Memo

To	**Michelle Kaysen / USEPA**	File no	**377882016.2400**
From	**Peter Guerra** **Russ Johnson**	cc	**Dan Sullivan / NIPSCO**
Date	**January 23, 2017**		
Subject	**SWMU 15 Geotechnical Investigation Summary** **Corrective Measures Study for Area C** **NIPSCO Bailly Generating Station**		

The Draft Area C Corrective Measures Study (CMS) report was issued in August 2015, which recommended encapsulation of coal combustion residuals (CCR) in Solid Waste Management Unit (SWMU) 15; monitored natural attenuation for dissolved constituents in groundwater beneath the Indiana Dunes National Lakeshore (IDNL); and monitored natural attenuation of pH in organic soils of Central Blag Slough. Northern Indiana Public Service Company (NIPSCO) received comments from the Environmental Protection Agency (EPA) in a letter dated December 3, 2015, with an attached comment letter from the National Park Service (NPS) dated December 1, 2015. In response to the NPS comments a meeting was held at the IDNL headquarters to discuss NPS concerns. In response to EPA comments a Revised Draft Area C CMS report was filed on March 18, 2016. The revised report maintained encapsulation as the proposed corrective measure for SWMU 15, comprised of a perimeter slurry wall to clay and an engineered, impermeable cover.

To further evaluate the corrective measure options, a geotechnical investigation work plan was prepared for the investigation of SWMU 15 and submitted to EPA on June 30, 2016. Comments on the work plan were received from EPA via e-mail on July 14, 2016, and NIPSCO submitted a response to EPA comments on July 22, 2016. The field investigation was initiated in July and completed on September 16, 2016.

OBJECTIVES

As described in the work plan, the primary objective of the SWMU 15 investigation was to better understand the presence and depth of the clay layer(s) underlying SWMU 15, particularly along the potential slurry-wall path. In addition to determining the presence and depth of clay, geotechnical samples were to be collected to evaluate the following:

- Consolidation of clay and CCR
- Tensile strain for engineered components of the cap
- Slurry-wall stability
- Hydraulic conductivity of the clay to estimate vertical seepage into the encapsulated CCR
- Bulk density of CCR

In addition, an existing conditions and topographic survey was proposed.

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WORK PERFORMED

The SWMU 15 investigation was initiated on July 11 and completed on September 16, 2016. The site topographic survey was completed intermittently between July 11 and September 16, 2016, whereas the soil borings were advanced from July 27 through August 17, 2016.

Site Survey

A site features and topographic survey area is shown in **Figure 1.** The following site features were included in the survey:

- roadways and utilities (e.g., manholes) including any notation regarding type;
- culverts and other drainage structures including invert elevations and pipe diameters;
- other linear features such as railroad tracks, fences, and dikes;
- transmission towers, including the corners of all foundations;
- catenary heights of the high-tension wires and service lines; and
- resources abutting SWMU 15, including wooded areas, surface drainage, and wetlands.

The catenary survey was to be completed before the drilling program to ensure adequate clearance at several proposed boring locations. The survey was terminated at the edge of any water bodies. In addition, two benchmarks were established along the west side of the road. An existing conditions plan is included as **Attachment A.**

Geotechnical Investigation

A total of 16 soil borings were advanced and identified as SWMU15-SB61 through SWMU15-SB76 for the site database (shown as blue dots with labels SB-61 to SB-76 in **Figure 1**). Each boring was marked out by DLZ, surveyors licensed in the State of Indiana. The following borings were moved from their proposed locations; **Figure 1** shows the final boring locations:

- SWMU15-SB61 – moved east to avoid low voltage power lines.
- SWMU15-SB68 – moved southeast as the original boring was in a wetland.
- SWMU15-SB67 – moved south as the original boring was in a wetland.

Soil borings were advanced by Cascade Drilling using a mini-sonic drill rig. As indicated in **Table 1**, borings were advanced to depths ranging from 57 feet below ground surface (ft bgs) to 100 ft bgs. Borings were sampled continuously for classification by a field geotechnical engineer using a modified Burmeister soil classification system. Boring logs are presented as **Attachment B**. Clay lithology information is also presented in **Table 1** and is discussed under the Results section below.

Split-spoon samples, undisturbed samples (brass rings and Shelby tubes), and bulk samples from the sonic core barrel (bag samples) were collected as presented in **Table 2**. This table indicates the depth intervals and types of sample collected from each boring. A summary of the geotechnical analyses performed on these samples is presented in the Results section below. Samples were generally collected where proposed; however, there were the following deviations from the work plan:

- SWMU15-SB61 – Due to low/no recovery the Shelby tube retrieved from the clay interval did not yield enough sample for laboratory testing.
- SWMU15-SB62 – clay was not encountered; therefore, a Shelby tube was not collected as proposed.
- SWMU15-SB63 – three Shelby tubes were proposed for the collection of undisturbed samples of fine CCR; however, the proposed interval for the third Shelby tube turned out to be sand, not CCR. Therefore, only two Shelby tubes were collected in the fine CCR.
- SWMU15-SB65 – Due to low/no recovery the Shelby tube retrieved from the clay interval did not yield enough sample for laboratory testing.
- SWMU15-SB67 – a Shelby tube was attempted in clay but there was no recovery; therefore, no Shelby tube was collected.
- SWMU15-SB70 – three Shelby tubes were proposed for the fine CCR; however, due to poor recoveries, only one Shelby tube was collected.
- SWMU15-SB73 – Due to low/no recovery the Shelby tube retrieved from the clay interval did not yield enough sample for laboratory testing.
- SWMU15-SB75 – Due to low/no recovery the Shelby tube retrieved from the clay interval did not yield enough sample for laboratory testing.

In addition, the work plan called for standard penetration test (SPT) sampling in accordance with ASTM D1586 from ground surface to 40 ft bgs. At a number of boring locations, SPT sampling could not be completed within the entire 0 to 40 ft bgs interval due to difficult drilling conditions. Fine sand under hydrostatic pressure was moving up into the casing, preventing the advancement of split-spoons for the collection of undisturbed samples. In place of SPT sampling, continuous Sonic discrete samples were collected.

Due to consistently poor recoveries of CCR during most of the geotechnical investigation, Amec Foster Wheeler returned to two borings that had been investigated earlier in the program to attempt CCR collection using Lexan® liners. In addition to the traditional geotechnical sampling methods, select sample intervals from SWMU15-SB71 and -SB72 were collected using Lexan® liners placed inside the rotosonic drill core barrel. Lexan liner sample locations are provided in **Table 2**. Material from these liners were selected for geotechnical sampling and analysis.

GEOTECHINCAL RESULTS

Table 3 summarizes the soil samples selected for laboratory testing, the sample type, and the analyses performed. Laboratory data sheets are included as **Attachment C**.

Key parameters (soil and CCR properties) measured using laboratory analysis include:

- Particle size distribution (PSD)
- Plasticity
- Properties of the CCR:
  - In-situ bulk density
  - Specific gravity of solids
  - Porosity
  - Primary and secondary consolidation and rebound
  - Shear strength

- Properties of soil/sediments:
  - Shear strength of sandy and clayey materials
  - Primary and secondary consolidation and rebound of clayey materials
  - Saturated hydraulic conductivity of clayey material

Some of the samples selected were found to be disturbed or deformed and unusable; these samples are identified as footnotes in **Table 3**.

Table 4 provides a summary of Phase A Testing which includes PSD, plasticity analysis results, and soil-texture type using the Unified Soil Classification System (USCS). Considering these Phase A results, our understanding of the generalized geology, and the CCR layer, the materials can be described as follows:

- **CCR:** Some portions of the CCR are above the static water table; however most of the CCR is contained in the shallow saturated zones. On average approximately 40% of the CCR particles are silt size or smaller; they pass through the number (No.) 200 sieve (200 openings per inch). On average 90% of the particles pass through the No. 10 sieve, which corresponds to very coarse sand particle size. The twelve CCR samples analyzed were all non-plastic. The USCS classifications of the CCR range from silt (ML) to poorly-sorted sand / silty-sand mixtures (SP-SM). Six of the twelve samples were classified as a silty sand (SM). Notably; the amount of natural soil/sediment mixed with the CCR varied across the samples. Based on visual observation of the sieved components trace amounts of gravel and sand and possibly some fraction of silt was observed.

- **SAND:** The sand layer is expressed at the land surface and generally extends below the CCR layer. The near-surface sand is unsaturated, but becomes saturated below the CCR. Deeper saturated sand is found between the clay layers. On average approximately 13% of the sand layer particles pass the No. 200 sieve while more than 90% pass the No. 10 sieve. The thirteen sand samples analyzed were all non-plastic. The USCS classifications of the sand range from silty sand (SM) to poorly-sorted sand (SP). Four of the thirteen samples were classified as a mixture of silty sand and poorly-sorted sand (SP-SM).

- **CLAY:** The clay layers were encountered at various depths below the upper sand layer. On average, approximately two-thirds (67%) of the clay layer particles pass the No. 200 sieve while approximately 90% pass the No. 40 sieve. The thirteen clay samples analyzed each exhibited some degree of plasticity. The average plasticity index across the thirteen clay samples is 7, which corresponds to a slightly-plastic attribute. The USCS classifications of the clay range from silty sand (SM) to sandy clay (SC). Eleven of the thirteen samples were classified as either a mixture of silt and low-plasticity clay (ML-CL); or, as low-plasticity clay (CL).

Two of the forty samples submitted for Phase A testing did not fall into the three generalized geologic groups described above. The sample collected from SB75 from 80.0 to 84.0 feet bgs was determined to be a silt with more than 80% passing the No. 200 sieve and exhibiting non-plastic attributes. This sample was classified as an ML. The sample collected from SB61 from 10.0 to 11.5 feet bgs was determined to be an organic soil by visual inspection. This material is classified as a

peat (PT) and contains mostly sand-grain size particles with less than 5% passing the No. 100 sieve.

The Phase A testing results were used to refine selection of samples for Phase B testing. The variation of material textures across generalized groups (CCR, sand, and clay) and sample depth ranges were considered in selecting samples for Phase B testing. This was performed to attain Phase B test results that span the range of textures found within the generalized material groupings, as discussed below.

CCR Properties Summary and Discussion:

Table 5 provides a summary of in-situ, gravimetric moisture content, dry bulk density, specific gravity of solids testing results and calculations of total porosity, in-situ density, and percent saturation for CCR material tests. Bulk dry density of the CCR waste materials average approximately 95 pounds per cubic foot (pcf) and the specific gravity of the solid CCR particles average approximately 2.7. The specific gravity of solids determined for the CCR materials at the site fall at the high-end of the specific gravity range for CCR materials reported by others (Lacour, 2012).

The average total porosity of the CCR is estimated at 43% +/- 8.8% (1 standard deviation). Also, the average percent in-situ water saturations are near 100% in most of the CCR samples. Assuming an effective porosity of 20%; if the material is allowed to freely drain after excavation it is estimated that 23.2% (0.432-0.20=0.232) of the water will be retained. Based on the average dry and in-situ densities (**Table 5**) and the retained porosity at 23.2%, the average density of the CCR after excavation and free draining of the water is estimated at 117 pcf or 1.58 tons per cubic yard (tpy). With additional dewatering efforts, such as windrowing followed by filter press application of the CCR after excavation, saturations could be driven towards residual, which is assumed to be 5%. If additional dewatering steps are implemented the average density of the excavated CCR is estimated at 98 pcf (1.32 tpy).

Considering the averages for the CCR densities, additional dewatering efforts would reduce the hauling and disposal by approximately 16%. Depending on the costs for hauling and disposal compared with the extra material handling and equipment costs to implement windrowing and filter press operations, additional effort to dewater CCR prior to hauling may or may not be economically worthwhile.

Table 6 provides a summary of direct shear tests. Four CCR samples were tested for internal friction angle and cohesion under consolidated drained conditions. Normal stresses for each test were designed to span in-situ conditions and expected loading during excavation so that results can be used to assess excavation floor and wall stability. Negligible [<80 pounds per square foot (psf)] to no cohesion force was measured in the CCR samples. The average internal friction angle measured across the four CCR samples is 27.5 degrees, which is considered very loose comparing the CCR to sand. The values for CCR shear strength correlate with the low values reported for blow counts during standard penetration testing conducted in the field. The internal friction angles determined for the CCR materials at the site fall within the range of, but on the low-end of the internal friction for CCR materials reported by others (Lacour, 2012).

Considering the low friction angles, relatively non-existent cohesive strength, and the saturated condition of the CCR materials, the safe angle for unsupported excavation sideslopes will likely be near half the friction angle or approximately 14 degrees, which is a 4 horizontal to 1 vertical slope. In other words the sidewalls of a 10 foot deep excavation without support may need to be laid back some 40 feet in each direction.

Table 7 provides a summary of consolidation tests performed on CCR material. Each of the four samples tested were subject to maximum loads of two tons per square foot (tsf) and tested by ASTM Method D2435M-11 Method A, which is performed with constant load increment durations of twenty-four hours at the in-situ (1 tsf) and surcharged under landfill cover (2 tsf) loads. Two of the four samples exhibited relatively moderate strain (approximately 4.5%) under the maximum load. The other two samples exhibited high to very-high strains, approximately 12% and 22%, under the maximum load. Following testing these samples were carefully examined to determine if sampling error or disturbance during sampling was at the cause of the high strain observed. The average strain observed under maximum loading was approximately 10.8%. Coefficient of consolidation (Cv) under the maximum loading interval determined by the consolidation tests ranged between approximately 175 square feet per day (sf/d) and 921 sf/d. The Cv values determined for the CCR materials at the site fall within the range of Cv values for CCR materials reported by others (Lacour, 2012), which states that reported values of Cv are highly variable, as might be expected for materials that have non-typical stress histories.

The consolidation testing results indicate that the CCR material, especially thicker portions, may require treatment to support a cover system. The potential for excessive strain or collapse of the CCR under load of the cover may damage or tear geotextiles or liner components placed under cover soil. Treatment alternatives for thicker portions of the CCR could include surcharging the area with imported soil prior to cover construction; deep dynamic compaction or rapid-impact compaction; and/or vibro compaction.

Shear Strength of Sand Material and Discussion:

Table 6 provides a summary of direct shear tests. Four sand samples were tested for internal friction angle and cohesion under consolidated drained conditions. Normal stresses for each test were designed to span in-situ conditions and expected loading during excavation so that results can be used to assess excavation floor and wall stability. Negligible (<15 psf) to no cohesion force was measured in the sand samples. The average internal friction angle measured across the three sand samples is 29.8 degrees, which is on the boundary of very loose to loose. The values for sand shear strength correlate with the low values reported for blow counts during standard penetration testing conducted in the field, as well as the heaving or flowing properties of the sand observed during drilling.

Considering the low friction angles, relatively non-existent cohesive strength, and the saturated condition of the sand materials, the excavation floor may not be stable, especially if the pit is dewatered. Excessive upward groundwater pressures at the floor of the excavation may result in exit gradients that are sufficient enough to move the sand particles and create boils or heaving sands. Confirmatory sampling, excavation, and backfilling methods that allow static water levels to remain in the excavation may be required.

Clay Properties Summary and Discussion:

Table 6 provides a summary of direct shear tests. Eight clay samples were tested for internal friction angle and cohesion under consolidated drained conditions. Normal stresses for each test were designed to span in-situ conditions so that results could be used to assess stability when excavated for the purpose of keying in a slurry wall. The average internal friction angle measured across the nine clay samples is 24.0 degrees and the average cohesive strength is 324 psf. The results of shear strength testing performed on clay samples can be used to support design of a cutoff wall excavation including specification of slurry properties. The shear strength properties of the clay material are typical and do not indicate any expected difficulties with slurry-supported excavation.

Table 7 provides a summary of consolidation tests performed on clay material. The eight samples tested were subject to maximum loads of four or eight tsf and tested by ASTM Method D2435M-11 Method A. Relatively moderate strain (between approximately 2% and 8%) under the maximum load was observed.

Considering the results of consolidation testing on the clay material, consolidation of the clay under stresses imparted by a new cover system resulting in unacceptable strain to the liner components is not expected to be an issue. Clay layers are encountered at sufficient depth such that the stresses imparted by the cover will be dissipated and resulting settlement at the surface negligent.

Table 8 provides a summary of hydraulic conductivity testing using a flexible wall permeameter (ASTM D5084-16). Ten clay samples were tested for vertical hydraulic conductivity (Kv). The Kv values measured in eight of the ten samples was between $2.8x10^{-8}$ centimeters per second (cm/s) and $2.9x10^{-7}$ cm/s. The other two samples yielded Kv values of $1.1x10^{-5}$ cm/s and $2.3x10^{-4}$ cm/s. Review of these samples indicate that they are predominantly clay and are considered CL by the USCS. The unexpectedly high vertical hydraulic conductivity values determined from these samples may be a result of sample disturbance during sample collection that could have formed preferential pathways within the sample. The geometric mean for the ten Kv samples is $2.9x10^{-7}$ cm/s.

SLURRY MIX DESIGN

Homogenized sand material, collected from perimeter borings SB61, SB62, SB66, SB67, SB68, and SB75, was blended with bentonite, and submitted for hydraulic conductivity testing using a flexible wall permeameter (ASTM D5084-16). The material was tested as-is (without bentonite), a 5% soil-bentonite slurry, and a 10% soil-bentonite slurry. Results of the tests are provided in **Attachment D**. Each mix design was tested three times. The geometric mean Kv value for the three as-is, remolded sand samples is $1.5x10^{-4}$ cm/s. As indicated in **Figure 2**, the geometric mean Kv values for the three 5% soil-bentonite slurry and the three 10% soil-bentonite samples are $6.2x10^{-5}$ cm/s and $4.2x10^{-6}$ cm/s, respectively.

Considering the range of hydraulic conductivities measured in undisturbed and remolded sand samples and the soil-bentonite mixtures, the mixtures that contain at or above an estimated 20% bentonite will likely achieve hydraulic conductivities equal to the clay layer material at $2.9x10^{-7}$ cm/s.

REVISED EVS MODEL

Data collected during the RCRA Facility Investigation were used to develop a three-dimensional model of SWMU 15 using the Environmental Visualization Software (EVS). That model has been periodically updated with data from the upper 40 feet of SWMU 15, below the maximum depths of CCR, and often into clay. The 2016 borings penetrated to depths much greater than 40 feet, and a great deal more information is now available to describe the subsurface geology beneath SWMU 15. Although additional data were gathered regarding the vertical and horizontal extent of CCR, that information did not substantial alter the conceptual site model for CCR distribution and volume, as summarized below.

CCR Volume (cubic yards)			
Position Relative to Water Table	2015 Investigation	2014 CMS Report	Percent Difference
Above	92,000	85,000	8%
Below	86,000	78,000	10%
Total CCR	178,000	163,000	9%

The EVS model and viewing software are included as **Attachment E**. Highlights from the model include the following:

- Multiple clay layers of varying thicknesses were encountered down to a maximum depth of 92 to 93 feet bgs.
- The number and continuity of clay layers was more prevalent in the southern portion of SWMU 15.
- The clay layers were thinner and discontinuous, and in some cases absent, in the northwestern portion of SWMU 15.

CONCLUSION

The 2016 investigation findings have significant cost implications on the recommended remedy for SWMU 15 (encapsulation), as wells as the alternate remedies evaluated in the CMS Report (Amec Foster Wheeler, 2015). The costs for water treatment, particularly for boron, have similar cost implications for the both the encapsulation and excavation remedies. For encapsulation, the depths to clay are greater than assumed in the CMS Report and the clay layers encountered are thin or discontinuous in the northwest portion of SWMU 15. Moreover, the consolidation properties of the CCR would require surcharging prior to capping, which increases the material handling costs. For the excavation scenario, the wet bulk density is higher than anticipated, which increase dewatering costs, transportation, and disposal. The loose nature of the native sands and CCR will make construction dewatering difficult, or will require excavation “in the wet”. Many of these problems may be overcome by the implementation of partial excavation of CCR above the water table and in situ solidification and stabilization (ISS) of CCR below the water table. This approach was evaluated in the CMS Report.

NIPSCO proposes to revise the conceptual designs and associated costs for encapsulation, full excavation, and partial excavation with ISS in a separate memo to EPA so as to make an informed decision on the final remedy for SWMU 15.

REFERENCE

Lacour, Nicholas A., 19 June 2012, “Engineering Characteristics of Coal Combustion Residuals and a Reconstitution Technique for Triaxial Samples” Master’s Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA, 2012.

ATTACHMENTS

Table 1 – Clay Intervals
Table 2 – Sample Intervals and Collection Method
Table 3 – Sample Analyses
Table 4 – Phase A Sample Results
Table 5 – Density and Porosity of Coal Combustion Residuals
Table 6 – Shear Strength Results
Table 7 – Consolidation Testing Results
Table 8 – Hydraulic Conductivity of Clays

Figure 1 – SWMU 15 Investigation Locations
Figure 2 – Soil-Bentonite Slurry Mix Design

Attachment A – Topographic Survey
Attachment B – Boring Logs
Attachment C – Laboratory Data
Attachment D – Soil-Bentonite Testing Results
Attachment E – EVS Model

Table 1. Clay Intervals
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

Boring ID	Boring Depth (feet bgs)	First Clay Encountered		Second Clay Encountered		Third Clay Encountered		Fourth Clay Encountered		Fifth Clay Encountered		Sixth Clay Encountered		Seventh Clay Encountered	
		Interval (feet bgs)	Thickness (feet)	Interval (feet bgs)	Thickness (feet)	Interval (feet bgs)	Thickness (feet)	Interval (feet bgs)	Thickness (feet)	Interval (feet bgs)	Thickness (feet)	Interval (feet bgs)	Thickness (feet)	Interval (feet bgs)	Thickness (feet)
SWMU15-SB61	100	39 - 42.5	3.5	50 - 54	4	--	--	--	--	--	--	--	--	--	--
SWMU15-SB62	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SWMU15-SB63	97	89.5 - 97+	>7.5	--	--	--	--	--	--	--	--	--	--	--	--
SWMU15-SB64	97	31 - 33	2	40 - 47	7	54 - 58	4	60.5 - 62.5	2	69.5 - 78	8.5	84.5 - 90	5.5	92 - 93	1
SWMU15-SB65	100	28 - 38.5	10.5	79.5 - 83	3.5	88.5 - 90	1.5	--	--	--	--	--	--	--	--
SWMU15-SB66	57	8 - 9.5	1.5	33 - 34.5	1.5	43 - 57+	>14	--	--	--	--	--	--	--	--
SWMU15-SB67	80	61 - 68	7	72 - 76	4	--	--	--	--	--	--	--	--	--	--
SWMU15-SB68	82	44.5 - 47.5	3	63.5 - 65	1.5	69 - 80+	>11	--	--	--	--	--	--	--	--
SWMU15-SB69	82	46.5 - 56.5	10	59.5 - 65	5.5	66.5 - 70	3.5	72.5 - 82+	>9.5	--	--	--	--	--	--
SWMU15-SB70	69	52 - 55.5	3.5	60 - 69+	>9	--	--	--	--	--	--	--	--	--	--
SWMU15-SB71	100	24.5 - 36	11.5	60 - 65	5	80 - 84	4	98 - 100+	>2	--	--	--	--	--	--
SWMU15-SB72	85	24 - 40	16	54 - 85+	>31	--	--	--	--	--	--	--	--	--	--
SWMU15-SB73	90	28 - 29	1	40.5 - 46.5	6	--	--	--	--	--	--	--	--	--	--
SWMU15-SB74	90	42.5 - 46	3.5	51.5 - 54.5	3	--	--	--	--	--	--	--	--	--	--
SWMU15-SB75	90	23 - 24	1	--	--	--	--	--	--	--	--	--	--	--	--
SWMU15-SB76	80	21 - 22.5	1.5	27.5 - 41	13.5	--	--	--	--	--	--	--	--	--	--

Notes:
bgs = below ground surface
+ indicates that the boring was terminated in clay (eg, 89-97+ indicates that clay was encountered at 89 ft bgs and the boring was terminated within clay at 97 ft bgs)

Table 2. Sampling Intervals and Collection Method
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

Area of Interest	Boring ID	Sample Depth Interval (ft bgs)	Material	Sample Collection Method
Within SWMU 15 Footprint	SWMU15-SB63	2-3	Sand	Bag Sample
		3-5	Fine CCR	Shelby Tube
		8-10	Fine CCR	Shelby Tube
		10-12	Fine CCR	Bag Sample
		12-20	Sand	Bag Sample
		25-30	Sand	Bag Sample
		35-36	Sand	Brass Rings
		39-41	Sand	Bag Sample
		40-41	Sand	Brass Rings
		41-42.5	Silty Sand	Split Spoon
		43-44.5	Silty Sand	Split Spoon
		45-46.5	Silty Sand/Sand	Split Spoon
		47-48.5	Sand	Split Spoon
		50-51.5	Sand	Split Spoon
		53-54.5	Sand	Split Spoon
		55-55.6	Sand	Split Spoon
		57-58.5	Sand	Split Spoon
		60-61.5	Sand	Split Spoon
		70-75	Sand	Bag Sample
		80-85	Sand	Bag Sample
		90-91	Clay	Brass Rings
		93-93.5	Clay	3" Rings
		94-95	Clay	Bag Sample
		95-97	Clay	Shelby Tube
		EOB at 97 ft bgs		
	SWMU15-SB64	2-2.9'	CCR	Bag Sample
		3-5	CCR	Bag Sample
		5-6.5	CCR	Split Spoon
		10-11.5	CCR	Split Spoon
		20-21.5	Sand	Split Spoon
		25-26.5	Silty Sand	Split Spoon
		30-31.5	Silty Sand/Clay	Split Spoon
		35-36	Sand	Brass Rings
		40-41.5	Sandy Clay	Split Spoon
		92.5-93	Clay	Brass Rings
		93-93.5	Silty Sand	3" Rings
		95-97	Silty Sand	Shelby Tube
		EOB at 97 ft bgs		

Table 2. Sampling Intervals and Collection Method
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

