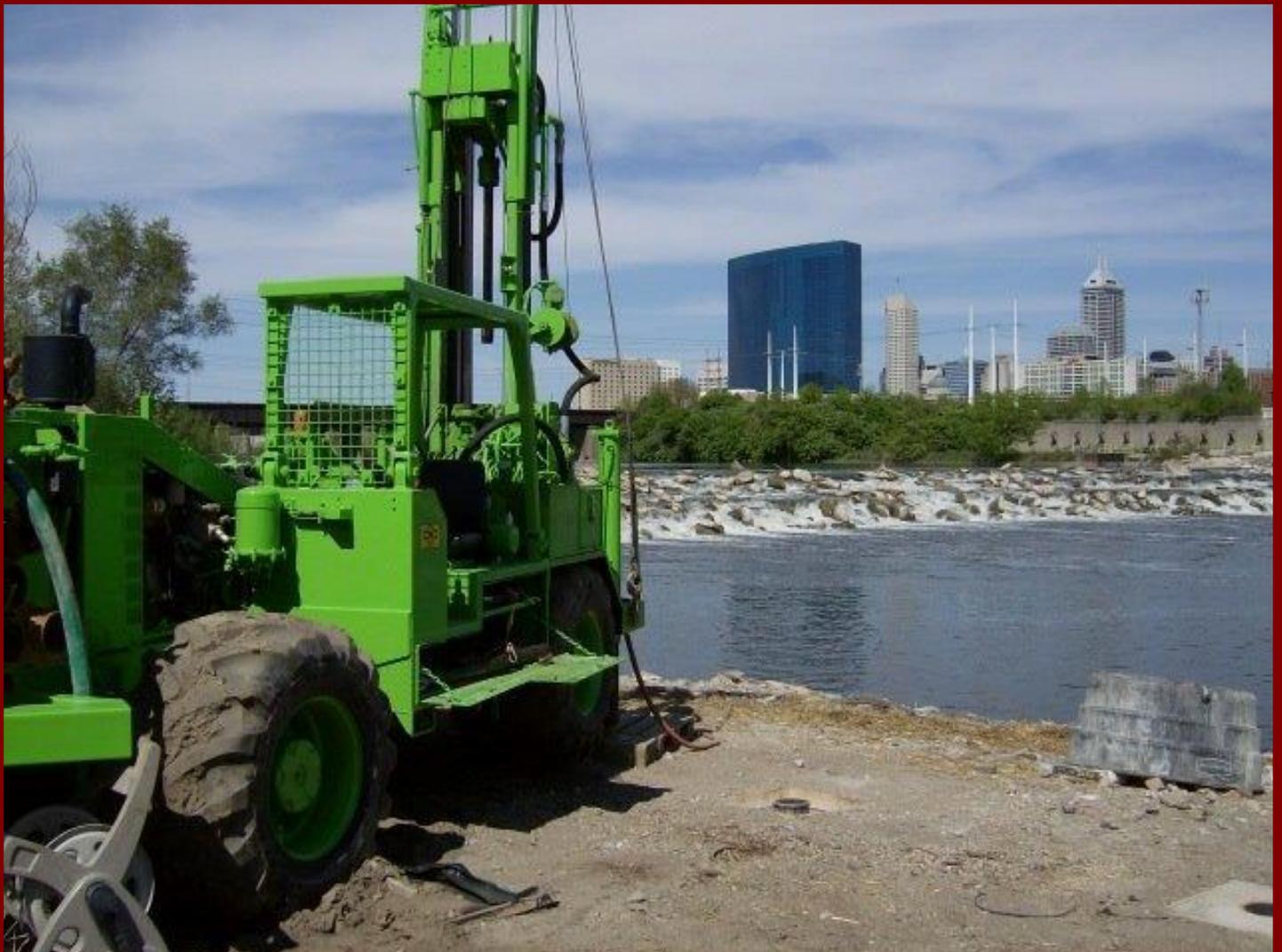


**7NT**



**Integrity. Reliability. Performance.**





7NT provides highly specialized complex drilling, engineering, inspection and testing services. The following pages will demonstrate our experience and knowledge of this highly complex work with a small sample of our project experience.

7NT Professional Services:

- ◆ Highly Complex Drilling Services (Specializing in Deep Tunnels)
- ◆ Construction Management/Inspection
- ◆ Laboratory Services
- ◆ Materials Testing
- ◆ Geotechnical Engineering
- ◆ Water/Wastewater Engineering



“Thanks for your dedication.  
Please extend my Thanks to the  
Crew.

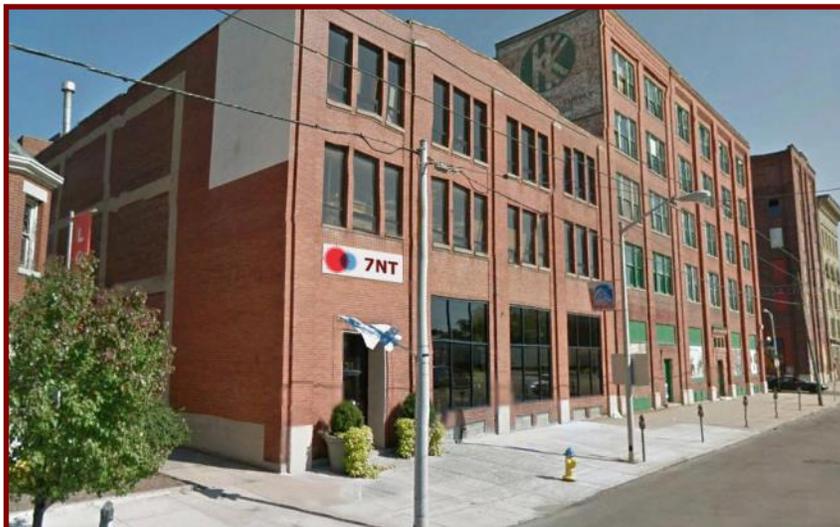
This is what makes my job easy,  
keep up the Great Job!”

