

Chapter II

I-69 Master Plan

As part of the I-69 Master Plan, Wilbur Smith Associates (WSA) has developed a list of recommended improvements, divided into logical corridor improvement segments with associated costs. These segments have been prioritized based upon the geometry and operational considerations for each roadway.

Understanding that project programming is an iterative process, a model has been developed to provide KYTC staff an interactive tool to define projects and estimate costs based upon the existing deficiencies. Users have the ability to define project reach limits, select deficiencies to fix or omit, designate funding categories and review cost summary data.

The following sections outline the recommended improvements, overview the prioritization process, provide a guide to use the attached I-69 PDAT (Project Development Analysis Tool), and suggest project segments.

RECOMMENDED IMPROVEMENTS

To form a basis for project recommendations, data collection efforts were undertaken to obtain current information on existing geometry, traffic volumes, and recent vehicle crash records. This information was analyzed to determine the impacts geometric and operational conditions played on performance of the two parkways. The results of these tasks are presented in **Appendix A**.

After compiling information from these efforts, there are 12 distinct types of existing features which do not meet AASHTO Interstate standards and/or KYTC common practice. Specific information about each type of feature is presented in **Chapter 3** of this report. Each item may be considered as one of three funding categories: I-69 Fix (to be completed only with dedicated interstate funding), 3R (an item to be addressed as part of 3R routine maintenance), or 4R (an item to be addressed with 4R funding). Resurfacing, restoration, and rehabilitation work fall within the 3R category; reconstruction activities elevate a project to 4R. These recommendations are summarized in the following list.

- **Narrow Bridges:** *I-69 Fix*. Mainline structures which do not meet AASHTO width standards should be widened. Structures which have brush-block curbs should be retrofitted with approved bridge rails; concrete jersey rails were assumed for costing purposes. These are relatively low-cost fixes.
- **Vertical Clearances:** *I-69 Fix*. Overpasses along the parkways which do not meet the mandated 16 foot vertical clearance should be addressed. Though other remedies may prove less costly, complete replacement was assumed for costing.
- **Interchange Spacing:** *I-69 Fix*. Interchanges spaced less than the 1-3 miles apart required by AASHTO can be addressed by constructing auxiliary lanes between interchanges. Current traffic volumes and crash histories do not indicate interchange spacing issues are creating operational concerns.

- **Ramp Taper Lengths:** *4R*. Insufficient taper lengths on ramps should be brought into compliance with AASHTO standards and/or KYTC common practice. Systems interchanges and toll-booth style interchanges are addressed separately.
- **Toll-booth Style Interchanges:** *I-69 Fix*. Exit 24/KY 109 on the Ford Parkway and Exit 63/KY 56 on the Breathitt Parkway are toll-style interchange configurations. Though merging lengths are short at both locations, traffic volumes and crash histories do not indicate operational concerns which justify major investments to reconfigure these interchanges to typical diamonds.
- **Guardrail End Treatments:** *3R*. Outdated Type 3 and Type 7 guardrail end treatments exist on both parkways and should be updated as a part of the routine maintenance.
- **Shoulder Widths:** *3R*. Deficient shoulder widths should be updated to meet AASHTO standards as a part of routine maintenance.
- **Stopping Sight Distance:** *4R*. Vertical alignments along the parkways create several instances where stopping sight/headlight sight distances do not meet current standards. In these cases, the actual sight distances are near standards and operational factors do not indicate major investments are justified to bring these locations into formal compliance.
- **Median Width:** *3R*. Sections of the corridor with median widths less than the required 36 feet may be addressed via the installation of a barrier median. Traffic volumes and performance history do not indicate that this measure is warranted based on current operating parameters.
- **Cross Slope and Superelevation:** *3R*. In instances where pavement cross slopes or superelevation rates do not meet current standards, routine pavement rehabilitation should bring these factors into compliance.
- **Ditch Widths and Foreslopes:** *4R*. Ditch widths and foreslopes do not meet current KYTC guidance. A detailed crash analysis does not indicate a correlation between vehicle crash rates or severity and narrow ditches. Based on current conditions, crash data does not justify investing in additional excavation and right-of-way costs to upgrade these features.
- **Systems Interchanges:** *I-69 Priority*. Modifying the systems interchanges at I-24 and the Breathitt/Ford interchange provides two-lane movements for all mainline sections, improves route continuity for interstates, and addresses design speeds in some instances. Traffic volumes and safety performance do not indicate major investments will significantly impact operations at either location.

As an independent work element within the larger I-69 study, the KY 813 interchange at Mortons Gap was studied. Three build alternatives were evaluated; the preferred alternative would reconstruct the interchange to remove the undesirable flopped diamond and replace this configuration with the preferred diamond layout. This alternative decreases the potential for wrong way entry crashes often attributed to flopped diamond interchanges, improves acceleration and deceleration lengths, is compatible with the I-69 corridor, and is the most cost effective of the alternatives considered. The estimated total cost for the recommended alternative is \$7,020,000, which includes estimates for Design (\$390,000), Right-of-Way (\$850,000), Utilities (\$600,000), and Construction (\$5,180,000). A basic construction estimate to only fix the deficient mainline taper lengths comes to \$3.4 million.