Area of Interest	Boring ID	Sample Depth Interval (ft bgs)	Material	Sample Collection Method
Within SWMU 15 Footprint	SWMU15-SB69	3-5	Fine CCR	Shelby Tube
		8-10	Fine CCR	Split Spoon
		13-15	Fine CCR	Split Spoon
		20-21.5	Sand	Split Spoon
		25-26.5	Sand	Split Spoon
		30-31.5	Sand	Split Spoon
		35-36.5	Sand	Split Spoon
		53-53.5	Clay	Brass Rings
		55-57	Clay	Shelby Tube
		80-82	Clay	Shelby Tube
		EOB at 82 ft bgs		
	SWMU15-SB70	4-5	Fine CCR	Bag Sample
		9.5-11.5	Fine CCR	Bag Sample
		14-16	Fine CCR	Shelby Tube
		20-21.5	Silty Sand	Split Spoon
		25-26.5	Silty Sand	Split Spoon
		30-31	Silty Sand	Brass Rings
		35-36.5	Silty Sand	Split Spoon
		40-41.5	Sand	Split Spoon
		63-65	Clay	Bag Sample
		65-67	Clay	Shelby Tube
		EOB at 69 ft bgs		
	SWMU15-SB71	3-5	Fine CCR	Bag Sample
		5-6.5	Fine CCR	Brass Rings
		7.5-8.0	Fine CCR	3" Rings
		9.0-9.5	Fine CCR	3" Rings
		8-10	Fine CCR	Bag Sample
		10-11	Fine CCR	Brass Rings
		13-15	Fine CCR	Shelby Tube
		15-16.0	Fine CCR	Brass Rings
		20-21.5	Fine CCR/Sand	Split Spoon
		25-26	Clay	Shelby Tube
		30-32	Clay	Bag Sample
		30-35	Clay	Lexan Liner
		33-33.5	Clay	Brass Rings
		57-57.5	Silty Sand	3" Rings
		65-70.0	Sand	Bag Sample
		98-98.5	Clay	3" Rings
		EOB at 100 ft bgs		

Table 2. Sampling Intervals and Collection Method
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

Area of Interest	Boring ID	Sample Depth Interval (ft bgs)	Material	Sample Collection Method
Within SWMU 15 Footprint	SWMU15-SB72	3-5	Fine CCR	Bag Sample
		5-6.5	Fine CCR	Split Spoon
		10-11	Fine CCR	Brass Rings
		9-11	Fine CCR	Bag Sample
		15-16	Fine CCR	Brass Rings
		17-18.5	Fine CCR	Split Spoon
		15-17	Fine CCR	Bag Sample
		15-20	Fine CCR	Lexan Liner
		25-27	Clay	Shelby Tube
		30-32	Clay	Bag Sample
		33-33.5	Clay	Brass Rings
		48-48.5	Silty Sand	3" Rings
		52.5-53.0	Silty Sand	3" Rings
		80-82.0	Clay	Shelby Tube
		EOB at 85 ft bgs		
Perimeter of SWMU 15	SWMU15-SB61	5-6.5	Sand	Split Spoon
		10-11.5	Peat	Split Spoon
		20-21.5	Sand	Split Spoon
		25-26	Sand	Brass Rings
		30-35	Sand	Bag Sample
		39.5-40	Clay	Brass Rings
		EOB at 100 ft bgs		
	SWMU15-SB62	5-6.5	Sand	Split Spoon
		10-11.5	Sand	Split Spoon
		15-16.5	Sand	Split Spoon
		8-20	Sand	Bag Sample
		22-40	Sand	Bag Sample
		60-70	Sand	Bag Sample
		EOB at 100 ft bgs		
	SWMU15-SB65	5-6.5	Sand	Split Spoon
		15-16.5	Sand	Split Spoon
		20-21.5	Sand	Split Spoon
		25-26.5	Sand	Split Spoon
		30-31.5	Sandy Clay	Split Spoon
		35.5-36	Clay	Brass Rings
		36-37	Clay	Bag Sample
		98-98.5	Clay	Brass Rings
		EOB at 100 ft bgs		

Table 2. Sampling Intervals and Collection Method
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

Area of Interest	Boring ID	Sample Depth Interval (ft bgs)	Material	Sample Collection Method
Perimeter of SWMU 15	SWMU15-SB66	5-6.5	Sand	Split Spoon
		10.11.5	Peat	Split Spoon
		15-16.5	Sand	Split Spoon
		35-36	Silty Sand	Brass Rings
		44-44.5	Clay	Brass Rings
		55-57	Clay	Shelby Tube
		EOB at 57 ft bgs		
	SWMU15-SB67	5-6.5	Sand	Split Spoon
		10.11.5	Sand	Split Spoon
		15-16.5	Sand	Split Spoon
		20-21.5	Sand	Split Spoon
		EOB at 80 ft bgs		
	SWMU15-SB68	5-6.5	Sand	Split Spoon
		15-16.5	Sand	Split Spoon
		20-21.5	Sand	Split Spoon
		30-35	Sand	Bag Sample
		44.5-47.5	Clay	Bag Sample
		50-55	Silty Sand	Bag Sample
		72-72-5	Clay	3" Rings
		74-74.5	Clay	Brass Rings
		80-82	Clay	Shelby Tube
		EOB at 82 ft bgs		
	SWMU15-SB73	5-6.5	Fine CCR	Split Spoon
		15-16.5	Sand	Split Spoon
		20-21.5	Sand/Clay	Split Spoon
		28-29	Clay	Bag Sample
		30-31	Sand	Brass Rings
		41-41.5	Clay	3" Rings
		45-45.5	Clay	Brass Rings
		EOB at 90 ft bgs		
	SWMU15-SB74	5-6.5	Sand	Split Spoon
		10.11.5	Sand	Split Spoon
		43-43.5	Clay	3" Rings
		44-44.5	Clay	Brass Rings
		45-47	Clay/Sand	Shelby Tube
		EOB at 90 ft bgs		

Table 2. Sampling Intervals and Collection Method
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

Area of Interest	Boring ID	Sample Depth Interval (ft bgs)	Material	Sample Collection Method
Perimeter of SWMU 15	SWMU15-SB75	2-4	Fine CCR	Bag Sample
		5-6.5	Sand	Split Spoon
		10-11.5	Sand	Split Spoon
		15-16.5	Sand	Split Spoon
		20-21.5	Sand	Split Spoon
		23-24	Clay	Bag Sample
		27-29	Clay	Bag Sample
		80-84	Silty Sand	Bag Sample
		EOB at 90 ft bgs		
	SWMU15-SB76	5-6.5	Sand	Split Spoon
		10-11.5	Sand	Split Spoon
		15-16.5	Sand	Split Spoon
		20-21.5	Sand/Clay Lens	Split Spoon
		30-32	Clay	Shelby Tube
		32-33	Clay	Brass Rings
		EOB at 80 ft bgs		

Notes:
ft bgs = feet below ground surface
CCR = Coal Combustion Residuals
EOB = End of Boring

Table 3. Sample Analyses
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

Area of Interest	Boring ID	Sample Depth Interval (ft bgs)	Material	Sample Collection Method	Geotechnical Lab Analysis							
					Phase A Tests			Phase B Tests				
					Sieve Analysis (Grain Size) ASTM D422	Moisture Content ASTM D2216-10	Atterberg Limits (Plasticity Index) ASTM D4318	Bulk Density ASTM D7263-09	Specific Gravity of Solids ASTM D854-10	Direct Shear Test ASTM D3080-11	Consolidation ASTM D2435-11 Method A	Vertical Hydraulic Conductivity / Permeability ASTM D5084-16 Method F
Within SWMU 15 Footprint	SWMU15-SB63	2-3	Sand	Bag Sample	X							
		3-5	Fine CCR	Bag Sample				D		D	D	
		8-10	Fine CCR	Shelby Tube		X		X	X			
		10-12	Fine CCR	Bag Sample	X							
		12-20	Sand	Bag Sample	X							
		25-30	Sand	Bag Sample	X							
		94-95	Clay	Bag Sample	X		X					
		95-97	Clay	Shelby Tube						X	X	X
		EOB at 97 ft bgs										
	SWMU15-SB64	2-2.9'	CCR	Bag Sample	X							
		8-10	CCR	Shelby Tube				D	X			
		20-21.5	Sand	Split Spoon	X							
		35-36	Sand	Brass Rings						X		
		40-41.5	Sandy Clay	Split Spoon	X		X					
		95-97	Silty Sand	Shelby Tube						X	X	X
		EOB at 97 ft bgs										
	SWMU15-SB69	3-5	Fine CCR	Shelby Tube		X[1]		X[1]	X	X	X	
		8-10	Fine CCR	Split Spoon	X							
		13-15	Fine CCR	Split Spoon	X							
		20-21.5	Sand	Split Spoon	X							
		55-57	Clay	Shelby Tube	X		X			X	X	X
		EOB at 82 ft bgs										
	SWMU15-SB70	4-5	Fine CCR	Bag Sample	X							
		9.5-10	Fine CCR	Bag Sample	X							
		15-17	Fine CCR	Shelby Tube		X[2]		X[2]	X	X	X	
		25-26.5	Silty Sand	Split Spoon	X							
		63-65	Clay	Bag Sample	X		X					
		65-67	Clay	Shelby Tube							D	X
		EOB at 69 ft bgs										
	SWMU15-SB71	2-5	Fine CCR	Bag Sample	X							
		5-6.5	Fine CCR	Brass Rings		X		X	X			
		8-10	Fine CCR	Bag Sample	X							
		10-11	Fine CCR	Brass Rings				LR		LR	LR	
		13-15	Fine CCR	Shelby Tube		X		X	X			
		15-16	Fine CCR	Brass Rings		X[2]		X[2]	X	X	X	
		30-35	Clay	Liner						X	X	X
		EOB at 100 ft bgs										
	SWMU15-SB72	3-5	Fine CCR	Bag Sample	X							
		5-6.5	Fine CCR	Split Spoon	X							
		10-11	Fine CCR	Brass Rings		X[2]		X[2]	X	X	X	
		9-11	Fine CCR	Bag Sample	X							
		15-17	Fine CCR	Brass Rings	X	X		X	X			
		15-20	Fine CCR	Liner		X		X	X			
		25-27	Clay	Shelby Tube						X	X	X
		30-32	Clay	Bag Sample	X		X					
		EOB at 85 ft bgs										

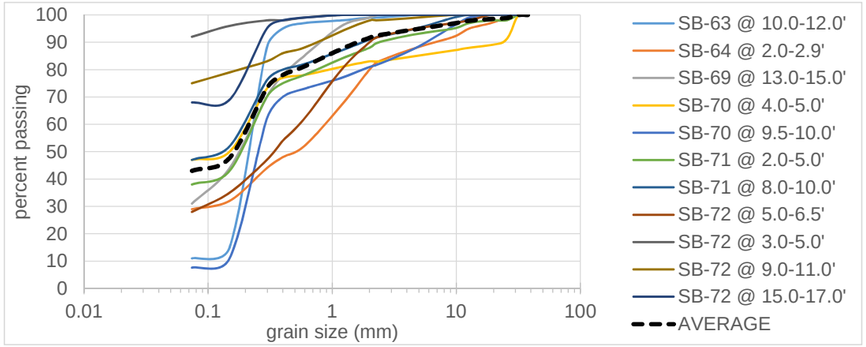
Table 3. Sample Analyses
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

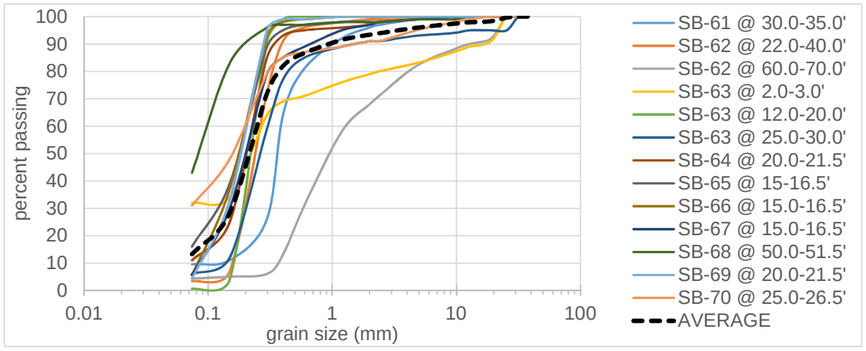
Area of Interest	Boring ID	Sample Depth Interval (ft bgs)	Material	Sample Collection Method	Geotechnical Lab Analysis							
					Phase A Tests			Phase B Tests				
					Sieve Analysis (Grain Size)	Moisture Content	Atterberg Limits (Plasticity Index)	Bulk Density	Specific Gravity of Solids	Direct Shear Test	Consolidation	Vertical Hydraulic Conductivity / Permeability
Perimeter of SWMU 15	SWMU15-SB61	10-11.5	Peat	Split Spoon	X							
		25-26	Sand	Brass Rings						X		
		30-35	Sand	Bag Sample	X							
		39.5-40	Clay	Brass Rings	X		X					
		EOB at 100 ft bgs										
	SWMU15-SB62	22-40	Sand	Bag Sample	X							
		60-70	Sand	Bag Sample	X							
		EOB at 100 ft bgs										
	SWMU15-SB65	15-16.5	Sand	Split Spoon	X							
		36-37	Clay	Bag Sample	X		X					
		EOB at 100 ft bgs										
	SWMU15-SB66	15-16.5	Sand	Split Spoon	X							
		35-36	Silty Sand	Brass Rings						X		
		55-57	Clay	Shelby Tube	X		X			X	X	X
		EOB at 57 ft bgs										
	SWMU15-SB67	15-16.5	Sand	Split Spoon	X							
		EOB at 80 ft bgs										
	SWMU15-SB68	50-51.5	Silty Sand	Bag Sample	X							
		74-74.5	Clay	Brass Rings	X		X					
		80-82	Clay	Shelby Tube						X	X	X
		EOB at 82 ft bgs										
	SWMU15-SB73	30-31	Sand	Brass Rings						X		
		41-41.5	Clay	3" Rings	X		X					
		EOB at 90 ft bgs										
	SWMU15-SB74	44.0-45.0	Clay	Bag Sample	X		X					
		45.0-46.5	Clay	Shelby Tube								X
		EOB at 90 ft bgs										
	SWMU15-SB75	27-29	Clay	Bag Sample	X		X					
		80-84	Silty Sand	Bag Sample	X							
		EOB at 90 ft bgs										
	SWMU15-SB76	30-32	Clay	Shelby Tube						X	X	X
		32-33	Clay	Brass Rings	X		X					
		EOB at 80 ft bgs										

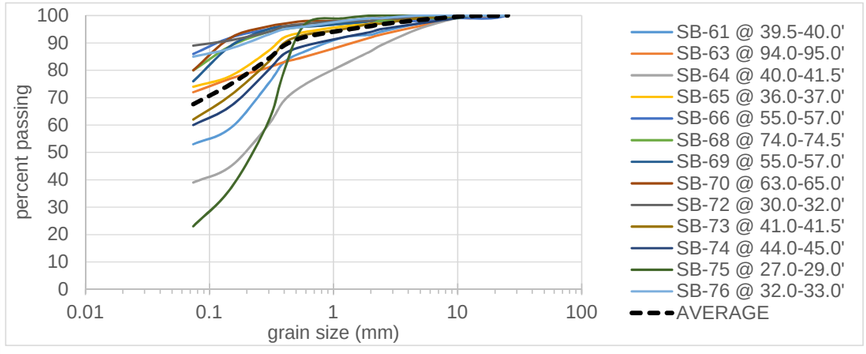
Notes:
ft bgs = feet below ground surface
CCR = Coal Combustion Residuals
EOB = End of Boring
X - sample submitted and analyzed by corresponding method
D - sample submitted and determined to be damaged or deformed and unusable for analysis
LR - sample submited and recovery determined to be insufficient for analysis
1 - moisture content and bulk density results part of direct shear and consolidation testing
2 - moisture content and bulk density results part of direct shear testing

Table 4. Phase A Testing Results Summary
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

MATERIAL TYPE	BORING ID	DEPTH INTERVAL (ft BGS)	SUMMARY OF PARTICLE SIZE ANALYSIS								PLASTICITY ANALYSIS		UNIFIED SOIL CLASSIFICATION
			PERCENT PASSING 200	PERCENT PASSING 100	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL	PI	
CCR	SB-63	10.0-12.0'	11.0	15	-	0.172	0.208	0.228	-	-	NV	NP	SP-SM
	SB-64	2.0-2.9'	29.0	32	-	0.088	0.505	0.871	-	-	NV	NP	SM
	SB-69	8.0-10.0'	51.0	56	-	-	-	0.170	-	-	NV	NP	ML
	SB-69	13.0-15.0'	31.0	44	-	-	0.175	0.227	-	-	NV	NP	SM
	SB-70	4.0-5.0'	47.0	50	-	-	0.144	0.201	-	-	NV	NP	SM
	SB-70	9.5-10.0'	7.6	11	0.126	0.194	0.253	0.289	1.0	2.3	NV	NP	SP-SM
	SB-71	2.0-5.0'	38.0	43	-	-	0.178	0.230	-	-	NV	NP	SM
	SB-71	8.0-10.0'	47.0	52	-	-	0.109	0.187	-	-	NV	NP	SM
	SB-72	5.0-6.5'	28.0	35	-	0.088	0.344	0.548	-	-	NV	NP	SM
	SB-72	3.0-5.0'	92.0	96	-	-	-	-	-	-	NV	NP	ML
	SB-72	9.0-11.0'	75.0	79	-	-	-	-	-	-	NV	NP	ML
	SB-72	15.0-17.0'	68.0	69	-	-	-	-	-	-	NV	NP	ML
		MIN	7.6	11.0	0.126	0.088	0.109	0.170	1.0	2.3	Non Plastic		SM (ML - SP)
		AVERAGE	43.7	48.5	0.126	0.136	0.240	0.328	1.0	2.3			
		MAX	92.0	96.0	0.126	0.194	0.505	0.871	1.0	2.3			
		STANDARD DEVIATION	25.2	24.7	-	0.056	0.129	0.233	-	-			
SAND	SB-61	30.0-35.0'	9.5	11	0.093	0.307	0.369	0.405	2.5	4.4	NV	NP	SP-SM
	SB-62	22.0-40.0'	3.3	7	0.154	0.190	0.235	0.261	0.9	1.7	NV	NP	SP
	SB-62	60.0-70.0'	4.3	5	0.358	0.584	0.974	1.326	0.7	3.7	NV	NP	SP
	SB-63	2.0-3.0'	32.0	34	-	-	0.217	0.272	-	-	NV	NP	SM
	SB-63	12.0-20.0'	0.6	4	0.158	0.184	0.215	0.233	0.9	1.5	NV	NP	SP
	SB-63	25.0-30.0'	6.0	12	0.120	0.195	0.260	0.302	1.0	2.5	NV	NP	SP-SM
	SB-64	20.0-21.5'	11.0	25	-	0.159	0.200	0.224	-	-	NT	NT	-
	SB-65	15-16.5'	16.0	39	-	0.114	0.175	0.200	-	-	NV	NP	SM
	SB-66	15.0-16.5'	5.6	37	0.081	0.128	0.176	0.199	1.0	2.5	NV	NP	SP-SM
	SB-67	15.0-16.5'	5.6	30	0.084	0.150	0.199	0.228	1.2	2.7	NV	NP	SP-SM
	SB-68	50.0-51.5'	43.0	83	-	-	0.084	0.100	-	-	NV	NP	SM
	SB-69	20.0-21.5'	4.3	33	0.085	0.141	0.181	0.202	1.2	2.4	NV	NP	SP
	SB-70	25.0-26.5'	31.0	48	-	-	0.156	0.195	-	-	NV	NP	SM
		MIN	0.6	4.0	0.081	0.114	0.084	0.100	0.7	1.5	Non Plastic		SP-SM
		AVERAGE	13.2	28.3	0.142	0.215	0.265	0.319	1.2	2.7			
		MAX	43.0	83.0	0.358	0.584	0.974	1.326	2.5	4.4			
		STANDARD DEVIATION	13.4	22.0	0.093	0.140	0.223	0.311	0.6	1.0			
CLAY	SB-61	39.5-40.0'	53.0	59	-	-	-	0.157	-	-	17	6	CL-ML
	SB-63	94.0-95.0'	72.0	77	-	-	-	-	-	-	20	6	CL-ML
	SB-64	40.0-41.5'	39.0	45	-	-	0.189	0.295	-	-	14	3	SM
	SB-65	36.0-37.0'	74.0	78	-	-	-	-	-	-	21	7	CL-ML
	SB-66	55.0-57.0'	86.0	92	-	-	-	-	-	-	19	5	CL-ML
	SB-68	74.0-74.5'	80.0	89	-	-	-	-	-	-	22	8	CL
	SB-69	55.0-57.0'	76.0	89	-	-	-	-	-	-	19	6	CL-ML
	SB-70	63.0-65.0'	80.0	92	-	-	-	-	-	-	20	7	CL-ML
	SB-72	30.0-32.0'	89.0	91	-	-	-	-	-	-	28	13	CL
	SB-73	41.0-41.5'	62.0	71	-	-	-	-	-	-	16	4	CL-ML
	SB-74	44.0'-45.0'	60.0	67	-	-	-	-	-	-	20	7	CL-ML
	SB-75	27.0-29.0'	23.0	37	-	0.105	0.218	0.290	-	-	20	8	SC
	SB-76	32.0-33.0'	85.0	88	-	-	-	-	-	-	25	11	CL
		MIN	23.0	37.0	-	-	-	-	-	-	14.0	3.0	CL-ML (SC & SM)
		AVERAGE	67.6	75.0	-	-	-	-	-	-	20.1	7.0	
		MAX	89.0	92.0	-	-	-	-	-	-	28.0	13.0	
		STANDARD DEVIATION	19.7	18.5	-	-	-	-	-	-	3.6	2.7	
SILT	SB-75	80.0-84.0'	84.0	93	-	-	-	-	-	-	NV	NP	ML
PEAT	SB-61	10.0-11.5'	0.4	4	0.158	0.188	0.223	0.243	0.9	1.5	NV	NP	SP







NOTES:
1. D10 - grain diameter at 10% passing
2. D30 - grain diameter at 30% passing
3. D50 - grain diameter at 50% passing (mean grain diameter)
4. D60 - grain diameter at 60% passing
5. Cc - Coefficient of Curvature
6. Cu - Coefficient of Uniformity
7. LL - liquid limit
8. PI - plastic limit

Table 5. CCR Properties Summary
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

BORING ID	DEPTH INTERVAL (ft BGS)	MOISTURE CONTENT[a] (%)	DRY BULK DENSITY[b] (pcf)	SPECIFIC GRAVITY OF SOLIDS[c] (-)	TOTAL POROSITY[d] (%)	IN-SITU DENSITY[e] (pcf)	PERCENT SATURATION[f] (%)
SB63	8.0'-10.0'	45	89.6	2.454	41	129.9	100+
SB64	8.0'-10.0'	N/A	N/A	2.759	N/A	-	-
SB69	3.0'-5.0'	23.2[g]	100.2[g]	2.642	39	123.5	95.3
SB70	15.0'-17.0'	46.1[h]	65.8[h]	2.518	59	101.6	96.7
SB71	5.0'-6.0'	23	108.6	2.913	40	133.6	99.8
SB71	13.0'-15.0'	19	116.5	2.777	33	138.6	100+
SB71	15.0'-16.0'	67.5[h]	56.0[h]	2.449	56	105.3	100+
SB72	10.0'-11.0'	23.3[h]	104.7[h]	2.751	39	129.1	100+
SB72	15.0'-16.0'	29	97.0	2.737	43	125.1	100+
SB72	15.0'-20.0'	20	105.2	2.684	37	126.2	90.7
MINIMUM		19	65.8	2.45	33	101.6	90.7
AVERAGE		33	95.0	2.67	43	123.7	98.0
MAXIMUM		56	116.5	2.91	59	138.6	100+
STANDARD DEVIATION		15	17.7	0.15	8.8	12.4	3.3

NOTES:

a Moisture Content by ASTM D2216-10
b Dry Bulk Density expressed in pounds per cubic foot (pcf) by ASTM D7263-09
c Specific Gravity of Solids by ASTM D854-10
d Total Porosity calculated based on the corresponding dry bulk density and the specific gravity of the solids
e In-situ Density expressed in pcf calculated based on the corresponding moisture content and dry bulk density
f Percent Saturation calculated based on the moisture content, dry bulk density, and specific gravity of the solids
g average value based on results from shear strength test performed on corresponding sample
h average value based on results from shear strength and consolidation tests performed on corresponding sample

Table 6. Shear Strength Test Results Summary
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

MATERIAL TYPE	BORING ID	DEPTH INTERVAL (ft bgs)	INTERNAL FRICTION ANGLE[a] (deg.)	COHESION[a] (psf)
CCR	SB69	3.0'-5.0'	27.0	78
	SB70	15.0'-17.0'	26.6	0
	SB71	15.0'-16.0'	24.4	54
	SB72	10.0'-11.0'	31.8	78
		MINIMUM	24.4	0.0
		AVERAGE	27.5	52.5
		MAXIMUM	31.8	78.0
		STANDARD DEVIATION	3.1	36.8
SAND	SB61	25.0'-26.0'	27.9	12
	SB64	35.0'-36.0'	32.5	0
	SB66	35.0'-36.0'	30.3	0
	SB73	30.0'-31.0'	28.6	0
		MINIMUM	27.9	0.0
		AVERAGE	29.8	3.0
		MAXIMUM	32.5	12.0
		STANDARD DEVIATION	2.0	6.0
CLAY	SB63	95.0'-97.0'	25.8	234
	SB64	95.0'-97.0'	27.7	0
	SB66	55.0'-57.0'	23.0	330
	SB68	80.0'-82.0'	24.6	282
	SB69	55.0'-57.0'	22.7	282
	SB71	30.0'-35.0'	25.8	96
	SB72	25.0'-27.0'	22.3	696
	SB76	30.0-32.0	19.8	672
		MINIMUM	19.8	0.0
		AVERAGE	24.0	324.0
		MAXIMUM	27.7	696.0
		STANDARD DEVIATION	2.5	247.3

NOTES:

a Cohesive Strength [pounds per square foot (psf)] and Internal Friction Angle (degrees) determined by ASTM D3080-11 , Direct Shear Test of Soilds Under Consolidated Drained Conditions

ft bgs - feet below ground surface

Table 7. Consolidation Test Results Summary
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

MATERIAL TYPE	BORING ID	DEPTH INTERVAL (ft BGS)	MAXIMUM LOAD[a] (tsf)	CONSOLIDATION[b] (%)
CCR	SB69	3.0'-5.0'	2.0	4.72
	SB70	15.0'-17.0'	2.0	11.60
	SB71	15.0'-16.0'	2.0	22.40
	SB72	10.0'-11.0'	2.0	4.31
		MINIMUM	2.0	4.31
		AVERAGE	2.0	10.76
		MAXIMUM	2.0	22.40
		STANDARD DEVIATION	0.0	8.45
CLAY	SB63	95.0'-97.0'	4.0	8.07
	SB64	95.0'-97.0'	4.0	1.95
	SB66	55.0'-57.0'	8.0	3.97
	SB68	80.0'-82.0'	8.0	2.93
	SB69	55.0'-57.0'	8.0	4.98
	SB71	30.0'-35.0'	4.0	8.01
	SB72	25.0'-27.0'	4.0	7.59
	SB76	30.0-32.0	4.0	5.20
		MINIMUM	4.0	1.95
		AVERAGE	5.3	5.34
		MAXIMUM	8.0	8.07
		STANDARD DEVIATION	2.1	2.36

NOTES:

a Maximum load expressed in tons per square foot (tsf) prescribed to assess potential consolidation of material considering exisiting stress and addition stress imposed by future cover system

b Consolidation represents maximum strain observed at maximum load by ASTM D2435-11 Method A with 24-hour minimum readings at maximum and preceding loads

Table 8. Verical Hydraulic Conductivity Test Results Summary
SWMU 15 Geotechnical Investigation
Bailly Generating Station
Chesterton, IN

BORING ID	DEPTH INTERVAL (ft BGS)	HYDRAULIC[a] CONDUCTIVITY (cm/sec)
SB63	95.0'-97.0'	1.1E-05
SB64	95.0'-97.0'	1.3E-07
SB66	55.0'-57.0'	9.2E-08
SB68	80.0'-82.0'	5.7E-08
SB69	55.0'-57.0'	1.1E-07
SB70	65.0'-67.0'	2.3E-04
SB71	30.0'-35.0'	2.8E-08
SB72	25.0'-27.0'	3.1E-08
SB74	45.0'-46.5'	2.9E-07
SB76	30.0'-32.0'	1.0E-07
	MINIMUM	2.8E-08
	GEOMETRIC MEAN	2.9E-07
	MAXIMUM	2.3E-04
	STANDARD DEVIATION	7.2E-05

NOTES:
[a] Hydraulic Conductivity by ASTM D5084-16 Method F Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

SWMU 15
Investigation Locations

Northern Indiana Public Service Company

Bailly Generating Station
Chesterton, Indiana

Legend

- Soil Boring Location
- Soil Boring Location 2016
- Test Pit End Location 2009
- Test Pit End Location 2005
- Monitoring Well Location
- Trail
- Bailly Generating Station Property Line
- Test Pit Location 2009
- Test Pit Location 2005
- Coal Combustion Residual Fill Area
- Approximate Area of Topographic Survey

Location of Site

Notes and Sources

FIGURE 1

Aerial Photo: 2005.
Courtesy of LizardTech, Inc.