Jerry L. Jung, P.E.

Metropolitan St. Louis Sewer  
District

7NT works on projects nationwide. We have offices in the following states:

- ◆ Illinois
- ◆ Indiana
- ◆ Michigan
- ◆ Missouri
- ◆ Nebraska
- ◆ Ohio
- ◆ Pennsylvania
- ◆ Washington, DC





## Prequalifications and Certifications

7NT is a nationally recognized Minority Business Enterprise (MBE) by the National Minority Supplier Development Council (NMSDC).

- ◆ 7NT is certified as an MBE with state, regional and local organizations in the areas where we do business.

### ODOT Prequalifications

- ◆ Geotechnical Engineering
- ◆ Geotechnical Testing Lab
- ◆ Geotechnical Field Exploration
- ◆ Geotechnical Drilling Inspection
- ◆ Construction Management Firm

### INDOT Prequalifications

- ◆ Construction Inspection
- ◆ Geotechnical Engineering

### PennDOT Prequalifications

- ◆ Drilling Class A and S

### KYTC Prequalifications

- ◆ Geotechnical Engineering
- ◆ Geotechnical Testing Lab
- ◆ Geotechnical Drilling Inspection

### Laboratory Certifications

- ◆ Dayton, OH– AASHTO Accredited (AMRL/CCRL), USACE Validated
- ◆ Indianapolis, IN– AASHTO Accredited (AMRL/CCRL), USACE Validated

## 7NT Project Map





## Signature Project

### **Deep Rock Tunnel Connector, Indianapolis, IN**

**Project Value: \$270 million**

**References: Mark Jacob, CEG (317) 429-3962. John Trypus, CEG (317) 429-3954**

7NT personnel have been part of the Deep Rock Tunnel Connector (DRTC) mega-project since its preliminary design phase in 2007. The DRTC is part of Citizen Energy Group's (CEG) federally mandated plan to curb the overflow of raw sewage into local bodies of water. The system will store 200 million gallons of sewage during and after wet weather events. The \$270M tunnel & pump station DRTC project commenced construction in December 2011. 7NT continues to service the project.

**The following services were performed by 7NT personnel throughout the project:**

**Geotechnical Drilling, Environmental Drilling and Sampling, Laboratory Services, Surveying Services, Project Management, Geotechnical Engineering, Construction Inspection, Materials Testing**

7NT personnel performed all of the geotechnical investigation and laboratory work for the project. The detailed design work included:

- ◆ 63 borings ranging from 15'-305' deep with overburden from 50'- 115'.
- ◆ Overburden drilling included dealing with predominantly heaving sands while conducting standard penetration testing, split spoon sampling, and Shelby tube sampling.
- ◆ 38 piezometers were installed totaling approximately 4,000 feet.
- ◆ Approximately 250 hours of Packer testing was performed.
- ◆ 9 of the borings were performed at a 20 degree incline from vertical
- ◆ A total of approximately 6,500 feet of HQ-size rock and 4,500 feet of overburden was drilled/cored for the project.
- ◆ Quality of rock cores obtained required minimal to no preparation by the laboratories to perform designated testing.



**We pride ourselves on being a small firm that prevents and solves large, complex problems**



Due to the time constraints of the overall project schedule, dictated mostly by EPA consent decree mandates, the drilling needed to be performed on fast track basis. Up to 6 drill rigs were utilized to complete the drilling in approximately 17 weeks. The drilling was performed through the harshest weather of the year (December to March). The drilling program was completed ahead of schedule and under budget.

In addition to design services, 7NT personnel have also played an integral role on the Construction Inspection team providing several inspectors (both underground and on surface), construction administration staff, and materials testing technicians for soil (levee embankment extension), shotcrete (shafts and tunnel), and concrete (tunnel lining and pump station).

The project has been extremely successful, setting world records for tunneling in a day, week and month. 7NT personnel take great pride in contributing to this massive accomplishment

**The DRTC Project is a great representation of who 7NT is as a company. We are a small company that works on very large projects. Our highly complex, specialized services have found us working on projects all over the country at the request of clients. 7NT was awarded contracts for construction management services for the next 4 upcoming tunnels, and associated sewers, in Indianapolis as a result of the success of this project.**



## Complex Drilling Services





## **REDUCING RISK AND UNCERTAINTY IN CSO TUNNEL CONSTRUCTION**

### **1. Accurate Geotechnical Data**

A primary risk factor in tunnel construction is inaccurate geotechnical data. This data is gathered during the planning stages of the project and later refined during the design stage. Information is gathered by drilling borings; deep, vertical and inclined, into the bedrock to gather soil and rock samples that are utilized in laboratory testing while also creating an opportunity to perform down-hole in-situ testing to aid in obtaining the following critical data:

- ◆ The consistency of the soil and rock strata to determine the optimal vertical and horizontal locations for tunnel alignment
- ◆ By drilling inclined and vertical borings, rock fractures themselves as well as the rock fracture orientation can be defined
- ◆ While soil sampling and rock coring, voids and other inconsistencies in the soil and rock strata can be determined
- ◆ By timing rock core runs during geotechnical drilling, the drilling progress can aid in determining the TBM's projected production rates
- ◆ Proper core runs provide quality samples to be tested for critical properties more accurately (abrasivity, moduli, drillability, hardness)
- ◆ Performing Hydraulic Conductivity Testing (Packer Testing) determines water movement within the rock
- ◆ Installing both standpipe and/or vibrating wire piezometers records long term seasonal groundwater conditions

The major goal of the geotechnical drilling and testing is to gain as much ACCURATE data of the soil, rock and water as possible. The more accurate the data, the less risk the Owner will bear during construction.

Decisions regarding the expenditure of hundreds of millions of dollars are made based on the data gathered by the drilling firm. While the Owner will often spend significant resources in evaluating and selecting the Prime Design Firm, the drilling firm is usually hired for local, political and low cost reasons. This is ill-advised. Most drilling firms do not have the specialized experience needed to perform this work accurately.

