MULTI-USE PATH FEASIBILITY STUDY

National Park Service

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INTRODUCTION

In August 2001 the National Park Service (NPS) began a General Management Plan (GMP) and Environmental Impact Statement (EIS) for the Blue Ridge Parkway (BLRI). During the project scoping process, the NPS received many public comments expressing interest in better accommodations of bicycling along the Parkway. To address the issue and as part of the process of developing planning alternatives, the NPS identified the need for more information about bicycle use on the Parkway and about accommodating demand while retaining the historic road prism.

David Evans and Associates, Inc. has prepared this Multi-Use Path Feasibility Study to understand the potential for better accommodation of bicycle use along the Blue Ridge Parkway. In addition to documentation of the current bicycle usage of the Parkway and existing and planned community trail connections, this study included field data collection to evaluate the relative suitability of the Parkway corridor for the development of a multi-use path outside of the historic road prism.

For this feasibility study, the multi-use path is defined as a paved path, approximately 10 feet wide, to be used by bicyclists and pedestrians. The Blue Ridge Parkway motor road prism is situated within a right-of-way with an average width of 800 feet or 125 acres per mile. The Parkway has been determined to be eligible for listing on the National Register of Historic Places and is being studied for listing as a National Historic Landmark. This wider-than-usual right-of-way and the historical significance of the motor road prism, including travel lanes, grass shoulders paved ditches and cut and fill slopes, establishes the basis for this study not considering paved bike lanes attached to the roadway. It is believed that to widen the paved road travel surface to accommodate bicycling and other non-motorized uses would adversely affect the Parkway's designed landscape, diminish its historic integrity and compromise the Park's mission as a national rural parkway.

EXISTING BICYCLE USE

The National Park Service (NPS) does not formally count bicycles along the Parkway, so there is no quantitative data on bicycle use available. Several industry sources were contacted to identify the current bicycle usage along the Parkway, including bicycle groups, avid bicyclists, Blue Ridge Parkway (BLRI) Rangers, and local and state agencies or organizations. Records of the conversations with individuals are included in Appendix A. The trail maps and information obtained through this research are listed in the Bibliography section at the end of this report.

The Parkway is most often used by bicyclists for day rides, although there are people that ride the entire length of the Parkway and camp along the way. Bicyclists typically ride the Parkway from the spring to fall when the weather is accommodating, although many use it year round. When sections of the Parkway are closed to vehicular traffic during the winter, bicyclists often take the opportunity to use these sections of the Parkway.

The bicycle groups contacted identified several organized bicycle rides and events along the Parkway. These events are noted in the following section, however, this information is not comprehensive and more rides may exist. As bicycling along the Parkway becomes more popular, more bicycle events are sure to be planned.

Many communities in the area would like to plan trail connections with the Parkway. While these plans generally include opportunities for hiking only, there is the potential for pressure to construct shared-use trails within the Park boundary to create connections to the community trails. Such trail construction may limit potential locations for a multi-use path. This community trail planning conflict, as identified in drafts of the Blue Ridge Parkway General Management Plan (GMP), also exists around the communities of Buena Vista, Roanoke, Galax to the Blue Ridge Music Center, Julian Price Park, Moses H. Cone Memorial Park, Boone to Blowing Rock, Asheville, and potentially Cherokee.

EXISTING AND PLANNED BICYCLE ACCESS AND USAGE

From the information provided by local bicycle industry sources and the NPS, areas along the Parkway with significant bicycle use were identified. There are generally four areas of the Parkway that currently experience steady levels of bicycle use. These areas are located around the population centers of Waynesboro, Roanoke, Boone/Blowing Rock and Asheville. Information on existing and planned community trail connections with the Parkway was also collected to identify possible opportunities and limitations for the multi-use path. It is assumed that all planned trail connections described in the following sections will be paved, unless otherwise noted.

Waynesboro Area

Waynesboro, Virginia is located near the north end of the Blue Ridge Parkway (MP 0) and the southern end of Shenandoah National Park's Skyline Drive. The area surrounding Waynesboro is home to many avid bicyclists. The section of the Parkway

most commonly used by area bicyclists is from MP 0 to the Parkway intersection with VA 664 (MP 13.7). There is a parking lot at the VA 664 intersection, shown in **Figure 1**, that serves a popular trailhead with access to the Appalachian Trail. Bicyclists regularly use the Parkway and VA 664 as a loop to and from the Waynesboro area.

Figure 1. MP 13.7 – VA 664 Intersection and Appalachian Trail parking

Due to the lack of concentrated population and facilities, the section of the Parkway from VA 664 to Roanoke is not heavily used by bicyclists. There are several popular NPS and Forest Service hiking trails that connect to the Parkway, including the Appalachian Trail near Buena Vista. No bicycle clubs or planning organizations identified regular bicycle use in this area. However, several bicyclists and pedestrians were observed utilizing the Parkway between MP 20 and MP 25 on a weekend during the field data collection for this study (November 2004), which are shown in **Figure 2**.

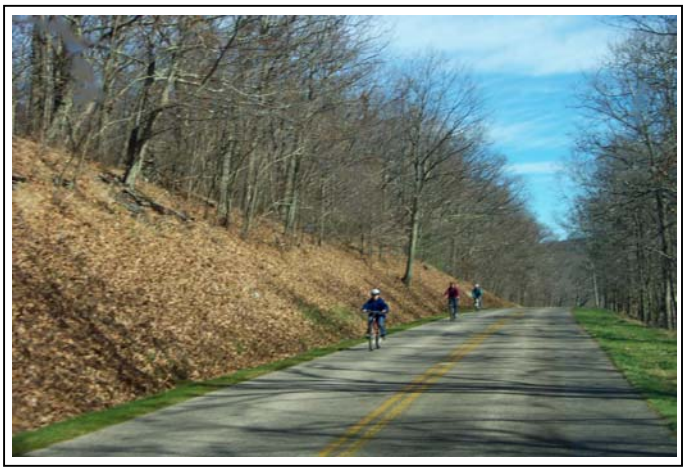


Figure 2. MP 23.3 – Observed Bicycle Use

Roanoke Area

Roanoke is the largest urban area near the Parkway and there are several bicycle groups in the region. One weekly ride, consisting of as many as 50 bicyclists, travels the section of the Parkway between the intersection with US 460/221 (MP 105.8) and US 220 (MP 121.4). This is the most heavily used section of the Parkway by bicyclists within the Roanoke area. However, it is also popular for bicyclists to ride the uphill grade out of the city as far south as MP 137 and then return to Roanoke on the long downhill grade.

The Roanoke Valley and Blue Ridge Parkway Trail Plan, completed by a team including Blue Ridge Parkway, Roanoke Valley Greenway Commission, and Rivers and Trails Conservation Program staff in collaboration with local stakeholders, has identified

numerous improvements and future recreational opportunities for this trail system. A trail system master plan, to be included and reviewed as a part of the Blue Ridge Parkway GMP, has been completed to propose shared-use of trails by hikers, mountain bicyclists, and equestrians. The combination of shared users for each trail section is yet to be agreed upon. The Roanoke Valley Greenway Commission has outlined a community greenway plan that would allow several loop trail systems to connect with approximately 22 miles of existing hiking/equestrian trails located within the Blue Ridge Parkway boundary from MP 110.6 at Stewart's Knob to US 220 (MP 121.4). This would include the approximately 5.5 miles of the Chestnut Ridge Trail system surrounding the Roanoke Mountain Campground that has been recently reconstructed. Some of the loop trail systems that would be created are the Wolf Creek Greenway and McDonald Farm connection, Mill Mountain to Roanoke River connection, Chestnut Ridge Trail Loop, and the Explore Park to Mill Mountain connection.

Bicycle industry sources indicated that the section of the Parkway between Roanoke and the Boone/Blowing Rock area is not heavily used by bicyclists due to the lack of dense population and amenities. No bicycle groups or planning organizations were identified in this region. Some interest has been expressed by residents for a bicycle path between Galax, Virginia, located west of the Parkway around MP 210, and the Blue Ridge Music Center at MP 212.8. BLRI staff has illustrated to citizens that existing State Routes could be used satisfactorily by bicyclists to access the Music Center.

Devil's Garden Overlook (MP 235.7) marks the beginning of the Mountains to Sea Trail (MST) along the Parkway. This trail follows the Parkway for hundreds of miles from this northern-most point to its southern-most point at MP 469 near Cherokee. The trail is meant for use by hikers only along most of the alignment, but shares some sections of trail with horses. The trail follows along the Parkway at various distances but always remains within the Park boundary. At times, the trail follows the edge of the Parkway road prism where it could not be constructed away from the road due to steep terrain, extensive stream crossings, sensitive natural resources, grazing leases or because the trail would have a negative visual impact. The MST was built along the most feasible side of the Parkway for construction with the least amount of switchbacks or trail structure such as steps, cribbing, bridges or water bars. The trail crosses the Parkway in numerous locations along the way to access the easiest terrain along the Parkway.

Boone/Blowing Rock Area

The section of the Parkway near Boone and Blowing Rock, North Carolina is another area used heavily by bicyclists. There are several bicycle advocacy groups in the area and one group supports a weekly ride using a section of the Parkway from Aho Road (MP 288.1) to Greenhill Road (MP 290.2). A common loop for individual bicyclists from Blowing Rock is to access the Parkway at US 321 (MP 291.8) and ride the Parkway south over the Linn Cove Viaduct (MP 304.0), through the Grandfather Mountain area and exit the Parkway at US 221 (MP 305.1) to return to Blowing Rock. This area also hosts a century bicycle ride called "Blood, Sweat, and Gears". Bicyclists in this annual event ride along the Parkway from US 421 (MP 276.4) to US 321 (MP 291.8).

The Middle Fork Greenway Association, a greenway planning group based in Blowing Rock, is preparing a master plan for a 5-mile trail system to extend along the corridor of US 321. This Greenway trail is being planned for shared-use between mountain bicyclists and hikers and will be constructed to meet Americans with Disabilities Act Accessibility Guidelines (ADAAG). This trail is being planned for construction through existing concrete culverts passing beneath US 321 and the Parkway.

The alignment of the Parkway between Boone/Blowing Rock and Asheville, North Carolina is mountainous with many curves. The surrounding area is mostly Forest Service land with very low population density. No bicycle groups or planning organizations were identified in this region. Bicycle industry sources indicated that this section of the Parkway is not heavily used by bicyclists due to the lack of facilities and long distances between access points.

Asheville Area

Asheville is a relatively large urban area adjacent to the Parkway. Several bicycle groups are located in this region. Some bicycle groups use the section of the Parkway between US 25 (MP 388.8) and NC 191 (MP 393.6) for a weekly ride. Bicyclists ride along the Parkway in this area, typically between US 70 (MP 382.5) and NC 191, but serious bicyclists may be seen as far north as Craggy Gardens Visitor Center (MP 364.5) and as far south as Mt. Pisgah Inn (MP 408.6). A bicyclist was observed utilizing the Parkway at MP 385.5, north of US 25, during the study field data collection.

The North Carolina Arboretum south of Asheville off of NC 191 has several paved paths that terminate within 5 miles of the Parkway. The Mountains to Sea Trail, which is for hikers only in this area, crosses the Parkway near US 70 and can be accessed from several parking overlooks along the Parkway south of Asheville. A trail connection is planned from Azalea Park, near US 70, into Asheville along the Mountains to Sea Trail. A multi-use path near the Parkway is also planned along the Elk Mountain Scenic Highway, which accesses the Parkway north of Asheville near Bull Gap (MP 375.6).

The Parkway south of Asheville is mountainous with many curves and tunnels, which are hazardous for bicyclists without lighting. The area surrounding the Parkway to the end (MP 469.0) is mostly forested with low population density. The section of the Parkway south of Mt. Pisgah is not heavily used by bicyclists due to the tunnels, long distances between access points and lack of facilities. However, a bicyclist was seen riding along the Parkway at MP 404.2, north of Mt. Pisgah, during the study field data collection.

The areas of typical bicycle use along the Parkway are illustrated in **Figure 3**. As shown, these areas are generally 10 to 15 miles in length and are located around the major population centers adjacent to the Parkway.

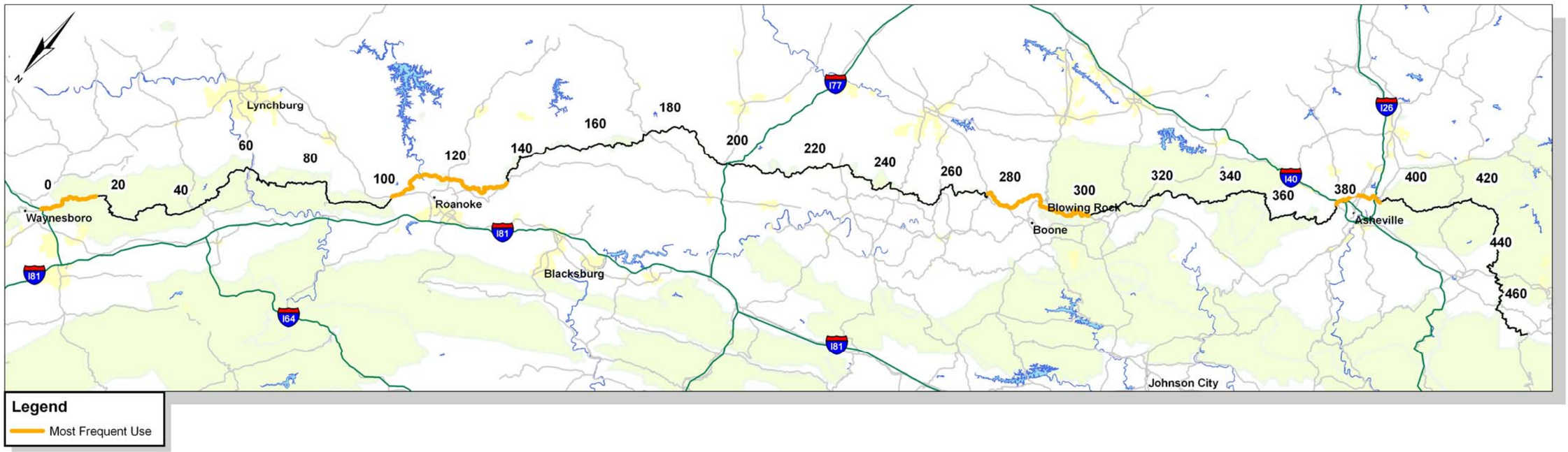


Figure 3
Areas of Most Frequent
Bicycle Use

BICYCLE USE ISSUES

All of the individuals contacted for this study were asked about bicycle usage issues along the Parkway. Their issues are summarized below. Records of the conversations are included in Appendix A.

Members of bicycle advocacy groups identified the following issues:

- The intermixing of cars and bicycles within the narrow 2-lanes of the Parkway can be dangerous, especially when cars exceed the speed limit.
- Law enforcement of traffic speeds is not adequate in some locations.
- Many drivers that are unfamiliar with the curves and/or bicyclists tend to be timid in passing a bicyclist along the Parkway. They may wait longer than is necessary, or may use more of the opposing lane than is necessary to safely maneuver around the bicycle, which creates an unnecessary back up in traffic.
- There is a lot of commuter traffic between US 460 and US 220 (in the Roanoke metropolitan area).
- Between US 74 and US 25 (in the Asheville metropolitan area), there have been serious accidents involving bicyclists. This is also a high commuter area.

National Park Service Staff identified the following issues:

- Bicyclist usage is increasing in the Roanoke Valley area.
- Bicyclists do not always follow safe procedures when riding in groups. Bicyclists should stay on the right, in single file, and should keep space in between each cyclist so that a car can pass them individually rather than trying to pass the entire group at once.
- Public education on sharing the road, including vehicle and bicycle laws and rights would be beneficial.
- The nature of the Parkway can make it difficult to see cyclists, especially in foggy weather. Requiring lights on bicycles at all times would help visibility.
- The Blue Ridge Parkway is popular to bicyclists because of its limited access and lower traffic levels (outside of commuter zones) when compared to most community streets and highways.
- Many local bicycle shops in the major communities along the Parkway advertise its merits. These shops host bicycle tour groups that use the Parkway, often by special use permit. Such groups are typically limited in size to an approximate maximum of 25 bicyclists. Single file bicycling is taught and advocated by these groups as is wearing brightly colored clothes, safety equipment, lighting, and other bicycle safety measures.
- Designated park camping locations are not spaced closely enough together to accommodate long-distance bicyclists traveling the Parkway. As a result, they often camp in an undesignated location.

Local Agency personnel identified the following issues:

- A common concern is that the lanes on the Parkway are too narrow for bicyclists and vehicles together.
- There is a large commuter zone between US 460 and US 220 (in the Roanoke metropolitan area), which is also a popular bicycle route.
- Increased speed enforcement may help alleviate problems of heavy Parkway usage in bicycle route areas.

SUITABILITY RATING SYSTEM

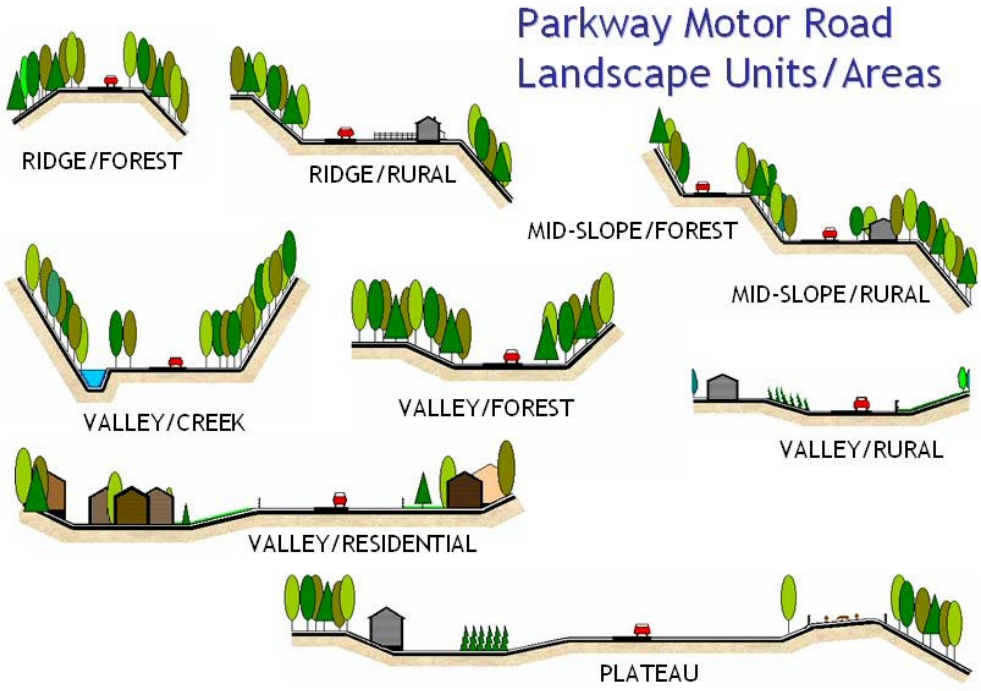
A rating system was developed to evaluate the feasibility of constructing a multi-use path along the Parkway. This evaluation focused solely on a separate path outside of the roadway prism but within the Park boundary to maintain the integrity of the historic roadway design. The general suitability of the terrain surrounding the Parkway was assessed during field data collection completed in November 2004 by the project team, consisting of consultant and Blue Ridge Parkway (BLRI) staff.

Suitability was determined with the assumption that Blue Ridge Parkway will continue to be managed as it is currently, the number of travel lanes will remain the same, shoulder conditions will not change, roadway grades will remain the same and the mix of vehicles will reflect current trends.

In order to assess the feasibility of a multi-use path, the type of path that would need to be constructed at locations along the Parkway was first determined. Due to the variable terrain along the Parkway, the type of path defined the general constructibility considered in the overall suitability rating.

Path types were based on "landscape units" provided by BLRI staff, which are used to describe the Parkway and are shown in **Figure 4**. Tables were also provided by BLRI staff that present the landscape units designated for sections of the Parkway. The landscape units were used to develop the general types of multi-use path that could be considered for construction parallel to the Parkway.

