Chapter 10

A New Park on the Delaware

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I. THE HEYDAY OF THE WATER GAP

From the coming of the railroad in the middle 1800s to the Great Depression of the 1930s, the Delaware Water Gap was a thriving resort. Summer after summer, families from New York and Philadelphia, with their Gladstone bags and wicker baskets, flocked to its hotels and boarding houses. By 1930, just before the precipitous decline, there were twenty hotels in the vicinity of the Water Gap itself and dozens of smaller establishments strung out for miles along the river upstream.

One of the earliest, and ultimately largest, hotels was Kittatinny House, which was situated on the Pennsylvania side just upstream from the Water Gap on a plateau 80 feet above the river and athwart a mountain stream that ran down from a scenic pond called Lake Lenape. At one time the stream ran right through the kitchen, where it was used for cooking and washing. As demand grew, the Kittatinny House was joined by other hotels. On a high ledge just behind it was built the Water Gap House, the plushest of them all. On the river itself, the steamboat, "Kittatinny" churned up and down on a three-mile run within and below the Gap. The more fashionable places were often graced with celebrities—Civil War generals, politicians, and, later, movie stars. The latter were sometimes there on business, actually making movies. By the standards of the day, a great variety of movies could be set against the Water Gap's scenery with sufficient plausibility. Among those made there

were hillbilly comedies, Perils of Pauline serials, and even Tom Mix westerns.

The river and adjacent lands north of the Water Gap and west of Kittatinny Ridge, where the Tocks reservoir would be situated, forms a natural province, which the Indians called the "Minisink." In a guidebook[1] published in 1870, Luke Brodhead, whose family owned two of the Water Gap hotels, and whose family name is attached to the largest local creek, describes the Minisink as follows:

> The forty miles of the course of this stream along the base of the mountain from Port Jervis to this place, is unsurpassed in the variety and beauty of the pictures it presents; and taken in connection with the fine character of the carriage roads, the numerous waterfalls adjacent, there is not perhaps a more desirable drive of the same extent along any river in the country.

The Minisink scenery had been valued for generations. In the early days, Durham boats, poled by hand, and rafts of logs coming down on the spring freshets often carried passengers for the pleasure trip. Inns along the bank catered to the raftsmen and their guests. Then, as now, bridges were few: overland travelers were pulled across the river on hand- or current-driven ferries in return for a small toll, and many of the ferrymen's names are still on the map.

In 1860 the beauty of the Minisink inspired an ambitious attempt to establish a steamboat line all the way from Belvidere, just below the Gap, to Port Jervis, 40 miles above. Despite the rocks and shallow water, the project was deemed feasible and a steamboat specially designed for the run was actually built at Easton. Unfortunately, this boat, the "Alfred Thomas," never survived its maiden voyage. As the new steamboat, loaded with dignitaries, plowed up the river to cheering crowds on the banks, the engineer, in his enthusiasm, "ran the pressure of steam up to 125 pounds to the square inch, when it should not have exceeded 80—the consequence of which was the explosion of the boiler."[2] Thirteen people were killed and no further attempts to extend steam navigation to the Minisink were made.

Although the Water Gap in its heyday reached to the social pinnacle, not all its visitors were rich. Nearby villages contained many humble boarding houses, and upriver in the Minisink a number of farmhouses took in guests of modest means. Most visitors came in family groups and returned to the same places year after year.

The railroads, whose advent in the middle 1800s made the Water Gap into a resort, provided not only transportation, but part of the entertainment:

> The Belvidere, Delaware and Flemington Railroad passes for the whole distance, from Trenton to Manunka Chunk, along the bank of the Delaware River, and one's eyes seldom look upon a more enchanting series of landscapes than stretches along this river, in one long and varied line of beauty, from New Hope and the Nockamixon Rocks to the Delaware Water Gap. The road possesses the reputation of admirable management, of which its cleanly and comfortable passenger cars give good evidence.[3]

Trains and vacations soon became inseparable concepts, and resorts and railroads became partners in promoting business. Just as Luke Brodhead was kind enough to give a railroad a plug now and then, as in the passage above, so the railroads were kind enough to run vigorous advertising campaigns promoting the Water Gap. This happy symbiosis endured for many decades.

But the railroads exacted an environmental toll, to which Luke Brodhead was not insensitive, despite the fortune the railroads brought to his family's hotels:

> The railroad, though a great improvement over the old method of reaching the Water Gap by stage-coach, has nevertheless made some innovations upon the primitive beauty of the place, that are not pleasant to contemplate: besides destroying that charming walk once studded with sycamores, free from underbrush and turfed with green, situated between the base of the cliff on which the hotel rests and the river, which the earlier visitors delighted in calling "Love Lane," it has forced the carriage-road so far up the ravine at Rebecca's Bath, as to destroy much of its former beauty, and caused the demolition of many grand old trees, under whose shelter passed the carriage-road of former days.[4]

The automobile, aided by the depression, brought the railroad-resort system to an end in the 1930s. Within a decade most of the big hotels had been destroyed by fire and neglect. Now, 40 years later, after traffic, air pollution, energy shortages, and further innovations upon primitive beauty that are not pleasant to contemplate, the old system is regarded by many people with strong nostalgia. One person whose regard for it goes beyond nostalgia is a man named Tom Taber.

Tom Taber is a peppery gentleman of 75 who has been urging New Jersey railroads to restore passenger service for two decades. He especially wants to see excursion trains running to the recreation areas—to the Jersey shore, to the Water Gap, to the Poconos. Restoration of recreation service, he feels, is a logical first step toward a general revitalization of all passenger service.

Although Tom Taber has never worked for a railroad, he knows every inch of track in the region and most of what has gone on in

regional railroading during the last hundred years. He is currently putting some of it down in a history of the Lackawanna Railroad. His office, packed with memorabilia, is right on the platform of the Madison, New Jersey station. When a train pulls in, he glances automatically at the clock. Following is some of what he said recently about the time, not so long ago, when railroads were vigorous enterprises:

"The Lackawanna was ambitious, but couldn't compete in speed with the New York Central and Pennsylvania, because their main line to Buffalo had the worst hills to go over. The Lackawanna had to have something to talk about, so they offered anthracite coal (which was clean) plus scenery in the Poconos. To promote the cleanliness they had a young woman, stage-named Phoebe Snow, who rode the trains in a spotless white dress. Everyone knew the jingles about her:

> When Phoebe Snow sets out to go
> From New York City to Buffalo
> All dressed in white
> She travels right
> Upon the Road of Anthracite.

At one time the name Phoebe Snow was considered as imperishable as Bon Ami, Kodak, and Coca-Cola. The jingles were endless and spawned hundreds of unprintable satires. . . .

"Anthracite didn't produce any real smoke—all you saw was a bluish-white haze above the stack. During World War I, all the anthracite was requisitioned for ships—the submarines looked for smoke in those days—and the anthracite railroads had to switch to soft coal. Phoebe's white dress was promptly replaced by an olive drab uniform. . . .

"In 1949 the Lackawanna established a train through the Water Gap to Buffalo and Chicago named after Phoebe Snow and it ran until the Erie merger in 1960. Then the Erie-oriented management killed it. But when William White came back as chairman in 1963, the first thing he did was to put Phoebe back on the tracks, and she ran until 1966.

"After World War II there was an upsurge of passenger service—improved equipment, speeded-up schedules. The zenith occurred around 1950, but then about five years later the recession in passenger service began to be obvious. Now, of course, the management just doesn't want to fool with passengers. They're not even interested in running the trains they've got to Great Gorge, McAfee, the Poconos, the Shore, etc. But they could. There is ample equipment right now

sitting idle, doing nothing, from Friday evening to Monday morning. Why not send it out to those places—*do* something with it? If you suggest it to the management or the State [which subsidizes passenger service] they just huff and puff and vaguely talk about operational details. When you try to pin them down (I speak their language, they can't kid me) they just avoid the issues. The mind! The mentality! Good God, when I was a kid—why every Sunday, every railroad ran excursions all over hell's half-acre. The Jersey Central and Pennsylvania for years and years ran special excursions: Point Pleasant, a dollar a round trip; Atlantic City, $2.50; Philadelphia, $2.50; Baltimore and Washington, $3.00; Scranton and the Poconos, $2.50—*every* weekend. Mauchunk and the Switchback, Lake Hopatcong—all summer long. In the entrance to the Jersey Central Ferry on Liberty Street, there was a board at least fifteen feet long covered with one solid mass of Sunday excursion handbills printed on long narrow strips of cheap paper of various colors. Got a lot of them around here someplace. We called them throwaways. On Saturday noon after work everybody went down to see where the excursions were going. . . .

"You never heard of the Switchback? Oh my, where have you been? Gee, if that were there today it would be a gold mine. It was on the Lehigh up above Allentown. You got in a car, were pulled up to the top of a mountain on an inclined plane, then you did a free flight. Coasted downhill, around curves, here, there, everywhere. Then at the bottom, they grabbed it on a rope and pulled it up to another mountaintop. It was partly thrills and partly scenery. In those small open cars you knew you were moving. On one three-mile stretch especially, it went like a bastard. . .

"The Water Gap was a big attraction. You had a whole string of big resort hotels along the Delaware—in fact a couple of them looked right down on the Water Gap Station. Kittatinny House—a hell of a big place—looked right across the river at the face of the rock. At Stroudsburg Station (and also at Cresco and Mount Pocono) the platform was long, and each hotel and boarding house had a stage backed up there, with the driver hollering out the name of his hotel. Same thing at Atlantic City. . . .

"They could be running trains right now. Getting to Stroudsburg is a cinch—block signals all there, track's in first class shape—no excuse there. But the railroad does nothing on its own initiative. The State orders them to run this train or that train and pays them for it. The State is paying the railroad nine million dollars this year in subsidy. . .Get the State to take some action? Good God, man, did you ever go over to Egypt and try to argue with the Sphinx?"

By the early 1960s when the Delaware Water Gap National Recreation Area (which was to surround the Tocks reservoir) was conceived, a new generation had grown up with no memory of the railroad-resort system. The automobile had brought with it new styles and seemingly new imperatives. The second great heyday of recreation on the Delaware, as planned by the Park Service, was to be very different from the first. Mass beaches and campsite cities were the accepted amenities and automobiles were the accepted means of transportation. Trains were out of the question. Now, ten years later, in the midst of pollution and energy crisis, the new heyday is still on the drawing board and some second thoughts are being expressed. Is Tom Taber behind his time—or ahead of it?

