Task Force Hope and the U.S. Army Corps of Engineers Mississippi Valley Division

A History of the Response to Hurricanes Katrina & Rita

Damon Manders • David Tajkowski • Michael Dace

REBUILDING HOPE:

Task Force Hope and the U.S. Army Corps of Engineers, Mississippi Valley Division, A History of the Response to Hurricanes Katrina & Rita

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Engineering and Construction Division
U.S. Army Corps of Engineers, St. Louis District

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About the Research Team

Damon Manders is the lead historian. Mr. Manders is the author or editor of two histories of the U.S. Army Corps of Engineers, Engineering Support Center in Huntsville, Alabama, covering the period 1988-1998, and is the author of "The Bayou Builders: A History of the U.S. Army Corps of Engineers, New Orleans District, 1976-2000" and "Improving the Common Stock of Knowledge: Research and Development in the U.S. Army Corps of Engineers." Prior to joining the Task Force Hope History Project Team, he served as marketing manager and senior writer and editor at Intergraph Corporation, where he researched and wrote widely about geospatial, engineering, and computing technologies. After graduating magna cum laude from the University of North Alabama with degrees in English, history, and political science, he earned his master's degree in history from the University of Mississippi in 1995. As a member of the Alabama Army National Guard, he served in Operation Iraqi Freedom and Hurricane Katrina Disaster Relief Operations.

David Tajkowski is a contributing historian. Mr. Tajkowski has worked in the Ordnance and Technical Services Branch, Engineering Division in the St. Louis District since 1993. He has conducted historical research on hundreds of Army, Air Force, Naval, and Marine Corps facilities throughout the United States for environmental restoration purposes. He also wrote "The History of the Hickman Bluff Stabilization Project," published by the Memphis District in 2004. He earned his bachelor's degree in history from the University of Missouri-Rolla in 1991 and his master's degree in history from Northern Illinois University in 1993.

Michael E. Dace, P.E., is the project manager and consulting engineer. Mr. Dace started at the St. Louis District Corps of Engineers in August 1969. In January 2007 he retired from the St. Louis District after more than 37 years of experience on civil works and military environmental restoration projects. He has been a structural engineer working on large concrete dams and flood walls, and a civil engineer working on levees and other civil works projects. He received many awards in his career including awards from the Chief of Engineers, the Inspector General of the Army, and from the Secretary of the Army.

Authors' Foreword and Acknowledgments

It was with great honor that the authors undertook this history of Task Force Hope and the U.S. Army Corps of Engineers, Mississippi Valley Division's response to hurricanes Katrina and Rita. Hurricane Katrina was the most destructive hurricane in recorded history, causing at least $81 billion in damages and costing roughly 1,500 lives. It was within the top three most intense hurricanes at landfall measured in central pressure and produced the largest waves ever measured in North America. Hurricane Rita, coming only three weeks after Katrina, was one of the largest hurricanes on record and was one of the most intense and destructive storms to hit the Gulf. Their impact on the United States in terms of lost lives, economic cost, number of responders involved, and lost confidence in government has been staggering. The humanitarian mission that resulted has been one of the largest ever attempted by the U.S. government, in general, and the U.S. Army Corps of Engineers, in particular. The Corps of Engineers' response was enormous, spanning five states, directly involving three divisions and their districts, and indirectly involving many others. There are, of course, countless stories and experiences surrounding the hurricanes, but few are as central to understanding the government's response as the story of the Mississippi Valley Division, which had responsibility for Federal Emergency Management Agency (FEMA) missions in Louisiana and Mississippi. It is a story that still has no ending since its activities continue to this day, although most of the action – and hence the focus of this history – occurred prior to September 30, 2006. Given the scope of this mission, chronicling the hurricanes and the response of the Corps in the area most affected is of incredible importance in remembering and learning from these tragic events. It is with a great sense of responsibility – responsibility to tell the story – accurately, responsibility to put to record for posterity the memories of





participants of the response, and responsibility to keep in remembrance the victims and heroes of the storms – that the authors proceeded with this project.

The Corps of Engineers played a critical role in the story of the hurricanes. Many news reports and recent books have focused primarily on the poor federal response, the failure of floodwalls, and mistakes made. However, such portrayals are too easy to make and are generally flat compared to the vivid story that follows. True life is both good and bad, with tragedy mixed with heroism, failures with triumphs. Yes, many parties at all levels of government made mistakes, but these were only a small part of what became one of the largest response missions the Corps has ever performed, and the largest reconstruction mission it has ever attempted. The mission of the Corps of Engineers includes, among other areas, building structures that help protect the nation from flooding and responding to natural disasters. After the initial breaches of the levees and floodwalls in the New Orleans area and the ensuing chaos, the Corps fulfilled its response and rebuilding missions successfully in spite of errors and against great odds. In fact, this is what makes this story so compelling. After incredible tragedy, surrounded by failure, stung by continual criticism, when all seemed hopeless, the Corps redoubled its efforts. It worked to rebuild hope, hope in the future and hope in man's ability to come through disaster with greater strength and knowledge.

When looking at the history of the disaster, it is important to remember that an organization such as the Corps of Engineers is more than an abstract entity. It is composed of people. Many of these people lived in the communities they were trying to protect. As with other victims of the storm, their homes were destroyed, their neighborhoods decimated, their families spread abroad. They struggled with worry, grief, hunger, exhaustion, and emotion. Yet, like many first responders, they continued to work 18-hour days for months on end because they cared about their mission. They wanted to secure their homes and to help their neighbors in the recovery. Many people, both within the Corps and outside it, willingly gave of themselves to fight the flood and help reconstruct the flooded areas. Altogether, more than 9,000 people, including 6,000 from nearly every Corps district and division, participated in the response mission of the Corps. The authors wish to dedicate this volume to the men and women who participated in the response to hurricanes Katrina and Rita.

Because of the wide geographic area and mission areas, the authors have taken a topical approach to the story. The introduction begins with a brief history of the storms. Part one discusses initial damage assessments, the formation of Task Force Hope, the restoration of navigation, and the response missions conducted for FEMA. Part two focuses on the unwatering mission. Part three discusses the work of Task Force Guardian in rehabilitating the hurricane protection system and includes descriptions of the investigations and their impact. Although focusing two sections on events in New Orleans may seem to give Mississippi less attention than it deserves, this was necessary because Corps leadership handled New Orleans differently. The conclusion discusses the state of recovery at the time the initial response to the storms ended in 2007. Although rebuilding continues, the manuscript ends here rather than describing what is a continuing story.

There is always a danger in writing recent history. We have intentionally confined most discussions to events prior to September 2006 to avoid doing more than introducing project aspects that are still unfolding. During the process of reviewing the manuscript, we asked dozens of Corps of Engineers employees and some outside the Corps to review all or part of the manuscript. Overall, comments from our reviewers contributed greatly to the accuracy and consistency of this history, even though we sometimes chose not to make requested changes to remain consistent with the written records we had at our disposal. As such, the views expressed in this document are those of the authors and do not necessarily represent those of the U. S. Army Corps of Engineers, the Army, or the United States.

The authors wish to thank the more than 50 individuals who agreed to participate in interviews. Among these were the commanders of the various units involved: Maj. Gen. Don Riley, Brig. Gen. Robert Crear, Col. Richard Wagenaar, Col. Duane Gapinski, Col. Lewis Setliff, Col. Anthony Vesay, Col. Charles Smithers, Col. Albert Bleakley, and Lt. Col. Murray Starkel, as well as the civilian employees who played key roles: Dan Hitchings, Jim Ward, Denny Lundberg, Jimmy Waddle, Al Naomi, and countless others. Many of these agreed to come out of retirement or interrupt new jobs to talk to us. We also wish to





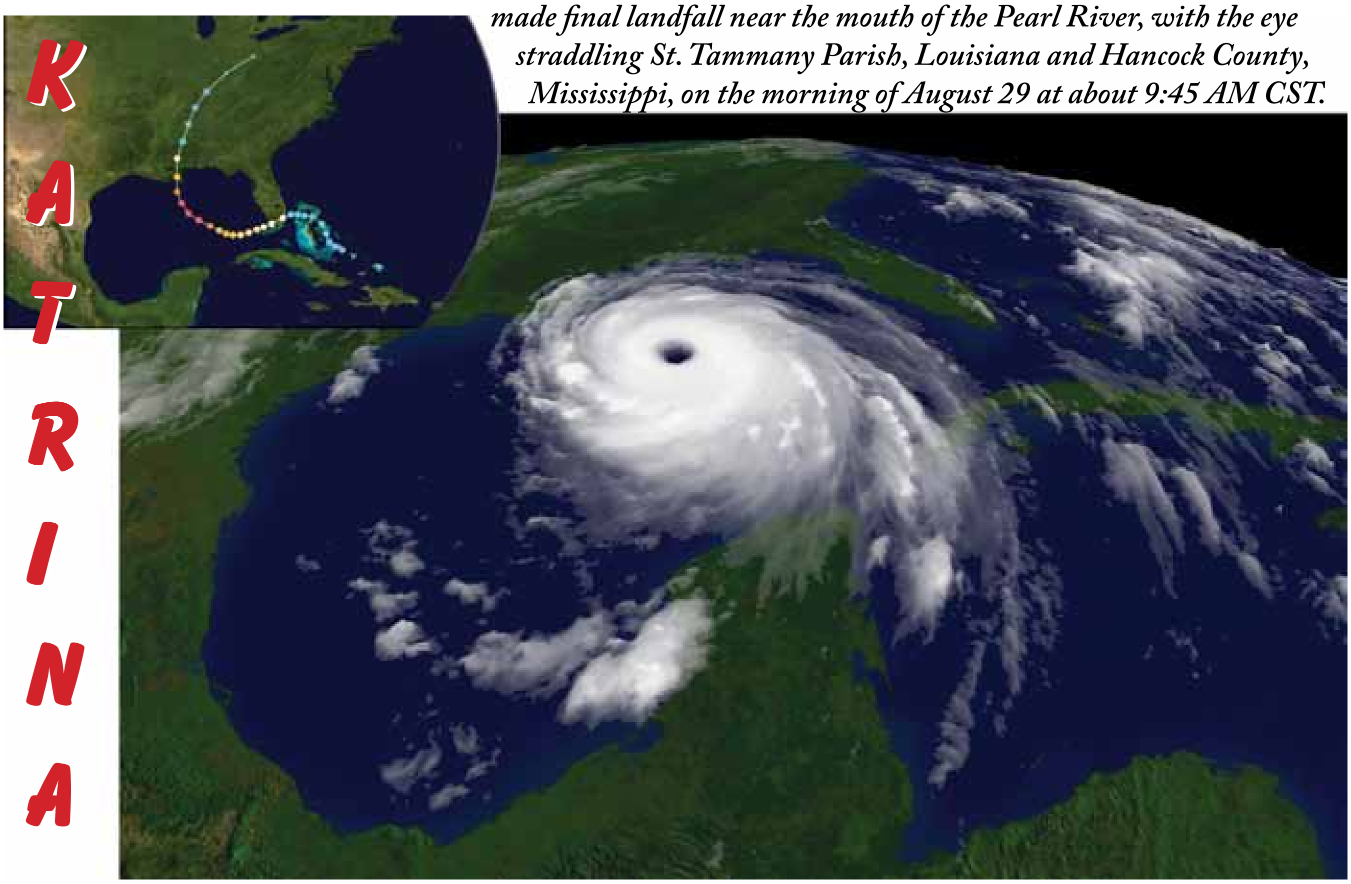
thank the many people who helped direct us to pertinent information, reviewed the manuscript, and provided input or direction. We want to specifically mention the New Orleans District, Memphis District, Vicksburg District, Engineer Research and Development Center, and St. Louis District Public Affairs Offices for their support during research trips and for reviewing the final draft. We are also indebted to Wayne Stroupe, Al Naomi, Gregory Miller, Brett Herr, Charles Shadie, and many others for their expertise. We also thank Matt Pearcy of the Office of History for his helpful input.

In addition, we wish to thank Charles Camillo, Historian, Mississippi Valley Division, for the foresight in chronicling and documenting the recovery effort and for supporting this project. Even while the recovery efforts were unfolding, he assembled primary source materials, saved e-mails and documents, and worked to organize sources. Without these efforts, it would have taken even more time and cost to write an initial history. There has been an incredible effort to document the events of the recovery in photography. We would like to thank Alan Dooley, Lane Lefort, Alfred Dulaney, George Stringham, Jim Pogue, and others for providing hundreds of photographs, of which we could only use a few dozen in the final product. We are indebted to Betty Watson, who did the final layout and design of the book, and Pat Caldwell, who designed the cover. Thanks go to Dan Hitchings, John Meador, Kim Gillespie, Lu Christie, and Susan Spaht for their efforts in securing authorization and funding for this project, without which it would not have proceeded. We also wish to thank Tom Freeman who helped manage the team and handled contracting and other issues, and Kelley Crook, who helped with transcribing interviews and providing administrative support. We appreciate the support of the entire Historical Services Team of the St. Louis District for their help throughout the project. Finally, the authors thank friends and family for their support, and I thank God for the opportunity to work on this project.

Damon Manders
November 2009

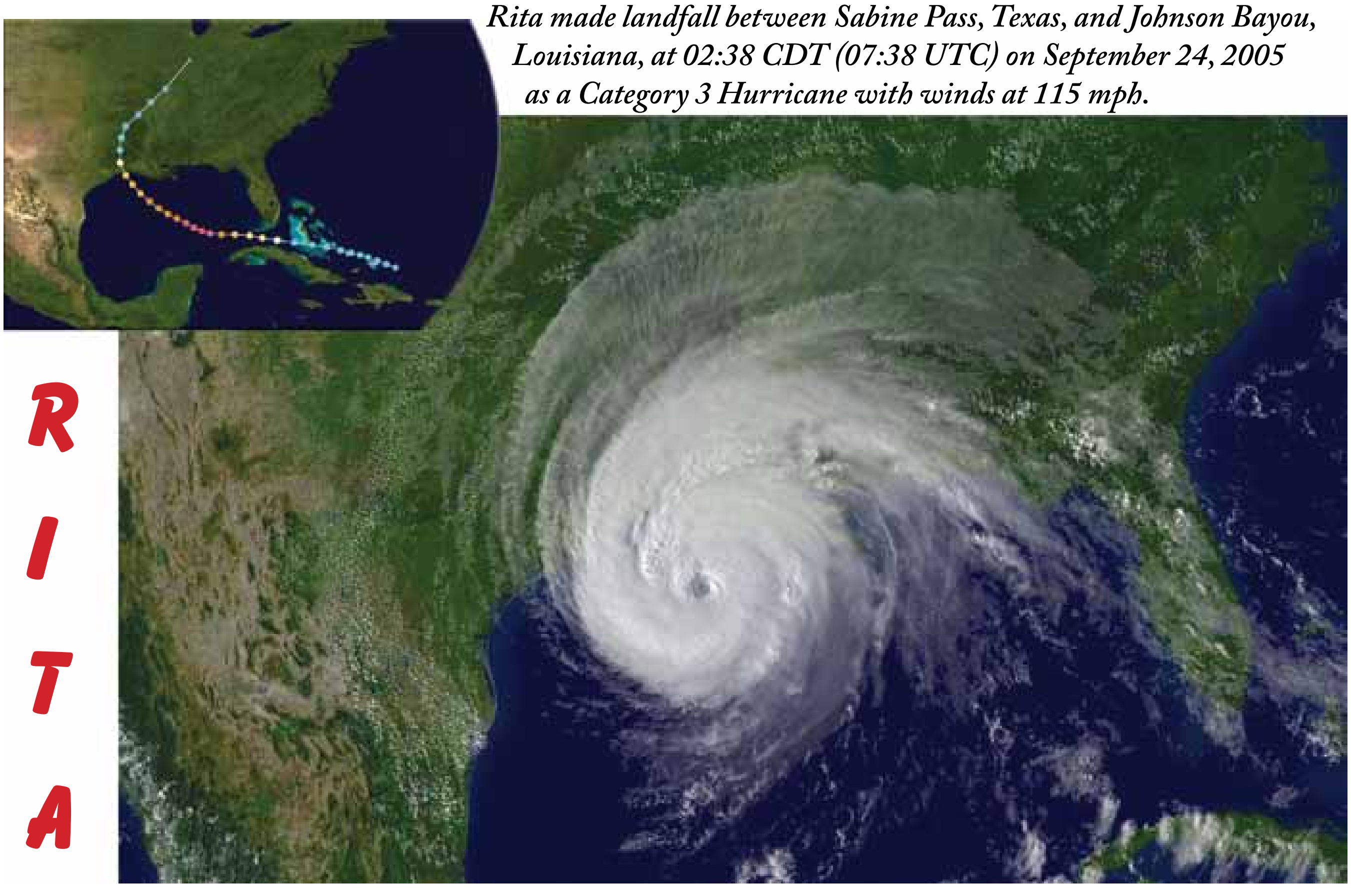
Hurricane Katrina first made landfall on August 25, 2005 in South Florida where it hit as a Category 1 hurricane, with 80 mph (130 km/h) winds. On August 29, Hurricane Katrina made landfall near Buras-Triumph, Louisiana with 125 mph (205 km/h) winds, as a strong Category 3 storm. Hurricane Katrina made final landfall near the mouth of the Pearl River, with the eye straddling St. Tammany Parish, Louisiana and Hancock County, Mississippi, on the morning of August 29 at about 9:45 AM CST.

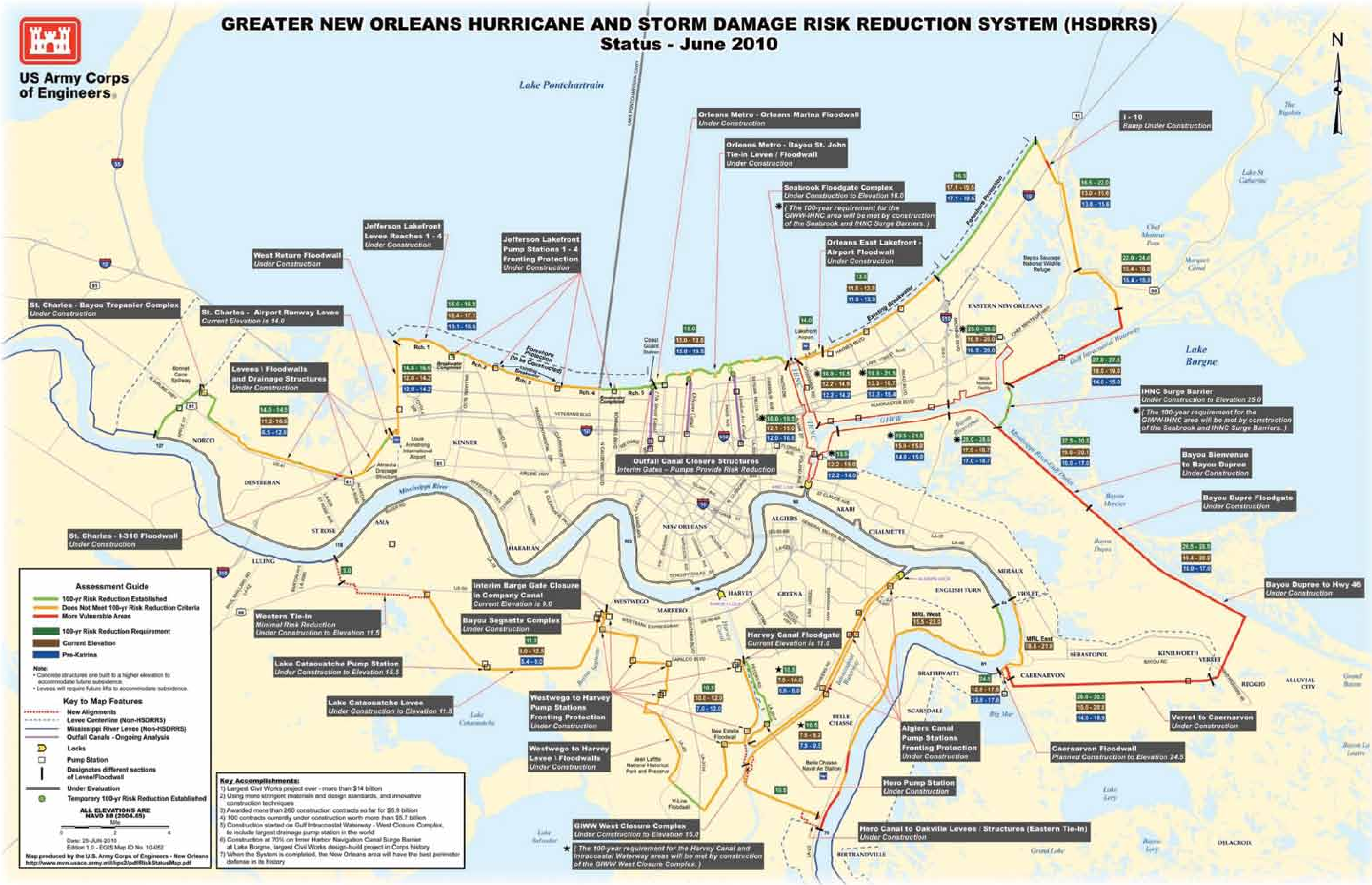
KATRINA



Rita made landfall between Sabine Pass, Texas, and Johnson Bayou, Louisiana, at 02:38 CDT (07:38 UTC) on September 24, 2005 as a Category 3 Hurricane with winds at 115 mph.

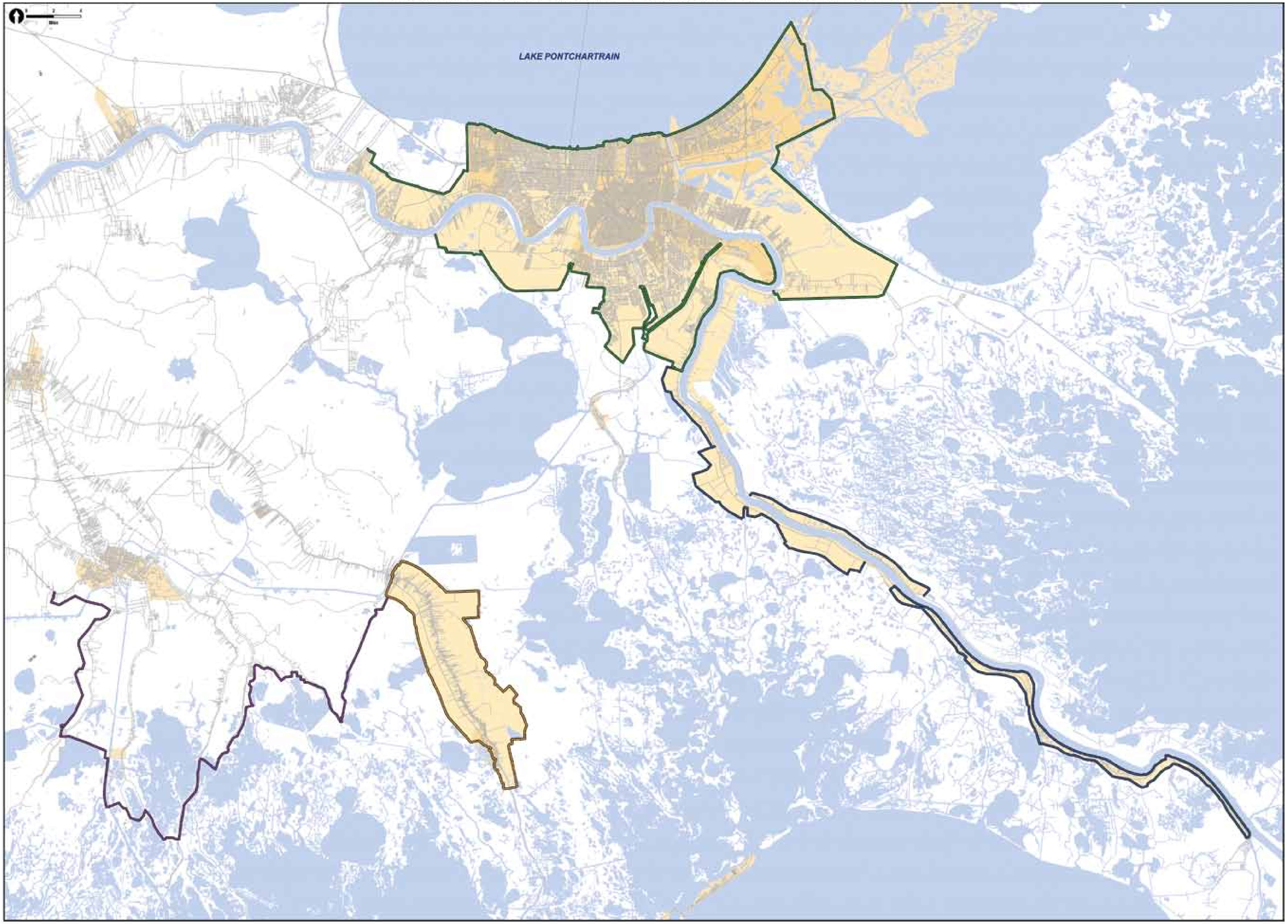
RITA





GREATER NEW ORLEANS HURRICANE AND STORM DAMAGE RISK REDUCTION SYSTEM (HSDRRS)
Status - June 2010
US Army Corps of Engineers
Lake Pontchartrain
Lake Borgne
Orleans Metro - Orleans Marina Floodwall
Under Construction
Orleans Metro - Bayou St. John Tie-in Levee / Floodwall
Under Construction
Seabrook Floodgate Complex
Under Construction to Elevation 16.0
(The 100-year requirement for the GIWW-IHNC area will be met by construction of the Seabrook and IHNC Surge Barriers.)
Orleans East Lakefront - Airport Floodwall
Under Construction
I - 10
Ramp Under Construction
Jefferson Lakefront Levee Reaches 1 - 4
Under Construction
Jefferson Lakefront Pump Stations 1 - 4 Fronting Protection
Under Construction
West Return Floodwall
Under Construction
St. Charles - Bayou Trepanier Complex
Under Construction
St. Charles - Airport Runway Levee
Current Elevation is 14.0
Levees \ Floodwalls and Drainage Structures
Under Construction
Outfall Canal Closure Structures
Interim Gates -- Pumps Provide Risk Reduction
IHNC Surge Barrier
Under Construction to Elevation 25.0
(The 100-year requirement for the GIWW-IHNC area will be met by construction of the Seabrook and IHNC Surge Barriers.)
Bayou Bienvenue to Bayou Dupree
Under Construction
Bayou Dupre Floodgate
Under Construction
Bayou Dupree to Hwy 46
Under Construction
St. Charles - I-310 Floodwall
Under Construction
Interim Barge Gate Closure in Company Canal
Current Elevation is 9.0
Western Tie-In
Minimal Risk Reduction
Under Construction to Elevation 11.5
Bayou Segnette Complex
Under Construction
Lake Cataouatche Pump Station
Under Construction to Elevation 15.5
Lake Cataouatche Levee
Under Construction to Elevation 11.5
Harvey Canal Floodgate
Current Elevation is 11.0
Westwego to Harvey Pump Stations Fronting Protection
Under Construction
Westwego to Harvey Levee \ Floodwalls
Under Construction
Algiers Canal Pump Stations Fronting Protection
Under Construction
Verret to Caernarvon
Under Construction
Caernarvon Floodwall
Planned Construction to Elevation 24.5
Hero Pump Station
Under Construction
Hero Canal to Oakville Levees / Structures (Eastern Tie-In)
Under Construction
GIWW West Closure Complex
Under Construction to Elevation 15.0
(The 100-year requirement for the Harvey Canal and Intracoastal Waterway areas will be met by construction of the GIWW West Closure Complex.)
EASTERN NEW ORLEANS
NEW ORLEANS
KENNER
NORCO
DESTREHAN
ST ROSE
AMA
LUTING
HARAHAN
WESTWEGO
MARRERO
HARVEY
GRETNA
ALGIERS
ARABI
CHALMETTE
MERAUX
VIOLET
ENGLISH TURN
SEBASTOPOL
KENILWORTH
VERRET
CAERNARVON
BRAITHWAITE
SCARSDALE
BELLE CHASSE
REGGIO
ALLUVIAL CITY
DELACROIX
BERTRANDVILLE
Mississippi River
Assessment Guide
100-yr Risk Reduction Established
Does Not Meet 100-yr Risk Reduction Criteria
More Vulnerable Areas
100-yr Risk Reduction Requirement
Current Elevation
Pre-Katrina
Note:
• Concrete structures are built to a higher elevation to accommodate future subsidence.
• Levees will require future lifts to accommodate subsidence.
Key to Map Features
New Alignments
Levee Centerline (Non-HSDRRS)
Mississippi River Levee (Non-HSDRRS)
Outfall Canals - Ongoing Analysis
Locks
Pump Station
Designates different sections of Levee/Floodwall
Under Evaluation
Temporary 100-yr Risk Reduction Established
ALL ELEVATIONS ARE NAVD 88 (2004.65)
Mile
0 2 4
Date: 25-JUN-2010
Edition 1.0 - EGIS Map ID No. 10-052
Map produced by the U.S. Army Corps of Engineers - New Orleans
http://www.mvn.usace.army.mil/hps2/pdf/RiskStatusMap.pdf
Key Accomplishments:
1) Largest Civil Works project ever - more than $14 billion
2) Using more stringent materials and design standards, and innovative construction techniques
3) Awarded more than 260 construction contracts so far for $6.9 billion
4) 100 contracts currently under construction worth more than $5.7 billion
5) Construction started on Gulf Intracoastal Waterway - West Closure Complex, to include largest drainage pump station in the world
6) Construction at 70% on Inner Harbor Navigation Canal Surge Barrier at Lake Borgne, largest Civil Works design-build project in Corps history
7) When the System is completed, the New Orleans area will have the best perimeter defense in its history

GREATER NEW ORLEANS HURRICANE AND STORM DAMAGE RISK REDUCTION SYSTEM (HSDRRS)
Lake Pontchartrain and Vicinity (LPV)/Westbank and Vicinity (WBV) 100 Year Attainment Status: 06 April 2011



Introduction: The 200-Mile Storm

Hurricane Katrina's landfall at Buras, Louisiana, on August 29, 2005, was the primary event that triggered monumental efforts to bring relief to the storm-stricken region of coastal Louisiana and Mississippi. Many agencies were involved in the response – the U.S. Coast Guard, Federal Emergency Management Agency (FEMA), Environmental Protection Agency, Department of Transportation, U.S. Northern Command, National Guard, and many state and local agencies, including governors' offices, emergency management agencies, police departments, fire and rescue, sewerage and water agencies, levee boards, and myriad others. Among these, the U.S. Army Corps of Engineers had one of the largest missions – public works and engineering – led by the Mississippi Valley Division, which had handled response activities in the affected areas of Louisiana and Mississippi. The Corps supported delivery of ice and water, unwatered flooded areas, helped build temporary roofing and structures, removed debris, rebuilt public facilities, and rebuilt more than 220 miles of levees in nine months – a process that ordinarily would have taken years to accomplish. For the Corps, response to hurricanes Katrina and Rita has been one of the largest emergency response missions in its history. During the course of the recovery, more than 6,000 Corps employees deployed at one time or another to the area, and another 3,000 supported the efforts of other agencies. Many worked for six months or longer, often putting in extensive overtime. The response involved personnel from all Corps divisions and districts in the U.S., support from Europe and the Persian Gulf, as well as teams from other countries. Geographically, it involved all Gulf of Mexico states – Florida, Alabama, Mississippi, Louisiana and Texas. From a monetary measure, the Corps spent billions of dollars on recovery – the estimated total is more than $5 billion (see Appendix D). The

NOAA Satellite Image of Hurricane Katrina. Hurricane Katrina made landfall at 6:00 a.m. on Aug. 29, 2005.

saga of the relief efforts is as complicated as it is long. In Louisiana, the Corps managed debris removal for more than two years; in Mississippi, for nearly a year. Today, the Corps continues to be involved in planning and building future protection, and the task force that managed the division response – Task Force Hope – still maintains an office in New Orleans overseeing division work related to hurricane protection.

Any retelling of the story of the relief efforts must begin with Hurricane Katrina, and include Hurricane Rita, which made landfall less than a month later on September 24, 2005, near Sabine Pass on the Louisiana-Texas border. These were the events that started it all. Fortunately, a full and extraordinarily detailed chronicle of the storms and their immediate aftermath has grown up rapidly since the storms. From 2005 to 2006, historians, journalists and scientists, most of them victims or direct participants in the storm and its recovery, published more than five major monographs on Hurricane Katrina. HBO and National Geographic completed two major video productions that aired on U.S. television. And as historian Douglas Brinkley noted, the national and local media did an incredible job of documenting the various twists and turns of the story, even when access to news or the ability to report them was very limited. It is unlikely additional works will document the story in any greater detail. A summary of events as told by these sources and supplemented by additional documentation provides the background of the events leading up to the hurricane and the immediate response that followed.[2]

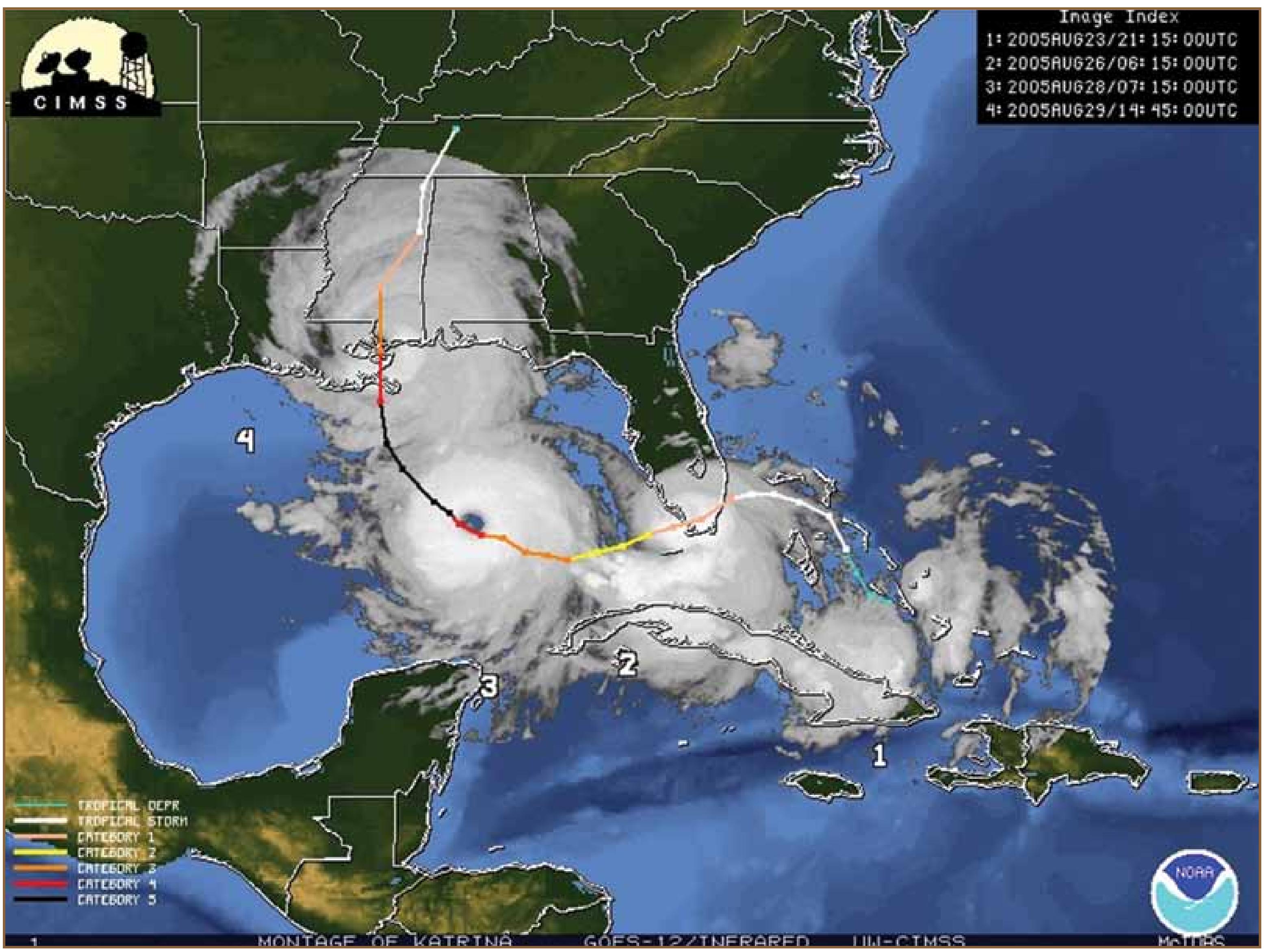
The 2005 hurricane season was the most active on record, with countless tropical depressions and more than 30 major storms. These included 12 tropical storms and 15 hurricanes, with seven of these being major hurricanes (Category Three to Five on the Saffir/Simpson Scale[3]). In fact, three other hurricanes – Cindy, Dennis, and Emily – hit the Gulf of Mexico earlier that year, but have been overshadowed in the U.S. by Hurricane Katrina. The Corps of Engineers responded to or conducted exercises during these earlier storms in preparation for possible landfall. Part of the reason for this increase in storm activity was the high temperatures in the Gulf of Mexico. The U.S. as a whole experienced the tenth highest temperatures on record, according to the National Climate Data Center. Because hurricanes get their strength from warm water temperature, the hot Gulf waters made conditions ideal for a severe storm season. Many have pointed toward global warming as part of the reason for these temperatures, the number of major hurricanes, and for Katrina itself. On this, opinion is mixed, and the exact relationship between climate change and hurricanes is still not well understood. The impact of rising sea levels and subsidence of Louisiana wetlands in increasing flood damage in low-lying areas is perhaps clearer.[4]

At 5:00 p.m. on Tuesday, August 23, 2005, the National Hurricane Center (NHC) first began tracking what would become Hurricane Katrina. It identified the storm simply as Tropical Depression 12. It was the latest of a dozen storms NHC had tracked that year, many of which had grown to storm strength but had dissipated or headed away from population centers before they had an opportunity to turn deadly. At 11:00 a.m. on Wednesday, August 24, the NHC issued an advisory declaring Tropical Storm Katrina, making it the eleventh named storm of the season. At 5:00 p.m. on Thursday, August 25, the NHC upgraded it to hurricane status, just prior to the storm making landfall at 7:00 p.m. just north of North Miami Beach. Within hours, the NHC had downgraded it back to a tropical storm as it raged across Florida, but the storm regained strength after entering the Gulf of Mexico, and the NHC renamed it a hurricane by 5:00 a.m. on Friday, August 26. By mid-day, as the storm shifted its path, the likelihood of a New Orleans strike started to increase rapidly, although probabilities of an impact there still remained relatively low. Most predictions suggested it would land farther east, along the Alabama or Mississippi coast. It was, in some ways, a routine storm at that point. It was only on Saturday, August 27, after Katrina reached Category Three status on the Saffir/Simpson Scale, that the strength of the storm and the probabilities for a strike on New Orleans increased and dramatically demanded action.[5]

A storm bearing down on the Louisiana coast had been of specific concern to federal authorities for years. The 23-parish area identified as a possible impact zone held 2.4 million people, or roughly 55 percent of the population of Louisiana. About $500 billion in assets were in this area and 75 percent of the state's industry. Louisiana and the many industries active in the state contribute to more than 10 percent of the U.S. economy. It is an area rich in oil, with about 25 percent of U.S. oil originating in the region. The 17 Mississippi and Alabama counties near the coast, although given less attention because of lower populations and economic activity, were also a concern. Hurricanes Audrey in 1957, Betsy in 1965, Camille in 1969, and more recently Georges in 1998 and Ivan in 2004 were proof enough of the region's vulnerability. For a decade, newspapers had published dire warnings of hurricane risk along the coast. As a result of these concerns, the Department of Homeland Security in 2004 identified a Louisiana hurricane as one of its top 15 disaster scenarios that the department would use for training, and FEMA identified it as one of its top three disaster concerns. FEMA even conducted a planning exercise using a fictitious Hurricane Pam to prepare for the possibility of a hurricane hitting New Orleans. The federal and state agencies involved in this exercise used data from computer-generated models to plan various response scenarios and help identify shortfalls. After the 2004 exercise, FEMA held numerous workshops through the spring of 2005 to discuss the results, although some issues remained unresolved, including evacuation and housing. Author and *Wall Street Journal* reporter, Christopher Cooper, Robert Block and others have observed that Hurricane Pam bore many resemblances to the real hurricane that barreled toward the gulf coast in late August 2005.[6]

Late on Friday, August 26, Louisiana Gov. Kathleen Blanco and Mississippi Gov. Haley Barbour declared a state of emergency in anticipation of the storm, although these were not widely reported until the following day when the storm began to turn deadly. President George W. Bush signed disaster declarations on August 27 and 28 for Louisiana and Mississippi respectively. Blanco and New Orleans Mayor Ray Nagin called for voluntary evacuations on Saturday, August 27. St. Charles and Plaquemines parishes started their evacuations according to the state evacuation plan. Because Louisiana is a peninsula, the planned evacuation took more than 10 hours and had to occur sequentially from south to north to prevent the main transportation artery – Interstate I-10 – from becoming overwhelmed with the traffic. However, according to census data, 127,000 people in New Orleans did not own a car, and a voluntary evacuation would not get them out. It was one of the unresolved planning issues. That evening, Max Mayfield, the director of the NHC, took the extraordinary step of personally calling Nagin, Blanco, and Barbour to warn them of the storm's growing strength. He had tracked the storm as it grew to Category Three, projected its landfall at or near New Orleans, and predicted its growth to a Category Five storm that would cause terrible damage to the region. As Cooper and Block wrote, "He used his position like a pulpit. The gospel was evacuation." It was a wake-up call. For the first time, Nagin considered doing what his predecessors had never done – call for a mandatory evacuation. He was unsure of the procedure and had his staff check on the legal ramifications. Finally, at 9:30 a.m. on Sunday, August 28, Nagin called for a mandatory evacuation. It was the first in 287 years of New Orleans' history. Eventually, estimates are that between 360,000 to a million people evacuated the city and its surrounding environments, or roughly 75 percent of the population. The rest could not or would not evacuate. Given the circumstances, it was a pretty good result, although the tragedy that struck those who remained behind will never be acceptable. That afternoon, the Mississippi Emergency Management Agency also ordered evacuations of Hancock, Harrison, and Jackson counties, which were in the immediate impact area, with other counties calling for voluntary evacuations.[7]

By the morning of Sunday, August 28, Hurricane Katrina had become a Category Five storm. It was heading directly toward New Orleans. Ruminations in the media and government that this was the big storm a generation had foreseen directly hitting New Orleans constantly grew. Everyone braced for the worst. At 2:00 a.m. on Monday, the NHC downgraded the storm to Category Four, and at 4:00 a.m., the storm shifted toward the east, with predicted landfall just east of Grand Isle. By 5:30 a.m., power was out along the coast. Finally, the storm touched down in Buras, Louisiana, in Plaquemines Parish, between 6:00 and 6:30 a.m., moving slowly northward. The eye of the storm landed just east of New Orleans, as did the strongest winds and highest flood surges, which normally occur in the northeast quadrangle from the eye. At 9:45, the storm made landfall again near the Pearl River, and passed over Pearlington, Mississippi, shortly thereafter. Although many of the statistics from the storm are still under dispute, just before landfall, maximum wind speeds registered at 117 to 127 miles per hour, eight to 14 inches of rain fell, and storm surge heights reached anywhere from 12 to 20 feet near New Orleans and 10 to 28 feet in Mississippi. In many places, the surge extended inland as far as six to 10 miles on land and even farther up river with two-foot surges experienced as far away as the Florida coast. Wave heights rose to as high as 55 feet about 64 miles off the coast of Dauphin Island, Alabama – the largest ever recorded by the National Oceanic and Atmospheric Administration (NOAA). Just prior to landfall, Katrina had an internal pressure of 920 millibars (mb). Hurricane-force winds extended 75 miles to the east and tropical storm-force winds even further, with a radius



This map shows the path of Hurricane Katrina to landfall at Buras, Louisiana.

The storm surge for Hurricane Katrina, shown here overtopping the Mississippi River-Gulf Outlet, was the highest on record in 2005.

of maximum winds extending 30 miles. By 10:00 a.m., the worst of Katrina had passed New Orleans, but the storm continued to demonstrate hurricane strength 100 miles inland until it passed Laurel, Mississippi, spawning numerous tornadoes and causing power outages and severe wind damage far inland. It would gradually decline to a tropical storm and depression, following the Tennessee and Ohio valleys across the U.S. into New York State.[8]

By most standards, the storm was a monster. However, analysis of the storm has been extraordinarily controversial because of its influence on the outcome of the many investigations into the flooding of New Orleans. One issue contributing to this controversy is the use of the Saffir/Simpson Scale for discussing hurricanes. On December 20, 2005, after a lengthy post-event analysis, the National Weather Service announced that Hurricane Katrina was only a Category Three storm when it made landfall. The reaction in the media was predictable as some reporters tended to see Katrina as less powerful than it was, increasing the blame of the government for flooding and poor response. Throughout the process of discussing the hurricanes and the level of protection afforded by levees, there was great misunderstanding, aided by popular misconceptions, about the Saffir/Simpson Scale and what it communicates. Herbert Saffir, an engineer, and Robert Simpson of the National Hurricane Center first proposed the scale in 1971 as a way to help communicate the relative level of hazard associated with a hurricane, not as a scientific measurement of all storm attributes. Saffir had developed the basic wind damage scale for the United Nations in 1968, and he and Simpson added storm surge and other factors. However, it remained primarily based on wind speed: e.g., a Category Three storm has wind speeds of 111 to 130 miles per hour, even if it has storm surge of 28 feet and central pressure index of 920 mb (normally associated with a Category Five storm) as Katrina had. Nor does the scale consider factors such as storm size, forward speed, wave run up, and rain, which can often contribute to hurricane damage. As it exists, the scale expresses the extreme wind conditions normally associated with a hurricane, but not the conditions that all in the hurricane path might experience, which vary from location to location. Dr. Simpson later acknowledged that, although it has served a good purpose, "It was premature to put the scale out without perhaps improving it a little bit …. It's been misinterpreted, misused in a lot of places, but almost any device which is technical is." Largely as a result of the misapplication of the scale following Katrina, the Corps of Engineers started standardizing on an annual probability-based scale to discuss its structures and the related storm impact, although the Saffir/Simpson Scale remains the primary means of warning the public and is used in media discussions.[9]

Another issue that contributed to the controversy about the size of the storm was a lack of reliable data, which has led to wide variance in interpretation. The primary method for analyzing the storm has been through the use of computer-generated models. However, such models are only as accurate as the data used to build them, and the resolution needed for forecasting is not the same resolution needed for analysis. Unfortunately, the storm destroyed nearly all flood and weather gauges in New Orleans, and there were a limited number of actual observation points, such as high water marks, to verify the models – for some regions there were no observations, forcing reliance on model results alone. None of these models perfectly aligned with observations and there were large differences in model results. Some modeled wind speeds averaging 117 miles per hour at landfall, others 127 miles per hour. Some modeled a storm surge that barely reached 15 feet in New Orleans, others up to a 20-foot storm surge in the New Orleans area and 27-foot surge in Mississippi, which would make Katrina's surge the largest on record. The NHC tended to accept lower wind speeds but higher surges. It noted that individual measurements of storm surges and wind speeds can differ widely from averages because of factors such as storm position at a particular location, shore contours, waterway and levee alignments, and vegetation. What is incontrovertible is the size and low central pressure (and hence greater intensity) of the storm. Katrina was gigantic – more than 200 miles across with 75 miles of hurricane-force winds and a 30-mile radius of maximum wind speeds that produced enormous swells. With a pressure of 920 mb, it was the third most intense storm on record. The combination of these factors explains the extent of damage despite the incongruences in observation that have served as the basis for some disputes.[10]

Over the remainder of the hurricane season, two other hurricanes contributed to the damage and impact of Hurricane Katrina. Among these, Hurricane Rita was the largest and most damaging, but Hurricane Wilma also produced higher flood stages that resulted in additional flooding. Rita was among the most powerful storms to ever hit the mainland. After reaching Category Five status, it made landfall near the Texas-Louisiana border as a Category Three hurricane at 2:38 a.m. on September 24, a little more than three weeks after Hurricane Katrina, and before the unwatering of New Orleans was complete. Later that day, the seas were 12 to 16 feet above normal in the eastern Gulf of Mexico, and 14 to 18 feet from the Mississippi River's Southwest Pass to the Atchafalaya River. Further west, Calcasieu Parish saw eight-foot surges and 20 inches of rain, Vermillion Parish had 12-foot surges and 15 inches of rain, and Iberia Parish had 10-foot surges and 10 inches of rain. The tides remained five to six feet higher than normal for several days after the storm, and the Mermentau Basin was severely

1. The Science of Hurricanes

All hurricanes begin as a tropical disturbance, a mass of organized, oceanic thunderstorms that persists for 24 hours. A tropical depression occurs when there is closed circulation of winds and the sustained wind speed is less than 39 mph. Sustained winds are the average wind speed measured 33 feet above the water's surface for one minute (in the Atlantic Ocean). The development of tropical storms and hurricanes are the result of the interaction of many environmental factors. Tropical disturbances form as a result of convergence, when there is a net inflow of air at the surface in a statically unstable environment. In addition, this disturbance must occur in a trough, an area of low atmospheric pressure that has a slight cyclonic rotation. All troughs that occur at least five degrees of latitude from the equator will have some rotation due to the "Coriolis force." This force is the deflection of wind caused by the rotation of the earth. The strength of the Coriolis force increases further away from the equator because of the greater curvature of the earth's surface. The Coriolis force deflects the air around the trough, developing a balance between the low pressure of the trough and the Coriolis force.

In the Atlantic, 55 to 75 tropical disturbances meet these criteria each year, but only 10 to 25 percent of these evolve into a tropical depression or greater. There are several other conditions needed for a depression to form. The water temperature must be at least 80 degrees Fahrenheit. The heat transferred from the ocean to the air maintains the static instability and thunderstorms in the disturbance. A weak vertical wind shear must also be present. Wind shear is the difference between the wind speed and direction at 40,000 feet aloft and the surface. Wind traveling at the same speed and direction along the vertical height of the system encourages the development of thunderstorms and allows the wind structure to grow. Although scientists speculate on other requirements, the three factors — warm water, surface trough, and weak wind shear — are always needed. Once a system becomes a tropical storm, it enters a period of intensification. The conditions that foster its development must remain present. Increased wind speed transfers more moisture from the ocean to the air. When this moisture changes from a gas to the liquid stage while forming clouds, latent heat is released. This heat remains in the vortex due to the complete rotation of the storm. As the air column gets warmer, the surface pressure goes down, and this lower pressure pulls in more air trying to equalize the atmospheric pressure, resulting in faster winds. When the sustained wind speed of the storm tops 74 mph, the NHC classifies it as a hurricane.

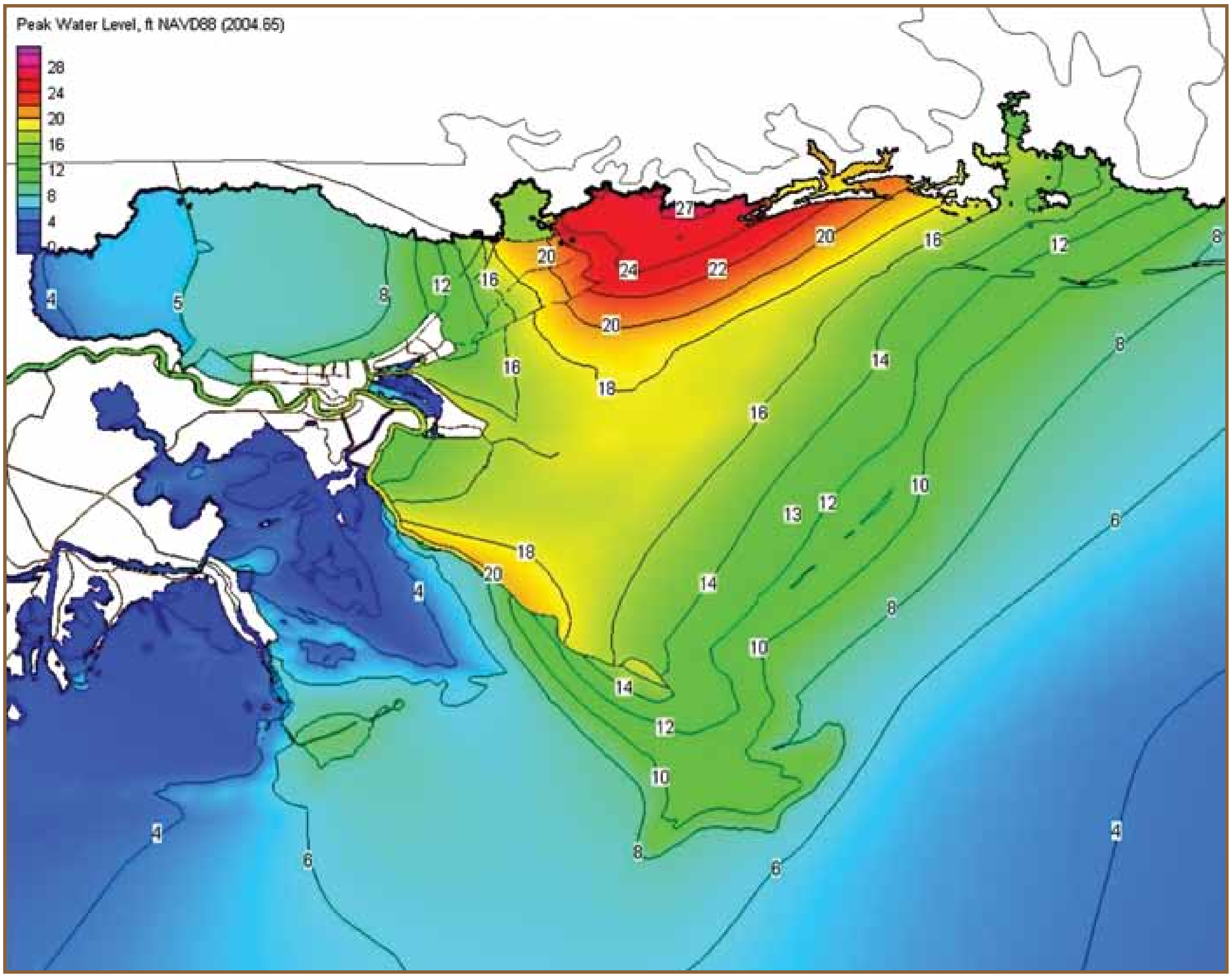
Fortunately, there are a handful of circumstances that can halt a storm's intensification or force its dissipation. Vertical wind shear is the most common inhibitor of a storm over warm water. It disrupts the vertical structure of the hurricane. Another factor that can weaken a storm is the introduction of dry air into the system, which disrupts the formation of thunderstorms inside the storm. Another weakening factor is cooler water temperatures. Cooler water stabilizes the atmospheric pressure, dissipates thunderstorms and weakens a hurricane. Hurricanes can move over a patch of cooler water, which will weaken a storm, or a storm may churn up warm surface water and mix it with cooler water from lower depths. This can occur when the warm water layer is less than 100 feet deep. Another way that the surface water cools is by up-swelling. When a hurricane pulls surface water away from its center, cooler water is pulled up to the surface as

To capture information about hurricanes, forecasters fly planes into the storm to take measurements, as with this P-3 flying in 1975 Hurricane Caroline. (Photo courtesy of the National Oceanic and Atmospheric Administration.)

its replacement. A slow-moving hurricane or stalled hurricane can actually kill itself by continually mixing its surface water. Landfall is another storm inhibitor. Dry land quickly removes the storm's moisture and heat source, and hurricanes tend to dissipate within 36 hours.

The destructive force of a hurricane comes in several forms. The easiest to see is from the wind. A 50 mph wind exerts 5.5 pounds of pressure per square foot, but the pressure increases exponentially with speed, and a 100-mph wind equals 30 pounds of pressure per square foot. When the wind speed exceeds the design specification of a structure, it fails, and propelled debris, falling trees, and power poles pose additional hazards. The winds can also have a significant impact on wave height and flood surge. Heavy rainfall during a hurricane threatens life and property in two ways: flash flooding and mudslides. Hurricanes average six to 12 inches of rainfall at landfall. This amount of water can cause rivers to quickly expand beyond their banks and can wash cars from roads. Flash flooding and mudslides most often devastate undeveloped, mountainous countries, but in 1969, Hurricane Camille caused massive flash flooding and mudslides in the Blue Ridge Mountains of Virginia and West Virginia, long after making landfall in coastal Mississippi, causing 116 fatalities in the mountainous region.

As destructive as the wind and the rains can be, however, the most threatening aspect of a hurricane is the storm surge, the abnormal rise of the sea along the shore. It has been responsible for the loss of many more lives than the wind, as in the most lethal natural disaster in U.S. history: the Galveston Hurricane of 1900, which killed between 8,000 and 12,000 people. It is not a tidal wave as commonly perceived, but the gradual rise of water as the storm approaches land, followed by a rapid increase at landfall. Storm surges can exceed 20 feet and are the result of the winds pushing the water ashore. As a storm reaches the shallower water near the shore, friction caused by the ocean's floor slows the movement and pushes the water even higher. Many factors affect the height of a surge. The greater the storm's size and intensity, the greater the surge. A slow-moving storm has more time to pile up the water and will have a larger surge. A faster storm will peak in a matter of hours, generally resulting in a lower surge. The direction of a storm's approach will also affect its surge. A perpendicular path to land will increase the storm surge, while an angled approach will see some of the surge deflected by the coastline.[11]



This storm-surge model developed by the Interagency Performance Evaluation Task Force (IPET) shows surge heights on the Gulf of Mexico coast during Hurricane Katrina.

flooded for weeks. In fact, as Gil Jamieson of FEMA observed, "Had Hurricane Katrina not come through here, the Rita storm would be really the event of the decade and the event we're all talking about." Then from October 17 to 20, Hurricane Wilma tore across the Gulf of Mexico as a Category Five storm, eventually making landfall on the Yucatan Peninsula before dissipating in the central U.S. It was never a threat to the region, but Wilma did cause tides of up to eight feet all along the Gulf, which impacted the Katrina recovery area. By the end of the hurricane season, in what one report called a "cruel joke," uncharacteristically dry conditions prevailed, which reached drought conditions by the spring. Although a relief to the ongoing recovery efforts, which slowed with each passing rainstorm, the drought brought its own problems.[12]

> *"Had Hurricane Katrina not come through here, the Rita storm would be really the event of the decade and the event we're all talking about."*
>
> *— Gil Jamieson*

After Hurricane Katrina made landfall on August 29, it soon became apparent that the storm had caused severe damage. Most people now know that there were actually two disasters – the hurricane with its winds and flood surge and the flooding of New Orleans – what Blanco called the "double punch" of Katrina. The destruction all along the coasts of Mississippi and Louisiana was overwhelming as the Corps started to survey the damage and respond according to plan as it had trained. First impressions from television images already showed that the response was going to be anything but routine. Yet even with this knowledge of the terrible impact of the hurricane, people were surprised by the level of flooding in New Orleans. New Orleans always flooded during heavy rains, and in fact the Corps anticipated considerable flooding as a result of the storms, but when reports came in of water 10 feet or higher in the city, it could only mean water coming in from Lake Pontchartrain, Lake Borgne, or the Mississippi River. The levees and floodwalls that kept these bodies at bay must have breached extensively to cause the level of flooding New Orleans was experiencing.[13] In the past 20 years, the protection systems surrounding the city had endured several hurricanes without fail, but this time they met their match. Hurricane Katrina had overwhelmed the system.[14]

As with all hurricanes, flooding accompanied Hurricane Katrina all along the impact area. The winds pushed a surge of water like a bulge before it in the sea. The flood surge started 24 hours or so before the storm made landfall along the northern coast of the Gulf of Mexico. In Mississippi, it grew to nearly 30 feet, extended more than 10 miles inland, and did not fully drain for 24 to 48 hours for most areas above sea level. Along the Mississippi and Louisiana coasts, what remained after the surge subsided was mile after mile of wind- and surge-damaged buildings and assets, with many boats, cars, junk, trees, and even houses pushed miles inland. Most roads and waterways were full of debris, and most landmarks were either completely gone or unrecognizable, making it difficult to navigate the impacted area. The few buildings that remained were missing roofs, windows, and even walls where the wind and water had shredded them. In New Orleans, this was not the case. In the outlying parishes where the storm came closer, there was devastation similar to that on the coast. In Lower Plaquemines Parish, for example, nearly every building adjacent to the Gulf or the river had completely washed away, leaving only the foundations.

However, inside New Orleans proper damage appeared relatively light at first. Within a few hours, water began to rise throughout the city, with some low-lying areas seeing flood heights greater than 15 feet. Eventually, more than 80 percent of the city was flooded. Some level of water remained for more than six weeks, initially isolating people who had remained behind, burying assets needed for recovery, blocking land transportation, and gradually rotting walls of buildings that had remained standing. It was this that made the situation in New Orleans a different kind of disaster than what had happened along the rest of the coast.[15]

How and when exactly this flooding occurred are matters that are still in dispute. The various teams that investigated the levees to determine the causes of the flooding have reached different conclusions. In part, this is due to the data they used – they have looked at varying combinations of water marks, the times clocks stopped, eye witness testimony, photographs, video, levee heights, boat drafts, and other clues as to how high the water may have risen. They have included and sometimes

These photos show the differing impacts of Hurricane Katrina – flooding in New Orleans and surge and wind damage in Mississippi.

rejected different data points based on a variety of factors, and they have interpreted common data points differently. Further, every agency involved and every author commenting on the flood has developed their own chronologies, which are often inconsistent. Despite this inconsistency, a basic chronology and order of events becomes clear, allowing for some variance in times.[16]

Reports had been coming in to the Corps of Engineers storm shelter on Leake Avenue all morning. Col. Richard Wagenaar, the New Orleans District commander, later recalled, "We had hundreds of reports of failures and breaches." Most of these, such as reports of breaches in the west bank levees, later proved inaccurate. Observations of flooding had occurred in Orleans East, the Lower 9th Ward, and St. Bernard Parish as early as 4:30 a.m. on Monday, August 29, shortly after Hurricane Katrina started to change direction east of Grand Isle, Louisiana. Most of these observations were not of breaches but flooding caused by heavy rainfall, overtopping,

Many speculated at the time that a barge, depicted here, caused the floodwall breach in the Industrial Canal, although evidence suggests otherwise.

"We had hundreds of reports of failures and breaches."

— Col. Richard Wagenaar

Photos of the Industrial Canal, 17th Street Canal, and Plaquemines Parish breaches show the varying structural damage caused by Katrina.

and gaps in the protection system, such as a missing floodgate at a railroad crossing in Desire. Shortly thereafter, waves started overtopping and destroying the Mississippi River – Gulf Outlet (MR-GO) levees. The first official report of flooding confirmed by federal, state or local officials came at 5:00 a.m. when Inner Harbor Navigation Canal (IHNC) Lock operator Michael O'Dowd called the storm shelter while witnessing overtopping of the floodwalls surrounding the canals in "real time," as Lt. Col. Murray Starkel, the deputy New Orleans District commander, said. Sometime between 5:00 and 7:00 a.m., possibly later, the IHNC floodwall breached toward the east, where the Lower 9th Ward sustained the worst damage. O'Dowd was giving elevation readings when he reported a precipitous drop at the time the floodwall failed.[17]

At about 8:00 a.m., residents heard a large explosion, which conspiracy theorists believe was the Corps dynamiting the levees, but was actually the water violently destroying the concrete floodwall at the IHNC or possibly an empty barge hitting it. Another breach would appear on the IHNC to the south of the first one over the next hour. Overtopping would cause an additional breach on the west side of the IHNC probably between 7:00 and 9:00 a.m. Between 6:00 and 8:00, the south side of the London Avenue Canal floodwall breached toward the east and the 17th Street Canal floodwall breached, followed within an hour or so by a breach on the north side of the London Avenue floodwall toward the west. By 8:00 a.m., it was clear that water was rising in St. Bernard Parish and the Lower 9th Ward. At 8:14, the National Weather Service officially reported the breach at the IHNC, making the fact widely known nationwide. By 9:00 a.m., water levels in the Lower 9th Ward reached six to eight feet. By 9:30, the breaches in the 17th Street and London Avenue south floodwalls had expanded and water was pouring into the city. However, it was not until about 1:00 p.m. that the Corps received the first official report of a breach in the 17th Street Canal. By 11:00 a.m., water reached 10 feet in St. Bernard Parish. Although the surge peaked in Lake Pontchartrain by noon, the water continued to rise in New Orleans, not stabilizing in some places until sometime on Wednesday, August 31, when the floodwaters in the city began flowing out of breaches as lake levels resumed normal levels. Flood heights rose slowly in some locations, quickly in others, eventually reaching heights greater than 15 feet in some areas.

Over the weeks that followed, investigators would find more than 50 breaches, nine of them fairly large, including the 450-foot breach on the 17th Street Canal floodwall and a 700-foot breach on the London Avenue Canal floodwall. On the MR-GO, there were entire levee sections that were gone.[18]

Unlike the New Orleans hurricane protection levees and floodwalls, the Mississippi River levees held up fairly well, including both the mainline river levees and the New Orleans to Venice hurricane protection levees. In Plaquemines Parish, there was significant scour in many locations, a small number of breaches, and complete failure at Buras where Hurricane Katrina first landed. Further north, there was a lot of debris and some scouring damage, but these levees performed much better overall. In New Orleans, Wagenaar and his team watched the river rise to more than 11 feet above high water marks on the river levees before they entered the bunker. After the storm, they observed that there was considerable overtopping and wave wash, but the levees stood the pressure. At other areas, the location of boats and other storm debris demonstrated that the river had overtopped the levees in many locations, but without a major breach. Had these levees failed, the flooding would have been more extensive and unwatering the region would have taken considerably longer.[19]

A cadaver dog searches debris for storm victims.

2. Corps Employees' Perspectives of the Storm

My wife Colleen is a nurse at Methodist Hospital in New Orleans East.... My wife and I joined others scrambling to move patients out of rooms with broken windows. When we ran out of room we moved patients down from the top floor to safer areas away from the torn roof.... During the height of this we lost generator power, and people were moving patients down from the sixth floor and up from the first floor, which was flooded. Nurses and doctors were struggling to keep patients alive without electricity. Nurses had to find beds for the relocated patients and try to reassemble the medical charts that were scrambled and soaked. The hospital was surrounded by water and buildings around the area were badly damaged. About eight feet of water covered the cars in the parking lot. We were stranded with limited electricity in a badly damaged building full of sick people, and families with children. The worst of our experience had only begun. Two days after the storm passed helicopters began evacuating more than 750 people from the hospital roof. We were airlifted out on the fifth day.

– Gregory Miller,
Program Management,
New Orleans District

All we lost was our home in Gentilly. There will be insurance money, but dollars do not restore memories. Not Beverly's piano, shattered by the giant limb of an oak tree that smashed our stucco home, nor for the sheet of music she'd treasured and supplemented since childhood nor her treasured paintings. I am naked without the books amassed over a lifetime and now ruined by saltwater.... But we are truly thankful. Thankful for so many specific things.

– John Hall,
Public Affairs Office,
New Orleans District

We were airlifted from the third floor of my sister's house by helicopter. After five days, they took seven of us – my mother, sister, brother, three nieces (one pregnant with twins), and a nephew – to I-10 and Crowder (Boulevard, in New Orleans East). They told us they were coming back for us, but we stayed two days before they rescued the rest of us.... We survived until they rescued us, cooking with candles and an aluminum pan .... When it was the last piece of meat, we were out of everything, especially water and food. If it would have been one more day, we would have probably suffocated. We stayed in the window, making all kinds of signs for the helicopters we saw, but to no avail.

– Charmaine Allen,
Information Management,
New Orleans District

Joey Wagner, right, consults with Greg Breerwood in the Vicksburg EOC during Hurricane Katrina.

We did not get to see our house until 35 days after the event. We could not get anybody into our house because the surrounding area was flooded out. We were watching on CNN search and rescue missions that were going on all around our house. We pretty much wrote our house off during the first 35 days until we got back into the city. It was 10 to 15 feet of water around the surrounding areas, but our house is a 100-year colonial that sat on one of the ridge lines, the Fountainebleau Ridge Line. That put us approximately four and a half feet above ground elevation. The water got right up to the floor joists of my house. It sat there for two to three weeks, which caused the foundation to shift. We lost 60 to 70 percent of our roof. Both floors were impacted. The first floor, the mold started growing, and on the second floor, we lost our roof. We lost an automobile, my in-law's automobile, and it was not until three weeks later that I was able to contact my stepmother. We did not know where she was. I had to keep my job in focus and not worry about personal things at the time that we were responding. Overall, I think my damages totaled on my house were about $100,000 or right about there of damages.

– Joey Wagner,
Natural Disaster Manager,
New Orleans District[21]

I was in Vicksburg, Mississippi. The storm came through, and we lost electricity. I had relatives in Hattiesburg, Mississippi. My father was there, and I was calling him during the storm asking how it was because he did not evacuate. He would tell me that these big long leaf pines were swaying in the wind, and the top came out of the neighbor's trees and hit the ground.... Then the next day I went down to the Mississippi Gulf Coast to set up our office down there for the hurricane recovery efforts and stopped in Hattiesburg and tried to get back to my fathers house. I could not get there because the roads were covered with pine trees and things. My brother, his family, and my father came up to stay with me right after I received restored power at my house in Vicksburg. I was fortunate that I was without power only for about a day and a half or two days. A lot of Vicksburg as you well know was out for several weeks.

– James Waddle,
Mississippi Recovery Field Office,
Vicksburg District

As time proceeded and additional damage assessments rolled in immediately after the storm, it quickly became apparent that Hurricane Katrina was the worst disaster the country had ever faced, with or without the flooding in New Orleans. It was exponentially more destructive than any storms in a generation, larger than Hurricane Camille or Betsy, which were the last storms to devastate the Louisiana and Mississippi coasts. Official estimates of damages as of 2007 were at least $84 billion for Florida, Alabama, Mississippi and Louisiana. Of course, some reports placed damages at $150 billion or higher. By comparison, Hurricane Andrew in 1992, the next most destructive storm, caused only $48 billion, adjusted for inflation. In New Orleans alone, damages exceeded $20 billion, with $16 billion of the total damages inflicted to residential areas. The Corps estimated that even without the floodwall breaches, damage would have exceeded $6 billion. The residential damage was particularly overwhelming – there were 524,000 homes damaged in Louisiana, including 180,000 in New Orleans, and 360,000 homes damaged in Mississippi. The storm displaced about 700,000 people in Louisiana and 90,000 in Mississippi. Some 13,000 evacuees used shelters in Mississippi; many more evacuated to other cities or moved altogether. In many cases, families became separated – more than 5,000 initially reported missing children. The storm destroyed 3,000 fishing vessels and 100 of the top U.S. shipyards, and closed 80 percent of the region's port facilities for a month or longer. For the most part, the economies of the affected areas shut down for weeks on end. Considering the amount of revenue produced in the area, this impacted the entire U.S. economy. The coastal area of Louisiana contributes to 75 percent of the Louisiana economy, 25 percent of U.S. oil, and 11 percent of the nation's fisheries. Such figures only begin to scratch the surface. Including the tourist industry, fishing, hunting and recreation, which produce more than $10 billion in revenue on an annual basis, the economic impact could be much larger. Early estimates were that the storms destroyed 118 square miles of wetlands. This amounts to four times Louisiana's annual wetlands loss, but all lost on a single day.[20]

The storm was not only destructive, it was deadly. Determining the exact number of deaths was difficult for many reasons, including the disparate methods used to calculate death and the fractured responsibility for maintaining a death count.

As of March 2006, FEMA's official death count based on remains recovered was 1,326, with 1,096 in Louisiana, 228 in Mississippi, and 2 in Alabama. In July 2006, one report placed it at 1,293 in Louisiana and 306 in Mississippi and Alabama, and in August the Interagency Performance Evaluation Task Force noted that the Louisiana Department of Health and Hospitals reported a death count in Louisiana of 1,464, including many who died later of storm-related maladies. Most place it around 1,500, but that could be too low. There were hundreds of people unaccounted for – 2,300 names from New Orleans remained on the Find Family National Call Center list in 2006, which gradually fell to several hundred. Authorities continued to find remains long after the storm – 20 in March and April 2006 alone, and some as late as May 2007. At 1,500, Katrina had the third highest death count on record, under unnamed storms from 1900 (Galveston, Texas) and 1928 (Lake Okeechobee, Florida), which had death counts of 8,000 and 2,500 respectively.[22]

Many of those who died were disadvantaged. Several reports have suggested that the storm affected mostly the poor. New Orleans had the seventh highest poverty rate in the nation, and nine percent had no vehicle to use to evacuate. Many low-income neighborhoods, which typically lay in low-elevation, low-cost areas, saw very high flooding. However, analysis of U.S. Census Bureau data shows low income households were only slightly more likely to experience heavy flooding and, in fact, higher income African Americans were most likely to see heavy flooding. For age and illness, the case is clearer. Eleven percent of the New Orleans population was elderly or infirm, and many health care facilities did not evacuate before the storm. Looking at the February 2006 report of one morgue near New Orleans, nearly 60 percent of 727 deceased were more than 70 years old, while only a little more than half were African American (compared to a population of 70 percent). Some tried to analyze deaths to relate them to specific causes. A January 2006 press report noted that authorities found 588 bodies near the 17th Street Canal and 286 near the IHNC, suggesting that the deaths were the direct result of breaches in these structures; however, since remains often washed miles away from their origination, it is impossible to determine with absolute certainty the specific events and locations of deaths.[23]

Of course, people understood the extent of the damage only much later. Initially, they only knew that Hurricane Katrina destroyed the coast for many miles, and that New Orleans was flooded. It was difficult to get around because of the debris and water, which blocked most roads and waterways. The biggest issue, however, from an immediate reporting and response perspective, was the continued power outages. Estimates are that more than one billion buildings were without power – pretty much everyone that did not have a backup generator, such as protected facilities and camera crews – and it remained out for a week or longer in New Orleans and 17 days in parts of Mississippi. Power outages and destroyed cell phone towers knocked out most communications devices. This greatly restricted the ability to get reports out to higher headquarters and to explain the situation. Most federal and state agencies evacuated personnel to other locations, although many had a few people on the ground to report status or prepositioned assets to prepare for the response. In New Orleans, national guardsmen remained in the Jackson Barracks in the Lower 9th Ward, which flooded for the first time in its history. First responders had also remained – police, emergency management, and some medical workers, as had many local government representatives, the mayor, pump station workers, and others. The Corps also maintained a small crew to enable it to survey damage and respond quickly as events unfolded.[24]

News reports in the days that followed focused mostly on the search and rescue operations, the conditions at the Superdome and Convention Center, and the alleged criminal activities. The city of New Orleans had established the Superdome stadium as a shelter for those who could not evacuate because it was on higher ground, and crowds had started gathering there before the storm hit. It had received some roof damage during the storm, but generally held up. Stockpiles of food and water were there. As the floodwaters rose after the storm, those who could do so walked, waded, swam, or boated from flooded areas to the Superdome, the Convention Center, the elevated portions of highways, or other high ground. Those who could not do so climbed on top of their houses and waited for rescue. Many died in their homes. Some unable to get out of their attics drowned, while others died of heat-related injuries while waiting on their roofs in the sweltering Louisiana sun. The Coast Guard and National Guard started conducting rescue flights with helicopters, dropping victims off near the Superdome, on elevated portions of highways, or other locations. The Fish and Wildlife Service, the Coast Guard, and private residents took to patrolling the flooded streets by boat to look for stranded citizens, often finding instead the floating dead or pets, which they abandoned as a lower priority. As the number of people at the Superdome quickly exceeded the stockpiles, and with no air conditioning in one of the hottest summers on record, tempers started to flare as people waited for transportation out of the city. Many suffered heat-related illnesses, and some even died while waiting. A few blocks away, crowds had started gathering at the Convention Center, a fact that remained unknown to federal officials for several days. With transportation hampered by the flooding and with police engaged with rescue operations, some residents turned to looting or other crimes. In fact, the looting and disaster rage-related crimes were limited, but they received the lion's share of news coverage and formed the backdrop for public perception.[25]

When the National Hurricane Center first started tracking Hurricane Katrina on August 23, no one suspected it was going to cause the damage it did. As the response unfolded, the federal, state and municipal governments often appeared caught off guard and overwhelmed. It was a situation where almost everything that could go wrong, did. Many federal agencies moved slowly in responding to Hurricane Katrina. One of these exceptions, however, was the U.S. Army Corps of Engineers. Even before the storms hit, the Mississippi Valley Division began mobilizing, within hours was making damage assessments, and within days was mounting a response in the affected areas in Louisiana and Mississippi. The division response that eventually became known as Task Force Hope included many other task forces and organizations. Its leadership recognized the storms were some of the worst natural disasters the organization had ever faced, calling for what would become one of the largest emergency response missions it had ever supported. According to law, it had responsibility to provide ice and water, build temporary structures and housing, remove debris, unwater flooded areas, repair protective works, and restore navigation, which formed the core of the recovery. It was the mission that had the potential of defining the Corps for a generation.

Part I.
Task Force Hope
And Disaster Response

Even before Hurricane Katrina hit, the U.S. Army Corps of Engineers was already bracing for the response. With responsibility for oversight of Corps works in the Louisiana and western Mississippi area, the Mississippi Valley Division of the Corps had the lead in the event of a Louisiana or Mississippi hurricane strike. Eventually, all of its districts would become involved in the response, including New Orleans, Vicksburg, Memphis, St. Louis, Rock Island, and St. Paul. As the disaster quickly surpassed its resources, the response efforts gradually involved the headquarters of the Corps, six other divisions, and 41 Corps districts, as well as more than 3,000 personnel from overseas and from other agencies. The response became known as Task Force Hope because, as Louisiana Gov. Kathleen Blanco noted, it provided one of the first publicly recognized signs of hope for recovery from the disaster. The range of activities that Task Force Hope addressed included the restoration of navigation under the authority of the Corps, the support of the Federal Emergency Management Agency (FEMA) in Mississippi and Louisiana through Recovery Field Offices, the unwatering of New Orleans, and the restoration of the levees and other civil works. Eventually, because of the unexpected complexity of the latter two missions, two separate organizations not originally part of the response plan evolved to handle unwatering and levee repairs – Task Force Unwatering and Task Force Guardian. Yet it was Task Force Hope that managed them all as part of an overall umbrella organization. While unwatering and levee repairs are the most visible of these missions, the restoration of navigation was critical to the resumption of industry, and the support for FEMA has been the longest running mission and the area where Task Force Hope struggled most to earn its name.

1. Damage Assessments

On Tuesday, August 23, 2005, just as the National Hurricane Center (NHC) started to track the storm that became Hurricane Katrina, U.S. Army Corps of Engineers personnel in potential impact areas were also starting to follow it, as they always did during a storm. At the New Orleans District, personnel were already making administrative preparations on the outside chance the storm grew and continued into the Gulf of Mexico. Before leaving to join the low-water inspection tour of the Mississippi River levees that day, Col. Richard Wagenaar, the commander of the New Orleans District, ordered that his planning cell go ahead and reserve blocks of hotel rooms in Vicksburg, Mississippi, and Baton Rouge, Louisiana – just in case. As the storm grew to become Tropical Storm and then Hurricane Katrina on Thursday, August 25, and plowed across Florida Thursday night, Wagenaar, Mississippi Valley Division Commander Brig. Gen. Robert Crear, and other personnel were watching on a large-screen television on the Motor Vessel *Mississippi*, then at Morgan City, Louisiana. As Hurricane Katrina entered the Gulf of Mexico on Friday, August 26, 2005, emergency operations centers (EOCs) at the New Orleans District, Vicksburg District, and Mississippi Valley Division stood up to closely monitor the situation. Even though it was still only an outside chance, "everything was moving with the thought that Katrina was going to make landfall here in New Orleans," Wagenaar said. It was the storm a generation had expected to hit New Orleans, and they were going to be ready. Key to their preparations was providing for an ability to quickly assess damage if the storm struck. It was this that enabled the Corps to respond as quickly as they did in the aftermath of Katrina. [26]

Wagenaar flew back to New Orleans, arriving by 1:00 p.m. on Friday, August 26, 2005. District employees were already boarding up their headquarters building on Leake Avenue. He sent out a message for everyone to watch the news and check e-mail and the district Web page. His guidance was that, unless they served on response teams, they should evacuate as directed by city, parish or state officials. On Saturday, August 26 at 11:00 a.m., Wagenaar held a conference call with key district leaders to make a final decision. The city had already announced a press conference for 1:00 p.m., and it was widely anticipated

Mayor Ray Nagin would announce an evacuation. The final decision was to close offices on Monday. That way, personnel could evacuate with family and return by Tuesday if nothing happened. He prepared and released the evacuation orders, and the Crisis Management Team and Crisis Action Team that were to form key members of the response team evacuated to Vicksburg on Sunday. Most of the employees, although not all, evacuated as directed by him or by local officials. [27]

Remaining in New Orleans was the Bunker Team – informally known as the "bunker rats" – nine personnel who would stay at the bunker at the New Orleans District headquarters: Wagenaar, Perry Lartigue, Chris Colombo, Jim Walters, Jim Davis, Dave Wurtzel, Joe Baker, Jeff Richie and Jason Binet. These represented boat operations, emergency management, facilities, information management, and other key areas needed to conduct damage assessments and start forming a response. It was the first time the Corps had ever ordered employees to remain in a storm impact area. They started running 24-hour operations on Sunday, August 28, and at around 8:00 p.m., as weather turned bad, they started moving operations into the bunker, which was a sealed and reinforced room built in 1992 in a warehouse in the headquarters compound. By 11:00 p.m.,

Located in an old warehouse at the New Orleans District headquarters on Leake Avenue, the Corps storm bunker provided shelter and vital communications links to the nine "bunker rats" who rode out the storm, including Col. Richard Wagenaar.

they had shut up the headquarters building and prepared to ride out the storm. At around 1:00 a.m., phones, power, air conditioning, and computers began to fail, and Wagenaar sent Chris Colombo, the information management specialist, to turn on the e-mail server inside the main building. By that time, hurricane winds had picked up, and Colombo, unable to return, rode out the storm in a stairwell. At 5:00 a.m. on August 29, Michael O'Dowd, the lock operator at the IHNC, reported overtopping of the canal. The Corps team in the bunker waited for a calm in the storm when the eye passed over, but it never came. The storm had shifted to the east at the last moment, avoiding a direct hit by the eye on New Orleans, which nevertheless experienced strong winds and rainfall. After 6 a.m., they began to receive additional reports, mostly unconfirmed reports from civilians riding out the storm. The calls began flooding in, with late morning reports of floodwall or levee breaches at the IHNC, the 17th Street Canal, and London Avenue Canal, as well as the west bank of the Mississippi and other areas that proved untrue. By 10:00 a.m., winds died down although the storm continued. The team began to take excursions from the bunker to inspect the headquarters. Although the building had suffered wind damage, including the flagpole being blown from the roof, it was not debilitating. There was water in the parking lot, but since the building stood near the levee, flooding was limited. There appeared to be minor overtopping along the Mississippi River levees – sections of sidewalk on the levee had washed away at points and the parking lot had partially eroded – but there was no hurricane flood surge from the city. [28]

At 2:00 p.m., the "bunker rats" finally ventured out from the headquarters to inspect the city and confirm the breach at the 17th Street Canal. Almost immediately, Wagenaar knew that New Orleans had suffered the worst catastrophe in decades. "We were hearing a lot of talk about how the city had missed a serious blow, but it was clear that conditions were very bad," Wagenaar recalled. Right out of the gate of the headquarters, he ran into a roving band of suspected looters, and it went downhill from there. Because of high water and debris, he was unable to get to the Lake Pontchartrain outfall canals to verify the breaches. They spent two and a half hours driving in an off-road vehicle trying to find a way to the 17th Street Canal, but only made it about three miles. Finally, he returned to the headquarters to start communicating with the division and with other agencies. That first official situational report to Brig. Gen. Robert Crear at 7:49 p.m. mentioned reports of breaches, severe flooding, and the poor condition of the city. Due to the situation, further investigation would have to wait.[29]

Col. Richard Wagenaar assumed command of the New Orleans District in the months before Hurricane Katrina and retired in 2007. The storm defined his tour of duty.

Although Wagenaar and other Corps personnel were unable to visually confirm or communicate the status of the hurricane protection system and the status of the coast for crucial hours, division employees already received news of the situation from the many news outlets reporting from New Orleans. Always prepared to face unsafe circumstances to get a story, many news outlets sent crews into the city, and by Monday evening, images of the flooding were on every television in America. Mayor Nagin appeared on NBC at 8:00 a.m. on Monday morning and discussed the breaches. Even officially, it is impossible to say that no one knew. The National Weather Service (NWS) had reported breaches at the Inner Harbor Navigation Canal at 8:15 a.m. FEMA's man on the ground in New Orleans, Marty Bahamonde, arranged a fly-over that afternoon and sent an e-mail on his return detailing the extent of flooding to FEMA Director Michael Brown, Secretary of Homeland Security Michael Chertoff, and others. According to one count, 29 agencies knew on Monday about the breaches, although President Bush did not receive a detailed briefing on the levee breaches until Tuesday morning. While it would take several days for some FEMA personnel to arrive onsite, there were several federal agencies that responded almost immediately. The U.S. Coast Guard was the first to respond from DHS. Within hours, it initiated search and rescue operations using helicopters and boats, aided in small numbers by private citizens, contingents from the Fish and Wildlife Service, and others. Over the first week, it rescued 30,000 people – more than all the disasters in 2004 combined – pulling them from rooftops and evacuating 9,400 from hospitals. Likewise, the military, and particularly the Army National Guard, responded. After the flooding of Jackson Barracks, the Guard set up a communication center at the Superdome, started handing out water from distribution centers around the city, and began to coordinate rescue operations. Another agency to respond was the Corps of Engineers. [30]

As one of the few federal agencies that maintained a presence in New Orleans during Hurricane Katrina, the Corps of Engineers was able to provide early assessments of damage and start working to respond. Because the Corps is responsible for engineering and public works during a national emergency response and had oversight of the levees and floodwalls that had breached, it was incumbent on the agency to unwater the city, repair the system, clear navigable waterways, and support FEMA in relief efforts. The Corps' Mississippi Valley Division already had plans in place to do just this. Although the extent of the flooding and damage required that the division make some modifications to the plan, it served the agency throughout the response. According to this plan, districts in the division would manage the disaster response while the "victim district" – in this case the New Orleans District – would focus on reconstitution. However, with New Orleans personnel already on the ground and with their familiarity with the works requiring repairs, the contractors, the local agencies, and the geography, they remained vitally involved throughout the process. It was in this way that the Corps was able to put together a preliminary response during the first few days.[31]

Wagenaar finally received confirmation of the reported breaches and the overall situation in the city on Tuesday morning, August 30, when he arranged with the National Guard to visually inspect the city by helicopter. He left at 9:00 a.m. and headed out over the lakefront area, where he confirmed the breach in the 17th Street Canal floodwall. After refueling, he flew out over the Inner Harbor Navigation Canal (IHNC) and confirmed the breaches there. "The damage took my breath away," he said. Water covered 80 percent of the city. The Lower 9th Ward had severe damage. Transportation routes were impassible. Prepositioned equipment was under water. Contractor work yards and equipment were under water. People were isolated on roofs. Many had evacuated to the Superdome and Convention Center. When he returned to the district headquarters, he immediately requested aid. "It was impossible for people outside New Orleans to visualize the level of devastation." The next day, after earlier receiving a call confirming a breach on the London Avenue Canal, he sent another team to verify the report and conduct a hasty survey. At one point, it took them five hours to drive a single mile. They called in the report at 1:00 p.m. and returned at 8:00 p.m. It had taken more than two days to visually confirm and assess the major breaches in the metro area. Outside New Orleans, the situation was just as bad. Wagenaar flew over I-10 and Slidell, and saw several hundred highway bridge sections missing. People were up on roofs waiting for rescue. A few days later, he flew over St. Bernard and Plaquemines parishes. While water covered New Orleans, most buildings there remained standing except for a little wind damage. In Plaquemines Parish, 99 percent of the homes appeared destroyed. Wagenaar later said, "There were no homes floating in water, there were no homes under water, there were no homes! They were just destroyed. You could just see the debris floating around in the water. Total destruction down there." [32]

Not all of the hazards in the flooded areas were easy to detect. Here, natural gas from a broken line percolates to the surface where it is ignited by an unknown source.

