Technical Report V

IHNC Lock Expansion EBIA Site Clearing

Excavations: Lower 9th Ward Breaches

Report to

Katrina Canal Breaches Consolidated Litigation

[Civil Action Number: 05-4182 "K" (2)]

United States District Court

Eastern District of Louisiana

Pertains to MR-GO, Robinson

[No. 06-2268]

By

Dr. Robert Bea and Chad Morris, P.L.S.

Risk Assessment & Management Services

Moraga, California

January 29, 2009

TABLE OF CONTENTS

INTRODUCTION.....1

BOLAND MARINE NORTH BREACH SITE.....9

EXCAVATION LOCATIONS.....9

PILE REMOVAL.....12

EXCAVATIONS WITH POOR BACKFILL.....17

SAUCER MARINE SOUTH BREACH SITE.....22

EXCAVATION LOCATIONS.....22

PILE REMOVAL.....25

EXCAVATIONS WITH POOR BACKFILL.....28

SUMMARY.....31

Introduction

During the 1990s, work was commissioned by the USACE to expand the IHNC locks to relieve shipping congestion and allow further expansion of the Port of New Orleans. Congress authorized the study for the lock enlargement / replacement in 1956. The proposed new locks would require a bypass channel that would be constructed at the East Bank Industrial Area (EBIA). The EBIA was located in the Lower 9th Ward, west of the floodwall and east of the IHNC, between Florida Avenue and Claiborne Avenue (Figure 1).



Figure 1. IHNC and EBIA (left side) (USACE photograph)

Available documentation indicates that the USACE purchased the EBIA site from the Port of New Orleans in order to proceed with the bypass channel construction (WGI, "Project Work Plan, Project Site Development and Remedial Action of East Bank Industrial Area, Inner Harbor Navigation Canal Lock Replacement Project," report to USACE, New Orleans District, 2000). WGI began working at the job site in January 2001.

The EBIA consists of 32 acres of former industrial sites previously leased from the Port of New Orleans to private owners. The EBIA consisted of six facilities named for their former occupants (Figure 2). These included (starting at the south) the International Tank Terminal, Saucer Marine, Mayer Yacht – Distributors Oil, Indian Towing, McDonough Marine, and Boland Marine. Available information indicates that the two Lower 9th Ward breach sites were located entirely in the Saucer Marine Service property (South Breach site, used primarily for ship building operations) and Boland Marine property (North Breach site, used primarily for ship repairs, storage, office space, painting operations, and steel fabrication).

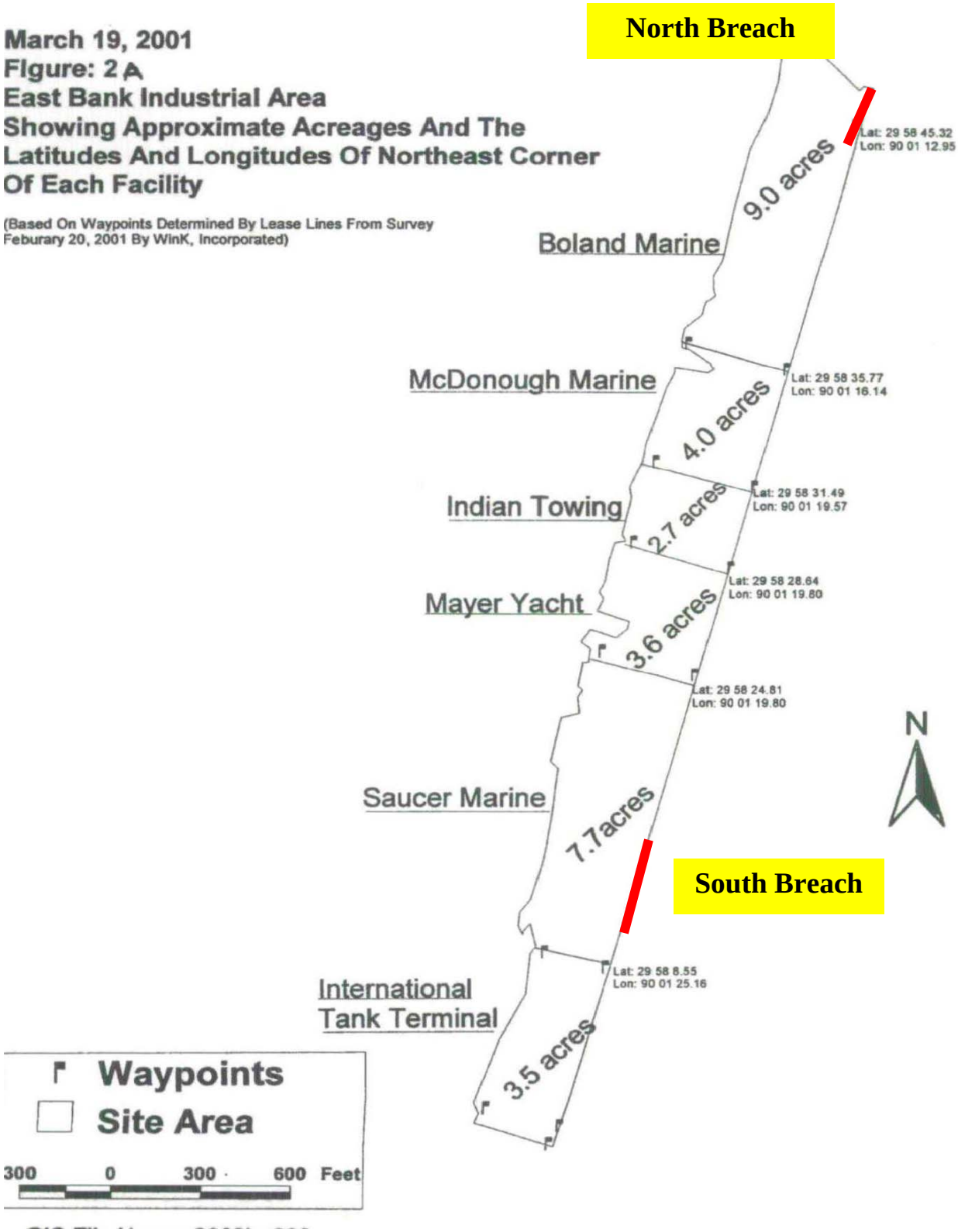


Figure 2. East Bank Industrial Area (EBIA) (WGI 2005). Site cleared to prepare for USACE Lock Expansion Project. The Boland Marine parcel is opposite the North Breach. The Saucer Marine parcel is opposite the South Breach.

At one time, underground storage tanks were located at both the Boland property and the Saucer property. These tanks were reported to have been removed. The State of Louisiana listed Boland Marine as an unspecified hazardous waste generator. In 1991, an anonymous employee contacted the Louisiana Department of Environmental Quality and reported that the company had buried drums containing hazardous waste onsite.

