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Louisiana Barrier Island Comprehensive Monitoring Program (BICM) Volume 1: Barrier Shoreline Post-Storm Assessment Part 3: 2005-2007 Photo Pairs

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LOUISIANA BARRIER ISLAND COMPREHENSIVE MONITORING PROGRAM (BICM)

Volume 1: Barrier Shoreline Post-Storm Assessment

Part 3: 2005-2007 Photo-Pairs

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August 2008



**US Army Corps
of Engineers®**

Louisiana Barrier Island Comprehensive Monitoring Program (BICM)

Volume 1: Barrier Shoreline Post Storm Assessment

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Introduction

The Louisiana Department of Natural Resources Office of Coastal Restoration and Management (LDNR) has implemented a Barrier Island Comprehensive Monitoring (BICM) Data Collection Program with science support from the Pontchartrain Institute for Environmental Sciences (PIES) at the University of New Orleans (UNO). UNO collected and analyzed data to facilitate the LDNR/Coastal Restoration Division (CRD) activities of barrier shoreline planning, design, maintenance, monitoring, and storm impact assessment. The baseline data collection effort and data delivery necessary to establish and develop the LDNR BICM program will provide invaluable information for future efforts involving restoration along Louisiana's sandy shorelines. The effects of the 2005 Hurricane season in Louisiana and subsequent development of integrated hurricane protection and coastal restoration planning programs make this an appropriate time to collect the baseline data necessary for understanding the past and planning for the future.

The Barrier Shoreline Post Storm Assessment consists of 5 Parts:

Part 1: 2005 Post Hurricanes Katrina and Rita Photography

Part 2: 2006/2007 Aerial Survey Photography

Part 3: 2005 – 2006/2007 Photo-Pairs

Part 4: Historic Photo-Pairs/Time Series

Part 5: 2006/2007 Aerial Video Survey

The Aerial Video Survey slide archive includes imagery from 1984 to 2007. Most images were taken from a helicopter during simultaneous video imagery capture as part of the Aerial Video Survey of Coastal Louisiana. Over many years of filming the coast, a standardized methodology produces imagery that can usually be closely compared. Images from any two flights can be paired to produce photo-pairs for illustration of landscape changes for the selected time-periods. Imagery selected from more than two surveys are considered a "Time-series" and are presented in Part 4.

For this report, the last two coastal surveys, Aerial Photo Survey of the 2005 Post-hurricanes Katrina and Rita Impact Zone and the 2006-2007 Aerial Video Survey of Coastal Louisiana, have been paired to provide recent coastal landscape changes as part of the BICM Barrier Shoreline Post Storm Assessment effort.

Funding for the acquisition of 2005 post-hurricanes Katrina and Rita photography was provided by the U.S. Geological Survey Coastal & Marine Geology Program in St. Petersburg, FL. Funding for the acquisition of 2006/2007 photography was provided by LCA Science & Technology Program, a partnership between the LDNR and the US Army Corps of Engineers (USACE), through LDNR Interagency Agreement No. 2512-06-06.

Part 3 includes:

1. Report
 - a. Location diagrams for all photo-pairs divided by region with the OSRADP satellite imagery as a background.
 - b. Water level data for both times of photo-acquisition.
 - c. Tables of location information for each photo-pair by date and segment
2. A CD including:
 - a. Report file in Word 2007 and pdf.
 - b. Excel file of the metadata tables
 - c. Jpeg of each Photo-pair grouped by region and listed by the 2006-2007 image number
 - d. Powerpoint slideshow for each photo-pair
 - e. Pdf slideshow for each photo-pair

Project Location

The LDNR BICM Program encompasses the mainland shoreline of the south Louisiana coast with special emphasis on the sandy beaches and barrier islands. Louisiana's mainland shoreline stretches 450 miles east from Sabine Pass on the Texas/Louisiana Border to the Pearl River on the Mississippi/Louisiana. Between Texas and Mississippi, Louisiana encompasses four distinct geologic regions: 1) Chenier Plain, 2) Acadiana Bays, 3) Mississippi River Delta Plain, and 4) the Pontchartrain Basin (Figure 1).

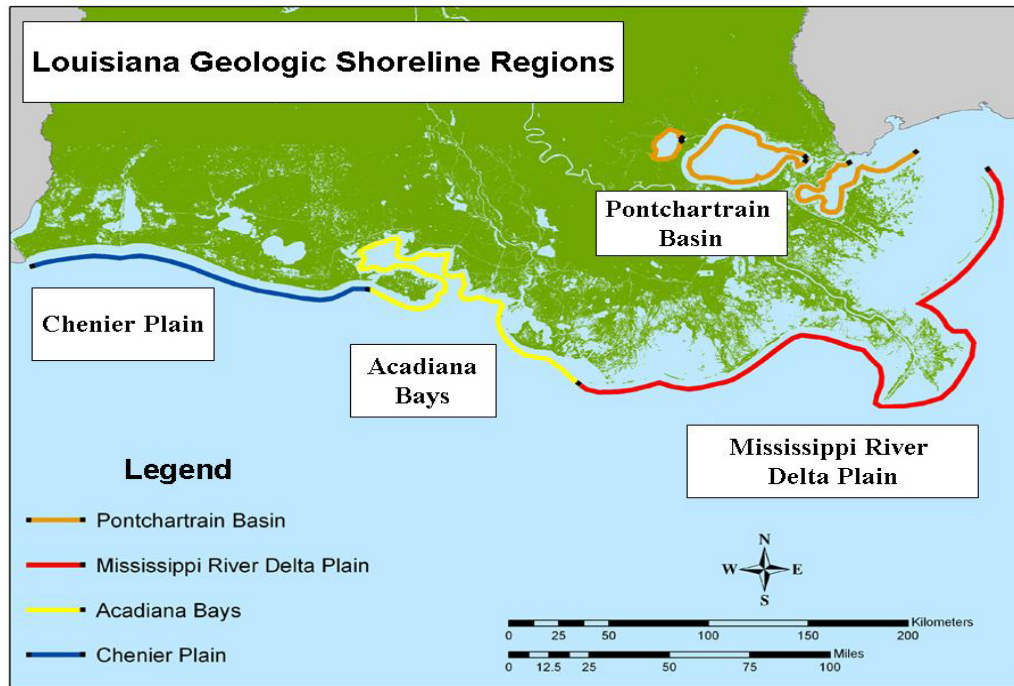


Figure 1. Louisiana's Geologic Shoreline Regions.

BICM further divided the coastline into eight regions: Western Chenier Plain, Eastern Chenier Plain, Acadiana Bays, Teche Delta, Lafourche Delta, Modern Delta, Chandeleur Islands, and the Lakes Region (Figure 2).

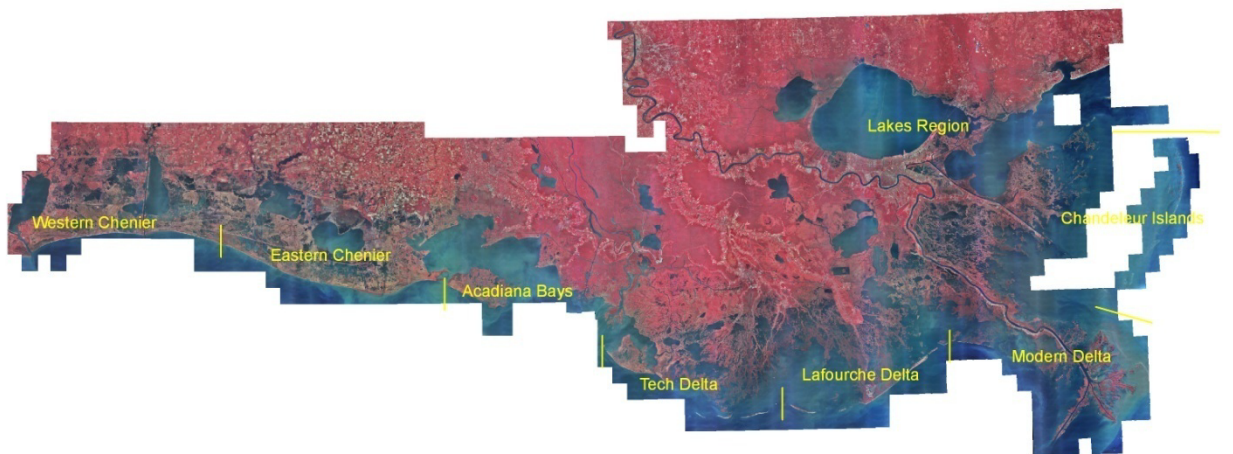


Figure 2. BICM divides coastal Louisiana into eight regions.

Methodology - Acquisition

The 2005 Post Hurricanes Katrina and Rita photography was acquired as a photo-survey and not part of a video survey. For quick response, the imagery was acquired from a small plane and was flown in the reverse direction of a standard video survey to maintain the standard

camera angle when shooting past the wing supports of the plane. An attempt was made to reproduce the same compositions as a standard video flight, but the plane could not execute the same maneuvers as a helicopter for control of each shot. The unavoidable result was that many areas, such as the island ends, could not be photographed in comparable compositions.

In the documentation, the 2005 images are listed in reverse order to be consistent with the order of historical files. The dates and areas of acquisition were:

September 28, 2005 - Point au Fer Island (9:05:33 CDT) to Sabine Pass (10:52:40 CDT), and

September 30, 2005 – Chandeleur Islands (9:42:04 CDT) to the Isle Dernieres (11:25:25 CDT).

The 2005 photos were taken by a Canon PowerShot A75 digital camera. Jpgs created by this camera have a file size just under 1 MB with dimensions averaging 2048x1536 pixels at 180 pixels/inch which corresponds roughly to 350dpi at a 4x6 inch size. Since no GPS data was collected during this flight, the locations and camera angle of each photo frame was established by visually matching the scene with the 2006/2007 Aerial Video Survey (AVS) imagery, manually creating a geo-referenced marker for each frame based on the 2006/2007 flight line data in MediaMapper, and transferring the location data for each frame to an excel file. The camera was aimed roughly perpendicular to the shoreline, so the camera angle was interpreted as 90 degrees counter-clockwise from the 2006/2007 trackline. In some cases, the camera angle had to be estimated based on angle of features in the image. Some of the images could not be accurately located by this method were estimated between the frames on either side, or by the “best-guess” method. The OSRADP 2001 satellite composite of Louisiana was used as a background for the figures.

The 2006/2007 oblique photography was taken from a helicopter during simultaneous video imagery capture as part of the 2006/2007 Aerial Video Survey of Coastal Louisiana. Along the Gulf shoreline, the helicopter traveled from west to east from Sabine Pass to the Mississippi River Delta, and then south to north along the Chandeleur Islands. The bays were recorded by keeping the undulating shoreline on the left side of the helicopter. The altitude was usually 200-300 ft other than at the end of islands, where the altitude was increased to 700 feet or more for a longshore view. Photos were taken by a Canon PowerShot S3 IS digital camera. Jpgs created by the camera have a file size at 1MB with dimensions averaging 2272x1704 pixels at 180 pixels/inch which corresponds roughly to 380dpi at 4x6 inch size.

