



September 12, 2018

NorthPoint Development  
4825 NW 41<sup>st</sup> Street, Suite 500  
Riverside, Missouri 64150

Attn: Mr. Brad Haymond – Project Manager

Re: Geotechnical Engineering Report Addendum 3  
Summit Square II Apartments - Pavements  
NW Ward Road and NW Donovan Road  
Lee's Summit, Missouri  
Terracon Project Number: 02185057.03

Dear Mr. Haymond:

Terracon Consultants, Inc. (Terracon) performed geotechnical engineering services and submitted a Geotechnical Engineering Report for the second phase of the Summit Square Apartments project (Terracon Project No. 02185057, report dated May 11, 2018). We understand that the client would like to use an alternative pavement section to the sections provided in Article 12 of the City of Lee's Summit Unified Development Ordinance (UDO).

Following submittal of two previous addendum letters (Terracon Project No. 02185057.01 letter dated June 14, 2018, and Terracon Project No. 02185057.02 letter dated August 17, 2018) we were asked to provide two equivalent alternative pavement sections to the section provided in Article 12 of the City of Lee's Summit UDO. This addendum letter provides two alternative sections for both light-duty and heavy-duty applications.

Terracon utilized the software SpectraPave to back calculate the design AASHTO equivalent single axle loads (ESALs) for the UDO pavement sections. The following table provides the standard layer coefficients for each pavement layer and subbase layer that were used to calculate the design ESALs. These coefficients are multiplied by the layer thickness and added together to calculate the structural number of a pavement section.

**UDO Stabilized Subgrade Pavement Sections**

Layer	Description	Layer Coefficient
ACC1	Asphalt Surface	0.400
ACC2	Asphalt Base	0.350
ABC	MoDOT Type 5	0.120
SBC	Stabilized Subgrade	0.080

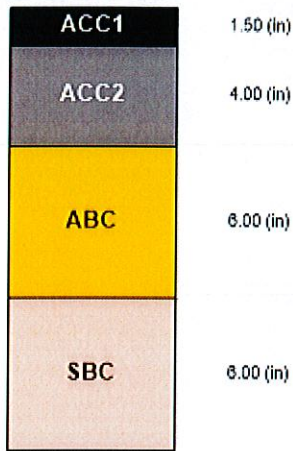
**UDO Geotextile Pavement Sections**

Layer	Description	Layer Coefficient
ACC1	Asphalt Surface	0.400
ACC2	Asphalt Base	0.350
MSL	MoDOT Type 5 with Tensorar TX5 at base	0.234

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**UDO Stabilized Subgrade Pavement Section**

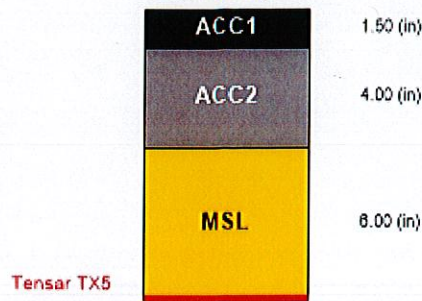
**Light-Duty**



Subgrade Modulus = 5,000 (psi)  
 Structural Number = 3.200  
 Calculated Traffic (ESALs) = 179,000

**UDO Geotextile Pavement Section**

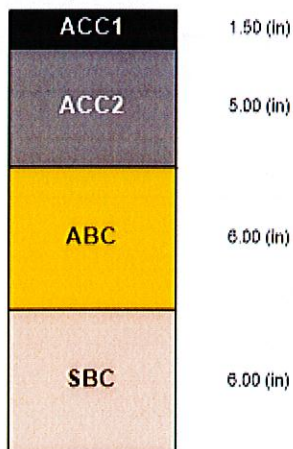
**Light-Duty**



Subgrade Modulus = 5,000 (psi)  
 Structural Number = 3.404  
 Calculated Traffic (ESALs) = 271,000

**UDO Stabilized Subgrade Pavement Section**

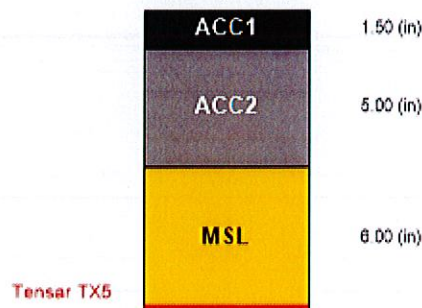
**Heavy-Duty**



Subgrade Modulus = 5,000 (psi)  
 Structural Number = 3.550  
 Calculated Traffic (ESALs) = 360,000

**UDO Geotextile Pavement Section**

**Heavy-Duty**



Subgrade Modulus = 5,000 (psi)  
 Structural Number = 3.754  
 Calculated Traffic (ESALs) = 527,000

Based on the Spectrapave analyses, the target design values for equivalent light-duty pavement sections are a structural number of 3.40 or 271,000 ESALs, and the target design values for equivalent heavy-duty pavement sections are a structural number of 3.75 or 527,000 ESALs.

