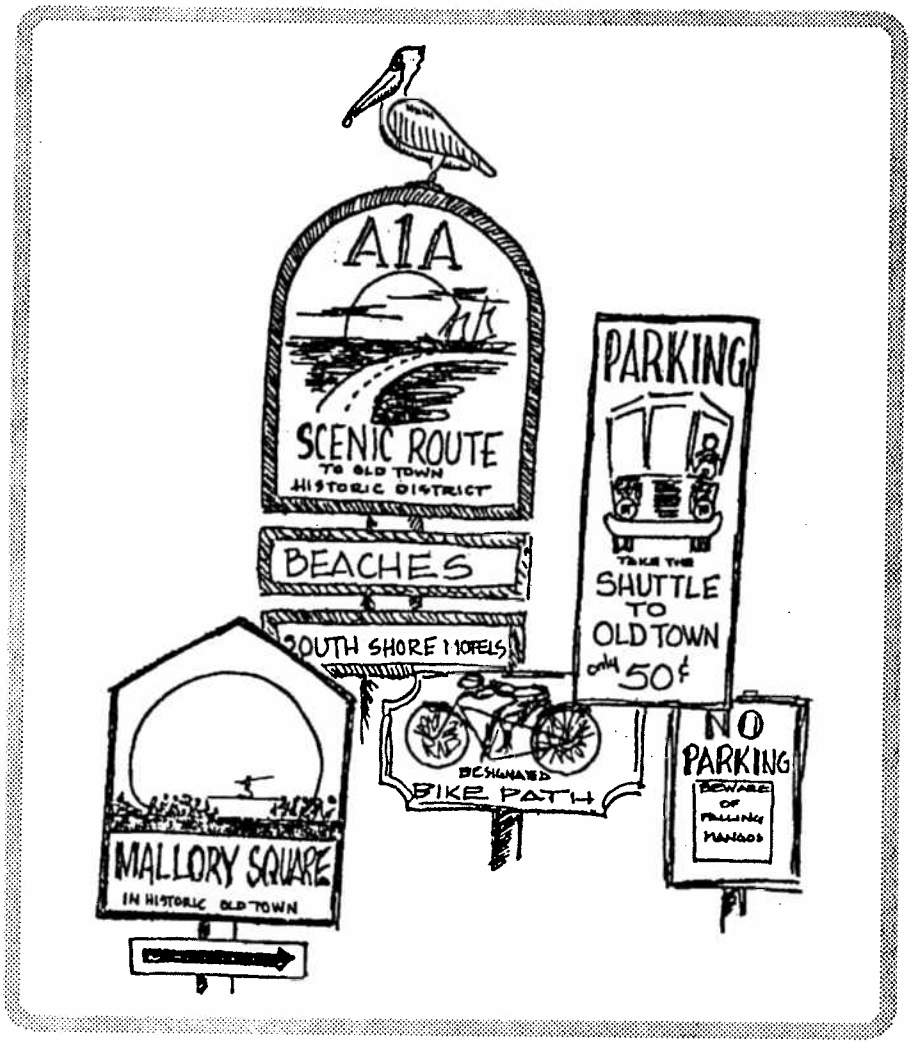
# KEY WEST

## TRAFFIC CIRCULATION STUDY

## TECHNICAL MEMORANDUM NO. 2




Prepared For
CITY OF KEY WEST
By The
FLORIDA DEPARTMENT OF TRANSPORTATION

# TECHNICAL MEMORANDUM NUMBER 2

Analysis of Existing Conditions
and
Future Capacity Deficiencies

Key West Traffic Circulation Study

Prepared For

City of Key West

Prepared By

Florida Department of Transportation

January 1988

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# INTRODUCTION

Existing and potential traffic circulation problems were identified by transportation planners from the Department of Transportation in February of 1984.

After an initial survey of the street system, it became evident that the primary problems associated with Key West could be defined as including:

(1) Narrow streets

(2) Tight corners (small turning radii)

(3) Visibility obstructions (parked cars, buildings, poles, etc.)

(4) Poor pavement conditions

(5) Poor signing and signalization

(6) Inadequate parking

(7) Limited right-of-way (no room for expansion)

These problems are compounded by substantial tourist generated traffic, delivery trucks and the allowance of bicycle and recreational vehicle traffic to use the street system.

This report will look at the traffic problems as it exists now and through modeling techniques developed by the Federal Government, project where the problems will be at buildout.

In the beginning of this report, a section on urban design standards is included to provide a basis to judge the depth of the existing problems.

The last section of this report will develop potential

approaches which could be applied to Key West to help relieve traffic congestion.

# URBAN DESIGN STANDARDS

Design standards will be referred to several times within this report. The design standard referred to here are national standards and are taken from A Policy On Arterial Highways In Urban Areas, published by the American Association of State Highway Officials.

## THROUGH TRAFFIC LANES

Lane widths on major streets normally should not be less than 11 feet and desirably not less than 12 feet. Under restricted conditions, it may be necessary to accept lane widths as narrow as 10 feet. However, as the lane width decreases from 12 feet the capacity is reduced considerably.

## PARKING LANES

Normally parking should not be considered on major streets. However, if parking is allowed, only parallel parking should be employed. Parking lanes should not be less than 10 feet wide with the outside edge of the space marked 8 feet from the curb.

## BORDERS

The border area lies between the roadway and the edge of the right-of-way and serves as a buffer strip providing space for

sidewalks and utilities. This border area should be at least 8 feet and preferably 12 feet wide. In residential areas the border strip is normally not less than 4 feet.

## INTERSECTIONS

Turning radii of 15 to 25 feet are adequate for passenger vehicles. For an occasional truck to turn without undue encroachment, a turning radii of 30 feet or more should be provided where feasible. For large truck combinations or buses a radii of 40 feet or more is needed. Preferably a 3-centered compound curve will be used.

Where parking is permitted, the parking lane in advance of and beyond the cross street should be kept clear to enable the driver of a stopped vehicle to see along the major street. Distances clear of parked cars should be at least 100 feet to the left and 70 feet to the right as measured from the cross street centerline.

## ONE-WAY OPERATION

In general, the same standards apply to both one-way and two-way street operation. At intersections of one-way streets where no left turns take place, radii of 5 to 10 feet are adequate.

## CIRCULATION ANALYSIS OF THE EXISTING STREET SYSTEM

The severity of the traffic problems depends on the location within the study area. In general, the newer areas of Key West were constructed to the latest design standards and therefore are capable of handling normal amounts of traffic. The older sections of Key West were constructed in some cases over a hundred years ago with streets designed for much narrower and slower moving vehicles. These narrow streets can not accommodate as much traffic as those streets in the newer sections of Key West.

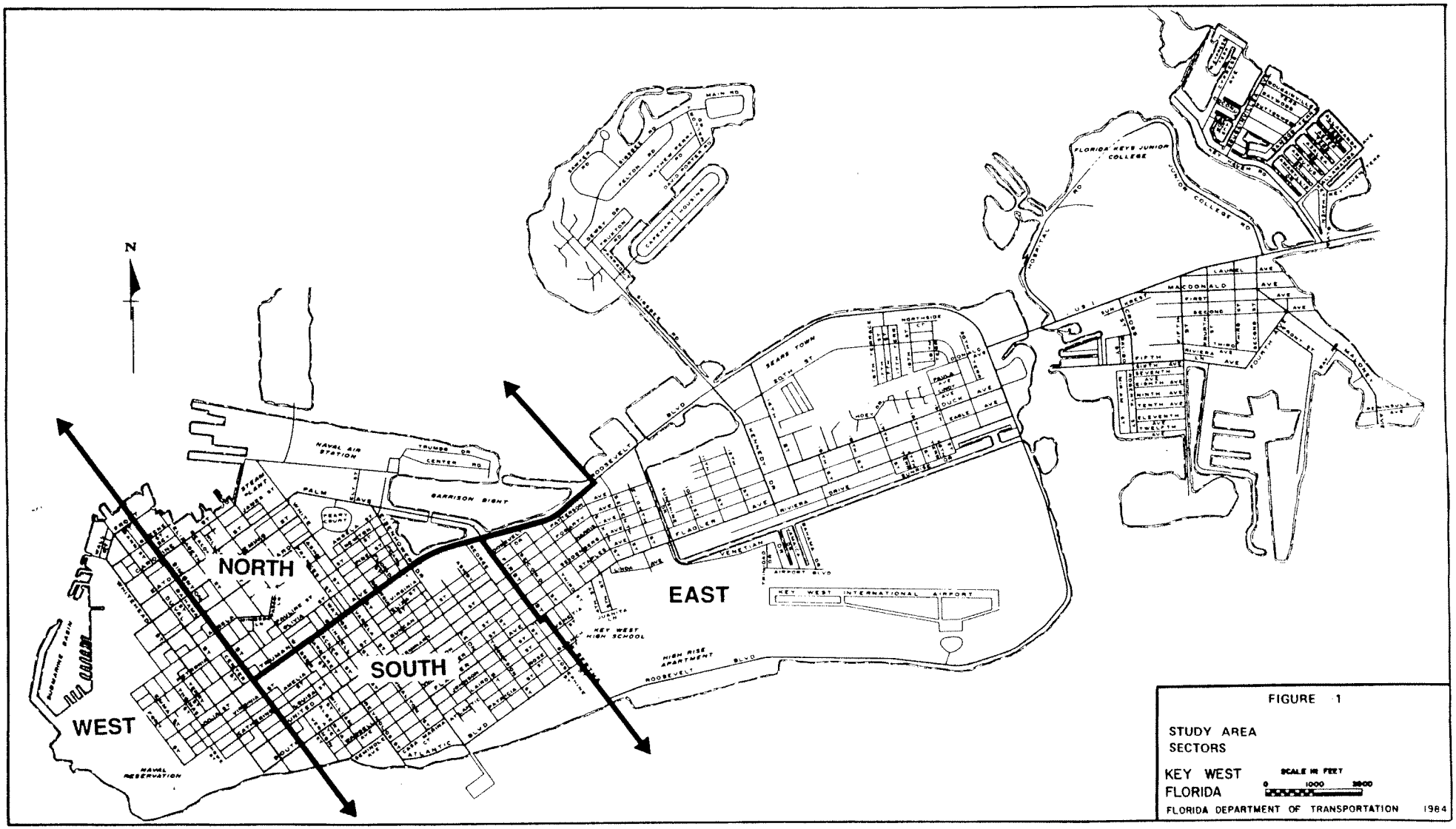
Figure 1 shows the study area split into four sectors. These sectors are generally homogeneous in nature and are provided in order to describe existing conditions in more detail.

