May 12, 2022
Kleinfelder Project No.: 20230052.001A

Ms. Cynthia Y. Lynn, President
Thunderhead Testing, LLC
1540 N. 107th E. Ave.,
Tulsa, Oklahoma 74116

**Subject:** **Geotechnical Explorations**
**City of Tulsa Non-Arterial Maintenance Zone 3017**
**Tulsa, Oklahoma**

Dear Ms. Lynn:

Kleinfelder has completed the authorized subsurface explorations for the above referenced project. Kleinfelder conducted the field work by performing twelve (12) pavement cores on April 1, 2022, and advancing the core holes to three feet below the bottom of the pavement, or hand auger refusal, whichever occurs first. The pavement cores were located in the field by a Kleinfelder representative using a hand-held Global Positioning System (GPS) with an accuracy of approximately 15 feet. The general site location and the approximate borings (C-1 through C-12) locations are shown on Figure 1, Exploration Location Plan and Vicinity Map.

## FIELD EXPLORATION PROGRAM

The existing pavement was cored with a 5-in diameter core barrel and were advanced with a hand auger to three feet into the subgrade below the bottom of the pavement, or auger refusal, whichever occurs first. Field logs included visual classification of the materials encountered during drilling, as well as drilling characteristics. Stratification boundaries indicated on the coring logs are based on observations during our field work, an extrapolation of information obtained by examining samples from the cores, and comparisons of soils with similar engineering characteristics. Locations of these boundaries are approximate, and the transitions between material types may be gradual rather than clearly defined.

## SUBSURFACE CONDITIONS

The pavement and subsurface conditions are summarized in Table 1. Detailed descriptions are presented on respective core logs in Attachment A. Shale and sandstone fragments were regularly encountered throughout subsurface exploration. Hand auger refusals were encountered on shale in borings C-2, C-3, C-8, and C-11 at depths ranging from 15 to 23 inches below the bottom of the pavement.





12727 E 61st Street, Suite A, Tulsa, OK 74146 **p|** 918.627.6161 **f|** 918.627.6262

| Table 1. Summary of Pavement and Subsurface Materials | | | |
|---|---|---|---|
| **Street** | **Pavement Cores** | **Pavement Thickness (in.)** | **Subgrade Materials** |
| S. 69th E. Ave. | C-1 through C-4 | 5-6" PCC | Lean and Fat Clay |
| S. 71st E. Ave. | C-5 through C-8 | 6.5-7" PCC | Lean and Fat Clay |
| E. 10th St. | C-9 and C-10 | 2-2.75" AC<br>6-7.5" PCC | Lean and Fat Clay |
| E. 9th St. | C-11 and C-12 | 0.75-1" AC<br>6-6.25" PCC | Silt and Lean Clay |

## LABORATORY TESTING PROGRAM

Laboratory tests including sieve analyses tests, Atterberg limit tests, and moisture contents were performed by Thunderhead on selected samples for classification purposes. In addition, soil samples were visually classified in accordance with the Unified Soil Classification System. All the lab results are summarized in Attachment B.

## LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

The report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two years from the date of this report. The work performed was based on project information provided by Client.

## CLOSING

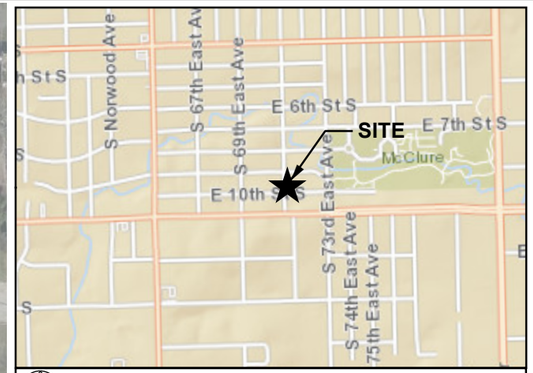
We appreciate the opportunity to be of service to you on this project. Please call us if you have any questions concerning the information presented within this letter.

