ATTACHMENT C

Black Hill Trail Renovation Facility Plan Report

Prepared for:
The Maryland-National Capital Park and Planning Commission
Park Development Division

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April 24, 2003

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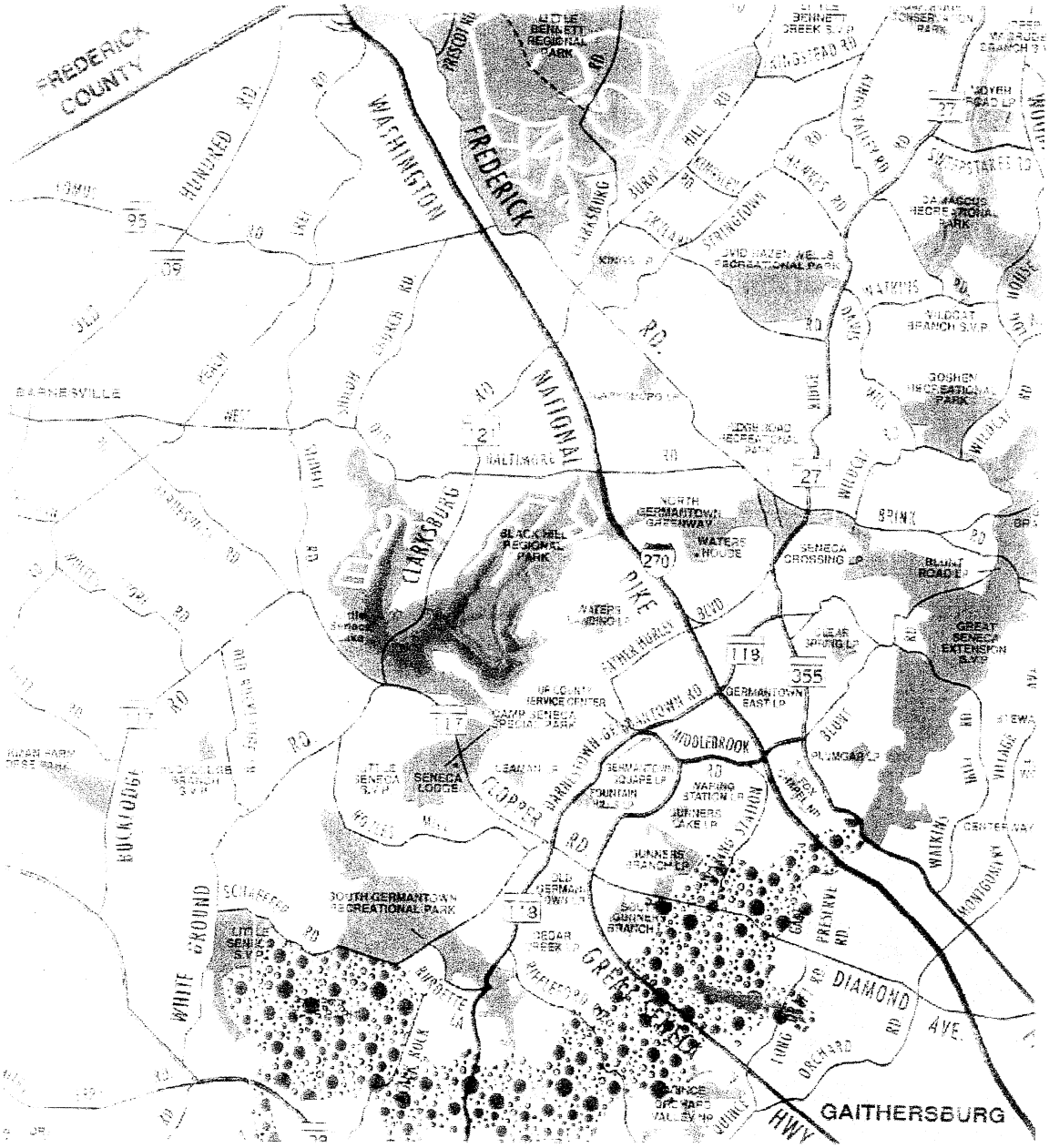

Project Overview

Black Hill Regional Park is located in northwest Montgomery County, north of Germantown and west of Interstate 270. The Park was developed by the Maryland-National Capital Park and Planning Commission for passive and active recreation, and conservation, and officially opened in June of 1987. The Black Hill Hard Surface Trail renovation project consists of the renovation of approximately 2-3/8 miles of existing

hard surface (asphalt) trail, including an existing wooden bridge, located along the east side of Little Seneca Lake between Wisteria Drive to the south and Spinning Wheel Drive to the north. The trail lies in a relatively narrow strip of land between the lake and the adjacent residential development known as Waters Landing. This section of trail is a critical component of the park in that it connects the park with the adjoining residential communities.