***SELECTION OF THE DRILLING FIRM SHOULD GET THE SAME LEVEL OF ATTENTION AS SELECTION OF THE PRIME DESIGN FIRM.***

### **2. Highly Specialized Experience**

7NT has highly specialized experience in conducting deep borings related to CSO projects. We have developed proprietary systems and procedures to accurately gather the data specified above. Key elements of our experience are as follows:

- ◆ Over 500 deep borings since 2008 in diverse locations & geological conditions around the country.
- ◆ Successful investigations on major tunneling projects in Indianapolis, Ft. Wayne, Louisville, St. Louis, Cleveland, Cincinnati and Hartford.
- ◆ Specialized equipment and trained personnel specifically geared towards deep CSO projects.



### 3. No Cost Insurance

Deep tunnel CSO projects are high risk projects as 9-figure decisions are often made based on limited geotechnical investigation. Even small inaccuracies in this data have resulted in change orders in the tens of millions of dollars.

Retaining 7NT to perform the drilling is a low/no cost way of insuring against this risk.

***FOR LITTLE OR NO ADDITIONAL COST, THE OWNER CAN HIRE THE BEST DRILLING FIRM AND REDUCE THE SUBSTANTIAL RISK ASSOCIATED WITH INACCURATE DATA GATHERING.***

7NT's track record on CSO tunneling projects includes the following:

- ◆ DRTC project in Indianapolis set **world records** for mining in a day, a week and a month.
- ◆ DRTC project in Indianapolis is **\$80 million under budget**, while the remaining 18 miles of the Indianapolis system are currently projected to come in **\$70 million under engineer's estimate**.
- ◆ South Hartford Conveyance Tunnel had multiple bids come in **\$30 million to \$50 million under engineer's estimate**.





## Drilling Equipment

Equipment is another area that distinguishes 7NT from other drilling firms. The equipment is the means by which the experienced and knowledgeable personnel carry out their responsibilities effectively and efficiently. 7NT has made significant investments in its equipment for our personnel to be the most effective. A condensed listing of the 7NT owned and leased equipment includes the following:

### **Drill Rigs:**

- ◆ (2) CME 550 X ATV w/ angle capacity
- ◆ CME 750 ATV w/ angle capacity
- ◆ CME 75 Truck Mount w/ angle capacity
- ◆ Mobile B58 Truck Mount

### **Support Trucks:**

- ◆ GMC C-7500 Water Truck
- ◆ Chevy 3500 1 Ton Box Truck
- ◆ (5) 2015 Dodge 3500 Pick Up
- ◆ 2016 GMC 3500 HD
- ◆ (10) Various smaller support trucks

### **Barge:**

- ◆ 36' x 20' Spud Barge and Support Boat

### **Tools:**

- ◆ 100' of 2.25" HSA, 300' of 3.25" HSA
- ◆ 400' of 3.25" HSA
- ◆ 600' of 4.25" HSA
- ◆ 150' of 6.25" HSA
- ◆ 200' of 3" NW Casing
- ◆ 1,100' of 4" HW Casing
- ◆ 6 Casing Advancers
- ◆ 2 10' NW Core Barrels
- ◆ 9 10' HQ3 Core Barrels (Wireline)
- ◆ 2 5' PQ Core Barrels (Wireline)
- ◆ 8 HQ3 Double Packer Systems w/ Transducers
- ◆ 3 NQ3 Double Packer Systems w/ Transducers
- ◆ 8 Deck Over Trailers
- ◆ 4 Troll Systems





## Drilling Capabilities

- ◆ Drilling to 400' on land and in water
- ◆ Packer Testing
- ◆ Rock coring
- ◆ Hollow stem auger drilling
- ◆ Solid flight auger drilling
- ◆ Mud rotary drilling
- ◆ Air rotary drilling
- ◆ Rock core drilling/extraction
- ◆ SPT soil sampling
- ◆ Shelby tube sampling
- ◆ Boring logs
- ◆ Field Classification (ASTM D2488)
- ◆ Hand penetrometer testing
- ◆ Inclinometer casing installation
- ◆ Test pit excavation



7NT owns and operates a fleet of 5 rigs that are all newer and well maintained. This minimizes mechanical breakdowns and delays.

Rigs are equipped with fluted Kelly bars. This allows for using up to 15' long casing and core barrels for higher quality sampling and faster production.

Rigs are equipped with calibrated automatic hammers for accurate SPT counts.

For deep drilling, wireline split inner triple barrels are used to maximize recovery and mechanical breaks in the rock core sample.

The core barrels are manufactured by Boart Longyear.

A double packer system is used with a vibrating wire transducer for water pressure testing. This allows for actual readings within the 10-foot section from the transducer; the calculated values from the surface gauges are used as backup confirmation.

Ability to install nested standpipe and vibrating wire piezometers. A grout mixer with moyno pump is also used during the piezometer installation that allows for accurate quantities and correct mix proportions/slump to be used.

Use a mole system for slug testing that contain a variety of transducers allowing pressures up to 1,500 psi ranges. Furthermore, software for the slug testing is continually upgraded.

The support trucks are equipped with trailer systems that have been specifically designed and stocked by 7NT drilling crews for deep drilling work. This allows for all equipment to be present at the drill site and organized in a manner to maintain high quality and increased production.