II. A NEW HEYDAY ON THE DRAWING BOARD

A basic tenet of the environmentalists, virtually a cliche, is that we have been brought to our present predicament by compartmental thinking. That is, we have subdivided our problems into small pieces, and then studied the pieces as if they had no relationship to each other. The piecemeal solutions, though possibly optimal within their scope, have often created new problems outside their scope. The new problems have again been attacked in a compartmental fashion, and so forth.

Perhaps this mode of thought is inevitable, since the human mind is finite and requires boundaries and limits in order to operate. Like a flashlight it can only illuminate one spot at a time. At any rate, it is often possible, in retrospect, to see how arbitrary constraints have propagated through the stages of a complicated planning process. Such a propagation is visible, for example, in the planning for transportation of visitors to the Delaware Water Gap National Recreation Area.[a] The original planning, done under the aegis of the Corps of Engineers, is presented in House Document 522,[5] an eleven-volume work covering many aspects of the Tocks Island Dam project as well as other projects in the Delaware River Basin. Comprehensive as this document is, it inevitably has boundaries, and one of these excludes consideration of transportation outside the Park. As we shall see, this exclusion had serious consequences.

[a]The term "National Recreation Area" is used to designate parks designed for intensive use where conservation is subordinate to recreation. In a "National Park" the priorities, in theory at least, are reversed. For simplicity I will use "park" in its ordinary generic meaning to include both, and "the Park" to designate the Delaware Water Gap National Recreation Area.

The primary impetus for undertaking the study presented in House Document 522 was, of course, the bad flood of 1955, which led to consideration of a large main stem dam. But a dam large enough to control bad floods would, among other things, create a lake that could be used for water sport. The planners felt that the recreational value of the lake would be best exploited in the public interest if it were surrounded by a park or "recreation area." Thus the Park evolved as an adjunct to recreation, which in turn was a by-product of flood control.

The detailed planning of recreational facilities was done by the National Park Service and was presented in a "Master Plan"[6] published in 1966. (The general outline of the Plan is also given in House Document 522, Appendix W.) This plan provided for very intensive use. According to the Nathan Report[7] (discussed below), "Attendance estimates anticipate that the project will be the most intensively used Federal recreation facility in the United States." This seemed justified because elaborate demand studies set forth in House Document 522 had concluded that the potential demand for outdoor recreation would exceed any conceivable supply that could be provided by the Park. Thus the capacity of the Park rather than demand appeared to be the limiting factor. Nevertheless, no analysis of capacity in either social or environmental terms was done.

In round figures, the plan provided for 150,000 people at one time and ten million visitor-days per year. This very high capacity was achieved in large part by means of giant beaches, some of which were to accommodate more than 10,000 people (see Fig. 10–1). Wherever the ground along the shore was level enough or could be made level enough by means of "land sculpturing," beaches, picnic areas, and parking lots were planned. Campsites were located in great number (see Fig. 10–2) throughout the Park, and scenic roads were provided so that a great many sightseers could be accommodated simply as auto passengers. The main limiting factors in this planning appear to have been the steepness of terrain and the difficulty of internal road access. Traffic outside the Park and other outside impacts were not considered.

The beaches and picnic areas did tend to concentrate people near the water's edge, though the steeper uplands were still to be densely used. The planners tried to locate the largest concentrations near the existing roads or roadheads, notably near the Route 206 crossing at Milford and around Wallpack Bend, which is accessible by a steep road over Kittatinny Ridge at Millbrook, and at a number of points accessible from the relocated Route 209 in Pennsylvania. Since the Park was long and narrow, every internal point was close to the

Figure 10–1. Beach Scene Showing an Estimated 3,000 People
Some Tocks beaches were, and still are, supposed to hold crowds three or four times this size at a density of one person for every 50 square feet. (The density in the picture is much less than this.)

boundary and could, in principle, be reached by a short transverse access road. This was generally the pattern followed, with little provision internally for longitudinal movement. If attention is focused on the amenities of the Park, and if virtually all movement is imagined to be by automobile, then certainly minimizing internal roads with their inevitable lines of noisy, polluting, pedestrian-menacing cars is a commendable goal. But the effect of this focused attention was to displace the longitudinal movement to the external roads.[8]

Pennsylvania and New Jersey, recognizing that the project would have important effects of many kinds in the surrounding region, co-sponsored an "impact study" by Robert Nathan Associates, which was carried out in 1966, the same year in which the Park Service Master Plan was released. Nathan Associates had access to the

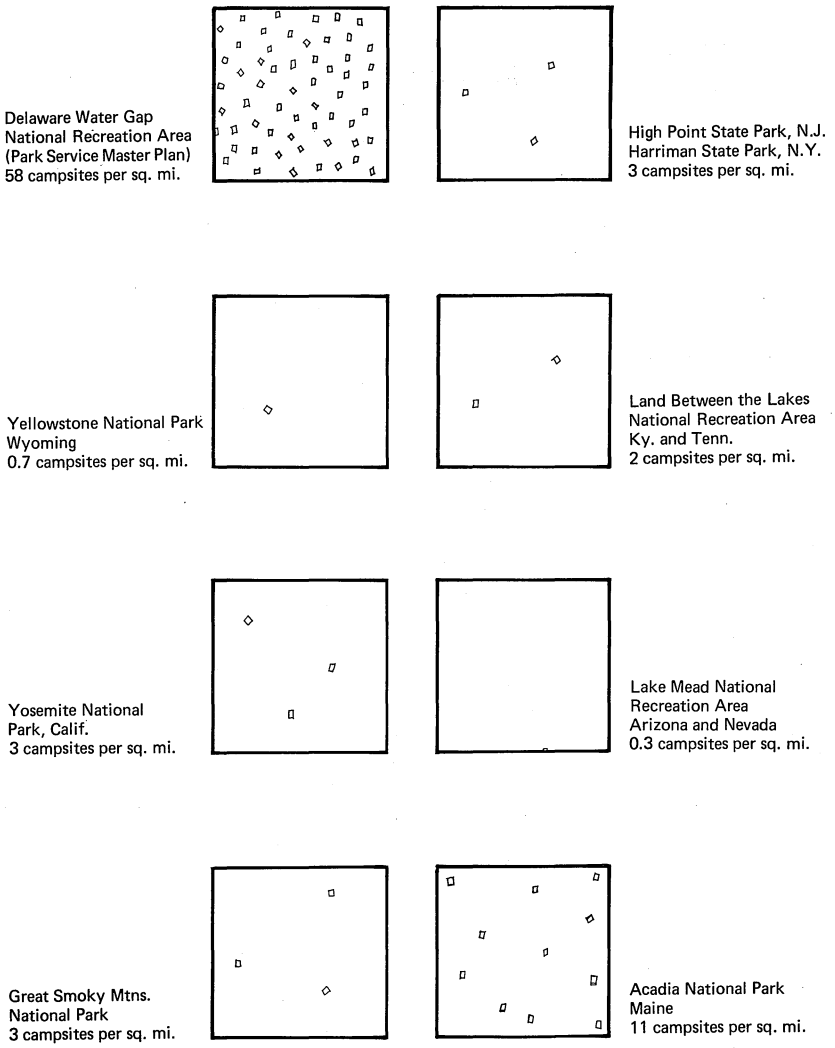

Figure 10-2. Campsites Compared to Total Park Area for Various Large Parks

developing Park Service plans and relied basically on them for the number and distribution of visitors in the Park. Nathan concluded, among other things, that

> . . .present and planned roads within the primary impact area will be unable to handle the anticipated level of traffic to DWGNRA [Delaware Water Gap National Recreation Area]. Although the high-speed express-

> ways will bring vehicles easily to the DWGNRA vicinity, a distributor system from the expressways to Park entrances and between destination areas is lacking. . . . U.S. Route 209 in Pennsylvania will evidence the most severe traffic problems, since it must also serve as the main north-south connector for the Pennsylvania Counties' general traffic. Sustained traffic volumes during summer months will be two to three times the capacity of relocated Route 209 as presently planned. Although destination areas in New Jersey served directly by Route 206 and N.J. 23 will be better able to absorb traffic demands, severe problems will occur on under-capacity roads southwest of 206. While the congestion is not expected to reduce levels of visitation substantially, it will have a deleterious effect on the environment.[9]

In view of this unpleasant news the New Jersey Department of Transportation commissioned the engineering firm of Edwards and Kelcey to make a study of the nearby roads on the New Jersey side and to recommend a specific plan for accommodating the traffic. Edwards and Kelcey, taking the Nathan impact study, the Park Service Master Plan, and the Corps' House Document 522 as given, laid out a dense network of freeways in the nearby parts of Sussex and Warren Counties.[10] They estimated the cost of this network at 680 million dollars (see Fig. 10–3). A highway impact study undertaken by the Pennsylvania Department of Transportation[11] estimated that the relocation and widening of Route 209, which was the main near-region construction occasioned by the project on the Pennsylvania side, would cost 40 million dollars. Added to the New Jersey figure this brought the total near-region highway cost to over 700 million dollars, or more than twice the estimated cost of the Tocks Dam project itself.[b]

The indirect impact of the highways in stimulating growth of the near-region would be much greater than the direct impact of the visitors to the Park. The visitors would create some demand for food, gasoline, and local services, but this would be small compared to the demands of the permanent residents and industries who would flock in on the heels of the new highway construction.[12] Thus the occurrence of an unusual (even freakish) flood appears to have led, by a circuitous route, to the planning of vast and seemingly unrelated development. One may speculate on the possibility that the planning could ultimately come full circle. If the new development stimulated by the highways should occur on the flood plains of Delaware tributaries, as it has in other parts of the basin, then flood damage, which was to be ameliorated by the dam, might in the end be worsened.

[b]In H D 522, Vol. X, p. U-59, the Corps includes $5 million for a minimal replacement of Route 209 that would not increase its capacity.

