

IV. DEVELOPMENT OF ALTERNATIVES

Based on the project purpose and the constraints imposed by the existing conditions within the project area, a number of alternatives were developed to address the rockfall and intersection elements of the project. The following sections outline the development process and resulting alternatives considered as part of this study.

A. First Project Team Meeting

The first project team meeting was held September 19, 2007, at the KYTC Central Office in Frankfort. The purpose of this meeting was to discuss the purpose of the study, examine the existing conditions, and define key constraints for the project area. The topography of the study area and storage space required by Pikeville Elementary School will limit the range of alternatives which will be feasible for the area. Minutes of this meeting are included in **Appendix B**.

B. Geotechnical Meeting

A coordination meeting between KYTC District 12, KYTC Geotechnical Branch, and consultant staff was held October 2, 2007, in Pikeville. The purpose of the meeting was to discuss potential rockfall solutions in more detail prior to development and analysis of the alternatives. Minutes of this meeting are included in **Appendix B**.

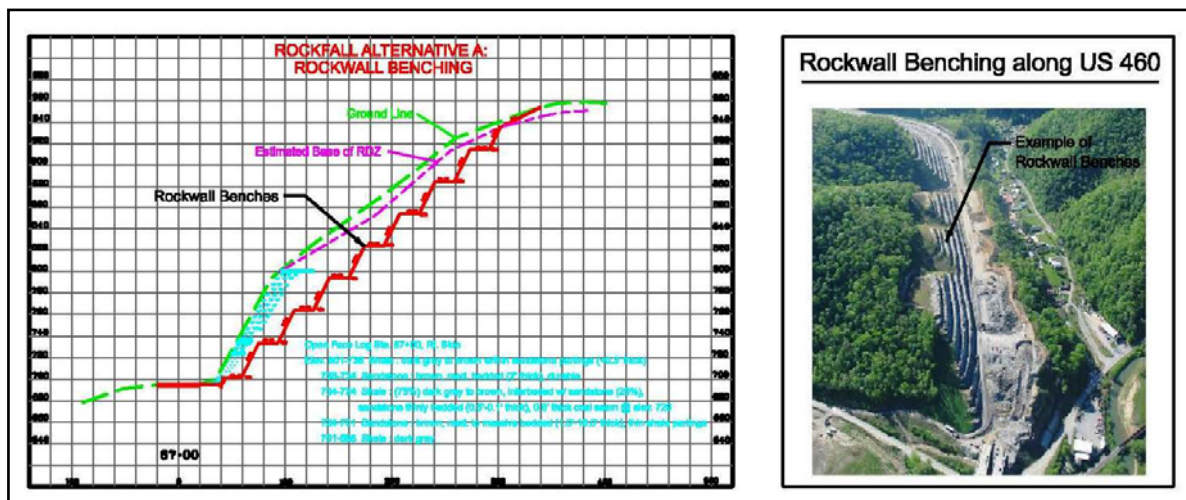
C. Definition of Rockfall Alternatives

Three separate “build” strategies were employed to address the rockfall hazard along KY 1426. In addition, the No Build Alternative was considered for evaluation. Drawings of the alternatives are presented in both **Appendices C** and **D**.

1. Alternative A: Rockwall Benching

This alternative calls for the embankment on the eastern side of KY 1426 to be cut back into tiered steps. Based on the existing terrain, this would require excavation of approximately 400,000 cubic yards of rock. Additional right-of-way on top of the ridge would be required and the project would have to undergo a detailed environmental review process. KY 1426 would not have to be relocated with this configuration. **Figure 4.1** provides an overview of this alternative.