Northpoint has requested two alternative designs for the light-duty pavements and two alternative designs for the heavy-duty pavements. Alternative 1 is designed to provide an

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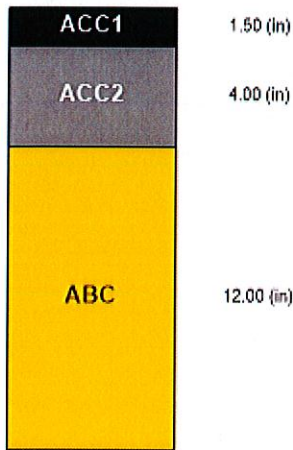


equivalent section by replacing the stabilized subgrade or geogrid with additional MoDOT Type 5 aggregate. Alternative 2 is designed to provide an equivalent section by replacing the stabilized subgrade or geogrid with the existing gravel-soil mixture on site. Terracon has estimated a layer coefficient for the soil-gravel mixture of 0.050. This coefficient has been conservatively estimated as less than half of MoDOT Type 5 coefficient (0.120) and less than a fly ash stabilized subgrade layer coefficient (0.080). The following table provides the layer coefficients for the equivalent alternative sections.

**Alternative Equivalent Pavement Sections**

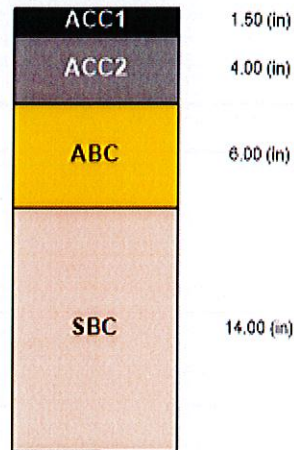
Layer	Description	Layer Coefficient
ACC1	Asphalt Surface	0.400
ACC2	Asphalt Base	0.350
ABC	MoDOT Type 5	0.120
SBC	Gravel-Soil Mixture	0.050

**Alternative 1 Pavement Section  
Light-Duty**



Subgrade Modulus = 5,000 (psi)  
Structural Number = 3.440  
Calculated Traffic (ESALs) = 291,000

**Alternative 2 Pavement Section  
Light-Duty**



Subgrade Modulus = 5,000 (psi)  
Structural Number = 3.420  
Calculated Traffic (ESALs) = 280,000

**Light-Duty Pavement Section**

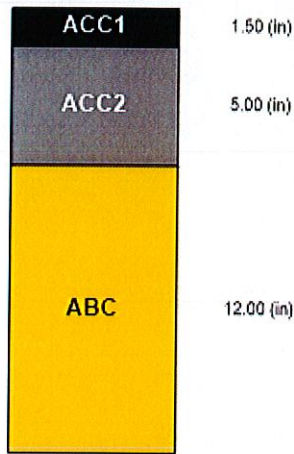
UDO Pavement Section	Alternative 1	Alternative 2
1.5 inches ACC surface	1.5 inches ACC surface	1.5 inches ACC surface
4 inches ACC base	4 inches ACC base	4 inches ACC base
6 inches granular base with geogrid – OR –	12 inches MoDOT Type 5 aggregate	6 inches MoDOT Type 5 aggregate
6 inches granular base course with 6 inches stabilized subgrade		14 inches compacted subgrade (gravel-soil mixture)

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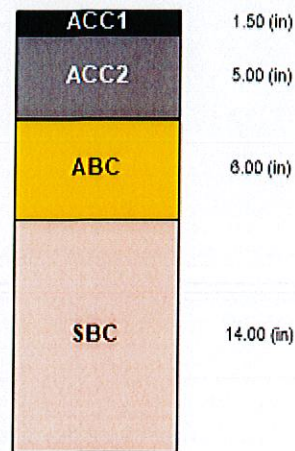


**Alternative 1 Pavement Section  
 Heavy-Duty**



Subgrade Modulus = 5,000 (psi)  
 Structural Number = 3.790  
 Calculated Traffic (ESALs) = 563,000

**Alternative 2 Pavement Section  
 Heavy-Duty**



Subgrade Modulus = 5,000 (psi)  
 Structural Number = 3.770  
 Calculated Traffic (ESALs) = 543,000

**Heavy-Duty Pavement Section**

UDO Pavement Section	Alternative 1	Alternative 2
1.5 inches ACC surface	1.5 inches ACC surface	1.5 inches ACC surface
5 inches ACC base	5 inches ACC base	5 inches ACC base
6 inches granular base with geogrid – OR –	12 inches MoDOT Type 5 aggregate	6 inches MoDOT Type 5 aggregate
6 inches granular base course with		14 inches compacted subgrade (gravel-soil mixture)
6 inches stabilized subgrade		

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The information and opinions in this addendum letter are intended only to supplement those in our referenced geotechnical report, and this letter should be considered part of that report. The recommendations in our original report remain valid. The qualifications and limitations stated in our geotechnical report apply to this addendum letter.

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

Sincerely,

**Terracon Consultants, Inc.**

Kevin D. Friedrichs, P.E.  
Project Engineer  
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