The EBIA had a long history spanning more than 4 decades of industrial use by marine service and petroleum distribution companies. Purportedly, tenants contaminated the property as a result of their industrial operations. Also of particular significance at the EBIA was the active placement of construction materials (concrete rubble) and solid wastes (barges, metal turnings, concrete blocks) to protect the properties from the effects of ship wakes. These two activities had two primary impacts derived from the existence of hazardous constituents that could negatively affect: 1) the environment at the time of construction, and 2) construction of the bypass channel.

To ameliorate these potential negative effects, the USACE New Orleans District contracted with WGI to characterize and remediate the EBIA's environmental contamination and identify and remove construction materials likely to interfere with bypass channel construction. Figures 3 and 4 summarize the site clearing activities at the north Boland site (adjacent to the North Breach) and south Saucier Marine site (adjacent to the South Breach), respectively. Note the very large number of surface and subsurface facilities that had to be removed. Even more facilities were discovered underground and removed during the site clearing operations (WGI 2005).

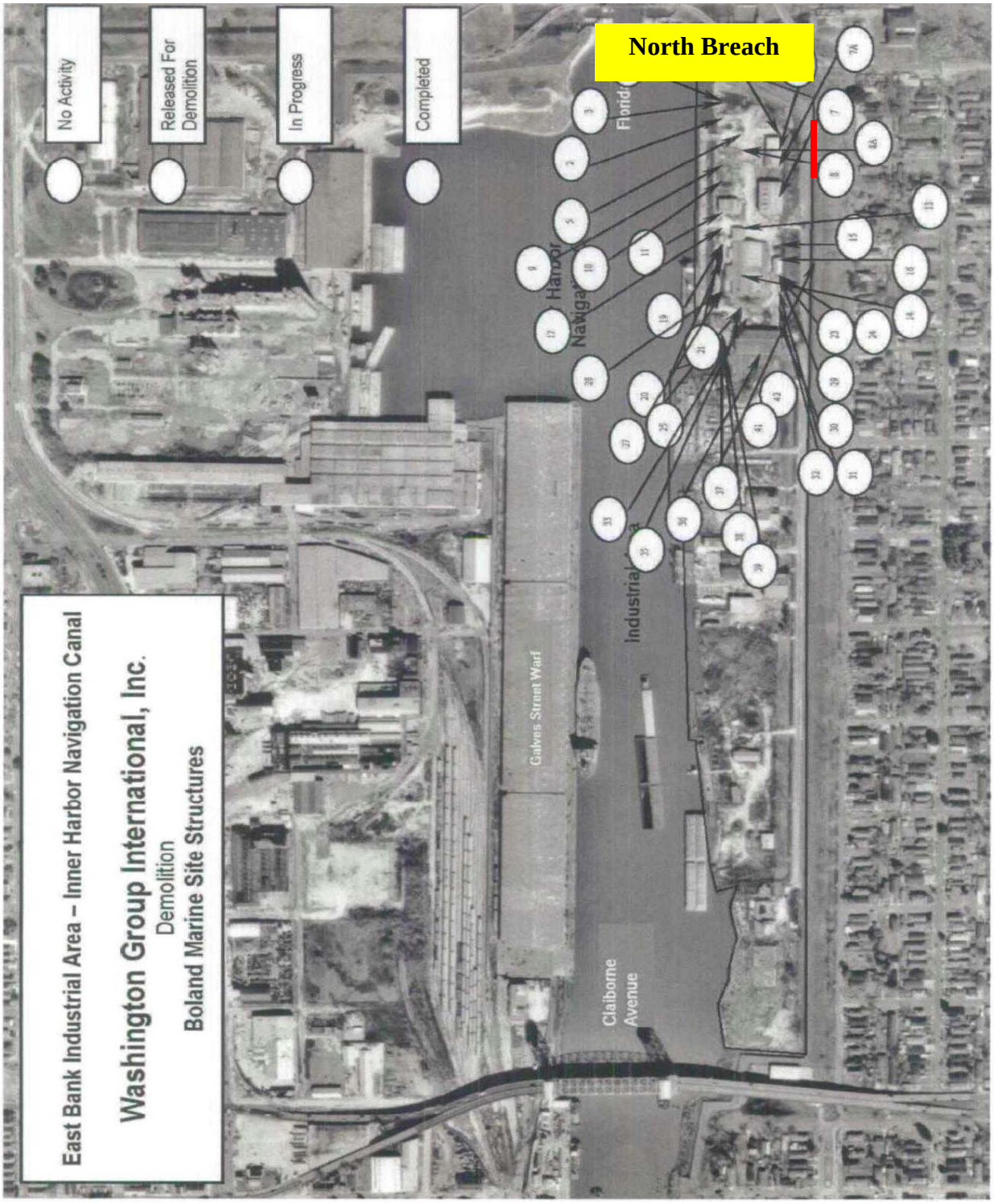


Figure 3. Boland Marine site structure removals and excavations at North end of EBIA – adjacent to North Breach (WGI 2005).