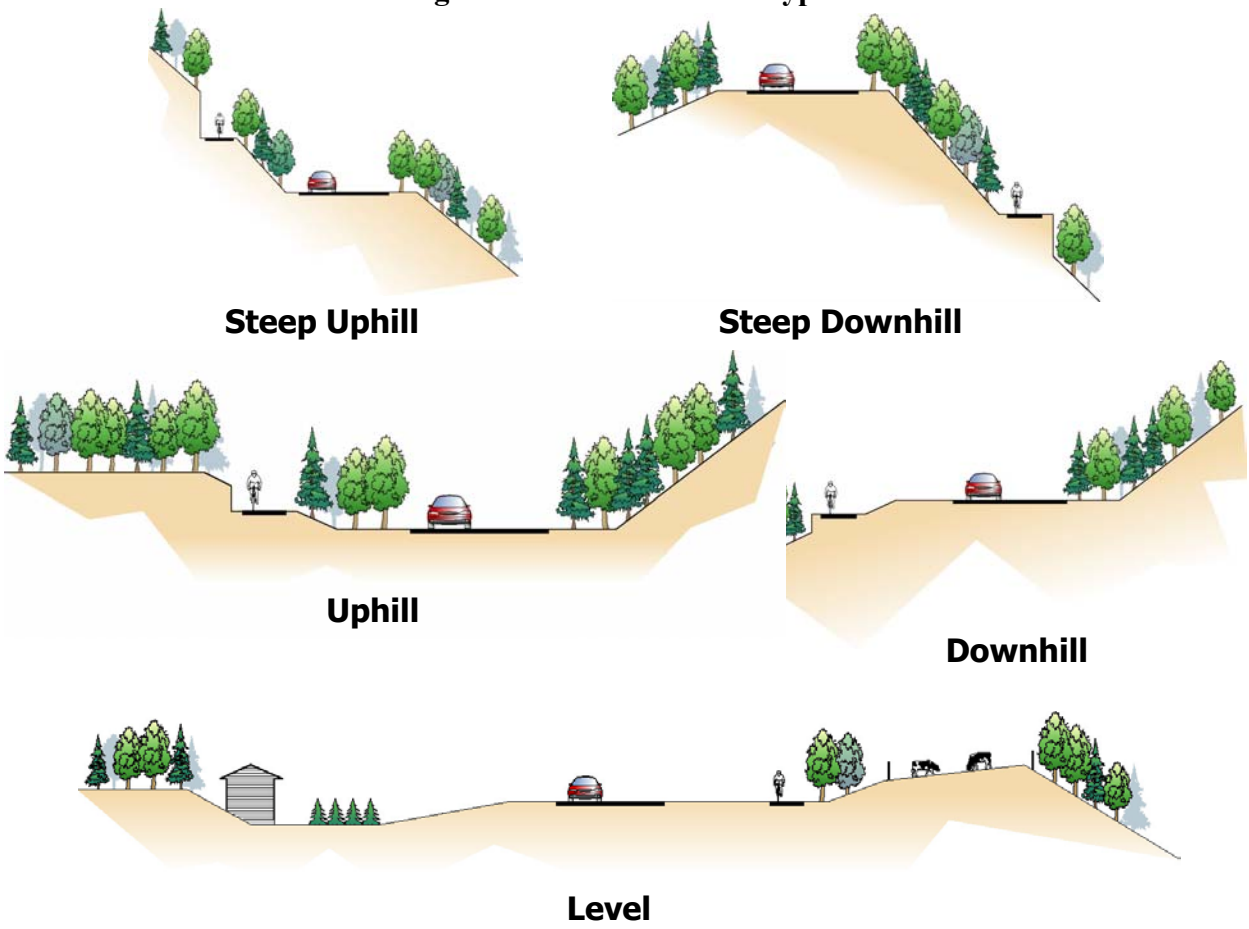
Figure 4. Parkway Landscape Units provided by BLRI Staff



Five general multi-use path types were created to assess the ease of path construction along the Parkway. Along the Parkway, the type of multi-use path that was assumed for the suitability rating was documented. The type of multi-use path was chosen based on the ease of construction given the surrounding terrain. If it was assumed that the trail must be constructed on a particular side of the Parkway with existing constraints, that side (left or right) was noted in the field notes so the density of trail crossings that may be required in a particular area could be evaluated. However, given the broad nature of this study, specific path alignment and cross-sections were not identified.

The type of path was chosen from those illustrated in **Figure 5**. A path could be cut into a steep uphill slope or filled into a steep downhill slope. For example, in the Plateau landscape units of the Parkway shown in Figure 4, a path could be constructed level with the existing terrain adjacent to the roadway. A path could also be cut or filled into less severe uphill or downhill slopes along Valley and Mid-Slope landscape areas, which would require short walls or minor sideslope impacts. The trail designation generally did not vary with small deviations, such as isolated rock outcroppings, although the locations of such features were documented in the supplemental field notes.

Figure 5. Multi-Use Path Types



A Suitability Rating (SR) was determined for Parkway segments, which varied in length with changes in terrain, infrastructure and environmental sensitivity. A numerical "1" to "5" rating was assigned to segments of the Parkway with SR 1 being the least suitable and SR 5 being the most suitable. Each numerical rating is broadly defined in **Table 1**.

SR1 would apply to areas where a multi-use trail is virtually infeasible on either side of the Parkway due to extraordinarily high cost or other broad physical and/or environmental impacts, such as at tunnels where a parallel bore would be required or major bridges. SR 5 would apply to areas with terrain adjacent to the Parkway that may only require limited infrastructure.

Table 1. Suitability Rating Definitions

Suitability Rating	Observation
1	Potential impacts are so major that path development would not be feasible due to no suitable means to mitigate impacts and/or constraints.
2	Potential impacts are major and path development would require extensive mitigation to develop a suitable path.
3	Potential impacts are substantial and path development may only be feasible if there are suitable means to mitigate impacts and/or constraints.
4	Potential impacts are minor and path development may be feasible since there are suitable means to mitigate minor impacts and/or constraints.
5	Potential impacts are negligible or no constraints to path development observed.

The suitability ratings assessed along the Parkway also considered general opportunities and constraints related to the following criteria. These criteria define the constraints considered with the assigned feasibility of the multi-use path.

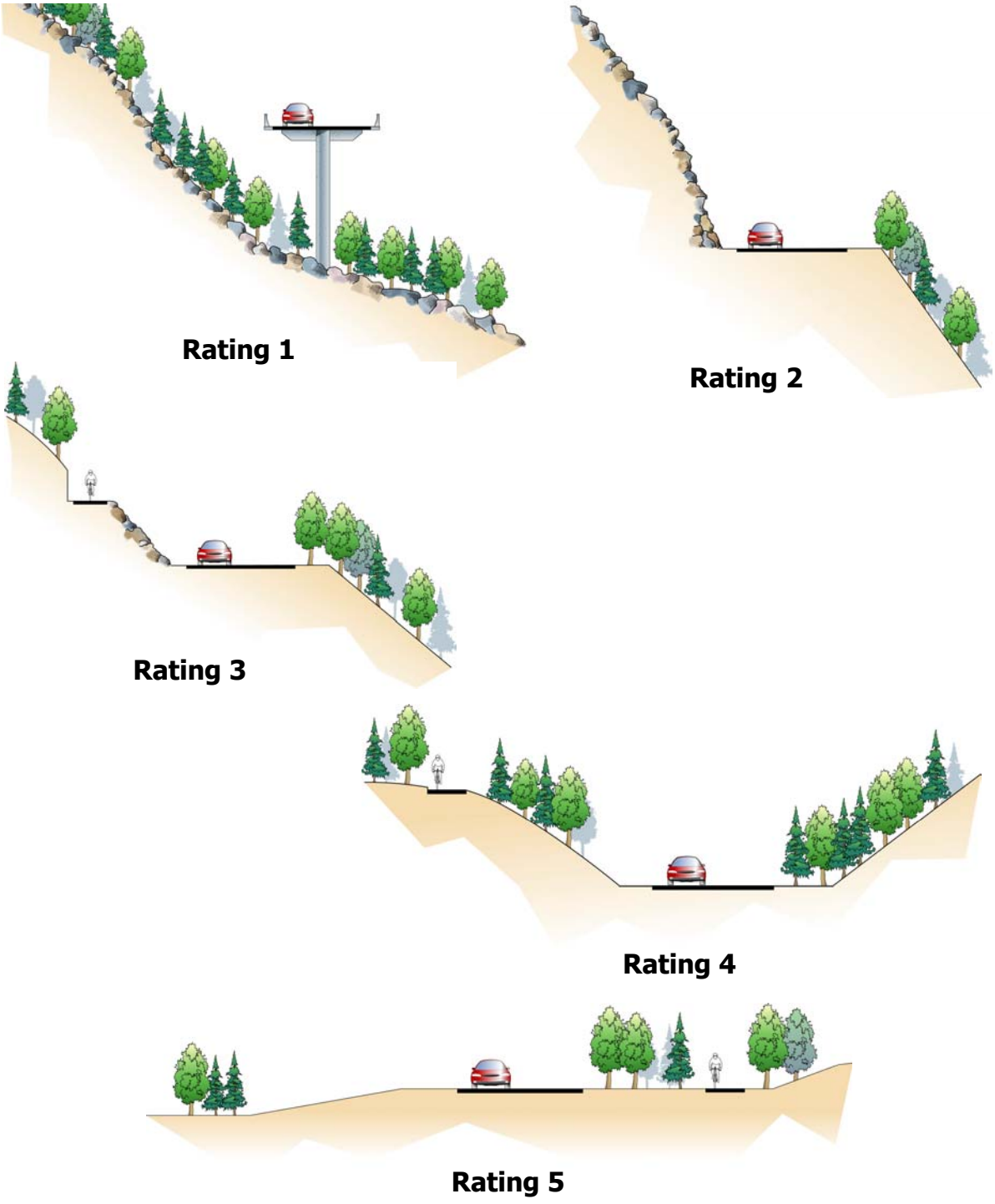
Constraint Criteria

- Topography – Landform adjacent to the Parkway that may or may not require specialized construction techniques given the assumed type of multi-use path.
- Infrastructure – Extensive path infrastructure that may be required, such as walls, bridges or drainage structures.
- Water – Rivers or streams that may require bridges or large culverts.
- Environmental –General environmental features that may be impacted, such as vegetation, wetlands, or wildlife.
- Viewshed – Views from Parkway that may be impacted by the intrusion of the multi-use path.

The typical terrain defined by each suitability rating is illustrated in **Figure 6**. Comparing these illustrations with the landscape units shown in Figure 4 and the path

types shown in Figure 5 shows the connection between the Parkway landscape, path type and subsequent feasibility ratings.

Figure 6. Illustrations of Typical Terrain for Suitability Ratings



The terrain adjacent to the Parkway was continuously evaluated for the construction of a multi-use path with the assignment of a path type and suitability rating. The combination of the type of path and suitability rating evaluated the general feasibility of constructing a path in each area. For example, an area evaluated as Uphill path type with SR 3 would describe a path cut into a relatively gradual ridge slope with frequent switchbacks and short walls or other minor structures required, such as the area shown in **Figure 7**. An area that would accommodate more gentle and rolling path grades without walls would be evaluated as a Level path type with SR 4, such as shown in **Figure 8**.

Figure 7. Typical Terrain with Uphill Path Type and Suitability Rating 3

Figure 8. Typical Terrain with Level Path Type and Suitability Rating 4

DATA COLLECTION

METHODOLOGY

The project team, consisting of consultant and Blue Ridge Parkway (BLRI) staff, collected field data during the first week of November 2004. Team members drove the Parkway and viewed the surrounding terrain to assess the general feasibility of construction of a multi-use along the Parkway outside of the historic road prism. GPS technology was used so that data points identifying the multi-use path type and suitability rating along the alignment could be entered into the GIS database and mapping already set up for the Parkway. Supplemental notes were also collected on the constraint criteria considered for the suitability rating, which are listed in the previous section of this report. These notes are included in Appendix B.

The suitability rating was assessed by a senior level consultant engineer with extensive experience in roadway and multi-use path design and feasibility analysis. This one senior engineer was responsible for the rating assessment along the entire Parkway in order to keep the relatively subjective nature of the assessment consistent. The qualifications of the consultant staff for this study are presented in Appendix C.

Observations related to the constraint criteria that established the basis for the ratings were also documented in the supplemental field notes. Notes were recorded at shorter increments than recorded for the changes in path type or suitability rating. For example, in an area where a trail is "Level" and has a suitability rating of "3", the location of a creek that would require a small bridge was recorded in the field notes although the type of trail and rating did not change.

MULTI-USE PATH TERRAIN

Waynesboro to Roanoke

The Parkway begins east of Waynesboro, Virginia at the southern end of Skyline Drive, which runs through Shenandoah National Park. The surrounding landscape in this area is heavily forested with dense underbrush. The terrain between Humpback Rocks Visitor Center (MP 5.8) and VA 664 (MP 13.7) is rocky with many steep rock outcroppings extending to the top of the ridge on both sides of the Parkway, which would make construction of a multi-use path difficult.

Around Whetstone Ridge (MP 29.0), which used to contain a restaurant until about five years ago, the landscape is level and open with pastures and fences adjacent to the Parkway. In this area, a path would be in view of the Parkway.

South of approximately MP 30.0, the Parkway alignment begins to follow below the ridgeline with the uphill ridge on one side and downhill, forested views on the opposite side. Generally, it was assumed that a multi-use path would follow the uphill ridge in these types of areas for easier construction and to stay out of the view of motorists

traveling the Parkway as much as possible. The Parkway traverses the George Washington National Forest in this area, which is owned by the United States Forest Service (USFS). Negotiations with the USFS may allow for a path to cut the sharp curves made by the Parkway, which would smooth out the path terrain considerably.

Around Indian Gap between MP 47.1 and MP 50.3, several parallel roads and houses within view of the Parkway indicate that keeping a multi-use path within NPS right-of-way and out of view of Parkway motorists may require mitigation. South of Indian Gap, the terrain surrounding the Parkway is densely forested with many steep ravines that would require structures to traverse with a multi-use path. The Bluff Mountain Tunnel (MP 53.1) would be very tough to pass over with a path and a parallel bore may be required to keep a path out of the roadway prism.

At approximately MP 55.0, the Parkway landscape transitions to Valley Creek where the roadway follows along Dancing Creek and Otter Creek. Otter Creek meanders adjacent to the Parkway for almost eight miles with a series of nine bridges leading to the lowest elevation on the Parkway (MP 63.2), located north of the James River. Crossing the area between Otter Creek and the James River with a multi-use path would have significant environmental, water and viewshed impacts given the amount of structures that would be required to traverse the creek and wetlands within the dense forest surrounding the Parkway.

The Parkway crosses the James River, the Chesapeake & Ohio (C&O) Railroad and US 501 with a long structure (MP 63.7), shown in **Figure 9**. The James River is the widest river on the Parkway and has an adjacent visitor center with exhibits, restroom facilities and several trails. An existing pedestrian bridge crosses the river, which would require some modifications, such as ramps, to be utilized for a multi-use path. New structures would also be required over the railroad and US 501.

Figure 9. MP 63.7 – James River Bridge

The area north of Peaks of Otter is densely forested with rock formations and large, rounded boulders scattered throughout the terrain on both sides of the Parkway. Several steep ravines would require structures for the multi-use path. The Appalachian Trail parallels the Parkway to the west between MP 70.0 and MP 80.0 and crosses the Parkway twice, at MP 74.9 and MP 76.3. Impacts to the Appalachian Trail would need to be avoided with a multi-use path.

The Peaks of Otter Lodge (MP 85.6) is one of the few facilities on the Parkway that is open year-round. There is also a Visitor Center, district ranger office, gas station, campground, picnic area and several trailheads in the Peaks of Otter developed area.

Between Peaks of Otter and the Roanoke metropolitan area, the Parkway travels through the Jefferson National Forest surrounded by dense forests with rock outcroppings and steep ravines adjacent to the roadway. A multi-use path would need to meander to follow the terrain, which may lead outside of the Park boundary. At many locations in this area the Parkway follows the ridgeline with gradual uphill slopes, as shown in **Figure 10**, or downhill slopes and open views on both sides. At Bearwallow Gap (MP 91.0), the Appalachian Trail crosses under the roadway and again closely parallels the Parkway for about seven miles. Impacts to the Appalachian Trail would need to be avoided with a multi-use path.

Figure 10. MP 102.2 – Gradual Uphill Slopes

Roanoke Area

East of the Roanoke metropolitan area, which extends from MP 105.8 at the US 460 overpass to approximately MP 128.0, the landscape surrounding the Parkway is largely forested with areas of residential development within view of the Parkway. Keeping a path within the Park boundary may be an issue in this area since there are many adjacent homes and farms. It appears that most of the local roadways and state routes crossing the Parkway in the area could be crossed at-grade with a multi-use trail and would not require a structure. However, the Roanoke River Bridge (MP 114.7), shown in **Figure 11**, crosses the Roanoke River and N&W Railroad and is the longest bridge on the Parkway. Constructing a multi-use path over this area may require suspending a new structure from the existing bridge.

Figure 11. MP 114.7 – Roanoke River Bridge

Explore Park is south of the Roanoke River with access to the Parkway at MP 115.0. This park is a major activity area for the Roanoke metropolitan area. The existing Roanoke Valley Horse Trail, on which NPS is planning to allow mountain bike use, is adjacent to the Parkway within this area and terminates at US 220 (MP 121.4). This horse trail would need to be avoided by a new multi-use path.

South of US 220, the terrain surrounding the Parkway becomes more mountainous with steep uphill slopes and residential areas on the downhill slopes adjacent to the roadway, which indicates relatively tight right-of-way constraints. Steep rock outcroppings extend to the top of the ridge on the east side of the Parkway.

Roanoke to Blowing Rock/Boone

Around approximately MP 140.0, the Parkway landscape transitions to Plateau with open farm views, relatively level forested areas and gradual ridge slopes, as shown in **Figure 12**. Between Smart View (MP 154.5) and I-77 (MP 200.7), the Parkway passes through rolling terrain, which may accommodate the construction of a multi-use path relatively easily. However, several local roads run parallel to the Parkway through the area, which may impact the location of a multi-use path as well as effect right-of-way and views.

Figure 12. MP 167.5 – Plateau Landscape

Existing forest areas may be used for screening a path from the Parkway in some locations south of Mabry Mill (MP 176.2), although the path would be within view through much of the rolling farmland, shown in **Figure 13**. Bicycle use between the Mabry Mill and Meadows of Dan developed area (MP 177.7) could follow VA 603, which runs east of the Parkway and provides access behind Mabry Mill. There are many driveways and local road intersections in this area, which a path could cross at-grade.

Figure 13. MP 192.7 – Rolling Farmland

Most of the open fields within this section of the Parkway are also agriculture fields, in which there is an inherent conflict with the construction of a multi-use trail. A multi-use path would have to be screened from view in these open areas, which is contrary to the desirable practice of keeping the fields open for panoramic views. A multi-use path may divide these fields and could render them undesirable for use by an agriculture lessee. There would be a safety issue with conflicts between path users and grazing of cattle, which many of these leases are assigned to in this area. To alleviate this conflict would require additional fencing and division of leases into smaller sections, which may render them undesirable for continued use.

Around the area of Cumberland Knob (MP 217.5), the Parkway begins to follow along several creeks with wetlands and meandering streams on both sides of the roadway. Pine Creek follows the Parkway for almost three miles with seven bridges leading to Hare Mill Pond (MP 225.3). Brush Creek then follows the Parkway for almost five miles with six bridges. Crossing this riparian habitat with a multi-use path would have significant environmental, water and viewshed impacts.

The Mountains to Sea Trail (MST) begins at MP 235.7 and follows the Parkway for hundreds of miles to the end of the Parkway at MP 469 near Cherokee. The trail crosses the Parkway in numerous locations along the way to access the most feasible side of the Parkway for construction, and so would a multi-use path. A multi-use path would most likely need to be located along the same sides of the Parkway as the MST to be feasible to construct, which creates a considerable amount of conflict. In numerous locations, switchbacks in the MST utilize the entire width of the Parkway boundary to keep grades reasonable. A multi-use path would either need to use the same switchback systems or frequently cross the MST, which would decrease the recreational experience of both trail systems. It would also create a safety issue where it would be necessary to cross one trail over the other, particularly along steep grades. In many locations, the two trails would have to be located side-by-side, which would require extensive vegetation removal and would detract from the wilderness experience that was intended for the MST.

Around Doughton Park (MP 238.5), the views surrounding the Parkway open up as the roadway follows the ridgeline with adjacent historic pastures and fences. Significant wetlands and meandering streams follow the Parkway between Doughton Park and the Northwest Trading Post (MP 258.7). There are many driveways and local road intersections as well as underpasses without connections in this area and a path would cross most of the local roads at-grade. The ephemeral landscape along the Parkway consisting of cattle and homes continues south to US 321/221 at Blowing Rock (MP 291.8).

Blowing Rock/Boone to Asheville

Moses H. Cone Memorial Park (MP 293.5) is undergoing a Developed Area Management Plan (DAMP) to determine the future of approximately 26 miles of historic carriage roads. These carriage roads have been identified as having historic significance and are presently under shared-use by horses and hikers only. In one of the plan alternatives,

some sections of the carriage trails are identified for the possibility of shared-use by mountain bicyclists. At this time, no alternatives have taken into consideration bicycle use, other than mountain bicycling, or adding new trails. Since Moses H. Cone Memorial Park comprises most of the Park boundary in this area, this section of the Parkway will have a considerable impact on constructing a new multi-use path. The conclusions of this DAMP will ultimately determine if a multi-use path could be considered within the Cone boundary.

The Julian Price Campground (MP 296.9) is considered one of the largest campgrounds and has the highest visitation rates along the Parkway. The campground provides access to several popular trails, including the Mountains to Sea Trail. South of Julian Price Memorial Park, the Parkway enters the Pisgah National Forest and the surrounding terrain becomes more mountainous.

Around MP 300.0, the Parkway enters the Grandfather Mountain area. Grandfather Mountain is located west of the Parkway and is environmentally sensitive and privately owned. There are many steep ravines and winding creeks adjacent to the Parkway. Grandfather Mountain has been designated a National Biosphere and resource managers have mapped extensive areas of rare and endangered plant species along its slopes.