On Tuesday, August 30, Brig. Gen. Crear made his first overflight to make an aerial assessment of the damage in the Mississippi River Commission's G-3 jetliner with Col. Charles Smithers, commander of the Memphis District responsible for response in Louisiana, along with several others. Director of Civil Works Maj. Gen. Don Riley also made his first overflight by helicopter. On Wednesday Smithers and Vicksburg

"The damage took my breath away"

— Col. Richard Wagenaar

"You have to see it to believe it"

— Brig. Gen. Robert Crear

Corps leaders conducted aerial surveys after the storm. Seen here are views of (a) the 17th Street Canal breach, (b) one of the Inner Harbor Navigation Canal breaches, (c) downtown New Orleans, (d) I-90 cutting through the city, and (e) coastal Mississippi.

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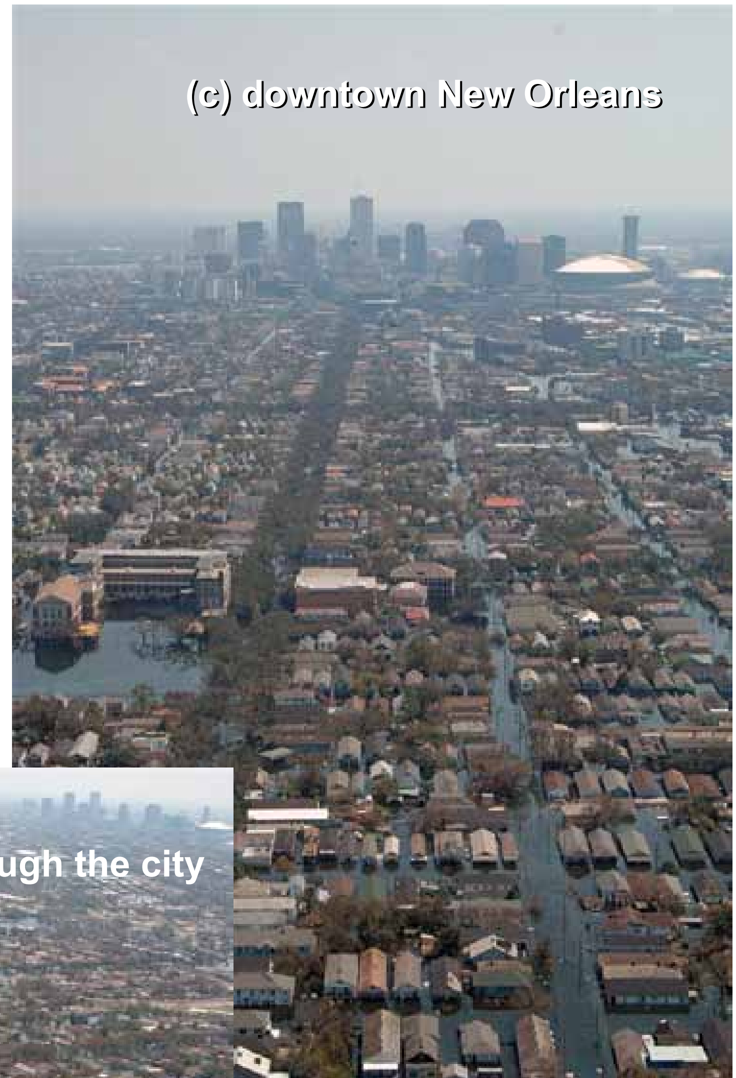
— *Col. Richard Wagenaar*


(c) downtown New Orleans


(d) I-90 cutting through the city


(e) coastal Mississippi

Damage along the Mississippi Gulf Coast

District Commander Col. Anthony Vesay, who had responsibility for response in Mississippi, joined Crear on an aerial assessment of the Mississippi and Louisiana coastal area via helicopter to get a more detailed view. The amount of debris was immense, extending mile after mile along the coast. "You have to see it to believe it," Crear said. Highway 90 was impassible, the bridge over Bay St. Louis was in pieces, and most of I-10 received some degree of damage. The only way to get around much of the area was by air or boat. Of the 350 miles of levees and floodwalls in and around the city of New Orleans, the storm damaged or destroyed 169 miles, and there were some 23 breaches in the Mississippi River levees, mostly in Plaquemines Parish where storm surge overwhelmed the levees from both sides. These were levees that the Corps had built over a 50-year span and now required immediate repair. In New Orleans, 80 percent of the city was underwater. Of the 73 neighborhoods in New Orleans, only eight were dry, and water had completely inundated 34. Getting the water out would take a long time; of the 22 pump stations in New Orleans, most were underwater, and 34 of the 71 individual pumps had received some kind of damage. Although New Orleans had an unwatering plan, it did not anticipate the failures and enormous breaches in the flood defenses. Larry Banks, hydrology expert at the division, and Kevin Wagner and John Grieshaber of New Orleans District, started to devise a new plan involving intentional breaches to allow gravity to remove some water, the use of temporary pumps, and the repair of the pumps that lay underwater. It was necessarily ambitious and would require close management for success. [33]

In Mississippi, damage was much more extensive along a larger land area along the coast. The flood surge had peaked miles inland, north of I-10. From the coast to I-10, Vesay saw row after row of empty lots and concrete slab foundations – the houses were completely gone. He would later recall, *My eye caught these blue swimming pools. I thought that was neat. Everybody had a swimming pool in his or her backyard. Then you go wait a minute, something is wrong because you equate a swimming pool with a house somewhere. Then you ask yourself, where is the house? Then you start making connections. There is no house, there's a slab upon a slab and there's a slab over there. Then you go, oh my God!*

— *Col. Anthony Vesay*

Ruined churches, casinos and houses were everywhere. Boats – including an ocean-going freighter – washed miles inland. There were cars and boats flipped around, lying in trees, or imbedded in other buildings, like some kind of war zone. The

On Interstate-10 near Waveland, Mississippi, the debris line shows the extent of flood surge miles from the coast.

Transportation routes, including I-10 as shown here, were severely damaged during Hurricane Katrina, limiting mobility during early recovery.

Bay St. Louis Bridge lay completely disabled. He later observed, "It was probably the most solemn and quiet flight I have ever had.… It was completely unlike anything I had ever seen before, to include Somalia, Iraq, etc." Debris formed a more permanent obstacle, requiring saws and cranes to clear paths to get vehicles into the region. However, with the flood surge having receded, many citizens were able to put up tents or reach shelters further inland, reducing the death toll. Since Katrina remained at hurricane strength as far north as Meridian, Mississippi – 150 miles inland – it wreaked havoc far beyond the coast, with heavy rains, high winds, and multiple tornadoes knocking out power and downing trees across roads as far north as Interstate 20. Flying past Hattiesburg, the scent of pine overpowered Vesay during his inspection "as if someone opened up 56 wintergreen fresheners in your car" because of downed pine trees and scattered needles. News reports showed mile after mile of debris-littered countryside and beaches, although most news coverage focused on the drama unfolding in New Orleans. Yet behind the scenes, private rescuers, city and parish or county officials, and federal agencies, including the Corps, carried on their missions without much notice.[34]

Soon after getting his first good look at the city on Tuesday, New Orleans District Commander Col. Richard Wagenaar started working with the Mississippi Valley Division EOC and with the remainder of his staff in Vicksburg to develop a response even while he started the process of reconstitution. The challenges were enormous. Several Corps-built floodwalls and levees were severely damaged and leaking water into the city. The water prevented access to the sites to start repairs, but even if personnel could access them, most of the contractors who could do the work had evacuated, and their equipment was under water, as were many of the pumps needed to get the water out. Only 15 percent of pumps continued to operate during the storm. Corps personnel familiar with the projects were mostly out of the city, and communications were unreliable at best. Most cell phone towers had no power the first week and those that did work were far out of range. Wagenaar had a satellite phone, but after the first day, even the satellites became overwhelmed with the number of calls. E-mail was working, but could not fully communicate many issues. On top of this, the location of many Corps personnel was unknown, and tracking them down would take time. There were only a dozen employees in New Orleans, and these were working around the clock with limited food and water, spotty communications, and almost no resources, all while worrying what had happened to their homes and family members. The priorities, then, were to properly communicate requirements to division and district elements in Vicksburg and Baton Rouge that were running the operations at that point, try to get access to the sites to make expedient repairs to the floodwalls and levees so they could start unwatering the city, and then start on long-term repairs to levees, locks and waterways, all while getting accountability, improving working conditions and reconstituting the district. Teams in Vicksburg and Baton Rouge rushed to line up the resources and materials needed, work the contract issues, and contact missing employees. [35]

Over the next several days, the Corps developed estimates of the cost and time it would take to complete its missions. Before the storm, New Orleans District estimates for unwatering were 30 days for one basin and three to six months if damage was more extensive. The first post-storm estimate on Saturday, September 3, was 60 to 80 days and tens of millions of dollars. Rebuilding the levees would take years and cost more than $700 million. In Washington, D.C., the Corps started to prepare $1.2 billion in emergency fund requests, but initial estimates suggested the total cost could exceed $20 billion. It was clear that this was beyond the capability of any single district or even division to manage. At the urging of Wagenaar and Smithers, Crear proceeded with his plan to bring in additional resources to manage the unwatering mission normally handled by the Memphis District so it and Vicksburg District could focus on the FEMA missions.[36]

Three weeks later when Hurricane Rita struck, the Corps went through a similar process of discovery and response, although to a lesser degree. Repairs at several sites in New Orleans were not fully complete, and neither was the unwatering mission. Due to the hard work of the Corps and its contractors, sheet piling across the outfall canals prevented flooding from Lake Pontchartrain. The worst surge occurred further west, where the impediments of an intricate levee system and large population would not complicate the flooding. Because the worst of Hurricane Rita to the west, the Corps had evacuated its western Louisiana offices. However, Louisiana did experience seas of 14 to 18 feet with tides as much as eight feet above normal. This was enough to overtop the IHNC in its weakened condition and cause some minor breaches, re-flooding much of the Lower 9th Ward with several feet of water. Although this put back the unwatering efforts a few days, it was not as bad as some predicted. In fact, New Orleans was minimally impacted. It was the western part of the state that bore the brunt of Rita. An additional 10,000 homes flooded in south Louisiana, bringing the total to 473,000 homes damaged or destroyed by the two storms. There was an additional $5 billion in damages, and the Mermentau Basin remained flooded for several weeks, complicating navigation in the region.[37]

In the hours after Hurricane Katrina struck on August 29, 2005, the Corps did not have a good assessment of the situation on the ground in New Orleans and along the coast. It was immediately apparent, however, that this was the largest emergency event the Corps had faced in a generation. To respond effectively, it needed to first understand the situation on the ground to determine the best course of action. Although there was extensive news coverage, it was often inaccurate and did not contain engineering information needed to mount a response. By Wednesday, however, the Corps had conducted surveys and started to put together teams to respond. What made this possible was the staging of Corps personnel in New Orleans to ride out the storm – one of the few federal agencies to do so – and a well-established response plan, which the Mississippi Valley Division was able to adapt to the evolving circumstances.

2. Formation of the Response

For outside observers, the federal response to Hurricane Katrina may have seemed unplanned, reactionary and chaotic. Although the floodwall breaches were unexpected, for the U.S. Army Corps of Engineers, the response itself was a mission carefully executed according to plan. Once Hurricane Katrina hit, the Corps activated its emergency operations centers (EOCs), started reconstitution of New Orleans District as a victim district, and began to execute its FEMA support and public works missions. Almost immediately, it became obvious that the size of the missions exceeded the plan, and like any effective military organization, the Corps improvised on the plan considerably as the mission evolved: two additional task forces would support large mission areas, additional staffing would help backfill employees of the Mississippi Valley Division, the New Orleans District would remain deeply involved in all response activities, and the mission would continue long after anyone expected. These adjustments in the plan enabled the Mississippi Valley Division to better manage its response.

A Mississippi resident, Brig. Gen. Robert Crear led the Mississippi Valley Division through Hurricane Katrina

Modern hurricane response within the Corps of Engineers originates with the Readiness 2000 program. Recognizing that hurricane response can overwhelm Corps districts, the Headquarters of the Corps of Engineers initiated the program in 1998. Readiness 2000 recommended the adoption of multi-discipline planning and response teams (PRTs) at a division level that can focus on events across district boundaries. It also included features that were highly successful in Hurricane Katrina – use of prescripted mission assignments, advanced contracting, and reliance on the 249th Engineer Battalion (Prime Power) – the Army's only power generation unit – to support emergency power missions. The program was first tested during Hurricane Bonnie, Hurricane Danielle and Tropical Storm Charley in 1998 which, although they were not major storms, provided opportunities to validate and refine the concepts it introduced. It even earned praise from FEMA Director James Lee Witt. Eventually, the Corps divisions – including

3. The *Motor Vessel Mississippi*

The *Motor Vessel* (*MV*) *Mississippi* is the vessel that serves the Mississippi River Commission (MRC). Among the duties of the MRC is conducting annual high- and low-water inspections of Mississippi River improvements and holding public meetings to discuss the state of the Mississippi River levees. Since the late nineteenth century, the MRC has used the *Mississippi* as its river headquarters and as the venue for public meetings held at various locations along the river. These inspection trips are often media events and attract dignitaries that have included heads of various agencies, members of Congress, and U.S. presidents such as Theodore Roosevelt, Howard Taft and Herbert Hoover, who used the vessel to monitor response to the 1927 flood as Secretary of Commerce under Calvin Coolidge. From the *Mississippi I*, built in 1882, to the *Mississippi III*, which served until 1961, the vessels were Texas-deck stern-wheel steamers that the Corps had previously used as tows or in other capacities. After 1961, they were modern diesel vessels. The *Mississippi V*, in use during Hurricane Katrina, entered service in 1993.

The *MV Mississippi* is a 242-foot long, 58-foot wide, 6,300 horse-powered towboat, making it one of the largest towboats ever built. It has 22 state rooms, a large 115-person conference room, and an 85-seat dining room, and has a maximum capacity of 150 passengers. Satellite capabilities provide a full range of telecommunications services, such as television, video teleconferencing, phones, and Internet. These resources make it an ideal communications center during an emergency, when power may be out in impacted areas. Brig. Gen. Robert Crear, the president of the MRC and commander of the Mississippi Valley Division, saw this potential and established it as the division command center in the division contingency operations plan (CONPLAN). However, prior to Hurricane Katrina, the division had never used it for this purpose. It ordinarily resided in the Memphis District, which uses the vessel as a towboat about

The MV Mississippi, which the Mississippi River Commission uses for semi-annual river inspection tours, provided a command center and housing with advanced communication capabilities.

90 percent of the year. Twice a year, the MRC uses it for their inspection trip, as it did just prior to Hurricane Katrina.

The vessel was on its semi-annual inspection trip in late August 2005, and had made it as far south as Morgan City, where Crear and Sen. David Vitter of Louisiana were attending a public hearing on August 27, 2005. That afternoon, Crear, fellow MRC member Rear Adm. Samuel P. DeBow, Jr., and others monitored Katrina as it passed into the Gulf of Mexico and started heading toward Louisiana. Instead of returning to Memphis, as was normally the case, Crear ordered the vessel to Vicksburg, where it rode out the storm. The following day, Crear, his director of regional business, Dan Hitchings, and other members of his staff started planning their operations. On initiation of the division CONPLAN, while Crear conducted aerial inspections of the impacted regions, the division loaded up the vessel with supplies and personnel and headed to the Port Allen Lock near Baton Rouge, Louisiana. There it served as the Task Force Hope headquarters and operation center, housing and feeding its staff and serving as a meeting room and office complex. This enabled the leadership to easily coordinate with the Louisiana Emergency Operations Center and the Louisiana Recovery Field Office, which operated out of Baton Rouge until July 2006. The *MV Mississippi* returned to ordinary service on October 31, 2005, when the mat-sinking mission started again.[39]

Task Force Hope leaders often held impromptu battle staff meetings on the MV **Mississippi**. *Shown here from left are Brig. Gen. Robert Crear, Col. James Rowan, Lt. Col. Murray Starkel, Col. Charles Smithers, and Stephen Gambrell having such a meeting on August 31, 2005.*

the Mississippi Valley Division – would adopt parts or all of the Readiness 2000 elements.

Hurricane Georges in 1998 had proven how vulnerable the New Orleans District was to a major hurricane strike. The eye of that storm had passed just north of New Orleans, but as a Category Two storm on the Saffir/Simpson Scale, it did less damage than Katrina, mostly because of the performance of the Lake Pontchartrain levees. Still, it made the Mississippi Valley Division aware of the need to develop a contingency plan (CONPLAN) based on Readiness 2000 concepts in case of a major hurricane in New Orleans. Division emergency planners completed this plan, and Division Commander Brig. Gen. Robert Crear signed it in May 2005. The plan assumed that the New Orleans District would be incapable of performing its missions because of being a victim of the storm, that FEMA would assign unwatering and response missions to the Corps, and that the other districts in the division would need to execute these missions. Each district in the division would assume part of the mission: Memphis District and Vicksburg District would manage the FEMA support missions; St. Louis District would handle the New Orleans civil works mission; St. Paul District and Rock Island District would provide support on ice and housing missions; the 249th Engineer Battalion (Prime Power) would install generators; and New Orleans District would focus on reconstituting from teams prepositioned in Vicksburg. The division would manage the operations out of the *Motor Vessel* (*MV*) *Mississippi* until the New Orleans District could take over its missions again, presumably within a year's time. It was a logical plan that provided continuity of operations in the worst circumstances imagined at that time. Although the division had only a single opportunity to test or train with this plan during Hurricane Dennis, and in many ways circumstances were worse than the plan anticipated during Hurricane Katrina, it nevertheless guided the response to Katrina in August 2005.[40]

On Thursday, August 25, Bill Frederick, a National Weather Service (NWS) employee assigned to support the Mississippi Valley Division, started tracking Hurricane Katrina. The division activated its EOC to track the storm according to plan. Once Katrina entered the Gulf of Mexico on Friday, Col. Richard Wagenaar, the commander of the New Orleans District, released evacuation orders and on Saturday morning announced the closure of the district offices. The Crisis Management Team and Crisis Action Team evacuated to Vicksburg on Sunday. By this time, the division EOC, headed by Deputy Division Commander Col. Albert Bleakley, was running 24-hour operations and preparing to execute the CONPLAN. General Crear was on the *MV Mississippi* on the semi-annual Mississippi River Commission (MRC) inspection tour with several members of his staff, members of the MRC, and other dignitaries. The vessel was some distance up river when Hurricane Katrina started to threaten New Orleans. Tracking the storm for the team on the *MV Mississippi* was Rear Adm. Samuel P. DeBow, Jr., a member of the MRC and director of the NOAA Office of Marine and Aviation Operations. On learning of the impending storm that Saturday, Crear ordered the vessel to return to Vicksburg instead of returning to its homeport of Memphis, which it did on Sunday, August 28. On August 29, Katrina struck the Louisiana coast, and then made its way up through Mississippi. Hurricane Katrina still packed hurricane force winds when it passed Vicksburg, causing considerable havoc, knocking power out at the division headquarters, and temporarily knocking out communications. Once the storm had passed, the division EOC relocated to the Vicksburg District headquarters across town where the power was still on. From there, Bleakley started to manage the response. Crear arrived that afternoon and immediately dispatched the *MV Mississippi* and quarter boats used by the mat-sinking unit to the Port Allen Lock in Baton Rouge, while he arranged for an aerial survey of the disaster area. The *MV Mississippi* would not arrive until just before midnight, Tuesday, August 30, and the advanced Division Forward team left the next day.[41]

On Saturday, August 27, the division EOC had received the first predeclaration taskers from FEMA to provide ice, water, and power; to start debris removal; to provide temporary roofing; for logistics and use of quarter boats for housing workers; and to establish Recovery Field Offices in Louisiana and Mississippi. The division assigned these missions to the Memphis and Vicksburg districts, initiating their response. The two districts, led by Col. Charles Smithers and Col. Anthony Vesay, respectively, started contacting their contractors, establishing their offices, determining staffing plans, and planning their initial actions. Wagenaar and his team in New Orleans provided updates to the EOC throughout Sunday and Monday

Director of Civil Works Maj. Gen. Don Riley. As Director of Civil Works and head of the U.S. Army Corps of Engineers Emergency Task Force, Maj. Gen. Don Riley oversaw Task Force Hope and other Corps response efforts to Hurricane Katrina.

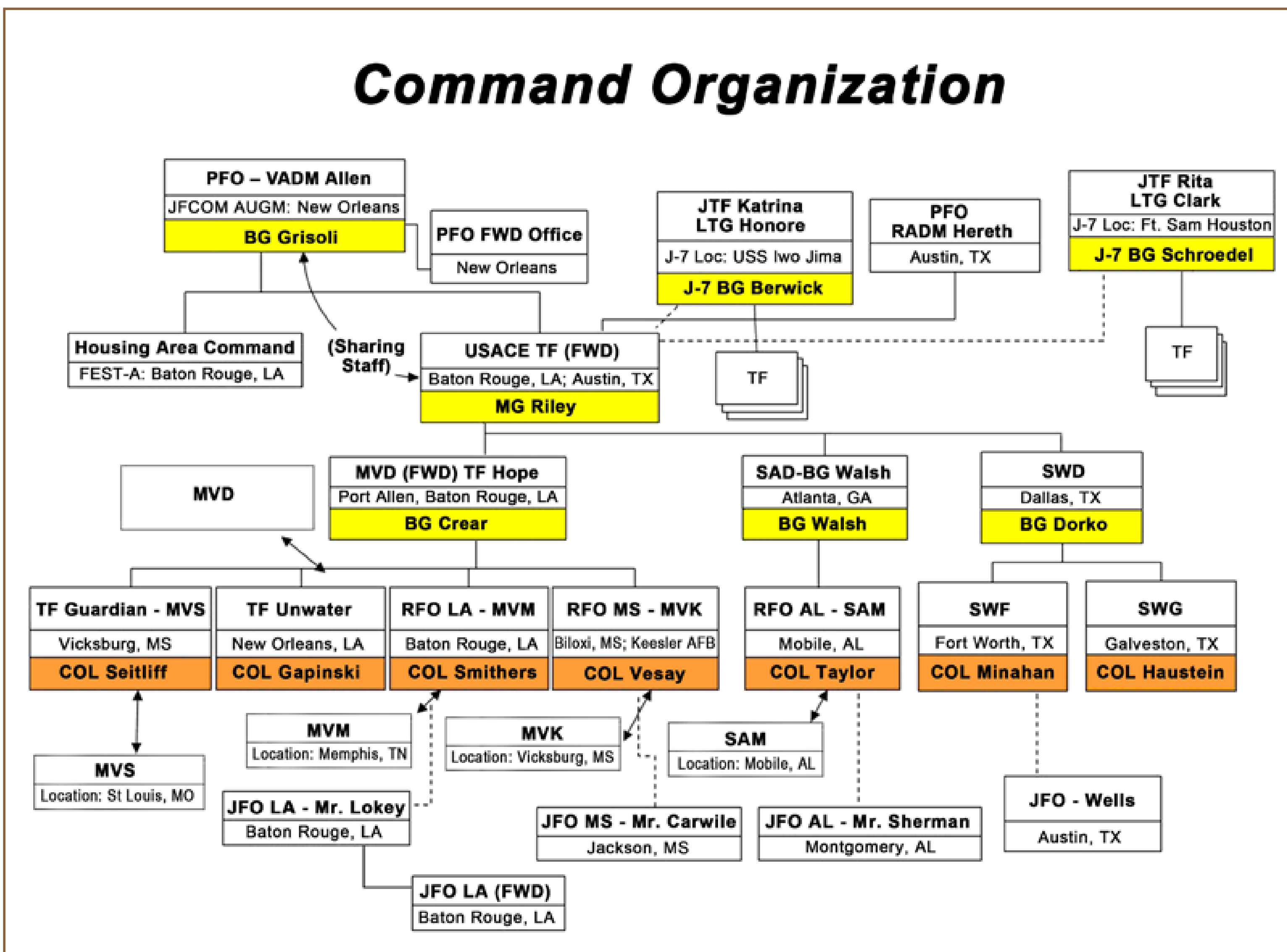
as they rode out the storm and made preliminary damage assessments. On Tuesday and Wednesday, Wagenaar, Crear, Smithers, Maj. Gen. Don Riley and Vesay conducted their aerial assessments of New Orleans and the coastal area via jetliner and helicopter, and started deploying their teams to the Gulf. Crear and the Division Forward team began working out of the *MV Mississippi* and the Baton Rouge EOC, while Bleakley continued running the Division Main EOC. This team returned to the division headquarters building in Vicksburg after the restoration of power. The initial challenge was to make hasty repairs to the breached floodwalls and levees to stop water from getting into New Orleans, and then start to unwater the city. The major obstacles were getting the money and engaging the contractors. "Don't let paperwork slow the job down," Crear advised early on, as they made preliminary arrangements by handshake or letter contract. They coordinated closely with the New Orleans District personnel in New Orleans and Vicksburg to start lining up contractors to work on repairs and to determine a way to stop the flooding.[42]

The mission initially seemed impossible. The work areas were completely underwater, destroyed houses and other debris blocked access routes, and negative publicity of the poor management of evacuees was taking its toll. In addition, as the death count and damage estimates mounted, work became more difficult as Corps employees or contractors learned of their personal losses. However, by Friday, they made significant progress. Helicopters were dropping large sandbags into the breaches at a rate of more than 100 per day. Trucks with gravel had started laying down a road to the breach at the 17th Street Canal floodwall, and flexifloat bridges and barges helped move equipment to the London Avenue Canal and Inner Harbor Navigation Canal (IHNC) breaches to start the repairs. That afternoon, President George W. Bush, Secretary of Homeland Security Michael Chertoff, FEMA Director Michael Brown, Louisiana Gov. Kathleen Blanco, New Orleans Mayor Ray Nagin, Director of Civil Works Maj. Gen. Don Riley, Wagenaar, and other dignitaries stood on the levee at the 17th Street Canal. Observing a line of gravel-loaded trucks extending into the distance, Governor Blanco said to Riley with tears in her eyes, "This is the first sign of hope, the first sign the city is coming back. I'll call this Project Hope." Impressed by the words, which Riley communicated to the Corps by e-mail, Crear redesignated the response efforts Task Force Hope the following day.[43]

"This is the first sign of hope, the first sign the city is coming back. I'll call this Project Hope."

— Governor Blanco

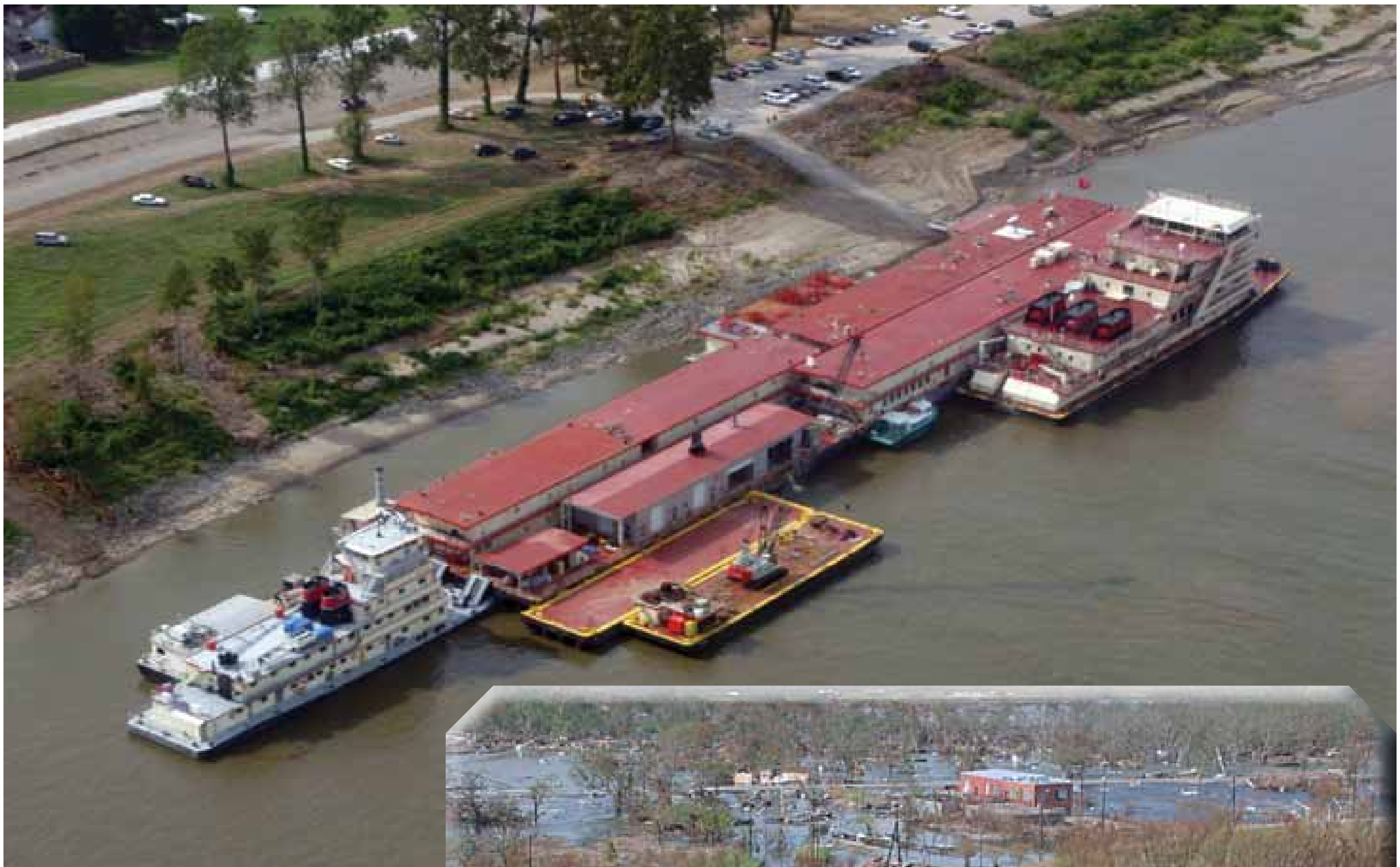
Task Force Hope encompased all Mississippi Valley Division activities in response to Hurricane Katrina and later to Hurricane Rita. There were three primary mission areas: first, the task force had responsibility to support FEMA. According to the National Response Plan, the Corps was the lead agency for Emergency Support Function (ESF) No. 3 – Public Works and Engineering, which included flood fighting, delivery of ice and water, temporary roofing, debris removal, repair or temporary replacement of critical public facilities, and other areas. The Corps also supported ESF No. 6 – Mass Care, Housing, and Human Services, and ESF No. 14 – Long-Term Community Recovery and Mitigation, as well as other areas. Second, the task force had a responsibility to meet all Corps of Engineers obligations, including emergency repair of civil works such as the levees and pumping stations, restoration of navigation, protection and restoration of Corps facilities, and execution of its ongoing civil works missions. Last, as a part of the U.S. Army, the Corps had a responsibility to the Department of Defense. This included providing operational support areas and engineering support to Army forces on the ground, maintaining command and control through various EOCs, and reporting through its chain of command to the Department of Defense. Each of the district commanders reported to Crear at Task Force Hope. He reported to Task Force USACE headed by Riley, and to Joint Task Force Katrina headed by Lt. Gen. Russell Honore of the U.S. Northern Command (NORTHCOM). According to plan, the Memphis and Vicksburg districts were responsible for the FEMA missions, and the St. Louis District for the civil works missions until the New Orleans District reconstituted. However, the commanders recognized very early that their units would require additional support. Initial estimates for



Task Force Hope reported to both the Corps of Engineers through the Mississippi Valley Division and to the U.S. Northern Command through Joint Task Force Katrina.

the mission size were well over $1 billion in Louisiana alone. Smithers and Wagenaar saw that neither of their units would be able to effectively concentrate on unwatering New Orleans, which was 80 percent flooded. They urged Crear to bring in additional support, and he quickly tapped Rock Island District Commander Col. Duane Gapinski to head up the unwatering mission. On Saturday, September 4, he announced the formation of Task Force Unwatering and issued orders a few days later. Similarly, when Crear recognized that repairing 220 miles of levees in nine months was beyond the capability of the New Orleans District to handle, he established Task Force Guardian on September 20 and appointed Col. Lewis Setliff of St. Louis District to manage levee repairs. (For more on the activities of these task forces, see Parts II and III).[44]

Task Force Hope quickly grew to be an enormous endeavor. Estimates of the total mission in October 2005 were $2.6 billion in Louisiana and $647 million in Mississippi. This included $1.8 billion in debris removal, $300 million in repair or temporary replacement of critical public structures and $336 million in temporary roofing. Levees repairs would take an additional $550 million. The total spent as of April 2007 exceeded $5 billion, including $3.8 billion for FEMA support, $869 million in civil works repairs, and nearly $350 million in other construction and maintenance costs (see Appendix D). Over the course of the mission, more than 9,000 people supported Task Force Hope, including some 6,200 from the Corps. The remainder came from the Department of Agriculture, Department of Justice, Bureau of Reclamation, Bureau of Indian Affairs, Fish and Wildlife Service, National Park Service, Geological Service, Army Materiel Command, the Army's Fort Leonard Wood and Fort Lewis, and teams from the Netherlands and Germany. Within the Corps, there was participation from all divisions, 41 districts, Headquarters, Institute for Water Resources, Engineer Research and Development Center, and several support centers. Within two weeks, more than 2,000 personnel were working directly for the task force. The number would grow, peaking at around 3,800 by early October 2005, and dwindling to around 1,100 by July 2006. It would remain around 1,000 until the completion of the Mississippi mission a few months later (see Appendix B). This huge number of personnel supporting the mission created considerable strain on the organizations involved. A staffing plan was not initially part of the CONPLAN,



*The MV **Mississippi**, quarter-boats, and grading units used for the mat-sinking mission provided a headquarters and housing at the Port Allen Lock near Baton Rouge. The **Mississippi** moved to New Orleans on October 8, 2005.*

and each organization developed plans over several days. In many cases, Corps employees volunteered to deploy and would sometimes remain deployed for six months or longer. Most, however, stayed only for a month or two. While employee volunteers worked on Task Force Hope, in their absence fellow employees often took up their official duties, increasing the burden on the parent districts. By November 2005, manning problems became a critical issue. With the rapid turnover of volunteers, the Corps was running out of employees to serve, and those that did serve over and over again typically got up to speed on the mission only a few weeks before leaving. To alleviate this situation, the Corps encouraged commanders to extend the time of deployment to 90 days, while simultaneously trying to reduce the number of personnel required to fulfill the missions, for example by having personnel at other districts work on projects remotely.[45]

A similar situation evolved with the use of Corps infrastructure, particularly floating plant. The *MV Mississippi,* moored at the Port Allen Lock in Baton Rouge, served as the operations center of Task Force Hope for several months. This vessel could house and feed dozens of employees and included high-tech equipment that allowed the staff to remain in communication with higher headquarters and with division assets during power outages. Accompanying this vessel were the quarter boats used to house revetment and bank grading teams during normal operations. Each year, the Corps sent the teams to lay articulated concrete mats and grade the banks to line and stabilize the Mississippi River banks. The CONPLAN included, and FEMA paid for, using these vessels to house responders for short periods of time, although Crear sometimes fought to maintain control over them as the Louisiana EOC and others sought to use them to house their own personnel or to house victims. On September 4, he initially decided to cancel the mat-sinking mission for the year and sent the vessels, the workers, and their bulldozers and other equipment to support Task Force Unwatering. It was an agonizing decision because so many people's livelihood depended on the mission over the winter. Once the Unwatering mission ended in October, ahead of schedule, Crear decided to resume the mat-sinking mission to ensure continued employment of the crews. The mission resumed on October 15, was 33 percent complete by October 23, and ended on January 11, 2006. In addition to these resources, Task Force Hope deployed many Corps dredges, survey boats, and other vessels. The first week, *MV Lafourche*, *Kirby Responder*, and *Boyer* started conducting surveys on the Mississippi River, the Gulf Intracoastal Waterway (GIWW), and the Houma Canal; while the *Dredge Jadwin* started dredging the lower Mississippi River. The New Orleans District used countless other vessels for search and rescue operations. Over the next few weeks, the dredges *Wheeler*, *McFarland*, *Stuyvesant*, *Wallace McGeorge*, *Padre Island* and *Mike Hooks* would deploy to start clearing the silted channels and bays, and *MV Breton*, *Gretna*, *Burrwood*, *Teche*, *Labord*, and *Bopp* conducted surveys. *MV Bienville*, *Kent*, *Ted Cook*, *Shorty Baird*, *Mr. Pat* and others transported workers or moved cranes into place to support unwatering. Dozens of smaller barges and vessels supported the operations. Throughout the mission, many vessels supported other Corps missions; for example, the *Wheeler* left for Galveston in March and the *Jadwin* left to support surveys in other regions. The division had to bring in additional resources or reschedule activities, which challenged its ability to complete dredging operations.[46]

Each element of Task Force Hope included the military commander, a senior civilian deputy, a public affairs specialist, and other personnel supporting the different mission areas. The commander of Task Force Hope Forward was General Crear or, when he was absent meeting with local leaders (as was often the case), an adjutant such as Col. James Rowan of the Engineer Research and Development Center or Col. Michael Pfenning of St. Paul District took control. The senior civilians were Dan Hitchings, the civilian director, and Jim Ward, the deputy director. At Task Force Hope Main, Colonel Bleakley was the senior officer and typically managed the EOC and daily data calls. Mike Rogers was the senior civilian at the division, and David Sills was the chief of emergency operations. Critical to the success of the mission were the public affairs specialists,

Col. Charles Smithers and Lt. Col. Murray Starkel brief Brig. Gen. Crear and the Division Forward battle-staff during a meeting onboard the MV ***Mississippi*** *at Baton Rouge. (Photo by Alfred Dulaney, U.S. Army Corps of Engineers, September 2, 2005.)*

who managed what would eventually become a circus-like media atmosphere. Media outlets and newspapers worldwide descended on Louisiana to report on the levees like sharks in a feeding frenzy. Congressmen and politicians from across the country visited the area to see with their own eyes the recovery they had to fund and to investigate the many issues related to the hurricane. Research teams from U.S universities or other nations made trips to see the levees. Dignitaries from many nations, such as Prince Charles of the United Kingdom, scheduled appearances. According to plan, the senior public affairs specialist, usually the chief, remained in the rear to better manage press activities where communications were more reliable; although, in some cases the senior person deployed forward at the request of the commanders. Senior project managers and technical personnel, such as Al Naomi or Jerry Colletti, fell to helping answer questions, conducting research, and fulfilling Freedom of Information Act requests. Task Force Hope Forward provided top cover to many of its sub-organizations to prevent the media circus from distracting from mission focus. A major issue was internal communication, which was critical both to mission success and to morale. The daily or later twice weekly, weekly, and monthly briefing calls, situational reports, and commander assessments helped keep information flowing up the chain of command. Publication of newsletters, such as the *Task Force Hope Status Report* and *Riverside*, helped to keep employees and stakeholders informed of ongoing missions.[47]

According to the CONPLAN, New Orleans District did not have a mission related to response activities, but as a "victim district" it was to focus on reconstitution. Teams deployed to Vicksburg would form the core of the reconstituted district. The ultimate goal of the CONPLAN was to provide continuity of operations until New Orleans could resume its mission responsibilities, although everyone quickly realized that district personnel would, in fact, stay involved in nearly all Louisiana missions. Following the plan, Wagenaar ordered an evacuation of the district on Friday, August 26, and deployed the Crisis Management Team and Crisis Action Team to Vicksburg on Sunday, August 28, until after the hurricane hit. Deputy District Commander Lt. Col. Murray Starkel headed up the New Orleans District EOC, which operated out of the Vicksburg District headquarters. Once the storm had passed, the first priority for Wagenaar was to get an accountability of his employees. This was a harder task than first anticipated. Four hundred employees had lost homes; 600 more had received significant damage to their homes. With nowhere to go, employees scattered across several states to stay with relatives or at hotels. The 80 or so personnel that formed the teams in Vicksburg and Baton Rouge were working 16-hour days, and many more eventually deployed to the field. Still, even before issuing the reconstitution order on September 8, Wagenaar's staff was already hunting down people and reporting accountability. At the end of the first week, he had 58 percent accountability. On September 8, he had 96 percent. A few days later, his team had located 1,230 of 1,232 employees. The last person took considerable effort. Human resources personnel had to use credit card records to locate him in Oklahoma. Finally, on September 19, Wagenaar had 100 percent accountability of his employees. The other district that had some of its employees evacuate – Vicksburg District – also had to get accountability. The first week, Colonel Vesay had located 98 percent of Vicksburg employees, and he located the remainder by September 6.[48]

By the end of September, New Orleans District was on its way back to reconstitution. In addition to employee

*Task Force Hope held daily commanders calls every morning in one of the conference rooms on the **MV Mississippi** to keep everyone informed of operations. The calls continued to occur on a weekly basis.*

The New Orleans District Headquarters on Leake Avenue in New Orleans continued to serve as its operations center, even though it was not reopened until the end of September 2005.

accountability, the district had reopened its headquarters building on Leake Avenue by September 29, although the personnel were using it long before then. The hurricane had lightly damaged the building and other facilities in the compound. As Wagenaar noted, everything had a little damage, but it was not very extensive. Power remained out for several days, and after a few days, the plumbing quit working. While most of his team set to work trying to plug the breaches and start unwatering, returning employees spent a little time each day making repairs to the facilities and floating plant, starting with posting the colors on a makeshift flagpole over the entrance to the headquarters building. With no cafeteria and with many employees losing or not having access to their homes, Wagenaar moved the *Dredge Wheeler* vessel to the district pier and used it as a dining and shower area. He began requesting employees in Vicksburg to report for duty, but always to carry with them food, drink and supplies. By September 7, nearly 100 employees had returned, with more returning daily. To support their childcare needs, the district worked to reopen its childcare center, which it accomplished on October 18. The district also established teams focusing on providing employees housing, office space, computers, phones, legal support and counseling. As part of the latter, the district opened a Trauma Center with help lines to counsel employees coping with the stress of returning. After several weeks of Wagenaar building up the district, on November 3, Crear approved his recommendation that the district was officially reconstituted. At that time, 93 percent of personnel had returned to work in New Orleans or elsewhere, they had restored 90 percent of facilities, and they had accounted for 85 percent of equipment.

One deviation from the plan was that the New Orleans District almost immediately started resuming its responsibilities. District employees were on the ground from day one helping to work contractor issues and get the unwatering and floodwall repairs going. As the mission progressed, they continued to manage dredging operations, repair non-federal levees, repair locks, conduct regulatory inspections, and fight flooding in Terrebonne and other parishes after Hurricane Rita. Each of the teams that took over responsibility of its other missions – Memphis District and FEMA missions, Rock Island District and unwatering, and St. Louis District and levee repairs – learned that New Orleans employees were not only available and ready to work on their teams, they were invaluable to them. New Orleans employees knew the contractors, knew the geography, and knew the local government and community leaders. And as part of the community, they had the desire and will to return and start to help their city and neighborhoods recover. Director of Program Management Greg Breerwood wrote in January 2006:

We have always been, and will always be, part of this community. We share in its fate. This is our chance to help shape its destiny. I know we will successfully fulfill that obligation. We'll do it because of the dedication of the countless Corps' men and women who I am proud to be associated.

— Greg Breerwood

On October 24, the district assumed responsibility for unwatering any new flooding as Task Force Unwatering ended. By the spring, it was already involved once more in new civil works and environmental projects, such as Southeast Louisiana (SELA) projects, Breaux Act work, and Superfund clean up. Crear observed early on that "being around those heroes assures you that MVN and New Orleans will bounce back. They are not victims." In after-action reviews, the division recommended replacing the concept of a victim district with one of an "impacted district." The CONPLAN, the commanders agreed, should not assume that the district could not perform any of its responsibilities, but should allow it to reassume responsibility as it was able.[50]

Although the New Orleans District was never fully a victim district, neither was it capable of reassuming all of its responsibilities according to plan. Crear's original intent was to transition the Task Force Unwatering and Guardian missions to New Orleans District by October. Original projections were that the Mississippi Recovery Field Office (RFO) would close with the end of its debris mission in January. In February, Crear planned to transition the Louisiana RFO to another district. With less oversight needed, Task Force Hope could deactivate at the end of November 2005 as the mission shifted from recovery to normal operations. As events unfolded, the only one of these transitions that occurred was the handover of the unwatering mission to New Orleans in October when Task Force Unwatering deactivated. Because New Orleans did not fully reconstitute until November and the Task Force Guardian estimate for completion of work turned out to be many months, Crear chose not to transition this mission to New Orleans, but retained Colonel Setliff as the commander through its completion on June 1, 2006. Further, the RFOs did not close when originally planned because FEMA repeatedly extended deadlines for debris collection and continually added new missions. The Mississippi RFO did not shut down until August 31, 2006, and the Louisiana RFO did not complete its mission until September 30, 2007. Given this extended mission, Crear briefed Corps leadership in November on several options for extended operations, including the continuation of a Division Forward office under Task Force Hope, the transfer of mission oversight to a project management office (PMO) or a reconstruction and recovery office, or a combination. Although he recommended a combination of division forward and PMO, the decision came down to continue with a Task Force Hope/Division Forward presence. However, headquarters also approved going to a 90-day rotation for deployed employees, which helped to ease the manning problems faced by the task force.[51]

When Hurricane Katrina hit, the Mississippi Valley Division of the Corps of Engineers responded according to an existing CONPLAN that provided continuity of operations until the victim district could resume its missions. The New Orleans District reconstituted in just over two months, but it had already assumed much of its original mission and had quickly recovered in its ability to execute, if not to manage, many of the Task Force Hope activities, including FEMA support, civil works, restoration of navigation, levee repairs, and unwatering. Although Task Force Hope executed about 80 percent of the plan as originally intended, the extent of the damage from Katrina complicated and extended the mission. The formation of Task Force Unwatering and Task Force Guardian and the mission extension of Task Force Hope were adjustments to this realization and part of an ever-evolving attempt to manage the Corps' largest response and recovery mission in history. Nevertheless, despite these deviations and mission extension, it executed its assigned responsibilities according to the legal framework in which the Corps operates. This framework guided the Corps in all its activities and in some ways contributed to the perception that the federal government was too slow in supporting recovery of the region.[52]

3. The Legal Framework of the Response

As the tropical depression that became Hurricane Katrina formed in the Atlantic Ocean, many federal and state agencies mobilized and began emergency preparation activities. The National Hurricane Center and Weather Service began issuing warnings and updates. The Federal Emergency Management Agency (FEMA) began to issue taskings to various agencies to start the response. The U.S. Army Corps of Engineers Emergency Operations Center (EOC) and the Corps divisions and districts in the possible path of the storm began to uptick their activities for disaster preparedness. Many other federal and state agencies were monitoring or starting action in preparation for the storm. Guiding many of these activities was the Department of Homeland Security's National Response Plan. In addition, the Corps of Engineers was also starting monitoring and advance planning under the auspices of the Flood and Coastal Storm Emergencies Act, Public Law (PL) 84-99, as amended by the Stafford Act (PL 93-288) and other acts that the Corps is solely responsible for executing. It also continued to monitor the environment and coordinate with other agencies according to the Clean Water Act and other laws. As with other agencies of government, the Corps operates under laws authorized and funded by Congress. These laws and regulations formed the framework of the response.

The primary framework for hurricane response is the National Response Plan (NRP). The Department of Homeland Security (DHS) developed the NRP in response to Homeland Security Presidential Directive-5. "The President directed the development of a new National Response Plan (NRP) to align federal coordination structures, capabilities and resources into a unified, all discipline and all-hazards approach to domestic incident management." The NRP uses "various Federal statutory authorities and policies" as "the basis for federal actions and activities in the context of domestic incidence management. The NRP uses the foundation of activities provided by the Homeland Security Act, including preservation, response and recovery." In essence, the plan does not create new law, but lays out a plan based on existing laws and "provides a framework for federal interaction with state, local and tribal governments; the private sector and non-governmental organizations (NGO) in the context of domestic incident prevention, preparedness, response and recovery activities." DHS completed the plan in 2004, and every federal agency involved in security or emergency response reviewed and signed it, including all presidential cabinet secretaries; offices such as the Environmental Protection Agency, Central Intelligence Agency, and National Aeronautics and Space Administration; and NGOs such as the American Red Cross. Department of Defense Secretary Donald Rumsfeld signed the NRP, which brings the resources of the Department of Defense to the table. This is the authority under which the Corps responds to DHS-declared disasters as well as the remaining portions of Department of Defense.[53]

The NRP contains annexes describing the Emergency Support Functions in greater detail. There were 15 functions in the plan in 2004. Under these functions, the Corps, at the direction of FEMA, performs missions such as ice and water distribution, debris removal, temporary power assessment and generation, temporary housing, temporary public structures, temporary roof repair, technical assistance for recovery planning, and other engineering support and technical assistance. The NRP functions under the National Incident Management System (NIMS), the purpose of which is to maximize the integration of incident-related prevention, preparedness, response, and recovery activities. One of the main tenets of NIMS is to establish a Federal Coordinating Official and a Joint Field Office. For hurricanes Katrina and Rita, FEMA established Joint Field Offices in Baton Rouge for Louisiana and Keesler Air Force Base for Mississippi. The Corps of Engineers provides Liaison Officers to the Joint Field Offices for coordinating Corps operations with FEMA.

FEMA headquarters issues missions or taskers to the Corps in accordance with the NRP and provides funding for the missions. The overall commander of emergency operations for the Corps of Engineers during the Katrina and Rita events was theDirector of Civil Works, Maj. Gen. Don Riley, who served as commander of the Corps of Engineers Emergency Task Force.

Brig Gens. Bruce Berwick (left) and Robert Crear (right) confer with Maj. Gen. Don Riley in a small cubicle at the Louisiana State Emergency Operations Center in Baton Rouge on September 3, 2005.

On receiving the taskers, Riley's office issued orders and funds through the chain of command to the subordinate divisions and districts involved. Since Katrina first caused damage in Florida, the Jacksonville District under the command of the South Atlantic Division was the first to respond under FEMA's mission to provide ice and water, temporary roofing, and debris removal. The Katrina and Rita missions in Mississippi, Louisiana, Alabama, and Texas likewise had Riley as the overall commander of the Corps operations on behalf of FEMA, but district responsibility, based on the watershed, was divided. The Mobile District, which is part of the South Atlantic Division, includes responsibility for part of Mississippi. However, the Corps assigned the Mississippi Valley Division responsibility for the entire disaster area in Mississippi for the purposes of response. To complicate this scenario, the Mississippi Valley Division CONPLAN considered the New Orleans District unable to respond to the missions and subsequently assigned portions of the disaster recovery to other districts in the division. As noted previously, New Orleans District personnel, as well as the New Orleans District commander, participated and were major players in the recovery efforts of Task Force Hope. During this same time frame the Corps of Engineers also responded to hurricanes Wilma and Ophelia.

The Department of Defense (DOD) also had responsibility under the NRP outside of the activities of the Corps of Engineers. As activities under the NRP start, the DOD establishes response and control authorities. For Hurricane Katrina, the Northern Command (NORTHCOM) established Joint Task Force Katrina, commanded by Lt. Gen. Russell Honore, at Camp Shelby, Mississippi, to provide DOD resources to FEMA as needed. This, too, was part of the command chain to which Riley and his subordinate commanders reported. Because the Posse Comitatus law prevents the U.S. military from performing security functions within the U.S. borders, most of the support the DOD provided was humanitarian in nature. Among other areas, the DOD helped the disaster recovery by providing hospital ships moored in ports along the coast, Blackhawk and Chinook helicopters to provide search and rescue capabilities, Meals-Ready-to-Eat (MREs) to distribute to victims, the 82nd Airborne Division and other units to support the mission, as well as other logistical equipment and supplies.[54]

4. The Ragin' Cajun

"He came off the doggone chopper, and he started cussing and people started moving,"

—New Orleans Mayor Ray Nagin

"He came off the doggone chopper, and he started cussing and people started moving," New Orleans Mayor Ray Nagin said on Thursday after Hurricane Katrina hit the city. He was talking about Lt. Gen. Russell Honore, the commander of Joint Task Force (JTF) Katrina, the military organization responsible for the overall mission responding to Katrina. Part of the U.S. Northern Command (NORTHCOM), the military organization responsible for North America and its security concerns, JTF Katrina oversaw all military operations in the region, including the National Guard contingencies from various states, the 82nd Airborne and other active Army responders, and the

Generals Don Riley and Robert Crear meet with Generals Russell Honore and Bruce Berwick of JTF Katrina.

Corps of Engineers. Known as the Ragin' Cajun, Honore was a native of Lakeland, Louisiana, and educated in Baton Rouge. He had only recently left NORTHCOM Headquarters to take command of the 1st Army in Fort Gillem, Georgia. A career infantry officer, he observed that Katrina was "a classic military attack" that "destroyed communications" and "created shock and paralysis."

The colorful Lt. Gen. Russell Honore of NORTHCOM served as the commander of JTF Katrina.

Immediately upon arriving in New Orleans, he took command with his hard-charging personality and characteristic one-liners. On Friday, September 2, he ordered National Guard troops carrying weapons into the city to lower them, reminding them that, "This isn't Iraq," but that it was a peaceful humanitarian relief mission. This lowered tensions considerably, while he set about organizing delivery of food and water, transportation of refugees, and ensuring injured persons received medical care. At the same time, he left no doubt that the cavalry had arrived and that he was going to cut through the local politics. "We're not stuck on stupid," he would later comment at a staff meeting. After stabilizing the situation in New Orleans, he left for Camp Shelby, Mississippi, where JTF Katrina had its headquarters. During his stint as JTF commander, the Corps of Engineers elements reported to him as well as to Chief of Engineers Lt. Gen. Carl Strock in Washington, D.C. Particularly during the first months, Task Force Hope personnel worked closely with Honore and JTF Katrina to coordinate with FEMA and meet with politicians in planning the mission. In October, Brig. Gen. Robert Crear praised Honore, saying he was a real advocate of the Corps.[56]

In addition to the missions performed under the auspices of FEMA and the NRP, the Corps performed several missions for Task Force Hope under other legal authorities. One such mission was restoration of navigation to the ports, harbors and inland waterways. This was a vital mission that the Corps accomplished working with the U.S. Coast Guard, the National Oceanic and Atmospheric Administration, and others to get the movement of goods and raw products once again flowing into and out of the U.S. The authority for this work falls under various River and Harbor acts, which Congress finances using annual or supplemental operation and maintenance funds provided to the Corps. Under these authorities, the Corps coordinated with navigation industry leaders in the region to prioritize which channels needed clearing first and then worked with the Coast Guard and contractors to remove obstructions, survey channels, and restore navigational aids needed to make channels safe. However, the majority of funds the Corps expended was to dredge channels, particularly the Mississippi River. Because the surge that accompanied the storms caused banks to cave in and washed silt into the channels, and sunken vessels or other debris blocked navigation, many critical channels became impassible. It was vital for the Corps to restore navigation to these channels as quickly as possible.[55]

Passed in 1955 and amended by the Stafford Act and other legislation, PL 84-99 authorizes the Corps to conduct flood fighting and rehabilitate federally authorized protective works damaged by flood or coastal storms, as well as to conduct rescue and emergency relief efforts during flood events. Although it shares rescue and relief activities with a variety of other agencies as directed by the NRP, the Corps is solely responsible for flood fighting (unwatering) and rehabilitation of protective works, most of which it also oversees under normal conditions. Flood fighting typically involves activation of personnel, EOC operations loading of equipment, and emergency contracting to remove water from a designated area, usually to supplement local resources. Rehabilitation involves "repair or restoration of any flood control work threatened or destroyed by flood, including the strengthening, raising, extending or other modification thereof as may be necessary in the discretion of the Chief of Engineers," as well as "emergency dredging for restoration of authorized project depths for Federal navigable channels and waterways." Activation of the law requires a state of emergency declaration and a written request from the local sponsor. The law requires that any protective works that are repaired had to have received damage during a flood or coastal storm and that repairs be economically justifiable. The law only authorizes return to pre-storm conditions or authorized level of protection, usually measured in physical height of levees or floodwalls.[57]

In addition, under the authority of both the NRP and PL 84-99, the Corps has responsibility for preparing for flood and coastal emergencies through planning, exercises, training, pre-positioned equipment – mainly communications and command and control mobile vehicles and equipment – and emergency plans. Each Corps district has flood fight teams with area engineers and responders to provide local technical assistance and monitoring of Corps constructed projects that have been turned over to local entities.

For the FEMA work, the Corps predetermines teams for roofing and housing, contracts for ice and water deliveries, and distribution points and assembly areas for each portion of the country by each Corps district and division. Subject matter experts receive training and are available for disasters throughout the country regardless of their normal duty station, to include FEMA disasters such as earthquakes and terrorist incidents.

For New Orleans, the Corps had a disaster plan in place that anticipated unwatering New Orleans from the excessive rainfall that might occur during a large hurricane. This included taking care of personnel from the New Orleans District and bringing in additional resources from unaffected Corps districts throughout the country. This plan included proposed actions to get the pumping system of New Orleans back on line, and deliberate levee breaches to allow water to flow into Lake Pontchartrain after the storm surge had abated. It was to this end that the Mississippi Valley Division EOC initiated activities the Friday before Hurricane Katrina made landfall in Louisiana and Mississippi.

The hurricane response team assembled in the Mississippi Valley Division headquarters in Vicksburg, with key personnel from New Orleans, to initiate the planning and possible emergency response prior to even knowing the exact landfall of Hurricane Katrina. In their hands lay the emergency plan for New Orleans and a dewatering plan for the anticipated excessive rainfall, but not for levee breaches or floodwall failures.

Although the NRP and 84-99 provided the basis for the bulk of the response, the Corps had additional statutory requirements. For example, the Clean Water Acts of 1960, 1965 and 1972; the Endangered Species Acts of 1964 and 1968; and the National Environmental Policy Act (NEPA) of 1970 required specific actions by the Corps to protect the environment, including coordinating with other federal, state, and local agencies such as the Environmental Protection Agency, the Fish and Wildlife Service, and the Louisiana Department of Environmental Quality to ensure that actions taken by the Corps, by federal or local contractors, and by private businesses and citizens did not harm the environment.

Another responsibility, under Section 106 of the National Historic Preservation Act (PL 89-665), was protecting historic places during construction, such as protection of the home of Jefferson Davis in Biloxi, Mississippi, which received considerable damage during the storm. Thus, while legal requirements sometimes delayed completion of some response activities, the Corps' often paused its response to ensure that it met these obligations, e.g., while disposing of asbestos-laden debris, while pumping floodwater back into Lake Pontchartrain, or while selecting debris disposal sites. Other laws such as the Small Business Act of 1953 and Civil Rights Act of 1964 guide the Corps contracting activities. In particular, the Small Business Act and its amendments encourage, provide advantages for, or require federal hiring of small, disadvantaged, women-owned, and Native American-owned businesses (often referred to as 8A after that section of the act) as contractors or subcontractors to the largest degree possible. Such laws also constrained the Corps in the speed of its response, but created an atmosphere of fairness and reduced fraud to the greatest degree possible.[58]

The Corps began its response within a legal framework developed over more than 50 years. At times, bureaucratic obstacles seemed unnecessarily onerous. "Miles of red tape" slowed progress on the recovery, one article noted. It sometimes took weeks to properly compete contracts, and one large debris-removal contract in 2006 did not proceed at all because of protests from other vendors. Slow payments and high standards set for contractors, whether for using local subcontractors or meeting environmental requirements, carried a level of risk, overhead costs, and additional duties that many companies and their workers found unacceptable, which led to high turnover rates and higher costs. Certainly, there were delays caused by a desire to ensure that all activities met environmental regulations. Others complained that the Corps favored large businesses and was too careless in enforcing environmental regulations. Yet

Two barge loads of pumping equipment and their support crew from the Little Rock and Tulsa Districts are locked through the Inner Harbor Navigation Canal Lock. The equipment would be unloaded shortly near the Florida Avenue Bridge and would be used to help pump the water out of the Lower 9th Ward. The MV Lipscomb, with barges laden with equipment and supplies critical to the ongoing recovery operations leaves Baton Rouge for New Orleans on September 2, 2005. (Photographs by Lane LeFort).

these constraints existed to prevent waste, fraud, misuse of or damage to resources, and to meet the needs of all groups in a community. Without the delays and constraints, projects and response may have gone faster but could have resulted in abuse. As it happened, there were a considerable number of complaints about fairness in contracting, waste, and fraud throughout the response. Most of these complaints resulted from large contracts let early in the process with limited or no competition. U.S. Rep. Tom Davis of Virginia observed that such contracts allowed an "unprecedented opportunity for fraud and mismanagement." Director of Civil Works Maj. Gen. Don Riley stressed the need to verify expenditures as early as August 30 and requested investigations into contracting, spending, and other issues by auditors and in one case by the Army Criminal Investigation Division. These found some cases of fraud by some Corps personnel and by contractors, which the Corps quickly corrected or turned over for prosecution as appropriate. The laws, although sometimes onerous, had fulfilled their purpose.[59]

4. Restoration of Navigation

Of all the missions that the U.S. Army Corps of Engineers supported under Task Force Hope, the one that had the largest impact to the nation as a whole and the one that has gone the most unnoticed was the restoration of navigation. The Corps of Engineers has been responsible for building and maintaining navigable waterways since the nineteenth century and in 2000 was responsible for more than 12,000 miles of waterways and harbors and 191 active locks.

The largest of these waterways is the Mississippi River and its tributaries, which touch 31 states and two Canadian provinces. In addition, there were 12 locks within the impact area of hurricanes Katrina and Rita, plus 16 other water control structures. These pass a significant amount of marine vessels doing business, not just in the leading ports of Louisiana – Lake Charles, New Orleans, Baton Rouge and southern Louisiana – but also throughout the rest of the nation. When Hurricane Katrina hit, it debilitated several of these structures, and the Mississippi River closed for several days. This directly influenced the operation of the ports and the flow of commerce, with a significant impact on the prices and availability of food, oil and other supplies nationwide. They were also critical in proceeding with the recovery, since water was often the easiest way to move cranes, back-hoes, bull dozers, pumps and levee materials in the flooded region. Getting the navigational works operational as quickly as possible became a critical mission requirement for Task Force Hope.[60]

Navigation in the Louisiana area is very important to the region and the United States as a whole. The Mississippi River and its tributaries drain 41 percent of the U.S. interior, making it an ideal highway for transporting goods from across the nation. Barge traffic is significantly cheaper and environmentally cleaner than most other transportation modes. According to the Institute for Water Resources, a 15-barge tow can carry 22,500 tons, which is equivalent to 225 rail cars or 870 semi-trucks, while using considerably less fuel.

The unavailability of barge traffic would eventually result in higher prices due to increased overland shipping or transportation costs. For this reason, many U.S. businesses prefer to ship by barge, particular for bulk goods. Some 60 percent of U.S.-grown grain flowed through New Orleans, which had been one of the top handlers of grain since 1980. The Port of New Orleans, which sported the largest wharf in the U.S., employed more than 107,000 personnel to handle these goods and was the fifth largest port in the U.S. in tonnage handled. The largest port in the U.S. was the Port of South Louisiana, a series of port facilities stretching 54 miles along the Mississippi River in St. Charles, St. John the Baptist, and St. James parishes. The Port of South Louisiana handled more than 15 percent of all U.S. tonnage. The Port of Baton Rouge was within the top 10 ports, largely due to its being one of the leading handlers of petroleum products. Lake Charles, in western Louisiana, was also among the top 20 ports. The closure or damage to these ports and the waterways that supported them would have an enormous impact on the economic well being of the country.[61]

When Hurricane Katrina hit the Gulf of Mexico states, the storm surge pushed up the coast, extending more than 10 miles up waterways, dumping up to 20 inches of rain in some locations, and swelling water levels throughout the area to the height of the Mississippi River levees. Debris in this surge collected along many waterways. Thousands of boats, ranging from barges to smaller vessels, ended up on top of levees, on

During Hurricane Katrina, the Port of New Orleans, one of the largest employers in the region, was closed for more than a month.

buildings, and along the shores. Many more had sunk and lay below the surface of the water, endangering water-borne traffic. Some of these would not emerge for many months. Trees and other vegetative debris choked many areas. Banks caved and silt collected, quickly blocking passage in waterways. Many buoys indicating deep channel locations were missing. Navigational lights along the Mississippi River had blown or broken. At first, no one knew how extensive the damage was or how deep the river now ran. Large deposits of silt collected along the passes to the Mississippi River, reducing the draft and endangering traffic. As a result, the U.S. Coast Guard closed the lower river to traffic immediately after the storm except for shallow draft traffic from Baton Rouge to New Orleans during daylight only. The Port of New Orleans was powerless and remained closed for more than a month, ruining a significant amount of refrigerated or frozen goods. It took until October 3 for it to return to 15 percent capacity, although 1,000 employees still had not returned. It would cost $1 billion to repair, but "at least we're back in business," said Gary LaGrange, the port's CEO. The Mississippi River-Gulf Outlet (MR-GO) saw the erosion of its protective levees, reducing the draft in Tiger Pass to six feet and in most other locations to under 30 feet. The eastern portion of the Gulf Intracoastal Waterway (GIWW) was impassible; although, west of Harvey Canal it remained open. Sunken barges in the Inner Harbor Navigation Canal (IHNC) and Port Fouchon made navigation difficult or impossible, and a downed power line blocked Algiers Lock. The lock operators who had remained at their posts were isolated, threatened by looters, and running low on supplies. The first tasks for Task Force Hope were to get these employees food and water, and to start taking surveys of all the waterways.[62]

As one of several dredges remaining in the Corps of Engineers fleet, the ***Dredge Jadwin*** *led the effort to clear the Mississippi River.*

Starting on Wednesday, August 31, the Corps was working with the Coast Guard and the National Oceanic and Atmospheric Administration (NOAA), and later the Maritime Recovery and Restoration Task Force operating out of St. Louis, Missouri, to survey and clear the Mississippi River and other waterways. Because of the dispersed state of the New Orleans District, the St. Louis District, which had responsibility for New Orleans civil works under the contingency plan (CONPLAN), took the lead on navigational issues. Lt. Col. Gregory Raimondo of St. Louis, who later led the advanced party for Task Force Guardian, took over management of the navigation mission soon after his arrival from St. Louis on September 2. Lt. Col. Murray Starkel, the deputy commander at New Orleans District, arranged the temporary return of navigational expert Edmond Russo from the Engineer Research and Development Center, to which he had recently transferred. Coordinating at the division level was Jim Hannon, the Chief of Operations, who helped relay information to commanders. Other team members included Dennis Fenske of St. Louis and Steve Jones and Doug McMichael from division. For the most part, the navigational team operated autonomously, only reporting in daily to provide updates. As Starkel later said, "It was something that was almost automatic." By Wednesday, August 31, the Corps had deployed *MV Lafourche*, *MV Kirby*, *MV Blyer*, and the *Dredge Jadwin* as part of its "aggressive" push to reopen navigation. On Friday, September 2, the team started participating in the Corps' daily call with navigational industry leaders, including lead federal agencies, pilots, ports, and port associations.[63]

Of the damaged waterways, the Mississippi River was most critical, being the central waterway for the entire nation. Initial surveys by the Corps showed the centerline channel relatively free of obstructions to 49 feet, although debris lined the banks. By Friday, September 2, the Coast Guard had opened the river to shallow draft vessels (less than 35 feet) one way only, at first from north of the Southwest Pass to Baton Rouge, then for the entire lower river. At the same time, the Corps worked with the Coast Guard and NOAA to conduct a deep-draft survey of the river and place navigational aids. On Sunday, September 4, survey ships located two sunken objects in the Southwest Pass, and the Corps brought in a contractor with a crane to remove the obstructions, even while the Coast Guard opened river traffic to 39 feet, again, one-way during daylight only. By September 12, the Coast Guard had opened the river Above Head of Passes (AHP; i.e., above Mile 0) to deep draft traffic, and then opened the entire river to one-way deep-draft traffic on September 14 once contractors had removed the obstructions in the Southwest Pass. Finally, after two more weeks of dredging, surveys and removal of debris, the Coast Guard lifted its final restrictions on September 29, allowing two-way traffic, 24 hours per day. Despite these improvements, river navigation continued to suffer from the hurricane damage. Many landmarks, warning lights and buoys had disappeared. Unclaimed vessels, broken rock jetties and wing dams, and shifting banks posed obstacles that continued to make the trip precarious. Because of the damage to river controls, the waters were more unpredictable, and the river bottom silted more quickly. As one article observed of river pilots in March 2006, "Their working life on the Mississippi River is a lot less predictable and a lot more reminiscent of Mark Twain's daredevil tales."[64]

Many of these issues remained a problem well into 2006, none more than silting, which led to the need for extensive dredging. The first dredge deployed was the *Dredge Jadwin*, which was at the Port Allen Lock in Baton Rouge by September 2; and by September 12, the Hopper Dredge *Stuyvesant* started dredging the Southwest Pass. Soon after, the dredges *McFarland*, *Padre Island*, *Mike Hooks*, and *Wallace McGeorge* were on the river to dredge the entire 250 miles of river to Baton Rouge, as well as to dredge other channels. Operations continued non-stop until December 2 before returning to intermittent maintenance dredging.

Another long-running problem was the obstacles. Many of the vessels in the river remained unmoved for many months. It was primarily the responsibility of the Coast Guard to remove vessels from public waterways, and the Coast Guard salvaged about 3,000 vessels. Those that ended up on levees were the responsibility of the owners, but many owners abandoned their junked vessels unless the cost of removal was less than the value, as was typically the case with large barges. Corps contractors were responsible for removing the vessels that remained. The Corps itself had to hire a contractor to lift its own vessel, the Derrick Barge *Brownlee*, from the river. New Orleans District let a contract on November 13, and the contractor had

Contractor Bisso Marine Co. uses a crane to remove a barge caught under a bridge at the Industrial Canal.

completed removal of the vessel by December 20 and returned it to service on December 27. The Corps collected most other debris in the waterways as part of its debris removal program. Local government representatives made periodic complaints about the amount of time it took to clear some waterways, but the Mississippi River had been a top priority. Repairs of the many jetties and other works would take even longer. Many of these were state or locally owned and maintained or else were not considered a high priority unless they obstructed navigation. For example, the New Orleans District did not undertake a repair of a jetty at Baptiste Collette Bayou, located just above Head of Passes, until February 17, 2006.[65]

One issue that could have complicated the river recovery was the possibility of a saltwater wedge protruding up the Mississippi River. This was a natural occurrence during most low water years. As the pressure of water discharging down river and out into the gulf lessened, sometimes saltwater crept up the river in a wedge shape because saltwater is heavier than fresh water. The difficulty occurred if the wedge were to ever move as far north as New Orleans, where it would ruin water treatment plants used by the city and by industry. The last time this was a threat was in the drought of 1988, when the Corps countered the wedge by building a sill (an underwater levee) on the river bottom. This blocked the wedge from proceeding further upriver by forcing the saltwater upwards into the current to wash away. The drought conditions that followed Hurricane Rita and the resulting low water – the Mississippi River flow was below 80 percent normal capacity for much of the spring – caused the wedge to become a concern again. The New Orleans District started monitoring the wedge, and on November 10 reported it to be at mile 55 AHP. The wedge needed to reach mile 90 AHP for a sill to become necessary because the Port of New Orleans was at mile 95. However, models of the river conditions suggested the wedge would only move up to mile 68 before receding. On November 16, it had reached mile 56, but increase in river discharge prevented any further movement. It receded to mile 42 by December 8, where it remained until January 12 when it continued to regress downstream and finally dissipated in the current.[66]

After the Mississippi River, the next highest priority for restoration was the IHNC, which connects the Mississippi River, MR-GO and Lake Pontchartrain. On navigation industry calls, local shipping interests identified it as the highest priority to support shipping because a number of industries maintained facilities along the canal. By the end of the first week, the Coast Guard had opened the IHNC to shallow draft traffic, but two barges obstructed passage to deep draft traffic, the closure of the Almanaster Bridge prevented the passage of large vessels, and security concerns at the lock kept it closed. Corps contractors removed the barges, locked the bridge in the up position, and cleared out debris, completing the work on September 13. The following day, the Coast Guard opened the northern half of the IHNC, but the southern half remained closed while contractors removed a barge near the Florida Avenue Bridge, which was a little tricky due to its proximity to an Entergy Lines electrical tower. Once Corps contractors removed the barge, the Coast Guard opened the IHNC to vessels 110 feet wide by 18 feet deep. Because a piece of dry dock remained partially submerged in the canal, salvage operations continued, pausing only while Hurricane Rita passed. The removal of the dry dock proved to be extraordinarily complicated. The contractors, Boh Brothers and Bisso Marine, tried using an air-powered lifting mechanism

Contractor Bisso Marine removes a piece of dry dock on the Industrial Canal.

to float it out, but due to holes in the dry dock, they were unable to get sufficient lift. After consulting Navy salvage teams, they tried a number of other techniques, including cutting the dry dock into pieces, which also proved difficult. To allow the contractors to complete the cuts and lift, the Coast Guard closed the canal on November 4. However, continued problems with lifting the pieces required further restrictions on the draft of passing vessels. At one point, three tugs tried unsuccessfully to pull the pieces free of an unseen obstruction. Finally, after the contractors positioned the plant, cranes, toggles, slides and tackle, the Coast Guard closed the canal once more to allow them to remove the final submerged piece of dry dock on November 30 and December 1. The Coast Guard then lifted the remaining restrictions on the IHNC.

On March 26, failure of a strut arm in the IHNC Lock forced its closure for repairs, but it reopened the following day. In early March, the Port of New Orleans approached the Corps about dredging the IHNC to a greater depth because of draft limitations on the MR-GO. After conducting some research, the New Orleans District determined it had authority to dredge to 32 feet. However, because of environmental concerns with disposing of dredge material from the canal, the District had to find a suitable disposal location and get approval to alter an injunction in place from a lawsuit over a proposed new IHNC lock. By the end of May 2006, it had taken soil samples, located a disposal facility in Venice, received approval to proceed, and issued the request for proposal.[67]

Repairs to the GIWW went much more quickly, largely because of the limited amount of damage. Initial surveys of GIWW showed no impact west of Harvey Canal. As a result, the Coast Guard quickly opened this segment of the waterway. However, problems raising a railroad bridge on Harvey Canal itself prevented access until contractors completed the lift on September 4. At Algiers Lock, a downed power line blocked the channel, which Entergy quickly removed, and the lock reopened on September 6. Because of problems with the IHNC, MR-GO became the default alternate GIWW route. Although it was restricted to shallow draft, small fishing vessels and supply boats were the primary users of this route. The eastern portion of the GIWW opened, but required use of Baptiste Collette Bayou as a detour due to continued restrictions with the IHNC.

With the clearance of Gulfport harbor, the Coast Guard opened the GIWW from Texas to Florida, eventually restoring the eastern route on September 24 with the opening of the IHNC. Occasional blockages occurred on an ongoing basis, largely due to accidents. The western portion of the waterway closed immediately following Hurricane Rita, but the Coast Guard reopened it a few days later. On January 14, 2006, the towing vessel *Cory Michael* collided with the Wagner Bridge and lost a 78-foot towing spud (steel shaft used for mooring), and the Coast Guard closed that portion of the waterway. A contractor removed it on January 18, and the Corps notified the Coast Guard the next day.

On January 24, another barge sank in the GIWW, closing it west of Harvey Canal. Contractors brought in a crane on January 25, offloaded the cargo, and began salvage the following day. On March 16, another barge involved in a collision sank 15 miles east of Bayou Boeuf Lock. A contractor removed the vessel, and the Coast Guard reopened the channel to normal two-way traffic on March 20. In April 2006, the Corps closed the Harvey Canal Lock for five months while it proceeded to install a storm surge barrier on the gates as part of the West Bank and Vicinity Hurricane Protection Project, although this did not impact traffic on the GIWW. [68]

The most controversial navigational issue was whether to reopen MR-GO after the hurricane passed. Hurricane Katrina had severely eroded the levee walls of the canal, resulting in considerable silting. Preliminary surveys showed a depth of less than 30 feet. It opened initially to shallow draft traffic of 27 feet other than Tiger Pass, which had silted to less than six feet. Floodgates at Bayou Bienvenue and Bayou Dupre received some damage, and repairs started on September 6. After additional surveys put the controlling depth at 23 feet, the Coast Guard further adjusted draft to 23 feet on September 17. Because the public believed that MR-GO had served as a "hurricane highway" that increased surge in St. Bernard Parish, many residents sought to limit dredging if not completely close the canal. On September 22, Louisiana U.S. Senators Mary Landrieu and David Vitter called for a commission to review the issue. Having put dredging the canal on hold on September 18, the New Orleans District committed to dredging only to maintain a 23-foot depth until Congress made a final decision. In the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery of 2006 (PL 109-234), which passed June 15, 2006, Congress directed the Corps to provide a closure report. At the same time, the Corps had been reviewing the issue as part of the Louisiana Coastal Protection and Restoration (LACPR) Program, which involved collaboration with multiple state and federal agencies. In a draft report released in August 2006, the Corps identified several options and the selection criteria, spurring commentary from many observers. In general, shipping interests continued to push for MR-GO remaining open at least to shallow draft to support the Port of New Orleans, while St. Bernard Parish residents and environmental interests pushed for complete and immediate closure. LSU released a report in early December, Mr. Go Must Go, that also recommended closure. In December 2006, the Corps released its interim Deep Draft Deauthorization (3-D) report, which again stated options for keeping it as a shallow draft canal, completely closing it, or allowing it to lapse by not dredging. It concluded that closing the canal through the construction of a dam was most cost-effective. The Corps planned to include the final report and closure designs in conjunction with the LACPR final report scheduled for December 2007.[69]

In the interim, the Corps examined ways to prevent further erosion of wetlands by repairing rock dikes adjacent to the channel, although the Corps suspended these improvements because Louisiana U.S. Sen. David Vitter objected to maintenance funds being used on the projects. In May 2007, the Corps held additional public meetings to discuss additional options, but, the final report explained, "the different stakeholders could not agree on a plan to close or de-authorize the channel." After further analysis and coordination with the LACPR team, the Corps completed the final 3-D report and environmental impact statement for closing MR-GO in November 2007. The selected plan was to close the channel by building a rock dam at Bayou La Loutre to prevent further navigation of the canal. The Corps eliminated most other options as too expensive or not in line with LACPR goals. It left unresolved the need for expanding the Inner Harbor Navigation Canal Lock to allow deep-draft traffic that ordinarily used the MR-GO, a key demand of shipping interests, but instead promised that the Corps would work with St. Bernard Parish and shipping interests to find an alternative plan. Nor did the report address the need for blocking hurricane surge, demanded by some residents and environmental scientists. "This is not a hurricane protection project. We're talking about a dam that will rise five feet above the surface of the water. It's not designed to stop storm surge," explained Corps MR-GO project manager Gregory Miller in June 2007. Congress authorized the project through the Water Resources Development Act of 2007 in November, although the Corps would have to wait for funding to proceed. Construction of the 950-foot dam would take approximately six months.[70]

Although Hurricane Katrina caused damage to several waterways, Hurricane Rita also did considerable damage, mostly to locks in western Louisiana. After Rita made landfall near the Louisiana-Texas border on September 24, 2005, the Coast Guard closed the Mississippi River, the Atchafalaya River, MR-GO, IHNC, and the GIWW west of Morgan City. However, by September 26, all of these had reopened except the Atchafalaya River, which reopened on September 30, and Algiers Lock, which operators repaired on October 1. Several

5. The Plight of Lock Operators

Leland Bowman Lock, which connects the Mermentau Basin to the GIWW in Vermillion Parish, Louisiana, remained closed for more than a week after Hurricane Rita.

On the night of Thursday, September 22, 2005, with Hurricane Rita menacing, Leland Bowman Lockmaster Harold Trahan, mechanic Donald Turner, and lock operator Anthony Lanlinais rejected fleeing for safety and stayed at their post near Abbeville, Louisiana, to provide passage to 26 tows (towboats pushing barges) seeking safe harbor. "Every tow got through that wanted to get through," Trahan said. Finally, on departing at 3:00 a.m., Friday morning, they left one gate of the lock open to allow drainage of the flood surge, giving rise to rumors that the lock had failed and was flooding the Mermentau Basin. The actual cause was the tremendous flood surge that accompanied Rita along the basin. On returning to the lock on Saturday, September 24, they found it covered in mud and debris, but able to function using back up power. "Using back up power we fully opened the gates. Water started flowing out at 2 p.m. Sunday," Trahan recalled. At the other locks and control structures, including Schooner Bayou Control Structure, Freshwater Bayou Lock, and Catfish Point Control Structure, operators returned to find them inundated, like islands in a vast sea of debris. "All three of these were also inundated, but the people got in and opened them quickly," said Robert Morgan, assistant operations manager for Southwest Louisiana.

At Calcasieu Lock near Lake Charles, Lockmaster Kevin Galley, mechanic Robert LeBoeuf, lock operators Clifton Heley and Walter Graske, and Bayou Boeuf Lockmaster Kenny Landry were unable to open the lock because of the inundated lock machinery. "We got back at about 10 a.m. on Sunday. We couldn't have gone the last half mile without Stacy Leonard, our airboat operator," Galley said. It was critical to get the lock open, so they could not wait the days it would take to repair the lock. Instead, they improvised a method to pull the 34-ton gates open. They tried a 27-horsepower tractor, a National Guard dump truck, and then finally got a tugboat, the *Allison Crosby* to push open the gates. Then the race was on to make the repairs. "We worked continuously for two weeks, daylight to dark, to get the lock back in operation," Galley said.[72]

of the other locks, however, remained closed. After the storm, Calcasieu Lock, Leland Bowman Lock, Freshwater Bayou Lock, Bayou Boeuf Lock, Keystone Lock, Catfish Point Control Structure, and Schooner Bayou Control Structure all remained closed. Calcasieu, Leland Bowman, and Freshwater were partially underwater. After surges up to 20 feet, most of the Mermentau Basin was flooded, and the locks prevented drainage out of these waterways. It became critical to open them. Since the lock operators could not apply electricity to the flooded locks, they had to improvise other ways to open them. At Calcasieu Lock, the operators tried using hand cranks, a tractor, a dump truck, and a tugboat to force the gates open. Fortunately, at Leland Bowman, lock operators had left one gate open and turned off the power prior to the storm to avoid damage to the lock prior to the storm. While the other locks eventually came back online, the lock operators were unable to initially repair Leland Bowman and Calcasieu. By September 28, the Corps arranged for towboats to help get shallow-draft vessels through the open locks against the flood waters pouring out of the basin. By September 29, the operators had repaired Calcasieu Lock, but Leland Bowman continued to have electrical problems until repaired on October 2. Traffic had backed up considerably, but there was also a need to keep the locks open to drain the basin. On October 2, Brig. Gen. Robert Crear approved a lock plan that allowed critical lockages between 6:00 p.m. and 6:00 a.m. with half hour delays between lockages to allow drainage. On October 15, he lifted the restrictions on the two locks, and they resumed normal operations. However, problems with dredging and debris continued. Dredging continued at Padre Island on the Calcasieu River near the lock until December 16. On December 16, a tug hit a submerged object in Calcasieu River, restricting the draft to 10 feet. A survey of the area found no object, and the Coast Guard lifted final restrictions on December 20, 2005.[71]

After hurricanes Katrina and Rita hit, a major concern for Task Force Hope was the restoration of navigation. Commerce along the Gulf Coast and through much of the interior depended on getting these critical transportation arteries open. The Corps, NOAA, and the navigation industry quickly started surveys and dredging, and worked with the Coast Guard to remove wrecks, repair the locks, and open the waterways. Most were open to shallow-draft traffic within a week; some took three months to return to normal operations. It would take many more months for the Corps to fully recover as debris and changes in the waterways continued to challenge pilots and slow traffic.