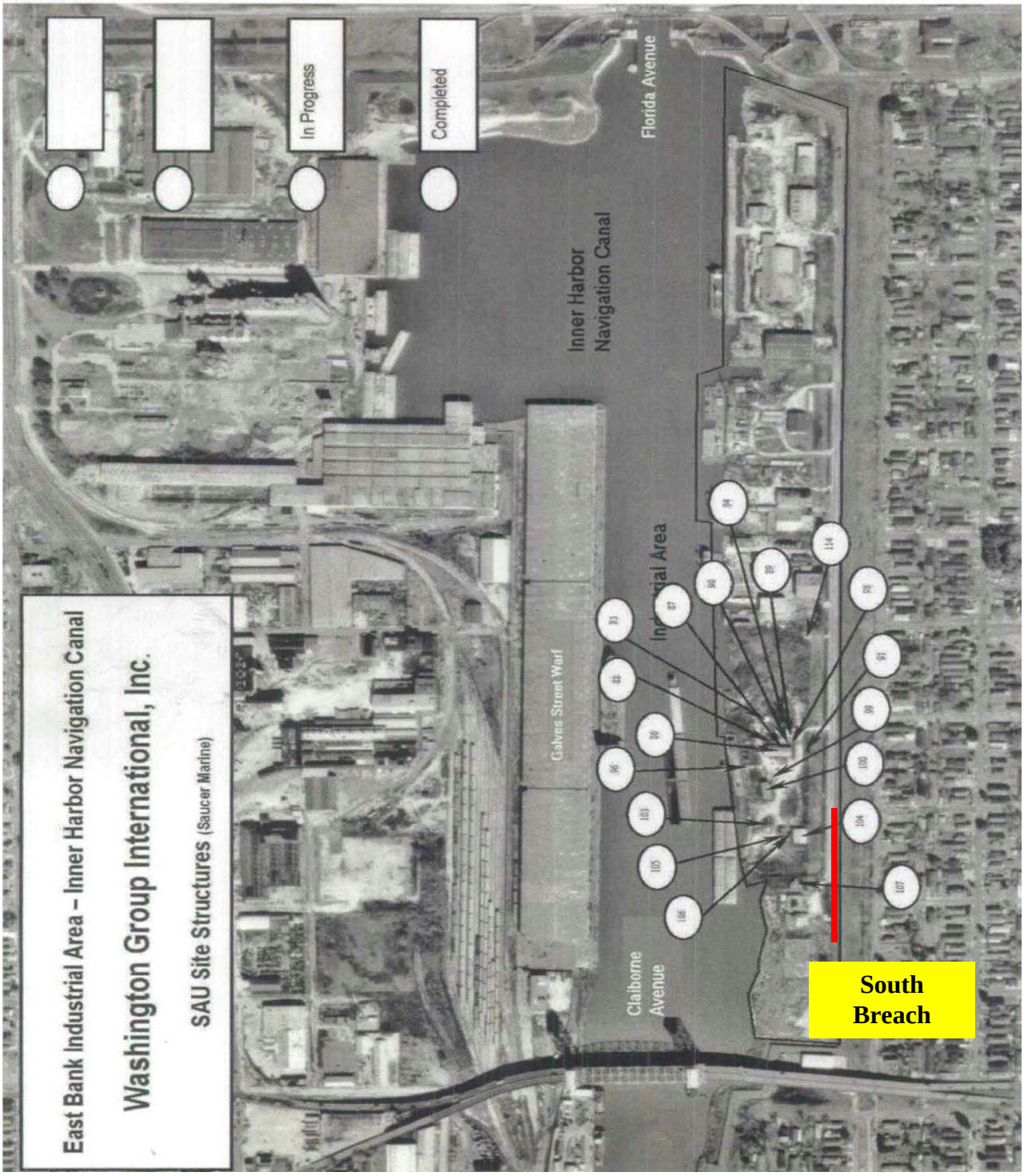


Figure 4. Saucier site structure removals and excavations at South end of EBIA adjacent to South Breach (WGI 2005).

It is reported by WGI ("Technical Completion Report," 2005) that in the majority of cases the canal bank was excavated as required to a depth of four feet, additional observations of contamination prompted excavations to depths exceeding nine feet. The records provided by WGI indicate that a total of 12,259 tons of contaminated soils were removed from the Boland site and 35,636 tons of contaminated soils were removed from the Saucer site.

In addition to removal of canal-side soils that had previously provided stability and protection to the flood protection structure, numerous underground storage tanks and debris were removed. At the Saucer site, large underground storage tanks had to be removed. In addition, a buried railroad tank car required construction of a cofferdam so that the tank car could be filled with air, floated free, lifted and transported from the site. At the northern Boland site, a wharf extended along most of the IHNC. Following removal of the wharf materials, the piles comprising the foundation were pulled and transported from the site. Excavations to remove contaminated soils were made immediately adjacent to the floodwall at the Boland Marine Site.

All of these excavations encountered severe water intrusion difficulties. Constant attention had to be paid to dewatering the excavations. Water intrusion was most severe at depths below the ground in the range of –15 feet to as deep as –30 feet. The greatest water intrusion was associated with excavations that encountered significant layers of buried organic materials. The experience with seepage and water intrusion associated with the deep EBIA excavations and those associated with another similar site to the north clearly indicate the pervasive nature of this problem. This experience clearly refutes the IPET conclusions (Volume V, V-127, IPET 2007): *"While these values of permeability would indicate seepage, IPET has found no justification for these assumptions and no physical evidence of seepage being a systemic performance issue at this site*."

The effects of these site remediation activities clearly extended well below the specified soil excavation levels cited earlier. Removal of barges, piles, underground storage tanks, and underground utilities (e.g. sewer, water, gas lines) could easily have reached to and substantially exceeded elevations of minus 10 feet to 25 feet; thus intersecting the underlying marsh deposits and providing. When backfilled with porous – pervious – materials, hydraulic connections would be developed between the backfilled excavations and the buried pervious – permeable marsh and swamp layers. This potential was particularly evident in the case of the sewer lift station and sewer line removed at the Saucier Marine site. The backfilled sewer lift station excavation was within approximately 100 feet of the floodwall. The sewer line crossed the floodwall at right angles and was located near the center of the South Breach.

WGI completed its work, removed its equipment, and demobilized from the job site in May 2005 (WGI 2005). The information that is available clearly indicates a high degree of correlation of the site remediation work conducted by WGI for the USACE at the EBIA sites and the breach locations in the flood protection structure adjacent to the Lower 9th Ward. This remediation work (removal of soils, formation of cavities, vibrations) very probably had important effects on the soils relied upon to provide stability and protection for the flood protection structure. Removal and disturbance of the surface soils overlying the permeable subsoils (Marsh and Swamp layers) would have facilitated the under seepage.

Information regarding waterside excavations indicate that work near the area of the breaches placed permeable material down to elevations of approximately –25 feet, approximately 15 feet deeper than the sheet pile tips; thus producing significantly shorter paths for hydraulic pressures to reach beneath the embankment soils and levee toe, starting material saturation and softening

potentially faster, as opposed to the subsoils being hydraulically charged from more than two hundred feet away (e.g. charged from the IHNC canal).

The following sections in this Technical Report will provide details regarding the nature, characteristics, and positions of the USACE Lock Expansion Project EBIA site clearing excavations adjacent to the North Breach and South Breach at the Lower 9th Ward.

