

Appendix A

Existing Conditions

Appendix A highlights the existing conditions of the Wendell H. Ford Western Kentucky Parkway (WKP) in western Kentucky from milepoint (MP) 76.758 to MP 136.796. The existing conditions were compiled and evaluated by comparing the WKP to design criteria for Interstates set forth by the Federal Highway Administration (FHWA). The American Association of State Highway and Transportation Officials (AASHTO) publications *A Policy on Geometric Design of Highways and Streets* (Green Book) and *A Policy on Design Standards - Interstate System* (Interstate Design Guide) provides minimum criteria for Interstate facilities shown throughout this appendix. In addition to the Green Book, FHWA has ten controlling criteria for facilities on the National Highway System (NHS), which includes the Interstate System. The ten controlling criteria were emphasized in the main report, as well as in this appendix. All of the data were compiled from the Kentucky Transportation Cabinet's (KYTC) Highway Information System (HIS), as-built plans, a field review, and Google Earth review for information not included in HIS or the as-built plans. This appendix is intended to supplement the existing conditions chapter of the report by providing data for the entire WKP (where it is not already included in the main report) and not just the locations that do not meet Interstate standards.

1.1 Mainline

The following subsections display the data and features pertaining to the mainline existing conditions. For information on the structures and interchanges, please refer to sections 1.2 and 1.3 respectively.

Terrain

The table below highlights existing terrain classifications of the WKP.

Route Unique	Begin Milepoint (BMP)	End Milepoint (EMP)	District	County	Terrain
092-WK-9001-000	76.758	87.544	2	Ohio	Rolling
016-WK-9001-000	87.544	88.433	4	Butler	Rolling
043-WK-9001-000	88.433	94.225	4	Grayson	Rolling
043-WK-9001-000	94.225	106.965	4	Grayson	Rolling
043-WK-9001-000	106.965	111.875	4	Grayson	Rolling
043-WK-9001-000	111.875	119.649	4	Grayson	Rolling
047-WK-9001-000	119.649	123.425	4	Hardin	Rolling
047-WK-9001-000	123.425	133.412	4	Hardin	Rolling
047-WK-9001-000	133.412	135.694	4	Hardin	Rolling
047-WK-9001-000	135.694	136.796	4	Hardin	Rolling

Shoulder Widths

The table below highlights existing shoulder widths, paved shoulder widths, and shoulder types of the WKP. Shoulders are classified by direction of the road where cardinal (CR) is in the eastern and northern directions and non-cardinal (NR) is in the western and southern directions. The other classification is inside shoulder (I) or outside shoulder (O). Minimum paved shoulder widths are 4 feet for inside shoulders and 10 feet for outside shoulders.

Route Unique	BMP	EMP	Length	Side	I/O	Shoulder Type	Shoulder Width (ft)	Paved Width (ft)
092-WK-9001-000	65.751	87.544	21.793	CL	I	Asphalt Combination	6	4
092-WK-9001-000	65.751	87.544	21.793	CR	O	Asphalt	10	10
092-WK-9001-000	65.751	87.544	21.793	NL	I	Asphalt Combination	6	4
092-WK-9001-000	65.751	87.544	21.793	NR	O	Asphalt	10	10
016-WK-9001-000	87.544	88.433	0.889	CL	I	Asphalt Combination	5	3
016-WK-9001-000	87.544	88.433	0.889	CR	O	Asphalt	10	10
016-WK-9001-000	87.544	88.433	0.889	NL	I	Asphalt Combination	5	3
016-WK-9001-000	87.544	88.433	0.889	NR	O	Asphalt	10	10
043-WK-9001-000	88.433	119.649	31.216	CL	I	Asphalt Combination	6	4
043-WK-9001-000	88.433	119.649	31.216	CR	O	Asphalt	10	10
043-WK-9001-000	88.433	119.649	31.216	NL	I	Asphalt Combination	6	4
043-WK-9001-000	88.433	119.649	31.216	NR	O	Asphalt	10	10
047-WK-9001-000	119.649	136.796	17.147	CL	I	Asphalt Combination	5	3
047-WK-9001-000	119.649	136.796	17.147	CR	O	Asphalt	10	10
047-WK-9001-000	119.649	136.796	17.147	NL	I	Asphalt Combination	5	3
047-WK-9001-000	119.649	136.796	17.147	NR	O	Asphalt	10	10

*Shoulder types classified as "Asphalt Combination" are defined as partially paved with asphalt and partially unpaved.

Median Widths

The 2011 AASHTO Roadside Design Guide requires a mainline highway with design speed of 70-mph to maintain a median width of between 30 feet and 60 feet, where median barriers remain optional depending on traffic density and safety concerns. Median widths less than 30 feet require median barriers to be installed. Barriers are optional between 30 and 50 feet. The Interstate Design Guide states that median widths should be at least 50 feet wide at a minimum, with 60 feet in width preferred in rural areas with level or rolling terrain. The table below highlights existing median types, widths, and barrier types of the WKP.

Route Unique	BMP	EMP	Length	Median Type	Width (ft)	Barrier
092-WK-9001-000	76.292	87.544	11.252	Depressed	30	None
016-WK-9001-000	87.544	88.433	0.889	Depressed	30	None
043-WK-9001-000	88.433	107.201	18.768	Depressed	30	None
043-WK-9001-000	107.201	107.512	0.311	Depressed	99	None
043-WK-9001-000	107.512	108.725	1.213	Other Positive Barrier	99	Earthed
043-WK-9001-000	108.725	109.048	0.323	Depressed	99	None
043-WK-9001-000	109.048	119.649	10.601	Depressed	30	None
047-WK-9001-000	119.649	135.949	16.300	Depressed	30	None
047-WK-9001-000	135.949	136.796	0.847	Depressed	40	None

Median Turnarounds

The 2018 *Green Book* states that median turnarounds may be provided where interchange spacing exceeds five miles. KYTC also prefers to provide median turnarounds at county lines. The table below highlights existing median turnarounds and whether the median turnaround is needed to meet Interstate standards.

Median MP	Median Turnaround Needed?	Note
77.100	No	Highway District would like this to be paved
78.709	No	
81.071	Yes	
83.430	No	
84.924	Yes	
87.394	Yes	
91.113	Yes	
92.314	No	
95.198	No	
96.642	Yes	
100.267	Yes	
103.681	No	
104.578	Yes	
105.944	No	
108.000	Yes	Keep for Snow & Ice
109.577	No	
112.681	No	
114.290	Yes	Keep for Snow & Ice
116.026	Yes	Keep for Snow & Ice
117.771	No	
119.792	Yes	Keep for Snow & Ice
120.728	Yes	Keep for Snow & Ice
125.996	Yes	
131.432	Yes	
134.137	No	
135.949	No	Highway District would like this to be paved

Clear Zones

The 2011 *AASHTO Roadside Design Guide* provides a range for the minimum clear zone requirement for an interstate, derived from the design speed, traffic volume, and roadside slope. For a 70-mph roadway that has slopes of 1V:6H or flatter requires a clear zone width of 30 to 34 feet, with steeper slopes requiring 38 to 46 feet. The table below highlights clear zones that may not meet the Interstate standard. Due to the inability to accurately identify the clear zone slope, clear zones were given a score of 1, 2, or 3 upon data compilation. A score of 1 is an obstruction which does not meet any clear zone requirements for an interstate facility and guardrail is required to protect vehicles from the obstruction. A score of 2 is an obstruction which does not meet clear zone requirements for an interstate facility if the clear zone slope is 1:5 or 1:4. A score of 3 is given to rock cuts, which do not require guardrail but were still

within clear zone widths. The data compiled in this table was collected through Google Earth, therefore milepoints could not be obtained. A shapefile is available showing locations of clear zones not meeting Interstate standard. A detailed survey should be completed to get accurate existing clear zones widths.

ID	Category	Obstruction Type	Length to Obstruction (ft)	Length of Obstruction (ft)
1	1	High Mast Light Pole	29	Point
2	2	Headwall	46	Point
3	1	Headwall	30	Point
4	1	Headwall	32	Point
5	1	Headwall	28	Point
6	1	Headwall	24	Point
7	1	Headwall	24	Point
8	3	Rock Cut	30	Point
9	1	Headwall	27	Point
10	1	Headwall	27	Point
11	1	Headwall	27	Point
12	1	Headwall	32	Point
13	1	Headwall	32	Point
14	1	Headwall	24	Point
15	1	Headwall	28	Point
16	1	Headwall	28	Point
17	1	Headwall	28	Point
18	1	Headwall	25	Point
19	1	Headwall	28	Point
20	1	Headwall	27	Point
21	1	Headwall	24	Point
22	1	Headwall	29	Point
23	1	Headwall	28	Point
24	1	Headwall	24	Point
25	1	Headwall	24	Point
26	1	Headwall	24	Point
27	1	Headwall	24	Point
28	1	Headwall	22	Point
29	1	Headwall	14	Point
30	1	Headwall	24	Point
31	1	Headwall	24	Point
32	1	Headwall	27	Point
33	1	Headwall	22	Point
34	2	Tree	36	Point
35	1	Headwall	25	Point
36	1	Headwall	28	Point
37	1	Headwall	25	Point
38	1	Headwall	28	Point

ID	Category	Obstruction Type	Length to Obstruction (ft)	Length of Obstruction (ft)
39	1	Headwall	26	Point
40	1	Headwall	28	Point
41	1	Headwall	28	Point
42	1	Headwall	24	Point
43	1	Headwall	20	Point
44	1	Headwall	25	Point
45	1	Headwall	24	Point
46	1	Headwall	24	Point
47	1	Headwall	26	Point
48	1	Headwall	24	Point
49	1	Headwall	24	Point
50	1	Headwall	24	Point
51	1	Headwall	25	Point
52	1	Headwall	25	Point
53	1	Headwall	24	Point
54	1	Headwall	25	Point
55	1	Headwall	27	Point
56	1	Headwall	26	Point
57	1	Headwall	28	Point
58	1	Headwall	24	Point
59	1	Headwall	24	Point
60	2	Headwall	34	Point
61	1	Headwall	27	Point
1	3	Rock Cut	30	1788
2	3	Rock Cut	30	1877
3	3	Rock Cut	30	1654
4	3	Rock Cut	30	558
5	3	Rock Cut	30	948
6	3	Rock Cut	30	575
7	3	Rock Cut	30	1000
8	3	Rock Cut	30	566
9	3	Rock Cut	30	1063
10	3	Rock Cut	32	279
11	3	Rock Cut	30	1684
12	3	Rock Cut	30	569
13	3	Rock Cut	30	2339
14	3	Rock Cut	30	1338
15	3	Rock Cut	30	827
16	3	Rock Cut	30	1445
17	3	Rock Cut	30	1161
18	3	Rock Cut	30	296
19	3	Rock Cut	30	572