## Project Experience

### **Lower Mill Creek Partial Remedy– Phase 1, MSDGC, Cincinnati, OH**

**Project Value: \$244 million. Reference: Jim Welp: Black & Veatch (513) 984-6630**

7NT personnel provided drilling services on this key project for Metropolitan Sewer District of Greater Cincinnati. The project consisted of a 9,600 foot long, 30 foot diameter sewer tunnel. The scope of drilling work consisted of 18 total borings, which included 14 deep borings to approximately 400 feet in depth and 4 shallow borings to top of rock. The following represents the scope of work for the Design Stage:

- ◆ 18 borings were completed for the project ranging from 35 feet to 410 feet in depth
- ◆ 12 geotechnical borings were part of our scope, they ranged in depth from 100 feet to 410 feet with overburden ranging from 70 feet to 110 feet.
- ◆ Environmental sampling was performed in 6 of the borings and included the containerization of all soil cuttings and drilling fluids. The drilling fluid was collected from both the overburden and the rock core. Of the six environmental borings three of them were drilled to depths exceeding 300’.
- ◆ A total of approximately 3,987 feet of HQ3-size rock was cored during the project using a split inner, triple tube core barrel. All of the rock was classified and photographed while still within the split inners.
- ◆ Approximately 273 hours of Packer testing was performed, all of which utilized a transducer within the testing zone. Our packer system also includes the traditional surface gauges that are used to confirm the accuracy of the transducer.
- ◆ We installed piezometers in 17 of the 18 borings for a total piezometers footage of 7,786 feet. 7NT personnel installed four 2inch PVC standpipe piezometers. Three vibrating wire transducers were placed at different elevations in each boring (i.e. 370, 290, 130 feet below the grounds surface.) Each piezometer was completed with a flush mounted protective cover and a 2’ x 2’ concrete pad stamped for identification.
- ◆ Quality of rock cores obtained required minimal to no preparation by the laboratories to perform designated testing.



The major complication while drilling included the encountering of methane gas. Pockets of natural gas created conditions that forced us to delay the drilling and the setting of piezometers. The delays, when encountered, lasted from a few hours to as much as seven days. In all cases we were equipped with enough tooling to move to the next boring and return once the methane was no longer an issue. The drilling schedule for this project required the use of 3 rigs at one time and was completed on schedule and under budget.



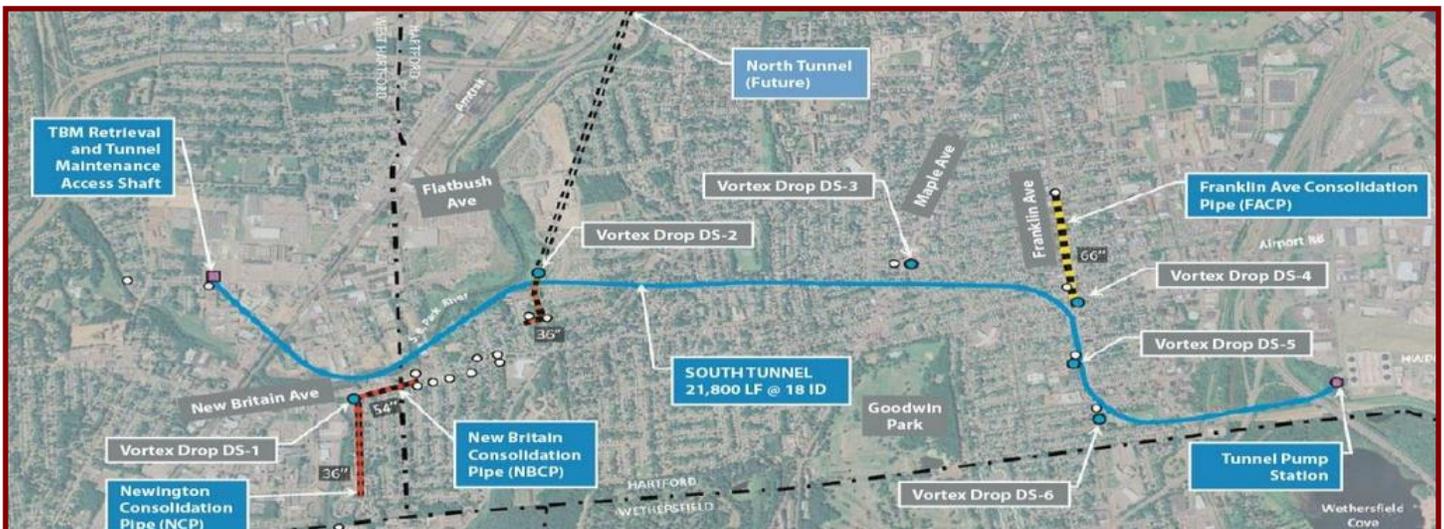
## South Hartford Conveyance Tunnel (SHCT), Hartford, CT

Project Value: \$279.4 million. Reference: Jim Sullivan, AECOM (860) 383-5316

The South Hartford Conveyance Tunnel project was completed in 2 stages. The project was completed for the Hartford Metropolitan District Commission (MDC) to store and convey combined sewer overflow as part of a long-term control plan to eliminate discharge into local bodies of water during high intensity events. The following represents the scope of work:

- ◆ 56 borings were completed for the project ranging from 50 feet to 300 feet in depth.
- ◆ 26 geotechnical borings were part of the scope that ranged from 230 feet to 300 feet in depth with overburden ranging from 30 feet to 160 feet
- ◆ Environmental and continuous sampling was performed in 4 of the borings
- ◆ 18 groundwater monitoring wells were set ranging from 20 feet to 300 feet in depth
- ◆ Overburden drilling included dealing predominantly with heaving sands while performing standard penetration testing, split spoon sampling, and Shelby tube sampling
- ◆ 12 piezometers were installed in the geotechnical borings
- ◆ Each piezometer was set with a flush mounted cover and a concrete pad stamped for identification
- ◆ Approximately 400 Packer tests were performed
- ◆ 3 of the borings were performed at a 20 degree incline
- ◆ A total of approximately 3,600 feet of HQ-size rock was cored during the project
- ◆ Quality of rock cores obtained required minimal to no preparation by the laboratories to perform designated testing
- ◆ A total of approximately 3,200 feet of overburden was drilled and/or sampled

The drilling schedule for this project required the use of up to 2 rigs at one time and lasted approximately 8 months. The drilling program was completed on schedule and under budget.





