CITY OF PORT ISABEL

COMPREHENSIVE PLAN

PLANNING PERIOD 2005-2015

APRIL, 2005

E. STREET SYSTEM

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The data, information, analysis, and recommendations presented herein are exclusively for planning and budgeting purposes and do not constitute engineering analysis or detailed cost estimates. Engineering for each of the recommended tasks are beyond the scope of these studies and should be performed in the customary fashion as projects are defined and implemented.

Prepared by:

RGA CONSULTANTS

RICARDO GOMEZ & ASSOCIATES

Urban Planning & Management Consultants

E.1. INTRODUCTION

Since a streets network is the link within and external to a community, a city's livelihood is critically dependent upon its streets. Convenient, safe and efficient access within the community as well as to adjoining areas is the primary function of a street network. The streets network of any city operates, in effect, as the arterial system of that city, providing access in varying degrees to all properties abutting the network. Thoroughfare and other rights-of-ways occupy a large section of the total developed area and allows for circulation between all areas within the City. In addition to moving traffic, streets provide access to and drainage for abutting properties, open space between buildings and right-of-ways for utilities. The street network is therefore a primary factor in supporting land use. Due to their visibility and exposure, street conditions are typically the most noticed infrastructure of a city and one which generates the most criticism. Due to the high cost in comparison to other infrastructure components, adequate street construction and maintenance can represent the largest single required expenditure of a city. Road conditions are affected by many factors such as: the drainage conditions on the pavement, and the City's ability to fund incremental improvements. Costs for improved drainage, matching elevations to existing streets and right-of-ways acquisitions serve to increase the already costly road construction process.

Port Isabel has provided adequate street coverage for a majority, if not all its residential areas. The streets in the City are in poor to good condition. Most of the roadways consist of asphalt and have curb and gutters. Most of the roads have been constructed with proper right-of-way and sufficient pavement widths. While the topography and in some cases, poor drainage, allows water to collect in some areas, most of the high-use roadways have been sufficiently maintained to prevent serious deterioration. However, it appears the City needs to create a streets maintenance department whose sole role is to provide routine maintenance of the streets. The most prevalent lack of maintenance appears to be grass on the streets and curbs which causes rapid deteriorating conditions to develop. Most streets are good to average condition, but improvements or complete reconstruction might be necessary. Before beginning any road or street project, it is essential that the City have a plan in place to support the land use and growth plans. This will help ensure that streets in the existing developed areas

are improved in a uniform and orderly manner. It is through such a plan that completed City projects will provide maximum benefits and will become an integral part of the City. This should also assist in minimizing duplicative expenses and obsolescence of improvements.

E.2 PREVIOUS STREET SURVEYS

Previous Studies

A Streets Improvement Program analysis was made in 1998. This study basically evaluated some streets that at the time City officials felt needed improvements. *Martin, Brown & Perez Engineering & Surveying* based in Harlingen, Texas was commissioned to do the study. The study basically estimated cost for improvements but offered no recommendations for funding or prioritization. Based on the observations of this author, only some of the noted improvements were addressed. A comprehensive street assessment study was recently (2004) made for the City of Port Isabel by *Cruz-Hogan Consultants, Inc.* also based out of Harlingen, Texas. It too, however consists only of estimated costs and methods for improvement of existing streets with no reference to financing or prioritization.

Current Study

This report includes an inventory of physical characteristics of the streets system of record including the following:

1) Classifications of existing street conditions
2) Paved areas
3) Right-of-way widths
4) Existing curb and gutter locations

E.3 STREET SYSTEM INVENTORY

D.3.1 Classifications

For the purpose of this planning study, the following classifications were used:

1) **"Good"** -Surface is smooth with no cracks or potholes.
2) **"Fair"** -Surface has longitudinal and vertical cracks, previously sealed cracks, and/or small areas of potholes.
3) **"Poor"** -Extensive patches, potholes, large unsealed cracks, loose gravel. All unimproved streets are classified here.

Each street or road is designated as pavement, caliche, dirt, and not distinguishable.

E.3.2. Existing Streets Information

Field survey results, width, length, etc. are tabulated in Table E-2 and are graphically depicted in **Map E.1. Street Conditions Map**. For ease of reference the "Street Conditions", Map E.1, illustrates the major characteristics of each road listed in the tables in Appendix B. Streets are typically described in terms of usage such as major or minor traffic use. The four most common terms used for Cities the size of Port Isabel are 1) Major Arterial, 2) Minor Arterial, 3) Collector Street and 4) Residential or Minor Street. Street rights-of-way and street widths are the most notable features to most persons. Major Arterial can have ROW's averaging 120 feet in width to up to 1,000 or more and are almost always multi-lane, four or more lanes, while minor streets usually have ROW of 50 feet and are two-lane streets with an average width of 32 feet. An example of a Major Arterial is U.S. Expressway 77 or U.S. Expressway 83, neither of which extend to Port Isabel. In a City like Port Isabel state highways and farm-to-market roads would be examples of minor arterials. As mentioned in another section of this Plan, there are two State Highways within the limits of the City, State Highway 100 and State Highway 48. The City's roadway system is comprised mainly of residential streets. Most streets are classified as residential, with a few collector streets. Residential streets are designed for a particular block or neighborhood and are laid out so as to discourage their use by fast and thru traffic. There principle use is that of the residents of that block or neighborhood. Collector streets are by definition, just that; they collect traffic from other streets. Collector streets are typically wider than most other "City" streets and are many times called side streets, because few if any lots front them. They are designed to collect traffic from minor streets, both in residential areas or commercial areas and direct traffic flows outwards from those areas. These streets are generally used by all traffic generating vehicles not just a particular neighborhood. Examples of collector streets in Port Isabel are 2nd and 3rd Streets and Harbor Island Avenue. Examples of residential streets are Michigan Street, Monroe Street, Hickman Street and Adams Street.

E.3.3. Existing Street Conditions Findings

A significant find during the study was that most streets in the City are in relatively good condition despite the fact that they appear to be poorly maintained. Compared to other City's of similar size in the Valley, the streets conditions are above average. Compared to the local Colonias found in the Valley were many streets are not paved and in many cases are dirt streets, existing street conditions are quite good. All City streets are constructed with an asphalt base except two streets, Maxan and about 100 feet of Garcia Street from Hwy. 100 to Maxan, which are made of concrete. The following **Table E.1** represents the percentage of each categorical condition:

TABLE E-1
Pavement Conditions

Condition	Estimated Linear feet	Percent of Total
GOOD	51,610	57.50%
FAIR	18,489	20.60%
POOR	19,656	21.90%
Total	89,775	100%

E.3.4. Peak Hour Data and average daily traffic counts

Peak Hour Data and average daily traffic counts are currently not available from TxDOT for streets in Port Isabel, however average daily traffic counts are listed in Tables E-3 and E-4 as are the counts for the South Padre Island Causeway.

