T	2/7.3	0.7, 0.6	10.3	7	12.8, 20.7, 17.0, 17.0, 17.0, 20.7, 10.9	90.0°	4.6	19.5	1962	1.6
32	I-4/21st-22nd Sts. (EB)	100154	AASHTO	HS34T	HS30T	2/7.3	0.7, 0.6	10.3	7	12.8, 20.7, 17.0, 17.0, 17.0, 20.7, 10.9	90.0°	4.6	19.5	1962	1.6

TABLE 4.11 (Continued)

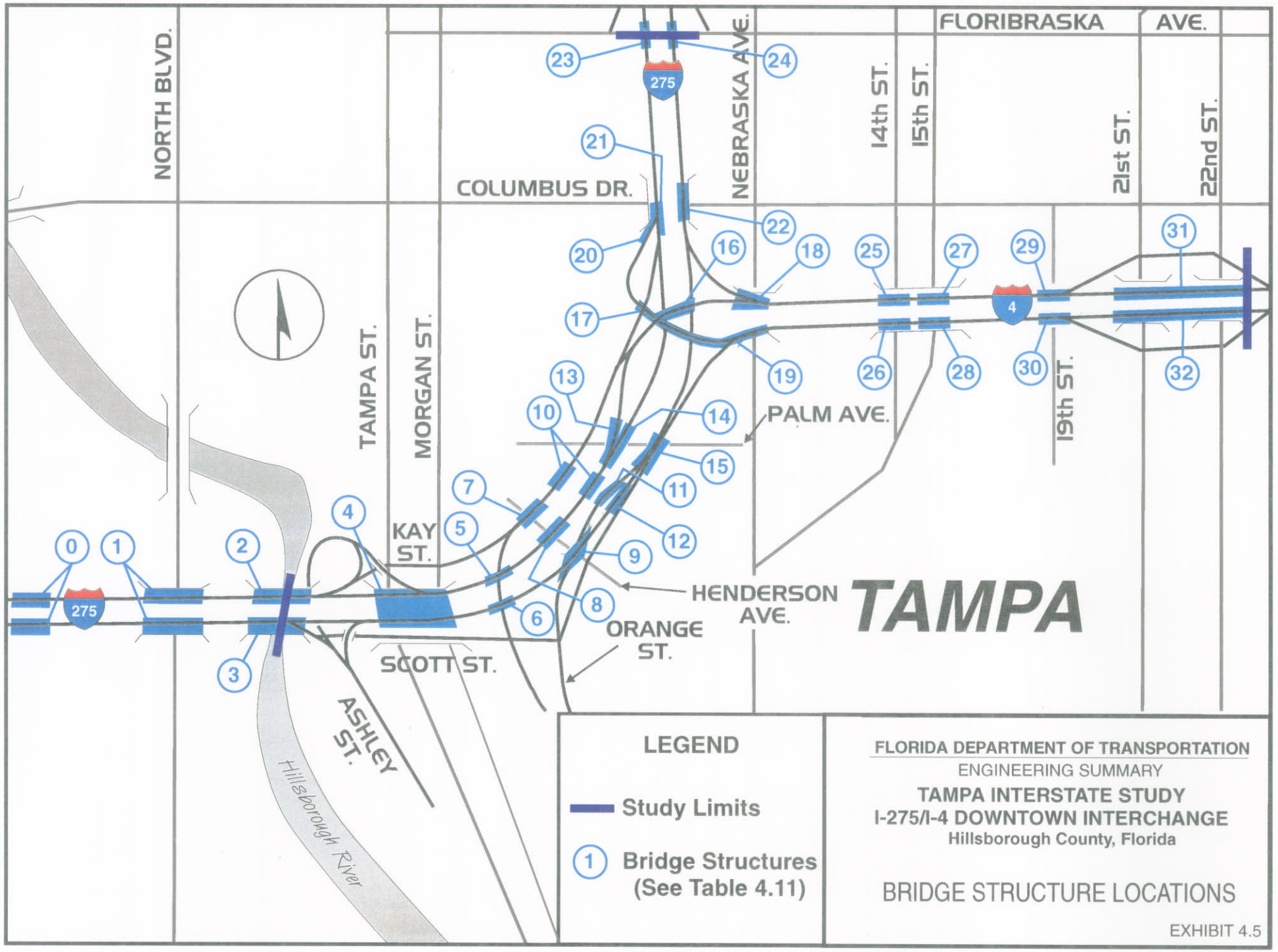
EXISTING STRUCTURES INVENTORY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Note: For the purposes of this inventory, bridge dimensions and clearances have been rounded off.

EB = Eastbound
NB = Northbound
SB = Southbound
WB = Westbound

[1] Maximum cross-slope for widening purposes (percent).
[2] Shoulder Dimensions: Left Side, Right Side.
[3] Structure was modified in 1967.
[4] Structure was modified in 1966.
[5] Metric conversions for Table 4.11:

Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet
0.3	1.0	5.3	17.5	14.0	46.0	22.5	74.0	42.9	141.0
0.4	1.4 - 1.5	5.5	18.2 - 18.3	14.3	47.0	22.8	75.0	44.1	145.0
0.5	1.7 - 1.8	5.8	19.2	14.4	47.5	23.1	76.0	45.1	148.0
0.6	2.0 - 2.2	6.1	20.3	14.6	48.0	23.4	77.0	47.2	155.0
0.7	2.3 - 2.5	6.6	21.8	14.9	49.0	24.0	78.8 - 79.0	49.0	161.0
0.8	2.7	6.7	22.0	15.2	50.0	24.1	79.3	53.0	174.0
1.0	3.6	7.0	23.0 - 23.3	15.5	51.0	24.3	79.8 - 80.0	54.2	178.0
1.1	3.7 - 3.8	7.1	23.4	15.8	52.0	24.6	81.0	56.9	187.0
1.2	4.0 - 4.2	7.3	24.0	16.1	53.0	24.9	82.0	58.2	191.0
1.3	4.4 - 4.5	7.9	26.0	16.4	54.0	25.6	84.0	65.5	215.0
1.4	4.6 - 4.8	8.5	28.0	16.7	55.0	25.9	85.0	67.9	223.0
1.7	5.6 - 5.8	8.9	29.5	17.0	56.0	26.2	86.0		
1.8	6.0 - 6.2	9.1	30.0	17.3	57.0	26.8	88.0 - 88.1		
1.9	6.4	9.4	31.0	17.6	58.0	27.1	89.0		
2.4	8.0 - 8.1	9.7	32.0	17.9	59.0	27.4	90.0		
2.5	8.4 - 8.5	10.0	33.0	18.2	60.0	28.0	92.0		
2.6	8.6 - 8.8	10.3	34.0	18.5	61.0	28.3	93.0		
2.7	9.0	10.6	35.0	18.8	62.0	28.6	94.0		
2.8	9.2 - 9.5	10.9	36.0	19.2	63.0	28.9	95.0		
2.9	9.8	11.2	37.0	19.5	64.0	29.8	98.0		
3.0	9.9 - 10.0	11.4	37.5	19.8	65.0	30.4	100.0		
3.1	10.2 - 10.4	11.5	38.0	20.1	66.0	30.7	101.0		
4.2	13.8	11.8	39.0	20.4	67.0	31.6	104.0		
4.3	14.1 - 14.4	12.1	40.0	20.5	67.5	32.0	105.0		
4.4	14.5 - 14.7	12.2	40.1	20.7	68.0	33.2	109.0		
4.5	14.8 - 15.0	12.4	41.0	21.0	69.0	33.5	110.0		
4.6	15.1 - 15.2	12.8	42.0	21.3	70.0	35.0	115.0		
4.7	15.3 - 15.6	13.1	43.0	21.6	71.0	35.3	116.0		
4.8	15.9	13.4	44.0	21.9	72.0	37.7	124.0		
4.9	16.0	13.7	45.0	22.2	73.0	42.0	138.0		


NORTH BLVD.
TAMPA ST.
MORGAN ST.
NEBRASKA AVE.
14th ST.
15th ST.
FLORIBRASKA AVE.
21st ST.
22nd ST.
19th ST.
COLUMBUS DR.
PALM AVE.
KAY ST.
HENDERSON AVE.
ORANGE ST.
SCOTT ST.
ASHLEY ST.
Hillsborough River
275
4
TAMPA
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
LEGEND
Study Limits
1 Bridge Structures (See Table 4.11)
FLORIDA DEPARTMENT OF TRANSPORTATION
ENGINEERING SUMMARY
TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida
BRIDGE STRUCTURE LOCATIONS
EXHIBIT 4.5

SECTION 5.0

ALTERNATIVES ANALYSIS

5.1 NO-ACTION ALTERNATIVE

To identify the traffic operations and safety impacts of not implementing the proposed downtown interchange operational improvements, a No-Action Alternative was considered. The No-Action Alternative was a viable alternative carried through the TIS Public Hearing. Existing traffic operations are currently deficient at several locations within the project limits. Safety is compromised by the design deficiencies of the existing interstate, based on design standards of the 1960's combined with the growth of traffic volumes.

Based on year 2015 traffic projections, congestion associated with the No-Action Alternative would become intolerable as the interstate corridor would fail to provide continuity in the regional transportation network. The No-Action Alternative would also result in further congestion on local roadways and would not improve access to existing and planned developments in and around the Tampa urban area. The No-Action Alternative does not fulfill the purpose and need of the project; does not provide for a safer, more efficient transportation system for the increased traffic volumes; and does not provide for improved access and incident management. The No-Action Alternative was dropped from consideration following the public hearing because of overwhelming support from the Tampa Bay community for the safety/operational improvement.

5.2 TRANSPORTATION SYSTEM MANAGEMENT

Hillsborough County has, wherever possible, implemented Transportation System Management (TSM) improvements to improve existing facilities. TSM improvements involve increasing the available capacity within the existing right-of-way with minimum capital expenditures and without reconstructing the existing facility. TSM improvements to upgrade the I-275/I-4 downtown interchange without total reconstruction would include adding High Occupancy Vehicle (HOV)/Transitway lanes by restriping existing lanes, increasing shoulder widths, implementing

incident management systems, improving weaving sections between interchange ramps, or providing ramp metering at on-ramps.

The operational improvements include some TSM improvements associated with the existing system that should improve safety and reduce congestion. TSM improvements include: increasing shoulder widths, where feasible, to increase sight distance and provide breakdown areas; improving merging and weaving sections; improving weaving patterns by changing the location of ramping; and removing some weaving movements from the mainline lanes.

Other TSM measures that are not part of the operational improvements include HOV lanes and ramp metering. The provision of HOV lanes could reduce the total number of vehicles in the corridor but would not resolve safety issues such as poor weaving sections, substandard shoulders, and poor sight distance. Ramp metering could limit the volume of traffic accessing the interstate, thus improving operations on the corridor, but would likely result in significant queues on the arterial street system.

5.3 DESIGN CRITERIA

Most of the alternative concepts for the operational improvements are based on improving the existing facility. As a result, much of the design criteria for these alternatives were established based on existing roadway geometries. As stated in Section 4.1, the existing facility does not meet current standards for several reasons and in many areas. Consequently, upgrading the facility to current standards would require removing the existing freeway and constructing new bridges and roadway for the entire project limits.

Given the diversity in alternative solutions, two design standard tables were created. Table 5.1 provides standards for the rehabilitation of the existing facility, while Table 5.2 provides current FDOT and AASHTO roadway standards for constructing a new facility in generally the same location.

TABLE 5.1

RECOMMENDED ROADWAY DESIGN STANDARDS - IMPROVE EXISTING FACILITY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvement
Engineering Summary

Design Factors	Recommended Standards
Speeds	
Freeway	80.5 km/h (50 mph)
Connecting Freeway Ramps	64.4 km/h (40 mph)
Other Ramps and SB Collector Freeway	64.4 km/h (40 mph) desirable
	48.3 km/h (30 mph) minimum
Pavement Widths	
Freeway	3.6 m (12 ft.) standard lane width
Ramps	4.5 m (15 ft.) single lane
	3.6 m (12 ft.) dual lanes
Shoulder Widths	
Freeway	Inside and Outside - 0.6 m (2 ft.) (existing minimum), 3.6 m (12 ft.) desirable
All Ramps (including freeway connections)	
- Single Lane	Inside and Outside - 0.6 m (2 ft.) (existing minimum), 1.8 m (6 ft.) desirable
- Dual Lane	Inside - 0.6 m (2 ft.) (existing minimum) 2.4 m (8 ft.) desirable
	Outside - 0.6 m (2 ft.) (existing minimum) 3.0 m (10 ft.) desirable
Maximum Grades	
Freeway and SB Collector Freeway	5% (existing)
Connecting Freeway Ramps	4.2% ascending (existing)
	5% descending
All Other Ramps	6% ascending
	5% descending
Maximum Degree of Curve	
Freeway and SB Collector Freeway	291.063m radius (6° - 00' existing)
Connecting Freeway Ramps	211.685m radius (8° - 15' existing)
Ramps to Surface Streets	70.0m radius (24° - 54') (230' R)
Ashley Street Loop Ramp	45.0m radius (38° - 11') (150' R)
Minimum Vertical Clearances	
Existing Structures over Cross Streets	Existing Clearance or 4.3m (14.0 ft.)
Existing Structures over Freeway	4.7m (15.5 ft.)
New Structure over Freeway and Cross Streets	5.0m (16.5 ft.)

Sources: Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways, FDOT, 1989.

Plans Preparation Manual, FDOT, 1993.

A Policy on Design of Highways and Streets, AASHTO, 1994.

TABLE 5.2

RECOMMENDED ROADWAY DESIGN STANDARDS - NEW FACILITY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Design Factors	Recommended Standards
Speeds	
Freeway	88.5 km/h (55 mph) desirable
	80.5 km/h (50 mph) minimum
Connecting Freeway Ramps	72.4 km/h (45 mph) desirable
	64.4 km/h (40 mph) minimum
Other Ramps and SB Collector Freeway	80.5 km/h (50 mph) desirable
	48.3 km/h (30 mph) minimum
Pavement Widths	
Freeway	3.6 m (12 ft.) standard lane width
Ramps	4.5 m (15 ft.) single lane
	3.6 m (12 ft.) dual lanes
Shoulder Widths	
Freeway and Connecting Freeway Ramps	3.6 m (12 ft.) inside and outside
All Other Ramps	
- Single Lane	1.8 m (6 ft.) inside and outside
- Dual Lane	2.4 m (8 ft.) inside
	3.0 m (10 ft.) outside
Maximum Grades	
Freeway and SB Collector Freeway	4%
Connecting Freeway Ramps	4% ascending
	6% descending
All Other Ramps	6% ascending
	6% descending
Maximum Degree of Curve	
Freeway	435m radius (4° - 00')
SB Collector Freeway	218m radius (8° - 30')
Connecting Freeway Ramps	212m radius (8° - 15')
All other Ramps	85m radius (20° - 28') (280' R)
Cross Slopes (in tangent)	
Freeway SB Collector Freeway, and Ramps	0.9 cm (0.03 ft.) per 0.3m (1.0 ft.) maximum
Shoulders	1.8 cm (0.06 ft.) per 0.3m (1.0 ft.) outside
	1.5 cm (0.05 ft.) per 0.3m (1.0 ft.) inside
Embankments	6:1 within clear recovery zone
Vertical Clearances	
Minimum over Freeway	5.0m (16.5 ft.)
Minimum over Cross Streets	5.0m (16.5 ft.)

Sources: Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways, FDOT, 1989..

Plans Preparation Manual, FDOT, 1993.

A Policy on Design of Highways and Streets, AASHTO, 1994.

5.4 ALTERNATIVES CONSIDERED AND REJECTED

As discussed in Section 3.1 (Transportation Deficiencies), four major problem areas within the project limits were identified. The following sections summarize the alternatives considered for the problem areas but rejected in favor of reasonable alternatives discussed in Section 5.5.

5.4.1 I-275 Northbound - Ashley Street On-ramp

An alternative was developed to extend the existing acceleration taper to improve both safety and operations at this ramp juncture with I-275. It was determined that this alternative would not provide as much benefit as other feasible alternatives developed to create an additional lane at the Ashley Street on-ramp to extend through the entire interchange to I-4.

Another alternative was developed to eliminate the Ashley Street on-ramp and divert all I-275 northbound and I-4 traffic to the Orange/Jefferson Street ramps. This alternative was also rejected since traffic congestion problems would be created on Scott and Orange Streets by forcing a significant portion of downtown traffic destined for the interstate system to the east side ramp locations.

5.4.2 Orange/Jefferson Street On-ramp to I-4

Alternatives were developed to either complete the taper for this on-ramp prior to the I-4/I-275 fork or to extend this ramp as an additional lane beyond the fork and continuing on I-4 eastbound. It was determined that operations would be optimized by extending this ramp as an additional lane. Therefore, the alternative to taper this ramp into the system was removed from consideration.

5.4.3 I-275 Southbound to Eastbound I-4 Flyover

An alternative was developed to replace this flyover with an alignment on the inside of the existing flyover and touching down on the inside of the I-4 eastbound lanes. Through video surveillance of I-4 between the existing flyover ramp gore and the 21st Street off-ramp and traffic capacity analysis, it was determined that a problem is currently caused by vehicles on the flyover that exit at 21st Street. This maneuver requires vehicles to change two lanes from left to right in order to exit at 21st Street. Capacity analyses show that a right-side entrance from the I-275 southbound flyover would improve this weaving problem. As a result, it was determined that if a new flyover was constructed, it should be placed on the outside of the I-4 freeway lanes instead of on the inside lanes. Therefore, this alternative was rejected.

5.4.4 I-275 Southbound Local Freeway Lanes

An alternative was developed to provide southbound access from the local freeway lanes to Orange/Jefferson Streets, Ashley Street and Kay Street. This alternative was dropped from consideration due to the insufficient weaving distance between the southbound I-275/I-4 ramp gore and the Orange/Jefferson Street ramp gore. Using 2010 traffic projections, only a Level of Service E could be attained with the weaving distance created by this alternative. In addition, the location of the Kay Street ramp gore (located south of the Orange/Jefferson Street exit) would require the closure of Morgan Street in order for the Kay Street ramp to be down to grade at Marion Street.

5.5 REASONABLE ALTERNATIVES

Based on review and analysis of numerous solutions in the identified problem areas within the study limits, three alternative concepts were developed. Two of the concepts (Alternatives 1 and 2) were developed utilizing and improving the existing interstate freeway lanes and ramps as much as possible and minimizing right-of-way acquisition. Alternative 3 was developed to demonstrate the improvements that would be necessary to bring the facility up to 1995 roadway standards. The three

alternative concepts are described in the following paragraphs and are graphically shown on Exhibits 5.1, 5.2, and 5.3.

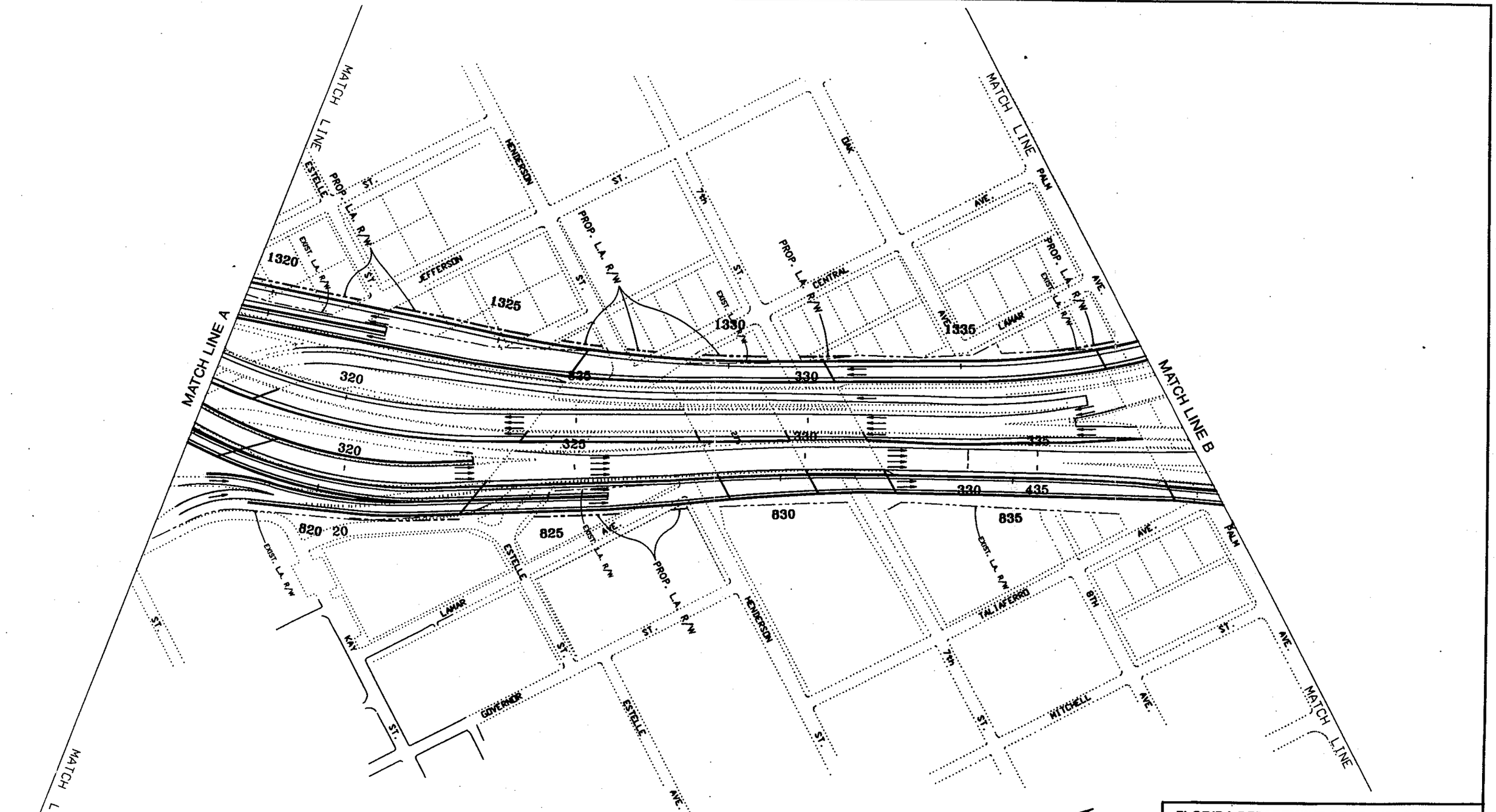
5.5.1 Alternative 1

Beginning on the west side of the project traveling northbound, the Ashley Street on-ramp enters at the same location as the existing ramp, but is situated on a separate alignment and structure that borders the outside of I-275 northbound and enters the I-4 through lanes beyond the I-275/I-4 fork on the east side of Nebraska Avenue. This ramp precludes access to I-275 northbound separating traffic from the mainline and forcing travelers to I-4. A new one-lane ramp is constructed to replace the Orange/Jefferson Street ramp to I-4. This ramp merges with the Ashley Street ramp prior to the I-275/I-4 fork.

From the north on the four-lane I-275 southbound section, the exit to I-4 is located approximately 183 m (600 ft.) north of the existing ramp gore in order to improve operations between this decision point and the following exit to the local freeway, where both exits drop one lane. East of the I-275 southbound to I-4 flyover ramp gore to the 21st/22nd Street off-ramp, I-4 carries a total of four lanes (one lane on the inside of I-4 from I-275 southbound, two lanes from I-275 northbound and one lane from the Ashley/Orange/Jefferson Street ramp) eastbound to a two-lane off-ramp. Three lanes continue eastbound over the 21st/22nd Street bridge and the inside lane merges into the two lanes at the 22nd Street on-ramp gore.

On the east side of the project, I-4 westbound carries the existing three-lane section to the vicinity of 11th Street where a new two-lane exit is provided. Beyond this exit area, another gore area splits the two lanes (on a new structure over Nebraska Avenue) for one add lane to I-275 northbound (existing) and one lane for a new southbound flyover ramp connecting to the local freeway lanes in the vicinity of Ross Avenue. Two through lanes on I-4 continue to I-275 southbound.

From the north end of the project, just south of the I-4 exit, I-275 southbound provides three lanes (existing) with one lane exiting to the southbound local freeway and two lanes continuing through



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 1 CONCEPT

EXHIBIT 5.1

MATCH LINE C

MATCH LINE

MATCH LINE

MATCH LINE

MATCH LINE D

MATCH LINE

MATCH LINE

MATCH LINE B

COLUMBUS DR.

SPARKMAN AVE.

AMELIA AVE.

FRANCIS AVE.

PARK AVE.

ROSS AVE.

15TH AVE.

14TH AVE.

12TH AVE.

11TH AVE.

NEBRASKA AVE.

CENTRAL AVE.

LAMAR ST.

10TH ST.

12TH ST.

EXIST. L.A. R/W

PROP. L.A. R/W

1440 1445 1450 1460

1350 1345 1340

355 350 345 340 335

275 250 245 240 235

40 45 50

460 455 450 445 440

GRAPHIC SCALE IN FEET

0 50 100 200

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

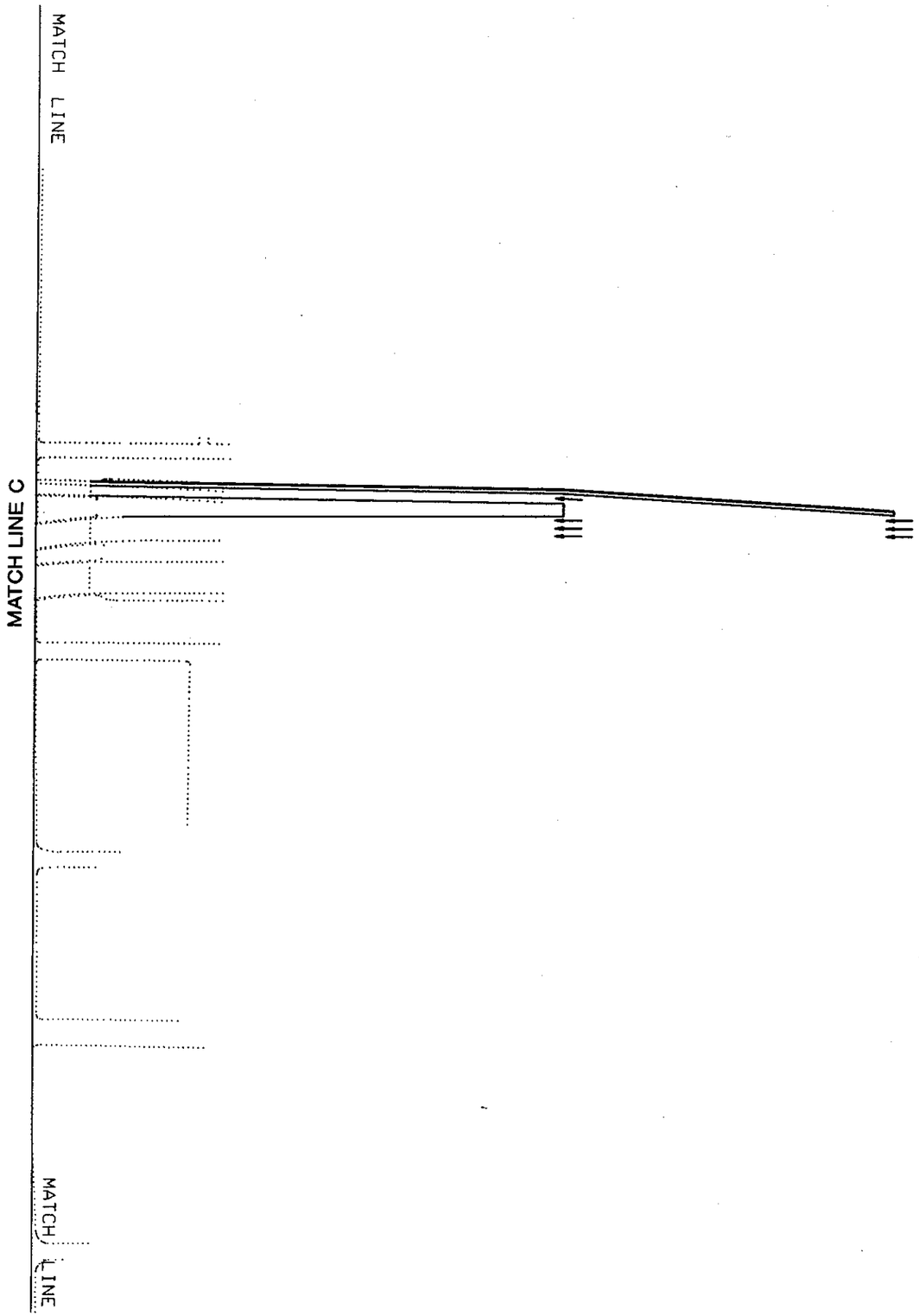
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 1 CONCEPT

EXHIBIT 5.1



0 50 100 200
GRAPHIC SCALE IN FEET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY
TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida

ALTERNATIVE 1 CONCEPT

EXHIBIT 5.1

MATCH LINE

MATCH LINE D

MATCH LINE E

MATCH LINE

MATCH LINE

MATCH LINE

DR.

ST.

AVE

15TH

AVE.

13TH

REPUBLICA DE CUBA

EXIST. L.A. R/W

14TH

465

470

475

480

485

490

16TH

17TH

18TH

19TH

NICK NUCCIO PKWY.

12TH

0 50 100 200

GRAPHIC SCALE IN FEET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

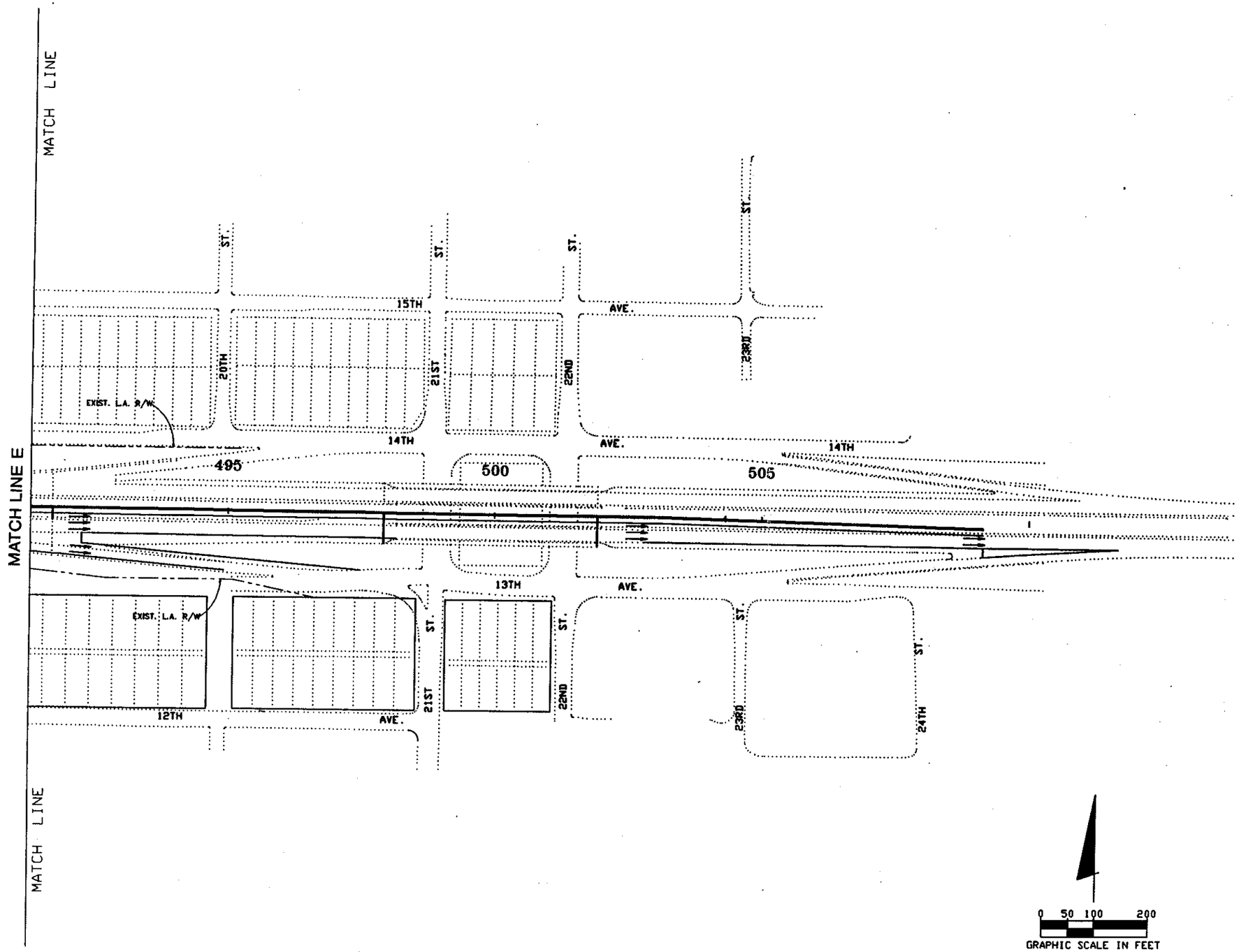
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 1 CONCEPT

EXHIBIT 5.1



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

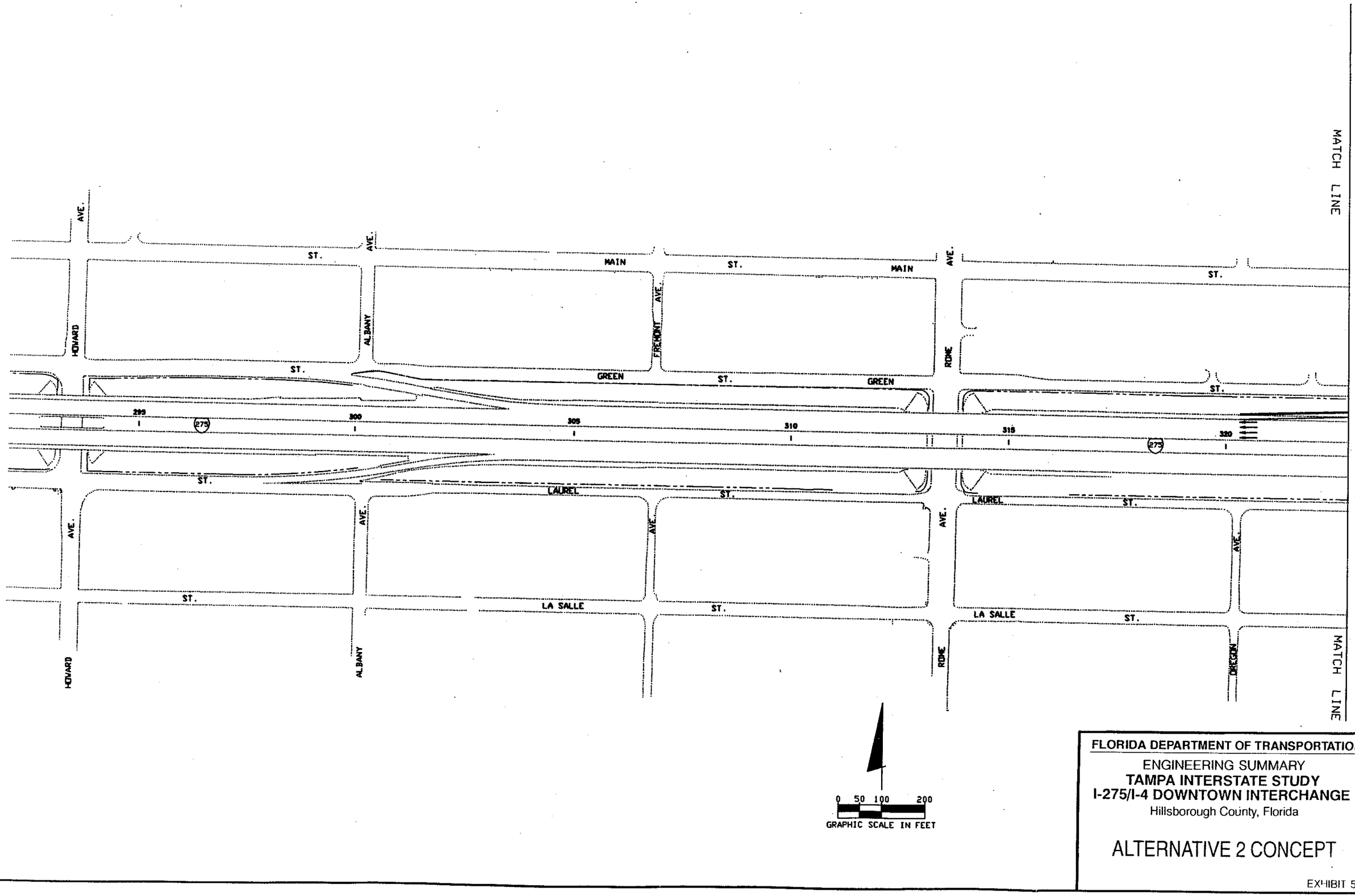
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 1 CONCEPT

EXHIBIT 5.1



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 2 CONCEPT

EXHIBIT 5.2

MATCH LINE

MAIN ST.

