

## History and Repair of Buffalo's Sinkhole in Hickory, North Carolina



Gary Taylor, PE and Matt Snyder, PE – RK&K

*History and Repair of Buffalo's Sinkhole in Hickory, NC*



## Presentation Summary

- History and Background
- Repair Plan
- Subsurface Investigation
- Shoring and Excavation Plan
- Shoring Design (by contractor)
- Construction Status

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### Location



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### Location



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## The Tale of the Hickory Sinkhole

- Five owners
- Fifteen+ years in the making
- Three failures and three repairs
- A Corvette
- Flooding
- Heroes
- Lawsuits

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## Timeline

- Original owner attached pipe to DOT's RCBC under US 70.
- **March 8, 2001:** Land purchased by Buffalo's developer
- **October 2001:** Buffalo's Southwest Cafe opens for business.
- **Aug. 17, 2002:** Two sinkholes open at Buffalo's on U.S. 70, SE, after a record rainfall. One of the sinkholes swallows a yellow Corvette. U.S. 70 was also closed for several days, due to flooding from the culvert under the road.
- **Nov. 2002 to April 2003:** Sinkhole repaired.
- **July 2003:** Buffalo's reopens.

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## Timeline

- **May 2004:** Buffalo's closes. Owner defaults on bank loan.
- **July 7, 2005:** The remnants of Hurricane Cindy sweep through Catawba County, and a second sinkhole developed.
- **Aug. 12, 2005:** The bank installs two eight-inch pumps at the sinkhole to pump out water.
- **March 2006:** Bank sells the property for one dollar
- **April 2007:** New owner notified that his property is in violation of Hickory's public nuisance ordinance.
- **Aug 2007:** Restaurant was demolished.

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## Timeline

- **April 2008:** New owner receives another letter from Hickory. Although he has done a lot of work on the property, including removing the restaurant building, no work has been done for months.
- **May 6, 2010:** New owner still trying to repair sinkhole. Says he wants to build a carwash on the site.
- **August 2016:** City Council members decide to authorize the taking of the property, to begin to make repairs along with the North Carolina Department of Transportation
- **November 2016:** NCDOT lets contract to repair the sinkhole. Completion expected by June 2017.

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## Original Site – Pre 2001

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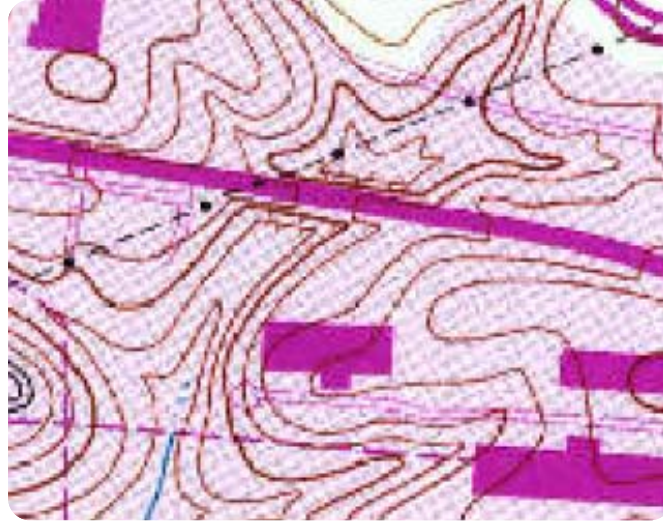
1993



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1993



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1998



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## Buffalos Restaurant - 2001



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## First failure

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## Flooding

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**PROCLAMATION  
 HENDRICK HONDA HEROES**

**WHEREAS**, during a thunderstorm on July 16, 2016, a flood situation occurred at the "sinkhole" site on Highway 70; and

**WHEREAS**, two women were caught in their vehicle in the flood waters while traveling on Highway 70; and

**WHEREAS**, Hendrick Honda employees Joey "Robert" Lankford and J.D. Roy put their own safety in jeopardy and pulled the two women from their flooding vehicle; and

**WHEREAS**, other Hendrick Honda employees, Chris Osborne, J.R. Dula, Kris Stephens, Villy Vongsarath, Cody Ayers, and Mark Sutton assisted with the rescue and pushed the car out of the roadway; and

**WHEREAS**, these unsung heroes understand that their heroism made a difference in the lives of these two women; and

**WHEREAS**, in the words of Ralph Waldo Emerson, "The hero is no braver than the ordinary man, but he is brave five minutes longer".

