

**Hurricane Relocation Planning  
for  
Hardin, Jasper, Jefferson, Newton and Orange Counties**

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College of Architecture and Environmental Design  
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TAMU-SG-84-620  
September 1983

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HURRICANE RELOCATION PLANNING  
FOR  
HARDIN, JASPER, JEFFERSON, NEWTON AND ORANGE COUNTIES

by  
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Project Leader

Study Prepared by the Research Center,  
College of Architecture and Environmental Design  
Texas A&M University  
College Station, Texas

September 1983

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This study is to be used as a planning tool or handbook for government officials. It is not a policy document. As such, when properly consulted, it may serve as a guide for providing officials with "worst case" situations so that they may determine when and how protective and/or evacuation measures should begin. It is designed for no other purpose.

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## TABLE OF CONTENTS

	Page
List of Figures .....	iv
List of Tables .....	v
Acknowledgments .....	vi
Introduction .....	I-1
Section One: Methodology .....	1-1
Part A: SLOSH .....	1-1
Part B: Survey .....	1-12
Part C: Evacuation Times .....	1-18
Section Two: SLOSH Data .....	2-1
Part A: Maximum Surge Penetration .....	2-1
Part B: Data Points .....	2-2
Part C: Hourly Tidal Data .....	2-6
Section Three: Zone Delineations .....	3-1
Part A: Rationale .....	3-1
Part B: Zone Delineations .....	3-2
Part C: Boundary Descriptions .....	3-8
Section Four: Survey Results .....	4-1
Part A: Potential Number of Evacuating Vehicles .....	4-1
Part B: Shelter Data .....	4-5
Section Five: Evacuations .....	5-1
Part A: Evacuation Times for Zones .....	5-1
Part B: Principal Evacuation Routes and Capacities ...	5-2
Part C: Use of Evacuation Time to Estimate When to Recommend and Evacuation .....	5-4
Appendix A: Hurricane Categories .....	A-1
Appendix B: Key Data Points by Hurricane Type .....	B-1
Appendix C: Hourly Surge Conditions .....	C-1
Appendix D: SOP .....	D-1
Appendix E: ESTEDLS .....	E-1

## LIST OF FIGURES

	Page
Figure 1-1, Polar Grid .....	1-5
Figure 1-2, Simulated Hurricane Tracks .....	1-6
Figure 1-3, Evacuation Survey .....	1-15
Figure 1-4, Survey Directions .....	1-16
Figure 1-5, Directions of Evacuations .....	1-17
Figure 2-1, Locations of Data Points Outside Study Area...	2-5
Figure 3-1, Contingency Zone for Hardin County .....	3-3
Figure 3-2, Contingency Zone for Jasper County .....	3-4
Figure 3-3, Evacuation and Contingency Zones for Jefferson County .....	3-5
Figure 3-4, Contingency Zone for Newton County .....	3-6
Figure 3-5, Evacuation and Contingency Zones for Orange County .....	3-7

## LIST OF TABLES

	Page
Table I-1, History of Hurricane Activity in the Study Area, by Type, 1900-1983 .....	I-6
Table I-2, Hurricane Response and "The Model Hurricane Flood Emergency Relocation Plan" .....	I-7
Table 1-1, SLOSH Data Points .....	1-7
Table 1-2, Simulated SLOSH Hurricanes (356), by Miles Right or Left of Sabine Pass Mouth .....	1-11
Table 4-1, Potential Number of Evacuating Vehicles by Direction for Jefferson County by Zone as Indicated in the Survey .....	4-2
Table 4-2, Potential Number of Evacuating Vehicles by Direction for Orange County by Zone as Indicated in the Survey .....	4-3
Table 4-3, Potential Number of Evacuating Vehicles by Direction for Hardin, Jasper and Newton Counties by Zone as Indicated in the Survey .....	4-4
Table 4-4, Evacuation Rates and Shelter Demand for Jefferson County .....	4-7
Table 4-5, Evacuation Rates and Shelter Demand for Orange County .....	4-8
Table 4-6, Evacuation Rates and Shelter Demand for Hardin, Jasper and Newton Counties .....	4-9
Table 4-7, Composite Shelter Demand for Five-County Area .....	4-10
Table 4-8, Number of Persons Seeking Shelter in Cities Outside of Study Area .....	4-11
Table 5-1, Evacuation Times by Zones .....	5-7



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At the state level, special thanks are extended to Robert Lansford, coordinator of the Governor's Division of Emergency Management, and Robert Halverson, assistant coordinator for operations, for their support and guidance.



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Carlton Ruch

Principal Investigator

September 1983

## INTRODUCTION

The Governor's Division of Emergency Management has been active in preparing coastal areas for the impact of hurricanes. The Gulf Coast is divided into five areas: Brownsville, Corpus Christi, Matagorda, Houston-Galveston, and Beaumont-Port Arthur-Orange. To date, a relocation/evacuation study has been completed for the Houston-Galveston area and the Corpus Christi area. The Beaumont-Port Arthur-Orange area is the third study completed. The Division of Emergency Management intends to follow these studies with vulnerability studies and, later, with contingency planning studies. Funding for the present study was made available by the State of Texas through the Governor's Division of Emergency Management.

Brochures based on this study are available through the Governor's Division of Emergency Management (DEM). There also is a computer-based ESTEDLS program for Estimating Safe Time before Evacuation Decisions (Lake Sabine) operational in the DEM (see Appendix E). Section Five, Evacuations, indicates how these times can be estimated manually along with Standard Operating Procedures (SOP) for figuring evacuation times manually found in Appendix D.

To ensure that the results of the study would be acceptable to the users, three advisory groups were established:

### State and Subnational Advisory Committee

Robert Lansford, State Coordinator  
Governor's Division of Emergency Management  
Texas Department of Public Safety

Robert Halverson, Assistant Coordinator (Operations)  
Governor's Division of Emergency Management  
Texas Department of Public Safety

Larry Mooney  
National Weather Service  
Southern Regional Headquarters

Regional Advisory Committee

Gary Haag, Region 2 Liaison Officer  
Governor's Division of Emergency Management  
Texas Department of Public Safety

Raymond Broussard, Meteorologist in Charge  
National Weather Service  
Port Arthur Area

Harold Webster, Manager  
American Red Cross  
South Jefferson County Chapter

Captain B. F. Wade  
Region 2  
Texas Department of Public Safety

Willard Collier, Supervising Traffic Engineer  
District 20  
Texas Department of Highways and Public Transportation

Municipal and County Advisory Committee  
(Representative Personnel at Meetings)

Arthur L. Roberts  
American Red Cross  
Corpus Christi, Texas

Audrey Wilson, Executive Director  
Orange County Red Cross

David Hassell, Coordinator  
Beaumont Emergency Management

Kirt Anderson  
Planning Department  
City of Beaumont

Robert Dickenson  
Physical Planning-Transportation  
Southeast Texas Regional Planning Commission  
Port Arthur

Nancy Walters  
Bevil Oaks

Dick Nugent, Coordinator  
Jefferson County Emergency Management

Joel Livingston, Coordinator  
Groves

Jerry McNeill, Coordinator  
Nederland Emergency Management

R. E. LeBlanc, Coordinator  
Port Arthur Emergency Management

Mayor Bernis Sadler, Director  
Port Arthur Emergency Management

Gary Shearer, Coordinator  
Port Neches Emergency Management

Richard Bruce, Coordinator  
Orange City-County Emergency Management

James P. Foyle, Coordinator  
Orange Emergency Management

Walter Schzxnyder, Coordinator  
West Orange Emergency Management

Cesar Dominguez, Coordinator  
City of Silsbee

Raymond Tennison, Coordinator  
Hardin County Emergency Management

The study area consisted of five counties (Hardin, Jasper, Jefferson, Newton and Orange) with a study area of approximately 2,500 square miles (only small parts of Hardin, Jasper and Newton Counties) containing a population of about 400,000 persons.

Hurricanes are classified by wind speed ranges (see Appendix A). For the purpose of this report, we will consider the

following types of hurricanes:

<u>WIND SPEED (MPH)</u>	<u>TYPE HURRICANE</u>
74- 95	A
96-110	B
111-130	C
131 and over	D

Table I-1<sup>1</sup> illustrates a chronology of hurricanes during the 20th Century in the two coastal counties within the study area. The frequency of hurricane landfall has been erratic with no large hurricanes since 1957.

This study is primarily designed to provide data for decision making regarding when evacuations need to be recommended. The information also can be used to update county and municipal plans, however, and as a guide for the district disaster committee. The American Red Cross can also use it to determine shelter needs for particular areas. Table I-2 indicates these and other relationships.

The data to assist in decision making consist of the following key items:

Possible surge penetration for hurricanes of varying intensities (see surge map inside back cover).

Critical locations in the area are given along with data that will indicate road cutoff times by hurricane type for both surge penetration and wind intensity. This will be given in hours plus or minus anticipated time of storm center landfall (see Appendix B).

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<sup>1</sup>In this study, tables and figures will always be grouped at the end of each section or part.

Areas subject to storm surge flooding from hurricanes with winds under 110 mph (evacuation zones) and from winds over 110 mph (contingency zones) are shown along with the times it would take to evacuate these areas. (See fold-out map.)

The first section of this report describes the methodology used (SLOSH data, the survey and determination of evacuation times). The remaining sections are SLOSH Data, Zone Delineations, Survey Results and Evacuations.

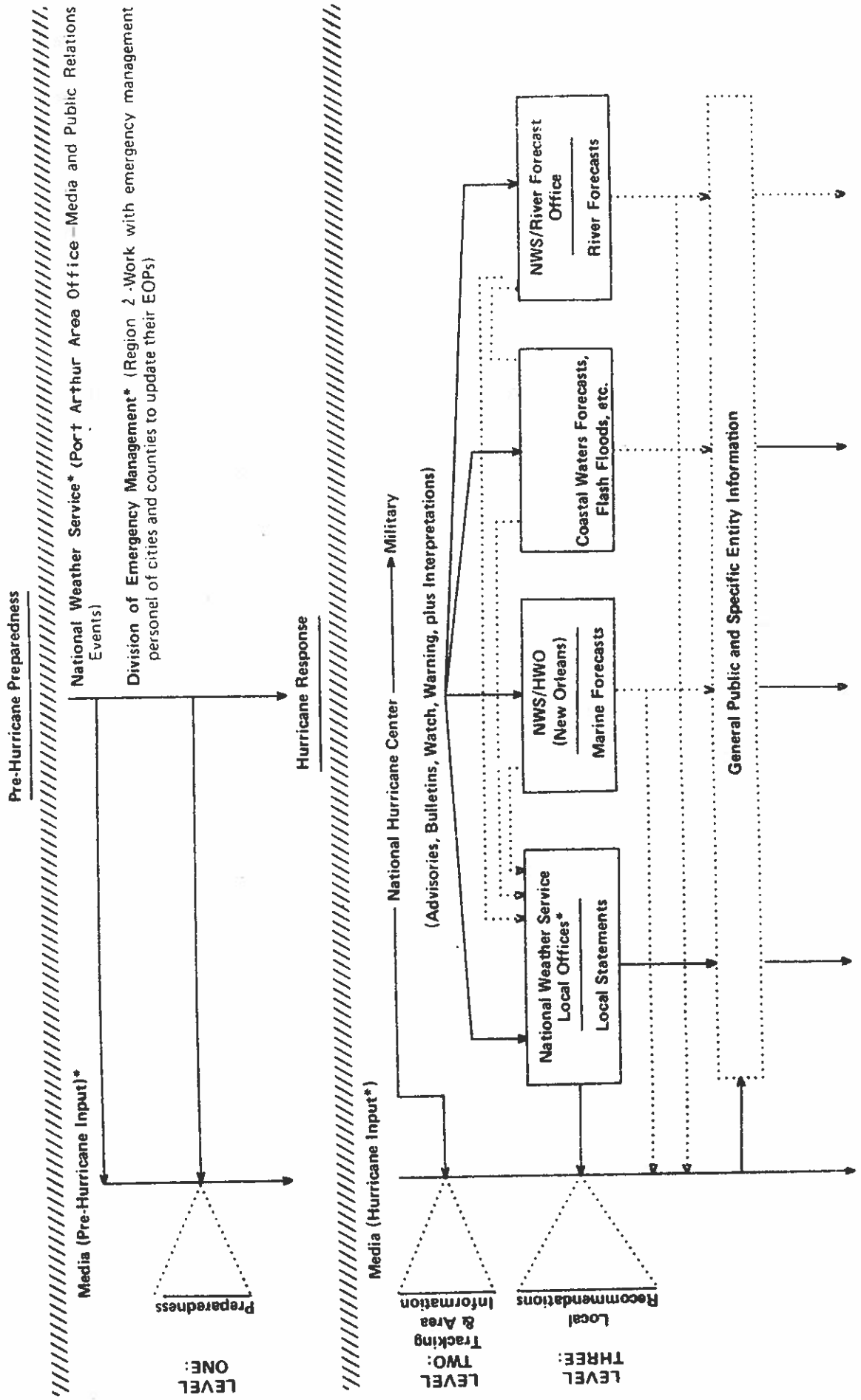
TABLE I-1

HISTORY OF HURRICANE ACTIVITY IN THE STUDY AREA  
BY TYPE, 1900-1983

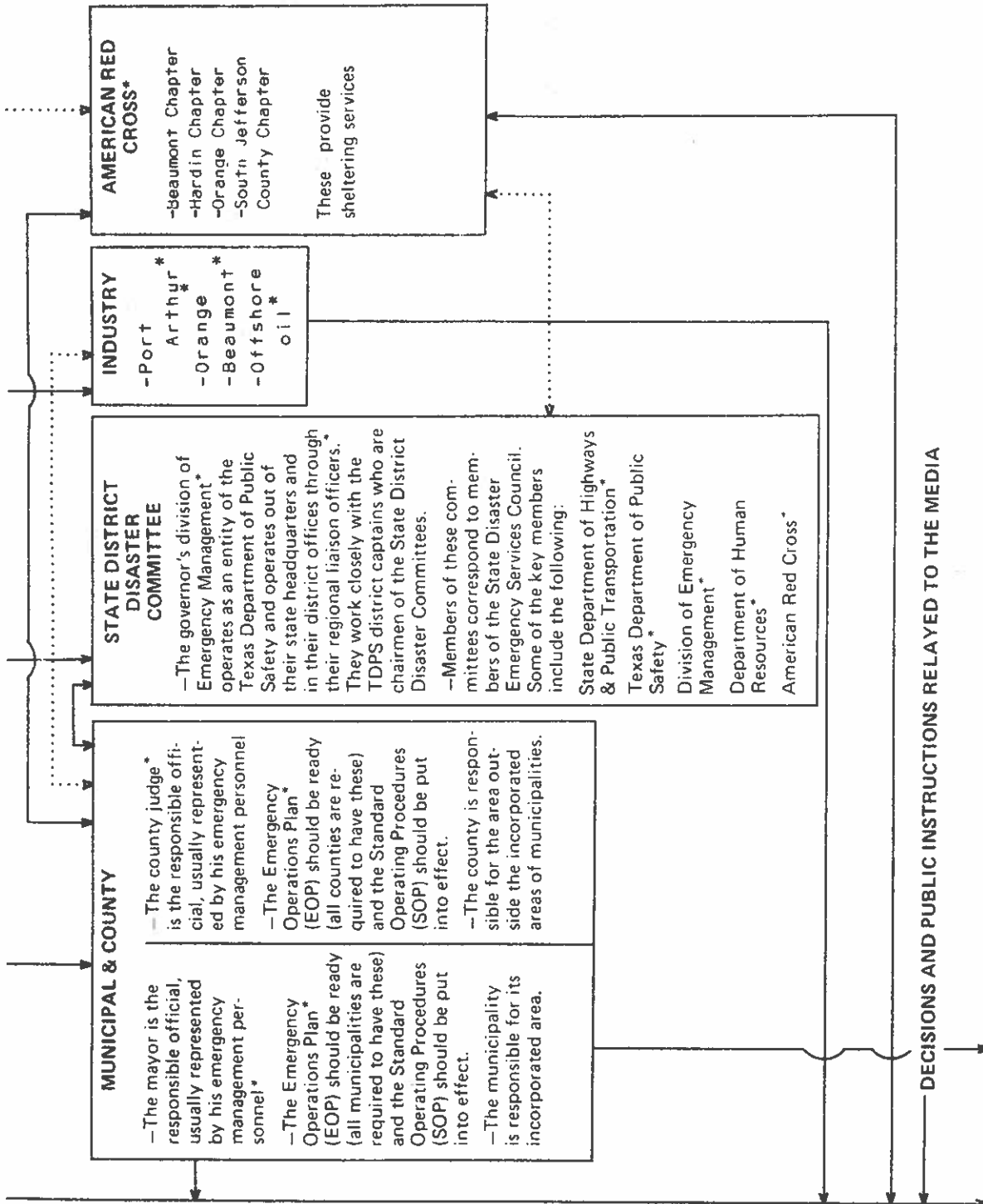
YEAR	COUNTY		NAME
	JEFFERSON	ORANGE	(ONLY AFTER 1950)
1915	(D)*	(D)	
1918	(C)	(C)	
1940	B	B	
1941	(C)	(C)	
1942	(C)	-	
1943	(B)	-	
1949	(B)	(B)	
1957	(D)	D	AUDREY
1963	A	(A)	CINDY
1980	(C)	(C)	ALLEN
1983	(C)	(C)	ALICIA

\* ( ) INDICATES INDIRECT HIT; ALL OTHERS, DIRECT HIT. A=74-95 MPH; B= 96-110 MPH; C=111-130 MPH; AND D=131 MPH AND OVER. SOURCE: Texas Architectural Research Center, Texas A&M University, College Station, Texas and Herbert, Paul J. and Glenn Taylor, HURRICANE EXPERIENCE LEVELS OF COASTAL POPULATIONS FROM TEXAS TO MAINE, National Hurricane Center, Miami, 1975.

HURRICANE RESPONSE AND "THE MODEL  
HURRICANE FLOOD EMERGENCY RELOCATION PLAN"







\*Suggested places where the "Hurricane Flood Emergency Relocation Plan" can provide information for decision making.

## Section One METHODOLOGY

Three primary methodologies are used in this study. Part A discusses the SLOSH model and how it operates to produce simulated hurricane wind speeds and storm surge. Part B details the survey used to develop estimates of persons and vehicles leaving certain areas for particular destinations, as well as estimates of shelter needs. Part C indicates the methods used to determine evacuation times.

### Part A: SLOSH

SLOSH (Sea, Lake and Overland Surges from Hurricanes) was developed for the Lake Sabine region in 1983. It is a computer model designed to project (or output) from given information (input data) the flow of surges over seas, lakes and land (taking into consideration water depths, land elevations and man-made constraints such as roads).

The input data for the model consists of:

Initial meteorological conditions that define a hurricane in terms of time, storm location (latitude and longitude), storm intensity in millibars (ambient less central pressure of storm), and storm radius in statute miles (distance from storm center to maximum winds).

Future storm conditions (at six-hour intervals out to 72 hours)<sup>1</sup> that provide information on location, intensity and size. Implicit in the storm track is the storm location for landfall and the speed direction of storm

---

<sup>1</sup>A 36-hour mode is possible.

movement.<sup>2</sup>

Initial water heights for the Gulf of Mexico. These levels are relative to mean sea level. An initial height of 2.0 feet above mean sea level was used for the simulated hurricane runs.

Based on this input, the SLOSH model numerically solves certain equations of motion to compute surge.<sup>3</sup> This surge is calculated on a computational polar grid (see Figure 1-1).<sup>4</sup> Strategic placement of this grid over the Lake Sabine region allows for fine spacing of grid points over heavily populated areas and coarse spacing over the Gulf of Mexico. The grid consists of 69 squares at the top and 59 at the side. The model contains 4,071 (59 x 69) grid squares or data points. The initial

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<sup>2</sup>Additional technical details of the storm model are contained in Jelesnianski and Taylor, 1973: A Preliminary View of Storm Surges Before and After Storm Modifications. NOAA Technical Memorandum, ERL WMP0-3, Washington, D.C.

<sup>3</sup>The model numerically solves a set of partial differential equations of motion. Except for the additional inclusion of the finite amplitude effect and horizontal viscosity, the equations are given by Jelesnianski, Weather Review, 95, 740-756. Coefficients for surface drag, eddy viscosity and bottom slip are exactly the same as used in the SPLASH (Special Program to List the Amplitudes of Surges from Hurricanes) model by Jelesnianski, 1972: I. Landfall Storms. NOAA Technical Memorandum, NWS TDL-46, Washington, D.C. There is no calibration or tuning to force agreement between observed and computed surges that is, the coefficients are universally set as constants, once and for all, and not varied locally for a particular geographical region. The model is used in a forecast mode; there is no requirement for input boundary values during surge activity (e.g., tide gauge readings or computed boundary surge values from an alternate surge model).

<sup>4</sup>In this study, the tables and figures will always be grouped at the end of each section or part.

size of the grid square is 0.6 mile in the more critical areas and 4.3 miles at the extremities. This gives greater accuracy in the more critical areas and less accuracy in the Gulf of Mexico. Each grid point can be identified by coordinate numbers.

Using X and Y coordinates, 60 grid squares or data points were identified as critical areas requiring more detailed data. These grid points are listed in Table 1-1.<sup>5</sup>

Based on the input data, SLOSH produces the following output:

A forward projection in time of the surge envelope<sup>6</sup> (penetration and height) at the time of landfall.

A composite of these surge envelopes that shows the maximum surge penetrations and heights for the entire time period.

For each of the 60 selected data points, SLOSH projects the surge height, wind speed and wind direction in ten-minute intervals for about 18 or more hours (depending on movement speed) before landfall and 12 hours after landfall.

Interpretation of the model output must be considered in view of the following constraints:

Given accurate input data for the storm's tract and meteorological parameters, the computed surges are estimated to be within plus or minus 20 percent of the observed water levels. That is, if surge is predicted to be 10 feet in a certain data point, the actual surge could range from 8 to 12 feet. With inaccurate forecasting of movement speed, direction, wind speed, and point of landfall, the error level could be greater.

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<sup>5</sup>In this study, the tables and figures will always be grouped at the end of each section or part.

<sup>6</sup>The surge envelope is produced on nine pages of computer printouts that, when taped together, show the surge height for each of the 4,071 data points. The surge height for each point is then subtracted from the land elevation to give surge penetration and height.

Terrain features of the Lake Sabine region were taken from storm evacuation maps prepared by the National Ocean Survey and topographical charts of the U.S. Geological Survey. The land calculations are based on 1972 field-edited data. Additionally, critical areas were field surveyed by National Hurricane Center personnel in 1982.

The forecast water height for each grid point represents an average condition over a grid square. Water depths above ground level for specific areas of each grid must be determined from a knowledge of the terrain heights in each specific grid square.

The model does not consider:

- Wind-generated waves;
- Rainfall generated by the storm;
- Astronomical tidal effects;<sup>7</sup>
- River flooding.

The wind speeds indicated in the ten-minute intervals are ten-minute sustained winds. For areas in proximity to the coast, these ten-minute sustained winds were translated into gusting by multiplying them by 1.69 and, for areas inland, by 1.3.

Table 1-2 lists simulated storms run through SLOSH. Their tracks are displayed in Figure 1-2.

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<sup>7</sup>Interpretive methods for the critical data points address the astronomical tidal effects by adding 1.5 feet for high tide and subtracting 1.5 feet for low tide.

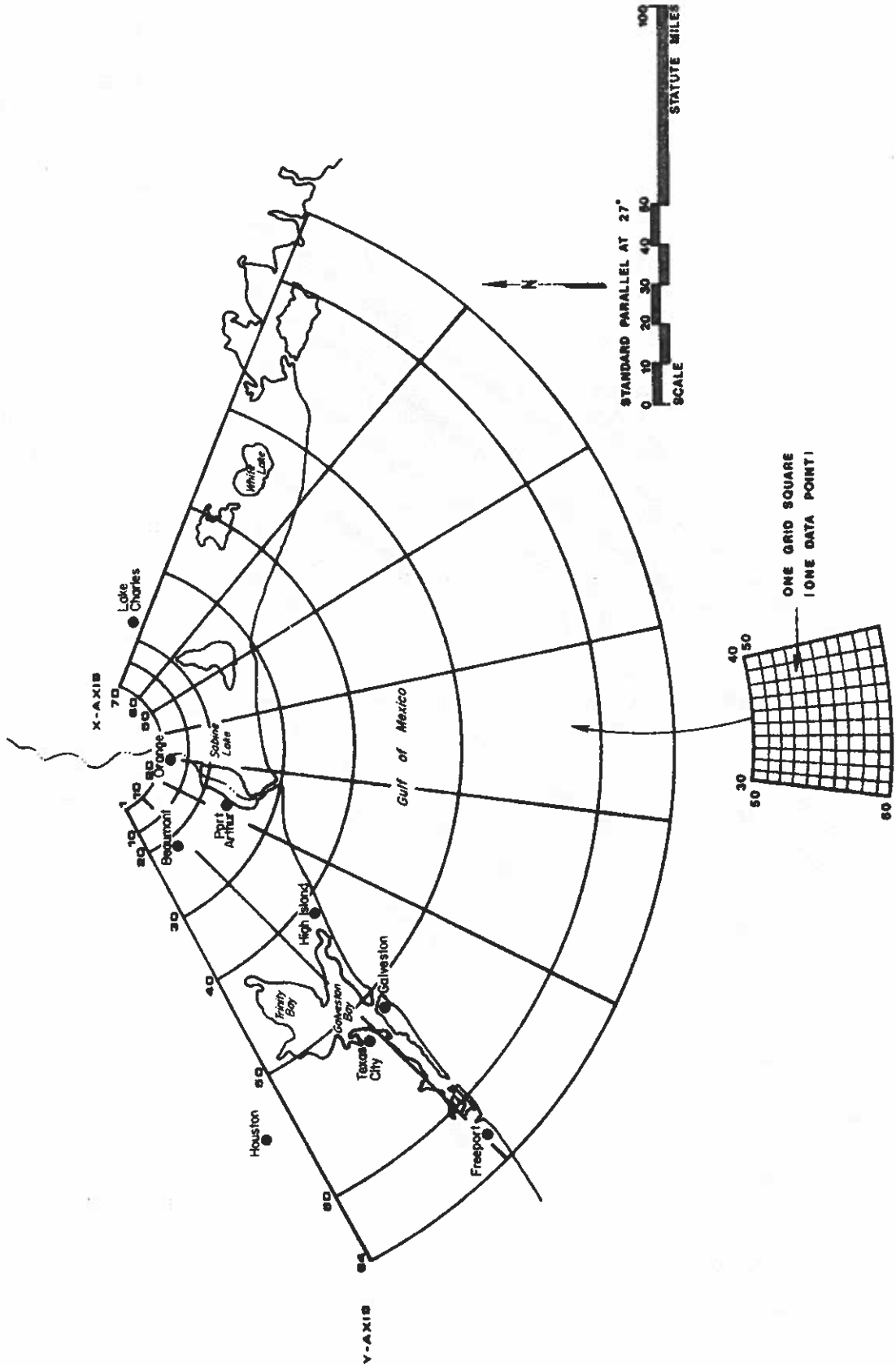
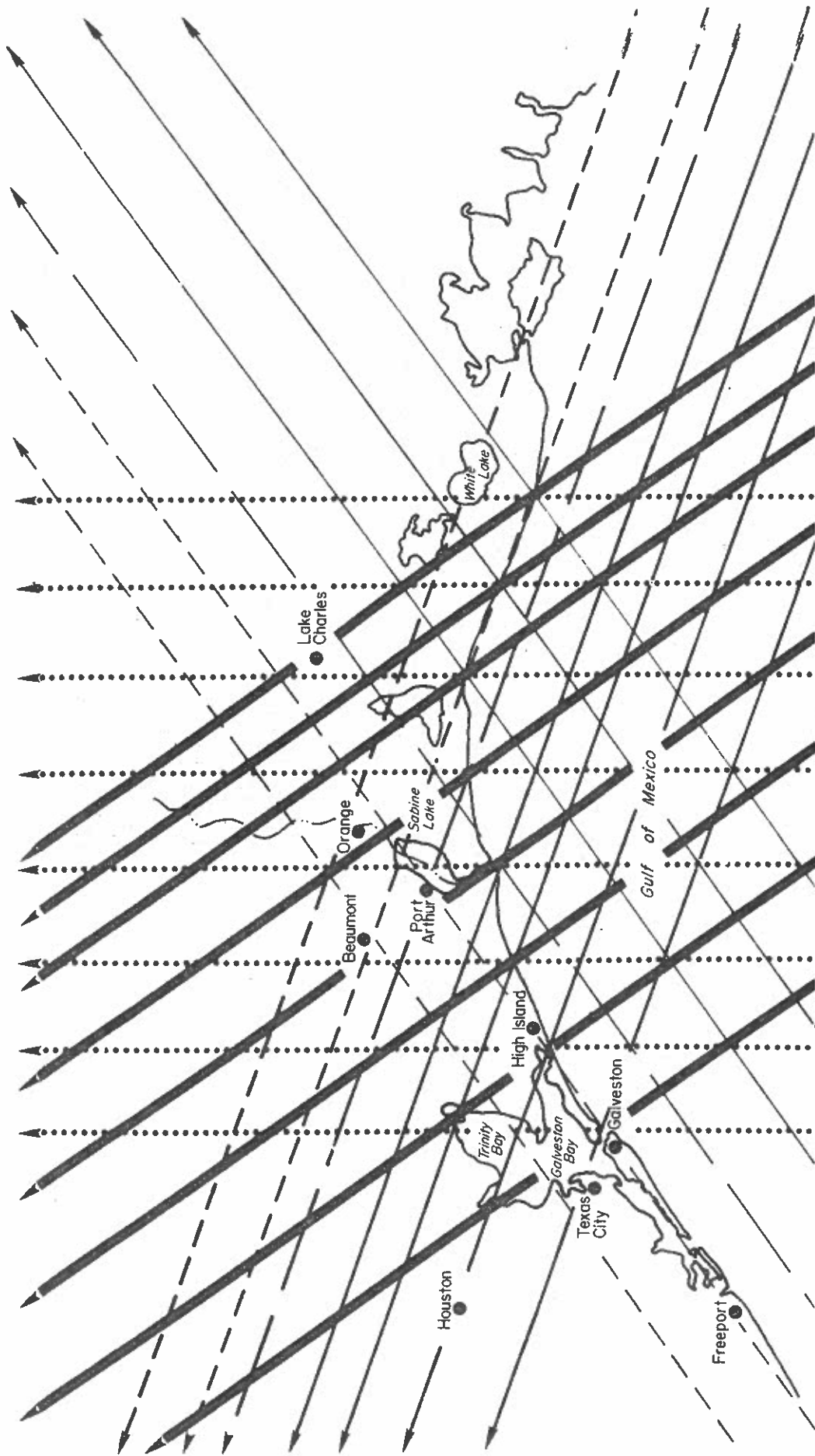


FIGURE 1-1: POLAR GRID



WIND SPEED (MPH)	TYPE HURRICANE	TYPE A	TYPE B	TYPE C	TYPE D	TYPE E
74-95	A	TYPE A	TYPE A & B	TYPE A through C	TYPE A through D	TYPE A through E
96-110	B	TYPE A	TYPE A & B	TYPE A through C	TYPE A through D	TYPE A through E
111-130	C	TYPE A	TYPE A & B	TYPE A through C	TYPE A through D	TYPE A through E
131-155	D	TYPE A	TYPE A & B	TYPE A through C	TYPE A through D	TYPE A through E
155 & OVER	E	TYPE A	TYPE A & B	TYPE A through C	TYPE A through D	TYPE A through E



FIGURE 1-2: SIMULATED HURRICANE TRACKS

TABLE 1-1  
SLOSH DATA POINTS

POINT NUMBER	CODE NAME	Y, X	ELEVATION	LOCATION
TE1	BAYRDANAU	43, 5	17	BAYSHORE ROAD BY ANAHUAC
TE2	87HIGHISLA	41, 15	5	87 BY HIGH ISLAND
TE3	124AND1985	38, 12	10	124 AND 1985
TE4	87WISEMLAK	33, 20	6	87 BY WISEMAN LAKE
TE5	73BYWINNIE	33, 10	13	73 OUTSIDE WINNIE
TE6	73BURWINRD	30, 13	13	73 BY BURREL WINGATE ROAD
TE7	73BYPOARLE	24, 16	8/19	73 OUTSIDE PORT ARTHUR/ SOUTH OF PA LEVEE
TE8	10NFORTABA	29, 8	20	10 AND NORTH FORK TAYLOR BAYOU
TE9	124BYWINNI	32, 9	15	124 OUT OF WINNIE
TE10	10ANDCHEEK	26, 8	18	10 AND CHEEK
TE11	10HILLEBAY	22, 7	17	10 AND HILLEBRANDT BAYOU
TE12	365HILLEBRD	25, 13	12	365 AND HILLEBRANDT ROAD
TE13	90AND326	31, 2		90 AND 326 AT NOME (WIND ONLY)
TE14	287NNEDWLE	20, 13	17/17	287 NORTH OF NEDERLAND/ WEST OF LEVEE
TE15	90WE0F10BE	21, 6	17	90 WEST OF 10 IN BEAUMONT



TABLE 1-1 (continued)

SLOSH DATA POINTS

POINT NUMBER	CODE NAME	Y, X	ELEVATION	LOCATION
TE16	10BETBEAVI	15, 7	16	10 BETWEEN BEAUMONT AND VIDOR
TE17	12NEVIDOR	10, 7	21	12 NORTHEAST OF VIDOR
TE18	12COWCREEK	3, 8	20	12 AT COW BAYOU
TE19	10COLECRK	3, 15	17	10 AT COLE CREEK
TE20	105SOVIDOR	12, 12	16	105 SOUTH OF VIDOR
TE21	105COWBAYO	7, 19	8	105 AND COW BAYOU
TE22	62AND105	7, 22	8	62 AND 105
TE23	358AND87	3, 28	12	358 AND 87 IN ORANGE
TE24	10SABRIV	2, 29	12	10 AND SABINE RIVER
TE25	87AND62	8, 22	12	87 AT 62
TE26	87AND1482	10, 22	11	87 AND 1482 AT BRIDGE CITY
TE27	87BYOLDRCO	14, 21	9	87 BY OLD RIVER COVE
TE28	PORTARLEVN	16, 20	16	NORTH OF PORT ARTHUR LEVEE
TE29	FISHLEVERD	24, 23	5	FISHING LEVEE ROAD
TE30	87BYPOARLS	25, 20	18/11	SOUTH OF PORT ARTHUR LEVEE/87 BEFORE LEVEE

TABLE 1-1 (continued)

SLOSH DATA POINTS

POINT NUMBER	CODE NAME	Y, X	ELEVATION	LOCATION
TE31	82ESABPABR	27, 25	7	82 AT SABINE PASS (EAST OF BRIDGE)
TE32	87NSABPSAP	29, 25	3/4	87 NORTH OF SABINE PASS/ SABINE PASS
TE33	87MOUNECRI	14, 22	9	87 AT MOUTH OF NECHES RIVER
TE34	PORTARLEVE	21, 22	19	EAST OF PORT ARTHUR LEVEE
TE35	380AT347	18, 12	20	380 AT 347
TT36	FREEPOR	62,11		BEFORE FREEPORT
TT37	SANLOUISPA	59,11		BEFORE SAN LOUIS PASS
TT38	GALBAYCHAN	50, 12		BEFORE GALVESTON BAY CHANNEL
LE39	82JOHNBAYO	26, 34	5	82 BY JOHNSON'S BAYOU
LE40	82HOLLBEA	27,43	5	82 AT HOLLY BEACH
LE41	82CALCPASS	28, 47	5	82 AND CALCASIEU PASS
LE42	82CAMERON	27,49	6	82 AT CAMERON
LE43	27NOHACKBE	18, 54	3	27 NORTH OF HACKBERRY
LE44	27BELMOSLA	10, 60	5	27 AT MOSS LAKE
LE45	10W0FSULPH	2, 64	14	10 WEST OF SULFUR

TABLE 1-1 (continued)

SLOSH DATA POINTS

POINT NUMBER	CODE NAME	Y, X	ELEVATION	LOCATION
LE46	10MAPLEWOD	8, 67	16	10 AT MAPLEWOOD
LE47	10LAKCHARL	11/68	13	10 AT LAKE CHARLES
LE48	14AND27	23, 67	16	14 AND 27 INTERSECTION
LE49	14LACBAYOU	32, 68	7	14 AND LACASSINE BAYOU
LE50	384SWEETLA	25, 61	9	384 AND SWEET LAKE
LE51	27GIBBSTOW	28, 60	6	27 AND GIBBSTOWN
LE52	27AND1143	31, 56	6	27 AND 1143 AT CREOLE
LE53	82OAKGROVE	32, 55	5	82 AT OAKGROVE
LE54	82GRANDCHE	35, 57	5	82 AT GRAND CHENIER
LE55	82SCHBAYCA	49, 67	8	82 AND SCHOONER BAYOU CANAL
LE56	108SABCANA	2, 50	12	108 WEST OF SABINE CANAL
LT57	SAPASSCHAN	29, 28		SABINE PASS CHANNEL
LT58	HACKBERRYB	34, 55		HACKBERRY BEACH
LT59	MILLERLAK	43,58		MILLER LAKE
LT60	VERMBAYEN	55, 67		ENTRANCE TO VERMILLION BAY

\* THE ELEVATION IS OF THE SPECIFIC LOCATION IN THE GRID SQUARE

T = GRID POINTS LOCATED IN TEXAS  
 L = GRID POINTS LOCATED IN LOUISIANA  
 E = GRID POINTS IDENTIFIED AS USEFUL FOR DETERMINING EVACUATION ROUTE CUTOFF TIMES  
 T = PRIMARILY FOR TIDAL SURGE

TABLE 1-2

SIMULATED SLOSH HURRICANES (356), BY MILES RIGHT OR LEFT OF SABINE PASS MOUTH

POINT OF LANDFALL	MOVEMENT SPEEDS (MILES PER HOUR)	DIRECTION (IN DEGREES)	CATEGORIES (SATTER-SIMPSON SCALE)	RADIUS OF MAXIMUM WINDS	PRESSURE DROPS (MILLIBARS)	CUMULATIVE NUMBER OF RUNS
OVERLAND	10, 20	55	1	25	20	(2)
60 LEFT	10, 20	55	1	25	20	(4)
SABINE PASS	10, 20	55	1, 2	25, 25	20, 40	(8)
40 RIGHT	10, 20	55	1, 2, 3	25, 25, 25	20, 40, 60	(14)
60 RIGHT	10, 20	55	1, 2, 3	25, 25, 25	20, 40, 60	(20)
80 RIGHT	10, 20	55	1, 2, 3	25, 25, 25	20, 40, 60	(26)
60 LEFT	5, 10, 20	290	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(41)
40 LEFT	5, 10, 20	290	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(56)
20 LEFT	5, 10, 20	290	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(71)
SABINE PASS	5, 10, 20	290	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(86)
20 RIGHT	5, 10, 20	290	1, 2, 3, 4	25, 25, 25, 25, 25	20, 40, 60, 80	(98)
80 RIGHT	5, 10, 20	290	1, 2, 3	25, 25, 25	20, 40, 60	(107)
114 RIGHT	5, 10, 20	290	1, 2, 3	25, 25, 25	20, 40, 60	(116)
60 LEFT	5, 10, 20	360	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(131)
40 LEFT	5, 10, 20	360	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(146)
20 LEFT	5, 10, 20	360	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(161)
SABINE PASS	5, 10, 20	360	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(176)
20 RIGHT	5, 10, 20	360	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(191)
40 RIGHT	5, 10, 20	360	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(206)
60 RIGHT	5, 10, 20	360	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(221)
80 RIGHT	5, 10, 20	360	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(236)
60 LEFT	5, 10, 20	325	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(251)
40 LEFT	5, 10, 20	325	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(266)
20 LEFT	5, 10, 20	325	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(281)
SABINE PASS	5, 10, 20	325	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(296)
20 RIGHT	5, 10, 20	325	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(311)
40 RIGHT	5, 10, 20	325	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(325)
60 RIGHT	5, 10, 20	325	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(341)
80 RIGHT	5, 10, 20	325	1, 2, 3, 4, 5	25, 25, 25, 25, 15	20, 40, 60, 80, 100	(356)

## Part B: Survey

A copy of the survey questionnaire is shown as Figure 1-3, while the accompanying directions are reprinted as Figure 1-4. This was a telephone survey that used a minimum number of questions to obtain the necessary information. The questionnaire was pretested for clarity. The sample was selected through the services of Metromail.<sup>8</sup>

It was estimated that there were 97,583 family units with telephones in more vulnerable areas. From these family units (selected using Metromail data), 3,683 names were chosen. This constituted a sample of approximately one out of every 26 families or 3.8 percent of the family units. Metromail was able to select approximately every 26th name in this area, and provided names, telephone numbers, addresses and zip codes.

Training sessions were held to instruct volunteers on correct telephone interviewing techniques. In order to avoid a survey bias that could be created by phoning only at certain times of the day, attempts were made to reach each household during three different time periods (morning, afternoon and evening or weekend) before they were labeled "unable to contact." Of the 3,686 questionnaires, 2,232 were completed. This represented a response rate of 60.6 percent.

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<sup>8</sup>A division of Metromedia, Inc., 11 Eisenhower Lane South, Lombard, Illinois.

Questionnaires were sorted into their respective zip code areas. If response totals for any given areas were less than 20, the responses for contiguous zip code areas were averaged with those of the given area to obtain an estimate. It was assumed that the values obtained for each zip code were representative of individual census tracts within each zip code area.<sup>9</sup>

A computer program was written to evaluate the survey data. The following estimates for each census tract within the study area were determined:

Percent of total households evacuating.

Percent of total households (of those not evacuating) staying in a local shelter.

Average number of vehicles per evacuating household.

Percent of total vehicles proceeding in each evacuation direction (see Figure 1-5 for direction of evacuation.)

The total 1980 population and occupied household census counts projected to 1985 were then applied to the survey results to obtain the following estimates by census tract:<sup>10</sup>

Number of households evacuating.

Number of vehicles from evacuating households by direction of evacuation (see Figure 1-5 for direction of evacuation).

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<sup>9</sup>If a census tract was split by a zip code area boundary, then tract households were apportioned to zip code areas based on the distribution and density of households. This was done with the use of local street and land use maps.

<sup>10</sup>Census of Population and Housing, 1980: Summary Tape File 1A, Bureau of the Census, Washington, D.C., 1981. Projections were based on trends from 1970 to 1980 with no negative trend projections used.

Number of persons staying in a local shelter.

Number of persons seeking shelter, by specific cities.

These census tract estimates were then grouped into evacuation and contingency zones<sup>11</sup> (see Section Three, Zone Delineations, for a detailed discussion of evacuation and contingency zones).

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<sup>11</sup>If a census tract was split by an evacuation or contingency zone boundary, then the census tract households were apportioned to zones based on the distributional density of households. The apportionment was done by using local street and land use maps.

FIGURE 1-3: EVACUATION SURVEY

Attempts Made:

- Morning
- Afternoon
- Evening or Weekend

EVACUATION SURVEY

Is this (telephone number)? *If a child answers, ask for a parent.*

\* \* \* \* \*

This is (name of person calling) from (organization or institution). We are making a survey to determine what people's intentions are regarding hurricane evacuation. This information will be used to help develop a long range evacuation plan for (name of county) county. Would you be willing to answer a few questions? *If "yes" proceed; if "no" thank them for their time and proceed to the next call.*

\* \* \* \* \*

If the local authorities recommend that you evacuate, would you leave?