The adjacent residential properties of Churchill Town Sector, which includes the Waters Landing development, were developed from the early 1970's up until the early 1990's. In the late 1980's, a dam was constructed by WSSC on the Little Seneca Creek to form Little Seneca Lake. The lake, owned by the Washington Suburban Sanitary Commission (WSSC), is used to help regulate the water level of the Potomac River and as an emergency water supply.

The oldest sections of the trail were originally constructed over 20 years ago and reportedly actually predate the creation of Little Seneca Lake. The width of the existing trail varies, but is generally 6-½ feet-wide. A large portion of the trail construction followed the clearing for the construction of the WSSC sanitary sewer line. The trail was constructed by different developers, over a period of time, and no single standard for construction was applied. A geotechnical investigation revealed that in some areas, the depth of pavement is as little as one-inch-thick, and in some areas no apparent base material was used. The facility plan recommends that the existing pathway will be removed and replaced with a standard eight-foot-wide section designed to support light vehicular loads.

In June 2002, the Commission contracted with Phoenix Engineering, Inc., a multi-disciplinary firm, to prepare Facility Planning for The Renovation of the Existing Hard Surface Trail at Black Hill Regional Park. The Phoenix Engineering team has worked closely with M-NCPPC staff to develop a plan that meets the recreational needs of the community, provides appropriate accessibility for persons with disabilities, and protects the site's invaluable natural resources.

The Black Hill Regional Park Master Plan

The Black Hill Regional Park Master Plan was approved and adopted in May 2002. The Master Plan recognizes the significance of the trail system and recommends the rehabilitation, specifically regrading and resurfacing, of this portion of the trail system. The plan identifies the need to protect natural resources and to avoid, minimize, and mitigate any environmental impacts in the park. The Master Plan also recommends the addition of trail related amenities and identifies the need to periodically selectively prune the understory layers to open up extended views of the lake.

Facility Planning Process

The creation of a Facility Plan for the trail renovations included the following steps:

1. Collect Data
2. Inventory and evaluate existing conditions
3. Develop Trail Design Criteria
4. Identify areas which (1) fail to meet ADA guidelines, and (2) with potential environmental impacts
5. Perform additional site specific survey work, including topographical and tree surveys
6. Geotechnical analysis of existing conditions
7. Natural Resources Inventory
8. Prepare a conceptual trail renovation plan with recommendations for areas to be reconstructed and realigned
9. Meet with the community and revise the plan based on community and staff comments
10. Obtain stormwater management concept approval from the Montgomery County Department of Permitting Services (DPS)
11. Prepare preliminary design drawings (30%) and a detailed cost estimate

Existing Conditions

The Existing Trail

The subject trail lies within a strip of parkland located along the eastern shore of Little Seneca Lake. The majority of the land around the trail is forested, and it serves as a buffer between the lake and the adjacent residential properties to the east. Little Seneca Lake is owned by the WSSC and is the centerpiece of Black Hill Regional Park. Fishing and non-motorized boating is permitted however; wading, swimming, and ice skating are not.

The six to seven foot-wide asphalt trail is mainly used by hikers and bicyclists. Horseback riding is not permitted on this portion of the trail system. Public access to the trail is somewhat limited and is provided at four locations from within the Waters Landing community. Most of these access points are steep and contain significant elevation changes. Access also exists from the soon-to-be completed Crystal Rock connector and from the existing natural surface Black Hill Trail at the north end of the project. Throughout its length, the alignment of the trail closely follows the existing WSSC sanitary sewer line.