Largely because of the intense coordination that occurred as a result of Katrina, the Corps developed a memorandum of agreement (MOA) that outlined many new procedures for resolving navigational issues in future emergencies. According to Jim Hannon, chief of Operations at the Mississippi Valley Division, the mission to restore navigation was successful because the Corps, NOAA, Coast Guard and navigation industry teamed up to tackle the problem. "We relied heavily on each other," Hannon said. "We placed great trust in each other to insure the navigation channel was clear. This would not have been possible without the collaborative efforts of the entire navigation community." [73]

5. Support for FEMA

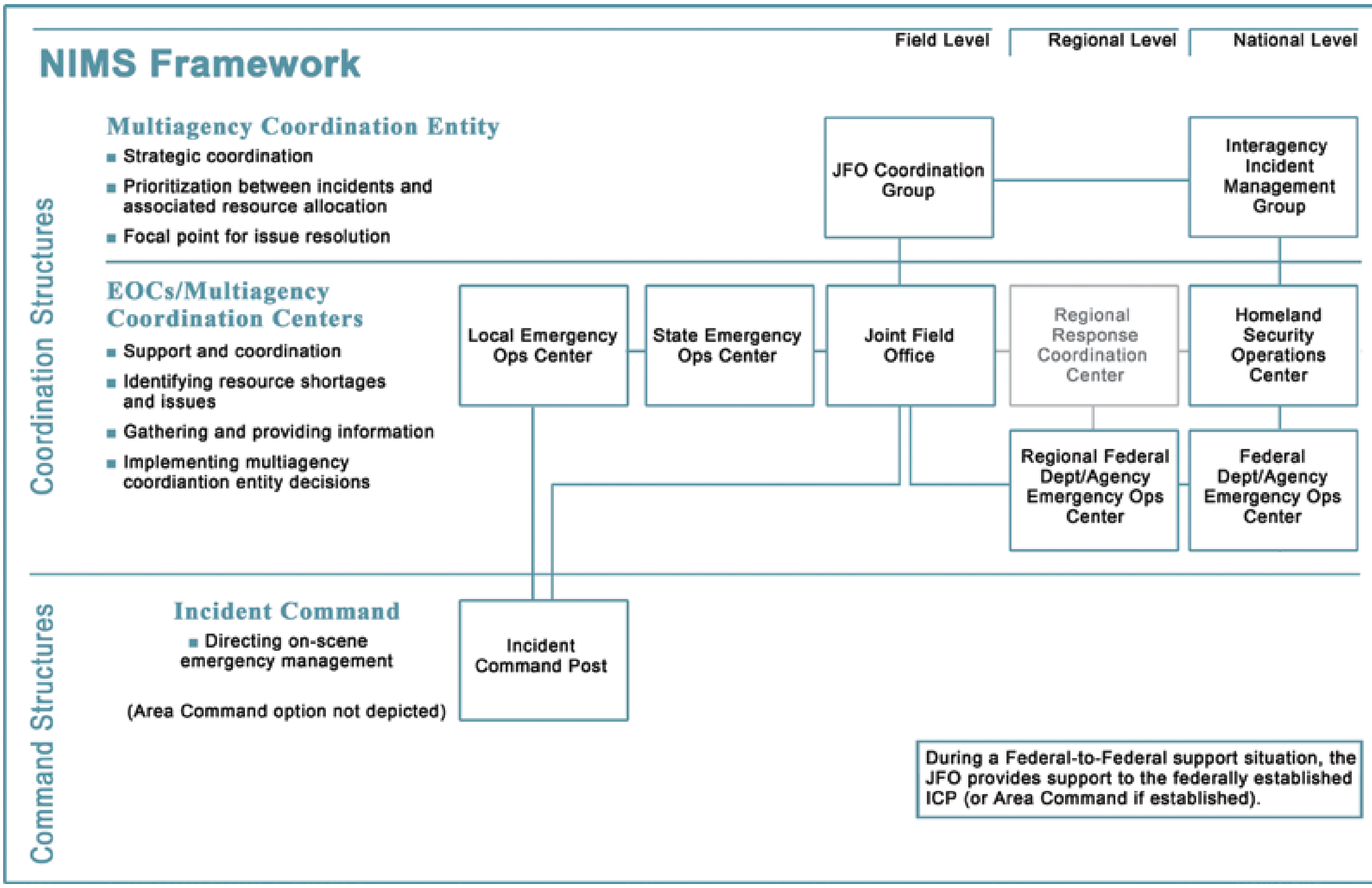
The longest-running mission and the core mission for Task Force Hope was engineering support provided to the Federal Emergency Management Agency (FEMA). Since its formation in 1979, FEMA has held responsibility for managing the national response to large-scale disasters within the U.S. As the nation's largest engineering agency, the Corps of Engineers has always supported this mission by providing construction support – primarily through the removal of debris, the provision of supplies and temporary shelters, and the coordination of expedient repairs. Under the National Response Plan (NRP) published in December 2004, the Corps became the lead agency for Public Works and Engineering, and gained responsibility for supporting other requirements as needed. During emergencies, the Corps works for and receives funds from FEMA. The Corps operates Recovery Field Offices (RFOs) close to FEMA-operated Joint Field Offices (JFOs), through which it coordinates the recovery operations. According to the Mississippi Valley Division contingency plan (CONPLAN), Vicksburg District established and operated the Mississippi RFO, and Memphis District was responsible for the Louisiana RFO. Initial estimates were that the FEMA mission would last for several months and amount to several hundred million dollars in each state. As the mission proceeded, however, and the amount of damage and support required became more apparent, cost estimates quickly spiraled to more than $4 billion and the mission continued for a year, then two years as FEMA continued to add new missions or extend existing ones. Although many have complained of FEMA's response to Katrina and Rita, aside from some minor issues mostly related to contracting, the Corps' mission in support of FEMA went well overall despite the fact that its high cost and extended length made it very complicated and liable to problems.

The history of emergency response in the U.S. provides an understanding of why FEMA received so much criticism after Hurricane Katrina. Prior to 1979, there was no central emergency management agency. A collection of more than 50 agencies provided different capabilities according to a patchwork of laws. The Corps provided repairs to structures and fought flooding. The Department of Transportation restored roads and bridges. The Department of Interior protected natural resources. The FBI conducted investigations. The only coordination that occurred was through the Office of Emergency Planning, which operated out of the White House, but its influence was limited. Congress had provided a fund for recovery in the Disaster Recovery Act of 1950, and later established a presidential declaration as the key to make federal aid available. Despite state and local government lobbying to create a single agency to improve the federal response, no such agency existed.

In 1979, President Jimmy Carter issued Executive Order 12127, which created FEMA. Even with its limited effectiveness during its first years, the agency was a vast improvement over the system that had existed previously. Under President Ronald Reagan and later President George H.W. Bush, it focused mostly on civil defense, and its response to natural disasters was mixed. In the Loma Prieta Earthquake of 1989, FEMA won praise, but in Hurricane Hugo in 1989 and Hurricane Andrew in 1992, it had proven less responsive. Three changes improved FEMA tremendously under President William Clinton – he made FEMA a Cabinet-level agency, he expanded its grant program, and he appointed the highly capable James L. Witt as director. The first years of the George W. Bush administration continued some of these trends, although FEMA Director Joe Allbaugh worked to curb the patronage of the grant programs. As late as 2004, FEMA received praise for its preparation and response to the intense hurricane season of 2004. It had earned a reputation for helping local governments respond to national emergencies.[74]

After the terrorist attacks of September 11, 2001, however, the agency had started to change. Not surprisingly, counterterrorism became a major focus. The creation of the Department of Homeland Security (DHS) further changed the agency. Instead of the director of FEMA serving in the Cabinet, he reported to the Secretary of Homeland Security. Placing FEMA, the Coast Guard, the Secret Service, the Immigration and Naturalization Service, and other agencies together into DHS created new budget priorities and problems as the agencies merged. FEMA lost many of its grant programs to the Office of Domestic Preparedness or other agencies, significantly reducing its role in preparation and making it more of a response agency. Furthermore, with budget reductions amounting to $80 million, it lacked the staffing and resources to do more than supplement local resources. As Christopher Cooper and Robert Block wrote in 2006, "DHS treated FEMA as if it were a federal firehouse.... But that's never what FEMA was intended to be. It was a coordinating agency, not a fire company." Limited stockpiles of emergency supplies were available, and the agency lacked a system to quickly order and track resources. FEMA maintained a small crew with plans to staff up during a disaster, but that process turned out slower than anticipated. There were also new processes. DHS started to implement the National Incident Management System in 2003, which greatly improved communication and provided a standard response model based on a system developed in California for responding to forest fires. In late 2004, DHS also introduced the National Response Plan (NRP,) which many inside and outside DHS have partially blamed for the poor response to Hurricane Katrina. Although the plan made improvements, it also created additional processes and organizations that made response more complicated. Mainly, it was an issue of timing. Because DHS did not start using the plan until early 2005, there had been little time to evaluate it or to train properly on the new processes prior to Katrina.[75]

The NRP formed the primary organizational plan for responding to Hurricane Katrina. Under the plan, individual



The National Response Plan provided the operational organization for the Corps, which worked through the Joint Field Offices and Interagency Management Group.

departments or agencies can declare a disaster to mobilize its own resources. Involving the full response of the federal government required a presidential emergency declaration and a DHS declaration of an incident of national significance. FEMA is responsible for coordinating these agencies and activities, which it does through a Joint Field Office (JFO). Heading the JFO is a Federal Coordinating Officer (FCO). If the incident is large enough, the FCOs may report to a Principal Federal Official, who coordinates the different JFOs. A Homeland Security Operations Center (HSOC) keeps all the parties apprised of events, serving as a clearinghouse for information. The plan identified 15 Emergency Support Functions (ESFs), led by FEMA or other agencies, which FEMA manages through a Federal Resource Coordinator. The Corps of Engineers is the lead for ESF-3 – Public Works and Engineering. This includes infrastructure and emergency repairs, construction management, critical infrastructure, risk assessments, ice, water, power, commodity delivery, demolition and inspection, debris removal, real estate, and clearing obstructions to navigation. Although FEMA was the lead for ESF-6 – Mass Care, Housing, and Human Services – and ESF-14 – Long-Term Community Recovery and Mitigation, it involved the Corps heavily in these missions as well. Other areas where the Corps could play a minor role were ESF-9 – Urban Search and Rescue – and ESF-10 – Oil and Hazardous Materials Response. The primary areas of confusion related to the NRP that caused problems during Katrina were the unclear process of declaring an incident of national significance, the conflicting roles of FEMA Director Michael Brown in relation to the Federal Coordinating Officer, and the time it took for the HSOC in Washington, D.C., to share information. These issues would slow the response during the first few days. Other issues arose with execution of the various ESF missions, discussed below.[76]

Even before Hurricane Katrina, 2005 was a very busy season for FEMA. It had to respond to more than 38 disasters, which, although mostly minor, pushed its resources to the brink. When the National Hurricane Center (NHC) predicted Katrina's landfall after Saturday, August 27, FEMA took the ordinary precautions for hurricane response. Because it already had teams in Mississippi and Alabama for the response to Hurricane Dennis, it established JFOs in Alabama and Mississippi on Friday, August 26, and Saturday, August 27. FEMA would not establish a separate JFO in Louisiana for nearly two weeks and instead worked out of the state EOC at Baton Rouge. By Sunday, August 28, President Bush had declared Louisiana and Mississippi disaster areas, enabling FEMA to start its response, and on Saturday and Sunday, FEMA issued its first taskers to the Corps of Engineers and others to activate ESF missions. It had prepositioned assets at locations around the edge of the predicted impact area prepared for use when responders went in after the storm. Marty Bahamonde, Michael Brown's man on the ground, deployed to New Orleans, while Brown monitored the storm from the Louisiana EOC in Baton Rouge. The storm made landfall after 6:00 a.m. on Monday, August 29, and started moving into central Mississippi by noon. That afternoon, Bahamonde conducted a flyover of the region and saw the breaches in the floodwalls and levees, the water throughout New Orleans, and the devastation. On hitting the ground, he immediately sent an e-mail to Brown, Chertoff, and others, describing the damage. By that time, Brown had already dispatched teams, giving them 72 hours to arrive in the area. It was standard FEMA practice to deploy resources several days after the storm, but given the constant news coverage, public perception no longer supported such a delay. The first command center arrived at Metairie at 10:30 p.m. on Monday, although some FEMA personnel would not arrive for several more days. Not among its assets was the Mobile Emergency Response System (MERS) vehicle, which could have provided critical communications in New Orleans. That vehicle never left Baton Rouge because of the poor state of the roads.[77]

At 7:30 p.m. on Monday, FEMA notified its ice vendor, Cool Express, to start rolling with deliveries, but with the closest staging center in Dallas, it would take a day or more before deliveries began in earnest. The National Guard and Corps of Engineers helped with distribution of ice, water and meals-ready-to-eat (MREs) had started using stockpiles at the Superdome and Camp Beauregard, Louisiana; Maxwell Air Force Base, Alabama; and Meridian, Mississippi. Yet, the supplies quickly proved insufficient, particularly at the Superdome, which resulted in rationing. Some distribution centers, such as Meridian, suffered severe damage, contributing to shortages. This was the source for many rumors that food was not forthcoming. However, the largest immediate need in New Orleans was for buses to evacuate the thousands of residents who had

The Army National Guard played a critical role in clearing roads in the impact area, particularly in Mississippi. (Photo by 1st Lt. Maury Shugars, Mississippi Army National Guard.)

remained in the city. The city's stock of buses was underwater, preventing execution of its evacuation plan. To get buses in the area, FEMA would require the support of the Department of Transportation. Since buses were not standard FEMA assets, a declaration of an incident of national significance was necessary. As yet, Secretary Chertoff had not made such a declaration. DHS briefed President Bush in detail on the morning of Tuesday, August 30, and Chertoff, who was traveling, declared an incident of national significance at 8:22 p.m. FEMA contracted the buses at 1:15 a.m. on Wednesday, August 31. The 455 buses and 360 ambulances arrived 36 hours later at the Superdome, and left at noon on Thursday for Houston. FEMA evacuated 22,000 in all.[78]

Once DHS had declared an incident of national significance, Brown could also request support from the Department of Defense. Already, Louisiana and Mississippi Army National Guard units had mobilized and deployed. Although members of the U.S. Army, the National Guard is a state-run resource, typically operating under Title 32 authority instead of Title 10 unless federalized at the request of the president. Each individual governor could order the support of a state's units prior to a national incident of significance declaration, making them critical to a fast response. On Monday, Guard units started handing out ice, water and MREs from distribution centers across the area. In New Orleans, the Guard established a command center

Col. Anthony Vesay of the Vicksburg District was the commander of the Mississippi Recovery Field Office.

at the Superdome and conducted search and rescue operations using Blackhawk helicopters. By Tuesday, an additional 2,000 guardsmen had deployed, and another 7,500 mobilized by the end of the week to help with search and rescue, clearing roads, and distribution of supplies. Over the course of the next 215 days, more than 50,000 guardsmen would serve in the Gulf region through interstate agreements. On Wednesday, federal troops from the U.S. Northern Command (NORTHCOM) started arriving, although the forward cell of Joint Task Force (JTF) Katrina had established a command center at Camp Shelby, Mississippi, even before the storm. The commander of JTF Katrina was Lt. Gen. Russell Honore, a flamboyant character of Louisiana heritage who drew immediate media attention and provided a sense that the cavalry had arrived. Of course, most NORTHCOM troops did not arrive until later, and the Posse Comitatus law limited their involvement to civil support activities, not security. Yet there is no doubt that his arrival in Baton Rouge and New Orleans on Wednesday, August 31, was a relief. JTF Katrina established its headquarters at Camp Shelby, a National Guard training facility, which would also host the FEMA JFO. The Corps of Engineers would also maintain a liaison office there. As a part of the Department of Defense, the Corps of Engineers reported to the JTF as well

Brig. Gen. Robert Crear talks with Col. Charles Smithers, Commander of the Louisiana Recovery Field Office.

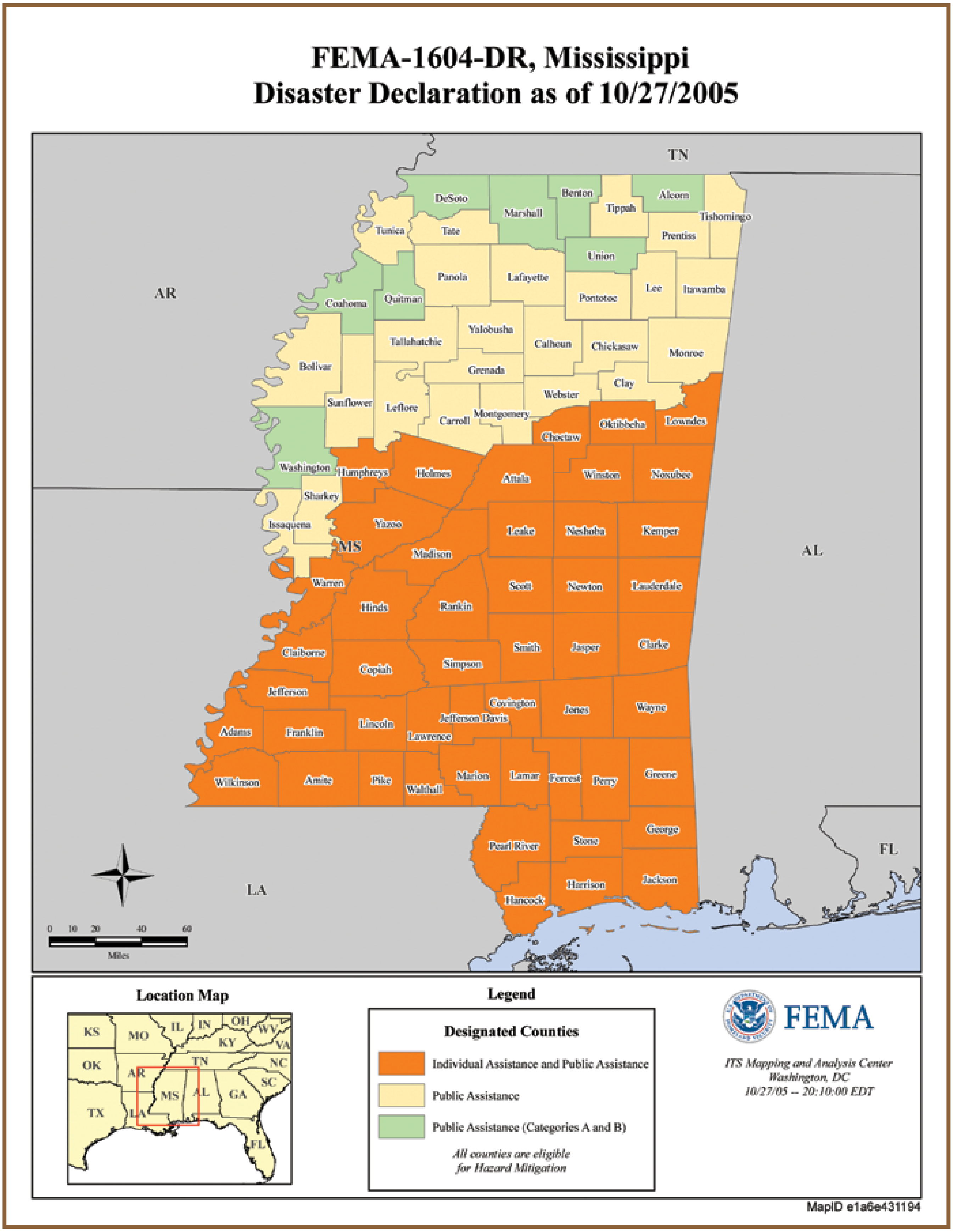
as to the JFO and its own headquarters. A similar situation existed when Lt. Gen. Robert Clark established JTF Rita after Hurricane Rita struck on September 24.[79]

The majority of the Corps of Engineers' FEMA missions were in support of ESF-3. These were the longest and most intense of the missions, although the Corps also supported FEMA's temporary housing mission under ESF-6 and provided engineering advice for long-term planning under ESF-14. To support these missions, the NRP requires the formation of RFOs near the JFOs. Neither the NRP nor the Corps of Engineers initially provided a standard operating procedure (SOP) for how to staff or set up the RFOs, or whether or how to establish engineer field offices (EFOs) or liaison offices (LNOs) in the various counties or parishes. As a result, the commanders of the Corps RFOs – Col. Charles Smithers in Louisiana and Col. Anthony Vesay in Mississippi – established different procedures, approached the establishment of their offices slightly differently, and developed different plans for LNOs or other sub offices. Despite these differences, there were in fact many similarities in their approaches. Per the NRP, both established offices close to the JFO, although the timing of when this occurred varied. They both established LNOs, although with the additional activities required for Rita, the Louisiana RFO found greater need for a large office in the western half of the state. They both followed similar processes for public affairs, funding, contracting, and management of teams.[80]

FEMA initially established its JFO in Jackson, Mississippi. Given the close proximity to Vicksburg, the Mississippi RFO operated at first out of the Vicksburg District headquarters. Within a few days, however, FEMA planned on relocating to Biloxi, but chose instead Camp Shelby near Hattiesburg, where JTF Katrina established its headquarters. By Friday, September 2, RFO Commander Col. Anthony Vesay had relocated the RFO to Keesler Air Force Base near Biloxi. At first, response activities spread pretty evenly throughout the state, since there was storm damage, especially wind damage to houses, as far north as Lowndes County. Mississippi declared the entire state a disaster area, of which 47 counties qualified for individual federal assistance. By November, however, most of the work in the northern part of the impact area had slowed, and considerable work in the coastal counties remained.

On November 8, Vesay established four EFOs: EFO West in Hancock County, EFO Central in Harrison, EFO East in Jackson, and EFO North in Forrest. In addition to Vesay, the civilian directors of the RFO were Jimmy Waddle, Sam Horton, and then Wayne Forrest, while Mike Logue was the public affairs chief. Clyde Scott managed the Vicksburg District EOC, and Greg Bertoglio and Kari Layman managed the temporary roofing and temporary structures programs. Most of the staff worked and lived out of barracks and other buildings at Keesler. The RFO operated as a separate Corps agency from the Vicksburg District. Because of the large Mississippi mission and the small number of district personnel remaining in Vicksburg, the mission caused considerable strain on personnel who remained in Vicksburg and who had to take up the work of absent personnel. Largely because of the absence of long-term flooding in Mississippi, the RFO was able to start its missions very quickly. Even before the RFO office was in place, the team was already contacting its contractors, including Ashbritt Construction, to start the mission using the predeclaration funds provided by FEMA. In addition, Vesay had assembled a planning and response team (PRT) to focus on special missions, starting with clearing major rights of way required to access key infrastructure, and to help move and establish the RFO. Within a week, the RFO had started debris removal, within 11 days it started installing temporary roofing, and it delivered the first temporary public structure within six weeks. Aside from a six-week pause at the end of 2005 while the Corps and EPA worked out how to handle asbestos disposal, the debris removal mission was the constant, lasting until the RFO closed in September 2006. After the end of the mission, five remained on the RFO rolls to complete contract closeouts, a process that continued into 2007.[81]

As part of his efforts to support the CONPLAN, Smithers and his team had chosen the site for their RFO facility before the hurricane season started at the Port Allen Lock facility in Baton Rouge. The Memphis District EOC started tracking Hurricane Katrina on Friday, August 26, and by Saturday had received its predeclaration mission and funds. After completing aerial inspections after the storm passed, Smithers and his team deployed to Baton Rouge on Wednesday, August 31, although some real estate personnel were on-site on Monday. The deputy RFO commander was Jack Hurdle, assisted by



FEMA's map of Mississippi shows the level of federal aid for which each county qualified and depicts the widespread nature of the impacts of Hurricane Katrina in the state. Those counties qualifying for public and private assistance had the worst damage.

6. The 9/12 Feeling

During his interview with the authors, Col. Anthony Vesay of Vicksburg District revealed that he was working in the Pentagon on September 11, 2001, about 100 yards from where the terrorists rammed American Airlines Flight 77 into the western wall of the iconic building. He did not, however, want to talk about that day; he chose, instead, to talk about his feelings the next day:

I am not here to talk about that other than it was an unbelievable event.... The feelings of patriotism and togetherness and unity on 9/12 after the frustration and anger died down, and you could not see anything but a sea of red, white and blue.... You felt good [to rise] out of the ashes again and be an American on 9/12 or 9/13.... The pride that people had, it was we are united, and we are going to get through this, and we are going to do it together. That same thing happened down at the coast. That was something, and I think that is why we all felt so good.... If you could capture the human interest and the 9/12 sense of pride, mission, and unity, boy, if we could bottle that thing up and sell it, it would be unbelievable. That would be my parting comment.[83]

—Col. Anthony Vesay

Col. Anthony Vesay was serving in the Pentagon during 9/11.

Mike Park, and the public affairs chief was Bob Anderson. Sid Falk and John Ashley managed debris removal, and James Mosner and Jay Joseph handled the installation of temporary structures. In October, Lt. Col. and later Col. Dwight Pearson became Smithers' executive officer and in January 2006 assumed "forward" command of the RFO when Smithers and Hurdle returned to Memphis. Park, who served as Pearson's deputy, became the RFO Director in June at the end of Pearson's tour of duty. RFO personnel initially worked and lived mostly out of the *MV Mississippi*, the inspection barge, and the mat-sinking quarterdeck boats. Within days, Smithers directed that the team find a facility closer to the Louisiana EOC, and on September 12, the RFO moved to Lobdell Boulevard in Baton Rouge. To help coordinate activities, it established LNOs at five of the six largest storm-damaged parishes on September 13. By the end of the first week, FEMA had tasked the RFO with ice and water missions, emergency power, temporary roofing, temporary housing, debris removal, and building a mortuary facility, although it would be several more days before contractors were on board and started working the missions. The Louisiana RFO also initially managed unwatering of New Orleans until Task Force Unwatering hit the ground, including issuing initial contracts to the Shaw Group and KBR (formerly known as Kellogg, Brown,and Root).[82]

After Hurricane Rita struck on September 24, new problems arose for the RFO as the president declared 41 parishes as disaster areas, initializing new FEMA missions to support relief efforts west of New Orleans. On recommendation of the Corps, FEMA assigned these missions to the Louisiana RFO instead of the Texas RFO, which was handling that state's response to Rita. To manage these new missions, Smithers established an EFO in Lake Charles. However, in October, FEMA reorganized its operations and dictated it would manage all of its missions from the Baton Rouge JFO, a plan that Brig. Gen. Crear feared would unnecessarily delay the western missions. Because most of the damage and the recovery efforts in Louisiana were in New Orleans, FEMA moved its JFO to the city in the spring of 2006. By April, the RFO was looking for a facility there also, eventually settling on moving into the Federal Reserve Bank building downtown, which Task Force Guardian vacated in June 2006. The RFO completed the move by July 5. The RFO had completed all its missions except demolition and debris

7. Planning an RFO

When Hurricane Katrina hit, Memphis District Deputy Commander Maj. Vincent Navarre was in Korea participating in a military exercise until September 9. An e-mail from Commander Col. Charles Smithers on August 28 minced no words: "need you to return to District ASAP for the hurricane fight upon us." According to plan, Major Navarre would assume command of the Memphis District while Smithers headed up the Louisiana Recovery Field Office (RFO). He immediately got a flight, while Smithers activated the emergency operations center (EOC). Contracting officer Jean Todd started lining up the pre-bid contractors they had in place for temporary roofing, debris removal, and other missions. On Monday, August 29, the EOC watched in amazement as news of the floodwall breaches came in. They knew it meant a huge unwatering fight ahead. On Tuesday, Smithers joined Brig. Gen. Robert Crear for an aerial reconnaissance of the region. There was stunned silence on the plane. It would be what Smithers later called "a disaster within a disaster."

On Wednesday, Smithers, Operations Chief Jack Hurdle, and their advanced party flew to Baton Rouge, where the mat-sinking quarterboats served as their floating operations center. Real estate personnel on site were already working on finding permanent facilities. The RFO immediately set about working the two fronts: flood fighting and response missions. FEMA had assigned additional tasks for ice and water delivery, emergency power, and debris removal by Friday, September 2, and contracting personnel were working on four multi-million dollar debris contracts. Their initial plan was to outline the first few days of the mission in detail. "We've learned if you could script the first seven days of the disaster, that every day you're going to do certain things, then by the time you get to day eight you can say, okay, we know where we are, we've got a good handle on the impact of the storm or the situation, and we can start refining our plan. We've had a very deliberate process of going through and determining what needed to be done for the first seven days," Smithers said.[85]

The Early Louisiana RFO Team with Maj. Vincent Navarre on the right poses for a picture in front of its headquarters in Baton Rouge, Louisiana.

removal by the end of the first year; these activities continued until September 2007. As with the Mississippi RFO, contract closeout would likely continue some 10 to 12 years – it had taken nearly 10 years after 1992's Hurricane Andrew to close out contracts and reconcile and verify bills and receipts.[84]

While the Corps was the lead agency for ESF-3, and these tasks formed the core of its mission, Task Force Hope directly supported FEMA on two other missions. Of these, the most complex, and the one most criticized, was the temporary housing mission that fell under ESF-6. Prior to the implementation of the NRP, the Corps traditionally had responsibility for the housing mission because of its obvious engineering content. Under the NRP, however, FEMA was the lead agency on housing. To manage this mission, FEMA had developed the concept of a Housing Area Command (HAC) based on lessons learned from the 2004 hurricane season. It was basically management by committee, with FEMA, the Corps, EPA, DOD, the Red Cross, and Housing and Urban Development (HUD) participating in the command. To support the mission, FEMA had pre-competed contracts, but issued additional contracts with Bechtel Corporation, Fluor Corporation, CH2M Hill, and Shaw Group on September 8, 2005, to implement temporary housing. The initial goal of FEMA was to get all evacuees into housing by mid-September, but as the estimated number of people needing housing grew from 30,000 to 42,000 in three states, it delayed this date to the end of October, then end of December, and finally end of March. The basic process entailed locating potential sites, which the Corps then assessed for suitability. These ranged from parks, playgrounds, and schools, to unused commercial lands or buildings. In many cases, cruise ships, hotels, trailer parks, apartment buildings, and federal housing provided the fastest route to get people out of shelters. An evaluation committee reviewed and chose the sites after consultation with local government on the best locations. Once the committee selected the site, FEMA committed funding and tasked the Corps with developing plans, which it approved. HAC would then manage construction, conduct inspections, and start occupancy. Throughout the process, HAC had to coordinate with EPA and the Corps on environmental issues, resolve location and distance issues with local government and commercial industry, and work to reduce costs, which continuously increased.[86]

The Corps received its first tasker to participate in the HAC strike teams on Tuesday, August 30, and within two weeks had more than 50 personnel supporting the mission (eventually cut to 16), with Col. Michael Pfenning of St. Paul District providing oversight. Immediately, the Corps' HAC team started coordinating with FEMA on the mission, but was largely outside the process. On September 9, HAC redirected cruise ships to Gulfport and Louisiana to meet immediate housing needs and started arranging hotel room rental. The same day 200 trailers arrived in Slidell, and another 1,500 arrived on September 10. The strike teams had identified more than 13,000 sites. By September 15, some 9,500 units were ready for delivery, and the Corps began to develop detailed project schedules and conduct environmental assessments. On September 17, the HAC had started renting spaces. However, by that point, the mission was already off track, running nearly 2,500 units behind schedule in Mississippi. For the most part, the Corps only reviewed designs and conducted environmental impact analysis of the projects, but FEMA led the strike teams to locate sites. By September 20, HAC had more than 14,000 sites ready, 8,000 of them on ships, but only 6,000 were in use. Most of these remained unused because of distances from work sites. "I'm continually amazed how unsynchronized and uncoordinated we are on the housing mission," Vesay observed on September 19. Crear agreed to review the problems with FEMA leadership.[87]

FEMA tried to make improvements to the program, such as moving HAC under the JFO, establishing an office in Gulfport, placing an LNO in the Corps RFO, and forming a new site selection committee. With 500 trailer sites ready, it decided to focus more on the smaller spaces. Still, the first trailer site did not begin construction until October 3 in Louisiana and October 4 in Mississippi. Construction was not complete on the first site until October 6. By October 11, FEMA had leased 2,917 spaces and delivered 9,508 units, of which only 5,219 had occupants. More than 20,000 required environmental impact evaluations. On October 12, to provide a fresh start FEMA reorganized HAC as the PFO Housing Group, brought in a lodging consultant, and on October 23 notified the Corps that it no longer needed its participation. FEMA would later request Corps quality assurance support to inspect some 10,000 housing units and would continue to involve small numbers of Corps personnel into 2007. Despite the changes that FEMA made, it would face consistent problems with the program. In particular, FEMA faced constant problems with low occupancy, which resulted in higher costs. At the end of September, FEMA housing had a 30 percent occupancy rate; by the end of October this rose to 78 percent, then to 90 percent, but it never improved much after this. Much of the problem was with the inconvenient locations, but some of it resulted from the units themselves. News reports complained that the trailers were cheaply constructed and leaky, the rules for those living in them strict, and the parks poorly managed. By August 2006, FEMA had delivered 36,000 trailers in Mississippi and 51,000 in Louisiana, although many more citizens still waited for their trailers. Once they occupied them, many families remained in them for more than a year. In November 2007, FEMA announced its intention to close all trailer parks by May 2008, gradually moving residents into other housing or working with the Department of Housing and Urban Development to help low-income families. Altogether, FEMA provided $12 million to the Mississippi RFO and more than $17 million to the Louisiana RFO to complete the mission.[88]

The other FEMA-led mission that the Corps supported was ESF-14, Long-Term Planning and Mitigation. This was a relatively new function under the NRP for helping local government and nongovernmental organizations plan long-term recovery programs. The FEMA team provides advice on the

FEMA led the housing mission, to which the RFOs contributed.

consequences of planned activities, helps coordinate the transition of responsibility from the federal government to local government for recovery activities, and identifies possible programs to apply for aid. Within this ESF, the Corps provides technical assistance and advice for community planning and transition of recovery activities, including regulatory advice and project studies as needed.

Starting on February 21, 2006, the Corps participated in a series of meetings with city and state officials in New Orleans to discuss potential projects. By March 20, however, the mission had more or less ended, although FEMA extended it until March 31, and then tasked the Corps to participate in the final meeting on April 4. Ultimately, the team decided to curtail the ESF-14 meetings because of overlap with ongoing efforts by the state of Louisiana and the Corps to develop a long-term plan that would address future projects related to recovery and protection, the Louisiana Coastal Protection and Restoration (LACPR) Plan. After the last meeting, the Corps officially deactivated the ESF-14 mission on April 4. The LACPR team, which started meeting in January 2006, would build on work conducted by previous coastal restoration programs, such as Coast 2050, to develop new programs and plans for restoring and protecting the coast. It included many similar approaches – such as dividing the coast into planning units based on watershed boundaries – and also some similar strategies and tactics. However, unlike previous efforts, it rolled new hurricane protection plans into an overarching scheme.

There was also an ESF-14 mission in Mississippi, but that mission fell to the Mobile District, which has responsibility for coastal Mississippi under normal conditions. Since the Mobile District reports to the South Atlantic Division of the Corps, its activities did not fall under the Mississippi Valley Division or Task Force Hope.[89]

FEMA started responding to Hurricane Katrina before it even arrived on the ground, and one of the primary agencies it tapped to respond was the Corps of Engineers, which started its mission and deployed its RFOs very early in the process. Like the rest of the federal government, FEMA received criticism for slow and ineffective response. Such blanket statements are only true to a degree. Certainly, FEMA personnel arrived late in some locations, and some programs proved ineffectively managed. One of these was the housing mission. "There is a disconnect," Mississippi ESF-3 Team Leader Frank Randon candidly admitted, between the demand and FEMA's ability to execute on the housing mission. Part of this was the result of changes to the agency following its consolidation into DHS and the late adoption of the NRP. Yet other programs were much more effective, including many of the missions that fell under ESF-3, Public Works and Engineering. It was in this area that Task Force Hope had the majority of its responsibilities under the NRP, and where it had to deliver to count the mission a success.[90]

6. Public Works and Engineering Support

As the lead agency for ESF-3 – Public Works and Engineering – the Corps of Engineers was responsible for distribution of ice and water, providing generators, installing temporary roofing, making emergency repairs, providing temporary public facilities, removing debris, and managing demolition of buildings. These missions were the mainstay of the Corps' support for the FEMA and were some of the longest-running missions that Task Force Hope performed. In Mississippi, the debris removal operations lasted until August 2006, while in Louisiana, the demolition and debris missions ended in September 2007. Although the unwatering and levee repair missions were perhaps the most noticed and best recognized of the missions the Corps performed, the ESF-3 missions touched the largest number of people and were critical to the federal government's immediate response to Hurricane Katrina and long-term recovery of the region.

The ice and water mission of the Corps was critically important during the first few weeks to help keep people alive. The Gulf coast saw record high temperatures that fall – overall, the U.S. experienced one of the top 10 hottest years on record in 2005. On Friday, August 26, and Saturday, August 27, two days before Hurricane Katrina made landfall, FEMA sent the first predeclaration mission taskers to the Corps of Engineers. The initial amount assigned to the taskers, $50,000 in Mississippi and $70,000 in Louisiana, enabled the Corps to start moving resources and begin executing contracts. Within the first week, the Corps received an additional $1.25 million in Mississippi and $2 million in Louisiana for delivery of ice, water, and meals-ready-to-eat (MREs). Because the vendors providing ice and water were located many miles away – the staging area for the ice vendor in Louisiana was in Dallas, Texas – at first the Corps relied mostly on stockpiles that existed at the Superdome, Camp Beauregard, and Barksdale Air Force Base (AFB), Louisiana; Camp Shelby and Meridian Naval Air Station, Mississippi; and Maxwell AFB, Alabama. In addition, National Guard units in New Orleans had stockpiled items at the Jackson Barracks and armories around the city, which they used as distribution centers. The National Guard played a crucial role in distributing supplies. FEMA initially executed contracts it had established long before the hurricane.

Once the Corps became involved, it focused on getting the supplies to staging areas or distribution points for the military or state and local government to further distribute. During the first critical days, limited supplies prestaged at the distribution centers and the destruction of some resources during the storm resulted in rationing at the Superdome and other locations. To get additional shipments, the RFOs had to coordinate with local government to put in orders with FEMA, which took additional time. Nevertheless, by Friday, September 2, the Corps had delivered 1.9 million MREs, 6.7 million liters of water, and 1.7 million pounds of ice. The next day, the Corps had delivered 13 million liters of water and ordered another 43 million. Already, it was starting to experience delays from contractors, which resulted in delays in meeting the demand. Further, FEMA had no mechanism to track the orders, so once trucks hit the road, there was no way to know where they were until they arrived, not always at the right location. It was a critical situation given the heat, and delays would result in increased heat casualties. The RFOs worked the phones to push the contractors. By September 7, the contractors started coming through, having delivered 500 trucks of ice and 700 trucks of water in Louisiana, 600 trucks of ice and 300 of water in Mississippi, and 135 trucks of ice and 300 of water in Alabama.[91]

Only a few days later, with a glut of deliveries and return of power to some areas, demand for ice and water started to decline, first in Louisiana and then in Mississippi, even as Task Force Hope missions for temporary roofing and debris removal started to ramp up. On September 9, the Louisiana RFO made its last water order, and in fact had to cancel some water orders on September 14. Likewise, the Mississippi RFO began to wrap up its ice and water mission on September 11. At that point, some two weeks after the hurricane, Task Force Hope had nearly doubled its deliveries from the previous week, having sent 1,225 trucks of ice and 1,221 of water in Louisiana, and 997 of ice and 424 of water in Mississippi. The RFOs had purchased more than $270 million of ice and water at that point. Finally, on September 20, Task Force Hope officially closed out its ice and water mission for Hurricane Katrina. Four days later, Hurricane Rita hit western Louisiana, prompting FEMA to task the Louisiana RFO with another ice and water mission. The RFO received another $2 million in taskers, started delivery, and ended the mission in January 2006. The total amount delivered was 170 million pounds of ice, 88 million liters of water, and 8.1 million MREs. A total of 5,500 trucks of water made deliveries, which would stretch roughly 107 miles if placed end to end.[92]

Although the mission was successful in the end, the first week of delays earned FEMA and the Corps some criticism. Initial shortages and rationing were the result of insufficient stockpiles to last until deliveries picked up. Contributing to the shortages was damage to distribution centers and predictions about the amount of commodities needed. FEMA had predicted amounts it needed to stockpile based on historical demand and modeling of demand by the Corps. FEMA found both methods to be imprecise; historical demand tended to be too high, while modeling consistently showed fewer commodities needed. As a result, FEMA was unable to say how many people their stockpiles would support or for how long. Later, the problem was with delivery, to which several problems contributed. According to DHS, one JFO received less than half of the ice and water requested, while in Louisiana there was an excess of ice. It took several days for Task Force Hope to receive new orders due to bureaucracy – local agencies made requests to the state, which contacted FEMA, which then tasked the Corps. Field personnel could not order directly based on needs on the ground, and centralized ordering caused a bottleneck. Several of the deliveries ran more than a day late, and two ran more than a week late. Further, because contractors sometimes used more than six assigned tracking numbers that did not provide an exact location, there was no accountability of the orders: it was

Task Force Hope coordinated thousands of trucks delivering ice and water, which local agencies then distributed.

very difficult to determine shipment amounts or predict delivery time. Despite these hiccups and the constraints of the tracking system, Task Force Hope was able to complete most deliveries in a timely manner until cooler weather prevailed and demand decreased.[93]

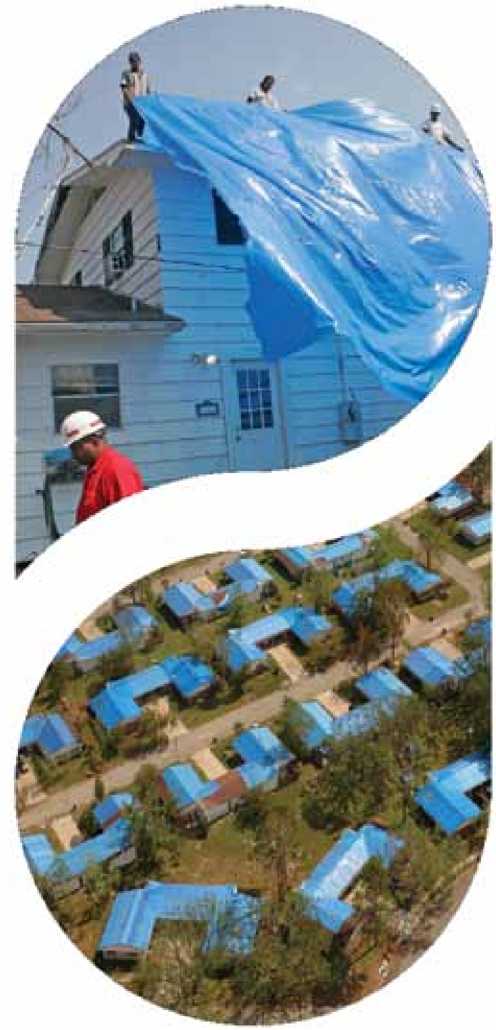
Another short-lived mission with a large impact was providing temporary power. Although some areas regained power within a week, power was out in 72 percent of New Orleans for more than a month and parts of Mississippi for 17 days. Most locations saw power restoration inconsistent. This had a huge impact on the ability of local government to respond because of limitations on back up generators at facilities such as cell phone towers, police headquarters, and emergency dispatchers. The Corps received its initial tasker from FEMA to provide power on Friday, August 26, and Saturday, August 27, for $150,000 and $300,000 in Mississippi and Louisiana respectively, plus another $10 million and $25 million the first week.

According to the Mississippi Valley Division CONPLAN, the 249th Engineer Battalion (Prime Power) out of Fort Belvoir, Virginia, was responsible for power missions. Supported by lead technician Chief Warrant Officer Thomas Black, the 249th responded immediately. Once the RFO received requests for generators, the 249th team would conduct assessments and install

Chief Warrant Officer Thomas Black, the lead technician on the emergency power team, installed hundreds of generators and helped solve power issues throughout the impact area.

generators provided by FEMA, the Army, and the Department of Energy. By the end of the first week, the 249th had completed 47 of 89 requested assessments and had installed 25 generators, including the first three at Camp Shelby, Mississippi. By September 9, the teams had conducted 178 of 223 requested assessments and installed 49 generators in Louisiana, and completed 259 of 357 requested assessments and installed 57 in Mississippi, eventually reaching a maximum of 82 installed in Louisiana and 72 in Mississippi. With power restored in many areas after September 12, the 249th started to uninstall generators in Mississippi, while outlying areas in Louisiana, such as Shreveport, received their first generators on September 23. At that time, Louisiana still had 815 power requests pending. After Hurricane Rita, the Louisiana RFO received 49 new requests in western Louisiana and installed the first generator in Lake Charles on September 30. The mission gradually closed out as power was restored. After Hurricane Wilma struck Florida, FEMA requested generators, and Task Force Hope delivered 175 by October 30. However, more than 36 generators remained installed in Louisiana as late as November 18. The RFO turned in the last of the generators by March 14, 2006. Altogether, Task Force Hope had conducted 1,337 assessments and installed 307 generators across the impact area.[94]

One of the more successful of the ESF-3 missions was Operation Blue Roof, the temporary roofing mission. The Corps and FEMA had developed the concept of plastic roofing after Hurricane Andrew. Essentially, contractors nailed plastic tarps on damaged roofs to prevent additional water damage. Because the plastic was blue, the Corps called them "blue roofs." The roofs provided a temporary measure to make houses livable for a month or so until the owner could make permanent repairs. Although designed to last at least one month, in fact, many of the roofs installed after Hurricane Katrina lasted up to six months, largely due to the dry conditions in the spring. In other cases, they did not last long enough for the owners to make permanent repairs, which sometimes took several months, and the owners had to request replacement blue roofs. Home owners had to request a temporary roof and sign a right-of-entry form that permitted the contractors to enter the property to install the roof, and then the Corps would assign a contractor to install the roof, which quality assurance supervisors inspected. After receiving the predeclaration tasker from FEMA on August 26 and August 27, the Corps received an additional $185 million in funds in both Mississippi and Louisiana for the Blue Roof mission that same week. For the first week, Task Force Hope worked on bringing a contractor on board and ordering supplies. On September 3, the Corps awarded the first contract to KBR, initially for 3,000 roofs, with a second contract awarded the following day. However, the tarps ordered still had not arrived, so the RFOs concentrated on collecting rights of entry, and had 545 within 48 hours. On September 6, more than 1,000 trucks delivered some 10 million tarps in Mississippi, and another 10 million arrived in Louisiana on September 8. By September 10, KBR subcontractors had installed the first



Installing "blue roofs," the blue plastic tarps that FEMA and the Corps used as roof covers, was one of the more hazardous duties for Task Force Hope contractors.

8. Working Task Force Hope

Personnel working Task Force Hope in the Recovery Field Offices (RFOs) rotated through over a period of months, usually working four to six weeks, with some working multiple deployments in a row. In Mississippi, the RFO was at Keesler Air Force Base. It put most people up in warehouses or barracks with three to four people to a room, but some had to sleep in their cars. Later, the base moved some people to officer housing. In Louisiana, the RFO put most people up in hotels or in a tent. There were many working in the RFOs or emergency operations centers that slept in the same building they worked in, finding a corner somewhere. Others stayed on quarter boats or other vessels on the river. Wherever they stayed, most of the time they only saw their quarters for five to eight hours a night. Work started at 5:30 a.m. for those preparing data for leader calls. For everyone else, it started at 6:30 or 7:00. Many worked until after midnight every night until October or November, when quitting time gradually scaled back until around nine or 10. The first people who arrived came with only the shirts on their backs and did not get replacement clothes until later. They often lacked facilities to wash clothes, and rarely had the time. In many locations, no power and only cold food greeted them. Later, conditions improved considerably.

Each day, personnel joined teams working roofing, debris, temporary structures, or other areas. Management would first collect data for daily briefings and help put out fires. Based on numbers coming in to the RFOs, they would determine manpower needs, when to enter a new county or parish, the severity of damage, or which road needed clearing. Some roofing personnel went to local communities to set up a right of entry sign up center and spent the day helping people fill out forms allowing contractors to enter their homes. Others coordinated with local government on what roads were priorities or where they

Some members of the Louisiana RFO initially stayed in tents such as this.

most needed public structures. Resident engineers worked on location with contractors actually installing roofs, removing debris, or building structures. Construction representatives measured the amount of debris, counted the number of roofs installed, the number of trucks filled, and the number of housing units installed, since contractors received payment based on these numbers. There were thousands of truckloads of materials moving at any given moment requiring constant supervision. The reps also checked on safety procedures. Quality assurance personnel monitored workers to ensure proper use of materials, separation of debris materials, and that contractors followed rules established by FEMA, the EPA, or other agencies. They worked from day to day, often having to start over in a new area the next day.[96]

roofs, and quickly surpassed 100 in both Mississippi and Louisiana. By September 14, subcontractors had installed 1,372 in Mississippi and 759 in Louisiana, and had expanded to include the communities of Gautier, Hattiesburg, Bay St. Louis, and Camp Shelby. Two right of entry collection centers opened in Mississippi and another in Lake Charles on September 28 following Hurricane Rita. They quickly collected more than 22,000 rights of entry in Louisiana and 25,000 in Mississippi. The new revised estimate was that the Corps needed more than 4.7 million tarps. By the end of September, installed roofs had reached 17,600 in Louisiana and 12,000 in Mississippi.[96]

In early October, it appeared that the Mississippi Blue Roof mission would end sometime in mid-November, which FEMA extended until the end of the month. However, Louisiana still required some 40,000 roofs, particularly in western Louisiana following Hurricane Rita. The Louisiana RFO installed the first of these on October 4. Finally, on October 5, the RFO established a right of way collection center in New Orleans and started working the city. The teams collected 85,000 altogether for the state, and by early November had 70 percent installed. In Mississippi, subcontractors had installed 26,000 of 48,000 roofs by October 10, and new requests had slowed considerably, causing FEMA to close the collection centers on November 11. In Louisiana, all collection centers closed on November 17 except those in Orleans, St. Bernard, and Plaquemines parishes, where collection would continue through the end of January. At times, this duty turned hazardous, as did many Corps missions, when New Orleans residents threatened right of entry center personnel on January 8. Task Force Hope completed the roofing mission for Hurricane Rita on December 8, the Mississippi roofing mission on February 2, and the Louisiana mission on February 19. On March 10, Task Force Hope officially closed out the Blue Roof mission. Altogether, contractors had installed 81,318 roofs in Louisiana and 47,976 in Mississippi. The team also set a record of installing 1,750 roofs in a single day. Although extended due to the extraordinary number of residents wanting the temporary roofing, the mission went well overall. The biggest complaint was the amount paid to roofing prime contractors, versus the amount paid to subcontractors or smaller contractors. The Corps would pay the prime contractor one amount, and the prime would pay a portion of this to subcontractors, who then paid their subcontractors, with each tier getting less money until bottom-tier subs four or five levels below received far less than the amount paid to the prime. Others argued that the amount paid per roof was excessive. One contractor in Alabama said he could have installed roofs for $1,000 each versus the $3,000 paid to the prime contractor in Mississippi, while outside observers noted that for this amount a contractor could install an asphalt shingle roof. The Corps defended these contracts arguing that some overhead was justified because larger contractors had to manage larger areas and more subcontractors, had greater responsibility, and were often the only companies that could quickly pull together the number of teams needed to perform the work. Nevertheless, complaints of price gouging continued throughout the operations.[97]

One of the more unique missions Task Force Hope supported was construction of a facility for the Disaster Mortuary Operational Response Team (DMORT). This was a team assigned by FEMA to handle the dead following disasters, according to the National Response Plan. Within days of the storm, Mayor Nagin had predicted that there were 10,000 dead. The number turned out to be significantly less than that, but still enough to warrant FEMA believing that a DMORT mission could last two years. On September 3, FEMA tasked the Corps to build a temporary mortuary facility and provided $31 million in funds. Task Force Hope representatives met with FEMA on September 8, and based on its input, started the site selection process. The final site selected was in St. Gabriel in Iberville Parish, far enough outside the city that other recovery efforts would not affect it. The facility would be more than 18,000 square feet with six living areas to house more than 300 people and two work facilities, including refrigeration units. FEMA suspended a second DMORT site originally part of the plan on September 17. By September 16, the Corps contractor, KBR, had installed a fence, and the Corps delivered generators for power at the facility a few days later. Construction started in earnest on September 22, only to pause the next day because of Hurricane Rita dumping nine inches of rain. Construction resumed on September 26 with a planned completion date of October 23. By October 2, KBR was already behind schedule on the larger of the two work facilities. Corps representatives met with KBR on October 19 to try to get the project back on schedule, but received a commitment only that the company would complete the dormitories by November 7.

The Corps built a large mortuary facility and housing for the DMORT team, the group FEMA assigned with handling deceased storm victims.

By October 28, KBR delayed the project once again, leading the Corps to reevaluate the mission. Nevertheless, the project got back on track, the facility was complete on November 28, and the DMORT crew immediately started moving in. The facility opened on December 2, and once KBR completed making final repairs, the Corps turned the facility over to FEMA on December 18.[98]

Another successful mission was the repair and construction of critical public facilities, which FEMA funded at $100 million in Mississippi and $200 million in Louisiana on September 8. In this mission, Task Force Hope managed repair of critical public structures if repairable or provided temporary structures to use as a replacement, typically using mobile trailers. Of the former activity, for example, the Corps assigned 60 personnel to help repair the roof of the federal building in downtown New Orleans. Since this building housed the U.S. Mint facility and required high security – Department of Treasury agents had deployed to the region to guard the facility – it was critical to make the repairs as quickly as possible. Another critical facility mission involved helping to repair wastewater treatment plants, which were particularly critical for recovery of the region. Many of the treatment plants had pumps or filters damaged by the saltwater from the storm surge. After FEMA provided it with $20 million in funds on September 7, the Mississippi RFO made the first assessment of one of the plants on September 12, and the following day had four teams in the field. By September 17, the RFO had identified 46 sites, conducted 34 assessments, and restored three plants to operation. Several of these facilities had damaged motors, so the Corps ordered replacements, which it received on October 8 and started to install. In the majority of cases, however, repair of public facilities was not possible, not desired, or not critical for recovery. In these cases, the critical public facilities team worked with contractors to design and build temporary replacement facilities – schools, offices, fire departments, police departments, and medical facilities. By September 14, more than 800 agencies had submitted requests. In Louisiana, Task Force Hope spent $50 million on public critical structure activities, the rest of the funds being de-obligated on September 12, 2006. In Mississippi, the final mission amounted to more than $100 million.[99]

Task Force Hope made quick progress in delivering the temporary facilities. By September 20, the team had completed 17 site assessments and installed its first fire department on September 22, but had to shut down operations until after Hurricane Rita. By early October, the Corps had received requests for 428 school buildings and 194 office buildings in Mississippi. By October 18, the team had delivered 104 facilities and completed installation of another 64 in Mississippi, while the Louisiana RFO had completed 10 and had another 16 on the way. Of the 720 facilities requested as of November 2, the RFOs had turned over 209 and delivered 453. Some of the facilities were very large. For example, the Louisiana RFO built a replacement hospital in St. Bernard Parish. The RFO ordered 30 trailers on September 24, delivered the first of the facilities on October 14, and completed construction on January 22, 2006.

In another case, the RFO helped to construct temporary classrooms for the University of New Orleans in time for use in the spring semester. After receiving the mission on November 22, it delivered the first 19 structures on January 29, and turned over the facility on February 21. On November 16, the Mississippi RFO had 10 structures remaining to complete, but the Louisiana public facilities mission was picking up. The Louisiana RFO installed 11 schools by January 11, and had completed 137 of 303 structures by February 7. On February 14, the Mississippi RFO completed the last structure, while the Louisiana mission continued through August 2006. The RFOs completed 310 structures in Louisiana and 726 in Mississippi. Despite this seeming success, this program, too, fell to complaints of perceived contracting irregularity. On September 18, the Corps awarded a $39 million sole-source contract for school facilities to an Alaskan Native Corporation, Akima Site Operations LLC. As a minority-owned 8(a) business with specific experience building structures for the Army, Akima qualified for sole-source awards, a frequent practice in U.S. government contracting to aid small business. Nevertheless, complaints arose in the media in October and again in November with a Yazoo City, Mississippi, contractor crying foul that Akima was overcharging. This led to a GAO investigation and report in April 2006, which found some evidence that higher prices did not result from any specific costs accrued. For its part, Akima noted that the contract had considerable risk related to expedited delivery. Ultimately, the company appealed to the success of the contract, the fast (19-day) turn around on the first units, and the satisfaction of the schools: “It was a very successful contract. Mississippi kids got back in school and we saved their school year,” said Akima CEO John Wood.[100]

The longest-lasting recovery mission for Task Force Hope was debris removal. The Corps received the initial taskers from FEMA on August 26 and August 27 for $50,000, and had received another $1.5 million in Louisiana on Monday, August 29. Mississippi received a total of $955 million. Initial estimates following the storm were for 55 million cubic yards (mcy) and another 50 mcy in Mississippi, and that it could take five years or more to clear this enormous amount of debris. As a result, FEMA approved an additional $1.5 million for Louisiana by Friday, September 2, for debris removal. Eventually, the estimates went down for Louisiana as some parishes decided to use

Task Force Hope helped to install and dedicate many temporary classrooms, earning highly visible recognition for community support.

private contractors, but increased again to around 50 mcy when FEMA added more debris categories, such as private debris and demolition. The RFOs had contacted 80 percent of parishes and counties by September 4 about starting clearing, focusing initially on removing debris from rights of way such as roads and waterways. Contractors started moving debris in Louisiana on September 7 and in Mississippi on September 9. Clean up after Hurricane Rita would not start in Terrebonne Parish until October 4. Because of the enormous amount of debris, Task Force Hope competed and let four $500 million contracts on September 15 to Ashbritt Inc., Ceres Environmental Services Inc., Environmental Chemical Corporation, and Phillips and Jordan Inc. Because of their size, amounts, and number of sub-contractors, these contracts were very controversial, but they nevertheless helped the debris removal program move quickly along – by the end of September, the contractors had removed 1.1 mcy of debris in Louisiana and 3.2 mcy in Mississippi.

By the end of October, the numbers had reached 7 mcy in Louisiana and 8.3 mcy in Mississippi. Despite these volumes, clearing the main thoroughfares was slow going, and some local government agencies complained of the slow pace in clearing waterways and streets, prompting FEMA to send a letter to the Corps on October 26. As a result, in November the Corps set a deadline of the end of December to complete clearance of rights of way in Mississippi. By early January, the Mississippi debris mission was 60 percent complete and 35 percent complete along the coast, and the Louisiana mission was 63 percent complete.[101]

Although it appeared simple, the removal of debris was complicated. To maintain environmental safety, contractors had to follow complex rules on separating wood, appliances, chemicals, asbestos, and even guns. Disposal was different for each type of item based on the guidance of EPA and state and local agencies, such as the Louisiana Department of Environmental Quality (LADEQ). In particular, disposal of asbestos became a serious problem once demolition of houses began. Quality assurance (QA) personnel closely monitored removal and shipment to ensure proper separation, verify amounts removed, and reduce fraud. The process was not entirely clear. In October, FEMA tried changing the rules for QAs by having them inspect and

The amount of debris resulting from Katrina and Rita was immense – more than 100 million cubic yards total – towering over roads and blocking rights of way.

tag debris when loaded rather than when removed, but this reduced the pace of the mission by 30 percent. After discussing the issue with FEMA, the Mississippi RFO worked out the process. There were also long-standing problems with QA shortages, resulting in a few instances of fraud. Corps auditors uncovered cases of double payments and inflated billings, which, despite critical media reports, were "exactly what I asked our auditors to find," Director of Civil Works Maj. Gen. Don Riley said. Between QA issues, contract payment issues, and returning populations that started moving debris around, delays became inevitable, causing a series of complaints. There was also occasional resistance to signing up for the program. Initially, the federal government paid for debris removal in rights of way with a plan to gradually increase local payments to 10 percent. However, because of the exorbitant cost of debris removal, local government agencies frequently complained about their lack of ability to pay, and FEMA extended the deadline for starting local payment to the end of the year and eventually to the end of July 2006. This became even more complicated once local governments learned that the Corps paid its contractors considerably more than smaller contractors charged. Several parishes or counties chose to hire their own contractors to remove debris and seek government reimbursement. This led to debates over how much FEMA was willing to reimburse. Initial guidance in October was full reimbursement for 60 days and 75 percent reimbursement thereafter, but FEMA eventually extended this deadline to January 15 and lowered the local share to 10 percent. FEMA and the Corps met with local government agencies to try to allay concerns and point out benefits of having Corps contractors remove the debris, which led to some parishes complaining of coercion. In March, one parish – Plaquemines – sued to gain access to contractor costs to make a full determination as to whether to accept the Corps work or hire its own contractor.[103]

As with many of the other FEMA mission areas, a number of complaints arose related to the subcontracting process on debris removal and the amounts charged. The Corps competitively awarded four large contracts valued at $2 billion to Ashbritt, Ceres, Environmental Chemical, and Phillips and Jordan. The initial objection was that there were too few local contractors working on the debris removal teams. Although there were no local businesses available when the Corps let the contract in

September, by November, many local businesses had returned and resented out-of-state companies getting such a large share of work. At that time, only 60 percent of the subcontractors working for the primes were local, but the Corps worked with the primes to increase this to 71 percent, although the amount of money going to local companies was only about 35 percent of the total. As with the blue roofs, some contractors grumbled about the fees paid to the primes versus the subcontractors, which ranged from $15 to $30 per cubic yard of debris for prime contractors to $4 or $5 paid to the one- and two-man teams at the bottom tier of subcontractors. For its part, the Corps argued that the original contracts were emergency measures to start the mission, that it lacked the resources to manage hundreds of small contractors effectively, and that most of these subcontractors lacked the resources and equipment to perform the work correctly or manage such a large area, not to mention dealing with occasional hazards such as violence directed toward work crews. This was why the larger companies received more overhead. Despite this argument, the Corps worked to increase local contractor involvement and required a significant percentage of subcontractors be local, just as they might require a percentage be small or disadvantaged businesses. In March, the Corps awarded a $150 million debris contract to Necaise Brothers Construction of Gulfport, Mississippi, stipulating in the request for proposal that only a local company could qualify. In April 2006, Ashbritt and several other companies filed a protest arguing that the contract overlapped with theirs and that it was illegal to limit the contract only to local companies. This effectively terminated the contract.[104]

Further complicating the removal of debris was access to sites and the availability of landfills, particularly in the New Orleans area. Because the urban environment and close proximity to wetlands limited access to some sites, there were very few locations to dispose of debris within easy driving distance. To speed the debris removal process, on October 30 the city reopened the Gentilly Landfill, which had closed years previously after EPA identified it as a hazardous waste site. The Sierra Club and Louisiana Environmental Action Network (LEAN) filed a suit to prevent its reopening, but operations at the landfill proceeded until complaints in February about potential hazardous leakage from the old landfill led the LADEQ and EPA to inspect the site. Both declared it safe, but questioned whether the amounts

To handle the large amount of debris in the New Orleans area, the city reopened the aging Gentilly Landfill against the protests of Louisiana Environmental Action Network and other environmental groups.

of debris exceeded height and weight limits. The LADEQ later ruled debris piles as high as 130 feet were acceptable, but Corps standards limited them to 25 feet. In February, heights were only around 20 feet. FEMA tried at first to limit debris disposal there to 5,000 cubic yards per day, although it quickly increased this to 12,000 cubic yards per day. On February 17, the EPA notified the Corps that grinding unsorted debris at the Empire Pit Landfill might be releasing asbestos, and the Corps quickly shut down that landfill, diverting loads to other landfills. After receiving new rules for handling the debris from EPA a week later, operations proceeded.[105]

Also in February, Mayor Nagin suspended zoning laws to allow a new landfill on Highway 90 near the Bayou Sauvage National Wildlife Preserve. The LADEQ approved the Chef Menteur Landfill for 6.5 mcy of debris, and the city scheduled to open it on April 26. However, a suit filed by Louisiana Environmental Action Network triggered an injunction against using it, which it largely based on a thousand Vietnamese-American families living in apartments two miles from the site. Once the court removed the injunction on May 2, operation of the landfill proceeded. Although the LADEQ confirmed on May 8 that the site contained "nothing toxic, nothing hazardous," political pressure led the Mayor to suspend operations to test the soil, which the owner refused to allow. On June 6, the

Fish and Wildlife Service (FWS) requested the addition of a liner under the landfill and vegetation on the preserve side to block the view, but LADEQ rejected these changes as unnecessary, noting that the FWS had approved a landfill on the site in 1993. Louisiana Environmental Action Network then lobbied the Corps to start nighttime pickup, which would allow contractors more time to transport debris to other landfills, but the Corps rejected this idea because of the increased costs in having contractors work around the clock. However, Corps spokesman Kenneth Ashworth said it would reevaluate the decision "when private property debris removal and demolition operations shift into high gear." [106]

Initially, FEMA limited collection of some commercial debris and did not allow removal of private property debris or dead trees, but as the debris mission expanded, all would eventually fall under the debris removal mission. Task Force Hope first received permission to remove debris from private property on October 9, 2005. However, the mission had a lot of questions – which debris could they remove; did it require right of entry

Contractors had to separate debris so the landfills could properly dispose of debris through grinding or burning.

permission; and what was the process? The Corps worked with FEMA over the next few weeks to define the rules, and then finally started what became known as private property debris removal (PPDR). It was, in many ways, similar to trash collection, as contractors removed debris but not personal property from private dwellings. The Mississippi RFO made quick progress on PPDR, passing 55 percent completion by March 28, 2006. The Louisiana RFO took longer, reaching 90 percent completion by September 2006. In New Orleans, FEMA also tasked the Corps to help with trash pickup. This mission continued until February 20, when the city agreed to take over public waste disposal. Altogether, Task Force Hope removed more than 120 million pounds of trash. Some removal of commercial debris was also not originally part of the mission. The Corps had received permission to include cars and boats in Mississippi on October 13, while New Orleans approved collection of commercial debris on July 13, 2006. In Mississippi, the Corps participated in a mission to remove stranded boats in Hancock County. After planning the mission on April 18, the Corps proceeded with the work and made significant progress by May 16. Another addition to the missions was the removal of dead, standing trees. At first, FEMA only allowed removal of fallen trees, but with trees stripped of all leaves and with heavily salinated soil, many trees died over the weeks that followed, yet remained standing. Noticing that many of the dead trees stood near temporary housing and would represent a hazard in the upcoming hurricane season, Mike Park, the director of the Louisiana RFO, brought the issue to FEMA's attention. The Corps then received permission to remove the trees, but only in rights of way, starting on July 18 in Mississippi and July 26 in Louisiana. The RFOs started evaluation of the trees on August 1. In Louisiana, the RFO received permission to remove trees on private property on September 19. A protest of the Corps-awarded contract delayed the start of removal in early November, but with the protest withdrawn on November 14, tree removal started forthwith.[107]

Although debris removal faced considerable challenges and changes over time, by the spring of 2006, Corps contractors had made considerable progress. By March 21, the Mississippi RFO had removed 80 percent of debris, while the Louisiana RFO had removed 70 percent of Katrina debris and 90 percent of Rita debris by early April. Within Louisiana, the New

Orleans area consistently ran behind the rest of the state, having reached 60 percent on April 4. By that time, Mississippi was 96 percent complete. By the end of May, the Louisiana RFO had completed its mission except for New Orleans and Slidell. The Mississippi RFO had completed all assigned debris removal in Hancock County, the worst hit, and actually held a completion ceremony on June 13, 2006. The same day, however, residents started complaining that more than 300 properties still had debris that they had not been able to haul to the road. FEMA agreed to extend the mission to the end of August, and it tasked the Corps with the new missions on June 21. The debris contractors made their final passes in Waveland, Bay St. Louis, and the county on August 18, 22 and 23, respectively. Although some debris remained, FEMA turned the mission over to the local government and the debris removal mission ended in Mississippi on August 31, 2006. In total, the RFO had managed the removal of 21 mcy of debris. In Louisiana, debris removal around New Orleans continued, with a closeout date of September 30, 2007.[108]

Of the debris missions the Corps supported, the most unusual was the removal and disposal of some very putrid debris – millions pounds of rotten meat. One of the leading industries in the Port of New Orleans was frozen meat products, and the port included a large cold storage facility, Jordan Cold Storage. When the power went out, the meat quickly went bad. On September 14, FEMA assigned the Corps the task of getting rid of the millions of pounds of thawed, rotting meat. Initial estimates from the Corps were that it would take 90 to 100 days, in part because of the health issues concerned. By September 17, the Louisiana RFO had people on the ground, completed a safety plan, started work on September 22, paused during Hurricane Rita, and started work in earnest on September 25. By September 30, the team had disposed of 367 tons; the mission was 15 percent complete by October 8, 65 percent by October 28, and 70 percent by the end of the month. FEMA added three additional sites, one in October and two in November. The Corps completed the first additional site of 700,000 pounds by the end of October. It completed the remaining sites, including the Jordan Storage site by December 16. Altogether, it removed and destroyed 36 million pounds of meat.[109]

One other major mission area that Task Force Hope supported was the demolition of buildings, which turned out to be one of the most complicated and sensitive missions, as one might imagine with destroying the personal property of residents. The Corps received the tasker from FEMA on October 9. It estimated the number of structures requiring demolition at anywhere from 30,000 to 50,000 houses, more than a quarter of them in New Orleans. Before proceeding, the Corps had to determine the precise size of the mission, so the first step was to perform surveys of houses to determine damage. The Corps contracted Shaw Group to provide inspectors and, although there were some initial hiring glitches, the inspectors quickly surveyed 30,000 houses and marked them with tags. Red-tagged houses had severe damage or were in imminent danger of collapse, making them prime candidates for demolition; yellow-tagged houses required repairs but were structurally stable, and green tags meant no damage. About 5,500 houses were red, and 7,000 houses were yellow. FEMA initially identified 2,500 for demolition. Between the inspection and demolition, the process often took months. First, the contractor had to get permission from the owner to destroy the residence and file paperwork with the proper authorities. This included inquiries about whether the home was a historic place, which could take 90 to 110 days. If the owner did not respond after a length of time or was known to be deceased, the city could make the decision. In many cases, they required further inspection. Once a residence was approved, the contractor had to shut down the utilities, which could also take several weeks. After demolishing the home, the contractor had to haul away the debris. The Louisiana RFO had been in discussions with Plaquemines Parish to start demolition there as early as November, but without full federal funding, the parish started working demolition with its own contractor. The RFO started talking to Cameron Parish in December. Although New Orleans had also planned on starting demolitions in December, residents opposing demolition filed a lawsuit, and the city delayed the mission until after the hearing on January 6 and then until after an additional hearing scheduled for January 19. Meanwhile in Mississippi, demolition started on January 10 as Ashbritt tore down the first two houses.[110]

Demolition of private homes in New Orleans was a very sensitive mission that Task Force Hope performed in cooperation with local government.

On January 17, New Orleans and resident groups came to a settlement, which the judge approved. According to rules they adopted, the city had to provide a 30-day notice to residents, or a 10-day notice in case of extremely hazardous structures, which numbered 123 altogether. The Corps proceeded to demolish its first house in Plaquemines Parish the same day. Soon after, EPA expressed concern about the proper removal of asbestos prior to demolition, but there were differing interpretations of federal regulations by EPA, the LADEQ, and the Corps. There was, nevertheless, a strong spirit of collaboration to establish sustainable protocols to protect human health and the environment. The EPA resolved the issue with a final ruling within days, and work proceeded. By February 14, the Louisiana RFO had demolished 42 homes, while the Mississippi RFO had demolished 534, with a goal of demolishing 50 per day. On March 7, the Louisiana RFO began removal of debris from demolition sites, while a week later the Mississippi RFO had completed demolition of 1,500 out of 5,400 structures. On March 16, the Corps made final arrangements to start demolitions in Slidell and by the end of the month had started demolitions in New Orleans. The Louisiana RFO started demolition in Vermillion Parish on April 25 and Calcasieu Parish on May 9. By May 2, 86 percent of Mississippi demolitions were complete and five percent of Louisiana demolitions. Mississippi completed demolition and debris removal by August 2006, but the Louisiana RFO would continue to demolish houses for several months, largely due to delays in local government developing and approving plans of action. On February 13, 2007, the mission was 91 percent complete, and completion of the mission was on September 30. At that time, more than 1,800 homes remained that required bulldozing. "It's just time … that the city should

During its final year, the RFO was headquartered in the New Orleans Federal Reserve Bank Building. Mike Park (standing second from right) looks on while the RFO team meets with Brig. Gen. Crear.

step up," RFO director Mike Park, said. The city would be responsible for any remaining debris using funds provided by or reimbursed by FEMA.[111]

The Mississippi RFO closed in September 2006. Open for nearly a year longer, the Louisiana RFO was highly active until its doors closed. In February 2007, the RFO and FEMA supported a volunteer gutting effort, in which college students tore out walls from eligible houses. In March, after months of debate, the city of New Orleans passed an ordinance allowing it to demolish or remediate properties that it deemed a health threat. Further, there were many buildings in danger of imminent collapse. As a result, demolition work continued throughout the summer. On March 31, the state ended a tire recycling program, in which the Corps picked up 259,000 rubber tires and delivered them to Colt Incorporated at Scott, Louisiana. The majority came from Orleans Parish. By the end of May, only four of the 13 parishes impacted by Katrina still required debris removal support: Jefferson, Orleans, St. Bernard and Plaquemines. The RFO ended debris pick up in Orleans Parish at the end of May, Plaquemines at the end of June, and St. Bernard at the end of July. Other debris missions continued for months, including removal of demolition debris and dead trees. In August, the RFO issued $10.4 million in contracts for the removal of debris and dead trees from private property in Jefferson Parish, an area that had received less public attention because it received less flooding. There was, however, significant wind damage to many houses. Corps contractors received an "eleventh hour" right-of-entry order to allow removal of dangerous trees and other private property debris without individual approval. Another contract for $10 million went for the deconstruction and salvage of historic structures in New Orleans. Altogether, the RFO removed more than 13 million cubic yards of debris, including debris from 64,000 properties, 71,000 trees, and 259,000 tires. It demolished 7,000 houses, of which roughly 4,000 were in New Orleans. This effectively ended the Corps' FEMA mission in Louisiana.[112]

Task Force Hope was born out of a desire to bring hope to the ravaged Gulf region following hurricanes Katrina and Rita. Although the Corps of Engineers reacted according to its plan, the response necessitated innovation, perseverance and an ability to work through the intricacies of regulatory and contracting requirements in order to get the job done. Central to this response was the mission for FEMA. While other missions achieved greater notoriety, the FEMA missions formed the underpinning of the response. The ESF-3 missions were what allowed the Corps to reach the communities at large, through distribution of needed goods, through temporary roofing and facilities, and through debris removal. The Corps slowly but surely worked in the background to help communities get back on their feet even as controversy swirled around the Corps in the national media. This is not to say that the FEMA missions were without their own controversy. There were the unavoidable complaints that emergency contracts were wasteful and favored the large government contractors and that emergency measures were not sensitive to the precarious Louisiana environment. Yet even as Task Force Hope moved its FEMA missions forward, the most critical need for the City of New Orleans was the unwatering mission. Without this, no recovery could begin in the region. This is what Brig. Gen. Crear called "our most strategically significant potential mission." [113]

Part II. Task Force Unwatering and the New Orleans Flood Fight

On Friday, September 2, Brig. Gen. Robert Crear, the commander of the Mississippi Valley Division; Col. Richard Wagenaar of the New Orleans District; and Col. Lewis Setliff of St. Louis District were e-mailing back and forth, discussing the need for a team dedicated to unwatering New Orleans.[114] Col. Duane Gapinski of Rock Island District, who was monitoring the situation while on a trip to New York, commented on his availability. A few days later, he received the call from Crear ordering him to take charge of Task Force Unwatering. On returning to Rock Island to prepare for the mission, he sat down with his civilian deputy, Gary Loss, and chief of engineering, Denny Lundberg. Loss and Lundberg had both worked the long floodfight during the Midwest Flood of 1993 and understood the gravity of the task. Loss commented that the Flood of '93 was "kid's play" compared to the situation in New Orleans. Gapinski and Lundberg left the next day for New Orleans.[115]

Loss had summarized the challenge of the flood fight before them. The situation in New Orleans was dire. There were enormous breaches in the floodwalls and levees protecting the city, letting water in to fill New Orleans, large areas of which lay below sea level. The volume of water was immense. Many of the dozens of pumps in the 22 major pump stations in the city were not functioning, and some were underwater, which meant that salt water had probably destroyed their motors. No one knew exactly since they still had not received a status report on all pumps. Although the Federal Emergency Management Agency (FEMA) had evacuated the majority of residents by that time, there was still an urgency to start recovery operations. Power was still out in the majority of the city, some residents had refused to leave, and there were serious security issues – particularly at the unsecure U.S. Mint and at critical defense industries such as Air Products Inc. Most importantly, the city government remained paralyzed because so much of the city was underwater, and the nation was focused on the plight of the city. Until the Corps could unwater New Orleans, recovery could not proceed. It was critical to get the water out as soon as possible. To ensure that the mission received the attention it needed, Crear established Task Force Unwatering, which would address the initial temporary repairs, restoration of the pumps, and removal of water. This most visible of Corps missions under Task Force Hope was perhaps the most successful.

1. The Most Strategically Significant Mission

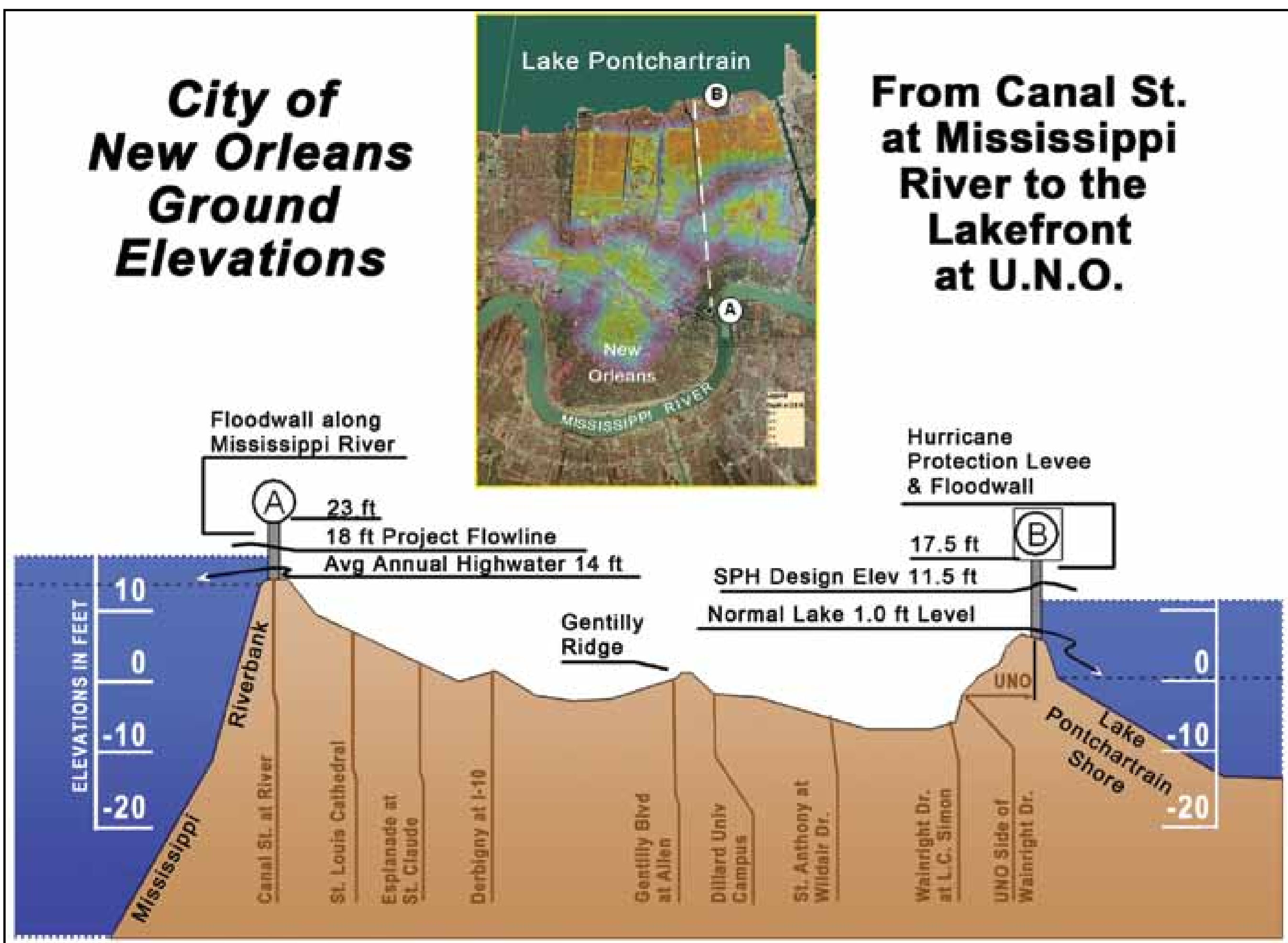
On Saturday, August 27, 2005, the New Orleans District briefed Director of Civil Works Maj. Gen. Don Riley and FEMA Response Director Dan Craig on the unwatering plan for New Orleans, anticipating flooding from heavy rainfall and overtopping of the levees. In that briefing, New Orleans Chief of Engineering Walter Baumy warned that it would take 30 days to unwater a single basin in New Orleans, and three to six months for more extensive flooding. The following day, on the eve of the storm, Mississippi Valley Division Commander Brig. Gen. Robert Crear e-mailed Riley and Chief of Engineers Lt. Gen. Carl Stock: "Unwatering of New Orleans is our most strategically significant potential mission. If this mission is necessary it will have national significance. We will need USACE, FEMA and administration support to manage expectations and execute the dewatering." In short, Corps leaders realized that with predictions of a Category Five hurricane, the storm surge was likely to overtop the region's protective levees, flooding some or all of the 13 primary leveed areas within New Orleans and the surrounding region. The existing unwatering plan called for the

> *"Unwatering of New Orleans is our most strategically significant potential mission. If this mission is necessary it will have national significance. We will need USACE, FEMA, and administration support to manage expectations and execute the dewatering."*
>
> *— Brig. Gen. Robert Crear*

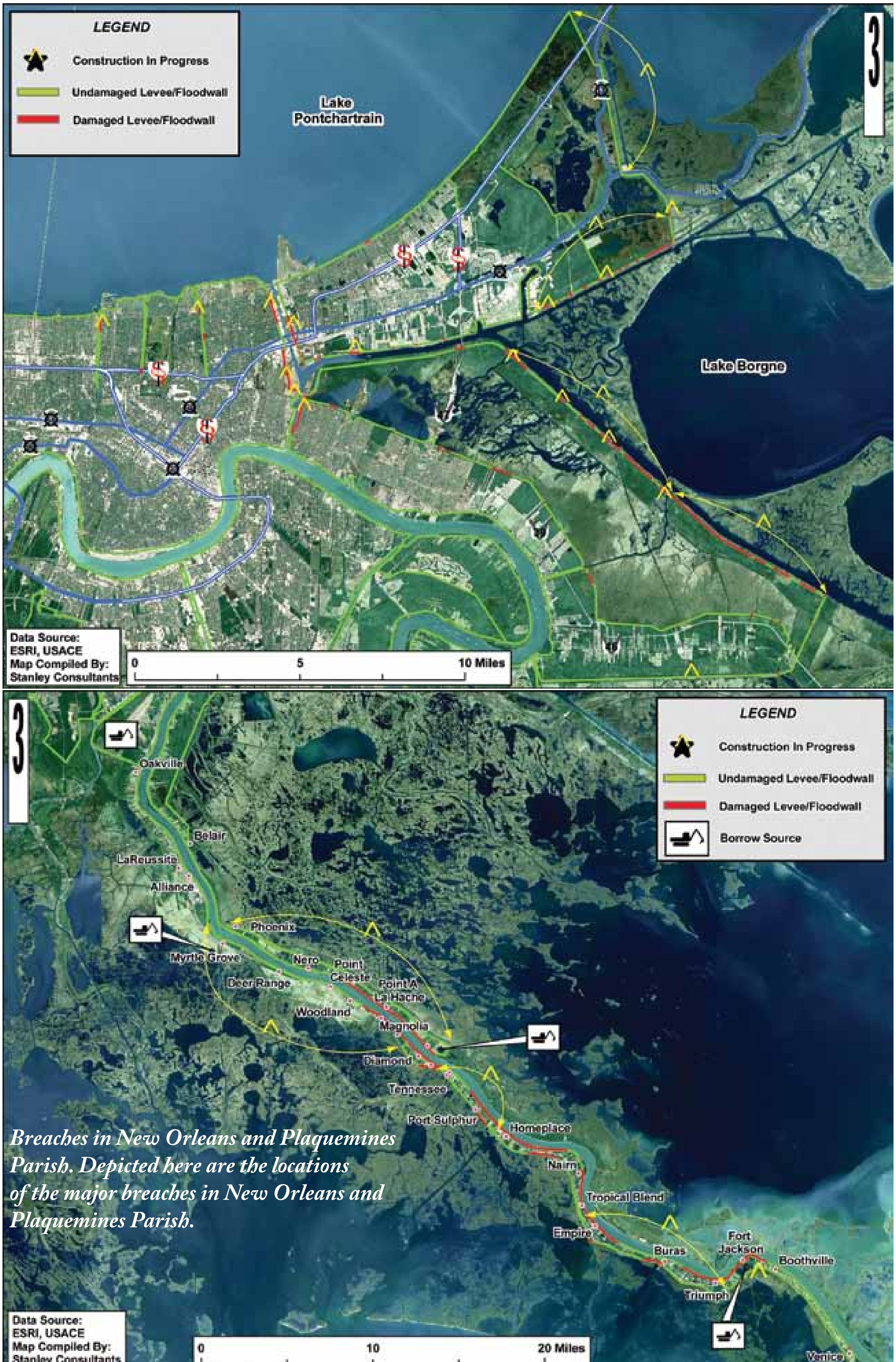
Kevin Wagner and Mike Sayler of the New Orleans District confer with a Red Cross worker. (Photo by Lane Leforte, September 10, 2005.)

Corps to intentionally breach the levees in certain areas to allow gravity to remove floodwaters until it equaled outside waters, such as Lake Pontchartrain and Lake Borgne. The Corps could then bring pump stations on-line to drain the remaining two to eight feet of water after it repaired any damaged levees. Division staff was already putting together a scope of work and cost estimate to submit to FEMA to formally be awarded the job of unwatering the city. The Memphis District assembled a list of contractors capable of handling the work and established a communications plan with FEMA.[116] As it turned out, the amount of flooding exceeded these expectations. After evaluating the situation on the ground on Wednesday, August 31, Larry Banks, Kevin Wagner, and other Corps personnel at the Mississippi Valley Division and New Orleans District, put together a modified step-by-step plan to unwater the city and surrounding areas based on the existing unwatering plan. It basically had three operations: intentionally breach some levees to allow water to recede, repair both the storm-induced and intentional breaches after water levels equalize, and get the pumping stations operational or place temporary pumps throughout the area to remove the remaining water. This new plan required trial and error, determination, and close management to successfully complete the unwatering mission in New Orleans and its neighboring parishes.

