20 January 2017
File No. 129630-002

Walker Parking Consultants
20 Park Plaza Suite 1202
Boston, MA  02116

Attention:  Mr. Christopher E. Brennan, PE
Director of Operations/Principal

Subject: Geotechnical Data Report
MBTA Commuter Lot
Waterfield Road
Winchester, Massachusetts

Ladies and Gentlemen:

This report presents the results from a geotechnical subsurface exploration program conducted by Haley & Aldrich in connection with the MBTA Commuter Parking Lot off Waterfield Road in Winchester, Massachusetts. These services were performed in general accordance with our proposal dated 9 January 2017.

The purpose of the subsurface exploration program was to obtain preliminary geotechnical information relative to subsurface soil/bedrock conditions at the site.

INTRODUCTION

The existing parking lot site is proposed to be developed with a mixed use building, about 2 to 4 stories in height and no below grade space. The limits and configuration of the development are not known. The development may consist of retail at ground floor with a mix of office and residential space on the upper floors. A site locus is included as Figure 1.

The project structural engineer, Walker Parking Consultants provided the following information on the proposed structure. The interior vertical column loads are planned to be about 500 kip per column and exterior columns would be about 350 kips per column. In addition to the column loads, vertical walls loads of about 15 kips per linear foot of wall are planned.
ELEVATION DATUM AND HORIZONTAL CONTROL

Elevations in this report are given in feet and refer to the North American vertical Datum of 1988 (NAVD88).

The plan location of the test boring completed by Haley & Aldrich was taped to existing features shown on the site plan. The accuracy of boring location should be considered to be consistent with the methods used.

SUBSURFACE INFORMATION

One (1) test boring was completed by Haley & Aldrich at the location shown on the attached Figure 2. The test boring was drilled from ground surface by New England Boring Contractors on 12 January 2017. The test boring was monitored in the field by a Haley & Aldrich geologist. Upon completion of the test boring, a groundwater monitoring well was installed in the completed borehole. A log of the test boring is included in Appendix A. A Groundwater Observation Well Installation Report is included as Appendix B.

Previous test borings were reportedly completed at the site by Jacobs and logs for the borings are included as Appendix C.

SUBSURFACE CONDITIONS

Results of test boring HA17-1 indicate a 3 ft thick layer of fill below ground surface. The fill soils are underlain by Glaciolacustrine deposits consisting of gray to brown silty SAND to SILT with trace sand. Glaciofluvial deposits consisting of very dense well graded SAND with gravel were encountered from a depth of 39 ft to 44 ft below ground surface.

Well graded gravel that may be weathered bedrock was encountered at a depth of 44 ft below ground surface. The top of this unit was sampled with a split spoon sampler at a depth of 50.3 ft.

The water level was recorded at the site in Observation Well HA17-1 on 18 January 2017, 6 days after well installation at a depth of 10.8 ft below ground surface, at El. 11.2.

PRELIMINARY GEOTECHNICAL CONSIDERATIONS

Based on the available test boring information, soil bearing footings are likely feasible provided they bear directly on the undisturbed, naturally deposited soils. We recommend foundations be supported by on naturally-deposited, undisturbed, inorganic glacial soils.

For the purpose of seismic design in accordance with the 8th edition the Massachusetts State Building Code, the site is classified as Site Class D. The site soils are not considered liquefaction susceptible in accordance with criteria in the Building Code.
LIMITATIONS

This report has been prepared for specific application to the MBTA Commuter Parking Lot in Winchester, Massachusetts, as understood by Haley & Aldrich at this time. After the design or location of the facilities is finalized, the conclusions and recommendations contained in this report should be reviewed and modified or verified in writing by Haley & Aldrich. Our recommendations are based in part upon data obtained from the referenced subsurface explorations. The nature and extent of variations between explorations will not become evident until construction. If significant variations then appear, it may be necessary to re-evaluate the recommendations of this report.

CLOSURE

We appreciate the opportunity to undertake this work and look forward to our association with you on the next phases of this project. Please contact the undersigned if you wish to discuss the above information or have additional questions.

Sincerely yours,
HALEY & ALDRICH, INC.