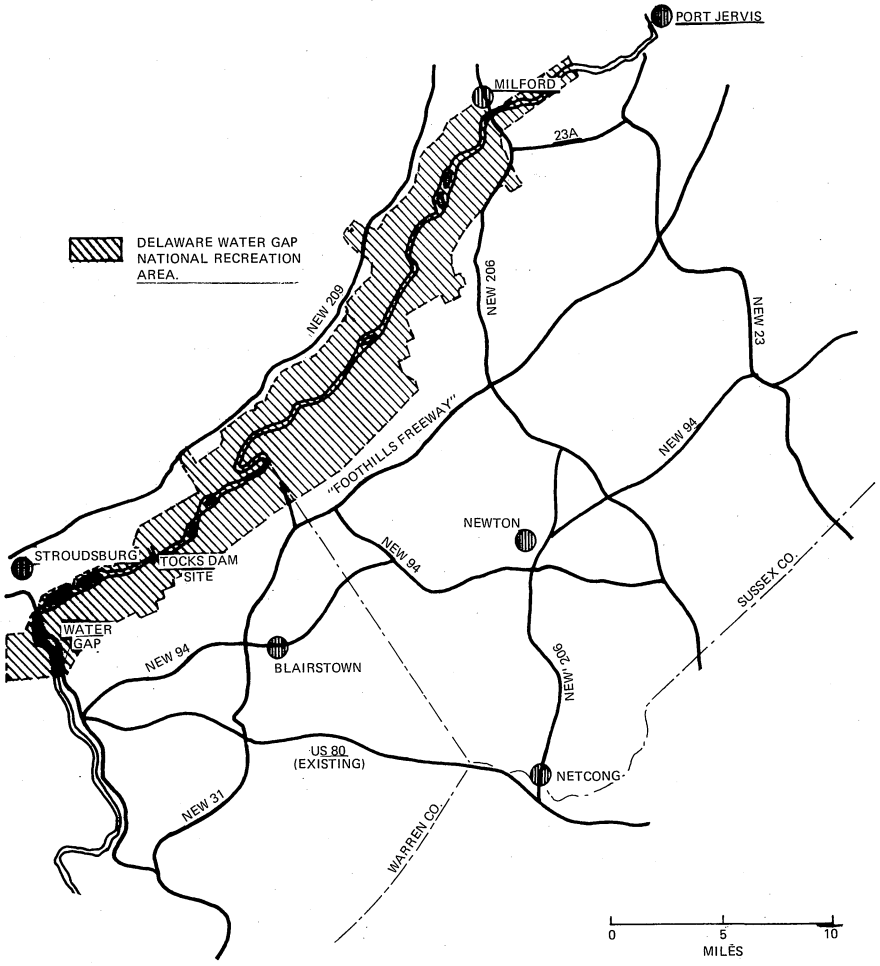

Figure 10–3. Proposed Freeways in Sussex and Warren Counties
The freeways follow virgin rights-of-way leaving the old roads intact. Old roads are not shown.

The high social and dollar cost of the regional highway network proposed by Edwards and Kelcey led Governor Cahill of New Jersey to insist, among other things, that the planned visitor load be reduced from ten million to four million visitor-days per year. His Department of Transportation estimated that this would reduce the cost of the regional highway net from $680 million to $370 million.[13] On the social side, the governor hoped that the reduction would bring to a manageable level the enormous pressures that would otherwise engulf the local communities. In response to Governor

Cahill's statement, the Delaware River Basin Commission officially adopted in May 1973 a reduced recreation plan prepared jointly by the Corps and Park Service.

This apparently substantial retreat, however, was more ostensible than real. The new plan turned out to be nearly identical to the first stage of the original plan. A Park Service official who had helped draft it said privately that he expected the full ten million people to show up eventually, and that when they did, the original plan would be implemented. He further saw no reason to suppose that the demand would stop at ten million. The Corps of Engineers, for its part, did not rush to revise its claimed recreation benefits downward.[14]

There the matter stood in late 1973. In 1974 and 1975, as the Tocks controversy developed, the possibliity of a park without a dam began to be taken seriously, and as a result, planning for the area took a new turn and perceptions began to change. This story is told in section V. The next two sections disgress briefly to discuss recreational transportation in general and to make some specific suggestions for public transportation to and within the Water Gap Park.

III. PUTTING THINGS IN THE RIGHT PLACES

The environmental, social, and economic costs of transportation are so overwhelming that they are necessarily a prime consideration in planning for outdoor recreation. As we saw in the case of Tocks Island, just the economic cost of highways alone easily dominated other economic costs associated with the project.

Two efficiency questions with respect to recreational transportation need to be addressed: (1) How should facilities of various types be located so as to minimize the amount of transportation needed? (2) How can the transportation that *is* needed be made efficient in energy use, pollution, social impact, safety, and economic cost? In the days of Luke Brodhead, before the automobile and the population explosion, these questions would have seemed less urgent. In those days the trip itself was part of the pleasure, and the need to minimize it would probably not have seemed pressing. Under modern conditions, improving efficiency may be the only reasonable way to restore the trip to its former civilized status.

The first efficiency question takes us back to Square One. In a region totally planned from scratch, recreational facilities (along with others) could be laid out in an efficient fashion with dense facilities like swimming pools and zoos close in and more expansive facilities

like parks for canoeing, camping, hiking, etc. farther out. If the location of facilities and the supply of transportation were governed by perfectly competitive markets, then, in theory at least, efficiency of location would be guaranteed by the invisible hand. In fact, since neither is governed by anything like a perfect market, we are able to observe the highly inefficient location of things across the landscape. We must, therefore, consciously consider locational efficiency in planning new facilities.

Even in a real region, such as that surrounding New York, where the possibilities of rearrangement are limited, many questions about efficiency of location can be raised. With respect to Tocks Island one may ask, for example, if it is efficient to provide massive swimming facilities so far from the metropolitan centers, if similar facilities can be provided at various lakes, ponds, and reservoirs that are closer in. Reservoirs in scenic locations, completely surrounded by barbed wire, stand unused in northern New Jersey. Natural ocean beaches occur on the doorstep of New York, and will be augmented by Gateway National Recreation Area. Swimming at a crowded beach (50 square feet per person is the density planned for Tocks beaches) is an essentially urban activity that does not require the unique features of the Delaware Valley. In contrast to mass swimming, dispersed activities, such as hiking, canoeing, and camping are not so easily provided closer to the urban centers.

A complication of the locational problem concerns human diversity and social class. Whom would the Tocks beaches serve? The urban poor, or the suburban middle class? Some proponents of the dam have argued that they will serve the urban poor. If this is the case, then the question should not be: "Given Tocks, what is the benefit to the urban poor?" but rather, "Given the urban poor, how much recreation benefit can you buy for them with the fraction of the Tocks budget properly allocable to recreation?"

This budget would buy a lot of neighborhood parks and swimming pools. Since it is reported by those who run day camps that poor children more often than rich children do not know how to swim and fear the water, it is not clear that occasional five dollar trips to Tocks beaches (the minimum transportation cost from the major cities) would be better for poor children than frequent short trips to a neighborhood pool or pond. The significance of location is a complex matter.

The location of the Tocks dam, hence of the surrounding park, was chosen for flood control rather than recreation. One may therefore ask whether, in the absence of flood control, this site would be chosen for recreation at all if transportation costs were fully con-

sidered. The answer is probably yes, but not as the site of a giant swimming pool. The upper Delaware River is one of the last large, free-flowing rivers in the East. The stretch to be included in the Park, the old Minisink, contains wooded islands and gentle riffles that make it ideally suited for interesting but nonexpert canoeing. The flat, relatively high flood plain provides much usable land for camping and long distance bicycle trails. It is bounded on both sides by steep wooded slopes, which, on the Pennsylvania side especially, are cut by a number of rocky creek gorges containing beautiful waterfalls. On the New Jersey side, the Appalachian Trail runs along the top of the Kittatinny Ridge, 1,200 feet above the river, and provides many scenic views. Several clear ponds, each with its own miniature watershed lie on top of the Ridge. Flatbrook Valley, joining the Delaware at Wallpack Bend, has great natural beauty and antique charm, as well as a good trout stream. The area contains several unspoiled old villages and farms of some historical interest as well as important archaeological sites. These assets led the conservationists to support the creation of the Park while opposing the reservoir. They argued, in fact, that the recreational value of the site was greater without the reservoir than with it.

The Minisink as it is offers some unique opportunities. One possibility is to build miles of scenic bicycle trails on the flood plain, where they would be free of steep grades and away from cars. Bicycling is an ideal activity for a public park because it is quiet, clean, and accessible to almost everyone, young and old. Laid out with imagination, bicycle paths through the Minisink flatlands could be very beautiful, passing variously under the lines of old trees on the river bank, across open fields, through the woods around ravine heads, past waterfalls and historical sites, across the river by ferry and so forth. The Park is big enough to allow for leisurely trips of more than a day.

If the Park offered uncrowded, rural recreation natural to its setting (such as 40-mile bicycle or canoe trips) and not available closer to the cities, then it would appear to be reasonably efficient with respect to location—that is, it would appear not be unduly wasteful of transportation. On the other hand, if the Park were noisy and overcrowded, so as to offer little respite from the urban hassle, or if the activities it provided could just as well be offered closer to the cities, then its use of transportation resources could well be questioned.

The second efficiency question concerns the nature of the transportation itself. The planners of the Water Gap Park assumed that virtually all visitors would come by car. This assumption was made at

the outset and was carried through all stages of planning without serious question. At one point the authors of the Nathan Report did make a wistful, passing remark about buses, but they were clearly resigned to the automobile: "Although public bus lines may (and probably should) serve the recreation area from metropolitan centers and neighboring communities, expected increases in rates of automobile ownership will sustain the dominance of automobile travel to the area."[15]

It is hardly necessary to dwell at length on the problems created by automobiles. It is well known that they use more energy, make more pollution, pre-empt more land, and kill more people per passenger mile than trains or buses. But important as these differences are, what is most important in the long run is the profoundly wasteful and destructive pattern of development that has almost always occurred in every new territory invaded by the automobile. Technical invention can make cars safer and more efficient, but only social invention (which is much harder) can change the kind of development that seems to follow merely from the existence of private capsules capable of scurrying arbitrarily over the landscape.

