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US Army Corps of Engineers
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GALVESTON HYDRAULIC SEDIMENT RESPONSE MODEL STUDY BRAZOS RIVER AND GULF INTRACOASTAL WATERWAY CROSSING

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ST. LOUIS DISTRICT
HYDROLOGIC AND HYDRAULICS BRANCH
APPLIED RIVER ENGINEERING CENTER
FOOT OF ARSENAL STREET
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Sponsored by and Prepared for: U. S. Army Corps of Engineers, Galveston District

In Cooperation With: KIRBY INLAND MARINE, NAT TOWING, AND GULF INTRACOASTAL CANAL ASSOCIATION

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Galveston HSR MODEL
GIWW Mile Point 401

HYDRAULIC SEDIMENT RESPONSE MODEL INVESTIGATION

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INTRODUCTION

The U.S. Army Corps of Engineers, St. Louis District, conducted a flow and sedimentation improvement study where the Brazos River intersects the Gulf Intracoastal Waterway (GIWW). This study was funded by the U.S. Army Corps of Engineers, Galveston District. The main objective of the study was to reduce or eliminate hazardous navigation crossing conditions at the intersection of the GIWW and the Brazos River.

The study was conducted between March, 2008 and July, 2009 using a physical hydraulic sediment response (HSR) model at the Applied River Engineering Center, St. Louis District in St. Louis, Missouri. The model study was performed by Mrs. Ashley Cox, Hydraulic Engineer, under direct supervision of Mr. Jasen Brown, P.E. and Mr. Robert Davinroy, P.E., Chief of River Engineering Section for the St. Louis District. Other Corps of Engineers St. Louis District personnel included: Mr. Leonard Hopkins, P.E., Hydrologic and Hydraulic Branch Chief, Ms. June Jeffries, P.E., Project Manager, and Mr. Shawn Kempshall, Cartographer. Galveston District personnel included: Ronny Beesley, P.E., Operations Manager, Bill Hopkins, Chief of Project Operations Branch, Robert Page, Lock and Dam Mechanic, and Robert George, Lock and Dam Operator. Other partners involved in the study from the navigation industry included: Captain Thomas Leister, Kirby Inland Marine, Mr. Ray Ficke, NAT Towing, and Mr. Raymond Butler, Gulf Intracoastal Canal Association.

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BACKGROUND

1. Problem Description

The Brazos River and GIWW crossing was designed at a time when most tug boats would pull barges behind the boat. They have since transitioned to tug boats that push barges through the crossing. The new tug boats and old alignment of the crossing resulted in an extremely difficult and troublesome navigation. Both the East Gate and the West Gate were narrow passageways that measured approximately 75 feet in width. Those factors left little room for pilot error even when there were ideal navigation conditions.

Tide shifts occasionally caused varying velocities through both the East and West Gates, which made navigation through the gates difficult. During high tides, the general trend was for water to travel from the Brazos River into the GIWW through both gates. The opposite would occur during low tide. Flood or high flow conditions in the San Bernard River sometimes caused high velocities into the Brazos River through the West Gate.

The hydraulic condition and layout of the crossing produced a strong eddy during most flow conditions near the East Gate. The eddy tended to pull vessels toward the North guide wall. There was also a shoaling problem along the South guide wall of the East Gate which had to be dredged every two to five years. This shoaling area restricted the width of the crossing that was available to the pilots for successful navigation of the crossing.

Each of these problems, alone or in combination, caused numerous allisions resulting in damages to vessels, loss of cargo, and damage to bank line structures (i.e. guide walls).

2. Study Purpose and Goals

The purpose of this Hydraulic Sediment Response (HSR) Model study was to evaluate various design alternatives with a goal of reducing or eliminating dangerous navigation crossing conditions in the Brazos GIWW crossing. The goal of

maintaining a safe and dependable navigation channel must be done while maintaining or improving environmental features in the reach.

3. Study Reach

The study comprised of a one mile stretch of the GIWW and two miles of the Brazos River, with the intersection of the two waterways near the model center. The study reach was located in the county of Brazoria in Texas. Plate 1 is a location and vicinity map of the study reach. Sediment samples were taken in the crossing and showed that the bed consisted mostly of consolidated clay material. Acoustic Doppler Current Profile (ADCP) was collected by the United States Geological Survey (USGS) from approximately 1.5 miles upstream of the crossing to approximately 0.75 miles downstream of the crossing. This velocity data illustrated the general velocity trends throughout the Brazos River and the eddy in the crossing. The Gulf of Mexico impacted the study area since it was less than 1.5 miles away from the crossing. At low tide the GIWW would flow out the gates and into the Brazos River. During high tide, occasionally the water would flow from the main channel into the GIWW through the gates. The San Bernard River emptied into the GIWW about 4 miles to the west of the West Gate. When the San Bernard River was at flood stage, its only outlet was the GIWW. When the gates were opened, the San Bernard and GIWW would release large flows which caused unsafe navigation conditions and delays. The Galveston District notified AREC personnel in April that they had dredged an opening for the San Bernard River to reach the Gulf of Mexico; as a result model test results should be evaluated taking the new dredged opening into account. The East and West Gates were designed to aid in navigation that crossed the Brazos River and to control the amount of sediment that entered the GIWW. The number of barges that were allowed to go through the floodgates at one time varied from company to company; some mandated only one barge through at a time and others required taking two barges through stacked. Still others would push a 1200 foot tow through the crossing. Navigation conditions would sometimes dictate that barge tows must wait in the crossing until the conditions are more favorable to proceed.

4. Study Reach Channel Characteristics and General Trends

Hydrographic surveys of the GIWW and Brazos River crossing are shown on Plates 4 -10. The plates show Range Line surveys from 2004 to 2008.

The following bathymetric trends have remained relatively constant after comparison of the above mentioned hydrographic surveys:

Brazos River and GIWW Crossing Description
Approximately 0.5 miles upstream of the crossing in the Brazos River, the thalweg crosses from the Left Descending Bank (LDB) toward the Right Descending Bank (RDB). Depths range between 16 and 20 feet below the North American Vertical Datum (NAVD 88). (Data provided to AREC from Galveston District).
The depths upstream of the crossing range between 20 and 30 feet below the NAVD 88. Just upstream of the GIWW crossing, the thalweg is located along the RDB.
Through the crossing, the thalweg depths decrease at the lower reaches of the crossing. A small scour hole is shown outside of the West Gate and a line of depth between 20 and 30 feet below NAVD 88 extends near the middle of the crossing (GIWW Mile Point (MP) 401). Depositional areas develop on both sides of the main channel.
Downstream of the crossing, the Brazos River has a range of depths between 16 and 20 feet below the NAVD 88.

HSR MODEL DESCRIPTION

1. Scales and Bed Materials

The model employed a horizontal scale of 1 inch = 150 feet, or 1:1800, and a vertical scale of 1 inch = 90 feet, or 1:1080, for a 1.67 to 1 distortion ratio of linear scales. This distortion supplied the necessary forces required for the simulation of sediment transport conditions similar to those observed in the prototype.

The bed material was granular plastic urea, Type II, with a specific gravity of 1.40.

2. Appurtenances

The HSR model insert was constructed according to the 2004 high-resolution aerial photography of the study reach. The insert was then mounted in a standard HSR model flume. The riverbanks of the model were constructed from dense polystyrene foam, and modified during calibration with clay and galvanized steel mesh. Rotational jacks located within the hydraulic flume controlled the slope of the model. The measured slope of the insert and flume was approximately 0.03 inch/inch. River training structures in the model were made of galvanized steel mesh.

Flow into the model was regulated by customized computer hardware and software interfaced with an electronic control valve and submersible pump. This interface was used to automatically control the flow of water and sediment into the model. Discharge was monitored by a magnetic flow meter interfaced with the customized computer software. The West and East Gate each had their own submersible pump and a hand valve to control the amount of water discharged. Small pieces of metal mesh screen were used to simulate the East and West Gates. The screen was high enough to prevent sediment from entering or exiting the GIWW from the main channel, but low enough that the screen allowed water to spill over the top from the GIWW discharge outlets. The water plane, which was the surface of the water in the model, was manually checked with a mechanical three dimensional point digitizer to ensure there was minimal or no slope in the plane. Resultant bed configurations

were measured and recorded with a three dimensional laser scanner. The magnitude and direction of the velocities of the water in the model were measured and recorded with a Laser Doppler Velocimeter (LDV).

HSR MODEL TESTS

1. Model Calibration

The calibration of the model involved the adjustment of water discharge, sediment volume, model slope, and entrance conditions of the model. These parameters were refined until the measured bed response of the model was similar to that of the prototype.

A. HSR Model Operation

There were two scenarios that best modeled the real world conditions; both of these conditions were conducted for each alternative. The two conditions were:

1. The Brazos River was maintained at a steady flow while simulating a low tide. The West and East Gates of the GIWW were closed so that no flow from the GIWW would enter the Brazos River crossing.
2. The Brazos River was maintained at a steady flow while simulating a low tide. The West and East Gates of the GIWW were opened so that flow from the GIWW could enter the Brazos River crossing.

These conditions were chosen as a result of an analysis of river conditions resulting in difficult navigation as well as model capabilities. Because of the constant variation experienced in the prototype, this calibrated flow was used to theoretically analyze the ultimate expected sediment response of both scenarios. The flow into the Brazos River was held steady at a constant flow rate of 1.86 gallons per minute (GPM) during model calibration and for all design alternative tests. An important factor during the modeling process is the establishment of an equilibrium condition of sediment transport. The regulated flow in the model simulated the governing energy condition representative of the river's channel forming flow and sediment transport potential.

2. Base Test

A. Condition 1: Gates Closed

Calibration of Condition 1 was achieved after favorable bathymetric comparisons of the prototype surveys were made to several surveys of the model. The resultant bathymetry served as the base test for the first condition in which both gates are closed. Plate 11 shows the bed configuration of the HSR model Condition 1 base test.

Results of the HSR model base test bathymetry and a comparison to the 2004 through 2008 prototype surveys (provided by the Galveston District) indicated the following trends:

Approximately half a mile upstream of the GIWW crossing in the Brazos River, the model base test survey and the prototype had similar trends. In both the prototype and model base test surveys the thalweg gently crossed from the LDB toward the RDB. The model base test survey had slightly more depth than the prototype survey.

In the prototype, the thalweg line was located along the RDB from approximately 0.33 miles upstream of the GIWW to the GIWW crossing. In the model base test, the thalweg was located along the RDB from a point approximately 0.25 miles upstream of the GIWW crossing.

The prototype channel depths decreased from upstream of the GIWW crossing to downstream. During Condition 1, both gates were closed at all times. The channel was relatively shallow in the crossing in this condition. Because this scenario was not observed in real world applications and has no consistent bathymetrical or ADCP data, engineering judgment was used to establish this case as being representative of a theoretical condition. Eddies existed near both the East and West Gates. The eddy formed near the north guide wall on the East Gate side extended slightly into the main channel and had higher velocities than the eddy near the West Gate. The

eddy that formed near the West Gate was smaller than the East Gate eddy and had minimal velocities. Depositional areas were shown in the northernmost and southernmost reaches of the crossing by both gates in the prototype and the model.

B. Condition 2 : Gates Opened

Calibration of the second model condition was achieved after favorable bathymetric comparisons of the prototype surveys were made to several surveys of the model. The resultant bathymetry served as the base test for the second condition in which both gates are opened. Plate 12 shows the bed configuration of the HSR model Condition 2 base test.

Results of the HSR model base test bathymetry and a comparison to the 2004 through 2008 prototype surveys (provided by the Galveston District) indicated the following trends:

Approximately 0.5 miles upstream of the GIWW crossing in the Brazos River, the model base test survey and the prototype show similar trends. In this area, both surveys show the thalweg slowly crossing from the LDB toward the RDB. The model base test survey showed slightly more depth than the prototype.

In the prototype, the thalweg was located along the RDB from a point approximately 0.33 miles upstream of the GIWW to the GIWW crossing. In the model, the thalweg is shown to be along the RDB from a point approximately 0.25 miles upstream of the GIWW crossing.

The prototype channel depths decreased from upstream of the GIWW crossing to downstream. In this model condition, both gates were open. A scour line was observed where the high velocities exited the GIWW through the West Gate and met with the flow from the Brazos River. The model base test crossing was slightly shallow compared to the prototype. Because of the increased width in the GIWW crossing relative to the Brazos River width, depositional areas developed on both sides of the main channel in front of the gates in both the prototype and the model. The depositional areas were more defined in the model base test. The eddy was

shown near the north guide wall on the East Gate side again, but had slower velocities and did not get as big as the eddy formed when the gates were closed. The eddy that formed near the West Gate when gates were closed divided into two even weaker eddies when the gates were opened; the eddies were located north and south of the discharge from the GIWW. The eddies formed in the gates opened condition were smaller, slower, and in slightly different locations than the eddies formed in the previous condition (gates closed).

Note: Upstream of the GIWW crossing, the Brazos River had a much deeper channel in Condition 1 (gates closed) than in Condition 2 (gates opened). This could be a result of water flowing through the open gates and slowing the downstream flow from the Brazos, thus slowing the sediment transport.

3. Design Alternative Tests

The testing process consisted of installing alternative structure configurations in the model in an attempt to alter the model bathymetry and velocity distribution in a manner intended to alleviate eddy formation and / or siltation. Evaluation of each alternative was accomplished through a qualitative comparison to the model base test bathymetry and model base test velocity (LDV) data.

(Mile points are measured from the entrance to the Gulf of Mexico upstream to the structure.)

Alternative 1:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.30	RDB	210	4.65	6.00

Condition 1: *Bathymetry (Plate 16) and Velocity (Plate 17) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X	X		

Condition 2: *Bathymetry (Plate 18) and Velocity (Plate 19) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 2:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.40	LDB	75	4.65	6.00
Install Dike	1.30	LDB	120	4.65	6.00

Condition 1: *Bathymetry (Plate 20) and Velocity (Plate 21) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Condition 2: *Bathymetry (Plate 22) and Velocity (Plate 23) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 3:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Notched Dike	1.46	LDB	75 Notch width = 20' (Start notch 28 ft from LDB)	4.65 EBD[1]	6.00 EBD[1]
Install Notched Dike	1.40	LDB	75 Notch width = 20' (Start notch 28 ft from LDB)	4.65 EBD[1]	6.00 EBD[1]
Install Dike	1.25	LDB	115	4.65	6.00

EBD[1] : Stands for Existing Bed Depth

Condition 1: *Bathymetry (Plate 24) and Velocity (Plate 25) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Condition 2: *Bathymetry (Plate 26) and Velocity (Plate 27) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 4:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Landing Wall	1.37	LDB	500	4.65	6.00

Condition 1: *Bathymetry (Plate 28) and Velocity (Plate 29) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X	X		

Condition 2: *Bathymetry (Plate 30) and Velocity (Plate 31) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 5:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Landing Wall	1.32	LDB	325	4.65	6.00

Condition 1: *Bathymetry (Plate 32) and Velocity (Plate 33) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Condition 2: *Bathymetry (Plate 34) and Velocity (Plate 35) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 6:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Landing Wall	1.40	LDB	500	4.65	6.00

Condition 1: *Bathymetry (Plate 36) and Velocity (Plate 37) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X	X		

Condition 2: *Bathymetry (Plate 38) and Velocity (Plate 39) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X	X		

Alternative 7:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Angled Landing Wall Install Extension at end of Wall	1.40 1.36	LDB LDB	500 120	4.65 4.65	6.00 6.00

Condition 1: *Bathymetry (Plate 40) and Velocity (Plate 41) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Condition 2: *Bathymetry (Plate 42) and Velocity (Plate 43) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 8:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Landing Wall	1.40	LDB	500	4.65	6.00

Condition 1: *Bathymetry (Plate 44) and Velocity (Plate 45) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X	X		

Condition 2: *Bathymetry (Plate 46) and Velocity (Plate 46) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 9:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.62	LDB	75	4.65	6.00
Install Dike	1.58	LDB	75	4.65	6.00
Install Dike	1.54	LDB	75	4.65	6.00
Install Dike	1.26	LDB	150	4.65	6.00

Condition 1: *Bathymetry (Plate 48) and Velocity (Plate 49) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Condition 2: *Bathymetry (Plate 50) and Velocity (Plate 51) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 10:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.63	RDB	75	4.65	6.00
Install Dike	1.59	RDB	75	4.65	6.00
Install Dike	1.55	RDB	75	4.65	6.00
Install Dike	1.26	LDB	150	4.65	6.00

Condition 1: *Bathymetry (Plate 52) and Velocity (Plate 53) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Condition 2: *Bathymetry (Plate 54) and Velocity (Plate 55) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 11:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.63	RDB	75	4.65	6.00
Install Dike	1.59	RDB	75	4.65	6.00
Install Dike	1.55	RDB	75	4.65	6.00

Condition 1: *Bathymetry (Plate 56) and Velocity (Plate 57) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Condition 2: *Bathymetry (Plate 58) and Velocity (Plate 59) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 12:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.46	LDB	75	4.65	6.00
Install Dike	1.43	LDB	75	4.65	6.00
Install Dike	1.40	LDB	75	4.65	6.00

Condition 1: *Bathymetry (Plate 60) and Velocity (Plate 61) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Condition 2: *Bathymetry (Plate 62) and Velocity (Plate 63) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 13:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.46	LDB	175	4.65	6.00
Install Dike	1.43	LDB	200	4.65	6.00
Install Dike	1.40	LDB	225	4.65	6.00

Condition 1: *Bathymetry (Plate 64) and Velocity (Plate 65) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Condition 2: *Bathymetry (Plate 66) and Velocity (Plate 66) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 14:

Type of Structure	Mile Point	LDB or RDB	Dimensions in Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.40	LDB	225	4.65	6.00

Condition 1: *Bathymetry (Plate 68) and Velocity (Plate 69) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Condition 2: *Bathymetry (Plate 70) and Velocity (Plate 71) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Alternative 15:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Build Mud Wall with Dredge Material	1.20-1.21	LDB	~153,500	2.65	4.00

Condition 1: *Bathymetry (Plate 72) and Velocity (Plate 73) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Condition 2: *Bathymetry (Plate 74) and Velocity (Plate 74) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Alternative 16:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Geotextile Tube					
1st Reach	1.33	LDB	300 ft from bank	2.65	4.00
2nd Reach	1.29	LDB	600 ft extension	2.65	4.00

Condition 1: *Bathymetry (Plate 76) and Velocity (Plate 77) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Condition 2: *Bathymetry (Plate 78) and Velocity (Plate 79) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 17:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.52	LDB	100 (at 30º angle)	4.65	6.00
Install Dike	1.52	RDB	100 (at 30º angle)	4.65	6.00

Condition 1: *Bathymetry (Plate 80) and Velocity (Plate 81) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Condition 2: *Bathymetry (Plate 82) and Velocity (Plate 83) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 18:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Structure Top Elevation (ft)	
				NAVD 88	MLT
Install Dike	1.47	LDB	100 (at 30º angle)	4.65	6.00
Install Dike	1.47	RDB	100 (at 30º angle)	4.65	6.00

Condition 1: *Bathymetry (Plate 84) and Velocity (Plate 85) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Condition 2: *Bathymetry (Plate 86) and Velocity (Plate 87) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 19:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Southeast Bank Line	1.13-1.25	LDB	43,627	-5.00	-3.65

Condition 1: *Bathymetry (Plate 88) and Velocity (Plate 89) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Condition 2: *Bathymetry (Plate 90) and Velocity (Plate 91) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X	X		

Alternative 20:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northeast Bank Line	1.40-1.49	LDB	67,992	-5.00	-3.65
Dredge (by Northeast Bank)	1.40-1.50	LDB	86,000	-10.00	-8.65

Condition 1: *Bathymetry (Plate 92) and Velocity (Plate 93) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Condition 2: *Bathymetry (Plate 94) and Velocity (Plate 95) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Alternative 21:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northeast Bank Line	1.40-1.49	LDB	67,992	-5.00	-3.65
Dredge (by Northeast Bank)	1.40-1.50	LDB	86,000	-10.00	-8.65
Remove Southeast Bank Line	1.13-1.25	LDB	43,627	-5.00	-3.65

Condition 1: *Bathymetry (Plate 96) and Velocity (Plate 97) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X		X			X	

Condition 2: *Bathymetry (Plate 98) and Velocity (Plate 99) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Alternative 22:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northeast Bank Line	1.40-1.49	LDB	67,992	-5.00	-3.65
Remove Southeast Bank Line	1.13-1.25	LDB	43,627	-5.00	-3.65

Condition 1: *Bathymetry (Plate 100) and Velocity (Plate 101) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Condition 2: *Bathymetry (Plate 102) and Velocity (Plate 103) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Alternative 23:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northeast Bank Line	1.40-1.49	LDB	67,992	-5.00	-3.65

Condition 1: *Bathymetry (Plate 104) and Velocity (Plate 105) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Condition 2: *Bathymetry Analysis (Plate 106)*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Alternative 24:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northeast Bank Line Remove Northwest Bank Line	1.40-1.49 1.39-1.48	LDB RDB	67,992 53,242	-5.00 -5.00	-3.65 -3.65

Condition 1: *Bathymetry (Plate 108) and Velocity (Plate 109) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X	X			X	

Condition 2: *Bathymetry (Plate 110) and Velocity (Plate 111) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X	X			X	

Alternative 25:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northeast Bank Line					
Remove Northwest Bank Line	1.40-1.49	LDB	67,992	-5.00	-3.65
	1.39-1.48	RDB	53,242	-5.00	-3.65
Remove Southeast Bank Line	1.13-1.25	LDB	43,627	-5.00	-3.65

Condition 1: *Bathymetry (Plate 112) and Velocity (Plate 113) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X		X			X	

Condition 2: *Bathymetry (Plate 114) and Velocity (Plate 115) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X		X			X	

Alternative 26:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northeast Bank Line	1.40-1.49	LDB	67,992	-5.00	-3.65
Dredge (by Northeast Bank)	1.40-1.50	LDB	86,000	-10.00	-8.65
Remove Northwest Bank Line	1.39-1.48	RDB	53,242	-5.00	-3.65
Remove Southeast Bank Line	1.13-1.25	LDB	43,627	-5.00	-3.65

Condition 1: *Bathymetry (Plate 116) and Velocity (Plate 117) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X		X			X	

Condition 2: *Bathymetry (Plate 118) and Velocity (Plate 119) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Alternative 27:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northeast Bank Line	1.40-1.49	LDB	67,992	-5.00	-3.65
Dredge (by Northeast Bank)	1.40-1.50	LDB	86,000	-10.00	-8.65
Remove Northwest Bank Line	1.39-1.48	RDB	53,242	-5.00	-3.65

Condition 1: *Bathymetry (Plate 120) and Velocity (Plate 121) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X		X			X	

Condition 2: *Bathymetry (Plate 122) and Velocity (Plate 123) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X			X		X	

Alternative 28:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northwest Bank Line	1.39-1.48	RDB	67,992	-5.00	-3.65
Dredge (by Northeast Bank)	1.40-1.50	LDB	86,000	-10.00	-8.65
Remove Southeast Bank Line	1.13-1.25	LDB	53,242	-5.00	-3.65

Condition 1: *Bathymetry (Plate 124) and Velocity (Plate 125) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
X		X			X	

Condition 2: *Bathymetry (Plate 126) and Velocity (Plate 127) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Alternative 29:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northwest Bank Line	1.39-1.48	RDB	53,242	-5.00	-3.65
Dredge (by Northeast Bank)	1.40-1.50	LDB	86,000	-10.00	-8.65

Condition 1: *Bathymetry (Plate 128) and Velocity (Plate 129) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X	X			X	

Condition 2: *Bathymetry (Plate 130) and Velocity (Plate 131) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Alternative 30:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northwest Bank Line	1.39-1.48	RDB	53,242	-5.00	-3.65

Condition 1: *Bathymetry (Plate 132) and Velocity (Plate 133) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X	X			X	

Condition 2: *Bathymetry (Plate 134) and Velocity (Plate 135) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Alternative 31:

Type of Structure	Mile Point	LDB or RDB	Area in Square Feet	Remove Bank to Elevation (ft)	
				NAVD 88	MLT
Remove Northwest Bank Line	1.39-1.48	RDB	53,242	-5.00	-3.65
Remove Southeast Bank Line	1.13-1.25	LDB	43,627	-5.00	-3.65

Condition 1: *Bathymetry (Plate 136) and Velocity (Plate 137) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X		X		X	

Condition 2: *Bathymetry (Plate 138) and Velocity (Plate 139) Analysis*

Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact or No Change in Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)	Additional Comments
	X	X		X		

CONCLUSIONS

1. Evaluation and Summary of the Model Tests (Condition Analyses Combined)

Alternatives	Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact on Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)
Alternative 1		X		X	X	
Alternative 2		X		X	X	
Alternative 3		X		X	X	
Alternative 4		X		X	X	
Alternative 5		X		X	X	
Alternative 6	X			X	X	
Alternative 7		X		X		X
Alternative 8		X		X	X	
Alternative 9		X		X	X	
Alternative 10		X		X		X
Alternative 11		X		X		X
Alternative 12		X		X	X	
Alternative 13		X		X	X	
Alternative 14		X		X		X
Alternative 15		X		X		X
Alternative 16		X		X		X
Alternative 17		X		X		X
Alternative 18		X		X	X	
Alternative 19		X		X		X
Alternative 20	X			X		X
Alternative 21	X			X		X
Alternative 22	X			X		X
Alternative 23		X		X		X

Alternatives	Positive Impact on East Gate Eddy	Negative Impact or No Change in East Gate Eddy	Positive Impact on West Gate Eddy	Negative Impact or No Change in West Gate Eddy	Positive Impact on Crossing (GIWW RM 401)	Negative Impact on Crossing (GIWW RM 401)
Alternative 24		X	X			X
Alternative 25	X		X			X
Alternative 26	X			X		X
Alternative 27	X			X		X
Alternative 28		X		X		X
Alternative 29		X		X		X
Alternative 30		X		X		X
Alternative 31		X		X		X

In order to determine the best alternative, certain criteria were used to evaluate each alternative. The first condition was that the alternative had to sufficiently weaken or completely stop the eddy formation at the approach to the East Gate (approximately GIWW Mile 400.5). The second condition was that the alternative had to reduce or stop the eddy formation at the approach to the West Gate (approximately GIWW Mile 401.5). Lastly, the condition of the navigable channel in the crossing at GIWW Mile 401 was to be enhanced in both depth and width or to remain the same.

The ideal alternative would have been able to meet all three conditions, however, no alternative tested successfully met all three conditions. There were several alternatives that met two of the three conditions. Although some alternatives did meet most of the criterion and were considered successful in reducing the eddies, they were not recommended because they would involve structures infringing too far upon the navigation channel or industry consultants stated that they did not want any structures near the gates' approaches. Some of those alternatives that met most of the criterion but were not chosen were alternatives 6, 20, 21, 22, 26, and 27.

2. Recommendations

Alternative 25 was recommended due to its ability to significantly reduce the strength of the eddy at the approach to both the East Gate and the West Gate. This greatly enhances the navigation safety of the crossing for industry, without adding any structures that could damage large vessels or hinder traffic. Since this alternative called for removing bank lines, it created a wider opening at the crossing and allowed the Brazos River's flow to spread out and slow down, thus dropping more sediment in the crossing. The results suggest that there would be a need for dredging around GIWW RM 401 if those bank lines were removed.

The recommended design included the following:

- Remove the Northwest Bank Line (Approximate Area = 53,242 sq. ft)
  - Located about 1.39-1.48 miles upstream from the Gulf of Mexico
  - Remove to depth of -5 ft NAVD 88 or -3.65 ft MLT
- Remove Northeast Bank Line (Approximate Area = 67,992 sq. ft)
  - Located about 1.40-1.49 miles upstream from the Gulf of Mexico
  - Remove to depth of -5 ft NAVD 88 or -3.65 ft MLT
- Remove Southeast Bank Line (Approximate Area = 43,627 sq. ft)
  - Located about 1.13-1.25 miles upstream from the Gulf of Mexico
  - Remove to depth of -5 ft NAVD 88 or -3.65 ft MLT

3. Interpretation of Model Test Results

In the interpretation and evaluation of the model test results, it should be remembered that these results are qualitative in nature. Any hydraulic model, whether physical or numerical, is subject to biases introduced as a result of the inherent complexities that exist in the prototype. Anomalies in actual hydrographic events, such as prolonged periods of high or low flows are not reflected in these results, nor are complex physical phenomena, such as the existence of underlying rock formations or other non-erodible variables. Flood flows were not simulated in this study.

This model study was intended to serve as a tool for the river engineer to guide in assessing the general trends that could be expected to occur in the GIWW and Brazos River crossing from a variety of imposed design alternatives. Measures for the final design may be modified based upon engineering knowledge and experience, real estate and construction considerations, economic and environmental impacts, or any other special requirements.

FOR MORE INFORMATION

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APPENDIX OF PLATES

1. Location and Vicinity Map of the Study Reach
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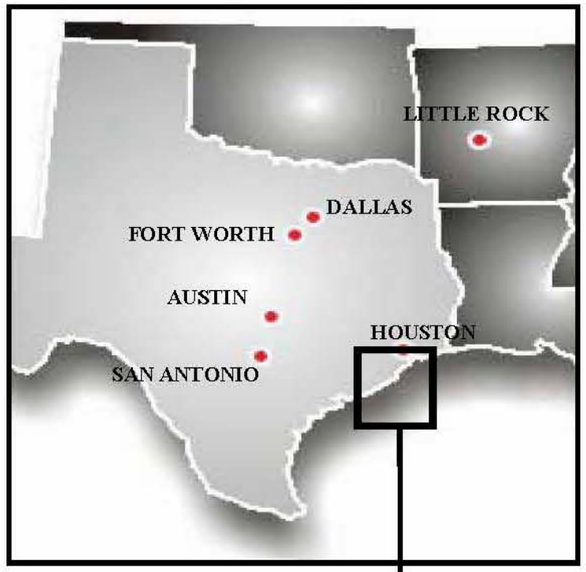
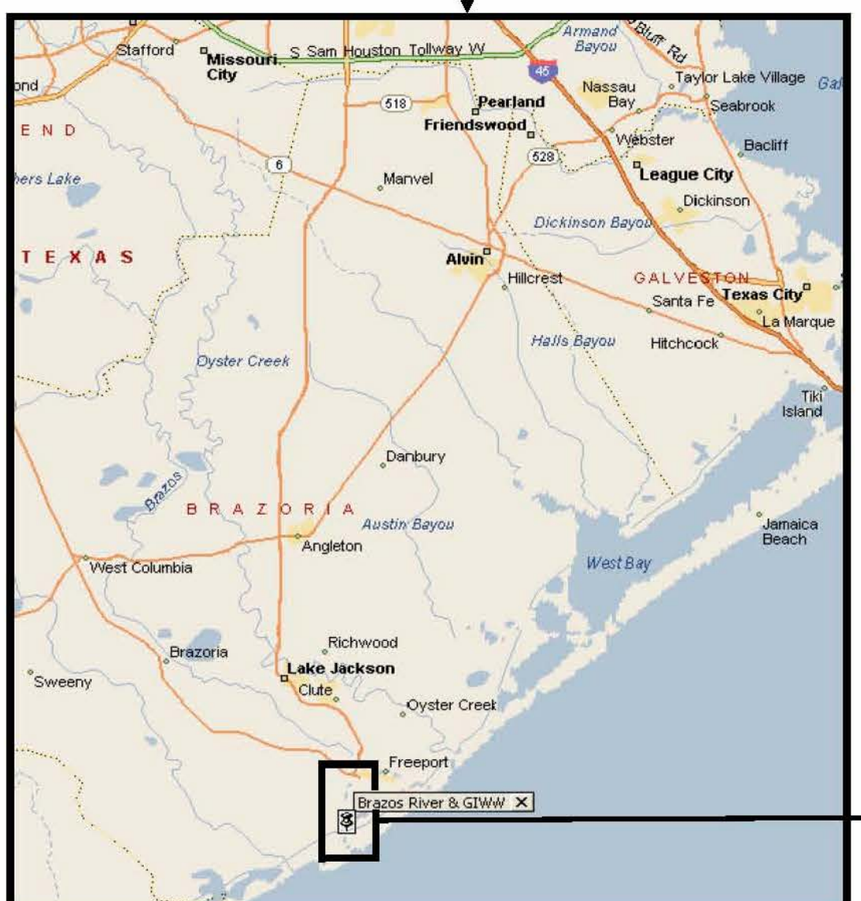
47. Alternative 8: Condition 2 LDV Data – 1:4,600
48. Alternative 9: Condition 1 – 1: 4,600
49. Alternative 9: Condition 1 LDV Data – 1:4,600
50. Alternative 9: Condition 2 – 1: 4,600
51. Alternative 9: Condition 2 LDV Data – 1:4,600
52. Alternative 10: Condition 1 – 1: 4,600
53. Alternative 10: Condition 1 LDV Data – 1:4,600
54. Alternative 10: Condition 2 – 1: 4,600
55. Alternative 10: Condition 2 LDV Data – 1:4,600
56. Alternative 11: Condition 1 – 1: 4,600
57. Alternative 11: Condition 1 LDV Data – 1:4,600
58. Alternative 11: Condition 2 – 1: 4,600
59. Alternative 11: Condition 2 LDV Data – 1:4,600
60. Alternative 12: Condition 1 – 1: 4,600
61. Alternative 12: Condition 1 LDV Data – 1:4,600
62. Alternative 12: Condition 2 – 1: 4,600
63. Alternative 12: Condition 2 LDV Data – 1:4,600

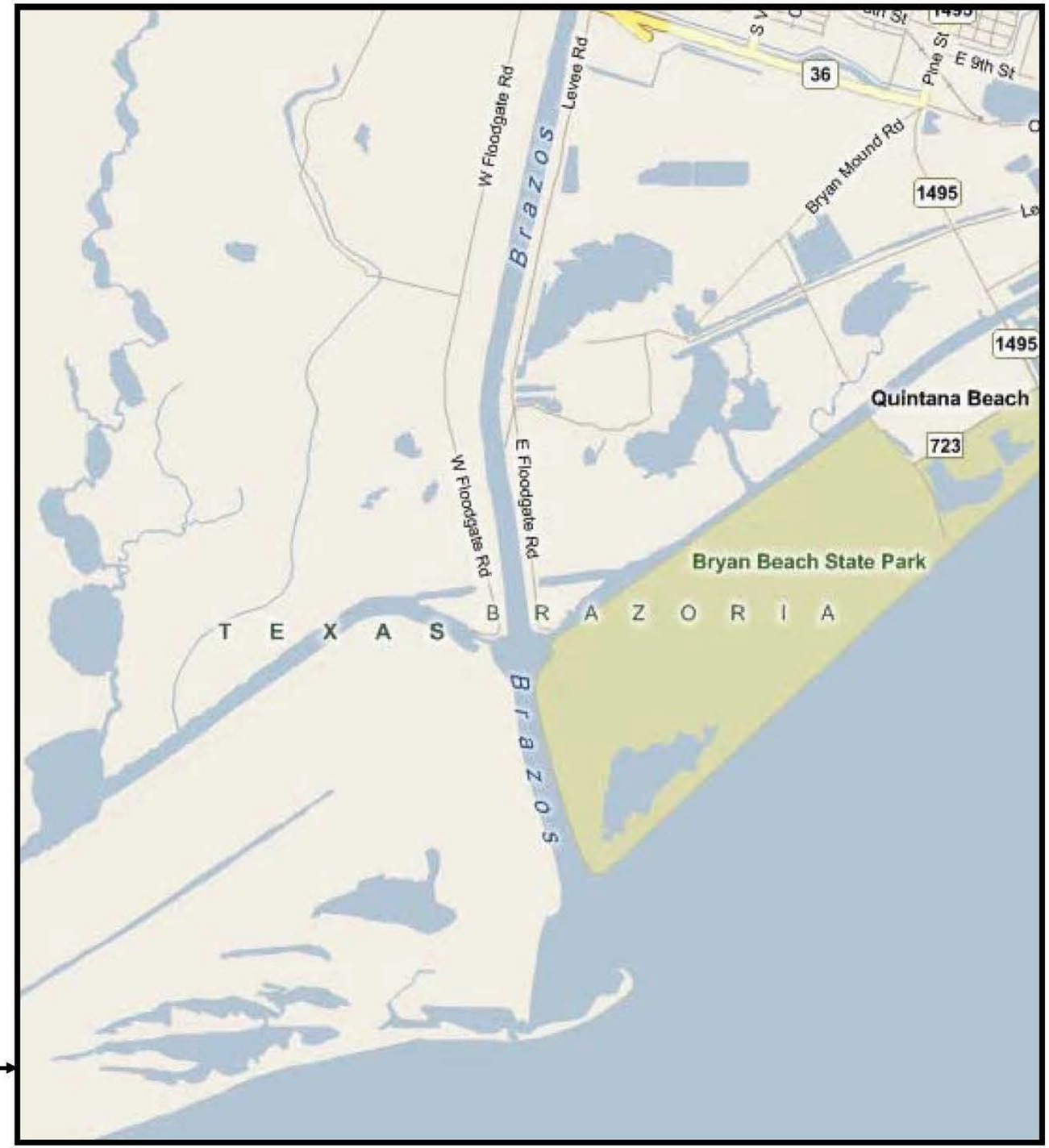
64. Alternative 13: Condition 1 – 1: 4,600
65. Alternative 13: Condition 1 LDV Data – 1:4,600
66. Alternative 13: Condition 2 – 1: 4,600
67. Alternative 13: Condition 2 LDV Data – 1:4,600
68. Alternative 14: Condition 1 – 1: 4,600
69. Alternative 14: Condition 1 LDV Data – 1:4,600
70. Alternative 14: Condition 2 – 1: 4,600
71. Alternative 14: Condition 2 LDV Data – 1:4,600
72. Alternative 15: Condition 1 – 1: 4,600
73. Alternative 15: Condition 1 LDV Data – 1:4,600
74. Alternative 15: Condition 2 – 1: 4,600
75. Alternative 15: Condition 2 LDV Data – 1:4,600
76. Alternative 16: Condition 1 – 1: 4,600
77. Alternative 16: Condition 1 LDV Data – 1:4,600
78. Alternative 16: Condition 2 – 1: 4,600
79. Alternative 16: Condition 2 LDV Data – 1:4,600
80. Alternative 17: Condition 1 – 1: 4,600
81. Alternative 17: Condition 1 LDV Data – 1:4,600
82. Alternative 17: Condition 2 – 1: 4,600
83. Alternative 17: Condition 2 LDV Data – 1:4,600
84. Alternative 18: Condition 1 – 1: 4,600
85. Alternative 18: Condition 1 LDV Data – 1:4,600
86. Alternative 18: Condition 2 – 1: 4,600
87. Alternative 18: Condition 2 LDV Data – 1:4,600
88. Alternative 19: Condition 1 – 1: 4,600
89. Alternative 19: Condition 1 LDV Data – 1:4,600
90. Alternative 19: Condition 2 – 1: 4,600
91. Alternative 19: Condition 2 LDV Data – 1:4,600
92. Alternative 20: Condition 1 – 1: 4,600
93. Alternative 20: Condition 1 LDV Data – 1:4,600
94. Alternative 20: Condition 2 – 1: 4,600
95. Alternative 20: Condition 2 LDV Data – 1:4,600

96. Alternative 21: Condition 1 – 1: 4,600
97. Alternative 21: Condition 1 LDV Data – 1:4,600
98. Alternative 21: Condition 2 – 1: 4,600
99. Alternative 21: Condition 2 LDV Data – 1:4,600
100. Alternative 22: Condition 1 – 1: 4,600
101. Alternative 22: Condition 1 LDV Data – 1:4,600
102. Alternative 22: Condition 2 – 1: 4,600
103. Alternative 22: Condition 2 LDV Data – 1:4,600
104. Alternative 23: Condition 1 – 1: 4,600
105. Alternative 23: Condition 1 LDV Data – 1:4,600
106. Alternative 23: Condition 2 – 1: 4,600
107. Alternative 23: Condition 2 LDV Data – 1:4,600
108. Alternative 24: Condition 1 – 1: 4,600
109. Alternative 24: Condition 1 LDV Data – 1:4,600
110. Alternative 24: Condition 2 – 1: 4,600
111. Alternative 24: Condition 2 LDV Data – 1:4,600
112. Alternative 25: Condition 1 – 1: 4,600
113. Alternative 25: Condition 1 LDV Data – 1:4,600
114. Alternative 25: Condition 2 – 1: 4,600
115. Alternative 25: Condition 2 LDV Data – 1:4,600
116. Alternative 26: Condition 1 – 1: 4,600
117. Alternative 26: Condition 1 LDV Data – 1:4,600
118. Alternative 26: Condition 2 – 1: 4,600
119. Alternative 26: Condition 2 LDV Data – 1:4,600
120. Alternative 27: Condition 1 – 1: 4,600
121. Alternative 27: Condition 1 LDV Data – 1:4,600
122. Alternative 27: Condition 2 – 1: 4,600
123. Alternative 27: Condition 2 LDV Data – 1:4,600
124. Alternative 28: Condition 1 – 1: 4,600
125. Alternative 28: Condition 1 LDV Data – 1:4,600
126. Alternative 28: Condition 2 – 1: 4,600
127. Alternative 28: Condition 2 LDV Data – 1:4,600

128. Alternative 29: Condition 1 – 1: 4,600
129. Alternative 29: Condition 1 LDV Data – 1:4,600
130. Alternative 29: Condition 2 – 1: 4,600
131. Alternative 29: Condition 2 LDV Data – 1:4,600
132. Alternative 30: Condition 1 – 1: 4,600
133. Alternative 30: Condition 1 LDV Data – 1:4,600
134. Alternative 30: Condition 2 – 1: 4,600
135. Alternative 30: Condition 2 LDV Data – 1:4,600
136. Alternative 31: Condition 1 – 1: 4,600
137. Alternative 31: Condition 1 LDV Data – 1:4,600
138. Alternative 31: Condition 2 – 1: 4,600
139. Alternative 31: Condition 2 LDV Data – 1:4,600







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St. Louis District®

APPLIED RIVER ENGINEERING CENTER

N W E S

DESIGNED BY: A.COX	DRAWN BY: A.COX	REVIEWED BY: J.BROWN, P.E.	SUBMITTED: A.COX
SURVEY DATE:	CHECKED BY: E.BRAUER	APPROVED: R.DAVINROY, P.E.	PLOT DATE: 03/11/2008
FILE NAME: ...GALVESTON/PLATES			

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

LOCATION AND VICINITY MAP

PLATE NUMBER

1

PLATE NUMBER 2

0 125 250 500 750 1,000
Feet

2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

DESIGNED: A COX		
DRAWN: A COX	REVIEWED: J BROWN, P.E.	DESIGNED: E BRAUER, P.E.
SUBMITTED: A COX		APPROVED: R DAVINROY, P.E.
HI NAME: ... Galveston/Plaza		REP DATE: 01/01/2009

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St. Louis District

Exiting the East Gate and entering the Brazos River Crossing

Damage from a Barge Allision on the North side of the East Gate

Damage from a Barge Allision on the South side of the East Gate

Approaching the Gulf Intracoastal Waterway through the West Gate

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U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	DESIGNED BY A COX	REVIEWED BY J BROWN, P.E.	SURVEY DATE
	DRAWN BY A COX		CHECKED BY E.B.BAUER
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing ESR Model	SUBMITTED A COX		APPROVED R. DAVIS-ROY, P.E.
	FILE NAME GALVESTONPLATE3		PLOT DATE 03/12/2009

GALVESTON
Date Photographed: November 6, 2007

PLATE NUMBER
3

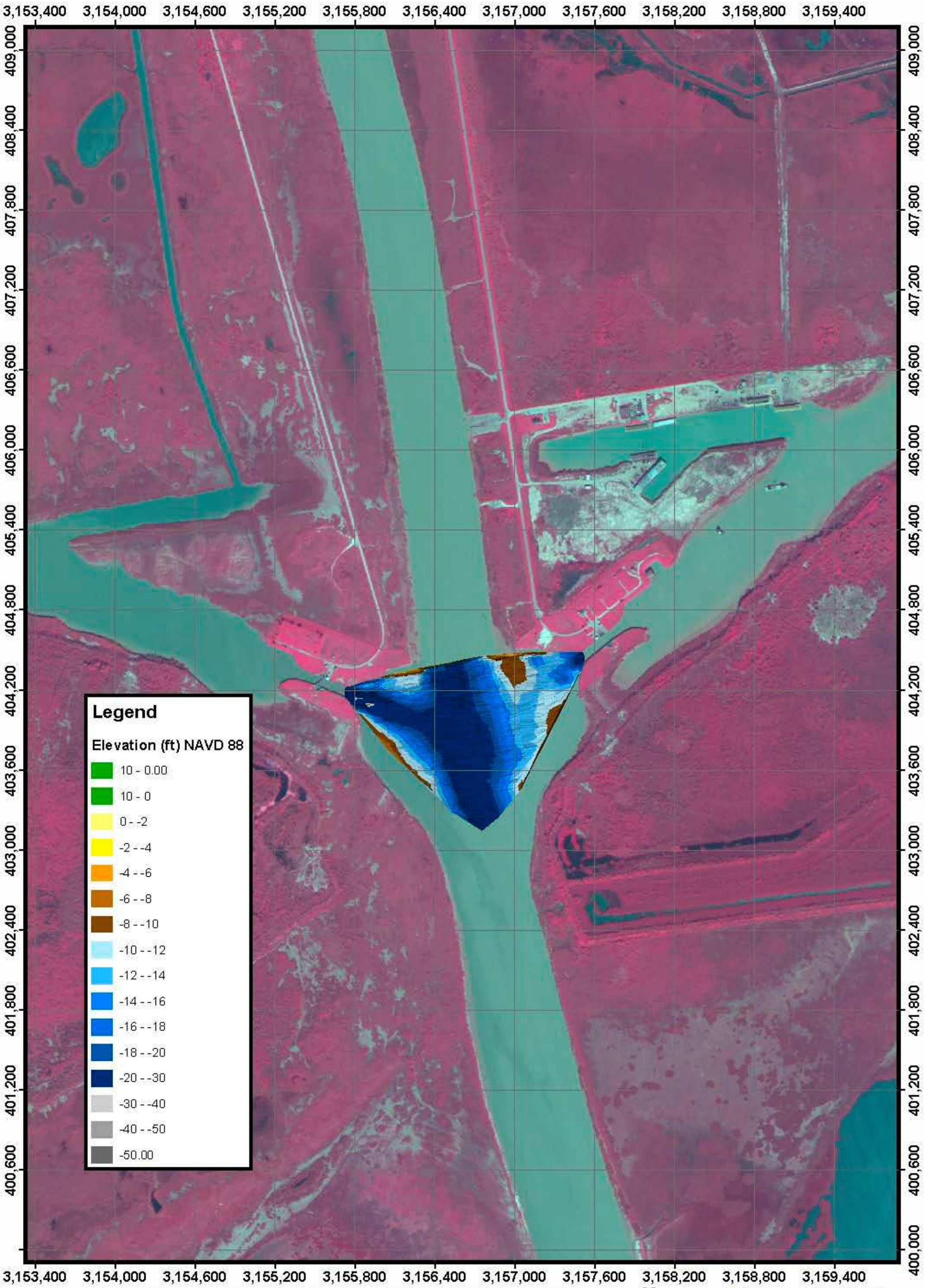

PLATE NUMBER 4

0 125 250 500 750 1,000
Feet

2004 Survey
2004 AERIAL PHOTOGRAPH

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ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		2004
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX		R DAVINROY, P.E.
... Galveston/Plaza		07/01/2009

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PLATE NUMBER 5

0 125 250 500 750 1,000
Feet

2005 Survey: Before Dredge
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

DESIGNED: A COX		SUPERVISED: 2005
DRAWN: A COX	REVIEWED: J BROWN, P.E.	DESIGNED: E BRAUER, P.E.
SUBMITTED: A COX		APPROVED: R DAVINROY, P.E.
HI NAME: ... Galveston/Plates		REP DATE: 07/01/2009

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St. Louis District

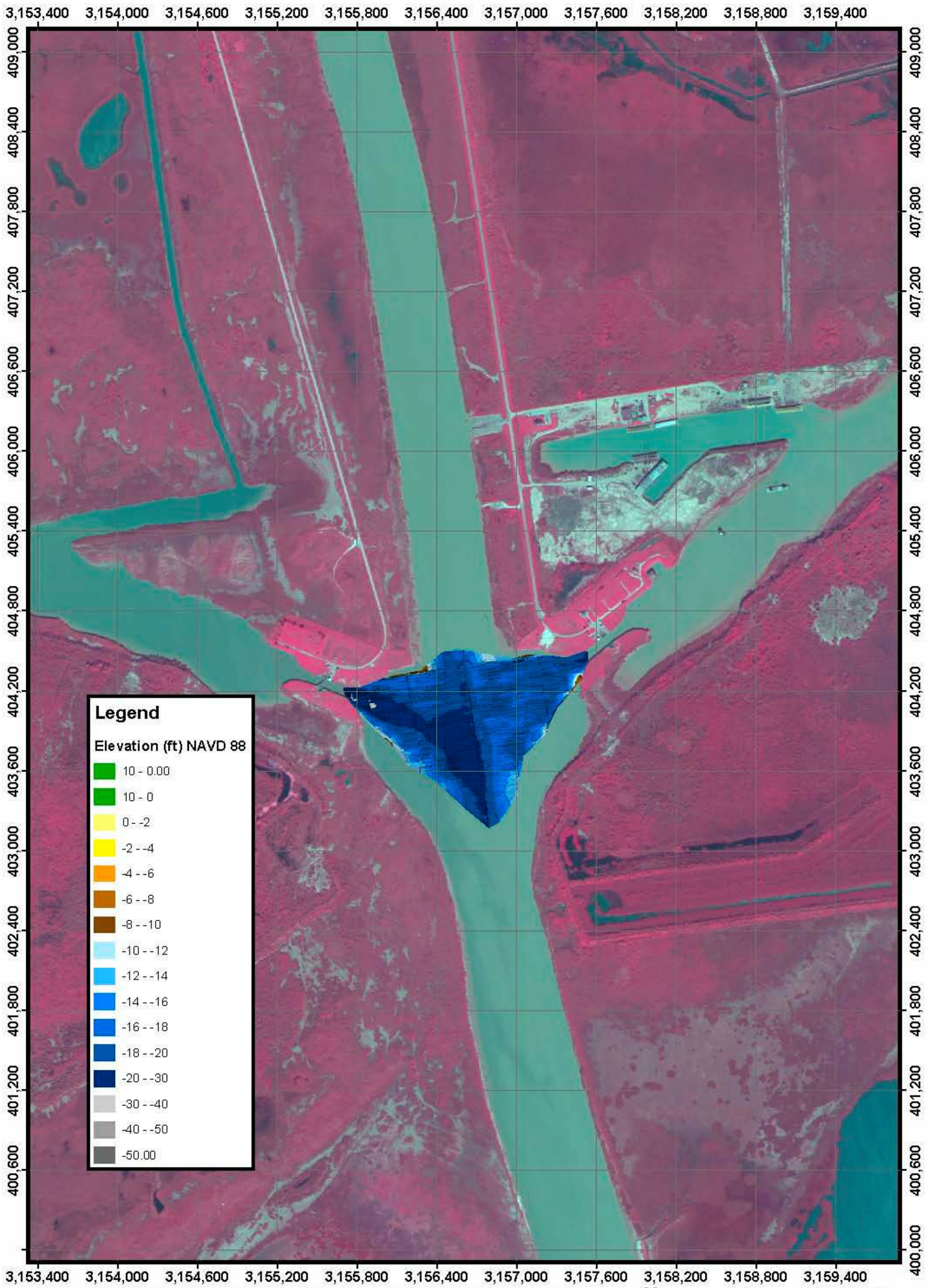

PLATE NUMBER 9

0 125 250 500 750 1,000
Feet

2005 Survey: After Dredge
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

DESIGNED: A COX		SUPERVISED: 2005
DRAWN: A COX	REVIEWED: J BROWN, P.E.	DESIGNED: E BRAUER, P.E.
SUBMITTED: A COX		APPROVED: R DAVINROY, P.E.
HI REVIEW: ... Galveston/Plans		REP DATE: 07/01/2009

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St. Louis District

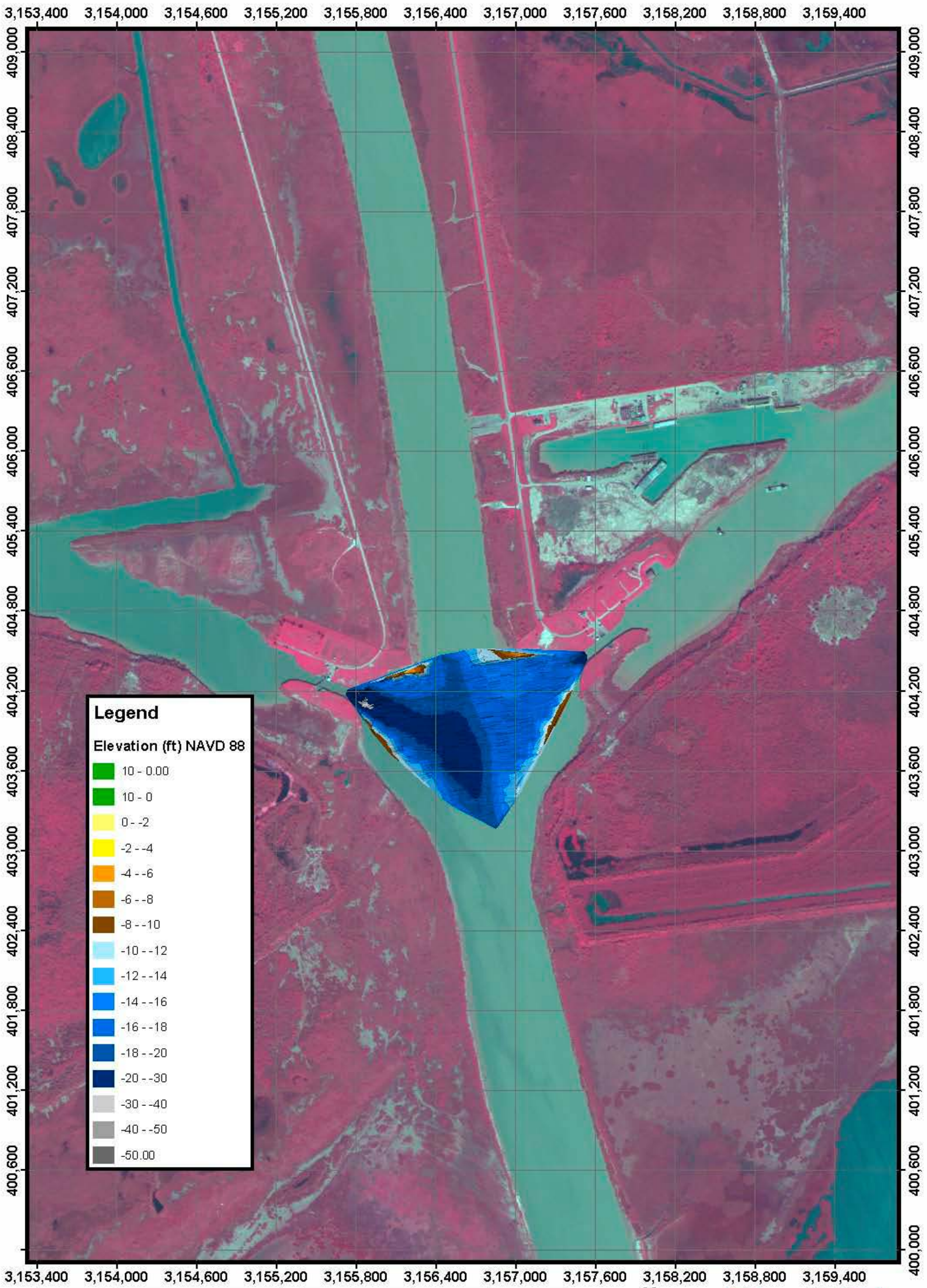

PLATE NUMBER 7

0 125 250 500 750 1,000
Feet

2006 Survey
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
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ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		2006
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX		R DAVINROY, P.E.
... Galveston/Plaza		07/07/2009

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St. Louis District

PLATE NUMBER 8

0 125 250 500 750 1,000
Feet

2007 Survey: Before Dredge
2004 AERIAL PHOTOGRAPH

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CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

DESIGNED: A COX		SURVEYED: 2007
DRAWN: A COX	REVIEWED: J BROWN, P.E.	DESIGNED: E BRAUER, P.E.
SUBMITTED: A COX		APPROVED: R DAVINROY, P.E.
HI NAME: ... Galveston/Plates		REP DATE: 07/01/2009

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US Army Corps of Engineers
St. Louis District

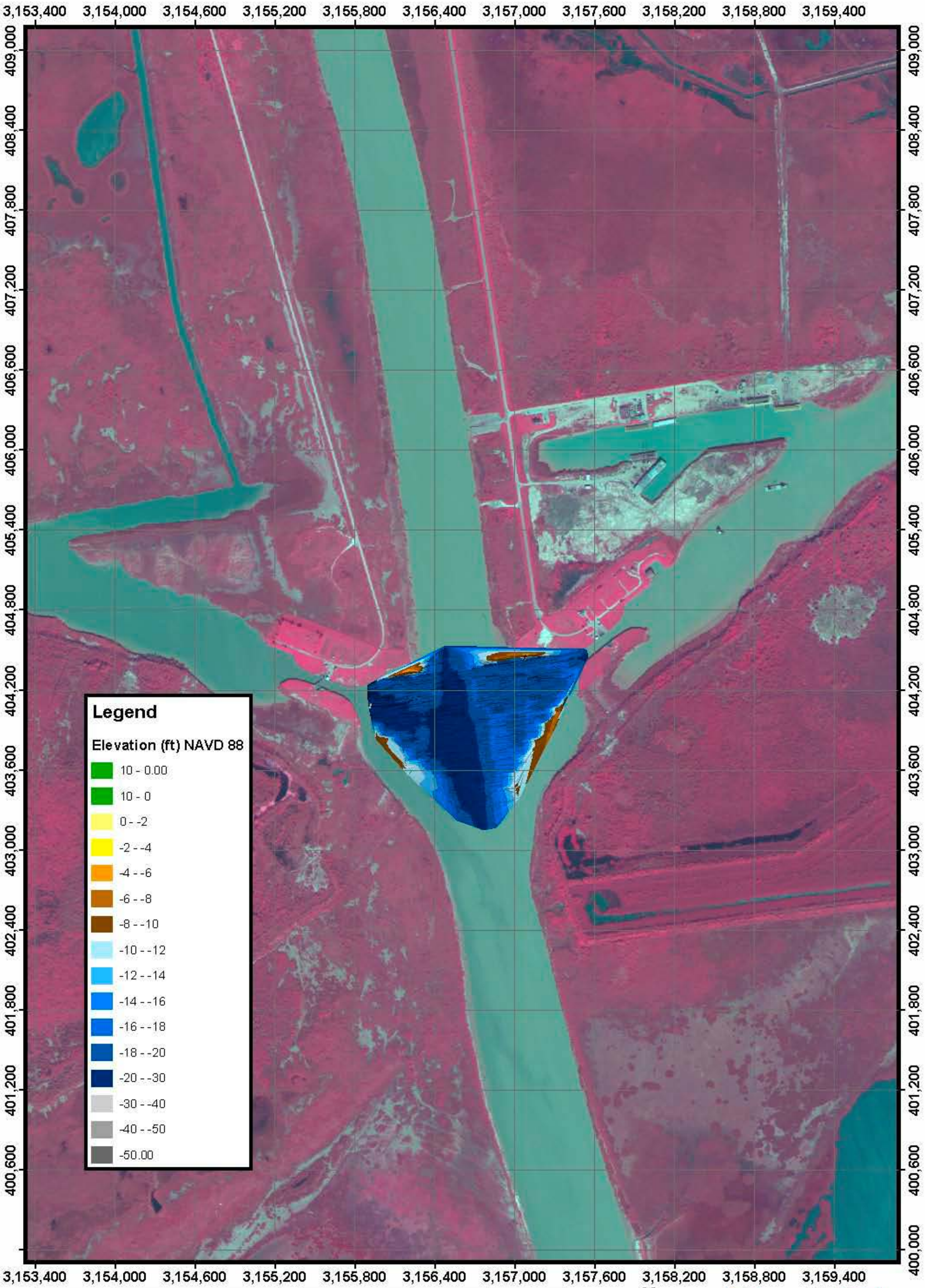

PLATE NUMBER 9

0 125 250 500 750 1,000
Feet

2007 Survey: After Dredge
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		2007
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
... Galveston/Plaza	07/07/2009	

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St. Louis District

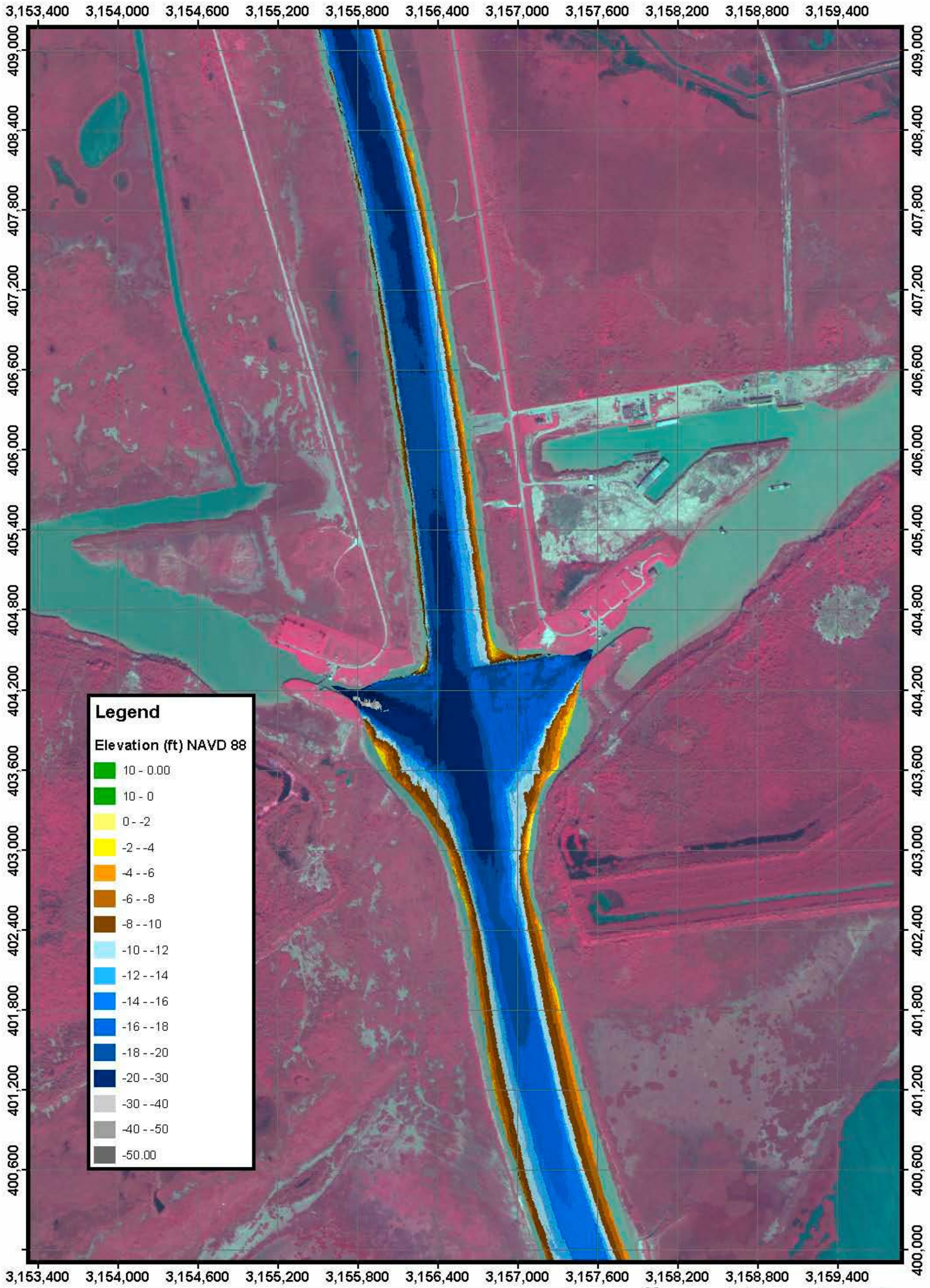

PLATE NUMBER 10

0 125 250 500 750 1,000
Feet

2008 Survey
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 2008
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
... Galveston/Plates | 07/01/2009

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US Army Corps of Engineers
St. Louis District

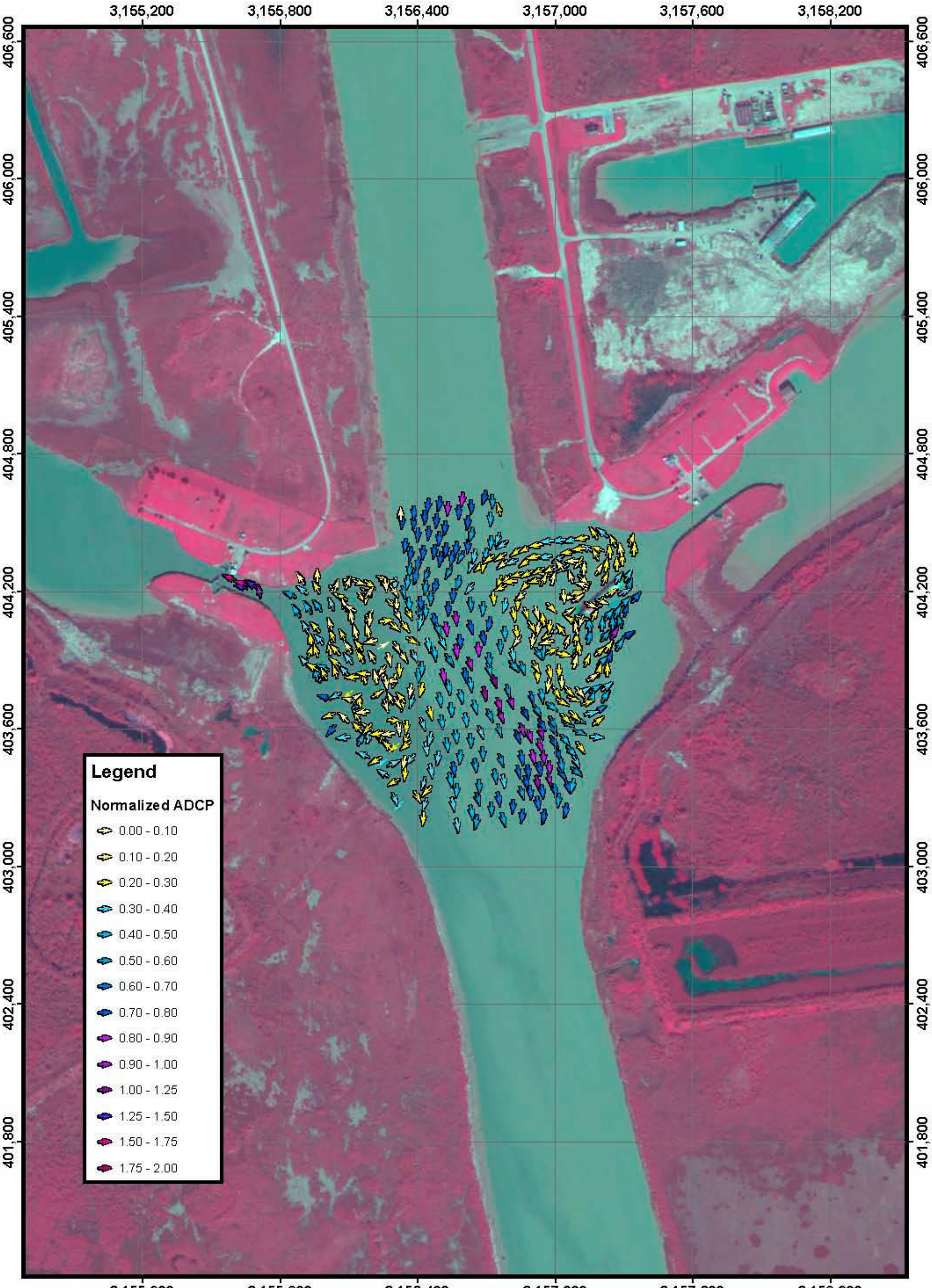

PLATE NUMBER 11

0 75 150 300 450 600
Feet

2008 ADCP
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		2008
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
... Galveston / Plano	07/01/2009	