E.3.4. Accident History

Interviews with local officials show the accident rate to be fairly insignificant. Aggressive police enforcement of speed limits within the city appears to be a significant factor. The low speed with of 30 MPH used throughout the City in most residential areas in down the Central Business District can also be credited with the low rate. Speed limits are even lower in school zones.

E.3.5 Traffic Control Data

Street signage appears to be fairly comprehensive with a large majority of the streets having uniform, consistent and proper signage. City officials should however immediately conduct a City-wide comprehensive inventory of all signage and replace or repair any inadequate or defective signs since they might pose a potential threat to the safety of the citizenry.

E.3.6. Parking restrictions

A City-wide wind-shield survey basically concluded that the City has adequate parking in all residential areas and all business related activities and for all public facilities. The construction standards contained in the City's Subdivision Ordinance is adequate for parking space needs as long as it is followed and enforced.

E.3.7. Curb and Gutters

Over 98% of City currently has some form of curb and gutter. All appears to be in relatively good condition, but in dire need of maintenance to remove all grass and dirt and sand. **Table E.2** shows the existing street R-O-W's, widths and whether they have curb and gutter.

TABLE E-2[1]
Existing Street Width Rights of Way and Pavement widths.

Street Name	R-O-W Width (LF)	Street Length (LF)	Street Width (LF)	Curb & Gutter (LF)
1st Street—Illinois to N. Shore	60	1050	30	2100
2nd Street				
Hwy. 100 to Illinois	60	1035	42	2070
Illinois to N. Shore	60	110	42	2200
3rd Street—Hwy. 100 to N. Shore	60	1590	30	3180
4th Street—Hwy. 100 to N. Shore	70	1200	20	2400
North Shore Drive				
4th to end of Pavement	60	2700	30	5400
Longoria to Gomez	60	1065	30	2130
Gomez to Yturria	60	1170	30	2340
Rhode Island Ave.—1st to dead end	30	350	20	700
Michigan				
4th to 3rd Street	60	650	30	1300
2nd to 1st Street	60	600	30	1200
Oklahoma—4th to 1st Street	60	1900	30	3800
Illinois—4th to 1st Street	60	1700	30	3400
Tarpon—H. Island to Cul-de-Sac	40	1665	25	3330
Pampano—H. Island to City Park	40	1300	25	2600

[1] Cruz-Hogan Consultants, Inc., 2004 and Study results by RGA Consultants, Nov. 2004

Harbor Island—Hwy. 100 toTarpon	60	2150	30	4300
Bass—H. Island to Cul-de-Sac	40	1180	25	2360
Trout—H. Island to Cul-de-Sac	40	850	25	1700
Basin—Hwy. 100 to R.V. Park	50	68	30	1370
Polk				
N. Shore to Gomez	40	350	30	700
Gomez to Yturria	50	750	30	1500
Summit—Harbor Light to Polk	45	470	30	940
Gomez				
N. Shore to Yturria	50	730	30	1460
Hwy. 100 to Houston	50	260	30	520
Yturria				
Hwy. 100 to Alley	70	150	30	300
Washington to Adams	60	250	33	500
Madison to Jefferson	60	300	30	600
Hwy. 100 to Gomez	70	900	38	1800
Gomez to N. Shore	60	1600	30	3200
Harbor Lights—N.Shore toHouston	70	750	30	1500
Davis				
Harbor Lights to Musina	60	125	30	250
Musina to Yturria	60	250	30	500
Harbor Lights to Longoria	60	200	30	400
Houston				
Boat Channel to Yturria	50	1000	30	2000
Yturria to Musina	50	400	30	800
Harbor Lights to Tarvana	50	800	30	1600
Maxan—Garcia to Yturria		1700	38	3400
Railroad				
Bridge to Musina	50	1300	30	2600
Musina to Tarnava	50	1170	30	2340
Tarvana to Garcia	50	370	30	740
Hickman				
S. Shore to Longoria	50	1100	30	3667
Longoria to Garcia	50	1130	30	2260
Washington				
Hickman to S. Shore	50	300	30	600
S. Shore to Garcia	50	2280	30	4560
Garcia to Dead End	50	315	30	630
Adams				
Garcia to Isabella	60	660	30	1320
Garcia to Manautou	60	700	30	1400
Manautou to Musina	60	700	30	1400
Musina to Yturria	60	1320	42	640
Yturria to S. Shore	60	1030	42	2060
Jefferson				
Garcia to Cisneros	50	2500	30	5000
Cisneros to Leal	50	500	30	1000
Garcia to Marina	50	270	30	540
Madison				
Marina to Tarvana	50	600	30	1200
Tarvana to Yturria	50	1500	30	3000
Yturria to Cisneros	50	650	30	1300
Cisneros to Leal	50	500	30	1000
Monroe				
Marina to Garcia	50	230	30	460
Garcia to Tarvana	50	320	30	640
Tarvana to Manautou	50	300	30	600
Manautou to Longoria	50	300	30	600
Longoria to S. Shore	50	2165	30	4330