Is it really necessary to accept the consequences of massive auto travel to and within the Park as the planners assumed, or can we do better? Can public transportation with its well known drawbacks be adapted to the conditions of our time? Can a workable symbiosis with the automobile be devised? The idea of public transportation in National Parks is being increasingly discussed and even experimented with. Experimental public systems are planned or operating in Yosemite, Grand Canyon, Mesa Verde, and elsewhere. In some cases severe auto congestion has virtually forced the Park Service to act. When the highway between Anchorage and Fairbanks was improved, the spur road to Mt. McKinley became jammed with cars. As a stopgap measure, leased school buses were brought in to carry passengers over the rugged 85-mile route. The magazine *Audubon* commented on this operation as follows:

> One logical result of the prohibition of motorized sightseeing at Mount McKinley has been a marked increase in the number of hikers and backpackers. For them the free public transportation is a special boon. They can board or leave the buses as they please anywhere along the park road. A survey conducted last summer among the bus passengers revealed that 90 per cent of the respondents favored the use of mass transit within the park.
>
> At first the new regulations received considerable static from local Alaskans, businessmen, editorial writers, and congressional representatives. But by the end of the season in 1972, most of the critics (as well as the

> tourists) had been converted to the new stytem. Those who hadn't would have been won over by witnessing the scene at summer's end when the park road was reopened to all traffic for ten days before being closed for the winter. On Labor Day weekend, cars were clocked through the Savage River checking station at the rate of one every three minutes. Their occupants pockmarked the roadside with trash and beverage bottles. Wildlife fled. A pall of dust hung over the road's route. It was a brief, grim reminder of what might have been.[16]

IV. PUBLIC TRANSPORTATION IN THE NEW PARK

The long, narrow shape of the Water Gap Park lends itself ideally to internal public transportation. All that is needed in principle is a single, longitudinal link. Because the Park is narrow, every point would lie within a mile or two of such a link. Access from outside could be along radial routes converging on hubs at the two ends of the Park, as shown schematically in Figure 10–4. An important feature of this general pattern is that it imposes no burden on the near region along the flanks of the Park. It is precisely in this region that the Edwards and Kelcey Plan was concentrated, and in which the large secondary impacts predicted by the Nathan Report would occur.

Even small numbers of visitors would support a frequent schedule on the internal link. Fifty-passenger vehicles on a five-minute headway carry 600 passengers per hour. Over a four-hour entering period this service would carry 2,400 visitors from each end into the Park, for a total of 4,800 visitors in one day. Under the original Park Service Plan the Park was to accommodate about 150,000 visitors on a peak day; under the reduced plan about 40,000. This is clearly far more than is needed to support the five-minute service postulated above, even if many people are accommodated in mass facilities such as picnic areas and swimming beaches near the Park entrances. If the Park is designed for more moderate numbers of people engaged only in dispersed activities such as hiking, bicycling, canoeing, etc., then demand for the public transportation link would be correspondingly less. But even in this case the demand would support a very frequent schedule on a single link.

In the absence of a reservoir, the service could be provided by buses running on existing roads. Since roads run along both sides of the river and up Flatbrook Valley, it would be possible to subdivide the link into two or three parallel routes. Although this would, in a sense, be a convenience for visitors, it is not, I believe, the kind of convenience the Park should provide. Within reason, people should

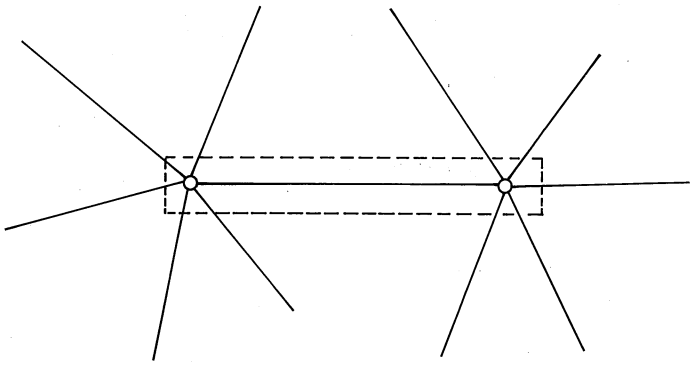

Figure 10–4. Conceptual Network for Public Transportation

be encouraged to walk, cycle, or paddle to where they are going. A single route not only minimizes the intrusion of motorized transport but also makes for simplicity: there is no worry about which bus goes where. A single route does necessarily run along one side of the river and not the other, but simple ferries of the kind that existed in colonial times could easily provide access to the opposite shore. In many places the ferries could be driven by the current, as they once were.

The internal route could run along either the New Jersey or the Pennsylvania side of the river. On the Pennsylvania side, plans for moving Route 209 (which would be inundated by the Tocks reservoir) are advanced and land is being acquired for the new right-of-way. In the absence of a reservoir, the old 209 could be used exclusively for the internal transportation link.[c] This would leave the New Jersey side with its scenic Old Mine Road and Flatbrook Valley entirely free of motorized traffic (except possibly for emergency vehicles) and available for walk-in camping and bicycling on autoless roads.

In the motorless part of the Park, all movement would necessarily be slow. But slowness has a special esthetic value. It allows the world to expand again to its original size. I know from experience that England seen from a five mph canal boat is a huge country. Similarly,

[c]It should be noted, however, that if no reservoir is built, then the option of leaving Route 209 where it is remains open. In view of the inevitable environmental cost of the new 209, this option should not be dismissed lightly. Nevertheless, the advantage to the Park of removing the noise, fumes, and unsightliness of the present heavy truck traffic on 209 is very great. The noise is continuous and audible throughout the section of the valley where 209 is close to the river.

the old Minisink, seen only from a canoe or a bicycle and never from a car, could be perceived in its true dimensions with the details of nature in sharp focus.

If a reservoir is built, then in order to provide the internal link, some new stretches of road would have to be built to replace inundated roads. The internal link would probably have to be on the New Jersey side. Ferries, with special landings to accommodate the varying water level, would have to be motorized; otherwise the public transportation link could be similar to that described above. The Park Service Master Plan includes a number of boat launching ramps for people who bring their own boats on trailers. Although heavy motor boats cannot easily be carried by public transportation, they could be offered for rent. A rental system would be advantageous anyway in that it would facilitate control of the number, type, and safety of boats used on the reservoir.

Buses for the internal link should be designed so that they do not insulate the passenger from the outdoors as the high, sealed-up, air conditioned highway buses do. They should be low, open, and quiet, with an expansive view in all directions. Speed should be moderate—probably not over 35 mph. Since the necessary range is small, this would appear to be an ideal situation for the battery-pack bus, with charging stations at the two ends of the Park.[17] (At the end of a run the spent battery-pack is slid out of the bus and replaced by a recharged pack. The operation takes only a few seconds.) Provision should be made for carrying camping gear and bicycles. Hang-up racks of the kind used on European trains can carry bicycles with little wasted space. Trucks or trailers with suitable racks could bring canoes back upstream, as they now do.

If the external transportation is public and is provided by buses, then the same buses could be used both inside and outside the Park. A bus from outside arriving at one end of the Park could make one or more trips on the internal link before returning along its external route. This would simpler and cheaper then having two separate sets of vehicles, and it would eliminate the need to transfer at the end of the Park. It would, however, entail some compromise in bus design: inside the Park the bus should be primarily quiet and odorless; outside it should be primarily fast and comfortable. These conditions are not entirely compatible.

The attractiveness, hence feasibility, of a public transportation system depends significantly on its details. Appendix B to this essay presents one way of filling in the details of the general arrangement described in the preceding paragraph. The purpose of this exercise is not to suggest specific details for a real system, but merely to demon-

strate (I hope convincingly) that at least one system exists that does the job insofar as the circumstances under which it would operate can be predicted. Appendix B takes account of the analysis of external public transportation set forth both below and in Appendix A.

A. External Public Transportation

The 680-million-dollar freeway network designed by Edwards and Kelcey for Sussex and Warren Counties (Fig. 10–3) is a dispersion device whose function is to spread the cars over the countryside so that they do not jam up in one place. A network for public transportation should have just the opposite sort of geometry. It should consist of a few routes converging at hubs, as in the network of Figure 10–4.

In Appendix A to this essay, a network of real roads conforming to the general pattern of Figure 10–4 is considered. It is shown that the density of demand on the main radial routes would be more than adequate to support very frequent schedules, which are essential in overcoming the inherent inconvenience of public systems relative to the automobile. Headways should be not more than five or ten minutes so that visitors can reasonably ignore the precise timetable.

By far the heaviest traffic would fall on the easterly spokes to New York and the southerly spokes to Philadelphia. An obvious candidate for the link to New York is the main line of the Erie-Lackawanna Railroad, which runs from Hoboken through the Water Gap to Stroudsburg and beyond, and which until recent years has carried regular passenger service. At present it carries commuter traffic as far as Dover, which is about halfway between Hoboken and the Water Gap, but the rest of the line is used only for freight. As pointed out by Tom Taber, service to the Water Gap Park with its heavy weekend peak would nicely complement the weekday commuter service. A number of improvements in the line are planned. At the outer end, electrification may be extended a few more miles out to Netcong and at the inner end rearrangements are planned that will allow Erie-Lackawanna trains to go directly under the river to Penn Station in New York. Another Erie-Lackawanna line presently carries a few trains from Hoboken to Port Jervis at the northern end of the Water Gap Park, but the route is circuitous and under current schedules the trip takes a little over two hours. Rail service from other directions does not appear to be feasible without extensive track changes. Buses, on the other hand, could operate in any direction using existing highways.

Since many people would have to drive their cars to reach the

train or bus line, parking lots would have to be provided at the stations. These lots may be thought of as replacing those otherwise needed inside the Park: without public transportation, visitors' cars must be stored in the Park; with it, they can be stored in scattered outlying lots. Some of the outlying lots, moreover, would not need to be new; they could be existing lots used by commuters during the week. Furthermore, some Park visitors from urban areas would be able to get to the station without driving. For these reasons, the total new parking area needed with a public system would be less than the total parking area needed inside the Park if all visitors travelled by car.[d]

The nuisance of transferring from car to bus or train is the major inconvenience that needs to be overcome by a public system. Several factors can relieve it. Sufficiently short headway can prevent the tedium of waiting; well located routes and stations can eliminate the need for anyone to go out of his way to get to a station (how this can be done is shown in Appendix A); safe, convenient walkways, carts to handle luggage, clear direction signs, etc. can reduce the physical nuisance; attractive design of structures and landscape, and clean vehicles, can counter the image of decrepitude associated with public transportation. Such seemingly minor amenities deserve very careful attention.

