Polaris Engineering & Surveying
34600 Chardon Road Suite D
Willoughby Hills, Ohio 44094
Office: (440) 944-4433
Fax: (440) 944-3722

10/29/2024

Nick Sugar, AICP
City Planner
City of Hudson
1140 Terex Road
Hudson, OH 44236

Re: The Preserve of Hudson
Roadway Pavement Design

Mr. Sugar,
Please find enclosed flexible (asphalt) pavement design calculations for the above mentioned project. The calculations have been performed per the Ohio Department of Transportation's Pavement Design and Rehabilitation Manual. The analysis indicates that the calculated structural number of the proposed pavement section of 3.15 is greater than the required structural number for the expected traffic loads for the development which is 2.60. The design calculations account for 1/3rd B type trucks (four or more axle single units and semi-tractor trailers) and 2/3rd C type trucks (three axle single units and buses). As such, it is my professional opinion that the asphalt fire apparatus access road can support a 60,000 lb. vehicle based on the assumed soils conditions having a California Bearing Ratio (CBR) of 3.

Please feel free to contact me with any additional questions.

Respectfully,

Kevin Hoffman, P.E.
Polaris Engineering & Surveying, Inc.

POLARIS ENGINEERING & SURVEYING
34600 CHARDON ROAD SUITE D
WILLOUGHBY HILLS, OHIO 44094
(440) 944 - 4433 F (440) 944 - 3722

PROJECT The Preserve of Hudson Townhomes

PROJECT NO. 24189 SHEET NO. 1 OF 1

CALCULATED BY KTH DATE 10/28/2024

CHECKED BY KTH DATE 10/28/2024

SUBJECT ODOT Asphalt (Flexible) Pavement Design

Traffic Calculations

ADT = #Lots x 10/Trips/Day/Lot = 29 x 10 = 290 ADT

EASLs From B Trucks = (ADT) (%24T)(D)(LF)(B:C)(B)
EASLs From C Trucks = (ADT) (%24T)(D)(LF)(C:B)(C)

Number of Lanes	=	2			
D = Directoinal Distance	=	50%	Based on Two Lanes (Fig 202-1)		
%T24 = 24 hour Trucks	=	5%	(Fig-202-1)		
LF = Lane Factor	=	100%	(Fig-202-1)		
B:C Ratio	=		(Fig-202-1)	>>>Or use Assumed Truck Ratio's Below	
B Factor	=	0.94	(Fig-202-1)	B Trucks Assumed	33% (B:C)
C Factor	=	0.43	(Fig-202-1)	C Trucks Assumed	67% (C:B)

EASLs From B Trucks = 2.27 ESAL's C per Day

EASLs From B Trucks = 2.08 ESAL's C per Day

TOTAL = 4.35 ESAL's Per Day

Design Period ESAL's = 4.35 x 365.25 Days/year x 20 Years = **31,768**
USE = **40,000** = 0.04 **Millions**

Required Structural Number

> Design Loading ESAL's	0.4	Millions		
> Assumed CBR Value	3			
> Reliability (Per ODOT Fig.201-1)	80	%	("Local - Urban")	
> Overall Standard Deviation (Fig. 201-1)	0.49	Flexible	0.39	Rigid
> Design Servicablity (Fig. 201-1)	2	Flexible	1.7	Rigid

> Resiliant Modulus M_R = CBR x 1200

M_R = 3 x 1200 = 3600

Using Chart 402-2 The Matchline Number is: 69

Using Chart 402-3 and the Design Serviablty Loss, The Design Structure Number is: 2.6

Flexible Pavement Design (Coeff. From Fig-401-1)

ODOT ITEM	Thick (in)	Coeff.	SN	
448 Surface Course (Type 1)	1.5	0.43	0.645	(Min. 1.25" - Max 1.5" Lift)
448 Intermediate Course (Type 2)	1.5	0.43	0.645	(Min 1" - Max 1.5" Lift)
301 Bituminous Base	4	0.36	1.44	(Min 3" Thick - Max 6" Lift)
304 Aggregate Base	3	0.14	0.42	
TOTAL PAVEMENT THICKNESS	10		3.15	

SUMMMARY

Assumed CBR 3

Calculated Structure Number Required 2.6

Designed Structural Number Provided 3.15 **OK**

Traffic Factors	202-1 January 1999
	Reference Section 202

RATIO OF B:C COMMERCIAL VEHICLES	
FUNCTIONAL CLASSIFICATION	B:C RATIO
Rural Interstate	5:1
Rural Principal Arterial	4:1
All Other Rural	2:1
Urban Interstate, Urban Freeway & Expressway, & Urban Principal Arterial	2:1
All Other Urban	1:2

ESAL CONVERSION FACTORS				
FUNCTIONAL CLASSIFICATION	RIGID		FLEXIBLE	
	B	C	B	C
Rural Interstate	1.84	0.53	1.18	0.40
Rural Principal Arterial	2.36	1.02	1.51	0.66
Rural Minor Arterial (All Others)	1.45	1.59	0.91	0.98
Urban Interstate	2.22	0.78	1.41	0.56
Urban Expressway & Freeway	1.35	0.65	0.78	0.48
Urban Principal Arterial (All Others)	1.60	0.71	0.94	0.43