The City of New Orleans is often referred to as a bowl, with much of its built-up areas below sea level. Actually, there are several "bowls" in the affected areas of Jefferson, Orleans, St. Bernard, and Plaquemines parishes. The Mississippi River divides these parishes with the basins often referred to as "east bank" or "west bank," depending on which side of the river the basins lay. Most of the west bank escaped any significant flooding, except for Plaquemines Parish, which was heavily damaged. The east bank of Jefferson Parish also avoided major flooding. The east bank of Orleans Parish, which is most of the City of New Orleans, St. Bernard Parish, and Plaquemines Parish received heavy damage from the four canal failures in Orleans Parish, as well as overtopped and breached levees and floodwalls



Because most of New Orleans is below sea-level, forming the so-called "bowl," flooding has a greater impact in the region.



Breaches in New Orleans and Plaquemines Parish. Depicted here are the locations of the major breaches in New Orleans and Plaquemines Parish.

throughout the system. The east bank of Orleans Parish includes two separate basins: Orleans East Bank, consisting of the majority of the City of New Orleans bounded by Lake Pontchartrain (north), the Inner Harbor Navigation Canal or IHNC (east), the Mississippi River (south), and Jefferson Parish (west); and New Orleans East, the portion of the parish east of the IHNC, north of the Gulf Intracoastal Waterway, and south of the lake. St. Bernard Parish contains two basins as well. The Chalmette area consists of the built up region of Chalmette along the east bank of the river, and the Chalmette Extension north of the first basin and south of the Mississippi River-Gulf Outlet. Plaquemines is the narrow parish straddling the Mississippi River below St. Bernard parish to the river's mouth.

Servicing these basins were more than four dozen pump stations, some of which dated to the late nineteenth or early twentieth centuries. Each station contained multiple pumps of varying capacity and make – there were modern hydraulic pumps and old screw pumps designed by Albert B. Wood for the Sewerage and Water Board in 1908; some ran off standard 60-hertz power, others were 25-hertz, requiring special generators or power converters to operate. In fact, the city had been working to standardize these pumps for many years, but still had considerable work to do. Some of these pumps were enormous, with capacities of 1,000 cubic feet per second (cfs) and taking up entire rooms. Others were small with many pumps at a single station. The pump stations lay near drainage or navigational canals and waterways, allowing the removal of rainwater to Lake Pontchartrain, the Mississippi River, or other drainage areas. The following table shows the number and capacity of pumps and pump stations tracked by Task Force Hope in each affected basin. Some pump stations included housing areas for pump operators to stay during flood periods, but most did not. Even those that did found the living quarters flooded, forcing pump operators to sleep on rafters or on top of pipes or machinery. Although close to half of pump operators evacuated, many remained on duty, going days with limited food or drink as they tried to perform their duties as best as possible. In Jefferson Parish in particular, where the majority of operators evacuated, many pumps contained no backflow prevention mechanism, allowing water to flow into the city via the pumps and piping. In Orleans Parish, more than half of the pumps shut down from flooding, power losses, or other causes.[117]

Pump Stations per Drainage Basin[118]			
Drainage Basin	**No. Pump Stations**	**No. Pumps**	**Capacity in cfs**
Orleans East Bank	10	66	39,350
New Orleans East	12	26	4,672
St. Bernard and Chalmette	6	19	5,537
St Bernard Sump	2	9	1,505
Jefferson	5	28	15,890
Plaquemines East Bank	5	6	2,942
Plaquemines West Bank	13	20	8,214

Initially, there was not a clear understanding of the amount of damage or of what resources remained to begin the response. Between reports from New Orleans District Commander Col. Richard Wagenaar and what they saw on media reports, Task Force Hope personnel knew from day one that there were multiple breaches in the protection system causing significant flooding in New Orleans. Later surveys showed that 65 of 73 New Orleans neighborhoods had flooding with 34 inundated, more than 150 miles of the protection system had received damage, and only about a third of the pumps in the city were functioning, mostly in dry neighborhoods. However, at the beginning they knew only that there was flooding and breaches. The first steps toward repairing the breaches and starting the process of unwatering were to get an accurate survey of the damage and to start making plans. New Orleans District Chief of Physical Support Branch, Chris Accardo, who was in Vicksburg, Mississippi, as part of the Crisis Management Team, had previously made arrangements for the survey of the waterways after the storm to ensure that navigation returned to normal as soon as possible. He had checked on the locks and the control structures to see how they were handling the storm on Monday, August 29. Early that morning, he talked to IHNC Lockmaster Michael O'Dowd, who reported that water was overtopping the levee and flowing into the Lower 9th Ward. Later that morning, Accardo received a call from fellow district employee Elizabeth Wiggins, who told him to turn on CNN. After watching the news coverage of the breach on the 17th Street Canal, a Crisis Management Team member informed Lt. Col. Murray Starkel, the Deputy Commander of the New Orleans District, and Greg Breerwood, the Chief of Planning, Programs and Project Management Division. After getting as much information as possible from the various sources, Starkel

On August 30, 2005, Lt. Col. Murray Starkel, the deputy commander of New Orleans District, briefs Brig. Gen. Robert Crear, the commander of the Mississippi Valley Division, as Greg Breerwood, Deputy District Engineer, looks on in the New Orleans District EOC. (Photo by Alan Dooley.)

pulled Accardo, Breerwood, Tom Podany and Walter Baumy into a separate room to discuss how to seal the breaches, which was the requisite step to unwatering the city. Starkel looked at the men and said, "OK, we are going to try and do this three different ways." Baumy was to see how the breach site could be filled from land, Breerwood would devise a water-borne plan, and Accardo had to figure out how to close it by air.[119]

Wagenaar and the "bunker rats," as they became known, left the reinforced shelter in a warehouse on the New Orleans District property along the Mississippi River on Leake Avenue after 10:00 a.m. and set up shop in the emergency operations center (EOC) in the main headquarters building by 2:00 p.m. At that time, he and his team began to evaluate all of the information they had received over the course of the last 12 hours. They had spent the night and morning collecting reports of flooding and breaches from media sources as well as from citizens that were somehow able to find a means of communication. They spoke with O'Dowd and knew about the flooding in the Lower 9th Ward and the damage on the IHNC, and in the early afternoon, they received a call from a firefighter who reported the breach on the 17th Street Canal. The firefighter being a credible source, Wagenaar and two of the bunker rats, Perry Lartigue and David Wurtzel, left the Corps compound in a four-wheel drive vehicle to investigate the report. After negotiating piles of debris, downed power lines, and looters, and driving on Mississippi River levees, up the down ramps and the wrong way on interstates, the group finally got to the Interstate-10/610 split from the Jefferson Parish side. That was as far as they could go. A crowd had gathered there as rescuers with boats were dropping off people, but there was no obvious way to go any further. After seeing 10 to 15 feet of water there, with only treetops and buildings' second stories sticking out of the water, Wagenaar realized that there was a breach somewhere; there was just too much water there to have come from rainfall. The crew made their way back to the district headquarters and made plans to get to the breach site by land and air the following day.[120]

Division personnel in Vicksburg and Baton Rouge arranged for additional aerial reconnaissance and coordinated with the local levee boards to provide assistance locally. Senior Corps of Engineers personnel made their first aerial reconnaissance on Tuesday, August 30. General Riley, who was already in the region for a conference on coastal restoration, canceled a trip to another conference in St. Louis and reported to the FEMA EOC in Baton Rouge on August 28. He arranged for a helicopter to be available and flew over New Orleans on August 30. He noticed that the water was already flowing back out of some of the breaches as the water levels receded, but the extent of the flooding was "shocking and devastating." Wagenaar arranged for a helicopter ride on August 30 as well. His first investigation was over the breach at the 17th Street Canal, an area he had been unable to reach by land the previous day. While in the air he witnessed two of his employees, Wurtzel and Lartigue, in a commandeered boat attempting to obtain the depth of the hole with a leadline, a rope marked off in sections with a heavy weight on the end that is dropped into the water. Wurtzel and Lartigue estimated the linear size of the breach by counting the wall sections on the far side of the canal. Later in the flight, Wagenaar viewed the IHNC breaches and noticed that the water was receding out of the Lower 9th Ward by this time. He also noticed the hundreds of people stranded on their roofs as he flew over the inundated area. When he returned to the district headquarters early in the afternoon, he met the first two employees to return to the district after evacuating, Kenny Crumholt and Scott Blanchard. Crear also made his first inspection of the area on that day, but he was not in a helicopter; he used the G-3 jet airplane of the Mississippi River Commission, and while he was able to tour the entire Gulf coast affected by the storm, at the higher altitude and speed of the airplane, he could not make a detailed assessment.[121]

The following day, however, Crear made his second flight over the stricken city by helicopter. Along with him were geotechnical engineer John Grieshaber from the New Orleans District and Larry Banks, a hydrology expert from the Mississippi Valley Division; between the two of them there were more than 60 years of experience in the helicopter. While in the air, Banks documented the extent of the flooding with hand-written notes scribbled onto a map of the region's hurricane protection system. The pumps west of Causeway Boulevard in Jefferson Parish had been functioning and discharged most of the rainwater. There was still water in the streets around Pump Station No. 1 east of the causeway, but there was no water in the houses. In Orleans Parish, he noted the breach in the 17th Street Canal; it was 400 feet in length and approximately 700 feet from the lakefront. The whole floodwall had shoved horizontally to the

Larry Banks, a Mississippi Valley Division hydrologist, returns from an aerial inspection.

Kenny Crumholt, project manager for the Orleans East area, discusses operations with Chief of Engineers Lt. Gen. Carl Strock.

east. Pump Station No. 7 had removed the water in its drainage area around the undamaged Orleans Avenue Canal. But water was within two streets of the Superdome. In New Orleans East, I-10 was underwater, and it appeared that only the Jahncke Pump Station No. 6 was operating. Nearby, the helicopter's occupants grimly noted a sign on a house "Help–100 People Inside." Along the IHNC, they noted that the water was flowing out of the protected area through the breaches at the canal. They also noted the need to expand the breaches to increase the outflow. A barge had washed up inside the protected area. Their notes on St. Bernard Parish were grim: "Entire area inundated. . . . Major levee overtopping for several miles, numerous breaches." But there, too, the water had started receding into the Mississippi River-Gulf Outlet (MR-GO). They also noted that the Mississippi River levees held up fairly well overall. In Upper Plaquemines Parish, they figured that it might be possible to aid the drainage of the water to the river by opening the Caernarvon Freshwater Diversion Structure, even though this was not the structure's purpose. Over on the west bank of the Mississippi River, the land remained dry from the Algiers Canal to the Hero Canal.[122]

While Wagenaar was making his aerial assessments of the damage on August 30, the bunker rats became aware of a breach on the London Avenue Canal at Robert E. Lee Boulevard. The district EOC had earlier received a call about it from a state

In many locations, pressure on the floodwalls shifted them completely out of place.

trooper. Considering the time of day and the difficulty in driving through the city, Wagenaar decided to wait until the next morning to attempt to verify this information. On Wednesday, August 31, Crumholt, who had arrived back at the district the previous day, and Jeff Richie headed out to find the breach in the morning. Crumholt, an easygoing man not prone to great shifts in excitement, described the trip as "quite the adventure." The two had to navigate the usual downed trees and power lines. They hugged the Mississippi River toward downtown. From there they reached the elevated expressway and headed toward the lake. At the St. Bernard exit of Interstate 610, they ran into a group of men from Lafayette who had packed up their boats and headed for the city to do their own search and rescue work. One of the men, a Marine Corps Reserve pilot, and his friend agreed to take Crumholt and Richie to the London Avenue Canal. They floated north on Paris Avenue to Mirabeau Avenue and took a right to the bridge to have a look at the London Avenue Canal. It was in the early afternoon when they called Wagenaar from the Mirabeau Avenue Bridge and told him about the breach at that location. After hearing about this second breach, Wagenaar ordered Crumholt and Richie north to Robert E. Lee Boulevard to investigate the report of the breach at that location. It took them twelve hours to assess the two separate breaches and return to the district headquarters, and they arrived in time to be told that they were headed to the 17th Street Canal breach the next day.[123]

Even while the initial surveys of the breach sites were ongoing, the Corps started working to close the breaches. The first major challenge was making expedient repairs so unwatering

Tim Holan of MHF Logistical Solutions personally delivered 1,000 multi-ton contaminated soil bags that played a major role in filling the breaches in New Orleans.

could proceed, since in many cases water pumped out of the city would merely pour back into it. The 17th Street Canal breach was the only one that had ground access because it straddled the border with Jefferson Parish, which was dry; therefore, it was the first one the Corps attacked. Accessing the London Avenue Canal was more difficult because, unlike the 17th Street Canal, it was surrounded by water and would require barges or access roads. The first thing the Crisis Management Team had to figure out was what to drop in the breaches, which were enormous. Anything and everything was on the table. The division EOC in Vicksburg suggested highway dividers, train cars, weighted barges, shipping containers, and other debris to fill the holes. It even suggested blowing up Hammond Highway Bridge to block the canal with rubble. None of those ideas materialized, but the Corps did manage to drop some items into the breach on Tuesday, August 30, with little effect. Working with the National Guard, David Wurtzel and Perry Lartigue, who had stayed behind with Wagenaar, arranged the use of Chinook and Blackhawk helicopters to drop standard (50- to 150-pound) sandbags obtained from the Orleans Levee District into the breaches, but these were small and had too little impact. It was "like spitting into the ocean," as Chris Accardo said. The state of Louisiana sent over highway Jersey barriers to drop into the breach. These barriers, however, were not made of solid concrete; they were concrete with a foam core and just shot through the breach. That night the Crisis Management Team received additional suggestions, including calls by CH2M-Hill and MHF Logistical Solutions offering 3,000 to 12,000 pound capacity bags used for hazardous waste disposal. Accardo quickly grabbed his contracting people and worked out a deal right then and there. CH2M-Hill agreed to send some and provided the name of the manufacturer to obtain more, while Tim Holan of MHF Logistical Solutions got on a plane with 1,000 bags that night. They made plans to stage its sandbag operations at the Coast Guard Station on Lake Pontchartrain near the 17th Street Canal. While the sandbags were in transit, the staff at Vicksburg arranged for the slings and rigging items necessary to lift the bags and assembled a work crew of Corps employees. Lock and dam operators, mechanics, boat pilots, and heavy equipment operators assembled at

9. Air Assault on the Beaches

With the Lake Pontchartrain outfall canals surrounded by water, with the tons of debris blocking all the major thoroughfares, and with barges isolated or sometimes sunk, the only way that the Corps could get to the breaches at first was by air. Starting on Tuesday, the Corps borrowed a helicopter from the Louisiana National Guard to start dropping sandbags and other small objects into the breaches, but the small sandbags and other items did not make a dent. They started to experiment with other items using a sling load. Chris Accardo, who worked the air assault from Vicksburg, had never used them. “Sling load? What the hell is that?” New Orleans District Deputy Commander Lt. Col. Murray Starkel, who was also in Vicksburg, explained that users hook it onto the bottom of a helicopter, drop it over the breach, and then have to recover the sling or have more on hand. Accardo started working to make arrangements for a helicopter, but was initially unsuccessful.

The problem was that most helicopters were conducting search and rescue operations. This was the primary mission of the Coast Guard. The Army had not deployed at this point, other than the Army National Guard, which also focused on local rescue missions. Starkel was constantly on the phone with Brett Herr at the Louisiana state EOC in Baton Rouge, saying, “We need more helicopters.” Throughout Tuesday, the helicopters would conduct one or two drops, and then the state would pull them off to work search and rescue. “We needed more helicopters to do sling load operations,” Starkel said. Unable to argue the point from Vicksburg, he flew down to Baton Rouge with Brig. Gen. Robert Crear on Wednesday and went straight to the state EOC to push hard on the state aviation officer, who was a National Guard engineer. “The conversation was you can either continue to do search and rescue and have more water come into the city, or you can give me some dedicated air assets so I can close the breaches. Then we can start pumping the city out, and you will not have to do as many rescues. Your choice.” Starkel continued to push until they worked out a deal with the state. The state provided six Blackhawk helicopters and a couple of Chinooks dedicated for the sling operations to close the breaches, and they would not be pulled off to work search and rescue operations. Eventually, Canada and the Republic of Singapore would also send helicopters to support the sand-bagging mission. For more than a week, they joined the Corps effort to plug the holes.

Once they had the dedicated helicopters, they were able to start conducting constant air drops on the breaches. By this time, Accardo had worked out the issue of what to drop. On Wednesday, Tim Holan of MHF Logistical Solutions and other contractors called offering to send large environmental disposal bags. Designed to hold contaminated soil, they were very similar to sandbags but could hold up to 12 tons. He agreed to fly down with 1,000 of the bags while other companies shipped some overnight, and by Thursday morning, the Corps had them in hand. Knowing that they would not be able to recover the slings but would have to abandon them with the load being dropped by the helicopters, Accardo requested additional slings, which also arrived in New Orleans on Thursday. The last requirement was the dirt. They arranged with the Coast Guard to use their facility on Lake Pontchartrain peninsula near 17th Street to load the bags with dirt and gravel. While Jason Binet and others held open the bags, Holan drove the front-end loader. Later contractors loaded the bags while military and Corps personnel loaded the helicopters. The helicopters would pick up the bags with the slings and drop them where Kenny Crumholt and Jeff Richie directed them. They were able to pick up about three bags every two minutes during daylight hours. Once the team started picking up speed, they realized they would need more bags, and having run through his supply, Holan contacted his customers to sell their supply back to provide a sufficient supply to the Corps. Meanwhile, other contractors, such as CH2M-Hill, had started shipping additional bags. The sling and cable providers also had to contact their suppliers, since the Corps was going through hundreds of slings per day.

For the first few days, because of limited personnel, helicopters, and supplies, they only were able to load 100 to 150 bags per day. The process was complicated. To avoid static electricity from the chopper blades, personnel working on land had to ground the helicopters with a wire on the end of a pole that attached the helicopter to a ground rod. A wire rope connected from the sling to the bottom of the helicopter. One member of the team had to hook the sling to the helicopter, while others helped pull the cable and keep it from tangling. Then, everyone would have to get 50 or 60 feet away and take shelter while the helicopters increased thrust to get off the ground, sending dust and rocks flying. Because of the wind, they had to improvise safety clothing – hardhats were out because of the wind, so they used padded hairnets, gloves, safety glasses, earplugs, and painter's overalls taped at the ankles and wrists. Three or four-man teams would rotate out every 10 or so bags to allow the others to rest and drink water because of the heat. The Blackhawks would carry one bag, the Chinooks would carry one to three depending on their fuel consumption and weight. They would load bags every two to three minutes until all the helicopters were on their way, and then they would have a half-an-hour wait while they refueled. By the end of the mission, five Chinooks and seven Blackhawks provided a constant stream of pickups. When ground teams were short-handed, military personnel would get out of the helicopters to help load. They would run the operation from sunup to sundown, averaging 400 to 500 bags per day, with one day peaking at 800 bags. A contractor loaded the sandbags each night and even tried to line up the slings. It took more than 2,000 bags before Crumholt and Richie could see them below the surface of the water. By the end of the mission, the team had dropped more than 20,000 bags.[124]

New Orleans District employees Konrad Frentz, George Loupe Sr., Marion Ellis, Norvell Davis, and Gerald Bell Sr. prepare to hook up sandbags to a CH-47 Chinook from the Oklahoma Air National Guard. (Photo by Lane Leforte, September 25, 2005.)

The sandbag crew, which worked for several weeks trying to fill the levee holes, poses for a picture with Brig. Gen. Bruce Berwick, Brig. Gen. Robert Crear, and Lt. Gen. Carl Strock.

Helicopters ran continuously dropping the sandbags, reaching up to 800 per day.

David Wurtzel (right), a structural engineer with the New Orleans District, confers with a contractor at the 17th Street Canal. (Photo by Alan Dooley, U.S. Army Corps of Engineers, September 14, 2005.)

A contractor from Boh Brothers meets with Fred Young, the Corps project manager for the Orleans area. Boh Brothers was a leading local contractor involved in the New Orleans flood fight.

the Port Allen Lock in Baton Rouge and made preparations to begin work as soon as possible.[125]

Since contractors do most of the construction for the Corps, getting contractors lined up was also critical. The Corps knew the type of contractors that would be needed if the city flooded and had several contracts in place. Knowing that the district would be working out of Vicksburg in the event of a crippling storm, many of the contractors evacuated to that location as well. On Monday, August 29, several contractors, including Boh Brothers Construction Company and Bertucci Contracting Corporation of New Orleans, contacted the district EOC in Vicksburg and informed personnel there that, provided they could recover their equipment, they were prepared to start repair missions. On nothing more than a handshake and a letter contract, the contractors got to work on Wednesday, August 31, to help local agencies build access roads to the breach site on the 17th Street and London Avenue canals, drive sheet pile at the mouths of the canals, and place rock to repair the breaches. They could not move all of their equipment out, however, and they

With limited time and access, Lt. Col. Murray Starkel assigned Chris Accardo, Walter Baumy and Greg Breerwood responsibility to attack the breaches by air, land and sea – helicopter-dropped sandbags, dump truck bridges, and barges.

did not know the condition of their resources immediately after the storm. The Corps provided Robert Boh of Boh Brothers Construction the use of a helicopter to get to his equipment yard to see what had survived the storm. Although the yard in Almonaster in New Orleans East had taken on quite a bit of water, he assessed what he could operate and made plans to begin work. One of the barge-mounted cranes had broken free from its moorings and ended up about a mile away on top of a levee. Other contractors had staged equipment elsewhere in the region. They quickly started moving dump trucks, cranes, and pile-driving equipment into the impact area using barges or clear roads in Jefferson Parish.[126]

The local and state officials were also trying to assess the status of their resources and personnel. A lack of communication made the initial organization of the operations at the 17th Street Canal difficult. In one instance, Jefferson Parish continued to pump rainwater into the 17th Street Canal, which then flowed through the canal breach into Orleans Parish neighborhoods. The Corps had to coordinate with Jefferson Parish to stop

Flexifloat bridges, which are quickly constructed floating bridge segments, formed a key part of closing the breaches by providing a water-based platform for equipment that could be moved into place using backhoe arms.

pumping until it repaired the breach. In another instance, the Corps, its contractors, the local levee board, the New Orleans Sewerage and Water Board, and the Louisiana Department of Transportation and Development (DOTD) were all at odds over who was in charge and how the operation should proceed. Crear described the situation as "hopeless." Everyone wanted to get going on the solution, but confusion and a lack of coordination meant everyone was getting in each others' way. Finally, Riley and Wagenaar met with the DOTD Secretary John Bradberry. Crear also met with him. In the end, Bradberry agreed that the Corps should take the lead in repairing the breaches since it was responsible for the floodwalls. After they made that decision, the three pronged attack, by land, water, and air, was much more coordinated and effective. Another difficult issue to resolve with all of the players was access to helicopters. Starkel moved from Vicksburg to Baton Rouge and set up shop at Division Forward. This also allowed him to be closer to the FEMA EOC. During the early sandbag operation, the Corps did not have any dedicated air assets. Helicopters continually abandoned breach operations to do search and rescue work. While it is impossible to disregard the importance of rescuing those stranded in the floodwaters, Starkel argued at the EOC that getting the breaches closed and the pumps working was going to reduce the need for search and rescue work since lower water levels would enable many to rescue themselves. Eventually, he won over the state aviation officer, and the Corps received six Blackhawk and two Chinook helicopters to fight the flood.[127]

By the time that President George W. Bush visited the operations at the 17th Street Canal on Friday, September 2, he witnessed a complex operation that was really starting to take hold under the direction of the Corps, despite the number of players, the limited support, and the tight area of operations. National Guard helicopters were picking up the 3,000-pound sandbags and dropping them into the breach on the 17th Street Canal. Boh Brothers drove sheet piles across the canal at the Hammond Highway Bridge in order to quickly close it off and prevent storm surge from a possible future storm from entering the canal. They left a gap in the closure to enable the water to flow out as lake levels decreased but kept a supply of sheet piles at the bridge in order to close it completely should another storm approach. To access the London Avenue Canal, the Corps used flexi-float bridges, temporary floating sectional bridges used by combat engineers, that could be trucked in and assembled in the water. They could carry heavy equipment and rock to close off breaches. A backhoe claw pulled the flexi-floats through the floodwaters like some strange bionic arm. By Friday, September 2, 2005, Bozelli Brothers Construction was on the site setting up flexi-floats, and the first of these was in place by Sunday, September 4. Lastly there were dump trucks filled with aggregate lined up as far as the eye could see. With no land access to the breach site, the contractors had to build a road from the nearest dry spot, dump truck by dump truck. Each one moved down the road and emptied its cargo into the water, slowly making its way toward the breach.[128]

While the nation watched the helicopters dropping the huge sandbags into the breaches, which were closing fast, the Corps recognized that the next step to unwatering the city was to get the local pump stations operational and to move temporary pumps into the area. Because of the constant inflow of water from the breaches, the local levee boards had turned off most

Building the Road to London Avenue. With no land access to the London Avenue Canal, the contractors had to build a road to the site dump truck by dump truck.

of the pumps. Once repair of the breaches was under way, the Corps needed as many pumps working as quickly as possible. By September 2, Corps management had received status reports on only about 25 pumps, and it did not look promising. Only seven were operational, and five of these were in the relatively dry Jefferson Parish. There were some portable pumps available, but most of these were fairly small capacity (100 or 150 cfs). As Lundberg later recalled, "There was probably more water that evaporated out of New Orleans than the temporary pumps got out. It was just like taking a teaspoon in a swimming pool – it just was not very effective." Although the Corps began to procure large capacity portable pumps to aid the unwatering effort, success would depend on aggressively providing the local authorities assistance in returning the mainline pumps to operational status. The most critical need in restoring the mainline pumps was restoring electrical power. The Corps called in the 249th Engineer Battalion (Prime Power) from Fort Belvoir, Virginia. Known as the "Black Lions," the 249th has the responsibility to generate and distribute electrical power in support of combat operations and disaster relief. The 249th Prime Power Battalion completed its assessments of the power requirements to get the pumps going again and coordinated with

> *"There was probably more water that evaporated out of New Orleans than the temporary pumps got out. It was just like taking a teaspoon in a swimming pool – it just was not very effective."*
>
> *— Lundberg*

the local power and gas companies to install two large natural gas generators. FEMA approved $10 million dollars to get the pumps operating. Based on incoming information on the receding water levels and the revised estimates of the pumping capacity that resulted from their ongoing efforts, Task Force Hope revised its preliminary unwatering projection of six months based on the original unwatering plan to 60 to 80 days. Each drainage basin would vary due to the local conditions.[129]

Mother Nature landed this massive blow, but the Corps was poised to use nature in the recovery effort. As Hurricane Katrina moved on, Lake Pontchartrain and Gulf of Mexico water levels began to return to normal. Floodwater actually began to flow out of the inundated areas by Wednesday. They now could notch the levees or intentionally breach them to allow gravity to drain water into waterways with a lower water level than in the city. On Friday, September 2, the Corps announced its intention to notch the levees along the MR-GO, at Caernarvon, and other locations. The IHNC breaches were the last the Corps addressed because the clearly visible gravity drain was removing water from portions of New Orleans and Chalmette. On Sunday, September 4, Corps contractors breached the local levee along Lake Borgne to allow gravity drainage to begin in the downriver New Orleans suburb of Chalmette. The contractors used swamp buggies equipped with backhoes and barges with draglines to breach the MR-GO levee between the Bayou Bienville and Bayou Dupre floodgates. They made a second cut in the levee near the Caernarvon Freshwater Diversion Structure. The Memphis District Clearing and Snagging Unit executed the first intentional breach in Plaquemines Parish at Bohemia. The breach would allow six feet of water to flow out of the protected area. The Corps evaluated two other breaches in Plaquemines Parish. Contractors inspecting the MR-GO levees reported that there was only a one-foot differential in water levels on the two sides of the levees, so no additional intentional breaches were necessary at that time. There was a similar water depth difference reported in New Orleans East, so they took no action there. The Corps would leave all of the intentional breaches open until the water level on the protected side of the levee equaled the natural water levels on the outside. At that point, it would close the breaches and pumping operations would begin.[130]

10. Improvising an Unwatering Plan

The New Orleans District of the Corps of Engineers long had an unwatering plan for hurricanes based on a scenario of water overtopping the levee system and storms dumping a significant quantity of rainwater. It was this plan that Walter Baumy briefed to FEMA Response Director Dan Craig, and Director of Civil Works Maj. Gen. Don Riley on August 27 in preparation for Hurricane Katrina. The plan included supply inventories, locations of possible intentional breaches to help drain the city, and other local information, and had an estimated unwatering time of up to 30 days per basin. It did not, however, presuppose the kind of levee breaches the city faced after Hurricane Katrina.

Within days of the storm, Task Force Hope Commander Brig. Gen. Robert Crear requested a revised unwatering plan and estimates for completion. Given the many unknowns – at that point Corps managers did not know the exact extent of the flooding or the status of the pumps or hurricane protection system – they had to improvise considerably in developing the plan. Over the course of a single day, Corps hydrology experts Larry Banks and Kevin Wagner, other New Orleans District engineers, and representatives of the contractor Shaw Group developed the step-by-step plan to unwater the city.

The plan consisted of three strategies following normal unwatering procedures – a combination of natural and intentional breaches to allow gravity to drain as much of

Temporary pumps lined the 17th Street Canal.

the water as possible, repair of the breaches, and restoration or addition of as many pumps as possible. Because the existing breaches were so large and would let out the majority of the water, the plan called for very few intentional breaches but mainly relied on enlarging existing breaches as necessary. The biggest focus was on plugging the existing breaches and restoring and supplementing the pumps, mainly in the metropolitan area (Orleans Parish). Some portable pumps were available – including those from Germany and the Netherlands – but most of these pumps were very low capacity. While these pumps were critical in unwatering contained areas where the static pumps could not reach, the mainline pump stations were necessary to get out most of the water volume. Once repair of the breaches was under way, the priority was restoring four large-volume pump stations (Nos. 6, 7, 4 and 19) located at the London Avenue, 17th Street, and IHNC canals. Then the team could focus on outlying areas. In the interim, they threw every portable pump available into action, placing them initially at the IHNC, London Avenue and 17th Street canals.

Duane Stagg, Charles Shadie, and Les Waguespack, all from the Mississippi Valley Division office, on the MV Mississippi line up temporary pumps for use in the flood fight. (Photo by Alfred Dulaney, August 31, 2005.)

Asked for a projected completion date as soon as the first pump came online, Banks and his team had to estimate the total amount of water in the area, which pumps they could repair and when, and the pumping capacity of the working pumps. Estimating the water volume was very difficult because of a lack of water gauges remaining after the storm. They requested Shaw to install some, but for most areas they still had to use elevation data to make guesses, which turned out to be close to correct. Then they made their projections, incorporating some contingency time in case of unforeseen problems or another storm, which helped account for Hurricane Rita. Their estimates turned out to be nearly exact.[131]

Meanwhile, work continued on the breaches in the city initially focusing on the 17th Street Canal. Helicopters continued working during daylight hours dropping sandbags to close the breach. To assist the helicopter sandbag operation, the Corps' contractors built a 700-foot access road along the back of the 17th Street Canal, from Hammond Highway to the breach site, to enable the placement of rock. The access road was the first heavily televised action in which progress was visible, and became a major morale booster as the nation saw that the Corps was doing something to improve conditions in the beleaguered city. On September 3, four 42-inch pumps arrived at the 17th Street Canal breach site from St. Charles Parish and started pumping. Contractors began to work in the New Orleans East area, and the Tulsa and Little Rock districts of the Corps of Engineers deployed teams to aid in the unwatering effort. Work sped up considerably over the next few days. On September 4, the first sandbags broke the surface of the water at the 17th Street Canal breach, and officials estimated that the breach closure was 80 percent complete. After an additional eight to 10 hours to finish the job, the full-scale pumping operation could begin. Although they did not expect water level increases in the canal, the engineers had to monitor the intact portions of the floodwalls for additional stress. They limited the rate of pumping to one foot per day. There were three 42-inch pumps staged at the sheet pile closure, and two 42-inch and two 30-inch pumps in place at the breach site.[132]

Although efforts focused first on the 17th Street Canal breach where there was easier land access, efforts were also proceeding to get access to the London Avenue Canal. The breach repairs had not started there as there was no ground or water access, and all of the air assets focused initially on the 17th Street Canal. The Louisiana DOTD started to build a dam at the lakefront at the mouth of the London Avenue Canal using concrete and asphalt ripped up from Lakefront Drive. The Corps also made arrangements to get more rock to help the state finish the dam, and soon shipments of rock were heading down river. On September 3, the rock weir had closed off about 50 percent of the London Avenue Canal. By September 5, the rock closure was complete with the exception of a small portion to allow for outflow drainage. By this time, the air assets previously directed at the 17th Street Canal started to shift to the London Avenue Canal breach at Mirabeau Avenue, and progress started there.

Then the Orleans Levee District began building an access road for the Corps contractor Bertucci Construction to begin closing the second London Avenue breach at Robert E. Lee Bridge. At the same time, the Corps awarded the firm Luhr Brothers the contract to close the eastern breaches on the IHNC. The company would build a road to the breach site and place a rock berm to close it off.[133]

Over the course of the next few days, the unwatering mission started to pick up speed as the Corps continued to complete assessments of pumping capacity, temporary pump availability, and power availability. Initially, Corps officials knew very little about the status or even number of pumps available, since the pumps were the responsibility of the New Orleans Sewerage and Water Board. Corps officials soon started to receive more information concerning the pumping capability of the parishes. On September 4, St. Bernard Parish reported having five pumps operational, and Plaquemines had one. And while they were still gathering information on the Orleans Parish Pump Stations, the first disabled Pump Station started working on Monday, September 5, when the I-10 Pump Station began operating at 1:10 p.m. Its capacity was only 850 cubic feet per second (cfs), but it was a beginning. The Corps continued to acquire and place into operation temporary pumps, including 20 12-inch pumps and one 24-inch pump in New Orleans East between the Citrus Pump Station and Dwyer Road along the Lakefront. These were not yet making much of an impact on the vast water levels, but were visible progress in unwatering the city.[134]

By the end of the first week, the Corps had made significant progress on the unwatering mission, this "most strategically significant" mission of getting water out of flooded New Orleans. Using a combination of airlifting large sandbags and other barriers, building access roads to start hauling rock, and floating in barge-mounted cranes and pile-driving equipment, it had started to close the four large breaches in the canal floodwalls that continued letting in flood water. The Corps had intentionally breached levees at strategic locations to use gravity to lower water levels. And it had started to repair pump stations and position temporary pumps to begin the long and laborious process of unwatering the city. However, there were weeks or possibly months to go before the mission was complete. It quickly became obvious that this critical mission required more resources and greater focus for it to be successful. And until the Corps unwatered the city, other recovery activities could not proceed. It was at this critical time that Task Force Unwatering was born.

2. Formation of the Task Force

By the end of the first week, Col. Richard Wagenaar, commander of the New Orleans District; Col. Charles Smithers, commander of the Memphis District; and Col. Lewis Setliff, commander of the St. Louis District, realized that their units would not be able to focus on the unwatering mission to the degree needed for complete success. The New Orleans District, which normally handled civil works in New Orleans, needed to focus on reconstitution according to the contingency plan (CONPLAN). Although still capable of providing support to the missions, the district had facilities and personnel in disarray, with people scattered over many states, and its headquarters building without power. The Memphis District, which assumed Federal Emergency Management Agency (FEMA) support missions under the CONPLAN, would have its hands full once debris removal and emergency repair missions started. The St. Louis District, which took over civil works missions from the New Orleans District under the CONPLAN, was preparing to start the repairs to the levee system. They raised the issue with Brig. Gen. Robert Crear, but he had already decided to call in reinforcements. On Sunday, September 4, he ordered Col. Duane Gapinski, commander of the Rock Island District, who was on his way back from a trip to New York, to take charge of Task Force Unwatering, a new task force created to focus on the

Col. Duane Gapinski, commander of the Rock Island District, served as commander of Task Force Unwatering.

unwatering mission under the authority of Task Force Hope. When he learned that Gapinski would be going, Riley called to brief him on the situation on the ground and provide an overview of New Orleans. Riley had previously served as Mississippi Valley Division commander, and Gapinski was unfamiliar with the area. In that call, Riley emphasized the importance of public perception that the recovery was making progress. Gapinski took the words to heart as his public affairs team set up interview after interview.[135]

Gapinski arrived to take over the unwatering mission on September 6, around the time that the Corps awarded the two major contracts for unwatering. The Corps chose the Shaw Group to be the primary contractor for the City of New Orleans and St. Bernard Parish, and KBR was the contractor for the outlying areas that had flooded. According to Gapinski, KBR was an excellent choice to take the Plaquemines Parish mission. It was a company with experience operating with limited support in "logistically constrained areas" such as Iraq, Kosovo and Bosnia. KBR had an existing Construction Capabilities Contract (CONCAP) with the U.S. Navy. This type of contract allowed the Navy to use KBR on a contingency basis for emergency construction, disaster relief, or humanitarian

Tony Bertucci of the New Orleans District Construction Division talks to a representative of the Shaw Group.

services; the Corps contracting staff worked with the Navy and KBR to authorize the company to unwater Plaquemines Parish (and later Terrebonne Parish after Hurricane Rita). KBR engaged its own resources, engineering support,and quality assurance and control and successfully completed its tasks. The Corps designed the contract with the Shaw Group to mimic the CONCAP contract with KBR. Gapinski later observed that it was not as successful over the course of the mission largely because, lacking assets of its own, Shaw often subcontracted specific tasks, and the Corps was often able to coordinate with the subcontractors easier than going through the parent company.[136]

Gapinski brought along his Chief of Engineering and Construction, Denny Lundberg, to serve as the senior civilian on Task Force Unwatering. Lundberg had 28 years of service in the Rock Island District, and he ran the emergency operations center (EOC) for the district during the Midwest Flood of 1993. The two men spent the first few days in New Orleans flying over the stricken areas, described by Lundberg as "destruction of biblical proportions," and shadowing Wagenaar until they were ready to take over the mission. In coordination with Wagenaar, Task Force Unwatering switched from an individual project management structure to management by each natural drainage basin, which allowed closer management of the areas being unwatered in coordination with a specific sponsor, versus a specific project that may overlap multiple drainage areas. Realizing that the engineers and managers from the New Orleans District knew the system, the area, and the local contractors better than anyone else, Gapinski kept the local district employees in charge (see following table). Each project manager had a staff of nine or 10 personnel who helped manage and report progress of unwatering. Another core team of technical experts reported directly to Lundberg and Gapinski. Joe Sullivan from the New Orleans Sewerage and Water Board was also actively involved in the team and attended meetings. Because Jefferson Parish was dry soon after Task Force Unwatering commenced, Darryl Bonura was able to support Gapinski and the other project managers. The breach-closing operations were continuing on the London Avenue Canal and the Inner Harbor Navigation Canal (IHNC), and Pinner and Waits remained project managers on a specific site as opposed to a drainage basin. The function of the project managers was to be the single Corps voice with each of the local sponsors in

The largest pump station in New Orleans, Pump Station No. 6, came back on line on September 6, 2005, giving a large boost to the unwatering mission.

their area. Gapinski gave them authority to function as the "air traffic controller" for all of the operations in their basin: intentional breaching, pumping and breach repair. The transition of unwatering missions to Task Force Unwatering from Wagenaar allowed him to focus on reconstituting his district personnel and pushing on with other missions of the New Orleans District.[137]

Task Force Unwatering Project Managers by Basin	
Project Manager	**Drainage Basin**
Darryl Bonura	Jefferson Parish-East Bank
Kenny Crumholt	New Orleans East
Fred Young	Orleans Parish-East Bank
Kevin Wagner	St. Bernard Parish
Mark Gonski	Plaquemines Parish
Richard Pinner	London Avenue Breach Sites
Stuart Waits	IHNC Breach Sites

The unwatering mission received a big boost on September 6 when the largest pump station in the city at the head of the 17th Street Canal – Pump Station No. 6 – began operating. Several days before, Chief Warrant Officer Thomas Black of the 249th Engineer Battalion (Prime Power) and others were searching for power sources by helicopter and located a functioning stoplight in Jefferson Parish – a nearby electrical substation had power. After several days of routing power lines and preparing the pumps at the station, Sewerage and Water Board pump operators were able to start two of them. Although initially only these two pumps were operational, and the 2,000 cfs being sent into the canal was just a fraction of its pre-storm capability, it was another step in unwatering the city. The pumping capacity in New Orleans East was beginning to improve as well. Pump Station No. 10 (Citrus) was not running due to a lack of power, but a generator was scheduled for arrival that day. Pump Station No. 14 (Jahncke) was pumping 900 cfs; its usual capacity was 1,200 cfs. Pump Station No. 16 was running at full capacity (1,000 cfs) off a generator. The Corps would need temporary pumps at Pump Stations Nos. 15 and 18. To avoid unnecessary delays resulting from water quality issues, the Environmental Protection Agency (EPA) provided the Corps a waiver for pumping floodwaters back into Lake Pontchartrain and the Gulf of Mexico. The waiver required the Corps to take "reasonable precautions to protect the environment." The struggle to close the remaining breaches was ongoing.

The 550 huge sandbags dropped by helicopter into the breach on the London Avenue Canal at Mirabeau still had not broken the surface of the water. At the east side breaches on the IHNC, contractors inserted three barge loads of rock into the water. The water level began to equalize at several intentional breaches, including at Bohemia in Plaquemines Parish, and contractors closed the cuts in the levees. However, they made a new breach in the back levee south of Violet Canal in St. Bernard Parish. Even then, more than a week after the storm, Task Force Unwatering continued to receive new information about storm damage and pumping status, especially information concerning Plaquemines Parish and the Mississippi River levees. It identified several breaches on the east bank in Plaquemines Parish at Bellevue and Pointe a la Hache. The west bank needed breaching to evacuate water that was trapped within the protected area because the Empire Floodgate was inoperable, and Fish and Wildlife agents reported several breaches on the Mississippi River levees.[138]

Steady progress continued in the fight against the floodwaters. Contractors closed the first of two breaches on the east side of the IHNC with additional rock on September 7, and they expected to close the second the following day. Even while making progress, the Corps was also making new discoveries. Further investigations along the IHNC uncovered another breach on the west side of the canal, and another 900 feet of floodwall was out of plumb. Aerial reconnaissance of Plaquemines Parish confirmed that the storm had overtopped Mississippi River levees from both sides, and they discovered the presence of many small breaches in the back levees. In New Orleans East, contractors cut a 10-foot breach into the Gulf Intracoastal Waterway (GIWW) east of the Michoud Canal to allow floodwater to drain.[139]

Task Force Unwatering found many floodwalls out of plumb, in most cases only by a few feet, in others by a significant margin.

On September 8, the Coast Guard alerted the Corps of Engineers about a large oil spill at the Murphy Oil Company's Meraux Refinery in Chalmette. Murphy Oil had contacted the EPA on September 4 after floodwaters had dislodged and damaged one of its aboveground storage tanks. The tank leaked approximately 25,110 barrels of oil into the refinery complex, nearby canals, and a 1,700-home residential area. The EPA and the Coast Guard began working to collect the oil spill with the Coast Guard capturing the free oil in the canals, the tank farm complex, the neighborhood, and the storm drains. The Coast Guard was worried that Pump Station No. 7 would pump the remaining oil/floodwater mix into the Biloxi Marsh. Task Force Unwatering worked to assess the situation and devise the proper procedures to move ahead. The following day, the team installed oil booms to collect the contaminated water at the intake and

Task Force Unwatering deployed oil booms at many pump locations to absorb petroleum or other chemicals from the surface of the water.

outtake ends of Pump Station No. 7. In addition to the Corps of Engineers and Coast Guard assets, Murphy Oil kept two contractors on the site to assist in containing the oil spill. Later, the Corps also placed oil booms at Pump Stations Nos. 1, 4 and 6 to control the oil slick and, on September 14, the Corps, in coordination with federal and state environmental officials, shut down the pumps at Station Nos. 4 and 7 until the last of the oil could be cleaned out of the canals in the vicinity.[140]

The Murphy Oil incident was only one of many environmental concerns in drying out the city, and the Corps worked with the Louisiana Department of Environmental Quality (LADEQ) and the EPA throughout Task Force Unwatering to minimize the environmental impact throughout the entire mission. During the unwatering mission, Larry Banks authored a proposal later signed by Crear to open the lock on the IHNC to allow water from the Mississippi River to flow through the canal to dilute some of the floodwater flowing into Lake Pontchartrain and the GIWW. Other mitigation measures included the use of aeration devices to introduce

Aerators helped to increase oxygen level in water being returned to public waterways.

additional oxygen into the floodwater. Near the end of the operation in early October, there were 27 aerators in Orleans Parish, which basically shot some of the floodwater up in the air to increase the oxygen content of the water being pumped into Lake Pontchartrain. The EPA and LADEQ also approved a plan to pump the floodwater from lower St. Bernard Parish into the Mississippi River. The temporary pumps did not exceed 500 cfs, and the 200,000 cfs flow of the river diluted the floodwater. As Task Force Unwatering was winding down in the middle of October, Gapinski noted in his situation report that the "shrimping boat crews are reporting good catches and quality shrimp." A few days later, the Food and Drug Administration announced the results of its study of possible contamination levels in the fish, shrimp and crab population of Lakes Pontchartrain and Borgne. It analyzed the levels of petrochemicals, pesticides, PCBs, and heavy metals in the flesh of the seafood, all of which were at pre-Katrina levels, while the level of petrochemicals in the lakes was below detection limits.[141]

As it turned out, Hurricanes Katrina and Rita did not cook up the "toxic soup" predicted by the media, however reasonable

11. Portable Pumps – An International Effort

Although the mainline pumps were critical to get the largest volume of water out, the portable pumps played a role as well. Most of the pumps were very small, no more than 100 or 150 cubic feet per second (cfs), but there were dozens of them deployed around the city. The strategy was really three-fold. First, getting some pumps – any pumps – operational was a moral victory. The pumps were mobile, and the Corps was able to get them into place quickly, apply power, and start pumping water before the mainline pumps were operational. Never mind that the pumps would take months to make a difference, they helped to quickly start making a small difference in public perception, if not in actuality. Second, the pumps supplemented the existing capabilities of mainline pumps. Several pump stations had a few pumps working, but not all. The portable pumps helped to add to this capability, particularly at the Inner Harbor Navigation Canal (IHNC), London Avenue, and 17th Street stations. The Corps had portable pumps lining Lake Pontchartrain to start moving some of the water. Last, the pumps made a tremendous difference in contained areas that the mainline pumps could not reach. Particularly along stretches of highways and roads, the portable pumps helped remove the water and the slag that blocked the roadways. This allowed greater access to parts of the city, which helped in recovery efforts.

The head of the five-man Dutch pump team, Jaap van Wiessen, seen here with Brig. Gen. Robert Crear, served with distinction during Hurricane Katrina unwatering operations.

Stuart Waits, the IHNC project manger, and Chad Rachel discuss strategy with members of the German pump team at Pump Station No. 19. (Photo by George Stringham, September 14, 2005.)

Among the portable pump teams were teams from the Corps' Little Rock and Tulsa Districts, as well as international teams from Germany and the Netherlands. Volunteers from the Little Rock and Tulsa Districts worked portable pumps on the IHNC. The 95-man German team, which also included Luxembourgers, came with several small pumps. Although not suited for drainage of large volumes of water, they were very good at mopping up isolated areas that would not drain from the mainline pump stations. A five-man pump team from the Netherlands came with small pumps and several larger volume ones. They worked in Plaquemines Parish and also helped at Pump Station No. 5 on the IHNC, which was partially functional. The Dutch, who live some 20 feet below sea level, were very experienced with flood fighting and added a great deal of expertise to the overall team. Due to a Memorandum of Agreement with the Dutch that was in place before Katrina, the Corps built on the success of their collaboration to exchange knowledge about flood fighting and protection systems.[142]

this seemed. Thousands of vehicles, homes and chemical storage tanks were underwater, and the city's sewage treatment facilities were inundated. Environmental sampling of the waters showed, however, that the floodwaters closely resembled normal rainfall runoff. Researchers from Louisiana State University's Water Resources Institute entered the floodwaters a few days after Katrina and began sampling the water column throughout the city. They tested for turbidity, pH, and concentrations of organics, nitrogen, dissolved oxygen and metals and published their findings on Environmental Science and Technology Online on October 11, 2005. Oxygen levels were low, and the concentration of lead, arsenic and, in some cases, chromium were higher than drinking water standards. They feared that fecal coliform levels were high due to the sewerage system flooding, but those levels were also similar to normal rain runoff. The water was not safe by any stretch, but it did not pose the immediate threat to human health that the media and some scientists initially believed likely.[143]

On September 8, Task Force Unwatering issued a mission status report that detailed its progress in getting the pumping stations operational. As mentioned previously, pumps dating to the late nineteenth and early twentieth centuries amounting to about 75 percent of the system ran on 25-cycle power. The Sewerage and Water Board used natural gas to fire a generator that delivered the 25-cycle power through buried dedicated lines to the pump stations. When Katrina flooded this power plant, the city lost the majority of its pumping capacity. There was just no way to find a 25-cycle generator in the early twenty-first century. Task Force Hope and the 249th Engineer Battalion worked with the local utilities to restore power to the 60-cycle

Pumping Capacity by Drainage Area (September 8, 2005)

Drainage Area	No. of Pumps in Operation	No. of Pumps Pre-Storm	Current Operational Capacity	Pre-Storm Operational Capacity
Orleans East Bank	10	66	4,910 cfs	39,350 cfs
New Orleans East	7	26	1,650 cfs	4,672 cfs
Chalmette	8	19	1,766 cfs	5,537 cfs
Chalmette Extension	3	9	837 cfs	1505 cfs
Plaquemines East	3	6	220 cfs	2,942 cfs
Plaquemines West	6	20	1,140 cfs	8,214 cfs

pumps, and the Corps and its contractors worked with local pump operators to get the pumps dried out and operating. The table below shows the pumping capacity on September 8.

Portable pumps were helping in the areas of Orleans East Bank and New Orleans East, but they were not adding a significant amount of volume to the flood fight. The table below includes the additional temporary pumps and shows the pump operation as a percentage of pre-storm capacity. It also shows the revised dates for the completion of the unwatering mission that were released on September 9 based on the normal seasonal rainfall and projections of future pumping capabilities. The largest portable pump used by Task Force Unwatering was a 42-inch pump, which had roughly one-tenth the capacity of the largest municipal pump, and there could be as many as nine large pumps in a pumping station. Obviously, finding a way to get the permanent pump stations operational was the key to getting the water out of the inundated areas, but the breaches on the London Avenue Canal and the IHNC were still not completely closed. In fact, access on the IHNC area continued to be an issue: a barge remained lodged on the L&N Railroad Bridge until September 6, and the Claiborne Avenue bridge was in the down position until September 8 when the 249th Engineer Battalion (Prime Power) was able to hook up a portable generator to lift the bridge and allow surveying of the channel. The same day, Chinook and Blackhawk helicopters dropped another 550 sandbags into the London Avenue Canal breach site at Mirabeau Avenue, finally breaking the surface of the water. Additional pumping capabilities continued to arrive in New Orleans in the form of a team of German and Luxembourger specialists and pump teams from the

Percentage of Prestorm Pumping Capacity by Drainage Area (September 8, 2005)

Drainage Area	Percentage of Pre-Storm Pumping Capacity	Estimated Completion Date for Unwatering
Orleans East Bank	13	October 2
New Orleans East	40	October 8
Chalmette	32	October 8
Chalmette Extension	56	October 8
Plaquemines East	7	October 18
Plaquemines West	14	October 18

A critical mission for Task Force Unwatering was restoring access to the Air Products liquid hydrogen plant, a leading supplier of hydrogen products to more than 30 countries.

Corps' Little Rock and Tulsa Districts, who went to work in the Lower 9th Ward.[144]

Task Force Unwatering also engaged in a critical mission with national significance in the New Orleans East area in restoring access to a liquid hydrogen production plant owned by Air Products. The company was an industry leader serving technology, energy and industrial customers. Its services included the production and distribution of industrial gases, semiconductor material, and advanced coatings and adhesives with customers that included the U.S. government. Air Products maintained operations in 30 countries and employed nearly 20,000 people around the globe, and it was the leading supplier of hydrogen in the world. The liquid hydrogen production plant in Louisiana suffered wind and water damage to its facilities, and access to the site was impossible due to flooding. The damage to the Louisiana facility combined with the planned shutdown of its hydrogen production plant in Ontario, Canada, forced Air Products to declare "*force majeure*" on its hydrogen production.

Force majeure, meaning greater force, allows one or both parties of a contract to not be held liable due to some unforeseen event beyond its control, such as a war or natural disaster.[145]

Regaining access to the Air Products plant was a priority for the New Orleans East team. Pump Station No. 15 removed water from the Air Products plant, the Six Flags Amusement Park, and the Almonaster area. The New Orleans East team built a rock dike across the main canal to the pump station, thereby isolating the Air Products plant. Basically, Pump Station No. 15 was dedicated to draining the plant, and because of national economic priorities, Six Flags and the surrounding residential area would have to wait. On September 9, the Corps finally cleared the intakes at Pump Station No. 15 of debris, and pumps with a 350 cfs capacity started to drain the area. Additional debris removal equipment and generators were on the way, and the 249th Engineer Battalion was working to restore power to the pumps. Continued generator problems actually reduced the pumping capacity over the next day or two, but this mission remained a priority, and the task force continued to work aggressively to remove the water.

On September 13, the water dropped an additional four inches over the previous 24 hours at the plant. Pump Station No. 15 had two permanent pumps and five temporary pumps going at 800 cfs, and contractors with swamp buggies were keeping the intakes free of debris. Three more 42-inch pumps were on the way to raise capacity to 1,000 cfs. Task Force Unwatering officials believed that large wheeled vehicles could access the site and reported the following day that the water level was less than 12 inches at the plant. Air received its first shipment of supplies on September 15, and four days later, the company announced that the access road to the plant was reestablished and thanked the Corps of Engineers for its work in removing the floodwaters. The company expected to begin operations within months and have substantial production capability by the end of the year. Afterwards, the Corps worked to remove the rock dike in the canal and drain the remaining portions of New Orleans East.[146]

In the meantime, work continued on the remaining breaches on the London Avenue Canal and the IHNC. On September 9, the sheet pile closure of the London Avenue Canal was complete. A temporary pump was installed and began pumping

Sheet piling closed off the drainage canals to prevent further surges and tides from Lake Pontchartrain from reflooding New Orleans. In most cases, contractors left a section incomplete to allow drainage, closing the gap if another storm appeared on the horizon.

water. The contractor finally closed the breach site at Robert E. Lee Bridge on the west side of the canal by hauling in aggregate to dump in the site. From this breach, the contractor was planning on continuing to build the road to the second breach site to begin operations there. Helicopters dropped another 250 sandbags in the Mirabeau breach on this day. At the IHNC, contractors were fitting barges to move generators to Pump Station No. 19 and using dense grade aggregate to close the breach sites.[147]

Even though Task Force Unwatering was beginning to hit a groove and was making progress in many areas, there were still confusion and unexpected problems to be overcome every day. On the same day that the aerial sandbag operation finally closed the London Avenue breach at Mirabeau Avenue, Pump Station No. 6 in New Orleans suddenly lost a significant portion of its pumping capacity when a fire-fighting helicopter struck one of the power lines serving the station. It lost 2,750 cfs, reducing it down to only 1,000 cfs. Chief Warrant Officer Black and the staff of Entergy made the necessary repairs, and the station was back to moving 3,750 cfs within the day. Increased pumping capacities lowered the water levels in some parts of the area

Col. Duane Gapinski, the commander of Task Force Unwatering, briefs Chief of Engineers Lt. Gen. Carl Strock.

to one foot per day, but the increased pumping abilities actually had a unique set of problems, too. Pump Station No. 3, which sits at the head of the London Avenue Canal, began pumping water after closure of the breaches. Unfortunately, the restarted pump station put too much water into the canal, and the temporary pumps at the sheet pile closure at the Leon C. Simon Bridge could not keep pace. Water began to overtop the repaired breach site causing some to think there was a new breach somewhere. The Corps worked with the parish to reduce the pumping rate at Station No. 3 until it could remove some of the sheet piles to decrease the water level inside the canal and drop additional sandbags on the repair to raise its level.[148]

On September 13, Crear inspected the progress of the unwatering mission from the air, and he was pleased with the increased pumping flow and decreased water levels. He noted improvements at the Air Products Plant, in the 9th Ward, and in Plaquemines Parish. Gapinski reported that more than nine billion gallons of water were being pumped out of Orleans East Bank, New Orleans East, and St. Bernard Parish each day, and that the water in the 17th Street Canal area had receded six feet based on the high-water marks on houses. By this time, 50 mobile pump teams were in operation throughout the area, including the teams from Germany and Luxemburg, and Corps of Engineer teams from Little Rock and Tulsa, as well as the newly arrived teams from the Netherlands. The following day, as a result of the aerial inspection of the floodwaters by Crear and his hydrology experts, the Corps adjusted the projected unwatering dates: Orleans East Bank remained the same at October 2; New Orleans East changed from October 8 to September 30; and Chalmette and the Chalmette Extension, previously set to be dry on October 8, were moved up 15 and eight days, respectively; for Plaquemines East, the dated changed from October 18 to September 30, and Plaquemines West remained at October 18. Pump Station No. 6 on the 17th Street Canal was starting to reduce its pumping because it was running out of water to move. The focus for Orleans East Bank became getting Pump Station No. 1 online because it fed into No. 6. Crear hoped to be able to adjust the mission completion date for Orleans East Bank, as well, once Pump Station No. 1 was operating.[149]

On September 15, Task Force Unwatering reported it had unwatered 60 percent of the flooded areas. Pump Station No. 1

in Orleans East Bank began pumping water over to Pump Station No. 6 to be sent down the 17th Street Canal. There were three main pockets of water remaining in the east bank of New Orleans. One was west of City Park and was being drained by Pump Station No. 7, and another was City Park itself which drained into Bayou St. John, which was full at the time. Once the task force was able to use the drainage system to lower the water level of Bayou St. John, the park would drain naturally.

The third area was around Pump Station No. 4, which was now operational and had lowered the water level by eight inches in the last 24 hours. Recovery operations could begin in the southern section of Orleans East Bank and the 9th Ward. St. Bernard Parish was 90 percent dry. Task Force Unwatering was waiting for removal of the contaminated oil before completing the mission there, but recovery operations were beginning. In New Orleans East, the crews were planning to break the temporary dam that had isolated water at the Six Flags Amusement Park and the nearby residential area. The temporary dam had aided the unwatering of the Air Products liquid hydrogen plant, and temporary pumps would reinforce Pump

The Six Flags amusement park in New Orleans East was one of the last areas unwatered in that basin.

Station No. 15 to make sure that the plant area did not receive any water when the dam was removed. KBR had repaired two of the three levees in Plaquemines Parish, and most of the pump stations survived the storm and would be available to drain the parish. The Dutch pump teams had set up operations near East Pointe a la Hache in Plaquemines. On September 17, Plaquemines East was dry.[150]

One week after Katrina, the unwatering mission still looked bleak. The Corps still did not have data about many of the pumps, and the data it had showed that very few pumps were operational. Power was still unavailable throughout the region, and the breaches were still open. Within two weeks, however, Task Force Unwatering had made significant progress. The 249th Engineer Battalion had restored power to several key pump stations, which soon became operational. Contractors had sealed breaches at 17th Street and London Avenue canals, and temporary intentional breaches had helped lower water levels considerably. "We can see the end of the road – Certainly, we can now see the road," Gapinski said on September 13. With the unexpected progress, the task force was able to move its estimates of the unwatering mission, originally set for mid-October, up by a week to two weeks depending on the drainage basin. Yet only a few days later, clouds on the horizon heralded another weather event that could put the unwatering mission back weeks or months – Hurricane Rita.[151]

3. Re-inundation and the Final Push

Task Force Unwatering was beginning to see the end of its mission; water levels were down everywhere, and recovery operations were beginning to get started. At approximately the same time, on September 18, Bill Frederick, the National Weather Service meteorologist assigned to the Mississippi Valley Division, began tracking a new storm expected to enter the Gulf of Mexico in two days. This storm eventually became Hurricane Rita. Although he expected the storm to make landfall west of New Orleans, Task Force Unwatering immediately evaluated its ability to hold up to another significant rain event. It analyzed where the most immediate pumping needs would be, and it mobilized temporary pumps and pushed to get as many permanent pumps operational as possible. By September 20, sheet piles closed off the 17th Street and London Avenue Canals to prevent storm surge entering the city from Lake Pontchartrain. The team also prepositioned pumps to get the water around the closures if necessary. Contractors began to raise the Inner Harbor Navigation Canal (IHNC) levee up to 10-feet above sea level because the size and depth of the IHNC made it impractical to close it off. Contractors made last-minute attempts to close the last breach in West Plaquemines with water bags, and the Corps stockpiled sandbags, aggregate, and other rapidly deployable flood-fighting equipment. It also had its contractors stage personnel and equipment for use if needed after the storm. On the east bank of Orleans Parish, Pump Station No. 7, on the undamaged Orleans Avenue Canal, and Pump Station No. 19, on the IHNC, would evacuate any rainwater, and once the water level in Lake Pontchartrain retreated, the contractors would remove 17th Street and London Avenue Canal closures and bring the pump stations back on line. Task Force Unwatering pulled its people out of the field in anticipation of Rita; some

Col. Duane Gapinski calls in a Situational Report after Hurricane Rita on September 24.

remained at the New Orleans District office, and some pulled back to Baton Rouge to wait out the storm.[152]

Hurricane Rita made landfall along the Louisiana/Texas border as a Category Three storm on the morning of September 24. Although the hurricane force winds and storm surge mostly impacted southeastern Texas and southwestern Louisiana where the eye landed, Texas, Louisiana and Mississippi experienced heavy rainfall and storm surges, which forced water levels to rise in the IHNC and overtopped levees on both the east and west sides. Joey Wagner, the New Orleans District emergency manager, would later remark, "If we would have had one more day, that would not have happened, but Rita came a day early. We were unable to get the protection in place on time." The 17th Street and London Avenue canals, however, remained sound.

The prediction of a five-foot storm surge on the IHNC was incorrect and the interim repairs were only at around eight feet when the storm hit. Col. Duane Gapinski and Denny Lundberg heard the widely distributed media reports of flooding and overtopping and left the bunker at the district headquarters to investigate. When they arrived, they witnessed water cascading over breach repairs and re-flooding the neighborhoods in the area. Pump Station No. 7 moved the rainwater out of the interior of the parish, and Pump Station No. 19 limited the damage inflicted by the levee overtopping on the west side of the IHNC. The Lower 9th Ward was flooded again by overtopping on the other side of the IHNC, but St. Bernard Parish pumps were working, and the parish reported no significant flooding. There was no significant increase in damage to these areas as the recovery process had not started in earnest yet.

Immediately after the storm cleared, the Corps went to work adding height to the IHNC repairs: large rock filled the scour hole and aerial sandbags topped the crest to stop the water and to add height, and helicopters dropped about two hundred 3,000 to 7,000 pound sandbags on the east side of the canal on September 24. The task force sent eight truckloads of sandbags down to Plaquemines Parish to stabilize the levees. The pump crews from Germany and the Netherlands prepared their personnel and equipment to return to the fight, as Task Force Unwatering prepared to unwater parts of the city for a second time.[153]

By September 26, Task Force Unwatering was back up to speed in finishing its mission. The team had shored up the IHNC levees and removed the sheet piles from the 17th Street and London Avenue canals. The Dutch and one German pump team set up in the Lower 9th Ward; the rest of the Germans began pumping out small areas in Orleans East Bank; otherwise, the Orleans East Bank was essentially dry. Pumping operations continued in the Six Flags region of New Orleans East. Pump Stations Nos. 1 and 6 were drawing down the water in St. Bernard Parish which was essentially dry on September 28.

Hurricane Rita breached a local levee in Terrebonne Parish near the city of Montegut, and local officials asked the Corps of Engineers for help. Jeff Richie went to Terrebonne Parish to oversee the helicopter staging area as he had done at the Coast Guard Station in New Orleans. Overall, Terrebonne Parish suffered seven breaches due to Hurricane Rita, and the Corps expanded the contract with KBR to include the unwatering of Terrebonne Parish. Otherwise, the Corps of Engineers and KBR attacked the problems in Terrebonne as they had elsewhere. Gapinski appointed David Wurtzel the project manager for the parish. The task force assigned eight helicopters to drop sandbags into the breach in an operation that Gapinski expected to last two or three days.[154]

Hurricane Rita also inflicted significant damage to Plaquemines Parish. It re-opened levees damaged by Katrina and opened new crevasses. Complicating making these repairs was the lack of accessibility to the region. Helicopters placed sandbags in both Plaquemines and Terrebonne parishes. KBR closed the seven Terrebonne breaches through the helicopter operations by September 30, and all helicopter assets then concentrated on Plaquemines Parish. Gapinski recalled that they dropped 10,000 of the 3,000- to 7,000-pound sandbags in Terrebonne Parish after Hurricane Rita. The Task Force opened a second sandbag loading area in Plaquemines, which allowed for 12 helicopters to operate simultaneously in the fight. Initially, eight helicopters were dropping approximately 400 sandbags per day.

Elsewhere in the area, Task Force Unwatering was moving more than 9,000 cfs of water in Orleans, St. Bernard, and Plaquemines parishes. The water level around Six Flags was down one foot, with two or three feet of water remaining. Clear

12. The Forgotten Flood Fight

With a larger population and the huge amount of flooding, New Orleans received the lion's share of attention in the unwatering mission following Hurricane Katrina. However, although often forgotten, the Corps spent more than three weeks unwatering Terrebonne Parish in south central Louisiana following Hurricane Rita. Hurricane Rita landed along the Texas-Louisiana border early on September 24, 2005. In New Orleans, the only new flooding came along the Inner Harbor Navigation Canal (IHNC), primarily in the Lower 9th Ward where pumps were operational. Plaquemines Parish was re-inundated. However, the majority of the damage was in Terrebonne Parish. Although the protective levees and other works there were mostly nonfederal, Rita severely damaged these resources, causing 16 breaches in state and local levees – seven of them major – and flooding the region to a depth of eight feet. Particularly hard hit was the city of Houma.

On September 26, the state requested support from the New Orleans District which started shipping sandbags to help the flood fight. By the next day the district was coordinating with Task Force Unwatering to drop hundreds of the two- to seven-ton sandbags into the breaches by helicopter. By September 29, the two organizations had closed all of the smaller breaches and had closed four of the seven large ones. They completed the sandbag operations on September 30, and started inspections on October 2. Simultaneously, the pumping started. Most of Terrebonne Parish's pump stations were operational, but Task Force Unwatering

Although Terrebonne Parish weathered well during Hurricane Katrina, the same couldn't be said during Hurricane Rita. Here, Robert Foret (left) and Jeff Richie review some of the damaged levees annotated on a map of the area. (Photo by Lauren Solis, U.S. Army Corps of Engineers.)

Terrebonne Parish remained flooded for more than three weeks after Hurricane Rita while the Corps of Engineers sought to close the breaches and unwater Houma and other cities.

tasked KBR to support their operations with portable pumps. However, holding up the activities were funding issues. FEMA did not assign unwatering taskers, so Task Force Unwatering Commander Col. Duane Gapinski worked to have Flood Control and Coastal Emergencies (FCCE) funding transferred to the KBR contract. By October 2, KBR got the first pumps on the ground, but a leak at Montegut required the placing of an additional 130 sandbags. At Ward No. 7, KBR provided two 42-inch pumps, which amounted to half of the pump capacity at that location. By October 10, the task force had increased pump capacity from a starting capacity of around 50 cfs to more than 1,100 cfs. It completed unwatering in three of the seven districts on October 11, gradually reducing temporary capacity as it completed unwatering the districts, and finally completing the mission on October 17.[156]

weather and low tides helped to speed the work. The Lower 9th Ward still had 2-1/2 feet of water around Pump Station No. 5, and the repairs to the IHNC reached a level of protection of greater than 10 feet. The unwatering mission in St. Bernard Parish was complete, and the focus of the task force shifted to improving levee access and ensuring the long-term capabilities of the damaged pump stations.[155]

On October 3, Task Force Unwatering used sheet piles to close off New Orleans' outfall canals again when Tropical Storm Stan began to raise the Gulf of Mexico water levels by about three feet. Increasing water levels overtopped breach repairs near the city of Montegut in Terrebonne Parish. KBR dropped about 70 sandbags to reinforce the repairs, which would continue as needed. In Plaquemines Parish, progress on the breach repairs caused by Rita continued; repairs at the breaches at Sunrise, Nairn and Myrtle Grove were complete; and the parish began pumping operations. The breaches at Scarsdale on the east bank of the river and the Citrus Land area on the west bank still needed closure. The Scarsdale breach was more difficult to close than expected, and the work progressed slowly. By October 5, Task Force Unwatering was placing 1,100 sandbags in the breaches daily. Aiding the drainage of the Six Flags area in New Orleans East were intentional breaches in an inner levee, which helped to move water to the Jahncke and Citrus Pump Stations, which joined Pump Station No. 15 in removing water from the area. The pump team from the Netherlands left the New Orleans area on October 4 after more than a month of hard work in removing the floodwaters from the city. The Dutch team left two of their pumps

A contractor closes the back levee at Citrus Land in Plaquemines Parish after Hurricane Rita.

behind, which continued to operate in the Lower 9th Ward and in East Pointe a la Hache in Plaquemines Parish.[157]

After several more days of slow progress, Crear announced that the unwatering of the Lower 9th Ward was complete on October 9, and on the following day he said the same for New Orleans East in the Six Flags area. Pump Stations in the area continued to remove small pockets of water, but they did not have any effect on recovery operations. Crews began to close the notches made in the inner levees to aid the draining of this area a couple of days later. Temporary pumping capacity reached 1,050 cfs in Terrebonne Parish as well. The unwatering of the parish was progressing well, and the task force began to schedule the removal of some of the temporary pumps. By October 11, three of the parish's seven drainage areas were dry. After swallowing more than one thousand sandbags a day, the large Scarsdale breach in Plaquemines Parish finally closed on October 10, allowing the pumping operations to start immediately, and after a couple of days, pumps were moving 3,707 cfs of water from the parish. On October 19, the Corps announced that both

Col. Richard Wagenaar and Generals Don Riley and Robert Crear show Vice President Dick Cheney, Louisiana Sen. David Vitter, Secretary of Homeland Security Michael Chertoff, Vice Admiral Thad Allen, and others progress on the 17th Street Canal.

Terrebonne and Plaquemines Parishes were unwatered, and the German pump teams finally returned home the following day.[158]

Despite declaring victory over the floodwater, Task Force Unwatering continued to work in several areas. Notched levees needed repair, several pumps continued to pump water out of unpopulated flooded areas in Plaquemines Parish, and the pump stations throughout the area required cleaning, repairing, and drying out. Temporary breach repairs had some seepage issues that needed addressing, and contractors reinforced or strengthened many of them. The task force's mission was to remove the water from the inundated areas so normal recovery operations could begin, and after reaching that goal, it began to transition its ongoing operations to the New Orleans District, Task Force Guardian, and local officials. Most of the New Orleans District project managers went to work on Task Force Guardian, and Gapinski, Denny Lundberg, and the other personnel from Rock Island returned to their home district on October 24. Task Force Unwatering operated for 44 days, a much shorter time than the original projections of as long as six months.[159]

At the end of the Task Force Unwatering mission, the permanent pumping capabilities of the area parishes had largely rebounded (see Appendix C). Orleans Parish East Bank was at 39 percent capacity, New Orleans East 76 percent, St. Bernard 83 percent (Chalmette and the Chalmette Extension), Plaquemines East 79 percent, and Plaquemines West 91 percent. The temporary pumps used in Task Force Unwatering were very small compared to the permanent pumps; for example, the team of 95 Germans brought over a variety of small pumps with a total pumping capacity of only 100 cfs. Charles Shadie of the Mississippi Valley Division, who worked the unwatering plan from *MV Mississippi* and *MV Vicksburg*, estimated that the temporary pumps removed only five percent of the total volume of floodwater. The permanent pumps removed the rest. The teams of specialists from the Netherlands and Germany, as well as Corps teams from Little Rock and Tulsa, brought their knowledge and expertise to specific problem areas. If a hospital needed its basement unwatered or a highway underpass was flooded, the specialists excelled on these sorts of tasks. They could work independently, and Task Force Unwatering often teamed them up with local authorities and sent them out to do

Unwatering the city required Task Force Unwatering to repair dozens of pump stations, each one containing multiple pumps of varying models and capacities.

their work. They operated quickly and efficiently and had the ability to set up their discharge lines to funnel into an operating pump station, and they moved on quickly. They would never have emptied the city by themselves, but they performed a great service and were invaluable to the success of the operation.[160]

In December 2005, the EPA released its results of testing on nearly 400 water samples taken from the floodwaters. They had tested these samples for more than 200 chemicals. All of the chemical levels were below exposure standards for short-term exposure, and only a couple of chemicals were above standards for 90-day exposure, but it is also unlikely that anyone would have been exposed to the floodwater for that length of time. Samples from the pump discharges into Lake Pontchartrain were similar to the test results from 2001 to 2004. And all results from the lake were below the standards set for recreational

Although the water at times appeared very unhealthy, the "toxic soup" predicted by the media never materialized – EPA tests showed some chemicals had higher levels that those recommended for drinking water, but overall the floodwaters had content similar to rain runoff.

use. Additionally, there was no great concern regarding the toxic effects on the area's seafood population. Samples of fish and shellfish samples from Lakes Borgne and Pontchartrain and the near shore of the Gulf of Mexico showed no reason for concern for the human consumption of seafood. Further testing of seafood samples from the lakes and the Gulf of Mexico continued and had similar results. This demonstrated that, despite predictions, the flooding of New Orleans and the resulting unwatering had not significantly altered water resources in the region or had any lasting adverse impact on personnel exposed to the floodwaters.[161]

Task Force Unwatering's mission was to remove the water from the inundated areas so that normal hurricane recovery operations could begin. The successful completion of this mission did not, however, mean that New Orleans and southern Louisiana was prepared for the next hurricane season. As Gapinski noted after closing the major breaches, "The system in its present condition does not ensure that the city will be protected from flooding." In fact, the glancing blow of Hurricane Rita proved that the interim repairs in the city were not ready.

As Task Force Unwatering shut down, another task force, called Guardian, was ramping up. Its job was to return the region's hurricane protection system to its pre-Katrina congressionally authorized level. The Corps of Engineers team assembled in New Orleans and jumped right into its task. What was already a monumental undertaking was made even more so by the deadline, June 1, 2006, the first day of the next hurricane season.[162]

Part III.
Task Force Guardian and Levee Rehabilitation

In February 2006, investigations into the failure of the hurricane protection system were in full force, while news reports repeatedly criticized the Corps as culpable for the floodwall failures that impacted New Orleans. Simultaneously, the Corps was working to quickly rebuild the storm-thrashed levees and floodwalls. Asked what it would take to restore public confidence in the Corps, Director of Civil Works Maj. Gen. Don Riley responded, "It is our commitment to build confidence back in the public and faith in the hurricane protections they live within. We are repairing them to pre-Katrina levels and repairing them in an improved state." It was an obvious connection that many residents and local officials also made – the Corps would rebuild hope and confidence mainly by rebuilding the hurricane protection system and fulfilling its mission of protecting the people it serves. Success in rebuilding was necessary if the Corps was to have success in restoring confidence. Unfortunately, the next hurricane season was only months away, and many of the levees and floodwalls in the New Orleans area remained damaged, with some levees 10 feet or more below authorized levels and with hundreds of scour holes or other weaknesses. It became critical for the Corps to complete reconstruction of the protection system if it were, in fact, to protect the people.[163]

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— Maj. Gen. Don Riley

It was the job of Task Force Guardian to achieve the monumental task of rebuilding the hurricane protection system by June 1, 2006, the start of the next hurricane season. Operating under Task Force Hope, Task Force Guardian not only had to rebuild the levees to their pre-storm level, but in many cases return them to their authorized level or higher, which sometimes differed by several feet because of subsidence. This was very complicated, requiring precise measurement, management of hundreds of millions of dollars in contracts with dozens of contractors, coordination with multiple federal agencies such as the Federal Emergency Management Agency (FEMA) and the Coast Guard, coordination with local government agencies to address their priorities and get approval for plans, locating borrow pits with the right quality of material, and coordination with investigating teams to ensure that the new construction avoided any errors inherent in the old system, all within a highly compressed time frame and highly contentious operating environment. The Corps completed this task, although it did not meet some goals. Only this would enable the Corps to start the process of rebuilding public confidence, which most acknowledged would take months or years.

1. Geaux!

After a long career as a combat engineer, Col. Lewis Setliff took over as commander of the St. Louis District of the Corps of Engineers on June 30, 2005, his first civil works assignment. Before Setliff could even settle into his new position and establish a permanent residence in St. Louis, Task Force Hope Commander Brig. Gen. Robert Crear called on him to bring the destroyed levee system in and around New Orleans back to its pre-storm level. Setliff brought a handful of people with him from St. Louis; he first set up shop at the Mississippi Valley Division headquarters in Vicksburg to assemble his team, which became known as Task Force Guardian. Later, they moved down to the city, first operating from the New Orleans District headquarters and ending up in the Federal Reserve Bank Building in downtown New Orleans. Their work would, under normal conditions, have taken five years. The situation in New Orleans was far from normal; Hurricane Rita had already hit the hurricane protection system with a second blow, and the area was virtually defenseless. Setliff had to push aside any doubt or trepidation because he had nine months to accomplish his mission. After consulting with Setliff on the goals and dates, Crear announced that the hurricane defenses would be rebuilt by the first day of the next hurricane season, June 1, 2006. Task Force Guardian adopted the single word "G-E-A-U-X" (pronounced "Go") as its mantra. It meant that the task force was focused and dedicated; it had one job, and it was going to succeed.[164]

Brig. Gen. Robert Crear chose Col. Lewis Setliff, commander of the St. Louis District, to head up Task Force Guardian and take charge of rebuilding New Orleans levees.

The Corps of Engineers' responsibility to rebuild flood control structures and hurricane protection systems damaged by floods and storms lay in the Flood Control Act of 1950 and its amendments (33 U.S.C. 701n or PL 84-99). Under the Flood Control and Coastal Emergencies (FCCE) funding authority, the Corps returns flood control works and hurricane protection systems to their previously authorized level of protection. In the first step in the PL 84-99 process, the local Corps of Engineers district commander informs the local sponsors that there is a 30-day deadline for them to request rehabilitation assistance under 84-99. After receiving a letter requesting federal assistance for repair work, the Corps produces a Project Information Report that details the damage to the protection system. The benefit-cost ratio for the rehabilitation must be greater than 1.0, meaning that average annual project benefits must exceed the average annual project cost. In testimony before the House Energy and Water Appropriations Subcommittee, Chief of Engineers Lt. Gen. Carl Strock stated that it would cost $1.6 billion to return the levees to their pre-Katrina condition.[165]

Even while Task Force Unwatering was making every effort to close the many floodwall and levee breaches and unwater the city, the Corps began to look to the future and the rehabilitation of the levee system. In the first week of September, Setliff began to organize the advance party for the levee rehabilitation team in Vicksburg, and by September 14, St. Louis District, as part of its assumption of the civil works mission of the New Orleans District, had received $450,000 to start on the damage assessments. One of the initial challenges was sorting out the funding authorities for the work needed. Although it also fell under PL 84-99 authority, FEMA funded the unwatering mission as part of Emergency Support Function-3, Public Works and

Engineering Support, under the National Response Plan. As part of its mission, Task Force Unwatering awarded Shaw and KBR the first "interim protection" work to restore the protection level of the levee system to greater than 10 feet and continue repairing pump stations. Funding for the overall rehabilitation of the system by Task Force Guardian came from the $80 million in the FCCE fund paid directly by the Headquarters of the Corps of Engineers. Some of the initial repairs to the Mississippi River levees came from annual operation and maintenance (O&M) funds for those projects, which the New Orleans District managed. Once funding started to come in, Task Force Guardian was ready to set up shop in New Orleans, but Hurricane Rita was on its way into the area, and the Task Force remained in Vicksburg until the storm passed.[166]

The advance party from Task Force Guardian arrived in New Orleans on September 26, on Hurricane Rita's heels. Its job was to prepare for the arrival of the rest of the group, which remained in Vicksburg to continue to collect aerial photography and assess any additional damage due to Rita. The damage inflicted by Hurricane Katrina was so extensive that the initial investigation uncovered little additional damage to the protection system by Hurricane Rita. On September 28, the 73-person task force finished its move to New Orleans, and the Corps introduced Task Force Guardian and its mission to the public with a press announcement the following day. Setliff noted the connection between the two districts, his 20-year personal relationship with Col. Richard Wagenaar, and the support the New Orleans District provided the upriver district during the 1993 Midwest Flood. Much of the initial work completed prior to the task force's arrival in New Orleans consisted of contracting out high-tech surveys of the damage, collecting data for the Project Information Reports (PIRs) in coordination with local government, and working with Task Force Unwatering personnel who were on the ground everyday to start transition of the rehabilitation mission to Guardian. Monumental tasks such as the reconstruction of the levees in Orleans, St. Bernard and Plaquemines parishes required a solid management structure, but also one that was supple enough to adjust to changing conditions and additional missions. All along, the Mississippi Valley Division contingency plan (CONPLAN) had intended the St. Louis District to handle the New Orleans civil works missions while that district reconstituted. With the monumental task of repairing the levees, this gradually evolved into the plan to stand up a separate task force. The task force had to include enough New Orleans District personnel who were familiar with the levee system and local contractors and government agencies to not have a huge learning curve, but enough St. Louis District personnel to be able to handle the contracting, real estate, and management workload. Based on briefings given by Setliff and Wagenaar, Crear finalized the team in mid-September.[167]

By September 19, Task Force Guardian set up its project teams for each geographic area (Orleans East Bank, New Orleans East, St. Bernard Parish, the Inner Harbor Navigation Canal, and Plaquemines Parish). Later, the task force divided the Inner Harbor Navigation Canal (IHNC) project and combined it with the Orleans East Project and the Chalmette Area Plan (formerly called the St. Bernard Parish Project). It also had teams dedicated to addressing other specific problem areas. There was a borrow team that tackled problems related to acquiring the three million cubic yards of needed fill material and a Mississippi River team to handle the repairs to O&M

Colonels Setliff and Wagenaar held the first Task Force Guardian meeting on September 28, two days after the arrival of personnel from St. Louis.

projects. The appropriate project team based on the geographic location would handle the repair work on the Mississippi River levee system. The task force also had its own in-house support team. About one month later, after the end of Task Force Unwatering, Task Force Guardian added a team dedicated to handling the repair work on pump stations with a project manager and the necessary support team. Task Force Guardian also began to study the damage and repairs needed for the nonfederal levees and levees that were undamaged but below design height. These tasks are examples of Task Force Guardian's mission to return the area's hurricane defenses to authorized levels, not just to rebuild what was there before Hurricane Katrina. Another special project team was dedicated to the removal of barges and other vessels stranded in the construction areas by the hurricane. The Barge Team worked with the U.S. Coast Guard and FEMA as well as the commercial shipping industry to prioritize a removal schedule based on getting the barges off the levees in order not to delay Task Force Guardian's contracting schedule. FEMA investigated the legal issues on removing the privately owned barges and tried to identify a funding source.[168]

Task Force Guardian started out as a small cadre of personnel from the St. Louis District and, as the mission got rolling, it continued to add the staff needed. As the New Orleans District reconstituted and the logistical situation in New Orleans improved, the task force grew to around 80 people in early October. Around the time Congress approved funding and the contracting process began to take off, the task force added 62 contractors, bringing the total number of people in the task force to 145. Task Force Guardian made plans to expand to about 270 people around the end of the month. This increase in size required additional facilities for the staff, and the logistics branch of the task force began looking for additional office space. Task Force Guardian signed a lease for office space in the Federal Reserve Bank Building in downtown New Orleans at Poydras Street and St. Charles Avenue on October 26, and signed an eight-month contract for $250,000. The task force moved to the Federal Reserve Bank on November 4. After remaining fairly constant in terms of the number of personnel through November and December, Task Force Guardian jumped to more than 200 people at the end of January 2006.[169]

Task Force Guardian Project Managers	
Manager	**Responsibility**
Walter Baumy	Sr. Civilian
Mike Rector	Sr. Project Engineer
Fred Young	Orleans East Bank
Ken Crumholt	Orleans East
Stuart Waits	Inner Harbor Navigation Canal
Kevin Wagner	St. Bernard/MR-GO
Mark Gonski	Plaquemines
Jim St. Germaine	Pump Station PDT
Dan Thurman	Borrow Material

The Task Force Guardian management team poses for a photo. Front Row: Dan Thurman, Col. Lewis Setliff, Brig. Gen. Robert Crear, Col. Richard Wagenaar, and Kevin Wagner. Back Row: Walter Baumy, Fred Young, Stuart Waits, Ken Crumholt, Mark Gonski and Dennis Fenske.