[Signature]
Denis J. Bell, P.E.
Senior Engineer

[Signature]
Bryan P. Sweeney, P.E.
Senior Vice President

Enclosures:
- Figure 1: Project Locus
- Figure 2: Subsurface Exploration Plan
- Appendix A: Test Boring Logs
- Appendix B: Groundwater Observation Well Installation Report
- Appendix C: Previous Test Borings

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APPENDIX A

Test Boring Logs
## TEST BORING REPORT

**Boring No.** HA17-1 (OW)

**Project** MBTA COMMUTER LOT, WATERFIELD ROAD, WINCHESTER, MA

**Client** WALKER PARKING CONSULTANTS

**Contractor** NEW ENGLAND BORING CONTRACTORS

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Depth (ft)</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>4.7</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>2.0</td>
<td>4</td>
</tr>
<tr>
<td>6.2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>10.5</td>
<td>1.0</td>
<td>2</td>
</tr>
<tr>
<td>15.8</td>
<td>1.0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Visual-Manual Identification and Description**

*Densitometry, consistency, color, GROUP NAME, max. particle size, structure, odor, moisture, optional descriptions, GEOLOGIC INTERPRETATION*

- **Asphalt**
  - S1: Medium dense brown well graded SAND with silt and gravel (SW-SM), mps 1 in., no structure, no odor, moist
  - S1A: Stiff brown ORGANIC SOIL (OIL/ML) intermixed with tan sandy SILT (ML)

- **Reworked Topsoil / Loess**
  - Medium dense light gray silty SAND (SM) grading to tan poorly graded SAND (SP), mps < 1 mm, stratified, no odor, dry

- **Glaciolacustrine Deposits**
  - Loose brown silty SAND (SM), mps < 1 mm, stratified, no odor, wet

- **Similar to above, except gray**

**Water Level Data**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Elapsed Time (hr.)</th>
<th>Depth (ft)</th>
<th>Sample ID</th>
<th>Well Diagram</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/12/17</td>
<td>1505</td>
<td>50.3</td>
<td>10.6*</td>
<td>Riser Pipe</td>
<td>Overburden (ft)</td>
<td>50.3</td>
</tr>
</tbody>
</table>

**Field Tests**

- Dilatancy: R - Rapid, S - Slow, N - None
- Plasticity: N - Nonplastic, L - Low, M - Medium, H - High
- Toughness: L - Low, M - Medium, H - High
- Dry Strength: N - None, L - Low, M - Medium, H - High, V - Very High

*Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

**Note:** Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>S5 18</td>
<td>20.0 22.0</td>
<td>SM</td>
<td>Medium dense silty SAND (SM), mps &lt; 1 mm, no structure, no odor, wet</td>
</tr>
<tr>
<td>25</td>
<td>S6 18</td>
<td>25.0 27.0</td>
<td>SM</td>
<td>GLACIOACUSTRINE DEPOSITS -</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Similar to above</td>
</tr>
<tr>
<td>30</td>
<td>S7 22</td>
<td>30.0 32.0</td>
<td>ML</td>
<td>Medium dense SILT (ML), mps &lt; 1 mm, laminated, no odor, wet, trace fine sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GLACIOACUSTRINE DEPOSITS -</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ML/SM</td>
<td>Dense brown SILT (ML) interbedded with seams of silty SAND (SM), mps 1 in., laminated, no odor, wet, trace gravel</td>
</tr>
<tr>
<td>40</td>
<td>S9 17</td>
<td>40.0 42.0</td>
<td>SW</td>
<td>Very dense brown well graded SAND with gravel (SW)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GLACIOFLUVIAL DEPOSITS -</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Note: Lost drill water at approximately 44 ft.</td>
</tr>
<tr>
<td>45</td>
<td>S10 18</td>
<td>45.0 47.0</td>
<td>GW</td>
<td>Dense orange brown to purple well graded GRAVEL with sand (GW), mps 1.5 in., no structure, no odor, wet, sample consists of highly fractured weathered igneous rock</td>
</tr>
</tbody>
</table>

**NOTE:** Soil identification based on visual-manual methods of the U.S.C.S as practiced by Haley & Aldrich, Inc.
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sampler Blow per ft</th>
<th>Sample No. &amp; Rec. (in.)</th>
<th>Sample Depth (ft)</th>
<th>USCIS Symbol</th>
<th>Stratum Change (ft)</th>
<th>Visual-Manual Identification and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>400/45</td>
<td>S11</td>
<td>50.0</td>
<td>GM</td>
<td>-28.3</td>
<td>Very dense light gray to purple gray silty GRAVEL with sand (GM) nps 1.5 in., no structure, no odor, wet, sample consists of highly fractured weathered igneous rock</td>
</tr>
</tbody>
</table>

**BOTTOM OF EXPLORATION 50.3 FT**

Note: Groundwater Observation Well installed at 18 ft upon completion.