## Fall Creek/White River Tunnel Storage Project, Phase 2 Design, Indianapolis, IN

**Project Value: \$350 million. Reference: Donnie Ginn, Black & Veatch (317) 570-8331.**

7NT personnel worked on the Advanced Facilities Plan Phase of the Fall Creek/White River Tunnel Storage Project (FCWRTS). For this project, 7NT personnel performed the drilling work for the Phase 2 Design that included drilling along the tunnel alignment in addition to shaft, drop structure, and pump station locations.

Phase 2 Design Stage included the following:

- ◆ 83 borings were completed for the project ranging from 50 feet to 320 feet in depth.
- ◆ 47 geotechnical borings were part of the scope that ranged from 110 feet to 320 feet in depth with overburden ranging from 70 feet to 110 feet
- ◆ Environmental and continuous sampling was performed in 8 of the borings
- ◆ 28 groundwater monitoring wells were set ranging from 50 feet to 320 feet in depth
- ◆ Overburden drilling included dealing predominantly with heaving sands while performing standard penetration testing, split spoon sampling, and Shelby tube sampling
- ◆ 35 piezometers were installed in the geotechnical borings totaling approximately 6,000 feet in length
- ◆ Each piezometer was set with a flush mounted cover and a concrete pad stamped for identification
- ◆ Approximately 400 Packer tests were performed
- ◆ 12 of the borings were performed at a 20 degree incline
- ◆ A total of approximately 4,500 feet of HQ-size rock was cored during the project
- ◆ Quality of rock cores obtained required minimal to no preparation by the laboratories to perform designated testing
- ◆ A total of approximately 5,500 feet of overburden was drilled and/or sampled



**“Over the years, 7NT has provided extensive geotechnical drilling and engineering services consisting of hundreds of exploratory borings. 7NT’s engineering and drilling staff regularly accommodate very tight time frames required due to the magnitude of these projects. 7NT’s qualifications are outstanding”**

**Spencer Fairfax, P.G.**

**Black & Veatch Corporation**



## 17th Street Bio-Infiltration System Monitoring, Louisville, KY

Project Value: \$1.2 Million. Reference: John Lapinski, PARS Environmental (609-890-7277)

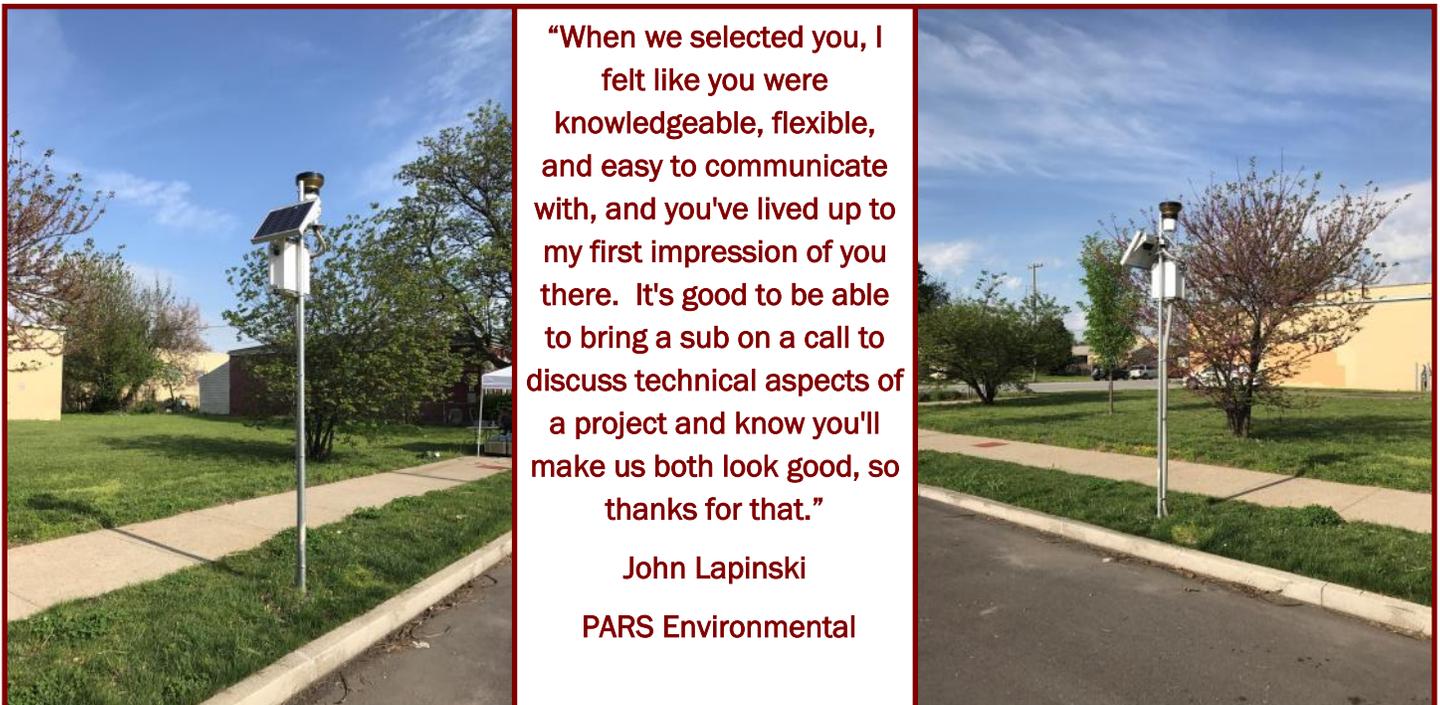
The 17<sup>th</sup> Street Bio-Infiltration Project was put in place to reduce the frequency and volume of discharge from combined sewer overflows. In order to do this the City of Louisville, along with the EPA's National Risk Management Research Laboratory, installed several storm water control measures (SCM) in the Portland section of the city. The data collected is being used by PARS Environmental to determine the effectiveness of the SCM.