Sincerely,
**KLEINFELDER, INC.**
Certificate of Authorization #7292, Expires 6/30/23

Kirby Falcon, EIT
Professional

Shiyun (Simon) Wang, PE
Senior Professional

Attachments:
Figures 1 – Exploration Location Plan and Vicinity Map
Attachment A – Field Exploration Program
Attachment B – Lab Testing Program


VICINITY MAP

NOT TO SCALE

NOTE:
BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2022 MICROSOFT CORPORATION.
COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE OKLAHOMA NORTH FIPS 3501

LEGEND

◎ PAVEMENT CORING

N

0 100 200

1 " = 100 SCALE IN FEET



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| | |
|---|---|
| PROJECT NO. | 20230052.001A |
| DRAWN BY: | KF |
| CHECKED BY: | SYW |
| DATE: | 5/11/2022 |

EXPLORATION LOCATION PLAN AND VICINITY MAP

COT NASM Zone 3017 - Thunderhead
Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

FIGURE 1

GIS FILE PATH: \\azrgisstorp01\working_clients_Automated_Exploration Plans\20230052.001A_COTNASMZone3017Thunderhead_20220511_kfalcon\MXD\
GIS FILE NAME: 20230052.001A_ELP_11x17_2021_20220511_1318_kf
PLOTTED: 5/11/2022 1:19:19 PM BY: KFALCON

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** S. 69th E. Ave.
**GPS** 36.14821° / -95.90006°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☐ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☐ Separation | ☒ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics | Layer Thickness (in) |
|---|---|---|---|
| C-1 | PORTLAND CEMENT CONCRETE | | 6 |
| | **Total Core Thickness** | | **6** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-1A | FILL - Lean CLAY with Sand: light brown, gray, moist | 0.0 to 6.0 |
| C-1B | FILL - Lean CLAY wiht Sand (A-7-6): gray, bluish gray, dark gray, brown, moist, trace glass | 6.0 to 36.0 |

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PROJECT NO.: 20230052.001A
DRAWN BY: SB
CHECKED BY: SYW
DATE: 4/5/2021

BORING LOG C-1

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE

C-1

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** S. 69th E. Ave.
**GPS** 36.14856° / -95.90006°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☐ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☐ Separation | ☒ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☐ Honeycomb | ☐ "D" Cracking | ☒ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics* | Layer Thickness (in) |
|---|---|---|---|
| C-2 | PORTLAND CEMENT CONCRETE | | 5 |
| | **Total Core Thickness** | | **5** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-2A | Lean CLAY with Sand: light brown, gray, moist, trace shale and sandstone fragments | 0.0 to 6.0 |
| C-2B | Lean CLAY with Sand (A-4): light brown, gray, moist, trace shale and sandstone fragments | 6.0 to 15.0 |

**REMARKS:**
- Hand auger refusal on shale encountered 15 inches below bottom of pavement

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DATE: 4/5/2021

BORING LOG C-2

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE
C-2

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** S. 69th E. Ave.
**GPS** 36.14907° / -95.90008°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☐ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☐ Separation | ☒ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics* | Layer Thickness (in) |
|---|---|---|---|
| C-3 | PORTLAND CEMENT CONCRETE | | 6 |
| | **Total Core Thickness** | | **6** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-3A | FILL - Sandy Lean CLAY (A-6): brown, gray, moist, trace glass | 0.0 to 6.0 |
| C-3B | FILL - Sandy Lean CLAY: brown, gray, light brown, moist, trace glass | 6.0 to 17.0 |

**REMARKS:**
- Hand auger refusal on shale encountered 17 inches below bottom of pavement

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PROJECT NO.: 20230052.001A
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CHECKED BY: SYW
DATE: 4/5/2021

BORING LOG C-3

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE
C-3

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** S. 69th E. Ave.
**GPS** 36.14954° / -95.90009°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☐ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☐ Separation | ☒ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics | Layer Thickness (in) |
|---|---|---|---|
| C-4 | PORTLAND CEMENT CONCRETE | | 6 |
| | **Total Core Thickness** | | **6** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-4A | Lean CLAY with Sand: gray, brown, light brown, moist, trace gravel | 0.0 to 6.0 |
| C-4B | Lean CLAY with Sand: gray, brown, light brown, moist, trace gravel | 6.0 to 20.0 |
| C-4C | Fat CLAY (A-7-6): bluish gray, brown, light brown, moist | 20.0 to 36.0 |