The dates and areas of acquisition that corresponded to 2005 coverage were:

November 20, 2006 –

Western Chenier Plain – Sabine Pass (11:49:49 CST) to Mud Lake Outlet (12:45:32 CST)

Eastern Chenier Plain – Mud Lake Outlet (14:49:37 CST) to Southwest Pass (16:11:11 CST)

April 20, 2007 –

Teche Delta -Raccoon Island of the Isles Dernieres (9:18:05 CDT) to Wine Island (10:02:46 CST)
 Lafourche Delta – Timbalier Island (10:06:40 CDT) to East Grand Terre Island (12:03:31 CDT)
 Modern Delta – Cheniere Ronquille (12:06:59 CDT) to Sandy Point (12:43:19 CDT)
April 21, 2007 –
 Chandeleur Islands (10:15:53 – 11:18:23 CDT)

Methodology - Processing

Images from each survey had to be manually searched for possible matches and were entered into an excel spreadsheet with pertinent location data. “Good” matches were highlighted in red for further processing. The spreadsheet is included at the end of this section.

Each photo-pair was processed in Adobe PhotoShop. The images were overlaid on a grid to match scales and crop as necessary to match compositions. At times it was necessary to digitally “stretch” an image to enhance the visual relationship because of the perspective produced by a difference in altitude or camera angle. The photos were then arranged together on one figure. Occasionally a red triangle was used to help identify the same feature or location on each image to enhance the visual comparison. The date of each image was added, and a text line was added at the bottom to provide location information – at a minimum: latitude, longitude and camera angle. Once images are matched, scaled, adjusted and cropped, the images were individually “flattened” and saved as individual jpegs. These individual jpegs were then assembled into a Powerpoint slideshow for each BICM region, to make it easier to scroll through and view. The finished PowerPoint is then saved as a pdf file for web-serving.

Locations are generally based on the GPS from the 2006/2007 Aerial Video Survey. Locations of each photo-pair were then located through the Media Mapper software and indicated on the location diagram by a red triangle.

Water level

Table 1 lists the mean range, spring range, and mean tide level for various stations along the Louisiana coastline. The table is modified from the NOAA website:

<http://tidesandcurrents.noaa.gov/tides07/tab2ec4.html#108>

Table 1. Mean range, spring range and mean tide levels in feet for tide gages along the Louisiana coast. Many of the listed stations are no longer active.

Station	Latitude	Longitude	Mean Range (ft)	Spring Range (ft)	Mean Tide Level (ft)
Chandeleur Light	30° 03'	88° 52'	- -	1.2	0.6
Comfort Island	29° 49.4'	89° 16.2'	1.45	1.57	0.80
Bay Gardene	29° 35.9'	89° 37.1'	1.34	1.44	0.75
Breton Islands	29° 29.6'	89° 10.4'	1.37	1.37	0.69

Jack Bay	29° 22.0' 89° 20.7'	--	1.2	0.6
Grand Bay	29° 23.1' 89° 22.8'	1.25	1.34	0.67
Lonesome Bayou (Thomasin)	29° 14' 89° 03'	--	1.1	0.5
Mississippi River				
North Pass, Pass a Loutre	29° 12.3' 89° 02.2'	1.08	1.10	0.55
Southeast Pass	29° 07.0' 89° 02.7'	--	1.2	0.6
SOUTH PASS	28° 59.4' 89° 08.4'	1.18	1.22	0.61
Port Eads, South Pass	29° 00.9' 89° 09.6'	--	1.1	0.5
Southwest Pass	28° 55.9' 89° 25.7'	--	1.3	0.6
Joseph Bayou	29° 03.5' 89° 16.3'	--	1.4	0.7
Paris Road Bridge	30° 00' 89° 56'	--	1.1	0.6
Empire Jetty	29° 15.0' 89° 36.5'	--	1.3	0.7
Bastian Island	29° 17.2' 89° 39.8'	--	1.2	0.6
Quatre Bayous Pass	29° 18.6' 89° 51.2'	--	1.3	0.6
Barataria Pass	29° 16' 89° 57'	--	1.2	0.6
Barataria Bay				
EAST POINT, GRAND ISLE	29° 15.8' 89° 57.4'	1.04	1.06	0.53
Bayou Rigaud, Grand Isle	29° 16' 89° 58'	--	1.0	0.5
Independence Island	29° 18.6' 89° 56.3'	--	0.9	0.4
Manilla	29° 25.6' 89° 58.6'	--	1.0	0.5
Caminada Pass (bridge)	29° 12.6' 90° 02.4'	0.99	0.99	0.50
Timbalier Island, Timbalier Bay	29° 05' 90° 32'	--	1.2	0.6
Pelican Islands, Timbalier Bay	29° 07.7' 90° 25.4'	--	1.2	0.6
Wine Island, Terrebonne Bay	29° 04.7' 90° 37.1'	--	1.3	0.6
Cocodrie, Terrebonne Bay	29° 14.7' 90° 39.7'	1.01	1.05	0.53
Caillou Boca	29° 03.8' 90° 48.4'	--	1.4	0.7
Raccoon Point, Caillou Bay	29° 03.5' 90° 57.7'	--	1.7	0.8
Ship Shoal Light	28° 55' 91° 04'	--	1.6	0.8
Atchafalaya Bay				
Eugene Island	29° 22' 91° 23'	--	1.9	1.0
Point Au Fer	29° 20' 91° 21'	--	2.0	1.0
Shell Island	29° 28' 91° 18'	--	1.5	0.7
South Point, Marsh Island	29° 29' 91° 46'	--	1.8	0.9
Lighthouse Point	29° 31' 92° 03'	--	2.0	1.0
Southwest Pass, Vermilion Bay	29° 35' 92° 02'	--	1.6	0.8
Weeks Bay, Vermilion Bay	29° 48' 91° 50'	--	1.5	0.7
Mermentau River entrance	29° 45' 93° 06'	--	2.5	1.2
Calcasieu Pass, Lighthouse wharf	29° 47' 93° 21'	--	2.0	1.0

Few of the stations in the previous list provided data along the coast for the time periods needed, and those that could be used are highlighted in bold red. The stations used were:

Sabine Pass North #8778094;
Calcasieu Pass, East Jetty #8768094;
Grand Isle, East Point #8761724;
Pilots Station East, Southwest Pass #8760922;
Gulfport Harbor #8745557; and

Figures 3-7 are graphs of the predicted (blue line) and observed (red line) tide levels during photo acquisition (NOAA at <http://tidesandcurrents.noaa.gov/>.) The graphs for both time periods are paired by region. The data obtained showed that the water-levels during the September 2005 flight post-hurricane Katrina/Rita remained roughly a half a foot higher

than normal. The November 2006 flight of western Louisiana and the Acadiana Bays were roughly a foot below normal, while the April 2007 water levels for southeastern, eastern and the Lakes Region were very close to normal or slightly (a few inches) above that predicted.

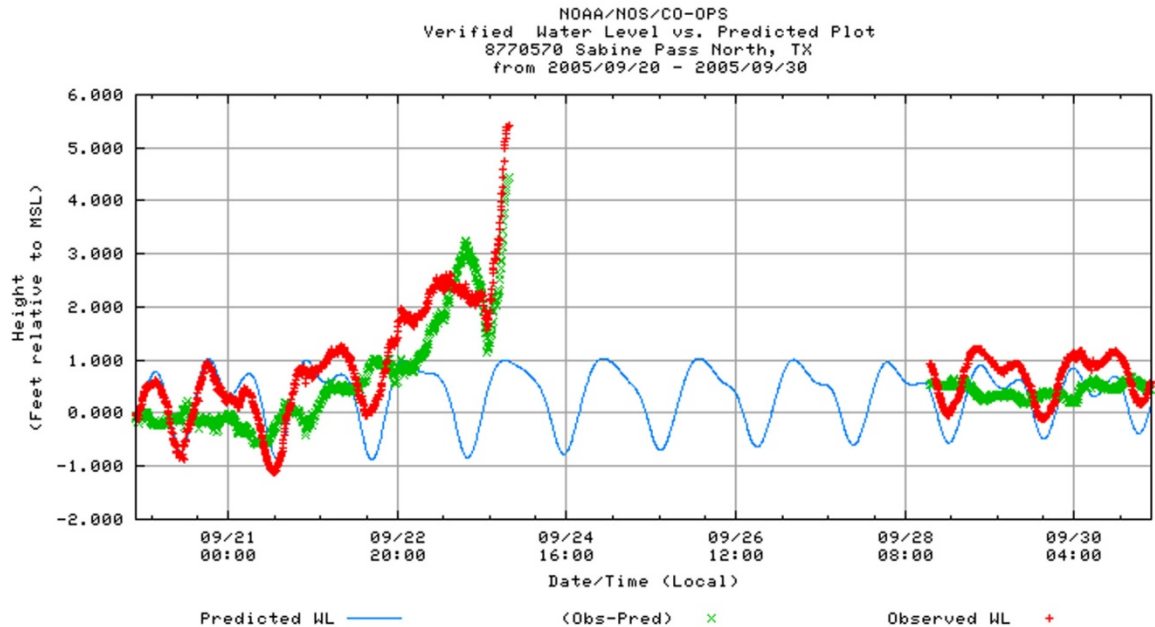


Figure 3A. Graph of the tide levels at Sabine Pass North for September 20-30, 2005, bracketing the landfall of Hurricane Rita on 9/24 and photo acquisition on 9/28 showing the predicted and observed data for the vicinity of BICM regions Western and Eastern Chenier Plain.

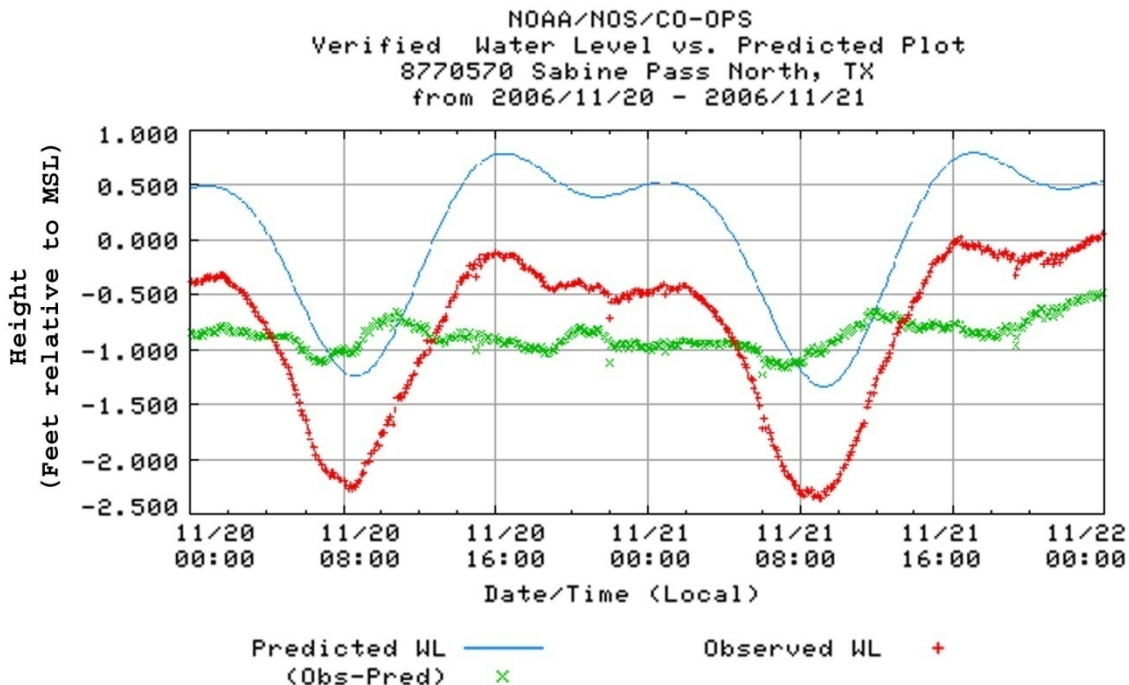


Figure 3B. Graph of the tide levels at Sabine Pass North for November 20-21, 2006 during photo acquisition on 11/20 for western Louisiana. This shows that the water levels were roughly a foot lower than predicted for the vicinity of BICM regions Western and Eastern Chenier Plain.