### Phase 1:

- ◆ Installation of 16 monitoring wells and 16 piezometers
- ◆ Completed prior to installation of SCM's
- ◆ Established baseline water level

### Phase 2:

- ◆ Installation of 16 Tensiometers and 16 pore water samples
- ◆ Installed 28 degrees off of vertical, surrounding the SCM's
- ◆ Tensiometers utilized small down-hole pumps and were self priming
  - Instruments placed in vados zone, allowing measurement of individual rain events
- ◆ Special tools fabricated by 7NT to install Tensiometers at angle & depth requested by EPA
- ◆ Embankment and retaining wall borings included SPT soil sampling as well as undisturbed Shelby tube testing





**Other notable complex drilling projects performed by 7NT include:**

**Three Rivers Protection & Overflow Reduction Tunnel (3RPORT), Fort Wayne, IN**

Project Value: \$150 million. Reference: Donnie Ginn, Black & Veatch (260) 420-2411 and TJ Short, Fort Wayne City Utilities (260) 427-1234.

**Deer Creek Tunnel Project, St. Louis, MO**

Project Value: \$300 million. Reference: Tom Abkemeier, Shannon & Wilson (314) 699-9660

**Lower Meramec Tunnel, St. Louis, MO**

Project Value: \$217 million. Reference Doug Hickey, HDR (314) 425-8300

**Riverbank Filtration Project, Louisville, KY**

Project Value: \$55 million. Reference: Donnie Ginn, Black & Veatch (502) 473-6718 and Kay Ball, Louisville Water Company (502) 569-3600

**“7NT has provided excellent service. Their testing reports have been accurate and timely. Their field personnel understand their responsibilities, perform their duties in a professional manner. The cooperation they have shown in meeting early morning and short notice testing demands and adjusting their schedule to accommodate frequent changes is greatly appreciated.”**

**Stephen W. Keiber, HDR**



# Construction Inspection and Materials Testing Services





## Construction Inspection Services

- ◆ Bid analysis
- ◆ Constructability review
- ◆ Value engineering
- ◆ Site evaluation/planning
- ◆ Reinforcing steel inspection
- ◆ Structural steel & weld inspection
- ◆ Building construction inspection
- ◆ Earthwork inspection
- ◆ Erosion control inspection
- ◆ Utility inspection
- ◆ Foundation inspection
- ◆ TBM inspection
- ◆ Shaft (Launch, Retrieval, Intermediate, Working, Utility Inspection)
- ◆ Levee inspection
- ◆ Construction Administrative Services

## Materials Testing Services

- ◆ **Soil**
  - Controlled Fill Construction Testing & Inspection
  - Deep Foundation Installation and Bearing Inspection
  - Shallow Foundation Installation and Bearing Inspection
  - Subgrade Inspection for Pavement & Slabs
  - Soil Erosion Control Analysis, Inspection & Permitting
- ◆ **Masonry**
  - Structural Reinforcing Steel Placement & Materials Analysis
  - Ferro-scan Reinforcement Detection Services
- ◆ **Asphalt**
  - Asphalt Coring
  - Density Testing In-Place (Nuclear Method)
  - Batch Plant Testing and Inspection
  - JMF Verification
  - QC and QA Plant Testing
- ◆ **Concrete**
  - Placement Inspection: Reinforcing Steel Placement, Slump, Air Content, Unit Weight
  - Batch Plant Inspection
  - Floor Flatness/Levelness Testing
  - Pre-Cast Concrete Inspection
  - Non-Destructive Evaluation
- ◆ **Structural Steel**
  - Fabrication Shop Inspection
  - Welded & Bolted Connections Inspection & Testing
  - Magnetic Particle Testing
  - Liquid Dye Penetrant Testing
  - Weld Procedure Qualification & Certification
  - Fireproofing Thickness, Adhesion & Density Testing
- ◆ **Roofing Services**
  - Roofing Materials Verification
  - Roofing Installation Inspection
  - Single Ply Construction Verification
  - Built-Up Construction
  - Infrared Surveys
  - Insulation Analysis & Recommendations
- ◆ **Field/Lab Testing**
  - Field CBR Test
  - Field Plate Test
  - Field Vane Shear Test
  - Standard Penetration Test
  - Field Density & Moisture Test
  - Dynamic Cone Penetrometer Test
  - Field Density by Nuclear Method
  - Rock Coring
  - Groundwater Monitoring



## Project Experience

**Omaha Public Works (OPW) 52648 (CSO) Missouri River , Omaha Nebraska**

**Project Value: \$50.4 Million. Reference: Todd Pfitzer, City of Omaha (402) 444-5226**

7NT is part of the special inspections team to provide construction inspection and material testing services for this project. A specific task we are undertaking is the inspection and testing related to the installation of a large diameter diaphragm wall, the first ever constructed by the City of Omaha. We were brought in specifically for this project due to our vast experience and expertise with this type of construction that we have been involved in with other CSO programs around the country. The scope of work includes the following:

- ◆ Reconfiguration of disinfection and odor control facilities as a result of the 2011 Flood to a less cost effective layout
- ◆ Changes to the flow handling and disinfection system to handle first flush flows from the SIFM
- ◆ Inclusion of facilities to maintain plant operation during future flood events and to protect plant assets
- ◆ Stabilization of the river bank to protect the existing plant and new facilities from further failure of the bank that resulted from the 2011 Flood
- ◆ Rehabilitation of the In-Plant Lift Station, grit removal for the South Omaha Industrial Area (SOIA) Lift Station, and raw sewage piping for SOIA and SIFM
- ◆ Capital asset replacement of several pumping systems to improve reliability for the increased wet weather flows
- ◆ Inclusion of additional piling to support large-diameter piping and shallow slabs
- ◆ Inclusion of an advanced grit removal system to accommodate wide fluctuations in plant influent flow rates
- ◆ Addition of odor control for municipal headworks and primary clarifier splitter box





## White River CCS Phase 1 Inspection, Indianapolis, IN

**Project Value: 15.8 Million. Reference: Jeremy Morris, Christopher B. Burke Engineering (317) 266-8000**

The White River CCS Phase 1 project consisted of construction along Waterway Blvd.