Trail studies have concluded that a high percentage of trails users leave the confines of the trail and enter into these rare and endangered plant species areas that grow among the rock outcroppings along Grandfather Mountain. They do so despite ranger patrols, signage, boardwalk and bridge construction, as well as other measures to notify the public of the impact to this natural resource. One of the mitigating measures being proposed to alleviate this negative impact in the Blue Ridge Parkway GMP is to relocate the Grandfather Mountain Trail system, such as the Tanawha and Rough Ridge Trails, to the opposite (east) side of the Parkway. This side of the Parkway is bounded by National Forest Service Lands, where it is believed trails would have much less natural resource impacts. However, there is an extremely steep downhill slope on the east side of the roadway and several major structures that would make path construction relatively infeasible. The Linn Cove Viaduct (MP 304.0), shown in **Figure 14**, was the last section of the Parkway completed and was built from the top down to mitigate environmental impacts.

Figure 14. MP 304.0 – Linn Cove Viaduct

Between Grandfather Mountain and the Linville Falls Visitor Center (MP 316.4), the Parkway travels through mountainous terrain with dense vegetation and steep rock

outcroppings adjacent to the roadway. A multi-use path would need to be located along the uphill slope to follow the ridgeline. South of Linville Falls, many steep ravines would require structures to traverse with a multi-use path. The Little Switzerland Tunnel (MP 333.4) would be very difficult for a path to pass over and a parallel bore may be required to keep the path out of the roadway prism. Around Little Switzerland (MP 333.9), the terrain levels for a short distance and there are several underpasses with local roads, which a multi-use path could cross at-grade.

Between Little Switzerland and Mount Mitchell State Park (355.3), the area surrounding the Parkway remains mountainous with only short sections of level terrain. The Twin Tunnels, located at MP 344.5 and MP 344.7, are major constraints that may require parallel bores for a multi-use path. There are several areas of rock outcroppings along steep ridges.

In the Craggy Gardens area, between Mount Mitchell State Park and Asheville, the Parkway travels along the ridgeline for a short distance before returning to midslope with the uphill ridge on one side and downhill, forested views on the opposite side. There are many steep rock outcroppings in the area, shown in **Figure 15**, as well as ravines that would require structures to accommodate a multi-use path. The region contains a Spruce Fir forest and most of the rocks are covered with plants and lichen. The freeze and thaw cycles experienced in this area fragment and weather the granite rock on the ridges, which contributes to frequent rock falls. The fragmented rock soil in the area would be difficult to stabilize for construction of a multi-use path. The Craggy Gardens segment of the Parkway is closed most of the winter season due to the ice formed along the roadway from the constant water flowing through the rock formations. There are also several tunnels in the area that may require parallel bores to accommodate a multi-use path out of the historic road prism.

Figure 15. MP 366.9 – Craggy Gardens Area

The Asheville Watershed is also located within the Craggy Gardens area, which would greatly limit new trail construction within this area. The environmental impacts within the watershed from path construction would make attaining environmental compliance virtually impossible. The opposite (west) side of the Parkway from the Asheville Watershed is also designated by resource managers as a sensitive and endangered Spruce Fir forest. Rare and endangered plants live among the rock outcroppings habitat on this side as well. Thus, either side of the Parkway boundary through this area would be environmentally impacted by path construction.

Asheville Area

East of the Asheville metropolitan area, there are nine roadway, river or railroad crossings that would require major structures for a multi-use path. The underpass at US 70 (MP 382.5) is a historical bridge and a path would need a single-span structure to cross the roadway. The existing structure at MP 383.6, shown in **Figure 16**, spans the Swannanoa River, I-40, and the railroad and a major structure would also be required for the path. Major structures would also be required at US 74 (MP 384.7), US 25A (MP 388.1), Southern Railroad (MP 388.4), US 25 (MP 388.8), I-26 (391.8), French Broad River (MP 393.5) and NC 191 (MP 393.6) to accommodate the path.

Figure 16. MP 383.6 – I-40 and Swannannoa River Bridge

South of Asheville

South of Asheville, the terrain surrounding the Parkway is mountainous with several tunnels north of Mt. Pisgah. It appears that a multi-use path could go over the tunnels as it travels along the uphill slope of the ridgeline. However, the path crossing over these historic tunnels would have extensive visual impact to the Parkway cultural landscape. The forest removal required and views of the path across these tunnels would extensively change the historic and natural scene that could likely not be mitigated. Parkway tunnels are considered contributing historic elements of the cultural landscape in the study to designate the Parkway as a National Historic Landmark.

South of Mt. Pisgah, there are many areas with steep rock outcroppings where major walls would be needed to stabilize the soil under the path. Between Graveyard Fields (MP 418.8) and the highest point on the Parkway (MP 431.4), the topography adjacent to the Parkway is rough with steep uphill and downhill slopes and extensive rock outcroppings, as shown in **Figure 17**. This segment contains Spruce Fir forests south of Beech Gap (MP 423.2) and ecologically sensitive areas surrounding Devil's Courthouse (MP 422.4) and Waterrock Knob (MP 451.2).

Figure 17. MP 424.7 – Steep Rock Outcroppings

The uphill ridge switches sides of the Parkway often in this region. Therefore, a multi-use path would need to cross the Parkway frequently to follow the ridgeline. These at-grade crossings could be located at overlooks to maximize sight distance. However, these crossings would have a major visual impact, particularly at overlooks, to the cultural landscape the Parkway is mandated to preserve.

South of MP 455.0, the landscape adjacent to the Parkway is forested with more gradual ridge slopes and dense vegetation. Steep ravines are frequent, but a path could meander to avoid requiring a structure. Although the Big Witch Tunnel (MP 461.2) and the Rattlesnake Mountain Tunnel (MP 465.6) may require parallel bores to keep the multi-use path out of the roadway prism, it appears that the path may be able to travel over the Sherrill Cove Tunnel (MP 466.2), shown in **Figure 18**.

Figure 18. MP 466.2 – Sherrill Cove Tunnel

PATH FEASIBILITY ASSESSMENT

The path types and Suitability Ratings (SR) assessed continuously along the Parkway during the field data collection are shown in **Figure 19**. The length of Parkway evaluated with each path type, Suitability Rating and combination of each is summarized in **Table 2**. No locations along the Parkway were assessed with SR 5, which indicates that all areas along the Parkway alignment contain some constraints to path development.

Table 2. Suitability Rating and Path Type Matrix

Path Type	Suitability Rating (SR)					
	1	2	3	4	5	Total (Miles)
Downhill	0.1	2.4	28.7	21.6	0.0	52.8
Level	0.2	1.2	32.9	94.6	0.0	128.9
Steep Downhill	0.1	2.8	5.7	3.0	0.0	11.6
Steep Uphill	0.3	4.8	39.4	7.3	0.0	51.9
Uphill	0.8	5.7	142.5	75.2	0.0	224.2
Total (Miles)	1.5	16.9	249.1	201.8	0.0	469.5

Almost half of the Parkway (224.2 miles) would consist of an Uphill path type due to the mountainous terrain and the general preference of constructing the path along the uphill ridgeline for easier construction and to stay out of the view of motorists. About 30 percent (142.5 miles) of the overall Parkway length was rated as an Uphill path type with SR 3, which describes a path cut into a ridge slope with frequent switchbacks and short walls or other minor structures required. Over half of the Parkway (249.1 miles) was rated at SR 3, where a path is considered generally infeasible due to costs and impacts associated with minor structures, unreasonable profile grades and viewshed issues.

This feasibility assessment was guided by the premise of constructing the paved multi-use trail outside of the historic road prism to maintain the Parkway's designed landscape and the Park's historic integrity. While the right-of-way along the Parkway is wider than most rural roads, it still will not always easily accommodate a multi-use path. Keeping the path out of the Parkway road prism and within the Park boundary severely limits the feasibility of a multi-use path in most areas. The path location is highly constrained by the narrow Park boundaries in many areas as well as the steep ridge slopes in mountainous areas. Due to the variable terrain outside of the roadway prism, the path would have sections of high vertical grades, which may limit the practical use of the path.

Several locations were identified where the multi-use path could cross local roads at-grade or where the path may require an overpass. These assessments of the possibility of the path crossings are based on observations of the existing roadway cross-section, geometry and traffic volumes. These existing conditions may change as future plans for these intersecting roads are completed, outside the influence of the National Park Service. Therefore, specific judgements about roadway crossings should be addressed during the

planning studies of specific path segments with detailed design and traffic volume information for the intersecting roadways.

Modern construction techniques and mitigation measures make almost any type of construction possible, as long as cost and environmental concerns are not a prevailing issue. Therefore, a Suitability Rating of "1" was basically only applied to spot locations that make a multi-use path virtually impossible due to extraordinarily high cost or seemingly insurmountable physical and/or environmental impacts, such as at tunnels where a parallel bore would be required or at major bridges. These locations of major constraints to path development are listed in **Table 3**. Because these constraints are generally spot locations of very short distance, the length of SR 1 ratings shown in Table 2 in relation to the overall Parkway length may be misinterpreted. These major physical constraints, although they make up a very small part of the overall Parkway corridor, would greatly limit the construction of a multi-use path and should be weighed heavily during the selection of feasible path segments.

Table 3. Multi-Use Path Major Physical Constraints – Suitability Rating 1

Milepost	Feature
53.1	Bluff Mountain Tunnel
63.7	James River and C&O Railroad Bridge
105.8	US 460 Bridge
200.7	I-77 Bridge
304.0	Linn Cove Viaduct
333.4	Little Switzerland Tunnel
344.5	Twin Tunnel (North)
344.7	Twin Tunnel (South)
364.4	Craggy Pinnacle Tunnel
365.5	Craggy Flats Tunnel
383.6	Swannanoa River and I-40 Bridge
391.8	I-26 Bridge
393.5	NC 191 and French Broad River Bridge
399.1	Pine Mountain Tunnel
439.7	Pinnacle Ridge Tunnel
443.0	US 74/23 and Southern Railroad Bridge
461.2	Big Witch Tunnel
465.6	Rattlesnake Mountain Tunnel

The multi-use path may be considered feasible at major physical constraints if the path alignment could be brought into the roadway prism, such as over structures or through tunnels. This may be acceptable within the more urban areas of the Parkway, although the paved road travel surface would not be widened and bicyclists would have to ride within the travel lanes as they currently do. The path alignment leading to the roadway surface would also have a major visual impact to the Parkway landscape.

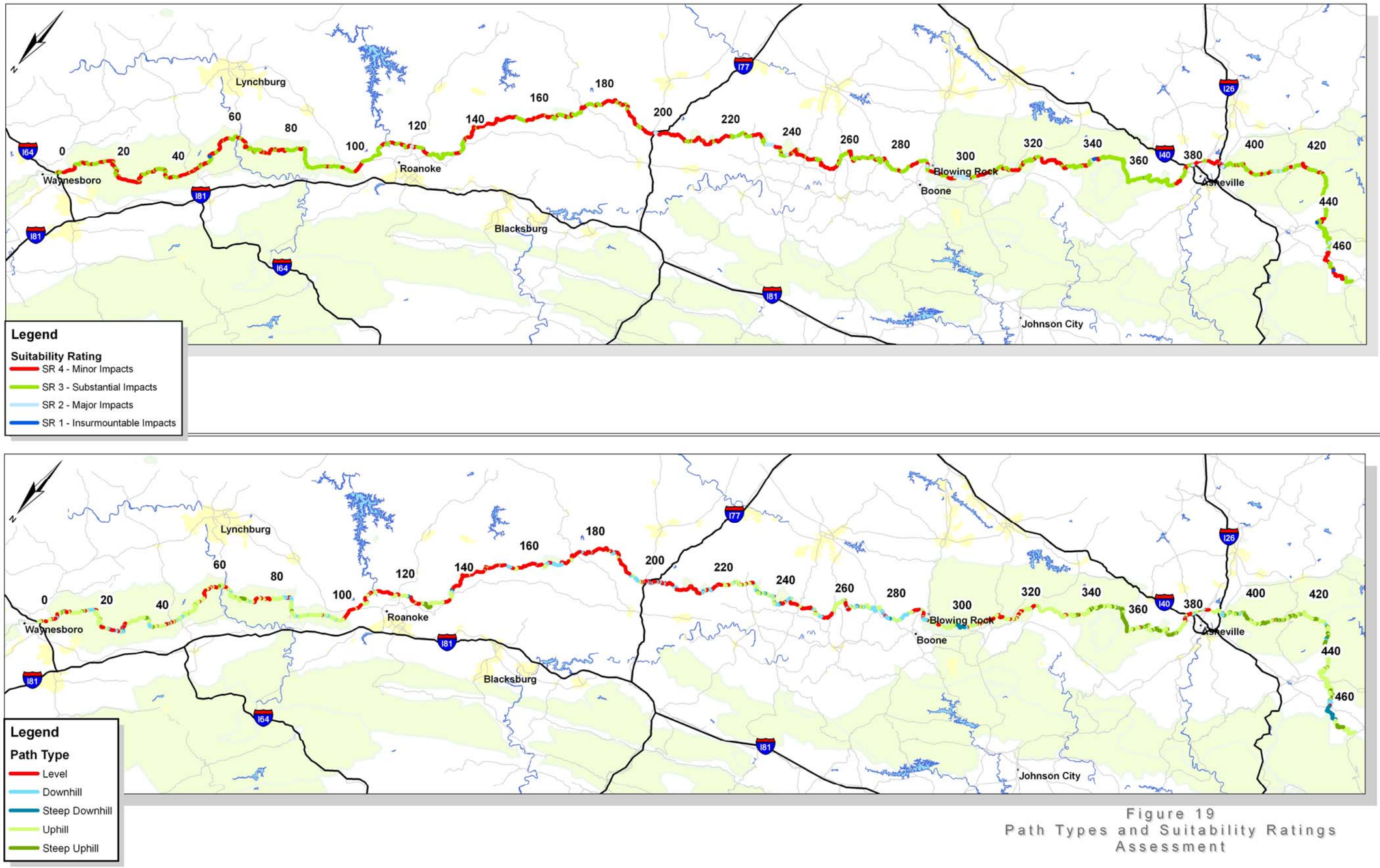


Figure 19
Path Types and Suitability Ratings Assessment

SUMMARY

This feasibility study was prepared to understand the potential for better accommodation of bicycle use along the Blue Ridge Parkway. Utilizing a combination of path type and suitability rating, this study considered the general constructibility of a multi-use path outside of the historic road prism and constraints related to topography, infrastructure and environmental and viewshed impacts to assess the feasibility of the path.

Public interest has been expressed for better accommodation of bicycling along the Parkway. The Parkway is most often used by bicyclists for day rides, although people do ride the entire length of the Parkway and camp along the way. Bicyclists typically ride the Parkway from the spring to fall when the weather is accommodating, although many use it year round. The areas that currently experience steady levels of bicycle use are generally 10 to 15 miles in length and are located around the urban areas of Waynesboro, Roanoke, Boone/Blowing Rock and Asheville. Many times, the Parkway serves as a section of a loop with other intersecting roads leading to and from the population centers.

Several issues were identified with the current bicycle use along the Parkway. Bicyclists must currently ride within the roadway travel lanes because no paved shoulders exist along the Parkway. Almost all of the issues identified by this study are related to the conflicts caused by the mixture of bicycles and cars within the relatively narrow lanes. The mountainous or rolling terrain of most of the Parkway makes it difficult for drivers to pass bicyclists, which causes congestion and frustration. It is also hard for drivers to see bicyclists with the area weather (i.e., fog) and roadway curvature. It is very difficult for drivers to see bicyclists within the tunnels along the mountainous sections of the Parkway.

Using the suitability rating system developed for this study to evaluate the terrain surrounding the Parkway, it is believed that a multi-use path can be considered generally feasible only in areas identified as a Level path type with Suitability Rating 4. Approximately 20 percent of the overall Parkway corridor was assessed with this path type and rating combination and can therefore be considered suitable for a multi-use path.

Figure 20 illustrates the sections of the Parkway deemed most feasible by this study, identified as a Level path type with SR 4. As shown, most of these segments are located within the Plateau District of the Parkway, where the landscape consists of open farm views and forested areas with rolling terrain and gradual ridge slopes. A major physical constraint to path construction identified during the study field data collection in this area is the bridge over I-77, located south of Fancy Gap at MP 200.7.

A multi-use path would have to be screened from view in these open areas, which is contrary to the desirable practice of keeping the fields open for panoramic views. A multi-use path cannot pass through many of the areas within this section without crossing an agriculture lease. Additional fencing and division of leases into smaller sections would render them undesirable for continued use.

Frequent bicycle use along the Parkway is also shown in Figure 19 as areas where a multi-use path would have the most demand. There are some areas where the feasible path segments overlap the most frequent bicycle use, mostly in the Waynesboro and Roanoke areas. Most of the terrain adjacent to the Parkway near the Blowing Rock/Boone and Asheville areas is not suitable for a multi-use path due to steep slopes, insurmountable environmental concerns or major physical constraints, such as tunnels or long-span bridges.

The section of the Parkway most commonly used by Waynesboro area bicyclists is from MP 0 to the Parkway intersection with VA 664 (MP 13.7). There were no major physical constraints identified during the study field data collection in this area of the Parkway. Bicyclists regularly use the Parkway and VA 664 as a loop to and from the Waynesboro area. There is a parking lot at the VA 664 intersection that is used by bicyclists and also serves a trailhead with access to the Appalachian Trail.

The most heavily used section of the Parkway by bicyclists within the Roanoke area is from US 460/221 (MP 105.8) and US 220 (MP 121.4), although bicyclists are commonly observed as far south as MP 137. The US 460/221 Bridge was identified by this study as a major physical constraint with Suitability Rating 1. The bridges at US 220 (MP 121.4) and VA 615 (MP 124.1) were also identified as constraints that would require extensive path infrastructure. These locations were assessed at Suitability Rating 2.

Along the Parkway, some of the more feasible sections for multi-use path construction are interrupted or divided by infeasible areas, which were assessed at Suitability Rating of 1, 2 or 3. Sections receiving a rating of 4, located on either side of a section rated at 1, 2 or 3 are adversely affected by the interruption of path continuity. The presence of the lower-rated areas in the generally feasible area becomes an obstacle that makes constructing a continuous, uninterrupted multi-use path infeasible. Therefore, short sections of major constraints with large impacts may have insurmountable effects on the feasibility of the multi-use path.

FUTURE MULTI-USE PATH STUDIES

More detailed future studies of multi-use path implementation along the Parkway should focus on the areas that have been identified by this study as the most feasible for path construction, such as the Plateau District, as well as the areas where the current bicycle use indicates the most demand for a path, such as the Waynesboro and Roanoke areas. Exact path alignment and logical termini should be identified by considering connections to intersecting roadways appropriate for bicycle use, parking demand and facilities, such as water, restrooms and overnight camping. Also, specific path design guidelines, such as tread surface, width and horizontal clearance should be identified based on the terrain characteristics within each area. Landscape design features should be consistent with those used for the Parkway historic road prism.

During the planning of future multi-use path segments along the Parkway, construction issues should be addressed that may be specific to each area. Depending on the path design characteristics and surrounding terrain, issues related to construction techniques, equipment, supplies and labor might be a factor in the final feasibility of the path. For example, path construction in certain areas may require blasting through rock outcroppings, widespread tree removal, high retaining walls and extensive culvert construction to provide for adequate drainage. These construction measures would make visual concealment in the cultural landscape areas, even along downhill or uphill slopes, highly unlikely.

Other issues critical to the path feasibility within specific areas that should be addressed by a detailed study include path maintenance requirements and cost, right-of-way agreements and the design of at-grade path crossings of the Parkway and intersecting roadways.

This study is a general evaluation of the relative suitability of the Blue Ridge Parkway corridor for the construction of a multi-use path. Because the study included the entire Parkway corridor, the assessment had to consider a broad range of issues, constraints and path types. The methodology of this study was by means of a drive-by feasibility assessment based on observation of slopes and terrain adjacent to the Parkway. More detailed studies within specific areas, requiring a conceptual layout of a proposed path alignment over topographic and aerial photography mapping, would reveal a greater amount of constructability information that may show that areas deemed feasible for a multi-use path by this study are actually infeasible.

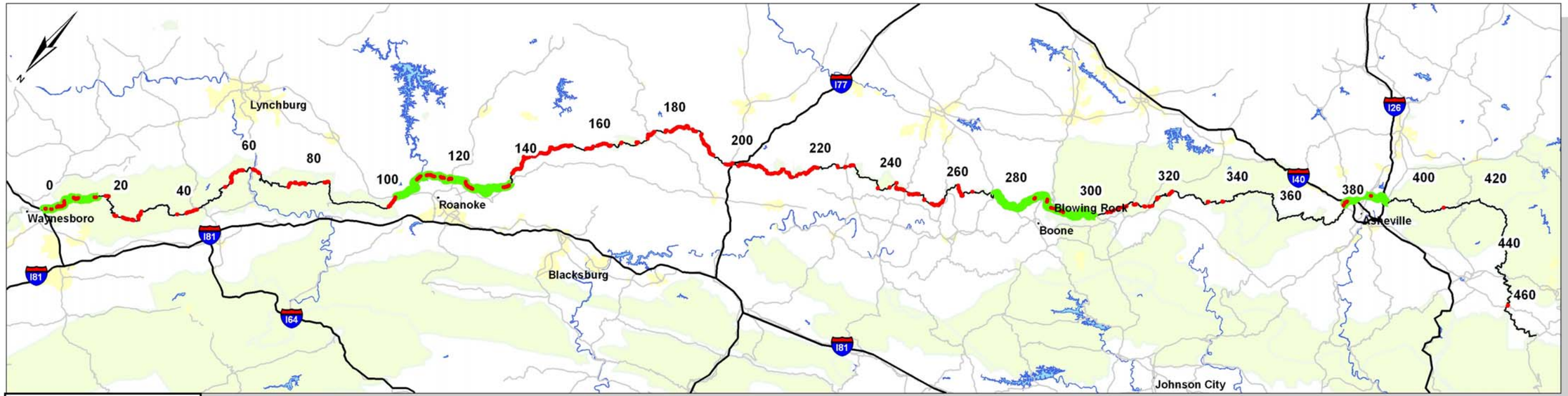


Figure 20
Multi-Use Path Feasible Areas and Frequent Bicycle Use

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Appendix A

Existing Bicycle Use Research Conversation Records

DAVID EVANS
AND ASSOCIATES INC.