Harrison—Longoria to Chapa	40	1070	30	2140
South Shore Drive				
Garcia to Leal	60	4660	38	9320
Leal to Railroad	60	1465	38	2930
Railroad to Hwy. 100	60	565	30	1130
Champion—Hwy. 100 to RV Park	60	800	30	1600
Channel—Hwy.100 to RV Park	40	200	22	400
Chapa—Monroe to S. Shore	50	500	30	1000
Martinez—Monroe to S. Shore	60	260	30	520
Bridge—Hwy. 100 to Railroad	50	530	30	1060
Trevino				
Hwy. 100 to Houston	50	260	30	520
Hwy. 100 to Railroad	50	500	30	1000
Leal—Adams to Monroe	60	930	30	3100
Cisneros—Adams to South Shore	60	1400	30	2800
Musina				
Hwy. 100 to Hickman	60	400	30	600
Hickman to Jefferson	60	900	38	1800
Madison to S. Shore	60	1000	38	2000
Hwy. 100 to Davis	60	700	30	1400
Longoria				
Hwy 100 to Railroad	60	300	28	600
Hickman to S. Shore	60	200	38	400
S.Shore	60	1800	38	3600
Hwy. 100 to Maxan	60	120	38	240
Maxan to N. Shore	60	900	30	1600
Manautou				
Hwy. 100 to Maxan	60	400	30	1333
Hickman to S. Shore	60	1800	30	3600
Hwy. 100 to Maxan	60	120	38	240
Maxan to Houston	60	200	30	600
Houston to Bay	60	250	30	500
Tarnava				
Hwy. 100 to Railroad	60	300	38	600
Railroad to S. Shore	60	2000	30	4000
Hwy. 100 to Maxan	60	300	30	600
Maxan to Houston	60	300	30	600
Garcia				
Hwy. 100 to S. Shore	60	2400	38	4800
Hwy. 100 to Maxan	60	120	38	240
Maxan to Cul-de-sac	60	200	30	400
West Garcia	60	400	30	800
Marina—Garcia to Adams	60	1500	30	3000
Windward—Adams to Cul-de-Sac	50	830	25	1660
Isabella Point—Adams to Cul-de-S	50	740	30	1480
Old Stadium—Tarpon Loop	50	1614	30	3228
Tarpon Field—Port Rd. to Champ.	60	1938	30	2100
Hockaday				
N. Port Road to S. Port Road	50	800	30	1600
N. Port Road to S. Port Road	50	500	30	1000
Ash—Port Road to end	50	650	30	1300
Bay Point Road	60	695	32	1390
Michigan Ave. Laguna Heights	40	1085	18	None
Woody's Lane—at Port Road	30	996	22	None
Furney Lane—Hwy. 100 to Park	50	180	30	None

E.3.8. Truck Routes

The City's unique physical characteristics and layout do not appear to require a designated truck route. Most heavy truck traffic is near the channel and towards the Navigation District and that through traffic going towards South Padre Island.

E.4. STREET IMPROVEMENT METHODS

There are several different methods of maintaining streets within a City. The appropriate choice depends upon the conditions of the roadways; the projected traffic loads and the available funds.

Generally, paving improvements utilize either a Hot-Mix Asphalt Concrete (HMAC) or an Asphalt Penetration surface treatment (APST).

The HMAC road surface consists of a mixture of asphalt and aggregate. This type of asphalt is prepared at an asphalt batch plant and transported in a heated state to the job site. Using specialized street paving equipment the HMAC is laid on a pre-installed crushed limestone road base, usually eight to ten inches in depth. The asphalt is then compacted, usually to a depth of 1 ½ to 2 inches in residential areas and as deep as several inches in major highways. HMAC pavement is expensive; however, its durability and relative ease of installation makes it the surface pavement of choice for most communities.

APST is generally used for road maintenance or where funding for road improvements is limited. Usually, APST is used by communities to renew the surface pavement where the road base is still in good conditions. APST is applied on a roadway by spreading oil on either an exposed road base or on an existing road surface. A gravel or aggregate is spread over the oil and rolled flat. On new roads, two courses of APST might be applied. APST provides a short-term extension of a roadway's life until funding can be obtained for complete reconstruction.

Specific types of improvements normally utilized include:

1. Point Repairs: Used to treat potholes and other imperfections and roadway hazards. Excavation of failed pavement sections to a depth of up to eight inches, back-filled

with about eight inches of crushed limestone, stabilized with 2% cement, primed and sealed with a coarse surface treatment.

2. Level-up: Leveling of depressions n pavement with HMAC or hot mix/cold laid asphalt concrete.

3. Seal-Coat: Typically used once every three to five years to maintain streets and forestall more costly repairs. Application of asphalt cements and covered with pre-coated aggregate at one cubic yard of aggregate per 90 square yards. Aggregate is rolled after application.

4. Overlay: Used to completely replace the surface material of a street to address pavement deterioration and extend street life. Depending on the severity of wear, a portion of the existing surface is milled off, typically one inch. The remaining surface material is then overlaid with a minimum of 1 ½ to 2 inches of HMAC or hot mix/cold laid asphalt concrete, followed by a surface treatment.

5. Reclaim: Used for applications where a 10 to 20 year life is desired. Mill existing base and asphalt materials to a depth of six inches, add water-based emulsified asphalt to create a recycled asphalt-enhanced roadway base. A two-course surface treatment or asphalt cement is then applied and covered with pre-coated aggregate. The aggregate is rolled after each application.

Curb and gutter is required for all streets, as stated in the Subdivision Ordinance. In addition to providing drainage and improving the appearance of the area, curbs and gutters help alleviate the problem of moisture seeping through the pavement and into the road base.

E.5 TRAFFIC COUNT INFORMATION(TxDOT counts)

Traffic volumes identify existing travel patterns and assist in determining the road system's ability to serve the community needs. A tool available for identification of flows and demands is the traffic count history maintained by the Texas Department of Transportation (TxDOT). Tables E-3, Table E-4 and Table E-5 below list traffic count data from surveys conducted in 2003 and 2004 by TxDOT in Port Isabel.

TABLE E-3[2] City of Port Isabel Traffic Counts	
Traffic Count Location	Annual Average Daily Traffic
Hwy. 100 approaching Hwy. 48 (west to east)	17,900
Hwy. 48 approaching Hwy. 100 (south to north)	6,700
Hwy. 100 approaching Port Road (west to east)	27,000
Hwy. 100 approaching South Shore (west to east)	22,000
Hwy. 100. approaching Garcia (west to east)	18,900
Hwy. 100 approaching Garcia (east to west)	22,000

TABLE E-4[3] SPI Causeway Daily Traffic Counts		
MONTH	Eastbound	Westbound
January 2004	9,403	9,330
February 2004	11,098	11,060
March 2004	13,597	13,594
April 2004	10,824	10,778
May 2004	11,062	11,108
June 2004	13,222	13,279
July 2004	16,246	16,321
August 2004	11,638	11,915
September 2004	9,237	9,171
October 2004	9,100	9,021

[2] 2003 Traffic Map, TxDOT
[3] 2004 SPI Causeway Counts, TxDOT, January thru October Only

TABLE E-5 SPI Causeway Monthly Traffic Counts		
MONTH	Eastbound	Westbound
January 2004	291,480	289,215
February 2004	244,118	243,313
March 2004	353,531	353,446
April 2004	313,906	312,565
May 2004	342,911	344,335
June 2004	395,658	398,375
July 2004	603,624	505,953
August 2004	349,125	357,444
September 2004	277,095	276,127
October 2004	273,008	270,623

E.6. STREET SYSTEM ANALYSIS

The existing grid-type street system configuration used by the City provides adequate control and capacity to handle traffic flow patterns. However, road system maintenance and improvements require a more methodical approach. The following is a list of deficiencies or problems and a ranking associated with each.