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BORING LOG C-4

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE

C-4

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** S. 71st E. Ave.
**GPS** 36.14836° / -95.89787°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☐ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☐ Separation | ☒ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics | Layer Thickness (in) |
|---|---|---|---|
| C-5 | PORTLAND CEMENT CONCRETE | | 7 |
| | **Total Core Thickness** | | **7** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-5A | Lean CLAY with Sand: brown, yellowish brown, gray, moist, trace shale fragments | 0.0 to 6.0 |
| C-5B | Lean CLAY with Sand: brown, yellowish brown, gray, moist, trace shale fragments | 6.0 to 19.0 |
| C-5C | Sandy Lean CLAY (A-6): dark gray, moist, trace gravel | 19.0 to 30.0 |
| C-5D | Sandy Lean CLAY: dark brown, light brown, moist, trace gravel | 30.0 to 36.0 |

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DATE: 4/5/2021

BORING LOG C-5

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE
C-5

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** S. 71st E. Ave.
**GPS** 36.14870° / -95.89790°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☐ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☐ Separation | ☒ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics | Layer Thickness (in) |
|---|---|---|---|
| C-6 | PORTLAND CEMENT CONCRETE | | 6.5 |
| | **Total Core Thickness** | | **6.5** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-6A | Fat CLAY with Sand: light brown, yellowish brown, gray, moist, trace shale fragments | 0.0 to 6.0 |
| C-6B | Fat CLAY with Sand (A-7-6): light brown, yellowish brown, gray, moist, increase amount of shale fragments | 6.0 to 36.0 |

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DATE: 4/5/2021

BORING LOG C-6

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE

C-6

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** S. 71st E. Ave.
**GPS** 36.14910° / -95.89787°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☐ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☐ Separation | ☒ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics | Layer Thickness (in) |
|---|---|---|---|
| C-7 | PORTLAND CEMENT CONCRETE | | 6.5 |
| | **Total Core Thickness** | | **6.5** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-7A | Lean CLAY (A-7-6): light brown, light gray, brown, dark brown, moist | 0.0 to 6.0 |
| C-7B | Lean CLAY with Sand: light brown, light gray, brown, dark brown, moist, trace iron staining, with sandstone and shale fragments | 6.0 to 36.0 |

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DATE: 4/5/2021

BORING LOG C-7

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE
C-7

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** S. 71st E. Ave.
**GPS** 36.14956° / -95.89788°

**TOP**


**CORE LAYER DATA:**

| | | | |
|---|---|---|---|
| **Surface Material Type:** | ☐ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete |
| **Stripping or Separation in Asphalt:** | ☐ Stripping | ☐ Separation | ☒ N/A |
| **Honeycomb or "D" Cracking PCC:** | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | ☐ Yes | ☒ No | ☐ Unknown |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics* | Layer Thickness (in) |
|---|---|---|---|
| C-8 | PORTLAND CEMENT CONCRETE | | 7 |
| | **Total Core Thickness** | | **7** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-8A | Fat CLAY with Sand: brown, gray, light brown, moist, trace shale fragments | 0.0 to 6.0 |
| C-8B | Fat CLAY with Sand (A-7-6): brown, gray, light brown, moist, trace shale fragments | 6.0 to 18.0 |
| C-8C | Decomposed SHALE: gray, brown | 18.0 to 23.0 |

**REMARKS:**
- Hand auger refusal on shale encountered 23 inches below bottom of pavement

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PROJECT NO.: 20230052.001A
DRAWN BY: SB
CHECKED BY: SYW
DATE: 4/5/2021

BORING LOG C-8

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE
C-8

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** E. 10th St.
**GPS** 36.14891° / -95.89858°

**TOP**

**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☒ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☒ Separation | ☐ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics | Layer Thickness (in) |
|---|---|---|---|
| C-9 | ASPHALTIC CONCRETE | | 2.75 |
| C-9 | PORTLAND CEMENT CONCRETE | | 7.5 |
| | **Total Core Thickness** | | **10.25** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-9A | FILL - Sandy Fat CLAY (A-7-6): gray, brown, moist, trace glass and shale fragments | 0.0 to 6.0 |
| C-9B | FILL - Sandy Fat CLAY: gray, brown, moist, trace sand and shale fragments | 6.0 to 15.0 |
| C-9C | Decomposed SHALE: bluish gray, brown, moist | 15.0 to 36.0 |

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PROJECT NO.: 20230052.001A
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CHECKED BY: SYW
DATE: 4/5/2021

BORING LOG C-9

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE

C-9

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** E. 10th St.
**GPS** 36.14890° / -95.89719°