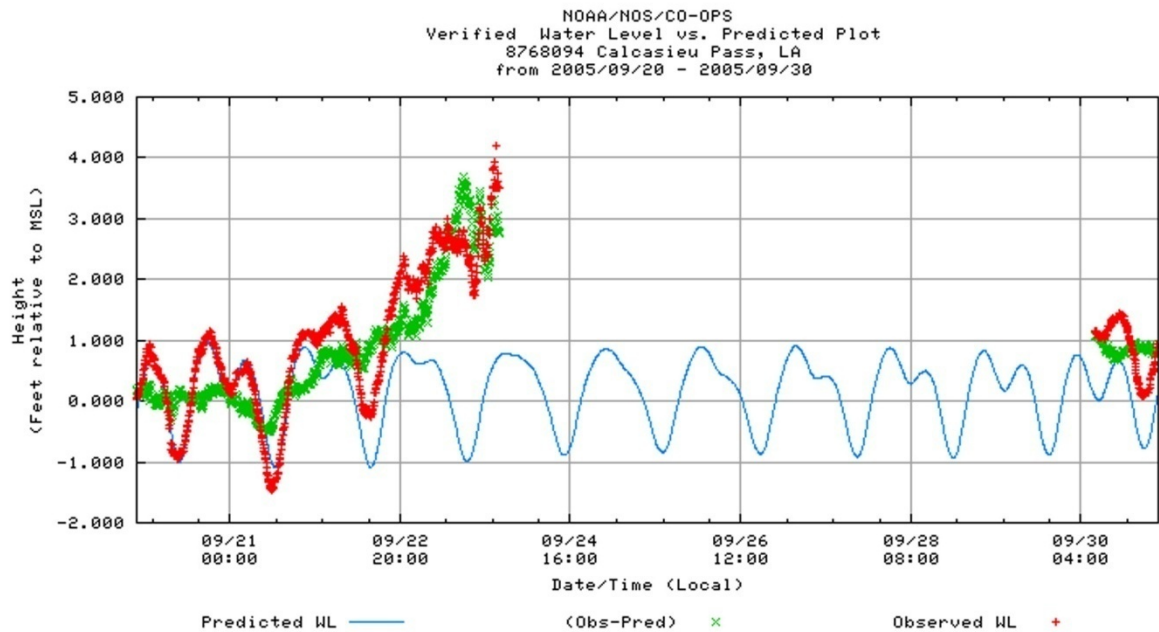


Figure 4A. Graph of the tide levels at Calcasieu Pass East Jetty for September 20-30, 2005, bracketing the landfall of Hurricane Rita on 9/24 and photo acquisition on 9/28 showing the predicted and observed data for the vicinity of BICM regions Western and Eastern Chenier Plain.

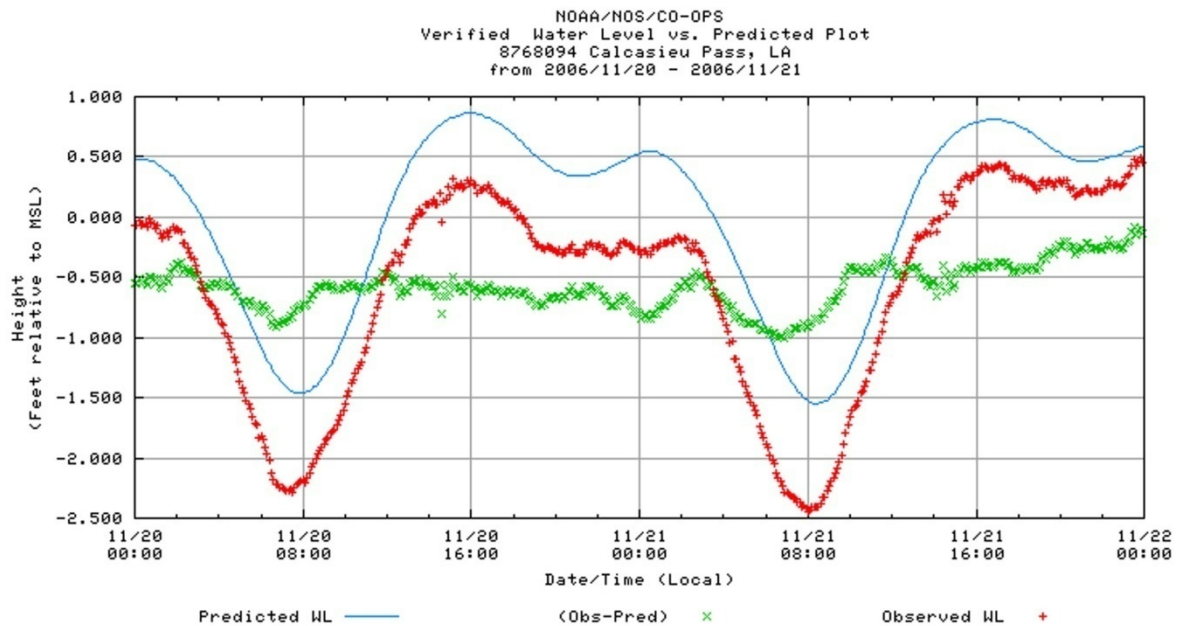


Figure 4B. Graph of the tide levels at Calcasieu Pass East Jetty for November 20-21, 2006 during photo acquisition on 11/20 for western Louisiana. This shows that the water levels were roughly a half a foot lower than predicted for the vicinity of BICM regions Western and Eastern Chenier Plain.

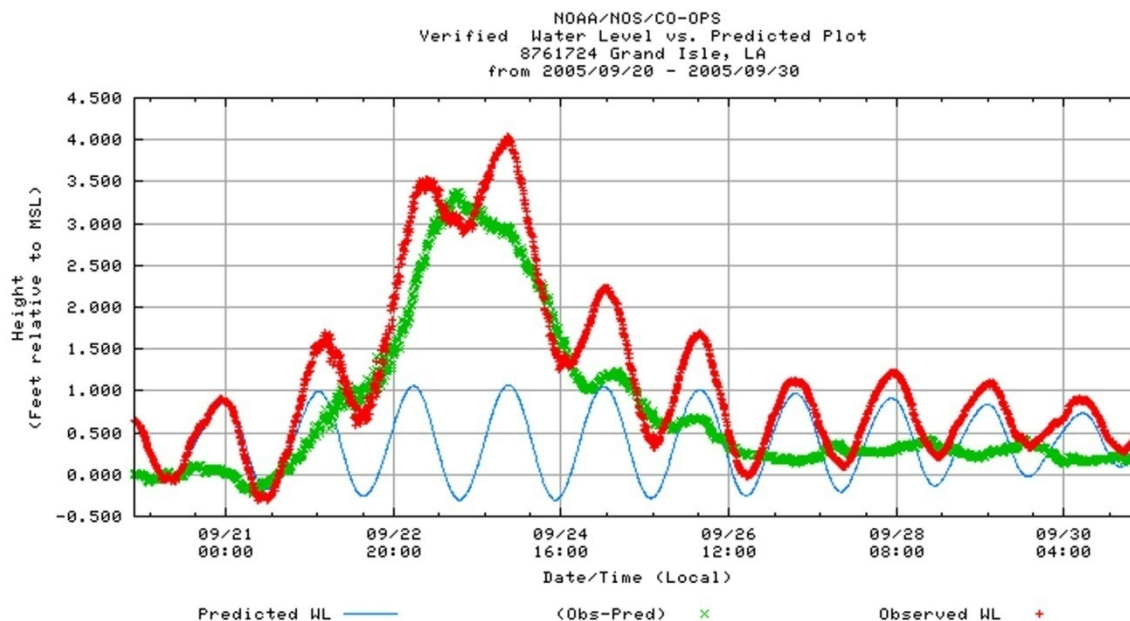


Figure 5A. Graph of the tide levels at Grand Isle, East Point for September 20-30, 2005, bracketing the landfall of Hurricane Rita on 9/24 and photo acquisition on 9/28 showing the predicted and observed data for the vicinity of BICM regions Teche Delta and Lafourche Delta.

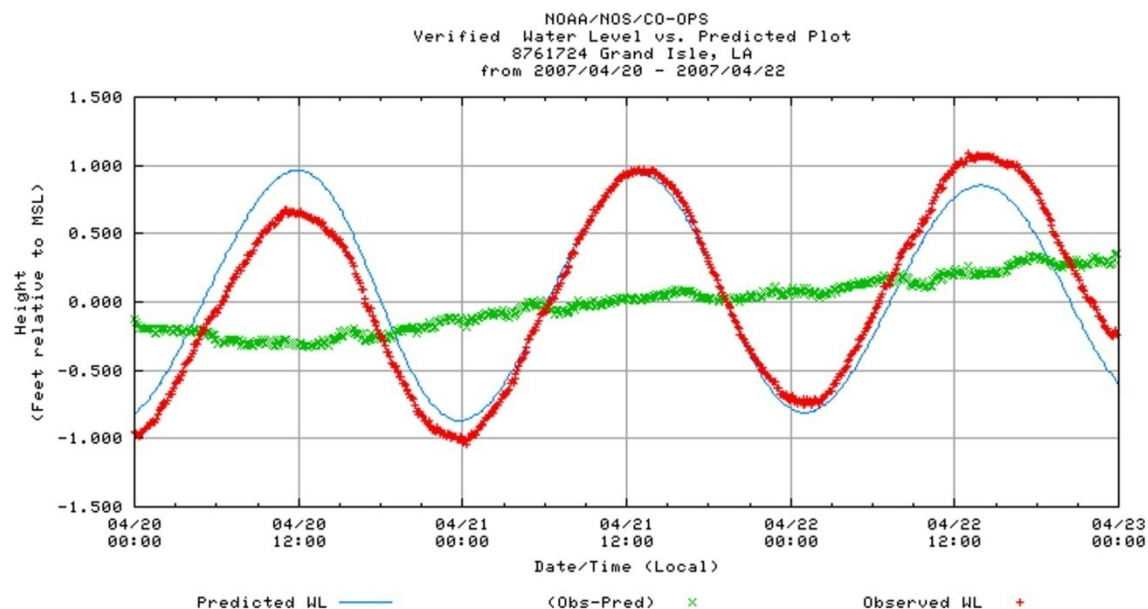


Figure 5B. Graph of the tide levels at Grand Isle East Point, LA for April 20-22, 2007 during photo acquisition on 4/20 for south eastern Louisiana. This shows that the observed water levels were normal and close to those predicted for the vicinity of BICM regions Teche Delta and Lafourche Delta.