MAIN ST.

MATCH LINE A

MATCH LINE

MATCH LINE B

MATCH LINE

VILLOW AVE.

BOULEVARD

NORTH

RETAINING WALL

GREEN ST.

RETAINING WALL

GREEN ST.

STATION EQUATION
339+45.84 BACK=
276+50.46 AHEAD

RETAINING WALL

325

330

335

275

290

295

LAUREL ST.

LAUREL ST.

AVE.

AVE.

AVE.

MONRO

LA SALLE ST.

LA SALLE ST.

WILLOW

DELAWARE

HILLSBOROUGH

LAUREL STREET

MATCH LINE

MATCH LINE

0 50 100 200
GRAPHIC SCALE IN FEET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY
TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida

ALTERNATIVE 2 CONCEPT

EXHIBIT 5.2

MATCH LINE

MATCH LINE B

MATCH LINE C

RIVER

CARLTON DR.

DOYLE

EXIST. L.A. R/W

RETAINING WALL

RAMP "D"

PROP. L.A. R/W

ESTELLE ST.

TAMPA ST.

FRANKLIN ST.

FLORIDA AVE.

KAY ST.

MARION ST.

MORGAN ST.

JEFFERSON ST.

SCOTT ST.

LAUREL ST.

ORANGE ST.

1305

1310

1315

290

295

300

305

310

315

275

STATION EQUATION
313+00.00 BACK=
314+08.45 AHEAD

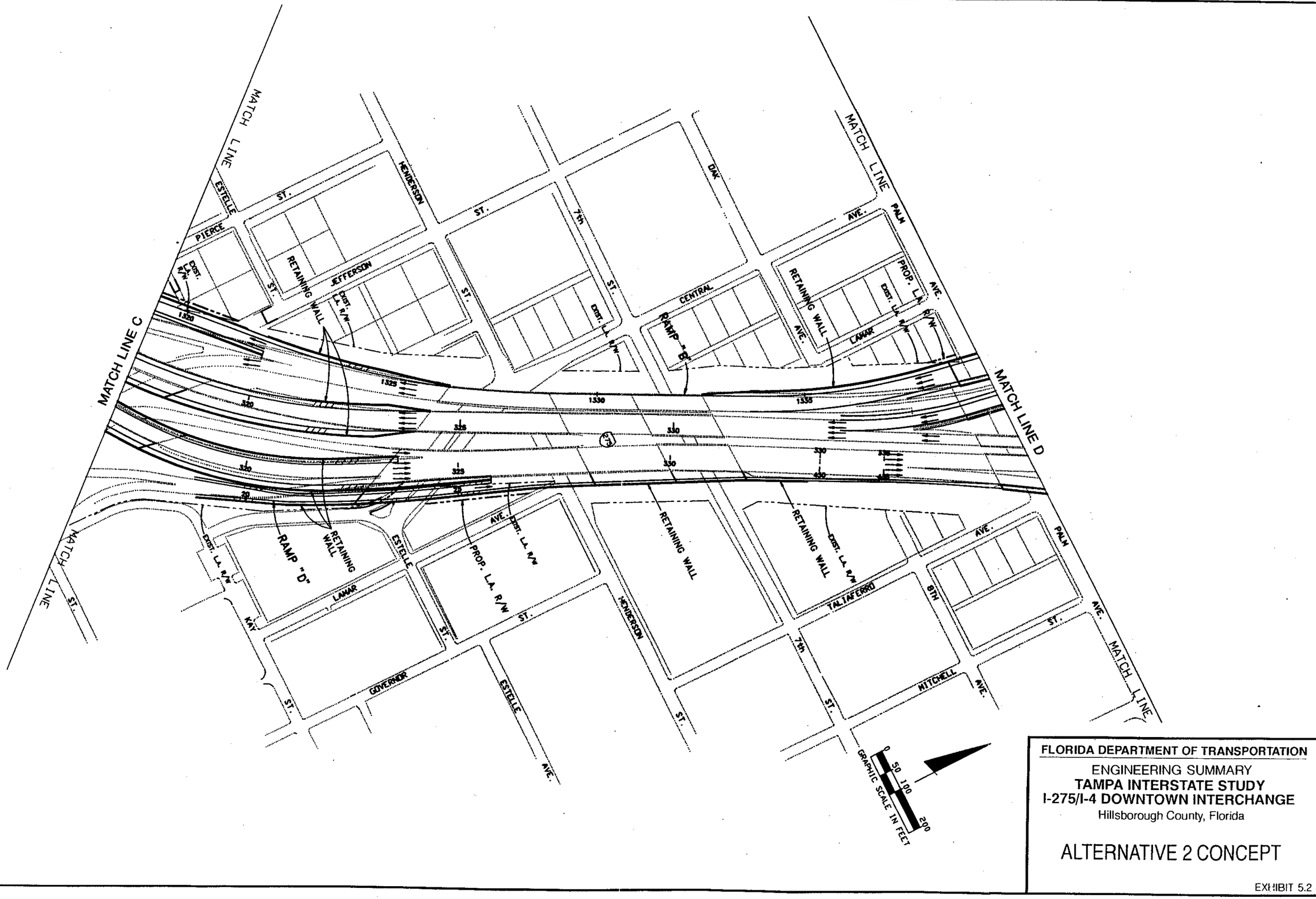
0 50 100 200
GRAPHIC SCALE IN FEET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY
TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida

ALTERNATIVE 2 CONCEPT

EXHIBIT 5.2



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 2 CONCEPT

EXHIBIT 5.2

MATCH LINE E

MATCH LINE

MATCH LINE

MATCH LINE F

MATCH LINE

MATCH LINE D

MATCH LINE

MATCH LINE

COLUMBUS DR.

SPARKMAN AVE.

AMELIA AVE.

FRANCIS AVE.

PARK AVE.

ROSS AVE.

CENTRAL AVE.

NEBRASKA AVE.

15TH AVE.

14TH AVE.

12TH AVE.

11TH AVE.

10TH ST.

12TH ST.

EXIST. L.A. R/W

PROP. L.A. R/W

RETAINING WALL

RAMP N-E

RAMP "B"

RAMP E-W

RAMP W-E

RAMP N-E

RAMP "B"

275

1440

1450

1455

1350

1340

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 2 CONCEPT

EXHIBIT 5.2

MATCH LINE

MATCH LINE E

RETAINING WALL

RETAINING WALL

MATCH LINE

FLORIBRASKA AVE.

FLORIBRASKA AVE.

715

720

725

730

735

380

0 50 100 200

GRAPHIC SCALE IN FEET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

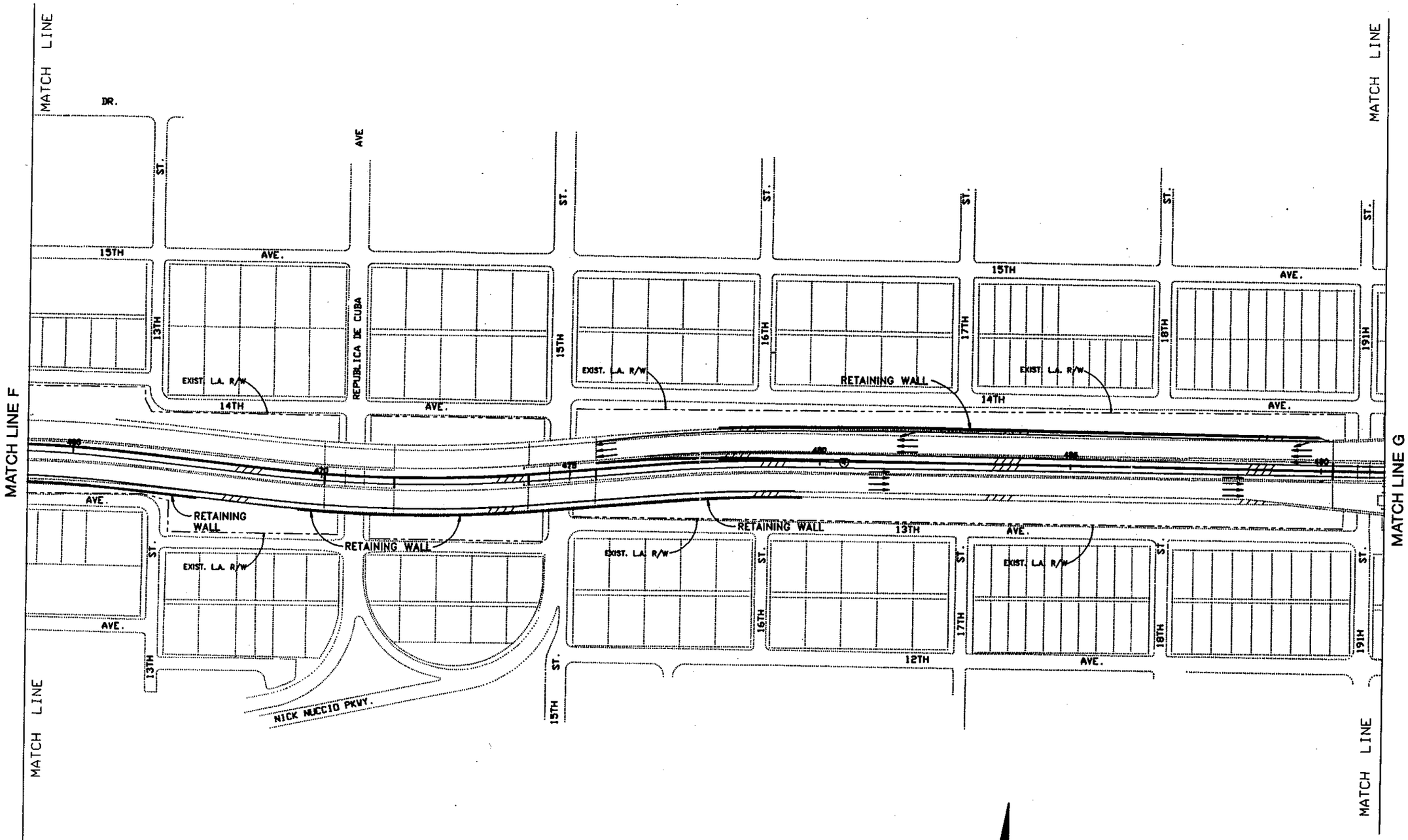
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 2 CONCEPT

EXHIBIT 5.2



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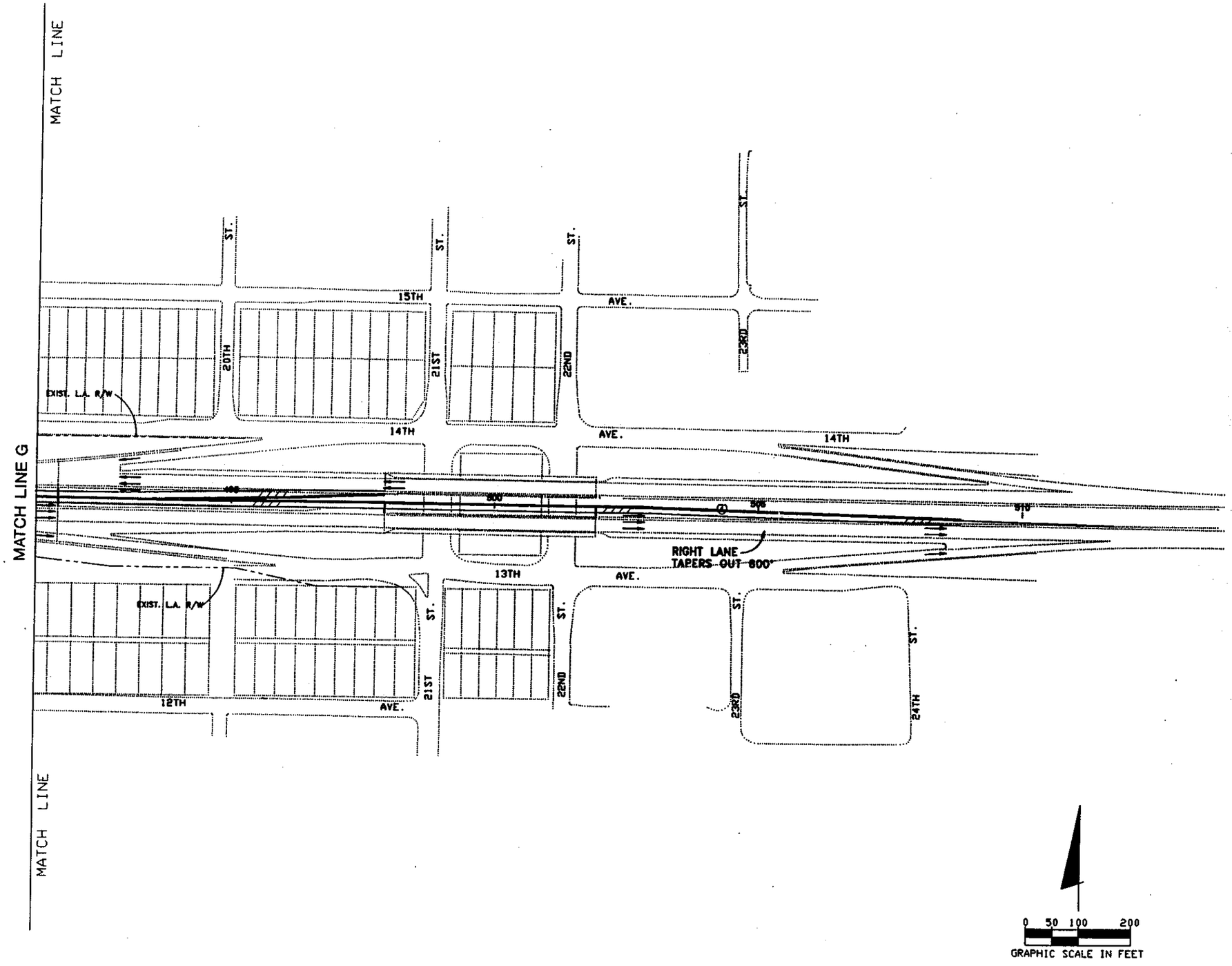
GRAPHIC SCALE IN FEET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY
TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida

ALTERNATIVE 2 CONCEPT

EXHIBIT 5.2



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

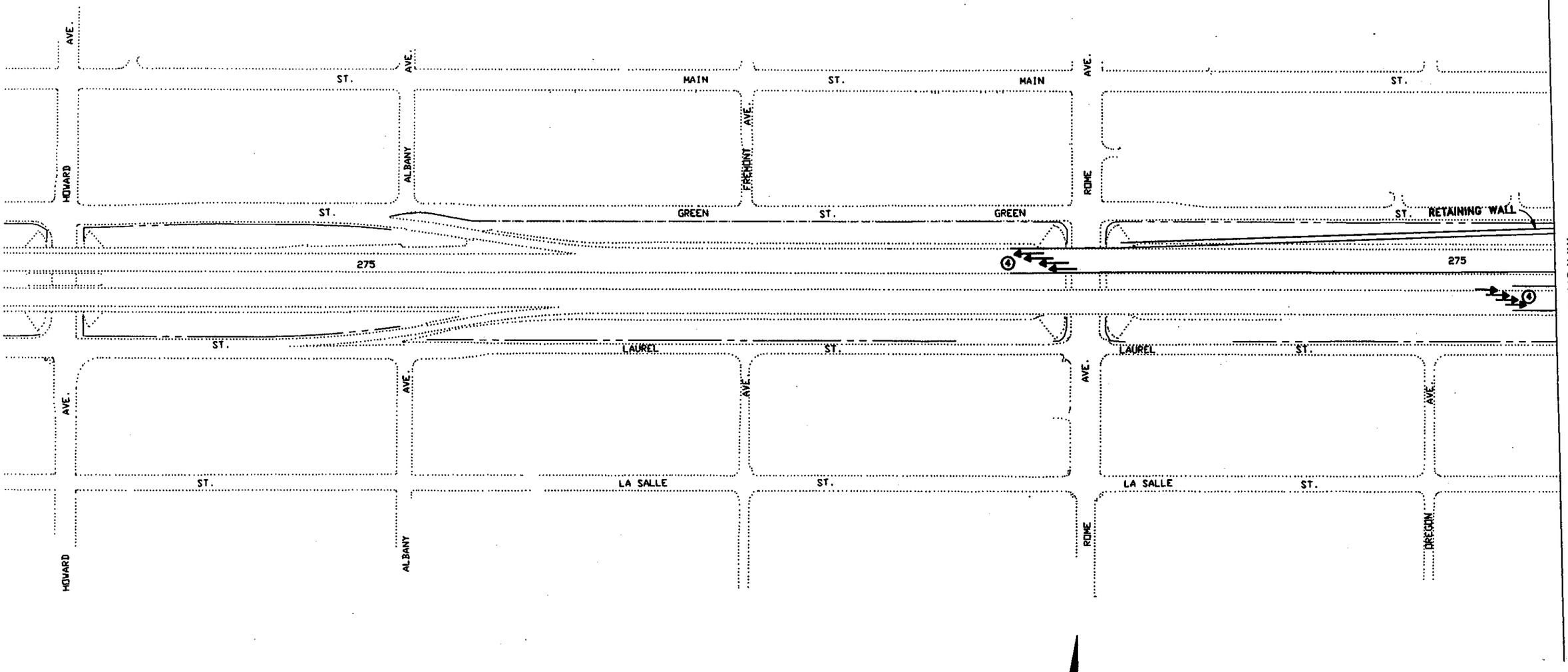
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 2 CONCEPT

EXHIBIT 5.2



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GRAPHIC SCALE IN FEET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 3 CONCEPT

EXHIBIT 5.3

MATCH LINE A

MAIN ST.

WILLOW AVE.

GREEN ST.

I-275 C/D

BEGIN NOISE BARRIER

END NOISE BARRIER

PROPOSED R/W

RETAINING WALL

RAMP J

BRIDGE LIMIT

BOULEVARD

RAMP A

MATCH LINE B

LAUREL ST.

RAMP C

RETAINING WALL

NORTH

DELAWARE AVE.

NUNEZ AVE.

LA SALLE ST.

HILLSBOROUGH

TO BE REMOVED

LAUREL STREET

EQ. 351+15.=
390+00 AD.

0 50 100 200
GRAPHIC SCALE IN FEET

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

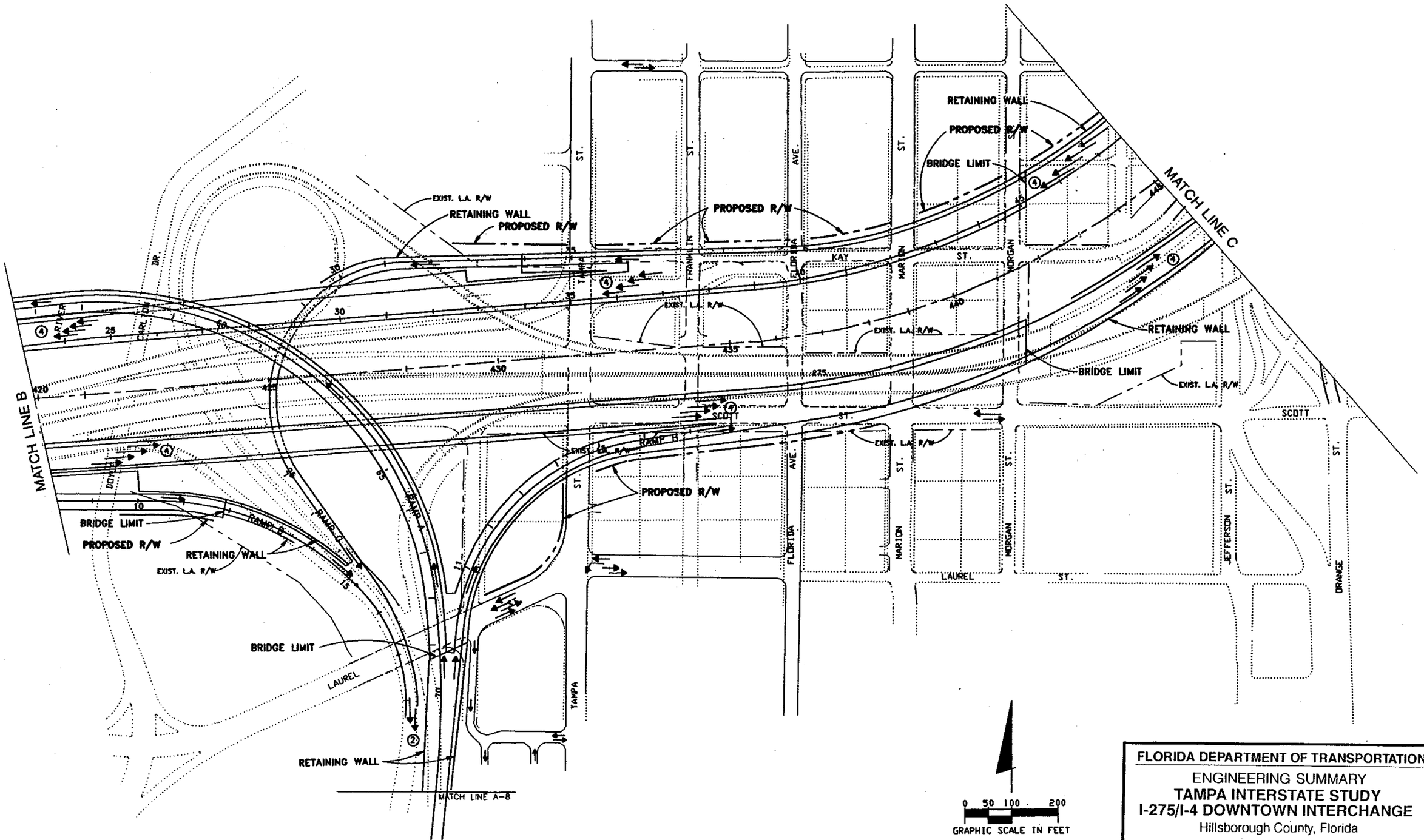
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 3 CONCEPT

EXHIBIT 5.3



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

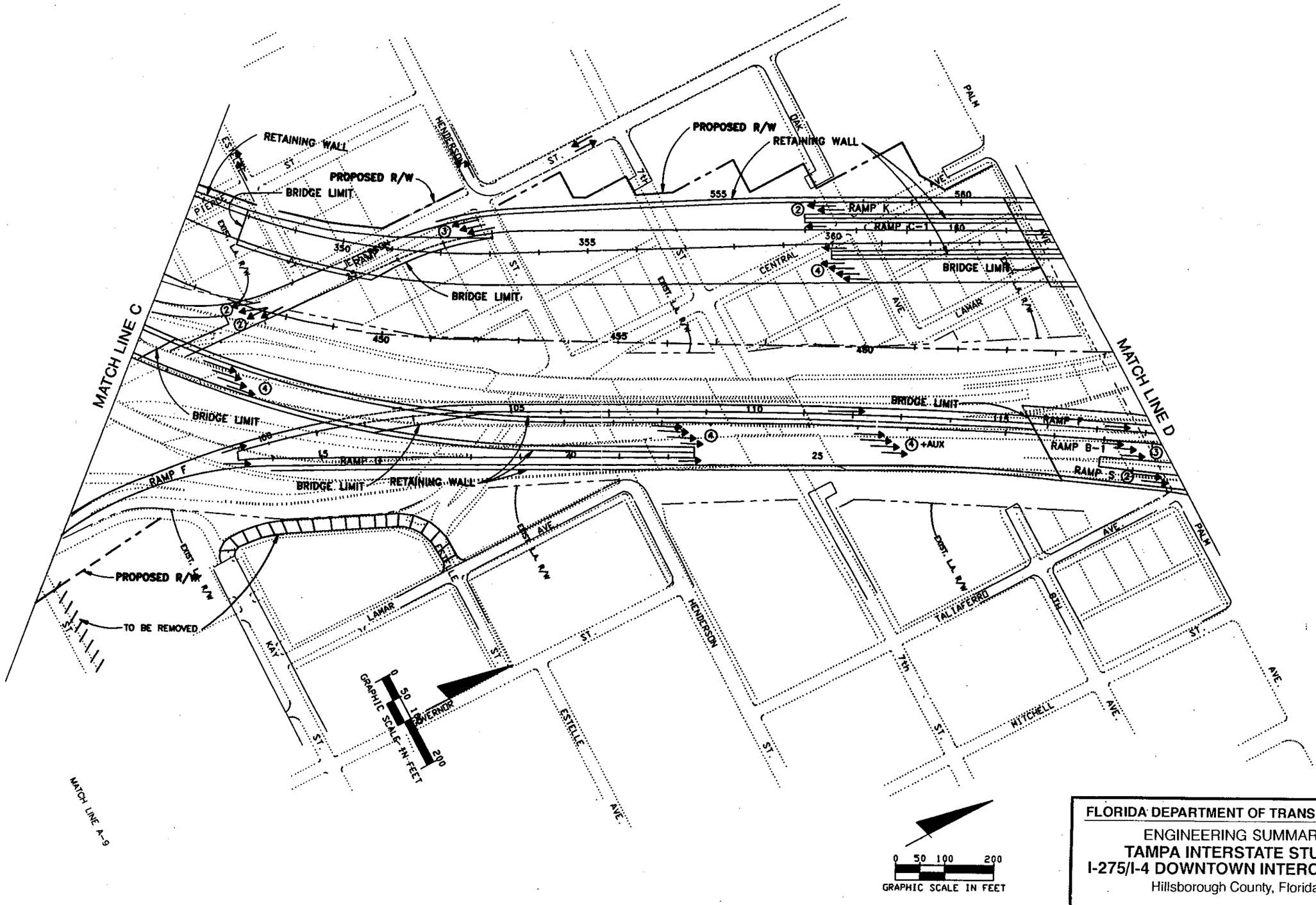
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 3 CONCEPT

EXHIBIT 5.3



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 3 CONCEPT

EXHIBIT 5.3

MATCH LINE E

MATCH LINE F

MATCH LINE D

COLUMBUS DR.

SPARKMAN AVE.

AMELIA AVE.

FRANCIS AVE.

PARK AVE.

ROSS AVE

CENTRAL AVE.

LAMAR ST.

NEBRASKA AVE.

15TH AVE.

14TH AVE.

12TH AVE.

11TH AVE.

10TH ST.

12TH ST.

PROPOSED R/W

EXIST. L.A. R/W

BRIDGE LIMIT

RETAINING WALL

RAMP K

RAMP R

RAMP N

RAMP H-1

RAMP R-1

RAMP C-1

RAMP D-1

RAMP S

RAMP S-1

RAMP B-1

RAMP A

RAMP B

I-4

GRAPHIC SCALE IN FEET

0 50 100 200

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

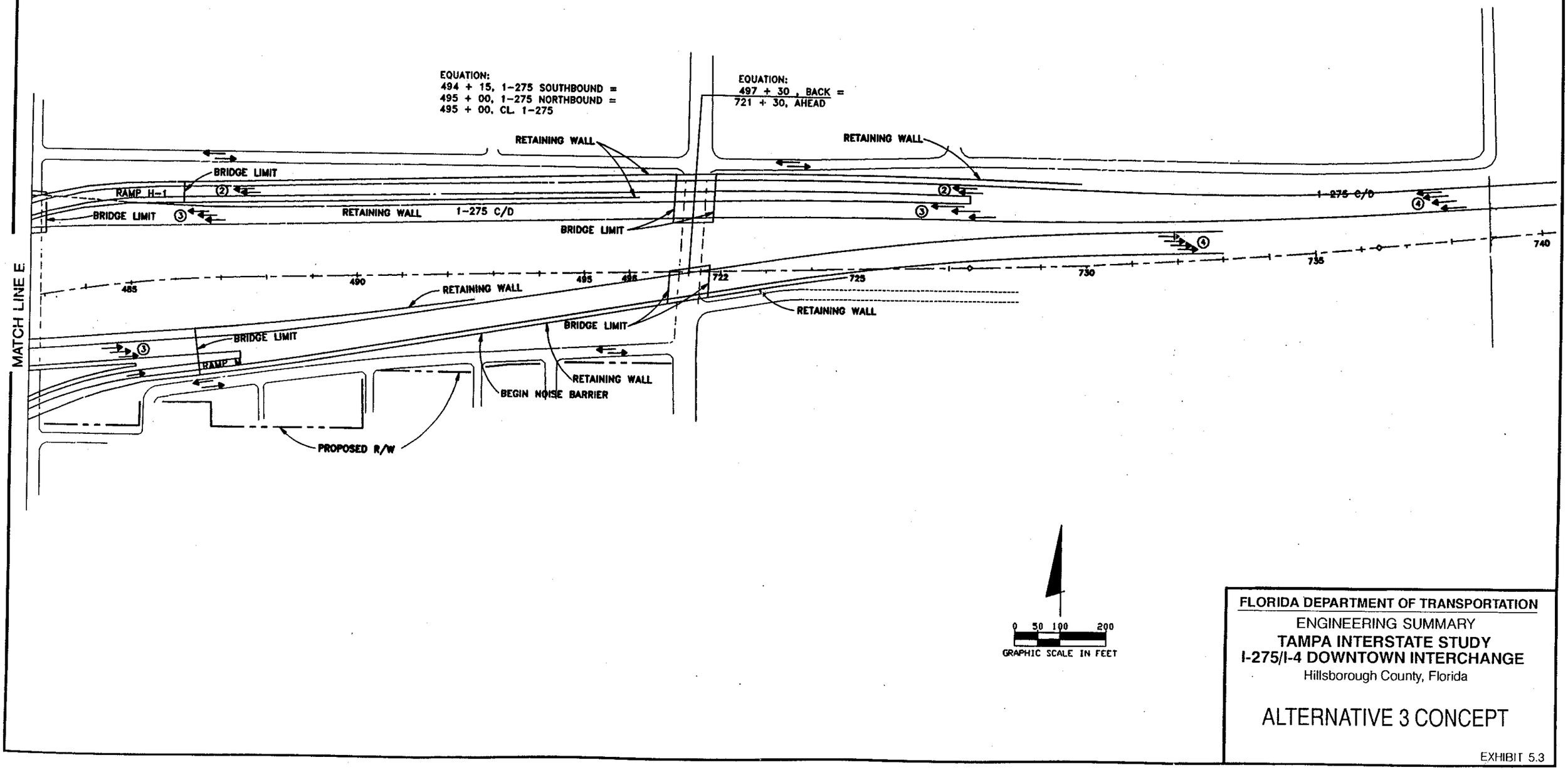
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 3 CONCEPT

EXHIBIT 5.3



FLORIDA DEPARTMENT OF TRANSPORTATION

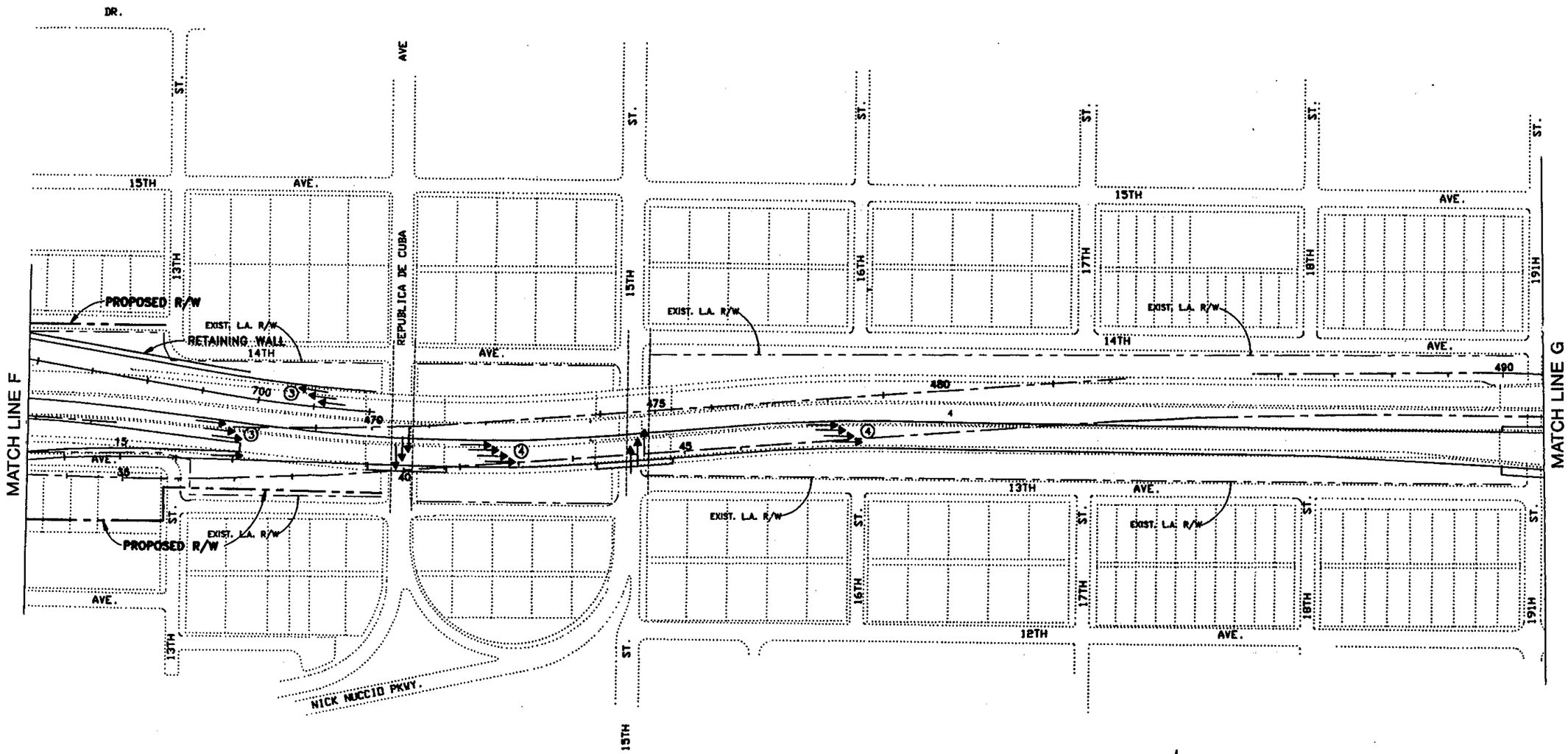
ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 3 CONCEPT

EXHIBIT 5.3



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

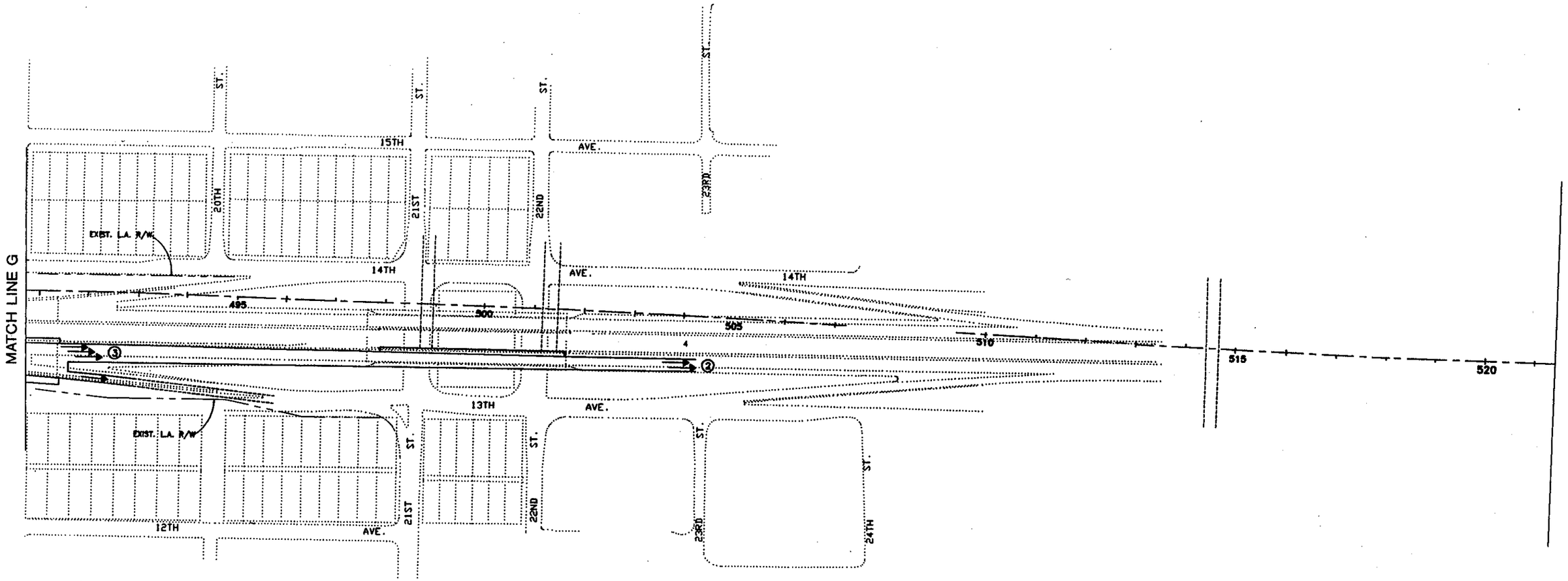
TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

ALTERNATIVE 3 CONCEPT

EXHIBIT 5.3



FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

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Hillsborough County, Florida

ALTERNATIVE 3 CONCEPT

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and joining two through lanes from I-4. Four through lanes continue southbound on I-275 to just before the Hillsborough River bridge, where the outside lane merges into a three-lane section. In addition, prior to the I-4/I-275 southbound merge, the two-lane section from I-4 provides a one-lane off-ramp to Orange/Jefferson Street.