ID	Category	Obstruction Type	Length to Obstruction (ft)	Length of Obstruction (ft)
20	1	Tree Line	28	348
21	2	Tree Line	34	624
22	3	Rock Cut	30	2029
23	3	Rock Cut	30	1216
24	3	Rock Cut	30	1643
25	3	Rock Cut	30	1112
26	3	Rock Cut	30	757
27	3	Rock Cut	30	627
28	1	Tree Line	29	961
29	1	Rock Cut	30	755
30	3	Rock Cut	30	1313
31	3	Rock Cut	28	967
32	3	Rock Cut	30	880
33	3	Rock Cut	30	486
34	3	Rock Cut	40	429
35	3	Rock Cut	30	2950
36	3	Rock Cut	30	395
37	3	Rock Cut	30	914
38	3	Rock Cut	38	371
39	3	Rock Cut	30	710
40	3	Rock Cut	20	640
41	3	Rock Cut	30	327
42	3	Rock Cut	30	381
43	3	Rock Cut	30	436
44	3	Rock Cut	30	339
45	3	Rock Cut	30	673
46	3	Rock Cut	30	2442
47	3	Rock Cut	30	893
48	3	Rock Cut	40	442
49	3	Rock Cut	30	2411
50	3	Rock Cut	30	786
51	3	Rock Cut	30	813
52	3	Rock Cut	30	822
53	3	Rock Cut	30	1035
54	3	Rock Cut	30	2307
55	3	Rock Cut	30	3238
56	3	Rock Cut	30	544
57	3	Rock Cut	30	919
58	3	Rock Cut	30	936
59	3	Rock Cut	30	1029
60	3	Rock Cut	30	2036
61	3	Rock Cut	30	521

ID	Category	Obstruction Type	Length to Obstruction (ft)	Length of Obstruction (ft)
62	3	Rock Cut	30	1903
63	3	Rock Cut	40	944
64	3	Rock Cut	30	1560
65	3	Rock Cut	40	1249
66	3	Rock Cut	30	800
67	3	Rock Cut	30	613
68	3	Rock Cut	30	306
69	3	Rock Cut	34	1539
70	3	Rock Cut	30	867
71	3	Rock Cut	30	570
72	2	Backslope	40	746
73	3	Rock Cut	30	444
74	3	Rock Cut	40	458
75	3	Rock Cut	40	732
76	3	Rock Cut	30	1540
77	3	Rock Cut	30	654
78	3	Rock Cut	30	2292
79	3	Rock Cut	30	595
80	3	Rock Cut	30	2421
81	3	Rock Cut	30	1273
82	3	Rock Cut	30	636
83	3	Rock Cut	30	658
84	3	Rock Cut	30	695
85	3	Rock Cut	30	487
86	3	Rock Cut	30	833
87	3	Rock Cut	30	1411
88	3	Rock Cut	30	563
89	3	Rock Cut	30	323
90	2	Tree Line	46	382
91	1	Backslope	30	417
92	1	Backslope	30	368
93	1	Backslope	30	1501
94	1	Backslope	30	1265
95	1	Backslope	30	443
96	1	Backslope	30	355
97	1	Backslope	30	87
98	1	Backslope	30	210
99	1	Backslope	30	369
100	1	Backslope	30	1176
101	1	Backslope	30	242
102	1	Backslope	30	268
103	1	Backslope	30	668

ID	Category	Obstruction Type	Length to Obstruction (ft)	Length of Obstruction (ft)
104	1	Backslope	30	214
105	1	Backslope	30	634
106	1	Backslope	30	292
107	1	Backslope	30	716
108	1	Backslope	30	598
109	1	Backslope	24	778
110	1	Backslope	30	971
111	1	Backslope	30	1572
112	1	Backslope	25	293
113	3	Rock Cut	30	2207
114	1	Backslope	30	1078
115	3	Rock Cut	32	763
116	3	Rock Cut	25	320
117	1	Backslope	30	659
118	1	Backslope	30	1378
119	3	Rock Cut	30	862
120	3	Rock Cut	30	807
121	3	Rock Cut	30	735
122	3	Rock Cut	36	4485
123	3	Rock Cut	32	537
124	3	Rock Cut	32	1545
125	3	Rock Cut	32	1523
126	3	Rock Cut	32	1568
127	3	Rock Cut	32	774
128	3	Rock Cut	32	2094
129	3	Rock Cut	32	542
130	3	Rock Cut	32	1618
131	3	Rock Cut	32	2144
132	3	Rock Cut	32	723
133	3	Rock Cut	32	730
134	3	Rock Cut	32	1218
135	1	Tree Line	28	2128
136	2	Tree Line	36	1897
137	1	Backslope	30	1108
138	1	Tree Line	30	997
139	1	Backslope	30	685
140	1	Backslope	30	1000
141	1	Backslope	30	401
142	2	Tree Line	35	1299
143	3	Rock Cut	30	3055
144	3	Rock Cut	30	1544
145	1	Backslope	30	122

ID	Category	Obstruction Type	Length to Obstruction (ft)	Length of Obstruction (ft)
146	3	Rock Cut	30	503
147	3	Rock Cut	30	538
148	3	Rock Cut	30	1590
149	3	Rock Cut	30	446
150	3	Rock Cut	30	375
151	3	Rock Cut	30	810
152	3	Rock Cut	30	2292
153	3	Rock Cut	30	1003
154	3	Rock Cut	30	1510
155	3	Rock Cut	30	994
156	3	Rock Cut	30	2175
157	3	Rock Cut	30	1153
158	3	Rock Cut	30	365
159	3	Rock Cut	30	562
160	3	Rock Cut	30	997
161	3	Rock Cut	46	1980
162	3	Rock Cut	40	2016
163	3	Rock Cut	30	2456
164	3	Rock Cut	30	1455
165	3	Rock Cut	25	524
166	3	Rock Cut	30	968
167	3	Rock Cut	30	1914
168	3	Rock Cut	30	382
169	3	Rock Cut	30	432
170	3	Rock Cut	30	674
171	3	Rock Cut	30	1021
172	2	Tree Line	42	3111
173	2	Tree Line	34	5623
174	3	Rock Cut	30	513
175	1	Tree Line	30	694
176	3	Rock Cut	30	1660
177	3	Rock Cut	30	523

Horizontal Alignment

The 2018 *Green Book* identifies the minimum radii for superelevation rates based on design speeds. The table below highlights the existing horizontal alignment along the WKP, and the required superelevation based on the radius of the curve. In some instances, curves have a radius over 14,500 feet and thus require a normal crown (NC). Curve radii between 11,000 feet and 14,500 feet are required to have a reverse crown (RC). KYTC's HIS provided curve length and superelevation. Upon further review, there was a discrepancy between the HIS data and what exists in the field. A comparison between the superelevation obtained from HIS data and values obtained from the record plans is presented in the below table. Record plans were considered to be the most accurate data source for

Route Unique	BMP	EMP	Curve Length (mi)	Curve Degree	Superelevation (HIS)	Superelevation (Record Plan)	Superelevation Required by Standard	Radius (ft)	Friction Factor Cardinal	Friction Factor Non Cardinal
092-WK-9001-000	77.029	78.334	1.305	0.5	0	Normal Crown	2.0%	11459	0.029	0.029
092-WK-9001-000	78.334	79.41	1.076	0	0	Normal Crown	Normal Crown	0	0.000	0.000
092-WK-9001-000	79.41	79.918	0.508	0.7	0	2.0%	2.6%	8185	0.040	0.040
092-WK-9001-000	79.918	80.513	0.595	0.5	0	Normal Crown	2.0%	11459	0.029	0.029
092-WK-900-000	80.513	81.122	0.609	0.1	0	Normal Crown	Normal Crown	57296	0.006	0.006
092-WK-9001-000	81.122	81.817	0.695	0	0	Normal Crown	Normal Crown	0	0.000	0.000
092-WK-9001-000	81.817	82.481	0.664	0.7	0	2.0%	2.6%	8185	0.040	0.040
092-WK-9001-000	82.481	83.079	0.598	0	0	Normal Crown	Normal Crown	0	0.000	0.000
092-WK-9001-000	83.079	83.673	0.594	0.9	0	2.8%	3.4%	6366	0.051	0.051
092-WK-9001-000	83.673	84.123	0.45	0.1	0	Normal Crown	0.0%	57296	0.006	0.006
092-WK-9001-000	84.123	84.719	0.596	0.9	0	2.8%	3.4%	6366	0.051	0.051
092-WK-9001-000	84.719	85.254	0.535	0	0	Normal Crown	Normal Crown	0	0.000	0.000
092-WK-9001-000	85.254	85.741	0.487	1.3	0	3.5%	4.6%	4407	0.074	0.074
092-WK-9001-000	85.741	86.993	1.252	0	0	Normal Crown	Normal Crown	0	0.000	0.000
092-WK-9001-000	86.993	87.544	0.551	0.1	0	Normal Crown	0.0%	57296	0.006	0.006
016-WK-9001-000	87.544	88.433	0.889	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-000	88.433	90.333	1.9	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-010	88.433	90.352	1.919	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-000	90.333	90.649	0.316	2	0	N/A	6.6%	2865	0.062	0.114
043-WK-9001-010	90.352	90.662	0.31	2	5.7	N/A	6.6%	2865	0.114	0.057
043-WK-9001-000	90.649	91.793	1.144	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-010	90.662	91.793	1.131	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-000	91.793	91.98	0.187	1.9	3.2	2.8%	6.4%	3016	0.076	0.108
043-WK-9001-010	91.793	91.965	0.172	1.9	0	2.8%	6.4%	3016	0.108	0.059
043-WK-9001-010	91.965	106.509	14.544	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-000	91.98	106.566	14.586	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-010	106.509	106.653	0.144	1.3	0	3.5%	4.6%	4407	0.074	0.054
043-WK-9001-000	106.566	106.758	0.192	1.3	2.8	3.5%	4.6%	4407	0.046	0.074