There are several different experiential qualities to the trail. In general, the southern portions of the trail are located relatively close, often within view of single-family and

multi-family homes. In many areas, a lawn area is all that separates the trail from adjacent yards and homes. At another point, the trail runs past a WSSC pumping station. An eight foot-tall chain link fence surrounds the building and asphalt parking lot, and little landscape screening is present. Further north, the trail is located within a mature, hardwood forest. In this area, views of adjacent residential properties are limited and the visual focus is of the adjacent natural environment and longer views of the lake are possible. Both the shoreline and trail alignment meander more in the northern portion of the trail. The curves in the trail create excitement and mystery for the trail user, and extended views of the lake are also more prevalent. In these areas minor pruning of the understory is recommended to enhance views of the lake and to create areas for rest stops with benches.

For much of the trail the existing drainage passes as "sheet flow" over the pathway. There are two points where existing drainage is concentrated and passes beneath the trail in culverts. One location is near the WSSC pumping station. The culvert in this area is approximately fifteen inches in diameter and conveys runoff from downspouts and pavement areas adjacent to the pumping station. The second culvert is further north, between Hazelnut Court and Spinning Wheel Drive, is approximately thirty inches in diameter, and conveys run-off from the adjacent residential development under the trail. The profile of the trail in this area is relatively steep and the side slopes of the drainage swale are eroded. Increasing the diameter of the culvert pipe would eliminate the erosion problems and also reduce the slope along the trail.

Large portions of this trail are currently failing and require ongoing maintenance to keep the trail safe for users. Most of these areas have been patched but it is clear that there is a need for a long-term solution. We observed areas where the pavement was cracked with grass or weeds growing in the exposed soil. In other areas, the pavement edges have degraded to a surface that is little more than gravel. Finally, there are sites where the base below the pavement has settled and significant depressions have developed. The depth of the asphalt section and base material is inconsistent and in many cases, is inadequate for continued long-term service.

Photo – 1. Pavement Failure – Sink Hole

Photo – 2. Pavement Failure – Cracking

Photo – 3. Pavement Failure

Photo – 1. Existing Wooden Bridge

The condition of the existing wooden bridge is also poor and does not meet the current design standards for bridges in the park system. The bridge is currently not used by park staff to move heavy maintenance equipment from one end of the park to the other. A new ten foot- wide prefabricated steel bridge with a single span of approximately 26 feet is proposed for this location. New concrete abutments will be constructed on both sides of the stream, behind the existing structures to accept the bridge.

Environmental Features

In general, the topography slopes from east to west towards the lake. The majority of the site is currently forested. The lake and adjacent forests provide high quality environments for varied populations of waterfowl, songbirds, reptiles, amphibians, and small mammals, including an active beaver population that continues to challenge both the community and park staff. It is anticipated that the proposed improvements to the existing trail will have no significant impact on the existing wildlife.

Phoenix Engineering's environmental team surveyed the site for signs of potential wetland areas. Three such areas were found. One area that exhibits the common characteristics of a wetland is found near the middle of the trail, within a short, narrow channel adjacent to the feeder stream. The other two areas are between the northern portion of the trail and the historic millrace and are associated with a seep. The limits of all three wetland were flagged in the field and their locations are recorded on the Natural Resources Inventory. No impacts to the wetlands are proposed.

A variety of soil types are mapped by the Soil Survey of Montgomery County (1995) for this portion of the park. Some of these soil types are on the erodible soils list in the Environmental Guidelines (2000). Slopes greater than 15% were observed in some areas mapped as erodible soils and slopes greater than 25% were observed elsewhere. These slopes are delineated on the FSD/NRI Summary Map [See Appendix C].

Natural Resources Inventory/Forest Stand Delineation

In August 2002, Phoenix Engineering completed preliminary mapping and conducted field investigations of the portions of the park adjacent to the trail. The fixed point sampling method as described in the Maryland Forest Conservation Manual (1991) and Trees: Approved Technical Manual (1992) was used and was supported by simplified cruising. An on-site investigation revealed that the project site contains eight forest units. The majority of the forests are within environmentally sensitive areas including wetland and stream buffers, and steep slopes.