Amid the confusion and urgency of the evacuation of displaced citizens and the operation to close the breaches, no one really knew the exact extent of the damages to the region's protection system. As Setliff later recalled, the "number one priority right after the storm was to organize and assess the situation." Thus, Setliff and the Task Force Guardian staff were the first to really assess the situation and report on rehabilitation plans in PIRs as required by PL 84-99 and Corps of Engineers procedures. Task Force Guardian divided its work into four main project areas: Orleans East Bank, consisting of the Lake

Pontchartrain lakefront levees, the levees and floodwalls on the three outfall canals (17th Street, Orleans Avenue, and London Avenue), and the western levee and floodwall on the IHNC; New Orleans East, bordered by Lake Pontchartrain lakefront levees, the eastern levee and floodwall of the IHNC and Gulf Intracoastal Waterway (GIWW) levees; the Chalmette Area, the region between the Mississippi River, the eastern levee and floodwall of the IHNC, and the Mississippi River-Gulf Outlet (MR-GO) including the Lower 9th Ward, and the neighborhoods of Violet and Chalmette; and Plaquemines Parish, the area protected by the New Orleans to Venice Hurricane Protection System in that parish. The inspection teams used visual ground inspections and light detection and ranging (LIDAR) assessments to produce a damage report that identified the extent of the damage and the amount of material needed to return the system to its pre-hurricane levels. LIDAR uses helicopter-mounted sensors that measure the time from the laser's transmission and its reflection off an object. It is tied in with global positioning system technology that can reproduce very precise 3-D measurements of the ground surface. Task Force Guardian contracted out a LIDAR survey of the hurricane damage in Louisiana, and the results provided the engineers with the length of breaches, the existing height of levees that had been degraded by overtopping, and the depth and size of scour holes. They used these measurements to determine the amount of fill material needed to rebuild the levees and with that information calculated the cost of the repairs. The first LIDAR surveys on New Orleans East and St. Bernard Parish were complete by September 14.[170]

Per PL 84-99 requirements, the Orleans Levee District applied for federal assistance on October 8, and Task Force Guardian issued its PIR for the east bank of Orleans Parish on October 18. On Lake Pontchartrain, Hurricane Katrina caused lakeside erosion and levee scour on the protected side due to overtopping in 14 locations. The erosion and scour damage sites ranged from six to 30 feet in length, from two to 20 feet wide, and from six inches to three feet deep. This damage required 231 cubic yards of compacted clay material to complete the repairs. The Orleans East Bank PIR included the west levee and floodwall of the IHNC. From the lock at St. Claude Avenue north to Florida Avenue, the damage consisted of scouring along the base of the floodwall. North of Florida Avenue to

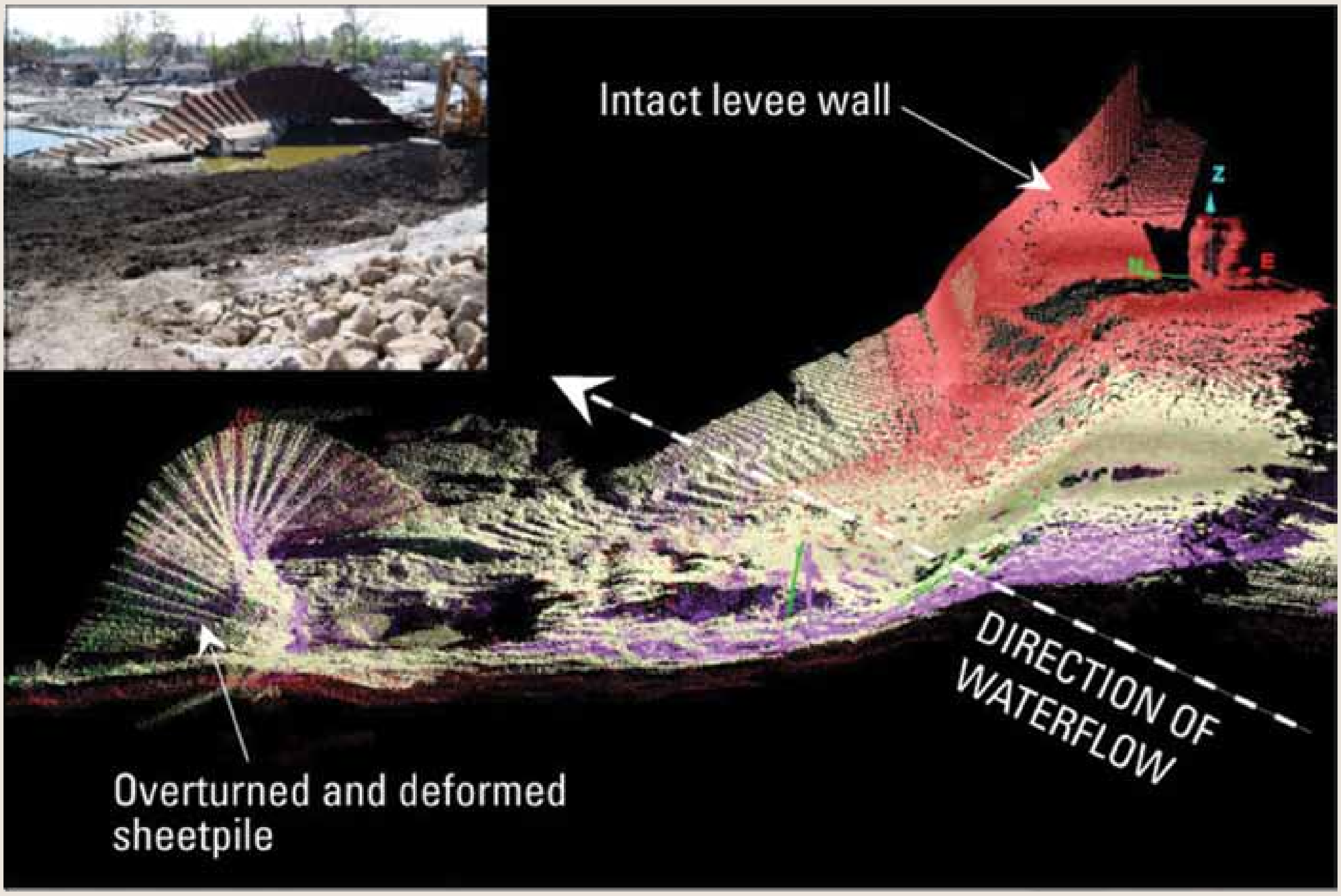
Highway 90, there were two breaches in the floodwall in addition to floodwall and levee scouring. From Highway 90 to the lake, there was only minor scouring. There were 19 damage sites identified ranging from 20 to 1,460 feet long and from three to 15 feet wide. The depth of the scouring was no more than five feet. The repairs would require more than 7,000 cubic yards of compacted clay material. Nearly 1,500 feet of damaged I-walls needed replacement with a buttressed I-wall – a wall braced by wing walls or other structures at a 90 degree angle – to provide greater stability due to changing foundation conditions along the canal. The 17th Street Canal suffered a 455-foot long breach, and the rushing floodwaters scoured out a hole 21 feet below sea level behind the breach. The London Avenue Canal breach at Mirabeau Avenue was 425 feet long with a scour hole 28 feet below sea level. The Robert E. Lee Boulevard breach was the largest at 720 feet long and had a scour hole of 20 feet. Task Force Unwatering had made the immediate repairs to get through the remainder of the 2005 hurricane season, and Task Force Guardian prepared a two-step plan to return the outfall canals to their pre-Katrina levels of protection. Phase one of the floodwall repairs called for the construction of a cofferdam around the damaged areas using sheet piling at a protection level of greater than 14 feet. Once the cofferdam was in place, during the second phase of the repairs, the contractors would remove the expedient repairs of Task Force Unwatering, prepare the site, and rebuild the levee foundation. The contractors would replace failed I-walls with reinforced concrete T-walls on top of the levees. In addition to the breach sites, the PIR also identified a 600-foot section of I-walls on the east side of London Avenue Canal that had shifted out of place and no longer provided a suitable amount of protection, and planned for replacement of this section by a T-wall. The PIR also included a small amount of scour and slope pavement repairs needed on the Orleans Avenue Canal. The total cost of these repairs was $88 million, and there would be 13 separate contracts for the work with at least three of them designated as small business contracts.[171]

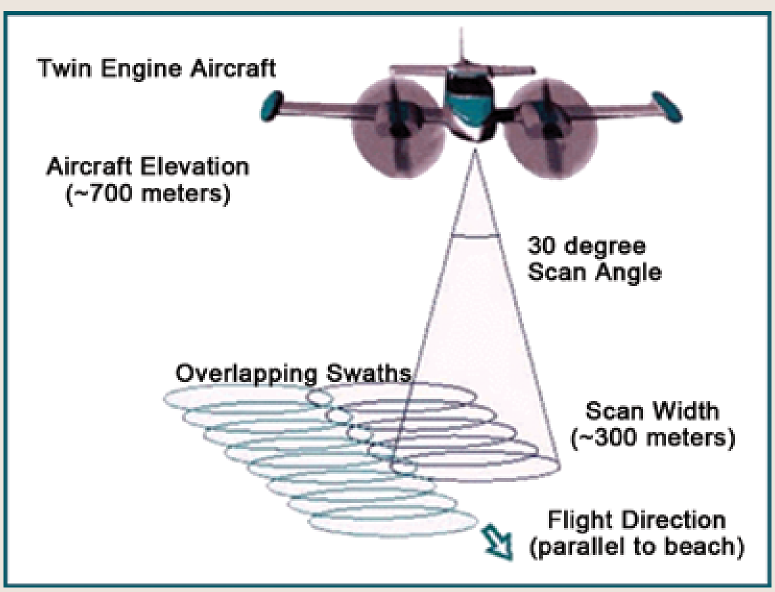
The PIRs were not set in stone, however. They could not be. The Corps was dedicated to making the most appropriate repairs based on solid engineering facts. As Task Force Guardian and other investigators uncovered new information, the plans for rebuilding the hurricane protection system changed.

13. LIDAR Investigations

Light detection and ranging (LIDAR) is a method used to collect elevation data very quickly and precisely while flying over a geographic region. It also has proven helpful in navigation, detecting changes to routes in Iraq, visualization of atmospheric conditions, and other uses. LIDAR collects data by constantly bouncing light (typically lasers or infrared signals) from multiple collection points off an object and measuring the time it takes from transmission to reception, calculating for any shifts in altitude or movement of the collection equipment while flying. This allows the collection of hundreds of data points per minute cross-referenced with precise global positioning system (GPS) locations, with the result that a computer can use the data to create high-fidelity and high-resolution 3-D models of an area. LIDAR is becoming increasingly popular as a photogrammetric and mapping technique because it is very fast and accurate, taking only a little more than the time it takes to fly over an area by plane or helicopter.

Task Force Guardian used LIDAR to help calculate the precise elevation of levees to determine the amount of work and money needed. This was a critical need since no one knew exactly how much work the damaged levees required, and there was no time for traditional surveys of the 350 miles of levees, which would have taken a dozen to 18 months. As the Corps of Engineers Center of Expertise for Photogrammetric Services, the St. Louis District had many resident experts who advised Task Force Guardian Commander Col. Lewis Setliff and the Guardian team on how to collect the data and create the models and maps. Starting around Labor Day 2005, a contractor flew over each levee segment by helicopter and collected the data, a process that took about six weeks to two months to complete. Over the following month, the Guardian team then built a model, which they compared with authorized levee heights. By subtracting the difference, they could calculate the amount of levee material required to bring each levee alignment up to design standards. Based on this amount, they could estimate the cost to raise the levees. This was a critical first step in developing the Project Information Reports and requesting funds necessary to complete the work. Using LIDAR and computer models saved the team about nine months to a year.[172]





Light detection and ranging (LIDAR) is a method used to rapidly capture elevation data during overflights, which typically translate into a 3-D graphic like that shown here.

Probably the most significant of these changes affected the work in Orleans East Bank. The task force produced a revision to this PIR in January 2006, which revealed that the foundations of the levees on the outfall canals had deteriorated and that the canals could not safely hold as much water as they had prior to Hurricane Katrina. The revised damage report indicated that the 17th Street Canal needed relief wells, seepage berms, or stability berms along 17,500 feet, or more than 3.25 miles, in three sections of the canal. Relief wells are vertically inserted wells that relieve hydrostatic pressure from seepage under a levee by giving the water a controlled outlet.

Engineers use seepage berms on the landside of a levee to provide additional weight to counteract the upward movement of seepage. Seepage berms also lengthen the path of seepage flow, which reduces its force as it exits the berm. Stability berms use their weight to reinforce levees and increase a levee's resistance to sliding. The London Avenue Canal needed relief wells or seepage berms in sections on both sides of the canal and a slurry trench above the Leon C. Simon Bridge. A slurry trench is an excavation into the soil beneath a levee that is back-filled with impervious clay slurry that prevents seepage beneath the levee. Nearly 3.5 miles of the London Avenue Canal needed these improvements. Although there were no breaches on the Orleans Avenue Canal, it needed improvements as well to combat foundation seepage on more than two miles of its length.[173]

"The outfall canals were probably the biggest challenge we were faced with that we did not know about going in."

— Setliff

These repairs, however, were time consuming. As Setliff recalled, "The outfall canals were probably the biggest challenge we were faced with that we did not know about going in." Expectations were that repairs to the canal floodwalls would take three years to complete, so to fulfill its mission of providing a pre-Katrina level of protection by June 1, 2006, Task Force Guardian had to come up with a new plan. The engineers knew the city's canals could not hold the surge from another hurricane, so they decided to construct temporary gates on the canals where they intersected with Lake Pontchartrain, similar to plans suggested by the Corps in the 1980s. That way, the storm surge would never reach the weakened canal walls. The gates would remain open during normal weather conditions and non-tropical rainstorms, and the closure sites would have temporary pumps installed to remove rainwater while the gates were closed. The pumping capacity at the gate closure was much less than the permanent pumping capacity available when the gates were open. At the 17th Street Canal closure, the temporary pumps would reduce pumping capacity from 10,440 cfs to 2,600 cfs; at London Avenue, it would be 2,600 cfs instead of 7,980 cfs; and on the Orleans Canal, the temporary pumps would operate at 2,000 cfs instead of 2,690 cfs. Task Force Guardian considered the canal closures as temporary measures that would remain in place until the canal walls could be strengthened.

The revised PIR also noted more construction needed on the IHNC. The hurricane had damaged an additional 3,600 feet of I-wall, which needed replacement with a buttressed I-wall or a T-wall. In addition, the task force would add large rocks or concrete to armor the levees and floodwalls and to prevent scour and erosion. The overall price of the repairs in Orleans East Bank increased from $88 million to $333.8 million. The normal implementation of PL 84-99 does not allow improvements to an existing project; the Corps is supposed to return projects to their previous plans and specifications, and since the original designs Congress approved and funded did not include these elements, the Corps could not make these improvements unless authorized. After Hurricane Katrina, however, Congress authorized the new canal closures and the armoring of sections on the IHNC because they were necessary to return the city to its previous level of protection. The changing foundation conditions of the levees and floodwalls meant that simply rebuilding the features would not protect the city as well as the original intent.[174]

Task Force Guardian submitted the PIR for New Orleans East on October 19 detailing the damages to the levees and floodwalls protecting the 44,700 acres of residential, commercial, and industrial land bordered by the lake, the IHNC and the GIWW. Prior to the hurricane, the levees and floodwalls offered protection ranging from 13.8 to 19 feet and included earthen levees, I-walls and sheet pile walls. Water overtopping the levees completely degraded 33,000 feet (6.25 miles) of the area's levees and floodwalls, leaving some levees as low as five feet high. Some sections of floodwalls had experienced lateral movement and the I-wall near Pump Station No. 15 was destroyed. One railroad closure gate suffered structural damage due to overtopping and scour. The task force needed 700,000 cubic yards of impervious fill material to repair the damage. The Corps of Engineers identified a borrow area for the material in the Bonne Carre Spillway. The total cost for the repairs in New Orleans East was $61 million, requiring nine contracts.[175]

The PIR for the Chalmette Area covered portions of both Orleans and St. Bernard Parishes. Orleans Levee District, St. Bernard Parish and the Lake Borgne Levee District issued the requests for federal assistance by October 8. Levees and floodwalls protected 75 square miles of commercial, residential and industrial land and included the Lower 9th Ward of New Orleans and the towns of Violet and Chalmette. Bounding the area was the Mississippi River, the MR-GO and the IHNC. The system had six roads and one railroad closure gate, the Creedmore Drainage Structure, and water control structures at Bayou Bienvenue and Bayou Dupre.

In Orleans Parish, the hurricane damaged both the GIWW and IHNC levee and floodwall. The GIWW suffered minor scour damage on the backside of the levee and structural damage to four road closures, requiring foundation repair and scour repair. The IHNC had two breaches north of the Mississippi River lock on the east wall. One was 350 feet in length and the other was 850 feet long. A 200-foot section and a 2,000-foot section of the IHNC floodwall had moved due to overtopping and scouring on the protected side of the floodwall, and two other sections of the floodwall (620 feet and 2,000 feet) suffered severe scour on the protected side, but the wall did not move laterally. The PIR planned for replacement of the destroyed and damaged portions of the floodwall with T-walls and repair of the major scouring.

In St. Bernard Parish, overtopping and scour destroyed 6.75 miles of levees along the MR-GO. Some areas of the levee lost 12 feet of height. Earthen levees replaced nearly one mile of damaged sheet pile floodwalls. Levee repairs in St. Bernard Parish required more than 1.5 million cubic yards of fill material. The two water control structures required structural and mechanical repairs, and the floodwall flanking them required replacement with new I-walls or T-walls and armoring. The gates, operating houses, and the chains and cabling needed repair, and all of the electronic components including the generator, motors, lighting and telecommunications systems needed repair or replacement. The Creedmore Drainage Structure needed to be dried out and cleaned of debris before its gate hoists and stems could be replaced. The initial cost for these repairs was $79 million. An amendment to the PIR in November added repair work on the 10.8-mile levee from MR-GO to the floodwall near Caernarvon at a cost of just over $1.5 million. Actual contract costs included in the economic analysis of the amended PIR showed that the project's cost increased from $79 million to $128 million. In December, Task Force Guardian revised its costs again as it began to actually award more contracts. Revision No. 3 from December 13 lowered the total construction costs to $111 million.[176]

The New Orleans to Venice Hurricane Protection System straddles the Mississippi River from river mile 59 to mile 10 in Plaquemines Parish. The west bank portion of the project has 37 miles of back levees in four sections, or reaches: Reach A (13 miles), Reach B-1 including a floodgate at Empire (12 miles), Reach B-2 (9 miles), and the St. Jude to City Price reach (3 miles). It also has 34 miles of enlarged west bank Mississippi River levees. The rest of the mainline Mississippi River levee on both banks was not part of the hurricane protection system. The east bank has 16 miles of enlarged back levees (Reach C). The system protected about 75 percent of the parish's population and 75 percent of the parish's improved land. Some sections of the system were not complete when Hurricane Katrina hit in 2005; on average the project was 84 percent complete in the parish. Although most of the Mississippi River levees were not part of the hurricane protection system, the PIR discussed the damage to the mainline levees. On both banks, the mainline levees suffered erosion on both the river and protected sides, and the crown as well. They also had large paving blocks along the levees, and impacts from barges and large debris during the hurricane had damaged many of these. On the west bank of the New Orleans to Venice project, the St. Jude to City Price Reach had levee erosion at the Diamond Pumping Station. On Reach A, there was minor crown damage and some major

Plaquemines Parish experienced both severe scouring of levees and damages to floodwalls, such as this floodwall in Venice.

damage on the marsh side of the levee. There were also three levee breaches, one at the Hayes Pump Station, one at Nairn, and a third downstream from Nairn. Another breach occurred at the Sunrise Pump Station in Reach B-2, and the hurricane inflicted major damage to the sheet pile wall at the Empire Lock. There was no visible damage to Reach B-2. On Reach C on Plaquemines East Bank, the hurricane damaged the crown and landside of the levees, and there was a 190-foot breach with a 21-foot deep scour hole between East Pointe a la Hache and the Bellevue Pump Station. The transition points from levees to floodwalls at the pump stations also had erosion damage. The cost estimate for the repairs in Plaquemines Parish was $58.7 million.[177]

Task Force Guardian revised the Plaquemines PIR in January 2006 based on further investigations of the damage in the parish. The second report addressed the damage to the floodwalls built on the west bank Mississippi River levees from Port Sulphur to Fort Jackson and other miscellaneous repairs on the back levee. The damaged floodwalls totaled approximately five miles in seven reaches. The damage included severe scour, tension cracks in the earthen levee, and a complete failure at Buras. The soil adjacent to the sheet pile floodwall lost about 50 percent of its strength, so the task force would have to replace floodwalls as opposed to repair them. Most of the damaged levees had small to large tension cracks on the flood side and severe scouring on the protected side, and the floodwall was leaning and noticeably or completely distorted in short, intermittent reaches. Near Buras, the hurricane had completely knocked down the floodwall, and the levee had large voids where the wall severely translated off its original alignment. The PIR described the levee as "actively failing."[178]

Task Force Guardian evaluated three options for these repairs. The first was to drive a new sheet pile wall six feet closer to the river and use fill material to fill in the area between the two sheet pile walls. The fill material would provide protection to greater than 17 feet. A rock berm added on the riverside would provide additional stability. The second option was to replace the existing I-wall with T-walls. Lastly, the Corps looked at expanding the landside embankment of the levee as a way to increase its stability and protection level. Task Force Guardian pursued the third option as the most economical, and it had more engineering advantages. The Mississippi River levees would remain intact, and the floodside toe would not move. The reshaped levee would have a 10-foot crown at elevation greater than 17 feet. The levee enlargement impacted 250 property owners because local government would have to acquire an additional 59 acres for the increased size of the levee. The task force would have to demolish seven existing structures and relocate three-quarters of a mile of Highway 23 in Port Sulphur. It needed an additional 108 acres of land for the borrow material. Based on the new project and other adjustments, the total cost for PL 84-99 repairs in Plaquemines Parish increased from $58.76 million to $139.2 million.[179]

Corps of Engineers regulations on the implementation of PL 84-99 after a flood or hurricane stipulate that the nonfederal sponsors of a project must share the burden of the cost or the repair work. The sponsor is responsible for providing, at no federal cost, lands, easements, rights-of-way, relocations and borrow and disposal areas, and they do not receive credit for these costs to cover their cost share of the actual rehabilitation work. The repair costs are split 80 percent federal, and 20 percent nonfederal sponsor. Also, if the local sponsors request improvements to a flood or storm protection project, they are responsible for the entire cost. They can pay the local cost share in cash, work-in-kind, or a combination of these payments. Based on the initial PIRs, the total cost of the rehabilitation in the four project areas was $287,745,790, and after Task Force Guardian completed the revised PIRs, the cost rose to $638,516,187. The communities in Orleans, St. Bernard and Plaquemines parishes faced immense difficulties after the hurricanes. They had a displaced population and stagnant economies; they needed all available resources to provide immediate care and infrastructure repairs, and their tax and revenue streams were greatly disrupted. "Using normal processes during this contingency just would not work, for instance, using a cost share for making the repairs because you had a community with no tax base at all. There was nobody there…. It just didn't make sense to cost share," Setliff said. The resources of Orleans, St. Bernard and Plaquemines Parishes simply could not cover their 20 percent: $57,549,158.00 (initial) or $127,703,237.40 (revised).[180]

The Corps had a few options in implementing the PL 84-99 process in Louisiana. It could provide no deviations to policy;

it could go to Congress and ask for legislative coordination and approval of the policy deviation – after all, Congress would have to provide the funding eventually. It could defer the sponsor's cost share for up to 30 years as allowed by the Water Resources Development Act of 1986, or it could issue a one-time deviation to policy and perform the rehabilitation work at full federal expense. Refusing a policy deviation would have placed an undue burden on the local sponsors and would have greatly increased hardship for the region and slowed down the overall recovery effort. Obtaining Congressional approval of a policy deviation would limit the precedent set by the deviation for future emergencies, but it was unlikely that Congress would take up the action in the immediate future, and time was critical. The construction needed to get started as soon as possible to be complete before the 2006 hurricane season. Lastly, deferring payment for up to 30 years seemed like a good option; the repair work would not initially tap the local resources, and the federal government would still receive the sponsor's share of the repairs over time. Time, again, was the issue with this option, which would likely delay construction by the extended contractual negotiations and the development of a complicated Project Cooperation Agreement, a document between the district commander and the local sponsor that provides details on each party's rights and obligations for the project. To avoid over-burdening the local governments and to get construction started as soon as possible, the Corps recommended that the federal government bear the entire cost of the protection system's repairs.[181]

On October 12, 2005, the Assistant Secretary of the Army for Civil Works, John Paul Woodley, approved a one-time deviation from the normal cost share procedures of PL 84-99. The federal government waived the 20 percent cost share of the actual repairs of the hurricane protection system, and it also waived the responsibility of the local sponsor to provide the necessary lands, easements, rights-of-way, relocations,and borrow and disposal areas (LERRDs) not owned or under the control of the local sponsor. The local sponsor had to exercise its commandeering authority to acquire the LERRDs not under its control, but the federal government would pay the expenses. The waiver applied to the hurricane protection works in Orleans, St. Bernard, and Plaquemines Parishes. After authorizing the deviation from policy, Assistant Secretary Woodley contacted the White House Office of Management and Budget (OMB)

Col. Richard Wagenaar and Kenny Crumholt escort John Paul Woodley (left), Assistant Secretary of the Army for Civil Works, in touring the impact area.

director to coordinate efforts with his office and prepare to inform Congress of the one-time change in policy.[182]

Before any actual construction could begin on a site, Task Force Guardian had to go through a step-by-step process before awarding any contracts. As each PIR was being finalized and the engineers got a good picture of the damage, Task Force Guardian organized the work into separate projects and envisioned the contracts needed for each one. Next, the Guardian teams wrote the plans and specifications for each project. The plans provided the overview of how each project would proceed, and the specifications provided the construction details for each repair. A Task Force Guardian team then conducted a "Biddability, Constructability, Operability and Environmental Review" of the projects. These teams asked questions regarding the ease of the contracts to be understood and administered: could the project be constructed? And after completion, what were the operations and management requirements? This review also made sure the environmental effects of the project adhered to Corps policy. Specific issues addressed by the review included the contract sequencing, the clarity and simplicity of the bid schedule, the availability of special material or labor skills in the locality, the accuracy of the site description including site accessibility and potential restrictions, the project's impact to the environment, and the mitigation plans of the contractor. After this review, Task Force Guardian could actually advertise the contract and begin to receive bids.[183]

While the PIRs were being finalized, Task Force Guardian moved into the execution phase in early October. One of the first steps taken by the task force was to identify potential borrow areas. Task Force Guardian estimated that it needed three million cubic yards of material. Since not just any dirt would suffice, after the task force identified a potential borrow area, it took borings of the site and analyzed the material's composition and strength to see if the soil was sufficient for use in levee construction. By October 1, the task force was evaluating borrow sites in Orleans East Bank, St. Bernard Parish and Plaquemines Parish. Task Force Guardian also began to coordinate with the Navy and Coast Guard on the removal of vessels thrown by the hurricane onto the construction areas. The task force provided the anticipated schedule of construction, so the Coast Guard could remove the barges in high priority areas first. During the first week in October, Task Force Guardian's first contract for site preparation and the acquisition of borrow material in St. Bernard Parish was ready to proceed. The Corps had not fully resolved all funding and policy issues, but Task Force Guardian was not content to sit back and wait. True to its mantra GEAUX, the task force pushed for and received a verbal authorization from Assistant Secretary of the Army Woodley to proceed. Its first contract turned dirt on the eastern hurricane protection levee in St. Bernard Parish on October 4, 2005. Five days later, the task force had advertised 10 of the expected 45 contracts, and awarded eight worth a total of more than $86 million.[184]

By mid-October, Task Force Guardian was facing its first major hurdle. Looking a week or two into the future, it was preparing some of its bigger, longer duration contracts, including the phase one repairs on the breach on the 17th Street Canal and the two breaches on the London Avenue Canal, the levee and I-wall repairs between the control structures at Bayou Bienvenue and Bayou Dupre, the levee and I-wall repairs beyond Bayou Dupre, and one borrow area preparation. Although Assistant Secretary of the Army Woodley had provided his one-time policy deviation for the local cost share, he still had to coordinate his decision with the OMB and notify Congress of the deviation. Until these actions took place, much of the task force's work was on hold. Task Force Guardian kept its eye on the future and wanted to get as much work done as possible before winter's wet weather. The New Orleans District engineers on the task force estimated 15 days of excusable delays due to inclement weather each month. They estimated that they could not make up any delays suffered in October by June. By the time Assistant Secretary Woodley had resolved the issue five days later, there were 15 contracts in the queue for award. On October 17, the OMB agreed that Assistant Secretary Woodley had the authority to grant the policy deviation, and its offices notified Congress of the change that evening. The following day, Task Force Guardian issued the "Notice to Proceed" for two contracts and awarded another.[185]

The quick succession of contracts being advertised and awarded led right into Task Force Guardian's next obstacle – funding. Assistant Secretary Woodley decided that the federal government was going to bear the full cost of the repair, but Congress still needed to provide the actual money to the Corps so it could pay its contractors. On October 19, the task force had $78 million on hand in FCCE funds to cover the initial contracts, but at the same time, it was advertising 16 contracts and had awarded three, totaling over $122 million. Again, the task force faced potential unnecessary delays during the prime construction season. Each day delayed during good weather was a day wasted. In Setliff's words, "Every day that we were delayed was a day longer out in the future. The weather was beautiful in September, October, November, and we did not know we were going to have a dry winter …. Obviously if it would have rained frequently, that would have hindered us from meeting our schedule and probably would not have allowed us to get as much done as we did, much less be on time." Corps of Engineers Headquarters in Washington, D.C., began scrubbing its books to identify any funds that it could transfer to the FCCE account, promising $110 million by October 25. Headquarters believed that an additional $30 to $40 million might be available as well. That $150 million was sufficient to keep awarding contracts until October 25, but an additional $152 million was needed before Halloween to stay on schedule. On October 28, Task Force Guardian ran out of money. It had obligated $114.3 million of the $115 million it had received to that point. Its contracting schedule was not getting any lighter either, needing an additional $190 million before November 6.[186]

November started off well for Task Force Guardian, as it was able to award two major contracts for repair work on the IHNC on November 1 when $87 million arrived. The two contracts were worth about $30 million, bringing the total value awarded to $175 million. At the beginning of the month, the task force had awarded 17 contracts and had advertised another 13. Three more contracts were awarded by the seventh when the task force ran out of funding again. It needed another $53 million over the following 12 days and $155 million before the end of 2005 to remain on its contracting schedule. In order to keep its pace, Task Force Guardian continued to find inventive ways to acquire funding, often receiving the funds "just in time" to award a contract. "When you are asking for that amount of money, people just do not have it in the bank," Setliff said. While waiting on one source of funding, the Corps often "robbed Peter to pay Paul." In the middle of November, it was waiting on $60 million that the New Orleans District was reprogramming from its dredging funds to keep the levee repairs going. It also began to use money originally planned for supervision and administration, engineering and design, and contract modifications to award contracts. At the end of November, the number of contracts advertised or awarded had jumped to 39 with 36 awarded at a value of around $303 million. In December, Assistant Secretary Woodley approved the transfer of $245 million from the Corps' General Construction funding over to the FCCE fund. This money was, at the time at least, enough to fund the rest of Task Force Guardian's contracts. Despite the continued struggle with finding funds, the biggest impact on issuing contracts was only three or four days.[187]

Administering a program consisting of 45 contracts costing hundreds of millions of dollars is no easy task, and despite the urgency of returning the hurricane protection to the area, Task Force Guardian administered its contracts professionally using established federal contracting principles. It used several different contracting vehicles to ensure a fair and equitable distribution of financial resources. It sought out local businesses, small businesses, and businesses owned by women, minorities, and disabled veterans. One such vehicle is the 8(a) Business

Development Program, named after the applicable section of the Small Business Act. Contractors certified as an 8(a) company can bid on "sole-source" contracts of a limited size, and they can also bid on contracts of any size that are "set aside" for 8(a) companies. To qualify for the 8(a) program, companies had to be owned by socially and economically disadvantaged individuals. Factors that determine eligibility include (but are not limited to) the owner's racial and ethnic status, as well as businesses owned by women, the disabled, and veterans. Another contracting vehicle that enhances small business opportunities for small companies is the "HUB Zone" contract. To qualify for these contracts, a small business must be located in what the Small Business Administration deems a "Historically Underutilized Business Zone" (HUB Zone). In addition to the company being based in a HUB Zone, at least 35 percent of the employees must reside in a HUB Zone. There are three kinds of HUB Zone preferences: "sole-source" contracts of a limited size, competitive contracts limited to HUB Zone companies, and open contracts that weighed HUB Zone bids differently than those of large companies.[188]

Task Force Guardian's contracting process encountered a variety of difficulties beyond funding. On October 20, it was forced to look at some of its contracting procedures after the bids for the phase one repairs on the London Avenue Canal came in at more than the government estimate. The contractors cited labor shortages, housing issues, and cost of material as reason for the increased bids. Task Force Guardian began monitoring these issues in its contracts to identify any possible systematic problems in the contracting strategy. The task force set aside about 15 percent of its contracts for small local contractors. By October 24, it awarded four contracts, at $2.7 million, to small and local contractors, but it was also awarding another six contracts worth more than $17 million to small and local contractors. The task force was unable to award one project, however. It had initially limited the floodwall repair on the east side of the IHNC from the GIWW to Lake Pontchartrain to HUB Zone companies, but the task force only received one bid, and could not let it without multiple bids. The task force later re-advertised it as an unrestricted contract. Measurable success in contracting was evident in the middle of November. Task Force Guardian had awarded 89 percent of its expected contracts for St. Bernard Parish, 78 percent of contracts for

New Orleans East, 37 percent for Orleans East Bank, 71 percent for the IHNC, 19 percent for Plaquemines Parish, and 100 percent of the contracts for the repair of the Mississippi River levees. By the end of November, the task force had awarded a total of seven contracts to businesses owned by women, eight contracts to small businesses, and another six contracts to local contractors. At the end of the year, the task force had awarded a total of 40 contracts, including 36 to local firms. Three went to the Corps of Engineers' own hired labor personnel, and only one of them went to a national company. Large companies won 21 of the contracts, and the other 19 went to small businesses. There were ten 8(a) contracts, six HUB Zone awards, three contracts to other small businesses, 18 contracts to large companies, and three to the government.[189] By keeping much of the rehabilitation work in the hands of local contractors, Task Force Guardian was making a difference in the long-term recovery of the region as well. Not only were the local employees of the New Orleans District guiding and administering the projects, locals were doing most of the work on the ground as well.

As the major contracts began to be let and the work began on the levees in earnest, Task Force Guardian continued to adapt to its ever-changing environment and push to complete its mission. Everyone on the team kept the June 1 deadline in focus, but they also had to deal with first things first. And the first things were removal of barges that blocked access to the levees needing repair and the location of levee material that would provide longer lasting levees. Hurricane Katrina had dumped hundreds of vessels and barges on the levees that had to be moved before any levee repairs could begin. The barge removal team with Task Force Guardian worked with the barge owners, the Navy, and the Coast Guard to successfully remove the barges so that it did not slow down the construction process. The team identified 51 barges as being in priority work areas, and by October 28, the barge owners and Task Force Guardian had removed 13 barges and were in the process of removing an additional 17. Industry owners were responsible for removing their property from the levees, but in cases where the owners could not be identified or when an owner's inability to get a barge removed would have an adverse effect on construction, Task Force Guardian had the authority to remove them using the PL 84-99 funds because removal fell under site preparation. If the Corps had to remove a barge with a known owner, it would seek

payment for the barge's removal from the owner after the fact. During the first week of November, the Coast Guard identified 120 vessels (later increased to 158) needing removal from the construction sites, and it was ready to begin the operation once it received funding. The overall cost estimate for the operation was $7 million. Task Force Guardian transferred $2 million to the Coast Guard on November 7 to begin the removal of barges impacting the construction schedule in Plaquemines Parish. About a week later, a contractor mobilized to remove barges in the St. Bernard Parish borrow area. On December 13, the Coast Guard started removing barges along the Mississippi River levees.[190]

As work progressed, one of the first things everyone realized was that they were going to need an incredible amount of material to reconstruct the levees. An early estimate was three million cubic yards. The identification and acquisition of borrow sites became crucial to the success of the mission. By early October, Task Force Guardian was hard at work conducting soil borings at sites in Orleans East Bank, New Orleans East, St. Bernard Parish and Plaquemines Parish. It needed the borings to evaluate the quality of the soils to ensure that they were suitable for levee construction. Since two hurricanes had hammered southern Louisiana and flooded it for many weeks, the moisture content of the soil was one of the key components in determining the suitability of soil for levee construction. In general, much of the soil in the area is former marshland, which is often not suitable for building levees. Therefore, the Corps was also evaluating the soil composition of potential borrow sites near Grammercy and Baton Rouge, Louisiana. Task Force Guardian established the first borrow pit in Plaquemines Parish on October 23 when the Clearing and Snagging Unit from the Corps' Memphis District began work on the Walker Road borrow pit. The unit worked the site until the contractor could get mobilized and in operation, thus saving valuable time on rehabilitating the Mississippi River levees. As construction progressed, the task force had to re-compute its borrow needs. At the end of 2005, when most of the projects had already started, the total estimate of required borrow material jumped to 4.6 million cubic yards. To obtain the required amount for most of the project areas in New Orleans East and St. Bernard Parish, the task force had identified locations for its borrow pits. However, Plaquemines Parish needed to commandeer an

Task Force Guardian worked with the Coast Guard to remove barges and boats from waterways, while it worked with contractors to remove vessels from levees or other areas.

additional borrow pit that contained 770,000 cubic yards of material, and Corps real estate personnel worked with local government to achieve this. Questions about the suitability of the material and accommodating for future needs forced Task Force Guardian to consider importing additional clay material from outside the immediate area, and it started to make the necessary arrangements to acquire the best value material needed for the job.[191]

Problems with securing borrow material did not end with just quantity; finding soils of the proper quality also posed a great challenge to Task Force Guardian. It was essential to ensure the soils it used were of the highest quality to avoid organic, loose soil that would be detrimental to stability of the repairs. The task force tested and analyzed all of the borrow material before using it in the levees. In January 2006, critics of the Corps began to question the quality of the soils being used in St. Bernard Parish. Because of urgency of repairs and Task Force Guardian's rapid-paced work, the task force changed the normal soil testing procedures. Previously, quality control personnel sent samples of each soil load to an outside laboratory for analysis. A soil engineer and a design firm then studied the lab results and sent their opinions on to the Corps and the general contractor. In the new process, continuous on-site inspections by quality control and assurance personnel and the resident engineer determined the quality of the soils, and they took samples periodically to labs for analysis to ensure a proper mix of sand and clay. They also routinely checked levee sections to ensure that the contractors had compacted the soils correctly. If not, the resident engineer would have the contractor build entire levee

Task Force Guardian took frequent soil borings to determine weaknesses and test the qualities of soils.

sections again to make sure they did it right, as later happened. Beginning in January, the task force started importing clay soil from Mississippi to mix in with the local material to increase its strength.[192]

Colonel Setliff and Task Force Guardian recognized the need to expand the mission footprint in the middle of October. After consulting with Corps leadership, the task force also began to study the damage and repairs needed for the non-federal levees, the Mississippi River levees, pump stations, and levees that were undamaged but below design height. The use of PL 84-99 funding to work on the non-federal levees required a waiver (or a different funding source) because they were not considered a hurricane protection feature. Although the detailed assessments of the local levees and the pump stations would not be complete until December 15, Setliff estimated that an additional $209 million was necessary to make those repairs. The pump station team began working with contractors to assess the conditions in the various parishes affected, and the team also partnered with FEMA to secure funding for the repairs needed in Jefferson and Plaquemines parishes. The Orleans Parish pump stations were going to be the most difficult, both to secure funding and to do the actual repair work. Task Force Guardian began to receive funding for the repairs needed on the Mississippi River levees in November. It awarded an $8 million contract on the levees from Port Sulphur to Fort Jackson on November 11, and received an additional $11 million the same day to award another $6.5 million contract on the following day. By the end of the month, contractors had taken the first load of clay to the Mississippi River levee reach from Port Sulphur to Fort Jackson. Delays in the contracting process, however, pushed the expected completion date for these repairs back from December 1 to December 22. The task force would have to monitor the river levels during this period, but weather predictions indicated that there would be no dangerous water level increases on the Mississippi in December.[193]

After several long months of surveying the hurricane protection systems, assessing damages, estimating costs, and working out funding issues, Task Force Guardian had finally completed the PIRs, located appropriate borrow sites, awarded the bulk of its contracts, started moving stranded barges, and was ready to devote all its energies to rehabilitating the system. Even as it did so, questions about the causes of the floodwall breaches and decimation of much of the lower levee system came to the forefront as the three investigating teams started their examinations. These investigations would play a critical role in rehabilitation of the system since the goal of the task force was to restore the authorized level of protection – if it merely restored the system to what had existed before Katrina only to see it breach again, it would not be protecting the people. "What was the truth in what really happened, what was the system, what was the storm, what was the performance of the system.... That is absolutely critical to our future in the design of the system," Maj. Gen. Don Riley said. Task Force Guardian had to know what had failed and why in order to avoid the same issues, and though the investigations eventually went much further than finding out the specific structural problems that caused the four failures in the system, they provided many answers and guided the task force in many of the changes in the repair plan that followed.[194]

2. Investigations, Recriminations and Corrections

On September 29, one month to the day from Hurricane Katrina, the incoming president of the American Society of Civil Engineers (ASCE) and former laboratory director at the U.S. Army Engineer Research and Development Center, William Marcuson, commented on the start of several investigations of the New Orleans flooding: "There will be an on-the-ground investigation where they will try to piece this thing together, as when they do an autopsy on a body. They will decide what muscles collapsed, what caused death. They will look for bullet holes." In fact, it turned out to be more like several coroner's offices competing over who could complete the autopsy first and declare the cause of death in the press, while outside, a physician waited on their reports to put the body back together correctly. For, indeed, there was neither the time nor the money to build a new hurricane protection system. Task Force Guardian had to repair and improve the old one as quickly as possible, but to do this the Corps needed the input of the investigators to ensure that the floodwalls and levees would perform as designed. "If there's any problem there, we need to know because we cannot afford to put back a system that's flawed," Chief of Engineers Lt. Gen. Carl Strock said. Although the investigations would continue for many months after the June 1, 2006, deadline for completing repairs to the protection system, and they would never see eye to eye on many issues, Task Force Guardian nevertheless incorporated many of the lessons learned in rebuilding the system. By showing openness and willingness to listen to others and have a fair and independent review of both its failures and its ongoing work, the Corps hoped to regain the confidence of people in its work.[195]

By the time Task Force Guardian personnel arrived in New Orleans on September 28, several investigations had already started. A team from Louisiana State University (LSU) started its analysis in mid-September, although it would not receive a commission from the Louisiana Department of Transportation and Development (DOTD) until October chartering it as Team Louisiana. Within days, Mississippi Valley Division Commander Brig. Gen. Robert Crear ordered full cooperation with LSU personnel. The University of California (UC) at Berkeley launched an investigation on September 26 led by professors Robert Bea and Raymond Seed and funded in part by a grant from the National Science Foundation. This eventually evolved into the Independent Levee Investigation Team (ILIT), which grew to include 37 scientists.[196] The ASCE sent investigators to New Orleans only days later. The Corps started its own analysis and data collection almost immediately, but official participation in the Corps-initiated Interagency Performance Evaluation Task Force (IPET) started after its genesis on October 10. IPET involved 150 nationally recognized scientists and engineers from the private and public sectors, had $26 million in funding, and included independent peer reviews by ASCE and a National Research Council panel that included members from the National Academy of Engineering, academia, industry, and government. Col. James Rowan, commander of the Engineer Research and Development Center, observed on September 26 that cooperating with the investigations "will take a lot of coordination" among the teams. It would also take a lot of public affairs coordination. Several of the investigations were already commenting in the press on a variety of issues, and in some cases they were drawing conclusions about causes of the breaches within days of beginning their investigations. Among factors discussed by levee district workers, Corps employees, LSU faculty, national engineering experts and reporters in the weeks after the storms were overtopping, wave action in the canals, a barge hitting floodwalls, dredging too deeply in the canals, poor soil qualities under the levees, poor maintenance, and weaknesses in transitions between floodwalls and levees. After formation of IPET, the Corps' policy was not to speculate on failure mechanisms until all the data was in and the analysis was complete. However, IPET would immediately share lessons learned with Task Force Guardian to use in repairs.[197]

The investigations occurred in two phases. The first phase was data gathering and preservation, which included conducting interviews with witnesses and reviewing hundreds of boxes of records. Despite perceived initial slights to some team members and the ultimate deviation of the teams on the actual investigations and conclusions, the teams worked closely together during the first few weeks. Twelve members of the UC Berkeley, ASCE, Louisiana, and Corps teams participated in gathering data. It was an incredibly complex process. The teams conducted interviews with hundreds of people, including Corps employees, local levee or Sewerage and Water Board employees, residents, ship captains and many others. From these, they collected a variety of documents, photos, and videotapes. There were also 325 boxes of records that the teams would have to sift through

"Notwithstanding the professor's anxiety to get this information so they can proceed with their analyses, I think the Corps here is really trying to be as open as we possibly can."

— Paul Mlakar

Corps research scientist Paul Mlakar at the Robert E. Lee Street breach on the London Avenue Canal.

Before investigations could proceed, contractors had to complete the coffer dam around the 17th Street Canal breach.

and prioritize, and in general the Corps reviewed and organized the documents before making them available to the teams. Over the next several months, multiple Corps employees spent 20 to 30 hours per week answering requests by Congress, by the FBI, by the Government Accounting Office, and other parties, which often delayed requests from the investigating teams. Complicating the records review was the Office of the Secretary of Defense guidance of October 24 on releasing documents, which placed a Department of Defense task force in charge of granting requests, including Freedom of Information Act requests, due to a Department of Homeland Security investigation. Within days of this guidance, Seed complained about the availability of some documents and personnel, but Corps research scientist Paul Mlakar noted that ILIT had already received some documents and would have access to all the information it needed in due time. "Notwithstanding the professor's anxiety to get this information so they can proceed with their analyses, I think the Corps here is really trying to be as open as we possibly can." It was only the first of a series of misunderstood delays and coordination problems that contributed to deteriorating relationships among the teams.

The second phase, consisting of in-depth investigations and analysis, did not proceed initially, nor was there a set plan or pattern for how this process happened. All of the teams conducted several site visits, beginning with an initial visit soon after the investigations began. The investigators took a lot of photographs and made some preliminary estimates, but they were not able to do a lot of precise measurements at several of the breach sites since repairs were still under way. This changed once Task Force Guardian completed the interim sheet pile closure on November 30, sealing off the breach site on the 17th Street Canal. The cofferdam surrounding the breach site allowed construction crews to remove the helicopter-dropped sandbags and all of the fill material used as a temporary fix, preparing the site for its permanent repair. It also allowed investigators to get their first look at the floodwalls immediately adjacent to the failure and verify the length of the sheet piles that anchored the I-walls into the levee foundation. Some initial sonar investigations – including one conducted by the Corps of Engineers – indicated that the sheet piles were only 10 feet in the ground instead of the 17 feet called for in the original design. The only way to verify the depth of the piles was to pull some of the intact ones up out of the ground. On December 12, with investigators, engineers, lawyers, and the media all present at the 17th Street Canal breach, Task Force Guardian began to take evidence from the I-wall in a public "sheet pile pull." First, workers removed portions of the concrete wall and marked it as evidence. Labs would later test the concrete and rebar to make sure their composition and strength matched the design criteria. It took the rest of the day to prepare the wall for the actual extraction of the sheet pile the following day. On the 13th, a construction crane dramatically pulled sections of the sheet piles from both the north and south sides of the breaches to be measured. Each of the sheet piles measured at least 23.5 feet in length. In the I-wall construction, six feet of sheet pile was above ground and covered by concrete, and the remaining 17.5 feet was underground. Although Team Louisiana and others maintained that their sonar readings were correct at other locations, every indication was that the Corps had indeed built the walls according to the project's specifications. "The hypothesis that the

The Corps of Engineers, as well as Team Louisiana, tried to determine the depth of sheet pilings under the 17th Street Canal floodwalls using sonar tests.

pilings were too short was wrong," Col. Richard Wagenaar said, "But this is just one piece of the puzzle." [199]

In the months that followed, the teams continued to make site visits and take measurements and soil samples. There were some time and procedural issues that slowed the process, as when, at the end of January, the Corps repeatedly delayed access to the 17th Street site to Joseph Wartman of the ILIT team over submitting a plan of action and safety plan. Eventually, Louisiana Attorney General Charles Foti intervened on behalf of the ILIT team. After prompting from Brig. Gen. Robert Crear and others, local Corps personnel eventually bent their own rules to allow Wartman and Seed access to the site. Despite such hiccups, the Corps eventually allowed ILIT unlimited access to the sites, although it did deny access to other investigations involved in the many litigation cases starting to proceed against the Corps. Because of funding constraints, ILIT and Team Louisiana would come to rely extensively on samples and analysis gathered by the IPET team, which had much greater funding. In addition to collecting samples, the investigative teams also conducted a series of tests using models

14. Pulling the Sheet Pilings

When Task Force Guardian pulled the sheet pilings along the 17th Street Canal in December 2005, it was one of the more dramatic episodes of the investigation of the floodwall failures. Despite claims to the contrary, no one in the Corps of Engineers knew exactly what they were going to find. The City of New Orleans had built the canals, built the first levees, and installed some of the sheet piling there over a period of 100 years, with the latest additions in the 1980s. When the Corps took over the project in the 1990s, it had contractors install additional sheet piles of varying depths depending on its estimates of the soil conditions. Project drawings showed three different depths in the location the Interagency Performance Evaluation Task Force (IPET) chose for taking a sample. Further, sonar investigations made by the Team Louisiana investigative team and by the Corps itself in many locations showed sheet piling to a depth of only 10 feet below the ground. According to design documents, the sheet piling should have been at least 17.5 feet below the ground. With no precise knowledge of

"There's an environment right now in which everybody wants to come after the Corps. But the Corps didn't come into New Orleans in the 1800s and build this canal. And we're not going to get anything done if people continue to want to blame people."

— Col. Richard Wagenaar

To test the sheet pilings at the 17th Street Canal, as well as determine their depths, contractors pulled sections of sheet pilings in the presence of Corps personnel, investigative teams, and the media, which then measured them and took samples.

where Team Louisiana took its samples, and no good feeling based on their own samples, there was a lot of doubt among some members of the Corps.

John Jaegar and Paul Mlakar, both from the IPET team, and Brig. Gen. Robert Crear and Col. Lewis Setliff wait on sheet pile pull.

After taking some initial samples of the wall section and the pilings on Monday, December 12, to test the materials for weaknesses, a crowd gathered on Tuesday to watch a contractor use a crane to pull eight sheet pile sections selected at random within the enclosed area behind a cofferdam around where the floodwalls failed. Members of the media, IPET, Team Louisiana, the Corps, and the University of California-led Independent Levee Investigation Team (ILIT) stood around, along with some local government representatives and citizens. It had the makings of high drama. Once pulled, the contractor placed the eight sections on the ground, and the teams started their measurements. All eight samples were the required 23 feet with 17.5 feet below ground. The Corps revealed that two were from areas where it had conducted the sonar tests, but it was at a loss to explain the inconsistency. Team Louisiana had not revealed the location of its tests, and the Corps evidently did not select samples from these locations, which lay outside the protective cofferdam.

Some took the test results as vindication of the Corps. Others, such as Ivor van Heerden of Team Louisiana pointed to their own tests, which they took at sites showing weakness at that time. New Orleans District Commander Col. Richard Wagenaar said, “There’s an environment right now in which everybody wants to come after the Corps. But the Corps didn’t come into New Orleans in the 1800s and build this canal. And we’re not going to get anything done if people continue to want to blame people.” However, ILIT member Raymond Seed accurately observed that, in fact, the tests only eliminated construction as a cause of failure, leaving the actual design of the floodwalls as the likely problem. Yet, while the sheet piling pull did not provide vindication of the project as a whole, it did serve as a warning to the investigations not to jump to conclusions. More investigation would be necessary.[200]

15. Model Investigations

As the Interagency Performance Evaluation Task Force (IPET) investigated the causes of the floodwall failures, one tool it used was modeling. Most of the models used were computer models. Computer applications such as the ADvanced CIRCulation Model (ADCIRC), the Cornell University Long and Intermediate Wave Modeling Package (COULWAVE), and the Steady State Spectral Wave Model (STWAVE) allowed very precise simulation of hydrological behavior under given conditions and were particularly useful for processing a vast amount of data points. IPET created detailed models of the Hurricane Katrina storm surge behavior using 377,815 available data points, such as levee height data collected from LIDAR and flood stage heights estimated from observations, water marks, and other factors. These models helped the investigators determine flood heights and direction throughout the storm. However, like all computer programs, the models were only as good as the data used, which means that they were very useful for areas where data existed but less so for areas where there was little data.

The Corps' Coastal and Hydraulics Laboratory built a physical model of the 17th Street Canal, which, used in conjunction with computer models, helped to verify data for the IPET investigation.

In one such case where there was limited data – the behavior of water inside the 17th Street Canal – IPET turned to a physical model to help supplement the data. Since the late nineteenth century, engineers have used scaled physical models to test structures and water behavior, although today such models typically feed data into computers for further calculation. To help it model the 17th Street Canal, IPET requested support from the Corps of Engineers Coastal and Hydraulics Laboratory (CHL) in Vicksburg, Mississippi, formerly known as the Waterways Experiment Station. The CHL, which is one of seven labs that make up the U.S. Army Engineer Research and Development Center (ERDC), is one of the largest hydraulics laboratories in the U.S. Created as the first national hydraulics lab by the Flood Control Act of 1928, CHL had extensive experience over 75 years creating large-scale models, such as the 1946 Mississippi River Basin Model, a 200-acre model of the 15,000-mile Mississippi River and Tributaries Project and largest hydraulics model ever created, as well as the original Lake Pontchartrain Hurricane Protection Project model used to test proposed gates into Lake Pontchartrain in the 1970s. The CHL took up the challenge to help estimate wave transmission near the canal's mouth, to calibrate and validate information through numerical models, and to quantify the potential for wave groups surging in the canals.

"We're getting a lot of good ideas on how to build the future system,"

— Donald Resio

The 17th Street Canal Model was 14,500 square feet at a 1:50 scale representing about half a mile of the canal. Over several weeks, the lab created the model in the Directional Spectral Wave Generator basin in Building 6006 of the CHL facility using modeling concrete and aluminum templates measured at precise elevations and distances. It depicted the canal, the Old Hammond Highway Bridge, and the region's bathymetry and topography. The model was filled with water to represent the highest level of the storm surge, and then unidirectional and multispectral computer-controlled wave generators simulated the storm waves using the precise surge and wave time history, while sensors throughout the model helped measure wave heights. The lab then used the data to create a numerical model and matched it against four different computer models to validate the data. The tests not only helped to validate the IPET conclusions that wave action in the canal made limited contribution to the failure of the floodwall, they also helped provide a deeper understanding of hurricane surge behavior that would improve engineering techniques for future projects. "We're getting a lot of good ideas on how to build the future system," said Donald Resio, a senior ERDC research scientist.[201]

or simulations. The teams used a variety of computer models, while the IPET team turned to the Engineer Research and Development Center (ERDC) to build an accurate physical model of the Lake Pontchartrain vicinity to test the impact of waves in the 17th Street Canal on the floodwalls. This model became critical for some of the IPET findings and to verify its computer models.[202]

"If we find that the entire foundation of the 17th Street Canal or London Avenue Canal is suspect, and we have to go and do a massive rebuilding of that levee and add additional structures there, then that might be more than we can do before next hurricane season."

— General Strock

From the very beginning, part of the exercise of conducting the investigations was to ensure the plans of Task Force Guardian took into account any possible errors. Guardian had liaison officials working with IPET, and a portion of the weekly IPET conference calls included discussions of new information that could help Guardian improve repairs. Of particular interest were the Lake Pontchartrain outfall canals and IHNC, where the worst failures occurred and where the greatest risk continued to exist. General Strock had noted in October that if the investigations found that design flaws caused the failures, fixing them could potentially delay restoration of the hurricane protection system: "If we find that the entire foundation of the 17th Street Canal or London Avenue Canal is suspect, and we have to go and do a massive rebuilding of that levee and add additional structures there, then that might be more than we can do before next hurricane season." Once the IPET investigation, which published its preliminary report on January 10, 2006, made it clear this was the case and that the Corps would not be able to make the necessary changes to the floodwalls and levees by June 1, Task Force Guardian announced that it would install temporary gates and pumps to close off the canals. "We cannot restore the existing system of canal levee walls to a credible level of protection by 1 June, but we can deliver a credible level of protection," said Donald Basham, chief of Engineering and Construction for the Corps. More permanent gates and pumps would require additional authorization and funding, and President Bush incorporated them, as well as armored levees and gates on the IHNC, into an emergency financing request in February 2006.[203]

"I'm confident in what we're building,"

— Col. Lewis Setliff

Another issue that came up repeatedly during the investigations was that the Corps was using substandard material for levee construction. As early as October 20, Seed had raised questions about the placement of sandbags on interim repairs around the 17th Street Canal, although the Corps was already addressing many of the issues before Seed went public. While making a site visit in January, Robert Bea took soil samples from several construction sites and complained about its sandy nature, as well as the lack of sufficient compacting of the soils. Ivor Van Heerden of Team Louisiana made similar observations, which the *Washington Post* published in early March. Engineers at one site corrected the issue, contractors had to replace another section, and the Corps doubled the number of inspectors. However, the Corps vehemently rejected the idea of systemic problems with levee material. It had used borrow sites from Mississippi and other out-of-city locations, had conducted regular tests of the soil, and had contractors rebuild levee reaches that they found substandard. "I'm confident in what we're building," Col. Lewis Setliff said. After several months of public recriminations, the Corps arranged a meeting with Bea and Seed to go through their list of problem areas. "These guys have a lot of experience, so if they see problems we're not seeing, we need to be aware of them and take care of them," Dan Hitchings, the civilian director of Task Force Hope, said. A tour of St. Bernard Parish immediately following the meeting and core soil samples taken on the tour ultimately left Bea and Seed satisfied, while Setliff praised the cooperation. Samples taken by Bea and Paul Kemp of Team Louisiana during another tour of the MR-GO levee construction site with IPET at about the same time also were satisfactory. Setliff would later state that he regretted that Guardian had not been able to involve them in the process earlier. Although the Corps continued to object to generalizations made about the entire project, the exchange resulted in many improvements in the process and the resulting levee system.[204]

On March 10, 2006, IPET released its interim findings and analysis for the 17th Street Canal breach, which found that the failure was due to the I-walls at the top of the levee tilting away from the canal, allowing a crack to form between the I-wall and the canal side of the levee. Water then flowed into the crack, weakening the levee and basically cutting the levee into two sections and allowing full hydrostatic pressure on the I-wall and the land-side levee section. Contributing to the failure were poor soil conditions under the toe of the levee that allowed the levee to slide away from the canal. However, unlike previous statements by Seed and others, it was not the peat layer that was the weak link, but the clay layer. Unfortunately, the Corps had not conducted soil borings at the levee toe during construction of the original levees, but had used average strength calculations that caused it to overestimate the levee's safety factor. Seed and others pointed out that in fact the Corps had conducted tests in 1986 that revealed the problem of I-wall tilting, but Reed Mosher of ERDC, who had participated in the report in question and was an IPET team co-leader, explained that the 1986 study focused on how deep to drive sheet pile, not on tilting of the I-wall. Meanwhile, the *Times-Picayune* criticized the IPET report for trying to exonerate the Corps by claiming the problems were unforeseen, a contention which Maj. Gen. Don Riley rejected. "Nobody wants to know more than we do about the performance of the hurricane protection system, as this information will help to guide our ongoing and future levee work around New Orleans," he said. Indeed, the Corps was already at work adjusting its own construction. Mosher added, "We're going back and doing borings at the toes of the levees in the system anywhere we think this failure mechanism might be present. We're already doing re-evaluations of the stability analysis … Now that we know what to look for, we're out there looking for it."[205]

A little over a month later, ASCE released its comments on the March IPET interim report, which it reiterated in an August statement. It criticized many processes that led to the errors noted in IPET, including fragmented ownership of the projects, their piecemeal construction, and a lack of overall risk analysis. It was a report the Corps never publically disputed.

Then in mid-May, ILIT released its final draft report, which blamed the floodwall failures on "human error, poor decisions and judgments, and failed policies." It heavily criticized, not just the mistakes it perceived the Corps made, but also the national cultural and policy changes that led to what it saw as a weakened Corps. While noting that there was little more the Corps could do before June 1, it included a number of recommendations for the future, including closer examinations of the soils and managing water levels in the outfall canals. Responding in *USA Today*, Riley wrote that, while the Corps questioned some ILIT findings, such as making conclusions about Corps decision-making processes without interviewing Corps leaders, it agreed with many others. "We invite experts from both teams to meet and discuss their findings…. We are receptive to any information that contributes to our understanding of what happened …to ensure the future effectiveness of the New Orleans-area hurricane protection system." However, based on his preliminary review, he believed that the Corps had addressed all of the issues the ILIT team raised that were within the purview of the Corps.[206]

"We invite experts from both teams to meet and discuss their findings…. We are receptive to any information that contributes to our understanding of what happened …to ensure the future effectiveness of the New Orleans-area hurricane protection system."

— Maj. Gen. Don Riley

As for the many internal issues that the IPET did not address, Riley had initiated an additional study in December 2005 at the request of Chief of Engineers Lt. Gen. Carl Strock and Assistant Secretary of the Army for Civil Works John Paul Woodley that would "enable the Corps and the nation to fully understand the long history of federal, state and local decisions that led to the design and construction of the New Orleans-area flood and storm damage reduction system," and "complement the technical engineering studies recently completed by the Corps and other organizations that examined the system's performance during Hurricane Katrina." Contractors working with

Task Force Guardian sought to rebuild levees to their pre-storm conditions.

the Institute for Water Resources started research in the spring of 2006 and completed a rough draft of the report in June 2006. An independent technical review panel then reviewed the document and identified additional documents about the project requiring incorporation. After making additional changes, the Corps completed the draft final Hurricane Protection Decision Chronology (HPDC) in June 2007 and released it for public review before making final changes. In describing the decisions and the operational environment, the report neither castigated nor exonerated the Corps, and in drawing conclusions, it made no final recommendations. It was, in any case, too late to impact Task Force Guardian. However, it did increase awareness of the issues involved by documenting them thoroughly for future generations.[207]

The investigations continued many more months, with release of the final ILIT report in July 2006, the final Team Louisiana report in February 2007, the final ASCE review of IPET in June 2007, and the IPET risk analysis volume in July 2008. At times, the investigations were unduly acrimonious and unnecessarily public. "It could be called a matter of scholarly dispute," New Orleans *Times-Picayune* editor and author Jed Horne wrote, "but the intensity with which [Team Louisiana lead Ivor] Van Heerden and the Corps soon ratcheted up their disagreement suggested that professional reputations were at stake." Soon after the release of the IPET interim report, Seed said without qualification, "IPET has its (analysis) wrong." Van Heerden openly talked about a cover up and wrote in his book, *The Storm*, "I conclude that no one at the Corps took any of this [construction of the levees] seriously enough." In response to one of the many Team Louisiana comments that ended up in the press, Col. Richard Wagenaar, the commander of the Corps' New Orleans District, observed, "These are meteorologists reporting on concrete structures." Despite the ongoing contention, the Corps gleaned a significant amount of data from the investigations, including those external to its own. It adjusted plans to providing protection at the outfall canals by incorporating gates, which Task Force Guardian was working to install. It made adjustments to its inspection processes, corrected levee soil anomalies, and increased its review of the levees and floodwalls throughout the system. And it started to incorporate many other suggestions – from permanent gates to armoring of levees to designing the system as a single unit – into future plans for the region. In addition, the investigations resulted in concrete changes to the Corps, including greater transparency of Corps actions to help restore public confidence. As Riley noted, this was the ultimate goal of cooperation with the many experts reviewing the breaches.[208]

3. The Deadline Looming

By the end of 2005, Task Force Guardian had reached a series of obstacles that could potentially prevent completion of an acceptable level of protection for the city of New Orleans by the start of the next hurricane season. With ongoing delays caused by funding issues, many of the individual projects, including the Mississippi River levees, were behind schedule. The Corps was having difficulty obtaining and moving enough borrow material in the time allotted, and it started to receive new input from the ongoing investigations requiring changes in its plans. Of these, the decision announced after the release of the Interagency Performance Evaluation Task Force (IPET) Preliminary Report on January 10, 2006, to build gates at the Lake Pontchartrain outfall canals was the most important, since it meant having to design, get parts, and construct several gates and pumps. It was not entirely clear the mission would be complete by June 1, 2006. Of course, the date was arbitrary since it was unlikely that a hurricane would strike on the first day of the official hurricane season. Most hurricanes struck the Gulf at the end of the summer and early fall. Yet, it was critical for public perception and morale for the Corps to keep its word.

Beginning in December, with the majority of contracts awarded and the funding situation settling down, Task Force Guardian began pushing contractors to keep on task and complete repairs before the June 1 deadline. The difficulties were enormous, with some contractors waiting on work, some waiting on workers, and others waiting on material. Many of the sites were inaccessible, requiring close management of transportation. In the latter part of December, many of the projects were behind schedule. At the end of the year in New Orleans East, contractors had placed only about 82,000 cubic yards of material in the levee repairs. The construction schedule called for the contractors to have more than 225,000 cubic yards in place by this time. In St. Bernard Parish, the contractors had put 152,000 cubic yards of fill material into the levees, but by the construction schedule, more than 440,000 cubic yards should have been in place; in Plaquemines Parish, the construction schedule called for 252,000 cubic yards of dirt to be in the levees, but in actuality contractors had only placed 136,000 cubic yards. On average, the contractors working in these three areas were placing less than 15,000 cubic yards in the levees per week, and at that rate, it was going to be very difficult to regain their schedule. Working against the contractors at this time was the fact that as the work actually began, Task Force Guardian was increasing its estimates on how much borrow material it needed for the repairs. The total estimate, which started out at three million cubic yards in October, jumped to four million and later 4.6 million cubic yards in December. Knowing that, above all else, the protection system had to be complete by June 1, the task force worked with the local officials and its contractors to make sure that production levels would increase. It worked with the local governments to identify additional and closer borrow pits, and it convinced contractors to add capacity either through sub-contractors or by acquiring additional equipment and manpower.[209]

In Plaquemines Parish, Task Force Guardian adjusted the existing contracts and removed some of the responsibilities. It awarded these jobs to other contractors as task orders. Work on the Mississippi River levees was also behind schedule. Of the 109 miles of the levees on both banks, all but 20 miles were at pre-Katrina strength and could handle the project flood they protected against. The 20-mile deficient section was the reach from Port Sulphur to Fort Jackson on the west bank of the river. Nineteen of these 20 miles had some damage, but the levee was high and strong enough to protect against river flooding. The remaining 6,000 linear feet of levee was below design grade and may not have provided protection against a rise in the Mississippi. Task Force Guardian adjusted the existing contract to add more contractors on the site and arranged for borrow areas closer to the work site, and it also brought some of its own levee construction crews to assist the contractors. The task force predicted that the low areas would be up to design grade on January 21. Not all areas were behind schedule; by the year's end the sheet pile cofferdams were in place on the breach sites on the outfall canals, and contractors were making preparations to remove the temporary fill material that closed off the breaches during the Unwatering mission. Once the sites were clear, phase two repairs to the breaches could begin.[210]

On January 11, Task Force Guardian announced that it was moving forward with a plan to build the temporary gate closure structures on each of New Orleans' drainage canals at 17th Street, London Avenue, and Orleans Avenue because it was the only way to provide pre-Katrina storm protection by June 1 as mentioned earlier. The task force simply could not strengthen the floodwalls quickly enough. Task Force Guardian advertised the contract for the London Avenue Canal and 17th Street Canal gate closures on January 13 and January 16, respectively, and advertised the Orleans Avenue closure a few days later. By the end of the month, it had awarded the London Avenue and 17th Street contracts for $39.8 million and $43.4 million, respectively, and awarded the Orleans contract a few days later for $31.4 million. Each closure consisted of a series of 11.9 by 27 foot sluice gates placed near the opening of the canal. They included a bridge built behind the gates, so a construction crane could place the gates into position if they needed to be lowered. When closed, the gates would block any storm surge from Lake Pontchartrain from reaching the weakened floodwalls on the canals. Temporary pumps, which the federal government acquired and provided to the contractor, would move the storm's rainwater pumped from low areas of the city past the canal gates into Lake Pontchartrain. The capacity of the temporary pumps was just a fraction of the capacity of the permanent pumps in the city, and Task Force Guardian acknowledged that there would be some possible rainwater flooding, but blocking a storm surge was vital. The task force awarded a temporary pump acquisition contract, valued at more than $26 million, in late January. Because of the amount of space needed to install the gates, the Corps had to request that Louisiana Gov. Kathleen Blanco and New Orleans Mayor Ray Nagin approve commandeering land needed for the construction, including local government and privately owned lands entailing all of Bucktown and parts of West End and Orpheum Avenue. The Corps real estate office started working with the mayor's and governor's offices on assuming the properties and with real estate companies to locate and help compensate private property owners. Similar commandeering became necessary in Plaquemines Parish to widen weak levees, and the Corps coordinated with Parish President Benny Rousselle to accomplish this.[211]

By February, Task Force Guardian started to get traction on several fronts. At the beginning of the month, funding levels had reached $541.5 million, including for the Mississippi River levees, and the Corps submitted a request for an additional $250 million to cover the remaining contracts in the Third Supplemental Appropriation, which Congress approved by February 16 and the Corps received shortly thereafter. Task Force Guardian awarded the last phase one contracts for Plaquemines Parish on February 10, for New Orleans East on February 17, and had competed and awarded the last of the three contracts for phase two (outfall canal breaches) on February 18. By March 7, it had awarded the last of the 59 planned contracts. The majority of these went to local firms. As of February 20, 48 of 52 contracts (92 percent) were local,. With the funding issues fully resolved, Col. Lewis Setliff adjusted his operations to focus fully on construction execution by adding additional project managers and analysts and emphasizing transitioning from "Red to Green" status on missions. Total task force personnel now numbered 269, including 70 direct-hire laborers. As the press increasingly took notice of the ongoing investigations and the Corps' pledge to complete work by June 1, public affairs became increasingly important. Setliff brought in additional public affairs staff to take the burden off of project managers, who would act as subject matter experts only as necessary.[212]

As a result of this new focus, Task Force Guardian was able to work through several obstacles and start making progress. Two areas receiving needed attention were the removal of vessels from construction areas and borrow pits. As noted earlier, construction could not proceed as long as the vessels were in the way, and the Corps worked with the Coast Guard and contractors to expedite salvaging the vessels or contacting owners. By early February, the Navy had pulled out of the mission, leaving the Coast Guard and Shaw Group to complete it. The contractor had removed 82 of 158 identified vessels, and was to submit a plan by February 15 to remove all but one of the remaining vessels. However, despite Shaw's best plans, it was only able to remove 101 vessels by February 14, and in fact only removed

Because of marshy and sandy soils near New Orleans, Task Force Guardian had to locate additional borrow sites to acquire suitable soil for levees, including this site in Fort Jackson being cleared before soil removal began.

about 10 more vessels by February 23. However, the contractor made steady progress – about one vessel per day – in removing the rest, having removed another 40 by the end of March, when only eight remained. The contractor finally removed the last barge on April 16, marking a major milestone. The other major obstacle – getting borrow material of sufficient quality – also continued to improve. After locating borrow pits in Mississippi in January to provide levee material with more clay content, a contractor started moving the clay using barges, and

Repair of the levees and floodwalls was a monumental task involving nearly 60 contracts worth $500 million.

by February 19 had 36 barges moving material to the construction sites with a goal of reaching 51 barges. By the end of February, contractors had delivered 400,000 cubic yards of clay to St. Bernard Parish and 800,000 cubic yards to Plaquemines Parish with additional task orders issued each week to bring in the right material. Even before questions arose about material from the ongoing investigations, Task Force Guardian was out testing the material to ensure compliance with its standards and frequently refusing material considered too sandy. "We've done more testing on this job than any levee construction we've ever done," Project Manager Kevin Wagner said. Henry "Junior" Rodriguez, the president of St. Bernard Parish, agreed.[213]

With the funding, contracting, borrow material and barge issues resolved, Task Force Guardian was able to get back on track and make some significant progress in the mission in a short time. By mid-February, contractors had placed approximately 241,000 of 731,000 cubic yards (33 percent) of borrow in New Orleans East, 373,000 of 1.65 million cubic yards (23.6 percent) in St. Bernard Parish, and 451,000 of 2.17 million cubic yards (20.8 percent) in Plaquemines Parish. In only two months, it had tripled or even quadrupled the amount of levee fill placed, by March 21 had completed 17 of 59 projects, and by the end of the month had completed 54 percent of the work overall.

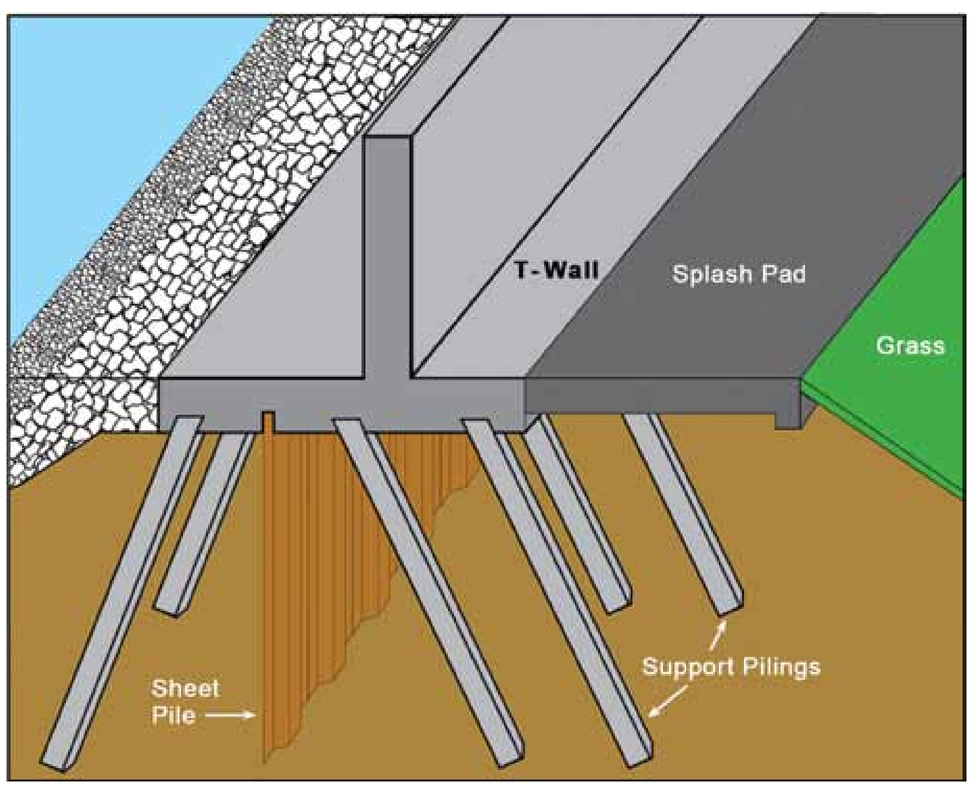
Mississippi River levee repair also finally made progress. By the end of February, completing the last reach was becoming critical as expected spring rains would start contributing to rising river stages. With the barges finally removed, the team was able to complete the Port Sulphur to Fort Jackson reach in Plaquemines Parish on March 17. Contractors also completed repairs to three control structures in St. Bernard Parish, including building an embankment at the Bayou Dupre Control Structure, filling a scour hole at the Bayou Bienvenue Control Structure, and clearing debris from piping at the Creedmore Structure. Likewise, work on the gates at the outfall canals had also made progress and was 60 percent complete by the end of March, with the framework for the gates coming together. With no hydraulic system to lower the gates, the Corps installed cranes to lower the gates into place if storms approached. "We didn't buy all the bells and whistles," Setliff said. The pumps ordered in January were due to arrive during the first week in

April. However, only about half of the pumps would be in place by June 1. "We're up against the laws of physics and how many pumps can be built in a certain amount of time. We'll keep making it better," Setliff promised.[214]

"We're up against the laws of physics and how many pumps can be built in a certain amount of time. We'll keep making it better."

— Setliff

Contributing to the progress were some innovative techniques as well as the dedication of Corps employees and contractors. Because of high demands for the relatively small number of employees with specific skill sets, such as welders or quality control analysts, management of personnel was critical to ensuring work was not waiting on them and delaying progress. Likewise, allowing contractors to stockpile materials – usually avoided on construction projects such as these because it increased the cost – helped prevent more costly delays. Constant quality control and testing of soil ensured proper compaction of the soil without requiring extensive rework. And with input



In many locations, Task Force Guardian replaced I-walls with more stable T-walls.

from IPET, Task Force Guardian made many changes in design, such as installing gates at the outfall canals, replacing I-walls with T-walls in many locations, or locking down T-walls using angled 70-foot H-piles along the Inner Harbor Navigation Canal (IHNC). Because of the flat concrete wing on the inverted T, T-walls were more stable than I-walls, even more so anchored by the H-piles.

At the same time, one cannot overlook the dedication of employees working seven days per week and 18 hours per day. Using multifunctional teams that included engineers, real estate personnel, and environmental personnel working each parish, Setliff was able to empower them to make key decisions more quickly, and he only intervened if the schedule went off track. By working the issues hard up front, they were able to avoid last minute delays before the deadline. "The schedule here is of paramount importance….Our philosophy early on was that we wanted to ensure victory back in February, instead of prevent defeat in May. Probably when people look back at this it will be seen as the wave of the future," Setliff said in May. Many contractors working with the Corps agreed.[215]

New issues arose in April and May that once again challenged Task Force Guardian's ability to complete its mission. By the end of March, the teams had identified 248 contract modifications required to correctly execute the mission. The contracting team completed 126 by early April, but 15 of the pending changes potentially impacted the schedule. Nevertheless, it continued to work through the issues. Other challenges included compensating property owners displaced by design changes and removing trees from the levees. Both were thorny issues that potentially impacted perception of the Corps and required considerable involvement of Corps real estate specialists. As noted previously, since January, Task Force Guardian had made major modifications to several projects requiring additional land acquisitions. In some cases, this meant closing well-known businesses, such as Sid-Mar's restaurant or removal of the Bucktown fishing fleet, which had existed since the late 1800s. In Plaquemines Parish, since much of the parish was marsh and most high lands were next to levees, widening of the levees cost the parish and the residents considerably. Most residents appeared to resign themselves to the acquisitions, aided by fair settlement over the cost of the land. This required time-consuming negotiations with individuals over real estate contracts, although an innovative turnkey contract initiated in May helped speed the process. The Corps purchased $50 million in real estate altogether, mostly through emergency commandeering. Tree removal became an increasing problem as Task Force Guardian attempted to improve the stability of levees. Over time, residents, local levee boards, and the Corps had allowed trees to grow in many locations in vegetation-free zones or easements near levees. These trees could contribute to seepage or damage floodwalls if they fell under high winds. As a result, the task force initiated a project to cut down trees, remove stumps and root systems, and fill in holes. This was also real estate-intensive, since the Corps often needed rights-of-way to remove some vegetation, and many residents still had not returned to grant these rights. Although similar problems arose with sheds, outbuildings, swimming pools, fences, or other structures, the Corps tried to address these with residents and not simply remove illegal structures. Since much of this mission concerned long-term maintenance of the levees, Task Force Guardian started to transition the mission to the New Orleans District starting in May.[216]

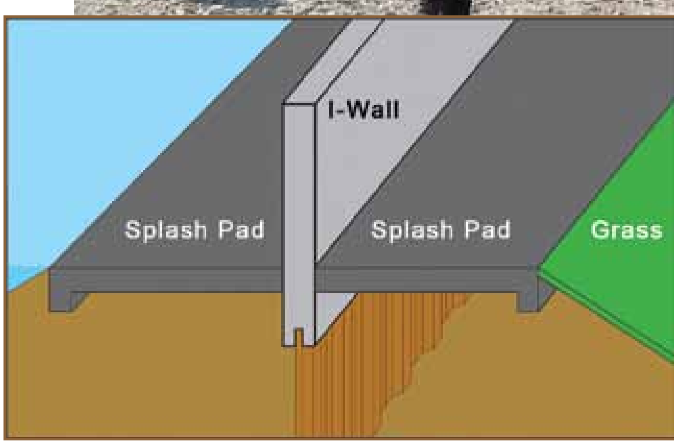
The other major challenge was completion of the gates at the Lake Pontchartrain canals. Construction had gotten off track in March, but by April construction was accelerating. The New Orleans Sewerage and Water Board had expressed concern that the pumping capacity at the canals – decreased significantly by damaged pumps – would not be sufficient to drain the city during heavy rain, so task force leaders evaluated the possibility of increasing pump capacity, although the window for doing so by June 1 was rapidly closing. The large temporary pumps ordered by the Corps were now delayed as the manufacturer worked through problems testing them before shipment. Nevertheless, by April 25 the first 10 had arrived, and contractors installed them at the London Avenue and Orleans Avenue canals. At approximately the same time, contractors hung the first two 75-ton jackets that would house the gates on the 17th Street Canal. By the first week in May, they had installed 22 pumps and two motors. The last of the 34 pumps arrived by May 9. With the delays in the pump deliveries and other materials and with construction problems caused mostly by the tight working space, the projects were now hopelessly behind schedule. On May 12, Task Force Guardian announced that the gates would not be

Because repair of the outfall canal floodwalls would require additional time, Task Force Guardian installed gates to close off the canals during storm events.

ready until after June 1. The revised schedule was to have the 17th Street Canal gates and pumps functioning by late June and London Avenue by July 1. Only the gate at the Orleans Avenue Canal would be ready on time. So as to meet the June 1 deadline, contractors would install sheet pile across the mouth of the canals when storms threatened, which would provide the same level of protection until the gates were ready. Setliff explained:

Our goal was to be able to shut the gates on June 1 to prevent a storm surge from entering the canals, but the real world requirement is to protect from surge by the time a storm threatens. And if there's a storm on the horizon, we can defend against it. We can do that with these braced sheet-pile closures, just like we did during Hurricane Rita.

— Setliff



Col. Lewis Setliff and Stuart Waits escort President George W. Bush in viewing construction.

Thus, although the gates would not be ready, Task Force Guardian would be able to provide the required protection on time. Most people accepted this. What they did not accept were delays in installing the pumps. With less than half of the expected capacity installed on June 1, a storm could have easily flooded the city with rainwater, and there was nothing the Corps could do to fix this other than installing the pumps as quickly as possible.[217]

The remaining aspects of the project were coming down to the wire. By the end of April, Task Force Guardian had completed 73 percent of the work overall and closed 22 of the 59 contracts. On May 23, with only a week left to go, it was at 92 percent completion overall with 38 of 59 contracts completed. Orleans Parish stood at 74 percent because of the canal closures, New Orleans East was at 94 percent, St. Bernard Parish was at 96 percent, Plaquemines Parish was at 89 percent, and the IHNC was at 99 percent. Two of the remaining contracts concerned the outfall canal gates, which would not be complete until after June 1. However, six contracts were critical to completing the levees, and Setliff focused primarily on these projects through intense management, site visits, phone calls, and status updates. It was going to be a nail-biter, but it appeared that New Orleans would have the promised level of protection. Suddenly, on May 29, a 400-foot section of levee in Plaquemines Parish near Buras High School slumped by six feet under its own weight. The Corps had been in the process of addressing weak soil found in tests before contractors prepared to raise the section its final two and a half feet by June 1. It would take three weeks to complete the repairs. The task force continued to work the contracts all night to complete the last levee section, and at 11:50 p.m. on May 31, the project manager called Setliff to tell him they had finished it. That day, repairs stood at 96 percent, with only the section at Buras being below the authorized level of protection. In any case, the Corps argued overall that the levees were in far better shape than before Hurricane Katrina. As Setliff said in one press interview, "You can hold the Corps accountable for our work. And I am also very confident that this will perform as it is designed." [218]

> ***"You can hold the Corps accountable for our work. And I am also very confident that this will perform as it is designed."***
>
> *— Col. Lewis Setliff*

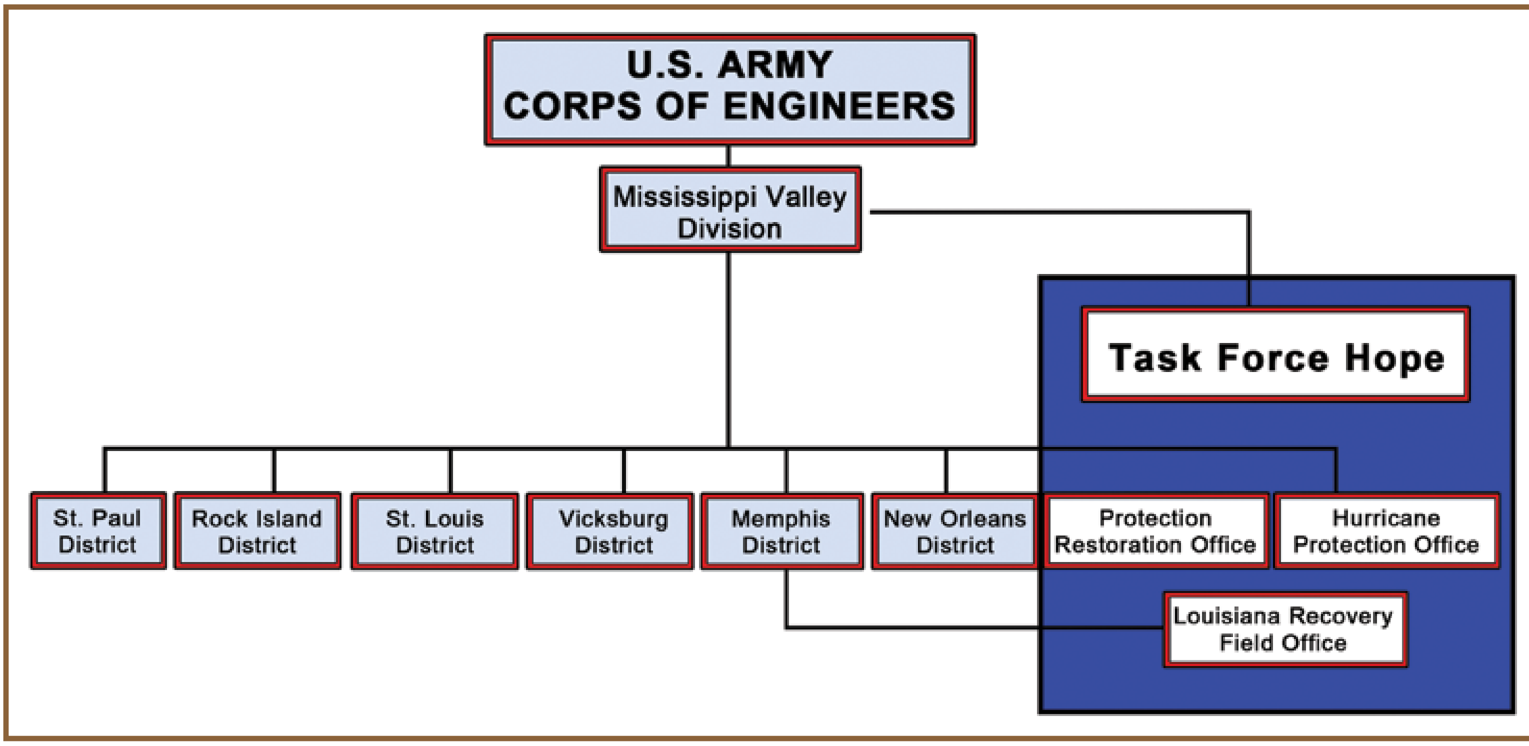
June 1 had finally arrived. It was, as one reporter observed, a "breathless finale that has been called one of this generation's greatest adventures in civil engineering." Task Force Guardian had installed the promised level of protection, although not all of it remained in place, and there were some goals the Corps did not meet. One section of levee had collapsed in Plaquemines Parish, and the Corps had not completed the gates or finished installing the pumps at the Lake Pontchartrain outfall canals as it intended. "There are some aspects that are not going to happen as we had hoped," Lt. Gen. Carl Strock said on May 30. He understood that the Corps was going to face increased scrutiny because of failures of the previous system. Nevertheless, he added, "I think we're where we need to be as we face the next hurricane season." Task Force Guardian had accomplished a difficult mission through close management and a lot of hard work. Yet, there was a lot of work that remained for it to complete before calling the mission over, including transitioning work to the New Orleans District.[219]

4. After the Deadline

As early as May 1, Col. Lewis Setliff anticipated that the work of Task Force Guardian would not end with the June 1 deadline. "A lot of work is going to go on beyond that date as we continue to make the system better," he said. Two weeks later, he recognized that, although the task force would be able to provide some level of protection, the gates the task force was placing at the Lake Pontchartrain outfall canals would not be ready on that date, nor would the long-term corrections to the floodwalls that had failed near the canals. There was indeed a lot of work to do, to the amount of several billion dollars over the coming years, but with the restoration of the system to pre-Katrina levels of protection on June 1, the planned temporary mission of Task Force Guardian was coming to an end.