- Area of SWMU 15 landfill is 16.56 acres.

-For abbreviated soil boring locations, the full location name is SWMU15-SB##.

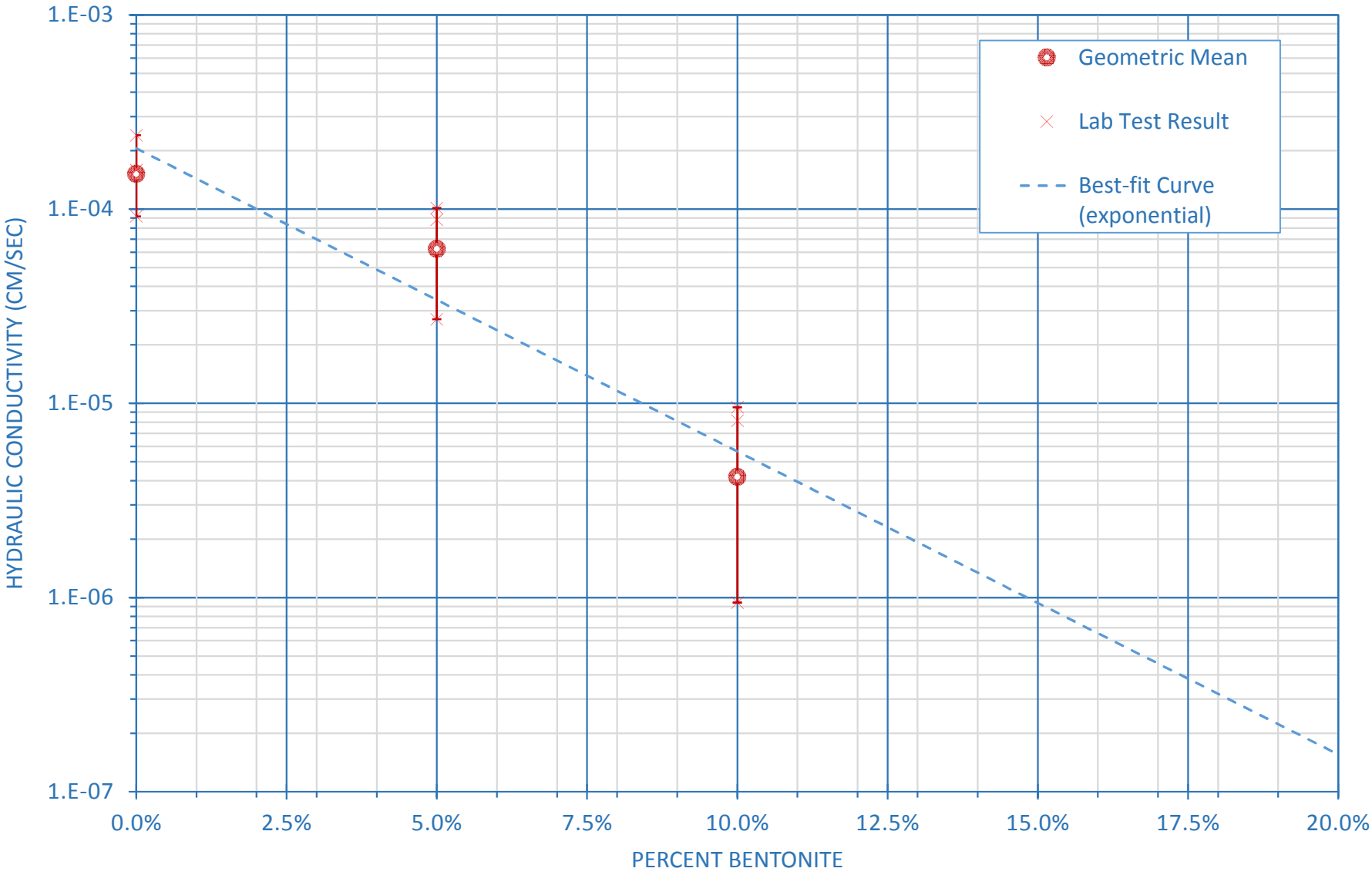
N

0 160 Feet

amec foster wheeler
AMEC Foster Wheeler
Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824
(978) 692-9090

H:\NiSource\BaillyGenerating\Task81\MXD\Fig1_SWMU15SoilBorings.mxd December 01, 2016 DWN: emily.gardiner CHKD: AKN

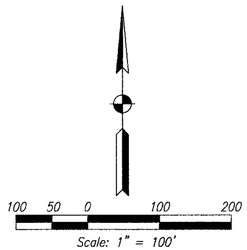
Figure 2. Soil-Bentonite Slurry Mix Design



ATTACHMENT A

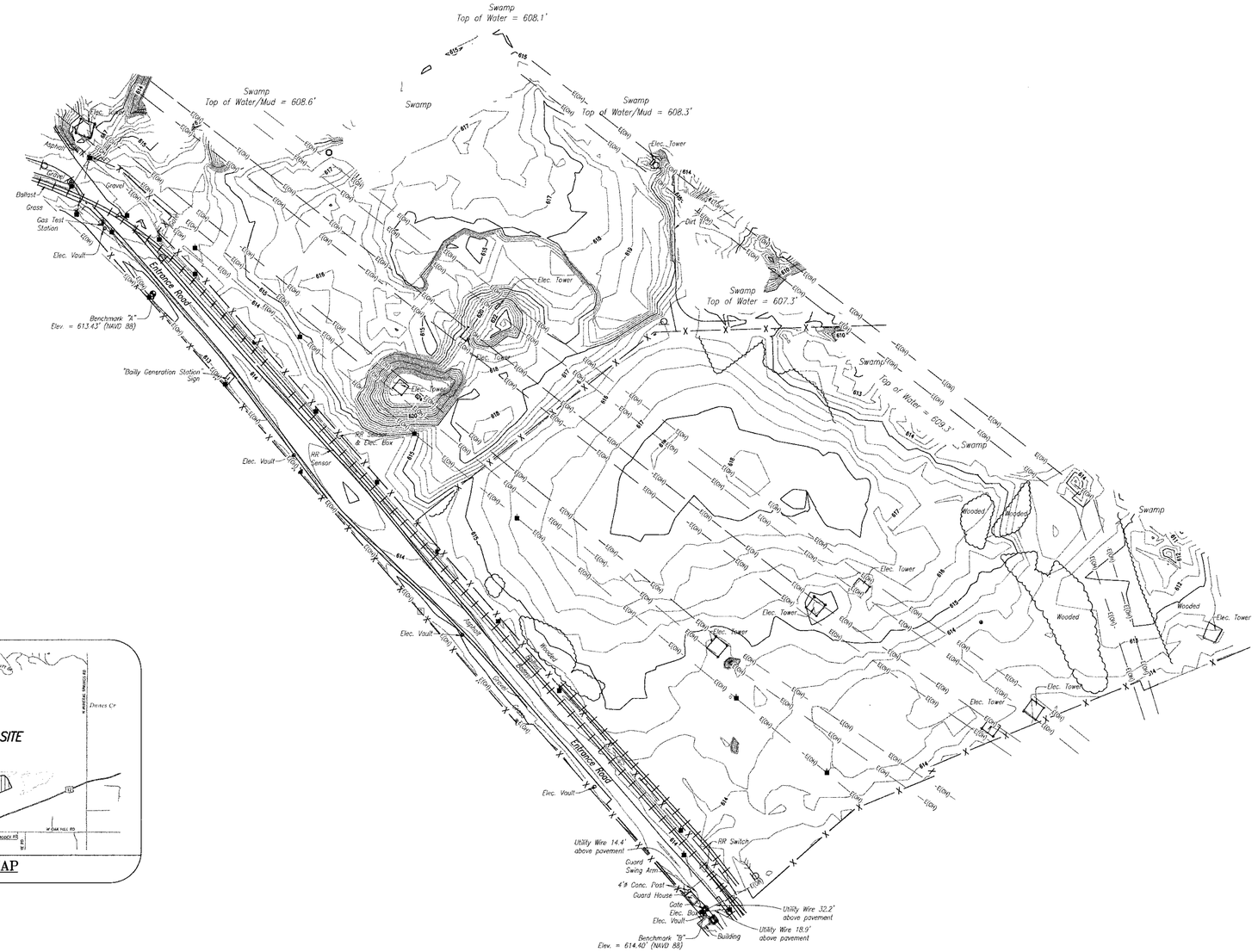
TOPOGRAPHIC SURVEY

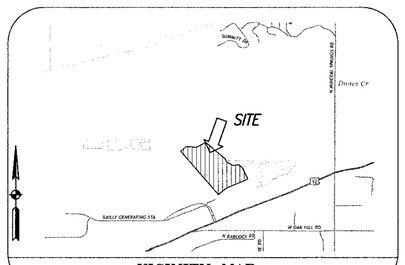
TOPOGRAPHIC SURVEY



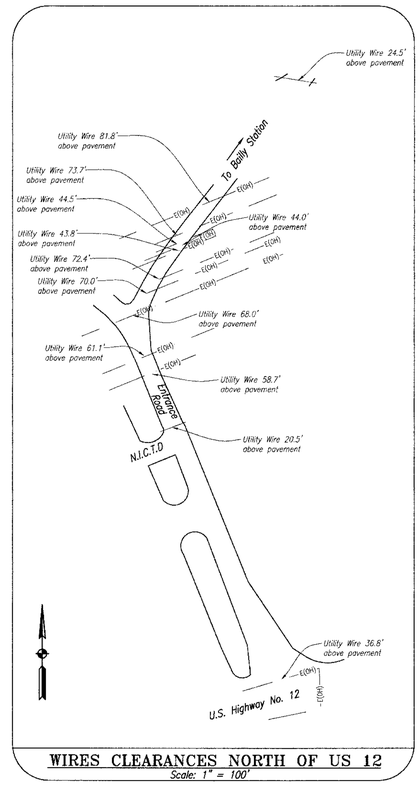
Legend

- Power Pole
- Electric Riser
- Cable Pedestal
- Telephone Pedestal
- Fiber Optic Marker
- Gas Marker
- Gas Vent Pipe
- Monitoring Well
- Sign
- Mailbox
- Post
- Guy Anchor
- Railroad Tracks
- Fence
- E (OH) Overhead Utility Wires
- Tree Line





VICINITY MAP
Not to Scale



WIRES CLEARANCES NORTH OF US 12
Scale: 1" = 100'

General Notes:

1. *This drawing is not intended to be represented as a retracement or original boundary survey, a route survey, or a Surveyor Location Report.*

2. *The contours shown hereon are based on a ground survey and are referenced to the North American Vertical Datum of 1988 (NAVD88) based on GPS measurements from the Indiana Department of Transportation Continuously Operating Reference Network (INDOT CORS). Ellipsoid heights were converted to elevations using Geoid 12A.*

Site Benchmarks:

Benchmark 'A' – Benchtie in the road side face of N.I.P.S.Co Utility Pole No. 956/838 located on the west side of the entrance road +/- 1300 feet northwest of the Guard House. Elevation: 613.43'

Benchmark 'B' – Benchtie in the road side face of N.I.P.S.Co Utility Pole No. 956/845 located on the west side of the entrance road on the southeast side of the Guard House. Elevation: 614.40'

Anthony J. Toscani
Indiana Professional Surveyor No. LS20600010
Date of Plat: September 19, 2016
Last Date of Fieldwork: Setember 16, 2016

ANTHONY J. TOSCANI REGISTERED No. LS20600010 STATE OF INDIANA LAND SURVEYOR

DLZ
DLZ INDUSTRIAL, LLC
316 TECH DRIVE, BURNS HARBOR, INDIANA 46304
TELEPHONE (219) 764-4700 FAX (219) 764-4156

PORTAGE INDIANA

TOPOGRAPHIC SURVEY WITHIN THE SWMU 15 AREA

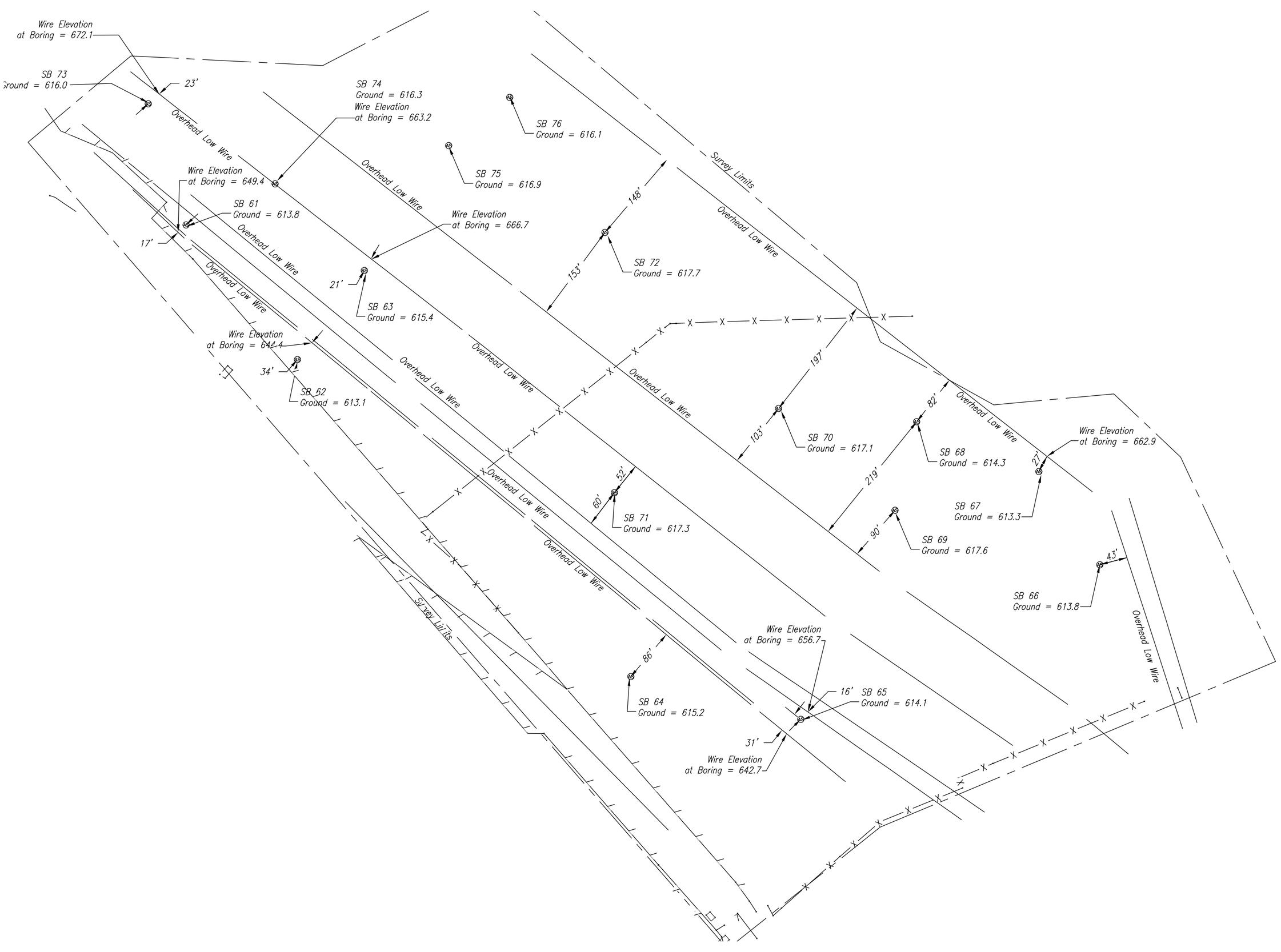
AT BAILLY STATION
FOR: AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

DRAWN: KLK	CHK'D. RHK
DESIGNED:	APPRV'D: AJT
DATE: 9/20/16	
SCALE: 1" = 100'	
PROJECT NUMBER	1650-8093-90

NO.	REVISION	BY	DATE
1			
2			
3			
4			
5			
6			

SHEET 1
OF 1
DRAWING NUMBER
8093TO

P:\PROJ\1650\8093\TOPO\8093TO.DWG


Wire Elevation
at Boring = 672.1
SB 73
Ground = 616.0
23'
Overhead Low Wire
SB 74
Ground = 616.3
Wire Elevation
at Boring = 663.2
SB 76
Ground = 616.1
SB 75
Ground = 616.9
Survey Limits
Wire Elevation
at Boring = 649.4
SB 61
Ground = 613.8
Overhead Low Wire
Wire Elevation
at Boring = 666.7
148'
153'
SB 72
Ground = 617.7
17'
21'
SB 63
Ground = 615.4
Wire Elevation
at Boring = 641.4
34'
SB 62
Ground = 613.1
197'
103'
SB 70
Ground = 617.1
82'
SB 68
Ground = 614.3
Wire Elevation
at Boring = 662.9
27'
219'
SB 67
Ground = 613.3
60'
52'
SB 71
Ground = 617.3
90'
SB 69
Ground = 617.6
43'
SB 66
Ground = 613.8
Survey Limits
Wire Elevation
at Boring = 656.7
86'
SB 64
Ground = 615.2
16'
SB 65
Ground = 614.1
31'
Wire Elevation
at Boring = 642.7

ATTACHMENT B

BORING LOGS

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/9/16

BORING NO. SB-61

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 613.8
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SP-SM		**SILTY SAND** with ballast to 1-1/4", subangular, nonplastic, dark-brown, damp
								SP	very loose	**SAND** fine grained, nonplastic, dark-brown to light brown, damp
▽ 5			X	S	4			SP	loose	**SAND** fine grained, nonplastic, black, wet
								SP	loose	**SAND** with gravel to 3/4", fine grained, nonplastic, brown, wet
10			X	S	7					
									loose	**PEAT** organic soils, trace root, wood fragments, wet
15								SP	loose	**SAND** trace peat, wood fragments, nonplastic, brown to black, wet
								SP-SM	loose	**SAND WITH SILT** fine grained, nonplastic, light brown, wet
20			X	S	7					color change gray-brown
25				U	7					trace gravel to 1/2", subangular
30				A					Due to heaving at 30' split spoon sampling was stopped	
35										
40				U	9			CH	loose	**CLAY** high plasticity, gray-brown
45								SP		**SAND** medium grained, nonplastic, gray-brown
50								CH		**CLAY** high plasticity, gray-brown, wet
55								SP		**SAND** medium grained, nonplastic, gray-brown, trace gravel 1/2", subround, wet
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	6.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana
DATE 8/9/16
AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-61

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 613.8
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										**SAND** medium grained, nonplastic, gray-brown, trace gravel 1/2", subround, wet
65										
70										
75										
								SM		**SILTY SAND** fine grained, nonplastic, gray-brown, wet
80				T		NR				
85										
90										
95										
								SP		**SAND** fine grained, nonplastic, gray-brown, wet
100										End of Boring @ 100'
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	6.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/8/16

AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-62

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 613.1
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM-SP		**SILTY SAND** with ballast to 1", subangular, nonplastic, dark brown
								SP		**SAND** fine grained, nonplastic, dark brown
▽ 5								SP		**SAND** with gravel to 3/4", medium to coarse grained, nonplastic, gray-white-brown
			S		7			SP		**SAND** fine grained, nonplastic, brown-black, trace peat
				A				SP		**SAND** fine grained, nonplastic, light brown
10			S							
15			S							
20								SP		**SAND** fine grained, nonplastic, gray-brown
				A						
25										
30										trace silt lens - 5" thick
35										trace silt lens - 4" thick
40										trace silt lens - 6" thick
45										
50								SP		**SAND** medium grained, nonplastic, gray-brown, trace gravel to 3/4", subround
								SP		**SAND** medium grained, nonplastic, gray-brown, wet
55										
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	5.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/8/16

BORING NO. SB-62

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 613.1
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60				A						**SAND** medium grained, nonplastic, gray-brown, wet
65										
70										
75										
80										trace gravel to 1", subround
85										
90								SM		**SILTY SAND** fine grained, nonplastic, gray-brown, wet
95										trace clay lens - 6" thick
								SP		**SAND** fine grained, nonplastic, gray-brown, wet
100										End of Boring @ 100'
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	5.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 7/27/16

BORING NO. SB-63

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 615.4
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM		**FILL: SILTY SAND WITH FINE CCR** with fine grained, fine gravel, nonplastic, black, damp
				A						
5				T					Pushed Shelby tubes on upper 30 feet.	
				T						
10				A						
▽				A				SP-SM		**SAND WITH SILT** fine grained, nonplastic, tan, wet
				T		NR				
15										
20										
25				A						change fine to medium grained, change in color light gray
30										
35				U	6	LR			loose	Little recovery - sample washed out
								SM	loose to medium dense	**SILTY SAND** fine grained, nonplastic, gray, wet
40				A						
				U	15	NR				
				S	44				SPT 40 to 60' to try to encounter clay layer.	
				S	15					
45				S	15					
								SP	medium dense	**SAND** medium to coarse grained, trace gravel, wet
				S	21					
50				S	10			SP	loose to dense	**SAND** medium to coarse grained, trace gravel to 1", subround, nonplastic, light gray
				S	12					
55				S	19					clay lens approximately 1' thick
				S	22					
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	12.0	10:30	7/27/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana
DATE 7/27/16
AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-63

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 615.4
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60				S	38				dense	**SAND** medium to coarse grained, trace gravel to 1", subround, nonplastic, light gray
65										
70				A						
75										
80				A						
85										
90				U				CL-ML		**SILTY CLAY** fine grained, high plasticity, grayish-brown
95				U A T						
100										End of Boring @ 97'
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	12.0	10:30	7/27/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/2/16

BORING NO. SB-64

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 615.2
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**FILL: SLAG** gravel to 1", medium to coarse grained, nonplastic, gray-brown
▽				A						
				A					soft	**FILL: CCR** medium to coarse grained, nonplastic, black
5				S	7					**FILL: CCR** fine to coarse grained, nonplastic, black
				T						
10				S	6					
15				U	6	NR		SP	soft to very soft	**SAND** fine grained, nonplastic, brown
20				S	2					
25				S	11			SM	moderately firm	**SILTY SAND** nonplastic to low plasticity, gray-brown
30				S	15					
								CH	stiff	**CLAY** high plasticity, gray-brown
								SP	medium dense	**SAND** medium grained, trace gravel to 1", subround, nonplastic, gray-brown
35				U	17				Heaving at 35' - Stopped SPT's after 40'	
40				S	14			SM	moderately firm	**SILTY SAND** fine to medium grained, trace gravel to 3/4", subangular, low plasticity, gray-brown
45										
								SP		**SAND** medium grained, nonplastic, gray-brown
50										trace gravel to 3", subround
55								CH		**CLAY** high plasticity, gray-brown
								SM		**SAND** fine grained, nonplastic, gray-brown
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	3.0		8/2/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana
DATE 8/2/16
AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-64

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 615.2
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										
								CH		**CLAY** high plasticity, gray-brown
								SM		**SILTY SAND** fine grained, nonplastic, gray-brown
65										
70								CH		**CLAY** high plasticity, gray-brown
75										
								ML		**SILTY SAND** fine grained, nonplastic, gray-brown
80										
85								CH		**CLAY** high plasticity, gray-brown
90								ML		**SILTY SAND** fine grained, nonplastic, gray-brown
								CH		**CLAY** high plasticity, gray-brown
				U				ML		**SILTY SAND** trace clay, low plasticity, gray-brown
95				U						
				T						
										End of Boring @ 97'
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	3.0		8/2/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/3/16

BORING NO. SB-65

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 614.1
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**FILL: SLAG** gravel to 1", subangular, medium grained, nonplastic, gray dark brown
								SP	medium dense	**SAND** fine grained, nonplastic, light brown to brown, damp to wet
▽ 5				S	23					color change brown to black
10										trace roots
										PEAT organic soil, nonplastic, black, wet
15				S	9			SM	moderately firm	**SILTY SAND** fine grained, nonplastic, brown, wet
20				S	10					color change at 21', gray-brown, sand fine to medium grained
25				S	8					
30				S	21			SC	firm	**SANDY CLAY** medium plasticity gray-brown, wet sand lens, medium grained at 29.5'
35				U A				CL-ML		**SILTY CLAY** high plasticity, gray-brown, wet
40								SP	Heaving at 40' stopped SPT sampling	**SAND** fine to medium grained, nonplastic, gray-brown, trace gravel to 1/2", subangular, wet
45										
50								SP		**SAND** fine grained, nonplastic, gray-brown, wet
55										
60								SM		**SILTY SAND** fine grained, nonplastic, gray-brown, wet, trace clay lens at 58', 6" thick