Route Unique	BMP	EMP	Curve Length (mi)	Curve Degree	Superelevation (HIS)	Superelevation (Record Plan)	Superelevation Required by Standard	Radius (ft)	Friction Factor Cardinal	Friction Factor Non Cardinal
043-WK-9001-010	106.653	106.691	0.038	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-010	106.691	106.768	0.077	1.4	0	2.8%	5.0%	4093	0.080	0.046
043-WK-9001-000	106.758	106.825	0.067	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-010	106.768	118.46	11.692	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-000	106.825	106.875	0.05	1.5	2.8	2.8%	5.2%	3820	0.058	0.086
043-WK-9001-000	106.875	115.52	8.645	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-000	115.52	115.569	0.049	1.3	0	2.8%	4.6%	4407	0.037	0.074
043-WK-9001-000	115.569	118.455	2.886	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-000	118.455	118.936	0.481	1.5	3.6	2.8%	5.2%	3820	0.050	0.086
043-WK-9001-010	118.46	118.942	0.482	1.5	0	2.8%	5.2%	3820	0.086	0.048
043-WK-9001-000	118.936	119.649	0.713	0	0	Normal Crown	Normal Crown	0	0.000	0.000
043-WK-9001-010	118.942	119.649	0.707	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-000	119.649	124.108	4.459	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-010	119.649	131.977	12.328	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-000	124.108	124.154	0.046	1.2	0	4.2%	4.4%	4775	0.036	0.068
047-WK-9001-000	124.154	131.965	7.811	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-000	131.965	132.327	0.362	1.5	3.5	4.2%	5.2%	3820	0.051	0.086
047-WK-9001-010	131.977	132.313	0.336	1.5	0	4.2%	5.2%	3820	0.086	0.035
047-WK-9001-010	132.313	133.432	1.119	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-000	132.327	133.251	0.924	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-000	133.251	133.283	0.032	1.4	0	2.8%	5.0%	4093	0.059	0.080
047-WK-9001-000	133.283	134.986	1.703	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-010	133.432	133.461	0.029	1.3	1.5	2.8%	4.6%	4407	0.074	0.059
047-WK-9001-010	133.461	135.61	2.149	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-000	134.986	135.03	0.044	1.7	1.4	2.8%	5.8%	3370	0.083	0.097
047-WK-9001-000	135.03	135.601	0.571	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-000	135.601	136.167	0.566	3	7.1	8.3%	8.0%	1910	0.100	0.171
047-WK-9001-010	135.61	136.167	0.557	3	0	8.3%	8.0%	1910	0.171	0.083

Route Unique	BMP	EMP	Curve Length (mi)	Curve Degree	Superelevation (HIS)	Superelevation (Record Plan)	Superelevation Required by Standard	Radius (ft)	Friction Factor Cardinal	Friction Factor Non Cardinal
047-WK-9001-000	136.167	136.546	0.379	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-010	136.167	136.526	0.359	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-010	136.526	136.703	0.177	1.6	3.1	N/A	5.4%	3581	0.091	0.060
047-WK-9001-000	136.546	136.714	0.168	1.5	0	N/A	5.2%	3820	0.042	0.086
047-WK-9001-010	136.703	136.796	0.093	0	0	Normal Crown	Normal Crown	0	0.000	0.000
047-WK-9001-000	136.714	136.796	0.082	0	0	Normal Crown	Normal Crown	0	0.000	0.000

determining locations that do not meet Interstate standards. The side friction factor was also calculated for each curve. As highlighted in the report, the side friction factor should be less than 0.1. Side friction factor acts as a safety complement to curve radius and superelevation. A detailed survey should be completed to collect the most accurate existing superelevation data.

Vertical Alignment

Vertical Grade

The Interstate Design Guide states that vertical grade should be less than 4.0% at 70-mph for rolling terrain. HIS data indicated a vertical grade greater than 4.0% at 23 locations, therefore the record plans were reviewed and found that 4.0% was the maximum grade utilized. The record plans showed more vertical grades along the corridor than HIS, and the MPs of the beginning and end of the grades did not match up between the two sources. Record plans were considered to be the most accurate for determining locations that do not meet Interstate standards. The table below shows grade percentage along the WKP.

Highway Information System (HIS) Record Plans					Record Plans			
Route Unique	BMP	EMP	Direction	Grade	BMP	EMP	Grade	Direction
092-WK-9001-010	77.286	77.434	Downhill	0.499	77.5	77.51893939	0.000	Uphill
092-WK-9001-000	77.298	77.462	Downhill	3.913	77.96401515	78.14393939	2.900	Uphill
092-WK-9001-010	78.225	78.352	Uphill	3.030	78.56060606	78.92045455	-2.200	Downhill
092-WK-9001-000	78.368	78.534	Uphill	3.607	78.99621212	79.43181818	0.500	Uphill
092-WK-9001-010	79.295	79.453	Uphill	1.107	79.50757576	80.17045455	-0.500	Downhill
092-WK-9001-010	80.076	80.18	Downhill	0.852	80.24621212	80.49242424	0.500	Uphill
092-WK-9001-000	80.406	80.487	Downhill	2.659	80.56818182	80.83333333	2.000	Uphill
092-WK-9001-010	81.061	81.18	Downhill	3.375	80.90909091	81.16477273	1.500	Uphill
092-WK-9001-010	81.268	81.409	Uphill	2.446	81.2405303	81.38257576	0.500	Uphill
092-WK-9001-000	81.689	82.189	Uphill	1.493	81.45833333	81.78030303	3.000	Uphill
092-WK-9001-000	82.527	82.695	Downhill	0.602	82.23484848	82.42424242	-2.554	Downhill
092-WK-9001-010	82.987	83.214	Downhill	0.844	82.5	82.61363636	-3.200	Downhill
092-WK-9001-010	83.326	83.992	Downhill	2.765	82.76515152	82.93560606	-0.500	Downhill
092-WK-9001-010	84.433	84.671	Downhill	0.376	83.19128788	83.36174242	4.000	Uphill
092-WK-9001-000	85.362	85.515	Uphill	2.462	83.98674242	84.45075758	-3.600	Downhill
092-WK-9001-000	85.533	85.71	Downhill	3.566	84.65909091	85.39772727	2.000	Uphill
092-WK-9001-010	86.342	86.537	Uphill	0.331	85.71969697	86.35416667	-1.800	Downhill
092-WK-9001-000	87.191	87.529	Uphill	3.029	86.50568182	87.20643939	2.600	Uphill

Highway Information System (HIS) Record Plans					Record Plans			
Route Unique	BMP	EMP	Direction	Grade	BMP	EMP	Grade	Direction
092-WK-9001-010	87.788	87.939	Uphill	3.554	87.64204545	87.8125	-2.600	Downhill
016-WK-9001-000	88.121	88.401	Downhill	2.077	87.90719697	88.1344697	1.016	Uphill
016-WK-9001-010	88.888	89.188	Downhill	3.677	88.47537879	88.88257576	-2.990	Downhill
043-WK-9001-010	90.846	91.165	Downhill	1.932	89.10984848	89.77272727	3.000	Uphill
043-WK-9001-010	91.265	91.426	Downhill	4.976	90.07575758	90.51136364	-1.070	Downhill
043-WK-9001-010	92.998	93.122	Uphill	4.789	90.76704545	90.84280303	-3.970	Downhill
043-WK-9001-010	93.122	93.325	Uphill	3.750	91.12689394	91.25	4.000	Uphill
043-WK-9001-010	94.62	94.999	Downhill	4.282	91.32575758	91.45833333	3.000	Uphill
043-WK-9001-010	94.999	95.254	Downhill	4.657	91.53409091	91.95075758	4.000	Uphill
043-WK-9001-010	95.919	96.352	Uphill	4.396	92.57575758	92.99242424	-4.000	Downhill
043-WK-9001-010	96.581	96.776	Uphill	2.432	93.06818182	93.14393939	-1.800	Downhill
043-WK-9001-010	97.705	98.121	Uphill	0.771	93.29545455	93.46590909	-3.500	Downhill
043-WK-9001-010	98.121	98.316	Downhill	2.353	93.73106061	93.7594697	3.750	UPHILL
043-WK-9001-010	99.063	99.173	Downhill	3.336	94.04356061	94.62121212	0.500	Uphill
043-WK-9001-010	99.543	99.972	Downhill	2.293	94.96212121	95.04734848	-3.400	Downhill
043-WK-9001-010	100.534	100.747	Uphill	3.282	95.23674242	95.29356061	0.600	Uphill
043-WK-9001-010	100.78	100.973	Uphill	2.103	95.6344697	95.65340909	-3.500	Downhill
043-WK-9001-010	101.825	102.122	Downhill	1.171	95.89962121	95.91856061	3.460	Uphill
043-WK-9001-010	102.131	102.29	Downhill	2.829	96.33522727	96.63825758	-1.600	Downhill
043-WK-9001-010	103.062	103.383	Downhill	1.453	96.71401515	97.31060606	-0.685	Downhill
043-WK-9001-010	103.383	103.575	Downhill	1.742	97.40530303	97.59469697	0.500	Uphill
043-WK-9001-010	104.067	104.331	Downhill	3.173	97.67045455	97.74621212	1.630	Uphill
043-WK-9001-010	105.453	105.76	Uphill	3.338	98.06818182	98.59848485	-2.026	Downhill
043-WK-9001-010	105.821	105.921	Uphill	1.758	98.75	98.90151515	3.200	Uphill
043-WK-9001-010	107.02	107.275	Downhill	1.502	99.31818182	99.65909091	-1.560	Downhill
043-WK-9001-010	107.635	107.893	Downhill	1.472	100.0378788	100.217803	2.000	Uphill
043-WK-9001-010	108.286	108.715	Downhill	3.521	100.5587121	100.6818182	-2.020	Downhill
043-WK-9001-010	108.793	109.129	Uphill	2.410	100.8333333	100.9280303	0.800	Uphill