New Orleans District had already assumed responsibility for back levee repairs and other repair missions. Since May, Setliff and his team had worked with Col. Richard Wagenaar to hand over missions as it made sense, such as maintenance issues and removal of trees from levees. Setliff's plan was to complete handover of the task force's remaining responsibilities by July 1 and vacate its headquarters in the New Orleans Federal Reserve Bank building, which the Louisiana Recovery Field Office (RFO) was waiting to occupy. However, with the huge amount of work and the overstrained New Orleans District still recovering from one of the worst disasters the country had ever seen, Corps leadership recognized that an additional organization with non-rotating staff was necessary to support the district in executing this sensitive mission. Thus was conceived the Hurricane Protection Office, which would be responsible for completing non-operations and maintenance (O&M)-related projects on the hurricane protection system.[220]

Brig. Gen. Robert Crear, his deputy Col. Albert Bleakley, Setliff, Wagenaar, and the RFO commanders had been discussing the concept of the Hurricane Protection Office for several months, along with other potential models of dealing with the increase in workload. It had become clear by January 2006 that the amount of work in New Orleans was too much for a single district. Over the next three to five years, they expected more than $4 billion in work, including completion of the Task Force Guardian projects, restoring undamaged levees to approved



In the post-Katrina organization, the Hurricane Protection Office and Protection and Restoration Office would work seamlessly under the authority of Task Force Hope.

project heights after years of subsidence, correcting floodwalls to fix weaknesses discovered by the Interagency Performance Evaluation Task Force (IPET), and supporting the development of plans to increase hurricane protection through the Louisiana Coastal Protection and Restoration Program or other vehicles. Looking at past similar situations, they had three possible options: create a new district, increase the size of the New Orleans District, or create a new office to focus on the work. The traditional way of handling increased workloads, particularly when combined with regional responsibilities, was the creation of a new district. A recent example of such an expansion was transitioning the Afghanistan Project Office to the Afghanistan District. In other recent situations, the division commander created a new project office to focus on a large construction project, such as when the Southwest Division created a special construction office in the Fort Worth District. However, the work of restoring the hurricane protection system was different from these past situations. The hurricane protection system overlapped with other work in the same geographic area, so it was clear that a new district was unwarranted. At the same time, the projects required greater managerial focus than a small project office under a single district commander could provide. The final decision of Corps leaders was the creation of a separate office, which, though far smaller than a district office, would have a colonel at its head. This would mean the office would have to report directly to the division, not to the district. Nevertheless, the office would have to coordinate closely with the district on all issues since the district would still have regional responsibilities and thus own the relationships with local decision-makers.[221]

The resulting plan approved by headquarters and implemented by the Mississippi Valley Division was the creation of the Hurricane Protection Office (HPO). The HPO would initially include a full colonel and civilian and contractor staff of approximately 100 to 200 people, with a small number of New Orleans District employees taking the upper management and technical positions and contractors providing most of the mid-level management and lower level positions. It would be responsible for executing slightly more than $2 billion in contracts focusing on the hurricane protection system mostly in Orleans Parish, leaving another $2 billion for New Orleans District to execute in the other parishes, including all operations and maintenance and non-hurricane protection civil works projects. On paper, both the district and the HPO would report to the division, which would provide oversight through the Task Force Hope office and redistribute workloads as necessary. Conceptually, New Orleans District would own the projects and identify requirements, while the HPO would be the service provider in its areas of responsibility. Since most technical positions and some upper management of the HPO were New Orleans District employees, and since they shared the same building, a certain amount of give and take was unavoidable, though relations between the HPO and district employees were initially sometimes rocky as some employees disliked the way assignments fell out to the two organizations. Stand up of the HPO started in late April with senior leadership selection and was to be complete by the first of June at the same time as the first contract award; however, there were the inevitable delays in certain aspects of the office's initialization, such as the arrival of its new commander, Col. Jeffrey Bedey, in mid-June.[222]

At the same time, another organization within the New Orleans District – the Protection and Restoration Office (PRO) – would share responsibility with the HPO for restoring, completing, and improving the hurricane protection system. The New Orleans District developed the office as a parallel

Col. Jeffrey Bedey, shown here touring the closure structures, assumed command of the Hurricane Protection Office on June 16, 2006.

organization to the HPO to coordinate with it. It evolved from the East Branch Office of the Planning, Programs and Project Management Division of the New Orleans District, which previously had responsibility for most of the projects that fell under the PRO. Initially, most of its employees were those of the East Branch. The PRO had responsibility for hurricane protection in project areas not covered by the HPO, including Jefferson and St. Charles parishes on the east bank of the Mississippi River and the West Bank and Vicinity project on the west bank. It also had overall responsibility for providing suitable borrow material to support contract awards in both the HPO and PRO, for removal of the trees that posed a threat to the integrity of the hurricane protection system, and for the close out of Task Force Guardian. In addition, the PRO would lead urban flood control efforts in the New Orleans metropolitan area falling under the Southeast Louisiana Flood Damage Reduction Program, Mississippi River-Gulf Outlet (MR-GO) deep draft de-authorization, as well as coastal restoration projects such as the Coastal Wetlands Planning, Preservation, and Restoration Act (CWPPRA) program administration the Louisiana Coastal Area, and the Louisiana Coastal Protection and Restoration program, under which all future planning for coastal Louisiana fell.[223]

While Task Force Guardian started transitioning some tasks to New Orleans District in May, it did not start to transition work to the HPO until after passing the June 1 deadline. The PRO had continued with district responsibility for work on the Jefferson Parish levees on both the east and west banks, levee work on the east bank of St. Charles Parish, for tree removal, as well as for SELA flood control projects. The district also continued with all of its normal civil works projects and studies. Soon after June 1, the HPO assumed responsibility for the contingency plans for sealing off the Lake Pontchartrain outfall canals using sheet piling or closure of the completed gates. The HPO and PRO assumed responsibility for executing the remaining Guardian contracts as well as related requirements. As of the first of June, 23 of the 59 contracts were complete. Of the 36 active projects that remained, 11 would continue through December 2006 under HPO management. The other projects, including 17 under PRO management, were due to be substantially complete by the end of June. Task Force Guardian started to transition these contracts to HPO and PRO, along with most of its employees. By June 13, the task force had transferred 41 people and transferred another 43 on June 16, after which it was no longer mission capable. All but 14 employees and one contractor vacated the task force's headquarters in the Federal Reserve Building in New Orleans by the end of the month, and another five contractors continued to occupy the field offices. These employees, aided by PRO, remained busy for many more months closing out the task force contracts.

Altogether, the task force and its contractors had removed 155 boats and barges from the levees, repaired 195 miles of levees, constructed 25 miles of new levees or floodwalls, repaired four closure structures, and built three interim gate structures on the outfall canals. It had managed 26 construction contractors (90 percent of them local) and 59 projects worth $557 million. It had also managed a clay supply contract worth $47.1 million. Task force project managers and real estate managers purchased 34 pumps for $35.3 million and commandeered 894 acres of land worth $63 million. It was incredible progress for only nine months worth of work.[224]

Even as Task Force Guardian transferred its contracts and employees, work continued on the remaining projects. The most critical of these was the completion of the interim closure gates and temporary pump stations, on which the New Orleans Sewerage and Water Board and Jefferson Parish depended to provide sufficient drainage in case rainfall and flood surge caused severe flooding. The Orleans Avenue Canal gates were in place by June 1, but contractors were still conducting tests on them and bringing them into an operational status one at a time, which they completed by the end of the month. The London Avenue Canal gates were also on schedule for completion by the end of June. The contractor had hung the west gates by June 13 and had started hanging the east side gates. However, the 17th Street Canal projects experienced a severe schedule slip with the pumps due to soil problems and worksite congestion – the work area was extremely cramped, allowing only a limited number of contractors to work at a given time, and the soil was very marshy. As a result, HPO estimated a new completion date in September. Despite the forecasted delay on the pumps, the contractors were able to make significant progress on the gates. Work on the west side gates started June 12, but the contractor had to add clay to the soil on the east side to firm it up sufficiently. Although installation work continued on the remaining gates, the closure structures at Orleans and London avenues were operational by the end of July. On August 8, contractors testing the gates found they would not seal because soil stabilization grout used to strengthen the foundation was getting into the sills. They quickly corrected the issue on all three of the closure structures. The contractor finally installed the last gate at the 17th Street Canal on August 14. Testing of the pumps then proceeded. All pumps and gates were mission capable by the end of the month, although testing and modification would continue through the end of September and into 2007 because of problems with the pumps.[225]

The low pumping capacity continued to be an issue with local government. Initial pump capacity was only 2,200 cfs at Orleans Avenue, 2,800 at London Avenue, and 1,400 at 17th Street. Before Hurricane Katrina, pump capacities at the three canals were 2,690, 7,980, and 10,440 cfs respectively. Because of this, some local officials believed that the pump stations at the mouths of these canals were inadequate, risking increased flooding if the gates closed. On the London and Orleans Avenue canals, the limited pumping capacities were less problematic since the temporary pump capacity was larger and the original pump capacity was smaller than at the 17th Street Canal. On the 17th Street Canal, however, local authorities estimated the need for a pumping capacity of at least 4,000 cfs, far more than either the short-term 1,400 or long-term 2,800 cfs plans. One of the first acts of the new HPO was to hold a "pump summit" in mid-June with the Corps, local government and consultants with the goal of obtaining 6,000 cfs output at the 17th Street Canal. As a temporary solution, the Corps worked with the contractor – Boh Brothers – to scare up an additional 1,000 cfs of pumping capacity using 23 high head portable pumps on the Old Hammond Highway Bridge, and they planned on adding two additional pumps for 450 cfs that season, plus four others by November 30 to provide a total of 5,150 cfs. They held similar meetings over the next several months to further develop the plans, although at the other sites there was little room for such additions.[226]

16. Contingency Plans for the Outfall Canals

Task Force Guardian had completed the interim repairs to the hurricane protection system by June 1, but it did not complete its goal of installing gates at the Lake Pontchartrain outfall canals until September and instead would rely on sheet-pile closures. However, whether using sheet pile or closing the gates, the Corps would need to coordinate closely with local authorities on when to close the gates or install the sheet pile, when to start the federal pumps, and what quantity of water its pumps could handle so that the local pumps at the other end of the canals would not pump too much water and flood the city again. There were concerns about the pump capacity being enough, which resulted in the Corps adopting a number of contingency measures and developing new organizations to work through the pumping issues. This included the establishment of canal captains – Corps employees with other jobs that were responsible for heading up the interim duties during an emergency. The three captains were David Constantine at Orleans Avenue Canal, Carl Robinson at London Avenue Canal, and Ray Newman at the 17th Street Canal. Each captain had four employees to assist him.

Ray Newman, the Corps Captain of the 17th Street Canal, is responsible for coordinating with local government and managing closure and Corps pumps at the canal. The other two captains are David Constantine at Orleans Avenue Canal and Carl Robinson at London Avenue Canal.

According to the captain's manual, the Corps would notify the crews of a tropical event four to five days ahead. The crews had to report to the control house at the canal structures, stock up on water and food, and check communications equipment. Prior to the completion of the gates, they would get the HPO project contractor to close off the canals with sheet pile stored nearby, and then start operating as many pumps as were functional. At Hammond Highway Bridge near 17th Street, contractors would start portable pumps, running the discharge tubes on the other side of the sheet pile. Once gates were partially operational, they would close the gates, although in the case of Orleans Avenue, a contractor would have to build a temporary crane ramp to allow cranes to drop the gates into place, a process that took four days. Once the Corps had fully installed the gates, there was a normal closure process. The gates would remain closed until directed by the New Orleans District commander, Col. Richard Wagenaar. Safety was paramount. The captains and their crews would stay in the reinforced control structures, but if the storm exceeded the strength of this structure, as a Category Four or Five storm would do, boats and safety gear stood at the ready in case evacuation was necessary.

"This is the most exciting work I've been involved in, and I understand the responsibility of restoring the public's faith in our flood protection system. This is an important assignment, and I take a lot of pride in it," Newman said. Robinson agreed: "I have the training, the experience, the staff and the drive to get the job done if a hurricane hits the area. I just hope I don't have to use those skills anytime soon."[228]

In August, the Corps and its contractors ran into an additional problem. After testing revealed that the pumps were causing significant vibration, the HPO team had to rebuild the engines on all the pumps. "We don't know what's causing it. The whole system starts to vibrate to the point where everything, the platform, everything starts shaking, so you have to shut it down because of the damage potentially to the pump itself," Wagenaar explained. HPO worked with the contractors to provide temporary pumps in case of storms until final repair of the pumps was complete at the end of September. By the end of the month, when the Corps took over operation of the gates and pumps from the contractors, pumping capacities had reached 4,000 cfs at the 17th Street Canal, and remained at 2,200 and 2,800 cfs at Orleans and London Avenue canals. Although the Corps was sensitive of local concerns, Corps studies showed that while a Katrina-sized storm would flood the city again with rainwater, only two other storms in the past 20 years packed enough surge to have closed the gates at the mouths of the canals – Hurricane Juan in 1985 and Hurricane Isidore in 2002. Both dropped less than three inches of rain in six hours,which the current pump capacity could easily have handled. Under normal rain events, the gates would remain open and not pose a problem to pumping capacity.[227]

Task Force Guardian contractors also completed several smaller projects. One of the first was repair of the Empire Gate hinges, which contractors completed on June 11. By June 7, the Shaw Group had completed interim placement of protective sheet pile at Buras where the levee had collapsed at the last minute, then the company proceeded to rebuild the levee using soil with higher clay content. It had reached 10 of the required 17 feet by June 13. The Corps meanwhile continued rigorous testing of the soils to ensure stability. The contractor completed the section by the end of June. Guardian contractors also worked toward completing several other projects, including enlargement of levees near Port Sulphur and Home Place, repairs at Sunrise and Hayes pump stations, miscellaneous back levee repairs, and final grading of several sections of levee. At the Inner Harbor Navigation Canal (IHNC), contractors made final repairs as well as added some safety features, such as adding a fence, placing concrete paving, and removing trees. The Corps continued to cooperate with the Sewerage and Water Board to restore the mainline pump stations throughout the city and by

September 28 had restored 93 percent of the overall capacity: Orleans Metro was at 91 percent, Orleans East was at 66 percent, St. Bernard at 85 percent, Jefferson at 100 percent, and Plaquemines at 88 percent. The HPO and PRO, meanwhile, set about inspecting and closing out the completed levees, a process that would formally end these projects. They also started to plan for the future, primarily through an armoring team that was to work with the IPET to determine the location of armoring funded by the Third Supplemental and other laws.[229]

By the end of June, Task Force Guardian had completed its transition and, other than closing out completed contracts, had fully demobilized. The HPO and PRO focused initially on executing the critical ongoing contracts, as well as the 610 contract modifications. Of the remaining contracts, contractors would complete five in August, seven in September, and one in October, including the 113 remaining modifications. At the same time, the HPO, PRO, and division were working out processes for quality assurance and communications activities. By July, they had turned to analysis of the various projects and contracts required to bring the levees up to authorized elevations over the next 11 months. By mid-August, the HPO and PRO had developed a plan to bring the system up to a 100-year level of protection that would include some 209 contracts through 2010. However, at the end of September, these projects were

Brig. Gen. Crear meets with Task Force Hope officials, Dan Hitchings and Jim Ward still in various stages of solicitation, and the Corps had awarded none of them. The primary reason for this delay, completing the Project Cooperation Agreements (PCAs) and getting signatures from local government agencies, was a legal requirement that sometimes took months or years to obtain under normal conditions. These agreements were in effect contracts with local government defining the projects and responsibilities of the parties, and the Corps had to have them to proceed with contracting. As of mid-August, the PCAs were in various stages of completion, with the Corps having only recently distributed some of the agreements for approval. Although the Corps received some blame for the delays, in fact, Corps leaders had waived many internal regulations and guidelines that ordinarily protected the process. However, it could not waive legal requirements.[230]

Dan Hitchings, Director, Task Force Hope.

Understandably, the New Orleans community was still very sensitive about the state of flood control. The installations of the canal closures and temporary pumps continued to extend for weeks as the Corps missed several self-imposed deadlines, and the remaining hurricane protection system projects were still in the planning stage. On August 4, 2006, Tropical Storm Chris raged across the Virgin Islands heading toward the Louisiana coast. Recognizing that some levee sections in Jefferson Parish were not ready, the Corps implemented what one observer called its "interim interim" plan, essentially placing fill behind levees and sheet piling to make them secure enough until the PRO implemented the more permanent structures. The Corps set to work closing the 17th Street Canal gate with sheet pile according to the emergency strategy. Local government expressed doubts that the new gates would hold, and complaints arose that the Corps had not even started construction on these improvements, despite Congressional authorization and funding in February. A similar response occurred after Tropical Storm Ernesto, but in fact weather overall had remained abnormally dry, perfect for construction projects. Within the Corps, this only made the anxiety over delays in projects that much more acute. "We are poised to do $6 billion

> *"We are poised to do $6 billion worth of work in an environment no one has ever been in before, and we have a lot of people working unbelievably hard to make it happen,"*
>
> *— Dan Hitchings*

worth of work in an environment no one has ever been in before, and we have a lot of people working unbelievably hard to make it happen," said Dan Hitchings, civilian director of Task Force Hope. The financing issues, the environmental regulations, and the contracting regulations – all necessary to ensure the Corps met its financial and legal obligations – continued to slow the process.[231]

Task Force Guardian had been one of the largest and most complex civil works rehabilitation missions completed in an incredibly short amount of time. Repairing the more than 200 miles of damaged levees would have ordinarily taken years to complete. The task force did it in nine months. During that time, it managed more than $500 million in contracts with nearly 30 contractors. The pieces were very complex. There were tight working conditions and limited materials such as soil of the right quality. To make the repairs correctly, the Corps had to expand many projects, requiring real estate acquisitions. There was constant criticism and second-guessing, leading to an often hostile media environment. Designs of some project aspects changed over time as the Corps received "lessons learned" from the many investigations into the floodwall failures during Hurricane Katrina, and the Corps conducted nonstop testing to ensure contractors did the job correctly. The Corps had to break many of its own guidelines to complete the projects while it and its contractors created many innovative practices to get the job done and done correctly. Few had ever conducted construction projects under the driving circumstances Task Force Guardian did. "It's been a voyage of discovery," Jim Ward, the civilian deputy director of Task Force Hope, observed. In such an atmosphere, there were inevitable mistakes and problems, but Task Force Guardian performed above expectations to provide the minimal level of protection required to defend New Orleans during the 2006 hurricane season until the Corps could make more permanent improvements in the hurricane protection system.[232]

Conclusion: End of the Response

On August 29, 2007, the city of New Orleans and the other cities across the Gulf Coast held Hurricane Katrina second anniversary remembrance ceremonies. Mayor Ray Nagin and other New Orleans officials broke ground on a new Hurricane Katrina memorial at Charity Hospital Cemetery on Canal Street. Bells rang out across New Orleans at the time of the storm, a new tradition. Louisiana Lt. Gov. Mitch Landrieu attended a memorial ceremony in St. Bernard Parish. President Bush, in his fifteenth visit to the region, marked the opening of the first public school to reopen in the Lower 9th Ward, and then left for a public appearance in Mississippi. At Waveland and Bay Saint Louis, the events were more upbeat, with singing of religious and patriotic songs and praise for the country and the region's strength in recovery. Other events across the region marked the anniversary, sometimes through public ceremonies and celebrations such as jazz funerals, and sometimes through church services, prayer vigils, or private remembrance. News outlets throughout the country took notice once again – however briefly – of Hurricane Katrina. In interviews, residents thanked the country for charity, and complained of the slow pace of recovery in equal measure. As *USA Today* noted in one headline, "Hope, skepticism mark Katrina anniversary." [233]

> ***"Hope, skepticism mark Katrina anniversary."***
>
> *— USA Today*

A few weeks later, on September 30, 2007, the Corps of Engineers held a ceremony marking the deactivation of the Louisiana Recovery Field Office. The office, which had opened on September 1, 2005, in Baton Rouge and moved to New Orleans in July 2006, had finally closed, as had the more than two-year long mission for the Federal Emergency Management Agency (FEMA). The Mississippi Recovery Field Office had closed one year previously on September 30, 2006, having gone through a similar process. Yet, despite the ceremony and the "official" closing of the mission, much work remained. For starters, there was $5 billion worth of funds requiring reconciliation with money actually spent, a process that took more than 10 years with 1992's Hurricane Andrew. In both Louisiana and Mississippi, teams of auditors worked side by side with FEMA auditors and Corps program managers, contracting officers, and quality assurance inspectors to ensure that the government properly spent all funds. At the same time, work continued through the Hurricane Protection Office and the New Orleans District to bring the hurricane protection system – now termed risk reduction system in acknowledgment that no system could provide total protection – to the congressionally authorized 100-year level of protection.

The Corps completed restoration of pre-Katrina levels of protection by June 1, 2006, but it had not resolved some issues such as the temporary pumps on the Lake Pontchartrain outfall canals. Unlike the very visible unwatering of New Orleans or removal of debris, repairs to the system were not always readily apparent since no new major storms tested these defenses during the hurricane seasons of 2006 or 2007. Behind the scenes, the planning process continued for future protective works and to coordinate with local communities on remaining storm-related issues. Recovery had ended, but rebuilding and improvements in flood control and hurricane protection continued.[234]

Even as criticism of the Corps increased in intensity as the levee investigations entered their final phase, a new spirit of co-operation seemed to take hold among the Corps and state and local agencies. Louisiana saw the first major reform of state-run, locally operated levee districts when media complaints came to bear that they had given maintenance of the risk reduction system short shrift over the years and that authority for the levees was fragmented and confusing. In February 2006, the Louisiana legislature approved merging the districts into two levee organizations – one for the east bank and one for the west bank – that reported to the Louisiana Coastal Protection and Restoration Authority (CPRA), a new state agency responsible for levee issues within the state of Louisiana. The existing district boards transferred their holdings to the new districts or to other authorities and closed by the end of 2006. However, the Corps was already working with the levee districts, old and new, to beef up the semi-annual inspections that had recently become an object of scrutiny. Instead of formal inspections conducted by a driving tour and supplemented by day-to-day levee operations and reporting, after Hurricane Katrina, the Corps and levee districts intensified their oversight by holding four inspections a year, conducting by-the-book inspections without guests or dignitaries, and training employees thoroughly on how to identify and report problems such as cracks, slides, shifts, scour, erosion, subsidence, movement, or violation of easements. The Corps also started to remove trees and other structures that had grown up on levee toes and within project easements. "We'll follow the letter of those regulations," said Jerry Colletti, the Chief of Operations for the Corps' New Orleans District.[235]

Meanwhile, the Corps was working closely with levee districts, the Sewerage and Water Board, and other local agencies on Southeast Louisiana Flood Damage Reduction Program (SELA). Repair of Sewerage and Water Board pump stations continued after the end of Task Force Unwatering, reaching 93 percent completion overall by the end of September 2006 and increasing only slightly over the next several months. By the end of 2006, repairs had reached 92 percent in Orleans Metro, 74 percent in Orleans East, 85 percent in St. Bernard, and 88.5 percent in Plaquemines. Many of these pumps were too old to repair and required complete replacements, which the Corps and local government worked to achieve. Other improvements included the addition of safe rooms at pump stations to protect pump workers, many of which had evacuated during Hurricane Katrina. The Jefferson Parish Council planned on adding 17 one-room safe houses for its pump stations, but could only afford to add eight in 2006. The safe houses would include remote controls for the pumps, so the workers could turn on air compressors if the pumps were not functioning to prevent backflow through the pumps, the main cause of flooding in Jefferson Parish. The parish worked closely with the Corps to install the controls until the gates at the mouths of the Lake Pontchartrain canals were in place. Construction on the initial rooms was complete in December 2006. In 2007, Congress included SELA projects in a bill funding the cost of raising the New Orleans levees to authorized 100-year protection levels because the $225 million provided after Katrina did not cover all of the costs, including costs voluntarily undertaken by local government to flood proof pumps or build safe rooms. This represented a shift

Jefferson Parish added pump station safe rooms to provide safe lodging for pump workers so that they could continue to work pumps during a storm event.

in thinking, since traditionally Congress authorized and funded the SELA projects and levee projects separately because they came from different local revenue streams. At last, it appeared that government at all levels saw the projects as interrelated. "The people don't care how they flood," said Jefferson Parish Councilman Tom Capella. "Whether it's the outfall canals or interior drainage, a flood's a flood's a flood." [236]

In addition to the repairs made by Task Force Guardian and now the Hurricane Protection Office and the Protection and Restoration Office to restore defenses to their pre-Katrina levels, Congress authorized and funded several other improvements beyond repairs to the existing system as part of the 100-year protection authorized by the Water Resources Development Act of 2007. Included among these projects were the closing of the Mississippi River-Gulf Outlet (MR-GO) discussed earlier, permanent closure structures at the mouths of the Lake Pontchartrain outfall canals, armoring of some of the levees, and other projects approved by the state. As already noted, the Corps received approval to install sluice gates as emergency measures in January 2006, and contractors completed construction in September 2006 but experienced challenges with temporary pumps installed with the gates. After problems with severe vibration, contractors rebuilt the pump motors, but the Corps continued to have problems with the pumps into 2007, and did not hold a successful test of all pumps until August of that year. The Corps worked with Orleans Parish officials throughout 2007 to plan for building permanent closures and pump stations at the mouths of the canals using butterfly gates and either moving existing pumps or building new ones.

Another area that the Corps quickly started planning was armoring sections of levees. The investigative teams had identified armoring of levees by lining the levee back side with rock or concrete as an effective means to protect against damage from overtopping, erosion, and possible breaching. Congress approved and appropriated money for armoring in the Third Supplemental Appropriation in February 2006, and by July, the Corps was already working with local governments to plan the best locations for armoring, which would include stretches along the MR-GO, sections of the New Orleans to Venice levees, at transitions between levees and floodwalls, and other vulnerable locations. The Corps incorporated these projects into the 100-year level of protection, which had a projected

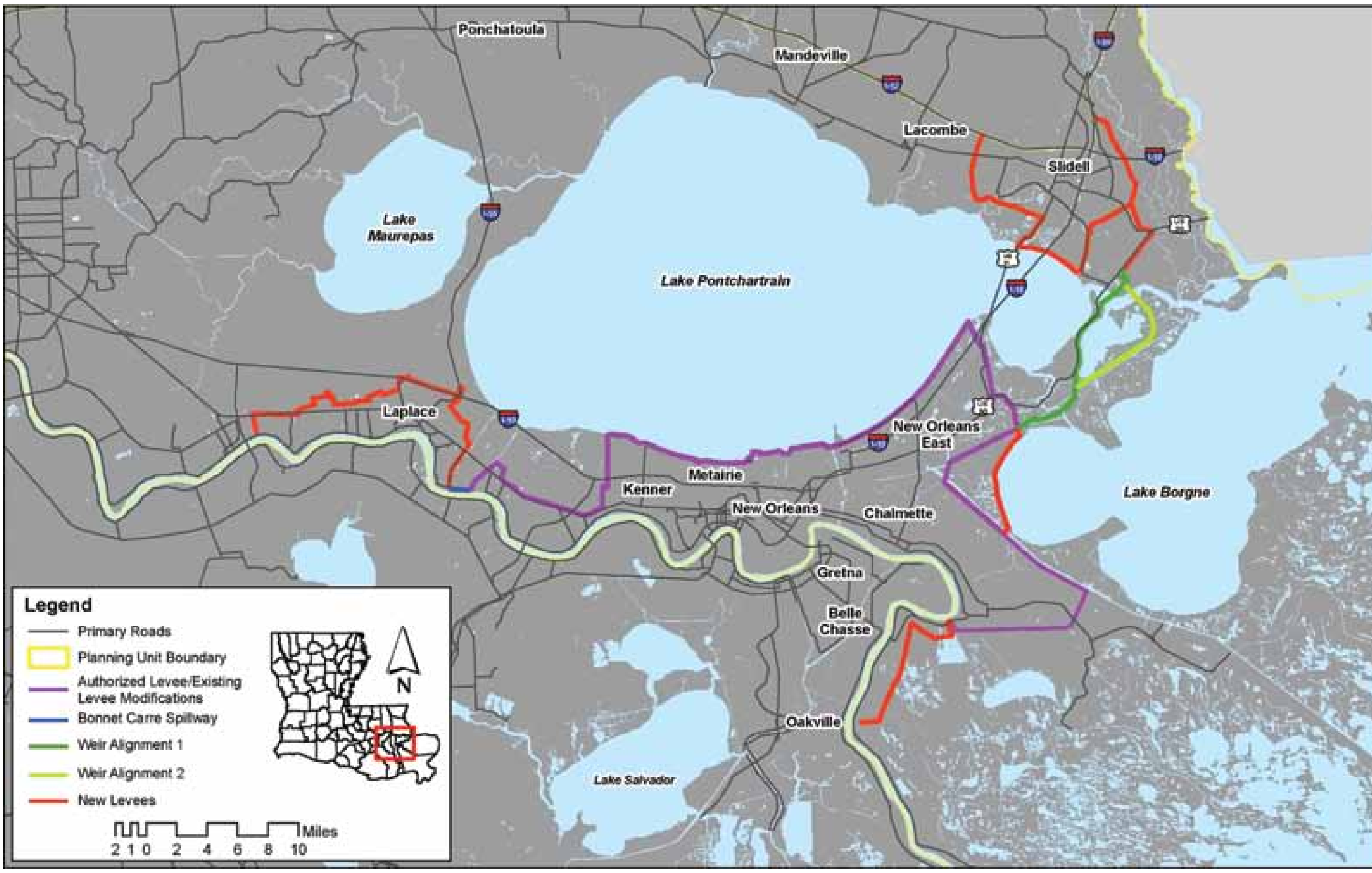
One of the investigators' suggestions being implemented is addition of armoring – concrete or rock protection on the back side of floodwalls and levees to reduce scouring.

completion date of 2011. Other projects forming the 100-year protection included raising levees in multiple locations, replacing or repairing floodwalls, flood-proofing pump stations, improving nonfederal levees, and building navigable floodgates on the Inner Harbor Navigation Canal at Seabrook, the Gulf Intracoastal Waterway and MR-GO.[237]

While local government was improving protection, local industry – primarily waterway operation, port, and shipping industries – was also doing its part. As a result of the intense cooperation that occurred among navigational industry, local government, federal agencies and others in restoring navigation quickly after the 2004 and 2005 hurricane seasons, the Gulf Intracoastal Canal Association (GICA) led an effort to establish a protocol for cooperation in post-hurricane navigational issues in 2006. Working with the Corps of Engineers, NOAA and the Coast Guard, GICA formed the Gulf Coast Inland Waterways Joint Hurricane Response Team, which established a permanent response plan over several months. According to this plan, the Corps is responsible for holding data calls and working with NOAA, the Navy and commercial surveyors to determine waterway depth. The Coast Guard is responsible for overall readiness and waterway closure/opening. GICA, meanwhile, serves as the industry representative and acts as a clearinghouse for information. The plan further established teams to coordinate activities related to communications, surveys, command and control, self-help and other areas, and established procedures for issuing warnings, holding conference calls and establishing command centers as well as steps to take to protect locks and ports before the storm and restore navigation after the storms. In many ways, the protocol merely formalized and codified the response efforts and lessons learned from Hurricane Katrina, but in establishing a permanent organization and activity to coordinate response, it showed the level of coordination and planning that resulted from the storm and how seriously commercial interests took ensuring that they minimized the impact of future storms on the regional economy.[238]

As for achieving a higher level of protection for the region, on November 19, 2005, the Energy and Water Development Appropriations Act of 2006 provided $8 million and directed the Corps to develop a comprehensive hurricane protection plan at full federal expense to protect against storm surge equivalent to a Category Five hurricane in coordination with the state of Louisiana. The Department of Defense Appropriations Act of 2006 passed on December 30, 2005, provided an additional $12 million on the condition that Louisiana developed a single state agency to oversee construction and maintenance, which it did with establishment of the Coastal Protection and Restoration Authority (CPRA) in Act No. 8 of the 2005 First Extraordinary Session, signed by Gov. Kathleen Blanco on November 28, 2005. By late December, the Corps was assembling team members, taking research trips, creating computer models, producing a project management plan, and developing budgets. At an initial workshop on December 20, the Corps worked with the National Hurricane Center, Louisiana State University, and others to define hurricane planning parameters used to screen future designs. Then after a January meeting to set policy, the Louisiana Coastal Protection and Restoration (LACPR) team started the plan formulation process on February 6, 2006, at the Corps' New Orleans District offices. The team represented more than 30 organizations, including government agencies, research institutions, environmental groups, land owner associations, and private engineering firms. Initially, the Corps also discussed protection in conjunction with FEMA's Emergency Support Function-14 (ESF-14) team focusing on Long-Term Planning and Mitigation. A few meetings proved, however, that the teams were focusing on the same tasks, and FEMA left planning of future protection to LACPR.[239]

The LACPR team held an Initial Plan Formulation Workshop on February 13, 2006, to gather public input, an Engineering Technical Approaches and Innovations Workshop on March 2 to meet with geotechnical and structural experts to discuss their recommendations, and a Scientist/NGO Engagement Meeting on May 15 to receive input from the scientific community and nongovernmental organizations. From March to May, it held public meetings to scope the projects and discuss alternatives for flood control, coastal restoration, and hurricane protection. In July 2006, it released its preliminary technical report to Congress. This mostly focused on methodology and overall strategies and presented "a decision-making framework that can be used by policy makers and legislators to evaluate differing risk-reduction alternatives." Among methodologies discussed were definition of storms used to screen



The preliminary LACPR report included potential alignments for protective structures.

the different plans and use of a risk-based decision-making framework. Similar to recent coastal restoration plans such as Louisiana Coastal Area, the plan broke the Louisiana coast into geographic planning units for developing localized projects. It also stressed the need for multiple lines of defense, a common risk reduction strategy. Unlike the claims of detractors, it also included 11 potential levee alignments and 13 appendices with 1,100 pages of technical data. Although the LACPR made progress on developing the final master plan and completed much of the analysis and many plan components, it did not have a fully vetted final product within the 24 months stipulated by Congress. On December 20, 2007, Assistant Secretary of the Army for Civil Works John Woodley notified Congress that the Corps would not meet its December deadline to complete the LACPR final report and external review, which would take additional time.[240]

Although not a part of the LACPR, the Mississippi Coastal Improvement Program (MSCIP) also developed plans in conjunction with the State of Mississippi in parallel with LACPR to protect Mississippi coastal counties: Hancock, Harrison and Jackson. Per the Department of Defense Appropriations Act of 2006, the MSCIP team, led by the Mobile District, developed a near-term plan by June 2006 and an interim plan published in August 2007, with a comprehensive plan scheduled for release in December 2007. Near-term plans included evacuation planning, beach or other ecosystem restoration, and improved drainage. Long-term plans included seawalls along portions of the coast, reinforced highways, storm surge gates near Bay St. Louis, and 50 million pounds of sand placed to restore beaches and barrier islands, as well as real estate buy-outs and housing regulations. By September 2007, the MSCIP team was already in discussion with Bay St. Louis, Waveland, and Pearlington about interest in a buy-out program in which the government would buy back homes and businesses built in flood-prone areas. It conducted a series of public hearings in late October and early November 2007 and was working on the final report as of December 2007.[241]

The Corps had successfully completed its recovery mission by the end of 2007 and had turned to improving protection of the region. The Corps had rebuilt the foundation for hope. It had managed a gargantuan effort to bring relief to the Gulf Coast. It had brought aid and removed debris. It had stopped the flooding and unwatered New Orleans. It had restored navigation and rehabilitated protective works. And it had started to reinvent itself while planning for the future. But it would take more time to fully erect the edifice of hope on the foundation it had started.

On August 11, 2006, Lt. Gen. Carl Strock, announced his retirement from the Corps of Engineers citing "family and personal reasons." The Chief of Engineers since 2004, he had presided over one of the most difficult eras of the Corps, when he had to stand before the world and admit for the first time that the Corps "had a catastrophic failure." Most called him a good man with character and honesty. He was "the right guy in the right place for everybody except himself," Raymond Seed said. On November 30, 2006, Col. Richard Wagenaar, the commander of the New Orleans District, also announced his retirement the following summer. Louisiana's U.S. senators wished him well, with Sen. Mary Landrieu saying that he had led the district through "a very challenging period for the corps." A few days later, the civilian director of Task Force Hope, Dan Hitchings, and the Director of Program Management at the New Orleans District, Greg Breerwood, both announced their retirements. Many others would also leave over the next year, including Task Force Unwatering Commander Col. Duane Gapinski and dozens of lower level workers. Although most cited other, personal reasons, one cannot help but place at least part of the blame on Katrina-fatigue. "It's been a very long road, post-Katrina, for me – both mental challenges and physical challenges – as we've been trying to execute an extremely complicated mission," Wagenaar said at his retirement announcement. They were part of the toll the agency paid for what was the largest and one of the longest-running relief and recovery missions in Corps history.[242]

It had been an emotionally draining two years since Hurricane Katrina. The challenges for all personnel involved in recovery were enormous. There were the long hours, the worrying about family members and homes, the complex work of managing dozens of contractors and billions of dollars in a compressed time, the balancing of many opposing interests all clamoring for competing resources, the balancing of legal requirements and a desire to get the recovery started, the increased scrutiny and constant criticism, and ultimately the desire to serve the nation by helping the region in the best way they could. Task Force Hope was a mission that had involved many Corps personnel from around the nation, as well as personnel from other federal agencies who supported the Corps often while being separated from family for weeks or months at a time. Task Force Hope was a mission to restore hope to the region by bringing aid and comfort to its citizens, restoring protection, and starting them on the long road to recovery. There can be no doubt that, whatever challenges it faced in the long run, in the short run the Corps had completed this mission.

The retirements of Strock, Wagenaar, and the others also represented a new beginning, a changing of the guard of sorts. A number of observers worried that the retirements would leave gaping holes in the Corps and prevent it from completing its mission, but Dan Hitchings confirmed that "we're going to have an orderly transition." After several weeks of working the transition with Hitchings, on March 7, 2007, Karen Durham-Aguilera took over as the civilian director of Task

Force Hope. On May 17, 2007, after considerable congressional review, Lt. Gen. Robert Van Antwerp became the 52nd Chief of Engineers. On July 20, 2007, Col. Alvin B. Lee became the 60th New Orleans District Engineer. Other employees filled the ranks behind those who left, many moving from other Corps districts and divisions to take up new positions in the storm-stricken region. "It's best that someone come in to take that next phase all the way to completion," Breerwood said. It was time for a new generation of employees and leaders to bring in fresh ideas and renewed strength to complete the mission of rebuilding hope in Louisiana and Mississippi.[243]

Postscript

The history of Task Force Hope begins with the raw, emotional story of a hectic, yet heroic, response to two very devastating hurricanes in 2005 — Katrina and Rita. The mission grew beyond the immediate response to the Federal Emergency Management Agency's request to assist damage-stricken areas to the ambitious goal of delivering a comprehensive hurricane risk reduction system to defend the Greater New Orleans area against a 100-year storm surge by 1 June 2011.

The initial mission was multifold, including evacuating millions of gallons of water from the City of New Orleans, repairing hundreds of miles of levees and floodwalls, restoring safe and reliable navigation on the inland waterway system, removal of massive amounts of debris, providing thousands of temporary blue roofs, delivering much needed water, ice, temporary housing and critical infrastructure throughout Louisiana and Mississippi, and constructing facilities for handling the deceased victims of the storm.

The next step was to deliver a hurricane perimeter system that could defend the Greater New Orleans area against a possible 100-year storm surge. The Administration and Congress acted quickly by providing the authority and upfront funding of nearly $15 billion for design and construction of the Hurricane and Storm Damage Risk Reduction System (HSDRRS). This amount is almost three times the Corps' entire average annual Civil Works budget of $5.5 billion. In response, the Corps of Engineers set itself the ambitious goal of delivering that system by the start of the 2011 hurricane season – a mere six years after Hurricane Katrina made landfall on August 29, 2005. The magnitude and timeframe of this mission is something that had never been attempted before.

The Corps and its contractors made remarkable progress on the HSDRRS and had their eye on the 1 June goal when the

Mississippi River began to make its own history. In the spring of 2011, the river was setting new high water records and topped its 1927 and 1937 flood levels. Due to the high water levels in the New Orleans area, the Corps suspended work on the Mississippi River levees that are co-located with the HSDRRS levees, a 15-mile stretch. Plans for a celebration of the 1 June date had to be postponed. But work on the system continued.

Over 330 construction contracts have been awarded to date and over $10.5 billion obligated from the almost $15 billion program. The Hurricane and Storm Damage Risk Reduction System is, in fact, one of the largest engineering projects in the nation's history.

The HSDRRS is built as a comprehensive perimeter system of levees, floodwalls, gates, surge barriers and pump stations. The complex work also had to be delivered in an atmosphere of intense media, congressional and public scrutiny in an environment of low trust in the Corps.

Several factors helped the Corps to succeed in building the HSDRRS as quickly as it has. The Administration's firm commitment and quick Congressional action after Hurricane Katrina provided authority and appropriations that enabled the Corps to repair and restore 220 miles of the system to the pre-Katrina level of protection by June 2006. Having a fully-funded program, rather than incremental appropriations, was one of the most important success factors. Continued support with several fund reprogramming actions enabled the Corps to keep up its quick construction pace with the rest of the system. The Corps also pursued a host of acquisition strategies and enjoyed a favorable bidding climate that brought many contracts in under budget.

Delivering a program of this magnitude and in this short timeframe presented numerous challenges. For instance, before any contracts could be awarded, the Corps had to document environmental impacts in accordance with the National Environmental Policy Act (NEPA). The Corps was allowed to use an expedited environmental review process on the HSDRRS that allowed for simultaneous completion of some twenty Individual Environmental Reports (IERs), later to be compiled into a comprehensive document in compliance with NEPA. The Corps and its partners had to execute Project Partnership Agreements (PPA) outlining agreed-upon methods, how projects would be funded and what roles each partner would play. The most critical PPAs to advance the program were for the Lake Pontchartrain and Vicinity, West Bank and Vicinity, and the Southeast Louisiana Urban Flood Control project (SELA). All IERs and PPAs for the system were completed after thorough collaboration with partners and stakeholders and the public participation required by the National Environmental Policy Act (NEPA). The Corps also signed agreements with the State of Louisiana that extend its payments for the cost-shared portion of the work over a 30-year period. The Corps has also been involving the public throughout the decision process, hosting more than 500 public engagements in the five Greater New Orleans area parishes to listen to stakeholders and obtain public comments about development of the system.

Another challenge associated with HSDRRS is the fact that much of this work was occurring adjacent to heavily populated areas. Construction took place close to people's private property. In many cases, the State of Louisiana and levee authorities had to provide real estate acquisition or right of entry. Some of the land is actually under water and Louisiana state laws are complex when it comes to water since people own mineral rights to the land under that water. It was a big challenge for the state and levee authorities to provide the real estate needed to get these projects done.

The Corps used the overall resources of the entire Mississippi Valley Division and other Corps expertise across the Nation to deliver this essential system to the citizens of greater New Orleans and Southeast Louisiana and meet our commitment to provide 100-year level risk reduction in 2011. The Corps pursued completion of the system with scientific rigor. The Corps has leveraged the knowledge and capabilities of our partners in industry, architect-engineer firms, members of academia and international counterparts to develop and apply state-of-the-practice engineering solutions to the Greater New Orleans Hurricane and Storm Damage Risk Reduction System and across coastal Louisiana.

To complete the massive HSDRRS project expeditiously and within budget, the Corps used several innovative techniques.

For instance, Early Contractor Involvement contracts allowed the construction contractor early access to work with the designer so they could begin construction earlier with knowledge of the design. Best Value Source Selection contracts allowed contractors to be selected based on several factors such as price and past performance to get the best value for the work. Design-Build contracts allowed project design and construction to proceed simultaneously. Bulk purchase of steel enabled the Corps to realize savings in cost and schedule by buying steel when the market prices were lower.

In addition, the Corps implemented a robust independent external peer review of the HSDRRS. This includes the overall design criteria and their application during design and construction, the armoring manual, the quality management plan, and several complex features of the system.

The design of the 100-year risk reduction system is complete. All environmental compliance documentation is complete, and all necessary real estate rights of entry have been provided.

Public safety is our first priority and the Corps is committed to providing a solution for robust perimeter protection at the three Outfall Canals (17th Street, Orleans Ave. and London Ave.). Interim Closure Structures (ICS) and Pump Stations at the three outfall canals currently provide 100-year level risk reduction, but these are temporary facilities. Designed for expedited construction, these interim facilities were placed in service in June 2006 with an estimated project life of five to seven years. The operational effectiveness of these interim system facilities was demonstrated during Hurricanes Gustav and Ike in 2008 when the gates were closed and the pumps successfully operated in concert with the city's interior pumps. Authorized and funded to replace the interim ICS with permanent gated pumping stations, the Corps will include adaptable design features in the permanent pumping stations, such as deepened sills, which are within current authority and funding. This will ensure that no large work element would have to be removed or replaced if other options are eventually authorized, funded and constructed. The Individual Environmental Report (IER) Decision Record for the Permanent Canal Closures and Pumps was signed in June 2009, satisfying the National Environmental Policy Act requirements. Construction completion is expected in 2015.

Work on two of the largest projects in the HSDRRS has progressed quickly. The Inner Harbor Navigation Canal Surge Barrier (IHNC) at Lake Borgne, the Corps' largest design-build civil works project, is nearly two miles long. This enormous barrier wall, built in water, is clearly visible by satellite and provides a formidable defense against storm surge with a concrete pile-supported wall spanning from the north bank of the Gulf Intracoastal Waterway to the south bank of the Mississippi River Gulf Outlet and includes three navigable gates. It will defend against surge that would come from the Gulf of Mexico, reducing risk to the Ninth Ward, Gentilly, New Orleans East, Orleans Metro and St. Bernard Parish. Unique in its magnitude and technical features, the IHNC Surge Barrier is unlike any project the Corps has ever done in the United States. The barrier wall stands 26 feet above the water line and defends against storm surge before it can reach land. Sediment dredged incidental to construction was used to restore 205 acres of marsh adjacent to the project site.

A second floodgate complex is under construction in the Seabrook area of the Industrial Canal to reduce storm surge entering from Lake Pontchartrain. This project will work in tandem with the IHNC Surge Barrier to provide 100-year level risk reduction to the entire IHNC corridor. The project is over 40% complete.

Seabrook Floodgate Complex

The West Closure Complex (WCC) on the West Bank, another colossal construction project, includes the world's largest drainage pump station, capable of pumping more than19,000 cubic feet per second. In addition to the giant pump station structure, the 200-acre WCC site includes a closure wall, six sluice gates, T-walls, a levee, and the nation's largest sector gated structure (225-feet wide) equipped with two 700-ton closure gates. The West Closure Complex defends against storm surge entering the Harvey and Algiers Canals from the Gulf of Mexico for the more than 250,000 people living on the West Bank. The West Closure Complex is about 85% complete.

West Closure Complex

Following Hurricane Katrina, about 80% of the St. Bernard Parish levees were either repaired or constructed to achieve the pre-Katrina authorized elevation. After evaluating several alternatives and conducting a rigorous public process, the Corps determined that T-walls on top of existing levees provided the most effective, timely, and cost-effective solution to provide 100-year risk reduction. The Record of Decision for Individual Environmental Report (IER) 10, signed in May 2009, advanced the plan to construct 23 miles of floodwalls in St. Bernard Parish. All five floodwall contracts for St. Bernard Parish were awarded in 2010. To complete the construction on schedule, the contractors proceeded at the rate of about two miles per month. Construction was complete by 1 June 2011.

The Eastern Tie-In project will tie the HSDRRS into the Mississippi River levee just south of Oakville on the west side of the Mississippi River. Three contracts for this work were awarded in 2010. The Corps is now building a floodwall with two gates across Highway 23 and the parallel railroad to provide risk reduction.

Since Katrina, the Corps has awarded 15 of 37 Southeast Louisiana Urban Flood Control Project (SELA) contracts for interior drainage projects with a total worth of nearly $330 million. Nine of the 37 contracts are complete, and one of the remaining contracts is scheduled to be completed in 2011. The other five should be completed by the end of 2013. Work in Jefferson and Orleans Parishes is approximately 40 percent complete and remaining work is scheduled to be completed by 2017. While completion of the SELA projects is not a requirement to provide 100-year risk reduction to the Greater New Orleans area, it will improve the system's ability to handle interior drainage.

At Grand Isle, the Corps completed a $26 million program that reconstructed about six miles of sand dunes with a geo-textile tube core/sand cap. Construction began in May 2009 and was completed in April 2010. The tubes were filled with sand removed from excavation of the existing dune. The sand cover and beach nourishment portion of the project was dredged from an offshore borrow site. This project will reduce the impact of storm surges to the island residents and structures.

In September of 2006, Congress authorized and appropriated $30 million for the Corps to repair, replace, modify, and improve the nonfederal levees and the associated protection measures in Terrebonne Parish. The completion of this project in July 2009 advanced the Terrebonne Parish Consolidated Government's plan of improving the Terrebonne Parish non-Federal levees.

After Katrina the Corps undertook a concerted effort to improve standard armoring methods and worked with academia to research the use of various armoring materials. Armoring adds resiliency to a levee and can reduce erosion and scouring of back slopes when wave overtopping occurs. About 420 transition spots (where a floodwall meets a levee) have been armored. The ongoing research determined where and if additional material other than grass might be needed to help make levees more resilient to wave overtopping. Armoring construction will begin in the spring of 2012.

The West Bank and Vicinity (WBV) Mississippi River Levee/Hurricane and Storm Damage Risk Reduction System Co-located project is located in southeastern Louisiana within Plaquemines and Orleans Parishes. The Corps completed a hydrological analysis on the Mississippi River Levees that are co-located with the HSDRRS and has begun Engineered Alternative Measures to raise approximately 15 miles of these levees to provide 100-year level of risk reduction in August 2011.

The Corps is engaged in two separate Non-Federal projects on a complementary timeline that will reduce risk in Plaquemines Parish below Oakville outside the 100-year HSDRRS. The Plaquemines Parish Non-Federal Levee project includes replacing or modifying 32 miles of current levees between Oakville and St. Jude on the west bank of the Mississippi River and constructing two miles of earthen levees from the ground level. When completed in 2014, these levees will be part of the New Orleans to Venice Federal levee system. The New Orleans to Venice project is completing existing Federal levees on the east bank from Phoenix to Bohemia, and on the West Bank from St. Jude to Venice and is scheduled for completion in 2014. Design activities and environmental compliance documentation are ongoing.

Since Hurricane Katrina, the Corps of Engineers has been involved in leading a number of simultaneous efforts located on or near the Mississippi River Gulf Outlet (MRGO). The comprehensive plan for deauthorization of deep draft navigation was completed in 2008. The MRGO channel was officially closed to all navigation in April 2009 and the physical construction (using over 430,000 tons of rock) was completed in July 2009. A study to identify the best ways to restore wetlands affected by the MRGO was completed in December 2010. Feasibility scoping meetings for this study have already taken place, and the Corps has completed the feasibility-level design and released a draft report for public comment and peer review in 2010. Independent external peer review and review of public comments are currently being completed and the team is working to complete the final report by 2012.

The Corps is also engaged on several other fronts, primarily under the Louisiana Coastal Area (LCA) and the several authorities that support the ongoing effort to restore the coastal ecosystem. The ecosystem restoration activities are conducted under multiple authorities, with funding from varying sources and an array of different cost-sharing formulas. They include: (1) the Coastal Wetlands Planning, Protection and Restoration Act; (2) a Louisiana Coastal Area (LCA) ecosystem restoration program; (3) a related effort to restore wetlands affected by the Mississippi River Gulf Outlet; and (4) the science needed to support all of these related ecosystem restoration efforts. Coastal protection and restoration and marsh creation provide another of the multiple lines of defense against hurricane surge.

The Louisiana Coastal Protection and Restoration (LACPR) Final Technical Report provides a description of a variety of alternatives for effectively attaining increased levels of risk reduction throughout five planning units across the coast. The evaluation presented in the final technical report quantifies and compares beneficial values and tradeoffs associated with each of the final plans. Plans include one or more of three types of risk reduction measures: structural, nonstructural, and coastal restoration. LACPR will be an effective tool to enable Louisiana to develop long range plans to provide multiple lines of defense for its coast. On June 3, 2010 the Office of the

Assistant Secretary of the Army for Civil Works transmitted the LACPR Final Technical Report to the U.S. Congress. Currently the Corps has team members embedded with the State of Louisiana team which is updating the State Master Plan.

Other major work in the HSDRRS program includes: completion of all existing pump station repairs, completion of pump station storm proofing projects, work on fronting protection at four pump stations in East Jefferson, completing levees and floodwalls in East New Orleans, Metro New Orleans, and Saint Bernard Parish, raising levees and floodwalls throughout the West Bank, and improving interior drainage.

The Corps has a commitment to small and disadvantaged businesses. Reaching over $2.6 billion in Small Business prime contracts is an accomplishment that the Corps worked hard to achieve. Of course, many more small businesses have received work as subcontractors. Of those Small Business Contracts almost 30% were awarded to Louisiana-based companies. Contracts going to Louisiana businesses have a positive economic effect on the area most affected by Hurricane Katrina. Louisiana-based businesses have received over $5 billion in HSDRRS contracts. That's almost 63% of all contracts. Work on this system has produced approximately 60,000 jobs.

Task Force Hope serves as an expeditionary force that was set up on short notice in response to a crisis with a staff tailored to achieve limited and clearly stated objectives. As the HSDRRS mission nears completion, Task Force Hope will gradually draw down and the New Orleans District will then absorb the remaining work.

In a little over five years, the Corps, working with its partners and stakeholders at every level – local, state, federal and international – has been able to deliver the hurricane system using several best management practices developed during implementation of the system. Several factors enabled this to happen: Presidential and Administration commitment; full federal funding and authorization upfront; the Corps' naming this mission its #1 domestic priority; the use of National Environmental Protection Act Alternative Arrangements; use of multiple acquisition strategies; a favorable bidding climate; shared responsibilities as partners; interagency collaboration and transparency; and extensive public input to include over 500 public meetings in five years. The magnitude of the project is truly historic but so is the process and climate that made the completion of the project possible.

The Corps' work on the HSDRRS is making history. The Corps has been getting the job done right because of the hard work, dedication, talent and excellent teamwork of everyone involved in this mission. The system is now stronger and more resilient than at any time. The success of Task Force Hope and its partners is evidenced by the work on the ground and the returning confidence of the people of the southeast Louisiana region.

Major General Michael J. Walsh
Commander, Mississippi Valley Division
Commander, Task Force Hope

Appendix A. Task Force Hope Chronology, Aug. 2005-Oct. 2005[247]

August 25 (D-4)

MVD activates its emergency operations centers. MVN HQ, crisis action team, and civil works group begin mobilizing to MVK; MVN unwatering team begins mobilizing to MVM.

August 27 (D-2)

MVD receives pre-declaration regional activation mission assignments for Mississippi and Louisiana.

August 28 (D-1)

BG Crear, MVD Commander, reports that potential unwatering mission is his most strategically significant mission. Augmented by MVN unwatering team, MVM begins planning for potential unwatering mission and preparing SOW and ROM cost estimate to be submitted to FEMA. MVM also begins identifying contractors with required capabilities and developing acquisitions strategies to execute potential unwatering mission as soon as the mission is assigned by FEMA. MVS personnel begin mobilizing to MVK and Baton Rouge to support PL 84-99 and civil works missions for MVN until the latter district is fully reconstituted. COL Wagenaar, MVN Commander, and seven others remain in the district "bunker" to provide assessments of hurricane and flood protection when anticipated storm passes. (MVN employees Jim Walters, OR-D; Perry Lartigue, OD-T; Jason Benoit, OD-YF; Chris Colombo, IM-SE; Jeff Richie, ED-T; David Wurtzel, ED-LL; and Joe Baker remain with Col. Wagenaar in bunker). Remaining MVN employees continue to evacuate along with the rest of New Orleans citizens.

August 29 (D-Day)

By 5 a.m. COL Wagenaar receives word of levees overtopping in Orleans Parish. By 8 a.m., rising water is observed on both sides of the breached Industrial Canal in New Orleans; and within an hour there is 6-8 feet of water in the lower 9th Ward. By 11 a.m. there is 10 feet of water in St. Bernard Parish. By 2 p.m., Wagenaar and his team move out of the bunker after receiving word of flooding near the 17th Street Canal. Wagenaar, Wurtzel, and Lartigue attempt to reach the 17th Street Canal to investigate reports of leaning floodwalls, but are unable to reach their destination because of rising water and debris filled streets. By 2 p.m. New Orleans officials publicly confirm the 17th Street Canal floodwall breach, which grows to about two city blocks in length. The London Avenue Canal floodwall also breached, presumably at around the same time, but it is not clear when the breach occurred. Early speculation for causes of the breaches is storm surge from Category Four storm overtopped and undermined the floodwalls. MVD receives post-declaration missions for Mississippi. MVD office sustains power outage as hurricane passes central Mississippi.

August 30 (D+1)

At 9 a.m. COL Wagenaar conducts a helicopter reconnaissance of the 17th Street Canal and IHNC breach sites and witnesses people awaiting rescue on rooftops in the New Orleans East area. Wagenaar and Wurtzel estimate that a 25-foot hole has developed along a 450-foot section of the 17th Street Canal.

MVD receives post-declaration missions for Louisiana and post–declaration unwatering mission. Because of power outage, MVD relocates its EOC to MVK. Expedient repairs commence at breach locations. BG Crear, along with members of the MVN Unwatering Team, MVM Commander COL Charles Smithers, MVD Senior Hydraulics Engineer Larry Banks, Doug Kamien of MVK, and Dan Hitchings (SES) and Mike Rogers (SES), conducts an aerial reconnaissance on the G3 of damaged areas along the Mississippi and Louisiana coastal areas. BG Crear notes that “the degree of destruction was unbelievable. You have to see it to believe it." MVM contracting office contacts two of three major contractors who indicate willingness to perform unwatering mission if needed.

August 31 (D+2)

BG Crear, Larry Banks, and John Greishaber complete an over-flight assessment of the New Orleans area. State workers, the Corps of Engineers, and its contractors, begin work on closing the 17th Street Canal breach. By 10 a.m. Mayor Nagin announces that the sandbagging of the canal breach has been abandoned until additional equipment can be brought in. By the end of the day, 80 percent of New Orleans is underwater. MVD Forward is established onboard the M/V Mississippi in Baton Rouge. MVD Fwd becomes the center of gravity for operations, but those operations are hampered by the poor state of communications in the affected area. Banks, Kevin Wagner, and others commence developing a plan to unwater the city based on the existing unwatering plan developed prior to the hurricane. The existing plan contained valuable information, such as locations for proposed levee breaches to allow for gravity draining, but the plan being matured by Banks, Wagner and others will be a more detailed plan of action. Initial project management structure in place is as follows:

17th Street Canal

- Ken Crumholt (CEMVN-ED-FS) Team Leader
- Jeff Richie (MVN) Sandbag Operations
- Marvin Manahan (CEMVN-OD-YC-4)
- Scott Blanchard (CEMVN-CD-QS) night shift
- David Wurtzel (MVN) night shift

IHNC Canal

- Mark Gonski (CEMVN-ED-TM) Team Leader
- Stuart Waits (CEMVN-NO-E)
- Chad Rachel (CEMVN-ED-FS)
- London Avenue Canal
- Richard Pinner (CEMVN-ED-FS) Team Leader
- Anthony Bertucci (CEMVN-CD-NO)
- Richard Oubre (CEMVN-CD-NO-Q) night shift
- Randy Persica (CEMVN-CD-NO-O) night shift

Pump Station Ops

- Fred Young (CEMVN-ED-TM) Team Leader
- Charles Brandstetter (CEMVN-ED-TF)
- Frank Vojkovich (CEMVN-ED-FS)
- Joe Sullivan (New Orleans Sewerage and Water Board)
- CWO4 Thomas Black (249th Eng. Bn, Prime Power)

September 1 (D+3)

Sealing of the 17th Street Canal from Lake Pontchartrain with sheet pilings begins, while efforts to close the breaches with 5-ton sandbags continues. Water finally stops rising in the city and the Corps continues assessing efforts to plug breaches. First priority is given to closing off the breaches at the 17th Street and London Avenue canals. LA DOT begins dropping debris and rubble to seal the London Avenue Canal breach. COL Wagenaar estimates it will take 3-6 months to unwater the city. Corps quarterboats arrive at Port Allen; *MV Mississippi* crosses the river and joins the quarterboats at Port Allen.

September 2 (D+4)

Sheet piling blocks water flow from lake into the 17th Street Canal, making closure of the breach not relevant to city flooding; work on closing the breach continues for purposes of pumping. Significant progress in closing breach with multi-ton sandbags experienced. Flexi-boat bridges constructed across 17th Street Canal to provide access to London Avenue Canal breach and pump station. Existing pumps in the city assessed and deemed not operable. Deliberate breaching operations commence. MG Riley reports that Governor Blanco is heartened by the flurry of Corps activity on the ground in New Orleans. Blanco indicates to MG Riley that the activity is the first indication that the city is coming back and that she will call the recovery effort “Project Hope.” The Corps of Engineers now estimates it will take 36 to 80 days to drain the city. The U.S. Coast Guard announces that the Mississippi River is open with a draft restriction to 35 feet.

September 3 (D+5)

The Corps of Engineers brings in pumps and generators from around the nation to help get New Orleans pumps back on line and bail out the city. London Avenue Canal closure completed; breach repairs not yet begun. USACE and NAVFAC conclude an MOA to allow use of the NAVFAC CONCAP contractor, KBR, to unwater Plaquemines East and West. Shaw (contractor) to have contract for unwatering New Orleans metropolitan area.

September 4 (D+6)

The first deliberate breach made in Plaquemines Parish at Mississippi River Mile 45 on the lower east bank. The breach is 35 feet wide and expected to expand to 200 feet. BG Crear designates MVD as Task Force Hope.

September 5 (D+7)

The 17th Street Canal breach is closed with truckloads of rock and sandbags. Canal reopened and partial pumping operations begin at pumping station no. 6—New Orleans' largest pumping station. Intentional breaches allow water to levels to drop by 4 feet in Plaquemines Parish. MVD forms Task Force Unwatering with mission to unwater the greater New Orleans metropolitan area and restore interim protection at breach sites to 10+ elevation. Because so many MVM resources are involved with ESF3 missions in Louisiana, and because MVN is still reconstituting, COL Duane Gapinski and an MVR-led team begin to transition toward assuming command of the unwatering task force. Corps removes first debris from Mississippi.

September 6 (D+8)

MG Riley, the USACE DCW, provides over-flight assessment of New Orleans and indicates that floodwaters are flowing strong through the deliberate breaches and out of the city. MG Riley also declares that water levels have dropped by 4-5 feet in the Chalmette area. Concerns are raised by media and environmental groups on water quality issues pertaining to pumping toxic waters into Lake Pontchartrain. First roof installed in Louisiana.

September 7 (D+9)

A total of 21 pumps are in operation, pumping more 9,000 cfs. TF Hope issues NTP through CONCAP to KBR.

September 8 (D+10)

MVM and MVN complete the transition of command and control for the unwatering mission to Task Force Unwatering. COL Gapinski indicates that the transition of management schemes will change from individual project management structure to management by basin. Denny Lunderg (CEMVR-ED) becomes Sr. Program Manager for the task force and the remainder of the project management system is set as follows: East Jefferson PM: Darryl Bonura (MVN);East Orleans PM: Ken Crumholt (MVN); Orleans PM: Fred Young (MVN); London Avenue PM: Richard Pinner (MVN); St. Bernard PM: Kevin Wagner (MVN); Plaquemines PM: Mark Gonski (MVN); IHNC PM: Stuart Waits/Mark Gonski (MVN).

September 9 (D+11)

The Corps of Engineers reports that 32 of 148 existing pumps in New Orleans are in operation, discharging 11,282 cfs; plus 38 portable pumps discharging 734 cfs; and 9 of 26 pumps in Plaquemines Parish discharging 1,360 cfs. The Corps of Engineers also announces that it is revising its estimates for unwatering and places dates to complete the process: Orleans East Bank (October 2); New Orleans East, Chalmette, and Chalmette Extension (October 8); and Plaquemines East & West (October 18). The revision is due to beneficial weather with no significant rainfall, no strong easterly winds that allowed lake levels to recede faster than expected; the development of the intentional breaches that drained Chalmette and Plaquemines parishes better than expected; and the ability to obtain more portable pumps. The first roof installed in Mississippi.

September 10 (D+12)

The Corps of Engineers closes off the final critical breach in the Orleans and East Orleans areas. COL Duane Gapinski assumes command of Task Force Unwatering; COL Wagenaar disengages from unwatering effort and assumes responsibility for reconstituting MVN.

September 11 (D+13)

Dutch pump team arrives in New Orleans to assist in the unwatering effort.

September 12 (D+14)

The Corps of Engineers continues to build significant momentum in the unwatering process with 17,646 cfs of total pump flow dropping water levels up to one-foot per day. COL Lewis Setliff, MVS Commander, reports that 27 breaches to the hurricane protection system are being tracked; twelve have been repaired to interim protection levels. The Coast Guard lifts all restrictions on the lower Mississippi River above the Head of Passes.

September 13 (D+15)

Total pump flow reaches 18,646, prompting BG Crear to declare "We are ahead of schedule." COL Gapinski reports that the Task Force Unwatering is commencing work to close breaches in Plaquemines Parish.

September 14 (D+16)

The Corps of Engineers revises some of its unwatering dates:

	Revised Date	Previous Date
Orleans East Bank	October 2	October 2
New Orleans East	September 30	October 8
Chalmette	September 20	October 8
Chalmette Extension	September 30	October 8
Plaquemines East	September 30	October 18
Plaquemines West	October 18	October 18

MVS assumes the MVN civil works missions and receives guidance to proceed with assessments of local flood control and hurricane protection projects. MVS contractor conducts LIDAR surveys of hurricane protection system. (Note LIDAR technology uses laser light beams and an optical system and precision

GPS satellite location data to build 3-D map of the system. Coupled with simultaneous high-resolution visual imagery, the system is adept at surveying areas that are inaccessible).

September 15 (D+17)

Pump Station No. 1 in Orleans East Bank is brought on line. Inundation of the city has been reduced from 80 percent to 40 percent. 9th Ward and southern part of Orleans Parish reported dry enough for normal recovery operations to begin. St. Bernard Parish reported at 90 percent unwatered. TF Hope awards 4 competitive contracts for debris removal in Louisiana and Mississippi.

September 16 (D+18)

The Corps of Engineers announces that its top priority is the development of a detailed plan for levee rehabilitation.

September 18 (D+20)

BG Crear reports that initial funding for several missions is nearly exhausted. Crear reiterates that the unwatering mission will continue but that new efforts will concentrate on "building the capacity to mitigate and respond to future rain events." COL Gapinski reports that the levee system "in its present condition does not ensure that the city will be protected from flooding resulting from storms and hurricanes. The Corps announces a three-phase process: 1) immediate—unwater and assess flood protection; 2) intermediate—provide interim level of protection to get the city through the hurricane season; and 3) return the level of protection to pre-Katrina conditions.

September 19 (D+21)

BG Crear activates Task Force Guardian, led by MVS Commander COL Setliff, to begin restoring federal elements of New Orleans' battered hurricane-flood system to provide pre-Hurricane Katrina protection.

September 20 (D+22)

After hitting the Florida Keys, Rita is upgraded to hurricane status. COL Wagenaar reports that all 1232 MVN personnel have now been accounted for.

September 21 (D+23)

Hurricane Rita reaches Category 5 status. Task Force Unwatering seals the 17th Street and London Avenue canals from Lake Pontchartrain with sheet piles and begins pre-positioning pumps to prepare for potential impacts from Hurricane Rita. The Corps of Engineers also begins shoring up repairs at the Industrial Canal breach and other breaches. BG Crear announces an aggressive plan to return hurricane protection levees to their pre-Katrina status by June 1, 2006.

September 23 (D+25)

Outer bands from Hurricane Rita dump rain on the New Orleans area. Floodwaters overtop levees on the east and west sides of the Industrial Canal, resulting in additional flooding of up to 8 feet in the Orleans East Bank (9th Ward) and St. Bernard basins. The Corps of Engineers reports no levee failures, just overtopping.

September 24 (D+26)

The Corps of Engineers places rock and 3,000 to 7,000 pound sandbags to stop the overtopping at the Industrial Canal. The Corps of Engineers reports that it will take a week to unwater the 9th Ward and St. Bernard Parish once pumping operations begin later in the week.

September 25 (D+27)

The Corps of Engineers reports that water in the 9th Ward and St. Bernard Parish has receded by 5 feet since Hurricane Rita overtopped the Industrial Canal.

September 26 (D+28)

Water levels in Lake Pontchartrain drop to levels that allow Task Force Unwatering to remove sheet pilings from 17th Street and London Avenue canals and commence pumping of Hurricane Rita water from the Orleans East Bank area. Mobile pumping operations resume and the Corps reports much progress in unwatering the 9th Ward and St. Bernard Parish.

September 27 (D+29)

COL Gapinski reports that St. Bernard Parish is essentially dry and that he expects floodwaters from Hurricane Rita will be pumped out of the lower 9th Ward area by October 2. Corps of Engineers begins working with river industry partners to reopen the Calcasieu and Leland Bowman locks. TF Hope achieves pre-Hurricane Rita debris removal rates and reports that it is exceeding temporary roofing rates.

September 28 (D+30)

Task Force Unwatering begins closing breaches reopened by Hurricane Rita in Plaquemines Parish. The Corps of Engineers formally announces that it will launch a formal investigation into the causes of floodwall breaches. Disclosure of the investigation prompts arguments from some non-federal engineering circles, particularly Ivor van Heerden, the deputy directory of the LSU Hurricane Center, that the examination be performed by an independent panel of experts and not the Corps of Engineers.

September 29 (D+31)

Task Force Guardian is fully operational. BG Crear estimates that it will cost $1.6 B to restore the levees. TF Guardian project management structure established as follows: Sr. Civilian: Walter Baumy (MVN); Sr. Project Engineer: Mike Rector (MVS); Orleans East Bank Project Manager: Fred Young (MVN); Orleans East Project Manager: Ken Crumholt (MVN), IHNC Project Manager: Stuart Waits (MVN); St. Bernard/MR-GO Project Manager: Kevin Wagner (MVN); Plaquemines Project Manager: Mark Gonski (MVN); Pump Station PDT Project Manager: Jim St. Germaine (MVN).

Task Force Unwatering reports that the unwatering in the 9th Ward, New Orleans basin and St. Bernard basin is nearly complete. Main efforts are focused on unwatering the New Orleans East basin and repairing breaches in Terrebonne and Plaquemines parishes. Coast Guard lifts all restrictions on the lower Mississippi River; two-way traffic and 24-hour transit is now permitted for deep draft vessels. Calcasieu and Leland Bowman locks now operational.

October 1 (D+33)

Task Force Unwatering declares that the unwatering mission in St. Bernard basin is complete. Unwatering mission continues to focus on Plaquemines Parish, lower 9th ward in Orleans Parish, and the Six Flags area in New Orleans East. New estimate for unwatering 9th ward is October 3. The task force is also initiates unwatering operations in Terrebonne Parish, and intermediate repairs continue in all basins. Task Force Guardian moves to execution on the east hurricane protection levee in St. Bernard Parish.

October 2 (D+34)

Task Force Unwatering announces that the unwatering of the 9th Ward and New Orleans East will be complete by October 5; Plaquemines Parish by October 18. Also announces that contracts are being awarded to raise the elevation of repaired breaches along the 17th Street and London Avenue canals. Works on the repairs is expected to be complete by October 10. Task Force Guardian's first construction contractor begins work by stockpiling materials in St. Bernard Parish. The task force announces that the contractor will begin levee preparation work by October 4. Louisiana RFO creates separate debris removal and temporary roofing assignments for Hurricanes Katrina and Rita.

October 3 (D+35)

The prediction of strong easterly winds and forecasts of higher than normal tides and potential rain lead the Corps of Engineers to close off the 17th Street and London Avenue canals from Lake Pontchartrain with sheet piling. The Corps of Engineers also begins to raise the level of protection at former floodwall breach locations at the IHNC, 17th Street, and London Avenue canals.

October 4 (D+36)

Dutch pump team leaves after supporting unwatering operations for more than one month along the IHNC in the lower 9th Ward and at East Pointe a la Hache in Plaquemines Parish. Task Force Unwatering describes the operable permanent pump capacity by as:

Orleans	15,185 cfs of 38,970 cfs (39%)
Orleans East	3,800 cfs of 4,982 cfs (76%)
St. Bernard	5,262 cfs of 6,311 cfs (83%)
Jefferson	42,331 cfs of 42,331 cfs (100%)
Plaquemines East	2,506 cfs of 3,035 cfs (83%)
Plaquemines West	7,528 cfs of 8,262 cfs (91%)

Task Force Guardian turns the first dirt on the east levee.

October 5 (D+37)

Task Force Unwatering announces that the unwatering of the 9th Ward is not complete, as water levels failed to drop over the past 24 hours. Task force continues to operate portable pumps and steps up efforts to seal breach repairs and prevent seepage. The Corps of Engineers announces that it has commenced gathering data as part of the investigation to determine the causes of the canal floodwall breaches. The Corps of Engineers also announces that the mission is placed under the leadership of ERDC. In addition, the Corps of Engineers is hosting other teams who are collecting data, including the ASCE, LSU, and the National Science Foundation from the University of California at Berkeley.

October 7 (D+39)

Task Force Unwatering removes sheet pile closure at the 17th Street Canal to allow resumption of pumping operations at P.S. No. 5. All temporary repairs in Orleans basin have reached 10-foot interim level. An additional 30-inch portable pump is installed in lower 9th Ward. Personnel assigned to, and engaged in support of, Task Force Hope reaches a peak force of 3,828.

Experts from the NSF, ASCE, and LSU now insist that floodwall failures at the 17th Street and London Ave. canals were not caused by overtopping, but by shifting soils that undermined the floodwalls.

October 8 (D+40)

The Corps of Engineers now proclaims that it is convinced that the breaches at the 17th Street and London Ave. canals were not caused by overtopping. MVD Forward and the *M/V Mississippi* relocate from Baton Rouge to New Orleans. Task Force Guardian advertises the first 8 of an anticipated 50 contracts.

October 9 (D+41)

Task Force Unwatering completes the unwatering of the lower 9th Ward.

October 10 (D+43)

In a memorandum to MG Riley, LTG Strock officially establishes the Interagency Performance Evaluation Task (IPET) Force with the mission to provide credible and objective scientific and engineering answers to fundamental questions about the performance of the hurricane protection and flood damage reduction systems in the New Orleans metropolitan area to assist in the reconstitution of protection for the area.

October 11 (D+43)

Task Force Unwatering completes the unwatering of East Orleans Parish, completing the unwatering of the New Orleans metropolitan area and leaving Plaquemines and Terrebonne parishes as the centers of the unwatering mission focus. At Plaquemines, the task force completes temporary repairs to the last breach site at Scarsdale. Corps of Engineers contractors complete their mission to clean pumps stations. City workers commence with electrical repairs and drying operations to get the pumps fired up again.

October 14 (D+46)

Task Force Unwatering announces that the unwatering mission in Terrebonne Parish will be complete by October 16. Task Force Guardian announces that delays in getting OMB concurrence and congressional notification of waivers to PL 84-99 policies are holding up six contracts. (Waivers include: LEERDS on Cat. 1; cost-share of non-Cat. 1; cost of HTRW investigations; and work on non-federal structures) Three of those contracts are for phase 1 repairs to the breaches on the 17th Street and London Avenue canals. COL Setliff warns that Task Force Guardian must take advantage of the current favorable weather in order to meet the June 1, 2006 deadline for restoring protection to pre-Katrina levels.

October 15 (D+47)

All remaining navigation restrictions are lifted at the Calcasieu and Leland-Bowman locks. BG Crear decides to resume mat-sinking operations on the Mississippi River by November 7. TF Hope has removed more than 10 m cubic yards of debris in Louisiana and Mississippi and installed more than 70 K blue roofs in both states.

October 16 (D+48)

Elements of Task Force Hope begin conducting mission analysis in the event that Tropical Depression No. 24 becomes Hurricane Wilma. MVN and Task Force Unwatering develop emergency action plans for a third possible flood fight resulting from another hurricane.

October 17 (D+49)

The White House Office of Management and Budget agrees that ASA-CW, John Paul Woodley, may approve the policy waivers for Task Force Guardian to repair levees at full federal expense pending congressional notification, which is accomplished overnight. Task Force Guardian announces that 19 contracts, with an estimated value of more than $122 m, have either been awarded or advertised. Tropical Depression No. 24 becomes Tropical Storm Wilma.

October 19 (D+51)

Task Force Unwatering announces that unwatering operations in Terrebonne and Plaquemines parishes are complete. Col. Gapinski indicates that he expects the entire unwatering mission to be complete by October 21, when interim repair heights at all breach locations will be attained. Task Force Guardian informs MG Riley (DCW) that only the federal elements of the hurricane protection system, which includes a sizeable portion of non-federal protection measures, will be restored to pre-Katrina levels by June 1, 2006. Task Force Guardian begins developing the scope and scale of damages to non-federal levees and pump stations. Hurricane Wilma strengthens to Cat. 5 status, but models indicate a track toward the Florida coast rather than further into the Gulf of Mexico. Despite the forecasted track, elements of Task Force Hope continue to prepare for any related impacts.

October 20 (D+52)

Defense Secretary Donald Rumsfeld sanctions the IPET and announces that an independent panel of experts, under the direction of the National Academy of the Sciences, will convene to evaluate the performance of the New Orleans area's hurricane levees and issue a formal report within 8 months.

October 22 (D+54)

Task Force Unwater concludes operations and stands down.

October 24 (D+56)

A 20 square-block area of the lower 9th Ward refloods with up to 1 foot of water when high winds from the north increase water levels in the IHNC and allows water to escape through a normally-sealed flap gate at P.S. #5.

October 25 (D+57)

Task Force Hope obligations exceed $1 b, including $113 m in FCCE funds, $165 m in O&M funds for disaster recovery, and $796 m in FEMA funds ($375 m for debris, $225 m for roofing, $69 m for temporary public structures, $64 m for unwatering, and $21 m for power). An additional $300 m in FCCE funds is expected to be obligated for hurricane protection system restoration. MVN announces that the lower 9th Ward has again been unwatered from flooding the previous day.

October 26 (D+58)

Task Force Guardian announces that the removal of 51 barges (153 vessels total) from levees is necessary to complete levee repairs. FEMA issues mission assignment for barge removal to the Coast Guard and Task Force Guardian submits a prioritized list for barge removal.

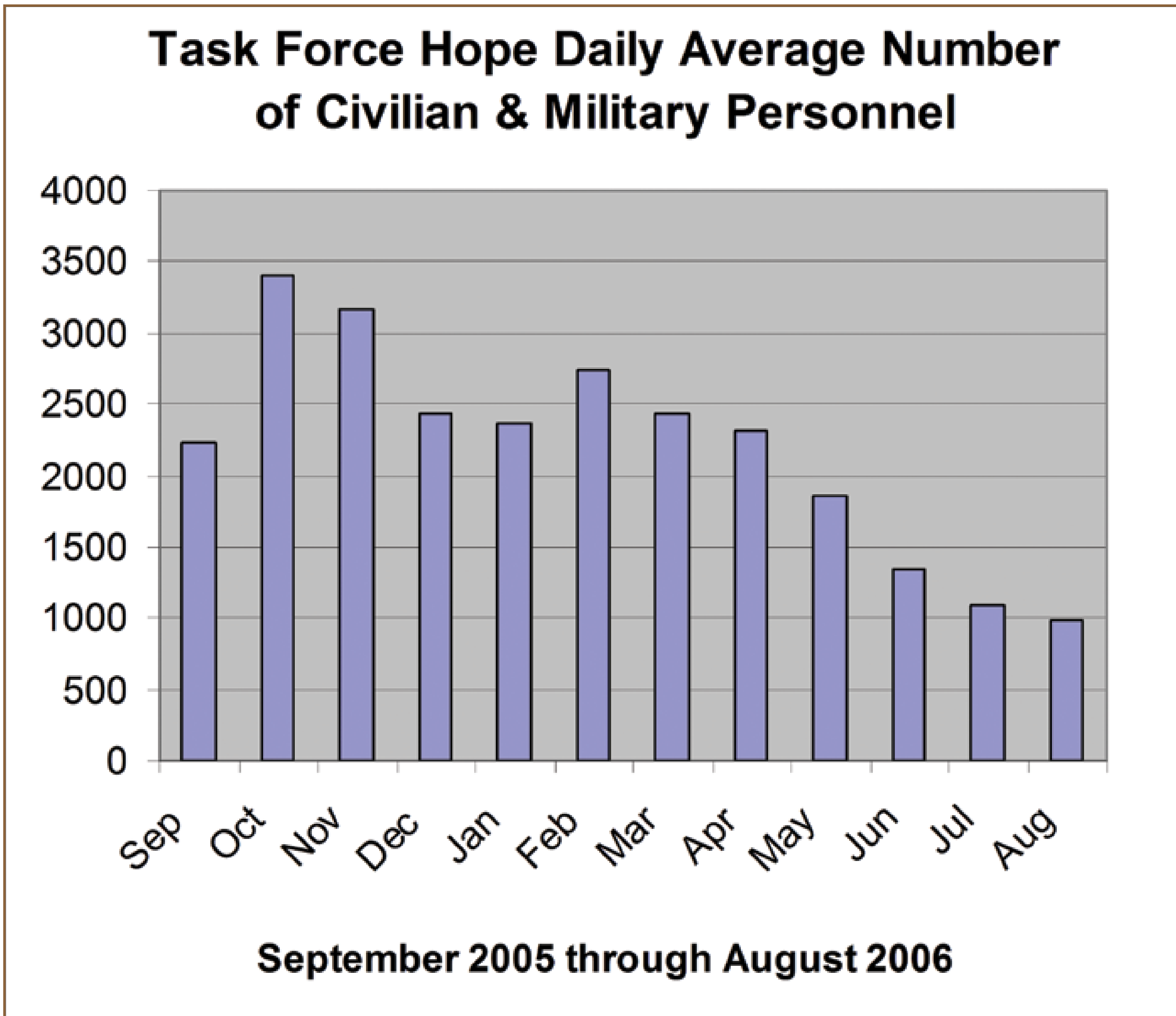
October 28 (D+60)

COL Lewis Setliff, Task Force Guardian Commander, warns that the practice of "just-in-time" funding for his mission is "cutting it too close fore comfort" and that the task force needs an additional $87 m to get contractors working on key elements of the mission. Setliff indicates that his task force is on schedule to meet the June 1, 2006 suspense date for repairing federal levees, but laments that, with current dry and favorable weather conditions, a one-day delay now will equate to a one-week delay once the rain season begins in December.

October 31 (D+63)

MVD Forward transfers from the *MV Mississippi* to the MVN headquarters building. The *MV Mississippi* departs New Orleans to assist in the resumption of mat-sinking unit operations.

