

APPENDIX B

**ENVIRONMENTAL IMPACT STATEMENT**

**FOR**

**PROPOSED TWO BRIDGES  
WALKILL RIVER - POCHUCK CREEK**

**VERNON, NJ**

Prepared for: STATE OF NEW JERSEY  
Department of Treasury  
Div. of Building and Construct:

Date: October 12, 1983  
Rev: 5/29/84

---

**ROBERT OTT**  
ENVIRONMENTAL CONSULTANT

CONTENTS

	<u>Pg.</u>
SUMMARY.....	1
PURPOSE OF THE PROJECT.....	2
LOCATION.....	4
HISTORY OF THE APPALACHIAN TRAIL.....	7
SCOPE OF STUDY.....	9
AMBIENT CONDITIONS.....	12
TRAIL USE.....	17
CONTEXT OF PRIOR STUDY.....	22
CONTEXT OF INFRASTRUCTURAL PLANNING.....	23
Water Supply.....	23
Sewerage.....	24
UNAVOIDABLE IMPACTS AND MITIGATING MEASURES.....	26
CULTURAL RESOURCE DISTURBANCE.....	31
AESTHETIC IMPACTS.....	33
CONSTRUCTION DISTURBANCE.....	36
SHORT-TERM BENEFITS VS. LONG-TERM PRODUCTIVITY.....	38
ALTERNATIVES.....	40
CONCLUSION.....	43
PERMITS, LICENSES AND OTHER APPROVALS.....	44
DOCUMENTATION.....	45
APPENDIX	
VEGETATION/WILDLIFE INVENTORY	
U.S. Army Corps of Engineers	

SUMMARY

This report is prepared in response to directives of the NJ Department of Environmental Protection regarding environmental assessment for predesign study of proposed Appalachian Trail Pedestrian Footbridges.

The project consists of construction of two pedestrian footbridges within recently-acquired land corridors, for realignment of the Appalachian Trail. Construction of the proposed bridges would complete this realignment, allowing for continuous foot travel within New Jersey state lines.

This assessment considers the motivations, desires, and perceptions of the end user (hiker) as well as ambient conditions, with particular attention to Ground and Visual disturbance. Cultural resource disturbance, construction impacts, and visual disturbance are considered of prime importance to the proposed project.

It is concluded that the proposed bridges are compatible with their surroundings and with their intended use. Environmental control measures are available to project developers to minimize impacts of disturbance, and the proposed Action will have no substantive impact upon existing uses of the trail, surrounding lands, or water resources.

---

### PURPOSE OF THE PROJECT

Completion of the proposed bridges will be the final step in a Trail relocation project begun approximately 10 years ago. The purposes of the proposed Trail relocation are two-fold:

- 1) To eliminate existing trail crossings into New York State and back again into New Jersey, with the accompanying administrative/maintenance difficulties.
- 2) To eliminate extensive use of paved roadways along substantial portions of the existing trail, creating a trail in keeping with the natural surroundings sought by trail users.

The State-line crossings have created many administrative difficulties, requiring inter-state agreements. The new bridges will complete the process of relocation within New Jersey, and thereby alleviate presently cumbersome administrative efforts.

The replacement of field and pathway walking for roadway walking will also eliminate a present health hazard. Hikers report that roadway walking is particularly damaging to the feet, especially during long-distance hiking when one's endurance can be taxed to the limit. Also, hiking on black-top-paved roadways during hot weather can lead to heat exhaustion and other health problems, especially to the hiker who must preserve water for long distances. While hardship and deprivation is intrinsic to the long-distance hike, the difficulties can be excessive. The "end-to-ender", hiking Georgia to Maine, can find himself on this stretch of pavement during mid-summer months.

Construction of the proposed bridges will complete the process of relocation to alleviate the present conditions. Property acquisitions for realignment have been under way for 10 years in order to establish a continuous corridor through open lands, and within New Jersey. Having now acquired the necessary lands, the proposed pedestrian bridges are the final step in the improvement of this stretch of Trail. The bridges will allow for the safe and efficient traverse of both the Wallkill River and Pochuck Creek within the new realignment.

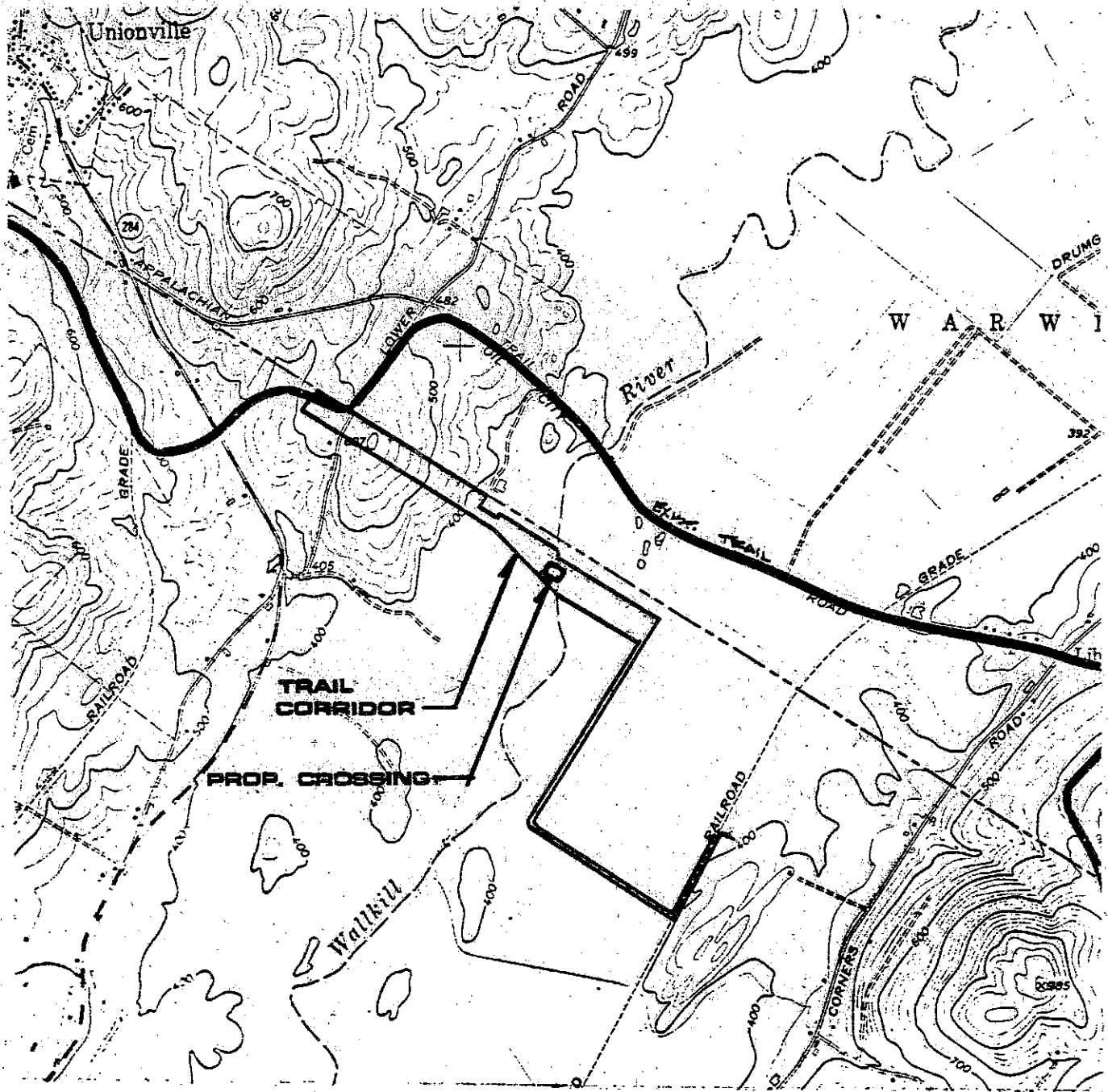
## LOCATION

The Project bridges are to be located in Sussex County, northwestern New Jersey, immediately proximate to the New York - New Jersey state line and Orange County, NY. Farmland in the basin of the Wallkill River has come to be known as the "Black Dirt Area" in reference to their rich dark soils. The lowlands about the Pochuck Creek are referred to as the Vernon Valley.

