Appendix 9.3:

Other Planning Documents

This Appendix contains a summary of other planning documents mentioned in or relevant to the Bergen County Parks Master Plan, as well as copies of documents that were not referenced with a corresponding web address.

9.3 OTHER PLANNING DOCUMENTS

OTHER BERGEN COUNTY MASTER PLANS

The Bergen County Parks Commission never drafted a written Master Plan for the park system. However, a number of other Bergen County planning initiatives have been written that contain park-related elements. Documents provided by Bergen County that support the park system include:

- 1962: Bergen County Map Highways Roads Recreation
- 2001: Hackensack River Pathway: Connecting Recreation, Revitalization, & Transportation
- 2004: Bergen County Open Space & Recreation Plan
- 2010: Bergen County's Hudson River Waterfront Walkway Design & Implementation Strategy Plan
- 2011: Vision Bergen: The Visioning Component of the Bergen County Master Plan
- 2014: Central Bergen BIKE + WALK: The Central Bergen Bicycle & Pedestrian Plan
- 2016: Bergen County Zoo Master Concept Plan
- 2018: Ramapo Valley County Reservation Management Plan – Maser Consulting: In Preparation
- 2009: Bergen County Ramapo Mountain Open Space System
- 2010: Natural Resource Inventory and Assessment: Ramapo Mountains County Park
- 2010: Ramapo Mountains County Park Visioning Workshop Findings Report

MASTER PLAN 1962 BERGEN COUNTY

This one page map shows "Recommended Conservation Areas", which include the Ramapo Reservation, extensions of Saddle River Park North and South following the river, areas to the north of the Hackensack River, and the Meadowlands in the southeastern section of the county.

The Ramapo Reservation has since been conserved and transformed into a Bergen County Park. Some of the suggested conservation areas around the Hackensack River have been preserved, primarily by municipalities, but parcels are fragmented, with the exception of the 3,500 acre conservation easement north of the Oradell Dam. Suggested conservation easements in the southern portion of the County have not been executed, but are in the approximate location of a suggested Anchor Park (Section 2, Chapters 3.01-3.02).

HACKENSACK RIVER PATHWAY: CONNECTING RECREATION, REVITALIZATION, AND TRANSPORTATION 2001

This plan contains information about mobility issues, land use and the redevelopment context. It integrates land use and transportation investment, enhancing bicycle and pedestrian mobility along the Hackensack River in the City of Hackensack.

BERGEN COUNTY OPEN SPACE & RECREATION PLAN 2004

A County study in 1982 revealed that only 12 percent, or 18,344 acres, of the County's privately held lands remained undeveloped. By 1988, as a result of over 950 approved subdivisions, this acreage declined by 8,400 acres to 6.8 percent of the County's stock of privately owned undeveloped land.

"The Bergen County Open Space and Recreation Plan was prepared by the Bergen County Department of Planning and Economic Development to provide a countywide policy direction on open space and recreation issues."

The document describes types and locations of Bergen County Open Space. Three types of development occurring in Bergen Count are identified - semi-rural suburbanization, suburban redevelopment, and urban redevelopment. Open Space is divided into four basic functions – environment, protection, recreation, and community character. A major County Open Space role is the protection and preservation of natural and scenic values, and to preserve an ecological balance in the County. Basic planning concepts guiding the Bergen County Open Space and Recreation Plan objectives were: the preservation of the major waterways in the County; the expansion of existing County Park areas where applicable; and the acquisition of major tracts of undeveloped land where suitable for County Park purposes.

Goals and policies that support the County's open space objectives included:

- Conserve major ridgelines, significant treed areas and areas designated as natural areas
- Improve the quantity, quality and availability of parks and open space, including active and passive recreational facilities, parks and environmentally sensitive areas
- Preserve the environment, including wetland areas, streams and wetland corridors
- Promote the establishment of a linear greenway park system along the Hackensack, Passaic, and Ramapo Rivers
- Protect the quality and purity of rivers and streams

An "Open Space Acquisition & Preservation Opportunities" map has six identified sections; Ramapo Mountains, Hackensack River Corridor, Meadowlands Region, Saddle River Corridor, East Hill Corridor.

Hackensack Watershed – Over 400 acres of woodland watershed property is identified as permanently protected from development in Emerson, Harrington Park, Old Tappan, River Vale, and Closter. Another 291 acres are also permanently protected as golf courses – Pascack Country Club, Emerson Country Club, and Haworth Country Club.

The Hackensack River County Park, a 31-acre waterfront environmental park adjacen to Riverside Square Mall, was created by the County. Plans were prepared for a 2-mile riverfront path from the City of Hackensack's Johnson Park, through the Hackensack River County Park, to the Historic New Bridge Landing Park l in River Edge. Finalizing access easement agreements and securing NJ Department of Environmental Protection permits remain before seeking construction bids. The municipalities of Hackensack, Teaneck, and New Milford have all prepared riverfront path greenway plans.

In 1993, 47-acres of Hackensack River riverfront property, located in the Borough's of Oradell and New Milford, were donated to the County by the Hackensack Water Company. Located within the 47-acres is the 13-acre Van Buskirk Island, which contains the Hackensack Water Company's former pump and filtration plant. Listed on the New Jersey and National Historic Registers, the Plant is nationally significant as the earliest example of mechanical filtration that enabled the American system to deliver purified drinking water to the public.

BERGEN COUNTY'S HUDSON RIVER WATERFRONT WALKWAY DESIGN & IMPLEMENTATION STRATEGY PLAN 2010

A design and implementation plan to create a continuous, non-motorized pathway that connects the Palisades Interstate Park, Hudson County's Hudson River Waterfront Walkway, the George Washington Bridge, and New York City's Westside Greenway.

VISION BERGEN: THE VISIONING COMPONENT OF THE BERGEN COUNTY MASTER PLAN 2011

This plan, developed by the Bergen County Planning Board, presents recommendations for the development of the County. The document addresses roadways, bridges, waterways, playgrounds, forests, parks, and public spaces.

CENTRAL BERGEN BIKE + WALK: THE CENTRAL BERGEN BICYCLE & PEDESTRIAN PLAN 2014

This one page map displays connections for pedestrian and cycling routes through the center of Bergen County. Downloadable from http://www.centralbergenbikewalk.com/.

BERGEN COUNTY ZOO MASTER CONCEPT PLAN 2016

This is an update to the 2011 Zoo Concept Plan prepared by Jones & Jones.

RAMAPO VALLEY CONSERVATION MANAGEMENT PLAN – MASER CONSULTING 2018

In Preparation at the time of this draft.

BERGEN COUNTY RAMAPO MOUNTAIN OPEN SPACE SYSTEM REPORT – MASER CONSULTING 2009

Provides overview and profile of the Ramapo Mountain Open Space System including natural resources, cultural resouces, and transportation and access.

NATURAL RESOURCE INVENTORY AND ASSESSMENT: RAMAPO MOUNTAINS COUNTY PARK – MASER CONSULTING 2010

Natural resource inventory and assessment of Ramapo Mountains County Park.

RAMAPO MOUNTAINS COUNTY PARK VISIONING WORKSHOP FINDINGS REPORT – REGIONAL PLAN ASSOCIATION (RPA) 2010

In 2010, the County of Bergen, Maser Consulting, and RPA held a joint visioning workshop to solicit public input on issues that would be addressed in the Ramapo management plan. This report shares findings from the visioning workshop.

OTHER RELEVANT PUBLICATIONS

TRUST FOR PUBLIC LAND 2017 CITY PARK FACTS

This data filled report provides statistical descriptions and rankings describing parks in 100 cites. The TPL ParkScore analysis evaluates how communities are meeting residents' needs for parks and recreation. These are the metrics used to evaluate how well Bergen County municipalities are serving parkland needs (Section 2, Chapter 2.11).

COHEN ET AL. NATIONAL STUDY OF PARKS AND AGING 2016.

An extensive infrastructure of neighborhood parks supports leisure time physical activity in most U.S. cities. Neighborhood parks have never been assessed nationally to identify their role in physical activity. Using a stratified multistage sampling strategy, a representative sample of 174 neighborhood parks in 25 major cities (population 4,100,000) across the U.S. was evaluated:

"Neighborhood parks are considered the backbone of park systems. They often contain multiple diverse facilities – playgrounds, picnic tables, basketball courts, green spaces, and shade trees – allowing residents of all ages to recreate there on a routine basis. Neighborhood parks are usually between 2 and 20 acres, have more facilities than mini-parks, and are intended to serve local residents living within a 1-mile radius around parks."

On average, the park amenity that generated the most time for adults and seniors was a walking loop, where 9% of users were seniors versus 4% in other park areas. After walking loops and gymnasiums, fitness zones and exercise areas generated the next-highest use for adults and seniors. Children and teens spent similar amounts of time on walking loops as they did in a pool or skate park.

1947-1984 BERGEN COUNTY PARK COMMISSION ANNUAL REPORTS

Reports published annually by the original Bergen County Park Commission that detail the creation of the park system, revenues generated by the parks, lands acquired, programming, expenses and funding sources. Available at http://cues.rutgers.edu/bergen-park-system/documents.asp.

NJDOT 2016 NEW JERSEY BICYCLE AND PEDESTRIAN MASTER PLAN

Report published in November 2016 presented a vision, goals and actions to improve quality of life in throughout New Jersey by better integrating biking and walking into the fabric of the transportation system.

AUDUBON INTERNATIONAL ENVIRONMENTAL MANAGEMENT PRACTICES FOR GOLF COURSES FACT SHEET (n.d.)

Fact sheet provides Audubon's standard enivronmental management practices applicable to all golf courses. Topics addressed include: environmental planning, wildlife and habitat management, chemical use reduction and safety, water conservation and quality management, and outreach/education.

2017 STATE OF NEW JERSEY COMPLETE STREETS DESIGN GUIDE

This third report in a series of Complete Streets guides developed by the NJ Department of Transportation focuses on tools and methodologies for designing Complete Streets in a variety of contexts.

Plans without a specified web address are included in Appendix 9.3.

COUNTY PLANNING BOARD

COUNTY OF BERGEN, N.J.

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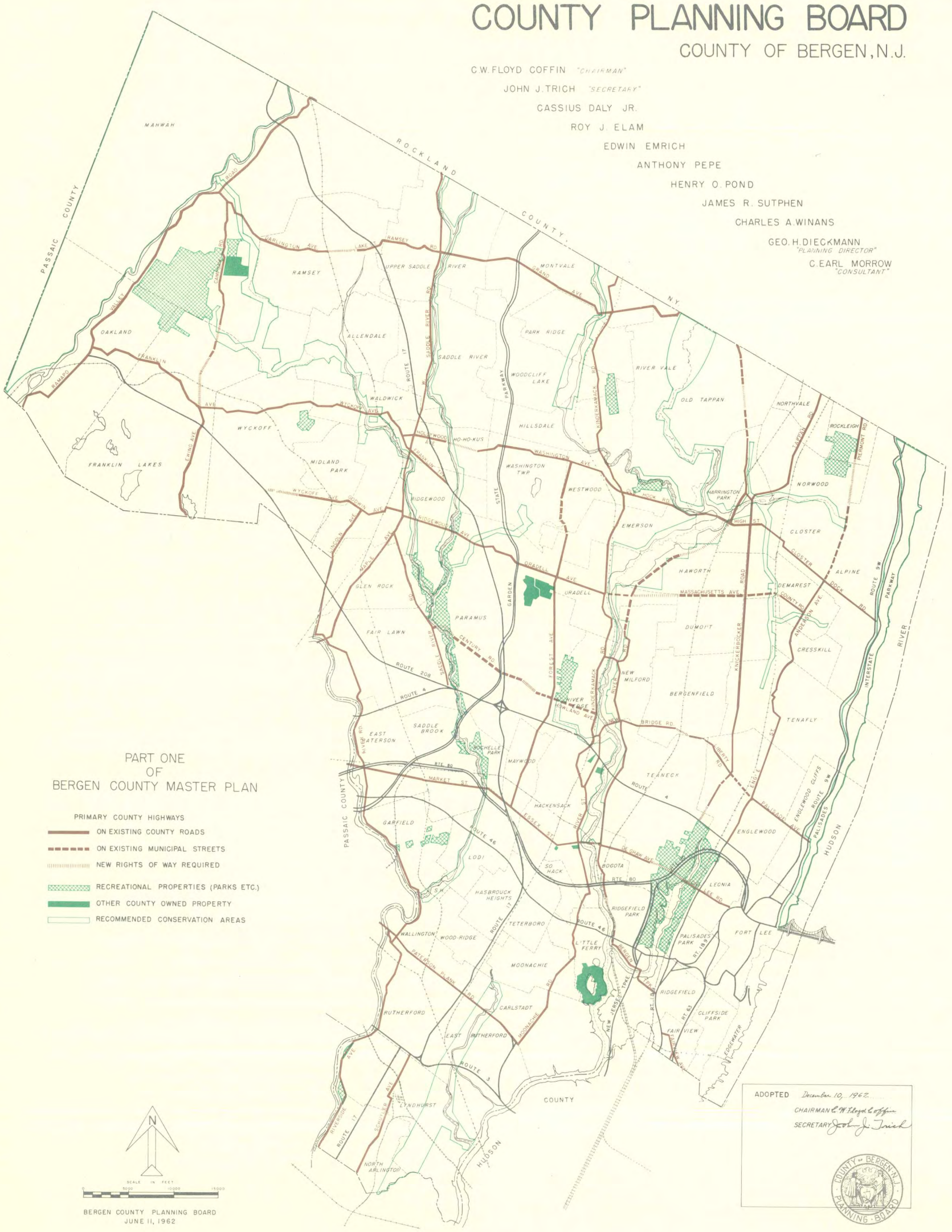

PART ONE
OF
BERGEN COUNTY MASTER PLAN

PRIMARY COUNTY HIGHWAYS
- ON EXISTING COUNTY ROADS
- ON EXISTING MUNICIPAL STREETS
- NEW RIGHTS OF WAY REQUIRED

- RECREATIONAL PROPERTIES (PARKS ETC.)
- OTHER COUNTY OWNED PROPERTY
- RECOMMENDED CONSERVATION AREAS

N

SCALE IN FEET
0 5000 10000 15000

BERGEN COUNTY PLANNING BOARD
JUNE 11, 1962

ADOPTED December 10, 1962
CHAIRMAN C.W. Floyd Coffin
SECRETARY John J. Trich

COUNTY OF BERGEN, N.J. PLANNING BOARD

Hackensack River Pathway

Connecting Recreation, Revitalization and Transportation

SUBMITTED TO:

Donna Orbach, Project Manager

Bergen County Department of Planning and Economic Development

Hackensack, New Jersey

June 30 th, 2001

MULLER BOHLIN
ASSOCIATES, INC.

McNally Engineering, L.L.C
393 Ramapo Valley Rd., Oakland, NJ 07436

CHA CLOUGH, HARBOUR & ASSOCIATES LLP
ENGINEERS, SURVEYORS, PLANNERS & LANDSCAPE ARCHITECTS
2001 Route 46, Suite 107, Parsippany, NJ 07054-1315

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Chapter 1: Overview and Approach

1.1 Introduction

It has been three years since Bergen County applied to the North Jersey Transportation Planning Authority to fund the Study whose results are summarized here. At the time, the Department of Planning & Economic Development was in the midst of a number of critical initiatives of relevance to this study

- the County had been intensively engaged in the development of a Public Private Partnership proposal to construct a Light Rail extension of the Hudson Bergen light Rail System into the County's economic core. As part of this work, it considered land side development that could be used to generate ridership for the line, as well as the way in which a reliable link to regional labor markets could trigger local redevelopment

- an aggressive open space program, that targeted first the Ramapo Mountains, but with the passing of a County Open Space Tax, was developing urban open space programs where the cost per acre of land is much higher.

- over more than a decade it had established a strong tradition of municipal based planning – an absolute must in a County with 70 municipalities in 234 square miles. Working with them, it grappled with the issues of sustainable development in a landscape where the usual source of value – land – was used up.

These three themes came together in its application to the NJTPA for a technical assistance grant for a planning study to examine the way in which a pathway along the Hackensack River could serve as a catalyst for economic redevelopment, advance the goal of establishing a transportation network, and enhance the local quality of life in its County seat.

Scope of Work

Yet, while the Study appeared to be "traditional" in the sense that it began with mobility issues in a transportation corridor, it took a considerably different course. Firstly, rather than beginning with an activity system (land use) and then evaluating specific alignments options, the County wished to find out how varying both the activity system and the potential alignments themselves could enhance the utility of both. Secondly, while it sought an open ended planning study, it was concerned that the outcome be a fundable project concept. So, the County added its own resources to the budget to take the planning study on to the next implementation phase.

Because of this rather open ended approach, the solicitation process allowed for each task to be scoped as the conclusions of the previous task were known. So, while the scope of work provided a general l direction, it did not provide a specific path to be followed. This can be seen in the proposed scope of work, which is reproduced with some minor alterations here:

Phase 1: Planning Study

The Planning study will consider the planning context for the pathway project. It will be developed with a continuous sensitivity to the interaction between transportation, land use and economic redevelopment along the Hackensack River Corridor. It will consider issues at both the corridor and site specific scales. It will begin with two baseline information pieces termed "scans" which will be conducted at the corridor scale. These scans will develop an overall sense of the way in which one or more pathways between Johnson Park and the NYS&W trestle could enhance the recreational values of the river inter-modal travel, the mobility dynamics in the corridor, and the revitalization of the landscape through which it passes.

These two scans will be completed in Task 1 (Mobility) and 2 (Land Use/Economic Development) and will include consideration of local planning goals. Planning activities include an inventory and analysis of aspects such as existing land use, zoning, transportation patterns, economic development and on going projects.

Having established a baseline information set, a number of potential pathways will be defined based on their ability to serve these mobility, recreational and economic development goals. (Task 3). The results of this work, including basic maps of the proposed pathway/s, feasibility criteria, and land use considerations, will be summarized in a first report (Task 4). This report will conclude the technical planning portions of the Study. Naturally, the scope also included an effective public involvement and interagency consultation process is vital to the project.

Phase II: Implementation

The Planning Phase will conclude with a report. However, this report will then serve as the basis for an implementation-oriented phase that will consider strategies to ensure project implementation.

Planning, Project Implementation and the Scope of Work

The intended approach, in which both land use and transportation variables would be allowed to vary to enhance each other, was very innovative. However, in its implementation two basic changes in emphasis were required:

At the outset of the Study, the field was wide open. The initial approach was to look at the land without its current mix of uses and then define a pathway that made the most sense in terms of the transportation, recreational and redevelopment purposes it might serve. However, as the Study progressed, developments outside of it began to limit the options. The most important developments in this regard related to the definition of a basic pathway concept that has a construction fund of nearly $2 million. Under this concept, a pathway will be constructed in two phases.

In the first phase, which is currently funded for construction, the City will complete a pathway along the river bank on City owned land. While there is still some discussion about the materials to be used (either concrete as in the already constructed sections or a wood structure on pilings, as has been done in the Hackensack River County park behind Riverside Square Mall) the basic routing is set. So, the land use and design team took a "river edge" alignment as a given.

In the second phase, construction will be advanced over the critical link between the two City owned pathway elements. This segment would cross 13 privately held parcels of land. These parcels of land are all subject to the waterfront development requirement that they provide access to the river, via the construction of a pathway should they seek to redevelop their properties. One option then would be to develop the pathway as redevelopment in the area occurred.

However, while the area appears to be ripe for a transition to higher uses, the review of development activity yielded no active proposals. This would mean that if left to the timing of markets and the goals of the property owners the "missing link" might be some years in arriving, reducing the utility of the pathway as a connector. An alternative approach would be for the public sector to acquire the pathway and develop it itself. However, the downside to this is that the maintenance and operational responsibility could shift to the public sector owner.[1]

Given the importance of the link in the overall operation of the pathway, the City elected to purse funding for the acquisition of an easement that would cause the minimum disruption to the existing land owners. A preliminary alignment was developed that moved between the water's edge and a pathway on pilings in the river where necessary. Funding was sought, and obtained, from State and County open space funds for the acquisition of the easements.

The outcome of developments in the project funding world was that for practical purposes, a key part of the pathway has been defined.. So, to spend a great deal of effort in a completely theoretical exercise was viewed as of limited utility. Accordingly the focus of task 3 was shifted from picking an alignment, to focusing on a potential redevelopment scenario and linkages to the other activity centers in the area -- primarily a redeveloping Main Street.

An important by product of the redevelopment scenario is that, by showing what might replace the existing low intensity uses, it might contribute to the City's discussions on its future as well as encourage private developers to think in ways that promote the pathway and redevelopment. Finally, by defining the pathway early, it is possible to include it in the redevelopment thinking of the different participants.

Secondly, due to the vagaries of the funding process, the Study was first suspended and then given a rather tight time frame in which to come to conclusions. This had a number of implications. Firstly, as is often the case in the consulting world, team members that were to play key roles in the study had moved on to different assignments and firms. Secondly, the products that are presented in this report had to be developed at times in parallel, rather than in the sequential mode that is a more comfortable approach. So, for example, the analysis of the pedestrian and bicycle network was completed before the details of the Redevelopment scenario were known. This also compressed the opportunities for review by the project management team, although the existence of a second phase no doubt provided some comfort in that details could be clarified and refined as necessary.

Finally, it should be noted that the public involvement process ahs been impacted by both the project development and management process. One the one hand, because of the

[1] Developing a solution to this dilemma will be a prime focus of the implementation phase of this study.

requirements of the Green Acres funding source, there has been a more extensive outreach process than anticipated at the outset of the project. This has included a public hearing (not charged to this project of course), various briefings to state and local elected officials and correspondence with property owners. On the other hand, the compressed timeframe, meant that some of the products will be reviewed in detail after the project has been completed. Nevertheless, through the active participation of the City, County Staff, and the technical advisory committee, along with the Hackensack Economic Development Commission, it is felt that the results presented in this report have passed an initial test of involvement and public acceptance.

The Structure of the Report

This report largely follows the outline of the scope presented above. However, for presentation reasons, some of the material does not follow the order in which it was developed. The heart of the report consists of 4 chapters as follows:

Chapter 2: Mobility Issues

In this chapter the potential role of a Pathway along the Hackensack River is reviewed in terms of the overall dynamics in the Corridor and City. Using socio-economic information and journey to work statistics, a study area is defined as the area of concern. This is followed by a description of the major activity centers in the study area that could form the focus for connections between the pathway and the rest of the City. Finally, as the area is subject to considerable dynamism from regional and local transportation initiatives, these are overviewed and related to the Study area.

Chapter 3: The Market For redevelopment

A major mixed use development of the scale proposed in Chapter 4 is only possible if it matches up the dynamics of the regional and local markets with public policies. In this chapter, a review of the I-80 corridor between Paterson and Hackensack is presented to profile overall regional dynamics. This review shows that there is a new economic vitality in the area after a long period of decline. Transportation investments, and waterfront access can play an important role in this redevelopment process, which is also consistent with State and Regional Planning and investment goals.

This review not only shows the regional viability of redevelopment, but also points to the potential lessons that other communities, many of which have underutilized waterfronts, can learn from this study. The chapter goes on to analyze local economic factors and land use policies and concludes with the delineation of key elements that should be part of the redevelopment scenario.

Chapter 4: Land Use and Redevelopment Scenario

In Chapter 4 a redevelopment scenario is defined in relationship to the pathway. It is illustrated with various urban design elements, and the way in which land use, transportation and economic development can be integrated is demonstrated. The development proposed, while subject to specific market and public policy variables could add 1, housing units of different types, 1,000 new jobs and over $350 million to the ratable base, while opening access to the River along the Pathway.

Chapter 5: The Bicycle/Pedestrian Network

As was noted above, as the focus had shifted slightly towards connections to a Hackensack River edge spine, these are examined in Chapter 5. It considers both bicycle connections as well as pedestrian connections. Recommendations are made about improvements to the bicycle and pedestrian network that can form the focus for both short term and longer term projects.

We believe that the results presented in this report not only demonstrate the feasibility and desirability of a pathway, but also provide important insights that can be followed by other redeveloping communities in the metropolitan planning area.

Chapter 2: Mobility Issues

This chapter examines the way in which a pathway between Johnson Park and the proposed Light Rail Station at the NYS&W trestle on River Street relates to general mobility issues and other transportation proposals in the area. It begins with an overview of the pedestrian and bicycle activity system in the City of Hackensack and the immediate area around the proposed pathway. It then identifies specific activity nodes that could be connected to the Pathway as part of an overall mobility system. The chapter concludes with a review of a number of transportation investments that are likely to alter the mobility characteristics of the corridor over the next few years.

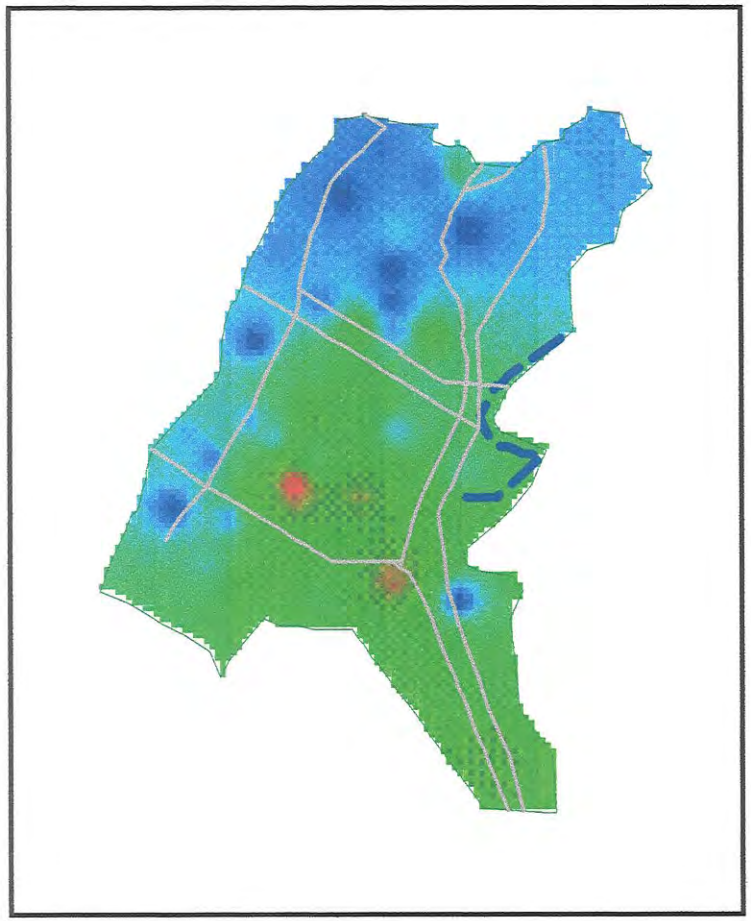
2.1. Description of the Study Area

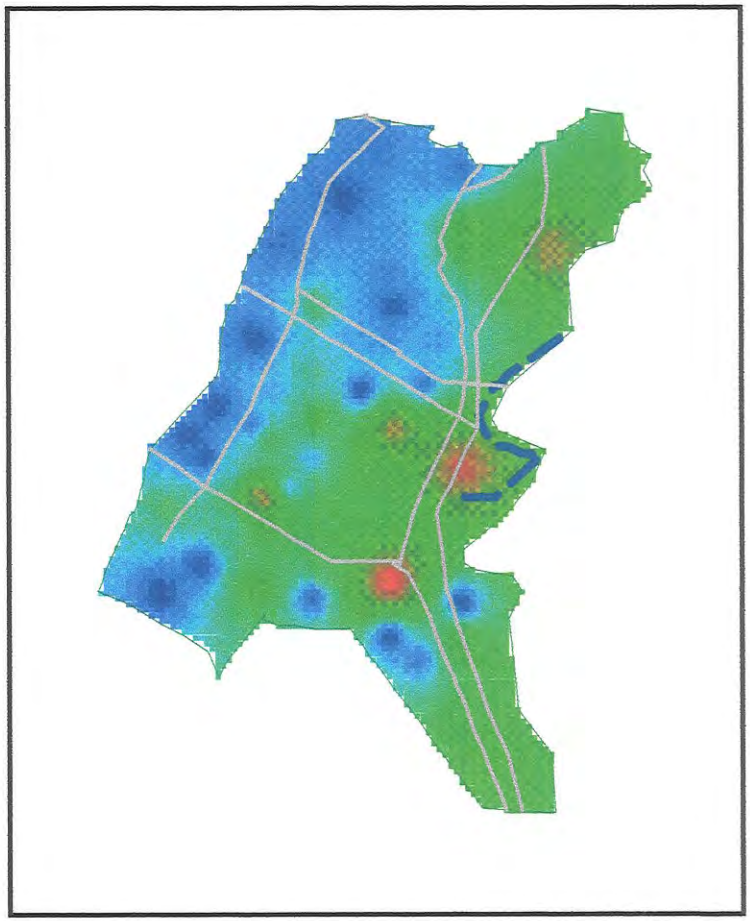
The Hackensack River Pathway is part of a wider mobility system. Figure 2.1 compares the patterns of bicycle/pedestrian trips for residents and worksites in the City using "grid pattern" thematic mapping approach. This means rather than shading each boundary, in this case, census block group, by the value range into which it falls, data are presented as if they are "continuous". The patterns can be determined both on the color and intensity of the cell. So, for example, the blue shades represent less than 19 trips per "cell" while the red cells represent values up to 147 trips.

In this case, it appears that few trips are produced in the northwest of the city, while the two nodes of concentration are around Essex Street and First Street and Essex and Hudson Street. In contrast, looking at the destinations or mode of arrival of workers at jobs, they are very strongly focused around the Pathway as well as at the complex around the County Courthouse. Most of the trip activity is focused in an area bounded by Anderson Street, First Street, Essex Street and the Hackensack River. This could serve as an initial definition of a study area or corridor. However, because the Pascack Valley Line acts as an effective barrier to walking trips, it was set as the western boundary of the Study area. So, the study area, or River Street Corridor, is defined as follows:

- western Boundary: the Pascack Valley Commuter Rail Line
- eastern Boundary: the Hackensack River
- northern Boundary: the Anderson Street Station on the Pascack Valley Line along Anderson Street to Anderson Park northern boundary.
- Southern Boundary: Essex Street from the Pascack Valley Station to the Court Street Bridge.

Figure 2.1 : Comparative Origins and Destinations of Bicycle and Pedestrian Trips





MULLER BOHLIN
ASSOCIATES, INC.

Bicycle and Pedestrian Trips
Residents

147
40
19
0

Major Local Roadways

Pathway

Bicycle and Pedestrian Trips
Workers

159
41
19
0

2.2. Socio-Economic Characteristics

The socio-economic characteristics of the area are important both to understand the existing dynamics as well as to assess the potential environmental justice implications of any proposed improvements. Census Block Groups are the smallest geographical unit for reporting detailed socio-economic characteristics. [1] Table 2.1 summarizes some of the mobility related characteristics pathway and corridor study areas and compares them with the City and County as a whole.

Table 2.1: Socio-economic Profile of the River Street Corridor

	Pathway	Corridor	Hackensack	Bergen
Land Area	0.3	0.5	4.1	234.0
Population	541	3,656	37,049	825,380
Households	209	1,376	16,487	308795
Population Density	1,747	6,648	8,997	3,524
Median HH Income	$35,437	$33,715	$38,976	$49,249
Mean HH Income	$34,348	$42,548	$44,814	$63,934
Per Capita Income	$14,820	$16,433	$20,217	$24,080
Percentage in Poverty	6%	11%	7%	4%
Percentage White	67%	47%	66%	87%
Percentage Over 64	9%	8%	15%	15%
Housing Units	188	1,455	17,705	324,817
Vacancy Rate	0%	4%	7%	5%
Rental Rate	97%	82%	65%	32%
Single Unit Rate	5%	6%	21%	56%
Median Year of Construction	1939	1951	1962	1954
Dwellings with No Vehicles	16%	25%	14%	8%

According to the information in Table 2.1 the immediate pathway area and the corridor share the following characteristics:

- A relatively old housing stock with the median year of construction in the pathway area being 1939 compared to 1951 for the corridor as a whole. This is slightly older than the averages for the county (1954) and the City as a whole (1962).
- A relatively high density of residential development. In the pathway area, for example, 94% of dwelling units are in multi-unit structures.
- A low vacancy rate but high rental rate for the pathway (97%) and the corridor (82%).
- Relatively high levels of "non-auto ownership. Occupants of one in seven units in the immediate area of the pathway and one in four in the corridor did not own an automobile.
- An interesting aspect of the profile is that the Pathway had a similar demographic profile to the City as a whole, although the less than average income and higher than average poverty rates may point to Environmental Justice issues.

[1] The socio-economic composition of the area is reported according to two census block based definitions. Firstly, Census Block Group 3 in Tract 231 is the closest approximation of the direct impact area of the pathway. Secondly, this is expanded to include Block groups 1 and 2 in Census Tract 235 and Block Group 4 in Tract 231 as the best definition of the River Street Corridor.

Table 2.2. provides a comparative profile of commuters who were resident in the Pathway, Corridor, City of Hackensack and County of Bergen.

Table 2.2. Characteristics of Resident Commuters

	Pathway	Corridor	Hackensack	Bergen
Resident Workers	349	2,025	20,801	429,102
Resident Commuters	349	1,991	20,520	419,054
Resident Commuters who:				
Worked in an Urban Area	44	334	3,932	98,488
Drove in SOV	185	1,015	13,257	310,055
Used Transit	68	451	2,914	45,021
Used Bus	59	433	2,512	33,245
Used Bicycle	0	45	159	865
Walked to Work	28	121	1,313	14,844
Median Travel Time to Work	17	17	17	21
Median Departure Time	745	745	745	815
Percentage worked in Urban Area	13%	17%	19%	24%
Percentage SOV	53%	51%	65%	74%
Percentage Transit	19%	23%	14%	11%
Percentage Bike/Ped	8%	8%	7%	4%

According to Table 2.2. :

- The single most notable characteristic of the profile is the relatively low rate of commutation in single occupant vehicles. While the average rate for the County was 74% of commuters, the comparative rate for the City was 65%, while the corridor and pathway areas had rates close to 50%.

- As a result, the rates of transit ridership and bicycle and pedestrian trips were higher in the Study area than in the City as a whole and the County.

- It is noteworthy that no residents in the immediate vicinity of the pathway used bicycles to get to work.

The comparative statistics for commuters who worked in the same areas as described in Table 2.2 are reflected in Table 2.3.

Table 2.3. Characteristics of Workers

	Pathway	Corridor	Hackensack	Bergen
Commuters to Jobs who	7,738	10,912	36,952	442,318
Used SOV	6,173	8,404	28,436	333,257
Used Bus	466	717	1,856	15,266
Used Rail	19	36	129	2,191
Used Bicycle/Walked	139	294	1,313	15,982
Jobs/Housing Ratio	41	7	2	1.4
Percentage SOV	80%	77%	77%	75%
Percentage Bike/Ped	1.8%	2.7%	3.6%	3.6%

There are a number of salient points in Table 2.3:

- the area around the Pathway is part of the City's regional employment center. In 1990, the Census journey to work figures showed that 7,738 jobs were located within the immediate vicinity of the Pathway and 10,912 in the Study area. This yields a jobs to housing ratio of 41:1 for the Pathway and 7:1 for the Study area. These are much higher than the totals for either the City (2:1) or the County (1.4:1). This suggests there is a strong market for housing within walking distance of these jobs.

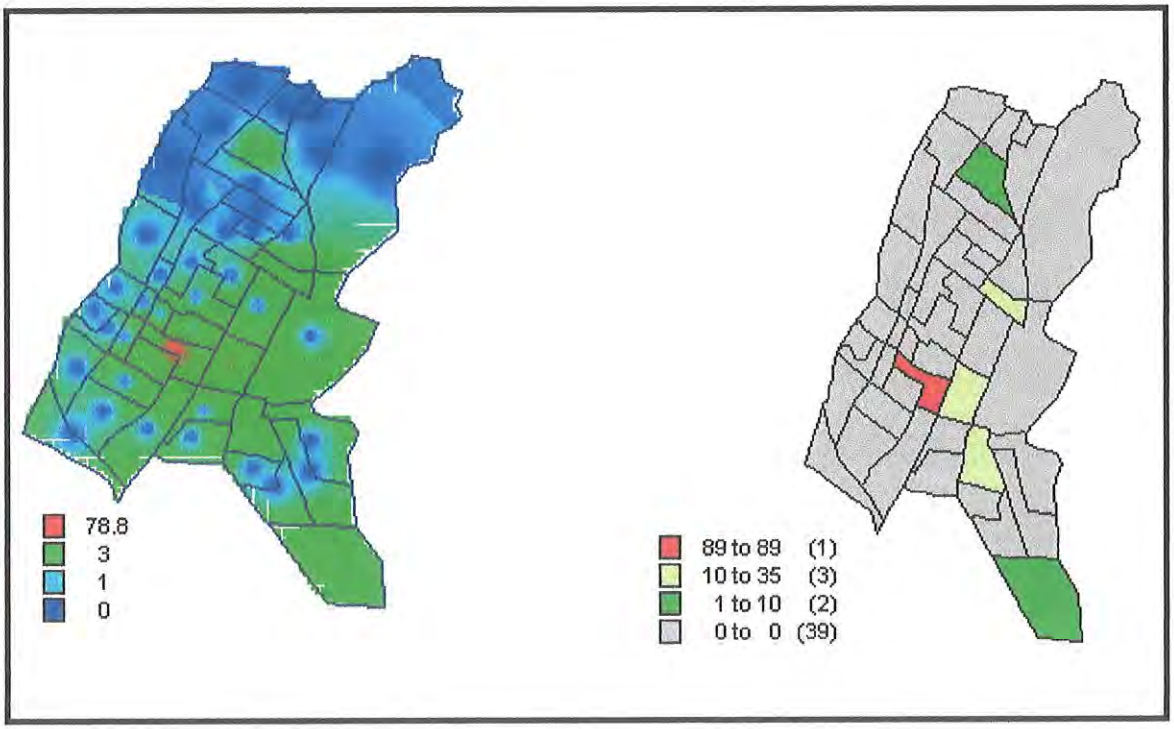
- commuters into the area overwhelmingly arrived in single occupant vehicles. The percentages for the Pathway area of 80% were higher than the numbers for the Study area (77%), City (77%) or County (75%).

- the percentage of workers who walked or rode a bicycle to jobs in both the Pathway and Study area was lower than for the rest of the City or the County as a whole.

- despite the extensive regional bus connections, relatively few riders chose this mode to access jobs in either the Pathway or Study area. Only 19 workers used rail, suggesting the relatively limited role of commuter rail in local congestion relief strategies.

In Figure 2.2 the data on bicycle trips by residents are presented in grid and traditional boundary based thematic mapping formats. Both maps show that trips are concentrated in the area around Essex Street and First Avenue. However, while the grid-based map on the left shows bicycle trips spread across the City, the boundary based approach shows it more as a number of distinct nodes.

Figure 2.2. Comparative Displays of Bicycle Trips by Residents



These patterns indicate that based on existing worktrips, the major focus of pedestrian investment should be in connecting the residential areas of production with the commercial areas of attraction. The key

pedestrian area would then be bounded by Anderson Street, Essex Street and follow the course of the Hackensack River between Main/River/Hackensack Avenue. As most of the trips included in the pattern are pedestrian trips, one might postulate that linking the residential areas which currently have few trips of any kind, with the employment centers in the east, might provide a strong focus for projects that increase bicycle safety and convenience. In the immediate area of the Pathway, there appears to be a strong demand for housing to serve the employers that are close by.

2.3 Activity Nodes in the Study Area

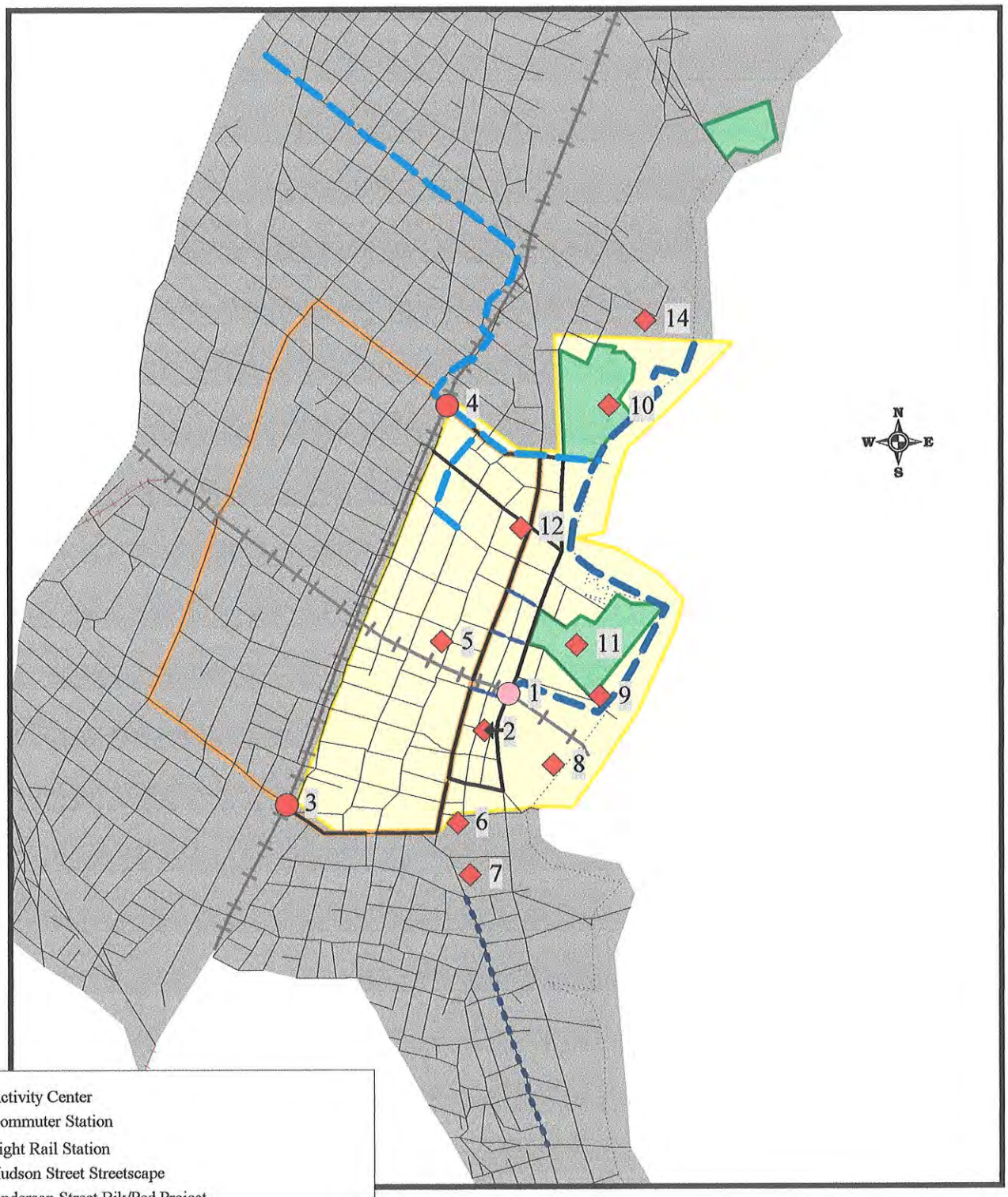
The previous analysis showed that in general terms, the pattern of land use meant that the primary flows of pedestrians and cyclists would be between the residential neighborhoods in the western part of the City and the employment centers concentrated along the Hackensack River. There are a number of key activity nodes in the corridor. These are depicted in Figure 2.3. Where applicable, the general conditions in the area are illustrated with photographs to provide an idea of the land use patterns and the general pedestrian and street conditions.

1. *Light Rail Station and Redevelopment Area:* As noted above, there is an active proposal to implement a high frequency light rail connection to the Hudson Bergen Light Rail Transportation System along the NYS&W freight rail right of way. This includes a station stop at the intersection of River Street and the NYS&W rail line. This is also the southern terminus of the current study. Those seeking to shop on Main Street, to access the County Complex to the south, or to walk along the Hackensack River Pathway could use this station.

2. *Hackensack Bus Transfer Terminal*: This is a major regional hub allowing for connections to bus services throughout the county and New York. The existing terminal is one block south of the proposed southern terminus of the pathway. As part of the planning for redevelopment to the south of the study area, consideration has been given to moving the terminal north to Mercer Street to provide an integrated Light Rail/Bus Transit center.

3. *Essex Street Station*: This station on the Pascack Valley line is the site of an important Park Ride opportunity. It has access by the buses that use Essex Street. It is anticipated that there will be a dramatically increased by the completion of the Secaucus Transfer Station. It is the current focus of a Transit Friendly Communities (TFC) initiative with NJ Transit. One of the proposals being considered as part of the TFC is to make the station the central focus of a community node that would convert the existing open lots into structured parking with a mixed use development on top. Essex Street would be an important pedestrian connector, to activity centers as well as the Walkway

Figure 2.3. Activity Centers and Related Local Transportation Initiatives



- Activity Center
- Commuter Station
- Light Rail Station
- Hudson Street Streetscape
- Anderson Street Bik/Ped Project
- Pathway
- Secondary Connector
- Primary Connector
- Community Shuttle Route
- Rail line
- Study Area
- Roadway

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4. *Anderson Street Neighborhood Mixed Use node and Station on the Pascack Valley Line:* The Anderson Street Station is less than one half-mile from the pathway. The station is a central focus of a mixed use node that includes retail/commercial development between Main Street and the Station, as well as a large amount of multi-family and stable single unit housing. It has many of the characteristics of a "transit village" and has been nominated for inclusion into the State's Transit Village program. It is anticipated that there will be a much greater need to provide alternatives to automobile access to the Station once Secaucus Transfer is opened and double tracking on the Pascack Valley Rail line is accomplished.

As can be seen in the photograph the Anderson St. Station is an example where both the pedestrian and bicycle environment has been improved by street treatments. Bicycle racks are located on the south side of the train station providing a convenient storage facility. The use of trees, paving treatment, and planters along Anderson St. provide an appealing environment for pedestrian use. This type of treatment can be used at any of the selected sites to improve pedestrian connections.

5. *City Hall:* The City hall is located on the corner of State St and Central Avenue. Pedestrian activity is centered on it and the Post Office across State Street. The picture to the right shows the intersection of State Street and Central Avenue. The pedestrian environment could be improved by the clearer demarcation of the pedestrian crossing.

6. *County Courthouse and Green:* This is an historic structure and the central location for judicial activity in the County. The area includes a community open space, statues and other cultural resources and the small pocket park is a prime space for office workers to use in their lunch-hours.

2.4. Transportation Investments promoting non-auto movement in the corridor.

There are a number of planned transportation investments that will impact on the mobility dynamics in the River Street Corridor:

Regional Rail Transportation Investments/Initiatives:

The Secaucus Transfer Station:

The Secaucus Transfer Station will offer transfer opportunities between the different rail lines in New Jersey. This will connect Hackensack's commuters more directly to mid-town Manhattan, as the Secaucus Transfer is only six minutes from Penn Station New York. Currently, commuters must either travel by bus to the Port Authority Terminal on 42nd Street, or transfer to path or ferry at Hoboken. It is anticipated that the short-term demand will be for an additional 700 park-ride spaces at Hackensack's two stations on the Pascack Valley Line in the River Street Corridor.

Double Tracking the Pascack Valley Line to Hackensack:

Currently, the Pascack Valley Line operates on a single-track right of way throughout Bergen County. However, NJ Transit has developed a plan to double track the Line from Secaucus Transfer to Route 4. The current single-track configuration means that the Pascack Valley Line effectively operates as a peak direction service with trains in in the morning peak and trains out in the evening. So, for example, someone wishing to use the Pascack Valley Line for a reverse commute opportunity cannot get to Hackensack before 1pm. With the double-tracking it will be possible to offer two way service in the peak periods.

Bergen Passaic Light Rail Extension of the Hudson Bergen Light Rail System:

The NJTPA plan notes that the I-80 Corridor between Hackensack and Paterson is within the area with the "greatest rail transit potential" in northern New Jersey. So, it is not surprising that Bergen County has built a partnership with Passaic County and the private sector to extend the Hudson Bergen Light Rail Line westwards from its planned terminus at the Vince Lombardi Park and Ride to Paterson. The proposed terminus of the pathway is at one of the proposed station stops on the line. This station stop could serve as a critical point of access for those wishing to come to jobs in the area, attend classes at either Bergen Community College or Fairleigh Dickinson, or to take advantage of the recreational and other opportunities afforded by the Ice-house and access to the Hackensack River.

Transit Friendly Communities Initiative:

Hackensack is one of 11 communities targeted under the NJ Transit "Transit Friendly Communities" initiative. The goals of this program are " to shape a new vision for linking train stations to community enhancement". While this is still in the planning stage, it is likely that this will yield a number of projects that will enhance access to the Essex Street Station and promote non-auto mobility in the corridor.

Local Initiatives

There are a number of local initiatives that will either enhance mobility in the corridor or provide direct access to the proposed pathway. These are depicted in Figure 2.3 and include:

Hackensack Community Shuttle:

The City of Hackensack applied successfully for two shuttle buses under NJ Transit's "Community Shuttle" program. The proposed route, to be implemented during 2001, will connect many of the activity nodes in the area, and, most importantly, will provide an easy way for residents on the "ridge" along Summit Avenue and Prospect Street to access the corridor.

Anderson Station Bike Pedestrian Project:

The Anderson Street Station on the Pascack Valley Line was recently refurbished by NJ Transit. It is a key node in a strong mixed use and high-density residential neighborhood. The Anderson Street Station project will define a number of key access points for pedestrians and bicyclists and identify specific strategies that will promote these modes and enhance safety. Most importantly, it will connect directly to the pathway at the intersection of River Street and Anderson Street.

Hudson Street Beautification:

Hudson Street is a primary gateway to the City between I-80 and the new County Administration complex. It is also the focus of a neighborhood commercial node centered on the intersection of Broadway and Hudson Street. The City, in partnership with the County and NJDOT has embarked on a beautification project that will beautify the area, enhance pedestrian activity, refurbish Veterans Park and provide benches for regional and local bus riders. Although located to the south of the Study area, this project is important because of its integration with a major activity center, the desire to link uses and because it can be connected relatively easily with the proposed pathway.

Hackensack River County Park and Pathway:

Bergen County constructed an award-winning park behind the Riverside Square Mall that includes nature trails through the area as well as elevated wooden pathways. The County is working on a project to construct a pathway from FDU north to the Pathway. When completed, this will link with the Pathway under consideration in this study and provide continuous access to the Hackensack River.

Hackensack River Walkway:

As land uses along the Hackensack River are converted as part of the city's revitalization process, each parcel is subject to NJDEP regulations requiring the construction of a riverfront walkway. While driven by the market for redevelopment of these properties, this has led to the construction of segments behind the recent Shoprite development, the City Public Works complex and the COSTCO development.

River Street Trestle Reconstruction:

The southern terminus of the current pathway study is at the NYS&W trestle over River Road. As can be seen in the photograph below, this structure has considerable vertical and horizontal restrictions for all modes of transportation underneath it. It is also one of the sites for a station under the proposed Bergen-Passaic Light Rail Transit System. Recently, Bergen County, the City of Hackensack, the NJDOT and the NYS&W railroad came together to design a new structure that will alleviate both traffic restrictions, accommodate light rail station platforms and enhance pedestrian access through sidewalk reconstruction. The new design should be constructed during 2001.

2.5. Summary and Conclusions

In this chapter we have examined the overall transportation context against which the planned Pathway will be implemented. Because of its potential role as a regional and local recreational resource, this Pathway was examined in the context of a wider study area. This examination showed that Hackensack's Pedestrian and Bicycle patterns are determined by the overall pattern of development which concentrated residential development in the west and commercial development on its eastern side, along the banks of the Hackensack River. The largest concentration of jobs and bicycle and pedestrian work trips was focused on the area immediately around the Pathway. The very high jobs-housing ratios around the pathway suggest that any development in the area include a residential component.

The area is subject to a considerable amount of dynamism. Major regional rail investments promise to make the area more attractive for residential development and there are stronger rail commuting possibilities inherent in the proposed double-tracking of the Pascack Valley Line and the extension of the Hudson Bergen Light Rail Line to Hackensack and Paterson. These investments are likely to spur the demand for non-auto access to the stations. Two local initiatives -- the community shuttle" and the Anderson Street Bicycle Connector" promise to increase access to the Pathway and connect the commercial/retail development in the east with the residential neighborhoods along the western boundary of the City.

A Pathway along the Hackensack River, when combined with other investments as part of a bicycle and pedestrian network can contribute to the promotion of non-automobile trips in the corridor as well as serving as a destination in its own right. For this reason, major east-west roadways will also need to be evaluated as part of an overall strategy of promoting pedestrian and cyclist use in the City and to access the Pathway. The study area includes a number of activity nodes that can be connected through a pedestrian/bike network that moves from the spine of the Pathway. These issues are addressed in more detail in Chapter 5.

Chapter 3: Land Use and Redevelopment Context

"New Jersey is tackling the problem of sprawl from two sides: saving precious open land and promoting smart growth everywhere else. " Governor Whitman's remarks to ***Partners for Smart Growth Conference*** *December 15-17, 1998 Austin, Texas*

"Whereas transportation spending in past years has supported sprawl-inducing highways and automobile-dependent land use, more people are beginning to see transportation programs as opportunities to turn things around and support the revitalization of long-neglected communities, planning, infrastructure maintenance, transit, walking, and bicycling. Local demand for other new modes of access is rising as well. In recent years, civic organizations, local governments, and other relative newcomers to the world of transportation infrastructure have conceived and vigorously supported the development of facilities for walking and bicycling, such as multipurpose trails, pedestrian malls, and bicycle lockers." [1]

3.1. Introduction

Perhaps more than any other land-use activity, redevelopment is the outcome of market demand and public policy working in close combination. Where, as was the case with the massive, failed, urban renewal schemes of the 1960's, public investments are made without regard to underlying regional and local economic forces, the result is to replace dilapidated structures with empty lots. Conversely, where as in the 1980's, the market drives development without regard to overall sensitivity to public sentiment, the result is a rebellion against the "costs of growth" and the accumulated costs of sprawl such as degraded water and air quality and traffic congestion. Wise public policy, is based on a balance between the imperatives of the private market and its drive for profit and the social concern with the hidden and indirect costs of growth.

As the quotation at the head of this chapter shows, transportation investment can itself be part of the problem. Yet, as northern New Jersey's mature suburban and urban communities look to reverse the patterns of the past in favor of new "engines of growth" they confront a number of basic problems. Firstly, and foremost, there is a question of the "seed of growth". While a northern New Jersey location immediately places one in the heart of the richest region in the world, this does not necessarily translate directly into an expanding jobs and ratable base.

The massive transit investments in the region provide one potential "seed" for such growth. As is already evident by the boost to property values in the Midtown Direct Corridor in Essex and Morris Counties and the strengthening pressures in Bayonne, Jersey City and Hoboken, new transit investments can focus interest in commuter oriented housing around stations. Another area of potential contribution lies in the increased concern with "community preservation" and "transportation enhancements". In such cases, investments with a transportation focus, such as a streetscape or urban walkway not only can have a transportation benefit, but can also significantly enhance the quality of life of residents in an area. This is all the more so if such investment signals a shift in public priorities or can unlock other kinds of investments such as HUD funded street façade programs.

These different themes come together in this chapter. We begin by outlining the way in which investments such as the proposed pathway and a mixed use development such as proposed in more detail

[1] *Sustainable Growth Network "Transportation Issues"* http://www.smartgrowth.org/ISSUEAREAS/transportation.html

in Chapter 4, match up with a general concern with the fortunes of communities in which the land has run out. We illustrate the economic challenges of communities such as Hackensack by outlining the pattern of growth for 17 communities along I-80 between Paterson and Hackensack. These communities are selected because they are part of the NJTPA's I-80 corridor and because waterfronts along the Passaic and Hackensack River could form an important focus for revitalization.

Having overviewed the general problems and potential policy prescriptions, we move on to discuss the market and public policy in Hackensack. The outcome of this overview is the definition the elements of a redevelopment scenario, that is refined in Chapter 4.

3.2. Regional Context

In this section we consider the overall dynamics of the region to establish the way in which regional economic trends and public policies have provided a favorable climate for redevelopment in the I-80 corridor and Hackensack. It begins with a brief description of economic patterns and then considers State and regional policies.

3.2.1. Regional Market Review: Economic Development and Redevelopment in the I-80 Corridor

Some of these challenges can be illustrated with the issues faced by a subset of communities included in the NJTPA 1-80 Corridor #7.

Table 3.1 : I-80 Corridor Communities, Paterson to Hackensack

Community	Area in Sq. miles	Population, 2000	Population Density per Sq. Mile	Median year of Con-struction	Dwellings with No Vehicles, 1990	Persons Living in poverty, 1990	Employment, 1998	Equalized Value of Real Estate, 2000 ($Million)
Bogota	0.8	8,249	10,311	1939	312	268	1,051	$429
Elmwood Park	2.7	18,925	7,009	1950	622	547	9,368	$1,215
Garfield	2.1	29,786	14,184	1941	1,588	1,975	6,241	$1,208
Hackensack	4.1	42,677	10,409	1962	2,468	2,483	41,454	$2,517
Hasbrouck Heights	1.5	11,662	7,775	1948	330	288	4,246	$942
Little Ferry	1.5	10,800	7,200	1964	274	437	3,238	$645
Lodi	2.3	23,971	10,422	1955	985	1,368	5,071	$1,136
Maywood	1.3	9,523	7,325	1947	383	297	3,774	$698
Ridgefield Park	1.7	12,873	7,572	1939	666	634	5,680	$841
Rochelle Park	1.0	5,528	5,528	1947	214	176	6,687	$566
Saddle Brook	2.7	13,155	4,872	1954	182	495	9,350	$1,236
South Hackensack	0.7	2,249	3,213	1958	64	129	5,192	$363
Teaneck	6.1	39,260	6,436	1944	1,112	1,280	12,872	$2,937
Teterboro	1.1	18	16	1946	0	0	9,652	$253
Clifton	11.3	78,672	6,962	1947	3,290	3,327	33,140	$5,199
Passaic	3.1	67,861	21,891	1944	5,734	9,794	19,627	$1,400
Paterson	8.4	149,222	17,765	1948	12,031	25,677	40,519	$3,085
Corridor	52.4	524,431	10,008		30,255	49,175	217,162	$24,668

Here are some common themes from these 17 communities that cover I-80 and US 46 between Paterson and Hackensack.[2]

They are all part of the metropolitan planning area and are targeted to receive infrastructure priority to enhance infrastructure already in place. They have an average population density of over 10,000 per square mile, although this masks considerable variation.

In general, they were recipients of the first round of suburban growth in the metropolitan area and benefited from the initial decentralization of manufacturing during and after World War II. So, between 1940 and 1970 their populations grew from 386,000 to 518,000 persons. Only the City of Passaic saw its population decline over this period.

Yet, after 1970, they suffered the fate of many mature suburban areas. Their downtowns were unable to compete with the new auto-oriented suburban malls that grew up around the massive highway investments between 1950 and 1980. Their once strong manufacturing base was eroded by competition within the region and, more importantly, from outside the US borders. Thus a review of land uses in Hackensack concluded:

> *"Industrial land uses have undergone the greatest decline of all land uses in Hackensack, reflecting the changing role of these facilities not only in New Jersey, but throughout the northeastern part of the United States. In 1973, 284 acres of industrial land uses were utilized. In 1999, industrial uses totaled 166 acres, a 41.5 percent decline."*[3]

There was very little change in the housing stock over this period. Only 1,295 units were added between 1980 and 1990 - most of which (1,401) were in the City of Hackensack. Between 1970 and 1990 nearly every community lost population and, as a whole, the corridor communities saw their populations decline by 34,000 residents. Nearly 50,000 of their residents (1 in 9) lived in poverty and 30,000 dwelling units were occupied by people without access to an automobile.

Yet, despite these struggles, the overall accessibility of the region, especially its transit system, was an asset on which to build. In 1990, the last year for which statistics are available, 22,418 of the 235,840 workers used transit to get to work. Of these, 20,103 used a bus. Because of the overall density of the environment and the integrated pattern of development, 13,814 workers walked to work. However, only 574 cycled to work, perhaps indicating that the environment does not favor cyclists. Despite the fact that the corridor was served by three commuter rail lines, only 1,687 workers used commuter rail to get to work.

By 1990, many of these smaller urban and mature suburban communities had suffered the cumulative effects of contrary economic forces and changing demographics. Their economic bases had been eroded for years. Many of their manufacturing plants that had gone out of business were clustered along the Passaic and Hackensack Rivers, reducing

[2] Passaic is the only one of the 17 not included in the NJTPA I-80 communities. However, its close economic and transportation integration with the corridor and other 16 suggests that it should be added to the list.
[3] Hackensack Draft Master Plan, p 11.

public access to the water and contributing to the overall feeling of neglect in the area. Public open spaces also showed signs of stress with an increase in crime, graffiti and reduced public expenditure on these keys to community well being and quality of life.

The 1990's proved to be somewhat of a schizophrenic decade. On the one hand there is much evidence of continued economic decline. Between 1991 and 1997, for example, at a time when jobs were expanding throughout the state, the number of jobs in the corridor declined from 230,000 to 212,000. The "equalized value" of real estate, perhaps the broadest measure of overall economic health, declined by more than a tenth from $25.2 billion in 1991 to $22.3 billion in 1998.

At the same time, the affordable housing stock and increased resources for education combined to attract the new wave of immigrants into New Jersey into many of these communities. This gave a new direction to population growth, and once again, population began to expand. The population growth of 40,000 persons between 1990 and 2000 more than offset the declines between 1970 and 1990 and corridor population reached its zenith in the 2000 Census.[4]

There was also evidence that the strong economic performance in the rest of the state was spreading to this corridor, with jobs growing by 6,000 between 1997 and 1998, the last year for which data are available. Similarly, after declining through much of the decade, the equalized value of real estate increased by $2.3 billion (roughly the value of real estate in the City of Hackensack) to a total of $24.7 billion in 2000. Although this was still $557 million less than in 1991, it may signal a shift in the long-term development pattern for the corridor.

Yet, while the pace of economic events might be quickening, all of these communities have very little vacant land[5]. Thus the City of Hackensack's Draft Master Plan states that "Statistically, the very small percentage of vacant land in the community is representative of the changing role that redevelopment will play in the future". Rather opportunities must be sought in reusing land that is either under-utilized or abandoned. One common area of such opportunities lies along the banks of the Hackensack and Passaic Rivers which cross a number of them. This has given rise to an increased interest in using the riverfronts as levers of revitalization. Almost all the riverfront communities in the Corridor have active projects and plans to achieve this through the construction of walkways, refurbishing and creating parks and other development opportunities. The Hackensack Pathway can provide a model for these efforts.

[4] This shift in demographic dynamics was not widely anticipated and population projections for the area completed even in the last two years, still forecast a continued pattern of decline. The 2025 forecast for the corridor communities by the NJTPA is a population total of 490,981 -- 33,450 persons less than in 2000.

[5] Using the 1993 aerial photographs for the state as a basis, the State Planning Commission identified only 14 acres of vacant land in the 17 communities. This was less than 0.5% of the land area. Although this is a very low estimate of vacant land, reflecting the difficulty of identifying such areas in developed communities, it does give some idea of the dimension of the problem.

3.3. State and Regional Transportation and Land Use Policies impacting on Hackensack's Redevelopment Market

As has been well documented, the combination of public investment policies and market forces led to the pattern of development described in the I-80 corridor. Highways, designed to facilitate travel between regions, also spurred the decentralization within regions and interstate and other facilities became critical pieces in the local and regional commuting network. The new accessibility of areas to the south and west in northern New Jersey promoted growth there, while the higher cost urban communities declined.

Yet, this pattern of growth did not come without its costs. The more decentralized region meant that trips were longer and more goods had to move by truck. Roadway traffic became an increasingly important source of air pollution, while land extensive development drove up the price of housing. Quality of life was impacted by rising traffic congestion that allocated more and more time to commuting. Farms and other open spaces were disappearing at a rapid rate as regions were transformed into what one author neatly called "edge cities".

Both in New Jersey and the country as a whole there was an increased attention to the impacts of public policies in general and transportation investments in particular on the pattern of regional growth. This gave rise to various policy initiatives including the New Jersey State Plan as well as the linkage of air quality and transportation policies in the federal Intermodal Surface Transportation Efficiency Act (ISTEA) and its successor TEA-21. The shifts can be illustrated with two examples:

The New Jersey State Plan

Under the State Plan, New Jersey is divided into a number of "planning areas" with the most urban area being designated Planning Area 1 and the "environmentally fragile" areas are given a 5 or lower planning area number. Within each planning area, development is to be encouraged in either centers or nodes. State policies and investments are then defined in terms of the following goals:

- ***Revitalize cities, towns and other urban areas experiencing socioeconomic distress*** by investing public resources to improve their livability and sustainability. Leverage private investments in jobs and housing, provide comprehensive public services at lower costs and higher quality and improve the natural and built environment. Build on the assets of cities and towns such as their labor forces, available land and buildings, strategic location and diverse populations.
- ***Conserve the State's natural systems*** and resources as capital assets of the public by concentrating development and redevelopment in PA1 and 2... and by restoring the integrity of natural systems in areas where they have been degraded or damaged.
- ***Promote beneficial economic growth, development and renewal***, and improve both the quality of life and the standard of living of New Jersey residents through partnerships and collaborative planning with the private sector. Retain and expand businesses, and encourage new businesses in Centers and areas with infrastructure. Encourage economic growth in locations and ways that are both fiscally and environmentally sound.

- ***Protect the environment, prevent and clean up pollution:*** Concentrate development and redevelopment in PA1... to reduce automobile usage, land, water and energy consumption, and to minimize impacts on biological systems, water and air quality. Plant and maintain trees, reduce waste and reuse and recycle materials.
- ***Provide adequate housing at a reasonable cost*** Create and maintain housing in Planning Area 1 at densities sufficient to support transit and reduce commuting time and costs, and at locations easily accessible, preferably on foot, to employment, retail, services, cultural, civic and recreational opportunities.
- ***Preserve and enhance areas with historic, cultural, scenic, open space and recreational value.***
- ***Ensure sound and integrated planning and implementation statewide.***

Hackensack is part of Planning Area 1 and is also an "urban ad" community. This means that it receives priority treatment in the allocation of various state economic development and transportation programs, including the conditions attached to the Pathway.

The North Jersey Transportation Planning Authority Regional Transportation Plan

Each year, more than one billion dollars is spent from federal sources on regional highway and transit projects in northern New Jersey. This is an important potential funding source for roadway, transit, pedestrian and "enhancement" for projects and is coordinated through the efforts of the North Jersey Transportation Authority. The role of ISTEA can be seen in their Planning Goals, which form the basis for their prioritization of projects for regional resources. Four that seem particularly appropriate to the Study include:

Goal 1: Protect and Improve the Quality of Natural Ecosystems and the Human Environment "A key strategy the NJTPA pursues to improve the environment is investing in transit and bicycle/pedestrian facilities to provide alternatives to automobile use"

Goal 3: Retain and increase economic activity and competitiveness

Goal 4: Enhance System Coordination, Efficiency and Intermodal Connectivity: "ensuring that train and bus stations are served by adequate pedestrian facilities"

Goal 6: Support the Coordination of Land Use with Transportation Systems: "the NJTPA looks to the State Plan as a guide to transportation investment for the region".

In this section we have reviewed state and regional land use and transportation policies. This review shows that investment in Hackensack and redevelopment of its landscape is supportive of, and supported by regional and state policies.

3.4. Local Land Use, Economic Development and Open Space Policies

The previous two sections have shown, respectively, that a redevelopment market is emerging in the I-80 corridor, and that State and Regional policies are supportive of investments in the City of Hackensack. In this section we examine local policies in Bergen County and the City of Hackensack itself.

3.4.1. Bergen County

Over the past decade, Bergen County has followed a "Growth Management" approach centered on open space protection and acquisition, development of an intermodal transportation network of regional and local projects, and redevelopment oriented land use and fiscal planning. Although not collected together in a formal master plan update, a key finding of the County's economic, transportation and land use analyses is that 60% of Bergen County's economic activity is contained in a densely developed "economic core" centered on the City of Hackensack. This 10 mile by 10 mile square area is not only the most congested, but includes many communities that must find ways to redevelop land and recycle buildings to enhance their economic foundations. Some of the County initiatives that are consistent with Hackensack's economic revitalization efforts include:

- ***Hackensack River Park and Pathway:*** The County developed an award winning urban pocket park along the Hackensack River behind the Riverside Square Mall. In combination with the municipalities along the River and the NJDEP has designated the entire length through the City of Hackensack as a "Greenway". In 1998, and again in the current draft Bergen County open Space and Recreation Plan, the longer Hackensack River Pathway is identified as one of the last three major county open space preservation and enhancement goals. This project is thus consistent with this initiative to increase access to the River.

- ***Cross County Light Rail:*** Over the past few years, the County has established the feasibility of a light rail connection on a new second track along the NYS&W right-of-way. Under the preliminary plan, this line will include two stops in the City of Hackensack that could form the focus for transit oriented development and provide a critical supplement to the City's rich transportation resource base.

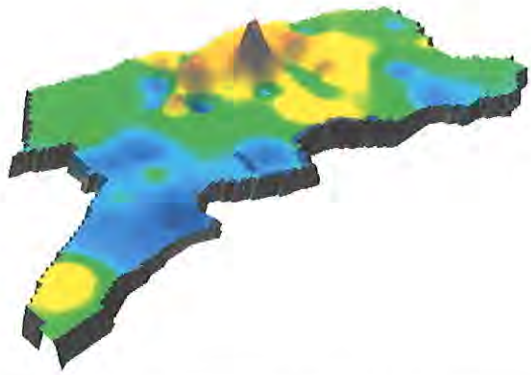
3.4.2 City Land Use and Economic Development Policies

The City of Hackensack is strategically located within the largest consumer and economic concentration in the world. Its 43,000 residents and 50,000 workers overwhelming rate it as a good place to live and work. Like other parts of the metropolitan economy, it shared in the economic "boom" of the 1980's and the subsequent "bust" and restructuring of the 1990's. Further complicating matters of course, is the city's wider attempt to move from a regional retail and manufacturing center to a modern "smart growth" community. In this sub section we consider first the market for redevelopment in Hackensack and then overview public policies in favor of redevelopment.

3.4.2.1. The Market for Redevelopment

One of the key challenges for revitalization of Main Street can be seen in Figure 3.1 which provides a 3D view of the distribution of income within the City of Hackensack.

Figure 3.1. Income Distribution in the City of Hackensack



According to Figure 3.1. the lowest 25% of income is found in the blue area. The next 25% in the green area, the third quartile in the yellow area, while the top 25% income is concentrated in the red area. The more concentrated the income within each area, the higher the "peak". This shows that incomes are highly concentrated in a small area which corresponds with the physical "ridge" in the City around Summit and Prospect Avenues. This area is spatially removed from Main Street as well as the Pathway, which can be seen as a dark blue line on the inner (western) edge of the figure.

The Downtown Market Analysis and Strategy

The perception that improvements in downtown economic activity might increase the share of local incomes captured by the "Main Street" economy formed the point of departure for the "Downtown Market Analysis and Strategy" prepared by Economics Research Associates. As suggested by its name, the strategy focused on a one-mile corridor along Main Street from the County Buildings in the south to the Packard's Site around Anderson Street in the north. Although it contains over a million sq. ft. of retail space, a key point of departure for the ERA Study was that the City could not depend primarily on retail activities for revitalization. So, the study included a consideration of market potential in a number of sectors. The findings by sector are:

> **Office Market:** The City of Hackensack includes 2.4 million square feet of office space, approximately 40% of which is viewed as Class A. The major office nodes are located at Continental Plaza III on Route 4 (290,000 sq. ft.), University Plaza (490,000 sq. ft.) Court Plaza (320,000 sq. ft.) and the Hackensack University Medical Center with the remainder scattered in smaller buildings. At the time of the study, the market was described as "soft, but skewed". The major changes in the market include the expansion of the HUMC and proposed construction of a new County Office Complex by the NJ Economic Development Authority.[6]
>
> **Hotel Market:** The relatively high levels of occupancy and daily room rates charged by hotels in Bergen County, point to the strength of the overall market and the potential attractiveness of adding to Hackensack's single hotel, the Best Western, located across from the Riverside Square Mall. However, this overall potential is offset by the projected

[6] However, as the economic expansion has continued, the market has probably tightened as it has in the rest of the county.

overbuilding of hotels in "many metropolitan markets" and the mismatch between local demand factors and highway access, a key to drawing regional travelers. So ERA concluded that a downtown hotel location was not viewed as desirable in the early phases and only potential highway oriented locations near I-80 and Route4/Hackensack Avenue were identified.

Retail Market: Bergen County's retail market is dominated by four regional shopping malls that, in combination, include over 4 million square feet of retail space, and around 20,000 parking spaces. If it is built, the proposed Meadowlands Mills Mall will add 2.1 million square feet in Gross Leasable Area. Thus, even though ERA estimated that there was up to 1 million square feet of retail space along Main Street alone, it concluded that "as much as 20% of this may be vacant" and "Hackensack cannot expect to compete directly with the larger malls" ... [because they] "are simply too large, and offer too many amenities, including ample parking." (p19). The report concluded that: "For the downtown to evolve into a healthy, mixed activity center, some of the retail must be retained and nurtured. Other retailers should be allowed to phase out with the intent of redevelopment in the future".

Entertainment Market: The proximity of Giant's Stadium, the Continental Airlines Arena and the Meadowlands, point to a strong regional entertainment market. Despite some uncertainty flowing from the potential impact of the Meadowlands Mills project, ERA concluded that "there may be a market for an additional movie theater complex ... in downtown Hackensack". The primary impetus for this was its analysis that "the region could support up to 31 additional screens". (p 41) and the recent construction of the Ice House offered potential synergy. Depending on the number of screens constructed -- ERA recommended between 12 and 16 screens -- such a cinema could draw between 732,000 and 976,000 visitors downtown each year.

Restaurant Market: The report observes that "presence of quality downtown restaurants" has been an important factor in the successful downtown efforts of Ridgewood and Englewood. This is contrasted with Hackensack's existing restaurants' focus on the "lunch time" market. The report thus "recommends that Hackensack attempt to attract additional restaurants to downtown". Although there is no formal market assessment the report recommends that the City target ethnic restaurants that match its diverse population, as well as an upscale restaurant/pub.

Housing Market: ERA's analysis of the link between downtown revitalization and housing patterns and development possibilities is, in many ways, the most intriguing part of the report. It noted the following features of the housing market:

- Hackensack is overwhelming a renters market with 61% of the 17,705 dwelling units being available for rental use.
- The housing stock is varied ranging in both age (with a median year of construction of 1962) and quality.
- "it is the hill or the large, mid-rise along Prospect Avenue" that "make the market place unique". This area is characterized as "targeted to the working professional, many of whom use public transportation to jobs in Manhattan". Because of their demographic profile these households "have discretionary spending that can support downtown revitalization efforts".

> Finally, in considering the role of housing in downtown revitalization, ERA notes that "the areas immediately surrounding downtown" are "older and lesser maintained". Consequently, while "there is a tradition of living downtown, it has not been extended to higher-rent, higher-amenity units". So, "ERA believes that this is a market that has potential" although "prospective development would not likely be right along Main Street, but in close in areas that are within walking distance of downtown". (p 23).

Based on its analysis of market opportunities, growth patterns and infrastructure, the ERA study saw a major economic opportunity in capturing an increasing share of Hackensack's residents and workers incomes for Main Street merchants. This could be done either by strengthening the market linkages between the higher income households and downtown, or by increasing the incomes of those living in close proximity of Main Street.

The study also found that Main Street was too long as a single area of focus and that it could be broken down into four "spheres of influence", each focused on a particular mix of activities. The approximate limits of each "sphere" are depicted in Figure 3.2 . As can be seen in the figure, the pathway provides a direct connection between three of the spheres.

3.4.2.2. Supportive Land Use Policies

Its draft Master Plan, which is due for public hearing and approval in August and September 2001, the City seeks to redevelop its waterfront. The focus in the coming years will be on new residential and commercial developments that will recognize the natural beauty of the waterfront. It will attract developments that will that would not only support downtown revitalization but will also tie into the proposed Light Rail Station at River and Mercer Streets and will open the City's waterfront for recreational uses through the planned Hackensack River Waterfront Walkway.

This waterfront redevelopment will take advantage of opportunities to draw new ratables to the City and tie into such strengths of the community as its strong transportation network, its in place development such as the downtown shops and restaurants and great location to the New York region. As part of these new developments, access across River Street to downtown would be encouraged to draw people from these new developments to the downtown area and at the same time, draw visitors and office workers within downtown to the waterfront.

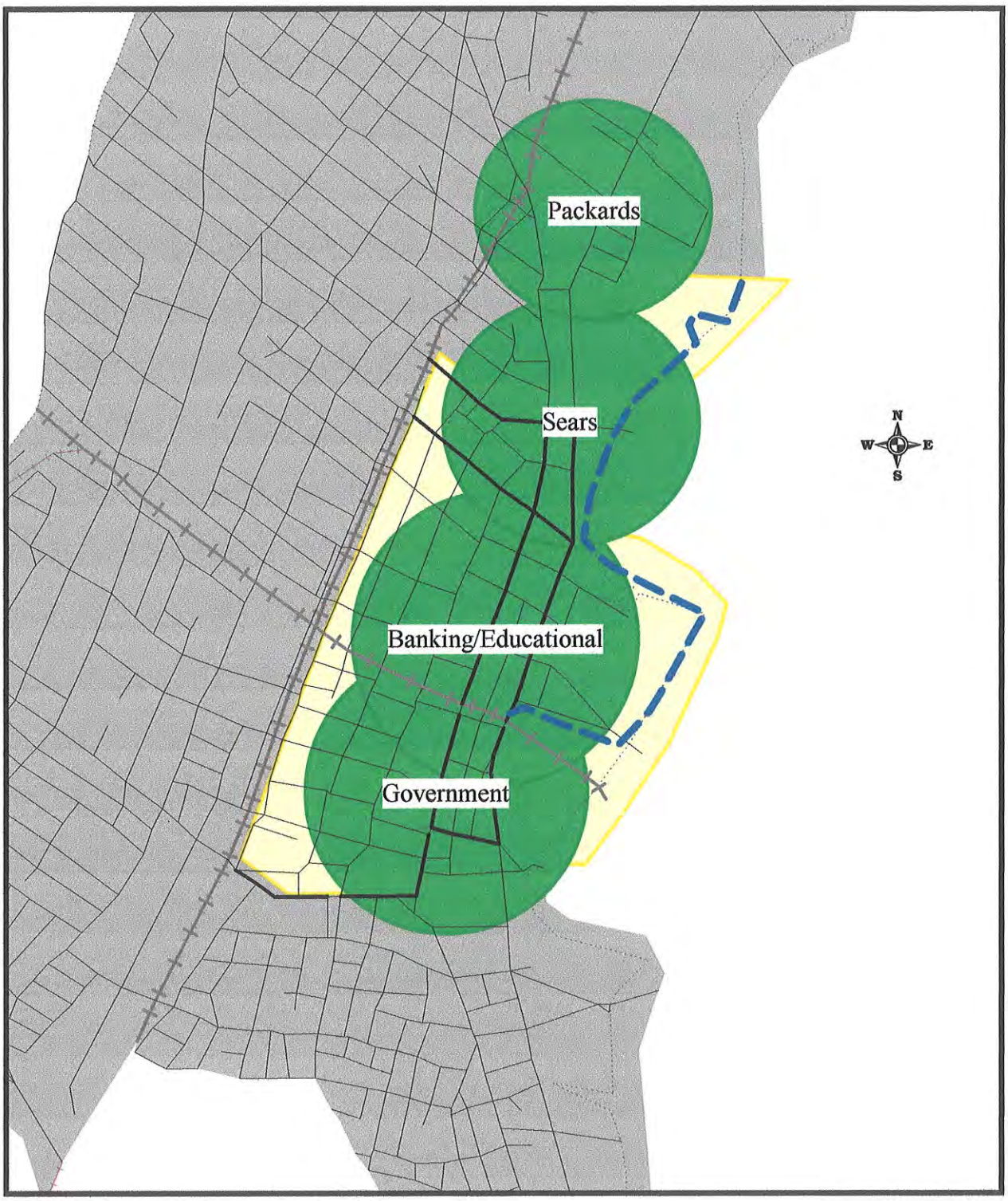
The Master Plan adopts the "spheres of influence" format proposed in the ERA study and, in its analysis makes two specific recommendations for redevelopment of direct relevance to this study:

> *"The majority of the two block area, extending from East Mercer to Bridge Street, is substantially underutilized and should be considered as an area for public/private redevelopment in the future". P 78.*

> *"The entire easterly frontage along River Street, extending from the railroad to the Passaic Street intersection should be considered for redevelopment purposes, including public parking facilities, apartment uses, and/or commercial development." P 83*

In this section we have considered local land use and economic development policies and the market for redevelopment in the City of Hackensack. This review demonstrated that there is a strong market for a mixed-use development and that such a development is consistent with the goals of the City as expressed in its Draft Master Plan.

Figure 3.2. Hackensack's Economic Development Spheres are linked by the Pathway



Spheres
Study Area
Pathway

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3.5. The Elements of the Redevelopment Scenario

The previous analysis can be used to define the basic elements of a scenario. This was supplemented by a number of on-site investigations that led to the following points of departure::

- Although the focus for the land use recommendations lies between River Street and the Hackensack River, it is necessary to consider both sides of River Street in developing a scenario. The block between River Street and Main Street is the major pathway for connecting Main Street to the Riverwalk area. It appears from a land use perspective that this block has historically served a supportive role for Main Street with most of the active retail and office uses focused on the Main Street side of the lot, with parking and building "rears" on the River Street Side.
- As has been noted in numerous sources, ranging from anecdotal evidence to the "Quality of Life Survey", parking is a critical constraint on redevelopment in the City. However, as the land use survey shows, there are a number of parking lots in the area. One of the key recommendations is to examine some of the lots along River Street and convert open lot parking to structured areas. Not only will this increase the supply of parking, an end in itself, but its location along River Street means that it could support both existing development along Main Street as well as parking for the new development along the River. This can be accomplished both because of the location and because many of the uses will occur in different time periods.
- The intensity of development should be greatest along the southern areas of the study area around the light rail station. This is dictated both by the existing scale of development, potential linkages to other uses in the area, and the availability of various transit options.
- The scenario assumes both the presence of a light rail station and a bus transfer that has been relocated from its current location a block south of the study area.
- There is minor development inside Foschini Park. This development, which is closely associated with the continued use of the area for active recreation, is designed to take advantage of the views of the river as well as to draw potential Riverwalk users to the area. By limiting such development the need for new infrastructure is minimized
- The recreational values of the Hackensack River should be enhanced. Although the Hackensack River has suffered the effects of pollution that are common for urban waterways, the shift in manufacturing out of the region and imposition of more and more water quality controls means that water quality in the River is improving. The plan anticipated that there will be a far greater interest in water-based activities in the future.

3.6. Summary and Conclusions

A successful integration of transportation investment (the proposed Pathway) and land use development will require a careful balance between market forces and public policies. In this Chapter we have reviewed regional and local economic and public policies. This review has shown that there is a strong emerging market for redevelopment in Hackensack and the I-80 corridor of which it is a part. Transportation investments can play a critical role for these communities by providing for land use development around station sites as well as opening up the Passaic and Hackensack Riverfronts.

The proposed Pathway and associated redevelopment matches up neatly with regional and state transportation investment and land use goals. Hackensack is a part of Planning Area 1 and has the characteristics of a center of place. It is a diverse community with an established infrastructure of roads, rails, bus transit, sewers and other infrastructure. In the next Chapter a detailed redevelopment scenario is developed based the favorable market and public policy landscape.

Chapter 4: "Riverwalk": Integrating Land Use and Transportation Investment

"It all starts with a common vision. Visions of neighborhoods where work, home, school, and shopping are close enough together to spend more time where you want to be, rather than in your car; communities where you have a choice in how you can get to all these places -- sidewalks, bike lanes, public transportation, as well as your car. Towns with parks and community centers, where historic areas are restored and cared for -- downtowns, urban centers that are once again hopping places on Friday and Saturday night. Places with clean air, fresh water, and safe land. " [1]

"New Community Design (NCD) offers a distinct alternative to the developmental "sprawl" that has dominated real estate growth over the last 50 years. NCD principles can be used to create vibrant neighborhoods of housing, parks, and schools within walking distance of shops, civic services, jobs, and transit—in short, a modern version of the traditional American town of times past. Key features of NCD include extensive mixed land use, reduced land consumption, community centers, ample green space, transportation options, and building designs that reflect the local culture and harmonize with the natural environment." [2]

4.1. Introduction

The general context for a pathway and redevelopment scenario as the outcome of public policy and market forces was presented in the previous two chapters. In this chapter, a more detailed examination of the linkage between the proposed pathway and redevelopment is provided. The process of developing a land use/redevelopment scenario that enables the pathway, fits the City's redevelopment plans, and is sensitive to market factors is described. The product is a set of color graphics and architectural renderings that illustrate the way in which redevelopment focused on the river and pathway can enhance the area. Developed in consultation with the City and County, the proposed scenario is viewed as only one possibility -- albeit a reasonable one. This development scenario is called "Riverwalk" and it can add 1,000 permanent jobs to the City's employment base and $350 million in ratables.

4.2. Developing a Land Use/Redevelopment Scenario

In Chapter 2 we examined general patterns impacting mobility in the area and determined that the Pathway could form an important part of a pedestrian and bicycle network for the City. This review also noted that the area was a major focus for work trips, containing nearly 20% of the City's jobs. However, the share of bicycle and pedestrian worktrips was much lower in the area than in the rest of the City or County. This was partly because of the relatively small number of dwelling units in the area. This pointed to the need to integrate housing into any redevelopment scenario.

The strong regional bus and commuter rail connections, to be enhanced by the Secaucus Transfer Station, the double tracking of the Pascack Valley Line, and the proposed Light Rail Station on the NYS&W line at River Street, also pointed to the opportunities to build commuter housing.

---

[1] Remarks by EPA Secretary Browner to "Partners for Smart Growth Conference", December 15-17, Austin, Texas.

[2] "New Community Design to The Rescue", National Association of Governors, 2001, p 4.

In Chapter 3 we examined the general context of development within the City to identify market forces and public policies that might impact on the desired development. This review showed that there was a strong market for most uses in the City and that public policies at State, Regional and Local levels were supportive of a mixed use development with strong transit connections along the Hackensack River -- especially if it could support the revitalization of Main Street.

Using these general findings as a starting point, a redevelopment scenario was developed that minimized the impact on the parks, but looked at restructuring the type and mix of development along the River. The specific steps included:

- Development of a Usage Mix
- Design and Physical Capacity Analysis

4.2.1. Development of Usage Mix

The proposed "Riverwalk" redevelopment scenario contains a mix of uses. While the actual mix will depend on market forces, the general considerations that played a role included:

Recreational /Entertainment Uses: The area is currently the focus for such activities with the Parks, Ice-house and Bowling Alley and entertainment activities are favored in the City Master Plan which identified this as the focus for an "entertainment" node. By bringing people to the Riverwalk, they will not only use the pathway but will also support the other activities. Through the pathway it might also be possible to draw people from the office/recreational/educational activities on the FDU campus.

Housing Uses: Hackensack has a very strong housing market, especially for those seeking to commute to Manhattan. Providing housing for households with incomes that resemble those in the residential areas to the west will also support Main Street Retail and provide riders for the Bergen Passaic Light Rail line. The presence of two major educational institutions in the area and the proposed creation of the area as an "entertainment node" influenced the proposal of one-bedroom apartments and "efficiencies".

Office Uses: There is a strong demand for Class A office space in Bergen County and Hackensack. The ready roadway access to Routes 4, 80 and 46 along River Road and the new light rail stop provide strong transportation advantages in this area. Hackensack is also strategically located on the national telecommunications grid, with a major switching station located only two blocks from the area. In addition, a number of fiber optic cables are laid along the NYS&W right of way. Finally, the area around the Light Rail station is within walking distance of the County Administration Complex and County Court House.

Retail Uses: The issue of retail development is one of the more vexing to deal with in the area. For purposes directly related to the Riverwalk and Pathway, such as restaurants, boating facilities etc. there is little debate. However, uses that might bleed away from the existing retail on Main Street are more difficult to accommodate. So, while it seems vital that first floor retail be considered for the area, as a means of attracting visitors and customers, this must be approached carefully. One potential solution would be to offer retail space in these areas to merchants on Main Street that might be displaced during redevelopment.

Parking: One of the major constraints on economic development in Hackensack, and indeed most urban environments is the shortage of parking. While the desire in this development is to make pedestrian movement a key focus and to reduce the need for an automobile, automobile trips will dominate access to the area itself. For this reason, the availability of parking was examined both on the site itself and within the corridor as a whole. Figure 4.1 includes the identification of these lots as well as opportunities for structured parking. This shows that it is possible to create sufficient parking for the Riverwalk development and the Pathway as well as to increase the overall supply for the City through shared parking opportunities.

4.2.2 Design and Physical Capacity Analysis: The Development Footprint

"Quality design is indispensable to a sustainable future and to the long-term environmental quality, economic vitality and community stability of New Jersey.... Design is on a par with coordinated planning and strategic investments in terms of its importance to State Plan Implementation" **Designing New Jersey** p.3.

Having established the general mix of development uses, the study area was examined to establish the likely footprint of development. In this case, general rules of thumb were used to set the footprint and the bulk. Mot importantly, there was minimal encroachment outside the already developed areas. Once again, while these are viewed as reasonable estimates, the final configuration of any redevelopment scheme will be determined by the market and public policy.

The overall development consists of the following components:

Riverwalk Transit Center and Entertainment District

The area around the proposed light rail station stop on the River Street Bridge Trestle was the first site subject to detailed analysis. This area is depicted in Figures 4.2. The key design elements here include the two parking lots at the corner of River and Mercer and the municipal lot surrounded by the Midtown Bridge access roads.

Proposed development in this area is of the highest density and is focused largely on shared parking for the light rail stop and the construction of a 12 screen multiplex to strengthen the existing recreational/entertainment values of the area (the park, active Olympic sized ice-rink, and bowling lanes). This supports the City Master Plan's identification of the area as a "recreation node". To take advantage of the draw of these elements as well as the proposed Riverwalk, the proposal includes an elevated restaurant with an outside seating area.

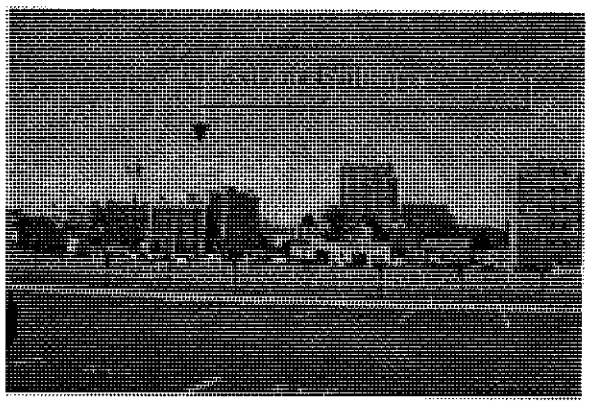

Figure 4.3 illustrates a potential redevelopment scenario limiting the height of structures to those in the area, Based on the footprint, the structure includes the following new development:

- 216,000 sq. foot office tower over a parking deck directly adjacent to the light rail station. This would replace an existing car wash and parking area.

Figure 4. 1

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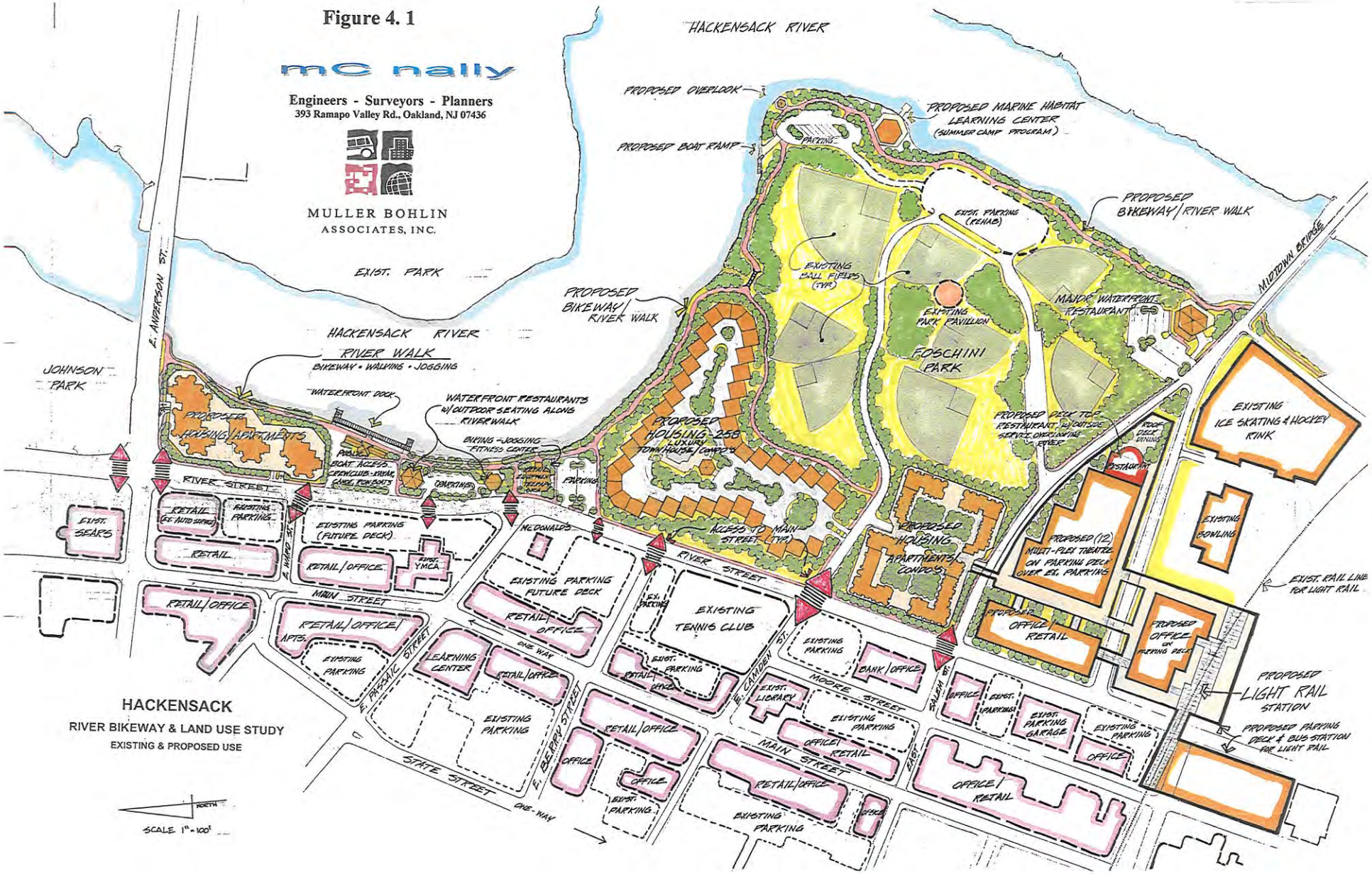

HACKENSACK
RIVER BIKEWAY & LAND USE STUDY
EXISTING & PROPOSED USE

Figure 4. 2

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HACKENSACK RIVER BIKEWAY & LAND USE STUDY

Existing E. Salem St. Area
Existing Grade Parking

View East

Figure 4. 3

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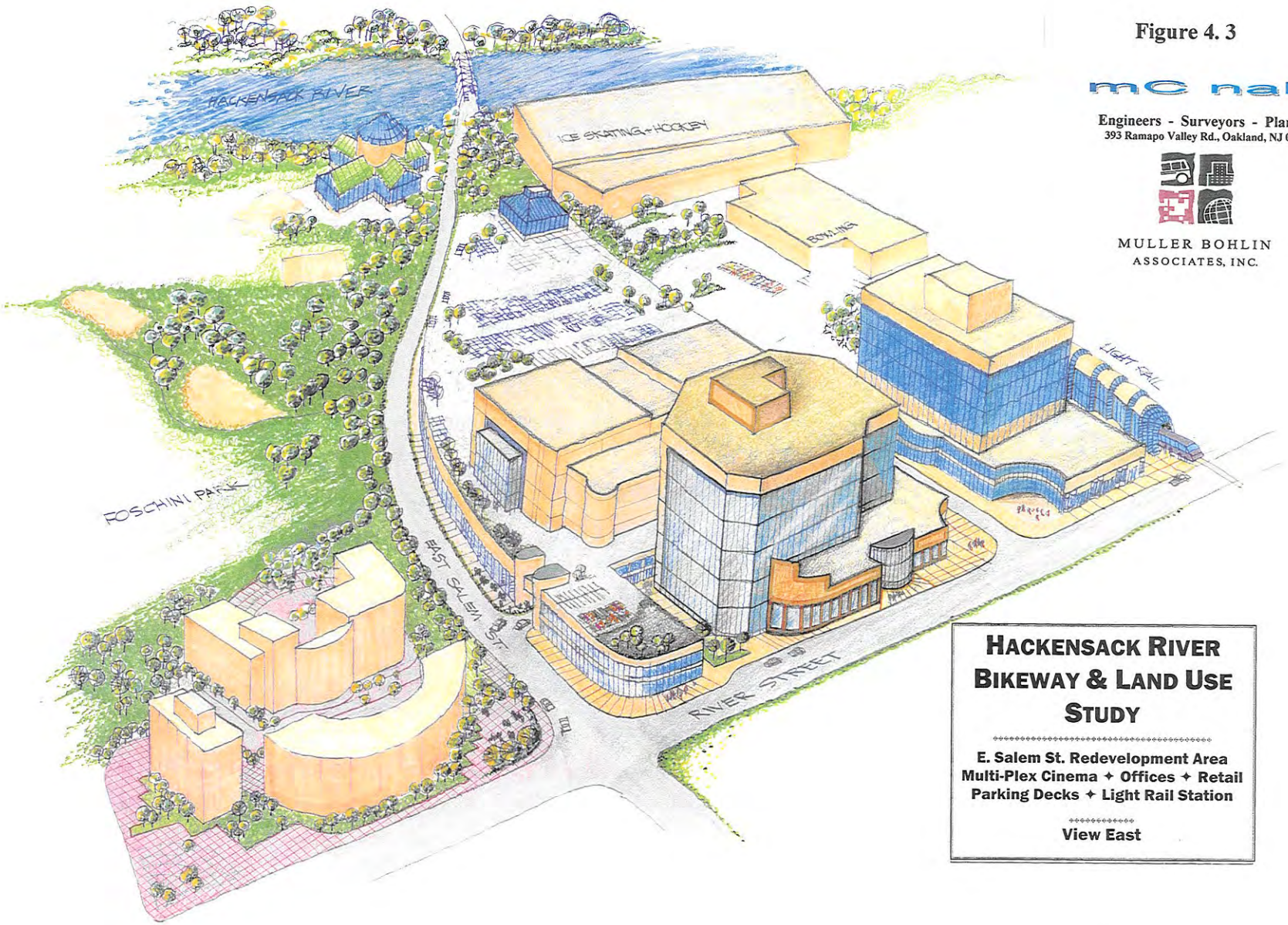

HACKENSACK RIVER BIKEWAY & LAND USE STUDY

E. Salem St. Redevelopment Area
Multi-Plex Cinema ✦ Offices ✦ Retail
Parking Decks ✦ Light Rail Station

View East

- 155, 000 sq. foot office/retail center with parking on the current municipal parking lot. A 12 screen multiplex theatre over a two story parking deck is proposed for the lot behind the office complex. The roof of the deck would offer both additional parking and a high end restaurant, perhaps a "Hard Rock" type, with a unique architectural style.