Boland Marine North Breach Site

Excavation Locations

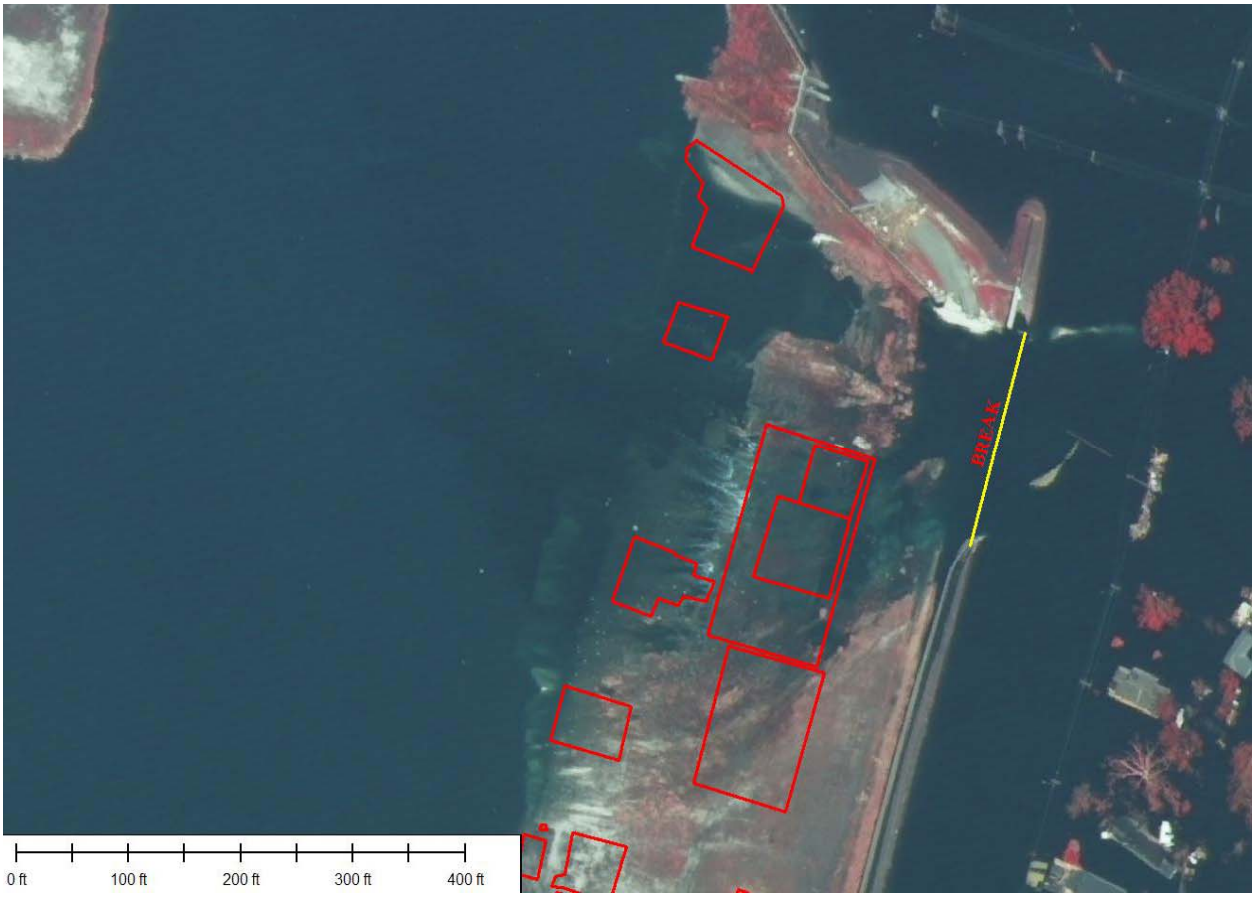


Figure 5. North IHNC Breach – 9/2/05 Photograph – Red figures are the outlines of primary WGI planned work areas.



Figure 6. North IHNC Breach – 4/15/05 Photograph – This image was taken after work was completed at the site, before Hurricane Katrina. Note how close the water's edge is to the breach site in this image. Images that follow will show that this was due to WGI work in the area.



Figure 7. North IHNC Breach – 11/13/02 Photograph – This image was taken while the WGI work was in progress. Note that buildings and the wharf are gone from the work area. Also note the significant difference in the bank line between this image and the 4/15/05 image in Figure 6.



Figure 8. North IHNC Breach – 10/18/96 Photograph – This image was taken prior to the WGI work at the site. Note that buildings and wharf are visible in the image.

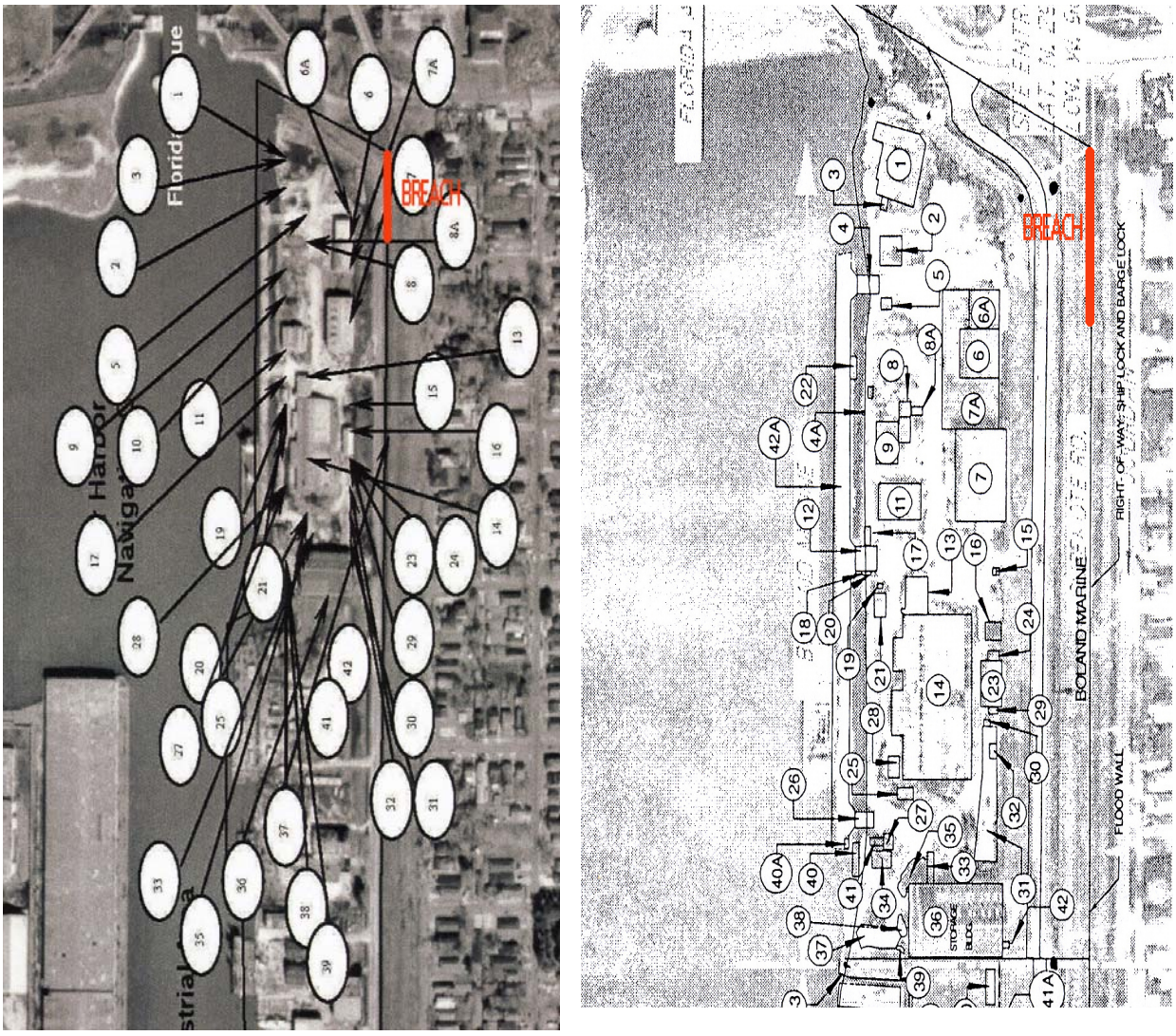


Figure 9. WGI Construction plans showing major work sites in the vicinity of the breach.

Pile Removal

Hundreds of piles where removed from the Boland Marine property, the site of the North Breach, by WGI under direction of the USACE during the years just prior to Hurricane Katrina. These piles were located under the waterfront wharf and under many of the structure foundations at the site.