Phone Record

DATE:	October 13, 2004
INDIVIDUAL CONTACTED:	**Ann Burgess**
COMPANY/AGENCY:	
PHONE NUMBER:	828-264-3754
AUTHOR:	Cassie Vetter
SUBJECT:	Bicyclist Contact Information
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Ann left a message with two contact names to call. She felt these two contacts would know more than she.

Harvard Areys (Airs): 828-262-5238
Mike Boone: 828-265-2211 Owns Magic Cycles in Boone, NC

DAVID EVANS
AND ASSOCIATES INC.

Phone Record

DATE:	October 15, 2004
INDIVIDUAL CONTACTED:	**Bill**
COMPANY/AGENCY:	League of American Bicyclists
PHONE NUMBER:	202-822-1333
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

They don't put on rides, clubs are associated with the League. He will send a link that I can search for all clubs in a state.

DAVID EVANS
AND ASSOCIATES INC.

Phone Record

DATE:	October 19, 2004
INDIVIDUAL CONTACTED:	**Claudia Nix**
COMPANY/AGENCY:	Liberty Bicycles – Part of RTD Bicycle program
PHONE NUMBER:	828-274-2453
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Are there any existing paved multi-use paths in your area?
?

Are there any plans for future paved multi-use paths in your area?
There is a trail along the river from the confluence of the Swannanoa and the French Broad River, south to 191.
There is also one from the Arboretum that goes to the Parkway

Are there any locations you would like to see connections made to access the Parkway?
From the Arboretum South to the Fletcher community park trails.
Connection from Azalea Park on Azalea Road near the intersection of 70 (part of the Mountains to Sea Trail)
This connection would really improve safety.

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
Daily by individual riders. Weekly organized rides from 5-10 people. The Hilly Hillacious ride is between 500-600 riders and has used part of the Parkway 2 of the years.

What areas are most often used for biking by (individuals/organized groups)?
From 25 to Pisgah or 25 to Craggy Gardens.
25 to 191 is used on organized weekly rides.

Are there any problems or issues with current bicycle usage along the Parkway?
Between 74 and 25 there have been several serious accidents involving bicyclists. This is also a high commuter area.

Additional Comments?
Park Service used to close the Parkway from 25 to 191 for use by Ped's and Bicyclists. They should do this again.
Many people would love and use a bikepath along the Parkway.

DAVID EVANS
AND ASSOCIATES INC.

Phone Record

DATE:	October 15, 2004
INDIVIDUAL CONTACTED:	**Daniel Foster**
COMPANY/AGENCY:	President of the Blue Ridge Bicycle Club – Roanoke
PHONE NUMBER:	540-598-83311
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Are there any existing paved multi-use paths in your area?
Go to www.greenways.org for existing greenways.

Are there any plans for future paved multi-use paths in your area?
?

Are there any locations you would like to see connections made to access the Parkway?
Wick Run Spur connects to the Parkway.
There is a NPS and City of Roanoke road that goes to Mill Mtn. that is frequently used.
Chestnut Mtn. Loop

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
It is used year round. When parts of the Parkway are closed to vehicular traffic in the winter, the mountain bikers use that area heavily.

What areas are most often used for biking by (individuals/organized groups)?
US 460 to the north is used often, but the heaviest usage is between US 460 and SR 221.

Are there any problems or issues with current bicycle usage along the Parkway?
There is a lot of commuter traffic between 460 and 220. It's a narrow 2-lane road that makes it dangerous when vehicles exceed the speed limit. Law enforcement is too minimal in this region for that reason.

Additional Comments?
He recently had a request to make a donation to help Bicycle Safety on the Parkway. They wanted to provide orange vests for riders. He feels visibility is not the issue since cyclists usually where bright clothing, it's the impatience of motorists.

DAVID EVANS
AND ASSOCIATES INC.

Phone Record

DATE:	October 14, 2004
INDIVIDUAL CONTACTED:	**Mike Graham**
COMPANY/AGENCY:	Milepost Zero Bicycle Club
PHONE NUMBER:	540-943-4867
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Are there any existing paved multi-use paths in your area?
None not connected to roadways.

Are there any plans for future paved multi-use paths in your area?
?

Are there any locations you would like to see connections made to access the Parkway?
Hwy 250 is most often used, this takes you to Milepost Zero
Mountain Bikers get on at Sherandoh

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
At least once per week. There are cyclists year round (mountain bikers in the winter)
There is an extreme century ride that takes place each year put on by a group out of Charlottesville. Look up route on web.

What areas are most often used for biking by (individuals/organized groups)?
Milepost Zero to Reeds Gap or to Love Gap.

Are there any problems or issues with current bicycle usage along the Parkway?
Rangers are unfriendly to cyclists. They have been stopped and told if they had it there way bikes wouldn't be aloud on the Parkway. They try to ride when there is less traffic.

Additional Comments?
It's a tremendous benefit to have the Parkway in their back yard. It's the reason many people live there.

DAVID EVANS
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Phone Record

DATE:	October 18, 2004
INDIVIDUAL CONTACTED:	**Jeff Burns**
COMPANY/AGENCY:	City of Asheville Pedestrian and Bike Coordinator
PHONE NUMBER:	828-259-5534
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Are there any existing paved multi-use paths in your area?
The North Carolina Arboretum is located just off the Parkway on NC 191. The Arboretum has a good multi-use trail system that would be within 5 miles of the Parkway.

Are there any plans for future paved multi-use paths in your area?
They are currently planning a connection from Azalea Road Park into the City along the Mountains to Sea Trail that would cross the Parkway.
They are currently planning a multi-use path along the Elk Mtn. Scenic Highway that would be near the Parkway.

Are there any locations you would like to see connections made to access the Parkway?
All of the above would be great connections.

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
It is heavily used by bicyclists. The hard core riders will ride 100 miles of the Parkway and use it year round. The recreational bicyclists will use it during the Spring through Fall.

What areas are most often used for biking by (individuals/organized groups)?
The portion of the Parkway between 25 and 70 is quite urbanized and heavily used by bicyclists.

Are there any problems or issues with current bicycle usage along the Parkway?
From his point of view no, by NC law bicyclists are treated the same as a motor vehicle, they have all the same rights, and obey the same laws. An average citizen would say the lanes are too narrow for bicyclists and vehicles.

Additional Comments?
Consider bike racks at overlooks? Published rides outlining new bikepath on web or in brochures.

Bicycling is becoming a major interest in the area. Lance Armstrong lives just over the state line in South Carolina, and does a lot of training in the area. Asheville was ranked 5th in the nation for Mountain Miking. Compliments to the Parkway for being proactive on an issue that is becoming well known in the area.

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Phone Record

DATE:	October 18, 2004
INDIVIDUAL CONTACTED:	**Jim Harmon**
COMPANY/AGENCY:	Mountain Magic Cycling Club
PHONE NUMBER:	828-265-8065
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Are there any existing paved multi-use paths in your area?
No

Are there any plans for future paved multi-use paths in your area?
?

Are there any locations you would like to see connections made to access the Parkway?
They use a lot of the USFS gravel roads to access the Parkway.

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
The Blood Sweat and Gears Ride began in 1999 with about 140 riders. They are now up to 1000. It is a hundred mile ride that occurs the last Saturday in June every year and includes a section of the Parkway. The Park Service has worked very well with them to facilitate the ride.
As an individual he uses the Parkway at least twice a week, 6-7 months a year. Every Wednesday they have an organized ride that includes part of the Parkway and is made up of anywhere from 10 to 50 riders.

What areas are most often used for biking by (individuals/organized groups)?
He rides anywhere from Mabry Mill to Asheville and sees other bicyclists – more day rides than long trips.

Are there any problems or issues with current bicycle usage along the Parkway?
Intermixing cars with bicyclists is always an issue. The cars that are impatient and speeding are the problems.

Additional Comments?
This is a big cycling community that is still growing. They are always looking for new places to ride, especially where you can be separated from cars.

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Phone Record

DATE:	October 19, 2004
INDIVIDUAL CONTACTED:	**Liz Belcher**
COMPANY/AGENCY:	Regional Greenway Coordinator – Roanoke Area
PHONE NUMBER:	540-776-7159
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Are there any existing paved multi-use paths in your area?
There was a plan put out in 1997 for a network of bike and ped paths. Should be able to find this online. Part of the RTCA. The parkway is shown as an on-road route in this plan.

Are there any plans for future paved multi-use paths in your area?
She has been working on a plan for the last 2 years that would link the Parkway to a 17 mile loop that connects Explorer Park, Wolf Creek Greenway, Mill Mountain, Roanoke River Greenway, and the Town of Vinton. Some of this is outlined in the trail management plan. There is an existing Horse/Ped trail that parallels about ¾ of the Parkway between 220 and 460. This cannot be paved, but could be opened to bikes.

Are there any locations you would like to see connections made to access the Parkway?
Wolf Creek Greenway has $ to connect to the Parkway, just needs approval. The loop discussed above would be a great connection. GPS and plan has already been done for entire 17 mile loop. The loop includes the Horse/Ped trail that parallels the Parkway.

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
Very often between 220 and 460.

Are there any problems or issues with current bicycle usage along the Parkway?
There is a big commuter problem between 220 and 460. The Parkway is known as the shortcut to Walmart. Commuters and bicyclists don't mix. They recently had a motorist convicted of harassment for yelling and throwing things at a cyclist on the Parkway. Speed enforcement seems to be the main problem.

Additional Comments?
There are lots of influential people willing to speak on behalf of making this happen.
Shane Sawyer has done lots of Bikepath LOS analysis in the area and could do it for us on the Parkway. He is part of RVARC.org and his number is 540-343-4417.
She would be able to meet with us, but will be leaving town November 4 after 11:00.

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Phone Record

DATE:	10/5/04
INDIVIDUAL CONTACTED:	**Michael Grey**
COMPANY/AGENCY:	VA DOT Salem District
PHONE NUMBER:	540.375.3565
AUTHOR:	Cassie Vetter
SUBJECT:	Contact Names and Numbers
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Michael was established as the Salem District contact person during the previous BLRI project. He was contacted to provide names, numbers, websites, etc. to gather the information needed for this project.

He is attending a bike path alternatives (Salem District) meeting tonight, and will collect some contact information there.

Each county designates bike routes and may have a plan and/or map. He will email a link to each county within his district that borders the Parkway. He will also give contact information for other districts the Parkway goes through.

Bike groups will be attending meeting tonight and he will try to collect contact information from them as well.

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Phone Record

DATE:	October 13, 2004
INDIVIDUAL CONTACTED:	**Mike Boone**
COMPANY/AGENCY:	Magic Cycles
PHONE NUMBER:	828-265-2211
AUTHOR:	Cassie Vetter
SUBJECT:	Bicycle Usage of the Parkway
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Are there any existing paved multi-use paths in your area?
He is part of the Greenway Committee in the area which recently constructed a Greenway path that starts in Blowing Rock, is an extended, paved shoulder along 221 and stops about a mile short of reaching the Parkway.

Are there any plans for future paved multi-use paths in your area?
This path was planned to extend to the Parkway but that part of the project was shut down.

Are there any locations you would like to see connections made to access the Parkway?
This path would be an easy, and well used connection to make.

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
Yes, as an individual he uses the Parkway very often, and he has an organized group that rides it every Wednesday night during the Spring, Summer and Fall (April – November).

What areas are most often used for biking by (individuals/organized groups)?
The Wednesday night group is on the Parkway from Aho Road to Greenhill.
A very common ride is to get on at 321, ride over the Viaduct to 221 on Grandfather Mtn., and then come back along 221.
For the last 5 years the "Blood, Sweat, and Gears" ride has attracted 600-700 riders on a route that includes a section of the Parkway from Greenhill to Deep Gap and exits onto 421.

Are there any problems or issues with current bicycle usage along the Parkway?
99.9% of the time there are no problems. When there are, it is typically that a car will not pass him when he is riding, even if there is plenty of room, and when they do, they go way into the other lane. He feels this most common with drivers unfamiliar with the curves and/or bicyclists. He has been harrassed a bit by ranges for clogging up traffic in a scenario like this.

Additional Comments?
Boone Bike and Touring is another bicyclist group in the area. Jim Harmon would be a good contact for more information. 828-265-8065.

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Phone Record

DATE:	October 22, 2004
INDIVIDUAL CONTACTED:	**Pete Schula**
COMPANY/AGENCY:	Ranger in the Plateau District
PHONE NUMBER:	540-745-9661
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

John Murphy is the District Ranger and can be reached at 540-745-9681. Pete has been a ranger in the Plateau District for 8 years. He also used to work for the Park Service in the early 80's. Back then there were virtually no bicyclists using the Parkway. There has been a significant increase in the past couple of years in bicyclisits on the Parkway.

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
He sees riders in the urban area (Roanoke) after work riding both in groups and alone.

What areas are most often used for biking by (individuals/organized groups)?
Between MP 106 and MP 137 he sees most of the bikers. Mill Mountain Spur Road is a perfect Bike access location, and many bicyclists use this. MP 106 – 136 has heavy commuter traffic. The parkway is great for both motorists and bicyclists, but not together. A bikepath seems feasible through Roanoke, but not once you get to ~ MP 137 where the Parkway is on the side of a mountain.

Are there any problems or issues with current bicycle usage along the Parkway?

- The Parkway is particularly dangerous for bicyclists when it is foggy. They cannot be seen at all.
- When bicyclists ride in groups they need to stay on right and should keep space in between each cyclist so that a car can pass then individually rather than trying to pass the entire pack.
- Bicyclist usage is definitely increasing in the Roanoke Valley. Everyone needs to learn to share the road – neither has more rights than the other, and education in this department is necessary.
- When he responds to an accident and has his siren on, he has to keep bicyclists in mind because they usually don't get off the road, and are harder to see that a vehicle.
- Bikers should be required to have lights at all times – particularly for the tunnels.
- Recently there was an accident that is a good example of the problems of both bikers and motorists on the Parkway. A woman well known in the area as a responsible bicyclist was hit by a pick-up while traveling up a hill. The pick-up was also driving appropriately (safely) but couldn't see the cyclist because of the setting sun. His right mirror clipped the biker and knocked her off her bike.

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Phone Record

DATE:	November 8, 2004
INDIVIDUAL CONTACTED:	**Brent Pennington**
COMPANY/AGENCY:	Highlands District Ranger State Line to MP 305 at Grandfather Mountain
PHONE NUMBER:	336-372-8568
AUTHOR:	Cassie Vetter
SUBJECT:	Parkway Bicycle Usage
Project:	Blue Ridge Parkway Bikepath Feasibility Study
Project No.:	NAPSBLRI-0050

Is the Parkway regularly used for biking by (individuals/organized groups)? How often? What Seasons?
Yes, he sees them scattered throughout his district with a heavier concentration around the Boone/Blowing Rock area. There are more bicyclists between May and October although he has seen them year round. Some are traveling the entire Parkway, or at least large sections of it and camping, others are just exercising in the evenings. There are several annual special events within his district.

What areas are most often used for biking by (individuals/organized groups)?
Special events are coordinated with the NPS. A permit is applied for, and the maximum number of riders is 750. They do not close the Parkway for the special events but they post warning signs, patrol heavily to slow vehicles down, and sometimes place rangers at busy intersections for traffic control. The following events are done annually:

- "Bridge to Bridge" is typically the 3rd week of September and uses the portion of the Parkway from Blowing Rock to Linville Falls.
- "Brutal 100" is typically held the 2nd week in August. It currently hosts about 200-250 riders and uses the portion of the Parkway Deep Gap @ MP 276 to Laurel Springs/Hwy 18.
- "Blood, Sweat & Gears" is the 3rd week in June and goes from Blowing Rock to MP 270.
- "Blue Ridge Triathalon" is fairly new, but takes place in April.

Are there any problems or issues with current bicycle usage along the Parkway?
No major problems. Overnight camping by bicyclists needs to be addressed. There are not designated camping locations spaced close enough together to accommodate bicyclists traveling the Parkway. They often pull over anywhere and camp in an undesignated location. This issue needs to be addressed by either creating more suitably located camping spots or enforcing no camping except for in designated locations.

Appendix B

Supplemental Field Notes

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
0	Landscape Change	Midslope Forest					
0	Underpass	I-64					
0	Bicycle Connection		Easy at grade connection with ramps on south side without going over bridge				
1.5	Transition path to right side at overlook					Dense underbrush in forest on right	
4.3	Path on left	Road parallel to Parkway on right					
5.7	Path on left	Facilities and parking with historic cabin on right	Levels off on both sides with heavy forest on both sides				
6	Path on left	Popular trailhead and parking on left					
7.2	Path on left		Steep rock outcropping on left and right				
7.6	Path on left		Steep rock outcropping on left and right				
10	Path on left		Steep rock outcropping on left				
10.5	Path on left		Steep rock outcropping on left				
11.5	Path on left		Steep rock outcropping on left				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
12.1	Path on left		Lots of rock - boulders scattered along ridge				
12.4	Path on left		Lots of rock - boulders scattered along ridge				
12.9	Path on left	Uphill ridge on left with downhill slope and views to right	Steep rock outcropping on left				
13.7	Bicycle Connection - Transition path to left at	VA 664	Popular trailhead and parking for cyclists (Appalachian Trail)				
14.7	Path on right			Steep ravine would require structure			
15	Landscape Change	Valley Rural	Path on downhill slope of Parkway with uphill ridge on left				
15.7	Path on right						Houses/small town within view of Parkway on right (Love Gap)
16	Landscape Change	Midslope Forest					
17.5	Transition path to right side at overlook						
18.4	Transition path to left side at trailhead	Busy trailhead with about 8 cars parked					
22	Landscape Change	Ridge Forest	Steep uphill ridge on one side with open views to opposite side			More traffic and cars in overlooks	
24	Landscape Change	Ridge Rural					

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
27.2	Underpass	SR-56		No structure - cross at grade			
28.8	Path on right		Steep rock outcropping on right				
29.1	Transition path to right side	Whetstone Ridge Visitor Center				Wetland on left	
29.5	Underpass	SR-603		No structure - cross at grade			
30	Landscape Change - Whetstone Ridge	Midslope Forest	More level and open with pastures on both sides with fences directly adjacent to Parkway	Path on left would have to be in field			Several houses and church within view of Parkway - path in view of Parkway
33.3	Path on left		Steep rock outcropping on left	Steep ravine would require structure			
34.1	Path on left			Steep ravine would require structure			
35.1	Path on left			Steep ravine would require structure			
35.8	Path on left		Steep rock outcroppings on left				
36.2	Path on left		Steep rock outcroppings on left				
37.5	Underpass	SR-605	Parallel road on left side	No structure - cross at grade			
38	Path on left		Uphill ridge on left with dense forest on both sides				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
39.6	Path on left		Steep rock outcroppings on left				
40.1	Path on left			Steep ravine would require structure			
40.2	Path on left			Steep ravine would require structure			
41	Landscape Change	Ridge Forest					
41.1	Transition path to left side	Shift to uphill ridgeline					
41.8	Transition path to right side	Uphill ridge on right side with downhill views to left					
45.6	Underpass - Path on left	US-60	Use ramp connection to get back to Parkway	No structure - cross at grade			Open on ridge with views to both sides
45.9	Transition path to left side						
46.4	Transition path to right side						
46.9	Underpass	Public Underpass		No structure - cross at grade			
47.1	Transition path to left side			Parallel road adjacent to Parkway on left			
47.6	Path on right		Tight ROW may require mitigation				Houses within view of Parkway on left

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
48	Landscape Change	Midslope Forest					
48.9	Transition path to right side						
50.3	Path on right	Parallel roads on right uphill and left downhill					
50.5	Underpass - Transition path to left side	SR-607	Dense forest on both sides alternating uphill and downhill	No structure - cross at grade			
51.3	Path on right		Steep rock outcropping on right				
52.2	Path on right			Steep ravine would require structure			
53	Path on right	Forested on both sides with uphill ridge on right and downhill slope on left					
53.1	Tunnel	Bluff Mountian Tunnel		Very tough to go over - would need a parallel bore			
53.7	Path on right			Steep ravine would require structure			
54.6	Creek - Path on right	Brown Creek	Path on uphill ridge on right with downhill views and creek below on left	Steep ravine would require structure			
55	Landscape Change - Transition path to right	Valley Creek	Path along creek		Creek on right		
55.9	Creek - Path on left	Dancing Creek			Creek on right		