**NOTE:** Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.
APPENDIX B

Groundwater Observation Well Installation Report
# GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

**Project:** MBTA COMMUTER LOT  
**Location:** WATERFIELD ROAD, WINCHESTER, MA  
**Client:** WALKER PARKING CONSULTANTS  
**Contractor:** NEW ENGLAND BORING CONTRACTORS  
**Driller:** M. D’Ambrosio  

<table>
<thead>
<tr>
<th>Initial Water Level (depth bgs)</th>
<th>10.6 ft</th>
</tr>
</thead>
</table>

## Well Construction Details

<table>
<thead>
<tr>
<th>Type of protective cover</th>
<th>Compression cover</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Depth of Roadway Box below ground surface</th>
<th>0.0 ft</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Depth of top of riser below ground surface</th>
<th>0.5 ft</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of protective casing</th>
<th>Roadway Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>1.0 ft</td>
</tr>
<tr>
<td>Inside diameter</td>
<td>6.0 in.</td>
</tr>
<tr>
<td>Depth of bottom of Roadway Box</td>
<td>1.0 ft</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of riser pipe</th>
<th>Schedule 40 PVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside diameter of riser pipe</td>
<td>2.0 in.</td>
</tr>
<tr>
<td>Depth of bottom of riser pipe</td>
<td>8.0 ft</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Seals</th>
<th>Top of Seal (ft)</th>
<th>Thickness (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>0.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Bentonite</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Bentonite</td>
<td>19.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diameter of borehole</th>
<th>4.5 in.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Depth to top of well screen</th>
<th>8.0 ft</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of screen</th>
<th>Machine slotted Sch 40 PVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen gauge or size of openings</td>
<td>6.010 in.</td>
</tr>
<tr>
<td>Diameter of screen</td>
<td>2.0 in.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Backfill around Screen</th>
<th>Filter Sand</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Depth to bottom of well screen</th>
<th>18.0 ft</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Bottom of silt trap</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of bottom of borehole</td>
<td>50.3 ft</td>
</tr>
</tbody>
</table>

**Comments:** Note: Well collapsed between 33.0 ft and 50.5 ft
APPENDIX C

Previous Test Borings
Borings are taken for Information purposes only and show conditions at boring points only, but do not necessarily show the nature of the material to be encountered during construction.
<table>
<thead>
<tr>
<th>LAYER NAME</th>
<th>SOIL AND ROCK DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S8</td>
<td>Wet, dense, brown, fine to coarse SAND and fine to coarse Gravel, little Silt.</td>
</tr>
<tr>
<td>S9</td>
<td>No recovery.</td>
</tr>
<tr>
<td>S10</td>
<td>Wet, dense, brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt. Bottom of Borehole at 51 feet.</td>
</tr>
</tbody>
</table>

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

3. Redrill 3’ auger to collect sample. Recovered 1” of fine gravel, probable wash.

Borings are taken for Information purposes only and show conditions at boring points only, but do not necessarily show the nature of the material to be encountered during construction.
Public Safety Lot Concept 1: Top Level

Concept 1

Public Safety Site

Car Counts

Concept 1:
- Ground Level: 26 Spaces
- Second Level: 36 Spaces
- Third Level: 38 Spaces
- Top Level: 38 Spaces
- Garage Total*: 139 Spaces

Efficiency (Garage Only): 521 sf/Space

*The asset has been reduced by 4.5% from what is drawn on the plan to accommodate certified design standards.

Net Gain:
- Concept 1: 139 Spaces
- Existing Surface Lot: 460 Spaces
- Total: 89 Spaces

Construction Cost Information
- Total: $7,850,000
- Per Space: $36,500
- Per Net Added Space: $84,000

Notes:
1. Cost are extrapolated values for comparison purposes not formal estimates
2. Based on $100/sf

Date: 3/06/2017
Project No. 16-2760.00
Public Safety Lot Concept 1: Second / Third Level

Concept 1
Public Safety Site

Car Counts
Concept 1:
- Ground Level: 26 Spaces
- Second Level: 36 Spaces
- Third Level: 36 Spaces
- Top Level: 26 Spaces
- Garage Total*: 139 Spaces

Efficiency (Garage Only): 521 sf/car

*The area has been calculated by 10% from what is shown on the plan to accommodate unknown design elements.

Net Space
Concept 1:
- Existing Surface Lot: 139 Spaces
- Top Level: 36 Spaces
- Total: 199 Spaces

Construction Cost Information
- Total: $7,850,000
- Per Space: $50,500
- Per Net Added Space: $88,000

Notes:
1. Cost are extrapolated values for comparison purposes not formal estimates
2. Based on $108/b.f

Date: 3/06/2017
Project No. 14-2762.00
Jenks Lot Site Concept 3: Second to Fourth Level

Car Counts
- Concept 3:
  - Surface Lot A and B: 43 Spaces
  - Ground Level: 52 Spaces
  - Second Level: 63 Spaces
  - Third Level: 83 Spaces
  - Fourth Level: 53 Spaces
  - Top Level: 52 Spaces
  - Garage Total*: 376 Spaces

Efficiency (Garage Only)
- 309 s/f/car

* The count has been reduced by 5% from what is shown on the plan to account for pedestrian design elements.