*If "yes" ask*

*If "no" ask*

To what area would you evacuate?

Would you plan to stay:

- with friends
- in a motel, or
- in a shelter if available

What form of transportation would you use?

*(If by own vehicle ask: Would you be taking more than one vehicle? Yes \_\_\_\_\_ No \_\_\_\_\_)*

What would you do?

Conclude call and thank them for their time.



FIGURE 1-4: SURVEY DIRECTIONS

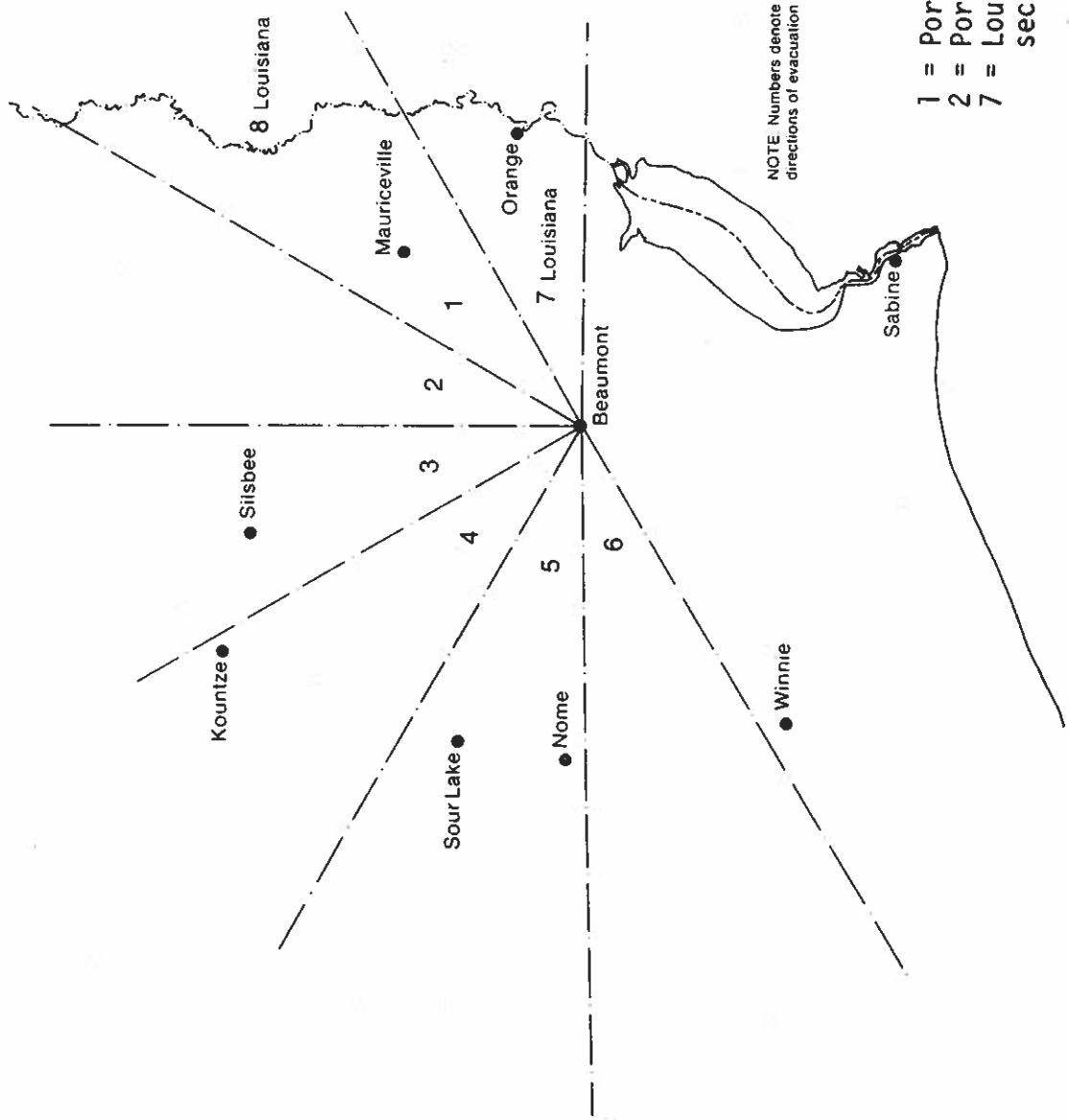
DIRECTIONS

1. Each telephone number should be called at least three times before it is placed in a no-answer category. One contact should be during a morning hour, one during an afternoon hour, and one during a night or weekend time. The order of morning, afternoon, and night or weekend can be changed to night, morning, afternoon, and so forth. If we do not follow this procedure, we will have a bias survey of people who are home at certain times of the day. Please check the forms to indicate each time contact was attempted. This will enable us to know that each non-contacted number was tried three different times.
2. The telephone number is the key to the proper source of information. Even if the name of the people at that telephone number is different, the number determines the correctness of the call.
3. The names on the questionnaires such as "Charles Black" or "John Doe" merely indicate the names as they are listed in the telephone directory. Do not ask for "Charles" or "John;" otherwise we will find out only what the males think. Rather, talk to the person answering the phone if possible (unless a child answers).
4. Try not to influence the answers people give. We are not interested in convincing them about what is right or wrong (at this point), but merely trying to discover what they think. Otherwise the survey will be invalid.
5. What you are to ask on the phone is in normal type; directions are in italics.
6. If the family cannot speak English and can only understand Spanish, write SPANISH on the top of the questionnaire and return it. They will later be contacted by someone fluent in Spanish.
7. In the event of a hurricane in the Gulf of Mexico, do not make phone calls to an area under a hurricane "watch" or "warning."
8. The label on the questionnaire on front is coded as follows:

Name listed in Telephone Directory

↓  
Carlton Ruch                    8453061  
4304 Maywood  
Bryan, Texas 77801

↑  
Telephone number



NOTE Numbers denote directions of evacuation

- 1 = Portions in Texas
- 2 = Portions in Louisiana
- 7 = Louisiana Only (no evacuations to this section of Texas)

FIGURE 1-5: DIRECTIONS OF EVACUATIONS

### Part C: Evacuation Times

Evacuation times were based on estimates of the amount of time it would take for evacuating vehicles to travel the available routes. These routes are indicated on the evacuation and contingency zone foldout map inside the back cover of this report.

The evacuation route capacity estimates<sup>12</sup> were 925 vehicles per hour for two-lane facilities (one in each direction).

Overall operating speeds under evacuation conditions on freeway facilities were assumed to be between 20 and 30 miles per hour in the absence of other constraints. Within this range, variations in operating speed would have no significant impact on capacity because vehicle spacing tends to "close up" as speed decreases. Similar speeds should prevail on other routes through rural areas.

Overall operating speeds on uncontrolled access facilities through urbanized areas are nearly impossible to estimate under evacuation conditions because of the numerous possible interacting and conflicting flows. Effective speeds of 10 miles per hour or less were assumed.

After determining the evacuation route capacities, evacuation times were determined by taking the total number of vehicles that will be evacuating under two conditions and dividing that figure by the hourly capacity of the evacuation routes. The entire area

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<sup>12</sup>Evacuation route capacity is defined as the maximum number of vehicles that can pass over a given section of roadway during a given time period.

was considered as one integrated system. It also was assumed that persons would take alternate routes if they found their desired evacuation route too crowded.

The first condition would be utilized when hurricane winds would be 110 mph or less with times figured for a partial evacuation of evacuation zones. The second condition would be for hurricanes with winds in excess of 110 mph with times figured for a 100 percent evacuation of both evacuation and contingency zones.

To estimate the number of vehicles evacuating, the survey results were utilized in conjunction with 1980 census data projected to 1985 (based on trends from 1970 to 1980). Only the positive growth trends were utilized in these projections.



## Section Two SLOSH DATA

The SLOSH data presented in this section describe wind and surge threats posed by various types of hurricanes. These data should assist in necessary decision-making when hurricanes pose threats to the study area. There are three parts to this section. The first contains the estimated maximum surge penetration possible for various storm intensities. The second contains the use of additional information supplied by selected data points. Finally, the third part contains the use of hourly tidal and gusting data.

### Part A: Maximum Surge Penetration

Maximum surge penetration for each wind speed classification represents a composite of all simulated hurricanes with similar wind speeds. The windspeeds are grouped into four classifications: 74 to 95 mph; 96 to 110 mph; 111 to 130 mph; and 131 or greater mph. It is important to note that no single hurricane in any of these classifications will produce the maximum surge.

Surge lines are drawn from the midsections of grid squares. Surge penetration is shown when the average land elevation of a grid square is less than the SLOSH projected surge elevation of that grid square. Since projected surge elevation can be plus or minus 20 percent of the actual surge elevation, the surge line projections must be interpreted accordingly. A composite map including Louisiana is in the back cover of this report.

## Part B: Data Points

More specific information has been extracted from selected SLOSH simulated hurricanes for 19 critical evacuation route locations from the 60 data points<sup>1</sup> (see Table 1-1 for a listing of data point locations). These are displayed in a map located inside the back cover. Figure 2-1 shows the locations of data points outside the study area.

Appendix B contains one page of data for each of the 19 selected data points that displays the decision-making information calculated for 82 different hurricane types. When a hurricane enters the Gulf, an estimate can be made as to which of the 82 hurricane types it will most closely resemble. The interpretive information for that particular hurricane can then be used to obtain the general estimates required for initial decision making.

The 82 key hurricane types displayed for each of the 19 selected data points in Appendix B are based on the following rationale:

The main focus should be on the Beaumont-Port Arthur-Orange area. The greatest threat to the area was posed by hurricanes with a point of landfall 20 miles left of the Sabine Pass Channel.

Two different directions were calculated ( $360^{\circ}$  and  $325^{\circ}$ ) for four different forward movement speeds (5 mph, 10 mph, 15 mph and 20 mph). This resulted in eight hurricanes for each wind speed category.

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<sup>1</sup>1, 4, 6, 7, 10, 11, 12, 13, 15, 16, 18, 19, 21, 23, 24, 26, 27, 30, 32, and 35.

The wind speed categories normally would be classified according to the Saffir-Simpson scale of:

- 74- 95 mph
- 96-110 mph
- 111-130 mph
- 131-155 mph
- Over 155 mph

The simulated hurricanes indicated that, for most conditions, hurricanes with wind speeds of 131 to 155 mph produced greater surge conditions than hurricanes with wind speeds in excess of 155 mph. This anomaly was caused by the smaller radius of maximum winds (15 miles) for hurricanes with wind speeds in excess of 155 mph than was used for hurricanes with wind speeds of 131 to 155 mph (25 miles). Wind speeds in excess of 155 mph do not permit the development of as large a radius of maximum winds. As a result of this anomaly, data were generated for both wind speed categories (131-155 mph and over 155 mph) and then collapsed into one category (131 mph and over), using the maximum conditions for both categories.

Because the point of Beaumont-Port Arthur-Orange landfall that produces maximum conditions for the area does not produce maximum conditions in the outlying areas, two additional points of landfall were chosen--one approximately 40 miles to the left of that point which produces the maximum for the Beaumont-Port Arthur-Orange area (60 miles left of the Sabine Pass Channel) and one approximately 40 miles to the right of that point (20 miles to the right of the Sabine Pass Channel). These hurricane types (at 325° and 360° respectively) not only indicate maximum type conditions for areas on either side of the Sabine Pass Channel, but these two landfall locations can also be used to estimate conditions in the Beaumont-Port Arthur-Orange area should a hurricane make landfall 40 miles left or 40 miles right of the point of landfall that produces worst case conditions for the Beaumont-Port Arthur-Orange area.

Because of the potential of hurricanes paralleling the coast, parallel moving hurricanes were also considered. The worst case paralleling hurricanes for the Beaumont-Port Arthur-Orange area were selected. For hurricanes heading northeast (55°) it was for a point of impact 40 miles right of the Sabine Pass Channel, while for hurricanes heading west-northwest (290°) the point of landfall was the Sabine Pass Channel. For hurricanes paralleling the coast in a northeasterly direction (55°) it was felt that they could not achieve sustained winds in excess of 130 mph.



The following types of data are given for each hurricane:

The number of hours before (or after, in a few cases) the time of landfall when wind gusts (50 to 55 mph) could tip trucks, buses, vans or recreational vehicles, along with the direction the wind would be blowing at that point in time. Also, the estimated number of hours these gusting conditions would continue if the forward movement speed is constant. The identical information is then repeated for the wind gust conditions (65 to 70 mph) that could tip automobiles.

The number of hours before (or after, in a few cases) the time of landfall when storm surge can block egress routes. These times are given for low tide, MSL and high tide conditions.

The maximum high tide surge that can be anticipated at that location.

B: The following cautions are given at the beginning of Appendix

Caution 1: Wave action and rainfall not included in calculations.

Caution 2: Errors of plus or minus 20 percent possible for peak surges with accurate initial data. For estimating, this error range can be generalized to other data.

Caution 3: Forward movement speeds of 15 mph are based on averaging the 10 mph and the 20 mph conditions.

High and low tide calculations were based on a 1.5 foot increase above mean sea level and a 1.5 foot decrease from mean sea level. Since tides vary at different times and in different places, actual estimates for low or high tide variations should be adjusted accordingly. An example follows:

	<u>Data Based on Tidal</u> <u>Variation of 1.5 feet</u>	<u>Actual Tidal</u> <u>Variation of .75 feet</u>
Low Tide Flooding FTOL	-2.0 (hours)	-3.0
MSL Flooding FTOL	-4.0 (hours)	-4.0
High Tide Flooding FTOL	-6.0 (hours)	-5.0
Maximum High Tide Surge	10 feet	9.5

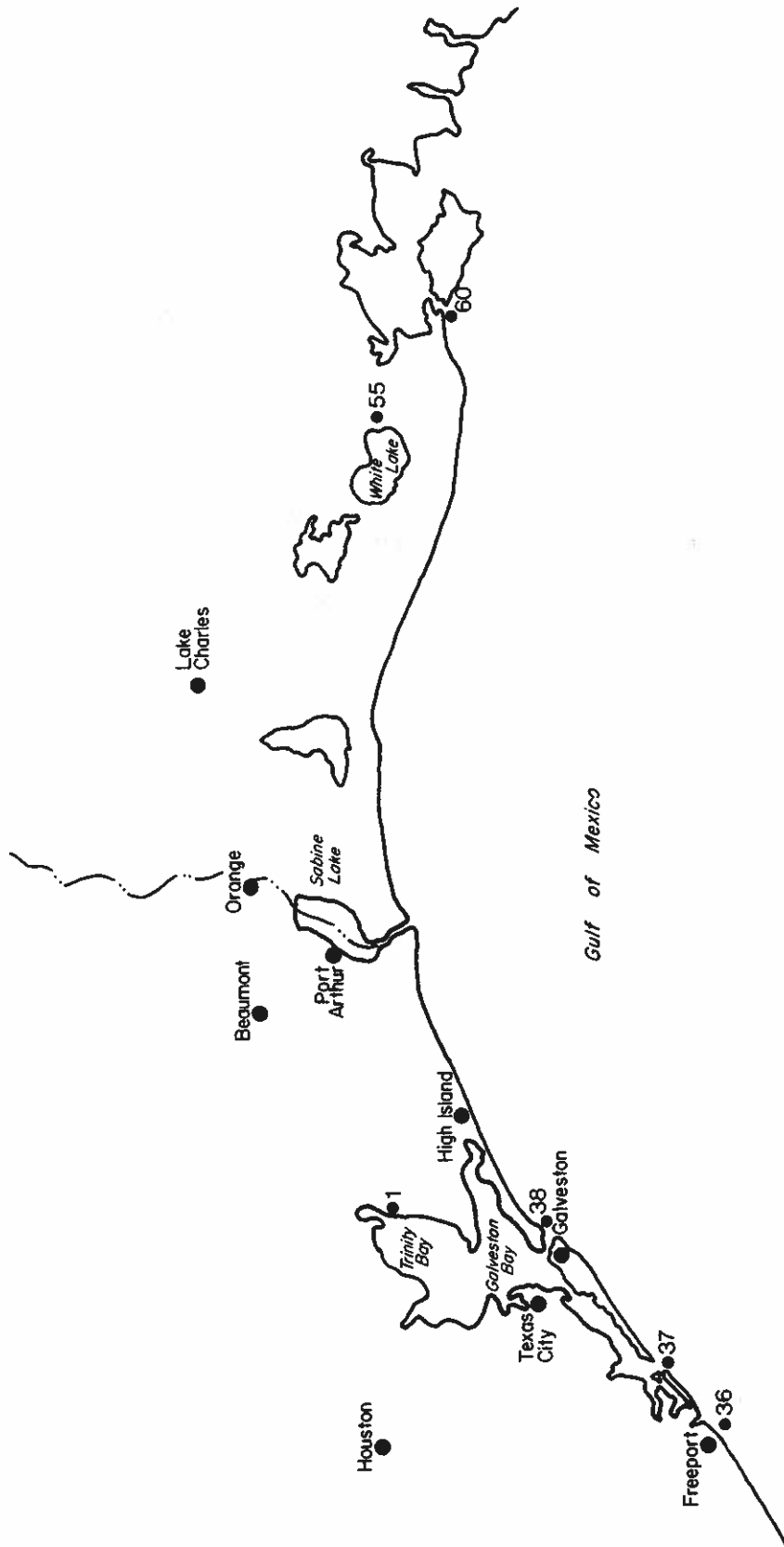


FIGURE 2-1: LOCATION OF DATA POINTS OUTSIDE OF STUDY AREA

### Part C: Hourly Tidal Data

In order to obtain a perspective on the impact of a hurricane, it is useful to know the anticipated tidal condition before the time of landfall and after the time of landfall. Data in Appendix C lists hourly tidal height 24 hours before (or when the data begin) and 12 hours after the anticipated time of landfall. The maximum highest anticipated surge above MSL also is indicated. This information is displayed for 28 different hurricanes (with varying intensities) for three data points along the Gulf Coast and two by the Port Arthur Levee. The three data points on the Gulf Coast can give an array of hourly surge conditions, while the data points by the levee can be used to portray hourly surge conditions above MSL to indicate potential threats to the levee system.

### Section Three ZONE DELINEATIONS

This section contains a rationale for zone delineations (Part A), the zone delineations themselves (Part B) and a boundary description of these zones (Part C).

#### Part A: Rationale

The purpose for zone delineation is to identify areas that are threatened by hurricane winds and storm surge. Once the threatened areas are identified, zones are delineated on the basis of roads, shorelines and/or county and municipal boundaries.

There are two types of zones--evacuation and contingency zones. Evacuation zones are in those areas which could be penetrated by storm surge from hurricanes with sustained winds up to 110 mph; contingency zones are in those areas which could be flooded by storm surge from hurricanes with sustained winds over 110 mph. Figures 3-1 to 3-5 illustrate the location, by county, of these zones (Part B). A fold-out map bound inside the back cover is a composite of all counties.

PART B: ZONE DELINEATIONS

	PAGE
FIGURE 3-1 HARDIN COUNTY	3 - 3
FIGURE 3-2 JASPER COUNTY	3 - 4
FIGURE 3-3 JEFFERSON COUNTY	3 - 5
FIGURE 3-4 NEWTON COUNTY	3 - 6
FIGURE 3-5 ORANGE COUNTY	3 - 7

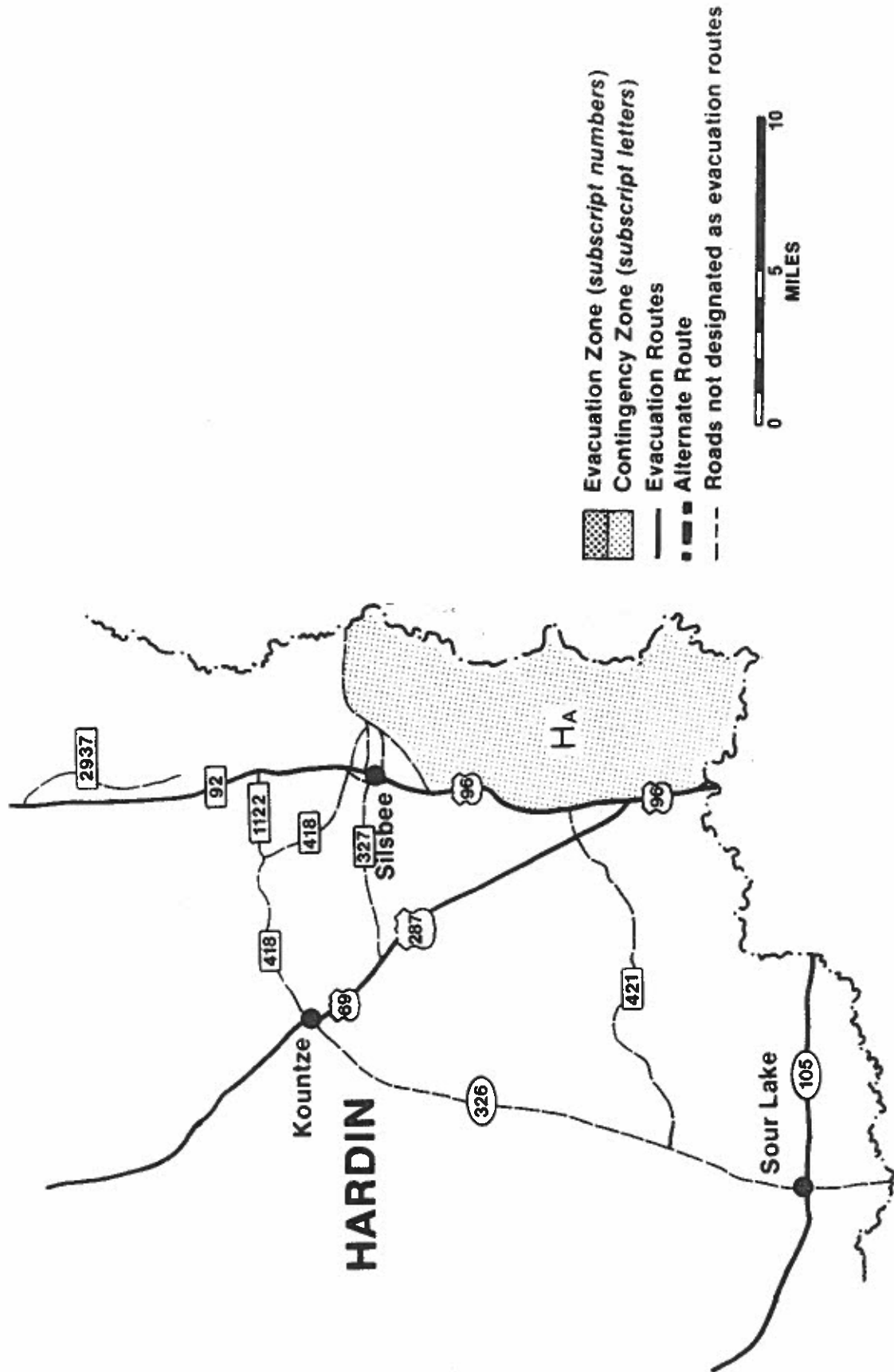


FIGURE 3-1: CONTINGENCY ZONE FOR HARDIN COUNTY

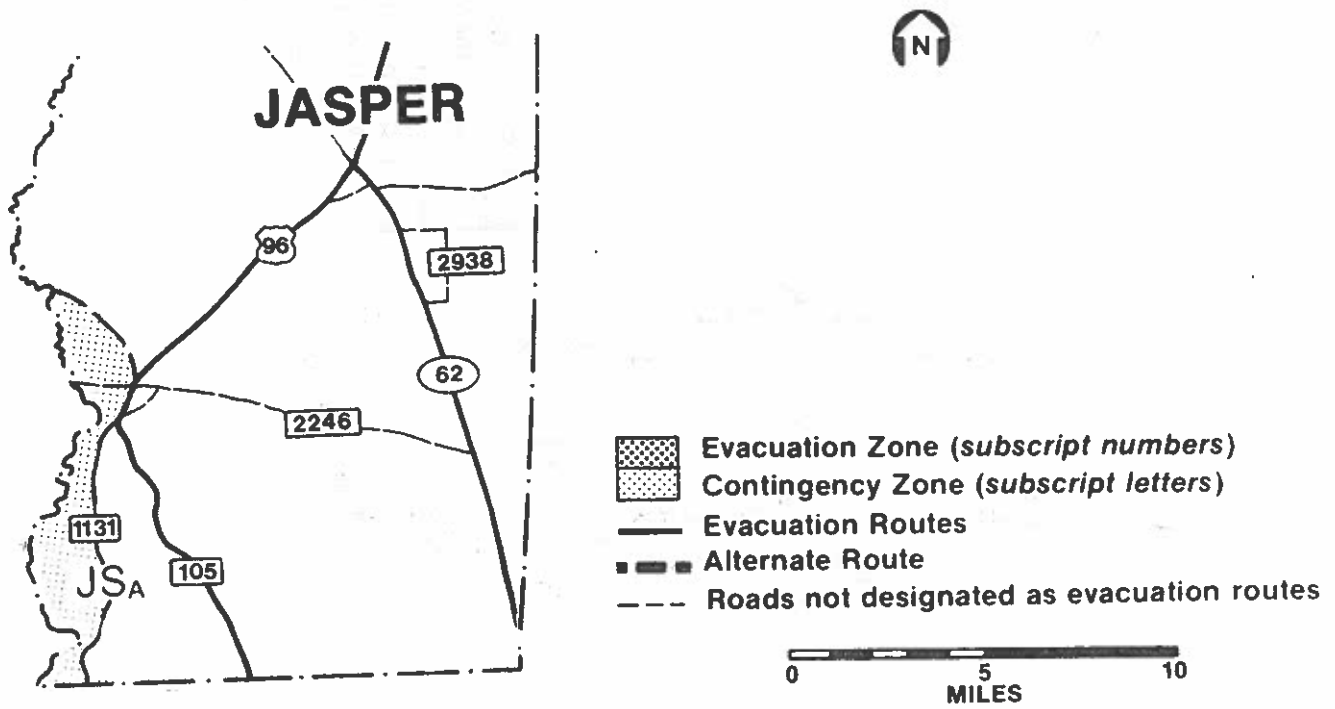


FIGURE 3-2: CONTINGENCY ZONE FOR JASPER COUNTY

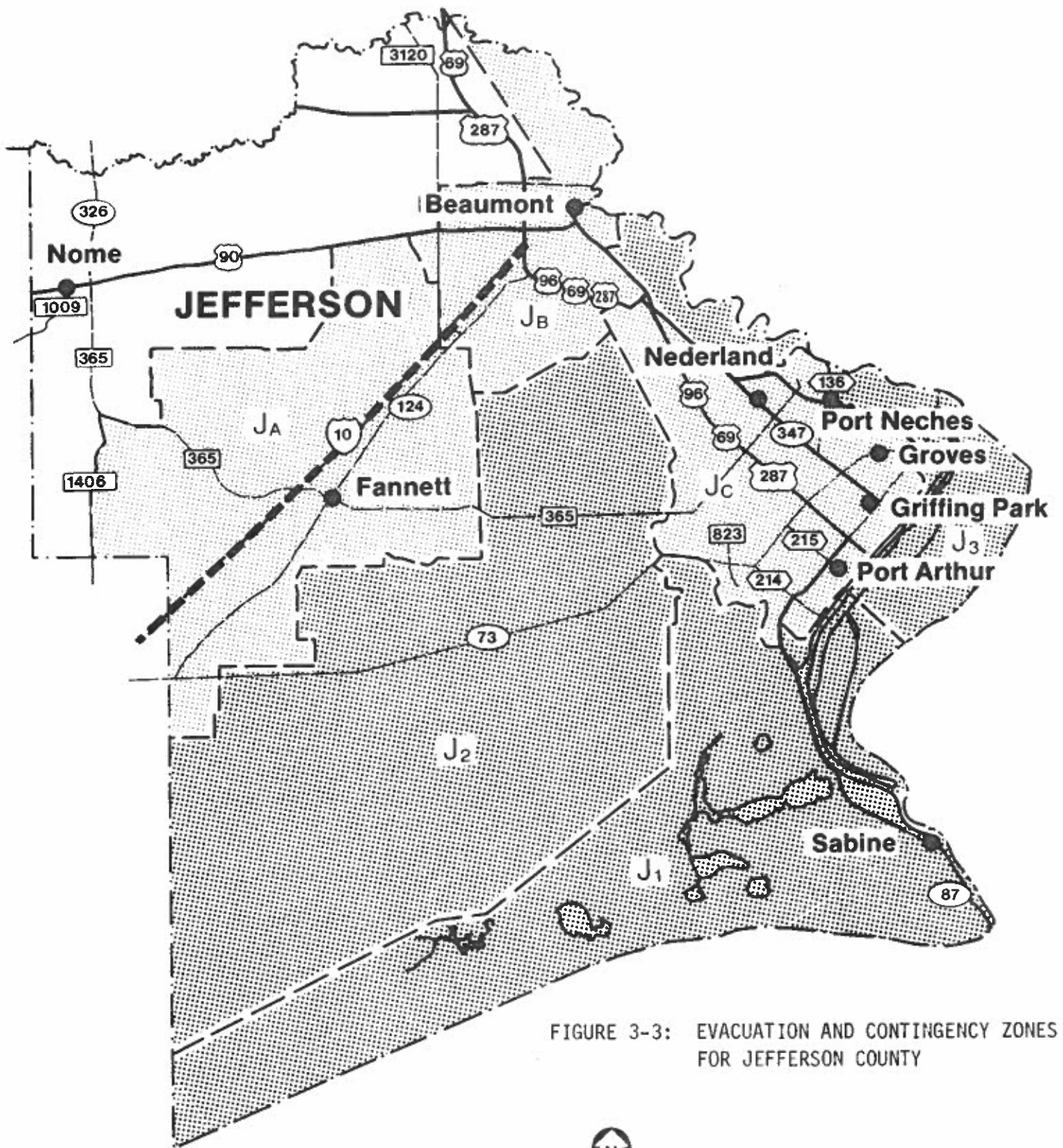







FIGURE 3-3: EVACUATION AND CONTINGENCY ZONES FOR JEFFERSON COUNTY



-  Evacuation Zone (subscript numbers)
-  Contingency Zone (subscript letters)
-  Evacuation Routes
-  Alternate Route
-  Roads not designated as evacuation routes

0 5 10  
MILES



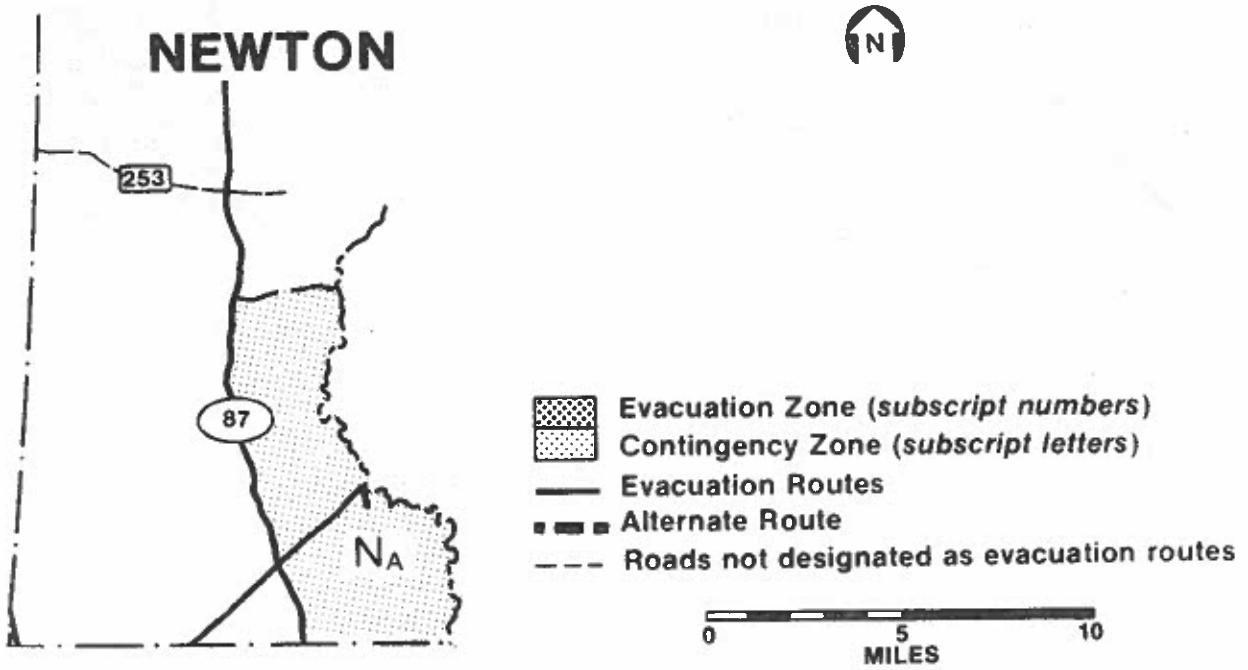


FIGURE 3-4: CONTINGENCY ZONE FOR NEWTON COUNTY

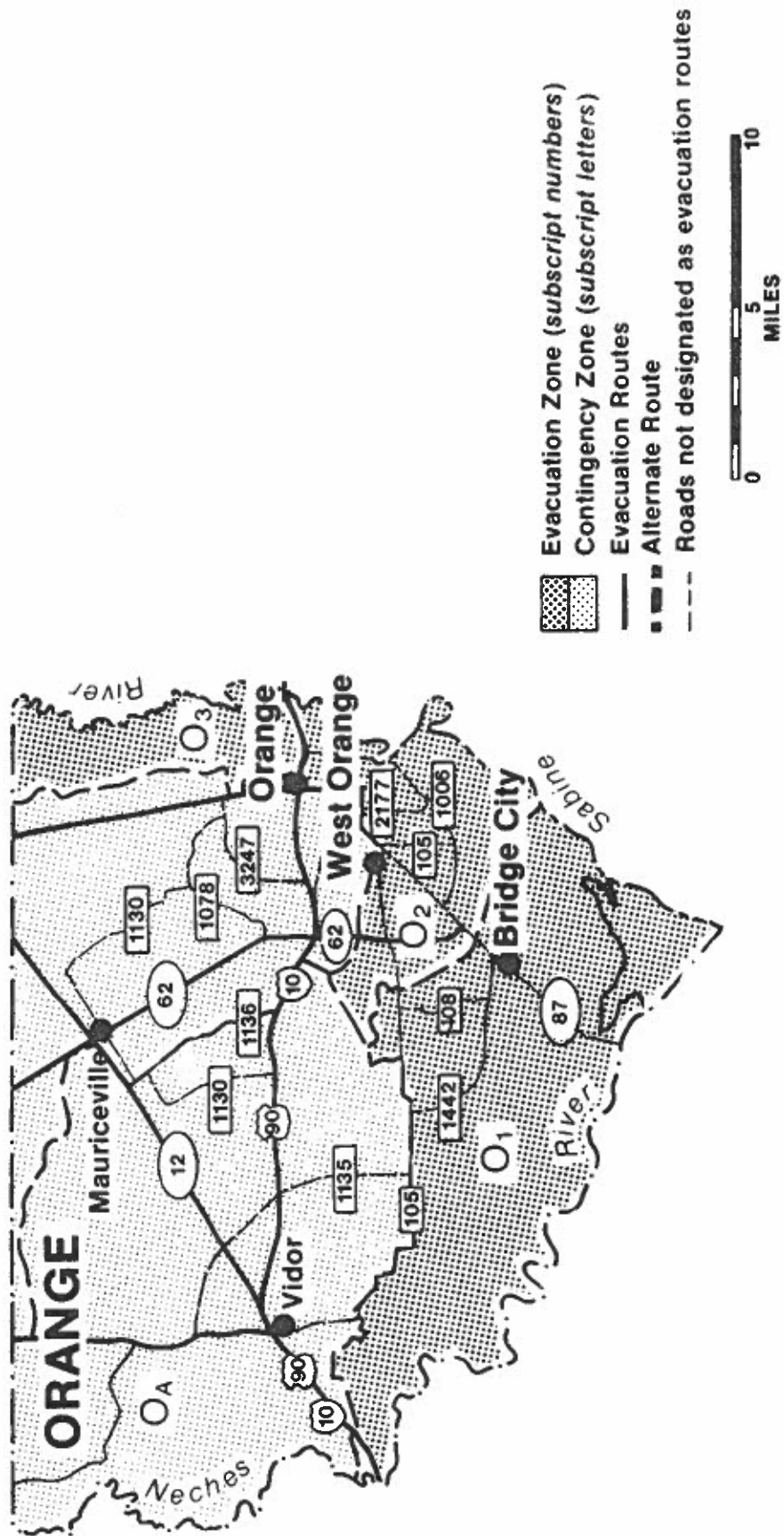


FIGURE 3-5: EVACUATION AND CONTINGENCY ZONES FOR ORANGE COUNTY

PART C: BOUNDARY DESCRIPTIONS

	PAGE
HARDIN COUNTY	3 - 9
JASPER COUNTY	3 - 9
JEFFERSON COUNTY	3 - 9
NEWTON COUNTY	3 - 12
ORANGE COUNTY	3 - 12

#### HARDIN COUNTY CONTINGENCY ZONE

HA

The northern boundary begins at the intersection of U.S. 96 and State Highway 498 .5 mile east of the eastern corporate limits of Silsbee. East on U.S. 96 to the Neches River.

The eastern boundary begins at a point on U.S.96 where it crosses the Neches River. Then south on the Neches River to a point where Hardin, Jefferson and Orange Counties all meet at the Pine Island Bayou.

The southern boundary begins at a point on the Neches River where Hardin, Jefferson and Orange Counties all meet at the Pine Island Bayou. Northwest on the Pine Island Bayou 6 miles to the Atchison, Topeka and the Sante Fe Rail Line.

The western boundary begins at a point where the Atchison, Topeka and Sante Fe Railroad crosses Pine Island Bayou. Northwest along the railroad 0.75 mile until it parallels U.S. 69-96-287. Then continue on U.S. 69-96-287 12.25 miles until it intersects State Highway 498 .5 mile east of the eastern corporate limits of Silsbee.

#### JASPER COUNTY CONTINGENCY ZONE

JSA

The northeastern boundary begins at a point approximately 2.5 miles north of U.S. 96 on the Neches River. Then southeast 1.25 miles to a point where a petroleum products pipeline crosses the longitudinal line of 94 degrees 5 minutes. Continue southeast .75 mile to Mill Creek. From this point, due south 1.25 miles to the intersection of U.S. 96, County Road 105 and County Road 2246 in Evadale.

The eastern boundary begins at a point in Evadale where U.S.96, County Road 105 and County Road 2246 intersect. South on 105 .75 mile to its intersection with County Road 1131. Then continue south on 1131 7.5 miles to the Jasper-Orange county line.

The southern boundary begins at a point on County Road 1131 where it crosses the Jasper-Orange county line. West along the county line 1.5 miles to the Neches River.

The western boundary begins at a point on the Neches River where Hardin, Jasper and Orange counties all meet. Then north along the river 11.5 miles to a point approximately 2.5 miles north of U.S. 96.

#### JEFFERSON COUNTY EVACUATION ZONES

J1

The northern boundary begins at a point on State Highway 73 where the Port Arthur levee system begins. The boundary follows the levee 9 miles southeast until it ends near State Highway 87. At this point, cross S.H.87 and follow the railroad spur to the southeast. Continue along the tracks until they split. At this point, southeast to the shoreline. Then northeast along the shoreline .75 mile to a point directly across the Intracoastal Waterway from the Port Arthur Pleasure Pier entrance. From this point, southeast 2.75 miles into Sabine Lake to the Texas-Louisiana state line.

The eastern boundary begins at a point on the state line southeast of the Port Arthur Pleasure Pier entrance and continues along the state line 14.5 miles south to the Gulf Coast.

The southern boundary begins at a point on the Texas-Louisiana state line at the Gulf Coast (mouth of the Sabine River) and follows the coast 33 miles west to the Jefferson-Chambers county line.

The western boundary begins at a point on the Jefferson-Chambers county line at the Gulf Coast and follows the county line north 15.5 miles to a point where it intersects the Gulf Intracoastal Waterway.

The northwestern boundary begins at the intersection of the Jefferson-Chambers county line and the Gulf Intracoastal Waterway and follows the Waterway northeast 22 miles until it meets the western boundary of the J.D. Murphee Wildlife Management Area. Then north along this boundary 8

miles to State Highway 73. East on S.H.73 .75 mile to a point where the Port Arthur levee system begins.

J2

The northern boundary begins at a point where Labelle Road (Co. Rd 364) intersects Steinhagen Road. East on Steinhagen Road 1.25 miles to a point where it turns to the south. Connect this point to a point northeast on Hildebrandt-Spindletop Road where it also makes a turn to the south. Follow Hildebrandt-Spindletop Road 2.25 miles northeast to West Port Arthur Road.

The eastern boundary begins at the intersection of West Port Arthur Road and Hildebrandt-Spindletop Road and follows West Port Arthur Road south 5 miles to Rhodair Gully. Then along Rhodair Gully 5 miles until it meets the boundary of the J.D. Murphee Wildlife Management Area. Then along the western boundary of the Wildlife Area 8 miles until it meets the Gulf Intracoastal Waterway.

The southern boundary begins at a point on the Gulf Intracoastal Waterway at the western boundary of the J.D. Murphee Wildlife Management Area. Southwest along the Waterway 22 miles until it intersects the Jefferson-Chambers county line.

The western boundary begins at the intersection of the Jefferson-Chambers county line and the Gulf Intracoastal Waterway. North along the county line 11.75 miles until it intersects Todd Road.

The northwestern boundary begins at a point on the Jefferson-Chambers county line at Todd Road and follows Todd Road east 1.75 miles to Englin Road. Then north on Englin Road 2.5 miles to State Highway 73. East on 73 3.75 miles to Wilber Road. Wilber Road north 4 miles to Craigen Road. Follow Craigen-Patterson Road 4.25 miles until it intersects with Jap Road. East on Burrell-Wingate Road 4 miles until it intersects Labelle Road. Then north on Labelle Road 6.25 miles to Steinhagen Road.

J3

The northeastern boundary begins at a point where the eastern corporate limits of Beaumont meet the Neches River near the oil refinery rail spur. Follow the river southeast to its mouth in Sabine Lake. Continue into the lake along the Port Arthur city limits to the Texas-Louisiana state line.

The southeastern boundary begins at a point on the Texas-Louisiana state line in Sabine Lake at the Port Arthur city limits. Follow the state line southwest 9 miles to a point southeast of the Port Arthur Pleasure Pier entrance.

The southwestern boundary begins at a point on the Texas-Louisiana state line in Sabine Lake at a point directly southwest of the Port Arthur Pleasure Pier entrance. Then northwest along a line perpendicular to the shoreline until it reaches the mainland shoreline.

The western boundary begins at a point on the shoreline directly across the Gulf Intracoastal Waterway from the Port Arthur Pleasure Pier entrance. Follow the shoreline northeast 4.5 miles until it reaches the rail spur south of the extension of Main Avenue. Follow the rail tracks to State Highway 87. Then northeast on 87 .5 mile to Atlantic Street. Follow Atlantic northwest 0.75 mile until the Port Arthur Levee System begins. Then along the levee 3.25 miles to State Highway 136. S.H. 136 north 1.25 miles to Port Neches Avenue which eventually becomes County Road 366. Follow 366 until it intersects State Highway 347. S.H.347 northwest 4 miles to its intersection with U.S. 69-96-287. Follow the eastern side of this intersection to a point where it passes over Spindletop Avenue. Northeast on Spindletop Avenue .1 mile to a point where the Beaumont corporate limits turn to the northwest. Continue along the city limits until it meets the Neches River.