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
56.6	Bridge - Path on left	Otter Creek Bridge #1	Creek moves to right side				
58.5	Bridge - Path on left	Otter Creek Bridge #2	Creek moves to left - Path level along creek		Medium structure over creek		Thick forest in flat area with meandering creek
58.8	Bridge - Path on left	Otter Creek Bridge #5	Creek on right		Wetlands on left		
59.1	Bridge - Path on left	Otter Creek Bridge #3	Creek moves to right side		Medium structure over creek		
59.6	Bridge - Path on left	Otter Creek Bridge #4	Creek on left adjacent to Parkway with path on other side of creek		Branch of creek moves to right side		
61.2	Bridge - Path on left	Otter Creek Bridge #6	Creek on left adjacent to Parkway with path on other side of creek		Creek meanders back and forth on both sides on Parkway		
61.5	Bridge	Otter Creek Bridge #7			Medium structure over creek		
61.6	Underpass	SR-130					
61.7	Bridge	Otter Creek Bridge #8					
62.1	Path on right			Steep ravine would require structure		Creek on right adjacent to Parkway - path on other side of creek	
62.1	Bridge	Otter Creek bridge #9				Cross river with existing bridge and cross road at grade	
62.3	Path on right			Steep ravine would require structure			

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
63.2	Path on right			Steep ravine would require structure	Creek adjacent to Parkway on left		
63.3	Path on right			Steep ravine would require structure	Creek adjacent to Parkway on left		
63.6	Creek	James River - Widest river on Parkway	Be on left side only through intersection with road/river/railroad and immediately transition to	Existing pedestrian bridge over river			
63.7	Underpass	Railroad		Medium structure over RR			
63.8	Underpass	US-501	Connect to ramps at grade on south side				
64.9	Underpass - Path on right	SR-600	Road parallels Parkway a bit to house on left	Medium structure over road			
66	Landscape Change	Midslope Forest	Flattened out with some houses		Creek adjacent to Parkway on left		
66.2	Path on right				Meandering creek on right		Path in trees would be screened from Parkway
66.7	Path on right			Steep ravine would require structure			
67.1	Path on right			Steep ravine would require structure			
70.2	Path on right			Steep ravine would require structure			
72.7	Path on right		Steep rock outcroppings on right				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
72.9	Path on right		Talis rock boulders scattered				
74	Transition path to right side	Uphill ridge on right with open views to left				Forested areas on both sides	
74.7	Path on left	Thunder Ridge picnic area on right - parking					
76.1	Transition path to left side	Uphill ridge on left with open views on right	Begin downgrade			Trees are twisted and weathered	
76.6	Path on right	Air Force road parallel on right close to Parkway in trees					
77.5	Path on right		Several large rocks on right				
78.6	Path on right		Several large rocks on right				
80	Landscape Change	Valley Forest	Uphill gradual ridge on right with views to left and forest on both sides				
81	Landscape Change	Midslope Forest				More vegetation	
83.5	Transition path to right side at overlook					Lots of trees on both sides uphill and downhill	
84	Transition path to left side						
85	Landscape Change	Valley Forest	Ridge uphill on left with views and forest to right				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
86	Transition path to right side at intersection	Peaks of Otter Visitor Center	Path on right side at Peaks of Otter Lodge				
87	Landscape Change	Midslope Forest					
87.2	Path on left	Existing unpaved road parallel and close to Parkway on left					
89	Transition path to left side at intersection	Path on left side benched into the ridge above Parkway	Forested areas with ridge slopes alternating uphill				
90	Path on right		Steep rock outcropping on right				
90.2	Path on right			Steep ravine would require structure			
90.7	Path on right		Steep rock outcropping on right				
90.9	Underpass - Transition path to right side	SR-43 & SR-695	Use existing bridge to transition path	No structure - cross at grade			
92	Landscape Change	Ridge Forest					
92.5	Transition path to left side at overlook						
93.2	Underpass	SR-617		Medium structure over road			
94	Path on right		Steep rock outcroppings on right				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
94.5	Transition path to right side						
94.9	Transition path to left side						
95.5	Transition path to right side						
96.7	Path on left		Steep rock outcroppings on left				
97	Transition path to left side at overlook						Viewshed to right downhill
97.6	Path on right		Steep rock outcroppings on right				
98	Landscape Change	Midslope Forest	Path on top of ridge line on right				
99.5	Transition path to right side at overlook	Parkway on ridge line with downhill slopes on both sides					
99.9	Path on right		Steep rock outcroppings on right				
100	Path on left		Steep rock outcroppings on left				
101.1	Transition path to left side						

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
102	Path on right		Steep rock outcroppings on right				
102.6	Path on right			Steep ravine would require structure			
103	Landscape Change	Valley Forest					
103.8	Path on right			Steep ravine would require structure			
104	Landscape Change - Path on right	Valley Residential	Forested on both sides - Gradual climb uphill				
104.4	Underpass	SR-652		No structure - cross at grade			
104.8	Underpass	SR-657		No structure - cross at grade			
105.8	Bicycle Connection	Good connection with ramps south of Parkway					
105.8	Overpass	US-460		Parallel tunnel would be required (double arch bridge) because can't cross highway at grade			
106.6	Path on right			Steep ravine would require structure			Houses adjacent to Parkway on left
107.5	Underpass	SR-738		No structure - cross at grade			Houses viewed by overlook in valley on left

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
107.6	Underpass	Railroad		No structure - cross at grade			
107.7	Creek	Glade Creek		Medium structure over RR			
107.8	Underpass - Transition path to right side	SR-685		No structure - cross at grade			
108.4	Underpass	SR-604		No structure - cross at grade			
108.8	Path on left			Steep ravine would require structure			
109.4	Underpass	Private Crossing - Culvert	Very tight ROW between houses and farms/pastures	No structure - cross at grade			
111.6	Bicycle Connection	Wolf Creek Greenway Extension		No structure - cross at grade			Houses and farms within view of Parkway
111.6	Underpass	SR-651	Uphill ridge on left with downhill views of Roanoke to right	No structure - cross at grade			
112.2	Underpass	SR-24	Signal on left that could be used for crossing	No structure - cross at grade			
113.6	Bicycle Connection	Future bike path and shared use trails to extend from north to River			Creek on right		
113.6	Underpass	SR-634		No structure - cross at grade			Open view of development and houses around intersection
114.7	Underpass	Railroad	Path on left	Suspend bike bridge off existing bridge only way - huge structure	Creek on right		

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
114.8	Creek	Roanoke River		Suspend bike bridge off existing bridge only way - huge structure - longest bridge on Parkway	Creek on right	Horse trail ends - eventually will go into Explorer Park	
115.4	Underpass	SR-618		No structure - cross at grade			
115.6	Explore Park on left - Major future bike connection	Path on left				Horse trail on right	
116.4	Underpass	SR-658		No structure - cross at grade			
117	Transition path to left side					Horse trail on left	
117.2	Overpass	SR-617	Open and rolling fields right of Parkway with forests to left	Path could go up and over to cross road at grade			
117.6	Underpass	SR-116		Medium structure over road			Path within view of Parkway due to tight ROW - houses within view of Parkway on right
117.9	Path on right			Steep ravine would require structure			
118.1	Transition path to right side					Horse trail transitions to left	
118.6	Underpass	SR-666		Path could go up and over to cross road at grade			
119.2	Underpass	SR-668		No structure - cross at grade	Relatively level area on both sides	Horse trail on right	Some houses within view of Parkway
120.5	Path on left	Mill Mountain Rd - lots of bike connection	Path on ridge uphill on left with downhill slope on right in forested area			Horse trail transitions to right - allowing mountain bikes (shared use) on horse trail	

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
120.8	Transition path to left side	Trails on right side had to be moved to avoid quarry on right					
121.4	Bicycle Connection	Connect with south ramps at grade without crossing bridge					
121.4	Underpass - Path on right	US-220		Major structure over highway		Horse trail on left	
122	Path on right			Steep ravine would require structure			House subdivision adjacent to Parkway on right
122.4	Underpass - Transition path to right side	SR-679	Path on right on uphill ridge	No structure - cross at grade		Forested	
122.6	Path on left			Steep ravine would require structure			Subdivision within view to right
123.9	Underpass	Railroad		Medium structure over road and railroad			
124	Underpass	SR-615		Medium structure over road and railroad			
124.2	Underpass	SR-613		Major structure over creek and road			
124.5	Underpass	Private Crossing					
125.8	Path on left		Grassy fields to left with rolling hills				New subdivision adjacent to Parkway on right
126	Landscape Change	Midslope Rural					Subdivision on right with rolling valley landscape on left

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
126.1	Underpass	SR-688		No structure - cross at grade			
126.5	Path on left		Parallel road on left with houses in view and subdivision planned				
127.6	Underpass	SR-691		No structure - cross at grade			Houses within view on right in forest
128.9	Underpass	SR-690	Steep rock outcropping on left	Medium structure over road			
129.7	Path on left	Huge ravine on left	Steep rock outcropping on left	Steep ravine would require structure			
130.7	Path on left	Steep ridge on left with steep downhill slope on right	Steep rock outcropping on left				Views to right
130.9	Underpass	SR-690		No structure - cross at grade			
133	Underpass	SR-612	Path on downhill slope on left with uphill slope on right - forested area on both sides	No structure - cross at grade			
133.7	Path on left			Steep ravine would require structure			
134.3	Underpass	SR-612		No structure - cross at grade			
135	Landscape Change	Plateau	Path on steep ridge on left with downhill views to right		Many small creeks		
135.4	Path on left					Cemetary adjacent to Parkway on right	

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
136	Underpass - Path on left	SR 602	Wide open views of farmlands and pastures	No structure - cross at grade		Cemetary adjacent to Parkway on left	
136.5	Path on left	Path along steep ridge on left with downhill slope on right with some houses in view					
137	Landscape Change	Midslope - More difficult terrain for path					
138.5	Underpass	SR-643		Steep ravine would require structure			
139	Landscape Change	Plateau					
142.2	Path on left	Some open farm views and grass areas and pastures				Cemetary adjacent to Parkway on right	
143.2	Transition path to left side	Level forested area with limited ROW on right	Parallel road right side on Parkway				
144.8	Transition path to right side	Gradual ridge on right with downhill slope on left and views on left					
147	Path on left	Forested area with more difficult terrain					
149	Path on left	Open farmland views on right with forested areas	Parallel road right side on Parkway				
150	Transition path to left side	Gradual ridge on left with steep downhill on right					
150.6	Path on right					Wetland on both sides	

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
150.8	Path on right			Steep ravine would require structure			
152.3	Path on right	Open farmland views on left	Parallel road close to Parkway on right				
153	Transition path to right side					Utilize existing screening of forest for path on right side	
153.2	Path on left		Parallel road close to Parkway on right				
154.8	Path on left	Smart View Picnic area - facilities for cyclists	Parallel road close to Parkway on right			Forest with less dense vegetation	
155.3	Path on left	Farms adjacent to Parkway on right					
156.3	Path on left	Parallel road close to Parkway on left			Wetland on left		
158.8	Path on left	Uphill slight ridge on right with downhill and farms on left			Creek on left		
159.6	Path on left				Wetland on right		
161.2	Path on left	Road parallel to Parkway close on right					Houses within view of Parkway on right
162.3	Path on left				Rakes Mill Pond on right and wetlands on both sides		
163	Path on left	Road parallel to Parkway on left					

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
165	Landscape Change	Ridge Rural	Road parallel to Parkway close on right				Many houses within view on right
165.3	Underpass	SR-8		No structure - cross at grade			
165.6	Path on left					Cemetary adjacent to Parkway on left	
167.8	Transition path to left side	Gradual ridge on left with steep downhill on right					
168.3	Path on right	Path within downhill forest on right with gradual ridge and some views on left					
169	Path on right	Rocky Knob campground on right					
171.5	Path on right	Parallel road on right					
173.5	Transition path to right side		Open views to farms on right				
174	Landscape Change	Plateau					
174.3	Creek	Laurel Fork Creek			Wetland area on left		
176.2	Mabry Mill	State Route behind Mill at left could bring in path to attraction	Path on left				
177.7	Underpass	US-58		No structure - cross at grade			

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
178.3	Path on left	Parallel road close to Parkway on left				Cemetary adjacent to Parkway on right	
179.3	Underpass	Private Crossing		No structure - at grade			
179.4	Creek	Creek		Minor structure over creek			
179.5	Underpass	Private Crossing		No structure - at grade			
180.6	Creek	Creek		Minor structure over creek			
180.7	Underpass	Private Crossing					
182	Path on left	Tight ROW may require mitigation	Rolling farmland with forest areas adjacent to Parkway				
184	Underpass	SR-610		No structure - cross at grade			Many houses within view of Parkway on right
185	Underpass	SR-638		No structure - cross at grade			
185.6	Path on left		Dense forest with good screening adjacent to Parkway				
186.6	Path on left	Parallel road close to Parkway on left	Many houses within view of Parkway				Path within view of Parkway between parallel road and Parkway
188.1	Path on left	Parallel road close to Parkway on left				Dense forest	Path within view of Parkway between parallel road and Parkway

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
188.6	Groundhog Mtn - Path on left	Facilities that could be used by cyclists					Path within view of Parkway between parallel road and Parkway
188.9	Underpass	SR-608					Path within view of Parkway between parallel road and Parkway
189.3	Underpass	Private Crossing - Parallel road close to Parkway on left		No structure - cross at grade			Path within view of Parkway between parallel road and Parkway
189.9	Path on left					Puckett Cabin on right	
192.7	Path on left						Many houses within view of Parkway
194.3	Transition path to left side						Path within view of Parkway in grass between Parkway and creek
195.5	Underpass	SR-608	Parallel road close to Parkway on right	No structure - cross at grade			Path within view of Parkway in grass between Parkway and local road
196.4	Underpass	SR-682	Relatively easy and rolling terrain	No structure - cross at grade			
197.8	Path on right		Parallel road close to Parkway on left			Dense vegetation in forest areas	Houses within view of Parkway on left
198.8	Path on right	Rolling farmland & forests on right with ridge on left	Parallel road close to Parkway on left				
199.4	Underpass	US-52		Medium structure over road		Historical bridge	Houses within view of Parkway
200	Path on right						Houses within view of Parkway

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
200.7	Underpass	I-77		Bad - major bridge over interstate			
201.5	Path on right			Steep ravine would require structure			
203.9	Transition path to right side	Path between Parkway and parallel road (within grass area)	Local road on right closely parallel to Parkway (Tight ROW)				Path within view of Parkway would require screening
204.3	Path on left		Open to fields and farms on left side				Path within view of Parkway would require screening
204.9	Path on left			Steep ravine would require structure			
206.1	Underpass	SR-620		No structure - cross at grade			
208.9	Path on left				Minor structure over creek		
209.1	Path on left					Wetlands and riparian habitaton left	
209.2	Path on left					Wetlands and riparian habitaton left	
210.5	Path on left				Small structure over creek - creek runs along left side of Parkway		Path within view of Parkway on left side along low ridge
211.1	Path on left						Houses within view of Parkway

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
211.7	Path on left				Wetland on left side		
212.2	Path on left				Minor structure over creek and wetlands		
212.6	Path on left				Wetland on left side		Houses within view of Parkway
213.1	Bridge	E. Fork Chestnut Creek			Minor structure over creek		
213.2	Path on left				Wetland on left side		
215	Path on left				Wetland on left side		
215.4	Transition path to left side				Significant wetlands on both sides		
215.7	Bridge	W. Fork Chestnut Creek			Minor structure over creek		
215.8	Overpass - Path on right	SR-89		No structure - cross at grade			Path within view of Parkway with some screening
216	Bridge	W. Fork Chestnut Creek			Minor structure to cross creek		
216	Landscape Change	Valley Creek					
216.1	Bridge	W. Fork Chestnut Creek			Minor structure to cross creek		

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
216.2	Bridge	W. Fork Chestnut Creek			Minor structure to cross creek		
217	Landscape Change	Ridge Rural			Meandering creek and wetlands on right side		
217.2	Underpass	NC-18		Medium structure to cross road			
218.1	Transition path to right side			Steep ravine would require structure			
220	Landscape Change	Valley Rural					
222.5	Path on left		Open to fields and farms on left side			Wetlands and riparian areas on both sides	Many houses within view of Parkway
222.8	Bridge	Pine Creek Bridge #1	Transition path with meandering creek		Medium structure over creek		
223	Landscape Change	Valley Creek					
223.1	Bridge	Pine Creek Bridge #2	Transition path with meandering creek		Medium structure over creek		
223.8	Bridge	Pine Creek Bridge #3	Transition path with meandering creek		Medium structure over creek		
224.1	Bridge	Pine Creek Bridge #4	Transition path with meandering creek		Medium structure over creek		
224.2	Bridge	Pine Creek Bridge #5	Transition path with meandering creek		Medium structure over creek		

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
224.8	Bridge	Pine Creek Bridge #6	Transition path with meandering creek		Medium structure over creek		
225.1	Bridge - Transition path to right side	Pine Creek Bridge #7	Transition path with meandering creek		Major structure over creek		
225.3	Bridge	Hare Mill Pond			Significant wetlands and ponds and streams		
225.8	Transition path to left side						
227.5	Bridge	Brush Creek Bridge			Medium structure over creek		
227.6	Overpass	SR-1464		Path would go under overpass			
228.1	Bridge	Little Glade Bridge			Lots of wetlands and streams and water on right		
229.3	Bridge	Little Glade Bridge			Medium structure over creek		
229.6	Underpass	US-21		No structure - cross at grade	Lots of wetlands on right near interchange		
229.9	Bridge	Little Glade Bridge			Minor structure over creek		
230.5	Bridge	Little Glade Bridge			Minor structure over creek		
231	Landscape Change	Plateau					

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
232	Bridge	Brush Creek Bridge			Significant wetland on right side		Houses wihin view of Parkway
232	Landscape Change	Ridge Forest			Lots of small streams on right side		
233.5	Transition path to right side						
235.2	Path on left		Ice rock on left side				
236.6	Path on left			Steep ravine would require structure			
237	Landscape Change	Ridge Rural	`				
237.1	Overpass	SR-1130		No structure - cross at grade			
238.5	Transition path to left side	Brinegar Cabin area	Path along ridge on left side with downhill views to right			Historic cabins on left	
239.2	Path on right					Dense vegetation - trees and evergreens	
240.1	Path on right			Steep ravine would require structure			
242.1	Path on either side		Ice rock on both sides - sheer slope uphill on left side and downhill on right side				
242.6	Path on right	Downhill slopes alternating between right and left sides					

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
244.6	Path on right					Cemetary adjacent to Parkway on right	Path would be in view of Parkway and would require screening
245	Landscape Change	Valley Rural					
245.2	Path on right				Lots of water - streams and wetlands on right		
246.5	Path on right	Flat with lots of water on right with ridge on left			Lots of water - streams and wetlands on right	Farming and wetlands/streams on right	
248.1	Underpass	US-18	Large open farm areas on both sides of Parkway	No structure - cross at grade	Large stream on right - path would stay right of stream	Historical bridge	Many houses within view of Parkway - Path would be in view of Parkway and would require
248.3	Path on right				Significant wetland on right		
248.8	Underpass	Private Crossing		No structure - cross at grade			
248.9	Bridge	Laurel Fork Viaduct			Small structure below bridge over river area		
249.3	Path on right				Small structure over small stream		
251.1	Path on right		Existing residential road on right parallel to Parkway		Wetland with meandering stream on right	Some ag leases adjacent to Parkway	Houses within view of Parkway
252	Landscape Change	Ridge Forest					
253.7	Path on right					Cemetary adjacent to Parkway on right	

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
255	Landscape Change	Valley Rural	`			Some ag leases adjacent to Parkway	Houses within view of Parkway
258.6	Northwest Trading Post	Possible connection/endpoint					
260	Landscape Change	Ridge Rural					
261.2	Underpass	SR-16	Easy connection with ramps on both sides	No structure - cross at grade			
263.4	Path on right	Path on downhill side on Parkway with ridge on left					
265.5	Path on right					Many ag leases adjacent to Parkway	Houses within view of Parkway
267.7	Path on right					Cemetary on right side directly adjacent to Parkway - Many ag leases adjacent to	
268.8	Transition path to right side	Path along ridge on right with downhill views on left					Path within view of Parkway due to limited ROW
269.9	Transition path to left side	Path on downhill side of Parkway with ridge on right					Many houses within view of Parkway
270	Landscape Change	Ridge Forest					
270.7	Path on right	Path along ridge on right with downhill views on left	Steep rock outcroppings on right	Alluvian slope failures in area			
272.5	Path on right					Historic cabins on left side	

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
274	Jeffress Park				Significant creek and waterfalls on left through park		
276.4	Bicycle Connection		Connection to south could be made with ramps on south side without crossing bridge				
276.4	Underpass	US-421		Major structure over highway			
276.9			Steeper uphill ridge on right with more rock formations				
278	Landscape Change	Plateau					
278.4	Transition path to right side						
279.1	Underpass	SR-1357		No structure - cross at grade			
279.4	Underpass	Private Crossing		No structure - cross at grade			
280.1	Path on left						Many houses and farms within view of Parkway
282	Underpass - Transition path to left side	SR-1508	Existing road closely parallel to Parkway on right side				
283	Underpass	SR-1509		No structure - cross at grade	Significant wetland on both sides		
285.5	Underpass	SR-1511		No structure - cross at grade		Many ag leases with owners that do not like path/trails through fields	