**NOW, THEREFORE**, I, Rudy Wright, Mayor of the City of Hickory, on behalf of Hickory City Council, do hereby recognize and commend the Hendrick Honda Heroes: Joey "Robert" Lankford, J.D. Roy, Chris Osborne, J.R. Dula, Kris Stephens, Villy Vongsarath, Cody Ayers, and Mark Sutton for being brave five minutes longer.

This the 1<sup>st</sup> day of November, 2016

*Rudy Wright*  
 Mayor Rudy Wright

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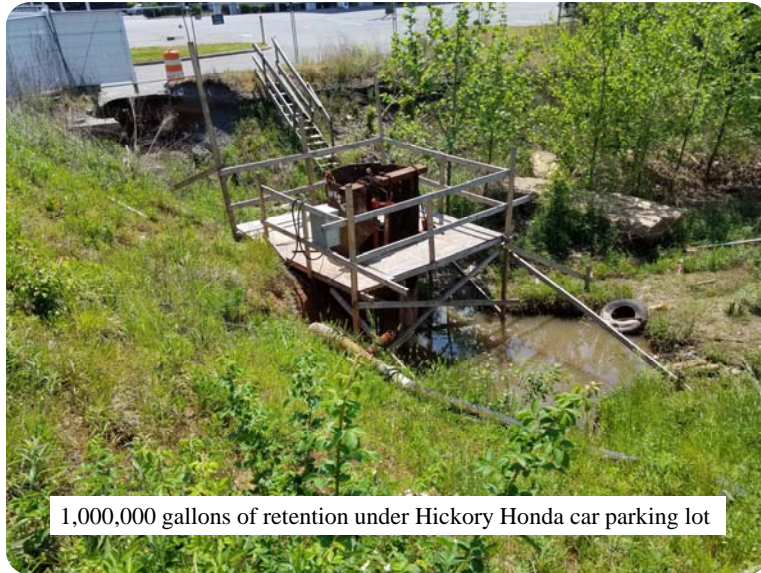


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## Initial Repair

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# Corvette

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**Lawsuits ?**

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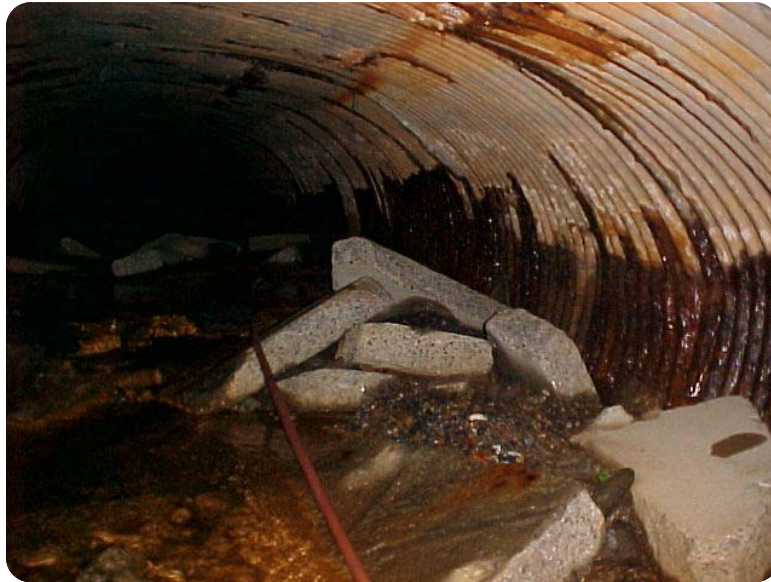
## Pipe Under 7th Street

