ADDENDUM NUMBER 3

Project Number 89008516
Project Title Wornall Road 74th to 79th Street
Federal STP-3301(509)

ISSUE DATE: 9/26/2023

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on October 3, 2023, are amended as follows:

Information to Bidders The following is provided to Bidders for information only:

Q1. Project no. 89060836 is referenced in the overview; what is the significance of that reference?
   A1. Reference to KCMO project #89060836 is for a separate, already constructed project.

Q2. What will NTP date be?
   A2. Bidders shall anticipate a construction NTP January of 2024.

Q3. Will the city consider life cycle analysis in selecting asphalt or concrete for street surface?
   A3. Life cycle analysis will not be used in making the selection of asphalt vs. concrete for the street surface. The selection will be based primarily on cost and what is in the best interest of the City.

Q4. Consider calendar days for construction for applicable phases rather than dates.
   A4. This project will be a calendar date completion. Completion dates have been revised.

Q5. Can we work multiple phases at the same time?
   A5. Construction work may occur within the limits of multiple phases provided the following requirements are met:
      ▪ Full access to at least one parking lot is to be maintained at all times.
      ▪ One lane of traffic is to be maintained in both directions for Wornall Road and 75th Street.

Q6. What is bonding requirement for street construction, water line construction, and does this satisfy federal requirements?
   A6. Performance Bond and 2 years for Water Services Dept. for Maintenance Bond; Performance Bond only for Public Works improvements.

Q7. Do we select a DBE from MO DOT list or City CREO list of approved DBE contractors?
   A7. Use the MoDOT DBE list.
Q8. Confirm 1000 hrs required for OJT.

A8. Yes, it is required.

Q9. Do liquidated damages apply for each phase?

A9. Yes, see 00210 Notice to Contractors, Sec. 3.

Q10. Do we assume all excavation costs are to be included in unit rates of constructed pavement?

A10. Yes.

Q11. Will MoDOT or KCMO labs provide material testing services?

A11. MoDOT or KCMO labs may be used.

Q12. Is polypropylene pipe allowed as a substitute for storm water pipe?

A12. Polypropylene pipe is an acceptable substitute.

Q13. Will permits be required for excavation, ROW and pedestrian sidewalks?

A13. City permits will need to be acquired, and fees will be waived.

Q14. Can you make the Geotech report available?


Q15. Should there be a bid item and quantities for brick pavers?

A15. Brick Pavers is shown as bid item #133.

Q16. Can stamped concrete be a substitute for brick pavers?


Q17. Will the untreated base be AB3 or MO DOT type 5?

A17. MoDOT Type 5 may be used as a substitute for Untreated Base.

Q18. What size are the pedestrian signal heads? Note 6 on sheet 117 states they are 16” but the bid item states 12”.

A18. Pedestrian signal heads are to be 16”. Bid item has been revised.

Q19. What is the intent of the temporary traffic signal – Sheet 122. The temp pole locations appear to be in the exact location of the new permanent poles.

A19. Sheet 122 Temporary Traffic Signal Plan Sheet has been replaced with Sheet 122 Traffic Signal Plan – Wyandotte and 75th. Bid item “Adjust Signal Timing & Head Locations” has been added to the project. Refer to bid item description for details.

Q20. Is the fiber interconnect intercepting any existing fiber on the north or south ends of the fiber limits?

A20. No. The proposed fiber is a standalone system connecting the two traffic signals.

Q21. There is no bid item for 96 CT fiber. There is only a bid item for 6 ct fiber and the quantity seems to be excessive for Qty 2 – 150’ gator patches. Should there be a bid item for 96 CT fiber AND 6 CT gator patch?

A21. Bid item #49 (base bid) and bid item #28 (add alternate 1) has been revised to “96-CT Fiber”.
Q22. Where is the fiber intended to stop between base bid and add alternate #1? Plans show the limit being south of 77th street but it stops between boxes. Shouldn’t this stop at either box 16 or box 15?

A22. Base bid work should include installation of box 16 and all fiber north of this location. Add alternate #1 shall include all fiber and boxes south of box 16.

Q23. Sheet 131 shows a Yellow Flashing Beacon at STA 105+29.38 – There is no bid item for this. Should this be a separate bid item or quantified under a current bid item?

A23. Bid item “Yellow Flashing Beacon” has been added.

Q24. Sheet 131 shows relocating a signal pole (ped pole) at STA 106+62.07 – there is no bid item for this. Should this be a separate bid item or quantified under a current bid item?

A24. Refer to Sheet 122 Traffic Signal Plan – Wyandotte and 75th Street. The work indicated on this sheet has been added to the traffic signal quantities.

Q25. The lighting note on sheet 161 states all luminaire arms shall be 6’ or 10’ but there are QTY 5, 12’ truss arms called for in the plans and on the BOM. Does these need to be reduced to 10’ truss arms, or are 12 truss arms allowable?

A25. 12’ arms are allowable. The note states that the poles shall have a mounting height of 35 ft with a 6 ft or 10 ft truss arm with a 3 ft setback from the back of curb unless otherwise noted.

Q26. Lighting note on sheet 161 and the plan sheets state all street lights shall have a mounting height of 35’ but the detail on sheet 173 shows the 6’ single arm poles having a mounting height of 30’. Should would follow the detail? Or follow the plans sheets and the general note?

A26. 30' mounting height with a 6' arm is allowable. The note states that the poles shall have a mounting height of 35 ft with a 6 ft or 10 ft truss arm with a 3 ft setback from the back of curb unless otherwise noted.

Q27. Bid item does not quantity for screw-in foundations for 30’ poles. If we follow the detail for 6’ single arm poles we will need a bid item for the smaller screw-in foundations.

A27. As noted on the quantities on sheet 161, the quantities are approximate and were prepared solely for the Contractor’s convenience. It is not guaranteed that this list of materials constitutes all of the items required for the completion of the work as specified in these plans. There are three different foundation types listed in these quantities: Luminaire Foundation (Large, 35 Foot Mounting Height Poles), Luminaire Foundation (Concrete Base per Storm Water Module), and Luminaire Foundation (Small, 30 Foot Mounting Height Poles). The small foundation should take into consideration the screw-in foundations per the detail on sheet 174.

Q28. The depth and bolt circle of the streetlight concrete foundations will also change depending on the result of the 6’ single arm mounting height.


Q29. The conduit quantities on sheet 120 do not match the quantities in the bid items. Please clarify the size of conduit from the signal controller to pull box 2 – is it 2-3” and 1-2” OR 2-4” and 1-2” and OR 2-4” and 1-2”? Also please clarify the size of the conduit from pull box 2 to pull box 4 – is it 2-3” and 1-2” OR 2-4” and 1-2”?
A29. Controller to pull box 2: 2-4” and 2-3” conduits. Pull box 2 to pull box 4: 2 – 4” and 1-2” conduit.

Q30. Can the greenspace South of 75th street on the East side of Wornall be utilized for a “laydown” area?

A30. The City does not own this space.

Q31. The wiring diagram for the signals on sheet 119 does not show all of the Opticom cable; it only shows cable from PB2 to Pole 2. Opticom is also not accounted for in the BOM; yet it shows Opticom on all 4 mast arms and there is a bid item for it.

A31. No Opticom for this project. Bid item “Opticom System” has been removed from the project.

Q32. There is no quantity or wiring shown for advanced radar, but there is advanced radar shown on Pole 4 and pole 8.

A32. Advanced radar is on all poles. Pole 4 has two – one on mast arm and one on pole. All other poles it is on the pole. Bid item quantity for Thermal Video or Radar Detection System

Q33. What cable is being used for the relocated OGL radios on Pole 2? Wire diagram shows Coax & 3C #16 but also shows Qty 2 Cat6 for radios.

A33. No new OGL systems are included in this project. Existing OGL radios are to be removed and returned to Chris Jenkins at OGL.

Q34. Why is there 2” streetlight conduit going to the signal cabinet? Plans show streetlights being fed from streetlight controller.

A34. This 2” conduit has been removed from the plans.

Q35. There are currently no details for the traffic signals; is there an intent to provide traffic signal details?

A35. Refer to answer for question #19.

Q36. There is no bid item for 2” fiber conduit yet there is 2” conduit crossing the road from box 20 to box 19 and from box 13 to new signal cabinet.

A36. The conduit crossing of Wornall from box 20 to box 19 is a 3”. The 2” conduit noted on the plans connects box 20 to the adjacent existing signal on the existing traffic signal box. No separate bid item for this 2” is included in the bid, and work and materials for this shall be subsidiary to other bid items.

Q37. The plans show Qty 1 PTZ/360 camera on signal Pole 8 but the bid item has Qty 4. Are there 3 cameras to be installed elsewhere on the project?

A37. There is one PTZ on the project. Bid quantity has been updated.

Q38. The signal plans show Qty 3 – Type 1 traffic signal pull boxes and Qty 1 – Type 2 traffic signal box. However the bid item has zero quantity for type 2 boxes and Qty 4 – type 1 pull boxes.

A38. The quantities shown on the Traffic Signal Summary of Quantities sheet are correct. Bid item quantity “Type I Pull Box” has been revised. Bid item “Type II Pull Box” has been added.
Q39. Sheet 2, note 10 mentions geotechnical surveying has been done in the project limits, however the data was not given in the bid package. Is the intent to share this data before the bid?

A39. **The Geotechnical Engineering Report is attached for reference purposes.**

Q40. The pavement section has either 21’ or 24” depth with the last 6” being tilled. 6” Cement treated base was not deep enough to pass the proof roll on previous projects. We have found from experience utilities will be in this zone which causes great delays. Would the city consider geogrid instead of the 6” cement treated base? Would additional 6” of baserock be an option in locations that the tiller can’t reach?

A40. **Bidders shall bid the project per the project requirements and specifications. Areas and locations where subgrade proofroll is not acceptable will be addressed during construction.**

Q41. Should the bidder circle either asphalt or concrete on the bid form to indicate which roadway pavement option is being bid?

A41. **Yes.**

Q42. Is there an or-equal to the GreenBlue products?

A42. **There are currently no known equivalent products.**

Q43. Nothing is called out and no quantities are in the bid form for Landscape/Restoration for the Alternate?

A43. **Bid item quantities have been revised to include sod for Alternate #1.**

Q44. Tree Watering Invert is indicated to be detailed on sheet 158, no detail provided.

A44. **Elevations for the tree watering piping can be found on the Green Infrastructure Plans.**

Q45. Can sand or gravel be used in lieu of the bituminous setting bed for the brick pavers, cannot be installed in cold weather?

A45. **No.**

Q46. Temporary Traffic Signal is shown to be in conflict with new signals.

A46. **Refer to answer for question #19.**

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**Project Manual**

1. **Revise** Section 00210 Notice to Contractors; Section 3, Period of Performance, and Section 4, Liquidated Damages

   **PERIOD OF PERFORMANCE:** If the bid is accepted, the bidder agrees that work shall be diligently prosecuted at such rate and in such manner as, in the judgment of the engineer, is necessary for the completion of the work within the time specified as follows in accordance with Article 14 of Section 700 (“General Conditions”) of this contract: Completion Date: Phases 1a, 1b, 2a, 2b, 3a, and 3b of the Base Bid must be completed by **December 1, 2024. Remaining phases of the Base Bid must be completed by August 1, 2025.** If Alternate 1 is awarded, the contract will be extended until October 1, 2025.
LIQUIDATED DAMAGES: The bidder agrees that, should the bidder fail to complete the work in the time specified in Section 3 of the Notice to Contractors, or such additional time as may be allowed by the engineer under the contract, the amount of liquidated damages to be recovered shall be as follows: If the Work is not completed and ready for final payment in accordance with Paragraph 14.07, by the dates stated in Section 3 of the Notice to Contractors, CONTRACTOR shall pay to CITY the amount of FOUR THOUSAND THREE HUNDRED AND 00/100 DOLLARS ($4,300.00) as liquidated damages and not as a penalty for each Calendar Day until the Work is completed and ready for final payment. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.