### EAST SECTOR

The traffic flow in the East sector of Key West experiences few problems. Although there are some streets within this area which are not constructed to established design standards, they are primarily local streets and carry low volumes.

The development within this sector is the most recent and the street system has generally been constructed to established design standards. This, in part, is due to the availability of adequate right-of-way thus making it possible to adhere to the latest design standards as discussed previously.

The major traffic carrying arterials are all four lane facilities with pavement in good condition. Visibility is good and


N
NORTH
SOUTH
EAST
WEST
NAVAL AIR STATION
GARRISON BIGHT
KEY WEST INTERNATIONAL AIRPORT
FLORIDA KEYS JUNIOR COLLEGE
SEARS TOWN
HIGH RISE APARTMENT
KEY WEST HIGH SCHOOL
NAVAL RESERVATION
SUBMARINE BASIN
ROOSEVELT BLVD
ATLANTIC BLVD
FLAGLER
VENETIAN
AIRPORT BLVD
MACDONALD AVE
LAUREL AVE
FIRST AVE
SECOND AVE
THIRD AVE
FOURTH AVE
FIFTH AVE
SIXTH AVE
SEVENTH AVE
EIGHTH AVE
NINTH AVE
TENTH AVE
ELEVENTH AVE
TWELFTH AVE
US 1
SUN CREST
CROSS
MAIN RD
CENTER RD
PALM AVE
WHITEHEAD ST
DUVAL ST
FRANKLIN ST
SIMONTON ST
FRANKLIN ST
SOUTH ST
PORTER ST
FLORIDA ST
ANTONIA ST
JUANITA LN
PAULA AVE
EAGLE AVE
EDUCATION DR
NORTHSIDE CT
KENNEDY DR
RIVIERA DRIVE
RIVIERA AVE
SEA GULL DR
MAJORE
BAHAMA VILLA AVE
STEAM PLANT
TRUMAN AVE
TRUMAN DR
SOUTHARD ST
WHITE ST
ANGELA ST
ALBERTA ST
ANNEX
CAPE CORAL
CAPE HORN
CAPE SPRING
CAPE VERDE
CAPE VIEW
CAPE VISTA
CAPE WINDS
CAPE YORK
CAPE ZEAL
CAPE ZEST
CAPE ZIP
CAPE ZOOM
CAPE ZOOM
CAPE ZOOM

there appears to be adequate parking within this sector. There is some onstreet parking but it does not appear to restrict traffic flow. Except for North Roosevelt Boulevard, the arterials within this sector are generally underutilized and have excess capacity.

There is some reduction in capacity on North Roosevelt Boulevard due to traffic turning into the numerous driveways which dot this section of roadway. Vehicles pulling onto North Roosevelt Boulevard from these driveways also have a tendency to reduce capacity. Visibility of approaching traffic is limited and vehicles have to edge into the street somewhat to view the oncoming traffic. This causes friction with the main street traffic, thus reducing capacity. This reduction in capacity has impacted the motorist to some degree, average vehicle speed is decreased and vehicle delay has increased.

North Roosevelt Boulevard appears to be the primary route to and from the Old Town area of Key West. North Roosevelt Boulevard also provides access to Key West's two major shopping centers. As Key West grows, traffic will increase on North Roosevelt Boulevard disproportionately more than the other arterials. North Roosevelt Boulevard is already beginning to experience severe problems and as buildout approaches, the problem will intensify.

SOUTH SECTOR

The traffic flow in the South sector experiences what could be characterized as interrupted flow. That is, motorists experience a substantial drop in operating speed due to

fluctuations in traffic volume and the increase in temporary restrictions.

This sector is primarily old residential with new highrise condominiums being constructed along the water front. The street system within this sector was constructed as local streets to serve as access to the residence. The streets are generally narrow, the pavement condition is poor and parking, although adequate, is allowed along the streets. This combines to reduce the capacity of the streets substantially.

With the growth of the East sector, or New Town, a new element in the traffic flow pattern emerged. Traffic before the growth of the East sector was primarily North and South, going to and coming from Old Town. Traffic originating in the East sector is now adding a through movement to the South sector. Streets that were constructed as collectors and locals are now operating as arterials, thus pushing the capacity of the street system to the limit. Additionally, there appears to be little or no possibility for expansion.

WEST SECTOR

The streets in the West sector of the study area are experiencing severe traffic problems.

This sector has a diverse mix of land uses. The Historic District makes up a large portion of this sector with its many old buildings, commercial redevelopment and some condominiums. The Historic District also contains most of Key West's famous tourist

attractions. In addition to the Historic District, this sector contains hotels and motels with a large concentration of residential structures located towards the southern most point.

Fort Zachary Taylor with associated beaches in conjunction with the potential development of the Truman annex, could become a large attractor of activity. This would add more traffic to an already overburdened system.

Many roads are narrow and do not meet today's established design standards. In addition, buildings in the Historic District were often constructed with very little setback, thus causing sight distance problems and affording few alternatives for roadway expansion.

Offstreet parking is inadequate, causing tourists and many residents to circulate through the area looking for parking.

Onstreet parking is located within this sector but there are not enough spaces to satisfy the demand. Intense competition exists for all vacant spaces at peak periods during the day.

Pavement conditions, although much improved following recent sewer line replacement, are still poor in many areas. This has a tendency to reduce average speed thus decreasing capacity. Further speed reductions are created by pedestrian and bicycle traffic mixing with motorized traffic.

This sector also incorporates what is considered the Central Business District (CBD). The CBD houses much of the city and county governmental offices as well as private business. Traffic generated here combines with the tourist traffic creating a situation where demand generally exceeds established capacity

standards.

NORTH SECTOR

The traffic flow in the North sector also experiences what could be characterized as interrupted flow.

This sector is composed of a mix of old residential structures transformed into apartments, hotels and motels, an assortment of restaurants and the naval air station.

The naval air station is physically saparated from the North sector with an exit/entrance at only one point. Traffic associated with the Navy impacts this sector basically in the morning and afternoon peaks.

Parking is provided in this area primarily as onstreet parking serving mainly the residents. Because of the prevalence of apartments in the area, parking along both sides of the road is necessary. Combined with narrow streets, the effective number of lanes in some cases is reduced to one.

Inadequate parking in the downtown has resulted in temporary parkers spilling over into the residential sections. This causes competition among the residents for the available spaces which in turn causes an increase in traffic circulating through the area.

Pedestrian traffic is not a widespread problem in the North sector. However, bicycle traffic is. Because of this area's close proximity to Old Town, residents choose to ride bicycles as a means to get around. Bicycle traffic as well as the poor road surface condition have a tendency to slow traffic and reduce capacity.

GENERAL KEY WEST COMMENTS

Delivery and recreational vehicles are allowed access to all parts of Key West. This compounds the traffic problem, especially in sections where the streets are too narrow and the turning radii too small to accommodate those types of vehicles.

The conch train, a well known institution on Key West, has both positive and negative effects on Key West's traffic problem. On the positive side, the train gets people out of their cars who would otherwise drive to the various tourist attractions. Thus, in a sense, the conch train reduces demand on the street system. On the negative side, the conch trains are slow moving vehicles making frequent stops, thus interrupting vehicular flow on the street system.

The conch train's primary pickup point and ticket office is in the heart of the Historic District where the streets are poorest by design standards. In this setting the trains cause the greatest disruption to traffic flow.

Key West has a city owned transit system. The bus system consists of four buses in operation on one route. Ridership is low. The bus system is used primarily by local residents without private transportation. The bus system connects Stock Island to the Old Town area. The route provides access to the Old Town area from most of the hotels and motels on the island. The system has the potential to provide a measure of relief to a street system

which is rapidly becoming overburdened.