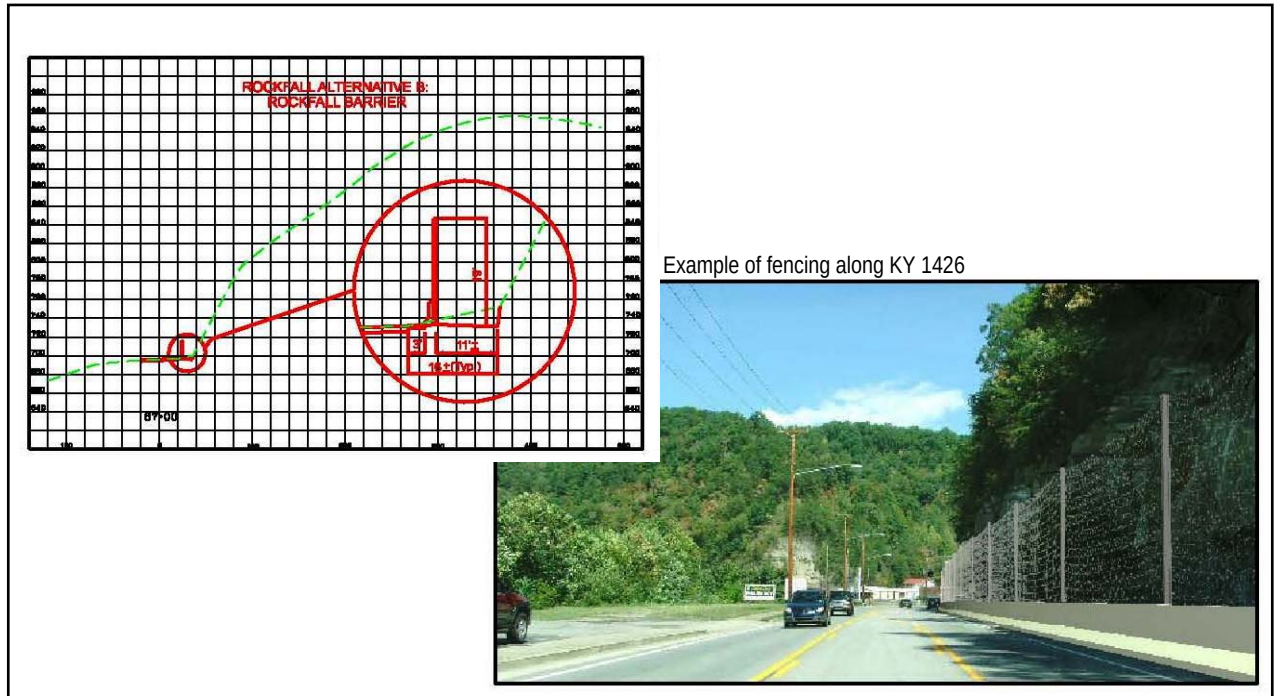
Figure 4.1 – Rockwall Benching Concept



2. Alternative B: Rockfall Fence

As shown in **Figure 4.2**, this alternative includes the construction of a protective barrier along KY 1426 to prevent falling rocks from entering the roadway. The barrier would be composed of concrete K-barriers alongside the road with an anchored 19-foot tall steel fence behind. No additional right-of-way will be required for this alternative. KYTC maintenance forces will need to have access behind the fence routinely to clear fallen debris; approximately 11 feet of clearance between embankment and fence would remain for this purpose.

Figure 4.2 – Rockfall Fencing Concept



3. Alternative C: Rockfall Drape

This alternative consists of a protective material draped along the cliff face to prevent loose stones from falling. Some additional right-of-way would be required and an environmental review would be necessary. The mountainside would have to be cleared prior to installation of the drape. **Figure 4.3** provides conceptual details for this strategy.

2. Alternative 2

With this alternative, KY 1460 would be relocated opposite existing Huffman Avenue. Summit Drive would be relocated to tie into the school access road, which then connects to KY 1460. This alternative would take the fire station training facility, but it preserves the station. A large culvert must be constructed.

3. Alternative 3

With this alternative, the Summit Drive approach at the KY 1426/Huffman Avenue intersection would be closed to form a three-leg intersection. KY 1460 would be reconstructed near its existing location, thus, forming a second three-leg intersection. The school access road would connect to Summit Drive, which connects to KY 1460 at a stop-controlled intersection. Although the fire station is preserved, the training facility would need to be removed to accommodate the improvements.

4. Alternative 4

With this alternative, the Summit Drive approach at the KY 1426/Huffman Avenue intersection would be closed to form a three-leg intersection. KY 1460 would be reconstructed approximately 150 feet south of its existing location to form a second three-leg intersection. Summit Drive would connect to the school access road, which ties into KY 1460 at a stop-controlled intersection. The short spacing between the two intersections on KY 1426 would generate poor operational conditions due to signal timing inefficiencies. The entire footprint of the fire station complex would be needed for the relocation of KY 1460.

5. Alternative 5

With this alternative, KY 1460 is relocated opposite existing Huffman Avenue. Summit Drive and KY 1460 would tie into the school access road opposite one another at a four leg stop-controlled intersection. This alternative would require the purchase of the fire station training facility, but preserves the station. Construction of a large culvert would be necessary. This alternative makes KY 1460 secondary to the school access road and creates a small radius (100 to 150 feet) for a rural highway with a 45 mph design speed.

6. Alternative 6

With this alternative, the Summit Drive approach at the KY 1426/Huffman Avenue intersection is closed to form a three-leg intersection. KY 1460 would be reconstructed near its existing location to form a second three-leg intersection. Summit Drive would connect to the school access road, which ties into KY 1460 at a stop-controlled intersection. This alternative would take the fire station training facility but preserves the station. As a modification to this alternative, KY 1460 could be widened along its current alignment to reduce costs.

Both the rockfall and intersection Alternatives were presented to the project team at the next meeting, discussed in the following section.