GROUNDWATER

	DEPTH	HOUR	DATE
▽	5.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/3/16

BORING NO. SB-65

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 614.1
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										clay lens 6" thick
65										clay lens 1' thick
70								ML		**SILTY SAND** fine grained, nonplastic, gray-brown, wet
75										
80								CH		**CLAY** medium plasticity, gray-brown, wet
85								SM		**SAND** fine grained, nonplastic, gray-brown, wet
90								CH		**CLAY** high plasticity, gray-brown, wet
95								SM	90' - 95' sampling barrel came up empty, tripped back in	**SILTY SAND** fine grained, nonplastic, gray-brown, wet
100										End of Boring @ 100'
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	5.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/4/16

AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-66

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 613.8
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM		**SILTY SAND** fine grained, nonplastic, brown to light brown trace grass, roots, damp
▽										
5			☒	S	2			SP	very loose	**SAND** fine grained, nonplastic, brown-black, damp to wet
								CH		**SILTY CLAY** high plasticity, black, wet
10			☒	S	2				very loose	**PEAT** organics, nonplastic, soft, black, wet
								SP-SM	loose	**SAND W/SILT** fine grained, nonplastic, brown, wet
15			☒	S	8					
20									Heaving at 20' - stopped SPT sampling	color change gray-brown
25								SP		**SAND** medium grained, nonplastic, gray-brown, trace gravel to 1/2", subround, wet
30								SM		**SAND** fine grained, nonplastic, gray-brown, wet
								CH		**CLAY LENS** high plasticity, gray-brown, wet
35			▯	U	11			SM	moderately firm	**SILTY SAND** fine grained, gray-brown, wet
40			▯	U						
45								CL-ML		**SILTY CLAY** high plasticity, gray-brown, wet
50										
55			■	T						
60										End of Boring @ 57'

GROUNDWATER

	DEPTH	HOUR	DATE
▽	4.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/4/16

AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-67

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 613.3
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM		**SILTY SAND** fine grained, nonplastic, brown, trace roots, damp
								SP	very loose	**SAND** fine grained, nonplastic, dark brown, trace grave to 1", subround, damp to wet
▽ 5				S	2					color change - brown to black
10				S	2					
										PEAT organic soil, soft, nonplastic, black-brown
15				S	14			SP-SM	medium dense to loose	**SAND WITH SILT** fine grained, nonplastic, light brown, wet
20				S	5					
								SP	4' of heaving - stopped SPT sampling	**SAND** fine to medium grained, nonplastic, gray-brown, wet
25										
30										
35										
								SP		**SAND** fine grained, nonplastic, gray-brown, trace gravel to 3/4", subround, wet
40										
45										4" clay lens at 43'
50										1' clay lens at 48'
								SM		**SILTY SAND** fine grained, nonplastic, gray-brown
55										
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	6.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/4/16

BORING NO. SB-67

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 613.3
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										
								CL-ML		**SILTY CLAY** high plasticity, gray-brown
65										
								ML		**SILTY SAND** fine grained, nonplastic, gray-brown
70										
				U				CL-ML		**SILTY CLAY** high plasticity, gray-brown
75										
								ML	Sample slid out of shelby tube	**SILTY SAND** fine grained, gray-brown
				T		NR				
80										End of Boring @ 80'
85										
90										
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	6.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/8/16

AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-68

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 614.3
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**TOP SOIL** fine grained, nonplastic, dark brown to black, damp
▽								SM	very soft	**SILTY SAND** fine grained, nonplastic, gray-black, damp to wet
5				S	2					
10				S	WT	NR				**PEAT** organic soil, trace sand, nonplastic, black-gray, trace roots, wet
15				S	3			SP	very loose	**SAND** fine grained, nonplastic, light brown, wet
20				S	2			SP	Heaving sands - stopped SPT sampling	**SAND** fine to medium grained, nonplastic, gray-brown, wet
25										
30				A						
35										
40								SP		**SAND** medium grained, trace gravel to 3/4", subround, nonplastic, gray-brown, wet
45				A				CL		**CLAY** medium plasticity, gray-brown, wet
50				A				SM		**SILTY SAND** fine grained, nonplastic, gray-brown, wet
55										
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	4.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/8/16

BORING NO. SB-68

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 614.3
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										
								CL		**CLAY** high plasticity, gray-brown, wet
65								SM	65-70' Run no material in sonic tube.	**SILTY SAND** fine grained, nonplastic, gray-brown, wet
70								CL		**CLAY** low plasticity, gray-brown, wet
				U						
75				U						
				T						
80										End of Boring @ 80'
85										
90										
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	4.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/1/16

BORING NO. SB-69

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 617.6
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**FILL: SLAG** gravel to 1", subangular, nonplastic, gray black, damp
▽								ML	very soft to soft	**FILL: CCR** fine to coarse grained, black, damp to wet
5				T						
10				S	2					
15				S	7					
20				S	6			SP-SM	loose to medium dense	**SAND** fine grained, nonplastic, olive-brown, wet
25				S	15					with gravel to 3/8", coarse grained, color change brown-gray
30				S	11			SP-SM	medium dense to dense	**SAND** fine grained, nonplastic, light brown, wet
35				S	63				Heaving at 35' - stopped SPT sampling	
40									No material in sonic tube.	
45										
50								CL-ML		**SILTY CLAY** low plasticity, gray-brown
55				U						
				T						
								SP		**SAND** fine grained, nonplastic, brown, wet
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	3.0	3:00	8/1/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/1/16

BORING NO. SB-69

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 617.6
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60								CL		**CLAY** high plasticity, gray-brown, wet
65								SP		**SAND** fine grained, nonplastic, gray-brown, wet
								CL		**CLAY** sand lens at 6" thick throught to 69.5', wet
70								SP		**SAND** fine grained, nonplastic, gray-brown, wet
								CL		**CLAY** high plasticity, brown-gray, sand seams in fractures, wet
75										
80			T							
										End of Boring @ 82'
85										
90										
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	3.0	3:00	8/1/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana
DATE 8/7/16
AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-70

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 617.1
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**FILL: SLAG** with gravel to 1/2", medium to coarse grained, nonplastic, dark brown, damp
								SM		**FILL: SAND** fine grained, nonplastic, brown, damp
▽ 5				A T						fine to coarse grained at 2.5'. 10" thick
										FILL: CCR fine to coarse grained, nonplastic, black, damp to wet
10				A T				SP-SM		**FILL: SAND WITH FINE CCR MIXTURES** with fine to coarse grained, nonplastic, brown-black, wet
15				T						
20				S	14			SM	moderately firm to firm	**SILTY SAND** fine grained, nonplastic, gray-brown, wet
25				S	15					
30				U	28					
35				S	5				soft	
								SP	medium dense	**SAND** trace gravel to 3/8", medium grained, nonplastic, gray-brown, wet
40				S	13				Stopped SPT sampling after 40' due to no clay encountered	
45										
50										
								CL		**CLAY** high plasticity, gray-brown, wet silt lens at 52', 6" thick
55										
								SP		**SAND** fine to medium grained, nonplastic, gray-brown, wet
60										clay lens at 58.5", high plasticity, gray-brown

GROUNDWATER

	DEPTH	HOUR	DATE
▽	6.0	11:30	7/28/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/7/16

BORING NO. SB-70

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 617.1
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60								CL		**CLAY** high plasticity, gray-brown, wet
65				A T						
70										End of Boring @ 69'
75										
80										
85										
90										
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	6.0	11:30	7/28/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 7/29/16

AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-71

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 617.3
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**FILL: SLAG** gravel to 3/4", sub angular, nonplastic, black
5				A U U A U U						**FILL: CCR** fine to coarse grained, black, damp to wet
10 ▽				U	6	NR				medium grained CCR, 1' thick
15				T U	4					
20				S	3					trace wood fragments
								SP		**SAND** fine grained, nonplastic, brown, wet
25								CH		**CLAY** high plasticity, gray-brown, wet
30				A					Aborted boring at 30' due to clay layer thickness on 7/29/16. Continued boring on 8/15/16 to 100'	trace sand lens 8" thick
35				U						
								SM		**SILTY SAND** fine grained, nonplastic, brown
40								SP	Stopped SPT sampling after 40' due to no clay encountered.	**SAND** fine grained, nonplastic, gray-brown
45										silty sand lens, nonplastic, gray-brown 5" thick
50								SM		**SILTY SAND** fine grained, nonplastic, gray-brown, wet
55				U						trace medium to coarse grained sand
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	12.0	10:30	7/27/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 7/29/16

BORING NO. SB-71

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 617.3
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60								CL		**CLAY** high plasticity, gray-brown, wet
65				A				SP		**SAND** fine grained, nonplastic, gray-brown, wet
70										
75								SP		**SAND** fine to medium grained, nonplastic, gray-brown, wet
80								CL		**CLAY** high plasticity, gray-brown, wet
85								SC-SM		**SAND** fine grained, nonplastic, gray-brown, wet trace clay lens at 85' - 87'
90										
95								SP-SM		**SAND** fine grained, nonplastic, gray-brown, trace lens with silt throughout
100				U				CL		**CLAY** high plasticity, gray-brown End of Boring @ 100'
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	12.0	10:30	7/27/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 7/28/16

AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-72

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 617.7
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**TOPSOIL SAND** fine grained, nonplastic, brown, damp
▽ 3				A	12					**FILL: CCR** fine grained, medium plasticity, black, damp to wet
5				S						
10				A U						
15				A	14				casing dropped 3'	trace coarse CCR, 6" thick
				S	10					
20								SP		**SAND** fine grained, nonplastic, brown, wet
25				T				CL		**CLAY** fine grained, high plasticity, gray-brown, wet
30				A						
				U						
35									Aborted boring at 35' due to clay layer thickness on 7/28/16. Continued boring on 8/16/16 to 100'.	
40								SM		**SILTY SAND** with sand lens throughout, fine to medium grained, nonplastic, gray-brown, wet
45										
50				U						
				U						
55								SC		**SANDY CLAY** fine grained sand, low plasticity, gray-brown, wet
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	3.0	5:15	7/28/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 7/28/16

BORING NO. SB-72

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 617.7
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										**SANDY CLAY** fine grained sand, low plasticity, gray-brown, wet
65										
70										
75								CL		**CLAY** high plasticity, gray-brown, wet
80				T						
85										End of Boring @ 85'
90										
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	3.0	5:15	7/28/2016
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/10/16

AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-73

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 614.9
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**TOPSOIL SAND** fine grained,nonplastic, dark brown, wet
									very soft	**FILL: CCR** fine grained, trace sand, damp to wet
▽ 5				S	3					
10										trace wood fragments, leaves, roots
										PEAT organic soil, trace roots, dark brown, wet
15				S	1			SP	very soft	**SAND** fine grained, nonplastic, brown, wet
20				S	2					clay lens in toe, gray brown at 21'
25										light brown
				A				MH		**CLAY** lens 1' thick, gray, wet
30				U	3			SP	very loose	**SAND** fine grained, nonplastic, gray, damp, wet
35									Heaving at 35', stopped SPT sampling.	
40				U				CL		**CLAY** medium to high plasticity, gray-brown, trace gravel to 1", subround, wet
45				U						
								SP		**SAND** fine grained, nonplastic, gray-brown, wet
50										trace gravel to 2", subround
55										
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	5.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/10/16

BORING NO. SB-73

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 614.9
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										**SAND** fine grained, nonplastic, gray-brown, wet
65										
70										
75										
80										
85										
90										End of Boring @ 90'
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	5.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana
DATE 8/11/16
AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-74

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 616.3
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**FILL: SAND** with ballast to 2", subround, fine grained, nonplastic, brown/light brown/gray, damp
5										**FILL: SAND** trace gravel to 1", subround, brown, fine grained, nonplastic, damp
				S	14				moderately firm	**FILL: SAND WITH FINE CCR** wood fragments, nonplastic, brown-black, damp
▽ 10				S	14			SM	moderately firm to very soft	**SAND** fine grained, nonplastic, brown, wet
15				S						
20				S						color change gray-brown
25								CL		**CLAYEY SILT** medium plasticity, gray-brown, trace shell fragments, wet
								SP		**SAND** fine grained, nonplastic, gray-brown, wet
30										
35										trace clay lens 10" thick
								SP	loose	**SAND** medium grained, nonplastic, gray-brown, trace gravel to 1/2", subround, wet
40				U	10	NR				
45				U A U T				CL		**CLAY** high plasticity, gray-brown, trace gravel to 1/2", subround, wet
								SP		**SAND** medium grained, gravel to 3/4", subround, nonplastic, gray-brown, wet
50								SP		**SAND** medium grained, gravel to 3/4", subround, nonplastic, gray-brown, wet
								CL		**CLAY** high plasticity, gray-brown, trace gravel to 1/2", subround, wet
55				T		NR		SP		**SAND** medium grained, nonplastic, gray-brown, wet
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	11.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/11/16

BORING NO. SB-74

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 616.3
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										**SAND** medium grained, nonplastic, gray-brown, wet
65										
70										
75								SM		**SILTY SAND** fine grained, nonplastic, gray-brown, wet
80										
85										
90										End of Boring @ 90'
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	11.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
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T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/12/16

AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-75

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 616.9
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**TOPSOIL** with grass, roots, fine grained, nonplastic, brown
								SM	very soft	**FILL: SAND** fine grained, nonplastic, light brown0
▽ 5				A						**FILL: CCR** fine to coarse grained, low plasticity, black, damp to wet
				S A	2					sand layer at 5' - 6', light brown, nonplastic
								SP	loose to medium dense	**SAND** fine grained, nonplastic, light brown, damp
10				S	6					
15				S	15					
20				S	2					
				A				CL		**CLAY LENS** 1' thick, high plasticity, gray, trace shell fragments, wet
25								SP		**SAND** fine grained, nonplastic, gray, wet
				A				SC		clay lens 10" thick
30										**CLAYEY SAND** fine to medium grained, low plasticity, gray-brown, wet
35										
								SP		**SAND** medium grained, nonplastic, gray-brown, wet
								SC		**CLAYEY SAND** fine to medium grained, trace gravel, subround, low plasticity, gray-brown, wet
40								SP		**SAND** medium grained, nonplastic, gray-brown, wet
										clay lens 10" thick at 40.5'
45								SP		**SAND** fine grained, nonplastic, gray-brown, wet
50										
55										
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	4.5		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/12/16

BORING NO. SB-75

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 616.9
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										**SAND** fine grained, nonplastic, gray-brown, wet
65								SP		**SAND** medium grained, trace gravel to 1/2", subangular, nonplastic, gray-brown, wet
70										
75								SP		**SAND** fine grained, nonplastic, gray-brown, wet
80				A				ML		**SILTY SAND** fine grained, nonplastic, gray-brown
85								SP		**SAND** medium grained, nonplastic, gray-brown, wet
90										End of Boring @ 90'
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	4.5		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana
DATE 8/12/16
AMEC FOSTER WHEELER PROJECT NO. 377882016

BORING NO. SB-76

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 616.1
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM		**SILTY SAND** fine grained, nonplastic, brown, trace grass, damp
								SP		**SAND** fine grained, trace gravel to 1", subround nonplastic, brown, damp
								SM		
5				S	9			SP	loose to very loose	**SILTY SAND** fine grained, nonplastic, brown, moist
										SAND fine grained, nonplastic, tan with dark brown, moist to wet
10				S	2					
▽										color change brown-black
15				S	3					
20				S	2					
								CL		**CLAY LENS** low to medium plasticity, dark brown, wet
								SP		**SAND** fine grained, nonplastic, brown
25										
								CL		**CLAY** high plasticity, gray-brown, wet, trace gravel to 3/4", subround
30				T						
				U						
35										
40										
								SP		**SAND** fine grained, nonplastic, gray-brown, wet
45										
								SP-SC		**SAND** with clay mixture, low plasticity, gray-brown, trace gravel to 3/4", subround, wet
50								SP		**SAND** with clay mixture, low plasticity, gray-brown, wet, trace gravel to 3/4", subround
55										
								SP		**SAND** fine grained, nonplastic, gray-brown, wet
60										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	12.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

PROJECT NIPSCO Bailly Corrective Measures
Chesterton, Indiana

DATE 8/12/16

BORING NO. SB-76

AMEC FOSTER WHEELER PROJECT NO. 377882016

LOCATION See Site Plan
RIG TYPE Sonic Mini
BORING TYPE Sonic
SURFACE ELEV. 616.1
DRILLING CO. Cascade Drilling, L.P.

Depth in Feet	Relative Drilling Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
60										**SAND** fine grained, nonplastic, gray-brown, wet
65										
70								SP		**SAND** medium grained, trace gravel to 2", subround, nonplastic, gray-brown, wet
75								SM		**SAND** fine grained, nonplastic, gray-brown, wet
80										End of Boring @ 80'
85										
90										
95										
100										
105										
110										
115										
120										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	12.0		
▼			

SAMPLE TYPE
A-Auger Cuttings; NR-No Recovery
BS-Bulk Sample
S-2" O.D., 1.38" I.D. tube sample
U-3" O.D. 2.42" I.D. tube sample
T-3" O.D. thin walled Shelby tube

ATTACHMENT C

LABORATORY DATA

Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attention: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: September 02, 2016

Project #: 377882016
Work Order #: 1
Sampled By: Carlton Pine
Date Sampled: 7/27/2016

Sieve Analysis (ASTM C117-04/C136-06)
Plasticity Index (ASTM D4318-10)
Soil Classification (ASTM D2487-10)

SOILS / AGGREGATES

Lab Number	Sample Location	Soil Class.	L.L.	P.I.	D10	D20	D30	D50	D60	D70	CC	CU	Cmu
16-0524-01	SB-61 @ 10.0-11.5'	SP	NV	NP	0.158	0.172	0.188	0.223	0.243	0.265	0.918	1.536	1.536
16-0524-02	SB-61 @ 30.0-35.0'	SP-SM	NV	NP	0.093	0.223	0.307	0.369	0.405	0.475	2.492	4.329	2.129
16-0524-03	SB-61 @ 39.5-40.0'	CL-ML	17	6	0	0	0	0	0.157	0.239	0	0	0
16-0524-04	SB-62 @ 22.0-40.0'	SP	NV	NP	0.154	0.171	0.190	0.235	0.261	0.29	0.900	1.693	1.693
16-0524-05	SB-62 @ 60.0-70.0'	SP	NV	NP	0.358	0.479	0.584	0.974	1.326	2.214	0.719	3.701	4.617
16-0524-06	SB-63 @ 2.0-3.0'	SM	NV	NP	0	0	0	0.217	0.272	0.492	0	0	0
16-0524-07	SB-63 @ 10.0-12.0'	SP-SM	NV	NP	0	0.157	0.172	0.208	0.228	0.251	0	0	1.602
16-0524-08	SB-63 @ 12.0-20.0'	SP	NV	NP	0.158	0.170	0.184	0.215	0.233	0.251	0.925	1.476	1.476
16-0524-09	SB-63 @ 25.0-30.0'	SP-SM	NV	NP	0.120	0.169	0.195	0.260	0.302	0.365	1.046	2.505	2.166
16-0524-10	SB-63 @ 94.0-95.0'	CL-ML	20	6	0	0	0	0	0	0	0	0	0
16-0524-11	SB-64 @ 20.0-21.5'				0	0.116	0.159	0.2	0.224	0.251	0	0	2.16
16-0524-12	SB-64 @ 40.0-41.5'	SM	14	3	0	0	0	0.189	0.295	0.438	0	0	0
16-0524-13	SB-64 @ 2.0-2.9'	SM	NV	NP	0	0	0.088	0.505	0.871	1.355	0	0	0
16-0524-14	SB-65 @ 15-16.5'	SM	NV	NP	0	0.084	0.114	0.175	0.200	0.23	0	0	2.727
16-0524-15	SB-65 @ 36.0-37.0'	CL-ML	21	7	0	0	0	0	0	0	0	0	0
16-0524-16	SB-66 @ 15.0-16.5'	SP-SM	NV	NP	0.081	0.102	0.128	0.176	0.199	0.224	1.018	2.438	2.193
16-0524-17	SB-66 @ 55.0-57.0'	CL-ML	19	5	0	0	0	0	0	0	0	0	0
16-0524-18	SB-67 @ 15.0-16.5'	SP-SM	NV	NP	0.084	0.113	0.150	0.199	0.228	0.262	1.184	2.723	2.329
16-0524-19	SB-68 @ 50.0-51.5'	SM	NV	NP	0	0	0	0.084	0.100	0.12	0	0	0
16-0524-20	SB-68 @ 74.0-74.5'	CL	22	8	0	0	0	0	0	0	0	0	0
16-0524-21	SB-69 @ 8.0-10.0'	ML	NV	NP	0	0	0	0	0.170	0.231	0	0	0

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

AMEC Environment & Infrastructure, Inc.
8519 Jefferson NE
Albuquerque, NM 87113
Tel 5058211801
Fax 5058217371
www.amec.com

Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attention: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: September 02, 2016

Project #: 377882016
Work Order #: 1
Sampled By: Carlton Pine
Date Sampled: 7/27/2016

Sieve Analysis (ASTM C117-04/C136-06)
Plasticity Index (ASTM D4318-10)
Soil Classification (ASTM D2487-10)

SOILS / AGGREGATES

Lab Number	Sample Location	Soil Class.	L.L.	P.I.	D10	D20	D30	D50	D60	D70	CC	CU	Cmu
16-0524-22	SB-69 @ 13.0-15.0'	SM	NV	NP	0	0	0	0.175	0.227	0.295	0	0	0
16-0524-23	SB-69 @ 20.0-21.5'	SP	NV	NP	0.085	0.109	0.141	0.181	0.202	0.226	1.149	2.381	2.066
16-0524-24	SB-69 @ 55.0-57.0'	CL-ML	19	6	0	0	0	0	0	0	0	0	0
16-0524-25	SB-70 @ 25.0-26.5'	SM	NV	NP	0	0	0	0.156	0.195	0.244	0	0	0
16-0524-26	SB-70 @ 4.0-5.0'	SM	NV	NP	0	0	0	0.144	0.201	0.271	0	0	0
16-0524-27	SB-70 @ 9.5-10.0'	SP-SM	NV	NP	0.126	0.17	0.194	0.253	0.289	0.42	1.027	2.288	2.475
16-0524-28	SB-70 @ 63.0-65.0'	CL-ML	20	7	0	0	0	0	0	0	0	0	0
16-0524-29	SB-71 @ 2.0-5.0'	SM	NV	NP	0	0	0	0.178	0.23	0.296	0	0	0
16-0524-30	SB-71 @ 8.0-10.0'	SM	NV	NP	0	0	0	0.109	0.187	0.250	0	0	0
16-0524-31	SB-72 @ 5.0-6.5'	SM	NV	NP	0	0	0.088	0.344	0.548	0.809	0	0	0
16-0524-32	SB-72 @ 3.0-5.0'	ML	NV	NP	0	0	0	0	0	0	0	0	0
16-0524-33	SB-72 @ 9.0-11.0'	ML	NV	NP	0	0	0	0	0	0	0	0	0
16-0524-34	SB-72 @ 15.0-17.0'	ML	NV	NP	0	0	0	0	0	0.154	0	0	0
16-0524-35	SB-72 @ 30.0-32.0'	CL	28	13	0	0	0	0	0	0	0	0	0
16-0524-36	SB-73 @ 41.0-41.5'	CL-ML	16	4	0	0	0	0	0	0.141	0	0	0
16-0524-37	SB-74 @ 44.0-45.0'	CL-ML	20	7	0	0	0	0	0	0.174	0	0	0
16-0524-38	SB-75 @ 27.0-29.0'	SC	20	8	0	0	0.105	0.218	0.290	0.350	0	0	0
16-0524-39	SB-75 @ 80.0-84.0'	ML	NV	NP	0	0	0	0	0	0	0	0	0
16-0524-40	SB-76 @ 32.0-33.0'	CL	25	11	0	0	0	0	0	0	0	0	0

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

AMEC Environment & Infrastructure, Inc.
8519 Jefferson NE
Albuquerque, NM 87113
Tel 5058211801
Fax 5058217371 www.amec.com

Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attention: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: September 02, 2016

Project #: 377882016
Work Order #: 1
Sampled By: Carlton Pine
Date Sampled: 7/27/2016

Sieve Analysis (ASTM C117-04/C136-06)
Plasticity Index (ASTM D4318-10)
Soil Classification (ASTM D2487-10)

SOILS / AGGREGATES

				Sieve Sizes																			Sieve Result are as Percent Passing.
Sample Location	Soil Class.	L.L.	P.I.	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4'	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	6"	12"	Lab Number
SB-61 @ 10.0-11.5'	SP	NV	NP	0.4	4	83	91	93	95	96	97	99		100											16-0524-01
SB-61 @ 30.0-35.0'	SP-SM	NV	NP	9.5	11	26	64	81	92	96	97	99		100											16-0524-02
SB-61 @ 39.5-40.0'	CL-ML	17	6	53	59	75	83	87	92	93	94	97		99	100										16-0524-03
SB-62 @ 22.0-40.0'	SP	NV	NP	3.3	7	72	91	96	98	99	99	99		100											16-0524-04
SB-62 @ 60.0-70.0'	SP	NV	NP	4.3	5	6	13	31	58	68	71	82		88	90	92	100								16-0524-05
SB-63 @ 2.0-3.0'	SM	NV	NP	32	34	64	69	71	76	79	80	83		87	89	91	100								16-0524-06
SB-63 @ 10.0-12.0'	SP-SM	NV	NP	11	15	88	95	97	98	99	99	100													16-0524-07
SB-63 @ 12.0-20.0'	SP	NV	NP	0.6	4	91	99	100																	16-0524-08
SB-63 @ 25.0-30.0'	SP-SM	NV	NP	6.0	12	59	77	85	89	91	91	93		94	95	95	95		100						16-0524-09
SB-63 @ 94.0-95.0'	CL-ML	20	6	72	77	81	83	85	89	92	93	96		99	99	100									16-0524-10
SB-64 @ 20.0-21.5'				11	25	85	93	95	96	97	98	99		100											16-0524-11
SB-64 @ 40.0-41.5'	SM	14	3	39	45	60	69	75	82	87	89	95		99	100										16-0524-12
SB-64 @ 2.0-2.9'	SM	NV	NP	29	32	44	48	52	67	80	83	88		92	95	97	99		100						16-0524-13
SB-65 @ 15-16.5'	SM	NV	NP	16	39	89	95	97	98	98	98	99		100											16-0524-14
SB-65 @ 36.0-37.0'	CL-ML	21	7	74	78	87	92	94	96	97	98	99		100											16-0524-15