In addition to the identification of specimen sized trees (trees >22" DBH) as required in the Forest Stand Delineation process, we identified trees greater than six inches DBH with critical root zones (CRZ) that would be impacted by the trail renovation. The CRZ was defined as a radius equal to 1-1/2' for every inch of DBH. The trees were identified and located in the field, and then located on the plans. Where the CRZ of a tree is within the trail section, root pruning at the limit of construction will protect the adjacent trees from additional impacts during the construction process.

In general, mixed hardwoods dominate the canopies of the forest stands. In some forest stands, Tulip Poplar ranging from 6"-18" DBH is the dominant species. Other stands have White Oak and/or Chestnut Oak as the dominant species. Most of the oaks average between 10"-18" DBH. Many trees of significant size (greater than 22" DBH) were observed and their approximate locations and critical root zones are shown on the

FSD/NRI Summary Map [See Appendix C]. The understory and shrub layers are mostly light to moderate in coverage and lack a rich diversity.

There is no apparent evidence of past management of the stands for timber production. Also, there is no apparent evidence of any serious insect or disease problems; however, it is apparent that beaver damage is an on-going problem evidenced by downed trees and hardware cloth wrapped around numerous tree trunks. Generally, the trees within this project area are in good condition with full, healthy canopies. A few dead trees were noted and downed woody debris is relatively light. The stands have good forest structure for habitat value according to the scale outlined by the Maryland Forest Conservation Manual (1991).

An NRI/FSD for this project was approved by the Environmental Planning Division of M-NCPPC on December 31, 2002.

Stormwater Management/Water Quality

A stormwater management concept was submitted to Montgomery County Department of Permitting Services (DPS) on January 29, 2003. The Concept was approved by DPS on February 5, 2003 [See Appendix E].

The linear nature of the project combined with the environmental sensitivity of the area requires a unique approach to stormwater management. The existing six to seven foot-wide pathway occupies approximately 1.74 acres and the proposed eight foot-wide path will occupy approximately 2.32 acres. This results in an increase in impervious area of 0.58 acres that is spread out over the 2-3/8 mile pathway. The existing forested buffer between the pathway and the lake provides an existing non-structural stormwater management facility, creating a natural "sheet flow to buffer credit". In addition to this credit, efforts will be made during the final design phase to identify areas for small, shallow vernal pools, bio-retention areas, or grassed swales, in existing clearings, adjacent to, and downstream of the trail.

Forest Conservation

A Preliminary Forest Conservation has been submitted to the Environmental Planning Division of M-NCPPC and is pending approval. The tree clearing proposed by the facility plan is very minor and is well below the threshold beyond which reforestation planting is required.

M-NCPPC policy dictates that trees removed during the course of a project be replaced at a ratio of 1:1. It is anticipated that there may be minor impacts to some existing trees adjacent to the path. In anticipation of the removal of some individual trees, a Conceptual Landscape Plan was developed to mitigate these disruptions [See Appendix G].

Geotechnical Investigation and Analysis

In October 2002, the consulting engineering firm E_2CR, Inc. preformed a geotechnical investigation to determine general subsurface conditions within the project limits and evaluate the subsurface conditions to develop recommendations for appropriate detail design and construction methods for the project. Six (6) shallow borings to a depth of five feet were preformed at designated sites along the trail, and two borings to a depth of 20' were made at the location of the proposed bridge. In addition to field observation during the sampling procedures, soil samples were analyzed in the laboratory to determine index properties of the subsurface soils. See the full report in Appendix B.

The borings indicate that the existing pavement over most of the trail consists of about 2 inches to about 4 inches of bituminous concrete underlain by up to about 3 inches of gravel base. In several borings, the gravel base was not encountered. The borings indicate that the underlying soils generally consist of clayey SILT to sandy SILT. These soils are considered to be poor subgrade soils with low California Bearing Ratio (CBR) values. The borings did not encounter auger refusal, however, several borings encountered hard drilling through decomposed rock. Therefore, hard digging through decomposed rock should be anticipated in deeper excavations. The borings next to the proposed bridge indicate 3' to 9' of fill material over similar underlying residual soils.