E. Second Project Team Meeting

A second project team meeting was conducted October 17, 2007, in Pikeville at the KYTC District 12 Office. At this meeting, the rockfall alternatives and preliminary intersection alternatives were presented for team review and comment. The meeting minutes are included in **Appendix B**. Team discussions included the following points:

- Realignment of KY 1426 far enough from the rockwall to avoid falling debris would require major utility relocations, structure replacement, stream relocation, and extensive right-of-way acquisitions and was therefore determined to be infeasible.
- The City is concerned about the aesthetics of the selected rockfall alternative as well as performance.
- A large queue forms during peak school drop off times and causes several alternatives to exhibit degrading performance during the AM peak hour. Adding a police officer at the school access road intersection with KY 1460 may improve operations; this measure will be evaluated as part of the Tier 2 traffic analysis.
- Intersection Alternative 5 is not considered a viable alternative due to the 100-150 foot radius created on KY 1460. KYTC common practice standards suggest a minimum radius of 600 feet for this class of roadway. Increasing this radius would require cutting into the hillside and would incur additional costs and environmental consequences, including impacts to the historic cemetery. This configuration creates unsafe conditions on a state-maintained, rural collector serving 7,000 vehicles per day. This Alternative was removed from further analysis.

F. Modification of Intersection Alternatives

As a result of discussions at the second project team meeting, the following modifications were made to the intersection alternatives before presenting them to stakeholders and the public. Drawings of each of these intersection alternatives can be found in **Appendix D**, along with drawings of the rockfall alternatives.

- Alternatives 1 through 4 remain unchanged.
- Alternative 6 described above was renamed Alternative 5 after the elimination of the layout with a sharp radius on KY 1460. Alternative 5 from this point forward refers to the layout with two three-leg intersections along KY 1426 that connects Summit Drive to the school access road.
- Alternative 6 widens KY 1460 on its existing alignment. The Summit Drive approach to KY 1426 is removed and Summit Drive is rerouted to tie into the school access route, which connects to KY 1460.
- Alternative 7 also widens KY 1460 along its existing alignment. The school access road is removed from Summit Drive and ties into KY 1460.

All seven of these intersection alternatives were modeled and evaluated at a network level. The results are presented in **Table 4.2** for the PM peak hour. For comparison, the results for the existing conditions are presented as well. **Table 4.3** shows cost and safety information; construction costs were developed by WSA while KYTC provided right-of-way and utility estimates.

The rockfall alternatives and modified set of intersection alternatives were presented to stakeholders and the public, as described in the following chapter.

Table 4.2 – Performance Measures for Refined Intersection Alternatives

Measure	Existing	Alt 1	Alt 2	Alt 3
Delay Per Vehicle (sec)	35.6	31.8	30.8	32.8
Total Delay (hr)	17.9	15.7	15.3	16.5
Total Stops	1,781	1,450	1,467	2,003
Travel Time (hr)	47.5	45.9	44.9	46.8
Average Speed (mph)	22	23	24	23
Conflict Points - Network wide	50	64	50	36
Conflict Points - Bypass	41	32	32	18
LOS at Key Intersections				
KY 1426 at Huffman	C	C	C	C
KY 1426 at KY 1460	C			C
KY 1460 at Summit/School*	n/a	School=F	Sum/Sch=E	Sum/Sch=E
Summit Dr at School Access*	School=B	Summit=B	Summit=B	Summit=B
Measure	Alt 4	Alt 5	Alt 6	Alt 7
Delay Per Vehicle (sec)	48.9	30.9	30.9	37.9
Total Delay (hr)	24.6	15.5	15.5	19.3
Total Stops	2,066	1,836	1,836	1,855
Travel Time (hr)	54.3	44.9	44.9	48.8
Average Speed (mph)	19	23	23	21
Conflict Points - Network wide	36	36	36	50
Conflict Points - Bypass	18	18	18	41
LOS at Key Intersections				
KY 1426 at Huffman	C	C	C	C
KY 1426 at KY 1460	D	C	C	C
KY 1460 at Summit/School*	Sum/Sch=E	Sum/Sch=E	Sum/Sch=E	School=D
Summit Dr at School Access*	Summit=B	Summit=B	Summit=B	n/a

NOTES: *LOS for unsignalized intersections reported for stop-controlled approach(es).

Some measures vary from those presented at public meeting due to subsequent analysis.

Table 4.3 – Costs and Conflict Points for Refined Intersection Alternatives

Alternative		Construction Cost (\$1,000)	Right of Way		Utility Cost (\$1,000)	Total Cost (\$1,000)	Safety (Conflict Points)	
			Acres	Cost (\$1,000)			Bypass	Total Network
Intersection	Current Conditions						41	50
	Alternative 1	\$3,100	5.6	\$2,910	\$1,720	\$7,730	32	64
	Alternative 2	\$2,700	4.5	\$2,210	\$1,720	\$6,630	32	50
	Alternative 3	\$1,900	4.6	\$2,560	\$1,720	\$6,180	18	36
	Alternative 4	\$2,100	4.5	\$3,640	\$1,720	\$7,460	18	36
	Alternative 5	\$2,000	4.4	\$3,990	\$1,720	\$7,710	18	36
	Alternative 6	\$1,500	3.9	\$2,110	\$1,720	\$5,330	18	36
	Alternative 7	\$950	2.7	\$1,490	\$1,720	\$4,160	41	50