Wallkill River Crossing - The section of the river located immediately south of the New York - New Jersey state line, approximately  $\frac{1}{2}$ -mile east of Route 84 and 1,400 feet south of Oil City Road in Vernon Township, Sussex County, New Jersey.

Pochuck Creek Crossing - The section of the Creek located in Vernon Valley, approximately  $1\frac{1}{2}$  miles south of the New York - New Jersey state line, Vernon Township, New Jersey. It is bounded by Canal Road on the east, Maple Grange Road on the south and Route 517 on the west.

Reference may be made to Location Maps, Pp. 5 and 6 for more definitive locations.



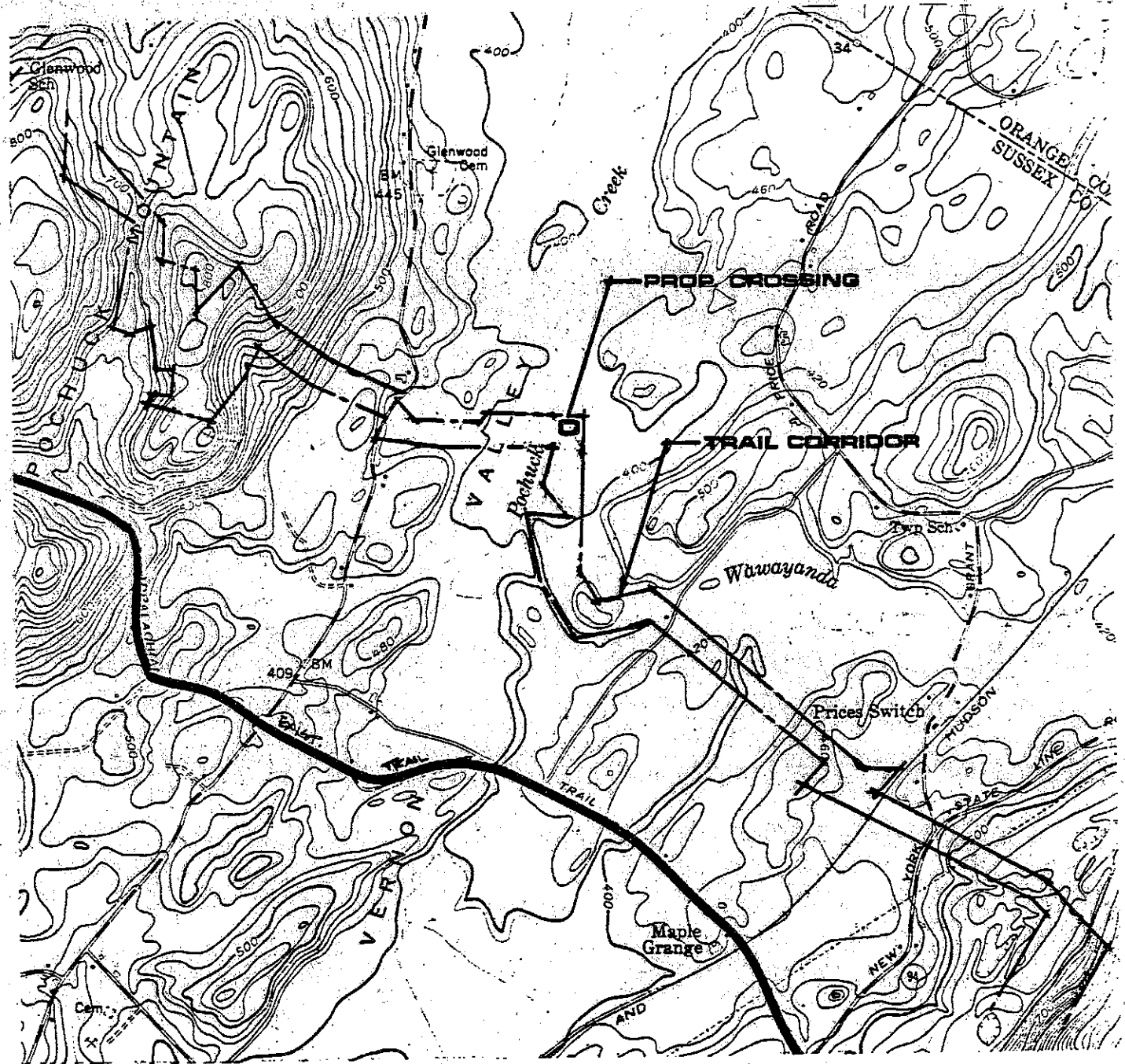
BASE MAP:  
USGS TOPOGRAPHIC SURVEY MAP -  
UNIONVILLE QUADRANGLE

**LOCATION MAP**  
WALKKILL RIVER CROSSING

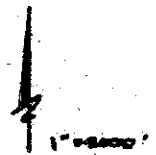
**PEDESTRIAN BRIDGES**  
APPALACHIAN TRAIL  
VERNON, NJ

**ROBERT OTT**  
ENVIRONMENTAL CONSULTANT





REFERENCE:  
USGS TOPOGRAPHIC SURVEY MAP -  
VERNON, QUADRANGLE



**LOCATION MAP**  
POCHUCK CREEK CROSSING

**PEDESTRIAN BRIDGES**  
APPALACHIAN TRAIL  
VERNON, NJ

**ROBERT OTT**  
ENVIRONMENTAL CONSULTANT

## HISTORY OF THE APPALACHIAN TRAIL

The primary purpose of the Appalachian Trail was the linking of wilderness areas which were suitable for recreation and accessible to metropolitan area residents along the Atlantic seaboard. In 1922 Benton MacKaye published an article in the Journal of the American Institute of Architects entitled "An Appalachian Trail, a Project in Regional Planning", an article which espoused the Trail as a backbone to wilderness recreation areas. His vision of the Trail was an expansion of the thoughts of other men, active in trail clubs and conferences, such as the Green Mountain Club, New England Trail Conference, Connecticut State Park and Forest Commission, and Appalachian Mountain Club.

Field work began in the Harriman and Bear Mountain Sections of the Palisades Interstate Park of New York and New Jersey, and new trails were completed south to Greenwood Lake by 1924. In order to administer construction of the Trail from the New York - Connecticut border across the Hudson River at Bear Mountain to the Delaware Water Gap, the Palisades Trail Conference was expanded to the New York - New Jersey Trail Conference. By 1931, the NY - NJTC completed the trail from the Hudson River to the Delaware Water Gap.

The continued growth of the trail has been the result of extensive efforts by countless individuals and groups. Seeming impossible gaps have been filled, and just as importantly, the continuing maintenance of the Trail has been achieved, despite wars, depression, and early Federal disinterest. In 1968, Bill S.2862 was signed into law to "facilitate the management, use, and public foot travel through natural or primitive areas, and extending generally from Maine to Georgia, and to facilitate and promote federal, state, local and private cooperation and

assistance for the promotion of the trail".\*

The Trail through New Jersey is presently under the jurisdiction of various Park System Agencies. From High Point east to the Wallkill River crossing is under the jurisdiction of the High Point State Park System; from the Wallkill River east through Wawayanda State Park and beyond is under the jurisdiction of the Wawayanda State Park System.