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US Army Corps of Engineers
St. Louis District

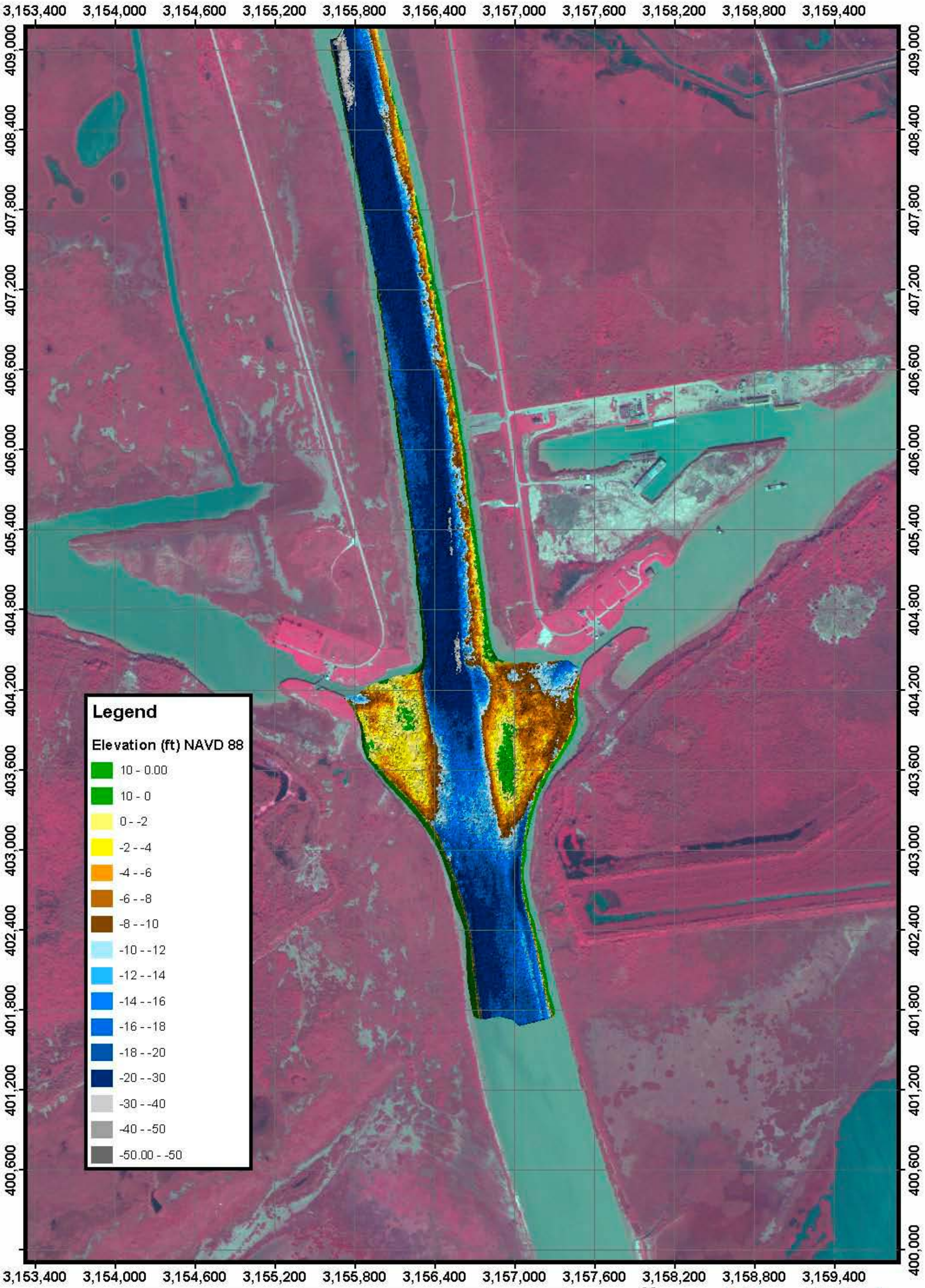

PLATE NUMBER 12

0 125 250 500 750 1,000
Feet

Base Test
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		05/11/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX		R DAVINROY, P.E.
... Galveston/Fleming		07/01/2009

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St. Louis District

PLATE NUMBER 13

0 75 150 300 450 600
Feet

Base Test
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 03/24/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
... Galveston/Plaza | 07/01/2009

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St. Louis District

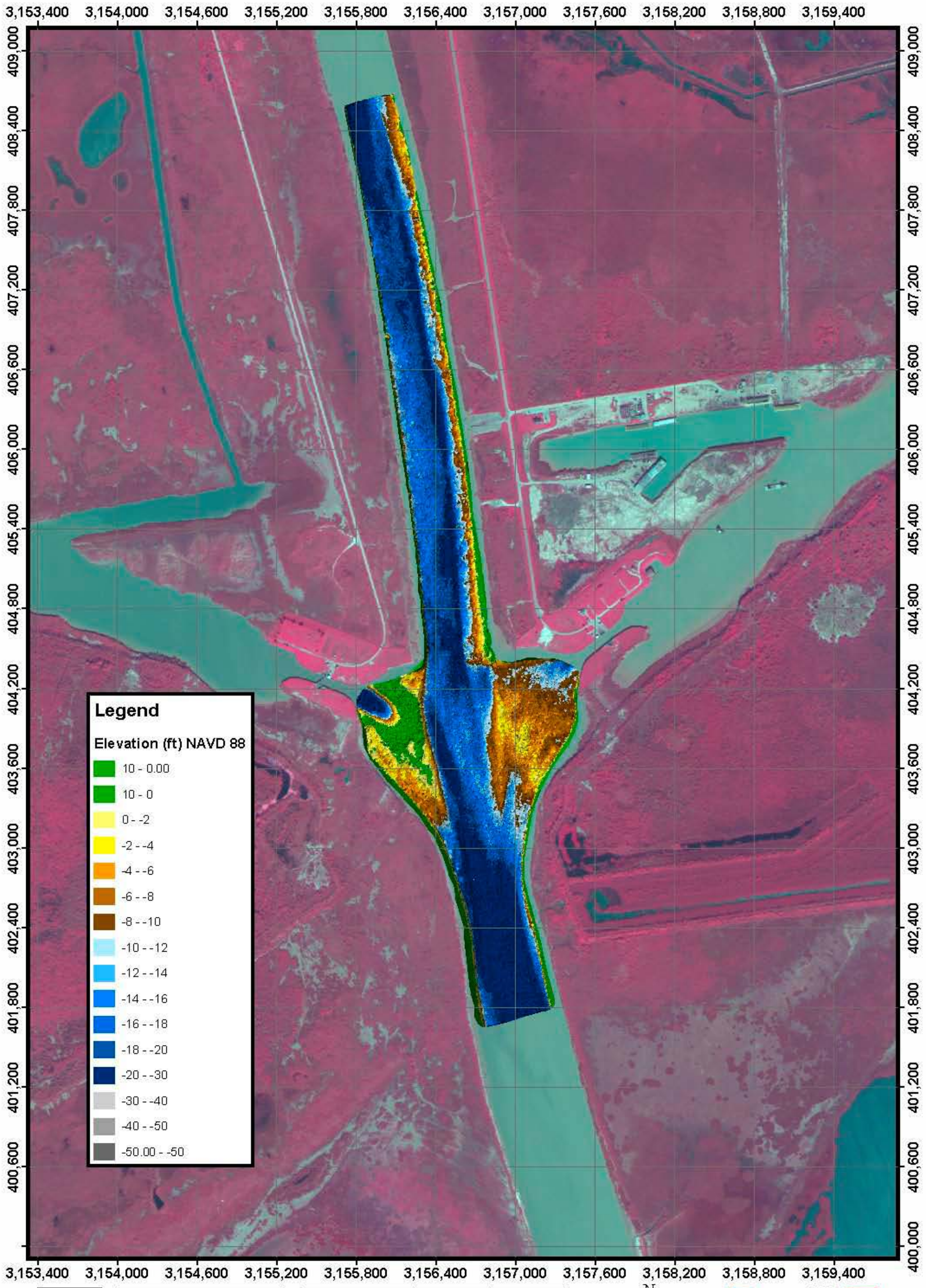

PLATE NUMBER 14

0 125 250 500 750 1,000
Feet

Base Test
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		05/11/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX		R DAVINROY, P.E.
... Galveston/Plano		07/07/2009

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US Army Corps of Engineers
St. Louis District

PLATE NUMBER 15

0 75 150 300 450 600
Feet

Base Test
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		00/00/00 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
... Galveston/Plans	07/01/2009	

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US Army Corps of Engineers
St. Louis District

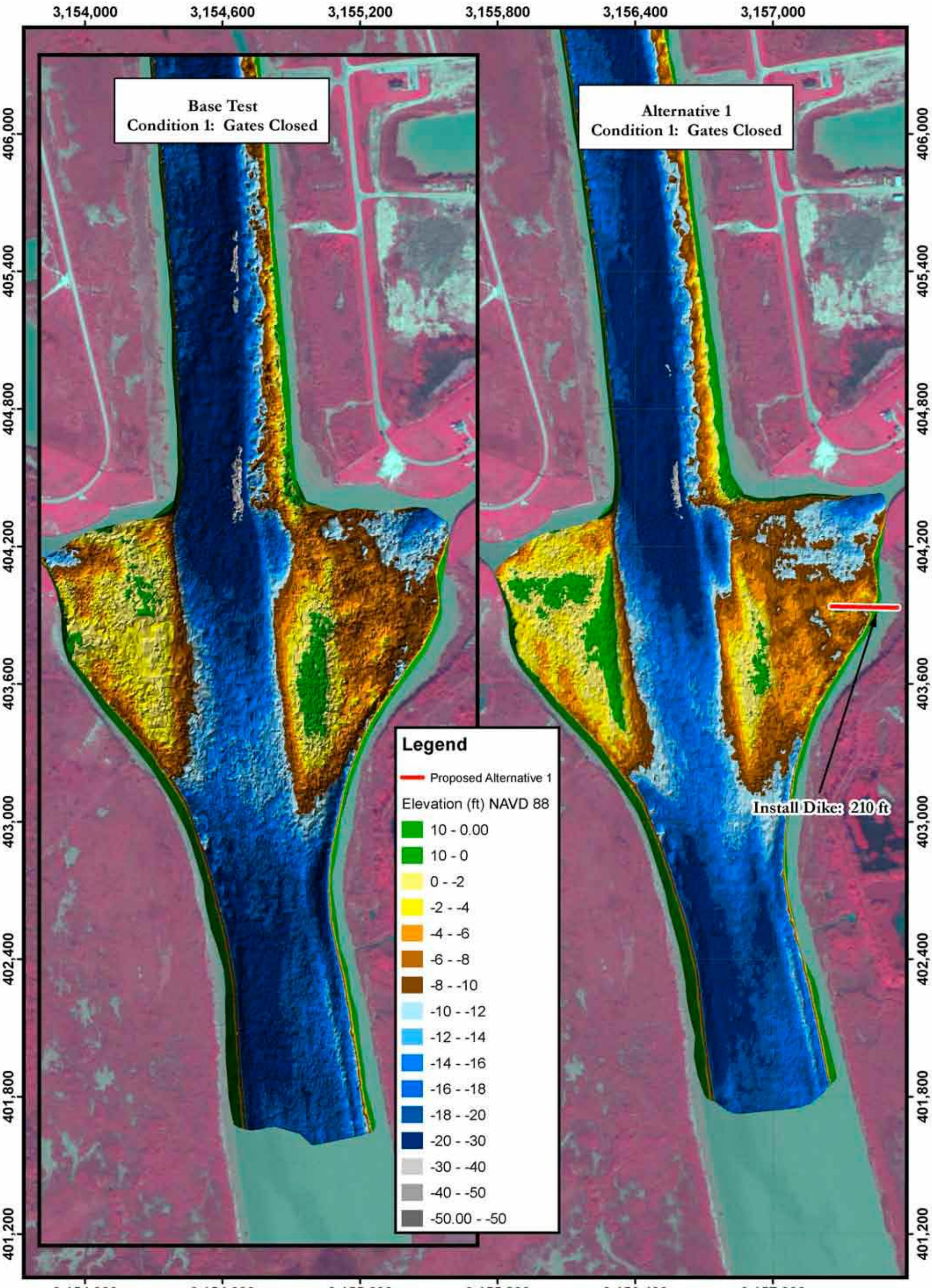

PLATE NUMBER 16

0 75 150 300 450 600
Feet

Alternative 1 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/11/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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US Army Corps of Engineers
St. Louis District

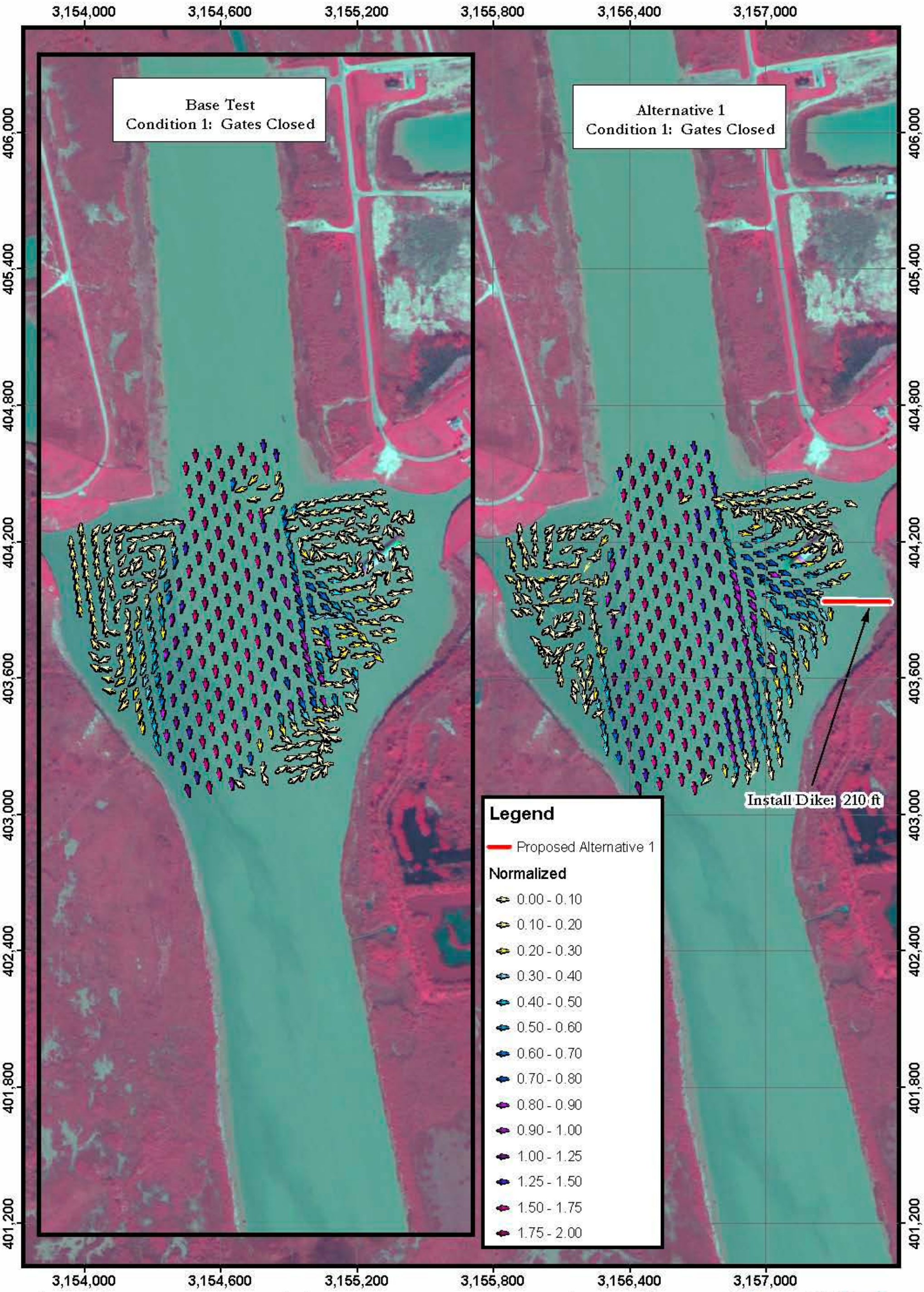

PLATE NUMBER 17

0 75 150 300 450 600
Feet

Alternative 1 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Bayou River Basin
Galveston District
Bayou Rivers and GIWW Crossing
HSR Model

A COX		03/11/09 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
... Galveston/Houston		07/06/2009

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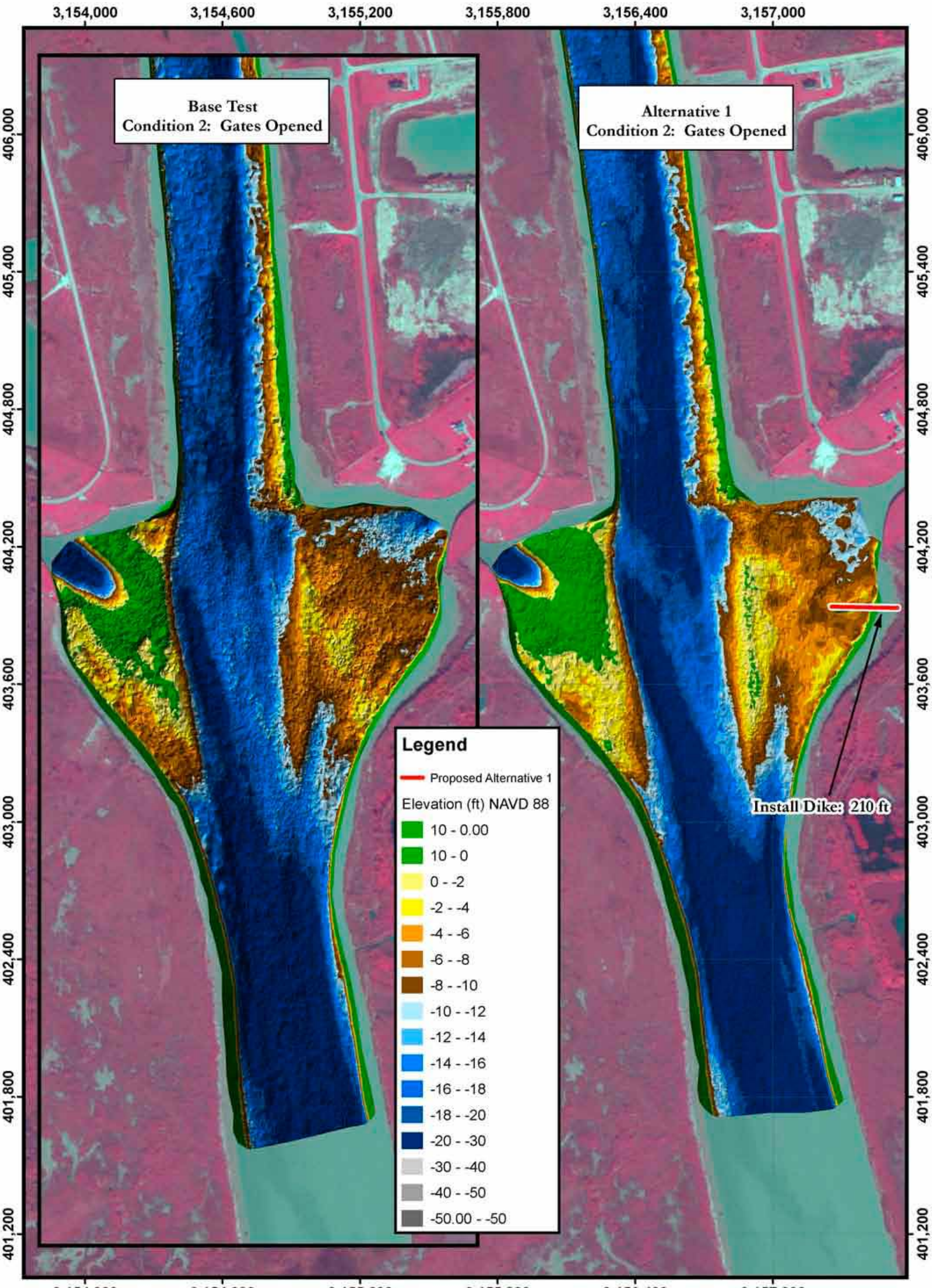

PLATE NUMBER 18

0 75 150 300 450 600
Feet

Alternative 1 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/12/09 Scan	
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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St. Louis District

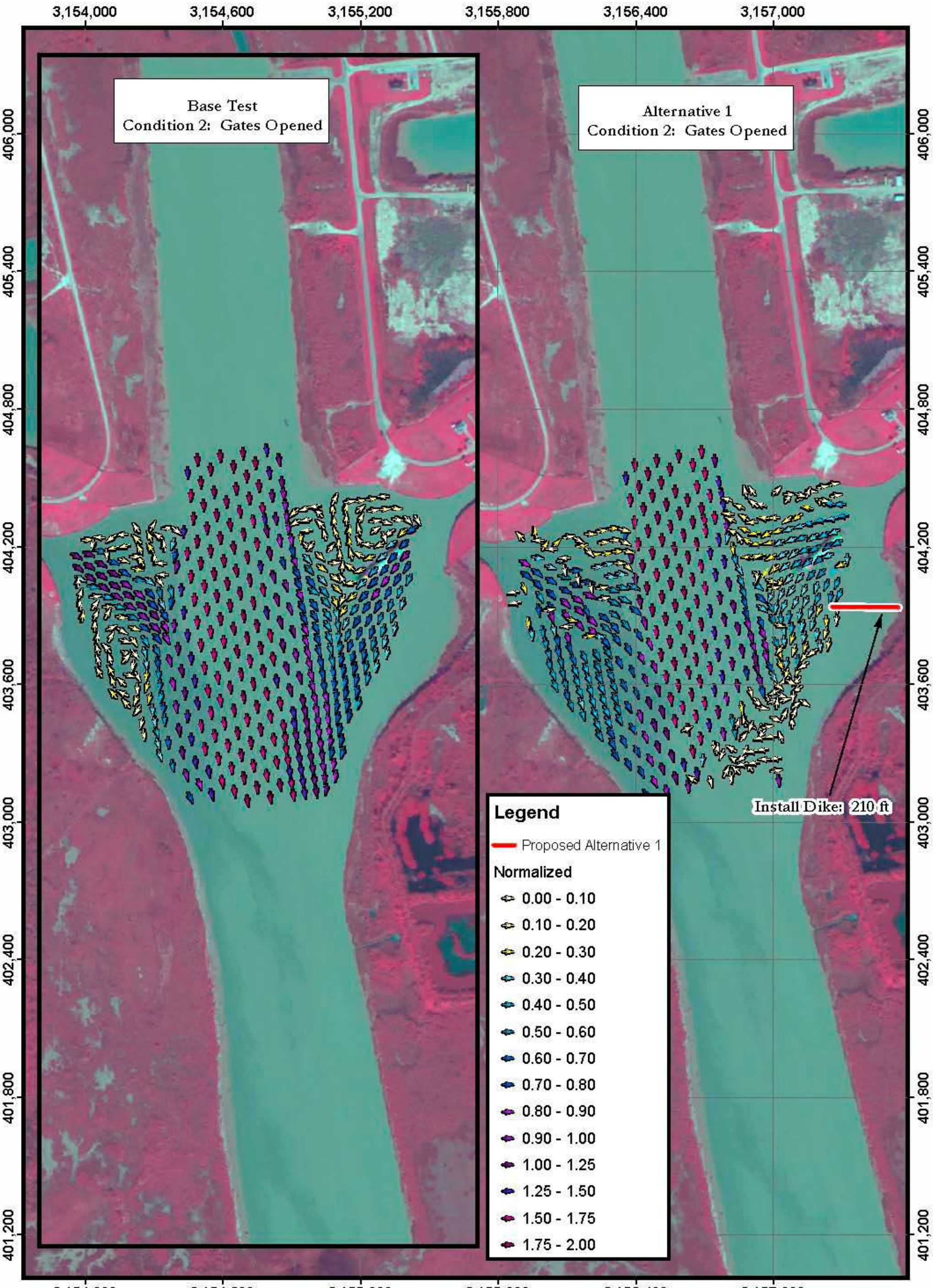

PLATE NUMBER 19

0 75 150 300 450 600
Feet

Alternative 1 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Corridor
HSR Model

DESIGNED: A COX
DRAWN: A COX
REVIEWED: J BROWN, PE.
DESIGN EST: E BRAUER, PE.
SUBMITTED: A COX
APPROVED: R DAVINROY, PE.
SCALE: 03/12/04 Scan
FILENAME: ...Galveston/Plates
REV DATE: 07/08/2004

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US Army Corps of Engineers
St. Louis District

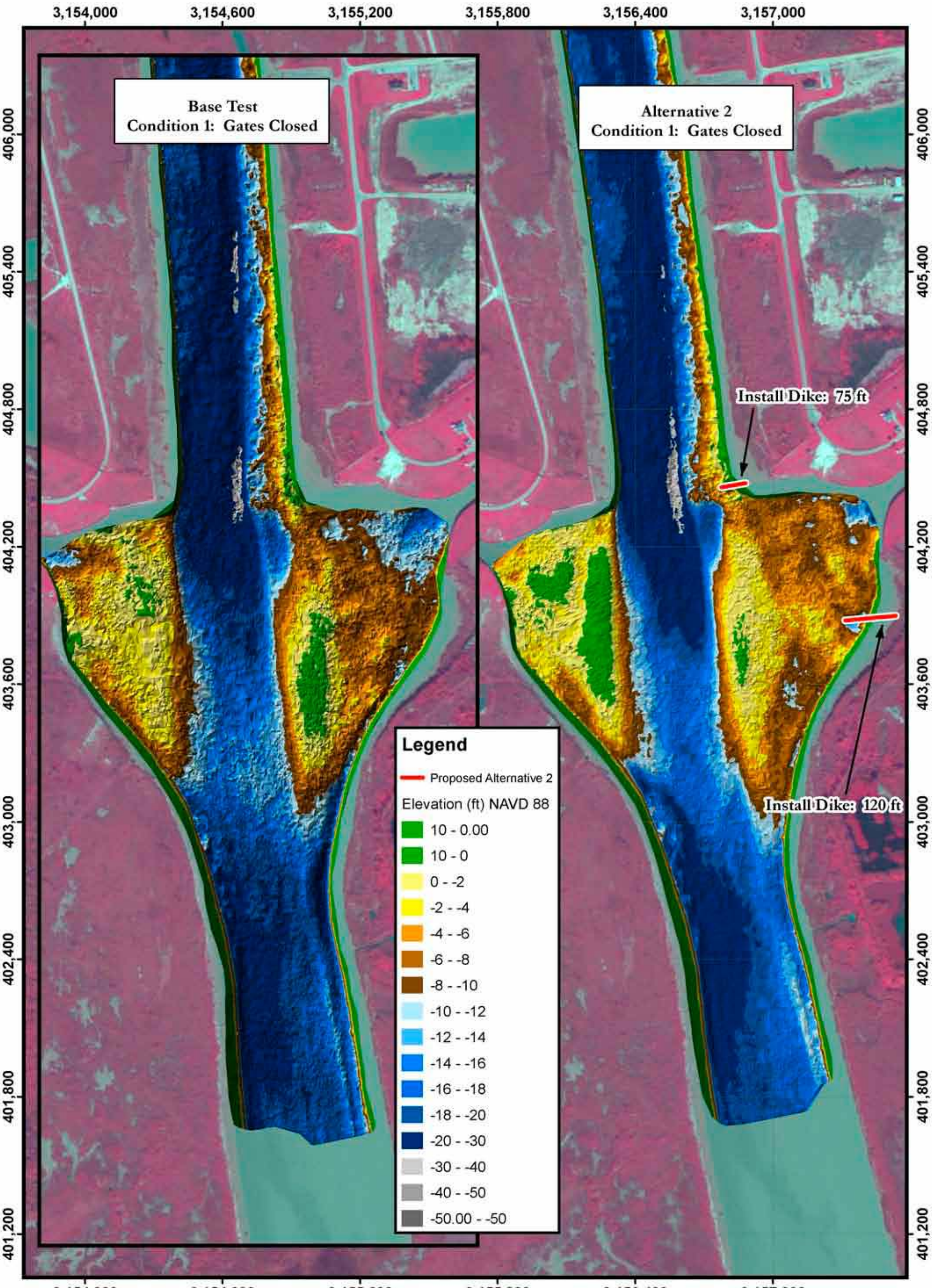

PLATE NUMBER 20

0 75 150 300 450 600
Feet

Alternative 2 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/12/09 Scan
	A COX / J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.
	...Galveston/Plates	07/07/2009

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US Army Corps of Engineers
St. Louis District

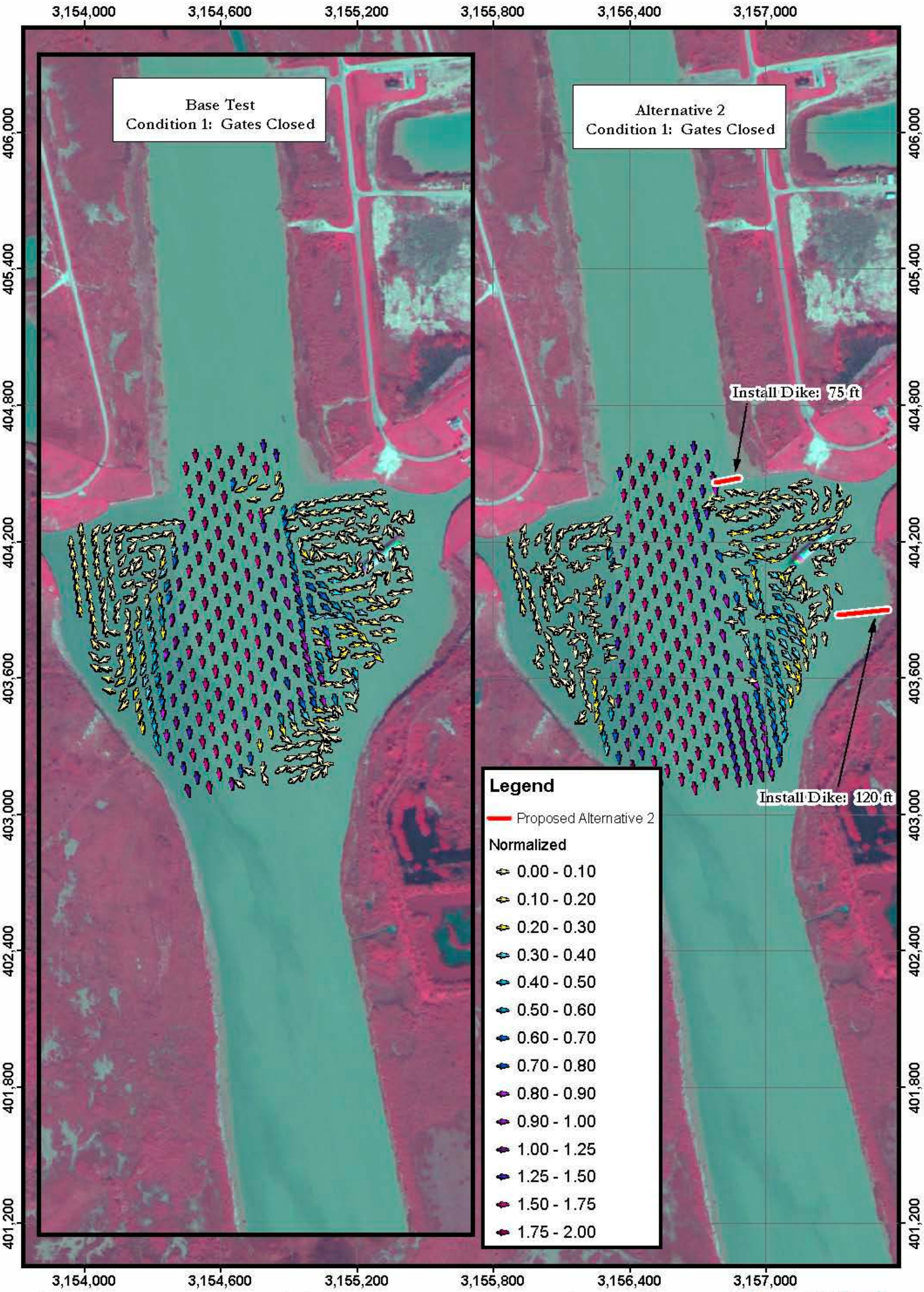

PLATE NUMBER 21

0 75 150 300 450 600
Feet

Alternative 2 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 03/12/04 Scan
A COX | J BROWN, PE. | E BRAUER, PE.
A COX | R DAVINROY, PE.
... Galveston/Florida | 07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

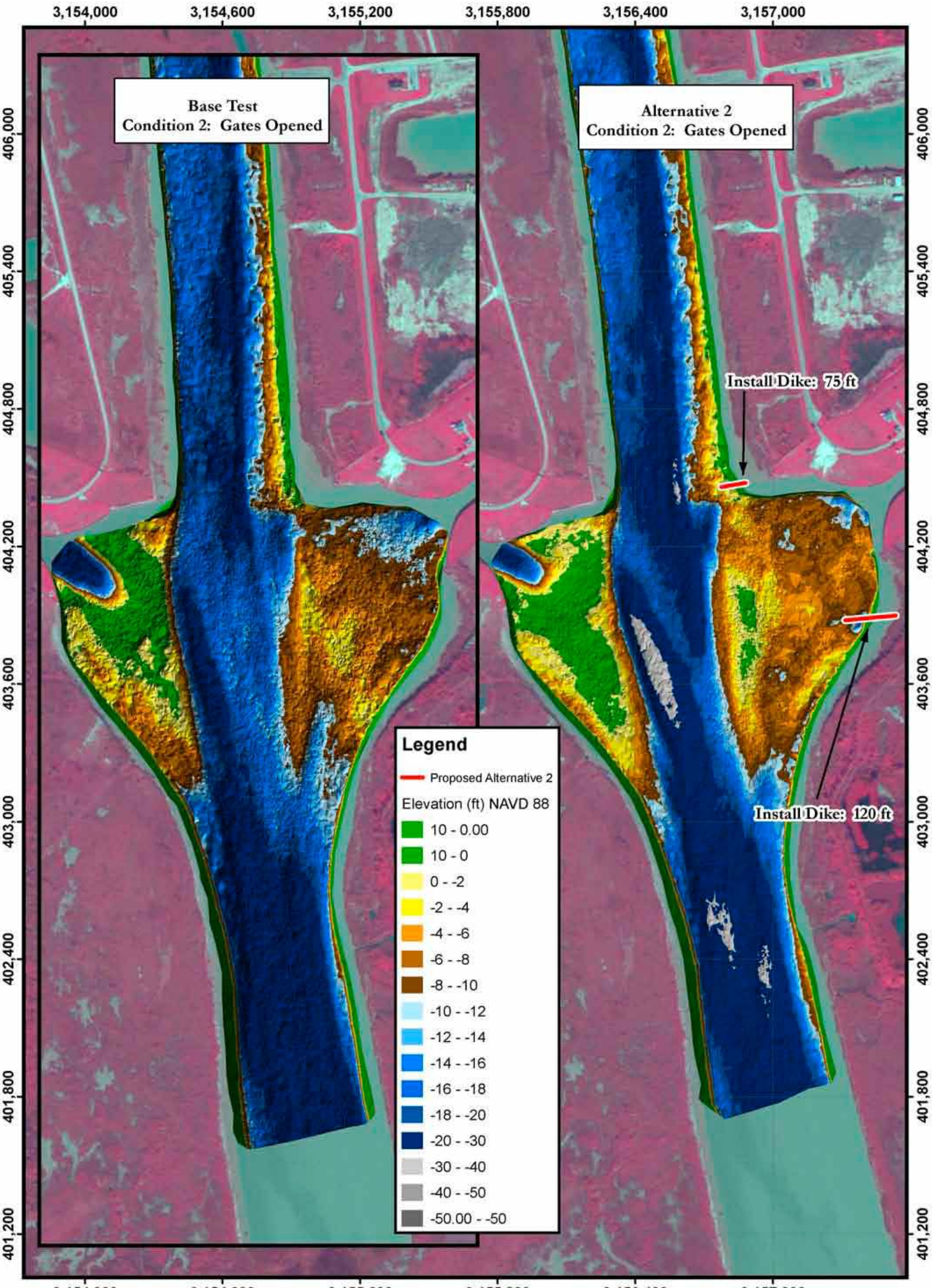

PLATE NUMBER 22

0 75 150 300 450 600
Feet

Alternative 2 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/12/09 Scan	
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

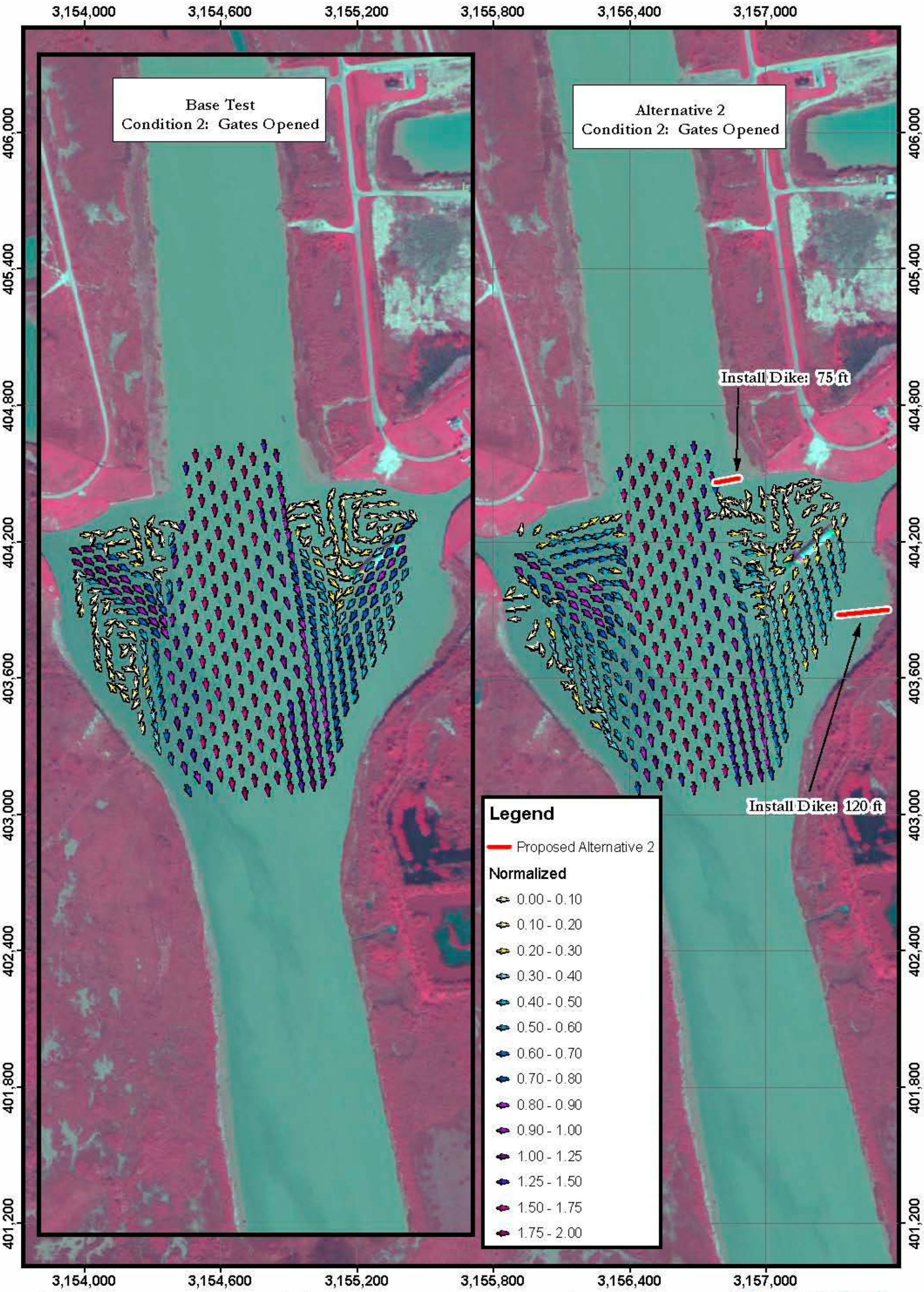

PLATE NUMBER 23

0 75 150 300 450 600
Feet

Alternative 2 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		03/12/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
...Galveston/Plots		07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

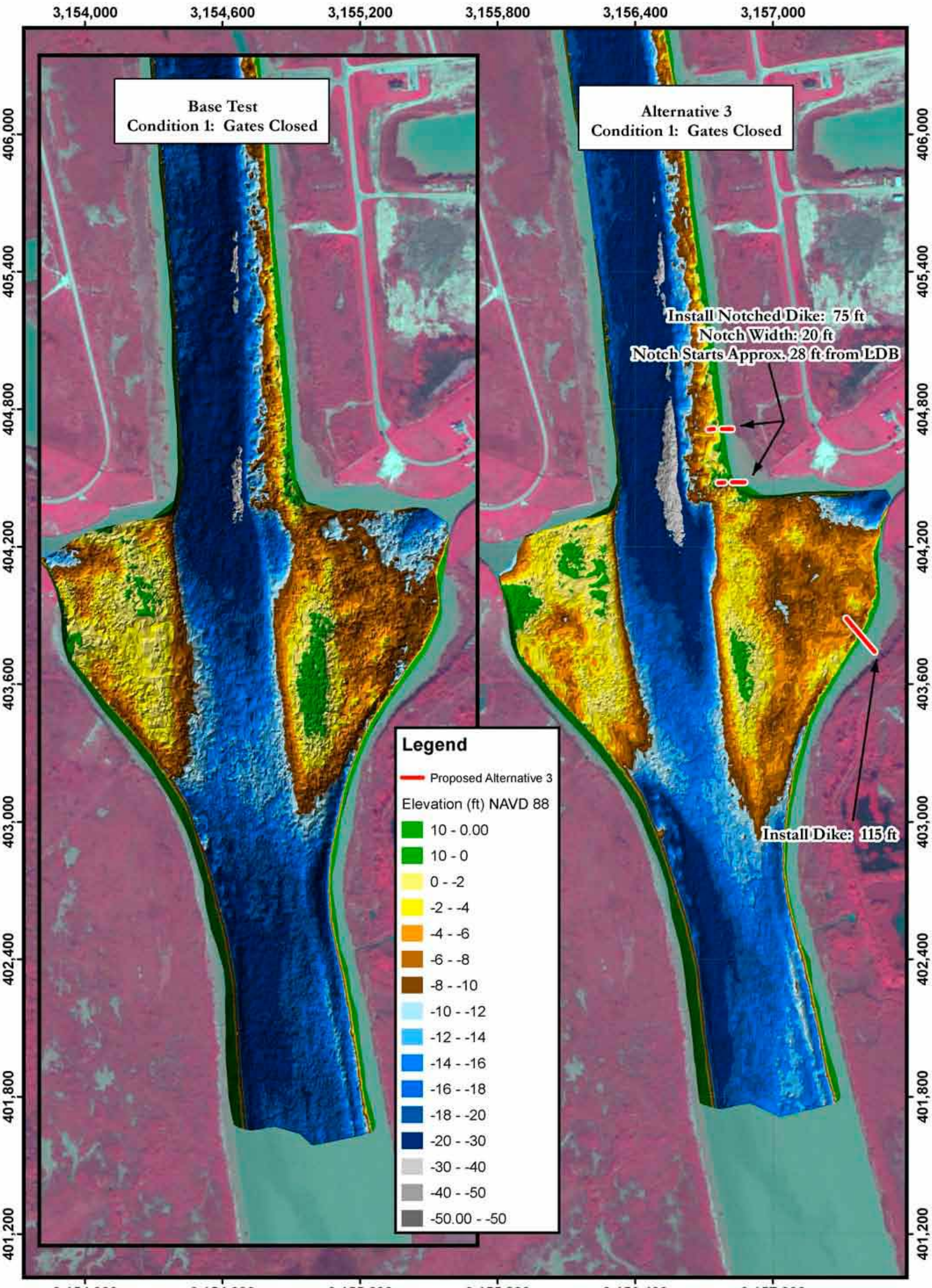

PLATE NUMBER 24

0 75 150 300 450 600
Feet

Alternative 3 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		03/12/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX		R DAVINROY, P.E.
...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

PLATE NUMBER 25

0 75 150 300 450 600
Feet

Alternative 3 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		03/15/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
... Galveston/Houston		07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

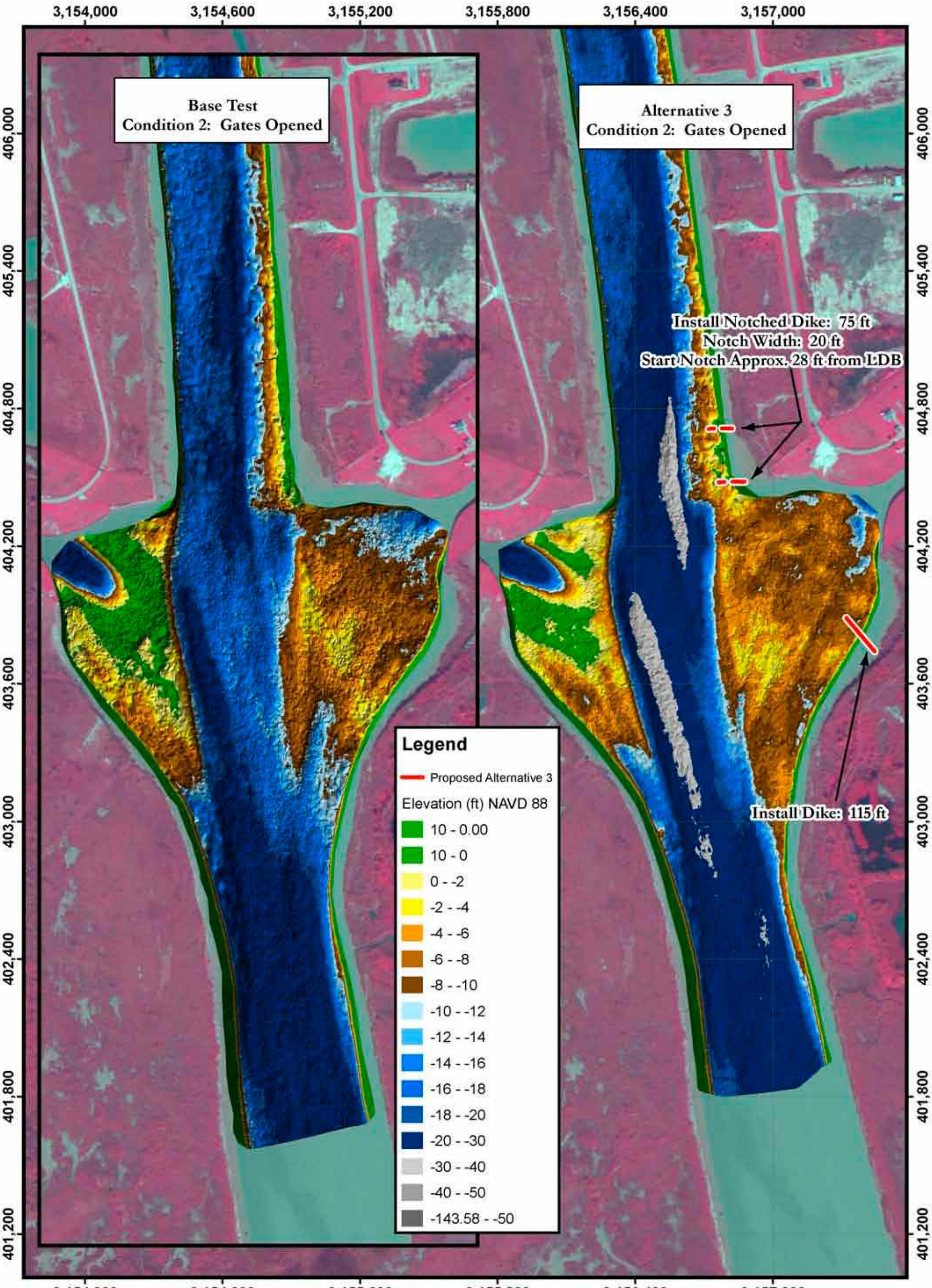

PLATE NUMBER 26

0 75 150 300 450 600
Feet

Alternative 3 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/13/09 Scan	
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

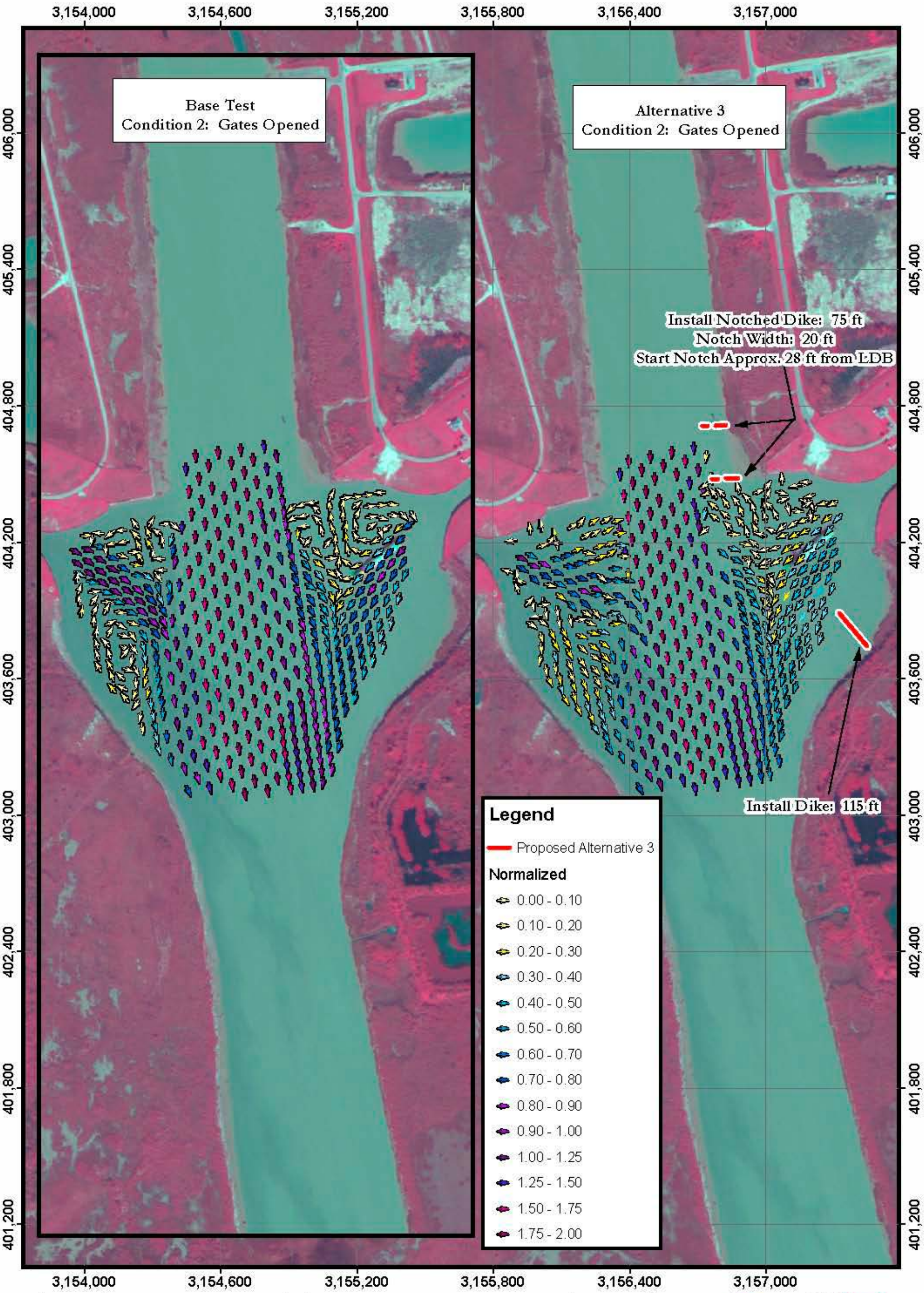

PLATE NUMBER 27

0 75 150 300 450 600
Feet

Alternative 3 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

A COX		03/15/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

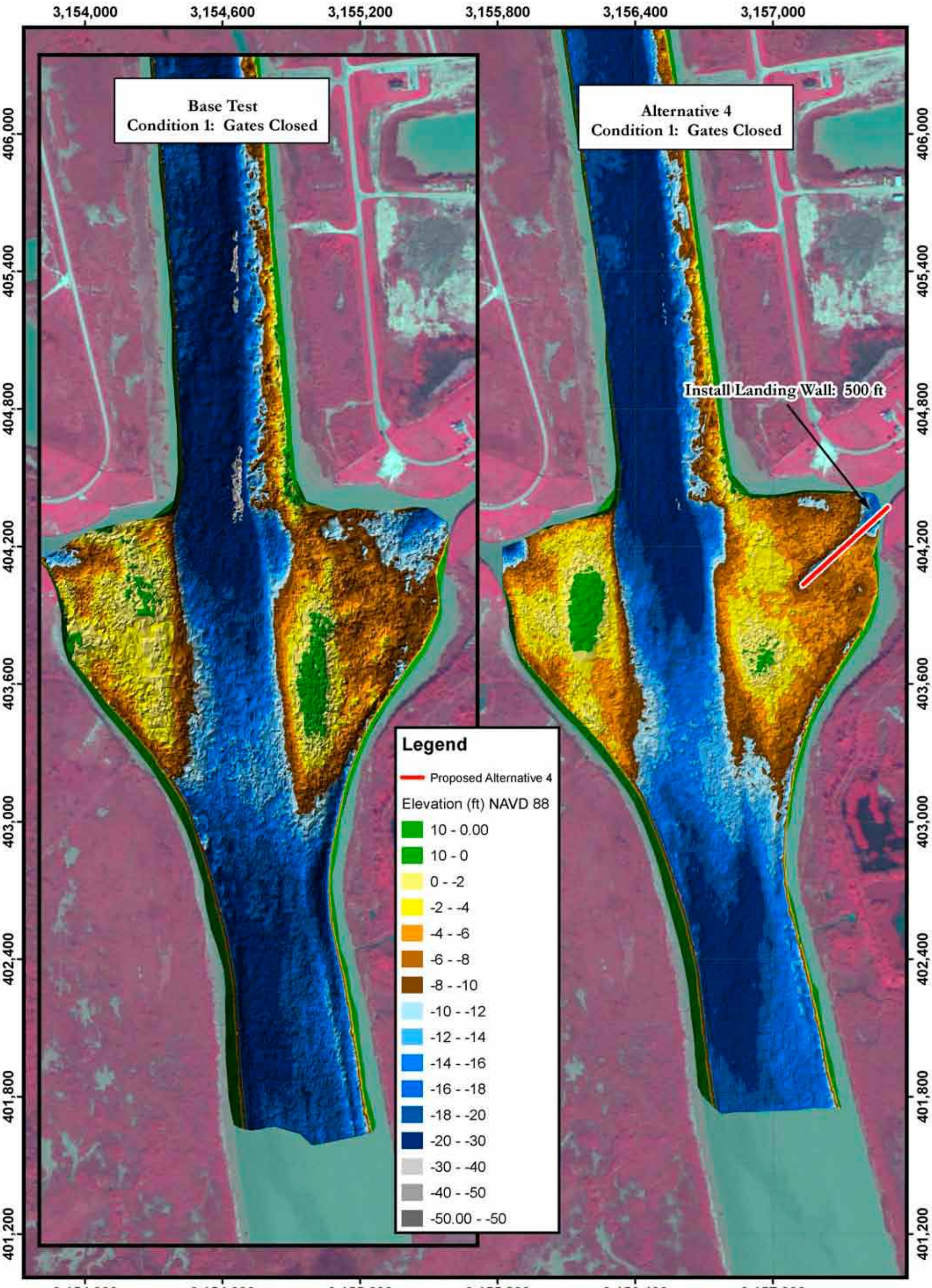

PLATE NUMBER 28

0 75 150 300 450 600
Feet

Alternative 4 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/16/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

PLATE NUMBER 29

0 75 150 300 450 600
Feet

Alternative 4 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 03/18/04 Scale
A COX | J BROWN, PE. | E BRAUER, PE.
A COX | R DAVINROY, PE.
... Galveston/Florida | 07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

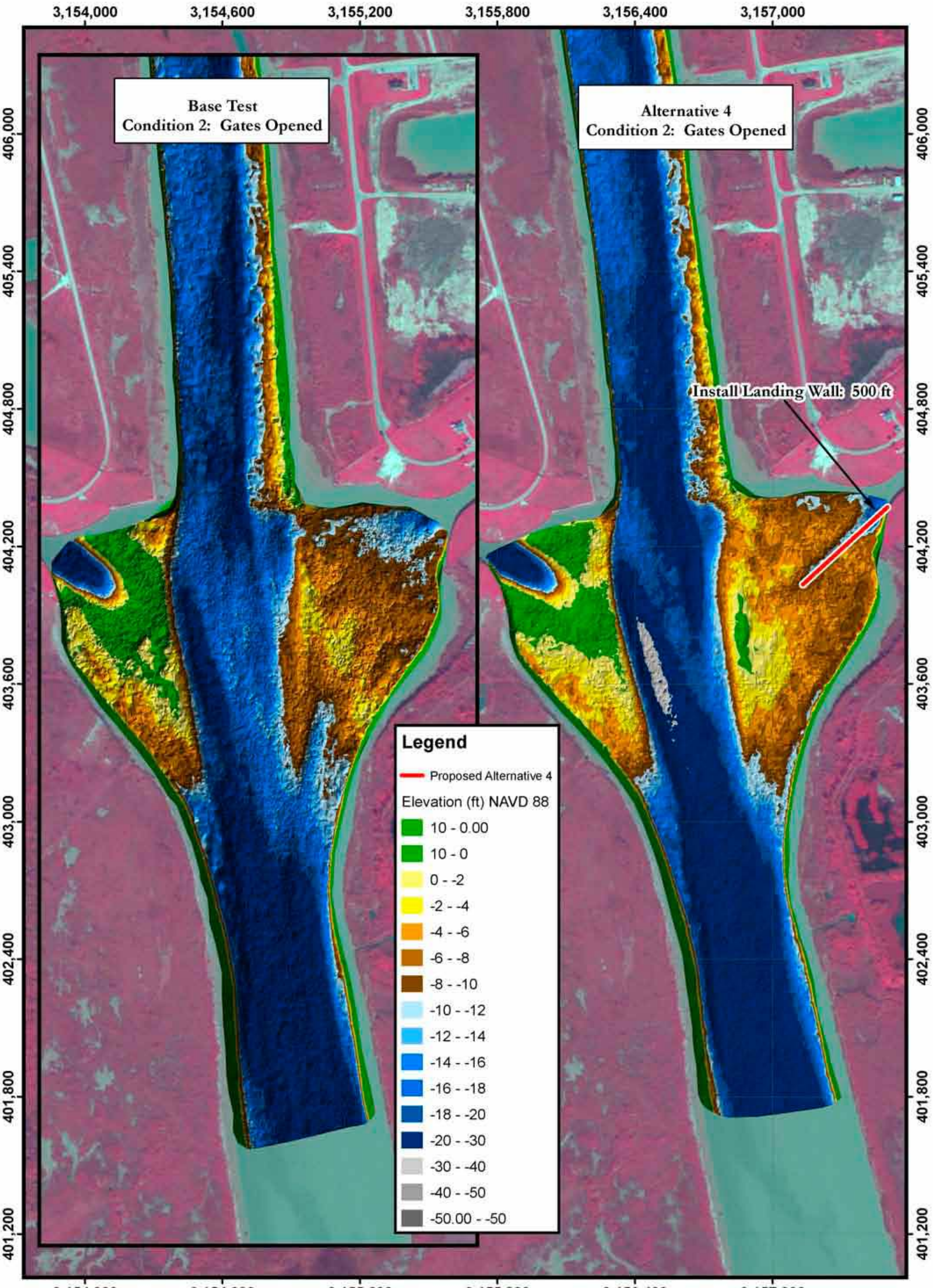

PLATE NUMBER 30

0 75 150 300 450 600
Feet

Alternative 4 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/16/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

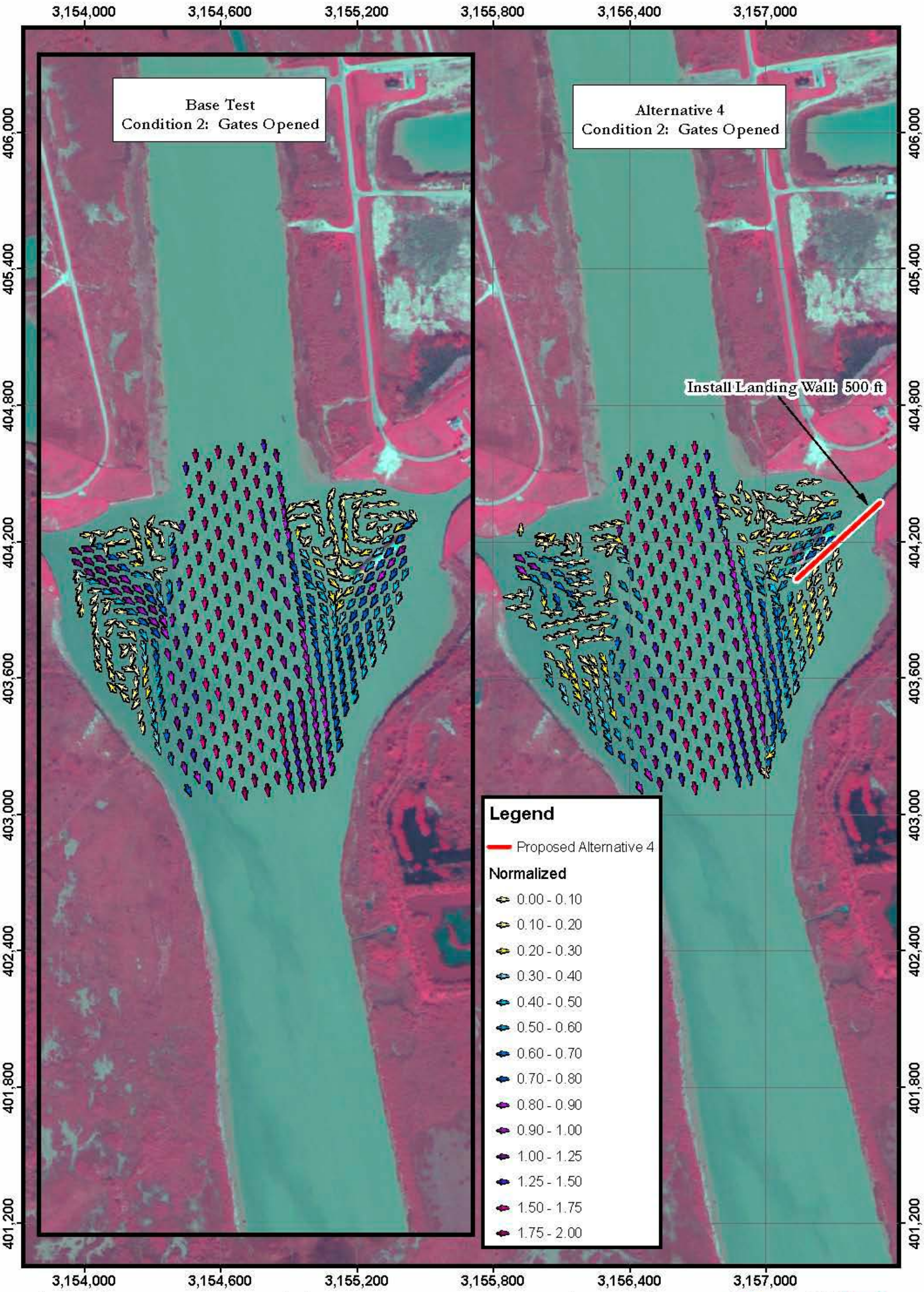

PLATE NUMBER 31

0 75 150 300 450 600
Feet

Alternative 4 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		03/26/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
... Galveston/Houston		07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

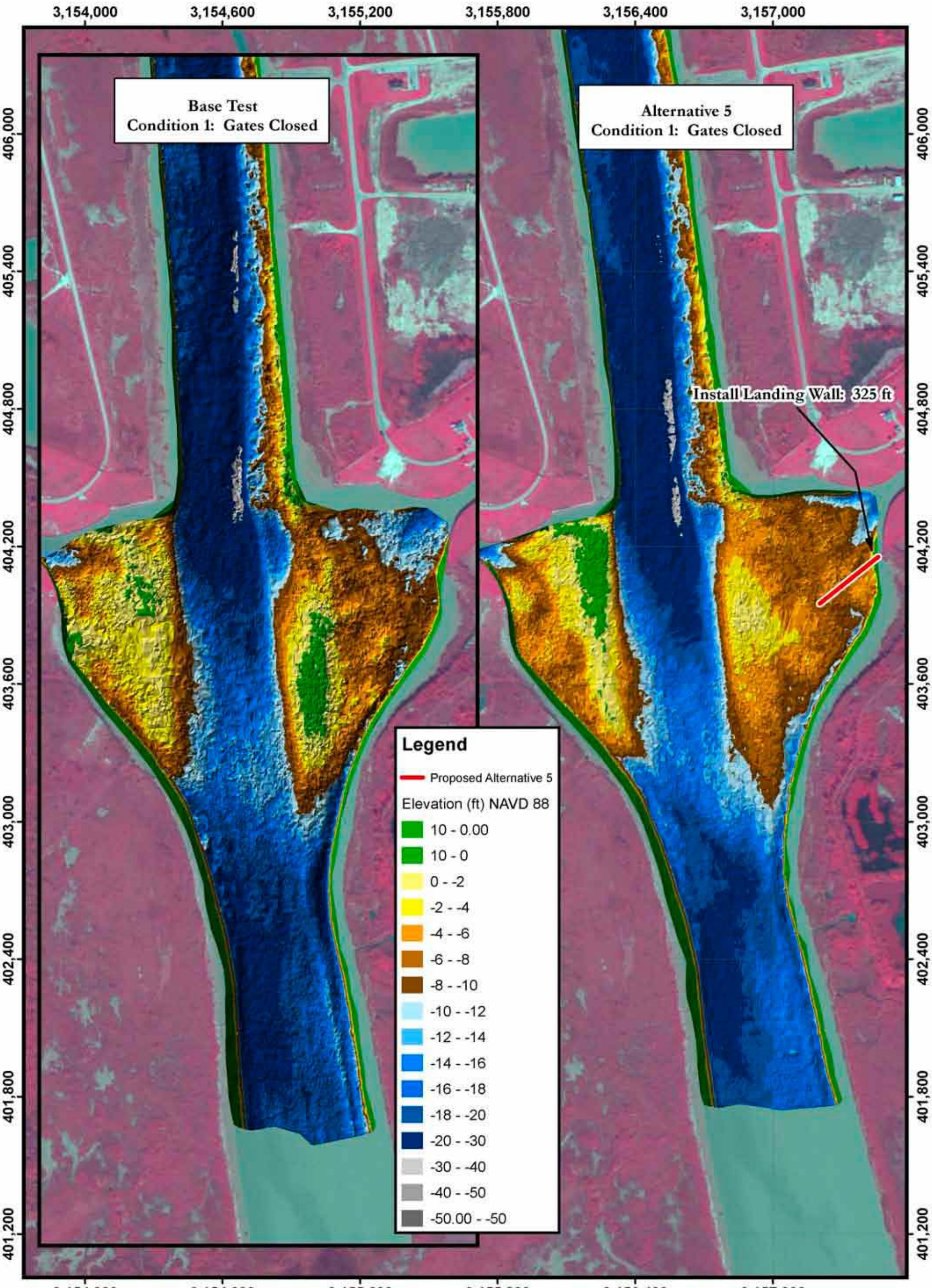

PLATE NUMBER 32

0 75 150 300 450 600
Feet

Alternative 5 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/16/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

PLATE NUMBER 33

0 75 150 300 450 600
Feet

Alternative 5 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Cross Ing
HSR Model

A COX		03/27/09 Scan
A COX	JE BROWN, PE.	E BRAUER, PE.
A COX	R DAVINROY, PE.	
... Galveston/Plate	07/06/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