LANE FACTORS		
Number of Lanes	% Trucks in Design Lane	Directional Distribution (%)
2 - Lane	100	50
4 - Lane	90	50
6 (or more) - Lane	80	50

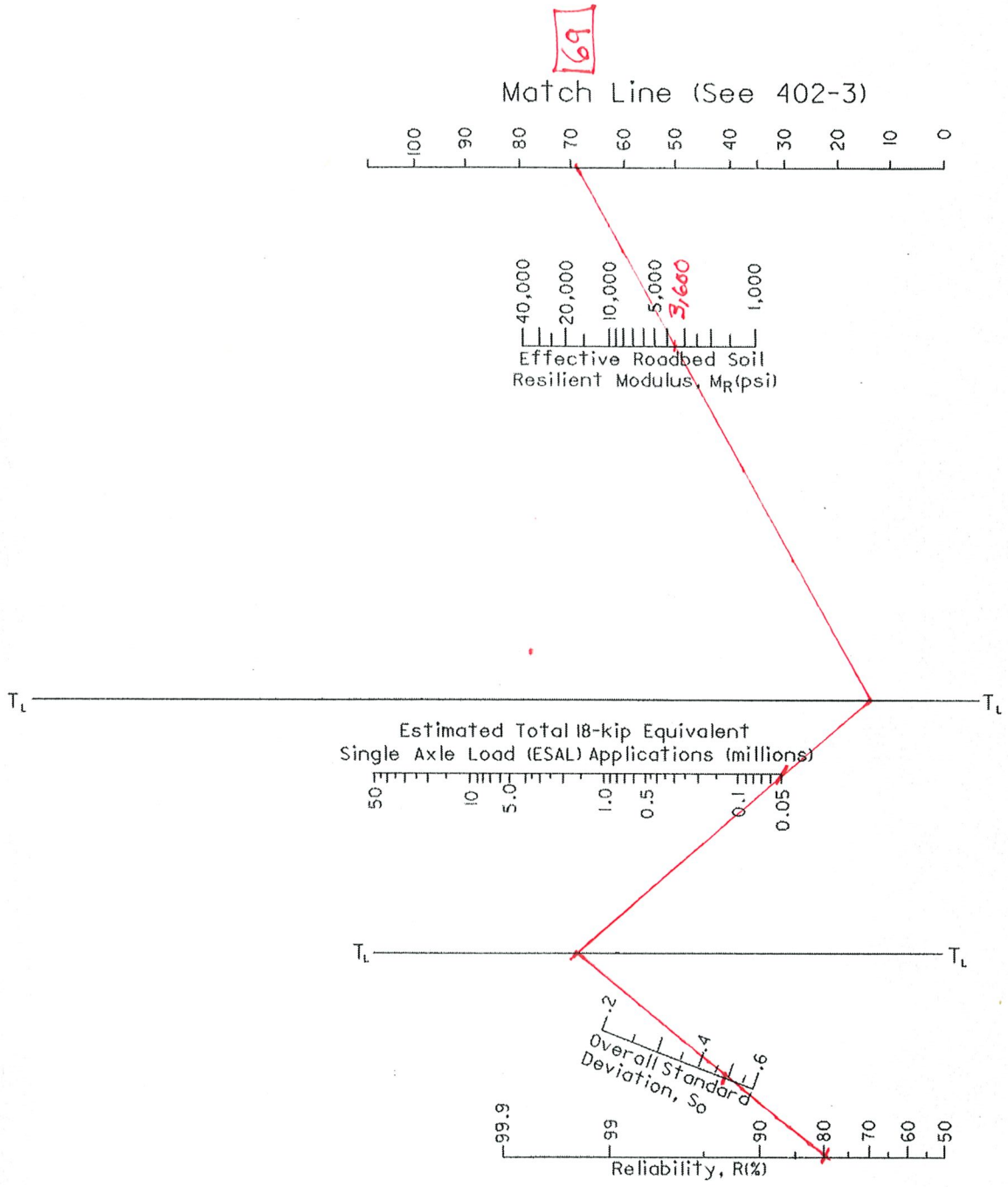
Serviceability & Reliability	201-1 January 1999
	Reference Section 201 & 204

SERVICEABILITY FACTORS		
	RIGID / COMPOSITE	FLEXIBLE
Initial Serviceability	4.2	4.5
Terminal Serviceability	2.5	2.5
Design Serviceability Loss	**1.7**	**2.0**

RELIABILITY LEVELS (%)		
FUNCTIONAL CLASSIFICATION	URBAN	RURAL
Interstate and Freeway	95	90
Principle Arterial, Minor Arterial	90	85
Collectors	90	85
Local	80	80

OVERALL STANDARD DEVIATION	
Flexible Pavement	0.49
Rigid Pavement	0.39

Flexible Pavement Design Chart Segment 1	402-2 July 2008 Reference Section & Figure 402, 402-1(step 3)



Flexible Pavement Design Chart Segment 2	402-3 July 2008 Reference Section & Figure 402, 402-1(step 3)