\* "Hiking the Appalachian Trail", James R. Hare, Rodale Press, Inc., Emmaus, PA 1975

## SCOPE OF STUDY

This report is prepared as part of Phase I - Pre-design Study for the proposed two pedestrian bridges. The scope of work under this Phase has been defined as follows:

### Scope of Work

#### Phase I - Pre-design Study

The consultant shall research, conduct and coordinate the following tasks:

1. Complete the necessary hydraulics and/or hydrology studies as required to determine the proposed bridge span and elevations, and to meet all requirements issued by the Division of Water Resources, New Jersey Department of Environmental Protection and the Army Corps of Engineers.
2. Responsible for filing and obtaining all permits and approvals from the appropriate authorities for the construction of the two bridges. Correspondence with the involved agencies must be documented.
3. Perform on-site boring tests.
4. Prepare an environmental assessment on the probable impacts of the proposed action and substantiate the section on cultural resource determination with pertinent data.
5. Investigate and recommend feasible design alternatives for both the bridges and access to the bridges complete with cost estimate comparisons. Possible design options to be examined include but not limited to suspension bridge, prestressed wooded bridge and center pier, fixed stringer bridges.

PHASE II - Preparation of construction plans and specifications on the selected design alternatives.

This study is prepared in response to Item 4, preparation of an environmental assessment.

The scope of study of any environmental assessment is dependent most importantly on the specific Action proposed, as well as on the type and limits of disturbance. In consultation with the Planning Group, NJDEP, this office has concerned itself most closely with:

- a) Cultural Resource Disturbance
- b) Aesthetic Impact
- c) Construction Impacts

Impacts of such environmental factors as the following, except as related to short-term construction impacts, were considered minimal or negligible, and detailed study has been foregone.

Population  
Traffic  
Air Pollution  
Noise Pollution  
Water Supply  
Sewage Disposal  
Socio-economics  
Student Population / School Systems

Additionally, elements under study as part of engineering study, i.e. flooding, hydraulics/hydrology, soil foundation suitability, and design alternatives, have been included in the scope of Prime consultants pre-design study, and are outside the scope of this report. The focus of this report, also, has been upon the proposed trail footbridges, and not on the proposed relocation of the Appalachian Trail more generally. Personal communications with Appalachian Trail Conference field representatives would further indicate that no elevated approaches will be necessary at the proposed bridge

crossing for the Wallkill River. Representatives have commented that along the west side of the Wallkill, due to the frequency of flooding, it may be best to simply designate an alternative high-water roadwalking route, rather than design an elevated approach above the 50 or 100-year flood level. For the Pochuck Creek, no elevated approaches have been determined at this time, though the approach from the west may require some elevation across wetlands. This approach is discussed under Unavoidable Impacts and Mitigating Measures, below.

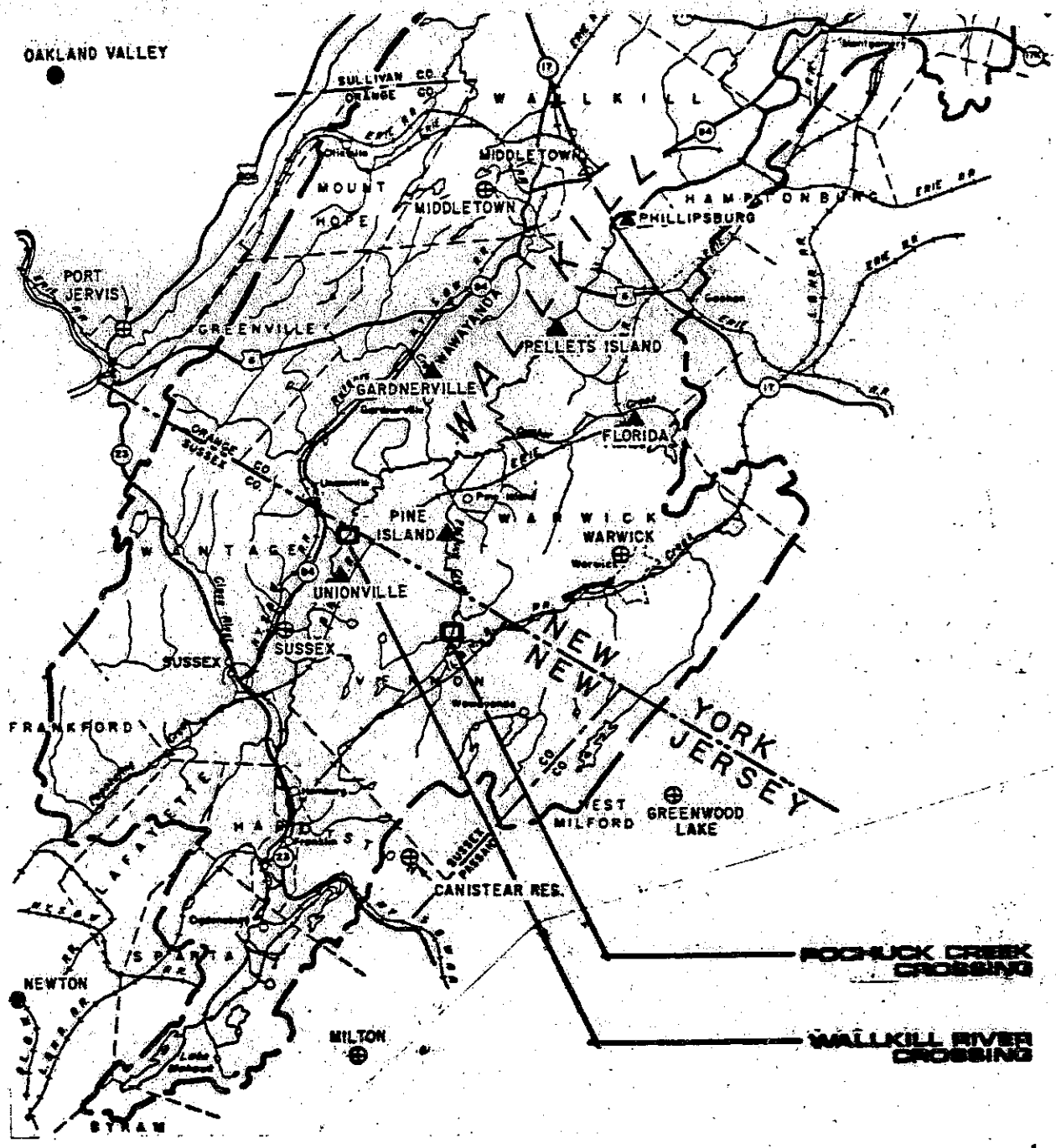
### AMBIENT CONDITIONS

Both proposed stream crossings lie within the watershed of the Wallkill River; The Wallkill River crossing located immediately proximate to the NY/NJ state boundary, and the Pochuck crossing lying upstream of the confluence of the Pochuck with the Wallkill River (refer to Drainage Basin Map P.13). The watershed of the uppermost reaches of the Wallkill River lies in Sussex County, NJ with the remainder in Orange County, NY. Approximately one half of Sussex County and a small portion of Passaic County in New Jersey are tributary to the Wallkill River. Approximately half of Orange County, a quarter of Ulster County, and a small portion of Sullivan County in New York also contribute to Wallkill River flow. The watershed has a length of 65 miles north to south, and includes approximately 785 square miles.