2. **Add** to Bid Item Description - Adjust Signal Timing & Head Locations

This work includes all materials, equipment and labor to adjust the existing signals for each phase of construction in accordance with KCMO requirements and MUTCD standards. Work includes maintenance of the signals and associated systems throughout each phase as may be required.

Measurement for payment shall be as indicated in the Bid Form of completed and acceptable work. Payment will be made following completion of the individual construction phase and shall be based upon the unit price, as set forth in the Bid Form, and shall constitute all labor, materials, and equipment necessary to complete these items. Additional adjustments which may be required due to alternate or additional construction phases shall be subsidiary to this bid item.

3. **Add** JSP D – Asphalt Cement Price Index

4. **Add** Geotechnical Report- Terracon Geotechnical Report, Sept. 19, 2018

**Drawings:**

1. **Replace** the following sheets. All changes are noted and clouded.

   - 1 – Cover Sheet
   - 3 – Summary of Quantities
   - 13 – Plan & Profile – Wornall Rd
   - 14 – Plan & Profile – Wornall Rd
   - 15 – Plan & Profile – Wornall Rd
   - 19 – Plan & Profile – Wornall Rd
   - 20 – Plan & Profile – Wornall Rd
   - 21 – Plan & Profile – Wornall Rd
   - 24 – Plan & Profile – 75th St
   - 25 – Plan & Profile – 75th St
   - 27 – Plan & Profile – 74th Ter
   - 29 – Cross Sections - Wornall Rd
   - 36 – Cross Sections - Wornall Rd
   - 37 – Cross Sections - Wornall Rd
   - 54 – Cross Sections – 75th St
   - 55 – Cross Sections – 75th St
   - 62 – Intersection Details – 77th Ter & Wornall Rd
   - 82 – Driveway Grading Enlargements
   - 116 – Traffic Signal Demo Plan – Wornall Rd & 75th St
- 118 – Traffic Signal Plan – Wornall Rd & 75th St
- 119 - Traffic Signal Dimension Plan – Wornall Rd & 75th St
- 120 – Traffic Signal Wiring Diagram, Phasing, & Sequence
- 121 – Traffic Signal Summary of Quantities
- 122 – Traffic Signal Plan – 75th & Wyandotte
- 129 – Pavement Marking and Signing Plan – Wornall Rd
- 131 – Pavement Marking and Signing Plan – 75th St
- 132 – Pavement Marking and Signing Plan – 75th St
- 133 – Overall Construction Sequencing
- 134 – Overall Detour Plan
- 135 – Construction Sequencing – Phase 1A
- 136 – Construction Sequencing – Phase 1B
- 137 – Construction Sequencing – Phase 2A
- 138 – Construction Sequencing – Phase 2B
- 139 – Construction Sequencing – Phase 3A
- 140 – Construction Sequencing – Phase 3B
- 141 – Construction Sequencing – Phase 4A
- 142 – Construction Sequencing – Phase 4B
- 143 – Construction Sequencing – Phase 4B
- 145 – Storm Sewer Plan & Profile
- 146 – Storm Sewer Plan & Profile
- 147 – Storm Sewer Plan & Profile
- 148 – Storm Sewer Plan & Profile
- 149 – Storm Sewer Plan & Profile
- 150 – Storm Sewer Plan & Profile
- 151 – Storm Sewer Plan & Profile
- 152 – Storm Sewer Plan & Profile
- 153 – Storm Sewer Plan & Profile
- 154 – Storm Sewer Plan & Profile

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.
## UNIT PRICES - ENGINEER’S ESTIMATE (BASE BID)

**Project Number:** City Project No. 89008516; Federal Project No. STP 3301(509)

**Project Title:** Wornall Road - 74th to 79th Streets

**NOTE:** IN THE EVENT OF DISCREPANCY, UNIT PRICE SHALL GOVERN.

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**WATER MAIN SUBTOTAL:**

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Note: May be printed, for manual fill-in, or filled in on electronic excel spreadsheet version.
## UNIT PRICES - ENGINEER’S ESTIMATE (ADD ALTERNATE NO. 1)

**Project Number:** City Project No. 89008516; Federal Project No. STP 3301(509)

**Project Title:** Wornall Road - 74th to 79th Streets

**NOTE:** IN THE EVENT OF DISCREPANCY, UNIT PRICE SHALL GOVERN.

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<td><strong>TRAFFIC - SIGNAGE AND PAVEMENT MARKINGS SUBTOTAL:</strong></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td>EA</td>
<td>11</td>
<td>REMOVAL - LUMINAIRE, BRACKET ARM AND CABLE</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
<td>EA</td>
<td>3</td>
<td>LUMINAIRE TYPE C</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>EA</td>
<td>11</td>
<td>LUMINAIRE TYPE D</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td></td>
<td>EA</td>
<td>2</td>
<td>POLE, METAL, FOR 30 FT LUMINAIRE MOUNTING HEIGHT</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td></td>
<td>EA</td>
<td>10</td>
<td>POLE, METAL, FOR 35 FT LUMINAIRE MOUNTING HEIGHT</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td></td>
<td>EA</td>
<td>2</td>
<td>BRACKET ARM, 6 FOOT, SINGLE MEMBER</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td></td>
<td>EA</td>
<td>9</td>
<td>BRACKET ARM, 10 FOOT, TRUSS TYPE</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td>EA</td>
<td>1</td>
<td>BRACKET ARM, 12 FOOT, TRUSS TYPE</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td></td>
<td>EA</td>
<td>2</td>
<td>ANTI-THEFT DEVICE (6&quot;)</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td></td>
<td>EA</td>
<td>10</td>
<td>ANTI-THEFT DEVICE (8&quot;)</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td></td>
<td>EA</td>
<td>13</td>
<td>ID LABELS KCMO: FOR LUMINAIRE POLES &amp; LUMINAIRE CONTROLLERS</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td></td>
<td>EA</td>
<td>24</td>
<td>BREAKAWAY KITS, HEB FUSED W/ 10A FUSES</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>EA</td>
<td>12</td>
<td>BREAKAWAY KITS, HEB UNFUSED</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td></td>
<td>EA</td>
<td>1</td>
<td>LIGHTING CONTROLLER, 120/240 VOLT 2 CIRCUIT</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td></td>
<td>EA</td>
<td>1</td>
<td>GROUND ROD</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td></td>
<td>LF</td>
<td>1312</td>
<td>CABLE-IN-DUCT, 1&quot; WITH 2 #8, 1 #8 G, RHH/RHW/USE</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td></td>
<td>LF</td>
<td>1250</td>
<td>TRENCHING FOR 1&quot; CABLE-IN-DUCT</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td>LF</td>
<td>95</td>
<td>3&quot; CONDUIT PVC SCH 40 TRENCHED</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td></td>
<td>EA</td>
<td>10</td>
<td>LUMINAIRE FOUNDATION (LARGE, 35 FT MOUNTING HEIGHT POLES)</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td></td>
<td>EA</td>
<td>2</td>
<td>LUMINAIRE FOUNDATION (SMALL, 30 FT MOUNTING HEIGHT POLES)</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td></td>
<td>EA</td>
<td>1</td>
<td>TYPE II PULL BOX</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>LF</td>
<td>1068</td>
<td>CABLE #10 RHW/USE (POLE AND BRACKET CABLE)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>STREET LIGHTING SUBTOTAL:</strong></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>SY</td>
<td>45</td>
<td>FESCUE TURF SOD</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>STREETScape SUBTOTAL:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>GRAND TOTAL - ALL ITEMS</strong></td>
<td>$ -</td>
</tr>
</tbody>
</table>

Note: May be printed, for manual fill-in, or filled in on electronic excel spreadsheet version.
JOB SPECIAL PROVISIONS

D. Asphaltic Cement Price Index:

This is the method of price adjustment for asphalt concrete materials (covered in this section) used on the Project. Adjustments will be made to the unit prices used to determine payments due the Contractor for any asphalt concrete base or asphalt concrete surface when the monthly average price for the asphalt cement used for the asphalt base or surface has fluctuated from the price determined on the month the project was bid. Adjustment calculations are based on PG64-22, but will apply equally to all grades of asphaltic cement. The calendar month price for the Kansas City metropolitan area shall be obtained from the following:

The monthly average price for the midpoint of the published prices of PG64-22 will be taken from the “Asphalt Weekly Monitor”® Kansas City, Missouri area and St. Louis, Missouri area, published by Poten & Partners Inc. The monthly base price will be the price from the last published “Asphalt Weekly Monitor”® prior to MoDOT’s monthly bid opening. This price will be published at http://www.modot.mo.gov/business/contractor resources/bidOpenIndex.shtml, and will be the price used for asphalt bidding and/or placement during the month following the published price.

1. The price adjustment will be applied to the percent of asphalt binder used in the mix design(s) of the asphaltic concrete approved for the project. The amount of asphalt shall be based on the percentage total of virgin asphalt binder contained in the design mix. The effective asphalt content obtained from the use of recycled asphaltic concrete pavement (RAP) will not be eligible for adjustment. Asphalt index adjustment will not be applied to work completed under a time-materials basis.

2. To determine the adjustment for any material specified in this provision the following formula will be used.

   \[ A = (B \times C) \times (D - E) \]

   Where:

   - A = Adjustment for mix placed during monthly average index period.
   - B = Tons of Mix Placed during the monthly average index period
   - C = % total of virgin asphalt binder as listed in the job mix formula in use
   - D = Monthly average price at time of mix placement
   - E = Monthly average price at time of bid

3. The Engineer will make adjustment payments (or deductions) for the applicable work completed. If the working days or calendar completion date expire, payments (or deductions) will continue to be applied, but the adjustment will be based on the index for the month the project working days or calendar completion date expired or the monthly average price at time of mix placement, whichever is lower.
Geotechnical Engineering Report
Wornall Road Improvements
Kansas City, Missouri
September 19, 2018
Terracon Project No. 02175345

Prepared for:
Walter P. Moore
Kansas City, Missouri

Prepared by:
Terracon Consultants, Inc.
Lenexa, Kansas
September 19, 2018

Walter P. Moore
1100 Walnut, Suite 1825
Kansas City, Missouri 64106

Attn:  Mr. Dan Brown, P.E. – Principal/Managing Director
      P:  (816) 701-2100
      E:  dlbrown@walterpmoore.com

Re:   Geotechnical Engineering Report
      Wornall Road Improvements
      74th Street to 79th Street
      Kansas City, Missouri
      Terracon Project No. 02175345

Dear Mr. Brown:

We have completed a geotechnical exploration for the above referenced project. This study was
performed in general accordance with Terracon Proposal No. P02175345 dated February 27,
2018. This report presents the findings of the subsurface exploration and provides geotechnical
recommendations concerning earthwork, stormwater basins, and pavements for the proposed
project.

We appreciate the opportunity to be of service to you on this project. If you have any questions
concerning this report, or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.