Only very limited parking should be provided at the Park, so that motorists who choose to drive all the way run a high risk of being turned away. An exception should be made for people whose driver's licenses show residence in one of the neighboring counties, and who therefore could not reasonably be expected to use the public lines. According to the estimates made in Appendix A, neighboring county people would make up about 10 percent of all visitors. A special parking lot could be provided for them.

A single, flat, per-car fee covering both parking and round trip transportation on the public line for all of the car's occupants could be charged at the entrance to the station parking lot. In addition to being simple, such a fee would create an incentive to double up on the use of cars. A reasonable structure for the fee would be $F = F_o + cD$, where F_o is the fee at the Park (distance $D = 0$) and c is a per-mile surcharge. The pecuniary incentive to drive all the way to the Park is small when c is small. To make the incentive negative, c should be less than the per-mile cost of driving—i.e. it should be less than

[d]The Park Service Master Plan includes parking for 33,000 cars. This would require about 330 acres. Under the reduced plan parking requirements would be about one-third of this.

about 12¢ per mile. It could well be much less than this, possibly even zero. It would be desirable, of course, for the public system to be self-supporting. Once c is chosen, the requirement of self-support puts a lower bound on F_o. Since in theory public transportation has great economies of scale relative to the automobile, even a self-supporting fee should seem moderate to an automobilist.

Unfortunately, the theoretical economies of scale of public transportation are not all realized in real markets. An important theoretical economy, for example, is in labor: one driver of a 40-passenger bus substitutes for about fifteen auto drivers. But this tremendous labor saving does not get counted in cost comparisons, because auto drivers do not count the value of their driving labor as part of the cost of driving. (Why is this? If driving is so much fun, why isn't the bus driver eager to drive for nothing?) At any rate, when the value of the auto driver's labor is omitted and that of the bus driver is included, the costs of bus and auto transport are comparable at three or four cents per passenger mile. (This assumes three people per car, which is twice the national average, but possibly reasonable for recreational trips.) The bus's economy in physical quantities is offset by the driver's wages. In effect, the bus substitutes paid labor for fuel, steel, concrete, and a lot of unpaid labor. This trade-off would appear to be socially and environmentally good, but our attitudes, habits, and imperfect markets are such that it is a hard trade-off to realize.

The Nathan Report found the secondary impacts of auto travel and the new highways it would entail to be large. The highway builders, seeing these impacts as good, tried to reinforce them. Edwards and Kelcey state this goal explicitly in their report: "In many instances, the alignment of a new road was located far from communities and existing routes generally heading for the same destination, to open up new areas for development."[18] To those who are concerned about the automobile and skeptical of conventional development based on it, this is a dismaying statement. But public transportation can also open up new territory, as the trolley-car builders of the early 1900s well knew. If we substitute public transportation to the Water Gap Park for the freeway network, will the accelerating effect on development be any less?

Since the public transportation system is concentrated (e.g., it does not extend to the flanks of the Park at all), its effects would not impinge on as large a territory as those of the highways. Nevertheless, a densely operated commuter line such as the Erie-Lackawanna might well accelerate the creeping suburban strip beyond Dover and Netcong toward the Water Gap. Whether such development would be

"bad," however, is not clear. Dense housing clustered within walking distance of the stations might well relieve some of the pressure for further sprawl.

A bus service operated primarily on weekends, with its main movement toward the Park in the morning and away in the evening, would hardly provide a very attractive schedule for would-be commuters. Moreover, its destinations, as seen by the commuter, would be somewhat limited and designed for far-end auto connection. Thus it would appear that public transportation to the Water Gap Park would stimulate relatively little secondary development, at least of the sprawly kind. Highways, on the other hand, are there twenty-four hours a day, ready to be used for any purpose. They therefore tend to stimulate development of all kinds, often in a pattern that is inefficient with respect to location.

We are all aware of the difficulty public transportation has had in competing with cars. Nevertheless, times are changing. The need for public transportation is gradually seeping into the public consciousness. In those situations where the conditions are right for it—as they seem to be in the case of the Water Gap Park—public systems should be set up, with meticulous attention to those details that can overcome the crucial nuisances, and with the strong incentives (a high probability of being turned away if you drive to the Park) that are probably needed at this early stage to wean people away from their cars.

V. A PARK WITHOUT A DAM

Within the water resources establishment, there are two diametrically opposed views of recreation on reservoirs. The older view, held almost unanimously by private and municipal water companies, is that reservoirs should be sealed off from public use. Thus, the map of northern New Jersey is dotted with small and not-so-small reservoirs, often in scenic locations, that are entirely encircled by chain link fence. According to the adherents of this view, the costs incurred because of pollution of the water by swimmers, damage to the watershed by picnickers, removal of trash, insurance against liability, etc. cannot be recovered at a level of admission charge that anyone will pay. Companies that have tried recreation, it is asserted, have had to give it up and close the gates. The argument is invariably reinforced by startling statistics on per capita trash quantities or on the fraction of swimmers that can be expected to urinate under water. A statistic

of the latter variety is faithfully reproduced in the comprehensive consultants' report of 1975.[e]

The opposite view, held by the Corps of Engineers, is that reservoirs should be "multipurpose" and that one of the purposes should be recreation. The more swimmers and tramplers of the watershed, the better. As planned, Tocks conforms to this view to an extreme degree, since it provides for more people per acre and more acres than almost any comparable project.

The two views appear to be absolutely contradictory. If it is true that private companies can make no net profit by opening their reservoirs to recreation, then it should be impossible for the Corps to claim a net benefit for recreation. Yet the Corps does claim such a benefit in large amounts.

It is curious that the conflict between the two views never seriously entered the Tocks controversy. To be sure, the opponents did suggest the recreation alternative of opening up the many closed-off reservoirs closer to population centers than Tocks. But the suggestion was never taken seriously, and the consultants, in discussing it, merely repeated the arguments, noted above, that they heard from the reservoirs' owners. Nowhere did they attempt either to refute these arguments or to apply them to the Tocks reservoir itself. The discussion of the Tocks reservoir occurred in another part of the report and was based on arguments received from other sources.

Only one person confronted the issue squarely, and that was Walter Lucking, president of the Hackensack Water Company. Lucking was appointed in 1974 by Governor Byrne to the ad hoc "Citizens' Advisory Board," whose function was to monitor the developing consultants' study and then to make recommendations about it to the governor. In accordance with his adherence to the first view, Lucking supported the construction of the Tocks reservoir, but recommended that it be entirely closed to the public. Presumably this was to be accomplished by means of the usual chain link fence, which in this case would have to be 80 miles long. As far as I know, this suggestion had never been made before, despite the fact that it would have solved the problems of regional impact and traffic in a single stroke.

The adherents of the heavy use view within the Corps and Park Service were apparently unfazed by the strong criticism of their original plan that had come from many quarters between 1970 and 1975. In 1974 they engaged the consulting firm of Clarke and

[e]URS Madigan-Praeger et al., p. XIII-73, without, of course, any mention of the fraction of fish with similar habits.

Rapuano to update their plans and reconcile differences of detail between the two agencies. A draft report in circulation in mid 1975 showed almost no significant concessions to the critics. There was, for example, no discernible attention paid to Governor Cahill's insistence that the yearly visitor load be reduced from ten million to four million. The original three phases remained, complete with dates:[19]

Phase I	1982	4,000,000 annual visitors
Phase II	1990	7,000,000 annual visitors
Phase III	2000	10,600,000 annual visitors

The "Foothills Freeway," which had set off a storm of protest when first proposed, also still remained, albeit in a shortened version and with a new name: "Kittatinny Highway." In some cases concerns expressed by local citizens were dismissed in a singularly insensitive way. One section, entitled "Detrimental Uses" is here reproduced in its entirety:[20]

> Park oriented uses, such as restaurants, gift shops, motels, service stations and transient campsites, will be generated by TIL-DWGNRA. These kinds of uses already exist in the surrounding land and cannot be considered detrimental. There would be no uses resulting from TIL-DWGNRA that would be detrimental.

Because this work was carried on without public participation and, in fact, out of the public view, it played no significant role in the debate during 1974 and 1975.

Meanwhile another current in the debate that *was* in the public view rapidly gathered momentum. This was the discussion of a park without a dam, or more generally, the future of the valley without a dam. As the possibility of no dam gradually began to seem likely enough to be taken seriously, a number of individuals and groups who had taken no part in the debate over the dam entered the discussion of the park. Their participation, along with a series of events and changed circumstances, led gradually to a changed perception of the issue.

The first written proposal for a park in the Minisink Valley without a dam was the Park Service's brief but lyrical "Natural Systems Plan," which was inadvertently leaked to the public in 1972 (see Essay 3). This plan, however, was too sketchy to make a serious case for a damless park. In late 1973 the Save-the-Delaware-Coalition scraped together enough money to engage the professional consulting

firm, Candeub-Fleissig, to prepare a more detailed plan. Two things are especially notable about this effort: First, the consultants and their sponsors recognized the paramount importance of transportation and tried to lay out an efficient system whose adverse impacts both inside and outside the Park would be minimal. They even adopted one or two suggestions from an early draft of this essay. Second, they found that the absence of the dam greatly relieved the problem of accommodating large numbers of people without crowding.

The reasons were both spatial and temporal: The absence of the dam made available 10,000 acres of eminently usable flat land — almost the only flat land in the valley. Moreover, the activities appropriate to a park without a dam—bicycling, canoeing, hiking, camping, etc.—can be pursued much of the year, particularly in the spring and the fall when the weather is usually at its best. The reservoir plan, by contrast, depended heavily on swimming, which is confined by temperature and drawdowns to the three summer months. Both the extra space and the temporal spreading of activity were helpful in reducing crowding.