The river flows in a south to north direction beginning at Lake Mohawk in Sparta, NJ. The wooded northern and southern segments of the watershed are broken by a highly cultivated central section, wherein lies the sites of the proposed two bridges. Soils in the watershed are considered of fair productivity, except in the "Black Dirt" area, bottomlands which include about 22,000 acres of rich black soil or peat. Within the Black Dirt area, cultivation with the help of artificial drainage has created a highly productive agricultural region, with a suitability for vegetable produce, especially onions.

The following excerpt from a study of the Watershed prepared by the US Army Corps of Engineers provides a comprehensive overview of the drainage area.

"The basin is located in the Hudson Valley Province of New York State. The Shawangunk Mountains are on the western margin of the valley and the Wallkill River Basin lies in the broad open depression to the east. The area was subject to glaciation as evidenced by



REFERENCE:  
 "STATE FISH AND GAME WALKKILL RIVER BASIN, ORANGE COUNTY, NY,  
 LEGAL FISH PROTECTION PROJECT, REPORT PAGE 2  
 GENERAL TECHNICAL INFORMATION, US ARMY CORPS OF  
 ENGINEERS, JULY 1981."

4276

# DRAINAGE BASIN MAP

WALKKILL RIVER BASIN

## PEDESTRIAN BRIDGES

APPALACHIAN TRAIL  
 VERNON, NJ

**ROBERT OTT**  
 ENVIRONMENTAL CONSULTANT



ground moraine, drift and outwash plains. The relatively recent reworking of the glacial materials by streams is responsible for the land forms and alluvial deposits.

The climate of the Wallkill watershed is one of long summers and short winters. The average annual temperatures are 48.5 degrees Fahrenheit at Mohawk Lake, New York, and 50.7 degrees at Sussex, New Jersey, with extremes varying from 24 degrees below zero to 106 degrees above zero. The average annual precipitation for the watershed is approximately 45 inches. The average annual runoff for the basin as a whole is about 20 inches, about 45 percent of the estimated average precipitation over the area.

Terrestrial wildlife in the Wallkill watershed has been primarily associated with the presence of suitable habitats and food supply. In the middle region of the basin, the past clearing and farming of land has favored species such as the cottontail rabbit and the meadow mouse and has maintained the racoon and several species of mice and shrew. The more wooded rolling hills in the northernmost and southernmost portions of the basin are inhabited by white-tailed deer, ruffed grouse, pheasant and cottontail. The southeast slopes of the Shawangunk Mountains are an important deer wintering area.

The Southern Bald Eagle and the Northern Bald Eagle are both endangered species and may inhabit portions of the watershed. The Indiana Bat, a small brown variety of bat, is also believed to inhabit the area and is an endangered species.

Fish species in the watershed are predominantly warm-water varieties including largemouth bass, smallmouth bass, black crappies, pumpkinseed, rock bass, and bullhead. Brown trout and brook trout are stocked by the New York Division of Fish and Wildlife in Rutgers Creek. The upper reaches of the Shawangunk Kill in New York also support cold-water species. The Bog Turtle, a small formerly plentiful species in this region, is presently rare, and its existence is threatened due to loss of its natural habitat (swamps and clear, slow moving streams with muddy bottoms).

The shallow streams on the Wallkill Basin Valley floor suffer from low dissolved oxygen. These conditions approaching eutrophication result from runoff from the extremely fertile muck deposits which occur throughout the watershed. The nutrient overload problem is com-

pounded by farmers adding commercial fertilizer to their muck farm plots and by inadequate sewage treatment facilities that add nutrients from the housing developments and townships in the upper reaches of the watershed.

The population of the basin, based on the 1970 census, is estimated to be approximately 200,000 people, an increase of 45,000, or nearly 30% over the 1960 census data. Of the total 1970 population, New York is estimated to contain 150,000 people and the New Jersey portion 50,000. Of the five counties partially within the basin, Sussex County experienced a more than 50% increase in population between 1960 and 1970 while the population of the New York counties increased between 15 and 35% during the same 1960 to 1970 period.

The population growth of the region is attributed to the general shift in population from New York City and the counties in New Jersey immediately adjacent to the city to the more open areas prevalent in the basin. This shift has been facilitated by the completion of major sections of the interstate highway system in the region and a greater reliance on the automobile.

Residents in the Wallkill River Basin are employed in agriculture, manufacturing, retail and wholesale trades, and service trades. Many persons are employed in servicing the large number of vacationers in the area. The principal manufacturing center is at Middletown and the main agricultural area is the flat, fertile "Black Dirt" area in Sussex and Orange Counties. The industrial development of the basin is relatively small.

The 1972 per capita income for the counties of the basin are as follows: Orange County \$3,729; Ulster County \$3,581; Sullivan County \$3,545; Sussex County \$4,049; and Passaic County \$4,174. For purposes of comparison, the 1972 per capita income for the nation was \$3,867.

The Wallkill Basin has become a highly developed resort area due to its proximity to the New York City metropolitan area. Resorts have been established in the mountain and lake areas which are especially suitable for golfing, fishing, hunting, swimming, biking and boating. Other major land uses are agricultural (as mentioned above) and residential.

During the period 1970 to 1974 the region experienced no effective growth in employment. The labor force expanded during this period and the result was a marked increase

in unemployment. Manufacturing was the most seriously affected."\*

As noted under Scope of Study above, the focus of this study has been limited to reflect the specific character of the proposed Action and the affected environment. In order to provide a comprehensive assessment, however, the Corps of Engineers inventory of the "General Environment" of the Wallkill River Basin is appended. As the Project sites are both proximate to the NY/NJ state boundary and upstream of the Black Dirt area, this assessment, most especially with regard to Water Resources, can be considered an assessment of the affected environment. Moreover, Black Dirt area agricultural characteristics extend into New Jersey and are inclusive of the Wallkill River crossing.

\* "Review of Reports for Flood Control, Wallkill River Basin, New York and New Jersey", US Army Corps of Engineers, July 1982.

### TRAIL USE

The Appalachian Trail user may be seeking the challenge and adventure of a long and solitary hike, or he may be simply taking an afternoon stroll with a companion. Trail users can be broken up into several categories: a) the Day-user, b) the Short-duration hiker, and c) the "end-to-ender".

The day user may be attracted to the Trail simply due to residence in its proximity, or by some visit to a day-use facility such as a State park. A short walk or picnic may be his goal, or access to some amenity such as a good fishing spot or fine view.

The short duration hiker may make frequent excursions along the trail for weekend or week-long hikes. He is likely more cognizant of the challenges of the Trail, and may be striving for distance over time, or eventual hiking of the entire Trail by pieces. He is schooled in the hardships of Trail life, accepting inclement weather, sore feet and dry throat with empty canteen. His objective will generally be the hike itself, and not the use of any particular resource such as a lake or mountain-top outlook.

The "end-to-ender" may be engaged in a once-in-a-lifetime endeavor. He will often make meticulous plans for equipping himself along the way, with supply drops at local post offices, or at agreed-upon locations where friends and relations can gain access by car. The challenge of a Maine-to-Georgia hike has inspired him to arrange for an average 5-month period free from outside obligations. Contrary to what might be expected, he will often be a gregarious individual, who will welcome companionship along the way, and will speak of the restoration of feeling for humankind that the Trail has inspired. He is often literate and well-educated, maintaining meticulous notes

on his exploits, and able to write amusingly of his adventures and trials. The quiet sense of achievement at Trail's end may be matched only by the desire for some new challenge to his endurance and abilities. The heat, rain, snow, and pain of the Trail become part of the treasured memories of a vigorous and optimistic adventure.