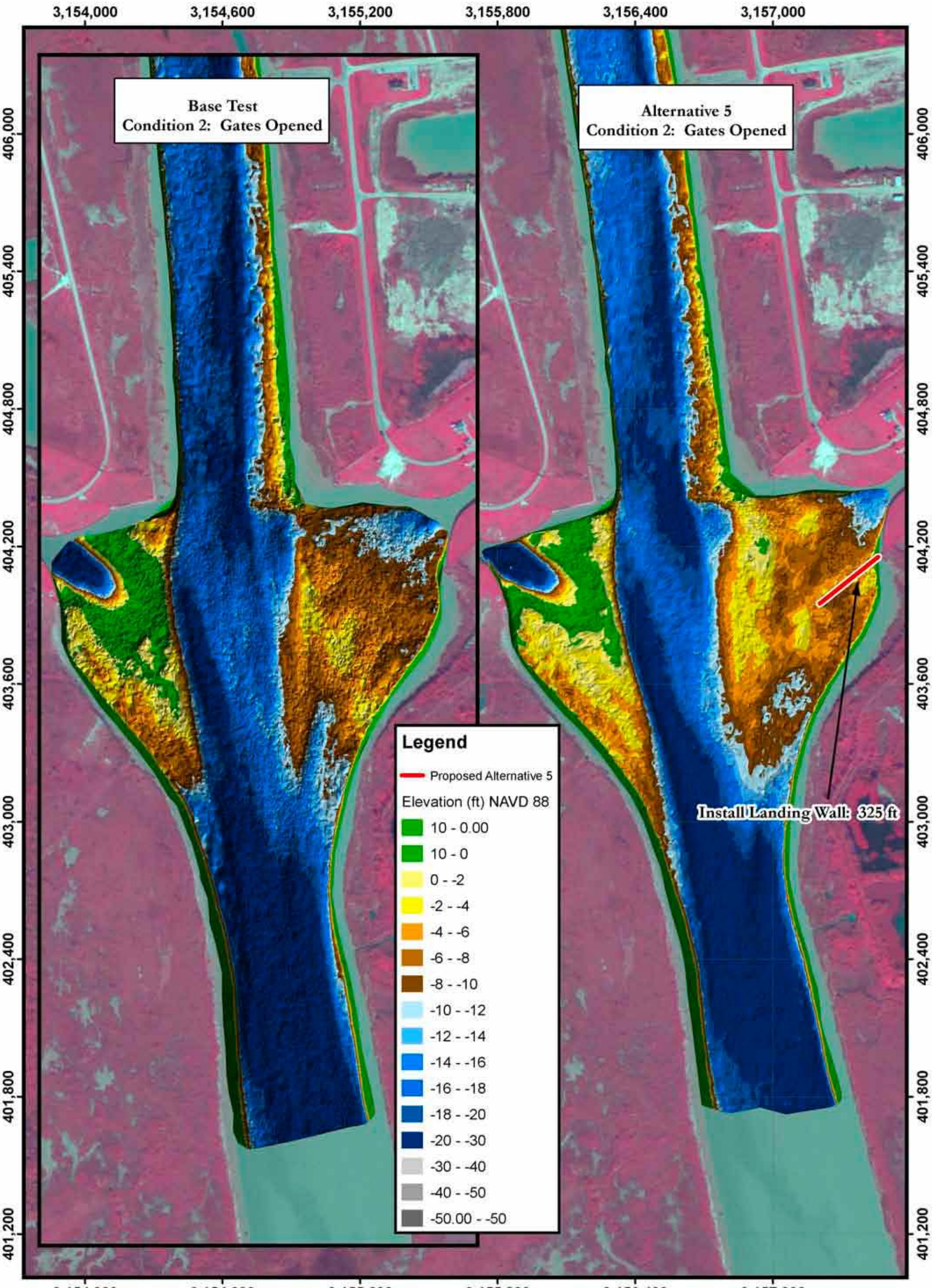

PLATE NUMBER 34

0 75 150 300 450 600
Feet

Alternative 5 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/17/09 Scan	
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

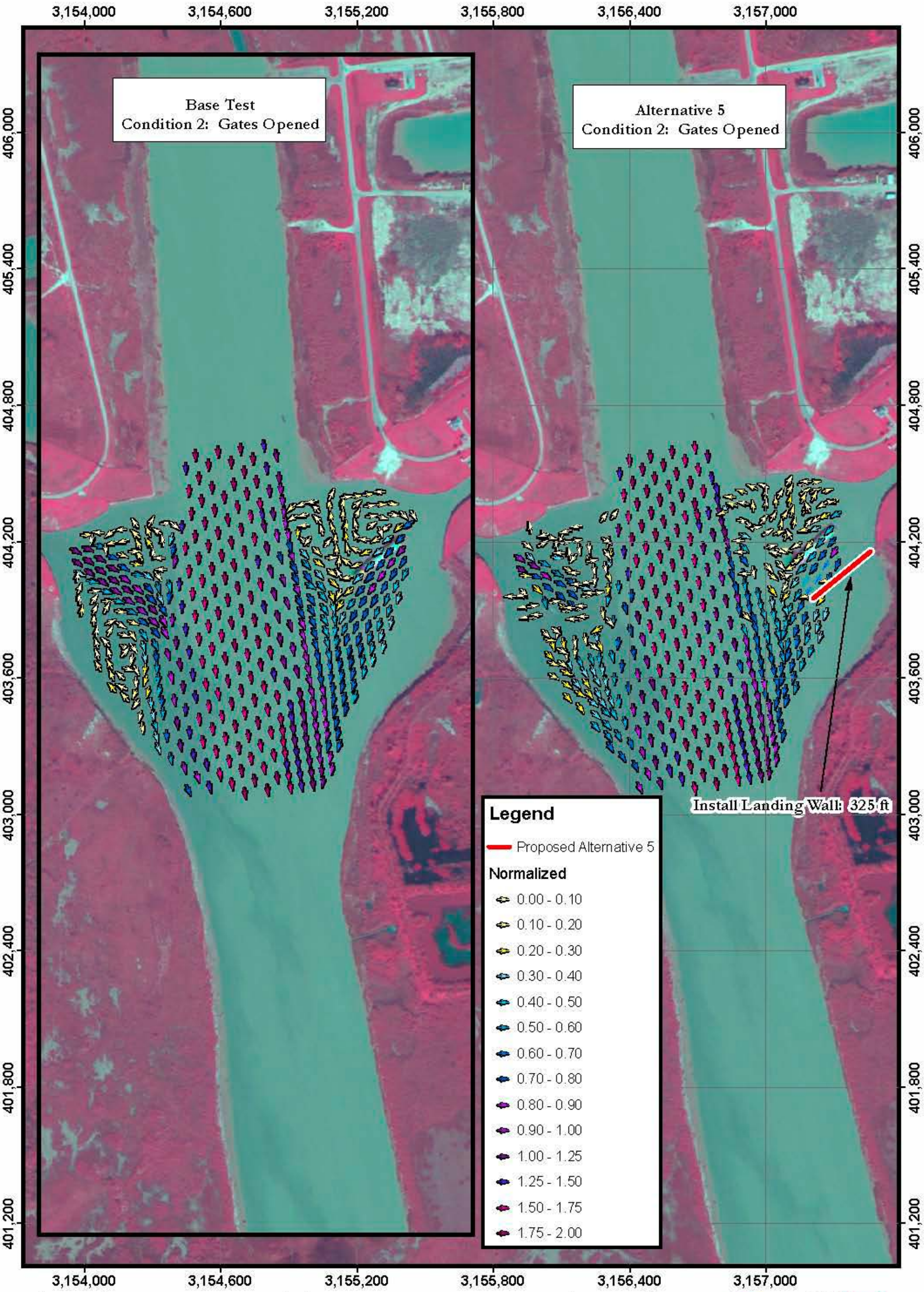

PLATE NUMBER 35

0 75 150 300 450 600
Feet

Alternative 5 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		03/27/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
... Galveston/Houston		07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

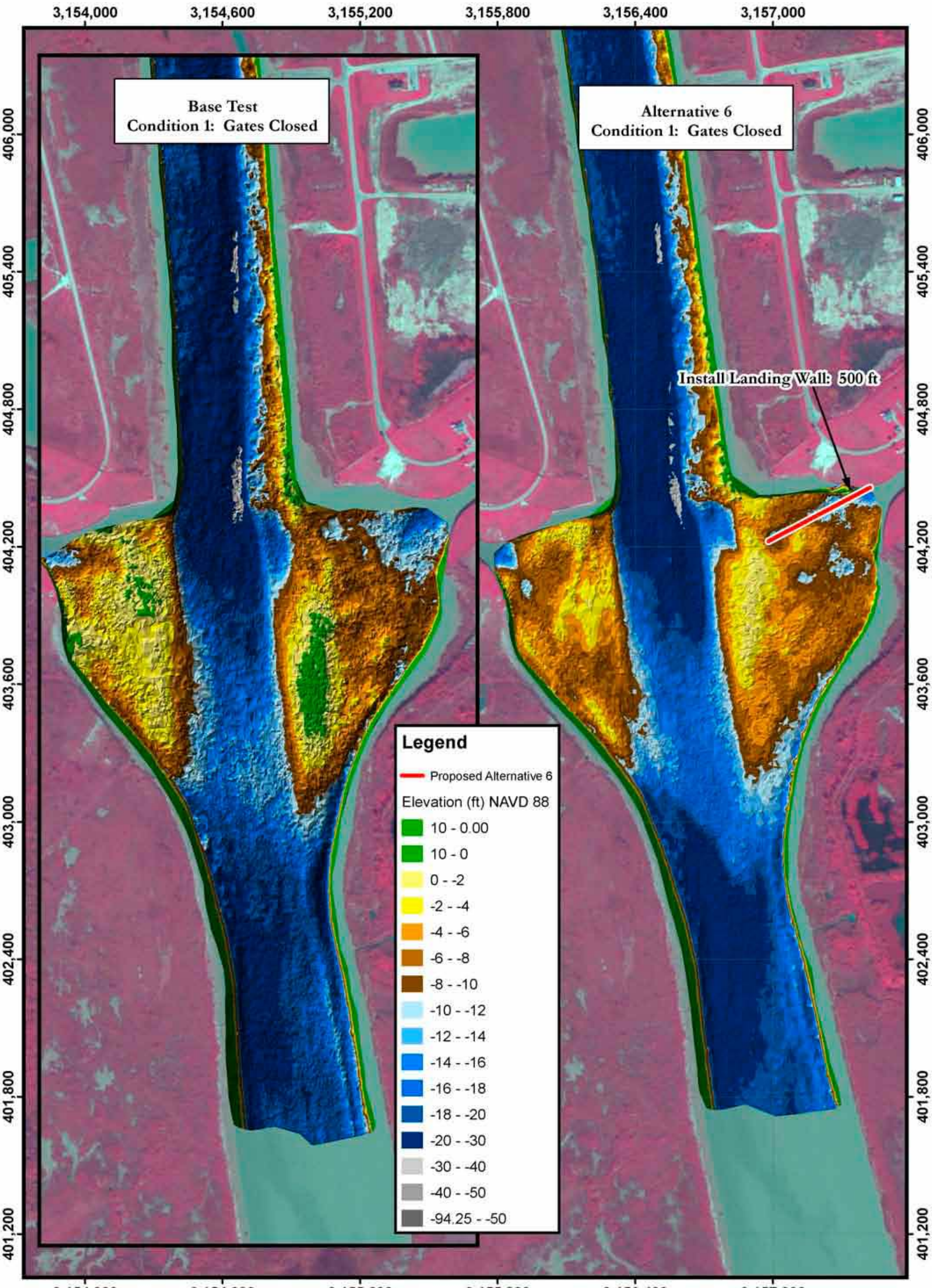

PLATE NUMBER 36

0 75 150 300 450 600
Feet

Alternative 6 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/17/09 Scan	
	A COX	J BROWN, P.E.	F. BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

PLATE NUMBER 37

0 75 150 300 450 600
Feet

Alternative 6 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Bonnet Carré Spillway
Galveston District
Bonnet Carré and GIWW Crossing
HSR Model

A COX		03/23/09 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
...Galveston/Florida		07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

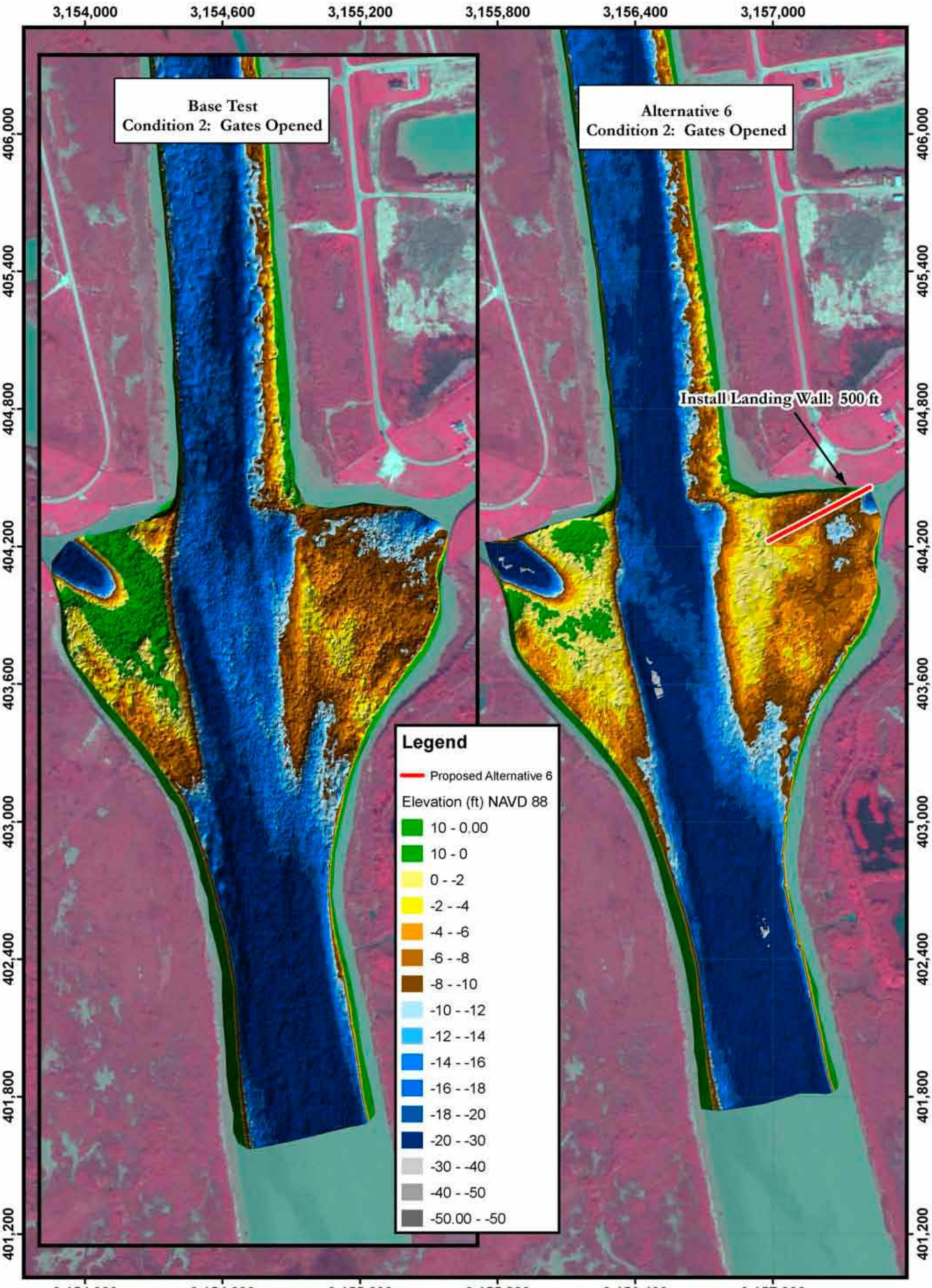

PLATE NUMBER 38

0 75 150 300 450 600
Feet

Alternative 6 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/17/09 Scan	
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

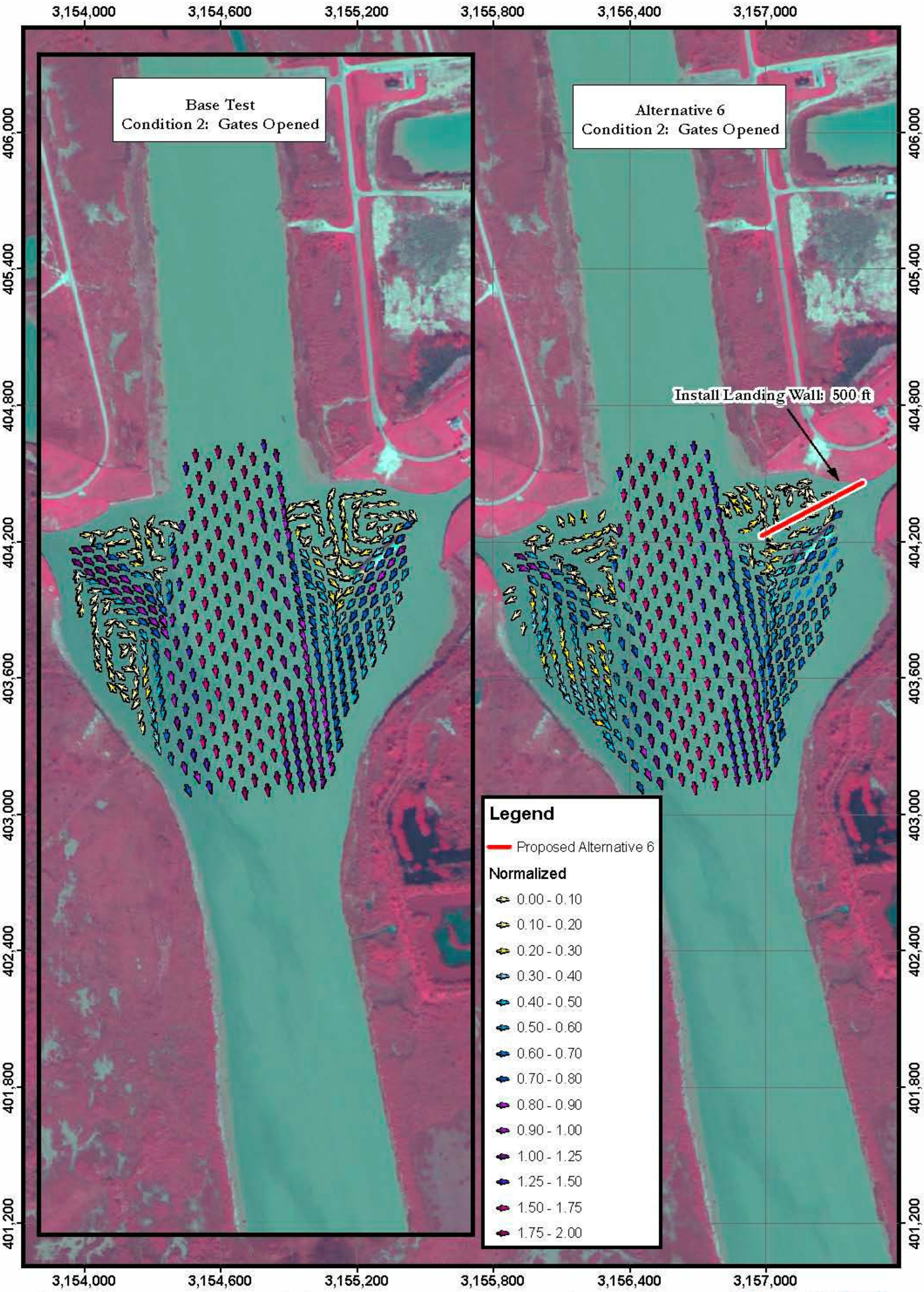

PLATE NUMBER 39

0 75 150 300 450 600
Feet

Alternative 6 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		03/23/09 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
... Galveston/Houston		07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

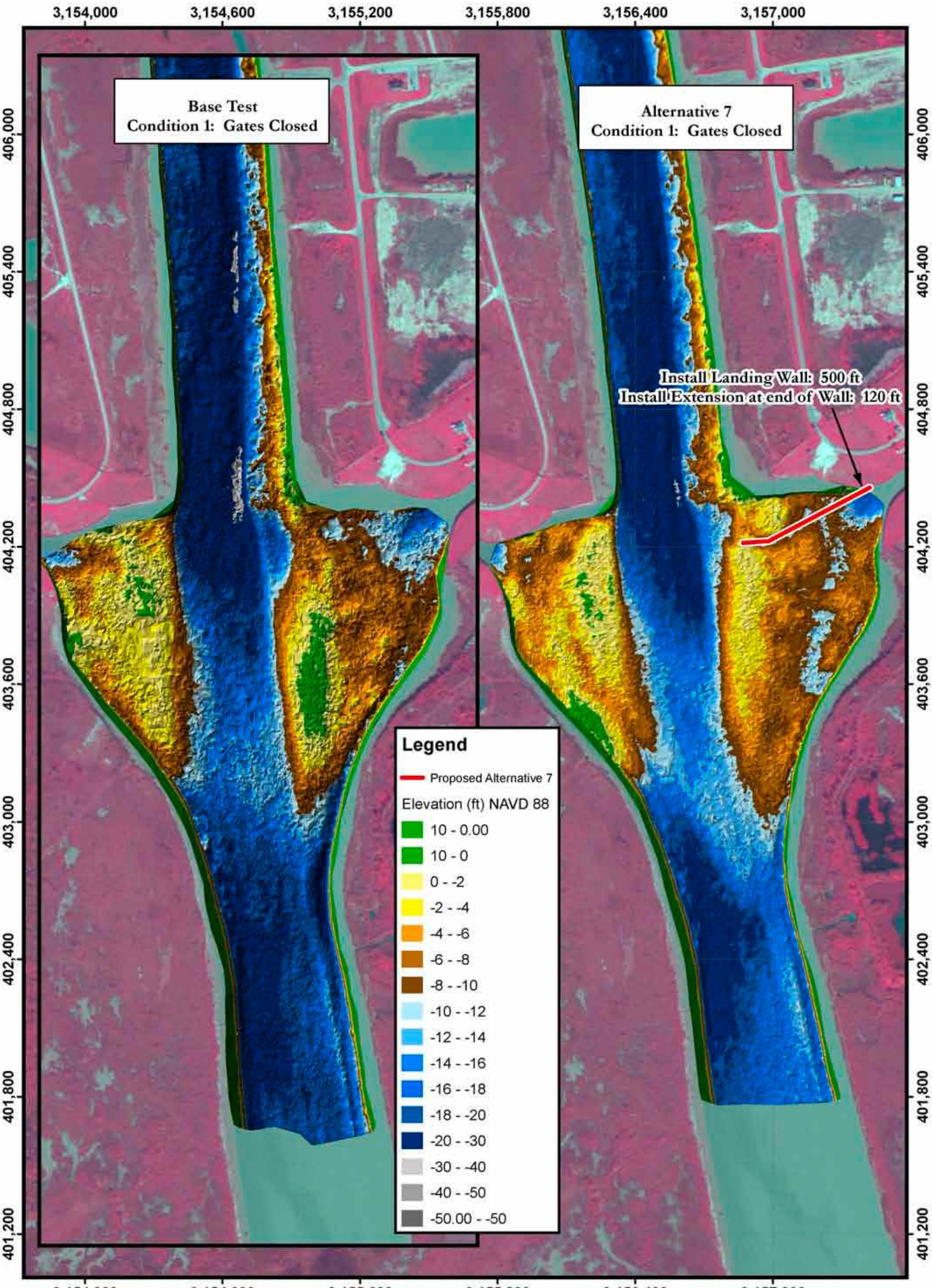

PLATE NUMBER 40

0 75 150 300 450 600
Feet

Alternative 7 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/18/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

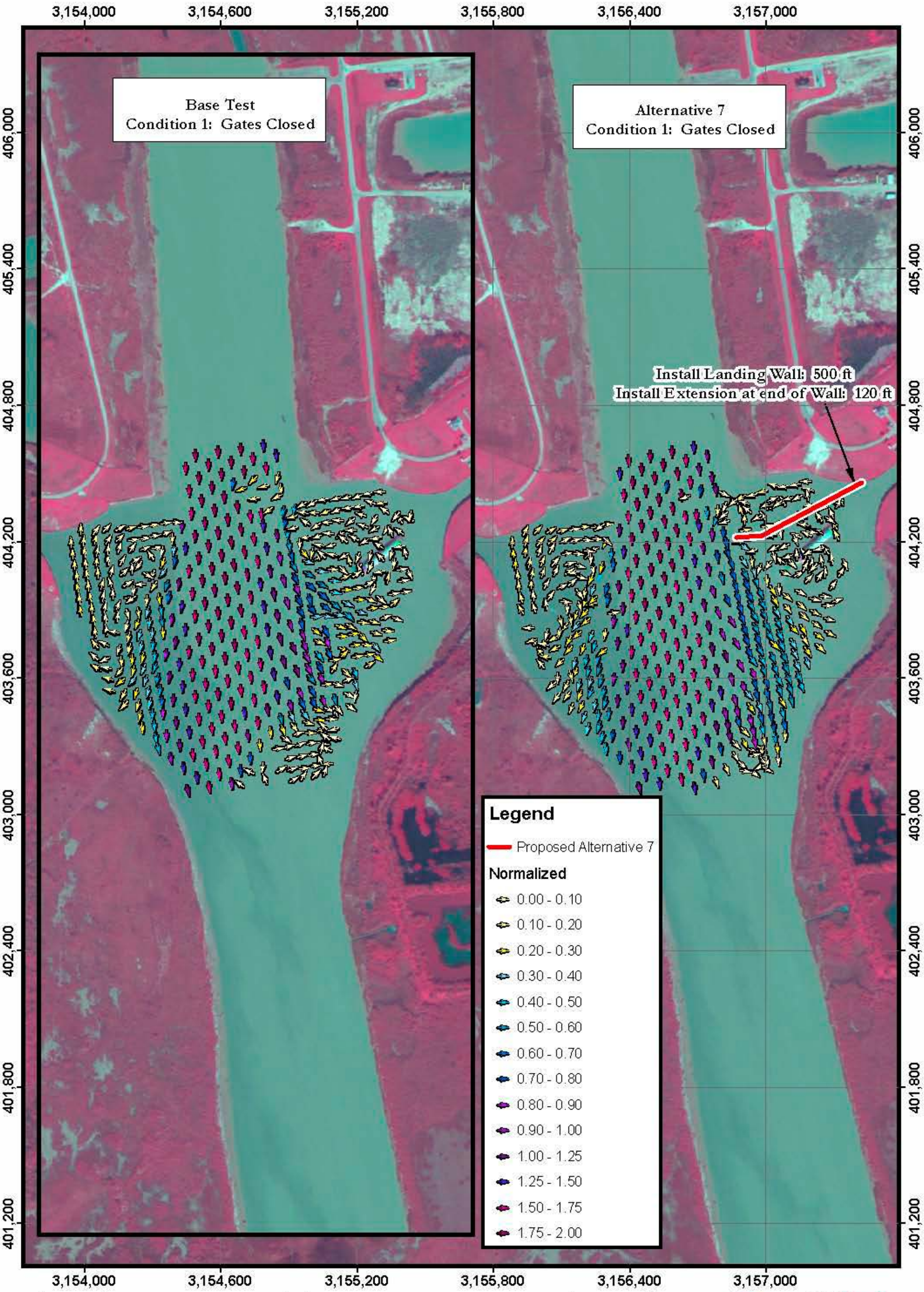

PLATE NUMBER 41

0 75 150 300 450 600
Feet

Alternative 7 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

A COX		03/29/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

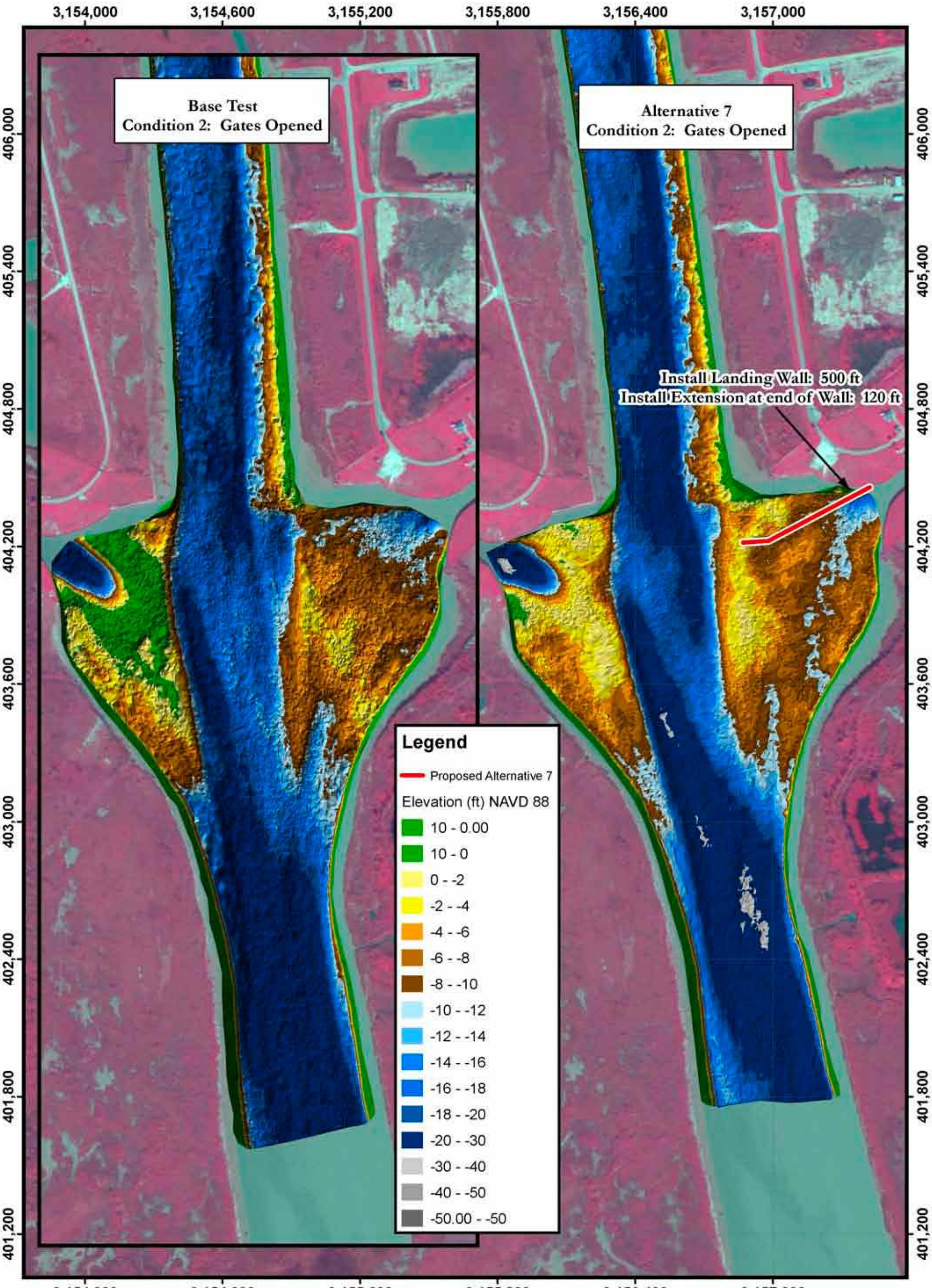

PLATE NUMBER 42

0 75 150 300 450 600
Feet

Alternative 7 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/18/09 Scan	
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

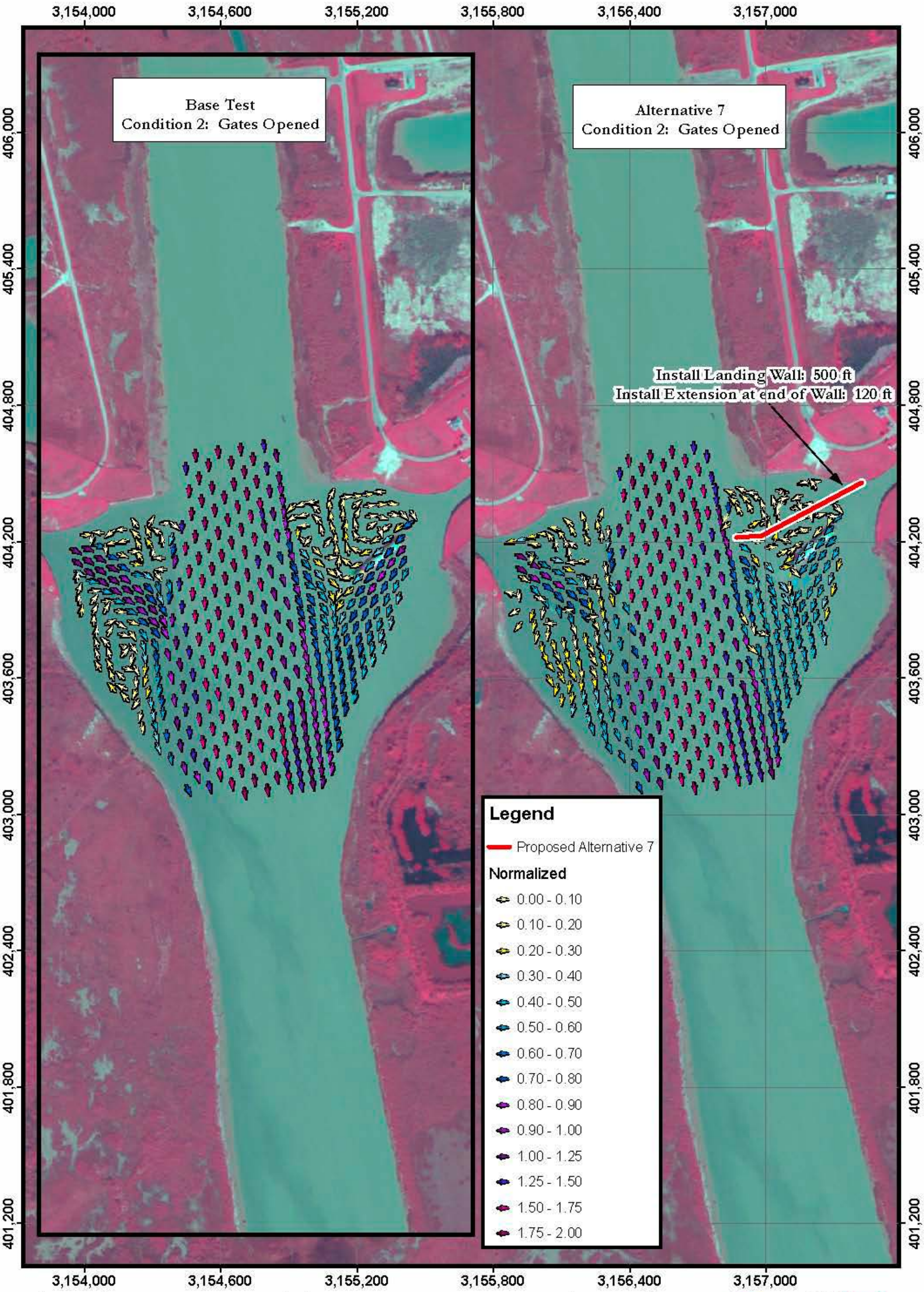

PLATE NUMBER 43

0 75 150 300 450 600
Feet

Alternative 7 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Bayou River Basin
Galveston District
Bayou Rivers and GIWW Crossing
HSR Model

A COX		03/23/09 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
... Galveston/Houston		07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

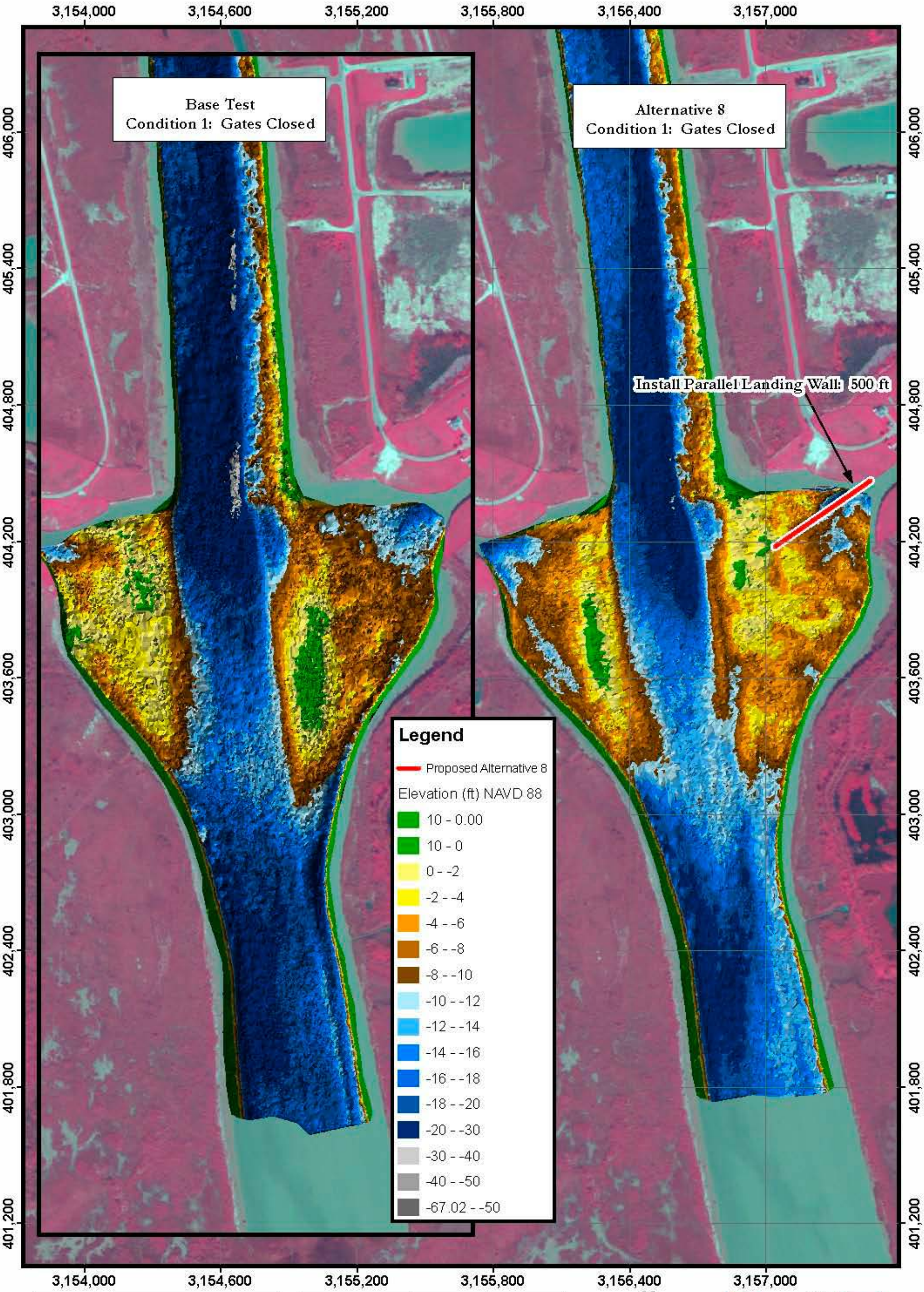

PLATE NUMBER 44

0 75 150 300 450 600
Feet

Alternative 8 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		03/19 /09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
... Galveston/Plaza	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

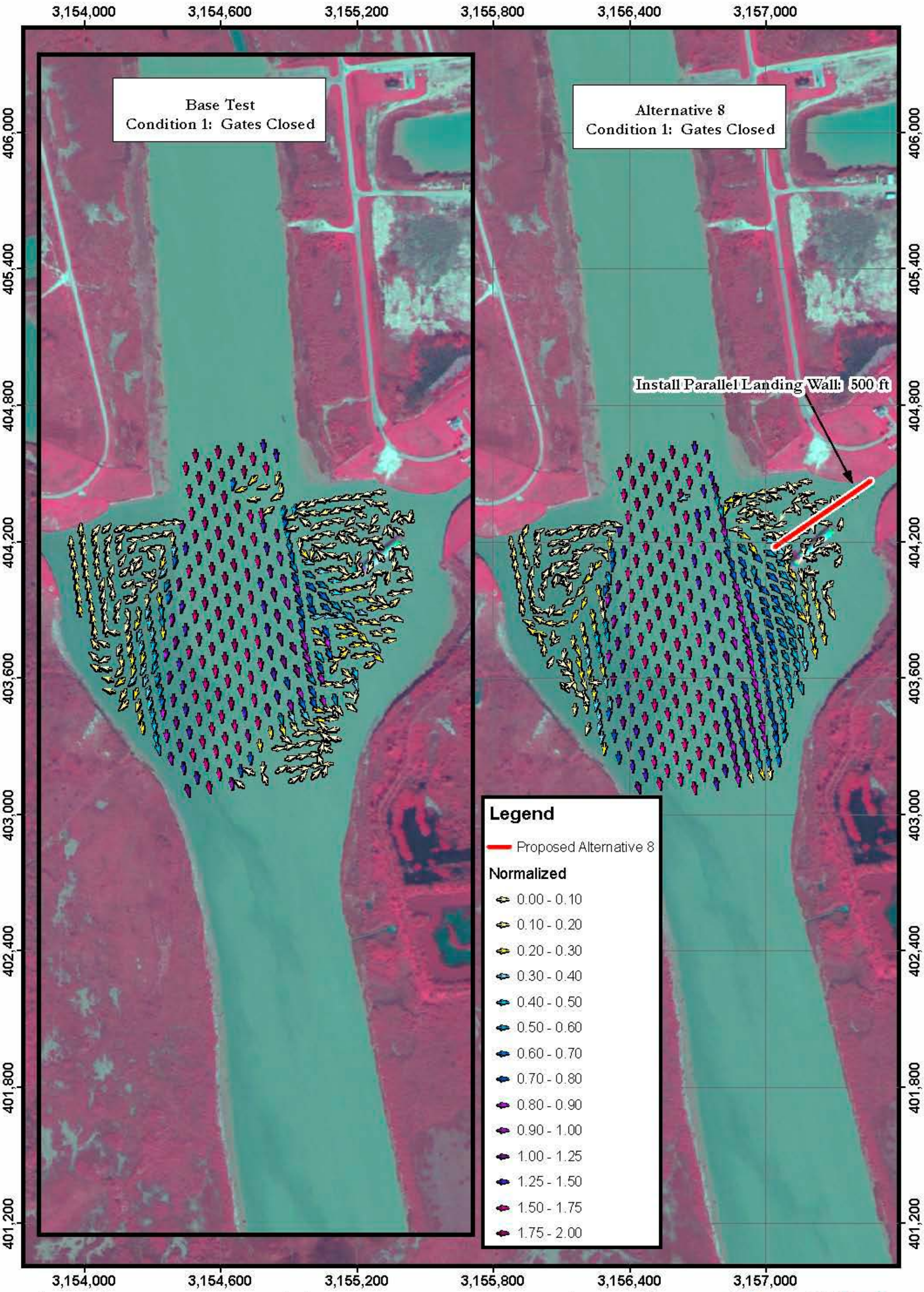

PLATE NUMBER 45

0 75 150 300 450 600
Feet

Alternative 8 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 03/29/04 Scan
A COX | J BROWN, PE. | E BRAUER, PE.
A COX | R DAVINROY, PE.
... Galveston/Florida | 07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

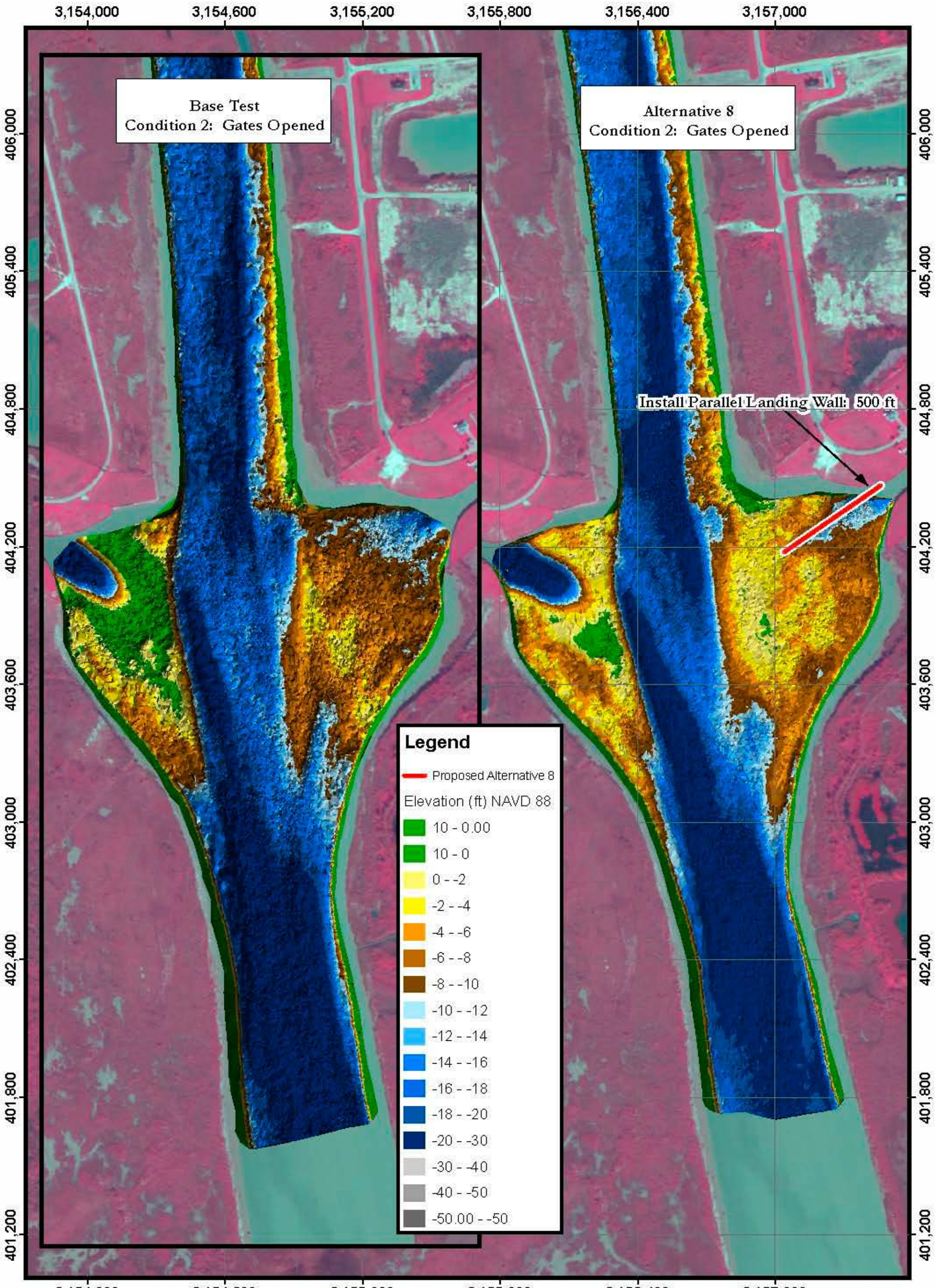

PLATE NUMBER 46

0 75 150 300 450 600
Feet

Alternative 8 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		03/19 /09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
... Galveston/Plano	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

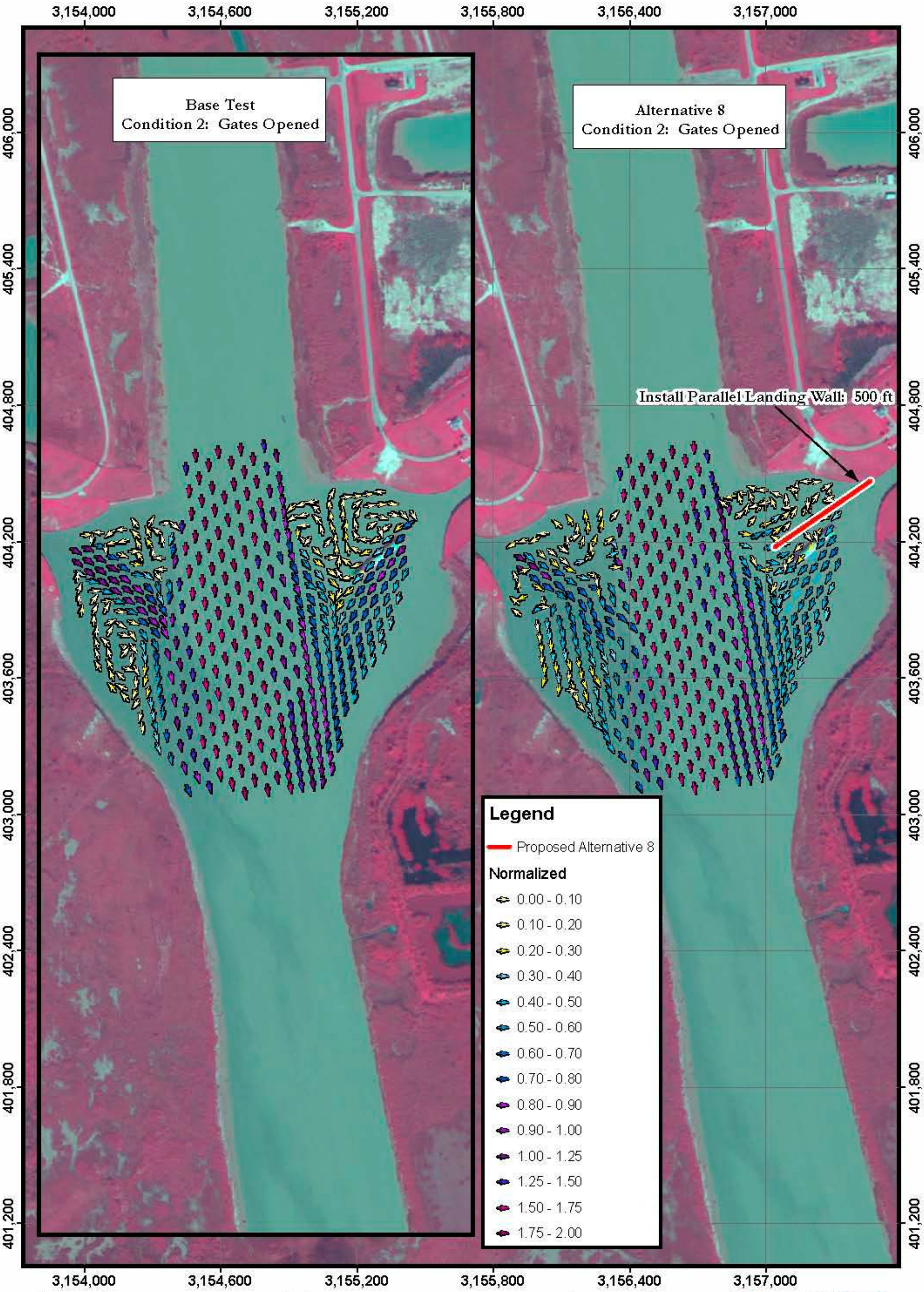

PLATE NUMBER 47

0 75 150 300 450 600
Feet

Alternative 8 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

A COX		03/29/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

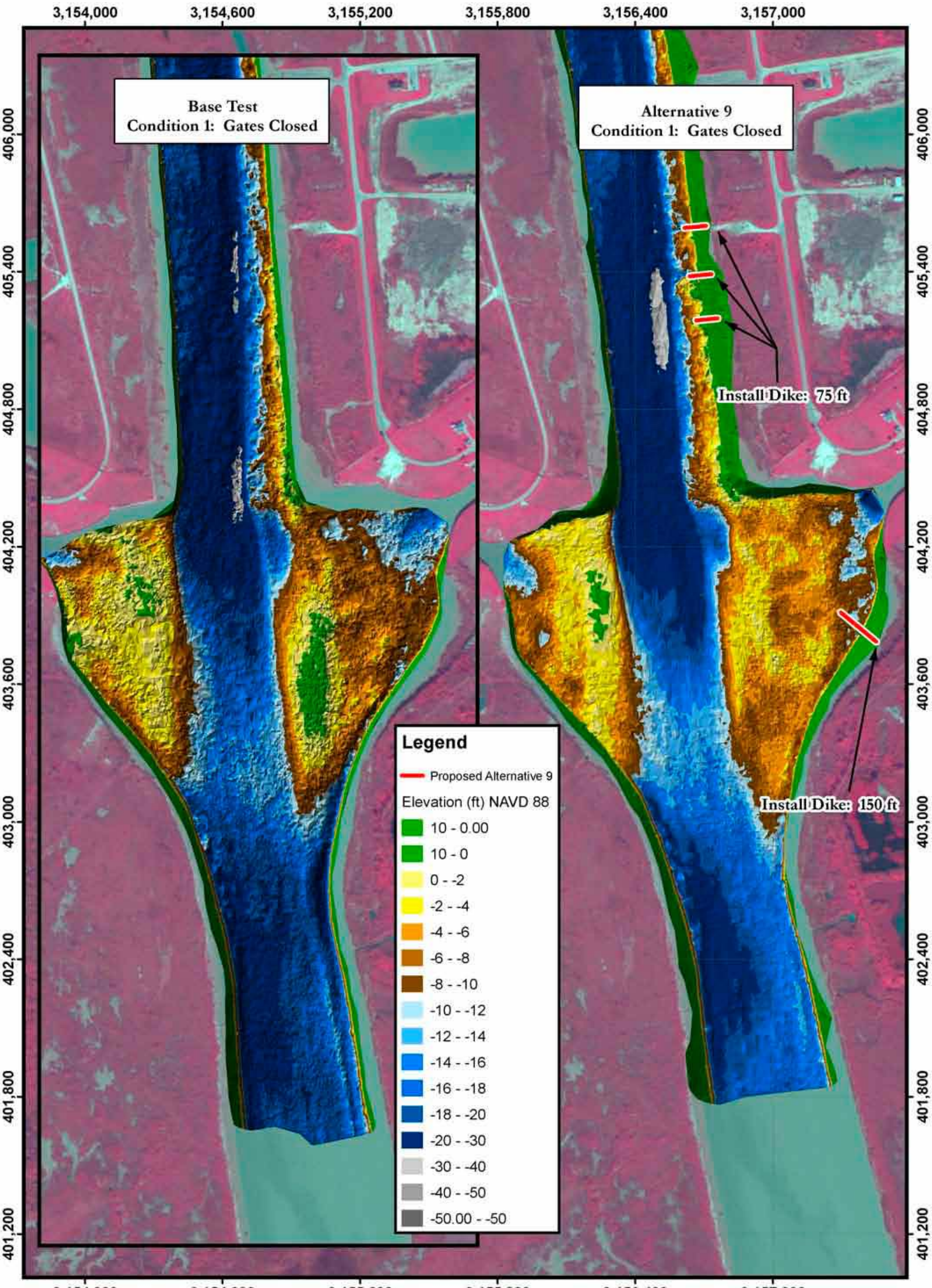

PLATE NUMBER 48

0 75 150 300 450 600
Feet

Alternative 9 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/25/09 Scan
	A COX	J BROWN, P.E.	F. BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

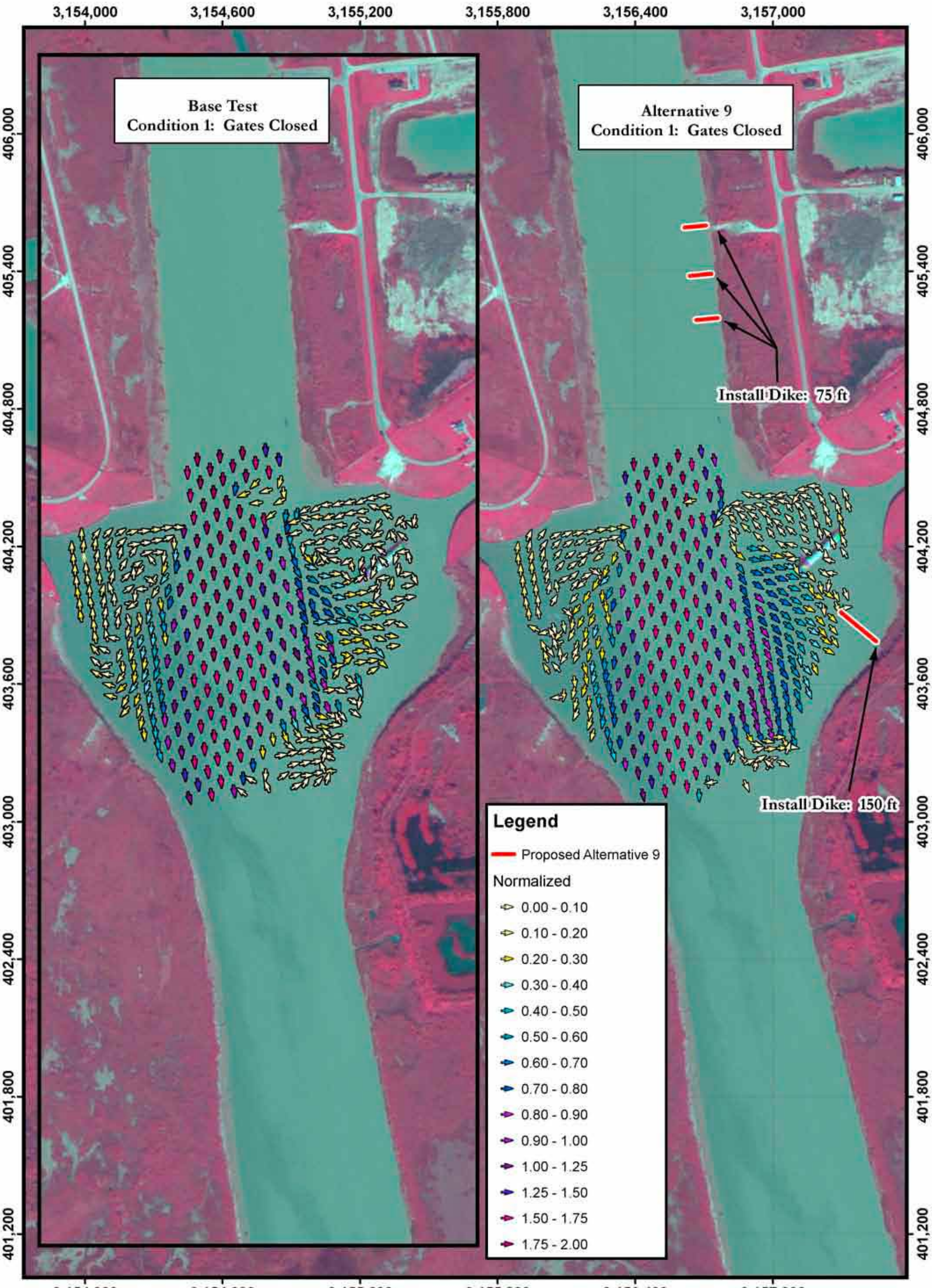

PLATE NUMBER 49

0 75 150 300 450 600
Feet

Alternative 9 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		05/25/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
...Galveston/Plates		07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

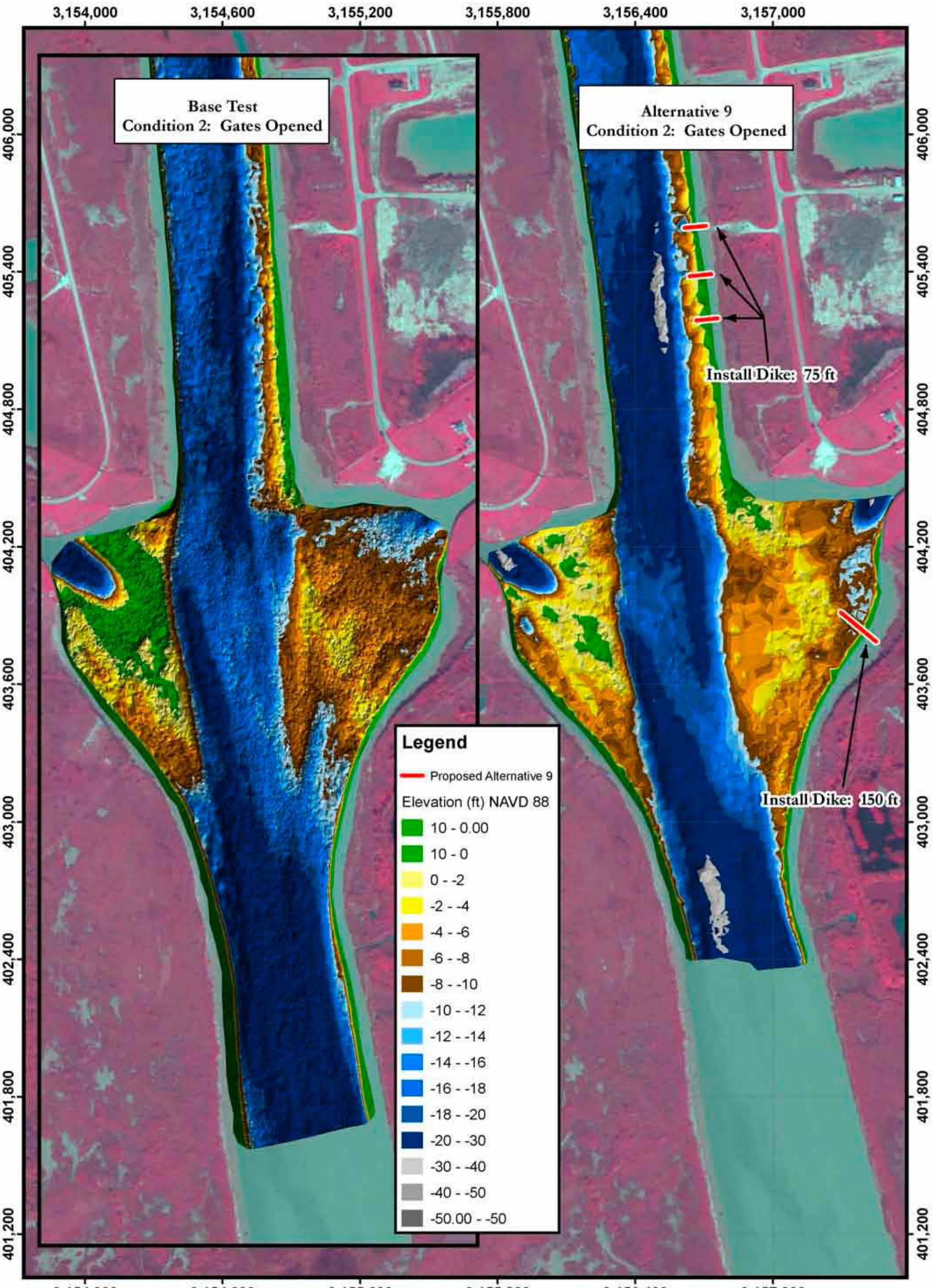

PLATE NUMBER 50

0 75 150 300 450 600
Feet

Alternative 9 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/25/09 Scan
	A COX	J BROWN, P.E. / E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.
	...Galveston/Plates	07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

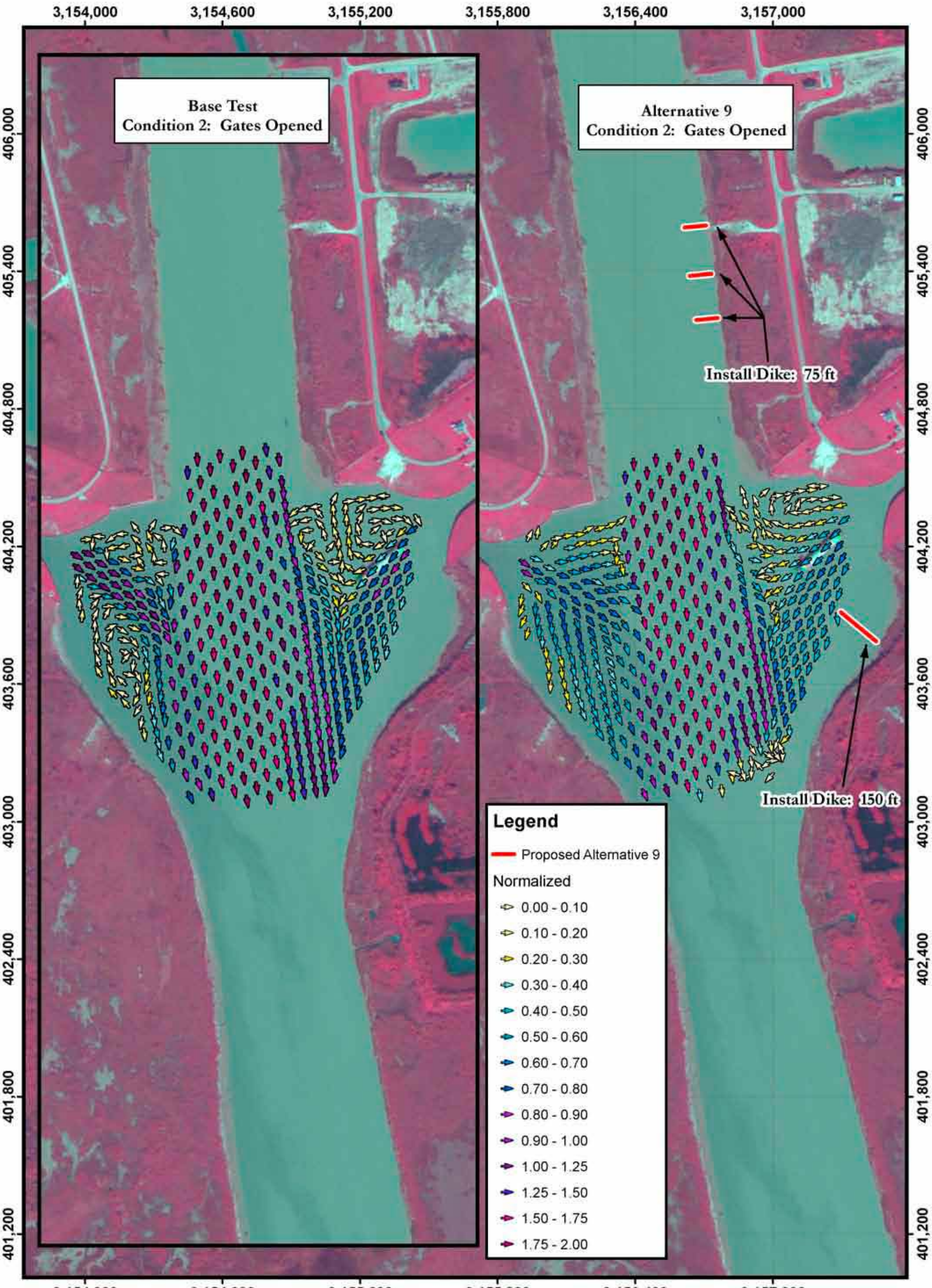

PLATE NUMBER 51

0 75 150 300 450 600
Feet

Alternative 9 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		05/25/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
...Galveston/Plates		07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

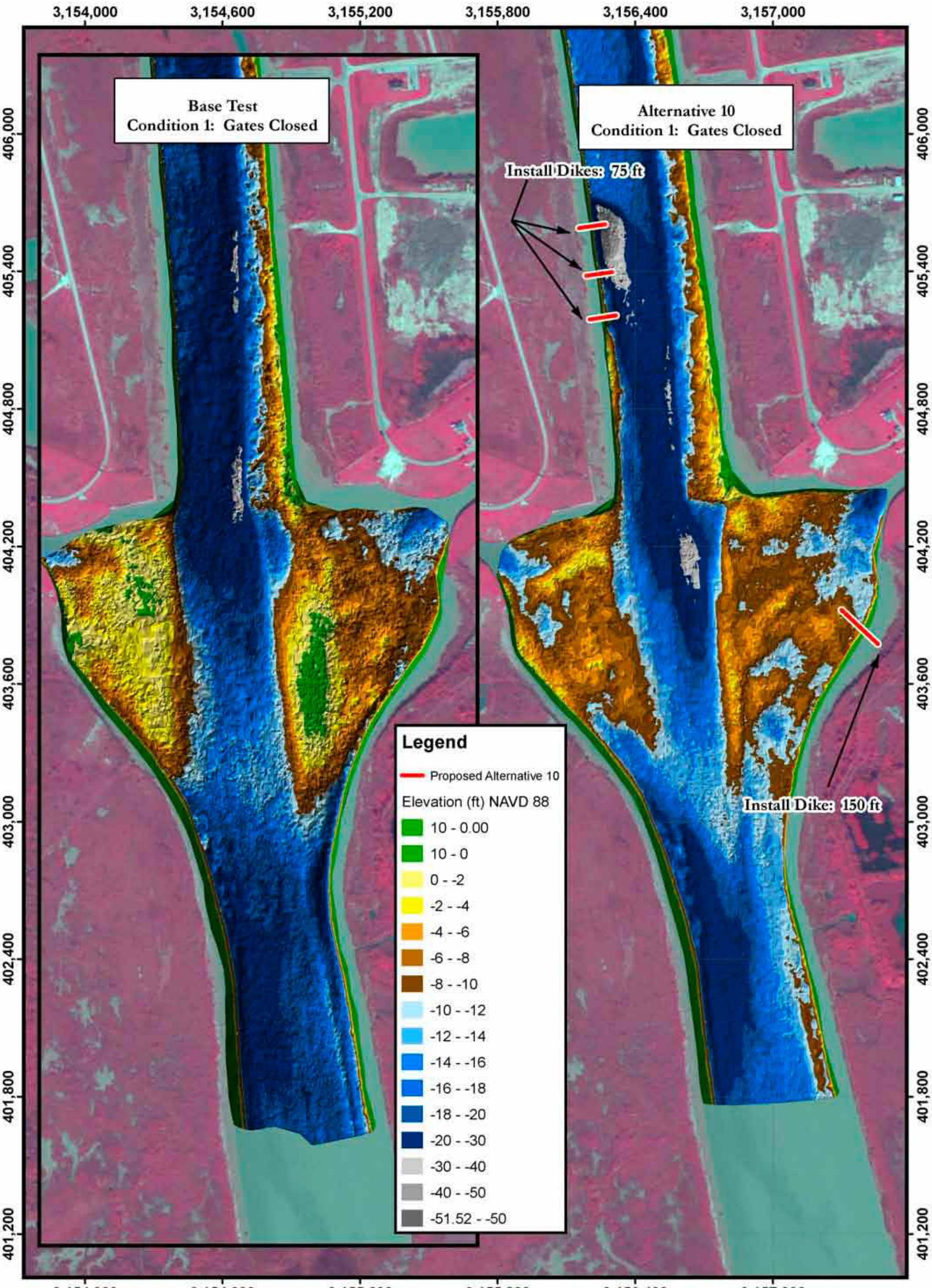

PLATE NUMBER 52

0 75 150 300 450 600
Feet

Alternative 10 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/26/09 Scan	
	A COX	J BROWN, P.E.	F. BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

