

## CASE STUDY



## PROJECT SNAPSHOT

### PROJECT

Hurricane Harvey Rehab  
Clay Road, Houston, Texas

### OWNER

Harris County Flood Control District

### PROBLEM

- A major multi-lane roadway risked collapse due to hurricane-damaged storm culverts running beneath it
- Structurally compromised, debris-filled culverts were hazardous and facing catastrophic failure
- Culverts were not draining properly, leading to road erosion

### CONTRACTOR

Vortex Lining Systems - Houston, Texas

### DIMENSIONS

- 138' Corrugated Metal Pipe, 84" - 96" in diameter
- 142' Corrugated Metal Pipe, 84" - 96" in diameter
- 148' Corrugated Metal Pipe, 84" in diameter

### OVERVIEW

Hurricane-ravaged storm pipes were fully restored, without the need for replacement, using a large diameter pipe relining application featuring GeoKrete.

# GeoKrete® Geopolymer Restores Failing Corrugated Metal Pipes Damaged by Hurricane Harvey, Prevents Potential Collapse

## CMP CULVERTS RUNNING BENEATH BUSY ROADWAY FULLY STRUCTURALLY RESTORED USING COMPLETELY TRENCHLESS GEOPOLYMER SOLUTION

**VORTEX PRODUCTS USED**

- 1 Quad-Flow®
- 2 GeoKrete®

### THE CHALLENGE

Hurricane Harvey is one of the worst natural disasters in the history of the United States. The Category 4 storm pummeled Houston, Texas with winds exceeding 130 mph, dumped more than 50 inches of rain, produced 57 tornadoes and flooded over 300,000 structures, causing \$120 billion in damage.

When Harris County Flood Control District officials conducted post-storm inspections, they discovered a three-pipe culvert system beneath a stretch of Clay Road — a highly traveled, multi-lane commuter artery — had begun to fail. Large sections of the CMP (corrugated metal pipes) inverts exhibited corrosion, extreme degradation and wide pipe joint separations, while some sections were missing entirely. The extremely compromised pipes put Clay Road at risk of collapse.





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### THE SOLUTION

Vortex Lining Systems provided a comprehensive, consultative assessment of the project's requirements and determined a multi-prong approach was necessary to address the gaps, voids and missing sections of the three CMPs, which ranged from 84" to 96" in diameter, prior to applying GeoKrete® Geopolymer.

Following standard F1216 practices, the design took all three loads (soil, hydrostatic, traffic) on the roadway into account. Prior to application, accumulated silt and debris were removed and surfaces were cleaned using a 3,500 psi pressure wash. Inverts were sealed with Vortex's Quadex® Quad-Flow, a quick-setting flowable high-strength repair mortar. Standard cementitious material and GeoKrete were used to fill pipe voids. GeoKrete was spray applied into open joints to fill and seal cavities, creating a monolithic structure.

The geopolymer was applied utilizing hand troweling, hand spraying and centrifugal methods to meet the diverse needs of each pipe section.

### THE RESULTS

The serious structural defects, massive amounts of corrosion, voids and missing sections were completely rehabilitated using a single lining solution. The permanent repair provided critical structural integrity and corrosion resistance to ensure the roadway safety. Vortex's trenchless method, combined with the repair versatility of GeoKrete geopolymer, helped the client save roughly 40% as compared to a dig-and-replace project.

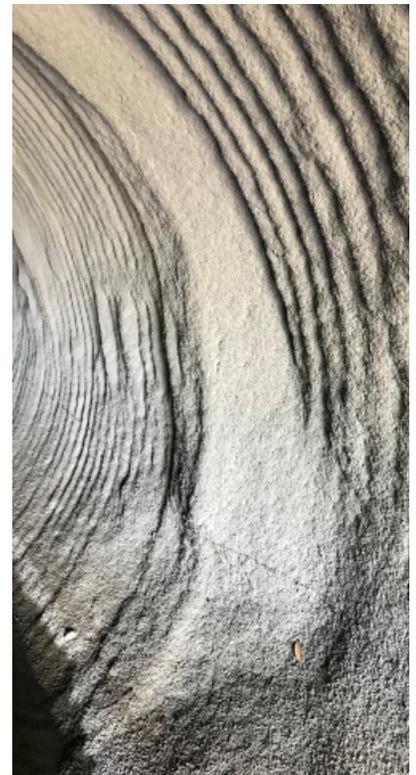
### THE INNOVATION

GeoKrete is a factory blended, one-component, eco-friendly, microfiber-reinforced geopolymer mortar. It is synthesized from reactive SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> from industrial byproducts and enhanced with monocrySTALLINE quartz aggregate.

Vortex's deep knowledge and consultative approach enable it to provide the correct solution, tailored for each project's unique needs, faster than competitors' custom options.



*The versatility of GeoKrete allows it to be sprayed, spun or trowel applied over obstructions and unique shapes within a structure.*



*GeoKrete bonds tenaciously to multiple surfaces such as brick, CMP, concrete and clay.*