Based on the collected data and field observations, E_2CR recommends that the proposed pavement section for the trail be three-inches of bituminous concrete and four-inches of CR-6 or DGA, on firm and compacted subgrade. Prior to the placement of the pavement, the subgrade should be proof-rolled with a loaded pick-up truck if possible, and soft or pumping areas should be undercut. The undercut areas should be backfilled with approved fill. The trail should be graded at minimum slopes to prevent ponding of the surface water on the pavement.

Recommendations related to the design of the new bridge were also included. The north abutment can be founded on a shallow spread footing at a depth of three feet for front protection. An allowable bearing capacity of 3,000 psf should be used to design the footing. The minimum width of the footing should be 18 inches. Several alternatives for the south abutment were investigated. The recommended alternative is to partially undercut the fill soil to a depth of seven feet, backfill the undercut with #57 stone, and place the footing on the #57 stone using an allowable bearing capacity of 1,500 psf. Anticipated settlement with this section would be approximately ½ inch.

Proposed Trail and Pavement Improvements

Trail Design Criteria

The primary task of the design team was to develop a Facility Plan that would direct future design development and construction documents for the improvements to the trail and provide an accurate detailed cost estimate for future budgeting purposes. Staff identified the following three primary goals that guided the recommended improvements to the trail:

1. Upgrade the trail and pavement section to meet M-NCPPC standards and provide a safe and maintainable surface.
2. Improve the overall accessibility of the trail for persons with special needs.
3. Minimize the disruption to existing environmental resources.

Throughout the design process the team focused on these goals as the plans evolved into the Final Facility Plan.

Trail and Pavement Conditions

As previously discussed, the existing trail pavement is failing in numerous places along its 2-3/8 mile length. Portions of the asphalt trail exhibit failures such as rutting, raveling, cracking, and a crumbling effect known as "alligatoring". There are also several sinkholes along portions of the trail

The existing trail width is also inadequate to safely accommodate the wide variety of users and the high level of intensity currently found on the trail. Generally, the existing trail is 6 1/2 feet wide. The proposed 8 foot-wide section affords minimum space for bicyclists, wheelchairs, strollers, maintenance crews, and, emergency vehicles.

Because the trail is failing along the entire length, is overall too narrow to safely accommodate the current level of trail use, and includes areas with slopes so steep as to render the trail inaccessible to some users, a recommendation is made to completely demolish and reconstruct the existing trail and pedestrian bridge.

The proposed new pavement section consists of a minimum of six inches of compacted CR-6 gravel, and three inches of new asphalt (2" base course, 1" surface). A bituminous tack coat will be applied to insure good adhesion between the layers.

Trail Accessibility

In recent years, design guidelines have been established that allow persons of various abilities access to outdoor recreational trails. The Regulatory Negotiation Committee on Accessibility Guidelines for Outdoor Developed Areas, Final Report, Sept 1999 states:

> 16.2.7.1 Cross Slope. The cross slope shall not exceed 1:20 maximum.
>
> 16.2.7.2 Running slope. Running slope of trail segments shall comply with one or more of the provisions of this section. No more than 30 percent of the total trail length shall exceed a running slope of 1:12.
>
> 16.2.7.2.1 Running slope shall be 1:20 or less for any distance.
>
> 16.2.7.2.2 Running slope shall be 1:12 maximum for 200 feet (61 m) maximum. Resting intervals complying with 16.2.8 shall be provided at distances no greater than 200 feet (61 m) apart.
>
> 16.2.7.2.3 Running slope shall be 1:10 maximum for 30 feet (9150 mm) maximum. Resting intervals complying with 16.2.8 shall be provided at distances no greater than 30 feet (9150 mm) apart.
>
> 16.2.7.2.4 Running slope shall be 1:8 maximum for 10 feet (3050 mm) maximum. Resting intervals complying with 16.2.8 shall be provided at distances no greater than 10 feet (3050 mm) apart.

Upon a detailed analysis of topographic information and on-site observations of the existing trail, it was discovered that in several places the profile of the trail exceeds the maximum gradient guidelines for accessible trails. In particular, the access points do not meet these standards. These areas of non-compliance were first identified, then closely studied in an effort to discover options for making the areas accessible with a minimal amount of disturbance to the adjacent wooded edge. This investigation concluded that the majority of the trail could be made accessible. The only area where modifications to make the trail accessible are not feasible is an area of steep slopes near the wood bridge and the trail access connector that leads to Waters Landing Road. These areas would require extensive grading adjacent to an existing cut-bank of the stream and significant disruption to the adjacent forest. For this reason, it was decided that this area should remain as it currently exists in order to avoid extensive tree clearing and the addition of large retaining walls.