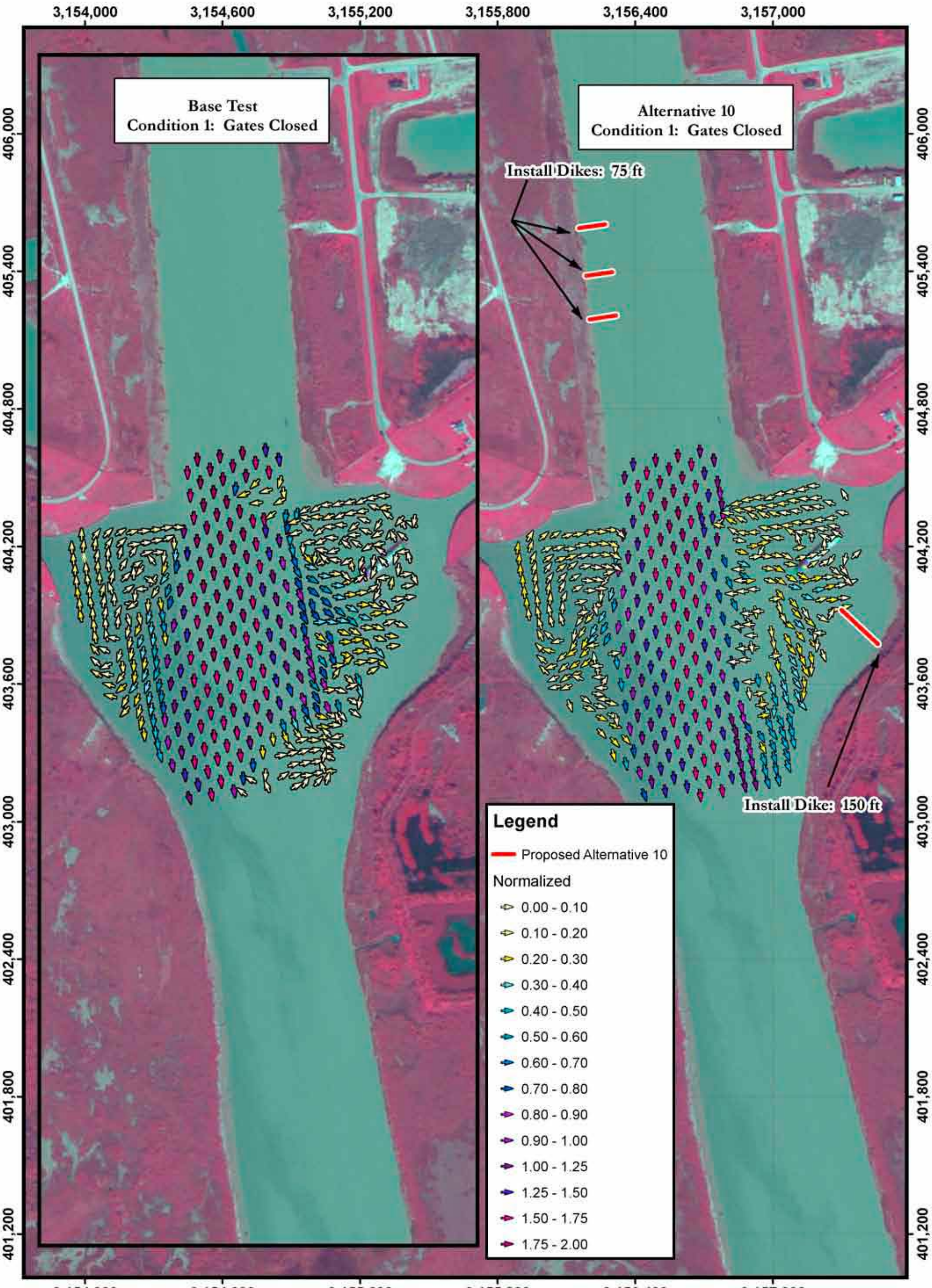

PLATE NUMBER 53

0 75 150 300 450 600
Feet

Alternative 10 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/25/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

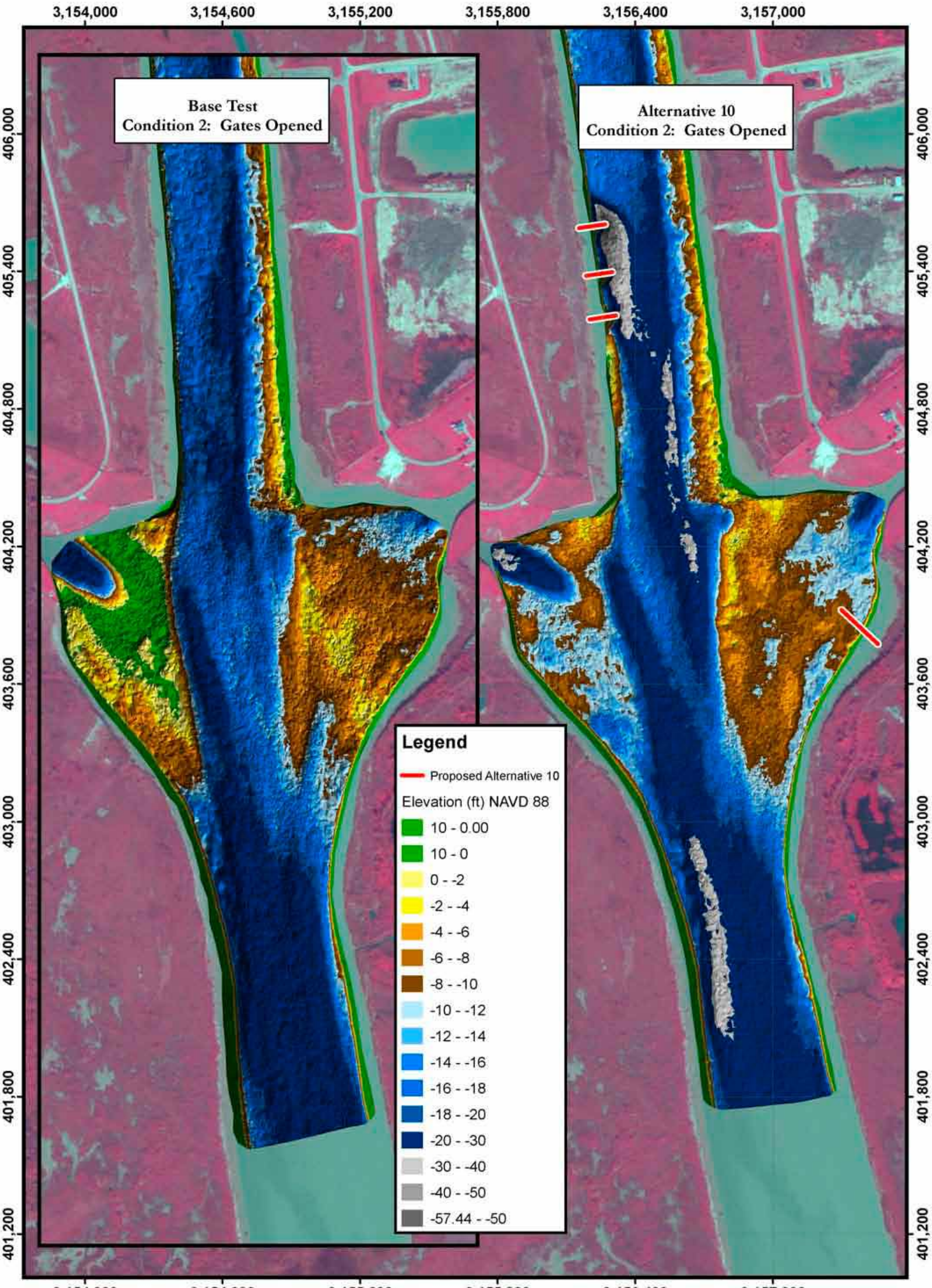

PLATE NUMBER 54

0 75 150 300 450 600
Feet

Alternative 10 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/26/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

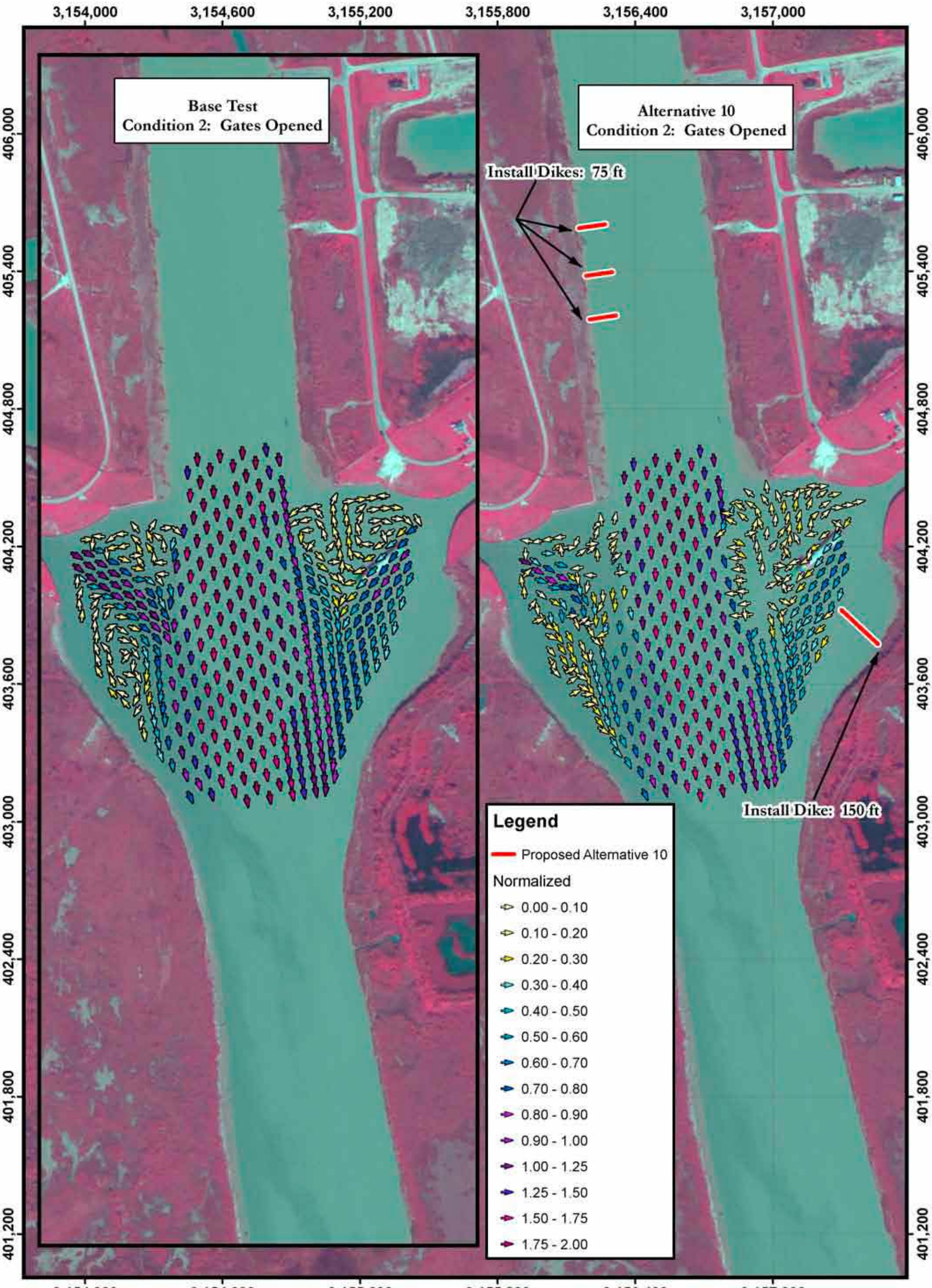

PLATE NUMBER 55

0 75 150 300 450 600
Feet

Alternative 10 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/25/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

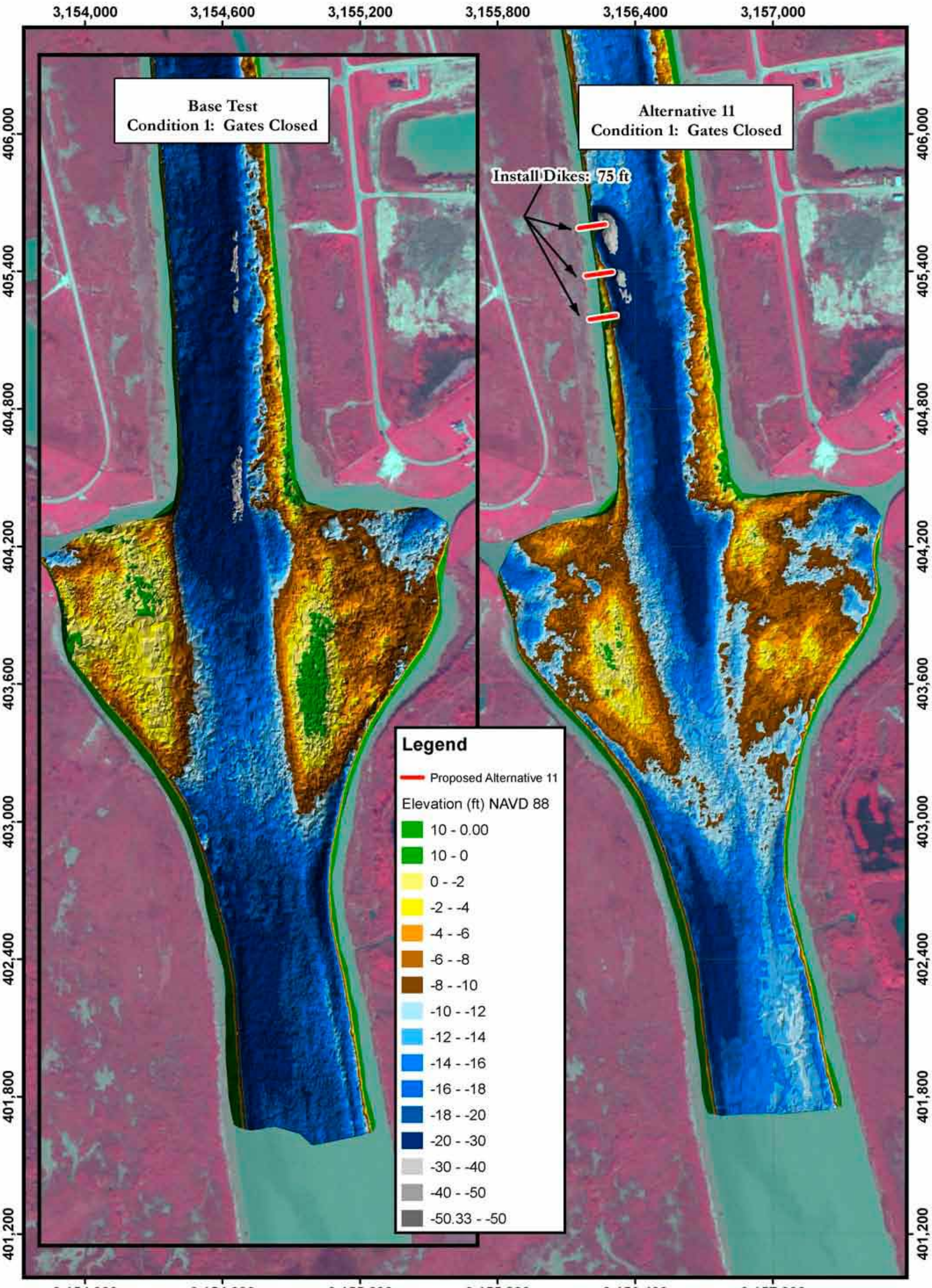

PLATE NUMBER 56

0 75 150 300 450 600
Feet

Alternative 11 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX	03/30/09 Scan
	A COX / J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.
	...Galveston/Plates	07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

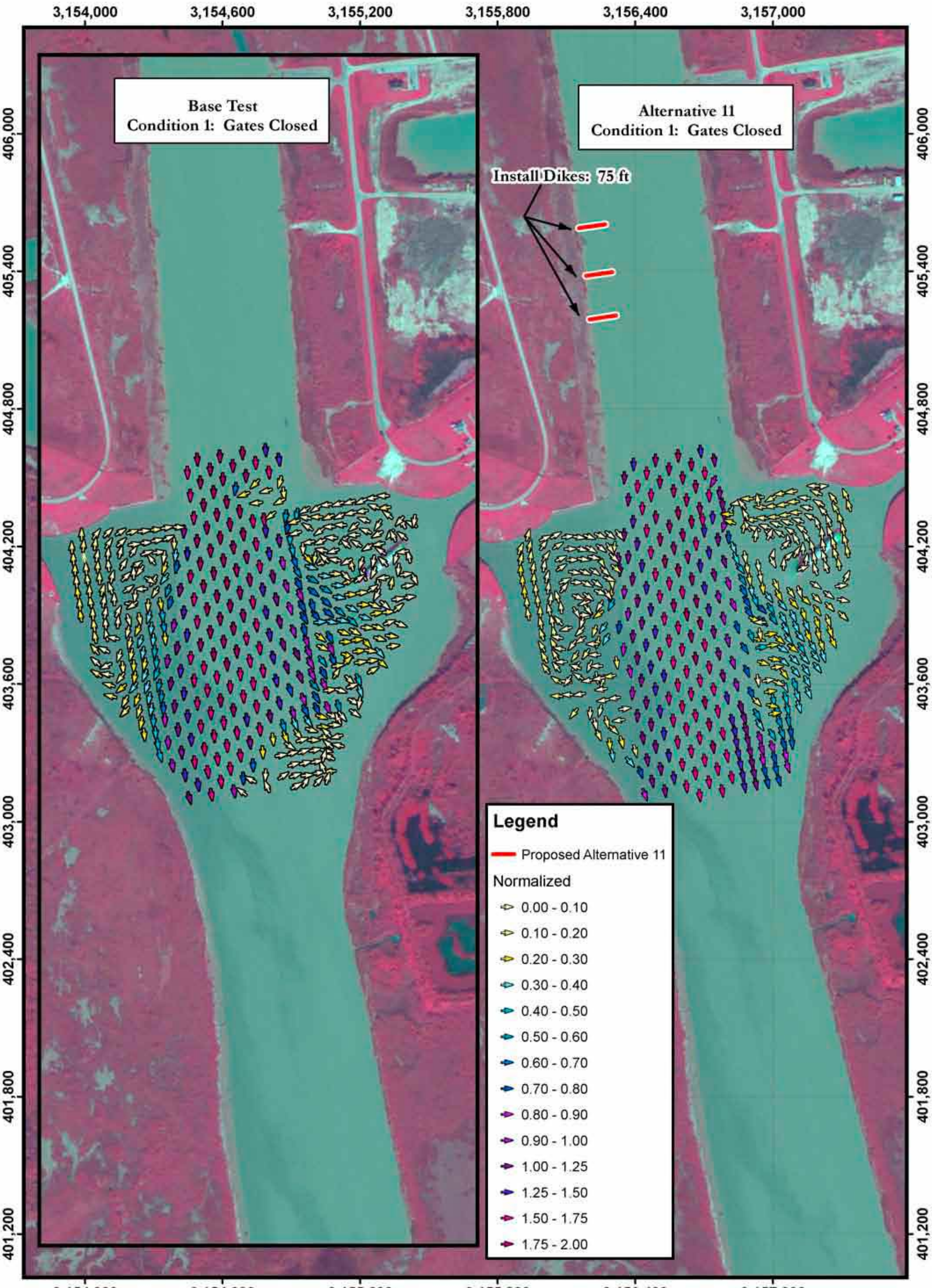

PLATE NUMBER 57

0 75 150 300 450 600
Feet

Alternative 11 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/25/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

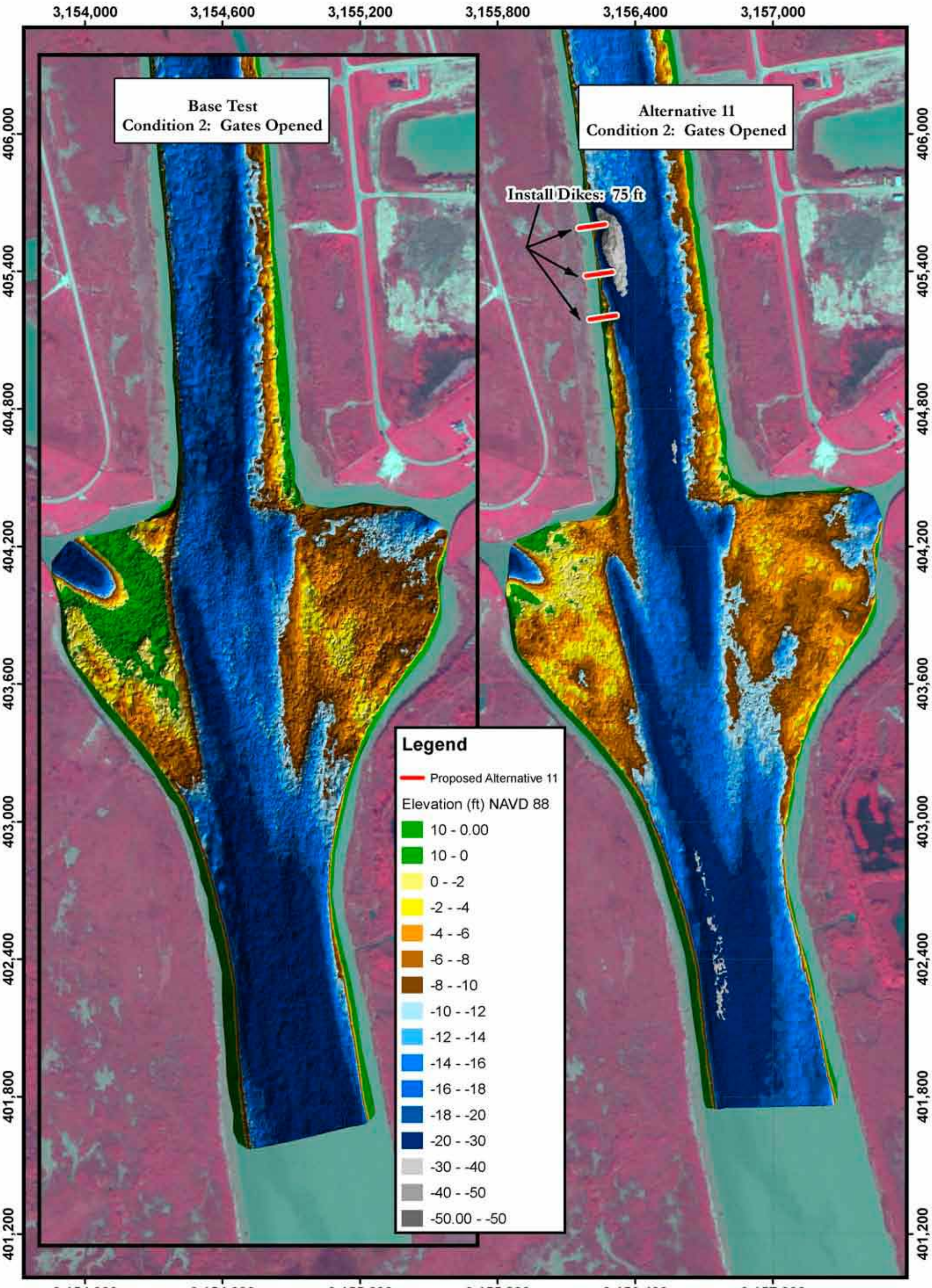

PLATE NUMBER 58

0 75 150 300 450 600
Feet

Alternative 11 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/30/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

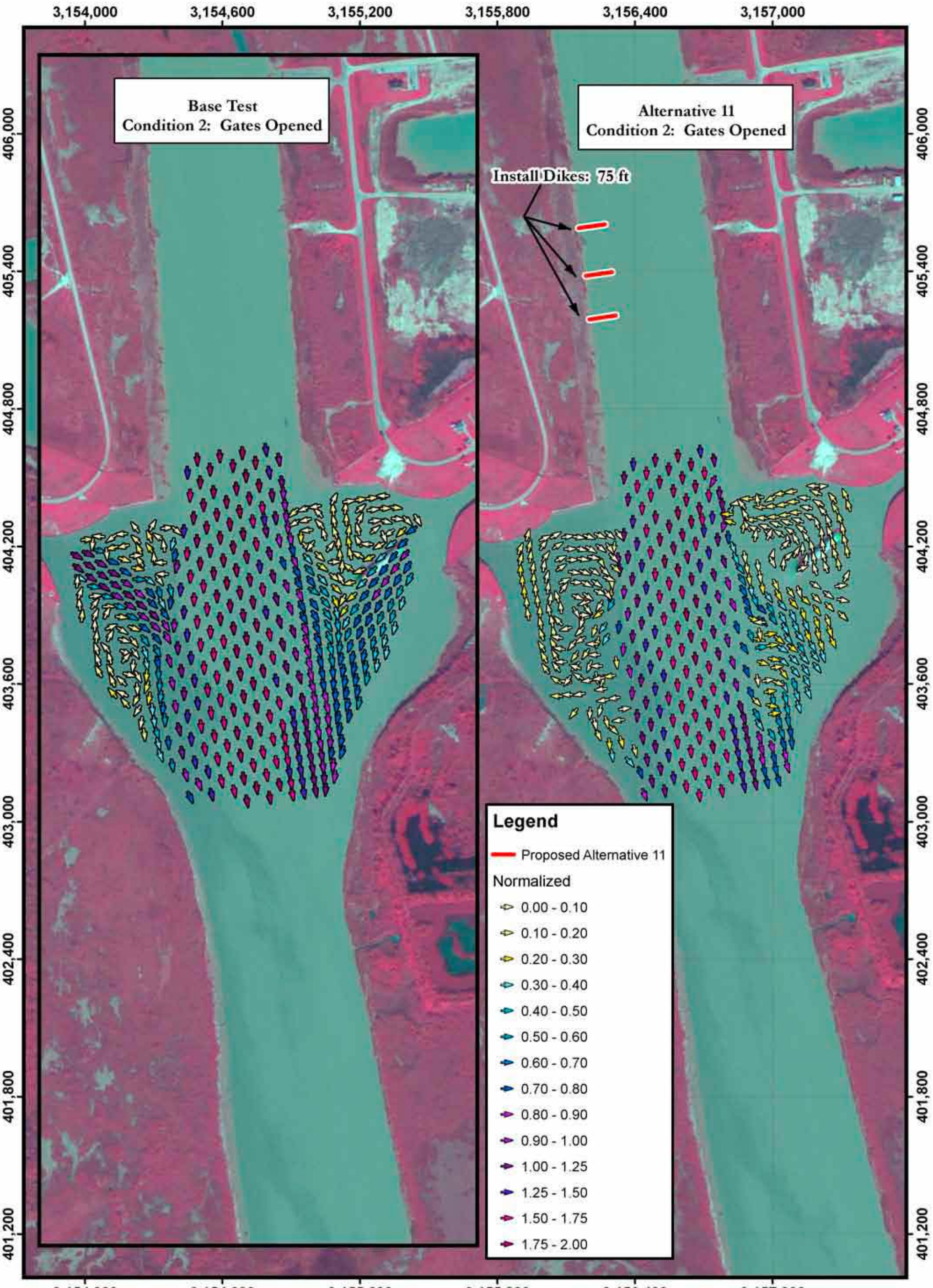

PLATE NUMBER 59

0 75 150 300 450 600
Feet

Alternative 11 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/30/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

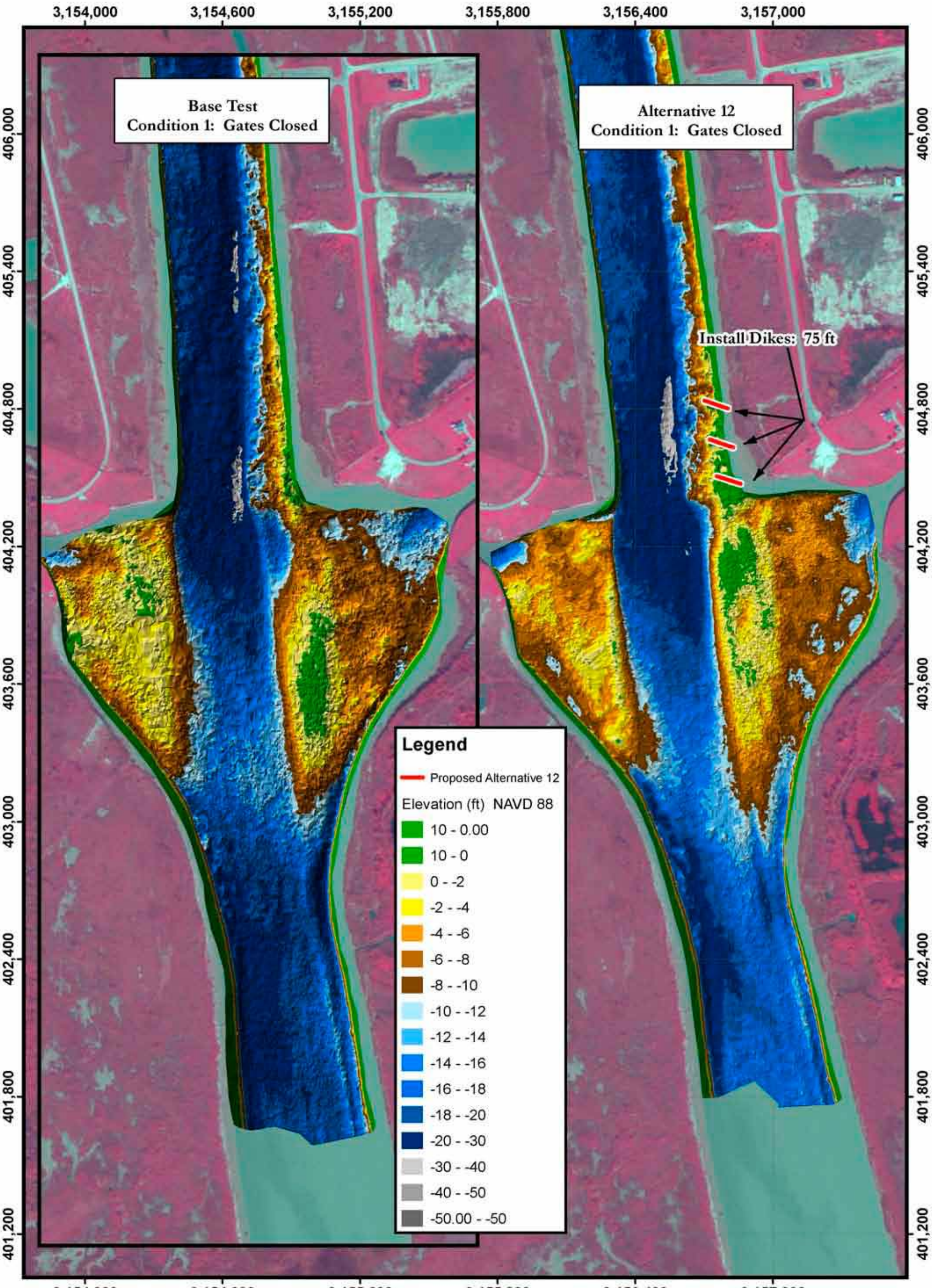

PLATE NUMBER 60

0 75 150 300 450 600
Feet

Alternative 12 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/31/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

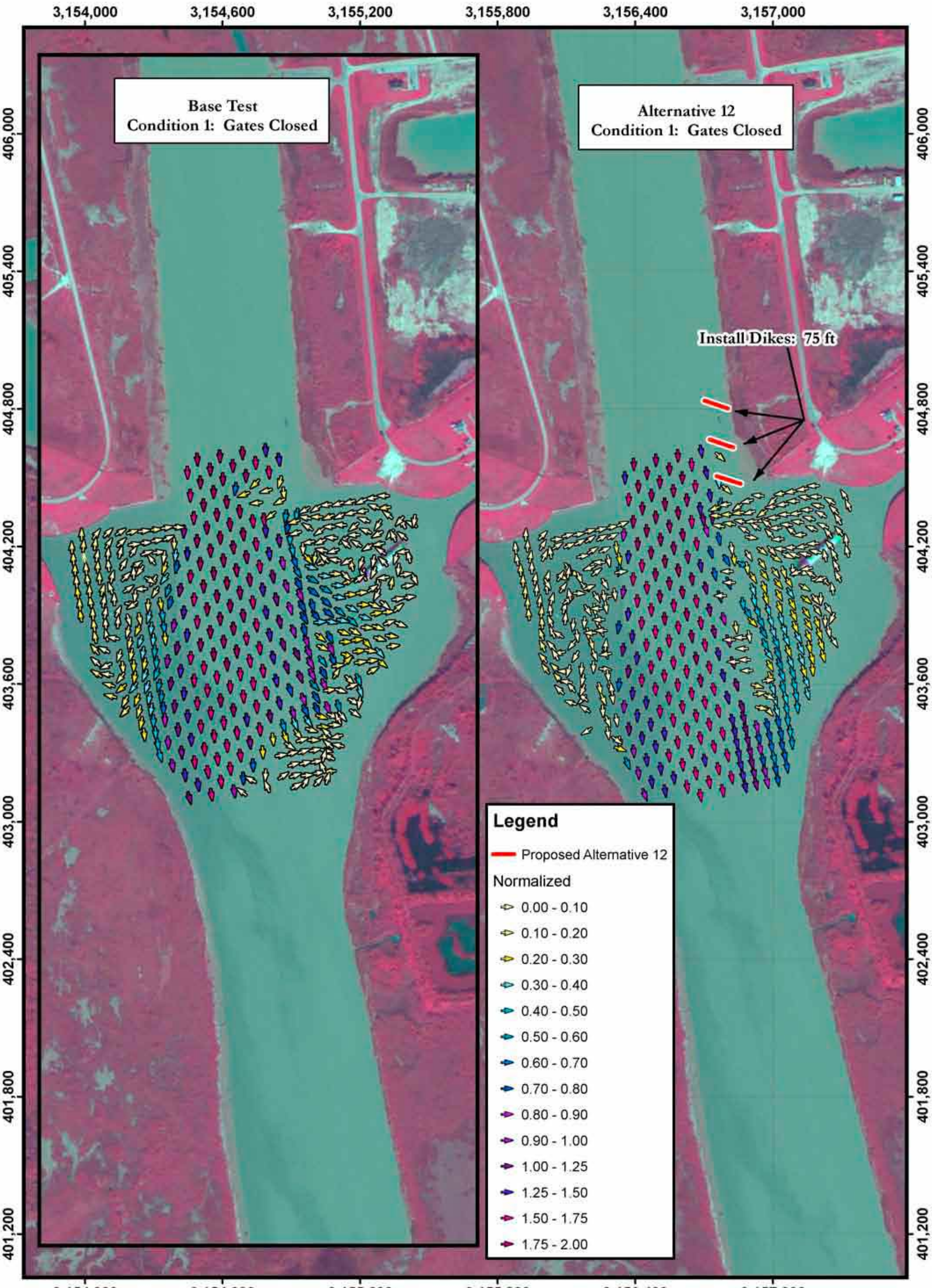

PLATE NUMBER 61

0 75 150 300 450 600
Feet

Alternative 12 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/31/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Texas | 07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

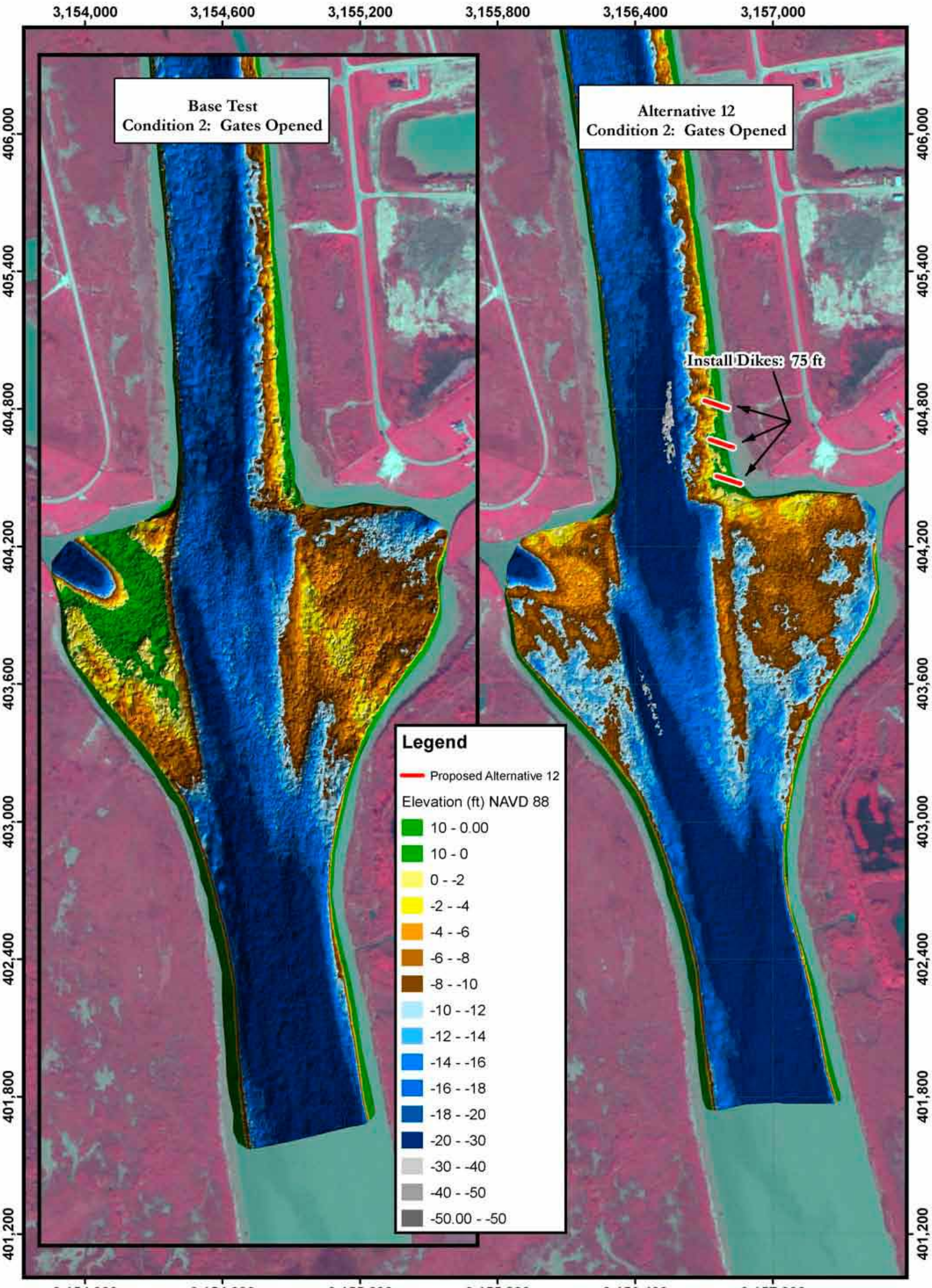

PLATE NUMBER 62

0 75 150 300 450 600
Feet

Alternative 12 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		03/31/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

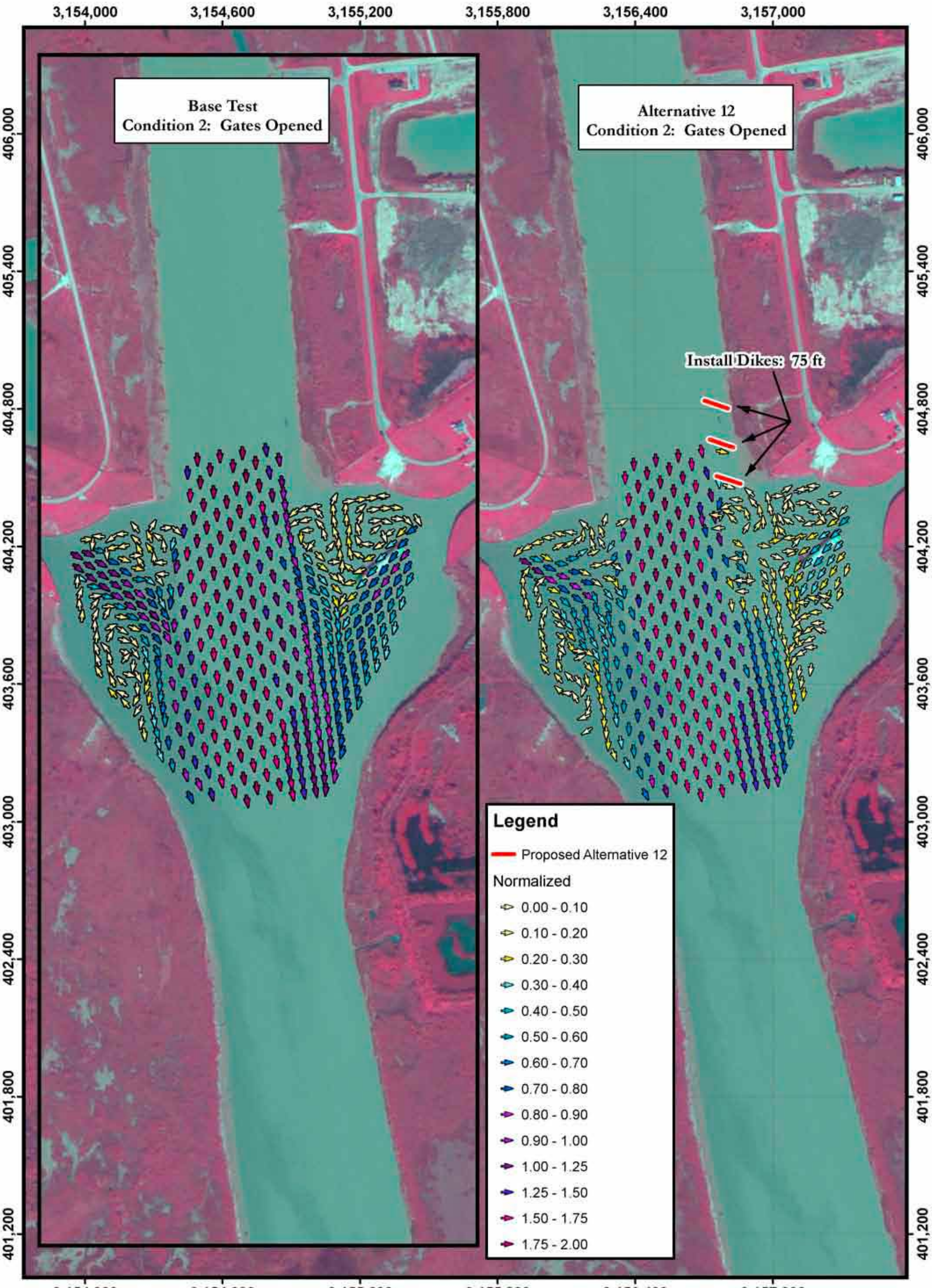

PLATE NUMBER 63

0 75 150 300 450 600
Feet

Alternative 12 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/31/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

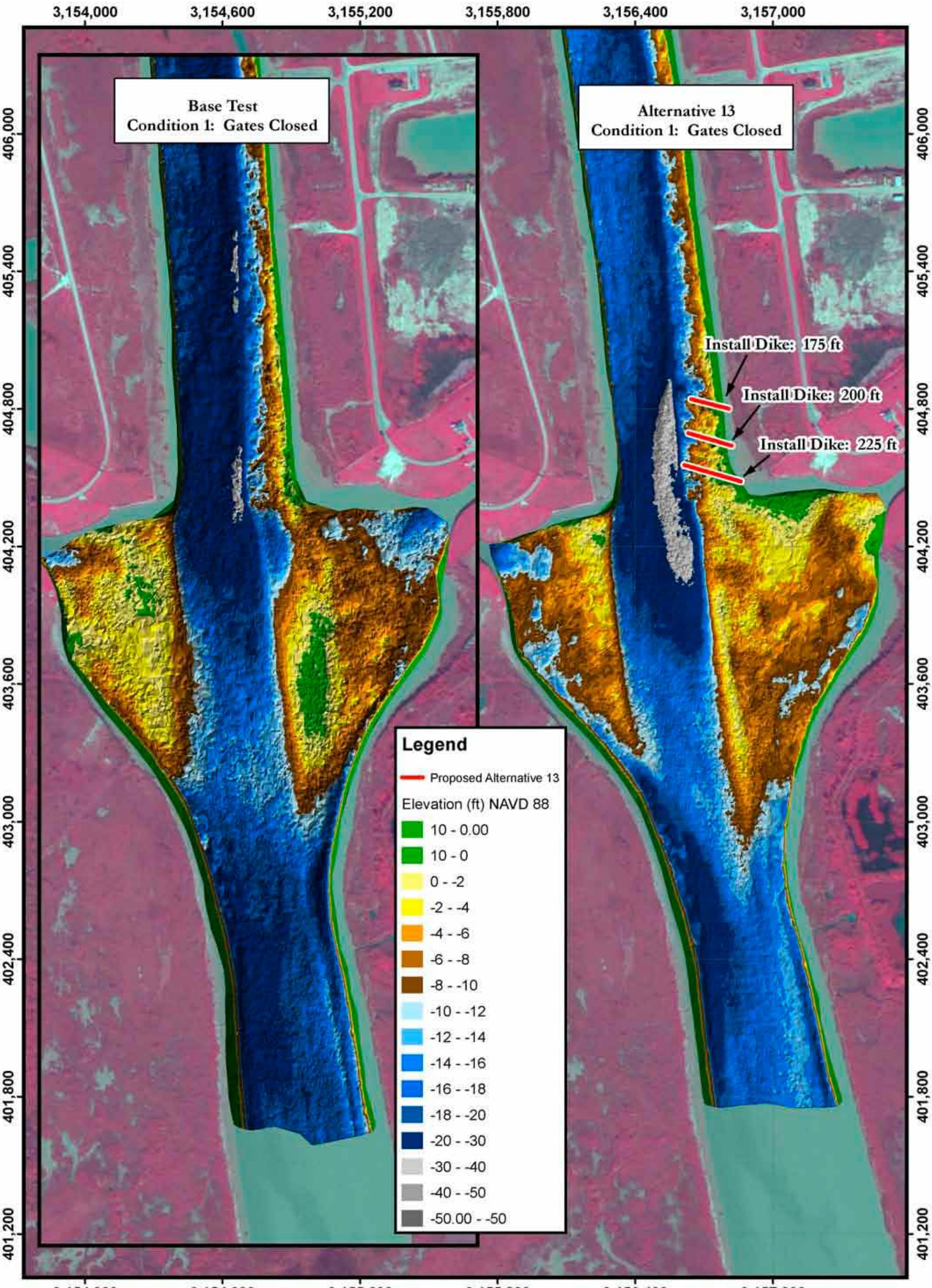

PLATE NUMBER 64

0 75 150 300 450 600
Feet

Alternative 13 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 03/31/09 Scan
A COX | J BROWN, P.E. | F. BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Plates | 07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

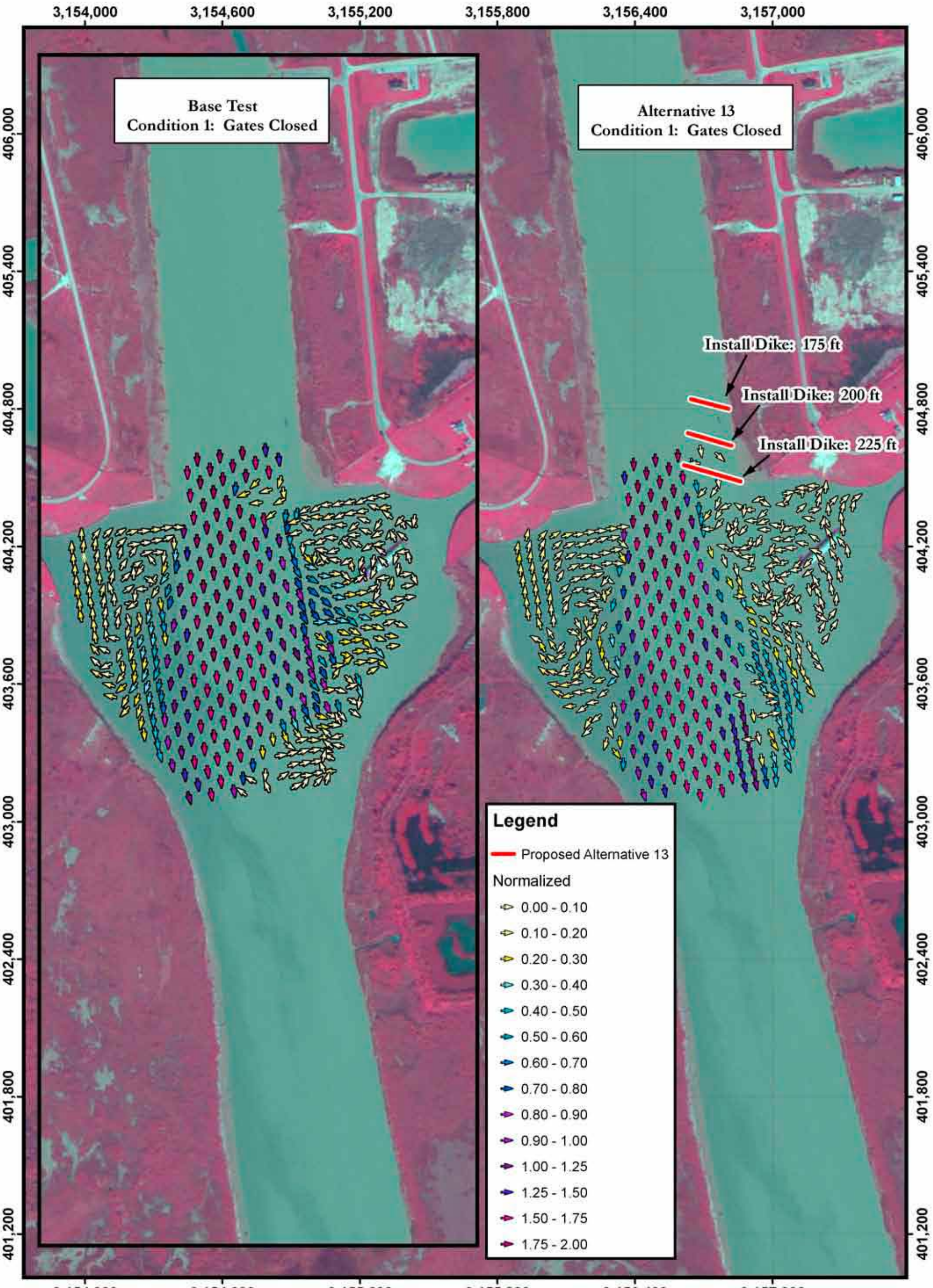

PLATE NUMBER 65

0 75 150 300 450 600
Feet

Alternative 13 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/01/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plans | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

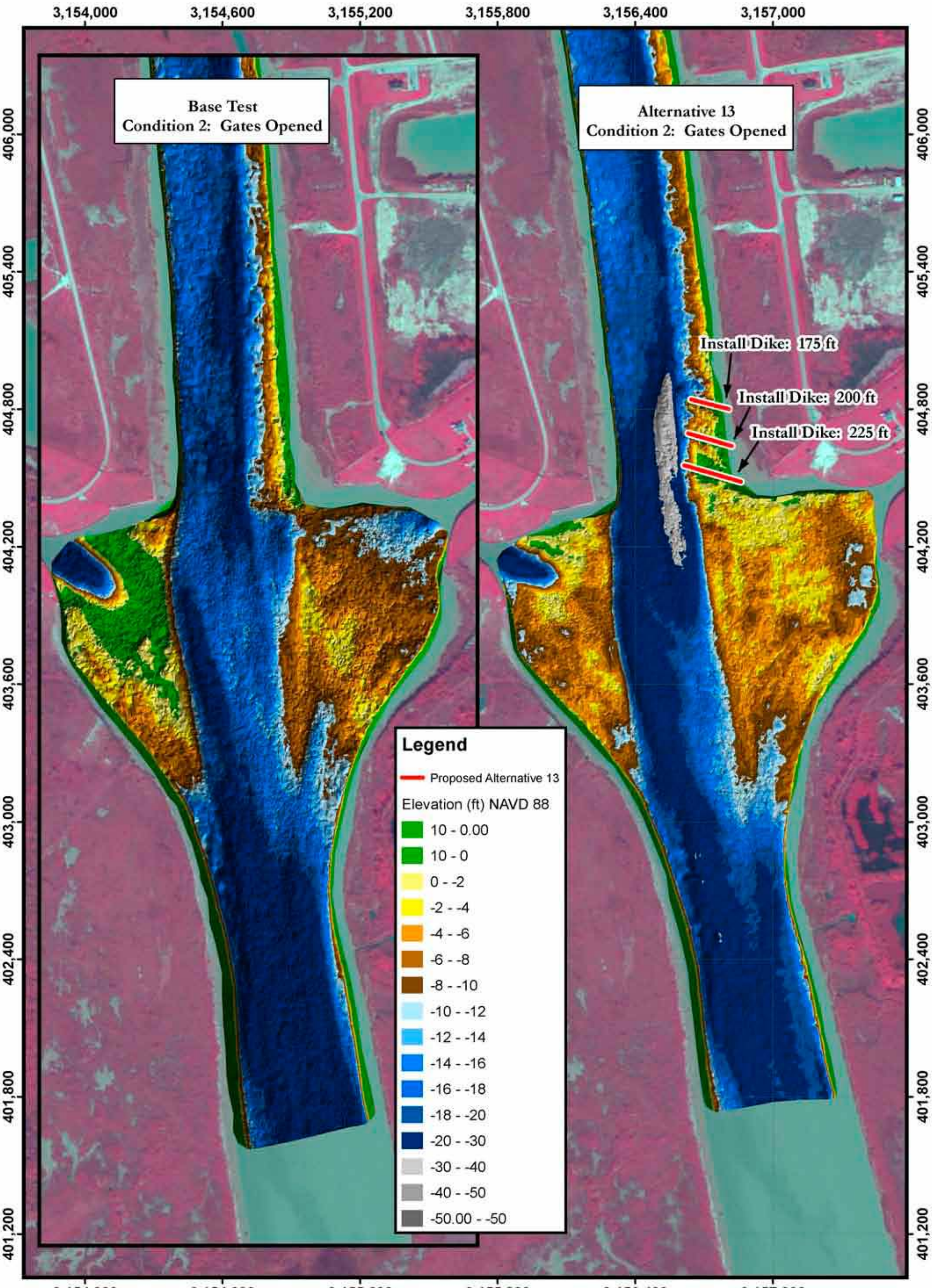

PLATE NUMBER 66

0 75 150 300 450 600
Feet

Alternative 13 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/01/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

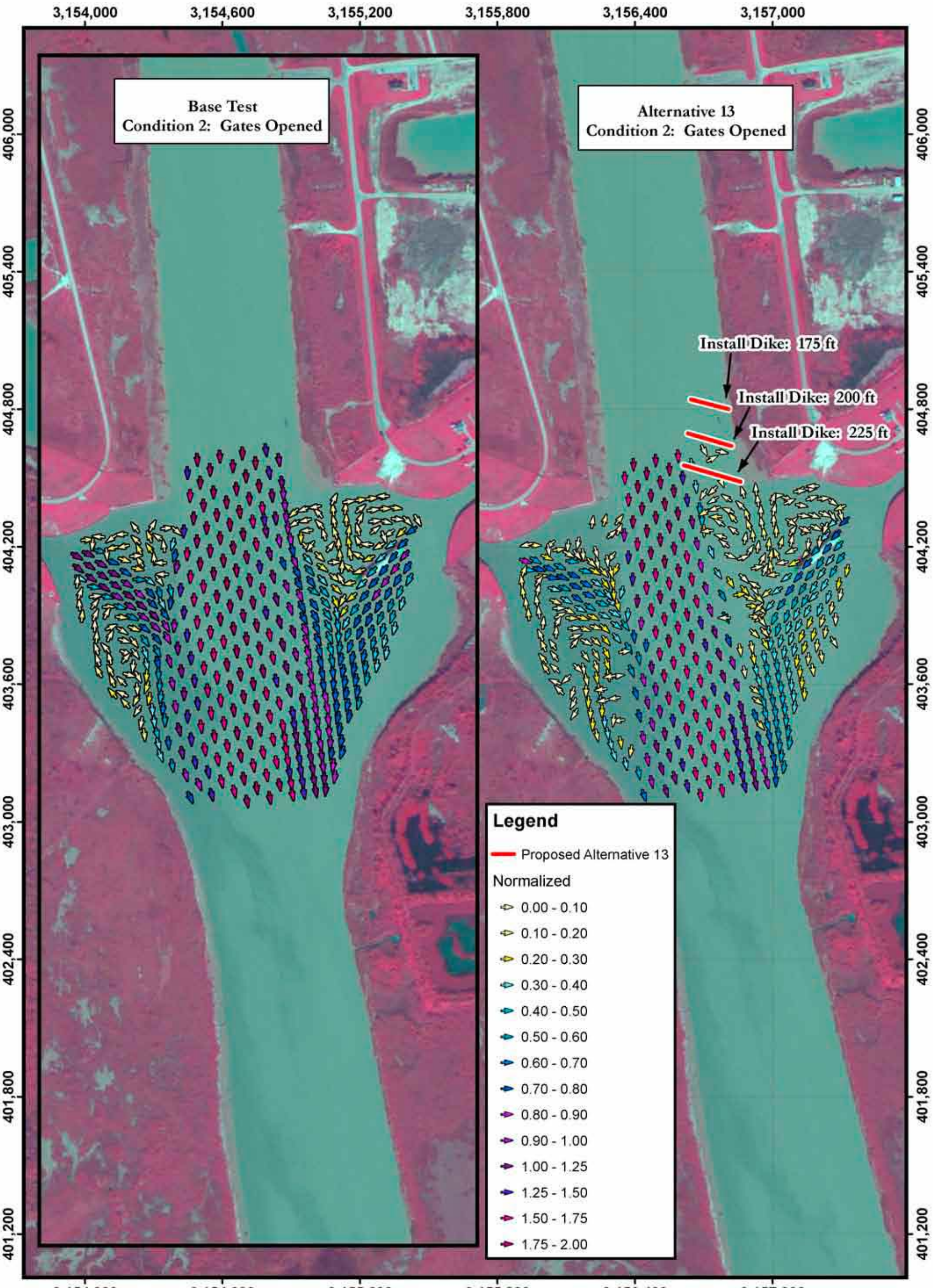

PLATE NUMBER 67

0 75 150 300 450 600
Feet

Alternative 13 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/02/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

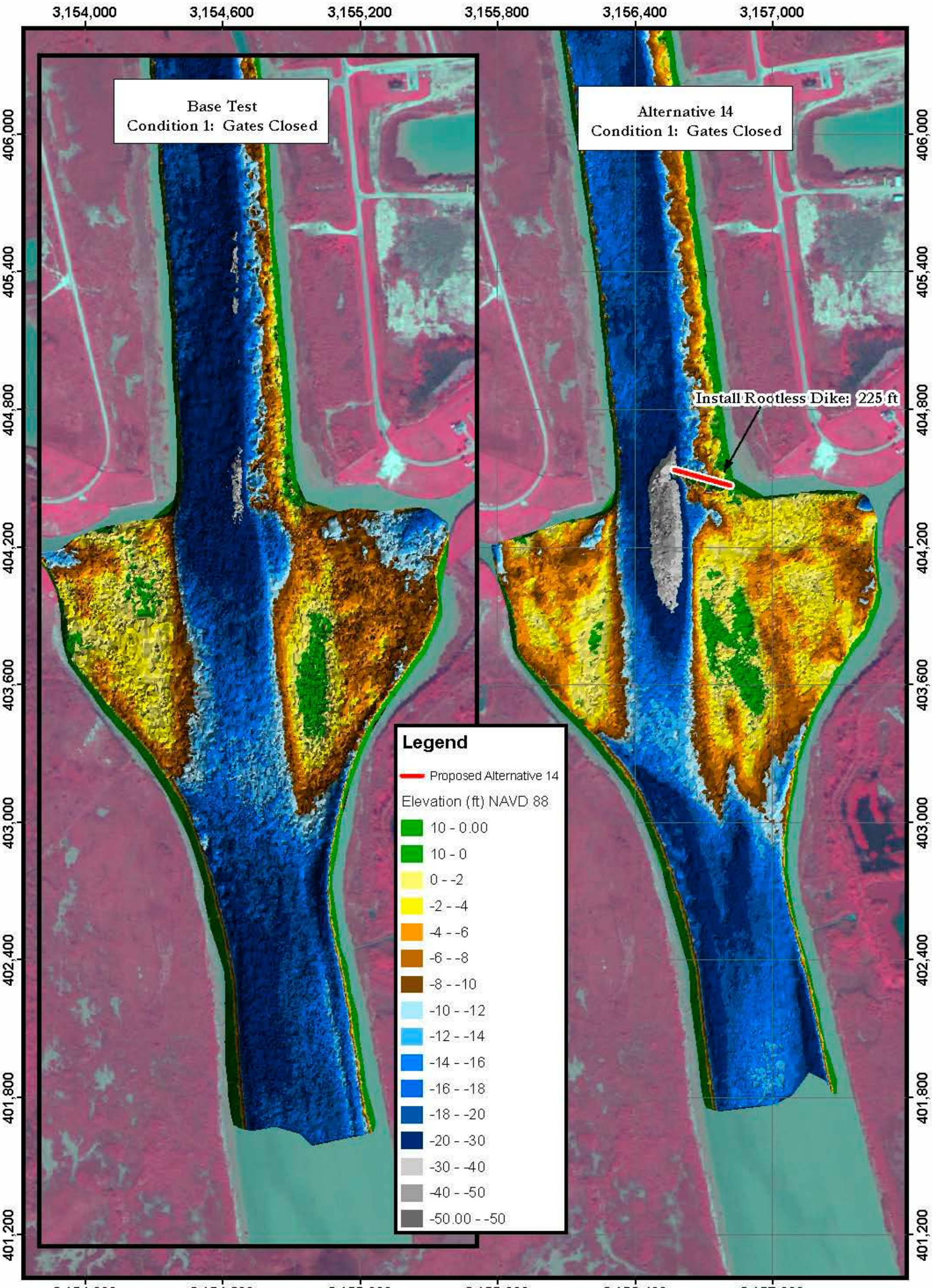

PLATE NUMBER 68

0 75 150 300 450 600
Feet

Alternative 14 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

DRAWN: A COX		DATE: 04/02/04 Scan
DESIGNED: A COX	REVIEWED: J BROWN, P.E.	REVIEWED: E BRAUER, P.E.
SUPERVISED: A COX		APPROVED: R DAVINROY, P.E.
REVIEW: ... Galveston/Plano		REPORT DATE: 07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

PLATE NUMBER 69

0 75 150 300 450 600
Feet

Alternative 14 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Bonnet Carre Spillway
Galveston District
Bonnet Carre and GIWW Crossing
HSR Model

A COX		04/02/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
...Galveston/Florida		07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

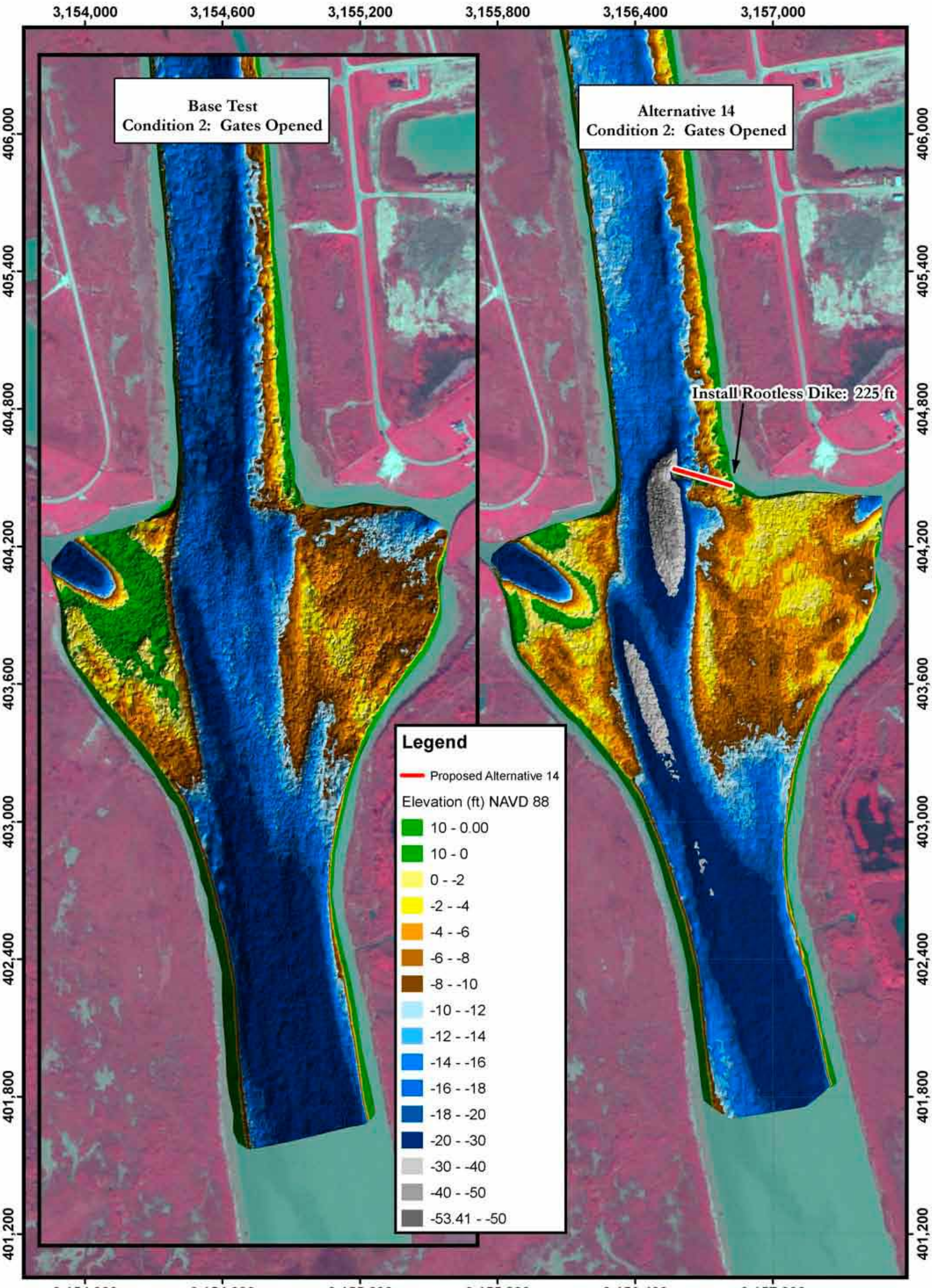

PLATE NUMBER 70

0 75 150 300 450 600
Feet

Alternative 14 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/02/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