Kevin D. Friedrichs, P.E.
Project Engineer
Missouri: PE 2013010325

Kole C. Berg, P.E.
Senior Engineer
Missouri: PE 2002016417
REPORT TOPICS

INTRODUCTION ..................................................................................................................... 1
SITE CONDITIONS .................................................................................................................. 1
PROJECT DESCRIPTION ....................................................................................................... 1
GEOTECHNICAL CHARACTERIZATION .............................................................................. 2
EARTHWORK ........................................................................................................................ 3
PAVEMENTS ......................................................................................................................... 5
STORMWATER BMPS .......................................................................................................... 6
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Note: This report was originally delivered in a web-based format. Orange Bold text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS (Boring Logs and Laboratory Data)
SUPPORTING INFORMATION (General Notes and Unified Soil Classification System)
INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering evaluation performed for the proposed improvements of Wornall Road from 74th Street to 79th Street in Kansas City, Missouri. Twenty-five (25) exploratory borings were performed at the site to depths ranging from approximately 4 to 10 feet below existing site grades. This report describes the subsurface conditions encountered at the boring locations, presents the test data, and provides geotechnical recommendations for earthwork, pavement subgrade preparation and considerations for stormwater basins.

Maps showing boring locations are shown in the Site Location and Exploration Plan section. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the Exploration Results section of this report.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Location</td>
<td>The project alignment is Wornall Road from 74th Street to 79th Street in Kansas City, Missouri.</td>
</tr>
<tr>
<td>Existing Improvements</td>
<td>The road is presently asphalt surfaced with concrete curb, gutter and sidewalks.</td>
</tr>
</tbody>
</table>

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed in the project planning stage. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:
**Geotechnical Engineering Report**

Wornall Road Improvements ■ Kansas City, Missouri  
September 19, 2018 ■ Terracon Project No. 02175345  

**Project Description**

Wornall Road will be fully reconstructed from 74th to 79th Street. Green infrastructure elements (including stormwater best management practice (BMP)) will also be incorporated into the reconstruction project adjacent to the roadway alignment.

**Grading**

A site grading plan was not provided. We have considered less than 2 feet of cut/fill will be required to develop final grades.

**Below Grade Structures**

Below grade stormwater storage is planned beneath the parking lot at the Northeast corner of Wornall Road and 75th Street.

**Pavements**

No information regarding anticipated vehicle types, axle loads, or traffic volumes was provided. We assume that pavement design thicknesses will follow the KC Metro APWA standards.

### GEOTECHNICAL CHARACTERIZATION

#### Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following table provides our geotechnical characterization.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

**Borings drilled along Wornall Road (P-1 to P-17)**

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Approximate Depth to Bottom of Stratum</th>
<th>Material Description</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11 to 19 inches</td>
<td>Pavement section – 3 to 10 inches of asphalt over cobble stone aggregate with asphalt binder or concrete</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>1½ to 5 feet</td>
<td>Fill – Clayey Gravel with varying amounts of cobbles</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Undetermined: Borings terminated within this stratum at the planned depth of approximately 10 feet</td>
<td>Fat Clay (CH), with varying amounts of gravel</td>
<td>Medium stiff to stiff</td>
</tr>
</tbody>
</table>

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on
the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

The boreholes were observed during drilling for the presence and level of groundwater. Groundwater was not observed within 6 feet of the surface in the boreholes during our subsurface exploration. Long-term observations in piezometers or observation wells, sealed from the influence of surface water, would be needed to develop more detailed groundwater information. Groundwater level fluctuations occur due to variations in rainfall, runoff, and other factors not evident at the time we performed the borings. The potential for groundwater level fluctuations should be considered when developing the design and construction plans for the project.

EARTHWORK

Site Preparation

All preparatory site work should be in compliance with the latest version of Section 2100 – Grading and Site Preparation – Kansas City Metropolitan Chapter of the American Public Works Association (APWA).

Initial Proofrolling

After the street subgrades have been cut to grade, but before fill is placed, the subgrades should be proofrolled with a fully loaded, tandem-axle dump truck or other equipment providing an equivalent loading. The initial proofrolling will aid in delineating soft, yielding, or otherwise unsuitable soil located at or just below the exposed subgrade level. Areas that rut, pump, or deflect during the initial proofrolling should be overexcavated and replaced with engineered fill. Proofrolling is also recommended in areas left near existing grade after rough grading is completed. A minimum gross weight of 25 tons is recommended for the proofrolling equipment. In our opinion, experienced personnel should observe proofrolling operations to help identify unstable subgrade material.

Excavations and Temporary Slopes

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local, state, and federal safety regulations. The contractor should be aware that slope height, slope inclination, and excavation depth should in no instance exceed those specified by these safety regulations. Flatter slopes than those dictated by these regulations may be required depending upon the soil conditions encountered and other external factors. These regulations are strictly enforced and if they are not followed, the owner, contractor, and/or earthwork and utility subcontractor could be
liable and subject to substantial penalties. Under no circumstances should the information provided in this report be interpreted to mean that Terracon is responsible for construction site safety or the contractor’s activities. Construction site safety is the sole responsibility of the contractor who shall also be solely responsible for the means, methods, and sequencing of the construction operations.

**Material Requirements**

Materials that will be used as engineered fill to support pavements and other features that are settlement sensitive should consist of approved materials. Approved materials should be free of organic matter and debris. Frozen materials should not be used, and fill should not be placed on a frozen subgrade. Fill materials should be placed and compacted as shown in the table below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift Thickness (maximum)</td>
<td>9 inches in loose thickness when large, self-propelled compaction equipment is used.</td>
</tr>
<tr>
<td></td>
<td>4 inches when small, hand-guided equipment (plate or &quot;jumping jack&quot; compactor) is used.</td>
</tr>
<tr>
<td>Minimum Compaction Requirements</td>
<td>At least 95 percent of the material’s maximum dry density ¹</td>
</tr>
<tr>
<td>Moisture Content of Clay Soil</td>
<td>LL&lt;45 -2 to +2 percent of optimum moisture content value ¹</td>
</tr>
<tr>
<td></td>
<td>LL&gt;45 0 to 4 percent above the optimum moisture content value ¹</td>
</tr>
<tr>
<td>Moisture Content of Granular Material</td>
<td>Sufficient to achieve compaction without pumping when proofrolled</td>
</tr>
</tbody>
</table>

¹ As determined by the standard Proctor test (ASTM D 698)

We recommend that engineered fill be tested for moisture content and compaction during placement. If the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

To reduce the potential for future subgrade swell, the subgrade moisture should be maintained within the recommended range until the pavements are constructed. Grades should be sloped to provide rapid drainage of surface water away from the pavements.

**Pavement Subgrades**

Pavement subgrades should be prepared as outlined in the latest version of Section 2201 – Subgrade Preparation of Construction and Material Specifications from the KC Metropolitan Chapter of APWA.
Pavement subgrades are expected to consist of existing fill soils and native clay soils. If soft or otherwise unsuitable areas are observed, additional over-excavation and replacement will be needed.

Grading and paving are commonly performed by separate contractors and there is often a time lapse between the end of grading operations and the commencement of paving. Subgrades prepared early in the construction process may become disturbed by construction traffic. Non-uniform subgrades often result in poor pavement performance and local failures relatively soon after pavements are constructed. Depending on the paving equipment used by the contractor, measures may be required to improve subgrade strength to greater depths for support of heavily loaded concrete/asphalt trucks.

We recommend the moisture content and density of the subgrade be evaluated and the pavement subgrades be proofrolled (using a loaded tandem-axle dump truck with a minimum gross weight of 25 tons or similarly loaded rubber-tire equipment) within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be scarified, moisture conditioned, and compacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. The subgrade should be in its finished form at the time of the final review.

**PAVEMENTS**

**Minimum Pavement Thickness**

The following table is a summary of minimum pavement thicknesses from the KC Metro APWA Design Criteria for City Streets.

<table>
<thead>
<tr>
<th>Pavement Type</th>
<th>Major Arterial</th>
<th>Minor Arterial</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCC (Option 1)</td>
<td>9 inches PCC</td>
<td>8 inches PCC</td>
</tr>
<tr>
<td></td>
<td>6 inches compacted subgrade (at least 95% of maximum density - standard proctor)</td>
<td>6 inches compacted subgrade (at least 95% of maximum density - standard proctor)</td>
</tr>
<tr>
<td>ACC (Option 2)</td>
<td>2 inches Type 3 ACC surface</td>
<td>2 inches Type 3 ACC surface</td>
</tr>
<tr>
<td></td>
<td>10 inches Type 1 ACC base</td>
<td>9 inches Type 1 ACC base</td>
</tr>
<tr>
<td></td>
<td>6 inches compacted subgrade (at least 95% of maximum density - standard proctor)</td>
<td>6 inches compacted subgrade (at least 95% of maximum density - standard proctor)</td>
</tr>
</tbody>
</table>
PCC pavements will perform better than ACC in areas where short-radii turning and braking are expected (i.e., entrance/exit aprons) due to better resistance to rutting and shoving.

Paved areas should be sloped to provide rapid drainage of surface water. Pavements should be designed so water does not accumulate on or adjacent to the pavement, since this could saturate and soften the subgrade soils and subsequently accelerate pavement deterioration.

Periodic maintenance of the pavements will be required. Cracks should be sealed, and areas exhibiting distress should be repaired promptly to help prevent further deterioration. Even with periodic maintenance, some movement and related cracking may still occur and repairs may be required.

**STORMWATER BMPS**

Project plans call for several stormwater BMPs adjacent to the roadway. We performed borings at these locations and collected samples to conduct flexible wall permeability tests to determine the approximate rate at which water will infiltrate into the soil. This test was conducted on an undisturbed sample of soil collected using a thin-walled Shelby tube. The sample was placed in the flexible wall permeameter and subjected to a constant head of water. The following table presents our results:

<table>
<thead>
<tr>
<th>Sample Location (Depth)</th>
<th>Material Type</th>
<th>Hydraulic Conductivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMP-1 (3½ to 5½ feet)</td>
<td>Lean Clay (CL)</td>
<td>0.000156 inches/hour</td>
</tr>
<tr>
<td>BMP-3 (1 to 3 feet)</td>
<td>Fat Clay (CH), trace gravel</td>
<td>0.000354 inches/hour</td>
</tr>
</tbody>
</table>

Based on these results the hydraulic conductivity or rate of infiltration is low for the clay soils encountered at the site. Typical hydraulic conductivity rates for clays in the Kansas City area range from 0.05 to 0.15 inches per hour. The results shown in the table above are based on testing a relatively small sample of soil in a controlled laboratory environment. We recommend a field infiltration test (double ring infiltration or similar) be conducted at the proposed bottom elevation of an accessible BMP location to either confirm or refute these laboratory rates in a field setting.

The hydraulic conductivity of the soils in the base of the BMP can be increased by decompacting the bottom 12 inches of the BMP and incorporating 2 inches of sand into the soil. This may be a viable option to increase the infiltration rate if results of the field double ring infiltration test confirm the low hydraulic conductivity rates from the flexible wall permeability tests conducted in the lab.

Borings BMP-3 and BMP-4 encountered fill and a concrete or limestone obstruction at a depth of approximately 3½ to 4 feet below the ground surface. Existing fill and any impermeable
obstructions should be removed from the bottom elevation of the BMPs and replaced with soil with an appropriate hydraulic conductivity that is acceptable to the BMP design engineer.

Groundwater was not encountered in any of the BMP borings and was not encountered at any location within 6 feet of the ground surface. We do not anticipate groundwater within the depth of excavation for the BMPs and groundwater is not anticipated to impact the performance of the stormwater BMPs.

**GENERAL COMMENTS**

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.
ATTACHMENTS
EXPLORATION AND TESTING PROCEDURES

Field Exploration

The borings were located in the field by Terracon personnel using a hand-held GPS unit with a horizontal accuracy of ±10 feet. Ground surface elevations at the boring locations were not measured by our field crew.