## CAPACITY ANALYSIS OF THE EXISTING STREET SYSTEM

Capacity on major streets is governed primarily by the capacity through intersections which, to a large degree, is operated under signal control. This capacity through intersections provide the basis for the development of capacities used within the state for systems level planning. These capacities were developed using the method described in the 1965 Highway Capacity Manual.

The Highway Capacity Manual is produced by the Federal Government as Highway Research Board Special Report 87.

The capacities found in the highway capacity manual describes how much traffic can be accommodated on a particular highway segment on an hourly basis. The traffic that is developed by the models used for the purpose of this study, however, are average daily volumes.

The general approach to be used is to start with recommended base capacities (hourly capacities) and adjust those capacities, by using adjustment factors, to daily capacities for comparison with projected daily volumes developed by the models.

A method for comparing the hourly as developed through techniques described in the Highway Capacity Manual, to the average daily traffic produced by the models will be described in this section.

## LEVEL OF SERVICE

The term level of service will be referred to several times throughout the remainder of this section. It is necessary that level of service be understood before preceeding with this report. Level of service is given a letter designation and ranges from level "A" through level "F". These levels of service describe the traffic operating condition existing under various speed and volume situations. Starting with level of service "A" as the best operating condition, the levels of service progressively decrease in quality, with level of service "F" being the poorest operating condition.

The characteristics of traffic flow for the various levels of service are summarized in Table 1.

## RECOMMENDED BASE CAPACITIES

The Florida Department of Transportation has developed a procedure which outlines recommended capacity values for various combinations of Area Type, Facility Type and Number of Lanes.

It is obvious that capacity will vary with the number of lanes, but it may not be so obvious that capacity will vary according to the area the road passes through and according to the type of facility the road is. This is generally due to the priority given to the traffic flow and the number of signalized intersections.

The recommended capacities are presented in Table 2. All

Table 1 Level of Service Concept

---

Level of Service A

- Free Flow conditions
- Low volumes
- High operating speeds
- No restrictions on maneuvering
- Drivers may not have to stop at signalized intersections

Level of Service B

- Stable flow conditions
- Operating speeds beginning to be restricted
- Drivers may have to stop at signalized intersections, but only for one signal indication

Level of Service C

- Drivers may have to wait through more than one signal indication
- Backups may develop behind turning vehicles
- Drivers feel somewhat restricted

Level of Service D

- Delays to approaching vehicles may be substantial during short peaks within the peak period, but there are enough cycles with lower demand to permit periodic clearance of developing queues
- Increasing restriction approaching instabability

Level of Service E

- Delay may be up to several signal indications
- Volumes at or near capacity
- Unstable flow
- Major delays and stoppages

Level of Service F

- Forced flow conditions
- Low speeds
- Volumes below capacity, may be zero at times
- Stoppages for long periods because of downstream congestion

---

Table 2 Recommended Base Capacities
(250,000 < Population < 750,000)

Hourly Capacities in Vehicles/Hour/Lane (LOS "E")

| # Lanes | Div Art | Art | Coll | One-Way |
|---|---|---|---|---|
| | | **Area Type 1: CBD** | | |
| 1 | --- | 560 | 460 | 650 |
| 2 | 670 | 540 | 430 | 660 |
| 3 | 700 | 560 | 450 | 670 |
| | | **Area Type 2: Fringe** | | |
| 1 | --- | 710 | 570 | 670 |
| 2 | 840 | 680 | 540 | 680 |
| 3 | 870 | 700 | 560 | 690 |
| | | **Area Type 3: Residential** | | |
| 1 | --- | 710 | 570 | 780 |
| 2 | 840 | 680 | 540 | 790 |
| 3 | 870 | 700 | 560 | 820 |

capacities shown in Table 2 are per lane, one direction, hourly capacities. These capacities are for level of service "E" and are generally considered the maximum capacities possible.

These capacities were derived based on a list of assumptions that can be found in Task C-Develop Standard Distribution and Assignment Models from the Florida Department of Transportation's Urban Transportation Planning Model Update Phase II, as prepared by COMSIS. These assumptions are reproduced in Table 3. The assumptions represent the prevailing condition found within the urban areas throughout the state.

Unfortunately, a large portion of the City of Key West was constructed over a century ago and do not conform to the prevailing conditions. The condition prevalent in Key West creates capacities that are somewhat less than the prevailing condition found in the state. The capacities in Table 2 can be used if it is realized that the actual Key West capacities may be less in some situations. That fact needs to be subjectively taken into consideration when determining what improvements are needed.

## POPULATION ADJUSTMENT FACTORS

The recommended capacities from Table 2 are based on an urban area population falling within the range of 250,000 to 750,000. Capacities can vary somewhat between urban areas depending on population. Large cities can actually squeeze more capacity out of the street system than smaller urban areas.

More flexibility in the assignment process was obtained by

Table 3 Capacity Calculation Assumptions

---

1. Capacities assume lane widths of 12 ft. for all facilities
2. Right Turn = 10%, Left Turn = 10%, Trucks = 5%
3. No parking on Divided Arterials
4. Parking permitted on 50% of Undivided Arterials and Collectors
5. One third of One-Ways have no parking. One third have parking on one side, and one third have parking on both sides
6. G/C for Divided Arterials = 60%, Undivided Arterials = 50% and for Collectors = 40%
7. All capacities are <u>per lane</u>, one direction, hourly capacities
8. Capacities are Level of Service "E", therefore the load Factor = 1.0
9. Lane widths, lateral restrictions, alinement, and grades will have negligible effect on capacity of freeways and expressways
10. Adjustment Factor for lane width and lateral clearance, W = 0.95
11. Area type will not effect freeway capacities
12. Grades have negligible affect on capacity
13. Population approximately 500,000
14. Peak hour factor = 0.85
15. For systems level planning in urban areas, critical arterial capacities will occur at signalized intersections, therefore, except for freeways, intersection capacities will be used
16. Parking lanes are 8 feet wide

---

making the capacity tables sensitive to area population. This is accomplished by multiplying the capacities presented in Table 2 by the appropriate population adjustment factor. The recommended population adjustment factors are found in Table 4.

## RELATIONSHIP TO DAILY CAPACITY

Volumes established by the quick response model, used in this effort, are average daily volumes (24 hour volumes). Since capacities developed by the Department are hourly capacities, a relationship needs to be established that relates hourly capacity to a daily capacity. The logical relationship is that if a roadway has an hourly capacity of "x" amount, then it should have 24 times that amount for the entire day. This, however, would be the case only if traffic was spread uniformly throughout the day.

Urban traffic varies throughout the 24 hours of the day as shown in Figure 2. Generally traffic is clustered around three peak periods of the day. The major peak period is almost always the evening peak, ranging usually from 4 to 6pm with the actual peak hour falling from 5 to 6pm. The morning peak hour normally occurs between 7 and 8am. A sub-peak, associated with the lunch period, usually occurs between 12 noon and 1pm. Average daily traffic is simply an average of all the days traffic from midnight to midnight.

Typically in urban areas the peak hour traffic is from 10 to 12 percent of the average daily traffic. By dividing the hourly capacity by the percent of traffic in the peak hour, a

Table 4 Population Adjustment Factors

| Population | Factor |
|---|---|
| <250,000 | 0.940 |
| 250,000 - 750,000 | 1.000 |
| 750,000 - 1,000,000 | 1.030 |
| >1,000,000 | 1.075 |

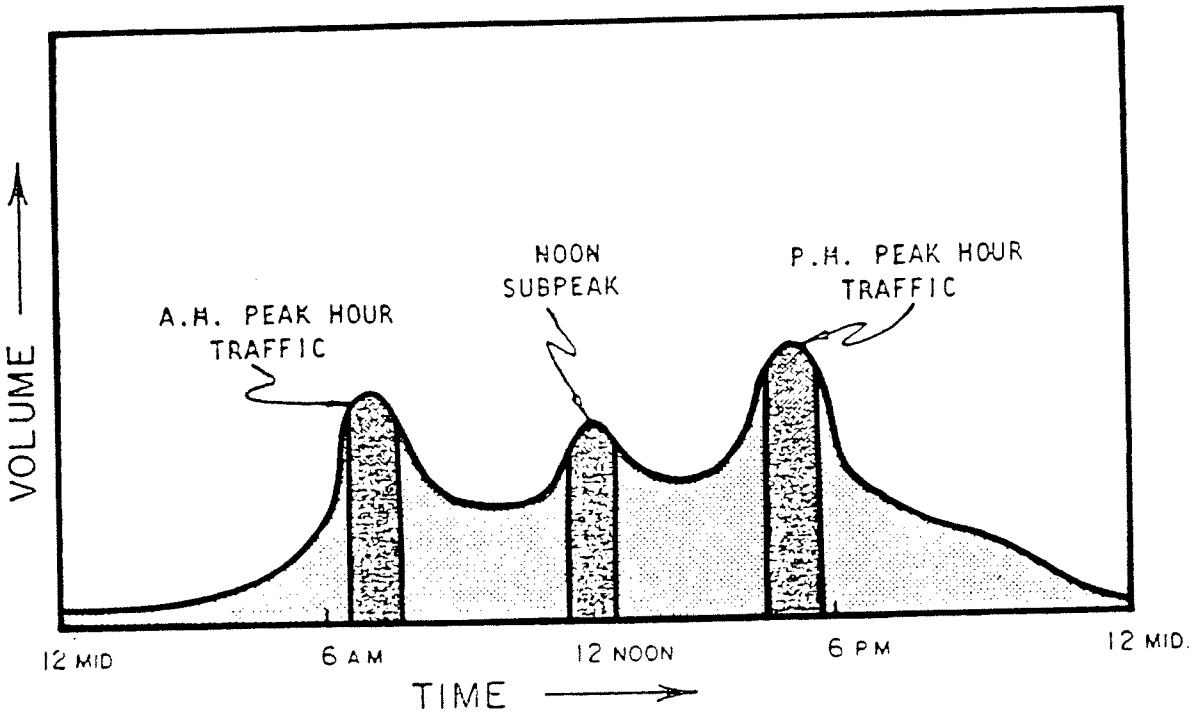



FIGURE 2 TYPICAL DAILY TRAFFIC DISTRIBUTION FOR URBANIZED AREAS

relationship between hourly and average daily capacity develops. This capacity then becomes the capacity of the roadway system that could reasonably be expected over the course of the day.