#### JEFFERSON COUNTY CONTINGENCY ZONES

JA

The northern boundary begins at the intersection of Pignut Road and Hildebrandt Road. East 5.75 miles on Pignut-Lawhon Road to Pine Island Levee Road.

Then to U.S.90. Then east 3 miles on U.S. 90 to a point where it intersects the Beaumont city limits.

The eastern boundary begins at the western corporate limits of Beaumont on U.S. 90. Then south and east along the city limits approximately 8 miles until it intersects Labelle Road. South on Labelle Road 8 miles to Burrell-Wingate Road.

The southern boundary begins at the intersection of Labelle Road and Burrell-Wingate Road. West 4 miles to Craigen Road. Follow Craigen Road 4.25 miles to Wilber Road. Then south on Wilber Road 4 miles to State Highway 73. West on 73 3.75 miles to Englin. South on Englin 2.5 miles to Todd Road. Then 1.75 miles west on Todd Road to the Jefferson-Chambers county line.

The western boundary begins at a point on the Jefferson-Chambers county line at Todd Road. North and west 9.5 miles along the county line to County Road 1406. North 6 miles on 1406 to County Road 365. East on 365 2.5 miles to Hildebrandt Road. Then north 3 miles to Pignut Road.

JB

The northeastern boundary begins at a point where the Pine Island Bayou (also the Beaumont city limits) meets the Atchison, Topeka and Sante Fe Rail Line. Follow the Pine Island Bayou southeast 5 miles to the Neches River. Then along the river until the Beaumont corporate limits turn due south. Continue along the city limits until it reaches Spindletop Avenue.

The southeastern boundary begins at the southeastern corner of the Beaumont city limits at Spindletop Avenue. West on Spindletop Avenue 1 mile to the Port Arthur Freshwater Canal. Then along the canal .75 mile until it meets Highland Avenue. Then southeast on Highland Avenue .25 mile to the railroad tracks. Follow the tracks west .33 mile to West Port Arthur Road. Then southeast on Port Arthur Road 1.5 miles to Hildebrandt-Spindletop Road.

The southern boundary begins at the intersection of Hildebrandt-Spindletop Road and West Port Arthur Road. Southwest on Hildebrandt-Spindletop

Road 2.25 miles to a point where it turns to the south. Connect this point to a point southwest on Steinhagen Road where it also makes a turn to the south. West on Steinhagen road 1.25 miles to Labelle Road.

The western boundary begins at the intersection of Steinhagen Road and Labelle. North on Labelle Road 1.75 miles to the Beaumont city limits. Follow the city boundary to the west and the north until it meets U.S. 90. Then east on U.S. 90 4 miles to Amelia Road (Co. Rd 364). North on Amelia Road 1.5 miles to Hall Road. East on Hall Road and continue east as it becomes Gladys Avenue 3.25 miles to major intersection of Interstate 10. Continue east through the intersection on Interstate 10 1 mile to the Atchison, Topeka and Sante Fe Railroad. Northwest along the railroad 7.25 miles to the Pine Island Bayou.

JC

The northern boundary begins at a point where the railroad tracks meet West Port Arthur Road .4 mile south of the Beaumont city limits. Then east .33 mile to Highland Avenue. Northwest on Highland Avenue .25 mile to the Port Arthur Freshwater Canal. Southeast along the canal .75 mile to a point where it crosses Spindletop Avenue. Northeast on Spindletop Avenue .75 mile to U.S. 69-96-287.

The northeastern boundary begins at the intersection of U.S. 69-96-287 and Spindletop Avenue. U.S. 69-96-287 southeast .75 mile to State Highway 347. S.H. 347 southeast 4 miles to 366. Follow 366 into Port Arthur and continue on it as it becomes Port Neches Avenue to its intersection with State Highway 136. South 1.25 miles on 136 to the Port Arthur levee. Follow the levee 3.25 miles to its end. At this point continue southeast on Atlantic Street .75 mile to State Highway 87, then southwest on S.H. 87 to the rail tracks. Follow the rail tracks through Steeltown until they parallel the shoreline and end just south of the extension of Main Avenue.

The southeastern boundary begins on the shoreline at the end of the Steeltown railroad spur south of Main Avenue. Then follow the shoreline 6.5 miles southeast until the railroad spur splits,

approximately .75 mile southeast of the Co.Rd 214 bridge across the waterway.

The southwestern boundary begins at a point on the shoreline at the rail spur split .75 mile southeast of Co. Rd 214. Then west and northwest along the rail tracks until they meet S.H. 87 where it makes a turn to the south. Cross S.H. 87 to the end of the Port Arthur Levee System. Continue northwest along the levee approximately 11 miles until it ends near Rhodair Gully .75 mile south of County Road 365. Continue north along Rhodair Gully 2.25 miles to West Port Arthur Road. North 6 miles on West Port Arthur Road to the railroad tracks .4 mile south of the Beaumont city limits.

#### NEWTON COUNTY CONTINGENCY ZONE

NA

The northern boundary begins at the intersection of State Highway 87 and the road to Laurel Sudduth Bluff. East 2.5 miles to the Sabine River. (Texas-Louisiana State Line).

The eastern boundary begins at that point on the Sabine River. South along the river to the Newton-Orange county line.

The southern boundary begins at a point on the Sabine River at the Newton-Orange county line. West along the county line 4 miles to State highway 87.

The western Boundary begins at a point on State Highway 87 where it crosses the Newton-Orange county line and proceeds north.

#### ORANGE COUNTY EVACUATION ZONES

01

The northern boundary begins at a point on Interstate 10 at the Jefferson-Orange county line. East on I-10 to the Rose City limits. Follow these limits and continue along the city limits of Vidor to the east and south 6.5 miles to County Road 105. Follow 105 south and east 2.5 miles to

Oilla Road. Due north on Oilla Road 1.5 miles until it deadends at Cow Bayou.

The northeastern boundary begins at a point on Cow Bayou near the deadend of Oilla Road. Then southeast on Cow Bayou 10 miles to the Sabine River.

The southeastern boundary begins at a point on the Sabine River at the mouth of Cow Bayou. Then southwest on the Sabine River (Texas-Louisiana state line) to Sabine Lake. Continue along the state line through Sabine Lake to the eastern city limits of Port Arthur.

The southwestern boundary begins at a point in Sabine Lake on the state line at the eastern city limits of Port Arthur. Northwest along the city limits 3.5 miles to the shore at the mouth of the Neches River. Continue up the River (Orange-Jefferson county line) to Interstate 10.

02

The northern boundary begins at a point where Oilla Road deadends at Cow Bayou. Connect this point with a line northeast to the deadend of Tulane Road. Then southeast on Tulane Road 1.75 miles to Dorman Road (S.H. 62). Cross Dorman Road and continue east along the railroad tracks of the Southern Pacific Railroad 2 miles to a point where they intersect the tracks of the Missouri Pacific Railroad. Then southeast along the Missouri Pacific Railroad .5 mile to State Highway 87. Continue on S.H. 87 east and north through Orange 5.75 miles until it crosses the northern city limits of Orange. Then follow the city limits east 0.5 mile, south 1.5 miles and then east to the Texas-Louisiana state line.

The eastern boundary begins at a point on the Texas-Louisiana state line (Sabine River) at the northern city limit of Orange. Then south along the state line to a point where Cow Bayou flows into the Sabine River.

The southwestern boundary begins at the mouth of Cow Bayou on the Sabine River. Northwest along Cow Bayou 10 miles to a point where Oilla Road deadends at Cow Bayou approximately 0.5 mile due south of the Southern Pacific Railroad.

03

The northern boundary begins at a point on the Newton-Orange county line at Old Highway 87. East 3 miles along the county line to the Texas-Louisiana state line (Sabine River).

The eastern boundary begins at the intersection of the Newton-Orange county line and the Texas-Louisiana state line. South along the state line to the Orange city limits just north of Interstate 10.

The southern boundary begins at a point on the Texas-Louisiana state line at the Orange city limits just north of Interstate 10. Then along the Orange city limits west, north 1.5 miles and west .5 miles to State Highway 87.

The western boundary begins at a point on the eastern side of State highway 87 at the Orange city limits. North on 87 .75 mile to County Road 1130. Then east on 1130 1.25 miles to the Southern Pacific Railroad tracks. North 5.25 miles along the tracks to Old Highway 87. Continue north on Old Highway 87 1.5 miles to the Newton-Orange county line.

#### ORANGE COUNTY CONTINGENCY ZONES

0A

The northern boundary begins at a point on the Neches River where Hardin, Jasper and Orange counties all meet. East along the Jasper-Orange county line 5.75 miles to County Road 105. South on 105 .75 mile to County Road 2802. Then east on 2802 (Old Texla Mill Road) 9 miles to State Highway 62.

The eastern boundary begins at the intersection of County Road 2802 and State Highway 62. South on S.H. 62 1 mile to State Highway 12. Then southwest 1.75 miles on S.H. 12 to County Road 1136. South on 1136 4.75 miles to Interstate 10. I-10 east 1.75 miles to Tulane Road. Take Tulane Road until it deadends west of Tulane Road. From this point connect a line southwest to the dead end of Oilla Road at Cow Bayou. Due south on Oilla Road 1.5 miles to County Road 105.

The southern boundary begins at a point on County Road 105 at Oilla Road. Follow 105 west and north 9.5 miles to the city limits of Vidor. Follow the Vidor city limits and continue along the city limits of Rose City 6.5 miles to Interstate 10. West on Interstate 10 1.5 miles to the Neches River.

The western boundary begins at a point where Interstate 10 crosses the Neches River. North on the Neches River to a point where Hardin, Jasper and Orange counties all meet.

0B

The northern boundary begins at the intersection of County Road 105 and the Jasper-Orange county line. East along the Jasper-Orange and Newton-Orange county line 16 miles to Old Highway 87.

The eastern boundary begins at the intersection of Old Highway 87 and the Newton-Orange county line. South 1.5 miles on Old Highway 87 to the Southern Pacific Railroad tracks. Continue south 5.25 miles along the tracks to County Road 1130. Then east 1.25 miles on 1130 to State Highway 87. South on S.H. 87 to Green Avenue (358 and 87) in Orange.

The southern boundary begins at a point where State Highway 87 turns to the west and becomes Green Avenue in Orange. Continue on Green Avenue (S.H. 87) west and southwest 2 miles to the tracks of the Missouri Pacific Railroad along the levee. Follow this rail line .5 mile northwest until it intersects with the Southern Pacific Railroad. West 2 miles on the Southern Pacific tracks to Dorman Road (S.H. 62). Cross Dorman Road and follow Tulane Road 2.75 miles until it meets Interstate 10.

The western boundary begins at the intersection of Tulane Road and Interstate 10. West on I-10 1.75 miles to County Road 1136. Then north on 1136 4.75 miles to State Highway 12. Northeast on S.H. 12 1.75 miles to State Highway 62. Northwest on 62 1 mile to County Road 2802. Then west on 2802 (Old Texla Mill Road) 9 miles to County Road 105. North on 105 .75 mile to the Jasper-Orange county line.





## Section Four SURVEY RESULTS

The results of the survey (described in Section One, Methodology) are divided into the potential number of vehicles evacuating (Part A) and where people will be seeking shelter (Part B).

### Part A: Potential Number of Evacuating Vehicles

In order to determine evacuation times, estimates need to be made on the number of vehicles that will be using the available evacuation routes for each zone. Two estimates were made for each zone. One, if only the percentage of those who indicated on the survey they would evacuate if evacuation were recommended, and two, if 100 percent evacuated.

It should be noted that vehicle estimates are based on 1985 population projections. The information can be seen by county in Tables 4-1 through 4-3. The directions indicated are based on destinations indicated on the survey (see Figure 1-5).

TABLE 4-1  
 POTENTIAL NUMBER OF EVACUATING VEHICLES BY DIRECTION FOR  
 JEFFERSON COUNTY BY ZONE AS INDICATED IN THE SURVEY

EVAC ZONES	EVAC RATE	VEHICLES PER H.H.	1	2	3	4	5	6	7	8	TOTALS
J1	73%	1.62	41 (57)*	79 (108)	79 (108)	282 (388)	--	--	41 (57)	--	522 (718)
J2	100%	0.99	--	250 (250)	--	--	250 (250)	--	250 (250)	--	750 (750)
J3	90%	1.40	6 (7)	87 (96)	1,160 (1,282)	372 (413)	129 (143)	175 (194)	119 (132)	69 (76)	2,117 (2,343)
SUB TOTALS			47 (64)	416 (454)	1,239 (1,390)	654 (801)	379 (393)	175 (194)	410 (439)	69 (76)	3,389 (3,811)
CONTINGENCY ZONES											
JA	72%	1.32	7 (9)	42 (58)	437 (657)	134 (187)	85 (118)	103 (143)	54 (75)	12 (17)	910 (1,264)
JB	70%	1.38	58 (84)	1,920 (2,738)	20,814 (29,481)	4,220 (6,002)	1,869 (2,659)	3,455 (4,915)	2,036 (2,896)	900 (1,280)	35,272 (50,055)
JC	91%	1.40	377 (417)	2,372 (2,584)	25,359 (27,825)	10,968 (12,142)	3,350 (3,701)	4,212 (4,660)	4,670 (5,168)	1,520 (1,665)	52,828 (58,162)
SUB TOTALS			442 (510)	4,334 (5,380)	46,646 (57,963)	15,322 (18,331)	5,304 (6,478)	7,770 (9,718)	6,760 (8,139)	2,432 (2,962)	89,010 (109,481)
GRAND TOTALS			489 (574)	4,750 (5,834)	47,885 (59,353)	15,976 (19,132)	5,683 (6,871)	7,945 (9,912)	7,170 (8,578)	2,501 (3,038)	92,399 (113,292)

\* "( )" INDICATES A 100 PERCENT EVACUATION FIGURE.

TABLE 4-2  
 POTENTIAL NUMBER OF EVACUATING VEHICLES BY DIRECTION FOR  
 ORANGE COUNTY BY ZONE AS INDICATED IN THE SURVEY

EVAC ZONES	EVAC RATE	VEHICLES PER H.H.	1	2	3	4	5	6	7	8	TOTALS
01	97%	1.50	2 (2)*	2,136 (2,202)	2,189 (2,257)	605 (624)	141 (145)	137 (141)	498 (513)	433 (446)	6,141 (6,330)
02	92%	1.34	--	4,573 (4,971)	2,582 (2,807)	676 (735)	356 (387)	269 (292)	714 (776)	232 (252)	9,402 (10,220)
03	89%	1.33	4 (4)	265 (298)	388 (436)	82 (92)	28 (31)	26 (29)	70 (79)	20 (23)	883 (992)
-----											
SUB TOTALS			6 (6)	6,974 (7,471)	5,159 (5,500)	1,363 (1,451)	525 (563)	432 (462)	1,282 (1,368)	685 (721)	16,426 (17,542)
=====											
CONTINGENCY ZONES											
-----											
0A	83%	1.40	51 (62)	644 (776)	5,939 (7,156)	825 (994)	295 (356)	230 (277)	673 (811)	352 (424)	9,009 (10,856)
0B	90%	1.33	20 (22)	3,594 (3,993)	3,250 (3,611)	743 (826)	321 (357)	270 (300)	678 (753)	201 (223)	9,077 (10,085)
-----											
SUB TOTALS			71 (84)	4,238 (4,769)	9,189 (10,767)	1,568 (1,820)	616 (713)	500 (577)	1,351 (1,554)	553 (647)	18,086 (20,941)
=====											
GRAND TOTALS			77 (90)	11,212 (12,240)	14,348 (16,267)	2,931 (3,271)	1,141 (1,276)	932 (1,039)	2,633 (2,932)	1,238 (1,368)	34,512 (38,483)
=====											

\* "( )" INDICATES A 100 PERCENT EVACUATION FIGURE.

TABLE 4-3  
 POTENTIAL NUMBER OF EVACUATING VEHICLES BY DIRECTION FOR HARDIN, JASPER,  
 AND NEWTON COUNTIES BY ZONE AS INDICATED IN THE SURVEY

CONTINGENCY ZONES	EVAC RATE	VEHICLES PER H.H.	1	2	3	4	5	6	7	8	TOTALS
HARDIN	76%	1.34	8 (10)*	23 (30)	499 (657)	92 (121)	15 (20)	23 (30)	69 (91)	23 (30)	752 (989)
JASPER	75%	1.36	2 (2)	5 (6)	101 (134)	19 (25)	3 (4)	5 (6)	14 (18)	5 (6)	154 (204)
NEWTON	79%	1.33	2 (3)	6 (8)	140 (177)	26 (33)	4 (5)	6 (8)	20 (25)	6 (8)	210 (267)

\* "( )" INDICATES 100% EVACUATION FIGURES

## Part B: Shelter Data

The information on shelter requirements resulting from the survey should be useful for the American Red Cross and other groups providing shelters. The data in this section merely indicate the intention of survey respondents to seek shelter in various areas. No consideration was given to the availability of shelters in these areas or to the advisability of seeking shelter in these areas.

The number of persons seeking shelter was based on 1980 census data projected to 1985. These figures do not include persons who indicated that they would seek shelter with friends or in a motel, but only those who indicated that they would plan to stay in a shelter in that area if available.

The estimated number of persons seeking shelter, by county and zone, are displayed in Tables 4-4 through 4-6. The categories indicated are described below:

Number of persons seeking local shelter: This is based on the percent of non-evacuating households who indicate that they would stay in local shelters.

Number of persons seeking shelter in cities in study area: This is based on the percent of evacuating households who indicated they would stay in shelters in cities in the study area.

Number of persons seeking shelter outside the study area: This is based on the percent of evacuating households who indicated that they would stay in shelters in cities outside of the study area.

The shelter requirements for the key cities (if there are any) are indicated at the bottom of these tables by source (local, from evacuation zones and from contingency zones).

A composite of these tables for all counties is displayed in Table 4-7. An indication of the number of persons who would seek shelter in cities outside the study area is shown in Table 4-8.

These shelter figures indicate sheltering needs for moderate-type hurricanes. For hurricanes with winds in excess of 110 mph, it would be anticipated that those seeking local shelter or shelter in some other city in the study area would be greatly reduced because of the hazard of staying in these areas, while at the same time, a large hurricane (with winds in excess of 110 mph) would generate a near 100 percent evacuation of the study area. This would increase the number of persons who would be seeking shelter in cities outside the study area.

TABLE 4-4  
EVACUATION RATES AND SHELTER DEMAND  
FOR JEFFERSON COUNTY

ZONES	PERCENT EVACUATING	NUMBER PERSONS SEEKING		NUMBER PERSONS SEEKING	
		LOCAL SHELTERS	SHELTER IN CITIES	IN STUDY AREA	SHELTER OUTSIDE STUDY AREA
J1	73	-	-	-	-
J2	100	-	783	-	-
J3	90	121	91	-	260
SUBTOTAL		121	874	-	260
JA	72	-	186	-	150
JB	70	22,380	427	-	4,619
JC	91	3,537	3,739	-	6,533
SUBTOTAL		25,917	4,352	-	11,302
GRAND TOTAL		26,038	5,226	-	11,562
KEY CITY SHELTER REQUIREMENTS		NUMBER LOCAL PERSONS	NUMBER PERSONS FROM EVACUATION ZONES	NUMBER PERSONS FROM CONTINGENCY ZONES	TOTAL SHELTER REQUIREMENTS
BEAUMONT	22,380	940	3,902	-	27,222
GRIFFIN PARK	74	-	-	74	74
GROVES	158	-	-	-	158
LAKEVIEW	121	-	-	-	121
NEDERLAND	447	-	-	-	447
PEAR RIDGE	128	-	-	-	128
PORT ARTHUR	2,265	1	-	-	2,266
PORT NECHES	465	-	-	-	465
TOTALS		26,038	941	3,902	30,881



TABLE 4-5  
EVACUATION RATES AND SHELTER DEMAND  
FOR ORANGE COUNTY

ZONES	PERCENT EVACUATING	NUMBER PERSONS SEEKING LOCAL SHELTERS	NUMBER PERSONS SEEKING SHELTER IN CITIES IN STUDY AREA	NUMBER PERSONS SEEKING SHELTER OUTSIDE STUDY AREA
01	97	30	4	1,011
02	92	1,067	75	666
03	91	130	9	65
-----				
SUBTOTAL		1,227	88	1,742
-----				
0A	83	1,153	210	1,294
0B	90	1,119	78	557
-----				
SUBTOTAL		2,272	288	1,851
GRAND TOTAL		3,499	376	3,593
=====				

418

KEY CITY SHELTER REQUIREMENTS	NUMBER LOCAL PERSONS	NUMBER PERSONS FROM EVACUATION ZONES	NUMBER PERSONS FROM CONTINGENCY ZONES	TOTAL SHELTER REQUIREMENTS
BRIDGE CITY	2	-	-	2
LITTLE CYPRESS	19	-	-	19
MAVRICEVILLE	20	-	-	20
ORANGE	1,861	8	529	2,398
ORANGEFIELD	2	-	-	2
PINE FOREST	14	-	-	14
PINEHURSE	242	-	-	242
VIDOK	1,089	13	234	1,336
WEST ORANGE	250	-	-	250
-----				
TOTALS	3,499	21	763	4,283
=====				

TABLE 4-6  
 EVACUATION RATES AND SHELTER DEMAND  
 FOR HARDIN, JASPER, AND NEWTON COUNTIES

ZONES	PERCENT EVACUATING	NUMBER PERSONS SEEKING LOCAL SHELTERS	NUMBER PERSONS SEEKING SHELTER IN CITIES IN STUDY AREA	NUMBER PERSONS SEEKING SHELTER OUTSIDE STUDY AREA
HA	76	-	17	103
JSA	79	-	5	29
NA	75	-	3	19

TABLE 4-7  
COMPOSITE SHELTER DEMAND  
FOR FIVE-COUNTY AREA

COUNTY	NUMBER PERSONS SEEKING LOCAL SHELTERS	NUMBER PERSONS SEEKING SHELTER IN CITIES IN STUDY AREA	NUMBER PERSONS SEEKING SHELTER OUTSIDE STUDY AREA
JEFFERSON			
EVAC ZONE	121	874	260
CONTIN. ZONE	25,917	4,352	11,302
TOTAL	26,038	5,226	11,562
ORANGE			
EVAC ZONE	1,227	88	1,742
CONTIN. ZONE	2,272	288	1,851
TOTAL	3,499	376	3,593
HARDIN	-	17	103
JASPER	-	5	29
NEWTON	-	3	19
TOTAL AREA			
EVAC ZONE	1,348	962	2,002
CONTIN. ZONE	28,189	4,665	13,304
TOTAL	29,537	5,627	15,306

TABLE 4-8  
NUMBER OF PERSONS SEEKING SHELTER  
IN CITIES OUTSIDE OF STUDY AREA

CITY	FROM CONTINGENCY ZONES	FROM EVACUATION ZONES	TOTAL
AUSTIN	978	20	998
CONROE	183	-	183
CROCKETT	198	4	202
DALLAS-FORT WORTH	1,061	121	1,182
HEMPHILL	78	84	162
HOUSTON	2,501	248	2,749
JASPER	2,758	261	3,019
KIRBYVILLE	638	13	651
KOUNTZE	83	84	167
LAKE CHARLES	428	8	436
LIVINGSTON	163	-	163
LUFKIN	51	13	64
NEWTON	172	174	346
SAN AUGUSTINE	5	-	5
SILSBEE	1,916	8	1,924
WINNIE	22	867	889
WOODVILLE	2,069	97	2,166



## Section Five EVACUATIONS

Part A in this section details evacuation times for zones, Part B discusses evacuation routes and capacities, and Part C indicates how these evacuation times can be used to estimate the time when evacuation may need to be recommended.

### Part A: Evacuation Times for Zones

Table 5-1 indicates minimum time (in hours) required to evacuate vehicles within each evacuation and contingency zone in the study area for partial evacuation (evacuation zones only) and for a 100 percent evacuation (for evacuation and contingency zones).

The partial evacuation figures are for hurricanes with winds of 110 mph or less, while the 100 percent evacuation is for hurricanes with winds in excess of 110 mph.

Two cautions must be made about the calculation of the minimum evacuation times. First, the minimum times assume the full utilization of evacuation routes over the entire evacuation time. If routes are not fully utilized at the beginning of the evacuation time, then the total time required will be greater. Second, the calculations assume that there are no other vehicles on the roadway going in the same direction as the evacuating vehicles.

## Part B: Principal Evacuation Routes and Capacities

This part includes a description of the principal evacuation routes and route capacities. The Evacuation and Contingency Zone map in the back of this report illustrates the principal evacuation routes of the highway network.

The entire Beaumont-Port Arthur-Orange area needs to be treated as one unit for evacuation purposes. During a partial evacuation of the evacuation zones during a hurricane with winds less than 110 mph, it is estimated that the following numbers of vehicles would need to be evacuated: 16,426 from Orange County, 3,389 from Jefferson County, 6,114 from I-10 East and 6,114 from I-10 West.<sup>1</sup> This is a total of 32,043 vehicles to be evacuated. For a total evacuation of all evacuation and contingency zones the following evacuating vehicle estimates were made: 30,483 from Orange County, 113,292 from Jefferson County, 6,114 from I-10 East and 6,114 from I-10 West,<sup>2</sup> 981 from Hardin County, 267 from Newton County, and 204 from Jasper County. This is a total of 165,298 vehicles to be evacuated.

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<sup>1</sup>These vehicles are coming into the area as part of normal east-west traffic which could be estimated for a small hurricane (under 110 mph) as about a 50 percent reduction. The time frame for estimating the reduction could be up to 40 hours before the eye of the hurricane would make landfall. Added to this figure would be some Houston evacuation traffic to Beaumont and some Calcasieu Parish traffic to Beaumont.

<sup>2</sup>This is based on the same percentage of persons from Calcasieu Parish going toward Beaumont as indicated they would go to the Lake Charles area in our study. I-10 West was given a similar figure. It was assumed that during a major hurricane (over 110 mph) normal east-west traffic would be minimal.

The major evacuation routes out of the area along with the estimated capacities are:

- 0 U.S. 90 and TX 146
- 0 TX 105 and northerly offshoots between TX 146 and U.S. 69
- 0 U.S. 69-287
- 0 U.S. 96 to TX FM 92
- 0 I-10 to 105 to 96 and TX 62 to 96
- 0 TX 87
- 0 TX 12 and LA 12
- 0 I-10 East to LA 109

The capacity of these eight routes was estimated at 6,850 vehicles per hour. This is based on 925 vehicles per hour for each route except TX 87 and TX 12 (because they intersect) where the capacities were estimated at 650 vehicles per route under controlled conditions.

Dividing the total number of evacuating vehicles for a partial evacuation (32,043) by the number of vehicles the evacuation routes can handle per hour (6,850) results in approximately 4.5 hours of evacuation time. Dividing the total number of evacuating vehicles for a total evacuation (165,298) by the number of vehicles the evacuation routes can handle per hour (6,850) results in approximately a 24-hour evacuation time.

The single-lane route capacity in this evacuation study was increased by 125 more vehicles per hour more than in previous evacuation studies. This was calculated at a higher rate because



I-10 West could be used as an evacuation route if evacuation becomes somewhat desperate on the routes leading inland. Such a decision would need to be made before travel on I-10 West would become hazardous because of winds and/or storm surge. It should be further noted that to maintain the traffic flow on U.S. 90 and TX 146 evacuating vehicles from the Galveston Bay area using TX 146 will be routed up TX 321 at Dayton. Also, U.S. 96 will be used to feed TX FM 92 rather than proceeding on U.S. 96. The capacity of U.S. 96 will be based on traffic from TX 105 on TX 62.

Part C: Use of Evacuation Time  
to Estimate When to Recommend an Evacuation

After it has been determined that, because of potential surge penetrations or potential high winds, it may be necessary to recommend an evacuation in various zones, it is important to know the safe time remaining before that decision must be made.

The amount of safe time remaining should be calculated for each hurricane advisory issued after the hurricane enters the Gulf of Mexico. That is, each hurricane advisory brings new information that can be used to estimate the safe period remaining.

For instance, the evacuation time for zone J<sub>C</sub> is 24 hours. The idea is to determine, after each advisory is issued, how much safe time remains before it would be too late to get the people evacuated before evacuation routes are blocked either by wind gusting or storm surge flooding. The following steps can be utilized to figure the remaining safe time for Zone J<sub>C</sub>:

Step One: Calculate the number of hours it would take for the eye of the hurricane to cross land 20 miles to the left of the Sabine Pass Channel (the location that can produce the maximum conditions for that zone). For example, if the eye of the hurricane is 400 miles from that point and is moving at 10 mph, it would be 40 hours.

Step Two: Determine which data point or points in Appendix B controls the potential evacuation route blockage by either wind or surge for that zone. In this particular case, it would be points 11, 15, 35, and 16 for surge (these are points on evacuation routes out of the area) and point 30 for wind (this point is closest to the most vulnerable area of the zone and would determine wind conditions for the roads in the zone).

Step Three: Locate in this data point information on the particular hurricane that most closely resembles the one in the Gulf of Mexico. This may be done locating the particular wind speed ranges on the left hand side. For a hurricane with sustained winds of 115 mph the third wind range would be used (111-130 mph). Next you would check at the top to find the applicable column. Three conditions determine which column to use: (1) direction of movement to point of landfall in degrees; (2) location of impact; and (3) forward movement speed in mph (5, 10, 15, 20).

Step Four: Locate the specific information that applies to that particular hurricane. For a hurricane moving at 10 mph with a wind speed of 115 mph moving directly north, truck-tipping gusting conditions would begin approximately 12.0 hours before the time of landfall and car-tipping gusting would begin approximately 8.0 hours before the time of landfall (data point 30).

Step Five: In order to have 24 hours evacuation time before the route is blocked (which can take place 8.0 hours before time of landfall for car-tipping gusting), the 8.0 hours (or the truck-tipping gusting time, or the surge flooding time for low, MSL or high tide conditions) should be added to the 24 hours. This gives a total of 32 hours.

Step Six: Since people do not begin evacuation as soon as the decision to recommend one is made, three hours are added to the 32 hours (for a total of 35 hours) to provide time for the decision to be communicated to people and for people to get packed and begin evacuating.

Step Seven: The 35 hours is then subtracted from the estimated 40 hours before the hurricane would make landfall. This would leave 5 hours before a decision would need to be made before it would be too late. In this case, you would wait for the next advisory and refigure the safe time.

Standard operating procedures (SOP) for estimating the safe time remaining before a decision to evacuate needs to be made after each advisory is issued can be found in Appendix D. A description of the ESTEDLS computer program that figures these times is in Appendix E.

TABLE 5-1  
EVACUATION TIMES\* BY ZONES

COUNTY AND ZONE	PARTIAL EVACUATION OF EVACUATION ZONES**	TOTAL EVACUATION OF EVACUATION AND CONTINGENCY ZONES
-----		
HARDIN		
HA	--	24.0 HOURS
JASPER		
JSA	--	24.0 HOURS
JEFFERSON		
JA	--	24.0 HOURS
JB	--	24.0 HOURS
JC	--	24.0 HOURS
J1	4.5 HOURS	24.0 HOURS
J2	4.5 HOURS	24.0 HOURS
J3	4.5 HOURS	24.0 HOURS
NEWTON		
NA	--	24.0 HOURS
ORANGE		
OA	--	24.0 HOURS
OB	--	24.0 HOURS
O1	4.5 HOURS	24.0 HOURS
O2	4.5 HOURS	24.0 HOURS
O3	4.5 HOURS	24.0 HOURS
=====		

\* EVACUATION TIME IS THE ESTIMATED NUMBER OF HOURS IT WOULD TAKE FOR ALL EVACUATING VEHICLES IN A ZONE TO REACH SAFE AREAS USING AVAILABLE EVACUATION ROUTES.

\*\* EVACUATION OF ONLY THOSE INDICATING ON THE SURVEY THEY WOULD EVACUATE IF SO ADVISED.



APPENDIX A  
HURRICANE CATEGORIES

(Developed by Herbert Saffir, Dade County, Florida, consulting engineer, and Dr. Robert H. Simpson, former National Hurricane Center Director.)

FORCE ONE--Winds of 74 to 95 miles per hour. Damage primarily to shrubbery, trees, foliage, unanchored mobile homes and, possibly, poorly constructed signs.

OR--Storm surge 4 to 5 feet above normal. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorages torn from moorings.

FORCE TWO--Winds of 96 to 110 miles per hour. Considerable damage to shrubbery and tree foliage, some trees blown down. Major damage to exposed mobile homes and poorly constructed signs. Some damage to roofs, windows and doors. No major damage to buildings.

OR--Storm surge 6 to 8 feet above normal. Coastal roads and low-lying escape routes cut by rising water two to four hours before arrival of hurricane center. Considerable damage to piers. Marinas flooded and small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying island areas required.

FORCE THREE--Winds of 111 to 130 miles per hour. Foliage torn from trees, large trees blown down. Practically all poorly constructed signs blown down and mobile homes destroyed. Some damage to roofs, windows and doors and some structural damage to

small buildings.

OR--Storm surge 9 to 12 feet above normal. Serious flooding at coast and many smaller structures near coast destroyed. Larger structures battered by waves and floating debris. Low-lying escape routes cut by rising water three to five hours before hurricane center arrives. Flat terrain five feet or less above sea level flooded eight miles inland or more. Evacuation of low-lying residences within several blocks of shoreline possibly required.

FORCE FOUR--Winds of 131 to 155 miles per hour. Shrubs and trees blown down, all signs down. Extensive damage to roofs, windows and doors. Complete destruction of mobile homes.

OR--Storm surge 13 to 18 feet above normal. Flat terrain ten feet or less above sea level flooded as far as six miles inland. Major damage to lower floors of structures near shore due to flooding and battering by waves and floating debris. Low-lying escape routes cut by rising water three to five hours before hurricane center arrives. Major erosion of beaches. Massive evacuation of all residences within 500 yards of shore possibly required, and of single-story residences on low ground within two miles of shore.

FORCE FIVE--Winds greater than 155 miles per hour. Shrubs and trees blown down and complete destruction of mobile homes. Extensive shattering of glass in windows and doors and complete failure of roofs on many residences and industrial buildings. Small buildings overturned or blown away.

OR--Storm surge greater than 18 feet above normal. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore. Low-lying escape routes cut by rising water three to five hours before hurricane center arrives. Massive evacuation of low-lying residential areas within five to ten miles of shore possibly required.





APPENDIX B  
KEY DATA POINTS BY HURRICANE TYPE

An interpretation of the data point information can be found in Part B: Data Points of Section Two, SLOSH Data. The locations of the 19 key data points included in this appendix are displayed in a map located on the inside of the back cover. Details of these points are also indicated in Table 1-1.

The following cautions should be kept in mind when interpreting the data in this appendix:

- Caution 1: Wave action and rainfall are not included in calculations.
- Caution 2: Errors of plus or minus 20 percent are possible for peak surges with accurate initial data. For estimating, this error range can be generalized to other data.
- Caution 3: Forward movement speeds of 15 mph are based on averaging the 10 mph and the 20 mph conditions.

Interpretive items to remember are:

FTOL stands for From Time Of Landfall.

Time is recorded in hour and half-hour units.

Maximum high tide surge is given in feet.

NA stands for Not Applicable.

CATEGORIES	87 BY WISEMAN LAKE (87WISEMLAK)										ELEVATION: 6.0 FT.																		
	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 15MPH 20MPH					360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 15MPH 20MPH					325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 15MPH 20MPH					360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 15MPH 20MPH					55 DEG. 40 MI RT OF SP 10MPH 20MPH					290 DEGREE, MOUTH OF SABINE, PASS 10MPH 20MPH			
WIND RANGE 74-95 MPH	-12.0	-6.5	-5.0	-3.5	-12.5	-6.5	-5.0	-3.5	-13.5	-7.0	-5.5	-3.5	-12.0	-6.0	-4.5	-3.0	-12.0	-6.0	-4.5	-3.0	-11.0	-5.5	-4.0	-3.0	-10.5	-5.5	-4.0	-3.0	
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	E	NE	NC	E	NE	NE	NE	NE	E	NE	NE	NE	NE	NE	NE	NE	E	E	E	E	N	N	N	N	
DIRECTION OF WIND	18.0	10.0	8.0	6.0	21.0	12.0	9.5	6.5	22.0	12.0	9.5	6.5	9.0	4.5	3.5	2.5	18.5	9.5	6.5	4.0	11.5	5.0	4.0	3.0	19.0	11.5	6.0	6.0	
DURATION IN HOURS	-2.0	-2.0	-2.0	-2.0	-7.5	-4.0	-3.0	-2.0	-9.0	-4.5	-3.5	-2.5	-	-	-	-	-4.5	-	-	-	-7.5	-4.0	-3.0	-1.5	-5.5	-3.0	-1.5	-	
65-70 MPH W GUSTS FTOL	-	-	-	-	E	E	E	E	NE	NE	NE	NE	NE	NE	NE	NE	N	-	-	-	E	E	E	E	N	N	N	N	
DIRECTION OF WIND	-	-	-	-	E	E	E	E	NE	NE	NE	NE	NE	NE	NE	NE	N	-	-	-	E	E	E	E	N	N	N	N	
DURATION IN HOURS	-	-	-	-	6.0	3.5	3.5	3.5	6.0	7.0	5.5	4.0	-	-	-	-	5.5	-	-	-	2.5	1.0	1.0	2.0	5.5	3.0	2.0	-	
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
M.S.L. FLOODING FTOL	-8.0	-5.5	-4.0	-2.0	-5.0	-5.0	-3.5	-2.0	-	0.5	-0.5	-1.0	-	-	-	-	-	-	-	-	-8.5	-4.5	-	-	-	-	-	-	
HIGH TIDE FLOODING FTOL	6.6	7.7	8.4	9.2	6.1	7.0	7.7	8.4	-	6.3	7.1	8.0	-	-	-	-	-	-	-	-	6.0	6.5	-	-	-	-	-	-	
MAXIMUM HIGH TIDE SURGE																													
WIND RANGE 96-110 MPH	-20.5	-10.5	-8.0	-5.5	-21.0	-10.0	-8.0	-5.5	-21.0	-10.5	-8.0	-5.5	-20.5	-10.5	-8.0	-5.0	-20.5	-10.5	-8.0	-5.0	-15.0	-7.5	-6.0	-4.5	-18.5	-9.5	-6.0	-3.0	
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	E	E	N	N	N	N	
DIRECTION OF WIND	29.5	16.5	13.0	9.5	32.5	17.5	13.5	9.5	32.0	17.5	13.5	9.5	29.5	16.0	12.0	8.5	29.5	16.0	12.0	8.5	18.5	9.5	6.0	3.0	30.0	17.0	12.0	9.5	
DURATION IN HOURS	-13.5	-7.0	-5.5	-4.0	-14.0	-7.0	-5.5	-3.5	-15.0	-7.5	-6.0	-4.0	-15.0	-7.5	-6.0	-4.0	-14.0	-7.0	-5.5	-3.5	-11.5	-6.0	-4.0	-2.0	-12.5	-6.0	-3.0	-	
65-70 MPH W GUSTS FTOL	-	-	-	-	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	E	E	N	N	N	N	
DIRECTION OF WIND	-	-	-	-	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	E	E	N	N	N	N	
DURATION IN HOURS	-8.0	-4.5	-3.0	-1.5	21.5	12.5	9.5	7.0	22.5	12.5	9.5	7.0	-	-	-	-	19.5	10.5	8.0	5.5	13.0	6.5	4.0	1.5	13.5	12.0	6.5	1.5	
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
M.S.L. FLOODING FTOL	-13.0	-6.5	-4.5	-2.5	-12.0	-6.0	-4.0	-2.0	-	-1.5	-1.5	-1.5	-2.5	-6.0	-4.0	-2.0	-	-	-	-	-11.0	-5.0	-	-	-14.0	-6.0	-	-	
HIGH TIDE FLOODING FTOL	20.0	8.5	6.0	3.0	19.5	8.5	5.5	3.0	20.0	8.5	5.5	3.0	19.5	8.5	5.5	3.0	19.5	8.5	5.5	3.0	8.8	4.0	2.0	1.5	14.0	6.0	2.5	1.5	
MAXIMUM HIGH TIDE SURGE	9.7	11.3	12.5	13.7	8.7	10.2	11.3	12.5	9.7	11.0	12.4	13.8	6.9	8.6	9.8	11.0	6.9	8.6	9.8	11.0	8.8	9.3	-	-	7.2	10.0	-	-	
WIND RANGE 111-130 MPH	-26.5	-13.5	-10.5	-7.0	-26.0	-13.0	-10.0	-6.5	-27.0	-13.5	-10.5	-7.0	-26.5	-13.5	-10.0	-6.5	-26.5	-13.5	-10.0	-6.5	-18.0	-9.0	-7.0	-5.0	-24.0	-12.0	-8.0	-6.0	
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	E	E	N	N	N	N	
DIRECTION OF WIND	38.5	21.0	16.0	11.5	38.5	22.0	16.5	11.5	38.5	22.0	16.5	11.5	38.5	20.5	16.0	10.5	38.5	20.5	16.0	10.5	22.5	12.0	8.0	5.0	21.5	11.5	7.5	4.5	
DURATION IN HOURS	-18.5	-9.5	-7.5	-5.0	-18.5	-9.5	-7.0	-5.0	-19.5	-10.0	-7.5	-5.0	-19.5	-10.0	-7.5	-5.0	-19.0	-9.5	-7.0	-4.5	-14.0	-7.0	-5.0	-3.0	-17.0	-8.5	-4.5	-2.5	
65-70 MPH W GUSTS FTOL	-	-	-	-	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	E	E	N	N	N	N	
DIRECTION OF WIND	-	-	-	-	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	E	E	N	N	N	N	
DURATION IN HOURS	-13.5	-6.5	-4.5	-2.5	26.5	14.5	11.5	8.0	26.5	14.5	11.0	7.5	-	-	-	-	27.5	14.5	11.0	7.5	16.5	8.5	5.0	2.5	28.5	16.0	8.5	1.5	
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
M.S.L. FLOODING FTOL	-19.0	-8.0	-5.5	-3.5	-19.0	-8.0	-5.5	-3.0	-20.0	-7.0	-4.5	-2.0	-20.0	-7.0	-4.5	-2.0	-21.5	-8.0	-5.0	-2.0	-13.5	-5.0	-	-	-17.0	-7.5	-	-	
HIGH TIDE FLOODING FTOL	23.5	10.0	6.5	3.5	22.0	9.5	6.5	3.5	23.0	9.5	6.5	3.5	22.0	9.5	6.5	3.5	22.0	9.5	6.5	3.5	11.1	6.0	3.0	1.5	17.0	7.5	3.0	1.5	
MAXIMUM HIGH TIDE SURGE	12.4	14.6	15.7	16.9	11.3	12.9	14.2	15.6	11.3	12.9	14.2	15.6	8.9	11.0	12.4	13.8	8.9	11.0	12.4	13.8	8.8	9.3	-	-	6.6	8.6	4.5	1.5	
WIND RANGE 131-OVER MPH	-31.5	-16.0	-12.0	-8.0	-30.5	-15.5	-11.5	-8.0	-31.5	-16.0	-12.0	-8.0	-31.5	-15.5	-12.0	-8.0	-31.5	-15.5	-12.0	-8.0	-	-	-	-	-29.0	-14.5	-7.5	-5.0	
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-	-	-	-	N	N	N	N	
DIRECTION OF WIND	43.5	24.0	18.5	13.0	43.5	24.5	19.0	13.5	43.5	24.5	19.0	13.5	43.5	23.5	18.0	12.5	43.5	23.5	18.0	12.5	-	-	-	-	NC	24.5	13.0	9.0	
DURATION IN HOURS	-22.5	-11.5	-9.0	-6.0	-22.0	-11.0	-8.5	-5.5	-23.0	-11.5	-9.0	-6.0	-23.0	-11.5	-8.5	-5.5	-23.0	-11.5	-8.5	-5.5	-	-	-	-	NC	-20.5	-10.5	-5.0	
65-70 MPH W GUSTS FTOL	-	-	-	-	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-	-	-	-	N	N	N	N	
DIRECTION OF WIND	-	-	-	-	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-	-	-	-	N	N	N	N	
DURATION IN HOURS	-31.0	-17.0	-13.0	-9.5	33.5	18.0	14.0	10.0	34.0	18.5	14.0	10.0	-	-	-	-	32.0	17.0	13.0	9.0	-	-	-	-	-	-	-	-	
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
M.S.L. FLOODING FTOL	-21.5	-9.0	-6.0	-3.0	-21.0	-9.0	-6.0	-3.0	-21.5	-9.0	-6.0	-3.0	-21.0	-9.0	-6.0	-3.0	-20.0	-7.0	-4.0	-2.0	-	-	-	-	-	-	-	-	
HIGH TIDE FLOODING FTOL	26.0	10.5	7.0	3.5	22.5	10.5	7.5	4.5	21.0	7.5	4.5	2.0	22.5	10.5	7.5	4.5	22.5	10.5	7.5	4.5	-	-	-	-	3.5	2.5	1.5	1.5	
MAXIMUM HIGH TIDE SURGE	15.1	17.8	19.0	20.3	13.9	15.9	17.6	19.3	11.8	13.5	15.3	17.0	11.8	13.5	15.3	17.0	8.1	8.3	7.8	7.4	-	-	-	-	7.0	8.1	3.5	1.5	