The southbound local freeway provides two lanes on structure and new alignment from the vicinity of Ross Avenue southward to a two-lane exit at Kay Street. One lane continues southbound on new structure to the Ashley Street off-ramp. Alternative 1 precludes access from I-275 southbound to Orange/Jefferson Street. Full shoulders are provided in sections where vertical clearances (under the structure) and horizontal constraints are not major factors in the design.

5.5.2 Alternative 2

Beginning on the west side of the project traveling northbound, the Ashley Street ramp adds one lane to I-275. A total of four through lanes are carried northbound to where the Orange/Jefferson Street ramp adds one lane on the inside and the new Orange/Jefferson Street ramp adds one lane on the outside. This six-lane section splits at the I-275/I-4 fork with three lanes continuing northbound on I-275 (existing) and three lanes heading eastbound on I-4.

From the north on I-275, the I-275 southbound exit is located approximately 183 m (600 ft.) north of the existing ramp gore in order to improve operations as indicated with Alternative 1. The I-275 southbound to I-4 ramp is on a new one-lane flyover alignment outside of the existing ramp. This flyover adds one lane on the outside of the three lanes from I-275 southbound which becomes a four-lane section on I-4 eastbound to the 21st/22nd Street off-ramp. This single lane exit drops one lane and carries three lanes eastbound over the 21st/22nd Street bridge before the inside lane merges into two lanes at the 22nd Street on-ramp gore.

On the east side of the project, just west of the 21st Street bridge, I-4 adds one through lane to match the three-lane section in the vicinity of the 15th Street bridge. The existing three-lane section continues westbound and retains the same exit to I-275 northbound and southbound with one

additional lane to total four lanes on I-275 northbound and two through lanes to I-275 southbound. Prior to the two lanes from I-4 joining the I-275 southbound lanes, a new one-lane off-ramp is provided to the new southbound local freeway.

From the north, I-275 southbound carries four lanes southbound to the I-4 exit where one lane is dropped. Three lanes continue to the local freeway exit where a two-lane ramp is provided with two through lanes continuing to join the two southbound through lanes from I-4. A four-lane section then continues southbound over the Hillsborough River bridge, matching the four-lane section to the west. In order to provide four through lanes over the river, the Ashley Street on-ramp (movements from the north and south) is reconstructed on a separate alignment north of the existing I-275 bridge and carries a two-lane on-ramp tapering into the four I-275 southbound lanes approximately 198 m (650 ft.) west of Willow Avenue.

The southbound local freeway provides three lanes from the vicinity of Ross Avenue southward to a two-lane exit for Orange/Jefferson Street. Two lanes continue southbound on structure to the Ashley Street off-ramp (one lane) and a new off-ramp at Doyle Carlton Drive (one lane).

Alternative 2 provides access to both downtown exits from I-4 and I-275 southbound. The Doyle Carlton Drive exit replaces existing access provided on the north side of I-275 by the Kay Street ramp.

5.5.3 Alternative 3

Alternative 3 follows the "ultimate" footprint for the TIS Preferred Alternative for the I-275/I-4 downtown interchange. Generally, this concept utilizes the local roadway lanes located on the outside of the ultimate concept as mainline freeway lanes. The "ultimate" freeway and HOV lanes are not constructed for this concept, but could be built later. Roadway segments different than the "ultimate" lanes are provided to transition this concept to I-275 to the south and north and I-4 to the east. Also, some minor changes were made to the concept to ensure that, generally, the same

movements provided in Alternatives 1 and 2 were provided or replaced at another nearby location in Alternative 3.

Beginning on the west side of the project traveling northbound, just east of the Rome Avenue bridge, the four I-275 northbound lanes provide a one-lane off-ramp to North Boulevard just east of Willow Avenue. This ramp, via Laurel Place, replaces the movement not provided to Scott Street from the Ashley Street ramp. The four lanes continue northbound with a one-lane off-ramp for Ashley Street just west of the Hillsborough Avenue bridge. Between Franklin Street and Florida Avenue, the one-lane Ashley Street ramp tapers into the four I-275 northbound lanes and continues northbound to where the Orange/Jefferson Street ramps join the freeway. This section of roadway through downtown is on structure from the Hillsborough River to the Orange/Jefferson Street ramp to I-275. The ramp from Orange/Jefferson Street to I-4 adds one lane to total five lanes at the I-275/I-4 fork. Two lanes exit to I-4, while three lanes continue northbound on I-275. Beyond the I-4 exit, the on-ramp from Orange/Jefferson Street to I-275 northbound merges into the three-lane section. Continuing northbound, I-275 adds one lane from the I-4 westbound exit, providing four lanes to the end of the project.

The two lanes from I-275 northbound to I-4 eastbound are joined by the ramp from I-275 southbound to I-4. The two-lane ramp splits, with one-lane merging into I-4 on the inside and one lane joining I-4 on the outside, creating a four-lane section eastbound. The four lanes continue eastbound, basically on the existing alignment to the 21st/22nd Street single-lane off-ramp that drops one lane. Three lanes continue over the 21st/22nd Street bridge before the outside lane merges into the existing two-lane section at the 22nd Street on-ramp gore.

From the east side of the project, the three existing lanes on I-4 westbound extend off the existing alignment just west of the 14th Street bridge. The new alignment carries three lanes to the I-275 fork with a one-lane exit to I-275 northbound and three lanes continuing to I-275 southbound and the local southbound freeway. The one lane to I-275 northbound joins the three through lanes and continues with four lanes over Floribraska Avenue tying into the existing I-275 northbound roadway

just south of 26th Avenue. The three southbound lanes from I-4 provide a single lane exit for the local southbound freeway and two lanes continue to I-275 southbound.

From the north side of the project, the four existing I-275 southbound lanes begin with a new two-lane off-ramp to I-4 with a gore location near Adalee Street. Three I-275 southbound lanes continue on the existing alignment over Floribraska Avenue and southbound over the Columbus Drive bridge where a two-lane ramp is provided for the local freeway and two through lanes, on a new alignment, join the two through lanes from I-4 in the vicinity of Ross Avenue. From this location, I-275 southbound provides a four-lane section on a new alignment on the north side of the existing interstate to over the Hillsborough River where it ties into the existing four-lane section just east of the Rome Avenue bridge. In the section near Tampa Street, a one lane off-ramp replaces the existing loop ramp and provides a direct connection under I-275 to Ashley Street. Through the downtown area, the four southbound lanes are on structure from Jefferson Street to North Boulevard.

Ashley Street access to I-275 southbound, from the south of I-275, is provided with a flyover ramp that is carried over I-275 and onto the southbound freeway with a one-lane ramp in the vicinity of North Boulevard. Access from the north of I-275 from Ashley Street is replaced by the one-lane on-ramp, via Laurel Place, from North Boulevard.

The local freeway lanes, located on the outside of the new I-275 southbound alignment, include two lanes from I-275 southbound and one lane from I-4 westbound. The three-lane section begins in the vicinity of Oak Avenue, travels southward under the new I-275 southbound lanes, and provides a two-lane exit to Kay Street with two lanes continuing to Orange/Jefferson Street.

Alternative 3 provides a facility that meets current 1995 roadway standards for both horizontal and vertical geometries. In addition to the transitions from the "ultimate" freeway to the existing facility, which are different than the "ultimate" lanes, three temporary structures and approximately 1,646m (5,400 ft.) of temporary roadway would be required for maintenance of traffic.

5.6 ALTERNATIVES EVALUATION

Alternatives 1 and 2 propose similar improvements involving minor modifications to the existing interstate, while Alternative 3 involves the reconstruction of the downtown interchange, incorporating portions of the proposed "ultimate" design. Alternatives 1 and 2 would minimize right-of-way acquisitions, while Alternative 3 would be confined within the ultimate right-of-way. The following paragraphs evaluate the alternatives in terms of maintenance of traffic, drainage, relocation, local access and right-of-way/relocation, and construction costs. A summary of the evaluation in matrix format is provided in Section 5.6.6.

5.6.1 Maintenance of Traffic

All existing traffic lanes on I-275 and I-4 will be maintained except for short periods of time during off peak hours. In addition, traffic will remain in its existing location. Tables 5.3, 5.4, and 5.5 provide the proposed maintenance of traffic plans for Alternatives 1, 2, and 3, respectively.

5.6.2 Drainage

The three alternatives were evaluated for proposed drainage requirements. This included determining proposed stormwater treatment volumes, preliminary detention pond locations, and estimated conveyance and outfall system improvements.

Existing and proposed new impervious areas were determined for each alternative and are shown in Table 5.6. Since the runoff from the existing and proposed roadways flows into the tidally influenced Hillsborough River, no stormwater peak attenuation, per FDOT 14-86, FAC or SWFWMD 40D-4, FAC, was considered.

Stormwater treatment of the first 25.4mm (1 in.) of runoff from the new impervious areas was determined for each alternative. Approximately 0.12 ha-m (43,560 $ft.^3$), 0.86 ha-m (30,492 $ft.^3$), and 0.25 ha-m (91,476 $ft.^3$) of stormwater treatment volume will be required for Alternatives 1, 2 and 3,

TABLE 5.3

PROPOSED MAINTENANCE OF TRAFFIC - ALTERNATIVE 1
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Environmental Analysis

ALTERNATIVE 1
Ashley Street Northbound On-Ramp
Reroute this traffic to Orange Street on-ramp.
Construct the Ashley street on-ramp to I-4 eastbound including structure over Tampa Street, Franklin Street, Florida Avenue, Marion Street, Morgan Street, and Jefferson Street. Construct the associated retaining walls, embankment, and pavement to north of Jefferson Street but south of existing on-ramp from Orange Street.
Close Orange Street on-ramp to I-4 and reroute traffic to Ashley Street on-ramp.
Construct new Orange Street on-ramp and continue construction of Ashley Street ramp to I-4 from north of Jefferson Street structure to I-4.
Construct the new and widened bridges over Central Avenue, Henderson Street, 7th Avenue, Palm Avenue, and Nebraska Avenue.
Construct associated retaining walls, embankment, and pavement from north of Orange/Jefferson Street to the I-4 connection.
Open the newly constructed Orange Street on-ramp to I-4.
Northbound I-275 Mainline
Construct bridge widening over Orange/Jefferson Street and associated retaining walls, embankment, and pavement between Morgan Street and Central Avenue.
I-275 Southbound Local Access
Construct a new connection from I-275 southbound and I-4 westbound to serve local access.
Construct new bridge for I-4 westbound to I-275 northbound over Nebraska Avenue and the retaining walls, embankment, and pavement for this movement.
Shift traffic for I-4 westbound to I-275 northbound onto this new ramp and remove the existing bridge.
Construct new bridges over Nebraska Avenue, I-275 (northbound and southbound), Palm Avenue, 7th Avenue, Henderson Street, Morgan Street, Marion Street, Florida Avenue, Franklin Street, and Tampa Street.
Construct associated retaining walls, embankment, and pavement between I-4 and south of Tampa Street.
I-275 Southbound Mainline
Construct bridge widening over 7th Avenue, Henderson Street, and Jefferson Street and Morgan Street, Marion Street, Florida Avenue, Franklin Street, and Tampa Street.
Construct associated retaining walls, embankment, and pavement widening between the Ashley Street ramps and Palm Avenue.
Eastbound I-4
Construct the widened bridges (left side) over the 14th Street, 15th Street, 19th Street, and 21st/22nd Street.
Construct the associated retaining walls, embankment, and pavement widening between Nebraska Avenue and east of 22nd Street (left side).
Construct the widened bridges (right side) over 14th Street, 15th Street, and 19th Street.
Construct the associated retaining walls, embankment, and pavement widening between Nebraska Avenue and 21st Street.

TABLE 5.4

PROPOSED MAINTENANCE OF TRAFFIC - ALTERNATIVE 2
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

ALTERNATIVE 2
I-275 Southbound to I-4 Eastbound
Construct new structure for proposed I-275 southbound to I-4 eastbound along with approaches on each end.
While this structure is being constructed, special care should be taken to erect beams during off-peak hours and by possible pacing of vehicles. During construction of the remaining superstructure, safety nets should be used over existing travel lanes.
Southbound I-275 Collector/Distributor (Doyle Carlton and Ashley Street Ramps)
Construct northern 7m (23-foot) portion of the structure from Tampa Street to the west. This will allow existing I-275 southbound off-ramp to Ashley Street to remain open.
Construct temporary roadway and embankment to the south (west of Tampa Street), shift traffic, and complete proposed roadway in this area.
Construct roadway and embankment along with associated retaining walls between Marion Street and Jefferson Street.
I-275 Southbound On-Ramp
Construct temporary realignment of the Ashley Street loop ramp (to the south), construct temporary realignment of the Tampa Street ramp (to the south) and merge these two ramps into one lane (allowing 5.7m (19 feet) face-to-face of barriers), and remove remaining portion of the existing structure over the Hillsborough River.
Construct the northern portion 6.7m ((22 feet) minimum) of new structure over the river for the southbound I-275 on-ramp from Ashley Street and Tampa Street.
After completion of the northern portion, shift traffic back to existing loop and align traffic over newly constructed portion. Remove remaining portion of the existing bridge.
Remove remaining portion of existing structure north of construction joint between southbound I-275 and the southbound I-275 on-ramp.
Construct the remaining portion of the proposed bridge over Hillsborough River.
Construct embankment, roadway widening, and structure over North Boulevard to complete the I-275 southbound improvement.
I-275 Northbound to I-4 Eastbound
Construct bridge widening for I-275 northbound to I-4 eastbound along with retaining walls, embankment, and roadway widening between Palm Avenue and gore area of I-275 southbound to I-4 eastbound. Construct roadway and bridge widening from the gore area to east of 15th Street.
I-275 Southbound to Orange Street and Ashley Street
Construct the realigned I-275 roadway and structure over Columbus Drive to Orange Street and Ashley Street ramps and shift traffic.
Realign I-275 north of this location in order to shift the gore 152.4m (500 feet) north to provide 243.8m (800 feet) between successive off-ramps.
Construct roadway widening to the north for I-4 westbound to I-275 southbound to local access and shift traffic (Nebraska Avenue to gore area).
Construct widened shoulders and complete I-4 westbound to I-275 southbound (gore area to Palm Avenue).
Northbound I-275
Construct widened northbound I-275 structures over Tampa Street, Franklin Street, Florida Avenue, Marion Street, Morgan Street, and Jefferson Street. Construct associated retaining walls, embankment, and roadway widening between Tampa Street and the Orange Street on-ramp.
To I-4 Eastbound
Close existing Orange Street, Scott Street, and eastbound I-4 on-ramp and reroute to the northbound Ashley Street on-ramp and sign I-275 northbound to eastbound I-4.
Construct widened northbound I-275 structures over Central Avenue, Henderson Street, 7th Avenue, and Palm Avenue. Construct associated retaining walls, embankment, and roadway widening between Central Avenue and north of Palm Avenue.
I-275 Southbound
Construct widening of I-275 southbound structures over Jefferson Street, Morgan Street, Marion Street, Florida Avenue, Franklin Street, and Tampa Street. Construct associated retaining walls, embankment, and roadway widening between Central Avenue and Tampa Street.

TABLE 5.5

PROPOSED MAINTENANCE OF TRAFFIC - ALTERNATIVE 3
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

ALTERNATIVE 3
I-4 Westbound to I-275 Northbound
Construct structure over Nebraska Avenue and Columbus Drive and structure over Floribraska Avenue.
Construct retaining walls, embankment, and pavement between I-4 (west of 14th Street) and I-275 (south of Plymouth Street).
Shift traffic onto newly constructed ramp and remove existing structure over Nebraska Avenue.
I-275 Southbound to I-4 Eastbound
Construct temporary retaining wall and embankment for I-275 southbound westerly between Floribraska Avenue and Columbus Drive. Alignment will allow construction of new structure for I-275 southbound to I-4 eastbound. Construct the southern portion east of the gore to permit traffic to access I-4 from the right-hand side when completed.
Construct the western half of structure over Floribraska Avenue then shift traffic and construct the eastern half.
Construct widened structures (right side) over 14th Street, 15th Street, and (both sides) over 19th Street.
Construct the associated retaining walls, embankment, and pavement between Plymouth Street and 19th Street.
Remove temporary retaining walls, embankment, and pavement between Floribraska Avenue and Columbus Drive and structures over Columbus Drive and flyover ramp to eastbound I-4.
I-275 Southbound
Construct western half of structures over Columbus Drive and Palm Avenue.
Construct local street modifications and closures adjacent to the southbound I-275 work areas between Columbus Drive and Willow Avenue.
Construct associated retaining walls, embankment, and pavement for the I-275 southbound ramp to local access.
Shift traffic onto this newly constructed ramp.
Remove western portion of existing structure over Columbus Drive and construct the eastern portion of this bridge for I-275 southbound.
Construct the eastern portion of the structure over Palm Avenue and total structure over Jefferson/Estelle Street, viaduct over Morgan Street, Marion Street, Florida Avenue, Franklin Street, Tampa Street and Hillsborough River.
Construct structures over North Boulevard and widening over Willow Avenue.
Construct associated retaining walls, embankment, and pavement between Columbus Drive and Rome Avenue.
Construct the Ashley Street to I-275 southbound flyover. Construct associated retaining walls, embankment, and pavement from south of Laurel Place to North Boulevard.
Shift all southbound I-275 traffic to newly constructed roadways.
I-4 Westbound to I-275 Local Traffic
Construct northern portion (minimum 6.7m (22 feet)) of structure over Nebraska Avenue and the complete structure width (west of the gore) over I-275 (northbound and southbound) and I-275 southbound to local access.
Construct associated retaining walls, embankment, and pavement between 10th Street and Palm Avenue.
Shift I-4 westbound traffic onto this newly constructed roadway. This is a one-lane structure; however, temporarily stripe for two lanes 0.6m ((2-foot) shoulder, two 3.5m 11½-foot lanes 0.6m (2-foot) shoulder) and remove existing structure.
Construct the portion of bridge to carry I-4 mainline to southbound I-275.
Reroute traffic for I-4 westbound to its ultimate location.
I-4 to southbound I-275 and I-275 southbound is now complete for this segment of the I-275/I-4 downtown interchange.
Northbound I-275
Construct new off-ramp to North Boulevard via Laurel Place. This will replace existing Ashley/Scott Street exits.
Shift I-275 northbound traffic onto existing I-275 southbound roadway west of North Boulevard and onto temporary roadway north of Palm Avenue to Columbus Drive and back onto existing I-275 northbound roadway just south of Columbus Drive structure.

TABLE 5.5 (Continued)

PROPOSED MAINTENANCE OF TRAFFIC - ALTERNATIVE 3
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

ALTERNATIVE 3
Restripe and provide a two-lane connection from I-275 northbound to I-4 eastbound to go over existing structure of Palm Avenue (between 7th Street and Palm Avenue).
Construct temporary connection from Orange Street on-ramp under existing bridge carrying I-275 northbound over Henderson Street. Continue this temporary connection northward along the west side of temporary I-275 northbound and make connection just south of structure over Palm Avenue.
Construct bridge over North Boulevard and realigned Laurel Street. Construct viaduct over Hillsborough River, Tampa Street, Franklin Street, Florida Avenue to south of Marion Street.
Construct southern portion of structure over Hillsborough River for ramp to Ashley Street. When this structure and associated retaining walls, embankment, and pavement are completed, open to traffic.
Construct temporary Acrow bridges over Marion Street, Morgan Street, and Orange Street along with associated embankment and pavement between Florida Avenue and Central Avenue. This will be north of the existing I-275 southbound alignment for a temporary connection of the I-275 northbound roadway.
Construct I-275 viaduct from south of Marion Street to north of Morgan Street.
Construct bridge over Orange/Jefferson Street and new Orange Street on-ramp to I-275 northbound.
Construct (western portion) the bridge viaduct (minimum 24.3 m (80 feet)) for I-275 from south of Palm Avenue to north of Columbus Drive.
Construct Orange Street on-ramp to eastbound I-4 and structure over Palm Avenue and Nebraska Avenue.
Construct associated retaining walls, embankment, and pavement between Morgan Street and 12th Street.
Reroute I-275 northbound traffic to new roadway between Willow Street and Floribraska Avenue. Shift temporary two-lane connection (for eastbound I-4) from temporary I-275 northbound to the completed I-275 northbound over Palm Avenue.
Remove the Acrow bridges over Marion Street, Morgan Street and Orange Street.
Remove all of the existing I-275 northbound and southbound pavement and structures between North Boulevard and Columbus Avenue.
Construct the new I-275 northbound to eastbound I-4 structure over Palm Avenue and Nebraska Avenue.
Construct associated retaining walls, embankment, and pavement between south of Palm Avenue to west of 12th Street on I-4.
Remove existing pavement and bridge for this movement.
I-275 Southbound to I-4 Eastbound
Construct the remaining portion (north side) of the flyover for I-275 southbound to I-4 eastbound for the left-hand on-ramp for I-4 westbound through traffic.
Construct associated retaining walls, embankment, and pavement for this movement between Nebraska Avenue and 12th Street.
I-275 Southbound to Ashley Street
Construct associated retaining walls, embankment, and pavement for the I-275 southbound to Ashley Street ramp under I-275 southbound and I-275 northbound structures.

TABLE 5.6

EXISTING AND PROPOSED NEW IMPERVIOUS AREAS
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Location	Pavement Area - Hectares (Acres)			
	Existing Pav't	New Pav't Alt. 1	New Pav't Alt. 2	New Pav't Alt. 3
Rome Ave. to Hillsborough River	3.6 (9.0)	*	*	1.4 (3.7)
Hillsborough River to Orange St.	4.2 (10.6)	*	*	1.6 (4.2)
Orange St. to Palm Ave.	4.0 (9.9)	2.5 (6.3)	1.8 (4.5)	2.3 (5.9)
Palm Ave. to Floribraska Ave. to Nebraska Ave.	4.2 (10.5)	0.8 (2.2)	0.6 (1.7)	3.1 (7.9)
Nebraska Ave. to 13th St.	1.9 (4.9)	0.7 (1.8)	0.4 (1.0)	0.8 (2.0)
13th St. to 19th St.	2.5 (6.4)	0.4 (1.1)	0.1 (0.4)	0.3 (0.9)
19th St. to 22nd St.	1.0 (2.6)	0.1 (0.2)	0.1 (0.4)	0.3 (0.9)
Total	**21.8 (53.9)**	**4.6 (11.6)**	**3.2 (8.0)**	**10.3 (25.5)**

* No construction proposed in these segments with this alternative.

respectively. Preliminary detention pond locations were identified within existing right-of-way or with impacted areas adjacent to the proposed roadway and are shown on Exhibit 5.4. The proposed ponds are assumed to be "wet" ponds with approximately 0.6m (2 ft.) of storage fluctuation and 6.1m (20 ft.) maintenance berms. The total detention pond area was 0.32 ha (0.8ac), 0.28 ha (0.7ac), and 0.60 ha (1.5ac) acres for Alternatives 1, 2, and 3, respectively.

With the construction of any of the alternatives, the existing stormwater conveyance and outfall system will require modifications and improvements. Currently, the interstate is on a fill or bridge section throughout the project area. Existing drainage is conveyed to scuppers, inlets or ditches and directed down to ground level. The existing drainage is then conveyed via a system of large diameter pipes [1,371mm (54 in.) to 1,676mm (66 in.) RCP] directly to the Hillsborough River along Scott Street. Drainage on the at-grade streets is conveyed via pipes and inlets to either the FDOT outfall or to an existing City of Tampa outfall system along Laurel Street. The proposed alternatives will consist of adding new travel lanes and shoulders. Depending on the alternative, the existing roadway collection system may still be utilized. However, additional inlets and pipes may be required to connect the new lanes or shoulder drainage system to the existing drainage system. In other cases, due to the roadway geometry, a new separate drainage collection system will be required. The ultimate roadway drainage system will have to be determined during final design.

It is anticipated that the interstate outfall system will also require modification. This will be required for two reasons: the outfall will have to convey runoff from increased impervious area, and portions of the proposed alternatives will cover the existing pipe alignment. Preliminary estimates of proposed outfall pipes sizes are shown in Table 5.7. Copies of correspondence and meeting minutes pertaining to drainage issues are contained in Appendix A.

5.6.3 Relocations

The additional right-of-way requirements associated with each of the three alternatives varies substantially by alternative; however, each alternative will impact some property owners along the existing corridor. Although minimizing required right-of-way was one goal of the project, some residential and business relocations are unavoidable.

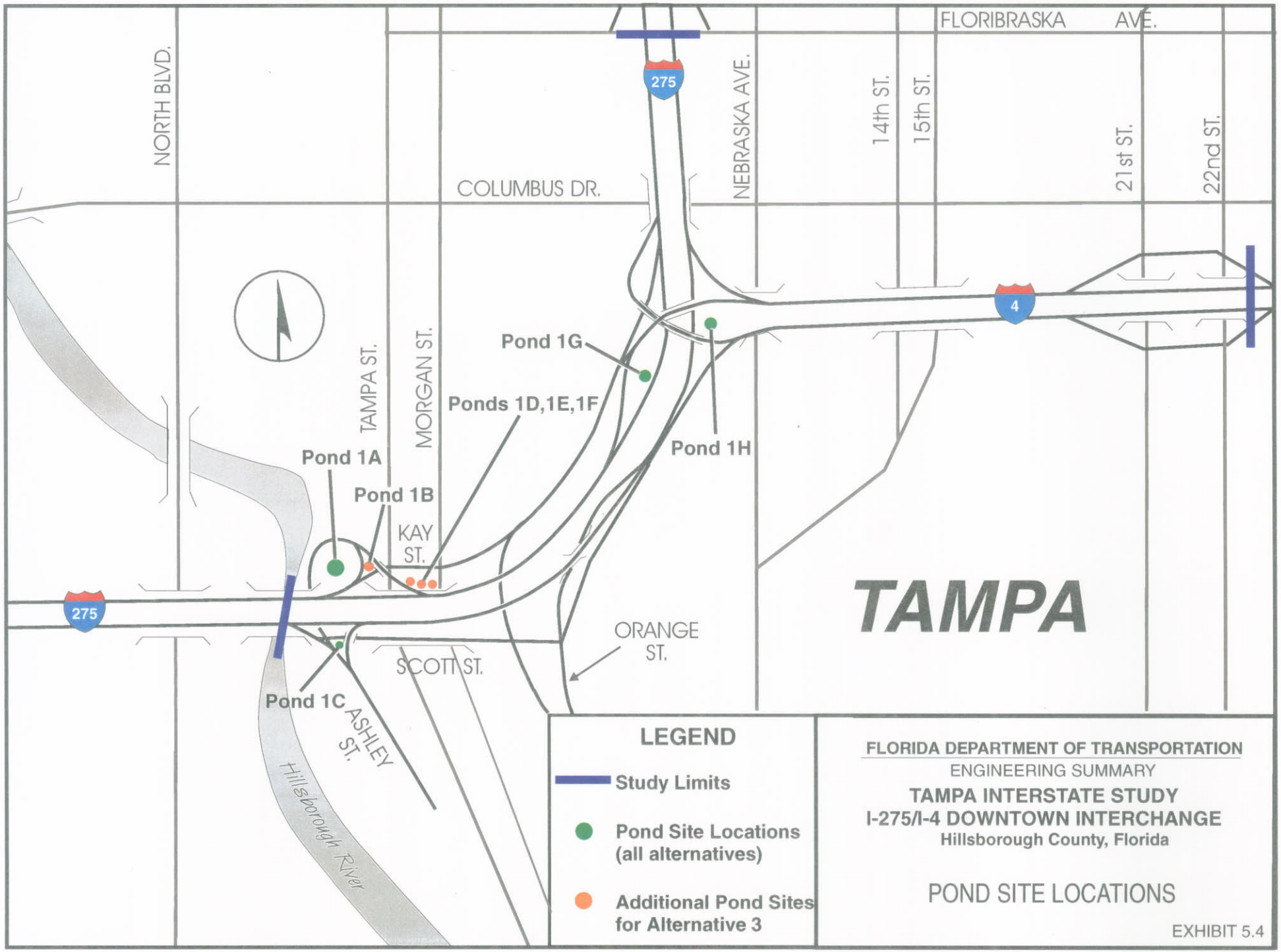

FLORIBRASKA AVE.
NORTH BLVD.
275
NEBRASKA AVE.
14th ST.
15th ST.
21st ST.
22nd ST.
COLUMBUS DR.
4
TAMPA ST.
MORGAN ST.
Pond 1G
Ponds 1D,1E,1F
Pond 1H
Pond 1A
Pond 1B
KAY ST.
275
TAMPA
ORANGE ST.
SCOTT ST.
Pond 1C
ASHLEY ST.
Hillsborough River
LEGEND
Study Limits
Pond Site Locations (all alternatives)
Additional Pond Sites for Alternative 3
FLORIDA DEPARTMENT OF TRANSPORTATION
ENGINEERING SUMMARY
TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
Hillsborough County, Florida
POND SITE LOCATIONS
EXHIBIT 5.4

TABLE 5.7

PROPOSED OUTFALL PIPE SIZE
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Location	Existing Pipe Size -mm (in.)	Proposed Pipe Size -mm (in.)[1]
Columbus Dr. to Park	1,524mm (60)	1,828.8mm (72)
Park to Palm Ave.	1,524mm (60)	1,828.8mm (72)
Palm Ave. To Henderson	1,524mm (60)	1,828.8mm (72)
Henderson to Marion St.	1,676.6mm (66)	2,133.6mm (84)
Marion St to Tampa St.	1,676.6mm (66)	2,133.6mm (84)
Tampa St. to Hills. River	1,676.6mm (66)	2,133.6mm (84)

[1] Or equivalent.

Relocation impacts associated with **Alternative 1** include two single-family residences, two multi-family dwellings containing six residences, and nine small businesses. The business relocations consist of an animal hospital, an auto-detailing establishment, a bail bond office, and a small six-tenant office building. In addition, this alternative will require the relocation of the Hartline Northern Transit Terminal and the acquisition of a small strip of land from Perry Harvey Park.

Relocation impacts associated with **Alternative 2** include four single-family residences, one multi-family dwelling totaling four residences, and three small businesses. The businesses consist of an animal hospital, an auto-detailing establishment, and a bail bond office. In addition, this alternative also requires the relocation of the Hartline Northern Transit Terminal passenger transfer facility and the acquisition of a small strip of land from Perry Harvey Park.

Relocation impacts associated with **Alternative 3** are much more substantial. Residential relocations include approximately 114 single-family residences; three multi-family buildings at the North Boulevard Homes complex comprising of 32 residential relocations and sixteen multi-family buildings at the Tampa Presbyterian Village totaling approximately 140 residential relocations; and three smaller multi-family dwellings totaling 12 residential relocations. Additional relocations include the City of Tampa Recreation Department Offices; the Henderson School and the old Velasco Building, both School Board properties; the Tampa Fire Department Communications Building; Faith Temple Missionary Baptist Church, Friendly Missionary Baptist Church, and the Baptist Fellowship Bible College of Tampa; a TECO substation; a portion of the Salvation Army complex; the Hartline Northern Transit Terminal; and approximately ten small businesses.

In order to minimize the unavoidable effects of right-of-way acquisition and displacement of people, the FDOT will carry out a right-of-way and relocation program in accordance with Florida Statute 339.09 and the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (Public Law 91-646, as amended by Public Law 100-17).

Detailed information regarding relocation impacts, available resources, and the relocation and acquisition programs is contained in the Conceptual Stage Relocation Plan Technical Memorandum

(July 1996) published separately for the I-275/I-4 Downtown Interchange Operational Improvements project.

5.6.4 Local Access

Alternative 1 maintains local access except for one movement. This concept precludes access from I-275 southbound to Orange/Jefferson Street. All access points are maintained with Alternative 2. To maintain local access, the existing "unsigned ramp" that presently touches down at the Kay/Morgan Street intersection is extended to Doyle Carlton Drive in order to keep access to the north side of I-275. Alternative 3 provides some changes in ramping configurations; however, all local access is maintained.

It should also be noted that when the interim improvements to segments 3A/3B are constructed, I-4 access to and from the west for 21st/22nd Street will be replaced by ramping for 14th/15th Street with a connecting one-way frontage to 21st/22nd Street.

5.6.5 Right-of-Way/Relocation and Construction Costs

Preliminary right-of-way, relocation, and construction cost estimates were prepared for each of the three proposed alternatives. A break-down of the costs is provided on Table 5.8.

5.6.6 Summary of Alternative Impacts

As shown on Table 5.8, right-of-way, relocations, and cost estimates are substantially higher for Alternative 3 than for Alternatives 1 and 2. It should be noted that all of the alternatives would improve conditions by providing wider shoulders and safety improvements to lessen queueing lengths and minimize sight distance problems. Alternative 3 would further improve safety by providing a new vertical profile designed to meet current standards. However, due to the substantial impacts associated with Alternative 3 and funding constraints, Alternative 3 was dropped from consideration in favor of selecting a Preferred Alternative from the best components and refinements

TABLE 5.8

PRELIMINARY COST ESTIMATES
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

	Alternative 1	Alternative 2	Alternative 3
Estimated Business Relocations	10	4	25
Estimated Residential Relocations	10	8	341
Estimated Sign Relocations	0	6	10
Total	**20**	**12**	**366**
Business Parcels	12	11	28
Residential Parcels	8	11	103
Unimproved Parcels	14	5	59
Total	**34**	**27**	**190**
Right-of-way Support Cost	$340,000	$270,000	$1,900,000
Right-of-way Operations	1,447,000	1,211,000	9,029,000
Right-of-way Land Costs	9,708,000	9,635,000	68,860,000
Right-of-way Acquisition Consultant	306,000	243,000	1,710,000
Relocation Costs	284,000	197,000	7,823,000
Total	**$12,085,000**	**$11,556,000**	**$89,322,000**
Construction Costs*	$60.5 Million	$64 Million	$261 Million

* Construction costs include:
- 6% Mobilization cost
- 25% Maintenance of Traffic cost
- $1,050,000 in Utility relocations
- $1,400,000 in Landscaping (excluding sodding)
- 15% Contingency

of Alternatives 1 and 2. Further evaluations of Alternatives 1 and 2, which resulted in a Preferred Alternative for this project, are discussed in Section 5.7.