PRIORITIZATION

In order to establish a prioritization scheme, categories were assigned by deficiency type for each feature. Priority Category 1 is the highest group and should be addressed before progressing to the next category, moving down the list to Category 4 as the lowest priorities. The categories are defined as follows:

- **Priority 1** – Substantive improvements to address capacity or safety issues along the parkways regardless of I-69 designation
- **Priority 2** – Regulatory improvements to bring deficiencies into interstate compliance, with the exception of granted FHWA DE
- **Priority 3** – Regulatory improvements to address remaining noncompliant features, including previously exempted DE with the exception of systems interchanges
- **Priority 4** – Systems interchanges

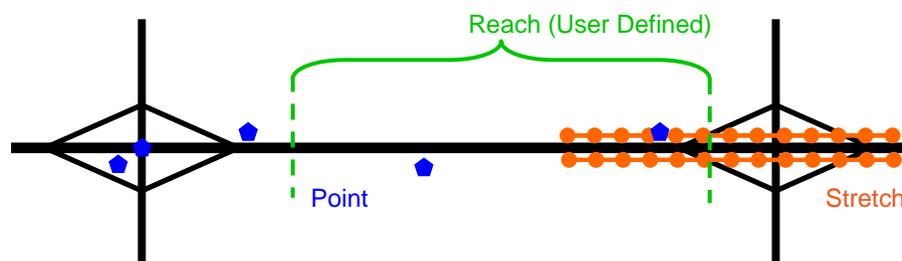
Following this chapter, **Figure 2.1** shows a series of maps of the study corridor depicting the deficiencies, color-coded by priority. Instances in which a design exception is recommended are noted. **Tables 2.1** and **2.2** also present an overview of recommendations and costs for the deficiencies along the Ford and Breathitt Parkways respectively, divided into counties.

MODEL OVERVIEW

To facilitate the project programming process, WSA developed the I-69 PDAT (Project Development Analysis Tool). This tool contains a full list of the deficiencies occurring within the study area which will need to be addressed as part of I-69. This tool allows the user to set project limits by milepoints along each parkway, select which deficiencies should be fixed or omitted, and review the associated cost estimates for this scenario (created by the user) and for the full build scenario.

As shown in **Figure 2.2** below, deficiencies, identified as part of this study, are separated into two distinct types: point features and stretches. Point features occur at a specific location which would logically be addressed as a part of a single project; costs are typically lump-sum values. Deficiency stretches are features which occur over a longer length within the corridor; costs are based on per-mile rates.

Figure 2.2
Definition of Reach, Point, and Stretch Terminology



Reaches are the milepoint boundaries for a project. The user has the ability to define reaches along each parkway and to change them throughout the process. All deficiencies falling within the milepoint limits of a reach will be included in the cost to fix that reach.

Each deficiency displays whether it is one of the 13 potential FHWA design exceptions or a design variance. Each deficiency can also be identified as a funding category: I-69 Priority, 3R Improvement, or 4R Improvement. An additional “Recommended Fix” column allows the user to select if a given deficiency should be included in the User Select Build Scenario (the set of features included in the current build package, based on user-input recommendations). Features which have already been addressed as part of previous projects may be removed from the list of deficiencies by selecting “Completed” from within this heading. For comparison, the Full Build Scenario cost estimates are provided throughout the summary information.

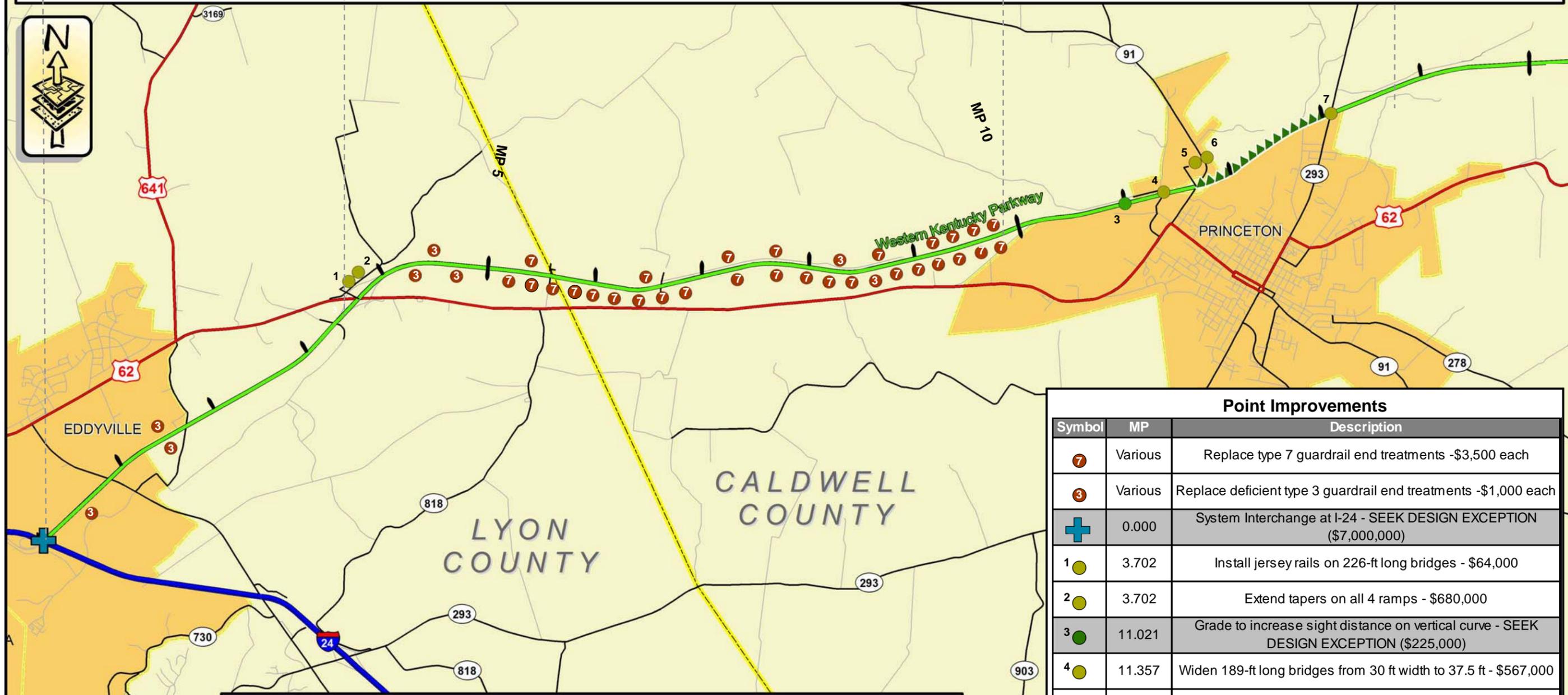
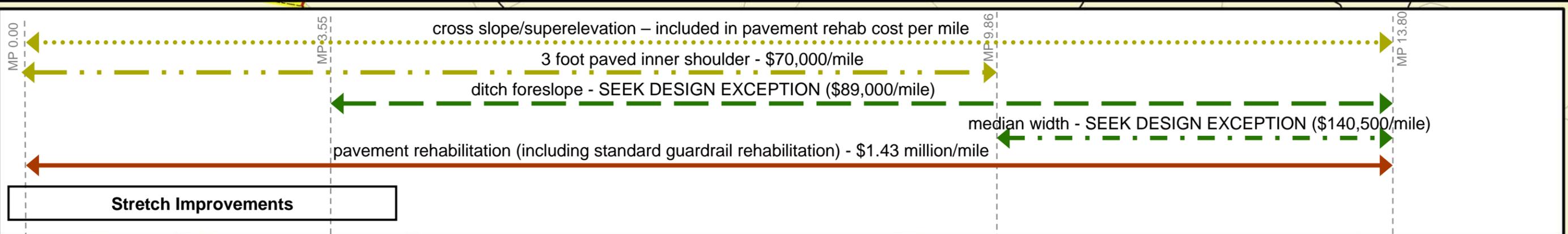
Following these inputs by the user, the model provides a set of summary cost tables. These tables include:

- Summary of Parkway by County for the User Selected Build Scenario;
- Summary of Parkway by Deficiency Type for both the User Selected and Full Build Scenarios;
- Summary of Parkway by Priority Category for both the User Selected and Full Build Scenarios;
- Summary of Parkway by Funding Category for both the User Selected and Full Build Scenarios; and
- Summary of Reach by Deficiency Type for both User Selected and Full Build Scenarios.

A full Users’ Guide and electronic copy of the I-69 Project Tool are provided within **Appendix B**.

SEGMENTATION OF CORRIDOR IMPROVEMENTS

For the Master Plan, the parkways have been divided into preliminary project reaches. A reach has been defined around each interchange; a reach of 1.1 miles surrounds each interchange as spacing permits. Additional reaches are located between the reaches around interchanges. Reaches were also broken at county boundaries. The recommended project segmentation is shown in **Tables B.1** through **B.2** in **Appendix B**. **Tables B.3** through **B.8** show the model outputs for the WSA-defined User Build and Full Build Scenarios.

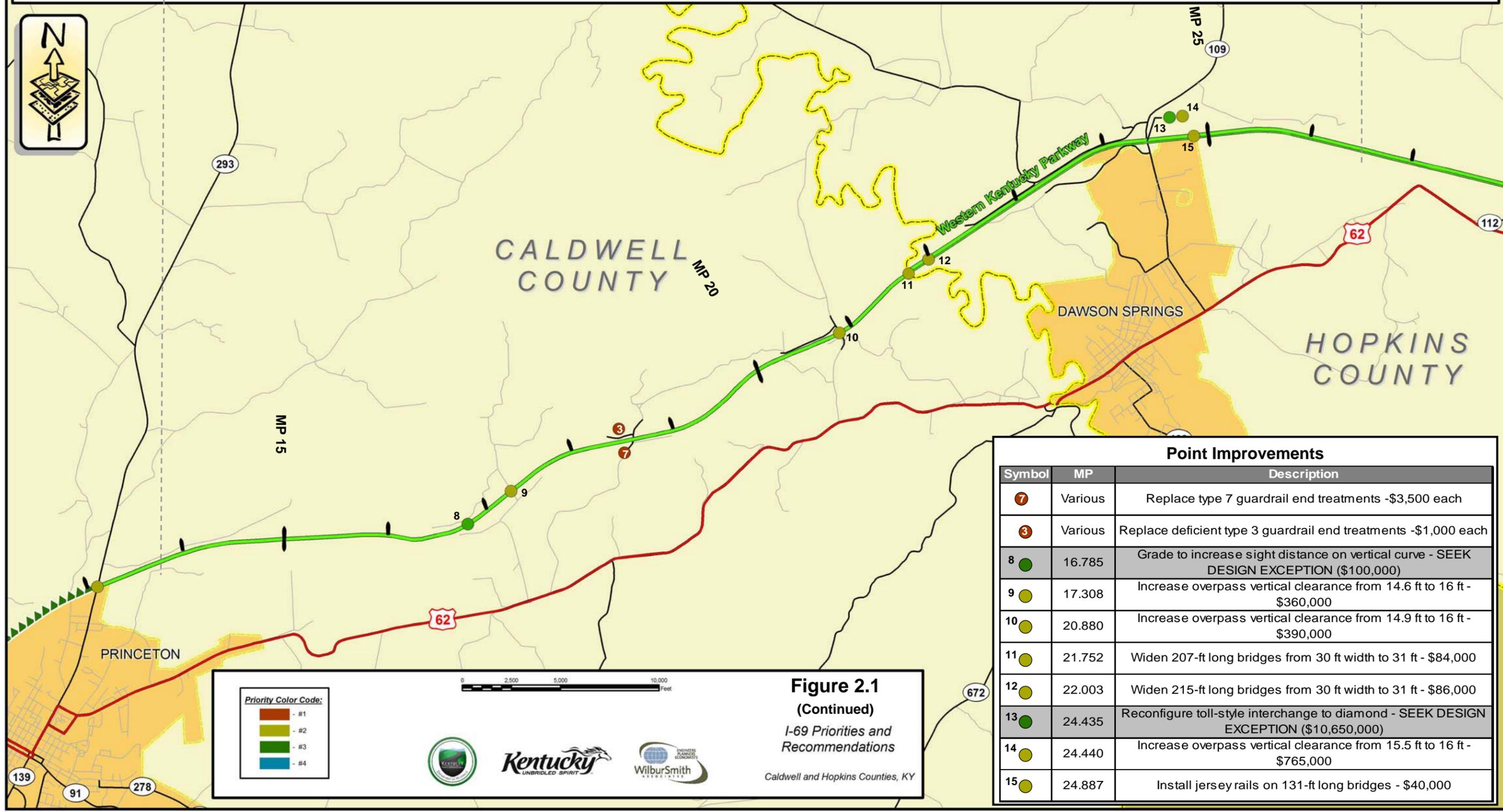
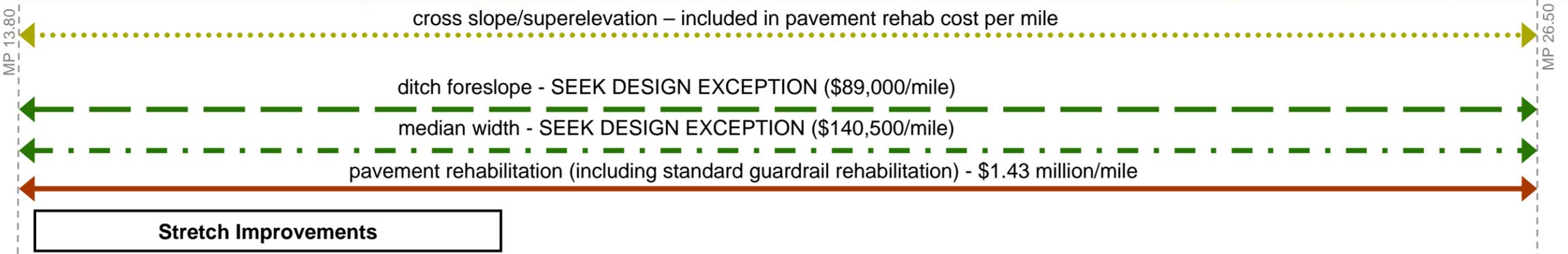