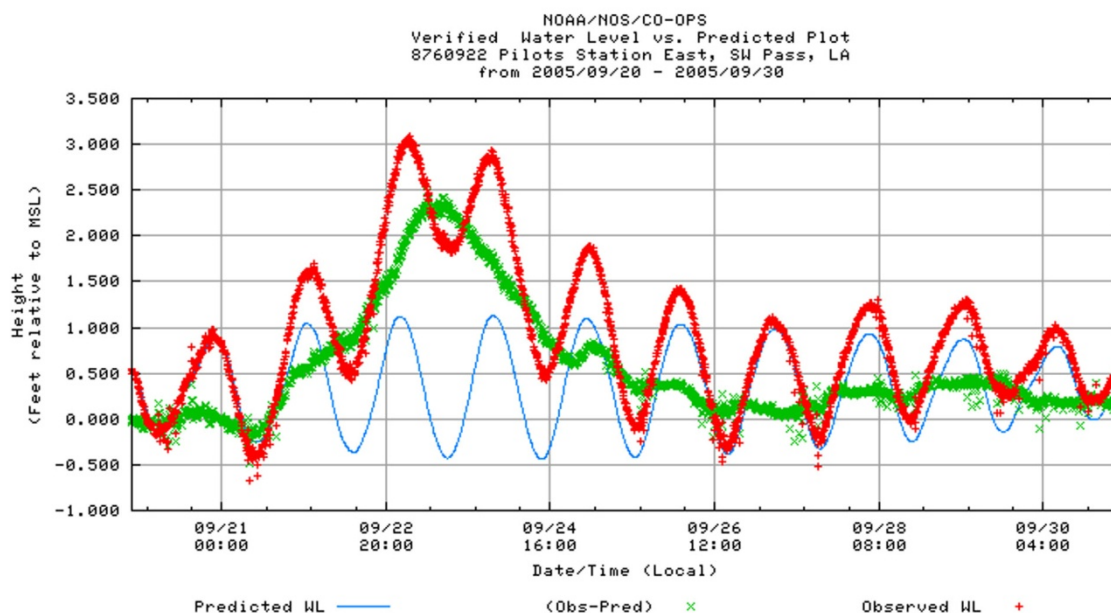


Figure 6A. Graph of the tide levels at Pilots Station East, Southwest Pass for September 20-30, 2005, bracketing the landfall of Hurricane Rita on 9/24 and photo acquisition on 9/28 showing the predicted and observed data for the vicinity of BICM region Chandeleur Islands.

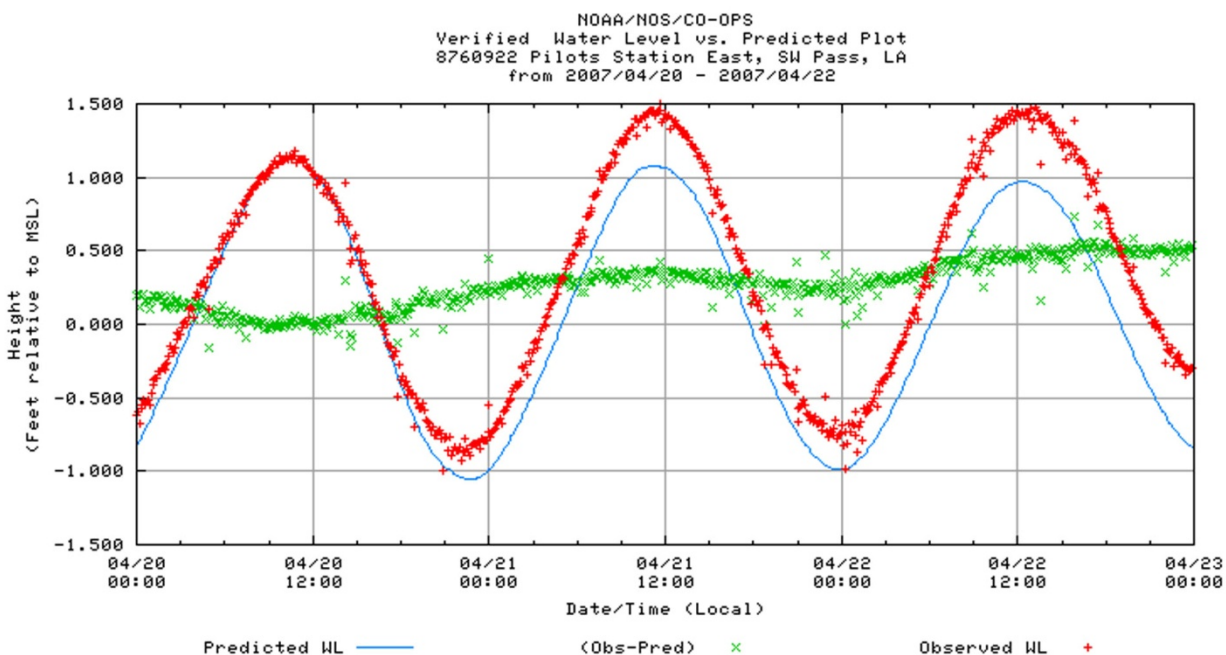


Figure 6B. Graph of the tide levels at the mouth of Southwest Pass, LA for April 20-22, 2007 during photo acquisition on 4/20-21 for south eastern Louisiana. This shows that the observed water levels were normal and close to those predicted for the vicinity of BICM region Modern Delta.

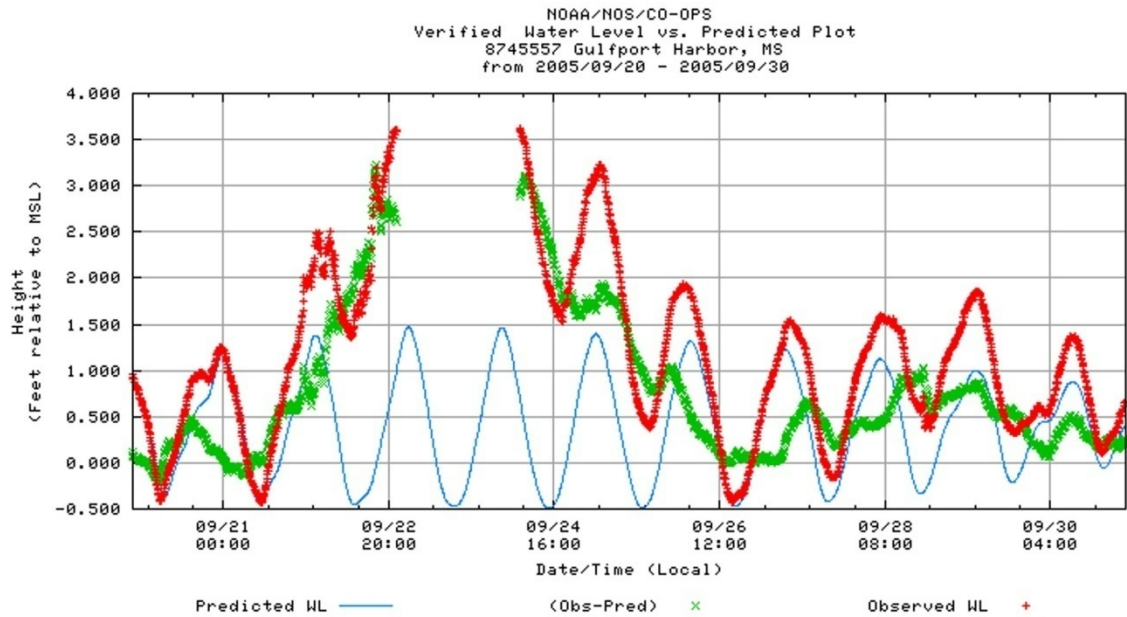


Figure 7A. Graph of the tide levels at Gulfport, MS for September 20-30, 2005, bracketing the landfall of Hurricane Rita on 9/24 and photo acquisition on 9/30 showing the predicted and observed data for the vicinity of BICM region Chandeleur Islands.

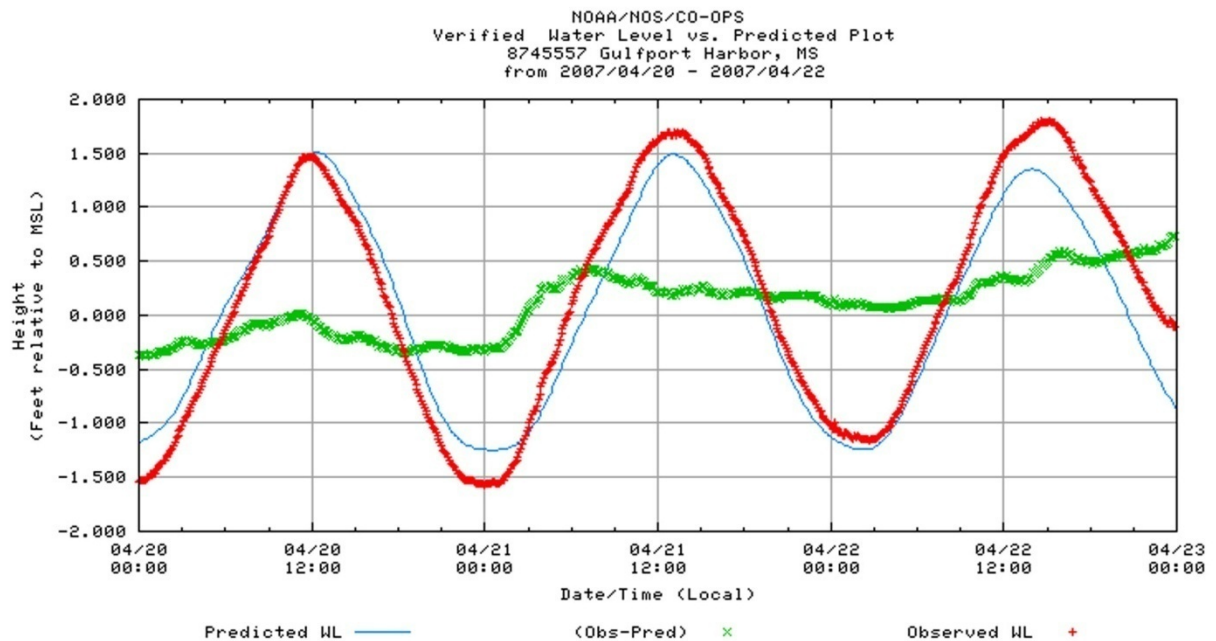


Figure 7B. Graph of the tide levels at Gulfport, MS for April 20-22, 2007 during photo acquisition on 4/21 for eastern Louisiana. This shows that the observed water levels were normal and close to those predicted for the vicinity of BICM region Chandeleur Islands.

Location Diagrams for the Photo-pairs

A total of 203 photo-pairs were constructed along the Louisiana coast. Locations of each photo-pair are indicated on the diagrams by a red triangle. The photo-pairs occurred in 6 BICM regions: Western Chenier Plain (32 pairs), Eastern Chenier Plain (25 pairs), Teche Delta (34 pairs), Lafourche Delta (75 pairs), Modern Delta (19 pairs) and Chandeleur Islands (20 pairs). Other regions are not included for the photo-pair since the 2005 coverage was limited.

All location data acquired and generated are archived by latitude/longitude, so these numbers were converted to UTM Zone 15 North, NAD 83 by an external spreadsheet (Corpscon6). The camera angle was interpreted as 90 degrees counter-clockwise from the trackline associated with the 2006-2007 data since the camera was aimed roughly perpendicular to the shoreline.

The data tables and associated excel file are organized by BICM region (Figure 2) with the images for each region on a separate table or a different worksheet in excel. Additionally, the BICM segment breaks are indicated on the tables by BICM segment number and title. To be consistent with other data, all images are listed generally from the west to east.

The satellite image provided by the Louisiana Oil Spill Research and Development Program was used as a background for the figures. The location of each photo-pair is represented by a red triangle and the file name is in yellow. Each figure also represents the coverage of the corresponding slideshow found on one of the included CDs.