Photo – 1. Existing steep slope at access point

The southern portion of the trail from Wisteria Drive to Wynfield Drive (approximately ¾ mile) will comply with the guidelines. Also, the trail will be accessible from the access point near the Shore Harbour Condominiums on Wynfield Drive to the wooden bridge, which is approximately ½ mile. At this point he trail becomes inaccessible for a short section as it continues over the steep slopes described above. Form this point the trail is accessible for the remaining mile to the trail node near Spinning Wheel Drive and the Crystal Rock connector.

The opportunity exists in this area to link the southern and northern accessible portions of the trail. The construction of a bridge/boardwalk across the stream would bypass the steep slopes and create a continuous system fully compliant with the accessibility guidelines. An alternative alignment showing the connection is shown on the plans and preliminary estimates are included in the construction estimate. An in-depth study of this connection was not however included in the scope of this project. Additional geotechnical and topographic studies of this area will be necessary prior to the final design.

Finally, a trail node will be created at the northern end of the trail. This node will connect this trail with the Crystal Rock Trail and the new boardwalk extending to the trailhead at Crystal Rock Drive. This node will also be a natural location for natural and historic interpretive signage, site furniture, and way-finding maps.

Environmental Protection

The proposed renovations to the hard surface trail require a balance between the protection of existing environmental resources and the need to provide a safe and enjoyable, experience for people of various abilities. As discussed in the NRI/FSD, there are a number of valuable environmental resources in this project area. The most obvious resource is Little Seneca Lake. Other important natural resources that require protection include the forest, significant and specimen trees, wetlands, steep slopes, and erodible soils. To minimize the potential impacts to these resources wherever possible, the proposed trail alignment follows the existing alignment, both horizontally and vertically. Approximately 80% (1.9 miles) of the proposed alignment will have only minor impacts on adjacent resources. In most cases, where adjustments to the vertical alignment of the trail are required to improve accessibility, excavation was avoided, reducing impacts to the critical root zones of trees adjacent to the trail. In places where excavation is unavoidable, a trenching machine will be used to cleanly prune tree roots and avoid unnecessary damage to the root system between the excavation and the tree. Low dry-laid walls using natural materials or segmented concrete block are recommended to reduce the impact of grading. In all cases, the walls would be less than three feet in height.

Construction Process

The location, topography, and environmental constraints increase the complexity of the construction of this trail. Access to site the site is limited. The five existing access points to the trail will need to serve as the primary construction access. Four of the five access points have direct access to public streets. The trail access off of Spinning Wheel Drive crosses Homeowners Association property for approximately 200'. An access agreement to uses this access will need to be secured from the Homeowners Association. An additional potential access opportunity exists at the WSSC pumping station.

Photo – 1. Limited area for construction operations.

Another constraint is the linear nature of the project. The area that is available for construction operations is in most cases limited to a relatively narrow swath of open land. We identified potential staging areas throughout the project. They are restricted in size by topography and vegetation, will provide for very limited storage of materials, but will allow trucks and equipment to maneuver and to turn around.

Photo – 1. Potential construction staging area.

These limitations will be a challenge for the contractor. The work will need to be performed in a linear nature with waste materials removed and new materials delivered and placed in a single operation. To improve maneuverability and reduce pressure on the environmental resources, the equipment employed in this process will likely be somewhat smaller than frequently used in road or wider path construction. The project will need to be completed by a contractor who is aware of the constraints and is committed to making the necessary adjustments to typical procedures.

The reconstruction will also require that portions of the trail be closed for a period of time. Temporary signage and barricades will need to be used to direct the users. It is recommended that construction be coordinated so only one section of trail is closed at any one time.

CPTED – Crime Prevention Through Environmental Design

Officer Dean Smith of Maryland-National Capital Park Police was involved in the development and review of these plans as well as contributed during the community presentation meeting. The proposed improvements to the trail were developed utilizing the five basic CPTED principles; Territoriality, Surveillance, Activity Support, Access Control, and Maintenance.