Point Improvements		
Symbol	MP	Description
⑦	Various	Replace type 7 guardrail end treatments -\$3,500 each
③	Various	Replace deficient type 3 guardrail end treatments -\$1,000 each
+	0.000	System Interchange at I-24 - SEEK DESIGN EXCEPTION (\$7,000,000)
1 ●	3.702	Install jersey rails on 226-ft long bridges - \$64,000
2 ●	3.702	Extend tapers on all 4 ramps - \$680,000
3 ●	11.021	Grade to increase sight distance on vertical curve - SEEK DESIGN EXCEPTION (\$225,000)
4 ●	11.357	Widen 189-ft long bridges from 30 ft width to 37.5 ft - \$567,000
5 ●	11.700	Extend tapers on all 4 ramps - \$672,000
6 ●	11.700	Increase overpass vertical clearance from 15 ft to 16 ft - \$1,120,000
▲▲▲	11.700-13.117	Add auxiliary lane to meet interchange spacing requirements - SEEK DESIGN EXCEPTION (\$2,600,000)
7 ●	13.120	Increase overpass vertical clearance from 15.7 ft to 16 ft - \$850,000

Priority Color Code:

- #1 - Red
- #2 - Yellow
- #3 - Green
- #4 - Blue

Figure 2.1
I-69 Priorities and Recommendations
Lyon and Caldwell Counties, KY



Point Improvements		
Symbol	MP	Description
7	Various	Replace type 7 guardrail end treatments -\$3,500 each
3	Various	Replace deficient type 3 guardrail end treatments -\$1,000 each
8	16.785	Grade to increase sight distance on vertical curve - SEEK DESIGN EXCEPTION (\$100,000)
9	17.308	Increase overpass vertical clearance from 14.6 ft to 16 ft - \$360,000
10	20.880	Increase overpass vertical clearance from 14.9 ft to 16 ft - \$390,000
11	21.752	Widen 207-ft long bridges from 30 ft width to 31 ft - \$84,000
12	22.003	Widen 215-ft long bridges from 30 ft width to 31 ft - \$86,000
13	24.435	Reconfigure toll-style interchange to diamond - SEEK DESIGN EXCEPTION (\$10,650,000)
14	24.440	Increase overpass vertical clearance from 15.5 ft to 16 ft - \$765,000
15	24.887	Install jersey rails on 131-ft long bridges - \$40,000

Priority Color Code:

- #1
- #2
- #3
- #4

Figure 2.1 (Continued)
 I-69 Priorities and Recommendations
 Caldwell and Hopkins Counties, KY

0 2,500 5,000 10,000 Feet

MP 26.50

MP 38.33

cross slope/superelevation – included in pavement rehab cost per mile

ditch foreslope - SEEK DESIGN EXCEPTION (\$89,000/mile)

median width - SEEK DESIGN EXCEPTION (\$140,500/mile)

pavement rehabilitation (including standard guardrail rehabilitation) - \$1.43 million/mile

Stretch Improvements



Priority Color Code:

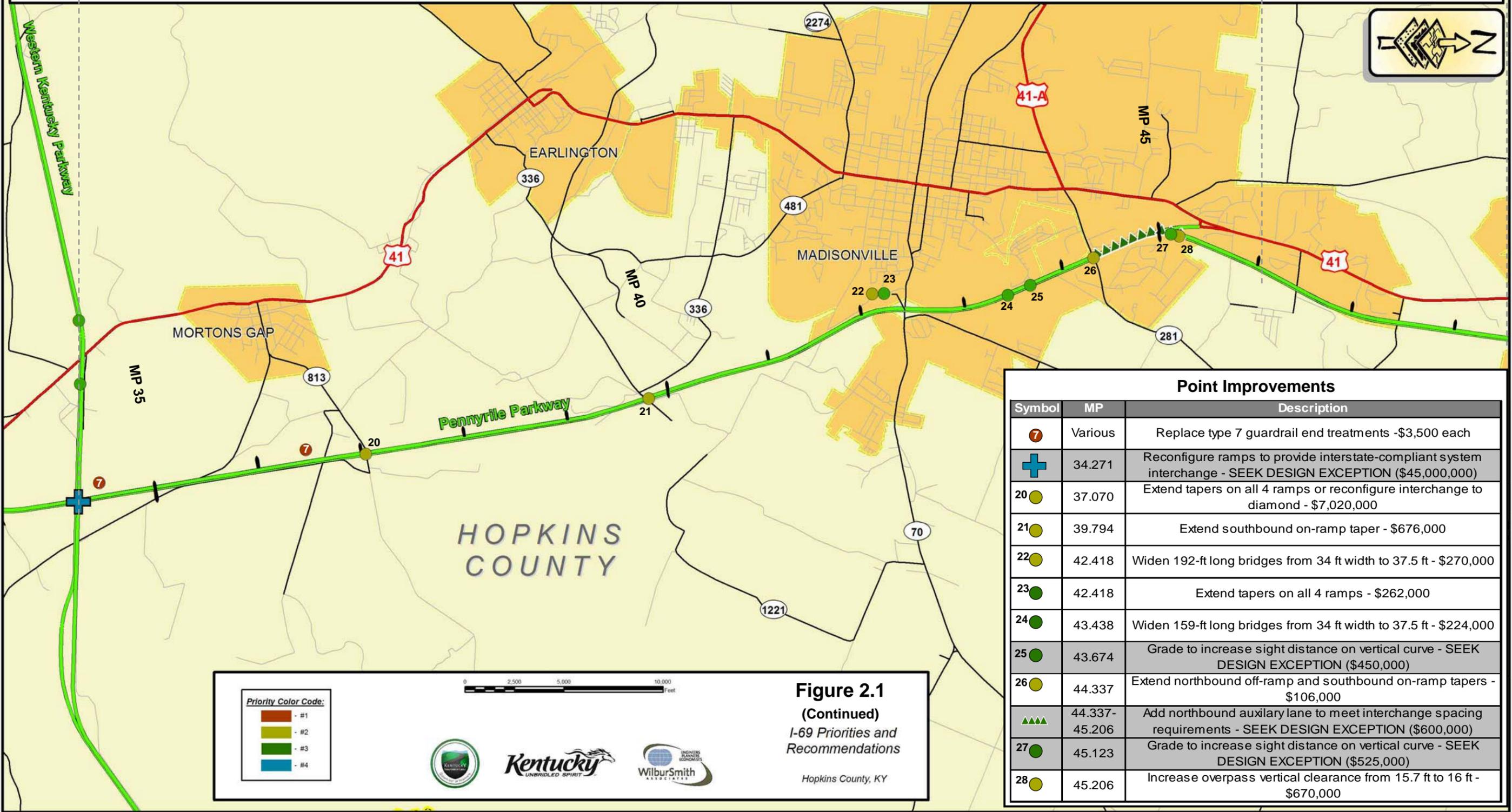
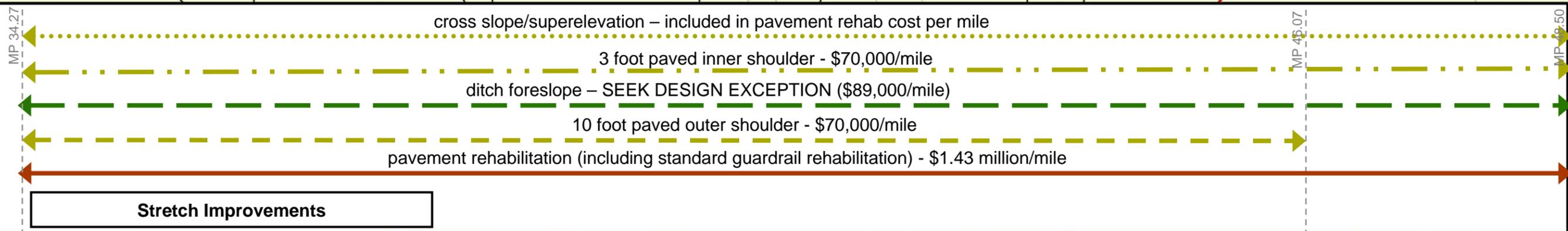
Orange	- #1
Yellow	- #2
Green	- #3
Blue	- #4