The borings were drilled with a truck-mounted, rotary drill rig using solid-stem, continuous flight augers to advance the boreholes. Samples of the soil encountered in the borings were obtained using thin-walled tube and split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outside diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. The drill crew backfilled the borings with auger cuttings after completion of drilling/sampling and prior to leaving the site.

The drill crew prepared a field log of each boring to record data including visual classifications of the materials encountered during drilling as well as the driller’s interpretation of the subsurface conditions between samples. The final boring logs included with this report represent the engineer’s interpretation of the subsurface conditions at the borings based on field and laboratory data and observation of the samples.

Laboratory Testing

Representative soil samples were tested in the laboratory to measure their natural water content, dry unit weight, and Atterberg limits. A pocket penetrometer was used to estimate the consistency of selected cohesive samples. Flex-wall permeability tests were conducted on select samples at proposed stormwater BMP locations. The test results are provided on the boring logs included in Exploration Results.

The soil samples were classified in the laboratory based on visual observation, texture, plasticity, and the laboratory testing described above. The soil descriptions presented on the boring logs are in accordance with the enclosed General Notes and Unified Soil Classification System (USCS). The estimated USCS group symbols for native soils are shown on the boring logs, and a brief description of the USCS is included in this report.
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION PLAN
Wornall Road Improvements ■ Kansas City, MO
July 17, 2018 ■ Terracon Project No. 02175345
EXPLORATION PLAN
Wornall Road Improvements ■ Kansas City, MO
July 17, 2018 ■ Terracon Project No. 02175345

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES
AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS
EXPLORATION PLAN
Wornall Road Improvements ■ Kansas City, MO
July 17, 2018 ■ Terracon Project No. 02175345

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS
NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED
BY MICROSOFT BING MAPS
EXPLORATION RESULTS
**BORING LOG NO. BMP-1**

**PROJECT:** Wornall Road Improvements  
**CLIENT:** Walter P Moore & Associates Inc  
**SITE:** Wornall Road Between 74th and 79th Street  
**Location:** Kansas City, MO

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>SAMPLE TYPE</th>
<th>FIELD TEST RESULTS</th>
<th>DRY UNIT WEIGHT</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>6&quot; ASPHALT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>8&quot; CONCRETE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.5</td>
<td>FILL - FAT CLAY, with gravel, dark brown to gray</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.5</td>
<td>FAT CLAY (CH), dark brown to gray, stiff</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Advancement Method:** Continuous Flight Auger  
**Abandonment Method:** Boring backfilled with Auger Cuttings  
**Surface capped with asphalt**

**Notes:**

- Water content (%)
- Dry unit weight
- Atterberg limits

**Graphical Log:**

- Stratification lines are approximate. In-situ, the transition may be gradual.
- Hammer Type: Automatic

**Elevations were not determined.**

**WATER LEVEL OBSERVATIONS:**

Groundwater not encountered

**Drill Rig:** RC  
**Driller:** RC

**Boring Started:** 05-18-2018  
**Boring Completed:** 05-18-2018  
**Project No.:** 02175345
**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
Kansas City, MO

**CLIENT:** Walter P Moore & Associates Inc  
Kansas City, MO

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**LOCATION**  
See Exploration Plan  
Latitude: 38.991841° Longitude: -94.59402°

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**WATER LEVEL OBSERVATIONS**

**DEPT (Ft.)** | **RECOVERY (In.)** | **FIELD TEST RESULTS** | **WATER CONTENT (%)**  
--- | --- | --- | ---
5 | 13 | 4.5+ | 18
5 | 16 | 1.75 | 29 96

---

**5" ROOT ZONE**

- **FILL - FAT CLAY**, with gravel, dark brown to gray
- **FAT CLAY (CH)**, dark brown to gray, stiff

---

**Stratification lines are approximate. In-situ, the transition may be gradual.**  
**Hammer Type:** Automatic

---

**Advancement Method:**  
Continuous Flight Auger

**Abandonment Method:**  
Boring backfilled with Auger Cuttings  
Surface capped with asphalt

---

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

---

**Notes:**

- Advancement Method: Continuous Flight Auger  
- Abandonment Method: Boring backfilled with Auger Cuttings  
Surface capped with asphalt  
- Notes:  
- Water Level Observations:  
- Stratification lines are approximate. In-situ, the transition may be gradual.  
- Hammer Type: Automatic

---

**Boring Terminated at 5 Feet**

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**Terracon**  
13910 W 96th Ter  
Lenexa, KS

---

**Boring Started:** 05-18-2018  
**Boring Completed:** 05-18-2018  
**Drill Rig:** RC  
**Driller:** RC  
**Project No.:** 02175345
BORING LOG NO. BMP-3

PROJECT:  Wornall Road Improvements

CLIENT:  Walter P Moore & Associates Inc
Kansas City, MO

SITE:  Wornall Road Between 74th and 79th Street
Kansas City, MO

GRAPHIC LOG

LOCATION  See Exploration Plan
Latitude: 38.99155° Longitude: -94.594085°

DEPT.

6" Root Zone

FILL - FAT CLAY, with gravel, dark brown to gray

3.8  limestone boulder or slab below 3.7 feet

Auger Refusal at 3.8 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Notes:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were not determined.

WATER CONTENT (%)
DRY UNIT WEIGHT (pcf)
ATTERBERG LIMITS

WATER LEVEL OBSERVATIONS

DEPTH (Ft.)  FIELD TEST RESULTS  RECOVERY (In.)  PENETRATOR (ft/s)

3.8  11  17  109  50-18-32

Berger

3.8  8  25  100

Berger

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG -NO WELL 02175345 WORNALL ROAD IMPROVEMENTS TERRACON DATATEMPLATE.GDT 7/17/18

Driller: RCBoring Completed: 04-26-2018

Boring Started: 04-26-2018

Drill Rig: RC
Driller: RC

Project No.: 02175345

13910 W 96th Ter
Lenexa, KS
### WATER LEVEL OBSERVATIONS

**Groundwater not encountered**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>HAND PENETROMETER (tsf)</th>
<th>WATER CONTENT (%)</th>
<th>DRY UNIT WEIGHT (pcf)</th>
<th>WALTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LL-PL-PI</td>
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<tr>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Auger Refusal at 3.8 Feet

Limestone boulder or slab below 3.7 feet

**6" ROOT ZONE**

**FAT CLAY**, with gravel, dark brown to gray

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

---

**Location:** See Exploration Plan

Latitude: 38.990811° Longitude: -94.594109°

---

**Notes:**

- Advancement Method: Continuous Flight Auger
- Abandonment Method: Boring backfilled with auger cuttings upon completion.
- See **Exploration and Testing Procedures** for a description of field and laboratory procedures used and additional data (if any).
- See **Supporting Information** for explanation of symbols and abbreviations.
- Elevations were not determined.

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**Boring Log No. BMP-4**

**Project:** Wornall Road Improvements

**Client:** Walter P Moore & Associates Inc

**Site:** Wornall Road Between 74th and 79th Street

**Kansas City, MO**

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**Driller:** RCBoring Completed: 04-26-2018

**Boring Started:** 04-26-2018

**Notes:**

- Project No.: 02175345
- Drill Rig: RC
- Driller: RC
- Drill Rig: RC
- Project No.: 02175345

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**Wornall Road Between 74th and 79th Street**

**Kansas City, MO**

---

**Elevations were not determined.**
**BORING LOG NO. BMP-5**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
Kansas City, MO

**CLIENT:** Walter P Moore & Associates Inc  
Kansas City, MO

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**LOCATION**  
See Exploration Plan

Latitude: 38.992206° Longitude: -94.592067°

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**GRAPHIC LOG**

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>WEATHERED LAYERS</th>
<th>STRATIFICATION</th>
<th>SAMPLE TYPE</th>
<th>RECOVERY (In.)</th>
<th>FIELD TEST RESULTS</th>
<th>ATTERBERG LIMITS</th>
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</thead>
<tbody>
<tr>
<td>0.5</td>
<td>6” ASPHALT</td>
<td>*</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>0.9</td>
<td>5” AGGREGATE BASE</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td>FAT CLAY</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*FAT CLAY, dark brown to gray, stiff*

*Stratification lines are approximate. In-situ, the transition may be gradual.*

Hammer Type: Automatic

---

**ADVANCEMENT METHOD**  
Continuous Flight Auger

**ABANDONMENT METHOD**  
Boring backfilled with Auger Cuttings  
Surface capped with asphalt

---

**WATER LEVEL OBSERVATIONS**  
Groundwater not encountered

---

**Elevations were not determined.**

---

Notes:

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Boring Started: 05-18-2018  
Boring Completed: 05-18-2018

Drill Rig: RC  
Driller: RC

Project No.: 02175345
## BORING LOG NO. S-1

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**LOCATION:** See Exploration Plan  

### GRAPHIC LOG

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>PENETRATION (ft)</th>
<th>WATER CONTENT (%)</th>
<th>DRY UNIT WEIGHT (pcf)</th>
<th>LL-PL-PI</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>6&quot; ASPHALT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>6&quot; AGGREGATE BASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1.5        | FILL - FAT CLAY, with gravel, dark brown to gray | 18 | 2.3.3  
N=6 | 29 | 77-24-53 | |
| 5.0        | FAT CLAY (CH), dark brown to gray, medium stiff to stiff | 15 | 3.3.5  
N=8 | 29 | |
| 10.0       | Boring Terminated at 10 Feet | 18 | 2.4.4  
N=8 | 24 | |
| 10.0       |                                | 18 | 3.3.5  
N=8 | 22 | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

**Advancement Method:** Continuous Flight Auger  
**Abandonment Method:** Boring backfilled with Auger Cuttings  
**Surface capped with asphalt**  

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any). See Supporting Information for explanation of symbols and abbreviations.

**Notes:**

- Elevations were not determined.

- Groundwater not encountered

---

**Boring Terminated at 10 Feet**
**BORING LOG NO. S-2**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street, Kansas City, MO

<table>
<thead>
<tr>
<th>DEPTH (FL)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>DRY UNIT WEIGHT (pcf)</th>
<th>ATTERBERG LIMITS (LL-PL-PI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>FILL - FAT CLAY, with gravel, dark brown to gray</td>
<td>12 3-2-3 N=5 27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>4&quot; ASPHALT</td>
<td>18 2-3-5 N=8 28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>12&quot; AGGREGATE BASE</td>
<td>18 3-4-5 N=9 27</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FAT CLAY (CH), dark brown to gray</td>
<td>18 3-4-5 N=9 23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Boring Terminated at 10 Feet*

Stratification lines are approximate. In-situ, the transition may be gradual.

**Notes:**

- **Advancement Method:** Continuous Flight Auger
- **Abandonment Method:** Boring backfilled with Auger Cuttings, Surface capped with asphalt
- **WATER LEVEL OBSERVATIONS:** Groundwater not encountered
- **Elevations were not determined.**

See **Exploration and Testing Procedures** for a description of field and laboratory procedures used and additional data (if any).

See **Supporting Information** for explanation of symbols and abbreviations.