Riverwalk Transit Oriented Housing

The second node of development would front River Street between East Salem Street and East Passaic Street. This area would be the site for housing developments. The first development type, between roughly East Salem Street and East Camden Street would consist of high-density housing apartments/condos. These would act as a buffer between the commercial and higher end residential and assist in the transition in scale from a 5-7 story office building to a two - three story housing development.

It could be geared to young, single/married no children adults who would enjoy the accessibility of the transit system (either bus or light rail), as well as the entertainment features of the area. It could also attract students at Fairleigh Dickinson University (with its Hackensack and Teaneck Campuses) or the Bergen Community College. It is estimated that around 400 such units could be built. This denser housing development would act as a transition from the office /recreation uses to the lower intensity to the north.

Good transit access and the natural features of the area underpin the construction of a luxury townhouse development along the bend in the river. As can be seen in Figure 4.4 a development can be designed to blend with the River, access the pathway, and maintain the "open" feeling of the area through the use of appropriate landscaping. Using the footprint set out in the drawing, as many as 258 luxury condos/townhouses could be constructed.

Riverwalk Marina

The Riverwalk Marina shows some of the very exciting development possibilities that are unlocked when the different design elements of pedestrian accessibility, waterfront vistas, and increased use of the Hackensack River are combined.

Figure 4.5 shows the existing riverfront property just north of East Passaic Street. This is a low intensity lot on which cars are parked for the auto dealership. Figure 4.6 illustrates how this lot could be redeveloped as a central Pedestrian Promenade including high end restaurants and retail activities in an open pedestrian environment. There are a number of basic extensions of this basic concept:

Firstly, perhaps taking advantage of the pathway and its potential to attract joggers and walkers, as well as the "health consciousness" of the young adult residents in the condos, this commercial strip includes a fitness center. This might also continue to draw people to the Riverwalk even in the winter when outside use of the walkway might be limited.

Figure 4. 4

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HACKENSACK RIVER BIKEWAY & LAND USE STUDY

View to West
Proposed Townhouse Condos at
Foschini Park

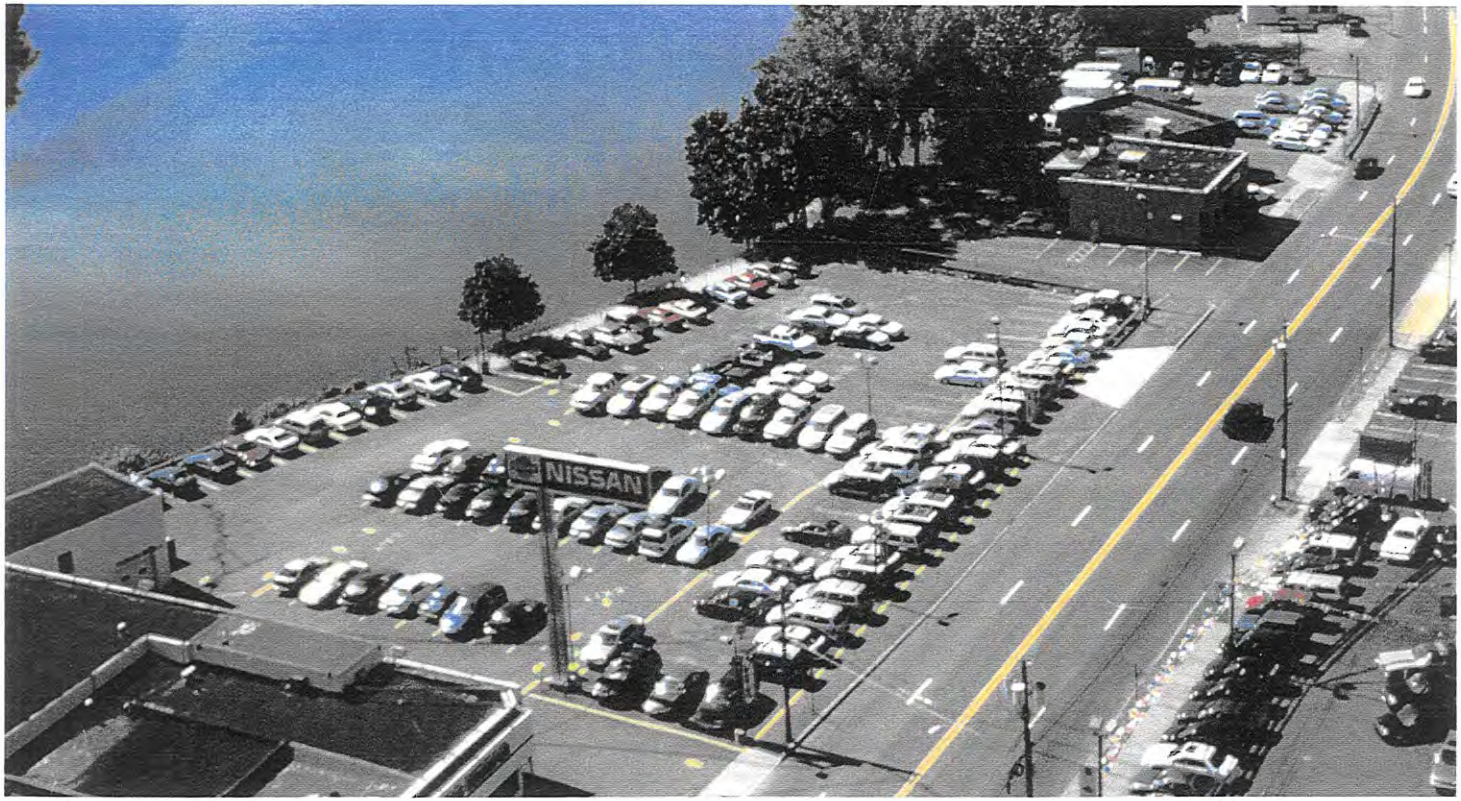

Figure 4. 5

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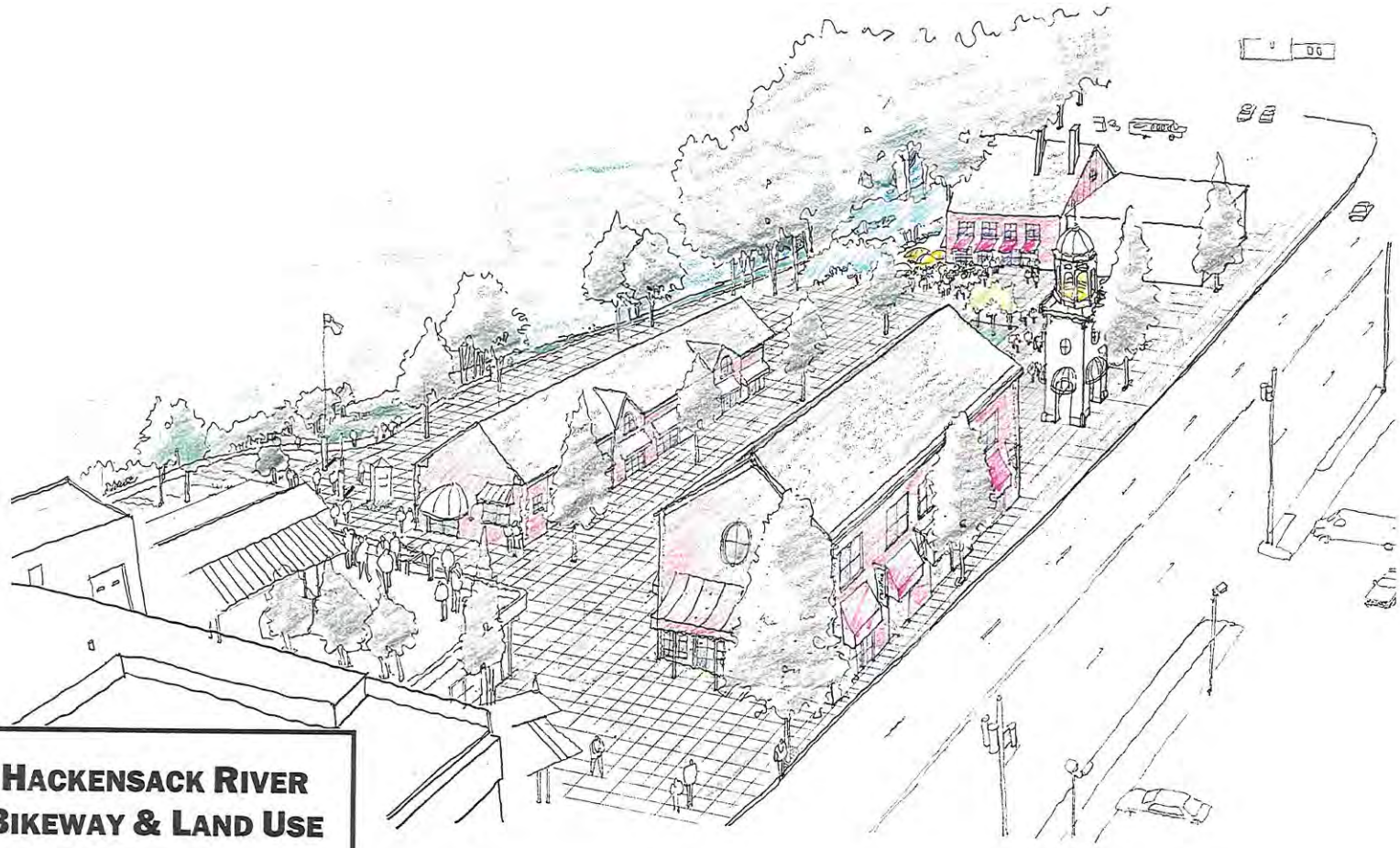
HACKENSACK RIVER BIKEWAY & LAND USE STUDY

Existing Land Use
Auto Dealer/Car Lot

View Southeast



HACKENSACK RIVER BIKEWAY & LAND USE STUDY

Proposed Redevelopment
Pedestrian Promenade ✦ Restaurants
Apartments ✦ Riverwalk - Bikeway

View Southeast

Area between River St. & River

Figure 4. 6

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Similarly in Figure 4.9 the parking lot at the rear of the existing land uses has been replaced by a neatly landscaped pathway. Finally, Figure 4.10 shows the comparative designs of a pedestrian mall on the existing connection to Main Street. Note the YMCA building in both pictures as reference.

4.4. Elements of the Riverwalk Pathway Bicycle and Pedestrian Network

In their Pedestrian Compatible Planning and Design Guidelines, the NJDOT includes a "Site Review Checklist for Pedestrian Facilities (p19). With minor adaptation, these are also applicable to bicycle projects. They can be introduced by showing how they were applied to the proposed design scheme. In doing so, we use the following basic scheme.

In the short run, a bicycle and pedestrian Pathway will be constructed from FDU along the Hackensack River's Edge to the southern terminus at the Ice-House. The existing sidewalks along River Street will be upgraded to provide an alternative route for walking trips. In the longer term, River Street -- or a parallel facility running from Passaic Street to the Light Rail Station -- will be upgraded to accommodate cycling trips between Passaic Street and Mercer Street. In the short term, these trips will use the existing access points including the internal circulation roadways in Foschini Park. The different elements thus include:

Spine: The Spine of the system is currently funded for acquisition and construction. It includes the construction of a bicycle and pedestrian pathway along the edge of the Hackensack River from the FDU Campus to the Ice-House. This is about 1.2. miles in length and is the spine to which the other components connect

Bicycle and Pedestrian Connections from Existing Park Roadways: Foschini Park is currently accessed by a one-way link from East Camden Street to Salem Street. Its primary purpose is to access the existing parking lot along the Hackensack River. This parking lot serves the existing ballfields, Park Pavilion, and picnic area. It is proposed that this roadway be enhanced for pedestrian and cyclists to use as an alternative point of access to the Pathway..

Connections to the City: East Camden Street and Midtown Bridge/East Salem Street: In the short run, East Camden (one way to the Park) and East Salem Street (one way from the Park) will be the primary southern connections for cyclists to the pathway. As can be seen from the photograph, this area does not have clear sidewalks and would be unpleasant to walk on in wet or snowy conditions. Currently,

Similarly in Figure 4.9 the parking lot at the rear of the existing land uses has been replaced by a neatly landscaped pathway. Finally, Figure 4.10 shows the comparative designs of a pedestrian mall on the existing connection to Main Street. Note the YMCA building in both pictures as reference.

4.4. Elements of the Riverwalk Pathway Bicycle and Pedestrian Network

In their Pedestrian Compatible Planning and Design Guidelines, the NJDOT includes a "Site Review Checklist for Pedestrian Facilities (p19). With minor adaptation, these are also applicable to bicycle projects. They can be introduced by showing how they were applied to the proposed design scheme. In doing so, we use the following basic scheme.

In the short run, a bicycle and pedestrian Pathway will be constructed from FDU along the Hackensack River's Edge to the southern terminus at the Ice-House. The existing sidewalks along River Street will be upgraded to provide an alternative route for walking trips. In the longer term, River Street -- or a parallel facility running from Passaic Street to the Light Rail Station -- will be upgraded to accommodate cycling trips between Passaic Street and Mercer Street. In the short term, these trips will use the existing access points including the internal circulation roadways in Foschini Park. The different elements thus include:

Spine: The Spine of the system is currently funded for acquisition and construction. It includes the construction of a bicycle and pedestrian pathway along the edge of the Hackensack River from the FDU Campus to the Ice-House. This is about 1.2. miles in length and is the spine to which the other components connect

Bicycle and Pedestrian Connections from Existing Park Roadways: Foschini Park is currently accessed by a one-way link from East Camden Street to Salem Street. Its primary purpose is to access the existing parking lot along the Hackensack River. This parking lot serves the existing ballfields, Park Pavilion, and picnic area. It is proposed that this roadway be enhanced for pedestrian and cyclists to use as an alternative point of access to the Pathway..

Connections to the City: East Camden Street and Midtown Bridge/East Salem Street: In the short run, East Camden (one way to the Park) and East Salem Street (one way from the Park) will be the primary southern connections for cyclists to the pathway. As can be seen from the photograph, this area does not have clear sidewalks and would be unpleasant to walk on in wet or snowy conditions. Currently,

there is limited lighting from general roadway lights.

River Street is the key north-south connector in the area, and is the primary alternative to trips along the River's edge between East Passaic and Mercer Street. It has sidewalks along both sides and while these suffer from limitations they are probably adequate with some minor improvement. However as redevelopment occurs, this should be a strong focus of activity.

New Pathways: Figure 4.1. depicts a number of internal circulation pathways. Some of these might be restricted to walking trips alone. However, their actual configuration will depend largely on the final development proposal.

How would a bicycle pedestrian network based on these elements match up with the NJDOT criteria?

Accommodating Recreation and Utilitarian Trips: An effective design should consider both recreational and utilitarian trips. While both trip purposes are closely aligned, the key difference appears to be that utilitarian trips seek to minimize travel time, while recreational trips may have benefit in themselves. It is clear that recreational trip are accommodated by the delineation of a route that follows the river edge. This maximizes the aesthetic benefits of the trip.

The accommodation of utilitarian trips is primarily achieved by providing a number of options for pedestrians and cyclists to access the different activity centers either by using the existing pathways or through the provision of new ones.

Connectivity: Utilitarian trips must connect the key pedestrian and bicycle activity centers. This is clearly provides as the pathway

Taking Advantage of Unique Site Features: The Hackensack River is the key "unique" feature of the site. The pathway is specifically designed to take advantage of its existence as well as the two parks that form its book ends.

Consideration of Current and Future Activity Centers: Clearly the pathway is designed to consider both types of activity center.

Clear Demarcation of Pedestrian Entrances: This is an urban design element.

Buffering from automobile traffic: The main spine is clearly buffered by its completely separate alignment.

Safety and Security: Safety and security issues relate to aspects such as lighting and conflicts with other modes. The proposed Pathway will have adequate lighting over its entire course and as a spearate right-of-way there are minimum conflicts with other modes. Places where such conflicts can occur, such as at Anderson Street, and at other points of access to the route, will be

addressed through intersection upgrades. Depending on the volume of pedestrian traffic and ultimate configuration of River Street, this might include "bump-outs, enhanced crosswalks, pedestrian activated signals etc. It should be noted, that one of the key sources of disturbance to wildlife in urban area comes from light pollution. So, consideration could be given to restricting use of the segment from the culvert bridge near the ballfields to the Ice-house to hours before 9:30 PM. After this time the Pathway could be closed and lights reduced or eliminated.

Walking surfaces and amenities: This will be a key design consideration in the final determination of the materials to be used.

4.5. Economic Impacts

Although the exact economic impacts of this development will depend on its final configuration, the consultant team used averages from Bergen County to estimate that around 2,500 construction jobs would be created by the development. The development would add around $350 million to Hackensack's tax base. In combination, about 1,000 permanent jobs would be created to service the offices, restaurants and retail establishments.

4.6. Summary and Conclusions

It is clear that while the specific configuration of a redevelopment world cannot be anticipated, it is possible to envision a world where economics, mobility and recreation come together in a way that each enhances the other. In this chapter a redevelopment scenario was developed that meets the general tests of market demand, public policy and access to the Hackensack River. The Riverwalk scenario takes advantage of the existing uses and proposes a development density and design that allows for the intensification of uses while maintaining a scale that is consistent with the recreational values of the river. The development will include around 400,000 square feet of new office space, thousands of new parking spaces, over a mile of urban walkway, 4 new restaurants, a 12 screen multiplex, vastly improved public access to the river, and would certainly meet the tests of being an urban place.

While the development concept proposed here would be a place unto itself, it is important that the pathway be linked into the existing fabric of the City. The links to the City and the overall network form the focus of chapter 5.

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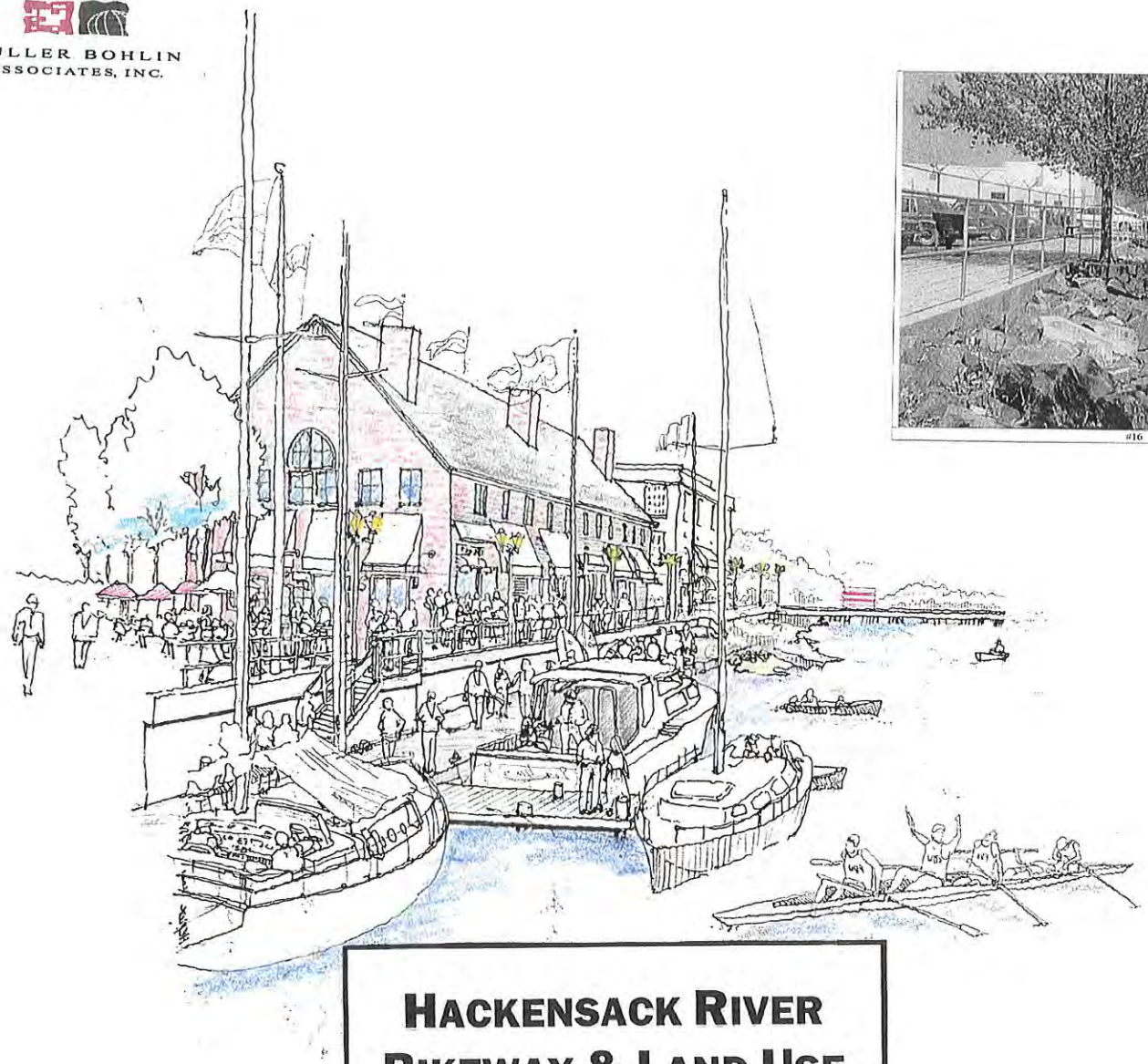

HACKENSACK RIVER BIKEWAY & LAND USE STUDY

Proposed Waterfront & Boathouse

Figure 4. 7

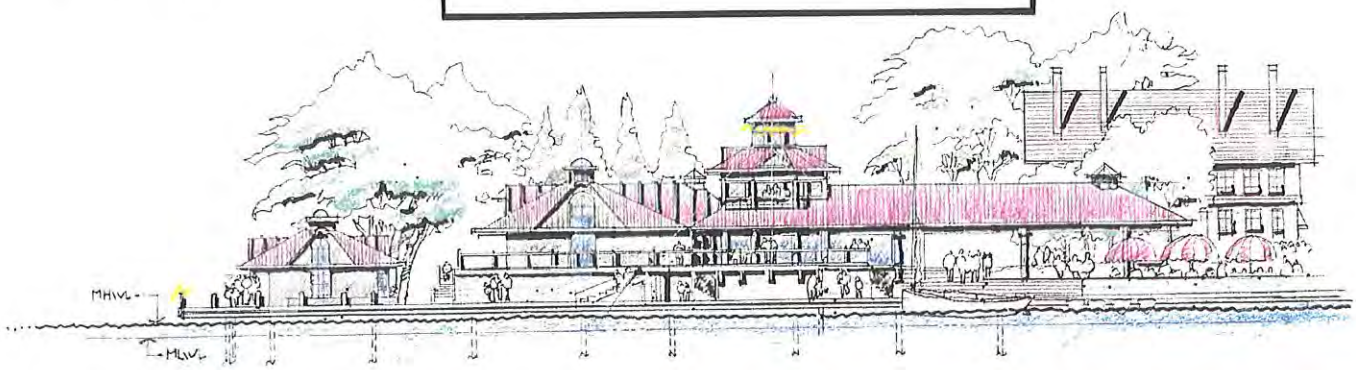

Figure 4. 8

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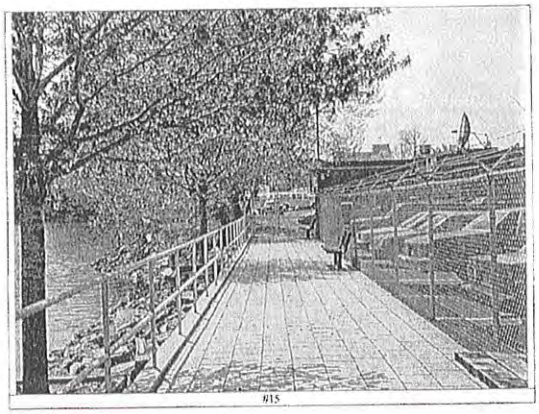
Proposed

HACKENSACK RIVER BIKEWAY & LAND USE STUDY

Views South along River

Existing

Proposed
Walkway Integrated
with Redevelopment



Isolated Section of
Existing
Walkway

HACKENSACK RIVER BIKEWAY & LAND USE STUDY

✦

Figure 4. 9

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Existing

Proposed

Figure 4. 10

HACKENSACK RIVER BIKEWAY & LAND USE STUDY

Typical East – West Access Corridor Linking Riverfront to Main St. Central Business District

Chapter 5: The Pathway and the Network: Enhancing Bicycle and Pedestrian Mobility in the Hackensack River Corridor

"Walking has become more dangerous than car travel with 49.9 deaths per 100 million miles traveled as compared to 1.4 for car travel."

"Pedestrianism requires a comprehensive network of pedestrian facilities, in the form of sidewalks, pathways, alleys, cut-throughs, short cuts and others which effectively link uses and destinations and offer pedestrians considerable mobility. Pedestrian facilities should be designed for both functional and recreational purposes, should be convenient, attractive and safe, and should provide a meaningful alternative to vehicular trips." **Designing New Jersey, Office of State Planning, p12.**

5.1. Introduction

As was noted in Chapter 2, the study area is a prime focus for bicycle and pedestrian trips within the City. Furthermore, the Hackensack River Pathway will promote bicycle and pedestrian mobility between a number of economic, social service and recreational activity nodes in the City of Hackensack. It will also improve access to rail and bus transit through connections to the Hackensack Bus Transfer Station on Mercer Street and to rail via the related Bicycle/Pedestrian project on Anderson Street. The Pathway will also connect with segments that have been constructed to the south of the study area.[1]

The Riverwalk will both produce and attract trips. So, planning a bicycle/pedestrian path must also take account of the potential network that it can form a part of. The network links are considered both in terms of streets that can connect the area with the neighborhoods to the west, where the focus is on bicycle trips, as well as the Main Street commercial district, where the focus is more on pedestrian connections.

The first section of this chapter provides an overview of the general factors to be considered in developing a bicycle and pedestrian friendly network in the City. It identifies a number of specific strategies and criteria that might be used in evaluating the appropriateness of a specific routing. This suggests that network should be examined in terms of three basic sets of strategies: right-of-way, intersections of modes, and general land use transportation strategies such as "traffic calming".

The major connections in the study area are identified and described. This is includes a general description of their potential use as bicycle and pedestrian connections through the Study area. Some of the issues relating to pedestrian and bicycle compatibility are illustrated with graphical analysis of some of the key intersections with River Street. This is followed by a review of the existing roadway connections between Main Street and the Riverwalk/Pathway. Finally, specific recommendations are made for potential improvements to the pedestrian connections and order of magnitude costs estimates produced.[2]

---

[1] Segments have been constructed behind the City's public works facility (Kansas Street), the new Shop Rite Development and behind Pep Boys and Cost Co.

[2] It should be noted that these projects have merit whether the pathway is implemented or not and the City and County have been encouraged to consider them for submission under the NJDOT Bicycle Pedestrian Program.

5.2. Review of Bicycle and Pedestrian Strategies

Transportation facilities, at a minimum, should be planned, designed, constructed and maintained to accommodate shared use by motor vehicles, bicycles and pedestrians. In general terms, there are three types of strategies that can accomplish this goal: Right-of-way, Intersection and Traffic Calming.

Right-of-way based strategies: The first and most obvious level of accommodation of bicycle and pedestrian traffic lies in the examination of the right-of-way. In this case, the primary concern is with the adequacy of the right of way to accommodate the level of demand, reduce conflicts with any shared modes, and improve the comfort of the trip through surface condition improvements. Example strategies include:

- Shared lanes, shoulder or exclusive bicycle lane
- Widened sidewalk or promenade type pedestrian walkway
- Bicycle safe drainage grates,
- Utility covers flush with roadway surface
- Pavement markings
- Signing

Sidewalks

Clearly, adequate sidewalks need to be provided throughout the study area and not limited to key pathways. Sidewalks should be provided on both sides of the street regardless of whether or not the street is one-way or bi-directional. Sidewalk widths should be based on anticipated pedestrian traffic volumes but should be a minimum of 5 feet clear width plus a 3 foot width for ancillary facilities such as pay phones, plantings, refuse receptacles, etc. Sidewalks should be set back or separated from adjacent traffic lanes as much as possible.

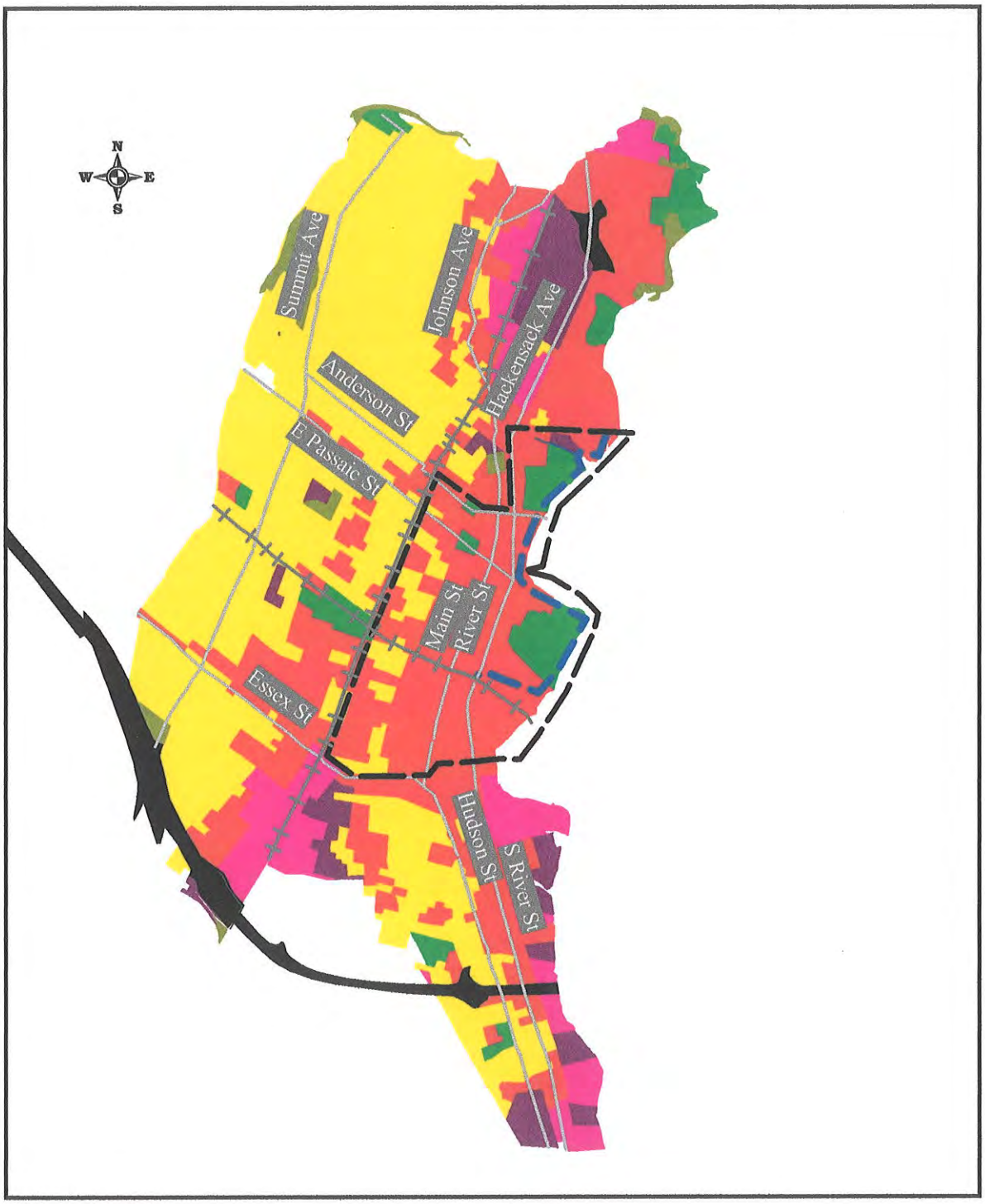
Limiting the number of curb cuts and maintaining the sidewalks to be free of obstructions, snow, cracks and other characteristics that impede pedestrian flow can enhance the safety and comfort of the pedestrian trip.

Bikeways and Bicycle Compatible Roadways

There are two basic strategies to accommodating Cyclists on existing roadways: Designated Bikeways and Bicycle compatible roadways. In the first case, part of the roadway right-of way is reserved for cyclists. NJDOT has provided recommendations for minimum widths of such Bike Lanes by land use type, roadway speed and the existence or otherwise of on-street parking. In urban environments such as Hackensack and with roadway AADT greater than 10,000, the average for the main roads in the corridor and speeds of less than 30 mph the minimum width of a lane is 5 feet. This increases to 6 feet if there is parking or speeds exceed 30 mph.

Accommodating dedicated bicycle lanes is dependent on the availability of right of way or in some cases, the elimination of street parking. This of course points to one of the most difficult issues in urban environments such as Hackensack: because of their density they have the greatest potential for bicycle and pedestrian activity, yet the very density of development heightens the competition for space. So, a recommendation to increase bicycle capacity by reducing parking, may severely exacerbate the shortage of parking in the area -- unless, of course, it could reduce the demand for parking sufficiently by diverting trips from autos to bicycles

Figure 5.1. Land Use and Roadways



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Rail line

Study Area/Corridor

Key Local Roadway

Hackensack Pathway

Generalized Land Use
Derived from NJDEP Land Use Map, 1997

- COMMERCIAL/SERVICES
- ENVIRONMENTAL
- INDUSTRIAL
- OTHER URBAN
- RECREATIONAL LAND
- RESIDENTIAL
- STREAMS AND CANALS
- TRANSPORTATION

This has given rise to the secondary strategy of bicycle compatible roadways. In this case, rather than a dedicated lane, cyclists are accommodated by sharing lanes with automobiles and other roadway users.

In addition to designating bike routes based on the roadway width, Roadway/pavement improvements must also be effected to provide an acceptable riding surface without obstructions or pavement irregularities. In order to provide a smooth travel surface, particularly for bicycles, all new and existing drainage grates must be "bicycle safe", as well as all utility manholes/covers must be flush with the roadway surface.

Intersection Based Strategies: These strategies apply either where different movements within the same mode occur or where one or more modes intersect. The primary concerns will relate to the safety of the different modes and movements as well as the impact of accommodating one mode on the other. Thus, for example, pedestrian safety at roadway intersections can be enhanced by prohibiting "right-on red" movements by automobiles. This of course will reduce the capacity of the intersection for automobiles. Access driveways are another relevant example. The more driveways that cross the pedestrian right-of-way the more opportunities for accidents and the more uneven, and uncomfortable the walking trip. Example strategies include:

- Bicycle detectors and pedestrian signals
- Crosswalks, curb ramps and refuge islands
- Streetscape improvements

Rehabilitation of existing intersections should include traffic signals that have pedestrian signals and bicycle detectors to integrate control of vehicles, bicycles, and pedestrians. All "right-on-red" movements should be eliminated. Signal timing should provide enough clearance time to accommodate a slower than average pedestrians. Crosswalks should be accentuated and made more visible. Curb ramps should be provided not only for handicap access but also access for strollers, shopping carts, children's tricycles, skates and all wheeled vehicles.

Island refuges could be introduced to provide greater pedestrian protection when crossing busy intersections. Streetscape improvements, such as brick paving, and surface treatments for sidewalks and roadways, landscaping areas, benches and other amenities could be introduced and should be coordinated with similar existing treatments along the adjacent street corridors.

Installation of mid block, crosswalks with flashing yellow lights enhance the mobility of pedestrians in the corridor. If possible, these crossings should be aligned with a refuge island in the middle of the roadway.

Pavement striping/markings should be provided to enhance and highlight proposed bicycle lanes and crosswalks. There are a number of new products on the market that enhance the visibility and safety of crossings. One such product is a solar powered recessed (into the pavement) strobe light that will automatically detect vehicular presence and activate. Signing should also be included to inform motorists and bicyclists of the shared use of the roadway/travel lane. Information/direction signing should be included to guide pedestrians and bicyclists to and from the riverfront corridor.

Traffic Calming Strategies: These are general strategies that affect the operation of roadways to enhance the safety and visibility of non-automobile modes. Strategies include:

- Enhanced intersection delineation

- Road humps & speed tables
- Chokers – chicanes
- Speedwatch Program
- Signing
- Pavement markings
- Textured roadway surfaces

These general strategies can be applied to the corridor over time. They form the basis for an evaluation of the overall pedestrian and bicycle friendliness of the corridor and its roadways. This is done in the next section.

5.3. Review of the River Street Corridor Bicycle and Pedestrian Connections

As can be seen in Figure 5.1, the study area includes major public transportation facilities such as the New Jersey Transit Pascack Valley line, public schools, libraries, retail centers and a Pathway proposed along the Hackensack River. The highly urbanized character of this area and the proximity of important supporting facilities warrant the creation of an extensive pedestrian/bicycle network. This network is needed not only to support utilitarian bike/pedestrian traffic within the area but also for local and regional recreational bike/pedestrian traffic. In this section we examine these corridors in terms of their ability to support an enhanced bicycle and pedestrian network.

River Street: This County road is the single-most important north-south roadway and provides connections between US 46 at the Little Ferry Circle, I-80 and NJ 4. River Street generally has four (4) lanes of traffic except in the vicinity of the of the railroad overpass at Mercer Street where, as depicted in the photograph, it narrows to two lanes. South of the railroad overpass, lane widths are approximately 15' and left-turn lanes are provided at signalized intersections.

North of the railroad overpass, as indicated in the photograph lane widths are approximately 12' and left-turn lanes are provided at signalized intersections north of Anderson Street. Sidewalks (4'-6') are provided along the entire length of River Street. Parking is not permitted. Traffic volumes reflect its importance with counts varying between 22,000 and 40,000 per day.

Although lane widths along River St meet the minimum requirements for a bicycle compatible roadway, it may not be desirable bicycle route :

- The predominant land uses along River Street seem to be motor vehicle oriented consisting of gas stations, repair facilities and other businesses that are commonly accessed primarily by motor vehicle.
- Limited opportunity for ROW widening along River Street and the absolute need to maintain two lanes of traffic in each direction preclude the creation of dedicated bicycle lanes.
- The high traffic volume and apparently high percentage of truck traffic together with shared bicycle facilities pose significant safety concerns.
- In addition, as shown in the photo above, River St. necks down at the overpass of the NYS&W and widens out after the overpass.

Main Street: is a one-way County facility that parallels River Street and is the primary commercial corridor of the City of Hackensack. It is a one-way street (forming a couplet with State Street, which runs one way in the opposite direction). Although once the premier shopping district in the County, downtown Hackensack has struggled to compete with the largest concentration of Malls in the world along the routes 4/17 corridor. Over the past few years there have been active attempt to revitalize Main Street and the proposed redevelopment of the Riverwalk in Chapter 4 can play a significant role if connected appropriately.

This is a key retail corridor in the community and on street parking is in demand. It also carries local and regional bus traffic. There are sidewalks on both sides. However, they are fairly narrow and suffer from utility poles and other obstructions. The southern end was the focus of a traffic calming exercise in the late 1970's at the intersection with Sussex Street. As can be seen in the photograph it has two 20 foot lanes going south to north and carries over 20,000 vehicles per day.

State Street: is one block west of Main Street and, as noted above, forms the other movement in the two one-way couplet's of Main (south-north) and State (north-south). It has three 20 foot lanes and on street parking is allowed for most of its course. Its speed limit is 25 mph and it's AADT exceeds 10,000. [3]It has a mix of uses including the City Hall and Post Office, some neighborhood commercial. It is a primary local and regional bus corridor with the intersection at Essex Street one of the largest boarding points in the City.

Because of its wide right of way, and parking restrictions, its bicycle compatibility could be enhanced either through the demarcation of a shoulder or the separation of a bicycle designated lane.

As can be seen in the picture, which shows the western side of State Street looking north from Central Avenue, pavement condition is very uneven. However, as the right of way exists, this could be addressed during redevelopment

Essex Street: is a two lane county roadway that runs east-west between Main Street and NJ 17. Its land uses vary from residential to commercial, with a strong local retail node in the vicinity of Prospect St/Summit Ave and the Hackensack Medical Center. Traffic volumes exceed 25,000 vehicles per day and the roadway suffers from a number of sever geometric constraints.

The key segment for this study is from the Essex Street Station on the Pascack Valley Road to Hudson Street, which provides access to the County Courthouse and the New Administration Complex. Parking is not permitted along this stretch. Like the other major roadways in Hackensack, it is a primary focus for local bus traffic, especially the route linking Hackensack and Paterson.

Although the right of way is wide enough to accommodate more than one lane of traffic in each direction, it is neither particularly pedestrian nor bicycle friendly. It is being studied as part of the Transit Friendly Communities initiative and a number of street

[3] A 1989 traffic count found a 12 -hour volume of over 25,000 vehicles at the intersection with Essex Street.

enhancements have been proposed to improve the pedestrian environment. As was noted in Section 2.2 , the largest concentration of bicycle trips in the City is found along its course.

Anderson Street: is a two-lane roadway that connects the residential areas to the west with the Station on the Pascack Valley Rail Line. Between the station and Johnson Park at the River the land uses are predominantly commercial in nature with the eastern end anchored by the Sears store. The area around Pangborn Place is ripe for residential revitalization. Like the other roadways in the area, it has sidewalks on both sides. The right-of way and sidewalk conditions vary quite dramatically between the Anderson Street Station and the Hackensack River.

.

Passaic Street: is a two lane county roadway that connects the residential neighborhoods to the west with the commercial districts along Main Street and River Street. Its lanes are 20 foot wide and it is a designated truck route. Average daily traffic volumes are around 20,000 vehicles per day. Its edges have a mix of uses and parking is restricted through most of the study area. It has good sidewalks that are probably adequate for the existing volumes of pedestrian traffic.

Central Avenue: Central Avenue connects the housing on the ridge with the downtown, It provides two way traffic on 20 foot lanes and has a protected crossing over the Pascack Valley Line. Currently, it terminates at State Street at the City Hall complex. Parking is restricted along most of its length and it has reasonable sidewalks. Traffic volumes are around 7,500 vehicles per day and the speed limit is 25 mph.

In general terms, the major roadway connectors in the Study area have AADT's in excess of 10,000 per day. Table 5.1. summarizes the recommendations for routing bicycle trips for these major local connections. All the roadways accommodate pedestrian traffic, but this is very uneven in quality and width. Priority should be given to the Essex Street Corridor in this regard. In the next section we consider specifically the key pedestrian connectors in the corridor.

Table 5.1. Summary of Main Bicycle Connectors

VARIABLE	AADT (000)			PARKING	LANE WIDTH	SPEED LIMIT	TRUCK TRAFFIC	GEOMETRY	SIDEWALK CONDITION	RECOMMENDATION
STREET	< 2	2-10	10 +							
Anderson Street		X		Yes none between Main and River	20	25	Local	Straight	Good	Secondary
Passaic Street			X	None	20	35	Truck Route	Straight	Good	Primary
Central Avenue		X		Limited	20-22	25	Local	Straight	Good	Primary
Essex Street			X	None	15 (2 lanes)	25	Truck Route	Poor	Poor	Not recommended
River			X	None	12 ft (2 lanes)	35	Truck Route	Straight	Average	Not recommended
Main			X	Yes	15ft (2 lanes)	25	Moderate, Local	Straight	Average	Primary
State			X	Yes, some restrictions	15ft (3 lanes)	25	Moderate	Straight	Uneven	Primary

5.4. Connections between the Riverwalk/Pathway and Corridor Activity Centers

In this section, we consider the primary pedestrian connections between the Pathway and the major activity centers in the area. A key focus is on the two blocks between Main Street and the Pathway. In each case an assessment is made of the potential access roadway and based on an initial review of land use and sidewalk condition a recommendation is made as to the suitability of otherwise of the roadway as a primary access to the Pathway. Where pathways are recommended, obvious defects are identified and potential mitigation strategies offered. All recommended pedestrian pathways are to be signed directing pedestrians to and from the River Walk. These signs are to be located on Main Street between Court and Anderson Streets and along the River Walk. It is recommended that approximately 85 signs be installed for pedestrian guidance.

Anderson Street is also a main crossing of the Hackensack River. The east approach to River Street has 4-12' traffic lanes with a 12' median, which becomes a 12' left-turn lane at the intersection. Exclusive right-turn lanes are provided to and from River Street on this approach. The west approach to River Street has 4-12' traffic lanes with a 12' left-turn lane. Sidewalks (4'-6') are provided on both approaches.

The traffic control box at the intersection of Anderson and River Streets and Anderson and Main Streets would have to be relocated. In addition, the curb at the intersection of Anderson and Main Streets would have to be dropped to comply with ADA requirements.

It is recommended that planters be placed on the south side curbside to visually and physically separate vehicular and pedestrian traffic. However, in order to place planters on the sidewalk it must be widened.

Expanding the sidewalk width at the expense of vehicular travel lanes is not recommended due to the nature of the traffic and the function of Anderson Street. Rather, when the opportunity becomes available, an easement should be acquired from the adjacent property to accommodate the wider sidewalk. Acquiring an easement would also eliminate the need to relocate the utility poles on the south side of Anderson Street.

Passaic Street Between Main Street and River Street

Although it is an important roadway for automobile access, the segment between Main and River Street is less suitable for pedestrian access. On both sides of Passaic Street, the major land uses are parking Lots. At the intersection of Passaic and River Streets, where Passaic Street terminates, the land uses on the east side of River Street are also auto oriented, specifically, a small "drive-in" diner, and an auto maintenance facility. The sidewalks in this section of minimal and there are several curb cuts. This type of environment is not conducive to pedestrian activity.

East Berry Street

The adjacent land uses on East Berry Street are auto oriented as parking lots line both sides of the street with primary access from East Berry Street. Furthermore, East Berry Street leads to a parking facility on the east side of River Street. The adjacent land uses of this street do not make it conducive for pedestrian activity.

East Camden Street

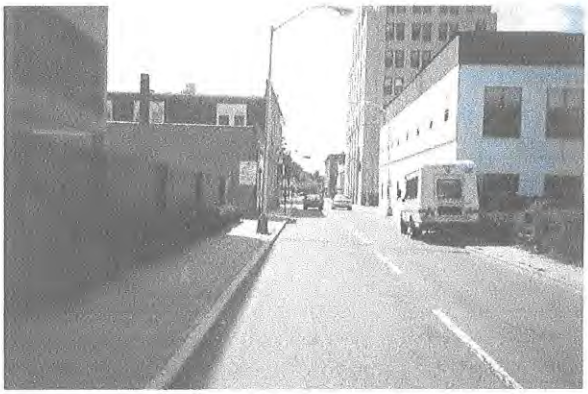
East Camden Street empties into Foschini Park thereby provide an excellent connection to the proposed River Walk. At the intersection of Moore and East Camden Streets between Moore and Main Streets is the Hackensack Public Library. The sidewalk on the south side of East Camden between Main and River Streets is in excellent condition providing a good even pedestrian pathway to the proposed River Walk. While it is not necessary, the Moore Street pedestrian crossing could be treated with concrete pavers that would clearly identify the crosswalk. No physical improvements are necessary for East Camden Street.

Salem Street Extension/Mid-Town Bridge Approach

This pathway provides access to the City Hall area, the Main Street corridor, and Foschini Park along the riverfront. It provides one-way (westbound) vehicular operation. Both east and west approaches of Salem Street to River Street provide 3-12' traffic lanes. The east approach has no sidewalks, however 6' sidewalks are provided along the west approach. This provides approximately 48' of apparent ROW. Parking is not permitted on either approach.

Salem Street Looking East

Salem Street Looking West



East Salem Street is recommended as a designated pedestrian pathway as it provides a direct connection to Foschini Park. Between Main and Moore Streets, East Salem is a two lane eastbound street with no parking on either side. On the south side of the street between Main and Moore Streets the sidewalk is paved with concrete pavers that are show signs of settlement. In this location, the sidewalk is approximately five feet wide. It is recommended that this sidewalk is widened to a minimum of eight feet and three trees are planted along the south side of the street. One street light would have to be relocated to accommodate the wider sidewalk. Furthermore, the corner curb on the southwest corner would have to be dropped to accommodate ADA requirements.

It is recommended that pedestrians be directed to walk on the south side of the in order to take advantage of the excellent pedestrian conditions that exist between Moore and River Street. This section of East Salem has a wide sidewalk with an even pathway and mature trees. The traffic light at the corner of River and East Salem Street is controlled with a pedestrian phase. The addition of the traffic calming will improve the pedestrian crossing environment of River Street.

Mid-Town Bridge Approach - Provides one-way (eastbound) vehicular operation from River Street to the Salem Street Bridge. The east approach to the River Street intersection has 2-15' traffic lanes. One small length of sidewalk is provided along the north side of the Mid-Town

Bridge Approach. A minimum 50' ROW exists on this pathway. Parking is not permitted on this approach.

Mid-Town Bridge Approach Looking East

Mercer Street

Mercer Street - This pedestrian corridor establishes a connection between the Hackensack riverfront, the Main Street corridor, and the major redevelopment considered for this area. This redevelopment would include the proposed Light Rail Station and facilities, the relocated NJ Transit Bus station, and their related parking facilities. It provides one-way (eastbound) vehicular operation from Moore Street to River Street. The west approach to River Street has 2-19' traffic lanes and 4' sidewalks along both the north and south sides of the street. Parking is not permitted on this approach. The north side of Mercer Street is bounded by the sides of business (between Moore and Main Streets) and the New York, Susquehanna, and Western right-of-way. A vacant building (between Moore and Main Streets) and a parking lot for a commercial concern bound the south side of Mercer between Moore and River Street. Mercer Street ends at River Street, requiring any pedestrian that wishes to travel further to either cross River Street at an uncontrolled location or travel north to E. Salem or south to E. Atlantic Streets, the next controlled intersections. Mercer Street does not provide an environment that is conducive to pedestrian activity. This will have to be addressed as it is a primary access point to the Light Rail Station.

It is recommended that the sidewalk between Moore and Old River Street be widened to the same dimension of its northern counter part. This requires the removal of the retaining wall and approximately fifteen feet of the berm. In addition, a double row of three trees totaling six trees should be planted to conform to the northern planting arrangement. If a retaining wall is required, it is recommended that a combination retaining wall with the capacity to contain planters be installed. However, it should be pointed out that planters can be a collectors of trash requiring regular maintenance to keep clear of trash.

Bridge Street/Court Street

This routing connects the County Office area, the Main Street corridor, and the Hackensack riverfront corridor as well as providing a potential second access to the above mentioned redevelopment area. It provides one-way (westbound) vehicular operation. Both east and west approaches of Bridge Street to River Street provide 2-15' traffic lanes. Sidewalks (4'-6') are provided on both approaches. Parking is not permitted on the east approach and the north side of the west approach, however parking is provided along the south side of the west approach as a bus layover zone. Court Street - Provides one-way (eastbound) vehicular operation. Both east and west approaches of Court Street to River Street provide 2-12' traffic lanes. One small length of sidewalk is provided along the north side of the Mid-Town Bridge Approach. Parking is not allowed on either approach.

Bridge Street

Bridge Street Looking East

Bridge Street Looking West

Bridge Street is one-way west bound that provides an excellent pedestrian connection between Main Street and the proposed River Walk. While the south side of Bridge Street may offer a better pedestrian ambiance, the presence of utilities will increase the improvement cost by approximately $60,000. Accordingly, it is recommended that pedestrian are directed to walk on the north side of Bridge Street.

Bridge Street terminates in a "cul de sac" at Main Street. Commercial vehicles layover at west end of Bridge Street and park on the north side of the street. To facilitate a pedestrian enhanced environment it is recommended that the parking on the north side of the street either be eliminated or moved to the south side and the layover parking at the west end of the street be eliminated. To facilitate on street parking for delivery vehicles, the existing south side curb cut should be eliminated.

It is recommended that approximately nine trees be planted on the north side of Bridge Street between River and Main Street. Tree planting should begin 21 feet from the curb point of tangency on the northwest corner of each block. Widening of the sidewalk to a minimum 8 feet between Main and River Street is also recommended. Modifications, specifically dropping of the curbs, are required to the corners to comply with ADA requirements.

NJ Transit maintains a bus layover for the NJT #182 and 183 at the intersection of River and Bridge Street. Relocation of this layover to Moore Street would enhance the pedestrian environment on Bridge Street.

Court Street

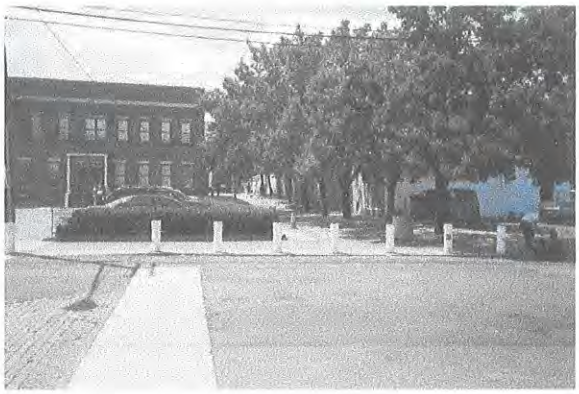
Court Street between Main and River Streets is a two lane one-way eastbound street. On the south side of the street at Main Street is the Bergen County Administration building. Immediately to the south of the Bergen County building is an active parking lot. The sidewalk on the south side is in excellent condition and is at the minimum width required for pedestrian use Land uses on the north side of Court Street consist of a church, its rectory, and some office buildings. The sidewalk on the north side of the street is narrow (approximately four feet in width) and requires widening to accommodate any additional pedestrian activity and the sidewalk on the south side is of sufficient width for pedestrian usage.

Court Street Looking East. Notice Curb Cuts and Parking on Right

Court Street is not recommended as a designated pedestrian access to the proposed River Walk. The active parking lot on the south side of the street poses a high potential for pedestrian and vehicular conflicts that are not acceptable. Widening of the sidewalk on the north side of the street necessitates encroachment into the vehicular travel lane, thereby requiring a narrowing of the travel lanes on Court Street. Court Street provides access to River Street from Main and Church Street and direct access to the W. Fort Lee Road Bridge to Bogota. Reducing the travel widths of this primary access road is not recommended, as it would impinge on this connection.

Transit Connections

All of these roadways are also important spokes in the local and regional bus transportation network that centers on a hub at the Hackensack Bus Transfer Station located at Moore and River Street.[4]



Hackensack Bus Station

Pedestrian connections to the Hackensack Bus Station between Main and Moore Streets are sufficient. Repair of the pedestrian crossing at Moore Street is warranted; however, the dip in the crosswalk should be maintained as it calms vehicular traffic.

[4] Bus routes that use the Transfer Station include: Newark- 76,Jersey City- 83 HACKENSACK CITY Local- 709,712,751,752,753,755,756,762,770,772,780

5.5. Summary and Conclusions

Chapter 5 includes an overview of the way in which the Riverwalk and Pathway can become part of an integrated bicycle and pedestrian network for the City of Hackensack. The chapter began with a general overview of strategies that could be applied to the Corridor. These included right-of-way based strategies, where the primary purpose was to increase safety and convenience by setting aside sufficient roadway/sidewalk capacity for existing users; intersection strategies, and traffic calming approaches.

In the context of the study, the major focus was on right of way and to some extent intersection strategies. In Section 5.3 we considered the general characteristics of the roadways in the area that could serve as bicycle and pedestrian connectors to the Pathway. Based on a matrix of factors including traffic volumes, speed limits and roadway characteristics, it was recommended that the primary access for cyclists to the Pathway occur along Passaic Street. North-South trips could be accommodated by Main Street and by State Street. While River Street is the most important connection the area, it was felt that, under its current configuration, it should not be a primary focus for bicycle trips.

In section 5.4 the focus shifted to the pedestrian connectors between Main Street and the Pathway. These roadways would be the most important for maximizing the synergy between the redevelopment activities in Riverwalk, the Pathway and Main Street. In general terms, these roadways were adequate in the sense that all had sidewalks. But the sidewalks differed considerably in available walkway width, obstructions, handicap accessibility and condition. A number of recommendations were made as to improvements that would enhance their activity. The East Camden Street connection between Main Street, Johnson Library and Foschini Park was identified as a key pedestrian gateway. Anderson Street was also noted as an important connection as it provided access to the Station. A key concern related to the condition of Mercer Street, a primary access to the Light Rail Station.

In general terms, the survey determined that there were a number of opportunities to enhance the pedestrian and bicycle network These can be pursued in a phased program at a cost of around $750,000.

Chapter 6: Summary and Conclusions

The Hackensack River Pathway, when completed will enable a person to travel the entire length of the city along a right-of-way reserved for walking and bicycling. As such it is not only an important recreational resource, but also an important part of the mobility system. This Chapter recounts the individual conclusions reached in each Chapter in support of the overall conclusion that the Hackensack River Pathway and associated Riverwalk Development can enhance the transportation options in the area, enlarge the city's tax base, support revitalization of Main Street and improve access to the Hackensack River. More specifically:

In Chapter 2 we examined the overall transportation context against which the planned Pathway will be implemented. This examination showed that Hackensack's Pedestrian and Bicycle patterns are determined by the overall pattern of development which concentrated residential development in the west and commercial development on its eastern side, along the banks of the Hackensack River. The largest concentration of jobs and bicycle and pedestrian work trips was focused on the area immediately around the Pathway. The very high jobs-housing ratios around the pathway suggest that any development in the area include a residential component.

The area is subject to a considerable amount of dynamism. Major regional rail investments promise to make the area more attractive for residential development and there are stronger rail commuting possibilities inherent in the proposed double-tracking of the Pascack Valley Line and the extension of the Hudson Bergen Light Rail Line to Hackensack and Paterson. These investments are likely to spur the demand for non-auto access to the stations. Two local initiatives -- the community shuttle" and the Anderson Street Bicycle Connector" promise to increase access to the Pathway and connect the commercial/retail development in the east with the residential neighborhoods along the western boundary of the City.

In Chapter 3 we postulated that a successful integration of transportation investment (the proposed Pathway) and land use development will require a careful balance between market forces and public policies. In this Chapter we reviewed regional and local economic and public policies. This review pointed to an emerging market for redevelopment in Hackensack and the I-80 corridor of which it is a part. Transportation investments can play a critical role for these communities by providing for land use development around station sites as well as opening up the Passaic and Hackensack Riverfronts.

The proposed Pathway and associated redevelopment match up neatly with regional and state transportation investment and land use goals. Hackensack is a part of Planning Area 1 and has the characteristics of a center of place. It is a diverse community with an established infrastructure of roads, rails, bus transit, sewers and other infrastructure..

While It is clear that while the specific configuration of a redevelopment world cannot be anticipated, it is possible to envision a world where economics, mobility and recreation come together in a way that each enhances the other. In Chapter 4 a redevelopment scenario was developed that meets the general tests of market demand, public policy and access to the Hackensack River.

The Riverwalk scenario takes advantage of the existing uses and proposes a development density and design that allows for the intensification of uses while maintaining a scale that is consistent with the recreational values of the river. The development will include around 400,000 square feet of new office space, thousands of new parking spaces, over a mile of urban walkway, 4 new restaurants, a 12 screen multiplex, vastly improved public access to the river, and would certainly meet the tests of being an urban place.

In Chapter 5, we considered the general characteristics of the roadways in the area that could serve as bicycle and pedestrian connectors to the Pathway. Based on a matrix of factors including traffic volumes, speed limits and roadway characteristics, it was recommended that the primary access for cyclists to the Pathway occur along Passaic Street. North-South trips could be accommodated by Main Street and by State Street. While River Street is the most important connection the area, it was felt that, under its current configuration, it should not be a primary focus for bicycle trips.

We also examined pedestrian connectors between Main Street and the Pathway. These roadways would be the most important for maximizing the synergy between the redevelopment activities in Riverwalk, the Pathway and Main Street. In general terms, these roadways were adequate in the sense that all had sidewalks. But the sidewalks differed considerably in available walkway width, obstructions, handicap accessibility and condition. A number of recommendations were made as to improvements that would enhance their activity. The East Camden Street connection between Main Street, Johnson Library and Foschini Park was identified as a key pedestrian gateway. Anderson Street was also noted as an important connection as it provided access to the Station. A key concern related to the condition of Mercer Street, a primary access to the Light Rail Station.

BERGEN COUNTY

OPEN SPACE & RECREATION PLAN

AUGUST 2004

Bergen County Department of Planning & Economic Development

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EXECUTIVE SUMMARY

The Bergen County Open Space and Recreation Plan ("OSRP") is prepared by the Bergen County Department of Planning and Economic Development to provide a countywide policy direction on open space and recreation issues. The preparation of the OSRP maintains the County of Bergen's eligibility to receive New Jersey Green Acres Planning Incentive grant funding. The OSRP serves as a strategic plan and guide describing Bergen County's open space and recreation needs and a proposed action plan.

Recognizing the importance of public involvement in developing the OSRP, a comprehensive public participation process was used to provide access to plan information and an opportunity for residents to express their concerns. The process commenced with the Bergen County Trust Fund Public Advisory Committee conducting the first public hearing on July 24, 2000. The Bergen County Trust Fund Public Advisory Committee is the 15-member advisory committee responsible for administering the Bergen County Open Space, Recreation, Farmland & Historic Preservation Trust Fund. The Bergen County Planning Board conducted its public hearings on June 14, 2004 and on August 9, 2004. At the August 9, 2004 Planning Board meeting, the Bergen County Planning Board passed Resolution No. 03-04, endorsing the Bergen County OSRP and application to the State of New Jersey's Green Acres Program's Planning Incentive Program. The Bergen County Board of Chosen Freeholders will adopt the OSRP as part of the County Master Plan the next time the Master Plan is updated.

The County Planning Board took all required steps to comply with the appropriate New Jersey Statutes. In accordance with the County Planning Law of the State of New Jersey, N.J.S.A. 40:27 et seq., the proposed Open Space and Recreation Plan, as an element of the County master Plan, was provided to the municipal clerk and secretary of the planning board of each municipality in the county and copies were available at the office of the Bergen County Department of Planning and Economic Development. The County published a notice of the public hearing in The Record, the official newspaper of the County and newspaper of general interest and circulation in Bergen County. The hearing was advertised as a legal notice 30 days prior to the hearing, and again in the same newspaper as a paid advertisement as a display ad 15-days prior to the public hearing. The advertisement specifically mentioned the proposed Green Acres application.

Interested parties such as nonprofit land trusts, conservation organizations and the municipal environmental commissions of Bergen County were also sent copies of the OSRP for comment. Copies of the draft plan were also provided to the members of the Bergen County Board of Chosen Freeholders and the Department of Parks. The OSRP was available to the general public and interested individuals on the Bergen County Planning and Economic Department's web site at www.co.bergen.nj.us/planning/os/OS_Plan.pdf. In total, approximately 300 public organizations, organizational representatives and Bergen County residents received information on the OSRP. Comments submitted by these various entities have been

incorporated into the OSRP. All of these efforts have provided the public the opportunity to participate in the development of this plan.

The OSRP has been prepared to meet the following goals:

1. To provide facilities regional in nature and capable of serving residents of the entire county.
2. To protect and preserve natural and scenic values in the county.
3. To present current information on the supply, demand and need for recreation and open space in Bergen County.
4. To implement open space and recreation planning policies and projects that are consistent with New Jersey's Development and Redevelopment Plan.
5. To encourage coordinated open space and recreation planning, acquisition and development initiatives of state and local governments, and conservation organizations.
6. To effectively use funds from the Bergen County Open Space, Recreation, Farmland and Historic Preservation Trust Fund (the "Bergen County Trust Fund"), New Jersey Green Acres funding, and other sources of funding which may become available.

The OSRP also contains findings based on research and planning processes. The findings presented in this OSRP are:

1. Bergen County government owns and maintains over 8,700 acres of preserved public open space and recreation areas.
2. According to the 2000 census data, Bergen County continues to contain the most residents of any county in New Jersey with 884,118 residents.
3. The County of Bergen is assessing a tax for land preservation, parks and recreation projects and historic preservation, providing an estimated $12 million annually.
4. The County and its municipalities use various financial mechanisms and funding sources to acquire and protect land.
5. Land use planning and coordination between the County of Bergen and its 70 municipalities are important elements of Bergen County's open space and recreation plan.
6. The recent passage and reauthorization of the Bergen County Trust Fund in 2003 and the increase of the number of local open space and recreation tax referendums indicate continued support in the future.
7. An indicator of open space demand and need are funding requests. Between 1999 and 2003, the Bergen County Trust Fund received funding requests that exceeded $67 million. The Trust Fund was able to provide grant funding totaling $41.9 million to 270 projects located in 63 Bergen County municipalities.

The OSRP is comprised of eight sections that discuss Bergen County's open space and recreation program and its various elements of planning preservation and funding. The OSRP is organized as follows:

Section I discusses the development of Bergen County and the types of open space by function.

Section II describes Bergen County's responsibilities in the field of open space and recreation planning and development; open space funding goals.

Section III describes the County of Bergen's open space and recreation system.

Section IV discusses the opportunities for open space facilities. It looks at the statewide comprehensive outdoor recreation plan.

Section V provides an assessment of those public and private land and water resources that have potential for providing open space or recreation opportunities. Identifies six regions for open space and preservation opportunities.

Section VI outlines an action plan that will support the implementation of policies to achieve the OSRP goals. Details partnerships that can be used to support open space and recreation policies.

Section VII provides the official county parks map entitled: "Bergen County Parks and Recreation Facilities".

Section VII is a listing of all of the open space properties owned by the County of Bergen that are contained on the current state Green Acres Open Space and Recreation Inventory.

BERGEN COUNTY OPEN SPACE & RECREATION PLAN

I. "OPEN SPACE" AND BERGEN COUNTY

Bergen County, as one of the inner counties ringing New York City, is heavily populated. It is the most populous county in the State of New Jersey, and has the largest workforce of any county in the state. Population growth and employment growth has been substantial in Bergen County since World War II and is expected to continue over the next 20 years. As a result, as different parts of the County have moved from being "rural" to "suburban" in character, and from being "suburban" to "urban" in character, the County has also seen a decline in the amount of available open space. (Bergen County Department of Planning and Economic Development studies determined that from 1982 to 1988, the amount of privately-owned open land fell from 12 percent of the County's land area to 6.8 percent, and is now estimated to be less than 4 percent.) The decline in the amount of open space has been accompanied by an increasing demand for high-quality open spaces to serve various functions. The projected growth of the County, in the face of the minimal supply of available open land, makes it critical that the County continue its ambitious goal of protecting as much of its remaining open lands as possible.

Bergen County contains communities of different characters -- ranging from urban to suburban to suburbanizing rural, with established suburban communities clearly predominating. Accordingly, the role that open space plays in determining or maintaining the character of each community varies throughout the County.

Bergen County already contains a rich, wide variety of open spaces that fall into different "user" and "function" categories. Large-scale public open spaces, which serve primarily recreational and scenic functions, include such spaces as Palisades Interstate Park and Saddle River County Park. A variety of smaller public open spaces exist as well, such as municipal parks and playing fields. In addition, the County contains a wide range of privately owned and "personalized" open spaces, ranging from golf courses and swim clubs to people's yards. (Given the predominance of suburban communities in the County, the yard is probably the largest supplier of open space.) There are also open spaces serving primarily a "preservation" function. These range in size from the County Reservations in the Ramapo Mountains and the Hackensack Meadowlands Conservation and Wildlife Area, to smaller stream corridors and wildlife areas. The amount of open spaces serving "resource" functions is rather limited, however. The County has minimal agricultural activity. In 2004, for example, there are about 60 farms remaining in Bergen County. They range in size from a minimum of five acres to a maximum of 218 acres, totaling approximately 1,000 acres. Even though this range of open spaces already exists, future growth will mount substantial additional pressure on them and will create substantial additional pressure to protect and provide additional open spaces in order to maintain and enhance the quality and level of open space throughout the County.

Given the predominately suburban and urban character of Bergen County, much of the emphasis in community efforts regarding open space is likely to focus on those types of open space that are part of the "suburban" and "urban" character of different communities. Given the increasing number of people that the available open space must serve, there is likely to be a greater emphasis on providing open spaces that serve a variety of functions in order to optimize the use of available open space. (This does not necessarily mean, however, that each individual open space must serve a variety of functions.) In addition, given the range of natural resources that exist in the County, it is important that open spaces continue to serve a "preservation" function. Preservation of existing natural resources -- forests, reservoirs, wetlands, and streams -- can also serve limited recreational functions, break up a monotonous pattern of development, provide important scenic amenities, and contribute to a sense of community identity. In general, there will be greater pressure to protect and provide high-quality open space as development continues.

A. THREE DEVELOPMENT TRENDS IN BERGEN COUNTY

Three types of development trends are likely to dominate Bergen County over the next 20 years. They are: (1) **the "suburbanization" of existing semi-rural communities**, which are concentrated in the western reaches of the County; (2) **the redevelopment of suburban communities** in ways that largely retain a "suburban" intensity and character of development; and, (3) **the redevelopment of suburban and urban communities** in ways **that create an "urban" intensity and character of development**. Each of these development or redevelopment trends presents different issues with regard to the protection, provision, and enhancement of open spaces.

1. SEMI-RURAL SUBURBANIZATION

The open space issues appearing in conjunction with new "suburbanization" are many. One of the principal issues will be how to ensure that valued natural resources are preserved in the face of new development, both for their "environmental" functions and their "recreational" functions. Decisions must be made as to whether lands that heretofore have been relatively untouched by development should be set aside and protected. In addition, recognizing that the character and quality of new development is defined in many ways by the character of the open spaces appearing within it, decisions must be made as to whether new directions will be taken to design and create open spaces that give the new suburban development a more coherent sense of "place" than appears in conventional subdivisions. On a related vein, decisions must be made as to whether to maintain open spaces that preserve the semi-rural visual character of the community, even though the overall intensity of development in the community will increase to "suburban" proportions.

2. SUBURBAN REDEVELOPMENT

The open space issues that appear with regard to the redevelopment of communities are largely similar. As Bergen County continues to grow in the face of a minimal supply of vacant land, redevelopment of existing developed areas will

become more and more prevalent, and existing open spaces will be threatened. Redevelopment projects too often sacrifice open space in order to intensify the number of buildings or dwelling units on the land in an effort to improve the economics of the redevelopment project. However, sacrificing open space in this way can also hinder the economics of the project; functional and attractively designed open space can substantially enhance the value of any development or redevelopment project, and a lack of good open space can suppress that value. Therefore, redevelopment brings with it the need to ensure that existing open spaces are protected and enhanced as redevelopment occurs in a community. Redevelopment also presents an opportunity for the creation of new open spaces that are appropriate to and contribute to the character, quality, and value of the redeveloped area.

Existing suburban communities (or parts of suburban communities) can be redeveloped in two ways: (1) to a "suburban" character where the overall intensity of development approximates what now exists, or (2) to an "urban" character where the overall intensity of development increases substantially above what now exists. The open space issues that arise in "suburban-to-suburban" redevelopment largely revolve around making the open spaces which are integral to a "suburban" community function better than they currently do, either by providing a fuller range of open space opportunities, by improving the quality of suburban open spaces, or by creating new open spaces that give the suburban community a greater sense of "place" than it currently has.

3. SUBURBAN AND URBAN REDEVELOPMENT

The open space issues that arise in "suburban-to-urban" redevelopment are somewhat broader, including some changes in the basic character of open spaces that define and indicate basic changes in the functioning of the community itself. This includes the need to provide a whole new type of open space that typically does not appear in suburban communities -- that is, public open space that is designed to accommodate a large number and wide diversity of people, a wide range of functions, and a greater intensity of use. Private yards will need to be exchanged for public plazas. As discussed previously, such open spaces not only satisfy the various functional needs of urban communities, but also give the urban community its sense of "place" and community identity. Therefore, in the "suburban-to-urban" redevelopment context, special care must be taken to ensure that this new form of open space is of a design and quality that enhances the character and functioning of the "redeveloped" community as an "urban" community.

B. TYPES OF OPEN SPACE

Open space is, essentially, land that is not developed with buildings -- an area whose character is dictated by the land itself rather than what is built on the land. Open space can take many forms. A large park or nature preserve is one example, and perhaps the one that most readily comes to mind when one hears the term "open space." A parking lot is another

example; but for the cars that may be parked on it at any particular time, a parking lot has open space character due to the fact that it is not covered with buildings. (In some cities, especially in Europe, key city plazas perform dual duty as parking areas and as key gathering spots for civic events.) In its many forms and functions, open space is an integral part of the fabric of community life -- not only in terms of the different practical functions that it serves but also in affecting the appearance of the community and providing a sense of community identity. Thus, a community needs to take a broad look at "open space" and the different types of "open space" that exist in and are needed in the community.

Open spaces can be categorized along a number of different lines or contexts. One categorization can occur along the lines of the functions that a particular open space serves, such as "environmental protection," "recreation," or "community character." Another categorization can occur along the lines of who owns and uses the open space; it can be "public," "private," or "borrowed," or it can be "personal," "neighborhood," or "regional" or "community" open space. The users and functions of the open space, and the character of the community in which the open space sits, will determine what form the open spaces in the community take. They also raise different issues regarding the way an open space can be acquired, the amount or type of control that may be exercised over the use of an open space, and the way to manage an open space so that it effectively performs its intended function in the way that most benefits the community.

1. TYPES OF OPEN SPACE BY FUNCTION

Open spaces can be categorized according to the different functions they serve or values they provide to the individual or the community at large. These functions and values vary widely. Some open spaces preserve the outdoors in a natural state. Other open spaces, however, do not appear "natural" at all. Nonetheless, both types of open space are important because they serve particular functions or enhance particular values that are important to the community. The following discussion breaks open spaces down into four basic functions it serves: environment, protection, recreation, and community character.

The ways in which an open space is established and maintained depend largely on the functions that the open space serves. Of course, an open space can serve more than one function for persons who use the open space. While some functions complement each other, others do not. The potential for conflicts between the intended or expected functions of a particular open space raise a host of planning and management issues. As a result, it is important to bear in mind the function or functions that different open spaces might serve, when developing an open space plan for the community.

a. "Environmental" Functions

The preservation of natural features and natural systems in a relatively undisturbed state is an important function of many open spaces. Open spaces serve as habitats for various forms of plant and animal life; and open spaces are often preserved and protected in order to protect such habitats. Other open spaces, such as wetlands and floodplains, not only serve as habitats for plant and animal life, but also play an important role in the hydrologic system by accommodating and storing stormwater, and by filtering pollutants from stormwater runoff before it reaches other bodies of water. Other open spaces may contain unique or notable landforms or other natural features. In addition, the vegetation that an open space may contain helps purify the air and moderate the temperature of the surrounding area.

Part of the "environmental" function is a "resource" function, in that some open spaces provide natural resources that people reap for sustenance and/or profit. These resources may include minerals, crops, timber, fish, and other forms of plant and animal life that human beings use for food or production of goods. They would also include water supplies, and the open spaces associated with reservoirs and groundwater recharge areas. While open spaces that serve a "resource" function most readily come to mind in the rural community, such spaces can appear on a smaller scale in urban communities, in the form of neighborhood gardens and rivers and lagoons for fishing.

b. "Protection" Functions

Somewhat related to the "environmental" functions of open spaces are several "protection" functions, in which the open space serves to somehow protect people from a potential harm or undesirable condition. For example, assuming a floodplain is not developed and remains open space, floodplains protect people from flood damage. In addition, open spaces may help relieve the potential impacts of overcrowding in a community, not only by helping to moderate the overall population density of an area but also by providing places where people can get natural light and fresh air. Sidewalks are another example of an open space that serves a "protection" function, in that they keep pedestrians from walking in the streets.

c. "Recreation" Functions

The "recreation" functions of open space readily come to mind. Open spaces provide a forum for human refreshment and relaxation. The level of intensity of recreational activity that occurs in an open space can be very low, as with a pedestrian trail, even to the point of where the open space serves a recreational function simply by being something that people see from a distance or by being a place from which they can view something else. (A scenic overlook is a good example of this.) The intensity of recreational activity that occurs in an open space also can be very high, as with a playing field for sports. The level of interaction that occurs between the individual and nature will vary widely from one open space to another, from the interpretive trail at a nature preserve to the football stadium. At

both extremes, however, the open space provides a person with a source of refreshment.

Part of the "recreational" function of open space is the opportunity that open spaces present for people to gather and interact with each other for any number of reasons, whether it is to view a sporting event, to have a picnic, or to attend a political rally. Open spaces can simply provide a gathering spot, for whatever purposes. The degree and type of interaction between people will vary from one open space to another.

d. "Community Character" Functions

Open spaces also play a role in determining the overall character and aesthetic quality of a community. Conversely, the overall character of the community will largely determine the character of the open spaces one finds in the community. This interplay between the character of the community and the predominant character of open spaces within the community varies from "urban" communities to "suburban" communities to "rural" communities.

In addition, the type of open space in the community also helps determine the character of the community as a reflection of the types of economic and recreational activities that occur there. For example, in a community with a lot of open water, the character of the community becomes more oriented toward the water. Similarly, in a community with a lot of golf courses or nature preserves, the overall character of the community reflects the existence of such open space resources -- showing the community to be one that places an emphasis on active recreation or on environmental quality.

(i) "Rural" Communities

The visual character of "rural" communities is principally defined by the predominance of open space. Rural areas are distinguishable for their relative lack of man-made structures. The number of people and buildings in relation to the amount of open land is relatively low, even though some of the human activities that occur in the open space can be quite intense (such as forestry or mining). Open spaces in rural areas are typically large in scale, such as farms and forest-covered hills. Accordingly, the appearance of more and more buildings in rural communities, and the breaking down of open spaces into smaller and smaller units, provide visual clues that a community is undergoing a transition from a "rural" character to a "suburban" character.

The open spaces in rural communities also define the economic and social character of the community. It is in rural communities that people and the local economy are most dependent on the land and its resources through such activities as farming and forestry. This common dependency on the land and its resources is

the tie that binds the community together, and around which many of the social activities of rural communities center.[1]

(ii) "Urban" Communities

"Urban" usually connotes buildings, and the small amount of open space relative to buildings is a key component of the visual character of "urban" communities. However, open spaces are also an integral part of the visual character of urban communities. Open space provides a visual focus in urban communities, such as by the convergence of major streets at a park or plaza, and a place from which to view the buildings, monuments, and other structures of the city. Compared to "rural" communities, the open space in "urban" communities is typically "linear" in character, organized as streets and boundaries. The visual character of a city is defined not only by the buildings, but also by the arrangement of buildings and the arrangement of spaces between buildings. It is the interplay and rhythm of buildings and open spaces (streets, parks, and plazas) that establish a unique, identifiable pattern or plan for each urban community.

Open spaces are also an integral part of the economic and social character of cities. Cities have always been marketplaces of goods and ideas, and much of the exchange of goods and ideas has traditionally occurred in open spaces. As gathering places, open spaces in the urban community also provide the forum for basic social and recreational activities between people. In addition, open spaces contribute to the economic character of a city as a basic, desirable amenity that can enhance the value of nearby property.

Overall, compared to rural and suburban communities, open spaces in an urban community will face a higher intensity of use, both in terms of the number of people who use it and the number of functions that the open space may serve. This is because of the large number of people in an urban community relative to the amount of open space available. In cities, streets serve not only as transportation routes but also serve as gathering places. Small-scale personal open spaces also exist in urban communities, however, serving as a form of sanctuary from the larger population and from the congestion and intensity of activity that occurs in urban communities. These smaller spaces are also part of the social character of cities.

In the "urban" community, it is much more likely that open space will be paved. The fact that an open space is paved, however, does not necessarily mean

[1] Rural communities do not consist entirely of open land, however. Rural communities include built-up areas -- towns and villages -- which are more "suburban" in their intensity of development but play a central role in the economic and social life of the rural community. These villages and towns typically contain smaller-scale, public open spaces -- such as the village square which hosts the farmer's market -- that serve many of the same functions that urban plazas perform. What distinguishes these rural villages and towns from suburban and urban communities, however, is the fact that they are discrete from other communities, being bounded by some expanse of open space that provides the basic resources on which the local people and economy subsist.

that it is unattractive or is not an important asset to the community. The Italian piazza is a classic example of an open space that is not green, and sits in the midst of high-intensity development, but is a highly functional open spacing that is integral to the fabric of the community. Nor are natural or green open spaces unknown in urban communities, even though these are rarer in "urban" communities than in "rural" communities. The green spaces in cities can range in size from New York's Central Park, to a neighborhood vegetable garden, to the garden on someone's terrace.

(iii) "Suburban" Communities

The visual character of a "suburban" community comes from some degree of balance between green open spaces and development, in which neither really predominates. Suburban communities are not as densely settled as urban communities, but they are more densely settled than rural communities. Compared to the visual character of urban communities, the open spaces in suburban communities tend to be "greener," in the form of lawns, tree-lined streets, and neighborhood recreation areas. Indeed, the disappearance of such green open spaces is one of the key visual clues that a community is in transition from a "suburban" character to an "urban" character.[2] Compared to the visual character of rural communities, it is much less likely that one will find an open space in a suburban community that provides a sweeping vista with few buildings. However, small-scale vistas exist on occasion to interrupt the pattern of suburban development, often in areas that have been passed over due to natural constraints to development (such as creeks and floodplains). In any event, it is the intermingling of nature and development which yields a "suburban" character.

The open spaces in suburban communities also reflect and define the social and economic character of suburban communities. Compared to urban communities, suburban communities have a higher degree and larger scale of "private" or "personal" open space in the form of individual yards and apartment courts. While these open spaces provide the visual or scenic qualities which often are associated with the suburban environment, they also reflect the emphasis on privacy, seclusion, and private land ownership which underlies suburban society as distinguished from urban society. Compared to rural communities, the economies of suburban communities do not depend on the resources of their land, and suburban communities have a much lesser degree and smaller scale of open space that is

[2] Suburban communities have a greater degree of green open space than urban communities, but they also have a greater degree of open space that is devoted exclusively to the automobile (in the form of streets and parking lots). This reflects the way in which the economic and social order of suburban communities has come to depend on the automobile as the principal form of transportation. It also reflects the way in which the functions of open spaces tend to be more specialized and segregated in suburban communities than in urban communities, perhaps because of the greater availability of open space relative to the number of people in the community. Accordingly, as with a diminution in the amount of green open space, an increase in the number of people and functions that a particular open space serves indicates that the character of the community is in transition from "suburban" to "urban."

devoted to resource uses. Nonetheless, open spaces (and especially green open spaces) have a strong impact on suburban economies, largely as an amenity which enhances the value of nearby property and makes the community more attractive overall as a place to locate a home or business.[3]

2. TYPES OF OPEN SPACE BY USER OR SCALE

Another way of categorizing open spaces is according to the user or owner of the space, or the scale of the population it serves. Some open spaces are small and private, being used by only a very few people. Other open spaces are large and public, being used by a large number of people. Between these two extremes lies a wide range of variations. However, the basic distinction of whether the open space is **"public"** or **"private"** (or "borrowed," "regional," "community," "neighborhood," or "personal" in terms of the population it serves) can influence the basic form of the open space and the way that the open space is acquired, managed, and protected.

a. "Public" Open Space

"Public" open space includes any open space that is available for use by the general public. This may include not only land that is owned by a public agency, but also land that is owned by private organizations but made available to use by the general public. The key here is that the land actually is used by the public. Of course, public open space has many forms, from the elementary school playground to the national park, and can serve many functions. What these open spaces share, however, is the fact that they are available for use by the general public. Public open space is the predominant form of open space in urban communities. Public open space can be further broken down into "neighborhood" open space and "regional" or "community" open space.

"Regional" or "community" open space is open space that is primarily designed or intended to serve the population of the entire community or the entire region of which the community is a part. As was explained above, different "regional" or "community" open spaces may serve very different functions and have very different characters. A county or city park with major recreational facilities is one example. A large cemetery is another example.

[3] Especially in urban and suburban communities, open spaces also play an important economic function by contributing to the basic attractiveness of the community, which both creates property value and attracts new people and businesses to the community. It cannot be denied that the presence of attractive open space increases the value of nearby commercial and residential property. It is hard to imagine New York City's Plaza Hotel being as valuable if it were not located on Central Park.

"Neighborhood" open space is primarily designed to serve a smaller population, namely the people living or working in the immediate vicinity of the open space. Examples of such open spaces include the neighborhood "tot lot," the playing fields at a neighborhood elementary school, and the small plaza in an office development where employees may gather for lunch.

b. "Private" or "Personal" Open Space

"Private" or "personal" open space is primarily designed and intended for use by a small, identifiable group of persons, such as an individual household or a group of households. These open spaces typically are privately owned. To some extent, they provide a "sanctuary" from the larger world, and an area in which primary social interactions can take place. This category includes such open spaces as back yards, and courtyards in townhouse and apartment complexes, and even the small neighborhood swim club. What these open spaces share is the fact that they serve a much smaller population than the general public, and create or maintain a sense of separation from the larger public. While such open spaces bring people outdoors, they also give people a certain sense of security and separation from others, providing a transition area between the home and the larger outside world. Private or personal open space is the predominant form of open space in rural and suburban communities.

c. "Borrowed" Open Space

"Borrowed" open space is a hybrid between "public" open space and "private" or "personal" open space. It includes those open spaces that benefit people without entering or using the space itself. A good example of this is the scenic highway, where the driver stays on the road but enjoys the open vistas on the side of the road. Another example is the view a person has of her neighbor's back yard. Even though the yard belongs to the neighbor, the viewer derives some benefit from being able to see the grass and trees, as a visual extension of her own yard. "Borrowed" open space is more prevalent in rural and suburban communities than in urban communities. Because "borrowed" open space is not directly controlled by the persons who benefit from its existence, however, there are few if any guarantees that it will be a perpetual element of or a contributor to the character of the community.

II. BERGEN COUNTY'S OPEN SPACE GOALS & POLICIES

The urbanized environment of Bergen County has placed on County government several demanding responsibilities in the field of open space and recreation planning and development. A primary objective is to **provide facilities regional in nature and capable of serving residents of the entire County**. This does not, and should not, preclude the County from providing certain specialized recreation facilities which may primarily serve a specific sector of the County, supplementing municipal recreation facilities.

A second major County open space role lies in **the protection and preservation of natural and scenic values in the County**. As more and more of the County's remaining vacant acreage are turned to urban land uses, the retention of nature in the environment becomes increasingly important. It is important not just for visual and aesthetic appeal, but to preserve an ecological balance in the County.

The basic planning concepts guiding the Bergen County Open Space and Recreation Plan objectives are: the preservation of the major waterways in the County; the expansion of existing County Park areas where applicable; and the acquisition of major tracts of undeveloped land where suitable for County Park purposes.

Following are the goals and policies that support the County's open space objectives:

- Conserve major ridgelines, significant treed areas and areas designated as natural areas.
- Improve the quantity, quality and availability of parks and open space, including active and passive recreational facilities, parks and environmentally sensitive areas.
- Preserve the environment, including wetland areas, streams and wetland corridors.
- Promote the establishment of a linear greenway park system along the Hackensack, Passaic, and Ramapo Rivers.
- Protect the quality and purity of rivers and streams.

In further refinement of these goals, several more specific guidelines and objectives can be stated for Bergen County with regard to open space. These can be broken down into **"people goals"** and **"plant and animal goals."**

A. PEOPLE GOALS

The "people goals," which pertain to the health, safety, and well being of individual residents of the County as well as the County as a whole, include the following:

- Maximize the amount of green permeable open space within developed areas.
- Promote the public health, safety, and welfare of the citizens of Bergen County.
- Maintain, protect, and improve the quality of human life.

- Enhance the urban and suburban environment by protecting nearby property values. Take advantage of opportunities to use recreational/open space as a catalyst to economic and residential redevelopment.

- Provide areas for relaxation, contemplation, and social and economic interchange.

- Enhance the appearance of neighborhoods through preservation of green spaces.

- Preserve local spots of natural beauty.

- Provide natural beauty in an urban environment.

- Protect and create scenic easements.

- Encourage the participation by all age groups in the use and care of local open space tracts in residential areas.

- Provide structure to neighborhood design.

- Counteract the effects of urban congestion and monotony.

- Add to the sense of spaciousness.

- Provide space for active and passive recreation.

- Prevent building in undesirable locations.

- Buffer environmental hazards and nuisances and separate incompatible land uses.

- Maintain existing public parks, green spaces and major private recreation areas.

- Conserve and enhance significant natural, cultural, historical and aesthetically significant areas and resources.

B. PLANT AND ANIMAL GOALS

The "plant and animal goals," which pertain to the preservation and protection of natural systems, include the following:

- Protect flora and fauna from suburban encroachment and habitat destruction.
- Provide habitat for wildlife.
- Prevent the food chain from being interrupted.
- Preserve and protect environmentally sensitive areas in a largely natural or undeveloped state.
- Maintain the natural open space character of waterfront areas.

C. BERGEN COUNTY'S OPEN SPACE FUNDING GOALS

Through State Law, New Jersey counties are permitted to establish a dedicated trust fund to acquire land for conservation/open space purposes, enhance recreational facilities, and for farmland and historic preservation. Counties are given great latitude in crafting their own trust funds to meet their particular priorities and objectives. Under State Law, N.J.S.A. 40:12-15, et. seq. the Board of Chosen Freeholders needed voter approval to create and fund such a Trust. The County of Bergen recognized the merits of a trust and, on November 3, 1998, placed a public question on the ballot to determine whether the County should establish such a trust fund. The ballot question was approved by a two to one majority of those who voted. The Referendum was advisory to the Freeholder Board, not binding upon them.

The **Bergen County Open Space, Recreation, Farmland and Historic Preservation Trust** was created by Freeholder resolution on November 24, 1998. It is divided into two separate programs each having its own distinct goals and objectives. First, the **County Program** will use trust fund dollars on a countywide basis to preserve land, maximize recreational opportunities, and preserve historic areas and farmland. The second component, the **Municipal Program**, will help the 70 municipalities of Bergen County improve their municipal open space and recreational facilities. The **Municipal Program** would supplement municipal efforts and will not serve as a full funding resource.

Bergen County's Trust Fund had an initial life span of 5 years, ending in 2003. Based on the success of this initial effort, the County of Bergen sought to re-authorize the Trust Fund, via a public question to the electorate on the ballot of November 4, 2003. The ballot question was approved by a two-to-one majority of those who voted. The vote of approval allowed the Freeholder Board to re-authorize and modify the Trust Fund,

which they did via Resolution #1753 on December 17, 2003.

Further information about the Trust Fund is contained in the Bergen County Open Space, Recreation, Farmland and Historic Preservation Trust Fund Program Statement.

To help achieve the goals and objectives of the Open Space and Recreation Plan, the County's funding opportunities shall:

- Encourage innovative financial mechanisms to enhance and maximize the limited funds available through the Bergen County Open Space, Recreation, Farmland and Historic Preservation Trust.

- Supplement the Trust Fund with other funding sources, such as State Green Acres state acquisition, non-profit acquisition and Green Trust's loan/grant municipal and county programs, Federal programs, local municipal trust fund programs, and private donations.

- Explore protecting land via conservation easements, Transfer of Development Rights (TDR) and other means.

The above goals and objectives shall serve as the guiding principles of this open space plan for the County. To the greatest extent possible, the strategies for preserving and enhancing open spaces set forth in this document seek to maximize the achievement of these goals and objectives.

D. OPEN SPACE GOALS OF THE STATE'S DEVELOPMENT AND REDEVELOPMENT PLAN

Bergen County's Open Space and Recreation Plan addresses the following State Planning Goals and Strategies, taken from the March 2001 New Jersey State Development and Redevelopment Plan:

a. **Revitalize the state's cities and towns.** "Protect, preserve and develop the valuable human and economic assets in cities, towns and other urban areas. Plan to improve their livability and sustainability by investing public resources in accordance with current plans that are consistent with the provisions of the State Plan. Reduce the barriers which limit mobility and access of city residents, particularly the poor, to jobs, housing, services and open space within the region."

b. **Conserve the state's natural resources and systems.** "…restoring the integrity of natural systems in areas where they have been degraded or damaged."

c. **Promote beneficial economic growth, development and renewal for all residents of New Jersey.** "Promote socially and ecologically beneficial

economic growth, development and renewal, particularly the poor and minorities, through partnerships and collaborative planning with the private sector. …Encourage economic growth in locations and ways that are both fiscally and environmentally sound."

d. **Protect the environment, prevent and clean up pollution.** "Promote ecologically designed development and redevelopment in the Metropolitan and Suburban Planning Areas and accommodate ecologically designed development in Centers in the Fringe, Rural and Economically Sensitive Planning Areas, to reduce automobile usage, land, water and air quality. Plant and maintain trees and native vegetation."

e. **Provide adequate public facilities and services at a reasonable cost.** "Reduce demands for infrastructure investment, by…purchasing land and easements to prevent development, protect flood plains and sustain agriculture where appropriate."

f. **Provide Adequate Housing at a Reasonable cost**. "Provide adequate housing at a reasonable cost through public/private partnerships that create and maintain a broad choice of attractive, affordable, ecologically designed housing, particularly for those most in need."

g. **Preserve and enhance areas with historic, cultural, scenic, open space and recreational value.** "Enhance, preserve and use historic, cultural, scenic and recreational assets by collaborative planning, design, investment and management techniques. Locate and design development and redevelopment and supporting infrastructure to improve access to and protect these sites."

h. **Ensure sound and integrated planning and implementation statewide.** "Use the State Plan as a guide to achieve comprehensive, coordinated, long-term planning based on capacity analysis and citizen participation; and to integrate planning with investment, program and regulatory land use decisions at all levels of government and the private sector, in an efficient, effective and equitable manner. Ensure that all development, redevelopment, revitalization or conservation efforts are consistent with the Statewide Policies and State Plan Policy Map of the State Plan."

i. **General plan strategy.** "Achieve all State Planning Goals by coordinating public and private actions to guide future growth into compact forms of development and redevelopment, consistent with the policy objectives of each Planning Area, and to support the maintenance of capacities in infrastructure, environmental, natural resource, fiscal, economic and other systems."

III. INVENTORY OF COUNTY-OWNED OPEN SPACE

A County study in 1982 revealed then that only 12 percent, or 18,344 of the County's privately held lands, remained undeveloped. By 1988, this total acreage had declined, as a result of over 950 approved subdivisions, by 8,400 acres to 6.8 percent of the County's stock of privately owned, undeveloped land. Nearly half of the 1982 total disappeared. In 1988, Bergen's County-owned parkland totaled 5,015 acres.

Bergen County is the seventh smallest of all the 21 counties in New Jersey. Yet, we are third among the 21 counties in total acres of County open space -- a remarkable accomplishment.

We have done this in such a way that, along our western border, Bergen's open space acquisitions have helped knit together a continuous expanse containing 19 square miles of open and natural lands extending northward from the Borough of Oakland to Sterling Forest. Further, our acquisitions on our eastern border have knit together a second continuous band of public open space totaling over 86 square miles from the George Washington Bridge northward to Bear Mountain State Park in New York.

These become remarkable features of the natural landscape available to our residents as yet another advantage of living in Bergen County.

A. KEY OPEN SPACE ACQUISITIONS

Ramapo Mountains

Ten open space transactions since 1988 have acquired, protected, and preserved over 4,100 acres of the mountains. When combined with existing parkland, a contiguous open space swath of over 12,950 acres has been knitted together joining Bergen with Passaic County, Sterling Forest and the Highlands Region.

Norwood East Hill

At the heart of our efforts in northeastern Bergen County was the acquisition and preservation of the 121-acre Norwood East Hill. Along with our partnership acquisition with Alpine and Rockleigh of the 134-acre Lamont tract, an open space corridor of almost 1,500 acres has been established west of the Palisades Interstate Parkway and Route 9W.