Appendix B. Task Force Hope Strength Numbers, Sept. 2005-Aug. 2006



Appendix C. Weekly Unwatering Statistics, Sept. 1, 2005-Oct. 20, 2005

Weekly Unwatering Statistics, Sept. 1, 2005-Oct. 20, 2005

	Sept. 2, 2005**				Sept. 8, 2005***			
Drainage Sub-basin*	Days to End	No. Pump	Cap. (cfs)	Wat. Lev. (ft.)	Days to End	No. Pump	Cap. (cfs)	Wat. Lev. (ft.)
Jefferson	Dry	28/28	0/15,890	0	Dry	28/28	0/15,890	0
Orleans East Bank	24	1/55	500/34,220	ND	24	10/66	4,910/39,350	15/15
New Orleans East	62	1/26	1,200/ 3,300	ND	62	7/26	1,650/ 4,672	15/15
Chalmette	80	0/16	1,766/ 5,049	ND	80	8/19	1,766/ 5,537	7
Chalmette Extension	36	0/ 2	0/ 1,505	ND	36	3	837/ 1,505	3
Plaquemines East	ND	ND	ND	ND	45	2	120/ 2,942	ND
Plaquemines West	ND	ND	ND	ND	45	7	1,240/ 8,214	ND

	Sept. 15, 2005				Sept. 22, 2005			
Drainage Sub-basin	Days to End	No. Pump	Cap. (cfs)	Wat. Lev. (ft.)	Days to End	No. Pump	Cap. (cfs)	Wat. Lev. (ft.)
Jefferson	Dry	28/28	0/15,890	0	Dry	0/28	0/15,890	0
Orleans East Bank	17	10/68	6,060/37,935	6/15	10	4/79	3,210/38,970	0/15
New Orleans East	15	9/29	1,700/ 3,950	6/15	8	8/29	2,200/ 4,982	4/15
Chalmette	5	0/17	0/ 5,532	1/12	Dry	0/14	0/ 4,816	0/12
Chalmette Extension	15	2/ 6	560/ 1,500	3/10	8	6/ 9	1,164/ 1,494	0/10
Plaquemines East	15	0/ 6	0/ 2,942	1/ 2	8	2/11	500/ 3,039	1/ 2
Plaquemines West	33	2/20	560/ 8,730	6/ 7	26	6/34	1,190/ 9,043	6/ 7

* Categories reported per drainage sub-basin: Days to End: No. of estimated mission days remaining at current capacity; No. Pumps: No. of mainline pumps currently operating out of total present, not including temporary pumps; Cap. (cfs): Total operating capacity of mainline pumps out of total capacity of pumps present, not including temporary pumps; Wat. Lev. (ft.): Current average estimated water level out of original water level reported. ND indicates no data is available or that none was reported.

** Sept. 2, 2005, was the first day any report of pumping capacity was available.

*** Sept. 8, 2005, was the first day a complete report of pumping capacity and progress was available.

Weekly Unwatering Statistics, Sept. 1, 2005-Oct. 20, 2005 (Cont.)

Drainage Sub-basin	Sept. 29, 2005				Oct. 6, 2005			
	Days to End	No. Pump	Cap. (cfs)	Wat. Lev. (ft.)	Days to End	No. Pump	Cap. (cfs)	Wat. Lev. (ft.)
Jefferson	Dry	0/95	0/42,331	0	Dry	0/95	0/42,331	0
Orleans East Bank	ND	11/79	7,260/38,970	ND	ND	3/79	3,100/38,970	.5
New Orleans East	ND	7/29	1,900/ 4,982	ND	ND	7/29	1,900/4,982	ND
Chalmette	ND	3/14	999/ 4,816	ND	ND	4/14	1,550/4,816	ND
Chalmette Extension	Dry	0/ 9	0/ 1,494	ND	Dry	0/ 9	0/1,494	0
Plaquemines East	ND	2/11	516/ 3,035	ND	ND	0/11	0/3,035	0
Plaquemines West	ND	17/34	5,920/ 7,922	ND	ND	10/33	1,818/8,262	ND
Terrebonne*	ND	ND	ND	ND	ND	ND	50	ND

Drainage Sub-basin	Oct. 13, 2005				Oct. 20, 2005			
	Days to End	No. Pump	Cap. (cfs)	Wat. Lev. (ft.)	Days to End	No. Pump	Cap. (cfs)	Wat. Lev. (ft.)
Jefferson	Dry	0/95	0/42,331	0	Dry	0/95	0/42,331	0
Orleans East Bank	Dry	3/79	3,100/38,970	0	Dry	0/79	0/38,970	0
New Orleans East	Dry	9/29	2,400/ 4,982	0	Dry	0/29	0/ 4,982	0
Chalmette	Dry	4/14	1,550/ 4,817	0	Dry	0/14	0/ 4,817	0
Chalmette Extension	Dry	0/ 9	0/ 1,494	0	Dry	0/9	0/ 1,494	0
Plaquemines East	ND	6/11	1,889/ 3,035	ND	Dry	0/11	0/ 3,035	0
Plaquemines West	ND	10/33	1,818/ 8,262	ND	Dry	0/33	1,190/ 9,043	0
Terrebonne*	3	ND	1,000	ND	Dry	0	0	0

* Added after Hurricane Rita on Sept. 24, 2005.

Appendix D. Mission Funding Summary, as of April 2007

Type	Allocated ($)	Obligated ($)	(%)
Katrina National (FEMA MAs)*	$3,371,168	$3,371,168	100%
Katrina LA (FEMA MAs)	$2,738,031,967	$2,493,560,597	91%
Katrina MS (FEMA MAs)	$1,311,192,219	$1,199,907,007	92%
Katrina FEMA Totals	$4,052,595,354	$3,696,838,772	91%
Rita LA (FEMA MAs)	$238,103,921	$210,225,881	88%
Rita MS (FEMA MAs)	$3,137	$3,137	100%
Rita FEMA Totals	$238,107,058	$210,229,018	88%
FEMA Totals	$4,290,702,412	$3,907,067,790	91%
Katrina FCCE Funding**	$4,250,907,171	$1,387,069,241	33%
Rita FCCE Funding	$994,705	$994,705	100%
FCCE Totals	$4,251,901,187	$1,388,063,946	33%
Katrina/Rita MR&T***	$152,750,000	$106,119,000	69%
Katrina/Rita Gen Invest	$25,996,000	$7,706,000	30%
Katrina/Rita Constr. Gen	$272,000,000	$674,000	0%
Katrina O&M, Gen****	$325,500,000	$237,451,000	73%
Other Approp. Totals	$776,246,000	$351,950,000	45%
Total Katrina Spending	$9,318,850,288	$5,647,081,176	61%

* FEMA Mission Assignments include Pre-Declaration, Post-Declaration, and Emergency
** USACE Flood Control and Coastal Emergencies Fund
*** Mississippi River and Tributaries
**** Operations and Maintenance

Appendix E.
Commander Biographies

Maj. Gen. Don T. Riley

Director of Civil Works, U.S. Army Corps of Engineers and Commander, USACE Emergency Task Force


Maj. Gen Don T. Riley

Maj. Gen. Don Riley became the Director of Civil Works, U.S. Army Corps of Engineers, on July 1, 2004. As such, he manages the Army's $5 billion annual Civil Works Program for the Corps of Engineers, the nation's primary planner, designer, builder, and operator of flood control, navigation, environmental restoration, and multiple-purpose water resource projects. Civil Works projects also provide hydroelectric power, water supply, recreation, and natural and cultural resource management on 12 million acres of land and water. Additionally, the Civil Works Program regulates construction in navigable waters and dredging and filling in waters of the U.S., including wetlands. Civil Works responsibilities also include emergency flood fighting, recovery operations, and providing emergency engineering and public works support in the event of natural or manmade disasters. As Director, Riley is also the President of the U.S. Section of the International Navigation Association (PIANC), President of the Corps' Coastal Engineering Research Board, and Executive Director of the Inland Waterways User Board.

Gen. Riley came to Corps of Engineers Headquarters following command of the Corps' Mississippi Valley Division (MVD) in Vicksburg, Mississippi from 2001 to 2004, where he received a Presidential appointment as President of the Mississippi River Commission. There he oversaw the work of six Engineer Districts that maintained the Mississippi River – the Nation's busiest inland waterway and port complex - and its tributaries for navigation, flood control and other purposes from the headwaters in Minnesota to the Gulf of Mexico. Prior to commanding MVD, Maj. Gen. Riley was the Deputy Chief of Staff (Engineer) of U.S. Army Europe, headquartered in Heidelberg, Germany.

A native of Hayward, California, Gen. Riley is a graduate of the United States Military Academy at West Point, N.Y., and was commissioned a second lieutenant in the Corps of Engineers in 1973. He earned a master's degree in civil engineering from the University of California, Berkeley, and is a Registered Professional Engineer in California. He is also a graduate of the U.S. Army Command and General Staff College and the United States Army War College and holds a Masters of Military Arts and Sciences from the School of Advanced Military Studies.

Brig. Gen. Robert Crear

Brig. Gen. Robert Crear

Commanding General, Mississippi Valley Division and Task Force Hope President, Mississippi River Commission

Brig. Gen. Robert Crear served as Commander of the Mississippi Valley Division (MVD), Vicksburg, Miss., and President of the Mississippi River Commission from June 23, 2004 through February 20, 2008.Crear came to MVD from Dallas, Texas, where he was the Commander for the Corps' Southwestern Division. As MVD Commander, Crear is responsible for a $7.5 billion civil works program over portions of 12 states and 370,000 square miles. He also served as Commander of Task Force Hope, the organization responsible for responding to Hurricanes Katrina and Rita.

Prior Corps assignments include Chief of Staff at Corps Headquarters, Washington, D.C.; and Commander of the Corps' Vicksburg District. Gen. Crear served as the Assistant Director of Civil Works at Corps headquarters, and as the Military Assistant for the Assistant Secretary of the Army for Civil Works at the Pentagon. He has held various other command and staff positions in the U.S. and overseas. During Operations Enduring Freedom and Iraqi Freedom, Crear served in Iraq as Commander, Task Force Restore Iraqi Oil (RIO), from January 2003 to November 2003, a first-of-its-kind mission to extinguish all oil fires and then to restore the oil infrastructure, production, export capability, and the internal distribution system, in addition to importing fuel for humanitarian purposes.

Born in Vicksburg, Miss., Gen. Crear graduated in 1975 from Jackson State University, Jackson, Miss., where he received a bachelor's degree in mathematics and a Regular Army commission as a second lieutenant in the Corps of Engineers. He holds a master's degree in national resource strategy from the Industrial College of the Armed Forces. His military education includes U.S. Army Airborne School, the Engineer Officer Basic and Advanced Courses, the Ordnance Officer Advanced Course, Command and General Staff College, and the National Defense University.

Col. Albert M. Bleakley, Jr.

Deputy Commander, Mississippi Valley Division and Task Force Hope

Col. Albert M. Bleakley, Jr.

Col. Albert M. Bleakley assumed his duties as Deputy Commander of the Mississippi Valley Division (MVD) and Secretary of the Mississippi River Commission (MRC) on July 11, 2005. Bleakley came to the Division from Kuwait where he was the Arabian Gulf Regional Engineer. Prior to this assignment, he was the Arabian Gulf Regional Engineer responsible for Corps of Engineers support to US Central Command components in Kuwait, Bahrain, Qatar, the United Arab Emirates, Oman, and Saudi Arabia from 2002 to 2005. The regional program included approximately $950 million in US and host nation funded military construction and Foreign Military Sales support.

Col. Bleakley graduated from the United States Military Academy at West Point, New York, in 1979 with a bachelor's degree with dual concentrations in engineering mechanics and literature and was commissioned into the Corps of Engineers. He later attended the Massachusetts Institute of Technology on a National Science Foundation Fellowship, earning his master's degree in civil engineering. He is a graduate of the Army Command and General Staff College, and he is a registered professional engineer in the Commonwealth of Virginia.

Col. Jeffrey A. Bedey

Col. Jeffrey A. Bedey

Commander, Hurricane Protection Office

Col. Jeffrey A. Bedey is Commander of the Hurricane Protection Office (HPO) in New Orleans, La., a position he assumed on June 1, 2006. Bedey oversees one of the most massive civil works projects in U.S. history: construction of the federal flood protection system that protects the city of New Orleans and southeast Louisiana. Before his assignment to New Orleans, Bedey was the Omaha District Commander and District Engineer, a position he held since July 2004.

Prior to his position in Omaha, Col. Bedey was assigned to Quaid-I-Azam University in Islamabad, Pakistan, where he earned a master's degree in defense and strategic studies. Bedey also earned a Master of Science degree in construction management from Colorado State University in December 1991 and a Bachelor of Science degree in construction engineering from Montana State University in March 1983. His military education includes the Engineer Officer Basic and Advanced Courses, Fort Belvoir, Va.; the U.S. Army Command and General Staff College, Fort Leavenworth, Kan.; and the Pakistani National Defense College, Islamabad, Pakistan.


Col. Duane P. Gapinski

Col. Duane P. Gapinski

Commander, Rock Island District and Task Force Unwatering

Col. Duane P. Gapinski served as the commander of the Rock Island District from July 10, 2003, to July 21, 2006, and served as the commander of Task Force Unwatering during Hurricane Katrina flood relief efforts. During his 21 years of military service, Gapinski has served with engineer units in the 9th Infantry Division, 1st Armored Division, and 1st Infantry Division. He commanded the 82nd Engineer Battalion from 1998 to 2000 and was the Task Force Falcon Engineer in Kosovo for seven months during that time. Additionally, Gapinski has served on the staff at Headquarters, Department of the Army and the Joint Staff in Washington, D.C., and on the staff and faculty of the United States Military Academy where he was an Assistant Professor of Chemistry.

Col. Gapinski was commissioned in the Corps of Engineers upon graduation from the United States Military Academy in 1982. In addition to a bachelor's degree from West Point, he holds masters' degrees in Chemical Engineering from Rensselaer Polytechnic Institute and National Resource Strategy from the National Defense University.

Col. Michael F. Pfenning

Commander, St. Paul District and Operations Officer, Task Force Hope

Col. Michael F. Pfenning

Col. Michael F. Pfenning served as 61st commander and district engineer of the St. Paul District from July 30, 2004, to June 8, 2007. Prior to assuming this command, he served as chief of the Well-Being Division in the Human Resources Policy Directorate of the Army G-1, or personnel.

Born in Vermont, Col. Pfenning was commissioned a second lieutenant in the Corps of Engineers upon graduation from the United States Military Academy in 1980. He earned a Bachelor of Science degree in engineering from the U.S. Military Academy, as well as a Masters of Science and Doctorate in Operations Research from the Colorado School of Mines in Golden, Colo. His military education includes the U.S. Army Airborne and Ranger schools, the Engineer Officer basic and advanced courses and the Command and General Staff College. Col. Pfenning also served as the Military Fellow at the Joint Center for Political and Economic studies in Washington, D.C.

Col. Lewis F. Setliff III

Commander, St. Louis District and Task Force Guardian

Col. Lewis F. Setliff III

Col. Lewis F. Setliff III became the 48th District Engineer of the U.S. Army Corps of Engineers, St. Louis District, on June 30, 2005. Before taking command of the St. Louis District, Setliff was the Deputy to the Deputy Chief of Staff – Engineer for the Multinational Forces-Iraq in Baghdad. Other staff assignments include civil engineer at the U.S. Army Construction Engineer Research Laboratory in Champaign, Ill., Staff Engineer at NATO's LANDSOUTHEAST Headquarters in Izmir Turkey, and Operations Officer in the Army's Transformation Office in DA G-3 the Pentagon. Following

Hurricane Katrina in August 2005, Setliff was selected to command Task Force Guardian, the team responsible for restoring New Orleans' flood and hurricane protection system to its pre-storm levels before the next hurricane season.

Col. Setliff's civilian education includes a bachelor's degree from the United States Military Academy and a master's degree in engineering science from the University of Florida. His military education includes attendance at the Engineer Officer Basic and Advanced Courses, the Combined Arms and Services Staff School, the Military Acquisition Management Course, the U.S. Army Command and General Staff College, the Armed Forces Staff College and the U.S. Army War College.

Col. Charles O. Smithers III

Col. Charles O. Smithers III

Commander, Memphis District and Louisiana Recovery Field Office

Col. Charles O. Smithers III served as the commander of the Memphis District from July 13, 2004, to July 13, 2007, and also the Louisiana Recovery Field Office in New Orleans, La.. He came to Memphis from the Third U.S. Army/U.S. Army Central Command/Coalition Forces Land Component Command, where he served as the Assistant Chief of Staff, C7 (Engineer), and as the Deputy Chief of Staff. He previously served as an Army National Guard and Army Reserve Advisor; as the Director of Installation Support, U.S. Army Central Command - Kuwait, at Camp Doha, Kuwait; as the first Commander, U.S. Army Central Command - Qatar, Camp As Sayliyah, Qatar; and as Chief, International Affairs Branch, Directorate of Plans, U.S. Space Command. He deployed to Kuwait for Operation Iraqi Freedom, where he synchronized Coalition engineering efforts across the Land Component Commander's Area of Operations. In July 2003, he established split-based C7 Battle Staff operations in Kuwait and Atlanta, with responsibility for Army Service Component Command Engineer activities throughout the U.S. Central Command Area of Responsibility, with focus on operations in Iraq, Afghanistan, Qatar and Kuwait.

Col. Smithers earned a Bachelor of Science degree in Applied Sciences and Engineering from the U.S. Military Academy in West Point, N.Y.; a Master of Science degree in Industrial Engineering from the Georgia Institute of Technology in

Atlanta, Ga.; and a Master of Science degree in National Resource Strategy from the Industrial College of the Armed Forces, National Defense University at Ft. McNair in Washington, D.C.

Lt. Col. Murray Starkel

Lt. Col. Murray Starkel

Deputy Commander, New Orleans District

Lt. Col. Murray Starkel started with the New Orleans District as deputy commander July 10, 2005. Just before Katrina hit the New Orleans area, he and the senior staff evacuated to Vicksburg, Mississippi to manage the response efforts. During the initial disaster response work, he was in command of recovery operations for the New Orleans District. He continued to be significantly involved in all aspects of the recovery, including current efforts to bring the hurricane and storm damage reduction system to the 100-year protection level. Because of his extensive long-term involvement in planning and execution of the disaster recovery for the New Orleans District, he was invaluable in bridging the various programs to ensure orderly transitioning from phase to phase.

Prior to this assignment, Starkel had deployed in support of Operation Iraqi Freedom as the area engineer for Victory Base in the outskirts of Baghdad, Iraq, for a seven-month tour, while assigned as the deputy district engineer of the San Francisco District from 2002-2005. Starkel's other assignments have included: platoon leader and assistant operations officer, 78th Engineer Battalion (Corps) (Mechanized), Ettlingen, Germany; facilities inspection officer, 22nd Support Command in Saudi Arabia and Kuwait; commander, 175th Engineer Company, 30th Engineer Battalion (Topographic), and commander, Headquarters and Headquarters Company, 20th Engineer Brigade (Corps) (Airborne), Fort Bragg, N.C.; and assistant professor, Department of Systems Engineering, U.S. Military Academy. He received a bachelor's degree from the United States Military Academy at West Point in 1988. He holds two master's degrees from Carnegie Mellon University, in business administration and in environmental engineering. He is a graduate of the Engineer Basic and Advanced Courses, the U.S. Army Airborne and Air Assault Schools, the French Armed Forces Commando School, and the Command and General Staff College.

Col. Antony C. Vesay

Col. Antony C. Vesay

Commander, Vicksburg District and Mississippi Recovery Field Office

Col. Anthony C. Vesay served as the Commander of the Vicksburg District from June 30, 2004, to June 29, 2007. He also served as commander of the Mississippi Recovery Field Office during the response to Hurricanes Katrina and Rita. Immediately prior to assuming command of the Vicksburg District, June 2004, Vesay served as J4, Iraq Survey Group, Baghdad, Iraq. Other assignments include Project Engineer, Norfolk Corps of Engineers; aide-de-camp to Deputy Chief of Engineers; Operations Officer, 249th Engineer Battalion; and Joint Engineer Trainer, U.S. Atlantic Command. He also served in Somalia during Operation Restore Hope.

Col. Vesay is a distinguished military graduate of Penn State University and holds masters degrees in civil engineering from PSU, Systems Management from the University of Southern California and National Security Strategy from the National War College. His military schooling includes the Engineer Officer Basic and Advanced Courses, the United States Army Command and General Staff College, the Armed Forces Staff College, and the National War College. He is a registered professional engineer in Virginia.

Col. Richard P. Wagenaar

Col. Richard P. Wagenaar

Commander, New Orleans District

Col. Richard P. Wagenaar was New Orleans District's 59th commander and district engineer from July 12, 2005, to July 20, 2007. He was responsible for a civil works program in south central and coastal Louisiana. Less than two months later, Wagenaar led the district's response to Hurricanes Katrina and Rita. His previous commands include Headquarters, Republic of Korea Combined Forces Command, where he served as the chief of Engineer Plans Division; the military assistant at the Office of the Assistant Secretary of the Army (Civil Works) at the Pentagon, Washington D.C., from August 2002 to June 2003; and the commander of the Walla Walla District, U.S. Army Corps of Engineers, from July 2000 to July 2002.

Col. Wagenaar is a ROTC graduate from New Mexico Military Institute where he earned an associate's degree in biology. He attended Syracuse University in New York, graduating with a Bachelor of Science degree in environmental science and forestry. He earned a Master of Science degree in management from Cardinal Stritch College, Milwaukee, Wis., and a second master's degree in National Resource Strategy from the National Defense University, Washington, D.C. His professional military education includes Industrial College of the Armed Forces, Army Command and General Staff College, Combined Arms Services Staff School, and Engineer Officer Advanced and Basic courses.

Carl A. Strock

Carl A. Strock

Carl Ames Strock served as the Chief of Engineers and the Commanding General of the United States Army Corps of Engineers from July 1, 2004 until his retirement from that position on May 17, 2007.

Prior to his selection as the Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers, he served as Director of Civil Works, Headquarters, U.S. Army Corps of Engineers. In September 2003, he returned from a six-month tour of duty in Iraq as the Deputy Director of Operations for the Coalition Provisional Authority. His previous assignment was Director of Military Programs, Headquarters, U.S. Army Corps of Engineers.

He enlisted in the Army and received his commission as an infantry second lieutenant following graduation from Officer Candidate School. After completing Ranger and Special Forces training, he served primarily with infantry units before transferring to the Engineer Branch of the U.S. Army in 1983. He holds a Bachelor of Science degree in civil engineering from the Virginia Military Institute and a master's degree in civil engineering from Mississippi State University. He is a Registered Professional Engineer.

Strock's command assignments include: U.S. Army Corps of Engineers Northwestern Division and Pacific Ocean Division; Engineer Brigade, 24th Infantry Division, Fort Stewart, Georgia; 307th Engineer Battalion, 82nd Airborne Division, where he led the battalion through Operation Just Cause in Panama and Operation Desert Shield and Desert Storm in Saudi Arabia and Iraq; Rifle Company Commander, 1st Battalion (Mechanized), 26th Infantry Regiment, 1st Infantry Division (Forward) in Germany; Operational Detachment Commander, 2nd Battalion, 5th Special Forces Group at Fort Bragg, North Carolina. Other assignments include: Chief of Staff, U.S. Army Engineer Training Center and Fort Leonard Wood, Missouri; Personnel Staff Officer, Army Deputy Chief of Staff for Personnel, Washington, D.C.; Colonels Assignment Officer, U.S. Army Personnel Command, Washington, D.C.; Exchange Officer and Instructor, Royal School of Military Engineering in England; Battalion Operations Officer, Assistant Division Engineer, and Battalion Executive Officer for the 307th Engineer Battalion, 82nd Airborne Division; Resident Engineer, Columbus Air Force Base, Mississippi; Project Officer, Tennessee-Tombigbee Waterway; Scout Platoon Leader and Company Executive Officer, 1st Battalion (Airborne), 505th Parachute Infantry Regiment, 82nd Airborne Division.

Lt. Col. David Berczek

Lt. Col. David Berczek

Deputy Commander Task Force Guardian
Risk and Reliability Program Manager

Lt. Col. David Berczek served twice in New Orleans in the Corps' response efforts to Hurricane Katrina, as the Deputy Commander for Task Force Guardian in 2006 and Task Force Hope risk and reliability/risk communication program manager in 2007. He was assigned to the Headquarters, U.S. Army Corps of Engineers in Washington, D.C. as an assistant director, Civil Works and Liaison to the Office of the Federal Coordinator, Gulf Coast Rebuilding.

Lt. Col. Berczek grew up in Canandaigua, New York and graduated from the United States Military Academy at West Point in 1985 with a Bachelor of Science Degree in Electrical Engineering. His military education includes the Army Command and General Staff College, Airborne School, and the U.S. Army Engineer Basic and Advanced Courses. Lt. Col. Berczek has served in a variety of command and staff assignments, in the United States, Europe and Southwest Asia. He commanded engineers at the company level while assigned to the 46th Engineer Battalion, Fort Rucker, Alabama. Other key assignments include service as the S-1 and Adjutant, 46th Engineer Battalion during Operations Desert Shield/Desert Storm; Construction and Environmental Operations Officer, DPW, Camp Doha Kuwait; Engineer Related Construction program manager, 416th ENCOM Fwd Cell, Third US Army; Deputy District Commander, Walla Walla District; and Executive Assistant, Joint Experimentation, Evaluation and Assessments Division, NATO Strategic Command, Allied Command Transformation. Among his decorations, Lt. Col. Berczek has been awarded the Bronze Star Medal with Oak Leaf Cluster, the Defense Meritorious Service Medal, the Army Meritorious Service Medal with five Oak Leaf Clusters, the Army Commendation Medal, the Joint Service Achievement Medal, the Army Achievement Medal, the Air Force Achievement Medal, the Liberation of Kuwait Medal (KSA)(GOK), the Southwest Asia Service Medal with three campaign stars, the Iraqi Campaign Medal, the Global War on Terrorism Service Medal, the Joint Meritorious Unit Commendation and Meritorious Unit Commendation Medals.

Col. Gregory J. Gunter

G-3 TASK FORCE HOPE
U.S. Army Corps of Engineers

Col. Gregory J. Gunter

Col. Gunter served as Operations Officer (G-3) for Task Force Hope in Louisiana, part of the U.S. Army Corps of Engineers' Mississippi Valley Division from 2008 until June 2011. He was responsible for supporting the Corps' $14.6 billion hurricane system risk reduction work in New Orleans and Southeast Louisiana, and the long-term planning of coastal restoration and hurricane damage risk reduction.

Col. Gunter served in a variety of troop positions with the 7th Engineer Battalion, 5th Infantry Division, Fort Polk, Louisiana and 2nd Engineer Battalion, 2nd Infantry Division in Korea. Following his tour of duty in Korea, Colonel Gunter went to the National Training Center, Fort Irwin, California from 1992 to 1994. While at the National Training Center, he served as the Division Engineer, Live Fire Exercise Officer and Engineer Company Trainer, Live Fire Division followed by an assignment as a Small Group Instructor for the Engineer Officer Advanced Course, US Army Engineer Center and School, Fort Leonard Wood, Missouri. Col. Gunter worked in the

Los Angeles District, U. S. Army Corps of Engineers as project engineer, Nellis AFB, project manager Civil Works Branch and as Resident Engineer; Ft. Irwin Resident Office, Ft. Irwin California. Colonel Gunter was assigned to the Albuquerque District, United States Army Corps of Engineers, where he was the Deputy District Commander from April 2000 to August 2002. Later he was assigned as the Chief, Installation Management Division, for the Saudi Arabian National Guard Modernization Program in Riyadh, Saudi Arabia. From September 2004 to July 2007 he was the Assistant Director, Directorate of Civil Works, U.S. Army Corps of Engineers in Washington DC. During this time he was temporarily assigned as the Deputy District Commander for the Gulf Region North District, Mosul Iraq, in support of Operation Iraqi Freedom. Prior to his assignment in New Orleans he served as the Deputy Commander for the Louisville District, U.S. Army Corps of Engineers.

Col. Gunter is a graduate of the Engineer Officer Basic and Advanced Courses, the Combined Arms Services Staff School and the Command and General Staff College. He holds a Bachelor's Degree in Civil Engineering from the University of Arizona, and a Master's Degree in Engineering Management from the University of Missouri at Rolla. Colonel Gunter is married to the former Jacqueline Purrington from New Orleans, Louisiana.

His military decorations include the Bronze Star Medal, Meritorious Service Medal, the Army Commendation Medal, the Army Achievement Medal, the Iraq Campaign Medal, the Korean Defense Medal and National Defense Service Medal. He wears the Army Parachutist Badge.

Col. Alvin B. "Al" Lee


Col. Alvin B. "Al" Lee

Col. Alvin B. "Al" Lee, served as the New Orleans District's 60th commander and district engineer from July 20, 2007 until July 23, 1010. As district engineer, Lee was responsible for a district which, in tandem with the Hurricane Protection Office, worked on the $14.6 billion Hurricane and Storm Damage Risk Reduction System in New Orleans and southeast Louisiana.

The New Orleans District's jurisdiction includes 2,800 miles of navigable waterways, 1,300 miles of levees and floodwalls eleven navigation locks, six major flood control structures, and other projects to create and protect coastal wetlands. Lee also serves as chairman of the federal-state Coastal Wetlands Planning, Protection and Restoration Act Task Force, which oversees a $60 million annual program to protect and restore Louisiana's coastal wetlands.

Lee's previous assignment was as a fellow in the Secretary of Defense Corporate Fellows Program, assigned to Caterpillar Inc. in Peoria, Ill. He comes with district-command experience, as his assignment previous to Caterpillar was as the commander and district engineer of the Charleston District, U.S. Army Corps of Engineers, in Charleston, S.C.

Col. Lee is a distinguished military graduate of Georgia Southern University and holds a masters degree in Engineering Management from St. Martins University. His military schooling includes the Engineer Officer Basic and Advanced Courses, the U. S. Army Command and General Staff College, and the U.S. Army War College.

Other assignments include Operations Officer for 1st Battalion, 50th Infantry Regiment; 36th Engineer Group Assistant Operations Officer and Ranger Support Element Operations Officer; Instructor/Writer at the U.S. Army Infantry School, Fort Benning, Ga.; Deputy Resident Engineer, Alaska District, Corps of Engineers, and Deputy Commander Forward, Rocky Mountain Area Office in Colorado Springs, Col., of the Omaha District, Corps of Engineers.

Other key command and staff positions include: Company Commander, 317th Engineer Battalion, 3rd Brigade, 24th Infantry Division (Mechanized); Commander, Alaska Projects Office, Cold Regions Research Laboratory; Battalion

Executive Officer of the 10th Engineer Battalion, and the Engineer Brigade Operations Officer, Third Infantry Division (Mechanized). Lee also served in Afghanistan during Operation Enduring Freedom as the Deputy Commander for the Afghanistan Engineer District.

His military awards include the Legion of Merit; the Bronze Star Medal; the Meritorious Service Medal, with three oak-leaf clusters; the Army Commendation Medal, with five oak-leaf clusters; and the Army Achievement Medal, with two oak-leaf clusters. He is a recipient of the Bronze de Fleury medal, and earned the Parachutist's Badge.

He and his wife have two children and one grandchild.


Col. Robert Sinkler

Col. Robert Sinkler

Commander, Hurricane Protection Office

Col. Robert Sinkler served as commander of the U.S. Army Corps of Engineers' Hurricane Protection Office (HPO) from May 29, 2009 until July 21, 2011. The Hurricane Protection Office is a temporary task force made up of Corps' supporting districts and personnel from the Mississippi Valley Division, and from across the Nation. As HPO Commander, Sinkler was part of the leadership team responsible for constructing the $14.4 Billion Hurricane and Storm Damage Risk Reduction System (HSDRRS) for the greater New Orleans area. His responsibilities included overseeing construction execution of the HSDRRS in areas that were flooded during Hurricane Katrina, primarily in the Orleans and St. Bernard Parishes (Lake Pontchartrain Coastal Zone).

Prior to his assignment to New Orleans, Col. Sinkler commanded the U.S. Army Corps of Engineers' Rock Island District from July 2006 through May 2009. As Commander of the Rock Island District, he supported the National response and recovery to the devastating 2008 Midwest Floods, which impacted five Midwestern states. While he was at Rock Island, the District was also responsible for overseeing engineering and design work to support the construction of levees in the Orleans Metro area, and the West Closure Complex in Plaquemines Parish. He also served as the Commander of Task Force Unwatering, the Corps' contingency organization responsible for assisting the City of New Orleans, and the State of Louisiana in unwatering the greater New Orleans area, if flooded.

Col. Sinkler began his military career in the Illinois National Guard where he served with the 682nd Engineer Battalion. Since receiving a commission in the U.S. Army Corps of Engineers in 1983 from the Eastern Illinois University Reserve Officer Training Corps program, he has served in a variety of command and staff positions with the 1st, 3rd and 4th Infantry Divisions, the 1st Armored Division, V Corps and 7th Army. Sinkler was the assistant division engineer for Multi-National Division North in Bosnia-Herzegovina during Operation Joint Guard. He commanded the 5th Engineer Battalion during Operation Iraqi Freedom, and recently served in the Operations Directorate of the U.S. Central Command Headquarters at MacDill Air Force Base, Florida, and in the CENTCOM Forward Headquarters in Qatar.

He has served on the faculty and staff of the U.S. Army Engineer School and his military education includes the Engineer Officer Basic and Advanced Courses, the U.S. Army Command and General Staff Course, the Advanced Military Studies Program, the Joint Warfighting Course, and the U.S. Army War College.

Sinkler holds a bachelor's degree in Geology from Eastern Illinois University, a master's degree in Geographic Information Systems from Kansas State University, a master's degree in Administration from Central Michigan University, a master's degree in Military Art and Science from the U.S. Army Command and General Staff College, and a master's degree in Strategic Studies from the U.S. Army War College.

He is a member of the Society of American Military Engineers and the Army Engineer Association.

Daniel H. Hitchings

Daniel H. Hitchings

Daniel H. Hitchings became Director of Task Force Hope, overseeing the Corps of Engineers' hurricane response and recovery work in Mississippi and Louisiana, in September, 2005 in the immediate wake of the destruction wrought by Hurricanes Katrina and Rita. He was responsible for overseeing the management of all the recovery, repair and restoration of the hurricane system until his departure in February 2007.

Prior to that Mr. Hitchings served as the Director of Regional Business for the Mississippi Valley Division/Mississippi River Commission (MVD/MRC), U.S. Army Corps of Engineers in September 2003. He is also a member of the Federal Government's Senior Executive Service. Mr. Hitchings earned a bachelor of science degree in water resources engineering from Pennsylvania State University and a master of public administration degree from Harvard University. He is also a registered professional engineer.

Mr. Hitchings began his career in 1973 as a design engineer with Reynolds, Smith and Hills, Architects, Engineers and Planners, Jacksonville, Fla. His career with the federal government began with the U.S. Army Corps of Engineers, Baltimore District in late 1974. Assignments involved water resources planning, navigation and flood control project operations, construction engineering and contract administration, engineering design and construction management. These assignments took him to such locations as the Albany Field Office of New York District, Wright-Patterson Area Office of Louisville District, and the Engineering Division in Europe. In 1986, Mr. Hitchings was assigned Chief, Contract Inspection and Administration for the Directorate of Engineering and Housing, Frankfurt Military Community, Germany and subsequently as Assistant Chief, Engineering Plans and Services Division. In 1988, he transferred to the U.S. Military Community in Neu Ulm, Germany, where he assumed the duties as Chief, Engineering, Plans and Services Division and remained there until 1991 when the installation was closed as part of the Intermediate Nuclear Forces Treaty implementation.

Upon returning to the states in 1991, Mr. Hitchings accepted the position of Facility Management Engineer at Headquarters, Test and Evaluation Command, Aberdeen Proving Ground. In 1994 he became Chief, Environmental Engineering Branch of the Directorate of Safety, Health and Environment, with the Garrison at Aberdeen Proving Ground. In 1994, he accepted a position as Chief, Buildings, Grounds and Utilities Division, Directorate of Public Works. From January - July 1997, Mr. Hitchings lead the Garrison Business Transition Team. He attended Harvard University in 1998, and then worked on the Commercial Activities (outsourcing competition) team to prepare the in-house proposal. From March 1999 to September 2003, Mr. Hitchings served as Chief, Engineering and Construction Division for the U.S. Army Corps of Engineers, Pittsburgh District. Mr. Hitchings also served 3 months, April 2003-July 2003, in Iraq as the Senior Advisor to the Iraqi Ministry of Housing and Construction for the Coalition Provisional Authority.

Mr. Hitchings is a native of Oneida, New York. He is married and has two sons.

Karen Durham-Aguilera, SES, P.E.

Karen Durham-Aguilera

Karen Durham-Aguilera, P.E., served as the Director of Task Force Hope in Louisiana, part of the U.S. Army Corps of Engineers' Mississippi Valley Division from 5 February 2007 until 17 December 2010. She was responsible for overseeing the Corps' $14.6 billion hurricane protection system work in New Orleans and Southeast Louisiana, and the long-term planning of coastal restoration and hurricane damage reduction.

A member of the Senior Executive Service, Durham-Aguilera was most recently Director of Programs for the Corps' Northwestern Division where she was responsible for $3.5 billion in civil works and military programs that included hydroelectric, navigation, flood damage reduction, and endangered species recovery projects, in an area that covered about 25 percent of the continental United States.

In 2005, Durham-Aguilera served as the Director of Reconstruction Programs, Project and Contracting office (PCO) in Baghdad, Iraq. She was responsible for planning, coordination, contracting acquisition and execution of nearly 3,200 projects spanning all construction sectors throughout Iraq with a workforce from all branches of the armed forces, multinational civilians and Iraqi professionals.

A registered professional engineer in the state of Louisiana, Durham-Aguilera holds a bachelor's degree in civil engineering and a master's degree in civil (geotechnical) engineering, both from the University of Louisville. Prior to her assignment to the Northwestern Division, Durham-Aguilera served as Chief, Construction-Operations Division, at the Corps' Sacramento District. After early career assignments in New Orleans, Louisiana, she served in numerous engineering positions in the United States and abroad, including project engineer, resident engineer and area engineer.

For several years, Durham-Aguilera served on the Army's Career Board for Engineers and Scientists. Her recognitions include the Bronze Order of the DeFleury Medal, Joint Civilian Service, Meritorious Service, Superior Civilian Service Awards and Commander's Awards. Durham-Aguilera was the Corps of Engineers' 1990 Southwestern Division Engineer of the Year and 1993 Federal Engineer of the Year. She is also a recipient of the Secretary of Defense Medal for the Global War on Terrorism, and a 2008 recipient of the Presidential Rank Award for Meritorious Service.


Robert L. Van Antwerp, Jr.

Robert L. Van Antwerp, Jr.

Lt. Gen. Robert L. Van Antwerp, Jr. M.Sc. M.B.A. PE served as the Chief of Engineers of the United States Army and Commanding General of the U.S. Army Corps of Engineers from May 18, 2007 until he retired from that position in June 2011.

Van Antwerp's previous assignment was as Commanding General, U.S. Army Accessions Command and Deputy Commanding General for Initial Military Training at Fort Monroe, Virginia. Additionally, Van Antwerp exercised Department of the Army directed executive agent authority over the United States Military Entrance Processing Command. Command assignments include the U.S. Army Maneuver Support Center and Fort Leonard Wood/Commandant, U.S. Army Engineer School; U.S. Army Corps of Engineers Los Angeles District during the Northridge earthquake of 1994; the U.S. Army Division, South Atlantic, Atlanta, Georgia; and the 326th Engineer Battalion, 101st Airborne Division (Air Assault) during the Gulf War. Other assignments include Chief of Staff, U.S. Army Corps of Engineers; Assistant

Chief of Staff for Installation Management, Washington, DC; Director, Office of Competitive Sourcing, Office of the Assistant Secretary of the Army (Research, Development and Acquisition), Washington, DC; Executive Assistant to the Vice Chairman of the Joint Chiefs of Staff, Washington, DC; Executive Office, Office of the Chief of Engineers, Washington, D.C.; Chief, Military Engineering and Construction Division, U.S. Army Western Command, Fort Shafter, Hawaii; Executive Officer, 84th Engineer Battalion, 45th General Support Group, Schofield Barracks, Hawaii; and Instructor, Department of Mechanics, U.S. Military Academy, West Point, New York.

Van Antwerp graduated from the United States Military Academy with a Bachelor of Science degree in 1972. He completed Ranger, Airborne and Air Assault training and the Engineer Officer Basic and Advanced Courses. He holds a Master of Science degree in mechanical engineering from the University of Michigan and a Master of Business Administration degree from Long Island University in New York. He is a Registered Professional Engineer. He served for a number of years as President of Officer's Christian Fellowship.

Maj. Gen. Merdith W.B. (Bo) Temple

Acting Commanding General, U. S. Army Corps of Engineers

Maj. Gen. Merdith W.B. (Bo) Temple

Maj. Gen. Merdith W. B. (Bo) Temple assumed duties as the Acting Chief of Engineers and Acting Commanding General on 17 June 2011. As such, he is in command of the U.S. Army Corps of Engineers, which has over 36,000 employees, and manages an over $40 billion annual program. He also remains as the Deputy Commanding General and Deputy Chief of Engineers.

Maj. Gen. Temple's previous assignment was as the Deputy Commanding General of Civil and Emergency Operations (DCG-CEO) for the U.S. Army Corps of Engineers. As the Nation's primary planner, designer, builder, and operator of flood control, navigation, environmental restoration, and multi-purpose water resource projects, he managed the Army's $10 billion annual Civil Works Program. Additionally, he was responsible for the federal emergency flood fighting effort, recovery operations, and emergency engineering and public works support in response to natural or manmade disasters. As the DCG-CEO, Major General Temple served as the President of the U.S. Section of the International Navigation Association (PIANC), President of the Corps' Coastal Engineering Research Board, and Executive Director of the Inland Waterways User Board.

Prior to serving as the DCG-CEO, Maj. Gen. Temple was the Deputy Commanding General of Military and International Operations, U.S. Army Corps of Engineers, where he was responsible for policy, program, and technical functions in the execution of over $20 billion of design, construction, and environmental programs for the Department of Defense and other federal agencies and foreign countries.

Before coming to Headquarters, Maj. Gen. Temple served as Commander of the North Atlantic Division for the U.S. Army Corps of Engineers. Other previous assignments include duty as the Theater Engineer (C7), Combined Joint Task Force Seven, Baghdad, Iraq and Commander of the Corps' Transatlantic Programs Center in Winchester, Virginia. He also served as the Assistant Chief of Staff, Operations (G3), XVIII Airborne Corps and commanded both the 20th Engineer Brigade (Combat) (Airborne Corps) and the 307th Engineer Battalion (Combat) (Airborne) at Fort Bragg, North Carolina.

Maj. Gen. Temple has also served as a Platoon Leader in the 44th Engineer Battalion, Korea and in the 548th Engineer Battalion (Combat) (Heavy), Ft. Bragg; and served on the staff of U.S. Army Europe & 7th Army, Germany. He commanded A/307th and later served on the 307th Engineer Battalion staff in Saudi Arabia, during the Persian Gulf War. Major General Temple served at the NATO Headquarters in Turkey, with the U.S. Army Personnel Command Center in Virginia, and as a Reserve Component advisor with the Readiness Group in Denver, Colorado.

Maj. Gen. Temple, a Virginia native, was commissioned in the Engineer Branch in 1975. He earned a bachelors degree in civil engineering from the Virginia Military Institute and a Masters degree in civil engineering from Texas A&M University. He is also a graduate of the U.S. Army Command and General Staff College and the U.S. Army War College, and is a registered professional engineer in the Commonwealth of Virginia.

Maj. Gen. Temple's military decorations include the Legion of Merit (two oak leaf clusters), the Bronze Star Medal, Joint Service Commendation Medal, Defense Meritorious Service Medal, the Army Meritorious Service Medal (six oak leaf clusters), Joint Service Commendation Medal, the Army Commendation Medal (four oak leaf clusters), the Army Superior Unit Award, and the Master Parachutist Badge.

Col. Michael McCormick

NORTHCOM's Defense Coordinating Officer (DCO)

Col. Michael McCormick

Col. Michael McCormick is NORTHCOM's Defense Coordinating Officer (DCO) collocated with FEMA Region X in Seattle, Washington. DCOs are primarily charged with the conduct of Defense Support of Civil Authorities (DSCA) operations – coordinating Title 10 (federal military) forces and resources in response to natural/manmade incidents.

Col. McCormick was the second Commander of the Hurricane Protection Office, his tenure lasting from September 2008 to May 2009. During his tenure he moved all remaining system projects through the pre-construction activities process such as Design, Environmental Compliance and Real Estate in order to meet 2011deadline. He also led the effort to use the Early Contractor Involvement acquisition strategy as a means to achieve the program goals in St. Bernard and Orleans parishes. This form of construction contracting is both innovative and relatively new to the Corps of Engineers and its use signifies Col. McCormick's commitment to completing the hurricane system on budget.

Col. McCormick received a bachelor's degree from the University of Pittsburgh in 1983. He holds three Master's Degrees – the first in construction management from George Washington University; the second in operational planning from the School of Advanced Military Studies, Fort Leavenworth, Kansas; and the third in National Strategic Studies, Naval War College, Newport, Rhode Island. He is a graduate of the Engineer Basic and Advanced Courses, the US Army Ranger and Airborne Schools, the Command and General Staff College, the Advanced Military Studies Program, and the Naval War College.

Col. McCormick's previous assignments include: Platoon Leader and Company Executive Officer, 317th Engineer Battalion (Corps) (Mech), Eschborn, Germany; Commander, C Company, 14th Engineer Battalion (Corps) (Wheeled), Fort Ord, California; Project Engineer, Omaha District, US Army Corps of Engineers; Chief, G3 Plans and Executive Officer, 307th Engineer Battalion, 82d Airborne Division, Fort Bragg, North Carolina; Executive Officer, Engineer Brigade 2d Infantry Division, Republic of Korea; Assistant Director, Civil Works Directorate, HQs US Army Corps of Engineers, Washington, DC; Commander, San Francisco District, US Army Corps of Engineers; and Chief, G3 (and C3) Plans, XVIII Airborne Corps (and Multi-National Corps – Iraq), Fort Bragg, North Carolina (and Baghdad, Iraq); Commander, Seattle District, US Army Corps of Engineers; Commander, Hurricane Protection Office, US Army Corps of Engineers, New Orleans, Louisiana; Commander, Afghanistan Engineer District, US Army Corps of Engineers, Kabul, Afghanistan.

His awards include the Legion of Merit, Bronze Star Medal, Meritorious Service Medal, the Army Commendation Medal, and the Humanitarian Service Medal. He is also a senior rated parachutist and a recipient of the Army Engineer Association's Bronze DeFleury Medal.

Michael D. Smith

Michael D. Smith

Task Force Hope G3, Operations Officer

Michael D. Smith currently serves as the Task Force Hope G3, Operations Officer. He has previously been the Senior Program Manager for the Independent External Peer Reviews and served another tour as the Task Force Hope Deputy G3, Operations Officer.

Mike came out of retirement as a Rehired Annuitant to assist in the Louisiana Recovery effort and deployed to the Joint Field Office in Baton Rouge on September 11th, 2005.

He was the ESF #3 Action Officer for the construction of the Victim Identification Center in Carville, La., and upon the completion of that Mission became the Action Officer for the Critical Public Facilities Mission. Mike became the ESF #3 Action Officer for Debris at the Transition Recovery Office on September 11th, 2006, and then the Assistant Director and later the Director of the LA-RFO.

Mike Smith received a bachelor's degree in Natural Resources Management in 1977 and a bachelor's degree in Recreation Resources Administration from North Carolina State University in 1983. He is a 6-year veteran of the United States Marine Corps with service in the Republic of South Viet Nam in 1967-68. He is a Life Member of Russell Chadwick Post #389 of the American Legion in Beverly, Ohio and was recently elected Commander of the 11th District of Ohio. He is also a Life Member of the Veterans of Foreign Wars, Post #5108, in Marietta, Ohio.

Mike started his Federal Career with the National Park Service and transferred into the U.S. Army Corps of Engineers in the early 1980s. His entire career with USACE has been with the Regulatory Branch, overseeing work in waters and wetlands of the United States, pursuant to the River and Harbor Act and the Clean Water Act. He has worked in both the Nashville and Wilmington Districts.

He also worked for the Assistant Secretary of the Army (CW) in 1992 and retired as the Acting Chief of the Regulatory Branch at Headquarters, US Army Corps of Engineers, in 2002. He has worked with FEMA on disaster recovery efforts for Hurricanes Hugo, Fran, Floyd, Katrina and Rita.

Mike and his wife Anne (also a Marine Veteran) have been married for almost 45 years. They have 3 children and 7 grand children.

Michael F. Park

Chief of Task Force Hope in Louisiana


Michael F. Park

Michael F. Park became the Chief of Task Force Hope in Louisiana, part of the U.S. Army Corps of Engineers' Mississippi Valley Division in January 2011. He is responsible for overseeing the Corps' $14.6 billion Hurricane and Storm Damage Risk Reduction System work in New Orleans and Southeast Louisiana, and the long-term planning of coastal restoration and hurricane damage reduction.

Prior to this position, Park served as the Deputy Director of Task Force Hope, exercising programmatic oversight and management of the hurricane system for the Greater New Orleans area.

In October 2005 Park joined the executive team for the Louisiana Recovery Field Office (LA-RFO) for the response and recovery from Hurricanes Katrina and Rita and served as the Director of the LA-RFO from June 2006 to July 2007. In this role Park led a $2.9 billion Public Works and Engineering response and recovery program in a 40-parish area of South Louisiana.

Park earned a bachelor's degree in Civil Engineering and a master's degree in Engineering Management, both from the University of New Orleans. Park has worked for the Army Corps of Engineers in New Orleans since 1985. He served 20 years in the New Orleans District Operations Division, where he occupied several key positions, including Acting Chief of Operations Division.

Col.George T. Shepard, Jr.

Col.George T. Shepard, Jr., P.E.

Deputy Commander, Mississippi Valley Division

Col. George T. "Thatch" Shepard, Jr., became Deputy Commander of the Mississippi Valley Division, U.S. Army Corps of Engineers, Vicksburg, Miss., on July 28, 2008. He also serves as Secretary for the Mississippi River Commission.

The Mississippi Valley Division is responsible for Corps of Engineers water resources programs in a 370,000-square-mile area in portions of 12 states from Canada to the Gulf of Mexico. Its subordinate districts are headquartered in St. Paul, Minn.; Rock Island, Ill.; St. Louis, Mo.; Memphis, Tenn.; Vicksburg, Miss.; and New Orleans, La. The Presidentially appointed Mississippi River Commission is responsible for the comprehensive Mississippi River and Tributaries flood control and navigation project and engineering work on the Mississippi River and its tributaries from Lake Itasca, Minn., to the Head of Passes in Louisiana.

Prior to this assignment, he was Deputy Commander for the Corps Savannah District. While there, he was tasked with an eight-month deployment to Iraq, where he served as the

Deputy Commander of the Gulf Region Division North District, Tikrit, Iraq. There he supported the Coalition Forces Campaign Strategy with a $700 million construction program across the 60,000-square-mile area of operation.

Upon graduation from the U.S. Military Academy at West Point, Lt. Col. Shepard was commissioned into the Army Corps of Engineers in May 1986.

His assignments include Platoon Leader, E (Mobile Assault Bridge) 1st Engineer Battalion (Combat), 1st Infantry Division (Mech); Platoon Leader, A/1st Engineer Battalion (Combat), 1st Infantry Division (Mech); Aide-de-Camp to the ADC-M, 1st Infantry Division (Mech); Executive Officer, B/1st Engineer Battalion (Combat), 1st Infantry Div. (Mech), all at Fort Riley, Kansas. He served as Assistant S-3, 84th Engineer Battalion (Combat) (Heavy); Commander, A/84th Engineer Battalion (Combat) (Heavy), both in Hawaii; Deputy Chief, Regulatory Functions Branch, New Orleans District, U.S. Army Corps of Engineers; Instructor, Environmental Engineering, and Assistant Professor of Environmental Engineering in the Department of Geography and Environmental Engineering, West Point; Deputy District Engineer, Wilmington District, U.S. Army Corps of Engineers, Wilmington, N.C.; Director of Public Works, 80th Area Support Group, Chievres, Belgium, supporting the joint communities of the Supreme Headquarters Allied Powers Europe (SHAPE), the NATO Support Activity in Brussels, and the Joint Forces Command in Brussum, The Netherlands.

Col. Shepard holds a master's degree in Environmental Engineering from the University of Florida. He is a registered Professional Engineer in the states of Virginia and North Carolina. His military education includes the Engineer Officer's Basic Course, the Infantry Officer's Advance Course, the Command and General Staff College and the Sapper Leader Course. His awards include the Bronze Star Medal, Meritorious Service Medal (4 awards), Army Commendation Medal (3 awards), Army Achievement Medal (3 awards), National Defense Service Medal (2 awards), Iraq Campaign Medal, Global War on Terrorism Service Medal, Humanitarian Service Medal, Military Outstanding Volunteer Service Medal, Army Service Ribbon, Overseas Service Ribbon (2 awards), Airborne Badge, Air Assault Badge, Combat Action Badge and the

Ranger Tab. He was also presented the Bronze Order of the DeFleury Medal. He is married to the former Jennie Bond and they have three children: Samantha, Mollie, and Thatcher.

John A. Meador

John A. Meador, P.E.

John A. Meador, P.E. served as the Deputy Director of Task Force Hope in Louisiana, part of the U.S. Army Corps of Engineers' Mississippi Valley Division from July 30, 2006 until July 19, 2009. His responsibilities included program integration, synchronization and strategic communication in the implementation of the Hurricane Storm Risk Reduction System work in New Orleans and southeast Louisiana.

In the aftermath of hurricanes Katrina and Rita, Meador actively served the Corps' mission. In October 2005 he deployed to the Gulf of Mississippi region as the team leader for the Infrastructure Support Integration Center which coordinated activities among Federal, state and local agencies. Then, Meador was named the Corps' liaison to the Office of the Federal Coordinator for Gulf Coast Rebuilding soon after the President established it.

Prior to his engagement in the Mississippi Gulf region, Meador was the Civil Works Deputy for the Southwest Division Regional Integration Team at the Corps' headquarters where he advocated for projects led by in the Division's four districts: Fort Worth, Galveston, Little Rock and Tulsa..

A registered professional engineer in the state of Mississippi, Meador holds a bachelor's degree in civil engineering from Mississippi State University. He began his career in the Vicksburg (Miss.) District as a hydraulic engineer and advanced to the role of Senior Project Manager for the Yazoo Basin, MS. He worked for the Mississippi Valley Division as a program manager for the St. Paul District and then moved to the Corps' headquarters in 2001 to become a senior program manager in the Civil Works Program Integration Division supporting the Pacific Ocean Division and the Research and Development Program. After the September 11, 2001, attacks, Meador was the USACE program manager the Corps' Critical Project Security Program to protect vulnerable civil works projects.

Meador's recognitions include the Army Engineer Association's Bronze Order of the De Fleury Medal; Department of the Army Superior and Meritorious Civilian Service Awards; Department of Army Commanders Award for Civilian Service; and commendations for his contributions by the U.S. Department of Justice and the Yazoo, Miss., Levee District.

Maj. Gen. Michael J. Walsh

Commander, Mississippi Valley Division
Commander, Task Force Hope
President-designee, Mississippi River Commission

Maj. Gen. Michael J. Walsh

Maj. Gen. Michael J. Walsh assumed command of the Mississippi Valley Division, Vicksburg, Miss., Feb. 20, 2008. He also serves as President-designee of the Mississippi River Commission. General Walsh came to MVD from Baghdad, Iraq, where he was the Commander for the Corps Gulf Region Division.

As MVD Commander, Walsh is responsible for a $7.5 billion civil works program. In addition, he plays a vital role in managing the Corps water resources program in the Mississippi River Valley. The boundaries of the Mississippi Valley Division extend from Canada to the Gulf of Mexico, include portions of 12 states, and encompass 370,000 square miles. The programs and activities overseen by the MVD and MRC are conducted by six district offices located in St. Paul, Minn., Rock Island, Ill., St. Louis, Mo., Memphis, Tenn., Vicksburg, Miss., and New Orleans, La. He also serves as Commander of Task Force Hope. Established in the wake of Hurricanes Katrina and Rita, Task Force Hope is responsible to deliver the nearly $15 billion construction program that will provide the 100-year level of storm surge risk reduction to the greater New Orleans area in 2011.

Previous assignments include: Commander of the South Atlantic Division, Atlanta, Ga., from June 2004 to September 2006, Chief of Staff at headquarters, Washington, D.C., from May 2003 to June 2004, Executive Director of Civil Works at headquarters, Washington, D.C., from August 2001 to May 2003, District Commander of the Sacramento District, Sacramento, Calif., from 1998 to 2001, and District Commander of the San Francisco District, San Francisco, Calif., from 1994 to 1996.

Maj. Gen. Walsh has held a wide variety of Army command and staff assignments, to include: project management officer for Engineer Branch, Supreme Headquarters, Allied Powers, Europe (SHAPE); Environmental Task Force Leader, Fort Stewart, Ga.; Executive Officer, 92nd Engineer Battalion, Fort Stewart, Ga., and Saudi Arabia; Project Engineer and Assistant Area Engineer, Baltimore District; Construction Officer, 18th Engineer Brigade, Darmstadt, Germany; and Commander, Company B, 94th Engineer Battalion, Darmstadt, Germany.

His awards include two Bronze Stars, four Legions of Merit, and numerous lesser awards. He is parachute and Ranger qualified.

Maj. Gen. Walsh was graduated from Polytechnic Institute of New York in 1977 with a bachelor's degree in civil engineering. He also earned a master's degree in construction management from the University of Florida. His military education includes the Engineer Officers Basic and Advanced Courses, U.S. Army Command and General Staff College, and the U.S. Army War College.

Walsh was born in Brooklyn, NY, and is married with two adult sons.

Col. Edward R. Fleming

Commander & District Engineer
New Orleans District

Col. Ed Fleming became the New Orleans District's 61st commander and district engineer on July 23, 2010. On assuming command, he became responsible for one of the largest civil works programs at over $350 million annually. The New Orleans District includes 2,800 miles of navigable waterways – including five of the top fifteen ports in the nation, 1,300 miles of levees and floodwalls, 11 navigation locks, six major flood control structures, and other projects designed to create and protect coastal wetlands.

Also under Col. Fleming's management is the Protection and Restoration Office (PRO). PRO is part of Team New Orleans' effort to reduce risk for South Louisiana by executing comprehensive and integrated flood control, ecosystem restoration, and hurricane and storm damage risk reduction projects.

A native of Lowell, Massachusetts, Col. Ed Fleming was commissioned a Second Lieutenant in 1989 upon graduation from the United States Military Academy, West Point, New York where he earned a Bachelor of Science Degree in Civil Engineering Management. In 1998, Col. Fleming graduated from the University of Maryland at College Park and earned a Master of Science Degree in Environmental Engineering. His military education includes the Engineer Officer Basic and Engineer Officer Advanced Courses, and the Command and General Staff Officers Course at Ft. Leavenworth, Kansas.

Col. Fleming recently earned a masters degree in National Security and Strategic Studies from the National War College. Prior to that assignment, he was the Executive Officer for the Commanding General, US Army Corps of Engineers (USACE).

Col. Fleming has served in numerous command and staff assignments marked by combat and peacekeeping deployments. In December 1990 he deployed to Iraq as a platoon leader in the 1st Infantry Division during Operations Desert Shield and Desert Storm where he was decorated for valor. In 2003, he deployed on a peacekeeping mission to Kosovo serving as the Operations Officer for the 82nd Engineer Battalion in support of Operation Joint Guardian. In January 2004, Colonel Fleming deployed to Iraq supporting Operation Iraqi Freedom as a Brigade Operations Officer in the 1st Infantry Division.

Other command and staff assignments include: Commander, Charleston District, USACE; project manager then Deputy District Engineer in the Baltimore District, USACE; company commander at Ft. Riley, Kan.; company commander at the National Training Center, Ft. Irwin, Calif.; platoon leader in Korea; and engineer staff officer positions in Heidelberg, Germany and Washington, DC.

Col. Fleming's awards and decorations include the Bronze Star with one oak leaf cluster, Meritorious Service Medal with five oak leaf clusters, the Army Commendation Medal with V device and three oak leaf clusters, and the Army Achievement Medal with two oak leaf clusters. Colonel Fleming has also been awarded the Bronze Order of the de Fleury medal and the Order of St. George.

James O. Ward, Jr.

James O. Ward, Jr.served as Deputy Director of Task Force Hope from September 2005 to August 2006, assisting in the oversight of the Corps of Engineers' hurricane response and recovery work in Mississippi and Louisiana in the immediate wake of the destruction brought about by Hurricanes Karina and Rita. Task Force Hope was responsible for overseeing the management of all the recovery, repair and restoration of the hurricane system.

James O. Ward, Jr. served as Chief of the Business Management Division for the Mississippi Valley Division/Mississippi River Commission, U.S. Army Corps of Engineers. He also serves as Executive Director of the Division Command Council and the Regional Management Board.

The purpose of the Business Management Division (BMD) is to continuously improve the products and services that the Corps of Engineers provides to the nation. The BMD accomplishes this purpose by facilitating development and management of strategic plans and initiatives; by managing outreach activities; by managing workforce development and by providing effective and efficient information management, public affairs, contracting and logistics support to the Mississippi Valley Division.

Mr. Ward began his career with the Corps as a Hydraulic Engineer at the Waterways Experiment Station in 1973. He moved to the Vicksburg District in 1975 and served as a Hydraulic Engineer, as Special Assistant Chief of Hydraulics Branch, as a Section Chief in the Project Management Branch, and as a Project Manager. His previous assignments at Mississippi Valley Division headquarters include Program Manager; Mississippi River Channel Improvement Coordinator and Chief, Technical Engineering Branch. In addition to his involvement in the planning, design, and management of numerous projects throughout the region; he has also lead Corps technical assistance activities in West Africa and Southeast Asia. In 2000, he completed a developmental assignment as Deputy District Engineer for Planning, Programs and Project Management in the St. Louis District.

Mr. Ward holds a bachelor of science degree in civil engineering from Mississippi State University and a master of science degree in civil engineering from Virginia Tech. He is also a graduate of the Army Management Staff College and the Senior Executive Fellows Program, John F. Kennedy School of Government, Harvard University. He is a registered Professional Engineer in the state of Mississippi.

His numerous awards and citations include the Commander's Award for Civilian service and the Superior Civilian Service Award.

Mr. Ward is a native of Jackson, Mississippi.

John C. Hess

Senior Program Manager for Task Force Hope

John C. Hess

John C. Hess is Senior Program Manager for Task Force Hope in New Orleans, Louisiana, a part of the U.S. Army Corps of Engineers' Mississippi Valley Division. He provides programmatic oversight of the Corps' $14.5 billion Hurricane & Storm Damage Risk Reduction System (HSDRRS) work in New Orleans and Southeast Louisiana, and the long-term planning of coastal restoration & hurricane damage reduction. Mr. Hess began working in this position on 19 July 2009.

Mr. Hess is a native to the New Orleans area and brings to his position over 25 years of combined federal service, including key assignments for executing large military programs with the Corps' European Division - Headquarters in Frankfurt, Germany from 1985-1990 and executing large civil works, environmental (ecosystem restoration) and hurricane response & recovery programs in the Jacksonville District, Florida from 1990 – 2009.

A registered Engineer-in-Training in the State of Louisiana, Mr. Hess holds a Bachelor's of Science degree in Civil Engineering from Tulane University. Before arriving to Task Force Hope, he served as Environmental Section Chief in Engineering Division and then as Project Execution Branch Chief in Everglades Division at the Corps' Jacksonville District.

He has a distinguished record of service with the Corps of Engineers, being recognized with several Achievement Medals for Civilian Service and a Superior Civilian Service Award. He is a Life Member of the Society of American Military

Engineers (SAME) and a member in good standing with the Louisiana Engineering Society (LES). He recently received the Corps of Engineers' Programmer of the Year award.

Bibliography

Secondary Sources

Bradley, James. History of the U.S. Army Corps of Engineers, Memphis District, 1998-2006. Champaign, Ill.: ERDC-CERL, 2007.

Brinkley, Douglas. The Great Deluge: Hurricane Katrina, New Orleans, and the Mississippi Gulf Coast. New York: William Morrow, 2006.

Cooper, Christopher, and Block, Robert. Disaster: Hurricane Katrina and the Failure of Homeland Security. New York: Times Books, 2006.

Dyson, Michael Eric. Come Hell or High Water: Hurricane Katrina and the Color of Disaster. New York: Basic Civitas, 2006.

Emmanuel, Kerry. Divine Wind: The History and Science of Hurricanes. New York: Oxford University Press, 2005.

Fatherree, Benjamin. The First 75 Years: History of Hydraulics Engineering at the Waterways Experiment Station. Vicksburg: USACE, Engineer Research and Development Center, 2004.

Fitzpatrick, Patrick J. Hurricanes: A Reference Handbook, 2nd ed. Contemporary World Issues. Santa Barbara: ABC-CLIO, 2006.

Horne, Jed. Breach of Faith: Hurricane Katrina and the Near Death of a Great American City. New York: Random House, 2006.

Iacovelli, Debi. "The Saffir/Simpson Hurricane Scale: An Interview with Dr. Robert Simpson." Mariners Weather Log 43:1 (April 1999): 10-12.

Reuss, Martin. "Notes on Probability Analysis and Flood Frequency Standards," Reducing Flood Losses: Is the 1% Chance (100-year) Flood Standard Sufficient? Background Reading for the 2004 Assembly of the Gilbert F. White National Flood Policy Forum. Washington D.C.: National Academies Keck Center, 2004: 20-25.

_____. "Searching for Sophocles on Bourbon Street," Technology and Culture (Apr. 2006): 353-4.

Robinson, Michael. "History of the 1% Chance Flood Standard," Reducing Flood Losses: Is the 1% Chance (100-year) Flood Standard Sufficient? Background Reading for the 2004 Assembly of the Gilbert F. White National Flood Policy Forum. Washington D.C.: National Academies Keck Center, 2004: 2-8.

Shallat, Todd. "Holding Louisiana." Technology and Culture. 47:1 (January 2006): 102-107.

Tidwell, Mike. Bayou Farewell: The Rich Life and Tragic Death of Louisiana's Cajun Coast. New York: Vintage Books, 2004.

_____. The Ravaging Tide: Strange Weather, Future Katrinas, and the Coming Death of America's Coastal Cities. New York: Free Press, 2006.

Van Heerden, Ivor, and Bryan, Mike. The Storm: What Went Wrong and Why During Hurricane Katrina – the Inside Story from One Louisiana Scientist. New York: Viking Press, 2006.

Primary Sources[250]

Advisories

National Hurricane Center. "Bulletin: Hurricane Katrina Advisory 1 – 31." 5 PM EDT Tues. Aug. 23, 2005 – 10 AM CDT Tues. Aug. 30, 2005. Hurricane Katrina Advisory Archive (www.nhc.noaa.gov).

U.S. Coast Guard. "Marine Safety Bulletin: Status of the Inner Harbor Navigation Canal (IHNC)," Sept. 2005. OH-MVD Files (electronic).

Congressional Documents

Robert T. Stafford Disaster Relief and Emergency Assistance Act, As Amended by PL 106-360. October 30, 2000, PL 106-390, 106th Cong., 2nd Sess. U.S. Code. Tit. 42, Ch. 68.

U.S. Congress. House, An Act Making Appropriations for the Department of Defense for the fiscal year ending September 30, 2006, and for other purposes, H.R. 2863, 109th Cong., 1st Sess.

_____. An Act To Provide for the conservation and development of water and related resources, to authorize the Secretary of the Army to construct various projects to rivers and harbors of the United States, and for other purposes, H.R. 1495, 110th Cong., 1st Sess.

Correspondence

Crear, Gen. Robert, to Maj. Gen. Don T. Riley and Lt. Gen. Carl A. Strock. Subject: MVD SITREP, KATRINA. August 28, 2005. TF Hope Historical Summary Documentation.

Frazier, Mitchell D. to Richard P. Wagenaar et al. Subject: Task Force Hope New Orleans – Talking Points – 0950 Sept. 25, 2005. September 25, 2005. TF Hope Historical Summary Documentation.

_____. To Mitchell D. Frazier et al. Subject: Talking Points – New Orleans as of 1200 3 OCT 05. October 3, 2005. TF Hope Historical Summary Documentation.

Gambrell, Stephen to John Grieshaber et al. Subject: Notes for overflight / Pump Status 31 Aug 05. September 1, 2005. TF Hope Historical Summary Documentation.

Gapinski, Col. Duane. Memorandum for Record. Subject: Task Force UNWATERING After Action Reviews, Dec. 27, 2005. OH-MVD Files (electronic).

_____. Task Force UNWATERING SITREPs, Oct. 1-20, 2005. ENGLINK.

Gillette, Constance S. to CDL-FOA-SES (distribution list) et al. Subject: USACE Support to Hurricane Katrina – Daily Message and Talking Points. September 26, 2005 and October 3 and 6, 2005. TF Hope Historical Summary Documentation.

Hall, Thomas M. to Gen. Robert Crear et al. Subject: SITREP 27 December 2005. TF Hope Historical Summary Documentation.

Jackson, Susan J. Subject: Media Advisory: No new levee breaches. September 12, 2005. TF Hope Historical Summary Documentation.

Kidby, Michael to Adam M. Jachimowicz et al. Subject: Status of Navigation Conditions Resulting from Hurricane Katrina – Tues AM 9/6. September 7, 2005. TF Hope Historical Summary Documentation.

Link, Lewis E., to Camillo, Charles. Subject: History of Task Force Hope. Apr. 24. 2008.

McAlpin, Stan to Larry E. Banks et al. Subject: CORRECTION – Status Update 8 Sep 05 0700 hours. September 8, 2005. TF Hope Historical Summary Documentation.

_____. To Gen. Robert Crear et al. Subject: CORRECTION – Status Update 8 Sep 05 0700 hours. September 8, 2005. TF Hope Historical Summary Documentation.

Riley, Maj. Gen. Don T., to Camillo, Charles. Subject: TF Hope History - DRAFT ManuscriptFrom. Apr. 23, 2008.

_____. To Camillo, Charles. Subject: TF Hope History – HPDC., Jan. 31, 2008.

_____. To Gen. Robert Crear. Subject: Unwatering SITREP. September 6, 2005. TF Hope Historical Summary Documentation.

_____. To all the Corps Team. Draft letter. N.D. OH-MVD Files (electronic).

Rowan, James R. to Donald L. Basham et al. Subject: TF HOPE SITREP UPDATE. September 9, 2005. TF Hope Historical Summary Documentation.

_____. Subject: TF HOPE SITREP. September 9, 2005. TF Hope Historical Summary Documentation.

Shadie, Charles E. to DLL-MVD-FORWARD (distribution list). Subject: Emergency capacity at PS 6 and 7. September 4, 2005. TF Hope Historical Summary Documentation.

Starkel, Lt. Col. Murray, to DLL-MVN-EOC-KATRINA (distribution list). Subject: Sit Rep London Avenue (Jackie Purrington). September 3, 2005. TF Hope Historical Summary Documentation.

Stark, James. Memorandum to Brig. Gen. Robert Crear. ESF#3 Transition/ Mission Close Out Plan – Hurricane Katrina. FEMA Louisiana Transitional Recovery Office: MVD., N.D. OH-MVD Files (electronic).

Stroupe, Wayne A. to Gen. Robert Crear et al. Subject: ASA-CW to waive cost-share on PL-99 repairs. October 18, 2005. TF Hope Historical Summary Documentation.

Verdros, Pam to Jewel A. Sibley et al. Subject: USACE Support to Hurricane Recovery – Daily Talking Points. September 30, 2005. TF Hope Historical Summary Documentation.

Wagenaar, Col. Richard P., to DLL-CEMVN-ALL Employees (distribution list). Subject: Update. September 11, 2005. TF Hope Historical Summary Documentation.

Walgate, Greg, to Teri Alberico et al. Subject: Task Force Hope New Orleans Pump Status Update. October 21, 2005. TF Hope Historical Summary Documentation.

Walton, CPT Victor, to Baumy, Walter O. et al. Subject: TFG Sitrep 22 Dec. 05. December 22, 2005. TF Hope Historical Summary Documentation.

File and Archival Material

California Department of Social Services. "Katrina Housing Area Command." Presentation. CDSS Disaster Planners and Managers (www.cdsscounties.ca.gov).

Camillo, Charles. Timeline for Operational History. August 2005-July 2006. OH-MVD Files (electronic).

COB Open Parishes 18 Dec 2005. USACE, TFH. TF Hope Historical Summary Documentation.

"Commander's Assessments." N.P. U.S. Army Corps of Engineers, Mississippi Valley Division, August 30, 1995 to April 11, 2007 (daily). TF Hope Historical Summary Documentation.

"Commander's Briefings, Katrina." N.P. U.S. Army Corps of Engineers, Mississippi Valley Division, September 2, 1995 to April 11, 2007 (daily). TF Hope Historical Summary Documentation.

Communication Plan: 17th Street Canal Sheet Pile and Floodwall Sampling, 12-13 December 2005. New Orleans, U.S. Army Corps of Engineers. TF Hope Historical Summary Documentation.

Corps Facts: Mississippi River Commission. Jul. 29, 2004. www.mvp.usace.army.mil.

Critical Issues for Hot Wash Brief. USACE, TFH, December 24, 2005. TF Hope Historical Summary Documentation.

Current Messages, Tuesday 08 November 2005. November 8, 2005. TF Hope Historical Summary Documentation.

Daily Report-TF Guardian, Dec. 22, 2005-Jan. 12, 2006. TF Hope Historical Summary Documentation.

Environmental Protection Agency. "Murphy Oil Spill." (www.epa.gov/katrina/testresults/murphy/).

Equipment List. Sept. 26, 2005. OH-MVD Files (electronic).

Fact Sheet: Portable Building Contracts with Alaska Native Firms. TF Hope Historical Summary Documentation.

FEMA Joint Policy, Disaster Support Ice Policy, Jul. 3, 2008 (JP9523.20). OH-MVD Files (electronic).

FEMA, News Release. "FEMA contracts to Provide Housing Relief for Displaced Hurricane Victims." Sept. 8, 2005. Author's personal files.

_____. "Tire Pickup Program Ends." Apr. 2, 2007. Louisiana Recovery Field Office (RFO) website (www.mvm.usace.army.mil/RFO/index.html).

_____. "FEMA's Private Property Debris Removal in the State Nears End." May 21, 2007. Louisiana RFO website (www.mvm.usace.army.mil/RFO/index.html).

"Hurricane Protection Office Implementation Concept," Presentation, N.P. TF Hope, N.D. TF Hope Historical Summary Documentation.

Issue Paper: Debris Removal, Contractor Ticketing – QA Inspections, October 6, 2005. TF Hope Historical Summary Documentation.

Issue Paper: Debris Removal, AshBritt Subcontracting Restructuring, October 6, 2005. TF Hope Historical Summary Documentation.

Katrina Plant Status. Oct. 22, 2005. OH-MVD Files (electronic).

Katrina Mission Summary. Jan. 10, 2008. OH-MVD Files (electronic).

Lake Pontchartrain and Vicinity and Westbank Sub-basins Report. Sept. 4-9, 2005. TF Hope Historical Summary Documentation, Vol. 2. Sept. 3-Oct. 21, 2005. OH-MVD Files (electronic).

"Louisiana and City of New Orleans – Debris Removal and Demolition Mission." Briefing, U.S. Army Corps of Engineers, February 23, 2006.

Louisiana, Office of the Governor. News Release. "Governor Blanco Declares State of Emergency." Aug. 26, 2005 (Author's Files).

Mississippi Emergency Management Agency, News Release. "Evacuation Traffic Expected to Increase on Interstates." Aug. 27, 2005. (www.msema.org).

"Mississippi Valley Division Hurricane Contingency Plan (CONPLAN)." MVD, May 18, 2005. OH-MVD Files (electronic).

MVD. "FRAGO 1 (TF UNWATER) to OPERATIONS ORDER 01-05 (HURRICANE KATRINA)." Vicksburg: MVD, Sept. 6, 2005.

MVD. "FRAGO 3 (TF GUARDIAN) to OPERATIONS ORDER 01-05 (HURRICANE KATRINA)." Vicksburg: MVD, Sept. 20, 2005.

MVD. "Katrina Navigation Status Cartoon." Presentation. Sept. 25, 2005. OH-MVD Files (electronic).

MVD. "MVD Forward Transition." Presentation. Nov. 22, 2005. OH-MVD Files (electronic).

MVD, Post Hurricane Katrina Navigation Status. Sept. 5, 2005-Jan. 26, 2006. OH-MVD Files (electronic).

MVD. "TF Hope Transition Strategy." Presentation. Oct.16, 2005. OH-MVD Files (electronic).

MVM. Definitions of Flood Control Terms (www.mvm.usace.army.mil/flood-control/Levees/berms.htm and relief_wells.htm).

MVN Commander's Weekly Report. Mar. 3-Sept. 24, 2006. TF Hope Historical Summary Documentation.

News Clips Summary. September 1 – 17, 2005; TF Hope Historical Summary Documentation.

Riley, Maj. Gen. Don T., "The Corps Response: Hurricane Katrina, Ophelia, Rita, & Wilma. Briefing, U.S. Army Corps of Engineers, October 26, 2005.

Situational Reports (SITREPs)/Daily Report, MVN. Dec. 29, 2005-Sept. 19, 2006. TF Hope Historical Summary Documentation.

Situational Reports (SITREPs), MVD. Sept. 4, 2005-May 16, 2006. OH-MVD Files (electronic).

Situation Reports (SITREPs), Task Force Guardian. October 1-November 3, 2005. TF Hope Historical Summary Documentation.

Situation Reports (SITREPs), Task Force Unwatering. October 1-23, 2005. TF Hope Historical Summary Documentation.

South Atlantic Division, "Draft Recovery Field Office Standard Operating Procedure." N.D. OH-MVD Files (electronic).

Status of Existing Pump Stations. September 2-7, 2005. TF Hope Historical Summary Documentation.

Status Briefing. September 2-14, 2005. TF Hope Historical Summary Documentation.

Task Force Guardian Commander's Report, Jan, 15-May 30, 2006. TF Hope Historical Summary Documentation.

Task Force Guardian Summary Commander's Report, June 13, 2006. TF Hope Historical Summary Documentation.

"Task Force Hope, 12 October 2005." Briefing, U.S. Army Corps of Engineers, October 12, 2005.

"Task Force Guardian, U.S. Army Corps of Engineers, New Orleans District." Briefing, December 8, 2005. OH-MVD Files (electronic).

Temporary Public Structures Mission Goals: Temporary School Building Request Status. October 30, 2005. TF Hope Historical Summary Documentation.

Unwatering Status. September 2-9, 2005. TF Hope Historical Summary Documentation.

Unwatering Mission Status. September 8 – October 21, 2005 (daily), November 4-December 24, 2005 (weekly). TF Hope Historical Summary Documentation.

"Update on the New Orleans Flood Fight." Vicksburg, MS: September 5, 2005. TF Hope Historical Summary Documentation.

"U.S. Army Corps of Engineers, New Orleans District, Project Update." September 8-9, 2005. TF Hope Historical Summary Documentation.

"U.S. Army Corps of Engineers Public Affairs Media Report: Hurricane Recovery Support, 23 December 2005." TF Hope Historical Summary Documentation.

USACE, NOD. Operations Order 01-05 (Hurricane Katrina). New Orleans: NOD, September 19, 2005. OH-MVD Files (electronic).

_____. Project Delivery Team Report. Sept. 8, 2005. OH-MVD Files (electronic).

USACE, News Release. "Army Corps of Engineers Makes Emergency Repairs to Industrial Canal Levees, Pumping Continues." New Orleans: U.S. Army Corps of Engineers, Task Force Hope, September 26, 2005. TF Hope Historical Summary Documentation.

_____. "Corps Launches Operation Blue Roof on Gulf Coast." Vicksburg: U.S. Army Corps of Engineers, Vicksburg District, September 6, 2005. TF Hope Historical Summary Documentation.

_____. "Corps Closes New Orleans Canals in Preparation for Severe Weather." New Orleans: U.S. Army Corps of Engineers, New Orleans District, September 21, 2005. TF Hope Historical Summary Documentation.

_____. "Corps Marks Halfway Point in Unwatering Mission." New Orleans: U.S. Army Corps of Engineers, New Orleans District, September 15, 2005. TF Hope Historical Summary Documentation.

_____. "Corps of Engineers Announces Five More Contracts To Rebuild Hurricane-Flood Protection System." New Orleans: U.S. Army Corps of Engineers, Task Force Hope, October 21, 2005. TF Hope Historical Summary Documentation.

_____. "Corps of Engineers to Restore Pre-Katrina Protection in New Orleans." New Orleans: U.S. Army Corps of Engineers, Task Force Hope, September 29, 2005. TF Hope Historical Summary Documentation.

_____. "Corps of Engineers Details Current Activity in Louisiana Hurricane Recovery." Baton Rouge: U.S. Army Corps of Engineers, Memphis District, September 10, 2005. TF Hope Historical Summary Documentation.

_____. "Corps Prepares for What Could Be Round Two as Rita Approaches." New Orleans: U.S. Army Corps of Engineers, New Orleans District, September 20, 2005. TF Hope Historical Summary Documentation.

_____. "Corps Prepares to Breach Levees to Help Drain N.O. Areas." New Orleans: U.S. Army Corps of Engineers, New Orleans District, September 2, 2005. TF Hope Historical Summary Documentation.

_____. "Critical Commodities Continue Into Disaster Areas While government Responds to Challenges of Most Catastrophic Disaster in U.S. History." Washington, D.C.: N.D. TF Hope Historical Summary Documentation.

_____. "Debris Removal Contracts Awarded for Hurricane Recovery Efforts." Washington, D.C.: U.S. Army Corps of Engineers, September 15, 2005. TF Hope Historical Summary Documentation.

_____. "District-sized Mississippi Response Team Stands up Almost Overnight." Vicksburg: U.S. Army Corps of Engineers, Vicksburg District, N.D. TF Hope Historical Summary Documentation.

_____. "Disaster Relief Support Continues." Camp Shelby, Miss.: U.S. Army Corps of Engineers, September 7, 2005. TF Hope Historical Summary Documentation.

_____. "Houma, La. Contractor Receives Levee Rebuilding Contract." New Orleans: October 12, 2005. TF Hope Historical Summary Documentation.

_____. "Katrina: one year later." Vicksburg: MVD, Aug. 25, 2006. TF Hope Historical Summary Documentation.

_____. "Lee becomes New Orleans district engineer." Jul. 20, 2007. (mvn.usace.army.mil).

_____. "LTG Van Antwerp Becomes Chief of Engineers and USACE Commander." May 17, 2007. (usace.army.mil).

_____. "Memphis Corps deactivates the Louisiana Recovery Field Office." Memphis: MVM, Sept. 30, 2005 (www.mvm.usace.army.mil).

_____. "The Mississippi River Commission: Celebrating 125 years of listening, inspecting and partnering on the Mississippi River." Oct. 21, 2004. www.mvd.usace.army.mil.

_____. "New Orleans begins to see results of recovery operations." New Orleans: U.S. Army Corps of Engineers, New Orleans District, September 11, 2005. TF Hope Historical Summary Documentation.

_____. "New Orleans Corps' District Announces Next Steps." Vicksburg: U.S. Army Corps of Engineers, Mississippi Valley Division, September 10, 2005. TF Hope Historical Summary Documentation, Vol. 1.

_____. "New Orleans water continues to recede over a foot a day." New Orleans: U.S. Army Corps of Engineers, New Orleans District, September 13, 2005. TF Hope Historical Summary Documentation.

_____. "Operation Blue Roof adds Gautier, Diamond Head, Hattiesburg, Bay St. Louis, Camp Shelby Center." Gulfport, MS.: U.S. Army Corps of Engineers, Mississippi RFO, September 14, 2005. TF Hope Historical Summary Documentation.

_____. "Progress Continues for Hurricane Katrina Cleanup Efforts." Washington, D.C.: U.S. Army Corps of Engineers, September 20, 2005. TF Hope Historical Summary Documentation.

_____. "Support Continues for Katrina Relief Efforts." Camp Shelby, Miss.: U.S. Army Corps of Engineers, September 6, 2005. TF Hope Historical Summary Documentation.

_____. "U.S. Army Corps of Engineers moves forward in disaster recovery efforts." Washington, D.C.: U.S. Army Corps of Engineers, September 11, 2005. TF Hope Historical Summary Documentation.

_____. "U.S. Army Corps of Engineers response to the 'Initial Comments on Interim (70%) IPET Study Report.'" Mar. 14, 2006. TF Hope Historical Summary Documentation.

_____. September 4, 2005. TF Hope Historical Summary Documentation.

_____. September 18, 2005. TF Hope Historical Summary Documentation.

Van Antwerp, Lt. Gen. Robert. "Louisiana RFO: Katrina-Rita Recovery." Presentation. May 2007. MVD-OH Files (electronic).

White House, News Release. "President Discusses Hurricane Katrina, Congratulates Iraqis on Draft Constitution," Aug. 28, 2005 (www.whitehouse.gov).

White House, Fact Sheet: "The Two Year Anniversary of Hurricane Katrina." Office of the Press Secretary, the White House. Aug. 29, 2007 (www.whitehouse.gov).

Williams, Randall. "Critical Issues for Hot Wash Brief." Dec. 19, 2005. OH-MVD Files (electronic).

Interviews

Accardo, Chris. By David Tajkowski. May 22, 2007.

Anderson, Bob et al. By Damon Manders. April 30, 2007.

Ashley, John. By Damon Manders. May 17, 2007.

Banks, Larry. By David Tajkowski. May 3, 2007.

Bertoglio, Greg. By Damon Manders. May 3, 2007.

Bleakley, Col. Albert. By David Tajkowski. May 30, 2007.

Colletti, Jerry. By Damon Manders. May 10, 2007.

Crear, Brig. Gen. Robert. By Damon Manders. May 29, 2007.

Crumholt, Kenny. By David Tajkowski. May 7, 2007.

Fogarty, John. By David Tajkowski. May 23, 2007.

Gapinski, Col. Duane. By David Tajkowski. May 10, 2007.

Hall, John. By Damon Manders. May 9, 2007.

Hannon, Jim. By Charles A. Camillo. Feb. 21, 2008.

Herr, Brett. By Damon Manders. March 11, 2008.

Hitchings, Dan. By Damon Manders. May 30, 2007.

Jackson, Susan. By Damon Manders. May 9, 2007.

Joseph, Jay. By Damon Manders. May 7, 2007.

Leonard, Stacey. By David Tajkowski. July 31, 2007.

Logue, Mike. By Damon Manders. May 1, 2007.

Lundberg, Denny. By David Tajkowski. May 24, 2007.

Manahan, Marvin. By David Tajkowski. July 25, 2007.

Miller, Gregory. By Damon Manders. Apr. 3, 2008.

Mosher, Reed. By Damon Manders. July 9, 2008.

Naomi, Al. By Damon Manders. May 7, 2007.

Park, Mike. By Damon Manders. May 11, 2007.

Riley, Maj. Gen. Don. By David Tajkowski, Damon Manders, and Charles Camillo. May 22, 2007.

Richie, Jeff. By David Tajkowski. May 10, 2007.

Setliff, Col. Lewis. By David Tajkowski. May 1 and June 12, 2007.

Shadie, Charles. By David Tajkowski. May 24, 2007.