Highway Information System (HIS) Record Plans					Record Plans			
Route Unique	BMP	EMP	Direction	Grade	BMP	EMP	Grade	Direction
043-WK-9001-000	109.214	109.798	Uphill	4.076	101.0795455	101.3257576	3.300	Uphill
043-WK-9001-010	109.862	110.05	Uphill	4.447	101.5340909	101.7424242	-1.600	Downhill
043-WK-9001-000	110.187	110.64	Uphill	4.778	102.1969697	102.2727273	0.500	Uphill
043-WK-9001-000	110.64	111.033	Downhill	4.151	102.3863636	102.7367424	2.200	Uphill
043-WK-9001-000	111.033	111.463	Uphill	4.684	102.8503788	103.1723485	1.300	Uphill
043-WK-9001-000	112.302	112.476	Downhill	4.537	103.4564394	103.5132576	-1.500	Downhill
043-WK-9001-000	112.803	113.012	Downhill	4.397	103.6837121	103.6931818	1.280	Uphill
043-WK-9001-000	113.013	113.418	Uphill	3.940	104.1193182	104.1950758	-3.780	Downhill
043-WK-9001-010	113.982	114.127	Downhill	3.370	105.0284091	105.0852273	-4.000	Downhill
043-WK-9001-010	114.127	114.642	Uphill	1.834	105.3882576	105.6060606	3.900	Uphill
043-WK-9001-010	114.814	115.041	Downhill	2.028	105.8712121	105.9564394	1.000	Uphill
043-WK-9001-000	115.505	115.743	Downhill	3.627	106.3731061	106.9128788	-4.000	Downhill
043-WK-9001-000	115.743	116.161	Downhill	0.494	106.9886364	107.1969697	-0.590	Downhill
043-WK-9001-010	116.254	116.466	Downhill	3.892	107.3484848	107.8125	3.600	Uphill
043-WK-9001-000	116.57	116.902	Downhill	2.498	108.0965909	108.4848485	0.500	Uphill
043-WK-9001-010	116.948	117.069	Uphill	1.599	108.8636364	108.9583333	-4.000	Downhill
043-WK-9001-000	117.115	117.292	Uphill	2.441	109.2424242	109.375	3.998	Uphill
043-WK-9001-010	117.404	117.586	Crest	1.256	109.9242424	110.0189394	-2.650	Downhill
043-WK-9001-000	117.418	117.596	Downhill	3.478	110.1704545	110.3314394	0.710	Uphill
043-WK-9001-000	117.596	117.998	Downhill	1.641	110.7291667	110.7954545	-3.870	Downhill
043-WK-9001-000	117.997	118.273	Uphill	3.301	111.1174242	111.2026515	3.997	Uphill
043-WK-9001-000	119.157	119.411	Downhill	1.803	111.500947	112.0265152	-0.577	Downhill
043-WK-9001-010	119.453	119.636	Uphill	3.558	112.1780303	112.4479167	0.500	Uphill
047-WK-9001-010	120.221	120.502	Downhill	4.815	112.907197	112.9166667	-1.500	Downhill
047-WK-9001-010	121.706	121.925	Uphill	4.188	113.1060606	113.125	2.300	Uphill
047-WK-9001-010	121.942	122.151	Downhill	4.309	114.2045455	114.2518939	1.710	Uphill
047-WK-9001-000	122.146	122.606	Uphill	0.228	114.7276515	114.9337121	-4.000	Downhill
047-WK-9001-010	122.606	122.92	Downhill	4.437	116.2405303	116.3825758	-1.210	Downhill

Highway Information System (HIS) Record Plans					Record Plans			
Route Unique	BMP	EMP	Direction	Grade	BMP	EMP	Grade	Direction
047-WK-9001-010	122.982	123.19	Downhill	1.768	116.5340909	116.6856061	3.000	Uphill
047-WK-9001-000	123.256	123.483	Uphill	3.845	116.8939394	116.969697	-0.500	Downhill
047-WK-9001-000	124.031	124.187	Uphill	4.384	117.0454545	117.1401515	0.500	Uphill
047-WK-9001-000	124.241	124.7	Downhill	4.491	117.2916667	117.4431818	-1.150	Downhill
047-WK-9001-000	125.561	125.727	Uphill	4.116	117.5757576	117.6231061	2.000	Uphill
047-WK-9001-010	126.359	126.498	Uphill	3.182	118.0113636	118.0208333	-2.750	Downhill
047-WK-9001-000	126.503	126.884	Downhill	4.536	118.2670455	118.3712121	1.170	Uphill
047-WK-9001-010	126.947	127.151	Downhill	1.290	118.4848485	118.7215909	1.750	Uphill
047-WK-9001-000	128.929	129.07	Uphill	4.438	118.8541667	119.2424242	0.500	Uphill
047-WK-9001-010	128.951	129.059	Uphill	4.302	119.4128788	119.4791667	4.000	Uphill
047-WK-9001-010	130.907	131.027	Downhill	1.157	119.8579545	119.905303	-0.550	Downhill
047-WK-9001-010	130.925	131.05	Downhill	4.685	120.094697	120.2935606	-2.480	Downhill
047-WK-9001-010	135.624	135.694	Downhill	3.014	120.5018939	120.5492424	2.540	Uphill
047-WK-9001-000	135.625	135.67	Downhill	3.214	121.0795455	121.1931818	-4.000	Downhill
047-WK-9001-000	136.339	136.57	Downhill	1.867	121.3068182	121.7992424	-3.610	Downhill
047-WK-9001-010	136.558	136.742	Downhill	0.499	122.1969697	122.2064394	2.600	Uphill
					122.6609848	122.6988636	-2.100	Downhill
					122.9450758	123.0776515	1.000	Uphill
					123.2670455	123.4090909	-1.180	Downhill
					123.5606061	124.1761364	0.500	Uphill
					124.2897727	124.4128788	3.750	Uphill
					124.8011364	125.6912879	-0.750	Downhill
					125.842803	126.0416667	0.550	Uphill
					126.2689394	126.5151515	-0.770	Downhill
					126.6098485	126.6287879	2.000	Uphill
					126.969697	127.1022727	-1.770	Downhill
					127.2537879	127.3390152	-0.300	Downhill
					127.4526515	127.594697	0.300	Uphill
					127.6704545	127.9261364	0.620	Uphill
					128.0018939	128.125	0.300	Uphill
					128.2007576	128.7215909	0.500	Uphill
					128.844697	128.9299242	-0.300	Downhill

Highway Information System (HIS) Record Plans					Record Plans			
Route Unique	BMP	EMP	Direction	Grade	BMP	EMP	Grade	Direction
					129.0056818	129.1193182	-0.500	Downhill
					129.1761364	129.592803	0.500	Uphill
					129.6685606	129.8200758	-0.333	Downhill
					129.8958333	130.2935606	0.500	Uphill
					130.5018939	130.5681818	-0.722	Downhill
					130.7954545	130.8475379	-2.108	Downhill
					130.9611742	131.0795455	0.850	Uphill
					131.1363636	131.3731061	2.450	Uphill
					131.6761364	132.3768939	-1.050	Downhill
					132.5378788	132.5710227	3.300	Uphill
					132.9166667	133.0113636	-1.000	Downhill
					133.0871212	133.219697	-0.500	Downhill
					133.5606061	133.9393939	0.500	Uphill
					134.7443182	134.8674242	3.604	Uphill
					135.3030303	135.8712121	-1.200	Downhill
					136.0227273	136.032197	2.740	Uphill
					136.3162879	136.7954545	-0.800	Downhill

Stopping Sight Distance on Crest Vertical Curves

The 2018 Green Book provides criteria for stopping sight distance (SSD) based on design speed. For a 70-mph facility, the minimum SSD (S) for a crest vertical curve is 730 feet. SSD is calculated using the length of the curve (L) in feet, and the difference in grade (A) as a percent. The following equations are used to calculate the SSD in feet.

When $S < L$

$$L = \frac{AS^2}{2158}$$

When $S > L$

$$L = 2S - \frac{2158}{A}$$

The table below highlights the existing SSD for crest vertical curves along the WKP. The original data was collected from KYTC’s HIS, which indicated that all crest curves meet the Interstate standard. Because of the discrepancy between HIS data and record plans, a detailed survey should be completed to collect the most accurate existing vertical curve data.