Phase 1 Inspection included the following:

- ◆ Capturing 2 Combined Sewer Overflows (CSO 044 and 043), diversion structure and 1 screen and gate structure, one drop shaft and 1 vent shaft approximately 200 feet deep, approximately 800 feet of 54" sewer and 200 feet of 72" sewer.
- ◆ The construction near 10<sup>th</sup> St. and Indiana Ave; included capturing 1 Combined Sewer Overflows (CSO 210), 1 diversion structure and 1 screen and gate structure; 1 drop shaft and 1 vent shaft approximately 200 feet deep and approximately 90 feet of 108" sewer.
- ◆ Construction Inspection tasks included the following:
  - ◆ Materials testing
  - ◆ Written daily work reports
  - ◆ Jack and Bore process inspection
  - ◆ Shaft drilling and construction inspection
  - ◆ Joint testing
  - ◆ Inspection of structure construction including steel reinforcement inspection, testing for concrete, grout, and soil density, field measurements, quantity calculations, as-built drawings, and field surveys.



## Other notable construction inspection projects performed by 7NT include:

**City of Indianapolis DPW On-Call Contract, Indianapolis, IN**

Reference: Rick Brost, City of Indianapolis Department of Public Works (317) 327-4000

**Runway 10R/28L Replacement Project, John Glenn International Airport, Columbus, OH**

Project Value: \$200 million. Reference: Dave Gotschall, CRAA (614) 239-4012

**Human Performance Wing: Wright- Patterson Air Force Base (USACE), Dayton, OH**

Project Value: \$195 million. Reference: Kevin Jefferson, Louisville Corps of Engineers (937) 255-2977

# Geotechnical Engineering Services





7NT’s geotechnical engineers and project managers work closely with owners, architects, and design engineers to develop an appropriate investigation program for the proposed project. Always sensitive to the requirements of the project team, our recommendations are based upon the most economically practical foundation systems for the intended construction. An overview of our technical service capabilities are outlined below:

**Scope of Services:**

- ◆ Subsurface Investigation
  - Site Reconnaissance
  - Geologic Investigation
  - Groundwater Monitoring
  - Sampling and Testing
  - Laboratory Investigations
- ◆ Existing Pavement Evaluation
  - Pavement Condition Index (PCI)
  - Structural Analysis
  - Material Evaluation
  - Subgrade Investigation
  - Traffic Analysis
  - Rehabilitation
  - Recommendation
- ◆ Settlement Analysis & Monitoring Program
- ◆ Earth Retaining Structure Design
  - Gravity Retaining Wall
  - Sheet-Pile Wall
  - Cantilever Retaining Wall
  - Counterfort Retaining Wall
  - Segmental Retaining Wall
  - Soil and Rock Nailing
  - Deep Mixing Method (DMM)
- ◆ Foundation Analysis and Design
  - Spread Footing
  - Mat Foundation
  - Pile and Group Pile
  - Drilled Shaft Caissons
  - Pile Drivability Analysis
- ◆ Ground Modification Techniques
  - Lime/Cement Stabilization
- Dynamic Compaction
- Geofabric/Geogrid
- Dewatering
- Micropile
- Sand/Stone Columns/Geopier
- ◆ New Pavement Design
  - Flexible Pavement
  - Rigid Pavement
  - Asphalt Reclamation
- ◆ Excavation Stability Analysis
  - Temporary Shoring System
- ◆ Slope Stability Analysis
- ◆ Soil Erosion Control

**Notable geotechnical projects performed by 7NT include:**

**Belmont North Relief Interceptor, Indianapolis, IN**

Project Value: \$94 million. Reference: Donnie Ginn, Black & Veatch (317) 570-8331 and Mark Jacob, Citizens Energy Group (317) 924-3311

**Castleton Relief Sewer, Indianapolis, IN**

Project Value: \$20 million. Reference: Donnie Ginn, Black & Veatch (317) 570-8331

**I64 & Grinstead CSO Basin, Louisville, KY**

Project Value: \$ 35 million. Reference: Rob Campbell, QK4 (502) 649-5072

**USACE Detroit/Chicago Geotechnical IDIQ Contract, IDIQ, OH/IN/MI/WI/IL/MN/KY**

Project Value: \$750,000. Reference: Phil Ross, USACE (313) 226-4680



## INDOT I-69 Design/Build (IB-33039-A) over Patoka River Floodplain & CR 150N

**Project Value: \$40 million. Reference: Brian Slagle, Janssen & Spaans Engineering (317) 254-9686**

The I-69 Patoka River Bridge Project is part of an ongoing INDOT plan to extend I-69 from Indianapolis to Evansville. 7NT personnel worked with designer Janssen & Spaans Engineering and contractor Kokosing for this **design/build** project that included a 4,400' bridge segment of the entire I-69 extension. The scope of work included providing full geotechnical services (drilling, laboratory, and engineering services) for both the north and south bound bridges.