At each of the entrances to the trail network there will be Trail Identification Signage. This signage will clearly indicate the name of the trail and the uses permitted on the trail. The sign will also indicate if the portion of the trail meets ADA standards for accessibility.

One of the attractions to the user of a trail is the sense of mystery that comes from hills, curves and a slightly limited site distance. [Photo 1]This drama needs to be balanced with the perception of safety and lack of isolation for the user of a trail. The alignment follows the bank of Little Seneca Lake with generally broad and sweeping curves. In some places this alignment creates a sense of mystery and wonder about what might be beyond the turn. Generally, the visibility along the path is adequate to give the user a site distance that is long enough for them to feel secure. Security also comes from the large number of people who utilize the trail. This trail segment is very popular and is at times crowded with people jogging, biking or walking. Periodic long, relatively open, views of the lake and the proximity of the adjacent homes also increase the sense of security. The ongoing maintenance of the trail should include minor pruning of the understory plant community to preserve of these periodic eyelevel views.

The conceptual landscape plans identify areas where additional pruning and selective clearing could take place to open views of the lake, increase visibility along the trail and enhance the experience of trail users.

Photo – 1. The curving path creates a sense of mystery in the landscape.

Community Outreach / M-NCPPC Coordination

Progress meetings were held throughout the design process. M-NCPPC Staff from Park Natural Resources, Park Development, Park Police, as well as, the Black Hill Regional Park Manager and Assistant Park Manager attended these meetings both at the site and in the office.

A community meeting was held on January 21, 2003 at the UpCounty Regional Services Center in Germantown. A discussion period followed the presentation where observations, concerns, and comments were discussed. One citizen asked why the trail was being widened to eight feet. It was explained that Montgomery County Park and Planning standards (which are based on ASHTO and ADA guidelines) are being followed. In general, the recommended standard for trail width is ten feet reduced to a minimum of eight feet where constrained. Questions were also raised about the existing beaver problem. MNCPPC staff explained that damaged trees will not be replaced, nor will the beavers be moved. Another concerned neighbor asked how unauthorized vehicular access to the trail would be prevented. Park Staff replied that removable bollards are used at many facilities and could be employed at this one as well. Overall, the community expressed positive feelings about the plan during the meeting and in the correspondence that followed.

Cost Estimate for Design and Construction

An estimate of the costs for the design and construction of the proposed facility was prepared by Phoenix Engineering, Inc. The following is a summary of that estimate. The complete estimate can be found in Appendix H.

SUMMARY

Construction Cost Estimate

Demolition $99,320.00
This item includes: removal of asphalt pavement (full depth), up to 20 small-medium trees, root pruning adjacent to trail, tree pruning, removal of shrub/scrub, and removal of wood bridge

Hard Surface Trail $280,313.00
This item includes excavation, grading, Allan Block walls, aggregate base course, asphalt surface course, temporary closure signage and trail barricades, reset manholes in asphalt, raise/lower manholes in asphalt, and raise/lower manholes adjacent to trail

Bridge Replacement $33,300.00
This item includes concrete abutments and prefabricated 8' wide x 26' span bridge in place

Drainage, SWM, and SEC $148,300.00
This item includes new 36" corrugated metal pipe with two end sections, new 18" corrugated metal pipe with two end sections, storm water quality management facilities, stabilized construction entrances, super silt fence, silt fence, additional chrusher run stone for stabilization, and seeding disturbed areas

Landscape, Signage, and Site Furnishings $47,550.00
This item includes benches, asphalt bench pads, landscaping around benches, trail identification signage, understory trees, and large shade trees

Alternate Boardwalk/Bridge $45,950.00
This item includes minor earthwork, timber abutments and 8' wide timber boardwalk constructed in place.

Design Costs (8%) $68,092.00

Design Contingency (10%) $6,809.00

Staff Chargebacks during Design $15,000.00

Total Design Costs $89,901.00

Construction Estimate $654,733.00

30% Cost Contingencies $196,420.00

Construction Management and Inspection (10%) $92,605.00

Total Construction Costs $943,758.00

Total Project Costs $1,033,659.00