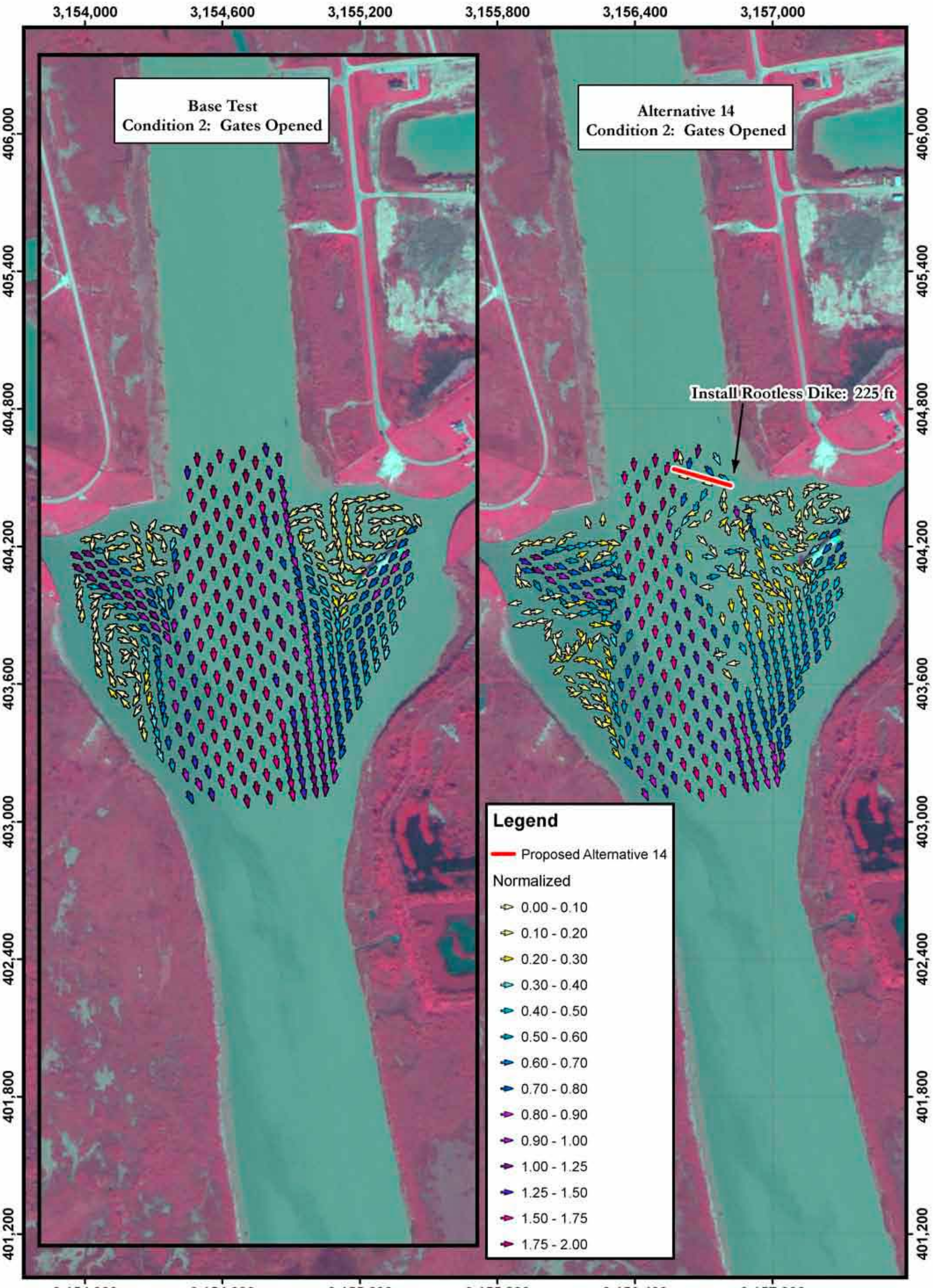

PLATE NUMBER 71

0 75 150 300 450 600
Feet

Alternative 14 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/02/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

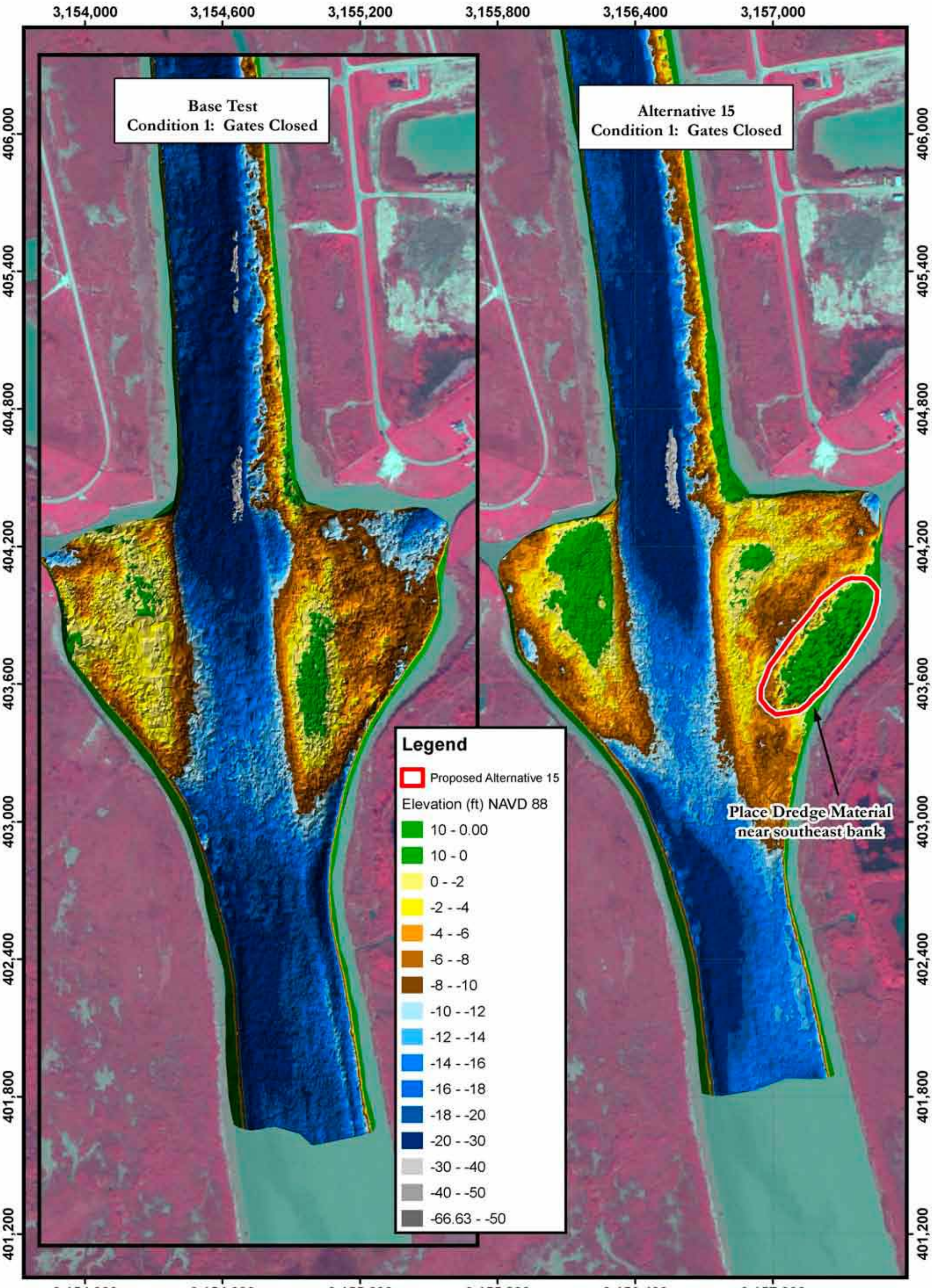

PLATE NUMBER 72

0 75 150 300 450 600
Feet

Alternative 15 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/06/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Plates | 07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

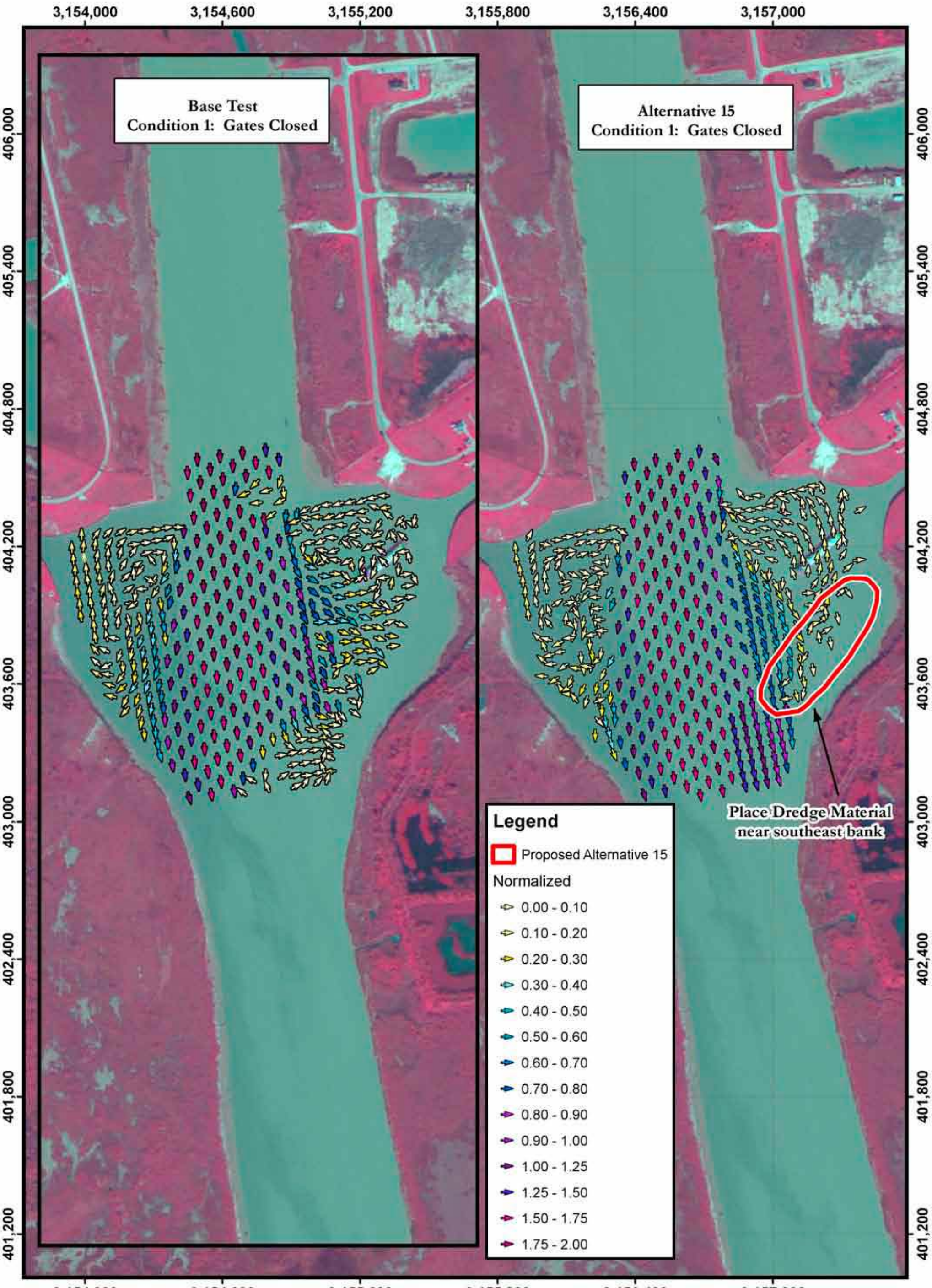

PLATE NUMBER 73

0 75 150 300 450 600
Feet

Alternative 15 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/07/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Flume | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

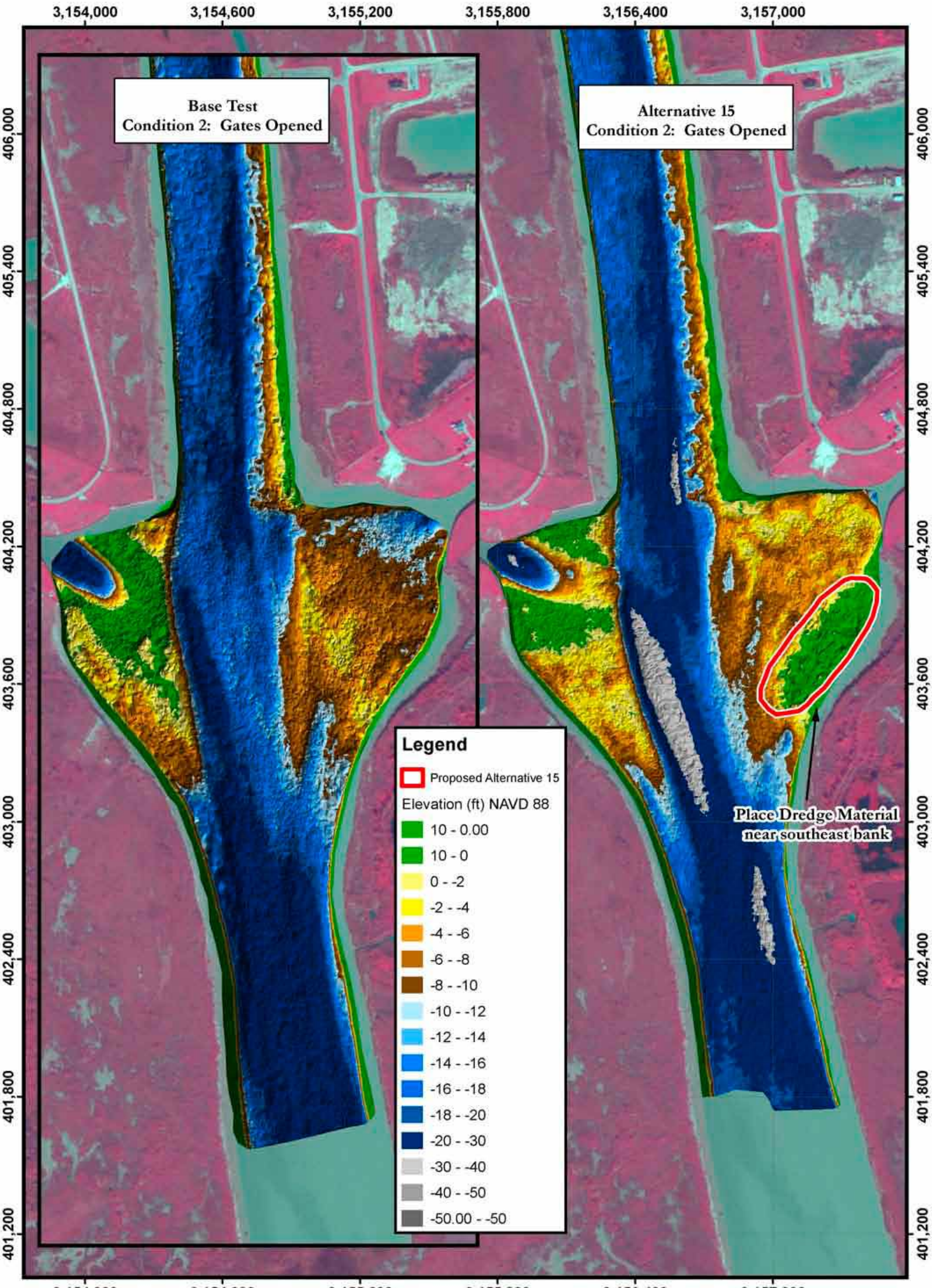

PLATE NUMBER 74

0 75 150 300 450 600
Feet

Alternative 15 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/06/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

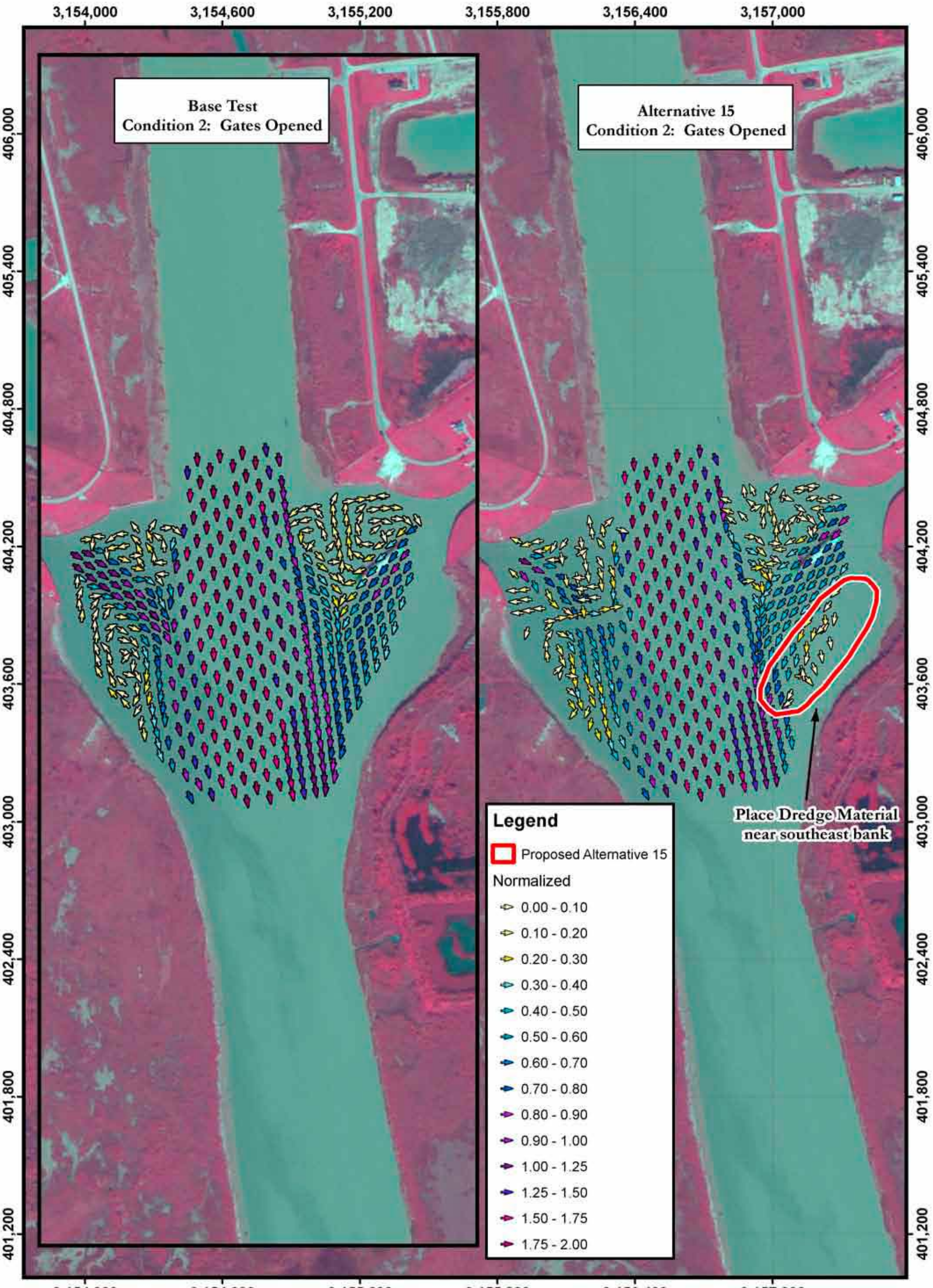

PLATE NUMBER 75

0 75 150 300 450 600
Feet

Alternative 15 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/07/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plans | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

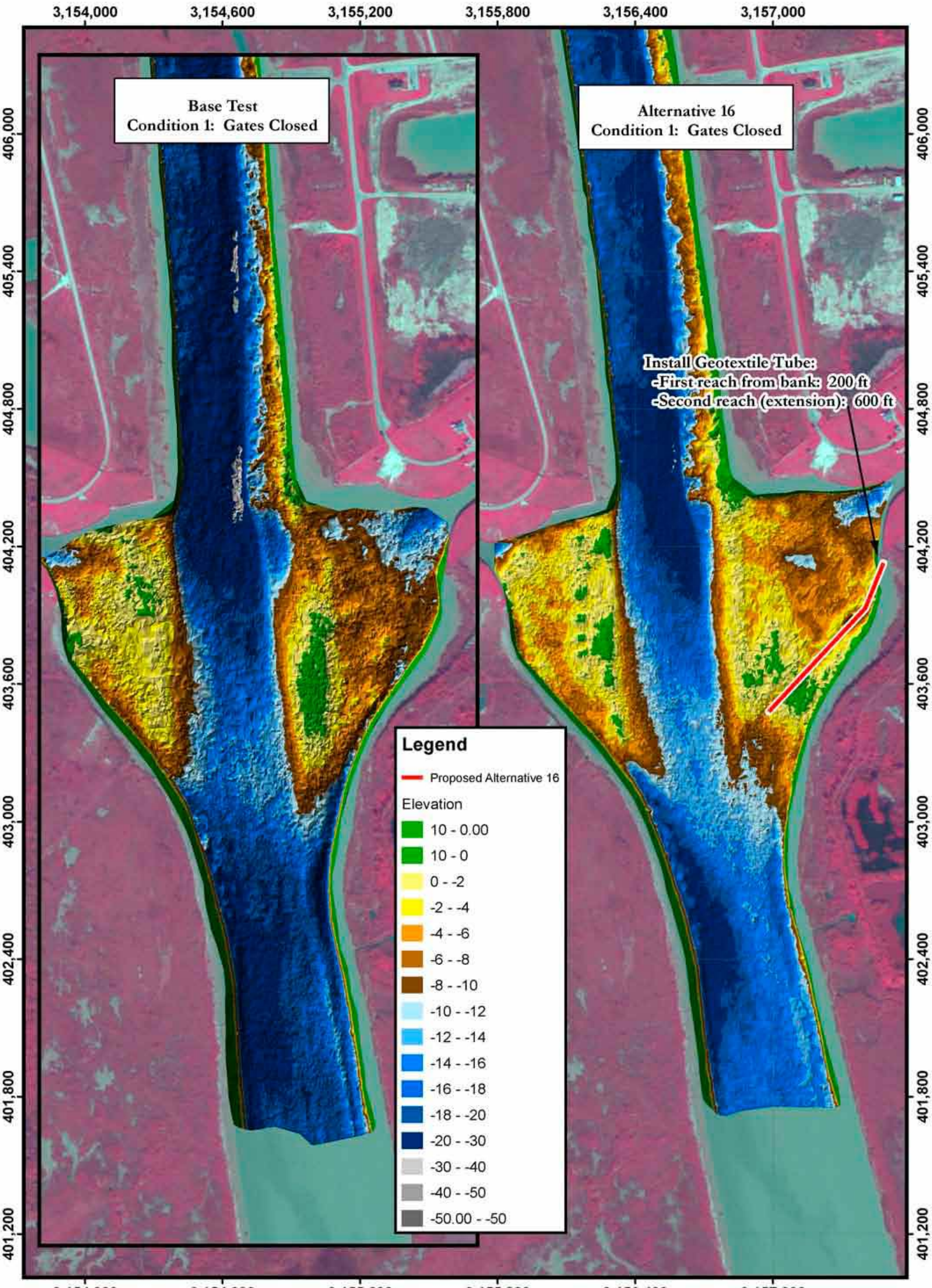

PLATE NUMBER 76

0 75 150 300 450 600
Feet

Alternative 16 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/10/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

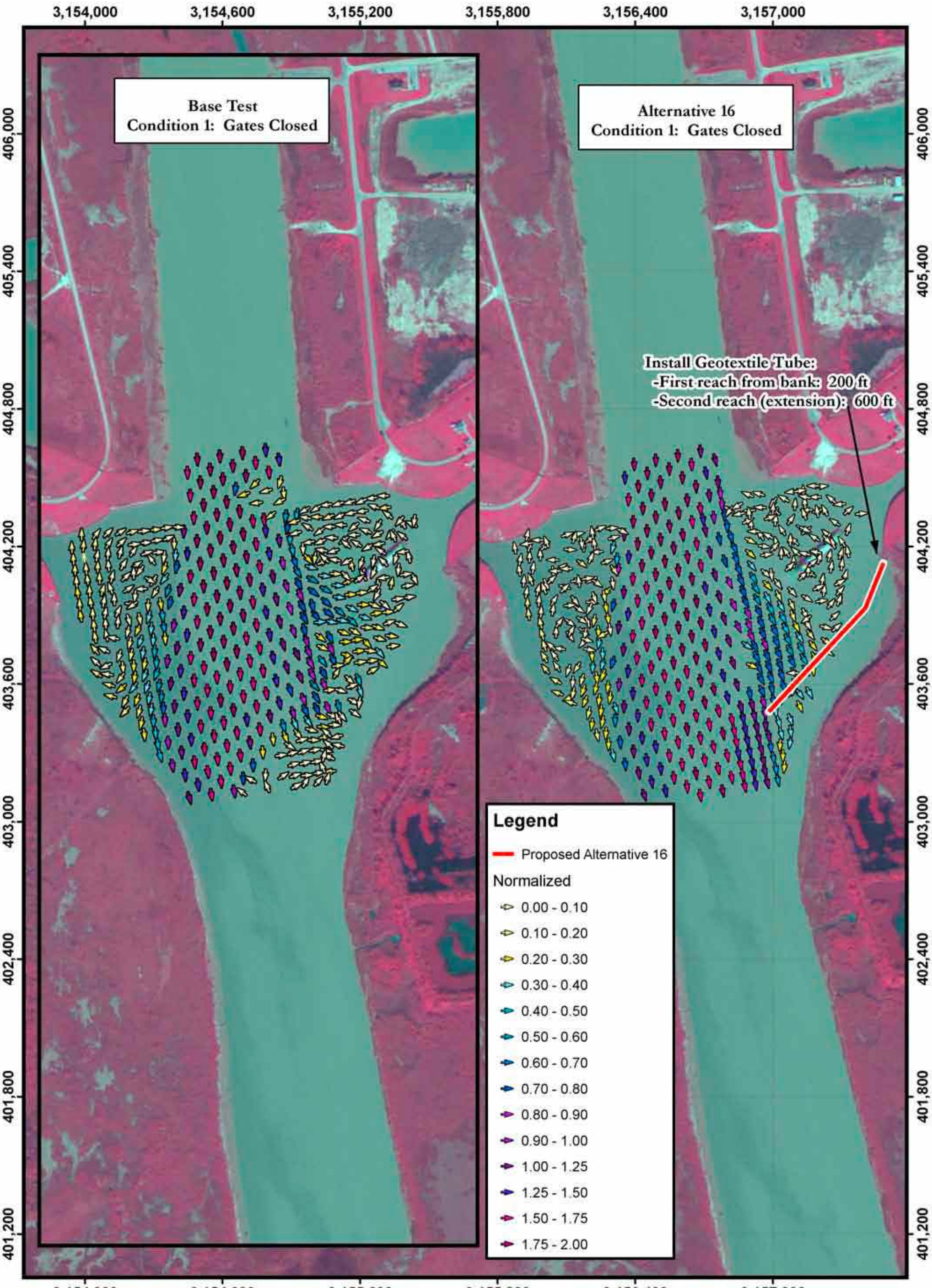

PLATE NUMBER 77

0 75 150 300 450 600
Feet

Alternative 16 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/13/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

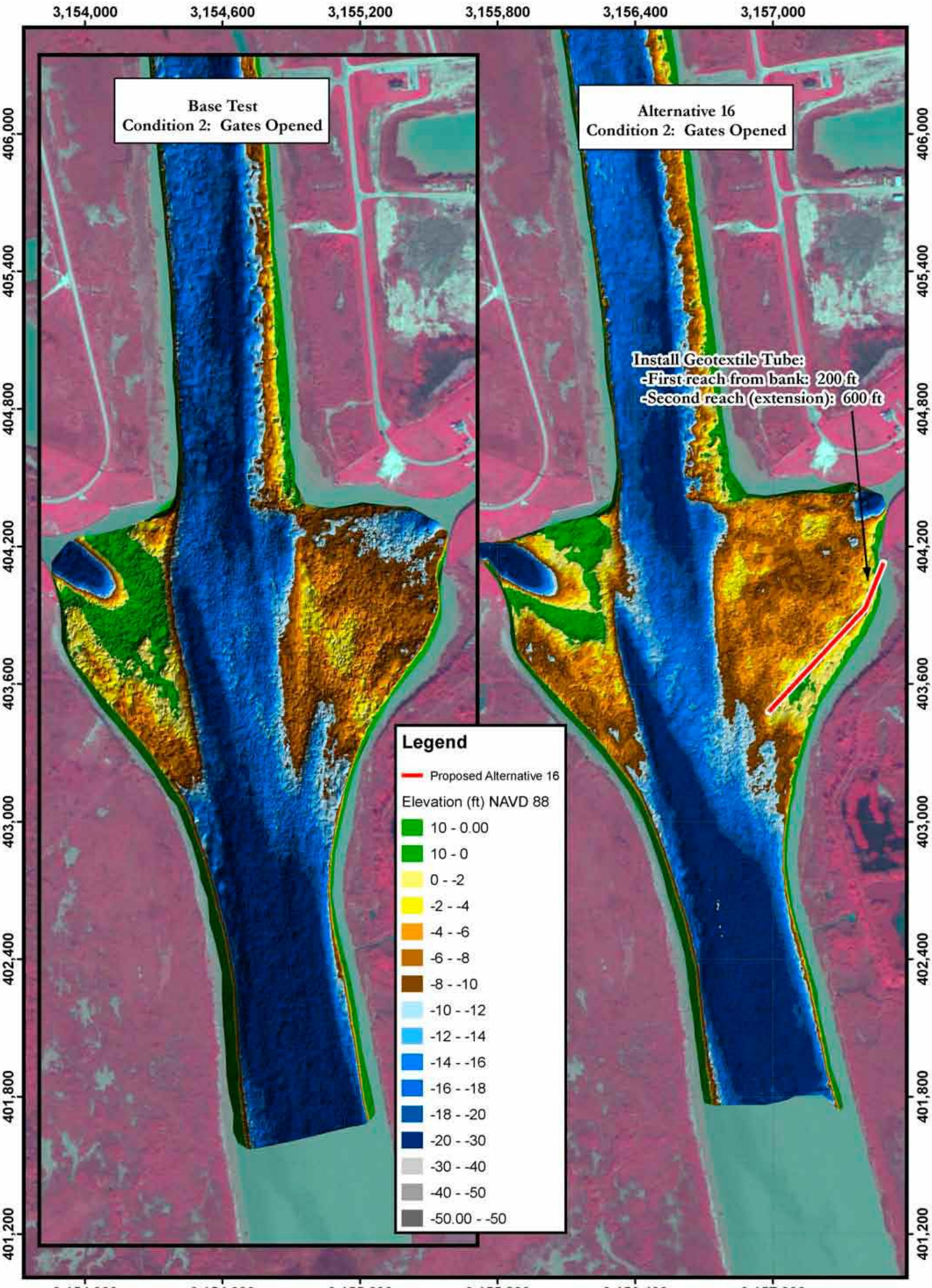

PLATE NUMBER 78

0 75 150 300 450 600
Feet

Alternative 16 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/10/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

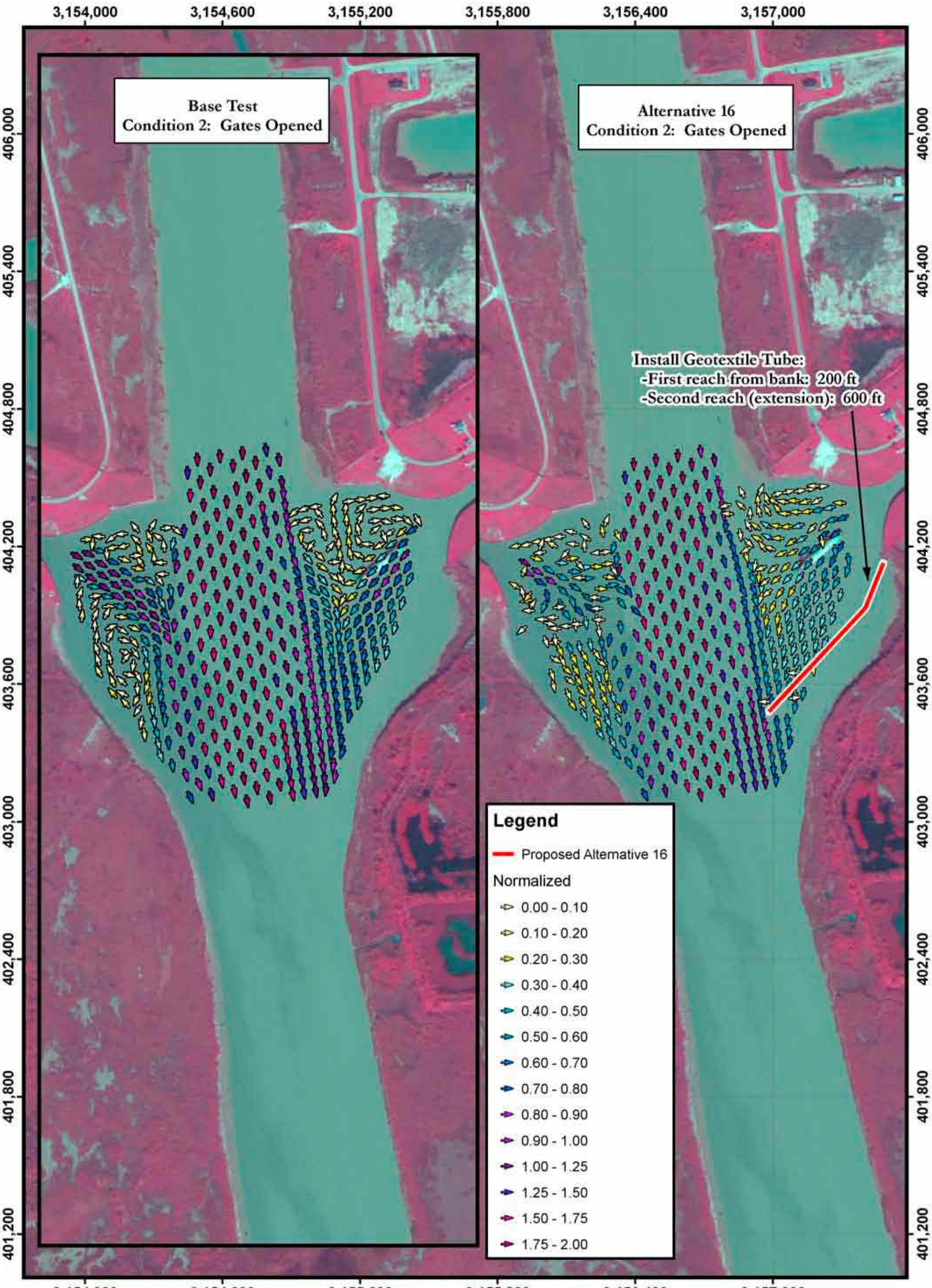

PLATE NUMBER 79

0 75 150 300 450 600
Feet

Alternative 16 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/13/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Flume | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

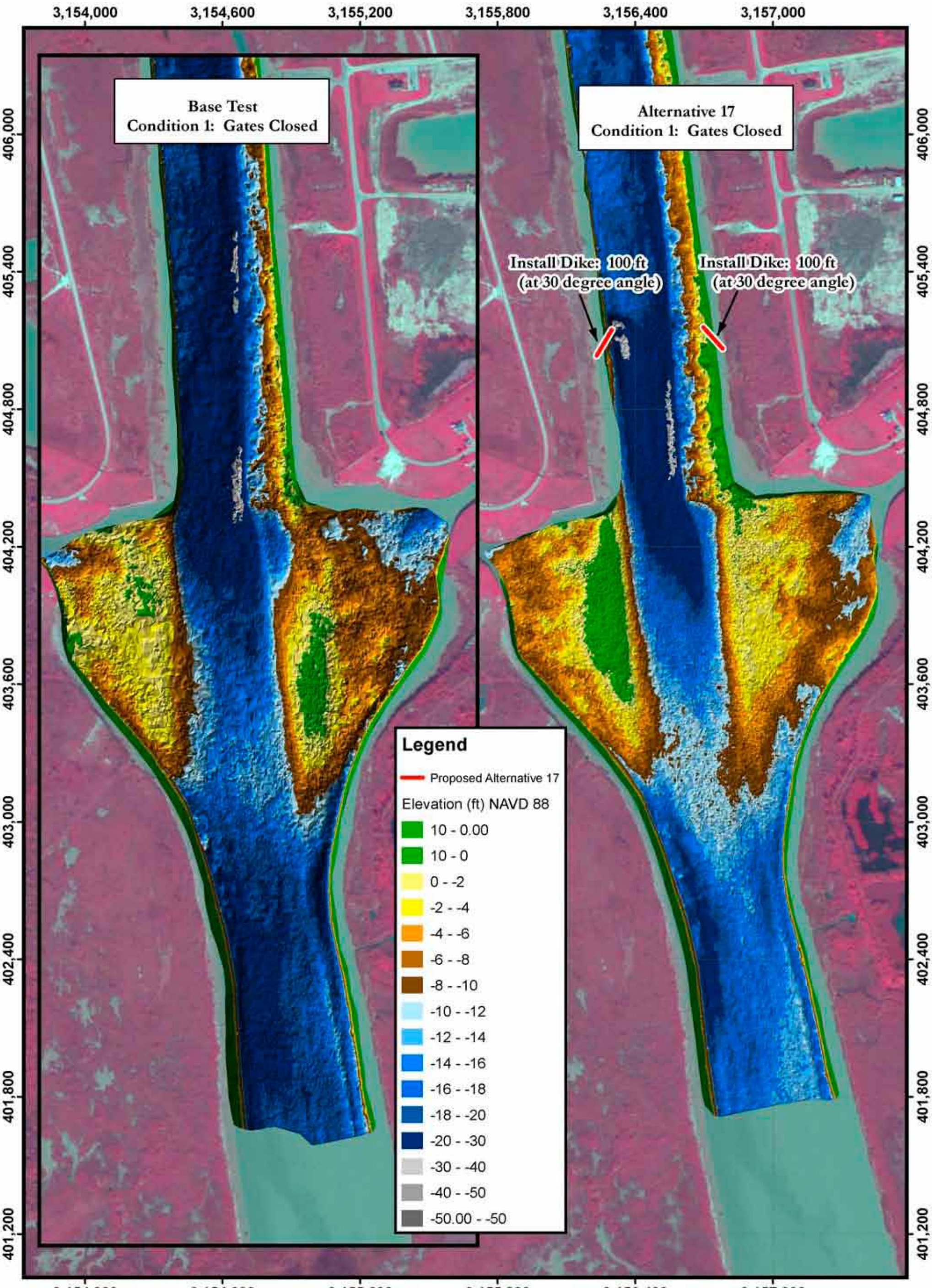

PLATE NUMBER 80

0 75 150 300 450 600
Feet

Alternative 17 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/13/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

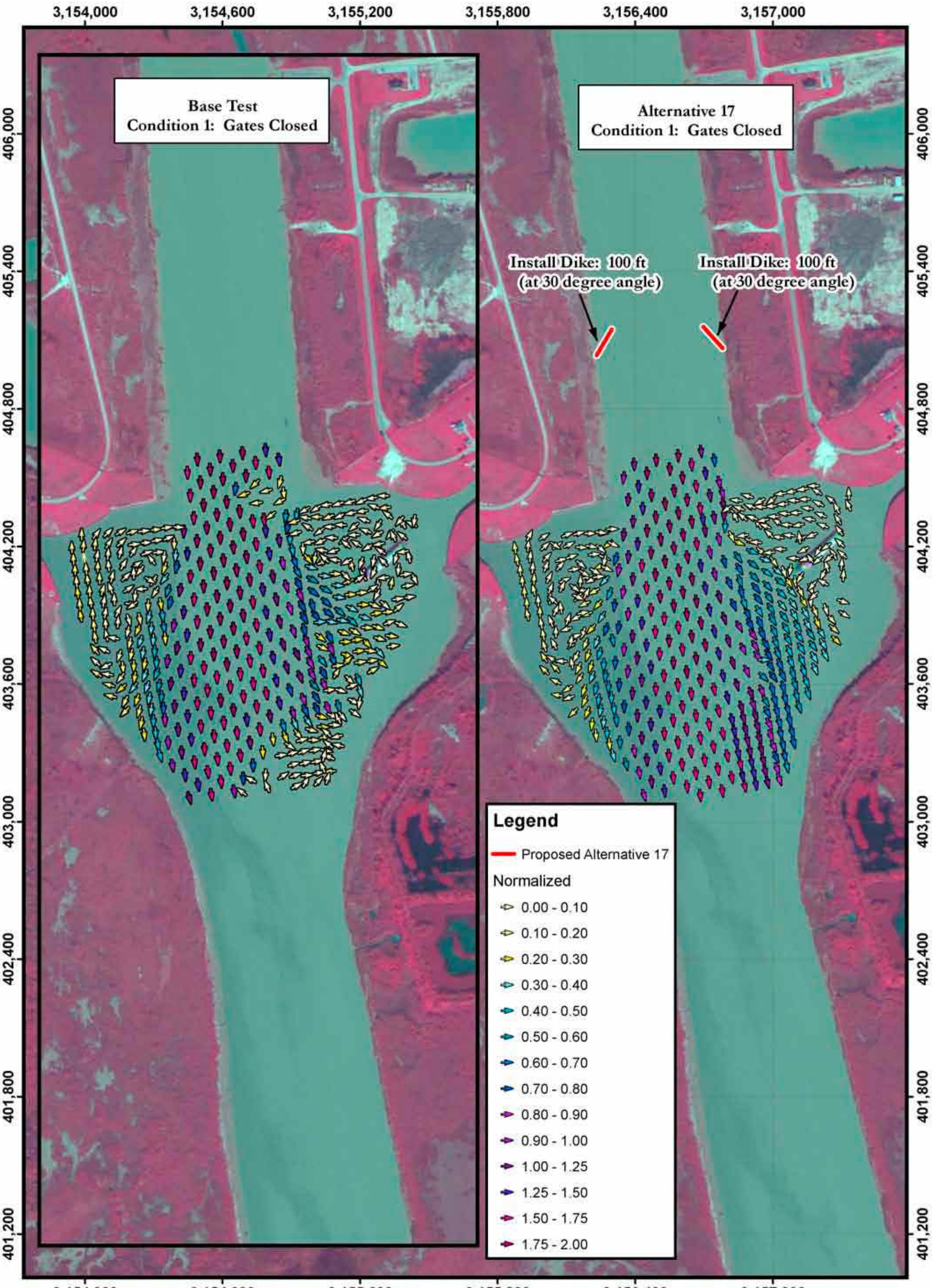

PLATE NUMBER 81

0 75 150 300 450 600
Feet

Alternative 17 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/14/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Texas | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

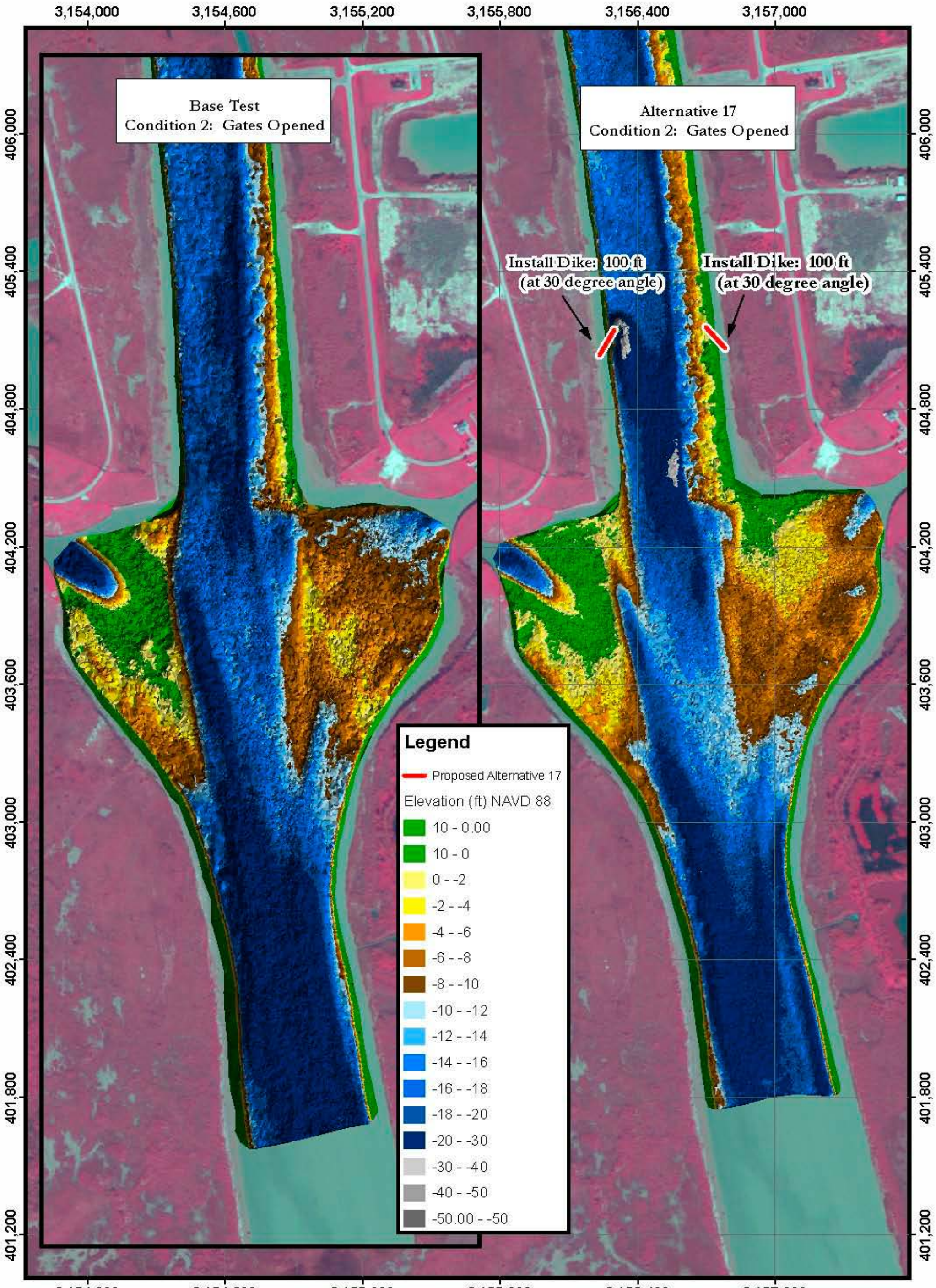

PLATE NUMBER 82

0 75 150 300 450 600
Feet

Alternative 17 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

DESIGNED A COX		DATE 04/10/04 Scan
DRAWN A COX	REVIEWED J BROWN, P.E.	DESIGNED E BRAUER, P.E.
SUBMITTED A COX		APPROVED R DAVINROY, P.E.
REVIEW ... Galveston/Plaza		REVISED 07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

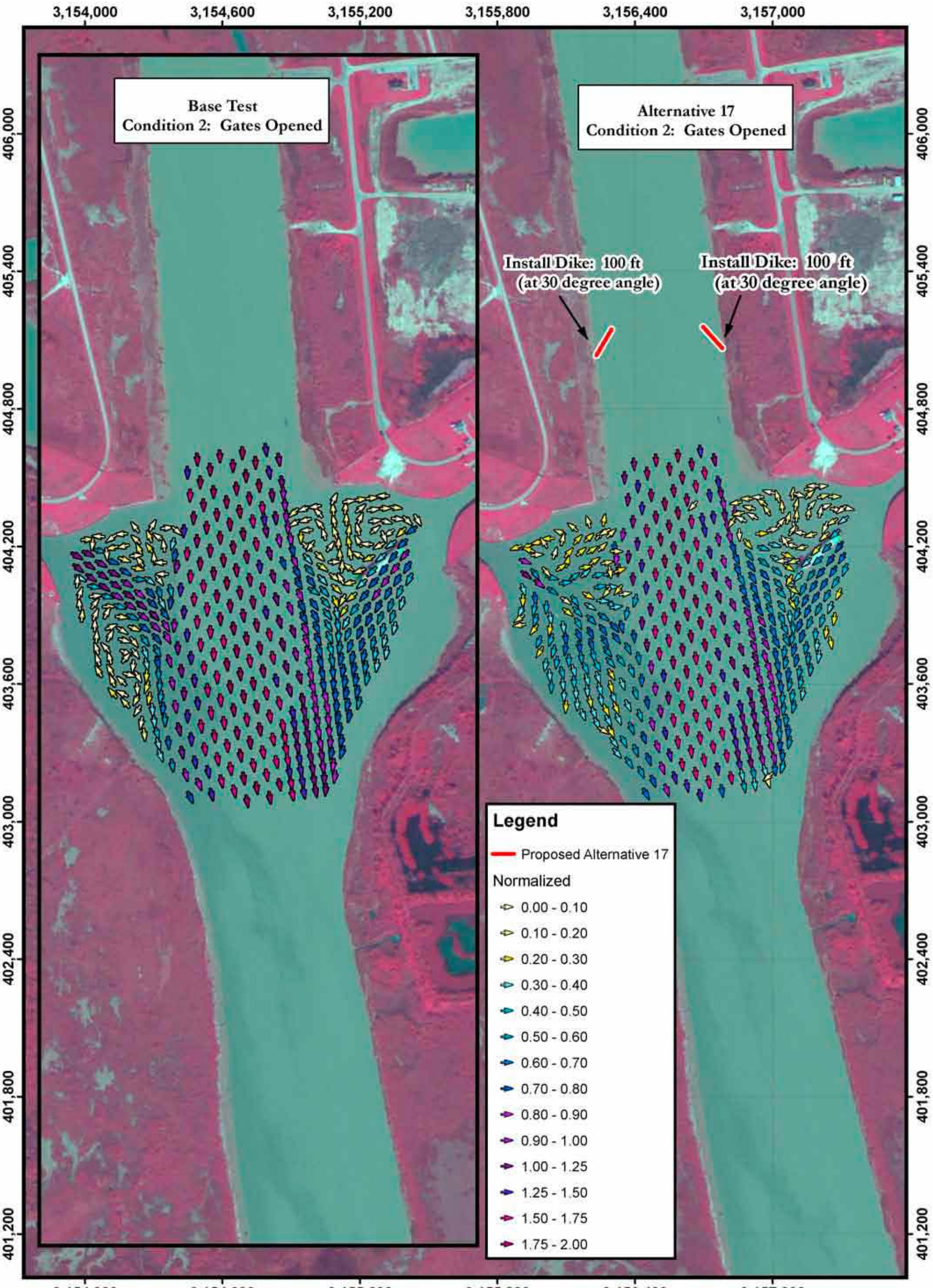

PLATE NUMBER 83

0 75 150 300 450 600
Feet

Alternative 17 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/14/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

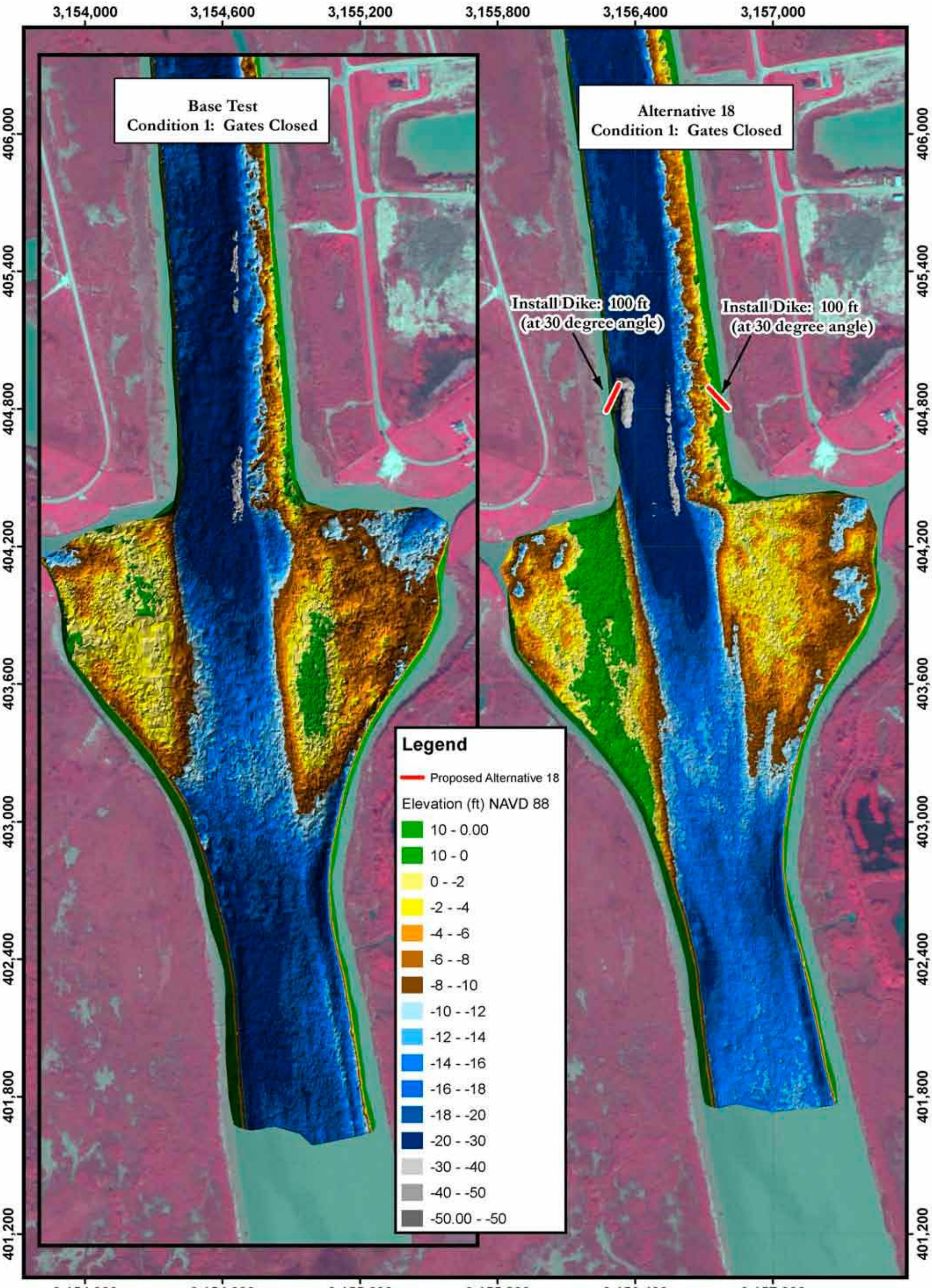

PLATE NUMBER 84

0 75 150 300 450 600
Feet

Alternative 18 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/15/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

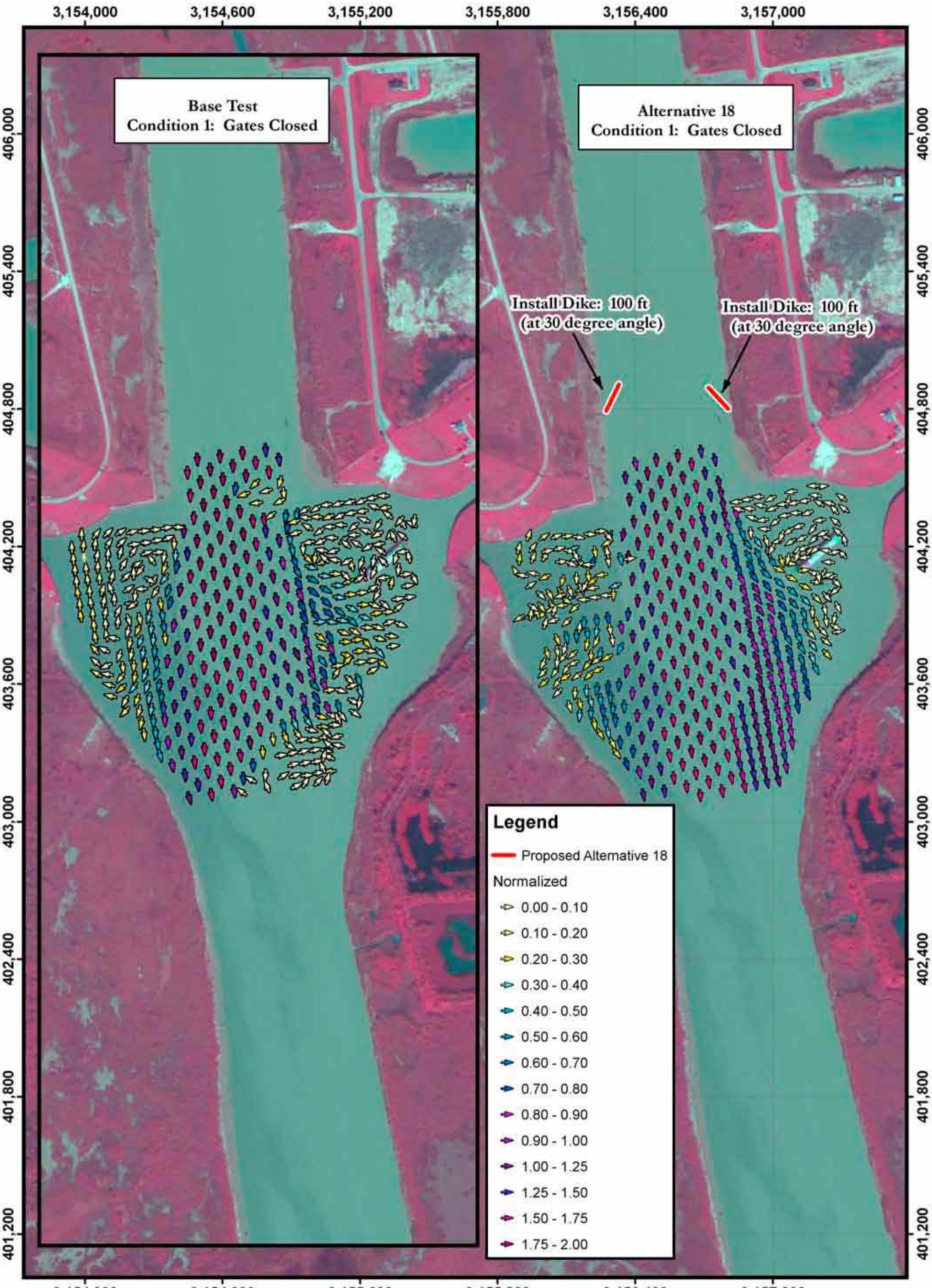

PLATE NUMBER 85

0 75 150 300 450 600
Feet

Alternative 18 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/16/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plans | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

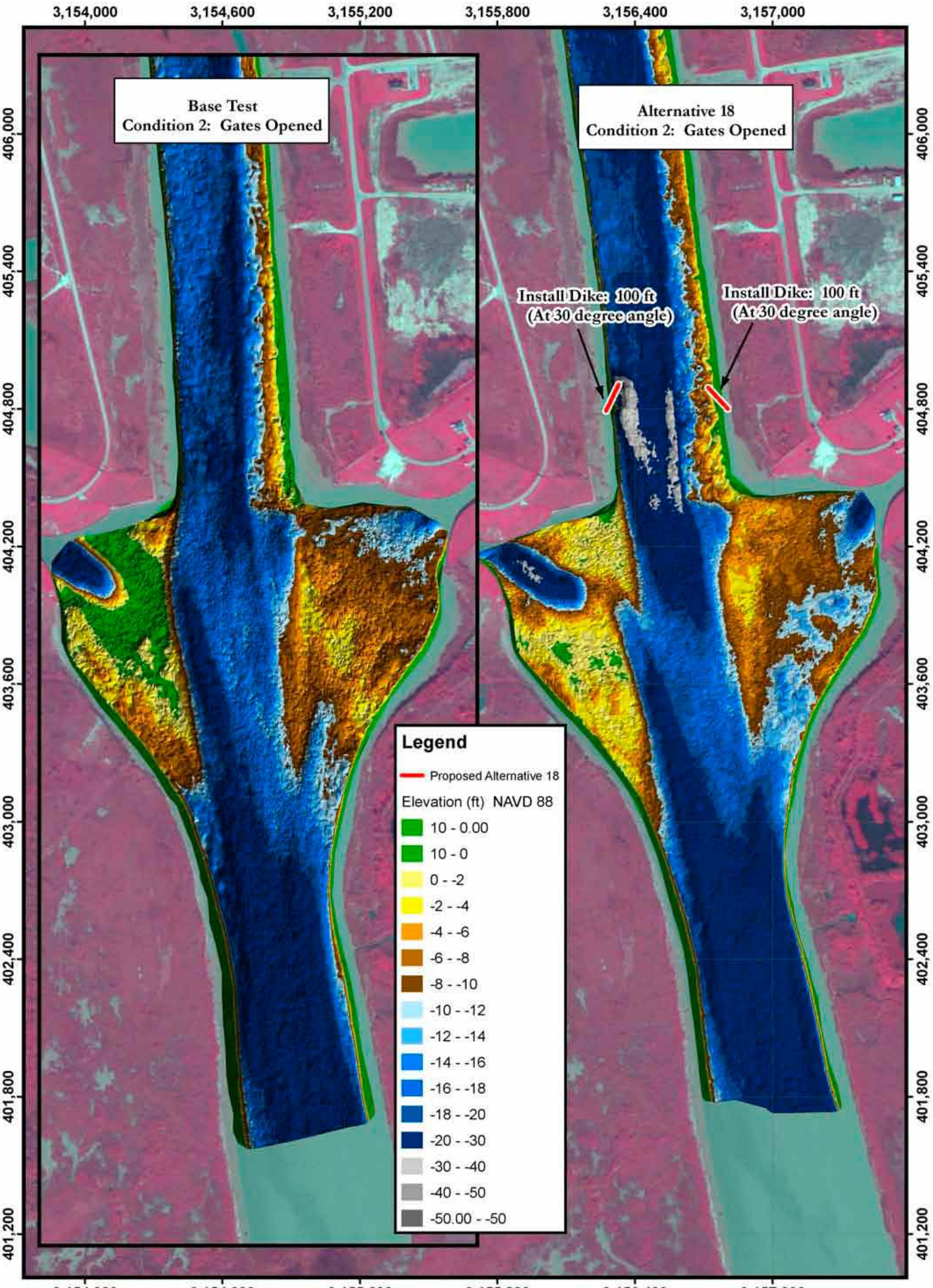

PLATE NUMBER 86

0 75 150 300 450 600
Feet

Alternative 18 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/16/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

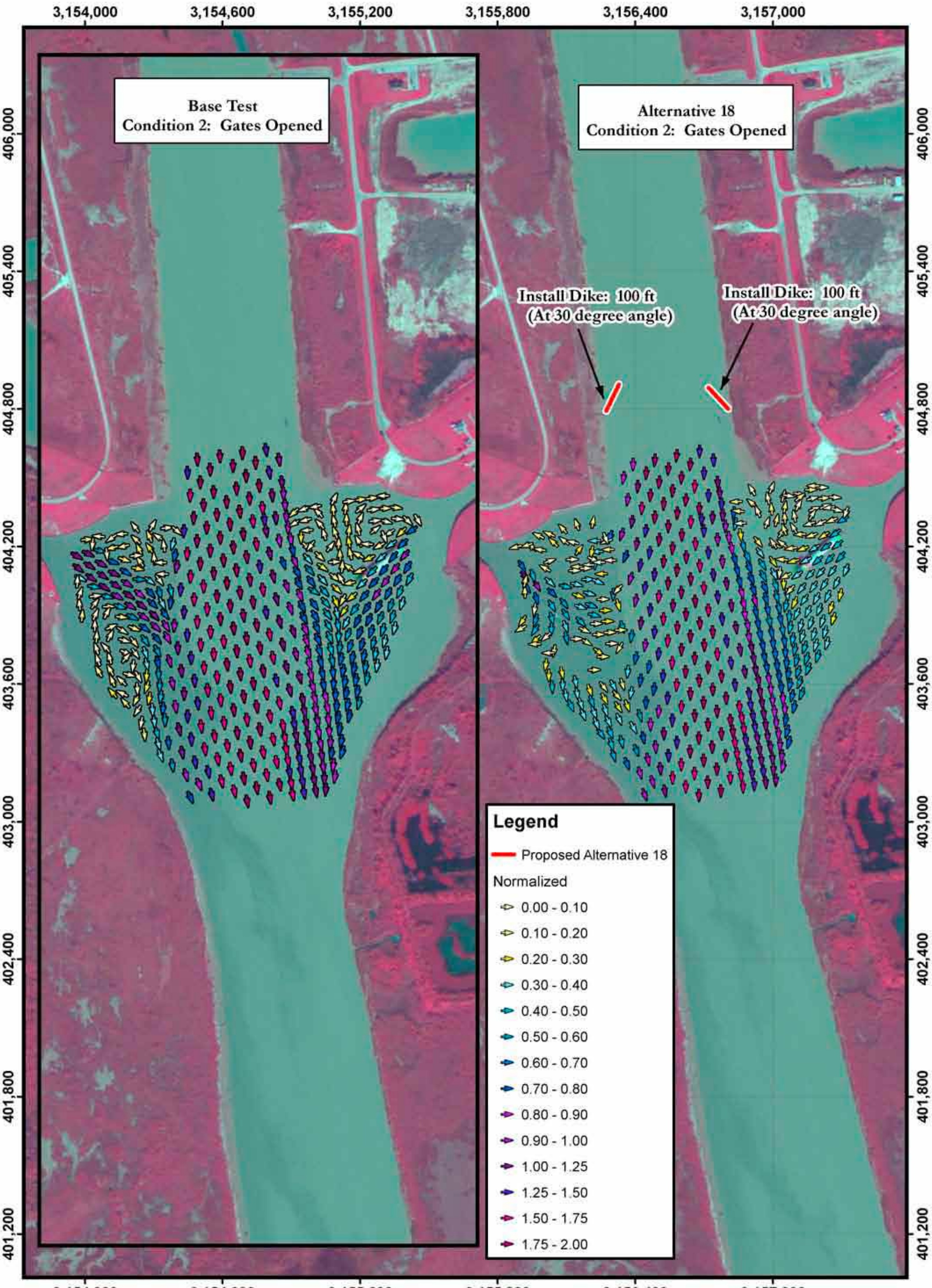

PLATE NUMBER 87

0 75 150 300 450 600
Feet

Alternative 18 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/20/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Texas | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

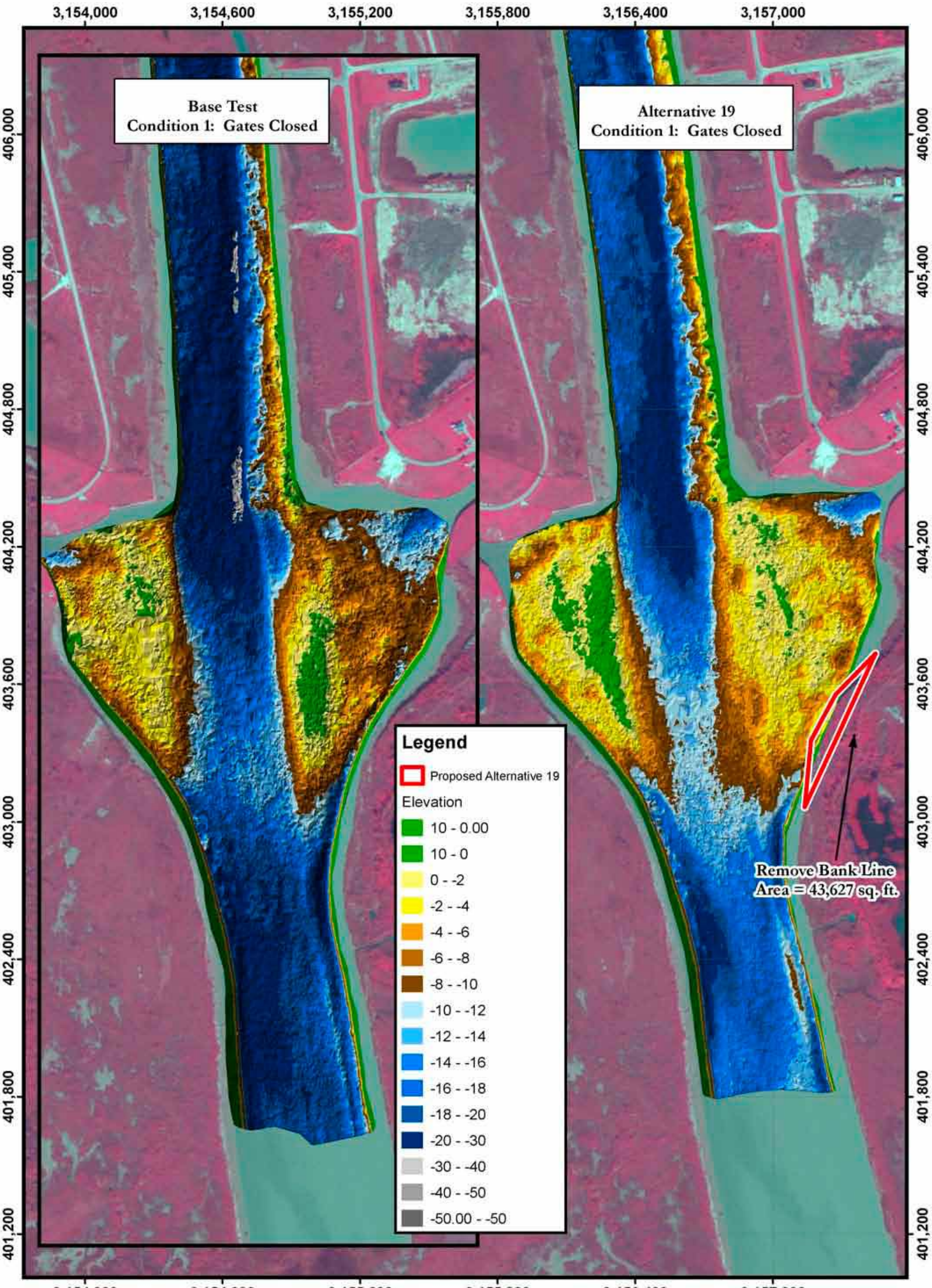

PLATE NUMBER 88

0 75 150 300 450 600
Feet

Alternative 19 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/22/09 Scan
	A COX	J BROWN, P.E.	F. BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