Route Unique	BMP	EMP	L (ft)	A	Required SSD (ft)	Actual SSD (ft) - HIS	Actual SSD (ft) Record Plans
092-WK-9001-010	77.729	77.919	1003.2	3.985	730	737	
092-WK-9001-000	77.746	77.918	908.16	3.607	730	737	
092-WK-9001-000	78.817	78.984	881.76	2.321	730	906	
092-WK-9001-000	78.819	78.968	786.72	6.405	730	515	1469
092-WK-9001-000	79.295	79.515	1161.6	1.797	730	1181	
092-WK-9001-010	80.406	80.495	469.92	1.807	730	832	
092-WK-9001-000	81.756	82.176	2217.6	1.457	730	1812	

Route Unique	BMP	EMP	L (ft)	A	Required SSD (ft)	Actual SSD (ft) - HIS	Actual SSD (ft) Record Plans
092-WK-9001-010	82.513	82.687	918.72	1.577	730	1144	
092-WK-9001-000	85.37	85.521	797.28	1.231	730	1275	
092-WK-9001-010	85.525	85.726	1061.28	1.198	730	1431	
016-WK-9001-010	87.807	87.944	723.36	6.064	730	507	977
016-WK-9001-000	88.045	88.399	1869.12	5.106	730	889	
043-WK-9001-010	93.457	93.762	1610.4	8.407	730	643	1035
043-WK-9001-010	93.762	94.08	1679.04	7.574	730	692	998
043-WK-9001-010	97.315	97.469	813.12	1.783	730	1012	
043-WK-9001-010	97.595	97.705	580.8	1.874	730	866	
043-WK-9001-010	98.445	98.659	1129.92	2.841	730	926	
043-WK-9001-010	98.719	99.037	1679.04	2.560	730	1190	
043-WK-9001-010	101.199	101.627	2259.84	4.102	730	1090	
043-WK-9001-010	101.627	101.825	1045.44	4.309	730	724	740
043-WK-9001-010	103.575	104.022	2360.16	1.115	730	2137	
043-WK-9001-010	105.941	106.267	1721.28	3.227	730	1073	
043-WK-9001-010	106.739	106.979	1267.2	2.920	730	968	
043-WK-9001-000	109.216	109.8	3083.52	4.051	730	1282	
043-WK-9001-000	109.867	110.078	1114.08	4.052	730	770	
043-WK-9001-010	110.635	111.033	2101.44	1.236	730	1915	
043-WK-9001-010	112.277	112.478	1061.28	9.221	730	498	983
043-WK-9001-010	112.478	112.803	1716	2.069	730	1338	
043-WK-9001-010	113.012	113.415	2127.84	3.679	730	1117	
043-WK-9001-010	113.415	113.651	1246.08	4.554	730	768	
043-WK-9001-010	113.65	113.981	1747.68	4.847	730	882	
043-WK-9001-000	113.981	114.119	728.64	5.007	730	560	930
043-WK-9001-010	115.041	115.503	2439.36	4.818	730	1045	
043-WK-9001-010	116.24	116.445	1082.4	3.398	730	829	
043-WK-9001-000	116.562	116.899	1779.36	1.719	730	1495	
043-WK-9001-000	117.115	117.289	918.72	3.412	730	762	
043-WK-9001-010	117.404	117.586	960.96	1.538	730	1182	
043-WK-9001-000	117.998	118.289	1536.48	5.151	730	802	
043-WK-9001-010	118.701	118.866	871.2	3.251	730	760	
043-WK-9001-010	119.665	120.111	2354.88	3.052	730	1290	
047-WK-9001-010	119.86	120.094	1235.52	5.191	730	717	974
047-WK-9001-000	120.502	121.028	2777.28	7.252	730	909	
047-WK-9001-000	121.713	121.926	1124.64	3.267	730	862	
047-WK-9001-010	121.944	122.146	1066.56	1.433	730	1286	
047-WK-9001-000	122.151	122.613	2439.36	4.135	730	1128	
047-WK-9001-010	123.262	123.45	992.64	2.982	730	848	
047-WK-9001-010	124.035	124.241	1087.68	4.738	730	704	992
047-WK-9001-000	126.372	126.503	691.68	7.280	730	453	1417
047-WK-9001-010	126.498	126.835	1779.36	7.361	730	722	1015

Route Unique	BMP	EMP	L (ft)	A	Required SSD (ft)	Actual SSD (ft) - HIS	Actual SSD (ft) Record Plans
047-WK-9001-000	130.139	130.388	1314.72	5.063	730	749	
047-WK-9001-000	130.152	130.409	1356.96	5.297	730	744	
047-WK-9001-010	130.685	130.846	850.08	5.118	730	599	1432
047-WK-9001-000	130.685	130.852	881.76	5.480	730	589	1378
047-WK-9001-000	132.198	132.417	1156.32	3.954	730	794	
047-WK-9001-000	132.207	132.424	1145.76	4.203	730	767	
047-WK-9001-010	133.059	133.418	1895.52	5.000	730	904	
047-WK-9001-000	133.734	133.896	855.36	4.598	730	634	957
047-WK-9001-000	133.911	134.236	1716	4.033	730	958	
047-WK-9001-010	134.252	134.373	638.88	4.115	730	579	1777
047-WK-9001-000	134.638	135.141	2655.84	6.265	730	956	
047-WK-9001-000	134.668	135.129	2434.08	6.382	730	907	
047-WK-9001-000	135.797	135.975	939.84	5.645	730	599	1016
047-WK-9001-010	135.799	136.101	1594.56	5.652	730	780	
047-WK-9001-000	136.109	136.295	982.08	4.765	730	667	956
047-WK-9001-010	136.321	136.558	1251.36	4.688	730	759	

Headlight Sight Distance on Sag Vertical Curves

The sight distance (S) for sag vertical curves is known as headlight sight distance (HLSD) and is 730 feet according to the 2018 Green Book. Similar to SSD for crest curves, HLSD for sag curves is calculated based on the length (L) of the curve in feet, and the difference in grade (A) as a percent. The following equations are used to calculate the HLSD in feet.

When $S < L$

$$L = \frac{AS^2}{400+3.5S}$$

When $S > L$

$$L = 2S - \frac{400+3.5S}{A}$$

The table below highlights the existing HLSD for sag vertical curves along the WKP. The original data was collected from KYTC's HIS. For locations where HIS data showed that HLSD does not meet Interstate standards, record plans were used to perform a second check. Record plans were considered to be the most accurate for determining locations that do not meet Interstate standards. A detailed survey should be completed to collect the most accurate existing vertical curve data.

Route Unique	BMP	EMP	L (ft)	A	Required HLSD (ft)	Actual HLSD - HIS (ft)	Actual HLSD - Record Plans (ft)
016-WK-9001-000	77.006	77.180	918.72	4.082	730	889	
092-WK-9001-000	77.013	77.254	1272.48	4.821	730	1027	
092-WK-9001-010	77.434	77.729	1557.6	4.111	730	1432	
092-WK-9001-000	77.462	77.746	1499.52	4.572	730	1253	
092-WK-9001-010	78.030	78.217	987.36	4.401	730	886	
092-WK-9001-000	78.038	78.558	2745.6	4.016	730	2502	
092-WK-9001-010	81.067	81.186	628.32	3.834	730	674	933
092-WK-9001-000	81.266	81.405	733.92	3.644	730	812	
092-WK-9001-000	82.996	83.220	1182.72	1.658	730	INFINITE	

Route Unique	BMP	EMP	L (ft)	A	Required HLSD (ft)	Actual HLSD - HIS (ft)	Actual HLSD - Record Plans (ft)
092-WK-9001-010	83.365	83.987	3284.16	2.354	730	6731	
092-WK-9001-000	84.416	84.669	1335.84	2.718	730	2082	
092-WK-9001-000	86.344	86.542	1045.44	3.632	730	1115	
092-WK-9001-010	87.187	87.527	1795.2	3.682	730	1814	
092-WK-9001 -010	87.788	87.939	797.28	5.080	730	646	646
092-WK-9001 -000	87.807	87.944	723.36	4.931	730	610	610
043-WK-9001-010	89.798	90.151	1863.84	3.661	730	1890	
043-WK-9001-010	90.508	90.846	1784.64	3.452	730	1927	
043-WK-9001-010	91.481	91.566	448.8	6.721	730	318	758
043-WK-9001-010	91.895	92.641	3938.88	6.868	730	2116	
043-WK-9001-010	95.254	95.643	2053.92	6.171	730	1270	
043-WK-9001-010	95.643	95.919	1457.28	6.543	730	881	
043-WK-9001-010	100.079	100.352	1441.44	5.575	730	1008	
043-WK-9001-010	100.377	100.468	480.48	5.438	730	398	1241
043-WK-9001 -010	104.067	104.331	1393.92	7.949	730	702	702
043-WK-9001-010	104.331	104.941	3220.8	5.08	730	2328	
043-WK-9001-010	104.941	105.299	1890.24	4.931	730	1448	
043-WK-9001-010	109.046	109.128	432.96	7.597	730	281	756
043-WK-9001-010	110.186	110.635	2370.72	9.278	730	997	
043-WK-9001-010	111.033	111.473	2323.2	1.512	730	INFINITE	
043-WK-9001-010	112.476	112.806	1742.4	2.572	730	2969	
043-WK-9001-000	112.806	113.013	1092.96	8.614	730	538	1024
043-WK-9001-000	113.418	113.650	1224.96	5.19	730	928	
043-WK-9001-010	113.651	113.982	1747.68	8.01	730	865	
043-WK-9001-000	114.119	114.645	2777.28	1.49	730	INFINITE	
043-WK-9001-000	114.813	115.037	1182.72	1.315	730	INFINITE	
043-WK-9001-000	115.037	115.505	2471.04	1.473	730	INFINITE	
043-WK-9001-000	115.503	115.743	1267.2	3.135	730	1579	
043-WK-9001-010	115.743	116.176	2286.24	4.082	730	2069	
043-WK-9001-010	116.902	117.070	887.04	4.097	730	859	
043-WK-9001-010	117.586	117.878	1541.76	3.774	730	1536	
043-WK-9001-010	117.894	117.997	543.84	3.112	730	768	
043-WK-9001-010	118.686	118.870	971.52	5.707	730	694	1266
043-WK-9001-000	119.185	119.420	1240.8	2.063	730	4728	
047-WK-9001-000	119.673	119.767	496.32	3.226	730	678	1014
047-WK-9001-010	120.224	120.502	1467.84	7.949	730	745	
047-WK-9001-000	120.502	121.039	2835.36	9.603	730	1137	
047-WK-9001-000	122.613	122.906	1547.04	3.535	730	1644	
047-WK-9001-010	122.989	123.193	1077.12	6.205	730	706	1641
047-WK-9001-000	124.258	124.696	2312.64	8.5	730	1055	
047-WK-9001-010	125.559	125.748	997.92	2.018	730	4503	

Route Unique	BMP	EMP	L (ft)	A	Required HLSD (ft)	Actual HLSD - HIS (ft)	Actual HLSD - Record Plans (ft)
047-WK-9001-010	126.96	127.159	1050.72	4.472	730	924	
047-WK-9001-000	128.555	128.716	850.08	4.533	730	756	
047-WK-9001-010	130.402	130.685	1494.24	9.571	730	643	900
047-WK-9001-000	130.415	130.685	1425.6	9.487	730	622	784
047-WK-9001-000	131.162	131.560	2101.44	2.651	730	3313	
047-WK-9001-010	131.209	131.555	1826.88	2.449	730	3486	
047-WK-9001-010	132.417	132.805	2048.64	4.14	730	1840	
047-WK-9001-000	132.424	132.807	2022.24	4.094	730	1836	
047-WK-9001-000	133.741	133.869	675.84	7.026	730	427	Infinite
047-WK-9001-010	133.896	134.375	2529.12	6.785	730	1410	
047-WK-9001-010	134.373	134.584	1114.08	2.594	730	1949	
047-WK-9001-010	134.375	134.602	1198.56	2.794	730	1795	
047-WK-9001-010	135.670	135.797	670.56	7.813	730	389	757
047-WK-9001-010	135.694	135.799	554.4	8.085	730	325	757
047-WK-9001-000	135.993	136.109	612.48	7.163	730	388	811
047-WK-9001-010	136.101	136.282	955.68	7.05	730	570	811
047-WK-9001-000	136.570	136.762	1013.76	5.083	730	798	

1.2 Bridges and Overpasses

Bridge data were obtained from a combination of bridge inspection reports, Google Earth & Streetview, and field visit verification. Structures along the WKP comprised of both bridges and box culverts (with spans greater than 20 feet as measured along the roadway centerline).