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## Second Repair

- From 2008 – 2010
- No DOT and no photos
- Supposedly replaced some sections of pipe
- Concrete cap

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## Abandoned Site

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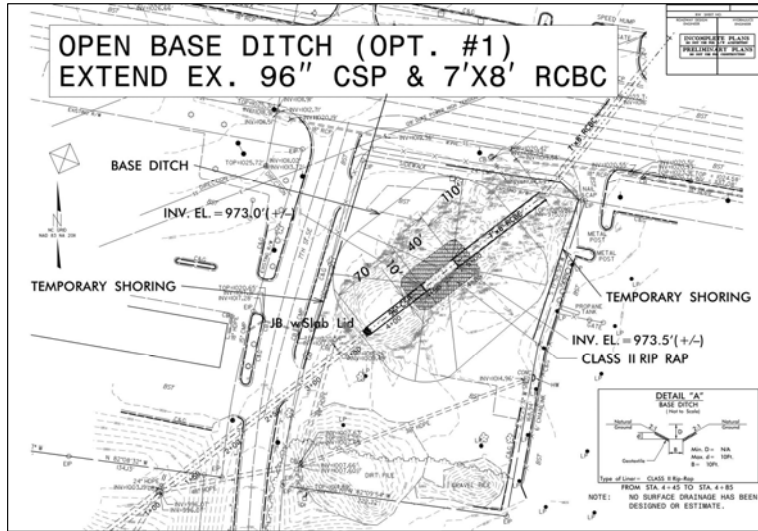
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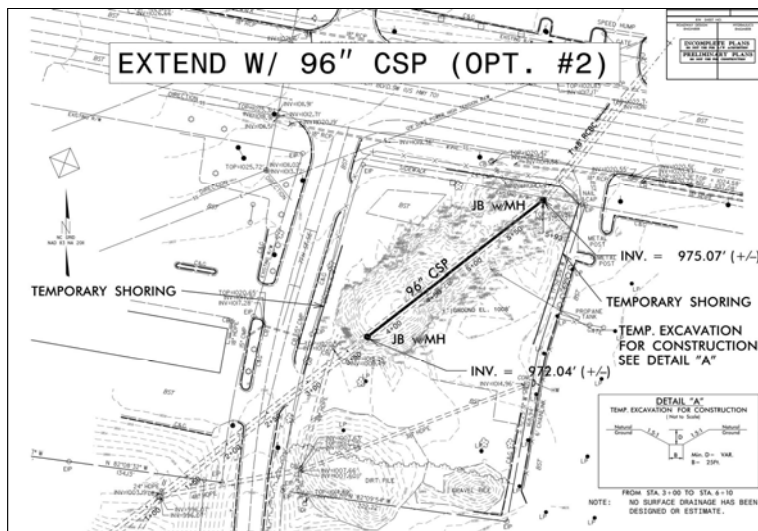
## Repair Plan

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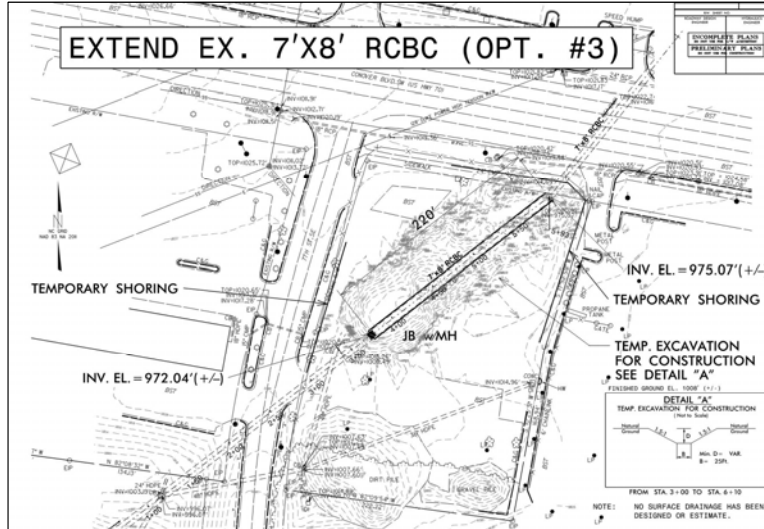