Sills, David. By Damon Manders. May 8, 2007.

Smithers, Col. Charles. By Damon Manders. June 13, 2007.

Starkel, Lt. Col. Murray. By Damon Manders. May 10, 2007.

Vesay, Col. Antony. By Damon Manders. May 31, 2007.

Waddle, Jimmy. By Damon Manders. June 26, 2007.

Wagenaar, Col. Richard. By David Tajkowski. May 9, 2007.

Wagner, Joey. By Damon Manders. May 25, 2007.

Ward, Jim. By Damon Manders. May 30, 2007.

Wurtzel, John. By David Tajkowski. May 8, 2007.

Periodicals

Alexandria Daily Town Talk.

Arizona Daily Star (Tucson).

Associated Press.

Baton Rouge Advocate.

BBC News.

Beaumont Enterprise.

Biloxi Sun Herald.

Bloomberg News.

Charlotte News and Observer.

Chicago Tribune.

Christian Science Monitor.

CNN.com.

Congressional Quarterly.

Dallas Morning News.

Dayton Daily News.

Duluth News-Tribune.

Engineer Update.

Engineering News Record.

Environmental Science and Technology Online News.

Fort Worth Star-Telegram.

Government Executive.

International Herald Tribune.

Jackson Clarion Ledger.

Knight Ridder.

Los Angeles Times.

Memphis Commercial Appeal.

Miami Herald.

Mississippi Press.

MSNBC.

NBC News.

Newsday.

Newshouse News Service.

New Orleans Advocate.

New Orleans City Business.

New Orleans Times-Picayune.

New York Times.

NOAA News.

Popular Science.

Riverside.

Salon.

Scripps Howard News Service.

Scientific American.

Slidell Daily Sentry-News.

South Mississippi Sun Herald.

Stars and Stripes.

St. Bernard News.

St. Bernard Voice.

USA Today.

Wall Street Journal.

Washington Post.

Regulations

USACE. Engineering Regulation (ER) 500-1-1: Civil Emergency Management Program. Sept. 30, 2001.

USACE. ER 415-1-11: Construction - Biddability, Constructibility, Operability and Environmental Review. Sept. 1, 1994.

Reports, Published

Anderson, Christine et al. Hurricane Katrina: One Year Later. What Must We Do Next? N.P.: American Society of Civil Engineers (ASCE), 2006.

Blake, Eric S.; Rappaport, Edward N.; and Landsea, Christopher W. The Deadliest, Costliest, and Most Intense United States Tropical Cyclones from

1851 to 2006 (and Other Frequently Requested Hurricane Facts). Miami, Fla.: National Weather Service, National Hurricane Center, April 2007.

"Climate of 2004 – August in Historical Perspective." National Climatic Data Center, September 2005. NCDC Web site (lcf.ncdc.noaa.gov).

Department of Homeland Security. National Response Plan. N.P.: Department of Homeland Security, December 2004.

_____, Office of Inspector General. A Performance Review of FEMA's Disaster Management Activities in Response to Hurricane Katrina. N.P.: Office of Inspections and Special Reviews, March 2006.

Emergency Management Assistance Compact (EMAC). 2005 Hurricane Season Response After-Action Report. N.P.: EMAC, Sept. 19, 2006.

Gulf Intracoastal Canal Association, "Gulf Coast Intracoastal Waterways Joint Hurricane Response Protocol," N.P., June 5, 2007.

Knabb, Richard D.; Rhome, Jamie R.; and Brown, Daniel P. "Tropical Cyclone Report: Hurricane Katrina, 23-30 August 2005. National Hurricane Center, 20 December 2005.

Rappaport Edward N. and Fernandez-Partagas, Jose. "The Deadliest Atlantic Tropical Cyclones, 1492-1996," NOAA Technical Memorandum NWS NHC 47. May 28, 1995. Updated April 22, 1997 by Jack Beven.

Seed, R.B., et al. Investigation of the Performance of the New Orleans Flood Protection Systems in Hurricane Katrina on August 29, 2005, Vol. I, Main Text and Executive Summary. N.P.: National Science Foundation, July 31, 2006. Final Report.

_____. Preliminary Report on the Performance of the New Orleans Levee Systems in Hurricane Katrina on August 29, 2005. N.P.: National Science Foundation, November 17, 2005. Preliminary Report.

U.S. Army Corps of Engineers (USACE). Integrated Final Report to Congress and Legislative Environmental Impact Statement for the Mississippi River-Gulf Outlet Deep-Draft De-authorization Study. N.P., USACE, Nov. 2006.

_____. Interim Report: Mississippi Coastal Improvements Program (MsCIP) Hanncock, Harrison, and Jackson Counties, Mississippi. N.P.: USACE, Aug. 2006.

_____. Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System Draft Final Report of the Interagency Performance Evaluation Task Force, Volume I – Executive Summary and Overview, 1 June 2006, FINAL DRAFT. N.P.: USACE, Jun. 2007.

_____. Performance Evaluation of the New Orleans and Southeast Lousiana Hurricane Protection System, Vol. VIII, Engineering and Operational Risk and Reliability Analysis, Interim Draft Report. N.P.: USACE, Nov. 2007.

_____. Mississippi River Gulf Outlet Deep-Draft De-Authorization Interim Report to Congress. N.P.: USACE, Dec. 2006.

_____. "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane/Shore Protection Projects, Chalmette Area Plan," Oct. 18, 2005.

_____. "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane/Shore Protection Projects, Chalmette Area Plan, Amendment No.

1 (Addition of Repair Work to the Verret to Caernarvon Levee and revision of overall cost estimates)," Nov. 30, 2005.

_____. "Project Information Report, PL 84-99 Rehabilitation of Hurricane or Shoreline Protection Project, New Orleans East," October 19, 2005.

_____. "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane or Shore Protection Projects from Hurricane Katrina, Orleans East Bank," Oct. 18, 2005.

_____. "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane or Shore Protection Projects from Hurricane Katrina, Orleans East Bank," Revision #01," Jan. 20, 2006.

_____. "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane/Shore Protection Projects, Chalmette Area Plan, Revision No. 3 (Addition of Repair Work to the Verret to Caernarvon Levee and revision of overall cost estimates)" Dec. 13, 2005.

_____. "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane or Shore Protection Projects, Plaquemines," Oct. 17, 2005.

_____., "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane or Shore Protection Projects, Plaquemines, Revision #1," Jan. 05, 2006.

USACE, New Orleans District (NOD). 2006 Louisiana Coastal Protection and Restoration: Preliminary Technical Report to United States Congress. New Orleans: NOD, July 2006.

_____. Summary Report: Louisiana Coastal Protection and Restoration Project (LACPR) Engineering Technical Approaches and Innovations Workshop. N.P.: USACE, March 2006.

Van Heerden, Ivor, et al. (Team Louisiana). The Failure of the New Orleans Levee System during Hurricane Katrina. Baton Rouge: Louisiana Department of Transportation and Development, December 18, 2006.

Woolley, Douglas; and Shabman, Leonard. "Decision-Making Chronology for the Lake Pontchartrain and Vicinity Hurricane Protection Project," Final Draft Report. USACE-IWR, June 2007.

State Documents

Louisiana, Revised Statutes (2006), 38:330.1.

Mississippi Executive Order 939, Mississippi Governor website (www.governorbarbour.com).

Transcripts

"CNN Interview with Lieutenant General Carl Strock." N.P.: CNN, Aug. 31, 2005.

"Defense Department Briefing on Hurricane Katrina Repairs; Presenter: Commander, U.S. Army Corps of Engineers Lt. Gen. Carl Strock." Washington, D.C.: U.S. Department of Defense News Transcript, September 15, 2005.

"Defense Department Special Briefing with Lt. Gen. Carl Strock – Hurricane Support." Washington, D.C.: U.S. Department of Defense News Transcript, October 6, 2005.

"FTS-USACE (Roundtable)." Washington, D.C.: CNN, September 2, 2005.

"Investigating Broken Levees: The Army Corps of Engineers sent a team of engineers to investigate the New Orleans levee failures after Hurricane Katrina." N.P.: PBS NewsHour with Jim Lehrer, October 20, 2005.

Williams, Brian. "Army: 'You can hold the Corps accountable.'" MSNBC transcript. N.P.: MSNBC, Thurs., June 1, 2006.

Unpublished Manuscripts

Manders, Damon. "The Bayou Builders: A History of the U.S. Army Corps of Engineers, New Orleans District, 1976 – 2000." Huntsville, Alabama: Alabama A&M Research Institute, August 2002.

Video and Multimedia

Lee, Spike. "When the Levees Broke: A Tragedy in Four Acts." Home Box Office Productions: 2006.

Endnotes

[1] Eric S. Blake, Edward N. Rappaport, and Christopher W. Landsea, The Deadliest, Costliest, and Most Intense United States Tropical Cyclones from 1851 to 2006 (and Other Frequently Requested Hurricane Facts) (Miami: Fla.: National Weather Service, National Hurricane Center, April 2007): 5.

[2] Popular treatments of the storm include Douglas Brinkley, The Great Deluge: Hurricane Katrina, New Orleans, and the Mississippi Gulf Coast (New York: William Morrow, 2006), which provides an excellent overview of the first week; Christopher Cooper and Robert Block, Disaster: Hurricane Katrina and the Failure of Homeland Security (New York: Times Books, 2006), which focuses mostly on the story of FEMA and its failures; Michael Eric Dyson, Come Hell or High Water: Hurricane Katrina and the Color of Disaster (New York: Basic Civitas, 2006), which examines race issues in the storm; Jed Horne, Breach of Faith: Hurricane Katrina and the Near Death of a Great American City (New York: Random House, 2006), which looks specifically at the impact on New Orleans; Mike Tidwell, The Ravaging Tide: Strange Weather, Future Katrinas, and the Coming Death of America's Coastal Cities (New York: Free Press, 2006), which reviews the storm and its environmental causes; and Ivor Van Heerden and Mike Bryan, The Storm: What Went Wrong and Why During Hurricane Katrina – the Inside Story from One Louisiana Scientist (New York: Viking Press, 2006), a sometimes polemical look at the science behind the storm, levee failures, and wetland loss. On news coverage, see Brinkley comments on p. xvii.

[3] The Saffir/Simpson Scale is a method developed by the National Hurricane Center in the early 1970s to measure storms based primarily on wind speed. Wind speed and tidal surge, respectively, for each category are Category 1: 74-95 mph, 4-5 ft.; Category 2: 96-110 mph, 6-8 ft.; Category 3: 111-130 mph, 9-12 ft.; Category 4: 131-155 mph, 13-18 ft.; Category 5: 155+ mph, 18+ ft.

[4] Blake, Rappaport, and Landsea, p.p. 13-14; "Climate of 2004 – August in Historical Perspective," National Climatic Data Center, September 2005, NCDC website (lcf.ncdc.noaa.gov); Interview with Albert Bleakley, by David Tajkowski, May 30, 2007; Brinkley, p. 75. On the dispute over global warming, compare "Katrina's Awful Wake," Wall Street Journal editorial (Wed., Sept. 1, 2005) with Tidwell, The Ravaging Tide, p. 98 and Bayou Farewell: The Rich Life and Tragic Death of Louisiana's Cajun Coast (New York: Vintage Books, 2004), in which he predicts hurricane flooding. For a summary of the conflict over subsidence and hurricane protection, see Todd Shallat, "Holding Louisiana," Technology and Culture (Jan. 2006): 102-107. Unless otherwise noted, periodicals cited were online editions, in which page numbers of the printed versions were unavailable.

[5] NHC, "Bulletin: Hurricane Katrina Advisory 1 – 31." 5 PM EDT Tues. Aug. 23, 2005 – 10 AM CDT Tues. Aug. 30, 2005. Hurricane Katrina Advisory Archive on the NHC website (www.nhc.noaa.gov).

[6] USACE, 2006 Louisiana Coastal Protection and Restoration (LACPR): Preliminary Technical Report to United States Congress (New Orleans: NOD, July 2006): iii, 12-14; Tidwell, pp. 27-2; Cooper and Block, pp. 4-16. See also "National Planning Scenarios" (N.P.: Homeland Security Council, 2005): 10-1.

[7] White House, "President Discusses Hurricane Katrina, Congratulates Iraqis on Draft Constitution," news release, Aug. 28, 2005; Lousiana Office of the Governor, "Governor Blanco Declares State of Emergency," news release, Aug. 26, 2005; Mississippi Executive Order 939, Mississippi Governor website (www.governorbarbour.com); Brinkley, pp. 5-8; The Storm, pp. 43-50; quote from Cooper and Block, p. 97; Mississippi Emergency Management Agency, "Evacuation Traffic Expected to Increase on Interstates, " news release, Aug. 27, 2005.

[8] Brinkley, pp. 129-133; Horne, p. 44; NHC, "Hurricane Katrina Advisory 1 – 31". The dispute over the size of the storm continues unabated; compare Van Heerden et al. (Team Louisiana), The Failure of the New Orleans Levee System during Hurricane Katrina (Baton Rouge: Louisiana Department of Transportation and Development, December 18, 2006): 29; and USACE, Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System Draft Final Report of the Interagency Performance Evaluation Task Force (IPET), Volume I – Executive Summary and Overview, 1 June 2006, FINAL DRAFT: 1-20 and 1-21. See also Richard D. Knabb, Jamie R. Rhome, and Daniel P. Brown, "Tropical Cyclone Report: Hurricane Katrina, 23-30 August 2005" (NHC, 20 Dec. 2005): 4-10, 18.

[9] John Pain, "Hurricane Katrina Hit as Category 3, Not 4," AP (Tues., Dec. 20, 2005); Debi Iacovelli, "The Saffir/Simpson Hurricane Scale: An Interview with Dr. Robert Simpson." Mariners Weather Log 43:1 (April 1999): 10-12, quote on p. 11.

[10] IPET, pp. 1-20 to 1-22, IV-8-19, 119-120, IV-5-63-65; Team Louisiana, pp. 25-46; The Storm, p. 85; R.B. Seed et al., Investigation of the Performance of the New Orleans Flood Protection Systems in Hurricane Katrina on August 29, 2005 (ILIT), Vol. I, Main Text and Executive Summary (N.P.: National Science Foundation, July 31, 2006, Final Report): 2-3 – 2-26; Knab et al, pp. 4-10; Horne, pp. 369; 2-4 - 2-6, 2-21 - 2-26.

[11] Patrick J. Fitzpatrick, Hurricanes: A Reference Handbook, 2nd ed.. Contemporary World Issues (Santa Barbara: ABC-CLIO, 2006): 2-11, 25-30; Kerry Emmanuel, Divine Wind: The History and Science of Hurricanes (New York: Oxford University Press, 2005): 83.

[12] Pam Easton, "Rita Could Be Strongest Storm to Hit Texas," AP (Thurs., Sept. 22, 2005); Jamieson quote in Beth Gallaspy, "Giving a storm its due," Beaumont Enterprise (Mar. 24, 2006); Alan Sayre, "On heels of hurricane, southern Louisiana suffering from drought," AP (Fri., Apr. 21, 2006); "Commander's Briefings, Katrina," Sept. 24-25, Oct. 17-22, 2005 (Charles Camillo, ed., Task Force Hope Hist. Sum. Doc., N.P. USACE, MVD, Aug. 2005-Apr. 2007 or TF Hope).

[13] A breach is a hole, rupture, collapse, or gap in a structure that sometimes occurs during a flooding event. A failure is a breach or collapse caused by a structure not performing as designed. Overtopping occurs when water flows over the top of a structure and can cause erosion, usually on the landside, that sometimes leads to a breach. A notch is an intentional breach used to lower water levels, usually flood water, from inside an area protected by a levee or floodwall. However, an intentional breach can also remove excessive rainfall from inside protected areas that have not been flooded by high river levels or coastal storm surges as well as protect adjacent downstream levee systems.

[14] Blanco quoted in Brinkley, p. 214; Ann Carrns et. al., "As U.S. Mobilizes Aid, Katrina Exposes Flaws in Preparation," Wall Street Journal (Thurs., Sept. 1, 2005).

[15] Knabb et al., p. 10; Brinkley, pp. 628-633.

[16] Compare Brinkley, pp. 625-637; The Storm, pp. 93-95; Team Louisiana, pp 54-55, 93-94; IPET, pp. I-4, 30-32, 164-201; ILIT, pp. 2-5 to 2-10. Brinkley focuses mostly on times reported, not on evidence of failure.

[17] Wagenaar quoted in "Engineers tackle disaster aftermath," Engineer Update (Oct. 2005); Interview with Lt. Col. Murray Starkel, by Damon Manders, May 10, 2007; Cooper and Block, pp. 133-142; Brinkley, pp. 142, 404, 625-637; The Storm, pp. 94-95; Team Louisiana, pp. 54-5, 89, 93-4; IPET, 4, pp. 164-201; ILIT 1-7, 2-5 to 2-10.

[18] E-mail, Stephen Gambrell to John Grieshaber et al., Aug. 31, 2005 (TF Hope); Susan Glasser and Michael Grunwald, "The Steady Buildup to a City's Chaos," Washington Post (Sun., Sept. 11, 2005); John McQuaid, "Anatomy of a Disaster," Newshouse (Tues., Sept. 27, 2005); Tara Young, "Rumor of levee dynamite persists," Times-Picayune (Mon., Dec. 12, 2005); Cooper and Block, pp. 133-142; Brinkley, pp. 142, 404, 625-637; The Storm, pp. 94-95; Team Louisiana, pp. 54-5, 89, 93-4; IPET, 4, pp. 164-201; ILIT, pp. 1-7, 2-5 to 2-10. IPET since produced models showing different times: IHNC East 4:30, 17th St. 6:30 to 9:00, London Ave. East 7-7:30, West 7-8:00, and IHNC West 7:00 a.m. Team Louisiana generally places the breaches much later, and places the south breach of the IHNC before the north. According to Maj. Gen. Don Riley, stabilization actually occurred on Tues., with further inflow due to tides; Riley to Camillo, Apr. 23, 2008.

[19] Interview with Maj. Gen. Don Riley, by David Tajkowski, Damon Manders, and Charles Camillo, May 22, 2007.

[20] Blake et. al., p. 9; LACPR, pp. 12-13; Brinkley, pp. 33, 173, 556; Dyson, pp. 3-7; Horne, p. 423; IPET, pp. 1-8, 1-38, VII-169; Commander's Briefing, Aug. 31, 2005 (TF Hope); Commander's Assessment, Sept. 2, 1995 (TF Hope); Richard Pyle, "Commander of the Army's Corps of Engineers reviews Katrina," AP (Fri., Sept. 1, 2006).

[21] "Surviving the storm: Personal accounts from MVN employees," Riverside (Special Edition 2005): 24-27; Interview with James Waddle, by Damon Manders, June 26, 2007; Interview with Joey Wagner, by Damon Manders, May 25, 2007.

[22] DHS, Office of Inspector General, A Performance Review of FEMA's Disaster Management Activities in Response to Hurricane Katrina (N.P.: Office of Inspections and Special Reviews, March 2006): 5; Tidwell, pp. 64-70; ILIT, p. xix, 2-8; IPET, pp. VII-62-84; "Death Toll from Katrina Likely Higher than 1300," MSNBC (Fri., Feb. 10, 2006); Mary Foster, "Experts: Katrina death toll still rising," AP (Sat., June 2, 2007).

[23] Tidwell, pp. 64-70; Cooper and Block, pp. 322-3; ILIT, p. xix, 2-8; IPET, pp. VII-62-84, VII-4-130-131; John Simerman, Dwight Ott, and Ted Mellnik, "Deaths from levee breaches broken down," Knight Ridder (Mon., Jan. 2, 2005). However, African Americans as a whole were 20 percent more likely to see flooding based on residency.

[24] Brinkley, pp. 386-7, 556; Commander's Briefing, Aug. 30, 2005 (TF Hope).

[25] Brinkley, pp. 366-386, 415-421, 499-507, 599.

[26] Interview with Col. Richard Wagenaar, by David Tajkowski, May 9, 2007.

[27] Interview with Wagenaar; Interview with Brig. Gen. Robert Crear, by Damon Manders. May 29, 2007; Interview with Bleakley; Interview with David Sills, by Damon Manders, May 30, 2007; Commander Assessment, Aug. 30, 2005 (TF Hope).

[28] Interview with Riley; Interview with Wagenaar; Diana Fredlund, "Emergency team rides out the storm," Riverside (Sp. Ed., 2005): 3-4.

[29] Interview with Wagenaar; Diana Fredlund, "Emergency team rides out the storm," Riverside (Sp. Ed., 2005): 3-4; Brinkley, p. 196; Cooper and Block, p. 104; The Storm, pp. 103-120.

[30] DHS OIG, pp. 6, 33; Cooper and Block, pp. 131-159; Mark Hosenball, "Katrina's Paper Trail," Newsweek (Jan. 30, 2006); "Files Show White House Knew Levees Had Failed on First Day," AP (Fri., Feb. 10, 2006); Lou Dolinar, "Katrina: what the Media Missed," Real Clear Politics (May 23, 2006).

[31] "Mississippi Valley Division Hurricane Contingency Plan (CONPLAN)," May 18, 2005, (OH-MVD).

[32] Interview with Wagenaar; Fredlund, "Emergency team," pp. 3-4; Brinkley, p. 196; Cooper and Block, p. 104; The Storm, pp. 103-120.

[33] Interview with Crear; Interview with Col. Antony Vesay, by Damon Manders. May 31, 2007; Interview with Col. Charles Smithers, by Damon Manders, Jun. 13, 2006; Commander's Briefing, Aug. 30-Sept. 4, 2005; Commander's Assessment, Aug. 30-Sept. 4, 2005, Crear quote from Aug. 30 (TF Hope); e-mail, Riley to Strock et. al., Aug. 30, 2005; IPET, p. 1-31 to 1-38; Interview with Larry Banks, by David Tajkowski, May 3, 2007.

[34] Interview with Vesay.

[35] Interview with Wagenaar CONPLAN; IPET, pp. VI-34.

[36] CONPLAN (OH-MVD); Interview with Crear; Interview with Wagenaar; "FTS-USACE (Roundtable)"; Commander's Briefing, Aug. 30-Sept. 4, 2005; Commander's Assessment, Aug. 30-Sept. 4, 2005, (TF Hope); Riley to Strock, Aug. 30, 2005; Horne, p. 370; Glasser and Grunwald, "Steady Buildup"; David Rogers and Jackie Calmes, "Washington gears up for disaster relief," Wall Street Journal (Thurs., Sept. 1, 2005); Interview with Banks.

[37] Commander's Assessment, Sept. 23-24, 2005; Commander's Briefing, Sept. 23-25, 2005 (TF Hope); Dwight Ott et. al., "New Orleans flooding: 'back to square one,'" Knight Ridder (Sat., Sept. 24, 2005); Allen Breed, "New Orleans' Levee System Strained Further," AP (Sat., Sept. 24, 2005); Ceci Connolly and Michael Grunwald, "New Surge Spills Over Repaired Levees," Washington Post (Sat., Sept. 24, 2005); LACPR, p. 13.

[38] William Irwin, "Readiness 2000 tested by storms," Engineer Update (Oct. 1998).

[39] Interview with Crear; Interview with Dan Hitchings, by Damon Manders, May 8, 2007; "The Mississippi River Commission: Celebrating 125 years of listening, inspecting and partnering on the Mississippi River," USACE News Release, Oct. 21, 2004 (www.mvd.usace.army.mil); Corps Facts: Mississippi River Commission, Jul. 29, 2004 (www.mvp.usace.army.mil).

[40] CONPLAN.

41 Interview with Wagenaar; Interview with Crear; Interview with Bleakley; Interview with Sills; Commander Assessment, Aug. 30, 2005.

42 James Stark, Memorandum to Brig. Gen. Robert Crear, ESF#3 Transition/ Mission Close Out Plan – Hurricane Katrina (FEMA Louisiana Transitional Recovery Office: N.D. MVD); Interview with Crear; Interview with Wagenaar; Interview with Vesay; Interview with Smithers; Commander Assessment, Sep. 3, 2005; Crear quote from Commander Briefing, Sept. 4, 2005.

43 Interview with Crear; Interview with Wagenaar; "Greatest Disaster, Greatest Response," Engineer Update (Nov. 2005); Commander Assessment, Sep. 3, 2005; Riley, "To all the Corps Team," draft letter, N.D.,; Riley e-mail to Ed Hecker, Subject: Presidential Visit, Sept 2, 2005 (OH-MVD).

44 DHS, National Response Plan (N.P.: DHS, Dec. 2004): ESF-v; Interview with Crear; Interview with Wagenaar; "Defense Department Briefing on Hurricane Katrina Repairs; Presenter: Commander, U.S. Army Corps of Engineers Lt. Gen. Carl Strock" (Washington, D.C.: U.S. DOD News Transcript, September 15, 2005); Commander Assessment, Sept. 4, 2005; "Task Force Hope, 12 October 2005" (Briefing, U.S. Army Corps of Engineers, October 12, 2005); MVD, "FRAGO 1 (TF UNWATER) to OPERATIONS ORDER 01-05 (HURRICANE KATRINA)" (Vicksburg: MVD, Sept. 6, 2005); MVD, "FRAGO 3 (TF GUARDIAN) to OPERATIONS ORDER 01-05 (HURRICANE KATRINA)," (Vicksburg: MVD, Sept. 20, 2005) (OH-MVD).

45 Interview with Crear; TF Hope Briefing, Oct. 12, 2005; Commander Assessments, Sept. 4, 2005 – April 2007 (TF Hope).

46 Post Hurricane Katrina Navigation Status, Sept. 5-Oct. 25, 2005; Katrina Plant Status Oct. 22, 2005; Equipment List, Sept. 26, 2005; Commander Assessment, Oct. 15, 2005; Command Briefing, Sept. 3, Oct. 23, 2005, Jan. 10, 2006; MVN SITREP, Jan. 31, Mar. 3, 2006; Daniel MacHalaba, "Hurricane Damage to Gulf Ports Delays Deliveries, Raises Costs," Wall Street Journal (Mon., Oct. 3, 2005).

47 Interview with Bleakley; Interview with Mike Logue, by Damon Manders, May 1, 2007; Interview with Bob Anderson et. al., by Manders, Apr. 30, 2007; Interview with John Hall, by Manders, May 9, 2007, Interview with Susan Jackson, by Manders, May 9, 2007; Interview with Al Naomi, by Manders, May 7, 2007; Interview with Jerry Colletti, by Manders, May 10, 2007.

48 Interview with Wagenaar; Interview with Starkel; Interview with Jackson; Commander Briefing, Sept. 4-19, 2005; Commander Assessment, Sept. 19, 2005; "Engineers tackle disaster aftermath," Engineer Update (Oct. 2005); "Disaster, Response," Engineer Update.

49 Commander Briefing, Sept. 29, 2005-Oct. 18, 2005; Commander Assessment, Nov. 3, 2005; NOD, "OPERATIONS ORDER 01-05 (HURRICANE KATRINA)" (New Orleans: NOD, Sept. 19, 2005) (OH-MVD).

50 Interview with Crear; Interview with Wagenaar; Interview with Bleakley; Interview with Starkel; Breerwood quote from "Carrollton Gage," Riverside (January 2006): 2; Commander Briefing, Oct. 24, 2005; Crear quote from Commander Assessment, Sept. 6, 2005 (TF Hope).

51 Interview with Crear; Interview with Bleakley; MVD, "MVD Forward Transition," (Presentation, Nov. 22, 2005); MVD, "TF Hope Transition Strategy" (Presentation, Oct.16, 2005), (OH-MVD).

52 Interview with Jim Ward, by Damon Manders, May 30, 2007.

[53] NRP, pp. i-x.

[54] NRP, pp. 10-12; MG Don Riley, "The Corps Response," Presentation (N.P.: USACE, Oct. 26, 2005) (OH-MVD).

[55] Riley, PPT.

[56] Nagin quoted in "Lt. Gen. Honore a 'John Wayne dude,'" CNN (Sat., Sept. 3, 2005); Honore quoted in Patrick Jonsson, "A Native Son Takes Charge in Gulf Coast," Christian Science Monitor (Sept. 9, 2005); Commander Briefing, Sept. 2-Oct. 12, 2005 (TF Hope).

[57] U.S.C., Title 33, Ch. 701n; Engineering Regulation, 500-1-1.

[58] Damon Manders, "The Bayou Builders: A History of the U.S. Army Corps of Engineers, New Orleans District, 1976 – 2000," unpublished manuscript (Huntsville, Alabama: Alabama A&M Research Institute, August 2002): 11-131.

[59] Angelle Bergeron et al., "Mission Incredible: Clean Up, Then Tear Down New Orleans," Engineering News Record (Mon., Feb. 20, 2006); Davis quoted in "Study: U.S. double-billed for Katrina work," AP (Fri., May 5, 2006); Interview with Riley; E-mail, Riley to Crear et al, Aug. 30, 2005 (OH-MVD).

[60] Manders, pp. 37-38; MVD, "Katrina Navigation Status Cartoon" (Presentation, Sept. 25, 2005) (OH-MVD).

[61] Manders, pp. 32-37; News Clips Summary. September 8, 2005 (TF Hope); Simon Romero, "A Barren Port Waits Eagerly for Its People," NYT (Thurs., Oct. 6, 2005).

[62] Post Hurricane Katrina Navigation Status, Sept. 5, 2005 (OH-MVD); Commander Assessment, Aug. 30 to Sept. 3, 2005 (TF Hope); Daniel Machalaba, "Hurricane Damage to Gulf Ports Delays Deliveries, Raises Costs," Wall Street Journal (Mon., Oct. 3, 2005); LaGrange quoted in Romero, "Barren Port."

[63] Commander Assessment, Aug. 30 to Sept. 3, 2005 (TF Hope); Interview with Starkel; the Coast Guard and NOAA formed the Maritime Recovery and Restoration Task Force on Sept. 16, after which the Corps coordinated with it – see www.marinelink.com/Story/ShowStory.aspx?StoryID=200319.

[64] Commander Assessment, Sept. 2-Sept. 29, 2005; News Release, "Critical Commodities Continue Into Disaster Areas," Sept. 2, 2005; News Release, Sept. 4, 2005; Press release, "Disaster Relief Efforts Continue," Sept. 12, 2005 (TF Hope); Daniel Machalaba, "For Pilots of Big Ships, The Mississippi Isn't What It Used to Be," Wall Street Journal (Mon., Nov. 28, 2005); quote from "Life on Mississippi turned upside down," AP (Tues., March 7, 2006).

[65] Post Hurricane Katrina Navigation Status, Sept. 5-Dec.20, 2005; Evan Eile, "Barge a contentious symbol of Hurricane Katrina," USA Today (Fri., Feb. 17, 2006); NOD Commander's Weekly Report, Feb. 17, 2006; MVN SITREP, Dec. 27, 2005 (TF Hope).

[66] Manders, p. 44; MVN SITREP, Dec. 27, 2005; Commander Assessment, Nov. 10, 16, Dec. 8, Jan. 12 (TF Hope).

[67] Post Hurricane Katrina Navigation Status, Sept. 5-Dec. 2, 2005; "Critical commodities"; Commander Briefing, Sept. 12, Nov. 11; Commander Assessment, Sept. 5-19; MVN Weekly Report, Mar. 15-Apr. 15, 2006 (TF Hope); USCG, "Marine Safety Bulletin: Status of the Inner Harbor Navigation Canal (IHNC)," Sept. 2005 (OH-MVD); Jaquetta White, "Corps wants to dredge canal," Times-Picayune (Fri., May 19, 2006).

[68] "Critical commodities"; Commander Assessment, Sept. 4-7, 2005; MVN SITREP, Jan. 19; MVN Commander Weekly Report, Mar. 25 (TF Hope); Post Hurricane Katrina Navigation Status, Sept. 5-25, 2005, Jan. 15, 24 (OH-MVD); Meghan Gordon, "Harvey Canal floodgates are expected by August," Times-Picayune (Tues., Mar. 7, 2006).

[69] Post Hurricane Katrina Navigation Status, Sept. 5-18 (OH-MVD); Commander Briefing, Sept. 18; Commander Assessment, Sept. 10-17 (TF Hope); "Louisiana Residents Blame Deaths on Canal They Sought to Close," Bloomberg News (Mon., Nov. 1, 2005); Matthew Brown, "Corps says it won't dredge the MR-GO," Times-Picayune (Tues., Nov. 22, 2005); Brown, "Just close MR-GO, the corps is urged," Times-Picayune (Tues., Sept. 5, 2006); Brown, "Shipping Interests pushing for MR-GO," Times-Picayune (Fri., Sept. 22, 2006); "Group: Close New Orleans Ship Channel," AP (Wed., Dec. 6, 2006); Mark Schleifstein, "Scientists criticize MR-GO report," Times-Picayune (Fri., Dec. 22, 2006; USACE, Mississippi River Gulf Outlet Deep-Draft De-Authorization Interim Report to Congress (N.P., USACE, Dec. 2006).

[70] "A small step on MR-GO," Times-Picayune editorial (Sat., Feb. 3, 2007); USACE, Integrated Final Report to Congress and Legislative Environmental Impact Statement for the Mississippi River-Gulf Outlet Deep-Draft De-authorization Study (N.P., USACE, Nov. 2006): viii-xxiii; Miller quoted in Paul Rioux, "Build rock dam to close Gulf Outlet, Corps urges," Times-Picayune (Wed., Jul. 4, 2007); Cain Burdeau, "Water bill benefits hurricane-hit Louisiana," Times-Picayune (Fri., Nov. 9, 2007).

[71] Commander Assessment, Sept. 23-Oct. 17, 2005; Commander Briefing, Sept. 23-Oct. 2 (TF Hope); Post Hurricane Katrina Navigation Status, Sept. 23-Dec. 20 (OH-MVD); John Hall, "Mermentau locks do their part before and after Hurricane Rita," Riverside (Sp. Ed. 2005): 18-19.

[72] Hall, "Mermentau locks do their part."

[73] Quote from Interview with Jim Hannon, by Charles A. Camillo, Feb. 21, 2008. On post-Katrina efforts to improve navigation, see Gulf Intracoastal Canal Association, "Gulf Coast Intracoastal Waterways Joint Hurricane Response Protocol," N.P., June 5, 2007 (OH-MVD).

[74] Cooper and Block, pp. 47-73.

[75] Cooper and Block, pp. 73-91, quote on 88; OIG, pp. 18-31, 81-86, 109-132.

[76] Cooper and Block, pp. 131-3; NRP, pp. 8-19, 22-39, ESF #3-1-8, ESF #6-1-8, ESF#14-1-6.

[77] OIG, pp. 2-28, 69-70; Cooper and Block, 97-133, 162-260; Dyson, pp. 89-96; Brinkley, pp. 233-266.

[78] Cooper and Block, pp. 120-133, 172-187; OIG, pp. 2-23; Brinkley, pp. 233-266, 386, 516.

[79] Brinkley, pp. 368-370, 415; Lou Dolinar, "Katrina: what the Media Missed," Real Clear Politics (May 23, 2006); Emergency Management Assistance Compact (EMAC), 2005 Hurricane Season Response After-Action Report (N.P.: EMAC, Sept. 19, 2006): EX 1.

[80] South Atlantic Division had, however, developed a draft SOP to which MVD referred, SAD, "Draft Recovery Field Office Standard Operating Procedure," N.D., (OH-MVD).

[81] Interview with Vesay; Interview with Logue; "Greatest Disaster, Greatest Response."

[82] James Bradley, History of the U.S. Army Corps of Engineers, Memphis District, 1998-2206 (Champaign, Ill.: ERDC-CERL, 2007): 2-4 to 2-21; Interview with Smithers; Interview with Jay Joseph, by Damon Manders, May 7, 2007; Interview with John Ashley, by Manders, May 17, 2007; Interview with Mike Park, by Damon Manders, May 11, 2007; Interview with Anderson; Commander Assessment, Sept. 13, 2005; Commander Briefing, Sept. 9, Oct. 13, 2005 (TF Hope); "Greatest Disaster."

[83] Interview with Vesay.

[84] Interview with Smithers; Interview with Park; Interview with Anderson; Commander Assessment, May 16, July 5, 2006; Commander Briefing, Apr. 25, 2006 (TF Hope); "Greatest Disaster."

[85] Quotes from Bradley, pp. 2-1, 2-13.

[86] FEMA News Release, "FEMA contracts to Provide Housing Relief for Displaced Hurricane Victims," Sept. 8, 2005; California Department of Social Services, "Katrina Housing Area Command," (CDSS Disaster Planners and Managers: www.cdsscounties.ca.gov); OIG, pp. 35-37; Commander Briefing, Sept. 11, 2005 (TF Hope).

[87] Commander Briefing, Sept. 5-19, 2005 (TF Hope).

[88] Stark, Close Out Plan – Katrina (OH-MVD); Commander Assessment, Aug. 30-Sept. 7, 2005; Katrina Mission Summary, Jan. 10, 2008; Commander Briefing, Sept. 15-Oct. 23, 2005; Mar. 18, 2006; Commander Assessment, Mar. 18, 2006 (TF Hope); OIG, pp. 35-43; Bill Walsh, "Senators say recovery moving at snail's pace," Times-Picayune (Wed., Jan. 18, 2006); "Who's to Blame for Katrina's Aftermath?"; "Gov't Fulfills Few Katrina Promises," AP (Sat., Aug. 19, 2006); Horne, pp. 214-215, 334-6; Leslie Eaton, "FEMA sets date for closing Katrina trailer camps," NYT (Wed., Nov. 27, 2007).

[89] Commander Briefing, Oct. 27, Nov. 16, 2005; MVN SITREP, Feb. 21, 2006; Commander Assessment, Mar. 21, 28, Apr. 4, Sept. 26, 2006; MVN SITREP, Feb. 21, 2006 (TF Hope); LACPR, passim.

[90] Commander Briefing, Sept. 19, 2005 (TF Hope).

[91] Stark, Close Out Plan – Katrina (OH-MVD); Commander Assessment, Aug. 30-Sept. 7, 2005; Katrina Mission Summary, Jan. 10, 2008; Commander Briefing, Sept. 6-7 2005; News Releases, "Critical commodities Continue Into disaster Areas while government Responds to Challenges of Most Catastrophic Disaster in U.S. History" (Wash., D.C.: Sept. 2, 2005); "Support Continues for Katrina Relief Efforts" (Camp Shelby, Miss.: USACE, Sept. 6, 2005).; "Disaster Relief Support Continues" (Camp Shelby: USACE, Sept. 7, 2005) (TF Hope).

[92] Commander Assessment, Sept. 7-20, 2005; Commander Briefing, Sept. 9-20 (TF Hope); "Defense Department Briefing on Hurricane Katrina Repairs; Presenter: Commander, U.S. Army Corps of Engineers Lt. Gen. Carl Strock," (Washington, D.C.: DOD News Transcript, Sept. 15, 2005); News Release, "Katrina: one year later" (Vicksburg: MVD, Aug. 25, 2006). "Memphis District leads thousands in response," (www.mvm.usace.army.mil/ RFO/aboutRFO.html).

[93] OIG, pp. 70-75; Williams, "Critical Issues for Hot Wash Brief," pp. 5-6.

[94] Stark, Close Out Plan(OH-MVD); Commander Assessment, Sept. 3-Oct. 30, 2005; Katrina Mission Summary; Commander Briefing, Sept. 5-Oct. 30, Nov. 18, 2005 (TF Hope); "Katrina: one year later"; "Memphis District leads thousands."

[95] Interview with Greg Bertoglio, by Damon Manders, May 3, 2007; Interview with Waddle.

[96] Stark, Close-Out Plan (OH-MVD); Katrina Mission Summary; Commander Assessment, Sept. 4-28; Commander Briefing, Sept. 4-28 (TF Hope); News Releases, "Corps Launches Operation Blue Roof on Gulf Coast" (Vicksburg: U.S. Army Corps of Engineers, Vicksburg District, September 6, 2005); "Operation Blue Roof adds Gautier, Diamond Head, Hattiesburg, Bay St. Louis, Camp Shelby Center" (Gulfport, MS.: U.S. Army Corps of Engineers, Mississippi RFO, September 14, 2005 (TF Hope); Amanda Jones, "To Clean and Protect," Riverside (Sp. Ed. 2005): 4-5; Natalie Chambers, "Blue roofs falling apart," Mississippi Press (Fri., Jan. 13, 2006).

[97] Commander Assessment, Sept. 30-Nov.17, Dec. 8, 2005; Jan. 8, Feb. 2, 19, 2006; Commander Briefing, Sept. 30-Nov. 17, Dec. 9, 2005 (TF Hope); "Katrina: one year later"; James Varney and Gordon Russell, "Blue roof costs have critics seeing red," Times-Picayune (Sun., Feb. 19, 2006); Steve Ritea, "Blue roof effort ends," Times-Picayune (Fri., Mar. 10, 2006).

[98] Stark, Close-Out Plan (OH-MVD); Commander Assessment, Sept. 8-Oct. 19, Nov. 28, 2005; Commander Briefing, Oct. 2, 28, Dec. 2, 16, 2005 (TF Hope); Brinkley, p. 571.

[99] Command Briefing, Sept. 9-Oct. 8, 2005; News Clips Summary, Sept. 10, 2005; Commander Assessment, Sept. 14, 2005 (TF Hope).

[100] Stark, Close-Out Plan (OH-MVD); Commander Assessment, Sept. 20-24, Oct, 14, Nov. 22, 2005, Jan. 24, 29, May 2, 2006; Commander Briefing, Oct. 6, 18, Nov. 2, 16, 2005, Feb. 7, 14, 21, 2006; MVN SITREP, Jan. 12, 2006; Fact Sheet: Portable Building Contracts with Alaska Native Firms (TF Hope); Lisa Myers, "Critics question no-bid Katrina contracts," MSNBC (Thurs., Oct. 6, 2005); Renae Merie and Griff Witte, "Katrina Recovery Officials Unsure What's Been Spent," Washington Post (Thurs., Nov. 3, 2005); Kevin McCoy, "Report: Army Corps Overpaid on Katrina Classrooms," USA Today (Wed., Apr. 12, 2006); Wood quote in "Katrina audit: U.S. overpaid by $7.8 million," AP (Sat., Apr.22, 2006); "Memphis District leads thousands."

[101] Stark, Close-Out Plan (OH-MVD); Commander Assessment, Sept. 2-28, Nov. 20, 2005; Commander Briefing, Sept. 4-15, Oct. 5, 26, 30, 2005; News Clip Summary, Sept. 9, 13, 2005; News Release, "Debris Removal Contracts Awarded for Hurricane Recovery Efforts" (Wash., D.C.: USACE, Sept. 15, 2005) (TF Hope); "Corps slow to clean out canals, officials say," AP (Wed., Oct. 26, 2005); Ryan Lafontaine, "Cleanup figures doubted," Biloxi Sun Herald (Fri., Jan 13, 2006).

[103] Interview with Riley; Commander Assessment, Oct. 5-7, 2005; Commander Briefing, Oct. 5-7, 20-21, 28, 2005 (TF Hope); Brendan McCarthy, "Rusting arsenals among storm debris," Times-Picayune (Sat. Mar. 17, 2007; Renae Merle, "Gulf Coast Officials Are Squeezed on Debris Cleanup," Washington Post (Fri., Nov. 25, 2005): D1; Matthew Brown, "Parish sues feds over trash contracts," Times-Picayune (Thurs., Mar. 9, 2006); Riley quote from "Study: U.S. double-billed for Katrina work," AP (Fri., May 5, 2006).

[104]Current Messages, Tues. 08 November 2005 (TF Hope); Mike Brunker, "Dust flies over Katrina's debris," MSNBC (Sun., Jan. 29, 2006); Patrick Danner, "Firm's deal on cleanup at issue," Miami Herald (Fri., Feb. 3, 2006); Chris Kirkham, "Contract Bids – Little guys may get a chance," Mississippi Sun Herald (Mon., May 1, 2006); Lisa Myers, "Is Katrina cleanup a fleecing of America?" NBC News (Mon., June 5, 2006); "Mississippi Firm Put On Hold after Awarded Debris Removal Contract," AP (Tues., Apr. 11, 2006); Commander Assessment, Apr. 25, 2006 (TF Hope).

[105] Manuel Roig-Franzia, "Hurricane Bends Landfill Rules," Washington Post (Sun., Oct. 30, 2005); Mike Dunne, "Report criticizes N.O. landfill," Baton Rouge Advocate (Feb. 10, 2006); "FEMA officials mum on landfill report," (Sat., Feb. 11, 2006); Mark Schleifstein, "Corps closes landfill over asbestos fears," Times-Picayune (Fri., Feb. 17, 2006).

[106]Command Briefing, Feb. 21-28, May 2, 2006; Commander Assessment, Apr. 25, 2006 (TF Hope); Gordon Russell, "Landfill dumping to slow under deal," Times Picayune (Thurs., Feb. 23, 2006); "Disputed landfill approved for eastern New Orleans," AP (Fri., Apr. 14, 2006); LADEQ quote from Leslie Eaton, "A New Landfill in New Orleans Sets Off a Battle," New York Times (Mon., May 8, 2006); Gordon Russell, "Landfill to close for testing," Times-Picayune (Wed., May 10, 2006); "Federal agency enters debate over landfill," Times-Picayune (Tues., June 6, 2006); Ashworth quote from Mike Dunne, "Officials reject plan targeting N.O. landfill," Baton Rouge Advocate (Fri., June 16, 2006).

[107] Commander Assessment, Oct. 9, 2005, Mar. 28, Apr. 4, Apr. 18, May 16, July 18, 26, Aug. 1, Sept. 19, 2006; Commander Briefing, Oct. 13, 2005, Feb. 14, Mar. 7, Apr. 11, 2006 (TF Hope); Interview with Park; Gordon Russell, "Promise was garbage, residents say," Times-Picayune (Fri., Mar. 10, 2006); "Katrina: one year later."

[108] Commander Briefing, Mar. 21-May 2; Commander Assessment, Apr. 4- July 11; Aug. 29-31 (TF Hope); "Katrina: Debris cleanup should be made right," Jackson Clarion Ledger editorial (Tues., June 13, 2006); Joshua Cogswell, "FEMA extends cleanup deadline," Jackson Clarion Ledger (Wed., June 21, 2006); "Katrina: one year later."

[109] Commander Briefing, Sept. 14-Dec. 16 (TF Hope); "Katrina: one year later."

[110] Commander Briefing, Oct. 10, Nov. 11, Dec. 18, 2005; MVM SITREP, Jan. 8, 2006; Commander Assessment, Jan. 10, 2005 (TF Hope); Adam Nossiter, "Thousands of Demolitions Are Likely in New Orleans," NYT (Mon., Oct. 24, 2005); Gordon Russell, "2,000 homes face possible razing," Times-Picayune (Sat., Nov. 5, 2005); Cain Burdeau, "Razing of homes on hold in New Orleans," AP (Thurs., Dec. 29, 2005).

[111] Adam Nossiter, "New Orleans Agrees to Give Notice on Home Demolitions," NYT (Wed., Jan. 18, 2005); Commander Assessment, Jan. 19, Feb. 7, Mar. 7, May 5, Oct. 3, 2006, Feb. 13, 2007; Commander Briefing, Feb. 14, 2005 (TF Hope); Christine Harvey, "Corps to clean, raze Slidell homes," Times-Picayune (Thurs., Mar. 16, 2006); Horne, pp. 214-215, 334-6; Park quoted in "Corps discontinues demolitions, debris removal," WWL TV (Thurs., Sept. 27, 2007).

[112] "Tire Pickup Program Ends," FEMA News Release, Apr. 2, 2007; "FEMA's Private Property Debris Removal in the State Nears End," FEMA News Release, May 21, 2007; LTG Robert van Antwerp, "Louisiana RFO: Katrina-Rita Recovery," presentation, May 2007 (OH-MVD); RFO website (www.mvm.usace.army.mil/RFO/index.html).

[113] Commander Assessment, Aug. 28, 2005 (TF Hope).

[114] Readers should distinguish among unwatering, which is the removal of water from a flooded region using pumping and other means; dewatering, which is the removal of water from solids suspended in them such as sludge or waste; and drying, which is the removal of all moisture usually using air.

[115] Interview with Col. Duane Gapinski, by David Tajkowski, May 10, 2007.

[116] MVD SITREP, KATRINA, Aug. 28 2005 (TF Hope).

[117] Unwatering Mission Status (TF Hope); IPET, pp. VI-29-48. According to Wagenaar, Orleans pump operators eventually shut down many pumps to prevent recirculating water; see interview with Wagenaar.

[118] Jefferson Parish registered at 0 pumps operating because by Sept. 8, it was dry; however, all its pumps were operational.

[119] Interview with Chris Accardo, by David Tajkowski, May 22, 2007; IPET, pp. 1-31 to 1-38.

[120] Interview with Wagenaar.

[121] MVD SITREP, KATRINA, Aug. 30, 2005; E-mail, Stephen Gambrell to John Grieshaber et. al., Sept. 1, 2005, "Notes for overflight/Pump Status, 31 Aug 05" (TF Hope); Interview with Riley; Interview with Crear; Interview with Wagenaar.

[122] Interview with Crear; Interview with Banks; Interview with David Wurtzel, by David Tajkowski, May 8, 2007.

[123] Interview with Kenny Crumholt by David Tajkowski, May 7, 2007; Interview with Jeff Richie, by David Tajkowski, May 10, 2007; Interview with Wagenaar; Riley to Camillo, Apr. 23, 2008. There is some discrepancy when the EOC received the call; Wagenaar places it at 3:00 p.m. on the 30th, while Riley places it the previous day.

[124] Interview with Starkel; Interview with Accardo; Interview with Stacey Leonard, by David Tajkowski, Jul. 31, 2007; Interview with Marvin Manahan, by David Tajkowski, Jul. 25, 2007; "Flood fight"; "Air attack on the breaches."

[125] Wagenaar Interview; Interview with Starkel; Interview with Accardo; Interview with Crear; Interview with Wurtzel; Jason Fanselau, "Air attack on breaches," Riverside (Sp. Ed., 2005): 13-14. Susan Jackson, "Flood Fight," Riverside (Sp. Ed. 2005): 9-11; Curtis Morgan et. al., "Broken levees, pumps complicate efforts to remove water," Miami Herald (Thurs., Sept. 1, 2005); Commander's Assessments, Aug. 30-Sept. 2, 2005; Commander's Briefing, Sept. 2-4, 2005 (TF Hope).

[126] Wagenaar Interview; Interview with Crear; Interview with Starkel; Jackson, "Flood Fight," pp. 9-11; Carrns et. al., "U.S. Mobilizes Aid"; Commander's Assessments, Aug. 30-Sept. 4, 2005; Commander's Briefing, Sept. 2-4, 2005 (TF Hope).

[127] Interview with Riley; Interview with Crear; Interview with Starkel.

[128] Commander's Assessment, Aug. 30-Sept. 5, 2005; Commander's Briefing, Sept. 2-4, 2005 (TF Hope); Interview with Crear; Interview with Riley. Wagenaar Interview; Interview with Starkel; Susan Jackson, "Flood Fight," Riverside (Sp. Ed. 2005): 9-11.

[129] Commander's Assessment, Sept. 2, 2005 (TF Hope); GlobalSecurity.org, "249th Engineer Battalion (Prime Power)" (www.globalsecurity.org/military/agency/army/249eng.htm); Interview with Gapinski; Interview with Denny Lundberg, by David Tajkowski, May 24, 2007.

[130] Commander's Assessment, Sept. 2-5, 2005; "Corps prepares to breach levees to help drain N.O. areas," USACE press release, Sept. 2, (TF Hope); Interview with Crear.

[131] Interview with Banks.

[132] "Corps prepares to breach levees"; Commander's Assessment, Sept. 3-5, 2005 (TF Hope); Interview with Crear.

[133] Commander's Assessment, Sept. 3-5, 2005 (TF Hope); Interview with Crear.

[134] Commander's Assessment, Sept. 4-Sept. 5, 2005; Lake Pontchartrain and Vicinity and Westbank Sub-basins Report, Sept. 4, 2005 (TF Hope); Interview with Crear.

[135] Interview with Gapinski; Interview with Crear.

[136] Col. Duane Gapinski, Memorandum for Record, Subject: Task Force UNWATERING After Action Reviews, Dec. 27, 2005; Interview with Gapinski; Interview with Bleakley.

[137] Charles Camillo, Timeline for Operational History, Jan. 31, 2006 (OH-MVD); Interview with Lundberg.

[138] Commander's Assessment, Sept. 6, 2005; Lake Pontchartrain and Vicinity and Westbank Sub-basins Report, Sept. 6, 2005 (TF Hope); John Schwartz, "Behind the First Roar of Machinery to Drain the City, A Tale of Pluck and Luck," NYT (Thurs., Sept. 8, 2005).

[139] Lake Pontchartrain and Vicinity and Westbank Sub-basins Report, Sept. 7, 2005; USACE, NOD, Project Delivery Team Report, Sept. 8 (TF Hope);

[140] EPA, "Murphy Oil Spill," (www.epa.gov/katrina/testresults/murphy); E-mail, Col. James Rowan to Donald Basham et. al., "TF Hope Update," Sept. 9, 2005; Commander's Assessment, Sept. 10, 2005; USACE, NOD, Project Delivery Team Report, Sept. 8, 2005; "New Orleans begins to see results of recovery operations," USACE news release, Sept. 11, 2005; Commander's Assessment, Sept. 14, 2005; E-mail, Constance Gillette to Marjorie DeBrot et. al., Subject: "USACE Support to Hurricane Recovery-Daily Message and Talking Points," Sept. 26, 2005; TF-Unwatering SITREP, Oct. 1-20, 2005; (TF Hope); Interview with Banks.

[141] TF-Unwatering SITREP, Oct. 1-20, 2005, quote from Oct. 17 (ENGLINK).

[142] Interview with Gapinski; Interview with Banks; Interview with Wurtzel.

[143] Paul D. Thacker, "New Orleans Floodwater is not 'toxic soup,'" Environmental Science and Technology Online News, Oct. 11, 2005 (pubs.acs.org/subscribe/journals/esthag-w/2005/oct/science/pt_neworleans.html, accessed on Sept. 20, 2007.

[144] Task Force HOPE Unwatering Mission Status ExSum, Sept. 8, 2005; Commander's Assessment, Sept. 10, 2005; US Army Corps of Engineers, New Orleans District, Project Delivery Team Report Sept. 8, 2005; Commander's Briefing, Sept. 10, 2005 (TF Hope); Interview with Starkel; Interview with John Fogarty, by David Tajkowski, May 23, 2007; Interview with Gapinski.

[145] www.airproducts.com; see in particular ../Press/ComapanyNews/Archived/2005/31Aug05.htm, 19Sept05.htm; www.library.yale.edu/llicense/forcegen.shtml; Interview with Crumholt.

[146] Commander's Assessment, Sept. 10, 2005; Commander's Assessment, Sept. 11, 2005; Commander's Assessment, Sept. 14, 2005 (TF Hope); Interview with Crumholt.

[147] USACE, NOD, Project Delivery Team Report, Sept. 9, 2005 (TF Hope).

[148] Commander's Assessment, Sept. 11, 2005; "New Orleans Begins To See"; Commanders' Briefing, Sept. 13, 2005 (TF Hope).

[149] Commander's Assessment, Sept. 14, 2005; "New Orleans water continues to recede over a foot per day," USACE-NOD-PAO news release, Sept. 13, 2005 (TF Hope).

[150] Commander's Assessment, Sept. 16-18, 2005 (TF Hope).

[151] "New Orleans water."

[152] Commander's Assessment, Sept. 22, 2005; Commanders' Briefing, Sept. 22, 2005 (TF Hope).

[153] Richard D. Knabb, Daniel P. Brown, and Jamie R. Rhome, "Tropical Cyclone Report, Hurricane Rita,18-26 September 2005," National Hurricane Center, March 17, 2006; Commander's Assessment, Sept. 23-26, 2005; Commanders' Briefing, Sept. 13, 2005; E-mail, Mitchell Frazier to Col. Richard Wagenaar et al., Subject: "Task Force Hope New Orleans-Talking Points," Sept. 25, 2005 (TF Hope); Interview with Lundberg; Interview with Wagner.

[154] E-mail, Constance Gillette, Sept. 26, 2005; Commander's Assessment, Sept. 27-8, 2005; Commanders' Briefing, Sept. 29, 2005 (TF Hope); Interview with Lundberg; Interview with Richie.

[155] Commander's Assessment, Sept. 28-Oct. 1, 2005; Commanders' Briefing, Sept. 29-Oct. 1, 2005; (TF Hope); Interview with Gapinski.

[156] Interview with Gapinski; Commander's Briefing, Sept. 24-Oct. 10, 2005; TFU SITREP, Oct. 1-17, 2005 (TF Hope).

[157] "TFUnwatering Situation Report," Oct. 3, 2005; Commander's Assessment, Oct. 5, 11-12, 20-21; 2005 (TF Hope).

[158] Commander's Assessment, Oct. 10, 2005. TF Unwatering SITREP, Oct. 9, 12, 2005; (TF Hope).

[159] Commander's Assessment, Oct. 23, 2005; (TF Hope); Task Force UNWATERING After Action Reviews (OH-MVD).

[160] E-mail, Greg Walgate to Teri Alberico et. al., Subject: "Task Force Hope New Orleans Pump Status Update," Oct. 21, 2005 (TF Hope); Interview with Lundberg; Interview with Charles Shadie, by David Tajkowski, May 29, 2007; Interview with Banks.

[161] "Environmental Assessment Summary for Areas of Jefferson, Orleans, St. Bernard, and Plaquemines Parishes Flooded as a Result of Hurricane Katrina," Dec. 6, 2005 (www.epa.gov/katrina/testresults/katrina_env_assessment_summary.htm); NOAA News Online (Story 2562), "Latest Tests of NOAA Gulf Fish Surveys Show No Negative Impact on Seafood Quality," Jan. 16, 2006 (www.noaanews.noaa.gov/stories2006/s2562.htm).

[162] News Release, USACE, Sept. 18, 2005 (TF Hope).

[163] Riley quoted in Tom Sawyer, "Corps Culpable for Flooding? Answers to the Accusations," Engineering News Record (Fri., Feb. 17, 2006).

[164] Interview with Col. Lewis Setliff, by David Tajkowski, May 11, 2007.

[165] USACE, ER 500-1-1: Civil Emergency Management Program, Sept. 30, 2001; Tom Ichniowski, "Corps Says Restoring Levees to Pre-Katrina Strength Would Cost $1.6 Billion," Engineering News-Record (Oct. 3, 2005).

[166] Commander's Briefing, Sept. 4, 2005; E-mail, Col. James Rowan to Donald Basham et. al., Subject: "TF HOPE SITREP UPDATE," Sept. 9, 2005; Commander's Assessment, Sept. 14-20, 2005 (TF Hope).

[167] Commander's Assessment, Sept. 25-27, 2005; Commanders' Briefing, Sept. 29, 2005; "Corps of Engineers to Restore Pre-Katrina Protection in New Orleans," USACE news release, Sept. 29, 2005; TF Guardian SITREP, Oct. 1-3, 2005 (TF Hope); Interview with Setliff, May 11.

[168] Commander's Assessment, Sept. 19, Oct. 28-29, 2005; SITREP-TF Guardian, Oct. 18-20, 2005; (TF Hope).

[169] Commanders' Briefing, Oct. 19-27, Nov. 4, 2005 (TF Hope); Commander's Assessment, Oct. 22, 2005, (TF Hope); Task Force Guardian Commander's Report, Jan. 31, 2006 (TF Hope).

[170] Commander's Assessment, Sept. 14, 2005 (TF Hope); Interview with Setliff, May 11.

[171] USACE, "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane or Shore Protection Projects from Hurricane Katrina, Orleans East Bank," Oct. 18, 2005, pp. 8-10, 14, 32-42, 56.

[172] Interview with Setliff, May 11.

[173] USACE, "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane or Shore Protection Projects from Hurricane Katrina, Orleans East Bank, Revision #01," Jan. 20, 2006, pp. 6-7; Alan Dooley, "Sandboils 101: Corps has experience dealing with common flood damage," Engineer Update, 30: 6, (June 2006); USACE-MVM, Definitions of Flood Control Terms (www.mvm.usace.army.mil/floodcontrol/Levees/berms.htm and relief_wells.htm).

[174] PIR, Orleans East Bank, Revision 1, pp. 1, 6-7, 10.

[175] USACE, "Project Information Report, PL 84-99 Rehabilitation of Hurricane or Shoreline Protection Project, New Orleans East," October 19, 2005.

[176] USACE, "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane/Shore Protection Projects, Chalmette Area Plan," Oct. 18, 2005, pp. 2-3, 5-9, 13, and B2-B4; "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane/Shore Protection Projects, Chalmette Area Plan, Amendment No. 1 (Addition of Repair Work to the Verret to Caernarvon Levee and revision of overall cost estimates)," Nov. 30, p. 3; "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane/Shore Protection Projects, Chalmette Area Plan, Revision No. 3 (Addition of Repair Work to the Verret to Caernarvon Levee and revision of overall cost estimates)" Dec. 13, p. 1.

[177] USACE, "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane or Shore Protection Projects, Plaquemines," Oct. 17, 2005, pp. 7-10, 25, and 58-69.

[178] USACE, "Project Information Report, PL 84-99 Rehabilitation of Damaged Hurricane or Shore Protection Projects, Plaquemines, Revision #1," Jan. 5, 2006, pp. 13-15.

[179] PIR, Plaquemines, Revision 1, Jan. 5, 2006, pp. 18-21.

[180] ER 500-1-1, pp. 5-12 to 5-13; Interview with Setliff, May 11.

[181] PIR, Plaquemines, Oct. 17, 2005, pp. 84-92.

[182] Ibid., pp. 33-37, 91-92.

[183] SITREP, Task Force Guardian, Oct. 1, 2005, (TF Hope); USACE, ER 415-1-11, Sept. 1, 1994.

[184] SITREP, Task Force Guardian, Oct. 1, 2005; Commanders' Briefing, Oct. 3, 2005; Commander's Assessment, Oct. 3-4, 10, 2005 (TF Hope).

[185] Commander's Assessment, Oct. 14, 17-19 (TF Hope).

[186] Commander's Assessment, Oct. 19-20, 25, 2005 (TF Hope), Interview with Setliff, May 11, June 12, 2007.

[187] Commander's Assessment, Nov. 1, 7, 9, 15, 30, Dec. 11, 2005; Commanders' Briefing, Dec. 11, 2005 (TF Hope); Interview with Setliff, June 12, 2007.

[188] www.fedaccess.com/8(a)program.htm and 8(a)-sdb-faqs01.htm; sba.gov/hubzone/section05b.htm.

[189] Commander's Assessment, Oct. 21, 25, Nov. 19, 27, 2005; Commanders' Briefing, Oct. 21, 2005; Daily Report-TF Guardian, Jan. 3, 2006 (TF Hope); Ralph Vartabedian and Stephen Braun, "Massive Levee Repair Project Set In Motion," Los Angeles Times, (Sat., Oct. 15, 2005).

[190] Commander's Assessment, Oct. 29, Nov. 3, 7, 12, Dec. 13, 2005; SITREP TF Guardian, Oct. 29, 2005 (TF Hope); Interview with Setliff, June 12.

[191] SITREP TF Guardian, Oct. 1, 5, Dec. 29, 2005; Commanders' Briefing, Oct. 3, 2005; Commander's Assessment, Oct. 24, 2005; Commanders' Briefing, Dec. 29, 2005 (TF Hope).

[192] Mark Schleifstein and Bob Marshall, "Canal gates planned before storm season," Times-Picayune (Wed., Jan. 11, 2006); Bob Marshall, "Engineers have qualms about MR-GO work," Times-Picayune, (Fri., Jan. 13, 2006).

[193] SITREP TF Guardian, Oct. 20, 2005; Commander's Assessment, Oct. 27, 29, Nov. 4, 12, 26; Commanders' Briefing, Oct. 28, 2005 (TF Hope).

[194] Interview with Riley.

[195] Marcuson quoted in John McQuaid, "Investigators Probe for Flaws in New Orleans' Floodwalls," Newshouse News Service (Thurs., Sept. 29, 2005); Strock quoted in McQuaid, "Orleans floodwall fixes could run into delays," Times-Picayune (Fri. Oct. 14, 2005); Interview with Setliff, June 12.

[196] Experts within the Corps dispute many of the findings of these investigations as well as the objectivity of their experts, many of whom have appeared as paid witnesses for plaintiffs in the litigation that resulted from the disaster.

[197] Commander's Briefings, Katrina," Sept. 22-26, 1995 (TF Hope), Rowan quote on Sept. 26; Mark Schleifstein and John McQuaid, "Corps levee problem role reduced," Times-Picayune (Thurs., Oct. 20, 2005); on comments in the press, see for example, "News Clips Summary," Sept. 1-5, 2005 (TF Hope); Pete Carey, "Soil failure caused floodwalls to collapse, investigators believe," Knight Ridder (Fri., Oct. 7, 2005)Alan Levin, "Evidence suggests water went under, not over, some levees," USA Today (Mon., Oct. 10, 2005); Matt Crenson, "Engineers Probe Cause of Levee Failure," AP (Mon. Oct. 10, 2005); "Engineers: Floodwalls worse than acknowledged," Knight-Ridder (Sun., Oct. 16, 2005); Christopher Drew and John Schwartz, "Engineers Point to Flaws In Flood Walls' Design as Probably Cause of Collapse," NYT (Mon., Oct. 24, 2005); Mark Schleifstein, "Wave action within canal factors into levee probe," Times-Picayune (Tues., Nov. 29, 2005).

[198] Commander's Briefing, Oct. 1, 2005; Commander's Assessment, Oct. 26, 2005 (TF Hope); Interview with Colletti; Drew and Schwartz, "Flaws"; Mlakar quote in Mark Schleifstein, "Levee team runs into wall," Times-Picayune (Wed., Oct. 26, 2005). On slights to the LSU team, see Van Heerden, Storm, p. 225.

[199] Commander's Assessment, Nov. 30, 2005 (TF Hope); Mark Schleifstein, "Corps pulls 17th Street floodwall sections," Times-Picayune (Tues., Dec. 13, 2005); Schleifstein and Bob Marshall, "Corps finds piles at designed depth," Times-Picayune (Wed. Dec. 14, 2005); Wagenaar quoted in Rochelle Konigsmark, "Tests on key levee in New Orleans show compliance," USA Today (Wed., Dec. 14, 2005).

[200] Mark Schleifstein and Bob Marshall, "Corps finds pilings at designed depth," Times-Picayune (Wed., Dec. 14, 2005); Schleifstein," LSU expert defends piling tests," (Thurs., Dec. 15, 2005).

[201] "Engineers to begin tests"; Ben Fatherree, The First 75 Years: History of Hydraulics Engineering at the Waterways Experiment Station (Vicksburg: ERDC, 2004): 1-10, 47-81); Fact Sheet, New Orleans 17th Street Canal Physical Model Study (ERDC, May 2006); Resio quoted in "Katrina Analysis Has Designers Building Faster and Smarter," Engineering News Record (Mon., May 1, 2006).

[202] Commander's Briefing, Jan. 31, 2006 (TF Hope); Wayne Stroupe, comments to manuscript, Jan. 25, 2008; John Schwartz, "Investigators Gain Access to Levee for Soil Test," NYT (Wed., Feb. 1, 2006);"Engineers to begin tests on model of canal flooded by Katrina," AP (Tues., Mar. 7, 2006).

[203] Stroupe, comments to manuscript; Strock quoted in McQuaid, "Orleans floodwall fixes could run into delays," Times-Picayune (Fri., Oct. 14, 2005); Basham quoted in Mark Schleifstein and Bob Marshall, "Canal gates planned before storm season," Times-Picayune (Wed., Jan. 11, 2006); John Schwartz, "Flood-Control Proposal Seeks Gates and 'Armored' Levees," NYT (Tues., Feb. 28, 2006); Interview with Setliff, June 12.

[204] IPET, Performance Evaluation Status and Interim Results (IPET, Mar. 10, 2006): I-3-I-4; Jim Lehrer, "Investigating Broken Levees," PBS transcript (Thurs. Oct. 20, 2005); Setliff quoted in Schwartz, "Too Little Clay, Too Much Sand Is Levee Worry," NYT (Sun., Feb. 19, 2006); Joby Warrick, "Warning Sounded About Levees," Washington Post (Wed., Mar. 8, 2006); Warrick, "Levee Fixes Falling Short, Experts Warn," Washington Post (Mon., Mar. 6, 2006); Hitchings quoted in Bob Marshall, "Corps, critics will try to reconcile," Times-Picayune (Fri., Apr. 7, 2006); Karen Bazile, "MR-GO levee looks better, engineers say," Times-Picayune (Sun., Apr. 9, 2006); Stroup comments; Interview with Setliff, June 12.

[205] Janet McConnaughey, "Corps: Foundation Problem in Levees Blamed," AP (Fri., Mar. 10, 2006); Bob Marshall, "Floodwall failure was foreseen, team says," Times-Picayune (Tues., Mar. 14, 2006); "Unforeseen or unforgivable," Times-Picayune editorial (Tues., Mar. 14, 2006); Riley quoted in USACE News Release, "U.S. Army Corps of Engineers response to the 'Initial Comments on Interim (70%) IPET Study Report,'" Mar. 14, 2006 (TF Hope); Mosher quoted in Marshall, "Omissions revealed in levee design," Times-Picayune (Fri., Mar. 17, 2006); News Release, "IPET Releases Results on London Avenue Canal Breaches," May 2, 2006 (https://ipet.wes.army.mil); see also, Interview with Reed Mosher, by Damon Manders, July 9, 2008.

[206] John Schwartz, "Report Links Corps' Planning to Inadequacies in Levee System," NYT (Wed., May 3, 2006); ILIT statement quoted in Sheila Grissett, "Katrina report blames human error," Times-Picayune (Tues., May 22, 2006); Riley, "Corps' goal is safety," USA Today (Thurs., May 24, 2006); Grissett, "Team pushes for levee system overhaul," Times-Picayune (Wed., May 23, 2006). See also Christine Anderson et al., Hurricane Katrina: One Year Later. What Must We Do Next? (N.P.: ASCE, 2006).

[207] E-mail, Riley to Camillo, Jan. 31, 2008; USACE News Release, "U.S. Army Corps of Engineers announces the New Orleans and Southeast Louisiana Hurricane Protection Decision Chronology (HPDC) study is under way," June 23, 2006; Douglas Woolley and Leonard Shabman, "Decision-Making Chronology for the Lake Pontchartrain and Vicinity Hurricane Protection Project," Final Draft Report (D.C.: USACE-IWR, June 2007): i-iii, ES-1 to ES-19, 6-1 to 6-18.

[208] Jed Horne, Breach of Faith: Hurricane Katrina and the Near Death of an American City (NY: Random House, 2006): 146-7; Seed quoted in Sheila Grissett, "Katrina report blames human errors," Times-Picayune (Mon., May 22, 2006); Wagenaar quoted in John Riley, "Floodwaters recede; Corps criticism rises," Newsday (Thurs., Sept. 29, 2005); Sands quoted in Ralph Vartabedian, "UC Report On Levees Sees Institutional Failings," Los Angeles Times (Fri., May 19, 2006); Hitchings quoted in Bob Marshall, "Corps, critics will try to reconcile," Times-Picayune (Fri., Apr. 7, 2006).

[209] Commander's Assessment, Dec. 27, 2005; Commanders' Briefing, Dec. 14, 29, 2005; Task Force Guardian Daily Report, Dec. 27-9, 2005 (TF Hope); Interview with Setliff, June 12.

[210] Ibid.

[211] Mark Schleifstein and Bob Marshall, "Canal gates planned before storm season," Times-Picayune (Wed., Jan. 11, 2006); Commander's Assessment, Jan. 15-17, 22, and 29, Feb. 5, 2006 (TF Hope); Sheila Grissett, "Corps requests more land," Times-Picayune (Mon., Feb. 13, 2006); Matthew Brown, "Plaquemines residents resigned to loss of land," Times-Picayune (Thurs., Jan. 26, 2006).

[212] Commander's Assessment, Feb. 5-19, Mar. 7-14; Task Force Guardian Commander's Report, Mar. 7-14 (TF Hope); Deon Roberts, "Corps program pumps $750 million to state firms," New Orleans City Business (Mon., Feb. 20, 2006).

[213] Commander's Briefing, Feb. 2, 16, 2006; Commander's Assessment, Feb. 5, 23, Mar. 28, Apr. 18. 2006; TFG Commander's Assessment, Feb. 28, 2006 (TF Hope); Wagner and Rodriguez quoted in John Schwartz, "Too Little Clay, Too Much Sand Is Levee Worry," NYT (Sun., Feb. 19, 2006).

[214] Commander's Assessment, Feb. 14, Mar. 7, 21, 28, 2006 (TF Hope); Setliff quoted in John Schwartz, "Big, Maybe Ugly, but Their Role Heroic," NYT (Thurs., Mar. 23, 2006).

[215] "Katrina Analysis Has Designers Building Faster and Smarter," Engineering News Record (Mon., May 1, 2006); TFG Commander's Report, Mar. 21, 2006 (TF Hope).

[216] Commander's Assessment, Apr. 4, 12, May 9, 23, 2006 (TF Hope); Sheila Grissett, "Corps requests more land," Times-Picayune (Mon., Feb. 13, 2006); Matthew Brown, "Plaquemines residents resigned to loss of land," Times-Picayune (Thurs., Jan. 26, 2006); "Corps plans for Phase 2 of tree removal," Task Force Hope Status Report (Apr. 12): 8. (OH-MVD).

[217] Commander's Assessment, Apr. 12, 18, 25, May 2, 9, 23 2006 (TF Hope); Setliff quoted in Sheila Grissett and Mark Schleifstein, "Gates Won't Be Ready By June 1," Times-Picayune (Fri., May 12, 2006).

[218] Commander's Assessment, Apr. 25, May 23, 20, 2006 (TF Hope); Mark Schleifstein, "Levee slumps; repairs to take weeks," Times-Picayune (Tues., May 30, 2006); Joe Gyan, "Corps: Storm work is 92% complete," Baton Rouge Advocate (Wed., May 24, 2006); Interview with Setliff; Setliff quoted in Brian Williams, "Army: 'You can hold the Corps accountable,'" MSNBC transcript (Thurs., June 1, 2006).

[219] John Schwartz, "Levees Rebuilt Just In Time, But Doubt Remains," NYT (Thurs., May 25, 2006); Strock quoted in T.D. Flack, "Commander: Corps is ready for hurricanes," Stars and Stripes (Tues., May 30, 2006).

[220] Setliff quoted in "Katrina Analysis Has Designers Building Faster and Smarter," Engineering News Record (Mon., May 1, 2006); Commander's Assessment, Feb. 12, May 23, 2006 (TF Hope).

[221] Interview with Bleakley; "Hurricane Protection Office Implementation Concept," Presentation, N.P.: TF Hope, N.D. (TF Hope).

[222] Interview with Bleakley; "Hurricane Protection Office Implementation Concept"; Commander's Assessment, June 6, 13, 2006 (TF Hope).

[223] TF Hope, "Hurricane Protection System," (New Orleans: MVD, N.D.); Interview with Brett Herr, by Damon Manders, March 11, 2008.

[224] Commander's Assessment, June 6, 13, 2006; Task Force Guardian Summary Commander's Report, June 13, 2006; MVN SITREP, June 6, 13; MVN Cdr's Weekly Report, June 18, 2006 (TF Hope).

[225] Commander's Assessment, Jun. 6 – Aug. 30, 2006; Task Force Guardian Summary Commander's Report, June 13, 2006; MVN SITREP, Jun. 6 – Aug. 30, 2006 (TF Hope).

[226] Commander's Assessment, Jun. 6 – Sept. 26, 2006; MVN SITREP, Jun. 6 – Sept. 26, 2006; Task Force Hope Status Report, Sept. 28, 2006 (TF Hope); Sheila Grissett, "Corps misses second deadline," Times-Picayune (Sun., Jul. 9, 2006); Grissett, "Drainage forecast cut at London Ave. Canal," Times-Picayune (Wed., Jul. 19, 2006);

[227] Commander's Assessment, Jun. 6 – Sept. 26, 2006; MVN SITREP, Jun. 6 – Sept. 26, 2006; Task Force Hope Status Report, Sept. 28, 2006 (TF Hope); Wagenaar quoted in "Katrina pumps vibrate hard enough to endanger themselves," AP (Aug. 22, 2006); Grissett, "Canal's pumps pass corps' test," Times-Picayune (Sat., Sept. 16, 2006); Grissett, "Corps issues maps of rainfall's impact," Times-Picayune (Thurs., Jul. 27, 2006).

[228] MVN SITREP, Jun. 13, 2006; Newman quoted in Leo Skinner, "Outfall Canal," Riverside (Aug./Sept. 2006): 6; Skinner, "Outfall Canal," Riverside (Nov. 2006): 6-7; Robinson quoted in Skinner, "Outfall Canal," Riverside (Spring 2007): 6.

[229] Commander's Assessment, June 6 – Jul. 25, Sept. 28, 2006; Task Force Guardian Summary Commander's Report, June 13, 2006; MVN SITREP, June 6 – Jul. 25; MVN Cdr's Weekly Report, June 18-Jul. 25, 2006 (TF Hope).

[230] Commander's Assessment, Jul. 5-Sept. 28, 2006; MVN SITREP, Jul. 5-Sept. 28, 2006; MVN Cdr's Weekly Report, Jul. 5-Sept. 28, 2006 (TF Hope); Sheila Grissett, "Corps racing against time, red tape," Times-Picayune (Aug. 14, 2006)

[231] Sheila Grissett, "Storm prods makeshift levee repairs," Times-Picayune (Aug. 4, 2006); Hitchings quoted in "Corps racing against time, red tape."

[232] Ward quoted in "Corps racing against time, red tape."

[233] "Katrina: Two Years Later," Nola.com (accessed Dec. 26, 2007); "Fact Sheet: The Two Year Anniversary of Hurricane Katrina," Office of the Press Secretary, the White House, Aug. 29, 2007; Mike Stuckey, "Upbeat Ceremony Marks Two-Year Anniversary," MSNBC (Wed. Aug. 29, 2007); Rick Jervis, USA Today (Wed., Aug. 29, 2007).

[234] Tom Clarkson, "Memphis Corps deactivates the Louisiana Recovery Field Office," News Release, Sept. 30, 2005.

100-year protection protects against a storm with a one percent chance of occurring in a given year; 1,000-year protection protects against a greater storm with a .1 percent probability to occur per year. Probability-based risk models date to 1914, when Weston D. Fuller first applied them to engineering analysis. The California Department of Public Works adopted them in 1923. After 1972, the "California Method" became the base flood standard for the National Flood Insurance Program. Although the Corps used the method for some purposes, from 1939 it designed to a standard project storm or flood. By 2007, the Corps always discussed protection using probability-based risk in an effort to move people away from thinking of protection in terms of the Saffir/Simpson Scale, although the media and popular culture continued to define the highest level of protection as Category Five. See Michael Robinson, "History of the 1% Chance Flood Standard," and Reuss, "Notes on Probability Analysis and Flood Frequency Standards," Reducing Flood Losses: Is the 1% Chance (100-year) Flood Standard Sufficient? Background Reading for the 2004 Assembly of the Gilbert F. White National Flood Policy Forum (Washington D.C.: National Academies Keck Center, 2004): 2-8, 20-25. However, the California Method is also not always clear and is considerably more manipulable; see Reuss, "Searching for Sophocles on Bourbon Street," Technology and Culture (Apr. 2006): 353-4.

[235] Ann Carrns, "Long Before Flood, New Orleans System Was Prime for Leaks," <u>Wall Street Journal</u> (Fri., Nov. 25, 2005); Ann Carrns and Betsy McKay, "Steps to Overhaul Gain Momentum New Orleans Levees," <u>Wall Street Journal</u> (Sat., Dec. 31, 2005); P.J. Huffstutter and Sam Quinones, "Merger of Louisiana Levee Boards Oked," Los Angeles <u>Times</u> (Fri., Feb. 17, 2006); Bruce Eggler, "Orleans Levee Board is history," <u>Times-Picayune</u> (Fri., Dec. 29, 2006); Interview with Colletti; quote from Sheila Grissett, "Levee checking to go by the book," <u>Times-Picayune</u> (Thurs., Feb. 16, 2006). IPET discusses the presence of trees (a maintenance issue) as an "enabler" not a "cause" of breaches and notes maintenance was a local responsibility, although it does not excuse the Corps from its oversight; <u>IPET</u>, pp. I-6-7, 16.

[236] Commander's Assessment, Dec. 19, 2006 (TF Hope); Kate Morgan, "Pump remote controls may be interim Jeff fix," <u>Times-Picayune</u> (Wed., Mar. 8, 2006); Meghan Gordon and Kate Morgan, "Safe-house storm plan shrinks in Jefferson," <u>Times-Picayune</u> (Thurs., Mar. 9, 2005); Meghan Gordon, "Bill includes SELA in 100-year defenses," <u>Times-Picayune</u> (Fri., Jun. 29, 2007).

[237] Sheila Grissett, "Pump tests end with impressive water show," <u>Times-Picayune</u> (Tues., Aug. 21, 2007); Bruce Alpert, "Water bill passes despite Bush veto," <u>Times-Picayune</u> (Thurs., Nov. 8, 2007); Commander's Assessment, July 5-18, 2006 (TF Hope); U.S. Congress, <u>An Act To Provide for the conservation and development of water and related resources, to authorize the Secretary of the Army to construct various projects to rivers and harbors of the United States, and for other purposes</u>, H.R. 1495, 110th Cong., 1st Sess., Tit. I, Sec. 1001.

[238] Gulf Intracoastal Canal Association, "Gulf Coast Intracoastal Waterways Joint Hurricane Response Protocol," N.P., June 5, 2007. USACE, <u>2006 Louisiana Coastal Protection and Restoration</u> (N.P.: USACE, July 2006): 1-2; U.S. Congress, House, <u>An Act Making Appropriations for the Department of Defense for the fiscal year ending September 30, 2006, and for other purposes</u>, H.R. 2863, 109th Cong., 1st Sess., Div. B, Tit. I, Ch. 3; Commander Briefing, Dec. 29, 2005; MVN SITREP, Feb. 21, 2006 (TF Hope); LACPR, pp. 3-6, 20, 29-30.

[239] USACE, 2006 Louisiana Coastal Protection and Restoration (N.P.: USACE, July 2006): 1-2; U.S. Congress, House, An Act Making Appropriations for the Department of Defense for the fiscal year ending September 30, 2006, and for other purposes, H.R. 2863, 109th Cong., 1st Sess., Div. B, Tit. I, Ch. 3; Commander Briefing, Dec. 29, 2005; MVN SITREP, Feb. 21, 2006 (TF Hope); LACPR, pp. 3-6, 20, 29-30.

[240] USACE, <u>Summary Report: Louisiana Coastal Protection and Restoration Project (LACPR) Engineering Technical Approaches and Innovations Workshop</u> (N.P.: USACE, March 2006); see also the LACPR website at lacpr.usace.army.mil; LACPR, pp. 3-11, 20-30, 33-41, 46-56, quote on p. 2; "Storm risk panel"; Amy Wold, "Corps won't meet December deadline for coastal protection plan," Baton Rouge <u>Advocate</u> (Fri., Dec. 28, 2007). At the time of manuscript completion, the draft technical report was under review.

[240] Robert Young and Orrin Pilkey, "Castles in the Sand," NYT Commentary (Wed., Dec. 13, 2006); Cornelia Dean, "Corps Proposal for Gulf Draws Criticism From Scientists," NYT (Tues., Dec. 19, 2006); Natalie Chambers, "Corps outlines plans to reduce future flooding," Mississippi Press (Wed., Dec. 20, 2006); Coleman Warner, "Buyout or Sellout?" Times-Picayune (Sun., Sept. 23, 2007); USACE, Interim Report: Mississippi Coastal Improvements Program (MsCIP) Hanncock, Harrison, and Jackson Counties, Mississippi (N.P.: USACE, Aug. 2006): passim. As the MSCIP was not part of Task Force Hope, it is not discussed in detail here. For more information, see mscip.usace.army.mil.

[242] John Schwartz, "Chief of Army Corps of Engineers Is Quitting," NYT (Aug. 11, 2006); "Corps Chief Tied to Katrina Failure to Retire," Reuters (Aug. 11, 2006); Landrieu, Wagner quoted in "Mark Schleifstein and Paul Purpura, "Corps' New Orleans head asking to resign," Times-Picayune (Nov. 30, 2006); Cain Burdeau, "Retirements hit Army Corps of Engineers in New Orleans," AP (Dec. 26, 2006). It is difficult to determine the actual reason for retirements or their timing: many were due to retire before Katrina and waited, but whether they planned on staying longer and did not or simply waited until after Katrina to serve, the record does not make clear.

[243] Hitchings, Breerwood quoted in "Retirements hit Army Corps"; "LTG Van Antwerp Becomes Chief of Engineers and USACE Commander," USACE news release, May 17, 2007 (usace.army.mil); "Lee becomes New Orleans district engineer," USACE news release, Jul. 20, 2007 (mvn.usace.army.mil).

[247] Charles Camillo, "Task Force Hope Timeline-August 05-January 06," (N.P.: USACE, N.D.).

[250] Primary sources originated mostly from four locations. The TF Hope Historical Documentation, compiled by MVD Historian Charles Camillo and located in the MVD Historical Office, comprises 15 volumes divided by date: Vol. 1: Aug. 27-Sept. 10, 2005; Vol. 2: Sept. 11-Sept.25, 2005; Vol. 3: Sept. 26-Oct. 9, 2005; Vol. 4: Oct. 10-31, 2005; Vol. 5-6: Nov.-Dec. 2005; Vol. 7-11: Jan.-May 2006; Vol. 12: Jun.-Jul. 2006; Vol. 13: Aug.-Sept. 2006; Vol. 14: Oct.-Dec. 2006; Vol. 15: Jan.-Apr. 2007. Refer to the date of a document to determine the volume. The OH-MVD electronic files are a share directory of electronic documents collected during the investigation by the Mississippi Valley Division Office of History and are maintained on an MVD server. SITREPs were originally located on ENG-LINK, although copies of many are available on the OH-MVD files. Most other agency documents were publicly available through the Internet. The author maintains a copy of some of these materials in his personal files. There may be some future consolidation of these sources.

REBUILDING HOPE

The Corps of Engineers' response was monumental - spanned five states, directly involved three divisions and their districts, and indirectly involved many others.

Task Force Hope and the U.S. Army Corps of Engineers Mississippi Valley Division