**Drill Rig:** RC  
**Driller:** RC  
**Project No.:** 02175345

**Boring Started:** 05-18-2018  
**Boring Completed:** 05-18-2018
**BORING LOG NO. S-3**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**Kansas City, MO**

<table>
<thead>
<tr>
<th>DEPTH (FL.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>SAMPLE TYPE</th>
<th>FIELD TEST RESULTS</th>
<th>PENETRATION TESTER (ft)</th>
<th>WET CONTENT (%)</th>
<th>DRY UNIT WEIGHT (g/ft³)</th>
<th>LL-PL-PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4</td>
<td>5&quot; ASPHALT</td>
<td></td>
<td>3-4-3 N=7</td>
<td>14</td>
<td>55-23-32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.9</td>
<td>6&quot; AGGREGATE BASE</td>
<td></td>
<td>3-4-5 N=9</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>FILL - FAT CLAY, with gravel, dark brown to gray</td>
<td></td>
<td>3-4-5 N=9</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>FAT CLAY (CH), dark brown to gray, medium stiff to stiff</td>
<td></td>
<td>3-3-5 N=8</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Boring Terminated at 10 Feet*

Stratification lines are approximate. In-situ, the transition may be gradual.

**Hammer Type:** Automatic

**Advancement Method:** Continuous Flight Auger

**Abandonment Method:** Boring backfilled with Auger Cuttings  
Surface capped with asphalt

**See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any). See Supporting Information for explanation of symbols and abbreviations.**

**Notes:**

**Elevations were not determined.**

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

---

**Notes:**

**Boring Started:** 05-18-2018  
**Boring Completed:** 05-18-2018

**Drill Rig:** RC  
**Driller:** RC

**Project No.: 02175345**
### BORING LOG NO. P-1

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**LOCATION:** Kansas City, MO

<table>
<thead>
<tr>
<th>GRAPHIC LOG</th>
<th>DESCRIPTION</th>
<th>DEPTH</th>
<th>WATERLEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>ATTERBERG LIMITS</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; ASPHALT</td>
<td>0.7</td>
<td>5</td>
<td>5-3-2 N=5</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot; COBBLE STONE AGGREGATE WITH ASPHALT BINDER</td>
<td>10</td>
<td>16</td>
<td>2-3-5 N=8</td>
<td>29</td>
<td>65-25-40</td>
<td></td>
</tr>
<tr>
<td>FILL - CLAYEY GRAVEL, with cobbles, light brown to gray</td>
<td>10.0</td>
<td>14</td>
<td>2-2-3 N=5</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAT CLAY (CH), dark brown to gray, medium stiff to stiff</td>
<td>10.0</td>
<td>18</td>
<td>2-3-3 N=6</td>
<td>23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.  
Hammer Type: Automatic

---

**ADVEANCEMENT METHOD:** Continuous Flight Auger  
**ABANDONMENT METHOD:** Boring backfilled with Auger Cuttings  
Surface capped with asphalt

**WATER LEVEL OBSERVATIONS**  
Groundwater not encountered

**See Exploration and Testing Procedures** for a description of field and laboratory procedures used and additional data (if any). See Supporting Information for explanation of symbols and abbreviations.

**ELEVATIONS WERE NOT DETERMINED.**

---

<table>
<thead>
<tr>
<th>WATERTABLE (Ft.)</th>
<th>DRY UNIT WEIGHT (pcf)</th>
<th>LL-PL-PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>65-25-40</td>
<td></td>
</tr>
</tbody>
</table>

---

**ADVANCEMENT METHOD:** Continuous Flight Auger  
**ABANDONMENT METHOD:** Boring backfilled with Auger Cuttings  
Surface capped with asphalt

**Notes:**

**WATER LEVEL OBSERVATIONS**  
Groundwater not encountered

---

**Drill Rig:** RC  
**Driller:** RC  
**Project No.: 02175345**
**BORING LOG NO. P-2**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**Location:** Kansas City, MO

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>DRY UNIT WEIGHT</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RECOVERY (In.)</td>
<td>PENETRATION (ft)</td>
<td>WATER CONTENT (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HAND PENETROMETER (tsf)</td>
<td></td>
<td>LL-PL-PI</td>
</tr>
<tr>
<td>0.0</td>
<td>8&quot; ASPHALT</td>
<td>15</td>
<td>2-3-3</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N=6</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>4&quot; COBBLE STONE AGGREGATE WITH ASPHALT BINDER</td>
<td>18</td>
<td>1-2-3</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>FILL - CLAYEY GRAVEL, with cobbles, light brown to gray</td>
<td></td>
<td>N=5</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>FAT CLAY (CH), dark brown to gray, medium stiff to stiff</td>
<td>18</td>
<td>3-4-4</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N=8</td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>Boring Terminated at 10 Feet</td>
<td>18</td>
<td>2-4-4</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N=8</td>
<td></td>
</tr>
</tbody>
</table>

Stratification lines are approximate. In-situ, the transition may be gradual.

**Hammer Type:** Automatic

**Advancement Method:** Continuous Flight Auger

**Abandonment Method:** Boring backfilled with Auger Cuttings  
Surface capped with asphalt

**Notes:**

- Elevations were not determined.
- See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).
- See Supporting Information for explanation of symbols and abbreviations.

**Groundwater not encountered**

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**Terracon**

13910 W 96th Ter  
Lenexa, KS

Boring Started: 05-18-2018  
Boring Completed: 05-18-2018  
Drill Rig: RC  
Driller: RC  
Project No.: 02175345
## BORING LOG NO. P-3

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
Kansas City, MO

**LOCATION**  
See Exploration Plan  
Latitude: 38.992675° Longitude: -94.594235°

### WATER LEVEL OBSERVATIONS

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>RECOVERY (IN.)</th>
<th>PENETRATION (TSF)</th>
<th>WATER CONTENT (%)</th>
<th>DRY UNIT WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td></td>
<td></td>
<td>18</td>
<td>3-5-8 N=13</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>12.0</td>
<td></td>
<td></td>
<td>8</td>
<td>3-10-12 N=22</td>
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<td>14.0</td>
<td></td>
<td></td>
<td>52-20-32</td>
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<td></td>
</tr>
</tbody>
</table>

**GRAPHIC LOG**  
Hammer Type: Automatic

### NOTES

- Advancement Method: Continuous Flight Auger
- Abandonment Method: Boring backfilled with Auger Cuttings, Surface capped with asphalt
- Boring Terminated at 10 Feet

- Stratification lines are approximate. In-situ, the transition may be gradual.
- Water content (%)
- Dry unit weight (pcf)
- Atterberg Limits

### WATER CONTENT

- 0.3
- 0.9
- 5.0

### WATER LEVEL OBSERVATIONS

- Groundwater not encountered

### WATER LEVEL OBSERVATIONS

- 3" ASPHALT
- 8" COBBLE STONE AGGREGATE WITH ASPHALT BINDER
- FILL - CLAYEY GRAVEL, with cobbles, light brown to gray
- FILL - FAT CLAY, with gravel, dark brown
- FAT CLAY (CH), dark brown to gray, stiff

### SITE

- See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).
- See Supporting Information for explanation of symbols and abbreviations.

### WATER LEVEL OBSERVATIONS

- See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).
- Elevation were not determined.

### BORING TERMINATED AT 10 FEET

- Boring Started: 05-18-2018  
Boring Completed: 05-18-2018

**PROJECT:** Wornall Road Improvements  
**LOCATION:** Lenexa, KS

**WATER LEVEL OBSERVATIONS**

- Groundwater not encountered

**DRILL RIG:** RC  
**DRILLER:** RC

**PROJECT NO.:** 02175345
**BORING LOG NO. P-4**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**Kansas City, MO**

**LOCATION**  
See Exploration Plan  
Latitude: 38.992196° Longitude: -94.594387°

---

**7" ASPHALT**

**12" COBBLE STONE AGGREGATE WITH ASPHALT BINDER**

**FILL - CLAYEY GRAVEL**, with cobbles, light brown to gray  
**FAT CLAY (CH)**, dark brown to gray, medium stiff to stiff

---

**DEPTH**

**WATER LEVEL OBSERVATIONS**

<table>
<thead>
<tr>
<th>Depth (Ft.)</th>
<th>Recovery (In.)</th>
<th>Field Test Results</th>
<th>Sample Type</th>
<th>Penetrometer (tsf)</th>
<th>Water Content (%)</th>
<th>Dry Unit Weight (pcf)</th>
<th>Atterberg Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>14</td>
<td>2-3-3 N=8</td>
<td>RECOVERY 1</td>
<td>33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td>17</td>
<td>3-3-5 N=8</td>
<td>RECOVERY 2</td>
<td>30</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>18</td>
<td>2-2-3 N=5</td>
<td>RECOVERY 3</td>
<td>29</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>18</td>
<td>2-2-4 N=6</td>
<td>RECOVERY 4</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boring Terminated at 10 Feet

---

**Notes:**

Adhesion Method: Continuous Flight Auger  
Abandonment Method: Boring backfilled with Auger Cuttings  
Surface capped with asphalt

---

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

---

**See Exploration and Testing Procedures** for a description of field and laboratory procedures used and additional data (if any).

**See Supporting Information** for explanation of symbols and abbreviations.

---

**Notes:**

Boring Started: 05-17-2018  
Boring Completed: 05-17-2018  
Drill Rig: RC  
Driller: RC  
Project No.: 02175345
**WATER LEVEL OBSERVATIONS**

- Depth: 10 feet
- Observation: Boring Terminated at 10 feet

**FIELD TEST RESULTS**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Sample Type</th>
<th>Recovery (In.)</th>
<th>Field Penetrometer (tsf)</th>
<th>Water Content (%)</th>
<th>Dry Unit Weight (pcf)</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>Fill - Clayey Gravel with cobbles</td>
<td>23</td>
<td>3.5</td>
<td>3.5</td>
<td>42.1-21</td>
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<tr>
<td>5</td>
<td>Clayey Gravel</td>
<td>27</td>
<td>4</td>
<td>4</td>
<td>21-21</td>
</tr>
<tr>
<td>10</td>
<td>Sand Gravel</td>
<td>28</td>
<td>5</td>
<td>5</td>
<td>42-21</td>
</tr>
</tbody>
</table>

**Advanced Method:** Continuous Flight Auger

**Abandonment Method:** Boring cuttings backfilled with auger cuttings

**Notes:**
- Elevations were not determined.
- See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data, if any.
- See Supporting Information for explanation of symbols and abbreviations.
- Water content, dry unit weight, and Atterberg limits were not determined.

**Boring Terminated at 10 Feet**

**Hammer Type:** Automatic

**Water Level Observations**

<table>
<thead>
<tr>
<th>Depth (Ft.)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>See Exploration Plan Latitude: 38.991789° Longitude: -94.594351°</td>
</tr>
<tr>
<td>5</td>
<td>9 feet while drilling</td>
</tr>
<tr>
<td>10</td>
<td>9.5 feet after completion</td>
</tr>
</tbody>
</table>

**Elevations were not determined.**

**See Exploration and Testing Procedures for an explanation of field and laboratory procedures used and additional data (if any).See Supporting Information for explanation of symbols and abbreviations.**
PROJECT: Wornall Road Improvements

SITE: Wornall Road Between 74th and 79th Street
Kansas City, MO

CLIENT: Walter P Moore & Associates Inc
Kansas City, MO

GRAPHIC LOG
LOCATION
See Exploration Plan
Latitude: 38.991225° Longitude: -94.594375°

DEPTH
10" ASPHALT
13.8
4" COBBLE STONE AGGREGATE WITH ASPHALT BINDER
FILL - CLAYEY GRAVEL, with cobbles, light brown to gray
3.5
FAT CLAY (CH), dark brown to gray, medium stiff to stiff
10.0

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Notes:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).
See Supporting Information for explanation of symbols and abbreviations.
Elevations were not determined.