Key West, however, is not a typical urban area. A large percentage of the traffic in Key West is tourist oriented. This traffic has a tendency to increase the off-peak traffic which reduces the percentage of traffic in the peak hour. From hourly counts conducted in Key West in January and February of 1984, the average percentage of traffic in the peak hour was determined as being 9%.

For Key West, the relationship to convert hourly capacity to daily capacity is to divide the hourly capacity by the percent traffic in the peak hour. Which in Key West's case, is to divide by 0.09.

## DAILY CAPACITY CALCULATIONS

The first step in determining the daily capacity is to multiply the capacities found in Table 2 by the population adjustment factor. Since this table is calibrated for cities with a population between 250,000 and 750,000, the capacity needs to be adjusted to reflect Key West's size. Population adjustment factors have been previously discussed and are listed in Table 4.

Since the capacity found in Table 2 is on a per lane one direction basis, the next step is to multiply the population adjusted capacity by the total number of lanes. This gives the total hourly capacity for any section of roadway.

The last step is to divide these capacities by the peak hour percentage which converts the value to a daily capacity.

The formula for daily capacity may be written as follows:

$$DC = (NL)(HC)(PAF)/(PHP)$$

DC = Daily Capacity
NL = Number of Lanes
HC = Hourly Capacity (Table 2)
PHP = Peak Hour Percentage (.09 for Key West)
PAF = Population Adjustment Factor (Table 4)

Note that the capacities at this point are still at level of service "E". Table 5 shows these capacities in tabular form.

## MAXIMUM CAPACITY

The capacities in Table 5, like the hourly capacities in Table 1, are arranged by Area Type, Facility Type and Number of Lanes. This is logical, as mentioned before capacity varies depending on the activity within an area and the Facility traveled. The Central Business District, with it's high density of intersections and signals can not be expected to develop the capacities of an area with a lesser density. Also, divided facilities, by vertue of their saparation of opposing movements can carry more traffic than a facility that is undivided. The capacities were developed specifically to be sensitive to varying landuses and differences in facility traveled.

Figures 3,4 and 5 shows the Area Types, Facility Types and Number of Lanes that are applicable to Key West. Applying the

Table 5 Key West Capacities

Daily Capacities in Vehicles/Day/Direction (LOS "E")

| # Lanes | Div Art | Art | Coll | One-Way |
|---|---|---|---|---|
| **Area Type 1: CBD** | | | | |
| 1 | ----- | 5850 | 4800 | 6800 |
| 2 | 14000 | 11300 | 9000 | 13800 |
| 3 | 21950 | 17550 | 14100 | 21000 |
| **Area Type 2: Fringe** | | | | |
| 1 | ----- | 7400 | 6000 | 7000 |
| 2 | 17600 | 14200 | 11300 | 14200 |
| 3 | 27300 | 21900 | 17550 | 21600 |
| **Area Type 3: Residential** | | | | |
| 1 | ----- | 7400 | 6000 | 8150 |
| 2 | 17600 | 14200 | 11300 | 16500 |
| 3 | 27300 | 21900 | 17550 | 25650 |