Linkages from this greenway corridor across the Palisades Interstate Parkway will allow for continuous access into the Palisades Interstate Park Commission lands southward down to Fort Lee Historic Park and northward to both Harriman and Bear Mountain State Parks in Orange County, New York.

Hackensack Watershed

Over 400 acres of woodland watershed property is now permanently protected from development in Emerson, Harrington Park, Old Tappan, River Vale, and Closter. Another 291 acres are also permanently protected as golf courses -- Pascack Country Club, Emerson Country Club, and Haworth Country Club.

Hackensack River Path Greenway

The Hackensack River County Park, a 31-acre waterfront environmental park along the river at Riverside Square Mall, was created and opened by the County. Designs and plans for a 2-mile riverfront path from the City of Hackensack's Johnson Park, through the Hackensack River County Park, to the Historic New Bridge Landing Park located in River Edge have been prepared. The finalizing of access easement agreements and securing of state Department of Environmental Protection permits remain before seeking construction bids. During this time, the municipalities of Hackensack, Teaneck, and New Milford have all prepared riverfront path greenway plans.

Van Buskirk Island - *Hackensack Water Pump Station*

In 1993, 47-acres of riverfront property along the Hackensack River, located in the Borough's of Oradell and New Milford, was donated to the County by the Hackensack Water Company, now known as United Water New Jersey. Contained within the 47-acres is the 13-acre Van Buskirk Island where the County Department of Parks is working on plans to provide public access to the Hackensack River and appropriate passive outdoor recreation opportunities.

Van Buskirk Island contains the Hackensack Water Company's former pump and filtration plant. Now listed on the New Jersey and National Historic Registers, the Plant is nationally significant as the earliest example of the American system of mechanical filtration on a scale large enough to enable the delivery of purified water to many cities and is a rare example of a complete water works from both purification and delivery.

Borg's Woods Nature Preserve

A 14.5-acre old growth, woodland forest was acquired and preserved as a nature area in Hackensack, along Coles Brook.

B. BERGEN COUNTY'S PARKS, RECREATION AND HISTORIC FACILITIES

The locations of the County Park and Recreation facilities are keyed to map entitled, "Bergen County Open Space - County Park Properties," attached to this Open Space and Recreation Plan.

1. **Ramapo Valley Reservation and Ramapo Mountain** - Ramapo Valley Road (Route 202), Mahwah. Explore the wooded hillside of this 3,400-acre site with mountain fishing, pond and scenic waterfall. Tent camping beside the Ramapo River offers canoe and raft owners portage access to the river.

2. **Campgaw Mountain County Reservation** - Campgaw Road, Mahwah. Hike along marked trails in this 1,351-acre wooded park. Campsites are also available. The Ski Center at the reservation includes a 1,650-foot chairlift slope enhanced by machine-made snow. The Visitors Center has a wood fire in the lounge, a snack bar, a shop that rents and sells skiing equipment, and the ski school.

3. **Camp Glen Gray –** Midvale Mountain Road, Mahwah. 758 wooded acres, primarily wilderness, with a core facility for family camping, including cabins, tent sites, hiking trails, lake and a dining hall. Besides hiking trails, there is a lake to fish, cabins, lean-tos and tent sites to camp in. A sports field, campfire ring and an amphitheater provide places to hold outdoor events.

4. **Camp Tamarack** – Skyline Drive, Oakland. 181-acres of wooded land with scenic Lake Tamarack. Hiking trails run through the wilderness acres.

5. **Saddle Ridge Riding Center -** Shadow Ridge Road (off Pulis Ave), Franklin Lakes - High on Campgaw Mountain, the County's 105-acre Saddle Ridge Horseback Riding Center Area has a panoramic view from the paddocks and has wooded bridle trails.

6. **Darlington County Park** - Darlington Avenue, Mahwah. Take the family to Darlington for a summer outing. Two lakes on the 232-acre site at the foothills of the Ramapo Mountains offer swimming and sand beaches; a third lake offers fishing. The park has picnic groves and tennis and handball courts. A snack bar is open during swimming season.

7. **Darlington County Golf Course** - Campgaw Road, Mahwah. This 18-hole golf course on 120 rolling acres has a pro shop, snack bar and lounge. There is also a 40-tee concession-operated driving range.

8. **James A. McFaul Environmental Center** - Crescent Avenue, Wyckoff. The exhibit hall, which overlooks the waterfowl pond, has a meeting room, browsing library and wildlife exhibits. Winding paths on this 81-acre site bring you to woodland gardens and animal shelters. There are 25,000 daffodils and flowering trees on the grassy slopes. Picnic tables are near the crossroad on the hill. There are free weekend and Tuesday public programs with guest speakers, guest hike leaders, and films. An accessible boardwalk winds through the wetland nature trail.

9. **Wood Dale County Park** - Prospect Avenue, Woodcliff Lake. The pond is the hub of activity in this park. In winter it is a popular ice skating area; in other seasons it affords fishing and model boat sailing. The park has free tennis courts with lights, picnic facilities and a children's playground.

10. **Baylor Massacre Burial Site** – Located at the intersection of Rivervale Road and Red Oak Drive, River Vale, the Baylor Massacre County Historic Site is a 2.7 acre interpreted historic park with extensive signage, meditational seating areas and pathways. The bodies of six Continental Dragoons slain in a merciless attack by British forces in Sept., 1778 are interred at Baylor, a Revolutionary War burial site.

11. **Wortendyke Barn** - Located at 13 Pascack Road in Park Ridge, the one-half acre Wortendyke Barn County Historic Site is one of the area's few remaining examples of the unique type of barn built in this Dutch-settled region. Erected on a farm owned by the Wortendyke family between 1735 and 1851, the barn was restored as a Bicentennial project by the county and is a fully interpreted historical museum.
12. **Camp Merritt Memorial Monument -** Contained within the one-half acre circle in Cresskill at the intersection of Knickerbocker Road and Madison Avenue, the Camp Merritt Monument County Historic Site is a 65-foot high neoclassical stone obelisk that commemorates the center of Camp Merritt, a World War I Camp through which over a million American soldiers passed between 1917 and 1920 on their way to and from the battle fields of Europe.

13. **Overbrook Brook County Park** – Westwood Avenue, Westwood. This 2.79-acre park provides open areas and wooded land offering a quiet fishing retreat along the Pascack Brook.

14. **Pascack Brook County Park** - Emerson Road, Westwood. This park offers free tennis courts with lights, a practice backstop, a children's playground, two ball fields, an area for soccer, and a fishing pond.

15. **Rockleigh County Golf Course** - Paris Avenue, Rockleigh. There are 27-holes on this 264-acre golf course at the base of the Palisades western slope, giving golfers a scenic view of all the changing seasons. The stone fieldhouse has a pro shop. Each of the three 9-hole courses has its own challenging characteristics.

16. **Norwood East Hill** – Located in Norwood, this 121-acre tract of County-owned, wooded conservation parkland is the centerpiece of an open space corridor in Northeastern Bergen County comprising almost 1500 acres.

17. **Alpine Reserve North** – Located in Alpine, this 134-acre tract of County-owned, wooded conservation parkland was preserved through a partnership with the Boroughs of Alpine and Rockleigh, and is the adjacent to the County's Norwood East Hill property.

18. **Alpine Reserve South** – Located in Alpine, this 197-acre tract of County-owned, wooded conservation parkland is part of an open space corridor in Northeastern Bergen County comprising almost 1500 acres.

19. **Orchard Hills County Golf Course** - Paramus Road, Paramus. This 9-hole course adjacent to Bergen Community College is set among mature trees and shrubs.

20. **Garretson Farm** - Garretson Farm County Historic Site is a 1.84-acre property located at 4-02 River Road, Fair Lawn, containing a large early Dutch stone house, carriage shed, barn and outbuilding. The house, a fine example of an important

early American type of architecture, was used by six generations of the Garretson family from about 1719 to 1950.

21. **Saddle River County Park** - Flanking the picturesque Saddle River for five miles, this park has a total of 596 acres. There are five recreation areas linked by a bicycle-pedestrian path.

    A. **Wild Duck Pond Area** - East Ridgewood Avenue, Ridgewood. Ducks and gees abound on the pond. The pond is also a popular fishing spot, and, in winter, attracts ice skaters. Tree-shaded picnic tables, a large play area for children, shuffleboard and horseshoe courts make this park a favorite family spot.

    B. **Glen Rock Area** - Alan Avenue, Glen Rock. Here, too, the pond is the focal point, affording fishing and model-boat sailing. A shaded grove of picnic tables, a children's playground and free tennis courts draw young and old to the park.

    C. **Dunkerhook Area** - Dunkerhook Road, Paramus. The cool shade of wooded picnic areas is especially welcome on hot summer days. Across the Saddle River in neighboring Fair Lawn, Dunkerhook offers free tennis courts.

    D. **Otto C. Pehle Area** - Saddle River Road, Saddle Brook. Lakeside fishing and bicycling are popular activities at this park. Mode-boat regattas are often seen on Sunday afternoons and for those who like to pitch horseshoes, facilities are provided.

    E. **Easton Tower/Otto C. Pehle Area** – Located in Paramus just south of Rte. 4 eastbound at Paramus Road (in the extreme northern tip of the park), the .88-acre Easton Tower County Historic Site is a sandstone frame tower with a wooden waterwheel that was erected in 1899 to pump water to a spacious landscaped estate owned by Edward Easton.

    F. **Rochelle Park Area** - Railroad Avenue, Rochelle Park. A one-mile walk drive that follows the river is particularly inviting. The South Trail of the pedestrian-bicycle path runs through the park, and tennis courts, picnicking and play areas offer lots of activity.

22. **Van Saun County Park** - Forest and Continental Avenues, Paramus. This 140-acre park is popular for its many attractions, but the Bergen County Zoological Park and the miniature railroad are probably on top of the list. The zoo, accredited by the American Association of Zoological Parks and Aquariums, offers 24 species of mammals, 19 species of birds, and 16 species of reptiles. Spider monkeys, tamarins, bison, elk, ocelot, and mountain lions are all at home in this zoo. Its aviary is the largest of its style in the Northeast. The miniature train, a replica of an 1886 locomotive, pulls canopied coaches in a loop around the zoo and an 1860s farmyard scene and through a tunnel. Many farm animals welcome visitors. Children will also enjoy a ride around the pony ring. Activities provided include a 12-court,

concession-operated tennis center, 4-acre Walden Pond for fishing and ice skating, picnic groves, and children's playgrounds. A shaded area surrounds Washington Spring Garden. This one-half-acre site of Revolutionary War skirmishes, the Washington Spring Garden County Historic Site is a natural spring traditionally used by George Washington at the center of a large Continental Army encampment in Sept. 1780.

23. **Hackensack River Pathway** – Located in New Milford, this 5.5-acre tract contains wetlands and woodlands within the Hackensack River Corridor.

24. **Borg's Woods –** Located in a residential Hackensack neighborhood, consists of the 15-acres old growth forest.

25. **Historic New Bridge Landing Park -** Located at 1201 Main Street in River Edge, Historic New Bridge Landing Historic Park is an 11.65-acre tract that contains wetlands and woodlands within the Hackensack River Corridor. Included among the three early stone houses at New Bridge Landing is the Campbell Christie House, a County Historic Site. Built about 1774, the restored house is an outstanding example of early regional architecture, with gambrel roof and sandstone walls.

26. **Hackensack River County Park** - Route 4 at Hackensack Avenue, Hackensack. This 30-acre park at Riverside Square Mall offers a formal promenade and viewing deck along the Hackensack River. A series of trails allows visitors to experience several diverse ecosystems including a tidal marsh and forested wetlands, bird blinds and two additional overlooks allow for nature observation. Illustrated signs help the visitor appreciate the existing environment and native wildlife. A number of benches are located adjacent to trails.

27. **Belmont Hill County Park** - Botany Street, Garfield. There is a scenic overlook, children's playground, and a display garden at this park.

28. **Dahnert's Lake County Park** - Midland Avenue, Garfield. Dahnert's Lake itself is the center of activity in this park. Ice-skating is popular in winter; model boat sailing takes over in the warmer weather. The park has picnic facilities, a playground and boccie and basketball courts.

29. **Gethsemane Cemetery -** Gethsemane Cemetery is a .96-acre state and National Historic Site located just off Rte. 46 West and between Liberty Street and Summit Place in Little Ferry. Between 1860 and 1930 more than 500 black residents of Bergen County were buried in the cemetery, which is acknowledged for the importance of the role it played in early New Jersey civil rights legislation and for the rare presence of West African burial customs discovered there.

30. **Overpeck County Golf Course** - East Cedar Lane, Teaneck. This 18-hole course on 150 acres challenges golfers with an 8-acre lake, ponds and lagoons. The contemporary redwood golf house has a pro shop and a lounge.

31. **Overpeck County Park** - Leonia, Palisades Park & Ridgefield Park. This 661-acre park is divided into the following four areas:

    A. **Henry Hoeble Area** - Fort Lee Road, Leonia. Fitness enthusiasts are drawn to this site with its fitness field and jogging path. The area has four free tennis courts with lights and practice backstop. A 1-1/4-mile bicycle-pedestrian path forms a figure-8 beside the lake.

    B. **Leonia South Area** - Fort Lee Road, Leonia. The all-weather concession-operated horseback riding center is perhaps the main attraction at this area of the park. The center includes a riding arena and paddocks.

    C. **Palisades Park Area** - Roosevelt Street, Palisades Park. A multi-use athletic Facility with four tennis courts, synthetic eight-lane track with steeplechase and field events. The synthetic fields include a football/soccer field with press box and bleachers, baseball, softball and little league and a challenger (ADA) field. Walking paths with a river walkway and over look.

    D. **Ridgefield Park Area** - Challenger Road, Ridgefield Park. This 22-acre site offers two softball fields complete with bleachers, and two regulation soccer fields.

    E. **Teaneck Creek Conservancy Area** – East Oakdene Avenue, Teaneck. Consisting of approximately 46 acres of land bounded by DeGraw Avenue and Teaneck Road, this passive nature preserve, centered around the Teaneck Creek, offers patrons the opportunity to participate in and enjoy the environmental and cultural park that uniquely uses art and landscape design to synthesize the natural, historic and cultural history of this area, and teaches children to take responsibility for preserving and enhancing this area.

32. **Samuel Nelkin County Park** - Rose Street, Wallington. Tennis, sledding and picnicking draw visitors to this 23-acre County Park. The pond attracts ice skaters in winter; fishing and model-boat sailing are popular in spring, summer and fall. For recreation or relaxation, ball fields, picnic tables, and children's playgrounds welcome visitors.

33. **Riverside County Park North** – J.A. Carrucci, Jr. Area - Riverside Avenue, Lyndhurst. Boccie and horseshoe courts are among the popular features of this park. There are also free tennis courts with lights, picnic groves and an 18-station fitness course. Concession-operated batting cages offer practice for the baseball enthusiast. There is a 0.7-mile bicycle-pedestrian path along the river.

34. **Riverside County Park South** - River Road, North Arlington/Lyndhurst. A playground is popular with youngsters visiting this park. The park also features five tennis courts, three of which are lighted. Horseshoe courts and picnic facilities make

this park a family favorite. There is a 0.6-mile bicycle-pedestrian path beside the Passaic.

35. **Garfield Waterworks in Elmwood Park –** located between Washington and Gilbert Avenues in the Borough of Elmwood Park, this 44-acre parcel of undeveloped woodlands provides drinking water to area residents through artesian wells located on the property.

IV. OPPORTUNITIES IDENTIFICATION

Generally, open space and recreational areas can be grouped into three major categories: Resource-based, intermediate and user-oriented. Each of these categories can typically be associated with a particular government level. Unique natural settings, scenic beauty or historical significance characterizes resource-based areas. They are generally located at considerable distance from major urban centers. However, their uniqueness is enough of a magnet to draw many visitors and vacationers from distant points.

The federal system of national parks and forests provides a good example of a resource-based recreational system.

The second categories of facilities are intermediate areas. These have, depending on the site location and size, features similar to both resource-based and user-oriented areas. They usually are more accessible to population concentrations than resource-based areas and generally have relatively large expanses of natural and forested acreage. Within an intermediate facility, sites for picnicking, swimming, camping and other outdoor activities are usually provided for daily visitors. State parks frequently can be classified in the intermediate category. In Bergen, the Ringwood Manor Skyland Park located in both Passaic and Bergen Counties is one such facility, as is the Palisades Interstate Park north of the George Washington Bridge on the west bank of the Hudson River.

Finally, there are the user-oriented facilities, whose prime location criteria is a high degree of accessibility to a given population concentration. Characteristically, these areas are developed for intensive recreational use and may or may not have special scenic or natural qualities. In general, the County and municipal park systems provide this kind of intensive use facility.

A fourth type of recreation facility has become increasingly popular in New Jersey through the State's Green Acres Program -- vacant open space designated as wilderness or primitive areas acquired by state, county or municipal government. These generally are forested or marshland with scenic and ecological significance. Their immediate function is public land preservation and environmental protection.

A. NEW JERSEY'S OPEN SPACE AND OUTDOOR RECREATION PLAN

In 2003, the NJ Department of Environmental Protection issued its *New Jersey Open Space and Outdoor Recreation Plan 2003-2007*. Known as SCORP, it is the seventh statewide comprehensive outdoor recreation plan to be released. The goal of this plan is to provide guidance to the various levels of government in acquiring, developing, maintaining and protecting outdoor recreation resources throughout the state. Open space, as written in this plan, is described as the basic resource for the development of recreational facilities and for satisfying recreational needs.

The *New Jersey Open Space and Outdoor Recreation Plan* is prepared to meet the following goals:

1. To preserve sufficient amounts of open space for current and future public use and to utilize the environmental protection amenities of open space to protect important natural resources for the enhancement of the quality of life in New Jersey.

2. To promote the development of parks in New Jersey's urban and suburban centers to support revitalization efforts and to provide close to home recreation opportunities for residents statewide.

3. To present current information on the supply, demand and need for recreation and open space in New Jersey.

4. To implement open space and recreation planning policies and projects that are consistent with New Jersey's smart growth principals and the State Development and Redevelopment Plan.

5. To encourage coordinated open space and recreation planning, acquisition and development initiatives of local governments and conservation organizations.

6. To effectively use funds from the Garden State Preservation Trust, Land and Water Conservation Fund, Forest Legacy Program, Pinelands Section 502 Program and other sources of funding which may become available.

V. RESOURCE ASSESSMENT

A. GENERAL OPEN SPACE AND RECREATION OPPORTUNITIES

This Section provides an assessment of those public and private land and water resources that have potential for providing open space or recreation opportunities. Includes:

- Opportunities for creation of linear recreation and open space facilities such as trails, bicycle paths, and greenways which link existing recreation and open space sites in an integrated system;

- Opportunities for supporting conservation objectives such as water supply protection, wildlife and rare species protection, protection of rivers, streams and forest lands, farmland preservation and historic preservation;

- Opportunities for the acquisition and re-greening of underutilized land or Brownfield sites;

- Opportunities for supporting community objectives for development and land use including open space which buffers or defines developed areas, open space which preserves scenic or distinctive landscape features, and open space with development-limiting characteristics such as floodplains, storm-prone areas and steep slopes;

- Opportunities for additional public access to waterways;

- Opportunities for the development of recreation facilities such as ball fields, playgrounds, court sports, swimming pools and golf courses, and;

- Opportunities for the preservation of the remaining privately owned golf courses, and;

- Opportunities for expanding environmental education.

Additionally, as outlined in the Bergen County Open Space, Recreation, Farmland and Historic Preservation Trust Fund Program Statement, on file in the Bergen County Department of Planning and Economic Development, the following types of land acquisition opportunities are encouraged:

- Encourage multi-use projects (projects including several elements such as water protection, recreation, historic and scenic preservation, etc.)

- Give consideration to projects involving land under an immediate threat of development where development of the property would be inconsistent with the overall character of the community.

- Encourage projects with qualified charitable conservancies.

- Encourage public/private sector projects.

- Encourage the use of conservation easements, covenants, or other interests in real property, which limit or restrict development.

These open space opportunities may be the acquisition of land for recreation and conservation purposes, the development and redevelopment of land existing or acquired for recreational and conservation purposes, historic preservation activities such as upgrade and acquisition, and, the acquisition of farmland for farmland preservation purposes.

B. BERGEN COUNTY'S OPEN SPACE ACQUISITION AND PRESERVATION OPPORTUNITIES

Current County open space acquisition and preservation opportunities include, but may not be limited to, the following:

- **Ramapo Mountains/Highlands Region** – The addition of appropriate lands adjacent to or abutting existing state, County, or municipal parklands that further expand or enhance conservation, preservation, scenic and greenway corridor development, and recreation objectives within the Ramapo Mountains and the state of New Jersey's Highlands Region.

- **Hackensack River Corridor** – The addition of appropriate lands adjacent to or abutting existing state, County, or municipal parklands that further expand or enhance riverside conservation, preservation and recreation objectives. Includes, but is not limited to, wetlands, woodlands, and watershed properties associated with the Hackensack River, its tributaries, lakes, ponds, reservoirs, and all other bodies of water.

- **Passaic River Corridor** - The addition of appropriate lands adjacent to or abutting existing state, County, or municipal parklands that further expand or enhance riverside conservation, preservation and recreation objectives. Includes, but is not limited to, wetlands, woodlands, and watershed properties associated with the Passaic River, its tributaries, lakes, ponds, reservoirs, and all other bodies of water.

- **East Hill Greenway Corridor** - The addition of appropriate lands adjacent to or abutting existing state, County, or municipal parklands in the northeast section of the County that further expand or enhance conservation, preservation and recreation objectives.

- **Saddle River Corridor** - The addition of appropriate lands adjacent to or abutting existing state, County, or municipal parklands that further expand or enhance riverside conservation, preservation and recreation objectives. Includes, but is not limited to, wetlands, woodlands, and watershed properties associated with the Saddle River, its tributaries, lakes, ponds, reservoirs, and all other bodies of water.

- **Meadowlands Region** – The addition of appropriate lands within the New Jersey Meadowlands Commission area that further expand or enhance their conservation, preservation and recreation objectives.

- **County Parks** - The addition of appropriate lands adjacent to or abutting existing County parklands that further expand or enhance their conservation, preservation and recreation objectives.

VI. ACTION PLAN

The acquisition of open space is to be financed through the Open Space, Recreation, Farmland and Historic Preservation Trust Fund and county capital funding. The Bergen County electorate overwhelmingly approved this tax in the November 1998 and November 2003 elections by a vote of more than two to one. This voter-supported referendum not only supplies a source of funding for the preservation of County and municipal open space, but expresses the commitment and desire for open space preservation by the citizens of Bergen County.

The 2003 ballot question as approved allows the Bergen County Board of Chosen Freeholders to fund the Trust by allocating a rate not to exceed one cent per $100 of total County equalized real property valuation.

For the tax year 2004 approximately $11.0 million dollars was collected through the Trust Fund. Annual authorization by the Freeholders is required to establish the tax collection.

The Trust Fund money is to be used for the acquisition and improvement of land by the County, for conservation and recreation purposes, for farmland and historic preservation by the County, and for grants to municipalities for the acquisition of land and improvement of outdoor recreation facilities.

It is important to acquire land presently as the availability of land decreases and the costs increase. It is also important to consider creative approaches for the use of the funds in order to preserve the maximum amount of open space.

There are various financial mechanisms and funding sources along with the trust fund that can be used to acquire land. The New Jersey Green Acres Program* provides several financial assistance programs. For instance:

- STANDARD ACQUISITION - This category is for acquisition projects undertaken by municipalities and counties that do not yet have an open space tax. Projects in this category are eligible to receive assistance in the form of a Green Acres 25% matching grant and some Green Acres loan funding, if available. Applicants can

pursue a loan from the Department's Environmental Infrastructure Financing Program (described below) to supplement the Green Acres funding and possibly fully fund the project.

- PLANNING INCENTIVE ACQUISITION -- This category is open to municipalities and counties that have an open space tax and an adopted Open Space and Recreation Plan approved by Green Acres. Funding is available in the form of a Green Acres 50% matching grant, with the opportunity to obtain the balance as a loan from the EIFP.

- SITE SPECIFIC INCENTIVE ACQUISITION - This category is for acquisition projects undertaken by municipalities and counties that have an open space tax but do not have an Open Space and Recreation Plan approved by Green Acres. Projects in this category are eligible to receive assistance in the form of a Green Acres 50% matching grant and some Green Acres loan funding, if available. You can pursue a loan from the Department's Environmental Infrastructure Financing Program (described below) to supplement the Green Acres funding and possibly fully fund the project. Applicants under this category must submit an application for each parcel they would like to purchase.

- URBAN AID PROGRAM (ACQUISITION OR DEVELOPMENT) - This category is limited to acquisition and development projects *located in* municipalities eligible to receive state aid pursuant to P.L. 1978, c. 14 (C.52: 27D-178 et seq.). Funding for Urban Aid acquisition projects is in the form of a 75% matching grant and the balance as a 2% loan, subject to available funding. Green Acres, not the EIFP, will provide the loans for Urban Aid acquisition projects, if funds are available. For park development projects, funding is available in the form of a 50% matching grant, with the balance as a 2% loan, also subject to available funding. Development loans are repayable over twenty years, while acquisition loans may be repaid over thirty years. As always, total demand will be weighed against available resources to determine the extent to which proposals can be funded.

- OUTDOOR RECREATION DEVELOPMENT - Green Acres provides funding for the development of outdoor recreation facilities in the form of a loan. All development loans are at 2% interest, repayable over twenty years. Projects are characterized as either small development (under $250,000) or large development (up to the maximum cap which historically has been $500,000). For park development projects located in Densely or Highly Populated Municipalities, or sponsored by a Highly Populated County, funding is available in the form of a 25% matching grant, with the balance as a loan, subject to available funding. For development projects sponsored by Densely Populated County (See NJDEP for eligible municipalities), funding is available in the form of a 50% matching grant, with a balance as a loan, subject to available funding.

- The New Jersey Environmental Infrastructure Financing Program (EIFP) is a low-cost loan program that is available to provide financial assistance for projects that

protect or improve water quality, including most land acquisition projects. The NJDEP's Division of Water Quality, Municipal Finance & Construction Element, administers the EIFP application.

** Please contact the NJ Green Acres Program for program guidance and administration.*

- Donations from non-profits, businesses, landowners, and other sources should always be explored and encouraged. The amount of money available through the Trust Fund is limited compared to the costs of land and the need to acquire it. Thus, funds from other sources and innovative acquisition/preservation ideas are considered.

- Similarly, acquisitions of less than fee simple, i.e., development rights, conservation or access easements, etc., should also be explored and encouraged where applicable. The proposed statewide Transfer of Development Rights (TDR) Program offers a new tool for the preservation of open space.

- There should also be strong support from cooperative projects using funds from a combination of municipal, County, state, and non-profit resources.

The types of action that must or should be taken to preserve or provide appropriate open spaces in the County vary depending on the type of open space.

No single technique for the preservation of open space will guarantee a successful open space program, or for that matter, the failure of a program. The particular technique used should be chosen carefully to ensure that the desired open space objective is achieved. Fee simple ownership by the government, for example, allows for the greatest degree of government control of the land, but is not necessarily the most advantageous technique for the achievement of a particular open space program's objectives, especially given the high cost of property acquisition and maintenance. The components of any open space program should be designed with an understanding of the particular task to be accomplished.

VII. SYSTEM MAP

Included, as a part of this Open Space and Recreation Plan, is the official County Parks map entitled, "Bergen County Parks and Recreation Facilities," prepared by Bergen County Department of Planning and Economic Development.

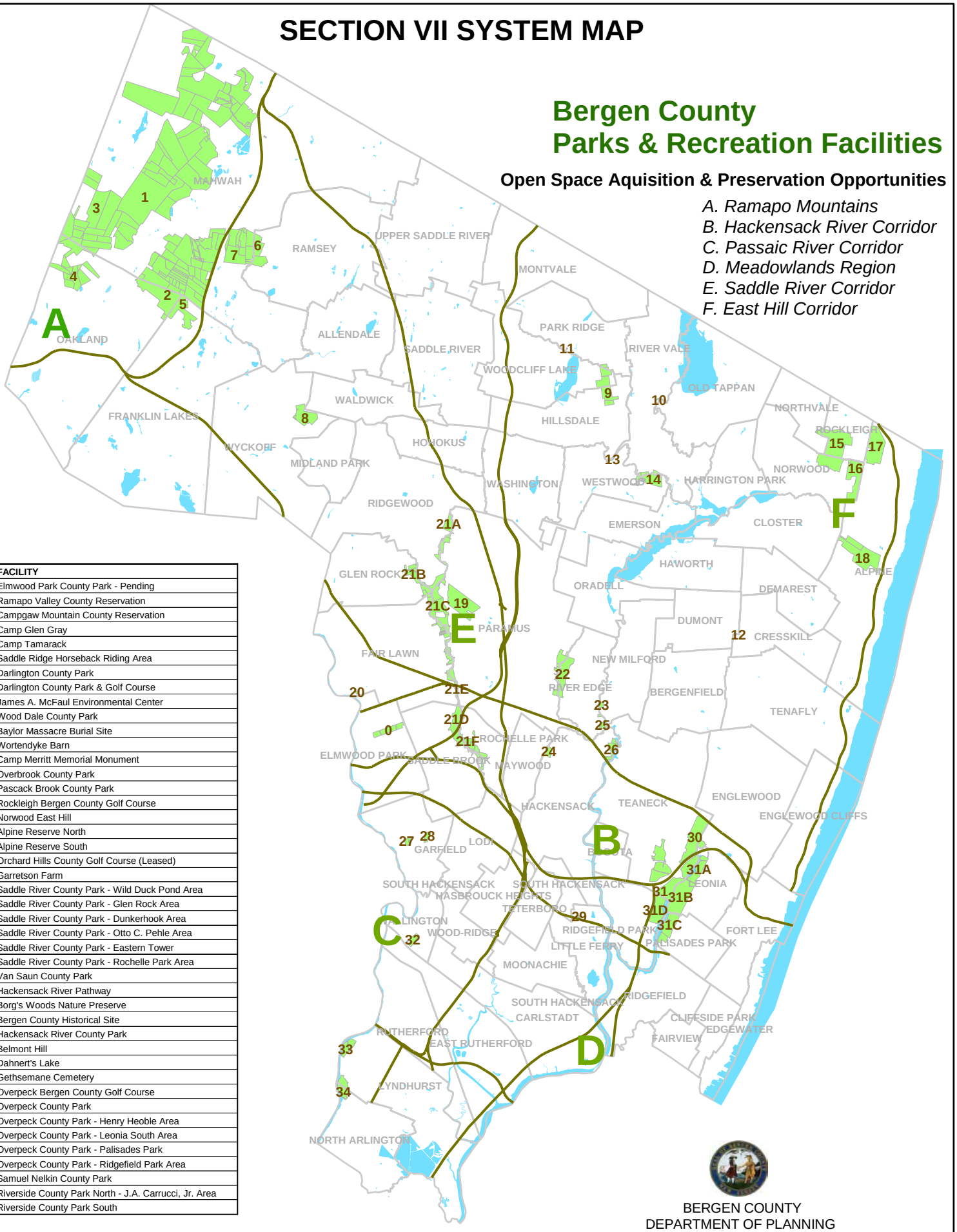
VIII. APPENDIX

Included, as a part of this Open Space and Recreation Plan, is a listing of all the open space properties in Bergen County that are contained on the current State Green Acres Open Space and Recreation Inventory.

IX. BERGEN COUNTY PLANNING BOARD RESOLUTION 03-04

Bergen County Planning Board Resolution 03-04, adopted on August 9, 2004, endorsing this OSRP and application to the State of New Jersey's Green Acres Program's Planning Incentive Program.

SECTION VII SYSTEM MAP



ID	FACILITY
0	Elmwood Park County Park - Pending
1	Ramapo Valley County Reservation
2	Campgaw Mountain County Reservation
3	Camp Glen Gray
4	Camp Tamarack
5	Saddle Ridge Horseback Riding Area
6	Darlington County Park
7	Darlington County Park & Golf Course
8	James A. McFaul Environmental Center
9	Wood Dale County Park
10	Baylor Massacre Burial Site
11	Wortendyke Barn
12	Camp Merritt Memorial Monument
13	Overbrook County Park
14	Pascack Brook County Park
15	Rockleigh Bergen County Golf Course
16	Norwood East Hill
17	Alpine Reserve North
18	Alpine Reserve South
19	Orchard Hills County Golf Course (Leased)
20	Garretson Farm
21A	Saddle River County Park - Wild Duck Pond Area
21B	Saddle River County Park - Glen Rock Area
21C	Saddle River County Park - Dunkerhook Area
21D	Saddle River County Park - Otto C. Pehle Area
21E	Saddle River County Park - Eastern Tower
21F	Saddle River County Park - Rochelle Park Area
22	Van Saun County Park
23	Hackensack River Pathway
24	Borg's Woods Nature Preserve
25	Bergen County Historical Site
26	Hackensack River County Park
27	Belmont Hill
28	Dahnert's Lake
29	Gethsemane Cemetery
30	Overpeck Bergen County Golf Course
31	Overpeck County Park
31A	Overpeck County Park - Henry Heoble Area
31B	Overpeck County Park - Leonia South Area
31C	Overpeck County Park - Palisades Park
31D	Overpeck County Park - Ridgefield Park Area
32	Samuel Nelkin County Park
33	Riverside County Park North - J.A. Carrucci, Jr. Area
34	Riverside County Park South

BERGEN COUNTY
DEPARTMENT OF PLANNING
& ECONOMIC DEVELOPMENT
One Bergen County Plaza, 4th Floor
Hackensack, NJ 07601-7076
Phone: (201) 336-6446 Fax: (201) 336-6449
www.co.bergen.nj.us/planning

VIII. APPENDIX: BERGEN COUNTY'S GREEN ACRES RECREATION AND OPEN SPACE INVENTORY

MUNICIPALITY	COUNTY FACILITY NAME	BLOCK	LOT	ACRES
ALPINE	Alpine Reserve North	140	3	134.0000
ALPINE	Alpine Reserve South	80	8	166.6100
ALPINE	Alpine Reserve South	90	1	30.2900
CRESSKILL	Camp Merritt Memorial Monument	14.05	1	0.1033
ELMWOOD PARK	Garfield Waterworks in Elmwood Park	410	1	10.0640
ELMWOOD PARK	Garfield Waterworks in Elmwood Park	504	40	10.2680
ELMWOOD PARK	Garfield Waterworks in Elmwood Park	507	36	23.8600
ENGLEWOOD	Overpeck Bergen County Golf Course	2604	1	7.2000
FAIR LAWN	Garretson Farm	5412	1	1.8400
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1101	1.01	0.1100
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1101	2.01	0.2100
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1101	3.01	0.2600
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1101	4.01	0.3500
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1101	5.01	1.2900
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1101	11.01	1.4000
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1101	12.01	0.0800
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1101	15	1.3000
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1201	3	1.5000
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1201	5	2.0000
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1202	1	0.5600
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1203	8.01	2.1000
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1203	7	0.5000
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1301	1.01	8.7800
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1301	10	2.7800
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1301	22	6.6500
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1401	1	8.6300
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1408	1	5.0400
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1505	10	2.2800
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1515	11	0.0700
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1515	12	9.5100
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	1	2.1000
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	2	3.3200
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	3	2.3700
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	4	3.0100
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	1.01	0.7500
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	2.02	0.8000
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	3.01	0.3700
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	4.01	1.1500
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	5.01	0.4800
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	6.01	2.4400
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	7.01	0.9700
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1601	8.01	0.4800
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1604	2	6.7200
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1801	1	2.0800
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1801	2	4.8600
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1801	4.01	6.1500
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1801	5.01	0.6800
FAIR LAWN	Saddle River County Park - Dunkerhook Area	1803	4.01	1.2500
FRANKLIN LAKES	Saddle Ridge Horseback Riding Area	1602	1	105.5600

APPENDIX: BERGEN COUNTY'S GREEN ACRES RECREATION AND OPEN SPACE INVENTORY

MUNICIPALITY	COUNTY FACILITY NAME	BLOCK	LOT	ACRES
GARFIELD	Belmont Hill	114	84	8.9600
GARFIELD	Belmont Hill	114	126	1.2980
GARFIELD	Dahnert's Lake	119 05	156.01	2.4800
GARFIELD	Dahnert's Lake	119 05	156.02	9.0300
GLEN ROCK	Saddle River County Park - Glen Rock Area	127	13	13.5460
GLEN ROCK	Saddle River County Park - Glen Rock Area	127	15	0.9000
GLEN ROCK	Saddle River County Park - Glen Rock Area	243	1	28.3700
GLEN ROCK	Saddle River County Park - Glen Rock Area	243	2	4.0400
GLEN ROCK	Saddle River County Park - Glen Rock Area	243	3	0.3830
GLEN ROCK	Saddle River County Park - Glen Rock Area	247	2	1.4900
GLEN ROCK	Saddle River County Park - Glen Rock Area	247	3	5.4620
GLEN ROCK	Saddle River County Park - Glen Rock Area	247	4	14.0150
HACKENSACK	Borg's Woods Nature Preserve	604	14.01	13.8700
HACKENSACK	Borg's Woods Nature Preserve	604	32	0.1293
HACKENSACK	Hackensack River County Park	504A	7A	0.6000
HACKENSACK	Hackensack River County Park	504A	8	21.0100
HACKENSACK	Hackensack River County Park	504A	17	7.5500
HILLSDALE	Wood Dale County Park	2002	28	11.7300
HILLSDALE	Wood Dale County Park	2101	1	41.5000
LEONIA	Overpeck County Park - Henry Heoble Area	102	1	89.9800
LEONIA	Overpeck County Park - Leonia South Area	703	1	135.8400
LITTLE FERRY	Gethsemane Cemetery	9	12	1.0000
LYNDHURST	Riverside County Park North - J.A. Carrucci, Jr. Area	48	3	15.6000
LYNDHURST	Riverside County Park North - J.A. Carrucci, Jr. Area	48	6	20.3000
LYNDHURST	Riverside County Park South	170	17A	23.7500
MAHWAH	Camp Glen Gray	1	63	39.2000
MAHWAH	Camp Glen Gray	1	64	33.7000
MAHWAH	Camp Glen Gray	1	151	55.5400
MAHWAH	Camp Glen Gray	1	163	19.1000
MAHWAH	Camp Glen Gray	1	164	50.6000
MAHWAH	Camp Glen Gray	1	165	22.1000
MAHWAH	Camp Glen Gray	1	166	32.2000
MAHWAH	Camp Glen Gray	1	167	24.8000
MAHWAH	Camp Glen Gray	1	168	1.9000
MAHWAH	Camp Glen Gray	1	169	27.4000
MAHWAH	Camp Glen Gray	1	170	43.5000
MAHWAH	Camp Glen Gray	1	171	19.8000
MAHWAH	Camp Glen Gray	1	172	9.5000
MAHWAH	Camp Glen Gray	1	173	28.0000
MAHWAH	Camp Glen Gray	1	177	4.7000
MAHWAH	Camp Glen Gray	1	182	159.6000
MAHWAH	Camp Glen Gray	1	183	127.1000
MAHWAH	Campgaw Mountain County Reservation	21	9	26.3400
MAHWAH	Campgaw Mountain County Reservation	21	10	43.1700
MAHWAH	Campgaw Mountain County Reservation	21	11	85.4200
MAHWAH	Campgaw Mountain County Reservation	21	11.01	1.7900
MAHWAH	Campgaw Mountain County Reservation	21	12	1.1000
MAHWAH	Campgaw Mountain County Reservation	21	13	6.0900
MAHWAH	Campgaw Mountain County Reservation	21	14	32.2400
MAHWAH	Campgaw Mountain County Reservation	21	15	0.1100
MAHWAH	Campgaw Mountain County Reservation	21	16	2.0000

APPENDIX: BERGEN COUNTY'S GREEN ACRES RECREATION AND OPEN SPACE INVENTORY

MUNICIPALITY	COUNTY FACILITY NAME	BLOCK	LOT	ACRES
MAHWAH	Campgaw Mountain County Reservation	21	17	3.3600
MAHWAH	Campgaw Mountain County Reservation	23	3	96.2000
MAHWAH	Campgaw Mountain County Reservation	23	4	7.8600
MAHWAH	Campgaw Mountain County Reservation	23	5	14.4700
MAHWAH	Campgaw Mountain County Reservation	23	6	8.4200
MAHWAH	Campgaw Mountain County Reservation	23	7	4.9370
MAHWAH	Campgaw Mountain County Reservation	23	8	0.2370
MAHWAH	Campgaw Mountain County Reservation	23	9	0.2500
MAHWAH	Campgaw Mountain County Reservation	23	10	1.5000
MAHWAH	Campgaw Mountain County Reservation	23	11	0.5510
MAHWAH	Campgaw Mountain County Reservation	23	12	1.0850
MAHWAH	Campgaw Mountain County Reservation	23	13	25.1700
MAHWAH	Campgaw Mountain County Reservation	23	14	24.5000
MAHWAH	Campgaw Mountain County Reservation	23	15	17.5300
MAHWAH	Campgaw Mountain County Reservation	23	16	19.8000
MAHWAH	Campgaw Mountain County Reservation	23	17	30.2500
MAHWAH	Campgaw Mountain County Reservation	23	18	22.5200
MAHWAH	Campgaw Mountain County Reservation	23	19	47.0000
MAHWAH	Campgaw Mountain County Reservation	23	20	31.7300
MAHWAH	Campgaw Mountain County Reservation	23	21	57.5800
MAHWAH	Campgaw Mountain County Reservation	23	22	6.5200
MAHWAH	Campgaw Mountain County Reservation	23	23	19.4300
MAHWAH	Campgaw Mountain County Reservation	23	24	11.5200
MAHWAH	Campgaw Mountain County Reservation	23	25	6.1900
MAHWAH	Campgaw Mountain County Reservation	23	26	6.1900
MAHWAH	Campgaw Mountain County Reservation	23	27	4.8600
MAHWAH	Campgaw Mountain County Reservation	23	28	10.5300
MAHWAH	Campgaw Mountain County Reservation	23	29	11.5000
MAHWAH	Campgaw Mountain County Reservation	23	30	13.1500
MAHWAH	Campgaw Mountain County Reservation	23	31	14.2500
MAHWAH	Campgaw Mountain County Reservation	23	32	7.3100
MAHWAH	Campgaw Mountain County Reservation	23	33	6.7000
MAHWAH	Campgaw Mountain County Reservation	23	34	21.7600
MAHWAH	Campgaw Mountain County Reservation	23	35	20.4400
MAHWAH	Campgaw Mountain County Reservation	23	36	34.3400
MAHWAH	Campgaw Mountain County Reservation	23	37	20.0600
MAHWAH	Campgaw Mountain County Reservation	23	38	58.2500
MAHWAH	Campgaw Mountain County Reservation	23	39	5.1100
MAHWAH	Campgaw Mountain County Reservation	23	40	81.5600
MAHWAH	Campgaw Mountain County Reservation	23	41	6.4700
MAHWAH	Campgaw Mountain County Reservation	23	43	23.3000
MAHWAH	Campgaw Mountain County Reservation	23	44	4.7600
MAHWAH	Campgaw Mountain County Reservation	23	52	39.0900
MAHWAH	Campgaw Mountain County Reservation	23	57	23.7800
MAHWAH	Campgaw Mountain County Reservation	23	58	0.4300
MAHWAH	Darlington County Park & Golf Course	135	6	0.9300
MAHWAH	Darlington County Park & Golf Course	141	4	36.6200
MAHWAH	Darlington County Park & Golf Course	141	5	3.6000
MAHWAH	Darlington County Park & Golf Course	141	7	33.7500
MAHWAH	Darlington County Park & Golf Course	141	8	3.6300
MAHWAH	Darlington County Park & Golf Course	141	9	14.2000

APPENDIX: BERGEN COUNTY'S GREEN ACRES RECREATION AND OPEN SPACE INVENTORY

MUNICIPALITY	COUNTY FACILITY NAME	BLOCK	LOT	ACRES
MAHWAH	Darlington County Park & Golf Course	141	10	1.7200
MAHWAH	Darlington County Park & Golf Course	141	11	46.5000
MAHWAH	Darlington County Park & Golf Course	141	12	18.3200
MAHWAH	Darlington County Park & Golf Course	141	13	82.3700
MAHWAH	Darlington County Park & Golf Course	141	15	14.7000
MAHWAH	Darlington County Park & Golf Course	141	16	26.3500
MAHWAH	Darlington County Park & Golf Course	141	17	0.7200
MAHWAH	Darlington County Park & Golf Course	141	18	3.1000
MAHWAH	Darlington County Park & Golf Course	141	19	2.9600
MAHWAH	Ramapo Valley County Reservation	1	4	60.7000
MAHWAH	Ramapo Valley County Reservation	1	5	30.0000
MAHWAH	Ramapo Valley County Reservation	1	7	11.7000
MAHWAH	Ramapo Valley County Reservation	1	8	15.0000
MAHWAH	Ramapo Valley County Reservation	1	10	89.8100
MAHWAH	Ramapo Valley County Reservation	1	11	60.0000
MAHWAH	Ramapo Valley County Reservation	1	12	46.4000
MAHWAH	Ramapo Valley County Reservation	1	16	200.0000
MAHWAH	Ramapo Valley County Reservation	1	18	165.7000
MAHWAH	Ramapo Valley County Reservation	1	39	22.1600
MAHWAH	Ramapo Valley County Reservation	1	40	27.1400
MAHWAH	Ramapo Valley County Reservation	1	42	3.1200
MAHWAH	Ramapo Valley County Reservation	1	45	2.9100
MAHWAH	Ramapo Valley County Reservation	1	47	11.6100
MAHWAH	Ramapo Valley County Reservation	1	49	8.8800
MAHWAH	Ramapo Valley County Reservation	1	50	6.0000
MAHWAH	Ramapo Valley County Reservation	1	51	32.0000
MAHWAH	Ramapo Valley County Reservation	1	54	290.0000
MAHWAH	Ramapo Valley County Reservation	1	96	90.0000
MAHWAH	Ramapo Valley County Reservation	1	97	40.7000
MAHWAH	Ramapo Valley County Reservation	1	98	34.1700
MAHWAH	Ramapo Valley County Reservation	1	101	3.2100
MAHWAH	Ramapo Valley County Reservation	1	102	8.4950
MAHWAH	Ramapo Valley County Reservation	1	106	145.6800
MAHWAH	Ramapo Valley County Reservation	1	107	47.4200
MAHWAH	Ramapo Valley County Reservation	1	109	199.6500
MAHWAH	Ramapo Valley County Reservation	1	110	88.7400
MAHWAH	Ramapo Valley County Reservation	1	111	91.4800
MAHWAH	Ramapo Valley County Reservation	1	136	126.4000
MAHWAH	Ramapo Valley County Reservation	1	137	68.9600
MAHWAH	Ramapo Valley County Reservation	1	138	20.6000
MAHWAH	Ramapo Valley County Reservation	1	139	56.7400
MAHWAH	Ramapo Valley County Reservation	1	140	38.1220
MAHWAH	Ramapo Valley County Reservation	1	141	3.2050
MAHWAH	Ramapo Valley County Reservation	1	142	55.6700
MAHWAH	Ramapo Valley County Reservation	1	143	22.1100
MAHWAH	Ramapo Valley County Reservation	1	144	6.2000
MAHWAH	Ramapo Valley County Reservation	1	145	65.1700
MAHWAH	Ramapo Valley County Reservation	1	146	66.8400
MAHWAH	Ramapo Valley County Reservation	1	148	462.7300
MAHWAH	Ramapo Valley County Reservation	1	149	57.2200
MAHWAH	Ramapo Valley County Reservation	1	150	56.8800

APPENDIX: BERGEN COUNTY'S GREEN ACRES RECREATION AND OPEN SPACE INVENTORY

MUNICIPALITY	COUNTY FACILITY NAME	BLOCK	LOT	ACRES
MAHWAH	Ramapo Valley County Reservation	1	184	50.0000
MAHWAH	Ramapo Valley County Reservation	12	21	30.6000
MAHWAH	Ramapo Valley County Reservation	13	8	131.1000
MAHWAH	Ramapo Valley County Reservation	13	9	0.9000
MAHWAH	Ramapo Valley County Reservation	13	10	6.2200
MAHWAH	Ramapo Valley County Reservation	13	11	20.1000
MAHWAH	Ramapo Valley County Reservation	13	13	74.0000
MAHWAH	Ramapo Valley County Reservation	13	14	3.8660
MAHWAH	Ramapo Valley County Reservation	13	14.04	3.2860
NEW MILFORD	Hackensack River Pathway	301	27	5.4610
NORTH ARLINGTON	Riverside County Park South	87	2	0.5500
NORTH ARLINGTON	Riverside County Park South	87	3	27.8600
NORTHVALE	Rockleigh Bergen County Golf Course	915	3	10.0400
NORWOOD	Norwood East Hill	7	15.01	119.3180
NORWOOD	Norwood East Hill	17	5	2.3300
NORWOOD	Rockleigh Bergen County Golf Course	27	4	89.1000
OAKLAND	Camp Glen Gray	1601	1	7.9000
OAKLAND	Camp Glen Gray	1601	2	59.4000
OAKLAND	Camp Glen Gray	1603	1	10.3000
OAKLAND	Camp Tamarack	1503	1	44.4300
OAKLAND	Camp Tamarack	1503	2	19.5500
OAKLAND	Camp Tamarack	1602	2	5.2800
OAKLAND	Camp Tamarack	1602	3	8.8000
OAKLAND	Camp Tamarack	1602	4	9.7600
OAKLAND	Camp Tamarack	1602	5	25.5300
OAKLAND	Camp Tamarack	1602	6	16.3500
OAKLAND	Camp Tamarack	1603	10	21.6000
OAKLAND	Camp Tamarack	1604	3	29.9800
OAKLAND	Campgaw Mountain County Reservation	3606	1	6.5000
OAKLAND	Campgaw Mountain County Reservation	3701	1	176.7000
PALISADES PARK	Overpeck County Park - Palisades Park	101	1	73.8000
PALISADES PARK	Overpeck County Park - Palisades Park	506	6	29.0700
PARAMUS	Orchard Hills County Golf Course (Leased)	3001	1	50.0000
PARAMUS	Saddle River County Park - Dunkerhook Area	102	3	3.6000
PARAMUS	Saddle River County Park - Dunkerhook Area	1001	10	13.0000
PARAMUS	Saddle River County Park - Dunkerhook Area	1001	11	0.1500
PARAMUS	Saddle River County Park - Dunkerhook Area	1501	8	0.9500
PARAMUS	Saddle River County Park - Dunkerhook Area	1602	9	7.4000
PARAMUS	Saddle River County Park - Dunkerhook Area	2202	11	29.2600
PARAMUS	Saddle River County Park - Dunkerhook Area	2204	5	0.5600
PARAMUS	Saddle River County Park - Dunkerhook Area	2803	12	59.4500
PARAMUS	Saddle River County Park - Dunkerhook Area	2901	1	28.8000
PARAMUS	Saddle River County Park - Dunkerhook Area	3501	6	4.8900
PARAMUS	Saddle River County Park - Dunkerhook Area	4002	11	0.4000
PARAMUS	Saddle River County Park - Dunkerhook Area	5903	7	22.7000
PARAMUS	Saddle River County Park - Dunkerhook Area	6701	8	0.4500
PARAMUS	Saddle River County Park - Easton Tower	101	1	0.8800
PARAMUS	Van Saun County Park	2710	9	12.4900
PARAMUS	Van Saun County Park	3405	3	0.5500
PARAMUS	Van Saun County Park	3405	4	10.6200
PARAMUS	Van Saun County Park	3406	3	0.7000

APPENDIX: BERGEN COUNTY'S GREEN ACRES RECREATION AND OPEN SPACE INVENTORY

MUNICIPALITY	COUNTY FACILITY NAME	BLOCK	LOT	ACRES
PARAMUS	Van Saun County Park	3905	5	0.5000
PARAMUS	Van Saun County Park	3905	6	25.0300
PARAMUS	Van Saun County Park	3905	8	3.9400
PARAMUS	Van Saun County Park	3905	12	0.2900
PARK RIDGE	Wood Dale County Park	2103	7	0.5500
PARK RIDGE	Wood Dale County Park	2103	8	5.1300
PARK RIDGE	Wood Dale County Park	2103	9	2.3900
PARK RIDGE	Wood Dale County Park	2103	10	1.7400
PARK RIDGE	Wortendyke Barn	1702	6	0.4700
RAMSEY	Darlington County Park	2001	1	41.7000
RAMSEY	Darlington County Park	2401	1	35.7800
RIDGEFIELD PARK	Overpeck County Park - Ridgefield Park Area	24 03	1	97.3900
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	3405	23	0.1900
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	3505	48	29.4300
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	4205	13	2.4300
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	4305	18	0.8800
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	4316	1	2.4600
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	4318	6	0.4300
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	4501	2	11.8300
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	4605	4	6.0100
RIDGEWOOD	Saddle River County Park - Wild Duck Pond Area	4609	2.02	28.5000
RIVER EDGE	Historic New Bridge Landing Park	1303	2	3.9200
RIVER EDGE	Hackensack River Pathway	1006	1	0.0200
RIVER EDGE	Hackensack River Pathway	1303	1	11.6500
RIVER EDGE	Van Saun County Park	307	7	0.1300
RIVER EDGE	Van Saun County Park	501	1	0.0300
RIVER EDGE	Van Saun County Park	504	1.08	91.5800
RIVER VALE	Baylor Massacre Burial Site	1106	29	0.6600
RIVER VALE	Baylor Massacre Burial Site	1106	30	0.5200
RIVER VALE	Baylor Massacre Burial Site	1106	31	0.7800
RIVER VALE	Pascack Brook County Park	2201	20	2.8500
RIVER VALE	Pascack Brook County Park	2203.03	8	6.7500
RIVER VALE	Pascack Brook County Park	2208	1	4.0000
RIVER VALE	Pascack Brook County Park	2208	7.01	1.7000
RIVER VALE	Pascack Brook County Park	220 01	17	2.0000
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	59	6	2.8400
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	63	5	3.7200
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	64	1	8.9600
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	64	3	0.2300
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	64	7	0.1000
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	66	1	6.4300
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	106 01	1	26.8600
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	106 02	1	1.3000
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	61 01	1.02	1.6400
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	65 01	1	11.5000
ROCHELLE PARK	Saddle River County Park - Rochelle Park Area	65 02	1	3.8000
ROCKLEIGH	Rockleigh Bergen County Golf Course	101	1	165.8900
SADDLE BROOK	Saddle River County Park - Otto C. Pehle Area	908	1	7.9200
SADDLE BROOK	Saddle River County Park - Otto C. Pehle Area	1108	1	18.7500
SADDLE BROOK	Saddle River County Park - Otto C. Pehle Area	1306	1	54.1800

APPENDIX: BERGEN COUNTY'S GREEN ACRES RECREATION AND OPEN SPACE INVENTORY

MUNICIPALITY	COUNTY FACILITY NAME	BLOCK	LOT	ACRES
TEANECK	Overpeck Bergen County Golf Course	4101	1	142.0000
TEANECK	Overpeck County Park	3501	1	36.6500
TEANECK	Overpeck County Park	3602	10	0.7800
TEANECK	Overpeck County Park	3608	1	39.6800
TEANECK	Overpeck County Park	3609	1	0.1800
TEANECK	Overpeck County Park	3712	17	0.4000
TEANECK	Teaneck Creek Conservancy Area	3719	1	45.6200
TEANECK	Overpeck County Park	4306	1	50.5500
TEANECK	Overpeck County Park	4501	1	56.6700
WALLINGTON	Samuel Nelkin County Park	49 01	1	17.3200
WALLINGTON	Samuel Nelkin County Park	49 02	8	1.1000
WESTWOOD	Overbrook County Park	1306	4	2.7900
WESTWOOD	Pascack Brook County Park	1701	3	3.7400
WESTWOOD	Pascack Brook County Park	1701	5	0.2300
WESTWOOD	Pascack Brook County Park	1701	7	0.1700
WESTWOOD	Pascack Brook County Park	1701	11	2.0000
WESTWOOD	Pascack Brook County Park	1701	18	0.1700
WESTWOOD	Pascack Brook County Park	1901	1	52.0100
WESTWOOD	Pascack Brook County Park	1902	6	0.3400
WESTWOOD	Pascack Brook County Park	1902	4	0.6000
WESTWOOD	Pascack Brook County Park	1903	2	1.4000
WOODCLIFF LAKE	Wood Dale County Park	2801	18	33.4200
WOODCLIFF LAKE	Wood Dale County Park	2903	1	21.9000
WYCKOFF	James A. McFaul Environmental Center	265	63.01	80.7500
				8,751.2316

IX.

Resolution No. 03-04

RESOLUTION OF THE BERGEN COUNTY PLANNING BOARD

WHEREAS, the Bergen County Open Space and Recreation Plan (the "OSRP") serves as a strategic plan and guide describing Bergen County's open space and recreation needs and a proposed action plan; and

WHEREAS, the OSRP is a required element of the Open Space, Recreation, Farmland and Historic Preservation Trust Fund Act (N.J.S.A.40:12-15.1 et seq.) and the State of New Jersey Green Acres Program's Planning Incentive Program; and

WHEREAS, the OSRP must be adopted by the County Planning Board as an amendment to, and element of, the County's Master Plan in accordance with N.J.S.A. 40:27 et seq. and

WHEREAS, the County of Bergen held a public hearing on said OSRP on July 24, 2000 and, in accordance with N.J.S.A. 40:27 et seq., the Bergen County Planning Board held a public hearing on June 14, 2004 and August 9, 2004, at all times the general public and all Bergen County municipalities were given notice and the opportunity to comment on the proposed plan; and

WHEREAS, the Green Acres Program requires the Board of Chosen Freeholders to adopt the OSRP as part of the Master Plan the next time the Master Plan is updated;

NOW, THEREFORE, BE IT RESOLVED, the Bergen County Planning Board endorses this Open Space and Recreation Plan, dated August 2004, and finds it in keeping with sound regional comprehensive planning principles and is consistent with the requirements as set forth in the New Jersey State Development and Redevelopment Plan.

BE IT FURTHER RESOLVED, that copies of this resolution be forwarded to the New Jersey Division of Green Acres, the Bergen County Board of Chosen Freeholders, and the municipal clerk and secretary of the planning board of each municipality in the county. This Resolution shall take effect this 9th day of August 2004.

Motion made by: Michael Pollotta

Motion seconded by: James Tedesco

Date: August 9, 2004

Bergen County's Hudson River Waterfront Walkway Design and Implementation Strategy Plan

December 8, 2010

Prepared by T&M ASSOCIATES with assistance from NEGLIA ENGINEERING ASSOCIATES

Bergen County's Hudson River Waterfront Walkway Design and Implementation Strategy Plan

Prepared for:
Bergen County, New Jersey

Prepared by:
T&M ASSOCIATES
11 Tindall Road
Middletown, NJ 07748

Prepared with assistance from:
NEGLIA ENGINEERING ASSOCIATES
34 Park Avenue
Lyndhurst, NJ 07071

Stanley C. Slachetka, PP, AICP, LEED-GA
T&M Associates

New Jersey Professional Planner
License No.: 33LI00350800

Jaclyn J. Flor, PE, PP, CME
T&M Associates

New Jersey Professional Engineer
License No.: 24GE04542600
New Jersey Professional Planner
License No.: 33LI00592000

The original of this document was signed and sealed in accordance with New Jersey Law.

Bergen County's Hudson River Waterfront Walkway Design and Implementation Strategy Plan was prepared with financial support from the New Jersey Department of Community Affairs, Office of Smart Growth

Acknowledgements

Bergen County
Kathleen A. Donovan, County Executive

County Freeholders
- John Driscoll, Jr., Freeholder Chairman
- Maura DeNicola, Freeholder Vice Chairwoman
- John D. Mitchell, Freeholder Chair Pro Tempore
- John A. Felice, Freeholder
- David L. Ganz, Freeholder
- Robert G. Hermansen, Freeholder
- Bernadettte P. McPherson, Freeholder

Bergen County Department of Planning & Economic Development
- Robert Garrison, Esq., Acting Department Director

Bergen County Division of Open Space
- Adam Strobel, Director
- Robert A. Abbatomarco

County Planning Board
- Joseph Valente, Chairperson
- Marc Shrieks, Vice Chairman
- Julie O'Brien, Secretary
- Fernando N. Garip
- Keith J. Misciagna
- Christine Ordway
- Mark Pasquali
- Robert G. Hermansen, Freeholder
- Joseph Femia, County Engineer
- John Libretti, Esq., Board Attorney
- Maizie O'Connor-Patterson, Recording Secretary

Visioning conducted under the direction of the Administration of County Executive Dennis McNerney

County Freeholders
- James M. Carroll, Freeholder Chairman
- Elizabeth Calabrese, Freeholder Vice Chairwoman
- David L. Ganz, Freeholder Chair Pro Tempore
- John Driscoll, Jr., Freeholder
- Robert G. Hermansen, Freeholder
- John Hogan, Freeholder
- Bernadette P. McPherson, Freeholder

Bergen County Department of Planning & Economic Development
- Farouk Ahmad, Department Director

Regional Collaborative

» Borough of Edgewater
- Mayor Nancy Merse, Mayor
- Gregory S. Franz, Administrator

» Borough of Fort Lee
- Mayor Mark Sokolich, Mayor

» New Jersey Department of Community Affairs Office of Smart Growth (NJDCA OSG)
- Karl Hartkopf
- Jennie Purcell

» Metropolitan Waterfront Alliance (MWA)
- Roland Lewis, Director
- Louis Kleinman, Community Outreach

» Hudson River Waterfront Conservancy of NJ, Inc.
- Helen Manogue, President

» New Jersey Department of Environmental Protection (NJDEP)
- Bob Martin, Commissioner
- Tali MacArthur, Environmental Specialist

» NJ Transit
- Charles Latini Jr., PP, AICP, Principal Planner

» East Coast Greenway (ECG) & Bicycle Touring Club of New Jersey
- Karen Votava, Executive Director (ECG)
- Ted Semegran

» Hudson County Division of Planning
- Stephen Marks, PP, AICP, Director
- Megan Massey, Principal Planner

» Bergen County Open Space Trust Fund Public Advisory Committee
- Mayor John De Rienzo, Chairman

Regional Collaborative (Continued)

» Bergen County Department of Parks
- Raymond W. Dressler, Director

» Office of Bergen County Executive
- Brian Hague, Chief of Staff
- June Montag

» New Jersey Department of Transportation (NJDOT)
- James S. Simpson, Commissioner
- Sheree Davis, Bicycle and Pedestrian Coordinator

» Bergen County Improvement Authority
- Edward Hynes, Executive Director
- Mauro D. Raguseo

» Palisades Interstate Park Commission
- James Hall, Executive Director

T&M Associates

» Ed Klump, P.E.
» Stan Slachetka, P.P., AICP, LEED Green Associate
» Jaclyn Flor, PE, P.P., C.M.E.
» Lee Klein, PE, P.T.O.E.
» Robert Dare, PP, AICP, MCIP, LEED Green Associate
» Anthony Rodriguez, LEED Green Associate
» Robert Molner

Neglia Engineering Associates

» Michael F. Berliner
» Stephanie Santos, P.E.

Vision Statement

By the year 2030, through the fiscally-responsible and multi-pronged efforts of a proactive Hudson River Waterfront Walkway Entity, Bergen County's Hudson River Waterfront Walkway will be transformed from a disjointed and underused waterfront walkway to a continuous, non-motorized transportation artery and recreational amenity that is a focal point of the region.

Bergen County's Hudson River Waterfront Walkway will be both a destination and a means to a destination. With its direct connections to the Palisades Interstate Park, Hudson County's Hudson River Waterfront Walkway, the George Washington Bridge, and New York City's Westside Greenway, the Waterfront Walkway will not only provide a sustainable transportation alternative to move about Bergen County and the greater New York/New Jersey Metropolitan Area, but also facilitate access to its wealth of cultural, natural, and scenic resources.

An integral part of the community, the Waterfront Walkway will be an attractive, safe, lively and family-oriented urban park. Its unique design, which will welcome visitors of various physical abilities, protect the environment, and respect the privacy of local residents, will have been achieved through a consensus-based approach and employ a design vocabulary that results in a cohesive appearance, and a memorable Hudson River experience.

Executive Summary

The Hudson River Waterfront Walkway Design and Implementation Strategy Plan creates an action-oriented plan for the implementation, maintenance, and enhancement of Bergen County's Hudson River Waterfront Walkway. The Study Area is within the boroughs of Fort Lee and Edgewater, from the George Washington Bridge to the North to the common border of Bergen and Hudson counties to the South. The Plan presents a targeted approach to implementing a regionally connected Waterfront Walkway that will serve both active and passive recreation. The focus is to create a Waterfront Walkway that is aesthetic and functional, and an experience that is safe, uninterrupted, accessible, inclusive, and respectful of local residents' privacy.

The Plan gathered feedback from all of its stakeholders through the Stakeholder Interviews, Visioning Sessions, and Public Meetings, and the County incorporated that feedback into all aspects of its Plan. Additionally, as part of the background work in developing this Plan, a detailed assessment of the history of the Bergen County Waterfront and a Study Area Profile Report of the baseline conditions of the existing Waterfront Walkway sections was prepared. The County created a Regional Collaborative (RC), consisting of various State, County, and local representatives which have a vested interested in the Hudson River Waterfront, and the RC vetted all aspects of the Plan. The result is an action-oriented plan for the short, medium, and long term that addresses active and passive recreation, while providing a regional link along the Hudson River waterfront. The Plan develops a Vision for proactive Hudson River Waterfront Walkway Entity, and a continuous, non-motorized transportation artery and recreational amenity that is a focal point of the region. The plan creates the foundation for a Waterfront Walkway that will be an attractive, safe, lively and family-oriented urban park.

Goals, Objectives, Strategies, and Actions were established based on feedback from the public and the RC. The Action plan identifies timeframes for the Actions, as well as potential lead implementation agencies, ranges of costs, and possible funding sources. Indicators and Targets are provided for the County and future Hudson River Waterfront Walkway Entity to measure its success in attaining the Goals, Objectives, and Strategies, as well as Baselines to use for comparison purposes.

The Plan creates design guidelines for all future Waterfront Walkway design. The guidelines address proposed alignments, perpendicular access points, and required surface and width. The purpose of these guidelines is to create a Waterfront Walkway that is accessible, safe, and cohesive not only through its continuous alignment but through its consistent appearance. The guidelines address all amenities, including lighting, railings, benches, and paver treatments, as well as locations of signage noting historic significance, site location maps, and walkway wayfinding signage. The locations of support facilities, such as restrooms and parking, as well as recreational facilities, such as kayak rentals, boat ramps, fishing piers, play grounds, a stage, and outdoor seating areas are also addressed. The Plan identifies how existing alignments will be updated, and gaps will be filled. The Plan identifies the costs for each alignment and all amenities, and provides available funding sources.

Lastly, the Plan identifies an Implementation Strategy which begins with the adoption of aspects of this Plan in local Land Development Regulations and in the County Site Plan and Subdivision Resolution. The Plan further recommends the creation of an Entity to oversee the Hudson River Waterfront Walkway and provides the framework to create this Entity.

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1. Introduction

1.1. Overview

The Hudson River Waterfront Walkway Design and Implementation Strategy Plan was made possible by the generous support of the Office of Smart Growth of the New Jersey Department of Community Affairs. Its goal is to create an action-oriented plan for the implementation, maintenance, and enhancement of Bergen County's Hudson River Waterfront Walkway.

The Study Area of the Hudson River Waterfront Walkway Design and Implementation Strategy Plan is located within the boroughs of Fort Lee and Edgewater, from the George Washington Bridge to the North to the common border of Bergen and Hudson counties to the South. For this area, the Plan presents a comprehensive and targeted approach to implementing a regionally connected Waterfront Walkway of the highest quality design that is safe, uninterrupted, accessible, inclusive, and respectful of local residents' privacy.

1.2. Background

The original idea for the Hudson River Waterfront Walkway first appeared in the 1966 Regional Plan Association study, "The Lower Hudson". A little over a decade later the Hudson River Waterfront Study, Planning, and Development Commission established by Governor Brendan Byrne, finalized a report recommending a continuous public Waterfront Walkway along the Hudson River.[1] The passage of State legislation in 1980 resulted in the requirement that a Waterfront Walkway be constructed along the Hudson River waterfront in all areas to the South of the George Washington Bridge, and this resulted in the 1984 "NJDEP Hudson Waterfront Walkway Plan and Design Guidelines."

Subsequently, in 1988, the NJDEP reinforced its previous efforts with Coastal Zone Management rules. Additionally, in 1989 it amended the "Hudson River Waterfront Walkway Plan and Design Guidelines" to include a higher degree of detail in the regulation of the Waterfront Walkway's design. Specifically, these guidelines require a thirty-foot easement from the water's edge as a prerequisite to a Waterfront Development Permit.

Several advances have also been made at the local level. As an example, the Planning and Zoning Boards of the Borough of Edgewater are diligent in including language in the Resolutions of Approval relative to the requirements of NJDEP for a Waterfront Walkway. Additionally, under Property Maintenance in the Edgewater Building Department, an individual checks the Waterfront Walkway on a daily basis for property maintenance issues, and has the power to issue fines to property owners who do not maintain their Waterfront Walkway segments and public access points.

However, despite these proactive measures, the Waterfront Walkway, in its present state, is disjointed and incomplete. Indeed, there are a number of sites that do not contain Waterfront Walkway segments, or whose segments are not

Figure 1.2-1: Edgewater Golf is one of a number of attractions along the Hudson River Waterfront Walkway in Bergen County. (T&M Associates)

1 http://www.state.nj.us/dep/cmp/czm_hudson.html

compliant with NJDEP guidelines. Also, there are numerous sites that lack onsite public access points, or are poorly maintained.

The presence of these conditions contradicts the intent and purpose of the 1980 legislation, and all of the Waterfront Walkway's subsequent planning foundations. Thus, this Waterfront Walkway Design and Implementation Strategy Plan has been developed as a consensus-based and action-oriented approach for the implementation, maintenance, and enhancement of the Hudson River Waterfront Walkway in Bergen County.

1.3. Methodology

The goal of the Hudson River Waterfront Walkway Design and Implementation Strategy Plan is to create an action-oriented plan for the implementation, maintenance, and enhancement of the Hudson River Waterfront Walkway in Bergen County.

To achieve this goal, a considerable effort was made to properly assess local baseline conditions, including, among others: planning foundations; gaps in the existing Waterfront Walkway; area characteristics; mobility options; local attractions; and, existing Waterfront Walkway design. By gaining a better understanding of baseline conditions, it was possible to obtain a clearer sense of how the Waterfront Walkway should be implemented, maintained, and enhanced.

With a firm understanding of the baseline conditions, a clear vision for the Hudson River Waterfront Walkway was developed. Attached to this vision are a series of goals, objectives, strategies and actions to be implemented in accordance with an action plan, as detailed in Section 3 of the Plan. To monitor progress on fulfillment of these actions, the Plan also includes a series of indicators of a successful implementation.

Finally, it is noted that active outreach and participation has been thoroughly integrated in the development of this plan. For instance, a Regional Collaborative, as detailed in Section 1.5 was involved in the development of the Plan's goals, objectives, strategies, and actions, and various stakeholders were interviewed for their unique perspectives. Additional public outreach mechanisms, as thoroughly described in Section 1.4 made use of local media, and a series of public meetings aimed at promoting a bi-directional flow of information and ideas.

1.4. Public Outreach

In recognition of the fact that understanding and support is essential to the success of this Plan, it was a guiding principle of its development that all public and private stakeholders should be actively involved it its preparation. As such, a rigorous public outreach component was included in its development.

Among others, specific elements of the public outreach component included Stakeholder Interviews, media coverage, and public meetings. Complete information on the Plan's public outreach component is provided below.

1.4.1. Stakeholder Interviews

Stakeholder interviews were conducted by the County and Project Team on December 2, 2009. They yielded a wealth of information on local conditions and provided valuable insight and guidance to the development of the Bergen County Hudson River Waterfront Walkway Design and Implementation Strategy Plan.

Among those interviewed were: members of the Edgewater Borough Council; officials from the Edgewater and Fort Lee departments of public works; the Borough administrators of Edgewater and Fort Lee; an official of the Edgewater Building Department; the Edgewater Construction Official; the Edgewater Planning Board Chairman; a representative of the Fort Lee Police Department; a member of the Edgewater Historic Preservation Committee; a representative of the Friends of the Palisades Interstate Park; local property owners and managers; and, representatives of homeowners associations.

1.4.2. Media Coverage

The Waterfront Walkway Plan's public outreach component was further supported and advanced by: advertisements in the Bergen Record and the Edgewater View; the dissemination of flyers advertising opportunities for public involvement; and, the creation of an informative website that described the project and visioning process. The sub-sections below detail the type and extent of coverage provided by these outlets:

Newspapers: The visioning process was advertised and covered by two print media outlets: the Bergen Record and the Edgewater View. Prior to the first visioning session, each newspaper ran an advertisement encouraging readers to attend the session and share their vision for the future of the Hudson River Waterfront Walkway in Bergen County. Prior to the second visioning session an advertisement was run in the Bergen Record, for the public to attend the second visioning session to review the draft plan. In addition to the above, following the first and second visioning sessions several newspapers published articles.

Websites: In an effort to keep the public informed on the process, timeline, and progress of the Plan, the County created a website dedicated solely to the project. The website contained a project overview, a brief background describing the Hudson River Waterfront Walkway, mapping depicting existing and proposed conditions along the Waterfront Walkway, a description of why public involvement is integral to the process of crafting the Plan, downloadable copies of the Plan, and downloadable Appendices. The website also contains contact information for key members of the project team, a description of the purpose and structure of a visioning session, links to the Office of Smart Growth Website and project presentations.

Figure 1.4.2-1: Flyer for the first public visioning session. (T&M Associates)

Flyers: To advertise the visioning workshops that took place as part of the public involvement process, flyers were created and distributed to the RC and stakeholders. Members of the RC and stakeholders were then encouraged to share these flyers with residents, business customers, fellow members of their respective organizations, and local residents.

1.4.3. Public Meetings

Input from the general public was solicited at two public visioning sessions and at Council Meetings in Edgewater and Fort Lee. The sections below describe the structure and common feedback received at each meeting.

First Public Meeting (December 9, 2009): The goal of the first visioning session was to inform the general public about the purpose of the visioning session, the approach taken to craft the plan, the objective of the Plan, and allow meeting participants to share their experiences along the Waterfront Walkway. The project team also informed the general public on the timeline for completion of the Plan, and provided a brief overview of the existing conditions along the Waterfront Walkway.

After the introductory presentation was completed by the project team, meeting participants had the opportunity to participate in small "breakout" groups, and describe positive and negative areas along the Waterfront Walkway. In addition, meeting participants had the opportunity to share their vision for the future of the Waterfront Walkway.

Second Public Meeting (May 25, 2010): The second public meeting presented the draft plan. The project team explained how the plan was created, and presented the proposed alignments, perpendicular access points, proposed cross section, and amenities for the Waterfront Walkway. The public vetted the proposed alignments and certain alignments were requested to be eliminated or revised. The project team agreed to analyze the feedback and revise the plan if necessary.

Edgewater Council Meeting (September 20, 2010), Fort Lee Council Meeting (October 7, 2010), Bergen County Planning Board Hearing (December 7, 2010): Final public outreach was provided in the form of a public hearings in front of the Councils of Edgewater and Fort Lee to obtain Resolutions of support, and appearing before the Bergen County Planning Board. These hearings included a presentation of the Bergen County Hudson River Waterfront Walkway Strategy Plan, and afforded the general public an opportunity to make additional comments before Council and Board action was taken.

1.5. Regional Collaborative

A Regional Collaborative (RC) helped to guide the development of the Bergen County Hudson River Waterfront Walkway Strategy Plan. The RC was comprised of municipal and county officials, professionals representing state agencies, and private interest groups. Specifically, members of the RC were sourced from the following organizations: Bergen County Open Space Trust Fund Public Advisory Committee; Bergen County Improvement Authority; Palisades Interstate Park Commission; Borough of Edgewater; Borough of Fort Lee; New Jersey Department of Environmental Protection (NJDEP); New Jersey Department of Transportation (NJDOT) Bicycle and Pedestrian Office; New Jersey Transit; New Jersey Department of Community Affairs Office of Smart Growth (NJDCA OSG); East Coast Greenway (ESG); Bicycle Touring Club of New Jersey; Hudson River Waterfront Conservancy; Bergen County Executive Office; Hudson County Division of Planning; Metropolitan Waterfront Alliance; Bergen County Department of Economic Development; Bergen County Department of Parks; and Bergen County Department of Planning.

The purpose of the RC was to assist in the collection of data, and to review all consultant deliverables. It also assisted with the development of goals, strategies, objectives, and actions. The RC met regularly throughout the preparation of this Plan, and developed the following Mission Statement:

"It is the mission of Bergen County's Hudson River Waterfront Walkway Design and Implementation Plan to establish a consensus-based approach to the design and implementation of Bergen County's section of the Hudson River Waterfront Walkway.

The Plan will be developed through a comprehensive community outreach program involving interested residents, organizations, and stakeholders. The foundation of this outreach program will be a series of interactive public visioning workshops, which are intended to aid and inform the County in the development of a valid and sustainable vision for the Waterfront Walkway. The resulting vision will address the physical aspects of the Walkway's design along the waterfront,

its value as a regional recreational resource and amenity, and its integration within the community fabric of Edgewater and Fort Lee.

The Plan will be designed to clearly and effectively communicate this vision and present an achievable and sustainable implementation and maintenance strategy for the Hudson River Waterfront Walkway in Bergen County as it extends from the County's boundary with Hudson County, through the Borough of Edgewater, to the Palisades Interstate Park in the Borough of Fort Lee.

When completed, it will be a consensus-based plan that achieves the following objectives:

» Revitalize the waterfront by attracting visitors to a well-designed and accessible open space amenity and Waterfront Walkway with a variety of activities, dynamic features and experiences;
» Provide opportunities to enjoy and appreciate the natural and cultural resources of the Hudson River;
» Link the Waterfront Walkway with the community fabric by creating inviting, easy, and pleasant access points and entries;
» Identify gaps in the Waterfront Walkway and present a strategy to eliminate them;
» Incorporate public art and local history into the Waterfront Walkway's design;
» Integrate smart growth design principles; and,
» Facilitate the Waterfront Walkway Plan's implementation with a coordinated Action Plan."

1.6. Benefits of a Completed Bergen County Hudson River Waterfront Walkway

A completed Hudson River Waterfront Walkway would be of great value to Bergen County's residents and visitors. Detailed below are some key benefits.

Wellness: A completed Waterfront Walkway would improve the quality of life for its users. By facilitating continuous and upgraded access to the Hudson, the Waterfront Walkway would provide local residents and visitors with a "feel good factor". Indeed, by facilitating such access and offering users the opportunity to enjoy the unique natural setting and scenic views of Manhattan, the Waterfront Walkway would support and improve the physical and emotional health of its users.

Mobility: When one considers the connections that the Waterfront Walkway would provide, including those leading across the George Washington Bridge to New York City and to Hudson County, its potential as a sustainable and non-motorized transportation route becomes apparent. This potential is increased by possible connections to public land- and water-based transportation.

Clearly, the positive impact of such a route would be felt by all. Not only would it help to reduce traffic and congestion in the area by providing an alternative form of mobility, it would also improve the environment by reducing oil consumption and the greenhouse gas emissions. When one considers that approximately 28 percent[2] of all greenhouse gas emissions are caused by transportation-related activities, the improved air quality that the Waterfront Walkway could bring must not be discounted.

Stewardship: Completion of the Waterfront Walkway and its development as a linear urban park also has great potential to protect the Hudson. By maintaining the area as a park, the Waterfront would not only be spared from inappropriate development, but public awareness and appreciation of its value would be raised. In turn, heightened public awareness and appreciation could lead to stronger advocacy for the Hudson, and enhanced protection of its waterfront.

2 United States Energy Information Administration. Emissions of Greenhouse Gases in the United States 2008. Washington, DC: United States Energy Information Administration, 2009.

Economic Development: From an economic perspective, completion of Bergen County's Hudson River Waterfront Walkway would support the local economy. One way it would support the economy would be by attracting visitors to the area, and encouraging residents to stay in the area. In turn, businesses would see increased profits as Waterfront Walkway users choose to shop and dine at local establishments. Additionally, local property values would likely increase due to the attractiveness of the completed Waterfront Walkway.

Increased Safety: Another key benefit of the completed Waterfront Walkway would be increased safety within the area. By completing the Waterfront Walkway and eliminating gaps, points of isolation would be eliminated, thereby yielding increased public safety. Also, a continuous Waterfront Walkway provides ample room for children to bicycle, run, and play in an area that is completely separated from vehicular traffic.

Figure 1.6-1: Historic Marker denoting the approximate location of Burdett's Landing, the location of a ferry crossing the Hudson River that was integral to the efforts of the Continental Army during the Revolutionary War. (T&M Associates)

Historic Preservation: A completed Waterfront Walkway would provide access to a range of historic attractions along its route. By facilitating such access and properly signing the area's historic sites, a completed Waterfront Walkway would foster a greater sense of awareness and appreciation for American heritage and culture.

2. Baseline Conditions

As part of the background work in developing this Plan, a detailed assessment of the history of the Bergen County Waterfront and a Study Area Profile Report of the baseline conditions of the existing Waterfront Walkway sections was prepared.

2.1. History of Bergen County Waterfront

Bergen County's Hudson River Waterfront has a rich and varied history. The public and stakeholders voiced the importance of documenting that history along the completed Walkway.

The original custodians of the region were Amerindians of the Algonquin Nation, who were driven from the area at the onset of European colonization during the early part of the seventeenth century. With its location on the navigable Hudson River and the Atlantic Ocean being nearby, the area was a prime target for early colonizers. Its proximity and easy access to the growing city of New York solidified its attractiveness, and the area quickly grew in importance.

A ferry service was established around 1758 by Étienne Bourdette, a New York merchant of French Huguenot origin, in an area that is now owned by the Edgewater Colony, near the present border of Fort Lee and Edgewater. Bourdette's ferry was initially used by local farmers to send their products to Manhattan, but during the American Revolution the site of Bourdette's ferry, which had become known as Burdett's Landing (Bourdette was anglicized as Burdett), was seized by the Continental Army.

While under the control of the Continental Army, Fort Constitution, which later became known as Fort Lee, was constructed upon the site. During the years of the American Revolution, the ferry would become of vital strategic importance, since it was the only supply linkage between Fort Lee and Fort Washington, located near the northern tip of Manhattan.

After the American Revolution ended and the United States had won its independence, Bourdette's ferry returned to its original purpose of providing a trade linkage for agricultural products to Manhattan. However, during the nineteenth century, the paving of Manhattan's streets resulted in a demand for cobblestones quarried from the Palisades, and Burdett's Landing also became a transfer point for these products.

Concurrently, the application of steam power to boats resulted in reduced travel times and greater efficiency of Hudson River crossings. This led to more traffic and greater importance of Bergen County's Hudson River Waterfront, which is demonstrated by its transformation into a resort area with the 1878 opening of the Fort Lee Hotel. However, when it was destroyed by fire in 1898, the Fort Lee Hotel was not reconstructed.

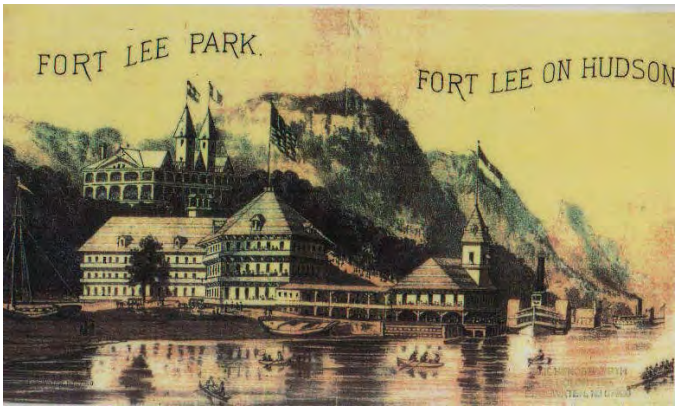


Figure 2.1-1: The Fort Lee Hotel (Public Domain)

However, advances in steam power technology had brought industry to the shores of the Hudson, and the first half of the twentieth century would bear witness to the rapid industrialization of the area, particularly in the southern portions of the Borough of Edgewater. The area's industrialization was supported by the development of an extensive freight rail network, as well as regional roadways and the George Washington Bridge, which opened in

Figure 2.1-2: Industrial Landscape of Edgewater along Hudson River Waterfront in 1930 (Public Domain)

1931. Indeed, the area's waterfront location and advanced infrastructure led to an industrial boom, and industry flocked to the shores of the Hudson. In particular, there was a strong concentration of chemical industries in the area, and notable companies included: Alcoa; Ford Motor Company; Lever Brothers; General Chemical Company; and, Valvoline Oil Company, among others.

Despite its pace and extent of industrial development that had occurred in the early part of the nineteenth century, the industrial importance of the Hudson River Waterfront began to fade in the second half of the century. The primary reasons for this shift in importance are changes in shipping technologies and local transportation networks. However, with the area's decline in industrial importance, formal industrial sites have been converted into residential and office properties. Given its waterfront location and fine views of Manhattan, in recent years the area has become a very desirable place to live and work.

2.2. Planning Foundations

The planning foundations of the Hudson River Waterfront Walkway date back to 1966 when the Regional Plan Association reacted to a decline in industrial activity along the waterfront by proposing a waterfront Walkway that would provide additional recreational space for the residents of the metropolitan area.

In 1979, Governor Byrne formed the Hudson River Planning and Development Commission to study the Hudson River Waterfront. The Commission's efforts resulted in a study, which recommended that the Hudson River Waterfront emphasize open space, parks, and public access, and that the waterfront should be a key design feature in all future development projects. The Commission's study also recommended that multi-use open space be a required component of all waterfront development.

Acting upon these recommendations, State legislation requiring the construction of a Waterfront Walkway as part of all development projects along the Hudson River to the South of the George Washington Bridge was enacted in 1980.

Next, the NJDEP issued the study "Hudson Waterfront Walkway: Existing Conditions and Preliminary Waterfront Walkway Delineation" in 1982. This document then led to the development of the NJDEP's "Hudson River Waterfront Walkway Plan and Design Guidelines" in 1984. The purpose of the 1984 document was to provide Waterfront Walkway construction and maintenance instructions for developers and municipalities.

In 1988, the State's previous Waterfront Walkway planning efforts were reinforced with the adoption of NJAC 7:7E-3.48 et seq., which required applicants for a Waterfront Development Permit to provide a thirty-foot easement along the water's edge of the Hudson River. During the same year the non-profit Hudson River Waterfront Conservancy was founded to oversee and support the development of the Waterfront Walkway.

In 1989, the NJDEP issued design standards as an addendum to the 1984 "Hudson River Waterfront Walkway Plan and Design Guidelines". This addendum sought to provide a higher level of detail in the regulation of the Waterfront Walkway's design, in order to ensure the continuity and reasonable standardization of its design elements.

2.3. Study Area Profile

The Study Area Profile for the Bergen County Hudson River Waterfront Walkway documents existing conditions along the Waterfront Walkway, including existing Waterfront Walkway segments, public access points, historic sites, contaminated sites, existing zoning provisions, deed restrictions and easements. The information contained in this section is based on research and field work conducted by Neglia Engineering Associates.

2.3.1. Gap Analysis & Orphan Sites

Although a substantial portion of the Hudson River Waterfront Walkway has been completed, there are still a number of sites that do not contain Waterfront Walkway segments, or whose Waterfront Walkway segments are not compliant with NJDEP's Design Guidelines. The following sites have been identified as Orphan Sites and will require Waterfront Walkway facilities to provide a complete Waterfront Walkway through Bergen County (see Figures 4.10-1 through 4.10-5):

» **Gap 1:** I-Park Edgewater (Block 99, Lots 1, 3, 4, and 5). A Waterfront Walkway segment has been proposed and is scheduled for construction in Fall 2009. This site is approved for a mixed use, consisting of commercial, residential, and a new Edgewater municipal complex. Construction of the Walkway segment had not commenced as of the adoption of this Plan.

» **Gap 2:** 115 River Road (Block 96, Lots 3.01 and 4.01). 115 River Road is an existing commercial and office facility. The property is exceptionally narrow and has adjoined structures spanning from its frontage on River Road onto a 500-foot long pier that extends into the Hudson River. The portion of the development that was constructed on the pier includes an existing boardwalk along the southerly wall of the building. However, the boardwalk is for tenant use only, and is not open to the public.

» **Gap 3:** Quantas Resources (Block 95, Lot 1). Quantas Resources is a vacant property that formerly housed a facility that stored, reprocessed, reclaimed, and recovered waste oil. The property is on the National Priorities List, and is listed as a Superfund Site by the Federal Environmental Protection Agency (EPA). Due to on-site contamination, the site will not be redeveloped until remediation is complete.

» **Gap 4:** MJM Waterfront Developers (Block 85.01, Lot 3.03); Sunrise Third Edgewater SL, LLC (Block 85.01, Lot 3.02). This site connects the Edgewater Multiplex Cinema to Independence Harbor. A Waterfront Walkway segment is approved for the site and will be constructed when construction commences on the proposed residential development. However, at the time of adoption of this Plan construction of the Waterfront Walkway had not commenced. The Waterfront Walkway is proposed to connect the two abutting walkways and run along the southern portion of the waterfront.

» **Gap 5:** Hess Oil and Chemical Corp (Block 76, Lot 5). The Hess Oil and Chemical Corporation currently operates the only remaining industrial use along the Hudson River Waterfront in Bergen County – an oil refinery. Due to Homeland Security reasons, as well as potential hazards to public safety and welfare, the site is completely fenced and is not accessible by the public.

» **Gap 6:** Admiral's Walk (Block 33, Lots 1N, 1S, and 2); Waterside (Block 33, Lots 1.02 and 1.03). Admiral's Walk and Waterside are two existing residential developments that were constructed prior to the passage of the NJDEP's Hudson River Walkway Plan and Design Guidelines in 1984, and are private, gated properties that lack public access to the Waterfront. As it exists, Admiral's Walk contains a private gravel walkway with a picnic area which may be used by residents only. Additionally, the development's fitness center is constructed adjacent to the waterfront, and the existing gravel path runs underneath the fitness center. Admirals Walk's lot boundary extends along the waterfront behind the Waterside property. Therefore, Waterside has limited property along the waterfront with the exception of the northern side of the property where the parking area abuts the waterfront.

» **Gap 7:** Veteran's Field (Block 30, Lots 1 and 2). Currently, there is no compliant Waterfront Walkway on-site. However, a Waterfront Walkway segment is scheduled for construction in 2010.

» **Gap 8:** Le Jardin (Block 22, Lots 1 and 4). Le Jardin is an upscale French and continental restaurant located on a property on which no Walkway segment is present. Currently, the property owner is under negotiations with the NJDEP. However, there is a significant grade change between this property and the existing Walkway segment located at Hudson Cove.

» **Gap 9:** The Moorings (Block 18, Lot 1.05). The Moorings is a residential townhome development that is currently under construction. As it exists, the property does not contain a Walkway segment, and does not provide an interim walking route for Walkway users. However, a compliant Walkway segment is planned for the property, and will be completed as construction on the property continues.

» **Gap 10:** Von Dohln Enterprises (Block 17, Lots 1, 2, 3.01, 3.02 and 4). The Von Dohln Enterprises property houses an existing marina and boat launch facility along the Hudson River Waterfront. Currently, the site contains a non-compliant Walkway segment that consists of a painted lane that is labeled "Riverwalk". However, in the winter the painted Walkway segment is being used as an informal storage area for what appears to be pier supports and floating docks. The Walkway segment is further impeded by an existing fence which prevents users from accessing the Walkway segment at the Vela Townhomes.

» **Gap 11:** North Hudson Yacht Club (Block 12, Lots 6.01, 6.02 and 7). The North Hudson Yacht Club is a private yacht club with waterfront access. A substantial number of boats and machinery are stored on the site, especially during the winter months. The site is accessed via a private driveway behind the Caribbean House Cooperative. As it exists, the site is fenced off, and public access to the waterfront is prohibited. The activities conducted on the property are marine-oriented and the site acts as a private yacht club.

» **Gap 12:** Edgewater Colony (Block 1, Lots 1 and 7). The Edgewater Colony is an existing cooperative residential development that contains a number of single-family homes. A substantial portion of the waterfront is developed with single-family homes. As it exists, the Edgewater Colony does not contain a Waterfront Walkway segment, however, it does contain NJDEP approved stone steps that connect to Palisade Interstate Park. Hudson River Waterfront Walkway signage is also present along the streets of the development, and the streets of the development act as the site's Walkway segment. The existing Walkway segments along the roads in the Edgewater Colony connect to the Palisades Interstate Park as well. However, there is no southerly Walkway connection to the property.

2.3.2. Perpendicular Access

According to some Edgewater residents in the stakeholder meetings, the perpendicular access points along River Road can be located by residents of Edgewater due to their familiarity with the waterfront. However, visitors to the area may have difficulty locating perpendicular access points due to lack of signage and gateways. Additionally, many of the access points have stairs, which make it difficult for bikes, strollers, and those with disabilities to access the Waterfront Walkway. The majority of the public either accesses the Waterfront Walkway from their home, if they live along the Walkway, or parks illegally at a commercial use and accesses the Walkway from the abutting parking lot. River Road experiences high levels of service and multiple vehicles exceeding the posted speed limit. As a result, access from the west side of River Road to perpendicular access points is difficult.

There are eleven (11) potential perpendicular access points along River Road to access the Waterfront Walkway (see Figures 4.10-1 through 4.10-5). These locations are as follows:

1. **I-Park Edgewater (Block 99, Lots 1, 3, 4, and 5):** Ten-foot wide access point is proposed along the southern portion of the property that will connect to River Road.
2. **City Place (Block 91, Lot 1):** A Perpendicular access point exists through City Place Shopping Level via stairway on the waterfront side of the property. The stairway is connected to the Walkway by an existing paver pathway. However, this access requires signage.
3. **Edgewater Multiplex Cinema (Block 91, Lot 2):** A public access point exists along the northerly property line connecting Waterfront Walkway segment to River Road.
4. **Edgewater Golf (Block 82, Lots 1 and 2):** Ten-foot wide access Waterfront Walkway to River Road along the southerly property line at the Edgewater Commons.
5. **Edgewater Towne Center (Block 58, Lots 1 and 2):** Ten-foot wide public access exists along the southerly property line connecting the Waterfront Walkway to River Road.
6. **Edgewater Marina (Block 38, Lots 1, 2, and 2.01):** An existing, functional Waterfront Walkway segment exists on-site. The Waterfront Walkway segment can be accessed via an eight-foot wide public access point to River Road on the northerly property line.
7. **Veteran's Park (Block 30, Lots 1 and 2):** A compliant Waterfront Walkway segment is schedule to be constructed in 2010, which will include a public access point to the Waterfront Walkway.
8. **Hudson Cove (Block 25, Lots 2.01-2.37):** The site has an existing and functional Waterfront Walkway segment. There is an eight-foot wide public access Waterfront Walkway that connects the Waterfront Walkway to River Road on-site.
9. **Le Jardin (Block 22, Lots 1 and 4):** No Waterfront Walkway segment exists on the site. However NJDEP is currently in negotiations with the property owners to allow for the construction of a Waterfront Walkway segment and an eight-foot wide public access to the Waterfront Walkway.
10. **Vela Townhomes (Block 13, Lots 1, 2.01, 2.02, 4, 5 and 5.01):** There is a concrete Waterfront Walkway segment on-site that wraps around the site and terminates at the North Hudson Yacht Club. Public access is provided via a concrete paver staircase that connects the site to River Road.
11. **Edgewater Colony (Block 1, Lots 1 and 7):** A perpendicular access pathway and staircase exists at the property's northerly boundary. The pathway begins at the River Road entrance to the Palisades Interstate Park. The pathway runs parallel to Henry Hudson Drive for a short distance before separating from the roadway and descending to the waterfront via several sets of steep, stone staircases. There is a small seating area and a bulletin board at the termination of the staircase, which leads to an unpaved trail that runs north along the waterfront and provides access through the Park.

2.3.3. Historic Sites and Attractions

The Study Area contains both registered and unregistered historic sites.

With regard to registered sites, it is noted that the Study Area contains three sites listed on the State and National registers of historic places. A description of each is found below:

» **Binghamton Ferry (Edgewater: Block 70, Lots 3 and 4.02; Block 75, Lots 2.02 and 2.03; Block 76, Lot 2.01):** The Binghamton Ferry was operated between Manhattan and Hoboken from 1905 to 1967. It was built for the Hoboken Ferry Company, and was designed to carry approximately 1,000 passengers and a limited number of vehicles. It was moored to its current location in 1975, and added to the National Register of Historic Places in 1982. For some time, the boat had been operated as a restaurant, but it is currently vacant.