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Tel 5058211801
Fax 5058217371
www.amec.com

Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attention: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: August 31, 2016

Project #: 377882016
Work Order #: 1
Sampled By: Carlton Pine
Date Sampled: 7/27/2016

Sieve Analysis (ASTM C117-04/C136-06)
Plasticity Index (ASTM D4318-10)
Soil Classification (ASTM D2487-10)

SOILS / AGGREGATES

				Sieve Sizes																			Sieve Result are as Percent Passing.
Sample Location	Soil Class.	L.L.	P.I.	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4'	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	6"	12"	Lab Number
SB-66 @ 15.0-16.5'	SP-SM	NV	NP	5.6	37	93	98	99	100																16-0524-16
SB-66 @ 55.0-57.0'	CL-ML	19	5	86	92	95	96	96	97	98	98	98		99	99	99	100								16-0524-17
SB-67 @ 15.0-16.5'	SP-SM	NV	NP	5.6	30	79	85	89	95	97	98	99		100											16-0524-18
SB-68 @ 50.0-51.5'	SM	NV	NP	43	83	96	97	97	98	98	98	99		99	100										16-0524-19
SB-68 @ 74.0-74.5'	CL	22	8	80	89	94	95	96	97	98	98	99		99	100										16-0524-20
SB-69 @ 8.0-10.0'	ML	NV	NP	51	56	78	82	84	89	93	94	96		99	99	100									16-0524-21
SB-69 @ 13.0-15.0'	SM	NV	NP	31	44	70	78	85	96	99	100														16-0524-22
SB-69 @ 20.0-21.5'	SP	NV	NP	4.3	33	95	99	99	100																16-0524-23
SB-69 @ 55.0-57.0'	CL-ML	19	6	76	89	95	96	96	97	98	99	100													16-0524-24
SB-70 @ 25.0-26.5'	SM	NV	NP	31	48	79	85	87	89	91	91	95		98	99	100									16-0524-25
SB-70 @ 4.0-5.0'	SM	NV	NP	47	50	73	77	78	81	83	83	85		87	88	89	91		100						16-0524-26
SB-70 @ 9.5-10.0'	SP-SM	NV	NP	7.6	11	62	70	73	77	81	82	88		96	99	100									16-0524-27
SB-70 @ 63.0-65.0'	CL-ML	20	7	80	92	96	97	98	98	99	99	99		100											16-0524-28
SB-71 @ 2.0-5.0'	SM	NV	NP	38	43	70	75	78	84	88	90	93		95	97	98	98		100						16-0524-29
SB-71 @ 8.0-10.0'	SM	NV	NP	47	52	76	80	82	87	91	92	95		99	100										16-0524-30

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

AMEC Environment & Infrastructure, Inc.
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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attention: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: September 02, 2016

Project #: 377882016
Work Order #: 1
Sampled By: Carlton Pine
Date Sampled: 7/27/2016

Sieve Analysis (ASTM C117-04/C136-06)
Plasticity Index (ASTM D4318-10)
Soil Classification (ASTM D2487-10)

SOILS / AGGREGATES

				Sieve Sizes																				Sieve Result are as Percent Passing.
Sample Location	**Soil Class.**	**L.L.**	**P.I.**	**#200**	**#100**	**#50**	**#40**	**#30**	**#16**	**#10**	**#8**	**#4**	**1/4"**	**3/8"**	**1/2"**	**3/4'**	**1"**	**1 1/4"**	**1 1/2"**	**2"**	**2 1/2"**	**3"**	**6"**	**12"**	**Lab Number**
SB-72 @ 5.0-6.5'	SM	NV	NP	28	35	47	54	62	80	90	92	95		97	98	100									16-0524-31
SB-72 @ 3.0-5.0'	ML	NV	NP	92	96	98	98	99	100																16-0524-32
SB-72 @ 9.0-11.0'	ML	NV	NP	75	79	83	86	88	94	98	98	99		100											16-0524-33
SB-72 @ 15.0-17.0'	ML	NV	NP	68	69	95	98	99	100																16-0524-34
SB-72 @ 30.0-32.0'	CL	28	13	89	91	94	96	97	98	98	99	99		100											16-0524-35
SB-73 @ 41.0-41.5'	CL-ML	16	4	62	71	83	90	93	95	97	97	99		100											16-0524-36
SB-74 @ 44.0-45.0'	CL-ML	20	7	60	67	80	86	89	92	94	95	97		99	100										16-0524-37
SB-75 @ 27.0-29.0'	SC	20	8	23	37	61	80	97	99	100															16-0524-38
SB-75 @ 80.0-84.0'	ML	NV	NP	84	93	99	100																		16-0524-39
SB-76 @ 32.0-33.0'	CL	25	11	85	88	93	95	96	98	99	99	100													16-0524-40

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: November 18, 2016

Project #: 377882016
Report #: 1968
Work Order #: 2
Sampled By: Carlton Pine
Date Sampled:

SOILS / AGGREGATES

MOISTURE CONTENT OF SOIL (ASTM D2216-10) AND IN-SITU DENSITY

Lab #	Color & Type of Material	Sample Source	Test Method	Oven Temp. (C)	Mass less than Min Req.	Material Type *	Moisture (%)	Dry Density (pcf)
16-0739-03	See Boring Log	SB63 8-10'	A	110	☐	☐	45	89.6
16-0739-06	See Boring Log	SB64 8-10'	A	110	☐	☐		
16-0739-16	See Boring Log	SB71 5-6'	A	110	☐	☐	23	108.6
16-0739-19	See Boring Log	SB71 13-15'	A	110	☐	☐	19	116.5
16-0739-22	See Boring Log	SB72 15-16'	A	110	☐	☐	29	97.0
16-0739-23	See Boring Log	SB72 15-20'	A	110	☐	☐	20	105.2

***Sample contains more than one type of material.**

Remarks: 16-0739-06 Density not possible tube is destroyed.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-03
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB63 8-10'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.455
Temperature Corrected Spec Gravity (at 20°C):	2.454

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-06
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB64 8-10'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.760
Temperature Corrected Spec Gravity (at 20°C):	2.759

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-12
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB69 3-5'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.644
Temperature Corrected Spec Gravity (at 20°C):	2.642

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-14
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB70 15-17'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.519
Temperature Corrected Spec Gravity (at 20°C):	2.518

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-16
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB71 5-6'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.914
Temperature Corrected Spec Gravity (at 20°C):	2.913

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-18
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB71 15-16'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.450
Temperature Corrected Spec Gravity (at 20°C):	2.449

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-19
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB71 13-15'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.778
Temperature Corrected Spec Gravity (at 20°C):	2.777

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-21
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB72 10-11'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.752
Temperature Corrected Spec Gravity (at 20°C):	2.751

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-22
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB72 15-16'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.738
Temperature Corrected Spec Gravity (at 20°C):	2.737

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-23
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB72 15-20'

SOILS / AGGREGATES

Specific Gravity of Soil Solids by Water Pycnometer (ASTM D854-10)

Test Method: B

Spec Gravity of Soils at Test Temperature:	2.685
Temperature Corrected Spec Gravity (at 20°C):	2.684

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

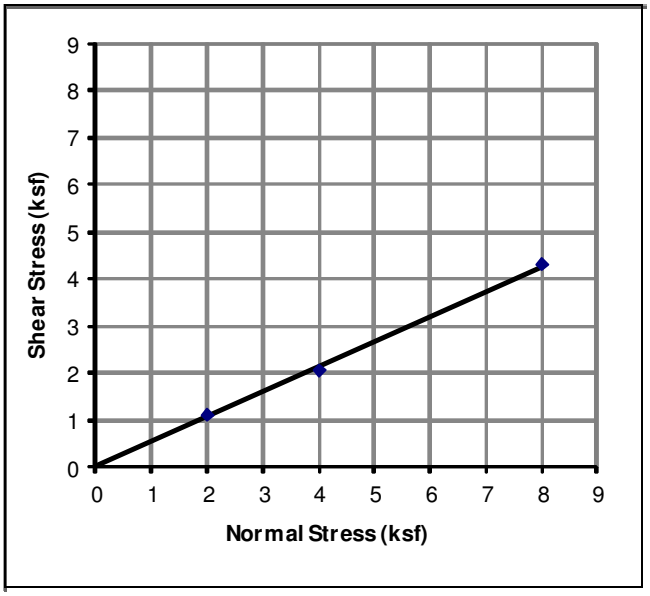
Report Date: October 21, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-01
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB61 25-26'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	130.0	140.2	127.3
Initial Moisture (%):	16.9%	17.4%	21.8%
Initial Wet Density (pcf):	125.9	136.3	128.4
Initial Dry Density (pcf):	107.7	116.1	105.4
Final Thickness of specimen (in.)::	1.00	0.98	0.94
Final Moisture (%):	17.0%	16.5%	22.3%
Final Wet Density (pcf):	125.6	138.3	136.7
Final Dry Density (pcf):	107.3	118.6	111.8
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.128	2.052	4.284
Vertical Deformation @ Max Shear (in.):	0.015	0.005	0.010
Horizontal Deformation @ Max Shear (in.):	0.146	0.160	0.151



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 27.9

Cohesion (kips/sq.ft.): 0.0120

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

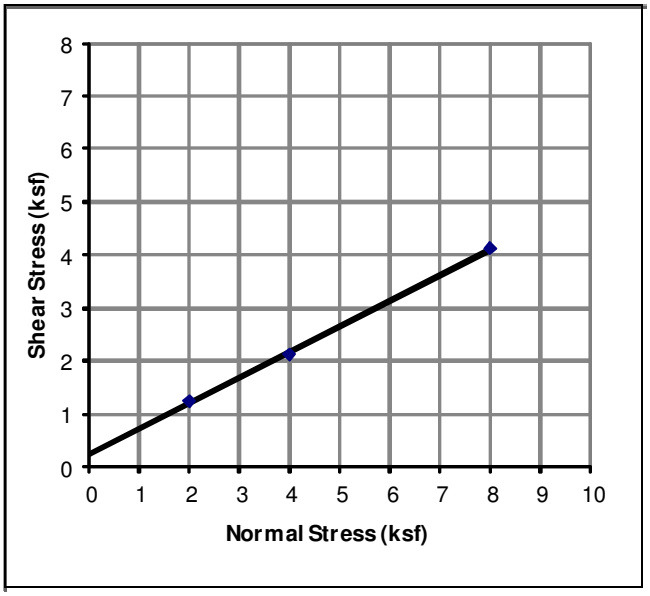
Report Date: October 21, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-05
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB63 95-97'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	136.1	132.6	131.6
Initial Moisture (%):	18.1%	18.4%	17.6%
Initial Wet Density (pcf):	133.1	130.0	128.1
Initial Dry Density (pcf):	112.7	109.8	109.0
Final Thickness of specimen (in.)::	0.99	0.85	0.95
Final Moisture (%):	18.4%	19.5%	19.2%
Final Wet Density (pcf):	134.3	154.3	136.1
Final Dry Density (pcf):	113.4	129.1	114.1
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.236	2.112	4.116
Vertical Deformation @ Max Shear (in.):	0.013	0.007	0.004
Horizontal Deformation @ Max Shear (in.):	0.116	0.110	0.131



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 25.8

Cohesion (kips/sq.ft.): 0.2340

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

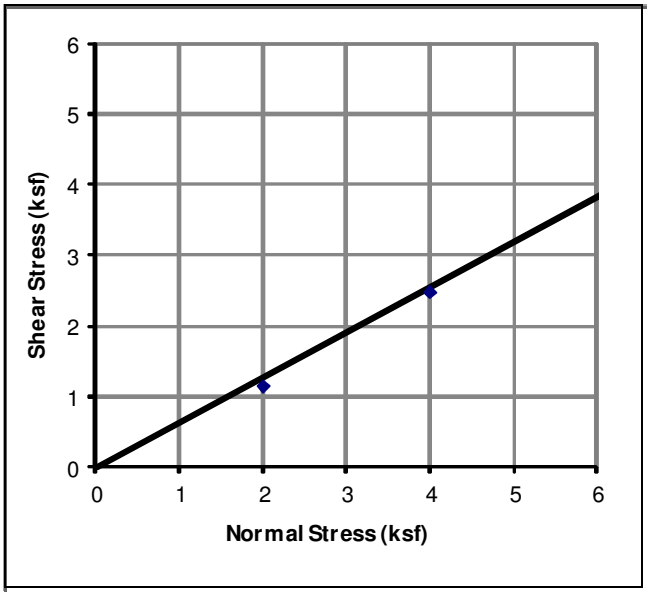
Report Date: October 21, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-07
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB64 35-36'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	140.7	149.2	148.1
Initial Moisture (%):	15.9%	13.4%	13.6%
Initial Wet Density (pcf):	135.0	140.1	139.3
Initial Dry Density (pcf):	116.5	123.5	122.6
Final Thickness of specimen (in.)::	0.98	0.97	0.95
Final Moisture (%):	15.5%	13.6%	13.3%
Final Wet Density (pcf):	137.7	144.3	146.4
Final Dry Density (pcf):	119.2	127.1	129.3
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.128	2.472	5.172
Vertical Deformation @ Max Shear (in.):	0.002	0.012	0.006
Horizontal Deformation @ Max Shear (in.):	0.121	0.121	0.141



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 32.5

Cohesion (kips/sq.ft.): 0.0000

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

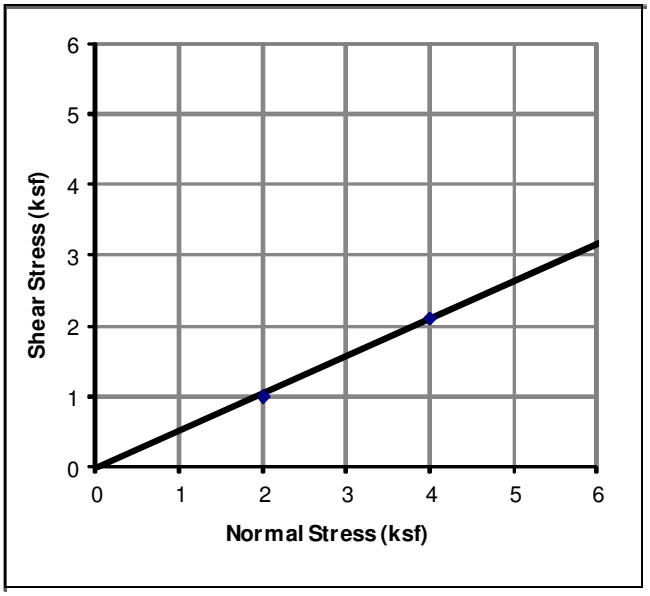
Report Date: October 24, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-08
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB64 95-97'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	4	8
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	128.7	134.8	131.3
Initial Moisture (%):	20.9%	19.4%	20.9%
Initial Wet Density (pcf):	128.9	133.3	131.4
Initial Dry Density (pcf):	106.6	111.6	108.8
Final Thickness of specimen (in.)::	0.97	0.95	0.96
Final Moisture (%):	21.8%	19.0%	20.5%
Final Wet Density (pcf):	134.0	140.0	136.5
Final Dry Density (pcf):	110.0	117.6	113.3
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.008	2.112	4.212
Vertical Deformation @ Max Shear (in.):	-0.002	0.004	0.004
Horizontal Deformation @ Max Shear (in.):	0.231	0.241	0.126



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 27.7

Cohesion (kips/sq.ft.): 0.0000

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

AMEC Environment & Infrastructure, Inc.
8519 Jefferson NE
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Tel 5058211801
Fax 5058217371
www.amec.com

Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

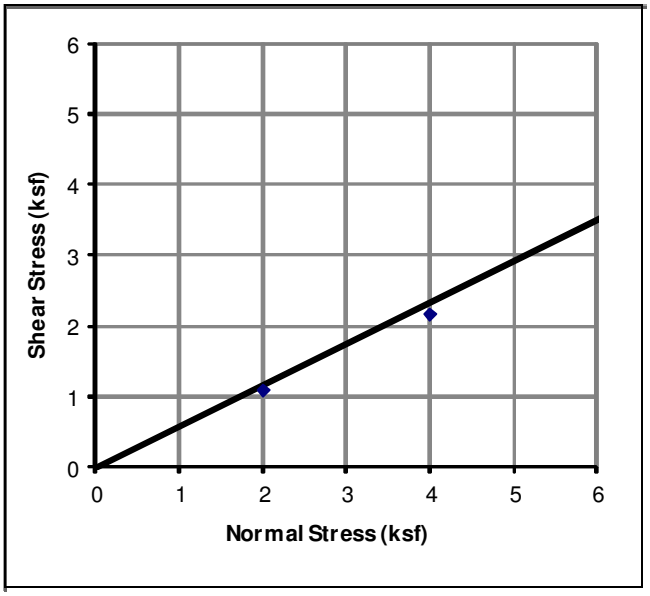
Report Date: October 19, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-09
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB66 35-36'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	126.0	131.5	132.3
Initial Moisture (%):	21.9%	19.7%	20.4%
Initial Wet Density (pcf):	127.3	130.4	131.9
Initial Dry Density (pcf):	104.4	108.9	109.6
Final Thickness of specimen (in.)::	0.98	0.94	0.97
Final Moisture (%):	21.4%	20.8%	20.5%
Final Wet Density (pcf):	129.3	140.5	135.6
Final Dry Density (pcf):	106.6	116.4	112.5
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.080	2.172	4.788
Vertical Deformation @ Max Shear (in.):	0.006	0.007	0.008
Horizontal Deformation @ Max Shear (in.):	0.131	0.136	0.131



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 1

Internal Friction Angle (deg.): 30.3

Cohesion (kips/sq.ft.): 0.0000

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
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Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

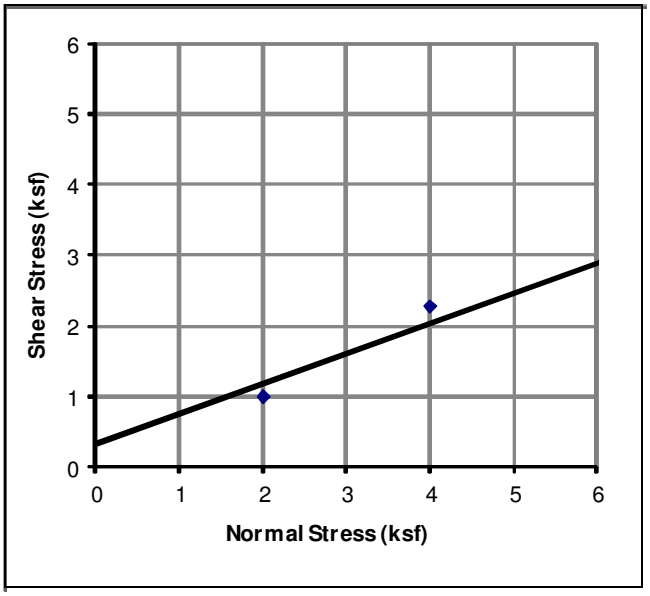
Report Date: October 28, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-10
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB66 55-57'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	125.7	132.7	133.5
Initial Moisture (%):	22.8%	20.5%	20.4%
Initial Wet Density (pcf):	127.8	132.5	133.1
Initial Dry Density (pcf):	104.1	109.9	110.6
Final Thickness of specimen (in.)::	0.97	0.96	0.88
Final Moisture (%):	21.0%	21.1%	17.4%
Final Wet Density (pcf):	130.3	138.5	147.7
Final Dry Density (pcf):	107.7	114.4	125.9
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.008	2.280	3.636
Vertical Deformation @ Max Shear (in.):	0.013	0.004	-0.011
Horizontal Deformation @ Max Shear (in.):	0.251	0.221	0.196



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 23.0

Cohesion (kips/sq.ft.): 0.3300

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Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

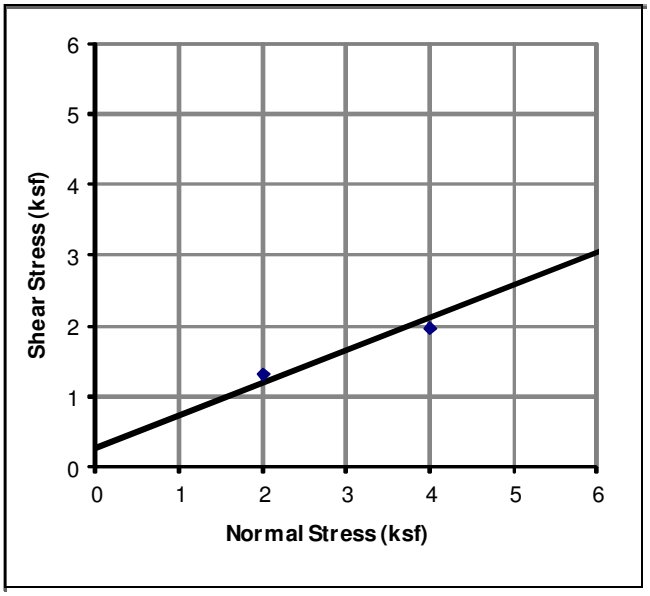
Report Date: October 28, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-11
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB68 80-82'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	146.9	147.7	136.1
Initial Moisture (%):	15.2%	13.1%	18.0%
Initial Wet Density (pcf):	140.2	138.4	133.0
Initial Dry Density (pcf):	121.6	122.3	112.7
Final Thickness of specimen (in.)::	0.98	0.94	0.95
Final Moisture (%):	14.9%	13.9%	16.8%
Final Wet Density (pcf):	143.3	147.7	139.2
Final Dry Density (pcf):	124.8	129.7	119.2
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.296	1.968	3.996
Vertical Deformation @ Max Shear (in.):	0.006	-0.006	0.001
Horizontal Deformation @ Max Shear (in.):	0.251	0.226	0.141



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 24.6

Cohesion (kips/sq.ft.): 0.2820

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

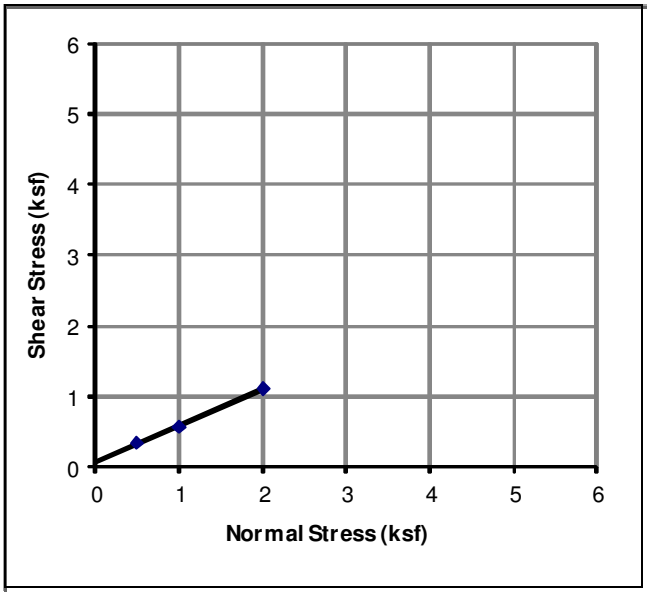
Report Date: October 28, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-12
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB69 3-5'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	124.0	120.2	118.9
Initial Moisture (%):	22.1%	21.4%	26.2%
Initial Wet Density (pcf):	125.4	120.9	124.4
Initial Dry Density (pcf):	102.7	99.5	98.5
Final Thickness of specimen (in.)::	1.00	0.99	0.98
Final Moisture (%):	19.3%	19.8%	20.8%
Final Wet Density (pcf):	122.6	120.4	121.0
Final Dry Density (pcf):	102.7	100.5	100.2
Normal Stress (ksf):	0.50	1.00	2.00
Maximum Shearing Stress (ksf):	0.348	0.564	1.104
Vertical Deformation @ Max Shear (in.):	0.011	0.009	0.006
Horizontal Deformation @ Max Shear (in.):	0.086	0.116	0.106



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 27.0

Cohesion (kips/sq.ft.): 0.0780

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

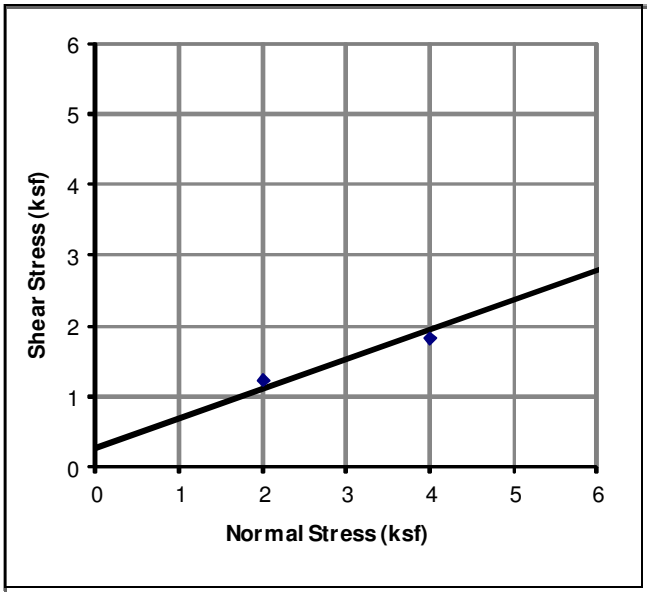
Report Date: November 10, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-13
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB69 55-57'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	145.6	138.3	144.9
Initial Moisture (%):	14.8%	15.7%	15.1%
Initial Wet Density (pcf):	138.4	132.5	138.1
Initial Dry Density (pcf):	120.6	114.5	120.0
Final Thickness of specimen (in.)::	0.97	0.94	0.92
Final Moisture (%):	14.8%	15.3%	14.3%
Final Wet Density (pcf):	142.1	141.0	149.0
Final Dry Density (pcf):	123.7	122.3	130.4
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.212	1.812	3.672
Vertical Deformation @ Max Shear (in.):	0.005	-0.010	-0.009
Horizontal Deformation @ Max Shear (in.):	0.201	0.236	0.206