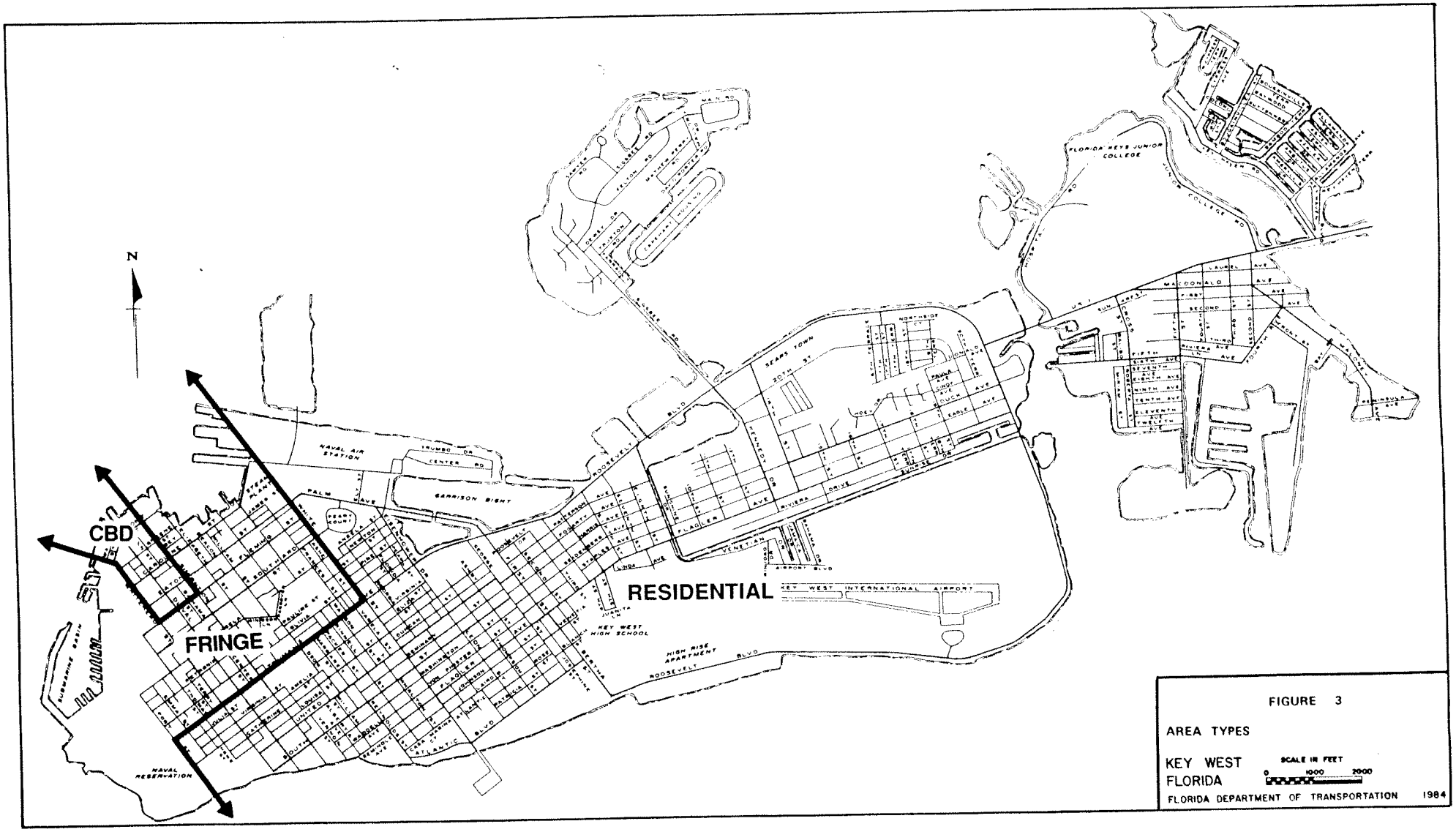



FIGURE 3

AREA TYPES

KEY WEST
FLORIDA

SCALE IN FEET
0 1000 2000

FLORIDA DEPARTMENT OF TRANSPORTATION 1984

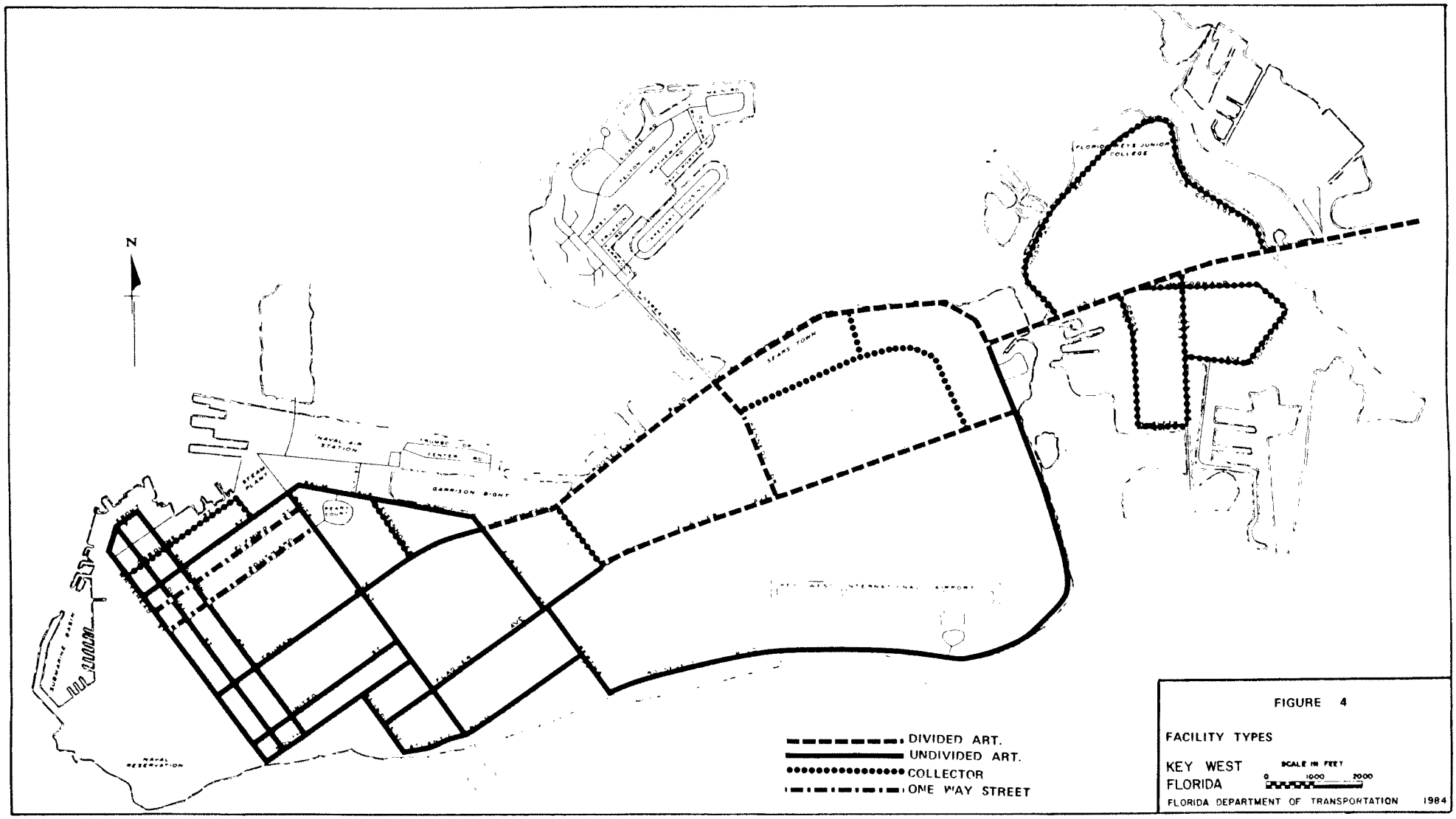



FIGURE 4

FACILITY TYPES

KEY WEST
FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION 1984

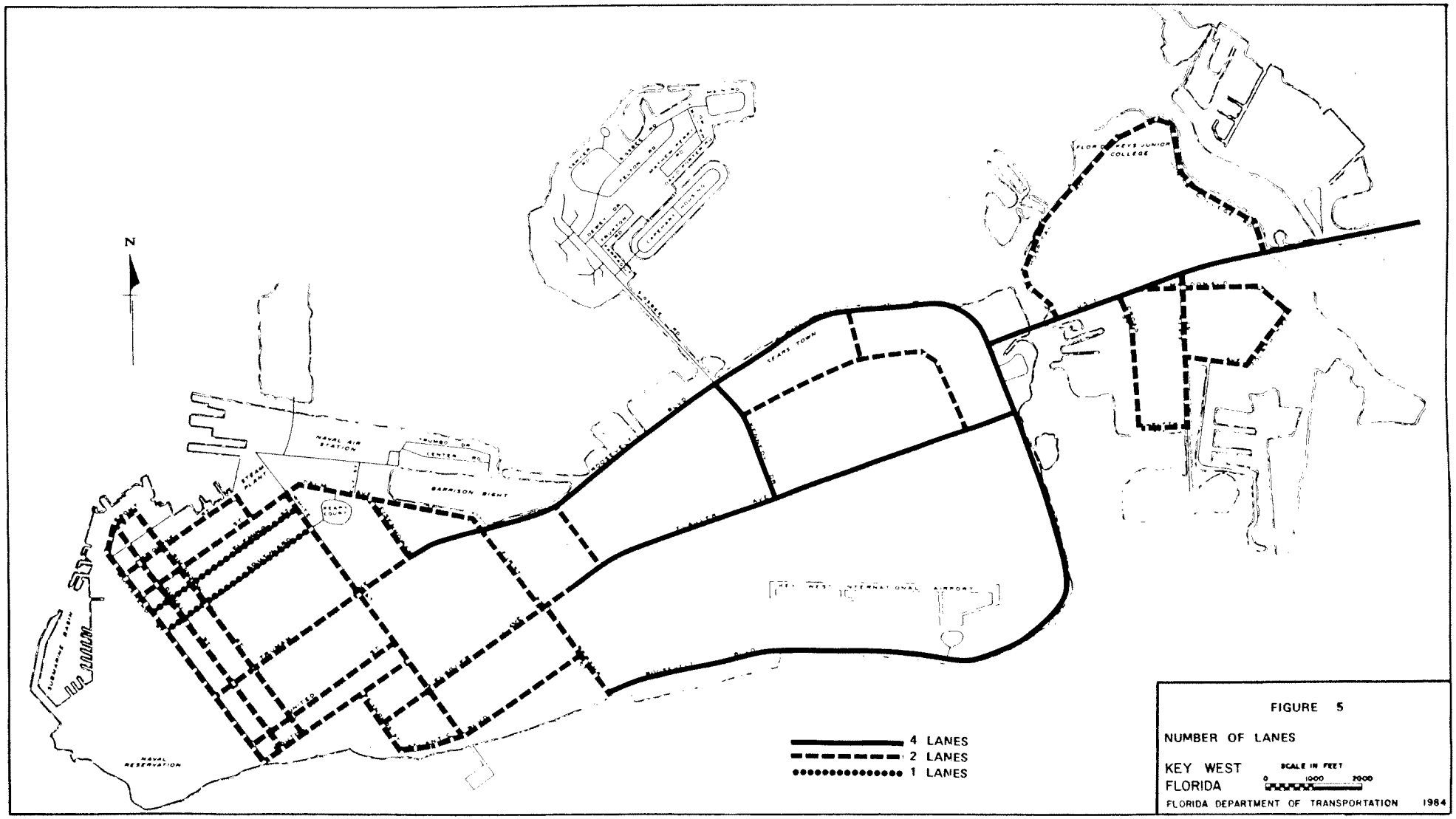



FIGURE 5

NUMBER OF LANES

KEY WEST
FLORIDA

SCALE IN FEET
0 1000 2000

FLORIDA DEPARTMENT OF TRANSPORTATION 1984

capacities found in Table 5 with the proper Area Types, Facility Type and Number of Lanes provides the network capacities found in Figure 6. These capacities are at level of service "E" and are theoretically the maximum capacities obtainable.

## DESIGN CAPACITY

At level of service "E" or maximum capacity, the transportation system is unstable. Any irregularity in the traffic flow will cause that portion of the system to break down. There is no reserve capacity to accommodate such irregularities. Roadways are typically designed with some measure of reserve.

Past recommendations have been to design roadways for level of service "C". Level of service "C" operating condition is generally where vehicles start to experience delays, where drivers may have to sit through more than one signal cycle. There is reserve capacity under level of service "C" and any irregularities short of total blockage can generally be accommodated. For the most part, delays under level of service "C" operating conditions are considered to be tolerable.