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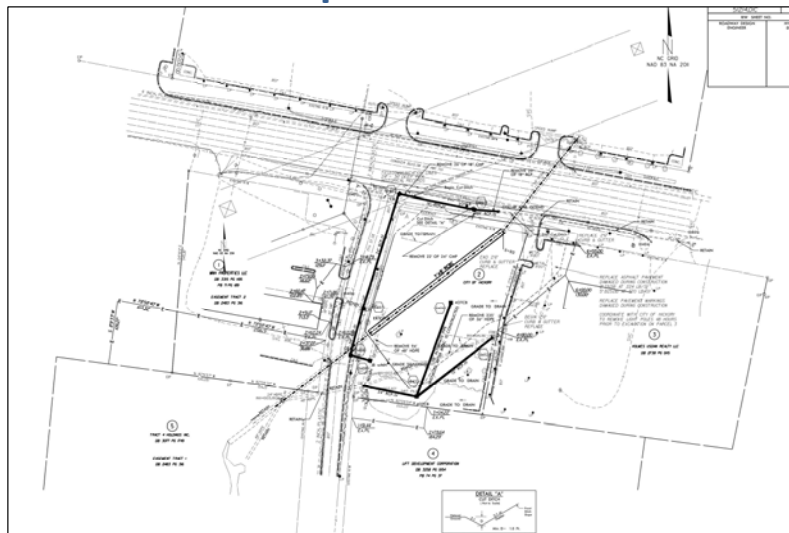




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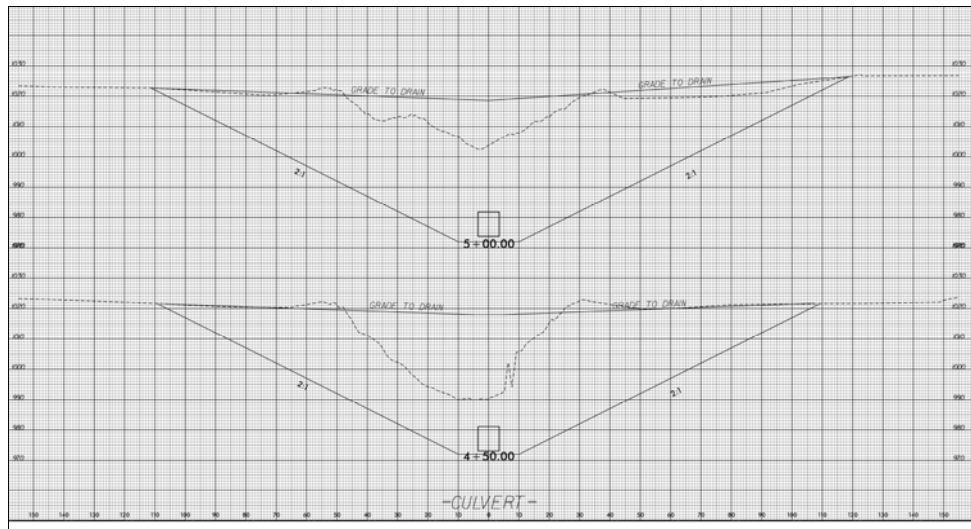


### Proposed Plan



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## Summary of Subsurface Exploration