By the summer of 1974, with both the Park Service's "Natural Systems Plan" and the Save-the-Delaware-Coalition's "Concept Plan for the Delaware River Park" in the public arena, discussions of a damless park had penetrated to official circles. Stimulated by a conversation with Commissioner Bardin and encouraged by Assistant Secretary of the Interior, Nathaniel Reed, a small group within the Park Service directed by David Kimball began work on a park without Tocks. Concentrating first on transportation, they laid out alternative routes for internal public transit, and specified roughly where entrances and nodes of concentrated activities should be. After some study they concluded that the annual visitor load should be two million or less. This is much more in keeping with normal densities for rural parks than the extreme figures that had been planned for the reservoir-based park.

On some other aspects, Kimball's group soon found valuable support in the Appalachian Mountain Club (AMC). Well versed in the practical lore of trail construction and maintenance, and enthusiastic about a damless park, the AMC undertook a detailed survey of the valley's soils, vegetation, drainage, etc. in close cooperation with Kimball's group. Weekend after weekend in early 1975, AMC volunteers explored the dozens of ecologically fragile creek ravines along both sides of the valley and took copious notes on what they found. As a result, the AMC's recommendations had the most solid foundation in data of any yet made.

Until about 1974 public discourse had focussed mainly on outdoor recreation as conventionally understood: physical activity in the open—swimming, hiking, setting a picnic table, building a fire, launching a boat, and so forth. But in the meantime another issue in the controversy, which suggested a rather different tone for the park and which added another dimension to "recreation," had been gaining prominence. This was the issue of historic and archaeological sites.

Since most of these are on the flood plain, the only question for the Tocks Island Dam planners had been how to salvage material or information from the most important ones before they were flooded. But if no dam were built, then the settings as well as the buildings and artifacts could be preserved, and in many cases the settings were of prime importance. If the landscape remained intact, it became possible to imagine a far more coherent and vivid picture of history being presented to the visitor. Thus history had much more potential as an element in a river-based park than in a reservoir-based park. Even more importantly, the archaelogical sites could be examined by scientists in a far more orderly manner. And some that would otherwise have to be hastily dug for salvage could be preserved for the future.

In February 1974 the historic issue was raised high in public consciousness by an action of the Corps of Engineers. For some time the Corps had been wrangling in the courts with a group of young squatters who were using empty land and buildings that had been acquired by the government. Having failed with orthodox methods of eviction, the Corps finally moved in with bulldozers. At dawn of Ash Wednesday, armed U.S. Marshalls appeared without warning, ordered the squatters (including young women with babies) out into the cold, and pushed the houses down before their eyes. Thereafter for the next two or three days the Corps demolished houses systematically, including many of historical value. One building whose destruction especially roused the ire of local citizens was the Everett House, which was said to have been in mint condition. Finally, when the Corps began to dismantle the Zion church, an 1850s building which was on the National Register of Historic Places, a group of citizens went into court and won an injunction against any further destruction of historic buildings.

This incident set off a flurry of angry organizing. A series of bus tours brought the matter to the attention of local officials, congressmen, and the press and public. Many participants on these tours were especially receptive because they were gearing up for the bicentennial and were already in a state of raised historic consciousness. The

Daughters of the American Revolution, who had not previously been involved in Tocks, found the energy to get 5,000 signatures on a petition urging Governor Byrne to preserve the valley.

The grievances of the activists went beyond the destruction of historically valuable buildings. The Park Service was accused of allowing important stone buildings, which could not be moved from the flood plain, to fall into decay, while moving worthless wooden buildings into inaccurately restored villages, and of neglecting to carry out legally mandated surveys. The Park Service pleaded lack of funds.

One spot that seemed destined for controversy was the town of Milford, Pa., whose location at the Route 206 crossing guaranteed its status as a park gateway whether the dam was built or not. Despite the growing line of tourist establishments along the highways, Milford retained, especially in its back streets, the old-fashioned air of a small town of 1900. It also contained, on a high hillside overlooking the valley, an elaborate estate called "Grey Towers" (complete with sweeping lawns, romantic grape arbors, terraces, reflecting pools, and a forbidding main house straight out of Sherlock Holmes), which had been the home of Gifford Pinchot, first head of the U.S. Forest Service and former governor of Pennsylvania. In Dave Kimball's view, Milford was on the thin edge and could go either way: it could become a garish tourist trap or it could be preserved as one of the valley's main historic centers.

Just north of Milford was "Arisbe," the rambling and eccentric wooden house of the American philosopher C.S. Peirce. Acquired by the Park Service in the late 1960s, this house was brought into the DWGNRA by means of a small boundary adjustment. Enthusiastic members of the Peirce Society had worked out detailed room-by-room plans for an intellectual museum explaining Peirce's wide-ranging thought, but by late 1975 no money had been found for restoration. So long as the reservoir seemed inevitable, the Peirce Society took little interest in the project. Dominated by mass beaches, it seemed to have no particular relationship to "Arisbe." But when the possibility of a park based on history emerged, they quickly extended their enthusiasm to it.

At a public hearing held by the Park Service in March 1975, interest in the historical possibilities surfaced in yet another sector. Mr. Robert Brooks, a descendent of the Lenni Lenape Indians who had once inhabited the valley, argued eloquently that a colony of Lenni Lenapes should be allowed to return and establish a cultural center. He ended his plea with a sonorous Indian language prayer full of whooshes and whistles. This was a timely reminder to the white Park

Service and white audience that history did not begin with the colonists.

Indeed, the soil of the Delaware flood plain above the Water Gap contained an almost unbroken archaeological record of human activity dating back to 10,000 BC or almost to the last Ice Age. According the archaeologist Russell Handsman,[f] this flood plain was one of the few spots in the region where the record had not been jumbled by construction. So far, the main disturbance of the deep soil had come from archaeologists themselves, who were doing salvage work in anticipation of the dam. With no dam in the offing, much less digging would have been done, and at a more deliberate rate and more closely coordinated with digs outside the area to be flooded. In the years between 1970 and 1975, Handsman observed, a fundamental change of outlook had occurred in the profession of archaeology. There had developed a new concern with preserving sites for future generations, when more refined techniques might be able to glean better information. In the absence of a dam threat, then, only a small, carefully selected set of sites would be opened. Also, thought could be given to stabilizing one or two of them for in situ public display.

Having brought together so many disparate groups by means of the historical theme, the activists began in 1975 to urge Congress to change the status of the park from a National Recreation Area to a National Historical Park. Although Park Service officials believed that the area would not satisfy existing criteria for a National Historical Park, they pointed out that Congress could do anything it liked. Whatever the official designation turned out to be, it appeared certain in late 1975 that history and archaeology would be a major element in any park without a dam, or a major issue if the controversy over the dam continued. Hardly visible in the original Tocks planning, the subject received thorough and sensitive treatment in the 1975 consultants' study.

From the beginning of the Tocks controversy, the value of the Minisink Valley's historic and prehistoric remains was dutifully mentioned in every report, but never as if it were important enough to make a difference. As early as 1966 there even appeared a book entitled "Before the Waters," which contained photographs of the houses, scenes, and people that were to be replaced by the Tocks reservoir. But the author, Elizabeth Menzies, believed the dam was inevitable. For her, the book was not a part of the politics of opposition; she only wished to record the sad passing of a place and a time.

[f]Private communication.

The convergent circumstances that brought history to prominence as an issue were mainly these: first, the gradual acceptance of the park without a dam as a credible possibility, which attracted the attention of such diverse groups as the Peirce Society, the Appalachian Mountain Club, the Lenni Lenape Indians, and the D.A.R.; second, the coming bicentennial, which heightened the general interest in history; third, the Corps' 1974 demolitions of historic buildings, which set off an angry reaction resulting in new grass roots organizing and publicizing; and finally, what is sometimes called the "crisis in archaeology"—the rapid destruction of the archaeological record all across the country because of development —which had brought archaeologists to the view that conserving as many sites as possible was a matter of utmost urgency.

The convergence of these circumstances was not entirely coincidental, however, because to a large extent they were simply separate manifestations of the change in public attitude toward the natural and human heritage that had occurred between 1965 and 1975. If the "environment" is taken to include culture as well as nature, then the historical issue was as much an environmental issue as any other.

APPENDIX A.
THE PATTERN AND VOLUME OF PARK TRAFFIC

The potential benefits of public transportation can be realized only if the traffic along each route is sufficiently intense. If the traffic is thin, then either the vehicles must be small so that there is little economy of scale, or else service must be infrequent so that the value of the transportation to its users is low. In order to increase the traffic density on each route, parallel routes can be spread widely apart so that each serves a large traffic generating area. But if the routes are too widely separated, then the distance users must travel to get to the public route becomes inconveniently long and again the value of the service is low. Neither the distance between routes nor the distance between vehicles along a route must be too great. Or, stated more simply, the number of vehicles per square mile must not be too low. On the other hand, the size of the vehicles must be sufficiently large if economies of scale are to be realized. These contrary constraints can be met only if the traffic generated per square mile per hour in the area served is sufficiently high.

This appendix examines whether the conditions for economical public transportation are met for the Water Gap Park. The answer appears to be yes for most of the people living within 50 or 60 miles

of the Park even if the number of visitors is considerably less than the four million currently planned for. The analysis is based on a bus system using existing roads. The link between New York and the Water Gap, which is by far the heaviest, could be provided by the Erie-Lackawanna Railroad, but for simplicity this possibility is not recognized explicitly. The general results are the same whether this link is provided by bus or train.

The model for the analysis is the following. Let $p(x)$ be the population density at position x, and let $f(r)$ be the annual visits per capita for people living at distance r from the nearest end of the Park. Then $f(r)\cdot p(x)$ is the absolute number of visits generated per square mile per year at position x. Imagine that each visitor drives from his home to the nearest end of the Park by the best route, and consider at every point on every road the intensity T of the traffic so generated. Let $N(T)$ be the set of points on the road network at which the traffic density of Park visitors is greater than T. If T_o is the minimum traffic density that can support public transportation, then in principle public transportation could be provided on the sub network $N(T_o)$.