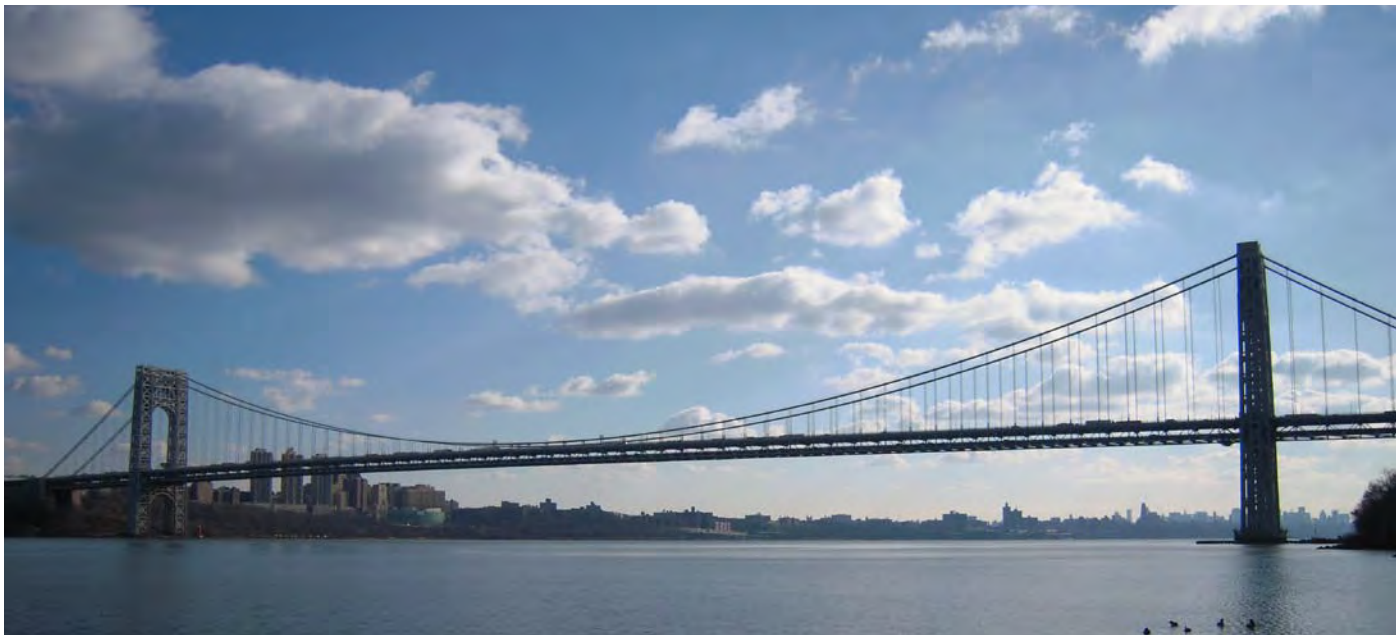
» **Palisades Interstate Park (Edgewater: Block 1, Lot 7205; Fort Lee: Block 6, lots 3 and 4; additional parcels located outside of the Study Area):** The Palisades Interstate Park was listed in 1965 on the basis of its status as an early interstate conservation area. The Park was formed in 1900 by governors Theodore Roosevelt of New York and Foster Voorhees of New Jersey. Its formation was a response to the destruction of the Palisades by quarry operators during the later part of the nineteenth century.

» **Ford Motor Company Edgewater Assembly Plant (Edgewater: Block 85.01):** The Ford Motor Company Edgewater Assembly Plant was listed on the State and National registers of historic places in 1983. However, the structure was demolished in 2006 and subsequently developed with the Independence Harbor condominium complex. Nonetheless, the site was one of the first assembly line plants in the United States and, therefore, it is a significant part of America's industrial heritage. To ensure that the importance of the site is not forgotten, the Ford Motor Company has commissioned a historic monument to be placed on the site.

With regard to unregistered sites of historic significance, the Study Area contains the following:

» **Landing site of Bourdette's Ferry (Edgewater: Block 1, Lot 1):** The site, whose historical significance is thoroughly described in Section 2.1, is currently owned by the Edgewater Colony. A plaque commemorates the location and provides a historical interpretation.

» **George Washington Bridge (Fort Lee: Block 7202, Lot 4):** The George Washington Bridge connects Fort Lee with Manhattan. It is historically significant for the engineering feat that it represents. When it opened in 1931, it had the longest span in the world. At 3,500 feet, it nearly doubled the previous record of 1,850 feet, which had been held by the Ambassador Bridge between Detroit, Michigan and Windsor, Ontario.



The Study Area also provides scenic views across the Hudson to the following historic sites on Manhattan:

» **General Grant National Memorial:** The General Grant National Memorial, also known as Grant's Tomb, is a mausoleum containing the bodies of President Ulysses S. Grant and his wife, Julia Dent Grant. The memorial is located in Riverside Park, in the Morningside Heights neighborhood of Manhattan.

Grant (April 27, 1822 – July 23, 1885) was General-in-Chief of the Union Army from 1864 to 1869, and United States President from 1869 to 1877. He is credited with leading the Union to victory during the American Civil War, and fighting for the civil rights of African Americans and Amerindians.

» **Riverside Church:** Riverside Church of New York City is located at 490 Riverside Drive in the Harlem neighborhood of Manhattan. It is an interdenominational church, which dates from 1930. It is a significant architectural landmark, being the tallest church in the United States and modeled after the gothic cathedrals of Chartres and Laon, France.

In addition to the above, the following historic attraction and sites are located within close proximity to the Study Area:

» **Fort Lee Historic Park (Fort Lee: Block 7251, Lot 2):** The Fort Lee Historic Park is located on Hudson Terrace in Fort Lee. The Park contains an 11,000 square-foot visitor's center with two floors of exhibitions on Fort Lee's role in the American Revolution and General George Washington's activities in the area. The site also contains a reconstructed blockhouse and eighteenth century huts, as well as reproduction gun batteries and firing steps. The Park has costumed historic interpreters on staff, and hosts student groups throughout the school year. Additionally, the Park organizes a reenactment of the British Invasion of 1776 in November of every year.

» **Edgewater Borough Hall (Edgewater: Block 54, Lot 1):** The Edgewater Borough hall is located at 916 River Road, and is listed on the State and National registers of historic places. It typifies the beaux-art architectural style that was popular in the late nineteenth and early twentieth centuries.

» **Edgewater Free Public Library (Edgewater: Block 41, Lot 14):** The Edgewater Free Public Library is located at 49 Hudson Avenue, and is listed on the State and National registers of historic places. The library's significance lies in the fact that it was built with funds from the Andrew Carnegie Foundation. Carnegie was an active philanthropist and provided capital for purposes of public interest and social and education advancement. Among his many endeavors, he funded approximately 3,000 libraries throughout the English-speaking world. The Edgewater Free Public Library is one of fifteen and the last library to be built with funds from the Andrew Carnegie Foundation in New Jersey.

2.3.4. Contaminated Sites

Due to the Study Area's waterfront location and the importance of access to shipping channels, a substantial number of industrial uses have taken place in the area over the past century, and a handful of industrial operations continue to take place today. These industrial operations have led to the contamination of several sites within the Study Area. A listing of contaminated sites within the project area can be found in Appendix C of the Plan.

2.3.5. Zoning

Zoning within the Study Area is diverse and provides for a wide variety of uses along the Hudson River Waterfront. Present uses along the Waterfront include residential, commercial, industrial, and public uses. The following zones are present in the Study Area:

- OR-1 (Office and Research District)
- MCRD (Mixed-Use Commercial Residential Development District)
- R-3 (Multi-Family Residential District)
- B-3 (Waterfront Commercial Business District)
- CBD (Central Business District)
- P (Public District)
- R-5 (Multi-Family Residential District)
- R-1 (Single-Family Residential District)

These zones permit a multitude of uses including: single-family and multi-family residential development, municipal buildings and facilities, child care centers, public schools, places of worship, banks, business and professional offices, financial institutions, hotels, retail and service uses, restaurants, commercial recreation, health clubs, movie theatres, and research laboratories.

2.3.6. Deed Restrictions and Easements

Ordinance §249.91.J. of the Borough of Edgewater Land Development Ordinance, requires every development application to include a "suitable provision for a pedestrian Waterfront Walkway along the bank of the Hudson River." The Ordinance requires a minimum of a 30-foot easement area and a minimum 16-foot travel lane, and lists the NJDEP Hudson Waterfront Walkway Plan as the guiding document for development of the Waterfront Walkway relative to the design and building material of the Waterfront Walkway.

In addition to the above-referenced provision, NJDEP Waterfront Development Permits granted for properties along the Hudson River contain provisions that require developers to provide conservation easements and Waterfront Walkway segments along the waterfront.

The following properties have existing conservation easements along the Waterfront:

- MJM Waterfront Developers (Block 85.01, Lot 3.03)
- Independence Harbor (Block 85.01, Lots 1.02 and 2)
- Edgewater Commons (Block 84.01, Lots 1.01, 1.03, 1.04 and 1.05)
- Crab House (Block 84.01, Lot 1.02)
- Windsor at Mariner's Tower/Cove (Block 46, Lots 3.01, 3.03, and 3.04)

- Edgewater Marina (Block 38, Lots 1, 2, and 2.01)
- Veteran's Field (Block 30, Lots 1 and 2)
- Le Jardin (Block 22, Lots 1 and 4)
- The Moorings (Block 18, Lot 1.05)
- Von Dohln Enterprises (Block 18, Lot 1.03)
- Vela Townhomes (Block 13, Lots 1, 2.01, 2.02, 4, 5, and 5.01)
- Certain areas of the Colony, however not its entire waterfront (Block 1, Lots 1 and 7)

2.4. Mobility

There is a range of mobility options that are relevant to would-be users of Bergen County's Hudson River Waterfront Walkway. These include trails, bicycle routes and ferry services. Also relevant is the availability of parking that is located within easy reach of the Waterfront Walkway, and planned connections to Hudson County's portion of the Hudson River Waterfront Walkway. These issues are discussed in the following sections.

2.4.1. Trails

Bergen County is a key destination on the East Coast Greenway Route, which is a 3,000 mile path that is currently under development and planned to stretch the entire eastern seaboard of the United States – from Calais, Maine to Key West, Florida. The project is being coordinated by the East Coast Greenway Alliance of Wakefield, Rhode Island. On the local level, the East Coast Greenway Route will connect neighborhoods, parks, and various historic and cultural resources. When completed, the East Coast Greenway Route will be a multi-modal, non-motorized transportation corridor for use by individuals of all abilities and ages. It is planned that the East Coast Greenway's Bergen County segment will include the full extent of the Hudson River Waterfront Walkway.

Although not part of the East Coast Greenway or Hudson River Waterfront Walkway, the Long Path is equally important. The Long Path is a 350 mile hiking trail that leads from the North Entrance of the Fort Lee historic park through the Palisades Interstate Park and as far North as Altamont, New York, which is located near Albany. In addition, the Long Trail provides easy connections to the Appalachian Trail in New York's Harriman State Park; the Appalachian Trail runs from Springer Mountain in Georgia to Mount Katahdin in Maine.

2.4.2. Bicycle Routes

Bicyclists can be accommodated on the Hudson River Waterfront Walkway as it exists and as proposed.

Connections to areas outside of the Study Area are provided by the East Coast Greenway, and on dedicated/non-dedicated bicycle routes that have been identified by local bicycle clubs. One such route leads through the Palisades Interstate Park, where cycling is permitted on Henry Hudson Drive from River Road in Edgewater up to and including Alpine Picnic Area on the Alpine Approach Road in the Borough of Alpine. Bicycles are also permitted in the Palisades Interstate Park on Old Route 9W to the border of New Jersey and New York.

In addition to the above, it is noted that the George Washington Bridge provides bicyclists with a connection to New York City and its network of bicycle paths, including its Westside Greenway.

2.4.3. Ferry

New York Waterway provides ferry service between the Edgewater Ferry Landing at 989 River Road in the Borough of Edgewater, and its terminal at West 39th Street and 12th Avenue in Midtown Manhattan. The service operates from the Edgewater Landing Terminal on weekdays from 6:15 a.m. to 9:50 a.m. and 4:15 p.m. to 7:45 p.m., with the last ferry returning from Manhattan at 8:15 p.m. No services are provided on weekends.

The Edgewater Ferry Landing is accessible by the Hudson River Waterfront Walkway. However, as an added service to local passengers, the New York Waterway operates a shuttle service along River Road to collect and distribute passengers. The frequency of this shuttle is coordinated with that of the ferry service.

2.4.4. Parking Areas for Motorized Routes

Within the Borough of Fort Lee, there are a total of nine municipal parking lots operated by the Fort Lee Parking Authority. Of particular relevance to the Hudson River Waterfront Walkway are those located at 124 Main Street and 144 Main Street, which provide a combined total of 112 parking spaces. All of Fort Lee's municipal parking lots are designed in compliance with the Americans with Disabilities Act (ADA), and as of the adoption of this plan, cost 25¢ for each half hour up to three hours, and $1.00 per hour thereafter, up to 24 hours. Fees are enforced 24 hours per day throughout the week.

Parking is also available at the Fort Lee Historic Park on Hudson Terrace in Fort Lee. From April through November, as of the adoption of this report, a fee of $5.00 is levied on weekends between 8:00 a.m. and 2:00 p.m.

Additional parking is provided along public roadways and at Veterans Park in the Borough of Edgewater. There is also one signed and dedicated parking space within the Vela Townhomes Complex.

2.4.5. Regional Connections

When completed, Bergen County's Hudson River Waterfront Walkway will provide a direct connection to the Hudson County portion of the Hudson River Waterfront Walkway. Through this connection, users of the Waterfront Walkway will be able to access a range of destinations in Hudson County. Key destinations include but are not limited to: Hoboken Terminal, which provides rail, bus, and ferry connections to Manhattan and other regional destinations; the Newport neighborhood of Jersey City with its shopping mall (Newport Centre) and PATH Station (Pavonia/Newport); Exchange Place in Jersey City with its access to New York Waterway services and PATH Station (Exchange Place); Liberty State Park and connections to Ellis Island and the Statue of Liberty; and Liberty Science Center.

Additionally, Bergen County's Hudson River Waterfront Walkway will provide direct connections to the George Washington Bridge and New York City's Westside Greenway. These connections will facilitate non-motorized access to New York City's broad spectrum of recreational and cultural resources, as well as shopping and employment opportunities.

2.5. Existing Attractions

The Bergen County Hudson River Waterfront Walkway contains a host of attractions ranging from dining and shopping to active recreation. The sections below classify existing attractions located along the Waterfront Walkway by type, and offer a description of each individual attraction.

2.5.1. Parks and Recreation

Veteran's Field (Block 30, Lots 1 and 2): Veteran's Field is a public park maintained by the Borough of Edgewater. Veteran's Field allows for passive and active recreation opportunities, including ball fields, tennis courts, basketball courts, a playground, and open space for public recreation.

Edgewater Golf (Block 82, Lots 1 and 2): Edgewater Golf is a two-story golf driving range facility with a netted enclosure that provides an active recreation opportunity along the Waterfront Walkway. The facility also contains a miniature golf course, which is located adjacent to the Walkway.

Van Dohln Enterprises (Block 17, Lots 1, 2, 3.01, 3.02, and 4): Von Dohln Enterprises is a private marina that provides opportunities for citizens to launch their boats into the Hudson River.

North Hudson Yacht Club (Block 12, 6.01, 6.02, and 7): The North Hudson Yacht Club is a private marina that offers boat launch facilities for its members.

Palisades Interstate Park (Block 1, Lot 6, Block 7205, Lots 3 and 4): Palisades Interstate Park is a National Historic Landmark and is registered on the National Register of Historic Sites. It provides active and passive opportunities for recreation such as playgrounds, picnic areas, hiking trails, and public boat launch facilities.

2.5.2. Dining and Entertainment

Given the pattern of mixed-use redevelopment along the Hudson River Waterfront, there are a multitude of restaurants located along the Hudson River Waterfront Walkway and the surrounding area. Dining establishments along the waterfront range from casual eateries and chain restaurants to fine dining establishments. There are also a number of restaurants that specialize in regional cuisine, including French, Cuban and Latin, Japanese, contemporary American, Italian, and Greek culinary fare.

Entertainment options along the Walkway are limited. These include the Edgewater Multiplex Cinema and a miniature golf course at the Edgewater Golf complex. However, New York City and its myriad entertainment uses are a short ferry ride away and are easily accessible from the Walkway.

2.5.3. Shopping

City Place (Block 91, Lot 1): City Place is mixed-use regional center that contains several high end retail establishments, personal services, and a number of restaurants. City Place also contains a hotel and luxury condominiums.

Edgewater Commons (Block 84.01, Lots 1.01, 1.03, 1.04, and 1.05): Edgewater Commons is a retail shopping center containing five buildings and associated parking facilities. The shopping center includes retail stores such as Barnes & Noble, Old Navy, and Target, and also contains several restaurants and service establishments.

Mitsuwa (Block 81, Lots 1 and 2): Mitsuwa is a Asian supermarket and book store. Mitsuwa also sells sundry imported products from Japan and other parts of Asia, which makes it a unique establishment.

The Market Place (Block 70, Lots 3 and 4.02, Block 75, Lots 2.02 and 2.03, Block 76, Lot 2.01): The Market Place consists of a retail shopping center, racquet ball club, and restaurant. Additionally, the former Binghamton Restaurant is located adjacent to the site on the moored Binghamton Ferry Boat.

Edgewater Towne Center (Block 58, Lots 1 and 2): The Edgewater Towne Center is an existing shopping center that is anchored by a Whole Foods Market. It also contains several personal service establishments, including a Duane Reade Pharmacy, and restaurants.

2.6. Existing Waterfront Walkway Design

Due to its largely piecemeal development, the Hudson River Waterfront Walkway is segmented with regard to physical design and appearance. Although relatively well-connected and fundamentally identical with regard to function, the Waterfront Walkway lacks cohesion in its design that prevents the Waterfront Walkway from achieving its true aesthetic potential and establishing a sense of place.

The sections below document the existing design elements of the various segments of the Waterfront Walkway.

2.6.1. Surface and Width

The Hudson River Waterfront Walkway varies in width from 10 feet to 22 feet, with the majority of existing Waterfront Walkway segments measuring 16 feet in width. Brick pavers are the most commonly used surface material among existing Waterfront Walkway segments. However, there are a number of Waterfront Walkway segments that are surfaced with other materials, such as: wood; concrete; stone dust; and, in the Palisades Interstate Park, natural terrain.

The color scheme of the brick pavers vary in color by Waterfront Walkway segment. The majority of Waterfront Walkway segments with brick paver surfaces have implemented a color scheme consisting of red and grey unit pavers. Other Waterfront Walkway segments consist of terracotta and grey unit pavers, red and beige unit pavers, grey unit pavers, and terracotta pavers.

2.6.2. Railings

The various segments of the Hudson River Waterfront Walkway exhibit a variety of railing types. Railing types include: aqua-colored, vertically-slatted aluminum railings; split rail metallic steel railings; six-bar metallic aluminum railings; vertically-slatted railings constructed with pressure-treated lumber; wood post and dock rope railings; wood post with chain railings; and, grey vertically-slatted steel railings. Railing types vary greatly by Waterfront Walkway segment, and there are several segments that do not contain railings due to the relative distance of the Waterfront Walkway from the bank of the Hudson River.

2.6.3. Lighting Fixtures

Like railings, lighting fixture types vary greatly by Waterfront Walkway segment. The most common lighting types found along the Waterfront Walkway way are vertically suspended fixtures and acorn-style lights. Other lighting types include post lights, bollard lights, and box lights. There are several Waterfront Walkway segments that have implemented more than one lighting type, while other Waterfront Walkway segments that lack appropriate lighting.

2.6.4. Benches

There are a number of different bench types that exist along the Hudson River Waterfront Walkway. Bench types include: benches constructed with metal legs and arms and slatted wooden seats; metal benches that lack seat backs; metal benches with seat backs; slatted wooden benches with concrete legs; benches constructed solely of wood; and benches comprised of stone. Wood/metal benches are the most prevalent type of bench along the Waterfront Walkway. While benches along the Waterfront Walkway are constructed of similar materials, the design of benches along the Waterfront Walkway varies greatly.

2.6.5. Trash Receptacles

There are several different types of trash receptacles along the Waterfront Walkway. These include: round, metal trash receptacles; pillbox metal and stone aggregate trash receptacles; pillbox plastic trash receptacles; round, industrial type plastic trash receptacles; and, rectangular, residential type trash receptacles; Trash receptacles are brown, black, green, white, or grey in color. The design of the existing trash receptacles varies greatly by Waterfront Walkway segment, and there are a number Waterfront Walkway segments that do not contain trash receptacles.

In addition to traditional trash receptacles, there are a small number of specialized waste receptacles along the Waterfront Walkway. For instance, there are a number of receptacles designed for the extinguishing and disposal of cigarette butts along the Waterfront Walkway. These receptacles, known as smoker's stations, are predominantly free-standing and columnar. Smoker's stations are typically made of plastic or metal. Additionally, there are a small number of receptacles along the Waterfront Walkway that are designed specifically for the disposal of pet waste.

2.6.6. Signage

The design of existing signage along the Waterfront Walkway is perhaps the most consistent of all of the amenities present along the Waterfront Walkway. Several sign types exist along the Walkway. The most prevalent sign types are Walkway identification signs at perpendicular access points (Figures 2.6.6-1 and 2.6.6-2), small wayfinding signage along the Walkway (Figure 2.6.6-3), and signage describing hours of operation for and regulations pertaining to the Walkway (Figure 2.6.6-4).

There are several additional sign types along the Walkway, including signage indicating public and private property, signage reminding Walkway users to clean up pet waste, and signage indicating public waterfront access.

Figure 2.6.6-1

Figure 2.6.6-2

Figure 2.6.6-3

Figure 2.6.6-4

3. Bergen County's Waterfront Vision

3.1. Vision Statement

By the year 2030, through the fiscally-responsible and multi-pronged efforts of a proactive Hudson River Waterfront Walkway Entity, Bergen County's Hudson River Waterfront Walkway will be transformed from a disjointed and underused waterfront walkway to a continuous, non-motorized transportation artery and recreational amenity that is a focal point of the region.

Bergen County's Hudson River Waterfront Walkway will be both a destination and a means to a destination. With its direct connections to the Palisades Interstate Park, Hudson County's Hudson River Waterfront Walkway, the George Washington Bridge, and New York City's Westside Greenway, the Waterfront Walkway will not only provide a sustainable transportation alternative to move about Bergen County and the greater New York/New Jersey Metropolitan Area, but also facilitate access to its wealth of cultural, natural, and scenic resources.

An integral part of the community, the Waterfront Walkway will be an attractive, safe, lively and family-oriented urban park. Its unique design, which will welcome visitors of various physical abilities, protect the environment, and respect the privacy of local residents, will have been achieved through a consensus-based approach and employ a design vocabulary that results in a cohesive appearance, and a memorable Hudson River experience.

3.2. Goals, Objectives, Strategies and Actions

In order to achieve its vision, Bergen County established nine major goals for the short, medium and long-term. These goals are discussed on the following pages.

3.2.1. Goal 1

Goal 1: Identify gaps in the Hudson River Waterfront Walkway and devise a strategy to incorporate these "orphan sites" into the Plan.

The Objectives to attain Goal 1 are as follows:

» **Objective G1-1:** Ensure complete connectivity along the Hudson River Waterfront Walkway.
» **Objective G1-2:** Establish a planned alignment so that private and public property owners can incorporate this alignment into their current approvals.
» **Objective G1-3:** Guard public safety.

Indicator:	Number of orphan sites present along the Waterfront Walkway
Target:	Eliminate orphan sites present along the Waterfront Walkway
Baseline:	There are currently 13 orphan sites along the Waterfront Walkway

Indicator:	Length of completed walkway
Target:	4.8 miles of completed walkway
Baseline:	As of April 2010, approximately 2.8 miles of walkway is complete

The Strategies to achieve Goal 1 are as follows:

» **Strategy G1-A:** Complete the gaps that currently exist along the Waterfront Walkway, namely: I-Park Edgewater (Edgewater; Block 99, Lots 1, 3, 4 and 5); 115 River Road (Edgewater; Block 96, Lots 3.01 and 4.01); Quantas Resources (Edgewater; Block 95, Lot 1); MJM Waterfront Developers (Edgewater; Block 85.01, Lot 3.03); Hess Oil and Chemical Corp. (Edgewater; Block 76, Lot 5); Admiral's Walk (Edgewater; Block 33, Lots 1N, 1S, and 2); Waterside (Edgewater; Block 33, Lots 1.02 and 1.03); Veteran's Field (Edgewater; Block 30, Lots 1 and 2); Le Jardin (Edgewater; Block 22, Lots 1 and 4); The Moorings (Edgewater; Block 18, Lot 1.05); Von Dohln Enterprises (Edgewater; Block 17, Lots 1, 2, 3.01, 3.02 and 4); North Hudson Yacht Club (Edgewater; Block 12, Lots 6.01, 6.02 and 7); Edgewater Colony (Edgewater, Block 1, Lots 1 and 7).
» **Strategy G1-B:** Work with public and private owners to update current approvals.

The Actions that should be implemented to achieve Goal 1 are as follows:

» **Action G1-1:** Advise NJDEP and municipal Planning Boards of proposed alignments and design guidelines contained in Section 4.10 of this Plan. Work with these entities to reference this plan in their approvals.
» **Action G1-2:** Work with the Borough of Edgewater to update their Land Use Ordinances to comply with the Design Guidelines and alignments of this Plan.
» **Action G1-3:** Meet with the Borough of Edgewater and NJDEP to discuss the NJDEP approved alignments and cross sections for Waterfront Walkway segments at I-Park and Veterans field. Work with the Borough to update these alignments, cross sections, surface and design amenities to comply with this Plan.
» **Action G1-4:** Meet with the current owners of the lot containing Le Jardin, and the owner of the lot containing the Moorings, as well as NJDEP to discuss the upgrading these alignments, cross sections, surface and design amenities to comply with this Plan.
» **Action G1-5:** Work with property owners to close the gaps listed in Section 2.3.1 and upgrade cross-sections.

3.2.2. Goal 2

Goal 2: Revitalize the waterfront by attracting visitors to a well-designed and accessible open space amenity and Waterfront Walkway along the Hudson River waterfront with a variety of activities, dynamic features and experiences.

The Objectives to attain Goal 2 are as follows:

» **Objective G2-1:** Ensure high-quality urban landscape design along the Waterfront Walkway.
» **Objective G2-2:** Develop a favorable business climate.
» **Objective G2-3:** Attract first-time visitors to the Waterfront Walkway.
» **Objective G2-4:** Provide accommodations for social and cultural events along the Waterfront Walkway.

Indicator:	Length of the Waterfront Walkway designed in accordance with Figure 4.1.1-4
Target:	Entire length of Waterfront Walkway
Baseline:	Zero (0) linear feet

The Strategies to achieve Goal 2 are as follows:

» **Strategy G2-A:** Implement the design standards contained in this Plan.
» **Strategy G2-B:** Create a Business Improvement District or Special Improvement District.
» **Strategy G2-C:** Hold festivals and cultural events along the Waterfront Walkway.
» **Strategy G2-D:** Develop picnic areas and spaces for performances and public events.

These Actions are as follows:

» **Action G2-1:** Adopt the design standards contained in Section 4.1 of this Plan as the regulating standards of any entity (as discussed in Section 2.3.7) formed subsequent to the adoption of this Plan, and at the municipal level.
» **Action G2-2:** Investigation the feasibility of, and act on, the creation of a Business Improvement District or Special Improvement District.
» **Action G2-3:** Plan, advertise, and hold public festivals and cultural events along the Waterfront Walkway.
» **Action G2-4:** Construct a stage at I-Park (Edgewater; Block 99, Lots 1, 3, 4 and 5).

3.2.3. Goal 3

Goal 3: Provide opportunities for people to enjoy and appreciate the natural and cultural resources of the Hudson River.

The Objectives to attain Goal 3 are as follows:

» **Objective G3-1:** Provide parking for the Waterfront Walkway users
» **Objective G3-2:** Provide opportunities for active interaction with the natural environment.
» **Objective G3-3:** Encourage awareness of local cultural resources.

Indicator:	Length of Waterfront Walkway designed in accordance with Figure 4.1.1-4
Target:	Entire length of Waterfront Walkway
Baseline:	Zero (0) linear feet

The Strategies to achieve Goal 3 are as follows:

» **Strategy G3-A:** Provide additional parking for Waterfront Walkway users.
» **Strategy G3-B:** Provide opportunities for boating and other unique experiences.
» **Strategy G3-C:** Provide interpretive signage at historic sites and key viewpoints along the Hudson.

The Actions that should be implemented to achieve Goal 3 are as follows:

» **Action G3-1:** Work with property owners to locate and sign designated Waterfront Walkway parking at the following locations: eight (8) parking stalls at I-Park (Edgewater; Block 99, Lots 1, 3, 4 and 5), a minimum of ten (10) parking stalls at Edgewater Multiplex Cinema (Block 91, Lot 2),a minimum of ten (10) parking stalls at Edgewater Commons (Block 84.01, Lot 1.01, 1.03, 1.04, and 1.05), eight (8) parking stalls at Edgewater Town Center (Block 58, Lots 1 and 2), five (5) stalls at the Borough of Edgewater Municipal lot (Block 53, Lots 1 and 2.02), and ten (10) parking stalls at Veterans Field (Edgewater; Block 30, Lots 1 and 3).
» **Action G3-2:** Locate kayak rentals on the Quantas Resources site (Edgewater; Block 95, Lot 1). Provide a boat ramp and spray ground on the Veteran's Field site (Edgewater; Block 30, Lots 1 and 2). Locate a fishing pier at I-Park (Edgewater; Block 99, Lots 1, 3, 4 and 5).
» **Action G3-3:** Place a monument at the former site of the Ford Motor Company Edgewater Assemble Plant (Edgewater; Block 85.01). Provide signage at other historic sites and attractions identified in Section 2 of this Plan.

3.2.4. Goal 4

Goal 4: Link the Waterfront Walkway into the community fabric by creating inviting, easy, and pleasant perpendicular access points and entries to and from the Waterfront Walkway, including safe unobstructed access for emergency vehicles.

The Objectives to attain Goal 4 are as follows:

- **Objective G4-1:** Facilitate access to the Waterfront Walkway.
- **Objective G4-2:** Enhance access to the Waterfront Walkway.
- **Objective G4-3:** Provide access for emergency vehicles and a variety of users.
- **Objective G4-4:** Enable users of all abilities to access the Walkway.
- **Objective G4-5:** Develop perpendicular access points as shown in Figure 4.4-2, which allows for a variety of users, including pedestrians and bicyclists and also provides a means of access for emergency vehicles.
- **Objective G4-6:** Comply with all applicable regulations for the Americans with Disabilities Act.

Indicator:	Number of perpendicular access points
Target:	Provide a total of 13 perpendicular access points within ten years of the adoption of this Plan
Baseline:	As of February 2010, there were eight perpendicular access points

The Strategies to achieve Goal 4 are as follows:

- **Strategy G4-A:** Increase the number of perpendicular access points to the Waterfront Walkway.
- **Strategy G4-B:** Upgrade the quality, function, and design of perpendicular access points to the Waterfront Walkway.
- **Strategy G4-C:** Develop hard-surface, multi-use perpendicular access points at a width that is sufficient for emergency vehicles.
- **Strategy G4-D:** Design the Walkway in accordance with the principles of barrier-free design.

The Actions that should be implemented to achieve Goal 4 are as follows:

- **Action G4-1:** Work with property owners to construct perpendicular access points at the Mitsuwa (Edgewater; Block 18, Lots 1 and 2); I-Park (Edgewater; Block 99, Lots 1, 3, 4 and 5); Marketplace (Edgewater; Block 70, Lots 3 and 4.02; Block 76, Lots 2.01); Veteran's Field (Edgewater; Block 30, Lots 1 and 2); and Le Jardin (Edgewater; Block 22, Lots 1 and 4) sites.
- **Action G4-2:** In accordance with Section 4.2 of this Plan, work with property owners to enhance the perpendicular access points at City Place (Edgewater; Block 91, Lot 1); Edgewater Multiplex Cinema (Edgewater; Block 91, Lot 2); Edgewater Golf (Edgewater; Block 82, Lots 1 and 2); Edgewater Town Center (Edgewater; Block 58, Lots 1and 2); Edgewater Marina (Edgewater; Block 38, Lots 1, 2, and 2.01); Hudson Cove (Edgewater; Block 25, Lots 2.01-23.7), Vela Townhomes (Edgewater; Block 13, Lots 1, 2.01, 2.02, 4, 5 an 5.01); and the Edgewater Colony (Edgewater; Block 1, Lots 1 and 7) sites.
- **Action G4-3:** Work with the owner of the Le Jardin property and NJDEP to provide a ramp to Hudson Cove when the walkway on this property is constructed.

» **Action G4-4:** Work with the owner of the Market Place property and NJDEP to provide a ramp to the Boardwalk behind Marketplace.

3.2.5. Goal 5

Goal 5: Integrate smart growth decision principles into the Waterfront Walkway Plan.

The Objectives to attain Goal 5 are as follows:

» **Objective G5-1:** Encourage public transit ridership.
» **Objective G5-2:** Reduce automobile trips originating from the area along the Waterfront Walkway.
» **Objective G5-3:** Encourage bicycling and pedestrianism.

Indicator:	Length of Waterfront Walkway designed in accordance with Figure 4.1.1-4
Target:	Entire length of Waterfront Walkway
Baseline:	Zero (0) linear feet

The Strategies to achieve Goal 5 are as follows:

» **Strategy G5-A:** Increase and enhance public transportation connections along the Walkway.
» **Strategy G5-B:** Ensure that the Waterfront Walkway is easily accessible and well-designed for its entire length.
» **Strategy G5-C:** Ensure that the Waterfront Walkway is not just a destination, but also a means to a destination.

The Actions that should be implemented to achieve Goal 5 are as follows:

» **Action G5-1:** Provide public transportation linkages at perpendicular access points and enhance the Walkway's connection to the Edgewater Ferry Terminal. Provide wayfinding signage leading to public transportation connections from the Walkway.
» **Action G5-2:** Advise NJDEP and municipal Planning Boards of proposed cross section that includes bike lanes contained in Section 4.10 of this Plan. Work with these entities to reference this cross section in their approvals.
» **Action G5-3:** Work with the Borough of Edgewater to update their Land Use Ordinances to comply with the perpendicular access (Figure 4.2-2) and Waterfront Walkway (Figure 4.1.1-4) cross-sections of this Plan.
» **Action G5-4:** Meet with the Borough of Edgewater and NJDEP to discuss the NJDEP approved cross-sections for Waterfront Walkway segments at I-Park and Veterans field. Work with the Borough to update these cross sections to comply with the perpendicular access (Figure 4.2-2) and Waterfront Walkway (Figure 4.1.1-4) cross-sections of this Plan.
» **Action G5-5:** Meet with the current owners of the lot containing Le Jardin, and the owner of the lot containing the Moorings, as well as NJDEP to discuss updating the cross sections to comply with the perpendicular access (Figure 4.2-2) and Waterfront Walkway (Figure 4.1.1-4) cross-sections of this Plan.
» **Action G5-6:** Provide wayfinding signage leading to local providers of goods and services along the Walkway, and connections to regional bicycle paths and networks.
» **Action G5-7:** Encourage activity along the walkway by requiring new construction to be designed in such a way that the walkway-facing façades encourage activity and function in a manner that is similar to that of the street-facing façades.

3.2.6. Goal 6

Goal 6: Utilize the Hudson River Waterfront Walkway as a means of promoting environmental stewardship, natural resource protection, and historic preservation along the Hudson River Waterfront.

The Objectives to attain Goal 6 are as follows:

» **Objective G6-1:** Preserve the Hudson River Waterfront.
» **Objective G6-2:** Increase awareness of local historic resources.
» **Objective G6-3:** Develop an appreciation for the Hudson as an environmental resource.
» **Objective G6-4:** Ensure proper management of lands along the Hudson River Waterfront.

Indicator:	Number of interpretative signs related to the environment and historic sites
Target:	Provide a minimum of six additional interpretative signs, including one sign for each of the following: Palisades Interstate Park, Ford Motor Company Edgewater Assembly Plant, George Washington Bridge; Riverside Church, General Grant National Memorial, and the Hudson River Ecosystem
Baseline:	In February 2010 there were two such signs, they identified the Bourdette's Landing and Binghamton Ferry historic sites

The Strategies to achieve Goal 6 are as follows:

» **Strategy G6-A:** Require conservation easements for the Waterfront Walkway.
» **Strategy G6-B:** Provide interpretive signage at historic sites and key viewpoints along the Hudson.
» **Strategy G6-C:** Provide opportunities for visitors to actively interact and interface with the Hudson.
» **Strategy G6-D:** Create a single entity that is responsible for the management of lands along the Walkway.
» **Strategy G6-E:** Develop and place environmentally-themed interpretive signage at key points along the Waterfront Walkway.

The Actions that should be implemented to achieve Goal 6 are as follows:

» **Action G6-1:**Require, as a condition of approval to any site plan application, that a conservation easement be in place upon the subject property. To the greatest extent possible, seek donations of such easements.
» **Action G6-2:**Place a monument at the former site of the Ford Motor Company Edgewater Assembly Plant (Edgewater; Block 85.01). Provide signage at other historic sites and attractions identified in Section 2 of this Plan.
» **Action G6-3:**Locate kayak rentals on the Quantas Resources site (Edgewater; Block 95, Lot 1) once remediation is complete. Provide a boat ramp and spray ground on the Veteran's Field site (Edgewater; Block 30, Lots 1 and 2). Locate fishing piers at I-Park (Edgewater; Block 99, Lots 1, 3, 4 and 5) and Edgewater Commons (Block 84.01, Lots 1.01, 1.03, 1.04, and 1.05). Locate a fishing area, sandy beach area, and kayak rentals, on Palisade Interstate Park.
» **Action G6-4:**Implement the objectives, strategies, and actions of Goal 7, which are provided in Section 3.2.7 of this Plan.
» **Action G6-5:**Place signage related to various environmental themes along the Hudson River. Potential themes include: information on local species; successes in habitat restoration and environmental cleanup of the area; a diagram of the food chain on a local basis; and, on a broader note, environmental concepts, such as global warming, and how it could potentially impact the area.

3.2.7. Goal 7

Goal 7: Create a single public, private, or quasi-public entity responsible for oversight, maintenance, and implementation to act as the Controller of the Waterfront Walkway.

The Objectives to attain Goal 7 are as follows:

- **Objective G7-1:** Establish a single entity to oversee the property dedications and redevelopment of the Waterfront Walkway through Bergen County and Hudson County.
- **Objective G7-2:** Provide reliable security along the Waterfront Walkway by a single entity.
- **Objective G7-3:** Eliminate the burden of maintenance to private property owners by transitioning maintenance responsibility of the Waterfront Walkway to a single entity.
- **Objective G7-4:** Establish perpetual funding sources that will enable a single entity to afford maintenance, security, and to fund capital improvement projects to complete Waterfront Walkway construction.
- **Objective G7-5:** Expedite remediation efforts and environmental clean-up along waterfront properties, including dredging, by providing a single entity that can obtain permits, enter into financing agreements, and oversee remediation.

Indicator:	Establishment of entity
Target:	Establish entity by the end of February 2015
Baseline:	As of February 2010, no entity has been established

The Strategies to achieve Goal 7 are as follows:

- **Strategy G7-A:** Achieve a cohesive Waterfront Walkway that is consistent in multiple ways, including design guidelines, maintenance, and security.
- **Strategy G7-B:** Minimize the number of agencies overseeing future Waterfront Walkway locations, guidelines, and amenities, so that developers of the Waterfront Walkway have a single agency providing direction.
- **Strategy G7-C:** Create an entity that has legal authority, proper funding, manpower, and equipment to fulfill its responsibilities.
- **Strategy G7-D:** Transfer oversight, maintenance, and security to a single entity, so that there is a greater appreciation of the Waterfront Walkway by abutting property owners, rather then these properties harboring feelings of resentment towards the Waterfront Walkway.
- **Strategy G7-E:** Fully understand funding needs and funding sources.

The Actions that should be implemented to achieve Goal 7 are as follows:

- **Action G7-1:**Establish the Waterfront Walkway extents that the single public, private, or quasi-public entity will govern (i.e., Bergen County waterfront, or entire New Jersey Hudson River waterfront).
- **Action G7-2:**Identify the potential partners and their roles in the single public, private, or quasi-public entity. These partners may include NJDEP, Bergen County, Hudson County, Palisades Interstate Park, and the various municipalities along the New Jersey Hudson River Waterfront. If the entity will only control the Bergen County portion of the Hudson River Waterfront Walkway, then Edgewater and Fort Lee may be potential partners on the municipal level.

» **Action G7-3:** The agencies that currently oversee future Waterfront Walkway locations, guidelines, and amenities are Bergen County, the Borough of Edgewater, NJDEP, Army Corps of Engineers, and the Hudson River Waterfront Conservancy. Identify the elements that these agencies currently review, and the deliverable that these agencies provide to Waterfront Walkway developers (i.e., permit, resolution, letter of approval, etc.). Determine which Ordinances, statutes, and regulations need to be revised to transition oversight to a single entity.

» **Action G7-4:** Based on the jurisdiction, partners, and deliverables required, work with County Counsel to determine the type of entity that could provide the required functions. The options for the entity could include:
- New Jersey Hudson River Waterfront Walkway Redevelopment Authority created by an act of the County Freeholders
- Public Partnership created by legal agreement
- Private Partnership created by legal agreement
- An entity within the State or County Park System governed by a Board of Commissioners appointed by either the Governor or the County Executive, respectively
- Hudson River Waterfront Commission created by an act of legislature
- Bergen County Improvement Authority (BCIA)

» **Action G7-5:** Meet with County Counsel to determine whether Waterfront Walkway lands, public access, and parking should be under entity ownership, lease with private property owners, or held within conservation/access easements.

» **Action G7-6:** Meet with County Counsel and private/public property owners to establish a means of potentially turning over lands, oversight, maintenance, and security to the entity (i.e., dedications, easements, Homeowners Association approvals, etc.)

» **Action G7-7:** Produce a Police study. At a minimum the study should:
- Identify baseline security measures that are in place along the Waterfront Walkway by private property owners, local police departments, and park systems
- Determine security needs and costs
- Review required manpower, surveillance, hours of operation, legal requirements, financing, and equipment including police boats, police bikes, and police vehicles

» **Action G7-8:** Prepare an operation and maintenance manual for the Waterfront Walkway. The manual should:
- Be developed by meeting with private property owners, municipalities, and park systems to determine current maintenance activities and annual costs, and current shortfalls in maintenance
- Review ADA requirements
- Review proposed amenities and landscaping within gap sites, and existing Waterfront Walkway segments and establish necessary maintenance
- Review required manpower, hours of operation, legal requirements, financing, and equipment

» **Action G7-9:** Compile operation, maintenance, security, lease/acquisition, and capital improvement costs, plus consultant, legal, permitting, and staffing fees. Compile committed funding sources, and review opportunities for new funding, which could include:
- Creation of a Transportation Enhancement District (similar to what the Meadowland Commissions enacted) to assess fees on existing and future high traffic generating properties
- State Funding Commitment
- County Funding Commitment (by referendum, tax, open space)
- Municipal Funding Commitment (by referendum, tax, open space)
- Creation of Business Improvement Districts that would fund the Waterfront Walkway
- Grants (see Section 3.3.4 for a listing)

- If 30-feet is dedicated to the entity along entire waterfront of Hudson and Bergen County, plus land needed for public access areas, parking areas, and docks, the entity could explore opportunities for lease agreements on acquired property where uses encroach on the land, or where businesses seek to use a portion of the land for private business, such as outdoor cafes, ferries, marine terminals, port uses, yacht clubs, and concessions. These leases would fund the entity and also encourage some properties to eliminate the encroachment. Other uses would perpetually need to lease the land for their use (i.e., port uses, terminals, ferries) and would be a perpetual source of funding for the entity. Properties would have incentives to dedicate the 30-feet to the entity. These incentives to property owners could include reduced tax burden, tax rebates, eliminated operation and maintenance costs, eliminated maintenance cost, and eliminated security costs, while still having the benefits of a waterfront location.

» **Action G7-10:** Compile a list of superfund sites along the Waterfront Walkway and areas in need of dredging. Meet with the Army Corps of Engineers and NJDEP and County Counsel to establish an agreement for the entity to perform the work using State and Federal funds.

» **Action G7-11:** The County should develop a Memorandum of Agreement (MOA) with the municipalities, property owners, and agencies involved relative to the creation of the entity and the ownership of the land.

3.2.8. Goal 8

Goal 8: Create thorough communication relative to the Waterfront Walkway, which includes wayfinding signage, branding of the Waterfront Walkway, and a public Education initiative.

The Objectives to attain Goal 8 are as follows:

» **Objective G8-1:** Establish an identity for the Waterfront Walkway.
» **Objective G8-2:** Provide directional orientation for Walkway visitors.
» **Objective G8-3:** Increase awareness of local historic and cultural resources.
» **Objective G8-4:** Provide for a greater understanding of the Hudson River as a complex and dynamic ecosystem.

Indicator:	Number of interpretive signs related to the environment and historic sites
Target:	Provide a minimum of six additional interpretative signs, including one sign for each of the following: Palisades Interstate Park; Ford Motor Company Edgewater Assembly Plant; George Washington Bridge; Riverside Church; General Grant National Memorial; and the Hudson River Ecosystem
Baseline:	In February 2010 there were two such permanent signs. They identified the Bourdette's Landing and Binghamton Ferry historic site

The Strategies to achieve Goal 8 are as follows:

» **Strategy G8-A:** Actively engage local artists and in the development of a branding scheme for the Walkway.
» **Strategy G8-B:** Provide wayfinding signage leading to public transportation connections, and local providers of goods and services.
» **Strategy G8-C:** Provide interpretive signage at historic sites and key viewpoints along the Hudson.
» **Strategy G8-D:** Develop and place environmentally-themed interpretive signage at key points along the Waterfront Walkway.

The Actions that should be implemented to achieve Goal 8 are as follows:

» **Action G8-1:** Plan, advertise, and execute a special competition to develop a branding scheme and graphic identity for the walkway. A panel of judges for this competition should be drawn from municipal officials and local residents.
» **Action G8-2:** Detail the benefits of wayfinding signage and seek assistance from NJ Transit, New York Waterway, and local business owners in the development and funding of such signage along the Hudson River Waterfront Walkway.
» **Action G8-3:** Place a monument at the former site of the Ford Motor Company Edgewater Assemble Plant (Edgewater; Block 85.01) Provide signage at other historic sites and attractions identified in Section 2 of this Plan.
» **Action G8-4:** Place signage related to various environmental themes along the Hudson River. Potential themes include: information on local species; successes in habitat restoration and environmental cleanup of the area; a diagram of the food chain on a local basis; and, on a broader note, environmental concepts, such as global warming, and how it could potentially impact the area. As a cost savings measure, consider the location of such signage with wayfinding signage.
» **Action G8-5:** At the entry to each perpendicular access, a Hudson River Waterfront Walkway sign shall be provided on the passive recreation side of the Walkway, as indicated on Figure 4.2-2.
» **Action G8-6:** A site map sign shall be located at each intersection of each perpendicular access and the walkway.
» **Action G8-7:** A "Welcome to Bergen County" sign, with the opposite side thanking visitors for coming, shall be located at the County line on the Walkway.

3.2.9. Goal 9

Goal 9: Create an ethic of conduct for the Waterfront Walkway and create Waterfront Walkway rules.

The Objectives to attain Goal 9 are as follows:

» **Objective G9-1:** Maintain safety and order along the Waterfront Walkway.
» **Objective G9-2:** Ensure cooperation of private property owners.
» **Objective G9-3:** Educate visitors on Walkway rules and regulations.

Indicator:	Annual number of citations issued in the area of the Waterfront Walkway, divided by the amount of linear feet of completed walkway
Target:	Reduction over baseline conditions
Baseline:	To be determined (information requested from Edgewater Police Department)

The Strategies to achieve Goal 9 are as follows:

» **Strategy G9-A:** Protect the healthy, safety, and welfare of local residents and Walkway visitors by developing a code of conduct that applies to the Waterfront Walkway.
» **Strategy G9-B:** Effectuate an enhanced Public Trust Doctrine within the regulated area of Bergen County's Hudson River Waterfront Walkway.
» **Strategy G9-C:** Provide signage detailing Walkway rules at perpendicular access points and entrances.

The Actions that should be implemented to achieve Goal 9 are as follows:

» **Action G9-1:** Develop a code of conduct governing walkway use. As appropriate, adopt ordinances/resolutions making such code of conduct enforceable.
» **Action G9-2:** Investigate the feasibility of the expansion of the Public Trust Doctrine to include areas above the mean high water line of the Hudson River. Based on the results of this study, develop a set of best practices to effectuate the expansion.
» **Action G9-3:** Provide signage with notice of Walkway rules and regulations at access points and entrances. Such signage should be clear and concise, plainly visible, and shall have a positive appearance and tone so as not to be unwelcoming.

3.3. Action Plan

The Actions that are contained in the Waterfront Walkway Plan are derived from the Goals, Objectives and Strategies. The Actions consist of projects and policies that are designed to support achievement of the goal.

An Action Plan Matrix is provided in Subsection 3.3.5. This Action Plan Matrix provides estimated costs, potential implementing agency and potential funding sources. It should be noted that for each action that is a capital investment, the ranges of costs pertain to administrative, design, construction, and/or inspection costs. For capital projects, the ranges of costs exclude operating and maintenance costs. Operating and maintenance costs are significant factors in assessing project feasibility and a viable operating and maintenance funding plan is an essential component of project advancement.

3.3.1. Timeframes

Timeframes are identified for each Action as short-term, medium-term, and long-term and represent the following timeframes:

- Short-Term: within the next 5 years; 2010-2015
- Medium-Term: within the next 5 to 10 years; 2015-2020
- Long-Term: greater than 10 years; 2020 - Beyond

It should be noted that some Actions may have activities and phases that may continue through more than one time period, therefore, the timeframe indicated represents the completion date of the respective Action. In identifying the timeframes for short, medium and long-term Actions, the implementing agencies were taken into account. For example, fewer agencies involved in implementation may result in more flexibility or efficiency.

3.3.2. Lead Implementing Agency

The Action Plan Matrix identifies one or more potential lead agencies for each Action. It is important to note that this document does not commit an outside agency to implementing or funding a specific Action. The identified potential lead implementation agency is the agency that would likely lead the Action through implementation.

3.3.3. Estimated Costs

To provide an order of magnitude cost for each Action, ranges of costs were identified. The ranges of costs pertain to administrative, legal, design, construction, and/or inspection costs. The ranges of costs exclude operating and maintenance costs, as those costs have not been analyzed for any of the projects within the matrix. The costs ranges were established as indicated below:

Code	Group	Range
TBD	To Be Determined	To be Determined
VL	Very Low	Under $100,000
L	Low	$100,000 - $500,000
M	Medium	$500,000 - $750,000
H	High	$750,000 - $1,250,000
VH	Very High	$1,250,000 or higher

3.3.4. Potential Funding Sources

There is a range of external funding opportunities that may be tapped to implement the Hudson River Waterfront Walkway Design and Implementation Strategy Plan. These opportunities, which include competitive grants and loans, are outlined in the following subsections.

New Jersey Department of Transportation (NJDOT)

- **County Aid Program:** County Aid Program funds are appropriated by the Legislature on an annual basis. While the program is primarily focused on public roads and bridges, it does fund public and other transportation projects under County jurisdiction. Given the Waterfront Walkway's potential to facilitate connections to public surface- and water-based transportation systems, there may be some potential to receive funds from the County Aid Program.
- **Local Aid Infrastructure Fund Program:** Subject to funding appropriation, a Local Aid Infrastructure Fund is established to address regional needs throughout the State. Any county or municipality may apply at any time, but projects are approved at the discretion of the Commissioner of Transportation. Under this program, a county or municipality may apply for funding for pedestrian safety and bikeway projects; the Hudson River Waterfront Walkway addresses both of these issues.
- **Bikeway Program:** The New Jersey Department of Transportation's Bikeway Grant Program provides funds to counties and municipalities to promote bicycling as an alternate mode of transportation in New Jersey. A primary objective of the Bikeway Grant Program is to support the State's goal of constructing 1,000 new miles of dedicated bike paths. In an effort to establish regionally connected bicycle networks, this program is available to every municipality and county throughout New Jersey.
- **Safe Routes to School Program:** Safe Routes to School (SRTS) is a federal, state and local effort to enable and encourage children, including those with disabilities, to walk and bicycle to school - and to make walking and bicycling to school safe and appealing. Given the Waterfront Walkway's proximity to primary and middle schools, there may be some potential to secure funds from this program.
- **Transportation Enhancements Program:** The Transportation Enhancements Program provides generous grants for a range of projects, including the provision of facilities for pedestrians and bicycles.

New Jersey Department of Environmental Protection (NJDEP)

» **Green Acres Program:** Green Acres funding provides for the acquisition of land and the construction of parks throughout the State.
» **Office of Natural Lands Management Grants:** The Office of Natural Lands Management of the NJDEP's Division of Parks and Forestry also funds trail development by means of an annual grant program, which typically provides up to $25,000 exclusively for non-motorized trail development and facilities.

North Jersey Transportation Planning Authority (NJTPA)

The North Jersey Transportation Planning Authority (NJTPA) serves as a channel for monies earmarked for projects and programs to rebuild, improve, and maintain transportation networks in Bergen County and other counties in its jurisdiction. To be eligible for funds, proposed projects must be included in the Transportation Improvement Program (TIP).

The NJTPA's TIP is the final step in a multi-step project development and implementation process. This process is known as the "Project Pipeline" and includes three components:

1. **Project Identification:** The NJTPA's Regional Transportation Plan establishes a vision and agenda for improving transportation within the jurisdiction of the NJTPA.
2. **Project Development and Prioritization:** Concepts are developed, feasibility is assessed, and projects are engineered. Projects are prioritized on the basis of how well they fulfill the goals of the RTP, as well as feasibility of project delivery, funding availability, and project timing.
3. **TIP:** Projects are selected for inclusion in the TIP on the basis of priority, and federally-mandated conformance with clean air standards. A draft TIP is prepared and made available for public comment before it is finalized.

After the TIP is adopted, it is included as part of the State Transportation Improvement Program (STIP), which is certified by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) of the US Department of Transportation (USDOT). The TIP is adopted every four years, but there are provisions for amendments and modifications. The current TIP is valid for FY 2010-2013, and lists more than $10 billion in State- and Federally-funded investments.

The TIP has funded waterfront walkways and pedestrian mobility improvements.

Federal Funds

» **SAFETEA-LU:** Historically, Federal funds have been used to construct walkways similar to the one envisioned by this Plan. These funds were channeled to the local level by various acts of Congress, namely: the Intermodal Surface Transportation Efficiency Act (ISTEA); the Transportation Equity Act for the 21st Century (TEA-21); and, most recently, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). ISTEA and TEA-21 have, however, expired.

The latest act, SAFETEA-LU, expired on September 30, 2009. On December 16, 2009, the House of Representatives passed the Jobs for Main Street Act, which, among other actions, authorized an extension of SAFETEA-LU to September 30, 2010. SAFETEA-LU was then extended through the end of 2010 as part of the Hiring Incentives to Restore Employment Act, which was signed into Law by President Obama on March 18, 2010.

As of June 22, 2010, the no further actions to extend SAFETEA-LU have been taken. However, it is anticipated that, at some point, and in some form, new legislation continuing the Federal Government's past record of providing monies for transportation investments will be passed. It is, therefore, critical to monitor transportation-related legislation within the Congress so that new funding opportunities may be identified as they arise.

» **Sustainable Communities Grant Program:** In 2010, the federal Department of Human and Urban Development (HUD) began its Sustainable Communities Grant Program. The goal of this program is to support multi-jurisdictional regional planning efforts that integrate housing, economic development, and transportation decision making in a manner that empowers jurisdictions to consider the interdependent challenges of economic growth, social equity, and environmental impact simultaneously.

There are three funding categories in this program, namely:

- Funding to support the preparation of regional plans for sustainable development that address housing, economic development, and environmental quality in an integrated fashion where such plans to not currently exist;
- Funding to support the preparation of more detailed execution plans and programs to implement existing regional sustainable development plans that address housing, economic development, transportation, and environmental quality in an integrated fashion; and,
- Implementation funding to support regions that have regional sustainable development plans and implementation strategies in place and need support for a catalytic project or program that demonstrates commitment to and implementation of the broader plan.

It is noted that if such a plan for sustainable development were developed, it may be possible to garner funds from the Sustainable Communities Grant Program under funding categories nos. 2 and 3 for the implementation of this plan.

It is further noted that although this program was first launched in 2010, HUD has asked Congress for $150 million for this program in its 2011 budget request.

3.3.5. Action Plan Matrix

The action plan matrix provided below lists the Actions and identifies the Goal or Goals it supports. Additionally, the matrix indicates short-term, medium-term, and long-term timeframes, the potential lead agency responsible for implementation, potential funding sources, and the ranges of costs. As previously stated, the ranges of costs for capital projects exclude operating and maintenance costs, as these costs have not been analyzed for any of the projects within the matrix.

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G1-1	Advise NJDEP and municipal Planning Boards of proposed alignments and design guidelines contained in Section 4.10 of this Plan. Work with these entities to reference this plan in their approvals.	Short-Term	VL	Bergen County Department of Planning and Economic Development	Bergen County
G1-2	Work with the Borough of Edgewater to update their Land Use Ordinances to comply with the Design Guidelines and alignments of this Plan.	Short-Term	VL	Bergen County Department of Planning and Economic Development	Bergen County
G1-3	Meet with the Borough of Edgewater and NJDEP to discuss the NJDEP approved alignments and cross sections for Waterfront Walkway segments at I-Park and Veterans field. Work with the Borough to update these alignments, cross sections, surface and design amenities to comply with this Plan.	Short-Term	VL	Bergen County Department of Planning and Economic Development	Bergen County and Borough of Edgewater
G1-4	Meet with the current owners of the lot containing Le Jardin, and the owner of the lot containing the Moorings, as well as NJDEP to discuss the upgrading these alignments, cross sections, surface and design amenities to comply with this Plan.	Short-Term	VL	Bergen County Department of Planning and Economic Development	Bergen County and Private Capital

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G1-5	Work with property owners to close the gaps listed in Section 2.3.1 and upgrade cross-sections.	Medium-Term	VH	Future Entity Created; Bergen County Department of Planning and Economic Development and Private Owners	NJDOT; NJDEP; Private Capital; Borough of Edgewater; Bergen County
G2-1	Adopt the design standards contained as Section 4.1 of this Plan as the regulating standards of any entity (as discussed in Section 2.3.7) formed subsequent to the adoption of this Plan, and at the municipal level.	Short-Term	VL	Future Entity Created; Borough of Edgewater; Borough of Fort Lee; Palisades Interstate Park Commission	Municipalities; Bergen County and State (PIP)
G2-2	Investigate the feasibility of, and act on, the creation of a Business Improvement District or Special Improvement District.	Medium-Term	L	Future Entity Created; Borough of Edgewater; Bergen County Department of Planning and Economic Development	Local Business Owners; Borough of Edgewater;
G2-3	Plan, advertise, and hold public festivals and cultural events along the Waterfront Walkway.	Short-Term	L	Future Entity Created; Borough of Edgewater; Bergen County Department of Planning and Economic Development	County General Operating Budget
G2-4	Construct a stage at I-Park (Edgewater; Block 99, Lots 1, 3, 4, and 5).	Short-Term	H	Borough of Edgewater	Borough of Edgewater; NJDEP

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G3-1	Work with property owners to locate and sign designated Waterfront Walkway parking at the following locations: eight (8) parking stalls at I-Park (Edgewater; Block 99, Lots 1, 3, 4 and 5), a minimum of ten (10) parking stalls at Edgewater Multiplex Cinema (Block 91, Lot 2),a minimum of ten (10) parking stalls at Edgewater Commons (Block 84.01, Lot 1.01, 1.03, 1.04, and 1.05), eight (8) parking stalls at Edgewater Town Center (Block 58, Lots 1 and 2), five (5) stalls at the Borough of Edgewater Municipal lot (Block 53, Lots 1 and 2.02), and ten (10) parking stalls at Veterans Field (Edgewater; Block 30, Lots 1 and 3).	Short-Term	VL	Future Entity Created; Bergen County	Entity Funding (See Action Plan G7-9); Bergen County; Private Capital; NJDEP
G3-2	Locate kayak rentals on the Quantas Resources site (Edgewater; Block 95, Lot 1). Provide a boat ramp and spray ground on the Veteran's Field site (Edgewater; Block 30, Lots 1 and 2). Locate a fishing pier at I-Park (Edgewater; Block 99, Lots 1, 3, 4 and 5).	Medium-Term	M	Future Entity Created; Borough of Edgewater	Entity Funding (See Action Plan G7-9); Private Capital; NJDEP; Borough of Edgewater
G3-3	Place a monument at the former site of the Ford Motor Company Edgewater Assemble Plant (Edgewater; Block 85.01). Provide signage at other historic sites and attractions identified in Section 2 of this Plan.	Short-Term	VL	Future Entity Created; Borough of Edgewater	Private Capital; NJDEP; NJ Historic Trust

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G4-1	Work with property owners to construct perpendicular access points at the Mitsuwa (Edgewater; Block 81, Lots 1 and 2), I-Park (Edgewater; Block 99, Lots 1, 3, 4, and 5), Marketplace (Edgewater; Block 70, Lots 3 and 4.02, Block 75, Lots 2.02 and 2.03, Block 76, Lot 2.01), Veteran's Field (Edgewater; Block 30, Lots 1 and 2), and Le Jardin (Edgewater; Block 22, Lots 1 and 4) sites.	Medium-Term	VH	Future Entity Created; Borough of Edgewater	Entity Funding (See Action Plan G7-9); Private Capital; NJDEP; NJDOT
G4-2	In accordance with Section 4.2 of this Plan, work with property owners to enhance the perpendicular access points at the City Place (Edgewater; Block 91, Lot 1), Edgewater Multiplex Cinema (Edgewater; Block 91, Lot 2), Edgewater Golf (Edgewater; Block 82, Lots 1 and 2), Edgewater Towne Center (Edgewater; Block 58, Lots 1 and 2), Edgewater Marina (Edgewater; Block 38, Lots 1, 2, and 2.01), Hudson Cove (Edgewater; Block 25, Lots 2.01-2.37), Vela Townhomes (Edgewater; Block 13, Lots 1, 2.01, 2.02, 4, 5 and 5.01), and the Edgewater Colony (Edgewater; Block 1, Lots 1 and 7) sites.	Medium-Term	VH	Future Entity Created; Borough of Edgewater	Entity Funding (See Action Plan G7-9); Private Capital; NJDEP; NJDOT
G4-3	Work with the owner of the Le Jardin property and NJDEP to provide a ramp to Hudson Cove when the walkway on this property is constructed.	Short-Term	VL	Bergen County Department of Planning and Economic Development; Borough of Edgewater	Private Capital; NJDOT

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G4-4	Work with the owner of the Market Place property and NJDEP to provide a ramp to the Boardwalk behind Marketplace.	Short-Term	VL	Bergen County Department of Planning and Economic Development; Borough of Edgewater	Private Capital; NJDOT
G5-1	Provide public transportation linkages at perpendicular access points and enhance the Walkway's connection to the Edgewater Ferry Terminal. Provide wayfinding signage leading to public transportation connections from the Walkway.	Short-Term	VL	Bergen County Department of Planning and Economic Development; Borough of Edgewater; Borough of Fort Lee	Private Capital; NJDEP; NJDOT; NJTPA; NJ Transit
G5-2	Advise NJDEP and municipal Planning Boards of proposed cross section that includes bike lanes contained in Section 4.10 of this Plan. Work with these entities to reference this cross section in their approvals.	Short-Term	VL	Bergen County Department of Planning and Economic Development	Bergen County
G5-3	Work with the Borough of Edgewater to update their Land Use Ordinances to comply with the perpendicular access (Figure 4.2-2) and Waterfront Walkway (Figure 4.1.1-4) cross-sections of this Plan.	Short-Term	VL	Bergen County Department of Planning and Economic Development	Borough of Edgewater
G5-4	Meet with the Borough of Edgewater and NJDEP to discuss the NJDEP approved cross-sections for Waterfront Walkway segments at I-Park and Veterans field. Work with the Borough to update these cross sections to comply with the perpendicular access (Figure 4.2-2) and Waterfront Walkway (Figure 4.1.1-4) cross-sections of this Plan.	Short-Term	VH	Bergen County Department of Planning and Economic Development	Borough of Edgewater; NJDEP

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G5-5	Meet with the current owners of the lot containing Le Jardin, and the owner of the lot containing the Moorings, as well as NJDEP to discuss updating the cross sections to comply with the perpendicular access (Figure 4.2-2) and Waterfront Walkway (Figure 4.1.1-4) cross-sections of this Plan.	Short-Term	VH	Bergen County Department of Planning and Economic Development	Private Capital; NJDEP
G5-6	Provide wayfinding signage leading to local providers of goods and services along the Walkway, and connections to regional bicycle paths and networks.	Medium-Term	L	Future Entity Created	Entity Funding (See Action Plan G7-9); Private Capital
G5-7	Encourage activity along the walkway by requiring new construction to be designed in such a way that the walkway-facing façades encourage activity and function in a manner that is similar to that of the street-facing façades.	Medium-Term	VL	Local Planning/ Zoning Board; Local Council	Private Capital
G6-1	Require, as a condition of approval to any site plan application, that a conservation easement be in place upon the subject property. To the greatest extent possible, seek donations of such easements.	Short-Term	VL	Bergen County Department of Planning and Economic Development; Borough of Edgewater	N/A
G6-2	Place a monument at the former site of the Ford Motor Company Edgewater Assemble Plant (Edgewater; Block 85.01). Provide signage at other historic sites and attractions identified in Section 2 of this Plan.	Medium-Term	L	Future Entity Created; Borough of Edgewater	Entity Funding (See Action Plan G7-9); Private Capital; NJDEP; NJ Historic Trust

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G6-3	Locate kayak rentals on the Quantas Resources site (Edgewater; Block 95, Lot 1) once remediation is complete. Provide a boat ramp and spray ground on the Veterans Field site (Edgewater: Block 30, Lots 1 and 2). Locate fishing piers at I-Park (Edgewater; Block 99, Lots 1, 3, 4, and 5) and Edgewater Commons (Block 84.01, Lots 1.01, 1.03, 1.04 and 1.05). Locate a fishing area, sandy beach area, and kayak rentals on Palisade Interstate Park.	Medium-Term	VH	Future Entity Created; Borough of Edgewater	Private Capital; NJDEP; OSG
G6-4	Implement the objectives, strategies, and actions of Goal 7, which are provided in Section 3.2.7 of this Plan.	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	County General Operating Budget
G6-5	Place signage related to various environmental themes along the Hudson River. Potential themes include: information on local species; successes in habitat restoration and environmental cleanup of the area; a diagram of the food chain on a local basis; and, on a broader note, environmental concepts such as global warming, and how it could potentially impact the area.	Medium-Term	L	Future Entity Created; Borough of Edgewater; Borough of Fort Lee; Palisade Interstate Park Commission	Private Capital; NJDEP; ANJEC
G7-1	Establish the Waterfront Walkway extents that the single public, private, or quasi-public entity will govern (i.e., Bergen County waterfront, or entire New Jersey Hudson River waterfront).	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	County General Operating Budget

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G7-2	Identify the potential partners and their roles in the single public, private, or quasi-public entity. These partners may include NJDEP, Bergen County, Hudson County, Palisades Interstate Park, and the various municipalities along the New Jersey Hudson River Waterfront. If the entity will only control the Bergen County portion of the Hudson River Waterfront Walkway, then Edgewater and Fort Lee may be potential partners on the municipal level.	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	County General Operating Budget
G7-3	The agencies that currently oversee future Waterfront Walkway locations, guidelines, and amenities are Bergen County, the Borough of Edgewater, NJDEP, Army Corps of Engineers, and the Hudson River Waterfront Conservancy. Identify the elements that these agencies currently review, and the deliverable that these agencies provide to Waterfront Walkway developers (i.e., permit, resolution, letter of approval, etc.). Determine which Ordinances, statutes, and regulations need to be revised to transition oversight to a single entity.	Short-Term	VL	Bergen County Department of Planning and Economic Development	County General Operating Budget

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G7-4	Based on the jurisdiction, partners, and deliverables required, work with County Counsel to determine the type of entity that could provide the required functions. The options for the entity could include: » New Jersey Hudson River Waterfront Walkway Redevelopment Authority created by an act of the County Freeholders » Public Partnership created by legal agreement » Private Partnership created by legal agreement » An entity within the State or County Park System governed by a Board of Commissioners appointed by the either the Governor or the County Executive, respectively. » Hudson River Waterfront Commission created by an act of legislature » Bergen County Improvement Authority (BCIA)	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	County General Operating Budget
G7-5	Meet with County Counsel to determine whether Waterfront Walkway lands, public access, and parking should be under entity ownership, lease with private property owners, or held within conservation/access easements.	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	County General Operating Budget
G7-6	Meet with County Counsel and private/public property owners to establish a means of potentially turning over lands, oversight, maintenance, and security to the entity (i.e., dedications, easements, Homeowners Association approvals, etc.)	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	County General Operating Budget

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G7-7	Produce a Police study. At a minimum the study should: » Identify baseline security measures that are in place along the Waterfront Walkway by private property owners, local police departments, and park systems » Determine security needs and costs » Review required manpower, surveillance, hours of operation, legal requirements, financing, and equipment including police boats, police bikes, and police vehicles	Short-Term	VL	Bergen County Department of Planning and Economic Development	County General Operating Budget; NJDEP;
G7-8	Prepare an operation and maintenance manual for the Waterfront Walkway.	Short-Term	VL	Bergen County Department of Planning and Economic Development	County General Operating Budget
G7-9	Compile operation, maintenance, security, lease/ acquisition, and capital improvement costs, plus consultant, legal, permitting, and staffing fees. Compile committed funding sources, and review opportunities for new funding.	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	County General Operating Budget
G7-10	Compile a list of superfund sites along the Waterfront Walkway and areas in need of dredging. Meet with the Army Corp of Engineers and NJDEP and County Counsel to establish an agreement for the entity to perform the work using State and Federal funds.	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	NJDEP

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G7-11	The County should develop a Memorandum of Agreement (MOA) with the municipalities, property owners, and agencies involved relative to the creation of the entity and the ownership of the land.	Short-Term	VL	Bergen County Counsel; Bergen County Department of Planning and Economic Development	County General Operating Budget
G8-1	Plan, advertise, and execute a special competition to develop a branding scheme and graphic identity for the walkway. A panel of judges for this competition should be drawn from municipal officials and local residents.	Short-Term	VL	Future Entity Created	County General Operating Budget; ANJEC
G8-2	Detail the benefits of wayfinding signage and seek assistance from NJ Transit, New York Waterway, and local business owners in the development and funding of such signage along the Hudson River Waterfront Walkway.	Short-Term	VL	Future Entity Created	Entity Funding (See Action Plan G7-9); Private Capital; NJDEP; NJ Transit
G8-3	Place a monument at the former site of the Ford Motor Company Edgewater Assemble Plant (Edgewater; Block 85.01). Provide signage at other historic sites and attractions identified in Section 2 of this Plan.	Medium-Term	VL	Future Entity Created; Borough of Edgewater	Entity Funding (See Action Plan G7-9); Private Capital; NJDEP; NJ Historic Trust

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G8-4	Place signage related to various environmental themes along the Hudson River. Potential themes include: information on local species; successes in habitat restoration and environmental cleanup of the area; a diagram of the food chain on a local basis; and, on a broader note, environmental concepts such as global warming, and how it could potentially impact the area. As a cost savings measure, consider the location of such signage with wayfinding signage.	Medium-Term	L	Future Entity Created; Borough of Edgewater; Borough of Fort Lee; Palisade Interstate Park Commission	Entity Funding (See Action Plan G7-9); Private Capital; NJDEP; ANJEC
G8-5	At the entry to each perpendicular access, a Hudson River Waterfront Walkway sign shall be provided on the passive recreation side of the Walkway, as indicated on Figure 4.2-2.	Medium-Term	VL	Future Entity Created; Borough of Edgewater	Entity Funding (See Action Plan G7-9); Private Capital
G8-6	A site map sign shall be located at each intersection of each perpendicular access and the walkway.	Medium-Term	VL	Future Entity Created; Borough of Edgewater	Entity Funding (See Action Plan G7-9); Private Capital
G8-7	A "Welcome to Bergen County" sign, with the opposite side thanking visitors for coming, shall be located at the County line on the Walkway.	Short-Term	VL	Bergen County Department of Planning and Economic Development	County General Operating Budget
G9-1	Develop of a code of conduct governing walkway use. As appropriate, adopt ordinances/ resolutions making such code of conduct enforceable.	Medium-Term	VL	Bergen County Counsel; Bergen County Department of Planning an Economic Development; Borough of Fort Lee; Borough of Edgewater; Palisades Interstate Park Commission	County General Operating Budget

Action Number	Action	Estimate Timeframe	Estimated Cost	Potential Lead Implementing Agencies	Potential Funding Sources
G9-2	Investigate the feasibility of the expansion of the Public Trust Doctrine to include areas above the mean high water line of the Hudson River. Based on the results of this study, develop a set of best practices to effectuate the expansion.	Short-Term	VL	Bergen County Counsel; NJDEP; Future Created Entity	County General Operating Budget; NJDEP
G9-3	Provide signage with notice of Walkway rules and regulations at access points and entrances. Such signage should be clear and concise, plainly visible, and shall have a positive appearance and tone so as not to be unwelcoming.	Medium-Term	VL	Future Entity Created	County General Operating Budget; Private Capital; NJDEP

3.4. Indicators, Targets and Baselines

The Goals, Objectives, Strategies and Actions represent the full vision of Bergen County's Hudson River Waterfront Walkway Design and Implementation Strategy Plan. To enable Bergen County to monitor the attainment of its progress in implementing its Plan, Indicators and Targets have been established for each Goal. The Indicators measure progress toward the Goals, Objectives and Strategies. The targets are a measurable milestone of achievement. Baselines are provided for comparison in the future, so that the County can measure its progress in implementing the Walkway Design and Implementation Strategy Plan.

3.4.1. Matrix of Indicators

The Matrix of Indicators shows that many of the Indicators measure the attainment of several Goals, Objectives, and Strategies. This demonstrates the linkages between each goal.

Indicator	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Goal 8	Goal 9
Number of orphan sites present along the Waterfront Walkway	X								
Length of completed walkway	X								
Length of the Waterfront Walkway designed in accordance with Figure 4.1.1-4		X	X		X				
Number of perpendicular access points				X					
Number of interpretative signs related to the environment and historic sites						X		X	
Establishment of entity							X		
Annual number of citations issued in the area of the Waterfront Walkway, divided by the amount of linear feet of completed walkway									X

4. Future Waterfront Walkway Design

The Bergen County Hudson River Waterfront Walkway is an amalgamation of various designs, widths, and amenities, with each area having its own design characteristics. This pattern of development has enabled the various sections of the Walkway to each have their own flair and sense of place. However, the changing design standards along the Waterfront Walkway also cause the Walkway to lack its own unified sense of place. This lack of consistency results in users feeling as though they have left the public domain and have entered private property. Additionally, the varying widths result in user conflicts, specifically for bikers and baby carriages in narrow areas. Therefore, future segments of the Walkway, and any subsequent redesign of existing segments, shall have the following guidelines for future design and construction.

4.1. Design Standards

Through review of the baseline conditions as outlined in the Study Area Profile Report (Appendix A), and the November 1989 NJDEP "Hudson River Waterfront Walkway Plan and Design Guidelines", the Plan has established Design Standards for Waterfront Walkway amenities as outlined in the following subsections.

4.1.1. Surface and Width

The width of the Waterfront Walkway for passive recreation shall have a minimum of 16 feet barrier-free width within a 30-foot conservation easement per NJDEP guidelines. The Bergen County recommended cross-section addresses these guidelines with 24.33 of barrier-free width consisting of 16 feet of barrier free passive recreation, and 10 feet of barrier free active recreation. In addition, there is 4 feet of Waterfront Walkway dedicated to passive recreation which is not barrier free which consists of benches, bike racks, and other amenities. Therefore, the total passive recreation width is 20 feet. It should be noted that the Bergen County proposed cross-section is modeled after NJDEP "Typical Cross Section 1" found on Page 84 of the November 1989 NJDEP "Hudson River Waterfront Walkway Plan and Design Guidelines".

The paver portion of the Waterfront Walkway shall have a surface of solid (uncored), hard burned, frost-free paver units complying with American Society for Testing and Materials (ASTM) C-936, Type FBS, Grade SW Pavers. The pavers should be installed per manufactures' instructions, and a detail should be provided by a licensed Engineer for proper installation. The approved detail should be of sufficient depth and material to accommodate vehicular loading, so that in the case of an emergency, the perpendicular accesses and walkways can be used for emergency access. The detail for paver walkway construction, color, and pattern shall be approved by the entity controlling the Walkway.

The following paver sizes and colors shall be utilized. The Waterfront Walkway Surface shall be a color similar to the Autumn Blend and shall be a herringbone pattern with an edging in a color similar to Pewter Blend (the selected pavers are as manufactured by EP Henry, however, an approved equivalent shall be acceptable):

» 4"x8"x3-1/8" – Autumn Blend
» 4"x8"x3-1/8" – Pewter Blend

Figure 4.1.1-1: Autumn Blend Paver (Source EP Henry)

Figure 4.1.1-2: Pewter Blend Paver (Source EP Henry)

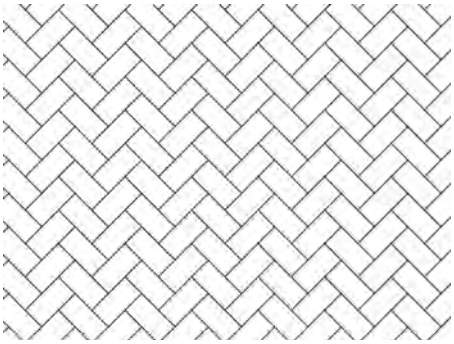


Figure 4.1.1-3: 45 Degree Herringbone Pattern

The total width of the Waterfront Walkway shall be 30-feet, with 20-feet devoted to passive recreation (16-feet of which is barrier free) and 10-feet devoted to active recreation. The width of the Waterfront Walkway for active recreation shall be a 10-foot paved path including p aver edging. The paver edging will prevent unraveling of pavement edge and tie the paved path into the aesthetic design of the passive Waterfront Walkway. The paved path shall be striped with traffic arrows relative to user direction, with 4-feet 8-inches devoted to each direction. The paved path shall be utilized for bikes and roller blades and other forms of active recreation.

Figure 4.1.1-4 depicts the proposed layout of future Waterfront Walkway segments. Buffer landscaping should be encouraged on the private property abutting the Walkway; however, non-invasive species should be used closest to the Waterfront Walkway to guard against encroachment onto the paved path. The buffer landscaping will aid in privacy to abutting residential uses.

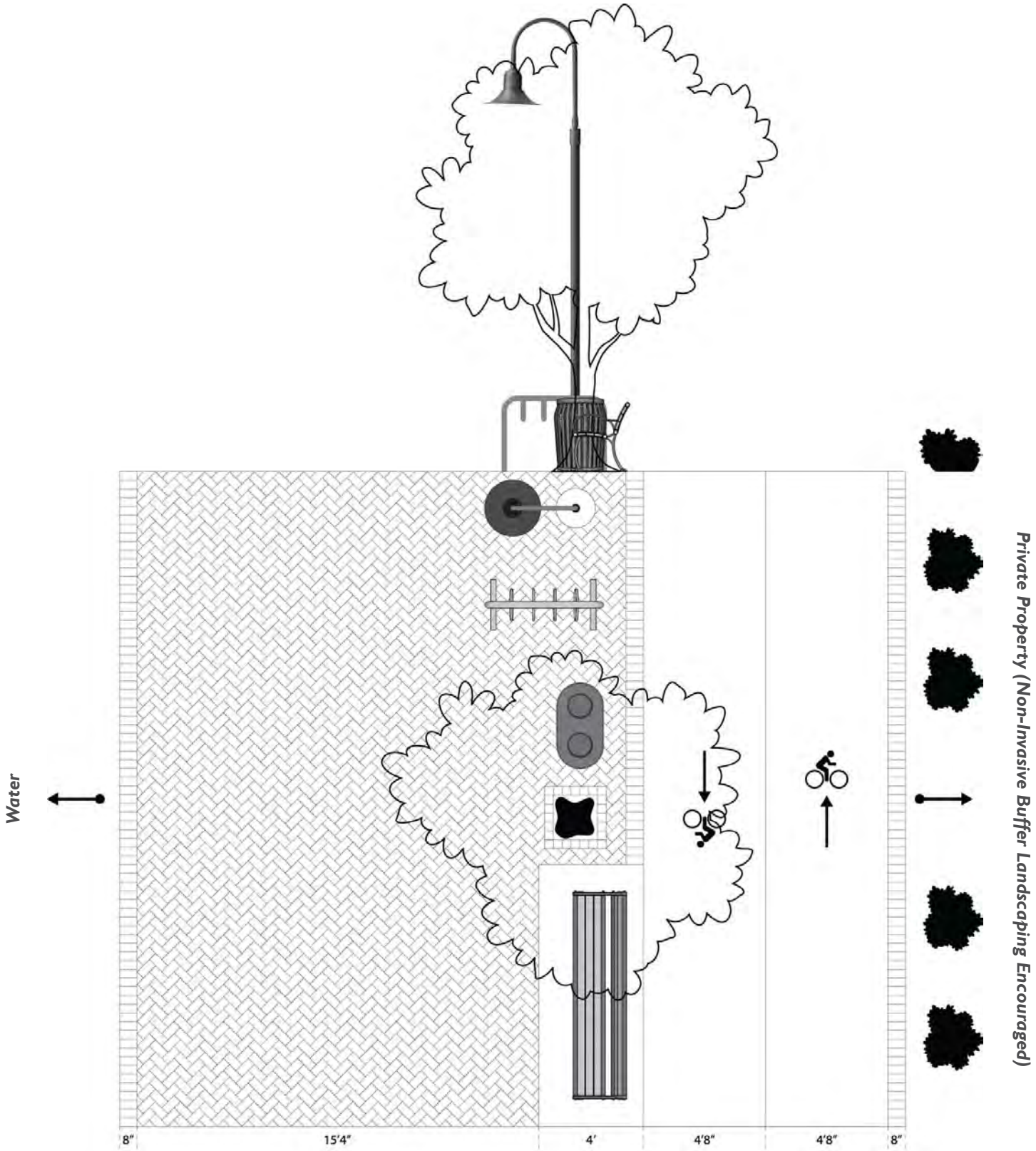


Figure 4.1.1-4: Walkway Cross Section

4.1.2. Bulkheads and Railings

The experience of the Bergen County Hudson River Waterfront Walkway is unique from any other experience in Bergen County, and arguably in the state of New Jersey, in that not only are users experiencing an amazing scenic view of New York City and the natural beauty of the Palisades, but they are doing so virtually unobstructed from the Hudson River. The majority of the areas in Bergen County are without bulkheads, therefore only rip rap stones separate users from the water.

However, with the projected global warming, many of these low lying areas will continue to experience erosion. Therefore, in areas significantly below the base flood elevation, new construction may require the construction of bulkheads and fill to raise elevation and guard against erosion.

The areas with bulkheads may require railings to guard against individuals inadvertently falling into the water. Future railings shall be black similar and be a style similar to Model Easy 400 as manufactured by Easyrailings (www.easyrailings.com).

3/4"x3/4", wall 1/16". Spacing between bars less than 4". Aluminum alloys 6063-T5, 6061-T6, powder coating finish.

Figure 4.1.2-1: Railing

4.1.3. Lighting Fixtures

Lighting fixtures shall be shielded, pole-top luminaries with asymmetrical distribution oriented to provide the main axis of distribution along the Waterfront Walkway. Poles shall have crooked-type neck to allow vertically-suspended fixtures. Fixtures shall have enclosed lamps to minimize vandalism. All fixtures shall be equipped with flared shades to minimize light spillage, similar to Bega-US product number 9962MH. Lamps shall be 150-watt, pulse-start metal halide.

Mounting heights shall vary from 14 to 20 feet, as appropriate to the width of the walkway, in order to provide uniform distribution across the area to be illuminated. Where set along a straight path, poles shall be spaced at intervals equivalent to five times the mounting height, which will typically result in a 4:1 uniformity. If placed on a curve, lighting poles shall be more closely together as needed to maintain a uniformity of 4:1.

The color of the fixtures should be black and shall have a glossy finish. The color black was chosen for all amenities as it should result in little variation between manufacturers, and should match any abutting color scheme on nearby private property, and portions of the Walkway that have not been renovated.

It should be noted that the November 1989 NJDEP "Hudson River Waterfront Walkway Plan and Design Guidelines" permit up to three types of lighting fixtures. However, the two other options are bulb type lights that result in glare. Due to the proximity to residential uses, the vertically suspended lighting fixture was chosen since it cast a downward light and minimizes glare. Additionally, this is the predominantly used fixture along the completed segments of the Bergen County Hudson River Waterfront Walkway.

4.1.4. Benches

Benches shall be provided to ensure a minimum rate of fifteen (15) feet of seating for every one hundred (100) linear feet of Walkway. Special consideration should be given to providing additional seating at existing and proposed gathering places along the Walkway, including plazas and high-density areas. In these areas, benches may be placed at 90-degree angles to one another to allow for social interaction. Additionally, at least fifty percent (50%) of all seating along the Walkway shall have backs to ensure the comfort of all Walkway users.

The bench framework shall be black and the bench shall be similar to Victor Stanley, Inc. (http://www.victorstanley.com) Model No. CM-324. The benches shall be 8' long and the entity constructing the Waterfront Walkway shall have the option of intermediate armrests matching Victor Stanley, Inc Model No. CM-214, and benches matching Victor Stanley, Inc Model No. CM-314 backless benches. Anchor bolts and concrete footings should be utilized to anchor benches and should be as recommended by the manufacturer.

Figure 4.1.4-1: Bench

4.1.5. Trash and Recycling Receptacles

The trash and recycling receptacles shall be grouped together and spaced at intervals of one group of receptacles per 250 linear feet of Walkway. The receptacles shall be black in color and shall be similar to Victor Stanley, Inc. (http://www.victorstanley.com) Model No. Model DYN-SD-36 (for trash) and similar to Victor Stanley, Inc. (http://www.victorstanley.com) and a separate model (for recycling). The capacities shall be standard capacities which accommodates 36-gallons (136 liters). Concrete footings should be utilized to anchor receptacles and should be as recommended by the manufacturer.

Figure 4.1.5-1: Trash and Recycling Receptacles

4.2. Gateways and Perpendicular Access

Figure 4.2-1: Signage will identify perpendicular access points to the Walkway

In order to facilitate access to the Hudson River Waterfront Walkway, a number of perpendicular access points that will link the Walkway to adjacent uses and transportation routes are proposed. These perpendicular access points will be clearly marked with signage identifying ingress and egress points to the Walkway. Additionally, signage describing the rules, regulations, and hours of operation of the Walkway should be placed along at the terminus of any access point along the Walkway.

Although there are few options to ensure ADA-compliant access to existing Walkway segments, especially those that exist within robust topographic areas, all proposed perpendicular access points shall

be constructed to be ADA-compliant. Additionally, when designing future perpendicular access points at the locations designated below, providing access for emergency vehicles shall be considered, and access points designed in such a way that will permit easy access to the Walkway for emergency vehicles and personnel.

Perpendicular access points shall be 20 feet in width, with 10 feet devoted to passive recreation and 10 feet devoted to active (including edging). See Figure 4.2-2 for perpendicular access.

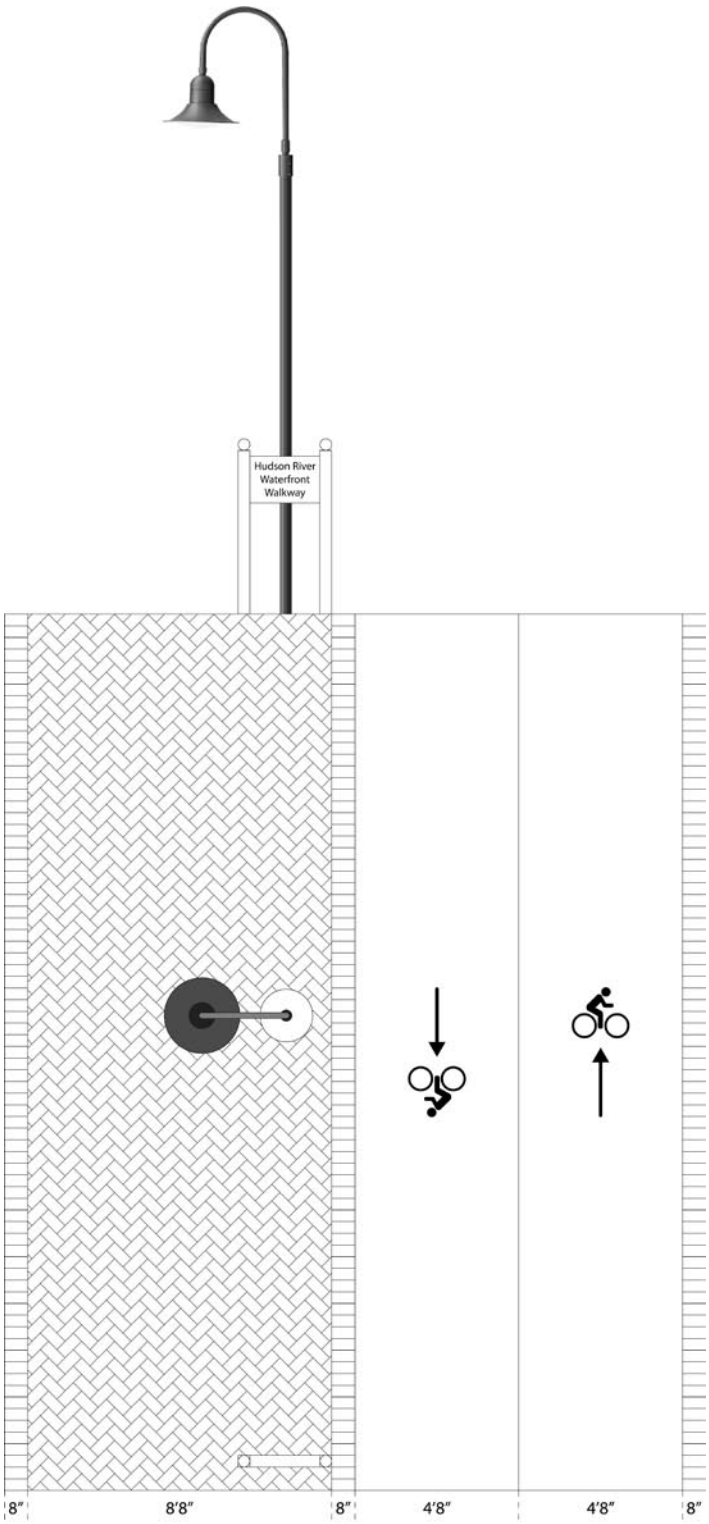


Figure 4.2-2: Perpendicular Access

Perpendicular access points shall be constructed and/or enhanced in the following locations:

1. **I-Park Edgewater:** A perpendicular access point is approved and will be constructed along the southerly property line of the proposed development.
2. **City Place:** The existing perpendicular access point from City Place shall be enhanced to provide easy pedestrian access from the existing pedestrian route along River Road. The perpendicular access point shall be clearly signed and marked through the existing development until its intersection with the Walkway on the easterly portion of the site.
3. **Edgewater Multiplex Cinema:** The existing perpendicular access point along the northerly property line shall be enhanced to include sufficient signage at its intersection with existing pedestrian facilities along River Road.
4. **Edgewater Golf:** The existing perpendicular access point along the southerly property line shall be enhanced to include sufficient signage at its intersection with existing pedestrian facilities along River Road.
5. **Mitsuwa:** To facilitate the use of a viable long-term interim Walkway segment around the existing Hess Corporation facility, a perpendicular access point is proposed on the northerly side of the market. The proposed perpendicular access will connect existing pedestrian facilities along River Road with the existing Walkway segment on the Mitsuwa site via an existing parking area along the northerly portion of the site. The proposed perpendicular access and interim walking route shall be clearly signed as described above.
6. **Marketplace:** To facilitate the use of a viable long-term interim Walkway segment around the existing Hess Corporation facility, a perpendicular access point is proposed along the existing pedestrian facilities that run along the front of the southerly building of the existing shopping center. The proposed perpendicular access will connect existing pedestrian facilities along River Road with the existing boardwalk that runs along the waterfront via this storefront pathway and an existing breezeway on the property. The proposed perpendicular access and interim walking route shall be clearly signed as described above.
7. **Edgewater Towne Center:** The existing perpendicular access point along the southerly property line shall be enhanced to include sufficient signage at its intersection with existing pedestrian facilities along River Road.
8. **Edgewater Marina:** The existing perpendicular access point along the northerly property line of the marina shall be enhanced to include sufficient signage at its intersection with existing pedestrian facilities along River Road.
9. **Veteran's Field:** A perpendicular access point is proposed along the southerly property line of Veteran's field. This perpendicular access point will connect the proposed Walkway segment on Veteran's field to existing pedestrian facilities along River Road. The perpendicular access point shall be sufficiently signed at its intersection with pedestrian facilities along River Road.
10. **Hudson Cove:** The existing perpendicular access point along the westerly portion of Hudson Cove shall be enhanced to include adequate signage at its intersection with existing pedestrian facilities along River Road.
11. **Le Jardin/The Moorings:** A perpendicular access point is proposed to provide access from existing pedestrian facilities on River Road to the Walkway segments proposed and existing at Le Jardin and the Moorings. The perpendicular access point shall be constructed to be ADA-compliant, and shall include sufficient wayfinding signage to alert users to the presence of the access point to the Walkway.
12. **Vela Townhomes:** The existing perpendicular access point at the Vela Townhomes shall be enhanced to include sufficient signage. Additionally, this access point should be evaluated with respect to providing access to the Walkway for those with strollers and young children and the disabled.
13. **The Edgewater Colony:** The existing perpendicular access point along the northerly property line of the Edgewater Colony shall be enhanced to provide sufficient signage to orient users of the Walkway and the Palisades Interstate Park to its presence. Additionally, the access point should be retrofitted to provide safety features such as hand rails along particularly steep portions of the access path.

4.3. Recreational Needs

Although the Hudson River Waterfront Walkway provides a passive recreation opportunity for its users, providing opportunities for active recreation is paramount to ensure that the needs of all Walkway users are accommodated. As articulated in Section 4.1.1, newly constructed Walkway segments shall provide a passive recreation component of twenty (20) feet, of which 14.33 feet will be barrier free. Newly constructed Walkway segments shall also provide ten (10) feet of width for active recreation including, but not limited to, skating and biking, in the form of a paved path parallel to passive recreation segments. The proposed 14.33-foot width of the passive recreation element of the Walkway will accommodate anticipated pedestrian volumes, as well as users of all age, fitness, and activity levels.

In addition to the enhanced passive and active recreation portions of the Walkway, and existing active recreation opportunities along the Walkway, a host of active recreation points are proposed along existing and proposed Walkway segments. Specifically, additional recreational amenities encourage users to "get into the water" via the proposed Walkway Kayak Rental facility proposed for the former Quantas Resources site, or the proposed boat house and boat ramp for small watercraft at Veteran's Field. Additionally, a number of areas will be designated as fishing areas, and a "sprayground" is proposed to be located in Veteran's Field. Finally, a stage is proposed for outdoor concerts and performances.

Figure 4.3-1: A "spraygound" is a water-oriented active recreation opportunity for children (Source: www.watersprayground.com)

4.4. Historic Preservation and Significance

As outlined in Section 2.3.3, there are a number of historic sites and attractions located on or in the immediate vicinity of the Hudson River Waterfront Walkway. Given the number of historic sites and attractions located on and around the Walkway, and the importance of preserving and educating the public on such sites, the Walkway should contain signage that provides information on existing historic sites and attractions. Such signage should contain information describing the historic site including historic significance and importance on a local, regional and/or national level, a description of the historic period which it represents, and any historic events or occurrences of which it was a part. At minimum, such signage and information shall be provided for the historic site and attractions outlined in Section 2.3.3. Additionally, signage and information shall be provided for any other historic site as identified.

In addition to providing signage on such historic sites, it may be possible to enhance public knowledge of historic sites and attractions around the Walkway through a pre-recorded audio tour of such sites. Such a tour can be implemented through an information kiosk that rents audio devices to Walkway users interested in utilizing the audio tour. Alternatively, given the prevalence of MP3 players, such as Apple's iPod, it may be possible to create, publish and share a "podcast" that Walkway users can download to their multimedia device free of charge.

4.5. Transportation

As noted in Section 2 of the Plan, the Hudson River Waterfront Walkway lacks adequate connections and facilities for cyclists. As it exists today, many cycling enthusiasts and self-described "hardcore" cyclists use River Road as their primary riding route, despite the fact that River Road lacks dedicated bike lanes and safety mechanisms to ensure the safety of cyclists. Additionally, cyclists ride along Henry Hudson Drive and other paved roadways in the Palisades

Interstate Park and utilize a newly-constructed paved path along the westerly boundary of the Park to reach the George Washington Bridge and access New York City.

In order to facilitate active recreation usage along the Waterfront, and provide adequate facilities for the users described above, Section 4.2 of the Plan proposes that all newly constructed segments of the Hudson River Waterfront Walkway contain a ten-foot wide paved path that can be used by bicyclists and roller skaters along the waterfront. By providing such facilities along the gaps identified in Section 2.3.1, and retrofitting existing Walkway segments for such facilities, it is hoped that the Walkway will provide a regional connection for non-motorized transportation, and minimize conflicts between these transportation modes and vehicular traffic. Additionally, a dedicated bicycle route is planned through the Edgewater Colony to facilitate access to a dedicated bicycle path along River Road that provides access to the George Washington Bridge.