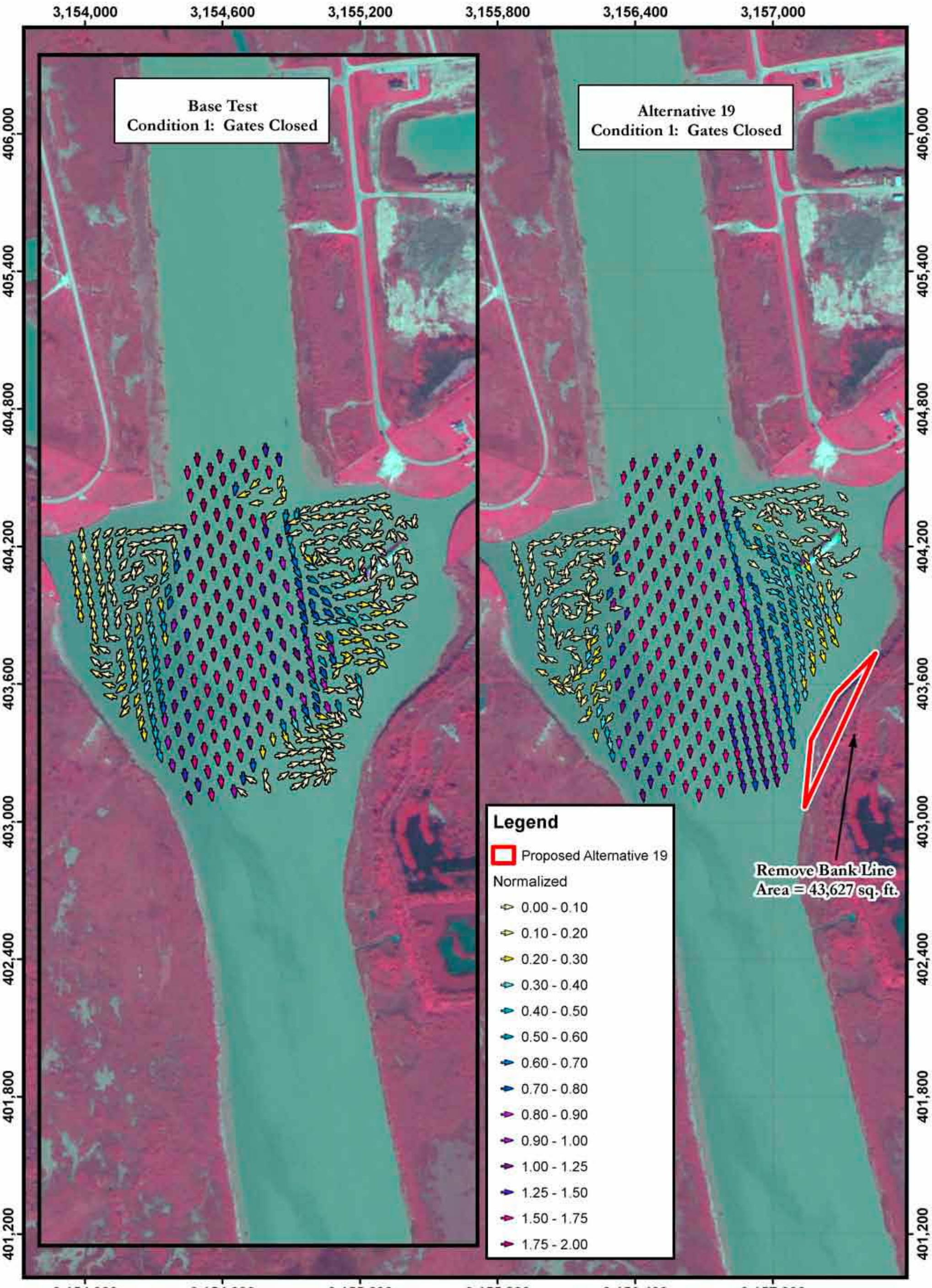

PLATE NUMBER 89

0 75 150 300 450 600
Feet

Alternative 19 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/22/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Texas | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

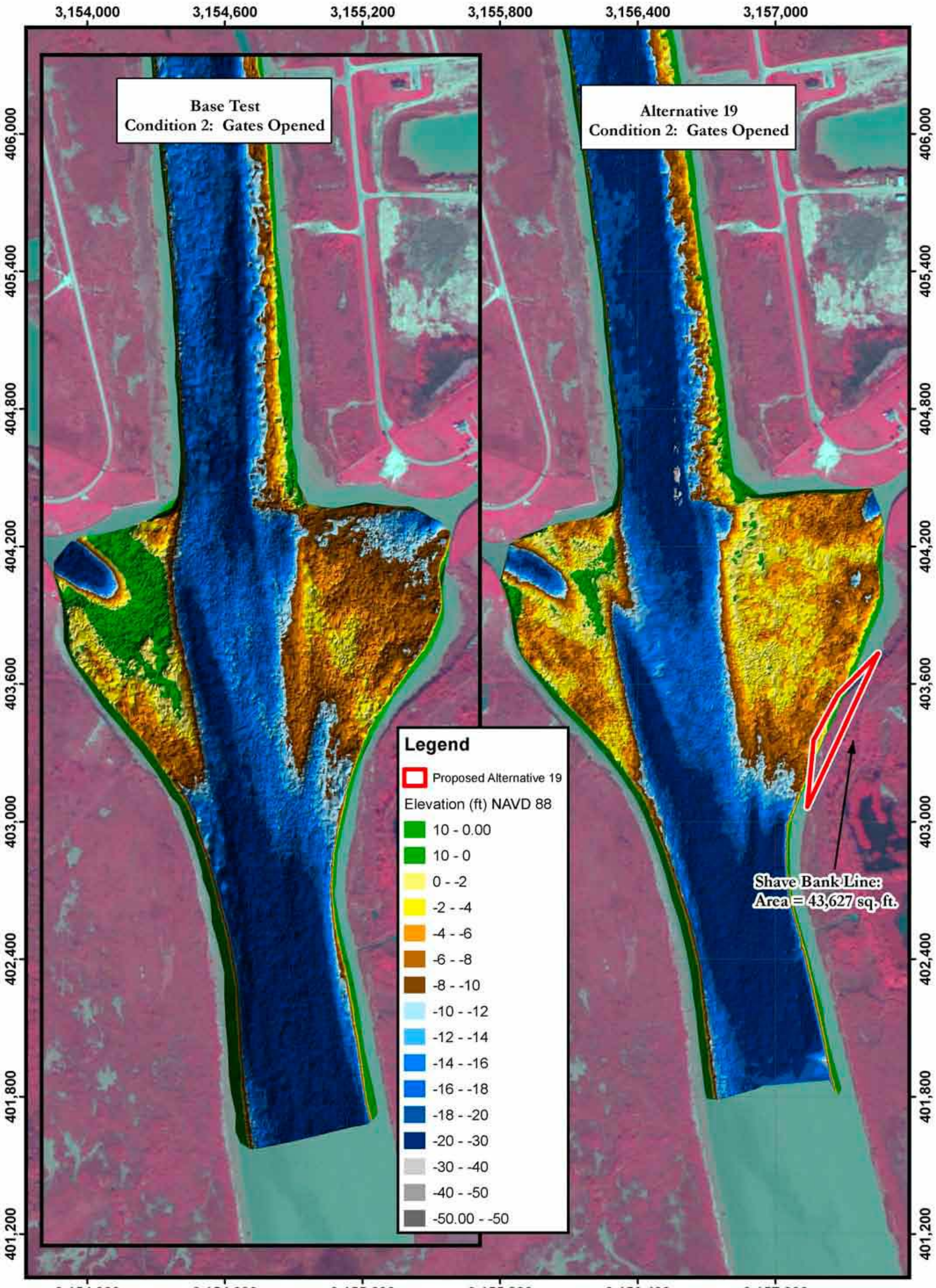

PLATE NUMBER 90

0 75 150 300 450 600
Feet

Alternative 19 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/22/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

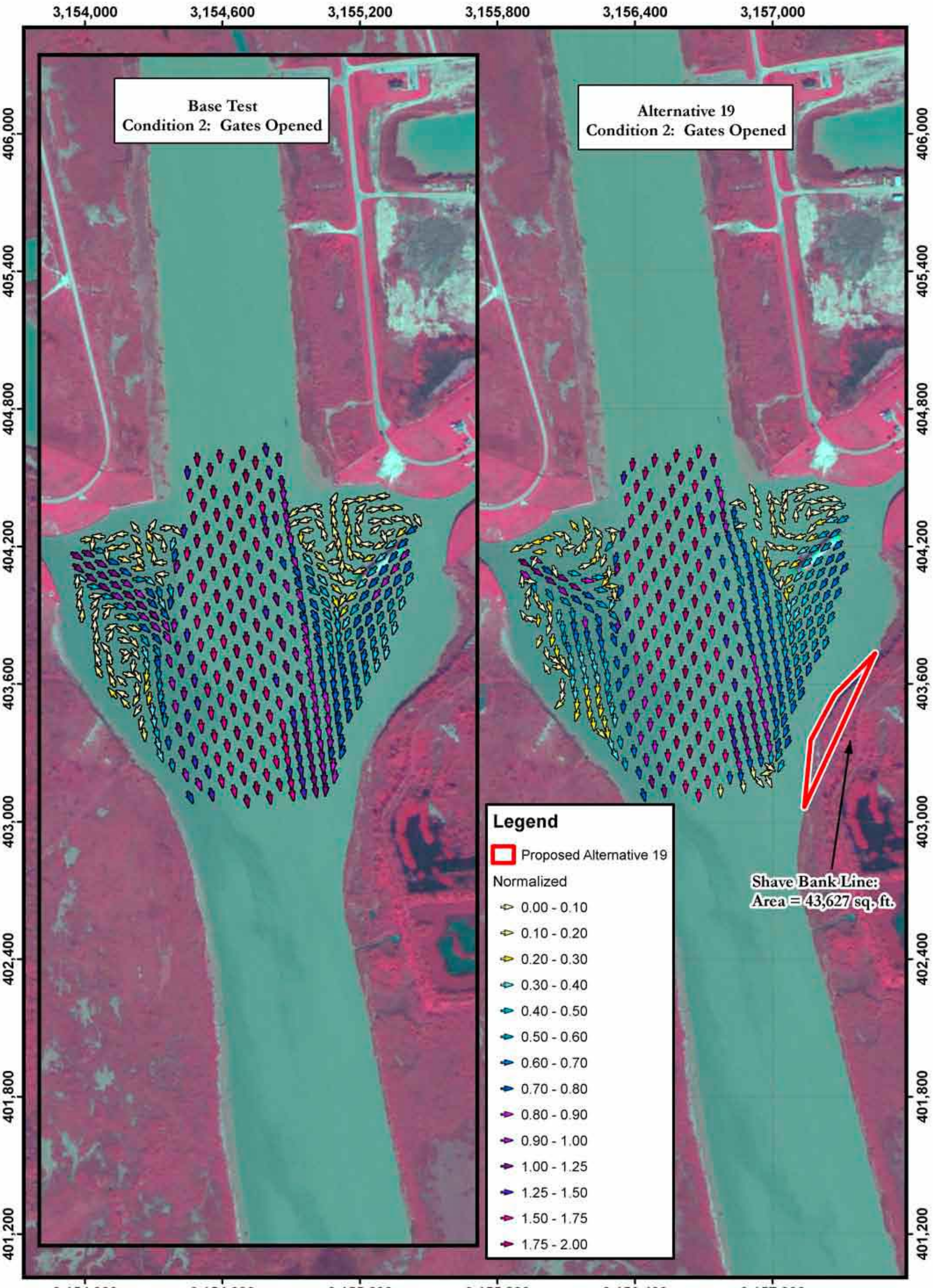

PLATE NUMBER 91

0 75 150 300 450 600
Feet

Alternative 19 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/22/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

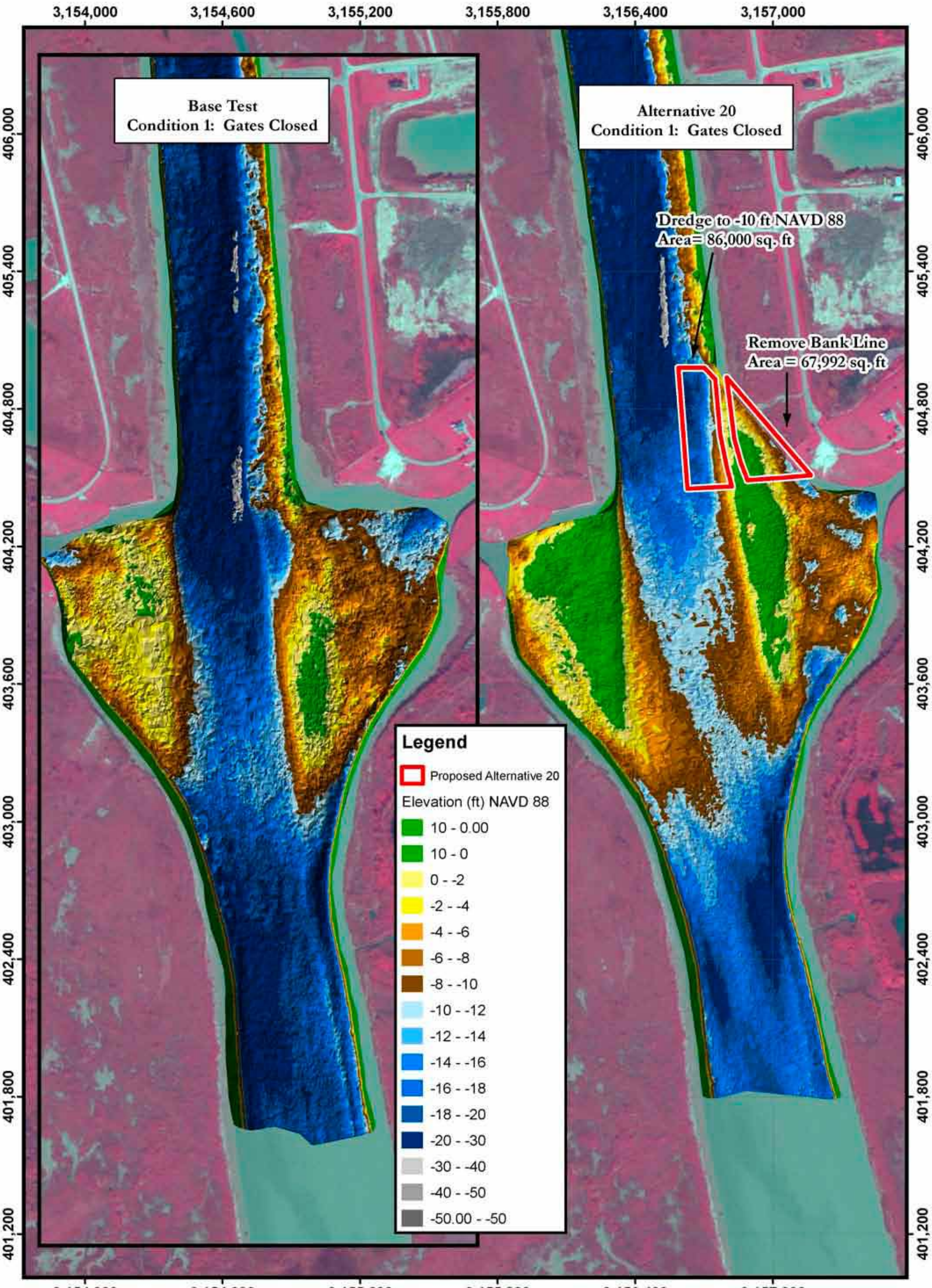

PLATE NUMBER 92

0 75 150 300 450 600
Feet

Alternative 20 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/23/09 Scan
	A COX	J BROWN, P.E.	F. BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

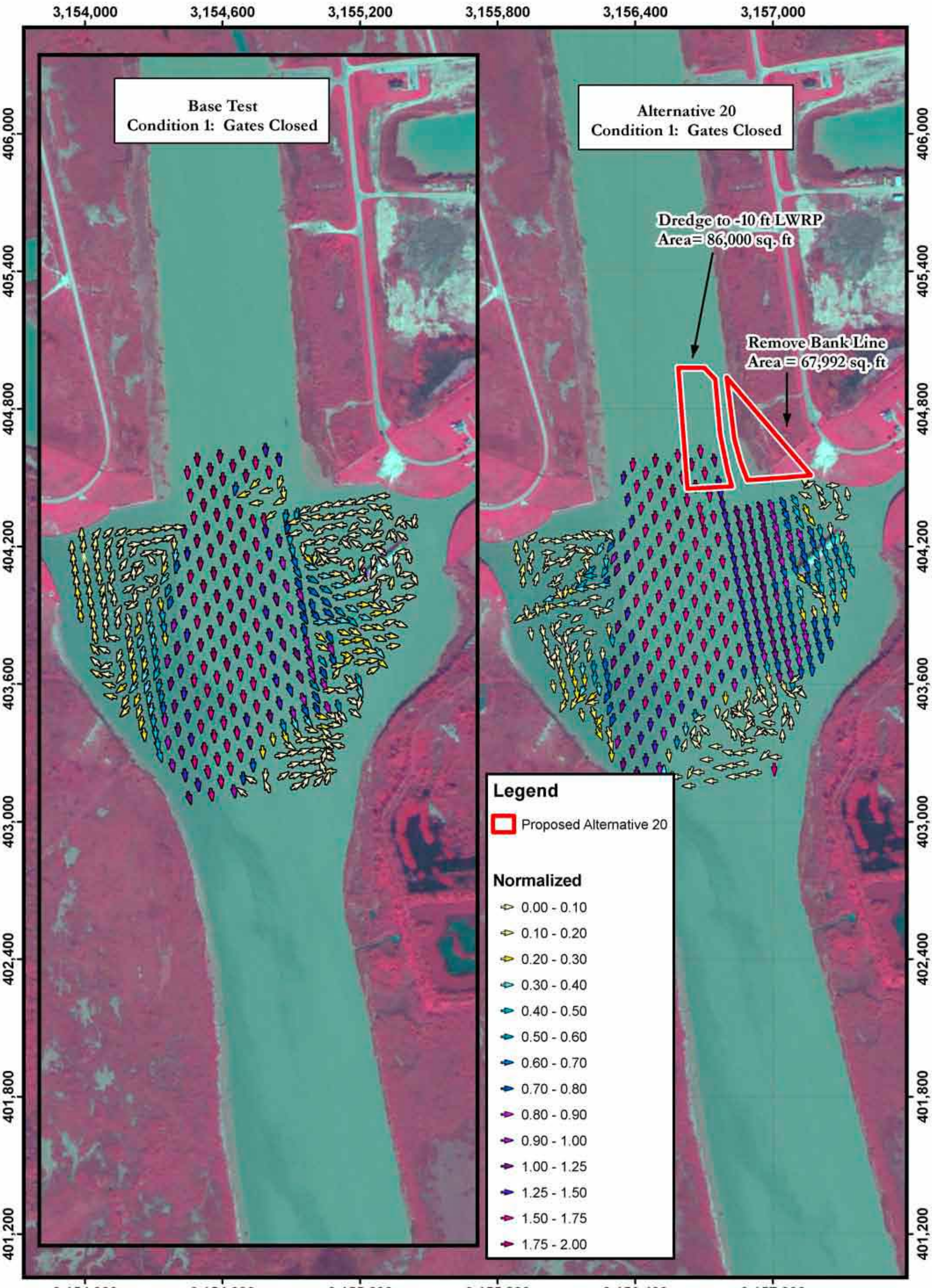

PLATE NUMBER 93

0 75 150 300 450 600
Feet

Alternative 20 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/23/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Flume | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

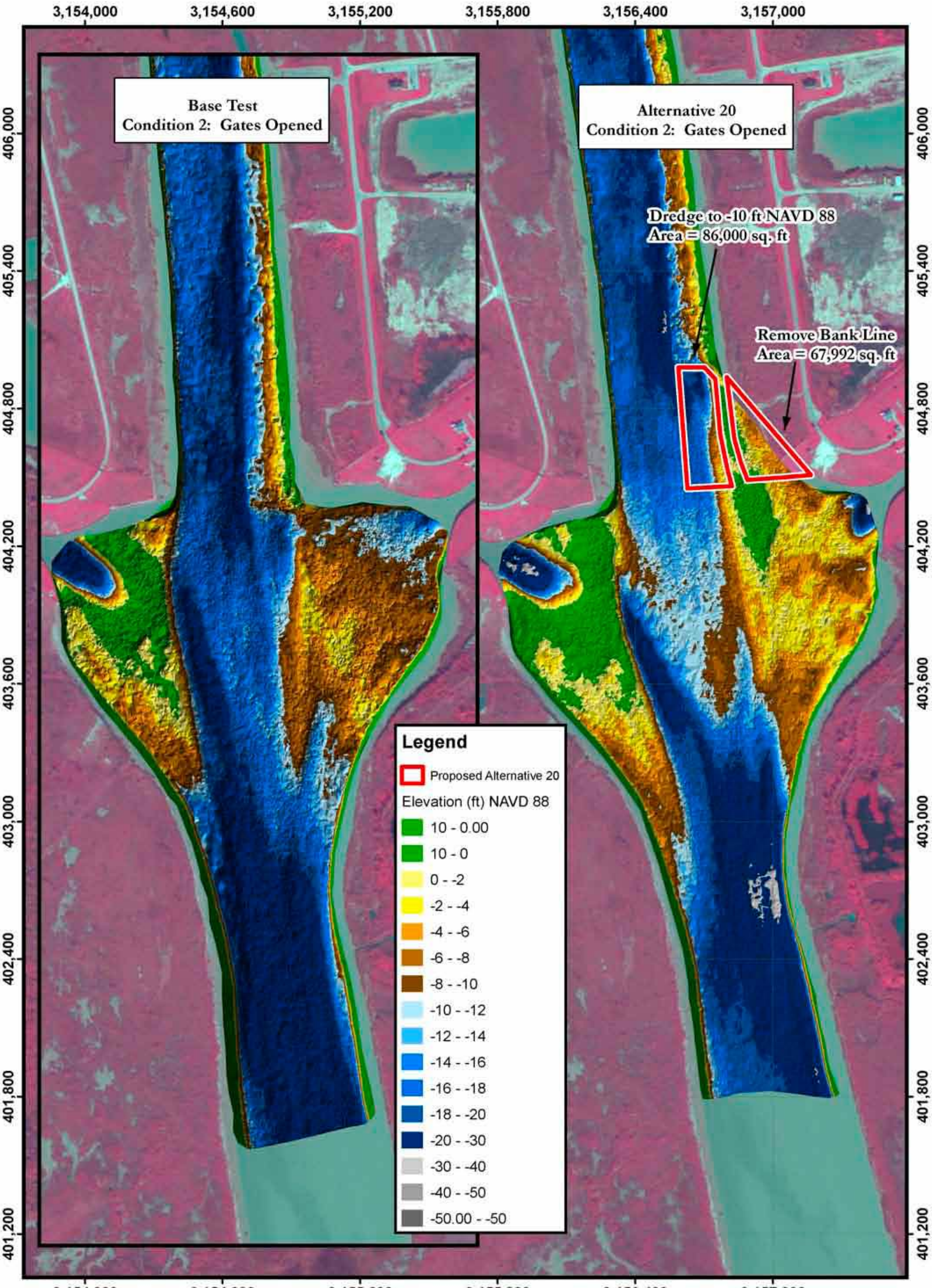

PLATE NUMBER 94

0 75 150 300 450 600
Feet

Alternative 20 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/24/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

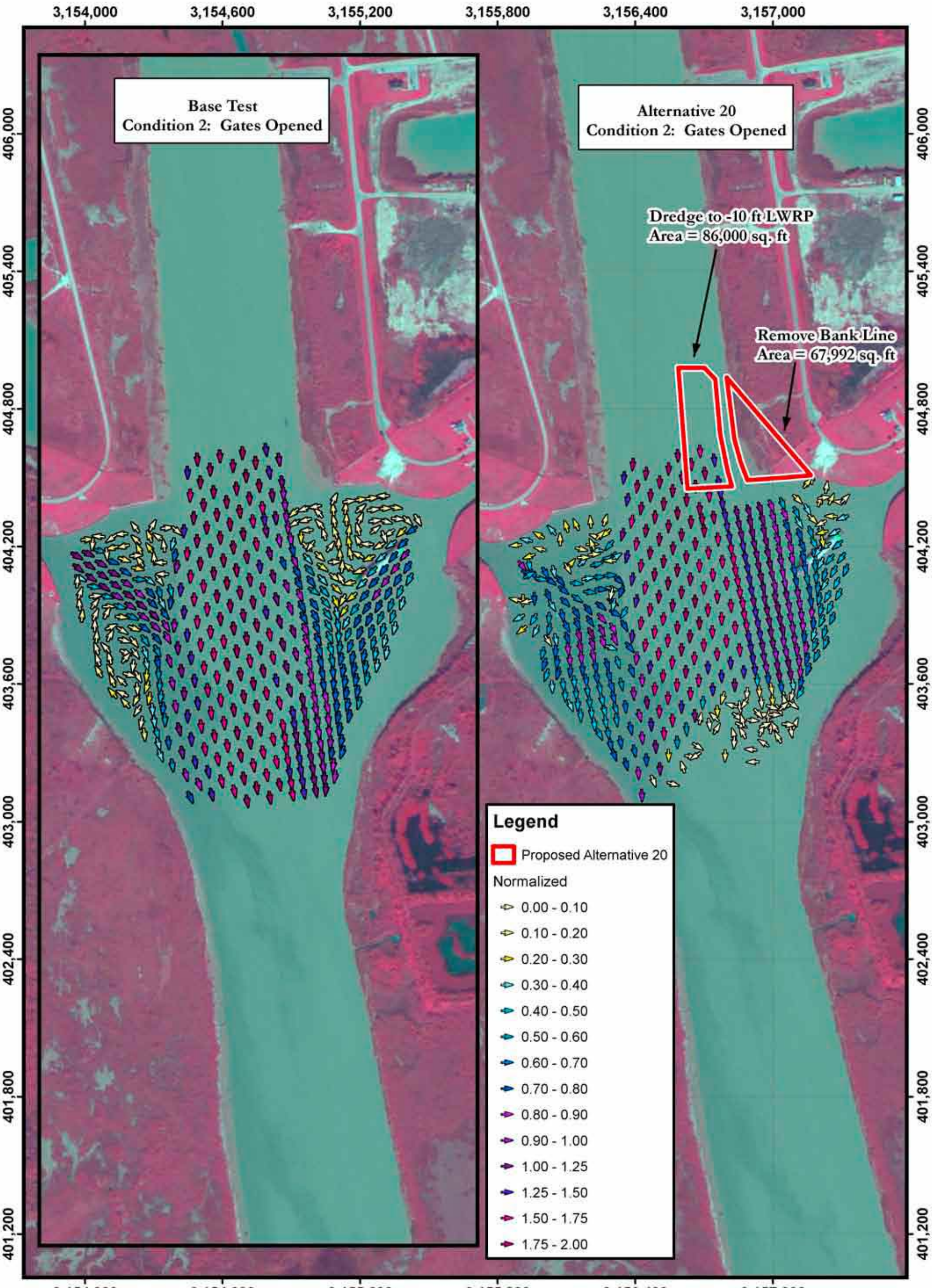

PLATE NUMBER 95

0 75 150 300 450 600
Feet

Alternative 20 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/23/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

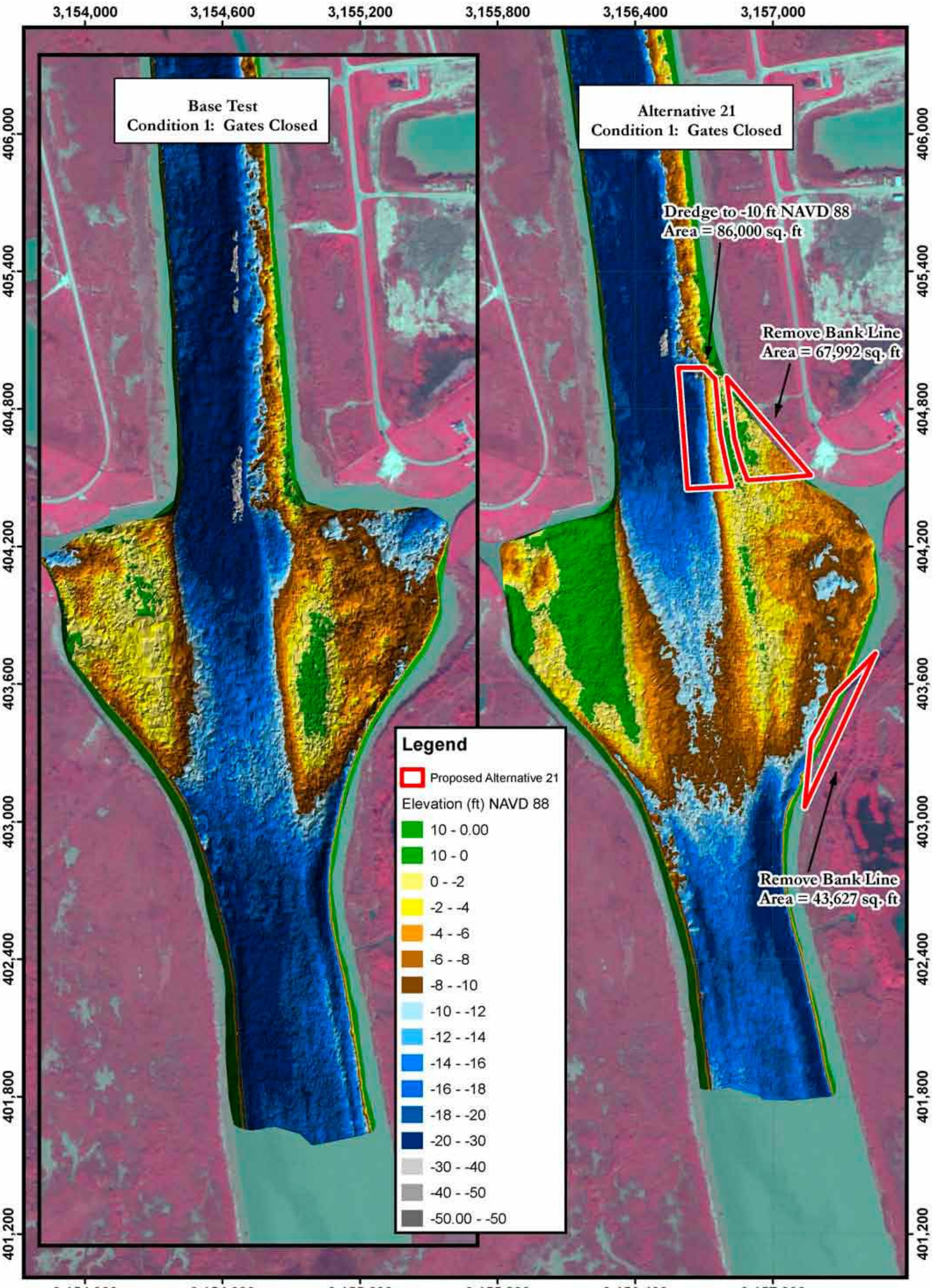

PLATE NUMBER 96

0 75 150 300 450 600
Feet

Alternative 21 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/24/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

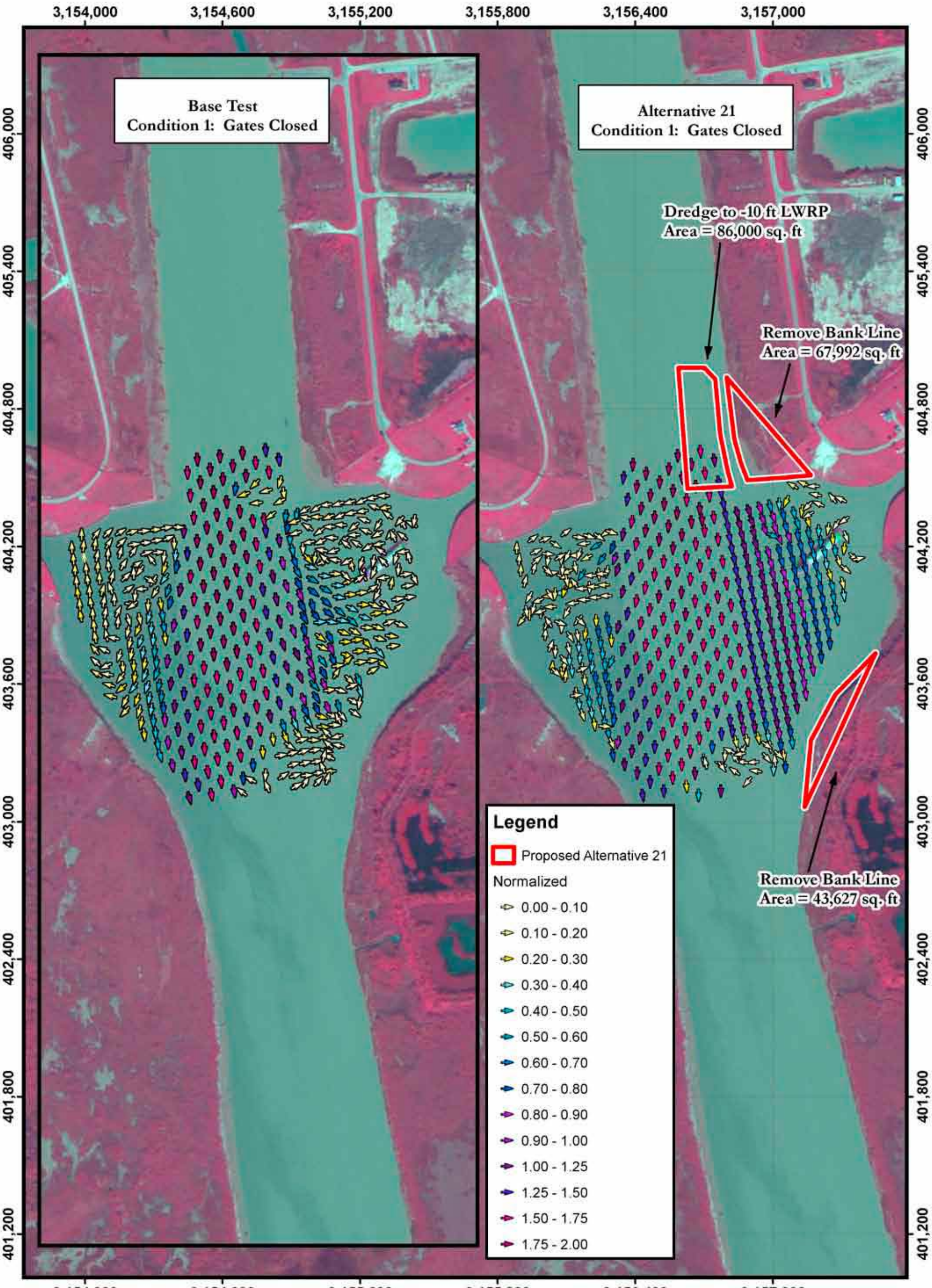

PLATE NUMBER 97

0 75 150 300 450 600
Feet

Alternative 21 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/27/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

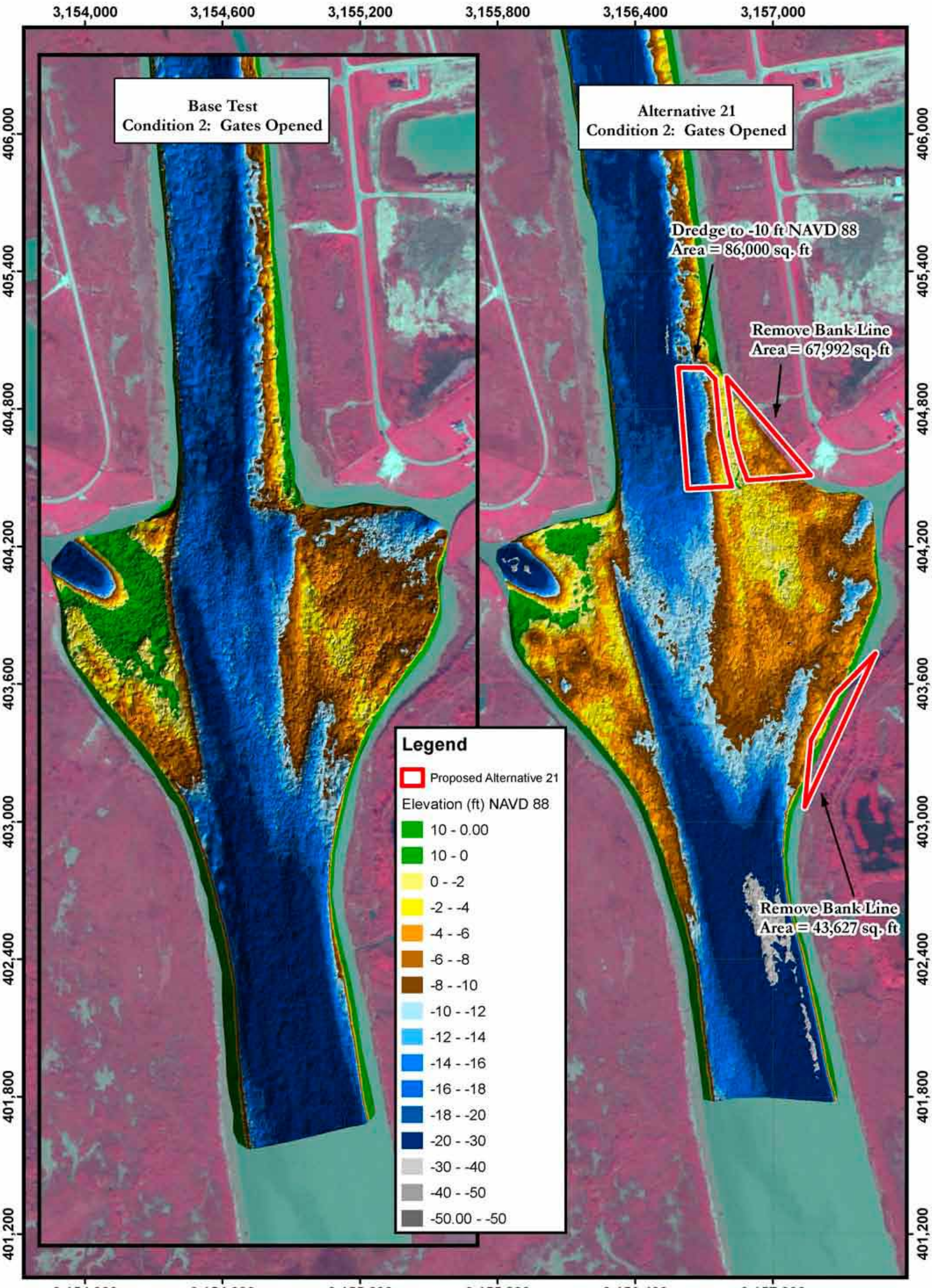

PLATE NUMBER 98

0 75 150 300 450 600
Feet

Alternative 21 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/28/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

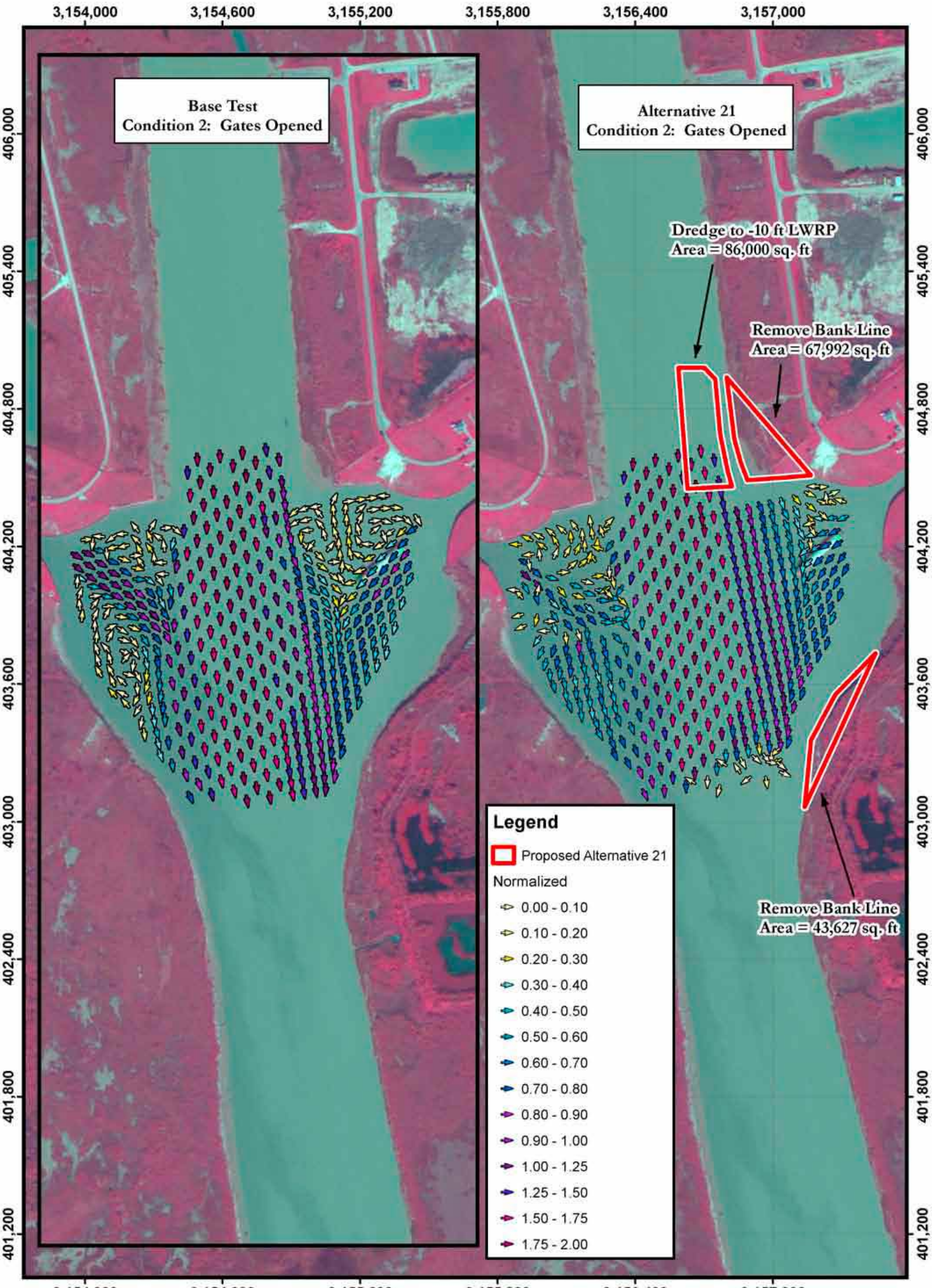

PLATE NUMBER 66

0 75 150 300 450 600
Feet

Alternative 21 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		04/27/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX		R DAVINROY, P.E.
...Galveston/Tiana		07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

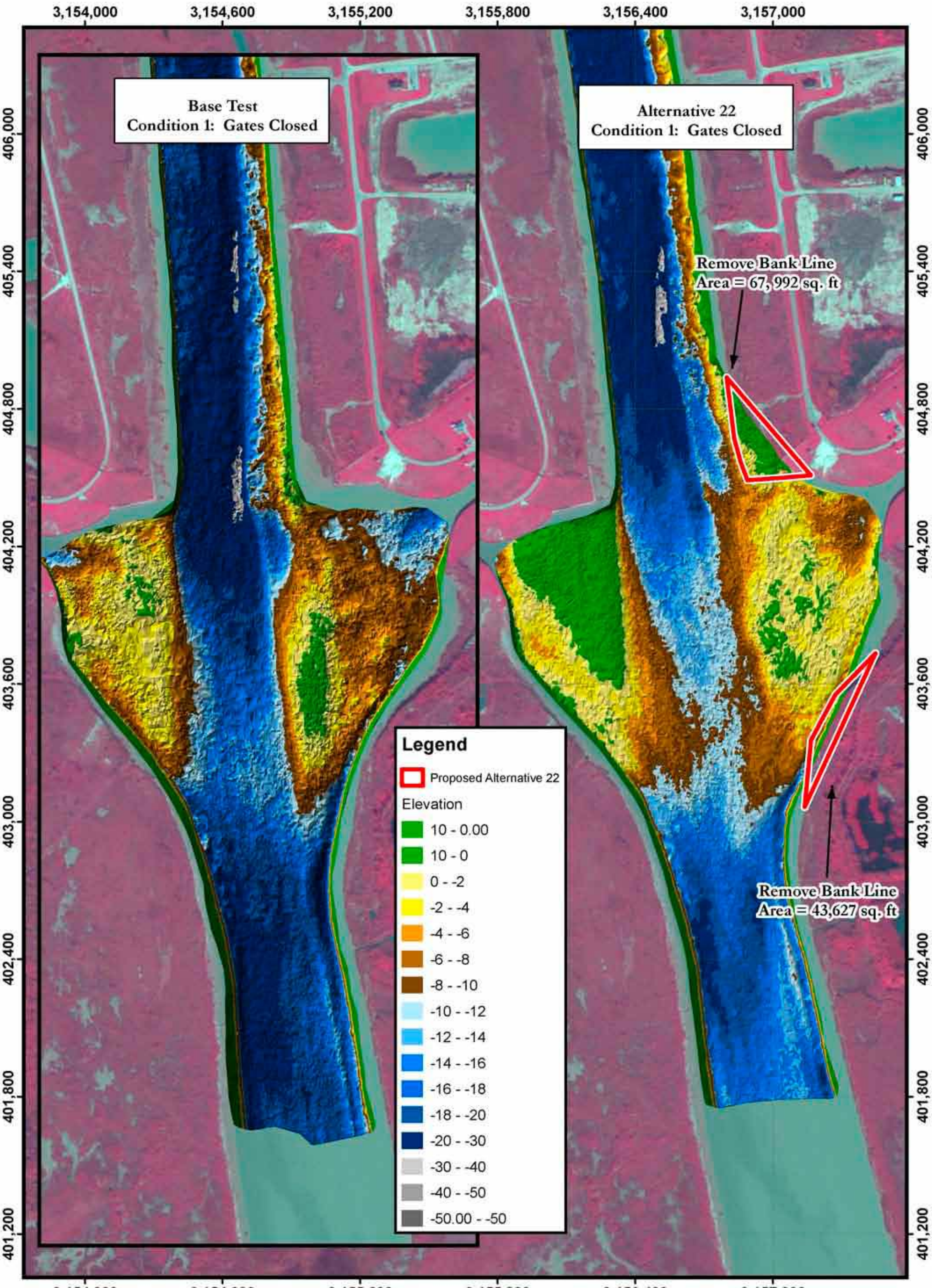

PLATE NUMBER 100

0 75 150 300 450 600
Feet

Alternative 22 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/28/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

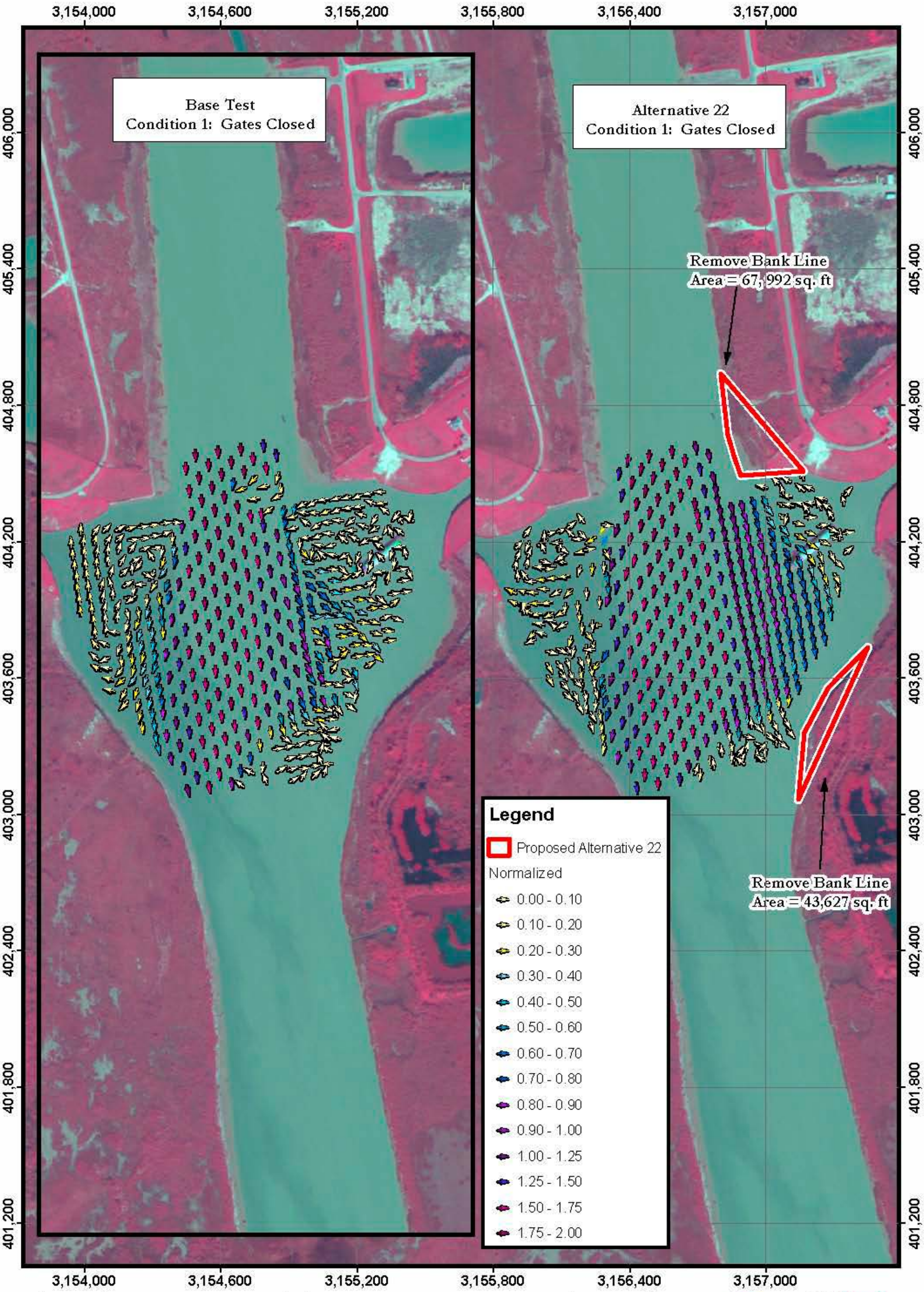

PLATE NUMBER 101

0 75 150 300 450 600
Feet

Alternative 22 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 04/30/09 Scan
A COX | J BROWN, PE. | E BRAUER, PE.
A COX | R DAVINROY, PE.
... Galveston/Houston | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

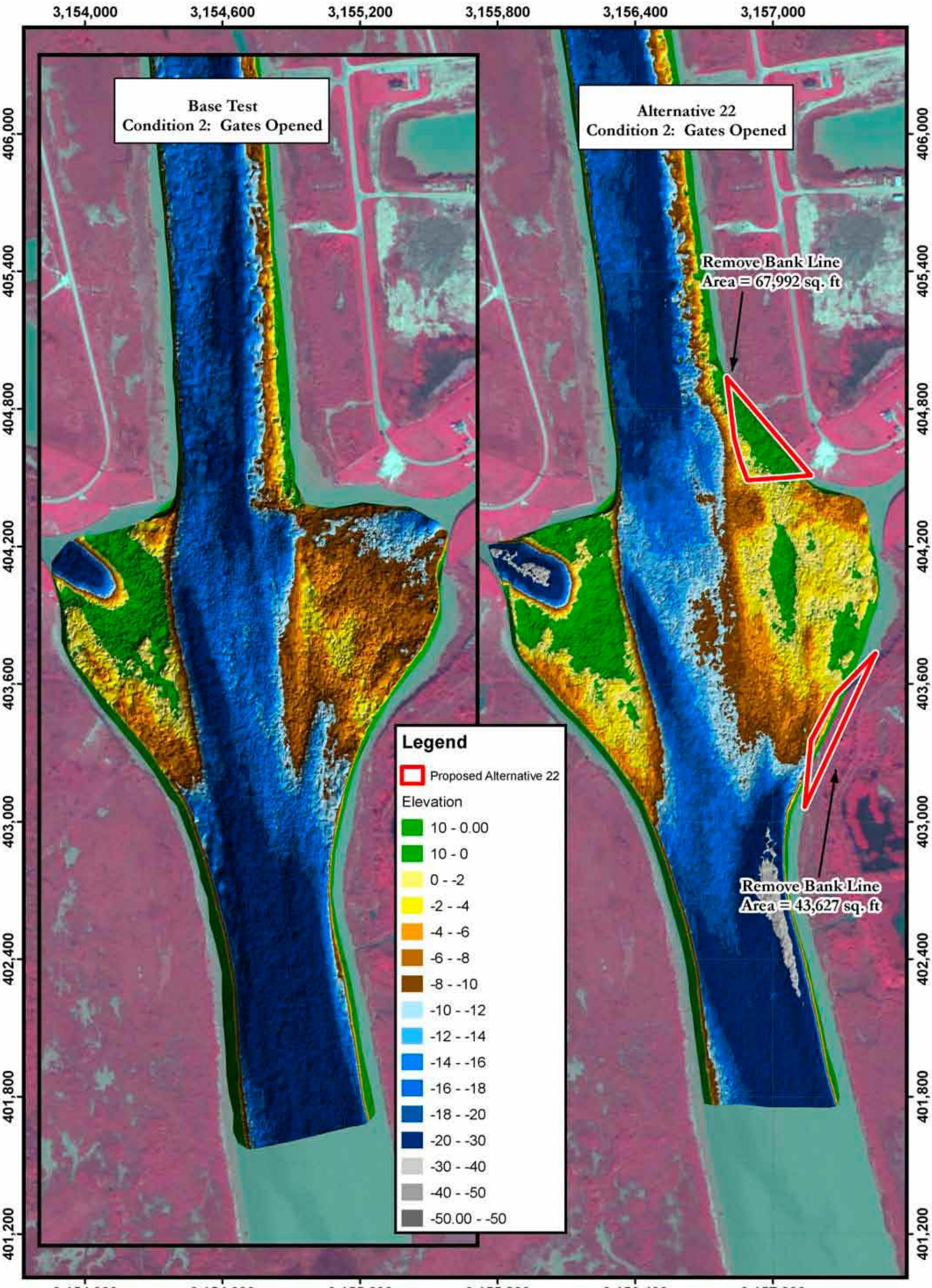

PLATE NUMBER 102

0 75 150 300 450 600
Feet

Alternative 22 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		04/30/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

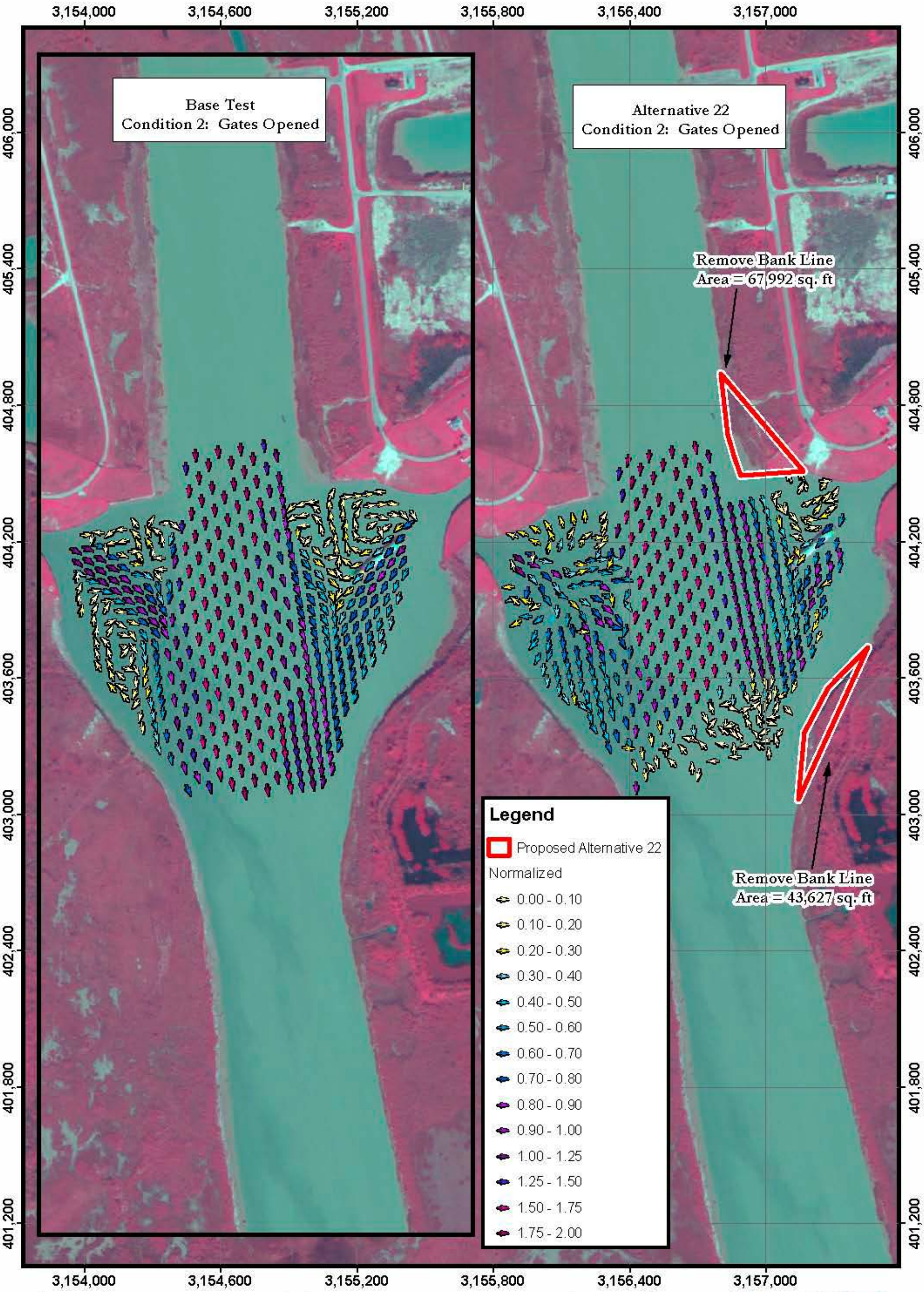

PLATE NUMBER 103

0 75 150 300 450 600
Feet

Alternative 22 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Bonnet Carre Spillway
Galveston District
Bonnet Carre Spillway GIWW Crossing
HSR Model

A COX		04/29/04 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
...Galveston/Houston		07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

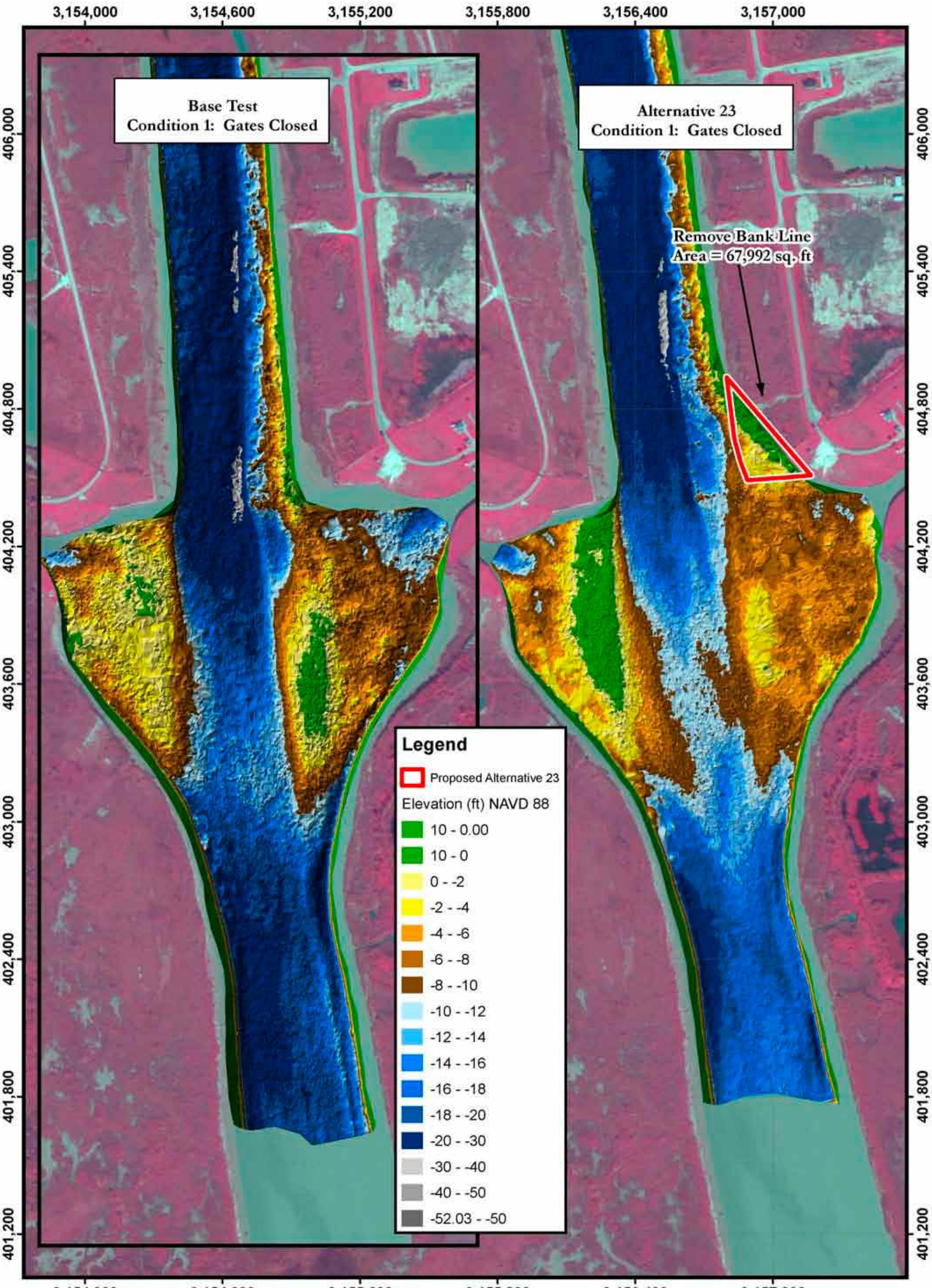

PLATE NUMBER 104

0 75 150 300 450 600
Feet

Alternative 23 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/04/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

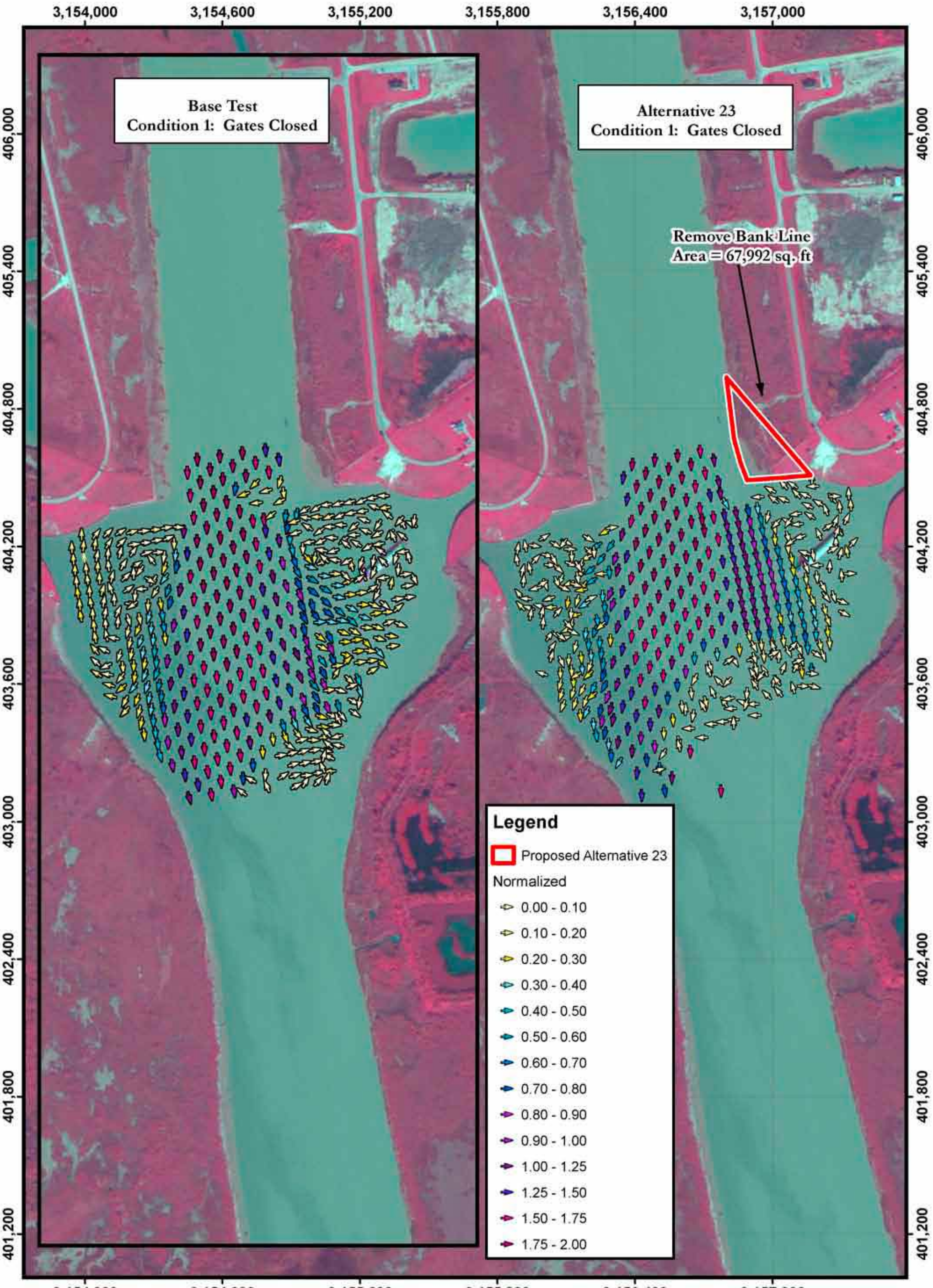

PLATE NUMBER 105

0 75 150 300 450 600
Feet

Alternative 23 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/04/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