These piles had an average length of 30 feet, with their top elevations varying from approximately 3 feet for the ones at the ground surface to -20 feet for some that were under structures. In almost all cases they protruded into and through the layers of buried marshy material, which is located between elevations of -10 feet and -30 feet.

The removal of these piles, followed by the lack of compacted backfill created a direct path for water to saturate the buried marsh and swamp layers. The high water pressure associated with the elevated storm surge water levels exploited these direct access pathways forcing water into the marsh and swamp layers and thereby undermining the stability of the adjacent flood protection structures.



Figure 10. Wharf piles at Boland Marine prior to removal by WGI.



Figure 11. Piles removed from Boland Marine site.



Figure 12. Concrete piles removed from under a foundation at the Boland site.



Figure 13. Piles exposed during removal of a foundation at Boland site.



Figure 14. Piles being removed at a Boland structure.



Figure 15. Piles under a foundation at the Boland site.



Figure 16: Void in soils left by extracted pile.

Excavations with Poor Backfill

In many areas at the North Breach site, WGI under direction of the USACE made excavations and replaced existing materials with non-compacted backfill and sand backfill. The extensive excavations were associated with removal of existing foundations, removal of contaminated soil and grid trenching.

These excavations, with poor backfill, served as direct access ways for water to communicate with the buried saturated marsh and swamp layers. During Katrina's storm surge these holes served as pathways utilized by the water to undermine the flood protection structure at the North Breach site.



Figure 17. Figure 12 - Deep excavations at Boland site.



Figure 18. Deep excavations at Boland site.



Figure 19. Sand backfill being pushed into excavation at Boland site.



Figure 20. Sand backfill being pushed into excavation at Boland site.

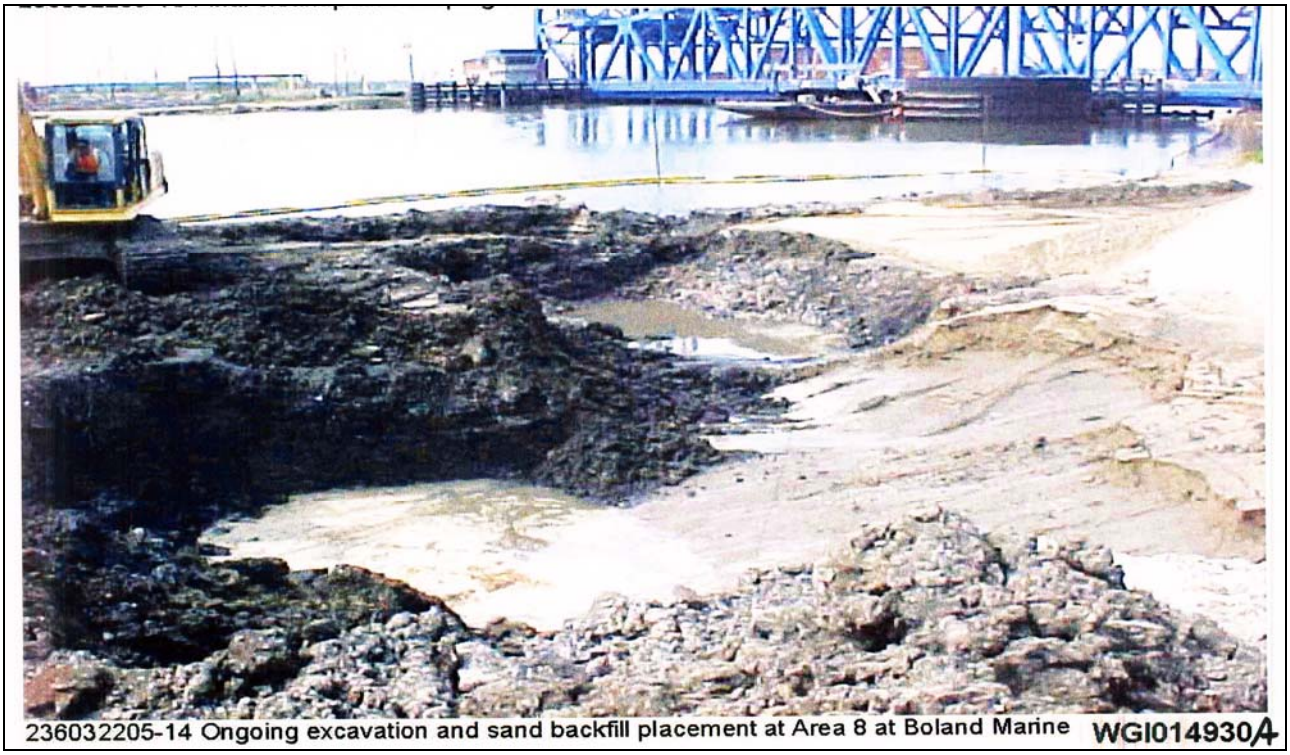


Figure 21. Excavation and sand backfill operation at Boland site.



1. Grid trench being excavated at Saucer Marine

2.Grid trench with excavated rubble stockpiled alongside at Saucer Marine

3.Grid trenching at southeast corner of Boland Marine

4.Grid trenching excavation and debris removal at Saucer Marine

WGI064958A

Figure 22. Grid trenching at both the North and South breach sites.