5.7 PREFERRED ALTERNATIVE

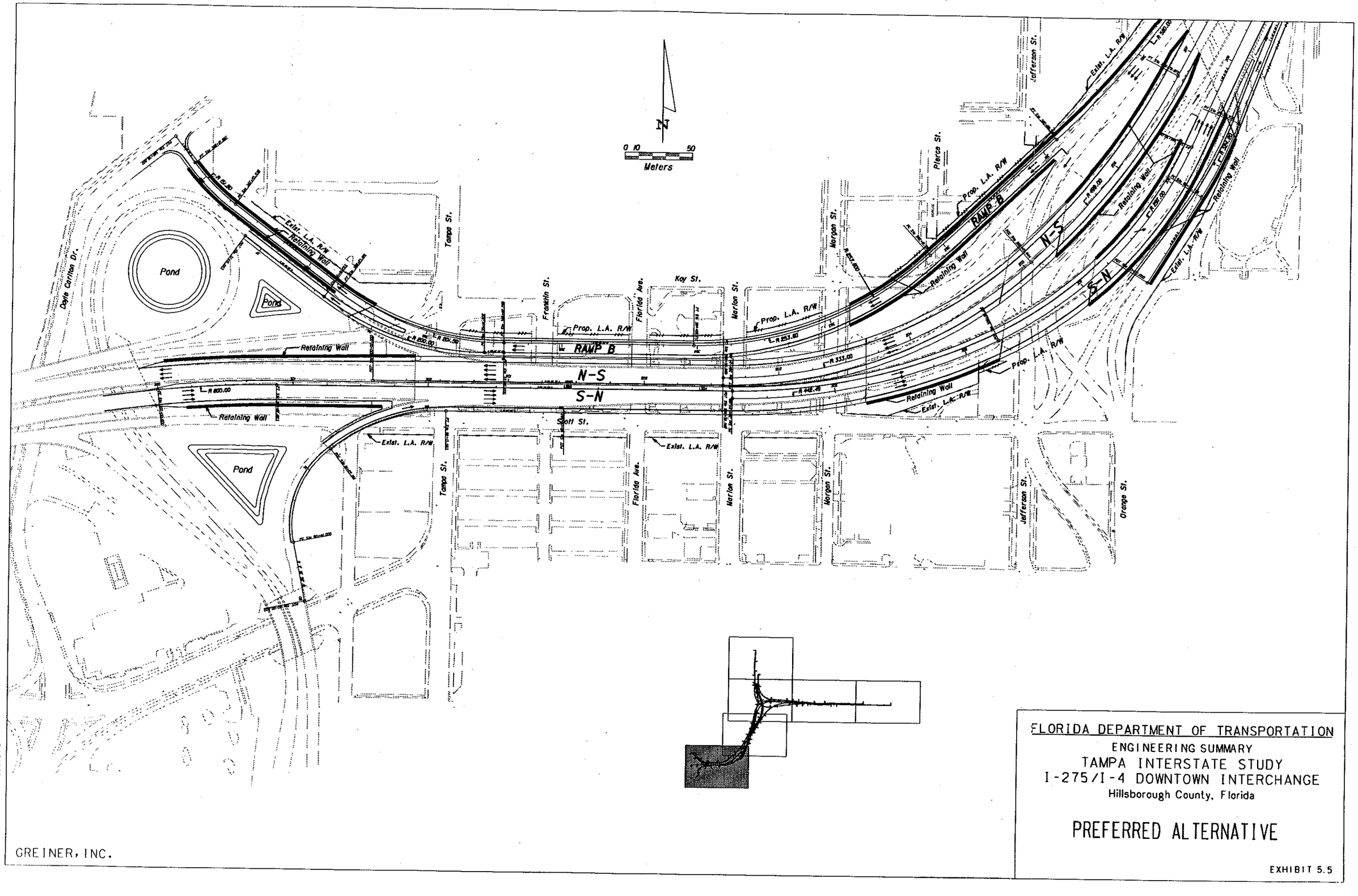
After a comparison of the alternatives presented in Section 5.6.6, it was determined that the southbound local freeway would operate more efficiently by bringing traffic from I-4 to the outside of the local freeway. This design would ease the weaving movement between I-4 and I-275 traffic destined for the east and west sides of downtown. This design requires two additional structures and slightly increases construction costs. A description of the Preferred Alternative is provided in the following sections and shown on Exhibit 5.5.

5.7.1 I-275 Northbound from Hillsborough River to I-4

This segment of the Preferred Alternative will include adding a fourth northbound through lane at the Ashley Street entrance ramp that will continue to I-4. This improvement, along with merging the Orange/Jefferson Street entrance ramp, will allow vehicles to access two through lanes from the river to I-4 without changing lanes and will eliminate the frequent crash problems that occur at the Ashley Street entrance ramp resulting from the substandard taper length and overloading of traffic destined for I-4 into one lane. The Alternative 1 improvement of diverting the Ashley Street ramp to a separate structure was not selected due to high costs (estimated at an additional $5 million) and opposition from the City of Tampa regarding precluding Ashley Street ramp traffic to access I-275 northbound.

5.7.2 I-275 Southbound to I-4 Eastbound Flyover Ramp

The Preferred Alternative provides a new flyover ramp entering I-4 on the right side and adding a new lane, replacing the existing left side ramp, as proposed in Alternative 1. The right side ramp eliminates the weave for I-275 southbound vehicles entering I-4 destined for the 21st/22nd Street exit ramp. This improvement becomes even more important if the segment 3A/3B improvements



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FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

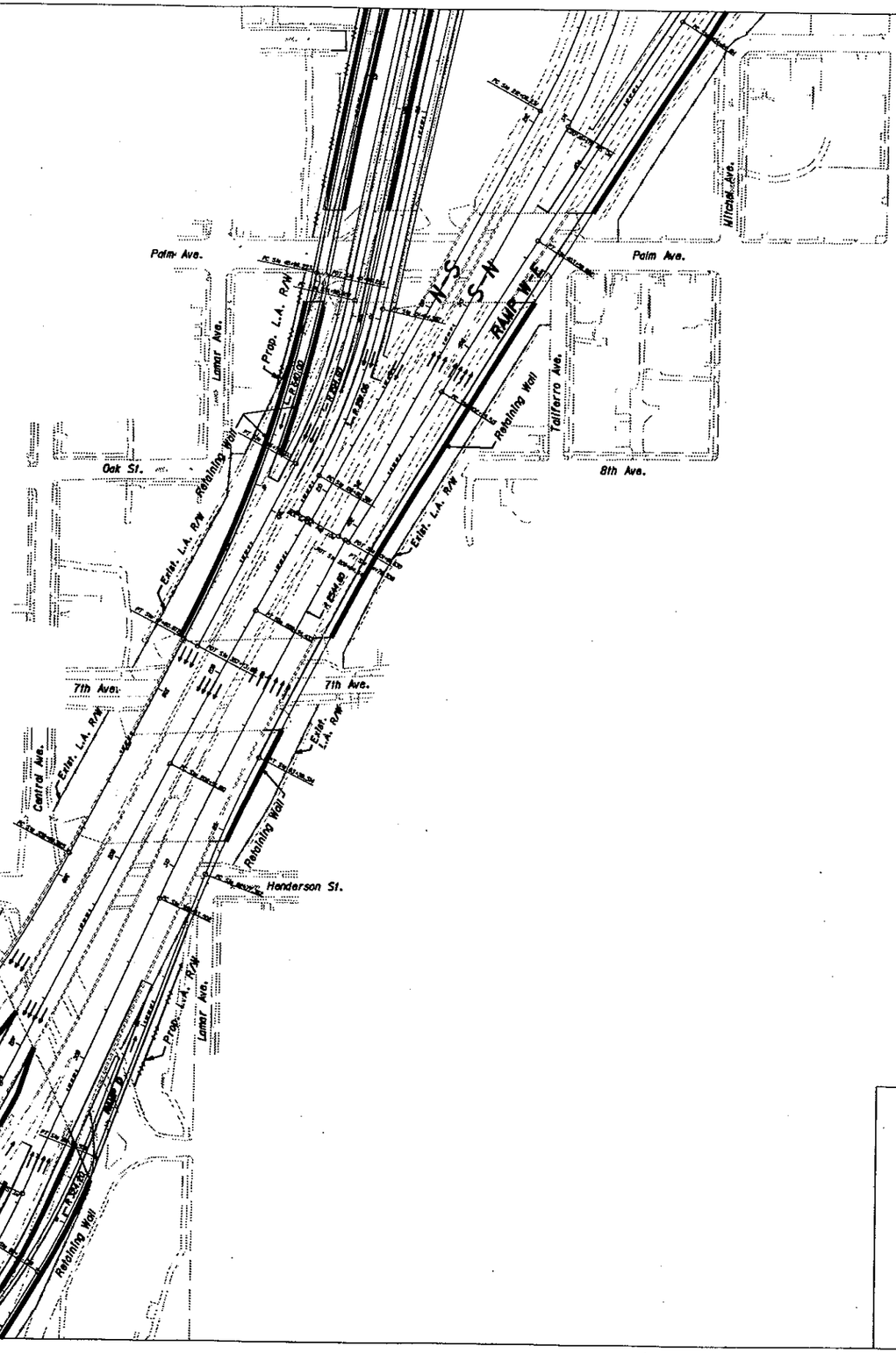
TAMPA INTERSTATE STUDY

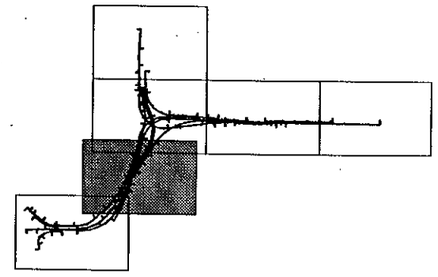
I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

PREFERRED ALTERNATIVE

EXHIBIT 5.5





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ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

PREFERRED ALTERNATIVE

EXHIBIT 5.5

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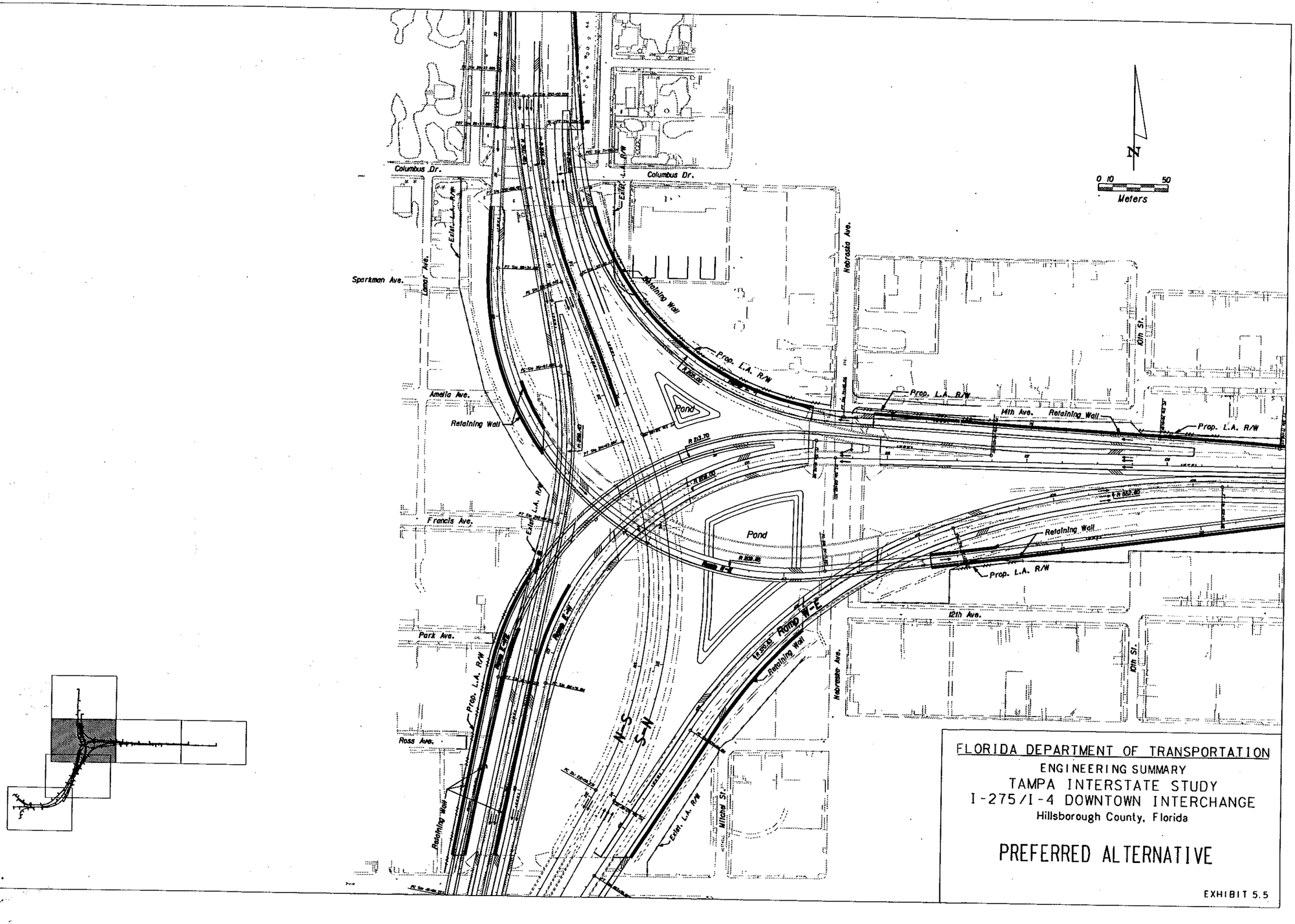

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ENGINEERING SUMMARY

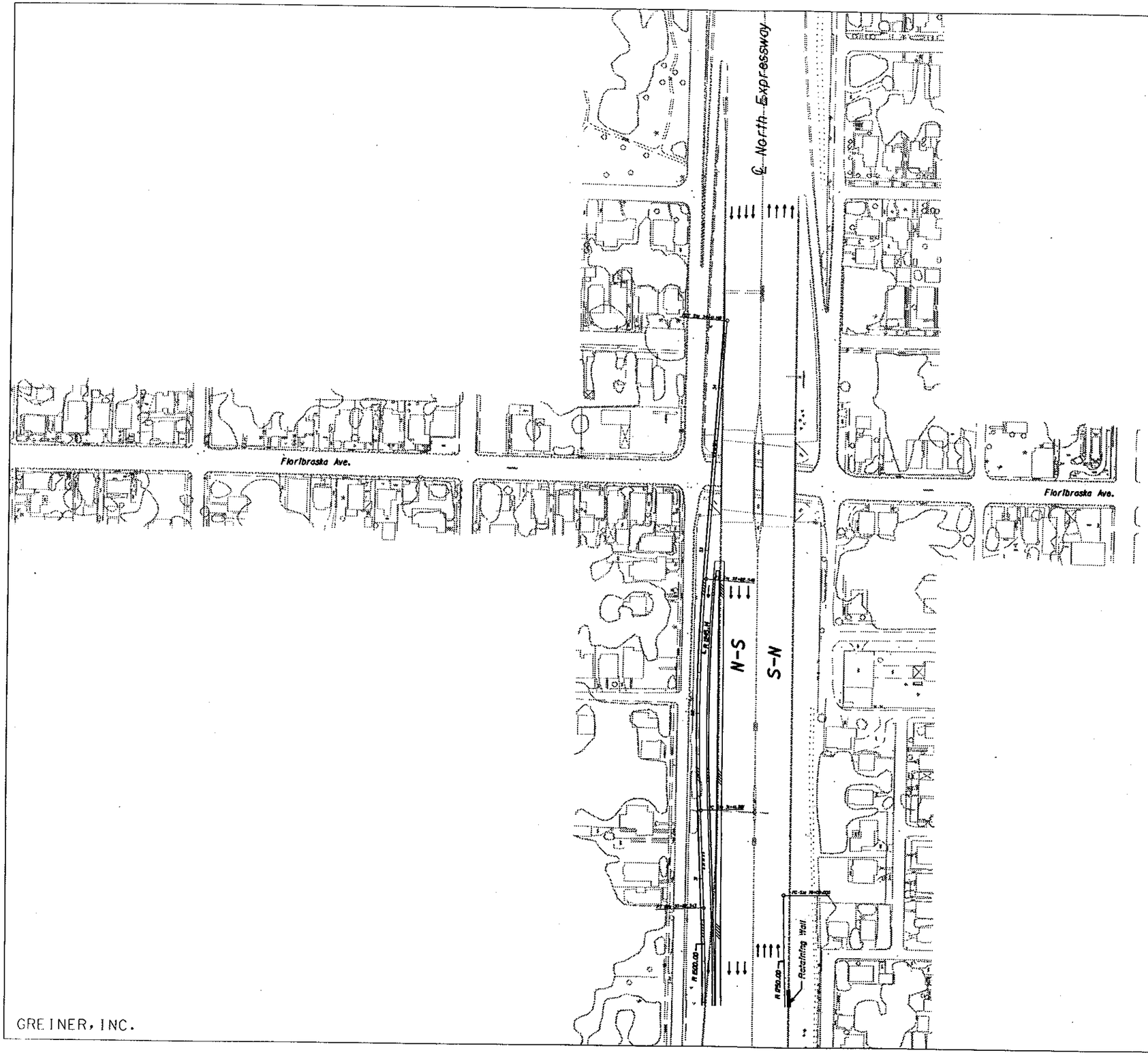
TAMPA INTERSTATE STUDY

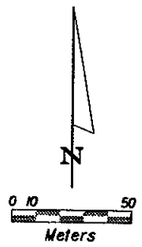
I-275/I-4 DOWNTOWN INTERCHANGE

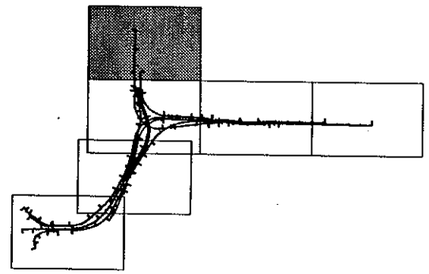
Hillsborough County, Florida

PREFERRED ALTERNATIVE

EXHIBIT 5.5







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FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

PREFERRED ALTERNATIVE

EXHIBIT 5.5

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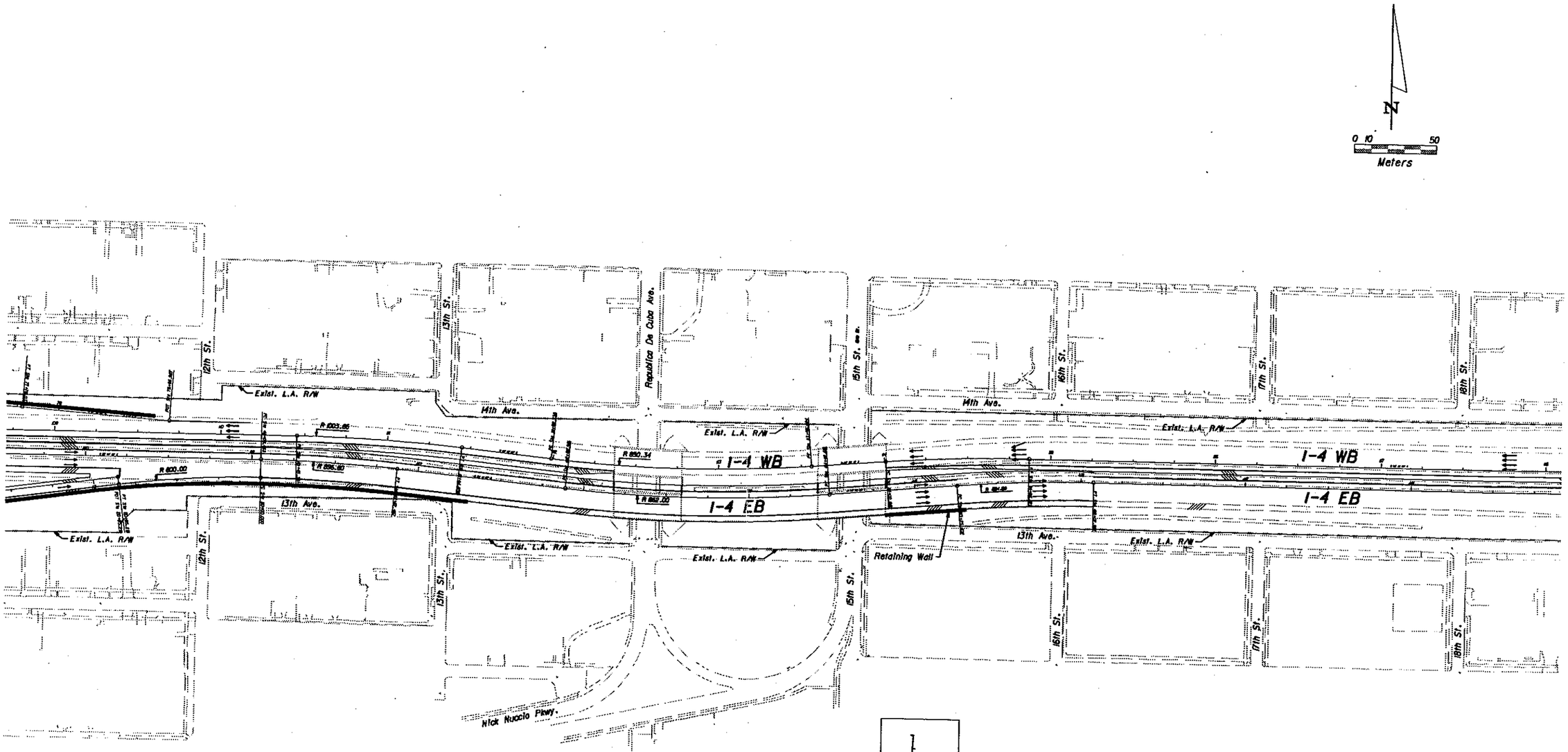

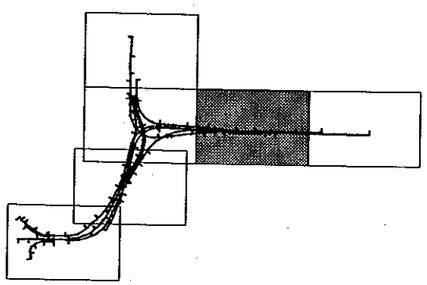

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

PREFERRED ALTERNATIVE

EXHIBIT 5.5

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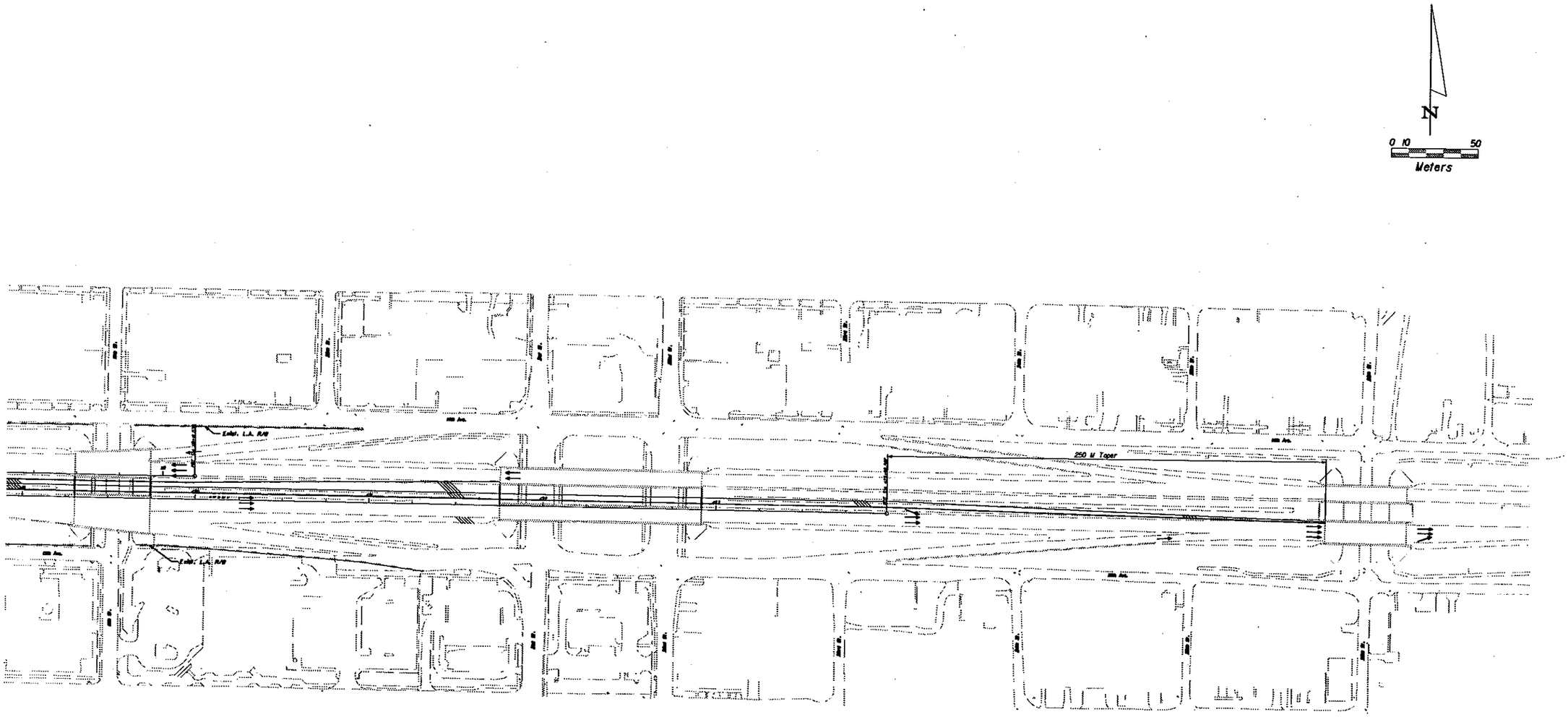

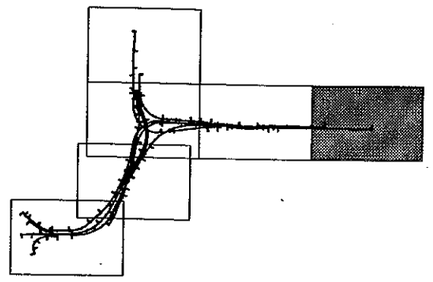

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY

I-275/I-4 DOWNTOWN INTERCHANGE

Hillsborough County, Florida

PREFERRED ALTERNATIVE

EXHIBIT 5.5

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are staged as currently planned due to funding constraints. The staged 3A/3B design moves the exit ramp gore for 21st/22nd Street approximately 427m (1,400 ft.) further to the west which would make the existing flyover ramp weave extremely difficult and unsafe to exit I-4. In addition, the existing flyover ramp would require rehabilitation if kept in place.

5.7.3 I-4 Eastbound from 13th Street to 22nd Street

In this segment, the Preferred Alternative provides a total of four eastbound lanes (three lanes from I-275 northbound and one lane from I-275 southbound) to the 21st/22nd Street ramp where one lane is dropped. Three lanes continue eastbound with the inside lane dropping and tapering back to a two-lane section in the vicinity of the 22nd Street entrance ramp gore. The improvement is less expensive and as effective as the Alternative 1 improvement that provides a two-lane exit.

5.7.4 I-4 Westbound from 21st Street to 15th Street

In this segment, the present condition requires westbound vehicles destined for I-275 northbound to weave over to where the 21st/22nd Street entrance ramp adds a lane to I-4. The Preferred Alternative provides a safer solution by creating a third through lane prior to the 21st/22nd Street entrance ramp signed for I-275 northbound and the entrance ramp merges into I-4 rather than adding a lane. This improvement eliminates the weave for westbound traffic destined for I-275 northbound from I-4 and the weave for traffic entering I-4 from 21st/22nd Street destined for I-275 southbound. This improvement should provide safer operations on I-4 in this segment.

5.7.5 I-4 Westbound from 15th Street to I-275 Northbound and Southbound

The Preferred Alternative carries the existing three through lanes to the I-275 interchange with a single lane exit (without a lane drop) to I-275 northbound and three through lanes continuing westbound where one lane is dropped for the southbound local freeway while two lanes continue to I-275 southbound. This improvement is a refinement to both Alternatives 1 and 2 that provides a safer condition by allowing the two lanes destined for I-275 southbound to travel through this

ramping area without interruption. It also provides the drop lane at the ramp that would carry the most volume (the local freeway ramp) rather than dropping the lane prior to this exit at the I-275 northbound ramp.

5.7.6 I-275 Southbound from Floribraska Avenue to I-4

Beginning at the Floribraska Avenue bridge, the four existing southbound lanes drop one lane for the new flyover ramp to I-4. Three lanes continue south for approximately 366 m (1,200 ft.), 213 m (700 ft.) longer than existing conditions, where the next lane drop takes place with a two-lane exit ramp to the local freeway. The two I-275 through lanes continue southbound to meet two lanes from I-4 totaling four southbound lanes.

5.7.7 I-275 Southbound from I-4 to Hillsborough River

The Preferred Alternative utilizes the Alternative 1 solution of carrying four southbound through lanes over the downtown viaduct and tapering out the outside through lane prior to the Hillsborough River bridge. The Ashley Street exit ramp is eliminated from this section and is accessible by the local freeway. The Alternative 2 solution of carrying four lanes over the river, tieing into the existing four-lane section and reconstructing the Ashley Street entrance ramp was dropped from consideration due to high construction costs (an additional $9 million). In addition, this area is outside the project study limits. This improvement could be implemented with a possible future interim project to improve the segment of I-275 west of the Hillsborough River.

5.7.8 Southbound Local Freeway from I-4 to Ashley Street

The local freeway begins with a two-lane exit from I-275 southbound and a single-lane flyover ramp from I-4 tieing into the local lanes on the right side. The three-lane section continues southbound on the existing bridge over 7th Avenue and Henderson Street. The alignment then provides a two-lane exit for Jefferson Street and continues on a new structure over Morgan Street, Marion Street, Florida Avenue, Franklin Street, and Tampa Street before the left lane exits for Ashley Street and

the outside lane exits to Doyle Carlton Drive. The Doyle Carlton Drive ramp replaces the Kay Street ramp which was eliminated due to the insufficient weaving section and geometric constraints created by the addition of the Ashley Street exit ramp to the local freeway.

This solution is a refinement of the Alternative 2 configuration that accommodated the I-4 volume on the left side of the local freeway. The refinement was developed since preliminary traffic analyses revealed that a significant percentage of the I-4 volume would be destined for Ashley Street (requiring a weave to the right side) and a significant volume of I-275 traffic would exit at Orange/Jefferson Street (requiring a left side weave). The braided configuration shown on Exhibit 5.5 minimizes the weaving activity between the junction of I-4 and I-275 traffic to the local freeway and the Orange/Jefferson Street exit. The Alternative 1 configuration was dropped from consideration since it does not provide access to Orange/Jefferson Street from I-275 southbound, access which the City of Tampa requested.

SECTION 6.0

PRELIMINARY DESIGN ANALYSIS

6.1 TYPICAL SECTIONS

Due to the complexity of the project and the varying lane configurations that exist within the project study limits, there are no "typical" sections. Sample cross-sections are used in this case as the typical sections. The proposed typical sections for I-275 and I-4 are shown in Exhibits 6.1 and 6.2. A typical section design package has been prepared and is available for review at FDOT District VII offices.

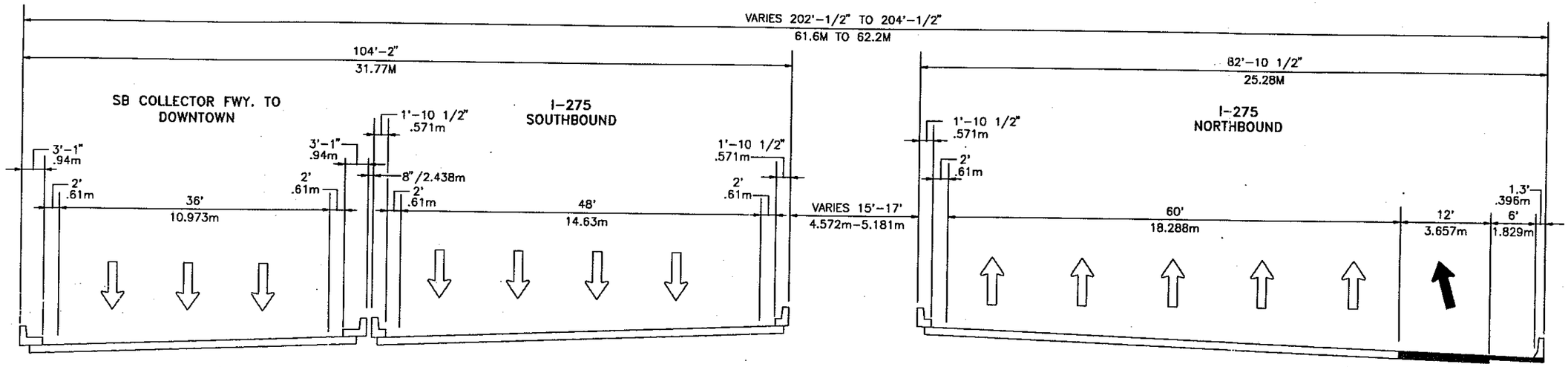
6.2 STRUCTURES ANALYSIS

Of the existing structures within the project limits, the vertical clearance will be affected at only six locations. All vertical clearances with the Preferred Alternative maintain a minimum clearance of 4.3m (14.0 ft.). In addition, seven new structures are proposed. A summary of existing and proposed vertical clearances is provided in Table 6.1.

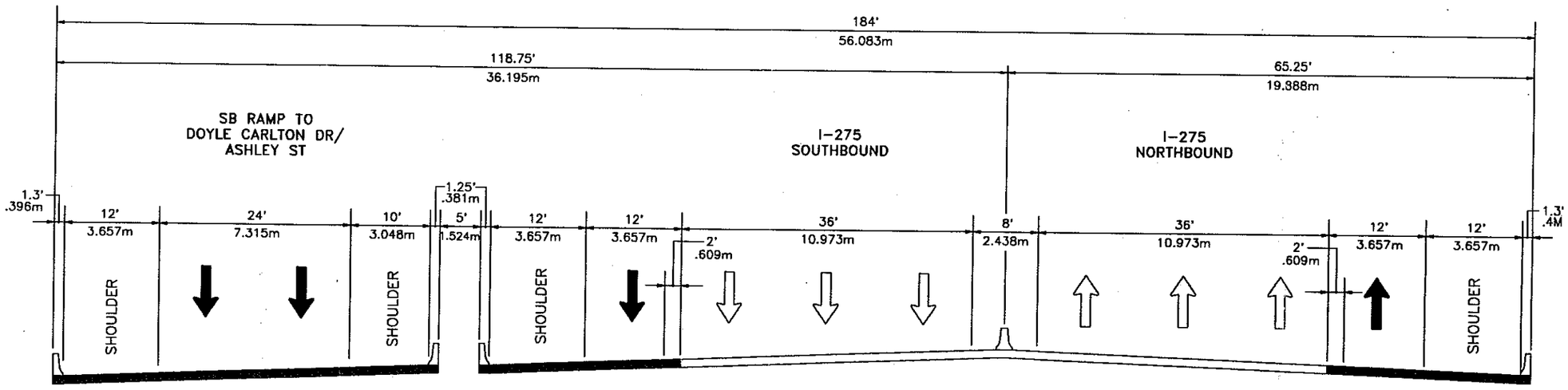
6.3 ALIGNMENT AND RIGHT-OF-WAY

Proposed right-of-way has been plotted on the appended concept plan set. A brief description of the right-of-way acquisition necessary for the proposed improvements is provided in the following paragraphs.