Figure 2.1
(Continued)
I-69 Priorities and Recommendations
Hopkins County, KY

Point Improvements

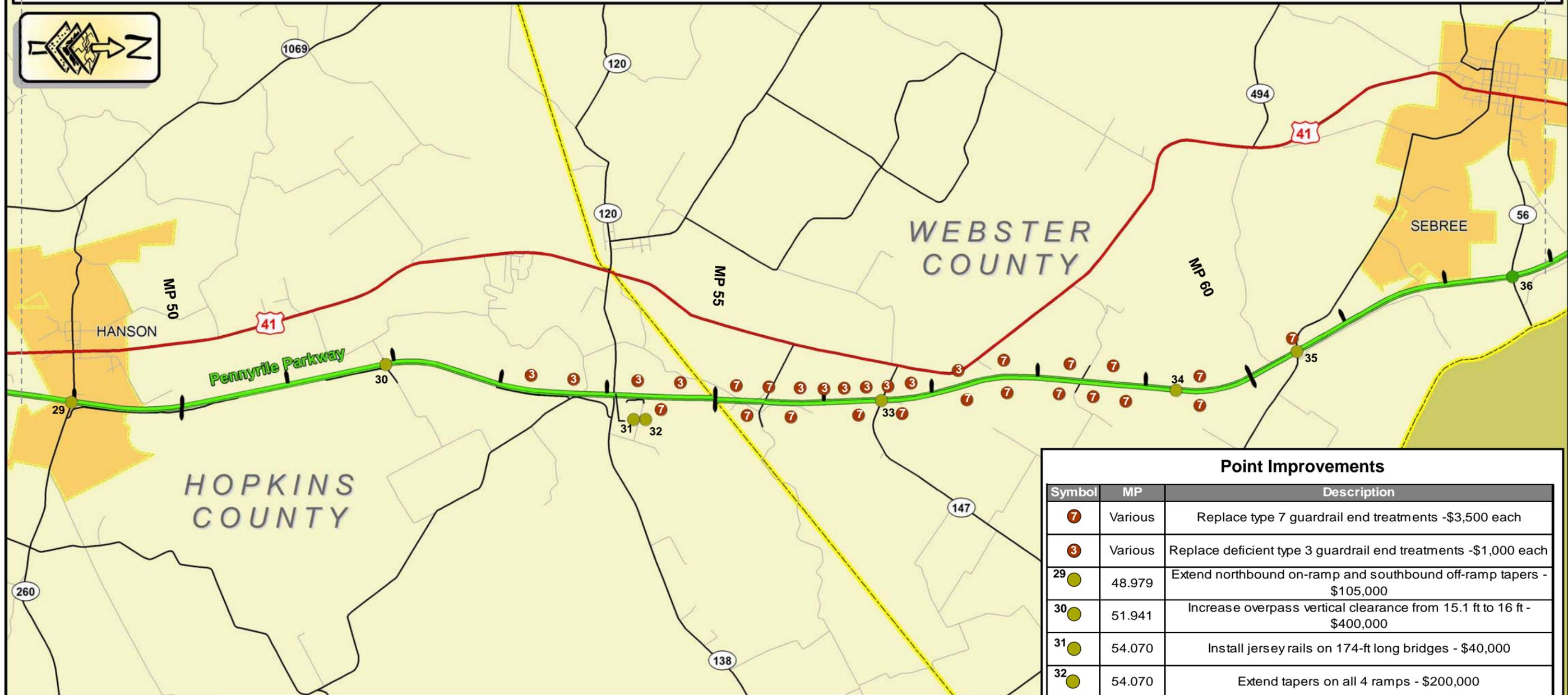
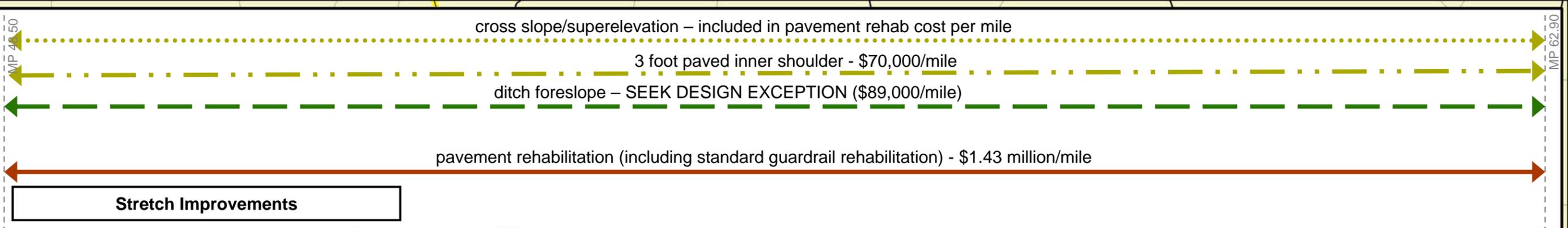
Symbol	MP	Description
● (Yellow)	31.580	Increase overpass vertical clearance from 15.8 ft to 16 ft - \$690,000
● (Green)	32.528	Grade to increase sight distance on vertical curve -SEEK DESIGN EXCEPTION (\$100,000)
● (Green)	36.603	Grade to increase sight distance on vertical curve - SEEK DESIGN EXCEPTION (\$100,000)
● (Green)	37.209	Grade to increase sight distance on vertical curve - SEEK DESIGN EXCEPTION (\$100,000)
+	38.373	Reconfigure ramps to provide interstate-compliant system interchange - SEEK DESIGN EXCEPTION (\$45,000,000)



Point Improvements		
Symbol	MP	Description
7	Various	Replace type 7 guardrail end treatments -\$3,500 each
+	34.271	Reconfigure ramps to provide interstate-compliant system interchange - SEEK DESIGN EXCEPTION (\$45,000,000)
20	37.070	Extend tapers on all 4 ramps or reconfigure interchange to diamond - \$7,020,000
21	39.794	Extend southbound on-ramp taper - \$676,000
22	42.418	Widen 192-ft long bridges from 34 ft width to 37.5 ft - \$270,000
23	42.418	Extend tapers on all 4 ramps - \$262,000
24	43.438	Widen 159-ft long bridges from 34 ft width to 37.5 ft - \$224,000
25	43.674	Grade to increase sight distance on vertical curve - SEEK DESIGN EXCEPTION (\$450,000)
26	44.337	Extend northbound off-ramp and southbound on-ramp tapers - \$106,000
▲▲▲	44.337-45.206	Add northbound auxiliary lane to meet interchange spacing requirements - SEEK DESIGN EXCEPTION (\$600,000)
27	45.123	Grade to increase sight distance on vertical curve - SEEK DESIGN EXCEPTION (\$525,000)
28	45.206	Increase overpass vertical clearance from 15.7 ft to 16 ft - \$670,000