Saucer Marine South Breach Site

Excavation Locations

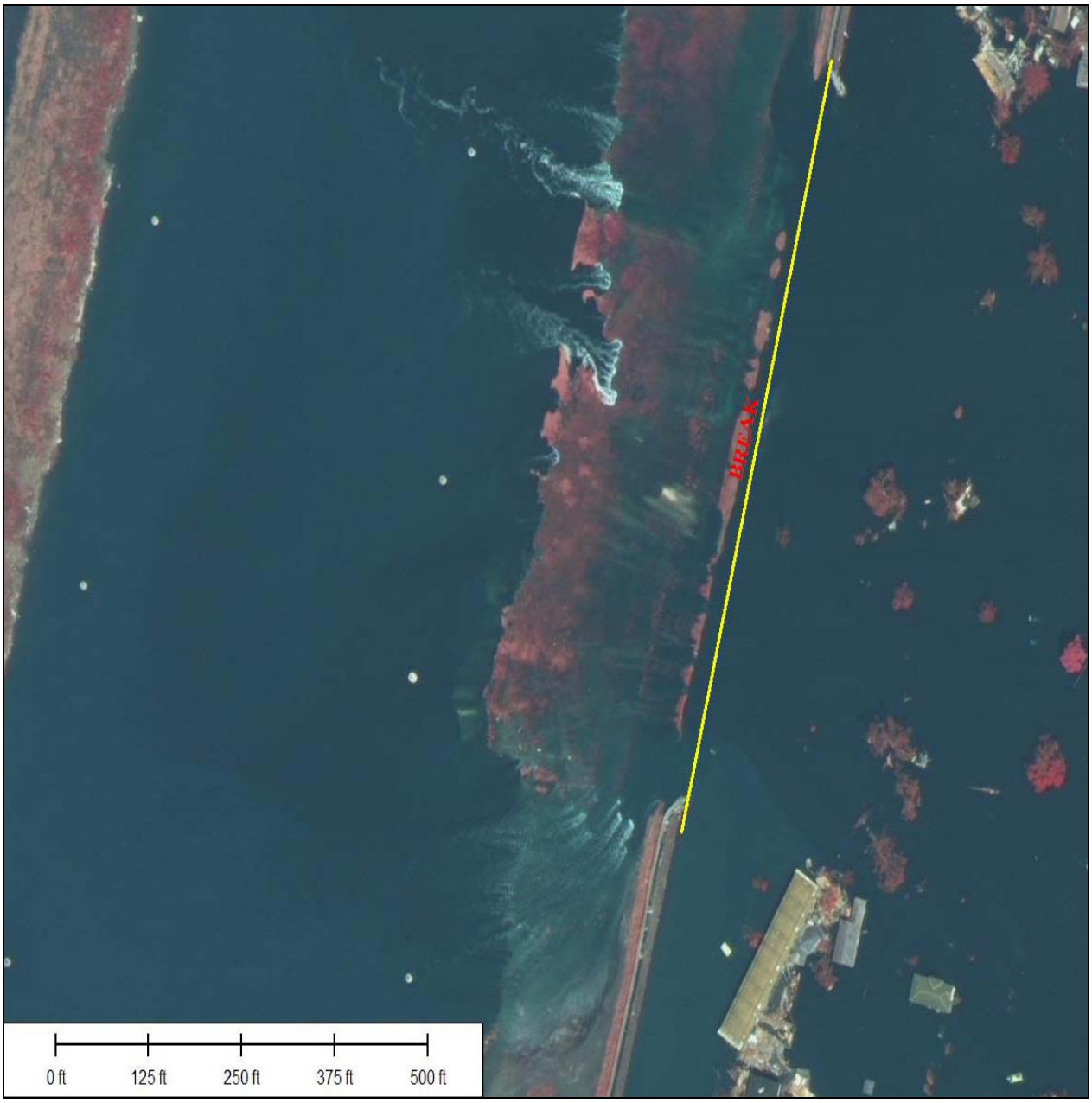


Figure 23. South Breach – 9/2/05 Photograph – Red figures are the outlines of primary WGI planned work areas.



Figure 24. South Breach – 4/15/05 Photograph – Note the wet soil near the south end of the breach site.



Figure 25. South Breach – 10/18/96 Photograph – This image was taken prior to WGI's work at the site. Note the buildings and wharf visible in the image.

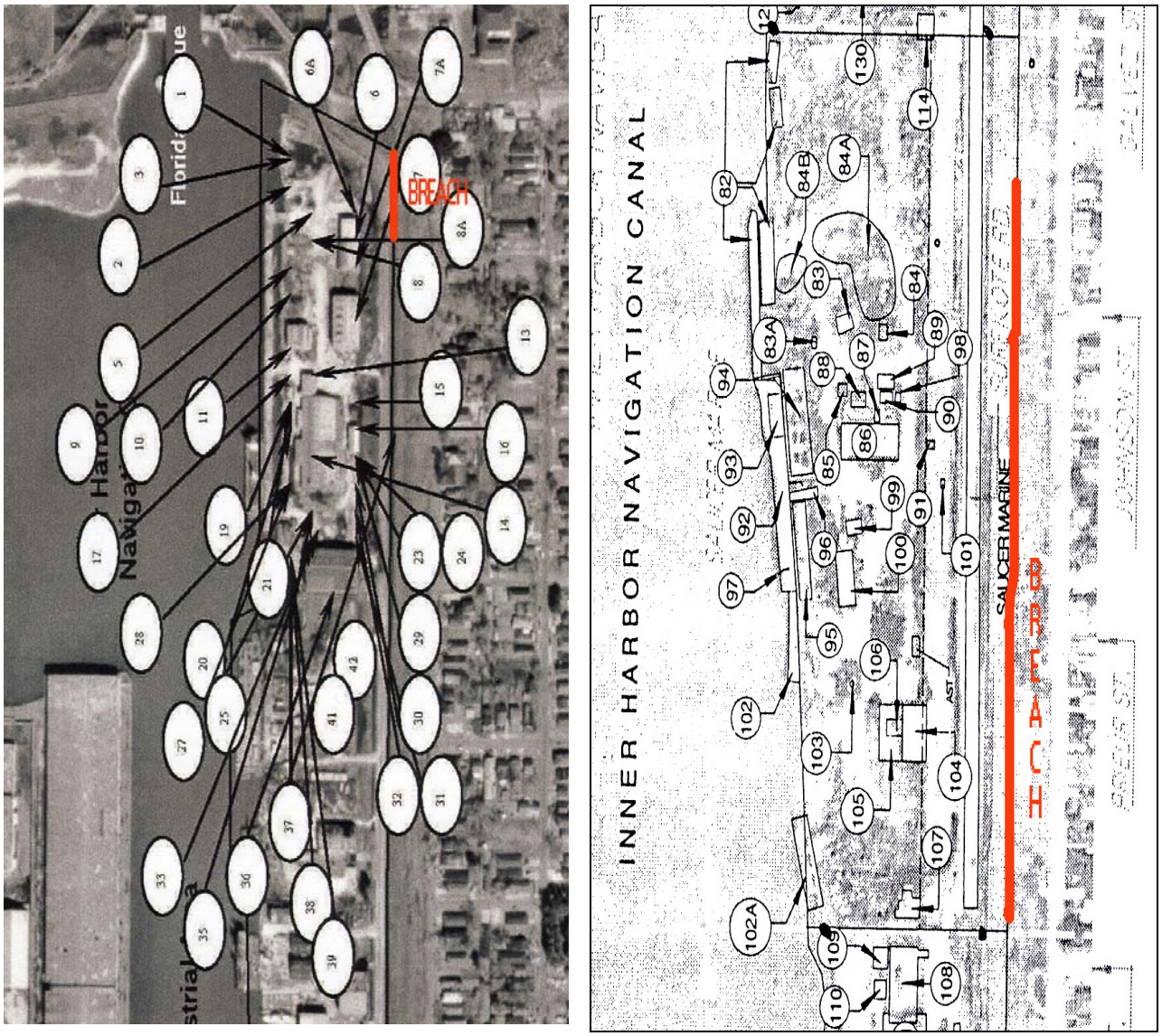


Figure 26. Construction plans showing major work sites in the vicinity of the South Breach.