As urban areas become more developed, the cost for additional right of way in some instances is prohibitive. Because of costs and to a greater extent public concerns, policy makers are increasing that threshold where improvements are considered necessary. The trend is now to raise that threshold to level of service "D". Delays for level of service "D" are somewhat more severe than level of service "C" but are generally still

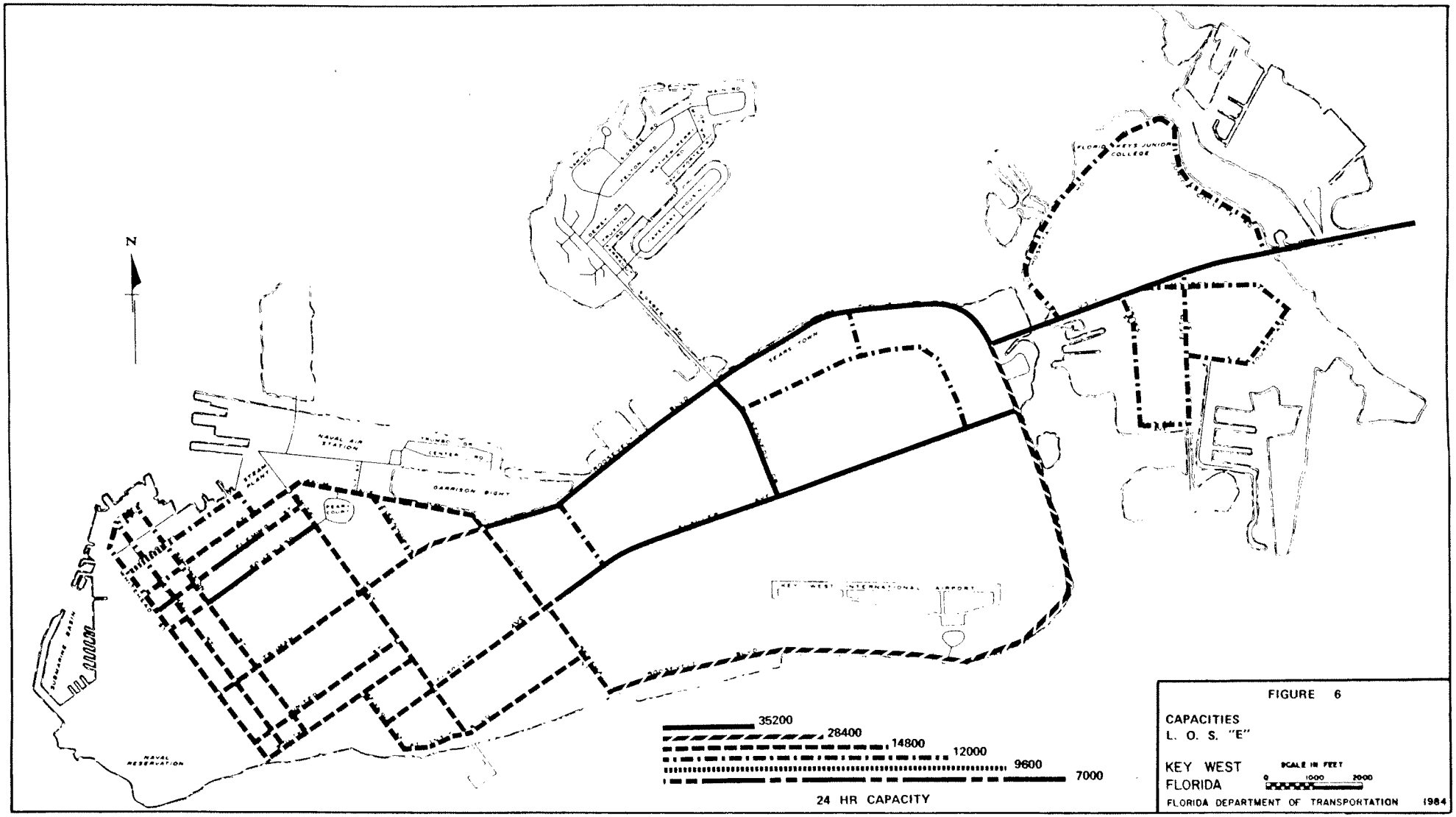



FIGURE 6

CAPACITIES
L. O. S. "E"

KEY WEST
FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION 1984

considered tolerable.

The Monroe County comprehensive plan calls for a level of service "D" but leaves the choice up to the municipalities to choose their own standards. As a reference, Key Colony Beach has set their level of service standard as "C".

For the purpose of this study, it is suggested to develop a plan where possible, based on a capacity that falls between level of service "C" and "D". Figure 7 shows the capacities suggested for use.

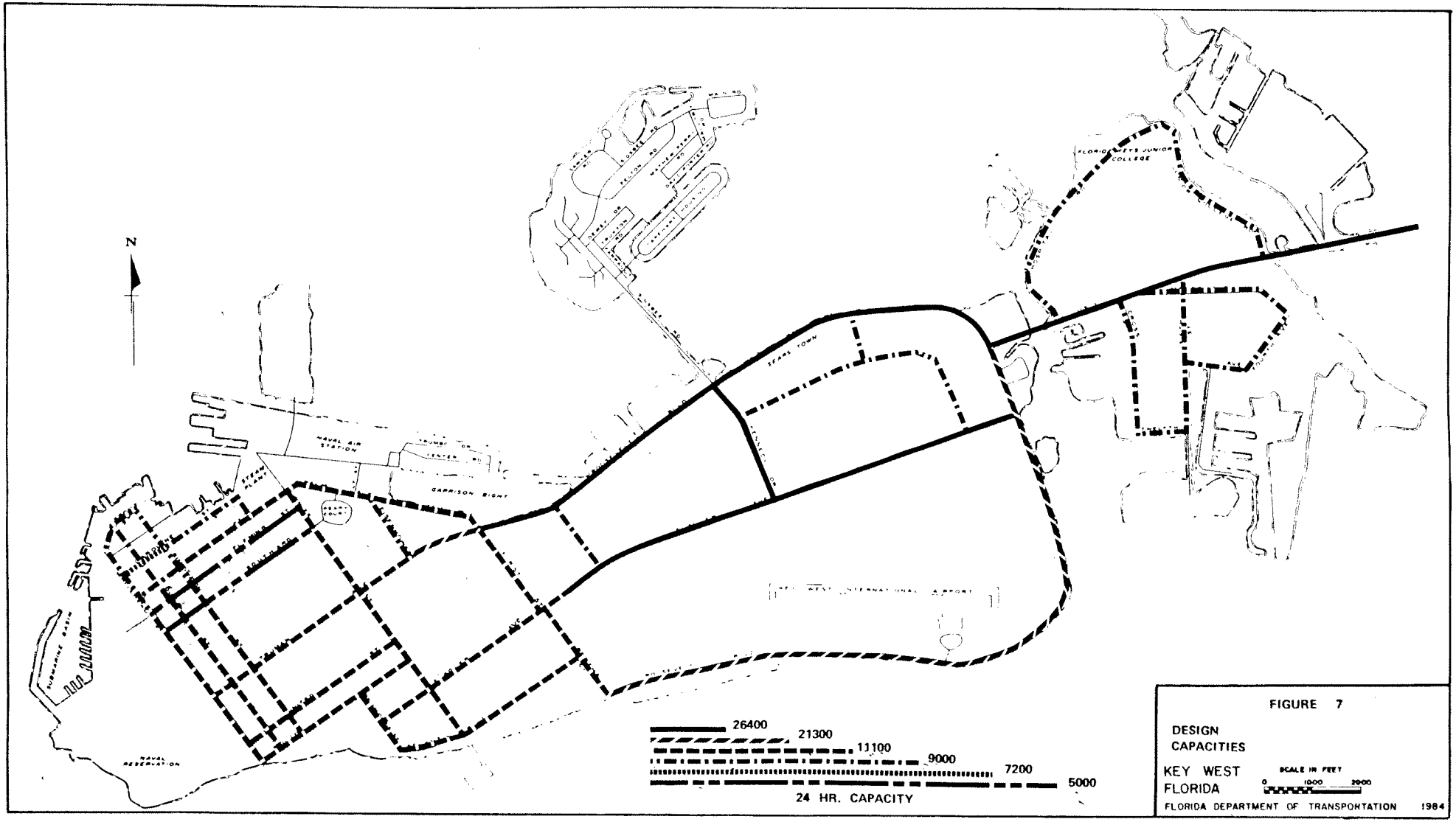



FIGURE 7

DESIGN CAPACITIES

KEY WEST FLORIDA

SCALE IN FEET 0 1000 2000

FLORIDA DEPARTMENT OF TRANSPORTATION 1984

## FUTURE TRAFFIC ASSIGNMENT

A future traffic assignment was generated from buildout data provided by City of Key West planners. The assignment provided buildout system traffic overlayed onto the 1980 street system. Figure 8 shows the results of that assignment. The posted volume is the highest volume determined along any particular segment of roadway.

Technical Memoranda 1 explains the process used in the development of the models. For any questions on the modeling process, please refer back to Technical Memoranda 1.

## DEFICIENCY ANALYSIS

Comparing the volumes for buildout with the recommended capacities establishes those areas which are deficient in capacity. Figure 9 outlines those roadways which have greater volume than capacity available.

The capacity deficient roadways for the future are not unexpected. They are generally the same sections that are experiencing some difficulty today. Referring back to Figure 9, those roadways highlighted with a heavy solid line are roadways where the volume exceeds the capacity by 10% or greater. The dotted line indicates those sections of roadway where the volume exceeds the capacity by less than 10%.

