



The LA 1 Team:

Committed to the Environment

The Louisiana Department of Transportation and Development (LADOTD) aims to create a new four-lane, fully access controlled, elevated highway in Lafourche Parish between Golden Meadow and Port



Fourchon to replace the current LA 1. The existing LA 1 is the only land route to Port Fourchon on the Gulf of Mexico and Grand Isle, which is located to the east of Port Fourchon in Jefferson Parish. Thus LA 1 is the primary hurricane evacuation route for 6,000 offshore workers and the residents of southern Lafourche Parish and Grand Isle. As the only land route to Port Fourchon, LA 1 also plays a significant role in the nation's energy production. Port Fourchon, through its specialized facilities that support offshore oil platforms, accommodates about 17% of this country's oil and 26% of its natural gas. LA 1 is also a primary transportation route for foreign oil offloaded from ships in the Gulf of Mexico at the Louisiana Offshore Oil Platform (LOOP), which is pumped to Port Fourchon. In addition, LA 1 also serves the commercial and recreational fishing industry, which is prevalent in Lafourche Parish and Grand Isle. Whenever severe weather occurs, LA 1 is inundated in water, and there is the constant threat that the highway could be utterly washed out in the event of a hurricane. LA 1 needs to be replaced. The proposed plan calls for a 17 mile elevated roadway consisting of low-level and medium-level bridges, two elevated interchanges, and two fixed high-level bridges over navigable waterways, including Bayou LaFourche and Boudreaux Canal at Leeville and Bollinger Canal.

The proposed 17 mile corridor spans an environmentally sensitive area containing wetlands, bayous, channels and flood plains. With this in mind, LADOTD, FHWA and Wilbur Smith Associates have committed to carefully minimizing the project's impact on the environment. One example of how this is being accomplished is the method designed by Soil Testing Engineers, Inc. (STE), the company contracted to do the geotechnical survey, by performing cone penetrometer (CPT) soundings and deep borings, techniques for obtaining soil information to be used when designing the substructure for the elevated sections of new highways. For the LA 1 project, CPT soundings and borings are being carried out from modified airboats. This is the first instance of subsurface geotechnical investigations being accomplished in this way.

Cone penetrometer soundings in marine environments are usually performed by several methods. One method used in offshore investigations normally employs rigs anchored to the sea floor, with the whole system underwater. This is a fairly expensive system which requires soils that can accommodate anchoring. This method is also time consuming, as travel between sounding locations is slow. Another method involves mounting the CPT pushing system on a boat that is heavy enough to provide resistance when the penetrating mechanism pierces the soil. This method requires ample water depth for normal boat access. The marsh environment encountered in the LA 1 project precludes the use of either of these methods due to the shallow water and unstable marsh beds. An alternative method involves mounting the CPT on a marsh buggy, which has enough weight to provide reaction for penetration and also maintains mobility. However, marsh buggies can cause harm to the marsh environment.



Protecting the marsh environment is paramount. Louisiana's wetlands, the most extensive in the nation, are one of the richest and most productive ecosystems in the world, and they are disappearing. The loss of wetlands is a threat to Louisiana and the entire nation. Wetlands are reverting to open water, and open water

is far less productive than marsh habitat. The waters off Port Fourchon and Grand Isle are considered one of the top ten fishing spots in the world. Louisiana is home to more fishery landings than any of the other conterminous states, and the harvest from these fisheries makes up 16% of the nation's fishery harvest, including shrimp, crabs, crawfish, and oysters. The Louisiana wetlands are responsible for \$2.8 billion in commercial fishing and \$1.6 billion in recreational fishing. It is notable that over 75% of Louisiana's commercially harvested fish and shellfish species are dependant on wetlands. The region is also home to or in the migration path of half the bird species of North America. Over 5 million waterfowl spend each winter in this marsh habitat, and it is home to many endangered species.

For this reason, LADOTD, FHWA and the LA 1 team at Wilbur Smith decided against using marsh buggies in order to reduce the impacts to vegetated marsh environment. Instead, the CPT pushing system has been mounted on an airboat, which reduces the impact. Airboats have not been used for subsurface geotechnical investigations in the past because this presents difficult challenges. The airboat used for the LA 1 project is approximately twice the size of a normal airboat and has twin 500 hp engines. In order to mount the CPT pushing mechanism, an airboat of this size is required. Airboats are comparatively lighter than marsh buggies. The light weight of the airboat presents a problem because it does not provide enough reaction for the CPT probe to penetrate the soil. Therefore, additional reinforcement was added to the airboat to accommodate the pushing and extraction forces needed to do the work. Water tanks were installed on the airboat to provide the reaction weight required. These drums are filled with water prior to each CPT sounding. However, the extra weight reduces the freeboard on an airboat which in turn reduces capacity during probe extraction. Thus, an operational procedure was developed which requires draining the water ballast before CPT probe extraction. The ballasting and unballasting procedures are time consuming. Furthermore, to reduce the impact to the marsh, each day of the survey the airboats perform one-way transects, traveling across the least possible area of marsh.

Additional alterations to standard CPT operation were made for the LA 1 project. These involve modifying the CPT probe. One adaptation was to install memory chips in the CPT probe. Electronic signals from the CPT soundings are normally transmitted through a cable or other means and the information stored in a computer or data acquisition device. The combination of the heat and marsh environment reduces the reliability of the computer or data acquisition device. Installing memory chips in the CPT probe allows the retrieval of the data from the computer in real time while simultaneously storing the data in the CPT probe. The chance of data loss is also reduced because in the event of failure of the computer or data acquisition device, the data can be downloaded to a backup device. Another modification to the CPT probe consists of replacing the strain gauges. The marsh soils encountered in this project are very weak. The normal data resolution of CPT sensors is 12 bits which translates to a lowest detectable shear strength of about 50psf. The soils at the project site require much higher precision because they have a much lower shear strength. As a result, the CPT probe was adapted by replacing the strain gauges to increase the data resolution from 12 bits to 18 bits.



The current system, consisting of airboat, memory cone, and higher resolution, is unique. Inquiries to other SDOT's and FHWA personnel support this statement. These adaptations have been made to ensure minimum impact to the marsh environment while obtaining good data. This is done at extra cost. The special airboat size requirement and equipment rental is over twice the cost of using a marsh buggy, from \$1,500/day per rig to \$3,850/day per rig. Furthermore, the expense of modifying the airboat and mounting the equipment is estimated to be about \$5000. The total estimated cost for airboat rental assuming 180 working rig days, including two drill rigs, one CPT, and three crew boats is \$658,000. The estimated cost savings of using marsh buggies is approximately \$350,000. This figure does not take into consideration the slower production rate of using airboat-mounted equipment. It must also be stated that due to the unique nature of the project, these figures are project specific.

LADOTD, FHWA and the LA 1 team at Wilbur Smith are committed to performing an environmentally friendly survey. The use of modified airboats, the tedious operational procedures developed for the survey, and the extra cost involved in doing so, demonstrates that LADOTD, FHWA and Wilbur Smith Associates are dedicated to good environmental stewardship.



The Wilbur Smith
Partnership

www.la1project.com

www.dotd.state.la.us

www.fhwa.dot.gov