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 22.7

Cohesion (kips/sq.ft.): 0.2820

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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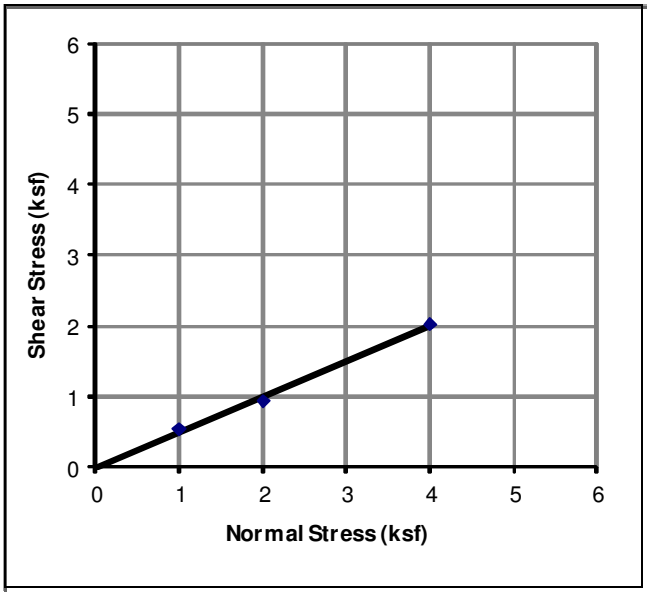
Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 10, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-14
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB70 15-17'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	72.9	80.7	79.3
Initial Moisture (%):	45.7%	42.4%	52.4%
Initial Wet Density (pcf):	88.0	95.1	100.1
Initial Dry Density (pcf):	60.4	66.8	65.7
Final Thickness of specimen (in.)::	0.93	0.82	0.83
Final Moisture (%):	51.3%	49.8%	46.2%
Final Wet Density (pcf):	97.8	121.8	115.5
Final Dry Density (pcf):	64.6	81.3	79.0
Normal Stress (ksf):	1.00	2.00	4.00
Maximum Shearing Stress (ksf):	0.540	0.924	2.028
Vertical Deformation @ Max Shear (in.):	0.002	-0.001	-0.015
Horizontal Deformation @ Max Shear (in.):	0.236	0.206	0.241



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 26.6

Cohesion (kips/sq.ft.): 0.0000

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

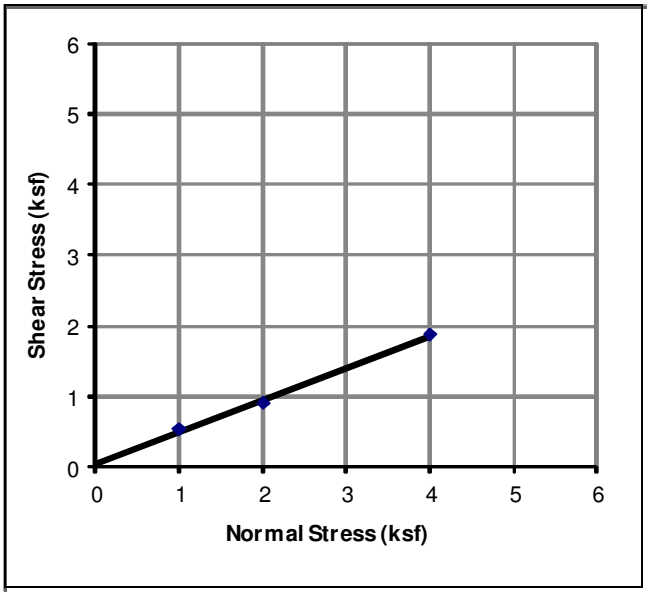
Report Date: October 21, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-18
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB71 15-16'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	94.8	84.2	93.3
Initial Moisture (%):	38.6%	48.9%	38.4%
Initial Wet Density (pcf):	108.9	103.9	107.0
Initial Dry Density (pcf):	78.5	69.8	77.3
Final Thickness of specimen (in.)::	0.98	0.91	0.88
Final Moisture (%):	41.0%	47.9%	38.1%
Final Wet Density (pcf):	113.5	113.7	121.9
Final Dry Density (pcf):	80.5	76.9	88.3
Normal Stress (ksf):	1.00	2.00	4.00
Maximum Shearing Stress (ksf):	0.540	0.912	1.884
Vertical Deformation @ Max Shear (in.):	0.008	-0.003	-0.011
Horizontal Deformation @ Max Shear (in.):	0.176	0.236	0.196



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 24.4

Cohesion (kips/sq.ft.): 0.0540

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

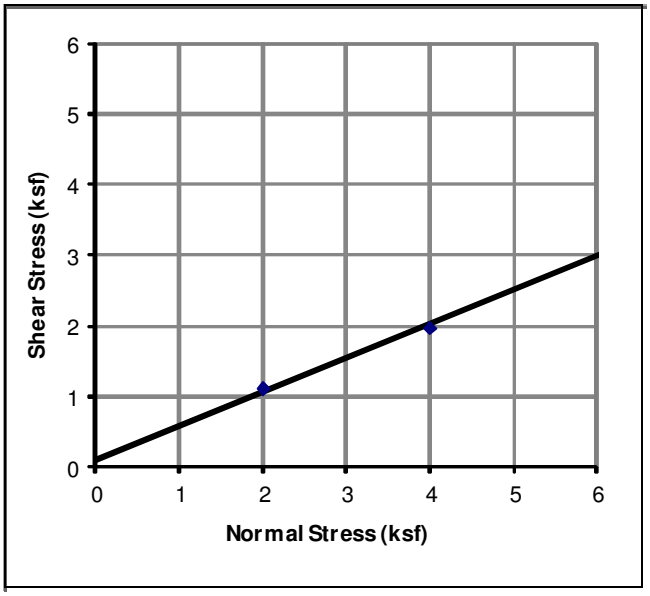
Report Date: November 10, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-20
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB71 30-35'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	137.9	137.4	135.7
Initial Moisture (%):	18.0%	18.7%	18.9%
Initial Wet Density (pcf):	134.8	135.1	133.6
Initial Dry Density (pcf):	114.2	113.8	112.4
Final Thickness of specimen (in.)::	0.95	0.91	0.92
Final Moisture (%):	17.1%	16.9%	16.0%
Final Wet Density (pcf):	140.7	146.4	142.3
Final Dry Density (pcf):	120.2	125.2	122.6
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.116	1.956	3.996
Vertical Deformation @ Max Shear (in.):	-0.003	-0.009	-0.013
Horizontal Deformation @ Max Shear (in.):	0.221	0.206	0.221



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 25.8

Cohesion (kips/sq.ft.): 0.0960

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Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

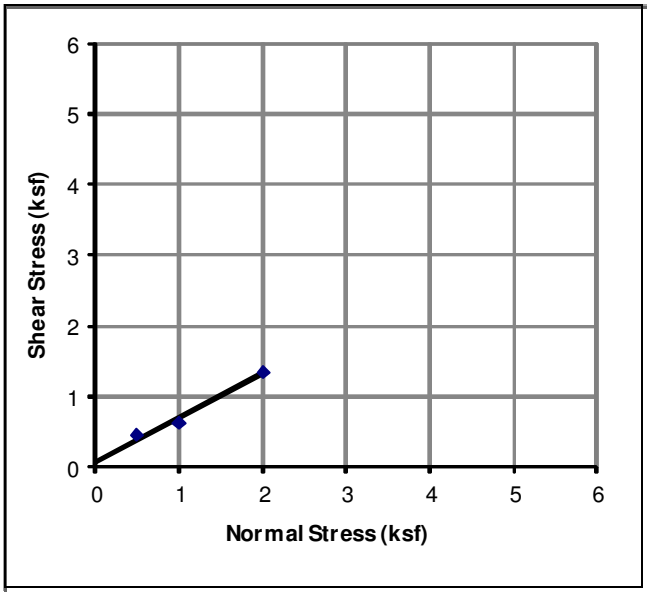
Report Date: October 28, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-21
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB72 10-11'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	126.5	125.7	126.5
Initial Moisture (%):	21.3%	24.7%	23.7%
Initial Wet Density (pcf):	127.0	129.8	129.7
Initial Dry Density (pcf):	104.8	104.1	104.8
Final Thickness of specimen (in.)::	1.01	0.99	0.97
Final Moisture (%):	21.9%	23.4%	21.9%
Final Wet Density (pcf):	126.4	130.1	131.8
Final Dry Density (pcf):	103.7	105.4	108.1
Normal Stress (ksf):	0.50	1.00	2.00
Maximum Shearing Stress (ksf):	0.444	0.612	1.344
Vertical Deformation @ Max Shear (in.):	0.019	0.010	0.007
Horizontal Deformation @ Max Shear (in.):	0.121	0.111	0.186



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 31.8

Cohesion (kips/sq.ft.): 0.0780

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Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

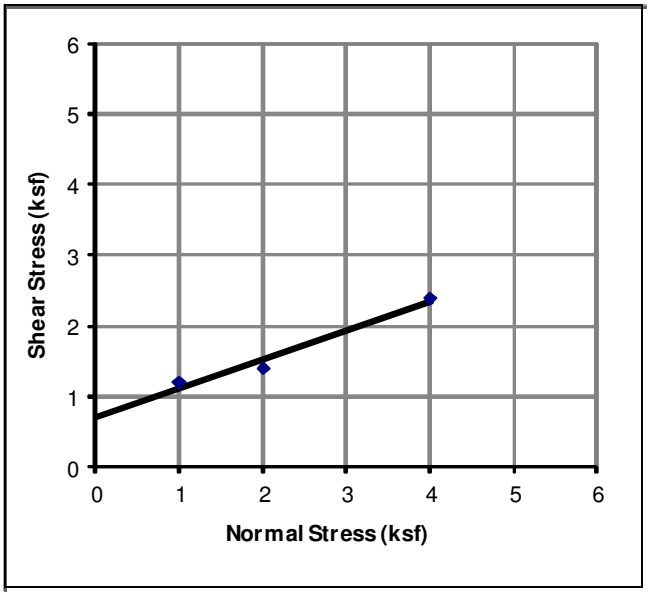
Report Date: November 10, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-24
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB72 25-27'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	139.0	135.5	134.2
Initial Moisture (%):	16.9%	16.9%	16.7%
Initial Wet Density (pcf):	134.5	131.2	130.2
Initial Dry Density (pcf):	115.1	112.2	111.5
Final Thickness of specimen (in.)::	0.99	0.99	-26.04
Final Moisture (%):	19.1%	18.8%	18.0%
Final Wet Density (pcf):	138.4	134.8	-5.1
Final Dry Density (pcf):	116.2	113.4	-4.3
Normal Stress (ksf):	1.00	2.00	4.00
Maximum Shearing Stress (ksf):	1.188	1.392	2.376
Vertical Deformation @ Max Shear (in.):	0.002	0.014	-27.000
Horizontal Deformation @ Max Shear (in.):	0.171	0.023	0.186



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 22.3

Cohesion (kips/sq.ft.): 0.6960

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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amec foster wheeler

Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

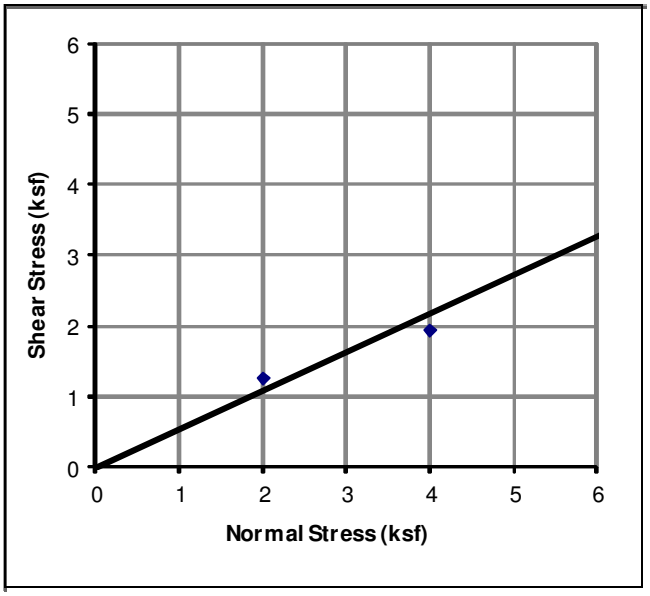
Report Date: October 24, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-25
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB73 30-31'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	4	8
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	136.7	136.5	131.5
Initial Moisture (%):	16.6%	17.8%	17.8%
Initial Wet Density (pcf):	131.9	133.2	128.3
Initial Dry Density (pcf):	113.2	113.0	108.9
Final Thickness of specimen (in.)::	0.98	0.97	0.96
Final Moisture (%):	17.3%	17.8%	17.4%
Final Wet Density (pcf):	135.6	137.6	132.5
Final Dry Density (pcf):	115.5	116.9	112.9
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.248	1.920	4.464
Vertical Deformation @ Max Shear (in.):	0.010	0.003	0.008
Horizontal Deformation @ Max Shear (in.):	0.126	0.131	0.196



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 28.6

Cohesion (kips/sq.ft.): 0.0000

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

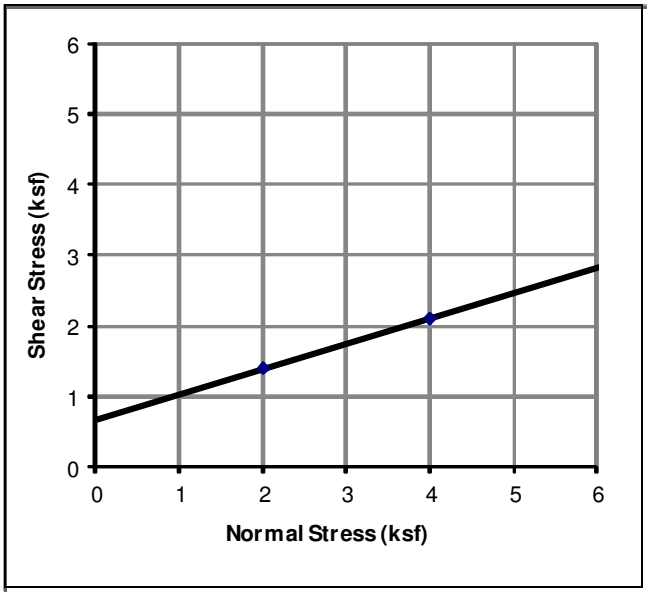
Report Date: November 10, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-27
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB76 30-32'

SOILS / AGGREGATES

Direct Shear Test of Soils Under Consolidated Drained Conditions (ASTM D3080-04)

Direct Shear Point Number:	1	2	3
Initial Diameter of specimen (in.):	2.42	2.42	2.42
Initial Thickness of specimen (in.):	1.00	1.00	1.00
Dry Mass of Specimen (g):	123.7	128.6	126.1
Initial Moisture (%):	21.4%	21.7%	22.3%
Initial Wet Density (pcf):	124.3	129.6	127.7
Initial Dry Density (pcf):	102.4	106.5	104.5
Final Thickness of specimen (in.)::	0.97	0.98	0.94
Final Moisture (%):	22.6%	21.9%	22.3%
Final Wet Density (pcf):	129.1	133.2	136.0
Final Dry Density (pcf):	105.3	109.2	111.2
Normal Stress (ksf):	2.00	4.00	8.00
Maximum Shearing Stress (ksf):	1.404	2.088	3.552
Vertical Deformation @ Max Shear (in.):	0.005	0.001	-0.005
Horizontal Deformation @ Max Shear (in.):	0.156	0.101	0.141



Shearing Device Used:
Geomatic Direct Shear Apparatus, Model 8914

Rate of Deformation (in./min.): 0.01

Internal Friction Angle (deg.): 19.8

Cohesion (kips/sq.ft.): 0.6720

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: November 10, 2016

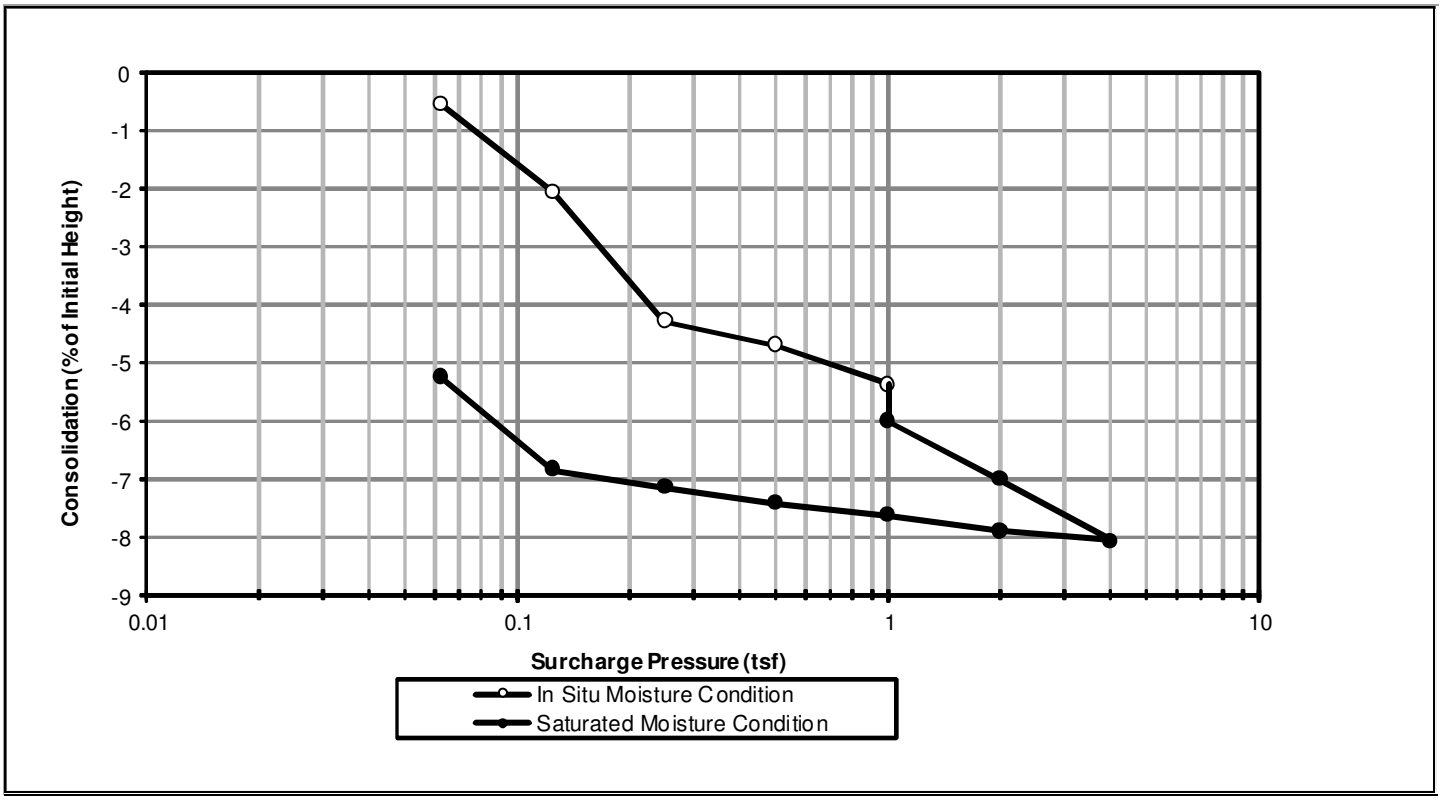
Project #: 377882016
Work Order #: 2
Lab #: 16-0739-05
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB63 95-97'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.38
Initial Moisture (%):	12.3%	**Final Moisture (%):**	12.5%
Initial Dry Density (pcf):	125.3	**Final Dry Density (pcf):**	131.5
Initial Degree of Saturation:	103%	**Final Degree Saturation:**	130%
Initial Void Ratio:	0.32	**Final Void Ratio:**	0.26
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	8.07%



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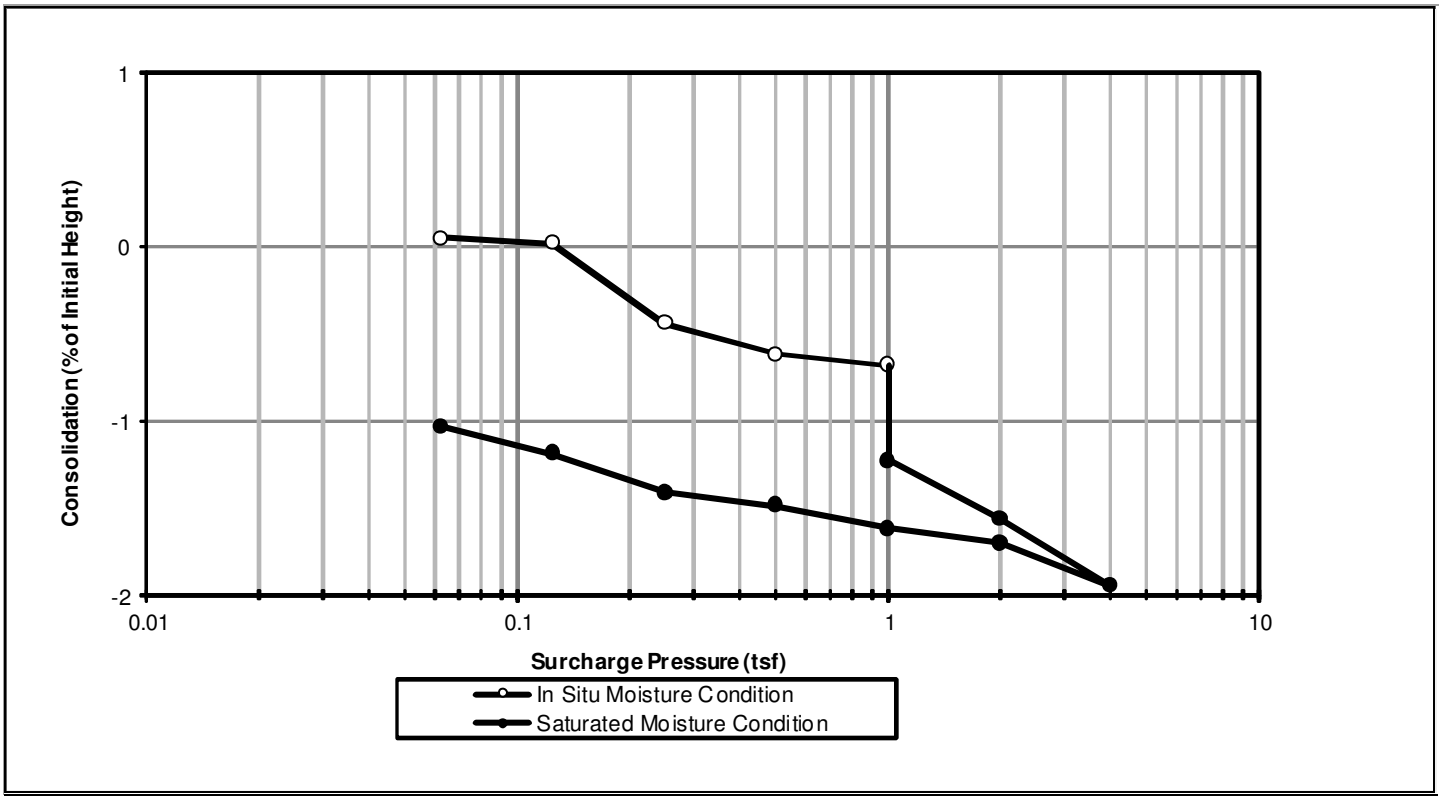
Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 10, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-08
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB64 95-97'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.55
Initial Moisture (%):	19.9%	**Final Moisture (%):**	20.3%
Initial Dry Density (pcf):	108.8	**Final Dry Density (pcf):**	110.0
Initial Degree of Saturation:	102%	**Final Degree Saturation:**	108%
Initial Void Ratio:	0.52	**Final Void Ratio:**	0.50
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	1.95%



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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: November 10, 2016

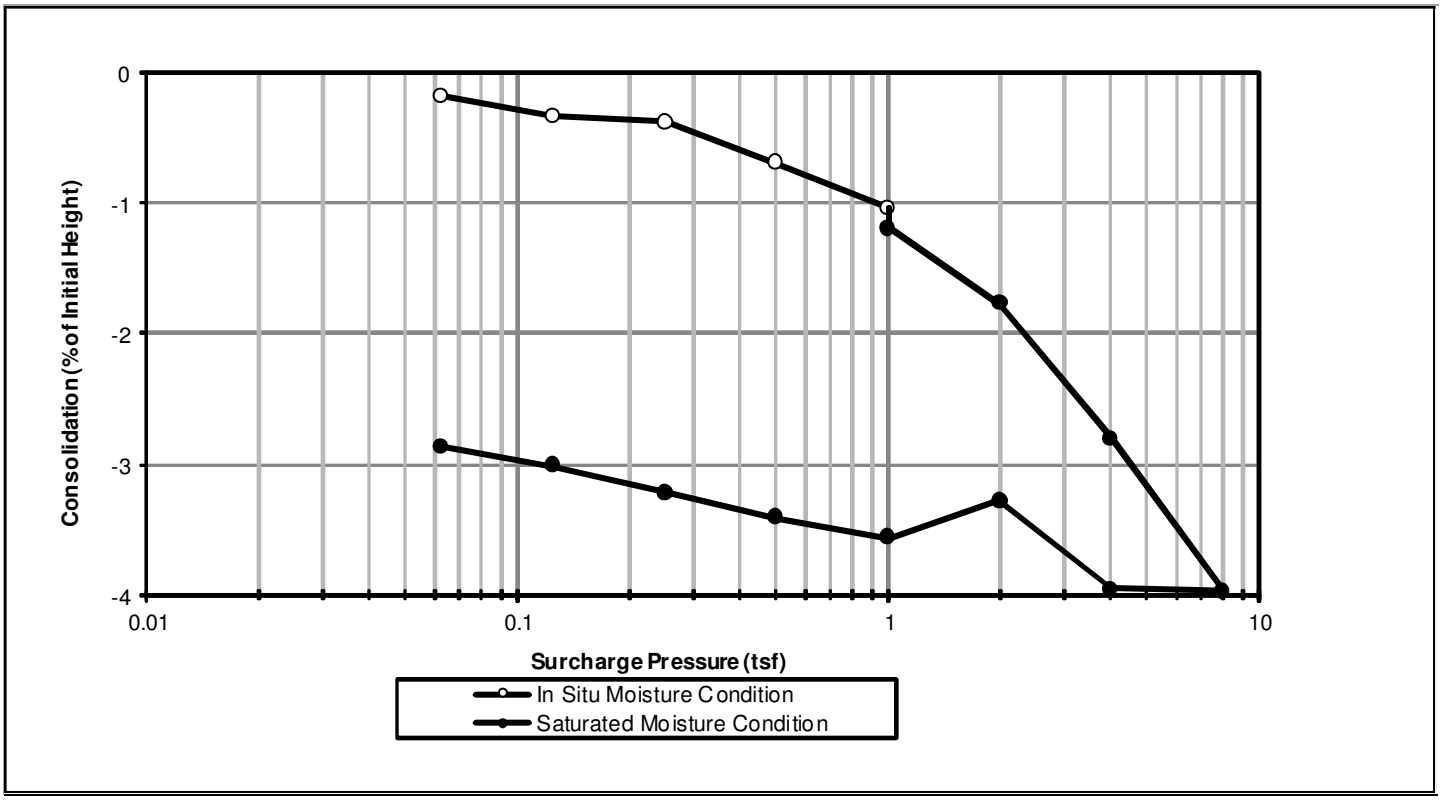
Project #: 377882016
Work Order #: 2
Lab #: 16-0739-10
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB66 55-57'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.48
Initial Moisture (%):	22.4%	**Final Moisture (%):**	19.1%
Initial Dry Density (pcf):	109.2	**Final Dry Density (pcf):**	112.2
Initial Degree of Saturation:	116%	**Final Degree Saturation:**	107%
Initial Void Ratio:	0.52	**Final Void Ratio:**	0.47
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	3.97%