In addition to lacking adequate facilities for bicyclists and skaters along the waterfront, the Walkway lacks adequate parking facilities, especially along its northern segments. Although there is adequate parking for Walkway users along the southern portion of the Walkway, many of these parking areas are for adjacent commercial uses, and not dedicated solely to parking for Walkway users. Therefore, the Plan proposes several parking areas dedicated solely to Walkway users, which are proposed to be located in commercial parking lots along the Walkway that are underutilized.

Lastly, wayfinding signage and site location signage shall be utilized to direct users to transit options such as ferry service, NJ Transit bus stops, and ferry shuttle locations.

4.6. Safety and Privacy

Given the relative isolation of the Hudson River Waterfront Walkway from public view and its relative proximity to residential uses, there is a need to balance safety and privacy along the Walkway. Specifically, there is a need to provide an adequate buffer for residential uses along the Walkway to ensure the privacy of residents living along the Walkway, while also minimizing the occurrence of isolated, unsafe Walkway segments that may invite criminal activity. Additionally, establishing a code of conduct for the Walkway, and implementing creative security strategies should be considered with regard to ensuring the safety and privacy of the general public.

To achieve a balance between residential privacy and public security, it is recommended that landscaping and buffering along the Walkway be limited with respect to residential uses. Residential uses should provide a landscaped buffer of no more than twenty (20) feet in width, consisting of dense, low-lying, native vegetation. To provide additional screening and security, residential developments may provide landscape plantings on a berm. No buffering is recommended for non-residential uses along the Walkway.

To enhance safety and security along the Walkway, the installation of emergency call boxes is recommended. Emergency call boxes should be located at each perpendicular access point to the Walkway, and at to-be-determined intervals along the Walkway. The spacing of emergency call boxes along the Walkway shall be determined by the County Police, Edgewater Police Department, and the Borough of Edgewater Fire Official.

Finally, it is recommended that the entity established to govern the Walkway develop a code of conduct for all Walkway users. This code of conduct should supplement existing signage along the Walkway that describes the hours of operation for the Walkway and the prohibition of alcoholic beverages along the Walkway. The code of conduct should also address pet waste clean up, rules and regulations for existing and proposed passive and active recreation facilities, and penalties for destruction of property along the Walkway. Additionally, the entity governing the Walkway should consider providing a small staff of police officers and/or security guards to patrol the Walkway on foot, bicycle or golf cart.

4.7. Building Design

Buildings shall be designed in such a manner that increases the attractiveness of the walkway and encourages its active use. The goal of any design shall be to increase safety and activity on the walkway, as well as encourage its use as a recreational space and non-motorized transportation route.

4.7.1. Non-Residential Buildings

Non-residential buildings shall be designed so that walkway-facing façades function in a manner that is similar to street-facing façades. Walkway-facing façades shall have entrances that are of equal importance to the street-facing façades. In addition, necessary infrastructure, such as air conditioner compressors, shall be disguised or relocated away from entrances. Further, walkway-facing façades shall contain an equal number of windows and façade variations as street-facing façades, and landscaping of a similar character to that of the street-facing façade shall be provided.

These measures shall be required for all new construction and renovations that generate a new certificate of occupancy. These measures shall be encouraged for existing construction.

4.7.2. Residential Buildings

To the greatest extent possible, new residential buildings shall be designed in such a way that front-façades face the walkway. This provision shall also extend to properties undergoing renovations that generate a new certificate of occupancy. To achieve a design where the front-façade faces the walkway, property owners shall be granted maximum design flexibility.

4.8. Support Facilities

The Walkway lacks an adequate number of restrooms. Currently, only one public restroom exists along the entire Walkway, and is located at the Edgewater Marina. Additional restrooms are located within commercial uses along the Walkway. However, these restrooms are not for public use. In order to provide adequate facilities for its users, restrooms are proposed at the following locations:

- I-Park Edgewater
- MJM Waterfront Developers
- Edgewater Municipal Lot
- Veteran's Field

The restrooms proposed above shall be ADA compliant and shall contain facilities for men and women, and shall also contain family restrooms that contain changing tables to accommodate parents with infants and toddlers. Restrooms shall only be open for the hours of operation of the Walkway.

4.9. Remediation and Permitting

Users of the Waterfront Walkway typically are not only seeking a contiguous walkway and unimpeded access to the waterfront and its associated amenities, they are also seeking a memorable, healthy, and enjoyable experience. In order to accomplish such an experience future Waterfront Walkway design shall include removal of existing debris, pile remains, concrete rubble, and steel sheet pile remains from the waterfront. Removal of these items is paramount if users are permitted to enter the Hudson River from the Waterfront Walkway.

All work associated with removal of such debris from the waterfront, especially below the mean high water line, is under the jurisdiction of the NJDEP's Land Use Regulation Program (hereafter referred to as the Department). As such, prior approval to undertake removal of the debris must be obtained in the form of an Upland Waterfront Development Permit. In order to expedite future Walkway construction, it is the recommendation of this Plan that the Entity in control of the Waterfront Walkway prepare an application that includes the entire project area. Once the permit is issued, the Entity will have an initial period of five years to perform the work; an extension to the permit may also be obtained if the work extends beyond the life span of the permit. It is important to note that an agreement between the owners of the individual properties and the applicant (i.e., the entity governing the Walkway) must be executed prior to submitting the permit application. In addition, the owner and applicant must sign the permit application form(s) to demonstrate that both entities are agreeable to any proposed work. Additionally, the individuals performing the work will be entirely responsible to dispose the debris as required by local, State, and federal regulation. This is especially the case relative to material that is characterized as hazardous or contaminated. Such material may include creosote treated piles and timber piers from marinas and waterfront industrial sites. This material would likely have to be sent to a properly licensed facility.

Although highly unlikely, portions of the Hudson River along the project area may still be claimed by the State of New Jersey – Bureau of Tidelands Management. As such, a search of all applicable Tidelands Maps must be completed during the planning phase of the project to ensure all waterfront properties have been assigned the appropriate tidelands instrument (i.e., grant). The entity governing the Walkway will have to obtain the appropriate instrument for those submerged properties still claimed by the State.

The US Army Corps of Engineers – NY District also has limited jurisdiction over the Waterfront Walkway Construction and associated amenities. Specifically, the NY District has jurisdiction over all work that takes place below the High Tide Line or the Hudson River. For in-water work, the Corps may, at its own discretion, allow the Department to issue federal approval under the State Programmatic General Permit Program (SPGP). If the project is not subject to the SPGP, the Entity in control of the Waterfront Walkway will have to obtain approval under the Corps' Nationwide Permit Program. If the Corps determines that the overall scope of the project extends beyond the regulatory criteria of the Nationwide Permit Program, the Entity in control of the Waterfront Walkway will have to obtain an Individual Permit.

Lastly, some areas of the Bergen County waterfront may require dredging. Dredging refers to the physical removal of accumulated sediment from a waterway to increase depth measured at mean low water. All dredging projects that occur in tidal waters are under the jurisdiction of the NJDEP's Office of Dredging and Sediment Technology (ODST). Dredging projects also require prior approval of a Waterfront Development Permit. Prior to preparing the permit application, the sediment must be sampled so it can be characterized as contaminated or non-contaminated. This is specifically done so that the spoils can be used as beneficial re-use (e.g., land cover, soil amendment, etc.) material or disposed of in licensed facilities due to contamination. The samples must be collected and processed in accordance with an approved Sediment Sampling Plan; the plan is reviewed and approved by ODST before sampling can commence. The Waterfront Development Permit application must specify how dredging will occur (clam-shell, hydraulic, etc.), where and how spoils will be de-watered, the proposed depth of water to be dredged, and where spoils will be disposed.

4.10. Renovation of Existing Waterfront Walkway

While the existing segments of the Hudson River Waterfront Walkway in Bergen County may be identical in function, existing segments vary greatly in form, appearance, and the types of amenities available to Walkway users. Variation in the design elements and amenities of existing Walkway segments causes the Walkway to lack a cohesive, unifying element that orients users to its route and inhibits the use of the Walkway by all non-motorized transportation modes along some segments due to exceptionally narrow Walkway widths and lack of separate travel lanes for bicycles. However, despite upgrades to make these existing segments more uniform, the alignment of these segments will remain as they currently exist. The subsections below detail the design elements and attributes of existing Walkway segments as well as any proposed improvements to existing Walkway segments.

4.10.1. Alignment

Existing segments of the Waterfront Walkway shall maintain current alignments along the waterfront as indicated on Figure 4.10-1 through 4.10-5 of this Plan.

4.10.2. Perpendicular Access

All existing perpendicular access points to existing Walkway segments shall remain as they exist. The design of any subsequent perpendicular access shall be in accordance with Figure 4.2-2 of this plan, which incorporates a total (including edging) of 10-feet of bike lane, and 10-feet of walkway.

4.10.3. Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles

When renovation occurs, all surfaces, widths, railings, lighting, benches, and trash and recycling receptacles are required to be in accordance with Section 4.1 of the Plan, or their approved equals. Renovation is triggered by maintenance activities, or any act requiring an NJDEP approval.

4.10.4. Signage

When renovation occurs, existing signage along the Hudson River Waterfront Walkway shall be upgraded in accordance with Section 4.2. Signage shall be provided along River Road for each perpendicular access to identify the Hudson River Waterfront Walkway, and wayfinding signage (site map) should also be provided at the intersection of the perpendicular access point with the Waterfront Walkway. Additionally, signage shall be provided in the following existing walkway locations:

- **Edgewater Multiplex Cinema:** Signage marking existing parking stalls as "Designated Walkway Parking" shall be installed at the location noted in Figure 4.10-1;
- **Independence Harbor:** A historic marker noting the former location of the Ford Motor Company assembly plant in Edgewater shall be erected at the location noted in Figure 4.10-1;
- **Edgewater Commons:** Signage denoting the proposed fishing pier and fishing areas shall be placed at intersections of the Walkway and the piers as noted in Figure 4.10-2. Additionally, signage marking existing parking stalls as "Designated Walkway Parking" shall be installed at the location noted in Figure 4.10-2. Historic signage denoting the locations of the General Grant National Memorial and the Riverside Church, both directly across the Hudson in New York, shall be placed in the locations indicated on Figure 4.10-2.

- **Marketplace:** Signage marking existing parking stalls as "Designated Walkway Parking" shall be placed at the location noted in Figure 4.10-2;
- **Binghamton:** A historic marker noting the location of the historic Ferryboat Binghamton shall be installed at the location noted in Figure 4.10-2;
- **Edgewater Towne Center:** Signage marking existing parking stalls as "Designated Walkway Parking" shall be placed at the location noted in Figure 4.10-3;
- **Edgewater Municipal Lot:** Signage marking existing parking stalls as "Designated Walkway Parking" and comfort stations (restrooms) shall be placed at the location noted in Figure 4.10-3.
- **Palisades Interstate Park:** A historic marker noting the history of the park and the George Washington Bridge will be located as indicated on Figures 4.10-4 and 4:10-5. An ecological marker noting its significance as a natural resource and a site map will also be placed on the property in the locations indicated on Figure 4.10-4.

4.10.5. Amenities

Existing amenities, including seating areas, tot lots, and fishing areas are proposed to remain along existing Walkway segments. Additionally, the following amenities are proposed along existing Walkway segments:

- **Edgewater Multiplex Cinema:** A number of existing parking stalls located at the Edgewater Multiplex Cinema will be provided for Walkway users at the location noted in Figure 4.10-1, and will be signed as noted above;
- **Edgewater Commons:** A number of existing parking stalls located at the Edgewater Commons will be provided for Walkway users at the location noted in Figure 4.10-2, and will be signed as noted above. Additionally, the existing piers located along the southerly portion of the property's waterfront shall be refurbished and designated as a recreational fishing area as noted in Figure 4.10-2;
- **Binghamton:** A number of existing parking stalls located at the Ferryboat Binghamton will be provided for Walkway users at the location noted in Figure 4.10-2, and will be signed as noted above;
- **Edgewater Towne Center:** A number of existing parking stalls located at the Edgewater Towne Center will be provided for Walkway users at the location noted in Figure 4.10-3, and will be signed as noted above;
- **Edgewater Municipal Lot:** A number of existing parking stalls located at the Edgewater Municipal Lot will be provided for Walkway users at the location noted in Figure 4.10-3, and will be signed as noted above. Additionally, a public restroom shall be constructed on the property to provide comfort facilities for Walkway users. The location of the proposed restroom is indicated on Figure 4.10-3;
- **Palisades Interstate Park:** The Plan proposes the cleanup and enhancement of an existing beach along the waterfront to provide an additional recreational opportunity along the Walkway. Additionally, the Plan proposes a kayak rental and launch point adjacent to Hazards Dock, and a sandy beach area along the Waterfront Walkway for kayak launching. The proposed locations of these amenities are indicated on Figure 4.10-5.

4.10.6. Easements

All existing Walkway segments shall maintain any existing perpendicular and waterfront access easements. For any subsequent redevelopment or improvement requiring a waterfront development permit from NJDEP as described in Section 4.8 of the Plan, a 20-foot-wide access easement shall be required for perpendicular access, and a 30-foot access easement shall be required for the Walkway.

4.10.7. Permits

See Section 4.8 of this Plan.

4.10.8. Constraints

There are a number of constraints facing the enhancement of existing Walkway segments along the Hudson River waterfront. Existing waterfront development patterns may prohibit the renovation of existing Walkway segments into compliant segments that are able to accommodate all types of non-motorized traffic, including pedestrians, cyclists, and roller skaters due to the proximity of existing development to the waterfront, and the lack of land available to provide adequate facilities for these transportation modes. Additionally, encouraging property owners to finance Walkway segments that are compliant with the design guidelines set forth herein in cases where only minor improvements are proposed may be difficult.

4.10.9. Costs

The cost per linear foot of new walkway using the surface width and amenities as outlined in section 4.1 is approximately $460.00. This price assumed the following:

- Full 30-foot cross section
- Benches are spaced every 100 feet
- Decorative lights are spaced every 50 feet
- Street trees are located every 50 feet
- All street trees contain a tree grate
- All benches contain an ash urn and planter
- Refuse and recyclable containers are spaced every 200 feet
- Bike racks are spaced every 500 feet
- Pavement markings for bike lanes are spaced every 250 feet

Perpendicular access points have a reduced width of 20 feet, and typically will not require benches. Alternate alignments will act as a bypass to the waterfront route, and therefore will be constructed using the perpendicular access cross section. Therefore, perpendicular access points and alternate alignments along River Road have a cost per linear foot of $355.

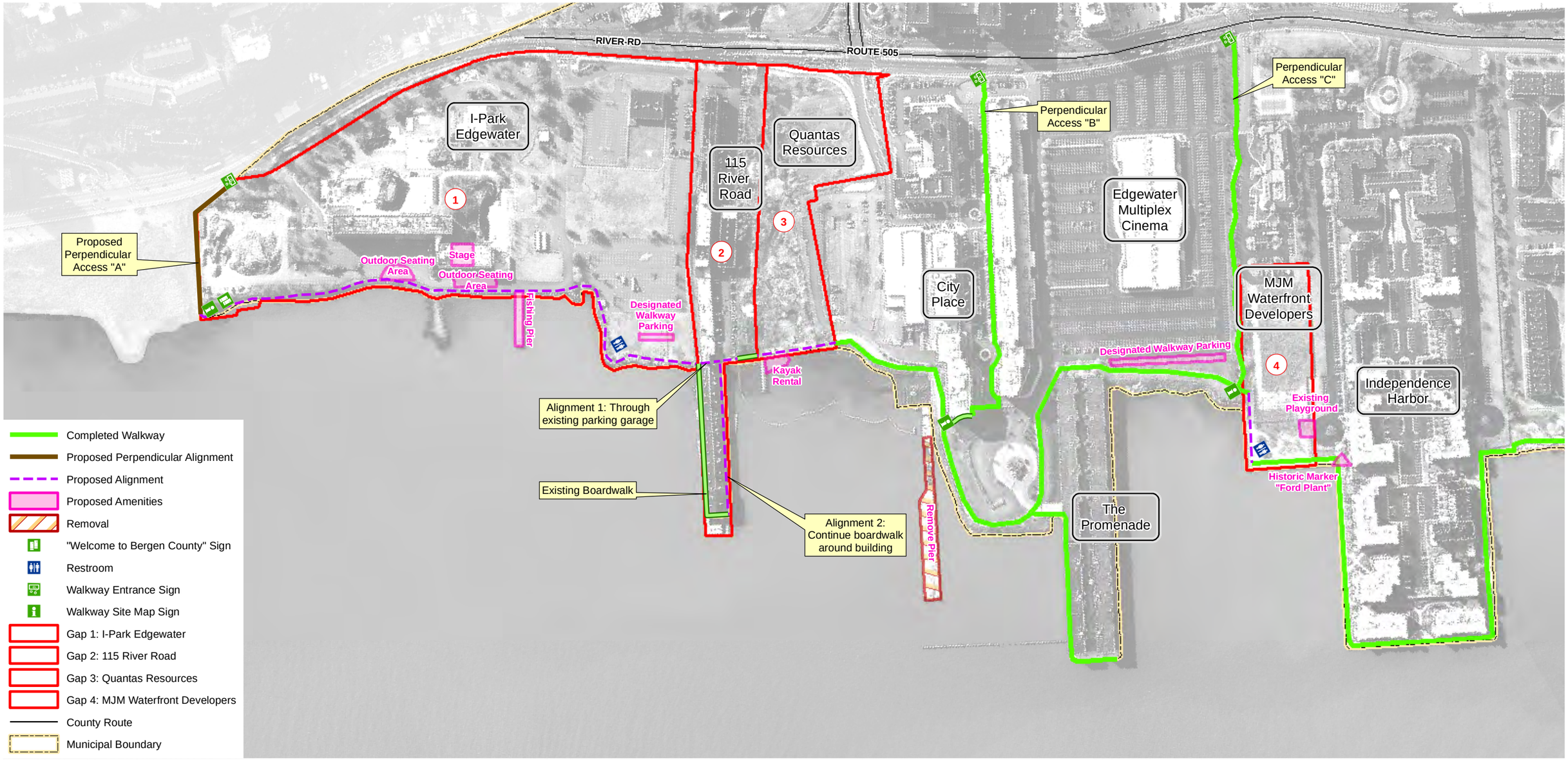
Bulkheads are listed as an alternate cost, and are calculated at $1,500 per linear foot which assumes steel sheeting, a 10-foot exposed face, and tie back construction. These costs per linear foot were applied to the various walkway segments to estimate the cost.

It should be noted that renovated segments may have a cost savings from the estimates below if certain elements can be reused or modified, or if the full width has to be modified die to existing constraints, however the prices estimated below assume replacement and full width, and are therefore conservative estimates. Soft costs, such as engineering, geotechnical investigations, surveying, architectural, and permitting, are not included in the estimates. A detailed cost breakdown for each site can be found in Appendix D of this report:

- **City Place:** 1,000 LF of Walkway with an estimated construction cost of $515,000; this estimate includes walkway construction including all amenities listed above, one (1) walkway entrance sign, one (1) site map sign, and removal of a large concrete pier. In addition, if a new bulkhead was installed on this site, then $1.5 million is estimated for the bulkhead.
- **The Promenade:** 1,175 LF of Walkway with an estimated construction cost of $543,000; this estimate includes walkway construction including all amenities listed above, and one (1) walkway entrance sign. In addition, if a new bulkhead was installed on this site, then $1,762,500 is estimated for the bulkhead.

- **Edgewater Multiplex Cinema:** 590 LF of Walkway with an estimated construction cost of $302,200; this estimate includes walkway construction including all amenities listed above, repaving and striping of the designated parking area, designated parking area signage, and one (1) site map sign. The 1,100 LF of perpendicular access upgrades are estimated at $390,500. In addition, if a new bulkhead was installed on this site, then $885,000 is estimated for the bulkhead.
- **Independence Harbor:** 1,945 LF of Walkway with an estimated construction cost of $899,700; this estimate includes walkway construction including all amenities listed above, and one (1) historic "Ford Plant" Marker to be installed. In addition, if a new bulkhead was installed on this site, then $2,917,500 is estimated for the bulkhead.
- **River Club:** 400 LF of Walkway with an estimated construction cost of $184,000; this estimate includes walkway construction including all amenities listed above. In addition, if a new bulkhead was installed on this site, then $600,000 is estimated for the bulkhead.
- **Edgewater Commons:** 2,490 LF of Walkway with an estimated construction cost of $2,257,250; this estimate includes walkway construction including all amenities listed above, repaving and striping of the designated parking area, designated parking area signage, retrofitting a concrete fishing pier, and retrofitting a concrete fishing area. In addition, if a new bulkhead was installed on this site, then $3,735,000 is estimated for the bulkhead.
- **Edgewater Golf:** 730 LF of Walkway with an estimated construction cost of $340,800; this estimate includes walkway construction including all amenities listed above, one (1) site map sign, and one (1) entrance sign. The 645 LF of perpendicular access upgrades are estimated at $228,975. In addition, if a new bulkhead was installed on this site, then $1,095,000 is estimated for the bulkhead.
- **Mitsuwa:** 860 LF of Walkway with an estimated construction cost of $395,600; this estimate includes walkway construction including all amenities listed above. In addition, if a new bulkhead was installed on this site, then $1,290,000 is estimated for the bulkhead.
- **Marketplace/Binghampton:** 920 LF of Walkway with an estimated construction cost of $1,415,850; this estimate includes walkway construction including all amenities listed above, repaving and striping of the designated parking area, designated parking area signage, a ramped and stepped up area to a boardwalk, a new commercial composite boardwalk with steel railings, a historic marker "General Grant National Memorial", a historic marker "Riverside Church", and a historic marker "Ferryboat Binghampton". In addition, if a new bulkhead was installed on this site, then $1,375,500 is estimated for the bulkhead.
- **Comfort Inn:** 460 LF of Walkway with an estimated construction cost of $211,600; this estimate includes walkway construction including all amenities listed above. In addition, if a new bulkhead was installed on this site, then $690,000 is estimated for the bulkhead.
- **Mariners Landing:** 490 LF of Walkway with an estimated construction cost of $225,400; this estimate includes walkway construction including all amenities listed above. In addition, if a new bulkhead was installed on this site, then $735,000 is estimated for the bulkhead.
- **Grand Cove:** 770 LF of Walkway with an estimated construction cost of $354,200; this estimate includes walkway construction including all amenities listed above. In addition, if a new bulkhead was installed on this site, then $1,155,000 is estimated for the bulkhead.
- **Edgewater Towne Center:** 760 LF of Walkway with an estimated construction cost of $363,700; this estimate includes walkway construction including all amenities listed above, repaving and striping of the designated parking area, designated parking area signage, one (1) walkway entrance sign, and one (1) walkway site map sign. The 330 LF of perpendicular access upgrades are estimated at $117,150. In addition, if a new bulkhead was installed on this site, then $1,138,500 is estimated for the bulkhead.
- **Edgewater Municipal Lot:** 130 LF of Walkway with an estimated construction cost of $418,900; this estimate includes walkway construction including all amenities listed above, repaving and striping of the designated parking area, designated parking area signage, and a public restroom. In addition, if a new bulkhead was installed on this site, then $195,000 is estimated for the bulkhead.
- **Windsor at Mariners Tower/Cove:** 890 LF of Walkway with an estimated construction cost of $409,400; this estimate includes walkway construction including all amenities listed above. In addition, if a new bulkhead was installed on this site, then $1,335,000 is estimated for the bulkhead.

- **Edgewater Marina:** 725 LF of Walkway with an estimated construction cost of $348,500; this estimate includes walkway construction including all amenities listed above, and security upgrades to the restrooms. The 330 LF of perpendicular access upgrades are estimated at $117,150. In addition, if a new bulkhead was installed on this site, then $1,087,500 is estimated for the bulkhead.
- **Shelter Bay:** 300 LF of Walkway with an estimated construction cost of $138,000; this estimate includes walkway construction including all amenities listed above. In addition, if a new bulkhead was installed on this site, then $450,000 is estimated for the bulkhead.
- **Hudson Cove:** 1,050 LF of Walkway with an estimated construction cost of $488,000; this estimate includes walkway construction including all amenities listed above, one (1) walkway entrance sign, and one (1) site map sign. The 255 LF of perpendicular access upgrades are estimated at $90,525. In addition, if a new bulkhead was installed on this site, then $1,575,000 is estimated for the bulkhead.
- **Vela Townhomes:** 590 LF of Walkway with an estimated construction cost of $276,400; this estimate includes walkway construction including all amenities listed above. In addition, if a new bulkhead was installed on this site, then $885,000 is estimated for the bulkhead.



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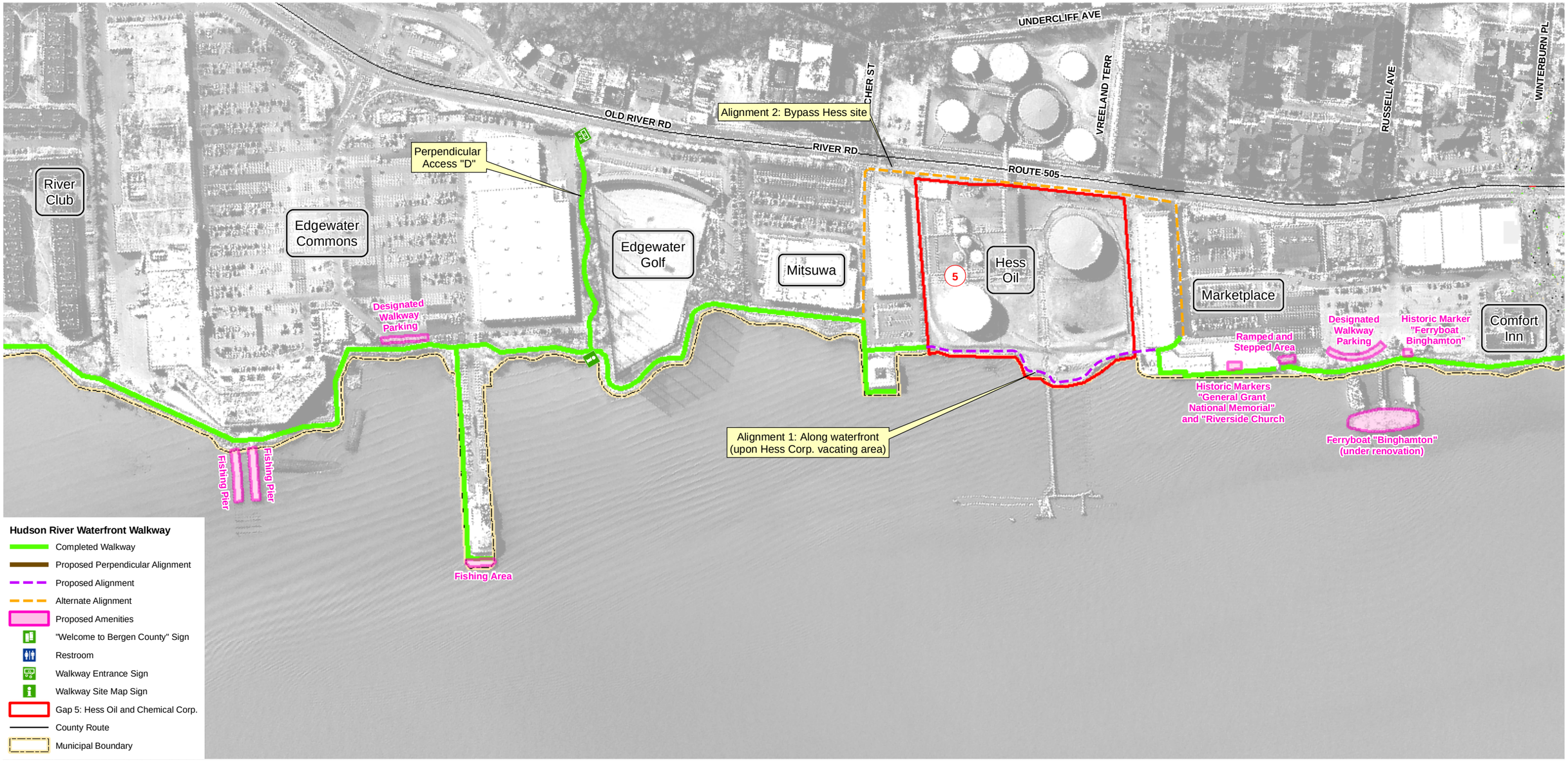
Feet

Figure 4.10-1
Hudson River Waterfront Walkway: Gaps 1-4
Boroughs of Edgewater and Fort Lee
Bergen County, New Jersey



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Feet

Figure 4.10-2
Hudson River Waterfront Walkway: Gap 5
Boroughs of Edgewater and Fort Lee
Bergen County, New Jersey

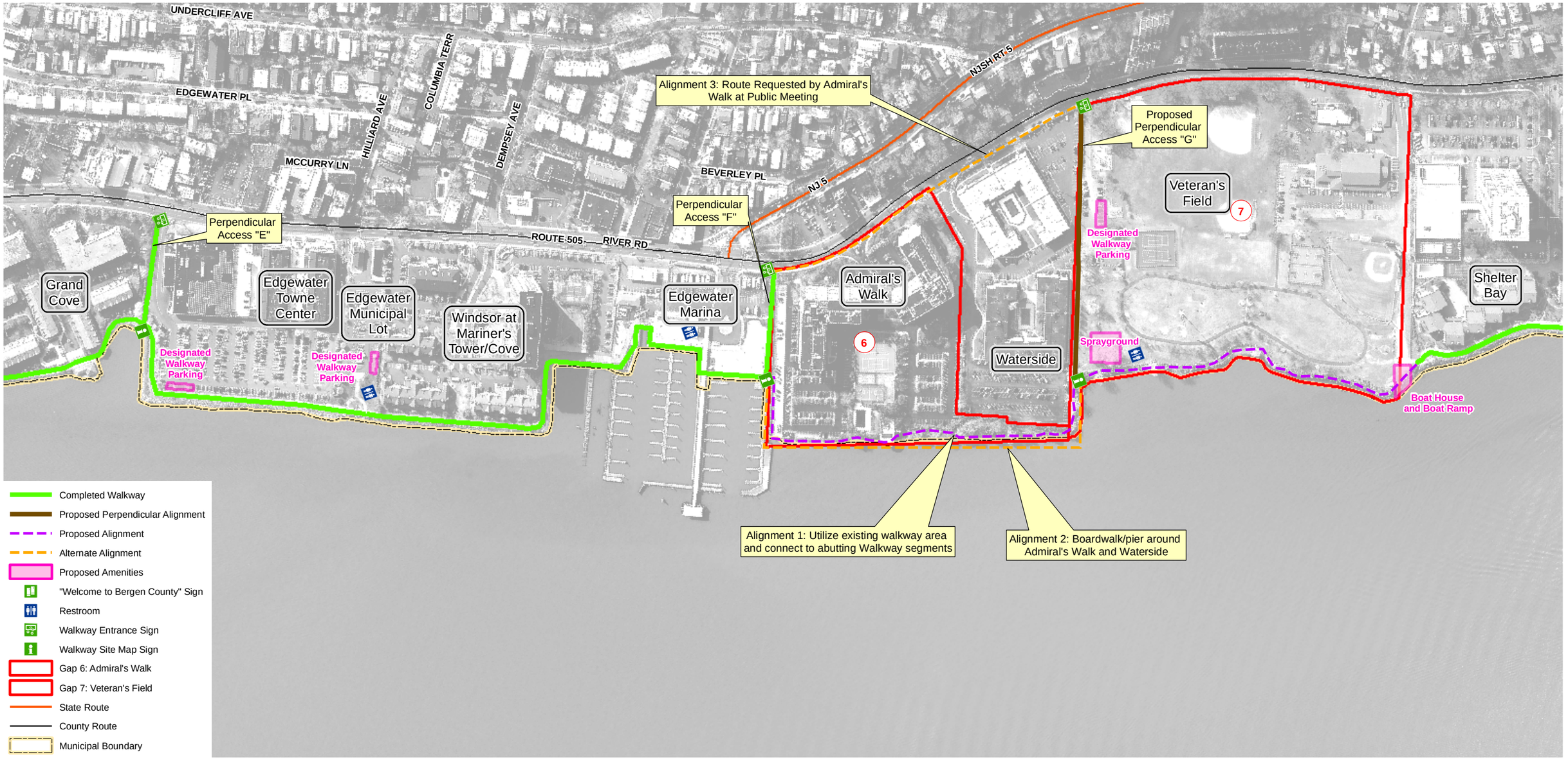
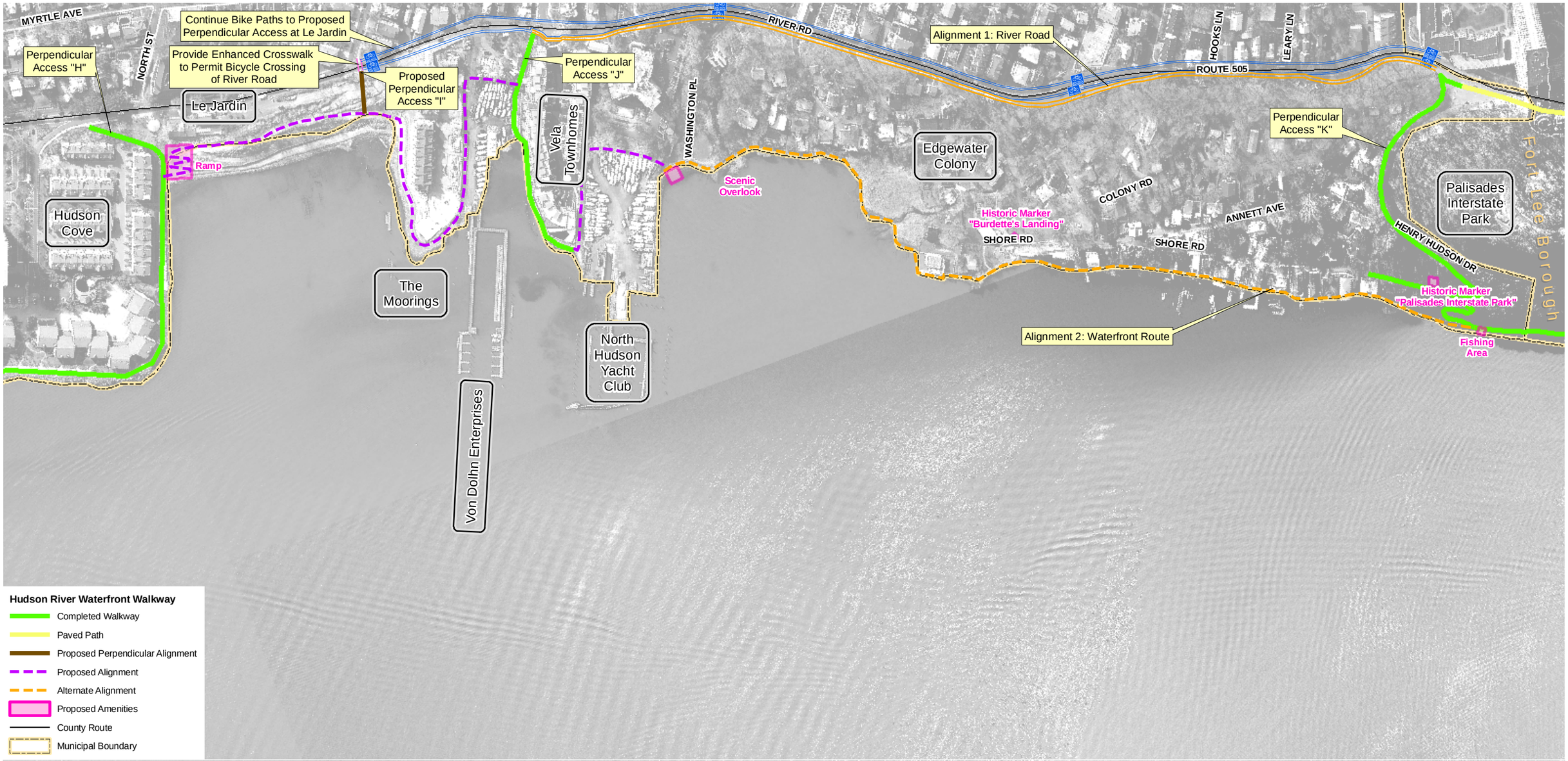


Figure 4.10-3
Hudson River Waterfront Walkway: Gaps 6-7
Boroughs of Edgewater and Fort Lee
Bergen County, New Jersey



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Feet

Figure 4.10-4
Hudson River Waterfront Walkway: Gaps 8-12
Boroughs of Edgewater and Fort Lee
Bergen County, New Jersey

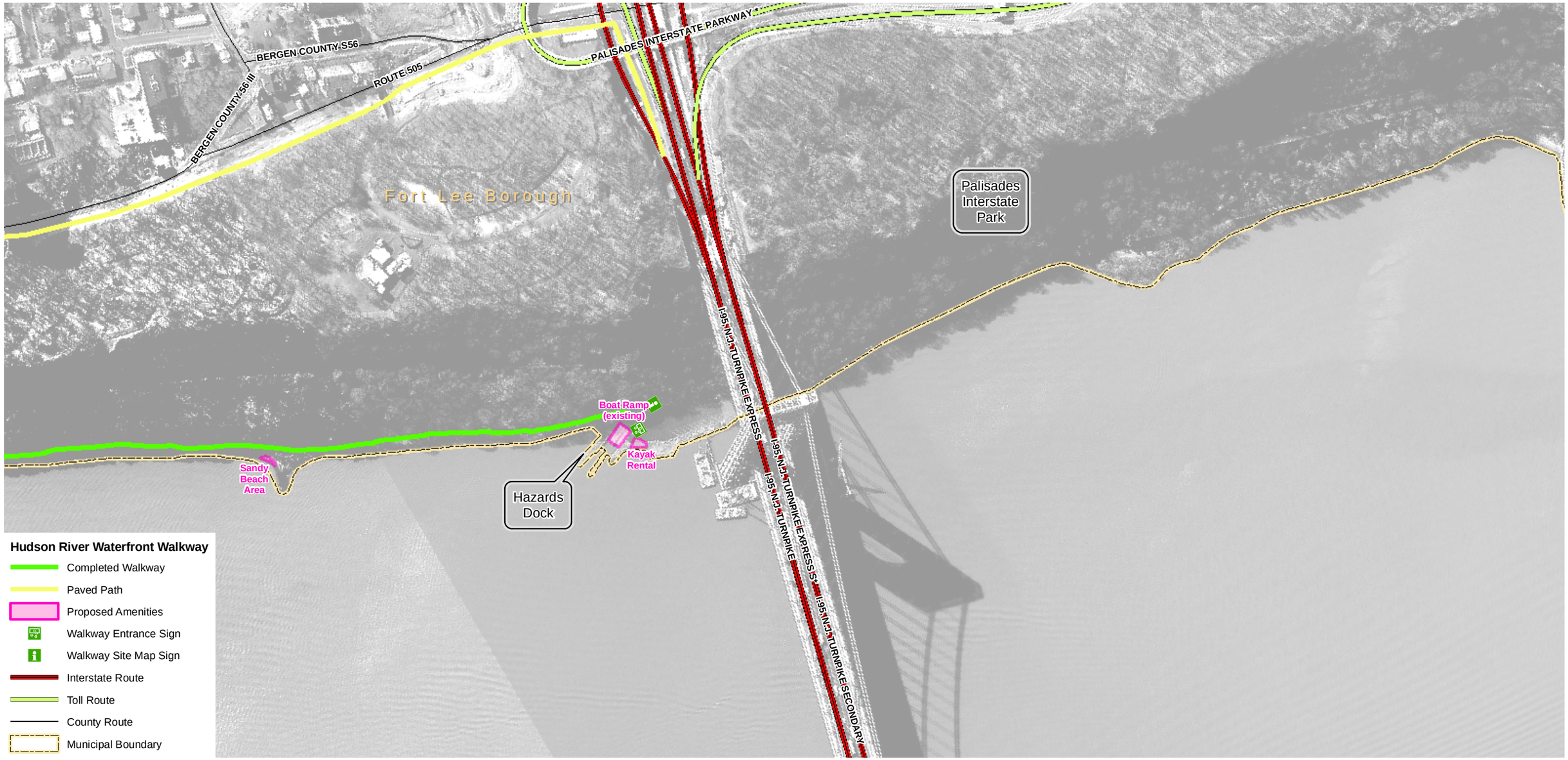


Figure 4.10-5
Hudson River Waterfront Walkway
Boroughs of Edgewater and Fort Lee
Bergen County, New Jersey

4.11. Completing the Gaps

As it exists today, the Hudson River Waterfront Walkway in Bergen County lacks complete connectivity along the Hudson River Waterfront. Inadequate or non-existent Walkway segments prevent the community from enjoying the full benefits of a completed Walkway. In addition, an incomplete Walkway presents a safety risk to its users, as it requires users to utilize alternate routes that lack adequate pedestrian facilities and provide minimal protection from vehicular traffic. Therefore, each gap location has been analyzed separately, and the plan of action to complete each gap identifies the proposed options for alignment, and addresses amenity locations, permitting, constraints, and costs. The following is a gap analysis for all areas lacking a walkway in the project area as of the adoption of this Plan. The following analysis provides the basis for the recommended actions contained within the Action Plan in Section 3, as well as the timeframes and costs associated with completing these actions.

4.11.1. Gap 1

Gap 1: I-Park Edgewater (Edgewater; Block 99, Lots 1, 3, 4, and 5)

Alignment: The Waterfront Walkway shall be placed along the alignment as indicated on the "Unilver Site Redevelopment" plans prepared by Lisa A. Digerolamo, P.E., of Paulus, Sokolowski, and Sartor, LLC., dated August 7, 2006 and revised through February 27, 2009. This alignment is indicated on Figure 4.10-1 of this Plan.

Perpendicular Access: A 20-foot perpendicular access point shall be located along the southern property extent from River Road to the Waterfront Walkway. The design of the perpendicular access shall be in accordance with the following:

» The alignment of the perpendicular access shall be as indicated on the "Unilver Site Redevelopment" plans prepared by Lisa A. Digerolamo, P.E., of Paulus, Sokolowski, and Sartor, LLC., dated August 7, 2006 and revised through February 27, 2009;
» The design of the perpendicular access shall be in accordance with Figure 4.2-2 of this plan which incorporates a total (including edging) of 10-feet of bike lane, and 10-feet of walkway.

Parking: Eight (8) parking stalls as indicated on Figure 4.10-1, and shall be designated with signage for Waterfront Walkway users.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals.

Signage: The following signage shall be located on the site:

» At the entry to the perpendicular access, a Hudson River Waterfront Walkway sign shall be provided on the passive recreation side of the Walkway, as indicated on Figure 4.2-2.
» A site map sign shall be located at the intersection of the perpendicular access and the walkway.
» A "Welcome to Bergen County" sign with the opposite side thanking visitors for coming, shall be located at the County line on the Walkway.

Recreational Amenities: A small stage, outdoor picnic area, and fishing pier shall be located on the site as indicated on Figure 4.10-1 of this Plan. A restroom facility will also be located on the site.

Easements: The easements shall be as indicated on the "Unilver Site Redevelopment" plans prepared by Lisa A. Digerolamo, P.E., of Paulus, Sokolowski, and Sartor, LLC, dated August 7, 2006 and revised through February 27, 2009. These plans provide for a 20-foot wide access easement for perpendicular access, and a 30-foot access easement for the Walkway.

Permits: See Section 4.8 of this Plan

Constraints: As plans have already been approved for this site, certain changes may result in amended site plan approval or revision to NJDEP permits. However, the recommend design elements do not appear to cause significant changes to the approved layout with the exception of the fishing pier which provides a re-use for an existing pier that extends into the water.

Costs: I-Park will consist of 1,750 LF of Walkway with an estimated construction cost of $2,354,762.00; this estimate includes walkway construction including all amenities listed above, repaving and striping of the designated parking area, designated parking area signage, one (1) walkway entrance sign, one (1) walkway site map sign, one (1) "Welcome to Bergen County" sign, retrofitting an existing concrete fishing pier, a stage, two outdoor seating areas, and a public restroom. The 450 LF of perpendicular access upgrades are estimated at $159,750. In addition, if a new bulkhead was installed on this site, then $2,625,000 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

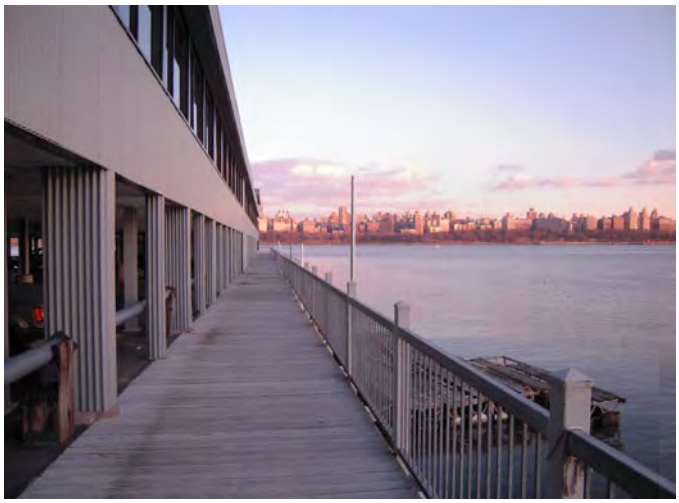
4.11.2. Gap 2

Gap 2: 115 River Road (Edgewater; Block 96, Lots 3.01 and 4.01)

Alignment: The Waterfront Walkway shall be placed along one of the following alignments as depicted on Figure 4.10-1 of this Plan:

» **Alignment 1:** The first alignment is to route the Walkway through an existing on-site parking garage. It is anticipated that this would act as an alternate direct route to the scenic route, which is Alignment 2. Additionally, this would be the preferred bike route and the boardwalk would be the passive recreational route.

» **Alignment 2:** The second alignment is to extend the existing boardwalk around the easterly and northerly walls of the building, and provide a connection to proposed and completed Walkway segments north of the property. If this alternate is selected, then signage should direct bicycles to use Alignment 1 through garage.



Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals.

Signage: Warning signage to alert drivers, bicycles and pedestrians of shared use in short segment within parking garage of Alignment 1; Alignment 2 would require same signage plus signage encouraging bikers to use Alignment 1 and not the Boardwalk.

Recreational Amenities: A Picnic Area open to the public shall be located at the end of the Boardwalk (tables currently exist in this location) as indicated on Figure 4.10-1 of this Plan.

Easements: A 30-foot access easement is required for the Walkway.

Permits: See Section 4.8 of this Plan.

Constraints: The site is entirely covered by structures that extend into the Hudson River. Therefore, the Waterfront Walkway may have to extend through the parking lot, which will require traffic calming measures and warning signage for Alternate 1. Alternate 2 will result in high costs to construct a boardwalk along the northern side of the building.

Costs: 115 River Road will consist of 185 LF of Walkway along the waterfront north of the parking garage. The portion within the parking garage would be asphalt and include pavement markings for the bike route. The boardwalk would be replaced and extended around the structure for the pedestrian route, and the replacement boardwalk would be a 10-foot wide steel frame structure with steel railings, and composite decking. The total estimated cost for the entire improvement including commercial boardwalk structure is $1,777,100. In addition, if a new bulkhead was installed on this site, then $277,500 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.3. Gap 3

Gap 3: Quantas Resources (Edgewater; Block 95, Lot 1)

Alignment: The alignment shall be along the waterfront as indicated on Figure 4.10-1 of this Plan.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals.

Recreational Amenities: As indicated on Figure 4.10-1 of this plan, Kayak rentals shall be located at the site once remediation is completed and accepted by NJDEP.

Easements: A 30-foot access easement is required for the Walkway.

Permits: See Section 4.8 of this Plan.

Constraints: The site is a superfund site and may take some time to complete remediation.

Costs: Quantas will consist of 240 LF of Walkway and a kayak rental area for an estimated cost of $125,400. In addition, if a new bulkhead was installed on this site, then $360,000 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.4. Gap 4

Gap 4: MJM Waterfront Developers (Edgewater; Block 85.01, Lot 3.03)

Alignment: The Waterfront Walkway shall be placed along the alignment as indicated on Figure 4.10-1 of this Plan, which is along the waterfront connecting two completed portions of the Waterfront Walkway.

Perpendicular Access: A perpendicular access point exists along the southern side of this property. Although not specifically located on this property, when the site is redeveloped, the design of the perpendicular access shall be reconstructed to be in accordance with Figure 4.2-2 of this plan. It is noted that Figure 4.2-2 incorporates a total (including edging) of 10-feet of bike lane, and 10-feet of walkway.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals.

Signage: The following signage shall be located on the site:

- At the entry to the perpendicular access, a Hudson River Waterfront Walkway sign shall be provided on the passive recreation side of the Walkway, as indicated on Figure 4.2-2.
- A site map sign shall be located at the intersection of the perpendicular access and the walkway.

Amenities: Public restroom facilities shall be provided and a playground (existing).

Easements: A 20-foot-wide access easement shall be provided for the perpendicular access, and a 30-foot-wide access easement shall be provided for the Walkway.

Permits: See Section 4.8 of this Plan.

Constraints: The site requires onsite remediation, which could take some time to complete. Upon the completion of on-site remediation, it is assumed that the site will be redeveloped.

Costs: MJM Waterfront Properties will consist of 235 LF of Walkway, a new playground, and a restroom facility for an estimated cost of $508,100. A portion of this Waterfront Walkway is constructed and there is an existing playground on the site, therefore may be a reduction in the above estimated cost if some amenities can be reused or renovated. In addition, if a new bulkhead was installed on this site, then $352,500 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.5. Gap 5

Gap 5: Hess Oil and Chemical Corp (Edgewater; Block 76, Lot 5)

Alignment: The Waterfront Walkway shall be placed along one of the following alignments as depicted on Figure 4.10-2 of this Plan:

» **Alignment 1:** The first alignment is along the waterfront and is the recommended route of this plan.

» **Alignment 2:** The second alignment is to bypass the waterfront by directing users to River Road and around the site, which would be an alternate route if an agreement cannot be made with the owner to construct the walkway along the waterfront.

Perpendicular Access: If Alignment 2 is implemented each extent of the property will act as a perpendicular access, and will have a 20-foot-wide width, which, in accordance with Figure 4.2-2 of this plan, incorporates a total (including edging) of 10-feet of bike lane, and 10-feet of walkway.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals.

Signage: The following signage shall be located on the site if Alignment 2 is implemented:

» At the entry to the perpendicular access, a Hudson River Waterfront Walkway sign shall be provided on the passive recreation side of the Walkway, as indicated on Figure 4.2-2.
» A site map sign shall be located at the intersections of both of the perpendicular access points with the walkway.

Easements: A 20-foot-wide access easement is required for Alignment 1; a 30-foot access easement is required for the Walkway for Alignment 2.

Permits: See Section 4.8 of this Plan.

Constraints: For Homeland Security reasons, public access to the waterfront of this site is prohibited, unless security measures are installed along the waterfront. It is unlikely that Alignment 1 will be constructed until the site changes ownership and use. If Alignment 2 is constructed, the width available along River Road would have to be reviewed to determine if redesign of River Road would be required to accommodate the walkway.

Costs: Hess has two proposed alignments. Alignment 1 is a 780 LF alignment along the waterfront, with an estimated cost of $358,800. Alignment 2 bypasses the site, and uses the perpendicular access alignment with a 20-foot width and no benches; it acts as a means to travel around the site. Alignment 2 is 1,800 LF, and has an estimated cost of $639,000. In addition, if a new bulkhead was installed on this site, then $1,170,000 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.6. Gap 6

Gap 6: Admiral's Walk (Edgewater: Block 33, Lots 1N, 1S, and 2)/ Waterside (Edgewater; Block 33, Lots 1.02 and 1.03)

Alignment: The Waterfront Walkway shall be placed along one of the following alignments as depicted on Figure 4.10-3 of this Plan:

» **Alignment 1:** The first alignment is to utilize the existing walkway area along the waterfront, which is currently gated off from public use, and extend it to connect to the abutting waterfront walkways. This is the recommended route of this plan.

» **Alignment 2:** The second alignment requires the construction of a boardwalk on a pier that bypasses the entire property. This alternate alignment could be constructed if an agreement cannot be reached with Admiral's Walk to construct Alignment 1.
» **Alignment 3:** The third alignment is to bypass the waterfront by directing users to River Road and around the site. This alternate alignment is a second option if an agreement cannot be reached with Admiral's Walk to construct Alignment 1.

Perpendicular Access: If Alignment 1 or 2 is implemented, then the existing perpendicular access on the southern extent of the property should be updated to comply with Figure 4.2-2. If Alignment 3 is implemented, each extent of the property will act as a perpendicular access, and will have a 20-foot width, which, in accordance with Figure 4.2-2 of this plan, incorporates a total (including edging) of 10-feet of bike lane, and 10-feet of walkway.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals. However, if Alignment 1 is implemented, then the width may have to be reduced in the vicinity of an encroaching work-out room facility.

Signage: The following signage shall be located on the site for perpendicular access points:

» At the entry to the perpendicular access, a Hudson River Waterfront Walkway sign be provided on the passive recreation side of the Walkway, as indicated on Figure 4.2-2.
» A site map sign shall be located at the intersections at both of the perpendicular access points to the walkway.

Easements: A 20-foot-wide access easement is required for Alignment 3; a 30-foot access easement is required for the Walkway for Alignments 1 and 2, with a 20-foot easement for the upgraded perpendicular access.

Permits: See Section 4.8 of this Plan.

Constraints: Admirals Walk and Waterside are gated communities and the majority of residents of these communities feel strongly that public access along the waterfront abutting their development creates safety issues that do not currently exist. Many residents of this community have expressed that they purchased units in this location, because it is a gated community and does not have public access. Therefore, in order to construct Alignment 1, security fencing, the realignment of the steps to the fitness center, and key card entry to the fitness center may be needed to alleviate the residents concerns. Alignment 2 is a costly alternative, however, it would provide a separation between the walkway and the site, which may also address resident concerns. Alignment 3 is costly due to the length that the walkway would need to be extended in order to bypass the site, and may require a redesign of River Road to accommodate the width.

Costs: Admirals Walk has three (3) options of Alignment. Alignment 1 is 1,090 LF along the Waterfront with an estimated cost of $588,600. This alignment includes eight (8) foot high security fencing. It should be noted that Alignment 1 may see a reduction from the above cost due to a reduced with in several areas due to existing site constraints, however the full width was used for the calculation of the site as this in case there is ever a full renovation of this section the property.

Alignment 2 is for a 1,100 LF 10 foot wide commercial boardwalk with steel frame, steel railings, and composite decking that is entirely separated from the property. This alignment has an estimated cost of $2,750,000.

Alignment 3 is a bypass route along River Road from perpendicular access point to perpendicular access point. The bypass uses the perpendicular access cross section. Alignment 3 is 1,050 LF with an estimated cost of $372,750. This route requires the perpendicular accesses to both be constructed on the abutting properties; however the cost estimates for these abutting perpendicular accesses are contained in under the respective lots.

In addition, if a new bulkhead was installed on this site, then $1,630,500 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimates for all alignments and the bulkhead.

4.11.7. Gap 7

Gap 7: Veteran's Field (Edgewater; Block 30, Lots 1 and 2)

Alignment: The Waterfront Walkway shall be placed along the waterfront, as indicated on Figure 4.10-3 of this Plan.

Perpendicular Access: A 20-foot perpendicular access point shall be located along the southern property extent from River Road to the Waterfront Walkway. The design of the perpendicular access shall be in accordance with Figure 4.2-2 of this plan which incorporates a total (including edging) of 10-feet of bike lane, and 10-feet of walkway.

Parking: Ten (10) parking stalls, as indicated on Figure 4.10-3, shall be designated with signage for Waterfront Walkway users.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals.

Signage: The following signage shall be located on the site:

- At entry to perpendicular access a Hudson River Waterfront Walkway sign shall be provided on the passive recreation side of the Walkway as indicated on Figure 4.2-2.
- A site map sign shall be located at the intersection of the perpendicular access and the walkway.

Recreational Amenities: A spray ground shall be located on the property as indicated on Figure 4.10-3, and a boat ramp.

Easements: A 20-foot wide access easement shall be required for perpendicular access and a 30-foot access easement for the Walkway.

Permits: See Section 4.8 of this Plan.

Constraints: The Borough is in the process of NJDEP approval for improvements to the site. This Plan generally complies with the alignment, however, the accommodation for bikes on the walkway, as well as the spray ground, may require revisions to the plans and permits.

Costs: Veterans field will consist of 1,160 LF of Walkway, designated walkway parking and signage, one (1) walkway site map sign, a restroom, a spray-ground, a boathouse and a boat ramp, for an estimated cost of $1,162,700. The 855 LF perpendicular access is estimated at $303,525. In addition, if a new bulkhead was installed on this site, then $1,740,000 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.8. Gap 8

Gap 8: Le Jardin (Edgewater, Block 22, Lots 1 and 4)

Alignment: The Waterfront Walkway shall be placed along an embankment along the waterfront as indicated on Figure 4.10-4 of this Plan.

Perpendicular Access: A 20-foot perpendicular access point shall be located along the northern property extent from River Road to the Waterfront Walkway. The design of the perpendicular access shall be in accordance with Figure 4.2-2 of this plan, which incorporates a total (including edging) of 10-feet of bike lane, and 10-feet of walkway.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All shall be in accordance with Section 4.1 of the Plan, or approved equal.

Signage: The following signage shall be located on the site:

- At entry to perpendicular access a Hudson River Waterfront Walkway sign shall be provided on the passive recreation side of the Walkway as indicated on Figure 4.2-2.
- A site map sign shall be located at the intersection of the perpendicular access and the walkway.

Easements: A 20-foot wide access easement shall be required for perpendicular access and a 30-foot access easement for the Walkway.

Permits: See Section 4.8 of this Plan.

Constraints: In order to provide an ADA-compliant Walkway segment that can be easily traversed, a winding ramp shall be constructed at the southern extent of the property with a bypass for bike traffic, which can be aligned at a steeper grade than the walkway and provide a more direct route. The grades are also a constraint at the site, as the Waterfront Walkway segment shall begin at the existing segment on the Hudson Cove property and shall wind up the existing slope before becoming level and moving north across the property, where it will gently decline in slope and connect with the Walkway segment that is under construction at the Moorings.

Costs: Le Jardin will consist of 985 LF of walkway and an ADA compliant ramped section of walkway to address the grade difference from Hudson Cove to this property. The estimated cost is $520,600, which includes the Walkway, the ramp, one (1) site map sign, and one (1) walkway entrance sign. The 135 LF perpendicular access is estimated at $47,925. In addition, if a new bulkhead was installed on this site, then $1,477,500 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.9. Gap 9

Gap 9: The Moorings (Edgewater, Block 18, Lot 1.05)

Alignment: The Waterfront Walkway shall be placed along the waterfront as indicated on Figure 4.10-4 of this Plan.

Perpendicular Access: A 20-foot-wide perpendicular access point shall be located along the southern property extent from River Road to the Waterfront Walkway. The design of the perpendicular access shall be in accordance with Figure 4.2-2 of this plan, which incorporates a total (including edging) of 10-feet of bike lane, and 10-feet of walkway.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals.

Signage: The following signage shall be located on the site:

» At the entry to the perpendicular access, a Hudson River Waterfront Walkway sign shall be provided on the passive recreation side of the Walkway, as indicated on Figure 4.2-2.
» A site map sign shall be located at the intersection of the perpendicular access and the walkway.

Easements: A 20-foot-wide access easement shall be required for perpendicular access, and a 30-foot access easement shall be required for the Walkway.

Permits: See Section 4.8 of this Plan.

Constraints: The Walkway segment is currently under construction at the Moorings. Therefore, incorporation of the bike path may require amended site plan approval and amended permits.

Costs: The Moorings will consist of 600 LF of walkway at an estimated cost of $276,000. It should be noted that this site is under construction and may see a reduction in costs if some of the site amenities and walkway already installed a can be renovated. In addition, if a new bulkhead was installed on this site, then $900,000 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.10. Gap 10

Gap 10: Von Dohln Enterprises (Edgewater; Block 17, Lots 1, 2, 3.01, 3.02 and 4)

Alignment: The Waterfront Walkway shall be placed through the site as it is indicated on Figure 4.10-4 of this Plan.

Surface, Width, Railings, Lighting, Benches, Trash and Recycling Receptacles: All surfaces, widths, railings, lighting, benches, and trash and recycling receptacles shall be in accordance with Section 4.1 of the Plan, or their approved equals. However, location of amenities may not be feasible, as this area also experiences traffic, and width can be reduced to 20-feet, since it is not along the waterfront and located within an existing site.

Signage: Warning signage to alert drivers, bicycles and pedestrians of shared use shall be required

Easements: A 20-foot-wide access easement shall be required for this segment.

Permits: See Section 4.8 of this Plan.

Constraints: The site is an active marina. Therefore, traffic calming measures that accommodate boat access shall be incorporated.

Costs: Von Dohln Marina will consist of 570 LF of walkway, traffic calming, and one (1) walkway site map sign for an estimated cost of $272,200. In addition, if a new bulkhead was installed on this site, then $855,000 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.11. Gap 11

Gap 11: North Hudson Yacht Club (Edgewater, Block 12, Lots 6.01, 6.02 and 7)

Alignment: The Waterfront Walkway shall be placed through the site as it is indicated on Figure 4.10-4 of this Plan.

Surface & Width: All shall be in accordance with Section 4.1 of the Plan, or approved equal, and width may have to be reduced due to the segment's proposed location between two existing sites and lack of available land. A retaining wall should be used to cut into the hill on the embankment so that the Walkway can run behind the fenced area on the property. It is also recommended that the fence be relocated approximately 5-feet into the property so that an existing raised ledge in the marina can be used as part of the walkway. Lastly it is recommended that the barbed wire fence be replaced with a more aesthetically pleasing black security fence.

Signage: Warning signage to alert drivers, bicycles and pedestrians of shared use at the location where the driveway crosses the walkway.

Easements: A 20-foot-wide access easement shall be required for this segment.

Permits: See Section 4.8 of this Plan.

Constraints: The site is an active yacht club. Therefore, traffic calming measures that accommodate boat access shall be incorporated at the driveway. Additionally, a retaining wall, fence relocation, and fence replacement would be required.

Costs: The North Hudson Yacht Club will consist of 810 LF of walkway, a retaining wall, and 8-foot high security fencing for an estimated cost of $543,600. In addition, if a new bulkhead was installed on this site, then $1,215,000 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimate.

4.11.12. Gap 12

Gap 12: Edgewater Colony (Edgewater, Block 1, Lots 1 and 7)[3]

Alignment: The Waterfront Walkway shall be placed along one of the following alignments as depicted on Figure 4.10-4 of this Plan:

» **Alignment 1:** Alignment 1 proposes to bypass the Edgewater Colony and provide a Walkway segment along River Road. This alignment would require the redesign River Road to provide the right-of-way to construct a compliant Walkway segment along the roadway. This alignment will provide a relative short-term solution to completing the existing gap on the property. The proposed Walkway segment along River Road will facilitate a connection to the Palisades Interstate Park and the George Washington Bridge and will provide dedicated bicycle lanes for cyclists traveling to and from the Park and the Bridge.

Pros	Cons
» Relative short-term solution to providing completed walkway segment.	» Does not offer waterfront access to Walkway users
» Provides access to Palisades Interstate Park, George Washington Bridge	» Full width of Walkway segment infeasible in some locations due to existing development patterns and topography
» Addresses safety and security concerns of Edgewater Colony Residents	» Will require redesign of River Road

3 Please note: Agreements between Edgewater Colony, Inc. and NJDEP, including a Settlement Agreement in Lieu of Permit, conservation easements and related plans, currently exist for the Edgewater Colony Property. Said documents contain information relating to the Project herein and are attached as Appendix B.

» **Alignment 2:** Alignment 2 proposes a compliant Waterfront Walkway segment along the waterfront from the southerly property line of the Edgewater Colony to Palisades Interstate Park. This alignment will require removal or modification of the existing docks and would be located adjacent to existing homes built on the water. This alignment would likely take years to accomplish due to constraints relative to the docks including environmental permitting and piered construction. Therefore it is considered a long term solution to providing continuous waterfront access.

Pros	Cons
» Provides waterfront access to Walkway users	» Existing development patterns along waterfront will make implementation costly
» Provides access to waterfront trail in Palisades Interstate Park	» Will require extensive environmental permitting.
» Complies with NJDEP Hudson River Waterfront Walkway Design Standards	» Long term solution that will take years to implement » Proximity to existing homes along waterfront

Perpendicular Access: Perpendicular access is provided on the northerly portion of the property via a crushed stone and stone staircase, from the entrance of the Palisades Interstate Park and the proposed Walkway segment to a walking trail along Hudson River Waterfront in the Palisades Interstate Park. However, this perpendicular access point is not ADA-compliant.

Surface & Width:

» **Alignment 1:** A paver walkway ten (10) feet in width will be provided along River Road along the length of the property except in those places where existing development patterns or other constraints prevent the construction of a 10-foot wide walkway. A dedicated bicycle path five (5) feet in width will be provided on each side of River Road.
» **Alignment 2:** A waterfront walkway constructed as a commercial boardwalk structure, with a steel frame, steel railings, and composite decking will be provided along the river bank for the length of the property.

Signage: As indicated on Figure 4:10-4, two (2) ecological information signs and a historic marker for Burdette's Landing will be located on the property, as indicated on the map. Additional signage will be located at the trail head of Palisades Interstate Park at the north end of Shore Road. Site maps notifying Walkway users of existing easements

within the Edgewater Colony will be provided at the intersection of River Road and Annett Avenue and Henry Hudson Drive and Annett Avenue.

Amenities: A fishing table will be located in near Palisade Interstate Park.

Easements: The existing conservation easements in the Colony will remain unchanged.

Permits: See Section 4.8 of this Plan.

Constraints: Alignments 1 and 2 are costly. Alignment 1 will require a redesign of River Road. Additionally, Alignment 1 also results in a long stretch of Walkway far from the waterfront. Alignment 2 will require extensive permitting and modification of existing docks along the Waterfront. Additionally, construction of Alignment 2 will be costly as the construction of the commercial boardwalk is estimated at $2,500/LF.

Costs: The Colony has two (2) options of Alignment. Alignment 1 is 2,800 LF along River Road with an estimated cost of $1,004,000. This alignment would have a 10-foot paver width where feasible and bike lanes along River Road. This alignment also includes one (1) Long Path Trail Connector Sign, one (1) walkway site map sign, and one (1) walkway entrance sign.

Alignment 2 is for a 2,800 LF 10 foot wide commercial boardwalk with steel frame, steel railings, and composite decking that is mostly separated from the property. The alignment also includes three (3) ecological information signs. This alignment has an estimated cost of $7,007,500.

In addition, if a new bulkhead was installed on this site, then $4,194,000 is estimated for the bulkhead. Please see Appendix D for the detailed cost estimates for all alignments and the bulkhead.

5. Plan Implementation

5.1. Walkway Entity

Central to the implementation of this Design and Implementation Strategy Plan will be the establishment of a single entity that will oversee and be responsible for the Hudson River Waterfront Walkway. This entity may be public, quasi-public, or private and will act as the Controller of Bergen County's Hudson River Waterfront Walkway. As detailed below, it will take a comprehensive approach to implementing the County's vision.

5.1.1. Surface and Width

One of the best ways to ensure that the entity is able to implement the vision of Bergen County's Hudson River Waterfront Walkway Design and Implementation Plan is for it to secure ownership of all lands within 30-feet of the Hudson River. By securing ownership, the entity would be in complete control of the land, and in the best position to achieve a cohesive Walkway this is free of gaps and consistent in its approach to design, maintenance, and security.

The most attractive way for an entity to acquire lands along the Hudson would be to encourage the dedication of such lands to the entity. By encouraging dedication of property, the entity is preserving capital for development and maintenance activities, while the donors are benefiting from possible income tax deductions and a reduced property tax burden. Donors would also have the added benefit of a cost savings from property development and maintenance, while the entity would gain a potential revenue stream from the sale of perpetual leases as discussed below.

In order to facility this, a Memorandum of Agreement (M.O.A.) that details technical standards should be made between the entity, the current owners of the parcels, and the municipality.

5.1.2. Funding

Adequate funding is vital to the stable, efficient, and successful operation of the entity. It is, therefore, critical that it have access to perpetual funding sources so that it may be effective in its role.

There are a number of potential funding sources. For instance, in addition to a potential funding commitment made by the State of New Jersey, there may be opportunities for the allocation of County and municipal open space tax revenues to the entity. Grants and favorable loans from State and Federal government, as well as the North Jersey Transportation Planning Authority, may also be a possibility[4].

Other funding sources may be realized through the use of special planning measures, such as the establishment of a Transportation Enhancement District. The use of such mechanisms could generate revenue from impact-based fees, and open the door to additional funding opportunities and technical assistance from the State and Federal governments.

In addition to the above, it is noted that if land is successfully acquired by the entity, it may also be used to generate revenues. One way that lands held by the entity could be used to generate revenues would be through the execution of leases. As an example, a lease may be sold when a use encroaches upon entity controlled land, or when a business seeks to use a portion of it. Indeed, such arrangements would provide the entity with a perpetual revenue stream.

4 See Section 3.3.4 for a detailed listing of potential opportunities.

5.1.3. Maintenance

Proper care and maintenance is a prerequisite to the Walkway's long-term success. As such, it is important that the entity engage municipal officials, local property owners and residents to establish a maintenance plan that it will execute on a routine basis. Through proper upkeep and maintenance of the Walkway, the entity is ensuring that it maintains a positive image within the community and is avoiding unnecessary expenses resulting from neglect.

5.1.4. Permitting

As previously noted in Section 4.10, it is recommended that the entity seek appropriate permits from the NJDEP's Land Use Regulation Program and the United States Army Corps of Engineers. Such permits should be applicable to the entire regulated area within the entity's jurisdiction, and would expedite the construction of the Waterfront Walkway by eliminating the need for multiple permits used for the same purpose.

It is noted that the issuance of one permit each from the NJDEP and the United States Army Corps of Engineers would have the effect of transferring the permitting process to the entity.

5.1.5. Organizational Arrangements and Legal Framework

Local oversight of the Walkway's construction is currently provided by the Borough of Edgewater during the municipal site plan review process. To ensure that the Walkway is developed in a coordinated manner, it is, however, recommended that this oversight be transferred to the entity. The guiding principles of this oversight should be the design standards contained in Section 4 of this plan, which should be formally adopted and enforced by the entity[5].

5.2. Plan Implementation

The Hudson River Waterfront Walkway Design and Implementation Plan should provide guidance for all new Waterfront projects along the Bergen County Waterfront. The Waterfront Walkway and Perpendicular Access cross sections as well as the amenities outlined in Chapter 4 should be incorporated into all private and capital improvement projects within the project area. The local Land Development Ordinances of Edgewater and Fort Lee, as well as the Bergen County Site Plan and Subdivision Resolution should be updated to adopt the alignments, cross sections, and amenities outlined in Chapter 4 of this plan and to require 30-foot conservation easements along the waterfront. All subsequent site plan and subdivision applications should be reviewed for consistency with this plan. Additionally, the County should work with the NJDEP to request that they cite these guidelines in their approvals.

It is the recommendation of this plan that a single entity be formed that will oversee and be responsible for the Hudson River Waterfront Walkway. Ultimately, this Entity would prioritize the actions in the Plan, identify and secure funding, and monitor the attainment of the goals using the Indicators described in the Plan. In the interim, while the County is working to form the Entity, funding should be secured to advance projects, policies, and studies for which the County is identified as the Lead Implementation Agency. The County should also work with all agencies identified in the Action Plan to advance other projects, policies, and studies. The County should monitor its progress in the attainment of its Goals, by tracking the Indicators and Targets.

5 To provide guidance for the period between this Plan's adoption and the formation of the entity, it is recommended that the boroughs of Fort Lee and Edgewater adopt and implement the design guidelines contained in Section 4.

By implementing Bergen County's Hudson River Waterfront Walkway Design and Implementation Plan, the Bergen County waterfront will be transformed into a continuous, non-motorized transportation artery and recreational amenity that is a focal point of the region.

Appendix A: Compendium of Public Comments

First Meeting of Regional Collaborative (September 9, 2009)

Louis Kleinman
Metropolitan Waterfront Alliance (MWA)

» Our stakeholders are those who get into the water, paddlers, rowers, boaters, and commercial users.
» A win for us would be a contiguous walkway with substantial public access into the river, assuming all the requirements of maintenance, safety, etc.

Helen Manogue
Hudson River Waterfront Conservancy of NJ, Inc.

» Definition: "The parents" of the walkway-the Waterfront Conservancy- is not exactly an "orphan."
  - Lack of perpendicular access
  - Lack of required signage
  - Lack of maintenance
  - Lack of walkarounds
  - A disintegrating shorefront
» Win – Creation, if required and funding of a waterfront regional entity to construct, maintain, oversee, and manage the walkway.
» Will someone make clear that there are rules and regulations for development and maintenance of the walkway in existence since 1982?

Mauro Raguseo
Bergen County Improvement Authority

» Interest: Provide a recreational opportunity for Bergen County.
» Issue/Concern: Costs? Timeframe?
» Win: A complete walkway with no gaps within five years.
» Will the walkway conform or complement walkways in Hudson County?

Jim Hall
Palisades Interstate Park Commission

» Interest: Connection to the (Palisades Interstate) Park that borders the north end of the walkway.
» Issue/Concern: Complete and interconnected walkway.
» Win: A complete and contiguous walkway with short term and long term plans to deal with "gaps".
» What legislation will be required to create entity to manage?

Nancy Merse
Mayor, Borough of Edgewater

» Interest: Maintenance budget
» Concerns:
  - Emergency services entrances
  - Policing walkway
  - Maintenance responsibility

Ted Semegran
East Coast Greenway (ECGA.com) & Bicycle Touring Club of North Jersey (BTCNJ.com)

» New Jersey Bicycle Coalition (NJBC.org) – new bicycle advocacy group in NJ
» Questions/Key Interests: Timeframe (for completion of Walkway)??
» Concerns:
  • Access by pedestrians/cyclists;
  • Wide enough for pedestrians/cyclists;
  • Input by cycling advocates;
» Win: A path somewhat like, as good or better than, NY Greenway, a 7-9 mile path along east side of Hudson River, starting at the George Washington Bridge to Battery.

Stephen Marks
Hudson County Government

» Win: Construction and completion of a world-class walkway and esplanade from the Bayonne Bridge to the Palisades Interstate Park by 2025.
» Additional Stakeholders:
  • NYNJ Baykeeper/American Littoral Society;
  • Hudson River Fisherman's Association;
  • DEP – Tali Engoltz McArther;
» "Magic Eight Ball" – will there be a consensus for public funding for the long-term maintenance and operation of the Hudson River Waterfront Walkway?
» Explore a joint meeting among municipalities, counties, and State as an administrative entity.
» Goals & Objectives:
  • Facilitate public access to the Hudson River Waterfront along its entirety from the Bayonne Bridge to the GWB/PIP;
  • Complete the walkway per NJDEP design standards;
  • Create scenic vistas and park, open space and recreation opportunities;
  • Facilitate direct contact with surface water through marinas, beaches, kayak & canoe launches.

Mayor John DeRienzo
Chairman, Bergen County Open Space Trust Fund Public Advisory Committee

» Supporting project $.
» Funding?
» Long term maintenance;
» Who will use? Estimation of numbers of users.

Unknown Responder

» Win: Build and sustain public awareness and support for walkways
» Issues: How will landowners support walkway if they don't like idea of "intrusive" public Walkway?

Sheree Davis
New Jersey Department of Transportation (NJDOT)

» Interest: Being a partner to create a safe & accessible walkway for all non-motorized users for recreation and transportation.
» Issue/Concern: That there is lack of funding to implement the recommendations. You need to incorporate in your goals and vision a strategic plan for maintenance. Also, you need to include an education component to include wayfinding.
» Win: Getting it complete.
» Question: How will you address maintenance jurisdiction of the walkway?

First Public Visioning Workshop (December 9, 2009)

Table 1 (Facilitated by Jaclyn Flor)

» General Comments
- Bike group is seeking to pave the trail in Palisades Park from Hazards Dock to the Colony (National Recreation Trail – Federal).
- Walkway model just north of Weehawken Ferry is ideal.
  - » Separate bike path and walkway
  - » Wider than Hudson River Waterfront Walkway.
  - » Tree surface for joggers. Approximately 3 feet would be like a ribbon tying it all together.
  - » There should be some level of consistency/uniformity along the Walkway.
  - » Gazebos.
- Consensus on Bergen County taking over the Walkway as a County Park, and overseeing maintenance.
- Sandy beach areas for kayaks, etc.
- Signage: Mileage along Walkway, recreation areas, history, ecological markers, perpendicular access points.
- Play area for children.
- No support for music/entertainment gathering area.
- Doggie bags and ecological trash cans.
- Lighting and benches and shaded areas.
- Implement designated fishing areas.
- Community boating area/boathouse.
- National Recreation Trail: "Share Trail", Federal Jurisdiction and Palisades.
- Question as to boundary between Palisades National Recreation Area and State/town jurisdiction.
- Generally positive reaction to alternate Walkway route around Admiral's Walk and Waterside developments.
- Reassess/upgrade the Binghamton.

» Concerns
- Need portages for small boat uses.
- Low tide areas dirty and smelly.
- Slippery wood when wet or freezing.
- Tripping hazards.
- Goose droppings along Walkway.
- Interim path on River Road is dangerous for cyclists.
- Differing materials are difficult for cyclists to navigate.
- Hess
- Overgrown areas in Palisades. Concerned with ticks.
- Walkway is in disrepair near Edgewater Golf facility.
- Grand Cove Walkway segment is very narrow, especially for cyclists.
- Concerns around Binghamton.
- Complete Walkway around Hess site.

» Opportunities
- Potential around Quantas Resources site.
- Area around Binghamton Ferry Boat.
- Breathe new life into the Binghamton.
- Adding a designated fishing area on the trail located to the north of the Colony.
- Using pier near Edgewater Commons as a fishing pier.

Table 2 (Facilitated by Anthony Rodriguez/Stan Slachetka)

» Concerns
- Gaps – Inability to walk entire Walkway.
- Safety and Security along Walkway, especially with reference to residential uses along the Walkway.
- Erosion/Sinking of Walkway Segments, especially in Grand Cove.
- Maintenance of quality of life for residents living on/around Walkway.
- Height of Vegetation and overgrown segments of Walkway.
- Problem with structural integrity of Walkway.
- Limited Walkway access along southerly portion of Marketplace.
- Need for better walking facilities around Hess.
- During autumn months, Walkway segment north of Colony can be hazardous, especially when leaves are wet.
- Who is responsible for maintenance/safety of the Walkway?
- Lack of room to accommodate several types of transportation (e.g., Walking, biking)
- Lack of public restrooms along the Walkway.
- Vandalism is a problem along certain segments (Grand Cove).
- "Dips" in Walkway resulting from erosion.
- Trash and litter are a problem along certain Walkway segments.
- Poor lighting in some areas.
- Need for parking, especially along northerly segments.
- Need for signage notifying those fishing to not take or eat fish caught from River.
- Public transportation around Walkway.
- Need for directories/maps along Walkway to orient users to locations.
- Increase number of public fishing areas.

» Opportunities
- Consider constructing a public boat launch near Binghamton site for small paddle boats and kayaks.
- The Walkway needs a uniform theme or some element to help users identify Walkway path (consistency of one key design element that isn't signage.)
- Walkway as a community-wide identifying characteristic. Something people can take pride in.
- Number of amenities/destinations along the Walkway that bring people to the Walkway.
- I-Park Edgewater: Chance to create beautiful Walkway segment akin to Whole Foods segment and municipal marina segment. Opportunity to do it right and create a community asset.
- Creating a multi-use Walkway (biking, sitting areas, pedestrian areas)

Table 3 (facilitated by Stephanie Ribeiro)

» Problem Areas:
- 115 River Road has closed the gate to the pier
- 115 River Road / Quantas is a contaminated area and fish should not be eaten when caught
- MJM Development – The overgrowth area gives it a dangerous/unsafe feeling
- Geese Droppings – Edgewater Golf, The Promenade, City Place, Marina, Veteran's Field
- Grand Cove – No lighting
- Market Place / Binghamton – "Ugly", unsafe due to erosion
- Admirals Walk – No Access for fishing, very vocal about not wanting a walkway
- Colony – Limited access, walkway unknown, dangerous terrain to get to lower viewing area

» Positive Areas:
- Whole Foods – Clean, Space is open, parking is available, food is available
- Municipal lot (next to Whole Foods) – Art sculpture is beautiful, however landscaping is neglected
- Veteran's Park – Nice area to visit
- Shelter Bay – Nice design
- Crab House – Very inviting to fishermen

» Walkway Future:
- More cleanliness, specifically the geese droppings

» One solution was to install a wiring system, similar to Grand Cove to deter Geese from entering walkway.
- Signs
  - » Walkway signage
  - » Signs illustrating the history of each property with etched pictures for public knowledge
  - » Signs at fishing locations like 115 River Road & Quantas to alert the public of the hazard and to designate the area as "Catch & Release"
- Ultimate goal would be a uniform walkway throughout, however realistically the group would like to see a common thread throughout for way finding to help designate the walkway. The group thought similar lighting, benches, and signage would be helpful.
- Additional lighting could be accomplished with bollards instead of overhead poles.
- More public restrooms and signs announcing their presence
- More art along the walkway, however not a lot because the group felt the walkway has a beautiful view of NYC that should not be taken away from.
- The table was in favor of having events and gathering places, but only on a small scale due to traffic, parking, and safety concerns.
- The group did not want bicycles on the walkway as they felt it was unsafe for pedestrians, however some mentioned the need for more bike racks along the walkway.
- The group was in favor of areas where row boats and other water activity items could be rented, but wanted to keep these areas on commercial properties where parking is available. The Binghamton site was considered a good location because of the parking availability, and the easy access to the water. The I-Park location was mentioned to also be proposing some type of water activity rentals in the future.

» Safety Concerns
- Time of Operation should be limited
- Additional Policing
- Security Cameras with signs warning people
- Additional Lighting

» The group also mentioned that the walkway should look into energy efficient lighting and making the walkway more "green"

» Erosion Issue need to be addressed along walkway.
- The group felt that the NJDEP and Army Corps of Engineers should be more accessible and available to address these issues.

» Create an authority for funding, maintenance, police, safety, etc.

» Admirals Walk:
- Many of my group members were residents of Admirals Walk and were very against any walkway proposal through their property. The members felt that they are grandfathered in as per NJDEP regulations and do not want to open their property up to the public. The members were in favor of the alternate route through River Road which would connect the Marina and Veteran's Field. The members felt that although they are not required to put a walkway in, there is not enough room at their waterfront to accommodate the walkway, but were still opposed to the walkway even if NJDEP waived the 30' easement and 16' wide walkway requirement. The general feeling at Admirals walk was that the walkway would compromise the safety on their property and that many of the residents bought into that location for the specific reason that it was a closed community. There was also mention of a possible lawsuits from residents of the walkway was to be constructed on their property because people may feel that they bought in the location because of the closed community and then that would be taken away.
- A discussion between the residents of Admirals Walk and the Fisherman's Association took place regarding the accessibility. The Fisherman's Association felt the Hudson River is not a private place and should be accessible by anyone and that Admiral's Walk is restricting people from getting onto the property. Admiral's Walk acknowledged that the area is restricted and that is what they like about the property and do not want to change access.
- In a possible compromise, the proposal to have a boardwalk/pier around the waterfront at Admiral's Walk was discussed. Many residents were open to this possibility as long as it was offset from their property and had fencing to prevent access to their property. Some residents were against this option all together.
- The residents also had concerns about flooding on the site and mentioned that the parking lot has been inundated at times and that some of their waterfront was washed away due to the Noreaster in the 90's.
- The residents were aware that if the property were to experience development which required a Waterfront Development Permit, a walkway would need to be put in.

Second Public Visioning Workshop (May 25, 2010)

» Michael Heanue, Edgewater Colony, opened the public comment portion of the meeting. Mr. Heanue stated that the piers and docks in the Edgewater Colony do not belong on the waterfront, and that the presence of these docks is illegal and criminal. Mr. Heanue also stated that he does not understand how the County fits into the development of the Walkway, given that the waterfront is state property.

» Adam Strobel, Director, Bergen County Department of Parks and Open Space, stated that the County applied for a grant with the Office of Smart Growth in order to undertake a study on how to close existing gaps along the Walkway. Mr. Strobel also noted that the plan is a planning study, and that the proposed alignments depicted in the Plan will ultimately result in a planning decision on how to provide the Walkway.

» David Jordan, Edgewater Colony, asked the project team why such substantial changes are proposed for the Edgewater Colony.

» Ms. Flor stated that the types of changes that are proposed for the Edgewater Colony are purely aesthetic, and that no changes are proposed for existing circulation patterns. She stated that only surface changes are proposed, and that Shore Road and Annett Avenue would be resurfaced with brick pavers to orient Walkway users to the appropriate Walkway route. Ms. Flor said that the purpose of such proposal is to enhance public space and allow users to follow the Walkway with relative ease.

» Mr. Jordan noted that the proposed boardwalk linking the Walkway route through the Edgewater Colony would traverse existing Wetlands on the southern portion of the Edgewater Colony. He stated that an NJDEP permit would be required, and questioned whether funding from NJDEP would be available given the agency's governance over the Hudson River Waterfront.

» Ms. Flor responded by noting that the Plan proposes the creation of an entity to govern maintenance, funding, and security issues on the Walkway in order to take the burden off of property owners along the waterfront.

» An unidentified resident of Admiral's Walk questioned why there is a walkway segment recommended on the Admiral's Walk property. Mr. Strobel replied by explaining that the Design and Implementation Plan is a planning study that attempts to consider all potential alternatives and alignments for the Walkway. He stated that an application, planning board approval, and cost feasibility will be required for all proposed Walkway routes.

» Iris Borman, Grand Cove, stated that she believes that the Walkway is favorable and beneficial for the County, but does not believe that the Walkway is favorable and beneficial to the Borough of Edgewater, and stated that she has concerns related to diminished quality of life for Borough residents. Ms. Flor replied by iterating that the Walkway is a recreation facility offering a variety of amenities to Borough residents, and that the Walkway provides a sense of place in the community, and a community element that all residents can identify with.

» Charlie Buckman, Admiral's Walk, stated that the proposed Walkway segment on the property would be too close to the existing gym, and that there is a private walkway for Admiral's Walk residents only. Mr. Buckman stated that he prefers the proposed alignment that bypasses the property along River Road.

» David Weinstein, Edgewater Colony, stated that the plan destroys the quality of life for Colony residents. He stated that there are hundreds of residents in the Colony, and that the property is not a park. He believes that the plan does not consider the residents of the property and that he has grave safety concerns and prefers only the alignment along River Road.

» Harut Sagandia, Edgewater Colony, stated that he has security concerns related to putting the Walkway through the Colony. He stated that there have been break ins, and that his bike was stolen. He is against putting the Walkway through the Colony.

» An unidentified Colony commented that the design of the Walkway should provide a unifying element consistent with the architecture.

» An unidentified resident stated that fencing should be considered to address concerns related to security. He also stated that the alignment along River Road makes the most sense for the Walkway at the Edgewater Colony given the rising altitude to the Palisades Interstate Park.

» An unidentified resident stated that he is concerned with the threat of erosion and the expense of maintaining the Walkway. He believes that bulkheads and pilings are needed.

» An unidentified Colony resident stated that the River Road alignment works best and that the existing seating area where the Walkway is proposed to enter the Colony is provided for residents who do not have access to the waterfront.

» Katherine Mikel, Edgewater Colony, stated that the lack of separation between vehicles and walkway users, especially bicyclists is a concern. She stated that walking access from the south and north is available from Annett Avenue, as is access to the beach. Ms. Mikel is opposed to the Walkway in the community amid concerns of trash and an increase in traffic. She stated that the Colony pays for everything, and that opening the Colony up to the public is not practical. She stated that there is no room for the sharing of roads, and that she prefers that River Road be utilized for a Walkway segment.

» Dan Entin, Grand Cove, requested more specific information regarding the implementation of the Plan. He stated that he sees the Walkway as an asset, but recognizes that there is still a financial and safety burden related to constructing, maintaining and policing the Walkway. Mr. Entin stated that he would like to see the creation of the proposed entity to oversee maintenance, security measures, and funding.

» An unidentified resident of Admiral's Walk spoke out against the Walkway, citing security concerns related to permitting public access on the property. He stated that the construction of a compliant Walkway segment on the property would cause a loss of parking spaces and boat slips at the Edgewater Marina. Additionally, he stated that he believes the construction of a Walkway segment would result in the loss of revenue and facilities for property owners. Finally, he stated that he has questions related to funding, and the he believes the Borough of Edgewater bears the financial burden for the Walkway.

» Susan Milligan, Independence Harbor, stated that she believes the Walkway is an asset, and commended the Plan for addressing maintenance and security issues along the Walkway. She stated that she has concerns related to erosion along the Walkway, and that currently, private property owners are responsible for maintaining their respective Walkway segments. She stated that she would like to see improvements at the Binghamton, and mentioned that is a state-owned historic site. She stated that the Binghamton site would be a perfect place for kayak rentals along the Walkway, and would like to see the proposed Walkway entity address, infrastructure, amenities and issues related to erosion protection.

» A resident from the Edgewater Colony stated that she is concerned with the volume of bicycle and pedestrian traffic that will be generated by the proposed Walkway alignment. She cited the narrowness of existing roadways within the Colony, and stated that when people step out of their homes they are on the street. She stated that there are always children playing on the street, and that there will be a conflict related to bicyclists traveling through the Colony. Finally, she stated that she is concerned with the use of eminent domain along the waterfront.

» David Weschler, Edgewater Borough Council, questioned when the entity will begin operating, when the plan will be adopted, and what the path of adoption will consist of. Ms. Flor stated that the details regarding the entity were still being worked out, and that she was uncertain as to when the details would be finalized. Ms. Flor stated that the adoption process would begin with the Borough of Edgewater Planning Board, and, if the Plan is approved by the Planning Board, would be referred to the County Planning Board and Board of Chosen Freeholders.

» Linda Klempner, Grand Cove stated that the proposed Entity governing the Walkway is of the utmost importance. She stated that, as it exists, the Walkway is "chopped up", and that there are gaps in existing amenities and infrastructure that need to be addressed. She also stated that she is concerned with big storm events and their effect on the Walkway, and cited the nor'easters that occurred this past winter as an example. Finally, she stated that the presence of mosquitoes and litter generated by Walkway users should also be addressed.

» An unidentified resident of the Edgewater Colony agreed with other residents of the Colony and stated that the only acceptable alignment would be along River Road.

» Another unidentified resident of the Edgewater Colony stated that she had concerns related to potential conflicts between Walkway traffic and vehicular traffic in the Colony. Specifically, she is concerned with potential injuries that may result from these conflicts. She stated that she prefers the Walkway to be constructed along River Road.

» Margaret Fisher, Edgewater Colony, stated that she would like to see the path constructed along River Road. Ms. Fisher stated that there is a substantial amount of open space and vacant land adjacent to River Road that she believes could accommodate the Walkway segment.

» Christina Rackow, Edgewater Colony, stated that the Edgewater Colony is a historic area that should be available to the public only on a controlled basis. She stated that currently, Veteran's Field is the center of the Borough, and that she feels that there is an element of intrusion related to providing walkway segments through a residential development. She stated she has security concerns regarding the provision of a Walkway segment in the Colony. She stated there are more public areas on the Walkway for people to use, and that the Colony should remain private. Finally, she stated that if a Walkway segment is going to be provided on the streets of the Colony as shown in the Plan, that cyclists should be required to walk through the Colony because she believes that bike traffic is dangerous and may cause injury.

» Lee Capozzi, Edgewater Colony, stated that he has safety concerns related to permitting cyclists to ride within the Edgewater Colony. He stated it was irresponsible to provide bike access in the Colony, given the proximity of residential doorways to the road. He said there River Road alignment is the only acceptable alignment, citing the narrow width of the existing roadways within the Colony.

» Charles Lee, Edgewater Colony, stated that the Colony has roadways that are only 11 to 12 feet wide in most areas, and that he is concerned with the volume of walkway traffic that will use these roads. He stated that he prefers the Walkway to be aligned along River Road.

» Michael Heanue, Edgewater Colony, stated that he had some responses for his neighbors in the Edgewater Colony. Mr. Heanue began to cite applicable NJDEP regulations with regard to the Waterfront Walkway. Mr. Heanue spoke for approximately 10 minutes regarding the "illegal and criminal" activities in the Edgewater Colony, before the meeting was adjourned.

Bergen County Planning Board Hearing (December 7, 2010)

Minutes of Meeting

Roll Call

» Joseph Valente
» Marc Schrieks
» Julie O'Brien
» Mark Pasquali
» Christine Ordway
» Joseph Femia

Staff/Planning & Economic Development

» John Libretti, Esq., Assistant County Counsel
» Mazie O'Connor-Patterson
» Farouk Ahmad, Director
» Adam Strobel

Mr. Valenti, called the meeting to order at 5:05 p.m., and announced that the meeting was being held in conformity with the requirements of the "Open Public Meeting Act."

Approval of Minutes

On a motion by Mr. Valenti, approved by Mr. Schrieks, seconded by Mr. Pasquali the Minutes of the November 9, 2010 meeting were approved. Motion carried. Motion passed. Abstention: Ms. O'Brien.

Oral Communication from Audience

Review of Applications

» Part A - Action On Subdivision Joint Reports
  • All subdivisions were approved unanimously by those preent.
» Part B- Action on Site Plan Joint Reports
  • All site plans were approved unanimously by those present

Committee Reports - Staff Reports

» Bergen County's Hudson River Waterfront Walkway presentation:
  • Farouk Ahmad explained the Department of Planning and Economic Development completed this Waterfront Walkway Study to examine the current state of the waterfront walkway within the boroughs of Fort Lee and Edgewater and to recommend a course of action to complete the missing sections.
  • Public participation efforts were undertaken to seek input from the community, business leaders, elected officials; feedback was incorporated into the Plan document.

- The report study area is part of a larger linear waterfront walkway corridor envisioned by the State of New Jersey in 1980 that would connect the George Washington Bridge in Fort Lee with the Bayonee Bridge in Bayonne.

» Jaclyn Flor, PE, PP, CME - T&M Associates
- A Study Area profile analysis was conducted to provide a baseline conditions report of the walkway; worked with a Regional Collaborative Committe to develop the Plan's goals, objectives, strategies and actions.
- Conducted two public bisioning sessions (December 9, 2009 and May 25, 2010) along with presentations to the governing bodies of Edgewater and Fort Lee on the Draft Study Report.
- The Plan creates design guidelines for all future Waterfront Walkway design. These guidelines; in keeping with the NJDEP Hudson River Waterfront Walkway Plan and Design Guidelines, adresses all amenities, including lighting, railings, benches, and paver treatments, as well as locations of signage noting historic significance, site location maps, and walkway wayfining signage.
- The Plan identifies the costs for each alignment and all menities, and sources of funding available. The Plan identifies an Implementation Strategy which recommends the revision of the County Site Plan and Subdivision Resolution to incorporate design guidelines; and discusses the creation of an Entity to help advance the Hudson River Waterfront Walkway.

» Bruce Ackerman, Esq.
- Attorney for Edgewater Colony
- Do not want walkway built along on or along the water.
- Submitted Exhibits (1-6)
- Donated 5.23 acres; agreement with DEP.
- Hudson River portion should be taken out of study, it violates agreement with DEP.
- Prefer having walkway built along River Road.

» President of Edgewater Colony:
- Does not agree with building walkway on the water.
- Build walkway over Colony.

» Michael Heanue
- Resident of Edgewater Colony
- Agrees with the study of Bergen County.

The Planning Board approved the Waterfront Study with changes made to cross referencing certain docments for future reference. Approved by Ms. O'Brien, seconded by Mr. Schrieks.

Unfinished Business

None

Next Meeting Date

January 4, 2011

Adjournement

Being no further business before the Board, the meeting was adjourned at 7:00 p.m.

For further verbatim details as to the above meeting, kindly consult the tapes.

Respectfully submitted,

Mazie O'Connor-Patterson, Board Recording Secretary

Appendix B: Study Area Profile Report and Bergen County Planning Board Meeting Transcript

See enclosed CD.