Ranking **Problem**

1) Street Paving: While a majority of the streets are paved and are in fair to good condition, creeping deterioration and increased road use are an influencing factor. However, lack of adequate maintenance appears to be the main reason for this problem.

2) Base failures and seal coating: Many of the streets are starting to show failures and the need for seal coating. The increased frequency of potholes and surface cracks are evidence of this need.

3) Unclear drain ditches: Although drainage capacity is not considered to be a significant issue, the few open ditches that do exist along non-curbed and curbed streets show vegetation

overgrowth that could hamper proper drainage and are therefore in need of clearing.

4) Right-of-way acquisition: Most of the streets currently enjoy sufficient right-of-way for any anticipated growth, however, some streets, such as those located in the "fingers area" were originally poorly planned and because of the physical characteristics, little or nothing can be done. However, for future subdivisions, adequate road right-of-ways should be allowed to prevent the need for future acquisition.

Addressing the deficiencies above will resolve or eliminate the primary roadway problems anticipated during the planning period. It is important to note that the two state highways in the City, particularly Hwy. 100 will require extensive maintenance because of its high use.

Map E.1. Street Conditions Map depicts the various street conditions classifications as per a drive-by survey conducted in October, 2004.

E.7. RECOMMENDATIONS: GOALS

The key objective of the Street Plan is to support the growth projected in this Plan and to ensure a long-lived healthy transportation system for the City. Maintenance of the current grid pattern will continue to allow for a smooth flow of traffic and easily integrate with expected growth patterns. One future objective is to upgrade the FAIR and POOR streets to a GOOD status. Because upgrades to the main arteries of the City should be the top priority, funding constraints will result in new streets being built as a component of new subdivisions or as a limited extreme special needs.

The following sections list the street systems goals established for use in this Plan.

E.7.1 GOAL 1: Develop Traffic Circulation.

1) Develop and adopt a Traffic Circulation Plan (TCP) for future major and minor traffic arteries and subdivision integration. By designating the location of future thoroughfares in conjunction with zoning/future land uses, the City can ensure sufficient right-of-way designation in future developments. The TCP can serve as a resource to developers in the purchase and platting of properties.

2) Review the existing Subdivision Ordinance requirements pertaining to street construction for adequacy. Also, ensure the enforcement of the Ordinance. The Ordinance should call for consistent quality and design throughout the City. Design details such as minimum pavement widths, parking, minimum right-out-ways, construction of curb and gutter, and cult-de-sac diameters should be established in the ordinance.

E.7.2. GOAL 2; Continue to Maintain Existing Streets

1) Develop a perpetual street maintenance schedule which includes street cleaning, minor pot-hole repairs and curb and gutter vegetation overgrowth elimination.

2) Develop and implement a perpetual seal-coating program and ensure all collector streets are addressed first.

3) Ensure the longevity of re-paved streets by analyzing the need for sealing within one year after re-paving and again at about five years.

E.7.3 GOAL: Improve Sub-Standard Streets

1) Begin to increase transportation access and sage, convenient movement of motor vehicles, bicycles and pedestrians by: re-paving streets in need; ensuring streets being used as collectors stay at a full collector width minimum (40 feet); integrating any trails, sidewalks and bikeways currently existing or planned and providing for lighting and signage to assure high levels of public

safety and awareness particularly around schools and highway access points.

2) Investigating sources for funding improvement projects. The City should maintain or establish a fund with an annual allocation for the purpose of making street and/or drainage improvements.

3) Plans for street remediation and/or reconstruction should consider the design requirements for drainage ditches to hold additional capacity required from the street or road improvements.

E.8. STREET PLAN & OBJECTIVES

The improvements proposed here are based on the current street analysis. Special attention is given to improvements that are most in need or will provide the most widespread benefit for the community. High priority projects including highly traveled roadways in poor conditions or of insufficient capacity should be considered as soon as the City is able to finance the repairs. Typically street and road repairs with the greatest traffic flow should be improved first since this will benefit a larger number of people and will also most likely boost economic development. This is summarized in **Table E. 6** which shows improvements that are phased in over a ten-year period. Their respective costs are difficult to estimate in this table since social and primarily political considerations will most likely dictate street improvement priorities. **Table E. 7** does show estimated construction cost necessary per street. Phasing of improvements is an implementation method intended to minimize the financial demand from a city and the inconvenience that typically results from street construction project.

Map E.2. Future Street Conditions Map depicts a plan for future street conditions as per this authors' conclusions and professional recommendations.

TABLE E-6[1] Street Improvement Plan		
YEAR	TASK	DESCRIPTION
YEARS 1-2	1	Hold Public Forums to inform public of Plan.
	2	Adopt a Traffic Circulation Plan.
	3	Improve one main collector street & establish a street maintenance program.
YEARS 3-5	1	Hold Public Forums to inform Public of Plan and its progress.
	2	Establish an improvement plan for collector street.
	3	Improve one main collector and update seal-coat program.
YEARS 6-10	1	Hold Public Forums to inform public of Plan and its progress.
	2	Design and implement a street signage strategy and expand collector street repairs.
	3	Improve one main collector street and update seal coat program.

TABLE E-7[1] Estimated Street Re-construction Cost		
Street Name	Total Street Reconstruction cost (in Dollars)	Total Estimated Street Reconstruction cost including curb & gutter replacement and all associated costs(in Dollars)
1st Street—Illinois to N. Shore	-0-	3,516
2nd Street	-0-	-0-
Hwy. 100 to Illinois	-0-	-0-
Illinois to N. Shore	-0-	-0-
3rd Street—Hwy. 100 to N. Shore	-0-	-0-
4th Street—Hwy. 100 to N. Shore	60,000	77,280
North Shore Drive		
4th to end of Pavement	135,000	173,880
Longoria to Gomez	53,250	68,586
Gomez to Yturria	58,500	75,348
Rhode Island Ave.—1st to dead end	-0-	-0-
Michigan		
4th to 3rd Street	32,505	41,866
2nd to 1st Street	30,000	38,640
Oklahoma—4th to 1st Street	94,995	122,253
Illinois—4th to 1st Street	-0-	-0-
Tarpon—H. Island to Cul-de-Sac	69,375	89,355
Pampano—H. Island to City Park	-0-	-0-
Harbor Island—Hwy. 100 toTarpon	-0-	-0-
Bass—H. Island to Cul-de-Sac	49,170	67,282
Trout—H. Island to Cul-de-Sac	-0-	2,846
Basin—Hwy. 100 to R.V. Park	-0-	-0-
Polk		
N. Shore to Gomez	17,505	22,546
Gomez to Yturria	37,500	48,300