Comparative Use

There is no specific data on the numbers of hikers using the Trail. The "Appalachian Trail Comprehensive Plan" prepared by the National Park Service in 1981 provides some significant insight.

"The Appalachian Trail provides a premier long-distance hiking opportunity which gives the Trail its unique character. However, most visitors are short-term hikers; only about 100 "end-to-enders" hike the entire length of the Trail each year. The pattern of heavy short-term use -- day hikes and backpack trips measured in days rather than months -- dictates careful balancing of the needs of the less experienced hiker with those of the long-distance hiker.

2000-Milers\*

From 1936 to 1969 only 50 people hiked the entire A.T.

1970.	10
1971.	23
1972.	35
1973.	88
1974.	71
1975.	69
1976.	92
1977.	60
1978.	77
1979.	115
1980.	118

\*Figures include only those hikers who reported their accomplishment to the Appalachian Trail Conference. They reflect hikers who walked the Trail over a number of years as well as those who accomplished the feat in one season.

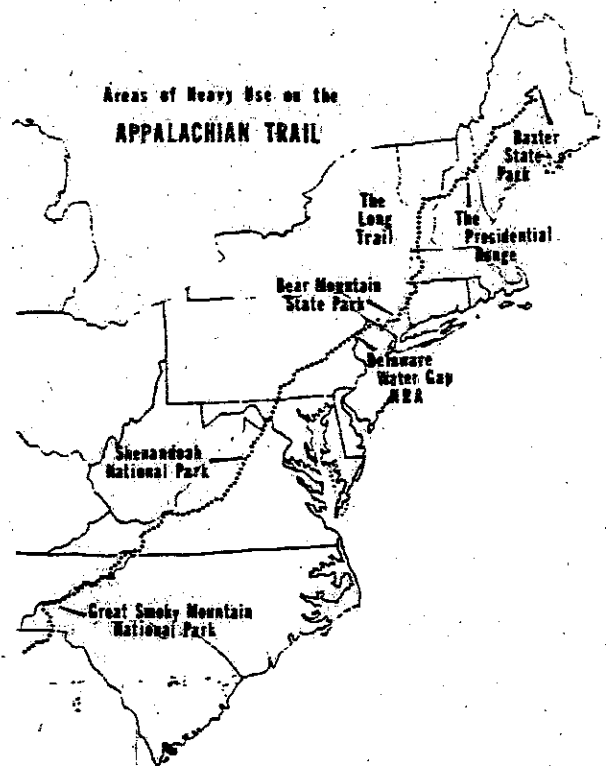
Given the spectrum of use, a total figure for use of the Appalachian Trail is neither easy to come by nor would it be particularly helpful. On the low end we have the numbers of end-to-enders (above); on the high end, we have the national and state parks and forests where visitors can step from their cars to walk briefly on the Appalachian Trail as it crosses a road or parking area. In Great Smoky Mountains National Park (with 8 million recreational visitors in 1980), White Mountain National Forest (2.8 million), Shenandoah National Park (1.8 million), and Bear Mountain-Harriman State Parks (1.9 million in 1979), the Trail is easily accessible from an automobile, and figures from these areas of "those who walked on the Appalachian Trail" could give an inflated view of Trail use. Between these extremes we have hikers (undoubtedly numbering in the millions) whose walks on the Appalachian Trail range from a few hours to a few months.

A great majority of use occurs from late spring through October; however, use during other months is increasing everywhere along the Trail.

#### Use of the Trail

No figures are available for "number of hikers using the Appalachian Trail", except for very short segments. The number of access points, and 12-month use in some areas, makes counting of hikers difficult; the varieties of use (ranging from hikes of a few hundred yards to journeys of the entire 2000 miles) make a single figure for Trail use of dubious value.

Areas which have been identified by local managers as enjoying heavy use are indicated on this map.



With the improvement in Trail quality resulting from the current protection program, and the emerging pattern of closer-to-home vacations, future use will probably be heavier on some sections of the Trail. However, the recent trends for both backpacking and use of the national parks indicates that the dramatic increase in hiking and backpacking of the 1970's has tapered off.\* Predictions for future use levels for the AT should take into account these opposing trends.

Access to the Appalachian Trail has traditionally been unrestricted for hikers, and freedom of use will continue along most of the Trail. The only exceptions are in Great Smoky Mountains and Shenandoah National Parks, certain designated Wilderness Areas, and Baxter State Park, where requirements for an overnight camping permit (in order to preserve the resource) effectively limit daytime use. In these cases, special attention to the needs of through-hikers is given. Formal access to the Trail is provided through side trails and trail-heads designated in local management plans; not all roadcrossings of the Trail are designated access points, and not all access side trails are on public land.\*\*

Though attendance at parks and forests may give an "inflated view of Trail use" as noted above, the following can give some understanding of relative use of the New Jersey segment, (compare our 300,000 day visitors to the 2.8 million in southern and northern areas such as Smoky Mountain and White Mountain, or with the 1.9 million in more proximate Bear Mountain-Harriman State Park, NY).

\* Scardino, et. al., 1980. Forecasting Trends in Outdoor Recreation on a Multi-State Basis. Paper given at National Recreation Trends Symposium. National Parks Statistical Abstract. 1979. USDA-Forest Service. 1980. An Assessment of the Forest and Range Situation in the United States. (RPA)

\*\* "Appalachian Trail Comprehensive Plan" Appalachian Trail Project Office, National Park Service, Harpers Ferry, W. VA., 1981.

The attendance of the five parks and forests traversed by the Trail in New Jersey:\*

	<u>1982</u> <u>Day Use</u>	<u>1982</u> <u>Overnight</u> <u>Use</u>	<u>1981</u> <u>Day Use</u>	<u>1981</u> <u>Overnight</u> <u>Use</u>
<u>State Forests</u>				
A. S. Hewitt	5,614		6,106	
Stokes	331,961	53,702	243,111	53,759
Worthington	74,891	29,629	65,788	25,582
<u>State Parks</u>				
High Point	348,014	34,386	278,146	61,940
Wawayanda	106,584	2,142	114,296	1,756

\* NJDEP, Division of Parks and Forestry, State Park Service.



CONTEXT OF PRIOR STUDY

Flooding

Flooding in the Wallkill River Drainage Basin, most especially north of the NY/NJ state line, has been of substantial concern for many years. The "Black Dirt" area is a major agricultural resource which includes a portion of the Wallkill Basin in Sussex County, NJ (Project Site - Wallkill crossing) and Orange County, NY. The area produces crops predominantly of onion, sod, lettuce and celery, and local production of these goods is considered to have a moderating influence on local prices.

Flood damage to these crops has been considerable, and thus considerable attention has been paid to the means of mitigating against future damage. The Black Dirt area has been subjected to serious flooding 15 times since 1927, one of the earliest events (July 1928) occurring at the height of the growing season, and causing estimated damages of \$1,622,000 both crop damage and structural damage. Disaster status was declared in August 1955 when the flood of record caused damages estimated at more than \$4.5 million. Again in 1972 a storm modest in terms of discharge occurred when high-value crops were exceptionally susceptible to flood damage, a combination of factors which caused crop and structural damages totalling more than \$12 million. Local farmers have been reported to say that the frequency of damages is increasing, now occurring every year or two, making it increasingly difficult to stay in business.\*

The frequency of damages and seasonal susceptibility has resulted in Federal concern, and in study by the US Army Corps of Engineers. In 1976, Congress authorized a project to reduce flood damages in the Black Dirt area, and on-going study has

\* "Draft Phase I General Design Memorandum, Local Flood Protection Project Black Dirt Area, Wallkill River Basin, Orange County, NY" US Army Corps of Engineers, July 1981.

produced substantial data with regard to the basin. Publications are tabulated in the Appendix.