WATER LEVEL OBSERVATIONS
Groundwater not encountered

FIELD TEST
SAMPLE TYPE
RECOVERY (in.)
FIELD TEST RESULTS
2-3-5
N=8
21
3-6-6
N=12

WATER CONTENT (%)
DRIED WEIGHT (pcf)

ATERBERG LIMITS
LL-PL-PI

WATER LEVELOBSERVATIONS
DEPTH (Ft.)
5
10
5
10

13
18
18
18

5
10

FIELD TEST
SAMPLE TYPE
RECOVERY (in.)
FIELD TEST RESULTS

Hammer Type: Automatic

Elevations were not determined.

Notes:

Drizzler: RC
Driller: RC
Project No.: 02175345

Boring Started: 05-17-2018
Boring Completed: 05-17-2018

Corporation
13910 W 96th Ter
Lenexa, KS
### BORING LOG NO. P-7

**PROJECT:** Wornall Road Improvements  
**CLIENT:** Walter P Moore & Associates Inc  
**SITE:** Wornall Road Between 74th and 79th Street  
Kansas City, MO

<table>
<thead>
<tr>
<th>LOCATION</th>
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<tbody>
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<td>Latitude: 38.990605° Longitude: -94.594385°</td>
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#### GRAPHIC LOG

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>RECOVERY (In.)</th>
<th>FIELD TEST RESULTS</th>
<th>DRY UNIT WEIGHT (pcf)</th>
<th>LL-PL-PI</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7</td>
<td>8&quot; ASPHALT</td>
<td>14</td>
<td>4-5-6 N=11</td>
<td>20</td>
<td>50-20-30</td>
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<tr>
<td>1.3</td>
<td>8&quot; CONCRETE</td>
<td>18</td>
<td>3-3-4 N=7</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td>FILL - CLAYEY GRAVEL, light brown to gray</td>
<td>18</td>
<td>2-3-4 N=7</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>FAT CLAY (CH), dark brown to gray, medium stiff to stiff</td>
<td>18</td>
<td>3-4-7 N=11</td>
<td>24</td>
<td></td>
<td></td>
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</tbody>
</table>

**Boring Terminated at 10 Feet**

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

<table>
<thead>
<tr>
<th>ADVANCEMENT METHOD</th>
<th>Abandonment Method</th>
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</thead>
<tbody>
<tr>
<td>Continuous Flight Auger</td>
<td>Boring backfilled with Auger Cuttings</td>
</tr>
</tbody>
</table>

**WATER LEVEL OBSERVATIONS**

- 6.5 feet while drilling
- 7.5 feet after completion

---

**Notes:**

- Elevations were not determined.

---

**See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).**

**See Supporting Information for explanation of symbols and abbreviations.**

**Advancement Method:**

**Continuous Flight Auger**

**Abandonment Method:**

Boring backfilled with Auger Cuttings  
Surface capped with asphalt

**Drill Rig:** RC  
**Driller:** RC  
**Project No.:** 02175345

**Boring Started: 05-17-2018**  
**Boring Completed: 05-17-2018**

**Client:** Kansas City, MO

---

**Teraccon**

13910 W 96th Ter  
Lenexa, KS

---

**Project No.:** 02175345
**BORING LOG NO. P-8**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**LOCATION:** See Exploration Plan  
Latitude: 38.990044° Longitude: -94.594422°

<table>
<thead>
<tr>
<th>DEPTH (FL.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>SAMPLE TYPE</th>
<th>RECOVERY (%.)</th>
<th>PENETRATION (ft.)</th>
<th>DRY UNIT WEIGHT (pcf)</th>
<th>LL-PL-PI</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>7” ASPHALT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>FILL - CLAYEY GRAVEL, with cobbles, light brown to gray</td>
<td>FAT CLAY (CH), dark brown to gray, medium stiff to stiff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>Boring Terminated at 10 Feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WATER CONTENT (%)

<table>
<thead>
<tr>
<th>WATER CONTENT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
</tr>
<tr>
<td>28</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>23</td>
</tr>
</tbody>
</table>

**DEPTH OBSERVATIONS**

- **9 feet while drilling**
- **9.5 feet after completion**

**Notes:**

- Advancement Method: Continuous Flight Auger
- Abandonment Method: Boring backfilled with Auger Cuttings, Surface capped with asphalt
- Notes:
  - Elevations were not determined.
  - See [Exploration and Testing Procedures](#) for description of field and laboratory procedures used and additional data.
  - See Supporting Information for explanation of symbols and abbreviations.

**Hammer Type:** Automatic

**Terrain:** See Exploration Plan

**Drill Rig:** RC  
**Driller:** RC

**Boring Started:** 05-17-2018  
**Boring Completed:** 05-17-2018

**Terrain:** See Exploration Plan

**Drill Rig:** RC  
**Driller:** RC

**Project No.:** 02175345

**13910 W 96th Ter**  
**Lenexa, KS**
### BORING LOG NO. P-9

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**Kansas City, MO**

<table>
<thead>
<tr>
<th>GRAPHIC LOG</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Sample Type</td>
<td>Recovery (In)</td>
<td>Penetration (tsf)</td>
</tr>
<tr>
<td>Latitude: 38.989498° Longitude: -94.594435°</td>
<td>Depth (Fl)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>7&quot; ASPHALT</td>
<td>N=7</td>
<td>3-3-4</td>
</tr>
<tr>
<td>1.0</td>
<td>5&quot; COBBLE STONE AGGREGATE WITH ASPHALT BINDER</td>
<td>N=10</td>
<td>3-5-5</td>
</tr>
<tr>
<td>1.8</td>
<td>FILL - CLAYEY GRAVEL, with cobbles, light brown to gray</td>
<td>N=7</td>
<td>3-3-4</td>
</tr>
<tr>
<td>10.0</td>
<td>FAT CLAY (CH), dark brown to gray, medium stiff to stiff</td>
<td>N=7</td>
<td>2-3-4</td>
</tr>
</tbody>
</table>

**Boring Terminated at 10 Feet**

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

**Advancement Method:** Continuous Flight Auger

**Abandonment Method:** Boring backfilled with Auger Cuttings, Surface capped with asphalt

**Notes:**

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

---

**Terrain:**

- **7" ASPHALT**
- **5" COBBLE STONE AGGREGATE WITH ASPHALT BINDER**
- **FILL - CLAYEY GRAVEL, with cobbles, light brown to gray**
- **FAT CLAY (CH), dark brown to gray, medium stiff to stiff**

**Borehole Details:***

- **Location:** See Exploration Plan
- **Water Content:** 0.60, 1.01, 1.80
- **Dry Unit Weight:** 10.00

---

**Water Level Observations:**

- **Depth (Ft):** 5, 10
- **Observations:** Groundwater not encountered

---

**Dates:**

- **Boring Started:** 05-17-2018
- **Boring Completed:** 05-17-2018
- **Drill Rig:** RC
- **Driller:** RC

---

**Supporting Information:**

- See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).
- See Supporting Information for explanation of symbols and abbreviations.
- Elevations were not determined.
PROJECT: Wornall Road Improvements

SITE: Wornall Road Between 74th and 79th Street
Kansas City, MO

CLIENT: Walter P Moore & Associates Inc
Kansas City, MO

LOCATION: See Exploration Plan
Latitude: 38.988945° Longitude: -94.594421°

GRAPHIC LOG

DEPTH (FL.) WATER CONTENT (%)
10.0 0.7

DEPTH (FL.) DRY UNIT WEIGHT (pcf)
10.0 100

WATER LEVEL OBSERVATIONS

DEPTH (Ft.) LOCATION
5 10.0

FIELD TEST RESULTS

RECOVERY (In.) PENETRATION (tsf)
6 2-4-4 N=8 5-4-4 N=8
18 2-3-4 N=7 5-4-5 N=9
18 2-2-3 N=5

STRATIFICATION lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Notes:

WATER CONTENT (%)

DRY UNIT WEIGHT (pcf)

ATERBERG LIMITS

10.0 100

Notes:

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Boring Terminated at 10 Feet

Drill Rig: 746
Driller: BP
Project No.: 02175345

Boring Started: 05-17-2018
Boring Completed: 07-12-2018
## BORING LOG NO. P-11

### PROJECT: Wornall Road Improvements

### SITE: Wornall Road Between 74th and 79th Street

### CLIENT: Walter P Moore & Associates Inc
Kansas City, MO

#### WATER LEVEL OBSERVATIONS

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>FIELD TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>2-3-6 N=9</td>
</tr>
<tr>
<td>18</td>
<td>2-2-3 N=5</td>
</tr>
</tbody>
</table>

#### STRATIFICATION

- **4.5" ASPHALT**
- **7.5" CONCRETE**
- **FAT CLAY (CH)**, dark brown to gray, medium stiff to stiff

#### Advancement Method:
Continuous Flight Auger

#### Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

#### Notes:
Elevations were not determined.

#### Boring Terminated at 10 Feet

#### Stratification lines are approximate. In-situ, the transition may be gradual.

#### Hammer Type: Automatic

#### WATER CONTENT (%)

#### DRY UNIT WEIGHT (pcf)

#### ATTERBERG LIMITS: LL-PL-PI

---

**THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.**

GEO SMART LOG-NO WELL 02175345 WORNALL ROAD IMPR.GPJ TERRACON_DATATEMPLATE.GDT 7/17/18

---

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

---

**WATER CONTENT (%)**

---

**DRY UNIT WEIGHT (pcf)**

---

**ATTERBERG LIMITS: LL-PL-PI**

---

**ELEVATIONS**

---

**SURFACE CONDITIONS**

---

**Notes:**

---

**Terrain:**

---

**Driller:** BP

---

**Boring Started:** 07-12-2018

---

**Boring Completed:** 07-12-2018

---

**Drill Rig:** 746

---

**Driller:** BP

---

**Project No.: 02175345**

---

**13910 W 96th Ter Lenexa, KS**

---

**Walter P Moore & Associates Inc**

---

**Kansas City, MO**

---

**TERRACON DATA TEMPLATE.GDT 7/17/18**

---

**THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.**
**BORING LOG NO. P-12**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**CLIENT ADDRESS:** Kansas City, MO  

### GRAPHIC LOG

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>See Exploration Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude: 38.987998° Longitude: -94.594455°</td>
<td></td>
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</table>

### DEPTH

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>10.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4.5&quot; ASPHALT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7&quot; CONCRETE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FAT CLAY (CH), dark brown to gray, medium stiff to stiff</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Boring Terminated at 10 Feet**

<table>
<thead>
<tr>
<th>WATER LEVEL OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater not encountered</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>FIELD TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEPTH (Ft.)</strong></td>
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<tr>
<td>16</td>
</tr>
<tr>
<td>18</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL-PL-PI</td>
</tr>
</tbody>
</table>

**Notes:**
- Advancement Method: Continuous Flight Auger
- Abandonment Method: Boring backfilled with Auger Cuttings  
  Surface capped with asphalt
- Water content not determined
- Elevations not determined
- Hammer Type: Automatic

**Supporting Information:** For explanation of symbols and abbreviations.

**Exploration and Testing Procedures:** For a description of field and laboratory procedures used and additional data (if any).