What does the subnetwork $N(T_o)$ look like? Since the traffic is most intense near the hubs at the ends of the Park, $N(T_o)$ will contain stretches of the radial approach roads if it contains anything at all. But it may also contain branches and subbranches from these roads. In the terminology of Graph Theory, $N(T_o)$ comprises two connected trees rooted at the hubs.

The traffic density T_o is actually realized on the public transportation system only if each visitor transfers from his car to the public system as soon as he finds himself on the subnetwork $N(T_o)$. (This assumption is implicit in the assertion that public transportation can be supported on $N(T_o)$.) On the other hand it is not necessary to assume that anyone goes out of his way to take the public system. It is assumed that everyone starts out to drive by the most direct route and transfers only if and when he comes to a station.

Since stations cannot be distributed continuously along the branches of $N(T_o)$, some visitors may have to drive some distance along $N(T_o)$ before coming to a station. The necessary discreteness of stations reduces the realized traffic density on the public system somewhat below T_o in some places. A full-fledged optimization of design would have to take station spacing into account, but this level of refinement need not concern us here.

Determination of the Network $N(T_o)$

The traffic density varies not only spatially but temporally: with season, day of the week, and weather. However, there is no particular

reason to suppose that temporal variations influence the shape of the spatial distribution. We assume, then, that the temporal and spatial effects are multiplicative. According to the spatial model outlined above, the absolute number of visitors generated per square mile per year at position x is given by $f(r)p(x)$. We assume that the number of visitors so generated on day t is given by the multiplicative formula $s(t)f(r)p(x)$, where $s(t)$ is the fraction of the yearly visits that occurs on day t.

We will consider the three factors in the formula separately. Population distribution $p(x)$ is straightforward. The agglomerations around Philadelphia and New York dominate the region overwhelmingly. The visitation rate f as a function of distance r is difficult to determine, though some data for other recreation projects have been collected. Generally these data have been fitted to an exponential decay function of the form $f(r) = Ae^{-ar}$. On the basis of some existing sets of data,[a] we assume a to be such that f falls off by a factor of ten in 50 miles. Fortunately the distribution of population is such that the results are not very sensitive to a. The routes to New York and Philadelphia are dominant in any case.

By examination of road maps we determined the routes that would carry the heaviest Park traffic, i.e., the routes that would be included in the network $N(T_o)$. Like a tributary in a river system, each route has a well defined territory or "shed" from which it draws its traffic. Given the existing roads, the region divided itself naturally into about fifteen major "traffic sheds" generating widely varying amounts of traffic. How many of these traffic sheds are included in $N(T_o)$ depends on the overall level of traffic, hence on $s(t)$, and also on the choice of T_o.

A rough figure for T_o, the traffic required to support public transportation, is 1,000 visitors per day. This is sufficient to maintain a ten-minute headway over an arrival period of three and one-third hours with full 50-passenger vehicles. If the total visitor load is 10,000 visitors in one day, then according to our estimates only two routes have enough traffic to support a public system, but these two

[a]The sources are the following:

1. Lewis and Clark Lake: Jack L. Knetsch and Marion Clawson, "Economics of Outdoor Recreation," Baltimore: Johns Hopkins Press, p. 65.
2. Kerr Reservoir: Knetsch and Clawson, p. 71.
3. Swanson Lake: Knetsch and Clawson, p. 69.
4. Palisades Park: Nathan, p. 63, note 4.
5. Tocks: Nathan, p. 66, Table 2.

The data are too sparse, scattered, and subject to special effects to support much precision, but decay by a factor of ten in 50 miles is reasonably consistent with most of the data.

routes together carry 50 percent of the visitors. If, on the other hand, the total visitor load is 50,000 visitors, then eleven of the fifteen routes have enough traffic for a public system, and these eleven routes carry 95 percent of the visitors. To appreciate the amount of transportation needed to get people out to the Water Gap Park, it may be noted that the 40,000 visits on a peak Sunday envisioned under the reduced reservoir based plan is more than the entire Erie-Lackawanna daily commuting load.

On any one route, the traffic density falls off with distance from the Park. With only two important exceptions, however, most of the traffic is generated near the outer ends of the routes so that the vehicles need not run with only a few passengers over long stretches. The two exceptions are Route 611 and the Northeast Extension of the Pennsylvania Turnpike. The former has a peak at about 20 miles because of Easton-Phillipsburg and the latter at about 30 miles because of Bethlehem-Allentown. A few special buses might serve these areas.

The distribution of visits over time—represented in our formula by $s(t)$—depends strongly on the kind of recreation offered. Using figures given in the Nathan Report,[21] we estimated the loads for various types of days, and found the variation to be considerable. The Nathan figures, of course, assume a reservoir and the correspondingly short summer season based largely on swimming. The best weather, however, usually occurs in the fall and the spring, when the reservoir would be too cold for swimming or unattractive because of drawdown. A park without a reservoir would offer a much longer recreational season (bicycling, canoeing, hiking, and camping can be pursued during much of the year) and therefore a more uniform demand for transportation. Thus it is difficult to estimate the temporal pattern of demand with any precision without taking account of the recreational facilities.

The temporal pattern is most favorable to public transportation, of course, when it is most uniform and predictable (with the exception that weekend recreational peaks dovetail nicely with weekday commuting peaks). The most important unpredictable element in recreational demand is the weather. This does not figure so much, of course, in business traffic. How is this unpredictable demand to be handled economically? If service is maintained regardless of the weather, then much gasoline, oil, labor, and other resources will be wasted. It was, after all, partly to avoid such waste that public transportation was suggested in the first place. If service is cut back on rainy days, then physical resources can certainly be saved, although drivers' wages could present a problem.

A reasonable way to meet this problem, I believe, is to offer a fixed seasonal salary in return for which a driver agrees to be available at specified times. The salary should be set so that when divided by the expected time worked (in the probabilistic sense of "expected") the quotient is a reasonable hourly wage. Under this arrangement the uncertainty is shared between the drivers and the management: the drivers have no financial uncertainty but they do have some uncertainty about their free time. The management has some financial uncertainty, since in sunny years there may be a surplus of fare revenue over expenses, and in rainy years a deficit. In accordance with standard business practice, some margin could be included in the fare to compensate for the risk.

In sum, the volume and pattern of traffic to the Water Gap Park appears to be more than adequate to support public transportation.

APPENDIX B
DETAILS OF A SPECIFIC PUBLIC TRANSPORTATION SYSTEM

This appendix sketches in details for one of the general arrangements discussed in the text. The attractiveness of any public transportation system for the Water Gap Park will depend strongly on the smoothness of the transfer between car and public vehicle. This appendix concentrates, therefore, especially on the details of this transfer.

The general arrangement considered is the following (see Fig. 10B–1). Each of several outlying parking lots is connected to the Park by a nonstop bus route. This is possible because most potential visitors live 50 miles or so away from the Park (see Appendix A). Each route enters the Park at one of the two ends and continues along an internal longitudinal road (all buses would use the same two-way road) to the far end of the Park, making half a dozen or so stops at main centers along the way. These centers would typically have picnicking, swimming, camping, canoe and bicycle rentals, trailheads, historical villages, etc. within close range. At the far end of the Park some buses would be stored until the evening exodus, while others would continue to shuttle back and forth along the internal road, serving local passengers.

This would be the general pattern. The actual geography dictates some exceptions, particularly the following two. (1) About five of the bus routes would begin most naturally in city centers, which many people could reach by public transportation. These termini would need special designs suitable to their urban settings. (2) About four of the bus routes (including two or three of those in (1)) should,

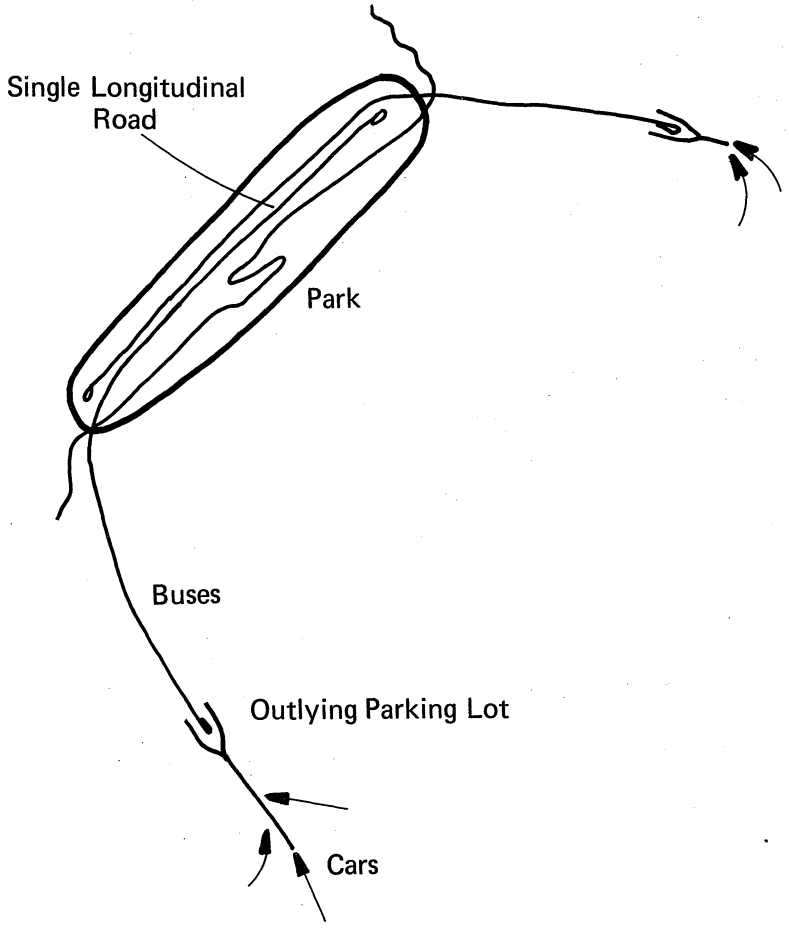

Figure 10B–1. Typical Bus Routes, Showing Superposition of Routes on Internal Road.

Buses carry local passengers inside Park.

if possible, be replaced by the main line of the Erie-Lackawanna Railroad.