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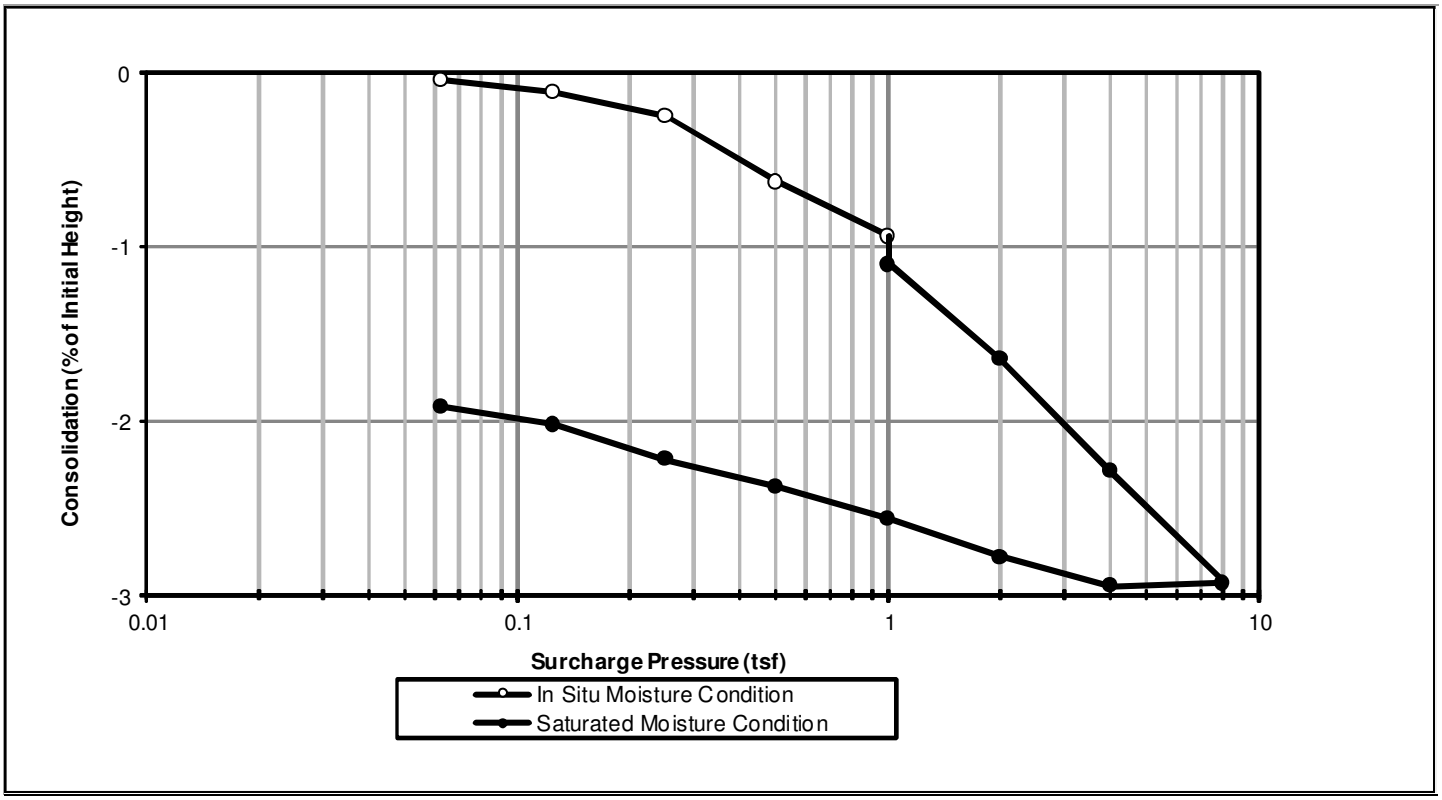
Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 10, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-11
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB68 80-82'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.51
Initial Moisture (%):	21.0%	**Final Moisture (%):**	19.7%
Initial Dry Density (pcf):	106.9	**Final Dry Density (pcf):**	108.9
Initial Degree of Saturation:	103%	**Final Degree Saturation:**	102%
Initial Void Ratio:	0.55	**Final Void Ratio:**	0.52
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	2.93%



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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: November 18, 2016

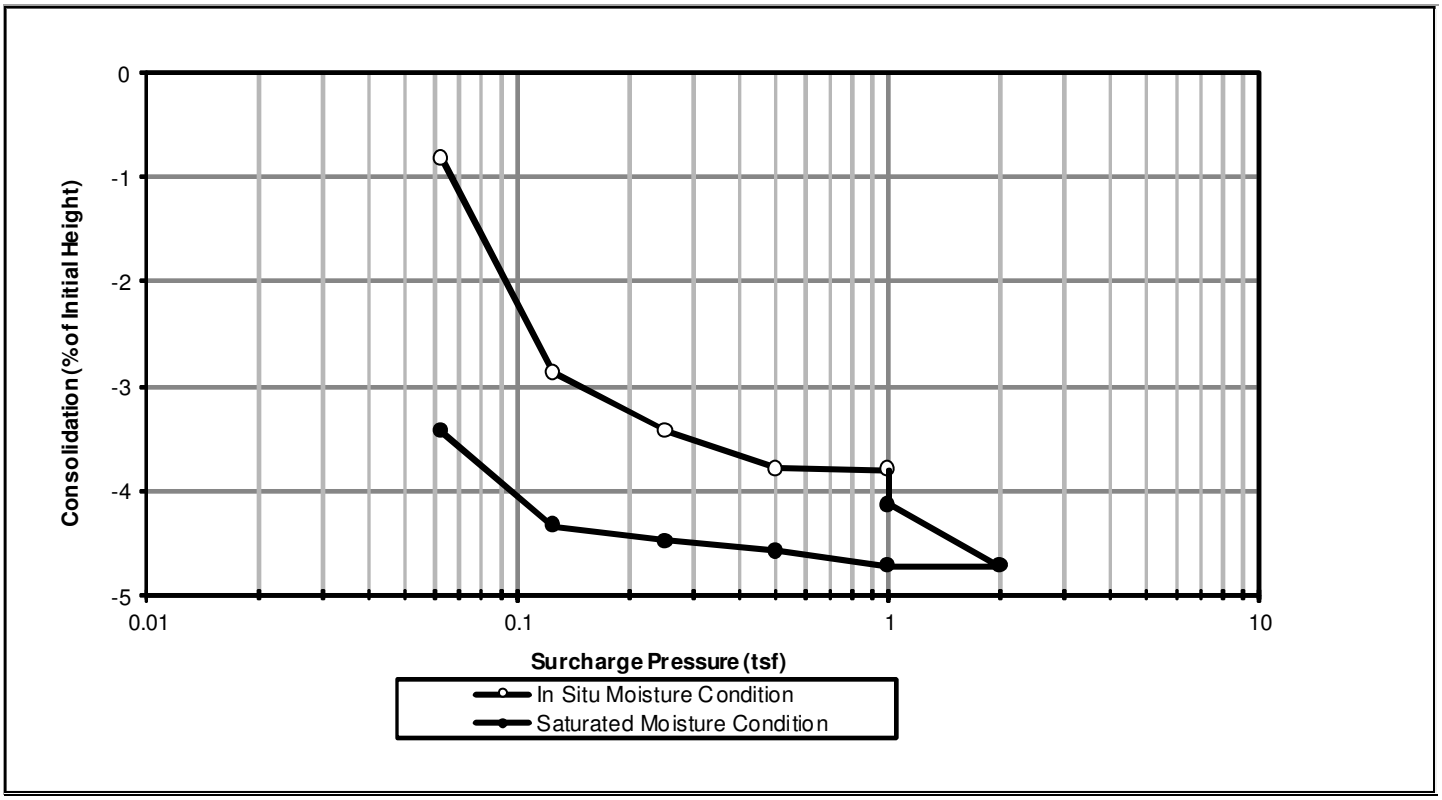
Project #: 377882016
Work Order #: 2
Lab #: 16-0739-12
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB69 3-5'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.48
Initial Moisture (%):	21.6%	**Final Moisture (%):**	23.6%
Initial Dry Density (pcf):	102.7	**Final Dry Density (pcf):**	105.5
Initial Degree of Saturation:	94%	**Final Degree Saturation:**	111%
Initial Void Ratio:	0.61	**Final Void Ratio:**	0.57
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	4.72%



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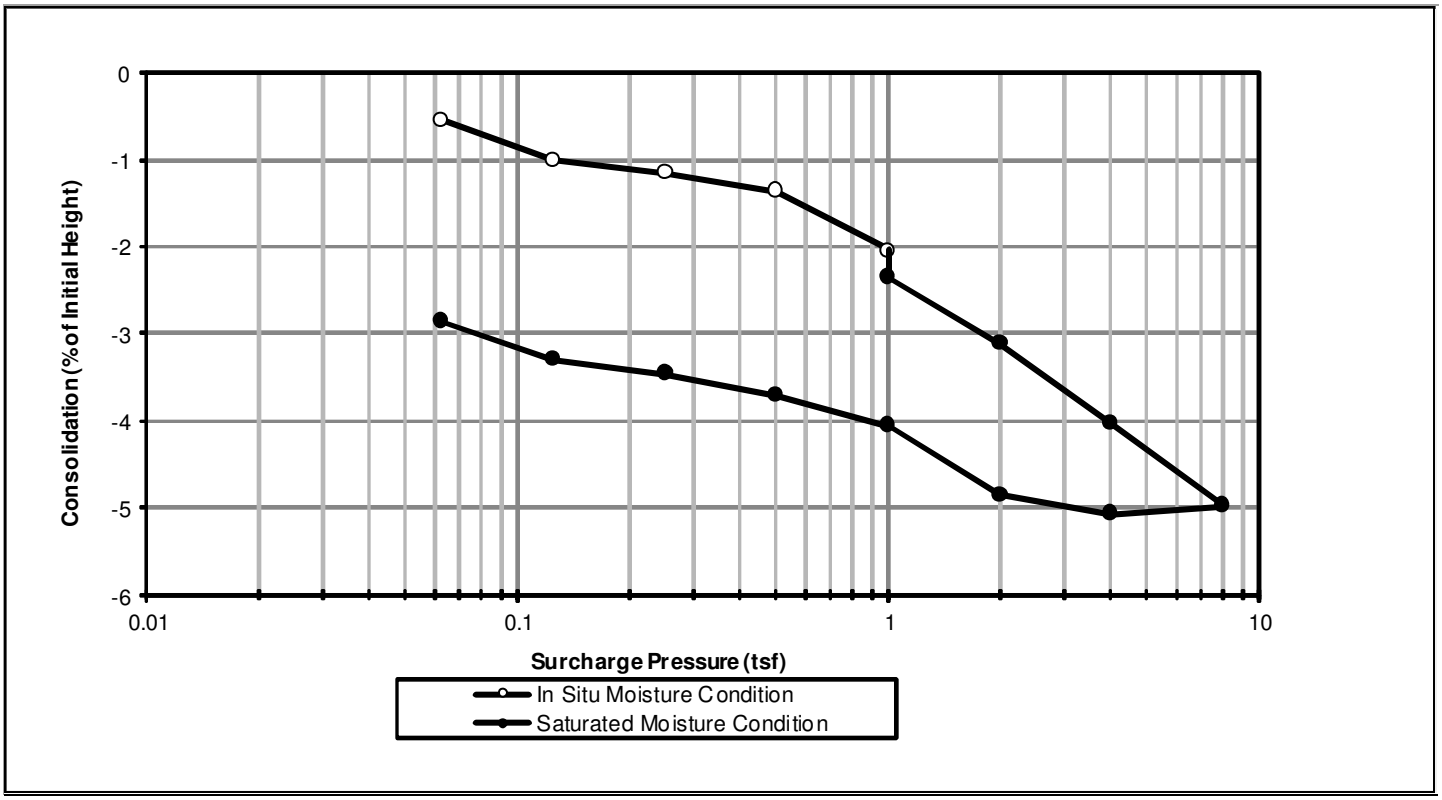
Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-13
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB69 55-57'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.49
Initial Moisture (%):	15.4%	**Final Moisture (%):**	15.3%
Initial Dry Density (pcf):	119.8	**Final Dry Density (pcf):**	122.6
Initial Degree of Saturation:	108%	**Final Degree Saturation:**	117%
Initial Void Ratio:	0.38	**Final Void Ratio:**	0.35
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	4.98%



Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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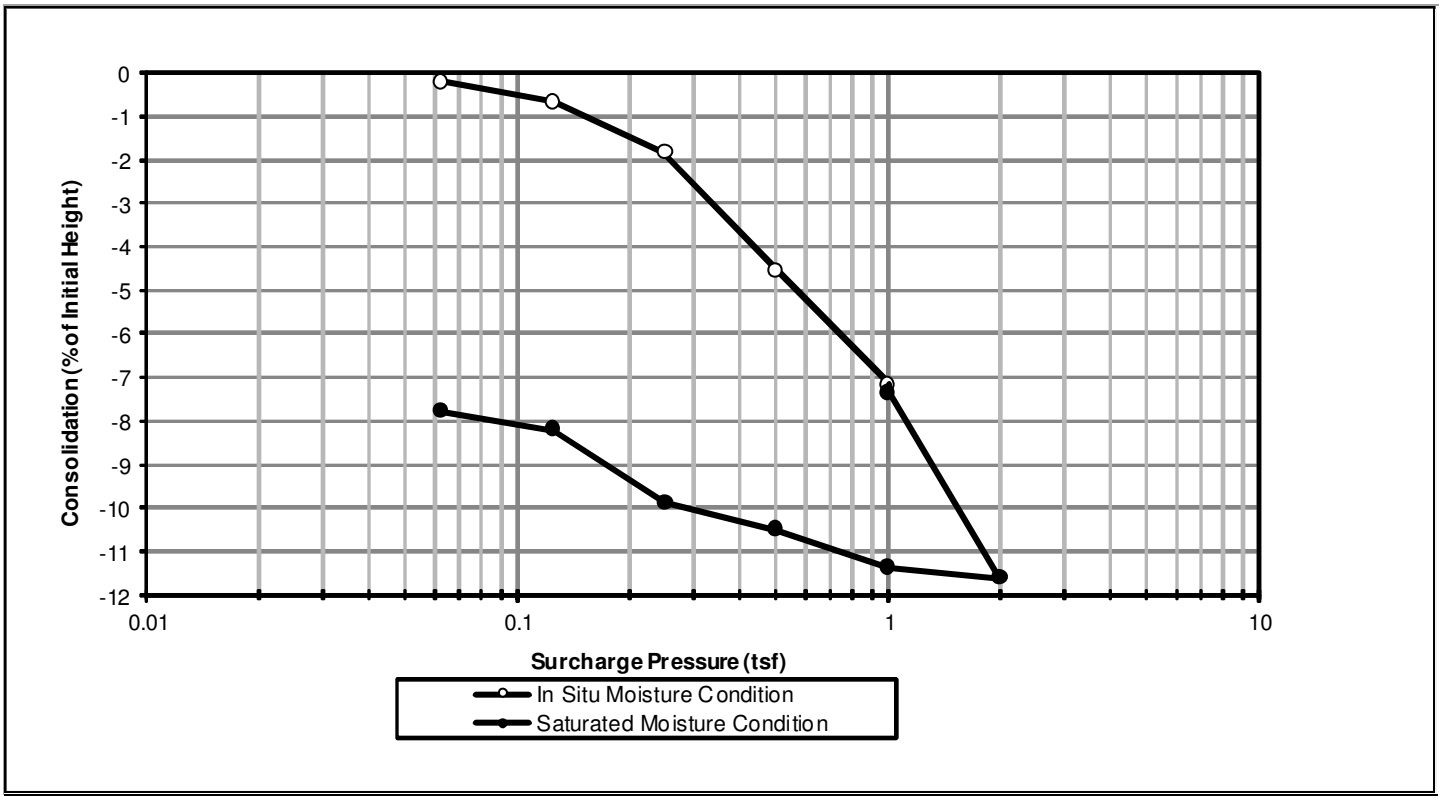
Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 22, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-14
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB70 15-17'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.25
Initial Moisture (%):	43.9%	**Final Moisture (%):**	43.9%
Initial Dry Density (pcf):	70.2	**Final Dry Density (pcf):**	75.9
Initial Degree of Saturation:	86%	**Final Degree Saturation:**	99%
Initial Void Ratio:	1.36	**Final Void Ratio:**	1.18
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	11.60%



Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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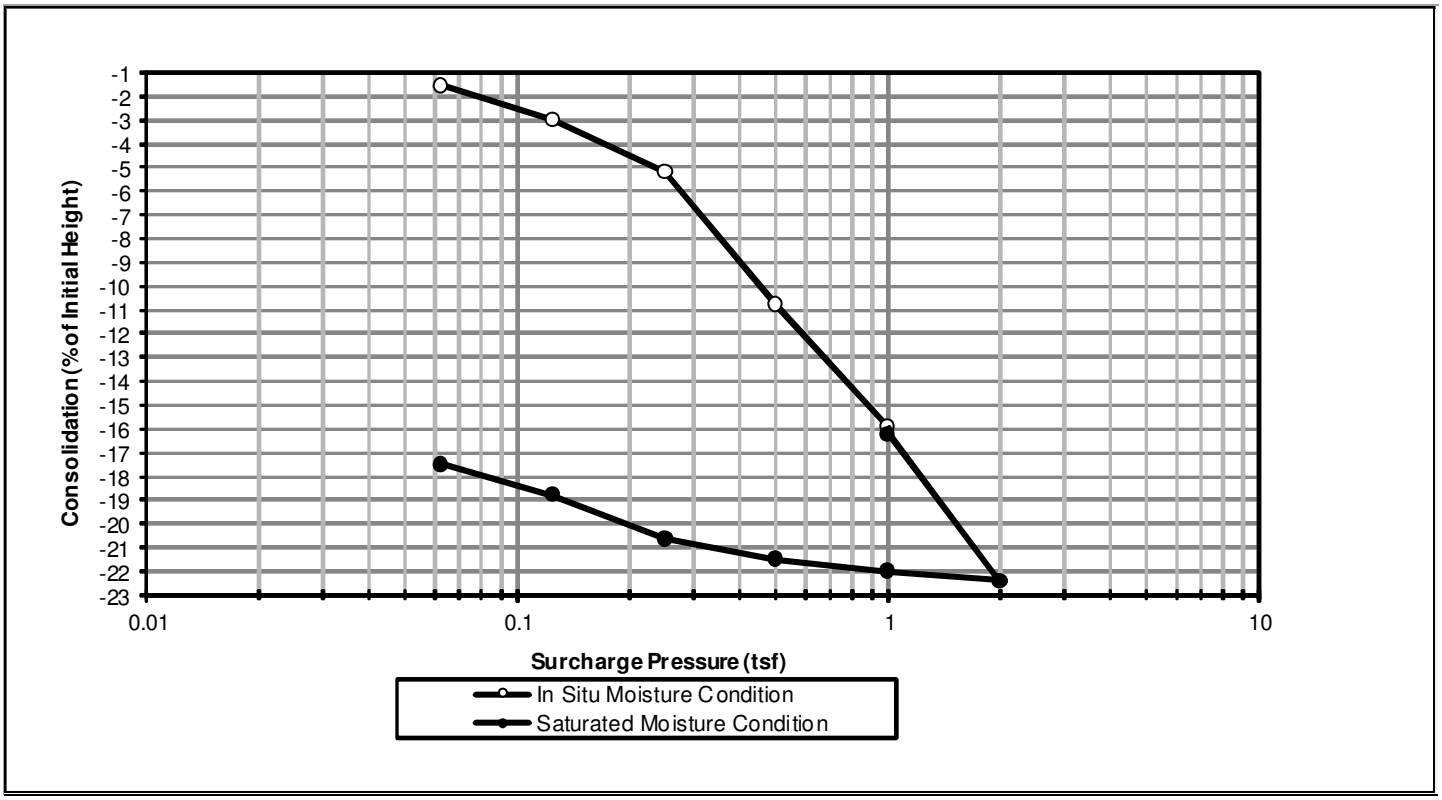
Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-18
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB71 15-16'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	3.87
Initial Moisture (%):	97.9%	**Final Moisture (%):**	74.5%
Initial Dry Density (pcf):	44.5	**Final Dry Density (pcf):**	52.9
Initial Degree of Saturation:	96%	**Final Degree Saturation:**	93%
Initial Void Ratio:	2.72	**Final Void Ratio:**	2.13
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	22.40%



Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
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Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: November 18, 2016

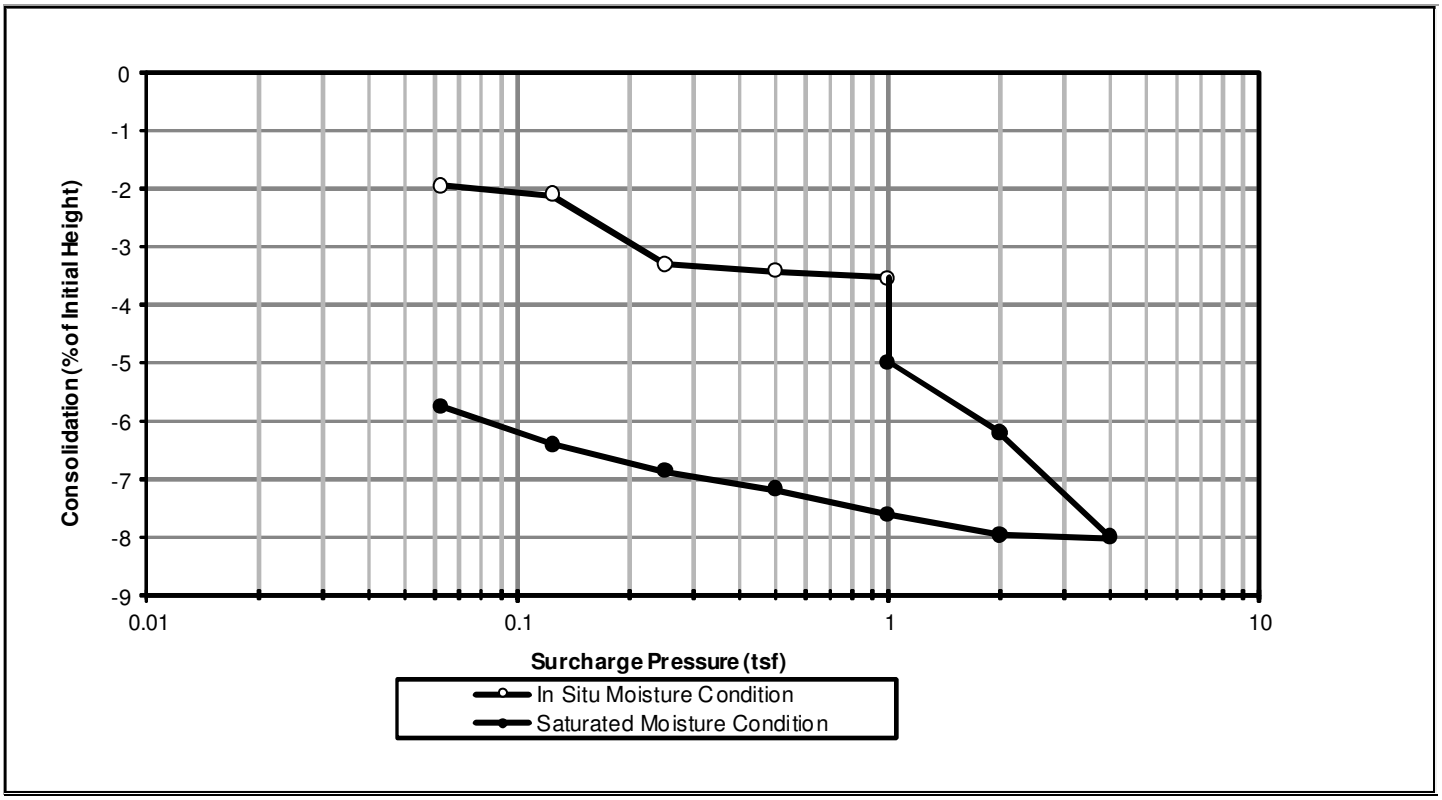
Project #: 377882016
Work Order #: 2
Lab #: 16-0739-20
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB71 30-35'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.42
Initial Moisture (%):	18.2%	**Final Moisture (%):**	15.5%
Initial Dry Density (pcf):	117.8	**Final Dry Density (pcf):**	122.4
Initial Degree of Saturation:	121%	**Final Degree Saturation:**	118%
Initial Void Ratio:	0.41	**Final Void Ratio:**	0.35
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	8.01%