Summit—Harbor Light to Polk	23,505	30,274
Gomez		
N. Shore to Yturria	36,495	47,005
Hwy. 100 to Houston	-0-	-0-
Yturria		
Hwy. 100 to Alley	-0-	-0-
Washington to Adams	-0-	10,631
Madison to Jefferson	15,000	19,320
Hwy. 100 to Gomez	-0-	-0-
Gomez to N. Shore	79,995	105,712
Harbor Lights—N.Shore toHouston	37,500	48,300
Davis		
Harbor Lights to Musina	-0-	4,835
Musina to Yturria	-0-	9,657
Harbor Lights to Longoria	-0-	7,733
Houston		
Boat Channel to Yturria	-0-	-0-
Yturria to Musina	19,995	25,753
Harbor Lights to Tarvana	40,005	53,526
Maxan—Garcia to Yturria	-0-	-0-
Railroad		
Bridge to Musina	-0-	-0-
Musina to Tarnava	58,500	75,348
Tarvana to Garcia	18,495	23,821
Hickman		
S. Shore to Longoria	-0-	-0-
Longoria to Garcia	-0-	43,668
Washington		
Hickman to S. Shore	-0-	-0-
S. Shore to Garcia	-0-	-0-
Garcia to Dead End	15,750	20,813
Adams		
Garcia to Isabella	-0-	-0-
Garcia to Manautou	-0-	27,045
Manautou to Musina	-0-	-0-
Musina to Yturria	22,395	29,380
Yturria to S. Shore	72,105	94,995
Jefferson		
Garcia to Cisneros	-0-	96,597
Cisneros to Leal	25,005	33,043
Garcia to Marina	-0-	-0-
Madison		
Marina to Tarvana	30,000	38,640
Tarvana to Yturria	75,000	96,600
Yturria to Cisneros	-0-	25,121
Cisneros to Leal	-0-	19,325
Monroe		
Marina to Garcia	11,505	14,818
Garcia to Tarvana	-0-	-0-
Tarvana to Manautou	-0-	11,593
Manautou to Longoria	-0-	-0-
Longoria to S. Shore	-0-	83,660
Harrison—Longoria to Chapa	53,505	68,914
South Shore Drive		
Garcia to Leal	295,140	380,140
Leal to Railroad	92,790	119,513
Railroad to Hwy. 100	-0-	-0-
Champion—Hwy. 100 to RV Park	40,005	54,205
Channel—Hwy.100 to RV Park	7,335	21,297

Chapa—Monroe to S. Shore	25,005	34,911
Martinez—Monroe to S. Shore	13,005	17,185
Bridge—Hwy. 100 to Railroad	26,505	34,138
Trevino		
Hwy. 100 to Houston	-0-	-0-
Hwy. 100 to Railroad	-0-	19,326
Leal—Adams to Monroe	46,500	66,858
Cisneros—Adams to South Shore	70,005	95,576
Musina		
Hwy. 100 to Hickman	-0-	-0-
Hickman to Jefferson	-0-	52,475
Madison to S. Shore	63,330	84,273
Hwy. 100 to Davis	34,995	45,073
Longoria		
Hwy 100 to Railroad	13,995	16,880
Hickman to S. Shore	-0-	-0-
S.Shore	-0-	99,538
Hwy. 100 to Maxan	-0-	5,878
Maxan to N. Shore	-0-	37,791
Manautou		
Hwy. 100 to Maxan	19,995	27,093
Hickman to S. Shore	-0-	75,582
Hwy. 100 to Maxan	-0-	-0-
Maxan to Houston	15,000	20,324
Houston to Bay	-0-	-0-
Tarnava		
Hwy. 100 to Railroad	-0-	-0-
Railroad to S. Shore	-0-	88,105
Hwy. 100 to Maxan	7,605	10,197
Maxan to Houston	15,000	20,324
Garcia		
Hwy. 100 to S. Shore	-0-	$8,039
Hwy. 100 to Maxan	-0-	-0-
Maxan to Cul-de-sac	-0-	-0-
West Garcia—Garcia to S. Shore	19,995	45,753
Marina—Garcia to Adams	75,000	96,600
Windward—Adams to Cul-de-Sac	-0-	-0-
Isabella Point—Adams to Cul-de-S	-0-	-0-
Old Stadium—Tarpon Field loop	-0-	-0-
Tarpon Field—Port Rd. to Champion	-0-	-0-
Hockaday		
N. Port Road to S. Port Road	40,005	51,526
N. Port Road to S. Port Road	-0-	-0-
Ash—Port Road to end	32,505	41,868
Bay Point Road	-0-	-0-
Michigan Ave. Laguna Heights	-0-	-0-
Woody's Lane—at Port Road	-0-	-0-
Furney Lane—Hwy. 100 to Park	-0-	-0-

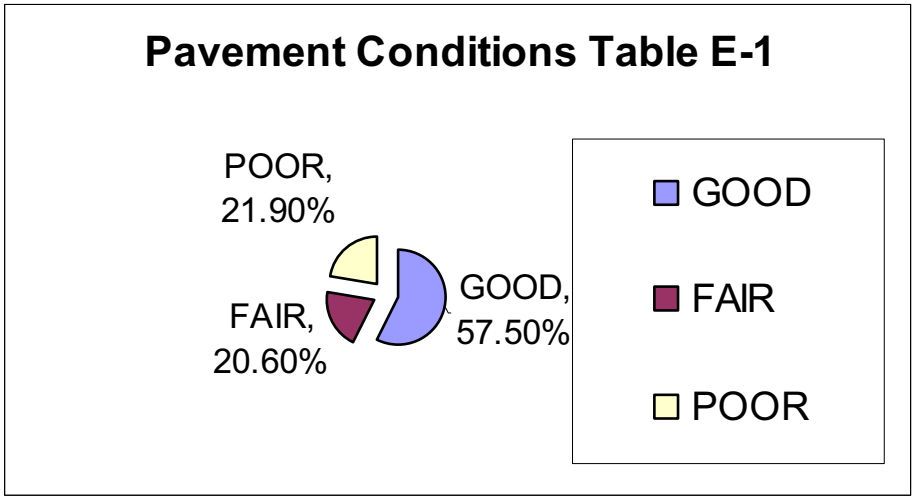
E.9. POSSIBLE FUNDING SOURCES:

Since funding will be constraint on the development of the Plan, all avenues of funding should be researched. Possible sources for funding the above improvement are as follows:

1) General Fund
2) General Obligation Bonds
3) Special Subdivision Fees
4) Grants—Office of Rural Community Affairs ORCA, FmHA, EDA, TxDOT
5) Low Interest Loans
6) Street Assessment Programs

It should be noted that grants are often structured to have a local contribution component or are limited in their application to specific components of community improvement projects. Since timing is a critical factor, it is unlikely that funding will be entirely available through multitude grants but will instead most likely require a local contribution in order to be effective for project funding. A common mistake by many administrators is the failure to recognize that most state and federal grant programs are subject to stringent rules and regulations and therefore are not very flexible in terms of changes or modifications. Another factor usually also forgotten is that most state and grant funds take much longer to administer than projects funded with local funds because of a maze of bureaucratic rules, regulations and policies.

