

Project Capsule

Geotechnical Asset Management (GAM) Phase II

PROBLEM

The Louisiana Department of Transportation and Development (DOTD) includes many elements that compose the state's transportation system. Consideration of Geotechnical Asset Management (GAM) within DOTD began with LTRC Project 18-4GT (Final Report 664). This project inventoried 410+ retaining wall segments as a pilot dataset.

GAM is a proactive way to manage geotechnical assets, similar to bridge maintenance and pavement management. GAM begins with an inventory of assets (location, construction dates, material properties, age, etc.). The 18-4GT research used aerial photos via Google Earth and Street Views to obtain its data. While these same tools can be utilized for other datasets, buried culverts and slopes will likely be tougher to locate and inventory via aerial photos. There is a need from multiple sections within the department (e.g., hydraulics, geotechnical, safety, maintenance, etc.) to grow this asset database to include these other datasets (culverts, slopes, embankments).

For example, the 2016 Southeast Louisiana Floods wreaked havoc on the state's transportation system for a prolonged period of time. Knowing the number, size, location, and properties of impacted culverts (not classified as bridges) could improve modeling and future planning across the state. Additionally, problematic slopes and slope failures could also affect our transportation system if they are not managed appropriately. DOTD should have ways of managing and addressing geotechnical assets to move forward with proactive maintenance efforts to prioritize and implement repairs.



Figure 2. Slope failure on I-10 near Bluebonnet Blvd in Baton Rouge, LA (2019)



Figure 1. Example of culvert failure (Source: FHWA)

Start Date

August 15, 2024

Duration

36 months

Funding

SPR: TT-Fed/TT-Reg - 5

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OBJECTIVE

The research objectives for this project can be summarized as follows:

1. Grow Geotechnical Asset Management (GAM) in Louisiana.
2. Build/rebuild a culvert inventory database that will benefit multiple DOTD sections.
3. Establish condition and consequence criteria for culvert risk determinations and maintenance priorities.
4. Develop a roadmap for GAM implementation related to PROTECT funding implementation and potential establishment of a Geotechnical Asset Manager.

METHODOLOGY

To achieve the objectives of this research, the research team will complete a series of tasks. First, they will research existing state and federal efforts regarding the asset management of culverts, embankments, and slopes. They will next locate existing databases within DOTD and create a georeferenced database for DOTD. After locating the aforementioned databases, the research team will develop a culvert criteria model regarding conditions and consequences to establish levels of risk and maintenance priorities.

The research team will then develop a roadmap for GAM implementation related to PROTECT funding implementation and potentially establish a Geotechnical Asset Manager. They will then provide recommendations and deliverables (i.e., a database) to DOTD for implementation. Lastly, the team will prepare and process a final report detailing their findings.

DISCUSSION

Culverts come in different shapes, sizes, lengths, materials, etc., and have different thicknesses of soil and/or pavement above them. These factors, along with others including age and average daily traffic, affect a culvert's functional life span. Creating a database to inventory smaller culverts that do not qualify as bridges (according to DOTD Bridge Section criteria) still has value. These culverts affect the stormwater flow across a watershed. They can also affect traffic should they corrode and/or no longer support their loads. LTRC Project 16-5GT (Report 585) addressed

the use of corrugated metal pipes and how saltwater exacerbates corrosion and shortens the lifespan of these pipes – ultimately leading to disallowing their placement in new projects in south Louisiana. The use of culverts, regardless of material, should come with a certain level of maintenance and inspection to ensure the asset is performing as expected. Additionally, knowing culvert details regarding diameter, invert elevations, and the pipe's relation to the watershed can assist with models to predict and potentially reduce flooding.

This project will focus on culverts as the dataset and establish criteria to help district forces standardize condition assessments and evaluate the consequences of culvert failure. The project will set a template for the management of culverts to share culvert information across the department via a GIS database. This will preserve this information for others, as the department moves towards the further implementation of GAM as a way to manage culverts and other geotechnical assets.

IMPLEMENTATION POTENTIAL

This research will expand on previous GAM efforts within Louisiana and provide DOTD with a logical method to manage and address each problematic location. Once inventoried, condition and consequence data will aid in risk, repair/replacement options, and potential costs. A proactive GAM system will help designers plan and maintain the state's transportation system for years to come.



Figure 3. Culvert example