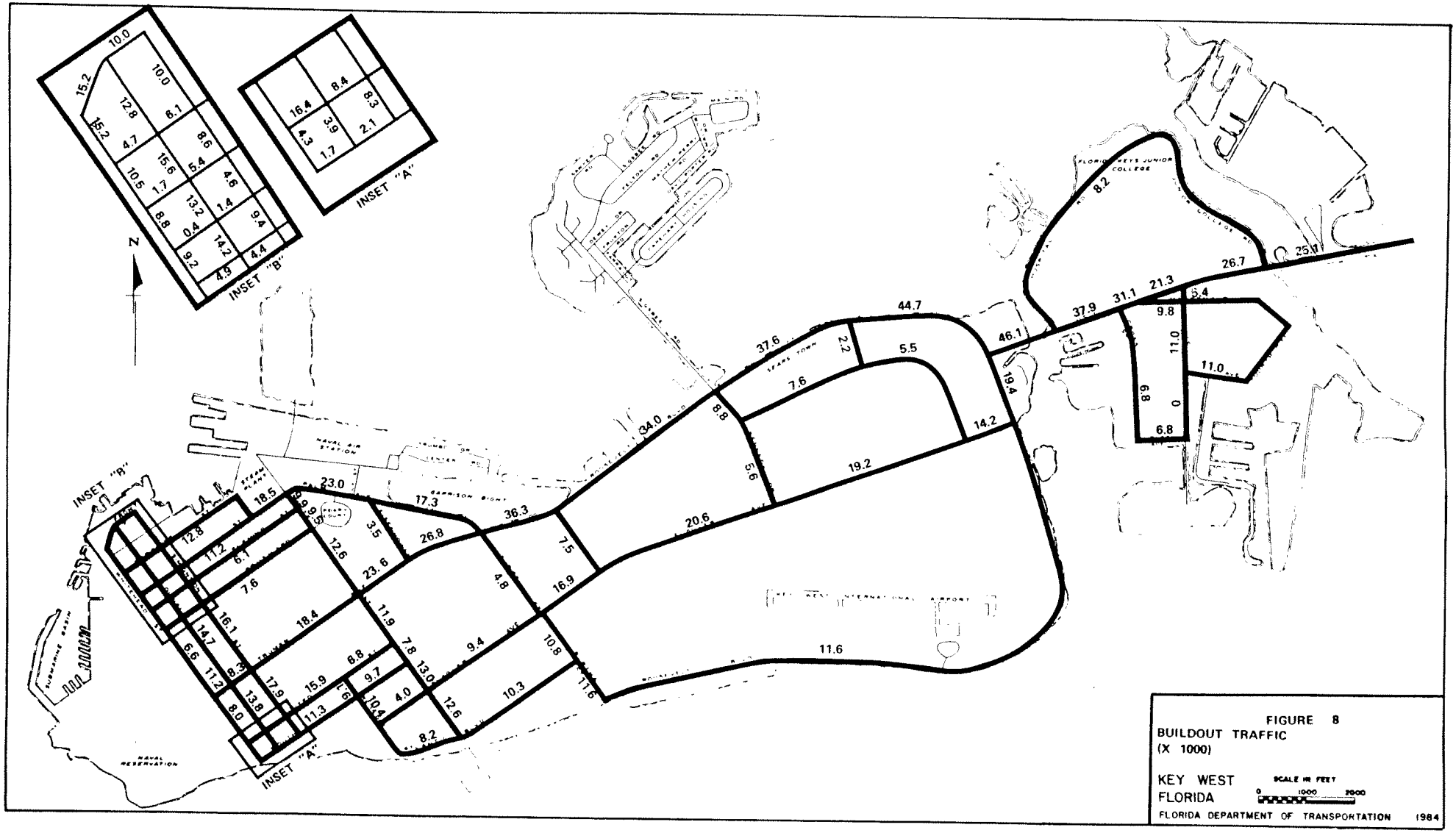



FIGURE 8
BUILDOUT TRAFFIC
(X 1000)

KEY WEST
FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION 1984

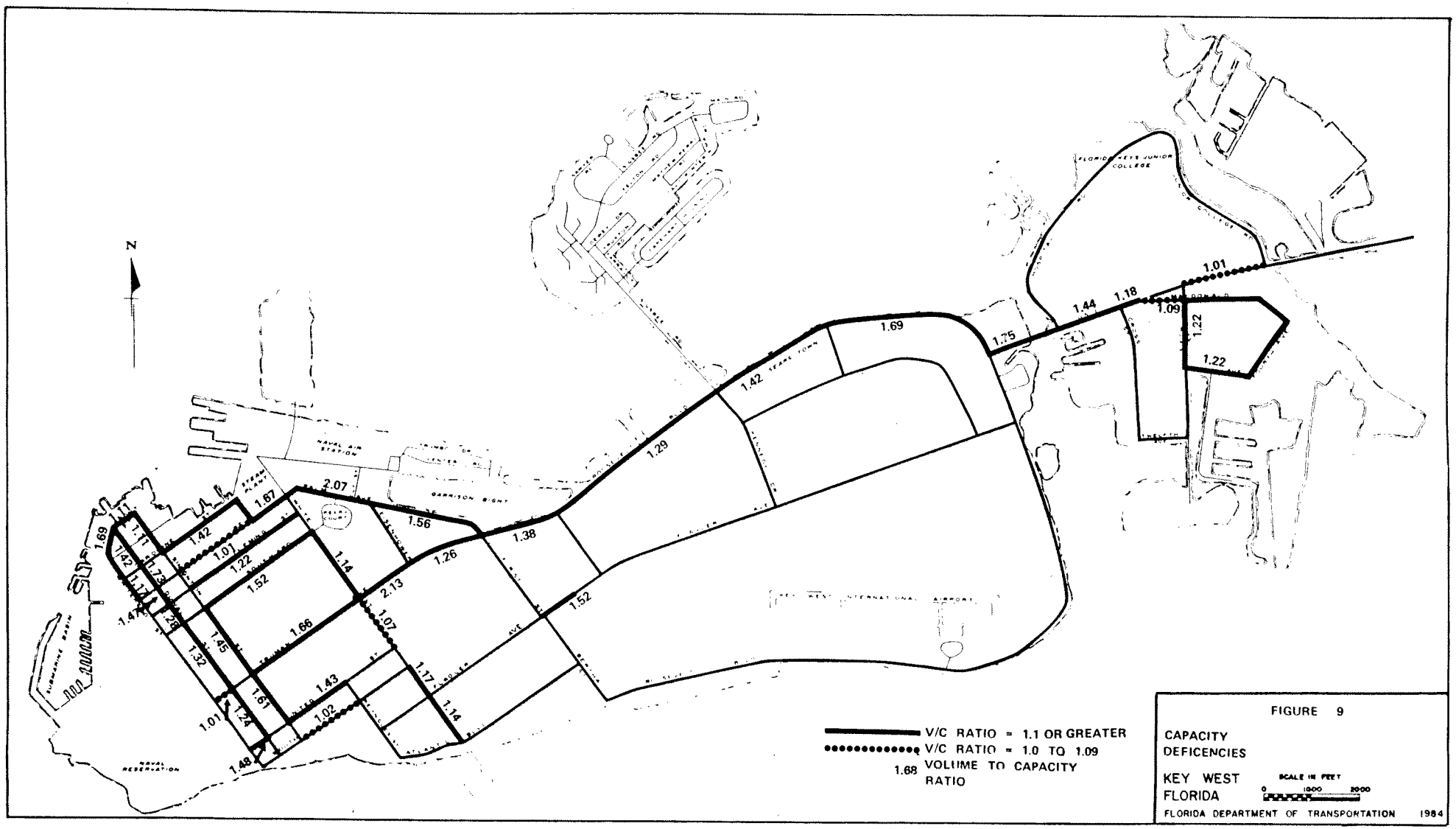



FIGURE 9

CAPACITY DEFICENCIES

KEY WEST
FLORIDA

FLORIDA DEPARTMENT OF TRANSPORTATION 1984

## DEFICIENT ROADWAYS

Out of the roadway sections where volume exceeds capacity by 10% or greater, the 10 sections with the worst problems are listed in Table 6. These roadway sections comprise the primary routes into town. Any solution should address these problem areas first. The appendix shows a complete listing of deficient roadways with volume to capacity ratios. Volume to capacity ratios greater than one, show roadways with volumes greater than capacity.

In some isolated circumstances, the model may overload segments of the street system that in reality may not become overloaded. An example of this is on Stock Island where the MacDonald Ave., Fourth Ave., Fifth Ave. and Fifth St. loop was loaded beyond capacity. This excessive loading is primarily due to the model only being able to load the street network at a minimum number of points. In reality, drivers would be able to access a street at any point along the street but this is too complex a situation for the model to recreate. Instead of the trips entering and exiting the street system at a multitude of access points, the model can only load at a few points. This can create some excessively high loadings in some places.

The models are only a tool and their results should not be used with out analyzing the whole situation. The models should not be a substitute for common sense, personal knowledge of the area or good judgment.