		ELEVATION: 13.0 FT.											
		73 BY BURREL WINGATE ROAD (73BURWIND)											
CATEGORIES		325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		55 DEG MI RT OF SP 10MPH 20MPH		290 DEGREE, MOUTH OF SABINE PASS 5MPH 10MPH 20MPH	
		WIND RANGE 74-95 MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS 65-70 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS M.S.L. FLOODING FTOL HIGH TIDE FLOODING FTOL MAXIMUM HIGH TIDE SURGE	-0.5 NE 2.0	-1.0 NC 2.5	-1.5 E 3.0	-3.0 NE 5.5	-5.5 NE 5.5	-3.0 NE 5.5	-2.5 NE 5.5	-2.5 NE 5.5	-6.0 NE 6.0	-3.5 NE 6.0	-2.5 NE 6.0
WIND RANGE 96-110 MPH													
50-55 MPH W GUSTS FTOL		-11.0 NE	-4.5 NE	-3.0 NE	-12.0 NE	-6.0 NE	-4.5 NE	-3.0 NE	-12.5 NE	-6.5 NE	-5.0 NE	-3.5 NE	-11.0 NE
DIRECTION OF WIND		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E
DURATION IN HOURS		16.5	8.0	6.0	13.0	11.5	9.0	7.0	13.5	12.0	9.5	7.0	11.5
65-70 MPH W GUSTS FTOL		-5.5 E	-2.5 NC	-2.0 NE	-8.0 NE	-4.0 NE	-3.0 NE	-2.0 NE	-8.5 NE	-4.5 NE	-3.5 NE	-2.5 NE	-8.0 NE
DIRECTION OF WIND		E	NC	NE	NE	NE	NE	NE	NE	NE	NE	NE	E
DURATION IN HOURS		8.0	6.0	5.0	8.5	4.5	4.5	5.0	9.0	8.5	6.5	5.0	6.5
LOW TIDE FLOODING FTOL													
M.S.L. FLOODING FTOL													
HIGH TIDE FLOODING FTOL													
MAXIMUM HIGH TIDE SURGE													
WIND RANGE 111-130 MPH													
50-55 MPH W GUSTS FTOL		-16.0 NE	-6.5 NE	-4.5 NE	-16.5 NE	-8.0 NE	-6.0 NE	-4.0 NE	-17.0 NE	-8.5 NE	-6.5 NE	-4.5 NE	-13.5 NE
DIRECTION OF WIND		NE	NE	NE	NE	NE	NE	NE	N	NE	NE	NE	E
DURATION IN HOURS		25.0	14.0	8.0	28.0	15.5	12.0	8.5	28.5	16.0	12.0	8.5	16.0
65-70 MPH W GUSTS FTOL		-10.5 NE	-4.5 NE	-3.0 NE	-12.0 NE	-6.0 NE	-4.5 NE	-3.0 NE	-12.5 NE	-6.5 NE	-5.0 NE	-3.0 NE	-11.0 NE
DIRECTION OF WIND		NE	NE	NE	NE	NE	NE	NE	N	NE	NE	NE	E
DURATION IN HOURS		16.5	9.5	7.5	21.0	12.0	9.0	6.5	22.0	12.0	9.5	6.5	11.5
LOW TIDE FLOODING FTOL		1.0	1.5	1.5	0.5								
M.S.L. FLOODING FTOL		1.0	0.5	0.5	0.0	0.5	NC		3.0	3.5	3.0	3.0	
HIGH TIDE FLOODING FTOL		-1.0	-0.5	0.0	14.7	13.6	NC		13.2	13.2	13.7	14.3	
MAXIMUM HIGH TIDE SURGE		15.4	16.9	17.6	18.3								
WIND RANGE 131-OVER MPH													
50-55 MPH W GUSTS FTOL		-20.0 NE	-8.0 NE	-5.5 NE	-20.0 NE	-10.0 NE	-7.5 NE	-5.0 NE	-20.5 NE	-10.5 NE	-8.0 NE	-5.5 NE	-13.5 NE
DIRECTION OF WIND		NE	NE	NE	NE	NE	NE	NE	N	NE	NE	NE	E
DURATION IN HOURS		30.0	16.5	13.0	30.0	18.0	13.5	9.5	30.0	18.0	14.0	10.0	16.0
65-70 MPH W GUSTS FTOL		-14.5 NE	-7.5 NE	-5.5 NE	-15.0 NE	-7.5 NE	-5.5 NE	-4.0 NE	-15.5 NE	-8.0 NE	-6.0 NE	-4.0 NE	-14.5 NE
DIRECTION OF WIND		NE	NE	NE	NE	NE	NE	NE	N	NE	NE	NE	E
DURATION IN HOURS		20.5	12.0	9.5	24.5	14.0	10.5	7.5	25.5	14.0	11.0	7.5	24.0
LOW TIDE FLOODING FTOL		-2.0	-1.0	-0.5	-2.0	-0.5	0.0	0.5	-0.5	0.5	1.0	1.5	
M.S.L. FLOODING FTOL		-3.0	-1.0	-0.5	-3.0	-1.0	0.0	0.5	-0.5	0.5	1.0	1.5	
HIGH TIDE FLOODING FTOL		-5.0	-1.5	-0.5	-3.0	-1.0	-0.5	0.5	-1.0	0.5	1.0	1.5	
MAXIMUM HIGH TIDE SURGE		18.8	21.0	22.0	19.3	19.3	18.5	17.7	19.4	19.3	19.0	18.7	

CATEGORIES	73 OUTSIDE PORT ARTHUR (73BYPOARLE)					ELEVATION: 8.0 FT.							
	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG. 40 MI RT OF SP 10MPH 20MPH	290 DEGREE, MOUTH OF SABINE, PASS 5MPH 10MPH 20MPH							
WIND RANGE 74-95 MPH	-	-4.5	-2.5	-2.0	-1.5	-5.0	-3.5	-2.5	-2.5	-	-5.0	-3.0	-1.5
50-55 MPH W GUSTS FTOL	-	E	E	E	E	NE	NE	N	N	-	N	N	N
DIRECTION OF WIND	-	6.0	3.5	3.5	4.0	7.5	7.0	3.5	3.5	-	6.0	3.5	4.0
DURATION IN HOURS	-	-	-	NC	-0.5	-	NC	NC	NC	-	-	-	-0.5
65-70 MPH W GUSTS FTOL	-	-	-	NC	E	-	NC	NC	NC	-	-	-	N
DIRECTION OF WIND	-	-	-	NC	1.0	-	-	-	-	-	-	-	1.0
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 96-110 MPH	-9.5	-5.0	-4.0	-3.0	-3.0	-12.5	-6.5	-5.0	-11.5	-5.5	-4.5	-3.0	-3.0
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	N
DIRECTION OF WIND	14.0	9.0	7.5	5.5	7.0	20.5	12.0	9.5	18.0	12.0	8.5	5.5	7.0
DURATION IN HOURS	-	-1.5	-1.5	-1.5	-2.0	-8.5	-4.5	-2.5	-6.5	-3.5	-2.5	-1.5	-2.0
65-70 MPH W GUSTS FTOL	-	E	E	E	E	NE	NE	NE	N	N	NC	NE	N
DIRECTION OF WIND	-	2.5	2.5	3.0	5.0	12.5	8.5	7.0	10.5	6.0	4.5	3.0	8.0
DURATION IN HOURS	-	NC	NC	3.0	3.0	-	-	NC	-	-	-	-	5.0
LOW TIDE FLOODING FTOL	-	3.0	3.0	3.0	3.0	-	-	6.0	-	-	-	-	-
M.S.L. FLOODING FTOL	5.0	2.5	2.5	3.0	3.0	-	6.0	4.5	-	-	-	-	-
HIGH TIDE FLOODING FTOL	9.1	10.6	11.0	11.4	10.7	-	8.8	9.7	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 111-130 MPH	-15.5	-8.0	-6.0	-4.5	-4.0	-17.0	-8.5	-6.5	-16.0	-8.0	-6.0	-4.0	-4.0
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	N
DIRECTION OF WIND	23.0	13.0	10.5	7.5	8.5	28.5	16.0	12.0	26.5	14.0	10.5	7.5	8.5
DURATION IN HOURS	-9.5	-5.0	-4.0	-3.0	-3.0	-12.5	-6.5	-5.0	-11.5	-5.5	-4.0	-2.5	-2.5
65-70 MPH W GUSTS FTOL	-	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	N
DIRECTION OF WIND	13.0	8.0	6.5	5.0	6.5	21.5	12.0	9.5	18.5	10.0	7.5	5.0	6.5
DURATION IN HOURS	-1.5	0.0	0.5	1.5	1.0	0.0	1.0	1.5	1.5	1.5	1.5	1.5	5.0
LOW TIDE FLOODING FTOL	-2.5	-0.5	0.5	1.5	1.0	0.0	1.0	1.0	1.5	1.0	1.5	1.5	5.0
M.S.L. FLOODING FTOL	-2.5	-0.5	0.5	1.5	1.0	0.0	1.0	1.0	1.5	1.0	1.5	1.5	5.0
HIGH TIDE FLOODING FTOL	13.6	15.1	16.2	17.4	17.7	15.6	16.9	17.5	18.1	17.5	18.1	18.1	8.8
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 131-OVER MPH	-19.5	-10.0	-7.5	-5.0	-5.0	-20.5	-10.5	-8.0	-20.0	-10.0	-7.5	-5.0	-5.0
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	N
DIRECTION OF WIND	28.0	15.5	12.0	9.0	9.5	32.5	18.0	14.0	30.5	16.5	12.5	9.0	10.0
DURATION IN HOURS	-13.5	-7.0	-5.5	-3.5	-3.5	-15.5	-8.0	-6.0	-14.5	-7.5	-5.5	-3.5	-3.5
65-70 MPH W GUSTS FTOL	-	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	N
DIRECTION OF WIND	18.0	11.0	8.5	6.0	7.5	25.0	14.0	10.5	22.5	12.5	9.5	6.5	7.5
DURATION IN HOURS	-5.0	-1.5	-0.5	0.5	0.5	-2.0	0.0	0.5	1.0	1.0	1.0	1.0	4.0
LOW TIDE FLOODING FTOL	-6.0	-2.0	-0.5	0.5	0.5	-2.5	-0.5	0.0	1.0	1.0	1.0	1.0	4.0
M.S.L. FLOODING FTOL	-6.5	-2.0	-0.5	0.5	0.5	-2.5	-0.5	0.0	1.0	1.0	1.0	1.0	4.0
HIGH TIDE FLOODING FTOL	16.2	17.3	19.0	20.8	23.5	18.2	20.5	21.2	21.9	21.2	21.9	21.9	13.5
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-

CATEGORIES	10 AND CHEEK (10ANDCHEEK)					ELEVATION: 18.0 FT.				
	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG. 40 MI RT OF SP 10MPH 20MPH	290 DEGREE, MOUTH OF SABLINE, PASS 5MPH 10MPH 20MPH				
WIND RANGE 74-95 MPH										
50-55 MPH W GUSTS FTOL	NC	-0.5	-1.5	-1.5		-2.5				
DIRECTION OF WIND	NC	E	NE	NE		N				
DURATION IN HOURS	NC	2.0	2.5	3.5		N				
65-70 MPH W GUSTS FTOL			NC	0.0		3.5				
DIRECTION OF WIND			NC	E		N				
DURATION IN HOURS			NC	0.5		1.0				
LOW TIDE FLOODING FTOL										
M.S.L. FLOODING FTOL										
HIGH TIDE FLOODING FTOL										
MAXIMUM HIGH TIDE SURGE										
WIND RANGE 96-110 MPH										
50-55 MPH W GUSTS FTOL	-8.5	-4.5	-3.5	-2.5		-9.5				
DIRECTION OF WIND	NE	NE	NE	NE		N				
DURATION IN HOURS	14.0	9.5	7.5	6.0		13.5				
65-70 MPH W GUSTS FTOL	-2.0	-1.5	-1.5	-1.5		-5.0				
DIRECTION OF WIND	E	E	E	E		N				
DURATION IN HOURS	3.5	4.0	4.0	3.5		8.0				
LOW TIDE FLOODING FTOL										
M.S.L. FLOODING FTOL										
HIGH TIDE FLOODING FTOL										
MAXIMUM HIGH TIDE SURGE										
WIND RANGE 111-130 MPH										
50-55 MPH W GUSTS FTOL	-14.0	-7.0	-5.5	-4.0		-12.5				
DIRECTION OF WIND	NE	NE	NE	NE		E				
DURATION IN HOURS	23.0	13.5	10.5	7.5		14.5				
65-70 MPH W GUSTS FTOL	-8.0	-4.5	-3.5	-2.5		-9.5				
DIRECTION OF WIND	NE	NE	NE	NE		E				
DURATION IN HOURS	13.5	9.0	7.0	5.5		11.0				
LOW TIDE FLOODING FTOL										
M.S.L. FLOODING FTOL										
HIGH TIDE FLOODING FTOL										
MAXIMUM HIGH TIDE SURGE										
WIND RANGE 131-OVER MPH										
50-55 MPH W GUSTS FTOL	-18.0	-9.0	-7.0	-5.0		-17.5				
DIRECTION OF WIND	NE	NE	NE	NE		N				
DURATION IN HOURS	28.0	15.5	12.5	9.0		18.0				
65-70 MPH W GUSTS FTOL	-12.0	-6.5	-5.0	-3.5		-12.5				
DIRECTION OF WIND	NE	NE	NE	NE		N				
DURATION IN HOURS	18.0	11.0	9.0	6.5		23.0				
LOW TIDE FLOODING FTOL										
M.S.L. FLOODING FTOL										
HIGH TIDE FLOODING FTOL										
MAXIMUM HIGH TIDE SURGE	18.8	21.4	22.8	24.3		13.5				

CATEGORIES	10 AND HILLEBRANDT BAYOU (10HILLEBAY)				ELEVATION: 17.0 FT.			
	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG MI RT OF SP 10MPH 20MPH	40 SP 10MPH 20MPH	290 DEGREE, MOUTH OF SABINE PASS 5MPH 10MPH 20MPH	
WIND RANGE 74-95 MPH	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-
WIND RANGE 96-110 MPH	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-
WIND RANGE 111-130 MPH	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-
WIND RANGE 131-OVER MPH	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-









10 BETWEEN BEAUMONT AND VIDOR (10BETBEAVI)										ELEVATION: 16.0 FT.										
CATEGORIES	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH			360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH			325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH			360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH			55 DEG MI RT OF SP 10MPH 20MPH			290 DEGREE, MOUTH OF SABINE PASS 5MPH 10MPH 20MPH				
	WIND RANGE 74-95 MPH	50-55 MPH W GUSTS FTOL	DIRECTION OF WIND	DURATION IN HOURS	WIND RANGE 96-110 MPH	50-55 MPH W GUSTS FTOL	DIRECTION OF WIND	DURATION IN HOURS	WIND RANGE 111-130 MPH	50-55 MPH W GUSTS FTOL	DIRECTION OF WIND	DURATION IN HOURS	WIND RANGE 131-OVER MPH	50-55 MPH W GUSTS FTOL	DIRECTION OF WIND	DURATION IN HOURS	WIND RANGE 131-OVER MPH	50-55 MPH W GUSTS FTOL	DIRECTION OF WIND	DURATION IN HOURS
WIND RANGE 74-95 MPH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 96-110 MPH	-5.0	-3.0	E	7.0	-8.0	-4.0	NE	11.0	-12.5	-6.5	NE	15.5	-16.0	-8.0	NE	17.5	-11.0	-5.0	NE	13.5
50-55 MPH W GUSTS FTOL	9.0	7.0	NC	6.0	12.5	11.0	NE	9.0	8.0	15.5	12.0	8.5	24.5	17.5	NC	13.5	9.5	9.5	11.0	8.5
DIRECTION OF WIND	NC	NC	NC	NC	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
DURATION IN HOURS	NC	7.0	6.0	5.0	4.0	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 111-130 MPH	-11.5	-6.0	NE	11.5	-12.5	-6.5	NE	15.5	-14.5	-7.5	NE	15.5	-18.0	-9.0	NE	17.5	-13.0	-6.5	NE	13.5
50-55 MPH W GUSTS FTOL	19.0	11.5	NC	9.0	8.0	12.0	8.5	8.5	19.5	11.5	9.0	6.5	23.0	13.0	10.0	7.5	20.5	11.5	9.0	6.0
DIRECTION OF WIND	NC	NC	NC	NC	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
DURATION IN HOURS	7.0	5.5	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 131-OVER MPH	-16.0	-8.5	NE	14.0	-11.5	-5.5	NE	13.5	-14.5	-5.5	NE	12.0	-17.0	-8.5	NE	16.0	-11.5	-6.0	NE	12.5
50-55 MPH W GUSTS FTOL	24.5	14.0	NC	11.0	8.5	13.5	9.5	8.5	29.0	13.5	10.5	8.0	29.0	16.0	NC	12.5	8.5	12.5	8.5	8.5
DIRECTION OF WIND	NC	NC	NC	NC	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
DURATION IN HOURS	9.0	7.0	7.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

12 AT COW BAYOU (12CONMCREEK)												
ELEVATION: 20.0 FT.												
CATEGORIES	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG MI RT OF SP 10MPH 20MPH	290 DEGREE OF SABINE PASS 5MPH 10MPH 20MPH	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG MI RT OF SP 10MPH 20MPH	290 DEGREE OF SABINE PASS 5MPH 10MPH 20MPH
WIND RANGE 74-95 MPH	-	0.0	-1.0	-0.5	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	E	E	E	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	E	E	E	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	4.0	4.0	4.0	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	NC	NC	0.5	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	E	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	1.0	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 96-110 MPH	-	0.0	-1.0	-0.5	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	E	E	E	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	E	E	E	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	4.0	4.0	4.0	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	NC	NC	1.0	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	E	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	1.0	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 111-130 MPH	-	0.0	-1.0	-0.5	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	E	E	E	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	E	E	E	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	4.0	4.0	4.0	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	NC	NC	1.0	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	E	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	1.0	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-
WIND RANGE 131-OVER MPH	-	0.0	-1.0	-0.5	-	-	-	-	-	-	-	-
50-55 MPH W GUSTS FTOL	-	E	E	E	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	E	E	E	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	4.0	4.0	4.0	-	-	-	-	-	-	-	-
65-70 MPH W GUSTS FTOL	-	NC	NC	1.0	-	-	-	-	-	-	-	-
DIRECTION OF WIND	-	-	-	E	-	-	-	-	-	-	-	-
DURATION IN HOURS	-	-	-	1.0	-	-	-	-	-	-	-	-
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-



105 AND COW BAYOU (105COMBAYO)										ELEVATION: 8.0 FT.									
CATEGORIES	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		55 DEG 40 MI RT OF SP 10MPH 20MPH		290 DEGREE, MOUTH OF SABINE PASS 5MPH 10MPH 20MPH								
	WIND RANGE 74-95 MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 96-110 MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 111-130 MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS	WIND RANGE 131-OVER MPH 50-55 MPH W GUSTS FTOL DIRECTION OF WIND DURATION IN HOURS							
WIND RANGE 74-95 MPH	-1.5	-1.0	-1.0	-1.0	-3.0	-2.0	-1.5	-2.5	-1.0	-0.5	-5.0	-2.0							
50-55 MPH W GUSTS FTOL	E	E	E	E	E	E	E	E	E	E	E	N							
DIRECTION OF WIND	6.0	5.0	4.0	4.0	5.5	4.5	4.0	5.0	-	-	10.0	6.5							
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-							
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
DIRECTION OF WIND	-	-	-	-	-	-	-	-	-	-	-	-							
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-							
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-							
WIND RANGE 96-110 MPH	-8.0	-4.0	-3.5	-2.5	-11.0	-5.5	-4.5	-9.5	-5.0	-3.5	-12.5	-6.5							
50-55 MPH W GUSTS FTOL	E	E	E	E	E	E	E	E	E	E	E	N							
DIRECTION OF WIND	15.5	11.0	9.0	6.5	18.5	11.0	9.0	15.0	10.5	8.0	20.0	12.0							
DURATION IN HOURS	-4.0	-2.0	-1.5	-1.0	-6.0	-3.5	-2.5	-5.5	-2.5	-2.0	-8.0	-4.0							
65-70 MPH W GUSTS FTOL	E	E	E	E	E	E	E	E	E	E	E	N							
DIRECTION OF WIND	8.5	7.0	6.0	4.5	10.5	7.5	6.0	8.5	5.0	4.0	12.5	8.5							
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-							
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-							
WIND RANGE 111-130 MPH	-13.5	-6.5	-5.0	-3.5	-15.5	-8.0	-6.0	-14.0	-7.0	-5.5	-17.0	-8.5							
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	N							
DIRECTION OF WIND	15.5	12.0	12.0	8.5	26.5	15.0	11.5	15.0	15.0	11.5	28.0	15.5							
DURATION IN HOURS	-2.0	-2.0	-3.0	-2.0	-10.5	-5.5	-4.0	-9.5	-5.0	-3.5	-12.0	-6.0							
65-70 MPH W GUSTS FTOL	E	E	E	E	E	E	E	E	E	E	E	N							
DIRECTION OF WIND	18.0	11.0	8.5	6.5	19.0	11.0	8.5	18.5	11.0	8.5	20.5	11.5							
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-							
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-							
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-							
WIND RANGE 131-OVER MPH	-16.5	-8.0	-6.0	-4.0	-19.0	-10.0	-7.5	-18.0	-9.0	-7.0	-21.0	-10.5							
50-55 MPH W GUSTS FTOL	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	N							
DIRECTION OF WIND	22.0	13.5	10.5	8.0	31.0	17.0	13.5	17.0	13.0	9.0	32.5	18.0							
DURATION IN HOURS	-9.0	-5.0	-4.5	-3.0	-14.0	-7.0	-5.5	-14.0	-7.0	-5.0	-15.5	-8.0							
65-70 MPH W GUSTS FTOL	E	E	E	E	E	E	E	E	E	E	E	N							
DIRECTION OF WIND	11.0	7.0	6.0	5.0	22.5	13.0	10.0	23.5	13.0	10.0	24.5	13.5							
DURATION IN HOURS	-0.5	1.0	2.0	2.5	-1.5	0.5	1.0	1.5	1.5	1.5	1.5	3.5							
LOW TIDE FLOODING FTOL	-0.5	0.5	1.5	2.0	-1.5	0.0	0.5	1.5	1.5	1.5	1.0	3.0							
M.S.L. FLOODING FTOL	-1.5	0.0	1.0	2.0	-2.5	0.0	0.5	1.0	1.0	1.0	0.5	2.5							
HIGH TIDE FLOODING FTOL	14.6	14.4	15.1	15.8	22.3	23.8	24.7	25.7	24.1	24.6	20.1	16.2							
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-							

ELEVATION: 12.0 FT.

CATEGORIES	358 AND 87 IN ORANGE (358AND87)				325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH				360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH				55 DEG. 40 MI. RT OF SP 10MPH 20MPH				290 DEGREE, MOUTH OF SABINE PASS 5MPH 10MPH 20MPH			
	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG. 40 MI. RT OF SP 10MPH 20MPH	290 DEGREE, MOUTH OF SABINE PASS 5MPH 10MPH 20MPH				
WIND RANGE 74-95 MPH																				
50-55 MPH W GUSTS FTOL																				
DIRECTION OF WIND																				
DURATION IN HOURS																				
65-70 MPH W GUSTS FTOL																				
DIRECTION OF WIND																				
DURATION IN HOURS																				
LOW TIDE FLOODING FTOL																				
M.S.L. FLOODING FTOL																				
HIGH TIDE FLOODING FTOL																				
MAXIMUM HIGH TIDE SURGE																				
WIND RANGE 96-110 MPH																				
50-55 MPH W GUSTS FTOL																				
DIRECTION OF WIND																				
DURATION IN HOURS																				
65-70 MPH W GUSTS FTOL																				
DIRECTION OF WIND																				
DURATION IN HOURS																				
LOW TIDE FLOODING FTOL																				
M.S.L. FLOODING FTOL																				
HIGH TIDE FLOODING FTOL																				
MAXIMUM HIGH TIDE SURGE																				
WIND RANGE 111-130 MPH																				
50-55 MPH W GUSTS FTOL																				
DIRECTION OF WIND																				
DURATION IN HOURS																				
65-70 MPH W GUSTS FTOL																				
DIRECTION OF WIND																				
DURATION IN HOURS																				
LOW TIDE FLOODING FTOL																				
M.S.L. FLOODING FTOL																				
HIGH TIDE FLOODING FTOL																				
MAXIMUM HIGH TIDE SURGE																				
WIND RANGE 131-OVER MPH																				
50-55 MPH W GUSTS FTOL																				
DIRECTION OF WIND																				
DURATION IN HOURS																				
65-70 MPH W GUSTS FTOL																				
DIRECTION OF WIND																				
DURATION IN HOURS																				
LOW TIDE FLOODING FTOL																				
M.S.L. FLOODING FTOL																				
HIGH TIDE FLOODING FTOL																				
MAXIMUM HIGH TIDE SURGE																				









CATEGORIES	87 BEFORE PORT ARTHUR LEVEE (87BYPOARLS)										ELEVATION: 11.5 FT.												
	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG MI RT OF SP 10MPH 20MPH	290 DEGREE, MOUTH OF SABINE, PASS 5MPH 10MPH 20MPH	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG MI RT OF SP 10MPH 20MPH	290 DEGREE, MOUTH OF SABINE, PASS 5MPH 10MPH 20MPH	325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG MI RT OF SP 10MPH 20MPH	290 DEGREE, MOUTH OF SABINE, PASS 5MPH 10MPH 20MPH					
WIND RANGE 74-95 MPH	-8.5	-5.0	-4.0	-3.0	-10.0	-5.5	-4.0	-3.0	-12.0	-6.5	-5.0	-3.5	-10.5	-5.5	-4.0	-2.5	-9.5	-4.5	-11.0	-6.0	-3.0		
DIRECTION OF WIND	E	E	NC	NE	E	E	E	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	N	N			
DURATION IN HOURS	13.0	8.5	7.0	5.5	20.5	12.0	9.0	6.5	20.5	12.0	9.5	6.5	18.0	10.0	7.0	4.5	10.5	4.5	21.0	12.0	6.5		
65-70 MPH W GUSTS FTOL	-	-	-	-	-5.0	-3.0	-2.5	-1.5	-7.0	-4.0	-3.0	-2.0	-4.5	-2.0	NC	-	-	-	-6.0	-3.5	-2.0		
DIRECTION OF WIND	-	-	-	-	E	E	E	E	NE	NE	NE	NE	N	N	NC	-	-	-	N	N	N		
DURATION IN HOURS	-	-	-	-	6.5	4.0	4.0	4.0	9.5	7.0	5.5	4.0	6.0	2.0	NC	-	-	-	6.0	3.5	2.0		
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
WIND RANGE 96-110 MPH	-18.0	-9.5	-7.5	-5.0	-18.0	-9.0	-7.0	-4.5	-19.5	-10.0	-7.5	-5.0	-19.0	-9.5	-7.0	-5.0	-13.5	-7.0	-19.0	-9.5	-5.0		
DIRECTION OF WIND	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	N	N	N		
DURATION IN HOURS	26.5	15.0	12.0	9.0	29.5	17.0	13.0	9.5	31.0	17.5	13.5	9.5	29.0	16.0	12.5	8.5	17.5	9.0	30.5	15.0	9.5		
65-70 MPH W GUSTS FTOL	-10.5	-5.5	-4.5	-3.5	-11.5	-6.0	-4.5	-3.0	-13.5	-6.0	-5.0	-3.5	-12.5	-6.0	-4.5	-3.0	-10.0	-6.0	-12.5	-6.5	-3.5		
DIRECTION OF WIND	NE	NE	NE	NE	NE	NE	NC	E	NE	NE	NE	NE	NE	NE	NE	NE	E	E	N	N	N		
DURATION IN HOURS	14.5	9.0	7.5	5.5	18.0	12.0	9.5	7.0	21.0	11.5	9.0	7.0	19.0	10.5	8.0	5.5	12.0	6.0	20.0	14.5	7.0		
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MAXIMUM HIGH TIDE SURGE	-	-	-	-	-	-	NC	1.0	-	-	2.5	2.0	1.5	-	-	11.8	12.2	12.7	-	-	-	-	-
WIND RANGE 111-130 MPH	-24.5	-12.5	-9.5	-6.5	-23.5	-12.0	-9.0	-6.0	-25.5	-13.0	-10.0	-6.5	-24.5	-12.5	-9.5	-6.5	-16.5	-8.5	-24.5	-12.5	-16.5		
DIRECTION OF WIND	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	N	N	N		
DURATION IN HOURS	36.0	20.0	15.5	11.0	36.0	21.5	16.5	11.5	38.0	22.0	16.5	11.5	36.0	20.5	16.0	11.0	22.0	11.5	36.0	22.0	11.5		
65-70 MPH W GUSTS FTOL	-16.0	-8.5	-6.0	-3.5	-16.0	-8.0	-6.0	-4.0	-18.0	-9.0	-7.0	-4.5	-17.0	-8.5	-6.5	-4.5	-12.5	-6.5	-17.0	-8.5	-4.5		
DIRECTION OF WIND	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	N	N	N		
DURATION IN HOURS	23.0	13.0	10.0	6.5	28.0	15.5	12.0	8.5	29.0	16.0	12.0	8.5	27.0	14.5	11.0	8.0	16.0	8.0	29.0	16.0	8.5		
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MAXIMUM HIGH TIDE SURGE	-0.5	-0.5	0.0	0.5	-2.0	-1.0	-0.5	0.0	-2.0	-0.5	0.0	0.5	-	-	-	-	-	-	-	-	-		
WIND RANGE 131-OVER MPH	12.4	14.0	15.1	16.3	15.2	16.2	17.0	17.9	15.3	16.5	17.3	18.0	-	-	-	-	-	-	-	-	-		
DIRECTION OF WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
65-70 MPH W GUSTS FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
DIRECTION OF WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
DURATION IN HOURS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
LOW TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
M.S.L. FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HIGH TIDE FLOODING FTOL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MAXIMUM HIGH TIDE SURGE	-29.5	-15.0	-11.5	-8.0	-28.5	-14.5	-11.0	-7.5	-30.5	-15.0	-11.5	-8.0	-29.5	-15.0	-11.0	-7.5	-	-	-29.5	-15.0	-7.5		
DIRECTION OF WIND	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-	-	N	N	N		
DURATION IN HOURS	41.5	23.0	18.0	12.5	41.5	24.5	18.5	13.0	43.5	25.0	19.0	13.0	41.5	23.5	18.0	12.5	-	-	NC	24.5	13.0		
65-70 MPH W GUSTS FTOL	-20.5	-10.5	-8.0	-5.5	-20.0	-10.0	-7.5	-5.0	-22.0	-11.0	-8.5	-5.5	-21.0	-10.5	-8.0	-5.5	-	-	-21.0	-10.5	-5.5		
DIRECTION OF WIND	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-	-	N	N	N		
DURATION IN HOURS	28.0	15.5	12.0	9.0	33.0	18.0	14.0	10.0	33.0	18.0	14.0	10.0	31.5	17.0	13.0	9.0	-	-	33.0	18.0	10.0		
LOW TIDE FLOODING FTOL	-1.0	-1.5	-0.5	0.0	-3.0	-1.5	-1.0	0.0	-2.0	-1.5	-0.5	0.0	-	-	-	-	-	-	1.0	-	2.5		
M.S.L. FLOODING FTOL	-3.0	-2.0	-1.0	0.0	-4.0	-1.5	-1.0	0.0	-3.0	-1.5	-0.5	0.0	-	-	-	-	-	-	0.5	-	2.5		
HIGH TIDE FLOODING FTOL	-4.5	-2.0	-1.0	0.0	-5.0	-2.0	-1.0	0.0	-4.5	-1.5	-1.0	0.0	-	-	-	-	-	-	0.5	-	2.5		
MAXIMUM HIGH TIDE SURGE	15.2	17.4	18.5	19.7	18.8	20.5	21.6	22.7	18.7	20.4	20.9	21.5	-	-	-	-	-	-	14.1	12.1	16.0		

SABINE PASS (87NSABPSAP)		ELEVATION: 4.2 FT.																
		325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH		55 DEG MI RT OF SP 10MPH 20MPH		290 DEGREE OF SABINE PASS 5MPH 10MPH 20MPH								
WIND RANGE 74-95 MPH		-10.5	-6.0	-5.0	-3.5	-11.5	-6.0	-5.0	-3.5	-13.0	-6.5	-5.0	-3.5	-10.0	-5.0	-12.5	-6.5	-3.5
50-55 MPH W GUSTS FTOL		E	E	NC	NE	E	E	E	E	NE	NE	NE	NE	E	E	N	N	N
DIRECTION OF WIND		14.0	8.5	7.0	5.5	18.5	12.0	9.5	6.5	22.0	12.0	9.5	5.0	11.5	5.5	21.0	12.0	6.5
DURATION IN HOURS		-	-	-	-	-7.5	-3.5	-2.0	-2.5	-7.0	-3.5	-2.0	-2.0	-7.0	-3.5	-7.5	-4.0	-2.0
65-70 MPH W GUSTS FTOL		-	-	-	-	E	E	E	E	NE	NE	NE	NE	E	E	N	N	N
DIRECTION OF WIND		-	-	-	-	10.0	7.0	5.5	4.0	12.5	7.5	5.5	2.0	2.5	1.0	5.5	3.0	2.0
DURATION IN HOURS		-2.0	-1.5	-0.5	-0.5	-1.5	-2.0	-1.5	-0.5	-1.0	-0.5	-1.0	-0.5	-6.5	-3.0	-	-	-
LOW TIDE FLOODING FTOL		-6.5	-4.5	-3.0	-1.0	-7.0	-4.0	-2.5	-1.0	-4.0	-3.5	-2.0	-0.5	-8.0	-3.5	-	-	-
M.S.L. FLOODING FTOL		-9.0	-5.5	-3.5	-1.5	-8.5	-4.5	-3.0	-1.5	-5.0	-4.0	-2.5	-1.0	-8.0	-3.5	-	-	-
HIGH TIDE FLOODING FTOL		6.3	7.3	8.1	9.0	7.2	8.1	9.0	9.9	6.9	8.0	9.0	10.0	5.8	6.5	-	-	-
MAXIMUM HIGH TIDE SURGE																		
WIND RANGE 96-110 MPH		-20.0	-10.5	-8.0	-5.5	-19.5	-10.0	-7.5	-5.0	-21.5	-11.0	-8.5	-5.5	-14.0	-7.0	-20.5	-10.5	-5.5
50-55 MPH W GUSTS FTOL		NE	NE	NE	NE	NE	NE	NC	E	NE	NE	NE	NE	E	E	N	N	N
DIRECTION OF WIND		27.5	16.0	12.5	9.0	30.5	17.0	13.5	10.0	32.0	17.5	13.5	10.0	18.0	9.5	31.5	18.0	9.5
DURATION IN HOURS		-12.5	-7.0	-5.0	-4.0	-13.0	-7.0	-5.0	-3.5	-15.5	-8.0	-6.0	-4.0	-10.5	-5.5	-14.0	-7.0	-3.5
65-70 MPH W GUSTS FTOL		-	-	-	-	NE	E	E	E	NE	NE	NE	NE	E	E	N	N	N
DIRECTION OF WIND		16.5	9.5	7.5	6.0	21.0	12.0	9.5	7.0	22.0	12.5	10.0	7.0	13.0	6.5	21.5	12.5	7.0
DURATION IN HOURS		-14.0	-6.5	-4.0	-2.0	-13.0	-6.0	-4.0	-2.0	-7.5	-5.0	-3.0	-1.5	-10.5	-4.0	4.0	2.0	1.5
LOW TIDE FLOODING FTOL		-16.5	-7.0	-4.5	-2.0	-15.5	-7.0	-4.5	-2.0	-11.5	-5.0	-3.5	-1.5	-11.5	-4.5	3.5	2.0	1.5
M.S.L. FLOODING FTOL		-20.5	-8.5	-5.5	-2.5	-19.5	-8.0	-5.5	-2.5	-18.5	-6.5	-4.0	-1.5	-12.5	-5.0	3.0	1.5	1.0
HIGH TIDE FLOODING FTOL		9.1	10.5	11.6	12.7	10.3	11.3	12.5	13.7	9.7	10.9	12.1	13.3	9.5	10.4	7.3	9.1	11.6
MAXIMUM HIGH TIDE SURGE																		
WIND RANGE 111-130 MPH		-26.5	-13.5	-10.5	-7.0	-25.0	-12.5	-9.5	-6.5	-27.5	-14.0	-10.5	-7.0	-17.0	-8.5	-26.0	-13.0	-6.5
50-55 MPH W GUSTS FTOL		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	E	NC	N	N
DIRECTION OF WIND		37.0	20.0	15.5	11.0	40.0	21.5	16.5	11.5	42.0	22.0	17.0	12.0	22.5	11.5	40.0	22.0	11.5
DURATION IN HOURS		-18.0	-9.5	-7.0	-4.0	-17.5	-7.0	-6.0	-4.5	-20.0	-10.0	-7.5	-5.0	-13.0	-6.5	-18.5	-9.5	-5.0
65-70 MPH W GUSTS FTOL		-	-	-	-	NE	NE	NE	NE	NE	NE	NE	NE	E	E	N	N	N
DIRECTION OF WIND		24.0	13.5	10.0	6.5	28.5	14.0	11.0	8.5	30.0	16.0	12.5	8.5	16.5	8.5	19.5	16.0	9.0
DURATION IN HOURS		-19.5	-8.0	-5.5	-2.5	-19.5	-8.0	-5.0	-2.5	-14.5	-6.0	-4.0	-1.5	-13.0	-6.0	2.0	1.5	1.0
LOW TIDE FLOODING FTOL		-21.0	-8.5	-5.5	-2.5	-20.5	-8.5	-5.5	-2.5	-18.0	-7.0	-4.0	-1.5	-14.0	-6.0	2.0	1.5	1.0
M.S.L. FLOODING FTOL		-24.0	-9.5	-6.5	-3.0	-23.5	-9.5	-6.5	-3.5	-20.5	-7.0	-4.0	-2.0	-15.5	-6.5	1.5	1.0	1.0
HIGH TIDE FLOODING FTOL		11.3	13.1	14.3	15.5	17.4	14.5	15.6	16.7	12.7	12.8	14.6	16.4	10.9	12.2	9.2	10.4	12.3
MAXIMUM HIGH TIDE SURGE																		
WIND RANGE 131-OVER MPH		-31.5	-16.0	-12.5	-8.5	-30.0	-15.0	-11.5	-7.5	-32.5	-16.0	-12.5	-8.5	-	-	-31.0	-15.5	-8.0
50-55 MPH W GUSTS FTOL		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-	-	N	N	N
DIRECTION OF WIND		43.0	23.5	18.0	13.0	46.0	24.5	19.0	13.0	48.0	25.0	19.5	13.0	-	-	NC	NC	NC
DURATION IN HOURS		-27.5	-11.5	-9.0	-6.0	-27.5	-11.0	-8.0	-5.5	-23.5	-11.5	-8.5	-6.0	-	-	-22.5	-11.5	-5.5
65-70 MPH W GUSTS FTOL		-	-	-	-	NE	NE	NE	NE	NE	NE	NE	NE	-	-	N	N	N
DIRECTION OF WIND		29.0	16.0	12.5	9.0	33.0	18.0	14.0	9.5	34.0	18.5	14.0	10.0	-	-	34.0	18.5	10.0
DURATION IN HOURS		-22.5	-9.0	-6.0	-3.0	-21.0	-9.0	-6.0	-3.0	-19.5	-7.0	-4.5	-1.5	-	-	0.0	1.0	1.0
LOW TIDE FLOODING FTOL		-25.5	-10.0	-6.5	-3.0	-23.0	-9.0	-6.0	-3.5	-20.0	-7.0	-4.5	-2.0	-	-	0.0	0.5	1.0
M.S.L. FLOODING FTOL		-27.0	-10.5	-7.0	-3.5	-22.0	-10.0	-7.0	-4.0	-21.5	-7.5	-5.0	-2.5	-	-	-0.5	0.5	1.0
HIGH TIDE FLOODING FTOL		13.8	16.2	17.4	18.6	16.2	17.7	18.9	20.2	15.6	17.4	18.5	19.7	-	-	12.4	10.8	16.0
MAXIMUM HIGH TIDE SURGE																		

		ELEVATION: 20.0 FT.									
		380 AT 347 (380AT347)									
CATEGORIES		325 DEGREE, 60 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	325 DEGREE, 20 MILES LEFT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	360 DEGREE, 20 MILES RIGHT OF SAB. PASS MOUTH 5MPH 10MPH 15MPH 20MPH	55 DEG 40 MI RT OF SP 10MPH 20MPH	290 DEGREE, MOUTH OF SABINE PASS 5MPH 10MPH 20MPH				
WIND RANGE 74-95 MPH											
50-55 MPH W GUSTS FTOL											
DIRECTION OF WIND											
DURATION IN HOURS											
65-70 MPH W GUSTS FTOL											
DIRECTION OF WIND											
DURATION IN HOURS											
LOW TIDE FLOODING FTOL											
M.S.L. FLOODING FTOL											
HIGH TIDE FLOODING FTOL											
MAXIMUM HIGH TIDE SURGE											
WIND RANGE 96-110 MPH											
50-55 MPH W GUSTS FTOL											
DIRECTION OF WIND											
DURATION IN HOURS											
65-70 MPH W GUSTS FTOL											
DIRECTION OF WIND											
DURATION IN HOURS											
LOW TIDE FLOODING FTOL											
M.S.L. FLOODING FTOL											
HIGH TIDE FLOODING FTOL											
MAXIMUM HIGH TIDE SURGE											
WIND RANGE 111-130 MPH											
50-55 MPH W GUSTS FTOL											
DIRECTION OF WIND											
DURATION IN HOURS											
65-70 MPH W GUSTS FTOL											
DIRECTION OF WIND											
DURATION IN HOURS											
LOW TIDE FLOODING FTOL											
M.S.L. FLOODING FTOL											
HIGH TIDE FLOODING FTOL											
MAXIMUM HIGH TIDE SURGE											
WIND RANGE 131-OVER MPH											
50-55 MPH W GUSTS FTOL											
DIRECTION OF WIND											
DURATION IN HOURS											
65-70 MPH W GUSTS FTOL											
DIRECTION OF WIND											
DURATION IN HOURS											
LOW TIDE FLOODING FTOL											
M.S.L. FLOODING FTOL											
HIGH TIDE FLOODING FTOL											
MAXIMUM HIGH TIDE SURGE											

Appendix C  
HOURLY SURGE CONDITIONS

See Part C: Hourly Tidal Data of Section Two, SLOSH Data for a description of this appendix.

