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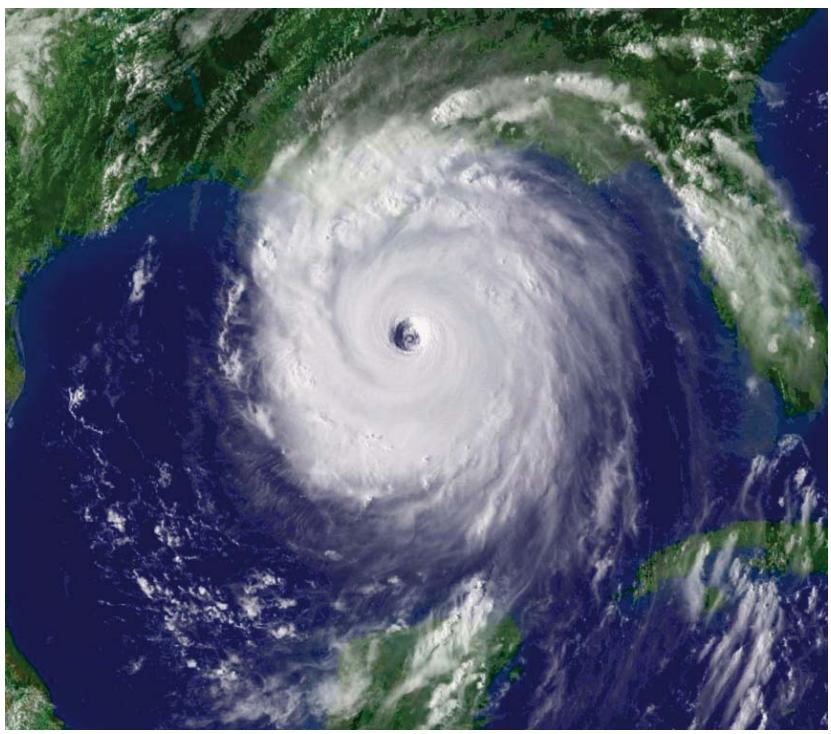
K plus 10; K minus 90 - Part 2 of 2

By: Charles W. Nelson, P.E.



Satellite image taken of Hurricane Katrina at peak intensity in the Gulf of Mexico on August 28, 2005.
Image credit: NOAA

With the previous issue of the "Consultant" as background to understanding the impact that the 1915 hurricane had on New Orleans, herein follows certain comparisons and contrasts between that event and Hurricane Katrina, which hit the city in 2005.

The first major difference is that advance warning of several days was available for Katrina, whereas no such "lead time" for preparation would have been possible in 1915. Although Mr. Earl's report dealt strictly with Sewerage and Water Board assets, it is known that many lives were lost outside of the city during that storm. Isaac Cline, the U. S. meteorologist for New Orleans in 1905, had telegraphic information on barometric pressure from weather stations in Florida and Cuba, from which he could deduce the approach of a hurricane, but with little insight into its actual track. His attempt to alert staff and guests at a hunting club on Chef Menteur Pass was only partially heeded, and dozens perished in that one location. A funeral party in a community on Lake Maurepas was also caught unaware of the approaching storm, with many lives lost. Although more than 1700 people died during Katrina, this was not due to lack of advance warning of the incoming hazard. The images broadcast on local and national weather services are memorable due to the size of Katrina, and such news gave heedful residents time to evacuate or prepare for the storm. (Figure 1)

A second notable difference from 1915 to 2005 was the extensive system of levees and flood walls that had been built to help protect the city in those 90 years. As a result of the original pumping stations mentioned in Earl's report, the city's population had spread north from the high ground along the Mississippi River (8 – 12 feet above sea level). The new subdivisions were built in the lower elevations in mid-city (at or below sea level), and toward Lake Pontchartrain on existing or reclaimed land that had been built to an elevation of 5 to 6 feet above sea level. Much of the mid-city and lakefront portions of the city would have been severely flooded in 1915, but as those areas were largely uninhabited, the floodwaters were of little consequence.