The stretch of river within which the Wallkill River crossing is located has been a part of the studies conducted by USACOE. For this particular reach, Wallkill River from Hamburg, NJ, to the NY/NJ boundary, it was concluded that annual costs of flood protection, in part due to the dispersed location of damage centers, would exceed the annual benefits of protection. The studies did suggest, however, that protection of the Black Dirt agricultural areas in immediate proximity to the River might show a positive benefit/cost ratio.\* Taken as a whole however, with consideration that no major flood damages have occurred since 1955, no federal flood control measures were recommended.

#### CONTEXT OF INFRASTRUCTURAL PLANNING

##### Water Supply

During USACOE study of the Basin's needs, the Sussex County Municipal Utilities Authority requested the Corps to investigate the feasibility of a multiple-purpose reservoir to be located in Vernon Valley on Pochuck Creek (Project Site - Pochuck Creek crossing). The concept consisted of a dam located near the NY/NJ boundary creating a reservoir for water supply, hydro-electric power, and water-related recreation, with the added benefit of greater flood control protection in the Black Dirt area downstream.

Preliminary investigations revealed that rapid growth of the area was bringing to bear greater pressure for a regional sewer system and treatment facility planned in this valley, and further study of the reservoir concept was halted by

\* Ibid.

resolution of the Sussex County MUA, in August 1976. While this regional sewerage system has not been pursued (refer to Sewerage, below) further interest in the reservoir has not been forthcoming.

#### Sewerage

The Sussex County MUA has received funding for a 2.5 MGD Sewage Treatment Plant to be located at the uppermost reaches of the Wallkill River, just west of Hamburg. The service area of that Plant will not extend to the site of the Wallkill River crossing. Capacity of the STP is sized for anticipated populations to the year 2000.

While such a regional system, located in a presently rural area, can often be a spur to new development, thus encouraging growth of the Wallkill River area, the real constraint on growth of this region is generally considered to be the lack of proximity to employment centers. The rapid rise in gasoline prices has made this area less desirable for full-time residence, as the trip to work becomes increasingly expensive. In conjunction with the recent recessionary trend, this has led to a marked decline in new home sales and housing starts in the area. Without some change in the employment base, it can be said that the new sewage treatment plant should have slight effect on the rate of growth of the area.

The STP will discharge effluents directly into the Wallkill River. Contemporary standards for maintenance of ambient water quality have dictated a system design of advanced secondary treatment with Nitrification, intended to minimize impacts on vegetative growth and native biota. Stream modeling demonstrating the effects of discharge has shown dissolved oxygen recovery sufficient to maintain aquatic life, with full recovery about 4 miles downstream after confluence with the Papakating, upstream of the Wallkill River crossing.

The Pochuck Creek drainage basin was considered at one time as part of a planned Vernon Valley regional sewerage system. That plan has for the most part been abandoned. The Vernon Valley recreational areas will be serviced by the Wallkill system, and there are presently no concrete plans for central sewerage in the area of the Pochuck Creek crossing.

## UNAVOIDABLE IMPACTS AND MITIGATING MEASURES

Completion of the Trail realignment by construction of the proposed two bridges will have nominal regional impacts, and impacts will for the most part be limited to recreational factors, short-term construction effects and impacts of elevated approaches.

### Recreational

Any trail, especially where water features are included, will enjoy a certain popularity for day-use. While the intention of The Appalachian Trail is most predominantly for the overnight hiker, the new access could in fact generate some new day use such as walking and fishing. Roadside parking could occur at proximate locations. This roadside parking, as at many points along the Trail, could be accommodated, if desired, by dirt or gravel turn-outs and noted as Trail access points in Trail manuals. Day use will not likely be excessive, as in High Point State Park, where heavy day use can become a problem due to heavy use of the Park.

Canoeing along the Wallkill and Pochuck is also popular. The proposed bridges should be raised to such an elevation as not to impede canoe passage during normal stream flow. Changes to the aesthetic experience of the canoeist are minimized by the proposed simple design of the chosen bridge.

### Construction

During construction, stream embankments will be disturbed by construction activities. Increased turbidity and sediment loading would result from excessive disturbance. Wherever feasible, disturbance should be limited to the immediate area of construction, as around footings, and footings should be set back from stream embankments.

All access routes should be selected to minimize damage to natural surroundings; this is especially critical as the finished Trail is intended for access to natural areas. Wherever wooded areas must be crossed, a path minimizing tree removal and regrading should be selected. Existing farm access roads or lumbered areas should be utilized wherever feasible. Any trees and shrubbery removed should be hauled off-site.

Excavation should proceed with care to maintain the natural stream channel and to disturb as little as possible the natural embankments and embankment vegetation. Should disturbance occur, jute matting should be used to stabilize slopes until such time as stabilizing vegetation can be reestablished. Construction of footings in a location removed from stream embankments, as proposed by Project Engineers, will also avoid scour and erosion around the finished abutments.

Where water table is encountered, a silting basin should be provided for water pumped from the excavation. A silting tub is preferable to a silting pond, as it will require less disturbance of natural conditions.

After completion, all disturbed areas should be dressed and seeded with native grasses such as *Andropogon scoparius* - Little Blue-stem, and *Agrostis alba* - red top. All debris should be removed from the site and access roads. Any fill trucked into the access roads along with any bank-run gravel, must be removed, and disturbed routes seeded with native grasses.

Project timing should avoid the months of December to March in order to minimize risks of flooding during construction. Should delays of bridge construction be encountered, all disturbed areas should be stabilized with annual rye grass. With timely completion, stabilization may occur following finegrading. Any soil erosion and sedimentation control measures such as hay bale filter berms, should be in place prior to excavation.

The results of Archeological investigation are pending. During construction proceedings, added attention should be given during excavation in order to avoid disruption should artifacts begin to be uncovered.

Backwaters created by the proposed bridges will be nominal given the flatness of surrounding fields. On overflowing of embankments, waters will inundate the surrounding fields without direction against bridge abutments or associated backwaters. Properly engineered footings will ensure the stability of the structure during extreme flooding and eliminate any potential for downstream damage by the structures' being swept away by floodwaters. Noise impacts by construction activities will be short-lived and minimized by the very nature of this rural area of limited and removed habitation.

Wildlife habitat in the construction area will be disturbed during activities. Short-term disruption will require that any species in the immediate area of the site must relocate elsewhere for shelter and security during Project activities. Species which are shy of man's presence, even as a pedestrian, may alter territorial habits permanently. No disruption of migrating patterns for large game species, however, should be expected. Restoration of vegetation as above will restore the physical habitat for repopulation, as well as for habits of feeding, watering, and territory determination.

#### Elevated Approaches

Elevated approaches to the stream crossing may be necessary only for the westerly approach to the

Pochuck crossing. The Appalachian Trail Conference and other agencies involved must consider three options:

1. No raised approach
2. "Bog bridging" or "Puncheon" approach
3. Gravel/Porous Fill

1. Without raised approaches more frequent detours by AT hikers will be necessary during storm events. The hiker would most likely use the paved route presently utilized. This option would prove the most "natural" as the hiker will make his way along a path at grade through open wetland meadows. Some stabilization of this path would be desirable, however, as frequent use and occasional inundation will wear away surface soils.