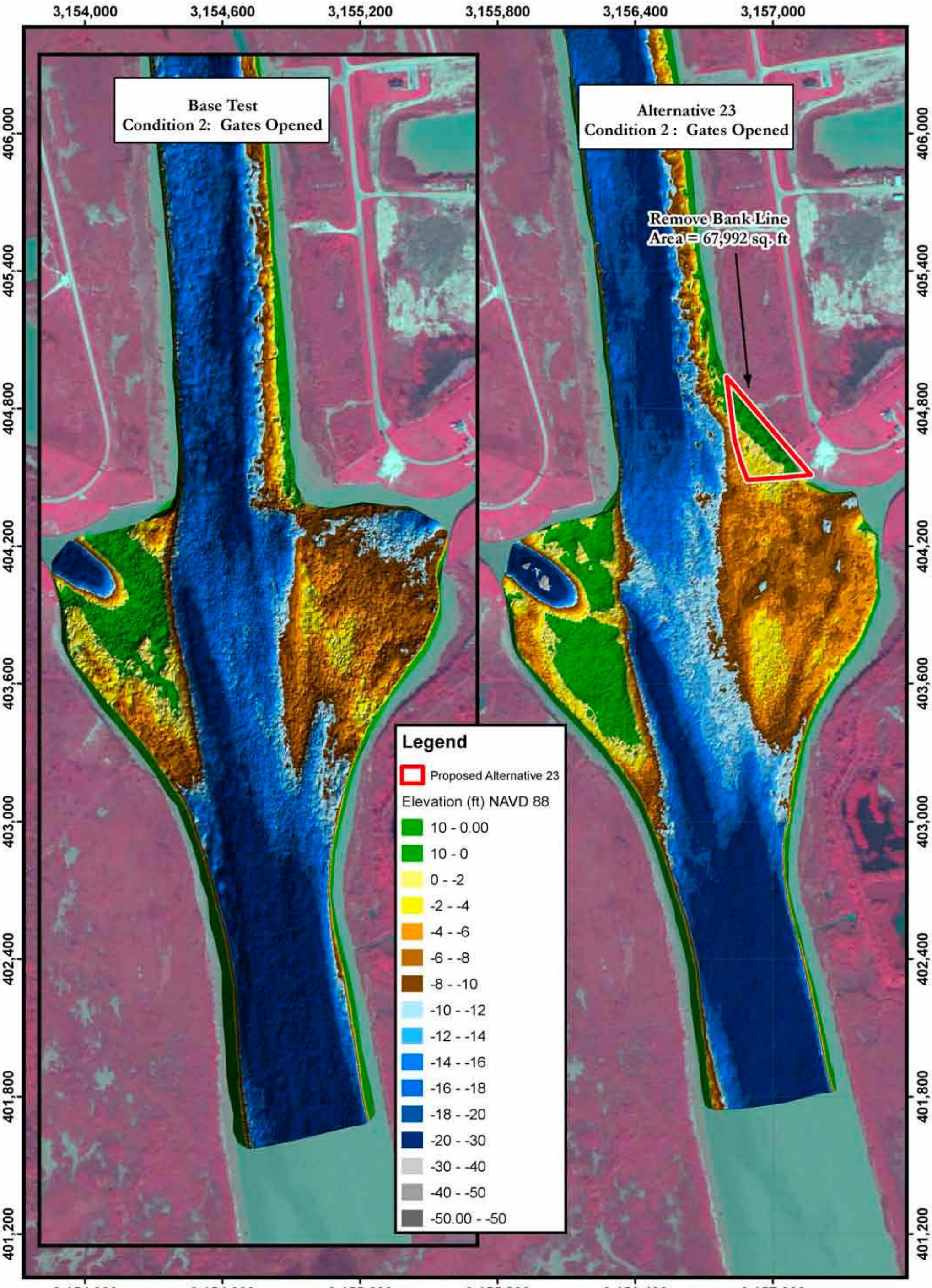

PLATE NUMBER 106

0 75 150 300 450 600
Feet

Alternative 23 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		05/04/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

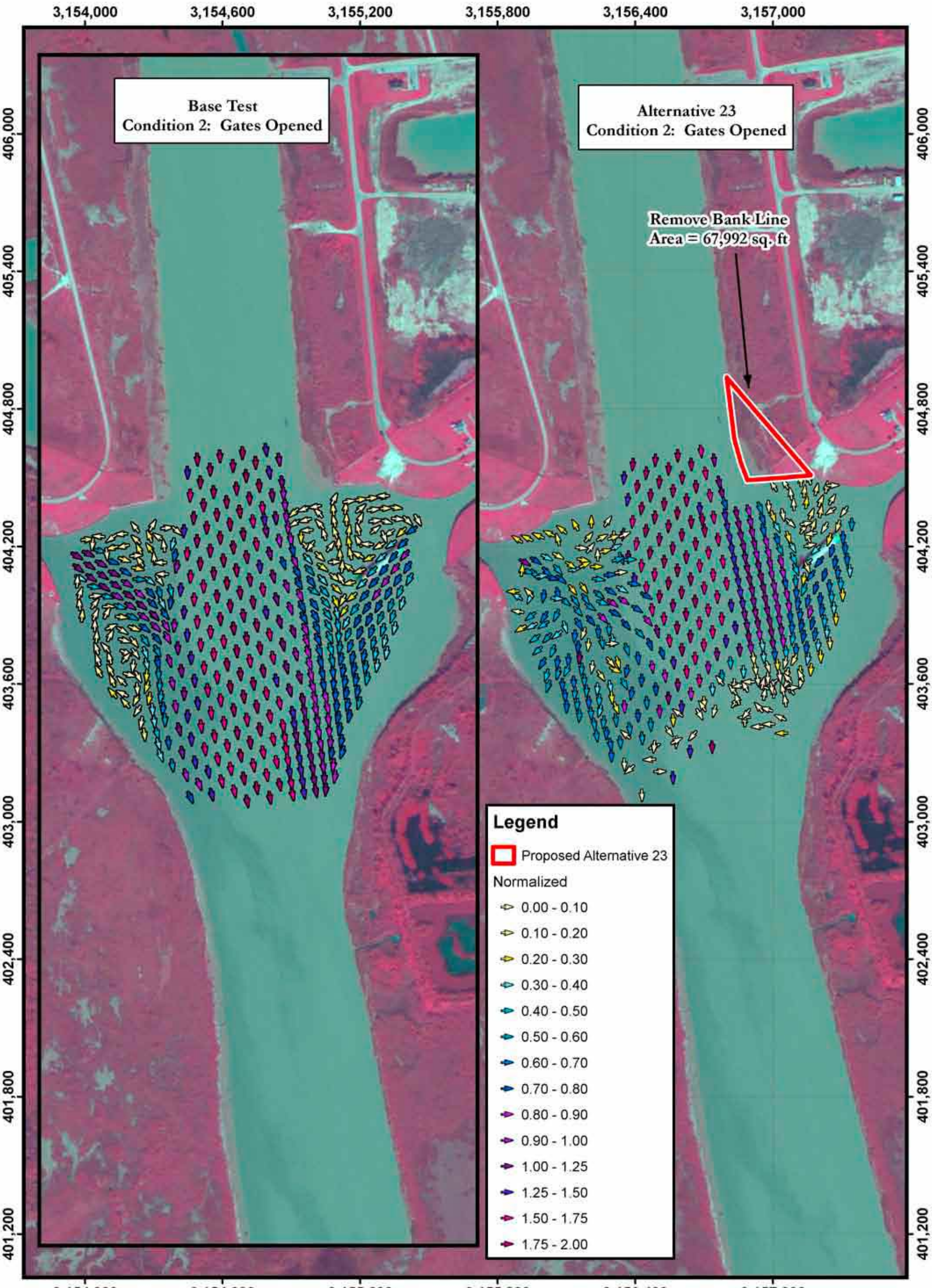

PLATE NUMBER 107

0 75 150 300 450 600
Feet

Alternative 23 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/04/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

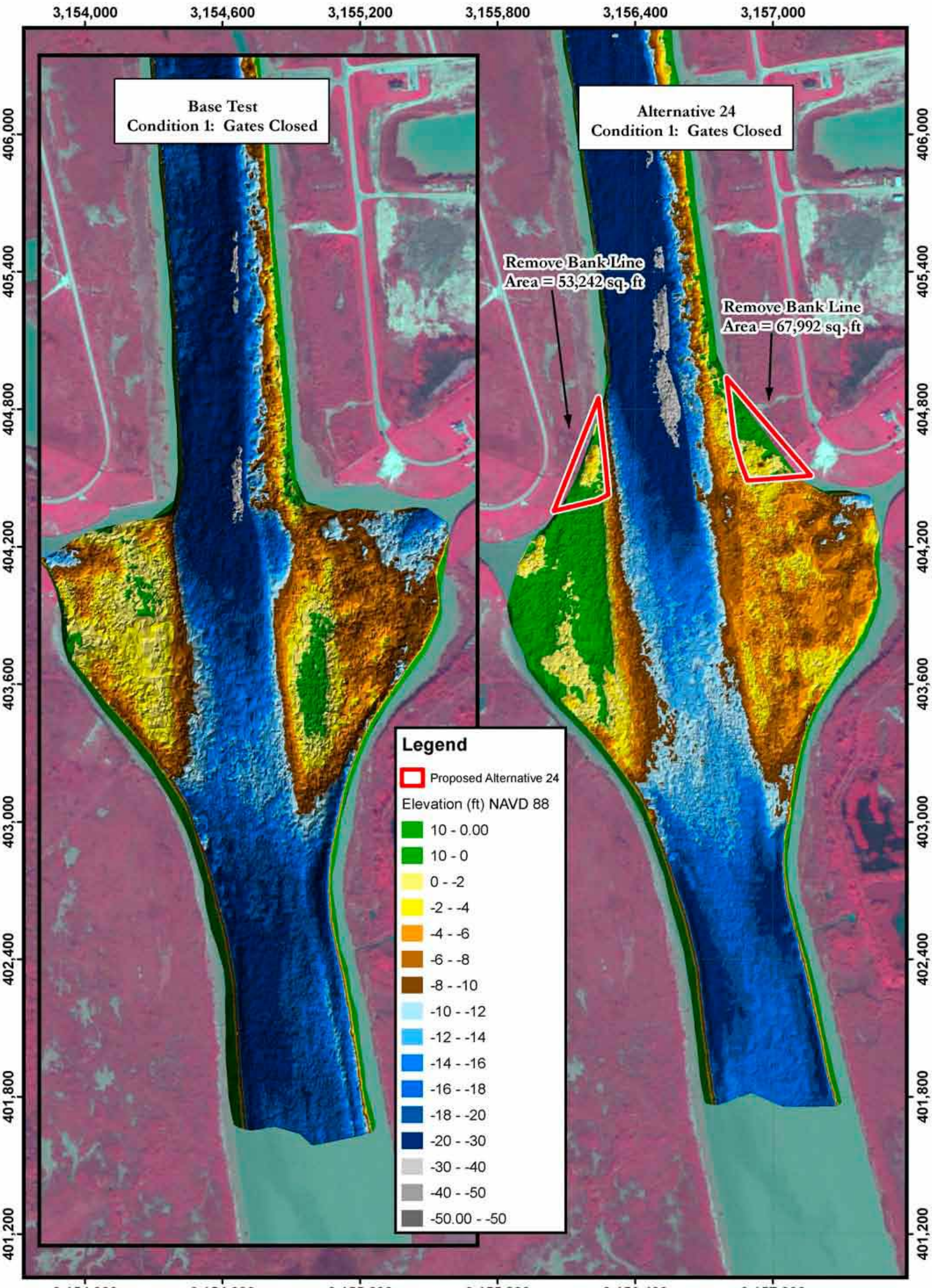

PLATE NUMBER 108

0 75 150 300 450 600
Feet

Alternative 24 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/05/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

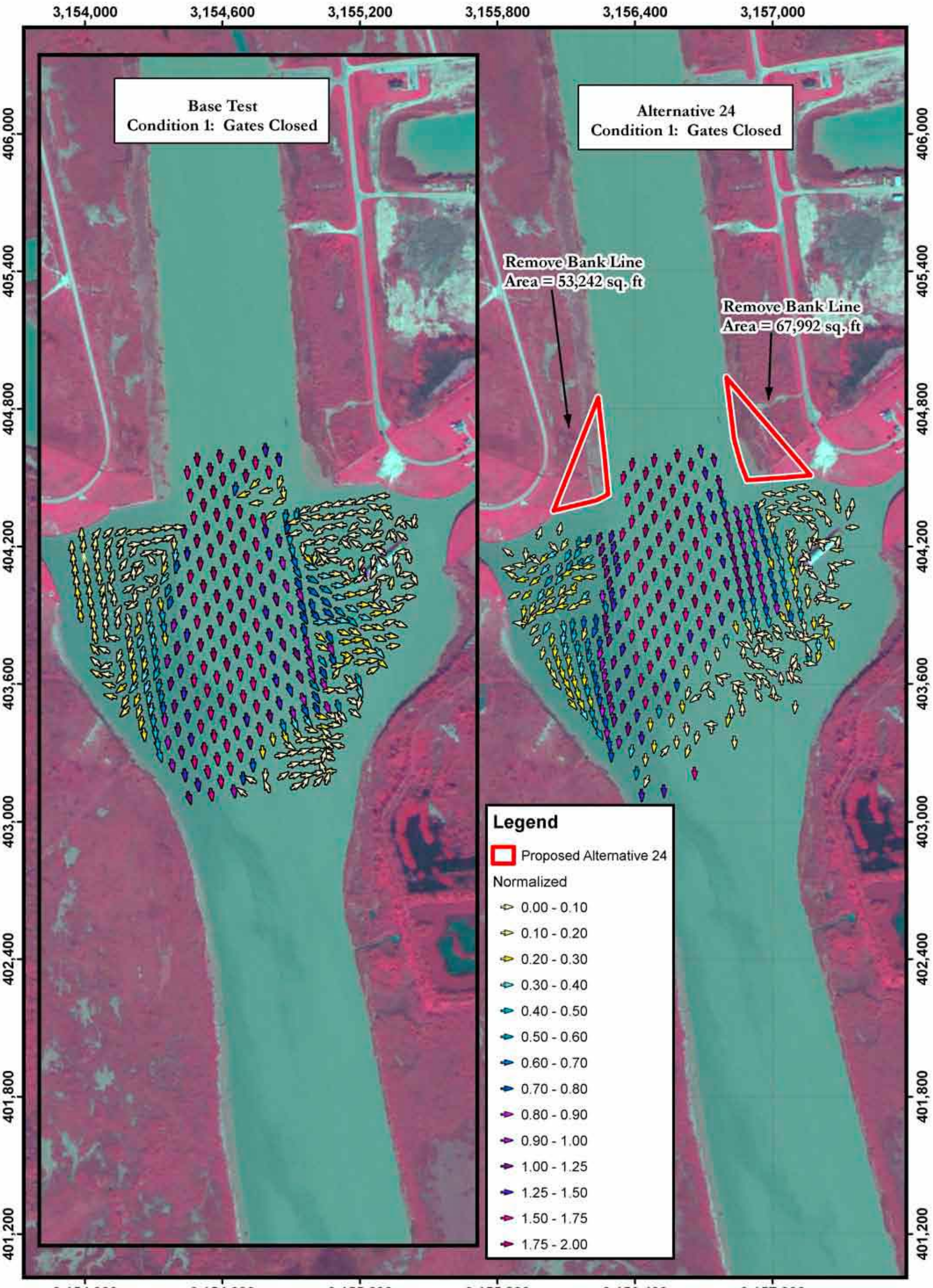

PLATE NUMBER 109

0 75 150 300 450 600
Feet

Alternative 24 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/05/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plans | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

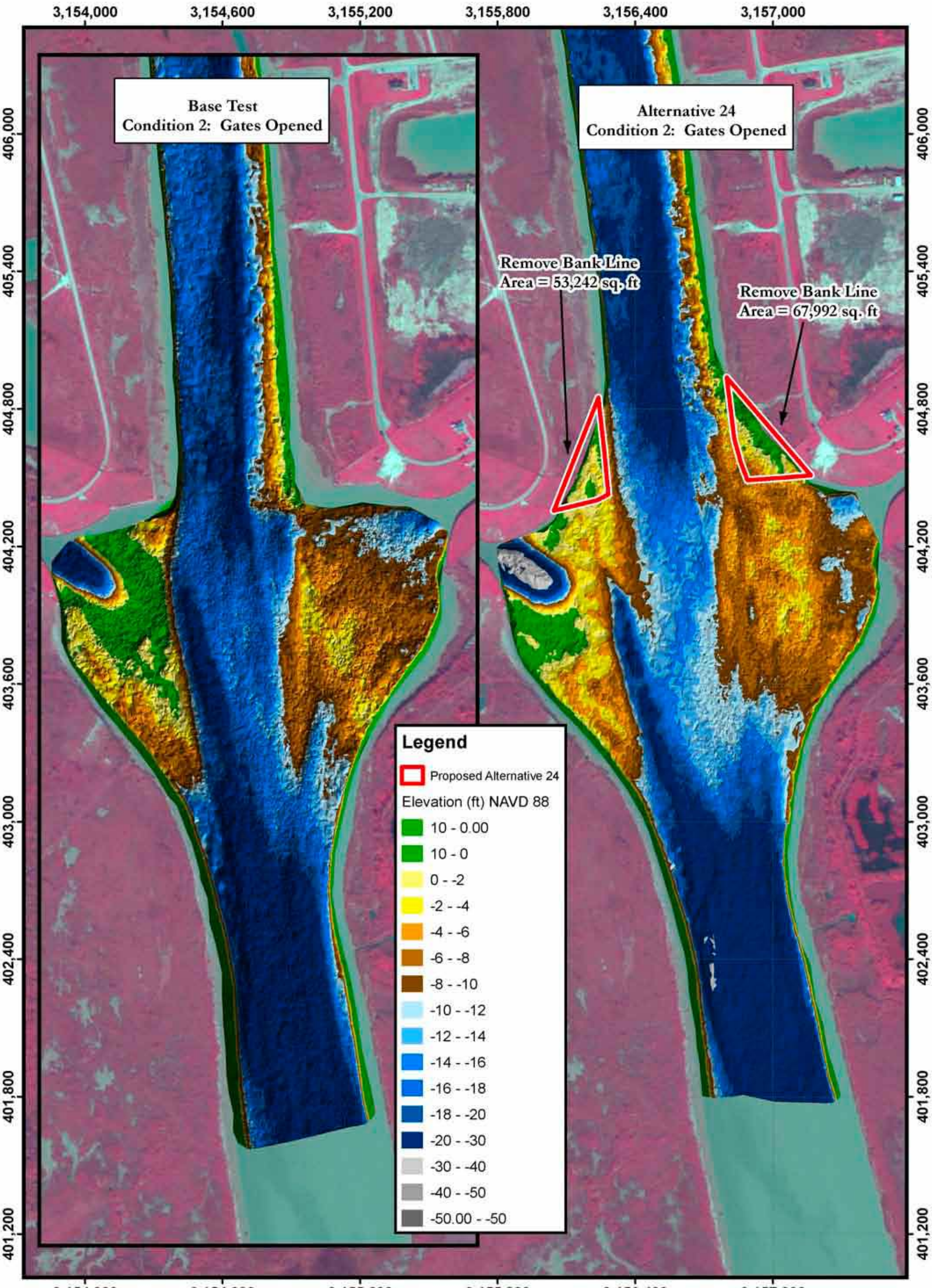

PLATE NUMBER 110

0 75 150 300 450 600
Feet

Alternative 24 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/06/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

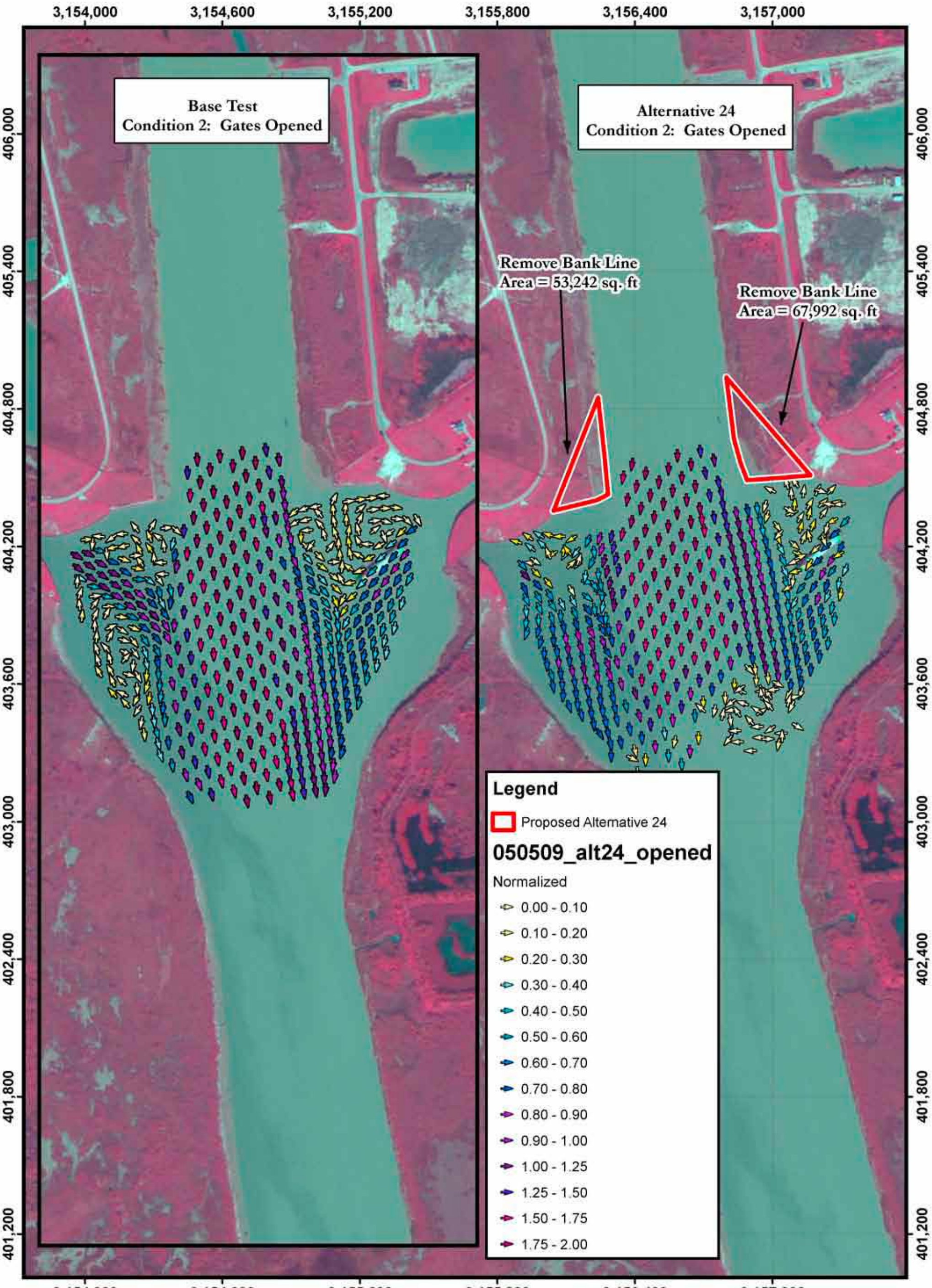

PLATE NUMBER 111

0 75 150 300 450 600
Feet

Alternative 24 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/05/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
. . . Galveston/Plans | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

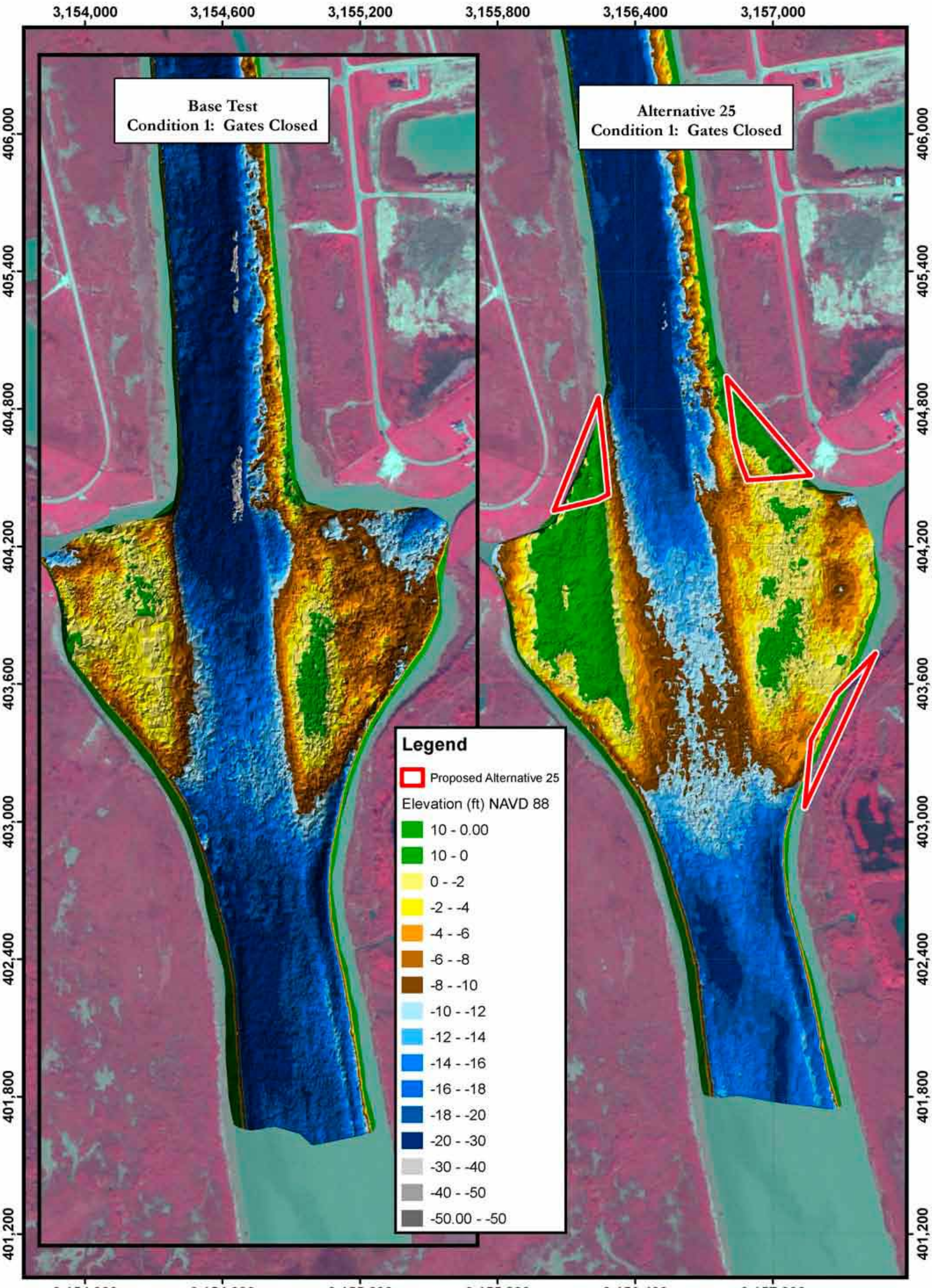

PLATE NUMBER 112

0 75 150 300 450 600
Feet

Alternative 25 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/06/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

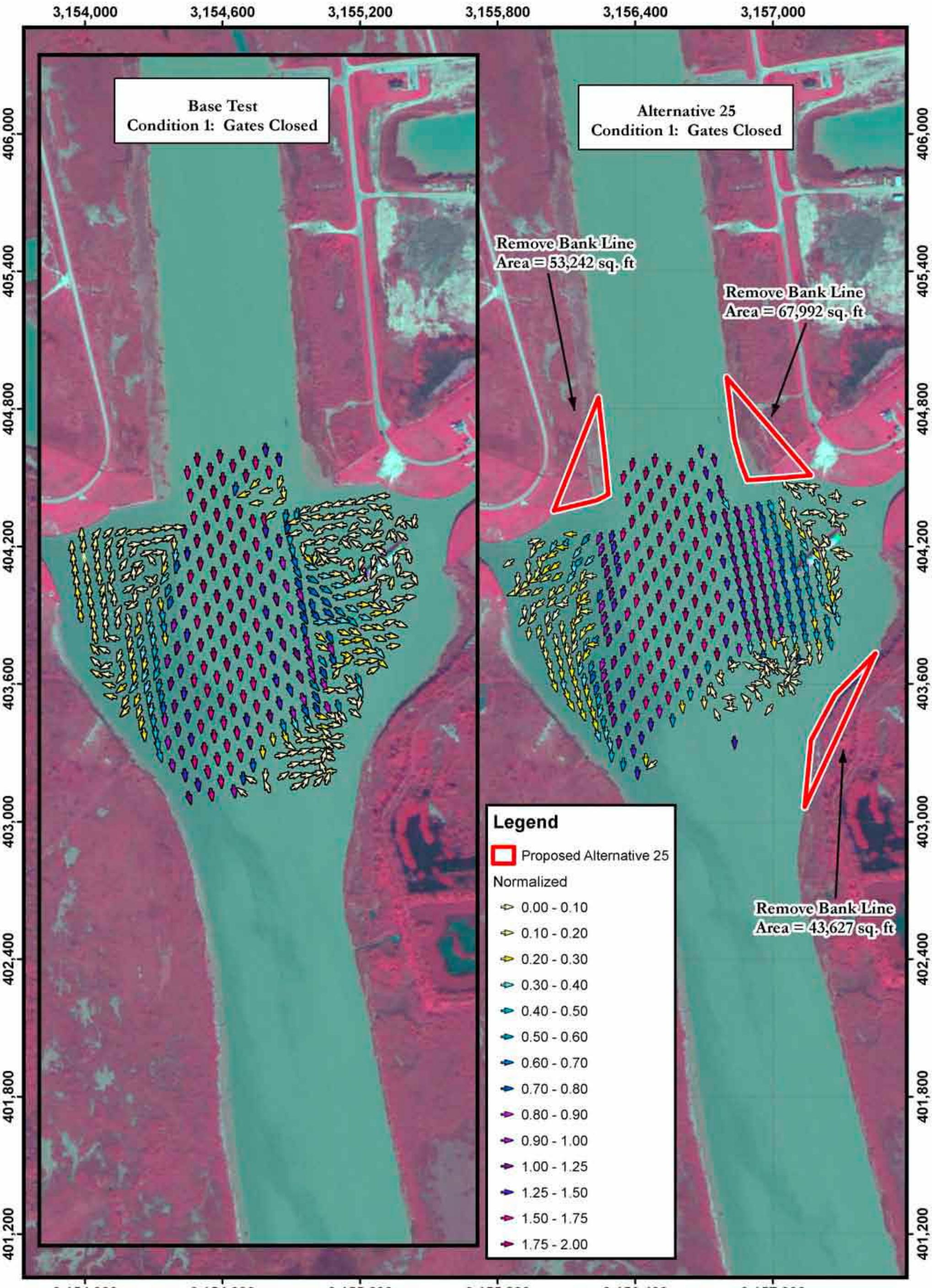

PLATE NUMBER 113

0 75 150 300 450 600
Feet

Alternative 25 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/06/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

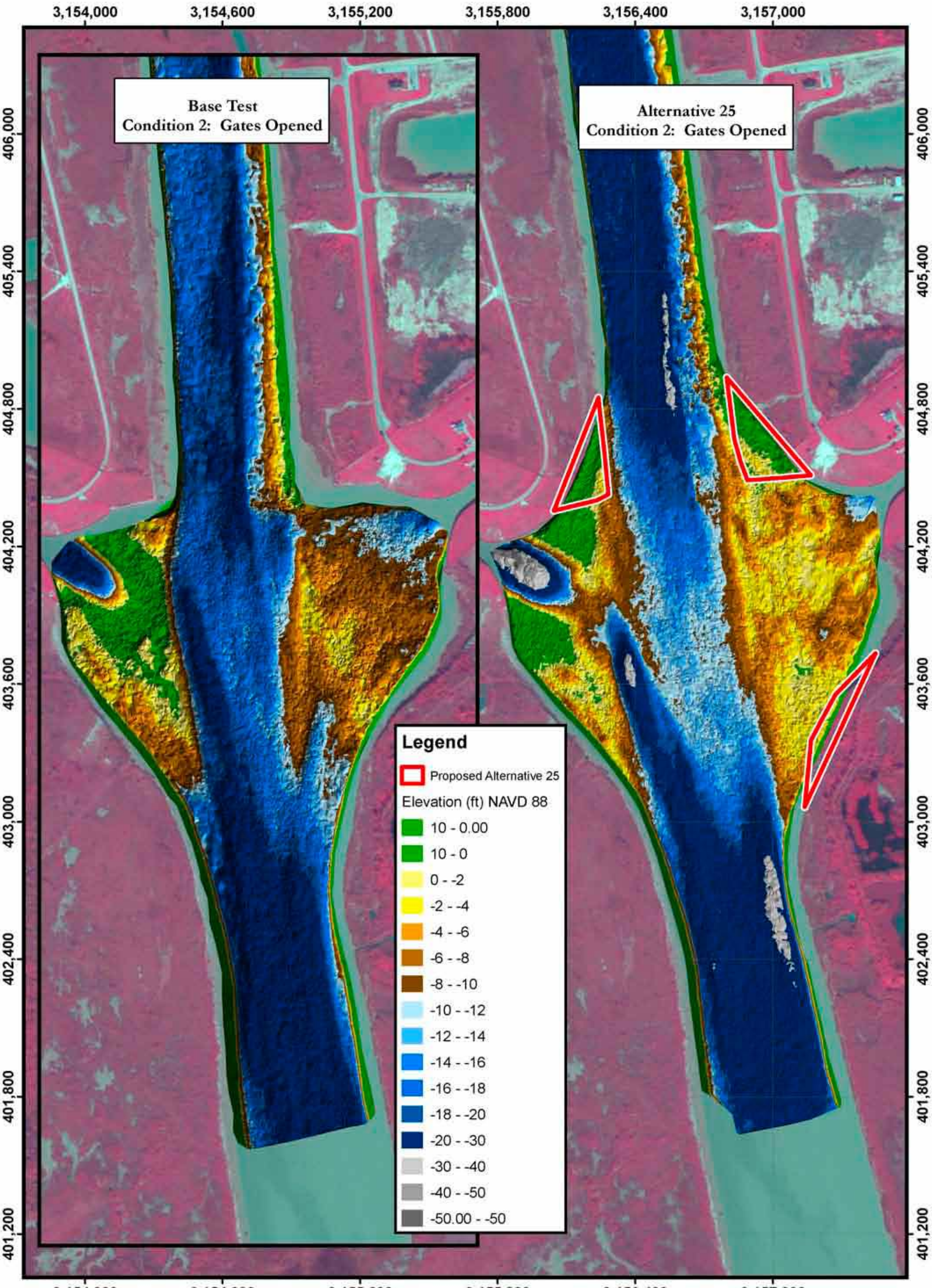

PLATE NUMBER 114

0 75 150 300 450 600
Feet

Alternative 25 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/07/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

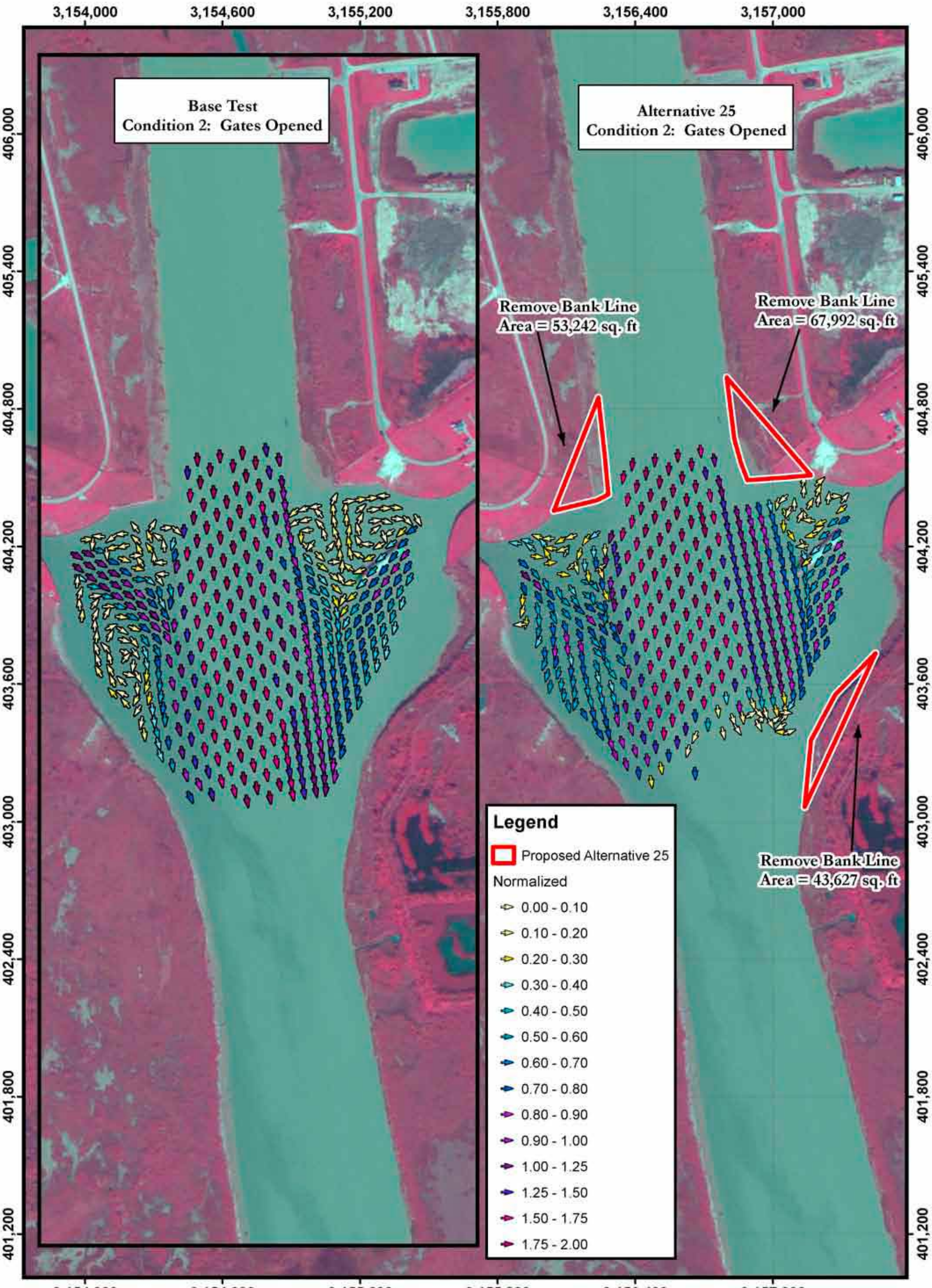

PLATE NUMBER 115

0 75 150 300 450 600
Feet

Alternative 25 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/07/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Texas | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

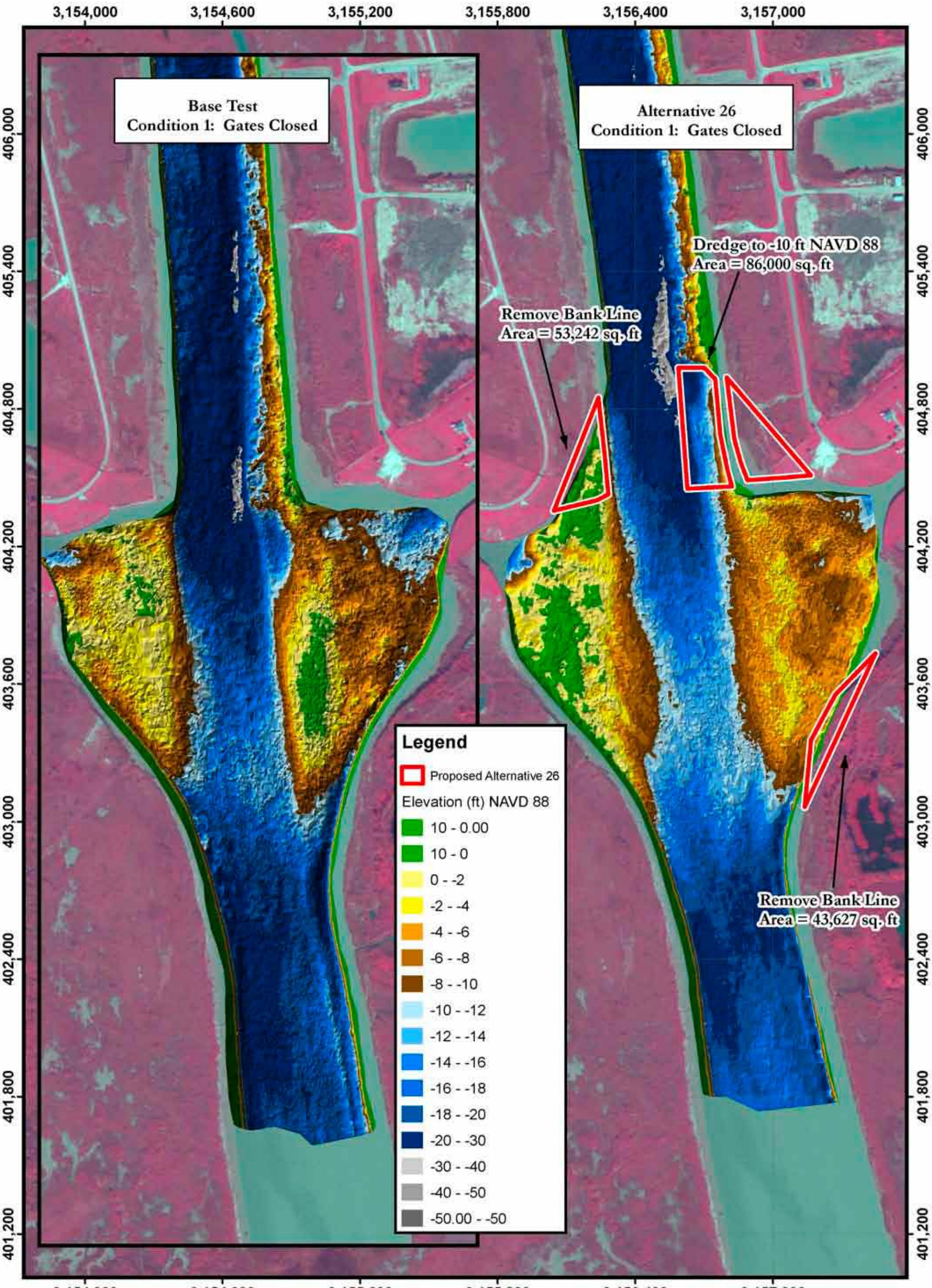

PLATE NUMBER 116

0 75 150 300 450 600
Feet

Alternative 26 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/08/09 Scan
	A COX	J BROWN, P.E.	F. BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

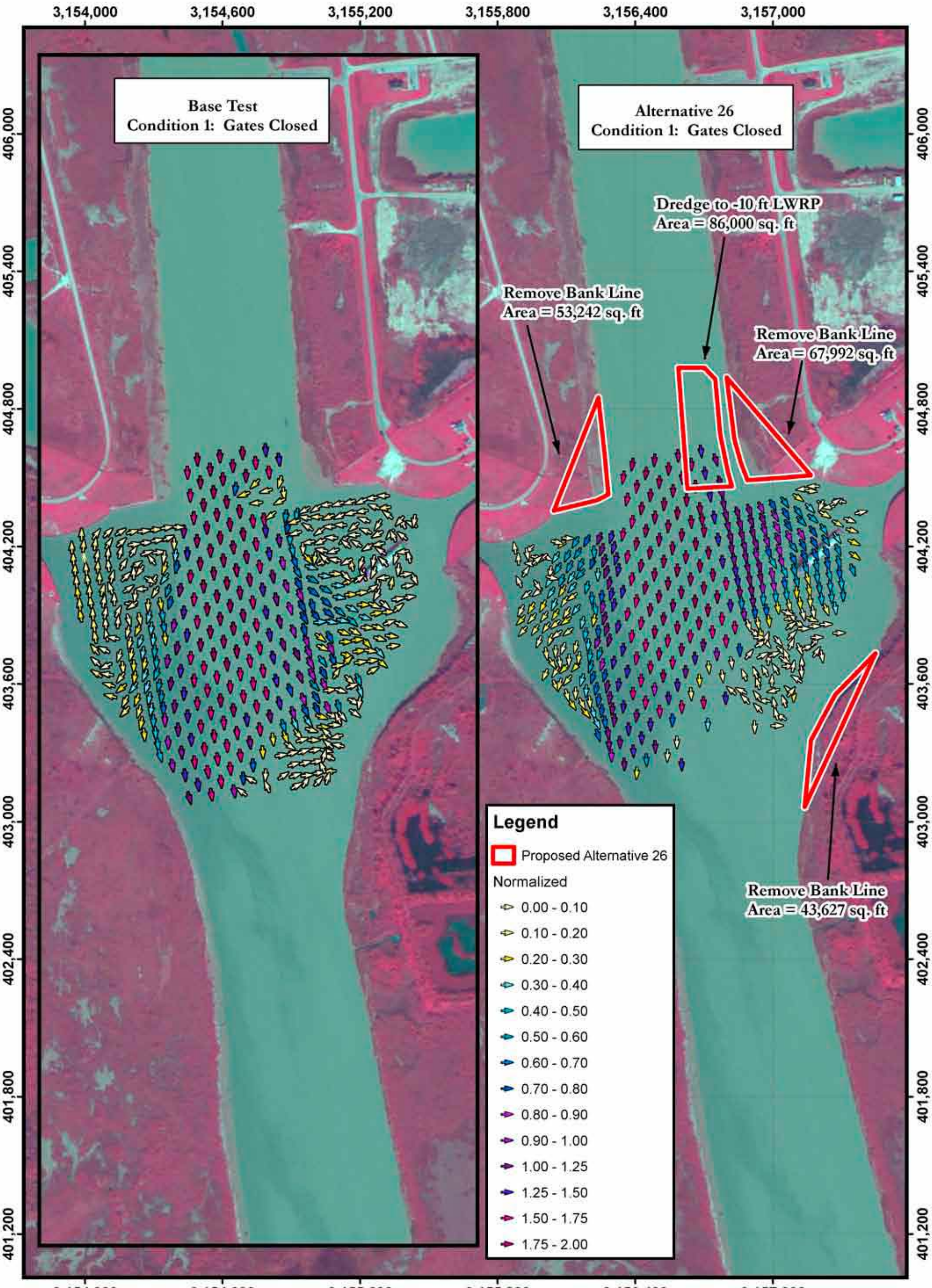

PLATE NUMBER 117

0 75 150 300 450 600
Feet

Alternative 26 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		05/11/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX		R DAVINROY, P.E.
...Galveston/Plans		07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

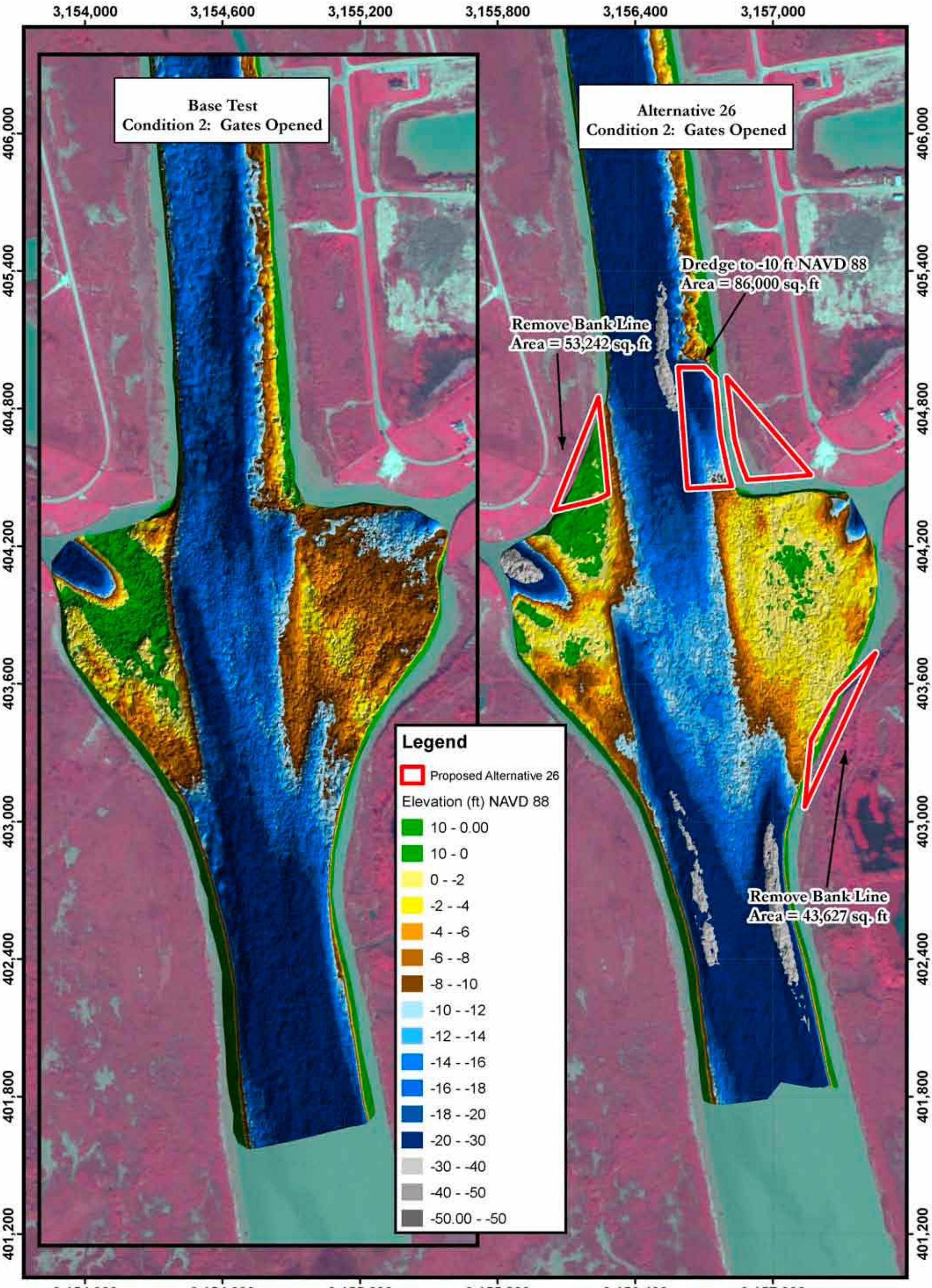

PLATE NUMBER 118

0 75 150 300 450 600
Feet

Alternative 26 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/11/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

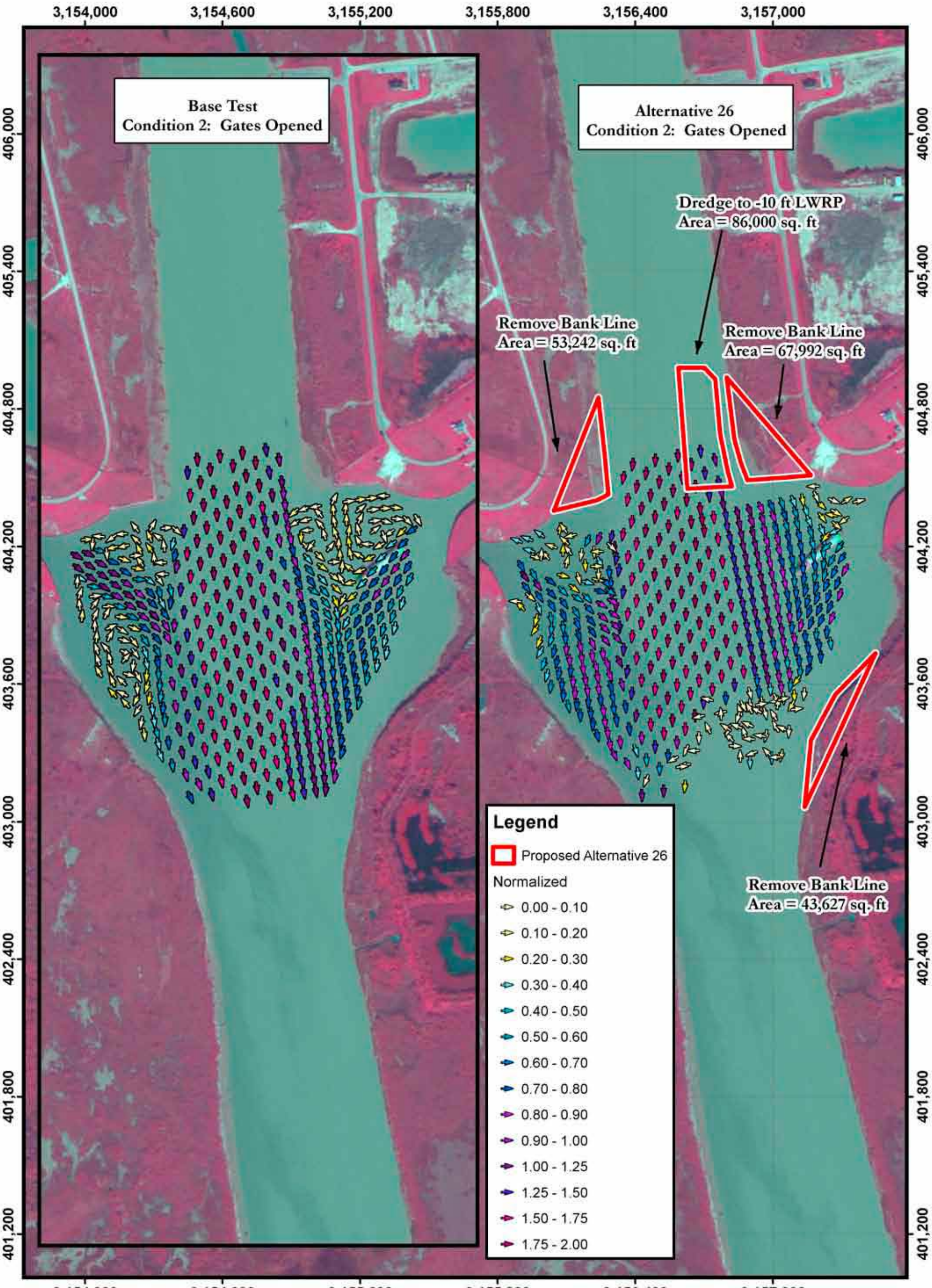

PLATE NUMBER 119

0 75 150 300 450 600
Feet

Alternative 26 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/11/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

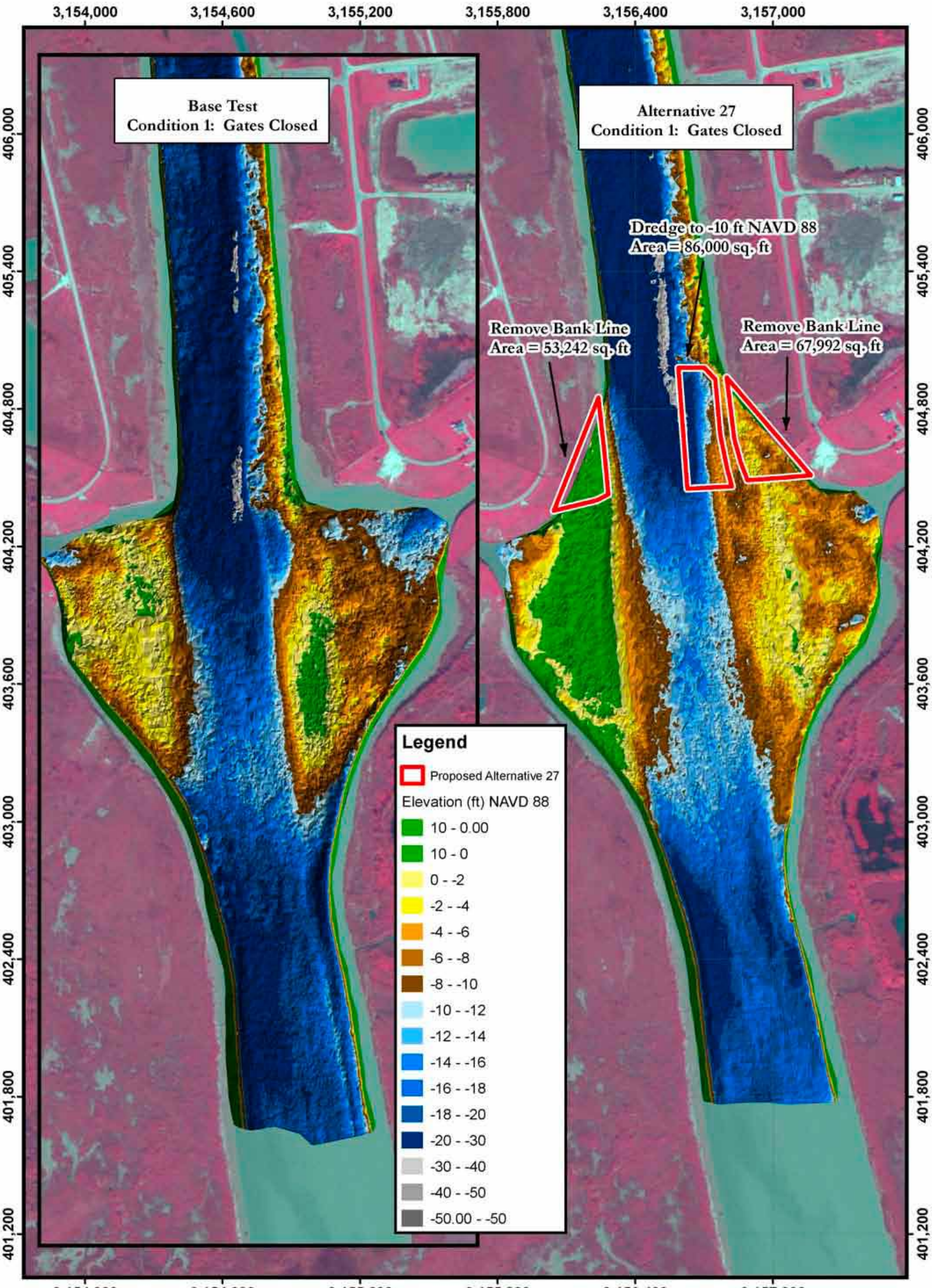

PLATE NUMBER
120

0 75 150 300 450 600
Feet

Alternative 27 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/12/09 Scan
	A COX	J BROWN, P.E.	F. BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

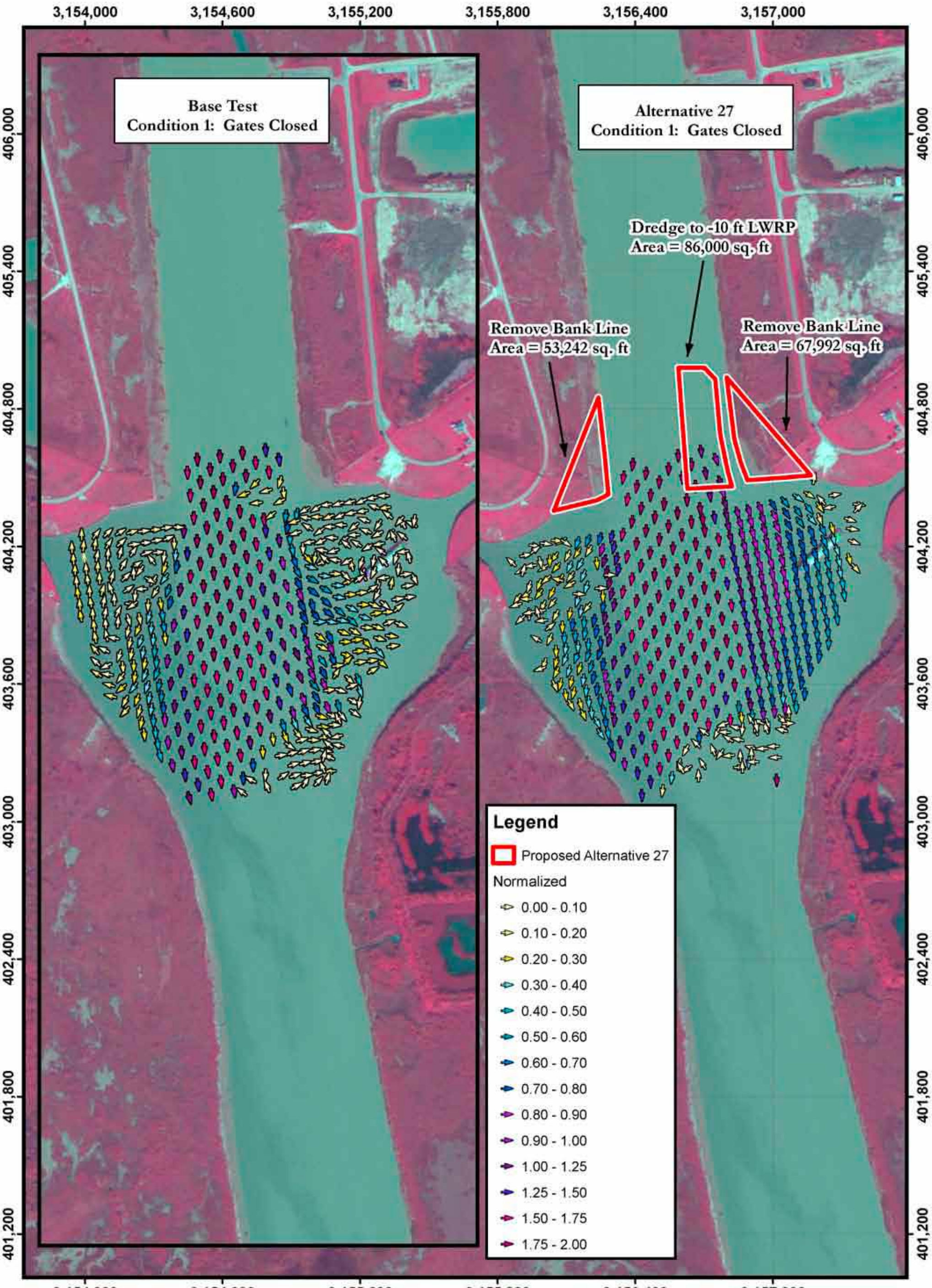

PLATE NUMBER 121

0 75 150 300 450 600
Feet

Alternative 27 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/13/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

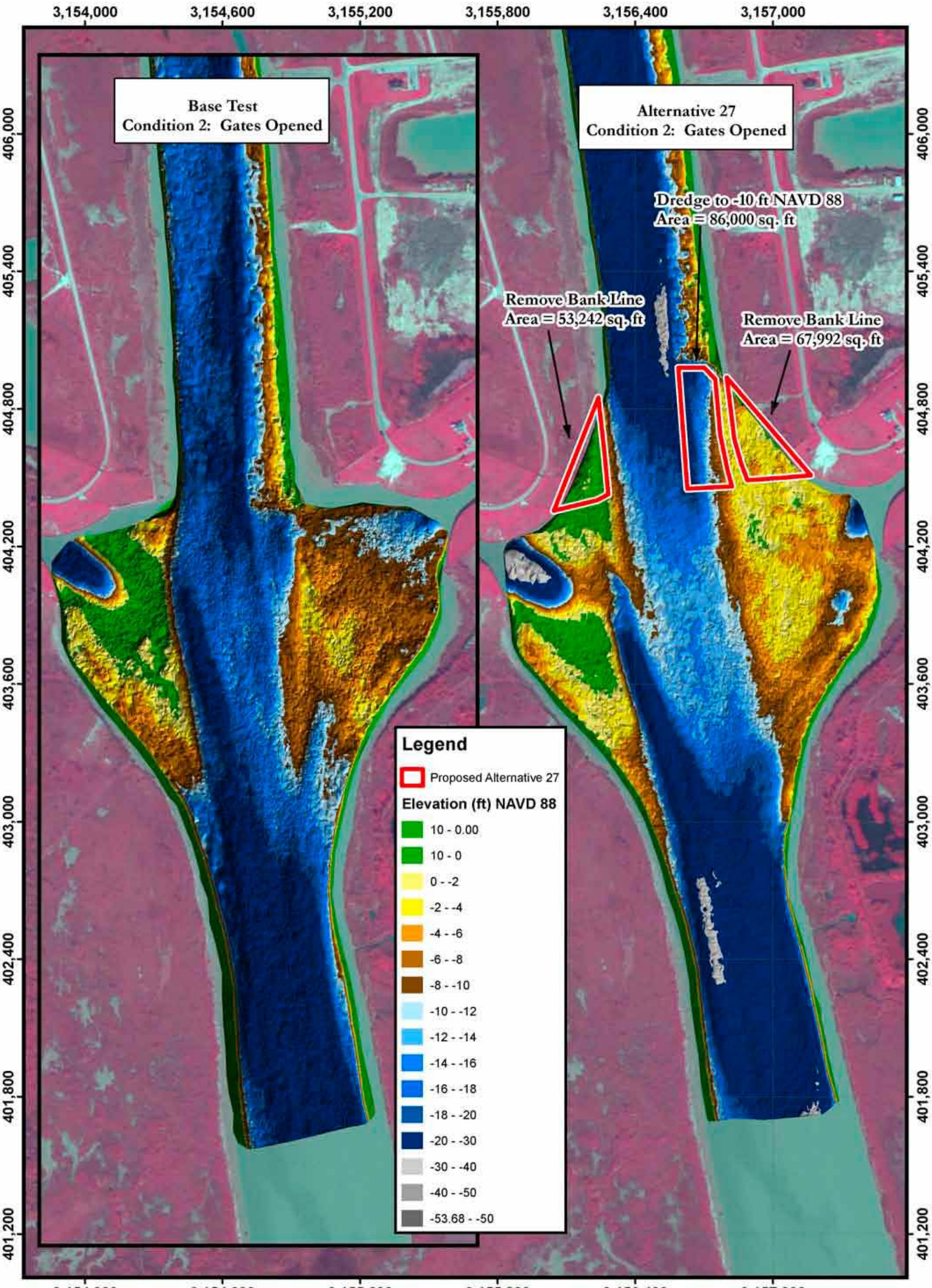

PLATE NUMBER 122

0 75 150 300 450 600
Feet

Alternative 27 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/13/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

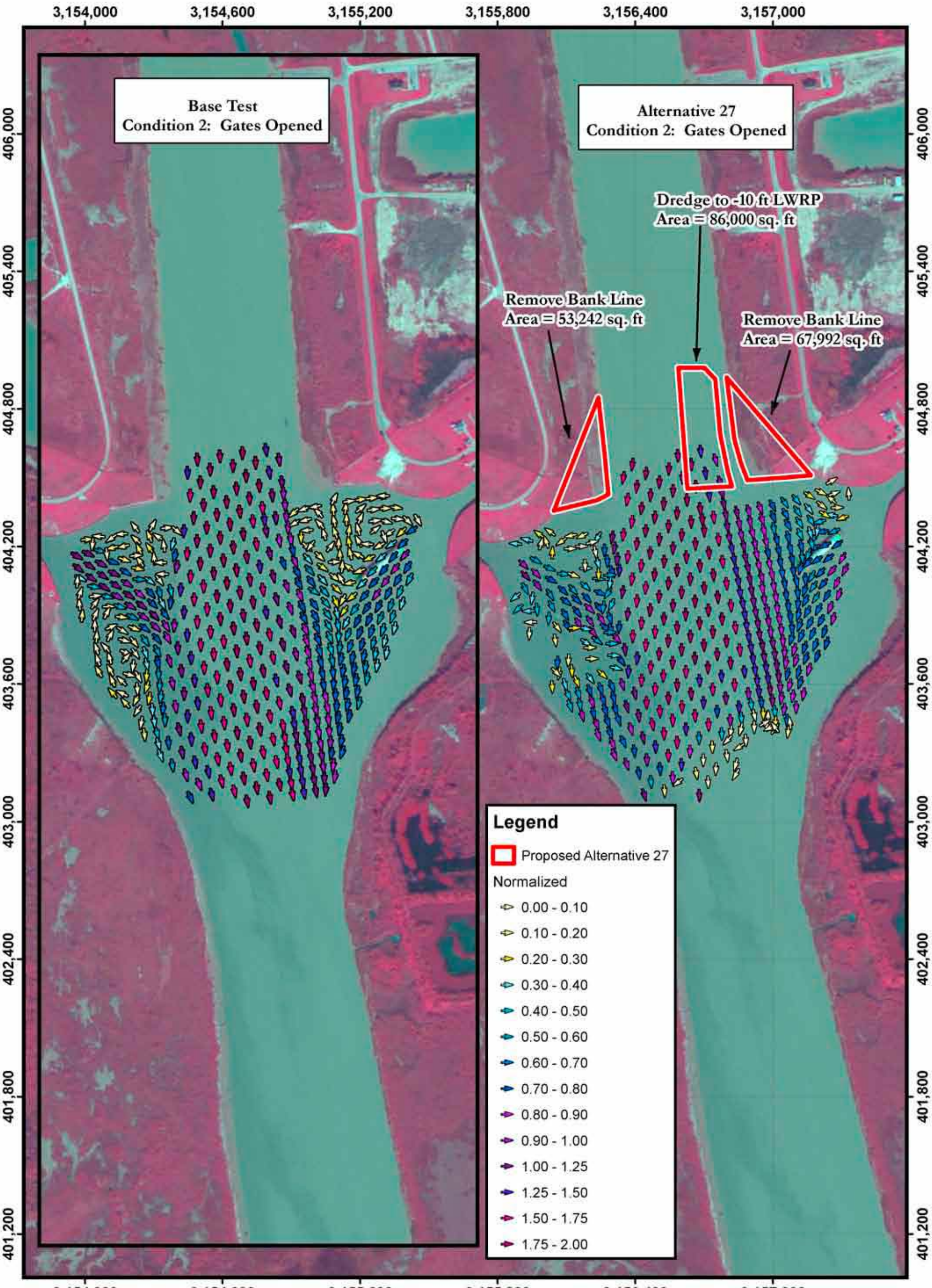

PLATE NUMBER 123

0 75 150 300 450 600
Feet

Alternative 27 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/13/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Texas | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