Bridge Width

A review of the bridge inspection reports yielded information on the clear width measured across each bridge. The table below shows the clear width (curb-to-curb) and the approach road width across each bridge on the WKP. Widths of the bridges that cross over the Parkway are not included in this table.

The Interstate Design Guide provides minimum clear widths across bridges for existing structures on the mainline on routes to be incorporated into the Interstate System. These widths are dependent on the length of the bridge and are classified into two categories: bridges less than or equal to 200 feet in length and bridges longer than 200 feet in length.

- Bridges that are less than or equal to 200 feet in length, the bridge cross section shall consist of at least 12-foot lanes, 10-foot right side shoulder, and 3.5-foot left side shoulder. With two lanes in a direction on the Expressway this equates to a minimum clear width of 37.5 feet.
- Bridges longer than 200 feet in length, the bridge cross section shall have shoulders on both the left and right sides that are at least 3.5 feet in width. With two lanes in each direction on the Expressway this equated to a minimum clear width of 31 feet.

Bridge clear widths across bridges that is less than the AASHTO standard are shown in red text. It should be noted that these minimum widths are only applicable to mainline. The below table does not contain box culvert crossings since the same mainline typical section is carried across each of these culvert locations resulting in no change in width.

Bridge ID	Milepoint	County	Crossing Feature	Approach Road Width (ft)	Bridge Clear Width (ft)	Bridge Length (ft)
092B00072L	76.766	Ohio	I-165 (Natcher Parkway)	38.06	41.99	249.00
092B00072R	76.770	Ohio	I-165 (Natcher Parkway)	38.06	41.99	249.00
092B00130L	85.717	Ohio	KY2713	38.06	38.00	116.10
092B00130R	85.744	Ohio	KY2713	38.06	38.06	116.10
043B00027L	99.121	Grayson	Pleasant View Rd.	74.15	38.06	119.10
043B00027R	99.130	Grayson	Pleasant View Rd.	74.15	38.06	119.10
043B00026L	104.011	Grayson	KY187	37.07	29.86	156.00
043B00026R	104.040	Grayson	KY187	37.07	29.86	156.00
047B00094L	130.886	Hardin	W. Rhudes Creek	38.00	38.00	130.00
047B00094R	130.894	Hardin	W. Rhudes Creek	38.00	38.00	130.00
047B00093R	132.417	Hardin	Valley Creek	49.87	29.86	210.00
047B00093L	132.419	Hardin	Valley Creek	49.87	29.86	210.00
047B00092R	132.574	Hardin	CSX-Gather St. Rd.	49.87	29.86	173.00
047B00092L	132.579	Hardin	CSX-Gaither St. Rd.	49.87	29.86	173.00
047B00127R	136.401	Hardin	I-65 (Kentucky Turnpike)	64.96	47.90	436.00
047B00127L	136.401	Hardin	I-65 (Kentucky Turnpike)	64.96	47.90	436.00

Vertical Clearance at Overpasses

With the WKP being a rural facility, the *AASHTO A Policy on Design Standards - Interstate System May 2016* requires the vertical clearance between the Parkway, including the entire roadway width, any auxiliary lanes, shoulders, ramps, and collector-distributor facilities, and any structure overpass to be a minimum of 16-feet. The vertical clearance requirement is not only needed for normal roadway operations but is also needed for the Strategic Highway Network (STRAHNET) and is a critical need for the Department of Defense's domestic operations.

Bridge inspection reports were reviewed for any locations with a reported vertical clearance of less than 16.50 feet. Locations with less than 16.50 feet were flagged for further data collection at a field review. Google Earth and bridge inspection photos were reviewed to determine which overpass bridges had haunched beams. These types of beams have a cross-sectional area that thickens near the supports. This can often result in less vertical clearance over the shoulders than the driving lanes. Additional vertical clearance measurements were taken at the inside and outside shoulder locations and are shown in the following table. Measurements less than 16.00 are shown in bold red text.

Bridge ID	Milepoint	County	Vertical Clearance over Driving Lanes*	Vertical Clearance at Edge of Shoulder (ft)**			
				EB Outside	EB Inside	WB Outside	WB Inside
092B00136N	77.382	Ohio	14.75				
092B00184N	82.123	Ohio	16.60				
016B00034N	87.842	Butler	17.27	14.50	16.17	19.50	17.75

Bridge ID	Milepoint	County	Vertical Clearance over Driving Lanes*	Vertical Clearance at Edge of Shoulder (ft)**			
				EB Outside	EB Inside	WB Outside	WB Inside
043B00082N	90.588	Grayson	23.18				
043B00094N	92.298	Grayson	16.68				
043B00023N	94.257	Grayson	15.96	13.92	15.50	15.33	15.83
043B00097N	95.217	Grayson	16.77				
043B00096N	96.602	Grayson	16.53				
043B00073N	105.884	Grayson	16.55	14.92	16.42	15.50	16.33
043B00098N	106.965	Grayson	17.25				
043B00060N	109.230	Grayson	16.77	18.17	16.75	17.25	17.17
043B00099N	110.843	Grayson	16.68				
043B00003N	111.841	Grayson	15.51	14.50	14.92	14.50	15.50
043B00095N	113.972	Grayson	16.71				
043B00078N	117.423	Grayson	15.60	15.17	16.00	14.17	15.50
043B00104N	119.333	Grayson	17.00				
047B00168N	120.987	Hardin	16.00				
047B00043N	123.429	Hardin	15.17	15.75	16.17	14.75	15.00
047B00167N	127.258	Hardin	16.42				
047B00045N	129.041	Hardin	14.50	15.33	14.75	14.75	14.67
047B00090N	131.831	Hardin	14.75	15.83	16.67	15.92	14.58
047B00171N	133.409	Hardin	16.50				
047B00153R	135.689	Hardin	16.00	>16.42	>16.42	>16.42	15.33
047B00108L	135.699	Hardin	15.40	>16.42	>16.42	>16.42	16.17
047B00172N	135.924	Hardin	16.75				

*From bridge inspection reports **From field measurements

Bridge Railing

The AASHTO A Policy on Design Standards – Interstate System May 2016 stipulates that mainline bridges on routes to be incorporated into the Interstate System may remain in place if the railing across the bridge meets or will be upgraded to the current standards. A review of the bridge inspection reports, and field verification resulted in the structures shown in the table below having substandard railing. This substandard railing usually consisted of metal railing on top of concrete barrier wall and in some locations included a small curb at the edge of the bridge deck. Any railing should be replaced with MASH Test Level IV compliant bridge railing.

The table is a listing from the bridge inspection report showing transitions from guardrail to bridge rail.

Bridge ID	Milepoint	County	Crossing Feature	Bridge Railing	Transition to Railing
092B00072L	76.766	Ohio	I-165 (Natcher Parkway)	Substandard	Meets
092B00072R	76.770	Ohio	I-165 (Natcher Parkway)	Substandard	Meets
092B00130L	85.717	Ohio	KY2713	Substandard	Meets
092B00130R	85.744	Ohio	KY2713	Substandard	Meets

Bridge ID	Milepoint	County	Crossing Feature	Bridge Railing	Transition to Railing
043B00027L	99.121	Grayson	Pleasant View Rd.	Meets*	Substandard*
043B00027R	99.130	Grayson	Pleasant View Rd.	Meets	Meets
043B00026L	104.011	Grayson	KY187	Meets	Meets
043B00026R	104.040	Grayson	KY187	Meets	Meets
047B00094L	130.886	Hardin	W. Rhudes Creek	Substandard	Meets
047B00094R	130.894	Hardin	W. Rhudes Creek	Substandard	Meets
047B00093R	132.417	Hardin	Valley Creek	Meets*	Meets
047B00093L	132.419	Hardin	Valley Creek	Meets*	Meets
047B00092R	132.574	Hardin	CSX-Gather St. Rd.	Meets*	Meets
047B00092L	132.579	Hardin	CSX-Gaither St. Rd.	Meets*	Meets
047B00127R	136.401	Hardin	I-65 (Kentucky Turnpike)	Meets	Meets
047B00127L	136.401	Hardin	I-65 (Kentucky Turnpike)	Meets	Meets

*Bridge railing reviewed by District after reports were obtained and deemed to meet the standard.

Bridge Sufficiency Ratings

There are 41 bridges along the WKP, 16 of which carry the facility over another roadway or stream. The other 25 bridges cross over the WKP carrying state and county routes. The majority of these bridges were constructed in the early 1960's with some new bridges being reconstructed in the 2000's. The table below provides the locations of the bridges and the condition from a review of the most current inspection reports.

The condition shown in the table below comes from the National Bridge Inventory (NBI) rating as provided in bridge inspection reports. Ratings are assigned for the bridge deck, superstructure and substructure. The condition given for the overall structure is based off of the lowest rated element. Bridge condition ratings are classified as such: **Poor** – rating less than or equal to 4, **Fair** – rating between 5 and 6, **Good** – rating greater than or equal to 7.