- Approximately 40-ft of artificial fill/embankment material encountered on north and west portions of site from construction of US 70 & 7<sup>th</sup> Street and development of site
- Alluvial deposits
- Weathered rock/rock (mica schist) elevation drops from southeast to northwest portions of site

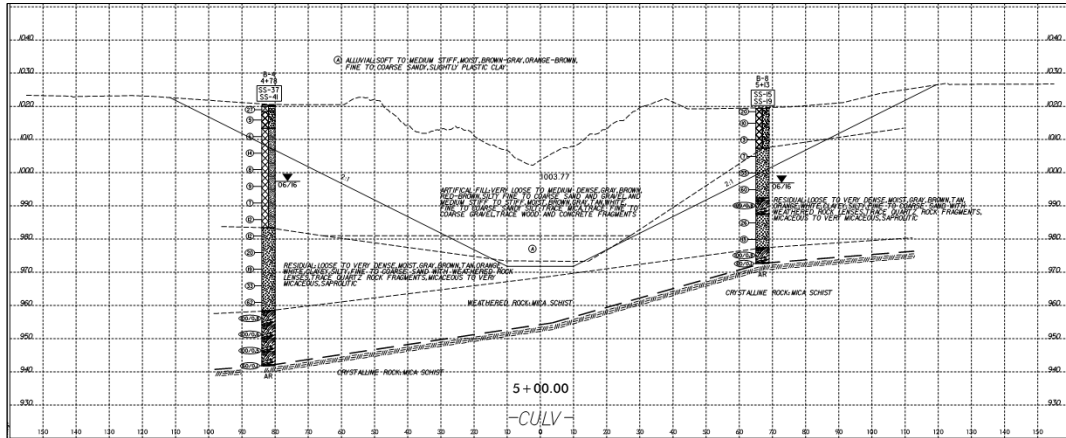
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## Cross Sections (Along Existing Pipe Alignment)



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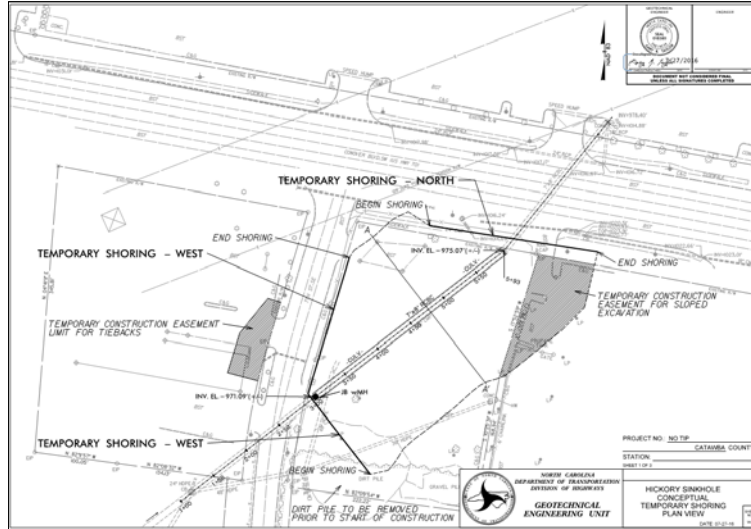
## Shoring and Excavation Conceptual Plan Summary

- Combination of temporary shoring and sloped excavation to minimize impacts on surrounding properties, 7<sup>th</sup> Street and US 70
- Temporary shoring options
  - 1) Anchored soldier piles with lagging or sheet piles
  - 2) Soil nail wall
- Temporary slopes at 2(H) : 1(V)
- Temporary construction easements for sloped excavation and tieback/nail installation