Figure 2.1
 (Continued)
 I-69 Priorities and Recommendations
 Hopkins County, KY

Priority Color Code:
 #1 - Red
 #2 - Yellow
 #3 - Green
 #4 - Blue

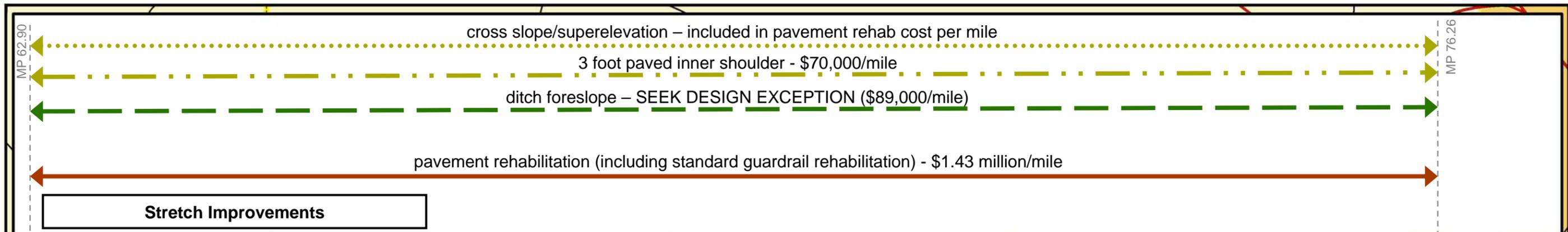


Point Improvements		
Symbol	MP	Description
7	Various	Replace type 7 guardrail end treatments -\$3,500 each
3	Various	Replace deficient type 3 guardrail end treatments -\$1,000 each
29	48.979	Extend northbound on-ramp and southbound off-ramp tapers - \$105,000
30	51.941	Increase overpass vertical clearance from 15.1 ft to 16 ft - \$400,000
31	54.070	Install jersey rails on 174-ft long bridges - \$40,000
32	54.070	Extend tapers on all 4 ramps - \$200,000
33	56.523	Install jersey rails on 163-ft long bridges - \$40,000
34	59.280	Widen 368-ft long bridges from 30 ft width to 31 ft - \$150,000
35	60.476	Install jersey rails on 166-ft long bridges - \$40,000
36	62.637	Reconfigure toll-style interchange to diamond - SEEK DESIGN EXCEPTION (\$10,250,000)

Figure 2.1
(Continued)
I-69 Priorities and Recommendations
Hopkins and Webster Counties, KY

Priority Color Code:
 #1 - Red
 #2 - Yellow
 #3 - Green
 #4 - Blue

0 2,500 5,000 10,000 Feet



Point Improvements		
Symbol	MP	Description
●	37	63.887 Widen 260-ft long bridges from 30 ft width to 31 ft - \$104,000
●	38	65.393 Install jersey rails on 183-ft long bridges - \$40,000
●	39	68.363 Extend northbound on-ramp and southbound off-ramp tapers - \$100,000
●	40	68.428 Grade to increase sight distance on vertical curve - SEEK DESIGN EXCEPTION (\$100,000)
●	41	75.360 Install jersey rails on 141-ft long bridges - \$40,000
●	42	76.258 Extend northbound on-ramp and both southbound tapers - \$160,000

Figure 2.1
(Continued)
I-69 Priorities and Recommendations
Webster and Henderson Counties, KY