Western Chenier Plain

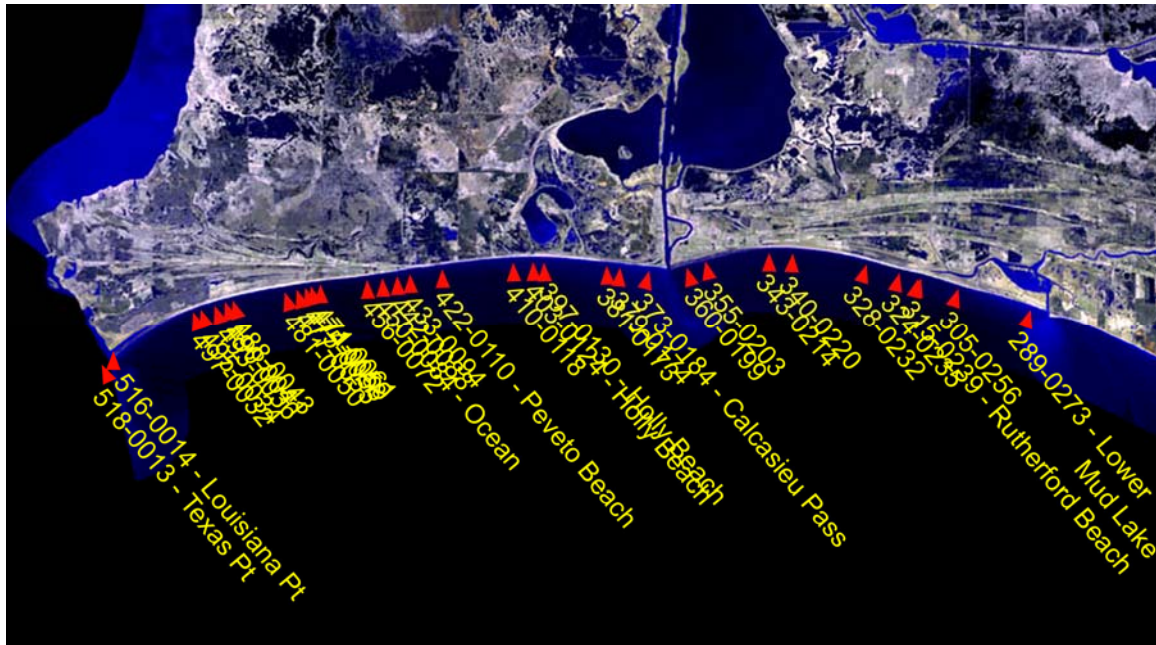


Figure 7. The locations of the 32 photo-pairs along the Western Chenier Plain from Sabine Pass to Mud Lake Outlet are indicated by red triangles.

Eastern Chenier Plain

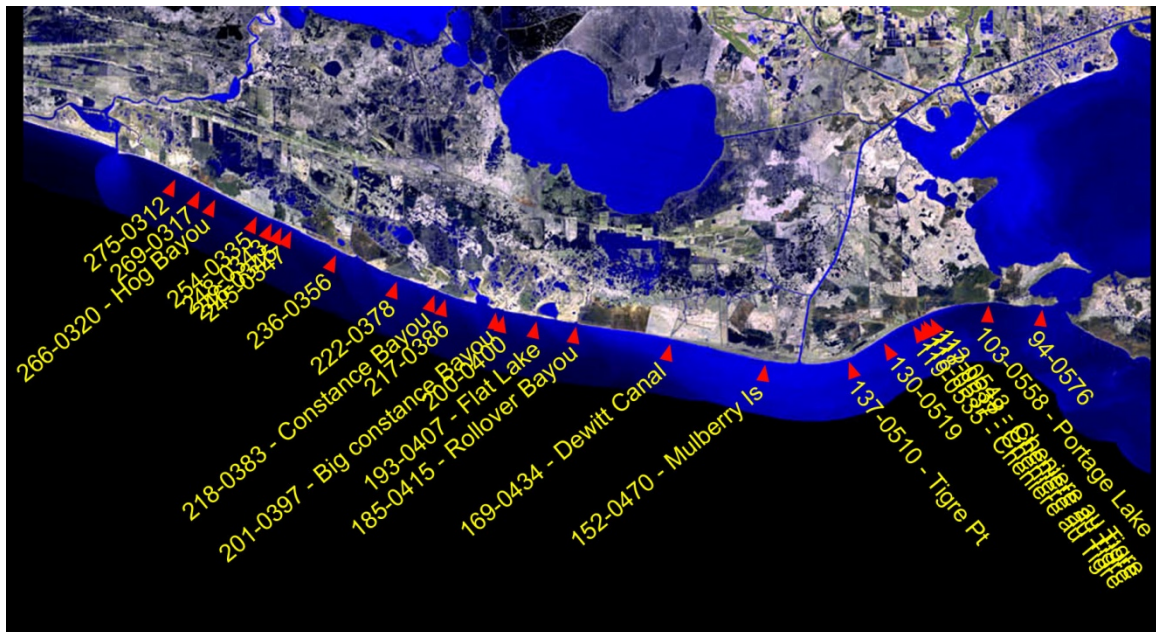


Figure 8. The locations of the 25 photo-pairs along the Eastern Chenier Plain from Mud Lake Outlet to Southwest Pass are indicated by red triangles.

Teche Delta

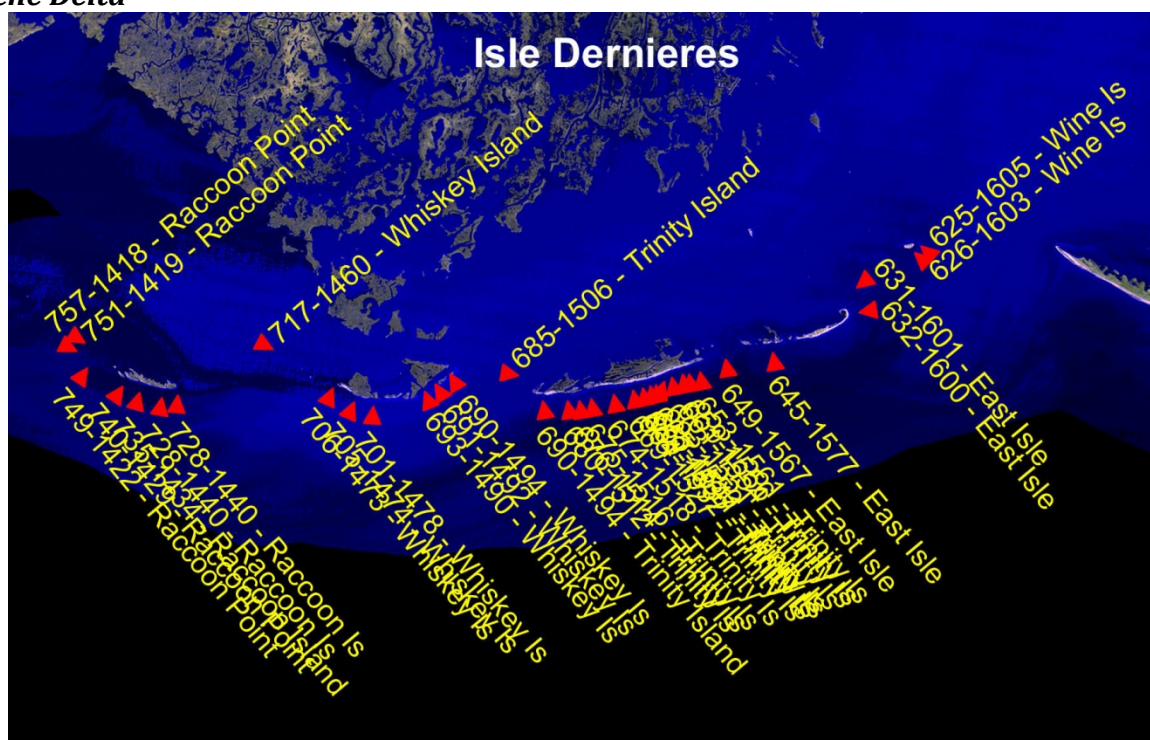


Figure 9. The locations of the 34 photo-pairs along the Teche Delta -Isles Dernieres are indicated by red triangles.

Lafourche Delta

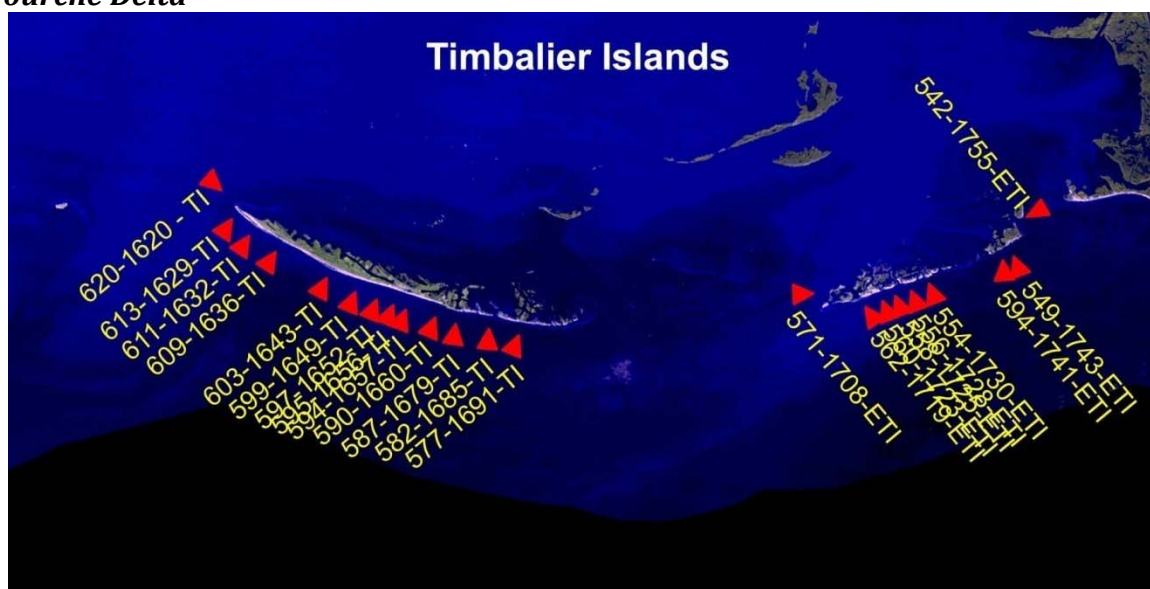


Figure 10. The locations of the 22 photo-pairs along the Lafourche Delta – Timbalier Islands are indicated by red triangles.

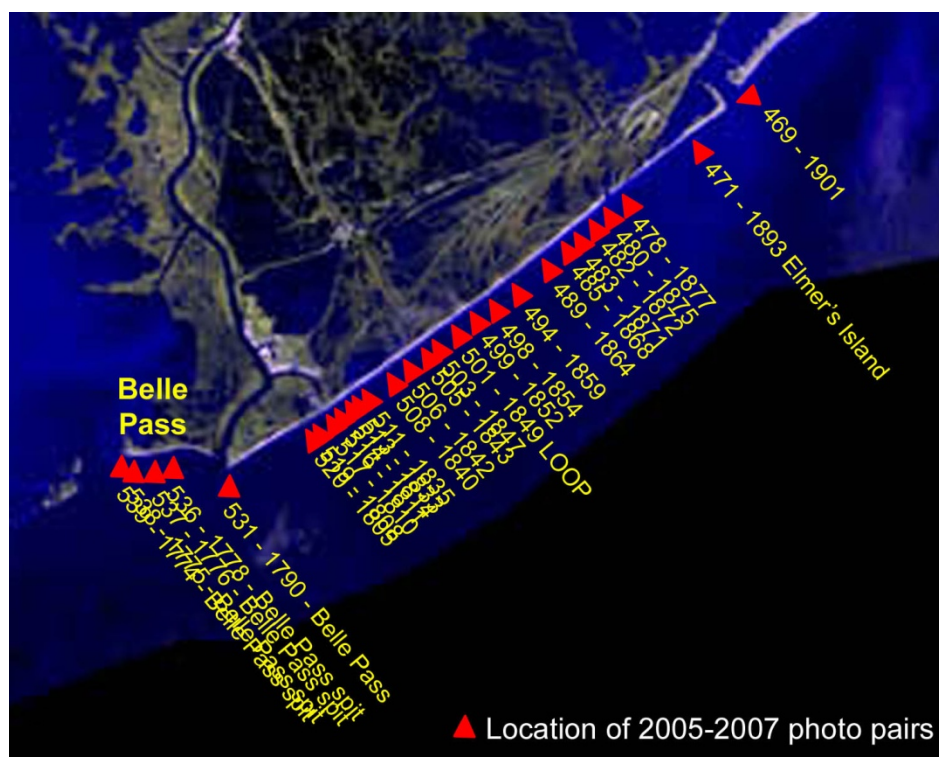


Figure 11. The location of the 28 photo-pairs compiled along the Lafourche Delta -Headland from Belle Pass Spit to Elmers Island are indicated by red triangles.