Beginning at the west end of the project at Doyle Carlton Drive, approximately 30.4m (100 ft.) of right-of-way will be necessary to complete the Kay Street ramp extension. Continuing east on I-275 from Tampa Street to Estelle Street, required right-of-way along the north side ranges from 6.1 m (20 ft.) to 30.4m (100 ft.). In addition, a 3.0 m (10 ft.) portion of the property bordering the interstate on the south side between Morgan Street and Orange Street will be required.



BRIDGE SECTION OVER 7TH STREET



LEGEND

- EXISTING BRIDGE
- NEW BRIDGE

BRIDGE SECTION
BETWEEN FLORIDA AVE. AND MARION ST.

FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
OPERATIONAL IMPROVEMENTS

Hillsborough County, Florida

PROPOSED TYPICAL SECTIONS FOR I-275

EXHIBIT 6.1

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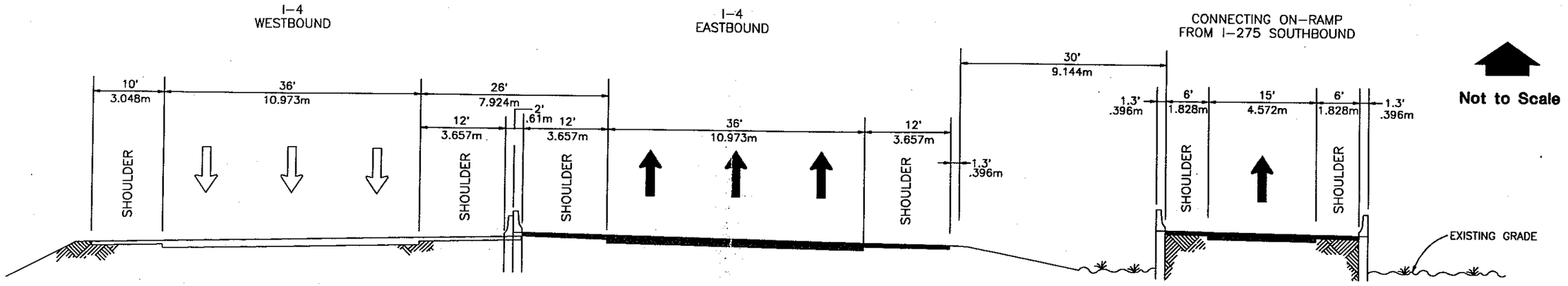
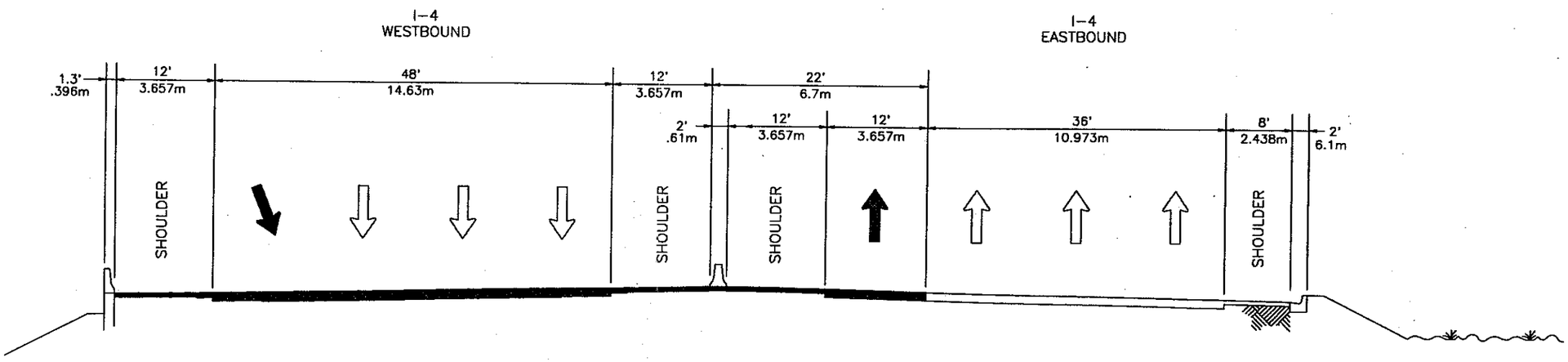


ROADWAY SECTION
BETWEEN 10TH STREET AND 12TH STREET



ROADWAY SECTION AT 17TH STREET

LEGEND

- EXISTING ROADWAY
- NEW ROADWAY

Greiner,Inc.

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FLORIDA DEPARTMENT OF TRANSPORTATION

ENGINEERING SUMMARY

TAMPA INTERSTATE STUDY
I-275/I-4 DOWNTOWN INTERCHANGE
OPERATIONAL IMPROVEMENTS

Hillsborough County, Florida

PROPOSED TYPICAL SECTIONS FOR I-4

EXHIBIT 6.2

TABLE 6.1
BRIDGE VERTICAL CLEARANCE SUMMARY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Bridge Location	Existing Minimum Vertical Clearance	Preferred Alternative Vertical Clearance
I-275(SB) Downtown Viaduct over:	-	-
Tampa St.	4.5 m (14'-8") (5)	4.5 m (14'-8")
Franklin St.	4.7 m (15'-7")	4.7 m (15'-7") (3)
Florida Ave.	4.9 m (16'-0")	4.9 m (16'-0") (6)
Marion St.	4.5 m (14'-10")	4.4 m (14'-6") (6)
Morgan St.	4.4 m (14'-6")	4.3 m (14'-0") (6)
I-275(NB) Downtown Viaduct over:	-	-
Ashley over Scott Street	4.6 m (15'-2")	4.5 m (14'-10")
Tampa St.	4.5 m (14'-8") (5)	4.4 m (14'-6")
Franklin St.	4.7 m (15'-7")	4.7 m (15'-7") (2)
Florida Ave.	4.9 m (16'-0")	4.9 m (16'-0")
Marion St.	4.5 m (14'-10")	4.5 m (14'-10")
Morgan St.	4.4 m (14'-6")	4.4 m (14'-6")
Ashley St. Viaduct	N/A	5.0 m (16'-6")
I-275(SB) over Jefferson St.	4.6 m (15'-2")	4.6 m (15'-2")
I-275(NB) over Jefferson St.	4.6 m (15'-3")	4.6 m (15'-3")
Local freeway over Henderson/Central	4.3 m (14'-2")	4.3 m (14'-2")
I-275(SB) over Henderson/Central	4.3 m (14'-1")	4.3 m (14'-1")
I-275(NB) over Henderson/Central	4.3 m (14'-0")	4.3 m (14'-0") (2)
Local freeway over 7th Ave.	4.4 m (14'-6")	4.4 m (14'-6")
I-275(SB) over 7th Ave.	4.5 m (14'-9")	4.5 m (14'-9")
I-275(NB) over 7th Ave.	4.5 m (14'-10")	4.5 m (14'-10") (6)
I-4(WB) to I-275(SB) over Palm Ave.	4.3 m (14'-1")	4.3 m (14'-1")
I-4(WB) to local freeway over Palm Ave.	N/A	4.4 m (14'-6") (7)
I-275(SB) over Palm Ave.	4.3 m (14'-2")	4.3 m (14'-2")
I-275(NB) over Palm Ave.	4.3 m (14'-2")	4.3 m (14'-2") (2)
I-4(WB) Ramp to I-275(SB) over I-275	4.7 m (15'-6") (4)	4.7 m (15'-6")
I-4(WB) Ramp to local freeway over I-275(SB)/local fwy	N/A	5.0 m (16'-6")
I-4(WB) Ramp to local freeway over I-275	N/A	5.0 m (16'-6")
I-275(SB) Ramp to I-4(EB)	N/A	5.0 m (16'-6")
I-4(WB) Ramp to I-275(SB) over Nebraska	4.6 m (15'-1")	4.6 m (15'-1")
I-4(WB) Ramp to I-275(NB) over Nebraska	N/A	4.4 m (14'-6") (7)
I-275(NB) Ramp to I-4(EB) over Nebraska	4.4 m (14'-6")	4.4 m (14'-6")
I-275(SB) Ramp to I-4(EB) over Columbus	5.8 m (19'-2")	5.8 m (19'-2")
I-275(SB) over Columbus Dr.	4.7 m (15'-4")	4.4 m (14'-6")
I-275(NB) over Columbus Dr.	4.4 m (14'-6")	4.4 m (14'-6")
I-4(WB) Ramp to I-275(NB) over Columbus	N/A	5.0 m (16'-6")
I-4(EB) over 14th St.	4.6 m (15'-2")	4.6 m (15'-2") (2)
I-4(EB) over 15th St.	4.5 m (14'-9")	4.5 m (14'-9")
I-4(WB) over 19th St.	4.6 m (15'-2") (5)	4.6 m (15'-2")
I-4(EB) over 19th St.	4.5 m (14'-9")	4.5 m (14'-9")
I-4(EB) over 21st and 22nd St.	4.6 m (15'-3")	4.6 m (15'-3")
I-275(SB) over Floribraska	4.5 m (14'-9")	4.4 m (14'-6") (6)

(2) - The beams used for widening the bridge are assumed to be modified to maintain the original vertical clearance.
(3) - The beams used for widening the bridge are assumed to be modified along with the cross-slope to maintain the original vertical clearance.
(4) - Obtained from the bridges SIA reports. The remaining clearances were obtained by Greiner's survey crew.
(5) - Surveyed vertical clerance was higher than SIA report value by several inches.
(6) - The beams used for widening the bridge are assumed to be shallower steel plate girders.
(7) - New bridge shows lower clearance to match existing structures at gore area.

Continuing north on I-275, between Estelle Street and Henderson Street, approximately 12.2m (40 ft.) of right-of-way will be required on the east side. On the west side of I-275, between Oak Avenue and Frances Avenue, maximum required right-of-way is approximately 30.9m (100 ft.).

Right-of-way acquisition required on I-4 includes a 3.0m (10 ft.) portion of two parcels on the south side located closest to Nebraska Avenue. On the north side of I-4, approximately 3.0m (10 ft.) of right-of-way will be required from 9th Street to Nebraska Avenue. A 6.1m (20 ft.) portion of the property adjacent to the I-4 westbound to I-275 northbound ramp, located on the corner of Nebraska Avenue and Columbus Drive, will be required for the improvements to the ramp.

6.4 RELOCATIONS

Although every effort has been made to minimize the impact of the proposed interchange improvements on existing land uses, some residential and business relocations are unavoidable. Relocation impacts associated with the Preferred Alternative include six single-family residences; one multi-family dwelling containing four residences; three businesses consisting of Central Animal Hospital, Willy's Auto Detailing, and Abe's Bail Bonds; and Faith Temple Missionary Baptist Church. In addition, the Preferred Alternative will also require the relocation of the Hillsborough Area Regional Transit (HART) Northern Transit Terminal located beneath, and immediately north of, the interstate.

Because of the adequate supply of homes available for sale or rent, the abundance of vacant leasable business space, and the frequency in which new listings become available, it is anticipated that all displaced residences, businesses, and non-profit organizations can be relocated within or near their respective neighborhoods, if so desired.

A more complete discussion of the relocation impacts associated with the Preferred Alternative, including some general demographics information, relocation resources available, and a discussion of the FDOT's Acquisition and Relocation Assistance Program, is contained in the Conceptual Stage Relocation Plan Technical Memorandum (July 1996) published separately for this project.

6.5 PRELIMINARY COST ESTIMATE

The preliminary cost estimate for right-of-way, relocations, engineering, and construction of the Preferred Alternative follows:

Right-of-Way/Relocations	$14 million
Engineering	5 million
Construction	64 million
Total	**$83 million**

Additional information regarding the construction cost estimate is provided in Table 6.2.

6.6 PEDESTRIAN AND BICYCLE FACILITIES

The nature of travel on interstate facilities prohibits bicycle and pedestrian traffic on I-275 and I-4. However, sidewalks are provided on the majority of cross streets under I-275 and I-4. Due to the character of the operational and safety improvement, funding limitation, and limited impacts to local streets, improvements to the existing bicycle and pedestrian accommodations will not be addressed as part of the improvement project. The Preferred Alternative has been developed to accommodate both bicycle and pedestrian movements on all cross streets.

6.7 SAFETY

Crash data provided by the FDOT for the study area was summarized in Section 4.1.10. As shown previously in Tables 4.3 through 4.9, data was provided for various segments of I-275 and I-4 for the years 1990 through 1994. These tables are referenced in this section as a source for crash/safety data.

Table 4.3 shows that a total of 415 crashes occurred within the five-year time frame on the I-275 segment between the Hillsborough River and Orange/Jefferson Streets. This segment also reports

TABLE 6.2

PRELIMINARY CONSTRUCTION COST ESTIMATE
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Pay Item Description	Cost
Mobilization	$2,994,876
Maintenance of Traffic	$9,982,919
Clearing	$961,210
Structures	$26,790,100
Earthwork	$3,690,196
Drainage	$1,092,292
Paving	$1,176,183
Safety and Traffic Control	$3,754,145
Landscaping	$1,519,079
Utilities	$1,050,000
Subtotal	**$53,011,000**
Contingency	15%
Subtotal	$61,000,000
Noise Barriers	$3,000,000
PROJECT TOTAL (Rounded)	**$64,000,000**

unsatisfactory safety ratios ranging from 1.661 to 2.474 during the five-year period. It is anticipated that the proposed add lane improvements to the Ashley Street ramp will have a greater effect in reducing crashes in this segment. For example, further analysis of crashes in this segment, as shown in Table 6.3, reveals that between the eastbound Ashley Street off- and on-ramps, 39 percent of the crashes occurred within the vicinity of the on-ramp merge area. In addition, between the Ashley Street on-ramp and Morgan Street, 33 percent of the peak hour crashes were sideswipe collisions. Finally, 64 percent of the crashes on the Ashley Street on-ramp were rear end collisions. This information underscores that a significant number of crashes in this segment can be attributed to the current substandard Ashley Street on-ramp geometry.

Table 4.4 shows that on I-275 from Orange/Jefferson Streets to the I-4 interchange, a total of 180 crashes occurred from 1990 to 1994. However, the safety ratio did not exceed 1.0 during this time period.

Tables 4.5 and 4.6 reflect crash data for I-4 from the I-275 interchange to east of the 21st/22nd Streets interchange. The safety ratio exceeded 1.0 in the roadway segment from I-275 to 15th Street during 1992 and 1994 and from 15th Street to east of the 21st/22nd Street interchange in 1991. On I-4 eastbound, six of the seven vertical curves are below current standards and on I-4 westbound, seven of the eight curves are also substandard for the 80 km/h (50 mph) design speed. With the lack of stopping sight distance being a possible cause of crashes in this location, it is believed that the proposed improvements will reduce queue lengths, minimize weaving conflicts, and allow drivers more time to react through these short crest curve sections. For example, Table 6.4 shows that, on I-4 westbound between the 21st Street on-ramp and the I-275 northbound off-ramp, 67 percent of peak hour crashes and 50 percent of off peak crashes occurred in the inside lane. This condition probably occurs because the inside lane is the only movement that continues through to I-275 southbound. This heavy movement usually has the longest queue length. The proposed improvements provide two through lanes to I-275 southbound that should significantly reduce westbound queuing. As shown on Table 6.4, approximately 49 percent of the crash total (peak and off-peak hours combined) on I-4 eastbound occurs in the middle lane. It is believed that this is partially because of the movement from the I-275 southbound flyover (that enters I-4 on the inside

TABLE 6.3

I-275 MAINLINE CRASH TYPOLOGY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Peak Hours	Non-Peak Hours
NB I-275 Between Ashley Street Off-Ramp and Ashley Street On-Ramp	
19 Total Crashes	91 Total Crashes
• 74% rear-end collisions • 21% angle collisions	• 54% rear-end collisions • 22% hit pole, guardrail or barrier wall
• 63% on straight-level roadway	• 55% on straight-level roadway
• 53% in Lane 3 • 21% at the on-ramp gore area	• 29% in Lane 3 • 29% at the on-ramp gore area • 22% in Lane 2
39 % Occurred in the Vicinity of the On-Ramp Merge Area	
NB I-275 Between Ashley Street On-Ramp and Morgan Street Overpass	
15 Total Crashes	54 Total Crashes
• 27% involved improper lane changing • 33% rear-end collisions • 33% sideswipe collisions • 20% hit guardrail or barrier wall	• 17% involved improper lane changing • 54% rear-end collisions • 24% hit guardrail, barrier wall, or other fixed object
• 73% on straight-level roadway • 20% on curved-level roadway	• 50% on straight-level roadway • 20% on curved-level roadway
• 46% in Lane 3 • 27% in Lane 1	• 31% in Lane 3 • 31% in Lane 2

RAMP CRASH TYPOLOGY

NB I-275 On-Ramp from Ashley Street
47 Total Crashes
• 64% rear-end collisions • 19% hit guardrail, barrier wall, or other fixed object • 13% sideswipe collisions
• 77% involved careless driving and/or improper lane changing
• 47% on straight-level sections of the ramp • 38% on curved sections of the ramp

TABLE 6.4

I-4 MAINLINE CRASH TYPOLOGY
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Peak Hours	Non-Peak Hours
EB from the SB I-275 Flyover Ramp to the 21st Off-Ramp	
29 Total Crashes	61 Total Crashes
• 24% involved improper lane changing • 52% rear-end collisions • 21% sideswipe collisions • 17% angle collisions	• 23% involved improper lane changing • 52% rear-end collisions • 18% sideswipe collisions
• 79% on straight-level roadway • 17% on straight upgrade/downgrade	• 59% on straight-level roadway • 38% on straight upgrade/downgrade
• 48% in Lane 2 • 38% in Lane 1	• 49% in Lane 2 • 18% in Lane 1 • 16% in Lane 3
WB Between 21st Street On-Ramp and NB I-275 Off-Ramp	
30 Total Crashes	124 Total Crashes
• 18% involved improper lane changing • 64% rear-end collisions	• 13% involved improper lane changing • 55% rear-end collisions • 20% hit pole, guardrail, barrier wall, or crash attenuator
• 49% on straight-level roadway • 46% on straight upgrade/downgrade	• 57% on straight-level roadway • 35% on straight upgrade/downgrade
• 67% in Lane 1 • 15% in Lane 2	• 50% in Lane 1 • 23% in Lane 2

lane) to the 21st Street exit ramp. The proposed improvements relocate the flyover to enter I-4 on the outside which will reduce the weaving conflict for this roadway segment. Again, the improvements should help reduce crashes.

6.8 UTILITY IMPACTS

The Preferred Alternative minimizes right-of-way requirements, resulting in impacts similar to Alternatives 1 and 2 and less than Alternative 3. A copy of the utilities located on the concept within the project area is available at FDOT District VII offices.

6.9 MAINTENANCE OF TRAFFIC

The proposed maintenance of traffic plan for the Preferred Alternative, categorized by roadway segment, is provided on Table 6.5.

6.10 NAVIGATION

The project study area includes only one bridge crossing of a navigable waterway, the Hillsborough River. The Preferred Alternative proposed would involve no changes to the existing bridge structures at the river. Therefore, the Preferred Alternative will have no impact on navigation or navigation-related land uses along the Hillsborough River.

6.11 COST ANALYSIS

As part of the evaluation and comparison of alternatives for this project, an engineering and economic analysis was accomplished to quantify the return-on-investment which can be expected for each alternative. A copy of the Cost-Effectiveness Analysis is contained in Appendix B.

The results of the cost-effectiveness analysis indicates that the Preferred Alternative is the most cost-effective alternative. The analysis also indicates that the Preferred Alternative would achieve the

TABLE 6.5

PROPOSED MAINTENANCE OF TRAFFIC - PREFERRED ALTERNATIVE
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

PREFERRED ALTERNATIVE
I-275 Southbound to I-4 Eastbound
Construct the new structure for proposed I-275 southbound to I-4 eastbound along with approaches on each and tieing into existing pavement, including realignment of the southbound ramp from Floribraska Avenue to Columbus Drive.
While this structure is being constructed, special care should be taken to erect beams during off-peak hours and by possible pacing of vehicles. During construction of the remaining superstructure, safety nets should be used over the existing travel lanes.
Shift traffic onto this newly-constructed roadway, demolish and remove the existing structure and roadway.
Southbound I-275 Local Access Lanes (Doyle Carlton and Ashley Street Off-Ramps)
Construct the viaduct structure from north of Morgan Street to south of Tampa Street full width.
Construct the northern 7m (23-foot) portion of the viaduct structure to the south from Tampa Street along with approaches and associated retaining wall to Doyle Carlton Drive.
Construct the roadway and embankment along with the associated retaining walls from Morgan Street to the north to tie into the existing pavement of the Jefferson Street ramp.
Shift the signing for the southbound Ashley Street off-ramp (both on I-4 westbound and I-275 southbound, north of Columbus Drive) and reroute traffic onto this newly-constructed roadway. The Ashley Street traffic will connect to the existing ramp via a temporary connector close to Doyle Drive at grade.
Remove the portion of structure and roadway which is no longer required for the Ashley Street southbound off-ramp.
Complete the remaining southern portion of the new southbound viaduct from Tampa Street to the south including the embankment and pavement for the Ashley Street off-ramp and connect to the existing ramp.
I-4 Westbound to I-275 Southbound Local Access Lanes
Construct structure widening to the right over Nebraska Avenue, new structure over existing southbound to Jefferson/Ashley Street ramps and new structure over Palm Avenue.
Construct embankment and roadway along with associated retaining walls from north of Nebraska Avenue to south of Oak Avenue tying into existing pavement on each end.
Shift traffic destined for Jefferson Street/Ashley Street ramps to the newly-constructed roadway.
I-275 Southbound to Jefferson Street/Ashley Street Local Access Lanes
Construct structure widening to the right over Columbus Drive and Palm Avenue.
Shift traffic to the left of the existing pavement utilizing the existing shoulder. Construct the western 20' of the end ramp and retaining wall. Construct the western shoulder to full depth for use in the next step, while placing temporary sheeting on the eastern side of this 20' pavement.
Shift the traffic destined for southbound Jefferson Street/Ashley Street off-ramps to this newly constructed portion of this roadway and construct the widening on the left side off I-275 southbound over Columbus Drive.
Construct the remaining (eastern portion) of this ramp. The temporary sheeting can either be pulled or cut off below grade before pavement section is constructed.
I-4 Westbound to I-275 Southbound Freeway Lanes
Construct structure widening to the right over I-275 northbound/southbound.
Construct the embankment and roadway along with the associated retaining walls from south of Nebraska Avenue to Ross Avenue.
Shift this traffic to the right side of this ramp and construct the structure widening on the left over I-275 northbound/ southbound and the widening to the left over Palm Avenue.
Make necessary modifications to pavement and shoulders for striping while shifting traffic to side in off-peak hours.

TABLE 6.5 (Continued)

PROPOSED MAINTENANCE OF TRAFFIC - PREFERRED ALTERNATIVE
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

PREFERRED ALTERNATIVE
I-4 Westbound to I-275 Northbound
Construct new structures over Nebraska Avenue and Columbus Avenue on new alignment.
Construct embankment and roadway along with associated retaining walls from 12th Street to north of Columbus Drive.
Shift I-4 westbound traffic destined for I-275 northbound and this newly-constructed roadway.
Demolish and remove existing structure and roadway not required.
Construct modifications for I-275 northbound on the right side n the vicinity of Columbus Avenue.
Shift I-275 northbound traffic to the right and construct the shoulder and structure widening over Columbus Avenue.
I-275 Southbound Freeway Lanes
Construct structure widening to the left over Jefferson Street and Morgan Street.
Construct embankment and roadway along with associated retaining walls from south of Central Avenue to north of Morgan Street.
Shift traffic to the left and construct the structure widening to the right over Morgan Street, Marion Street, Florida Avenue, Franklin Street and Tampa Street.
Construct embankment and roadway along with associated retaining walls from south of Central Avenue to structure over Ashley Street.
I-275 Northbound to I-4 Eastbound
Construct the new structure, right of the existing structure for Scott Street and Orange Street on ramps, over Central Avenue and Henderson Street.
Construct the widening of structure, on the right side, over Seventh Street, Palm Avenue and Nebraska Avenue.
Construct the embankment and the roadway along with the associated retaining walls from Kay Street to Nebraska Avenue.
Shift the traffic over to the right onto this newly-constructed roadway.
Construct the widening of structures, on the left side, over Nebraska Avenue, Republic De Cuba Avenue, 15th Street, 19th Street and 21st/22nd Streets.
Construct the embankment and the roadway along with the associated retaining walls from south of Nebraska Avenue to east of 22nd Street.
It should be noted that the construction of the structure over 19th Street is widening for both eastbound and westbound roadways of I-4.
I-275 Northbound - Ashley Street to Central Avenue
Construct structure widening on the right from Tampa Street to north of Morgan Street, over Jefferson Street and over Central Avenue.
Construct embankment and pavement along with the associated retaining walls from Morgan Street to Central Avenue.
Shift the traffic to the right and construct structure widening over Morgan Street and Jefferson Street.
Construct modifications to embankment and pavement along with associated retaining walls from Morgan Street to Central Avenue.
Construct new roadway for Orange Street ramp, open for traffic.
Shut down and remove existing superstructure for Ashley on ramp - reroute traffic to new Orange Street ramp.
Construct new superstructure for Ashley on-ramp.

conventionally-held criterion for cost effectiveness, which is that the benefits over time would be expected to equal, or offset, the cost to put the improvements in place.

As shown in the Benefit/Cost calculation tables contained in Appendix B, the Preferred Alternative will achieve a benefit/cost ratio of 0.98, indicating that the investment to put the operational and safety improvements in place will be essentially offset by crash-reduction benefits over the useful life of the improvement.

6.12 MASTER SIGNING PLAN

A master signing plan has been proposed for the Preferred Alternative that includes an expanded study area. This plan is available for review at the FDOT District VII offices.

6.13 DESIGN EXCEPTIONS/VARIATIONS

Given the fact that the Preferred Alternative involves the reconstruction of an existing facility built in the early 1960's, several design elements fall below current FDOT and/or AASHTO standards. As a result, variation and exception submittals were prepared for five areas where standards are compromised. To date, design variations (where FDOT criteria is not met) have been submitted and approved, in the areas of superelevation, vertical clearances, and stopping-sight distance. Design exceptions (where both FDOT and AASHTO criteria are not met) were proposed for the design of the vertical curves and shoulder widths.

6.13.1 Superelevation

Existing superelevation segments fall within a range of emax .06 to emax 0.10. All new or reconstructed roadways will use emax 0.10 criteria. This design variation is provided in Appendix C.

6.13.2 Vertical Clearances

The result of the Preferred Alternative improvements show a total of seven structures with vertical clearances under the FDOT Standards 4.4 m (14.5 ft.). AASHTO policy states, "In highly urbanized areas, a minimum clearance of 4.3 m (14 ft.) may be provided if there is one route with 4.9 m (16 ft.) clearance)." Florida Avenue would maintain its 4.9 m (16 ft.) vertical clearance under I-275 to serve as the alternate route. This design variation is provided in Appendix C.

6.13.3 Stopping Sight Distance

Horizontal geometries meet AASHTO standards for stopping sight distance in every segment where construction is proposed. There are two curves with deficiencies in stopping sight distance measured by FDOT standards where improvements are proposed. These areas are the northbound segment of I-275 from Jefferson Street to Central Avenue and the southbound segment of I-275 from Jefferson Street where improvements are proposed. This design variation is provided in Appendix C.

6.13.4 Vertical Curves

In most cases, the existing vertical curve lengths fall below AASHTO standards. The design exception to this criteria is provided in Appendix C.

6.13.5 Shoulder Widths

Although many areas of the proposed improvements increase shoulder widths to current standards, there are still areas that maintain existing substandard shoulders due to other constraints. The design exception to this criteria is provided in Appendix C.

6.14 ENVIRONMENTAL IMPACTS

This section presents a discussion of the potential environmental impacts associated with the Preferred Alternative. Since the Preferred Alternative incorporates the best conceptual design features of Alternatives 1 and 2, the environmental impacts associated with it are similar as well.

6.14.1 Social Impacts

6.14.1.1 Land Use Changes

Land use impacts as a result of the Preferred Alternative are anticipated to be minor. Potential relocations include three small businesses, one church, one multi-family dwelling totaling four residences, approximately six single-family residences, and the acquisition of some small areas of undeveloped land. In addition, a small strip of land from Perry Harvey Park and the HART Northern Transit Terminal will be impacted.

6.14.1.2 Community Cohesion

The proposed improvements will not sever any neighborhoods nor socially or culturally isolate any specific ethnic groups or minority communities. While a few community resources may be impacted, overall impacts to the community will be minor. Local traffic circulation patterns within existing neighborhoods will be maintained. Residences and businesses within the project area required to relocate will find ample resources available within their existing neighborhoods. The Preferred Alternative will have no adverse impact on commneighborhoods.

6.14.1.3 Community Services

Many community services are located in the vicinity of the proposed interchange improvements. These include schools, post offices, libraries, police and fire services, multi-family subsidized housing complexes, parks, and churches. The Preferred Alternative will require the acquisition of

approximately 566.5 m^2 (0.14 ac.) from Perry Harvey Park. This impact is anticipated to have little or no effect on the function or usage of the park. The Preferred Alternative will also require relocation of the HART Northern Transit Terminal located between Florida Avenue and Marion Street, beneath the existing interstate; and Faith Temple Missionary Baptist Church.

6.14.1.4 Title VI and VIII

The proposed improvements have been developed in accordance with the Civil Rights Act of 1964 as amended by the Civil Rights Act of 1968. No discriminatory criteria have been used during the development and selection of alternatives. The proposed improvements have not been planned to impact any specific groups or individuals but rather to improve the safety and operations of the existing interstate facility. The Preferred Alternative will have no undue effect on any specific groups or organizations including ethnic groups, minorities, the elderly, or handicapped individuals.

6.14.1.5 Controversy Potential

The proposed I-275/I-4 downtown interchange operational improvements represent a much smaller project than the overall Tampa Interstate Study and result in far fewer impacts. As such, the mitigation associated with the ultimate impacts does not apply. The Tampa Heights Civic Association has asked the FDOT to consider early acquisition of the ultimate right-of-way to enable the neighborhood to utilize the right-of-way area as interim open space because the greenway proposed for the ultimate impact is not programmed to occur within the next 25 years.

The FDOT is coordinating with FHWA to establish a voluntary purchasing plan in an effort to assist the neighborhood with their short-term goal of providing an open space buffer area adjacent to the interstate.

6.14.1.6 Railroads

The Preferred Alternative will have no impact on active or abandoned railroad tracks or railroad crossings.

6.14.1.7 Aesthetics

Aesthetic design treatments were considered for incorporation into the proposed interchange improvements. However, due to reasons of practicality, continuity, and cost reasonableness, they have not been included as part of the Preferred Alternative.

6.14.2 Cultural Impacts

6.14.2.1 Archaeological and Historic Sites/Districts

Within the vicinity of the I-275/I-4 downtown interchange project exists the Ybor City National Historic Landmark District and the Tampa Heights National Register Historic District. Right-of-way acquisition associated with the Preferred Alternative will directly impact two historic structures: Faith Temple Missionary Baptist Church, a contributing structure to the proposed Tampa Heights National Register Historic District; and a multi-family (fourplex) residence, a contributing structure within the Ybor City National Historic Landmark District. Neither structure is a suitable candidate for moving. In addition, the Preferred Alternative will also require the acquisition of property at the Velasco Building, a Hillsborough County School Board property and also a National Register building. The building structure itself will not be impacted by the alternative.

6.14.2.2 Parks and Recreational Facilities

Two public parks and recreational areas are located adjacent to the proposed I-275/I-4 downtown interchange project: Riverfront Park and Perry Harvey Park. Riverfront Park is located outside of

the project study limits. Only Perry Harvey Park will be directly impacted by the Preferred Alternative.

The Preferred Alternative will require the acquisition of approximately 566.5 m^2 (0.14 ac.) from the 37,231 m^2 (9.2 ac.) park. This right-of-way impact is confined to the northernmost section of the park, bounded by Estelle Street to the to the south, Central Avenue to the west, Lamar Avenue to the east, and Henderson Street to the north. This small disconnected parcel hosts little visitor activity and contains no visitor facilities. As a result, impacts to the park associated with this alternative are anticipated to be minor and should not substantially impair nor diminish the park's activities, features, functions, attributes, or usage.

The Preferred Alternative minimizes the impacts to the park in comparison to Alternatives 1 and 2. A conceptual mitigation plan has been developed and approved as a part of the overall TIS project. Two coordination meetings with the City of Tampa Parks and Recreation Departments, and three meetings with Councilman Perry Harvey, Jr. and representatives of the community were conducted as part of the overall TIS project to discuss the effects at Perry Harvey Park and potential mitigation measures. Copies of correspondence and meeting minutes are contained in the Appendix to the Environmental Impact Statement, published for the TIS project. It is anticipated that upon implementation of the full TIS project, the overall mitigation plan, including measures for Perry Harvey Park, will be implemented.

6.14.3 Natural Environment

6.14.3.1 Wetlands

The proposed I-275/I-4 downtown interchange project contains only one natural wetland, the Hillsborough River. I-275 crosses the river via twin fixed bridge structures. No improvements to these structures are proposed as part of the Preferred Alternative. The Preferred Alternative will have no impact on the Hillsborough River.

6.14.3.2 Aquatic Preserves

No Aquatic Preserves exist within the project vicinity. The Preferred Alternative will have no impact on Aquatic Preserves.

6.14.3.3 Water Quality

Surface waters within the project study limits are designated by the FDEP as Class II and Class III Waters. The proposed stormwater facility design for the Preferred Alternative will include, at a minimum, the water quality requirements for water quality impacts as required by the SWFWMD in Chapter 40D-40 F.A.C. Therefore, no further mitigation for water quality impacts will be needed.

6.14.3.4 Outstanding Florida Waters

No Outstanding Florida Waters exist within the project vicinity. The Preferred Alternative will have no impact on Outstanding Florida Waters.

6.14.3.5 Wild and Scenic Rivers

No Wild and Scenic Rivers exist within the project vicinity. Therefore, the Preferred Alternative will have no impact on Wild and Scenic Rivers.

6.14.3.6 Floodways and Floodplains

The only 100-year floodplain encroachment in the vicinity of the project is the I-275 crossing of the Hillsborough River, outside of the project study limits. Floodplain impacts associated with the Preferred Alternative are not anticipated. No floodways will be affected by the project.

6.14.3.7 Coastal Zone Consistency

The Office of Planning and Budget, Office of the Governor, has determined that this project is consistent with the Florida Coastal Zone Management Plan. A copy of the correspondence is contained in the Appendix to the Environmental Impact Statement for the TIS project.

6.14.3.8 Coastal Barrier Islands

The proposed project does not involve coastal barrier islands. Therefore, the Preferred Alternative will have no impact on coastal barrier islands.

6.14.3.9 Wildlife and Habitat

The U.S. Fish and Wildlife Service has determined that the proposed project will not impact any threatened or endangered species nor impact any designated critical habitat. The project has been found consistent with the Endangered Species Act. Copies of all correspondence and coordination with the USFWS are contained in the Appendix to the Environmental Impact Statement, published for the TIS project.

6.14.3.10 Farmlands

The provisions of the Farmlands Protection Policy Act of 1984 do not apply to this project. The Preferred Alternative will have no impact on farmlands.