From 1915 to 2005, significant improvements in the perimeter protection for the city had been constructed, first by the Orleans Levee District, and after 1927 by the U. S. Army

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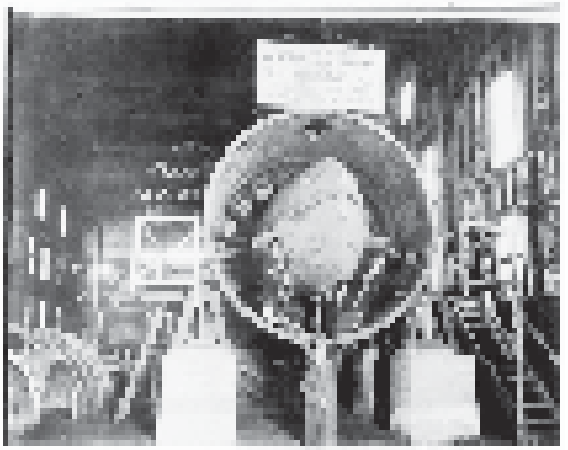
Corps of Engineers (USACE). The reason for the shift in responsibility was the 1927 record-breaking flood of the Mississippi River, when rainfall and river levels in the Mississippi River basin from Kansas to Kentucky to Louisiana caused flooding of 27 thousand square miles, mostly in Arkansas, Louisiana and Mississippi, with inundation up to a water depth of 30 feet. Fortunately, mainline river levees in or near New Orleans were not breached.

Realizing the significance of the event, flood control at a national level was added to the USACE list of responsibilities, and first river levees and then lake levees surrounding New Orleans were enhanced under numerous programs of work. The responsibility of the Orleans Levee District shifted from building levees to maintaining the levees and floodwalls after they were built by the USACE. The Orleans Levee District was also responsible for managing assets such as an airport, subdivisions, marinas and roads built on land reclaimed from Lake Pontchartrain. The loss of focus on flood protection as time went on is chronicled in reports filed after Katrina.



Baldwin Wood Pump
Image credit: New Orleans Public Library

Notwithstanding the additional flood protection structures, Katrina proved to be an overwhelmingly severe storm, with a return interval estimated at 440 years. Also, design flaws in sheetpile "I-walls" along the 17th Street outfall canal leading from Pump Station No. 6 to Lake Pontchartrain proved to be a devastating error that caused a four hundred foot section of that wall to fail, flooding a major portion of the city and a lesser portion of an exclusive neighborhood in Metairie, in adjoining Jefferson Parish. This and other floodwall and levee failures demonstrated that an integrated flood control system across multiple political jurisdictions was long overdue.

A notable difference between the 1915 and 2005 storms is the size and capability of the pumping system that is required to drain the city of New Orleans during heavy rains. The seven stations mentioned in Earl's report were just the start of the system existing in 2005. Interestingly, a significant part of the 2005 system pumps dated to the 1915 version, consisting of slow speed electric motors designed by Thomas Edison and General Electric, and running on 25 cycle power generated by the Sewerage and Water Board's equipment. One main reason this museum-quality equipment is serviceable today is the dedicated servicing provided by the S&WB crews, and the fact that the largest of these motors only have to run approximately 200 hours each year, when spring and summer rains deluge the city.

In 1915, the then new pumping system had an estimated capacity of 4,600 cubic feet per second, discharging into outfall canals emptying into Lake Pontchartrain. On each side of these canals was a small levee, which was really more of a spoil bank created when the outfall canals were

Industrial Canal - Spoil Banks - 1925
This photo was taken in the early years of the Inner Harbor Navigation Canal, known locally as the Industrial Canal.
Image Credit: U.S. Army Corp of Engineers New Orleans District

Flood Walls built along the Inner Harbor Navigation Canal after Katrina

dredged. Judging from Mr. Earl's report of overtopping, it is inferred that the crown elevation of these levees or spoil banks was no more than 5 feet above sea level. In 2005, the city had a system capacity of at least 45,000 cfs in pumping capacity, although this covered a much larger area than was inhabited in 1915.