Bridge ID	Milepoint	County	Crossing Feature	Condition	Health Index	Year Built	Posting/Notes
092B00072L	76.766	Ohio	I-165 (Natcher Parkway)	Poor	95.66	1963	None
092B00072R	76.770	Ohio	I-165 (Natcher Parkway)	Fair	91.22	1963	None
092B00136N	77.382	Ohio	KY2712	Poor	85.06	1963	Posted for Load
092B00184N	82.123	Ohio	KY505	Fair	93.58	1962	Posted for Load
092B00130L	85.717	Ohio	KY2713	Fair	99.01	1999	None
092B00130R	85.744	Ohio	KY2713	Fair	90.91	1962	None
016B00034N	87.842	Butler	KY340	Fair	99.89	2003	None
043B00082N	90.588	Grayson	Dog Creek Rd.	Good	99.54	2003	None
043B00094N	92.298	Grayson	KY736	Good	96.72	1963	None

Bridge ID	Milepoint	County	Crossing Feature	Condition	Health Index	Year Built	Posting/Notes
043B00023N	94.257	Grayson	KY79	Good	96.21	1963	None
043B00097N	95.217	Grayson	KY185	Good	98.67	1963	Posted for Load
043B00096N	96.602	Grayson	Higgs Rd.	Good	88.33	1963	Posted for Load
043B00027L	99.121	Grayson	Pleasant View Rd.	Good	89.22	1963	Posted for Load
043B00027R	99.130	Grayson	Pleasant View Rd.	Good	99.20	2004	No
043B00026L	104.011	Grayson	KY187	Fair	83.93	1963	Posted for Load
043B00026R	104.040	Grayson	KY187	Fair	99.88	2005	No
043B00073N	105.884	Grayson	McDonald Rd.	Fair	90.36	1963	Posted for Load
043B00098N	106.965	Grayson	KY259	Good	99.91	2003	No
043B00060N	109.230	Grayson	KY1214	Poor	85.84	1962	Posted for Load
043B00099N	110.843	Grayson	KY88	Good	99.91	2012	No
043B00003N	111.841	Grayson	KY224	Good	99.89	2012	None
043B00095N	113.972	Grayson	Crow Hollow Rd.	Good	95.15	1962	Posted for Load
043B00078N	117.423	Grayson	KY720	Fair	100.00	2012	No
043B00104N	119.333	Grayson	Clifty Church Rd.	Good	91.77	1962	Posted for Load
047B00168N	120.987	Hardin	Rock Creek Rd.	Good	97.01	1962	None
047B00043N	123.429	Hardin	KY84	Fair	96.64	1962	None
047B00167N	127.258	Hardin	KY1375	Good	79.52	1962	Posted for Load
047B00045N	129.041	Hardin	KY222	Fair	87.85	1962	None
047B00094L	130.886	Hardin	W. Rhudes Creek	Fair	85.33	1962	None
047B00094R	130.894	Hardin	W. Rhudes Creek	Fair	81.03	1962	None
047B00090N	131.831	Hardin	KY1904	Fair	88.40	1962	None
047B00093R	132.417	Hardin	Valley Creek	Good	99.97	2013	None
047B00093L	132.419	Hardin	Valley Creek	Good	99.49	1995	None
047B00092R	132.574	Hardin	CSX-Gather St. Rd.	Fair	99.75	1974	None
047B00092L	132.579	Hardin	CSX-Gaither St. Rd.	Fair	99.47	2013	Posted for Load
047B00171N	133.409	Hardin	KY3005 (Ring Rd.)	Good	95.66	1963	None
047B00153R	135.689	Hardin	US31W Bypass	Good	91.22	1963	None
047B00108L	135.699	Hardin	US31W Bypass	Good	85.06	1963	Posted for Load
047B00172N	135.924	Hardin	KY1136	Good	93.58	1962	Posted for Load
047B00127R	136.401	Hardin	I-65 (Kentucky Turnpike)	Good	92.38	1983	None
047B00127L	136.401	Hardin	I-65 (Kentucky Turnpike)	Good	97.77	1983	None

Box Culverts

Seven reinforced concrete box culverts with span lengths in excess of 20-foot are located along the WKP. These culverts were built in the early 1960s and accommodate the crossing of streams. The table below provides the locations of these culverts and the culvert conditions.

Bridge ID	Milepoint	County	Crossing Feature	Condition	Health Index	Year Built	Posting/Notes
092B00131N	84.561	Ohio	Indian Camp Creek	Poor	33.07	1963	RCBC - Posted for Load
043B00031N	91.005	Grayson	Dog Creek	Fair	79.91	1962	RCBC - None
043B00030N	93.612	Grayson	Buck Creek	Fair	71.97	1962	RCBC - None
043B00029N	95.787	Grayson	Alder Creek	Fair	67.03	1962	RCBC - Posted for Load
043B00028N	97.524	Grayson	Caney Fork	Fair	88.10	1962	RCBC - None
043B00032N	115.604	Grayson	Clifty Creek	Good	99.40	1963	RCBC - None
047B00095N	127.353	Hardin	Overflow Structure	Fair	98.93	1962	RCBE - Posted for Load

Overhead Signing

The AASHTO A Policy on Design Standards – Interstate System May 2016 requires the vertical clearance under sign trusses and pedestrian overpasses to not be less than 17-foot. This vertical clearance applies to all travel lanes, auxiliary lanes, shoulders, and collector-distributor roads. Six overhead truss signs are present along the WKP. Field measurements were obtained for all six of these locations and all overhead signs met the 17-foot minimum vertical clearance. The table below shows the locations of these sign trusses.

Milepoint	County	Description
76.75	Ohio	Cantilever sign over weave lane, WB
76.82	Ohio	Cantilever sign over weave lane, EB
77.12	Ohio	Truss-mounted sign over WB lane
135.80	Hardin	Truss-mounted sign over EB lane
136.08	Hardin	Truss-mounted sign over EB lane
136.37	Hardin	Truss-mounted sign over mainline

1.3 Interchanges and Ramps

This section shows data for interchanges and ramps along the WKP. Data was collected from KYTC's HIS, record plans, Google Earth, and a field review for confirmation of data. It should be noted that a full survey should be conducted to provide up-to-date and accurate data within this study area.

Interchange Type and Interchange Lighting Presence

The following table shows the interchange locations along the WKP, interchange type, and presence/absence of interchange lighting. A Google Earth review and field visit confirmation were used for verification.

County	Exit Number	BMP	EMP	Intersecting Route	Interchange Type	Lighting
Ohio	77	--	77.143	I-265 (Natcher Parkway)	Full Cloverleaf	Yes
Grayson	94	93.922	94.438	KY 79	Diamond	Yes
Grayson	107	106.777	107.201	KY 259	Diamond	Yes
Grayson	112	111.621	112.035	KY 224	Diamond	Yes
Hardin	124	123.104	123.641	KY 84	Diamond	No
Hardin	133	133.124	133.830	KY 3005	Diamond	Yes
Hardin	136	135.294	135.949	US 31W Bypass	Trumpet	Yes
Hardin	137	136.062	136.668	I-65	Full Cloverleaf	Yes

Design Speed, Posted Auxiliary Speed, and Weaving Sections

The *Green Book* provides values for ramp design speed as related to highway design speed. These design speeds apply to the sharpest ramp curve. For standard ramps, the design speed may range from 35-mph to 60-mph, and for loop ramps the design speed should not be less than 20-mph. The following table shows the posted auxiliary speeds (mph) and weaving sections for the WKP ramps.

County	Exit Number	Intersecting Route	EB Entrance	EB Exit	WB Entrance	WB Exit	Weave (Y/N)
Ohio	77	I-265 (Natcher Parkway)	45	30	30	45	Yes
Grayson	94	KY 79	NA	NA	NA	45	No
Grayson	107	KY 259	NA	NA	NA	NA	No
Grayson	112	KY 224	NA	NA	NA	NA	No
Hardin	124	KY 84	NA	NA	NA	50	No
Hardin	133	KY 3005	NA	NA	NA	NA	No
Hardin	136	US 31W Bypass	40	50	50	50	No
Hardin	137	I-65	25	NA	NA	25	Yes

Ramp Lane Width

The following table shows the lane widths for the WKP ramps. The *2018 Green Book* requires lane widths to be 14 feet wide for a standard ramp and 15 feet wide for loop ramps.

County	Exit Number	Intersecting Route	Lane Width (ft)			
			EB Entrance	EB Exit	WB Entrance	WB Exit
Ohio	77	I-265 (Natcher Parkway)	14	15 (Loop)	15 (Loop)	14
Grayson	94	KY 79	14	14	14	14
Grayson	107	KY 259	14	14	14	14
Grayson	112	KY 224	14	14	14	14
Hardin	124	KY 84	14	14	14	14
Hardin	133	KY 3005	14	14	14	14
Hardin	136	US 31W Bypass	15 (Loop)	14	14	14
Hardin	137	I-65	15 (Loop)	14	14	15 (Loop)

Ramp Shoulder Width

The following table shows the shoulder widths for the WKP ramps. The 2018 Green Book requires inside shoulder widths to be paved and at least 2 feet wide and outside shoulders to be paved and at least 6 feet wide.

County	Exit Number	Intersecting Route	EB Entrance Inside/ Outside Width (ft)	EB Exit Inside/ Outside Width (ft)	WB Entrance Inside/ Outside Width (ft)	WB Exit Inside/ Outside Width (ft)
Ohio	77	I-265 (Natcher Parkway)	6'/10'	6'/6'	4'/6'	4'/6'
Grayson	94	KY 79	4'/6'	6'/8'	4'/6'	4'/6'
Grayson	107	KY 259	4'/6'	4'/6'	4'/6'	4'/6'
Grayson	112	KY 224	4'/6'	4'/6'	4'/6'	4'/6'
Hardin	124	KY 84	4'/6'	4'/6'	4'/6'	4'/6'
Hardin	133	KY 3005	4'/6'	4'/6'	4'/6'	4'/6'
Hardin	136	US 31W Bypass	8'/10'	8'/10'	6'/6'	6'/6'
Hardin	137	I-65	6'/6'	4'/6'	6'/8'	6'/6'

Ramp Horizontal Alignment

The 2018 Green Book requires that the superelevation for interstate ramps be less than 10%, which is what some of the WKP interchanges were designed to, however it is KYTC common practice to keep superelevation below 8%. Locations with superelevation greater than 8% but less than or equal to 10% are typically allowed since this does meet the 2018 Green Book requirement even though it is greater than KYTC common practice. Record plans were used to determine the superelevation of interchange ramps. Ramp radius is contingent on the superelevation of the ramp and the ramp speed. The existing radius was found in the record plans while the radius required was found in the superelevation table in the 2018 Green Book. During the original design of the WKP, ramps were designed at an $e_{\max} = 10\%$. Any ramp with a superelevation over 8% in the table below adheres to the $e_{\max} = 10\%$ table in the 2018 Green Book. All others adhere to the $e_{\max} = 8\%$ table.