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
285.7	Path on right						Many houses within view of Parkway - Path would be within view because of limited ROW and
286	Path either side				Significant wetland on both sides		
286.3	Underpass	SR-1514		Major structure over creek and road	Lots of water and wetland impacts		
286.7	Transition path to left side at creek bridge				Locate path next to creek		
287.3	Path on right				Significant wetland on right		
287.5	Path on right			Steep ravine would require structure			
288.1	Bicycle Connection	Aho Road - Path on right	Easy at grade connection (path level)				Houses within view of Parkway - viewshed project underway to screen
288.8	Underpass	SR-1529		No structure - cross at grade			
290.2	Bicycle Connection	Green Hill Road	Good at-grade connection with gravel road				
291.8	Transition path to right side		Uphill on left side and downhill on right with small segments of level			Lots of grazing leases on both sides with fenses close to Parkway	
291.9	Bicycle Connection	Bicycle Trail along 321 stops short	Locals want to build trail under Parkway and stream - could make connection along ramps				
291.9	Underpass	US-321/221		Major structure over highway			

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
292.7	Underpass	SR-1538		No structure - cross at grade			
294	Underpass	NPS Carriage Road		No structure - cross at grade			
294.7	Underpass - Path on left	SR-221		No structure - cross at grade			
295	Landscape Change	Valley Rural					
295.4	Bridge - Transition path to left side	Sims Creek Bridge		Major structure over creek			
296.4	Path on right				Stream and wetlands crossings		
296.7	Bridge	Julian Price Lake		Major structure at lake			
297.3	Transition path to right side	Campground may utilize path - largest campground in park				Must avoid Julian Price historical carriage roads	
297.7	Path on left					Stream and wetlands on left would require boardwalk	
298	Landscape Change	Midslope Forest					
298.6	Underpass	SR-1559		Medium structure over road		Historical bridge	
299.2	Transition path to left side						

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
299.8	Path on right	Existing bridge		Steep ravine would require structure			
300	Path on right	Existing bridge		Steep ravine would require structure			
300.2	Bridge	Green Mtn Creek Bridge		Major structure over creek			
301	Path on right			Steep ravine would require structure			
301.2	Path on right			Steep ravine would require structure			
302	Transition path to right side						
302.5	Bridge	1st Bridge N of Raven Rocks Overlook	Extreme steep down slope on left side	Major structure			
302.6	Bridge	1st Bridge S of Raven Rocks Overlook	Extreme steep down slope on left side	Major structure			
302.7	Path can be on either side		Extreme steep down slope on left side				
303	Bridge	Great Wall of China Bridge	Extreme steep down slope on left side	Major structure			
303.4	Bridge	Wilson Creek Bridge #1	Extreme steep down slope on left side	Major structure over creek			
303.5	Bridge	Wilson Creek Bridge #2	Extreme steep down slope on left side	Major structure over creek			

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
303.7	Bridge	Wilson Creek Bridge #3	Extreme steep down slope on left side	Major structure over creek		Very historic walls	
304	Bridge	LINN COVE VIADUCT	Extreme steep down slope on left side	Major structure			
304.7	Bridge	Stack Rocks Bridge	Steep down slope on left side	Major structure		Historical bridge	
305.1	Bicycle Connection		Connection could be made with ramps at grade				
305.1	Underpass	US-221		Major structure over road			
305.3	Bridge	Stack Rock Creek		No structure - cross at grade			
305.4	Path on left	BLRI study shows all trails will be on left side to avoid Grandfather Mtn				Sensitive area around Grandfather Mtn - national biosphere, plants and sensitive	
307.1	Path on left		Steep rock outcropping on left				
307.2	Path on left		Steep rock outcropping on left				
307.8	Transition path to left side		Path uphill along ridge line				
309	Transition path to right side						
309.6	Transition path to left side					Dense vegetation	

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
311	Landscape Change	Valley Rural					
312.2	Overpass	SR-181		Take path up and over to cross highway at grade			
312.6	Path on right			Steep ravine would require structure			
313.5	Transition path to right side				Wetlands and creek on left		Existing road within view parallel to Parkway on left
314.5	Path on left				Creek and wetlands on left	Dense vegetation in forest	Path within view of Parkway around pastures
316.6	Bridge	Linville River Bridge	Transition to right side		Major structure required over river	Historical bridge	
316.8	Path on left			Steep ravine would require structure			
317.5	Underpass - Parkway gates closed	US-221		No structure - cross road at grade, but minor structure over creek			
318	Landscape Change	Ridge Forest					Houses within view of Parkway
318.5	Transition path to left side						
319	Path on right			Steep ravine would require structure			
319.2	Path on right			Steep ravine would require structure			

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
319.3	Path on right			Steep ravine would require structure			
319.4	Path on right			Steep ravine would require structure			
319.5	Path on right			Steep ravine would require structure			
320	Landscape Change	Midslope Forest					
323.7	Path on right	High accident area - about 34 a year		Steep ravine would require structure			
324	Landscape Change	Ridge Rural					
324.7	Local road - Parkway closed at gate						
325.8	Path on right		Steep rock outcroppings on right				
326	Transition path to right side	at overlook					
326.6	Path on left			Steep ravine would require structure		Dense vegetation along ridge	
327.5	Underpass	US 221		No structure - cross at grade			
328.2	Path on right					Apple orchard on left side	

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
328.7	Path on right						Path within view along right ridge due to limited ROW
330	Landscape Change - Transition path to right side	Ridge Forest	Limited ROW for level path may require mitigation				
330.1	Transition path to left side						
330.9	Underpass - Transition path to right side	SR-226		No structure - cross at grade			Houses within view of Parkway
332.6	Underpass	Public Road		No structure - cross at grade			
333.6	Tunnel	Little Switzerland Tunnel		Major constraint			
334	Underpass	McCall Gap Road	Little Switzerland	No structure - cross at grade			
335.4	Underpass	Crabtree Road		Minor structure over road			
335.6	Path on left		Tight ROW may require mitigation				Houses within view of Parkway
336.3	Underpass	Wildacres Road		Minor structure over road			
336.8	Tunnel	Wildacres Tunnel 249' long		Path to go up over the tunnel			
336.9	Transition path to right side						

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
337.3	Path on left			Steep ravine would require structure			
339	Transition path to left side						
339.2	Path on right		Steep rock outcroppings on right				
339.5	Crabtree Meadows	Visitor Center					
340	Landscape Change	Midslope Forest	Small section of level path around maintenance area				
342.1	Transition path to right side	At existing at grade intersection					Path within view of Parkway on right due to limited ROW
344	Landscape Change	Ridge Forest					
344.1	Underpass - Parkway gates closed	SR-80 - Transition path to left side		Major structure required over road on curve		Historical bridge	
344.5	Path on right		Steep rock outcroppings on right				
344.6	Tunnel	240' long		Major constraint			
344.7	Tunnel	401' long		Major constraint			
346	Transition path to left side		Some short sections of downhill/level, but majority is uphill and steep uphill				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
347	Path on right		Steep rock outcroppings on right				
347.4	Transition path to right side						
348.4	Transition path to left side						
348.7	Parkway washed out	Parkway will need to be repaired with major retaining wall					
349	Tunnel	Rough Ridge Tunnel 245' long		Path to go up over the tunnel			
349.3	Parkway washed out	Parkway will need to be repaired with major retaining wall					
350.1	Path on right		Steep rock outcroppings on right				
351.4	Path on right		Steep rock outcroppings on right				Path within view of Parkway on right side at top of ridge
351.9	Transition path to right side						
352	Landscape Change	Midslope Forest					
355	Landscape Change	Ridge Forest					

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
355.3	Mt Mitchell State Park - Transition path to left side	Parkway closed with barricades					
356.7	Path on right		Steep rock outcroppings on right				
358	Landscape Change	Midslope Forest					
358.3	Path on right		Tough steep ridge without bench opportunity	Steep ravine would require structure			
359.8	Transition path to right side	at Balsam Gap overlook					
360	Landscape Change	Ridge Forest					
361.3	Path on left			Steep ravine would require structure		Spruce Fir forest	
364.4	Tunnel	Craggy Pinnicle Tunnel 246' long		Major constraint after being at grade at Visitor Center			
364.5	Craggy Gardens Visitor Center	Possible connection to Visitor Center as destination	Transition path to left side			Plants/lichen growing on rock	
365	Landscape Change	Midslope Forest	Steep rock outcroppings on right	Huge retaining walls had to be built for Parkway			
365.5	Tunnel	Craggy Flats Tunnel 335' long		Major constraint			
367	Path on right		Steep rock outcroppings on right				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
368.5	Path on right		Steep rock outcroppings on right				
369.5	Path on right		Steep rock outcroppings on right				
370	Path on right						Path within view of Parkway along right side (major view to left)
372.1	Path on right		Steep rock outcroppings on right				
373	Path on right		Steep rock outcroppings on right			Lots of water flowing through rock. Local geothermal activity. Fragmented rock.	
374.2	Path on right	Would have to go through rock cannot go over - granite rock	Steep rock outcroppings on right	Steep ravine would require structure		Would have to blast through rock - they have trouble keeping up road with stability of rock	
374.4	Tunnel	Tanbark Ridge Tunnel 780' long		Path to go up over the tunnel			
375	Path on right		Steep rock outcroppings on right	Fragmented rock soil would be difficult to stabilize		Problems with rock slides	
375.7	Existing road intersection	Popular connection with cyclists	Good at grade connection with road intersection				
376.1	Path on right			Steep ravine would require structure			
376.2	Path on right		Steep rock outcroppings on right				
376.5	Path on right		Steep rock outcroppings on right				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
377.3	Intersection with parallel road	Popular connection with cyclists	Good at grade connection with road intersection				
378	Landscape Change	Midslope Residential					
378.3	Parallel road to right on ridge	Path on right between road and Parkway	Path constrained by steep slope and location between Parkway and existing road				
379.1	Transition path to right side		Uphill slope on right with views to left				
380	Path on left		Rock outcropping/vertical wall on left				Houses in view of Parkway on right
381	Path on left						Houses in view of Parkway on right
381.9	Underpass	Ricaville Road		Medium structure required over road			
382	Landscape Change	Valley Residential					
382.6	Bicycle Connection	Mountains to Sea Trail nearby	Good at grade connection to road/trail (they chose best side to put it - on parallel to				
382.6	Underpass	US-70		Medium single-span structure required		Historical bridge	
383.4	Underpass	SR-2754		Major structure over road, RR and local road			
383.5	Creek	Swannanoa River			Major structure over river. (Existing separate bridge over river and RR.)		

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
383.6	Underpass	SR-2766		Major structure over road, RR and local road			
383.7	Underpass	Railroad	Existing bridge under large structure	Major structure over road, RR and local road			
383.8	Underpass - Transition path to right side	I-40		Major structure over road, RR and local road			
384.2	Underpass - Path on left side uphill	Old Hemphill Road		No structure - cross at grade			
384.7	Bicycle Connection		Good at grade connection with ramp intersection				
384.7	Underpass	US-74		Major structure over road			
386.5	Path on left			Steep ravine would require structure			
387	Underpass	Private Crossing		Steep ravine would require structure			
387.5	Path on left		Tight ROW may require mitgation	Steep ravine would require structure			
388	Underpass	US-25A		Medium structure over road			
388.4	Underpass	Railroad		Small structure over RR			
388.9	Bicycle Connection		Good at grade connection with ramp intersection				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
388.9	Underpass	US-25		Major structure over road			
389.5	Path on right						Houses within view of Parkway on both sides
389.9	Underpass	Private Crossing		No structure - cross at grade			
390.9	Underpass - Transition path to right side	Private Crossing & creek		Minor structure over creek			
391.7	Underpass	I-26		Very bad - Major structure over interstate			
392.7	Underpass - Transition path to left side	Private Road - Halfway Road					Path within view of Parkway - level and within trees
393.2	Underpass - Path on right side downhill	Private Road - Halfway Road					
393.5	Creek	French Broad River	Tough connection from Parkway due to grades and rock outcroppings on right side	Very bad - Major structure over 191 and River	French Broad River		
393.6	Bicycle Connection	Arboretum Trails nearby	Tough connection from Parkway due to grades and rock outcroppings on right side	Very bad - Major structure over 191 and River	French Broad River		
393.6	Underpass	SR-191	Tough connection from Parkway due to grades and rock outcroppings on right side	Very bad - Major structure over 191 and River	French Broad River		
394	Landscape Change	Midslope Forest					
396	Landscape Change	Ridge Forest					

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
397	Path on right			Steep ravine would require structure			
397.1	Tunnel	Grassy Knob Tunnel 600' long		Path to go up over the tunnel			
399.3	Tunnel	Pine Mt. Tunnel 1320' long		Major Constraint - Path cannot go over			
400	Landscape Change	Midslope Forest					
400.3	Underpass	Bent Creek Gap USFS Road					
400.4	Path on right side on ridge			Steep ravine would require structure			
400.9	Tunnel	Ferrin Knob Tunnel #1 360' long		Path to go up over the tunnel			
401.3	Tunnel	Ferrin Knob Tunnel #2 310' long		Path to go up over the tunnel			
401.5	Tunnel	Ferrin Knob Tunnel #3 230' long		Path to go up over the tunnel			
403	Tunnel	Young Pisgah Ridge Tunnel 400' long		Path to go up over the tunnel			
403.8	Transition path to right side						

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
403.9	Tunnel	Fork Mountain Tunnel 350' long		Path to go up over the tunnel			
405.5	Transition path to left side	SR 151	Possilbe bike connection through Hominy Valley				
406.9	Tunnel	Little Pisgah Tunnel 500' long		Path to go up over the tunnel			
407.4	Tunnel	Buck Springs Tunnel 380' long		Path to go up over the tunnel			
407.8	Transition to right side on top of ridge						
408	Landscape Change	Ridge Forest					
408.8	Mt Pisgah Visitor Center - Transition to left side	Path connection & destination					
409.5	Path on right		Steep rock outcroppings on right side				
410.1	Tunnel	Frying Pan Tunnel 577' long		Path to go up over the tunnel			
411.4	Path on right		Steep rock outcroppings on right side				
411.9	Underpass - Transition path to right side on uphill	US-276		Medium bridge crossing			
412.5	Transition to left side						

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
413.3	Path on right		Steep rock outcroppings on right side	Major walls needed to stabilize soil			
414.5	Transition to right side		Steep rock outcroppings on right side				
415	Transition to left side						
415.5	Path on right		Steep rock outcroppings on right side				
416.6	Transition to right side		Limited ROW at MP 416 would require mitigation				
416.9	Transition to left side						
417.5	Path on right		Steep rock outcroppings of right side				In view of Parkway on right side
417.8	Transition to right side						
418.4	Path on left		Steep rock outcroppings on left side				
419	Path on left	Graveyard Fields (Forest Service site) with hiking, blueberry picking, popular site)					
421.2	Path on left		Difficult topography on both sides of Pkwy - steep uphill and downhill with ravines and rock	Steep ravine would require structure			
422.1	Tunnel	Devil's Courthouse Tunnel 665' long					

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
422.3	Existing path along left side of Pkwy	Existing path up to Devil's Courthouse from overlook before tunnel				Ecologically sensitive	
423.2	Underpass	SR-215	Large interchange	Medium structure over road			
425.2	Transition to right side		Extensive rock outcroppings for at least mile				
425.8	Transition to left side						
426.5	Transition to right side		ROW that may be required is within Forest Service				
427.5	Transition to left side						
428.5	Transition to right side at overlook		Tight ROW may require mitigation			Spruce Fir forest	
430.5	Transition to left side at overlook						
431.3	Highest Point on Parkway	Possible connection/end point for path	Uphill on right side and open view on left side				
431.5	Path on right					Spruce Fir forest	
432.7	Transition to right side at overlook						
433.3	Transition to left side at overlook						

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
433.7	Path on right			Steep ravine would require structure			
434.8	Transition to right side uphill	Path on right ridge line					Path close to Parkway (uphill)
437	Landscape Change - Switch path to left side at overlook area	Midslope Forest					
439.7	Tunnel	Pinnacle Ridge Tunnel 813' long		Major constraint			
440.5	Path on right			Steep ravine would require structure			
441.5	Underpass - Path on left side	Red Bank Road	Path on left side (uphill) due to view and ROW constraints				
442.1	Underpass - Transition path to left side	Timberiane Road		Crossing opportunity with existing private road crossing		Landowner issues with existing private road crossing	Many houses within view of Parkway
443	Underpass	Railroad		Major structure required over interstate and RR			
443.1	Underpass	US-19A/23		Major structure required over interstate and RR			
444.5	Underpass	Hood Road	Very limitied ROW may require mitigation	Small bridge required over road			
450	Path on right	Path on right ridge (benched) due to limited ROW and steep slope on left		Steep ravine would require structure		Most Spruce Fir out of Park boundary	Close ROW would require path to be within view of Parkway

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
451.8	Path on right	Path on right ridge (benched) due to limited ROW and steep slope on left				Waterrock Knob - highly sensitive T&E area - lichen/plants growing on rock	
453.5	Path on right					Spruce Fir forest	In view on upper viewshed
453.9	Path on right			Steep ravine would require structure			
454.5	Path on right	Benched ridge requires less steep		Steep ravine would require structure			
455.7	Underpass	US-19	Path crosses US 19 at grade - path would need to meander out and around wide ramps				
456	Path on right	Transition to right side up hill					
457.6	Underpass - Path rides along ridge on left side	Indian Road		Path could transition to left side in conjunction with existing bridge			
458	Path perched on ridge on right side						
458.8	Tunnel	Lickstone Ridge Tunnel 402' long					
459.3	Tunnel	Bunches Bald Tunnel 255' long					
460	Path on tip of ridge close to Parkway on right side		Ravines less frequent - every mile or so	Culverts may not be required for ravines (shallow)			
460.9	Path on right		Uphill on right side and downhill slope on left				

Milepost	Feature	Description	Topography	Infrastructure	Water	Environmental	Viewshed
461.2	Tunnel	Big Witch Tunnel		Major constraint			
461.6	Underpass	Indian Road					
462.2	Transition of path to right side	View opens on left side with uphill on right side					
464	Path on left	Limited ROW on right at toe of slope and on left at top of ridge	Path would be riding on ridgeline close to ROW				
464.7	Path on left	Steep uphill on left and steep downhill on right with dense tree cover	Ravines every 500 - 1000 feet would require bridges/culverts and meandering path to miss				
465.6	Tunnel	Rattlesnake Mountain Tunnel 395' long		Major constraint			
466.3	Tunnel	Sherrill Cove Tunnel 550' long		May be able to go over tunnel			
468	Path on left	Path location constrained by limited ROW and steep slopes					
468.9	Underpass	Indian Road					
469	Creek	Oconaluftee River	Area begins with large upslope on left and valley on right belonging to Cherokee	Path would require medium bridge over river	Oconaluftee River		

Appendix C

Consultant Team Members Qualifications

Stephen N. Long, P.E.

Vice President, Transportation Engineer

Education
B.S., Civil Engineering, 1984, University of Colorado

Registration
Professional Engineer, Colorado (26372), 1989

Professional Engineer, Idaho (6684), 1991

Professional Engineer, Montana (11348), 1993

Professional Engineer, Nebraska (E7301), 1991

Professional Engineer, New Mexico (12302), 1994

Professional Engineer, Oregon (15689), 1992

Professional Engineer, Utah (8888), 1990

Professional Engineer, Washington (28348), 1992

Professional Affiliations
American Society of Civil Engineers

Institute of Transportation Engineers

Mr. Long has a diverse background in civil engineering that includes highway, rail, aviation, multi-modal, light rail and drainage projects. He is experienced in all phases of a project from environmental compliance and planning through preparing final construction documents and providing construction management. Specializing in complex multimillion dollar, multidisciplinary projects, Steve brings expertise in constructability and risk assessment to projects of all types and sizes. In addition, he has been a senior representative on value engineering studies throughout the United States.

Yale Bridge Replacement Project over I-225, Aurora, Colorado, for Colorado Department of Transportation, Region 6

Mr. Long is the project manager for this project which includes the replacement of the Yale Street Bridge over Interstate 225 in the southwest Denver metropolitan area. The new bridge will include two traffic lanes in each direction with bike lanes and widened sidewalks on each side for pedestrians.

Central Phoenix/East Valley Light Rail Transit; Phoenix, Arizona; for Valley Metro Rail

Mr. Long is design task manager for Line Section 2 of the federally funded LRT project serving the cities of Phoenix, Mesa, and Tempe. He leads a multi-office DEA team that is a prime subconsultant in the large general engineering consulting effort for completing final design of the 20-mile long starter LRT system stretching from northwest Phoenix through the Central Business District to the Arizona State campus.

Miller Creek Road Environmental Impact Statement, Missoula, Montana for FHWA, Western Federal Lands Highway Division

Steve Long is project manager for this project which includes conceptual design, transportation analysis, and preparation of an EIS for road and bridge improvements. The study area is approximately four miles long and three miles wide including portions of US 93, the Bitterroot River, the City of Missoula, Missoula County and Lolo National Forest. Key issues include compatibility with local plans and development, and effects upon residences and businesses, natural resources including floodplain, aquatic and riparian habitat, and open space.

State Highway 145 Feasibility and Safety Enhancement Project; Telluride, Colorado; for Colorado Department of Transportation, Region 5

Mr. Long is the planning design manager for this 20-mile corridor on a high altitude scenic byway adjacent to the historic resort town of Telluride, Colorado. The project began as a feasibility study to identify and prioritize improvements along the corridor to meet current and future demands. Final prioritized projects included bridge replacement over Leopard Creek and the addition of a climbing lane over Keystone Hill. Mr. Long has resumed his project management role on this design which is scheduled for construction in the summer of 2005.