2. Bog bridging commonly consists of telephone pole runners connected to pole footings in sections of three feet. Inasmuch as the westerly approach to the Pochuck could be as extensive as 1000 linear feet, this could prove to be a costly option. This option however would eliminate continual wear on surface soils and would also discourage side trips into wetland vegetation by strongly delineating the accepted footpath. The path planking would be more visible than option 1, but the wood planking is not considered aesthetically objectionable and is suitable for access in a parklike setting. The bridging also is not considered disruptive of wildlife habitat.

3. For use of fill a disturbed area of 12 feet in width would be required for 2 feet depth of fill, with 2:1 side embankments. A disturbed area of 16 feet in width would be required for 3 feet depth of fill. The disturbed area is thus 3 to 4 times the width of the 4 foot treadway achieved. Use of fill in a wetland



would also require U.S. Army Corps of Engineers review and approval. This option would thus maximize disturbance while adding to the administrative difficulties of project implementation.

It can be concluded then, that where required, the bog bridging would achieve the purposes of elevated approach, with minimal environmental impact. For cost factors, the bridging may be limited to those areas most easily impacted by foot access; areas with seasonal high water table at surface, or alluvial soils with shallow depth to water.

### CULTURAL RESOURCE DISTURBANCE

Review of prior studies of the Wallkill River Basin reveals that the basin has been found to have sites of Indian occupation as well as other elements of cultural significance. Flood control reports by the US Army Corps of Engineers have included substantive findings within the Black Dirt area. Though the main focus of past studies for the most part has been on the Wallkill River downstream (north) of the NY/NJ state line, the characteristics of the basin have been defined generally as follows:

"Local areas of known aboriginal occupation have been found in the flat, marshy, central portions of the basin. These sites have been located on higher ground adjacent to the "Black Dirt" area. Artifacts recovered from the lower Pochuck Creek area showed many different cultural affiliations extending from late Archaic to late Woodland times. In addition, the swampy condition of the "Black Dirt" area has made it a source of mammal megafaunal remains including such animals as mastadon, Pleistocene moose, elk and caribou. In the Goshen vicinity, the Dutchess Quarry Cave Site, containing Paleo-Indian remains from Archaic to late Woodland times, is on the National Register of Historic Places.

Sites of historical interest in the Wallkill River Basin include the Elias Van Bunschoten House in Sussex County near Sussex, New Jersey. Also included are the historic track and 1841 Goshen Court House in Goshen, New York and the Johannes Decker Farm and Locust Lawn Estate near the Town of Gardiner, New York. The Jean Hasbrook House, the Huguenot Street Historic District and the Lake Mohawk Mountain District, all located in or near New Paltz, New York, are also of historic significance. All of the above sites are on the National Register of Historic Places."\*

It is these characteristics which have prompted a close examination of historical records as well as provision for future sampling on-site. While it has been found that colonial inhabitation of this area was minimal and substantial agricultural activity

\* "Review of Reports for Flood Control, Wallkill River Basin, New York and New Jersey", US Army Corps of Engineers, July, 1982.

did not begin until 1860, the potential for native American or other cultural artifacts does indeed exist. Arrangements have therefore been made for field sampling by a professional Archeologist. Upon finalization of the access agreements which are necessary for the Project Engineer's soil borings, the Archeologist will perform hand auger borings and shallow surface explorations seeking evidence of colonial or Indian occupation. Appropriate design responses will be considered following the results of these explorations.

### AESTHETIC IMPACTS

The Wallkill River, at the location of the proposed bridge, is within a remote area, visible only from the adjoining farmland to the south. Wooded areas to the North and East screen the site from any adjoining roadways or residences. Visual access can be gained by the boating enthusiast (canoe, rowboat) who makes use of the river for touring or fishing. The Pochuck Creek crossing is located within vegetation surrounding the Creek beds, visible only in immediate proximity, or on close visual inspection from a distant subdivision or farmland. Again, the bridge will be visible to boaters.

The simplistic truss bridge is reminiscent of country road one-lane bridges found on many rural back roads. A weathered finish will be achieved shortly after construction. The weathering and aging process will soon lend an appearance of maturity compatible with the surrounding natural setting.

An alternative approach might be the attempt to construct a bridge of antique appearance. A structure of heavy timbers, rough logs, and sturdy railings would have to be assembled on-site. The effort could prove difficult, however, as such timbers as used in the past are no longer available and would have to be custom-milled or obtained by removal from some other historical structure. Contemporary standards of footing design would require some masking of contemporary elements or a simple recognition of necessary inconsistencies. Finally, such a treatment must be carefully handled by artisans in the field to ensure the proper finished appearance.

Another alternative would be use of a simple suspension bridge. Such a treatment is used on the Mill River Bridge along the Appalachian Trail in Vermont. Across a deep ravine, cables

are strung from uprights on opposite shores. Cross-beams and planking serve as the floor of the bridge and the cables also serve as floor support and handrails. The lightness and airiness of this treatment shows a strong consciousness of the elevated nature of the bridge, and the bridge demonstrates a fitness for its site. Crossing a deep rocky ravine in rolling woodlands, the bridge design blends nicely with its surroundings. A cable treatment is also utilized in the suspension bridge over Mill Creek, AT, Georgia, though with a more strictly functional appearance. Metal uprights and cabling support the bridge floor in a woodland setting.

The setting for the Wallkill and the Pochuck is a low flat valley of farmland and woods. The streams during most of the year are slow moving bodies of uninterrupted waters. In the opinion of this writer, while simple and functional, the cable suspension bridge in this lowland setting lacks some of the solidity and fitness to the surrounding bottomlands which a clear-span truss bridge can offer.

A final alternative might be a rugged woodland wilderness bridge, with an appearance of being hastily constructed by country laymen. Such a footbridge can be found over Laurel Fork, AT, Tennessee. Rough-sawn and full-round logs are used as planking across timber beams. Tree branches are lain as a toe-railing along the outside of the planking. Two simple rough timber posts support a loose cable handrail along one side of the structure. While this treatment is perfect for the back woods wilderness setting of the Trail in certain locations, it lacks some of the permanence desired for Wallkill/Pochuck crossings. Also, with the day and weekend use possible given the ready access of this portion of the Trail, a sturdier and safer structure is desirable. Finally, the prosperous farmland setting calls for a more refined treatment at this location.

Thus while each bridge type is suitable in its own way, the truss bridge can be a fitting response to the environmental setting of the sites. Weathering effects on the bridge will, in the opinion of this writer, create a bridge suited to its mixed farmland/woodland setting, and a bridge which will not be disruptive of the aesthetic experiences of recreational users, both hikers and boaters.

### CONSTRUCTION DISTURBANCE

Construction is expected to occur in the following sequence:

Access routes to all embankments will be selected by the Project Engineer. A bulldozer will be utilized to clear finished routes for construction machinery to follow. Trees will be removed, low wet spots will be filled, and abrupt elevation changes leveled. Bank-run gravel may be required to sufficiently stabilize any areas where alluvial soils provide insufficient support. Each access route will have its own difficulties and requirements.

Following access completion, a rubber-tired backhoe will proceed to the site under construction, and begin excavation for footings. As of this writing, the footings have not been designed; however, a 10x8' footing would require possibly a 12x10' excavation of 6' in depth. It is the intent of the Project Engineer to begin excavation 5' back from stream banks to avoid disturbance of the naturally-stabilized banks. No blasting is expected to be required for rock excavation.

Should water be encountered in excavation, that water must be pumped out for subsequent construction. Timber forms will be constructed for forming of concrete footings, and a concrete truck will proceed to the site to deliver its load of concrete. Workers will provide all surfaces with a finished appearance by dressing and treating. All connectors for bridge fastening will be firmly embedded in the footings. Excavated material will then be backfilled around the footings.