Table 6 Deficient Roadways

| Roadway Description | Percent of Capacity |
|---|---|
| (1) US 1<br>From: Cross Street on Stock Island<br>To: Roosevelt Boulevard | 175 |
| (2) North Roosevelt Boulevard<br>From: US 1<br>To: Palm Avenue | 169 |
| (3) Palm Avenue<br>From: North Roosevelt Boulevard<br>To: White Street | 207 |
| (4) Truman Avenue<br>From: Simonton Street<br>To: Palm Avenue | 213 |
| (5) Flagler Avenue<br>From: First/Bertha Street<br>To: Four lane section | 152 |
| (6) Caroline Street<br>From: Simonton Street<br>To: Grinnell Street | 142 |
| (7) Southard Street<br>From: Simonton Street<br>To: White Street | 152 |
| (8) Simonton Street<br>From: Southard Street<br>To: United Street | 161 |
| (9) Duval Street<br>From: Front Street<br>To: United Street | 173 |
| (10) Eaton Street<br>From: White Street<br>To: Grinnell Street | 167 |

## IMPROVEMENTS FOR CONSIDERATION

The range of possible improvements which can be implemented in urban areas to reduce congestion fall within two groups. The first group of improvements are those projects which increase the capacity of the roadway. These projects when completed tend to have a noticeable and immediate effect. Typical projects that increase capacity are projects such as:

Lane Additions
Lane Width Improvements
Surface Condition Improvements
Removal of Onstreet Parking
Implementation of One-Way Pairs
Improve Signalization

The other group of improvements are those projects which decrease demand. These projects are less noticeable and may take some time before the effects are maximized. Typical projects which decrease demand are projects such as:

Creation of Offstreet Parking
Non-Resident Traffic Prohibition
Promotion of Bicycling
Provide Remote Parking for Large Vehicles
Peak Period Truck Restrictions
Improve Signing
Improve Bus Service

Each improvement is discussed in more detail over the next few pages.

## CAPACITY INCREASING IMPROVEMENTS

### Lane Additions

The obvious solutions are those which pertain to roadway widening. Sometimes the only way to reduce congestion is to increase capacity by the addition of more lanes. The Roadways listed earlier as having the worst problems are all candidate roadways for additional lanes.

### Lane Width Improvements

Lane width improvements pertain to increasing the widths of the existing lanes. Lane widths play an important role in the capacity considerations. Up to a point, the wider the lane of travel the greater the capacity. By improving a two lane roadway from a width of 20 feet to the standard 24 feet, a considerable amount of capacity can be added. Where adequate right of way exists, considerations should be given to bringing all principle street system roads up to width standards. Twelve feet lanes are ideal, although eleven feet lanes are generally acceptable.

### Surface Condition Improvements

Although much improved following sewer line replacement, The surface condition of many of the roads in the Old Town area is very poor. A poor road surface reduces the average speed, thus

reducing the capacity. Considerations should be given to repaving most roads in the Old Town section which are on the principle street system.

### Removal of Onstreet Parking

Removing onstreet parking helps to improve vehicular flow by increasing street capacity. The increase in capacity is provided in two ways. First, the removal of parking makes it physically possible to increase the laneage without additional right of way or construction. Second, the elimination of parking removes those vehicles searching for parking from the street, thus reducing demand.

As an alternate to removing all parking along the street, parking could be removed from one side only. Parking could then be restricted to neighborhood residents only to keep temporary parkers from taking up needed spaces. In some instances, the elimination of parking spaces from one side of the road could create enough room to add one more travel lane to the street. Fleming and Southard would be good examples.

### Implementation of One-Way Pairs

From the standpoint of capacity and traffic flow, one-way operations tend to be more efficient than two-way operations of the same width. Conversion to one-way streets generally decreases the number of potential vehicular conflicts at intersections and

midblock, because the number of opposing movements is reduced. As a result, roadway safety and efficiency is improved.

### Improve Signalization

Critical capacities generally occur at signalized intersections. The traffic cycle length and the control concept for the traffic network are the major elements influencing the number of vehicles that can pass through an intersection in a given period. By determining the most efficient use of signal time on an intersection by intersection basis, the amount of time available for individual movements at a group of intersections can be optimized and vehicular throughput can be increased. Signalization improvements include:

(1) Retime existing signals based on the latest count information
(2) Install traffic-actuated signals
(3) Interconnect traffic signals to allow for progression, and
(4) Installation of a computerized traffic-responsive control system

## DEMAND DECREASING IMPROVEMENTS

### Creation of Offstreet Parking

One of the reasons traffic is high within the Old Town or CBD is because of an inadequate supply of parking for tourists as well as business. Traffic destined for this area tends to circulate around until it finds parking. By providing adequate offstreet

parking, a large portion of this congestion can be reduced.

Non-Resident Traffic Prohibition

If adequate parking is provided near the Old Town or CBD that is convenient, then non-resident vehicular traffic could be prohibited. Residents could be provided with a parking sticker and only stickered vehicles would be allowed within the area. Adequate signing would need to be provided directing traffic to the offstreet parking areas.

Promote Bicycling

Create safe bicycle routes and in some cases, bike only routes to encourage increased bicycling. The potential effect that a substantial shift from autos to human-powered travel modes could have on reducing traffic congestion is great. For instance, recent estimates indicate that short distance bicycle trips for trip purposes that were once served by auto now represent over one billion vehicle-miles annually. Non-vehicular travel modes can reduce traffic.

Remote Parking for Large Vehicles

Large vehicles such as trucks and R.V.'s can not negotiate the tight turns that are found in the Old Town region of Key West. These vehicles block traffic as well as create a hazard to

pedestrians. Remote parking should be provided for these vehicles in order to keep them from areas that can't accommodate them.

### Peak Period Truck Restrictions

Whether trucks are moving on heavily traveled arterials, maneuvering through narrow streets, or parking to load or unload commodities, truck movement in the CBD is frequently viewed as a significant contributor to traffic congestion. In order to reduce the level of congestion attributed to truck movement, regulatory measures, such as instituting truck routes and preventing travel on certain streets, have been used in the past by most urban areas and should be considered here.

Alternatively, consideration should also be given to the possibility of restricting truck loading and unloading to the off-peak periods only.

### Improve Signing

Signing needs to be improved so that traffic is directed to various destinations by means of the shortest or sometimes the least congested routes. This would reduce traffic circulating throughout the area searching for the proper directions.

### Improve Bus Service

Expand the hours of operation past 10:00 pm at night and use

improved bus service to tie the remote parking lots, as proposed before, to the Old Town area. Also provide smaller buses as a shuttle bringing passengers from the hotels to the Historic District and back.

## GENERAL COMMENTS

The preceding improvements were compiled to serve as examples of potential projects which could reduce congestion. Similar projects have been implemented in urban areas throughout the country. The degree of improvement realized depends on the characteristics of the urban area. What works in one area may not work in another. Each improvement for Key West needs to be evaluated carefully, weighing the advantages and disadvantages to determine if each improvement is suitable.

# APPENDIX

## APPENDIX - Capacity Deficient Roadways

Volume Exceeds Capacity By 10% or Greater

STOCK ISLAND

| Vol/Cap Ratio | Roadway Description |
|---|---|
| 1.22 | Fifth Avenue From Fifth Street To Fourth Ave. |
| 1.22 | Fourth Avenue From Fifth Street To Maloney Ave. |
| 1.22 | Maloney Avenue From Fourth Avenue To MacDonald St. |
| 1.22 | MacDonald Street From Fifth Street To Maloney Ave. |
| 1.22 | Fifth Street From Fifth Ave. To MacDonald St. |
| 1.75 | US1 From Hospital Road To N. Roosevelt Blvd. |
| 1.18 | US1 From Cross Street To MacDonald Street |
| 1.44 | US1 From Hospital Road To Cross Street |

KEY WEST ISLAND

| Vol/Cap Ratio | Roadway Description |
|---|---|
| 1.29 - 1.69 | North Roosevelt Blvd. From US1 to Palm Avenue |
| 1.26 - 2.13 | Truman Avenue From Simonton To Palm Avenue |
| 1.14 | White Street From Southard St. To Truman Ave. |
| 1.14 - 1.17 | White Street From South St. To Atlantic Blvd. |
| 1.52 | Flagler Avenue From First/Bertha St. To Four Lane Section |
| 1.56 - 2.07 | Palm Avenue From White St. To N. Roosevelt Blvd. |
| 1.52 | Southard Street From Simonton St. To White St. |
| 1.48 | United Street From Whitehead St. To Duval St. |
| 1.24 - 1.73 | Duval Street From Front St. To United St. |
| 1.45 - 1.61 | Simonton Street From Southard St. To United St. |
| 1.17 - 1.69 | Whitehead Street From Front St. To Caroline St. |
| 1.42 | Caroline Street From Simonton St. To Grinnell St. |
| 1.43 | United Street From Simonton St. To Reynolds St. |
| 1.67 | Eaton Street From Grinnell Street To White St. |
| 1.22 | Fleming Street From Simonton Street To White St. |
| 1.11 | Front Street From Duval Street To Simonton St. |
| 1.11 | Simonton Street From Front Street To Caroline St. |
| 1.42 | Grinnell Street From Caroline Street To Eaton St. |

## Volume Exceeds Capacity By Less Than 10%

STOCK ISLAND

| Vol/Cap Ratio | Roadway Description |
|---|---|
| 1.09 | MacDonald Street From US1 To Fifth Street |
| 1.01 | US1 From Fifth Street To Junior College Road |

KEY WEST ISLAND

| Vol/Cap Ratio | Roadway Description |
|---|---|
| 1.07 | White Street From Truman Avenue To United St. |
| 1.01 | Eaton Street From Simonton St. To Grinnell St. |
| 1.01 | Truman Avenue From Whitehead Street To Duval St. |
| 1.02 | South Street From Simonton Street To Reynolds St. |