**The design/build work consisted of the following:**

- ◆ Supplement the 35% design documents with 26 additional borings totaling 1,800' of soil boring and 680' of rock coring
- ◆ Drilling performed by multiple truck and ATV mounted drill rigs within the Patoka River flood plain
- ◆ Laboratory testing was conducted to classify and determine the engineering properties of the subsurface soils and rock. Tests included:
  - Natural Moisture Content, Hydrometer Analysis, Atterberg Limits and Compressive Strength of Rock Core
- ◆ Analysis performed in accordance with Indiana Department of Transportation (INDOT) guidelines and AASHTO Load and Resistance Factored Design (LRFD) Bridge Design Specifications

**During delivery of the supplemental geotechnical program, it was determined that much of the data supplied in the 35% documents was deemed unreliable. As a result, our scope transitioned very quickly from a supplemental verification to a full blown geotechnical design of a bridge over a floodplain that was to be built on 118 drilled shafts that needed to be completed expeditiously in order to keep the project on schedule. This additional scope included:**

- ◆ 118 borings totaling 8,080' of soil sounding and 5,625' of rock coring
- ◆ Drilling performed by multiple truck and ATV mounted drill rigs over 9 1/2 months within the flood plain at the exact location of 118 drilled shafts for the 59 bridge piers
- ◆ Drilling was completed even as the river was in flood stage
- ◆ Laboratory testing was conducted to classify and determine the engineering properties of the subsurface rock encountered. Tests included Compressive Strength of Rock Core
- ◆ The subsurface rock at bridge shaft locations was analyzed for rock design resistances at both the strength and extreme loading conditions
- ◆ The shaft tip end bearing elevations were adjusted based on the precise subsurface information value design program





## Laboratory Services

### ◆ Soil

- Moisture-Density & Relations
- USCS Classification
- Porosity, Void Ratio
- Soil Resistivity
- Permeability
- Triaxial Compression Testing (UU, CU, CUPP)
- Swell Potential
- Consolidation
- Unconfined Compression
- California Bearing Ratio (CBR)
- Atterberg Limits
- Moisture Content
- Particle Size Analysis
- Organic Content (LOI)
- Specific Gravity
- Unit Weight and Density
- Rock Core Logging
- Drilled Rock Core Strength
- Direct Shear

### ◆ Rock Testing

- Moisture Content
- Unconfined Compression
- Moduli in Uniaxial Compression
- Bulk Density

- Splitting Tensile Strength
- Punch Penetration
- Slake Durability
- Cerchar Abrasivity
- Thin Section Analysis
- Direct Shear Strength

### ◆ Aggregate

- Gradation
- LA Abrasion
- Organic Impurities
- DOT Parameters
- MOH's Hardness
- Specific Gravity
- Clay Lumps
- Sodium Sulfate (or Magnesium Soundness)
- Crush Count
- Acid Solubility/Insoluble Residue
- Moisture Density Relationships
- Lightweight Particles
- ASTM C33- Quality Analysis
- Freeze-Thaw
- Porosity
- Sand Equivalency

### ◆ Masonry

- Compressive Strength Testing

### ◆ Concrete

- Unit Weight and Absorption Determinations
- Grout and Mortar Testing
- Fire Rating
- Compressive Strength
- Drilled Concrete Core Strength
- Block Testing
- Prisms
- Point & 3rd Point (Beams)
- Flexural Strength- Center Voids and Absorption
- Concrete Mix Designs
- Concrete Mix Design Verification

### ◆ Asphalt

- Extraction/Gradation
- Density
- Thickness
- Specific Gravity
- AC Content
- Marshall Stability/Flow
- Air Voids
- DOT/FAA/ASTM Parameters
- QA/QC Testing at Bituminous Mix Plants





## Water/Wastewater Engineering & Environmental Services

7NT offers water/wastewater design engineering and environmental services as part of our portfolio. We assist our Clients with tailoring services to the needs of the project, whether it involves pipeline design, consolidation sewer design as part of large CSO programs, or rehabilitation of aging pipelines. Our personnel have been involved in some of the largest water/wastewater programs in the Midwest.

### Pleasant Run Deep Tunnel Consolidation Sewer

**Project Value: \$460 Thousand Fee. Reference: Maceo Lewis, Black & Veatch (317) 570-8331**

As part of the implementation of the Long Term Control Plan (LTCP) to address combined sewer overflows (CSO) in the City of Indianapolis, Citizens Energy Group plans to construct the Pleasant Run Deep Tunnel. The tunnel will both serve storage and conveyance. Apart from the tunnel, included in the plan are provisions for a series of consolidation sewers, drop shafts, and relief manhole modifications in order to capture 95 percent of CSO along Pleasant Run and Bean Creek.

As a sub consultant to Black and Veatch, 7NT is responsible for the design of:

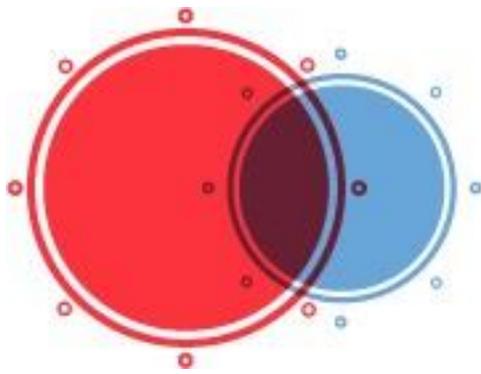
- ◆ 1800 LF of consolidation sewers associated with 2 drop shafts
- ◆ Layout and design of 3 diversion structures
- ◆ 2 relief structures and modifications to multiple existing CSO regulators
- ◆ Identify potential high cost/risk utility conflicts, land issues, transportation and potential environmental impacts
- ◆ The final deliverable includes consolidation sewer plans and profiles, and the process layout design of diversion structures, relief structures and modified CSO regulators



### Pleasant Run Deep Tunnel Technical Memoranda's

As a sub-consultant to Black & Veatch, 7NT was responsible for three technical memos:

- ◆ **TM #2: Coke and Gas Plant Intermediate Shaft Evaluation:** Evaluate the feasibility of locating a tunnel shaft or a construction staging area considering the cost/benefit and the required construction area. The Coke and Gas Plant has areas of environmental contamination.
- ◆ **TM #4: Tunnel Spoils Handling:** Evaluate and compare alternatives for the handling, transportation, and disposal of main tunnel spoils.
- ◆ **TM #7: Consolidation Sewer Evaluation:** Review and evaluate the preliminary design criteria for the consolidation sewers



**7NT**

**Integrity. Reliability. Performance.**