**TOP**


**CORE LAYER DATA:**

| | | | |
|---|---|---|---|
| **Surface Material Type:** | ☒ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete |
| **Stripping or Separation in Asphalt:** | ☒ Stripping | ☒ Separation | ☐ N/A |
| **Honeycomb or "D" Cracking PCC:** | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | ☐ Yes | ☒ No | ☐ Unknown |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics | Layer Thickness (in) |
|---|---|---|---|
| C-10 | ASPHALTIC CONCRETE | | 2 |
| C-10 | PORTLAND CEMENT CONCRETE | | 6 |
| | **Total Core Thickness** | | **8** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-10A | FILL - Sandy Lean CLAY (A-6): dark brown, moist, trace gravel and glass | 0.0 to 6.0 |
| C-10B | FILL - Sandy Lean CLAY: dark brown, gray, light brown, moist, trace gravel, shale and standstone | 6.0 to 20.0 |
| C-10C | Sandy Lean CLAY: yellowish brown, dark gray, brown, moist | 20.0 to 36.0 |

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PROJECT NO.: 20230052.001A
DRAWN BY: SB
CHECKED BY: SYW
DATE: 4/5/2021

BORING LOG C-10

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE

C-10

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** E. 9th St.
**GPS** 36.14979° / -95.89906°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☒ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☒ Separation | ☐ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics* | Layer Thickness (in) |
|---|---|---|---|
| C-11 | ASPHALTIC CONCRETE | | 1 |
| C-11 | PORTLAND CEMENT CONCRETE | | 6 |
| | **Total Core Thickness** | | **7** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-11A | Sandy SILT (A-6): brown, grayish brown, yellowish brown, moist, trace gravel | 0.0 to 6.0 |
| C-11B | Sandy SILT: brown, grayish brown, yellowish brown, moist, increase in shale fragments | 6.0 to 17.0 |

**REMARKS:**
- Hand auger refusal on shale encountered 17 inches below bottom of pavement

KLEINFELDER
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PROJECT NO.: 20230052.001A
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CHECKED BY: SYW
DATE: 4/5/2021

BORING LOG C-11

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE

C-11

**PROJECT / LOCATION DATA:**

**CORE DATE** April 1, 2022
**LOCATION** E. 9th St.
**GPS** 36.14977° / -95.89684°

**TOP**


**CORE LAYER DATA:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Surface Material Type:** | ☒ A.C. | ☒ P.C.C. | ☐ Continuously Reinforced Concrete | | | |
| **Stripping or Separation in Asphalt:** | | ☐ Stripping | ☒ Separation | ☐ N/A | | |
| **Honeycomb or "D" Cracking PCC:** | | ☒ Honeycomb | ☐ "D" Cracking | ☐ N/A | | |
| **Stabilized Subgrade Beneath Pavement or Subbase?** | | ☐ Yes | ☒ No | ☐ Unknown | | |

**CORE & BASE LAYER DATA (FROM TOP TO BOTTOM):**

| Core No. | Layer Type | Layer Characteristics | Layer Thickness (in) |
|---|---|---|---|
| C-12 | ASPHALTIC CONCRETE | | 0.75 |
| C-12 | PORTLAND CEMENT CONCRETE | | 6.25 |
| | **Total Core Thickness** | | **7** |

**SUBGRADE LAYER DATA (FROM BELOW CORES, OR AGGREGATE BASE, IF PRESENT):**

| Sample No. | Layer Type | Layer Depth (in) |
|---|---|---|
| C-12A | Sandy Lean CLAY: brown, gray, yellowish brown, moist, trace shale fragments | 0.0 to 6.0 |
| C-12B | Sandy Lean CLAY (A-7-6): brown, gray, yellowish brown, moist, trace shale fragments | 6.0 to 12.0 |
| C-12C | Sandy Lean CLAY: bluish gray, brown, moist, trace shale fragments | 12.0 to 30.0 |
| C-12D | Sandy Lean CLAY: bluish gray, brown, moist, trace shale fragments | 30.0 to 36.0 |