Contents of CD:

» Study Area Profile Report
» Transcript of December 7, 2010 Bergen County Planning Board Meeting

Appendix C: Contaminated Sites

I-Park Edgewater (Block 99, Lots 1, 3, 4 and 5) – Currently undergoing remediation.
» Brownsfields Site – Case Number 3986
» ISAR Case Number E20040267

Quantas Resources (Block 95, Lot 1) – Currently undergoing remediation.
» Superfund Site – EPA ID: NJD000606442
» Brownsfields Site – Case Number 3988
» ISRA Case Number: E20040267

City Place (Block 91, Lot 1) – Remedial investigation and action completed prior to construction.
» ISRA Case Number: 91278 – Lustrelon Portion of Site
» NJDEP Site Remediation Case Number: 96-05-02-1722-24 – Celotex Portion of Site
» Brownsfields Site – Case Number 3989 (Lustrelon) and 3990 (Celotex)

The Promenade (Block 91, Lot 3) – Remedial investigation and action completed prior to construction.
» ISRA Case Number: 91278 – Lustrelon Portion of Site
» NJDEP Site Remediation Case Number: 96-05-02-1722-24 – Celotex Portion of Site
» Brownsfields Site – Case Number 3989 (Lustrelon) and 3990 (Celotex)

Edgewater Multiplex Cinema (Block 91, Lot 2) – Remedial investigation and action completed prior to construction.
» ISRA Case Number: 91278 – Lustrelon Portion of Site
» NJDEP Site Remediation Case Number: 96-05-02-1722-24 – Celotex Portion of Site
» Brownsfields Site – Case Number 3989 (Lustrelon) and 3990 (Celotex)

MJM Waterfront Developers (Block 85.01, Lot 3.03) – Remedial investigation and action completed.
» NJDEP Site Remediation PI Number: 435603

Independence Harbor (Block 85.01, Lots 1.02 and 2) – Remedial investigation and action completed prior to construction.
» NJDEP Site Remediation PI Number: G000035477
» Brownsfields Site – Case Number 3993

Edgewater Commons (Block 84.01, Lots 1.01, 1.03, 1.04, and 1.05) – Remedial investigation and action completed prior to construction.
» NJDEP Site Remediation Case Number: 94-9-6-1339-37

Crab House (Block 84.01, Lot 1.02) – Remedial investigation and action completed prior to construction
» NJDEP Site Remediation Case Number: 94-9-6-1339-37

Edgewater Golf (Block 82, Lots 1 and 2) – Remedial investigation and action completed prior to construction.
» NJDEP Site Remediation PI Number: 012255

Hess Oil and Chemical Corporation (Block 76, Lot 5) – Remedial action is currently being conducted on-site.
» NJDEP Site Remediation PI Number: 003922 and 255369

Edgewater Towne Center (Block 58, Lots 1 and 2) – Remedial investigation and action completed prior to construction

» NJDEP Site Remediation PI ID: 022656

Windsor at Mariner's Tower/Cove (Block 46, Lots 3.01, 3.03, and 3.04) – Remedial investigation and action completed prior to construction

» NJDEP Site Remediation PI ID: 91501

Appendix D: Cost Estimates

BERGEN COUNTY

Edgewater Multiplex Cinema - Perpendicular Access 1100 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	1225	$6.00	$7,350.00
2	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	1225	$30.00	$36,750.00
3	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	1225	$15.00	$18,375.00
4	CONCRETE PAVER SIDEWALK (3 1/8" THICK PAVERS)	SY	1225	$125.00	$153,125.00
5	DECORATIVE STREET LIGHTS	UNIT	22	$5,000.00	$110,000.00
6	TRASH RECEPTACLE	UNIT	5	$1,500.00	$7,500.00
7	RECYCLING RECEPTACLE	UNIT	5	$1,000.00	$5,000.00
8	BIKE RACK	UNIT	1	$1,250.00	$1,250.00
9	TREE GRATE	UNIT	22	$1,500.00	$33,000.00
10	ZELKOVA, 3" CAL., B&B	UNIT	22	$500.00	$11,000.00
11	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	1100	$5.00	$5,500.00
12	PAVEMENT MARKINGS	UNIT	10	$3.00	$30.00
				SUBTOTAL=	**$388,880.00**

NOTES:

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

*** Total of $388,880 divided by 1,100 LF of walkway equals $355/LF for perpendicular access construction.**

BERGEN COUNTY

I-Park Edgewater - Perpendicular Access 450 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	450	$355.00	$159,750.00
				SUBTOTAL=	**$159,750.00**

NOTES:

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY

Edgewater Golf - Perpendicular Access 645 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	645	$355.00	$228,975.00
				SUBTOTAL=	**$228,975.00**

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY

Edgewater Town Center - Perpendicular Access 330 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	330	$355.00	$117,150.00
				SUBTOTAL=	**$117,150.00**

NOTES:

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY

Edgewater Marina - Perpendicular Access 330 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	330	$355.00	$117,150.00
				SUBTOTAL=	**$117,150.00**

NOTES:

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY

Veteran's Field - Perpendicular Access 855 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	855	$355.00	$303,525.00
				SUBTOTAL=	**$303,525.00**

NOTES:

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY

Hudson Cove - Perpendicular Access 255 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	255	$355.00	$90,525.00
				SUBTOTAL=	**$90,525.00**

NOTES:

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY

Le Jardin - Perpendicular Access 135 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	135	$355.00	$47,925.00
				SUBTOTAL=	**$47,925.00**

NOTES:

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
I-PARK EDGEWATER - 1750 LF
GAP 1

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	1945	$6.00	$11,670.00
2	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	1945	$20.00	$38,900.00
3	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	1945	$10.00	$19,450.00
4	CONCRETE PAVER SIDEWALK (3 1/8" THICK PAVERS)	SY	3890	$100.00	$389,000.00
5	DECORATIVE STREET BENCH, 6' LONG	UNIT	17	$1,500.00	$25,500.00
6	ASH URN	UNIT	17	$800.00	$13,600.00
7	PLANTER	UNIT	17	$1,500.00	$25,500.00
8	TRASH RECEPTACLE	UNIT	9	$1,500.00	$13,500.00
9	RECYCLING RECEPTACLE	UNIT	17	$1,000.00	$17,000.00
10	BIKE RACK	UNIT	3	$1,250.00	$3,750.00
11	TREE GRATE	UNIT	34	$1,500.00	$51,000.00
12	ZELKOVA, 3" CAL., B&B	UNIT	34	$500.00	$17,000.00
13	DECORATIVE STREET LIGHTS	UNIT	34	$5,000.00	$170,000.00
14	TOPSOIL, FERTILIZE, MULCH AND SEED	SY	390	$4.00	$1,560.00
15	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	1750	$5.00	$8,750.00
16	PAVEMENT MARKINGS	UNIT	14	$3.00	$42.00
17	WALKWAY ENTRANCE SIGN	UNIT	1	$2,500.00	$2,500.00
18	"WELCOME TO BERGEN COUNTY" SIGN	UNIT	1	$2,500.00	$2,500.00
19	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
20	RESTROOM	LS	1	$350,000.00	$350,000.00
				SUBTOTAL=	**$1,163,722.00**
	ALTERNATE 1				
21	BULKHEAD	LF	1750	$1,500.00	$2,625,000.00
				TOTAL=	**$3,788,722.00**

Using items #1 through#16 divided by 1,750 LF, a linear foot cost for the Walkway of **$460.70**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

NO.	OUTDOOR SEATING AREAS (EACH ~ 4500 SF)	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	CONCRETE PAVER SIDEWALK (3 1/8" THICK PAVERS)	SY	500	$100.00	$50,000.00
2	DECORATIVE STREET BENCH, 6' LONG	UNIT	49	$1,500.00	$73,500.00
3	ASH URN	UNIT	14	$800.00	$11,200.00
4	PLANTER	UNIT	14	$1,500.00	$21,000.00
5	TRASH RECEPTACLE	UNIT	5	$1,500.00	$7,500.00
6	RECYCLING RECEPTACLE	UNIT	5	$1,000.00	$5,000.00
7	TREE GRATE	UNIT	10	$1,800.00	$18,000.00
8	ZELKOVA, 3" CAL., B&B	UNIT	10	$500.00	$5,000.00
				SUBTOTAL=	**$191,200.00**
			TOTAL FOR BOTH AREAS=		**$382,400.00**

NOTES:
1
Benches are spaced every 4 feet deep. Approx 20' apart.

NO.	FISHING PIER	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	RETROFIT CONCRETE FISHING PIER	LS	1	$500,000.00	$500,000.00
				TOTAL=	$500,000.00

ASSUME:

1 Reinforcing steel, grade 60, galvanized diameter.
2 Test piles, concrete filled steel pipe piles, 18" diamater.
3 Concrete filled steel pipe piles, 18" diameter.
4 Steel pipe piles only, 18" Diamager (incudes drilling).
5 Structural steel.
6 IPE decking.
7 Precast pier caps.
8 Epoxy seal coating of pier caps.
9 Pedestrian hand railing, pier.
10 Test pits.

NO.	STAGE	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	STAGE	LS	1	$300,000.00	$300,000.00
				TOTAL=	**$300,000.00**

ASSUME:

1 Raised decking.
2 Lighting.
3 PA system.

NO.	DESIGNATED WALKWAY PARKING	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	175	$6.00	$1,050.00
2	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	175	$20.00	$3,500.00
3	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	175	$10.00	$1,750.00
4	DESIGNATED PARKING SIGNAGE	UNIT	10	$150.00	$1,500.00
5	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	420	$2.00	$840.00
				TOTAL=	**$8,640.00**

I-PARK EDGEWATER TOTAL ESTIMATE (WITHOUT BULKHEAD)=	$2,354,762.00
I-PARK EDGEWATER TOTAL ESTIMATE (WITH BULKHEAD)=	$4,979,762.00

I-Park Edgewater - Perpendicular Access 450 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	450	$355.00	$159,750.00
				SUBTOTAL=	**$159,750.00**

NOTES:

1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
115 RIVER ROAD ~ 185 LF
GAP 2

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	185	$460.00	$85,100.00
2	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	125	$6.00	$750.00
3	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	125	$20.00	$2,500.00
4	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	125	$10.00	$1,250.00
5	COMMERCIAL COMPOSITE & STEEL BOARDWALK W/ STEEL RAILINGS	LF	675	$2,500.00	$1,687,500.00
				SUBTOTAL=	**$1,777,100.00**
	ALTERNATE 1				
6	BULKHEAD	LF	185	$1,500.00	$277,500.00
				TOTAL=	**$2,054,600.00**

NOTES:
1 Boardwalk assume 10' wide.

BERGEN COUNTY
QUANTAS RESOURCES ~ 240 LF
GAP 3

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	240	$460.00	$110,400.00
2	KAYAK RENTAL	LS	1	$15,000.00	$15,000.00
				SUBTOTAL=	**$125,400.00**
	ALTERNATE 1				
3	BULKHEAD	LF	240	$1,500.00	$360,000.00
				TOTAL=	**$485,400.00**

NOTES:

1 Kayak Rental area shall consist of loading area, rental booth and kayak rack.

BERGEN COUNTY
MJM WATERFRONT PROPERTIES ~ 235 LF
GAP 4

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	235	$460.00	$108,100.00
2	NEW PLAYGROUND	LS	1	$50,000.00	$50,000.00
3	RESTROOM	LS	1	$350,000.00	$350,000.00
				SUBTOTAL=	**$508,100.00**
	ALTERNATE 1				
4	BULKHEAD	LF	235	$1,500.00	$352,500.00
				TOTAL=	**$860,600.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
HESS OIL ~ 780 LF
GAP 5

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	780	$460.00	$358,800.00
				SUBTOTAL=	**$358,800.00**
	ALTERNATE 1				
2	BULKHEAD	LF	780	$1,500.00	$1,170,000.00
				TOTAL=	**$1,528,800.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

ALTERNATE 2
Hess Oil - Alignment 2 - 1800 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1800	$355.00	$639,000.00
				SUBTOTAL=	**$639,000.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
ADMIRAL'S WALK ~ 1090 LF
GAP 6

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1090	$460.00	$501,400.00
2	8 FT DECORATIVE SECURITY FENCING	LF	1090	$80.00	$87,200.00
				SUBTOTAL=	**$588,600.00**
	ALTERNATE 1				
3	BULKHEAD	LF	1087	$1,500.00	$1,630,500.00
				TOTAL=	$2,219,100.00

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

ALTERNATE 2
Admiral's Walk - Alignment 2 - 1100 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	COMMERCIAL COMPOSITE BOARDWALK W/ STEEL RAILINGS	LF	1100	$2,500.00	$2,750,000.00
				SUBTOTAL=	**$2,750,000.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Refuse and Recyclables are spaced every 200 feet.
3 Bike racks are spaced every 500 feet.
4 Pavement markings are spaced every 250 feet.

ALTERNATE 3
Admiral's Walk - Alignment 3 - 1050 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1050	$355.00	$372,750.00
				SUBTOTAL=	**$372,750.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
VETERAN'S FIELD ~ 1,160 LF
GAP 7

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1160	$460.00	$533,600.00
2	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	200	$6.00	$1,200.00
3	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	200	$20.00	$4,000.00
4	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	200	$10.00	$2,000.00
5	DESIGNATED PARKING SIGNAGE	UNIT	10	$150.00	$1,500.00
6	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	200	$2.00	$400.00
7	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
8	RESTROOM	UNIT	1	$350,000.00	$350,000.00
9	SPRAYGROUND	UNIT	1	$50,000.00	$50,000.00
10	BOAT HOUSE	LS	1	$150,000.00	$150,000.00
11	BOAT RAMP	SY	450	$150.00	$67,500.00
				SUBTOTAL=	**$1,162,700.00**
	ALTERNATE 1				
12	BULKHEAD	LF	1160	$1,500.00	$1,740,000.00
				TOTAL=	**$2,902,700.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

Edgewater Marina - Perpendicular Access 855 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	855	$355.00	$303,525.00
				SUBTOTAL=	**$303,525.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
LE JARDIN ~ 985 LF
GAP 8

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	985	$460.00	$453,100.00
2	RAMP	SY	200	$150.00	$30,000.00
3	HANDRAILS	LF	300	$100.00	$30,000.00
4	WALKWAY SITE MAP SIGN	UNIT	2	$2,500.00	$5,000.00
5	WALKWAY ENTRANCE SIGN	UNIT	1	$2,500.00	$2,500.00
				SUBTOTAL=	**$520,600.00**
	ALTERNATE 1				
6	BULKHEAD	LF	985	$1,500.00	$1,477,500.00
				TOTAL=	**$1,998,100.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)
10 Ramp shall consist of 10" thick reinforced concrete.

Le Jardin - Perpendicular Access 135 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	135	$355.00	$47,925.00
				SUBTOTAL=	**$47,925.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
THE MOORINGS ~ 600 LF
GAP 9

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	600	$460.00	$276,000.00
				SUBTOTAL=	**$276,000.00**
	ALTERNATE 1				
2	BULKHEAD	LF	600	$1,500.00	$900,000.00
				TOTAL=	**$1,176,000.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
VON DOHLN MARINA ~ 570 LF
GAP 10

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	570	$460.00	$262,200.00
2	TRAFFIC CALMING	LS	1	$10,000.00	$10,000.00
				SUBTOTAL=	**$272,200.00**
	ALTERNATE 1				
3	BULKHEAD	LF	570	$1,500.00	$855,000.00
				TOTAL=	**$1,127,200.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
NORTH HUDSON YACHT CLUB ~ 810LF
GAP 11

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	810	$460.00	$372,600.00
2	8 FT DECORATIVE SECURITY FENCING	LF	810	$100.00	$81,000.00
3	RETAINING WALL	SF	3000	$30.00	$90,000.00
				SUBTOTAL=	**$543,600.00**
	ALTERNATE 1				
4	BULKHEAD	LF	810	$1,500.00	$1,215,000.00
				TOTAL=	**$1,758,600.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
EDGEWATER COLONY ~ 2,800 LF
GAP 12

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	2800	$355.00	$994,000.00
2	LONG PATH TRAIL CONNECTOR SIGN	UNIT	1	$2,500.00	$2,500.00
3	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
4	WALKWAY ENTRANCE SIGN	UNIT	2	$2,500.00	$5,000.00
				SUBTOTAL=	**$1,004,000.00**
	ALTERNATE 1				
5	BULKHEAD	LF	2796	$1,500.00	$4,194,000.00
				TOTAL=	**$5,198,000.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

ALTERNATE 2
Admiral's Walk - Alignment 2 (Concrete Pier) - 2800 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	COMMERCIAL COMPOSITE & STEEL BOARDWALK W/ STEEL RAILINGS	LF	2800	$2,500.00	$7,000,000.00
2	ECOLOGICAL INFORMATION SIGN	UNIT	3	$2,500.00	$7,500.00
				SUBTOTAL=	**$7,007,500.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Refuse and Recyclables are spaced every 200 feet.
3 Bike racks are spaced every 500 feet.
4 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
CITY PLACE ~ 1000 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1000	$460.00	$460,000.00
2	REMOVE PIER	LS	1	$50,000.00	$50,000.00
3	WALKWAY ENTRANCE SIGN	UNIT	1	$2,500.00	$2,500.00
4	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
				SUBTOTAL=	**$515,000.00**
	ALTERNATE 1				
5	BULKHEAD	LF	1000	$1,500.00	$1,500,000.00
				TOTAL=	**$2,015,000.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
THE PROMENADE ~ 1175 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1175	$460.00	$540,500.00
2	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
				SUBTOTAL=	**$543,000.00**
	ALTERNATE 1				
3	BULKHEAD	LF	1175	$1,500.00	$1,762,500.00
				TOTAL=	**$2,305,500.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
EDGEWATER MULTIPLEX CINEMA ~ 590 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	590	$460.00	$271,400.00
2	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	575	$6.00	$3,450.00
3	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	575	$20.00	$11,500.00
4	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	575	$10.00	$5,750.00
5	DESIGNATED PARKING SIGNAGE	UNIT	40	$150.00	$6,000.00
6	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	800	$2.00	$1,600.00
7	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
				SUBTOTAL=	**$302,200.00**
	ALTERNATE 1				
8	BULKHEAD	LF	590	$1,500.00	$885,000.00
				TOTAL=	**$1,187,200.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

Edgewater Multiplex Cinema - Perpendicular Access 1100 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1100	$355.00	$390,500.00
				SUBTOTAL=	**$390,500.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
INDEPENDENCE HARBOR ~ 1945 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1945	$460.00	$894,700.00
2	HISTORIC MARKER "FORD PLANT"	LS	1	$5,000.00	$5,000.00
				SUBTOTAL=	**$899,700.00**
	ALTERNATE 1				
3	BULKHEAD	LF	1945	$1,500.00	$2,917,500.00
				TOTAL=	**$3,817,200.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
RIVER CLUB ~ 400 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	400	$460.00	$184,000.00
				SUBTOTAL=	**$184,000.00**
	ALTERNATE 1				
2	BULKHEAD	LF	400	$1,500.00	$600,000.00
				TOTAL=	**$784,000.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
EDGEWATER COMMONS ~ 2490 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	2490	$460.00	$1,145,400.00
2	RETROFIT CONCRETE FISHING PIER	UNIT	2	$500,000.00	$1,000,000.00
3	RETROFIT FISHING AREA	UNIT	1	$100,000.00	$100,000.00
4	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	250	$6.00	$1,500.00
5	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	250	$20.00	$5,000.00
6	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	250	$10.00	$2,500.00
7	DESIGNATED PARKING SIGNAGE	UNIT	15	$150.00	$2,250.00
8	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	300	$2.00	$600.00
				SUBTOTAL=	**$2,257,250.00**
	ALTERNATE 1				
9	BULKHEAD	LF	2490	$1,500.00	$3,735,000.00
				TOTAL=	**$5,992,250.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
EDGEWATER GOLF ~ 730 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	730	$460.00	$335,800.00
2	WALKWAY ENTRANCE SIGN	UNIT	1	$2,500.00	$2,500.00
3	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
				SUBTOTAL=	**$340,800.00**
	ALTERNATE 1				
4	BULKHEAD	LF	730	$1,500.00	$1,095,000.00
				TOTAL=	**$1,435,800.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

Edgewater Golf - Perpendicular Access 645 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	645	$355.00	$228,975.00
				SUBTOTAL=	**$228,975.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
MITSUWA ~ 860 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	860	$460.00	$395,600.00
				SUBTOTAL=	**$395,600.00**
	ALTERNATE 1				
2	BULKHEAD	LF	860	$1,500.00	$1,290,000.00
				TOTAL=	**$1,685,600.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)
10 Ramp shall consist of 10" thick reinforced concrete.

BERGEN COUNTY
MARKETPLACE / BINGHAMTON ~ 920 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	920	$460.00	$423,200.00
2	RAMPED AND STEPPED AREA	LS	1	$10,000.00	$10,000.00
3	COMMERCIAL COMPOSITE BOARDWALK W/ STEEL RAILINGS	LF	375	$2,500.00	$937,500.00
4	HISTORIC MARKER "GENERAL GRANT NATIONAL MEMORIAL"	UNIT	1	$5,000.00	$5,000.00
5	HISTORIC MARKER "RIVERSIDE CHURCH"	UNIT	1	$5,000.00	$5,000.00
6	HISTORIC MARKER "FERRYBOAT BINGHAMTON"	UNIT	1	$5,000.00	$5,000.00
7	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	600	$6.00	$3,600.00
8	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	600	$20.00	$12,000.00
9	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	600	$10.00	$6,000.00
10	DESIGNATED PARKING SIGNAGE	UNIT	45	$150.00	$6,750.00
11	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	900	$2.00	$1,800.00
				SUBTOTAL=	**$1,415,850.00**
	ALTERNATE 1				
12	BULKHEAD	LF	917	$1,500.00	$1,375,500.00
				TOTAL=	**$2,791,350.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
COMFORT INN ~ 460 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	460	$460.00	$211,600.00
				SUBTOTAL=	**$211,600.00**
	ALTERNATE 1				
2	BULKHEAD	LF	460	$1,500.00	$690,000.00
				TOTAL=	**$901,600.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
MARINER'S LANDING ~ 490 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	490	$460.00	$225,400.00
				SUBTOTAL=	**$225,400.00**
	ALTERNATE 1				
2	BULKHEAD	LF	490	$1,500.00	$735,000.00
				TOTAL=	**$960,400.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
GRAND COVE ~ 770 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	770	$460.00	$354,200.00
				SUBTOTAL=	**$354,200.00**
	ALTERNATE 1				
2	BULKHEAD	LF	770	$1,500.00	$1,155,000.00
				TOTAL=	**$1,509,200.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
EDGEWATER TOWNE CENTER ~ 760 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	760	$460.00	$349,600.00
2	WALKWAY ENTRANCE SIGN	UNIT	1	$2,500.00	$2,500.00
3	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
4	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	200	$6.00	$1,200.00
5	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	200	$20.00	$4,000.00
6	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	200	$10.00	$2,000.00
7	DESIGNATED PARKING SIGNAGE	UNIT	10	$150.00	$1,500.00
8	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	200	$2.00	$400.00
				SUBTOTAL=	**$363,700.00**
	ALTERNATE 1				
9	BULKHEAD	LF	759	$1,500.00	$1,138,500.00
				TOTAL=	**$1,502,200.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

Edgewater Town Center - Perpendicular Access 330 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	330	$355.00	$117,150.00
				SUBTOTAL=	**$117,150.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
EDGEWATER MUNICIPAL LOT ~ 130 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	130	$460.00	$59,800.00
2	RESTROOM	LS	1	$350,000.00	$350,000.00
3	DENSE GRADED AGGREGATE BASE COURSE, 6" THICK (IF & WHERE DIRECTED)	SY	200	$6.00	$1,200.00
4	HOT MIX ASPHALT BASE COURSE, 4" THICK	SY	200	$20.00	$4,000.00
5	HOT MIX ASPHALT SURFACE COURSE, 2" THICK	SY	200	$10.00	$2,000.00
6	DESIGNATED PARKING SIGNAGE	UNIT	10	$150.00	$1,500.00
7	TRAFFIC STRIPING, LONG-LIFE EPOXY, 4" THICK	LF	200	$2.00	$400.00
				SUBTOTAL=	**$418,900.00**
	ALTERNATE 1				
8	BULKHEAD	LF	130	$1,500.00	$195,000.00
				TOTAL=	**$613,900.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
WINDSOR AT MARINER'S TOWER / COVE ~ 890 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	890	$460.00	$409,400.00
				SUBTOTAL=	**$409,400.00**
	ALTERNATE 1				
2	BULKHEAD	LF	890	$1,500.00	$1,335,000.00
				TOTAL=	**$1,744,400.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

BERGEN COUNTY
EDGEWATER MARINA ~ 725 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	725	$460.00	$333,500.00
2	RESTROOM (EXISTING RESTROOM, ASSUME SECURITY UPGRADE)	LS	1	$10,000.00	$10,000.00
3	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
4	WALKWAY ENTRANCE SIGN	UNIT	1	$2,500.00	$2,500.00
				SUBTOTAL=	**$348,500.00**
	ALTERNATE 1				
5	BULKHEAD	LF	725	$1,500.00	$1,087,500.00
				TOTAL=	**$1,436,000.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

Edgewater Marina - Perpendicular Access 330 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	330	$355.00	$117,150.00
				SUBTOTAL=	**$117,150.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
SHELTER BAY ~ 300 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	300	$460.00	$138,000.00
				SUBTOTAL=	**$138,000.00**
	ALTERNATE 1				
1	BULKHEAD	LF	300	$1,500.00	$450,000.00
				TOTAL=	**$588,000.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)
10 Ramp shall consist of 10" thick reinforced concrete.

BERGEN COUNTY
HUDSON COVE ~ 1050 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	1050	$460.00	$483,000.00
2	WALKWAY ENTRANCE SIGN	UNIT	1	$2,500.00	$2,500.00
3	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
				SUBTOTAL=	**$488,000.00**
	ALTERNATE 1				
4	BULKHEAD	LF	1050	$1,500.00	$1,575,000.00
				TOTAL=	**$2,063,000.00**

NOTES:
1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)
10 Ramp shall consist of 10" thick reinforced concrete.

ALTERNATE 2
Hudson Cove - Perpendicular Access 255 LF

NO.	WALKWAY	UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	255	$355.00	$90,525.00
				SUBTOTAL=	**$90,525.00**

NOTES:
1 Decorative lights are spaced every 50 feet.
2 Street trees are located every 50 feet.
3 All street trees contain a tree grate.
4 Refuse and Recyclables are spaced every 200 feet.
5 Bike racks are spaced every 500 feet.
6 Pavement markings are spaced every 250 feet.

BERGEN COUNTY
VELA TOWNHOMES - 590 LF

NO.		UNIT	TOTAL QUAN.	UNIT PRICE	TOTAL COST
1	WALKWAY	LF	590	$460.00	$271,400.00
2	WALKWAY SITE MAP SIGN	UNIT	1	$2,500.00	$2,500.00
3	WALKWAY ENTRANCE SIGN	UNIT	1	$2,500.00	$2,500.00
				SUBTOTAL=	**$276,400.00**
	ALTERNATE 1				
4	BULKHEAD	LF	590	$1,500.00	$885,000.00
				TOTAL=	**$1,161,400.00**

NOTES:

1 Benches are spaced every 100 feet.
2 Decorative lights are spaced every 50 feet.
3 Street trees are located every 50 feet.
4 All street trees contain a tree grate.
5 All benches contain an ash urn and planter.
6 Refuse and Recyclables are spaced every 200 feet.
7 Bike racks are spaced every 500 feet.
8 Pavement markings are spaced every 250 feet.
9 Bulkhead shall consist of Steel Sheeting (assume 10' exposed face tied back)

T&M ASSOCIATES

11 Tindall Road
Middletown, NJ 07748

Phone: 1.732.671.6400
Fax: 1.732.671.7365
www.tandmassociates.com

March 2011

Vision Bergen

The Visioning Component of the Bergen County Master Plan

Kathleen A. Donovan, County Executive

Bergen County Board of Chosen Freeholders

John Driscoll, Jr., Freeholder Chairman
Maura DeNicola, Freeholder Vice Chairwoman
John D. Mitchell, Freeholder Chair Pro Tempore
John A. Felice
David L. Ganz
Robert G. Hermansen
Bernadettte P. McPherson

Bergen County Department of Planning & Economic Development

Robert S. Garrison, Esq., Acting Department Director

Vision Bergen Professional Staff

Donna Orbach, AICP, P.P.
Christopher Helms, AICP, P.P.
Kenneth Aloisio, AICP, P.P.
Eric Timsak, P.P.
Adam Strobel

Bergen County Planning Board

Joseph Valente, Chairman
Mark Shrieks, Vice Chairman
Julie O'Brien, Secretary
Fernando Garip
Keith J. Misciagna
Christine Ordway
Mark Pasquali
Robert G. Hermansen, Freeholder
Joseph Femia, County Engineer

Visioning effort conducted under the direction of the Administration of County Executive Dennis McNerney

Farouk Ahmad, Department Director

Bergen County Board of Choosen Freeholders

James M. Carroll, Freeholder Chairman
Elizabeth Calabrese, Freeholder Vice Chairwoman
David L. Ganz, Freeholder Chair Pro Tempore
John Driscoll
Robert Hermansen
John Hogan
Bernadette P. McPherson

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Introduction

The Challenge

Bergen County is the most populous county in New Jersey with over 900,000 residents, and also has the most local governments – seventy municipalities on 246 square miles, an average of only 3.5 square miles/municipality. While often described as the quintessential suburban county the reality on the ground is considerably more complex. In fact, Bergen County is a microcosm of the state of New Jersey, exhibiting many of the same contrasts and contradictions, strengths and shortcomings, as the state as a whole.

Bergen is a county of deep contrasts and startling extremes. Within its borders can be found a broad range of land uses from highly urbanized high density places capable of supporting sophisticated transit services to quasi-rural, auto-dependent low density ones. The county's population is extremely diverse, with a wide variety of ethnic groups and an equally wide diversity of religious beliefs and world views. One of the most affluent counties in the Nation, it nevertheless hosts significant pockets of populations that struggle to make ends meet. Its workforce is highly skilled and educated and its employment base boasts leading medical and health care facilities but it also hosts a large number of relics from an earlier manufacturing age that undermine its tax base and are a blighting influence on surrounding neighborhoods. It is a county with a world class park system that includes large nature preserves, but most of its residents are not within walking distance of a park or public open space. It is a retail mecca with a major concentration of regional malls and outlet centers and the healthy demographics to support them, yet a number of the county's small downtowns are struggling and depopulated. Limited access highways offer convenient North/South linkages, but East/West mobility is seriously hampered by a sparse network of mostly local roads that always seem congested, twist and turn in unintuitive ways and are notoriously difficult for outsiders to navigate.

A new master plan for the county must recognize and meet the challenges contained both in these conditions and in the jurisdictional fragmentation that constitutes the county's political landscape. The new master plan must take a hard look at current conditions, understand why things are the way they are, and identify ways to reinforce the county's strengths and mitigate its weaknesses. Key to this is developing a common vision that transcends municipal boundaries and empowers small local governments to work together on initiatives that are often too large for each of them to tackle individually. Sharing resources, skills, knowledge and practical experiences is crucial to a smarter, more efficient future.

Scope and Purpose of County Master Plan

In New Jersey, county master plans have a required scope defined legislatively in the New Jersey County and Regional Planning Act, NJSA 40:27-2 et seq.: "The county planning board shall make and adopt a master plan for the physical development of the county. The master plan of a county, with the accompanying maps, plats, charts, and descriptive and explanatory matter, shall show the county planning board's recommendations for the development of the territory covered by the plan, and may include, among other things, the general location, character, and extent of streets or roads, viaducts, bridges, waterway and waterfront developments, parkways, playgrounds, forests, reservations, parks, airports and other public ways, grounds, places and spaces; the general location and extent of forests, agricultural areas, and open-development areas for purposes of conservation, food and water supply, sanitary and drainage facilities, or the protection of urban development, and such other features as may be important to the development of the county."

In addition, a county master plan – and the process used to develop it – can perform several important functions that are not explicitly captured in the statute. County master plans can promote cooperation and collaborative thinking between municipalities on issues of common interest, including issues or facilities that are too large, costly or complex for municipalities to handle on their own, that cut across municipal boundaries and/or that require inter-jurisdictional cooperation. County master plans can educate municipalities and the general public with respect to a wide range of planning-related issues. They can publicize best practices and planning tools, drawn both from within the county, and from outside, that municipalities can pursue locally in search of solutions to common problems.

County Sub-Regions

In order to facilitate the public visioning and outreach process, the county was divided into three sub-regions, as follows:

- The Northeastern Region: Alpine, Bergenfield, Closter, Cresskill, Demarest, Dumont, Emerson, Harrington Park, Haworth, Hillsdale, Montvale, New Milford, Northvale, Norwood, Old Tappan, Oradell, Park Ridge, River Edge, River Vale, Rockleigh, Tenafly, Washington Township, Westwood and Woodcliff Lake.\
- The Southern Region: Bogota, Carlstadt, Cliffside Park, East Rutherford, Edgewater, Elmwood Park, Englewood, Englewood Cliffs, Fairview, Fort Lee, Garfield, Hackensack, Hasbrouck Heights, Leonia, Little Ferry, Lodi, Lyndhurst, Maywood, Moonachie, North Arlington, Palisades Park, Ridgefield, Ridgefield Park, Rochelle Park, Rutherford, Saddle Brook, South Hackensack, Teaneck, Teterboro, Wallington, Wood-Ridge
- The Northwestern Region: Allendale, Fair Lawn, Franklin Lakes, Glen Rock, Ho-Ho-Kus, Mahwah, Midland Park, Oakland, Paramus, Ramsey, Ridgewood, Saddle River, Upper Saddle River, Waldwick, Wyckoff.

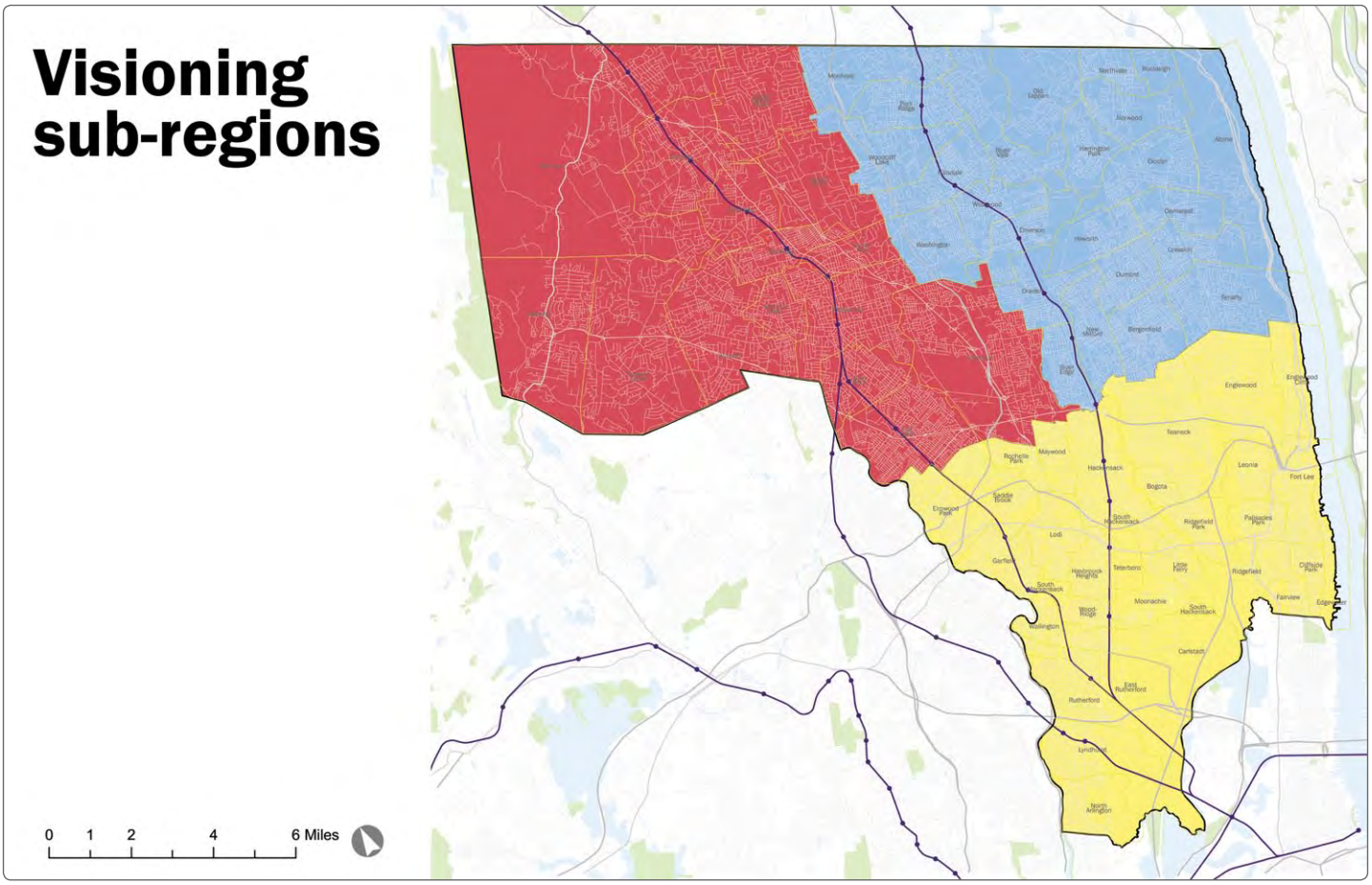
Our geographical approach to conducting the three visioning exercises to which we are constrained by the budget is based in common geography, but transcends this factor alone as we consider the broad brush of planning, development, environmental, and community issues.

The mix of factors used to identify three (3) planning areas for the purposes of visioning are spelled out below:

- Densities of development
- Population distribution
- Transportation facilities and issues
- Watersheds and water resources
- Historical political subdivisions and planning units
- Existing municipal boundaries
- Existing councils of government (mayors associations, shared services, school districts, etc.)
- Size and scope of area

It was ultimately decided to divide the county into Northwestern, Northeastern, and Southern Visioning Areas. These areas were achieved by roughly dividing the county by two axes: Route 4 dividing north and south, and the Garden State Parkway dividing northeast and northwest. These were then extrapolated to account for a number of factors, as listed above,

Visioning sub-regions



with particular attention to watershed and drainage systems as well as municipal boundaries, but careful not to split up existing regional and sending/receiving school district arrangements. Generally speaking, the historical township delineation of Bergen County (pre-1890s "Boroughitis") corresponds with the breakdown of the visioning areas – representing a shared history.

Background & Analysis

A briefing book provided the factual basis and questions used to frame the conversation at breakout tables during the visioning process. It was not intended as a comprehensive compilation of data on all topics relevant to Bergen County, but rather as a concise summary of the issues most amenable and relevant to the visioning process. A summary of what we heard at the three visioning sessions can be found in the back of this report

Bergen County within the New York Metropolitan Region

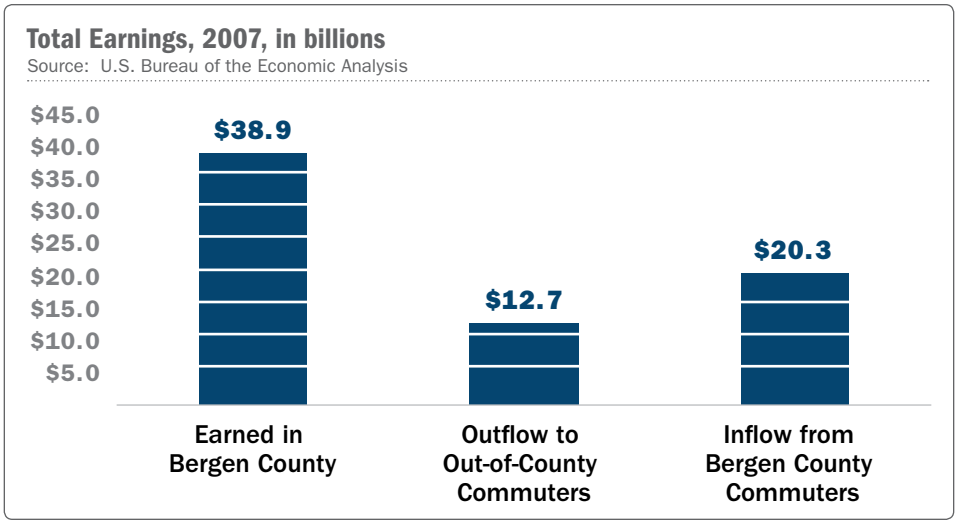
Bergen County developed in tandem with the larger New York metropolitan region, and shares a range of physical, economic and environmental resources. The Hudson River serves as both a boundary and a corridor that connects the county to the New York-New Jersey Harbor, the Hudson River Valley to the north and the cities to the south and east. The Ramapo Mountains define the county's northern edge, but also connect it to the Appalachian Highlands, a national resource that forms the spine of the Eastern seaboard. The watersheds of the Hackensack, Passaic and other rivers form ecological links between Bergen and other counties in Northern New Jersey.

Shared infrastructure facilitates the flow of people and goods between Bergen and the rest of the metropolitan area. Interstate highways such as I-95 and I-80, crossings such as the George Washington Bridge, rail freight lines, and commuter rail and bus services operated by New Jersey Transit and others are critical to the economy of the county and the rest of the region. Electric power grids, water systems and waste management systems are also part of the underlying fabric linking the county to the region.

With a $1.3 trillion economy and nearly thirteen million jobs, the tri-state metropolitan region gives Bergen residents and businesses access to one of the largest and most dynamic labor and consumer markets in the world. It also ties it to the challenges of high costs and congestion that come with this dense concentration of activity.

The interdependence between the county and the region can be seen in the flows of commuters and income. The majority of Bergen County residents (57.6%) commute to work within the county. This generates a demand for travel that is met mostly by private vehicles on local and county roads and certain portions of regional highways. The main locations of jobs for those who commute from Bergen are the adjacent counties of Manhattan, Hudson, and Passaic. In 2000, 14% percent of Bergen's resident workforce commuted to Manhattan. While these are generally the highest paid jobs, twice as many residents commute to other locations.

The county has a workforce that supports businesses throughout the region and brings back a large portion of the income that supports home values, local businesses and tax revenues within the county. $20 billion, or 44% of all the income earned by Bergen



residents, comes from wages and salaries earned from jobs located outside of the county.

Bergen also has a large employment base that supports both residents and commuters from outside of the county. Of the $40 billion in wages generated by Bergen County businesses, about a third is earned by residents of other counties.

This two-way flow gives the county's economy diversified sources of income, job and business opportunities. In fact, of all the counties in the region, Bergen has one of the more evenly balanced economies in terms of reliance on both local businesses and regional employment opportunities.

Bergen also serves as an important housing market within the region, providing a mix of communities and housing types. As with other mature suburban counties, housing construction has slowed and prices have risen in recent years. The ratio of home values to household incomes in Bergen is comparable to counties such as Rockland, Nassau, and Fairfield, and somewhat less than in Hudson, Passaic, and Westchester.

From 1998-2007, about 25 new homes were built in Bergen County for every 1,000 residents. This is a much slower pace than either New York City or exurban areas of the region. It is slightly higher than Rockland or Westchester but much less than in Hudson County. Over the last decade, multi-family housing accounted for more than half of new construction. Note here that the amount of developable land remaining in Bergen is next to nothing, and that the bulk of any future housing development will take the form of redevelopment, likely at higher densities.

Regional and Local Economies

Bergen's recent economy can be thought about in three distinct periods – a period with relatively rapid growth through the 1970's and 1980's, a period of stability from the early 1990's to 2008, and the current period of recession and uncertainty.

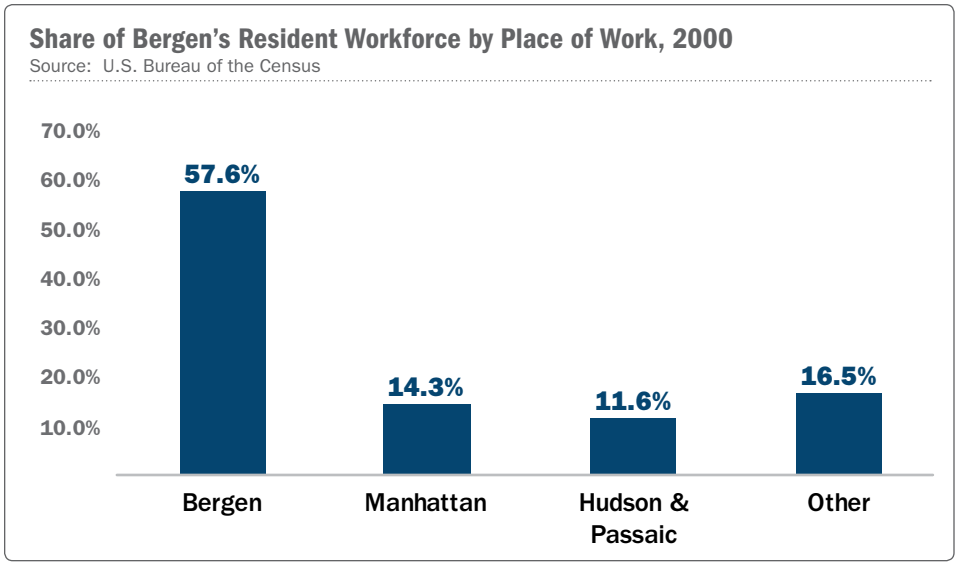
Jobs grew steadily through 1989, but have been relatively stable at just under 500,000 since rebounding from the recession of the early 1990s. Average wages peaked at $57,000 per job in 2000 and have since declined to $56,000. In spite of stagnant wages, household income grew during this period. This is partly due to the sharp increase in wages for those who commuted to Manhattan, and partly due to increases in non-wage income such as investment income.

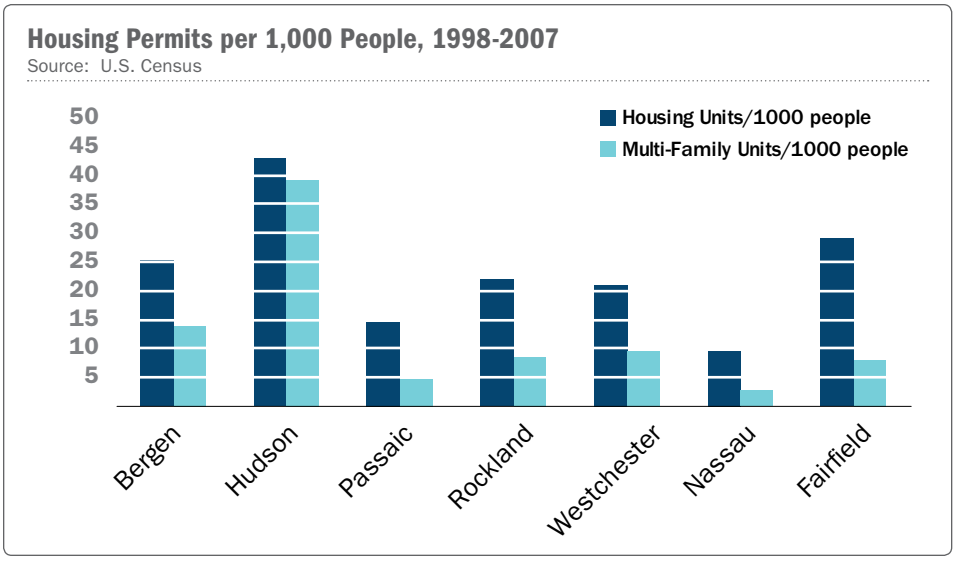
More than many counties in the region, Bergen has a diverse economic base with large sectors in health care, professional services, trade and manufacturing. While this does not necessarily make the county less susceptible to cyclical ups and downs, it does provide it with multiple avenues for potential growth.

Between 2001 and 2007, two sources of growth generated the largest numbers of new jobs in the county. The "Eds and Meds" sector that includes education, health care and social services grew by 18,000 jobs. These activities have been growing for decades through ups and downs in the economy, and can be expected to generate significant growth in the future. The other source of growth was the overheated real estate market. Real estate related activities, including sales, leasing and construction, added 17,000 jobs during this period.Since the bursting of the real estate bubble in 2007-2008, these industries have lost jobs and can be expected to continue their cyclical behavior in the future. The county has also added an estimated 30,000 self-employed. It is not clear what drove this growth, but many were likely in the real estate, financial and professional services industries.

Like the rest of the United States, the county is in the throws of a recession that has lasted nearly two years. It is not clear when it will end or what the recovery will look like. While this "Great Recession" is the worst national downturn since the Depression of the 1930s, for Bergen County and the rest of the tri-state region, it still has far to go to match the number of jobs lost in the early 1990s. The early 1990s recession hit the New York area much harder than the rest of the country.

Since April 2008, the Bergen-Hudson-Passaic Labor Market Area has lost over 3% of its jobs, slightly more the rest of northern New Jersey and New York City. These job losses, are thus far only about a third of those experienced in the recession of 1989-1992.





The current recession has been broad-based, with every major industry except Education and Health Services experiencing a loss of jobs. Industries with the largest losses include those that grew the most between 2001-2007, including Financial Services, Construction, and Professional Services.

Bergen's recovery from the recession, and its long-term growth, will depend on how it responds to likely changes in the global and regional economies:

- The U.S. is likely to experience a shift from consumption to savings. This could favor activities such as research and development, education, business investment and public infrastructure and undermine others, such as retail.
- The New York region is likely to remain one of leading global financial centers, but financial services will be less highly leveraged and potentially less highly paid. This could restrain income growth for residents working in finance, particularly Manhattan-based finance jobs.
- The region should retain advantages for activities with high intellectual capital. Because of its highly skilled workforce and concentration of high-value industries, universities, cultural institutions and other assets, the region is likely to remain a draw for activities ranging from global media and finance to research and consulting. As a result, keeping and expanding a highly skilled workforce is arguably the most important factor in maintaining Bergen County's prosperity.
- As the baby boom retires, a decline in the working age population will make competition for skilled workers more intense. Those places that provide a high quality of life and affordable places to live for working age families and individuals will have a distinct advantage.
- Bergen County will be particularly challenged to provide workforce housing options not only to lower paid workers, but also to recent college graduates and young professionals, whose residence in Bergen County is critical to its economy. Their presence represents the future highly skilled workforce that will drive the economy in the future.

Although there is no one single center of commercial or industrial activity, there are several areas and corridors where certain types of firms and jobs are located. As shown in the map of employment by zip code, there is a concentration of jobs stretching from Paramus through Hackensack, Teaneck and Englewood to Fort Lee. This east-west corridor has the largest concentrations of retail, office and health service jobs.

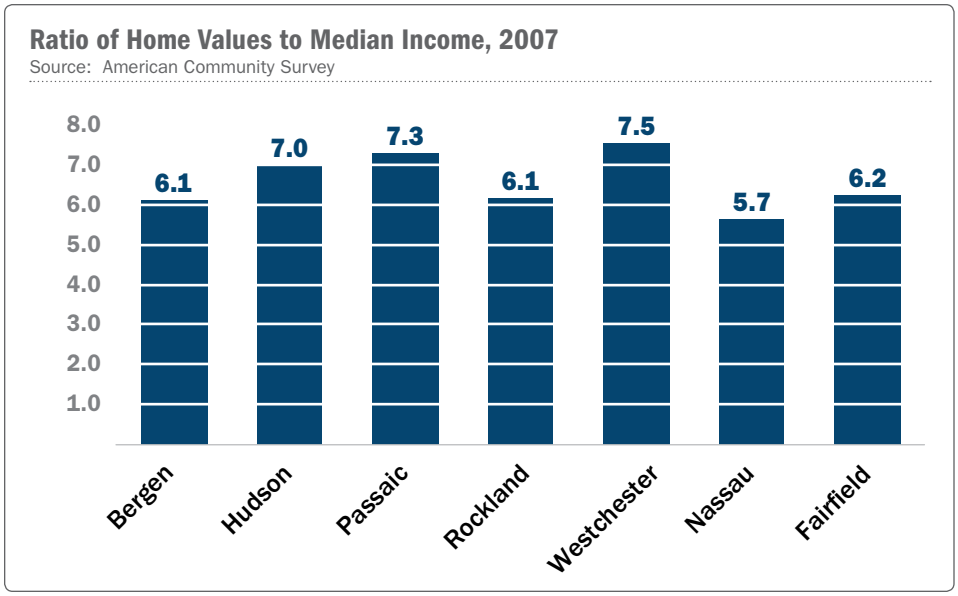
The two biggest employment centers are in Hackensack and Paramus. Hackensack, the county seat has over 50,000 jobs, with the county's largest number of health services jobs and a substantial amount of retail, professional services and public administration employment. Paramus, with 45,000 jobs, is characterized by its large concentration of regional malls, retail strip development along the highways, office parks, and related employment.

Industrial jobs are located primarily in the southern part of the county. In addition to manufacturing jobs, there are also large numbers of wholesaling, transportation and warehousing jobs in places such as Lyndhurst, East Rutherford, Carlstadt and Saddle Brook.

The northeastern portion of the county is largely residential, but does have a significant amount of corporate office employment near the northern edge, particularly centered on Montvale. Professional services, retail, health services and education are the largest industries in this part of the county.

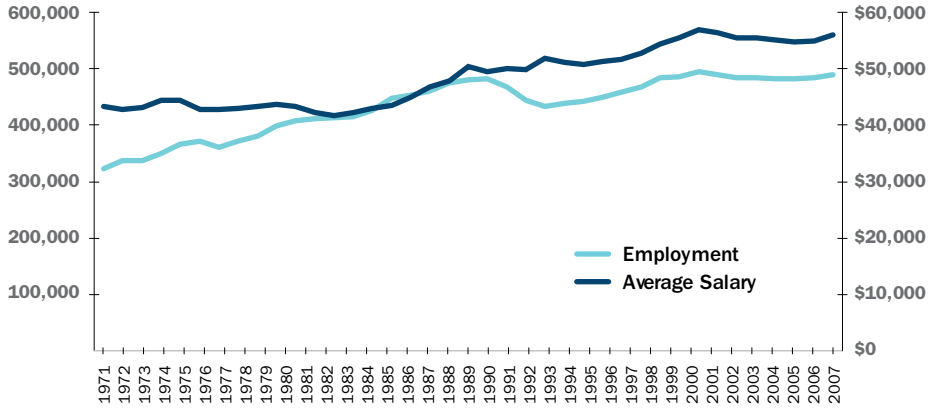
The northwest section has a diverse mix of commercial industrial activity, including a concentration of health services in Ridgewood and a mixture of manufacturing, wholesale and retail employment near Mahwah and Ramsey.

The North Jersey Transportation Planning Authority (NJTPA) forecasts that Bergen County's employment base will grow from 474,600 jobs in 2005 to 545,100 jobs in 2035, a gain of 70,500 jobs. An important consideration for this plan is the question of where this job growth will take place and in what type of environment. Will it be in the auto-dependent corporate office parks



Number of Payroll Jobs and Average Annual Salary (adjusted for inflation) in Bergen County, 1969-2007

Source: U.S. Bureau of Economic Analysis



found in the northeastern part of the county, or in the denser, more transit-oriented environments found in the southern part of the county?

Disparities in Underserved Populations

Bergen is an affluent county, compared to the tri-state metropolitan region and to the country. Its median household income, $82,354, is nearly a third larger than the regional average and nearly 60% higher than the national median. Only 5% of the population is below the poverty line, compared to 13% in the region and 12% in the United States.

However, average incomes and poverty statistics do not tell the whole story. Because the cost of living, and in particular housing, is also high, low-income individuals and families can find it even more difficult to make ends meet. For example, 38% of Bergen households spend more than 35% of their income to cover housing costs, compared to 30% nationally. This is only slightly less than the 40% of households in the region paying this much of their income for housing.

Overall, 20% of county households have incomes less than $30,000 per year. However, these households are concentrated in two areas in the southern part of the county. One concentration stretches east from the border of Passaic through Garfield, Wallington, Lodi and Hackensack, and the other stretches south from Fort Lee through Palisades Park, Cliffside Park, Fairview and Ridgefield.

Demographic Trends

A review of Bergen County's historical and projected population growth reveals that moderate population growth is expected to continue in the future. Bergen County's population posted steady and consistent gains up until 1970 when the population stood at 897,148 (US Census). The two decades that followed, 1970 to 1980 and 1980 to 1990, saw the County's first declines, by 5.8% and 2.4 % respectively. That relatively brief trend was reversed between 1990 and 2000 when the population increased moderately by 7%, just under the statewide growth rate of 8.6%. Based on the 2005 US Census estimate the County has continued to grow by an additional 2% to just under 903,000 people. Bergen's recent growth is in line with growth trends in neighboring counties.

The North Jersey Transportation Planning Authority (NJTPA) projects continued growth in Bergen County with the population reaching 919,400 by the year 2015, an increase of 4% over the 2000 population and crossing the 1 million threshold by 2035, an increase of about 10%. The NJTPA also forecasts that the county will gain 63,300 new households, from 332,200 in 2005 to 395,500 in 2035. Of great interest to this master plan is the question of where this additional population and these additional households will live, in what type of housing and in what type of community.

Population Density

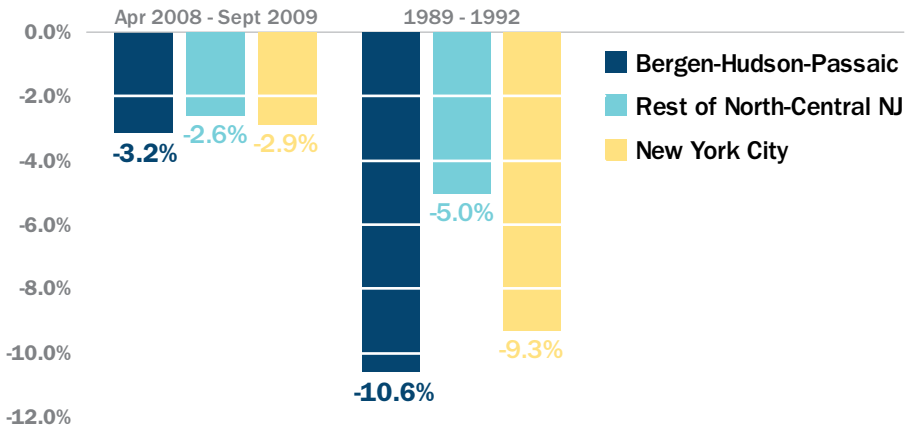
Bergen County's residents live in a fairly dense environment, at about 3,700 persons per square mile, placing Bergen County fourth in density among New Jersey counties behind Hudson (13,000), Essex (6,200) and Union (5,000), and far exceeding the statewide density of 1,100 persons per square mile. Southern Bergen is the most densely populated area, particularly the southeastern municipalities with over 10,000 people per square mile approaching Hudson County-like density, with Cliffside Park topping the list at 23,847 persons per square mile. The northwestern area is the least dense with just over 1,800 people per square mile.

Age

The median age in Bergen increased from 37.5 in 1990 to 39.1 in 2000. Bergen County's 2000 median age was the third highest of the twenty-one counties behind only Cape May (42.3) and Ocean (41),

Percent Employment Change, 2008-2009 vs 1989-1992

Source: U.S. Bureau of Labor Statistics



County Employment by Industry, 2001-2007

Industry	2007	Change 2001-2007
Self-employed	121,672	30,422
Construction	29,770	5,914
Manufacturing	43,473	(12,337)
Wholesale trade	47,612	(3,768)
Retail trade	63,151	(2,699)
Transportation and warehousing	19,315	(1,033)
Information	15,053	(5,703)
Finance and insurance	30,916	1,135
Real estate and rental and leasing	34,590	11,181
Professional, scientific, and technical services	53,609	2,421
Management of companies and enterprises	16,446	(116)
Administrative and waste services	36,655	(1,015)
Educational services	13,832	3,913
Health care and social assistance	74,041	14,281
Arts, entertainment, and recreation	12,507	1,389
Accommodation and food services	33,763	7,569
Other services, except public administration	33,722	3,142
Government and government enterprises	50,045	4,923

Source: U.S. Bureau of Economic Analysis

and was higher than the statewide median age of 36.7. It was substantially higher than the surrounding counties of Essex (34.7), Hudson (33.6), Passaic (34.8) and Rockland (36.2). Municipalities with a higher median age than the County average are concentrated across the middle of the County.

As a counter to this apparent aging trend, the County saw a 14% increase in population less than twenty years old between 1990 and 2000. This increase is slightly higher than the NJ average of 12%. An increase in youth population means more families with children.

George Washington Bridge- Fort Lee

Diversity

Bergen County has a very diverse population in terms of race, ethnicity and religion. In 2000, 78% of Bergen's population was White, 12% was Asian and five percent were Black or African American. Hispanic or Latinos of any race amounted to 10%. This differs from the statewide average which has a higher proportion of Black or African Americans (13.6%) and significantly less Asians (5.7%).

Bergen County's population includes a wide variety of ethnicities. Italian is the most commonly identified first ancestry among Bergen residents. Irish-Americans and German-Americans are the next largest ethnic groups, followed by residents of Polish descent and Greek-Americans. The diverse Latino population includes residents from Colombia, Cuba and an increasing number of immigrants from Mexico, Guatemala, El Salvador, the Dominican Republic, Peru and Ecuador. There are a significant number of members of the Jewish faith and a moderately sized Muslim population.

Bergen has a significant Asian population, particularly Korean-Americans. In 2000, Bergen's Asian population included Korean (38%), followed by Indian (19%), Filipino (15%) and Chinese (15%). Asians were the second largest racial component in 2000, except for in the Southwest and Central areas of the county where Hispanics had higher percentages. A high number of Asians – over half of the state's entire Korean population – reside in the Southeastern part of the county. Eight of the nation's top ten municipalities by percentage of Korean population are located in Bergen.

Selected Indicators of Economic Disparities

	Bergen County	Tri-State Metropolitan Region	United States
Poverty (Percent of people below poverty level)	5%	13%	12%
Income (Median household income)	$82,354	$63,957	$52,175
Housing Costs (Percent of households paying over 35% of income for housing)	38%	40%	30%

Source: 2006-2008 American Community Survey

Educational Attainment

From 1990 to 2000 there was a significant increase in the number of people aged twenty-five years and over with an Associate or Bachelor's degree in Bergen County, mirroring a State-wide trend.

Natural Systems

Watersheds, Rivers, and Lakes

Bergen County is drained by a number of important river corridors. To the east, five Bergen County municipalities are located along the Hudson River. Nine other municipalities are located along the Passaic River to the west. The Hackensack, Ramapo and Saddle River also traverse the county and play significant roles in shaping the regional landscape. Other smaller water courses – such as Berry's Creek and Canal, Overpeck Creek, Bellmans Creek, Wolf Creek, Sprout Brook, Fleisher Brook, Teaneck Creek, Musquapsink Brook, Tenakill Brook, Sparkill Brook, Dorotockeys Run, Pascack Brook, Hohokus Brook, Darlington Brook, Ramsey Brook, Allendale Brook, and Valentine Brook – have an important presence at the local, but not regional scale. These smaller, more localized watercourses affect the region as tributaries to larger water systems including key drainage corridors, reservoirs and drinking water systems, and ecosystems.

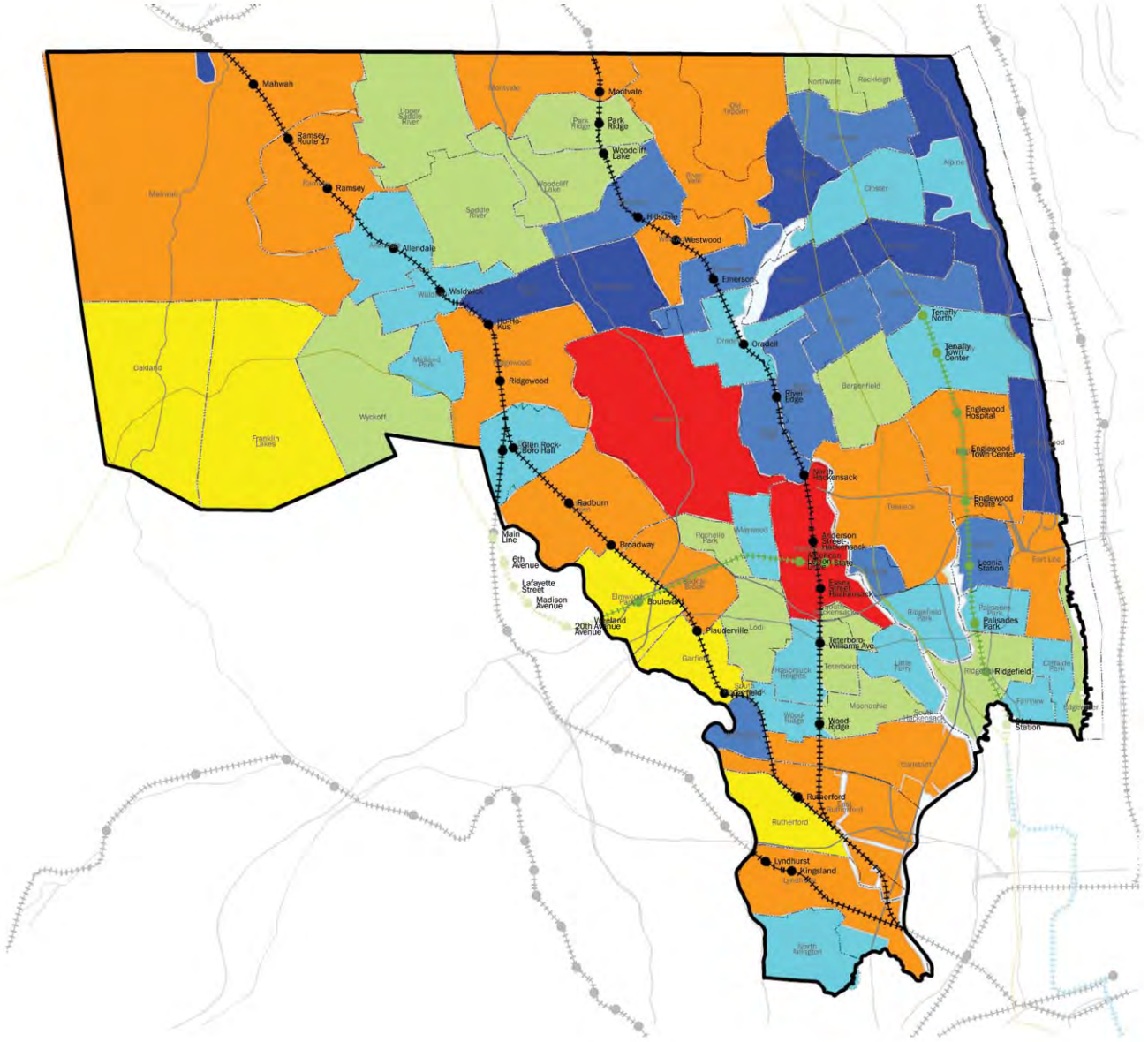
Employment

Total employment, by zip code.

Source: RPA analysis of Reference USA data, 2009.

Jobs per zip code tabulation area

- 0 - 1,640
- 1,650 - 3,400
- 3,410 - 5,090
- 5,100 - 7,220
- 7,230 - 10,500
- 10,600 - 17,900
- 18,000 - 53,600
- Municipal boundary



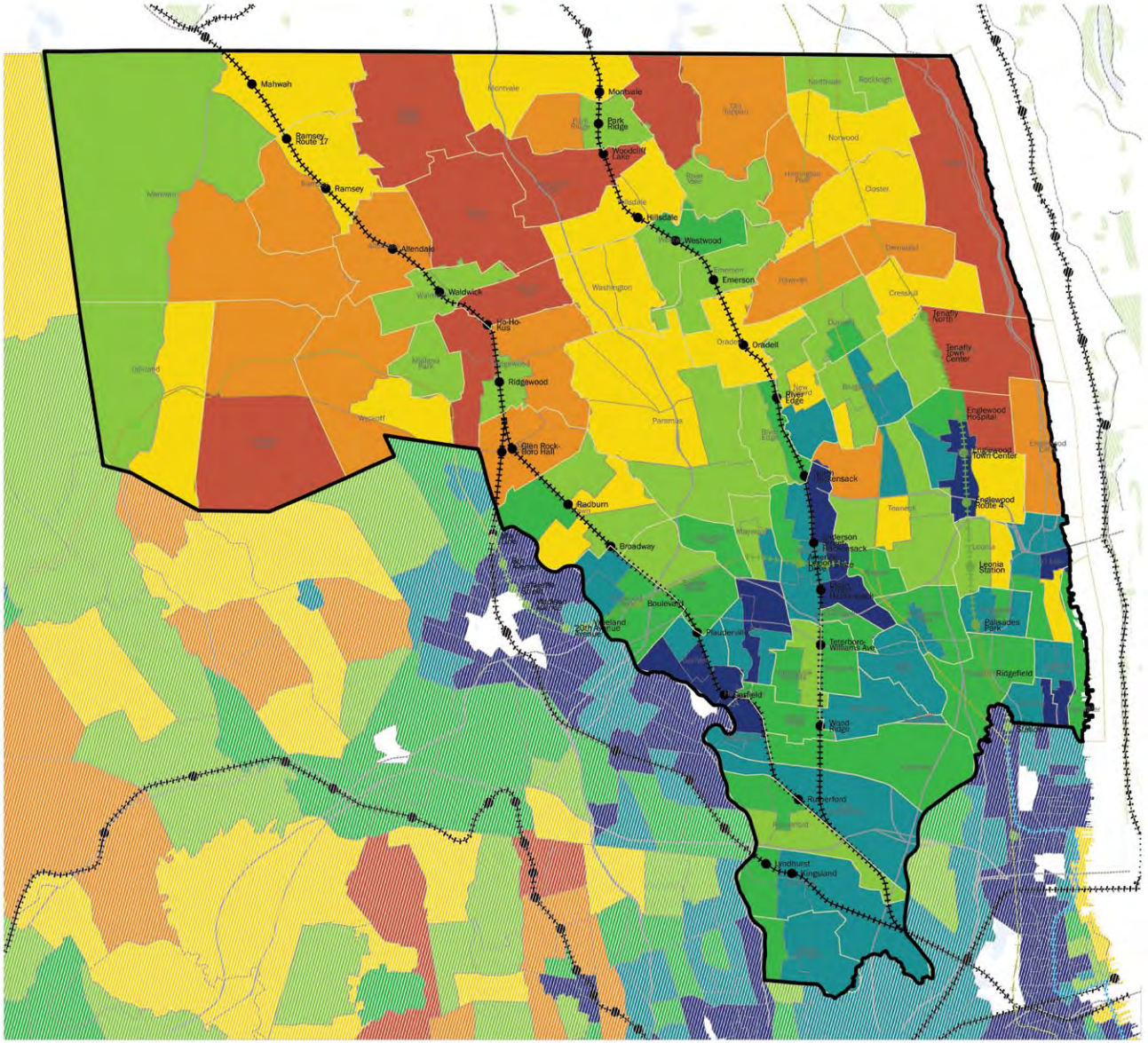
0 1 2 4 6 Miles

Median household income

Source: Census 2000, shown by tract.

Median household income ($)

- 26,800 - 44,200
- 44,300 - 53,000
- 53,100 - 63,500
- 63,600 - 77,800
- 77,900 - 93,900
- 94,000 - 117,000
- 118,000 - 172,000



Significant wetlands formations exist in the southern part of the county, along the Hackensack River and in the eastern portions of Carlstadt, East Rutherford, Rutherford, and Lyndhurst. Other wetlands formations generally associated with 100- or 500-year flood zones can be found along the four major rivers corridors and their tributaries and to the east of Tenakill Brook.

Lake Tappan, Oradell Reservoir and Woodcliff Lake Reservoir are also significant regional water features.

Parks, Open Space and Nature Preserves

The Bergen County Parks System encompasses almost 8,000 acres and offers a wide range of passive and active recreation opportunities. Residents can enjoy picnics overlooking the Hudson River, as well as overnight camping, swimming, horseback riding, skiing and visits to a zoo. The County also offers public golfing opportunities at five golf courses in the central and northern areas, fifteen miles of bicycle/pedestrian paths and a trail system. Large parks and recreation spaces and facilities are afforded by the County Park System at various locations including: Overpeck, Saddle River, Van Saun, Riverside and Darlington County Parks and the Ramapo Valley and Campgaw Mountain County Reservations, among others.

Other significant preserved open space areas include the following:

- Palisades Interstate Park, formed in 1900 to protect the cliffs on the west bank of the Hudson River across from Manhattan. The Palisades park system now includes twenty-four parks and eight historic sites, covering over 100,000 acres along with more than twenty miles of Hudson River shoreline in New Jersey and New York. The Palisades Interstate Park was designated a national Historic Landmark in 1965.
- Flat Rock Brook Nature Center, a 150-acre preserve and education center situated on the western slope of the Palisades in Englewood and one of the last remnants of the Palisades Forest.
- Tenafly Nature Center, a sixty-five-acre nature preserve adjoining the 316 acre Lost Brook Preserve, sits on top of the Palisades overlooking the Hudson River.

Ramapo Mountain State Forest, a 4,200 acre state forest in Bergen and Passaic Counties, containing the 1,417-acre Ramapo Lake Natural Area and a 120-acre mountain lake. The forest borders the Ramapo Valley County Reservation, part of the Bergen County park system, and has a trail system which runs along the ridge of the Ramapo Mountains north to Mahwah.

Of considerable interest is the role these large areas of preserved or regulated open space, along with privately-owned open space, can play as part of a countywide strategy to mitigate carbon emissions, create additional carbon sinks and adapt to the effects of global climate change.

Perspectives on Climate Change

Under our current energy system, the necessities of daily life such as heating & cooling, transportation, manufacturing, and electricity, all rely on the burning of fossil fuels which contribute heat trapping ("greenhouse") gases into the atmosphere. The United Nations' Intergovernmental Panel on Climate Change has established a conservative global warming estimate of between four and seven degrees by end of century. Worldwide, this warming is expected to result in a loss of sea ice, an increase in hurricanes and cyclones, increased extinction of species, and water shortages, all of which may have widespread impacts on human populations and ecosystems.

Locally, climate change scenarios predict summer temperatures to rise by as much as six to fourteen degrees Fahrenheit. Communities across the region are expected to be affected by heat waves that are more frequent, intense, and of longer duration, potentially increasing the annual number of heat-related deaths by 50%. More frequent summer droughts also suggest a need to preserve and expand water recharge and storage capacities for the Hackensack, Ramapo and Passaic rivers and aquifers. Coastal areas are expected to be impacted by more frequent and intense storms that will cause erosion and damage transportation and utility infrastructure with particular risk to water supply and water treatment facilities. Flooding within the "100 year" flood zone may occur every few years, stressing coastal communities, infrastructure and habitats. Ocean levels are expected to rise as a result of warming water temperatures and sea ice melting. Increased sea levels may inundate low-lying marshlands, damage or destroy beaches, dunes, and cliffs, and expose inland areas to flooding. Infrastructure and habitat along the Hackensack and Passaic Rivers and within the Hackensack Meadowlands is considered particularly vulnerable.

Twelve of Bergen County's seventy municipalities – Cliffside Park, Closter, Demarest, Englewood, Fair Lawn, Haworth, Northvale, Ridgewood, Saddle Brook, Teaneck, Tenafly, and Washington Township – have signed the US Mayors Climate Protection Agreement to support the goals of the United Nations Kyoto Protocol in local communities through local actions to inventory emissions and initiate strategies that include greater municipal efficiency, recycling, and adopting smart growth and alternative transportation policies.

The State of New Jersey has adopted legislation calling for a 20% reduction in emissions statewide by 2020; and has drafted recommendations to limit the growth of vehicle miles travelled (VMT) and encouraging more efficient land use and transportation patterns.

As NJ's most populous county, uses and activities in Bergen County are a significant contributor to the state's greenhouse gas emissions and the results of choices and decisions made within the county will significantly impact overall state emissions. Major emissions contributors in the state are electrical generation, gas and diesel fuel burning vehicles, heating oil and natural gas, and methane emissions from landfills. Although Bergen County has slightly higher transit ridership than the rest of the state, the share of single-occupancy drivers is equivalent to the state average. On-road gasoline usage has increased 34% between 1990 and 2005. VMT has increased 1.5% per year from 1990 to 2005.

While a county master plan does not directly affect local land use and transportation, it can promote a better understanding of how local decisions affecting land use and transportation translate into outcomes that affect greenhouse gas emissions in positive or negative ways. It can also promote cooperation between municipalities with respect to more efficient land use patterns capable of supporting transit. The county master plan can publicize best management practices and showcase case studies where local actions have helped to reduce greenhouse gas emissions.

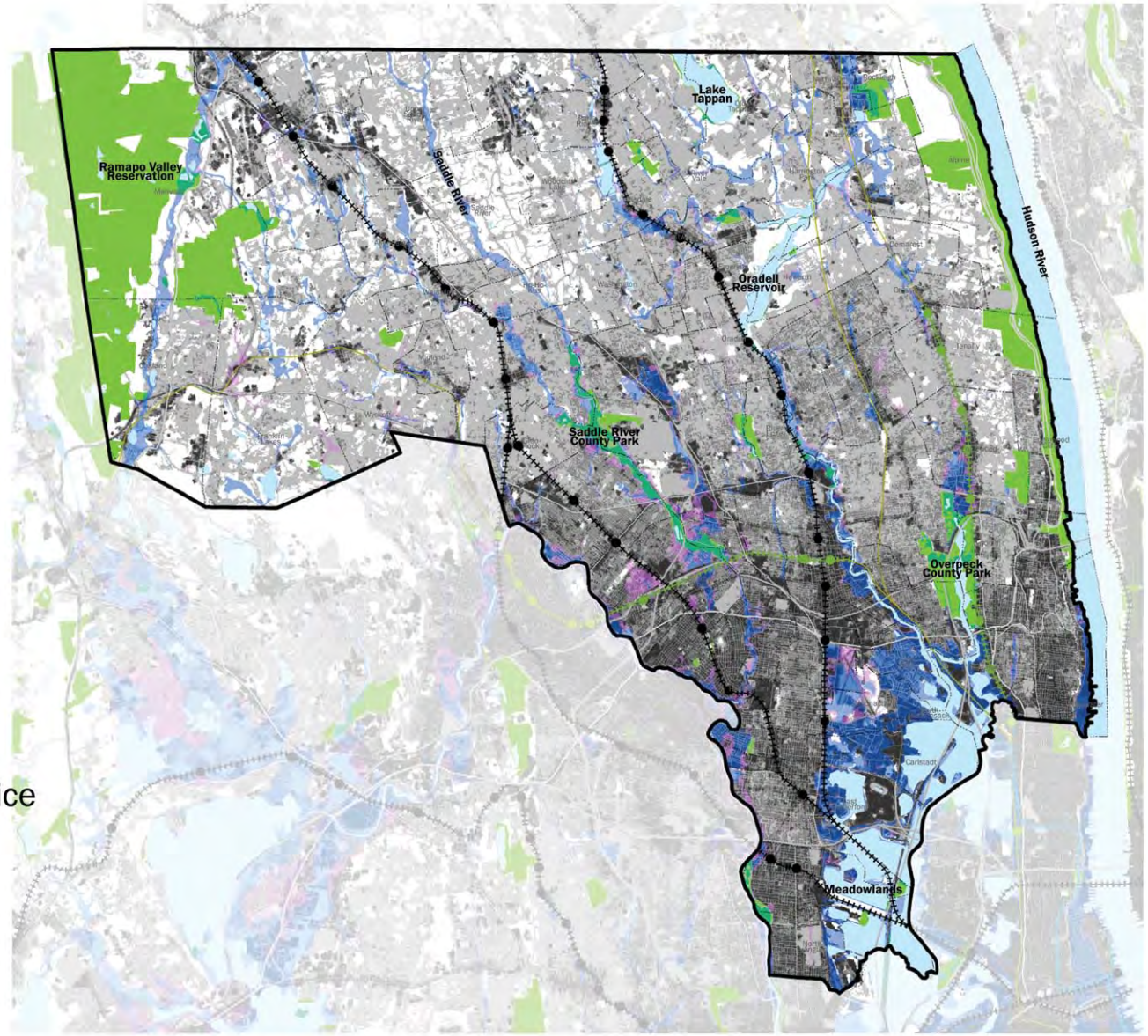
Water and open space

Federal, state, county and municipal open space. Dark blue shows land within the estimated 100 year flood extent, pink shows 500 year flood extent.

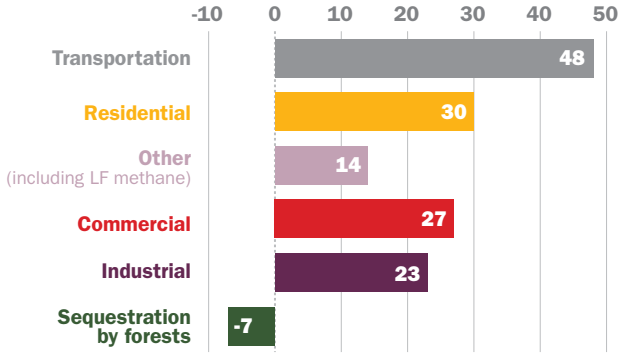
Source: NJDEP, RPA, NJTransit.

- Open space
- Water bodies
- Urbanized area
- 100 year flood
- 500 year flood
- Passenger rail service
- Proposed passenger rail service
- Light Rail
- Freight rail
- Municipal boundary

0 1 2 4 6 Miles



Greenhouse Gas Emissions by Sector, New Jersey 2004 (including CO2 from generation of electricity used by sector: millions of metric tons CO2 equivalent



Transportation and Mobility

Travel Behavior

Where do Bergen County Residents Work?

Over half (58%) of Bergen residents are employed within the county. New York City, specifically Manhattan, ranks second at 18%, and Hudson and Passaic Counties each attract 6% of the workers residing in Bergen County.

How do Bergen Residents Commute to Work?

85% of Bergen County residents drive to work and only 13% use transit. This divide is even greater when we filter out those destined for workplaces only within the County, where a vast majority (91%) commute by auto, only 3% by bus and less than 1% by rail.

New York City is the next most popular destination for Bergen County commuters, with 82% of these working in Manhattan. Among the Manhattan bound group, 38% use buses and 15% rail. Manhattan bound work trips grew by 14% between 1900 and 2000, but work trip travel to other places has declined.

This data only reflects work-trips and does not include discretionary or non-work trips, which are considerable.

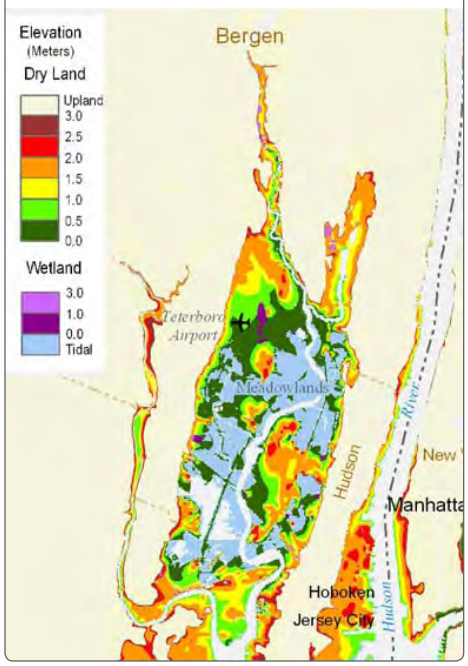
From 1990 to 2000 average travel times across the county have increased by four minutes. The southern portion of the county has some of the worst congestion and delays, with travel times increasing by almost eight minutes on average during the same period.

Vehicular Circulation

The macro arterial grid serving Bergen County includes some of the largest and most heavily travelled facilities in the state, and indeed in the nation, with high volume toll roads – such as the New Jersey Turnpike and the Garden State Parkway (GSP) – limited access highways, such as the Palisades Interstate Parkway (PIP), I-80 and I-287 – and a number of state highways. Unfortunately, the highway network has a predominantly north-south orientation, and the much sparser east-west connections create circulation difficulties, particularly in the central and northern parts of the county.

Lands Most Vulnerable to Impacts of Climate Change – Elevations of Land Close to Sea Level

Source: Excerpted from J.G. Titus and J Wang. 2008. "Maps of Lands Close to Sea Level along the Mid-Atlantic Coast". US Environmental Protection Agency. This map is a general graphical representation of regional elevation variation and is accurate at any one point within 150 cm.



In southern Bergen, north-south movement occurs by way of the New Jersey Turnpike (I-95), Tonnelle Avenue (Routes 1&9), Route 17, and Route 21 on the western side of the Passaic River. The only high volume east-west roads are Routes 3 and 46.

In central Bergen, north-south trips take place on the Garden State Parkway, Palisades Interstate Parkway, and Routes 9W, 17 and 4/208. East-west movement is limited to Route 80. In the absence of other east-west connections, Route 17 functions as a proxy, connecting the few discontinuous east-west routes.

Commuters by Mode to All Destinations & Regional Share of County Commutation

	Auto		Bus		Rail		Other		
Region Name	#	Share	#	Share	#	Share	#	Share	Total
Southern	182,925	82%	23,901	11%	4,634	2%	10,430	5%	221,890
Northwest	84,266	88%	4,105	4%	4,971	5%	2,227	2%	95,569
Northeast	85,422	88%	6,545	7%	2,218	2%	2,527	3%	96,712
Bergen County Total	352,613	85%	34,551	8%	11,823	3%	15,184	4%	414,171
Southern vs County	52%		69%		39%		69%		54%
Northwest vs County	24%		12%		42%		15%		23%
Northeast vs County	24%		19%		19%		17%		23%

Source: US. Census 2000 – Census Transportation Planning Package- Tables 8 & 14 Calculated Shares

Finally, in northern Bergen, north-south traffic can take the GSP, I-287 and Routes 17 and 202. There is no major east-west facility.

Route 17 plays a special role in circulation within the County. Constructed in the early 1930's it continues to serve as a major regional artery and a vital link in the Northern New Jersey transportation network. Route 17 traverses Bergen County from its northern border with Rockland County, cutting diagonally to its southern border with Hudson County at Route 7 in North Arlington. In the north, Route 17 is almost a limited access highway with three lanes in each direction. In the South, through the commercial areas of Paramus, Route 17 operates as a land-service highway with grade-separated cross-streets and numerous curb cuts for retail and offices. The County considers Route 17 its highest highway priority.

Route 17 also serves as the "missing link" between the New Jersey Turnpike and the New York State Thruway for truck freight movements to all points north. This is the most convenient route for trucks coming from the New Jersey Turnpike, logging significantly less mileage than the much more circuitous I-287 beltway around the Metropolitan area.

Regional Roads

Southwest Bergen

- Major state roads – New Jersey Turnpike, Route 17, Route 120 and Route 46.
- Major county roads – Washington Avenue/Moonachie Road (CR 43), Union Avenue (CR 32), Paterson Avenue (CR 55) and Empire Boulevard (CR 36).
- Route 80 in Teterboro, Route 3 in East Rutherford and Rutherford and Route 17 in Hasbrouck Heights all have over 100,000 Average Annual Daily Trips (AADT). They are the most heavily traveled roads in this part of the county and are among the most heavily traveled in the State.
- Trucks contribute to congestion in Carlstadt and the southern corridor of Route 17. There is major congestion in Lyndhurst at Orient Way and Valley Brook Avenue.
- There is considerable congestion on roads accessing the Meadowlands Sports Complex during events.

Southeast Bergen

- North-south roads – I-95, Palisades Avenue/Sylvan Avenue (Route 67), Broad Avenue/Grand Avenue (Route 67), Anderson Avenue (CR 135) and Palisades Avenue (CR 505).
- East-west roads – Route 4, Route 46, Broad Boulevard (Route 5), Fort Lee Road/Main Street (CR 12) and Engle Street (CR 501).
- Four locations in Fort Lee (Main Street at Schlosser Road, Lemoine Avenue, Center Avenue at Hudson Terrace and Center Avenue at Bigler Street) and four in Edgewater (River Road at Russel Avenue, Hillard Avenue, Garden Place, and NJ Route 5) experience major congestion.
- The routes that access the major highways serving New York City experience severe congestion. Other heavily traveled locations are Route 1 between Christies Lane and Main Street in Fort Lee (57,000 AADT), Route 9W between Shopping Center and Linwood Avenue in Fort Lee (41,000 AADT), Route 1 between Pleasantview Terrace and Lancaster in Ridgefield Borough (29,000+ AADT) and Route 67 in Fort Lee (23,000 AADT).

Commuters by Mode to New York City with Manhattan Detail

		Auto		Bus		Rail		Other	
Origin Region	Destination	#	Share	#	Share	#	Share	#	Total
Southern	**New York City**	20,690	50%	16,431	40%	4,052	10%	295	41,468
Northwest	**New York City**	6,968	47%	3,574	24%	4,326	29%	21	14,889
Northeast	**New York City**	11,440	61%	5,293	28%	1,803	10%	73	18,609
All Counties	**New York City**	39,098	52%	25,298	34%	10,181	14%	389	74,966
Southern	**Manhattan**	14,640	43%	15,249	45%	3,698	11%	239	33,826
Northwest	**Manhattan**	5,056	41%	3,360	27%	4,048	32%	8	12,472
Northeast	**Manhattan**	8,215	55%	4,937	33%	1,734	12%	69	14,955
All Regions	**Manhattan**	27,911	46%	23,546	38%	9,480	15%	316	61,253

Source: US. Census 2000 – Census Transportation Planning Package – Tables 8 & 14 Calculated Shares

Commuters by Mode to Intra-County – Region to Region

		Auto		Bus		Rail		Other		
Origin Region	Destination	#	Share	#	Share	#	Share	#	Share	Total
Southern	**Southern**	73,226	86%	3,751	4%	83	0%	8,414	10%	85,474
Southern	**Northwest**	19,786	93%	871	4%	33	0%	524	2%	21,214
Southern	**Northeast**	10,445	93%	501	4%	0	0%	272	2%	11,218
Northwest	**Southern**	14,695	98%	145	1%	46	0%	142	1%	15,028
Northwest	**Northwest**	31,789	94%	230	1%	90	0%	1,687	5%	33,796
Northwest	**Northeast**	6,644	99%	15	0%	6	0%	65	1%	6,730
Northeast	**Southern**	20,279	96%	557	3%	44	0%	260	1%	21,140
Northeast	**Northwest**	11,093	99%	92	1%	5	0%	46	0%	11,236
Northeast	**Northeast**	24,744	92%	353	1%	57	0%	1,882	7%	27,036
All Intra-County Trips		212,701	91%	6,515	3%	364	0%	13,292	6%	232,872

Source: US. Census 2000 – Census Transportation Planning Package- Tables 8 & 14 Calculated Shares

Central Bergen

- North-south roads – Garden State Parkway, Route 17, Route 208, Paramus Road, Passaic Street, Fairview Avenue, Forest Avenue, Maywood Avenue, and Kinderkamack Road.
- East-west roads – Route 80, Route 4, US Route 46, Ridgewood Avenue and Oradell Avenue.
- Five most congested locations are Teaneck Road in Teaneck, Selvage Avenue in Teaneck, South River Street in Hackensack, River Road and Slater Drive in Elmwood Park and Forest Avenue and Route 4 in Paramus.
- Most heavily traveled route in the County – I-95 in Teaneck (296,200 AADT) which accesses New York City via the George Washington Bridge.
- Other locations with AADT exceeding 100,000 – Route 80 in Elmwood Park, Route 4 in Paramus / Teaneck, Route 17 in Paramus, and the GSP in Paramus and Saddle Brook.

Northern Valley

- North-south roads – Route 9W, the Palisades Interstate Parkway and Knickerbocker Road (CR 505).
- East-west roads – Route 4, Palisade Avenue, Liberty Road (CR 505), Clinton Avenue, River Edge Road (Route 114); Madison Avenue, Union Avenue, Hillside Avenue, CR 110, and CR 502.
- Most congested locations on county roads – West Forest Avenue – at Engle Street and at South Dean Street in Englewood Cliffs.
- The Palisades Interstate Parkway in Alpine carries the most traffic, with 61,000 AADT.
- Routes that access the major highways serving New York City or Paramus experience congestion during peak commuting hours and depending on commercial activity experience congestion mid-day and on Saturdays as well.

Pascack Valley

- North-south roads – Garden State Parkway Pascack Road, Forest Avenue and Kinderkamack Road (CR 503).
- East-west roads – Grand Avenue, Woodcliff Avenue, Prospect Avenue and Washington Avenue.
- No major highways serve as truck routes, trucks rely on the County road system.
- Two most congested locations – Chestnut Ridge Road and County Road in Woodcliff Lake and Spring Valley Road and Paragon Drive in Montvale. There is also considerable congestion on the Garden State Parkway in Washington Township and Montvale Borough. There are moderately congested locations in Park Ridge, Washington, and Woodcliff Lake.

Northwest Bergen

- North-south roads – I-287, Route 208, Route 17 and Route 202, all of which have very high AADT and experience peak hour congestion, especially at some interchanges.
- East-west connections – Franklin Avenue (CR 502) and Wyckoff Avenue (CR 87).
- Route 17 in this region has no signalized intersections, but the extensive land uses along the highway and regional traffic demand create congested conditions.
- During peak hours county routes experience periodic congestion at key intersections: East Saddle River Road and Wearimus Road in Ho-Ho-Kus, Main Street/Wyckoff Avenue and Central Avenue in Ramsey, Franklin Avenue and Old Mill Road/ Summit Road and Franklin Avenue with Colonial Road.

Accident Locations

NJDOT 2003 accident data (the latest year available) identifies the top accident locations in Bergen County.

- Central Bergen – Contains the most locations in the Top 100 and the Top 10. Route 17 and Route 4 in Paramus, Route 4 in Teaneck and Hackensack Avenue/ River Street (Route 503) in Hackensack had the most accidents in the county. Route 17 had the most locations.
- Southeast Bergen – Twenty-four locations in the Top 100 and one in the Top 10. River Road in Edgewater (CR 505) had the most accidents. Grand Avenue (Route 93) in Palisades Park, Route 95 in Ridgefield and Route 46 in Ridgefield had the highest percent of injuries. Route 93 in Palisades Park had the highest percent of accidents involving pedestrians.
- Southwest Bergen – Route 17 in Hasbrouck Heights, Route 3 in Rutherford and Route 95W in Carlstadt had the most accidents.
- Northern Valley – One accident location in the Top 25 – Route 4 in Englewood. Route 39 (South Washington Avenue) in Bergenfield had the most pedestrian accidents in the County.
- Northwest Bergen – Three accident locations in the Top 50, with Route 17 in Ramsey as the location with the highest number of accidents.

Transit

How is the Railroad Network Used Today?

There are two active commuter lines that serve the county, the Pascack Valley Line, with thirteen stations and the Main-Bergen Line, with sixteen stations. The Main-Bergen Line has relatively frequent service throughout the morning and evening peak, with an average of four trains per-hour in the peak direction and an average of two trains per hour in the off-peak direction. Over the past seven years there have been two important developments that have improved the county's commuter rail service.

The first was the opening of the Secaucus Junction Station in 2003. This station made it possible for commuters on the Main-Bergen Line and the Pascack Valley Line to access Penn Station New York by transferring at the new station, enabling them to reach midtown Manhattan more quickly. These commuters previously had to transfer in Hoboken and use the uptown PATH branch to reach midtown.

The second was the construction of passing sidings on the Pascack Valley Line. Until recently, service on the line was infrequent and limited to only the peak-direction due to its single track configuration. Trains were stored at Hoboken during the day and turned around for the evening commute to Spring Valley. In 2007 NJ Transit completed the construction of four passing sidings, making bi-directional service possible on the line. These improvements enabled NJ Transit to add fifteen additional trains each day, including twenty-three on the weekends where there was previously no service available. Today, there are an average of three trains per peak hour and one per hour at other times.

Both lines have weekend service and run until almost 12:30 AM (last train departing New York).

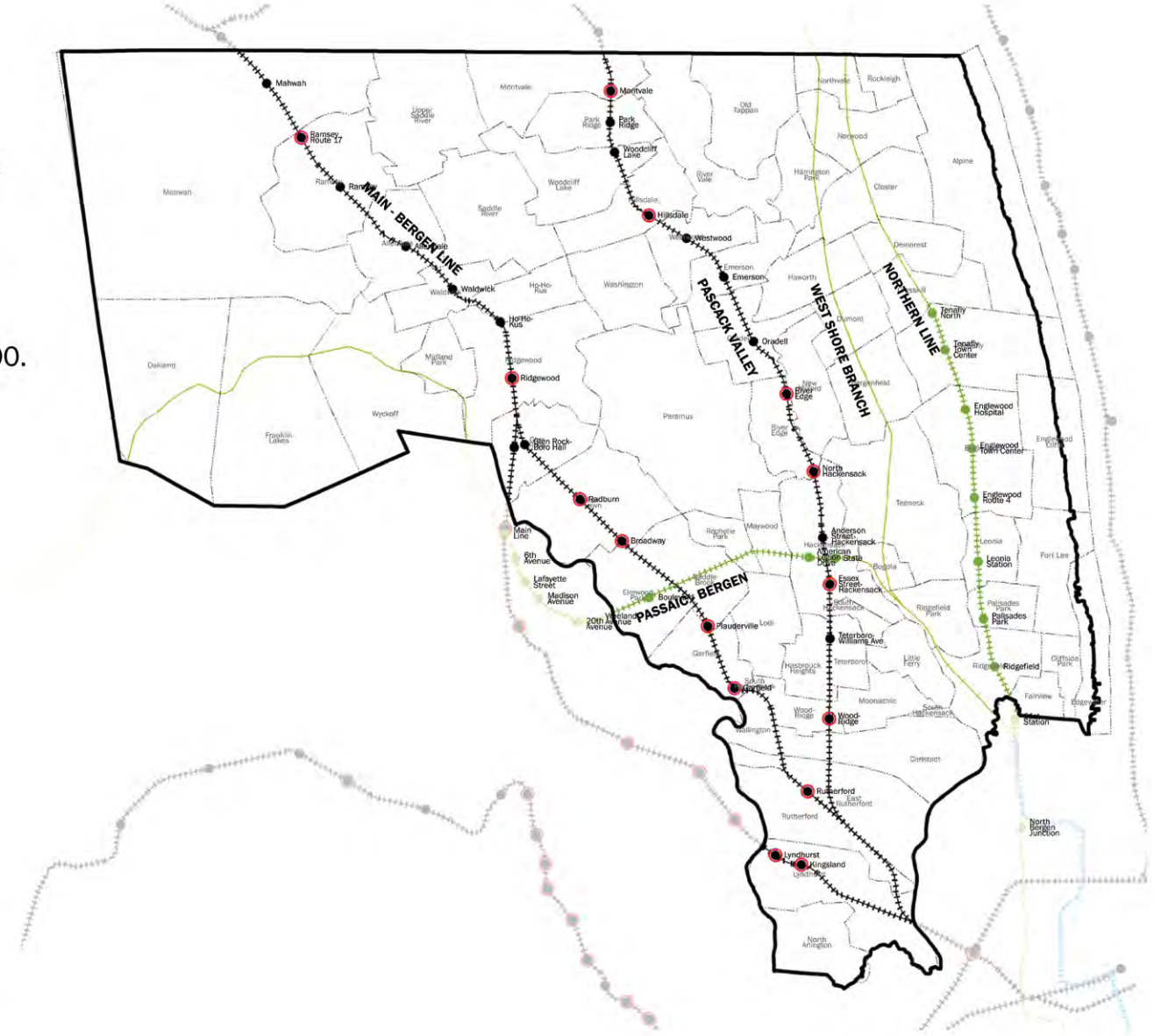
Rail

All active rail lines, including passenger, freight, and proposed services.