Figure 12. The location of the 25 photo-pairs compiled along the Lafourche Delta –Grand Islands from Grand Isle to East Grand Terre Island are indicated by red triangles.

Modern Delta -Plaquemine Barrier Shoreline

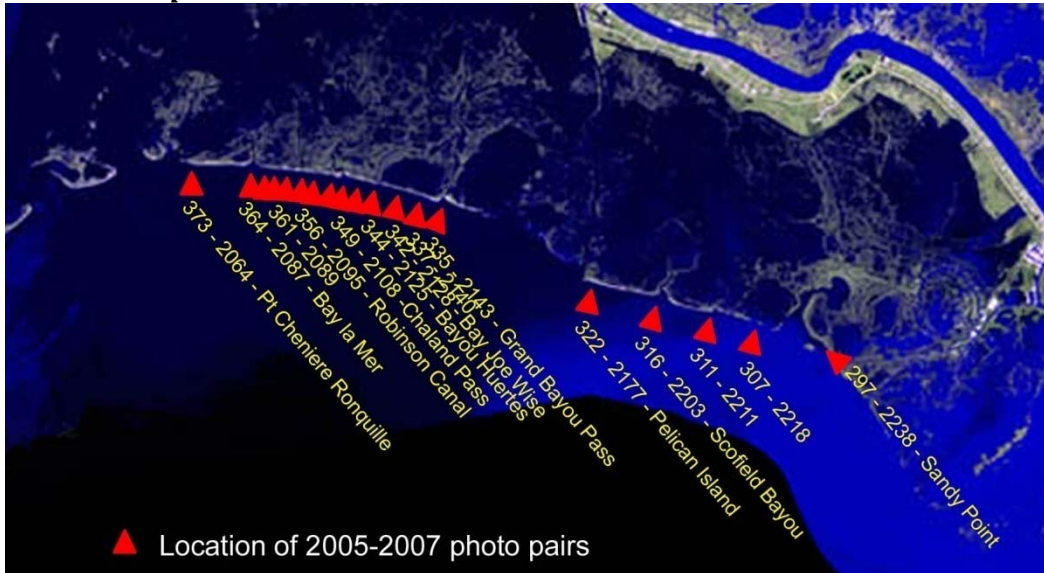


Figure 13. The locations of the 19 photo-pairs compiled for the Modern Delta - Plaquemine Barrier Shoreline from Quatre Bayou Pass to Sandy Point are indicated by red triangles.

Chandeleur Islands

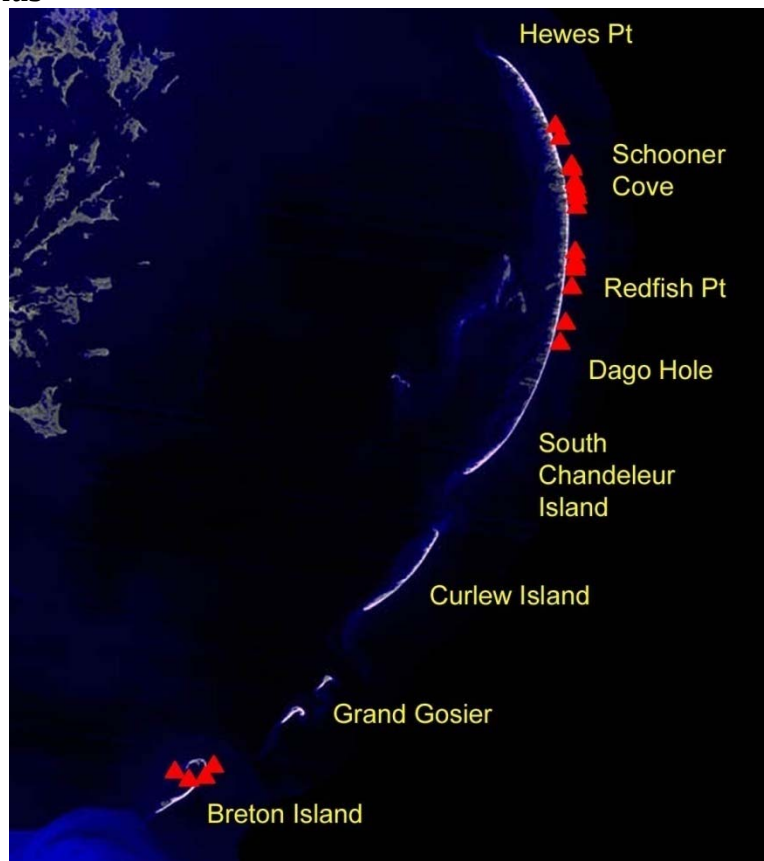


Figure 14. The locations of the 20 photo-pairs prepared along the Chandeleur Islands from Breton Island to Hewes Point are indicated by red triangles.

Metadata for 2005 – 2006/2007 Photo-pairs

The following tables list the location data for the 2005 and 2006 - 2007 matching photography. The location data for the 2005 photography was based on the flight line for 2006 by visually matching the photography to the video.

Western Chenier Plain Sabine Pass to Mud Lake Outlet	APS05R digital post- Rita	2005 CDT	AVS07 digital 2007	2006 UTC	camera angle	(location data based on 2006/07 GPS data)		UTM Northing	UTM Easting
						latitude	longitude		
Texas Point	518	9/28/2005 10:52	13	11/21/06 17:51	330°	29°40'32"	93°50'05"	3283126	419231
BICM segment 1 - Johnsons Bayou									
Louisiana Point	516	9/28/2005 10:51	14	11/21/06 17:51	355°	29°41'25"	93°49'58"	3284756	419431
South of Hackberry Ridge	497	9/28/2005 10:48	32	11/21/06 17:58	344°	29°43'53"	93°44'50"	3289255	427738
	495	9/28/2005 10:47	34	11/21/06 17:58	345°	29°43'55"	93°44'38"	3289315	428061
East of Smith Bayou	493	9/28/2005 10:47	36	11/21/06 17:59	345°	29°44'07"	93°43'48"	3289676	429406
	490	9/28/2005 10:47	41	11/21/06 17:59	352°	29°44'14"	93°43'17"	3289886	430240
	488	9/28/2005 10:46	43	11/21/06 18:00	345°	29°44'17"	93°42'56"	3289975	430805
	481	9/28/2005 10:45	50	11/21/06 18:01	354°	29°44'40"	93°40'45"	3290661	434328
BICM segment 2 - Ocean View Beach									
South of Johnson's Bayou - Parish Rd 532	477	9/28/2005 10:44	55	11/21/06 18:02	358°	29°44'47"	93°39'56"	3290869	435645
	475	9/28/2005 10:44	58	11/21/06 18:02	356°	29°44'48"	93°39'35"	3290897	436210
Johnson's Bayou	474	9/28/2005 10:44	59	11/21/06 18:03	355°	29°44'49"	93°39'25"	3290926	436478
	471	9/28/2005 10:44	61	11/21/06 18:03	0°	29°44'52"	93°38'59"	3291014	437177
Road	456	9/28/2005 10:42	72	11/21/06 18:05	1°	29°45'05"	93°36'52"	3291396	440591
Ocean, LA - Beach Blvd	450	9/28/2005 10:42	84	11/21/06 18:07	356°	29°45'09"	93°36'17"	3291514	441531
Constance Beach	442	9/28/2005 10:42	88	11/21/06 18:08	350°	29°45'13"	93°35'29"	3291630	442821
Constance Beach - JB Lane	433	9/28/2005 10:41	94	11/21/06 18:09	348°	29°45'21"	93°34'45"	3291871	444004
Peveto Beach and Hwy 82	422	9/28/2005 10:40	110	11/21/06 18:13	355°	29°45'38"	93°32'45"	3292378	447229
Highway 82	410	9/28/2005 10:37	118	11/21/06 18:16	358°	29°46'00"	93°28'44"	3293027	453704
BICM segment 3 - Holly Beach									
Holly Beach - Riviera Lane	403	9/28/2005 10:37	124	11/21/06 18:17	355°	29°46'00"	93°27'48"	3293021	455208
Holly Beach - LaFitte Road	397	9/28/2005 10:36	130	11/21/06 18:17	359°	29°46'00"	93°27'13"	3293017	456148

Oil Field Road	381	9/28/2005 10:34	173	11/21/06 18:24	10°	29°45'53"	93°23'51"	3292781	461572
	379	9/28/2005 10:34	174	11/21/06 18:24	5°	29°45'49"	93°23'15"	3292655	462538
West of Calcasieu Pass	373	9/28/2005 10:33	184	11/21/06 18:26	18°	29°45'39"	93°21'39"	3292339	465115
BICM segment 4 - Hackberry Beach									
Calcasieu Pass Gas field south of Cameron	360	9/28/2005 10:32	199	11/21/06 18:28	351°	29°45'46"	93°19'39"	3292545	468338
South of Cameron	355	9/28/2005 10:31	203	11/21/06 18:29	349°	29°46'02"	93°18'29"	3293032	470220
South of Cameron	343	9/28/2005 10:29	214	11/21/06 18:32	0°	29°46'30"	93°15'25"	3293882	475163
	340	9/28/2005 10:28	220	11/21/06 18:33	10°	29°46'27"	93°13'56"	3293784	477552
	328	9/28/2005 10:26	232	11/21/06 18:36	16°	29°46'00"	93°10'36"	3292944	482921
	324	9/28/2005 10:25	235	11/21/06 18:38	12°	29°45'40"	93°09'00"	3292324	485498
Rutherford Beach - Gulf Drive	315	9/28/2005 10:25	239	11/21/06 18:38	20°	29°45'24"	93°07'54"	3291830	487270
Rutherford Beach - West Avenue	314	9/28/2005 10:25	240	11/21/06 18:38	17°	29°45'23"	93°07'51"	3291799	487351
Hackberry Beach	305	9/28/2005 10:23	256	11/21/06 18:41	13°	29°44'47"	93°05'16"	3290687	491513
South of Mud Lake	289	9/28/2005 10:21	273	11/21/06 18:44	29°	29°43'48"	93°01'32"	3288868	497529