At completion of footings on both opposite embankments, bridge sections will arrive at a staging area, likely off-site, for assembly. Once assembled, a track-mounted crane will transport the bridge to the site of the footings, lower into place, and

workers will attach firmly onto footings. The site will then be finish-graded, and construction is complete. Construction should be under way for a period of no more than two weeks. Reference should be made to Unavoidable Impacts and Mitigating Measures above for discussion of disturbance relative to impacts.



SHORT-TERM BENEFITS VS. LONG-TERM PRODUCTIVITY

The immediate benefit of bridge construction will be the completion of the realignment of the Appalachian Trail. The health and safety benefits to hikers as discussed above will be relief of excessive footwear, improvement of aesthetic experience, and relief from exposure to blacktop during hot weather.

Commercial interests in Unionville, NY which presently service hikers as they travel the Trail will be unaffected by bridge construction, as access to Unionville will be identical following completion of the realignment. The same is true of commercial interests in Vernon at the northern end of the realignment. Both Vernon and Unionville are noted in Appalachian Trail guidebooks as sources of services, supplies and accommodations, and both will continue as such after completion of bridge construction.

The recreational benefits of a completed protected, pedestrian corridor are permanent. As spot building or subdivision development occurs along existing roadways, the Trail will continue as a preserved pedestrian link with State open space such as Wawayanda State Park and High Point/Stokes with sufficient corridor width to ensure buffering of new development.

The long-term productivity of surrounding lands as farmland will be unaffected by Trail completion as represented by bridge construction. As a location for new residential homes, the land will be enhanced by the completed continuous pedestrian corridor and consequent access by foot to many recreational resources such as swimming and boating (Wawayanda State Park), fishing (Wallkill River, Pochuck Creek), hiking and site-seeing (High Point, Stokes). While not intended primarily for day use, such use can be a secondary benefit, as with the Trail in Wawayanda and High Point, where day use can be exten-

sive. As a general rule, however, day use should not be encouraged, as it can lead to over-use and abuse of the Trail. The question whether bridge completion will encourage day-use is difficult to assess, but at this time, the rural character of the area, and overall absence of wide-spread public knowledge of the amenities of the Trail, would lead to the conclusion that a minor amount of day-use will be encouraged, and that over-use will continue to be limited to those areas which already experience and encourage day use, such as in the state parks.

## ALTERNATIVES

Few alternatives to a bridge are possible given the character of the channels of both the Pochuck Creek and the Wallkill River. The width of the streams makes other alternatives unsafe or at best, temporary in nature.

### Catwalk

Simple catwalks are often used for brook crossings along the Appalachian Trail. They can consist of, for example, two log or telephone pole spans on a telephone pole "footing", with 2x6" planking. This type of crossing is found on the Appalachian Trail just west of the last westerly stretch of realignment, where the Trail crosses a small brook before intersecting NJ Route 284.

The catwalk is appropriate to crossings of channel widths of possibly 25' as in the above. However, where channel spans of 120 feet (Wallkill) and 60 feet (Pochuck) are needed, a more structural solution is required. Also, the flooding which occurs in both streams will, even following moderate-frequency storms, straddle the catwalk. In such an instance the catwalk could simply float away, or be subject to damage from floating debris. The flooding experienced in these two valleys requires bridges with substantial footings and sturdy construction.

Direct impacts under this option however, would be dramatically reduced. No heavy construction machinery would be needed and consequently no access roads need be cleared and improved. Additionally, no footings would necessarily be called for and therefore no excavation along stream lands would be required. Visual character of the catwalk would be much less evident than the prefabricated bridge. The necessarily low profile of the bridge, however, could interfere with the passage of canoes, and thus with

the enjoyment of those recreational users.

#### Alternative Pre-Fabricated Bridges

A variety of pre-fabricated bridges are available on the market. The bridge chosen was selected for simplicity of design and low maintenance requirements. It is a simple truss bridge, functionally formed, and painting is not required, for all exposed metal surfaces oxidize for a clean rust surface. It is considered suited to the use and requirements of maintenance personnel. Other bridges of wood would require more consistent maintenance and, it is felt, would not prove as durable.

The means of construction and delivery for alternative bridges would be similar (footing, crane delivery, bolted-in-place). Thus the impacts of other pre-fabricated bridge types would prove similar.

#### Constructed-in-Place

The proposed crossings could be made by bridges constructed on-site. The consulting engineer's evaluation of costs has shown this to be a more costly approach, and he has opted for a pre-fab structure, subject to the review and approval of NJDEP. While footing construction for this alternative would also require construction machinery access, as with the pre-fab alternative, the lift machinery (cranes) for the pre-fab may require more clearing for construction access, with more required care to minimize access-road disturbance during construction.

With efficient delivery and a Project Supervisor who is cognizant of the final purpose of the Trail as a natural corridor, access road recovery can be comparable for in-place and pre-fab construction.

However, this alternative could represent an option of minimal off-site disturbance. Should footing construction be possible without heavy construction machinery, no access road need be improved. The minimal disturbance of a staging ground at the site of the bridge could be quickly stabilized, and recovery would be rapid. This treatment does present difficulties in erection; all equipment would necessarily be hand-carried or delivered by vehicle suited to off-road usage.

#### No-Action

The Appalachian Trail hiker, in certain points along the Trail, is required to wade or make his way across-stream as best he can. This is not considered desirable in this instance. Spring and fall are the heavy use periods for the Trail, and spring floods are frequent for both crossing locations. High waters in the stream would frequently make them both impassible during their periods of greatest use.

During especially low-frequency, high-discharge storms, when both valleys are completely inundated, it is anticipated that the hiker will be required to make his way by road, as in the existing non-realigned trail, or to wait out the subsidence of floodwaters. The short-duration hiker (weekend) will in many cases not pursue his hike during such weather. During high-frequency low-discharge storms, however, the no-action alternative would still disrupt the average hiker, or make his crossing unsafe. For these reasons, the no-action alternative is not considered a viable alternative.

CONCLUSION

The proposed construction represents minimal disturbance of environmental resources, most notably stream embankments. Secondary impacts such as construction access roadways, can be renovated to restore existing character. Measures to minimize impacts of disturbance are available to project developers, and should be included in engineering plans for the project. Development as proposed will not result in appreciable harm to the natural environment, nor will it place excessive demands upon the existing land and water resources.

LICENSES, PERMITS, AND OTHER APPROVALS

STREAM ENCROACHMENT PERMIT

N.J. Department of Environmental Protection.

GENERAL PERMIT

U.S. Army Corps of Engineers.

DOCUMENTATION

- "Forecasting Trends in Outdoor Recreation on a Multi-State Basis". Paper given at National Recreation Trends Synopsium. Scardino, et al., 1980.
- "Hiking the Appalachian Trail", James R. Hare, Rodale Press, Inc., Emmaus, PA 1975.
- "Black Dirt Area, Walkill River Basin, Orange County, NY., Local Flood Protection Project, Draft Phase I, General Design Memorandum" US Army Corps of Engineers, July 1981.
- "Review of Reports for Flood Control, Walkill River Basin, New York and New Jersey", US Army Corps of Engineers, July 1982.
- "Appalachian Trail Comprehensive Plan" Appalachian Trail Project Office, National Park Service, Harpers Ferry, W. VA., 1981.
- "Draft Phase I General Design Memorandum, Local Flood Protection Project Black Dirt Area, Walkill River Basin, Orange County, NY" US Army Corps of Engineers, July 1981.
- "Guide to the Appalachian Trail New York and New Jersey", 9th ed., Appalachian Trail Conference, 1983.