The basic criteria adopted for this capacity was to remove 1 inch per hour of rainfall for the first hour of a storm, and then ½ inch per hour indefinitely thereafter. Between soil absorption of the first hour's inundation, and the fact that rainfall is localized to neighborhoods in intensity, the logic of that criteria has been proven over time except for the hurricane events, when 12 to 20 inches of rain over a large area in 24 hours can be experienced. During that time, street flooding is expected and acceptable to an extent, as traffic is in large part curtailed during such a storm. Older sections of the city, where houses are built on piers one to seven feet above grade, easily survive not only street flooding, but yard flooding. Newer subdivisions with slab-on-grade houses are more dependent on the performance of the system affecting their neighborhood.

One closing remark on differences between the 1915 storm and Katrina is the distribution of our regional population during each event. In 1915, the New Orleans population of approximately 360 thousand people lived predominately along the Mississippi River, where higher ground created by thousands of years of natural riverbank building, supported habitation. Outside of the city limits, other communities, such as Kenner, were also sited along the river. By 2005, the population of New Orleans was approximately 460 thousand, including both east and west bank portions of the city. After Katrina, the entire city was evacuated by local and federal authorities. Since damage to the city was concentrated on the east bank communities, and floodwalls protected much of the adjoining communities in Jefferson Parish, however, many residents in flooded areas were able to relocate to nearby neighborhoods. As re-building efforts began soon after the storm subsided, residents and incoming work crews were able to live in these neighborhoods and commute to the city during daylight hours to carry out repairs to homes, utilities, parks and thoroughfares to begin the first decade of recovery by the city.

New Orleans	1905	1915	2005	2006	Present
Population	290K	360K	460K	210K	380K
Jefferson Parish	1905	1915	2005	2010 & 2013	
Population	16K	20K	455K	433K	

Christmas Celebrations

Josh Webber, Karla Denis, Kim & Chris Wilson

Shannon & Ian Walsdorf

Evan & Ashley Gilbert, Nick Maalouli, Tala Maalouli

Holly Beaulieau, Casta Pumilia and Tonya Coleman

Steve & Casta Pumilia

Erin Douglass & Blayne Coleman, Craig & Cass Richardson, Ken Nelson & Karin Levesque, Gloria Schultz, Laura & Jim Lane

Angel Boudreaux & Melanie Mechura with Salvation Army Angel Tree Gifts.

Karen Martin with Caitlin Scanlan from Volunteers of America

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Glenn J. Richoux, P.E.

Glenn Richoux, a longtime member of our Civil Engineering department, retired from the firm following nearly 37 years of service, in order to focus on his recovery from a serious skiing accident on March 31st, 2015. Following a lengthy hospital stay in Utah, he returned to New Orleans to his sister's home. Exhibiting tremendous tenacity and courage, he renovated his house for handicap access and has returned to his own home. He continues physical and occupational therapy and is making slow but very steady progress. The team of physical therapists have been so impressed with his determination and success that they asked him to be a demonstrator at LSU's School of Allied Health Professions, Department of Physical Therapy in New Orleans, Louisiana to demonstrate his excellence in bed mobility and at transferring from his wheelchair. This requires tremendous upper body strength and helps Glenn on his path to independent living.

Glenn graduated in Civil Engineering from Tulane in 1978, and began his career at the Corps of Engineers where he worked for several months, then joined us in late-summer, 1978. A willing traveler, Glenn took on long term projects away from home, domestically in Florida and overseas in Korea. Glenn moved to the Houston office April 1st, 2002 and returned to New Orleans in May of 2010. He was promoted to Staff Engineer in November of 2004 and to Assistant Vice President in November, 2014. His dedication to the profession and long time service to the firm have been much appreciated. We find Glenn's indomitable spirit inspiring as he continues in the hard work towards recovery, and we look forward to his ongoing progress reports.