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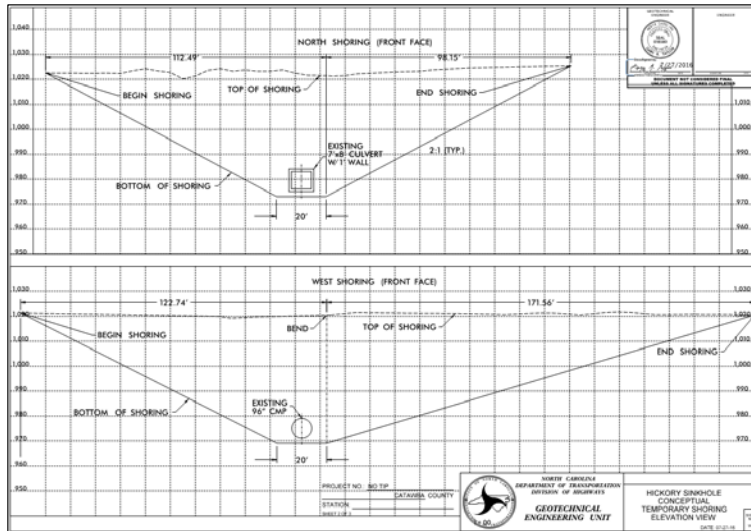
# Shoring and Excavation Conceptual Plan



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# Conceptual Shoring Envelopes



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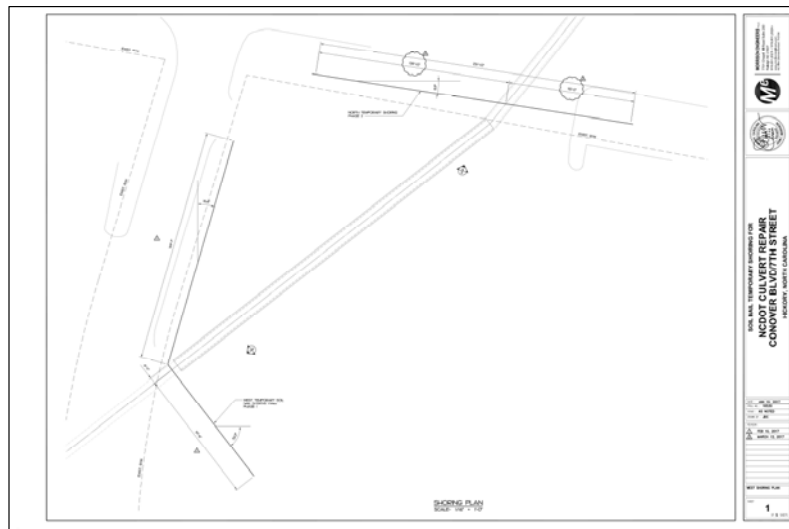


## Shoring Design (by contractor)

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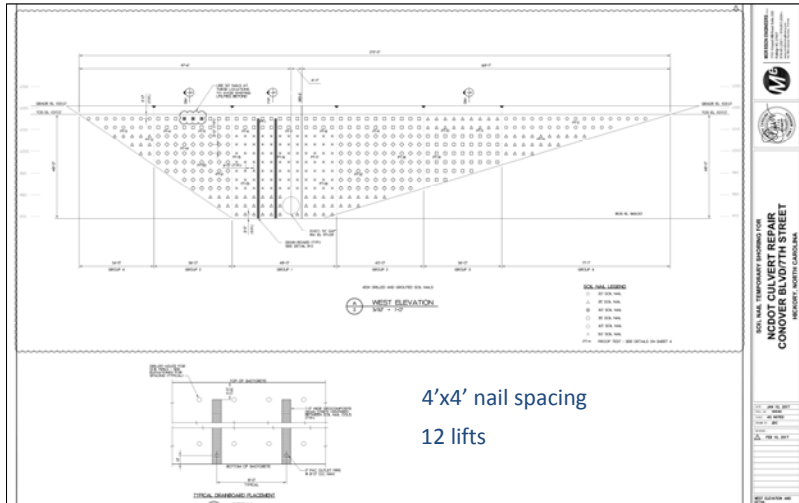
## Plan