Stations with more than 15% growth in ridership since 2000 are highlighted.

Source: RPA, NJ Transit, US Census 2000.

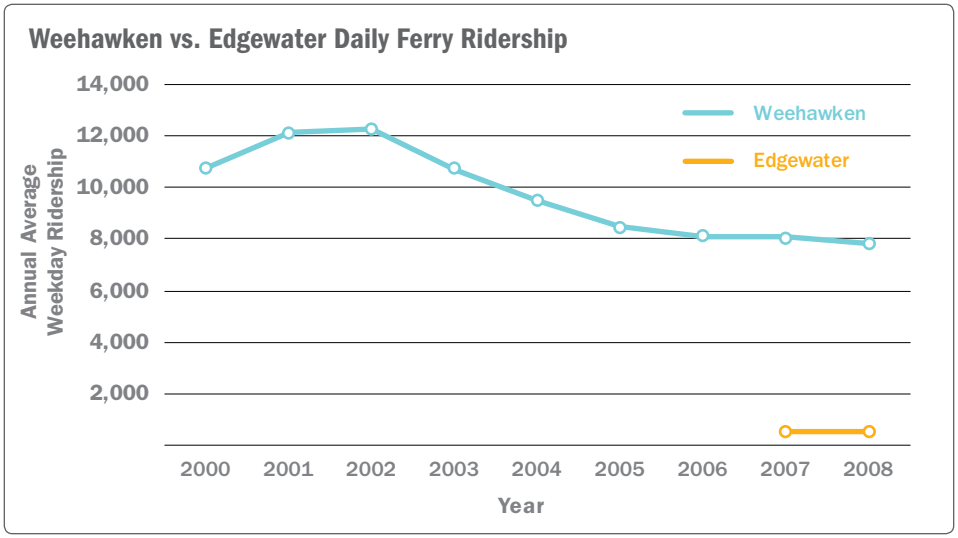
- Passenger service
- Proposed passenger service
- Light Rail
- Freight
- Ridership up more than 15%



Commuter Rail Station Parking in Bergen County

Line	Stations	Parking Spaces	Average # of Spaces per Station		Parking Utlilization (2007)
Bergen-Main Line	16	4,654	274	2,726	60%
Pascack Valley Line	11	1,878	171	1,502	80%
Total:	27	6,532			

Source: New Jersey Transit – 2007 Parking Database



Not surprisingly, ridership has increased by over 20% on the Pascack Valley Line due to these service improvements, whereas prior to this it had remained relativity the same from 1999 to 2006. Ridership on the Main-Bergen Line has grown steadily by 44%, or by an average of 4% annually. Ridership on both lines has continued to increase even during the current economic downturn.

The Main-Bergen Line still carries about three times the number of passengers as the Pascack Valley (10,238 daily boardings vs. 3,688). This difference can be explained in two ways. First, the Bergen-Main Line has long had a more robust service pattern with service throughout the day and on weekends. Second, the Pascack Valley is slow, its speed hampered by closely spaced stations. Third, the Pascack Valley Line typically has stations with less parking available, constraining the usage of its stations as the data above suggests.

A new service recently inaugurated by NJ Transit is Sunday passenger service on a spur from Secaucus Junction to the Meadowlands and Giants Stadium, offering rail service to sports fans on game days.

Are Other Rail Lines Possible?

The West Shore freight rail line also runs through Bergen County. Restoring passenger service on the West Shore line has been discussed in the past. The issue is primarily one of heavy freight movements. The line is currently owned by CSX and is considered a critical link for freight service between the port facilities in NJ and points north. The freight railroad interests have as yet been unwilling to share the track for passenger service, which would require either separate and expensive rights of way to be obtained or temporal separation with freight running during the night and passenger service during the day along with major infrastructure to be built.

Light Rail in Bergen County

The Hudson Bergen Light Rail terminates at Tonnelle Avenue, approximately 2 miles south of the Bergen County line. NJ Transit plans to extend the light-rail to Tenafly along the Northern Branch railroad, a lightly used freight corridor with no current outlet to the north. This is designed to be a frequent service that will connect with both the NY Waterway ferry and PATH train to New York City and provide access to job centers along the "Gold Coast" in Hoboken and Jersey City.

River Road Multi-Modal Corridor

The county's one existing ferry landing is located in the municipality of Edgewater off County Route 505/River Road. New York Waterway runs a single service to Pier 79 on West 39th Street in Manhattan and provides a free transfer to crosstown buses. Traffic along the seven mile stretch of River Road has increased during the last twenty years, with industrial facilities being redeveloped for residential use. Little consideration has been given to transit access on River Road leading to the auto-centric nature of these developments and resulting in congestion. This congestion, along with limited east/west access along the Palisades and the lack of robust transit connections are major factors contributing to the low ridership numbers for the Edgewater Ferry (see table). By comparison, the Weehawken ferry in Hudson County has connections to the Hudson Bergen Light Rail (HBLR) and numerous bus routes, and twelve times the ridership of Edgewater.

To increase ferry ridership at Edgewater and improve intra/inter-county mobility on River Road transit solutions like Bus Rapid Transit, extension of the HBLR and others should be considered.

Bus Service

There are fifty-one NJ Transit1 bus routes in Bergen County, the majority of which serve the residents of the southern region. Interstate bus ridership from Bergen County to New York increased by almost 23% between 2007 and 2008. In contrast, local bus ridership dropped by 2% during the same period and has been decreasing since 2004.

The concentration of service in the south is closely linked to the higher population density and lower levels of auto ownership in that area, which in turn generates sufficient demand to support a greater level of transit service. The northern and western sections of the county have higher levels of auto ownership and lower population densities. Not surprisingly the 2008 American Community Survey indicates that 58% of all households in Bergen County have 2 or more cars available, while 35% have one car and 8% have no motor vehicles.

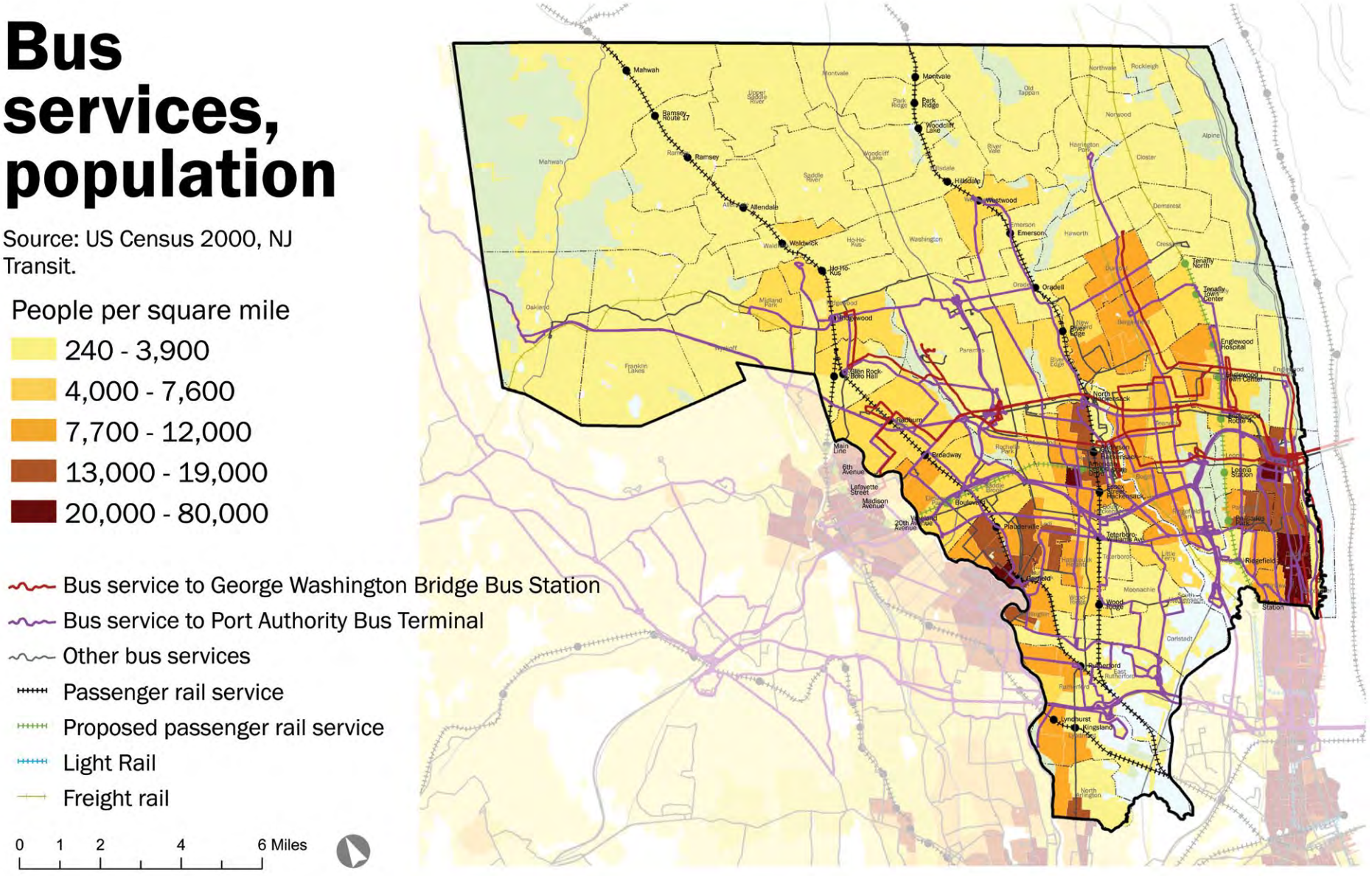
The final stop for 80% of the Bergen County NJ Transit buses will be one of the two bus facilities in New York City.

Fourty-one NJ Transit routes in Bergen County are linked to Manhattan at either the Port Authority Bus Terminal (PABT) at 41st Street and Eighth Avenue or to the George Washington Bridge Bus Station (GWBBS) in Washington Heights on upper Manhattan.

1 Most of the trans-Hudson service is directly operated by NJT; conversely much of the local bus service has been contracted out by NJT. These private operators run NJT branded buses and collect the same uniform fares; however, NJT does not collect detailed ridership data for these routes.

Bus services, population

Source: US Census 2000, NJ Transit.



Private bus carriers do cover the areas of the county that are currently not served by New Jersey Transit, predominantly in the northern and western portion of the county. The major private carrier is Coach USA, which includes the subsidiaries Red & Tan and Rockland Coaches.

Private commuter bus service to New York City works better for those residing in the western part of the northeastern region, further out from the City, than those commuting from municipalities closer to the Hudson River. This can be explained by the lack of limited-access roadways in the eastern part of the region preventing buses from Alpine, for example, from quickly accessing the major crossings to the City, whereas buses originating in Montvale can use the Garden State Parkway or Interstate 80. Buses are not permitted on the Palisades Interstate Parkway.

Local Bus Service

Local buses, for the most part, serve residents who do not own cars or prefer not to drive and are reliant on them for mobility. To attract "choice" riders who have a car available to them buses must be able to compete from a travel time perspective. This is difficult because, as long as buses have to share the same roads with other traffic and face the same congestion delays, they will have trouble competing. Even worse, buses are slowed because they must stop to drop off and receive passengers, making travel times by bus less competitive.

There are many ways to speed up buses. In recent years, many of these methods have been put in place nationally under the rubric of Bus Rapid Transit or "BRT". Methods to speed buses include the provision of a separate right-of-way to allow buses to avoid congestion traffic. Other means include the provision of preferential treatment at intersections, institution of off-vehicle fare collection to speed up loading, and bus fleets with low floors to reduce the effort and time for boarding and alighting, and marketing of BRT service branding it as "premium" transit.

The most difficult of these BRT actions is the provision of separate rights-of-way, since it requires the use of existing rights-of-way currently used by mixed traffic lanes or for parking lanes in more urban settings. This can take away capacity from the majority who remain in private cars or from parking capacity. To justify a BRT right-of-way requires enough bus volumes so that the benefits to the transit rider outweigh the loss to those in other vehicles. This might be accomplished even with insufficient bus volumes if the lane is also used as a high occupancy vehicle lane (HOV) permitting private vehicles with either two or more or three or more occupants. Should separate rights-of-way not be available it is still possible to institute other BRT features, such as low-floor buses and off-vehicle fare collection.

Informal Transit Services

Informal transit in Bergen County has accelerated over the past two decades due to an increase in immigrant populations. These services are more accessible to immigrants because they are able to transcend the language barrier, are more affordable and serve many areas that are not covered by the NJ Transit network. Not much is known about how these services operate within Bergen County, with most of them concentrated in the southern section of the county, connecting to Hudson and Passaic counties – and especially evident in the Route 4 corridor between Paterson, Paramus and New York City. Hudson County has recently shed some light on these operations as part of a study they undertook in 20072. The study recommended regulating these services to ensure safe operations and to rationalize the routes to reduce congestion and better serve residents.

Transit Oriented Development

Transit Oriented Developments or TODs cluster development around transit to support more frequent service and reduce discretionary auto trips by fostering walkable communities and mixed-used development. For a successful TOD there must be local community interest, the surrounding environment should be walkable and there needs to be the potential for more development around the station.

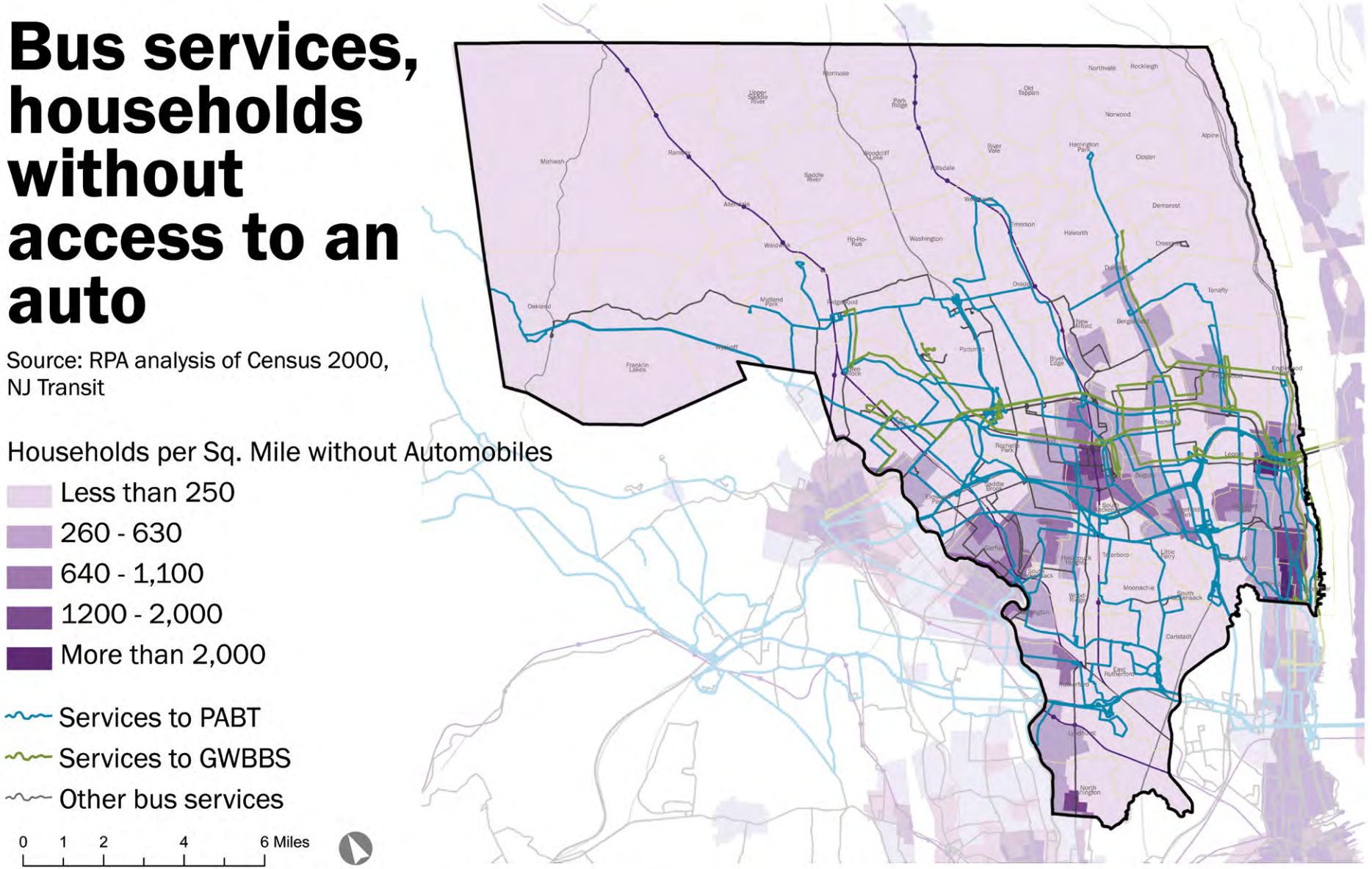
The southern and northwestern regions are served well by transit, with a number of existing traditional neighborhoods that are transit oriented. There are opportunities to further enhance the existing transit oriented communities and other transit assets in this region that might be potential candidates for transit oriented developments (TOD).

Some stations may have limited TOD development potential while others may have the ingredients required for successful TODs. Not surprisingly, the municipalities of Ridgewood and Radburn have the greatest number of residents within walking distance of their rail stations. However, preliminary analysis suggests that Glenrock, Walkwick, Ho-Ho-Kus, Ramsey Main Street and many of the proposed Northern Branch HBLRT stations are strong candidates for TODs. The municipalities, County, and NJ Transit should work together, considering these possibilities to make the rail system a more integral part of the community.

2 A Hudson County Division of Planning report prepared by Urbitran Associates Inc. Hudson County Bus Circulation and Infrastructure Study, November 2007, Chapters, 5 & 6.

Bus services, households without access to an auto

Source: RPA analysis of Census 2000, NJ Transit



Transit improvements

Proposed transit service improvements, including:

Access to the Region's Core

Northern Branch

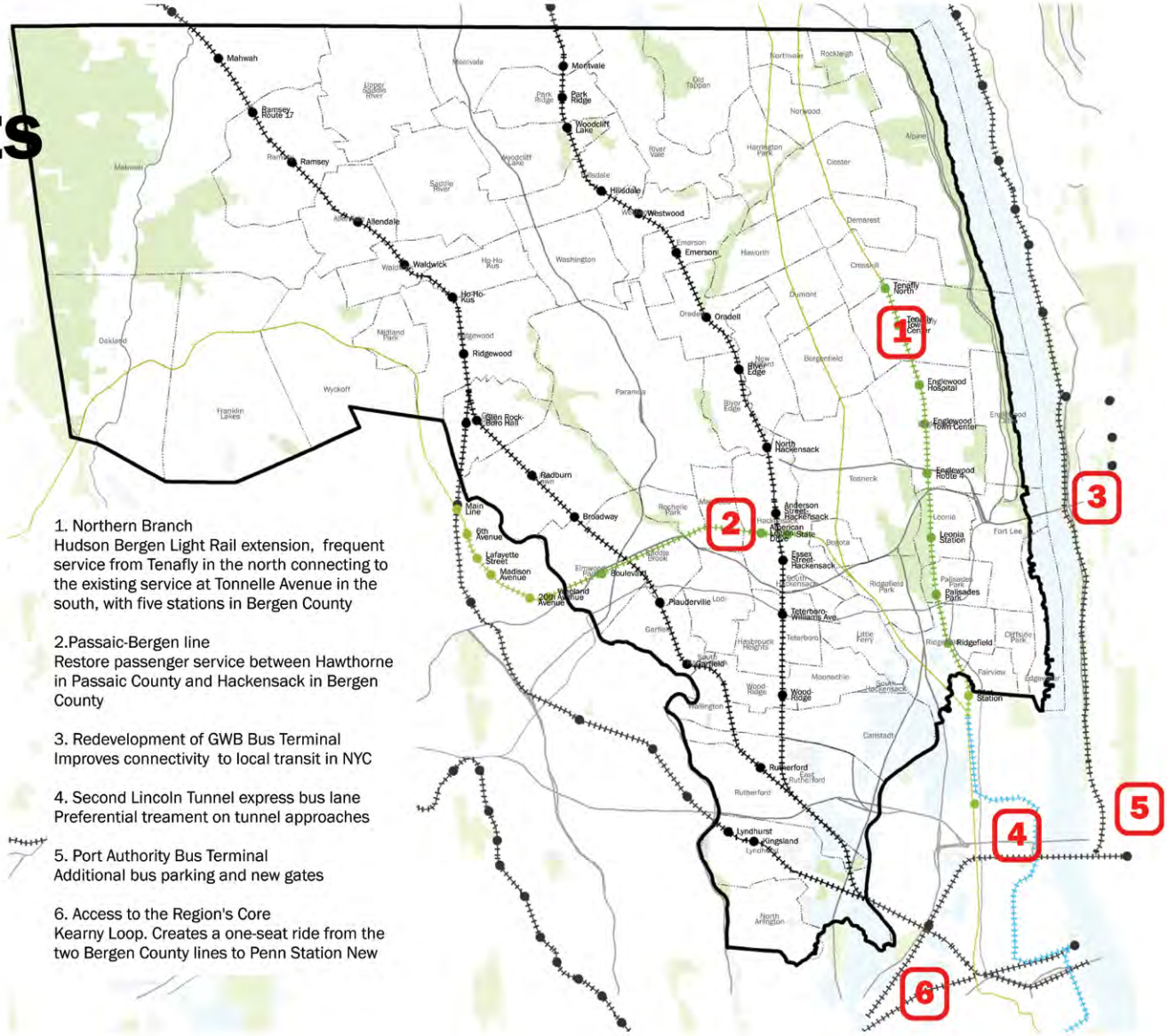
Passaic-Bergen Line

Redevelopment of the GWB bus station

Lincoln Tunnel express bus lane

Port Authority Bus Terminal improvements

Source: RPA.



Future Transit Improvements

- The planned "Access to the Region's Core" ("ARC Tunnel") project (with increased tunnel and platform capacity to Manhattan along with the "Kearny Loop" direct-connect to the Bergen County rail lines) will provide a one-seat ride from the two Bergen County lines to Penn Station New York. Based on a multiple regression analysis of increased residential real estate values caused by previous system improvements in the NJTransit rail network, RPA estimates that the residential property tax base of rail station towns within 75 minutes of New York Penn Station – which includes all Bergen County Communities – will increase in a very substantial way.
- The extension under consideration of the Hudson Bergen Light Rail line to the Northern Branch will create eight stations in Bergen County – Ridgefield, Palisades Park, Leonia, Englewood-Route 4, Englewood-Palisade Avenue, Englewood Hospital, Tenafly and Tenafly North – and offer frequent service from Tenafly in the north connecting to the existing service at Tonnelle Avenue in the south.
- The Passaic-Bergen Line will restore passenger rail service between Paterson and Bergen County. It remains to be seen whether this new line will significantly improve transit service to residents of Bergen County.
- The proposed expansion of the Port Authority Bus Terminal in Midtown would create additional bus parking and new gates.
- A proposed second Lincoln Tunnel Express Bus lane would provide preferential treatment on approaches to the Lincoln Tunnel to reduce bus travel times to the PABT.
- The proposed redevelopment of the George Washington Bridge Bus Terminal could improve connectivity to local transit in NYC.
- On-going studies are evaluating the potential for new trans-Hudson ferry services.
- On-going studies are evaluating the potential of Bus Rapid Transit to serve various high-intensity corridors and activity centers throughout Bergen County, and linking these with regional transit and rail lines.
- NJ Transit is the lead agency for the "Northeast New Jersey Metro Mobility Study" which is studying how to better coordinate and enhance bus service in Bergen and Passaic Counties, as well as looking at interstate bus services passing through Bergen County from Orange and Rockland Counties to the north.

Land Use

Bergen County has a wide variety of land uses which are combined in different ways across the county. Significant industrial and warehousing uses are found primarily in the southern part of the county, which also has considerably more compact, mixed-use environments. The more recently developed northern part of the county has lower density residential, stand alone retail centers and single use corporate office parks.

This notwithstanding, there are compact, traditional mixed-use downtowns surrounded by residential neighborhoods everywhere in the county, often but not always associated with an existing stop on one of the county's rail lines. While many of these downtowns have suffered from the competition presented by stand alone suburban shopping centers – and are consequently underperforming in terms both of retail sales and as centers of their communities – this existing network of places provides a framework that, if reinforced in appropriate ways, can help revitalize downtowns and better anchor the more dispersed, lower density parts of the county.

The twelve municipalities in the Southwestern part of the county – wedged between the Hackensack River to the east and the Passaic River to the west – are characterized by relatively high population densities, a still significant industrial base and the Meadowlands. Industrial uses occupy a significant amount of land in the northeastern section of this area. The majority of existing residential land is situated west of the Pascack Valley rail line and Route 17. There are residential clusters in Little Ferry, Moonachie and South Hackensack. Commercial uses are scattered throughout, and are also centered along the Route 3 and 17 corridors. Large tracts of public and therefore tax exempt land are owned by the New Jersey Meadowlands Commission and Teterboro Airport.

The eight municipalities in the Southeastern part of the county have an even higher density land use pattern. The Palisades run north-south along the banks of the Hudson River and the top of the Palisades are intensely developed. Fort Lee, Edgewater and Cliffside Park, located directly across from New York City, have substantial high rise residential uses near the Hudson River. There is a residential concentration east of the Northern Branch rail line and commercial corridors along Bergen Boulevard (County Route 501 and NJ Route 63), Anderson Avenue (CR 135) and Lemoine Avenue (NJ Route 67). Industrial and public land lies between the Northern Branch rail line and Route 95. A large residential cluster exists west of Route 95 in the Village of Ridgefield Park.

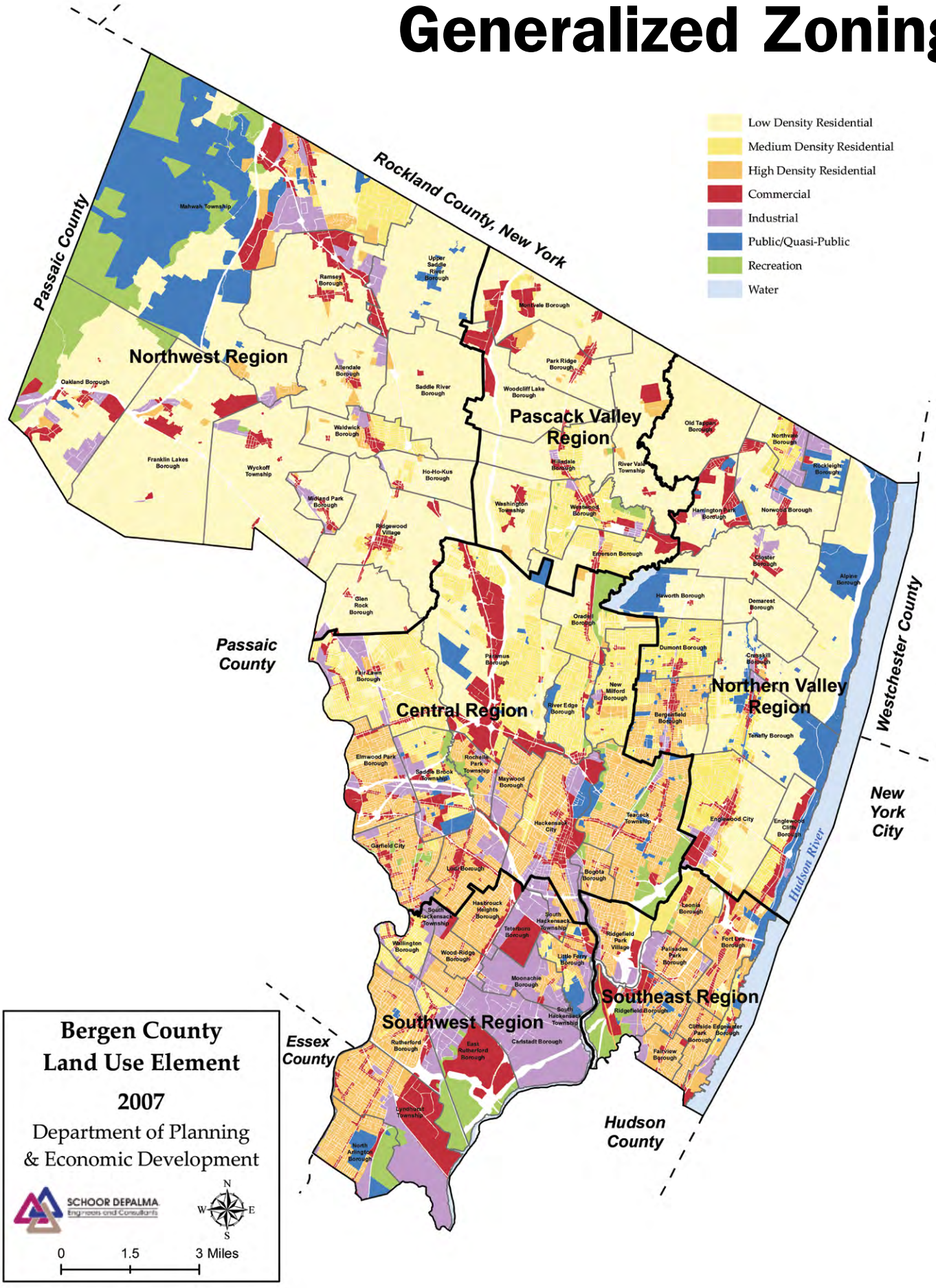
The fourteen municipalities in the Central part of the county are characterized by older suburban land use patterns that include "garden apartment" style residential development and single-family homes on smaller lots. Radburn in Fair Lawn is one of the "Garden Cities" prototypical of early 20th century planning. Paramus is the regional shopping hub of Bergen County with several million square feet of commercial space. Hackensack is the County seat. Large nodes of commercial uses are located along the Route 4 and 17 corridors. Public land and exempt properties are situated along the Saddle River and Hackensack River.

The fifteen municipalities of the Northern Valley are characterized by a suburban land use pattern that includes residential development on larger lots and lower than average population densities. The area is mostly residential. The Palisades Interstate Park runs north-south along the Hudson River. Englewood's central business district represents a large mixed-use node in the Northern Valley. Other Northern Valley communities with smaller downtowns include Closter, Tenafly, Northvale, Bergenfield and Dumont.

The eight municipalities in the Pascack Valley Region are characterized by a suburban land use pattern with residential development on larger lots and lower than average population densities. This area is mostly residential, although commercial clusters exist in Montvale, Hillsdale, Westwood, along Kinderkamack Road and along Chestnut Ridge Road (County Route 73) in the vicinity of the Garden State Parkway and also along Summit Avenue (CR 104).

Finally, the thirteen municipalities in the Northwestern part of the county are also characterized by a suburban land use pattern that includes residential development on larger lots and lower than average population densities. There are large areas of open space in Oakland and Mahwah. The area is mostly residential although significant commercial nodes exist along Route 17.

Generalized Zoning



The northwestern portion of Oakland and Mahwah are in the Highlands Preservation Area. The remainder of Oakland and Mahwah are in the Highlands Planning Area.

Redevelopment

Because Bergen is a mature county in terms of its development pattern, future growth will primarily occur through redevelopment and infill. This trend is already occurring in the Southeastern part of the county, in former industrial properties fronting on the Hudson River which have been redeveloped into luxury condominiums, retail and service oriented developments. This trend is not limited to the high value Hudson waterfront. It can be found throughout the county including in its more suburban environments. Of particular interest is the redevelopment potential of vacant or underutilized lands in communities that will benefit from new or enhanced transit service, such as the communities that will benefit from reactivation of passenger service on the Northern Branch Rail Line, on the future Bergen-Passaic line and along potential Bus Rapid Transit corridors.

Redevelopment also provides opportunities to create new public spaces and green areas in places that have none – an increasingly important indicator of quality of life – as well as to reduce impervious coverage and put in place more effective, naturalized mechanisms for reducing storm water run-off, increasing storm water retention and infiltration and improving water quality. Redevelopment on a large scale using green guidelines has the potential over time to significantly ameliorate many of the county's storm water run-off and water quality issues.

Redevelopment can occur spontaneously and be privately driven, or it can take place as a result of a public initiative, usually under the jurisdiction of a local redevelopment agency. There is no comprehensive source on the number of active or dormant redevelopment agencies in Bergen County. A partial list is available from the NJ Office of Smart Growth, which indicates active redevelopment agencies in the following towns: Edgewater, Englewood, Fort Lee, Garfield, Hackensack, Lodi, Ridgefield, Ridgefield Park, Ridgewood, River Edge and Wallington.

Land Use and Traffic

A significant feature of the existing land use pattern in Bergen County is that large amounts of commercial space – generating high volumes of traffic – are located along a limited number of corridors.

There are also many downtowns in Bergen County, both in the southern part of the county in Hackensack, Garfield, Englewood, as well as further north, Westwood, Ridgewood, Allendale, Ramsey, Hillsdale, Mahwah, Teaneck, Closter, Northvale and Bergenfield. These downtowns of various sizes – with commercial uses clustered in walking environments and mixed with a variety of other uses, including housing, generally perform better in terms of traffic. Those parts of the county where commercial uses are strung along miles of arterial roads – including corridors leading into downtowns – are more auto-dependent and contribute to the significant traffic congestion experienced on all the major arterials. This pattern is also behind the intense competition between local downtowns and main streets and highway commercial and regional malls.

Community Character

The diverse and densely-developed land use pattern in Bergen County presents special concerns for the preservation of community character and existing neighborhoods. Many residential neighborhoods abut or are located in proximity to industrial areas, major commercial centers, high traffic corridors and major community facilities, particularly in those areas (Southwest, Southeast and Central) of the county that have the highest densities and the most diverse range of land uses. This trend is likely to grow in the future as the premium for developable land increases and pressures for redevelopment and infill continue. Careful planning and sensitive design guidelines for redevelopment and infill can help address these concerns.

Low Density Single-Family Bias

One significant concern with the existing zoning is that the most prevalent zoning category in the County is Low-Density Residential. This produces a pattern of land development that does not support most forms of transit and is therefore largely auto-dependent, is expensive and generally out of reach for people with lower or fixed incomes, and is poorly suited to the changing demographics of single and two-person households. The only part of the county where Low-Density Residential does not exist is in the Southwest. The bulk of land in the Northern Valley, Pascack Valley and Northwest is zoned Low-Density Residential, together comprising a significant amount of the total land area for the County. The Central area also includes Low-Density Residential zones, mainly in Paramus and Oradell; in the Southeast they can be found in Leonia and Fort Lee. While a certain amount of land dedicated to this use is desirable, over zoning for low density residential does not lead to a sustainable land use pattern and is a fiscal disaster at the local level.

Brownfields

According to the US Environmental Protection Agency, Bergen County has seven Superfund sites on the National Priorities List. The site thought to have the worst contamination is the Scientific Chemical Processing site in Carlstadt. Other

Superfund sites in Bergen County include Universal Oil Products in East Rutherford, the 40-acre Ventron/Velsicol site in Wood-Ridge, the Maywood Chemical Company, located in Maywood, Lodi, and Rochelle Park, the 15-acre Quanta Resources site in Edgewater, the Fair Lawn Well Field; and the Curcio Scrap Metal site in Saddle Brook.

According to the NJDEP Site Remediation Program, there are currently over 2,000 "active" known contaminated sites in the county, and another 117 sites "pending".

Housing

Type of Housing

The majority of the housing stock in Bergen County (55%) takes the form of single-family detached housing, with attached and multi-family housing accounting for the rest of the stock. This contrasts with the surrounding New Jersey counties, where the majority of the housing stock is attached or multi-family housing, with Hudson County topping the list at 90%.

Much of the county's stock of attached and multi-family housing (72% and 57%, respectively) is concentrated in the southern part of the county.

In the Northern Valley, Pascack Valley, Central and Northwest areas over 60% of the housing stock is single-family detached. The balance between single-family detached and other housing types was more evenly split in the Southwest and Southeast. More housing in the Southeast was multi-family.

Median Age of Housing Stock

In 2000, the median year of housing construction countywide was 1955. The housing stock in the northern tier of municipalities is even more recent. Bergen has a younger housing stock than the surrounding New Jersey counties, where the median was 1948 in Hudson County, 1951 in Essex County and 1954 in Passaic County. The statewide median year was 1962.

New Construction

From January 2000 to December 2003, municipalities in Bergen County issued almost 8,000 building permits for residential construction, including over 2,500 building permits in the Southeast, over 1,500 permits in the Central and Northwest areas, and over 1,000 permits in the Northern Valley. Less than 1,000 permits were issued in the Southwest and Pascack Valley. In 2004, another 2,164 permits were issued, with 2,972 in 2005 and 2,142 in 2006. Generally, 40% to 50% were for single-family detached units, about 10% for two-family units and 35% to 40% were for multifamily units. Construction permit activity has dropped significantly in the last two years as a result of the poor economic conditions and collapse of the capital markets.

The scarcity of vacant, developable land in "greenfields" locations means that future housing construction in the County will take place largely through redevelopment of previously developed sites – whether brownfields or greyfields – usually occupied by commercial or industrial uses. Redevelopment is generally more expensive and often only feasible at higher densities.

Two major concerns resulting from modest housing production are the challenge to provide adequate housing stock for the special population segments that are growing in Bergen County – including seniors, students and new immigrants – and maintaining overall housing affordability.

Demolitions

New housing construction is off-set by residential demolitions. From 2000 to 2007, there were over 4,900 residential demolitions countywide, for an average of over 600 per year. Over 95% of demolitions were for single and two-family units. Communities with high demolition rates include Palisades Park, Cliffside Park and Leonia.

Households and Families

Between 1990 and 2000, the total number of households increased by 7% in the County, and by 10% statewide. Every region of the County increased in the total number of households. The Northwest Region posted the greatest increase (20%) in the total number of households, with the Southeast Region following a close second at 11%. The Central and Northern Valley Regions both reported the smallest increases (less than five percent) in total households.

Average household size in the County remained constant from 1990 to 2000 at 2.64 persons per household, slightly lower than the State-wide average of 2.68. Average household size is lower in the southern part of the county and higher in the north.

The number of family households increased throughout the county, ranging from a 1.7% increase in the Central area to 9.6% in the Southeast. Family household growth between 1990 and 2000 was 4.4% countywide and 6.6% statewide.

In 2000, the average family size in Bergen County was 3.17, slightly under the State average of 3.21. Every area, except the Pascack Valley and the Northwest, increased in median family size.

Housing Prices

Median housing values in Bergen County increased 11%, from $226,000 to $250,300, between 1990 and 2000. Statewide, the median housing value of $170,800 was $79,500 lower than the County's median value, although it also increased 6% percent from 1990 to 2000.

Tenure

With 65% of housing units owner-occupied, Bergen has a home-ownership rate higher than the statewide average of 61%. But there are wide disparities within the county in the distribution of rental and owner-occupied units. In the southeast, there are as many rentals as owner-occupied units, and in the southwest there are 1.3 owner-occupied units for every rental. But in the northwest there are seven owner-occupied units for every rental and 5.5 in the Pascack Valley.

The number of owner-occupied units in Bergen County increased marginally (1%) between 1990 and 2000, just slightly under the Statewide average of two percent. Homeownership increased everywhere in the County except for the Central Region, where it decreased by one percent.

The County also marginally increased its stock of renter-occupied units, by 1.4%. Statewide, the number of renter-occupied units decreased by 0.1%. In the Pascack Valley and Northwest the number of renter-occupied units also decreased. Elsewhere in the County the number of rentals increased, in particular in the Southwest where they increased four percent.

Contract Rents

In 2000, median contract rent in Bergen County was $805, a 17% increase from 1990. The median contract rent Statewide increased by 14% from $592 in 1990 to $672 in 2000. Each region followed the County and Statewide trend and increased in median contract rent by 16% or more. The median contract rent increased the most in the Northern Valley, from $886 to $1,237, and the least in the Pascack Valley (16%).

Residential Conversions

One area of concern is the legal and/or illegal conversion of housing from single-family to multi-family. A review of the existing land use maps for each Region reveals significant amounts of land currently being used for single family residential and only clusters in certain areas – including the Southeast, Southwest and Central Regions – shown as being used for multi-family residential. Conversions are not reflected on the existing land use maps. Given the density levels in the County, particularly in the southern Regions, a significant amount of legal and/or illegal conversions may exist in the areas currently depicted on the existing land use maps as single-family residential.

State Affordable Housing Requirements

The State of New Jersey, through the Council on Affordable Housing (COAH), determines municipal affordable housing obligations. The so-called COAH "3rd Round" rules adopted in 2008 allocated a total obligation to Bergen County communities of almost 20,000 affordable units – 8,297 new affordable units resulting from a share of anticipated growth, 3,483 units in need of rehabilitation and 8,017 units carried over as unmet need from the prior round obligation.

Regardless of what one may think of the State's calculations and of the rules COAH has adopted for satisfying these, the affordable housing obligations indicate a need for affordable housing which is hard to contest. Major employers generally confirm the importance and need to increase the supply of workforce housing, which transportation advocates would like to see occur in close proximity to major employment centers. The challenge then is to find solutions that do not exacerbate already difficult fiscal conditions at the municipal level, that do not further strain an already stressed circulation system and that are environmentally benign.

Sewer & Water Infrastructure

Sewer

Most of Bergen County has public sewers and is located within a sewer service area. Wastewater treatment in Bergen County is provided primarily by three utility authorities – the Bergen County Utilities Authority (BCUA), the Northwest Bergen County Utilities Authority (NBCUA), and the Passaic Valley Sewerage Commissioners (PVSC).

- The BCUA covers the majority of the County, including the entirety of the Pascack Valley and Northern Valley Regions, and portions of the Central, Southeast and Southwest Regions excluding Edgewater. In 2004, the BCUA served a population of almost 539,000 people in 51 municipalities. The flow through BCUA's facilities averaged 85.19 Million Gallons Per Day (MGD). The maximum month design plant capacity is 109 MGD. The sewage is conveyed to the secondary treatment plant, located in Little Ferry, by a 108-mile system of gravity and pressure sewer lines and pumping stations. The treatment plant discharges into the Hackensack River.
- The NBCUA covers the Northwest Region excluding Oakland. Allendale, Ho-Ho-Kus, Midland Park, Ramsey, and Waldwick are considered completely sewered. Saddle River, Upper Saddle River, Franklin Lakes and Ridgewood are partially covered by the NBCUA sewer service area. Saddle River and Upper Saddle River do not have a significant length of sewers. In 2004, the NBCUA served a residential population of approximately 75,000 in eleven municipalities. The NBCUA operates a secondary treatment plant in Waldwick, and discharges into the Ho-Ho-Kus Brook. Average daily plant flow is around 11 MGD. The capacity of the treatment plant is rated at 16.8 MGD on a monthly basis.
- The PVSC generally covers the western portion of the Central Region and the southern portion of the Southwestern area and serves nine municipalities in Bergen County: Glen Rock, Fair Lawn, Elmwood Park, Saddle Brook, Garfield, Lodi, Wallington, Lyndhurst and North Arlington. Rutherford and East Rutherford are partial contributors. The secondary treatment facility is located in Newark. The average capacity of the secondary treatment plant is 330 MGD with peak dry weather flows of 400 MGD, and peak wet weather flows of 550 MGD. The average wastewater flow is 278 MGD and permitted to discharge 330 MGD into the New York Harbor. The PVSC does not treat wastewater generated in the BCUA sewer service area.

Areas not covered by these utility authorities are Oakland and Edgewater which have individual sewer service. A small section of Ridgewood is included in the NBCUA's water quality management plan (WMP), with the rest included in the PVSC's WMP. Similarly, a small section of Washington Township is in the NBCUA's WMP, and the rest served in the BCUA's WMP. There are also hundreds of regulated individual dischargers, mostly industrial and commercial. In response to NJDEP's new water quality management planning rules, the utility authorities in Bergen County, like all other utility authorities around the state, updated their plans in 2009.

In addition to the three major providers, the local providers that serve individual municipalities or smaller areas are as follows:

- The Oakland Municipal Authority owns and operates its own sewer service.
- Edgewater owns and operates a treatment plant.
- The Orangetown Sewage Treatment Plant, located in Orangetown, Rockland County, New York serves portions of Rockleigh. The permitted capacity is 12.75 MGD which are discharged into the Hudson River.
- The Ridgewood Water Pollution Control Plant located in Glen Rock serves the Village of Ridgewood and portions of Glen Rock, Ho-Ho-Kus, Midland Park, and Washington Township. The plant has a system capacity of 3.0 MGD and discharges into the Ho-Ho-Kus Brook.

Edgewater has a combined sewer system (CSS) where sanitary and storm water flow through the same system. A sewer separation project is underway. Portions of Cliffside Park, Fort Lee, Hackensack and Ridgefield Park are also served by CSS. Inflow and infiltration is considered a major problem in many of the older systems, where it is estimated to contribute up to 40% of wastewater flow.

Water

There are a number of both large and small water purveyors in Bergen County.

United Water New Jersey is the largest purveyor, providing water to the majority of Bergen County, with the exception of Allendale, Elmwood Park, Garfield, Ridgewood, Glen Rock, Midland Park, Wyckoff, Ho-Ho-Kus, Lyndhurst, Mahwah, North Arlington, Oakland, Park Ridge, Ramsey, Saddle River and Waldwick. United Water serves a resident population of 750,000. In 2003, 38 billion gallons of water was delivered. The average system capacity is 300 MGD. In 2003, the average daily demand was 104-105 MGD, and the peak daily demand was 166-168 MGD. United Water also sells water to Fair Lawn, Lodi, Wallington, Woodcliff Lake and Saddle Brook.

The Passaic Valley Water Commission (PVWC) serves approximately 750,000 customers, and distributes 83 MGD of water. The primary source of water supply is the Pompton and Passaic Rivers. The main treatment facility is located in Totowa, in Passaic County. The PVWC partially serves Lodi and North Arlington.

There are also a number of smaller municipal water departments:

- Allendale Water and Sewer Department serves 6,700 people and has five active wells.
- Elmwood Park Water Department serves close to 19,000 people with purchased surface water.
- Fair Lawn Water Department serves 32,000 people, operates sixteen production wells which draw water from the New Brunswick Aquifer, and treats it at a treatment facility. The wells provide 55% of the Borough's water. The Borough purchases treated water in bulk from the PVWC and United Water to augment its groundwater supply.
- Garfield Water Department serves close to 30,000 people, primarily from groundwater.
- Ho-Ho-Kus Water Department serves over 4,000 people from groundwater.
- Lyndhurst Water Department serves 19,800 people with purchased surface water.
- Mahwah Water Department serves 40,000 people from surface water.
- Oakland Water Department serves 12,000 people from groundwater.

- Park Ridge Water Department serves 4,700 customers of Park Ridge and Woodcliff Lake and operates 19 wells located throughout the two towns.
- Ramsey Water Department serves 18,500 people with five deep groundwater wells.

Public Services

Hospitals and Medical Centers

Bergen Regional Medical Center is located on a 65-acre campus in Paramus and it is the largest hospital in the state with 1,070 beds.

Hackensack University Medical Center is a 775-bed teaching and research hospital and the largest provider of inpatient and outpatient services in the state of New Jersey. It has more than 1,400 physicians and dentists and a volunteer population of more than 1,600.

Holy Name Hospital, in Teaneck is a 361-bed acute care medical center.

Kessler Institute for Rehabilitation, in Saddle Brook is a 112-bed, four-story hospital campus.

Select Specialty Hospital-Northeast New Jersey in Rochelle Park is the first free-standing Long Term Acute Care Hospital in New Jersey.

Englewood Hospital and Medical Center – the largest voluntary acute care hospital in Bergen County and the third largest in New Jersey with 547 beds, a nursing staff of 800 and a medical staff of 380. A 400-seat auditorium is an important location for medical and educational conferences.

Valley Hospital in Ridgewood – an acute care 451 bed hospital and the second busiest hospital in New Jersey in terms of admissions.

Level of service for hospitals is often measured in terms of "hospital beds per 1,000 persons," an indicator of hospital capacity frequently used in international and intra-national comparisons. However, as a result of significant changes in health care technology this indicator has been declining considerably in the last 10 years, and is now considered of limited value. According to the final report of the NJ Commission on Rationalizing Health Care Resources (2008), the Hackensack-Ridgewood-Paterson market area had one of the highest surplus of hospital beds in the state and the highest proportion of hospitals below the statewide average financial viability score. The commission predicts at least one hospital will close by 2015.

Public and Private High Schools

There are eighty school districts in Bergen County with 279 public schools or programs and a 2008-2009 enrollment of almost 135,000 students, according to the NJ Department of Education. Enrollments in individual school districts vary from 144 in Alpine to 5,659 in Ridgewood. There are also 139 private schools in the county. The county is home to 45 public high schools and twenty-three private high schools. There are seven regional school districts: Carlstadt-

East Rutherford (HS), Northern Highlands, Northern Valley, Pascack Valley (HS), River Dell (HS) and Westwood.

Institutions of Higher Education

The county is also home to the following institutions of higher education:

- Felician College is a private Roman Catholic college with two campuses located in Lodi and Rutherford. It has 500 full-time and 500 part-time undergraduates. The Rutherford campus is home to the historic Iviswold Castle.
- Touro University is a medical school recently located on Route 17 in Hasbrouck Heights.
- Bergen Community College is a two-year college in Paramus with 15,000 students enrolled in Associate's degree programs and another 10,000 students in non-credit, professional development courses.
- Berkeley College is a private, for-profit college specializing in business with seven locations in New York and New Jersey including Paramus. The college offers Associate's and Bachelor's degrees.
- Fairleigh Dickinson University is the largest private university in New Jersey with a largely commuter campus in Teaneck and Hackensack, a second campus in Madison and Florham Park, and 5,400 undergraduate and 2,500 graduate students.
- Ramapo College in Mahwah is a public liberal arts and professional studies institution on a 300-acre campus in Mahwah offering four-year liberal arts, sciences, and professional studies to 5,700 students. The campus includes the Angelica and Russ Berrie Center for Performing and Visual Arts and a 2,200-seat arena.

Libraries

All 62 of Bergen County's public libraries are members of the Bergen County Cooperative Library System (BCCLS), along with 13 libraries from Essex, Hudson, and Passaic counties. The BCCLS was formed in 1979 to foster resource sharing among Bergen County public libraries. A patron's hometown library card is honored at all participating libraries. The BCCLS also participates in an Open Borrowing program with participating libraries in Middlesex, Morris, Passaic, Sussex and Warren counties. Patrons have the opportunity to access more than ten million books, DVDs and CDs by in-person borrowing from over 150 public libraries.

Historic Resources

The National Register of Historic Places is the official list of the nation's historic resources worthy of preservation. The New Jersey Register is the official list of the state's historic resources of local, state and national interest. It is closely modeled on the national program. Inclusion on the New Jersey and National Registers provides historic resources with a level of review and protection from inappropriate, publicly funded modifications and damages, but not from private actions. Property owners investing in these properties are eligible for financial incentives in the form of federal tax credits.

According to the New Jersey State Historic Preservation Office (SHPO) Bergen County has almost 400 individual properties on the New Jersey and National Registers of Historic Places. These include a wide variety of buildings, structures, grounds and archaeological sites, from large complexes such the Hackensack Water Works in Oradell, to individual houses. Many are publicly owned, but many are not. Of the publicly owned properties, many have been turned into museums and are open to the public. There are also a number of museums housed in structures that are not historic.

There are also designated historic districts encompassing multiple properties in Alpine, Closter (two), Englewood (two), Fairlawn, Hackensack, Lyndhurst, Mahwah, Maywood, North Arlington, Ridgewood (two), Rockleigh, Rutherford, Saddle River and Westwood. In addition, a number of linear historic districts encompass multiple jurisdictions – railroad rights-of-way (Bergen County Line/Erie Railroad Main Line), highway rights-of-way (Garden State Parkway, Palisades Interstate Parkway, US Route 46) as well as the Palisades Interstate Park.

Three of the properties in Bergen County included on the federal and state registers – the Hermitage in Ho-Ho-Kus, Palisades Interstate Park in Alpine and the Stanton (Elizabeth Cady) house in Tenafly – are also designated as National Historic Landmarks. These properties are designated by the US Secretary of the Interior and are deemed to have national significance and exceptional historic value.

Further protection of historic resources can be accomplished through local historic preservation ordinances and the creation of historic preservation commissions. A number of municipalities in Bergen County have adopted such ordinances and have active commissions. The level of protection afforded by these ordinances varies widely. Locally designated historic districts may also receive federal tax advantages.

The County has a 2001 (revised August 2003) draft Historic Preservation Plan prepared by the Bergen County Historic Preservation Advisory Board. The plan is intended to provide guidance for historic preservation efforts in coordination with land use decisions. The County has an annual Historic Preservation Commendation Program and funds historic preservation projects through its Open Space, Recreation, Farmland Preservation and Historic Preservation Trust Fund.

In addition to the preservation of historic resources and their protection from destruction or inappropriate transformation, the public policy challenge with respect to historic preservation is to find effective

ways to take advantage of the great potential found in all these resources to enhance the County's sense of identity and civic pride and to create more vibrant and dynamic places that build on, rather than destroy, their historical heritage.

Cultural Arts Facilities

- Williams Center for the Arts, Rutherford – two live theater venues, three cinemas and an open-air meeting gallery housing the Rivoli Theater.
- Art Center of Northern New Jersey, New Milford is Fine Arts School and Gallery for children and adults.
- Bergen County Players, Oradell is one of the oldest amateur groups in America.
- Hackensack Cultural Arts Center, Hackensack is stand-up comedy, poetry readings, lectures, plays, musicals, book readings, music, cabaret and dance.
- Puffin Cultural Forum, in Teaneck is a gallery and performance space.
- River Edge Cultural Center, in River Edge has exhibits; musical events in the park and at the library.
- Bergen County Performing Arts Center, in Englewood has a theater and performing arts.
- JCC on the Palisades, in Tenafly is a performing arts school, music school, center for special services and art gallery.
- Old Church Cultural Center School of Art, in Demarest has educational and cultural programs.
- Onstage, in Ramsey is a youth oriented summer theatre group.
- Saddle River Valley Cultural Center, in Upper Saddle River has a theater, workshops, enrichment classes, art exhibits, acting classes and music.

Visioning Format

In order to solicit public input on a number of critical topics in the master plan, Bergen County – assisted by Regional Plan Association and Maser Consulting – hosted three visioning sessions:

- November 14, 2009 – Northeast Bergen, Demarest
- December 5, 2009 – Southern Bergen, Hackensack
- January 20, 2010 – Northwest Bergen, Mahwah

Sessions were widely publicized and open to anyone interested. Close to 200 people participated.

The intention behind these sessions was to allow the participants to productively explore all relevant ideas. To achieve this result and still remain focused, it was helpful to establish a framework and define parameters for the discussion. The group discussion followed an iterative two step process. First, participants were encouraged to discuss "big picture" issues relevant to the entire county and to its relationship with the metropolitan region. Tables were set up to facilitate small group discussions around a number of relevant themes – economic development, housing, the environment, transportation and others. Each table was provided with a list of questions to help focus and frame the discussions, without limiting the creative thinking.

Participants were free to move from the broader county-wide scale to more localized discussions, and back up again, thus providing local illustrations to countywide issues. These discussions help develop both the countywide and more localized agendas.

In addition, the county planning staff – assisted by Regional Plan Association – organized a well publicized one-day master plan conference at the Sheraton-Mahwah on May 18, 2010. With over 300 participants, including representatives from the surrounding counties, the conference confirmed the strong level of interest in planning issues among Bergen county stakeholders, residents and businesses.

Summary of Workshop Discussions

Economic Vitality

There is every indication that economic prosperity in the future cannot be taken for granted and that increased competition for economic assets will increase between regions. What should Bergen county and its municipalities do to better position themselves in the economic arena?

Questions for Discussion

- What types of businesses and jobs should the County have in the future?
  - Do you see the County being able to encourage these and if so, how?
  - What economic sectors will be most important to the County?
  - Which ones will grow and which ones will shrink?
- Where do you see new business and jobs locating, and where will they leave?
  - What specific cities, towns, and commercial areas will this happen to?
  - What areas can have more commercial activity and what industrial or otherwise underutilized areas can be reused and redeveloped to benefit the economy?
  - How will this impact the surrounding neighborhoods and municipalities?
- What business development policies should be pursued by the County and/or municipalities? How can we attract and locate new businesses?
  - Can zoning, tax incentives, infrastructure development and public-private partnerships work?
  - What other forms of business assistance might help?
- What will happen to the County's retail areas in the future? How and in what ways will they change or should they change?
  - What forms and types of retail will be most and least successful?
  - How will they impact communities positively and negatively?
  - How can large retail areas have a more productive co-existence with communities?
- What will the County's workforce look like in the future? What do we want it to look like and what workforce and education policies can shape it?
  - What industry specific job training and specific education programs would help?
  - What other issues will affect employees and employers in the future?

Ideas and Issues Discussed Include

Employers in the county find it difficult to attract and retain a skilled labor force, in particular young professionals, which face high housing costs and high taxes. There is also shortage of day care centers, an important type of public service to support the labor force.

Few areas are seen as having more room for development. But the reality is that there are many sites throughout the county that offer opportunities for significant additional growth through redevelopment, but these are not readily apparent to many local officials.

Improvements to intra-county mobility are a major economic factor. The current barriers compromise further economic prosperity. Opportunities for additional transit service should also be explored, to better link jobs and housing.

Industry is leaving Bergen County because of high taxes. Taxes, home rule (fragmented government) and inadequate transportation services are discouraging new business from locating in Bergen County.

Health care industry jobs are very important for the county and hospitals are major employers. With the advent of health care reform there are nascent opportunities for gaining more economic activities given the strong medical presence in the County. There could be opportunities for expansion of jobs by leveraging the federal changes in insurance and provision of health services.

Arts and culture activities in downtowns could be better leveraged, to help ensure that the County's Main Streets are healthy and thriving again. Residential development above retail can help keep downtowns alive, especially at night.

There was a perception that the mix of industry in the county is imbalanced, with a need for more of an industrial base. The displacement of industrial activities by residential cited as a concern, as industry is an area of potential growth for the County's economy. Green industries could be a solution for the transition of industrial economic activities into the new century. Instead of zoning all industrial lands for mixed use activities, incentives should be put in place to grow new types of green industries.

International business attraction is an important economic development strategy. Bergen County's strategic location in the region provides a competitive advantage that could be leveraged by better economic development planning.

Should there be another referendum on the "Blue Laws"? Better research would be needed to quantify the impact on the communities and businesses.

It was suggested that Asian immigration is viewed a positive trend, and that the relationship between South Korea and Bergen County may be explored as a potential avenue for economic vitality. Attraction of new talent could provide for

future opportunity; e.g., attraction of foreign students from countries that value quality education to the County's colleges and universities.

What we heard people suggest for the County's Vision

- Commission a study analyzing the competitive position of the county – to better inform decisions for economic planning – complemented by a marketing plan to attract and retain businesses.
- Investigate ways to assist municipalities decrease property tax and business tax burdens to stimulate economic growth.
- Sponsor a series of case studies that showcase how redevelopment that is sensitive to its surroundings and context can improve local communities.
- Encourage temporary uses for large parking lots for office buildings and train stations, which can become farmer's markets on weekends when there is no demand for parking.
- Investigate potential transit service in high employment and transit-deficient areas such as the area around the Sheraton in Mahwah.
- Investigate potential partnerships between medical institutions in the County and renown institutions of higher learning to create new educational and economic opportunities for development.
- Try to attract a large university of high standards.
- Encourage more mixed-use.
- Encourage the transition of industrial activities to "green industries".
- Educate, facilitate and provide tools and incentives to empower municipalities to attract jobs, industries and businesses.
- Identify each county sub-area's strengths and develop strategies to capitalize on them.

Open Space, Parks and Recreation, and Natural Systems

Parks and open space, whether free-standing or associated with natural systems such as river corridors perform invaluable environmental functions and also constitute important amenities for the local population. It is increasingly recognized that healthy natural systems perform invaluable services that sustain human habitation. Investments in the regeneration of deteriorated natural systems, such as wetlands, can generate significant returns in terms of improving natural resources, mitigating adverse impacts of climate change and enhancing quality of life.

Questions for Discussion:

- Will there be an appropriate amount of open space in the County in the future?
  - Will all areas of the County have appropriate amounts of open space?
  - Where could more open space be added and where might it disappear?
  - What land use policies can help ensure adequate amounts of open space?
- Are there better ways to acquire and manage open space in the future?
  - Could forming non-profit boards for open space and parks work?
  - Could a fund that developers contribute to for open space and parks work?
- What would you like to see the County and municipal park system look like in the future?
  - What features do you want to see more of or less of?
  - What amenities are needed that do not currently exist?
- Will the County have enough recreation areas, passive and active?
  - What specific recreational facilities will be needed, or not needed, and for which types of users?
- What natural areas and systems will be most vulnerable in the future? What are some ways we can better protect them?
  - Should there be bans on development in certain areas? If so, where and what should be banned?
  - What land use policies can help better protect natural areas and systems?
- What role will Open Space, Parks and Natural Systems have in facing a changing climate? Can they help us adapt and mitigate the negative impacts of climate change? How?
- What types of strategic investments in restoration of natural systems should the county be contemplating and what types of funding mechanisms should be considered?

Ideas and Issues Discussed include

There is a need to better establish the economic value assigned to the preservation of natural resources. The public also needs to be better educated on a variety of environmental issues, including climate change and the negative impacts of excessive impervious coverage, with a focus on what actions individuals can take.

It was perceived that there is a fundamental lack of open space in Bergen County; in particular, passive open space is at a crisis point. Everyone should have a park within ¼ mile walking distance of their home.

Additional open space that should be available to the public – including pocket parks – could include parts of the Upper Hackensack Watershed, Lake Tappan and Cedar Farms.

The mission and function of the County Parks Department could be expanded to include natural resource protection. The department could add environmental scientists and botanists to advise on development constraints and environmental education. County Parks may be viewed both in terms of recreation and as natural areas.

It was suggested that vacant lands adjacent to parks be the County's first priority for acquisition. Other suggestions included that: local officials need to be educated on the benefits of open space trust funds, because there is concern about the ratable loss from open space; developers should be asked to contribute funds or contribute in some other fashion towards satisfying recreation needs; and that the use of grants for open space and recreation should be directed by the Master Plan. In addition, it was perceived that too much funding goes toward active recreation and not enough toward open space preservation.

The Hudson River is an air quality buffer between Bergen County and New York City. Preservation of natural areas and pristine open space areas along waterways should be a clear priority. Completing the construction of the Hudson River Walkway is a priority.

The original 1969 Hackensack Meadowlands Master Plan could be used as a model for a new study.

As far as impervious surface, it was suggested that additional parking for parks should only be provided in an environmentally responsible manner, and not in the riparian areas of the Upper Hackensack Watershed, for instance, and that trails through passive recreation areas should not be paved.

It was also suggested that river banks be returned to their natural state, where practicable. Better protection of water quality in reservoirs is very important to maintain clean water and also reduce the costs of removing pollutants from drinking water. For example, implementation of a larger buffer zone around the Passaic River between the Dundee Dam and Great Falls was suggested.

Public access should be provided to allow everyone to appreciate the rivers, but without compromising valuable bird habitats or other environmental resources. Goals may include: providing opportunities for waterborne recreation, as well as increasing visibility of the waterways; better publicizing of available access points; creating new river access in urbanized areas in tandem with redevelopment projects; and restoration of boathouses for canoe and kayak access, among others, including those near New Bridge Landing and Route 4.

Non-Profit open space preservation boards may be a good idea if they are accountable to County.

The existing recreation centers could better coordinate activities and share services, thereby eliminating the need to provide a new County Recreation Center or Aquatic Center.

It was suggested that farmland preservation efforts focus on legitimate working farms. A problem was cited in that the farmland assessment minimum requirement of $500 in income and 5 acres is antiquated, and that the law allows for major tax incentives for farms of an insignificant size. Restrictions could be placed on the type of farming allowed on preserved farms, limiting them to traditional farming or community farming. In addition, it was suggested that farms surrounding reservoirs be prioritized, and that preserved agriculture should be better tied to the community through community supported agriculture, farm stands, farmers markets, community gardens, etc.

Shade trees in many communities are reaching the end of their life span; a "tree crisis" is on the horizon. This creates an opportunity to plant more sustainable species. It was suggested that every municipality should have a shade tree commission (not committee) to apply for grants and advise on appropriate shade trees for planting. Too many male trees are planted to avoid the fruit borne by female trees and the mess that results. The large number of male trees also helps explain why there is so much pollen – a better balance may be struck. In addition, utility companies were called out to be better stewards of trees. Overall, it was suggested that Bergen County adopt a "no net loss of shade trees policy".

Some participants suggested that bicycle facilities be provided through the addition of bike lanes to roads, rather than creating new paths and additional impervious surface. To encourage more biking, an appropriate bike infrastructure – conveniently located bike racks, bike lockers, showers at work and so forth – would need to be provided. Bike racks could also be provided at parks, along with better public transportation options. The County could investigate a "complete streets" policy, with continuous sidewalks on at least one side of road. Bikers must be required to follow the same safety rules that apply to automobiles.

Solar energy collectors could be placed on top of buildings, rather than in public open space. Permeable pavements could also be encouraged. Simple things like white roofs on large buildings would help to reflect heat and reduce energy costs as well as consideration for Green roofs (park-like) if possible.

What we heard people suggest for the County's Vision

- Place a strong emphasis on "green" in the Master Plan, which needs clarity and structured goals for open space preservation (habitat, recreation, etc).
- Establish policies supporting LEED building standards, including municipal participation and tax breaks for LEED buildings.
- Make the public aware of climate change and green issues.
- Organize educational sessions for local officials focusing on environmental issues.
- Carry out a public educational effort to explain the benefits of open space.
- Take an active role in preventing passive open space from being converted to active uses.
- Play a strong role in storm water, floodplain management and associated land use control such as limiting steep slope and headwater area disturbance using the County's powers to regulate drainage.
- Protect the view sheds of parks and encourage buffer ordinances around parks.
- Maximize the use of County Open Space Trust Funds with municipal Trust Funds to acquire lands and create active parks.
- Encourage and provide assistance to towns that do not currently have a municipal open space tax program.
- Continue to encourage and assist landowners in placing conservation easements on their property.
- Take on a larger role in brokering open space deals between towns and private landowners.
- Focus on providing more forested areas along the Hudson River corridor.
- Audit the Hackensack River watershed and prepare a regional storm water and flood plain management plan.

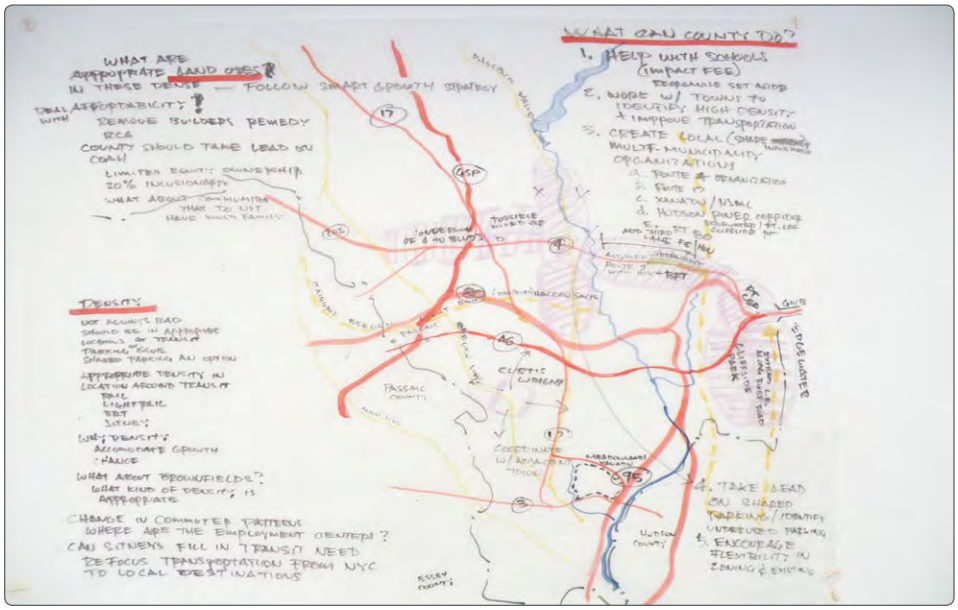
- Provide increased access to trail heads at parks.
- Improve existing trails that are in a state of disrepair before building additional trails and work to interconnect trails from multiple parks.
- Organize a volunteer organization to provide trail maintenance.
- Work to ensure flood hazard areas are protected and returned to their natural state.
- Consider enacting a 500-foot buffer rule to prevent over development of sensitive areas and provide assistance to municipalities to implement ordinances requiring buffer zones along all water ways.
- Combine historic preservation, recreation and educational activities.
- Investigate the establishment of a Parks Foundation that would raise funds to help improve the Bergen County Park System.
- Evaluate existing recreational and cultural resources and promote a network of shared resources so towns do not provide duplicate facilities in close proximity.
- Re-evaluate the farmland preservation program and tools to better achieve the goals of food access and community participation.
- Support an environmental commission in every town and help educate municipal officials about the advantages of different types of trees.

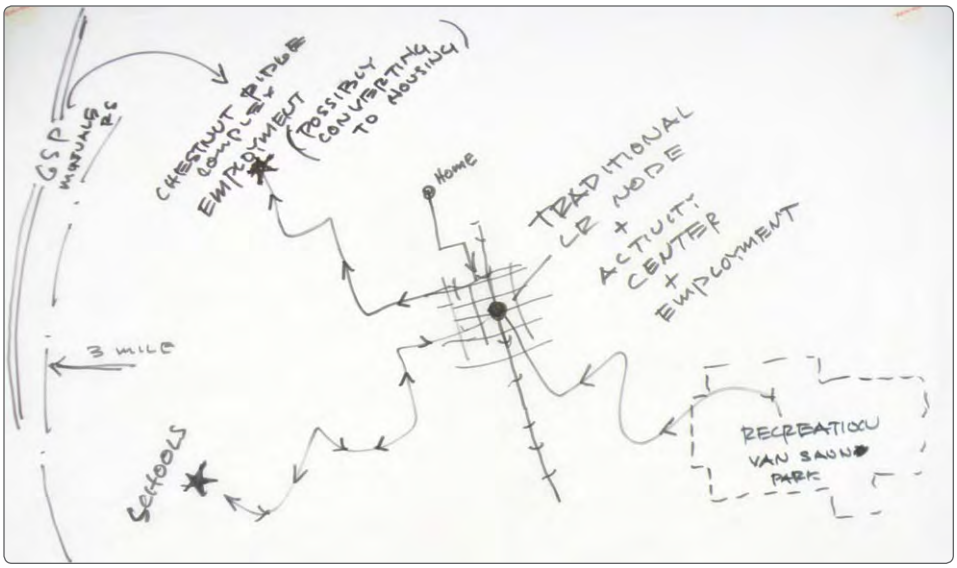
Transportation

The macro arterial road system provides Bergen County with good North-South connections, including several limited access highways, but more difficult East-West connections. NJ Transit rail lines also provide North-South service, but East-West service is provided by bus only. Peak hour congestion on local and arterial roads is considerable and is not expected to improve. Rail transit service will improve considerably once the new trans-Hudson tunnel goes into service.

Questions for Discussion

- Where and what will the demand for travel be in the future? What are our future needs?
  - Where will demand increase or decrease?
  - Where will people travel to more or less?
  - When will they travel more or less?
- How will the transportation system meet those future needs? What will the transportation system look like? How will people travel around and to and from the County?
  - What modes of travel will be more (and less) important in the future?
- How will linkages between different modes of travel be made?
  - Can the different modes of travel get people through to "the last mile"?
  - Do you see additional opportunities for expanding ferry service?
- Will the rail system in Bergen County be adequate to meet our needs? How might we expect the planned rail improvements (the Northern Branch, Bergen-Passaic Line and the ARC Tunnel) to change travel behavior in the county?
  - How might the rail system be further improved?
  - How might this impact communities, both positively and negatively?
  - How can we get the most out of our rail system including the coming projects?
  - On the future Bergen Passaic line, should stations be added to link the Bergen and Pascack Valley line?
  - What kind of service is envisioned for the Bergen Passaic line (i.e. what type of commuter might be expected to use the line)?
- Will bus transportation in Bergen County, including intra-county and New York City-bound buses, be adequate to meet our needs?
  - Where is bus service missing or inadequate?
  - How might bus service be improved and made more effective?
  - Where and how might Bus Rapid Transit (BRT) be used in Bergen County?
- What do we see in the future for our rail stations and the land immediately surrounding them? Do you think Transit Oriented Development (TOD) is a good idea? Where should it go?
  - How can we maximize the effectiveness of public transit?
  - How should we capitalize on its presence in communities?
  - How can we increase accessibility to transit – through additional parking, more walkable communities, more development within walking distance, better bus feeder routes, jitneys, others strategies?
- What will be the issues facing pedestrians and bicyclists in Bergen County? Where will they want to travel? Where and what kind of problems will they face?





- How should they be accommodated on local roads, county roads, in downtowns and other commercial areas including retail centers?
- How should they be accommodated in and around transit stations and in terms of better access to trains, buses and ferries?
- Should the county take a comprehensive approach to local traffic calming?

- What will the transportation needs of students be? Will those needs be met and how? What about the needs of the disabled, the elderly and low-income households?
- Knowing that most Bergen County residents use private vehicles for transportation, what will roadway travel be like in the future?
  - How will it look in specific areas, directions and corridors?
  - How can it be made safer and more efficient?
  - How can we reduce vehicle emissions that contribute to poor air quality and greenhouse gases?
- What types of issues will goods movement (freight) raise in the County, both in terms of rail and truck? What and where will the impacts of increased goods movement be felt?

Ideas and Issues Discussed

There is a general recognition that we rely too much on the automobile. Discussion centered on improving transit alternatives as the transportation focus for the county. Transit could be improved for all users, including but not limited to transit alternatives for commuters destined for jobs in New York City and within Bergen County. Mobility should be improved for intra-county trips. Improving transit options that make it more convenient to riders is more effective in reducing road congestion than any approach focusing on the road system itself.

The county should implement Bus Rapid Transit (BRT) to provide an alternative to the automobile, especially for intra-county trips. BRT could connect existing rail and bus services and major activity centers, creating a transit network in the county. BRT should be fast, efficient, branded and marketed as a premium service with real-time information – all of which help attract current automobile users and help address congestion.

East/west mobility in the County is recognized as a major problem and some transit improvements could potentially worsen these conditions, e.g. increased delays at rail grade crossings, as a result of increases in both passenger and freight rail service. The solution could be to eliminate at-grade crossings within major east/west corridors, but those costs have yet to be estimated. The creation of "quiet zones" along active rail corridors may also be encouraged. There is recognition that current problems cannot be solved in the immediate future and the benefits from increased investments in transit will require a period of 5 to 10 years or longer to be fully realized.

There is general support for the Northern Branch extension of the Hudson Bergen Light Rail line, which will have eight new stations in Bergen County, but there is also some concern about how people will access the new service and about parking at the stations. It was suggested that NJ Transit continue to look at extending the line north beyond Tenafly to Closter, as this might help reduce the number of commuters driving to the currently planned terminus to access the light rail. (Current forecasts show little potential ridership north of Tenafly). There is also concern that the proposed service on the Northern Branch will not run late enough into the evening for riders to take excursion trips into NYC; NJ Transit may wish to look into extending the proposed service hours. In Leonia, there is concern about providing a parking deck on parkland for a station, and that nearby Fort Lee Road already experiences heavy congestion. NJ Transit and the county must make sure that these issues are being mitigated.

It was suggested that NJ Transit analyze its existing rail schedules and look for opportunities to improve reverse commute service, especially on the Pascack Valley, but also on the Bergen-Main Line. Not everyone is destined to NYC for work and efforts should be made to improve reverse-peak transit service for commuters within the county and for those who commute to the county from other parts of NJ and NY, as well as intra-county commuters. For example, in Montvale, employers would like to create a feeder service from the Pascack Valley station on Grand Avenue to the major office parks nearby. The Montvale, Park Ridge and Woodcliff Lake area has a large reverse commuter population, with over 25,000 jobs in corporate offices and a swelling daytime population. Most of these travel from the south by car on the Garden State Parkway. The current schedules of reverse commuter trains on the Pascack Valley line does not provide convenient service to reverse commuters.

The forthcoming Passaic-Bergen ("Cross-County") Line has the possibility to serve as an east/west connector in the county, but as currently planned it will not have good connections with the Pascack Valley Line and few stations are currently anticipated in Bergen communities. Bergen county towns – specifically Rochelle Park and Saddle Brook – did not express an interest in stations along this line. Hackensack wanted a station near the hospital but not near Essex Street Station. Hackensack does not support the currently proposed rail stops on the Cross-County Line because it is perceived that they will not bring economic benefits.

It was suggested that NJ Transit electrify Bergen County rail lines to make them better and faster than diesel, and more like NJ Transit's Morris-Essex line, where there is better service. In addition, some sort of overhead transit system was suggested on Route 4.

Amtrak does not currently stop at Secaucus Junction; such a stop would provide access from the 11 connecting lines without having to go to Newark or New York, giving Bergen County residents access to Philadelphia and Washington, DC.

It was suggested that in the long-term, NJ Transit should consider adding additional sidings or double-tracking the Pascack Valley line. This would create the operational flexibility to improve service dramatically in the reverse direction.

There is a perceived need to speed up bus service, increase frequency and improve coverage. Allowing buses on the Palisades Interstate Parkway would provide a strategy to improve service to NYC, mostly to the George Washington Bridge Bus Station, although it is not clear how receptive the Parkway Authority is to this idea, and the geometry of the access ramps to the GW Bridge from the Palisades might prevent or make it more difficult for buses to navigate this route. The Port Authority is currently redesigning these approaches to the bridge and there may be an opportunity to make them more "bus friendly" and maybe even for a GW Bridge express bus lane.

There is a perception that more riders will take local bus service to NYC instead of driving to a park-n-ride or getting dropped-off at the GW Bridge if bus service is more frequent. Many of the existing local bus services in the north have headways of 30 minutes or more. Taking a bus to the GW Bridge Bus Terminal to access midtown or northern Manhattan is not as far fetched now as in the past. Subway service (A train) from the station to the rest of the City has improved; northern county residents tend to drive to the bridge and catch a bus over to the station and then connect to the subway. Better connections to the NYC transit system would help those northeast Bergen residents that commute to northern Manhattan, to work primarily in health care and higher education. Existing bus network coverage and the location of bus stops can be improved.

Some people cannot take transit to work in Bergen County, because although there might be a bus stop next to their residence, there may not be a stop close to the job site, and although the bus drives past the office the driver is not allowed to stop.

Many county residents are generally satisfied with existing express bus service to NYC. Improved express bus service in Teaneck (Teaneck Armory on Teaneck Road) is an example of a location where higher frequency of bus service has made it an attractive alternative to rail. In order to compete effectively, bus service needs to be clean, relatively fast, convenient and frequent. Train service is easier to find because riders know where the stations are – many bus stops are shabby, barely identifiable and hard to access. Suburban "cross town" green routes are needed and bus loading should be sped up. Visible improvement along with better branding and marketing are also needed to better promote bus service. Some thought buses need to move faster going up to the GW Bridge from Leonia. Better bus route data from Coach USA/Red & Tan is needed. There are three "high-density clusters" of bus service in Bergen County: Hackensack, the towns on the Palisades and the Garfield/Wallington area. Can we have better integration between bus and rail service at these (and other) locations?

Limited access highways should not serve only autos and trucks; there should be some form of public transportation. Efforts to implement Bus Rapid Transit (BRT) should be focused along major population and employment corridors.

Extending para-transit services to northern Bergen might be helpful with the commuter issues in the tri-Borough area. Local corporate employers are said to be keen to participate and contribute. This could also be a candidate for the shuttle program if NJ Transit is able to adjust the reverse train schedules to better match business hours.

Jitney buses run to and from north Hudson County and on Bergenline Avenue and Route 4. It is not known if they are insured. Meadowlink could use jitneys to provide better feeder services to rail. The success of the NJ Transit pilot program providing three years of funding is hampered when towns are not willing to contribute.

"Last mile" and transit parking issues – the need for feeder bus/shuttle services from train stations to local employment centers – are a priority. The need also exists to provide feeders from surrounding towns without rail service. For example, the Westwood station is running out of parking; but adding parking will increase station traffic and congestion. In Oradell, there was a feeling that parking should be limited – more centralized and integrated with transit feeder service. Feeder services could be provided from the surrounding municipalities that are not currently served by commuter rail. Better mode integration and feeder service is generally needed at train stations. More trains may be justified.

Other substantive comments include:

- The ARC project is desperately needed to enhance transit access and provide a one-seat ride to Manhattan.
- The West Shore Line is choking with freight and there is little public support for opening it up to commuter rail.
- Access to transit in general, and particularly to Manhattan, by the physically challenged is considered very difficult (if not impossible) and needs to be improved.
- There may also be demand for more and better transit service to sports facilities.
- Fare integration among transit systems would provide for easier and more efficient use..
- The Garden State Parkway and Route 17 are potential transit-ways; preferential treatments for transit should be considered and coordinated with park & ride facilities.
- Greater participation in the state's Safe Routes to School program is seen as a way to alleviate peak school traffic.
- Participants generally favored slower speeds on local roads.
- It was suggested that the county revisit and reconsider the county route numbering system. In addition, a countywide way-finding and signage program would be helpful.
- Transportation Improvement Districts may be a useful tool for municipalities that anticipate significant new development or redevelopment.
- Carpooling and vanpooling should be encouraged.
- The feasibility of a roadway safety audit should be explored.
- Corridor studies can be valuable – the Kinderkamack Road corridor study is an example.

The increased popularity of transit-oriented development and the benefits of mixed-use zoning are recognized. However many towns prefer a maximum of three- and four-story buildings, and resist taller ones. Many towns are also still ambivalent about transit-oriented development, which they equate with increased density and traffic and which triggers additional affordable housing requirements which are difficult to satisfy. The Municipal Land Use Law and County Planning Act would need to be amended to change this cycle. A first step would be a recommendation of a Master Plan. Models from other States and Counties could be referenced to effect such changes.

It was suggested that the county needs more mixed-use, center-based development. This is particularly relevant in Southern Bergen County where there are opportunities for redevelopment. Transit Oriented Development (TOD) was discussed

for such locations as River Edge, Saddle Brook, Garden State Plaza, Paramus and the Mahwah Sheraton/Ford site. Participants pointed out that the former Ford site in Mahwah could have been a large TOD. A mixed-use community was proposed and turned down because the local officials feared it would contribute more kids into the school system. A TOD could have created a whole new village where the Sheraton Hotel is now and could have been served by rail, since there was a spur from the NJ Transit Main Line to the old Ford Plant, although trains would have had to back into the spur. In addition, Ramsey Lumber on Route 17 was cited as a large property available in the future for redevelopment into a TOD. Essex Street Station in Hackensack has significant underdeveloped land. It has great potential to be a TOD as it could connect the "downhill" and "uphill" parts of the City. The parking lots at the station are always full, and parking would have to be addressed. The opportunities for TOD activity at Anderson Street in Hackensack are not obvious. It was also noted that there is not enough parking provided at the Garden State Parkway Park and Ride lot in Paramus.

The discussion touched on many such land-use issues. A question was posed: where can we build up density and have people willing to live in a 50-unit complex? In Manhattan, Hoboken, Jersey City, but also in Hackensack along Prospect Avenue and in downtown Englewood.

Poor coordination between traffic signals at signalized intersections is a big problem in Bergen County. With recent legislative changes, this relatively simple and inexpensive work can now be done locally as NJDOT no longer has jurisdiction over non-state highway signals. Better signal coordination can significantly improve roadway performance and alleviate congestion hot-spots.

It was suggested that the average road is off limits to everyone but motor vehicles; there is no room for bikes. Roads should be for everyone. Bike lanes are needed on County roads. All new roads should be designed for all users, according to a "complete streets" policy. County roads should be viewed as complete streets because they connect towns. However, County roads were built out of farm roads and tend to be too narrow.

Bikes are part of a sustainable strategy for our transportation problems, but municipalities would need technical assistance in promoting their use. Bike storage would need to be made available on the front of every bus, and bike parking at malls and other large trip generators would need to be increased. Both the general public and the Police would also need to be educated on the use of bikes on roads. Pedestrian and bicycle accidents are on the rise. County site plan and subdivision review standards could be amended to require bicycle parking as part of the review process. Local land development ordinances could also be amended in such a way, to promote increased pedestrian and bicycle use.

Municipalities require more guidance from the County and State regarding funding for transportation projects and how to apply for it. Lack of funding for transportation is causing a crisis. One strategy to fund transportation would be to collect additional gas tax. NJ has one of the lowest gas taxes in the nation and there have been numerous attempts to raise it.

An aging population is cause for concern on the transportation front. Seniors cannot easily get around. Shuttle loops or circulators can help address this problem. The changing demographics will affect town finances; as populations age, low-density land use patterns will become even more financially unsustainable; in 30 to 50 years towns may feel differently about increasing density as a matter of finance.

What we heard people suggest for the County's Vision

- Explore potential BRT service along Routes 4 and 17 and major county roads, serving activity centers throughout the County, including Hackensack, Ridgewood, Englewood, and the Meadowlands.
- Engage Meadowlink, Bergen's Transportation Management Association, along with NJ Transit, to explore the possibility of extending para-transit services to northern Bergen.
- Work with the Access Management Division of NJDOT to develop access management plans for Route 17 and Route 4 to improve mobility and safety along these two very busy corridors.
- Develop a countywide way-finding and signage program.
- Reconsider the county route numbering system and improve posted signage.
- Revise County development review standards regarding transit oriented development and bicycle and pedestrian amenities.
- Play a role in major commercial development. As a neutral regional agency, encourage the County to provide input into local plans for each downtown and/or major shopping area.
- Take the lead in coordinating traffic signals at signalized intersections.
- Consider creating a traffic signal operations center.
- Adopt a "complete streets" policy and make sure all new roads are designed for all users.
- Take the lead in helping municipalities complete their sidewalk networks.

- Provide guidance to municipalities regarding funding for transportation projects and how to apply for it – technical assistance, workshops, and the latest manuals, rules and regulations.

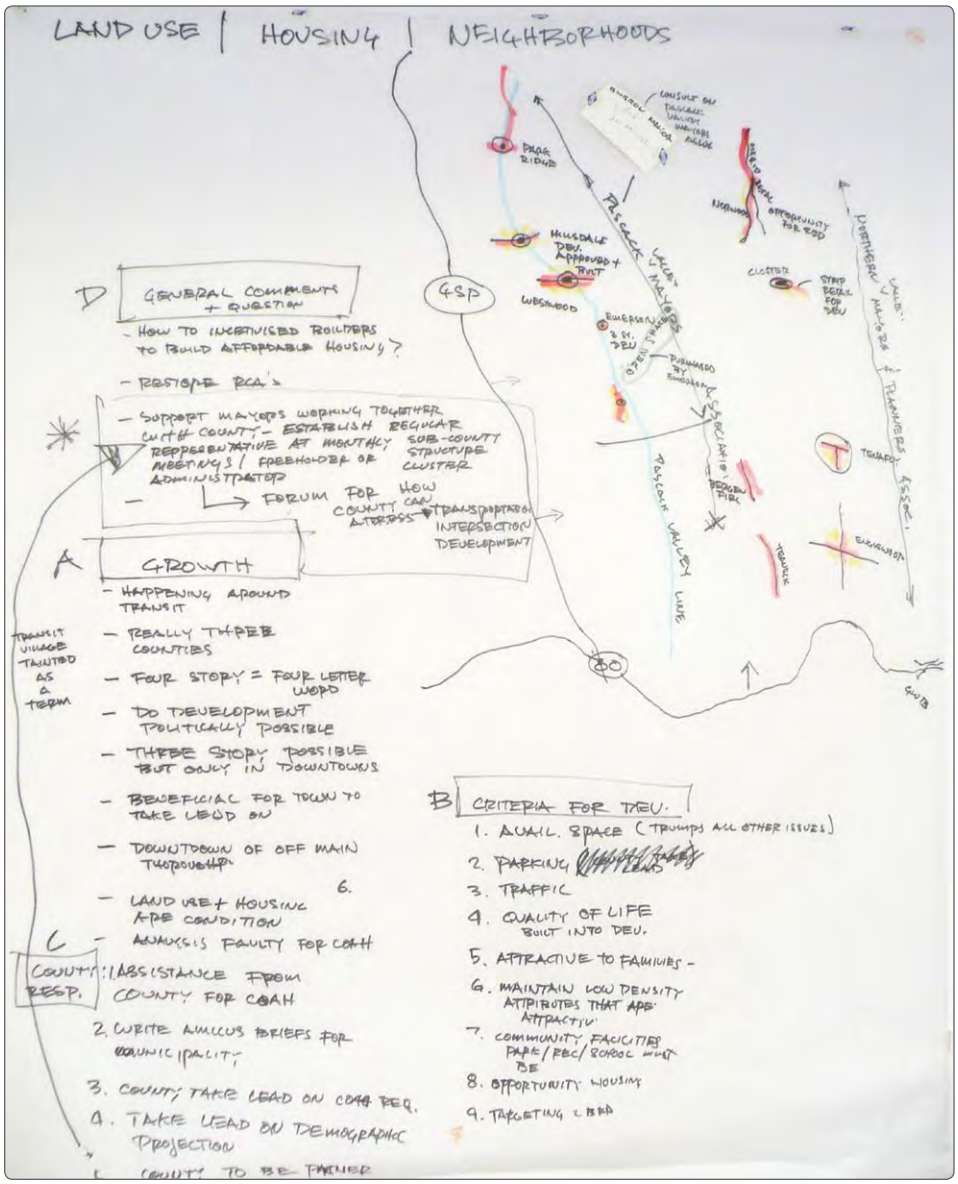
Land Use, Housing, and Neighborhoods

Bergen County is a highly complex physical and natural environment, exhibiting a wide variety of conditions in terms of land use and transportation patterns. Land use patterns and transportation systems have significant consequences in terms of economic competitiveness, household budgets, community character, energy use, environmental impacts and quality of life.

All areas reflect past choices and values, which may no longer be valid. These areas also perform differently in terms of economic activity, environmental impacts, place-making and quality of life.

Questions for Discussion

- Are there parts of the County that are too dense, or not dense enough? Where and why?
- What land uses are missing in neighborhoods and in downtowns?
- Why are they missing and what can be done about it?
- What strategies should be pursued by county/municipalities to strengthen these areas?
- What types of planning and design principles create the most successful mixed-use environments? Can new public spaces assist in this effort?
- Are there creative ways for towns to increase housing choices and diversify the existing housing stock that might bring additional benefits to the community as a whole, including:
  - Help satisfy the state's affordable housing requirements.
  - Create new workforce housing. What criteria should towns follow to identify potential sites and development opportunities?
  - Increase the supply of age-appropriate housing.



Ideas and Issues Discussed

Bergen County is really three different Counties in terms of development patterns. Any approach to land use and housing should recognize that.

Growth has been occurring around transit hubs and this trend is expected to continue and intensify. But the term Transit Village is "tainted" because of its association with state-mandated affordable housing requirements. It is better to find another name for this type of development?

In some parts of the county, four-story development is a "four letter word"; three-story development is only possible in downtowns. But it is accepted that density is not always a bad thing and is an effective strategy to better accommodate future growth. In keeping with smart growth, it should be located in appropriate areas where transit access is available and parking can be reduced or shared. Appropriate transit oriented locations for increased density include those with rail, light rail, bus rapid transit (BRT), jitney service and located along key highway corridors, such as Routes 4 and 17.

How can the county help encourage greater mixed use density around rail stations? It was suggested that NJ Transit re-establish commuter rail service on the Susquehanna line through Wyckoff, Franklin Lakes and Oakland; this line could tie into a proposed hub station in Hawthorne (Passaic County).

It was suggested that municipalities take an active lead with respect to future development, and that all new development projects should have quality of life features and amenities built in. Community facilities (parks, recreation, schools) must be provided and attractive to families, even though the county's demographics (like the state and the nation) are shifting rapidly toward non-traditional households.

COAH is not popular in many parts of the county for a number of reasons. In particular, the vacant land analysis is seen as faulty and a number of towns have struggled with that. Are there viable models for affordable housing provisions that might be applied in communities that do not have (and do not want) multi-family housing?

A simple alternative to COAH would be to require that a fixed 20% of housing units in all developments over eight units be affordable. This can be implemented locally, but it may not satisfy State requirements. How can we incentivize builders to build more affordable housing?

Should the State restore Regional Contribution Agreements? Should impact fees be implemented to cover the cost of additional school children?

Monthly sub-county meetings between the County Executive, county directors, freeholders, mayors and administrators could help to build trust and discuss issues of common interest. In this context, the County would likely be seen as a willing partner with municipalities over the full range of development and conservation issues. The meetings could become a forum for disseminating best practices and publicizing success stories.

How can Saddle River County Park be integrated into other county or municipal parks via utility rights of way, stream beds, dedicated easements and Route 17 right-of-way?

What we heard people suggest for the County's Vision

- Become a leader / partner in helping promote viable downtowns that fulfill local retail needs and do not compete with regional retail (Paramus, Hackensack and Rutherford).
- Work with municipalities and NJ Transit to get increased bus service through their downtowns / commercial centers.
- Take the lead with respect to new jitney and local circulator services.
- Produce more detailed demographic projections that will show the municipalities what to expect in terms of market shifts.
- Take the lead in helping municipalities figure out how to best meet COAH requirements and help them avoid builder's remedy lawsuits.
- Provide technical and financial assistance in building and managing affordable units as well as in disseminating alternative ownership and financing models, such as limited equity ownership.
- Create more opportunities for mayors to work together and with the county.
- Evaluate projects of major impact, in particular if they affect several municipalities.
- Take the lead in effectuating improvements to county roads so as to allow for better east – west traffic flow.
- Work with the municipalities to improve the Route 17 corridor and encourage a better balance between the types of commercial uses – the mix of office and retail space – and allow for some green space as well.
- Work with the municipalities and NJDOT to evaluate the viability of service roads along the Route 17 corridor.
- Work with communities to analyze industry types and evaluate the existence / need for support businesses.
- Engage in the development of business retention / attraction strategies.

Property Taxes and Shared Services

The property tax burden in New Jersey generally, and in Bergen County is one of the highest in the nation and a source of continuous frustration for homeowners. A struggling national and international economy and a crisis in public finance and government revenue require that we carefully re-think how we do things. Long established practices that have served us well in the past may not be viable or appropriate in the future. The state has encouraged consolidation and shared services as a way to reduce public sector costs and increase efficiency. There are a number of on-going initiatives in Bergen County which have shown some promise.

Questions for Discussion

- What are the most successful examples of shared services agreements currently operating in Bergen, and do they provide transferable models that can be emulated in other jurisdictions and by other organizations (e.g. BCCLS Library system?)
- How should the ways we make decisions with economic consequences evolve to ensure the county remains highly competitive and retains a high quality of life?
- What opportunities do you see for shared services in education, law enforcement, fire, EMS, municipal administration, Public Works, sanitation, etc?
- Is there a greater role for the county in promoting shared services?
- Are there corridor-wide (roadways, transit, bikeways, stream corridors, etc.) issues that would benefit from a shared services focus (traffic signal coordination, connecting municipal/county parks, bikeway identification, way finding signage, etc.)?

Ideas and Issues Discussed Include

There are a number of on-going initiatives in Bergen County which have shown some promise, including: shared sewer trucks, health department services, cooperative bidding road programs, senior van shuttles and lending through the Bergen County Improvement Authority.

Further coordination and sharing efforts could include facilitate leaf removal (support/replicate efforts of Pascack Valley Managers Association), common permitting for de-snagging streams, brine distribution, bicycle/pedestrian best practices (sidewalk inventory, etc.), provide technical support for challenging the "if it is not in the NJDOT manual it can't be done" mentality, COAH clearinghouse, open space acquisition along waterways, and improved transportation options to transit stations. None of these are very controversial. Waste management / garbage collection can provide a good starting point for an inter-municipal shared services program. While the cost savings to the tax payer are not likely to be significant, it nevertheless starts to build a sense of trust and working relationships and towns can tackle more difficult (and potentially more rewarding) areas later on.

The County's role might be viewed as helping to build trust and confidence at the local level, starting with the "smaller things" which may eventually lead to increased support for the much "bigger ticket" shared services items, such as school districts or emergency services. The County might take the lead in educating and facilitating; and provide economic incentives where appropriate to get things moving. Greater efficiency in the dissemination of information about shared services between

the County and municipalities, between the municipalities themselves and between Departments within County Government is also needed. Better and more current technology (e.g websites, streaming media, and newsletters) was discussed as the probable solution to this.