Pile Removal

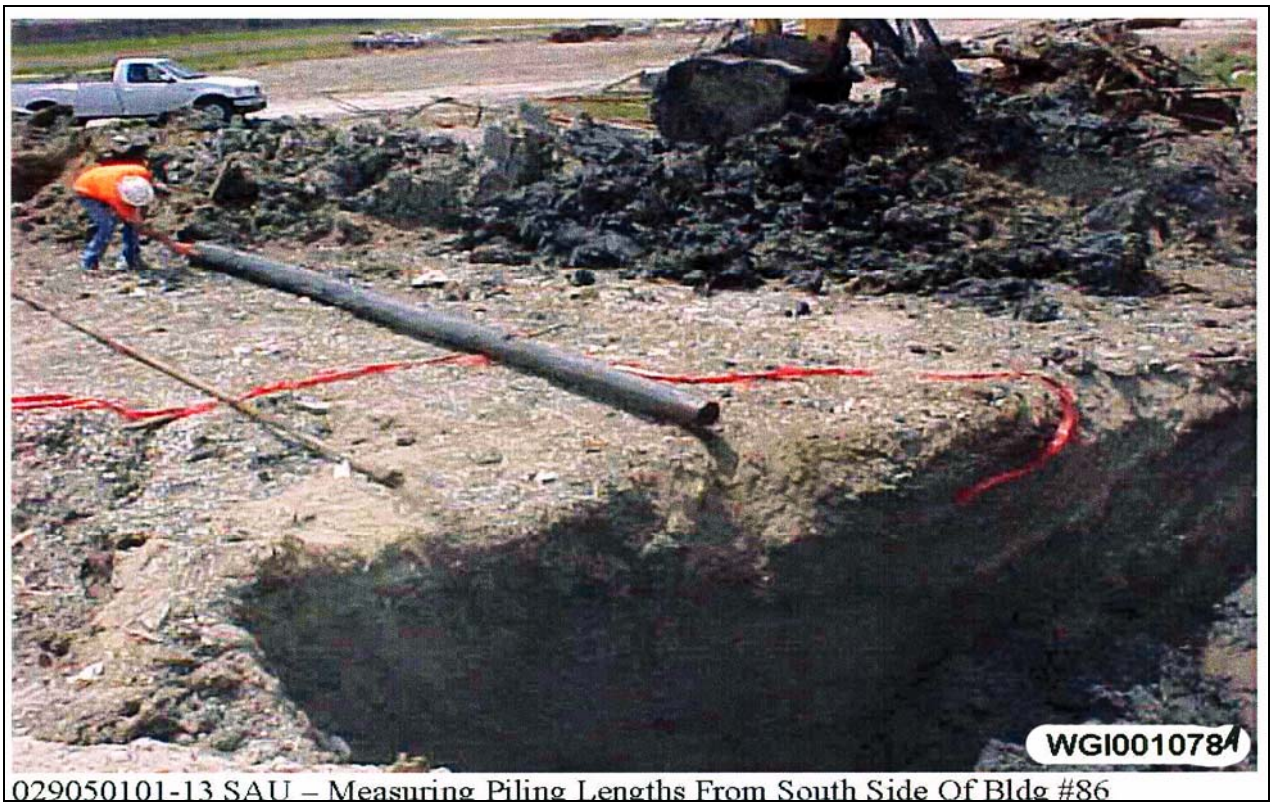
Hundreds of piles where removed from the Saucer Marine property, the site of the South Breach, by WGI under direction of the USACE during the years just prior to Hurricane Katrina. These piles were located under waterfront structures and under many of the foundations at the site.

These piles had an average length of 30 feet, with their top elevations varying from approximately 3 feet for the ones at the ground surface to -20 feet for some that were under structures. In almost all cases they protruded into and through the layers of buried marshy material, which is located between elevations of -10 feet and -30 feet.

The removal of these piles, followed by the lack of compacted backfill created a direct path for water to communicate directly with the buried saturated marsh and swamp layers. The high water pressure associated with the elevated storm surge water levels exploited these direct access pathways forcing water into the marshy layers undermining the stability of the flood wall.



Figure 27. Excavation to expose pile tops for excavation near floodwall at Saucer site



029050101-13 SAU – Measuring Piling Lengths From South Side Of Bldg #86

Figure 28. Piling removed from deep excavation at Saucer site.



034051401-08 SAU – Piling Removal At #100

WGI001085A

Figure 29. Piling removal at Saucer site.



Figure 30. Pilings tops exposed below foundation at Saucer site.

Excavations with Poor Backfill

In many areas at the South Breach site, WGI under direction of the USACE made excavations and replaced existing materials with non-compacted backfill and sand backfill. The extensive excavations were associated with removal of existing foundations, removal of contaminated soil and grid trenching.

These excavations, with poor backfill, served as direct access ways for water to seep into and saturate the marshy layers. During Katrina's storm surge these holes served as pathways utilized by the water to undermine the floodwall at the breach site.



Figure 31. Excavations at Saucer site.



Figure 32. Excavation at Saucer site.



Figure 33. Excavation with poor backfill at Saucer site.



Figure 34. Grid Trenching at Saucer site.

Summary

The documentation provided in this report provides sufficient evidence that there were many poorly backfilled excavations developed during the USACE IHNC Navigation Lock Expansion Project EBIA site clearing operations. These poorly backfilled excavations provided many conduits for hurricane surge waters in the IHNC to communicate directly with the buried marsh layers that underlie this entire area (Figures 35 – 39). These buried marsh and swamp layers are able to transmit high water pressures developed in the IHNC directly under the flood protection structures adjacent to the Lower 9th Ward. These high water pressures can contribute significantly to destabalization of the flood protection structures (Figure 40).



177-042903-10 Century old stumps found in borrow pit at McDonough Marine



68101101-25 MCD – Borrow Pit (SE Corner) Cypress/Vegetation At 15'

Figure 35. Buried marsh and swamp layers under the Lower 9th Ward.



072103101-22 SAU – Excavating Inside The Cofferdam – Cypress Roots and Vegetation



Figure 36. Buried marsh and swamp layers under the Lower 9th Ward.