Contents of Appendix C

Hourly tidal approaches to the coastline at five locations by hurricane type:

Locations

Data Point Name	Data Point Number
Galveston Bay Channel	38
Sabine Pass Channel	57
Hackberry Beach	58
South of Port Arthur Levee	30
East of Port Arthur Levee	34

Hurricane Types

Pointof Impact	Direction	Forward Movement Speeds	WindSpeed	Page
60 Miles Left of Sabine Pass Channel	3250	5,10,20	74- 95 mph	C- 3
			96-110 mph	C- 4
			111-130 mph	C- 5
			131-155 mph	C- 6
			Over 155 mph	C- 7
20 Miles Left of Sabine Pass Channel	3600	5,10,20	74- 95 mph	C- 8
			96-110 mph	C- 9
			111-130 mph	C-10
			131-155 mph	C-11
			Over 155 mph	C-12

### Hurricane Types

Point of Impact	Direction	Forward Movement Speeds	Wind Speed	Page
20 Miles Left of Sabine Pass Channel	325°	5,10,20	74- 95 mph	C-13
			96-110 mph	C-14
			111-130 mph	C-15
			131-155 mph	C-16
			Over 155 mph	C-17
20 Miles Right of Sabine Pass Channel	360°	5,10,20	74- 95 mph	C-18
			96-110 mph	C-19
			111-130 mph	C-20
			131-155 mph	C-21
			Over 155 mph	C-22
40 Miles Right of Sabine Pass Channel	Parallel 550°	10,20	74- 95 mph	C-23
			96-110 mph	C-24
			111-130 mph	C-25
Sabine Pass Channel	Parallel 290°	5,10,20	74- 95 mph	C-26
			96-110 mph	C-27
			111-130 mph	C-28
			131-155 mph	C-29
			Over 155 mph	C-30

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
60 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH			10 MPH							20 MPH					
	Direction, Windspeed															
	325°															
	74 - 95 MPH															
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	
-24	2.8	3.0	2.8	7.0	2.3	2.1	2.2	2.1	7.0	2.0						
-23	2.9	3.1	2.8	7.0	2.3	2.2	2.2	2.1	7.0	2.0						
-22	3.0	3.2	2.9	7.0	2.4	2.2	2.2	2.2	7.0	2.0						
-21	3.0	3.2	3.0	7.0	2.4	2.2	2.2	2.2	7.0	2.0						
-20	3.2	3.3	3.0	7.0	2.4	2.2	2.3	2.2	7.0	2.1						
-19	3.3	3.4	3.1	7.0	2.5	2.2	2.3	2.2	7.0	2.1						
-18	3.4	3.5	3.2	7.0	2.5	2.3	2.3	2.3	7.0	2.1	2.0	2.1	2.1		2.0	
-17	3.5	3.7	3.2	7.0	2.6	2.3	2.4	2.3	7.0	2.1	2.0	2.1	2.0	7.0	2.0	
-16	3.6	3.8	3.2	7.0	2.6	2.3	2.4	2.4	7.0	2.1	2.0	2.1	2.0	7.0	2.0	
-15	3.7	3.9	3.3	7.0	2.7	2.4	2.5	2.4	7.0	2.1	2.0	2.1	2.0	7.0	2.0	
-14	3.8	3.9	3.3	7.0	2.7	2.4	2.6	2.5	7.0	2.1	2.1	2.1	2.0	7.0	2.0	
-13	3.9	4.0	3.3	7.0	2.8	2.5	2.7	2.6	7.0	2.2	2.1	2.1	2.1	7.0	2.0	
-12	4.0	4.1	3.3	7.0	2.9	2.6	2.8	2.7	7.0	2.2	2.1	2.1	2.1	7.0	2.0	
-11	4.0	4.1	3.3	7.0	2.9	2.7	2.9	2.8	7.0	2.2	2.1	2.2	2.1	7.0	2.0	
-10	4.1	4.3	3.3	7.0	3.0	2.8	3.2	3.0	7.0	2.2	2.2	2.2	2.2	7.0	2.1	
-9	4.1	4.3	3.3	7.0	3.1	2.9	3.3	3.2	7.0	2.4	2.2	2.3	2.2	7.0	2.1	
-8	4.1	4.4	3.4	7.0	3.1	3.3	3.7	3.4	7.0	2.4	2.2	2.3	2.3	7.0	2.1	
-7	4.2	4.5	3.3	7.0	3.2	3.6	4.0	3.6	7.0	2.5	2.3	2.4	2.4	7.0	2.1	
-6	4.1	4.5	3.3	7.0	3.3	3.9	4.4	3.7	7.0	2.6	2.4	2.6	2.5	7.0	2.2	
-5	4.1	4.6	3.3	7.0	3.3	4.2	4.7	3.8	7.0	2.8	2.5	2.8	2.7	7.0	2.2	
-4	4.0	4.6	3.3	7.0	3.4	4.6	5.0	3.9	7.0	2.9	2.7	3.2	3.0	7.0	2.3	
-3	3.9	4.6	3.3	7.0	3.4	4.9	5.3	3.9	7.0	3.0	3.2	3.6	3.5	7.0	2.5	
-2	3.8	4.6	3.3	7.0	3.4	5.0	5.4	3.8	7.0	3.2	4.1	4.7	4.2	7.0	2.7	
-1	3.7	4.5	3.2	7.0	3.5	4.9	5.4	3.6	7.0	3.2	5.2	5.9	4.6	7.0	2.9	
0	3.5	4.4	3.2	7.0	3.5	4.7	5.3	3.5	7.0	3.3	5.6	6.8	4.8	7.0	3.0	
+1	3.4	4.3	3.1	7.0	3.5	4.3	4.9	3.3	7.0	3.3	5.2	6.8	4.6	7.0	3.0	
+2	3.2	4.2	3.1	7.0	3.5	3.9	4.4	3.1	7.0	3.3	4.6	5.9	4.2	7.0	3.0	
+3	3.5	4.0	3.0	7.0	3.5	3.3	3.8	2.8	7.0	3.3	4.0	4.5	3.4	7.0	3.0	
+4	2.7	3.8	2.9	7.0	3.5	3.1	3.4	2.6	7.0	3.2	3.1	2.9	2.3	7.0	2.9	
+5	2.6	3.6	2.9	7.0	3.4	2.4	2.8	2.4	7.0	3.1	2.4	1.9	1.4	7.0	2.8	
+6	2.4	3.5	2.8	7.0	3.4	2.2	2.6	2.3	7.0	3.3	2.1	1.4	1.1	7.0	2.7	
+7	2.3	3.3	2.7	7.0	3.4	2.0	2.4	2.3	7.0	3.0	1.9	1.4	1.5	7.0	2.7	
+8	2.3	3.2	2.7	7.0	3.3	2.0	2.4	2.4	7.0	2.9	2.0	1.7	2.0	7.0	2.6	
+9	2.3	3.0	2.7	7.0	3.3	2.1	2.5	2.5	7.0	2.9	2.1	2.3	2.6	7.0	2.6	
+10	2.3	3.0	2.6	7.0	3.2	2.1	2.6	2.6	7.0	2.9	2.2	2.7	2.8	7.0	2.6	
+11	2.3	2.9	2.6	7.0	3.2	2.1	2.6	2.6	7.0	2.8	2.3	2.8	2.8	7.0	2.6	
+12	2.3	2.9	2.6	7.0	3.1	2.2	2.6	2.5	7.0	2.8	2.3	2.5	2.5	7.0	2.6	
Max.	4.2	4.6	3.4	7.0	3.5	5.0	5.5	3.9	7.0	3.3	5.6	7.0	4.8	7.0	3.1	



HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
60 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	5 MPH			10 MPH						20 MPH											
	325°															96 - 110 MPH					
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.						
-24	3.6	3.8	3.5	7.0	2.6	2.3	2.3	2.2	7.0	2.1											
-23	3.7	4.0	3.6	7.0	2.7	2.3	2.3	2.2	7.0	2.1											
-22	3.9	4.2	3.7	7.0	2.7	2.3	2.3	2.2	7.0	2.1											
-21	4.1	4.4	3.9	7.0	2.8	2.3	2.4	2.2	7.0	2.1											
-20	4.3	4.6	4.0	7.0	2.9	2.4	2.4	2.3	7.0	2.1											
-19	4.5	4.8	4.1	7.0	3.0	2.4	2.5	2.3	7.0	2.1											
-18	4.8	5.1	4.3	7.0	3.1	2.5	2.6	2.4	7.0	2.1	2.0	2.1	2.1	7.0	2.0						
-17	5.0	5.3	4.4	7.0	3.2	2.5	2.6	2.5	7.0	2.2	2.0	2.1	2.0	7.0	2.0						
-16	5.2	5.4	4.4	7.0	3.3	2.6	2.7	2.6	7.0	2.2	2.1	2.0	2.0	7.0	2.1						
-15	5.5	5.7	4.5	7.0	3.4	2.7	2.8	2.7	7.0	2.2	2.1	2.0	1.9	7.0	2.1						
-14	5.7	5.8	4.6	7.0	3.5	2.8	3.0	2.8	7.0	2.3	2.1	2.0	1.9	7.0	2.0						
-13	5.9	6.0	4.6	7.0	3.7	2.9	3.2	3.0	7.0	2.3	2.1	2.1	2.0	7.0	2.1						
-12	6.0	6.2	4.6	7.0	3.8	2.9	3.3	3.2	7.0	2.4	2.1	2.1	2.0	7.0	2.1						
-11	6.2	6.3	4.7	7.0	3.9	3.3	3.6	3.5	7.0	2.5	2.2	2.2	2.1	7.0	2.1						
-10	6.3	6.5	4.7	7.0	4.0	3.5	4.0	3.8	7.0	2.6	2.2	2.3	2.2	7.0	2.1						
-9	6.4	6.6	4.7	7.0	4.1	3.9	4.5	4.2	7.0	2.7	2.3	2.4	2.3	7.0	2.1						
-8	6.4	6.8	4.7	7.0	4.2	4.4	5.1	4.6	7.0	2.9	2.4	2.5	2.4	7.0	2.2						
-7	6.4	6.9	4.7	7.0	4.3	5.0	5.8	5.0	7.0	3.0	2.5	2.7	2.5	7.0	2.2						
-6	6.4	7.0	4.7	7.0	4.3	5.7	6.6	5.3	7.0	3.2	2.6	2.9	2.7	7.0	2.3						
-5	6.1	7.0	4.7	7.0	4.4	6.5	7.3	5.6	7.0	3.4	2.7	3.2	3.1	7.0	2.4						
-4	6.1	7.1	4.6	7.0	4.6	7.8	7.9	5.7	7.0	3.7	3.0	3.7	3.7	7.0	2.6						
-3	6.0	7.1	4.5	7.0	4.8	7.7	8.2	5.7	7.0	4.0	4.0	5.0	4.7	7.0	2.8						
-2	5.7	7.1	4.5	7.0	4.9	8.0	8.4	5.5	7.0	4.2	5.8	6.8	5.8	7.0	3.2						
-1	5.5	7.1	4.5	7.0	5.0	7.9	8.5	5.2	7.0	4.4	8.6	9.3	6.8	7.0	3.5						
0	5.1	6.9	4.5	7.5	5.1	7.4	8.3	5.0	7.4	4.6	8.8	9.8	7.3	7.0	4.0						
+1	4.8	6.7	4.3	7.9	5.0	6.7	7.8	4.6	9.0	4.9	7.9	10.5	7.1	7.4	4.5						
+2	4.3	6.4	4.1	8.5	5.0	5.6	7.0	4.2	8.6	5.0	7.4	9.1	6.2	10.0	6.6						
+3	4.0	6.0	4.0	8.4	5.0	4.9	5.8	3.7	8.6	4.9	5.5	7.0	5.0	10.3	6.9						
+4	3.4	5.3	3.7	8.2	4.9	3.9	4.5	3.1	8.3	4.8	4.4	4.4	2.7	9.1	6.5						
+5	3.1	4.6	3.4	7.9	4.8	3.0	3.3	2.6	8.2	4.6	3.2	2.0	1.0	8.7	6.3						
+6	3.1	4.1	3.1	7.7	4.7	2.4	2.5	2.2	8.1	4.4	2.4	1.0	0.3	8.4	6.0						
+7	2.6	3.7	2.8	7.6	4.5	2.1	2.1	2.0	8.0	4.2	2.0	0.4	0.6	8.2	5.7						
+8	2.3	3.4	2.7	7.4	4.4	2.1	2.2	2.2	7.9	4.0	2.1	1.0	1.5	8.1	5.5						
+9	2.4	3.4	2.7	7.3	4.3	2.2	2.4	2.6	7.8	3.9	2.2	2.0	2.4	8.0	5.4						
+10	2.5	3.4	2.9	7.3	4.2	2.3	2.8	3.0	7.7	3.8	2.4	3.0	3.4	7.8	5.3						
+11	2.6	3.4	3.0	7.2	4.1	2.4	3.0	3.1	7.6	3.7	2.6	3.3	3.5	7.6	5.2						
+12	2.6	3.3	2.9	7.2	4.0	2.4	3.0	3.0	7.5	3.7	2.7	3.1	3.0	7.5	5.1						
Max.	6.6	7.2	4.7	8.5	5.1	8.2	8.6	5.7	9.1	5.1	8.8	10.5	7.4	10.3	7.0						

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
60 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	5 MPH					10 MPH					20 MPH				
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
	325°					111 - 130 MPH									
-24	4.3	4.6	4.1	7.0	2.9	2.4	2.3	2.2	7.0	2.1					
-23	4.5	4.9	4.3	7.0	3.0	2.4	2.4	2.2	7.0	2.1					
-22	4.8	5.2	4.5	7.0	3.1	2.4	2.4	2.2	7.0	2.1					
-21	5.1	5.5	4.7	7.0	3.2	2.5	2.5	2.3	7.0	2.1					
-20	5.4	5.8	4.9	7.0	3.3	2.5	2.5	2.3	7.0	2.2					
-19	5.8	6.2	5.1	7.0	3.5	2.6	2.6	2.4	7.0	2.2					
-18	6.1	6.5	5.3	7.0	3.6	2.7	2.7	2.5	7.0	2.2	2.0	2.1	2.1	7.0	2.0
-17	6.5	6.8	5.4	7.0	3.7	2.7	2.9	2.6	7.0	2.3	2.1	2.1	2.1	7.0	2.1
-16	7.0	7.1	5.6	7.0	3.8	2.8	3.0	2.7	7.0	2.3	2.1	2.0	1.9	7.0	2.1
-15	7.1	7.4	5.7	7.0	4.0	3.0	3.1	2.9	7.0	2.3	2.1	2.0	1.9	7.0	2.1
-14	7.5	7.6	5.8	7.0	4.1	3.1	3.3	3.1	7.0	2.4	2.1	2.0	1.8	7.0	2.1
-13	7.8	7.8	5.9	7.0	4.2	3.2	3.5	3.3	7.0	2.5	2.1	2.0	1.9	7.0	2.1
-12	8.0	8.1	5.9	7.0	4.4	3.4	3.9	3.6	7.0	2.6	2.2	2.1	1.9	7.0	2.1
-11	8.2	8.3	5.9	7.0	4.6	3.7	4.3	4.0	7.0	2.7	2.2	2.2	2.1	7.0	2.1
-10	8.4	8.5	6.0	7.0	4.8	4.1	4.9	4.5	7.0	2.8	2.3	2.3	2.2	7.0	2.1
- 9	8.5	8.7	6.0	7.0	5.1	4.7	5.6	5.1	7.0	3.0	2.4	2.5	2.3	7.0	2.2
- 8	8.6	8.8	6.0	7.0	5.4	5.4	6.5	5.7	7.0	3.2	2.5	2.6	2.4	7.0	2.2
- 7	8.7	9.0	6.0	7.1	5.8	6.4	7.6	6.4	7.0	3.4	2.6	2.8	2.6	7.0	2.3
- 6	8.7	9.1	6.0	7.6	6.2	8.0	8.7	6.9	7.0	3.7	2.8	3.1	2.9	7.0	2.4
- 5	8.5	9.2	6.0	8.0	6.6	8.5	9.2	7.3	7.0	4.1	3.0	3.4	3.4	7.0	2.5
- 4	8.4	9.3	5.9	8.6	7.4	9.3	10.0	7.5	7.0	4.4	3.4	4.3	4.3	7.0	2.8
- 3	8.2	9.3	5.8	8.7	8.3	10.0	10.7	7.3	7.0	5.0	4.6	6.0	5.7	7.0	3.1
- 2	7.9	9.4	5.8	8.8	9.2	10.4	11.0	7.2	8.9	7.1	7.4	9.0	7.4	7.0	3.6
- 1	7.6	9.3	5.7	9.5	9.7	10.7	11.2	6.9	9.5	9.2	10.4	11.2	8.8	7.0	4.2
0	7.2	9.2	5.6	10.4	10.1	10.0	11.0	6.5	11.5	10.6	10.7	13.3	9.3	7.0	5.6
+ 1	6.2	8.9	5.5	10.8	10.1	9.2	10.4	5.9	12.3	11.3	10.1	13.4	9.1	12.7	10.8
+ 2	5.8	8.4	5.2	10.9	9.9	8.2	9.3	5.1	12.4	11.0	9.2	11.9	8.4	14.3	12.5
+ 3	5.0	7.5	4.8	10.7	9.6	7.0	7.7	4.4	12.0	10.4	8.1	9.3	6.1	13.3	11.6
+ 4	4.1	6.5	4.2	10.2	9.2	5.2	5.7	3.5	11.2	9.7	6.2	6.0	2.8	11.9	10.1
+ 5	3.6	5.4	3.6	9.7	8.9	3.1	3.8	2.5	10.3	9.2	4.2	2.3	0.7	10.5	9.3
+ 6	3.2	4.5	3.0	9.4	8.5	2.7	2.0	1.7	10.0	8.7	3.6	0.6	-0.2	9.9	8.8
+ 7	2.9	3.9	2.8	9.2	8.2	3.0	1.4	1.5	9.8	8.4	3.2	-0.6	-0.3	9.6	8.5
+ 8	2.9	3.7	2.8	9.0	7.9	2.3	1.6	1.8	9.5	8.0	2.5	-0.3	0.3	9.3	8.2
+ 9	2.9	3.9	3.1	8.9	7.7	2.6	2.3	2.6	9.4	7.8	2.6	1.3	2.1	8.9	8.0
+10	3.0	4.0	3.4	8.8	7.5	2.8	3.2	3.4	9.1	7.6	2.9	3.2	3.5	8.6	7.8
+11	3.1	4.2	3.6	8.7	7.3	2.9	3.7	4.0	8.8	7.4	3.1	4.0	4.2	8.4	7.6
+12	3.0	4.1	3.4	8.6	7.1	2.9	3.8	3.7	8.6	7.2	3.0	3.8	3.7	8.2	7.5
Max.	8.8	9.4	6.1	10.9	10.1	10.8	11.2	7.5	12.5	11.3	11.1	13.8	9.5	14.8	12.6

## HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING 60 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH						10 MPH						20 MPH					
	Direction, Windspeed																	
	325°						131 - 155 MPH											
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.			
-24	5.0	5.4	4.7	7.0	3.2	2.4	2.4	2.1	7.0	2.1								
-23	5.3	5.7	4.9	7.0	3.3	2.5	2.4	2.2	7.0	2.1								
-22	5.7	6.1	5.2	7.0	3.4	2.5	2.5	2.2	7.0	2.1								
-21	6.1	6.5	5.5	7.0	3.5	2.6	2.5	2.3	7.0	2.2								
-20	6.5	7.0	5.9	7.0	3.7	2.6	2.6	2.4	7.0	2.2								
-19	7.6	7.5	6.1	7.0	3.8	2.7	2.8	2.5	7.0	2.2								
-18	7.8	7.9	6.3	7.0	4.0	2.8	2.9	2.6	7.0	2.3	2.1	2.1	2.1	7.0	2.0			
-17	8.0	8.2	6.6	7.0	4.1	3.0	3.0	2.7	7.0	2.3	2.1	2.1	2.0	7.0	2.1			
-16	8.3	8.5	6.7	7.0	4.3	3.1	3.2	2.9	7.0	2.4	2.1	2.0	1.9	7.0	2.1			
-15	8.7	8.9	6.8	7.0	4.5	3.2	3.3	3.1	7.0	2.4	2.1	2.0	1.8	7.0	2.1			
-14	9.2	9.2	7.0	7.0	4.7	3.4	3.6	3.3	7.0	2.5	2.1	2.0	1.7	7.0	2.1			
-13	9.6	9.5	7.1	7.0	5.1	3.5	3.9	3.6	7.0	2.6	2.1	2.0	1.8	7.0	2.1			
-12	10.0	9.8	7.2	7.0	5.6	3.8	4.3	4.0	7.0	2.7	2.2	2.0	1.8	7.0	2.1			
-11	10.3	10.1	7.2	7.2	6.7	4.1	4.9	4.6	7.0	2.9	2.2	2.2	2.0	7.0	2.1			
-10	10.6	10.4	7.3	7.7	8.0	4.7	5.6	5.2	7.0	3.1	2.3	2.4	2.2	7.0	2.1			
-9	10.8	10.6	7.3	8.0	8.9	5.5	6.6	6.0	7.0	3.3	2.5	2.5	2.3	7.0	2.2			
-8	10.9	10.9	7.3	8.6	9.9	6.5	7.9	6.9	7.0	3.5	2.6	2.7	2.4	7.0	2.3			
-7	11.0	11.1	7.2	8.9	10.7	8.1	9.1	7.8	7.0	3.8	2.7	2.9	2.6	7.0	2.4			
-6	11.0	11.4	7.3	9.1	11.2	9.1	9.8	8.3	7.0	4.2	2.9	3.2	3.0	7.0	2.5			
-5	10.8	11.5	7.3	9.9	11.5	10.1	11.3	8.8	7.0	4.7	3.2	3.6	3.6	7.0	2.7			
-4	10.7	11.6	7.2	11.0	11.8	11.3	12.5	8.9	7.1	6.8	3.7	4.7	4.8	7.0	3.0			
-3	10.6	11.6	7.1	11.7	12.2	12.7	13.1	9.0	9.8	9.8	5.3	7.0	6.7	7.0	3.4			
-2	10.1	11.6	7.0	12.4	12.7	13.5	13.6	8.8	11.3	12.1	9.1	10.9	8.7	7.0	4.0			
-1	9.7	11.6	6.9	13.0	12.9	13.5	13.9	8.5	14.0	13.6	12.2	13.3	10.4	7.0	5.0			
0	9.2	11.4	6.8	13.4	13.1	12.9	13.8	7.9	15.3	14.3	13.5	16.2	11.1	13.0	10.2			
+1	8.4	10.9	6.6	13.7	13.0	11.5	13.0	7.3	15.9	14.5	12.4	16.3	11.0	17.9	15.5			
+2	7.4	10.0	6.1	13.5	12.7	10.3	11.4	6.4	15.5	14.1	11.0	14.6	9.9	18.0	15.9			
+3	5.1	8.5	5.4	12.6	12.2	8.8	8.9	5.0	14.1	12.9	10.2	11.0	7.0	15.8	14.3			
+4	5.0	7.0	4.4	11.7	11.5	6.4	6.1	3.2	12.5	11.8	8.6	6.9	3.4	12.9	12.2			
+5	3.4	5.6	3.2	10.9	10.9	4.0	3.6	1.5	11.4	11.0	4.4	3.4	0.1	11.5	11.0			
+6	3.5	4.6	2.7	10.2	10.4	3.1	1.7	1.1	10.8	10.5	3.7	0.5	-1.0	10.8	10.4			
+7	5.3	4.4	2.7	10.0	10.1	5.4	1.0	1.1	10.4	10.0	3.5	-1.0	-1.2	10.2	9.9			
+8	3.9	3.9	3.1	9.7	9.7	3.6	1.0	1.5	10.0	9.6	1.9	-0.9	-0.2	9.8	9.4			
+9	3.3	4.3	3.3	9.6	9.5	2.8	2.4	2.8	9.7	9.3	2.2	0.9	1.6	9.4	9.1			
+10	3.3	4.6	3.8	9.4	9.3	2.8	3.9	4.0	9.5	9.0	3.1	3.4	3.8	9.0	8.8			
+11	3.2	4.7	3.9	9.1	9.1	3.0	4.4	4.4	9.1	8.8	3.1	4.4	4.7	8.7	8.6			
+12	3.3	4.4	3.6	8.9	8.9	3.1	4.3	4.1	8.8	8.6	3.2	4.3	4.3	8.4	8.4			
Max.	11.1	11.7	7.3	13.7	13.2	13.8	14.0	9.0	15.9	14.6	13.5	16.4	11.3	18.2	15.9			

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
60 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	325°														
	Over 155 MPH														
-24	3.9	4.1	3.7	7.0	2.8	2.3	2.3	2.2	7.0	2.1					
-23	4.0	4.4	3.9	7.0	2.8	2.3	2.3	2.2	7.0	2.1					
-22	4.3	4.6	4.1	7.0	2.9	2.3	2.4	2.2	7.0	2.1					
-21	4.6	4.9	4.3	7.0	3.0	2.4	2.4	2.3	7.0	2.1					
-20	4.9	5.2	4.5	7.0	3.1	2.4	2.5	2.3	7.0	2.1					
-19	5.2	5.5	4.7	7.0	3.2	2.5	2.6	2.4	7.0	2.2					
-18	5.6	6.0	4.9	7.0	3.3	2.6	2.6	2.5	7.0	2.2	2.0	2.1	2.1	7.0	2.0
-17	6.1	6.3	5.0	7.0	3.5	2.6	2.7	2.5	7.0	2.2	2.0	2.1	2.0	7.0	2.0
-16	6.5	6.6	5.2	7.0	3.6	2.7	2.8	2.6	7.0	2.2	2.1	2.0	1.9	7.0	2.1
-15	7.4	6.9	5.2	7.0	3.8	2.8	2.9	2.7	7.0	2.3	2.1	2.0	1.9	7.0	2.0
-14	7.2	7.1	5.3	7.0	3.9	2.9	3.1	2.9	7.0	2.3	2.1	2.0	1.9	7.0	2.0
-13	7.5	7.2	5.3	7.0	4.0	2.9	3.3	3.1	7.0	2.4	2.1	2.1	2.0	7.0	2.1
-12	7.7	7.3	5.2	7.0	4.1	3.2	3.5	3.3	7.0	2.5	2.1	2.1	2.0	7.0	2.1
-11	7.9	7.5	5.2	7.0	4.2	3.4	3.8	3.6	7.0	2.6	2.2	2.2	2.1	7.0	2.1
-10	8.1	7.6	5.1	7.0	4.4	3.6	4.2	4.0	7.0	2.7	2.3	2.3	2.2	7.0	2.1
-9	8.3	7.8	5.1	7.0	4.6	4.0	4.8	4.5	7.0	2.8	2.3	2.4	2.3	7.0	2.1
-8	8.5	7.9	5.1	7.0	4.8	4.7	5.6	5.0	7.0	3.0	2.4	2.5	2.4	7.0	2.2
-7	8.7	8.1	5.1	7.0	5.1	5.6	6.6	5.6	7.0	3.2	2.5	2.7	2.5	7.0	2.2
-6	9.0	8.2	5.1	7.0	5.3	6.7	7.7	6.1	7.0	3.4	2.6	2.9	2.7	7.0	2.3
-5	9.1	8.3	5.1	7.2	5.6	8.0	8.7	6.5	7.0	3.8	2.7	3.2	3.1	7.0	2.4
-4	9.3	8.4	5.0	7.6	5.8	9.1	9.0	6.7	7.0	4.1	3.1	3.6	3.7	7.0	2.6
-3	9.9	8.4	4.9	8.4	6.0	10.1	9.7	6.6	7.0	4.5	3.7	4.9	4.8	7.0	2.9
-2	9.9	8.4	4.9	8.6	6.2	11.4	10.1	6.1	7.0	5.0	6.0	7.1	6.2	7.0	3.3
-1	9.8	8.3	4.8	8.6	6.5	12.7	10.1	5.9	9.2	6.5	10.7	10.4	7.5	7.0	3.9
0	9.5	8.2	4.8	8.8	6.7	12.3	9.8	5.4	9.5	8.2	13.0	11.6	8.3	7.0	4.6
+1	7.8	7.8	4.7	9.9	6.7	9.3	9.1	4.9	11.2	8.9	10.3	12.4	8.2	11.5	7.7
+2	5.1	7.0	4.2	10.2	6.6	8.3	7.8	4.0	11.5	9.1	8.6	10.5	7.0	13.2	10.0
+3	5.2	5.9	3.8	9.8	6.4	6.6	5.8	3.1	10.7	8.6	8.0	7.6	5.3	12.2	9.9
+4	4.1	4.6	3.3	9.2	6.1	4.8	3.6	2.4	9.9	8.0	5.4	3.8	1.7	10.6	8.6
+5	3.6	3.8	2.6	8.8	5.8	4.6	1.8	1.5	9.6	7.5	5.1	1.0	-0.7	9.8	8.0
+6	2.8	3.5	2.1	8.6	5.5	3.0	1.2	1.0	9.4	7.2	3.5	-0.2	-0.8	9.4	7.5
+7	2.9	3.3	2.6	8.5	5.3	2.5	0.9	1.3	9.3	6.8	0.5	-1.2	-0.3	9.0	7.2
+8	3.3	3.6	3.0	8.4	5.2	2.9	1.5	2.1	9.0	6.6	2.9	-0.2	0.9	8.7	6.9
+9	3.1	4.2	3.4	8.4	5.0	2.8	2.9	3.0	8.7	6.3	2.7	1.8	2.6	8.4	6.7
+10	3.1	4.6	3.8	8.3	4.9	2.9	3.6	3.8	8.5	6.1	2.9	3.7	4.0	8.2	6.6
+11	3.2	4.4	3.8	8.3	4.8	3.0	3.9	4.1	8.4	5.9	3.1	4.3	4.3	8.1	6.5
+12	3.2	3.9	3.1	8.2	4.7	3.0	3.7	3.4	8.1	5.8	3.1	3.5	3.5	8.0	6.3
Max.	10.1	8.5	5.3	10.2	6.7	12.8	10.2	6.7	11.6	9.1	13.8	12.7	8.3	13.2	10.1

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	360°					74-95 MPH									
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
-24	2.5	2.6	2.5	7.0	2.2										
-23	2.6	2.8	2.6	7.0	2.2										
-22	2.8	3.0	2.8	7.0	2.2										
-21	2.9	3.2	2.9	7.0	2.3										
-20	3.1	3.3	2.9	7.0	2.3										
-19	3.3	3.3	2.9	7.0	2.4										
-18	3.4	3.4	2.9	7.0	2.4										
-17	3.5	3.5	3.0	7.0	2.5	2.0	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	3.6	3.5	3.0	7.0	2.6	2.1	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-15	3.7	3.7	3.1	7.0	2.6	2.1	2.2	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.0
-14	3.8	3.8	3.2	7.0	2.7	2.2	2.2	2.2	7.0	2.1	2.1	2.1	2.1	7.0	2.0
-13	3.8	3.9	3.3	7.0	2.8	2.3	2.4	2.3	7.0	2.1	2.1	2.2	2.1	7.0	2.1
-12	3.8	4.1	3.3	7.0	2.8	2.4	2.6	2.5	7.0	2.2	2.2	2.2	2.2	7.0	2.1
-11	3.7	4.2	3.4	7.0	2.9	2.6	2.8	2.6	7.0	2.2	2.2	2.3	2.2	7.0	2.1
-10	3.6	4.3	3.4	7.0	3.0	2.8	3.0	2.8	7.0	2.2	2.2	2.3	2.3	7.0	2.1
-9	3.4	4.4	3.5	7.0	3.0	2.9	3.3	3.0	7.0	2.3	2.3	2.4	2.3	7.0	2.1
-8	3.2	4.6	3.6	7.0	3.1	3.3	3.4	3.1	7.0	2.4	2.3	2.4	2.3	7.0	2.1
-7	3.1	4.7	3.6	7.0	3.2	3.6	3.8	3.3	7.0	2.5	2.4	2.5	2.4	7.0	2.2
-6	2.7	5.0	3.7	7.0	3.3	3.8	4.1	3.5	7.0	2.6	2.5	2.6	2.5	7.0	2.2
-5	2.4	5.2	3.8	7.0	3.4	3.8	4.6	3.7	7.0	2.7	2.6	2.8	2.7	7.0	2.3
-4	2.0	5.4	3.9	7.0	3.6	3.8	4.9	3.9	7.0	2.9	2.8	3.1	2.9	7.0	2.3
-3	1.6	5.5	4.0	7.0	3.7	3.4	5.5	4.1	7.0	3.1	3.4	3.6	3.2	7.0	2.5
-2	1.3	5.6	4.0	7.0	3.8	3.3	5.9	4.3	7.0	3.3	3.8	4.5	3.8	7.0	2.7
-1	1.0	4.0	4.0	7.0	3.9	2.4	6.3	4.4	7.0	3.6	3.7	6.2	4.7	7.0	3.1
0	0.8	5.5	4.1	7.0	4.0	1.8	6.3	4.5	7.0	3.8	3.2	8.0	5.6	7.0	3.6
+1	0.6	5.3	4.1	7.0	4.0	1.3	5.9	4.4	7.0	3.7	2.2	7.6	6.0	7.0	3.2
+2	0.6	5.0	3.9	7.0	3.8	1.1	5.0	4.2	7.0	3.2	1.8	5.6	5.5	7.0	2.6
+3	0.6	4.5	3.9	7.0	3.6	1.1	3.9	3.7	7.0	2.9	1.9	3.6	3.9	7.0	2.8
+4	0.7	4.1	3.7	7.0	3.4	1.2	3.3	3.2	7.0	2.8	2.0	2.3	2.0	7.0	2.9
+5	0.8	3.7	3.5	7.0	3.3	1.2	2.7	2.9	7.0	2.7	1.9	1.6	1.1	7.0	3.0
+6	0.9	3.5	3.4	7.0	3.2	1.2	2.4	2.7	7.0	2.8	1.6	1.2	1.2	7.0	3.0
+7	0.9	3.1	3.2	7.0	3.1	1.2	2.2	2.6	7.0	2.8	1.3	1.1	1.7	7.0	2.9
+8	1.0	2.9	3.1	7.0	3.1	1.2	2.1	2.6	7.0	2.7	1.3	1.4	2.2	7.0	2.8
+9	1.1	2.7	3.0	7.0	3.0	1.3	2.1	2.6	7.0	2.7	1.4	1.9	2.6	7.0	2.8
+10	1.2	2.6	2.9	7.0	3.0	1.4	2.2	2.5	7.0	2.7	1.7	2.4	2.6	7.0	2.8
+11	1.3	2.6	2.9	7.0	2.9	1.5	2.2	2.5	7.0	2.7	1.9	2.6	2.5	7.0	2.8
+12	1.4	2.5	2.8	7.0	2.9	1.6	2.2	2.4	7.0	2.7	2.0	2.4	2.3	7.0	2.7
Max.	3.8	5.7	4.1	7.0	4.0	3.8	6.4	4.5	7.0	3.8	3.9	8.2	6.0	7.0	3.7

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	5 MPH					10 MPH					20 MPH				
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
-24	2.8	3.0	2.8	7.0	2.3										
-23	3.3	3.4	3.1	7.0	2.3										
-22	3.6	3.9	3.5	7.0	2.4										
-21	4.0	4.2	3.7	7.0	2.5										
-20	4.3	4.5	3.9	7.0	2.6										
-19	4.6	4.7	3.9	7.0	2.7										
-18	4.9	4.8	3.9	7.0	2.8										
-17	5.1	4.9	3.9	7.0	2.9	2.1	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	5.3	5.1	4.0	7.0	3.0	2.1	2.2	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.0
-15	5.5	5.3	4.2	7.0	3.1	2.2	2.2	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.1
-14	5.6	5.6	4.3	7.0	3.2	2.4	2.4	2.2	7.0	2.2	2.2	2.2	2.1	7.0	2.1
-13	5.7	5.8	4.5	7.0	3.4	2.5	2.6	2.4	7.0	2.2	2.2	2.3	2.2	7.0	2.1
-12	5.6	6.1	4.6	7.0	3.5	2.7	2.9	2.8	7.0	2.3	2.3	2.4	2.3	7.0	2.1
-11	5.5	6.3	4.7	7.0	3.7	3.0	3.3	3.1	7.0	2.4	2.3	2.4	2.3	7.0	2.1
-10	5.3	6.6	4.8	7.0	3.9	3.6	3.8	3.5	7.0	2.4	2.4	2.5	2.4	7.0	2.2
- 9	4.9	6.8	4.9	7.0	4.0	4.0	4.3	3.8	7.0	2.6	2.5	2.6	2.5	7.0	2.2
- 8	4.4	7.1	5.1	7.0	4.1	4.6	4.9	4.2	7.0	2.7	2.6	2.8	2.6	7.0	2.2
- 7	3.9	7.5	5.3	7.0	4.3	5.1	5.5	4.5	7.0	2.9	2.8	2.9	2.7	7.0	2.3
- 6	3.5	7.8	5.4	7.0	4.5	5.5	6.1	4.9	7.0	3.1	3.0	3.1	2.9	7.0	2.4
- 5	4.4	8.2	5.6	7.0	4.8	5.7	7.0	5.3	7.0	3.3	3.2	3.4	3.1	7.0	2.5
- 4	1.9	8.5	5.9	7.0	5.1	5.5	7.8	5.7	7.0	3.7	3.6	3.9	3.5	7.0	2.6
- 3	1.1	8.7	6.0	7.0	5.5	4.9	8.6	6.1	7.0	4.1	4.4	4.8	4.2	7.0	2.9
- 2	0.4	8.7	6.1	7.0	6.0	3.7	9.2	6.4	7.0	4.4	5.4	6.6	5.3	7.0	3.3
- 1	-0.2	8.8	6.1	7.3	6.8	3.3	9.6	6.7	7.0	5.1	5.2	10.1	6.9	7.0	4.0
0	-0.7	8.6	6.2	8.9	7.9	1.5	9.7	6.8	7.4	6.6	3.5	11.4	8.5	7.0	5.0
+ 1	-1.1	8.3	6.1	8.7	9.2	0.5	6.7	6.8	9.4	8.8	2.2	11.2	9.3	9.4	8.1
+ 2	-1.1	7.6	5.9	8.6	9.8	0.0	6.4	6.3	9.0	9.3	1.4	8.4	8.3	10.3	9.3
+ 3	-0.9	6.9	5.6	8.5	9.4	0.1	5.6	5.4	9.3	8.3	1.3	5.5	6.1	9.6	8.3
+ 4	-0.6	6.0	5.1	8.4	8.6	0.4	4.9	4.3	9.2	7.3	1.9	2.9	2.4	8.7	7.5
+ 5	-0.3	5.1	4.5	8.3	7.9	0.7	4.8	3.4	8.7	6.8	2.0	1.7	0.4	8.1	7.2
+ 6	0.0	4.1	4.0	8.1	7.4	0.7	4.8	2.8	8.3	6.5	1.6	0.7	0.3	7.8	7.1
+ 7	0.2	3.5	3.5	8.0	7.0	0.7	4.7	2.5	7.9	6.3	1.1	0.2	1.0	7.6	7.0
+ 8	0.3	3.1	3.2	7.9	6.7	0.5	4.7	2.5	7.8	6.2	0.7	0.6	1.9	7.4	6.9
+ 9	0.4	2.8	3.2	7.8	6.5	0.5	4.6	2.5	7.6	6.0	0.7	1.3	2.5	7.2	6.8
+10	0.6	2.7	3.2	7.7	6.3	0.8	4.6	2.7	7.5	5.9	1.3	2.4	3.0	7.1	6.7
+11	0.8	2.7	3.2	7.6	6.1	1.2	4.6	2.8	7.3	5.9	1.8	2.9	2.8	7.1	6.6
+12	1.1	2.8	3.2	7.5	6.0	1.4	4.5	2.7	7.2	5.8	2.1	2.8	2.6	7.0	6.6
Max.	5.7	8.8	6.2	9.0	9.8	5.5	6.8	6.9	9.5	9.2	5.5	11.8	9.3	11.1	9.7