Region 1 Non-Project Specific General Engineering Services, Colorado, for Colorado Department of Transportation, Region 1
Mr. Long has lead this multi-year, multidisciplinary general consulting services contract for CDOT Region 1 during the past three years. Work has included nearly 20 work orders representing a variety of projects ranging from full, all encompassing projects to acting as an extension of CDOT staff on specialized individual components of project designed in-house or by other consultants.

Yosemite Valley Plan, Yosemite National Park, for the National Park Service, California
Currently directing design projects including temporary parking, temporary bus loading/unloading, and temporary pedestrian path improvements in support of implementation of the Yosemite Valley Plan.

Devils Tower General Management Plan – Transit Implementation, Devils Tower National Monument, for the National Park Service
Work included research of the historical and physical context, a detailed site analysis, conceptual design options, conceptual cost estimates, and conceptual environmental analysis for development improvements related to implementation of a transit system at Devils Tower National Monument.

U.S. 2, Havre to Fort Belknap, Montana; for Montana Department of Transportation
This 45-mile project is to replace the aging US 2 highway facility with an efficient and safe highway that will be attractive to the needs of agriculture, industry, commerce, and tourism. The project was designed to fit the physical setting of the area in order to preserve and enhance the area's scenic, cultural, historic, environmental, and commercial resources.

Belfry–North Environmental Assessment and Design; Belfry, Montana for Montana Department of Transportation
This project involves the full reconstruction of 11 miles of Montana P-72, a non-NHS primary arterial. DEA will develop roadway alignment alternatives, conduct an environmental assessment and develop a public outreach program. An analysis of hydraulic surveys, detailed field surveys, traffic reports, geotechnical issues and utilities will be performed. DEA will provide design services in civil engineering, roadway design and bridge engineering for the reconstruction of the roadway, and right-of-way documents will be prepared.

Cut Bank Railroad Overpass Environmental Assessment and Design; Cut Bank, Montana; for Montana Department of Transportation
Mr. Long is the roadway design manager for the design of a railroad overpass in Cut Bank, Montana. This project includes preparation of an Environmental Assessment, a public involvement process, and conceptual, preliminary, and final design of a railroad overpass to safely connect the two halves of the community.

Stephen N. Long, PE
(Continued)

Wolf Creek Pass – West; Pagosa Springs, Colorado; for Colorado Department of Transportation, Region 5
The project included a full "major reconstruction" of the US160 (12 miles) alignment from the summit of Wolf Creek Pass to lower reaches west. Work included over half the alignment to be totally reconstructed. Project construction costs are anticipated between $12 and $17 million dollars.

Wolf Creek Pass East Reconstruction; South Fork, Colorado; for Colorado Department of Transportation, Region 5
Services include full Environmental Assessment and design for reconstruction of Highway US 160 for 8 miles in steep mountainous terrain. Improvements are planned to include upgrading the existing facility to meet current design standards and meet future travel demands. The roadway is in steep canyons and will require extensive blasting and structures including a bridge, laterally cantalevered structures and extensive use of retaining walls.

Ken Pratt Boulevard Extension; Longmont, Colorado; for City of Longmont and Colorado Department of Transportation, Region 4
The project included a feasibility study, environmental assessment and final design of a 5-mile long bypass around the historical downtown of Longmont Colorado.

US 285 Corridor Feasibility Study, Foxton Road to Fairplay; Fairplay, Colorado; Colorado Department of Transportation, Region 1
Responsible for engineering analysis for improvements to a 50-mile mountainous highway corridor between Conifer and Fairplay. The work included development of a conceptual design and engineering plan incorporating grade separated intersections and prioritizing improvements for the next 20 years.

Highway 9 – Frisco to Breckenridge; Summit Colorado; for Colorado Department of Transportation, Region 5
Project included full multi-modal feasibility study and environmental impact statement for a 12-mile long rural corridor and corresponding urban improvements in the towns of Frisco and Breckenridge.

Crowfoot Valley Road; Douglas County, Colorado; for Douglas County
The Project provided surveying, geotechnical, hydraulic, and roadway design associated with the preparation of preliminary and final design plans and specifications for the paving of Crowfoot Valley Road.

Colorado Boulevard Sidewalks; Denver, Colorado, for City and County of Denver
This award-winning project utilized federal funds administered through CDOT to reconstruct and provide over 2 miles of missing sidewalk links on Colorado Boulevard from I-25 to Virginia Avenue. The project included all phases of planning, environmental documentation, design and construction. The project segments were prioritized utilizing a GIS database and evaluated base on need, environmental impacts and right-of-way constraints.

Arapahoe Road/Parker Road Interchange Feasibility Study; Arapahoe County Colorado; for Arapahoe County
The project provided a full interchange feasibility study and environmental assessment to upgrade an existing high volume intersection to an interchange. Work included identification of near term improvements to the intersection which could improve congestion and safety with available funding and which was compatible with the ultimate interchange.

74th and Federal Intersection Reconstruction; Westminster, Colorado; for City of Westminster
This project was performed in conjunction with the redevelopment of the Westminster Plaza to accommodate new access along the frontage of both 74th and Federal and to reconstruct the substandard intersection at this location. Work included design for both interim and ultimate phase for all four quadrants of the intersection. Design elements included traffic, roadway, site layout and urban design.

U.S. 24 Bypass; Colorado Springs, Colorado; Colorado for Department of Transportation, Region 2
Managed and coordinated all roadway, traffic, construction phasing, drainage, water distribution and sanitary sewer facilities and landscaping elements for a new five-mile, high-speed, six-lane facility with adjacent frontage roads with a partial interchange at Airport Road.

Cody to Powell, Wyoming, US 14A; Cody to Powell, Wyoming; for Wyoming Department of Transportation
Conducted a corridor feasibility study and environmental assessment for 20-mile highway corridor safety and capacity improvements. Conceptual design included four build alternatives.

US 93 Somers to Whitefish Environmental Impact Statement; Flathead County, Montana; for Federal Highway Administration
Provided conceptual design, alternatives development and evaluation and technical summary documentation for this highly controversial 30-mile corridor in rapidly developing Flathead County, just south and west of Glacier National Park.

Peoria Street Extension; Douglas County, Colorado; for Douglas County
Led the design effort for the extension of Peoria from E-470, approximately 1-mile north, to the new UPS site. Extensive coordination with adjacent developers and projects was required to optimize the design. Provided conceptual design for Peoria Street Extension for the UPS site north and east to future Chambers/Potomac.

Piney Lake Road; Douglas County, Colorado; for Douglas County
Provided final design for the Piney Lake Road Paving Project from Inspiration Drive north to Smoky Hill Road (1-mile). Significant changes to the vertical alignment were necessary to meet the required 45-mph design speed. An additional ½ mile from Inspiration Drive South to Bronco Drive was also included in the project.

Stephen N. Long, PE
(Continued)

Travios Trail; Douglas County, Colorado; for Douglas County
Provided final design for 1.3 miles of Travios Trail from Inspiration Drive north to the Arapahoe County line. Only minor changes to the horizontal and vertical alignments were required for the 30-mph design speed. Profiles were prepared for all driveways and designed to match into the new roadway profile and section.

Clayton Street Traffic Calming; Thornton, Colorado; for City of Thornton
The project included the study and design of traffic calming features on a minor arterial over a seven-block area. Improvements included bulb outs, raised crosswalks, entry features and an offset tee traffic circle.

128th Avenue at Colorado Boulevard Entryway Improvements; Thornton, Colorado; for City of Thornton
Project consisted of reconfiguring and channelizing the eastbound approach leg of 128th Avenue utilizing medians to provide a traffic-calming effect. Also included was an entryway sign feature adjacent to the roadway providing identification to the residential neighborhood.

136th Avenue Roadway Improvements, York Street to Cottonwood Lake Boulevard; Thornton, Colorado; for City of Thornton
Project consisted of approximately 0.5 miles of roadway improvements, including geometric and drainage improvements, to upgrade an existing 2-lane gravel road to a 2-lane minor urban arterial.

General Services Contract, Boulder, Colorado, for the City of Boulder
This multi-year general consulting services contract for the City of Boulder required ongoing coordination of work, such as design of major and minor arterial roadways, including traffic calming and signal design. Some projects completed under this contract include:

- ***1995 to current Sidewalk Programs***
- ***Table Mesa/Broadway Intersection***
- ***27th Way Pedestrian Underpass at Skunk Creek***
- ***Hwy 119/63rd Street Improvements***
- ***55th Street Improvements***
- ***Lookout Road Improvements***
- ***55th Street On-street Bike Lanes***
- ***Noorwood Street Reconstruction***
- ***Violet Avenue Extension***
- ***Valmont Road Improvements***
- ***North Broadway Reconstruction***

Stephen N. Long, PE
(Continued)

Southeast Aurora Transportation Study; Aurora, Colorado; for City of Aurora
Prepared conceptual plan profile and drainage analysis for over 100 miles of proposed roadways in the rapidly developing area of southeast Aurora surrounding the Aurora Reservoir. The analysis utilized land use forecast data and traffic forecasts by the City of Aurora to analyze road facility needs, including alternate road alignments and cross sections to optimize land development and transportation opportunities. Consideration was given to pedestrian and bicycle facilities and trail connections to enhance alternative modes of travel.

Coal Mine Avenue Extension; Jefferson County, Colorado; for Jefferson County
Provided roadway design services to Jefferson County for the extension of coal Mine Avenue from Kipling Street to Moore Street. The 2,200-foot roadway extension included five lanes with detached sidewalks. The roadway had to be designed and aligned to minimize subsidence risks from an abandoned underground coal mine.

McIntyre Bridge Replacement; Jefferson County, Colorado; for Jefferson County
Provided structural and roadway design services to Jefferson County for the replacement of the McIntyre Bridge over the Farmers Highline Canal Bridge. The project included public involvement, surveying right-of-way acquisition and preliminary and final designs for construction of a new bridge.

Glenwood Springs North/South Alternative Route Environmental Assessment; Glenwood Springs, Colorado, for City of Glenwood Springs
Led conceptual design of alternatives evaluating engineering feasibility of a major local bypass around the city.

Washington Streetscape; Thornton, Colorado; for City of Thornton
Managed and coordinated two miles of streetscape and roadway improvements including aesthetic embankments, ornamental lighting and sidewalk and pavement rehabilitation.

Thornton Parkway and Pecos Roadway Intersection; Thornton, Colorado; for City of Thornton
Added acceleration lane, traffic signal modifications and sanitary sewer vault modification. The project also included coordination of all utility agreements and right of way.

Street Rehabilitation Projects; Thornton, Colorado; for City of Thornton
Provided design, traffic control, detouring and coordination with involved agencies. Managed construction for major street rehabilitations including 88th Ave, Huron Street and Pearl Street (approximately 3 miles of reconstruction).

U.S. 285 Traffic Study; Englewood, Colorado; for City of Englewood
Prepared evaluation of current and future capacity requirements of U.S. 285, developed feasible roadway and operational improvements to provide for traffic capacity, and local traffic and access functions.

Stephen N. Long, PE
(Continued)

Lawrence Street Viaduct; Denver, Colorado; for Colorado Department of Transportation, Region 6
Designed interchange between major arterial(Colfax), interstate highway(I-25), and link to Denver's central Business district(Walnut Viaduct). Designed much of the geometry, special intersection detailing, pavement, detour and lighting.

Clear Creek Bike Path from I-70 to Golden; Jefferson County, Colorado; for Jefferson County
Prepared final design plans and hydraulic analysis (floodplain study) for pedestrian bridge over Clear Creek. Work included HEC-2 and scour analysis evaluation.

I-385 Phase II; Greenville, South Carolina; for South Carolina Department of Transportation
Performed hydrology and hydraulic studies and design of a seven-mile portion of I-385 in Laurens County. Design included three major multi-level interchanges and analysis of large off-site basins.

I-385 Phase II; Greenville, South Carolina; for South Carolina Department of Transportation
Performed hydrology and hydraulic studies and design of a seven-mile portion of I-385 in Laurens County. Design included three major multi-level interchanges and analysis of large off-site basins.

I-76/I-25 Interchange; Denver, Colorado; for Colorado Department of Transportation, Region 6
Provided on-site and off-site hydrology and hydraulics including roadway drainage, wetland impacts, pipe network, detention ponds and major drainage facilities.

Roper Rail Yard Improvements; Salt Lake City, Utah; for Southern Pacific Railroad
Provided design for reconstruction of a 2,000-car auto lot/intermodal transfer station for the Southern Pacific Railroad.

Denver International Airport - Pena Boulevard; Denver, Colorado; for City and County of Denver
Prepared hydrology and hydraulics studies for 9-mile roadway linking I-70 to new airport. Studies included modeling of 20,000-acre upstream basin and recommendations for cost sharing between upstream developers and local government agencies.

Denver International Airport General Engineering; Denver, Colorado; for City and County of Denver
Provided general engineering design and construction management services as needed, to assist the city in opening the new Denver International Airport. The projects were managed to assure timely and cost-effective completion.

Stephen N. Long, PE
(Continued)

Friedman Memorial Airport Apron Rehab and Runway Overlay; Hailey, Idaho; for Federal Aviation Administration
Provided design recommendations and evaluation of a 6,600-foot runway and parallel taxiway for airport rehabilitation, including field analysis to determine localized pavement distress and to identify major drainage concerns.

Southern Pacific Rail Consulting; Denver, Colorado; for Southern Pacific Railroad
Provided design and improvements to track alignment facilities and rail yards throughout the western region. Tasks also included emergency response for derailments and crash sites.

North Denver Yard Improvements; Denver, Colorado; for Southern Pacific Railroad
Provided design for reconstruction of a 2,000-car auto lot/Intermodal transfer station for the Southern Pacific Railroad.

Value Engineering
For the past decade Mr. Long has been a senior representative on multiple value engineering teams as the lead Civil Design Manager. His diverse expertise in large complex urban projects coupled with mountainous design experience brings a broad range of experience and perspective to project issues and values associated with those issues. Recent value engineering team experience includes:

- ***C-470 Feasibility Study, for Colorado Department of Transportation Region -5***
- ***State Highway 119/US 6 Gaming Area EI, for Colorado Department of Transportation Region 1***
- ***US 550 Corridor Improvements, for Colorado Department of Transportation***
- ***Region 5***
- ***I-25/Fillmore Interchange, for Colorado Department of Transportation Region 2***
- ***Wolf Creek Pass Conceptual Design, for Colorado Department of Transportation Region 5***
- ***Wolf Creek Pass Final Tunnel Design, for Colorado Department of Transportation Region 5***
- ***Glenn Highway Improvements, for State of Alaska Department of Transportation and Public Facilities.***
- ***Seward Highway Improvements, for State of Alaska Department of Transportation and Public Facilities.***

Stacy S. Tschuor, P.E.

Senior Transportation Engineer

Education

M.S. Civil Engineering
1996, University of Texas at Austin

B.S. Civil Engineering
1994, University of Miami

Professional Registration

Professional Engineer, Colorado
(34715), 2000

Professional Affiliations

Institute of Transportation Engineers

Ms. Tschuor has ten years of experience in traffic engineering with a focus on traffic operations and design. This experience includes data collection, traffic analysis, traffic simulation, traffic modeling, report preparation, and public presentations. She has managed projects for government agencies and private developer clients and she has presented project information to stakeholders, including government agency committees and councils as well as the general public. She is an experienced user of traffic simulation and analysis programs and has used the programs to evaluate area-specific transportation issues and develop short and long range solutions. Ms. Tschuor is also experienced in designing isolated traffic signals, signal systems, traffic control and maintenance of traffic plans, quantities, specifications and cost estimates.

South Broadway Safety Improvements; Boulder, Colorado; for the City of Boulder
Design and coordination of traffic plans for traffic calming strategies along arterial and local street network, including vehicle, bicycle and pedestrian elements.

I-70 West Ramp Meter Feasibility Study; Clear Creek County, Colorado; for the Colorado Department of Transportation, Region 1
Identification of locations and phasing for the implementation of ramp metering along I-70 between Denver and Eagle County through the analysis of traffic volumes, levels of service, accident history and VISSIM simulation modeling.

Saguaro National Park Transportation Data Collection and Assessment; Tucson, Arizona; for the National Park Services
Coordination of parkwide transportation data collection, traffic and parking analysis, identifications of issues and analysis of transportation elements of GMP alternatives.

Douglas County Traffic Study Services; Douglas County, Colorado; for Douglas County
Project management data collection, traffic analysis and report preparation for various studies including neighborhood traffic mitigation, review of traffic impact studies and other traffic engineering issues.

Blue Ridge Parkway Transportation Study Support for GMP/EIS; Ashville, North Carolina; for the National Park Services
Project management, analysis of existing transportation system and related visitor use, development of forecasts and analysis of transportation issues for future conditions.

West Quincy Avenue Improvements; Denver, Colorado; for the City and County of Denver
Construction traffic control and signing and striping plans for roadway widening and bike path design. Speed study and sight distance analysis for evaluation of profile modifications.

Marin Headlands/Fort Baker Roadway Infrastructure and Transportation Management Plan; Golden Gate National Recreation Area; for the National Park Service
Traffic forecasting and level of service analysis for alternatives analysis to support park planning, and preparation of EIS.

Table Mesa/Broadway Transit Operational Improvements; Boulder, Colorado; for the City of Boulder
Design and coordination of traffic plans for a transit queue jump lane and raised bike path crossing.

Yosemite National Park Planning Services; Yosemite National Park, California; for the National Park Service
Traffic forecasting, level of service analysis and production of transportation planning reports for the implementation of various projects within Yosemite Valley.

Blue Ridge Parkway Transportation Data Collection; Asheville, North Carolina; for the National Park Service
Coordination of large-scale transportation and visitor use data collection effort along 470 miles of roadway in National Park and preparation of report presenting data, level of service analysis and subsequent recommendations for scope of future studies.

Lawrence and Larimer Bridges Reconstruction; Denver, CO; for the City and County of Denver
Design and coordination of construction traffic control plans for detouring traffic around bridge closures within Downtown Denver.

Thornton Signal System; Thornton, Colorado; for DRCOG/City of Thornton
Project management, traffic signal system design, specification and cost estimate for the initial phase of a new central signal system utilizing fiber optic interconnect.

US 2 Havre to Fort Belknap EIS; Havre, Montana; for Montana Department of Transportation
Traffic analysis and production of transportation planning documents of vehicle, bicycle and pedestrian use following MDT guidelines to support an EIS for the reconstruction of 45 miles of rural highway.

Northwest Parkway; Boulder County, Colorado; for Kiewit Northwest Parkway Constructors
Traffic Design Task Leader, traffic analysis, corridor traffic report, signal design, signing/striping design and construction traffic control design and construction support for design/build project constructing 11 miles of a new tollway facility.

Thornton Signal System; Thornton, Colorado; for DRCOG/City of Thornton
Project management, traffic signal system design, specification and cost estimate for the initial phase of a central signal system utilizing fiber optic interconnect.

Green Valley Ranch Transportation Planning; Denver, Colorado; for Oakwood Development
Traffic forecasting, analysis, report preparation and coordination with the City and County of Denver and the City of Aurora for the planning of five square miles of a multi-use development involving large-scale multi-modal planning as well as traffic impact studies for individual sites.

63rd Street Feasibility Study; Boulder, Colorado; for the City of Boulder
Traffic and accident analysis and report preparation to support the need for safety and capacity improvements along 63rd Street between Lookout Road and SH 119 in Boulder.

RTD Network Planning Transfer Analysis; Denver, Colorado; for TMD
Assisted with data collection, review of transit link connections and identification of improvement opportunities and priorities for several routes within the Denver Metro area.

Foothills Parkway/Arapahoe Avenue Intersection Study; Boulder, Colorado; for the City of Boulder
Project management, traffic analysis, CORSIM traffic simulation, public involvement, and study report for intersection design alternatives.

I-70/Vasquex/Steele Safety Study; Denver, Colorado; for CDOT Region 6
Traffic analysis, SimTraffic simulation, data collection, and study report for design and signal system alternatives to resolve pedestrian and vehicular safety issues in area.

Glenwood Springs to Aspen Corridor; Roaring Fork Valley, Colorado; for the Colorado Department of Transportation, Region 3
Signal and traffic control plans for three intersections included in the reconstruction of SH 82.

Speer Boulevard and Colfax Avenue Traffic Signal Systems; Denver, Colorado; for the City and County of Denver
Plan set to change out controllers, install interconnect cable, provide upgrades to the existing ATMS, and provide modifications to existing cabinets to accommodate the system operations and fiber optic communications within the ICON system.

12th/McKinley; Casper, Wyoming; for the City of Casper
Signal plan for intersection reconstruction and traffic control plans and specifications for construction of mid-block pedestrian crossing.

Joseph A. Hart, P.E.

Vice President, Transportation

Education
M.S., Civil Engineering, 1984, University of Colorado

B.S., Civil Engineering, 1977, University of Dayton

Continuing Education
Leadership Seminar, Colorado Leadership Forum, 1995

Major Investment Studies Training Course, National Transit Institute, 1995

Professional Registration
Professional Engineer, Colorado (18310), 1981

Professional Engineer, Arizona (25246), 1991

Professional Engineer, Nebraska (E7281), 1991

Professional Engineer, Nevada (09207), 1991

Professional Engineer, North Carolina (17896), 1991

Professional Engineer, Texas (70955), 1991

Professional Engineer, Montana (10758), 1992

Professional Engineer, Florida (PE0046323), 1993

Professional Engineer, New Mexico (12360), 1993

Professional Engineer, Wyoming (6626), 1994

Professional Engineer, Washington (34069), 1997

Professional Affiliations
Consulting Engineers Council of Colorado
Institute of Transportation Engineers

Mr. Hart has extensive experience in traffic engineering, transportation planning, transit systems analysis, alternatives assessment and environmental studies. His transportation planning work has included interchange feasibility studies, highway corridor studies, and area-wide transportation plans involving coordination of extensive public participation programs. His transportation design work has focused on integrating traffic-engineering elements into the civil and structural design of complex roadway and transit projects.