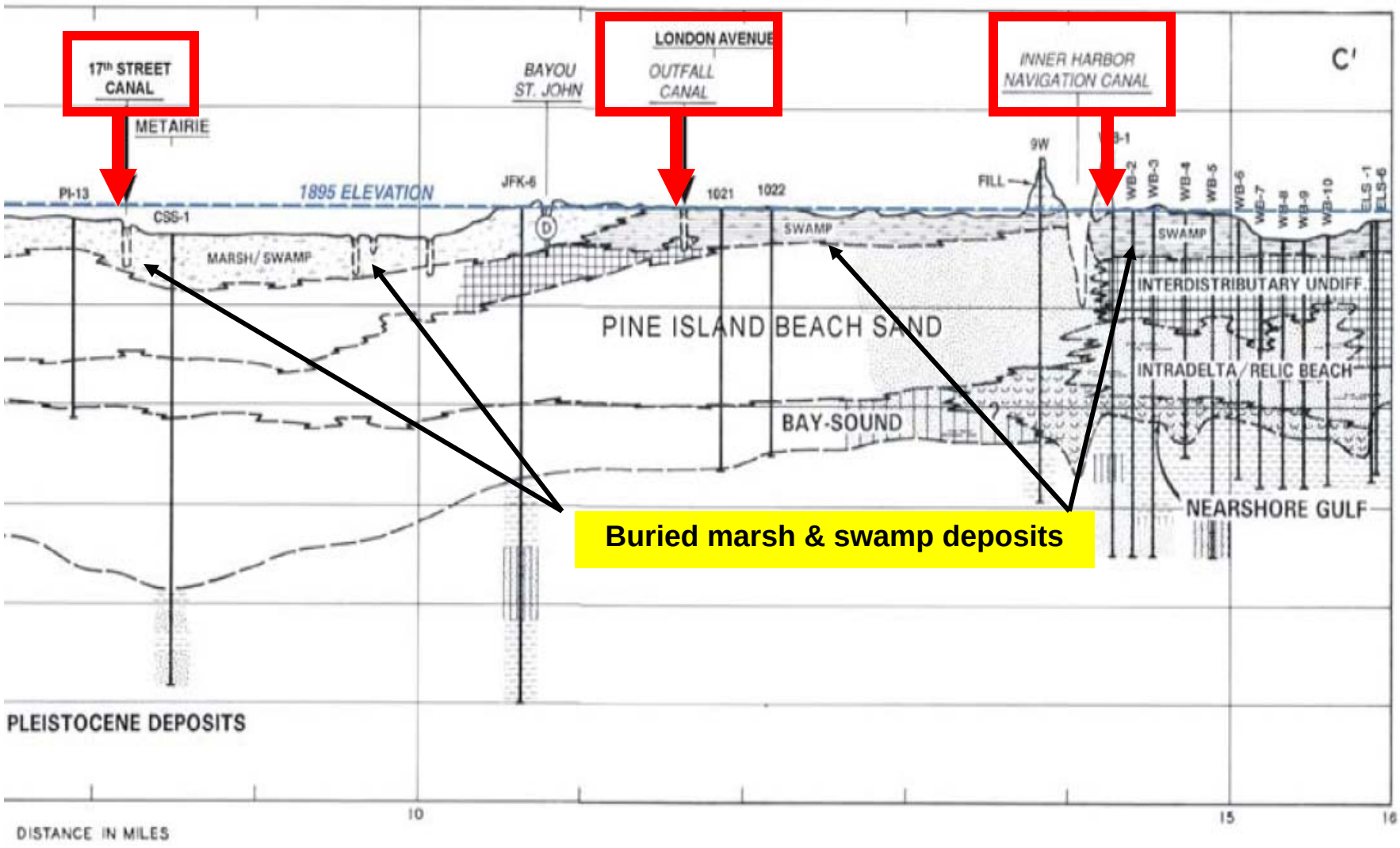


Figure 37. Geologic cross-section (east west) showing buried marsh and swamp layers that underlie much of the Greater New Orleans Area (after USACE IPET 2007).

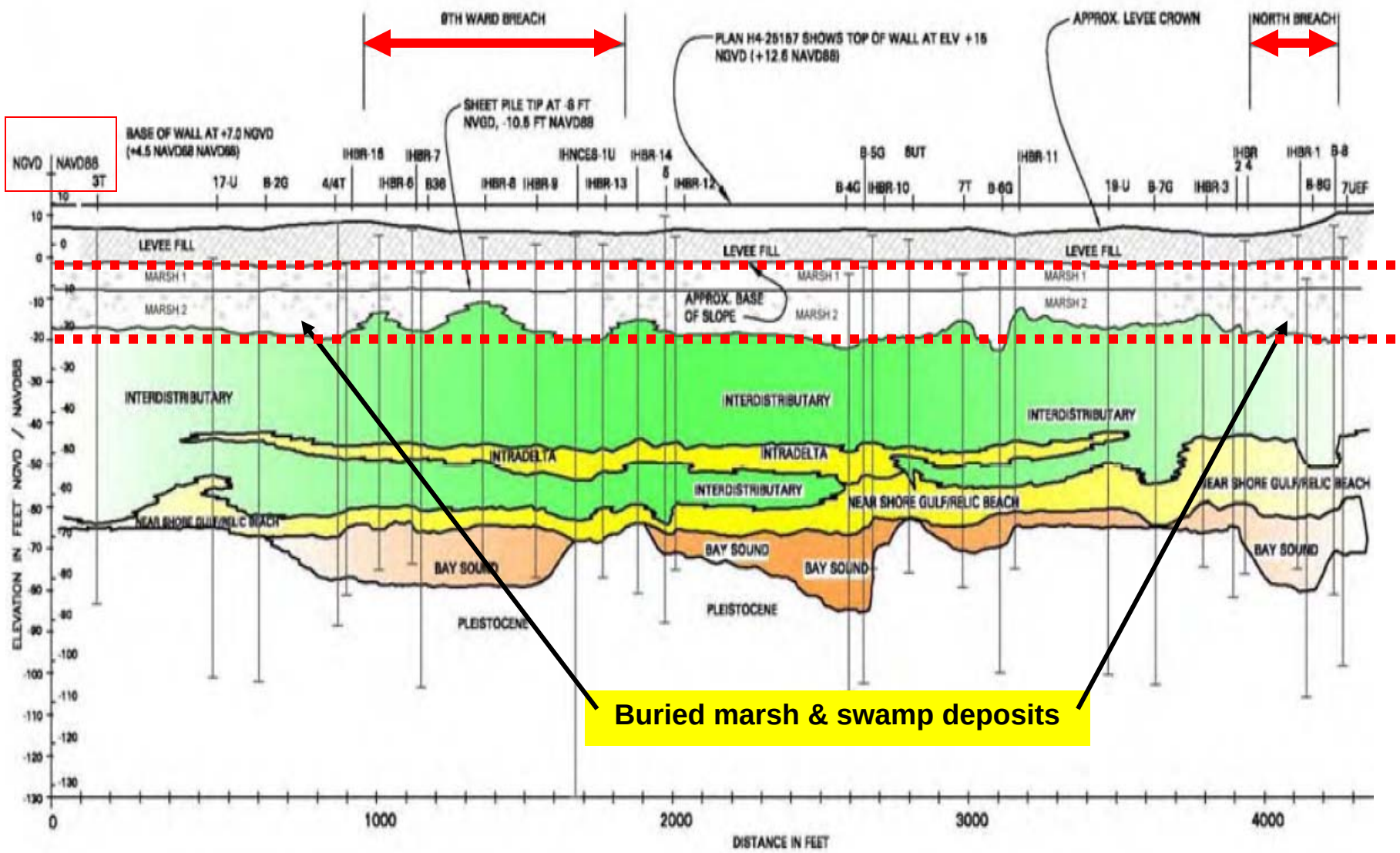


Figure 38. North-south geologic cross section through Lower 9th Ward North and South Breaches (after IPET 2007).



Figure 39. Exposed marsh and swamp layers buried under the Lower 9th Ward (Tyrone Turner photograph).



Figure 40: Photographs taken during Hurricane Gustav showing high water in IHNC communicating under the protected side of the floodwall through a decommissioned sewer line from the EBIA (Dr. Bertucci Hip Pics photographs 2008).