Eastern Chenier Plain Mud Lake Outlet to Southwest Pass	APS05R		AVS07			(location data based on 2006/07 GPS data)		UTM	UTM
	digital	2005	digital	2006	camera	latitude	longitude	North	East
Location	post-Rita	CDT	2007	UTC	angle				
BICM segment 5 - Mermentau Beach									
South of Grand Chenier	275	9/28/2005 10:18	312	11/21/06 20:53	23°	29°42'26"	92°57'14"	3286345	504460
East of Club Canal	269	9/28/2005 10:17	317	11/21/06 20:54	25°	29°41'53"	92°55'44"	3285330	506879
Beach Prong of Hog Bayou	266	9/28/2005 10:17	320	11/21/06 20:55	29°	29°41'28"	92°54'50"	3284562	508331
BICM segment 6 - Rockefeller Refuge									
Sturlese Lake	254	9/28/2005 10:15	335	11/21/06 20:57	25°	29°39'58"	92°51'18"	3281797	514032
	248	9/28/2005 10:14	343	11/21/06 20:58	26°	29°39'32"	92°50'06"	3281000	515968
shipwreck	246	9/28/2005 10:13	345	11/21/06 20:59	30°	29°39'18"	92°49'38"	3280570	516721
	245	9/28/2005 10:13	347	11/21/06 20:59	20°	29°39'10"	92°49'17"	3280325	517286
South of Miller Lake	236	9/28/2005 10:12	356	11/21/06 21:01	23°	29°38'05"	92°46'45"	3278331	521376
South of Deep Lake	222	9/28/2005 10:09	378	11/21/06 21:04	22°	29°36'41"	92°43'05"	3275759	527298
Little Constance Lake	218	9/28/2005 10:08	383	11/21/06 21:05	29°	29°36'12"	92°41'23"	3274873	530044
	217	9/28/2005 10:08	386	11/21/06 21:06	22°	29°35'58"	92°40'43"	3274445	531121
Big Constance Bayou	201	9/28/2005 10:05	397	11/21/06 21:09	3°	29°34'54"	92°36'48"	3272494	537449
	200	9/28/2005 10:05	400	11/21/06 21:09	13°	29°34'53"	92°36'27"	3272466	538014
Flat Lake	193	9/28/2005 10:04	407	11/21/06 21:11	13°	29°34'32"	92°34'34"	3271830	541056
BICM segment 7 - Mulberry Island									
Rollover Bayou	185	9/28/2005 10:03	415	11/21/06 21:12	8°	29°34'13"	92°32'22"	3271259	544610
BICM segment 8 - Freshwater Bayou									
Dewitt Canal	169	9/28/2005 9:59	434	11/21/06 21:17	20°	29°33'13"	92°26'33"	3269453	554009
South of Mulberry Island	152	9/28/2005 9:56	470	11/21/06 21:25	15°	29°31'51"	92°20'15"	3266983	564196
BICM segment 9 - Cheniere Au Tigre									
Bill Ridge at Tigre Point	137	9/28/2005 9:53	510	11/21/06 22:00	343°	29°32'02"	92°16'05"	3267362	570923
Bill Ridge at Tigre Point	130	9/28/2005 9:52	519	11/21/06 22:02	326°	29°32'48"	92°14'12"	3268797	573955
BICM segment 10 - Rainey Refuge									
Cheniere au Tigre	119	9/28/2005 9:50	535	11/21/06 22:04	341°	29°34'03"	92°11'39"	3271133	578057
Cheniere au Tigre	118	9/28/2005 9:50	537	11/21/06 22:04	338°	29°34'09"	92°11'19"	3271322	578594
Cheniere au Tigre	117	9/28/2005 9:50	538	11/21/06 22:04	338°	29°34'11"	92°11'14"	3271384	578728
East of Cheniere au Tigre	113	9/28/2005 9:47	543	11/21/06 22:05	336°	29°34'22"	92°10'43"	3271729	579560
Portage Lake	103	9/28/2005 9:47	558	11/21/06 22:08	2°	29°35'05"	92°06'50"	3273098	585819
West of Southwest Pass	94	9/28/2005 9:46	576	11/21/06 22:10	7°	29°34'55"	92°03'30"	3272833	591202

Teche Delta Isles Dernieres	APS05R digital	2005	AVS07 digital	2007		(location data based on 2006/07 GPS data)		UTM	UTM
Location	post-Rita	CDT	2007	UTC	camera angle	latitude	longitude	Northing	Easting
BICM segment 33 - Raccoon Island									
West end of Raccoon Island	757	9/30/2005 11:34	1418	4/21/11 15:18	120º	29º04'30"	90º58'03"	3218001	697844
West end of Raccoon Island	751	9/30/2005 11:34	1419	4/21/11 15:18	119º	29º04'16"	90º58'12"	3217566	697608
West end of Raccoon Island	749	9/30/2005 11:34	1422	4/21/11 15:19	37º	29º03'42"	90º58'04"	3216523	697843
Raccoon Island	740	9/30/2005 11:32	1429	4/21/11 15:20	22º	29º03'07"	90º56'12"	3215498	700891
Raccoon Island	735	9/30/2005 11:32	1434	4/21/11 15:21	22º	29º02'52"	90º55'41"	3215051	701738
Raccoon Island	728	9/30/2005 11:32	1440	4/21/07 15:21	14º	29º02'40"	90º55'12"	3214695	702529
East end of Raccoon Island	727	9/30/2005 11:32	1441	4/21/07 15:21	5º	29º02'38"	90º55'07"	3214636	702665
BICM segment 34 - Whiskey Island									
West end of Whiskey Island	717	9/30/2005 11:29	1460	4/21/07 15:28	97º	29º03'27"	90º52'50"	3216210	706344
Whiskey Island	706	9/30/2005 11:27	1473	4/21/07 15:31	27º	29º02'42"	90º50'37"	3214890	709967
Whiskey Island	705	9/30/2005 11:27	1474	4/21/07 15:31	26º	29º02'40"	90º50'33"	3214831	710077
Whiskey Island	701	9/30/2005 11:27	1478	4/21/07 15:32	7º	29º02'35"	90º50'08"	3214689	710756
Whiskey Island	693	9/30/2005 11:26	1490	4/21/07 15:33	328º	29º02'45"	90º48'43"	3215039	713050
Whiskey Island	691	9/30/2005 11:26	1492	4/21/07 15:34	320º	29º02'55"	90º48'29"	3215354	713423
East end of Whiskey Island	690	9/30/2005 11:26	1494	4/21/07 15:34	320º	29º03'02"	90º48'18"	3215575	713717
BICM segment 35 - Trinity Island									
West end of Trinity Island	685	9/30/2005 11:25	1506	4/21/07 15:40	55º	29º02'46"	90º47'00"	3215122	715836
West end of Trinity Island	680	9/30/2005 11:23	1512	4/21/07 15:41	340º	29º02'25"	90º45'49"	3214512	717769
Trinity Island	676	9/30/2005 11:23	1514	4/21/07 15:42	347º	29º02'34"	90º45'16"	3214806	718657
Trinity Island	675	9/30/2005 11:23	1516	4/21/07 15:42	338º	29º02'37"	90º45'07"	3214903	718898
Trinity Island	674	9/30/2005 11:23	1518	4/21/07 15:42	357º	29º02'39"	90º44'55"	3214971	719222
Trinity Island	669	9/30/2005 11:22	1527	4/21/07 15:43	347º	29º02'45"	90º44'05"	3215181	720571
Trinity twin houses	664	9/30/2005 11:22	1532	4/21/07 15:44	348º	29º02'46"	90º43'32"	3215229	721463
Trinity Is -Madonna	659	9/30/2005 11:22	1537	4/21/07 15:45	355º	29º02'49"	90º43'05"	3215336	722192
Trinity Island	657	9/30/2005 11:21	1541	4/21/07 15:45	343º	29º02'53"	90º42'47"	3215468	722677
Trinity Island House	665	9/30/2005 11:22	1550	4/21/07 15:45	20º	29º02'49"	90º43'15"	3215330	721921
Trinity Island Houses	663	9/30/2005 11:22	1551	4/21/07 15:49	346º	29º02'46"	90º43'28"	3215231	721572
Former Trinity Bayou area	661	9/30/2005 11:22	1554	4/21/07 15:49	351º	29º02'48"	90º43'19"	3215298	721814
	659	9/30/2005 11:22	1556	4/21/07 15:49	355º	29º02'49"	90º43'05"	3215336	722192
West end of Trinity Island	653	9/30/2005 11:21	1561	4/21/07 15:50	348º	29º03'01"	90º42'02"	3215738	723889

BICM segment 36 - East Island									
East Isle - west washover	649	9/30/2005 11:20	1567	4/21/07 15:51	0°	29°03'13"	90°41'13°"	3216134	725208
East Isle	645	9/30/2005 11:20	1577	4/21/07 15:52	342°	29°03'31"	90°40'05°"	3216724	727036
East end of East Isle	632	9/30/2005 11:18	1600	4/21/07 15:57	270°	29°04'22"	90°37'54°"	3218365	730549
East end of East Isle	631	9/30/2005 11:18	1601	4/21/07 15:57	240°	29°04'27"	90°37'57°"	3218517	730464
Wine Island	626	9/30/2005 11:15	1603	4/21/07 15:58	319°	29°05'18"	90°36'46°"	3220126	732353
Wine Island	625	9/30/2005 11:15	1605	4/21/07 15:59	321°	29°05'20"	90°36'43°"	3220190	732433

Lafourche Delta Timbalier Islands	APS05R digital	2005	AVS07 digital	2007		(location data based on 2006/07 GPS data)		UTM	UTM
Location	post-Rita	CDT	2007	UTC	camera angle	latitude	longitude	Northing	Easting
BICM segment 37 - Timbalier Island West End									
West end of Timbalier Island	620	9/30/2005 11:13	1620	4/21/07 16:07	119º	29º05'59"	90º33'30"	3221497	737628
Timbalier Island	613	9/30/2005 11:12	1629	4/21/07 16:09	12º	29º04'38"	90º32'05"	3219051	739979
Timbalier Island	611	9/30/2005 11:12	1632	4/21/07 16:09	24º	29º04'33"	90º31'51"	3218905	740360
Timbalier Island	609	9/30/2005 11:11	1636	4/21/07 16:10	28º	29º04'23"	90º31'26"	3218612	741043
Timbalier Island: Canal Cut	603	9/30/2005 11:11	1643	4/21/07 16:11	26º	29º04'03"	90º30'32"	3218026	742517
Timbalier Island	599	9/30/2005 11:10	1649	4/21/07 16:12	9º	29º03'52"	90º29'52"	3217711	743606
Timbalier Island	597	9/30/2005 11:10	1652	4/21/07 16:12	17º	29º03'48"	90º29'36"	3217597	744042
Timbalier Island	595	9/30/2005 11:10	1656	4/21/07 16:12	20º	29º03'41"	90º29'14"	3217394	744641
Timbalier Island	594	9/30/2005 11:10	1657	4/21/07 16:13	24º	29º03'38"	90º29'04"	3217307	744914
BICM segment 38 - Timbalier Island East End									
West end of seawall	590	9/30/2005 11:10	1660	4/21/07 16:13	21º	29º03'27"	90º28'49"	3216977	745327
East end of seawall	587	9/30/2005 11:09	1679	4/21/07 16:16	11º	29º03'22"	90º28'26"	3216837	745952
Timbalier Island	582	9/30/2005 11:09	1685	4/21/07 16:17	357º	29º03'18"	90º27'28"	3216747	747524
East end of Timbalier Island	577	9/30/2005 11:09	1691	4/21/07 16:18	20º	29º03'18"	90º26'46"	3216772	748661
BICM segment 39 - East Timbalier Island									
East Timbalier Island	571	9/30/2005 11:06	1708	4/21/07 16:24	83º	29º03'45"	90º20'59"	3217810	758030
West end of East Timbalier Island	562	9/30/2005 11:04	1719	4/21/07 16:26	321º	29º03'29"	90º19'54"	3217357	759800
East Timbalier Island	560	9/30/2005 11:03	1723	4/21/07 16:27	338º	29º03'39"	90º19'38"	3217675	760226
East Timbalier Island	558	9/30/2005 11:03	1725	4/21/07 16:27	339º	29º03'45"	90º19'24"	3217868	760601
East Timbalier Island	556	9/30/2005 11:03	1728	4/21/07 16:27	338º	29º03'50"	90º19'06"	3218033	761084
East Timbalier Island	554	9/30/2005 11:03	1730	4/21/07 16:28	345º	29º03'56"	90º18'48"	3218229	761567
East end of East Timbalier Island	549	9/30/2005 11:02	1741	4/21/07 16:31	0º	29º04'12"	90º17'22"	3218775	763882
ETI - E facility	548	9/30/2005 11:02	1743	4/21/07 16:31	341º	29º04'13"	90º17'18"	3218809	763990
ETI- East end long shot	542	9/30/2005 11:01	1755	4/21/07 16:36	270º	29º04'49"	90º16'39"	3219942	765019