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## West Elevation

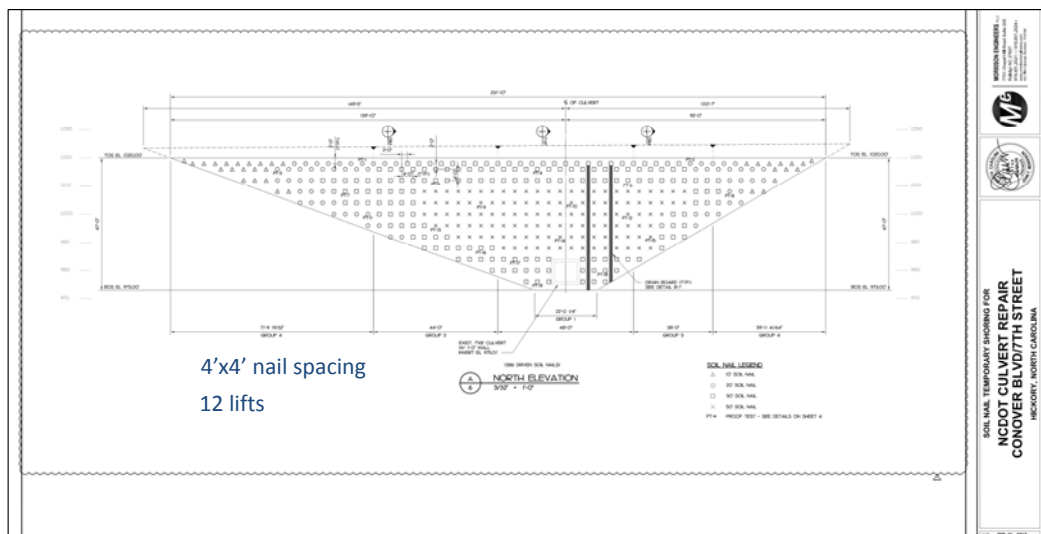


4'x4' nail spacing  
12 lifts

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## North Elevation

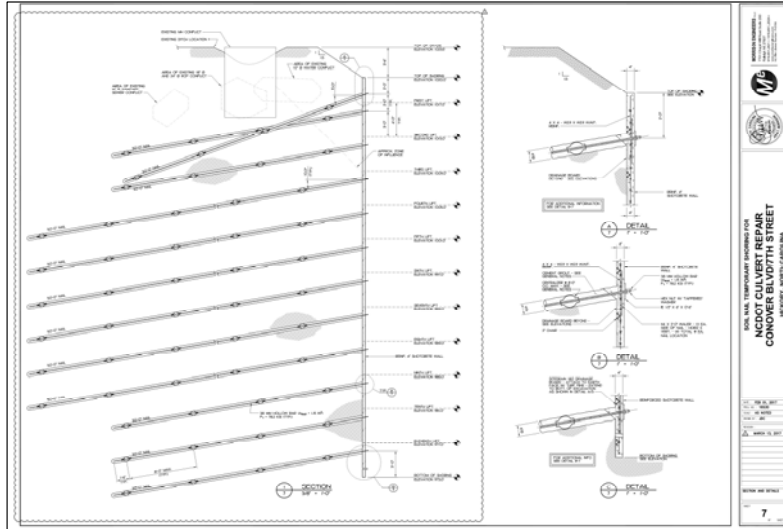


4'x4' nail spacing  
12 lifts

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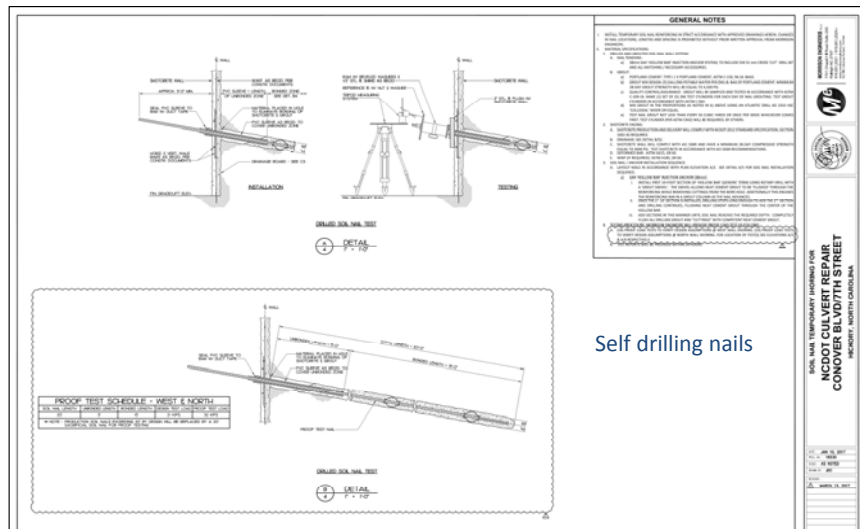
### Typical Section



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### Test Nail Details

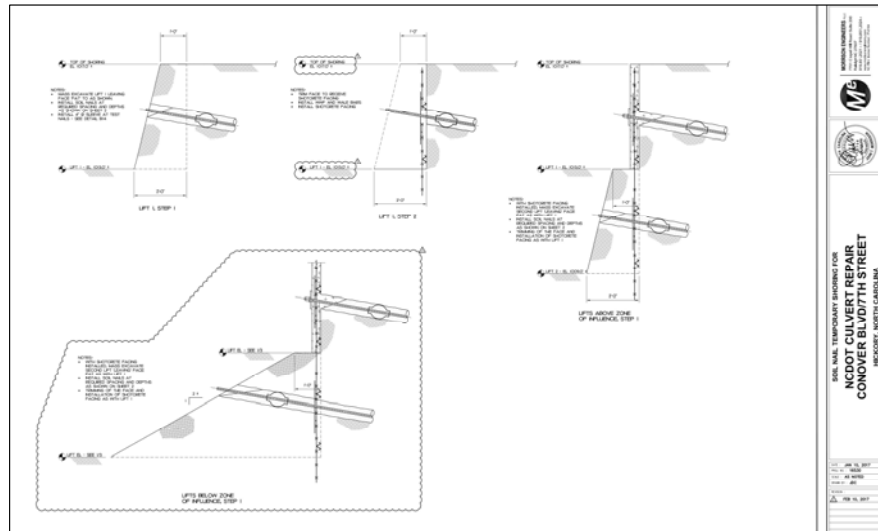


Self drilling nails

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## Berm Details



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## Construction

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## Dewatering Plan

- Avoid submerging the shotcrete facing during a storm event
- Repeatedly submerging the shoring system could have detrimental effects on the shoring system
- Minimize US 70 flooding during storm event
- Primary and backup pumping
- Keep water in hole pumped down
- Keep water in stand pipe pumped down
- Pump water from standpipe into storm drain
- Pump water from hole to stilling basin

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## Money Down the Hole

- Initial repair \$1M
- Business Losses \$\$\$
- Bank losses \$\$\$
- NCDOT pumping since 2012 \$400K
- Final repair \$4.2M
- Flood damage \$\$\$

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## Acknowledgements

- **Larry Carpenter, PE** – NCDOT, Division 12 Construction Engineer
- **Chuck Hansen, PE** – City of Hickory, City Engineer (Retired)
- **Dean Hardister, PE** - NCDOT, Geotechnical Engineering Unit, Western Region Operations Engineer
- **Christina Bruinsma, PG** – NCDOT, Geotechnical Engineering Unit, Project Geological Engineer
- **Mohammed Mulla, PE** – NCDOT, Geotechnical Engineering Unit, Contract & Statewide Services Manager

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Questions?

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