The following is a graphic illustration of Table E-1.



CITY OF PORT ISABEL

COMPREHENSIVE PLAN

PLANNING PERIOD 2005-2015

APRIL, 2005

F. THOROUGHFARE SYSTEM

The Office of Rural Community Affairs in conjunction with the United States Department of Housing and Urban Development furnished financial support to the Activity described in this publication which does not necessarily indicate the concurrence of the Office of Rural Community Affairs or of the United States Department of Housing and Urban Development with the statements or conclusions contained in this publication

The data, information, analysis, and recommendations presented herein are exclusively for planning and budgeting purposes and do not constitute engineering analysis or detailed cost estimates. Engineering for each of the recommended tasks are beyond the scope of these studies and should be performed in the customary fashion as projects are defined and implemented.

Prepared by:

RGA CONSULTANTS

RICARDO GOMEZ & ASSOCIATES

Urban Planning & Management Consultants

F.1. INTRODUCTION

As mentioned in the streets section of this study, a streets network is the link within and external to a community, a city's livelihood is critically dependent upon its streets. Convenient, safe and efficient access within the community as well as to adjoining areas is the primary function of a street network, major thoroughfares included. The streets network of any city operates, in effect, as the arterial system of that city, providing access in varying degrees to all properties abutting the network. Thoroughfare and other rights-of-ways occupy a large section of the total developed area and allows for circulation between all areas within the City. In addition to moving traffic, these thoroughfares provide access to and drainage for abutting properties, open space between buildings and right-of-ways for utilities. The street network including these major thoroughfares are therefore primary factors in supporting land use. Due to their visibility and exposure, street conditions are typically the most noticed infrastructure of a city and one which generates the most criticism. Due to its high cost in comparison to other infrastructure components, adequate street construction and maintenance can represent the largest single required expenditure of a city. Fortunately, both major thoroughfares in the City, State Hwy. 48 and Hwy. 100 are maintained by the State of Texas. With the exception of drainage, and land acquisition, the state usually provides most if not all construction and maintenance on these roads.

Both of these roadways consist of asphalt and adequate drainage. Hwy. 100 has curbs and gutter from where it enters the City near Laguna Heights in the west to the Causeway. A recent annexation located north on South Padre Island was designed as a rural highway and lacks curb and gutter. Both of the roads have been constructed with proper right-of-way and sufficient pavement widths. The thoroughfares appear to be very well maintained by the State and the City has done an exceptional job with the landscaping. Since the State is currently working on construction of a second causeway, it critical that the City planners coordinate the location and design a thoroughfare plan for the new route. Traffic, land acquisition, drainage and economic considerations should be well thought out before beginning any improvements. It is essential that the City have a plan in place to support the proposed new land uses and growth that are sure to develop with the construction of a second causeway. It is through such a plan that this proposed

project will provide maximum benefits and will become an integral part of the City. This should also assist in minimizing duplicative expenses and obsolescence of improvements.

F.1.2. Definition for major and collector streets

Field survey results and classifications are graphically depicted in **Map F.1. Thoroughfare Conditions Map**. For ease of reference the "Thoroughfare Conditions", Map F.1, illustrates the major characteristics of Hwy. 48 and Hwy. 100 and the various collector streets identified in this Study. Streets and roads are typically described in terms of usage such as major or minor traffic use. The four most command terms used for Cities the size of Port Isabel are 1) Major Arterial, 2) Minor Arterial, 3) Collector Street and 4) Residential or Minor Street. Street rights-of-way and street widths are the most notable features to most persons. Major Arterial can have ROW's averaging 120 feet in width to up to 1,000 or more and are almost always multi-lane, four or more, while minor streets usually have ROW of 50 feet and are two-lane streets with an average width of 32 feet. An example of a Major Arterial is Expressway 77 or Expressway 83, neither of which extend to Port Isabel. In a City like Port Isabel state highways and farm-to-market roads would be examples of minor arterials. As mentioned previously in this Plan, there are two State Highways within the limits of the City, State Highway 100 and State Highway 48. The City's roadway system is comprised mainly of residential streets. Most streets are classified as residential, with a few collector streets. Residential streets are designed for a particular block or neighborhood and are laid out so as to discourage their use by fast and thru traffic. Collector streets are by definition, just that; they collect traffic from other streets. Collector streets are typically wider than most other "City" streets and are many times called side streets, because few if any lots front them. They are designed to collect traffic from minor streets, both in residential areas or commercial areas and direct traffic flows outwards from those areas. Examples of collector streets are 2nd and 3rd Streets. Examples of residential streets are Hickman Street and Adams Street

F.2 PREVIOUS THOROUGHFARE STUDIES

Previous Studies

A Streets Improvement Program analysis was made in 1998. This study basically evaluated some streets that at the time City officials felt needed improvements. *Martin,*

Brown & Perez Engineering & Surveying based in Harlingen, Texas was commissioned to do the study. The study basically estimated cost for improvements but offered no recommendations for funding or prioritization. Based on the observations of this author, only some of the noted improvements were addressed. A comprehensive street assessment study was recently (2004) made for the City of Port Isabel by *Cruz-Hogan Consultants, Inc.* also based out of Harlingen, Texas. It too, however consists only of estimated costs and methods for improvement of existing streets with no reference to financing or prioritization. Neither study made references to "thoroughfares or collectors". The State of Texas is currently conducting studies, not specifically thoroughfare studies, but aimed at the feasibility and location of a second causeway.

Current Study

This report includes an inventory of physical characteristics of the thoroughfares and collectors street system of record including the following:

1) Classifications of existing street conditions
2) Paved areas
3) Right-of-way widths
4) Existing curb and gutter locations
5) Land use and traffic generator
6) Truck routes

These inventories and results are found in other sections and tables within this Chapter.

F.3 THORUGHFARE SYSTEM INVENTORY

F.3.1 Classifications

For the purpose of this planning study, the following classifications were used:

1) **"Good"** -Surface is smooth with no cracks or potholes.
2) **"Fair"** -Surface has longitudinal and vertical cracks, previously sealed cracks, and/or small areas of potholes.
3) **"Poor"** -Extensive patches, potholes, large unsealed cracks, loose gravel. All unimproved streets are classified here.