6.14.4 Physical Impacts

6.14.4.1 Noise

Noise levels within the study area were evaluated using the methodology discussed in Section 4.4.1. of the Environmental Impact Statement for the TIS project. As shown in Table 6.6, the distances to

TABLE 6.6

NOISE ISOPLETHS FOR THE PREFERRED ALTERNATIVE
Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvements
Engineering Summary

Noise Study Area	Limits	Approximate Distance From Roadway Centerline m (ft.)		
		Hourly LEQ (dBA)	1990 Existing	Preferred Alternative
SEGMENT 2B				
G1	From Hillsborough River to Orange St., north of I-275	67 65	103.6 (340) 137.1 (450)	112.7 (370) 152.4 (500)
G2	From Hillsborough River to Orange St., south of I-275	67 65	94.1 (310) 128.0 (420)	97.5 (320) 134.1 (440)
H	From Orange St. to I-4/I-275 Interchange	67 65	115.8 (380) 152.4 (500)	118.8 (390) 155.4 (510)
I	From Morgan St. to Palm Ave., northwest of I-275	67 65	115.8 (380) 158.4 (520)	128.0 (420) 179.8 (590)
J	From Palm Ave. to 14th St., south of I-4	67 65	103.6 (340) 140.2 (460)	112.7 (370) 152.4 (500)
K	From Palm Ave. to Floribraska Ave., west of I-275	67 65	106.6 (350) 143.2 (470)	106.6 (350) 143.2 (470)
L1	From Floribraska Ave. to 10th St., I-275/I-4 Interchange	67 65	118.8 (390) 161.5 (530)	118.8 (390) 161.5 (530)
L2	From 10th St. to 14th St., north of I-4	67 65	100.5 (330) 134.1 (440)	103.6 (340) 143.2 (470)
SEGMENT 3A				
A	From east of 14th St. to 20th St. Crosstown Connector, south of I-4	67 65	97.5 (320) 131.0 (430)	100.5 (330) 134.1 (440)
B	From east of 14th St. to 20th St., north of I-4	67 65	94.4 (310) 131.0 (430)	97.5 (320) 131.0 (430)

the 65 and 67 dBA contour lines are predicted to remain about the same as existing conditions for Noise Study Areas 2B-G (south), 2B-H, 2B-K, 2B-L, 3A-A and 3A-B. In contrast, the distances for areas 2B-G (north), 2B-I and 2B-J are predicted to increase because of the expanded roadway cross section to accommodate realigned ramps.

The analysis indicates that for existing and 2010 no-build conditions, approximately 301 noise sensitive sites located within the project limits experience noise levels that approach or exceed the FHWA criteria. These noise sensitive sites, which include single and multi-family residences, recreational areas, a church and a vacant school, are primarily located in the first- and second-row of structures bordering the existing roadway.

The analysis indicates that for the Preferred Alternative, approximately 317 noise sensitive sites are predicted to approach or exceed the FHWA criteria in 2010. Nine sites identified under existing conditions are required as part of right-of-way acquisition, 292 sites are the same as those identified for existing conditions, approximately 22 sites experience a 2 dBA or less increase resulting in a predicted noise level of 65 to 66 dBA and three sites experience a 6 dBA or less increase resulting in a predicted noise level of 70 dBA. Approximately 7 dBA is the largest increase predicted for any noise sensitive site. No sites with predicted noise levels below 65 dBA are anticipated to experience a substantial increase above existing levels.

A noise barrier analysis was conducted to determine if the installation of noise barriers is cost reasonable. As shown on Table 6.7, the installation of noise barriers within the downtown interchange would be cost reasonable and benefit approximately 177 noise sensitive sites.

Through analysis, noise barriers were originally determined to be reasonable along I-4 to the limits of the operational improvements at the 21st/22nd Street interchange. However, TIS design segments 3A and 3B, which begin at 13th Street, are currently under design and funded for construction. Any construction of barriers from 14th/15th Streets to 21st/22nd Streets as part of the operational improvements would be temporary. Construction of segments 3A and 3B would require their removal. Therefore, the construction of noise barriers from approximately 14th/15th Street to

TABLE 6.7

BARRIER SPECIFICATIONS FOR THE PREFERRED ALTERNATIVE
(Study Area Cutoff at 13th Street, NSA 3A-A and 3A-B Not Included)
I-275/I-4 Downtown Interchange Operational Improvement
Engineering Summary

Noise Study Areas[1]	Barrier Number	Total Length (Feet)[2,3]	Length x Height (Feet)	Barrier Location	Total Cost (@ $16.50/ft²)	Number of Benefitted Receivers	Total Cost/ Benefitted Receiver
2B-H, 2B-J, 3A-A	1	304.8 (1,000)	137.1 x 2.4 (450 x 8) 167.6 x 5.4 (550 x 18)	Southwest End - At off-ramp to southbound Orange Street; Northeast End - 30.4 m (100 feet) southwest of Lamar Avenue	$1,683,000	48 (2B-H) 37 (2B-J) 0 (3A-A)	$19,800
	2	115.5 (3,660)	338.3 x 2.4 (1110 x 8) 777.2 x 5.4 (2550 x 18)	Southwest End - 45.7 m (150 feet) northeast of Orange Street; East End - at 10th Street			
	3	697.9 (2,290)	228.6 x 2.4 (750 x 8) 469.3 x 5.4 (1540 x 18)	West End - 18.2 m (60 feet) of Nebraska Avenue; East End - 18.2 m (60 feet) east of 14th Street			
2B-L (1 & 2), 3A-B	1	1,155.1 (3,790)	57.9 x 2.4 (190 x 8) 1,097.2 x 5.4 (3600 x 18)	North End - 118.8 m (390 feet) south of Floribraska Avenue; East End - 18.2 m (60 feet) east of 13th	$1,094,280	20 (2B-L1) 29 (2B-L2) 0 (3A-B)	$22,332
2B-1, 2B-K	1	478.5 (1,570)	60.9 x 2.4 (200 x 8) 417.5 x 5.4 (1,370 x 14)	North End - 158.4 m (520 feet) south of Floribraska Avenue; South End - 18.2 m (60 feet) of Frances Avenue	$1,060,950	12 (2B-1) 31 (2B-K)	$24,673
	2	121.9 (400)	121.9 x 4.8 (400 x 16)	North End - At Amelia Avenue; South End - 18.2 m (60 feet) south of Frances Avenue			
	3	807.7 (2,650)	201.1 x 5.4 (660 x 8) 606.5 x 4.8 (1,990 x 16)	North End - 60.9 m (200 feet) northeast of Frances Avenue; Southwest End - 137.1 m (450 feet) southwest of Henderson Street			

1. Corresponds to the Noise Study Areas established for the EIS.

2. All barriers on structures are limited to a height of eight feet.

3. All barriers heights at 18 feet can be increased to 20 feet with the cost per benefitted receiver remaining below $25,000.

21st/22nd Street will not be included as part of the operational improvements. Coordination with the design of Segments 3A and 3B resulted in the end barrier locations as noted on Table 6.7.

6.14.4.2 Air Quality

The project is in an area which has been designated as a maintenance area for ozone under criteria in the Clean Air Act Amendments of 1990. Based upon worst-case microscale dispersion analysis results documented in the previous TIS Air Quality Report, published separately, the Preferred Alternative will result in no violations of National Ambient Air Quality Standards.

The project is in conformance with the State Implementation Plan. The project is included in the area's conforming long-range plan and is included in the area's Conformity Determination report approved by the FHWA/FTA on June 30, 1995.

6.14.4.3 Contamination

The Preferred Alternative results in direct impacts at nine sites along the project corridor known, or with the potential to contain environmental contamination. The sites are comprised mainly of businesses which maintain underground storage tanks for petroleum products or sites which previously contained underground storage tanks. Detailed information regarding each site and recommendations for Level II investigations are contained in the Contamination Screening Evaluation Technical Memorandum (July 1996), published separately for this project.

6.14.4.4 Drainage

It is anticipated that portions of the existing roadway collection system be utilized with the Preferred Alternative, while a new separate drainage collection system may be necessary in some areas. Portions of the interstate outfall system to the Hillsborough River may also require modification. The ultimate roadway drainage system will be determined during final design.

Approximately 3.9 ha (9.7 ac) of new pavement area was identified and approximately 0.3 ha (0.8 ac) of stormwater treatment volume will be required. Since the roadway flows to the tidally influenced Hillsborough River, no stormwater peak attenuation (per FDOT 14-86, FAC or SWFWMD 40D-4, FAC) was considered. Preliminary detention pond areas of 0.3 ha (0.8 ac) were identified within the existing Ashley Street and I-275/I-4 interchange infield and ramp areas. The proposed ponds are assumed to be wet ponds with approximately 0.6 m (2 ft.) of storage fluctuation and 6 m (20 ft.) maintenance berms. Proposed detention pond locations are discussed in detail in the Pond Siting Report (April 1996), published separately.

6.14.4.5 Construction Impacts

Construction activities associated with the project will result in temporary air, noise, water quality, traffic flow, and visual impacts for those residents, businesses, and travelers within the immediate vicinity of the project. These construction impacts are summarized below.

The air quality impact will be temporary and will primarily be in the form of emissions from diesel-powered construction equipment and dust from embankment and haul road areas. Air pollution associated with the creation of airborne particles will be effectively controlled through the use of watering or the application of calcium chloride in accordance with FDOT's Standard Specifications for Road and Bridge Construction, as directed by the FDOT Project Manager.

Noise and vibration impacts will be from heavy equipment movement and construction activities, such as pile driving and vibratory compaction of embankments. Noise control measures will include those contained in FDOT Standard Specifications for Road and Bridge Construction.

Water quality impacts resulting from erosion and sedimentation will be controlled in accordance with FDOT's Standard Specifications for Road and Bridge Construction and through the use of Best Management Practices.

Maintenance of traffic and sequence of construction will be planned and scheduled so as to minimize traffic delays throughout the project. These maintenance of traffic plans may include undertaking construction activities during night time to reduce congestion and shorten construction schedules. Signs will be used as appropriate to provide notice of road closures and other pertinent information to the traveling public. The local news media will be notified in advance of road closings and other construction-related activities which could excessively inconvenience the community so that motorists, residents, and businesses can plan their day and travel routes in advance. Access to all businesses and residences will be maintained to the extent practical through controlled construction scheduling. Close coordination with the Tampa Central Business District Transportation Management Association and the FDOT will be undertaken to develop a program for maintaining mobility in the CBD/Ybor City urban area. Development of travel demand management and transportation system management techniques during construction will be considered and evaluated by the FDOT as part of its design and construction activities. Traffic delays will be controlled to the extent possible where many construction operations are in progress at the same time. The contractor, whenever practical, will maintain the existing number of traffic lanes in each direction and comply with the Best Management Practices of FDOT. When lane closures are required, they should be limited to nighttime hours.

For the residents and businesses along the project's right-of-way, some of the materials stored for the project may be visually displeasing; however, this will be a temporary condition and should pose no substantial problem in the long term.

Construction of the roadway may require excavation of unsuitable material (muck), placement of embankments, and use of materials such as limerock, asphaltic concrete, and portland cement concrete. Demucking is anticipated at the wetland site and would be controlled by Section 120 of the FDOT Standard Specifications for Road and Bridge Construction. Disposal would be on-site in detention areas or off-site. The removal of debris will be in accordance with local and state standards. The contractor is responsible for his methods of controlling pollution on haul roads, in borrow pits, other material pits, and areas used for disposal of waste materials from the project. Temporary erosion control features as specified in the FDOT's Standard Specifications for Road and

Bridge Construction, Section 104, will consist of temporary grassing, sodding, mulching, sandbagging, slope, drains, sediment checks, artificial covering, and berms.

6.15 PERMITS REQUIRED

The permitting requirements of several federal, state, and local agencies must be satisfied prior to completion of the proposed project. The anticipated permits consist of the following:

- U.S. Army Corps of Engineers
  - Section 404 Dredge and Fill Permit
  - Section 10 Obstruction or Alteration of Navigable Waters Permit
- U.S. Environmental Protection Agency - National Pollutant Discharge Elimination System (NPDES) Permit
- Southwest Florida Water Management District (SWFWMD) - Environmental Resource Permit
- Tampa Port Authority - Permit to Conduct Work in Waters of the Hillsborough County Port District

6.16 COMMITMENTS

Construction - Construction activities for the Preferred Alternative concept will result in temporary air, noise, water quality, traffic flow, and visual impacts for those residents, businesses, and travelers within the immediate vicinity of the project. The impacts will be effectively controlled in accordance with FDOT's Standard Specifications for Road and Bridge Construction. In addition to the following accepted standards, the FDOT is committed to implementing the following specific construction impact mitigation measures where they are determined to be cost reasonable and feasible from an engineering and construction perspective:

1. Pile driving operations will be restricted to the hours of 7 a.m. to 9 p.m. to avoid interfering with any adjacent noise sensitive land uses or a different foundation design will be considered, i.e., drilled shaft.

2. Preformed pile holes will be required where they are in proximity to vibration sensitive land uses to minimize vibration transfer.

3. Back-up alarm noise from heavy equipment and trucks will be minimized by requiring the Contractor to operate in forward passes or a figure-eight pattern when dumping, spreading, or compacting materials.

4. Restriction of operating hours for lighting the construction areas will be determined and required of the Contractor prior to beginning construction activities requiring lighting.

5. Coordination with the local law enforcement agencies will be undertaken prior to commencing construction activities to ensure that construction-related impacts are minimized or adequately mitigated when work during non-daylight hours is required.

Urban Design Guidelines - The TIS Urban Design Guidelines (UDG), approved by FHWA in December 1994, have been developed to minimize indirect adverse visual and auditory impacts to land uses adjacent to the system and to users of the freeway. The goal of the guidelines is to ensure a consistent, aesthetically pleasing design and to mitigate adverse effects of the project on the residents, neighborhoods, and businesses indirectly affected. The Urban Design Guidelines specify mitigation measures for indirect adverse effects to historic properties and communities in the vicinity of the project. The Urban Design Guidelines provide guidance on specific aesthetic design requirements for bridge structures, retaining walls and embankments, noise walls, lighting, fencing and sign supports, stormwater and surface water management areas, landscaping, public art, utilities, mounds and grading, and recreation facilities. Due to this type of proposed project, which is a safety and operational improvement, there are minimal areas where it is economically appropriate or feasible from an engineering perspective to apply the Urban Design Guidelines. Specific areas of application are planned to be evaluated for implementation of the Urban Design Guidelines. These areas include stormwater and surface water management areas, landscaping, retaining walls and embankments, and noise walls.

Noise Barriers - The TIS Master Plan Report (August 1989) first discussed the feasibility of noise abatement measures to mitigate noise impacts. Due to the number of noise sensitive sites identified and evaluated and in response to public comments received throughout the study, the FDOT and FHWA are committed to providing noise barriers as part of the project where they are economically

reasonable and feasible. This commitment is identified in the TIS Environmental Impact Statement (August 1996). The FDOT is committed to providing noise barriers that meet both the acoustic and aesthetic goals of the project as identified in the TIS Urban Design Guidelines and the TIS EIS Noise Study Report. (See Table 6.7 for specific locations of proposed noise barriers.) Specific noise abatement measures will be further evaluated during final design.

Tampa Heights Greenway Area - The FDOT is committed to pursuing with FHWA a voluntary right-of-way acquisition program for the proposed Tampa Heights Greenway area, located directly north of I-275 from the I-275 southbound Ashley Street exit ramp to Columbus Drive. The details of the proposed greenway are included in the TIS Environmental Impact Statement (August 1996) and apply only as mitigation for the ultimate concept. Once right-of-way for the downtown operational improvement, discussed in this document, is established, the FDOT will pursue the voluntary acquisition of those properties between the required downtown operational improvement right-of-way and the ultimate right-of-way. This will further the community's goal of the redevelopment of the Tampa Heights neighborhood.

Historic Resources - A Section 106 Memorandum of Agreement (MOA) has been prepared to address mitigation measures for direct and indirect impacts to historic resources. The MOA includes FDOT commitments for the mitigation of impacts to historic structures within the Area of Potential Effect (APE) including the proposed moving and rehabilitation of certain historic structures, and numerous design amenities defined in the TIS Urban Design Guidelines. Three historic structures could potentially be impacted by the improvements to the downtown interchange if right-of-way for the concept is not minimized. These structures include the Faith Temple Baptist Church in Tampa Heights; the Old Velasco Building, an individually eligible structure in the northeast corner of the interchange; and a residential fourplex located on 12th Avenue in the Ybor City National Register Landmark District. If any of these structures are impacted, they must be documented and possibly moved and rehabilitated in accordance with the TIS MOA.

HART Northern Transit Terminal - Based on the required relocation of HART's existing Northern Transit Terminal, the FDOT is committed to providing a new facility as part of the

downtown interchange operational project. The FDOT will attempt to not select a final location for the new facility until separate Mobility MIS, High-Speed Rail, and Electric Streetcar studies being conducted by other agencies have been coordinated with the proposed operational improvements. The FDOT will coordinate with those agencies to integrate the related studies in order to optimize the facility's location and design and to maximize its use.

The relocation of the HART Northern Transit Terminal will be addressed with input from HART. Options for the new location of the Northern Transit Terminal will be identified and evaluated prior to vacating the existing site. FHWA and FDOT are committed to providing the opportunity for functional replacement of the Northern Transit Terminal based on HART's preference and acceptable application of the functional replacement requirements.

APPENDIX A

Supporting Information

Greiner

C102380.21
January 18, 1996

MEMORANDUM

TO: File

FROM: Robert E. Johnson, P.E. RET

SUBJECT: **Tampa Interstate Study Downtown Interim Interchange**
City of Tampa Meeting

On Thursday, January 11, 1996 a meeting was held at Greiner, Inc. to discuss drainage and utility issues regarding the TIS Downtown Interim Interchange Project. The following were in attendance:

Henry Dorzback	-	City of Tampa
Michael Burwell	-	City of Tampa
Elaine Illes	-	Greiner, Inc.
Larry Sly	-	Greiner, Inc.
Robert Johnson	-	Greiner, Inc.

The following major topics were discussed:

- Greiner reviewed the proposed project. The project improvements are intended to improve safety and lane movements and are not capacity improvements. Several alternatives have been identified and the preferred alternative selected. The alternative will include construction of new pavement areas, widening of existing areas and removal of pavement areas.

- Greiner indicated that approximately 8.0 acres of new pavement area is proposed.

- Pond areas within the Ashley Street and I-4/I-275 interchange are proposed for stormwater treatment areas.

- Due to the combination of new and the expansion of existing pavement, equivalent treatment is proposed. We are currently proposing to treat one-inch of runoff over the 8.0 acres of new pavement (wet-detention).

- The interchange and interstate roadway from the interchange to the Hillsborough River (134 acres) is currently drained directly to the River via a storm sewer outfall system (54"-66" RCP). Since this area drains directly to the tidally influenced Hillsborough River, no peak attenuation is proposed. However, due to the interchange project construction, the outfall system may require upgrading of the pipes. The City of Tampa did not object to this providing that it is demonstrated that there is no adverse impact to adjacent drainage systems.

- The City may require improvements to the outfall system in lieu of peak attenuation in the Ybor City area. These outfalls are currently overloaded. Some discussion of outfall improvements has been done between the City and FDOT (Lisa Hansen).

  During final design the increase in peak discharge due to the roadway improvements will be calculated to determine what outfall improvements may be required.

- Greiner discussed potential utility conflicts due to the lowering of Marion and Morgan Streets from the superelevation/widening of the interstate structures. The City requested that Greiner send proposed plans and profiles to the City (Mike Davis - Utility Coordinator) for review. The City may want to coordinate with FDOT on replacement of existing 8-inch sanitary line along Marion Street during construction.

REJ:ha

xc: Attendees

Greiner

C102380.21
December 26, 1995

MEMORANDUM

TO: File

FROM: Robert E. Johnson, P.E. RJ

SUBJECT: **Tampa Interstate Study Downtown Interchange Project - SWFWMD Meeting**

On Thursday, December 21, 1995 a meeting was held at the SWFWMD Tampa office to discuss drainage issues regarding the TIS Downtown Interchange Project. The following were in attendance:

Alba Mas	SWFWMD
Carlos Lopez	FDOT
Robert Johnson	Greiner

The following major topics were discussed:

* Greiner reviewed the proposed project. The project improvements are intended to improve safety and lane movements and are not capacity improvements. Several alternatives have been identified and the preferred alternative selected. The alternative will include construction of new pavement areas, widening of existing areas and removal of pavement areas.

* Greiner indicated that approximately 8.0 acres of new pavement area is proposed.

* Pond areas within the Ashley Street and I-4/I-275 interchange are proposed for stormwater treatment areas.

* Due to the combination of new and the expansion of existing pavement, equivalent treatment is proposed. SWFWMD wants us to maximize our treatment capacity. We are currently proposing to treat one-inch of runoff over the 8.0 acres of new pavement (wet-detention).

* The interchange and interstate roadway from the interchange to the Hillsborough River (134 acres) is currently drained directly to the River via a storm sewer outfall system (54"-66" RCP). Since this area drains directly to the tidally influenced Hillsborough River, no peak attenuation is proposed. However, due to the interchange project construction, the outfall system may require upgrading of the pipes. SWFWMD did not object to this providing that it is demonstrated that there is no adverse impact to adjacent drainage systems.

* SWFWMD said the project will require a standard general permit ($1600 permit fee). No wetland impacts are anticipated.

* See attached sheet for a copy of the SWFWMD minutes.

RJ:ha

xc: Elaine Illes
Carlos Lopez

Southwest Florida Water Management District

PRE-APPLICATION MEETING NOTES

Date: 12.21.95
Project Name: Tampa Interstate Study - Interchange
Attendees: Robert Johnson
Carlos Lopez
Alba Más

The following is the District's understanding of the meeting. Please do not send copies of minutes. If you have any questions or need clarifications, please feel free to contact us at (813) 985-7481.

- Ashley Exit will be rerouted
  Widening shoulders
- New pavement is 8 acres
  will upgrade pipes so there's no attenuation
- Treating ~~only~~ road - no offsite will treat as much as he can in ponds (over 8 acres) can take equivalent treatment for portions that he can't treat by treating existing (even though he should have treated those anyway since not off line)
- Standard General permit $1600
  Forms A, C, E

Greiner

RECORD OF CONVERSATION

DATE: 11/7/95 JOB NO: C102380.21

RECORDED BY: R. Johnson OWNER/CLIENT: FDOT

TALKED WITH: Carlos Lopez OF FDOT District 7 Drainage

NATURE OF CALL: INCOMING ___ OUTGOING X MEETING ___

ROUTE TO: Elaine Illes

MAIN SUBJECT OF CONVERSATION: TIS Downtown Interchange

ITEMS DISCUSSED: I reviewed with Carlos my discussion with Alba Evans of SWFWMD concerning stormwater requirements for the TIS Downtown Interchange project.

Carlos concurred with the results of the discussion.

I asked Carlos about upgrading the existing 66-inch outfall from the interchange in lieu of providing peak attenuation ponds. Carlos said the outfall should be evaluated to determine existing capacity and upgrade requirements from this project. He said additional right-of-way for ponds should be avoided if possible. I told Carlos we would take a preliminary look at the outfall. I also asked Carlos about FDOT 14-86 requirements. He said since we are discharging to the Hillsborough River (tidal area), FDOT 14-86 will not apply.

I told him we would schedule meetings with SWFWMD and City of Tampa to discuss preferred alternative.

APPENDIX B

COST-EFFECTIVENESS ANALYSIS

APPENDIX B
Cost-Effectiveness Analysis

Introduction and Summary of Findings

As part of the evaluation and comparison of alternatives for this project, an engineering economic analysis was accomplished to quantify the return-on-investment which can be expected with each of the alternatives. The two alternatives tested were improvements to the existing facility (also called the "Preferred Alternative" in this analysis) and an interim portion of the ultimate master plan footprint (Alternative 3) which would address the safety issues, but would not constitute the addition of lane capacity. The physical and operational details of these alternatives are discussed in appropriate sections of this document.

Accident reduction can be expected to produce economic benefits on several levels. Accidents may result in costs for personal injury and loss of life, as well as economic loss associated with vehicle damage, damage to the infrastructure (e.g., fire damage to pavements, guardrail damage, bridge structure damage, etc.). In addition, accidents almost always create delays for the other traffic on the roadway. These delays can often be substantial, particularly during peak traffic periods, and the result is additional fuel consumption with slow speeds, extensive idling, and travelers' time costs. It is within these categories of accident costs that the analysis quantifies benefits of safety improvements which would reduce accidents.

Analysis of accident reports from the records of the Department of Transportation for this section of I-275 and I-4 indicated that two areas of the interchange and approaches have historically experienced exceptionally high accident rates. Those areas are the segment of I-275 between the Hillsborough River and the Orange/Jefferson Street ramps and the segment of I-275 from the vicinity of Palm Avenue to just past the 21st/22nd Street ramps on I-4. On the former section, records show an average of 83 accidents per year; on the latter, 67 accidents per year. These accident occurrence rates are double the Florida average for similar facilities; Florida accident rates, in turn, are higher than the national average.

This analysis focuses on these two areas of high accident rates within the interchange. This is not to say that the proposed safety improvements would not be expected to reduce accident rates elsewhere along the routes; certainly that could be anticipated. It is simply that these are the two areas with the most remarkably high accident rates; they are expected to be the areas which would yield the bulk of the return in terms of reduced accidents. To keep the analysis manageable--and for conservatism--it was determined that the analysis would focus on the benefits of accident reduction in these two areas. The balance of the study area experiences another 67 accidents per year. If the safety improvements will have a reducing effect on accidents in those areas, that will be an added benefit over and above what is calculated in this analysis.

The results of the analysis indicate that the Preferred Alternative for the safety improvements would be approximately three times more cost-effective than the other alternative. The analysis also shows that the preferred alternative would achieve the conventially-held criterion for cost-effectiveness,

which is that the benefits over time would be expected to equal, or off-set, the "up-front" costs to put the improvement in place. The other alternative would not approach this criterion for cost-effectiveness, according to the findings of the analysis.

Methodology

In order to determine the economic value of accident reduction, the analysis used a conventional cost-effectiveness or benefit/cost analysis methodology, comparing the value of the expected benefits of each alternative against that alternative's estimated costs for implementation. The result of this analysis is a benefit/cost (B/C) ratio for each alternative, using a "no action" alternative as the baseline case. The formula for calculating the B/C ratio is as follows:

$$B/C = PV(\Delta B) \div [PV(\Delta I) + PV(\Delta M) - PV(\Delta R)]$$

where:

B/C = Benefit/cost ratio

PV = The present value of the associated stream of costs or benefits, found by applying to each annual cost or benefit value in the stream a compound interest factor or present worth factor which discounts that value to a common dollar value (in this case, 1996 dollars)

(ΔB) = Incremental benefits which are expected to accrue from having the improvement in place, as compared to the "no action" alternative

(ΔI) = Incremental investment costs or capital costs which are required to put the improvement in place

(ΔM) = Incremental costs, if any, for maintaining the added infrastructure created by implementing the improvements

(ΔR) = Residual value of any improvements at the end of the analysis period

All dollar values in the analysis are expressed in constant 1996 dollars. More details of the procedures used to assign values of benefits, costs, and other components of the B/C calculation are presented below.

Discount Rate and Time Period of the Analysis

Two important assumptions which must be established at the outset of an economic analysis such as this are the discount rate at which the compound interest factor shall be determined for reducing future costs and benefits to "present value" and the time period over which B/C will be calculated.

Discount Rate

In analyses in which monetary values are expressed in "constant" dollars (i.e., no inflation rate is applied), the literature suggests a discount rate of four percent annually should be used. This is the estimated "real value" or "time value" of money, representing the difference between what can be expected to be earned in a low-risk investment and the long-term inflation rate. Therefore, the four percent rate was used in this analysis.

Time Period of the Analysis

For this analysis, the time period was assumed to be Year 2002 (the anticipated first year of investment) to Year 2025 (the anticipated year for implementing the ultimate improvement). The time period of an analysis such as this is ideally the same as the expected useful life of the improvements or benefits. In this case, the two alternatives have different lengths of useful lives, since the alternative which would construct a portion of the ultimate improvement will have continued useful life after it is incorporated into the ultimate improvement. Therefore, the analysis must include an adjustment in the final year for a discounted value of the remaining useful life (or residual value) of that alternative. The Preferred Alternative is assumed to have no remaining useful life at that time, since it will be removed to allow implementation of the ultimate improvement.

Determination of Values for Benefits and Costs

The literature includes a number of valuable references for assisting in the evaluation of costs and benefits for highway improvements. Among those relied upon in this analysis were:

- Microcomputer Evaluation of Highway User Benefits, Texas Transportation Institute, 1993
- A Manual of User Benefit Analysis of Highway and Bus-Transit Improvements, American Association of State Highway and Transportation Officials, 1977
- Freeway Incident Management, FHWA Traffic Research Division, 1977
- Highway Capacity Manual, Transportation Research Board, 1995
- Transportation Research Record No. 1401, Transportation Research Board, 1993
- Transportation Research Record No. 1239, Transportation Research Board, 1989
- State of the Art Report 6, Transportation Research Board, 1987
- Transportation Research Circular No. 362, Transportation Research Board, 1990
- Transportation Research Circular No. 416, Transportation Research Board, 1993

The following paragraphs discuss specifically how the values of costs and benefits of the alternatives were determined for this analysis.

Costs

The costs for highway improvement alternatives typically include the capital costs to put the improvements in place and the continuing routine and periodic maintenance costs to keep the

improvement in operating condition. The former is what is referred to in this analysis as "investment costs." Those were determined for each alternative and their values inserted into the B/C calculation in the year or years in which they would be expected to be spent. For the Preferred Alternative, those costs are estimated to be $83 million and would be invested during Years 2002 and 2003. For the other alternative, investment costs would total $350 million and would be invested in four equal increments over the period 2002-2005.

The second cost category mentioned above--maintenance costs--was determined inappropriate for this analysis. Typically, incremental maintenance costs are included in highway cost-effectiveness analyses because proposed improvements may have a substantial requirement for added maintenance over and above the "no action" alternative. Examples may be projects which add extensive travel lanes that require routine patching and periodic resurfacing, or extensive new bridge structures which also have high on-going maintenance costs, or significant new amounts of right-of-way and drainage structures which must be maintained and cleaned--all of this over and above the "no action" condition. This is not the case with either of the alternatives in the present analysis. On the one hand, the Preferred Alternative would not add a significant amount of infrastructure to the existing system; added maintenance costs over and above the "no action" condition would be negligible. The other alternative, which would replace considerable aged pavement and bridges with new infrastructure, would be expected to reduce overall maintenance costs when compared to the "no action" alternative. For these reasons, the present analysis has excluded maintenance costs from the B/C calculation.

Benefits

As mentioned briefly in the Introduction and Summary of Findings above, the analysis quantified safety improvement-related benefits in the categories of personal injury and vehicle damage, damage to infrastructure, and fuel consumption and time delay of the traffic stream which would be inconvenienced with accident occurrence.

A key assumption in the analysis was to determine how much of an accident reduction could be expected with the safety improvements. This issue was considered from several perspectives--from findings in the literature, from comparison with statewide average accident rates, and considering the actual accident types which have historically occurred along the route and the anticipated effect the proposed improvement may have in reducing or eliminating the causes of such accidents.

Several studies have attempted to assess the effects of improvements to existing projects on accident rates. These studies have shown that there is a positive correlation between conflict rates in weaving sections and accident rates and between shoulder and lane widths and accident rates. For projects involving the improvement or reduction of conflict areas, the direct correlation between that improvement and the amount of the subsequent reduction on accident rates has not been determined. However, it has been shown in the studies of shoulder and lane widening projects that the accident rates have decreased by as much as 53 percent. Accident data supplied by the Florida Department of Transportation showed that 42 percent of the accidents in the viaduct region were in the vicinity if the Ashley Street on- and off-ramps. Additionally, many of these accidents were side-swipes and rear-end collisions—the types of accidents which will be reduced by the proposed improvements to

the merge and weave sections. Similar accident dynamics were found on I-4 EB and WB from the interchange to 21st/22nd Street.

If it were to be assumed that the safety improvements would place the accident rates in the interchange area in line with the statewide average rate for similar facilities, that would be a 60 percent reduction in the rates.

Given these findings from the literature and the historic record, it was assumed for the analysis that the expected reduction in the accident rates would be between 40 and 60 percent. For conservatism, the lower bound of 40 percent was adopted for the B/C calculation.

With the assumption in hand as to how much of an accident reduction would be expected, the other major component of calculating benefits was to calculate the dollar value of accidents which would be reduced. Department of Transportation records for the historic accidents in the study area indicated that the average economic loss (injury, vehicle damage, infrastructure damage, etc.) for accidents along the I-4 section were approximately $14,700/accident; along the I-275 section, approximately $12,800.

The values assigned to the delay costs for the traffic stream affected by accidents required assumptions as to how many vehicles would be delayed and the length of the delay, as well as assumptions as to the cost of fuel and the value of travelers' time. Sources used to establish these assumptions included Department of Transportation accident records for the segments, various literature sources as introduced above, and socio-economic data for the region. The assumptions are summarized below:

Time of accident occurrence:	30 percent peak/70 percent off-peak (I-275 segment) 32 percent peak/68 percent off-peak (I-4 segment)
Vehicle hours (vh) delay:	13,727 vh/accident (peak, both segments) 2,447 vh/accident (off-peak, I-4 segment) 2,627 vh/accident (off-peak, I-275 segment)
Added fuel consumption during delay:	563 gal/1000 vh
Value of traveler's time:	$12.37/hr (80 percent of avg. regional wage)
Average vehicle occupancy:	1.145

Calculations for each of the components discussed are shown in tables at the end of this section. The total benefit, or accident reduction value, was found to be approximately $5.75 million/year. An important point to make regarding this value is that it is based on the accident rates and the number of accidents occurring at the time of the analysis. In principle, it is certain that as traffic volumes increase over the years, it can be expected that accidents and accident rates would also increase. No

attempt has been made in this analysis to estimate this increase. The more conservative approach has been used instead.

Calculation of B/C Ratio

The details of the final calculation of B/C ratios for the two alternatives are summarized in tables at the end of this section. For each alternative, the tables show the constant 1996 dollar values for benefits and costs and the years in which they are expected to occur. Also shown is the compound interest factor for each year, assuming the four percent discount rate. The final column in each table shows a running computation of the B/C ratio, found by applying the discount factors and inserting the accumulated discounted values into the B/C formula.

As shown in the B/C calculation tables, the Preferred Alternative will achieve a B/C=0.98, indicating the investment to put the safety improvements in place will be essentially off-set by accident-reduction benefits over the useful life of the improvements. The alternative which would construct a portion of the ultimate improvement was calculated to have a B/C=0.31, considerably below the conventionally-held criterion for cost-effectiveness and well below the Preferred Alternative.

Repeatedly in this discussion of the cost-effectiveness analysis, it has been emphasized that conservatism has guided assumptions. Where assumptions offered some latitude, the "conservative path" was always followed. One example is the use of the accident data from only the highest accident areas, equaling approximately 70 percent of the total accidents in the interchange area. Another example is the assumption that the improvements would reduce accident rates by approximately 40 percent, rather than the 53 percent indicated in the literature or the 60 percent reduction which could be assumed using the statewide average for similar facilities. Still another example of conservatism exercised in this analysis is that no attempt has been made to escalate benefits over the years in anticipation of higher accident rates with increased traffic, though it is certain in principle that this will occur. The importance of these observations of conservatism is that, if an alternative is found cost-effective with these conservative assumptions, then confidence in its return-on-investment is enhanced by the possibility that one or more of the assumptions will exceed the lower bounds used.

Calculation of Annual Benefits of Safety Improvements
(I-4 Segment)
Constant 1996 $

Base data and assumptions:

1. 66.8 accidents/year average
2. Time of accident occurrence: 32% peak
   68% off-peak
3. Economic loss per accident, excluding delay costs = $14,708
4. Accident reduction resulting from improvements = 40%, or fewer accidents
5. Value of travelers' time = $12.37/hr. (80% of avg. regional wage) x 1.145 vehicle occupancy = $14.16/hr.
6. Average vehicle occupancy = 1.145
7. Delay time = 2,447 vehicle hrs./accident (off-peak)
   13,727 vehicle hrs./accident (peak)
8. Fuel cost = $1.25/gal.