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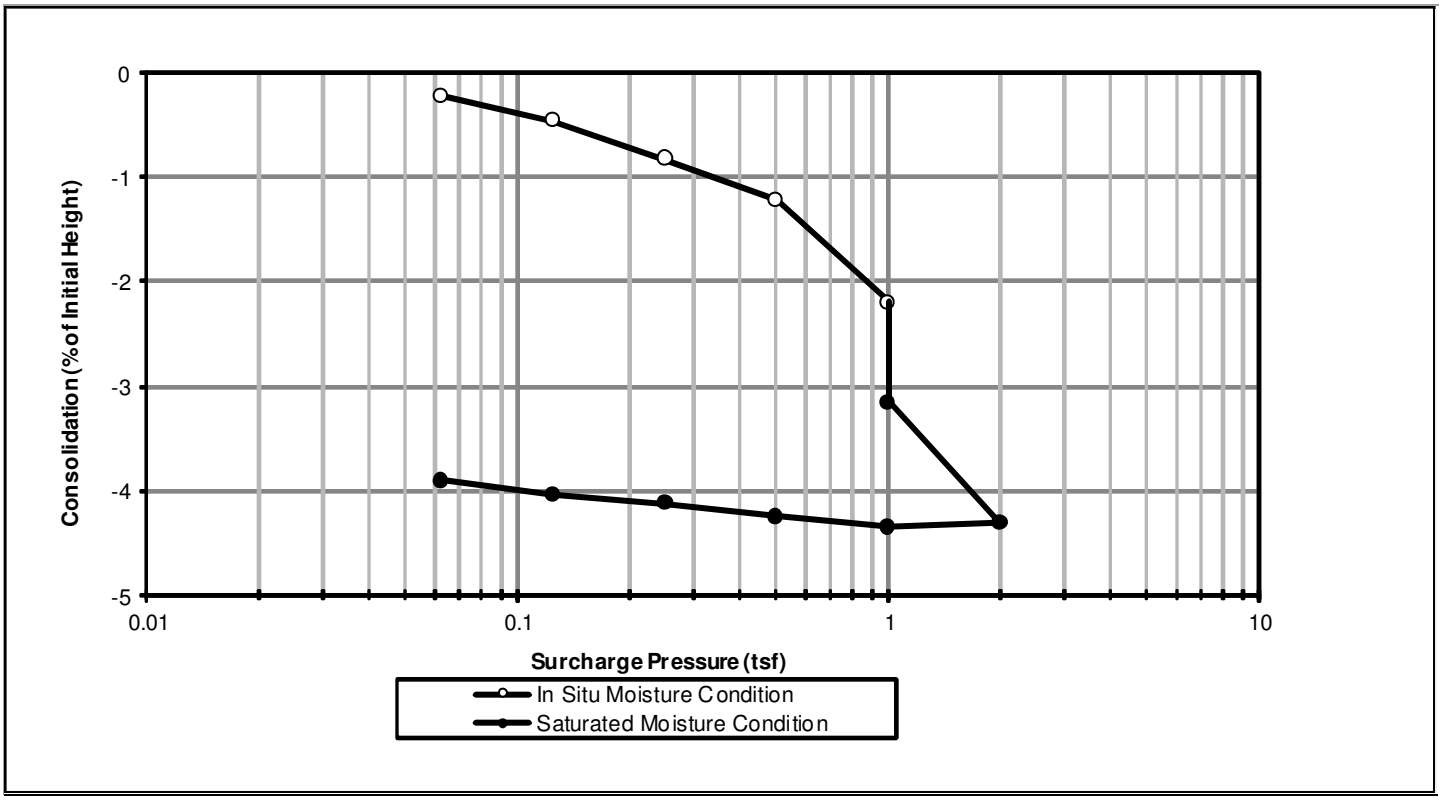
Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-21
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB72 10-11'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.43
Initial Moisture (%):	23.4%	**Final Moisture (%):**	22.0%
Initial Dry Density (pcf):	105.2	**Final Dry Density (pcf):**	109.2
Initial Degree of Saturation:	109%	**Final Degree Saturation:**	114%
Initial Void Ratio:	0.57	**Final Void Ratio:**	0.52
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	4.31%



Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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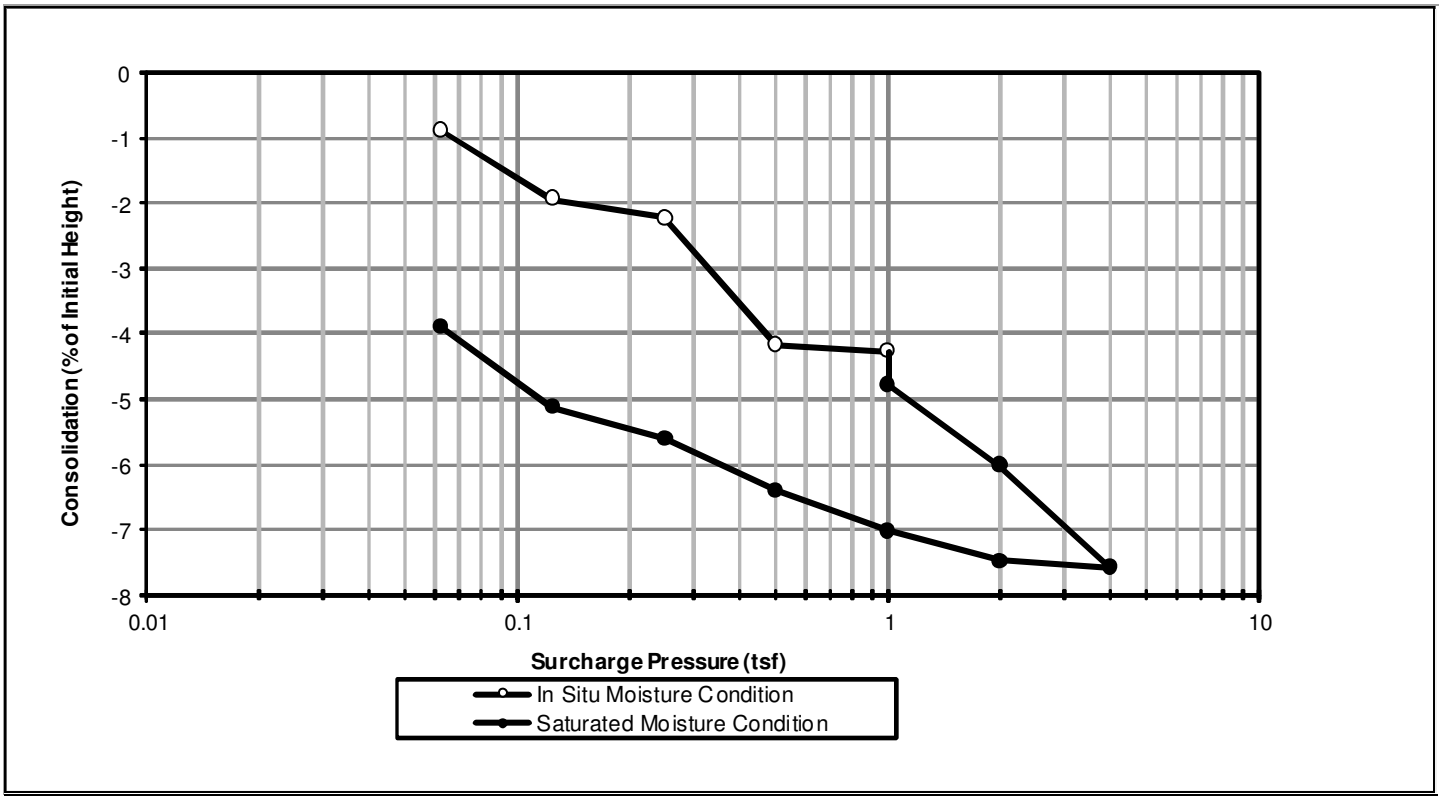
Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 18, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-24
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB72 25-27'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.46
Initial Moisture (%):	17.6%	**Final Moisture (%):**	18.4%
Initial Dry Density (pcf):	110.8	**Final Dry Density (pcf):**	114.3
Initial Degree of Saturation:	95%	**Final Degree Saturation:**	110%
Initial Void Ratio:	0.49	**Final Void Ratio:**	0.45
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	7.59%



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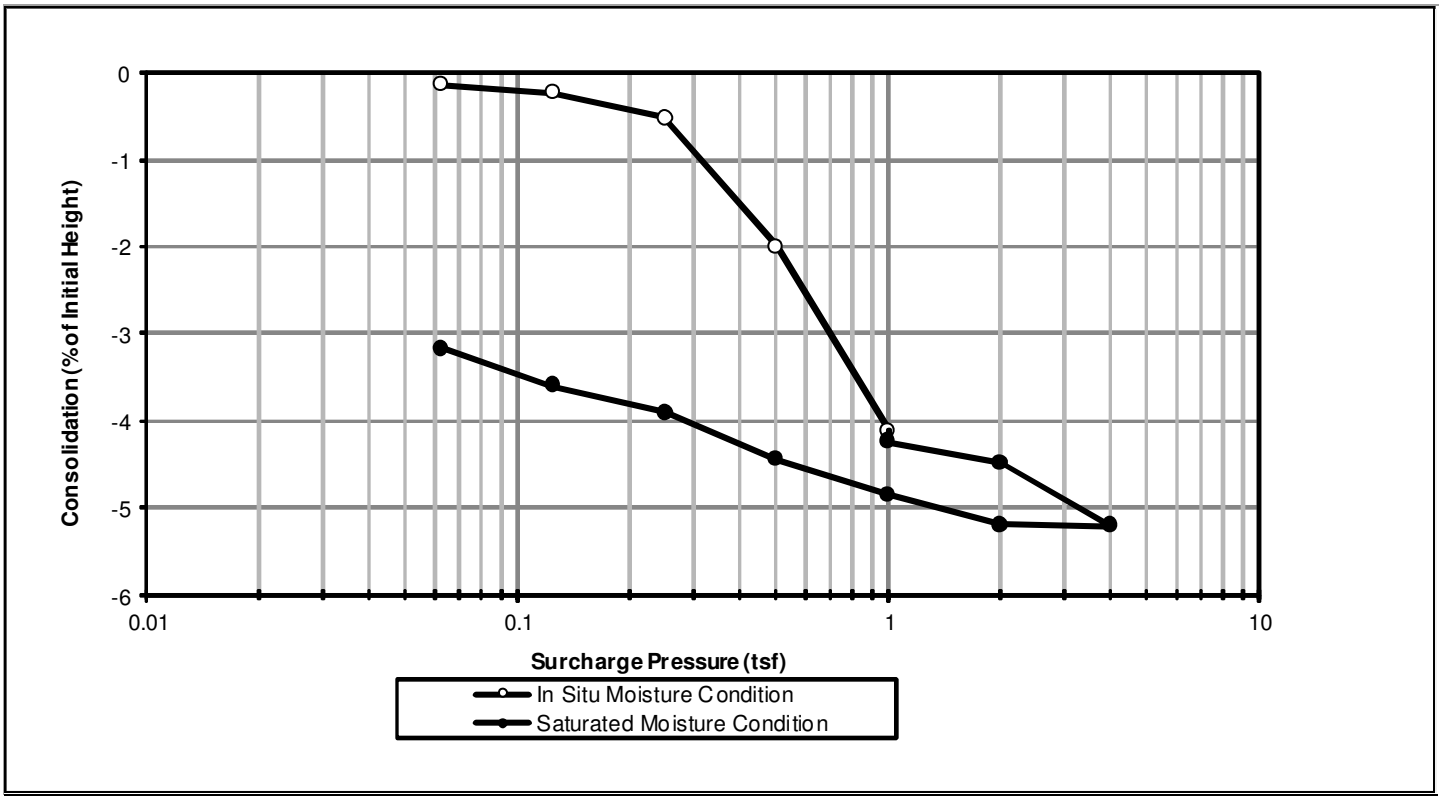
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-27
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB76 30-32'

SOILS / AGGREGATES

One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-11)

Sample Preparation: In-situ

Initial Volume (cu.in.):	4.60	**Final Volume (cu.in.):**	4.46
Initial Moisture (%):	15.5%	**Final Moisture (%):**	14.8%
Initial Dry Density (pcf):	118.3	**Final Dry Density (pcf):**	122.0
Initial Degree of Saturation:	104%	**Final Degree Saturation:**	111%
Initial Void Ratio:	0.40	**Final Void Ratio:**	0.36
Estimated Specific Gravity:	2.651	**Saturated at:**	1 tsf
Soil Classification:		**Consolidation at Max Load:**	5.20%



Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Albuquerque, NM 87113
Tel 5058211801
Fax 5058217371
www.amec.com

Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: October 26, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-05
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB63 95-97'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.04	**Final Diameter (cm):**	5.90
Initial Length (cm):	7.55	**Final Length (cm):**	7.61
Initial Moisture:	15.6%	**Final Moisture:**	15.3%
Initial Unit Weight (pcf):	118.6	**Final Unit Weight (pcf):**	123.3
Initial Volume (in³):	13.2	**Final Volume (in³):**	12.7
Initial Degree of Saturation:	104%	**Final Degree of Saturation:**	118%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 58.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
5	1.05E-05
4	1.12E-05
4	1.12E-05
4	1.04E-05
Average:	1.1E-05

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	October 26, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-08
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB64 95-97'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.06	**Final Diameter (cm):**	6.06
Initial Length (cm):	7.65	**Final Length (cm):**	7.62
Initial Moisture:	19.3%	**Final Moisture:**	19.2%
Initial Unit Weight (pcf):	111.8	**Final Unit Weight (pcf):**	112.2
Initial Volume (in³):	13.5	**Final Volume (in³):**	13.4
Initial Degree of Saturation:	107%	**Final Degree of Saturation:**	107%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 58.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
45	1.32E-07
49	1.32E-07
50	1.31E-07
51	1.30E-07
Average:	1.3E-07

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	October 27, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-10
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB66 55-57'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.09	**Final Diameter (cm):**	6.13
Initial Length (cm):	7.62	**Final Length (cm):**	7.45
Initial Moisture:	16.8%	**Final Moisture:**	15.8%
Initial Unit Weight (pcf):	118.0	**Final Unit Weight (pcf):**	119.2
Initial Volume (in³):	13.5	**Final Volume (in³):**	13.4
Initial Degree of Saturation:	111%	**Final Degree of Saturation:**	108%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 58.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
64	9.15E-08
66	9.16E-08
62	9.34E-08
67	9.12E-08
Average:	9.2E-08

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	October 28, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-11
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB68 80-82'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	5.98	**Final Diameter (cm):**	5.97
Initial Length (cm):	7.64	**Final Length (cm):**	7.67
Initial Moisture:	13.2%	**Final Moisture:**	13.5%
Initial Unit Weight (pcf):	124.2	**Final Unit Weight (pcf):**	124.1
Initial Volume (in³):	13.1	**Final Volume (in³):**	13.1
Initial Degree of Saturation:	105%	**Final Degree of Saturation:**	108%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 53.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
106	5.75E-08
107	5.75E-08
110	5.65E-08
109	5.48E-08
Average:	5.7E-08

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 07, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-13
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB69 55-57'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.09	**Final Diameter (cm):**	6.10
Initial Length (cm):	7.64	**Final Length (cm):**	7.65
Initial Moisture:	10.1%	**Final Moisture:**	11.1%
Initial Unit Weight (pcf):	126.2	**Final Unit Weight (pcf):**	125.7
Initial Volume (in³):	13.6	**Final Volume (in³):**	13.6
Initial Degree of Saturation:	86%	**Final Degree of Saturation:**	93%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 53.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
56	1.15E-07
57	1.15E-07
54	1.15E-07
55	1.15E-07
Average:	1.1E-07

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 14, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-15
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB70 65-67'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: C

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.06	**Final Diameter (cm):**	6.07
Initial Length (cm):	4.66	**Final Length (cm):**	4.31
Initial Moisture:	11.0%	**Final Moisture:**	18.4%
Initial Unit Weight (pcf):	105.3	**Final Unit Weight (pcf):**	113.4
Initial Volume (in³):	8.2	**Final Volume (in³):**	7.6
Initial Degree of Saturation:	51%	**Final Degree of Saturation:**	106%

Permeant Liquid:	Tap Water
Magnitude of Total Backpressure:	58.0
Effective Stress:	2.0
Range of Hydraulic Gradient Used:	3.55 **To** 5.15
Estimated Specific Gravity:	2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
20	2.26E-04
13	2.29E-04
14	2.28E-04
15	2.25E-04
Average:	2.3E-04

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 07, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-20
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB71 30-35'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.11	**Final Diameter (cm):**	6.13
Initial Length (cm):	7.55	**Final Length (cm):**	7.45
Initial Moisture:	17.9%	**Final Moisture:**	17.4%
Initial Unit Weight (pcf):	116.3	**Final Unit Weight (pcf):**	117.1
Initial Volume (in³):	13.5	**Final Volume (in³):**	13.4
Initial Degree of Saturation:	112%	**Final Degree of Saturation:**	112%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 53.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
219	2.87E-08
220	2.82E-08
227	2.70E-08
223	2.73E-08
Average:	2.8E-08

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: November 07, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-24
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB72 25-27'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.00	**Final Diameter (cm):**	6.04
Initial Length (cm):	7.03	**Final Length (cm):**	7.03
Initial Moisture:	16.9%	**Final Moisture:**	18.6%
Initial Unit Weight (pcf):	114.1	**Final Unit Weight (pcf):**	112.6
Initial Volume (in³):	12.1	**Final Volume (in³):**	12.3
Initial Degree of Saturation:	99%	**Final Degree of Saturation:**	105%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 58.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
209	2.97E-08
196	3.06E-08
193	3.15E-08
185	3.32E-08
Average:	3.1E-08

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	November 01, 2016
		Project #:	377882016
		Work Order #:	2
Attn:	Dan Sullivan	**Lab #:**	16-0739-26
Project Name:	NIPSCO Bailly Corrective Measures	**Sampled By:**	Carlton Pine
		Date Sampled:	
	Chesterton, IN	**Visual Description of Material:**	See Boring Log
		Sample Source:	SB74 45-46.5'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.09	**Final Diameter (cm):**	6.08
Initial Length (cm):	7.67	**Final Length (cm):**	7.66
Initial Moisture:	10.9%	**Final Moisture:**	11.0%
Initial Unit Weight (pcf):	128.0	**Final Unit Weight (pcf):**	128.6
Initial Volume (in³):	13.6	**Final Volume (in³):**	13.6
Initial Degree of Saturation:	99%	**Final Degree of Saturation:**	102%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 58.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
24	2.88E-07
23	2.94E-07
23	2.90E-07
22	2.93E-07
Average:	2.9E-07

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: November 01, 2016

Project #: 377882016
Work Order #: 2
Lab #: 16-0739-27
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: See Boring Log
Sample Source: SB76 30-32'

SOILS / AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Cut Shelby Tube
Compaction Method: Insitu

Initial Diameter (cm):	6.12	**Final Diameter (cm):**	6.12
Initial Length (cm):	7.64	**Final Length (cm):**	7.63
Initial Moisture:	15.8%	**Final Moisture:**	16.2%
Initial Unit Weight (pcf):	118.1	**Final Unit Weight (pcf):**	118.3
Initial Volume (in³):	13.7	**Final Volume (in³):**	13.7
Initial Degree of Saturation:	104%	**Final Degree of Saturation:**	108%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 48.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
60	1.02E-07
59	1.01E-07
59	9.96E-08
53	1.09E-07
Average:	1.0E-07

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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ATTACHMENT D

SOIL-BENTONITE TESTING RESULTS

Client:	Northern Indiana Public Svc Co 801 E. 86th Street Merrillville, IN 46410	**Report Date:**	January 12, 2017
		Project #:	377882016
		Work Order #:	3
Attn:	Dan Sullivan	**Lab #:**	17-0021-01
		Sampled By:	Carlton Pine
Project Name:	NIPSCO Bailly Corrective Measures	**Date Sampled:**	
	Chesterton, IN	**Visual Description of Material:**	Sand
		Sample Source:	Remold 1

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	6.11	**Final Diameter (cm):**	6.12
Initial Length (cm):	7.74	**Final Length (cm):**	7.77
Initial Moisture:	8.6%	**Final Moisture:**	12.2%
Initial Unit Weight (pcf):	126.2	**Final Unit Weight (pcf):**	125.7
Initial Volume (in^3):	13.7	**Final Volume (in^3):**	13.6
Initial Degree of Saturation:	56%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 55.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
36	2.45E-04
37	2.51E-04
34	2.38E-04
35	2.36E-04
Average:	2.4E-04

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: January 12, 2017

Project #: 377882016
Work Order #: 3
Lab #: 17-0021-02
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: Sand
Sample Source: Remold 2

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	6.07	**Final Diameter (cm):**	6.08
Initial Length (cm):	7.69	**Final Length (cm):**	7.68
Initial Moisture:	8.9%	**Final Moisture:**	12.3%
Initial Unit Weight (pcf):	125.7	**Final Unit Weight (pcf):**	126.2
Initial Volume (in^3):	13.7	**Final Volume (in^3):**	13.7
Initial Degree of Saturation:	55%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 56.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
36	8.89E-05
37	9.25E-05
34	9.55E-05
35	9.05E-05
Average:	9.2E-05

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: January 12, 2017

Project #: 377882016
Work Order #: 3
Lab #: 17-0021-03
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: Sand
Sample Source: Remold 3

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	6.09	**Final Diameter (cm):**	6.11
Initial Length (cm):	7.62	**Final Length (cm):**	7.60
Initial Moisture:	6.9%	**Final Moisture:**	13.0%
Initial Unit Weight (pcf):	124.3	**Final Unit Weight (pcf):**	124.4
Initial Volume (in^3):	13.5	**Final Volume (in^3):**	13.4
Initial Degree of Saturation:	52%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 56.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
38	1.44E-04
40	1.68E-04
39	1.62E-04
40	1.56E-04
Average:	1.6E-04

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

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Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: January 12, 2017

Project #: 377882016
Work Order #: 3
Lab #: 17-0021-04
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: Sand
Sample Source: 5% S-B 1

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	5.98	**Final Diameter (cm):**	5.92
Initial Length (cm):	7.60	**Final Length (cm):**	7.55
Initial Moisture:	11.2%	**Final Moisture:**	16.0%
Initial Unit Weight (pcf):	122.3	**Final Unit Weight (pcf):**	122.4
Initial Volume (in^3):	13.4	**Final Volume (in^3):**	13.3
Initial Degree of Saturation:	85%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 57.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
48	9.02E-05
49	1.13E-04
50	9.56E-05
49	1.15E-04
Average:	1.0E-04

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Email:** ☐ **Other:** Addressee (2)

AMEC Environment & Infrastructure, Inc.
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Tel 5058211801
Fax 5058217371
www.amec.com

Client: Northern Indiana Public Svc Co
801 E. 86th Street
Merrillville, IN 46410

Attn: Dan Sullivan

Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: January 12, 2017

Project #: 377882016
Work Order #: 3
Lab #: 17-0021-05
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: Sand
Sample Source: 5% S-B 2

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	6.06	**Final Diameter (cm):**	6.07
Initial Length (cm):	7.28	**Final Length (cm):**	7.24
Initial Moisture:	11.7%	**Final Moisture:**	16.4%
Initial Unit Weight (pcf):	122.4	**Final Unit Weight (pcf):**	122.1
Initial Volume (in^3):	13.5	**Final Volume (in^3):**	13.4
Initial Degree of Saturation:	88%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 58.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
49	8.29E-05
52	8.84E-05
48	1.02E-04
50	8.03E-05
Average:	8.8E-05

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

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Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: January 12, 2017

Project #: 377882016
Work Order #: 3
Lab #: 17-0021-06
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: Sand
Sample Source: 5% S-B 3

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	6.10	**Final Diameter (cm):**	6.09
Initial Length (cm):	7.18	**Final Length (cm):**	7.15
Initial Moisture:	11.5%	**Final Moisture:**	16.3%
Initial Unit Weight (pcf):	122.6	**Final Unit Weight (pcf):**	122.3
Initial Volume (in^3):	13.3	**Final Volume (in^3):**	13.2
Initial Degree of Saturation:	84%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 54.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
49	2.77E-05
52	2.72E-05
48	2.65E-05
50	2.68E-05
Average:	2.7E-05

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

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Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: January 12, 2017

Project #: 377882016
Work Order #: 3
Lab #: 17-0021-07
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: Sand
Sample Source: 10% S-B 1

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	6.08	**Final Diameter (cm):**	6.06
Initial Length (cm):	7.08	**Final Length (cm):**	7.05
Initial Moisture:	13.5%	**Final Moisture:**	18.3%
Initial Unit Weight (pcf):	121.6	**Final Unit Weight (pcf):**	121.3
Initial Volume (in^3):	13.0	**Final Volume (in^3):**	12.9
Initial Degree of Saturation:	83%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 56.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
44	8.83E-06
46	1.07E-05
44	8.99E-06
49	9.41E-06
Average:	9.5E-06

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

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Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: January 12, 2017

Project #: 377882016
Work Order #: 3
Lab #: 17-0021-08
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: Sand
Sample Source: 10% S-B 2

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	6.18	**Final Diameter (cm):**	6.16
Initial Length (cm):	7.02	**Final Length (cm):**	7.01
Initial Moisture:	13.3%	**Final Moisture:**	18.5%
Initial Unit Weight (pcf):	121.4	**Final Unit Weight (pcf):**	121.2
Initial Volume (in^3):	13.2	**Final Volume (in^3):**	13.1
Initial Degree of Saturation:	86%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 57.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
52	1.09E-06
53	8.82E-07
50	9.39E-07
51	8.50E-07
Average:	9.4E-07

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

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Project Name: NIPSCO Bailly Corrective Measures

Chesterton, IN

Report Date: January 12, 2017

Project #: 377882016
Work Order #: 3
Lab #: 17-0021-09
Sampled By: Carlton Pine
Date Sampled:
Visual Description of Material: Sand
Sample Source: 10% S-B 3

SOILS I AGGREGATES

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084-10)

Method: F

Sample Preparation: Remolded
Compaction Method: 3 Lifts

Initial Diameter (cm):	6.04	**Final Diameter (cm):**	6.02
Initial Length (cm):	7.14	**Final Length (cm):**	7.13
Initial Moisture:	13.0%	**Final Moisture:**	18.2%
Initial Unit Weight (pcf):	121.3	**Final Unit Weight (pcf):**	121.0
Initial Volume (in^3):	13.1	**Final Volume (in^3):**	13.0
Initial Degree of Saturation:	84%	**Final Degree of Saturation:**	99%

Permeant Liquid: Tap Water
Magnitude of Total Backpressure: 55.0
Effective Stress: 2.0
Range of Hydraulic Gradient Used: **To**
Estimated Specific Gravity: 2.65

Time Interval (sec)	Corrected Hydraulic Conductivity (cm/sec)
49	8.05E-06
50	8.32E-06
52	8.88E-06
50	7.29E-06
Average:	8.1E-06

Note: All final sample dimensions are subject to sample deformation caused by exsolution of air in pore water and handling during removal from cell.

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ATTACHMENT E

EVS MODEL

(Provided as a Compact Disk)