Net Gain
- Concept 3: 376 Spaces
- Existing Surface Lot: (140) Spaces
- Linear Blending Demand: (160) Spaces
- Total: 186 Spaces

Construction Cost Information
- Total: $10,700,000
- Per Space: $58,500
- Per Net Added Space: $57,500

Notes:
1. Cost are extrapolated values for comparison purposes; not formal estimates
2. Based on $52/s.f.
3. Excludes cost related to liner building construction

Date: 3/6/2017
Project No. 10-2710.00
Jenks Lot Site Concept 3: Top Level

Car Count
Concept 3:
- Surface Lot A and B: 43 Spaces
- Ground Level: 52 Spaces
- Second Level: 63 Spaces
- Third Level: 63 Spaces
- Fourth Level: 63 Spaces
- Top Level: 32 Spaces
Garage Total*: 378 Spaces

Efficiency (Garage Only): 300 sF

Net Gain
Concept 3: 378 Spaces
Existing Surfase Lot: 140 Spaces
Linear Building Demand: 160 Spaces
Total: 378 Spaces

Construction Cost Information
Total: $10,700,000
Per Space: $28,500
Per Net Added Space: $57,500

Notes:
1. Cost are extrapolated values for comparison purposes not formal estimates
2. Based on $65/sF
3. Excludes costs related to final building construction

Date: 3/06/2017
Project #: 16-2750.00
Jenks Lot Site Concept 4: Ground Level

Car Counts

Concept 4:
- Surface Lot: 19 Spaces
- Ground Level: 77 Spaces
- Second Level: 127 Spaces
- Third Level: 127 Spaces
- Top Level: 114 Spaces
- Garage Total*: 464 Spaces

Efficiency (Garage Only)
- 341 sf/Car

* The count has been reduced by 9% from what is shown on the plan to accommodate anecdotal design elements.

Net Gain

- Concept 4: 464 Spaces
- Existing Surface Lot: (140) Spaces
- Retail/Office Demand: (160) Spaces
- Total: 269 Spaces

Construction Cost Information

- Total: $14,000,000
- Per Space: $30,300
- Per Net Added Space: $43,700

Notes:
1. Cost are extrapolated values for comparison purposes not formal estimates
2. Based on $80/sf
3. Excludes cost related to liner building construction

Date: 3/06/2017
Project No.: 16-2760.50
Jenks Lot Site Concept 4: Second to Fourth Level

Car Counts
Concept 4:
- Surface Lot: 180 Spaces
- Second Level: 127 Spaces
- Third Level: 127 Spaces
- Top Level: 115 Spaces
- Garage Total*: 464 Spaces

Efficiency (Garage Only):
- 341 s/Car

* The result has been reduced by 1% from what is shown on the plans to accommodate unverified design elements.

Net Gain
Concept 4:
- Existing Surface Lot: 140 Spaces
- Retail/Office Demand: 280 Spaces
- Total: 420 Spaces

Construction Cost Information
- Total: $14,000,000
- Per Space: $30,330
- Per Net Added Space: $44,700

Notes:
1. Cost are extrapolated values for comparison purposes not formal estimates
2. Based on $85/sf
3. Excludes cost related to liner building construction

Date: 3/06/2017
Project #: 16-2750.00
**Wedgemere Lot Site Concept 1: Ground Level**

**Sheet 1 of 3**

**Car Counts**

Concept 1:
- Ground Level: 103 Spaces
- Second Level: 120 Spaces
- Top Level: 110 Spaces
- Garage Total: 333 Spaces

**Efficiency (Garage Only)**
- 323 sf/car

*The ratio has been reduced by 9% from what is shown on the plan to accommodate unforeseen design elements.*

**Net Gals**

Concept 5:
- Existing Surface Lot: 124 Spaces
- Total: 215 Spaces

**Construction Cost Information**

Total: $7,855,000
- Par Space: $23,150
- Par Net Added Space: $26,000

**Notes:**

1. Cost estimate information is based on concept level design information and extrapolated sf, values. Information is for option comparison purposes only.
2. Based on $99/sf

**Date:** 05/19/2017

**Project:** 16-0760.00
Wedgemere Lot Site Concept 2: Top Level

Sheet 3 of 3

Car Counts
Concept 1:
Ground Level: 102 Spaces
Second Level: 126 Spaces
Top Level: 110 Spaces
Garage Total*: 338 Spaces

Efficiency (Garage Only): 323 efc/acre
* The count has been reduced by 3% from what is shown on the plans to accommodate undefined design elements.

Net Gain:
Concept 1: 338 Spaces
Existing Surface Lot: (154) Spaces
Total: 215 Spaces

Construction Cost Information
Total: $7,850,000
Per Space: $34,160
Per Net Added Space: $36,500

Notes:
1. Cost estimate information is based on concept level design information and extrapolated sf, values. Information is for option comparison purposes only.
2. Based on $35/sf

Date: 05/19/2017
Project N. 16-2790.00