**Terrain:** Boring Started: 07-12-2018  
**Terrain:** Boring Completed: 07-12-2018  
**Drill Rig:** 746  
**Driller:** BP  
**Project No.: 02175345**

---

**Terrain:** See Exploration Plan  
**Location:** See Exploration Plan  
**Latitude:** 38.987998°  
**Longitude:** -94.594455°  
**Surface:** Asphalt  
**Boring Method:** Continuous Flight Auger  
**Surface:** Capped with asphalt  
**Abandonment Method:** Boring backfilled with Auger Cuttings  
**Notes:**
- Water content not determined  
- Elevations not determined  

---

**Terrain:** Boring Started: 07-12-2018  
**Terrain:** Boring Completed: 07-12-2018  
**Drill Rig:** 746  
**Driller:** BP  
**Project No.: 02175345**
**BORING LOG NO. P-13**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**PROJECT:** Wornall Road Improvements  

**LOCATION**  
See Exploration Plan  
Latitude: 38.987343° Longitude: -94.594495°

**DEPTH**  
- 3.3 3.5" ASPHALT
- 6.9 7" CONCRETE
- 5.0 FILL - CLAYEY GRAVEL, gray, very loose
- 5.0 FAT CLAY (CH), dark brown to gray, medium stiff
- slight petroleum odor at 8.5 feet

**Boring Terminated at 10 Feet**

**GRAPHIC LOG**  
Hammer Type: Automatic

**WATER LEVEL OBSERVATIONS**  
Groundwater not encountered

**FIELD TEST RESULTS**  
- 1-1-2 N=3
- 2-2-4 N=6

**ATERBERG LIMITS**  
- LL-PL-PI

**ADVANCED METHOD**  
Continuous Flight Auger

**ABANDONMENT METHOD**  
Boring backfilled with Auger Cuttings  
Surface capped with asphalt

**ELEVATIONS**  
Elevations were not determined.

**See Supporting Information** for explanation of symbols and abbreviations.

**TERRECON**  
13910 W 96th Ter Lenexa, KS

**Boring Started:** 07-12-2018  
**Boring Completed:** 07-12-2018  
**Drill Rig:** 746  
**Driller:** BP  
**Project No.:** 02175345
Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Elevations were not determined.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

WATER LEVEL OBSERVATIONS
Groundwater not encountered

Boring Started: 07-12-2018
Boring Completed: 07-12-2018

Drill Rig: 746
Driller: BP

Project No.: 02175345
**BOURING LOG NO. P-15**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
Kansas City, MO

**CLIENT:** Walter P Moore & Associates Inc  
Kansas City, MO

**LOCATION**  
See Exploration Plan  
Latitude: 38.986308° Longitude: -94.594536°

<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>FIELD TEST RESULTS</th>
<th>PENETRATION (ft)</th>
<th>WATER CONTENT (%)</th>
<th>DRY UNIT WEIGHT (psf)</th>
<th>ATTERBERG LIMITS</th>
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</thead>
<tbody>
<tr>
<td>3.3</td>
<td>4&quot; ASPHALT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LL-PL-PI</td>
</tr>
<tr>
<td>1.0</td>
<td>8&quot; CONCRETE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>FAT CLAY (CH) dark brown to gray, soft to medium stiff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

**Advancement Method:** Continuous Flight Auger

**Abandonment Method:** Boring backfilled with Auger Cuttings  
Surface capped with asphalt

**Notes:**

- Groundwater not encountered

--

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

**Drill Rig:** 746  
**Driller:** BP  
**Project No.:** 02175345

**Boring Started:** 07-12-2018  
**Boring Completed:** 07-12-2018

**Hammer Type:** Automatic

**See** Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

**See** Supporting Information for explanation of symbols and abbreviations.

Elevations were not determined.
**BORING LOG NO. P-16**

**PROJECT:** Wornall Road Improvements  
**SITE:** Wornall Road Between 74th and 79th Street  
**CLIENT:** Walter P Moore & Associates Inc  
**Kansas City, MO**

**GRAPHIC LOG**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>See Exploration Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude: 38.985766° Longitude: -94.594569°</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (ft.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>PENETRATION TEST RESULTS</th>
<th>ASSESSMENT</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3</td>
<td>3&quot; ASPHALT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.8</td>
<td>6&quot; CONCRETE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FIELD TEST RESULTS**

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>LOCATION</th>
<th>SAMPLE TYPE</th>
<th>RECOVERY (In.)</th>
<th>PENETRANT (ft)</th>
<th>WATER CONTENT (%)</th>
<th>DRY UNIT WEIGHT (pcf)</th>
<th>LL-PL-PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3</td>
<td></td>
<td>1-1-2</td>
<td>8</td>
<td>29</td>
<td></td>
<td>59-23-36</td>
<td></td>
</tr>
<tr>
<td>6.8</td>
<td></td>
<td>2-2-3</td>
<td>18</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Boring Terminated at 10 Feet**

*Stratification lines are approximate. In-situ, the transition may be gradual.*  
*Hammer Type: Automatic*

**Advancement Method:** Continuous Flight Auger  
**Abandonment Method:** Boring backfilled with Auger Cuttings  
Surface capped with asphalt

**Notes:**

- See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).
- See Supporting Information for explanation of symbols and abbreviations.
- Elevations were not determined.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

**TERRACON**

13910 W 96th Ter  
Lenexa, KS

**Boring Started:** 07-12-2018  
**Boring Completed:** 07-12-2018

**Drill Rig:** 746  
**Driller:** BP

**Project No.:** 02175345
<table>
<thead>
<tr>
<th>DEPTH (Ft.)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>SAMPLE TYPE</th>
<th>FIELD TEST RESULTS</th>
<th>PENETRATION RESISTANCE</th>
<th>WATER CONTENT</th>
<th>DRY UNIT WEIGHT</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>0-0-1</td>
<td>N=1</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td>2-3-4</td>
<td>N=7</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

PROJECT: Wornall Road Improvements

SITE: Wornall Road Between 74th and 79th Street
Kansas City, MO

CLIENT: Walter P Moore & Associates Inc
Kansas City, MO

Hammer Type: Automatic

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advection Method: Continuous Flight Auger

Abandonment Method: Boring backfilled with Auger Cuttings
Surface capped with asphalt

Notes:
Boring Started: 07-12-2018
Boring Completed: 07-12-2018

Drill Rig: 746
Driller: BP

Project No.: 02175345

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

See Supporting Information for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS
Groundwater not encountered

FAT CLAY (CH), dark brown to gray, very soft to medium stiff

10.0
SUPPORTING INFORMATION
### General Notes

**Soil Classification**

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

**Location and Elevation Notes**

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

### Descriptive Soil Classification

<table>
<thead>
<tr>
<th>Descriptive Term (Density)</th>
<th>Standard Penetration or N-Value Blows/Ft.</th>
<th>Descriptive Term (Consistency)</th>
<th>Unconfined Compressive Strength Qu. (psf)</th>
<th>Standard Penetration or N-Value Blows/Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Loose</td>
<td>0 - 3</td>
<td>Very Soft</td>
<td>less than 500</td>
<td>0 - 1</td>
</tr>
<tr>
<td>Loose</td>
<td>4 - 9</td>
<td>Soft</td>
<td>500 to 1,000</td>
<td>2 - 4</td>
</tr>
<tr>
<td>Medium Dense</td>
<td>10 - 29</td>
<td>Medium Stiff</td>
<td>1,000 to 2,000</td>
<td>4 - 8</td>
</tr>
<tr>
<td>Dense</td>
<td>30 - 50</td>
<td>Stiff</td>
<td>2,000 to 4,000</td>
<td>8 - 15</td>
</tr>
<tr>
<td>Very Dense</td>
<td>&gt; 50</td>
<td>Very Stiff</td>
<td>4,000 to 8,000</td>
<td>15 - 30</td>
</tr>
<tr>
<td>Hard</td>
<td></td>
<td></td>
<td>&gt; 8,000</td>
<td></td>
</tr>
</tbody>
</table>

### Consistency of Fine-Grained Soils

Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance.

### Relative Proportions of Sand and Gravel

<table>
<thead>
<tr>
<th>Descriptive Term(s) of other constituents</th>
<th>Percent of Dry Weight</th>
<th>Major Component of Sample</th>
<th>Particle Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace</td>
<td>&lt; 15</td>
<td>Boulders</td>
<td>Over 12 in. (300 mm)</td>
</tr>
<tr>
<td>With</td>
<td>15 - 29</td>
<td>Cobbles</td>
<td>12 in. to 3 in. (300mm to 75mm)</td>
</tr>
<tr>
<td>Modifier</td>
<td>&gt; 30</td>
<td>Gravel</td>
<td>3 in. to #4 sieve (75mm to 4.75 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sand</td>
<td>#4 to #200 sieve (4.75mm to 0.075mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silt or Clay</td>
<td>Passing #200 sieve (0.075mm)</td>
</tr>
</tbody>
</table>

### Plasticity Description

<table>
<thead>
<tr>
<th>Descriptive Term(s) of other constituents</th>
<th>Percent of Dry Weight</th>
<th>Term</th>
<th>Plasticity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace</td>
<td>&lt; 5</td>
<td>Non-plastic</td>
<td>0</td>
</tr>
<tr>
<td>With</td>
<td>5 - 12</td>
<td>Low</td>
<td>1 - 10</td>
</tr>
<tr>
<td>Modifier</td>
<td>&gt; 12</td>
<td>Medium</td>
<td>11 - 30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>&gt; 30</td>
</tr>
</tbody>
</table>
### UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests

<table>
<thead>
<tr>
<th>Group</th>
<th>Symbol</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravels</td>
<td>Cu ≥ 4 and 1 ≤ Cc ≤ 3</td>
<td>GW Well-graded gravel</td>
</tr>
<tr>
<td>Gravels with Fines</td>
<td>Cu &lt; 4 or/and 1 &gt; Cc &gt; 3</td>
<td>GP Poorly graded gravel</td>
</tr>
<tr>
<td>Clean Gravels</td>
<td>Fines classify as ML or MH</td>
<td>GM Silty gravel</td>
</tr>
<tr>
<td>Gravels with Fines</td>
<td>Fines classify as CL or CH</td>
<td>GC Clayey gravel</td>
</tr>
<tr>
<td>Clean Sands</td>
<td>Cu ≥ 6 and 1 ≤ Cc ≤ 3</td>
<td>SW Well-graded sand</td>
</tr>
<tr>
<td>Sands with Fines</td>
<td>Cu &lt; 6 and/or 1 &gt; Cc &gt; 3</td>
<td>SP Poorly graded sand</td>
</tr>
<tr>
<td>Sands</td>
<td>Fines classify as ML or MH</td>
<td>SM Silty sand</td>
</tr>
<tr>
<td>Clean Sands</td>
<td>Fines classify as CL or CH</td>
<td>SC Clayey sand</td>
</tr>
</tbody>
</table>

**Coarse Grained Soils:**
- More than 50% of coarse fraction retained on No. 4 sieve
- More than 50% retained on No. 200 sieve

**Sands:**
- 50% or more of coarse fraction passes No. 4 sieve

**Sands with Fines:**
- More than 12% fines

**Gravels:**
- More than 50% of coarse fraction retained

**Clean Gravels:**
- Less than 5% fines

**Gravels with Fines:**
- Fines classify as ML or MH

**Clean Sands:**
- Less than 5% fines

**Sands with Fines:**
- Fines classify as ML or MH

**Sands with Fines:**
- More than 12% fines

**Sands with Fines:**
- More than 12% fines

**Inorganic:**
- PI > 7 and plots on or above “A” line
- PI < 4 or plots below “A” line

**Organic:**
- Liquid limit - oven dried
- Liquid limit - not dried

**Sands and Clays:**
- Liquid limit less than 50

**Sands and Clays:**
- Liquid limit 50 or more

**Fine-Grained Soils:**
- 50% or more passes the No. 200 sieve

**Sands and Clays:**
- Liquid limit 50 or more

**Highly organic soils:**
- Primarily organic matter, dark in color, and organic odor

---

A By field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.
B By field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.
C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
E Cu = D_60/D_10
F Cc = (D_30)^2 / D_10 x D_60
G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
H If fines are organic, add “with organic fines” to group name.
I If soil contains ≥ 15% gravel, add “with gravel” to group name.
J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
K If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.
L If soil contains 30 to 29% plus No. 200 predominantly sand, add “sandy” to group name.
M If soil contains 30 to 29% plus No. 200 predominantly gravel, add “gravelly” to group name.
N PI > 4 and plots on or above “A” line.
O PI < 4 or plots below “A” line.
P PI plots on or above “A” line.
Q PI plots below “A” line.
R PI plots on or above “A” line.
S PI plots below “A” line.
### SUMMARY OF QUANTITIES