0 2,500 5,000 10,000 Feet

Priority Color Code:
 #1 - Red
 #2 - Yellow
 #3 - Green
 #4 - Blue

Table 2.1
I-69 Recommendations, Ford Parkway

MP	Description	Recommendation	Cost	Priority
Various	Replace type 7 guardrail end treatments	Build	\$3,500 each	1
Various	Replace deficient type 3 guardrail end treatments	Build	\$1,000 each	1
Lyon County				
0.000	System Interchange at I-24	Design Exception	\$7,000,000	4
0.000-5.610	Widen 3 foot paved inner shoulder to 4 foot	Build	\$390,000	2
0.000-5.610	Rehabilitate pavement, addressing cross slopes, superelevation, and linear guardrail replacement	Build	\$8,020,000	1
3.550-5.610	Widen and/or regrade roadside ditches	Design Exception	\$180,000	3
3.702	Install jersey rails on 226-ft long bridges	Build	\$64,000	2
3.702	Extend tapers on all 4 ramps	Build	\$680,000	2
Caldwell County				
5.610-9.860	Widen 3 foot paved inner shoulder to 4 foot	Build	\$300,000	2
5.610-21.764	Widen and/or regrade roadside ditches	Design Exception	\$1,400,000	3
5.610-21.764	Rehabilitate pavement, addressing cross slopes, superelevation, and linear guardrail replacement	Build	\$23,100,000	1
9.860-21.764	Install median barrier in 30 ft median	Design Exception	\$1,673,000	3
11.021	Grade to increase sight distance on vertical curve	Design Exception	\$225,000	3
11.357	Widen 189-ft long bridges from 30 ft width to 37.5 ft	Build	\$567,000	2
11.700	Extend tapers on all 4 ramps	Build	\$672,000	2
11.700	Increase overpass vertical clearance from 15 ft to 16 ft	Build	\$1,120,000	2
11.700-13.117	Add auxiliary lane to meet interchange spacing requirements	Design Exception	\$2,600,000	3
13.120	Increase overpass vertical clearance from 15.7 ft to 16 ft	Build	\$850,000	2
16.785	Grade to increase sight distance on vertical curve	Design Exception	\$100,000	3
17.308	Increase overpass vertical clearance from 14.6 ft to 16 ft	Build	\$360,000	2
20.880	Increase overpass vertical clearance from 14.9 ft to 16 ft	Build	\$390,000	2
21.752	Widen 207-ft long bridges from 30 ft width to 31 ft	Build	\$84,000	2
Hopkins County				
21.764-38.332	Widen and/or regrade roadside ditches	Design Exception	\$1,500,000	3
21.764-38.332	Install median barrier in 30 ft median	Design Exception	\$2,328,000	3
21.764-38.332	Rehabilitate pavement, addressing cross slopes, superelevation, and linear guardrail replacement	Build	\$23,700,000	1
22.003	Widen 215-ft long bridges from 30 ft width to 31 ft	Build	\$86,000	2
24.435	Reconfigure toll-style interchange to diamond	Design Exception	\$10,650,000	3
24.440	Increase overpass vertical clearance from 15.5 ft to 16 ft	Build	\$765,000	2
24.887	Install jersey rails on 131-ft long bridges	Build	\$40,000	2
31.580	Increase overpass vertical clearance from 15.8 ft to 16 ft	Build	\$690,000	2
32.528	Grade to increase sight distance on vertical curve	Design Exception	\$100,000	3
36.603	Grade to increase sight distance on vertical curve	Design Exception	\$100,000	3
37.209	Grade to increase sight distance on vertical curve	Design Exception	\$100,000	3
38.373	Reconfigure ramps to provide interstate-compliant system interchange	Design Exception	\$45,000,000	4

Table 2.2
I-69 Recommendations, Breathitt Parkway

MP	Description	Recommendation	Cost	Priority
Various	Replace type 7 guardrail end treatments	Build	\$3,500 each	1
Various	Replace deficient type 3 guardrail end treatments	Build	\$1,000 each	1
Hopkins County				
34.271	Reconfigure ramps to provide interstate-compliant system interchange	Design Exception	\$45,000,000	4
34.271-46.070	Widen 10 ft paved outer shoulder to 12 ft	Build	\$830,000	2
34.271-55.003	Widen 3 foot paved inner shoulder to 4 foot	Build	\$1,450,000	2
34.271-55.003	Widen and/or regrade roadside ditches	Design Exception	\$1,800,000	3
34.271-55.003	Rehabilitate pavement, addressing cross slopes, superelevation, and linear guardrail replacement	Build	\$29,600,000	1
37.070	Extend tapers on all 4 ramps or reconfigure interchange to diamond	Build	\$7,020,000	2
39.794	Extend southbound on-ramp taper	Build	\$676,000	2
42.418	Widen 192-ft long bridges from 34 ft width to 37.5 ft	Build	\$270,000	2
42.418	Extend tapers on all 4 ramps	Build	\$262,000	3
43.438	Widen 159-ft long bridges from 34 ft width to 37.5 ft	Build	\$224,000	3
43.674	Grade to increase sight distance on vertical curve	Design Exception	\$450,000	3
44.337	Extend northbound off-ramp and southbound on-ramp tapers	Build	\$106,000	2
44.337-45.206	Add northbound auxiliary lane to meet interchange spacing requirements	Design Exception	\$600,000	3
45.123	Grade to increase sight distance on vertical curve	Design Exception	\$525,000	3
45.206	Increase overpass vertical clearance from 15.7 ft to 16 ft	Build	\$670,000	2
48.979	Extend northbound on-ramp and southbound off-ramp tapers	Build	\$105,000	2
51.941	Increase overpass vertical clearance from 15.1 ft to 16 ft	Build	\$400,000	2
54.070	Install jersey rails on 174-ft long bridges	Build	\$40,000	2
54.070	Extend tapers on all 4 ramps	Build	\$200,000	2
Webster County				
55.003-65.305	Widen 3 foot paved inner shoulder to 4 foot	Build	\$720,000	2
55.003-65.305	Widen and/or regrade roadside ditches	Design Exception	\$920,000	3
55.003-65.305	Rehabilitate pavement, addressing cross slopes, superelevation, and linear guardrail replacement	Build	\$14,700,000	1
56.523	Install jersey rails on 163-ft long bridges	Build	\$40,000	2
59.280	Widen 368-ft long bridges from 30 ft width to 31 ft	Build	\$150,000	2
60.476	Install jersey rails on 166-ft long bridges	Build	\$40,000	2
62.637	Reconfigure toll-style interchange to diamond	Design Exception	\$10,250,000	3
63.887	Widen 260-ft long bridges from 30 ft width to 31 ft	Build	\$104,000	2
Henderson County				
65.305-76.258	Widen 3 foot paved inner shoulder to 4 foot	Build	\$770,000	2
65.305-76.258	Widen and/or regrade roadside ditches	Design Exception	\$970,000	3
65.305-76.258	Rehabilitate pavement, addressing cross slopes, superelevation, and linear guardrail replacement	Build	\$15,700,000	1
65.393	Install jersey rails on 183-ft long bridges	Build	\$40,000	2
68.363	Extend northbound on-ramp and southbound off-ramp tapers	Build	\$100,000	2
68.428	Grade to increase sight distance on vertical curve	Design Exception	\$100,000	3
75.360	Install jersey rails on 141-ft long bridges	Build	\$40,000	2
76.258	Extend northbound on-ramp and both southbound tapers	Build	\$160,000	2