The divergence angle for an interstate should be between two and five percent. The divergence angle was found by measuring the two legs of the off-ramp divergence and solving for the tangent degree. The table below highlights the superelevation and radius of most ramps, but record plans were not available for some interchanges. The divergence angle was estimated for all off-ramps using Google Earth.

Exit Number	Intersecting Route	Ramp	Speed (mph)	Actual Superelevation	Superelevation Required	Actual Radius (ft)	Radius Req. (ft)	Divergence Angle (deg)
77	I-165 (Natcher Parkway)	EB Exit	30	NA	8%	NA	214	4
		EB Entrance	45	NA	8%	NA	587	
		WB Exit	45	NA	8%	NA	587	5
		WB Entrance	30	NA	8%	NA	214	
94	KY 79	EB Exit	45	NA	8%	NA	587	4
		EB Entrance	45	10%	10% (40-mph)	430	540	
		WB Exit	45	10%	10%	600	540	5
		WB Entrance	45	9.70%	9%	818	648	
107	KY 259	EB Exit	45	2.50%	4%	2290	3860	4
		EB Entrance	45	4.00%	6%	1146	2220	
		WB Exit	45	4.40%	7%	955	1960	2
		WB Entrance	45	4.00%	6%	1146	2220	
112	KY 224	EB Exit	45	5.90%	6%	1255	1285	4
		EB Entrance	45	6.20%	6%	1185	1180	
		WB Exit	45	7.40%	8% (35-mph)	375	822	5
		WB Entrance	45	7.60%	8%	800	765	
124	KY 84	EB Exit	45	8.00%	8%	755	587	4
		EB Entrance	45	Normal Crown	8%	716	6710	
		WB Exit	50	9.2%	9.2%	954	948	4
		WB Entrance	45	8%	8%	755	587	
133	KY 3005	EB Exit	45	NA	8%	NA	587	4
		EB Entrance	45	NA	7%	1000	1000	
		WB Exit	45	NA	7%	1000	1000	3
		WB Entrance	45	Normal Crown	7%	1000	6710	
136	US 31W Bypass	EB Exit	50	NA	7.6% (35-mph)	422	422	5
		EB Entrance	40	NA	8%	NA	444	
		WB Exit	50	NA	8%	NA	758	4
		WB Entrance	50	NA	8%	NA	758	
137	I-65	EB Exit	45	NA	8%	NA	587	4

Exit Number	Intersecting Route	Ramp	Speed (mph)	Actual Superelevation	Superelevation Required	Actual Radius (ft)	Radius Req. (ft)	Divergence Angle (deg)
		EB Entrance	25	NA	8%	NA	134	
		WB Exit	25	NA	8%	NA	134	5
		WB Entrance	45	NA	8%	NA	587	

Ramp Vertical Grades

The 2018 Green Book requires that the vertical grade for interstate ramps be between 4% and 8% based on the design speed of the ramp. The required SSD for crest curves and HLSD for sag curves are determined by the ramp speed, and actual SSD and HLSD are calculated using the same equations as shown for the mainline. There are four locations where the HLSD is less than what is required, however these locations are at interchanges where lighting is present, which mitigates the issue. The following table shows the vertical grades and the associated HLSD and SSD for the WKP ramps. Data was not available for all ramps.

Exit	Ramp	Curve Length (ft)	Grade 1	Grade 2	A	Actual SSD / HLSD (ft)	Required SSD / HLSD (ft)	Design Speed (mph)
77	EB Exit	NA	NA	NA	NA	NA	200	30
	EB Entrance	NA	NA	NA	NA	NA	360	45
	WB Exit	NA	NA	NA	NA	NA	360	45
	WB Entrance	NA	NA	NA	NA	NA	200	30
94	EB Exit	NA	NA	NA	NA	NA	360	45
	EB Entrance	500	-3.5	1.3	4.8	459	360	45
	WB Exit	650	-1.1	3.9	5	562	360	45
	WB Entrance	200	-4.3	0.5	4.8	223	360	45
107	EB Exit	600	-0.7	2.6	3.3	768	360	45
	EB Entrance	400	-6.2	1.4	7.6	294	360	45
	WB Exit	600	-3.1	5.4	8.5	407	360	45
	WB Entrance	400	-6	2.13	8.13	286	360	45
112	EB Exit	200	-0.5	0.8	1.3	Unlimited	360	45
	EB Entrance	500	-6	0.7	6.7	348	360	45
	WB Exit	400	-1.56	0.56	2.12	1586	360	45
	WB Entrance	250	-2	1.1	3.1	437	360	45
124	EB Exit	197	0.5	3	2.5	594	360	45
	EB Entrance	400	-3	1.6	4.6	396	360	45
	WB Exit	300	-0.64	2	2.64	667	425	50
	WB Entrance	328	-1	0.4	1.4	Unlimited	360	45
133	EB Exit	450	-0.23	3.73	3.96	493	360	45
	EB Entrance	600	-3.75	0.96	4.71	540	360	45
	WB Exit	500	3.11	-0.6	3.71	575	360	45
	WB Entrance	500	-3.18	0.72	3.9	545	360	45

Exit	Ramp	Curve Length (ft)	Grade 1	Grade 2	A	Actual SSD / HLSD (ft)	Required SSD / HLSD (ft)	Design Speed (mph)
136	EB Exit	NA	NA	NA	NA	NA	425	50
	EB Entrance	NA	NA	NA	NA	NA	305	40
	WB Exit	400	-3.32	1.04	4.36	411	425	50
	WB Entrance	NA	NA	NA	NA	NA	425	50
137	EB Exit	NA	NA	NA	NA	NA	360	45
	EB Entrance	NA	NA	NA	NA	NA	155	25
	WB Exit	NA	NA	NA	NA	NA	155	25
	WB Entrance	NA	NA	NA	NA	NA	360	45

Acceleration and Deceleration Lane Lengths

Acceleration and deceleration lanes allow vehicles time and space to increase their speed when entering a freeway or decrease their speed when exiting a freeway. The required acceleration and deceleration lane lengths from the *2018 Green Book* vary based on the design speed of the ramp. The table below shows the minimum length based on auxiliary speed.

Auxiliary Speed (MPH)	Minimum Acceleration Lane Length (ft)	Minimum Deceleration Lane Length (ft)
	1,420	550
	1,350	520
	1,230	490
	1,000	440
	820	390
	580	340

The following table shows the acceleration and deceleration lane lengths for the WKP ramps.

County	Exit Number	Intersecting Route	Acceleration / Deceleration Lane Length (ft)			
			EB Entrance	EB Exit	WB Entrance	WB Exit
Ohio	77	I-165 (Natcher Parkway)	575	580	600	600
Grayson	94	KY 79	660	1000	325	590
Grayson	107	KY 259	900	330	1000	760
Grayson	112	KY 224	875	550	850	640
Hardin	124	KY 84	975	850	475	925
Hardin	133	KY 3005	900	1000	1050	775
Hardin	136	US 31W Bypass	385	650	400	500
Hardin	137	I-65	860	720	900	835

Control of Access

The following table shows the control of access for the WKP. Access points should be greater than 300 feet away from ramp terminals in rural areas and 100 feet in urban areas. Interchanges located in urban areas are shown in italics.

County	Exit Number	Intersecting Route	EB Entrance	EB Exit	WB Entrance	WB Exit
Ohio	77	I-165 (Natcher Parkway)	300+ feet	300+ feet	300+ feet	300+ feet
Grayson	94	KY 79	300+ feet	300+ feet	180 feet	300+ feet
<i>Grayson</i>	<i>107</i>	<i>KY 259</i>	<i>300+ feet</i>	<i>300+ feet</i>	<i>300+ feet</i>	<i>300+ feet</i>
<i>Grayson</i>	<i>112</i>	<i>KY 224</i>	<i>140 feet</i>	<i>140 feet</i>	<i>300 feet</i>	<i>300+ feet</i>
Hardin	124	KY 84	50 feet	120 feet	160 feet	300+ feet
<i>Hardin</i>	<i>133</i>	<i>KY 3005</i>	<i>300+ feet</i>	<i>300+ feet</i>	<i>300+ feet</i>	<i>300+ feet</i>
<i>Hardin</i>	<i>136</i>	<i>US 31W Bypass</i>	<i>300+ feet</i>	<i>0 feet</i>	<i>300+ feet</i>	<i>300+ feet</i>
<i>Hardin</i>	<i>137</i>	<i>I-65</i>	<i>300+ feet</i>	<i>300+ feet</i>	<i>300+ feet</i>	<i>300+ feet</i>

Interchange Spacing

Interchange spacing is shown in the following table for the WKP. Interstate requirements for interchange spacing are one mile in urban areas and two miles in rural areas. Interchange spacing is measured from overpass to overpass. Interchanges located in urban areas are shown in italics.

County	Exit Number	Intersecting Route	Interchange Spacing From Last (mi)	Interchange Spacing To Next (mi)
Ohio	77	I-165 (Natcher Parkway)	-	17.037
Grayson	94	KY 79	17.037	12.809
Grayson	107	KY 259	12.809	4.839
Grayson	112	KY 224	4.839	11.5445
Hardin	124	KY 84	11.5445	10.1045
Hardin	133	KY 3005	10.1045	2.1445
Hardin	136	US 31W Bypass	2.1445	0.7435
Hardin	137	I-65	0.7435	