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>APPROXIMATE QUANTITY</th>
<th>UNIT</th>
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<tbody>
<tr>
<td>14</td>
<td>10TH STRUCTURAL COLUMN</td>
<td>140</td>
<td>EA</td>
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<tr>
<td>16</td>
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<tr>
<td>17</td>
<td>13TH STRUCTURAL COLUMN</td>
<td>140</td>
<td>EA</td>
</tr>
<tr>
<td>18</td>
<td>14TH STRUCTURAL COLUMN</td>
<td>140</td>
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<td>19</td>
<td>15TH STRUCTURAL COLUMN</td>
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<td>16TH STRUCTURAL COLUMN</td>
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<td>26</td>
<td>22ND STRUCTURAL COLUMN</td>
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<td>27</td>
<td>23RD STRUCTURAL COLUMN</td>
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<tr>
<td>44</td>
<td>40TH STRUCTURAL COLUMN</td>
<td>140</td>
<td>EA</td>
</tr>
</tbody>
</table>

**NOTE:** The quantities listed above may include sub-quantities such as footings, columns, beams, and other structural components. The complete list of quantities is available in the project documentation. For detailed information, please refer to the project's materials takeoff and construction drawings.
WORNALL ROAD IMPROVEMENTS
74TH STREET TO 79TH STREET
KANSAS CITY, MISSOURI
CITY PROJECT NO. 89008516
FEDERAL PROJECT NO. STP-3301(509)

1100 Walnut, Suite 1825
Kansas City, Missouri 64106
816.701.2100
walterpmoore.com
MO PE Corporation No. 1999141112

DRIVEWAY GRADING ENLARGEMENTS

75TH ST @ STA 101+30.72

75TH ST @ STA 102+63.70

75TH ST @ STA 104+13.21

GRADING LEGEND:

- TOP OF CURB ELEVATION
- DOT ELEVATION
- UP OF CURB ELEVATION
- HIGH CURB ELEVATION
- MNL POINT
- LOW POINT

SCALE 1" = 50'

75TH ST @ STA 101+30.72

75TH ST @ STA 102+63.70

75TH ST @ STA 104+13.21

ADDENDUM #3
## Removals Chart

<table>
<thead>
<tr>
<th>Location</th>
<th>Poles</th>
<th>Heads</th>
<th>Pull Boxes</th>
<th>Controller</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast Corner</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southeast Corner</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>Northwest Corner</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southwest Corner</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Contractor shall salvage all equipment to 5310 Municipal Avenue, City of Kansas City, Missouri.*

### Notes:
- **09/26/2023**
- **ADDENDUM #3**

**TRAFFIC SIGNAL DEMO PLAN - WORNALL RD AND 75TH ST**
TRAFFIC SIGNAL DIMENSION PLAN - WORNALL RD AND 75TH ST

PROJECT NAME: WORNALL ROAD IMPROVEMENTS 74TH STREET TO 79TH STREET
KANSAS CITY, MISSOURI

CITY PROJECT NO. 89008516
FEDERAL PROJECT NO. STP-3301(509)

WALTER P. MOORE AND ASSOCIATES, INC.
1100 Walnut, Suite 1825
Kansas City, Missouri 64106
816.701.2100
walterpmoore.com

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MO PE Corporation No. 1999141112

DATE: 09/26/2023

ADDENDUM #3

DRAWN BY

DESIGNED BY

REVIEWED BY

PROJECT NUMBER

DATE

SUBMITTALS
### Traffic Signal Summary of Quantities

#### Project Details
- **Project Name:** Wornall Road Improvements
- **Location:** Kansas City, Missouri
- **City Project No.:** 89008516
- **Federal Project No.:** STP-3301(509)
- **Date:** 21 December 2022

#### Pedestal Pole Summary

<table>
<thead>
<tr>
<th>Post No.</th>
<th>Pole Length</th>
<th>Mast Arm Type I/II/III</th>
<th>Mast Arm Length</th>
<th>Signal Head Spacing</th>
<th>Luminaire Length</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>28-30</td>
<td>10/1</td>
<td>30</td>
<td>1</td>
<td>1</td>
<td>SE Corner</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>10/3</td>
<td></td>
<td>1</td>
<td>NW Corner</td>
</tr>
<tr>
<td>6</td>
<td>28-18</td>
<td>10/3</td>
<td>18</td>
<td></td>
<td>1</td>
<td>NE Corner</td>
</tr>
<tr>
<td>8</td>
<td>28-18</td>
<td>10/3</td>
<td>18</td>
<td></td>
<td>1</td>
<td>NE Corner</td>
</tr>
</tbody>
</table>

#### Cable Summary

- **Conduit:** Type 2 Fiber Box in SE Corner included in Fiber Plans

#### Notes:
- **NOTE:** Signal head spacing to be adjusted to site conditions and approved by the project inspector.

---

### Pedestal Pole

- **Signal Heads:**
  - **Indicators:**
    - **No.**
    - **Visors:**
    - **BBRT:**
      - **See note below**
    - **One-Face:**
      - **Type:**
      - **Sections:**

### Cable

- **From:**
- **To:**
- **Power:**
- **Signal Cable:**
- **Det Lead In:**
- **Cat 6:**

### Trench

- **From:**
- **To:**
- **Trench:**
  - **2"**
  - **3"**
  - **4"**

---

**NOTE:** The image contains detailed tables and diagrams related to traffic signal systems, including specifications for pole lengths, signal head spacings, and cable conduit information. The text is structured to provide clear and precise data for engineering purposes.
TRAFFIC SIGNAL PLAN
- 75TH ST AND WYANDOTTE

NOTES:
1. Lines worship shown on plan information only.
   Refer to Parsons Maneuvers Sheets.
2. Coordinate all signal crossings with the city
   of Kansas City, Missouri.
3. All streets shown on plans shall be coordinated
   with the proper Kansas street name ghost, city
   of Kansas City, Missouri.
4. Street name checked on signal plates shown
   for information only. Contractor shall street
   streets name per the street listing plan

5. All items are shown for information only.
   Contractor is responsible for making before
   the street and location of the signal crossing
   to the proper intersection. The contractor
   shall submit location of undersigned crossing
   coordinates are deemed not of
   changing the dimensions of the notes.

Signal Phases

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Wornall Road
Improvements
74th Street to
79th Street
Kansas City, Missouri
City Project No. 89008516
Federal Project No. STP-3301(509)

Addendum #3
09/26/2023
WORNALL ROAD IMPROVEMENTS
74TH STREET TO 79TH STREET
KANSAS CITY, MISSOURI
CITY PROJECT NO. 89008516
FEDERAL PROJECT NO. STP-3301(509)

DATE: 21 DECEMBER 2022
M08-18002-00

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MO PE Corporation No. 1999141112

ADDENDUM #3

PARKING SPACE MARKING

PATH
ROAD CLOSED
AHEAD
LOCAL TRAFFIC ONLY.
PHASE 3A CONSTRUCTION:
- Construct north side of 75th Street.
- Install curbs and gutters along new phase limits.
- Install storm drain pipe for new phase.
- Install traffic control devices for new phase limits.

NOTES:
1. Follow traffic control plan for traffic control requirements.
2. Maintain access and permanent access to adjacent properties.
3. Adjust signal timing and street lighting as required for new traffic patterns.

CONSTRUCTION SEQUENCING - PHASE 3A
PHASE 3B CONSTRUCTION:

- Construct south side of 79th Street.
- Install paving, curb, and sidewalks within project limits.

NOTES:

1. Apply to overall design for traffic control requirements.
2. Maintain pedestrian and bicycle access to adjacent properties.
3. Maintain access to all driveways.
4. Maintain normal access to private property and public utilities.
5. Allow retail, trash, and private access as required to maintain pedestrian, commercial, and public utility access.

CONSTRUCTION SEQUENCING - PHASE 3B

- Phase 3B Construction:
  - Construct south side of 79th Street.
  - Install paving, curb, and sidewalks within project limits.

NOTES:

1. Apply to overall design for traffic control requirements.
2. Maintain pedestrian and bicycle access to adjacent properties.
3. Maintain access to all driveways.
4. Maintain normal access to private property and public utilities.
5. Allow retail, trash, and private access as required to maintain pedestrian, commercial, and public utility access.
PHASE 4A CONSTRUCTION:

- Construct side curb of Wornall Road.
- Move area of side curb and streetlight. Rental curb and streetlight for future construction.
- Install parking, bike, and sidewalk from one pair of four units.

NOTES:

1. Need to adjust elevations from ESRI panels. Centerline roadways for one section.
2. Maintain sidewalk and pedestrian access by using existing panels if at all safer. Coordinate with city and property owners for future construction.

ROAD CLOSED AHEAD
LOCAL TRAFFIC ONLY
ROAD CLOSED AHEAD
LOCAL TRAFFIC ONLY

MATCHLINE STA 23+00
09/26/2023

ADDENDUM #3

NOTES:
1. NEEDED TO DRAIN WITHIN AHTN PIPES.
   CENTERLINE REQUIREMENTS:"V" SHAPE CENTERLINE.

2. NEEDED TO DRAIN WITHIN AHTN PIPES.
   CENTERLINE REQUIREMENTS:"V" SHAPE CENTERLINE.

CONSTRUCTION SEQUENCING - PHASE 4A
WORNALL ROAD
IMPROVEMENTS
74TH STREET TO
79TH STREET
KANSAS CITY, MISSOURI
CITY PROJECT NO. 8663316
FEDERAL PROJECT NO. STP-3301(509)

STORM SEWER PLAN & PROFILE

NOTE:
1. 100'-H2O FLOOD PAVEMENT OUTSIDE OF PROJECT LIMITS PER FLOOD MAP PROVIDED:
   - DIMENSIONS EXT. 1/20/2017
   - DIMENSIONS EXT. 3/29/2017
   - CRK 100'-H2O FLOOD EXT. 06/01/2017

2. NEW STRUCTURES FOR ALL TRENCHES ARE ARTIC MASONRY

3. CHAINAGE FOR ALL STRUCTURES SHALL BE DEPICTED WITH CHAINAGE MARKER

4. PLAN IN PLACE. FOR DEPTH AND WIDTH OF EXCAVATION AND LENGTH OF PIPE AND CONSTRUCTION, SEE ATTACHED SHEET.

5. ALL SITE AND STRUCTURES THAT ARE SHOWN IN PAVEMENT PLAN ARE DEPICTED FOR THEễ Trench, Depth, and Location of All Sewers and Culverts. The Contractor shall provide all applicable plans and specifications to the City.

6. STORM SEWER STRUCTURE SHALL BE NO STORM SEWER GRATE.
WORNALL ROAD
IMPROVEMENTS
74TH STREET TO
79TH STREET
KANSAS CITY, MISSOURI
CITY PROJECT NO. 89008516
FEDERAL PROJECT NO. STP-3301(509)

STORM SEWER PLAN & PROFILE - LINE F

STORM SEWER PLAN & PROFILE - LINE FA

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