Each street or road is designated as pavement, caliche, dirt, and not distinguishable.

F.3.2. Existing Street Conditions Findings

As mentioned in other sections of this Study a significant find during the study was that most streets in the City are in relatively good condition despite the fact that they

appear to be poorly maintained. Compared to other City's of similar size in the Valley, the collector streets conditions are above average. All City collector streets are constructed with an asphalt base except about 100 feet of Garcia Street from Hwy. 100 to Maxan, which are made of concrete. The following **Table F.1** represents the percentage of each categorical condition:

TABLE F-1
Collector Street Pavement Conditions

Condition	Estimated Linear feet	Percent of Total
GOOD	21,600	57.2
FAIR	15,025	39.7
POOR	1,200	3.1
Total	37,825	100%

F.3.3. Peak Hour Data and average daily traffic counts

Peak Hour Data and average daily traffic counts are currently not available from TxDOT for streets in Port Isabel, however average daily traffic counts are listed in Tables F-3 and F-4 as are the counts for the South Padre Island Causeway.

F.3.4 Traffic Control Data

Collector street signage appears to be fairly comprehensive with a large majority of the streets having uniform, consistent and proper signage. City officials should however immediately conduct a City-wide comprehensive inventory of all signage and replace or repair any inadequate or defective signs since they might pose a potential threat to the safety of the citizenry. State highway system signs are above average.

F.3.5. Parking restrictions

A City-wide wind-shield survey basically concluded that the City has adequate parking for all business related activities and for all public facilities. The construction standards contained in the City's Subdivision Ordinance is quite adequate for parking space needs as long as it is followed and enforced. State standards for on-street parking are adequate in those areas where off-street parking on Hwy. 100 is required.

F.3.6. Curb and Gutters

Hwy. 48 does not have curb and gutter, however Hwy. 100 and all collector streets in the City currently has some form of curb and gutter. All appears to be in relatively good condition, but collector streets are in dire need of maintenance to remove all grass and dirt and sand. **Table F.2** shows the existing street R-O-W's, widths and whether they have curb and gutter.

TABLE F-2[1]
Existing Street Width Rights of Way and Pavement widths.

Street Name	R-O-W Width (LF)	Street Length (LF)	Street Width (LF)	Curb & Gutter (LF)
Hwy. 48	+120	3,000	38	none
Hwy. 100	+120	14,800	Varies	29,600
1st Street—Illinois to N. Shore	60	1050	30	2100
2nd Street				
Hwy. 100 to Illinois	60	1035	42	2070
Illinois to N. Shore	60	110	42	2200
3rd Street—Hwy. 100 to N. Shore	60	1590	30	3180
4th Street—Hwy. 100 to N. Shore	60	1200	20	2400
Harbor Island—Hwy. 100 toTarpon	60	2150	30	4300
South Shore Drive				
Garcia to Leal	60	4660	38	9320
Leal to Railroad	60	1465	38	2930
Railroad to Hwy. 100	60	565	30	1130
Garcia—Hwy. 100 to S. Shore	60	2400	38	4800
Port Road	100	3800	32	none

F.3.7. Truck Routes

The City's unique physical characteristics and layout do not appear to require a designated truck route. Most heavy truck traffic is near the channel and towards the Navigation District and that thorough traffic going towards South Padre Island. The City has basically only one major thoroughfare which is State Highway 100. It bisects the City from west to east. State Highway 48 is another major thoroughfare in the City, although not an urban thoroughfare in Port Isabel because it dead-ends with Highway 100.

F.4 TRAFFIC COUNT INFORMATION(TxDOT counts)

Traffic volumes identify existing travel patterns and assist in determining the road system's ability to serve the community needs. A tool available for identification of

[1] Cruz-Hogan Consultants, Inc., 2004 and Study results by RGA Consultants, Nov. 2004

flows and demands is the traffic count history maintained by the Texas Department of Transportation (TxDOT). Tables F-3, Table F-4 and Table F-5 below list traffic count data from surveys conducted in 2003 and 2004 by TxDOT in Port Isabel.

TABLE F-3[2] City of Port Isabel Traffic Counts	
Traffic Count Location	Annual Average Daily Traffic
Hwy. 100 approaching Hwy. 48 (west to east)	17,900
Hwy. 48 approaching Hwy. 100 (south to north)	6,700
Hwy. 100 approaching Port Road (west to east)	27,000
Hwy. 100 approaching South Shore (west to east)	22,000
Hwy. 100. approaching Garcia (west to east)	18,900
Hwy. 100 approaching Garcia (east to west)	22,000

TABLE F-4[3] SPI Causeway Daily Traffic Counts		
MONTH	Eastbound	Westbound
January 2004	9,403	9,330
February 2004	11,098	11,060
March 2004	13,597	13,594
April 2004	10,824	10,778
May 2004	11,062	11,108
June 2004	13,222	13,279
July 2004	16,246	16,321
August 2004	11,638	11,915
September 2004	9,237	9,171
October 2004	9,100	9,021

[2] 2003 Traffic Map, TxDOT
[3] 2004 SPI Causeway Counts, TxDOT, January thru October Only

TABLE F-5 SPI Causeway Monthly Traffic Counts		
MONTH	Eastbound	Westbound
January 2004	291,480	289,215
February 2004	244,118	243,313
March 2004	353,531	353,446
April 2004	313,906	312,565
May 2004	342,911	344,335
June 2004	395,658	398,375
July 2004	603,624	505,953
August 2004	349,125	357,444
September 2004	277,095	276,127
October 2004	273,008	270,623

F.5. THOROUGHFARE SYSTEM ANALYSIS

The existing grid-type street system configuration used by the City provides adequate control and capacity to handle traffic flow patterns. However, road system maintenance and improvements require a more methodical approach. The following is a list of deficiencies or problems and a ranking associated with each.

Ranking **Problem**

1) Street Paving: While a majority of the streets are paved and are in fair to good condition, creeping deterioration and increased road use are an influencing factor. However, lack of adequate maintenance appears to be the main reason for this problem.

2) Base failures and seal coating: Many of the streets are starting to show failures and the need for seal coating. The increased frequency of potholes and surface cracks are evidence of this need.

3) Unclear drain ditches: Although drainage capacity is not considered to be a significant issue, the few open ditches that do exist along non-curbed and curbed streets show vegetation

overgrowth that could hamper proper drainage and are therefore in need of clearing.