Numbers

We will assume 45,000 day visits at one time. This is approximately the peak load currently assumed in the Park Service-Corps of Engineers (PS-CE) plan. The dam opponents, in their alternative plan with no reservoir, assume the same yearly load as PS-CE, but because

their plan has a less pronounced seasonal peak, the maximum daily load is less than 45,000.

The 45,000 visitors fall naturally into fourteen or fifteen traffic sheds of about 3,000 visitors each (see Appendix A). A parking lot to serve 3,000 visitors would need to hold about 1,000 cars. Buses carrying 45 passengers each, leaving from such a lot over a four-hour busy period, would on the average be spaced 3.6 minutes apart. (This, of course, is very approximate: some departures would have to be scheduled throughout the day, and during the peak the rate might be higher). Since the time required to load a bus would probably be longer than the time between departures, two or three buses would be at various stages of loading at any one time. There would be no wait for a bus to arrive; the wait to physical departure would be no more than the bus loading time.

1. **Separation of Pedestrian from Vehicular Traffic.** Figure 10B–2 shows a general parking lot arrangement that separates auto, bus and foot traffic. People with gear could back into a parking space so that their trunks or tailgates would open directly onto the walkway.

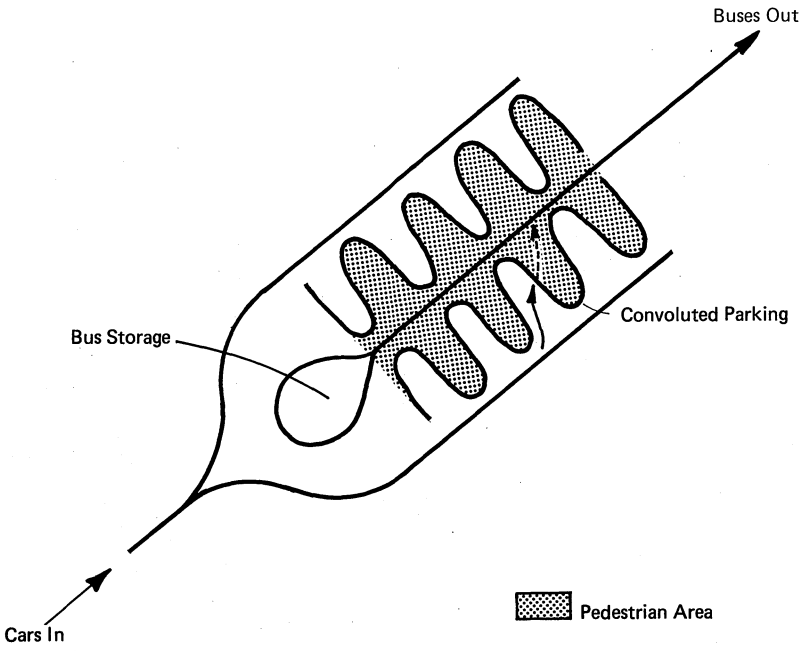

Figure 10B–2. Parking Lot, Showing General Arrangement to Separate Auto, Foot, and Bus Traffic

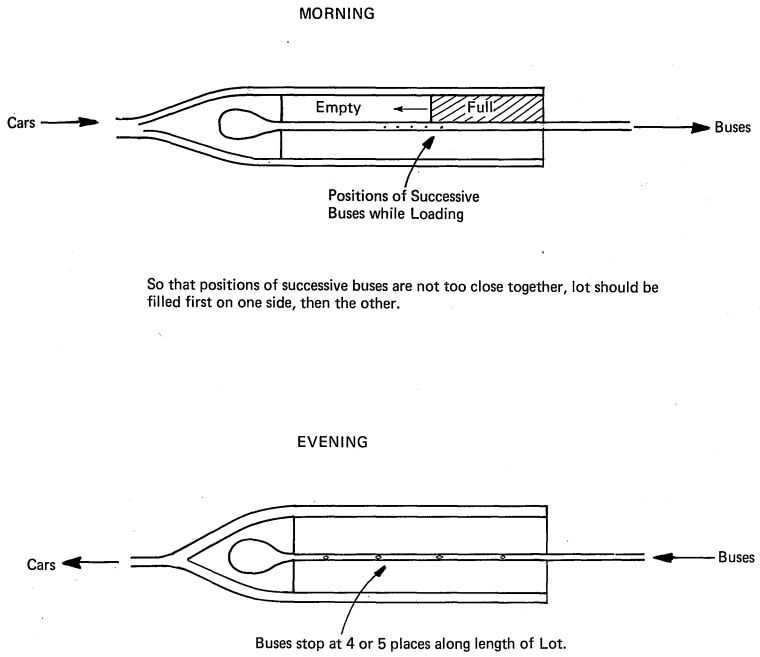

Figure 10B-3. Morning and Evening Parking Lot Operation

2. **Walking Distance.** Examination of a scaled version of this lot showed the average distance between auto and bus to be about 90 ft. in the morning and 125 ft. in the evening. This is probably considerably less than the distance one would have to walk to get out of a typical parking lot in the PS-CE plan. (The asymmetry between morning and evening operations is explained in Figure 10B–3.)

3. **Gear Handling.** Both the prodam and antidam plans provide primarily for day use. Even the extraordinarily dense campsite "cities" planned by the PS-CE account for only a small fraction of all visitors. Most visitors would carry little gear—perhaps a lunch, a fishing rod, or a bathing suit. Nevertheless, provision should be made for carrying bulkier things such as camping equipment and bicycles. Storage for this should be accessible from the outside of public vehicles. One possibility is to use trailers. Probably only every other bus would need to pull a trailer. Boats and canoes should probably be taken privately. However, the present canoe rental system, under which rental agencies carry canoes back upstream on specially designed trucks, seems to be perfectly satisfactory. There is presently

little incentive to take your own canoe. In any case, under every plan, canoeists and boaters are a small fraction of all visitors.

4. Bus Stops in Park. Each route has enough traffic to justify its own set of stops (e.g., platform and shelter) inside the park. The stops for different routes could be clustered together at main centers, but they need not be. The routes can be thought of as independent operations that are simply superimposed. On the interior road, the effect of the superposition is to create total traffic of one bus every 20 seconds or so.[a] This is not very heavy traffic by ordinary standards. Buses running shuttle service during the middle of the day, and perhaps all buses, could probably afford to drop off passengers at any station on request. This would constitute the only real interaction between routes.

5. Information. To use the New York subway system efficiently one must be privy to a great many arcane facts. To hardened New Yorkers, knowing these facts has a certain one-up value, but to visitors, the need to know them is a considerable nuisance. For the Water Gap Park system, whose purpose, after all, is pleasure, I believe that simplicity is important. Many visitors will use the system only occasionally. For going out to the Park, the only information necessary would be the location of the nearest parking lot. Since this would be near home, on a prominent road, its location would soon be common knowledge. Coming home, it would only be necessary to locate a station with the right label on it. Since all stations lie along the same road, that should not be difficult. One could take a shuttle bus if necessary.

6. Overall Size of Operation. It is important to appreciate what it means to move 45,000 people out to Tocks and back. This is an enormous operation, whether it is done with automobiles or public vehicles. The entire Erie-Lackawanna commuter rail system, with all its various tentacles reaching into northeastern New Jersey, moves only 38,000 people each way on a typical day. If each bus in the system we are considering made only one round trip in a day, then about 1,000 buses would be needed. This number can be reduced to the extent that demand peaks can be flattened so that some buses can make more than one round trip. For example, campers going out in the evening or coming back in the morning would help. Costs

[a]During the PM busy period, 20 seconds between southbound buses (ten routes), 40 seconds between northbound buses (five routes).

could be reduced somewhat if idle buses could be used for commuter service on weekdays.[b] About one-fourth of the buses could be eliminated by using the main line of the Erie-Lackawanna. There is an ideal spot for a cross-platform transfer near the Water Gap. Of course, many train passengers might choose to stay in the Water Gap area and not take a shuttle bus.

The cost of this large public transporation system needs to be compared not to zero, but to the cost of the automobile alternative (15,000 cars). The highway costs alone are at least in the hundreds of millions (depending on what you include and whose figures you believe), but in addition there are the considerable environmental and social costs, including the degradation of the park, the impact on the surrounding region, and the inevitable extra loss of life and limb.

NOTES

1. L.W. Brodhead, *Delaware Water Gap, Its Scenery, Its Legends and Early History* (Philadelphia: Sherman and Co., 1870). p. 252.
2. *Ibid.*, p. 268.
3. *Ibid.*, p. 272.
4. *Ibid.*, p. 25.
5. *Delaware River Basin*, House Document 522, 87th Congress, 2nd Session, 1962.
6. *Master Plan*, Delaware Water Gap National Recreation Area, National Park Service, 1966.
7. *Potential Impact of the DWGNRA on its Surrounding Communities*, Washington, D.C.: Robert R. Nathan Associates, February 1966.
8. *Ibid.*, p. 171.
9. *Ibid.*, p. 9.
10. Edwards and Kelcey, *Approach Roads Study, Tocks Island Region*, New Jersey Department of Transportation, April 1969, Parts I and II.
11. *Highway Impact Study, DWGNRA*, Bureau of Advance Planning, Pennsylvania Department of Highways, December 1966.
12. Nathan, *loc. cit.* p. 124 and p. 159.
13. William T. Cahill, Governor of New Jersey, *Statement Concerning the Tocks Island Dam*, September 13, 1972.
14. Letter dated August 1, 1973, from Worth D. Phillips, Corps of Engineers, to Harold Lockwood, acknowledging that the Corps had not found time to revise the recreation benefit downward.
15. Nathan, *loc. cit.*, p. 69.
16. *Audubon*, July 1973, p. 108.

[b]This is complicated, though, because some costs (e.g., most maintenance) are related to mileage rather than time. These are not helped by augmenting use.

17. For a brief survey of electric bus technology, see Hoffman, "Electric Bus Designs for Urban Transportation," *Transportation Research* 6(1972):49.
18. Edwards & Kelcey, *loc. cit.*, Part II, p. 10.
19. Conceptual Development Plan, p. 62.
20. *Ibid.*, p. 29. (TIL-DWGNRA is the "Tocks Island Lake-Delaware Water Gap National Recreation Area.")
21. Nathan, *loc. cit.*, Table 1, p. 63.