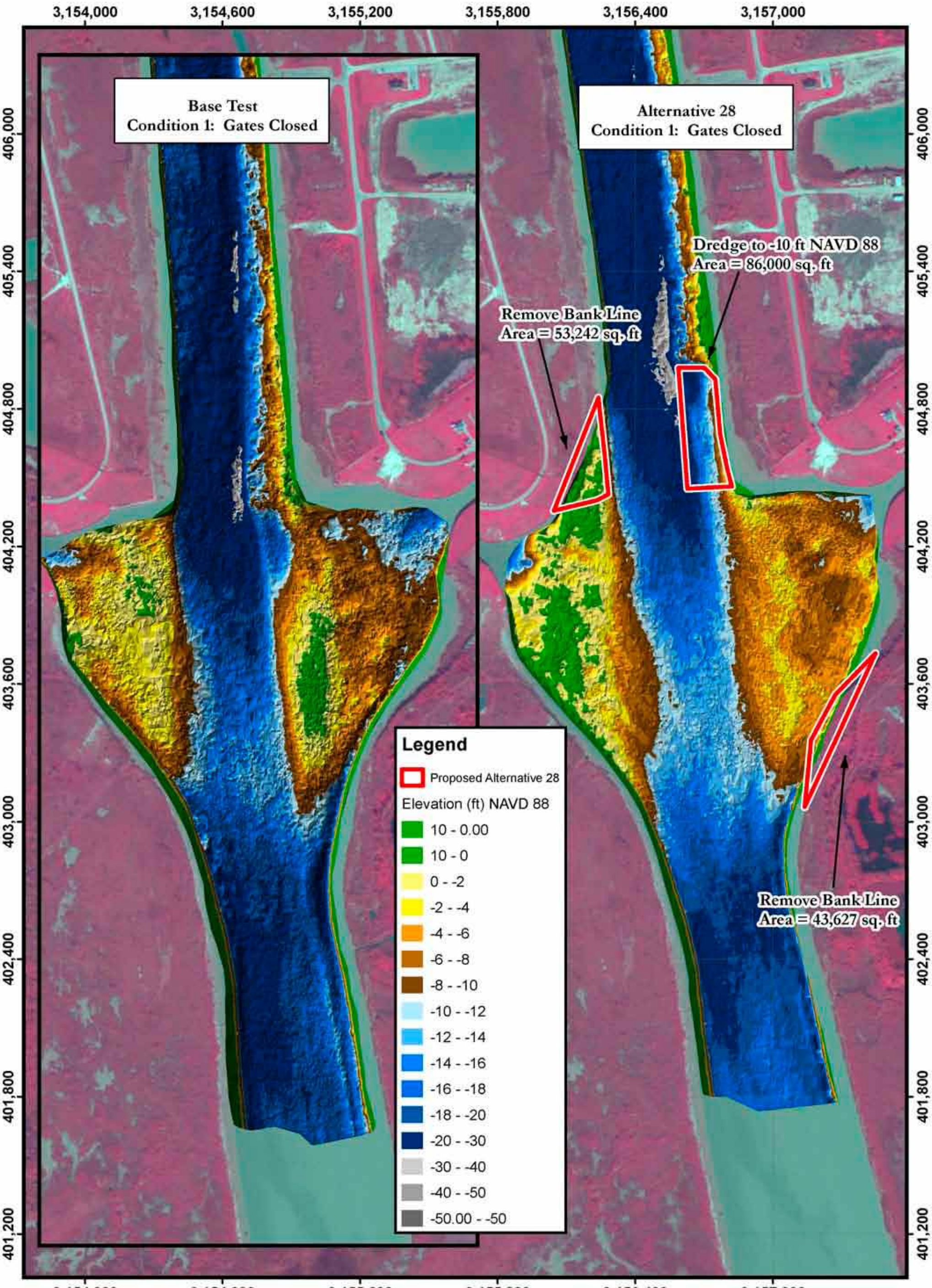

PLATE NUMBER 124

0 75 150 300 450 600
Feet

Alternative 28 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/14/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

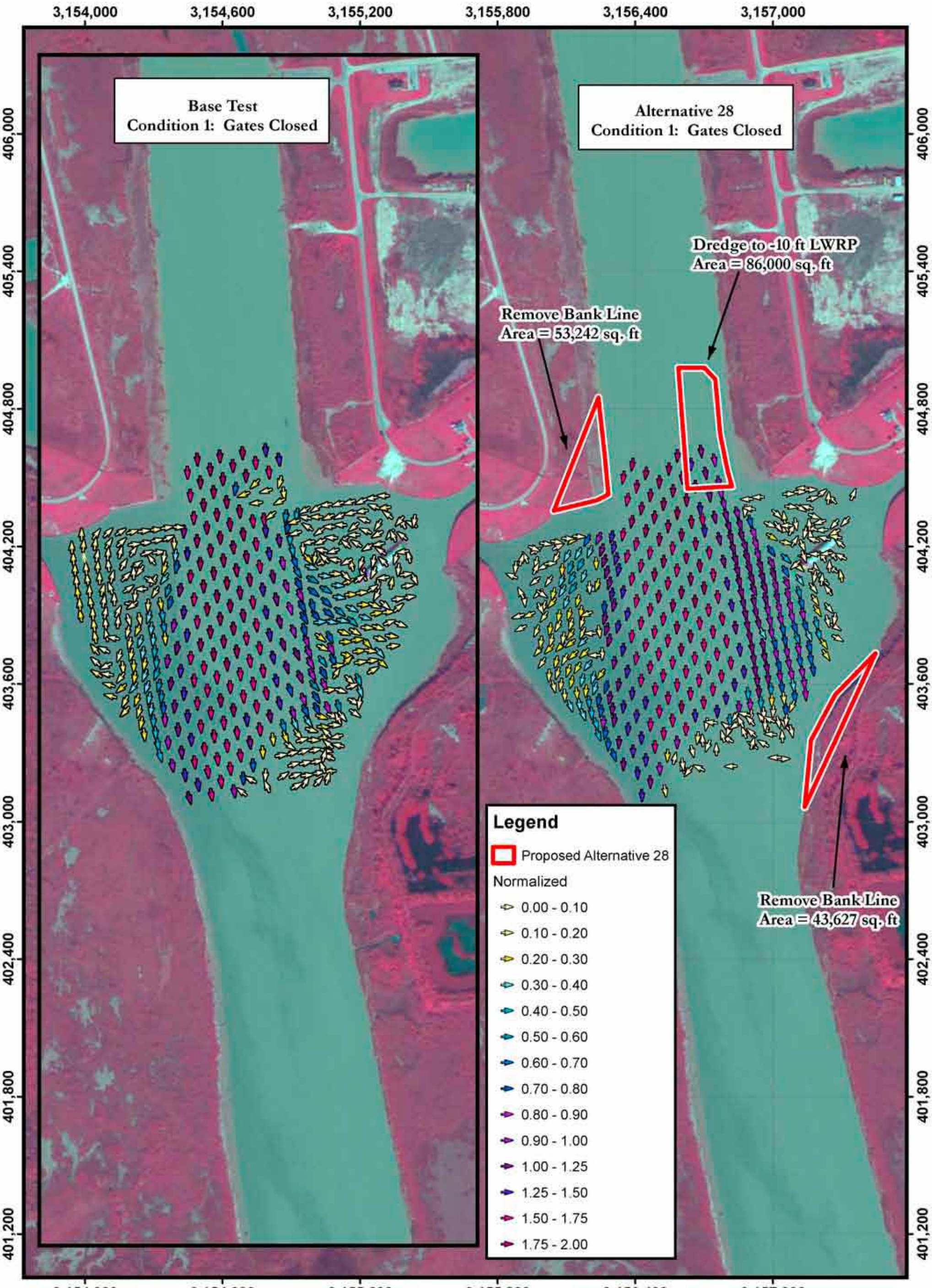

PLATE NUMBER 125

0 75 150 300 450 600
Feet

Alternative 28 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/14/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

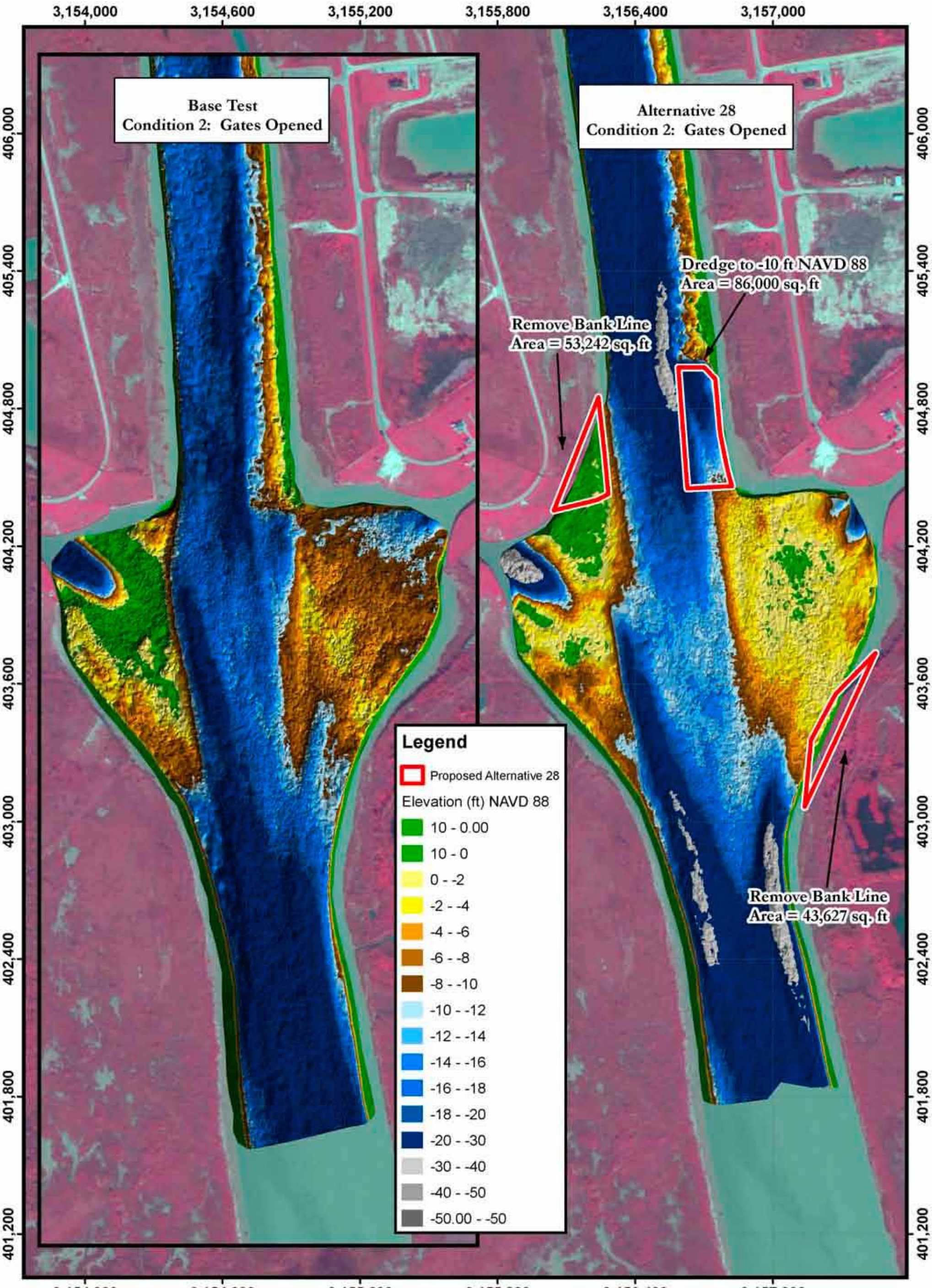

PLATE NUMBER 126

0 75 150 300 450 600
Feet

Alternative 28 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/14/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX	R DAVINROY, P.E.	
	...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

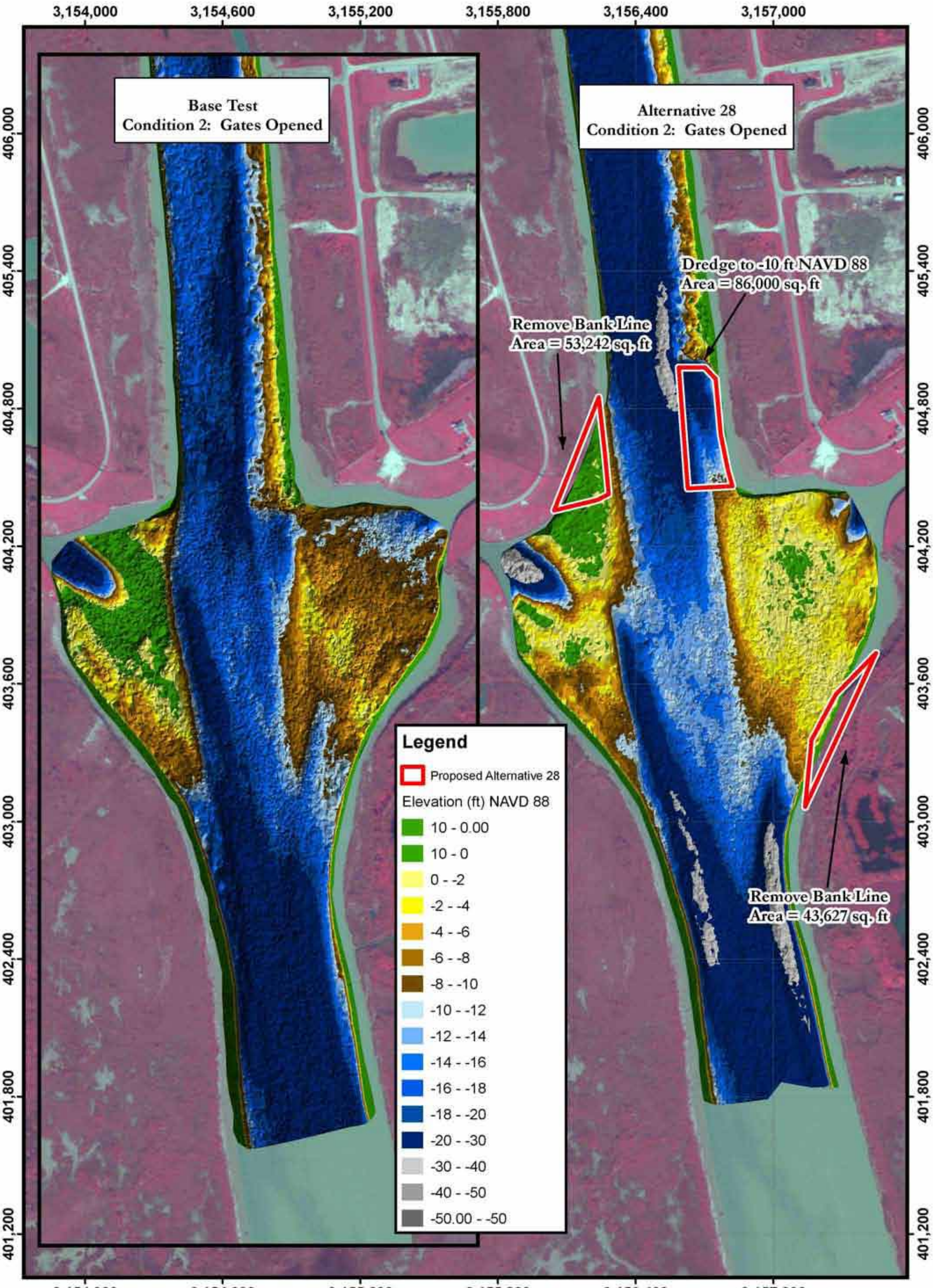

PLATE NUMBER 126

0 75 150 300 450 600
Feet

Alternative 28 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		05/14/09 Scan
A COX	J BROWN, P.E.	E BRAUER, P.E.
A COX	R DAVINROY, P.E.	
...Galveston/Plates	07/07/2009	

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

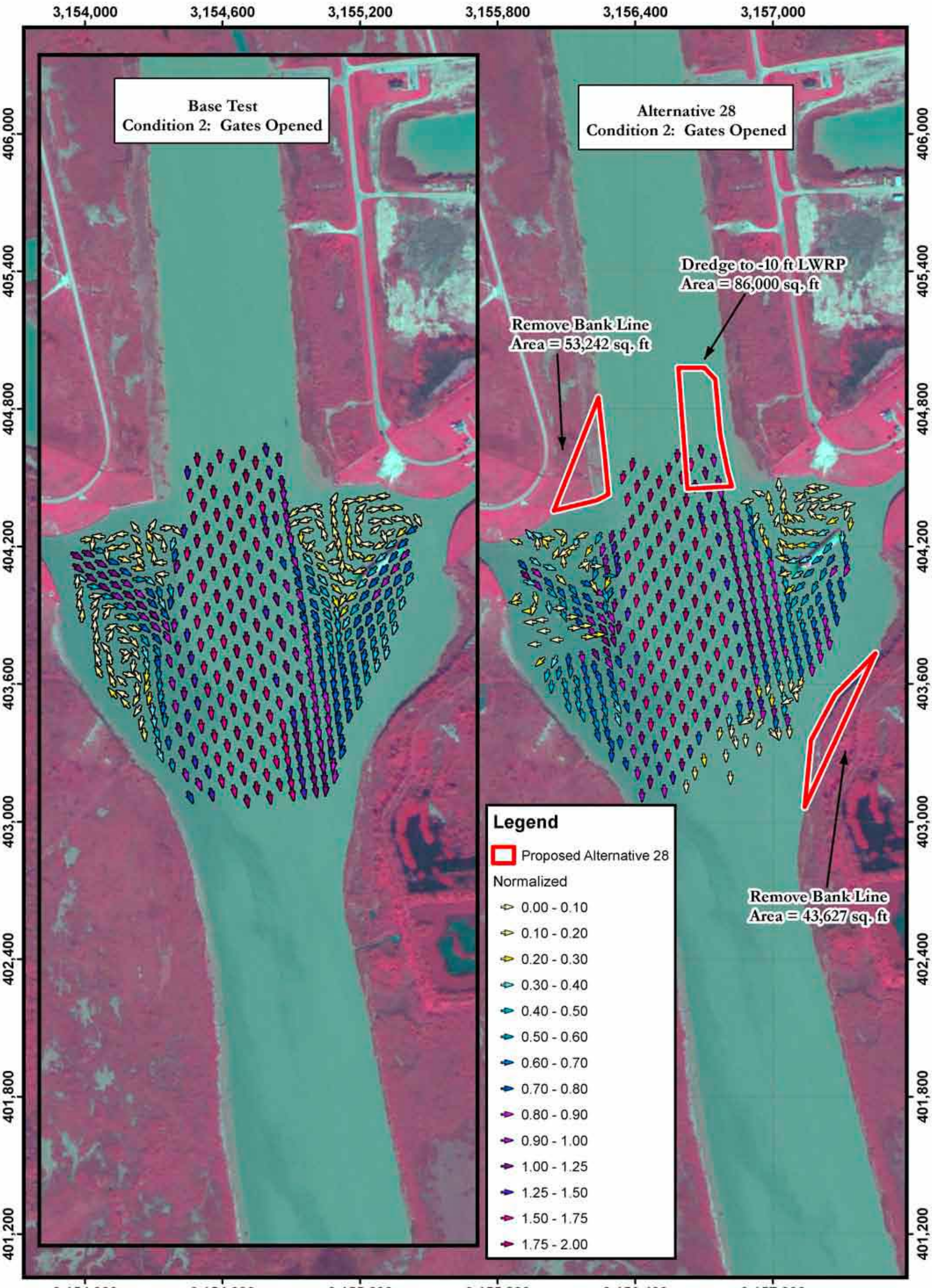

PLATE NUMBER 127

0 75 150 300 450 600
Feet

Alternative 28 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/14/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

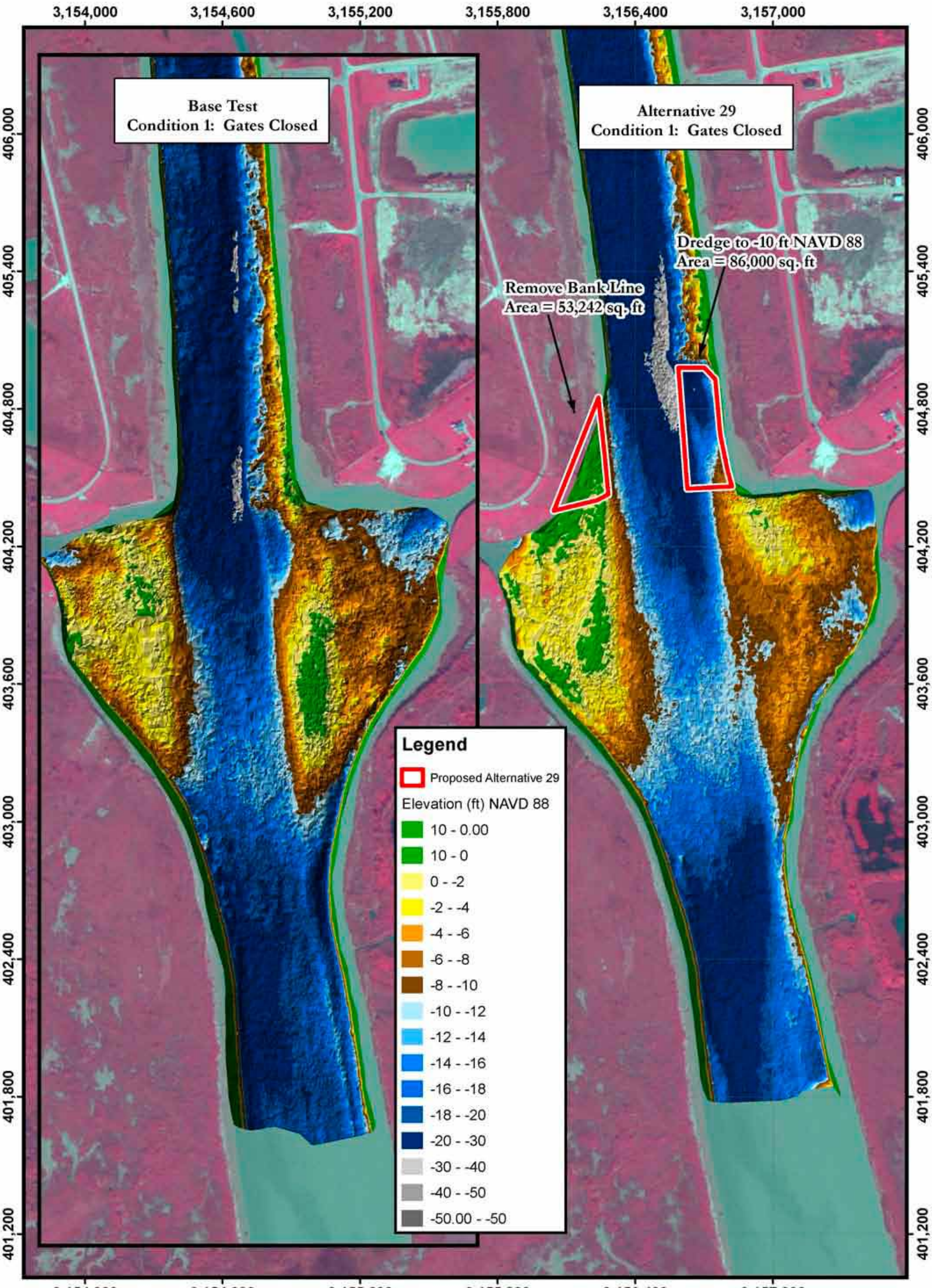

PLATE NUMBER 128

0 75 150 300 450 600
Feet

Alternative 29 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/18/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Plates | 07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

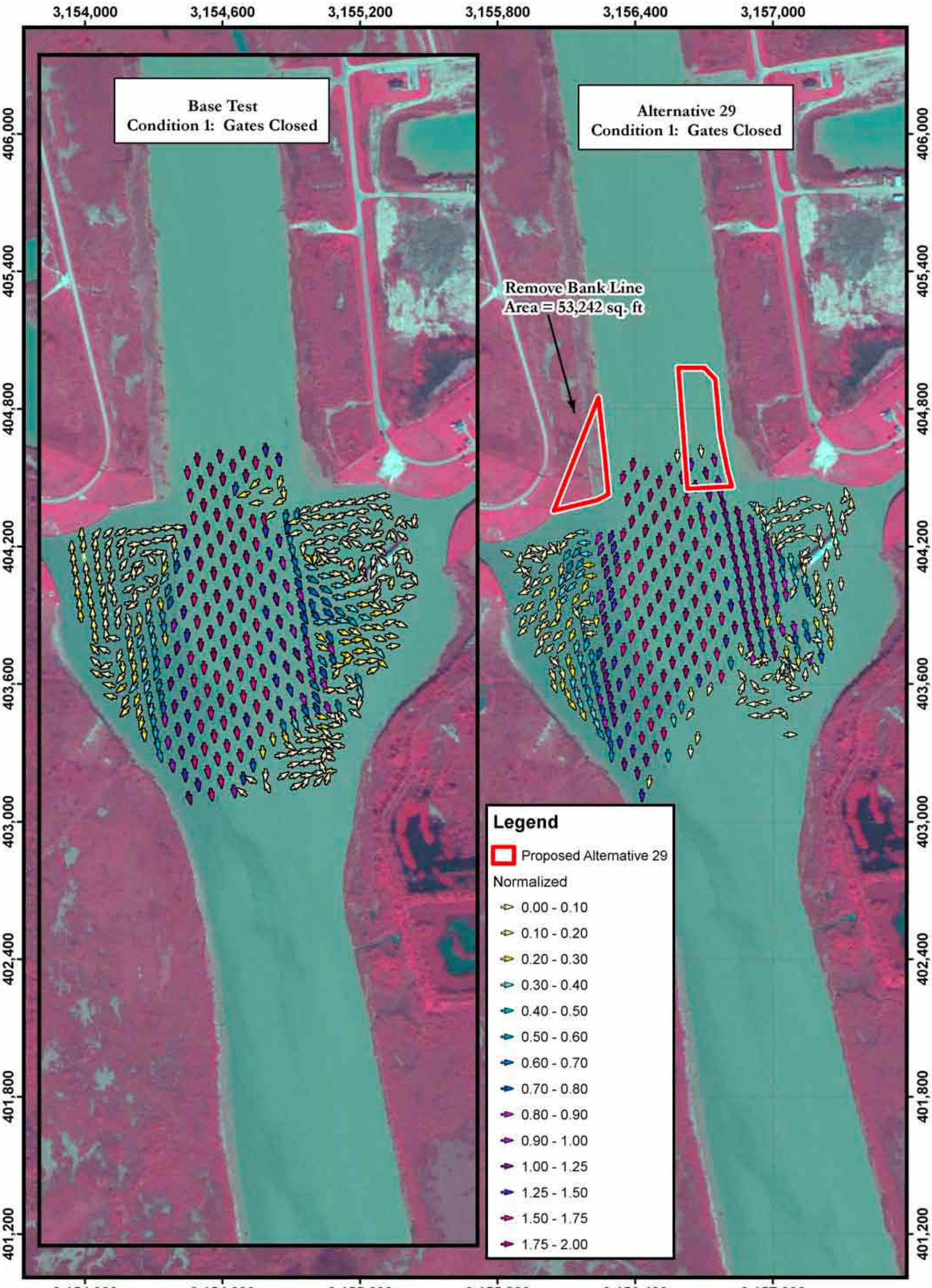

PLATE NUMBER 129

0 75 150 300 450 600
Feet

Alternative 29 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/18/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
Galveston/Texas | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

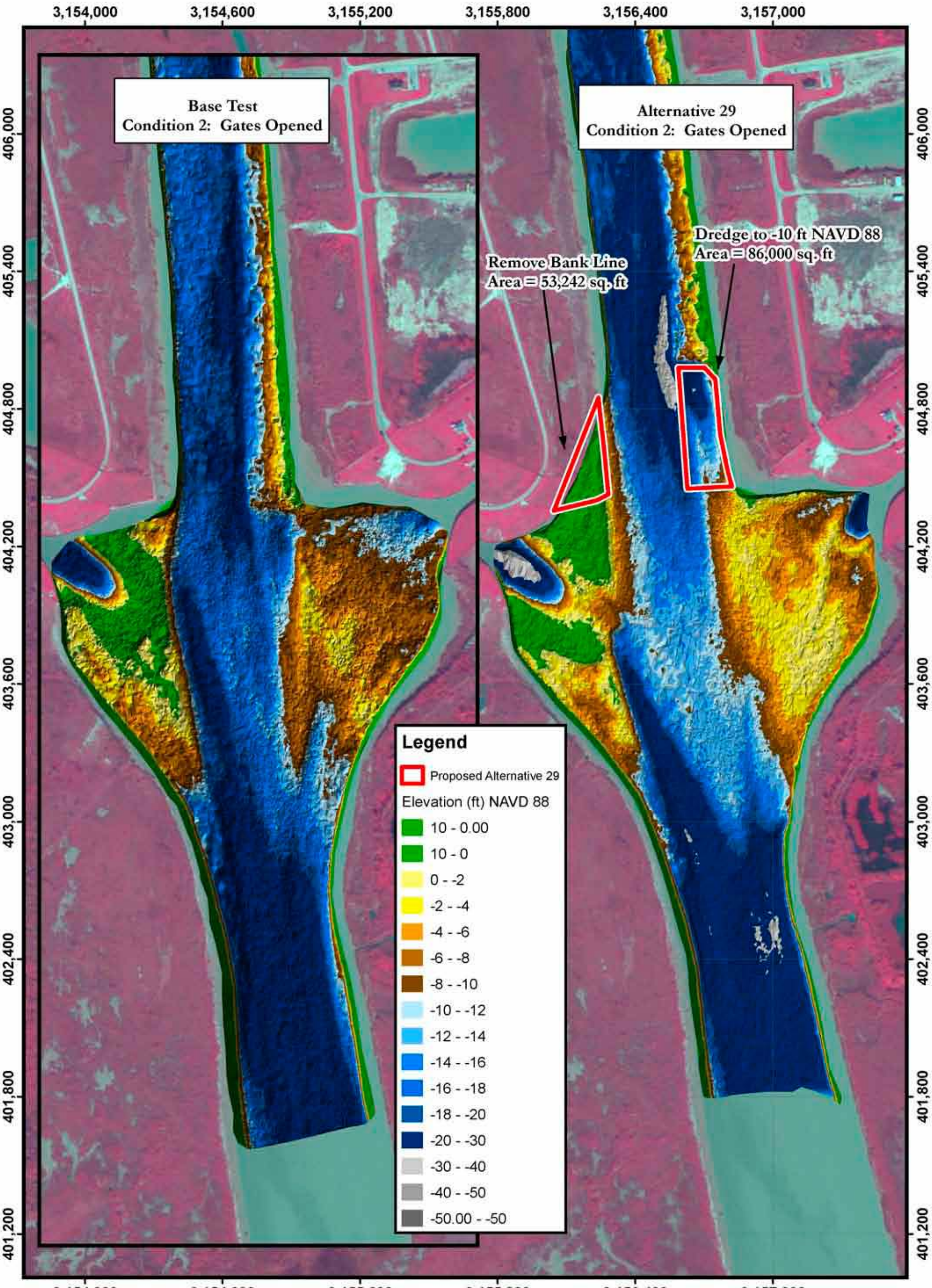

PLATE NUMBER 130

0 75 150 300 450 600
Feet

Alternative 29 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/18/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

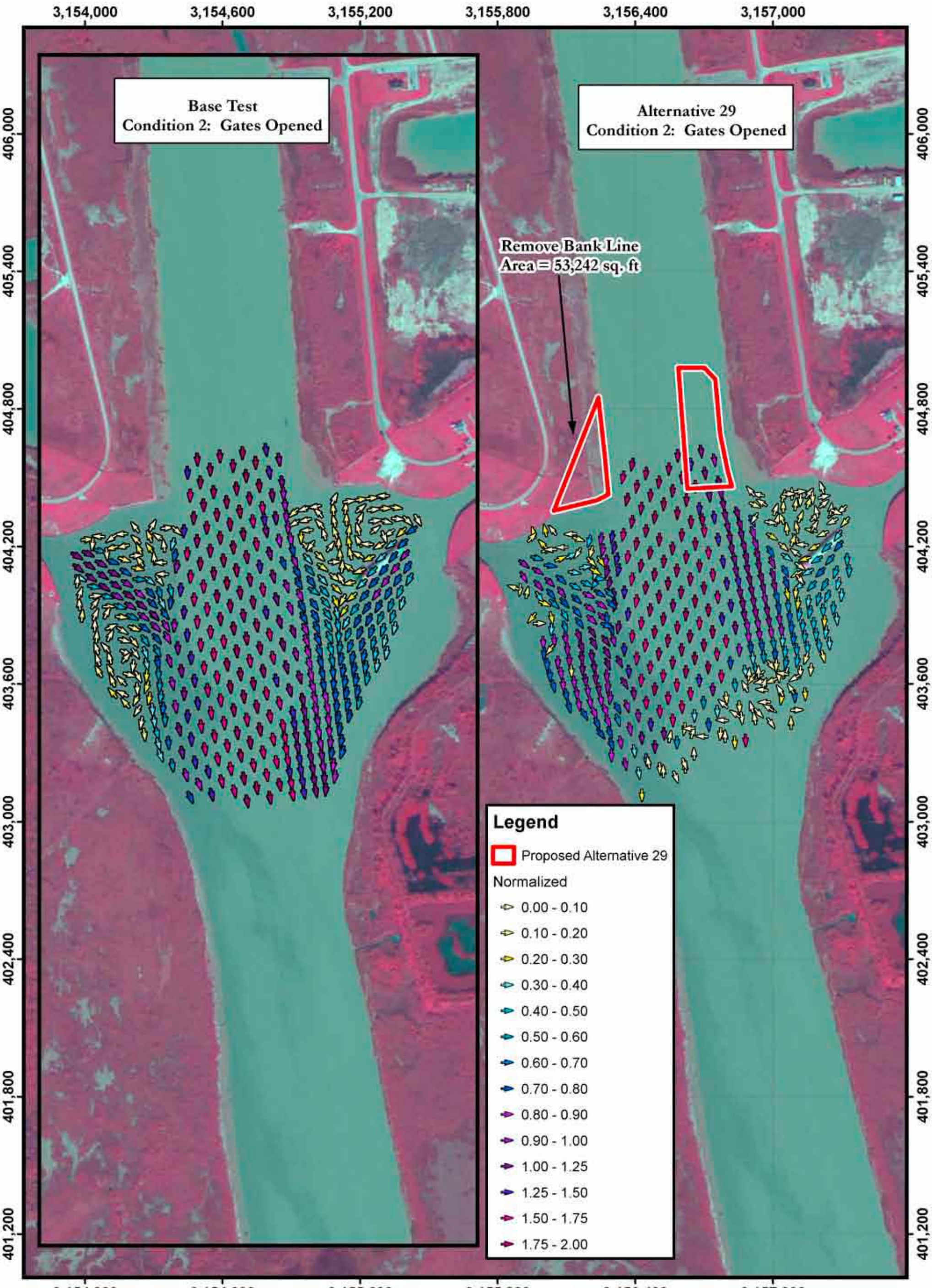

PLATE NUMBER 131

0 75 150 300 450 600
Feet

Alternative 29 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/18/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
...Galveston/Plates | 07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

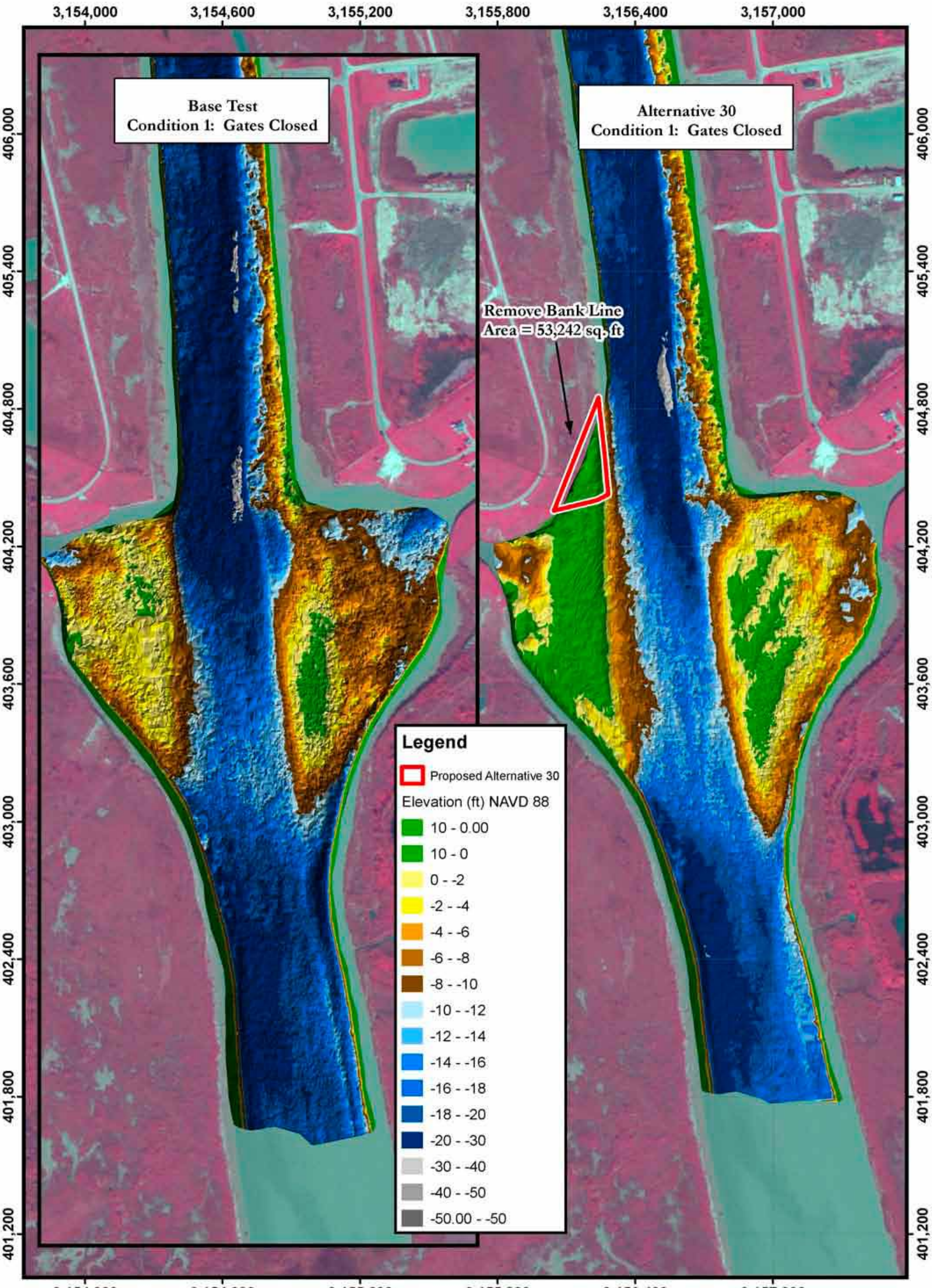

PLATE NUMBER 132

0 75 150 300 450 600
Feet

Alternative 30 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/19/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

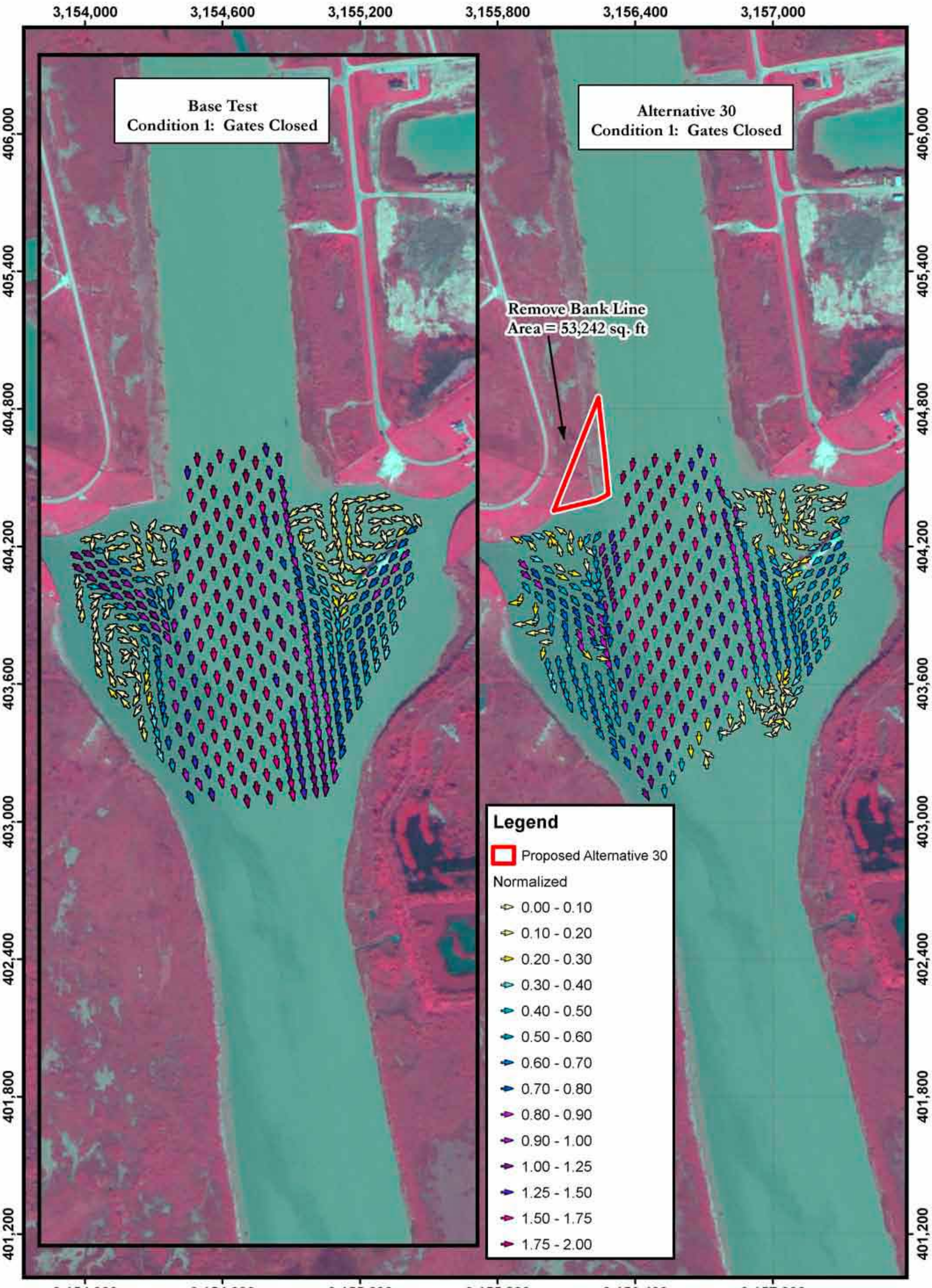

PLATE NUMBER 133

0 75 150 300 450 600
Feet

Alternative 30 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/19/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
... Galveston/Flume | 07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

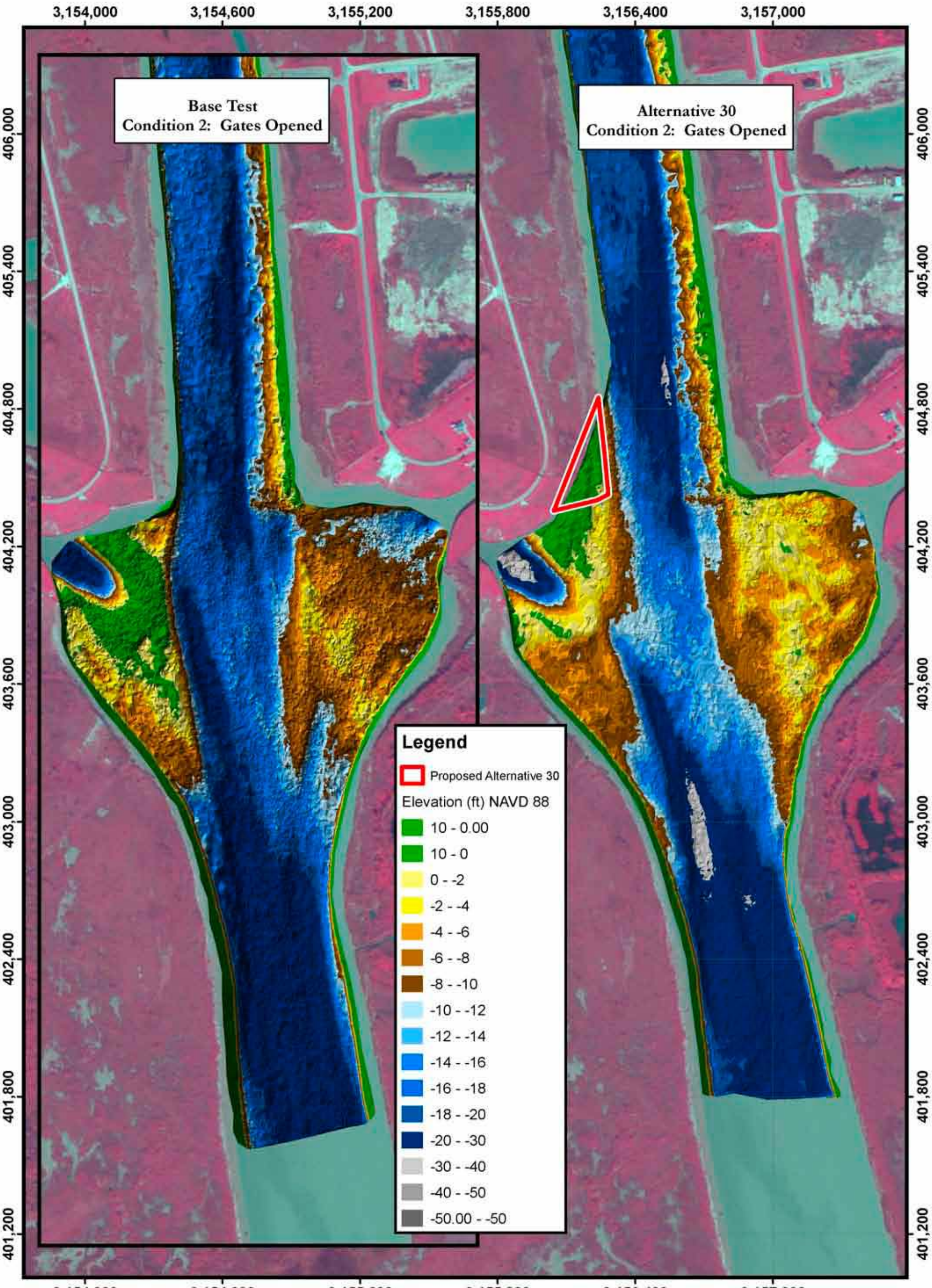

PLATE NUMBER 134

0 75 150 300 450 600
Feet

Alternative 30 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/19/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

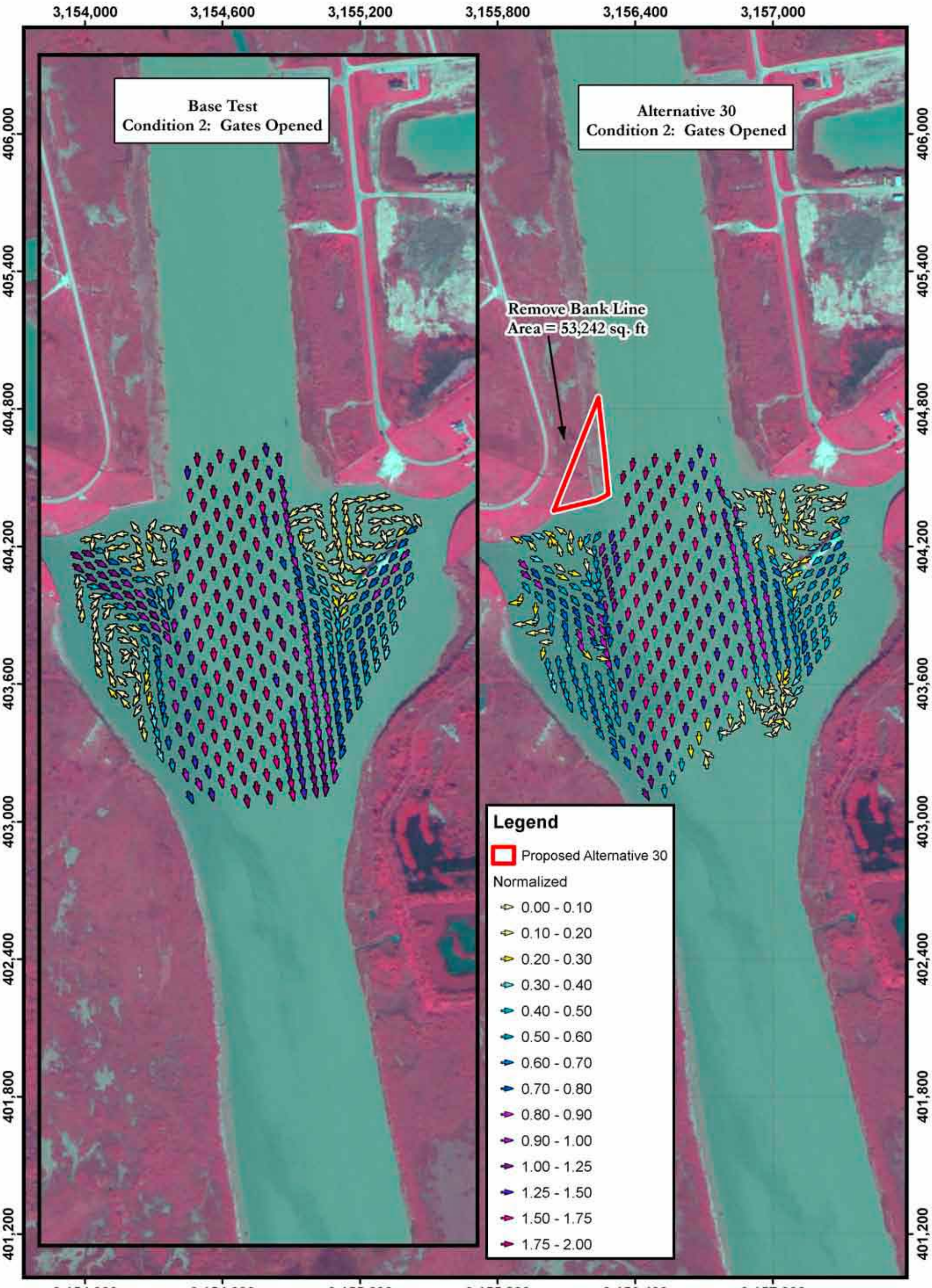

PLATE NUMBER 135

0 75 150 300 450 600
Feet

Alternative 30 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX | 05/19/09 Scan
A COX | J BROWN, P.E. | E BRAUER, P.E.
A COX | R DAVINROY, P.E.
... Galveston/Flume | 07/08/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

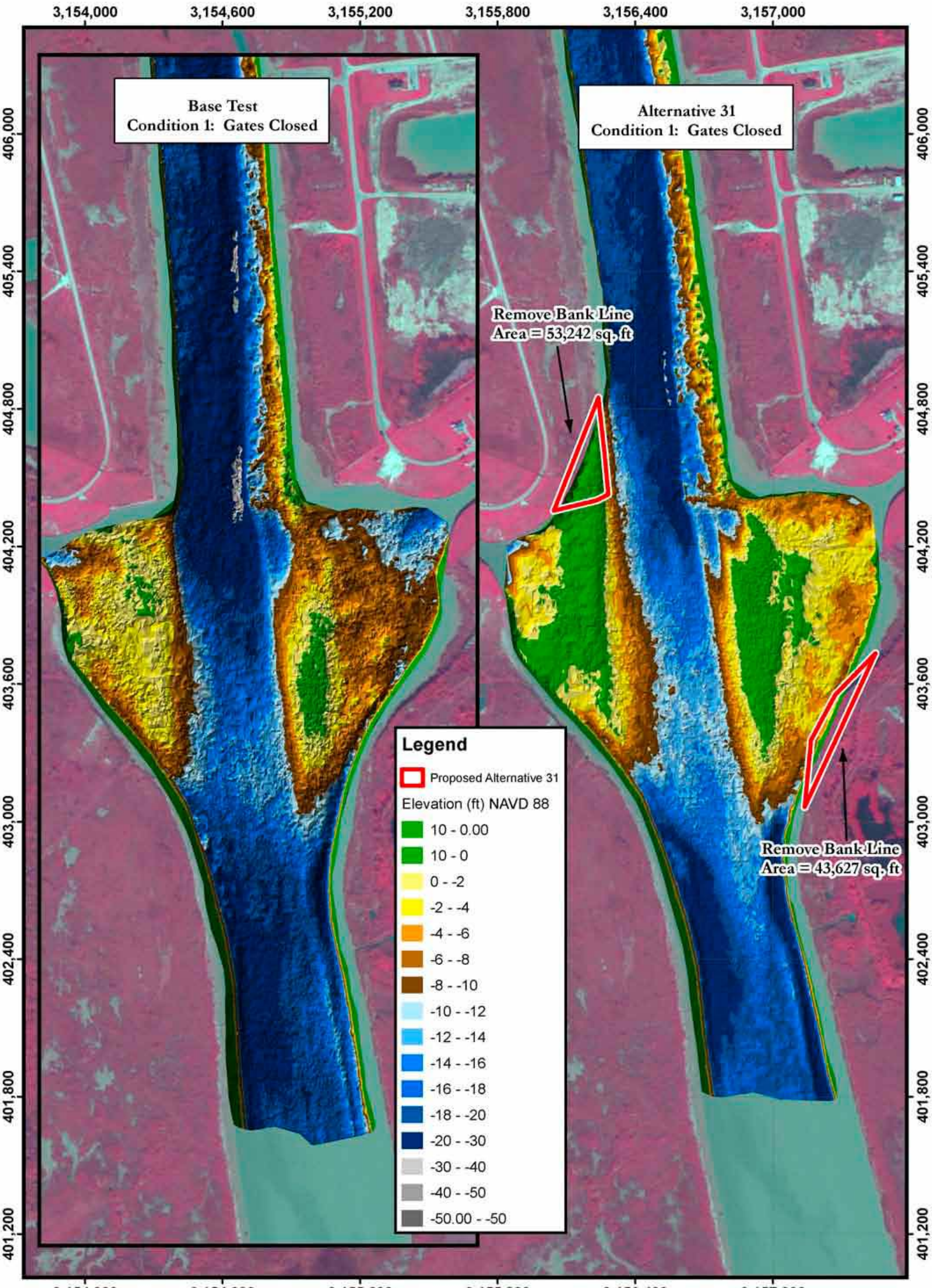

PLATE NUMBER 136

0 75 150 300 450 600
Feet

Alternative 31 Bathymetry Scan
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/20/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

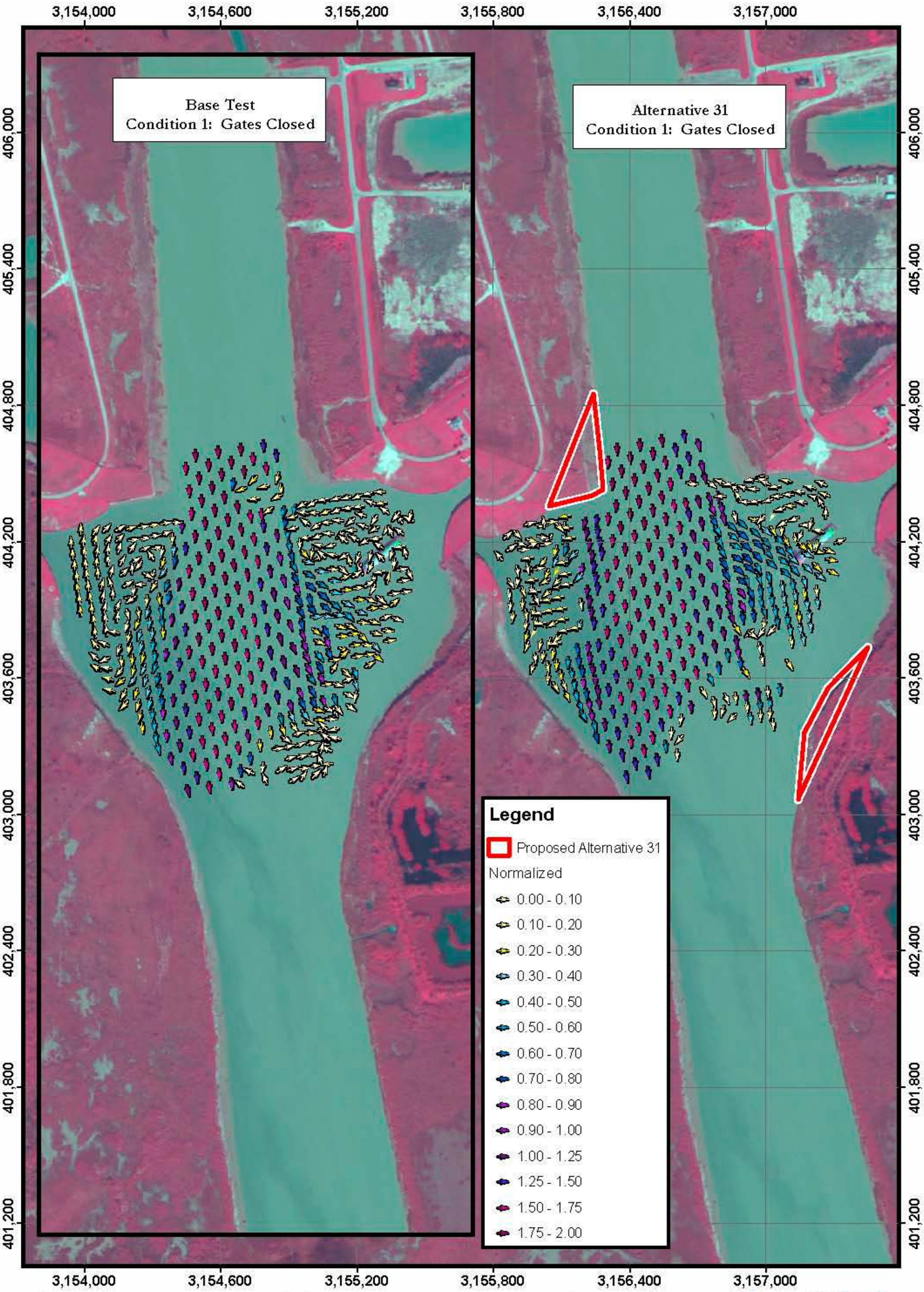

PLATE NUMBER 137

0 75 150 300 450 600
Feet

Alternative 31 LDV Data
Condition 1: Gates Closed
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model

A COX		05/20/09 Scan
A COX	J BROWN, PE.	E BRAUER, PE.
A COX		R DAVINROY, PE.
...Galveston/Florida		07/06/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

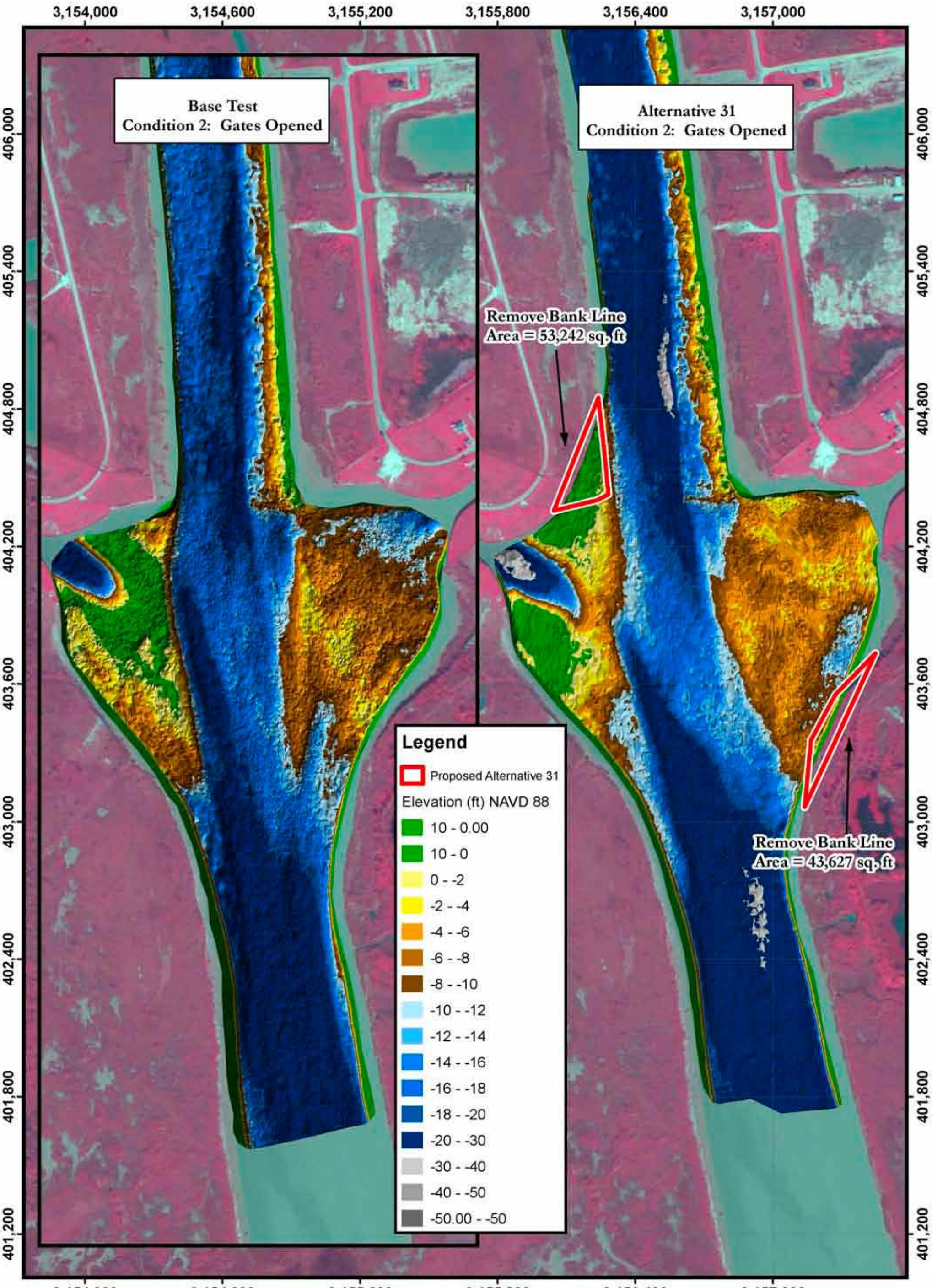

PLATE NUMBER 138

0 75 150 300 450 600
Feet

Alternative 31 Bathymetry Scan
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION CORPS OF ENGINEERS ST. LOUIS, MISSOURI	A COX		05/20/09 Scan
	A COX	J BROWN, P.E.	E BRAUER, P.E.
Lower Brazos River Basin Galveston District Brazos River and GIWW Crossing HSR Model	A COX		R DAVINROY, P.E.
	...Galveston/Plates		07/07/2009

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District

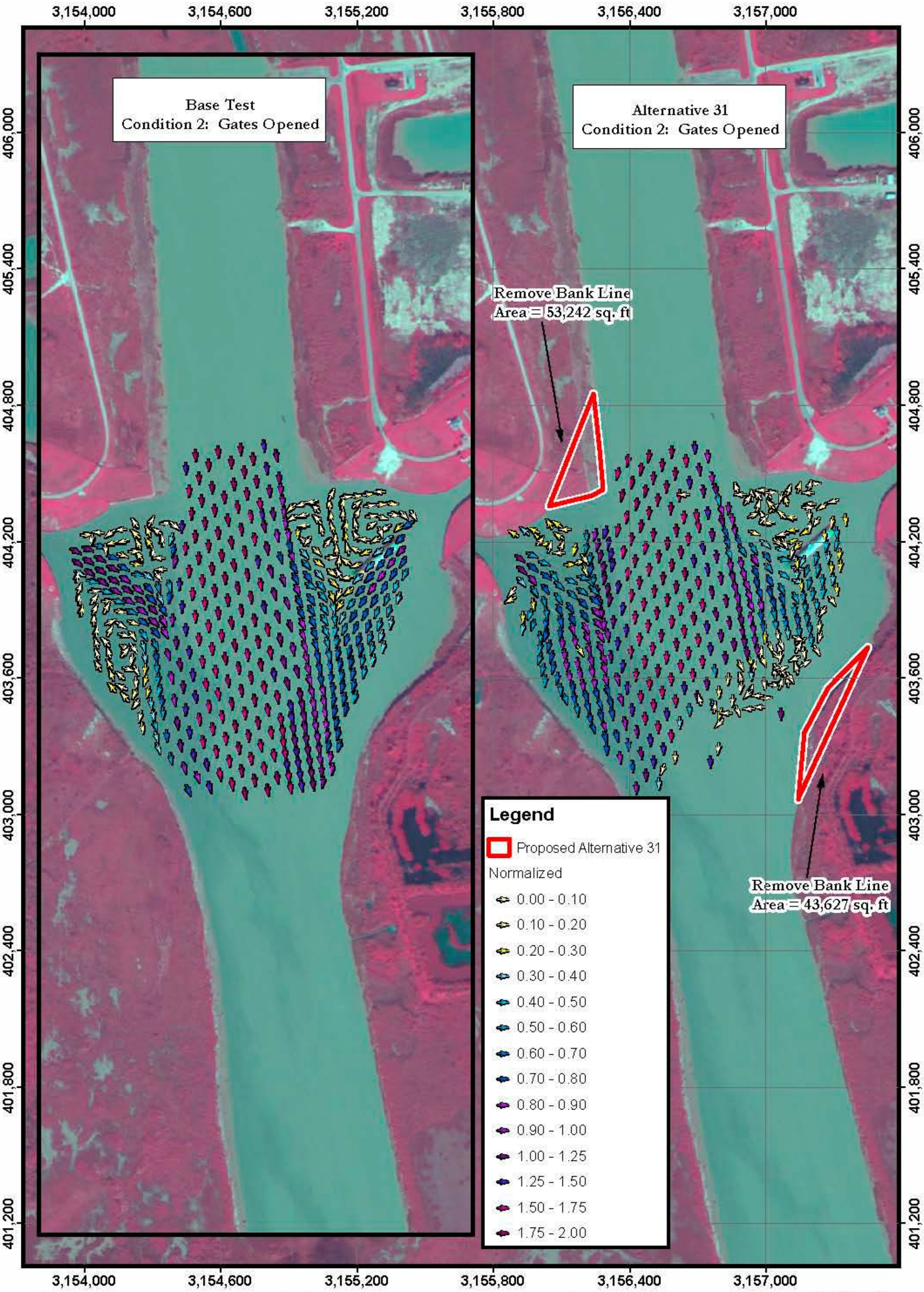

PLATE NUMBER 139

0 75 150 300 450 600
Feet

Alternative 31 LDV Data
Condition 2: Gates Opened
2004 AERIAL PHOTOGRAPH

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

A COX | 05/20/04 Scan
A COX | J BROWN, PE. | E BRAUER, PE.
Lower Brazos River Basin
Galveston District
Brazos River and GIWW Crossing
HSR Model
A COX | R DAVINROY, PE.
... Galveston, Florida | 07/06/2004

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APPLIED RIVER ENGINEERING CENTER

US Army Corps of Engineers
St. Louis District