4) Right-of-way acquisition: Most of the streets currently enjoy sufficient right-of-way for any anticipated growth, however, some streets, such as those located in the "fingers area" were originally poorly planned and because of the physical characteristics, little or nothing can be done. However, for future subdivisions, adequate road right-of-ways should be allowed to prevent the need for future acquisition.

Addressing the deficiencies above will resolve or eliminate the primary roadway problems anticipated during the planning period. It is important to note that the two state highways in the City, particularly Hwy. 100 will require extensive maintenance because of its high use.

Map F.1. Thoroughfare Conditions Map depicts the various street conditions classifications as per a drive-by survey conducted in October, 2004.

F.6. RECOMMENDATIONS: GOALS

The key objective of the Street Plan is to support the growth projected in this Plan and to ensure a long-lived healthy transportation system for the City. Maintenance of the current grid pattern will continue to allow for a smooth flow of traffic and easily integrate with expected growth patterns. One future objective is to upgrade the FAIR and POOR streets to a GOOD status. Because upgrades to the main arteries of the City should be the top priority, funding constraints will result in new streets being built as a component of new subdivisions or as a limited extreme special needs.

The following sections list the street systems goals established for use in this Plan.

F.6.1 GOAL 1: Develop Traffic Circulation.

1) Develop and adopt a Traffic Circulation Plan (TCP) for future major and minor traffic arteries and subdivision integration. By

designating the location of future thoroughfares in conjunction with zoning/future land uses, the City can ensure sufficient right-of-way designation in future developments. The TCP can serve as a resource to developers in the purchase and platting of properties.

2) Review the existing subdivision ordinance requirements pertaining to street construction for adequacy. Also, ensure the enforcement of the Ordinance. The Ordinance should call for consistent quality and design throughout the City. Design details such as minimum pavement widths, parking, minimum right-out-ways, construction of curb and gutter, and cult-de-sac diameters should be established in the ordinance.

F.6.2. GOAL 2; Continue to Maintain Existing Streets

1) Develop a perpetual street maintenance schedule which includes street cleaning, minor pot-hole repairs and curb and gutter vegetation overgrowth elimination.

2) Develop and implement a perpetual seal-coating program and ensure all collector streets are addressed first.

3) Ensure the longevity of re-paved streets by analyzing the need for sealing within one year after re-paving and again at about five years.

F.6.3 GOAL: Improve Sub-Standard Streets

1) Begin to increase transportation access and sage, convenient movement of motor vehicles, bicycles and pedestrians by: re-paving streets in need; ensuring streets being used as collectors stay at a full collector width minimum (40 feet); integrating any trails, sidewalks and bikeways currently existing or planned and providing for lighting and signage to assure high levels of public safety and awareness particularly around schools and highway access points.

2) Investigating sources for funding improvement projects. The City should maintain or establish a fund with an annual allocation for the purpose of making street and/or drainage improvements.

3) Plans for street remediation and/or reconstruction should consider the design requirements for drainage ditches to hold additional capacity required from the street or road improvements.

F.7. THOROUGHFARE SYSTEM PLAN & OBJECTIVES

The improvements proposed here are based on the current street analysis. Special attention is given to improvements that are most in need or will provide the most widespread benefit for the community. High priority projects including highly traveled roadways in poor conditions or of insufficient capacity should be considered as soon as the City is able to finance the repairs. Typically street and road repairs with the greatest traffic flow should be improved first since this will benefit a larger number of people and will also most likely boost economic development. This is summarized in **Table F. 6** which shows improvements that are phased in over a ten-year period. Their respective costs are difficult to estimate in this table since social and primarily political considerations will most likely dictate street improvement priorities. **Table E. 7** does show estimated construction cost necessary per street. Phasing of improvements is an implementation method intended to minimize the financial demand from a city and the inconvenience that typically results from street construction project.

Map F.2. Future Improved Thoroughfare Map depicts a plan for future improved thoroughfare conditions as per this author' conclusions and professional recommendations.

TABLE F-6[1] Street Improvement Plan		
YEAR	TASK	DESCRIPTION
YEARS 1-2	1	Hold Public Forums to inform public of Plan.
	2	Adopt a Traffic Circulation Plan & contract study for by-way from Port Road to Hwy. 48.
	3	Improve one main collector street & establish a street maintenance program.
YEARS 3-5	1	Hold Public Forums to inform Public of Plan and its progress.
	2	Establish an improvement plan for collector street.
	3	Improve one main collector and update seal-coat program.
YEARS 6-10	1	Hold Public Forums to inform public of Plan and its progress.
	2	Design and implement a street signage strategy and expand collector street repairs.
	3	Improve one main collector street and update seal coat program.

TABLE F-7[1] Estimated Thoroughfare & Collector Street Improvement Cost		
Street Name	Total Street Reconstruction cost (in Dollars)	Total Estimated Street Reconstruction cost including curb & gutter replacement and all associated costs(in Dollars)
Hwy. 48	-0-	-0-
Hwy. 100	-0-	-0-
1st Street—Illinois to N. Shore	-0-	3,516
2nd Street	-0-	-0-
Hwy. 100 to Illinois	-0-	-0-
Illinois to N. Shore	-0-	-0-
3rd Street—Hwy. 100 to N. Shore	-0-	-0-
4th Street—Hwy. 100 to N. Shore	60,000	77,280
Harbor Island—Hwy. 100 to Tarpon	-0-	-0-
South Shore Drive		
Garcia to Leal	295,140	380,140
Leal to Railroad	92,790	119,513
Railroad to Hwy. 100	-0-	-0-
Garcia—Hwy. 100 to S. Shore	-0-	8,039
Port Road	-0-	-0-

F.9. POSSIBLE FUNDING SOURCES:

Since funding will be constraint on the development of the Plan, all avenues of funding should be researched. Possible sources for funding the above improvement are as follows:

1) General Fund
2) General Obligation Bonds
3) Special Subdivision Fees
4) Grants—Office of Rural Community Affairs ORCA, FmHA, EDA, TxDOT
5) Low Interest Loans
6) Street Assessment Programs

It should be noted that grants are often structured to have a local contribution component or are limited in their application to specific components of community improvement projects. Since timing is a critical factor, it is unlikely that funding will be entirely available through multitude grants but will instead most likely require a local contribution in order to be effective for project funding. A common mistake by many administrators is the failure to recognize that most state and federal grant programs are subject to stringent rules and regulations and therefore are not very flexible in terms of changes or modifications. Another factor usually also forgotten is that most state and grant funds take much longer to administer than projects funded with local funds because of a maze of bureaucratic rules, regulations and policies.

The following is a graphic illustration of Table F-1.