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	360°					111-130 MPH									
-24	3.2	3.4	3.1	7.0	2.4										
-23	3.8	3.9	3.6	7.0	2.5										
-22	4.4	4.6	4.2	7.0	2.6										
-21	4.9	5.3	4.5	7.0	2.7										
-20	5.5	5.7	4.7	7.0	2.9										
-19	5.9	6.0	4.7	7.0	3.0										
-18	6.3	6.1	4.8	7.0	3.2										
-17	6.6	6.3	4.8	7.0	3.3	2.1	2.2	2.2	7.0	2.0	2.1	2.1	2.1	7.0	2.0
-16	7.2	6.6	5.0	7.0	3.5	2.2	2.2	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.1
-15	7.3	6.9	5.2	7.0	3.7	2.3	2.3	2.1	7.0	2.2	2.2	2.2	2.1	7.0	2.1
-14	7.5	7.3	5.4	7.0	3.8	2.5	2.5	2.2	7.0	2.3	2.2	2.2	2.1	7.0	2.1
-13	7.6	7.6	5.6	7.0	4.0	2.7	2.8	2.5	7.0	2.4	2.3	2.3	2.2	7.0	2.1
-12	7.5	7.9	5.9	7.0	4.1	3.1	3.3	3.0	7.0	2.4	2.4	2.5	2.3	7.0	2.1
-11	7.3	8.3	6.0	7.0	4.4	3.6	3.6	3.5	7.0	2.5	2.5	2.6	2.4	7.0	2.2
-10	7.0	8.6	6.2	7.0	4.5	4.2	4.5	4.1	7.0	2.6	2.6	2.7	2.5	7.0	2.2
-9	6.5	8.9	6.4	7.0	4.9	4.9	5.3	4.6	7.0	2.8	2.7	2.9	2.6	7.0	2.3
-8	5.7	9.2	6.6	7.0	5.3	5.8	6.1	5.1	7.0	3.0	3.0	3.1	2.8	7.0	2.3
-7	4.9	9.7	6.9	7.0	5.8	6.6	7.1	5.6	7.0	3.3	3.1	3.3	2.9	7.0	2.4
-6	4.1	10.2	7.2	7.0	6.6	7.7	8.1	6.1	7.0	3.6	3.4	3.5	3.2	7.0	2.5
-5	3.7	10.7	7.4	7.5	8.6	7.6	8.9	6.7	7.0	4.0	3.7	4.0	3.5	7.0	2.7
-4	3.4	11.2	7.7	8.7	10.3	7.1	9.9	7.4	7.0	4.4	4.2	4.6	4.1	7.0	2.9
-3	1.0	11.6	7.9	9.4	12.0	6.2	11.0	7.9	7.0	4.8	5.4	5.8	5.0	7.0	3.3
-2	-0.3	11.9	8.1	9.8	13.1	4.7	12.2	8.5	7.3	7.2	6.9	8.7	6.6	7.0	3.8
-1	-1.3	11.9	8.2	12.1	13.9	3.6	12.9	8.8	10.0	11.3	6.7	12.4	8.6	7.0	4.7
0	-2.1	11.7	8.2	13.4	14.8	2.0	13.1	9.1	13.3	14.4	4.1	15.4	10.8	7.3	8.7
+1	-2.6	11.3	8.1	13.7	15.3	-0.4	12.2	8.9	14.6	15.4	3.2	14.5	11.6	15.9	16.2
+2	-2.6	10.2	7.6	13.5	15.0	-1.1	10.2	8.2	13.9	14.6	0.8	11.1	10.9	15.0	14.7
+3	-2.3	9.0	7.0	12.9	14.4	-0.7	7.8	6.8	12.9	12.9	1.1	6.8	7.7	12.4	11.5
+4	-1.8	7.7	5.9	12.3	13.7	-0.3	5.7	4.9	12.1	11.8	2.0	3.8	2.7	10.8	11.2
+5	-1.4	6.5	5.0	12.0	13.0	0.2	3.9	3.4	11.3	11.5	2.0	2.5	-0.2	10.0	11.2
+6	-1.1	5.5	4.3	11.6	12.3	0.0	2.4	2.4	10.5	11.1	1.7	1.1	-0.7	9.5	10.4
+7	-0.8	4.3	3.9	11.2	11.7	-0.1	2.1	2.5	10.0	10.6	0.8	0.1	0.6	9.1	9.9
+8	-0.6	3.8	3.8	10.8	12.2	-0.2	1.7	2.6	9.6	10.1	0.3	-0.3	1.5	8.7	9.5
+9	-0.3	3.6	3.8	10.4	10.7	-0.2	1.9	2.8	9.3	9.7	0.2	1.1	2.5	8.4	9.2
+10	0.0	3.7	3.9	10.0	10.3	0.3	2.2	3.1	8.9	9.4	0.9	2.5	3.3	8.2	9.0
+11	0.4	3.6	3.8	9.7	9.9	0.9	2.8	3.3	8.6	9.1	1.6	3.6	3.1	8.1	8.8
+12	0.7	3.6	3.7	9.4	9.6	1.3	2.8	3.1	8.4	8.9	2.1	3.4	2.8	8.0	8.6
Max.	7.6	11.9	8.2	13.7	15.3	7.7	13.1	9.1	14.7	15.5	7.7	15.6	11.7	16.4	16.2

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	360°					131-155 MPH									
-24	3.6	3.6	3.4	7.0	2.5					7.0					
-23	4.3	4.4	4.0	7.0	2.6					7.0					
-22	5.1	5.4	4.8	7.0	2.8					7.0					
-21	5.9	6.2	5.3	7.0	2.9					7.0					
-20	6.6	6.9	5.6	7.0	3.1					7.0					
-19	8.0	7.2	5.6	7.0	3.3					7.0					
-18	8.1	7.4	5.6	7.0	3.5					7.0					
-17	8.2	7.6	5.7	7.0	3.7	2.2	2.2	2.2	7.0	2.0	2.1	2.1	2.1	7.0	2.0
-16	8.5	7.9	5.9	7.0	3.9	2.2	2.3	2.2	7.0	2.1	2.1	2.2	2.1	7.0	2.1
-15	8.8	8.4	6.1	7.0	4.1	2.4	2.4	2.1	7.0	2.3	2.2	2.2	2.0	7.0	2.1
-14	9.0	8.7	6.5	7.0	4.3	2.6	2.6	2.3	7.0	2.4	2.3	2.3	2.0	7.0	2.1
-13	9.3	9.2	6.8	7.0	4.5	2.9	3.0	2.6	7.0	2.5	2.4	2.4	2.2	7.0	2.2
-12	9.3	9.6	7.1	7.0	4.9	3.4	3.5	3.2	7.0	2.5	2.5	2.6	2.4	7.0	2.2
-11	9.2	10.0	7.3	7.0	5.5	4.0	4.2	3.8	7.0	2.7	2.6	2.7	2.5	7.0	2.2
-10	8.9	10.5	7.6	7.2	6.5	4.8	5.1	4.6	7.0	2.9	2.8	2.9	2.7	7.0	2.3
- 9	8.4	11.0	7.8	7.7	8.2	5.8	6.3	5.3	7.0	3.1	2.9	3.1	2.8	7.0	2.4
- 8	7.3	11.5	8.0	7.9	9.6	6.9	7.5	6.0	7.0	3.3	3.3	3.3	2.9	7.0	2.4
- 7	6.1	12.1	8.4	8.6	11.0	8.0	8.6	6.7	7.0	3.7	3.5	3.6	3.1	7.0	2.6
- 6	4.7	12.8	8.7	9.8	12.1	8.9	9.4	7.6	7.0	4.1	3.8	4.0	3.4	7.0	2.7
- 5	4.3	13.4	9.0	9.8	13.0	9.1	10.7	8.2	7.0	4.5	4.1	4.4	3.9	7.0	2.9
- 4	2.4	13.9	9.3	11.6	14.0	8.8	12.3	8.9	7.0	5.6	4.8	5.2	4.6	7.0	3.2
- 3	1.3	14.3	9.5	13.3	15.3	7.9	13.6	9.4	8.7	9.0	6.4	6.9	5.7	7.0	3.6
- 2	-0.3	14.7	9.8	14.6	16.8	5.6	15.0	10.3	10.2	12.9	8.4	10.6	7.8	7.0	4.3
- 1	-1.8	14.7	10.0	16.1	17.9	3.3	16.0	10.6	14.7	16.2	7.9	14.7	10.6	7.0	5.3
0	-3.2	14.6	10.0	17.1	18.9	2.2	16.2	10.8	18.0	19.0	4.7	18.7	13.1	16.2	14.1
+ 1	-3.5	13.8	9.7	17.1	18.8	-0.1	14.8	10.8	18.1	19.1	3.3	17.5	14.1	19.8	20.2
+ 2	-3.3	12.0	9.1	15.9	17.8	-1.3	11.9	9.6	16.0	17.3	0.7	13.0	12.8	17.6	17.6
+ 3	-2.7	10.1	7.7	14.8	16.7	-1.1	8.9	7.6	14.6	15.7	1.6	7.9	9.0	13.2	14.8
+ 4	-2.3	8.5	6.2	14.3	15.8	-0.6	6.5	4.8	13.5	14.5	2.2	5.5	2.9	12.0	14.0
+ 5	-2.1	7.3	4.8	13.7	15.1	-0.4	4.6	2.9	12.4	13.5	2.1	2.6	-0.8	11.5	12.9
+ 6	-1.9	5.9	4.2	13.1	14.3	-0.5	2.3	2.0	11.5	12.8	1.4	1.6	-1.3	10.7	11.7
+ 7	-1.4	4.6	4.0	12.5	13.5	-0.4	2.0	2.3	10.9	12.1	0.9	-0.1	0.1	10.0	10.9
+ 8	-0.9	4.1	4.0	11.9	12.7	-0.5	1.8	2.6	10.3	11.3	0.1	-0.4	1.2	9.5	10.3
+ 9	-0.5	4.1	4.1	11.2	12.0	-0.5	2.1	3.1	9.9	10.6	0.0	0.9	2.4	9.1	9.8
+10	-0.2	4.2	4.2	10.7	11.4	0.0	2.9	2.4	9.5	10.1	0.7	2.2	3.4	8.7	9.5
+11	0.4	4.1	4.2	10.2	10.8	0.9	3.4	3.6	9.1	9.7	1.5	3.7	3.3	8.4	9.2
+12	0.7	3.8	4.0	9.9	10.3	1.3	3.3	3.3	8.7	9.3	2.1	3.6	3.0	8.2	9.0
Max.	9.4	14.8	10.2	17.3	18.9	9.1	16.2	10.9	18.2	19.1	8.7	18.7	14.1	20.4	20.4



HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH			10 MPH						20 MPH					
	Direction, Windspeed														
	360°					Over 155 MPH									
-24	2.1	2.2	2.2	7.0	2.0										
-23	2.2	2.3	2.2	7.0	2.1										
-22	2.3	2.4	2.2	7.0	2.3										
-21	2.5	2.7	2.4	7.0	2.4										
-20	2.8	3.1	2.8	7.0	2.4										
-19	3.6	3.7	3.5	7.0	2.5										
-18	4.5	4.6	4.1	7.0	2.6										
-17	5.3	5.6	4.8	7.0	2.8	2.1	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	6.1	6.4	5.1	7.0	2.9	2.2	2.2	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.1
-15	6.6	6.9	5.3	7.0	3.1	2.3	2.3	2.1	7.0	2.2	2.1	2.1	2.1	7.0	2.1
-14	7.5	7.0	5.2	7.0	3.3	2.5	2.5	2.3	7.0	2.3	2.2	2.2	2.1	7.0	2.1
-13	7.1	7.0	5.1	7.0	3.5	2.7	2.8	2.6	7.0	2.3	2.3	2.3	2.2	7.0	2.1
-12	7.0	7.1	5.0	7.0	3.8	3.0	3.2	3.0	7.0	2.4	2.3	2.4	2.3	7.0	2.1
-11	6.8	7.2	5.0	7.0	3.9	3.4	3.5	3.4	7.0	2.4	2.4	2.5	2.4	7.0	2.1
-10	6.6	7.5	5.2	7.0	4.1	3.8	4.1	3.7	7.0	2.6	2.5	2.6	2.4	7.0	2.2
-9	6.2	8.0	5.5	7.0	4.3	4.3	4.6	4.0	7.0	2.7	2.6	2.7	2.5	7.0	2.2
-8	5.6	8.6	5.8	7.0	4.5	5.0	5.2	4.3	7.0	2.9	2.7	2.8	2.6	7.0	2.3
-7	4.8	9.1	6.1	7.0	4.9	5.8	6.0	4.8	7.0	3.1	2.9	3.0	2.7	7.0	2.3
-6	4.1	9.7	6.3	7.0	5.5	6.6	7.0	5.3	7.0	3.4	3.1	3.2	2.9	7.0	2.4
-5	3.4	10.3	6.5	7.0	6.1	7.4	8.2	6.0	7.0	3.7	3.3	3.4	3.2	7.0	2.5
-4	2.0	11.1	6.7	7.2	7.7	6.8	9.2	6.6	7.0	4.1	3.6	4.0	3.6	7.0	2.7
-3	-0.4	11.9	6.8	7.7	10.4	6.1	10.3	7.1	7.0	4.6	4.2	4.8	4.2	7.0	3.1
-2	-2.3	12.6	7.0	10.2	12.5	4.3	11.9	7.4	7.0	5.9	5.8	6.8	5.3	7.0	3.5
-1	-3.7	13.2	7.2	12.3	14.5	3.5	13.6	7.8	8.4	9.6	6.3	11.9	7.3	7.0	4.5
0	-4.9	13.5	7.3	15.7	16.3	-0.6	14.5	8.0	14.0	15.1	3.4	16.2	9.8	7.0	7.2
+1	-4.5	12.8	7.1	17.2	17.1	-2.4	13.5	7.7	18.9	18.3	0.3	15.6	10.6	20.9	20.2
+2	-3.6	10.4	6.4	15.6	16.5	-2.3	9.9	6.7	16.8	16.4	-0.1	10.2	9.4	17.0	15.1
+3	-1.9	8.6	5.4	14.8	15.2	-0.5	6.4	4.8	14.5	13.1	0.9	5.1	6.0	12.4	10.1
+4	-1.5	7.2	4.0	14.0	14.2	0.4	4.1	2.6	12.7	11.4	2.5	1.8	0.4	10.8	10.9
+5	-1.4	6.1	3.7	13.1	13.1	0.6	3.2	1.9	11.7	10.8	2.4	1.5	-2.0	10.3	10.9
+6	-1.5	4.7	3.7	12.5	12.1	-0.1	2.2	2.4	10.9	10.7	1.5	0.8	-0.9	9.8	10.2
+7	-1.1	3.8	3.8	12.1	11.5	-0.6	1.6	2.8	10.3	10.3	0.4	0.1	1.4	9.4	9.7
+8	-0.6	3.7	3.7	11.4	11.1	-0.6	1.6	2.9	9.9	9.9	0.1	-0.3	2.0	9.0	9.3
+9	-0.2	3.9	3.8	10.8	10.8	0.0	2.1	3.0	9.5	9.5	0.3	1.4	2.9	8.6	9.0
+10	0.4	4.0	3.9	10.3	10.3	0.7	2.7	3.1	9.2	9.2	1.2	3.4	3.4	8.4	8.7
+11	0.8	4.0	3.9	10.0	9.9	1.3	3.6	3.1	8.8	8.9	1.9	3.5	2.9	8.1	8.6
+12	1.0	3.4	3.6	9.7	9.5	1.4	2.9	3.0	8.5	8.7	2.2	3.3	2.6	8.0	8.4
Max.	7.7	13.5	8.8	17.2	17.1	7.7	14.5	8.1	19.0	18.3	6.5	17.5	10.7	21.2	20.2

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	5 MPH					10 MPH					20 MPH				
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
-24	2.1	2.4	2.5	7.0	2.1										
-23	2.2	2.7	2.8	7.0	2.1										
-22	2.4	2.9	3.0	7.0	2.1										
-21	2.5	3.1	3.2	7.0	2.2										
-20	2.6	3.2	3.3	7.0	2.2										
-19	2.7	3.3	3.3	7.0	2.3										
-18	2.7	3.3	3.3	7.0	2.3										
-17	2.7	3.4	3.4	7.0	2.4	2.0	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	2.8	3.5	3.5	7.0	2.4	2.0	2.1	2.1	7.0	2.0	2.0	2.1	2.0	7.0	2.0
-15	2.8	3.6	3.6	7.0	2.5	2.1	2.0	2.0	7.0	2.1	2.0	2.0	2.0	7.0	2.0
-14	2.8	3.7	3.7	7.0	2.5	2.0	2.0	1.9	7.0	2.1	2.0	2.0	2.0	7.0	2.0
-13	2.8	3.8	3.8	7.0	2.6	2.0	2.0	1.9	7.0	2.1	2.0	2.0	2.0	7.0	2.0
-12	2.8	3.9	3.9	7.0	2.7	2.0	2.0	2.1	7.0	2.1	2.1	2.1	2.0	7.0	2.0
-11	2.7	4.0	4.0	7.0	2.8	2.1	2.2	2.3	7.0	2.1	2.1	2.1	2.0	7.0	2.0
-10	2.6	4.1	4.1	7.0	2.9	2.1	2.5	2.7	7.0	2.1	2.1	2.1	2.1	7.0	2.0
- 9	2.4	4.2	4.1	7.0	2.9	2.3	2.9	3.2	7.0	2.7	2.1	2.2	2.1	7.0	2.0
- 8	2.2	4.3	4.2	7.0	3.0	2.4	3.4	3.7	7.0	2.2	2.1	2.2	2.1	7.0	2.1
- 7	2.0	4.5	4.3	7.0	3.2	2.6	3.7	4.1	7.0	2.3	2.2	2.3	2.2	7.0	2.1
- 6	1.7	4.7	4.3	7.0	3.3	2.7	4.2	4.4	7.0	2.5	2.2	2.3	2.2	7.0	2.1
- 5	1.5	5.0	4.3	7.0	3.4	2.8	4.6	4.7	7.0	2.7	2.2	2.4	2.4	7.0	2.1
- 4	1.3	5.2	4.4	7.0	3.5	2.8	5.1	4.9	7.0	2.9	2.3	2.7	2.9	7.0	2.2
- 3	1.0	5.3	4.3	7.0	3.7	2.6	5.5	5.1	7.0	3.2	2.4	3.4	3.9	7.0	2.4
- 2	0.8	5.5	4.3	7.0	3.8	2.3	6.0	5.1	7.0	3.4	2.6	4.7	5.2	7.0	2.7
- 1	0.7	5.4	4.2	7.0	3.8	1.9	6.4	5.0	7.0	3.7	2.9	6.6	6.1	7.0	3.2
0	0.6	5.4	4.0	7.0	3.8	1.6	6.5	4.8	7.0	3.7	2.8	8.2	6.4	7.0	3.7
+ 1	0.5	5.2	3.9	7.0	3.8	1.4	6.1	4.4	7.0	3.6	2.3	7.6	6.1	7.0	3.3
+ 2	0.5	5.0	3.8	7.0	3.7	1.5	5.5	3.9	7.0	3.4	2.3	6.2	5.1	7.0	3.2
+ 3	0.6	4.6	3.6	7.0	3.6	1.7	4.6	3.4	7.0	3.3	2.9	4.7	3.7	7.0	3.2
+ 4	0.7	4.2	3.4	7.0	3.5	1.8	3.8	2.9	7.0	3.3	2.9	3.3	2.3	7.0	3.2
+ 5	0.9	3.9	3.3	7.0	3.5	1.7	3.2	2.6	7.0	3.2	2.3	2.3	1.6	7.0	3.2
+ 6	1.0	3.7	3.1	7.0	3.4	1.6	2.7	2.4	7.0	3.1	1.8	1.7	1.5	7.0	3.1
+ 7	1.1	3.4	3.0	7.0	3.4	1.4	2.3	2.3	7.0	3.1	1.6	1.5	1.8	7.0	3.1
+ 8	1.2	3.2	2.9	7.0	3.3	1.5	2.2	2.3	7.0	3.0	1.6	1.6	2.1	7.0	3.0
+ 9	1.3	3.1	2.8	7.0	3.3	1.5	2.2	2.4	7.0	2.9	1.8	2.1	2.3	7.0	2.9
+10	1.4	3.0	2.8	7.0	3.3	1.6	2.3	2.4	7.0	2.9	2.1	2.5	2.5	7.0	2.9
+11	1.5	2.9	2.8	7.0	3.2	1.7	2.4	2.5	7.0	2.9	2.2	2.7	2.5	7.0	2.9
+12	1.6	2.9	2.7	7.0	3.2	1.8	2.5	2.5	7.0	2.8	2.2	2.5	2.4	7.0	2.9
Max.	2.8	5.5	4.4	7.0	3.8	2.8	6.5	5.1	7.0	3.7	3.0	8.3	6.5	7.0	3.7

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	325°					96 - 110 MPH									
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
-24	2.0	2.4	2.7	7.0	2.1										
-23	2.3	3.0	3.4	7.0	2.1										
-22	2.6	3.6	4.0	7.0	2.2										
-21	2.9	4.1	4.3	7.0	2.3										
-20	3.2	4.3	4.4	7.0	2.4										
-19	3.4	4.5	4.5	7.0	2.5										
-18	3.4	4.5	4.6	7.0	2.6										
-17	3.4	4.6	4.7	7.0	2.7	2.1	2.2	2.2	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	3.5	4.8	4.9	7.0	3.8	2.1	2.1	2.0	7.0	2.1	2.0	2.1	2.0	7.0	2.0
-15	3.5	5.0	5.2	7.0	2.9	2.1	2.0	1.8	7.0	2.1	2.1	2.0	1.9	7.0	2.1
-14	3.6	5.3	5.4	7.0	3.0	2.0	1.9	1.6	7.0	2.1	2.1	2.0	1.9	7.0	2.0
-13	3.5	5.5	5.7	7.0	3.1	1.9	1.8	1.5	7.0	2.2	2.1	2.0	1.9	7.0	2.0
-12	3.4	5.7	5.9	7.0	3.3	1.9	1.7	1.7	7.0	2.1	2.1	2.0	1.9	7.0	2.0
-11	3.2	5.9	6.0	7.0	3.4	1.9	1.9	2.2	7.0	2.1	2.1	2.0	1.9	7.0	2.0
-10	3.1	6.1	6.2	7.0	3.6	2.0	2.5	3.0	7.0	2.2	2.1	2.1	2.0	7.0	2.0
-9	2.8	6.3	6.3	7.0	3.7	2.2	3.4	4.0	7.0	2.2	2.1	2.2	2.0	7.0	2.1
-8	2.3	6.5	6.4	7.0	3.9	2.6	4.3	5.1	7.0	2.4	2.2	2.2	2.0	7.0	2.1
-7	1.8	7.0	6.6	7.0	4.1	3.0	5.2	5.8	7.0	2.6	2.2	2.3	2.0	7.0	2.1
-6	1.4	7.3	6.7	7.0	4.3	3.3	6.1	6.6	7.0	2.8	2.3	2.3	2.1	7.0	2.2
-5	0.9	7.7	6.8	7.0	4.5	3.4	6.8	7.3	7.0	3.1	2.2	2.4	2.4	7.0	2.2
-4	0.3	8.1	6.8	7.0	4.8	3.3	7.8	7.8	7.0	3.5	2.3	2.8	3.3	7.0	2.3
-3	-0.2	8.3	6.8	7.0	5.3	3.1	8.5	8.1	7.0	3.9	2.4	3.8	5.2	7.0	2.6
-2	-0.7	8.5	6.6	7.0	5.7	2.5	9.3	8.1	7.0	4.5	2.8	6.5	7.5	7.0	3.1
-1	-1.1	8.5	6.4	7.0	6.4	1.5	9.8	7.9	7.0	5.0	3.2	10.2	9.7	7.0	4.1
0	-1.3	8.4	6.2	7.0	8.5	0.8	9.8	7.5	7.0	7.8	3.0	11.5	9.9	7.0	5.3
+1	-1.4	8.1	5.9	7.0	9.8	0.4	9.3	6.8	7.0	10.0	2.1	11.4	9.4	7.0	8.5
+2	-1.3	7.6	5.5	7.9	10.3	0.5	8.5	5.9	9.9	10.7	2.0	9.8	8.0	11.2	10.8
+3	-0.9	7.0	5.1	9.1	9.9	1.1	7.2	4.8	9.5	10.1	3.3	7.4	5.6	9.8	9.9
+4	-0.5	6.3	4.6	8.8	9.3	1.6	5.7	3.8	8.6	9.2	3.8	5.1	3.0	8.9	8.9
+5	-0.2	5.4	4.1	8.4	8.8	1.6	4.0	3.0	8.3	8.7	3.0	2.8	1.2	8.3	8.5
+6	0.1	4.5	3.6	8.3	8.4	1.3	2.9	2.3	8.0	8.3	2.3	1.8	1.1	7.9	8.2
+7	0.2	3.8	3.2	8.2	8.0	0.9	2.1	2.1	7.8	8.0	1.2	0.9	1.2	7.7	8.0
+8	0.3	3.5	3.0	8.0	7.7	0.7	1.7	2.0	7.6	7.8	1.0	0.9	1.5	7.5	7.8
+9	0.5	3.3	3.0	7.8	7.5	0.8	1.8	2.1	7.5	7.6	1.3	1.4	2.0	7.4	7.6
+10	0.7	3.2	3.0	7.7	7.2	1.1	2.2	2.5	7.3	7.4	1.9	2.5	2.6	7.2	7.5
+11	1.0	3.2	3.1	7.6	7.0	1.4	2.6	2.8	7.2	7.2	2.2	3.0	2.8	7.1	7.3
+12	1.3	3.3	3.1	7.4	6.9	1.6	2.8	3.0	7.1	7.1	2.2	3.0	2.8	7.1	7.2
Max.	3.6	8.5	6.8	9.2	10.3	3.4	9.9	8.1	10.3	10.7	3.9	11.9	10.2	11.2	10.9



# HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING 20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed	5 MPH						10 MPH						20 MPH					
	Direction, Windspeed																	
	325°												131 - 155 MPH					
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.			
-24	1.7	2.1	3.0	7.0	2.0													
-23	2.1	3.6	4.6	7.0	2.0													
-22	2.9	4.9	5.6	7.0	2.1													
-21	3.7	5.9	6.5	7.0	2.3													
-20	4.2	6.4	6.7	7.0	2.4													
-19	4.5	6.8	7.0	7.0	2.6													
-18	4.5	6.8	7.2	7.0	2.7													
-17	4.6	7.0	7.3	7.0	2.9	2.1	2.2	2.2	7.0	2.0	2.1	2.1	2.1	7.0	2.0			
-16	4.7	7.3	7.7	7.0	3.1	2.1	2.1	2.0	7.0	2.1	2.1	2.1	2.0	7.0	2.1			
-15	4.9	7.7	8.1	7.0	3.2	2.1	1.9	1.5	7.0	2.2	2.1	2.0	1.8	7.0	2.1			
-14	5.0	8.1	8.6	7.0	3.3	1.9	1.5	0.9	7.0	2.2	2.1	1.9	1.6	7.0	2.1			
-13	4.9	8.7	9.1	7.0	3.7	1.7	1.0	0.4	7.0	2.3	2.0	1.8	1.5	7.0	2.1			
-12	4.6	9.1	9.4	7.0	4.0	1.5	0.8	0.7	7.0	2.2	2.1	1.7	1.5	7.0	2.0			
-11	4.2	9.4	9.7	7.0	4.2	1.4	1.0	1.6	7.0	2.2	2.0	1.7	1.5	7.0	2.0			
-10	3.7	9.8	10.0	7.0	4.5	1.6	2.1	3.5	7.0	2.3	2.1	1.9	1.6	7.0	2.1			
-9	3.3	10.3	10.1	7.0	5.6	2.0	4.1	5.6	7.0	2.4	2.1	2.0	1.7	7.0	2.1			
-8	2.9	10.8	10.4	7.0	7.0	2.7	6.0	7.8	7.0	2.6	2.2	2.1	1.7	7.0	2.1			
-7	1.6	11.5	10.6	7.0	8.8	3.6	8.0	9.5	7.0	2.9	2.2	2.0	1.6	7.0	2.2			
-6	0.7	12.1	10.8	7.0	10.7	4.3	9.5	10.4	7.0	3.3	2.2	2.0	1.6	7.0	2.2			
-5	-0.4	12.8	10.9	7.1	12.4	4.5	11.0	11.2	7.0	3.8	2.1	2.0	2.0	7.0	2.3			
-4	-1.5	13.4	11.0	11.2	14.1	4.0	12.3	12.3	7.0	4.7	1.9	2.5	3.6	7.0	2.5			
-3	-2.6	13.8	11.0	11.5	15.5	3.4	13.6	12.6	7.0	8.6	2.0	4.2	7.3	7.0	2.9			
-2	-3.7	14.0	10.8	13.4	17.0	3.0	14.9	12.8	7.0	13.0	2.7	10.1	11.6	7.0	3.8			
-1	-4.7	14.2	10.6	15.4	18.3	0.8	15.9	12.8	13.4	17.2	3.7	15.1	14.5	7.0	5.1			
0	-5.3	14.0	10.2	16.6	18.9	-0.8	16.1	12.4	17.1	19.4	3.4	18.2	15.3	10.1	15.1			
+1	-4.9	13.4	9.5	16.8	18.8	-1.4	15.4	11.4	18.5	19.4	1.6	18.0	15.1	20.0	20.1			
+2	-4.3	11.9	8.7	16.2	17.8	-0.7	13.3	9.8	17.6	18.9	2.0	14.8	12.8	18.5	18.9			
+3	-3.2	10.3	7.1	15.4	16.9	0.8	11.1	7.1	16.2	17.3	3.8	11.5	9.4	15.5	17.1			
+4	-2.6	8.8	5.4	15.0	16.0	1.4	8.5	4.4	14.9	15.6	5.0	8.6	3.8	14.1	15.1			
+5	-2.3	7.5	4.1	14.4	15.2	1.3	6.2	2.2	13.6	14.5	4.0	5.9	1.4	12.8	13.6			
+6	-2.1	6.1	3.7	13.6	14.3	0.6	3.5	1.5	12.7	13.6	3.0	2.3	0.2	11.8	12.4			
+7	-1.6	4.7	3.5	12.8	13.5	0.0	1.9	1.3	12.2	12.9	1.4	1.0	0.3	11.0	11.6			
+8	-1.2	4.4	3.5	12.3	12.8	-0.5	1.2	1.5	11.6	12.1	0.3	0.4	0.5	10.4	10.9			
+9	-0.8	4.6	3.7	11.8	12.2	-0.4	1.9	2.1	11.0	11.3	0.5	1.1	1.3	9.8	10.3			
+10	-0.3	4.9	4.0	11.3	11.7	0.3	2.8	2.9	10.4	10.7	1.5	2.3	2.6	9.4	9.8			
+11	0.4	4.9	4.0	10.9	11.2	0.9	3.9	3.6	9.9	10.3	2.1	3.6	3.2	8.9	9.5			
+12	0.9	4.6	3.9	10.5	10.7	1.4	4.0	3.8	9.5	9.8	2.4	3.8	3.4	8.6	9.2			
Max.	5.0	14.2	11.1	16.9	19.1	4.5	16.2	12.9	18.5	19.8	5.0	18.5	15.7	20.0	20.6			

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES LEFT OF SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	5 MPH					10 MPH					20 MPH				
	325°														
	Over 155 MPH														
-24	2.0	1.9	1.6	7.0	2.2										
-23	1.9	1.7	1.4	7.0	2.2										
-22	1.7	1.5	1.5	7.0	2.2										
-21	1.7	1.7	2.3	7.0	2.2										
-20	1.9	2.4	3.3	7.0	2.2										
-19	2.2	3.7	4.7	7.0	2.3										
-18	2.8	4.9	5.6	7.0	2.4										
-17	3.5	5.9	6.5	7.0	2.6	2.1	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	3.9	6.3	6.7	7.0	2.7	2.1	2.1	1.9	7.0	2.1	2.0	2.0	2.0	7.0	2.0
-15	4.1	6.6	6.8	7.0	2.9	2.1	1.9	1.6	7.0	2.2	2.0	2.0	1.9	7.0	2.1
-14	3.9	6.5	6.8	7.0	3.1	2.0	1.7	1.4	7.0	2.2	2.0	2.0	1.9	7.0	2.0
-13	3.7	6.5	6.7	7.0	3.3	1.9	1.6	1.3	7.0	2.2	2.1	2.0	1.8	7.0	2.0
-12	3.5	6.5	6.8	7.0	3.5	1.9	1.6	1.6	7.0	2.2	2.1	2.0	1.8	7.0	2.0
-11	3.3	6.8	7.1	7.0	3.6	1.9	1.9	2.2	7.0	2.2	2.1	2.0	1.9	7.0	2.0
-10	3.2	7.2	7.5	7.0	3.9	2.0	2.7	3.4	7.0	2.2	2.1	2.1	2.0	7.0	2.0
-9	3.0	7.9	7.9	7.0	4.1	2.3	3.8	4.8	7.0	2.3	2.2	2.2	2.0	7.0	2.1
-8	2.2	8.7	8.1	7.0	4.3	2.8	5.0	5.9	7.0	2.5	2.2	2.2	2.0	7.0	2.1
-7	1.4	9.5	8.2	7.0	4.6	3.4	6.2	7.2	7.0	2.8	2.2	2.2	2.0	7.0	2.1
-6	0.6	10.2	8.3	7.0	5.1	3.7	7.2	8.3	7.0	3.0	2.3	2.2	2.0	7.0	2.2
-5	-0.3	11.3	8.2	7.0	6.8	3.8	8.5	8.9	7.0	3.4	2.2	2.2	2.1	7.0	2.2
-4	-1.5	12.0	8.2	7.0	9.5	3.5	9.7	9.2	7.0	3.8	2.1	2.3	2.8	7.0	2.4
-3	-2.8	12.9	8.1	7.3	12.3	3.3	11.5	9.6	7.0	4.6	2.0	3.3	5.1	7.0	2.6
-2	-4.0	13.5	8.0	11.4	14.4	2.6	13.3	9.8	7.0	6.5	2.1	6.8	8.6	7.0	3.2
-1	-4.9	13.6	7.7	13.7	16.0	0.6	14.6	9.6	7.0	12.6	2.7	13.7	11.6	7.0	4.5
0	-5.7	13.5	7.5	16.2	17.4	-1.8	15.1	9.2	16.0	17.8	2.6	16.8	12.1	7.0	10.0
+1	-5.2	12.4	6.9	17.1	17.2	-2.8	13.8	8.2	18.8	18.1	0.1	15.6	11.3	19.2	19.3
+2	-3.9	10.0	5.9	15.6	15.9	-1.6	10.7	6.6	16.3	16.0	0.4	11.6	9.2	16.4	15.2
+3	-2.2	8.2	4.7	14.6	14.8	0.9	7.9	4.2	14.2	13.9	3.6	8.2	6.1	12.6	12.6
+4	-1.6	7.0	3.5	14.0	13.8	2.0	5.9	2.2	12.8	12.8	4.4	5.5	1.7	11.6	11.9
+5	-1.5	5.9	3.2	12.9	12.9	1.6	4.0	1.5	12.0	12.0	3.3	2.9	-0.3	10.9	11.2
+6	-1.6	4.6	3.3	12.4	12.2	0.5	3.4	1.9	11.5	11.4	2.2	1.9	0.4	10.3	10.6
+7	-1.4	4.1	3.4	11.8	11.7	-0.3	1.6	1.9	11.0	10.9	0.8	0.7	1.0	9.8	10.0
+8	-0.9	4.1	3.3	11.4	11.3	-0.4	1.4	1.9	10.5	10.5	0.6	0.6	1.3	9.3	9.5
+9	-0.2	4.2	3.6	11.0	10.9	0.3	1.8	2.1	10.1	10.0	1.0	1.5	2.0	8.9	9.2
+10	0.4	4.6	3.8	10.7	10.5	0.9	3.4	2.8	9.7	9.6	1.9	2.8	2.9	8.6	8.9
+11	0.9	4.6	3.7	10.3	11.2	1.3	3.4	3.2	9.3	9.3	2.3	3.6	3.0	8.3	8.7
+12	1.1	4.3	3.6	10.0	9.9	1.5	3.4	3.5	9.0	9.1	2.3	3.5	2.9	8.1	8.5
Max.	4.1	13.8	8.3	17.3	17.7	3.8	15.3	9.8	18.9	18.6	4.4	17.0	12.1	19.8	19.6

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES RIGHT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed					360°					74 - 95 MPH				
-24	2.4	2.7	2.7	7.0	2.1										
-23	2.5	2.9	2.8	7.0	2.2										
-22	2.6	3.1	2.9	7.0	2.2										
-21	2.7	3.2	3.0	7.0	2.3										
-20	2.8	3.2	3.0	7.0	2.3										
-19	2.9	3.3	3.1	7.0	2.3										
-18	3.0	3.3	3.1	7.0	2.4										
-17	2.9	3.4	3.2	7.0	2.4	2.0	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	3.0	3.5	3.3	7.0	2.5	2.1	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-15	3.0	3.5	3.4	7.0	2.5	2.1	2.1	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.0
-14	3.0	3.6	3.5	7.0	2.6	2.1	2.2	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.0
-13	2.8	3.6	3.6	7.0	2.6	2.2	2.2	2.2	7.0	2.1	2.1	2.1	2.1	7.0	2.1
-12	2.8	3.6	3.6	7.0	2.7	2.2	2.4	2.4	7.0	2.1	2.1	2.2	2.2	7.0	2.1
-11	2.6	3.6	3.7	7.0	2.7	2.3	2.5	2.5	7.0	2.1	2.2	2.2	2.2	7.0	2.1
-10	2.4	3.5	3.8	7.0	2.7	2.4	2.8	2.8	7.0	2.2	2.2	2.3	2.2	7.0	2.1
- 9	2.2	3.4	4.0	7.0	2.8	2.5	3.1	3.1	7.0	2.2	2.2	2.3	2.3	7.0	2.1
- 8	2.0	3.4	4.1	7.0	2.8	2.7	3.4	3.4	7.0	2.3	2.3	2.4	2.3	7.0	2.1
- 7	1.8	3.3	4.3	7.0	2.8	2.8	3.6	3.6	7.0	2.4	2.3	2.4	2.4	7.0	2.1
- 6	1.5	3.1	4.5	7.0	2.8	2.8	3.8	3.9	7.0	2.5	2.4	2.5	2.4	7.0	2.2
- 5	1.3	2.8	4.8	7.0	2.7	2.7	4.0	4.2	7.0	2.6	2.4	2.7	2.6	7.0	2.2
- 4	1.0	2.5	5.0	7.0	2.7	2.6	4.1	4.6	7.0	2.7	2.4	2.9	2.9	7.0	2.3
- 3	0.8	2.2	5.1	7.0	2.6	2.3	4.1	5.1	7.0	2.8	2.5	3.3	3.4	7.0	2.4
- 2	0.6	1.8	5.3	7.0	2.5	2.0	3.6	5.5	7.0	2.9	2.6	4.0	4.6	7.0	2.5
- 1	0.4	1.4	5.3	7.0	2.4	1.6	2.8	5.9	7.0	2.8	2.5	4.7	6.3	7.0	2.8
0	0.3	1.2	5.2	7.0	2.2	1.3	2.1	6.0	7.0	2.6	2.2	4.3	7.7	7.0	2.8
+ 1	0.2	0.9	5.1	7.0	2.0	1.0	1.4	5.7	7.0	2.2	1.8	3.1	7.6	7.0	2.2
+ 2	0.2	0.9	4.8	7.0	1.7	0.8	1.2	4.9	7.0	1.8	1.5	2.4	5.6	7.0	1.9
+ 3	0.2	0.9	4.5	7.0	1.5	0.8	1.4	4.0	7.0	1.6	1.5	2.5	3.1	7.0	1.9
+ 4	0.3	1.0	4.1	7.0	1.3	1.0	1.5	3.2	7.0	1.5	1.6	2.1	1.9	7.0	2.1
+ 5	0.5	1.2	3.8	7.0	1.1	1.1	1.5	2.9	7.0	1.5	1.9	1.4	1.3	7.0	2.1
+ 6	0.6	1.3	3.5	7.0	1.1	1.2	1.5	2.6	7.0	1.6	1.9	1.2	1.4	7.0	2.1
+ 7	0.7	1.4	3.3	7.0	1.2	1.1	1.5	2.5	7.0	1.7	1.5	1.2	1.9	7.0	2.1
+ 8	0.8	1.5	3.1	7.0	1.2	1.1	1.5	2.4	7.0	1.7	1.3	1.5	2.3	7.0	2.1
+ 9	0.9	1.6	2.9	7.0	1.3	1.1	1.6	2.3	7.0	1.8	1.4	1.9	2.4	7.0	2.1
+10	1.0	1.6	2.8	7.0	1.3	1.2	1.7	2.2	7.0	1.8	1.7	2.1	2.2	7.0	2.1
+11	1.1	1.7	2.7	7.0	1.4	1.3	1.8	2.2	7.0	1.8	1.9	2.1	2.1	7.0	2.1
+12	1.1	1.8	2.6	7.0	1.5	1.4	1.9	2.2	7.0	1.9	2.0	2.1	2.1	7.0	2.1
Max.	3.0	3.6	5.3	7.0	2.8	2.8	4.1	6.0	7.0	2.9	2.6	4.8	7.9	7.0	2.9

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES RIGHT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH																			
	Direction, Windspeed																													
	360°															96 - 110 MPH														
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.															
-24	2.7	3.2	3.2	7.0	2.3																									
-23	3.0	3.6	3.6	7.0	2.3																									
-22	3.3	4.0	3.8	7.0	2.4																									
-21	3.5	4.2	3.9	7.0	2.5																									
-20	3.7	4.4	4.0	7.0	2.6																									
-19	3.8	4.5	4.1	7.0	2.7																									
-18	3.9	4.6	4.2	7.0	2.8																									
-17	3.9	4.7	4.3	7.0	2.8	2.1	2.2	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0															
-16	3.9	4.8	4.5	7.0	2.9	2.1	2.2	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.0															
-15	3.9	5.0	4.7	7.0	3.0	2.2	2.2	2.0	7.0	2.1	2.1	2.1	2.0	7.0	2.1															
-14	3.8	5.1	4.9	7.0	3.1	2.2	2.2	2.0	7.0	2.2	2.1	2.1	2.1	7.0	2.1															
-13	3.7	5.1	5.0	7.0	3.2	2.2	2.3	2.2	7.0	2.2	2.2	2.2	2.1	7.0	2.1															
-12	3.5	5.1	5.2	7.0	3.3	2.3	2.5	2.5	7.0	2.2	2.2	2.3	2.2	7.0	2.1															
-11	3.1	5.0	5.4	7.0	3.3	2.4	2.8	2.8	7.0	2.3	2.3	2.3	2.3	7.0	2.1															
-10	3.0	5.0	5.7	7.0	3.4	2.7	3.3	3.3	7.0	2.3	2.3	2.4	2.3	7.0	2.1															
-9	2.4	4.9	6.0	7.0	3.4	3.0	3.9	3.9	7.0	2.4	2.4	2.5	2.4	7.0	2.2															
-8	1.9	4.8	6.4	7.0	3.4	3.3	4.4	4.5	7.0	2.5	2.5	2.6	2.5	7.0	2.2															
-7	1.4	4.6	6.8	7.0	3.4	3.5	5.0	5.1	7.0	2.7	2.6	2.7	2.7	7.0	2.3															
-6	0.8	4.3	7.3	7.0	3.3	3.5	5.4	5.6	7.0	2.8	2.6	2.9	2.7	7.0	2.3															
-5	0.3	3.9	7.8	7.0	3.3	3.3	5.9	6.4	7.0	3.0	2.6	3.0	2.9	7.0	2.4															
-4	-0.2	3.3	8.2	7.0	3.2	3.1	6.0	7.1	7.0	3.2	2.7	3.3	3.3	7.0	2.5															
-3	-0.7	2.5	8.4	7.0	3.0	2.6	5.8	8.2	7.0	3.4	2.9	4.0	4.4	7.0	2.7															
-2	-1.2	1.7	8.5	7.0	2.8	1.8	5.1	8.9	7.0	3.4	3.0	5.4	6.6	7.0	3.0															
-1	-1.5	0.9	8.5	7.0	2.6	1.1	3.9	9.3	7.0	3.2	2.8	6.8	9.4	7.0	3.2															
0	-1.8	0.1	8.5	7.0	2.2	0.3	2.1	9.6	7.0	2.8	2.2	5.9	11.9	7.0	3.2															
+1	-1.9	-0.4	8.2	7.0	1.7	-0.3	0.6	9.2	7.0	2.1	1.5	3.5	11.4	7.0	2.0															
+2	-1.9	-0.4	7.6	7.0	1.3	-0.6	0.3	7.7	7.0	1.4	0.8	2.7	8.8	7.0	1.3															
+3	-1.7	-0.2	6.7	7.0	0.9	-0.5	0.8	5.9	7.0	1.0	0.6	2.8	5.1	7.0	1.3															
+4	-1.4	0.2	5.8	7.0	0.6	-0.1	1.2	4.2	7.0	0.9	1.2	2.3	2.0	7.0	1.8															
+5	-1.0	0.7	4.8	7.0	0.6	0.4	1.3	3.2	7.0	1.1	1.9	1.4	0.7	7.0	2.1															
+6	-0.6	0.8	4.1	7.0	0.5	0.6	1.1	2.6	7.0	1.3	1.9	0.8	0.8	7.0	2.1															
+7	-0.4	0.9	3.6	7.0	0.6	0.5	0.9	2.4	7.0	1.5	1.4	0.6	1.5	7.0	2.1															
+8	-0.2	0.9	3.4	7.0	0.6	0.4	0.8	2.3	7.0	1.5	0.8	0.9	2.1	7.0	2.1															
+9	-0.8	1.0	3.2	7.0	0.7	0.3	1.0	2.3	7.0	1.6	0.7	1.3	2.5	7.0	2.0															
+10	0.1	1.3	3.1	7.0	0.8	0.5	1.2	2.3	7.0	1.7	1.2	1.9	2.3	7.0	2.0															
+11	0.3	1.5	3.0	7.0	0.9	0.8	1.5	2.3	7.0	1.7	1.7	2.1	2.1	7.0	2.1															
+12	0.6	1.7	2.9	7.0	1.0	1.0	1.8	2.4	7.0	1.7	1.9	2.1	2.0	7.0	2.1															
Max.	3.9	5.1	8.5	7.0	3.4	3.5	6.0	9.6	7.0	3.4	3.0	7.0	12.4	7.0	3.3															



## HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING 20 MILES RIGHT OF SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	5 MPH					10 MPH					20 MPH				
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
	360°														
	111-130 MPH														
-24	3.0	3.6	3.6	7.0	2.3										
-23	3.4	4.3	4.2	7.0	2.4										
-22	3.9	4.9	4.6	7.0	2.6										
-21	4.2	5.3	4.8	7.0	2.7										
-20	4.5	5.5	4.9	7.0	2.8										
-19	4.7	5.6	5.0	7.0	2.9										
-18	4.8	5.8	5.2	7.0	3.0										
-17	4.8	5.9	5.4	7.0	3.2	2.1	2.2	2.2	7.0	2.0	2.1	2.1	2.1	7.0	2.0
-16	4.9	6.1	5.7	7.0	3.3	2.2	2.2	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.1
-15	4.9	6.4	6.0	7.0	3.4	2.2	2.2	2.0	7.0	2.2	2.1	2.1	2.0	7.0	2.1
-14	4.8	6.5	6.3	7.0	3.6	2.2	2.2	1.9	7.0	2.3	2.2	2.2	2.0	7.0	2.1
-13	4.5	6.6	6.6	7.0	3.7	2.2	2.3	2.1	7.0	2.3	2.3	2.3	2.1	7.0	2.1
-12	4.1	6.6	6.8	7.0	3.7	2.3	2.5	2.5	7.0	2.3	2.3	2.4	2.2	7.0	2.1
-11	3.6	6.5	7.2	7.0	3.8	2.5	2.9	3.0	7.0	2.4	2.4	2.4	2.3	7.0	2.2
-10	3.2	6.4	7.5	7.0	4.0	2.9	3.7	3.8	7.0	2.4	2.5	2.6	2.4	7.0	2.2
-9	3.0	6.3	7.9	7.0	4.1	3.3	4.6	4.7	7.0	2.6	2.6	2.7	2.5	7.0	2.2
-8	1.8	6.1	8.3	7.0	4.1	3.7	5.5	5.6	7.0	2.8	2.7	2.9	2.6	7.0	2.3
-7	1.1	5.9	8.9	7.0	4.1	4.1	6.3	6.5	7.0	2.9	2.9	3.0	2.7	7.0	2.4
-6	0.2	5.6	9.5	7.0	4.0	4.2	7.0	7.3	7.0	3.1	2.8	3.1	2.8	7.0	2.4
-5	-0.6	5.0	10.1	7.0	3.9	3.9	7.6	8.3	7.0	3.4	2.8	3.3	3.1	7.0	2.5
-4	-1.5	4.2	10.7	7.0	3.7	3.3	7.7	9.3	7.0	3.5	2.9	3.6	3.7	7.0	2.7
-3	-2.3	3.2	11.0	7.0	3.5	3.0	7.6	10.5	7.0	3.7	3.1	4.5	5.2	7.0	2.9
-2	-3.0	1.7	11.3	7.0	3.4	1.7	6.7	11.5	7.0	3.8	3.2	6.7	8.3	7.0	3.2
-1	-3.6	0.3	11.3	7.0	3.3	0.5	4.7	12.3	7.0	3.6	3.1	8.9	12.8	7.0	3.5
0	-4.0	-0.8	11.3	7.0	2.8	-0.6	1.8	12.6	7.0	3.0	2.2	7.3	15.2	7.0	3.5
+1	-4.2	-1.8	10.9	7.0	2.3	-1.6	-0.2	12.0	7.0	2.0	1.1	4.1	14.8	7.0	1.5
+2	-4.1	-2.1	10.1	7.0	1.8	-2.1	-0.9	10.3	7.0	1.1	0.0	2.5	11.6	7.0	0.5
+3	-3.6	-1.7	8.8	7.0	1.4	-1.8	-0.1	7.6	7.0	0.6	-0.1	2.8	6.4	7.0	0.8
+4	-3.0	-1.0	7.3	7.0	1.0	-1.0	0.8	5.1	7.0	0.4	0.8	2.4	1.7	7.0	1.5
+5	-2.4	-0.4	6.1	7.0	0.8	-0.3	1.0	3.5	7.0	0.7	1.6	1.4	0.2	7.0	2.0
+6	-1.9	-0.1	5.0	7.0	0.6	0.1	0.7	2.5	7.0	1.1	2.1	0.5	0.1	7.0	2.1
+7	-1.6	0.2	4.4	7.0	0.6	-0.1	0.4	2.4	7.0	1.3	1.3	0.2	1.3	7.0	2.1
+8	-1.4	0.3	4.0	7.0	0.7	-0.4	0.0	2.3	7.0	1.4	0.4	0.3	2.0	7.0	2.1
+9	-1.1	0.5	3.8	7.0	0.8	-0.6	0.3	2.3	7.0	1.5	0.0	0.9	2.5	7.0	2.0
+10	-0.9	0.8	3.6	7.0	0.9	-0.4	0.8	2.4	7.0	1.5	0.8	1.8	2.4	7.0	2.0
+11	-0.5	1.3	3.5	7.0	1.1	0.1	1.3	2.4	7.0	1.6	1.4	2.0	2.0	7.0	2.1
+12	0.0	1.6	3.3	7.0	1.2	0.6	1.7	2.5	7.0	1.7	1.8	2.1	2.0	7.0	2.1
Max.	4.9	6.6	11.4	7.0	4.1	4.2	7.8	12.6	7.0	3.8	3.2	9.0	15.7	7.0	3.5

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES RIGHT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	360°					131 - 155 MPH									
-24	3.2	3.9	4.0	7.0	2.4										
-23	3.8	5.0	4.9	7.0	2.6										
-22	4.4	5.8	5.4	7.0	2.7										
-21	4.9	6.3	5.7	7.0	2.9										
-20	5.3	6.6	5.9	7.0	3.0										
-19	5.5	6.8	6.0	7.0	3.2										
-18	5.6	6.9	6.2	7.0	3.3										
-17	5.8	7.1	6.5	7.0	3.5	2.2	2.3	2.2	7.0	2.0	2.1	2.1	2.1	7.0	2.0
-16	5.8	7.4	6.8	7.0	3.6	2.2	2.1	2.1	7.0	2.1	2.1	2.1	2.1	7.0	2.1
-15	5.8	7.7	7.2	7.0	3.7	2.3	1.2	1.9	7.0	2.2	2.2	2.1	2.0	7.0	2.1
-14	5.7	7.9	7.7	7.0	4.0	2.2	2.2	1.8	7.0	2.3	2.3	2.2	2.0	7.0	2.1
-13	5.4	8.0	8.1	7.0	4.1	2.2	2.2	1.9	7.0	2.4	2.3	2.3	2.1	7.0	2.1
-12	4.9	8.1	8.3	7.0	4.2	2.3	2.5	2.4	7.0	2.4	2.4	2.4	2.2	7.0	2.2
-11	4.1	8.0	8.6	7.0	4.3	2.6	3.0	3.1	7.0	2.4	2.5	2.5	2.3	7.0	2.2
-10	3.4	7.8	9.1	7.0	4.3	3.1	3.8	4.2	7.0	2.6	2.6	2.7	2.5	7.0	2.2
-9	3.5	7.8	9.6	7.0	4.4	2.6	5.2	5.4	7.0	2.8	2.7	2.9	2.6	7.0	2.3
-8	1.9	7.7	10.2	7.0	4.4	4.2	6.6	6.6	7.0	3.0	2.9	3.0	2.7	7.0	2.4
-7	0.7	7.4	11.0	7.0	4.6	4.7	7.7	7.9	7.0	3.1	2.9	3.2	2.8	7.0	2.5
-6	-0.4	7.1	11.7	7.0	4.7	4.9	8.5	9.0	7.0	3.4	3.1	3.3	2.9	7.0	2.6
-5	-1.4	6.5	12.4	7.0	4.6	4.5	9.1	9.9	7.0	3.6	3.0	3.4	3.2	7.0	2.7
-4	-2.7	5.5	13.1	7.0	4.6	3.7	9.6	11.1	7.0	4.1	3.1	3.9	3.9	7.0	2.9
-3	-3.8	4.4	13.6	7.0	4.5	3.0	9.4	12.7	7.0	4.2	3.2	5.1	5.8	7.0	3.2
-2	-4.8	3.8	14.0	7.0	5.0	1.5	8.6	14.0	7.0	4.6	3.4	8.1	9.9	7.0	3.5
-1	-5.6	1.4	14.1	7.0	5.6	0.1	5.9	15.1	7.0	4.4	3.2	10.4	15.3	7.0	3.7
0	-6.1	-0.7	14.0	7.0	6.2	-1.6	3.5	15.5	7.0	4.3	2.5	9.0	18.4	7.0	3.7
+1	-5.9	-2.1	13.2	7.0	6.5	-2.5	0.1	14.5	7.0	4.0	0.6	4.6	17.7	7.0	1.7
+2	-5.8	-2.2	11.5	7.0	6.5	-3.1	-1.3	11.9	7.0	3.2	-0.5	2.8	13.5	7.0	1.0
+3	-4.9	-1.6	9.7	7.0	6.4	-2.5	-0.4	8.7	7.0	2.5	-0.3	3.2	7.6	7.0	1.5
+4	-3.9	-1.5	7.6	7.0	5.6	-1.4	0.5	5.2	7.0	2.1	0.5	2.4	1.6	7.0	2.2
+5	-3.2	-1.0	6.4	7.0	4.8	-0.6	0.8	3.4	7.0	2.2	1.8	1.4	0.6	7.0	2.5
+6	-2.8	-0.5	5.4	7.0	4.1	-0.4	0.4	2.9	7.0	2.3	1.9	0.6	0.9	7.0	2.8
+7	-2.6	-0.2	4.7	7.0	3.6	-0.7	0.0	2.6	7.0	2.4	1.3	0.3	1.6	7.0	3.2
+8	-2.2	0.0	4.3	7.0	3.3	-1.1	-0.2	2.4	7.0	2.5	0.3	0.5	2.1	7.0	3.7
+9	-1.8	0.4	4.0	7.0	3.2	-1.2	0.0	2.3	7.0	2.6	-0.2	0.7	2.4	7.0	4.2
+10	-1.3	1.0	3.8	7.0	3.2	-0.8	0.7	2.5	7.0	2.8	0.9	1.7	2.4	7.0	4.7
+11	-0.7	1.5	3.7	7.0	3.2	-0.2	1.4	2.5	7.0	3.1	1.3	1.8	1.7	7.0	5.0
+12	-0.3	1.8	3.6	7.0	3.3	0.3	1.8	2.7	7.0	3.3	1.6	2.0	2.0	7.0	5.3
Max.	5.8	8.1	14.1	7.0	6.6	4.9	9.7	15.5	7.0	4.6	3.4	10.5	18.6	7.0	5.3

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
20 MILES RIGHT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	360°					Over 155 MPH									
-24															
-23	2.1	2.2	2.2	7.0	2.0										
-22	2.1	2.2	2.1	7.0	2.1										
-21	2.1	2.1	2.0	7.0	2.2										
-20	2.0	2.1	2.0	7.0	2.3										
-19	1.9	2.4	2.5	7.0	2.3										
-18	2.2	3.0	3.5	7.0	2.4										
-17	2.6	3.8	4.5	7.0	2.5	2.1	2.1	2.1	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	3.3	5.1	5.3	7.0	2.6	2.1	2.2	2.1	7.0	2.1	2.1	2.1	2.0	7.0	2.1
-15	3.8	6.1	6.0	7.0	2.7	2.2	2.2	2.0	7.0	2.2	2.1	2.1	2.0	7.0	2.1
-14	4.1	6.5	6.5	7.0	2.9	2.2	2.2	2.0	7.0	2.2	2.2	2.2	2.1	7.0	2.1
-13	4.1	6.6	6.6	7.0	3.1	2.3	2.4	2.2	7.0	2.2	2.2	2.2	2.1	7.0	2.1
-12	3.7	6.3	6.5	7.0	3.2	2.4	2.6	2.6	7.0	2.3	2.3	2.3	2.2	7.0	2.1
-11	3.3	6.1	6.5	7.0	3.4	2.6	3.0	3.1	7.0	2.3	2.3	2.4	2.3	7.0	2.1
-10	3.0	5.8	6.7	7.0	3.4	2.9	3.6	3.6	7.0	2.4	2.4	2.5	2.4	7.0	2.2
-9	2.3	5.7	7.2	7.0	3.5	3.2	4.3	4.3	7.0	2.5	2.5	2.6	2.4	7.0	2.2
-8	1.6	5.8	8.0	7.0	3.6	3.6	4.9	4.9	7.0	2.7	2.6	2.7	2.5	7.0	2.2
-7	0.9	5.9	8.7	7.0	3.6	3.9	5.7	5.6	7.0	2.9	2.6	2.8	2.6	7.0	2.3
-6	0.2	5.8	9.5	7.0	3.5	4.0	6.3	6.6	7.0	3.0	2.7	2.9	2.7	7.0	2.4
-5	-0.6	5.5	10.3	7.0	3.4	3.9	6.9	7.5	7.0	3.3	2.7	3.0	2.9	7.0	2.4
-4	-1.5	4.5	11.2	7.0	3.1	3.4	7.3	8.7	7.0	3.4	2.7	3.2	3.2	7.0	2.6
-3	-2.4	2.5	12.0	7.0	2.7	3.0	7.5	10.0	7.0	3.5	2.7	3.6	4.1	7.0	2.7
-2	-3.2	0.0	12.5	7.0	1.9	1.9	6.9	11.6	7.0	3.5	2.9	5.0	6.7	7.0	3.0
-1	-4.0	-2.8	13.0	7.0	0.8	0.6	3.9	13.5	7.0	2.8	2.8	8.3	12.1	7.0	3.1
0	-4.5	-5.2	13.1	7.0	-0.9	-0.7	-2.4	14.1	7.0	1.1	2.0	6.0	16.9	7.0	2.2
+1	-4.4	-6.3	12.0	7.0	0.9	-1.7	-4.2	12.9	7.0	-0.6	0.8	0.2	15.4	7.0	-0.5
+2	-4.2	-4.1	9.7	7.0	2.7	-2.2	-3.1	9.6	7.0	-1.2	0.0	1.1	10.7	7.0	-0.8
+3	-3.2	-2.8	7.4	7.0	3.7	-1.8	-0.1	5.6	7.0	-1.3	-0.2	3.0	4.2	7.0	-0.4
+4	-2.2	-0.8	6.3	7.0	3.8	-0.5	1.1	2.9	7.0	-1.3	1.0	2.6	0.6	7.0	0.5
+5	-1.6	-0.3	5.2	7.0	2.7	0.6	1.0	2.4	7.0	-0.8	2.2	1.2	-0.3	7.0	1.0
+6	-1.5	-0.2	4.7	7.0	2.1	0.7	0.6	2.7	7.0	-0.3	2.4	0.3	0.1	7.0	1.1
+7	-1.5	0.0	4.6	7.0	2.1	0.0	0.3	2.9	7.0	0.1	1.3	0.4	2.1	7.0	1.2
+8	-1.5	0.3	4.2	7.0	2.0	-0.7	0.4	2.7	7.0	0.3	0.2	0.6	2.4	7.0	1.3
+9	-1.2	0.7	3.7	7.0	1.9	-0.7	0.6	2.4	7.0	0.5	0.1	1.3	2.7	7.0	1.5
+10	-0.6	1.2	3.4	7.0	1.9	0.0	1.0	2.1	7.0	0.7	1.0	1.9	2.1	7.0	1.9
+11	-0.1	1.6	3.4	7.0	2.0	0.5	1.3	2.0	7.0	0.8	1.8	2.0	1.8	7.0	2.3
+12	0.3	1.8	3.3	7.0	2.2	0.8	1.7	2.4	7.0	1.0	1.9	2.0	1.8	7.0	2.7
Max.	4.1	6.6	13.1	7.0	3.6	4.0	7.5	14.2	7.0	3.5	2.9	9.3	17.0	7.0	3.1

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
40 MILES RIGHT OF SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	55°					74-95 MPH									
-24						2.1	2.2	2.1	7.0	2.1					
-23						2.3	2.3	2.2	7.0	2.1					
-22						2.4	2.4	2.3	7.0	2.1					
-21						2.5	2.5	2.4	7.0	2.1					
-20						2.6	2.6	2.4	7.0	2.2					
-19						2.7	2.6	2.5	7.0	2.2					
-18						2.8	2.7	2.5	7.0	2.2					
-17						3.0	2.7	2.4	7.0	2.3	2.0	2.1	2.1	7.0	2.0
-16						3.1	2.8	2.4	7.0	2.3	2.1	2.1	2.1	7.0	2.0
-15						3.5	2.9	2.5	7.0	2.3	2.1	2.1	2.1	7.0	2.0
-14						3.7	3.0	2.6	7.0	2.4	2.2	2.2	2.2	7.0	2.0
-13						4.0	3.2	2.7	7.0	2.5	2.3	2.3	2.2	7.0	2.1
-12						4.2	3.4	2.8	7.0	2.6	2.3	2.4	2.3	7.0	2.1
-11						4.2	3.6	3.0	7.0	2.6	2.4	2.4	2.3	7.0	2.1
-10						4.2	3.8	3.1	7.0	2.8	2.5	2.5	2.4	7.0	2.1
-9						3.7	4.1	3.2	7.0	2.9	2.6	2.6	2.4	7.0	2.1
-8						3.3	4.4	3.4	7.0	3.1	2.8	2.7	2.4	7.0	2.2
-7						2.9	4.7	3.6	7.0	3.2	3.4	2.8	2.5	7.0	2.3
-6						1.9	4.9	3.9	7.0	3.3	4.0	3.1	2.7	7.0	2.4
-5						1.4	4.8	4.3	7.0	3.2	3.5	3.6	2.9	7.0	2.5
-4						1.0	4.3	4.7	7.0	3.0	2.4	4.3	3.3	7.0	2.7
-3						0.7	3.4	5.0	7.0	2.8	1.9	5.4	4.4	7.0	2.9
-2						0.5	2.0	5.3	7.0	2.5	1.2	5.4	5.0	7.0	3.1
-1						0.5	0.7	5.2	7.0	2.2	0.7	3.9	6.4	7.0	2.7
0						0.4	-0.1	4.2	7.0	1.9	0.5	1.0	6.2	7.0	2.4
+1						0.4	-0.5	3.3	7.0	1.9	0.6	-0.5	3.6	7.0	2.1
+2						0.5	-0.7	2.1	7.0	1.8	0.7	-1.0	0.8	7.0	1.9
+3						0.5	-0.5	1.4	7.0	1.6	0.8	-0.6	-0.1	7.0	1.9
+4						0.6	-0.2	1.2	7.0	1.6	0.9	0.0	0.1	7.0	1.8
+5						0.7	0.1	1.1	7.0	1.5	1.0	0.3	0.2	7.0	1.8
+6						0.8	0.4	1.1	7.0	1.5	1.1	0.7	1.3	7.0	1.7
+7						0.9	0.6	1.3	7.0	1.5	1.3	1.1	1.9	7.0	1.7
+8						1.0	0.8	1.4	7.0	1.5	1.5	1.7	2.2	7.0	1.7
+9						1.3	1.1	1.4	7.0	1.5	1.6	1.9	1.9	7.0	1.7
+10						1.2	1.2	1.4	7.0	1.5	1.7	1.8	1.6	7.0	1.8
+11						1.3	1.2	1.5	7.0	1.5	1.7	1.6	1.5	7.0	1.8
+12						1.3	1.3	1.5	7.0	1.5	1.6	1.5	1.5	7.0	1.8
Max.						4.2	4.9	9.3	7.0	3.2	4.2	5.5	8.1	7.0	3.1

# HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING 40 MILES RIGHT OF SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	5 MPH			10 MPH			20 MPH								
	55°			96 - 110 MPH											
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
-24						2.3	2.3	2.2	7.0	2.1					
-23						2.6	2.5	2.3	7.0	2.1					
-22						2.9	2.8	2.5	7.0	2.2					
-21						3.2	3.0	2.7	7.0	2.2					
-20						3.4	3.2	2.9	7.0	2.3					
-19						3.6	3.3	2.9	7.0	2.3					
-18						3.9	3.3	2.9	7.0	2.4					
-17						4.2	3.4	2.8	7.0	2.5	2.0	2.1	2.1	7.0	2.0
-16						4.6	3.5	2.9	7.0	2.5	2.1	2.2	2.1	7.0	2.1
-15						5.2	3.7	3.0	7.0	2.6	2.2	2.3	2.2	7.0	2.1
-14						5.7	4.0	3.2	7.0	2.7	2.4	2.4	2.3	7.0	2.1
-13						6.2	4.4	3.4	7.0	2.8	2.5	2.6	2.4	7.0	2.1
-12						6.7	4.9	3.7	7.0	3.0	2.6	2.8	2.6	7.0	2.2
-11						6.6	5.3	3.9	7.0	3.1	2.8	2.9	2.7	7.0	2.2
-10						6.5	5.8	4.1	7.0	3.3	3.2	3.0	2.7	7.0	2.3
-9						5.7	6.5	4.4	7.0	3.5	3.5	3.1	2.7	7.0	2.3
-8						4.5	7.0	4.8	7.0	3.8	4.0	3.3	2.8	7.0	2.4
-7						3.6	7.5	5.2	7.0	4.1	5.0	3.6	3.0	7.0	2.6
-6						3.0	7.8	5.7	7.0	4.3	6.4	4.1	3.3	7.0	2.7
-5						1.2	7.6	6.4	7.0	4.5	6.5	5.1	3.8	7.0	2.9
-4						0.1	6.6	7.2	7.0	4.3	4.7	6.7	4.5	7.0	3.3
-3						-0.6	4.8	8.2	7.0	4.1	3.8	8.7	5.7	7.0	3.7
-2						-1.1	1.8	8.8	7.0	3.4	2.0	8.4	7.7	7.0	4.1
-1						-1.4	-0.7	8.3	7.0	2.8	0.4	5.2	10.0	7.0	3.5
0						-1.4	-2.4	6.8	7.0	2.3	-0.7	-0.3	9.8	7.0	2.7
+1						-1.3	-3.4	4.9	7.0	1.9	-1.0	-3.2	5.5	7.0	2.2
+2						-1.1	-3.6	2.1	7.0	1.7	-1.0	-4.0	-0.4	7.0	2.1
+3						-1.0	-3.0	0.8	7.0	1.6	-1.0	-3.1	-1.9	7.0	2.0
+4						-0.9	-2.3	0.4	7.0	1.6	-0.2	-1.8	-1.5	7.0	2.1
+5						-0.6	-1.6	0.4	7.0	1.5	0.1	-1.1	-0.4	7.0	2.0
+6						-0.2	-0.8	0.4	7.0	1.5	0.2	-0.2	0.6	7.0	1.9
+7						0.0	-0.2	0.7	7.0	1.4	0.4	0.6	1.9	7.0	1.9
+8						0.4	0.1	1.0	7.0	1.4	0.7	1.4	2.5	7.0	1.9
+9						0.5	0.5	1.2	7.0	1.4	1.0	1.9	2.0	7.0	1.9
+10						0.6	0.8	1.3	7.0	1.4	1.3	1.8	1.4	7.0	1.9
+11						0.8	0.8	1.2	7.0	1.4	1.4	1.5	1.2	7.0	1.9
+12						0.9	1.0	1.3	7.0	1.4	1.4	1.2	1.2	7.0	1.9
Max.						7.0	7.8	8.8	7.0	4.5	6.7	8.7	10.5	7.0	4.1

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
40 MILES RIGHT OF SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	5 MPH			10 MPH			20 MPH								
	55°														
	111 - 130 MPH														
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
-24					2.4	2.4	2.3	7.0	2.1						
-23					3.0	2.7	2.4	7.0	2.2						
-22					3.4	3.1	2.7	7.0	2.3						
-21					3.9	3.4	3.1	7.0	2.3						
-20					4.2	3.8	3.3	7.0	2.4						
-19					4.5	4.0	3.4	7.0	2.5						
-18					4.9	4.1	3.3	7.0	2.6						
-17					5.4	4.1	3.2	7.0	2.7	2.1	2.1	2.1	7.0	2.0	
-16					6.0	4.3	3.3	7.0	2.8	2.2	2.2	2.2	7.0	2.1	
-15					6.8	4.6	3.5	7.0	2.9	2.4	2.4	2.3	7.0	2.1	
-14					7.5	5.1	3.8	7.0	3.1	2.6	2.6	2.4	7.0	2.2	
-13					8.2	5.6	4.1	7.0	3.2	2.8	2.9	2.6	7.0	2.2	
-12					9.1	6.4	4.5	7.0	3.4	3.2	3.2	2.9	7.0	2.3	
-11					9.1	6.9	4.8	7.0	3.7	3.4	3.3	3.0	7.0	2.3	
-10					8.6	7.6	5.1	7.0	3.9	3.9	3.4	3.0	7.0	2.4	
-9					7.8	8.4	5.5	7.0	4.2	4.4	3.5	3.0	7.0	2.5	
-8					6.0	9.1	5.9	7.0	4.5	5.2	3.6	3.2	7.0	2.6	
-7					3.8	9.7	6.6	7.0	5.1	6.6	4.0	3.5	7.0	2.8	
-6					3.8	10.1	7.5	7.0	5.9	8.7	4.5	3.9	7.0	3.1	
-5					1.7	10.1	8.6	7.0	7.1	9.0	5.2	4.5	7.0	3.4	
-4					-0.7	9.0	9.5	7.0	8.6	6.0	6.5	5.5	7.0	3.9	
-3					-2.0	6.9	10.6	7.0	9.0	3.7	9.0	7.3	7.0	4.5	
-2					-2.6	3.4	11.4	7.0	8.0	2.8	11.0	10.0	7.0	5.6	
-1					-2.9	-0.9	11.3	7.0	6.5	-0.2	10.9	12.7	7.0	6.2	
0					-2.9	-3.8	9.5	7.0	4.8	-1.8	7.4	13.0	7.0	5.0	
+1					-2.9	-5.8	6.5	7.0	3.9	-2.6	-5.1	8.2	7.0	4.3	
+2					-2.5	-6.7	2.6	7.0	3.4	-2.5	-7.0	-1.2	7.0	4.0	
+3					-2.2	-5.8	-0.3	7.0	3.3	-1.6	-5.7	-2.9	7.0	3.9	
+4					-1.9	-4.5	-1.1	7.0	3.2	-1.0	-3.9	-3.0	7.0	3.7	
+5					-1.5	-3.3	-0.7	7.0	3.2	-2.3	-2.1	-2.1	7.0	3.7	
+6					-1.1	-2.3	-0.2	7.0	3.1	-0.4	-1.0	-0.2	7.0	3.6	
+7					-0.7	-1.2	0.3	7.0	3.0	-0.3	-0.2	2.0	7.0	3.6	
+8					-0.4	-0.5	0.9	7.0	3.0	0.2	1.1	3.0	7.0	3.5	
+9					0.0	0.0	1.1	7.0	2.9	0.6	2.2	2.4	7.0	3.5	
+10					0.2	0.4	1.1	7.0	2.9	1.0	2.1	1.3	7.0	3.5	
+11					0.5	0.6	0.9	7.0	2.8	1.3	1.4	0.8	7.0	3.4	
+12					0.6	0.6	0.9	7.0	2.7	1.4	0.8	0.8	7.0	3.3	
Max.					9.3	10.2	11.7	7.0	9.0	9.3	11.4	13.6	7.0	6.4	

# HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING AT SABINE PASS CHANNEL

Movement Speed	5 MPH						10 MPH						20 MPH						
	Direction, Windspeed																		
	290°						74 - 95 MPH												
-24	1.6	0.6	-0.3	7.0	1.8														
-23	1.5	0.3	-0.5	7.0	1.8														
-22	1.4	0.2	-0.4	7.0	1.7														
-21	1.3	0.3	-0.3	7.0	1.6														
-20	1.3	0.3	-0.3	7.0	1.6														
-19	1.3	0.6	-0.4	7.0	1.5														
-18	1.3	0.3	-0.5	7.0	1.5													2.0	
-17	1.3	0.1	-0.6	7.0	1.4	2.0	2.1	2.1	7.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	7.0	2.0	
-16	1.2	-0.1	-0.7	7.0	1.4	2.0	2.0	2.0	7.0	2.0	2.0	2.0	2.0	2.0	1.9	7.0	2.0	2.0	
-15	1.0	-0.3	-0.7	7.0	1.3	2.0	1.9	1.8	7.0	2.0	2.0	2.0	2.0	1.9	7.0	2.0	2.0	2.0	
-14	0.9	-0.5	-0.5	7.0	1.3	2.0	1.8	1.4	7.0	2.0	2.0	2.0	2.0	1.8	7.0	2.0	2.0	2.0	
-13	0.8	-0.5	-0.1	7.0	1.2	1.9	1.5	0.9	7.0	2.0	2.0	1.9	1.8	7.0	2.0	2.0	2.0	2.0	
-12	0.8	-0.5	0.4	7.0	1.2	1.8	1.2	0.4	7.0	1.9	2.0	1.9	1.7	7.0	2.0	2.0	2.0	2.0	
-11	0.7	-0.4	1.1	7.0	1.1	1.7	0.7	-0.2	7.0	1.9	2.0	1.8	1.7	7.0	2.0	2.0	2.0	2.0	
-10	0.7	-0.3	1.8	7.0	1.1	1.6	0.4	-0.6	7.0	1.8	1.9	1.8	1.6	7.0	2.0	2.0	2.0	2.0	
-9	0.6	-0.2	2.5	7.0	1.1	1.4	0.2	-0.8	7.0	1.8	1.9	1.8	1.5	7.0	1.9	1.9	1.9	1.9	
-8	0.6	-0.1	3.1	7.0	1.1	1.3	0.0	-0.8	7.0	1.7	1.9	1.5	1.3	7.0	1.9	1.9	1.9	1.9	
-7	0.5	0.1	3.7	7.0	1.1	1.2	-0.2	-0.4	7.0	1.6	1.9	1.6	0.9	7.0	1.9	1.9	1.9	1.9	
-6	0.4	0.2	4.1	7.0	1.1	1.1	-0.2	0.5	7.0	1.6	1.9	1.5	0.4	7.0	1.9	1.9	1.9	1.9	
-5	0.4	0.6	4.4	7.0	1.2	1.1	0.0	1.9	7.0	1.5	1.8	1.2	-0.3	7.0	1.9	1.9	1.9	1.9	
-4	0.3	1.0	4.7	7.0	1.3	1.0	0.3	3.2	7.0	1.6	1.7	0.8	-0.8	7.0	1.8	1.8	1.8	1.8	
-3	0.2	1.5	4.8	7.0	1.4	0.9	0.6	4.2	7.0	1.6	1.6	0.4	1.0	7.0	1.8	1.8	1.8	1.8	
-2	0.2	2.2	4.8	7.0	1.6	0.8	1.1	4.8	7.0	1.8	1.4	1.0	1.0	7.0	1.8	1.8	1.8	1.8	
-1	0.1	2.8	4.7	7.0	1.7	0.7	2.0	5.0	7.0	2.1	1.2	-0.4	5.0	7.0	2.1	2.1	2.1	2.1	
0	0.1	3.2	4.6	7.0	1.8	0.5	3.2	4.8	7.0	2.2	0.9	1.8	5.9	7.0	2.7	2.7	2.7	2.7	
+1	0.1	3.7	4.4	7.0	1.7	0.3	4.0	4.5	7.0	2.1	0.6	5.4	5.6	7.0	2.3	2.3	2.3	2.3	
+2	0.2	4.0	4.2	7.0	1.7	0.4	4.6	4.1	7.0	2.0	0.5	6.4	4.7	7.0	2.1	2.1	2.1	2.1	
+3	0.3	4.1	3.9	7.0	1.7	0.8	4.7	3.7	7.0	2.0	2.0	5.3	3.6	7.0	2.2	2.2	2.2	2.2	
+4	0.4	4.2	3.7	7.0	1.7	1.2	4.4	3.3	7.0	2.1	3.8	3.9	2.9	7.0	2.2	2.2	2.2	2.2	
+5	0.6	4.1	3.5	7.0	1.8	1.5	3.9	3.0	7.0	2.2	3.3	3.2	2.4	7.0	2.2	2.2	2.2	2.2	
+6	0.8	4.0	3.3	7.0	1.9	1.7	3.5	2.8	7.0	2.2	2.1	2.4	2.0	7.0	2.2	2.2	2.2	2.2	
+7	0.9	3.8	3.2	7.0	2.0	1.7	3.0	2.6	7.0	2.2	1.6	1.7	1.8	7.0	2.2	2.2	2.2	2.2	
+8	1.1	3.6	3.0	7.0	2.0	1.7	2.7	2.4	7.0	2.2	1.4	1.4	1.7	7.0	2.1	2.1	2.1	2.1	
+9	1.2	3.4	2.9	7.0	2.1	1.7	2.5	2.3	7.0	2.1	1.6	1.5	1.8	7.0	2.1	2.1	2.1	2.1	
+10	1.4	3.3	2.8	7.0	2.1	1.8	2.4	2.3	7.0	2.1	2.0	2.0	2.0	7.0	2.1	2.1	2.1	2.1	
+11	1.5	3.2	2.8	7.0	2.2	1.9	2.5	2.4	7.0	2.1	2.1	2.6	2.5	7.0	2.1	2.1	2.1	2.1	
+12	1.6	3.1	2.7	7.0	2.2	2.0	2.6	2.5	7.0	2.2	2.1	2.8	2.8	7.0	2.1	2.1	2.1	2.1	
Max.	1.6	4.2	4.8	7.0	2.2	2.0	4.8	5.0	7.0	2.2	3.8	6.5	5.9	7.0	2.7	2.7	2.7	2.7	

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
AT SABINE PASS CHANNEL

Movement Speed Direction, Windspeed	290°														
	5 MPH					10 MPH					20 MPH				
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.
-24	1.1	-1.4	-2.8	7.0	1.7										
-23	0.8	-1.9	-3.0	7.0	1.6										
-22	0.5	-2.2	-3.0	7.0	1.5										
-21	0.4	-1.9	-3.0	7.0	1.4										
-20	0.3	-2.2	-3.0	7.0	1.3										
-19	0.3	-2.2	-3.0	7.0	1.2										
-18	0.2	-2.1	-3.0	7.0	1.2										
-17	0.1	-2.1	-3.0	7.0	1.1	2.1	2.1	2.2	7.0	2.0	2.0	2.1	2.1	7.0	2.0
-16	-0.1	-2.5	-3.0	7.0	1.0	2.1	2.0	2.0	7.0	2.0	2.0	2.0	2.0	7.0	2.0
-15	-0.3	-3.0	-3.0	7.0	0.9	2.0	1.8	1.4	7.0	2.0	2.0	1.9	1.8	7.0	2.0
-14	-0.6	-3.5	-3.0	7.0	0.9	1.9	1.3	0.5	7.0	2.0	2.0	1.8	1.7	7.0	2.0
-13	-0.8	-3.9	-2.7	7.0	0.7	1.7	0.7	-0.7	7.0	1.9	1.9	1.7	1.6	7.0	2.0
-12	-1.0	-4.1	-2.0	7.0	0.6	1.5	-0.1	-1.9	7.0	1.8	1.9	1.6	1.4	7.0	1.9
-11	-1.1	-4.1	-0.2	7.0	0.6	1.2	-1.1	-2.7	7.0	1.7	1.8	1.5	1.3	7.0	1.9
-10	-1.2	-3.8	1.5	7.0	0.5	0.9	-1.9	-3.0	7.0	1.6	1.8	1.4	1.2	7.0	1.9
-9	-1.2	-3.5	3.1	7.0	0.5	0.6	-2.5	-3.0	7.0	1.5	1.8	1.4	1.0	7.0	1.9
-8	-1.3	-3.2	4.4	7.0	0.5	0.3	-3.1	-3.0	7.0	1.4	1.8	1.2	0.7	7.0	1.8
-7	-1.5	-2.9	5.5	0.7	0.5	0.1	-3.5	-3.0	7.0	1.3	1.7	1.0	0.1	7.0	1.8
-6	-1.7	-2.5	6.7	7.0	0.6	-0.2	-3.6	-2.0	7.0	1.2	1.6	0.6	-0.8	7.0	1.8
-5	-1.7	-2.1	7.2	7.0	0.7	-0.3	-3.0	1.7	7.0	1.2	1.5	-0.1	-2.0	7.0	1.7
-4	-2.0	-1.3	7.6	7.0	1.0	-0.6	-2.1	4.2	7.0	1.2	1.2	-1.1	-2.8	7.0	1.6
-3	-2.1	-0.1	7.8	7.0	1.3	-0.7	-1.6	6.3	7.0	1.3	0.8	-2.4	-3.0	7.0	1.6
-2	-2.2	2.5	7.8	7.0	1.7	-0.9	-0.7	7.6	7.0	1.6	0.4	-3.7	-2.0	7.0	1.5
-1	-2.2	3.6	7.6	7.0	1.9	-1.2	2.0	8.2	7.0	2.2	-0.3	-4.6	7.8	7.0	2.0
0	-2.2	4.5	7.4	7.0	2.0	-1.7	4.4	7.9	7.0	2.5	-1.0	0.0	9.9	7.0	3.3
+1	-2.2	5.3	7.0	7.0	2.0	-2.0	6.1	7.1	7.0	2.2	-1.7	8.9	8.8	7.0	2.4
+2	-2.0	5.8	6.4	7.0	1.7	-1.6	6.9	6.0	7.0	1.9	-1.9	9.6	7.0	7.0	2.0
+3	-1.7	6.0	5.8	7.0	1.7	-0.6	7.0	5.2	7.0	1.9	1.8	7.8	5.1	7.0	4.4
+4	-1.2	6.0	5.1	7.0	1.7	0.3	6.3	4.3	7.0	2.0	5.5	6.1	3.7	7.0	4.5
+5	-0.7	5.6	4.5	7.0	1.8	1.0	5.3	3.6	7.0	2.1	4.1	4.2	2.5	7.1	4.7
+6	-0.2	5.0	3.9	7.0	1.9	1.3	3.9	3.0	7.0	2.7	0.9	2.2	1.6	7.3	4.6
+7	0.1	4.4	3.5	7.0	2.0	1.2	3.2	2.7	7.0	2.6	0.6	1.0	1.6	7.2	4.5
+8	0.3	4.0	3.2	7.0	2.1	1.0	2.5	2.2	7.0	2.6	0.4	0.1	0.8	7.2	4.4
+9	0.4	3.8	3.1	7.0	2.2	1.0	2.2	2.1	7.0	2.2	0.8	0.4	1.1	7.1	4.3
+10	0.6	3.6	3.1	7.0	2.2	1.3	2.3	2.2	7.0	2.2	1.8	1.7	1.7	7.1	4.2
+11	0.9	3.6	3.1	7.0	2.3	1.6	2.6	2.5	7.0	2.2	2.1	3.0	2.8	7.0	4.2
+12	1.3	3.5	3.1	7.0	2.3	1.8	2.9	2.8	7.0	2.2	2.1	3.5	3.7	7.0	4.2
Max.	2.1	6.0	7.9	7.0	2.3	8.2	7.2	8.2	7.0	2.5	5.6	4.7	10.0	7.3	4.7



HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
AT SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH						
	Direction, Windspeed					290°					111 - 130 MPH						
-24	0.5	-3.4	-3.0	7.0	1.6												
-23	0.0	-4.3	-3.0	7.0	1.5												
-22	-0.4	-4.9	-3.0	7.0	1.3												
-21	-0.6	-5.1	-3.0	7.0	1.2												
-20	-0.7	-5.1	-3.0	7.0	1.1												
-19	-0.9	-4.9	-3.0	7.0	1.0												
-18	-1.0	-4.8	-3.0	7.0	0.9												
-17	-1.0	-5.2	-3.0	7.0	0.8	2.1	2.2	2.2	7.0	2.0	2.0	2.1	2.1	7.0	2.0		
-16	-1.3	-6.1	-3.0	7.0	0.7	2.1	2.0	1.9	7.0	2.0	2.0	2.1	2.0	7.0	2.0		
-15	-1.6	-7.1	-3.0	7.0	0.6	2.0	1.6	1.0	7.0	2.0	2.0	1.9	1.7	7.0	2.0		
-14	-2.1	-8.0	-3.0	7.0	0.5	1.8	0.9	-0.5	7.0	2.0	1.9	1.7	1.5	7.0	2.0		
-13	-2.5	-8.5	-3.0	7.0	0.4	1.5	-0.2	-2.2	7.0	1.9	1.9	1.5	1.3	7.0	1.9		
-12	-2.8	-8.6	-2.9	7.0	0.3	1.2	-1.5	-2.9	7.0	1.8	1.8	1.3	1.0	7.0	1.9		
-11	-3.0	-8.1	-1.8	7.0	0.2	0.7	-3.0	-3.0	7.0	1.6	1.7	1.1	0.8	7.0	1.9		
-10	-3.1	-7.8	1.3	7.0	0.2	0.2	-4.3	-3.0	7.0	1.5	1.7	1.0	0.7	7.0	1.8		
-9	-3.2	-6.9	3.7	7.0	0.1	-0.3	-5.5	-3.0	7.0	1.4	1.6	0.9	0.4	7.0	1.8		
-8	-3.3	-6.3	5.8	7.0	0.1	-0.8	-6.5	-3.0	7.0	1.2	1.6	0.7	-0.2	7.0	1.7		
-7	-3.6	-5.4	7.8	7.0	0.1	-1.2	-7.5	-3.0	7.0	1.1	1.5	0.2	-1.1	7.0	1.7		
-6	-3.9	-4.6	8.6	7.0	0.1	-1.6	-8.1	-2.8	7.0	1.0	1.3	-0.5	-2.4	7.0	1.6		
-5	-4.0	-3.0	9.5	7.0	0.3	-1.9	-6.7	1.5	7.0	0.9	1.0	-1.6	-3.0	7.0	1.5		
-4	-4.4	-1.4	10.0	7.0	0.7	-2.2	-4.8	5.3	7.0	0.9	0.6	-3.2	-3.0	7.0	1.4		
-3	-4.5	0.8	10.3	7.0	1.1	-2.4	-4.3	8.8	7.0	1.1	0.0	-5.4	-3.0	7.0	1.4		
-2	-4.7	2.6	10.3	7.0	1.5	-2.7	-2.6	10.7	7.0	1.5	-0.8	-7.8	-3.0	7.0	1.3		
-1	-4.8	4.1	10.1	7.0	1.8	-3.2	2.5	10.7	7.0	2.2	-1.8	-8.8	10.5	7.0	1.9		
0	-4.9	5.6	9.7	7.0	2.1	-4.0	5.2	10.2	7.0	2.8	-3.0	-4.1	12.9	7.0	3.6		
+1	-4.9	6.6	9.3	7.0	2.0	-4.5	7.3	9.2	7.0	2.5	-4.2	11.2	11.4	7.0	2.9		
+2	-4.6	7.5	8.5	7.0	2.1	-3.8	8.8	7.9	7.0	2.0	-4.6	11.6	9.0	7.0	5.0		
+3	-3.8	7.6	7.3	7.0	7.9	-2.4	8.6	6.5	7.0	4.1	1.0	9.7	6.5	7.8	10.0		
+4	-2.9	7.7	6.2	7.0	11.1	-1.1	7.8	4.9	7.0	8.1	6.5	7.7	4.4	9.6	10.0		
+5	-2.2	7.4	5.1	7.0	12.0	0.3	6.5	3.7	7.0	8.8	4.9	5.3	2.4	9.1	9.1		
+6	-1.8	6.7	4.4	7.0	11.9	0.7	5.0	3.2	7.0	8.5	0.2	2.2	1.3	8.3	8.7		
+7	-1.4	5.9	4.0	7.0	11.6	0.7	3.7	2.6	7.0	8.3	-0.2	0.2	1.1	8.0	8.5		
+8	-0.9	5.3	3.7	7.0	11.2	0.5	2.5	2.3	7.0	8.0	-0.6	-1.1	0.2	7.8	8.2		
+9	-0.5	4.9	3.6	7.0	10.8	0.4	2.2	2.1	7.0	7.8	-0.2	-0.9	0.3	8.0	8.0		
+10	0.0	4.8	3.6	7.0	10.5	0.8	2.4	2.4	7.0	7.6	1.5	1.5	1.5	7.5	8.0		
+11	0.5	4.7	3.6	7.0	10.3	1.2	2.8	2.7	7.0	7.5	2.0	3.3	3.1	7.4	7.7		
+12	0.9	4.6	3.5	7.0	10.1	1.7	3.2	3.0	7.0	7.3	2.1	4.2	4.4	7.3	7.6		
Max.	2.1	7.7	10.4	7.0	12.0	2.1	8.7	10.8	7.0	8.8	6.9	12.5	13.5	10.7	11.0		

HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING  
AT SABINE PASS CHANNEL

Movement Speed	5 MPH						10 MPH						20 MPH					
	Direction, Windspeed																	
	290°						131 - 155 MPH											
	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach	Port Arthur Levee/South	Port Arthur Levee/S.L.	Galveston Bay Channel	Sabine Pass Channel	Hackberry Beach
-24	-0.1	-5.4	-3.0	7.0	1.5													
-23	-0.7	-6.8	-3.0	7.0	1.3													
-22	-1.3	-7.8	-3.0	7.0	1.2													
-21	-1.6	-8.3	-3.0	7.0	1.0													
-20	-1.8	-8.5	-3.0	7.0	0.9													
-19	-2.0	-8.3	-3.0	7.0	0.8													
-18	-2.2	-8.0	-3.0	7.0	0.7													
-17	-2.3	-8.2	-3.0	7.0	0.6	2.1	2.2	2.3	7.0	10.0	2.1	2.1	2.1	7.0	2.0			
-16	-2.5	-8.7	-3.0	7.0	0.5	2.1	2.0	1.8	7.0	10.0	2.0	2.0	1.9	7.0	2.0			
-15	-3.0	-8.9	-3.0	7.0	0.4	2.0	1.4	0.6	7.0	10.0	2.0	1.8	1.6	7.0	2.0			
-14	-3.6	-8.9	-3.0	7.0	0.3	1.7	0.4	-1.4	7.0	10.0	1.9	1.6	1.3	7.0	2.0			
-13	-4.2	-9.0	-3.0	7.0	0.2	1.2	-1.1	-2.9	7.0	10.0	1.8	1.3	0.9	7.0	1.9			
-12	-4.7	-9.0	-2.1	7.0	0.1	0.8	-2.9	-3.0	7.0	10.0	1.7	1.0	0.6	7.0	1.9			
-11	-5.0	-9.0	2.0	7.0	0.0	0.1	-5.0	-3.0	7.0	10.0	1.6	0.7	0.3	7.0	1.8			
-10	-5.1	-9.0	5.0	7.0	-0.1	-0.6	-6.9	-3.0	7.0	10.0	1.5	0.6	0.1	7.0	1.8			
-9	-5.2	-9.0	7.8	7.0	-0.2	-1.2	-8.4	-3.0	7.0	10.0	1.4	0.4	-0.3	7.0	1.7			
-8	-5.5	-8.7	9.5	7.0	-0.3	-1.8	-8.8	-3.0	7.0	10.0	1.3	0.1	-1.1	7.0	1.6			
-7	-5.9	-8.7	10.8	7.0	-0.4	-2.4	-8.9	-3.0	7.0	10.0	1.2	-0.6	-2.3	7.0	1.6			
-6	-6.2	-7.7	11.6	7.0	-0.5	-3.0	-9.0	-3.0	7.0	10.0	1.0	-1.6	-2.9	7.0	1.5			
-5	-6.3	-4.7	12.3	7.0	-0.3	-3.5	-9.0	1.3	7.0	10.0	0.6	-3.1	-3.0	7.0	1.4			
-4	-6.8	-2.4	12.6	7.0	-0.1	-3.9	-8.3	6.2	7.0	10.0	0.0	-5.4	-3.0	7.0	1.3			
-3	-7.1	0.4	12.7	7.0	0.4	-4.1	-8.2	10.2	7.0	10.0	-0.9	-8.5	-3.0	7.0	1.1			
-2	-7.4	3.0	12.6	7.0	1.0	-4.8	-4.5	12.2	7.0	10.0	-2.0	-8.8	-3.0	7.0	1.1			
-1	-7.6	5.0	12.6	7.0	1.6	-5.2	3.4	12.7	7.0	10.0	-3.4	-9.0	12.5	7.0	1.7			
0	-7.7	6.9	12.2	7.0	10.3	-6.3	5.9	12.6	7.0	10.0	-5.1	-8.9	15.7	7.0	3.8			
+1	-7.2	8.6	11.4	7.0	15.1	-6.7	8.3	11.3	7.0	10.0	-6.2	14.2	13.3	7.0	2.7			
+2	-6.4	8.9	9.9	10.2	15.2	-5.4	9.4	9.4	7.0	10.0	-6.7	12.8	10.6	7.0	12.7			
+3	-5.0	9.1	8.3	11.2	15.7	-3.6	9.2	7.1	7.0	10.0	1.1	11.0	8.4	13.3	13.8			
+4	-3.5	8.8	6.4	11.5	15.6	-1.5	8.5	5.0	7.0	11.1	7.4	8.9	4.8	11.7	12.0			
+5	-3.0	8.2	5.1	11.9	15.1	-0.2	7.2	3.4	10.0	13.1	4.8	6.7	2.3	10.9	11.3			
+6	-2.7	7.3	4.5	11.6	14.3	0.1	5.4	3.2	9.6	12.1	0.0	3.3	0.9	9.8	10.6			
+7	-2.3	6.1	4.0	11.4	13.5	0.1	3.7	2.6	8.5	11.5	-0.9	0.0	0.6	9.1	9.9			
+8	-1.7	5.4	3.7	10.8	13.0	0.0	2.5	2.2	8.2	11.4	-1.2	-2.3	-0.5	8.7	9.5			
+9	-1.1	5.3	3.7	10.3	12.5	-0.1	2.3	2.2	7.9	11.1	-0.9	-1.7	-0.4	8.4	9.1			
+10	-0.4	5.4	3.8	10.0	12.0	0.4	2.7	2.4	7.8	10.9	1.1	1.4	1.3	8.2	8.9			
+11	0.3	5.3	3.9	9.8	11.5	1.1	3.4	2.9	7.6	10.5	1.9	3.5	3.4	8.1	8.7			
+12	0.8	5.1	3.9	9.6	11.0	1.6	3.6	3.3	7.4	10.3	2.1	4.8	4.8	7.9	8.5			
Max.	0.8	9.1	12.7	11.9	15.8	2.1	9.5	12.9	10.3	13.1	7.9	14.8	16.0	14.5	14.3			

# HOURLY SURGE CONDITIONS FOR HURRICANES LANDFALLING AT SABINE PASS CHANNEL

Movement Speed	5 MPH					10 MPH					20 MPH				
	Direction, Windspeed														
	290°														
	Over 155 MPH														
-24															
-23															
-22															
-21															
-20															
-19															
-18	2.1	2.2	2.3		2.0										
-17	2.1	1.8	0.8	7.0	2.2	2.1	2.1	2.1	7.0	2.0	2.0	2.0	2.0	7.0	2.0
-16	1.9	0.5	-2.1	7.0	1.9	2.0	1.9	1.7	7.0	2.0	2.0	2.0	1.9	7.0	2.0
-15	1.4	-1.7	-3.0	7.0	1.8	1.9	1.5	0.7	7.0	2.0	2.0	1.9	1.8	7.0	2.0
-14	0.7	-4.1	-3.0	7.0	1.7	1.8	0.9	-0.6	7.0	1.9	1.9	1.8	1.6	7.0	2.0
-13	0.0	-6.6	-3.0	7.0	1.5	1.5	0.0	-2.1	7.0	1.8	1.9	1.6	1.4	7.0	2.0
-12	-1.0	-8.6	-3.0	7.0	1.3	1.3	-1.1	-2.9	7.0	1.8	1.9	1.5	1.3	7.0	1.9
-11	-1.8	-8.6	-2.6	7.0	1.1	0.9	-2.4	-3.0	7.0	1.6	1.8	1.4	1.2	7.0	1.9
-10	-2.1	-8.7	0.6	7.0	0.9	0.5	-3.5	-3.0	7.0	1.5	1.8	1.4	1.1	7.0	1.9
-9	-2.2	-8.5	5.3	7.0	0.7	0.0	-4.8	-3.0	7.0	1.4	1.7	1.3	0.8	7.0	1.8
-8	-2.2	-8.0	8.9	7.0	0.5	-0.4	-6.4	-3.0	7.0	1.3	0.9	1.1	0.4	7.0	1.8
-7	-2.3	-6.2	10.5	7.0	0.4	-0.9	-8.2	-3.0	7.0	1.1	1.6	0.7	-0.4	7.0	1.7
-6	-2.6	-5.8	11.2	7.0	0.3	-1.4	-8.7	-3.0	7.0	1.0	1.5	0.2	-1.6	7.0	1.7
-5	-2.9	-5.3	11.9	7.0	0.2	-1.9	-8.6	-1.6	7.0	0.9	1.3	-0.8	-2.9	7.0	1.6
-4	-3.5	-4.8	11.6	7.0	0.2	-2.4	-5.7	5.5	7.0	0.8	-3.3	-2.3	-3.0	7.0	1.5
-3	-4.1	-1.7	11.2	7.0	0.0	-1.9	-8.6	10.0	7.0	0.8	0.4	-4.9	-3.0	7.0	1.4
-2	-4.7	1.8	10.8	7.0	-0.2	-2.9	-8.4	11.4	7.0	0.9	-0.4	-8.7	-3.0	7.0	1.2
-1	-5.3	6.8	10.3	7.0	1.6	-3.3	1.9	10.7	7.0	1.1	-1.6	-9.0	13.0	7.0	1.4
0	-5.5	7.9	9.8	7.0	14.5	-4.8	7.9	9.9	7.0	3.2	-3.3	-9.0	13.2	7.0	4.3
+1	-5.2	9.6	9.0	13.6	17.0	-5.7	9.0	8.9	7.0	4.5	-4.8	13.9	10.5	7.0	5.2
+2	-4.6	9.0	7.3	12.4	16.5	-4.9	8.4	6.5	7.0	13.8	-6.1	11.0	7.7	7.0	13.3
+3	-3.1	8.7	5.7	12.3	15.8	-2.9	8.3	4.2	7.0	13.5	-0.5	8.3	4.6	11.5	11.9
+4	-1.5	8.4	4.5	12.5	15.3	-0.4	6.7	3.0	10.2	12.1	7.5	6.4	2.3	9.9	10.4
+5	-1.8	7.6	4.1	12.6	14.6	0.7	5.3	2.6	9.3	11.1	4.6	3.9	1.5	8.8	9.7
+6	-1.7	6.6	3.9	12.2	13.7	0.6	4.4	2.9	8.5	10.4	-0.1	1.8	1.3	8.3	9.4
+7	-1.8	5.6	3.7	11.5	12.9	0.0	2.6	2.8	8.2	10.1	-0.7	-0.1	1.1	8.0	9.0
+8	-1.1	4.9	3.4	11.0	12.3	-0.2	2.2	2.3	7.8	9.8	-0.5	-1.3	0.5	7.8	8.7
+9	-0.4	5.2	3.5	10.5	11.8	0.2	2.2	2.1	7.6	9.6	-0.1	-1.2	0.2	7.6	8.5
+10	0.3	5.1	3.5	10.2	11.4	0.9	2.6	2.3	7.4	9.3	2.0	1.8	1.2	7.5	8.3
+11	0.9	5.1	3.6	9.9	11.0	1.5	3.3	2.6	7.3	9.0	2.2	3.3	3.0	7.4	8.1
+12	1.1	4.8	3.7	9.7	10.6	1.7	3.4	3.1	7.2	8.9	2.0	4.2	4.2	7.3	8.0
Max.	2.1	9.6	11.9	15.8	17.4	2.1	9.1	11.8	10.6	14.4	7.9	16.5	15.0	12.2	14.7

APPENDIX D  
SOP

STEP ONE

Estimate the time the eye is to cross coastline. This time can be estimated by dividing the distance of the eye from the probable point of landfall by its forward movement speed. For safety purposes, other possible points of landfall that could place your area in greater danger should also be considered.

Example One: If a storm 250 miles from Sabine Pass were heading toward Sabine Pass at 5 mph, then the estimated time the eye would cross the coastline would be 250 divided by 5, or 50 hours.

50 hours

$$5 \text{ mph} \overline{) 250 \text{ miles from Sabine Pass}}$$

Example Two: If a storm were 300 miles from Sabine Pass and heading toward Galveston at 5 mph, you would want to consider what would happen if the hurricane would change its course and head toward Sabine Pass. Divide the distance by the forward movement speed to estimate the time the eye could cross the coastline; this would be 60 hours.

60 hours

$$5 \text{ mph} \overline{) 300 \text{ miles from Sabine Pass}}$$

Now place those hours in the upper portion of the Step One box and count forward in time and place the estimated day and hour the eye of the hurricane will cross the coastline in the lower portion of the Step One box (D-6).

STEP TWO

Determine the possible cut-off times for critical data points that affect your area. Data point locations can be found in the map located inside the back cover of this report. You will have to determine which data point or points can indicate a blockage on the evacuation route or routes controlling your area, or representing a location to give wind gusting conditions which could make travel hazardous in the zone. Suggested data points by zone are:

	<u>Surge</u>	<u>Wind</u>
<u>Hardin</u>		
H <sub>A</sub>		16
<u>Jasper</u>		
J <sub>S</sub> <sub>A</sub>		16
<u>Jefferson</u>		
J <sub>A</sub>	10	10
J <sub>B</sub>	11, 15	11, 15
J <sub>C</sub>	11, 15, 35, 16	30
J <sub>1</sub>	4, 32, 30	4, 32
J <sub>2</sub>	6, 12, 7	6, 12, 7
J <sub>3</sub>	27	27
<u>Newton</u>		
N <sub>A</sub>		24
<u>Orange</u>		
O <sub>A</sub>	16, 18	18
O <sub>B</sub>	24	24
O <sub>1</sub>	26	26
O <sub>2</sub>	23, 24	23
O <sub>3</sub>	24	24

These point locations are numbered and can be found by these numbers in Appendix B. In Appendix B, route cut-off times are given by storm type. There are 82 storm types displayed for each

data point. Your first step is to find the row with the appropriate wind speed. The classifications are:

- 74- 95 mph
- 96-110 mph
- 111-130 mph
- 131 mph and over

When you have found the proper row, you can find which of the six columns to use by the direction the hurricane is heading (in degrees) and its anticipated point of landfall. Since you may not find the exact hurricane direction or point of landfall, you may have to do some estimating. These storms were chosen because they can pose the greatest threats to the area, however, with the changeable nature of hurricanes, it is well to plan on the worst case. Once you have found the row and column, the movement speed will determine the exact column. The route cut-off time should be determined either by surge penetration or by wind gusts.

Now place the number of hours in the top half of the Step Two box. If it is a minus figure, count backwards in time (if it is a rare plus figure, place a "0" in time) and figure the estimated day and hour the evacuation route will be blocked and place that day and hour in the bottom half of the Step Two box.

### STEP THREE

Estimate the probable evacuation time needed to evacuate your area and/or zones. This can be done by determining the location of zones in your area on the enclosed fold-out map. This fold-out also gives the estimated times for two differing storm conditions. If winds are under 110 mph, use the estimated hours in the first

column; if winds are in excess of 110 mph, use the estimated hours in the second column.

Now place the number of hours in the top of the Step Three box and then go backward in time and place the proper day and hour in the lower portion of the box.

#### STEP FOUR

Adjusted time estimates consist of adding three hours to Step Three. It is estimated that it will take about one hour to warn the people to evacuate, another hour for them to prepare and evacuate, and another hour to establish a monitoring system that will permit maximum utilization of the evacuation routes.

Now place the number of hours in the top of Step Four box and then go backward in time and place the proper day and hour in the lower portion of the box.

#### STEP FIVE

Final adjustment factors should include the unpredictability of hurricane intensification or weakening, varying forward movement speed, changing direction, and evacuation route blockage by unexpected rainfall.

Now place the number of hours (if any) in the top of the Step Five box and then go backwards in time and place the proper day and hour in the lower portion of the box. This now gives you the time the evacuation needs to begin to evacuate the residents in your area and/or zones. To facilitate traffic control, the Texas Department of Public Safety regional office needs to know when an evacuation is going to be recommended.

## CAUTION

Your evacuation needs to be coordinated with other areas that may be affected by evacuation of your area.

Example One: You are located some distance inland and you decide to play it safe and call for an evacuation of your area long before it would be needed. How could this possibly affect any other area? It could cause confusion in more vulnerable areas where an evacuation has not yet been recommended.

Example Two: You are located in a vulnerable area and you recommend an evacuation long before the circumstances would indicate the need for an evacuation. What effect could this have on other areas? It could start persons evacuating in the areas through which your evacuees would travel.



## ESTIMATED EVACUATION TIMES

Advisory No. \_\_\_\_      Advisory No. \_\_\_\_      Advisory No. \_\_\_\_      Advisory No. \_\_\_\_  
 Day \_\_\_\_ Hour \_\_\_\_      Day \_\_\_\_ Hour \_\_\_\_      Day \_\_\_\_ Hour \_\_\_\_      Day \_\_\_\_ Hour \_\_\_\_

	Step One:	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>
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	Step Two:	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>
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	Step Three:	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>
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	Step Four:	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>
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	Step Five:	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;">(hours)</div> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>(Day)</span> <span>(Hour)</span> </div>
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**Note:** Compare the results of Step Five to the time the advisory was issued to obtain the estimated safe time remaining before an evacuation decision needs to be made. For more information on evacuation time estimating procedures see Section Five.

## APPENDIX E ESTEDLS

ESTEDLS is an acronym for a computerized program to Estimate Safe Time before Evacuation Decisions (Lake Sabine). The program is not designed to tell when you need to recommend an evacuation, but how much "safe" time remains before it will be too late to recommend an evacuation.

The program considers five conditions for indicating safe time to decision makers. These conditions are:

1. Storm surge at low tide
2. Storm surge at mean sea level
3. Storm surge at high tide
4. Wind gusting conditions that could tip cars (gusts of 65-70 mph)
5. Wind gusting conditions that could tip trucks (gusts of 50-55 mph)

The actual decision to recommend evacuation needs to consider the potential damage the hurricane under consideration can inflict upon the area under consideration.

This section describes the use of the ESTEDLS program, interpretation of the results, cautions to be exercised, a description of the way ESTEDLS calculates times, and information for the program operator.

## Program Use

Program use involves using the program as soon as a hurricane enters the Gulf of Mexico or is generated in the Gulf of Mexico. The program takes information provided in each hurricane advisory issued by the National Hurricane Center and figures the remaining safe time before an evacuation decision needs to be made. The data to be indicated (apart from the present date and the date and time of advisory) include the following:

1. Hurricane movement speed in miles per hour.
2. Hurricane sustained wind speed.
3. Direction of movement if the hurricane were to head directly to a point 20 miles to the left of the Sabine Pass Mouth (in degrees).
4. Number of statute miles from the eye of the hurricane to a point 20 miles to the left of the Sabine Pass Mouth.
5. Direction of movement if the hurricane were to head directly to a point 60 miles to the left of the Sabine Pass Mouth (in degrees).
6. Number of statute miles from the eye of the hurricane to a point 60 miles to the left of the Sabine Pass Mouth.
7. Direction of movement if the hurricane were to head directly to a point 20 miles to the right of the Sabine Pass Mouth.
8. Number of statute miles from the eye of the hurricane to a point 20 miles to the right of the Sabine Pass Mouth.

Because hurricanes can increase or decrease their forward movement speed, the forward movement speed given in the advisory can be increased and/or decreased to see the potential changes that could result if the hurricane forward movement speed were to

increase or decrease. The same procedure can be used to indicate the results of an increased wind speed.

### Results

Results of these inputs will give an array of data for all evacuation and contingency zones as indicated in Hurricane Relocation Planning for Hardin, Jasper, Jefferson, Newton and Orange Counties for a point of landfall 20 miles left of the Sabine Pass Channel. After this, an array of data will be given by zones for a point of landfall 60 miles left of the Sabine Pass Channel. Finally, an array of data will be given by zones for a point of landfall 20 miles right of the Sabine Pass Channel. Maximum time frames for each zone can easily be seen by checking all printouts. If the time remaining before a decision needs to be made is a negative time (that is, has already passed), it will be indicated by the letters "TL"--meaning Too Late. "NC" indicates Not Calculated. An asterisk next to a date indicates a date transition from one month to another. Contingency zones will remain blank unless the hurricane wind speeds are above 110 mph.

### CAUTIONS

Cautions regarding use of the program include the following:

1. The program does not consider wave action in evacuation route cut-off time. Since waves need water depth to generate, this can be a minimal problem.

2. There is no way to include rainfall in these calculations. It is possible for a hurricane to stall and dump unprecedented amounts of rainfall at any location. The slower a hurricane moves, the more rainfall it can produce. Maximum rainfall can be estimated roughly by dividing 100 by the forward movement speed to indicate inches of rainfall.
3. Wind condition estimates are based on the incidental wind speeds used to generate storm surge. The goal of SLOSH (Sea, Lake and Overland Surges from Hurricanes) was to predict surge. Windfields had to be generated to do this. Although surge conditions have been checked with historic hurricanes, there has been no valid way to double check estimated wind speed arrival times with historic hurricanes.
4. No attention has been given to the advantage of evacuating during daylight hours.
5. Anticipated time of landfall printout numbers should be disregarded for hurricanes moving parallel to the coast.

#### Program Internal Calculations

Program internal calculations should be understood if the user is to have confidence in the program. The following steps are involved in these calculations:

1. The distance the eye of the hurricane is from the point of landfall is divided by the forward movement speed to arrive at the anticipated time of landfall.
2. The evacuation route cut-off times before the anticipated time of landfall are calculated for differing storm surge (low tide, MSL and high tide) conditions and wind (car tipping and truck tipping gusting) conditions. Because vehicles need to be evacuated before evacuation routes are blocked, this amount is subtracted from the anticipated time of landfall. The result is the time remaining for evacuation. Note that in these calculations, if any evacuation route is to be blocked after the time of landfall, that amount is not added since it would be unwise to plan an evacuation that could not be completed before the time of landfall. Also, wind conditions were considered as not only blocking key evacuation routes, but also vehicular movement within a zone if there were no major evacuation routes controlling a zone.

3. The evacuation time for each zone under varying conditions (for hurricanes with wind speeds up to 110 mph and for hurricanes with winds over 110 mph) is subtracted from the time remaining for evacuation. This gives the time remaining to complete evacuation before the evacuation routes are blocked. Three hours are added to this time because there is a time delay between when the decision to evacuate is reached and when the public has a chance to receive the information and begin evacuating.

The data point locations along with the zones they govern are listed below (for details of cut-off times, see Hurricane Relocation Planning for Hardin, Jasper, Jefferson, Newton and Orange Counties).

	<u>Surge</u>	<u>Wind</u>
<u>Hardin</u>		
HA		16
<u>Jasper</u>		
JA		16
<u>Jefferson</u>		
JA	10	10
JB	11,15	11,15
JC	11,15,35,16	30
J1	4,32,30	4,32
J2	6,12,7	6,12,7
J3	27	27
<u>Newton</u>		
NA		24
<u>Orange</u>		
OA	16,18	18
OB	24	24
O1	26	26
O2	23,24	23
O3	24	24

## Program Operator

The program hardware consists of a CRT terminal, floppy disk drives and the CPU (Central Processing Unit). A line printer can be used as needed if hard copies are desired; otherwise, screen output is available. The program software can be used on the operating system called CP/M, which stands for Control Program for Microprocessors (CP/M is the registered trademark of Digital Research). Also, the screen control characters for the specific system are needed so the screen input and output are in the correct place on the screen.

The ESTEDLS Program is stored in an eight-inch single-sided, single density, standard CPM format diskette. This diskette must be stored in a cool, dry, dust-free location. It should never be bent, and the plastic surface should not be touched. It is also important that the diskette be stored in a static-free and magnetic-free location to prevent partial or total erasure of the program.

Since the program is subject to revision and updating depending on population growth and additional evacuation route availability, caution should be exercised to ensure you have the most recent version of the program.

Before this diskette can be used, CP/M must first be loaded into the computer. This is usually done by placing the CP/M diskette into the disk drive labeled "A"; the reset button is depressed either before or after this. This sequence may vary from one system to another; refer to the user's guide for this

information. After this has been done, a prompt (usually "A>") will appear on the CRT, signalling that the computer is ready with CP/M loaded. This prompt indicates that the disk drive "A" is the primary drive. Now the program diskette should be placed into the disk drive labeled "B." The diskette label should be up for horizontal drives or to the left for vertical drives. Next, type "B:" and depress the return, enter, or new line key. Now another prompt (usually "B>") will appear on the CRT screen, signalling that the second drive is ready and is now the primary drive.

To run the program, simply type "ESTEDLS" on the CRT keyboard and depress the return, enter, or new line key. You then enter the values as requested. The program will automatically print the output on the line printer (if one is available). To end the program, type an "!" at any input time. This will present a menu on the CRT. A choice on the menu includes ending the program. Without this step, the program will continue to run again and again.

Additional information regarding the availability of the program can be obtained by contacting the Texas Agricultural Extension Service of the Texas A&M University System. Inquiries should be addressed to:

Computer Services Unit--TAEX  
USDA Building, Room 133  
Texas A&M University  
College Station, Texas 77843  
Phone: (409) 845-3929

A sample printout of this program follows.



A LOCATION 20 MILES LEFT OF SABINE PASS MOUTH  
EVACUATION TIMES FOR ZONES

DATE OF RUN: 6/1/84  
TIME OF RUN: 12:00  
BULLETIN DATE: 6/1/84  
BULLETIN TIME: 12:00

HURRICANE MOVEMENT SPEED IN MPH: 10  
HURRICANE WINDSPEED IN MPH: 135  
DIRECTION OF MOVEMENT TOWARD  
A POINT 20 MILES LEFT OF SABINE PASS MOUTH IN DEGREES: 360  
NUMBER OF MILES FROM LANDFALL  
FOR A LOCATION 20 MILES LEFT OF SABINE PASS MOUTH: 450

ZN	ANTICIPATED			MEAN SEA			AUTOMOBILE		TRUCK		EARLIEST LISTED
	TIME OF LANDFALL	LOW TIDE	DAY HR:MN	LEVEL	DAY HR:MN	HIGH TIDE	DAY HR:MN	WIND SPEED	DAY HR:MN	WIND SPEED	DAY HR:MN
HA	J3	9:00	N C	N C	N C	N C	J2	0:30	J1	22:00	J1 22:00
SA	J3	9:00	N C	N C	N C	N C	J2	0:30	J1	22:00	J1 22:00
J1	J3	9:00	J1 21:00	J1 21:00	J1 19:30	J1 19:30	J1	19:00	J1	14:30	J1 14:30
J2	J3	9:00	J2 5:00	J2 5:00	J2 5:00	J2 5:00	J1	22:30	J1	20:00	J1 20:00
J3	J3	9:00	J2 4:30	J2 4:00	J2 4:00	J2 4:00	J1	21:00	J1	17:00	J1 17:00
JA	J3	9:00	.	.	J2 6:00	J2 6:00	J1	23:30	J1	21:00	J1 21:00
JB	J3	9:00	J2 6:00	J2 6:00	J2 5:00	J2 5:00	J1	24:00	J1	21:30	J1 21:30
JC	J3	9:00	J2 6:00	J2 6:00	J2 5:00	J2 5:00	J1	20:00	J1	15:30	J1 15:30
NA	J3	9:00	N C	N C	N C	N C	J2	0:30	J1	22:00	J1 22:00
O1	J3	9:00	J2 5:00	J2 5:00	J2 4:30	J2 4:30	J1	22:00	J1	21:30	J1 21:30
O2	J3	9:00	J2 6:00	J2 6:00	J2 6:00	J2 6:00	J2	0:30	J1	22:00	J1 22:00
O3	J3	9:00	J2 6:00	J2 6:00	J2 6:00	J2 6:00	J2	0:30	J1	22:00	J1 22:00
OA	J3	9:00	J2 6:00	J2 6:00	J2 6:00	J2 6:00	J2	1:00	J1	22:30	J1 22:30
OB	J3	9:00	J2 6:00	J2 6:00	J2 6:00	J2 6:00	J2	0:30	J1	22:00	J1 22:00

IF IT IS TOO LATE TO EVACUATE A ZONE, THEN A 'T L' IS PLACED IN THAT LOCATION.  
IF A VALUE IS NOT CALCULATED, THEN AN 'N C' IS PLACED IN THAT LOCATION.  
IF A VALUE IS CALCULATED BUT NOT SIGNIFICANT, THEN A '.' IS PLACED IN THAT LOCATION.

VALUES FOR CONTINGENCY ZONES ARE NOT CONSIDERED SIGNIFICANT UNTIL WIND SPEEDS EXCEED 110 mph.

THE "S" UNDER ZONES STANDS FOR JASPER COUNTY.

A LOCATION 60 MILES LEFT OF SABINE PASS MOUTH  
EVACUATION TIMES FOR ZONES

DATE OF RUN: 6/1/84  
TIME OF RUN: 12:00  
BULLETIN DATE: 6/1/84  
BULLETIN TIME: 12:00

HURRICANE MOVEMENT SPEED IN MPH: 10  
HURRICANE WINDSPEED IN MPH: 135  
DIRECTION OF MOVEMENT TOWARD  
A POINT 60 MILES LEFT OF SABINE PASS MOUTH IN DEGREES: 355  
NUMBER OF MILES FROM LANDFALL  
FOR A LOCATION 60 MILES LEFT OF SABINE PASS MOUTH: 440

IN	ANTICIPATED TIME OF LANDFALL DAY HR:MN	LOW TIDE DAY HR:MN	MEAN SEA LEVEL			HIGH TIDE DAY HR:MN	AUTOMOBILE WIND SPEED		TRUCK WIND SPEED		EARLIEST LISTED EVACUATION TIME
			DAY HR:MN	DAY HR:MN	DAY HR:MN		DAY HR:MN	DAY HR:MN	DAY HR:MN	DAY HR:MN	
HA	J3 8:00	N C	N C	N C	N C	J1 24:00	J1 20:30	J1 20:30	J1 20:30	J1 20:30	
SA	J3 8:00	N C	N C	N C	N C	J1 24:00	J1 20:30	J1 20:30	J1 20:30	J1 20:30	
J1	J3 8:00	J1 20:00	J1 19:00	J1 18:30	J1 17:30	J1 17:30	J1 13:00	J1 13:00	J1 13:00	J1 13:00	
J2	J3 8:00	J2 3:30	J2 3:00	J2 3:00	J1 21:30	J1 21:30	J1 18:30	J1 18:30	J1 18:30	J1 18:30	
J3	J3 8:00	J2 4:00	J2 3:00	J2 2:30	J1 19:30	J1 19:30	J1 15:00	J1 15:00	J1 15:00	J1 15:00	
JA	J3 8:00	J2 5:00	J2 5:00	J2 5:00	J1 22:30	J1 22:30	J1 20:00	J1 20:00	J1 20:00	J1 20:00	
JB	J3 8:00	J2 5:00	J2 5:00	J2 5:00	J1 23:00	J1 23:00	J1 20:00	J1 20:00	J1 20:00	J1 20:00	
JC	J3 8:00	J2 5:00	J2 5:00	J2 5:00	J1 18:30	J1 18:30	J1 14:00	J1 14:00	J1 14:00	J1 14:00	
NA	J3 8:00	N C	N C	N C	J2 0:30	J1 20:30	J1 20:30	J1 20:30	J1 20:30	J1 20:30	
O1	J3 8:00	J2 5:00	J2 4:00	J2 3:30	J1 23:30	J1 20:00	J1 20:00	J1 20:00	J1 20:00	J1 20:00	
O2	J3 8:00	.	J2 5:00	J2 5:00	J2 0:30	J1 20:30	J1 20:30	J1 20:30	J1 20:30	J1 20:30	
O3	J3 8:00	.	J2 5:00	J2 5:00	J2 0:30	J1 20:30	J1 20:30	J1 20:30	J1 20:30	J1 20:30	
OA	J3 8:00	.	.	J2 5:00	J2 1:00	J1 21:00	J1 21:00	J1 21:00	J1 21:00	J1 21:00	
OB	J3 8:00	.	J2 5:00	J2 5:00	J2 0:30	J1 20:30	J1 20:30	J1 20:30	J1 20:30	J1 20:30	

IF IT IS TOO LATE TO EVACUATE A ZONE, THEN A 'T L' IS PLACED IN THAT LOCATION.  
IF A VALUE IS NOT CALCULATED, THEN AN 'N C' IS PLACED IN THAT LOCATION.  
IF A VALUE IS CALCULATED BUT NOT SIGNIFICANT, THEN A '.' IS PLACED IN THAT LOCATION.

VALUES FOR CONTINGENCY ZONES ARE NOT CONSIDERED SIGNIFICANT UNTIL WIND SPEEDS EXCEED 110 mph.

THE 'S' UNDER ZONES STANDS FOR JASPER COUNTY.

A LOCATION 20 MILES RIGHT OF SABINE PASS MOUTH  
EVACUATION TIMES FOR ZONES

DATE OF RUN: 6/1/84  
TIME OF RUN: 12:00  
BULLETIN DATE: 6/1/84  
BULLETIN TIME: 12:00

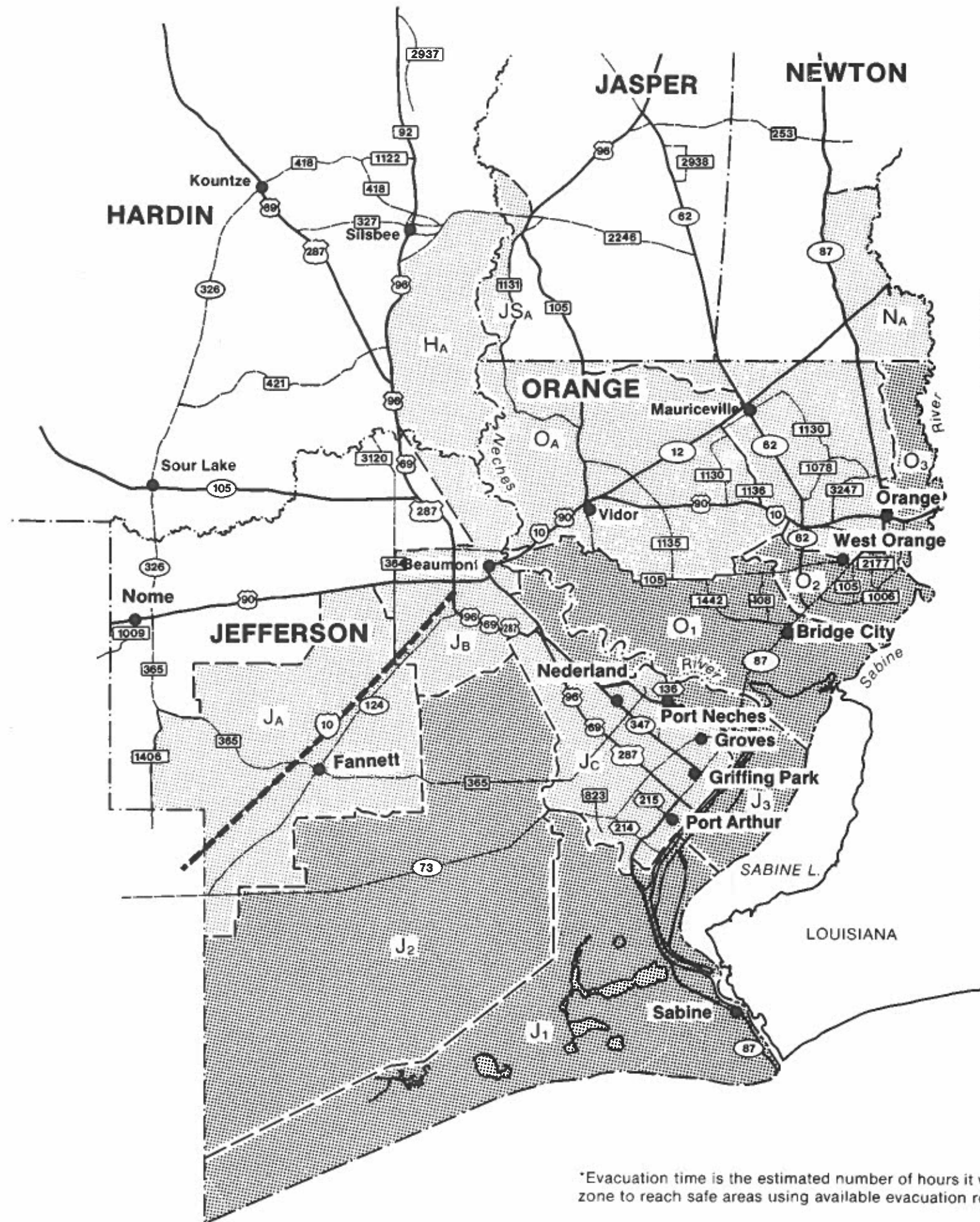
HURRICANE MOVEMENT SPEED IN MPH: 10  
HURRICANE WINDSPEED IN MPH: 135  
DIRECTION OF MOVEMENT TOWARD  
A POINT 20 MILES RIGHT OF SABINE PASS MOUTH IN DEGREES: 5  
NUMBER OF MILES FROM LANDFALL  
FOR A LOCATION 20 MILES RIGHT OF SABINE PASS MOUTH: 455

ZN	ANTICIPATED TIME OF LANDFALL		LOW TIDE		MEAN SEA LEVEL		HIGH TIDE		AUTOMOBILE WIND SPEED		TRUCK WIND SPEED		EARLIEST LISTED EVACUATION TIME	
	DAY	HR:MN	DAY	HR:MN	DAY	HR:MN	DAY	HR:MN	DAY	HR:MN	DAY	HR:MN	DAY	HR:MN
HA	J3	9:30	N C		N C		N C		J2	0:30	J1	22:00	J1	22:00
SA	J3	9:30	N C		N C		N C		J2	0:30	J1	22:00	J1	22:00
J1	J3	9:30	J1	23:00	J1	23:00	J1	22:00	J1	19:00	J1	14:30	J1	14:30
J2	J3	9:30	.	.	.	.	.	.	J1	23:00	J1	20:30	J1	20:30
J3	J3	9:30	.	.	.	.	.	.	J1	21:00	J1	16:30	J1	16:30
JA	J3	9:30	.	.	.	.	.	.	J2	0:30	J1	21:30	J1	21:30
JB	J3	9:30	.	.	.	.	.	.	J2	0:30	J1	21:30	J1	21:30
JC	J3	9:30	.	.	.	.	.	.	J1	20:00	J1	15:30	J1	15:30
NA	J3	9:30	N C		N C		N C		J1	24:00	J1	21:30	J1	21:30
O1	J3	9:30	.	.	.	.	.	.	J1	24:00	J1	21:00	J1	21:00
O2	J3	9:30	.	.	.	.	.	.	J1	24:00	J1	21:30	J1	21:30
O3	J3	9:30	.	.	.	.	.	.	J1	24:00	J1	21:30	J1	21:30
OA	J3	9:30	.	.	.	.	.	.	J2	1:00	J1	22:30	J1	22:30
OB	J3	9:30	.	.	.	.	.	.	J1	24:00	J1	21:30	J1	21:30

IF IT IS TOO LATE TO EVACUATE A ZONE, THEN A 'T L' IS PLACED IN THAT LOCATION.  
IF A VALUE IS NOT CALCULATED, THEN AN 'N C' IS PLACED IN THAT LOCATION.  
IF A VALUE IS CALCULATED BUT NOT SIGNIFICANT, THEN A '.' IS PLACED IN THAT LOCATION.

VALUES FOR CONTINGENCY ZONES ARE NOT CONSIDERED SIGNIFICANT UNTIL WIND SPEEDS EXCEED 110 mph.

THE 'S' UNDER ZONES STANDS FOR JASPER COUNTY.



Evacuation Zones: Areas that can be flooded by storm surge from hurricanes with sustained winds up to 110 mph.  
 Contingency Zones: Areas that can be flooded by storm surge from hurricanes with sustained winds over 110 mph.

- Evacuation Zone (subscript numbers)
- Contingency Zone (subscript letters)
- Evacuation Routes
- Alternate Route
- Roads not designated as evacuation routes



Estimated Evacuation Time in Hours by County and Zone\*

		Partial Evacuation*	Total Evacuation**
Hardin	HA	--	24.0
	JSa	--	24.0
Jefferson	JA	--	24.0
	JB	--	24.0
	Jc	--	24.0
	J1	4.5	24.0
	J2	4.5	24.0
	J3	4.5	24.0
Newton	NA	--	24.0
	OA	--	24.0
Orange	OB	--	24.0
	O1	4.5	24.0
	O2	4.5	24.0
	O3	4.5	24.0

\*Evacuation of only those in evacuation zones indicating they would evacuate if so advised.

\*\*Total evacuation of all evacuation and contingency zones.



\*Evacuation time is the estimated number of hours it would take for all evacuating vehicles in a zone to reach safe areas using available evacuation routes.