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BORING LOG C-12

Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

CORE

C-12

| Field No. | Soil Group | Station | Description | Depth* (in) | LL | PI | Percent Passing | | | | | | Water Content (%) | Soluble Sulfates (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Passing 3 in. | Passing 3/4 in. | Passing #4 | Passing #10 | Passing #40 | Passing #200 | | |
| C-1A | | | | 0 - 6 | | | | | | | | | 29.0 | |
| C-1B | A-7-6 | | LEAN CLAY WITH SAND | 6 - 36 | 41 | 19 | 100 | 100 | 100 | 100 | 90 | 77 | 21.0 | |
| C-2A | | | | 0 - 6 | | | | | | | | | 19.2 | |
| C-2B | A-4 | | LEAN CLAY WITH SAND | 6 - 15 | 33 | 10 | 100 | 100 | 100 | 100 | 86 | 75 | 15.9 | |
| C-3A | A-6 | | SANDY LEAN CLAY | 0 - 6 | 34 | 11 | 100 | 100 | 100 | 100 | 75 | 55 | 22.7 | |
| C-3B | | | | 6 - 17 | | | | | | | | | 17.7 | |
| C-4A | | | | 0 - 6 | | | | | | | | | 18.6 | |
| C-4B | | | | 6 - 20 | | | | | | | | | 25.1 | |
| C-4C | A-7-6 | | FAT CLAY | 20 - 36 | 60 | 37 | 100 | 100 | 100 | 100 | 95 | 88 | 25.4 | |
| C-5A | | | | 0 - 6 | | | | | | | | | 25.6 | |
| C-5B | | | | 6 - 19 | | | | | | | | | 20.0 | |
| C-5C | A-6 | | SANDY LEAN CLAY | 19 - 30 | 31 | 12 | 100 | 100 | 100 | 100 | 96 | 67 | 20.4 | |
| C-5D | | | | 30 - 36 | | | | | | | | | 20.3 | |
| C-6A | | | | 0 - 6 | | | | | | | | | 29.8 | |
| C-6B | A-7-6 | | FAT CLAY WITH SAND | 6 - 36 | 52 | 25 | 100 | 100 | 100 | 100 | 84 | 71 | 22.3 | |
| C-7A | A-7-6 | | LEAN CLAY | 0 - 6 | 43 | 23 | 100 | 100 | 100 | 100 | 99 | 97 | 27.7 | |
| C-7B | | | | 6 - 36 | | | | | | | | | 23.2 | |
| C-8A | | | | 0 - 6 | | | | | | | | | 27.5 | |
| C-8B | A-7-6 | | FAT CLAY WITH SAND | 6 - 18 | 52 | 25 | 100 | 100 | 100 | 100 | 86 | 75 | 25.2 | |
| C-8C | | | | 18 - 23 | | | | | | | | | 16.4 | |
| C-9A | A-7-6 | | SANDY FAT CLAY | 0 - 6 | 50 | 25 | 100 | 100 | 100 | 100 | 84 | 68 | 26.4 | |
| C-9B | | | | 6 - 15 | | | | | | | | | 25.0 | |
| C-9C | | | | 15 - 36 | | | | | | | | | 16.8 | |
| C-10A | A-6 | | SANDY LEAN CLAY | 0 - 6 | 32 | 16 | 100 | 100 | 100 | 100 | 91 | 67 | 27.2 | |
| C-10B | | | | 6 - 20 | | | | | | | | | 23.1 | |
| C-10C | | | | 20 - 36 | | | | | | | | | 23.3 | |
| C-11A | A-6 | | SANDY SILT | 0 - 6 | 39 | 13 | 100 | 100 | 100 | 100 | 78 | 63 | 27.0 | |
| C-11B | | | | 6 - 17 | | | | | | | | | 16.7 | |

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = Nonplastic

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LABORATORY TEST RESULT SUMMARY

COT NASM Zone 3017 - Thunderhead
Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

TABLE
B-1

| Field No. | Soil Group | Station | Description | Depth* (in) | LL | PI | Percent Passing | | | | | | Water Content (%) | Soluble Sulfates (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Passing 3 in. | Passing 3/4 in. | Passing #4 | Passing #10 | Passing #40 | Passing #200 | | |
| C-12A | | | | 0 - 6 | | | | | | | | | 27.4 | |
| C-12B | A-7-6 | | SANDY LEAN CLAY | 6 - 12 | 41 | 21 | 100 | 100 | 100 | 100 | 91 | 69 | 27.0 | |
| C-12C | | | | 12 - 30 | | | | | | | | | 23.6 | |
| C-12D | | | | 30 - 36 | | | | | | | | | 18.6 | |

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = Nonplastic

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LABORATORY TEST RESULT SUMMARY

COT NASM Zone 3017 - Thunderhead
Non-Arterial Maintenance Zone 3017
Tulsa, Oklahoma

TABLE
B-2