Savings in Accident Economic Loss, Excluding Delay Costs:

27 accidents/yr. x $ 14,708 =	$ 397,116

Savings in Travelers' Delay Avoidance:

(Peak)	13,727/vh x $14.16/hr x 6 accidents =	1,166,246
(Off-Peak)	2,447/vh x $14.16/hr x 21 accidents =	727,640

Savings in Delay Fuel Consumption Avoidance:

(Peak)	13,727/vh x 6 accidents x 563 gal./1000 vh x $ 1.25/gal. =	57,962
(Off-Peak)	2,447/vh x 21 accidents x 563 gal./1000 vh x $ 1.25/gal. =	36,164

TOTAL ANNUAL BENEFITS	$ 2,385,128

Calculation of Annual Benefits of Safety Improvements
(I-275 Segment)
Constant 1996 $

Base data and assumptions:

1. 83 accidents/year average
2. Time of accident occurrence: 30% peak
   70% off-peak
3. Economic loss per accident, excluding delay costs = $12,809
4. Accident reduction resulting from improvements = 40%, or 33 fewer accidents
5. Value of travelers' time = $12.37/hr. (80% of avg. regional wage) x 1.145 vehicle occupancy = $14.16/hr.
6. Average vehicle occupancy = 1.145
7. Delay time = 2,627 vehicle hrs./accident (off-peak)
   13,727 vehicle hrs./accident (peak)
8. Fuel Cost = $1.25/gal.

Savings in Accident Economic Loss, Excluding Delay Costs:

33 accidents/yr. x $ 12,809 =		$ 422,697

Savings in Travelers' Delay Avoidance:

(Peak)	13,727/vh x $14.16/hr x 10 accidents =	1,943,743
(Off-Peak)	2,627/vh x $14.16/hr x 23 accidents =	855,561

Savings in Delay Fuel Consumption Avoidance:

(Peak)	13,727/vh x 10 accidents x 563 gal./1000 vh x $ 1.25/gal. =	96,604
(Off-Peak)	2,627/vh x 23 accidents x 563 gal./1000 vh x $ 1.25/gal. =	42,521

TOTAL ANNUAL BENEFITS $ 3,361,126

Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvement
Benefit / Cost Analysis
Preferred Alternative
(Constant 1996$)

Year	Compound Interest Factor	Benefits (ΔB)	Investment Costs (ΔI)	Residual Value (ΔR)	Benefit / Cost Ratio (B/C)
2002	1.0000	$0	$41,500,000		0.0000
2003	0.9615	$0	$41,500,000		0.0000
2004	0.9246	$0			0.0653
2005	0.8890	$0			0.1280
2006	0.8548	$5,746,000			0.1883
2007	0.8219	$5,746,000			0.2464
2008	0.7903	$5,746,000			0.3022
2009	0.7599	$5,746,000			0.3558
2010	0.7307	$5,746,000			0.4074
2011	0.7026	$5,746,000			0.4570
2012	0.6756	$5,746,000			0.5046
2013	0.6496	$5,746,000			0.5505
2014	0.6246	$5,746,000			0.5946
2015	0.6006	$5,746,000			0.6370
2016	0.5775	$5,746,000			0.6777
2017	0.5553	$5,746,000			0.7169
2018	0.5339	$5,746,000			0.7546
2019	0.5134	$5,746,000			0.7909
2020	0.4936	$5,746,000			0.8257
2021	0.4746	$5,746,000			0.8592
2022	0.4564	$5,746,000			0.8914
2023	0.4388	$5,746,000			0.9224
2024	0.4220	$5,746,000			0.9522
2025	0.4057	$5,746,000		$0	0.9808
	Discount Rate	4.00%			

$B/C = PV(\Delta B) \div [PV(\Delta I) - PV(\Delta R)]$

Tampa Interstate Study
I-275/I-4 Downtown Interchange Operational Improvement
Benefit / Cost Analysis
Alternative 3 (Utilizing Ultimate Footprint)
(Constant 1996$)

Year	Compound Interest Factor	Benefits (ΔB)	Investment Costs (ΔI)	Residual Value (ΔR)	Benefit / Cost Ratio (B/C)
2002	1.0000	$0	$87,500,000		0.0000
2003	0.9615	$0	$87,500,000		0.0000
2004	0.9246	$0	$87,500,000		0.0000
2005	0.8890	$0	$87,500,000		0.0000
2006	0.8548	$5,746,000			0.0149
2007	0.8219	$5,746,000			0.0292
2008	0.7903	$5,746,000			0.0429
2009	0.7599	$5,746,000			0.0561
2010	0.7307	$5,746,000			0.0688
2011	0.7026	$5,746,000			0.0811
2012	0.6756	$5,746,000			0.0928
2013	0.6496	$5,746,000			0.1041
2014	0.6246	$5,746,000			0.1150
2015	0.6006	$5,746,000			0.1254
2016	0.5775	$5,746,000			0.1355
2017	0.5553	$5,746,000			0.1451
2018	0.5339	$5,746,000			0.1544
2019	0.5134	$5,746,000			0.1634
2020	0.4936	$5,746,000			0.1719
2021	0.4746	$5,746,000			0.1802
2022	0.4564	$5,746,000			0.1881
2023	0.4388	$5,746,000			0.1958
2024	0.4220	$5,746,000			0.2031
2025	0.4057	$5,746,000		$256,000,000	0.3066
	Discount Rate	4.00%			

$B/C = PV(\Delta B) \div [PV(\Delta I) - PV(\Delta R)]$

APPENDIX C

DESIGN EXCEPTIONS/VARIATIONS

Greiner

C102380.18
July 16, 1996

MEMORANDUM

To: Lisa Hansen, P.E., District VII Design Engineer

From: Stephan F. Heimburg, P.E.

Subject: **WPI No.: 7140004**
State Project No.: 99007-1402
FAP No.: IR-9999-(1402)
I-275/I-4 Downtown Interchange Operational Improvements
Hillsborough County
Design Exception: Vertical Curve Lengths

A Project Development and Environment Study is being conducted to develop feasible operational improvements to the above referenced interchange, which is proposed for ultimate improvements as part of the Tampa Interstate Study (TIS) Environmental Impact Statement (EIS). Three alternatives were developed within the study area limits of the Hillsborough River to the west on I-275, Floribraska Avenue to the north on I-275 and the 21st/22nd Street interchange to the east on I-4. Alternatives 1 and 2 would involve improvements to the existing facility. Alternative 3 was developed as a new facility using the most current FDOT and AASHTO design standards.

Due to the constraint of available funding and the high costs associated with Alternative 3, it was eliminated from consideration. The Preferred Alternative consists of a combination and refinement of segments of Alternatives 1 and 2 that best serve the safety and operational needs of the downtown interchange within a limited budget.

The initial design of the I-275/I-4 interchange occurred in the early 1960's. The plans were prepared with design speeds of 80 km/h (50 mph) for mainline and connecting ramps for I-4 and I-275 and 60 km/h (35 mph) for the local C/D roadway. The current minimum AASHTO design speeds for urban freeways are 80 km/h (50 mph) and 55 km/h (35 mph) for direct connecting ramps. The Preferred Alternative concept proposes improvements utilizing most of the existing vertical geometrics on I-275 and I-4. In most cases, the existing vertical curve lengths on mainline segments are below current AASHTO standards. Therefore, a design exception is requested to construct improvements to the existing facility.

Tables 1, 2 and 3 provide information on the vertical curves identified for I-4 and I-275 mainline sections, connecting freeway ramps and ramps serving surface streets and the local C/D roadway. Table 1 indicates that most of the existing vertical curves proposed for the mainline sections of I-275

and I-4 are below AASHTO minimum standard curve lengths. As a result, the required stopping sight distance of 112.8 meters (457 feet) for the mainline cannot be met for most of these curve lengths. However, AASHTO publication *A Policy on Geometric Design of Highways and Streets*, 1994, Chapter III, Page 293 states, "Sag vertical curves shorter than the lengths computed may be justified for economic reasons in cases where an existing element, such as a structure not ready for replacement, controls the vertical profile." AASHTO also allows shorter sag curves where fixed source lighting is provided. On this project, only one structure is recommended and proposed for replacement, and lighting is provided for all roadway segments. As for the crest curves on the mainline, there are eight areas where vertical curves are below minimum AASHTO criteria.

All of the connecting freeway ramps (Table 2) and the southbound collector freeway (Table 3) will provide adequate stopping sight distances for vertical conditions.

Currently, traffic volumes on the interstate within the study area range from 134,000 to 182,000 vehicles per day. Since the proposed improvements will not add capacity to the system, volume is expected to increase but will remain constrained without additional lanes added to the system. Therefore, the existing vertical geometrics will have little or no effect on the future Level of Service or the capacity of the interstate.

Crash data provided by FDOT District 7 for the study area was summarized. As shown in Tables 4 through 10, data was provided for various segments of I-275 and I-4 for the years 1990 through 1994.

Table 4 shows that a total of 415 crashes occurred within the 5-year time frame on the I-275 segment between the Hillsborough River and Orange/Jefferson Streets. This segment also reports unsatisfactory safety ratios (above 1.0) during the five-year period ranging from 1.661 to 2.474. Referring to Table 1, this segment has one sag curve that is below standards. It is anticipated that the proposed improvements to the Ashley Street ramp will have a marginal effect in reducing crashes in this segment. For example, further analysis of crashes in this segment, as shown in Table 5, reveals that between the eastbound Ashley Street off- and on-ramps, 39 percent of the crashes occurred within the vicinity of the on-ramp merge area. In addition, between the Ashley Street on-ramp and Morgan Street, 33 percent of the peak hour crashes were sideswipe collisions. Finally, 64 percent of the crashes on the Ashley Street on-ramp were rear end collisions. This information underscores that a significant number of crashes in this segment can be attributed to the current substandard Ashley Street on-ramp geometrics rather than vertical profile.

Table 6 shows that on I-275 from Orange/Jefferson Streets to the I-4 junction, a total of 180 crashes occurred from 1990 to 1994. However, the safety ratio did not exceed 1.0 during this time period.

Tables 7 and 8 reflect crash data for I-4 from the I-275 junction to east of the 21st/22nd Streets interchange. The safety ratio exceeded 1.0 in the roadway segment from I-275 to 15th Street during 1992 and 1994 and from 15th Street to east of the 21st/22nd Street interchange in 1991. On I-4 eastbound, six of the seven vertical curves are below current standards and on I-4 westbound, seven of the eight curves are also substandard for the 80 km/h (50 mph) design speed. Specifically, the crest curves over 14th/15th Streets and 19th Street are nearly half of their required lengths. With the lack of stopping sight distance being a possible cause of crashes in this location, it is believed that the proposed improvements will reduce queue lengths, minimize weaving conflicts, and allow drivers more time to react through these short crest curve sections. For example, Table 9 shows that, on I-4 westbound between the 21st Street on-ramp and the I-275 northbound off-ramp, 67 percent of peak hour crashes and 50 percent of off peak crashes occurred in the inside lane. This condition probably occurs because the inside lane is the only movement that continues through to I-275 southbound. This heavy movement usually has the longest queue length. The proposed improvements provide two through lanes to I-275 southbound that should significantly reduce westbound queuing. As shown on Table 9, approximately 49 percent of the crash total (peak and off-peak hours combined) on I-4 eastbound occurs in the middle lane. It is believed that this is partially because of the movement from the I-275 southbound flyover (that enters I-4 on the inside lane) to the 21st Street exit ramp. The proposed improvements relocate the flyover to enter I-4 on the outside which will reduce the weaving conflict for this roadway segment. Again, the improvements should help reduce crashes.

The proposed improvements will tie into existing sections of I-275 to the west and north and I-4 to the east that currently provide substandard vertical curve lengths. At this time, there is no funding for the ultimate construction segments on I-275 to the west (Segment 2A) or to the north (Segment 2B). Interim improvements to the segment on I-4 to the east (Segment 3A) is under design with right-of-way acquisition scheduled for the years 2000/2001. There is no construction funding at this time. The proposed improvements are compatible to transitioning into the existing facility and to the proposed interim improvements to Segment 3A.

An alternative solution of providing vertical geometry to current standards was explored with the complete replacement of the facility (Alternative 3). This concept constructs the outside lanes of the ultimate Tampa Interstate Study EIS improvement. As stated previously, this alternative was eliminated from consideration due to its high construction and right-of-way costs. Alternative 3 is estimated to cost approximately $350 million to construct as compared to approximately $80 million for the Preferred Alternative.

Finally, the purpose of the operational improvement is to enhance safety and operations. Although some design aspects of the proposed improvements will not meet current minimum standards, safety and operations will be improved from the existing conditions.

SFH/MDF:sas

Attachments

TABLE 1

PREFERRED ALTERNATIVE
SUMMARY OF VERTICAL CURVES ON I-275 AND I-4
80 KM/H (50 MPH) DESIGN SPEEDS

Roadway	Location	Existing Curve Length	Curve Type	AASHTO Minimum Curve Length
I-275 NB	Doyle Carlton Drive to Ashley Street	140 m (460')	Sag	156 m (513')
	Ashley Street to Tampa Street	91 m (300')	Crest	53 m (175')
	Over Orange Street	91 m (300')	Sag	50 m (164')
	Over Henderson Street	122 m (400')	Crest	96 m (315')
	7th Avenue to Oak Avenue	61 m (200')	Sag	48 m (158')
	Over Palm Avenue	168 m (550')	Crest	192 m (630')
	Under I-4 Flyovers	196 m (644')	Sag	230 m (755')
	Over Columbus Drive	213 m (700')	Crest	243 m (798')
	Matthew Street to St. Clair Street	137 m (450')	Sag	150 m (492')
I-4 EB	10th Street	91 m (300')	Sag	140 m (461')
	13th Street	76 m (250')	Sag	68 m (225')
	Over 14th/15th Streets	165 m (540')	Crest	192 m (630')
	15th Street to 18th Street	329 m (1,080')	Sag	150 m (492')
	Over 19th Street	165 m (540')	Crest	192 m (630')
	20th Street	91 m (300')	Sag	89 m (292')
	Over 21st/22nd Streets	98 m (320')	Crest	113 m (373')
I-4 WB	Over 21st/22nd Streets	116 m (380')	Crest	136 m (445')
	20th Street	91 m (300')	Sag	106 m (347')
	Over 19th Street	165 m (540')	Crest	192 m (630')
	18th Street to 15th Street	274 m (900')	Sag	150 m (492')
	Over 14th/15th Streets	165 m (540')	Crest	192 m (630')
	13th Street	76 m (250')	Sag	65 m (214')
	10th Street to 12th Street	122 m (400')	Sag	174 m (570')
	Over Nebraska Avenue	201 m (660')	Crest	166 m (544')

TABLE 1

PREFERRED ALTERNATIVE
SUMMARY OF VERTICAL CURVES ON I-275 AND I-4
80 KM/H (50 MPH) DESIGN SPEEDS
(Continued)

Roadway	Location	Existing Curve Length	Curve Type	AASHTO Minimum Curve Length
I-275 SB	St. Clair Street to Matthew Street	137 m (450')	Sag	150 m (492')
	Over Columbus Drive	229 m (750')	Crest	253 m (829')
	Under I-4 Flyovers	213 m (700')	Sag	247 m (812')
	Over Palm Avenue	229 m (750')	Crest	205 m (672')
	Oak Avenue to 7th Avenue	61 m (200')	Sag	48 m (157')
	Over Henderson Street	122 m (400')	Crest	76 m (249')
	Over Jefferson Street	91 m (300')	Sag	48 m (157')
	Ashley Street	91 m (300')	Crest	63 m (207')
	Ashley Street to Doyle Carlton Drive	140 m (460')	Sag	164 m (537')

PREFERRED ALTERNATIVE
SUMMARY OF VERTICAL CURVE LENGTHS NEAR RAMP GORES
65 KM/H (40 MPH) DESIGN SPEEDS

Roadway	Location	Existing[1] Curve Length	Curve Type	AASHTO Minimum Curve Length
I-275 NB	Orange Street Entrance	New - 213 m (700')	Crest	93 m (306')
I-4 EB	21st Street Exit	152 m (500')	Crest	126 m (413')
I-4 WB	21st Street Entrance	122 m (400')	Crest	112 m (367')
I-4 WB	Southbound Collector Exit	New - 73 m (240')	Crest	36 m (118')
I-275 SB	Southbound Collector Exit	No Curve	N/A	N/A

[1] All vertical curves use existing geometrics except for where designated as "new."

Note: AASHTO may justify shorter sag curve lengths where fixed source lighting is provided and for economic reasons, such as a structure not ready for replacement.

These meet FDOT PPM standards, therefore, no design variance or exception is needed.

TABLE 2

PREFERRED ALTERNATIVE
SUMMARY OF VERTICAL CURVE LENGTHS ON
CONNECTING FREEWAY RAMPS
60 KM/H (35 MPH) DESIGN SPEEDS

Ramp Location	Vertical[1] Curve Length	Curve Type	AASHTO Minimum Curve Length
I-275 NB to I-4 EB	122 m (400')	Sag	68 m (225')
	150 m (492')	Crest	62 m (204')
I-4 WB to I-275 NB	New - 187 m (612')	Crest	47 m (155')
	New - 91 m (300')	Crest	33 m (108')
I-4 WB to I-275 SB	61 m (200')	Crest	33 m (108')
	180 m (590')	Sag	45 m (147')
	201 m (660')	Crest	60 m (196')
I-275 SB to I-4 EB	New - 138 m (454')	Sag	79 m (258')
	New - 274 m (900')	Crest	114 m (375')
	New - 192 m (630')	Sag	81 m (267')

[1] All vertical curves use existing geometrics except for where designated as "new."

Note: AASHTO may justify shorter sag curve lengths where fixed source lighting is provided and for economic reasons, such as a structure not ready for replacement.

These meet FDOT PPM standards, therefore, no design variance or exception is needed.

TABLE 3

PREFERRED ALTERNATIVE
SUMMARY OF VERTICAL CURVES ON SOUTHBOUND COLLECTOR FREEWAY
60 KM/H (35 MPH) DESIGN SPEEDS

Roadway	Location	Existing[1] Curve Length	Curve Type	AASHTO Minimum Curve Length
I-275	Southbound Exit to Collector	New - 181 m (593')	Sag	128 m (421')
		New - 183 m (600')	Crest	71 m (232')
I-4	Westbound Exit to Collector	New - 85 m (280')	Sag	60 m (196')
		New - 95 m (311')	Crest	35 m (113')
Southbound Collector	From Oak Avenue to Doyle Carlton Drive	New - 152 m (500')	Sag	91 m (299')
		New - 131 m (430')	Crest	46 m (151')
		New - 90 m (296')	Crest	40 m (132')
		New - 73 m (240')	Sag	62 m (205')

[1] All vertical curves use existing geometrics except for where designated as "new."

Note: AASHTO may justify shorter sag curve lengths where fixed source lighting is provided and for economic reasons, such as a structure not ready for replacement.

These meet FDOT PPM standards, therefore, no design variance or exception is needed.

TABLE 4

CRASH DATA SUMMARY
I-275 FROM THE HILLSBOROUGH RIVER TO ORANGE/JEFFERSON STREETS
(MILEPOSTS 6.400 TO 6.899)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	90	76	103	76	70	415
Actual Crash Rate	3.266	2.758	4.238	3.438	2.582	N/A
Critical Crash Rate	1.925	1.634	1.713	1.690	1.554	N/A
Safety Ratio	1.696	1.687	2.474	2.034	1.661	N/A
Fatalities	0	0	0	1	1	2
Injuries	43	55	76	54	66	294
Property Damage Crashes	56	44	54	43	31	228
Economic Loss (Millions)	2.655	2.242	3.039	2.242	2.065	12.243

TABLE 5

MAINLINE CRASH TYPOLOGY

Peak Hours	Non-Peak Hours
NB I-275 Between Ashley Street Off-Ramp and Ashley Street On-Ramp	
19 Total Crashes	91 Total Crashes
• 74% rear-end collisions • 21% angle collisions	• 54% rear-end collisions • 22% hit pole, guardrail or barrier wall
• 63% on straight-level roadway	• 55% on straight-level roadway
• 53% in Lane 3 • 21% at the on-ramp gore area	• 29% in Lane 3 • 29% at the on-ramp gore area • 22% in Lane 2
39 % Occurred in the Vicinity of the On-Ramp Merge Area	
NB I-275 Between Ashley Street On-Ramp and Morgan Street Overpass	
15 Total Crashes	54 Total Crashes
• 27% involved improper lane changing • 33% rear-end collisions • 33% sideswipe collisions • 20% hit guardrail or barrier wall	• 17% involved improper lane changing • 54% rear-end collisions • 24% hit guardrail, barrier wall, or other fixed object
• 73% on straight-level roadway • 20% on curved-level roadway	• 50% on straight-level roadway • 20% on curved-level roadway
• 46% in Lane 3 • 27% in Lane 1	• 31% in Lane 3 • 31% in Lane 2

RAMP CRASH TYPOLOGY

NB I-275 On-Ramp from Ashley Street
47 Total Crashes
• 64% rear-end collisions • 19% hit guardrail, barrier wall, or other fixed object • 13% sideswipe collisions
• 77% involved careless driving and/or improper lane changing
• 47% on straight-level sections of the ramp • 38% on curved sections of the ramp

TABLE 6

CRASH DATA SUMMARY
I-275 FROM ORANGE/JEFFERSON STREETS TO I-4 JUNCTION
(MILEPOSTS 6.900 TO 7.399)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	40	34	31	31	180
Actual Crash Rate	1.683	1.532	1.323	1.296	1.162	N/A
Critical Crash Rate	1.943	1.651	1.696	1.665	1.559	N/A
Safety Ratio	0.866	0.927	0.780	0.778	0.745	N/A
Fatalities	0	2	0	0	1	3
Injuries	20	22	16	18	26	102
Property Damage Crashes	28	20	21	17	12	98
Economic Loss (Millions)	1.298	1.180	1.003	0.915	0.915	5.311

TABLE 7

CRASH DATA SUMMARY
I-4 FROM I-275 JUNCTION TO 15TH STREET
(MILEPOSTS 7.400 TO 7.973)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	42	63	33	42	224
Actual Crash Rate	1.639	1.565	2.627	1.402	1.619	N/A
Critical Crash Rate	1.934	1.642	1.718	1.670	1.567	N/A
Safety Ratio	0.847	0.953	1.529	0.839	1.033	N/A
Fatalities	0	0	0	0	1	1
Injuries	29	26	39	20	46	160
Property Damage Crashes	28	22	34	22	18	124
Economic Loss (Millions)	1.298	1.239	1.859	0.974	1.239	6.609

TABLE 8

CRASH DATA SUMMARY
I-4 FROM 15TH STREET TO EAST OF 22ND STREET
(MILEPOSTS 7.974 TO 8.300)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	31	30	14	17	18	110
Actual Crash Rate	2.056	1.989	1.045	1.417	1.201	N/A
Critical Crash Rate	2.157	1.842	1.935	1.923	1.753	N/A
Safety Ratio	0.953	1.079	0.540	0.736	0.685	N/A
Fatalities	1	0	0	0	0	1
Injuries	15	33	7	7	22	84
Property Damage Crashes	18	12	9	10	9	58
Economic Loss (Millions)	0.915	0.855	0.413	0.502	0.531	3.216

TABLE 9

MAINLINE CRASH TYPOLOGY

Peak Hours	Non-Peak Hours
EB I-4 from the SB I-275 Flyover Ramp to the 21st Off-Ramp	
29 Total Crashes	61 Total Crashes
• 24% involved improper lane changing • 52% rear-end collisions • 21% sideswipe collisions • 17% angle collisions	• 23% involved improper lane changing • 52% rear-end collisions • 18% sideswipe collisions
• 79% on straight-level roadway • 17% on straight upgrade/downgrade	• 59% on straight-level roadway • 38% on straight upgrade/downgrade
• 48% in Lane 2 • 38% in Lane 1	• 49% in Lane 2 • 18% in Lane 1 • 16% in Lane 3
WB I-4 Between 21st Street On-Ramp and NB I-275 Off-Ramp	
39 Total Crashes	124 Total Crashes
• 18% involved improper lane changing • 64% rear-end collisions	• 13% involved improper lane changing • 55% rear-end collisions • 20% hit pole, guardrail, barrier wall, or crash attenuator
• 49% on straight-level roadway • 46% on straight upgrade/downgrade	• 57% on straight-level roadway • 35% on straight upgrade/downgrade
• 67% in Lane 1 • 15% in Lane 2	• 50% in Lane 1 • 23% in Lane 2

TABLE 10

CRASH DATA SUMMARY
I-275 FROM I-4 JUNCTION TO FLORIBRASKA AVENUE
(MILEPOSTS 0.00 TO 0.707)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	24	33	20	34	155
Actual Crash Rate	1.488	0.826	1.013	0.620	1.304	N/A
Critical Crash Rate	1.903	1.619	1.626	1.577	1.566	N/A
Safety Ratio	0.781	0.510	0.623	0.393	0.832	N/A
Fatalities	0	0	0	0	1	1
Injuries	20	20	24	13	22	99
Property Damage Crashes	30	16	17	13	19	95
Economic Loss (Millions)	1.298	0.708	0.974	0.590	1.003	4.573

Greiner

C102380.18
July 16, 1996

MEMORANDUM

To: Lisa Hansen, P.E., District VII Design Engineer

From: Stephan F. Heimburg, P.E.

Subject: **WPI Number: 7140004**
State Project Number: 99007-1402
FAP Number: IR-9999-(1402)
I-275/I-4 Downtown Interchange Operational Improvements
Hillsborough County
Design Exception: Inside and Outside Roadway and Bridge Shoulder Widths

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A Project Development and Environment Study is being conducted to develop feasible operational improvements to the above referenced interchange, which is proposed for ultimate improvements as part of the Tampa Interstate Study (TIS) Environmental Impact Statement (EIS). Three alternatives were developed within the study area limits of the Hillsborough River to the west on I-275, Floribraska Avenue to the north on I-275 and the 21st/22nd Street interchange to the east on I-4. Alternatives 1 and 2 would involve improvements to the existing facility. Alternative 3 was developed as a new facility using the most current FDOT and AASHTO design standards.

Due to the constraint of available funding and the high costs associated with Alternative 3, it was eliminated from consideration. The Preferred Alternative consists of a combination and refinement of segments of Alternatives 1 and 2 that best serve the safety and operational needs of the downtown interchange within a limited budget.

The Preferred Alternative utilizes a majority of the existing structures, which is the primary reason why standard shoulder widths cannot be provided in all areas. The concept proposes the construction of standard inside and outside shoulder widths on the interstate through lanes, collector roadway lanes and ramps where feasible. In some cases, the existing substandard shoulder widths are proposed to remain, due to specific constraints such as vertical clearance; constructibility; and construction and right-of-way/relocation costs. AASHTO publication *A Policy on Geometric Design of Highways and Streets, 1994*, Chapter VIII, Page 557 states, "The usable paved width of the right shoulder should be at least 3.0 meters (10 feet) and where truck traffic exceeds 250 DDHV it should preferably be 3.6 meters (12 feet)" and "On freeways of six or more lanes, the usable paved width of the median shoulder should be also 3.0 meters (10 feet) and preferably 3.6 meters (12 feet) where the truck traffic exceeds 250 DDHV." Based on this AASHTO criteria for both inside and outside shoulder widths, a design exception is requested.

Table 1 summarizes the existing and proposed shoulder widths for mainline sections of I-275 and I-4, Table 2 summarizes the shoulder widths for the connecting ramps between I-275 and I-4, and Table 3 contains shoulder widths for surface streets and the southbound collector roadway. On I-275 southbound at the downtown viaduct, the proposed outside shoulder widths for the through lanes are 3.6 meters (12 feet), but the inside shoulder widths are a minimum (existing) 0.6 meters (2.0 feet). Standard shoulders could not be attained on I-275 southbound due to encroachment of vertical clearances at Morgan Street, Marion Street and Florida Avenue. The clearances at Morgan and Marion Streets would fall well below 4.3 meters (14 feet) and the required 4.9 meters (16 feet) at Florida Avenue would also be impacted. Since shallower steel plate girders are already proposed to maximize clearances, the only other option would be to lower Morgan Street, Marion Street and Florida Avenue by as much as a foot, as well as the possibility of lowering neighboring Scott and Kay Streets. In addition, stopping sight distance would not be improved. For the downtown viaduct on I-275 northbound, the standard inside shoulder widths proposed do not impact vertical clearances.

No improvements to existing shoulders are proposed in the following areas; since there are no construction improvements in these segments: I-4 westbound from 12th Street to 15th Street; the outside lanes of I-4 from 19th Street 24th Street; I-275 northbound and southbound from Amelia Avenue to Palm Avenue; and the inside lanes of I-275 southbound from Palm Avenue to Central Avenue.

In addition, no shoulder improvements are proposed for the collector roadway for I-275 southbound on the structure that spans over 7th Avenue, Henderson Street and Central Avenue. The existing pier placements under this structure preclude its feasibility for widening, due to their possible encroachment on surface streets.

Currently, traffic volumes on the interstate within the study area range from 134,000 to 182,000 vehicles per day. Since the proposed improvements will not add capacity to the system, volume is expected to increase but will remain constrained without additional lanes added to the system. Therefore, areas where there will be no improvements to existing shoulder widths will have little or no effect on the future Level of Service or the capacity of the interstate.

Crash data provided by FDOT District 7 for the study area was summarized. As shown in Tables 4 through 10, data was provided for various segments of I-275 and I-4 for the years 1990 through 1994.

Table 4 shows that a total of 415 crashes occurred within the 5-year time frame on the I-275 segment between the Hillsborough River and Orange/Jefferson Streets. This segment also reports unsatisfactory safety ratios (above 1.0) during the five-year period ranging from 1.661 to 2.474.

Referring to Table 1, the southbound lanes of this segment will maintain below-standard 0.6-meter (2-foot) inside shoulder widths on a tangent section where stopping sight distance is not a factor. In addition, the proposed lane addition and shoulder improvements to I-275 northbound and the Ashley Street ramp will have a greater effect in reducing crashes than improving the southbound inside shoulders in this segment. For example, further analysis of crashes in this segment, as shown in Table 5, reveals that between the northbound Ashley Street off- and on-ramps, 39 percent of the crashes occurred within the vicinity of the on-ramp merge area. In addition, between the Ashley Street on-ramp and Morgan Street, 33 percent of the peak hour crashes were sideswipe collisions. Finally, 64 percent of the crashes on the Ashley Street on-ramp were rear end collisions. This information underscores that a significant number of crashes in this segment can be attributed to the current substandard Ashley Street northbound on-ramp geometries rather than substandard shoulder widths in the southbound direction.

Table 6 shows that on I-275 from Orange/Jefferson Streets to the I-4 junction, a total of 180 crashes occurred from 1990 to 1994. However, the safety ratio did not exceed 1.0 during this time period and the accident total only represents 18 percent of the total accidents occurring in the downtown interchange over the last 5 years.

Tables 7 and 8 reflect crash data for I-4 from the I-275 junction to east of the 21st/22nd Streets interchange. The safety ratio exceeded 1.0 in the roadway segment from I-275 to 15th Street during 1992 and 1994 and from 15th Street to east of the 21st/22nd Street interchange in 1991. On I-4, many of the shoulder widths (mostly where no construction is proposed) fall below current standards. With the lack of vertical stopping sight distance in the vicinity of the 14th/15th Streets overpass being a possible cause of crashes in this location, it is believed that the proposed improvements will reduce queue lengths, minimize weaving conflicts, and allow drivers more time to react through these short crest curve sections. For example, Table 9 shows that, on I-4 westbound between the 21st Street on-ramp and the I-275 northbound off-ramp, 67 percent of peak hour crashes and 50 percent of off peak crashes occurred in the inside lane. This is probably because the inside lane is the only movement that continues through to I-275 southbound. This heavy movement usually has the longest queue length. The proposed improvements provide two through lanes to I-275 southbound that should significantly reduce westbound queuing. As shown on Table 9, approximately 49 percent of the crashes total (peak and off-peak hours combined) on I-4 eastbound occur in the middle lane. It is believed that this is partially because of the movement from the I-275 southbound flyover (that enters I-4 on the inside lane) to the 21st Street exit ramp. The proposed improvements relocate the flyover to enter I-4 on the outside, which will reduce the weaving conflict for this roadway segment.

The proposed improvements will tie into existing sections of I-275 to the west and north and I-4 to the east, that currently provide substandard inside and outside shoulder widths. At this time, there is no funding for the ultimate construction segments on I-275 to the west (Segment 2A) or to the north (Segment 2B). Interim improvements to the segment on I-4 to the east)Segment 3A) are under design with right-of-way acquisition scheduled for the years 2000/2001. There is no construction funding at this time. The proposed improvements are compatible with both transitioning into the existing facility and the proposed interim improvements to Segment 3A.

Other solutions to provide full shoulder widths were explored, which included jacking up the existing structure and total replacement of the existing structure. Jacking up the existing bridges to meet minimum vertical clearances would require shutting down the interstate. All lanes would require closure since the downtown viaduct would have to be jacked up in its entirety due to its monolithic construction. Once the structure is jacked up, holes would have to be drilled in the existing pier caps, rebar inserted, and concrete poured all in a space less than 0.6 meters (2.0 feet) in height. Aside from the difficulty of this construction, the additional costs of maintaining traffic flow alone discount this alternative as a solution.

The other solution of complete replacement of the facility was explored with Alternative 3. This concept would construct the outside lanes of the ultimate Tampa Interstate Study EIS improvement. As stated previously, this alternative was also eliminated from consideration due to its high construction and right-of-way costs. Alternative 3 is estimated to cost approximately $350 million to construct as compared to approximately $80 million for the Preferred Alternative.

Finally, the purpose of the operational improvement is to enhance safety and operations. Although some design aspects of the proposed improvements will not meet current minimum standards, safety and operations will be substantially improved over the existing conditions.

SFH/MDF:sas

Attachments

TABLE 1

SHOULDER WIDTHS ON I-275 AND I-4

Roadway	Location	Existing			Proposed with Design Exception		
		No. of Lanes	Inside	Outside	No. of Lanes	Inside	Outside
I-275 NB	Hillsborough River to Tampa Street (Rdwy.)	3	0.6 m (2')	2.6 m (8.5')	3	3.0 m (10')	3.0 m (10')
	Tampa Street to Morgan Street Viaduct	3	0.6 m (2')	0.6 m (2')	4	0.6 m (2')	3.0 m (10')
	Morgan Street to Jefferson Street (Rdwy.)	3	0.6 m (2')	2.6 m (8.5')	4	3.6 m (12')	3.6 m (12')
	Jefferson Street Bridge	3	0.6 m (2')	0.6 m (2')	4	3.6 m (12')	3.0 m (10')
	Jefferson Street to Central Avenue	3	0.6 m (2')	2.4 m (8')	4	3.6 m (12')	3.6 m (12')
	Central Avenue/Henderson Street Bridge to 7th Avenue Bridge	5	0.6 m (2')	0.6 m (2')	5	0.6 m (2')	1.8 m (6')[1]
	7th Avenue to Palm Avenue	5	2.7 m (9')	2.6 m (8.5')	5	2.7 m (9')	2.4 m (8')[1]
	Palm Avenue Bridge	3	0.6 m (2')	0.6 m (2')	3	0.6 m (2')	0.6 m (2')
	Palm Avenue to Columbus Drive	3	2.7 m (9')	3.0 m (10')	3	2.7 m (9')	3.0 m (10')
	Columbus Drive Bridge	3/4	0.6 m (2')	0.6 m (2')	3	2.7 m (9)	3.0 m (10')
	Columbus Drive to Floribraska Avenue	3	1.8 m (6')	3.0 m (10')	3/4	1.8 m (6')	3.0 m (10')
I-275 SB	Floribraska Avenue Bridge	4	1.8 m (6')	2.7 m (9')	4	1.8 m (6')	1.8 m (6')[1]
	Floribraska Avenue to Columbus Drive	4/3	1.4 m (4.5')	2.6 m (8.5')	4/3	1.4 m (4.5')	3.6 m (12')
	Columbus Drive Bridge	3	0.6 m (2')	0.6 m (2')	3	3.0 m (10')	3.0 m (10')[1]
	Columbus Drive to Palm Avenue	3/2	2.7 m (9')	2.6 m (8.5')	3/2	2.7 m (9')	2.6 m (8.5')
	Palm Avenue Bridge	2	0.6 m (2')	0.6 m (2')	2	0.6 m (2')	0.6 m (2')
	Palm Avenue to 7th Avenue	2/4	1.2 m (4')	2.6 m (8.5')	2/4	1.2 m (4')	2.6 m (8.5')
	7th Street Bridge to Central Avenue/Henderson Street Bridge	4/3	0.6 m (2')	0.6 m (2')	4	0.6 m (2')	0.6 m (2')
	Central Avenue to Jefferson Street	3	0.6 m (2')	2.6 m (8.5')	4	3.6 m (12')	3.6 m (12')
	Jefferson Street Bridge	3	0.6 m (2')	0.6 m (2')	4	3.0 m (10')	3.6 m (12')
	Jefferson Street to Morgan Street (Rdwy)	3	0.6 m (2')	2.6 m (8.5')	4	3.6 m (12')	3.6 m (12')
	Morgan Street to Tampa Street Viaduct	3	0.6 m (2')	0.6 m (2')	4	0.6 m (2')	3.6 m (12')
	Tampa Street to Hillsborough River	3	0.6 m (2')	2.6 m (8.5')	4/3	0.6 m (2')	3.6 m (12')

TABLE 1 (Continued)

SHOULDER WIDTHS ON I-275 AND I-4

Roadway	Location	Existing			Proposed with Design Exception		
		No. of Lanes	Inside	Outside	No. of Lanes	Inside	Outside
I-4 EB	12th Street 17th Street	3	1.2 m (4')	2.6 m (8.5')	4	3.6 m (12')	3.6 m (12')
	17th Street to 19th Street	3	1.2 m (4')	2.6 m (8.5')	4	3.0 m (10')	2.6 m (8.5')
	19th Street Bridge	3/2	1.2 m (4')	0.6 m (2')	4/3	2.5 m (8')	0.6 m (2')
	19th Street to 21st Street	3	1.2 m (4')	2.6 m (8.5')	3	3.6 m (12')	2.6 m (8.5')
	21st/22nd Street Bridge	2	0.6 m (2')	0.6 m (2')	3	3.0 m (10')	0.6 m (2')
	22nd Street to 24th Street	2	1.2 m (4')	2.6 m (8.5)	3/2	3.6 m (12')	2.6 m (8.5')
I-4 WB	21st Street to 19th Street (Rdwy.)	2/3	1.2 m (4')	2.6 m (8.5')	2/3	3.0 m (10')	2.6 m (8.5')
	19th Street Bridge	3	1.2 m (4')	0.6 m (2')	4	2.5 m (8')	0.6 m (2')
	19th Street to 17th Street (Rdwy.)	3	1.2 m (4')	2.6 m (8.5')	4	3.0 m (10')	2.4 m (8')[1]
	17th Street to 16th Street	3	1.2 m (4')	2.6 m (8.5')	4/3	3.6 m (12')	2.4 m (8')[1]
	16th Street to 14th Street	3	1.2 m (4')	2.6 m (8.5')	3	1.2 m (4')	2.6 m (8.5')
	14th Street to 12th Street	3	1.2m(4')	2.6m (8.5')	3	3.6m (12')	2.6m (8.5')
	12th Street to Nebraska Avenue	3	1.2 m (4')	2.6 m (8.5')	3	1.2 m (4')	3.6 m (12')

1. A ramp lane is located in this segment.

These meet FDOT PPM standards; therefore, no design variance or exception is needed.