Highlands Ranch Transportation Planning Services; Highlands Ranch, Colorado; for Shea Homes

Mr. Hart served as project manager for the following transportation planning and traffic engineering analysis services for new development areas.

- **Preliminary Plan 118 Traffic Impact Study and Emergency Access Analysis**
  A Traffic Impact Study was prepared for a private residential community in conformance with Douglas County study guidelines. The study addressed the unique trip making characteristics of the large, private residential community on the very southern edge of the Denver Metropolitan Area, immediately adjacent to the Wildcat Reserve open space in Douglas County. DEA assisted in analysis and development of private roadway design standards appropriate for the nature and topography of this community.

- **Laurelglen Lane Analysis South of McArthur Ranch Road**
  Transportation analysis was completed to determine roadway improvements necessary to accommodate future traffic volume anticipated upon completion of the new Southridge Recreation Center.

US 285/Sunset, Grade Separated Intersection Feasibility Study Transportation in conjunction with the TSR Group; Park County, Colorado; for Colorado Department of Transportation Region 1

Assisted in development, analysis and quality control reviews of an interchange feasibility study for a new grade separated intersection along US 285 about one-half mile west of Mt. Evans Road in Park County. The analysis considered alternative intersection design concepts and future widening plans for the corridor. The Feasibility Study report was completed in three months and presented to the Colorado Transportation Commission for approval in June 2002.

Belfry North, Environmental Assessment; Belfry, Montana; for the Montana Department of Transportation

Provided Quality Control Reviews of traffic analysis, Preliminary Traffic Report and alternatives analyses with respect to an 11-mile two lane corridor improvement involving horizontal and vertical alignment improvements and safety enhancements.

Publications and Presentations

"An Analysis of Access Management Policies and Standards for Urban Arterial Highways," thesis, University of Colorado, 1984

"Consensus Building for a Unique Highway/Pedestrian Grade Separation at Las Vegas Boulevard and Tropicana Avenue," presented at the 1993 District 6 Institute of Transportation Engineers Conference, Las Vegas, Nevada

"Trip Generation Factors in Mexico City," presented at the 1995 Annual Institute of Transportation Engineers Conference, Denver, Colorado
US 93, Somers to Whitefish, Montana – Access Management Issues," presented at the 2nd National Conference on Access Management, Vail, Colorado, 1996

"Access Management Slows Incidence of Traffic Accidents," Public Works, February, 1995

"Major Investment Studies Overview, " presented to University of Colorado Planning Studio, April, 1995

"Origin/Destination Surveys in Mountain Resort Areas," presented at ITE Intermountain and Colorado-Wyoming Sections Annual Meeting, 1996

"School Site Access Optimization," presented at 1997 District 6 Institute of Transportation Engineers Conference, Salt Lake City, Utah

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(Continued)

Cut Bank Railroad Overpass; Cut Bank, Montana; for the Montana Department of Transportation

Conducted traffic engineering study for a new railroad grade separation and realignment of S-213 north of US 2 including redirected travel forecasts, intersection improvement concepts and traffic engineering design.

Big Fork North & South, MT 35; Big Fork, Montana; for the Montana Department of Transportation

Prepared Preliminary Traffic Engineering report for the approximately 7 mile long improvements planned to MT 35 through Big Fork, including bridge replacement for the narrow two lane bridge over the Swan River. Assisted with community workshops and Citizen's Advisory Committee meetings and alternatives development and analysis.

Yosemite National Park, ITS/Travel Forecasting Analysis; Yosemite, California; for the USDOT Volpe Transportation Center

Coordinated development of trip tables of existing travel patterns by mode within Yosemite National Park as input to travel demand forecasting in conjunction with transportation improvement plans within the park.

Blue Ridge Parkway, General Management Plan, Transportation and Visitor Data Collection; North Carolina and Virginia; for the National Park Service

Coordinated transportation data collection and analyses for the 469 miles of the Blue Ridge Parkway through North Carolina and Virginia, including traffic volumes, parking, travel forecasts, accident analysis, roadway deficiencies review and roadside visitor survey.

Hawaii Volcanoes National Park, Transportation Data Collection; Hawaii; for the National Park Service

Developed roadside survey to question park patrons on trip making and travel characteristics, and coordinated data collection and summary report of findings.

Over the River Environmental Assessment, in conjunction with J.F. Sato; Fremont County, Colorado; for the Colorado Department of Transportation, Region 2

Conducted traffic data collection and operational analysis and US 50 between Canon City and Salida to determine potential traffic impacts and necessary mitigation for visitor traffic associated with the proposed Jeanne Claude and Christo art project along this segment of the Arkansas River.

I-76 and I-25 Interchange; Denver, Colorado; for the Colorado Department of Transportation

Assisted in preparation of construction staging, detour and final signing and pavement marking plans for the new interchange construction and reconstruction of 70th Avenue over I-25.

North I-25 Bus/HOV Lanes; Denver, Colorado; for the Regional Transportation District
Provided traffic engineering components for environmental assessment and preliminary engineering of three miles of interstate bus/HOV lanes, new 20th Street viaduct and interchange alternatives at I-25, and alternative access routes into lower downtown; involved facility capacity analyses, conceptual plans and construction phasing plans.

US 24 Bypass; Colorado Springs, Colorado; for the Colorado Department of Transportation
Prepared access control alternatives analysis and schematic design recommendations for improvements to Fountain Avenue and Powers Boulevard. Assisted the project designers in alternative alignments and access control measures for adjacent and intersecting arterial roadways.

Las Vegas Boulevard and Tropicana Avenue Pedestrian Crossing Feasibility Study; Las Vegas, Nevada; for the Nevada Department of Transportation
Conducted a feasibility study of overpass, underpass and people-mover alternatives for pedestrian grade separation on the four legs of the intersection, connecting two existing casinos/hotels, a future casino/hotel and a proposed theme park. Analysis included conceptual design alternatives for pedestrian flows, intersection capacity and operations during construction, conceptual bridge alternatives, geotechnical and tunneling alternative considerations with respect to a large concrete-box culvert on one corner of the intersection and extensive landowner and agency coordination.

Hilltop Road, Lincoln Avenue & Flintwood Road Speed Studies; Douglas County, Colorado; for Douglas County Public Works
Conducted speed limit studies for three roadways in Douglas County experiencing rapid growth in traffic volume. Made recommendations for adjusted regulatory speed limit, warning signs and speed advisory signs.

Citywide Railroad Grade Crossing Study; Denver, Colorado; City and County of Denver
Assembled current relevant information on railroad operations in Denver with a special focus on mitigating transportation system conflicts at the 224 railroad grade crossings in the city. Assessed the goods movement functions of the railroads as a function of the local economy, as well as impacts of railroad facilities on adjacent properties. The study resulted in the development of a priority listing of at-grade crossing improvements that will increase the safety and mobility or motor vehicle users.

Nebraska Rail-Highway Crossing Hazard Index Formula; for the Nebraska Department of Roads
Coordinated study of Nebraska's formula used to prioritize rail-highway improvements and controls. The analysis included literature review, database correlation, and analysis.

City's High Accident Intersection Reduction Program; Dayton, Ohio; for the City of Dayton, Traffic Engineering Division
Prepared roadway and intersection modification plans, traffic signal plans and signing/pavement marking plans; conducted traffic and parking studies; coordinated signing and pavement marking crew work; developed an analysis procedure for the City's High Accident Intersection Reduction Program.

Region Two Traffic Safety Study; Larimer and Weld Counties, Colorado; for the Colorado Department of Transportation
Conducted extensive field investigations, accident analyses and prepared short- and long-term traffic safety improvement recommendations for two-county area in northern Colorado, including the Cities of Greeley and Loveland and over 30 towns.

On-Call Transportation Planning/Traffic Engineering Services; Douglas County, Colorado; for Douglas County Public Works
Mr. Hart served as project director for the following projects:

- **Neighborhood studies of cut-though traffic impacts and traffic safety in the Butterfield neighborhood, in Highlands Ranch north of Mountain Vista High School, and in the Ponderosa East area**
  The analyses have included origin/destination surveys, alternatives development and traffic operations assessment, and cost estimates for possible road closures during peak traffic hours.

- **Assistance with research, analysis, and presentations regarding the creation of Play Streets**
  Neighborhood requests, analyses, approvals and implementation processes were outlined for County consideration prior to possible future Commission approval.

- **Highlands Ranch/Lone Tree traffic signal assessment**
  The report examined the initial plans and existing roadway network and the current and planned traffic signal locations. Comparisons were made to the density of traffic signals along similar corridors in neighboring Arapahoe County.

- **Traffic Impact Study review**
  Traffic impact studies prepared in conjunction with new development were reviewed for Public Works staff. The reviews included checking technical analysis and assumptions, as well as confirmation of report contents for consistency with County requirements and future plans.

Englewood Transportation Plan; Englewood, Colorado; for the City of Englewood
Conducted an update to the city-wide transportation plan for addressing neighborhood traffic calming and school access safety issues, transit connections to LRT station, transit-oriented development access, and arterial capacity enhancements in this mature, 35,000 population, suburban community.

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(Continued)

96th Street/SH 42 Connection; Louisville, Colorado; for the City of Louisville
Conducted feasibility study of alternative alignments for connecting 96th Street with SH 42, just east of downtown Louisville. Traffic operations, environmental considerations regarding Coal Creek and grade separation with the BNSF Railroad were key elements of the analysis.

Arapahoe County Transportation Plan; Arapahoe County, Colorado; for Arapahoe County
Conducted county-wide Transportation Plan, addressing highway, transit, pedestrian and bicycle systems. The work entailed travel forecast modeling, alternative assessment, public involvement and coordination with municipalities within the County.

US 36 Corridor Study; Denver, Colorado; for the Regional Transportation District
Coordinated development and evaluation of corridor improvement alternatives including toll road concepts, designated HOV lanes, transit, ITS and pedestrian/bicycle improvements for 20 miles of US 36 Corridor from Boulder to Denver.

Yellowstone Park and Snake River Canyon Wyoming Congressional Funding Application; for the Wyoming Department of Transportation
Prepared funding application package for discretionary funds for US highways of national importance.

Foothills Parkway Congestion Management Plan; Boulder, Colorado; for the City of Boulder
Conducted study of corridor traffic and developed package of TDM, alternative mode and transportation network solutions for management of corridor congestion. Work included close coordination with corridor employers, neighborhood groups and affected agencies in developing feasible recommendations. Led alternatives development, analysis and implementation planning tasks and presentation at a series of public meetings.

School Site Access Optimization Study; Douglas County, Colorado; for Douglas County Public Works
Developed a new guideline for use by Douglas County School District and Douglas County Public Works in planning for new school sites in the County. Basic site access principals were outlined to improve safety and efficiency, encourage pedestrian and bicycle travel, and enhance school bus travel. Several presentations of the guidelines were made to statewide planning groups to share the results of applicable elements of the study.

US 285, Hampden Avenue, Traffic Feasibility Study; Englewood, Colorado; for the City of Englewood
Evaluated current and future capacity requirements of US 285; developed feasible roadway and operational improvements to provide for competing through traffic capacity and local traffic and access functions in this highly-developed, commercial area of Englewood.

North-South Corridor Study; Scottsdale, Arizona; for the City of Scottsdale
Conducted an analysis of north-south traffic flows and developed alternative improvements and recommendations for five north-south corridors extending through the southern portion of the city. Prepared conceptual cost estimates for he various roadway widening and traffic control improvements totaling $25 million. The project also included extensive public involvement and agency coordination throughout the study.

Hospital Area Circulation Study; Denver, Colorado; for the City and County of Denver
Conducted circulation analyses and prepared recommendations for roadway, signage, on-street parking and one-way/two-way street conversions in the Uptown Hospital Area (Children's, St. Joseph's, Kaiser and AMI). Included extensive agency coordination and public involvement presentations.

Traffic Operations Study; Whitefish, Montana; for the City of Whitefish and Federal Highway Administration
Conducted analyses of traffic operations on city street network related to school access, new development area roadway needs, railroad grade crossings, truck bypass and conversion of two-way streets to one-way flow in conjunction with US 93 operational improvements through the city.

Traffic Calming Overview; Douglas County, Colorado; for Douglas County Public Works
Prepared an overview of traffic calming strategies and measures applicable to local suburban streets in Douglas County. The study included a survey of a dozen Denver metro area agencies on their traffic calming experiences. The study provides the County with information on the range of available strategies and their resulting benefits, impacts, and costs.

Jefferson County Transportation Plan, Phase One; Jefferson County, Colorado; for Jefferson County
Provided digital data compilation services to support Phase II development of a combined, comprehensive multi-modal transportation plan for Jefferson County, Colorado. The project included agency coordination, public involvement, transportation planning, transit analysis, pedestrian/trail analysis, and the use of Geographic Information Systems (GIS) to provide Jefferson County with a digital product.

Road Over the Hill Study; Rapid City, South Dakota; for the City of Rapid City
Prepared a sub-regional transportation plan for the southwestern portion of Rapid City related to a new planned route across the famous Dinosaur Ridge; alternatives included two potential tunnel locations, two routes across the ridge and related improvements to connecting arterial streets.

Feasibility Study for US-14A; Cody to Powell, Wyoming; for the Wyoming Department of Transportation
This project entailed a feasibility study and environmental assessment for 20 miles of highway corridor slated for safety and capacity improvements. Project tasks included extensive public involvement and utility company coordination.

Broadway Viaduct Replacement Phase I; Denver, Colorado; for the City of Denver
Responsible for development and evaluation of 17 design alternatives for replacement of historic Broadway Viaduct. Conducted analysis, evaluated design constraints and costs and considered environmental and community impacts in developing recommendation for underpass of the Union Pacific tracks and vehicular and pedestrian bridge connecting parking lots of the new Coors Field major league baseball stadium.

Traffic Noise Study and Draft Negative Declaration, Bigger Road (MOT-34); Centerville, Ohio; for the City of Centerville
Prepared traffic noise analysis and environmental assessment document related to a 1.25-mile arterial roadway widening project in conjunction with the construction of I-675.

Glenwood Springs Alternate North-South Alternate Route Environmental Assessment; Glenwood Springs, Colorado; for the City of Glenwood Springs
Conducted an Environmental Assessment of two low-speed alternative routes parallel to SH 82 to accommodate local inter-city through traffic. The route involved analysis of alternative crossings of the Colorado River and Southern Pacific Railroad, traffic forecasts, geologic evaluation, wildlife impacts, noise analysis and public presentations at a series of Citizen's Advisory Committee/Public Meetings.

US 93 Environmental Impact Statement; Polson, Montana; for the Montana Department of Transportation
Provided senior technical review and project oversight for transportation analysis and conceptual design of short- and long-range solutions, including alternative bypass routes to alleviate congestion on US 93 through the town of Polson (population of 5,000).

Justification Report for Pedestrian Walkways/Bikeways Over I-75; Vandalia, Ohio; for the City of Vandalia
Conducted pedestrian surveys, developed alternative routes and conceptual plans and cost estimates for two pedestrian overpasses over I-75 approximately one-half mile north and south of US 40 to provide connections between residential neighborhoods and local schools, recreation and shopping centers.

Joseph A. Hart, P.E.
(Continued)

Integrated Bus Maintenance Facility Traffic Impact Analysis; Las Vegas, Nevada; for the Regional Transportation Commission
Completed traffic impact analysis for the RTC's new North Las Vegas site for bus maintenance, in coordination with building and site design.

Telluride Regional Transportation Plan; Telluride and San Miguel County, Colorado; for City of Telluride
The Regional Transportation Plan for this mountain community focused on transportation demand management and transit improvements to accommodate high tourist traffic and parking demands. The project was completed in conjunction with a concurrent Regional Growth Management Plan.

Transit Development Program; Grand County, Colorado; for Colorado Department of Transportation
Analyzed transit service alternatives, financial program and five-year operations program for recommended transit service routes serving the Winter Park and Silver Creek ski areas and the towns of Granby, Hot Sulfur Springs and Grand Lake, Colorado.

Planning and Management Region IV, Rural Transit Development Program; Park, Teller and El Paso Counties, Colorado; for Pikes Peak Area Council of Governments
Analyzed and developed transit service alternatives, financial program and five-year operations and marketing program; conducted public meetings and coordinated plans with the Colorado Department of Transportation's Program Management Branch.

Summit County Transit Development Program; Summit County, Colorado; for Summit County
Prepared a five-year operations program for recommended transit services within Summit County, including expansion of the Summit Stage shuttle bus system that serves Breckenridge, Copper Mountain and Keystone ski areas. Assisted in the development of transit service alternatives, financial analysis for the expanded operations plan and coordinated with the three ski areas, local towns and Colorado Department of Transportation planning staff.

Cassie L. Vetter, P.E.
Project Engineer

Education
B.S. Civil Engineering, 1997, Oregon State University

Continuing Education
Certificate, C++ Programming, 2000, Colorado Technical University

Macromedia Dreamweaver 4 Fundamentals

Fundamentals of Geometric Design Workshop

Professional Registration
Professional Engineer, Colorado (36730), 2002

Professional Affiliation
American Society of Civil Engineers

Cassie Vetter is a civil engineer with experience ranging from technical engineering to planning. Her project experience includes roadway design, complete civil site design and extensive drainage facilities. She has analyzed different hydrologic and hydraulic features of many different sites using a variety of programs and techniques in both the northwest and central states. She has developed master plans for storm, sewer and water systems, and published two hydraulic summaries for the Alaska Department of Transportation.

Quincy Retaining Wall; Denver, Colorado; for the City and County of Denver
Non-Structural design of retaining wall to be located adjacent to an existing box culvert wing-wall.

Green Valley Ranch; Aurora, Colorado; for Oakwood Development
Prepared overall Traffic Impact Analysis for the planned development of over 2,200 acres of land east and west of E-470 south of 56th Avenue. The study addressed the phased construction of arterial roadways serving the area in conjunction with the Final Development Plan submitted.

Blue Ridge Parkway General Management Plan; North Carolina and Virginia; for National Park Service
Collected and compiled system wide data for a report to be used for the General Management Plan of National Park spanning over 470 miles.

US 2 – Havre to Fort Belknap EIS; Havre to Fort Belknap, Montana; for Montana Department of Transportation
Preparation of alignment alternatives using context sensitive design concepts. Analysis of the safety of the existing adjacent railroad crossings with the highway. Design and maintenance of the project website.

Tucson International Airport; Tucson, Arizona; for Walker Parking
Completed civil construction drawings and specifications for a three floor parking structure and site improvements to an adjacent parking lot. Civil design included the relocation of several utilities, sewer and water line layout and connections, demolition plan, grading and drainage, and erosion control plans.

Northwest Parkway; Boulder, Colorado; for Kiewit Northwest Parkway Constructors
Assisted with the signing and striping design and plan preparation.

Taft Avenue; Loveland, Colorado; for MSP Companies
Conversion of a 1-mile two-lane roadway to a four-lane major arterial. Scope included curb and gutter and sidewalk.

Northridge at Park Centre; Westminster, Colorado; for Imprimis Corporation
Completed construction documents, providing full civil engineering services for the design of public and private infrastructure to accommodate a commercial site development on two separate lots.

Alford Lakes PUD; Loveland, Colorado; for MSP Companies
Responsible for civil design of a *s*ingle and multi-family development on 140 acres and analyzing the drainage and detention system using UDSWMM. The wetlands present on the site provided both challenges for mitigation and opportunities to use them for amenities. Analyzed and designed lot grading for most economical use of space. The project included design of over a mile of streets classified from local to arterial.

Preserve at Weaver Creek; Lakewood, Colorado; for Fairfield Homes
Responsible for both a Conditional Letter of Map Revision (CLOMR) and subsequent Letter of Map Revision (LOMR) in order to move the existing 100-year floodplain boundaries to accommodate the proposed development.

Horseshoe Ridge Sanitary Sewer; Parker, Colorado; for MSP Companies
New 127-acre mixed-use development. Responsible for design of new 3,700-lineal foot off-site sanitary sewer system to connect this and subsequent developments to the Parker Water and Sanitary District.

Green Mountain Vistas; Lakewood, Colorado; for Fairfield Homes
Civil design of new 5-acre, 24-lot subdivision. Responsibilities included grading, erosion control, water and sewer system design, a lined detention pond, and the drainage report. Erosion control was a major issue on this site as steep grades below the subdivision were a major concern.

Water System Improvements; Denver, Colorado; for Belle Bonfils Blood Center
Responsible for design of water system changes. The center is on the site of the former Lowry Air Force Base and improvements were required before the building could be connected to the city water system.

Engineering Intern, Creek Crossing; Outside of Valdez, Alaska; for the Alaska Department of Transportation
Assisted the Regional Hydrologist in the design of the highway crossing of major drainage creek. Responsible for sizing a culvert to allow for fish passage as well as accommodating the runoff from the natural basin. Prepared and published a drainage summary of the recommended alternative.