Lafourche Delta Caminada Headland Location	APS05R digital	2005	AVS07 digital	2007	camera angle	(location data based on 2006/07 GPS data)		UTM	UTM
	post-Rita	CDT	2007	UTC		latitude	longitude	Northing	Easting
BICM segment 40 - Raccoon Spit									
West end of Belle Pass spit	539	9/30/2005 11:01	1774	4/21/07 16:40	11°	29°05'26"	90°14'51"	3221149	767914
Belle Pass spit	538	9/30/2005 11:01	1775	4/21/07 16:40	12°	29°05'25"	90°14'44"	3221122	768104
Belle Pass spit	537	9/30/2005 11:01	1776	4/21/07 16:40	8°	29°05'23"	90°14'35"	3221067	768349
Belle Pass spit	536	9/30/2005 11:00	1778	4/21/07 16:40	4°	29°05'23"	90°14'24"	3221074	768647
BICM segment 41 - Fourchon Beach									
Belle Pass	531	9/30/2005 11:00	1790	4/21/07 16:42	5°	29°04'58"	90°13'30"	3220338	770125
Fourchon Beach	520	9/30/2005 10:59	1805	4/21/07 16:44	329°	29°05'48"	90°11'43"	3221946	772983
Fourchon Beach	519	9/30/2005 10:59	1808	4/21/07 16:44	339°	29°05'52"	90°11'30"	3222078	773332
Old Pass Fourchon	517	9/30/2005 10:59	1810	4/21/07 16:45	334°	29°05'59"	90°11'15"	3222303	773732
Fourchon Road	516	9/30/2005 10:58	1811	4/21/07 16:45	331°	29°06'03"	90°11'06"	3222432	773973
Fourchon Beach	514	9/30/2005 10:58	1814	4/21/07 16:45	325°	29°06'11"	90°10'52"	3222688	774346
BICM segment 42 - Caminada Headland									
West Bay Champagne	513	9/30/2005 10:58	1833	4/21/07 17:29	321°	29°06'17"	90°10'43"	3222878	774585
Bay Champagne	511	9/30/2005 10:58	1835	4/21/07 17:30	317°	29°06'33"	90°10'27"	3223381	775005
East Bay Champagne	508	9/30/2005 10:58	1840	4/21/07 17:30	333°	29°06'55"	90°09'49"	3224083	776017
Caminada Headland	506	9/30/2005 10:57	1842	4/21/07 17:31	328°	29°07'05"	90°09'30"	3224404	776523
Caminada Headland	505	9/30/2005 10:57	1843	4/21/07 17:31	320°	29°07'12"	90°09'19"	3224627	776815
Bayou Moreau	503	9/30/2005 10:57	1847	4/21/07 17:31	322°	29°07'29"	90°08'54"	3225167	777479
LOOP	501	9/30/2005 10:57	1849	4/21/07 17:32	325°	29°07'40"	90°08'36"	3225517	777957
Caminada Headland	499	9/30/2005 10:57	1852	4/21/07 17:32	325°	29°07'48"	90°08'22"	3225773	778330
Caminada Headland	498	9/30/2005 10:57	1854	4/21/07 17:32	324°	29°07'53"	90°08'15"	3225931	778515
Caminada Headland	494	9/30/2005 10:56	1859	4/21/07 17:33	322°	29°08'19"	90°07'32"	3226760	779658
Caminada Headland	489	9/30/2005 10:55	1864	4/21/07 17:34	328°	29°08'51"	90°06'41"	3227780	781013
Bayou Moreau	485	9/30/2005 10:55	1868	4/21/07 17:35	312°	29°09'17"	90°06'06"	3228604	781940
Bayou Thunder von Tranc	483	9/30/2005 10:55	1871	4/21/07 17:35	322°	29°09'27"	90°05'54"	3228920	782256
Caminada Headland	482	9/30/2005 10:55	1872	4/21/07 17:35	325°	29°09'33"	90°05'45"	3229110	782495
Caminada Headland	480	9/30/2005 10:55	1875	4/21/07 17:36	323°	29°09'45"	90°05'27"	3229492	782973
Caminada Headland	478	9/30/2005 10:54	1877	4/21/07 17:36	330°	29°09'56"	90°05'10"	3229842	783424
Elmer's Island	471	9/30/2005 10:53	1893	4/21/07 17:38	329°	29°11'04"	90°03'13"	3232015	786534
Elmer's Island	469	9/30/2005 10:53	1901	4/21/07 17:39	263°	29°11'33"	90°02'38"	3232932	787457

Lafourche Delta Grand Islands	APS05R digital	2005	AVS07 digital	2007		(location data based on 2006/07 GPS data)		UTM	UTM
Location	post-Rita	CDT	2007	UTC	camera angle	latitude	longitude	Northing	Easting
BICM segment 43 - Grand Isle									
West end of Grand Isle - west jetty West end of Grand Isle - bridge 									

Modern Delta Plaquemines Shoreline	APS05R digital	2005	AVS07 digital	2007		(location data based on 2006/07 GPS data)		UTM	UTM
Location	post-Rita	CDT	2007	UTC	camera angle	latitude	longitude	Northing	Easting
BICM segment 46 - Chaland Headland									
Pt Cheniere Ronquille	373	9/30/2005 10:44	2064	4/21/07 18:10	41º	29º18'52"	89º49'16"	3247021	808765
Bay la Mer	364	9/30/2005 10:43	2087	4/21/07 18:14	11º	29º18'38"	89º47'09"	3246683	812205
East Bay la Mer	362	9/30/2005 10:43	2088	4/21/07 18:14	21º	29º18'33"	89º46'52"	3246542	812668
Robinson Canal	361	9/30/2005 10:43	2089	4/21/07 18:14	5º	29º18'31"	89º46'38"	3246491	813048
	359	9/30/2005 10:43	2091	4/21/07 18:15	1º	29º18'27"	89º46'16"	3246384	813645
	356	9/30/2005 10:43	2095	4/21/07 18:15	17º	29º18'28"	89º45'44"	3246438	814508
	353	9/30/2005 10:42	2101	4/21/07 18:16	10º	29º18'23"	89º45'09"	3246311	815458
Bay Chaland	351	9/30/2005 10:42	2104	4/21/07 18:16	15º	29º18'17"	89º44'43"	3246145	816165
Chaland Pass	349	9/30/2005 10:42	2108	4/21/07 18:17	3º	29º18'18"	89º44'18"	3246195	816839
East Bay Chaland	347	9/30/2005 10:42	2120	4/21/07 18:19	21º	29º18'13"	89º43'52"	3246060	817545
Bayou Huertes - west of Bay Joe Wise	344	9/30/2005 10:41	2125	4/21/07 18:20	2º	29º18'04"	89º43'17"	3245810	818498
Western Bay Joe Wise	342	9/30/2005 10:41	2128	4/21/07 18:20	18º	29º18'01"	89º42'58"	3245732	819013
Eastern Bay Joe Wise	337	9/30/2005 10:40	2140	4/21/07 18:22	15º	29º17'39"	89º41'21"	3245128	821652
BICM segment 47 - Shell Island									
Grand Bayou Pass and Shell Island	335	9/30/2005 10:40	2143	4/21/07 18:22	21º	29º17'33"	89º41'03"	3244957	822143
BICM segment 48 - Scofield									
Pelican Island east of Empire jetties	322	9/30/2005 10:37	2177	4/21/07 18:30	27º	29º15'06"	89º36'18"	3240649	829970
West of Scofield Bayou	316	9/30/2005 10:36	2203	4/21/07 18:34	12º	29º14'35"	89º33'55"	3239807	833861
Eastern Plaquemine Shoreline	311	9/30/2005 10:35	2211	4/21/07 18:36	15º	29º14'10"	89º32'33"	3239102	836100
Sandy Point	297	9/30/2005 10:33	2238	4/21/07 18:41	300º	29º12'58"	89º28'50"	3237063	842192

Chandeleur Islands	APS05R digital	2005	AVS07 digital	2007	(location data based on 2006/07 GPS data)				
Location	post-Rita	CDT	2007	UTC	camera angle	latitude	longitude	Northing	Easting
BICM segment 57 - Breton Island									
North Breton Island	268	9/30/2005 10:14	2765	4/22/07 16:20	256º	29º29'39"	89º10'00"	3268865	871721
N BI	262	9/30/2005 10:13	2776	4/22/07 16:22	89º	29º29'38"	89º11'03"	3268778	870023
N BI	260	9/30/2005 10:12	2779	4/22/07 16:22	21º	29º29'27"	89º10'59"	3268443	870142
N BI	257	9/30/2005 10:12	2784	4/22/07 16:23	213º	29º29'30"	89º10'10"	3268579	871460
BICM segment 59 - Chandeleur Island									
South Chandeleur Island	231	9/30/2005 9:54	2860	4/22/07 17:01	301º	29º49'31"	88º50'14"	3306703	902372
S CI	225	9/30/2005 9:53	2867	4/22/07 17:02	291º	29º50'33"	88º49'43"	3308644	903136
S CI- Redfish Point	218	9/30/2005 9:53	2874	4/22/07 17:04	273º	29º51'52"	88º49'23"	3311098	903584
S CI	210	9/30/2005 9:52	2883	4/22/07 17:05	277º	29º53'18"	88º49'05"	3313767	903971
S CI	209	9/30/2005 9:52	2884	4/22/07 17:05	277º	29º53'21"	88º49'04"	3313860	903995
S CI	207	9/30/2005 9:51	2885	4/22/07 17:05	274º	29º53'36º"	88º49'03"	3314323	904005
Chandeleur Islands	202	9/30/2005 9:51	2888	4/22/07 17:06	276º	29º54'09"	88º49'00"	3315343	904048
CI	191	9/30/2005 9:50	2898	4/22/07 17:07	265º	29º55'54"	88º48'59"	3318581	903957
CI	189	9/30/2005 9:50	2901	4/22/07 17:08	263º	29º56'17"	88º49'02"	3319287	903851
south of Schooner Cove	188	9/30/2005 9:50	2902	4/22/07 17:08	263º	29º56'27"	88º49'04"	3319593	903786
Schooner Cove	186	9/30/2005 9:49	2904	4/22/07 17:08	263º	29º56'56"	88º49'07"	3320484	903673
Schooner Cove	177	9/30/2005 9:46	2905	4/22/07 17:08	258º	29º57'02"	88º49'08"	3320668	903639
CI	173	9/30/2005 9:46	2925	4/22/07 17:12	262º	29º57'35"	88º49'16"	3321677	903387
CI	172	9/30/2005 9:46	2926	4/22/07 17:12	265º	29º57'43"	88º49'17"	3321922	903351
North Chandeleur Island	166	9/30/2005 9:45	2931	4/22/07 17:14	245º	29º58'49"	88º49'33"	3323941	902848
North CI	163	9/30/2005 9:45	2936	4/22/07 17:14	248º	29º59'36"	88º49'57"	3325366	902151