TABLE 2

SHOULDER WIDTHS ON CONNECTING FREEWAY RAMPS

Roadway	Location	Existing			Proposed with Design Exception		
		No. of Lanes	Inside	Outside	No. of Lanes	Inside	Outside
I-275 NB to I-4 EB	Palm Avenue Bridge	2	0.6 m (2')	0.6 m (2')	3	1.2 m (4')	2.4 m (8')[1]
	Palm Avenue to Nebraska Avenue	2	1.2 m (4')	2.6 m (8.5')	3	3.6 m (12')	3.6 m (12')
	Nebraska Avenue Bridge	2	0.6 m (2')	0.6 m (2')	3	3.0 m (10')	3.0 m (10')
	Nebraska Avenue to 12th Street	2/3	1.2 m (4')	2.6 m (8.5')	3/4	3.6 m (12')	3.6 m (12')
I-4 WB to I-275 NB	10th Street to Nebraska Avenue	N/A	N/A	N/A	1	1.8 m (6')	1.8 m (6')
	Nebraska Avenue Bridge	1	0.6 m (2')	1.8 m (6')	1	1.8 m (6')	3.6 m (12')
	Nebraska Avenue to Columbus Drive	1	1.2 m (4')	2.0 m (6.5')	1	1.8 m (6')	3.6 m (12')
	Columbus Drive Bridge	N/A	N/A	N/A	1	1.8 m (6')	3.6 m (12')
I-4 WB to I-275 SB	10th Street to Nebraska Avenue	3/2	1.2 m (4')	2.6 m (8.5')	3	1.2 m (4')	3.6 m (12')
	Nebraska Avenue Bridge	2	0.6 m (2')	0.6 m (2')	3	3.6 m (12')	1.8 m (6')[1]
	Nebraska Avenue to I-275	2	2.0 m (6.5')	2.4 m (8')	3	3.6 m (12')	3.6 m (12')
	I-275 Bridge	2	0.6 m (2')	0.6 m (2')	3	3.6 m (12')	3.0 m (10')
	I-275 to Palm Avenue	2	2.0 m (6.5')	2.4 m (8')	3/2	3.6 m (12')	3.6 m (12')
	Palm Avenue Bridge	2	0.6 m (2')	0.6 m (2')	2	3.0 m (10')	3.0 m (10')
	Palm Avenue to I-275 SB	2/4	2.0 m (6.5')	2.4 m (8')	2/4	3.6 m (12')	3.6 m (12')
I-275 SB to I-4 EB	Floribraska Avenue to Columbus Drive	1	0.6 m (2')	2.4 m (8')	1	1.8 m (6')	1.8m (6')[1]
	Columbus Drive Bridge	1	0.6 m (2')	1.8 m (6')	1	0.6 m (2')	1.8 m (6')
	Columbus Drive to Nebraska Avenue	1	0.6 m (2')	1.2 m (4')	1	3.6 m (12')	1.8 m (6')
	Nebraska Avenue to I-4 EB	1	2.0 m (6.5)	1.8 m (6)	1	1.8 m (6')[1]	1.8 m (6')

1. A ramp lane is located in this segment.

These meet FDOT PPM standards, therefore, no design variance or exception is needed.

TABLE 3

SHOULDER WIDTHS ON RAMPS

Roadway	Ramp/Location	Existing			Proposed		
		No. of Lanes	Inside	Outside	No. of Lanes	Inside	Outside
I-275 NB	Scott Street/Orange Street Entrance	1	0.2 m (.5')	0.2 m (.5')	1	1.8 m (6')	1.8 m (6')
I-4 EB	21 Street Exit	1	0.2 m (.5')	0.2 m (.5')	2	0.2 m (.5')	0.2 m (.5')
I-4 WB	21st Street Entrance	1	0.2 m (.5')	0.2 m (.5')	1	0.2 m (.5')	0.2 m (.5')
I-4 WB to SB Collector	Nebraska Avenue to Ross Avenue	N/A	N/A	N/A	1	3.6 m (12')	1.8 m (6')
	Ross Avenue to Oak Avenue	N/A	N/A	N/A	1	1.8 m (6')	1.8 m (6')
I-275 SB	Exit to SB Collector	1	1.8 m (6')	2.4 m (8')	2	2.4 m (8')	3.6 m (12')
SB Collector	Oak Avenue to 7th Avenue	3	1.8 m (6')	2.4 m (8')	3	1.8 m (6')	1.8 m (6') [1]
	7th Avenue Bridge to Central Avenue/Henderson Street Bridge	3	0.5 m (1.5')	0.5 m (1.5')	3	0.5 m (1.5')	0.5 m (1.5')
	Central Avenue to Jefferson Street	3	0 m (0')	2.0 m (6.5')	3	0 m (0')	3.0 m (10')
	Jefferson Street to Ashley Street/ Doyle Carlton Drive Gore	N/A	N/A	N/A	2	2.4 m (8')	3.0 m (10')
	Doyle Carlton Drive Exit	N/A	N/A	N/A	1	1.8 m (6')	1.8 m (6')
	Ashley Street Exit	1	0.5 m (1.5')	0.5 m (1.5')	1	1.8 m (6')	1.8 m (6')

1. A ramp lane is located in this section

These meet FDOT PPM standards, therefore, no design variance or exception is needed.

TABLE 4

CRASH DATA SUMMARY
I-275 FROM THE HILLSBOROUGH RIVER TO ORANGE/JEFFERSON STREETS
(MILEPOSTS 6.400 TO 6.899)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	90	76	103	76	70	415
Actual Crash Rate	3.266	2.758	4.238	3.438	2.582	N/A
Critical Crash Rate	1.925	1.634	1.713	1.690	1.554	N/A
Safety Ratio	1.696	1.687	2.474	2.034	1.661	N/A
Fatalities	0	0	0	1	1	2
Injuries	43	55	76	54	66	294
Property Damage Crashes	56	44	54	43	31	228
Economic Loss (Millions)	2.655	2.242	3.039	2.242	2.065	12.243

TABLE 5

MAINLINE CRASH TYPOLOGY

Peak Hours	Non-Peak Hours
NB I-275 Between Ashley Street Off-Ramp and Ashley Street On-Ramp	
19 Total Crashes	91 Total Crashes
• 74% rear-end collisions • 21% angle collisions	• 54% rear-end collisions • 22% hit pole, guardrail or barrier wall
• 63% on straight-level roadway	• 55% on straight-level roadway
• 53% in Lane 3 • 21% at the on-ramp gore area	• 29% in Lane 3 • 29% at the on-ramp gore area • 22% in Lane 2
39 % Occurred in the Vicinity of the On-Ramp Merge Area	
NB I-275 Between Ashley Street On-Ramp and Morgan Street Overpass	
15 Total Crashes	54 Total Crashes
• 27% involved improper lane changing • 33% rear-end collisions • 33% sideswipe collisions • 20% hit guardrail or barrier wall	• 17% involved improper lane changing • 54% rear-end collisions • 24% hit guardrail, barrier wall, or other fixed object
• 73% on straight-level roadway • 20% on curved-level roadway	• 50% on straight-level roadway • 20% on curved-level roadway
• 46% in Lane 3 • 27% in Lane 1	• 31% in Lane 3 • 31% in Lane 2

RAMP CRASH TYPOLOGY

NB I-275 On-Ramp from Ashley Street
47 Total Crashes
• 64% rear-end collisions • 19% hit guardrail, barrier wall, or other fixed object • 13% sideswipe collisions
• 77% involved careless driving and/or improper lane changing
• 47% on straight-level sections of the ramp • 38% on curved sections of the ramp

TABLE 6

CRASH DATA SUMMARY
I-275 FROM ORANGE/JEFFERSON STREETS TO I-4 JUNCTION
(MILEPOSTS 6.900 TO 7.399)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	40	34	31	31	180
Actual Crash Rate	1.683	1.532	1.323	1.296	1.162	N/A
Critical Crash Rate	1.943	1.651	1.696	1.665	1.559	N/A
Safety Ratio	0.866	0.927	0.780	0.778	0.745	N/A
Fatalities	0	2	0	0	1	3
Injuries	20	22	16	18	26	102
Property Damage Crashes	28	20	21	17	12	98
Economic Loss (Millions)	1.298	1.180	1.003	0.915	0.915	5.311

TABLE 7

CRASH DATA SUMMARY
I-4 FROM I-275 JUNCTION TO 15TH STREET
(MILEPOSTS 7.400 TO 7.973)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	42	63	33	42	224
Actual Crash Rate	1.639	1.565	2.627	1.402	1.619	N/A
Critical Crash Rate	1.934	1.642	1.718	1.670	1.567	N/A
Safety Ratio	0.847	0.953	1.529	0.839	1.033	N/A
Fatalities	0	0	0	0	1	1
Injuries	29	26	39	20	46	160
Property Damage Crashes	28	22	34	22	18	124
Economic Loss (Millions)	1.298	1.239	1.859	0.974	1.239	6.609

TABLE 8

CRASH DATA SUMMARY
I-4 FROM 15TH STREET TO EAST OF 22ND STREET
(MILEPOSTS 7.974 TO 8.300)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	31	30	14	17	18	110
Actual Crash Rate	2.056	1.989	1.045	1.417	1.201	N/A
Critical Crash Rate	2.157	1.842	1.935	1.923	1.753	N/A
Safety Ratio	0.953	1.079	0.540	0.736	0.685	N/A
Fatalities	1	0	0	0	0	1
Injuries	15	33	7	7	22	84
Property Damage Crashes	18	12	9	10	9	58
Economic Loss (Millions)	0.915	0.855	0.413	0.502	0.531	3.216

TABLE 9

MAINLINE CRASH TYPOLOGY

Peak Hours	Non-Peak Hours
EB I-4 from the SB I-275 Flyover Ramp to the 21st Off-Ramp	
29 Total Crashes	61 Total Crashes
• 24% involved improper lane changing • 52% rear-end collisions • 21% sideswipe collisions • 17% angle collisions	• 23% involved improper lane changing • 52% rear-end collisions • 18% sideswipe collisions
• 79% on straight-level roadway • 17% on straight upgrade/downgrade	• 59% on straight-level roadway • 38% on straight upgrade/downgrade
• 48% in Lane 2 • 38% in Lane 1	• 49% in Lane 2 • 18% in Lane 1 • 16% in Lane 3
WB I-4 Between 21st Street On-Ramp and NB I-275 Off-Ramp	
39 Total Crashes	124 Total Crashes
• 18% involved improper lane changing • 64% rear-end collisions	• 13% involved improper lane changing • 55% rear-end collisions • 20% hit pole, guardrail, barrier wall, or crash attenuator
• 49% on straight-level roadway • 46% on straight upgrade/downgrade	• 57% on straight-level roadway • 35% on straight upgrade/downgrade
• 67% in Lane 1 • 15% in Lane 2	• 50% in Lane 1 • 23% in Lane 2

TABLE 10

CRASH DATA SUMMARY
I-275 FROM I-4 JUNCTION TO FLORIBRASKA AVENUE
(MILEPOSTS 0.00 TO 0.707)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	44	24	33	20	34	155
Actual Crash Rate	1.488	0.826	1.013	0.620	1.304	N/A
Critical Crash Rate	1.903	1.619	1.626	1.577	1.566	N/A
Safety Ratio	0.781	0.510	0.623	0.393	0.832	N/A
Fatalities	0	0	0	0	1	1
Injuries	20	20	24	13	22	99
Property Damage Crashes	30	16	17	13	19	95
Economic Loss (Millions)	1.298	0.708	0.974	0.590	1.003	4.573

Greiner

C102380.18
July 11, 1996

MEMORANDUM

To: Lisa Hansen, P.E., District VII Design Engineer

From: Stephan F. Heimburg, P.E.

Copies: Billy Hattaway, P.E.

Subject: **WPI No.: 7140004**
State Project No.: 99007-1402
FAP No.: IR-9999-(1402)
I-275/I-4 Downtown Interchange Operational Improvements
Hillsborough County
Design Variation: Vertical Clearances

A Project Development and Environment Study is being conducted to develop feasible operational improvements to the above referenced interchange, which is proposed for ultimate improvements as part of the Tampa Interstate Study (TIS) Environmental Impact Statement (EIS). Three alternatives were developed within the study area limits of the Hillsborough River to the west on I-275, Floribraska Avenue to the north on I-275 and the 21st/22nd Street interchange to the east on I-4. Alternatives 1 and 2 would involve improvements to the existing facility. Alternative 3 was developed as a new facility using the most current FDOT and AASHTO design standards.

Due to the constraint of available funding and the high costs associated with Alternative 3, it was eliminated from consideration. The Preferred Alternative consists of a combination and refinement of segments of Alternatives 1 and 2 that best serve the safety and operational needs of the downtown interchange within a limited budget.

As shown on Table 1, a total of 33 existing structures were reviewed for changes in vertical clearance. Of the 33 structures, six already provide existing vertical clearances under 4.4 meters (14 feet, 6 inches). The result of the Preferred Alternative improvements show a total of seven structures with vertical clearances under the FDOT Standards 4.4 meters (14 feet, 6 inches). AASHTO publication, *A Policy on Geometric Design of Highways and Streets, 1994,* Chapter VII, Page 515 states, "In highly urbanized areas, a minimum clearance of 4.3 meters (14 feet, 0 inches) may be provided if there is one route with 4.9 meters (16.0 feet) clearance." As indicated in Table 1, Florida Avenue would maintain its 4.9-meter (16-foot) vertical clearance under I-275 to serve as the alternate route. Therefore, based on these structures meeting AASHTO criteria, a design variation to FDOT criteria is requested.

The proposed improvements will tie into existing sections of I-275 to the west and north and I-4 to the east that currently provide vertical clearances. At this time, there is no funding for the ultimate construction segments on I-275 to the west (Segment 2A) or to the north (Segment 2B). Interim improvements to the segment on I-4 to the east)Segment 3A) is under design with right-of-way

acquisition scheduled for the years 2000/2001. There is no construction funding at this time. The proposed improvements are compatible to transitioning into the existing facility and to the proposed interim improvements to Segment 3A.

Other solutions to provide current FDOT and AASHTO standards for vertical clearances included jacking up the existing structure and total replacement of the existing structure. Jacking up the existing bridges to meet minimum vertical clearances would require shutting down the interstate. All lanes would require closure since the downtown viaduct would have to be jacked up in its entirety due to its monolithic construction. Once the structure is jacked up, holes would have to be drilled in the existing pier caps, rebar inserted, and concrete poured all in a space less than 0.6 meters (2 feet) in height. Aside from the difficulty of this construction, the additional costs for maintaining traffic flow alone discount this alternative as a solution.

The other possible solution of complete replacement of the facility was explored with Alternative 3. This concept would construct the outside lanes of the ultimate TIS improvement. As stated previously, this alternative was also eliminated from consideration due to high construction and right-of-way/relocation costs. Alternative 3 is estimated to cost approximately $350 million to construct as compared to $80 million for the Preferred Alternative.

Finally, it should be mentioned that improving vertical clearances over cross streets (without realignment of the interstate) would have no impact on improving current accident rates and would have no effect on the amount and character of traffic using the facility.

RECOMMEND BY:

Stephan F. Heimburg, P.E.
Greiner, Inc. 7/11/96

APPROVED BY:

Lisa Hansen, P.E.
District VII Design Engineer 7/14/96

SFH/MDF:sas
Attachment

TABLE 1
Bridge Vertical Clearance Summary

Bridge Location	Existing Minimum Vertical Clearance	Preferred Alternative Vertical Clearance
I-275(SB) Downtown Viaduct over:	-	-
Tampa St.	4.5 m (14'-8") (5)	4.5 m (14'-8")
Franklin St.	4.7 m (15'-7")	4.7 m (15'-7") (3)
Florida Ave.	4.9 m (16'-0")	4.9 m (16'-0") (6)
Marion St.	4.5 m (14'-10")	4.4 m (14'-6") (6)
Morgan St.	4.4 m (14'-6")	4.3 m (14'-0") (6)
I-275(NB) Downtown Viaduct over:	-	-
Ashley over Scott Street	4.6 m (15'-2")	4.5 m (14'-10")
Tampa St.	4.5 m (14'-8") (5)	4.4 m (14'-6")
Franklin St.	4.7 m (15'-7")	4.7 m (15'-7") (2)
Florida Ave.	4.9 m (16'-0")	4.9 m (16'-0")
Marion St.	4.5 m (14'-10")	4.5 m (14'-10")
Morgan St.	4.4 m (14'-6")	4.4 m (14'-6")
Ashley St. Viaduct	N/A	5.0 m (16'-6")
I-275(SB) over Jefferson St.	4.6 m (15'-2")	4.6 m (15'-2")
I-275(NB) over Jefferson St.	4.6 m (15'-3")	4.6 m (15'-3")
Local freeway over Henderson/Central	4.3 m (14'-2")	4.3 m (14'-2")
I-275(SB) over Henderson/Central	4.3 m (14'-1")	4.3 m (14'-1")
I-275(NB) over Henderson/Central	4.3 m (14'-0")	4.3 m (14'-0") (2)
Local freeway over 7th Ave.	4.4 m (14'-6")	4.4 m (14'-6")
I-275(SB) over 7th Ave.	4.5 m (14'-9")	4.5 m (14'-9")
I-275(NB) over 7th Ave.	4.5 m (14'-10")	4.5 m (14'-10") (6)
I-4(WB) to I-275(SB) over Palm Ave.	4.3 m (14'-1")	4.3 m (14'-1")
I-4(WB) to local freeway over Palm Ave.	N/A	4.4 m (14'-6") (7)
I-275(SB) over Palm Ave.	4.3 m (14'-2")	4.3 m (14'-2")
I-275(NB) over Palm Ave.	4.3 m (14'-2")	4.3 m (14'-2") (2)
I-4(WB) Ramp to I-275(SB) over I-275	4.7 m (15'-6") (4)	4.7 m (15'-6")
I-4(WB) Ramp to local freeway over I-275(SB)/local fwy	N/A	5.0 m (16'-6")
I-4(WB) Ramp to local freeway over I-275	N/A	5.0 m (16'-6")
I-275(SB) Ramp to I-4(EB)	N/A	5.0 m (16'-6")
I-4(WB) Ramp to I-275(SB) over Nebraska	4.6 m (15'-1")	4.6 m (15'-1")
I-4(WB) Ramp to I-275(NB) over Nebraska	N/A	4.4 m (14'-6") (7)
I-275(NB) Ramp to I-4(EB) over Nebraska	4.4 m (14'-6")	4.4 m (14'-6")
I-275(SB) Ramp to I-4(EB) over Columbus	5.8 m (19'-2")	5.8 m (19'-2")
I-275(SB) over Columbus Dr.	4.7 m (15'-4")	4.4 m (14'-6")
I-275(NB) over Columbus Dr.	4.4 m (14'-6")	4.4 m (14'-6")
I-4(WB) Ramp to I-275(NB) over Columbus	N/A	5.0 m (16'-6")
I-4(EB) over 14th St.	4.6 m (15'-2")	4.6 m (15'-2") (2)
I-4(EB) over 15th St.	4.5 m (14'-9")	4.5 m (14'-9")
I-4(WB) over 19th St.	4.6 m (15'-2") (5)	4.6 m (15'-2")
I-4(EB) over 19th St.	4.5 m (14'-9")	4.5 m (14'-9")
I-4(EB) over 21st and 22nd St.	4.6 m (15'-3")	4.6 m (15'-3")
I-275(SB) over Floribraska	4.5 m (14'-9")	4.4 m (14'-6") (6)

(2) - The beams used for widening the bridge are assumed to be modified to maintain the original vertical clearance.

(3) - The beams used for widening the bridge are assumed to be modified along with the cross-slope to maintain the original vertical clearance.

(4) - Obtained from the bridges SIA reports. The remaining clearances were obtained by Greiner's survey crew.

(5) - Surveyed vertical clearance was higher than SIA report value by several inches

(6) - The beams used for widening the bridge are assumed to be shallower steel plate girders.

(7) - New bridge shows lower clearance to match existing structures at gore area

File: WP_ISC\L:\TIS\I275INTR\VERTCL4.WK4

Greiner

C102380.18
July 10, 1996

MEMORANDUM

TO: Lisa Hansen, P.E., District VII Design Engineer

FROM: Stephan F. Heimburg, P.E.

COPIES: Billy Hattaway, P.E.

SUBJECT: **WPI Number: 7140004**
State Project Number: 99007-1402
FAP Number: IR-9999-(1402)
I-275/I-4 Downtown Interchange Operational Improvements
Hillsborough County
Design Variation: Superelevation

A Project Development and Environment Study is being conducted to develop feasible operational improvements to the above referenced interchange, which is proposed for ultimate improvements as part of the Tampa Interstate Study Environmental Impact Statement (EIS). Three alternatives were developed within the study area limits of the Hillsborough River to the west on I-275, Floribraska Avenue to the north on I-275 and the 21st/22nd Street interchange to the east on I-4. Alternatives 1 and 2 would involve improvements to the existing facility. Alternative 3 was developed as a new facility using the most current FDOT and AASHTO design standards.

Due to the constraint of available funding and the high costs associated with Alternative 3, it was eliminated from consideration. The Preferred Alternative consists of a combination and refinement of segments of Alternatives 1 and 2 that best serve the safety and operational needs of the downtown interchange within a limited budget.

The initial design of the I-275/I-4 interchange occurred in the early 1960's, The plans were prepared with design speeds of 80 km/h (50 mph) for mainline and connecting ramps for I-4 and I-275 and 60 km/h (35mph) for the local C/D roadway. The minimum AASHTO design speeds for urban freeways are 80 km/h (50 mph) and 60 km/h (35mph) for direct connecting ramps. The Preferred Alternative concept proposes improvements utilizing most of the existing concrete pavement on I-275 and I-4 in order to meet the proposed construction budget of $80 million.

Traffic volumes on the interstate within the study area range from 134,000 to 182,000 vehicles per day (ADT). Since the proposed improvements will not add capacity to the system, volume is expected to increase, but will remain constrained without additional lanes added to the system.

Therefore, the existing horizontal geometrics will have little or no effect on the future Level of Service or the capacity of the interstate.

According to the Plans Preparation Manual, Volume 1, the design of all freeways both urban and rural should be designed using the emax=.10 table. Urban highways should be designed using emax=.05 criteria. The purpose of this proposed variation is to request that existing superelevations be maintained on the proposed project. These superelevations fall between those found in the AASHTO Green Book on Tables III-8 (emax=.06) and Table III-10 (emax=.10). For reconstructed roadways, emax=.10 criteria will be used. Although this variable criteria could be considered inconsistent with driver expectation, it represents a compromise between economics, the criteria of existing I-4 and I-275 and the criteria of the proposed improvements to I-4 and I-275. In addition, commuters are already familiar with the varying criteria as it currently exists and tourists will be at a greater level of awareness because of the number of decisions required to negotiate the interchange.

It is believed that the use of emax=.06 criteria will not have adverse effect on the safety of the interchange. For any superelevated roadway at a given design speed, a combination of friction and superelevation counteract the forces that tend to make a vehicle skid. Since the superelevation is fixed on an actual roadway, the actual friction varies within limits to keep a vehicle from skidding. The AASHTO superelevation tables (Tables III-7 to III-11) are derived by calculating the minimum radius for a given design speed, emax and maximum friction. Superelevation values for curves flatter than the minimum radius are derived by applying "the method 5 procedure" (see AASHTO Green Book p 148-153) to reduce the required friction from the maximum amount. This reduction in friction increases the safety factor and driver comfort level. Thus because of the nonlinear relationships between superelevation, radius and design speed and emax, a given curve and design speed combination will have a different required superelevation rate depending on which AASHTO emax table is used. This leads to the conclusion that there is a range of superelevation values (instead of a single value) that are appropriate for a given curve at a given design speed.

Several resurfacing options were explored for providing superelevation in accordance with FDOT criteria (emax=0.10). Asphalt overlay of PCC pavement was considered for this rehabilitation. However, this would not extend the design life and would increase maintenance costs. In addition, the PCC joints would reflect through the asphalt as cracks. A PCC overlay of the existing pavement was also considered. However, this approach is not common in Florida and PCC does not lend itself to variable overlay such as that required. Additionally, the existing bridges will not handle the loads imposed by such an overlay. A crack and seat overlay (where existing PCC pavement is systematically crushed and becomes the base for an asphalt overlay) was also considered. However, this option would also require the redecking of affected bridges due to the overlay thickness. Any resurfacing will also increase the effort and cost of maintenance of traffic.

Another possible solution, the complete replacement of the facility, was explored with Alternative 3. This concept would construct the outside lanes of the ultimate TIS improvement. As stated previously, this alternative was also eliminated from consideration due to high construction and right-of-way/relocation costs. Alternative 3 is estimated to cost approximately $350 million to construct as compared to $80 million for the Preferred Alternative.

SFH:dos
Attachments

RECOMMENDED BY:

Stephan F. Heimburg, P.E.
Greiner, Inc. 7/10/96

APPROVED BY:

Lisa Hansen, P.E.
District Design Engineer 7/15/96

F:\l4\M-HANSEN.619

Greiner

C102380.18
June 24, 1996

MEMORANDUM

To: Lisa Hansen, P.E., District VII Design Engineer

From: Stephan F. Heimburg, P.E.

Copies: Billy Hattaway, P.E.

Subject: **WPI Number: 7140004**
State Project Number: 99007-1402
FAP Number: IR-9999-(1402)
I-275/I-4 Downtown Interchange Operational Improvements
Hillsborough County
Design Variation: Stopping Sight Distance (Horizontal Alignment)

A Project Development and Environment Study is being conducted to develop feasible operational improvements to the above referenced interchange, which is proposed for ultimate improvements as part of the Tampa Interstate Study Environmental Impact Statement (EIS). Three alternatives were developed within the study area limits of the Hillsborough River to the west on I-275, Floribraska Avenue to the north on I-275 and the 21st/22nd Street interchange to the east on I-4. Alternatives 1 and 2 would involve improvements to the existing facility. Alternative 3 was developed as a new facility using the most current FDOT and AASHTO design standards.

Due to the constraint of available funding and the high costs associated with Alternative 3, it was eliminated from consideration. The Preferred Alternative consists of a combination and refinement of segments of Alternatives 1 and 2 that best serve the safety and operational needs of the downtown interchange within a limited budget.

The initial design of the I-275/I-4 interchange occurred in the early 1960's. The plans were prepared with design speeds of 80 km/h (50 mph) for mainline and connecting ramps for I-4 and I-275 and 60 km/h (35 mph) for the local C/D roadway. The minimum AASHTO design speeds for urban freeways are 80 km/h (50 mph) and 60 km/h (40 mph) for direct connecting ramps. The Preferred Alternative concept proposes improvements utilizing most of the existing horizontal geometrics on I-275 and I-4.

As indicated in Table 1, the horizontal geometrics meet AASHTO standards for stopping sight distance in every segment where construction is proposed. AASHTO standards are not met in the segment of I-275 between Columbus Drive and Palm Avenue; however, no construction is proposed in this segment of I-275 for either the northbound or southbound lanes. Table 1 indicates only two curves with deficiencies in stopping sight distance measured by FDOT standards where improvements are proposed. These areas are the northbound segment of I-275 from Jefferson Street to Central Avenue and the southbound segment of I-275 from Jefferson Street where improvements are proposed. Therefore, a design variation to FDOT standards is requested.

TABLE 1

HORIZONTAL STOPPING SIGHT DISTANCE

MAINLINE I-275 AND I-4 80 KM/H (50 MPH) DESIGN SPEED						
		Proposed				
Roadway	*Location*	*Radius of Curve*	*Applied Shoulder Width*	*Stopping Sight Distance*	*FDOT Design Speed Attained*	*AASHTO Design Speed Attained*
I-275 NB	Morgan St. to Jefferson St.	443.0 m	3.6 m	138 m (453')	80 km/h (50 mph)	93 km/h (58 mph)
	Jefferson St. to Central Ave.	295.0 m	3.6 m	113 m (371')	64 km/h (40 mph)	80 km/h (50 mph)
I-275 SB	Central Ave. to Jefferson St.	499.0 m	3.6 m	146 m (479')	68 km/h (42 mph)	101 km/h (63 mph)
	Jefferson St. to Morgan St.	333.0 m	3.6 m	119 m (390')	74 km/h (46 mph)	80 km/h (50 mph)
I-4 EB	12th St. to 17th St.	862.0 m	3.6 m	193 m (633')	98 km/h (61 mph)	130 km/h (81 mph)
I-4 WB	15th St. to 12th St.	873.0 m	2.6 m	176 m (577')	92 km/h (57 mph)	119 km/h (74 mph)
CONNECTING FREEWAY RAMPS 60 KM/H (35 MPH) DESIGN SPEED						
I-275 NB to I-4 EB	Palm Ave. to Nebraska Ave.	367.8 m	3.0 m	103 m (407')	72 km/h (>35 mph)	87 km/h (54 mph)
	Nebraska Ave. to 12th St.	552.8 m	3.0 m	154 m (525')	87 km/h (>35 mph)	101 km/h (63 mph)
I-4 WB to I-275 NB	Nebraska Ave. to Columbus Dr.	205.0 m	3. 0 m	99 m (330')	67 km/h (>35 mph)	72 km/h (45 mph)
I-4 WB to I-275 SB	Nebraska Ave. to Ross Ave.	208.0 m	3.0 m	89 m (320')	64 km/h (>35 mph)	71 km/h (44 mph)
I-275 SB to I-4 EB	Columbus Dr. to Nebraska Ave.	213.7 m	3.0 m	101 m (330')	66 km/h (>35 mph)	72 km/h (45 mph)
	Nebraska Ave. to 12th St.	600.0 m	1.8 m	138 m (453')	87 km/h (>35 mph)	93 km/h (58 mph)
SOUTHBOUND COLLECTOR RAMPS 60 KM/H (35 MPH) DESIGN SPEED						
I-275 SB Exit to SB Collector	Columbus Dr. to Francis Ave. Ramp B	296.4 m	3.0 m	106 m (348')	68 km/h (>35 mph)	77 km/h (48 mph)
I-4 WB Exit to SB Collector	Nebraska Ave. to I-275	213.7 m	3.0 m	95 m (312')	76 km/h (>35 mph)	84 km/h (52 mph)
	I-275 to Ross Ave.	640.0 m	1.8 m	136 m (446')	71 km/h (>35 mph)	74 km/h (46 mph)
SB Collector	Central Ave. to Jefferson St.	580.0 m	3.0 m	149 m (488')	77 km/h (>35 mph)	82 km/h (51 mph)
	Pierce St. to Florida Ave.	253.6 m	3.0 m	99 m (325')	72 km/h (>35 mph)	77 km/h (48 mph)
	Franklin St. to Ashley St.	201.5 m	3.0 m	98 m (322')	68 km/h (>35 mph)	71 km/h (44 mph)

Meets FDOT and AASHTO standards, therefore, no design variation/exception is needed.

Traffic volumes on the interstate within the study area range from 134,000 to 182,000 vehicles per day (ADT). Since the proposed improvements will not add capacity to the system, volume is expected to increase, but will remain constrained without additional lanes added to the system. Therefore, the existing horizontal geometrics will have little or no effect on the future Level of Service or the capacity of the interstate.

Crash data provided by FDOT District 7 for the study area was summarized. As shown in Table 2, data was provided for the segment of I-275 from west of Morgan Street to north of Central Avenue for the years 1990 through 1994. Table 2 shows that 67 crashes occurred within the 5-year time frame on this segment of I-275. These crashes represent only less than seven percent of the total number of accidents that occurred in the downtown interchange. In addition the existing critical shoulder widths will be increased from 0.6 meters (2 feet) to 3.6 meters (12 feet). This improvement will increase stopping sight distance from 92 meters (303 feet) to 113 meters (371 feet) northbound and from 75 meters (247 feet) to 119 meters (390 feet) southbound. This segment currently reports safety ratios well under 1.0 in every year between 1990 and 1994. This increase in stopping sight distance should reduce the already low crash rates.

An alternative solution of providing horizontal geometry to current standards was explored with the complete replacement of the facility (Alternative 3). This concept constructs the outside lanes of the ultimate Tampa Interstate Study EIS improvement. As stated previously, this alternative was eliminated from consideration due to its high construction and right-of-way costs. Alternative 3 is estimated to cost approximately $350 million to construct as compared to approximately $80 million for the Preferred Alternative.

RECOMMENDED BY:

Stephan F. Heimburg P.E.
Greiner, Inc. 6/27/96

APPROVED BY:

Lisa Hansen, P.E. District Design Engineer 7/5/96

SFH/MDF:sas
Attachments

TABLE 2

CRASH DATA SUMMARY
I-275 FROM WEST OF MORGAN STREET TO NORTH OF CENTRAL AVENUE
(MILEPOSTS 6.75 TO 6.98)

Item	Year					Total
	1990	1991	1992	1993	1994	
Total Crashes	17	18	12	2	18	67
Actual Crash Rate	1.289	1.424	0.968	1.631	1.327	N/A
Critical Crash Rate	2.217	1.915	1.968	3.588	1.792	N/A
Safety Ratio	0.581	0.743	0.491	0.454	0.740	N/A
Fatalities	0	0	0	0	1	1
Injuries	5	5	6	0	19	35
Property Damage Crashes	12	13	8	2	5	40
Economic Loss ($ Millions)	0.502	0.531	0.354	0.059	0.531	1.977