The master plan could address what is perceived to be the "core fear" of sharing services and attempt to diffuse this feeling through better education as well as financial incentives. Examples of how much can be saved without losing service quality might be more broadly publicized. A "monetary value" for shared service initiatives for example, could be publicized to educate the public. Another core fear is the perceived loss of "power" – local elected officials feeling they have lost control over the delivery of services in their town. A possible solution to this is to have the County act as negotiator and facilitator. The Library "BCCLS System" – where the various member libraries take turns running the cooperative – provides a successful model. The New York Police Department's precinct system provides another model where management responsibilities rotate at the highest level. Bergen Community College is a possible model for high schools – it has 3 campuses and provides excellent education.

Should the County openly encourage towns to merge? Perhaps not, but at a minimum, the County could provide data and technical assistance to municipalities. The Master Plan should not be constrained in its proposals just because this is a difficult issue. As part of the educational process, the County can also develop a case study of a hypothetical municipality which is run like a business, including a non-profit business plan and a mission statement. This would show local officials that if their towns were a "business," they would not survive without making important adjustments. But while economies of scale can be found, sometimes wealthier towns are reluctant to "pair up" with less affluent towns.

Everyone agrees that schools and police represent the areas where big savings can potentially be achieved. Bergen County has 78 school districts. Consolidation might start at the very top, down to the level of school principals. In Pennsylvania, counties run the schools and there is a single superintendent for the entire county. They also have centralized procurement and bulk purchases. The same principle can be applied to police. Use a "precinct" approach, and only cut the highest level. Consolidation of police staff makes it more efficient. What about equipment? It is often said that Bergen County municipalities combined have more police and fire trucks than New York City. This equipment – which many towns cannot afford – is woefully underutilized. Perhaps the county should sponsor a program for sharing specialized heavy equipment? Consolidation at a higher level should also be considered, for example should the Sheriff's office and the Bergen County police be merged? Westchester County (NY) did something similar when it created a Department of Public Safety. The County can demonstrate its commitment to shared services by looking carefully at the possibility of combining police and sheriff's departments.

Perhaps special needs education could be addressed on a County-wide basis and managed by the County. Children are sometimes sent out-of-state, sometimes to the age of 23. The annual cost to educate special needs children often exceeds $100,000 per child. Perhaps special needs could be treated similarly to the technical schools, with satellite locations; otherwise, it is too expensive. Schools might also consider charging service fees for clubs and other extra-curricular activities.

Some have suggested that County government could be eliminated. But approximately 80 – 85% of local property tax goes to municipal schools and services, and the County accounts for only 3% of the average property tax bill. That is not where significant savings can be found.

Should the County be responsible for all tax assessments and property valuation? Maybe there should be a separate county tax (e.g. sales tax). Or should the county impose a new charge of $1.00 per person at Giants Stadium to generate extra county revenues?

We should all carefully examine the rules we have in place for emergencies, overtime costs for crossing guards and other possible savings. School crossing guards earn $10.00 or $11.00 an hour, but collect unemployment during the summer. The County might help train crossing guards for all municipalities. Police officers are too expensive to work on construction. The County pays municipal police officers $80.00 to $120.00/hour to direct traffic in construction zones. NJDOT pays flaggers $45.00/hour. Two police officers from each town are required by NJDOT to be present when test borings are conducted. Why not only pay NJDOT flagger rate? In the end, the tax payer pays for that. We should only use police for police work – non-law enforcement staff can handle other tasks, such as flagging. Municipal traffic control reforms are needed. The Ridgewood Police made over $1M in fees from construction projects last year.

Governor Christie's message is that unless towns partner with their neighbors, the State will continue to reduce funding. But State-imposed mandates for certain personnel, e.g., recycling coordinators for each town, also drive up costs unnecessarily. Towns have separate police contracts and fire contracts. Labor unions are part of the cost discrepancies and the State has not yet provided towns with the proper tools to take them on.

What we heard people suggest for the County's Vision

- Help build trust and confidence at the local level, starting with the "smaller things" which may eventually lead to increased support for the much "bigger ticket" shared services items, such as school districts or emergency services.
- Continue to take the lead in educating and facilitating; and provide economic incentives where appropriate to get things moving.
- Openly encourage towns to consolidate?
- Sponsor a program for sharing specialized heavy equipment?
- Help train crossing guards for all municipalities.
- Impose a new charge of $1.00 per person at Giants Stadium to generate extra county revenues?

Water, Sewer, Utilities, Energy Infrastructure

Much of Bergen County has public sewers, which is a pre-requisite for higher density development. Some of these systems are old and need to be upgraded. While there appears to be ample water and energy available to meet current (and perhaps future) needs, everything suggests that conservation measures, greater efficiency and smarter systems will become increasingly important in the future.

Questions for Discussion

- Are there areas that would benefit from new utility infrastructure? From better maintenance / rebuilding of existing utility infrastructure? How should these upgrades be funded and who should take the lead?
- Are there opportunities for regional approaches to storm water management?

- What types of programs can the County and its municipalities employ to encourage the reduction of unnecessary impervious surfaces on both public and private property? (e.g. shared parking lots? Reduced parking standards? Narrower streets? Green roofs? Regulatory limits on impervious coverage? Financial incentives to reduce storm water run-off?)
- What / where can renewable energy projects be promoted? What about energy conservation?
- What can the county and municipalities do to better promote energy-efficient building options (technology and building types, solar orientation, wind, hydro)?

Ideas and Issues Discussed

Combined (sanitary and storm water) sewer systems are a big concern for Hackensack, Little Ferry, Teaneck and other Bergen county communities. Fixing the Hackensack system alone has been estimated to cost $490 million. No one has the resources to meet the USEPA mandate. All development could be shut down if USEPA decides to enforce its rules. Hackensack has been approached with the possibility of privatizing its sewer system and is currently conducting an evaluation. Older cities in the southern part of the county are particularly at risk because they are largely built out, with little opportunity to address storm water issues through new development or larger, corporate development.

There is a need for regional approaches to stormwater management. USEPA is considering imposing a Total Maximum Daily Discharge Load (TMDL) into the Hudson River. Better storm water management in the northern part of the county will help with south county flooding. NJDEP watershed planning, Rutgers and the Northeast Watershed Alliance have identified many of the storm water issues and opportunities in the county. Homeowners also need to be better educated with respect to what they can do to help address storm water issues.

Green infrastructure is key – street trees and pervious surfaces intercept rainwater and increase real estate values. But is permeable pavement practical in this climate? Will the freeze thaw cycle rapidly break down the permeable pavement structure, especially since pavement surfaces are generally plowed of snow exposing the pavement surface to a freeze thaw cycle every sunny day? The alternative is for stormwater to be directed to a swale and then percolate into the ground. Draining an impervious pavement surface to a buried recharge basin might accomplish the same ground water recharge objective.

Green Roofs also reduce stormwater run off. Cisterns can be used to capture excess stormwater and later used to irrigate the green roof and other vegetation. Philadelphia is embarking on an effort to map 10,000 green roofs in the city.

Stormwater management regulations need to encourage existing development to retrofit their drainage systems to retain more stormwater and return it to the ground even in highly urbanized areas. Some flexibility is needed since some areas of Bergen County can not rapidly absorb stormwater. Current NJDEP regulations for redevelopment sites only require retention / detention for the additional impervious surfaces created. Some towns require additional actions to reduce the predevelopment stormwater run-off as well. The responsibility for maintaining new stormwater management systems – while usually spelled out in a developer's agreement – can be expected in the future to impose some enforcement costs on municipalities.

Potable drinking water, while only available thru the tap for roughly 100 years, is taken for granted as a readily afforded resource. United Water Services provides, either directly or indirectly through municipal Water Departments, drinking water to roughly 85% of Bergen County.

An agreement between New York and New Jersey requires New York to pass 8 million gallons of water a day down the Ramapo River into New Jersey. Rockland County returns roughly 1.5 million gallons of tertiary treated sanitary sewer water into the Ramapo River north of the state line. Monroe Township's wastewater treatment plants contribute roughly 5 million gallons a day to tributaries to the Ramapo River. The Mahwah River feeds wells serving Orangeburg and Tuxedo Reservoirs. At one time the Ramapo River had much more water flowing to it, but it has been diminished by wells drawing ground water in New York State. There are wells along Route 202 in New York that draw down the water table along the Mahwah River.

United Water has water lines to some municipal water departments to supplement their water supplies in the case of drought or other cause. Currently United Water does not have the resources to increase its water supplies. United Water is exploring the possibility of purifying Hudson River water for domestic use in Rockland County. But there is a need to more aggressively promote water conservation. There are concerns that we could run out of water for domestic consumption.

Domestic water consumption in Bergen County has continued to grow despite its stable population. Per capita water consumption increased dramatically in the 1990's with lifestyle changes. The use of domestic water for lawn watering is an area where conservation measures could be effective. We should discourage the use of domestic water for lawn irrigation and encourage the use of non-domestic water (stored rain water or possibly treated water from septic systems) for such use. Since ground water is used in many municipalities for domestic purposes, the use of well water to irrigate lawns is counterproductive and should be discouraged. Workshops should be held for lawn care professionals to encourage them to install and maintain smarter lawn irrigation control systems to conserve water. Smarter systems do not irrigate during rain events and monitor ground moisture to determine when there is a need to irrigate the lawns. Towns might consider requiring annual inspections and certifications by trained professionals that the irrigation systems are functioning to conserve water and are not leaking.

Identifying and repairing broken and leaky pipes should be part of water conservation efforts. United Water loses about 20% of its flow to leaks, but replacement and repairs are very expensive. Sewer and water pipes have a useful life ranging from 40 to 100 years. Some of our pipes have exceeded their anticipated useful life and their replacement will be a major infrastructure expense.

Legislators have been reluctant to impose conservation measures on homeowners outside of drought conditions. It may be politically difficult for legislators to impose restrictions on water consumption. State or County government can help promote conservation by providing model ordinances for municipal consideration. A state mandate may be needed.

Septic systems that recharge to ground water are preferable to extending sanitary sewers systems to lower density areas. Improved septic systems also diminish the need for sanitary water treatment plants. Water flushed into the sanitary sewer systems is for the most part lost to the ground water table and placed in systems which expedite its flow to the ocean. In addition to the water diversion, bio-solids are also being removed from the land. These bio-solids should be composted and returned to the soil. And the current wastewater treatment technologies may not always be effective at removing from

the water certain drugs, pesticides and other elements that are flushed into the sanitary sewers.

The Bronx Zoo has toilets which only use 3 ounces of water per flush, versus the 1.5 gallons typical of commonly used toilets. Nordstrom uses waterless toilets.

Over fertilization of lawns is a big source of non-point pollution. Should artificial turf be used in playing fields? Natural fields are believed to work just as well. The public's expectations about the quality of playing fields are often overblown. There are increased demands for bigger and better playing fields, and existing fields are over used. Lighting playing fields for use at night further exacerbates their over use. Grass playing field absorb solar energy while artificial turfs radiate heat back up to the players on the field and into the atmosphere.

All Hackensack (United) Water Company lands are now under a water conservatory. Additional restrictions on development on or near critical watershed lands may be necessary.

The cost of improving water quality can be a burden for water providers. When the standard for arsenic in drinking water was changed from 10 parts per million (PPM) to 5 ppm, it cost Ramsey $2 million (un-reimbursed) to install the necessary facilities to reduce the arsenic content in its water from 7 ppm to the required 5 ppm.

What we heard people suggest for the County's Vision

- Undertake a comprehensive environmental resource inventory, calculate the carrying capacity of the County as a whole and prepare a Countywide build-out analysis based on existing zoning. This exercise would identify areas of discrepancy between zoning and capacity. Target population and housing densities should maintain the variety of Bergen County and reject a "one size fits all" solution.
- Better address non-point sources in the stormwater management system.
- Work with SWAN, Rutgers and others and sponsor educational efforts on stormwater management in selected neighborhoods, bringing together a variety of partners. While these efforts may showcase small solutions they will help identify the need to raise and allocate the resources required to address larger issues.
- Lead by example by retrofitting its own property and assets including buildings, roads, bridges and parks. These could be educational, demonstration projects. It should look to other counties that have taken on this role.
- Expand the Bergen County CAP program, which promotes energy efficient fixtures, to include water efficient fixtures. This effort could be focused in redeveloping older neighborhoods.
- Work with older malls and other large commercial properties to plant street trees and undertake other greening efforts that increase value and help reduce storm water issues.
- Promote the use of waterless (or lower water consumption) toilets.
- Take the lead in encouraging homeowners and other property owners to allow lawns to return to a natural state.
- Lead by example in terms of energy conservation and renewables. It should publicize existing solar panels on municipal or educational buildings. The County can set itself targets for renewable sources – solar and wind – for the energy it consumes. It can look aggressively for opportunities to place solar panels on its own facilities, where appropriate and possibly wind turbines, if justified. It can also engage local industry, such as Sharp, a major producer of solar panels.

Arts, Culture, and Historic Resources

Arts and cultural activities play important roles in defining and strengthening a community's fabric. As anchors in downtowns, arts and cultural institutions can jumpstart downtown revitalization, support ancillary businesses and ensure long-term stability. Historic resources are also fundamental to a community's identity and knowledge of its past. All have documented significant positive economic spin-offs. However, the importance of this sector is not always appreciated by local officials.

Questions for Discussion

- What are the big issues with respect to Arts, Culture, and Historic Resources in the county? Are they well promoted and adequately supported? What ingredients are necessary for arts and cultural institutions to survive and thrive?
- How can we create greater synergies between the arts, cultural and historic resources? How can we create greater synergies between these institutions and the places where they are located?
  - What are the factors or ingredients that can increase success (e.g. location in a vibrant downtown; access to public transit; high pedestrian access; proximity to restaurants, cafes, hotels, schools; proximity to vibrant public spaces)?
  - Do these synergies need to co-exist to make them successful?
  - How can we tap into other synergies between these institutions and other complementary institutions such as schools, universities, local employers and local foundations?
- What types of land use, zoning and transportation policies encourage/discourage these activities?

Ideas and Issues Discussed

The Manhattan draw for arts, culture and entertainment is hard to compete with, but there is a strong local market in Bergen which needs to be nourished.

Arts, culture and entertainment activities generate significant income and there are empirical studies to prove it.

Arts and culture events would benefit from better promotional efforts.

Need to diversify sources of funding and financing for arts and culture and explore innovative funding techniques, such as Certificates of Participation and Municipal Bond Financing. More corporate support, beyond PSEG and United Water, is needed.

Need to better engage the hospitality industry and hotel operators to provide greater support for arts and culture institutions and events. Would a hotel tax be an appropriate mechanism to raise public funding to support the arts and culture?

Need better planning to more effectively integrate arts, culture and historic resources with downtown revitalization and redevelopment. There are opportunities in downtowns and Main Street environments to create new performing arts facilities associated with new public spaces by more efficiently using land. Mixed use projects can perform better financially and create opportunities to expand the arts which otherwise will be missed.

There are also opportunities to create synergies between natural areas and the arts. Arts and cultural facilities can benefit tremendously from being located in high visibility reclaimed locations, such as newly created public spaces, waterfront locations or in new parks. The arts can also be very effective and powerful in attracting people to places where they might not otherwise think of going. Are there opportunities to do something similar or comparable along the Hackensack River? This could benefit both river restoration and arts and culture activities. Arts in the Park?

Continued support of agri-tourism and local farmers' markets provides important ways to allow our remaining farms to be economically viable and to remain a part of our historical agrarian landscape.

It is often hard to engage elected officials from neighboring towns to work collaboratively on projects of common interest. Should we seek to convene the mayors of Hackensack River towns to discuss potential interventions with – an arts and culture incidence – along the river? Might the Rutgers Blue Raritan initiative provide a model for Bergen County institutions of higher education to collaborate on an initiative involving the Hackensack River that might also create opportunities for arts, culture and historic preservation projects? Might it be possible to engage Fairleigh Dickinson University in Teaneck, for example?

There are also potentially very exciting but mostly untapped synergies between the visual arts programs in institutions of higher education, public spaces in need of animation and arts and cultural special events. Some towns have negotiated to host long term, large public art exhibits from foundries that do not have the capacity to store large sculptures. The area around the New Jersey Transit train station in Hamilton, Mercer county is a prime example, showcasing the work of the Johnson atelier. Kingston, NY also has a program that exhibits public art and sculpture in streets and public buildings. Where in Bergen County might this model apply?

What we heard people suggest for the County's Vision

- Engage the Arts Build Communities program at Rutgers Bloustein School for technical assistance.
- Fund an analysis quantifying how much arts and culture pump into the local economy.
- Create a user-friendly clearinghouse (web portal) for local groups promoting events and for the general public seeking activities.
- Develop a promotional booklet – similar to the open space booklet developed with Hackensack Riverkeeper – listing countywide arts groups and facilities.
- Take the lead in establishing "Preserve America" districts.
- Organize joint promotional and marketing efforts with Passaic County.
- Create a County Office of Tourism.
- Create a County-sponsored 501(c)3 non-profit subsidiary to facilitate fund-raising to support arts and cultural activities.
- Develop and implement a new and improved county-wide way-finding scheme.
- Provide greater transparency in the way funds for arts and culture are allocated.
- Act as broker or facilitator to match arts and culture groups looking for new space with developers/landlords looking to recruit them.
- Identify and promote case studies of successful, multi-purpose projects that combine office and commercial space with the performing arts.
- Create the Bergen equivalent of the Liberty Science Center.
- Publicize examples of towns that showcase the arts in the public realm and identify towns or locations that might be interested in pursuing this.
- Convene the mayors of Hackensack River towns to discuss potential interventions with – an arts and culture incidence – along the river.
- Promote arts and culture events along the riverfront.
- Encourage farmers markets and locally grown markets

Summary of Vision Bergen Symposium

Networking Transportation to Make it Work

Creating a Premium Transportation Network Using Our Existing Roads, Rail, and Rapid Transit.

How can we better tap into our resources in-place to create an effective transit network that is geared not only toward the New York City commute, but also serves users who travel throughout Bergen County?

Panelists

Moderator: **Darius Sollohub**, *AIA, NJIT – Dan Baer, AICP, Parsons Brinkerhoff*

Andre Luboff, *P.E., HNTB Corporation*

Paul May, *P. Eng., York Region Rapid Transit Corporation, Ontario*

James Hamre, *Washington Area Metropolitan Transit Authority*

Anton Nelessen, *M.A. Arch. UD, PP, CNU, A. Nelessen Associates Inc.*

Presentation Summary

Bergen County is served by a complex public transportation network that is largely oriented towards New York City but does not adequately serve intra-county trips. Furthermore, the public transportation systems in the County are viewed as competitive rather then coordinated.

The County's north/south spine, New Jersey Route 17 (Route 17), carries over 90,000 vehicles per day and is plagued by congestion that is exacerbated by a general lack of public transportation options. Further, with very few updates to the design of the road over its 80+ year lifetime, the ever-worsening congestion is spilling over to adjacent roadways that were never intended to handle high volume traffic. To try and address the congestion and related safety concerns, several alternatives for improvement are being examined in the "Route 17 Bottleneck Project" study.

To further alleviate congestion and provide greater public transit along the entire Corridor, a study is currently underway to investigate the viability of implementing Bus Rapid Transit Service (BRT) along and parallel to Route 17. BRT, as described by Darius Sollohub, is an innovative bus service that provides the best features of light rail service – including large windows, a curving frame, an articulated look, and low floors – while providing the flexibility of bus service. The modern vehicle design signifies an updated high quality transportation system to its riders and provides the capacity to add-on articulated segments – similar to light rail – to accommodate increased demand. On the road, BRT vehicles receive signal priority and dedicated lanes at intersections eliminating 11% of the delay associated with stop and go traffic while providing constant speed and frequent, predictable schedules for riders. In terms of regional service area, the implementation of BRT service is forward-looking, aiming to meeting the needs of the existing population to accommodate the region's booming population while quickly.

Public Transportation improvements – such as those being carried out in Ontario, Canada and Washington DC – provide examples of ongoing BRT projects that focus on relieving congestion on regional highways comparable to Route 17. In Ontario, the first phase of construction has provided the essentials of BRT service with intelligent transportation systems such as signal priority, electronic message signs, added infrastructure to bypass congested intersections via tolls, and the ability to pay fares before boarding. Subsequent phases of the service will provide increased pedestrian facilities, dedicated right of ways, and streetscape improvements. Since the start of implementation, the region has seen

a significant increase in transit ridership and acceptance, which has led to improved air quality, pedestrian friendly streets, and a vibrant mix of commercial, residential and employment land uses. Similarly, in Washington DC, the focus has been on select priority corridors, enhancing stations and the level of service while creating express routes that are coordinated with targeted land use objectives.

Intensity of land uses dictates the viability of public transportation. As illustrated by Anton Nelessen's planning transect – a planning tool that helps people visualize how land uses differ across development types – areas with demand for public transit ridership are distinguished by the 5 minute (1,500 feet) and 6-12 minute walk (3,000 feet), and the two and a half mile bike ride from station stops. As such, the highest density levels should be found within close proximity to station stops. As distances from station stops progress through the urban center and urban residential areas, density levels decrease significantly as does the demand for public transportation access. In further sections, land uses become primarily rural and auto-centric. In the high density areas, creating shared use of roadways provides for increased pedestrian mobility and access to goods and services within walking distance. Access to public transit, such as BRT, provides opportunities for mobility across greater distances such as between residences and areas of employment.

A key component to developing and implementing an effective BRT system is public participation to gather the input of potential riders and those who would benefit and be impacted by the system. It must be recognized that we cannot solve tomorrow's problems with yesterday's solutions. Sprawl, the type of development that has largely made public transit unviable, is clearly unsustainable; but transportation solutions can be a catalyst for exciting new development schemes that create a sense of place.

Ideas and Issues Discussed by Panelists and Audience

- There are 251 train stations and over 38,000 bus stops in New Jersey. Bus is a major form of transportation in the state. BRT needs to be "bus rebranded"
- The Newark BRT effort has been growing from the bottom up and serves as a good example for Bergen County.
- What happens to land uses within the 5 to 10 minute walking distance?
- Route 17 in Bergen County
  - Identifying trunk lines
  - Route 17 Bottleneck – how do you add another lane to be used for BRT or should we take away an existing one
- York region in Canada has a very successful BRT branded as Viva which includes 9 municipalities and 1 million people (roughly the population of Bergen County).
  - The lesson learned is to establish a transportation vision early on, in order to be able to successfully sell it to people and engage project champions
- Bus stops and gateways to the system need to be dignified
- The system needs courteous drivers
- The area within a 5 minute walk around a train station should have the highest density; followed by an area within a 15 to 20 minute walk; finally the area within a two and a half miles.
  - A Rutgers University Studio estimated that there are 96 billion square feet of possible new construction around the 251 existing train stations in NJ.
- The Federal Government is finally focusing on funding projects that promote sustainability and public health.
  - Each brick saved saves three gallons of gas
- The new generation (Millenials) has shown a propensity toward living in areas offering increased mobility options, and away from the isolation from the community that is characteristic of the suburbs.
- The City of Stockholm in Sweden has adopted a 9-foot standard for street travel lanes. This reduced standard makes room for bicycles by taking away some space normally dedicated to the vehicular right-of-way.
  - There are 43,000 highway fatalities in the US every year.
  - We should restripe our roads and highways and turn them into "skinny streets".
  - Similar efforts are underway in New York City to "give the streets back to the pedestrian."
  - In Ridgefield Park one participant mentioned that County roads are truck routes and are less then fifty feet wide.
- Bicycling in Portland, Oregon is a huge business. It has pumped $800 million into the local economy. This success story could be replicated in Bergen County through the implementation of a county-wide series of bike routes and localized networks of bike lanes that provide access to public transportation and key locations of employment and residence.
- Ridgefield Park has 44 developable acres on the proposed Light Rail Transit line, along with existing bus service, and is looking to find a developer to spur revitalization.
  - How do they get the word out?
    - Through trade organizations, word of mouth and a Request for Proposals and to make sure the redevelopment plan is solid and feasible in terms of the market.
  - Municipalities should work closely with the County on major development and redevelopment to ensure coordination between County-wide efforts and to take advantage of any assistance programs that may be available.

Taming the 800 Pound Gorilla

Reining in Local Budgets

Property taxes are out of control in New Jersey, and hit Bergen County communities especially hard. How can we realize real cost savings for taxpayers and greater efficiencies for our communities?

Panelists

Moderator: **Dave Roberts**, *AICP/PP, LLA, RLA, LEED-AP, Maser Consulting*

Douglas Blonsky, *Central Park Conservancy*

Tim Evans, *New Jersey Future*

Gina Genovese, *Courage to Connect New Jersey*

Mark Pfeiffer, *Division of Local Government, NJ Department of Community Affairs*

Hiram Birch, *Department of Legislative Services, Office of Policy Analysis, State of Maryland*

Presentation Summary

The debate surrounding property taxes in New Jersey often results in more questions than answers. New Jersey residents'

competing desire to have both comprehensive public services and lower taxes often puts an extensive strain on municipalities to do more with less. Identifying and implementing the greatest opportunities for cost savings – including municipal consolidation, shared services, and school district consolidation – requires out-of-the-box thinking as well as greater levels of transparency in budgeting processes at all levels of government.

In Bergen County there are 889,915 residents in seventy municipalities and seventy-five school districts. Each school district requires a budget for administrative operations. In other similar-sized counties, such as Montgomery County, Pennsylvania and Montgomery County, Maryland, there are far fewer school districts. Montgomery, PA has 62 municipalities and 23 school districts while Montgomery, MD has only 19 municipalities and one school district. However, Maryland's system of local government is much different from that of New Jersey. In Maryland, counties provide most basic local services such as police, fire, water, and parks and recreation, creating economies of scale that cannot be realized with the fragmented home rule style of government in New Jersey.

To create the necessary economies of scale, municipalities must begin to implement municipal consolidation and shared services programs. The consolidation of five to ten municipalities can be used as an optimal model to realize such economies. Woodbridge, New Jersey is an excellent working example of this model. The Township contains approximately 97,000 people in nine distinct communities, all of which function under one unit of local government yet maintain their individual identities.

Public Private Partnerships are another way that government can trim costs while providing high quality services. Central Park in New York City has long been subject to periods of decline. In 1998 the City entered a public private partnership with the Central Park Conservancy for continued maintenance, public programming, and capital restoration. Since this agreement the Conservancy, through a public private partnership, has received only a fraction of its annual revenue from City government with the remaining levels coming from fundraising efforts. City budgets support the Conservancy's fundraising during difficult times; and similarly, the Conservancy makes up for losses in government funding through fundraising during City budget shortfalls. The Conservancy has also developed a core of volunteers to offset the need for full time staffing thus mitigating costs while ensuring a high level of maintenance and giving City residents a stake in the Park's future. Through the public private partnership Central Park has once again become the most valuable piece of real estate in New York City while fundraising and volunteer coordination has limited the costs to tax payers.

Ideas and Issues Discussed by Panelists and Audience

- One major road block to consolidation is that people are in favor of home rule and it would be difficult to modify it.
  - There is a better chance of consolidating schools with an alternative school funding formula.
  - Wealthy schools are affected disproportionately
  - Many of the challenges to reducing or stabilizing property taxes such as school consolidation and coordinated land use are exacerbated by jurisdictional fragmentation.
- Good business decisions are not always good political decisions.
  - Per pupil costs are higher in regional school districts than in local districts
  - There is no explanation for this except employee costs.
- Property taxes were reasonable until employees unionized and salaries escalated.
  - Superintendent and police chief salaries are out of line with their responsibilities.
  - There has been a 14% decrease in public jobs in Bergen County in the last four years; the County government is doing its part to keep costs down.
- Jobs lost through consolidation and the impact on the economy need to be considered.
  - There is currently a study being conducted by Courage to Connect New Jersey to investigate this very issue.
- People fear consolidation; the pension system in New Jersey was consolidated and is now in trouble because of special interests.
  - Participants argued that there is a fear that larger government will overwhelm local character.
    - Large bureaucracies are not compatible with quaint communities. There is greater accountability with a local mayor and council, not a county. But can we afford it?
    - Consolidation in many cases may not deliver the level of cost savings that some believe.
  - In Maryland representation is regionalized to ensure local concerns are heard.
- The County needs to look at services provided by higher levels of government versus efficiency in terms of municipal consolidation
  - Municipal consolidation has occurred, but obstacles included in the impacts are never equitable between the merged towns.

- In Westwood the municipality has driven down the cost of road construction by combining projects with eight towns. The result was savings of hundreds of thousands of dollars in engineering fees and ten million dollars in construction costs.
  - Similar results have been seen with regional stream cleaning between ten towns and saved hundreds of thousands of dollars.
- The Woodbridge – Carteret shared sanitation services has proven extremely beneficial to both towns
- Numerous towns in Bergen County already share schools and a variety of other services
- A participant stated that some state taxes (utility, railroad, ect) used to be collected at the local level and stay local. Now the state does not return these sources of revenue to the local level.
- Another participant mentioned that he was tired of towns getting hit financially. If you take away the character of small communities, that's not sustainable. Bigger is not always better. Small towns can partner with others to achieve good things without formally merging.
  - Voluntary inter-local service agreements are a way to achieve efficiencies without getting stuck on a discussion about municipal size.
- Can we deliver new sources of revenue for towns? Should we pursue privatization of certain services?
  - The Central Park Conservancy has had great success in revitalizing the park as a public private partnership while continually reducing its reliance on public money for maintenance and construction projects.
  - The Conservancy consists of only 250 employees and has over 100,000 volunteers that help maintain the park in zones.

Complete the Street! Roads Aren't Just for Cars Anymore

Squeezing More Out of Our Landscape by Thinking Multimodal and Multi-Use

Vibrant Communities are intrinsically tied with a mix of land uses, travel modes, and street life. What opportunities and challenges arise when we consider all modes if travel and a mix of uses in our planning?

Panelists

Moderator: **Sharon Z. Roerty**, *AICP/PP, National Center for Walking & Bicycling-*

Robert Cotter, *AICP/PP, City of Jersey City*

Kimberli Craft, *P.E., Township of Montclair*

Michael Dannemiller, *P.E., The RBA Group*

Louis L. D'Arminio, *Esq, Price, Messe, Shulman, & D'Arminio*

Presentation Summary

"Complete streets" are those that are designed and operated to accommodate all users and all trips safely and efficiently. On a complete street, pedestrians, bicyclists, motorists, and public transportation users of all ages and abilities are able to move safely along and across. They are characterized by a variety of features, including sidewalks, bike lanes, special bus lanes, transit stops, frequent crossing opportunities, median islands, accessible pedestrian signals, and curb extensions; all of which may vary depending on the street's setting in urban, suburban or rural areas. In December of 2009 the New Jersey Department of Transportation adopted a complete streets policy to "create and implement complete streets through the planning, design, construction, and maintenance of new and retrofit existing transportation facilities within existing rights of way that are federally or state funded."

Recent national polls found that 52% of Americans want to bike more than they do now and 55% of Americans would prefer to drive less and walk more. This apparent demand for alternative modes of transportation presents a welcome opportunity for the implementation of complete streets, which could serve as important tools to reduce car use. Jersey City and Montclair, New Jersey are great examples of where complete streets programs have been implemented. Jersey City has transformed from a place characterized by industrial uses to a high density metropolis without creating a single lane of highway. In fact, 40% of Jersey City residents do not drive, leading to greater demand for and acceptance of bicycling and walking facilities.

In Montclair – the first New Jersey municipality to adopt a complete streets policy – change was difficult, but the Township had many of the ideal elements to implement complete streets. Such elements included six commuter rail stations, four local bus routes, two private commuter bus routes (NJ Transit), five business districts, and 97.7 miles of road (14.4 of which are county). Combined with the consensus building efforts of local advocacy groups – who provided vital public education through seminars and events like the "walking school bus" and walk or bike to school days – the complete street policy was successfully implemented.

Complete streets are more than just bricks and mortar and they will change from one place to another. They should be place-appropriate and place-specific, taking into account present and future land uses and should contain amenities that are specific to the type of use anticipated and desired. If implemented properly, complete streets can provide desirable change in a municipality's traffic and land use, offering a diverse set of transportation options, while instilling a sense of place and community.

Issues and Ideas Discussed by Panelists and Audience

- Walkable communities are very expensive and can be cost prohibitive for lower income families, why?

- There is a limited supply of dwelling units within walkable communities which pushes prices higher as demand increases. Increased supply and a contentious effort to include affordable housing can provide a diverse stock of housing options within walkable communities.

- The new generation (Millenials) desires increased mobility options that are not isolated from the community as they are the suburbs
- The City of Stockholm in Sweden has adopted a 9-foot standard for street travel lanes. This reduced standard makes room for bicycles by taking away some space normally dedicated to the vehicular right-of-way.
  - There are 43,000 highway fatalities in the US every year. We should restripe our roads and highways and turn them into "skinny streets".
  - Similar efforts are underway in New York City to "give the streets back to the pedestrian."
  - In Ridgefield Park one participant mentioned that County roads are truck routes and are less then fifty feet wide.
- Bicycling in Portland, Oregon is a huge business. It has pumped $800 million into the local economy. This success story could be replicated in Bergen County through the implementation of a county-wide series of bike routes and localized networks of bike lanes that provide access to public transportation and key locations of employment and residence.
- To eliminate surprises the governing body and the County should be engaged early on in the Complete Streets process to flesh out any issues and ensure cooperation and coordination

Safeguarding Our Health & Heritage

How Open Space, Cultural and Historic Resources Provide Bergen with an Enriched Quality of Life.

Our residents and visitors are treated to a wealth of such resources. How can we maintain, expand upon, and continue to preserve these value-added assets in Bergen County's overall portfolio?

Panelists

Moderator: **Michael Catania**, *Conservation Resources Inc.*

Dorothy Guzzo, *New Jersey Historic Trust*

Terrence Nolan, *Trust for Public Land*

Teresa Penbrooke, *CPRP, Green Play LLC, Colorado*

David Rodriguez, *Bergen Performing Arts Center*

Summary of Presentations

Open space and the arts both contribute to Bergen County's economy. Parks have been found to increase property values by 10 to 15%, while every dollar spent on the arts generates four dollars in indirect revenue for the local economy. Further, protecting lands, preserving historic landmarks and improving existing and creating new parks generate intangible values such as keeping communities vibrant, improved health and increased social interaction. Clearly, protecting the landscape and historic development that has shaped our culture is of the utmost importance but requires adequate funding, good stewardship, and close monitoring.

While there is widespread demand for programs to support open space and cultural landmarks, there are only 160 Historic Preservation Commissions in all of New Jersey's 566 municipalities. Many of these commissions have limited staff, little to no budgets and a membership untrained in Historic Preservation. In terms of open space programs, 232 New Jersey municipalities have open space trust funds which should not be viewed as expenses, but rather as investments for creating a quality tourism experience in an urban or suburban setting. Partnerships with local businesses and grants for technical assistance can further assist the County in historic preservation efforts and drive open space preservation and park development efforts.

Comprehensive Plans, Business Plans, Master Plans, and Strategic Plans create a framework for implementation and decision making that allows preservation efforts to thrive and new cultural institutions to meet the needs of an ever-changing society. The Master Planning process provides an avenue for prioritizing preservation needs that ensure funding is directed to the most critical sites, while special districts for the arts can have a dramatic effect on retail sales and downtown revitalization creating a comprehensive tourism experience that brings dollars into struggling downtowns and strengthens the long heritage of Bergen County.

Ideas and Issues Discussed by Panelists and the Audience

- There is a need for volunteers who care to give time to Historic Preservation Commissions and provide funding for technical assistance.
- Finding new uses for historic buildings are often the best way to preserve them
- The County should leverage public and private funding for parks
  - Parks are viewed as number one on the chopping block for funding during tough economic times. We need to prioritize funding as an essential service.
  - Businesses can be supportive of preservation efforts
  - The reallocation of the Bergen County Hotel Tax to Herritage and Tourism will yield the greatest return for the County.
    - For every one dollar spent on the arts four are generated for the local economy
- There is still much land left to preserve in Bergen County, including the Ramapo Mountains and areas surrounding waterways and reservoirs (such as Lake Tappan).
- Parks promote better health
  - 10% increase in greenspace equals five year increase in lifespan
  - Parks promote physical activity which can help decrease the alarming obesity rate in the United States
  - Parks bring people together and encourage social interactions
- Parks help mitigate air pollution and serve as a natural filter for water
- A participant mentioned that linking Bergen County arts, historic, and open space sites is a good idea.
  - Look at Middlesex County and New Brunswick
  - Public transportation and signage is essential. It is currently easier to get to New York City then it is to get to the Bergen Performing Arts Center.

Toward a Sustainable Future

How Green Initiatives and Innovative Approaches to Energy, Utilities, Transportation, and Land Use Decisions Can Secure a Sustainable Future

How can we continue to engage our communities in taking on an innovative perspective for the sake of sustaining not only our environment, but also our economy, quality of life, and viability as a regional force?

Panelists

Moderator: **Martin Bierbaum**, *Ph.D., J.D. National Center for Smart Growth*

Mitchell Hersh, *Mack-Cali Realty Corporation*

Ashwani Vasishth, *Ph.D., Ramapo College of New Jersey*

Jonathan Meisel, *LEED AP, Jones Lang LaSalle Americas, Inc.*

Joanne Potter, *Cambridge Systematics, Inc.*

Presentation Summary

In order to accurately discuss sustainability, the issue needs to be defined. At the 2005 United Nations World Summit it was noted that sustainability requires the reconciliation of environmental, social and economic demands. Our actions must be based on how they will affect the future; whatever we take, we must put back. So-called "green technologies" can play a significant role in helping us to achieve a sustainable future.

Transportation currently accounts for 28% of U.S. greenhouse gas emissions. As a society we need to live, work, play, and shop, but doing so by driving less is not only more environmentally sustainable, it is more socially sustainable as well. Smart growth interventions can help to create neighborhoods that are less automobile-oriented and reliant. By focusing on underdeveloped areas near transit stops and transforming them into livable, walkable, mixed use communities filled with green spaces and exciting storefronts, it is possible to revive existing downtowns and reduce car trips., Planting shade trees along streets and in parking lots in these communities serves to mitigate the urban heat island effect while providing better air quality and increased ground water recharge. This can then relieve strain on aging stormwater and Combined Sewer Overflow (CSO) systems, helping to minimize the discharge of untreated effluent into rivers and streams during major storm events.

Another major source of greenhouse gas emissions comes from our residential and commercial building stock. Existing buildings, particularly those that are within urbanized areas impacted by the urban heat island effect, consume significant shares of energy for heating and cooling. While green technology and programs such as the Leadership in Energy and Environmental Design (LEED) have become the state of the art in building over the past few years, Bergen County's building stock is too young to be considered economically viable for "green" retrofits given the current rates of return. New buildings on the other hand can and should be built using green technology. Until it becomes more economically favorable, existing buildings should take small, inexpensive measures to minimize energy consumption such as painting roofs white, which helps to mitigate the urban heat island effect. Then, as Bergen County's building stock ages, rehabilitations should be done using green technology.

Ideas and Issues Discussed by Panelists and Audience

- Investment in green technology must bring a positive return.
  - Studies show that green buildings have a lower vacancy rate, which in the right market can be an incentive for a developer to go green.
- Private investment is the only way that green technology will move forward. The Public sector does not have the investment capabilities to take on large scale green projects especially in light of the recent budget crunch.
- Social responsibility will be the driving force toward sustainability while economics will drive what types of green technology will develop.
- We should look at different ways to address greenhouse gas emissions such as the effects of reducing speed limits and increasing density.
- Roof tops and pavement create a temperature difference of five to ten degrees higher then the surrounding areas.
  - Urban forestry is one way urban heat islands can be tamed.
  - There must be a maintenance and replacement program for trees
  - Many street trees in the county are dying of old age
  - The Master Plan should look at the type of tree that will best suit the street and provide the most benefit for the environment.
- Bergen County needs to see more mixed-use high density developments, especially in areas that need revitalization.
  - With more density green technology becomes more economically feasible
  - Higher densities better supports mass transit
  - Increased densities use less land area allowing more to be preserved for open space.

Health Education, and Human Services

Strategies to Optimize a Desirable Future

What actions will be necessary to make our visions for managing the health care system, preparing tomorrow's work force, and coordinating a system for delivering human services a reality?

Panelists

Moderator: **Julia Orlando**, *CRC, Ed. M., MA, Bergen County Housing and Human Services Center*

Tammy Graves-Milinelli, *Bergen County Workforce Investment Board*

Luis Tamayo, *Northern Region, NJ Department of Human Services*

Tom Toronto, *Bergen County's United Way*

Marla Kein, *MS, RD, CHES, Bergen County Department of Health Services*

Presentation Summary

Preparing a vision for the future of Bergen County's health care, health education, and human services revolves around the ways these systems can be improved to serve greater levels of the population. There is a distinct need across the Country to train and retrain workers to build a 21st Century health care workforce that can meet ever-changing employment conditions in the field. In order to train a new work force, it is essential to maximize individual potential, natural skills and abilities in today's workers

while providing the next generation with the social skills, technological capacity, and self-sufficiency that will maintain Bergen County as an economic engine in the state. The County should focus on facilitating these necessary skills through life-long learning programs and career counseling in the field of health care, a growth industry in the County.

Bergen County needs more health care workers and better access to health services for the nearly 180,000 homebound individuals. However, State aid cuts and inadequate pay for providers make the field undesirable for many. There is also a need for more support for housing disabled individuals, and for chronic disease prevention and treatment. Initiatives such as electronic record keeping and information sharing enables collaboration and can provide a single point of access for services that are currently segregated throughout the County administration. Further, the new federal health care legislation should be fully understood by the County to help position it well in a new age of health care.

Ideas and Issues Discussed by Panelists and the Audience

- Increase Medicaid, Medicare and charity care reimbursement rates
- Increase chronic disease self management programs to decrease health care costs in emergency rooms, hospitals, and clinics
- Pay home health aids a competitive salary.
- Create a system for mobile health care services
- General Assistance (GA) programs are being cut or having their budgets reduced which could push more individuals towards homelessness.
- The New Jersey Family Care program needs to be better publicized, especially towards the Latino population.
- Partner with schools to build a system to reach children with no healthcare
- State and local departments need to collaborate as partners to share information and use it to assist families in accessing services
  - Create a single point of access for clusters of services

Keynote Address

Changed Circumstances Create Future Development Opportunities

Jeff Otteau, *The Otteau Valuation Group*

Beneath the recent crisis gripping the financial and real estate markets are long term structural changes that are reshaping consumer demand in New Jersey. Mr. Otteau led the discussion to explore the sweeping economic and demographic changes taking root in New Jersey and their effect on future real estate development patterns.

Summary of Keynote Presentation

The train wreck that has occurred over the past couple of years in the real estate and financial markets, and in the overall economy has obscured some very broad, underlying shifts taking place in New Jersey. These structural changes have been in motion for a decade will dictate spending patterns as we climb out of the great recession. What began with the unraveling of the housing market back in 2005 led to what we have seen in the past couple of years. The direction of commercial real estate markets, job markets, unemployment conditions, and financial markets, all flow from what begins in the housing market. Going all the way back to 1900 there has never been a recession that did not begin with a slowdown in housing and a slowdown in new home building. Our economy is 70% driven by consumer spending and housing development is the key driver of that spending.

Before any hint of the recession, larger shifts in economics, demographics and societal attitudes toward spending were underway, comprising a long term trend that will guide where the State will head on the other side of this recession. What led to New Jersey's rapid growth, prior to the recession, was largely rooted in the low cost alternatives to employers looking to flee the high costs of New York City and Connecticut. This brought high paying jobs to a state that largely had a manufacturing economy and opened the door to tremendous economic growth, creation of wealth, and prosperity for several decades. Today, the State has reached the point where high costs need to be balanced with what is sustainable going forward.

Starting with economics, New Jersey's job creation coming out of the recession is growing at a slower pace than in the rest of the nation. While the nation as a whole came out of the great recession in the third quarter of 2009 New Jersey continued to experience high unemployment growth. In past decades the nation had a record economy with 26 out of 28 quarters in a seven year period seeing growth in GDP. Meanwhile, New Jersey saw stagnation in private sector employment growth. The state was not creating jobs in very good times. The changes made now will govern how New Jersey moves out of the recession. Moving forward we can count on the federal government to raise interest rates – stifling New Jersey's spending power – and can anticipate higher energy costs as more oil is consumed by nations emerging from the recession. Although New Jersey has fared relatively well compared to the rest of the country in terms of home mortgage challenges, there is still a long line of foreclosures that will come to market during the recovery phase. Finally, banks have been so financially weakened that it will be a long time before we see the free flow of money appear in the markets again. The free flow of money is crucial for businesses to create and expand jobs that will push the economic recovery forward. In other words, this will be a slow process.

Demographic changes have also been underway in the State for some time now. Excluding immigrants from other countries, New Jersey now has more people leaving then coming in. The net loss of population

is approximately 49,000 per year, going back to 2002. People are leaving because the high paying jobs are leaving and New Jersey's cost of living no longer matches up with the relative reduction in pay. "According to Boston University, between 2004 and 2008 New Jersey saw a net loss of $70 Billion in personal wealth as a result of households leaving the state".

The number of New Jersey households with children is also declining and along with it, school enrollment. Since 1985, the number of New Jersey households with school children has declined such that 67% of households are childless. The reasons for this decline are relative to the reduction of income Generation Y is seeing as compared to their parents. Generation Y earns approximately 15% less than their parents and cannot afford to have children when taking into account the need to give up one income or pay for childcare. This decline in school children has been seen where municipalities have had hundreds of housing units built yet still saw a decline in school children. There are obviously some exceptions but by far the overwhelming majority of municipalities are seeing a decline in school enrollment. The upshot is that municipalities need be less concerned with density and the effects it has on school enrollment. It also makes clear that childless households are going to have less interest in living in far flung suburbs and more interest in high quality walkable communities because of their inherent efficiencies.

The rise of multigenerational households is also beginning to take hold in the State. As of now, approximately one in six households is multigenerational and that number is on the rise mostly for of the inherent economic advantages. In part it is Generation Y who cannot find jobs or if they do find jobs they are not high paying enough to afford to live on their own. The other contributor is senior citizens who can no longer afford housing in the state. These citizens will either leave the state in pursuit of areas with little-to-no-income tax and relatively low property taxes or move in with their kids at costs much lower than those that currently exist in the housing market and tax structure. Going forward, we need to think about housing differently as an increasing portion of housing demand will be generated by multigenerational households and young, childless professionals.

Finally, there are societal changes that have been underway in New Jersey since before the recession and that will continue long after recovery. The reordering of spending patterns moving from conspicuous spending to practical consumerism will continue to drive value-shopping as a long term trend. Also as the baby boomers retire, a generation more comfortable with the internet will spend more via online shopping, changing the face of retail shopping as we know it today. The baby boomers, who account for 75% of spending, will begin to spend less to conserve their retirement funds. As many as six in ten baby boomers do not have enough savings to last their retirement years, in part because of the recession, and in part because cost of living has risen. As a result baby boomers will begin to sell housing for equity to make up the shortfalls and as they do that they will move into smaller more affordable housing if they stay in New Jersey at all.

All of this brings New Jersey to a new version of normal which is more of a European market model. There are things that we can do to keep some of the market structure we have – such as attracting new economic growth into our markets – but over the long term the shift will take place. Capitalism loves cheap real estate and cheap labor. New Jersey can no longer compete with other states and other countries while maintaining the quality of life here. Going forward, we are going to have much more basic housing demand. Already new housing construction is on average smaller and it will likely get smaller still. The nation as a whole is going to see first time home buyers get progressively older because it is going to take longer before personal economic conditions meet the cost of homeownership. The upshot is that there will be a rental rebound that takes place and the percentage of owner-occupied, versus rental housing will shift, creating an enhanced market for upscale rental units. As housing demand begins to circle back away from the sprawling outskirts of the city, municipal officials and planners need to rethink zoning with higher densities and make clear these rental units are not the ones now associated with blight; they are upscale luxury units with working, childless professionals. As with every type of housing development trend, the retail and office markets will begin to follow the housing demand into areas where there are higher efficiencies and desirable communities. All of this provides great opportunity for planning and coordination to rethink developments and rethink zoning with efficiency as a mandate.

Tying It All Together

Sense and Sustainability Thinging beyond Borders to Create A Shared Vision for Future Prosperity

All of our visioning efforts have driven home the notion that our key quality of life issues are intrinsically ties together – land use decisions affect transportation which affects business, trade, and economic viability which impacts revenue generation and taxes which in turn affect future land use decisions, ect. ect. These all criss-cross, comingle, and interplay to affect and create our current stat of being and wellness. How can we break the cycle and thing outside the box and beyond the scale of our neighborhoods to create a shared vision to ensure our future prosperity.

What we heard people suggest for the County's Vision and the Panel's response to those suggestions.

After the inspiring speech by Jeff Otteau, Jim Hooker, Senior Anchor for NJN News, asked the moderators from each of the six panels to present to the audience a brief summary of their discussions and opened the floor to general questions from the public. The intention of this session was to allow the exploration of all ideas relating to the

development of the Bergen County Master Plan within the context of the six previously discussed topic areas.

- An audience member first suggested that Bergen County needs retention policies for residents. People are leaving the County because they are being priced out of their homes. These are mostly people on fixed incomes such as seniors who desire affordable housing however we are also dealing with declining school enrollments. How will the Master Plan address these concerns? Will it call for the development of additional age restricted housing?
  - The issue of population retention is a complicated problem. The Baby Boomer generation is retiring at nearly 10,000 people per day, making affordable senior housing a real concern. At the same time, declining school enrollment could possibly mean that there are empty schools. In this respect, Bergen County represents a snap shot of the state. People are leaving the State, and the issue going forward is not just that we need housing that is affordable to people of all generations, but where do we put that housing and at what density. Should the County consider converting empty schools to senior housing? If so, then what happens when school enrollment increases, will we have to then build new schools? If we do build new housing then that housing should follow general principles of sustainability where residents can be fully mobile viawalking andbiking on safe streets, and public transportation is readily available. These are the issues that make developing a Master Plan difficult and why the County is not just trying to develop a standard Master Plan, but one that is unique to Bergen County. The culture of the retired Baby Boomer is far different than that of past generations. Baby Boomers prefer to retire in place or retire in places where they can continue to lead active lives. Developing places where seniors can lead active lives mixed with other generations will foster the creation of lively downtowns. Where downtowns are more active and people tend to walk more, the community will see safer streets which will in turn create an even more livable community.
- Another participant suggested that the County needs to create more affordable housing, but how do you create more affordable housing? You can either sprawl more, or you can densify. Is it possible to densify Bergen County?
  - Density is relative. There are ample places in Bergen County where infill development is possible, and there are even more places where redevelopment or rehabilitation is possible. At issue is the word density. Many people associate density with increased school children and an increased tax burden, but studies have shown that the Millenials, or Generation Y, are delaying starting families or not starting families at all. They also do not want what their parents wanted; they desire urban situations where public transportation is available and numerous activities and opportunities for social interaction are available. This suggests that dense urban developments can contain units that are significantly smaller and thus will not create nearly as many school children as traditional single family detached housing. Further, these more dense developments that are located with access to public transportation permit residents far more discretionary income that supports a variety of activities that help make lively downtowns. Right now, places in New Jersey like these (e.g Princeton, New Jersey) are amongst the most expensive places to live. This is largely because there is a strong desire to live in areas that are walkable, but there are so few of these places that the supply and demand factor in turn drives prices up. Increasing the number of these types of communities will help to to alleviate the high costs of living in walkable communities ensuring more affordable units and a greater diversity of residents.
- A small business owner said capital formation and job creation have been absent from the conversation. What will the "new normal" in economic growth look like? Over eighty percent of jobs are created by small business. We need to increase job formation and economic wealth through tax incentives and bail outs for small businesses not large banks.
- A participant from Ridgefield Park said the town has forty-four developable acres on the proposed Hudson Bergen Light Rail Line that have been deemed in need of redevelopment. The town created and adopted a redevelopment plan but as of yet has not found any interest in developing the property? How can they make it work?
- The Panel suggested that they continue to advertise the redevelopment plan through trade organizations, word of mouth, as well as the issuance of a Request for Proposals to gather interest from potential developers. Further, the panel suggested that the Town examine the redevelopment plan to determine if it is feasible in terms of market demands. Right now, because of the economic recession, there are not many developers willing to take on big projects; however, activity is beginning to take hold and though right now it is primarily related to infill developments, larger projects will begin to materialize. Another big deterrent that could be at play is whether or not the redevelopment plan requires the developer to fund a huge infrastructure project as part of the development of the site.

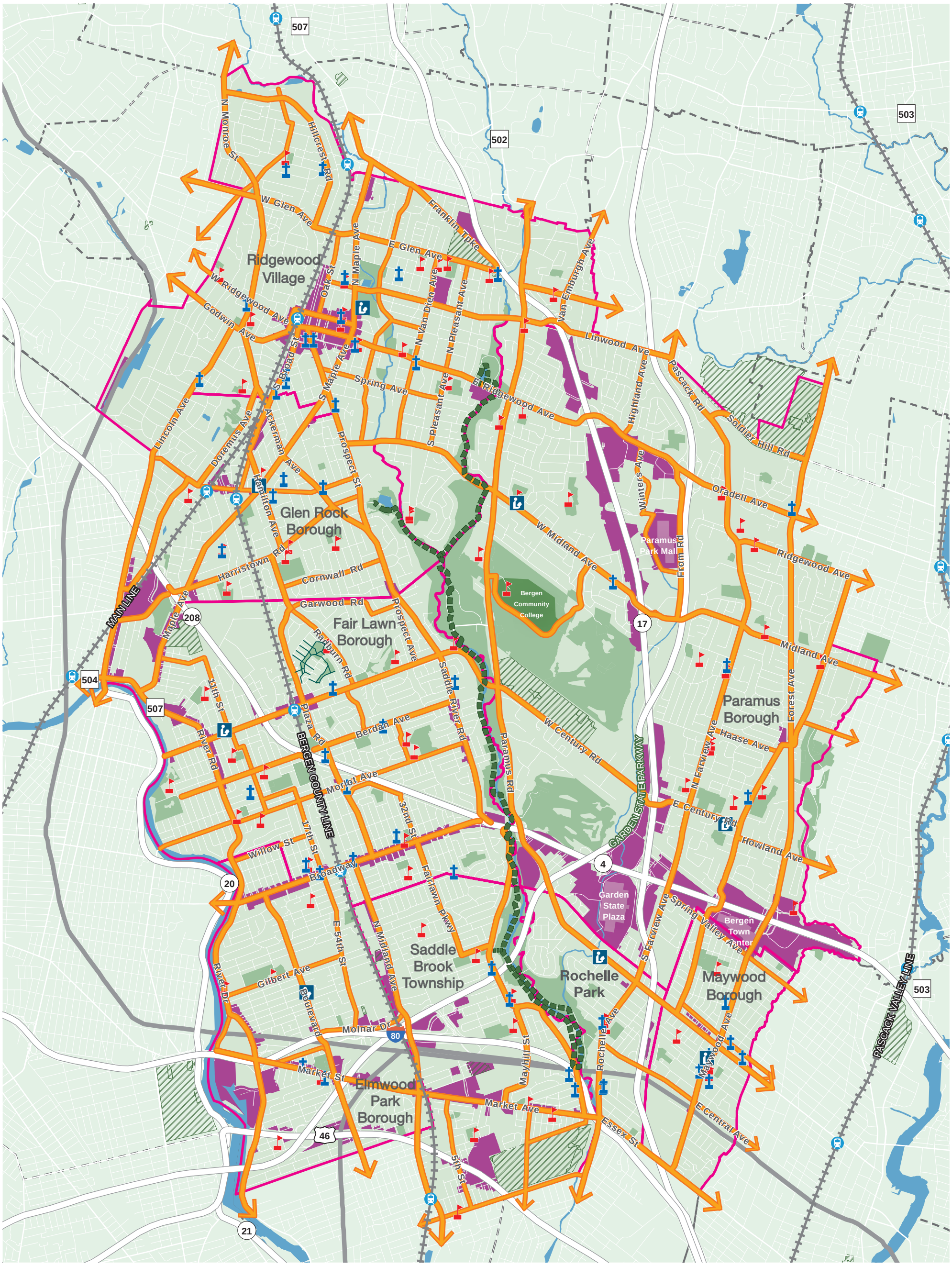
NY • NJ • CT
Regional Plan Association
www.rpa.org

MASER CONSULTING P.A.

Central Bergen BIKE+WALK

The Central Bergen Bicycle & Pedestrian Plans

10/22/14



PRIORITYROUTES

Source: NJDOT, NJGIN, NJDEP, BERGEN COUNTY

- Priority Network
- Bike Trails
- Limited Access
- Commuter Rail
- Freight Rail Line
- Libraries
- Places of Worship
- Schools
- Study Area Municipalities
- Cemeteries
- Commercial

0 0.5 1 2 Miles

Van Saun Park & Current Bergen County Zoo

JONES JONES
ARCHITECTS
LANDSCAPE ARCHITECTS
PLANNERS

Construction
Maintenance
Construction
Construction
Maintenance
Train Service
Holding
Storage
Spider Monkey
Ocelot
Temporary
Commissary
Pasture
Tamarin
Amphitheater
Animal Care
Holding
Holding
Park Security
Aviary
Cougar
Hay Storage
Heating Plant
Holding
RR
Bison/Elk Holding
Zoo Office
Education Building & Discovery Center
Gift Shop
Ticket Booth
Proposed New Prairie Dog/ Red Wolf
Train Depot
0 25 50 100'

Spectacled Bear
Penguin
Train Service
Harpy Eagle
Howler Monkey
Migratory Birds
Peccary
Condor
RR
Coati
Nutria
Holding
Goeldi's Monkey
Marmoset
Red Brocket
Ocelot
Giant Anteater
Maned Wolf
Tapir
Special Events & RR
Flamingo
Golden Lion Tamarin
Birds
Spectacled Owl
Amphitheater
Future Cultural Resource Center
Commissary
Animal Care
Holding
Bergen Dutch Farmyards
Education
Sloth
Jaguar
Guanaco
Rhea
Capybara
Reptile
Spider Monkey
RR
Hay Storage
Alligator
Wetlands Aviary
Bison/Elk Holding
Admin
Education
New Fast Food
Gift Shop
Zoo Entrance
Red Wolf
Bison/Elk
Prairie Dog
Eagle
Lizards
Bobcat/ Lynx
Scorpion
River Otter
Pallas Bat
Train Station
Snowy Owl
Puffin
Ruins
Kiva
Peregrine Falcon
Seal
Black Bear
RR
Roadrunner & Quail
Amphitheater
Mountain Lion
0
25
50
100'

EMPLOYEE PARKING
Spectacled Bear
Penguin
Train Service
Harpy Eagle
Howler Monkey
Migratory Birds
Peccary
RR
Condor
Nutria
Coati
Holding
Goeldi's Monkey
Red Brocket
Ocelot
Giant Anteater
Marmoset
Maned Wolf
Tapir
Special Events & RR
Flamingo
Golden Lion Tamarin
Spectacled Owl
SOUTH AMERICA
Commissary
Future Cultural Resource Center
Amphitheater
Animal Care
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Bergen Dutch Farmyards
Education
Sloth
Jaguar
Guanaco
Rhea
Capybara
BERGEN COUNTY FARMYARD
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Hay Storage
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Wetlands Aviary
Bison/Elk Holding
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Education
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Zoo Entrance
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NORTH AMERICA
Prairie Dog
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Scorpion
River Otter
Pallas Bat
Ruins
Kiva
Train Station
Snowy Owl
Puffin
Peregrine Falcon
Seal
Black Bear
RR
Roadrunner & Quail
Amphitheater
Mountain Lion
EXPANDED PARKING
0
25
50
100'

Bergen County Zoo Master Plan Concept

AREA CALCULATIONS

EXISTING ZOO - 13 ACRES

PROPOSED EXPANSION - 11 ACRES

TOTAL BUILDOUT - 24 ACRES

N

1" = 100'

0 50 100 200 400'

JONES JONES ARCHITECTS LANDSCAPE ARCHITECTS PLANNERS

Bergen County Zoo Master Plan Concept

AREA CALCULATIONS

EXISTING ZOO - 13 ACRES
PROPOSED MASTER PLAN - 24 ACRES
(PREVIOUSLY - 18 ACRES)

NORTH AMERICA - 4.22 ACRES
(PREVIOUSLY 4 ACRES)

SOUTH AMERICA - 6.15 ACRES
(PREVIOUSLY 5.17 ACRES)

BERGEN COUNTY FARMYARD - 2.41 ACRES
(TO INCLUDE PONY RIDES)

MEADOWLANDS - 1.4 ACRE

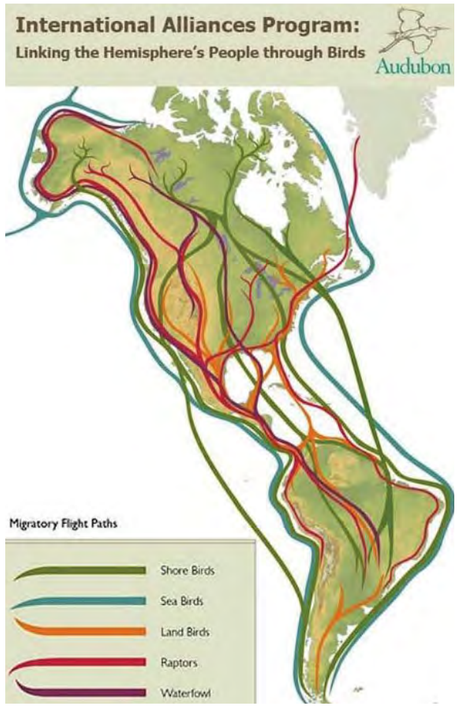
FOREST LANDS - 0.83 ACRE

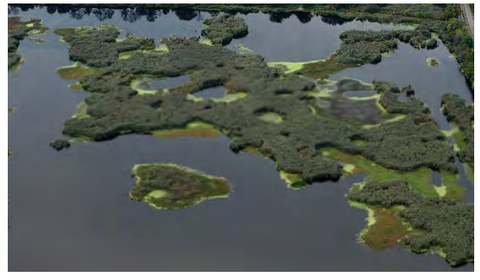
TRAIN SERVICE -3,086 LINEAL FEET
(WITH THREE STOPS)
(PREVIOUSLY - 2,651 LF W/ ONE STOP)

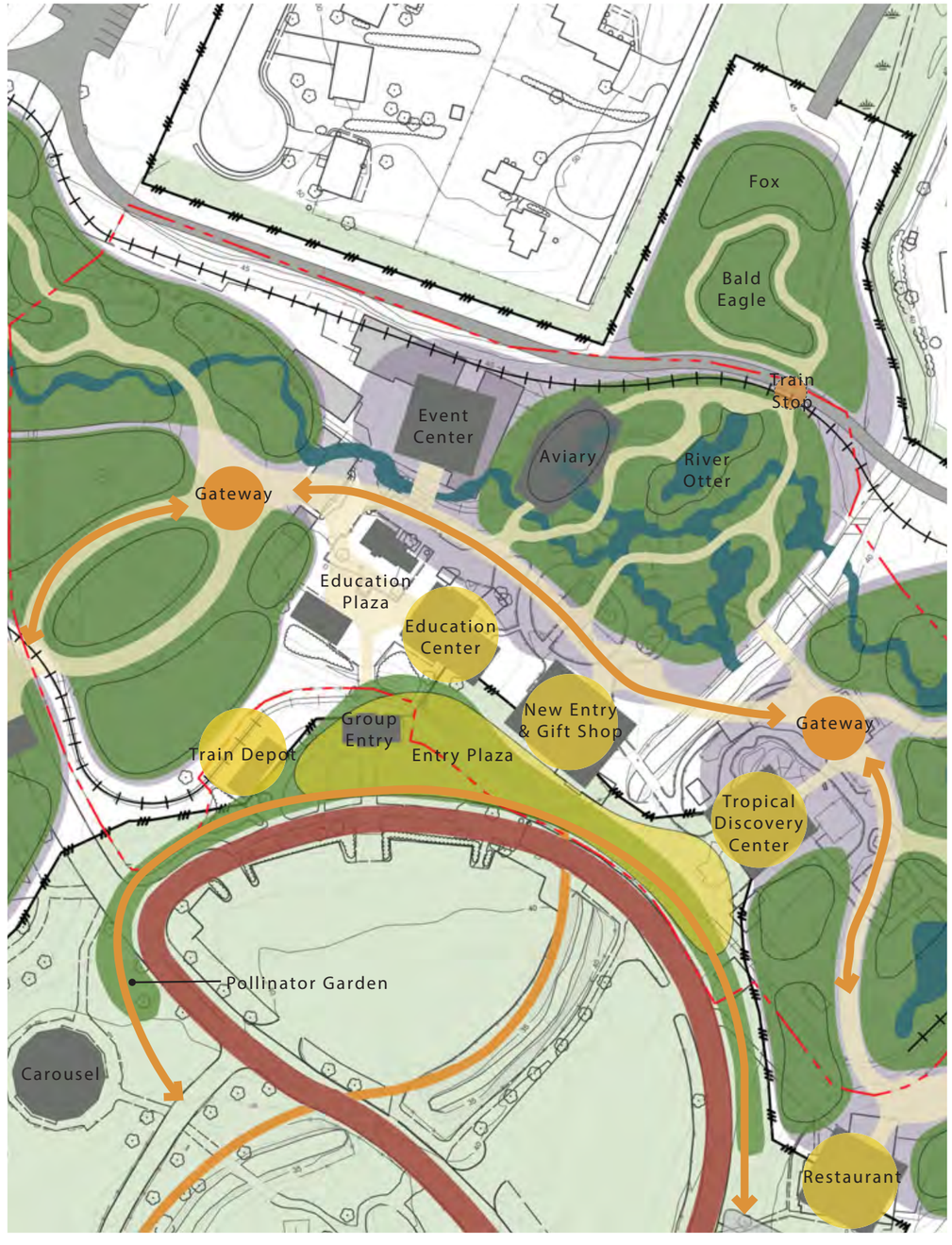
Bergen County Zoological Park
JONES JONES ARCHITECTS LANDSCAPE ARCHITECTS PLANNERS

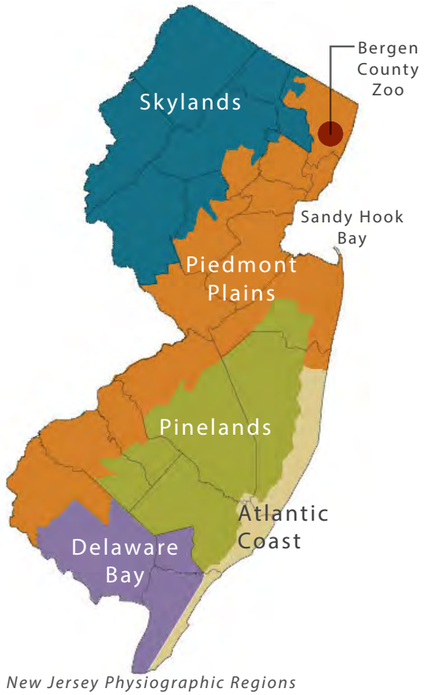
Bergen County Zoo Master Plan Concept

New Jersey Meadowlands and Entry Promenade









New Jersey Physiographic Regions

New Jersey Meadowlands
Wetland & Grassland
- River Otter
- Walk-through Aviary

New Jersey Forestlands
Forest
- Bald Eagle
- Red Fox

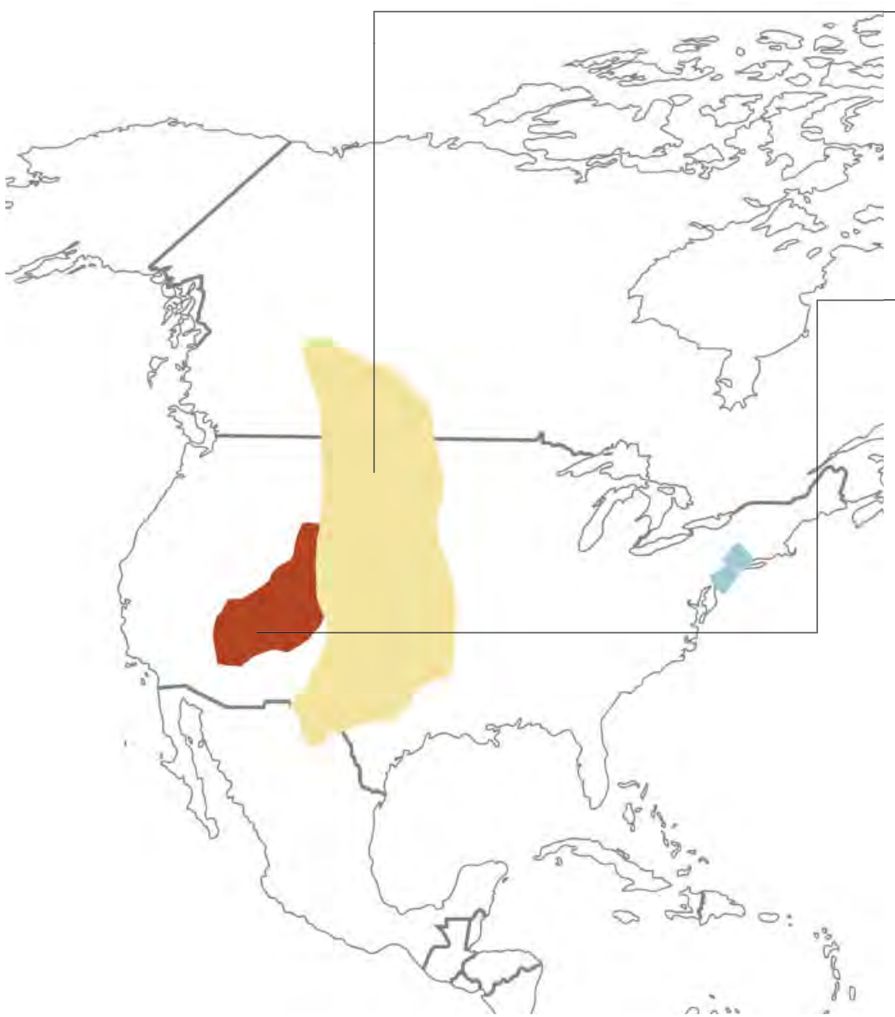
● Indicates new species

Bergen County Zoological Park

JONES JONES ARCHITECTS LANDSCAPE ARCHITECTS PLANNERS

Bergen County Zoo Thematic Concept

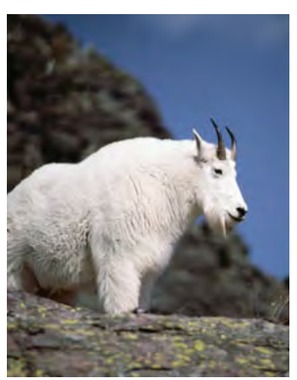
North American Regions



Great Plains
Grassland
- American Bison
- Black-tailed Praire Dog
- Elk
- Pronghorn Antelope

Rocky Mountain Canyonlands
Forest + Riparian
- Bat
- Bighorn Sheep
- Black Bear
- Mountain Lion
- Lynx
- Mountain Goat
- Red Wolf

● Indicates new species



Bergen County Zoological Park

JONES JONES ARCHITECTS LANDSCAPE ARCHITECTS PLANNERS

SOUTH AMERICAN REGIONS

LLANOS
GRASSLAND + FOREST EDGE

- Caiman
- Capybara
- Coatimundi
- Harpy Eagle
- Jaguar
- Macaw
- Monkeys
- Ocelot
- Red Brocket
- Spectacled Bear

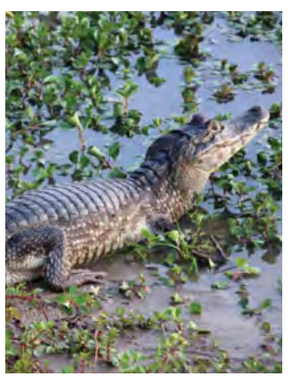
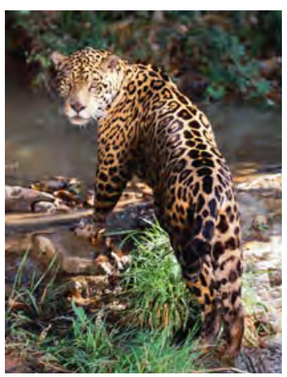
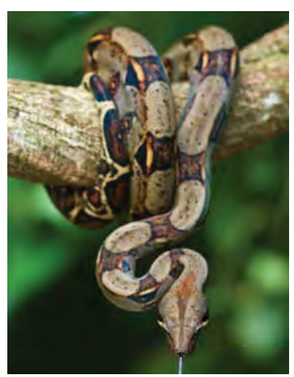
MATA ATLANTICA & PANTANAL
FOREST & WETLAND

- Baird's Tapir
- Black Crowned Night Heron
- Boa Constrictor
- Giant Anteater
- Greater Rhea
- Nutria
- Roseate Spoonbill
- Scarlet Ibis

ANDES
MONTANE

- Chilean Flamingo
- Condor
- Guanaco
- Penguin

● Indicates new species

Bergen County Zoological Park
JONES JONES ARCHITECTS LANDSCAPE ARCHITECTS PLANNERS

	Phase 1	Phase 2	Phase 3	Phase 4	As Funded	Future
New Jersey						
New Jersey Meadowlands Flyway		2-B				
Walk-Through Aviary		2-B				
River Otter		2-B				
New Jersey Forestlands						x
Bald Eagle						x
Fox						x
Entry Complex						
Entry Complex + Gift Shop					x	
Education Center					x	
Welcome Plaza					x	
Events Center					x	
North America						
Bergen Dutch Farmyard						
Activity Meadow				4-B		
Farmyard				4-A		
Homestead				4-A		
Horses				4-A		
Pony Rides				4-A		
Sheep				4-A		
Great Plains						
Bison		2-A				
Elk		2-A				
Prairie Dog				4-B		
Pronghorn Antelope		2-A				
Red Wolf				4-B		
Rocky Mountain Canyonlands						
Bat		2-A				
Bighorn Sheep		2-A				
Black Bear		2-A				
Lynx		2-A				
Mountain Goat		2-A				
Mountain Lion		2-A				

	Phase 1	Phase 2	Phase 3	Phase 4	As Funded	Future
South America						
LLanos						
Caiman	1-A					
Capybara			3-B			
Coatimundi	1-A					
Harpy Eagle						x
Jaguar	1-A					
Macaw						x
Monkeys						x
Ocelot	1-A					
Red Brocket			3-B			
Spectacled Bear	1-A					
Mata Atlantica & Pantanal						
Giant Anteater	1-B					
Flight Aviary			3-B			
Nutria	1-B					
Tapir			3-B			
Andes						
Condor	1-B					
Guanaco	1-B					
Penguin	1-B					
Amphitheater	1-B					
Tree Top Nature Trail	1-B					
Additional Facilities						
Discovery Center						x
Restaurant						x
Park Road/Parking Realignment			3-A/B			
Future Quarantine						x
Future Hospital						x
Train Service			3-A			

Overview
&
Profile

Bergen County Ramapo Mountain Open Space System

August 2009

MC Project #0800529G

I OVERVIEW

II RAMAPO MOUNTAIN OPEN SPACE SYSTEM

III NATURAL RESOURCES

IV CULTURAL RESOURCES

V TRANSPORTATION AND ACCESS

I. OVERVIEW

Approximately 25 miles from Midtown Manhattan lies a largely undisturbed forested mountainside known as Ramapo Mountain. Over the years Bergen County New Jersey has acquired approximately 4,500 acres of Ramapo Mountain for open space preservation purposes.

Ramapo Mountain is included within the New York - New Jersey Highlands physiographic province which is part of a geological formation composed mostly of Precambrian igneous and metamorphic rock. Geographically, the region is a component of the Appalachian Mountain chain. The Highlands physiographic province extends in New Jersey from the Delaware River near Musconetcong Mountain, northeast through the Skylands Region of New Jersey crossing over into New York.

Bergen County's Ramapo Mountain Open Space System is a portion of a large preservation area of contiguous lands owned by State, County, water authorities and local municipalities located along the New Jersey New/York State border in the Counties of Bergen, Passaic, Orange and Rockland. The publically owned and protected lands adjacent to the Bergen County Ramapo Mountain System include: Borough of Oakland Park, Mahwah Township Park, Ringwood State Park, Ramapo Mountain State Forest, Wawayanda State Park, Tranquility Ridge County Park, Norvin Green State Forest, Long Pond Iron Works State Park, Wanaque Wildlife Management Area, Wanaque Reservoir and surrounding lands (North Jersey District Water Supply Commission), Sterling Forest State Park, Palisades Interstate Park and Harriman State Park. In total there are approximately 19 square miles of open space along the New Jersey/New York border.

The regional greenway system is part of the Metropolitan Greensward which is the Regional Plan Association's (RPA) vision of a system of protected lands in the New York/New Jersey/Connecticut metropolitan region. The Greensward is significant in the fact that is located within the most densely populated metropolitan area of the United States. The regional greenway creates an area for aquifer protection, habitat preservation, recreational opportunities and aesthetically pleasing viewsheds.

The Bergen County Ramapo Mountain Open Space System is comprised of four contiguous lands and/or areas owned and managed by Bergen County and include Ramapo Valley County Reservation, Camp Glen Gray, Camp Tamarack, and Camp Todd. The entire System encompasses approximately 4,500 acres of preserved lands which are contiguous with other publically owned and preserved lands owned by the State of New Jersey and local municipalities.

The property on Ramapo Mountain owned by Bergen County is essentially undeveloped save for the park entrance area and Camp Glen Gray. The most popular and frequent use in the Reservation is hiking. There are a number of trails which are administered and managed by the New York – New Jersey Trails Conference. The Conference has its headquarters on Ramapo Valley Road in Mahwah.

Ramapo Valley County Reservation has elevations ranging from the Ramapo Valley floor of approximately 250 ft above sea level to the crest of Bald Mountain in the northern portion of the Reservation at approximately 1184 ft. The Ramapo Mountains are characterized by a small chain of north-south trending parallel ridges with individual peaks in Bergen and Passaic counties, New Jersey and extending into Rockland County, New York. They are bound on the east by the Ramapo River Valley, where they form the eastern boundary of the Highlands Physiographic Province. In Bergen County, the Ramapo Mountains are fragmented by a series of west to east trending streams that drain to the Ramapo River and form small valleys perpendicular to the trend of the ridges. Several of these streams are dammed to form ponds or reservoirs.

RAMAPO MOUNTAIN OPEN SPACE SYSTEM

II RAMAPO MOUNTAIN OPEN SPACE SYSTEM

Ramapo Valley County Reservation

The Ramapo Valley County Reservation core property, the parking lot for which is located in Mahwah along Ramapo Valley Road (US 202) about two miles south of NJ Route 17, encompasses 3313 acres and offers 19.7 miles of challenging hiking trails, areas for permitted tent camping and casual strolling areas. The Reservation's trails connect with those in Ringwood State Park to the west, Ramapo Mountain State Forest to the southwest, and Camp Glen Gray to the south. The majority of the Reservation has been left in its natural wild state, and is mostly hilly forming part of the eastern tier of the Ramapos. Only the strolling areas immediately adjacent to the parking lot on US 202 and Scarlet Oak Pond (a former quarry) have been substantially impacted by past human activities and more recently by intensive recreational use. Restroom facilities and picnic areas are also available in the vicinity of the parking lot. Fishing is permitted with a NJ State license in the Reservations two reservoirs, Scarlet Oak Pond and McMillan Reservoir, and the Ramapo River located along the parks eastern boundary.

The Reservation was a portion of the former A. B. Darling Estate (circa 1864). As owner of a Fifth Avenue Hotel in New York City, Darling used a good portion of the Reservation and adjacent valley areas as a dairy farm. George Crocker purchased the majority of the lands in 1900, and subsequently sold them to Emerson McMillan who then sold the lands to the Roman Catholic Diocese of Newark.

Camp Glen Gray

Camp Glen Gray is a camping facility located along the border of the municipalities of Oakland and Mahwah, located off of State Routes 202 and 208 and Interstate Route 287. It was originally developed as a Boy Scout camp in 1917 and is named for one of its founders, Frank F. Gray.

In January of 2002, the 750-acre wooded camp became part of Bergen County's park system. The park is managed by the Friends of Glen Gray and use of the facilities requires a reservation and applicable use fees. The park offers hiking trails, fishing and boating opportunities on Lake Vreeland and camping. Cabins, lean-tos and tent sites are available for camping. A sports field, campfire ring and an amphitheater provide places to hold outdoor events. A Dining Hall (with a kitchen) may be used for indoor events and meals. Bathroom facilities at campsites consist of latrines in keeping with the camp's rustic mode. Toilets (in warm weather) are located off the parking lot.

Camp Tamarack Area

The Camp Tamarack Area was a former Boy Scout camp encompassing 182 acres of mostly unimproved woodlands along a ridgeline of the Ramapo Mountains. The entrance to the former camp is along the eastern side of Skyline Drive in the Borough of Oakland. The camp abuts Camp Glen Gray to the north, Camp Todd to the east and Ramapo Mountain State Forest to the west and south. No facilities are available in the area; however, footprints of the former camp structures are evident. The Camp Tamarack Area offers hiking trails connected to adjacent State and County owned lands and fishing opportunities in Lake Tamarack.

Camp Todd Area

The Camp Todd Area was a former Boy Scout camp encompassing 73 acres of mostly unimproved woodlands along a ridgeline of the Ramapo Mountains. The entrance to the former camp is along the eastern side of Skyline Drive in the Borough of Oakland. The camp area abuts Oakland parkland to the north, Camp Tamarack to the west and privately owned properties to the east and south. The Camp Todd Area offers hiking trails connected to adjacent State and County owned lands and fishing opportunities in Todd Lake. The Camp Todd Area also contains ecologically significant features such a trout production stream and several vernal pools.

Nearby County Parks:

Campgaw Mountain County Reservation

Campgaw Mountain Reservation is a 1351 acre park located mostly within Mahwah, but includes some areas of Oakland and Franklin Lakes. The Reservation is bordered by US Route 202 to the west, Interstate 287 to the east and private properties to the north and south. The Reservation includes a ski area located on the Reservation's highest peak, Campgaw Mountain, 735 feet above sea level. The ski area has two 2-person chairlifts and one magic carpet suitable for novice skiers. The area also has opened up a section of the smaller hill for patrons to rent inner tubes and slide down to the bottom. The area also has a small lodge, snack bar, and equipment rental shop.
The Reservation was originally an U.S. Army Nike Missile station which was created in 1955 for the defense of the New York Metropolitan Area from strategic bombers. In 1959, the site was upgraded to house Nike-Hercules Missiles with increased range, speed and payload characteristics. The missile site closed in June 1971.

Saddle Ridge Riding Stables

This area which is part of Campgaw Reservation offers County residents the opportunity to board horses, take riding lessons, and utilize indoor and outdoor riding facilities. The Park is part of and situated adjacent to the southeastern boundary of Campgaw Mountain Reservation, and is operated by a concession. As with Campgaw, the facility was originally a portion of the U.S. Army Nike Missile station. The stables are the old barracks.

NATURAL RESOURCES

III NATURAL RESOURCES

Maser Consulting P.A. along with The Regional Plan Association (RPA) was retained by Bergen County to develop an *Open Space Management Plan* (OSMP) for the Ramapo Mountains: Ramapo Valley County Reservation, including the area of Camp Glen Gray, Camp Tamarack, and Camp Todd. The four properties total approximately 4,500 acres and are characterized by extensive areas of natural landscape including wetlands, vernal pools, forest, rock outcrops, and rare plant and animal habitat. The County desires that the OSMP be "nature-based". Therefore a natural resource inventory and assessment was a fundamental part of the effort, resulting in the preparation of the *Ramapo Mountain Open Space System Natural Inventory and Assessment: Ramapo Valley County Reservation* (NRIA).

Background information was compiled from online resources and published information as cited throughout the NRIA. Focus was given to particular areas of interest, including the region's geology, soils, surface and groundwater resources, botanical and wildlife resources. A series of field trips were conducted by team members from Maser Consulting P.A. during which the botanical and wildlife resources, bedrock and surficial geology, and wetlands including vernal pools were identified and located. Information regarding rare plants and animals was obtained from the NJDEP Natural Heritage Program. Additional information on the botanical resources was provided by local botanists, and also obtained from web-based sources.

GIS-based maps of selected natural resources and features including, topography, bedrock geology, surficial geology, soils, watersheds, surface water features, aquifers, vegetation, wetlands, and environmentally sensitive features were prepared. The combined knowledge of field and mapped conditions was used to perform a constraints and opportunities analysis that will serve as a guide for the preparation of the *Ramapo Mountain Open Space Management Plan*. The following summarizes the results of the natural resource inventory. The full Natural Resource Inventory and Assessment along with Appendices and references is available in a separate document.

The natural resource inventory provides detailed information covering a broad array of natural resources. This information was applied in an assessment of potential constraints and opportunities for use of the resources as part of the public access and recreational benefits of this public open space. In considering the various approaches that could be used as a basis for the assessment of resources and after review of alternatives, this assessment of constraints and opportunities was based on a subwatershed approach. This approach anchors the assessment in a natural landscape framework, as well as a regulatory framework, resulting in the demarcation of the Reservation into four individual assessment or management areas. These are proposed as the "management zones" for which "management prescriptions" will be identified subsequently in the OSMP.

A brief overview of the individual subwatersheds is presented below followed by a list of potential constraints and opportunities based upon field observations and information contained in the inventory. ***Potential constraints*** are defined for the purposes of this assessment as environmental features (e.g., wetlands and steep slopes) or other features (access) that could impact the placement and use of recreational development such as trails, signs, buildings,

parking lots and other manmade structures. ***Opportunities*** are defined as environmental features (e.g., vernal pools and flat topography) and other features (roads, existing structures) that provide one or more favorable circumstances to achieve goals of County open space planning including goals for recreation and/or education. To facilitate communication regarding the subwatersheds, vernacular names have been applied to them based upon one of the prominent drainages in the subwatershed that drains to the Ramapo River.

The Ramapo River (above 74d 11m 00s) subwatershed, referred to as the "Stag Brook" subwatershed, is located in the northernmost region of the Ramapo Mountain Open Space Management Plan project area. This subwatershed encompasses a total of 6,504.18 acres. Approximately 869.85 acres of the project area are included within this subwatershed. The primary waterway present within the subwatershed is Stag Brook which ultimately flows to the Ramapo River. *Potential constraints* include: remote portions with limited access; lack of maintained trail network; lack of parking at trail heads; there are two non-contiguous portions of the subwatershed in the management area; significant topographic relief; riparian corridor in the lower subwatershed; stream crossings; wetlands and buffers in the upper subwatershed; vernal pools and buffers; residential community north of and adjacent to the county open spaces; utility corridors and rights-of-way; and views interrupted by utility easements. *Opportunities* include: Bald Mountain, highest elevation (1,164 ft) in the Reservation; wetlands and vernal pools for interpretive program; coordination of resource management with adjacent community; additional area for new trail network; views: Stag Hill Road – Stag Brook corridor/gorge.

The Ramapo River (above Fyke Brook to 74d 11m 00s) subwatershed, referred to as the "MacMillan Brook" subwatershed, includes the largest number of major rivers and ponds in the project area. Approximately 1,428.99 acres of the Ramapo Mountain Open Space Management Plan project site are included in the 10,809.65 total acres of the subwatershed. Two different water systems are located within the subwatershed: MacMillan Brook and Havemeyer Brook, both of which drain to the Ramapo River. The headwaters of the two waterways begin within the boundary of the Ramapo Mountain Open Space Management Plan project area. MacMillan Brook flows entirely within the grounds of the Reservation, while Havemeyer Brook connects to the Ramapo River just outside of the Reservation's boundary. Both waterways have reservoirs, or artificial ponds created with dams for water storage, named after the streams that feed them. Scarlet Oak Pond, located within the eastern portion of the subwatershed, drains directly to the Ramapo River. *Potential constraints* include: steep slopes and rock outcrops; utility corridor and right-of-way; riparian corridors, buffers, and stream crossings; wetlands and buffers; vernal pools and buffers; flooding along Ramapo River. *Opportunities* include: public parking and restrooms; maintained trails; views of pond, reservoir, and river; trail access to Scarlet Oak Pond and MacMillan Reservoir for education; trail access to the Ramapo River; trail access to wetlands and riparian corridors; educational field trips along Havemeyer Hollow; top rope/bouldering, rock climbing (Green Trail); broad ridge-top views east to Newark Basin and to Manhattan; views – Hawk Rock; Green Trail to Lake Henry & Ramapo College Campus; Orange trail – waterfall, MacMillan Brook, MacMillan reservoir; Blue trail – Ramapo River Valley; view of mature Forested Wetland on floodplain of Ramapo River

The Ramapo River (Bear Swamp Brook through Fyke Brook) subwatershed, referred to as Bear Swamp Brook subwatershed, is approximately 13,827.74 acres in size. The park is located

within 1,105.59 acres of the subwatershed. Only one main waterway, Bear Swamp Brook, and its associated tributaries, flows through the subwatershed. Bear Swamp Brook briefly flows through a small portion of the Ramapo Mountain Open Space Management Plan area before flowing through Bear Swamp Lake located outside the Park's boundaries and reentering the project area. Multiple sources outside the Park contribute to the waterway, including Cannonball Lake. Bear Swamp Brook ultimately drains to the Ramapo River, located just outside the project area's limits. *Potential constraints* include: two non-contiguous portions of the management area separated by state land; no parking access; steep slopes and rock outcrops; utility corridor and right-of-way; riparian corridors, buffer, and stream crossing; wetlands and buffers; vernal pools and buffers. *Opportunities* include: existing trails; trail access to wetlands, riparian corridors, and vernal pools for education; trail access to and view of large glacial erratic; areas for creating parking off Bear Swamp Road; new trail heads; top rope/bouldering, rock climbing (Trails: Orange, Yellow, Yellow/Silver).

The Ramapo River (Crystal Lake Brook to Bear Swamp Brook) subwatershed, referred to as "Fox Brook" subwatershed, is located in the southernmost region of the project area. The overall subwatershed includes 17,868.95 acres; however, only 1,179.50 acres are included within the project site. Fox Brook is located in the northern portion of the subwatershed and is located within Mahwah Township, Bergen County. The waterway flows in a west to east direction through the project area, and drains to the Ramapo River, located outside of the project area. Lake Vreeland, an artificial lake, is located along the waterway. Located within the same watershed as Fox Brook and Lake Vreeland, but located within Oakland instead of Mahwah are Lake Tamarack and Todd Lake. These two artificial lakes are located along tributaries of the Ramapo River. *Potential constraints* include: several subareas barely contiguous and surrounded by state and private lands; cleanup of abandoned scout campgrounds at Camp Tamarack and Camp Todd areas; vehicular access to Tamarack and Todd camp areas only from west through easement on state land; Common Reed invasion at Lake Tamarack; shallow water and dense pond vegetation at Todd Lake; riparian corridors, buffers, and stream crossings, wetlands and buffers; vernal pools and buffers. *Opportunities* include: three open water ponds (Lake Tamarack, Todd Lake, Lake Vreeland; functional scout campground at Glen Gray and Lake Vreeland; vehicular access; underutilized, abandoned scout campgrounds at Camp Tamarack and Camp Todd areas; trail access to wetlands, riparian corridors, and vernal pools for education; areas for new trail network; areas for creating parking for western portion of the Reservation; more intensive recreation in areas impacted by former uses including camping, boating; expansion of winter camping and group camping at Glen Gray; views: Yellow and White Trails – Manhattan/Verrazano Bridge; Green Trail – Bear Swamp Lake; green Trail – Lake Vreeland; Yellow Trail – Ramapo Valley County Reservation.

The four subwatershed study areas, identified as a result of the resource inventory and assessment, are proposed for use as the *management "zones"* for preparation of the OSMP. These zones, based on natural landscape features and regulatory surface water boundaries, are a logical and "nature-based" approach to preparation of the OSMP. As part of this Plan, the existing trails system within each management zone, for example, could be assessed for trail coverage, linkage, proximity to sensitive resources, and other attributes. Management "*prescriptions*" for each of the management zones can be developed from a combination of the results of the resource inventory and assessment, additional observations from each

subwatershed area, and linkage to the goals for each area identified as part of the planning process. Example prescriptions for a particular management zone may include, for example: eradicate "Common Reed", an invasive exotic plant species associated with Lake Tamarack; control or eradicate "Siltgrass", an invasive exotic grass that invades natural habitat areas along trails; placement of new trails should avoid sensitive vernal pool habitats; existing trail adjacent to sensitive vernal pool habitat should be relocated to avoid impacts but also provide interpretive and educational opportunities regarding importance of vernal pools.

Each of the four subwatershed management zones should have a *zone-specific programmatic management plan*, including identified programs (e.g., administrative, resource management, access, recreation, and education programs) with listed goals, policies, actions, schedules, and estimated costs. This could be accomplished with separate plans for each management zone or with a single, Reservation-wide plan containing portions with common programs and related goals and portions with individual management zone programs and related goals.

Other key finds of the Natural Resource Inventory and Assessment of the Ramapo Mountain Open Space System include the following:

Water Features and Water Quality

Ramapo River

The Ramapo River is the main waterway that receives drainage from all waterways located within the Ramapo Mountain Open Space Management Plan project area. It is located along the eastern edge of the Ramapo Mountains and it flows in a north to south direction along eastern boundary of the project limits. As one of the four main rivers within the Pompton, Pequannock, Wanaque, Ramapo Watershed, the river begins in New York before flowing into New Jersey and converging with the Pequannock River to form the Pompton River.

According to the 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9), the Ramapo River is classified as a freshwater, non-trout (FW2-NT) waterway from New Jersey State line until it's confluence with Fox Brook. From its confluence with Fox Brook to Patriots Way bridge, the Ramapo River is classified as a freshwater, non-trout, category 1 (FW-NT/C1) waterway.

Stag Brook

Stag Brook is the northernmost waterway, located in the Stag Brook subwatershed (HUC 14 No. 02030103100010). The 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9) classifies Stag Brook (also known as Clove Brook within the Standards) as a freshwater, trout producing category one (FW2-TP/C1) waterway.

Havemeyer Brook

Havemeyer Brook is located within the MacMillan Brook subwatershed. According to the 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9), the waterway is classified as a freshwater, trout producing category one (FW2-TP/C1) waterway.

MacMillan Brook

MacMillan Brook is located in the MacMillan Brook subwatershed (HUC 14 No. 0230103100030) in addition to Havemeyer Brook. This waterway is not classified by the 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9). In these cases, the waterway is given the same classification as the receiving waterway. Because MacMillan Brook drains to the Ramapo River and the Ramapo River is classified as a FW2-NT waterway at the location of the confluence, MacMillan Brook is also classified as a FW2-NT waterway. To support this, the NJDEP iMap also classifies the waterway as FW2-NT.

Bear Swamp Brook

Bear Swamp Brook (Fig. 8) is located within the Bear Swamp Brook subwatershed (HUC14 No. 0230103100040). The waterway originates from Cranberry Pond, located in the Village of Sloatsburg, New York The 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9) classify Stag Brook (also known as Clove Brook) as a freshwater, trout producing category one (FW2-TP/C1) waterway.

Fox Brook

Fox Brook is located within the Fox Brook subwatershed and is classified as a Freshwater Non-trout (FW2-NT) waterway, as per the 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9).

At least three waterfalls are located in the Reservation, including Bear Swamp Brook Falls #1, Swamp Brook Falls #2 and Buttercup Falls (New Jersey Waterfalls 1999).

Ponds, lakes and reservoirs located within the project area include the followings:

Macmillan Reservoir

This waterbody is a 20-acre lake located along the MacMillan Brook. Once used to supply the Crocker Mansion on the far side of Ramapo Valley Road, the Bergen County Department of Parks-owned reservoir is primarily used for recreational purposes. The dam used to create MacMillan Reservoir is a gravity dam constructed out of compacted soil. It is approximately 21 feet high and 265 feet across. Maximum discharge is 408 cubic feet per second. Normal storage is 141 acre feet. It drains an area of 0.75 square miles. (Unknown Accessed August 13, 2009)

Havemeyer Reservoir

This reservoir is a small waterbody located within the same HUC 14 subwatershed as MacMillan Reservoir along the Havemeyer Brook.

Scarlet Oak Pond

Scarlet Oak Pond is located in the MacMillan Brook subwatershed. It is a former gravel quarry (NYNJTC 2009) located in the floodplain of Ramapo River. This pond is classified by the NJDEP Surface Water Quality Standards (2008) as a freshwater, trout maintenance (FW2-TM) waterway.

Lake Vreeland
This artificial lake is located within Camp Glen Gray. It was formed in the early days of the camp when the Kidde-Miller dam was constructed. It is used primarily for recreational purposes (Camp Glen Gray 2009).

Lake Tamarack
Lake Tamarack is located along an unnamed tributary of Ramapo River. It is owned by Bergen County and is primarily used for recreational purposes. Created by dam approximately 11 feet high and 200 feet long, the embankment dam holds approximately 98 acre feet. Maximum discharge is approximately 117 cubic feet per second and drains approximately 0.37 square miles (Unknown Accessed August 13, 2009)

Todd Lake
Todd Lake is located in Camp Todd, a former Boy Scout camp.

Vegetation

Regarding vegetation cover types, the following general groups are identified by NJDEP:

- Uplands:
  - Coniferous and Deciduous Brush/Shrubland
  - Deciduous Forest
  - Mixed Deciduous and Coniferous Forest
  - Old Field
- Wetlands:
  - Deciduous Scrub/Shrub Wetlands
  - Deciduous Wooded Wetlands
  - Mixed Wooded Wetlands
  - Herbaceous Wetlands

Table 1 includes the acres by each vegetation type in the Ramapo Mountain Open Space System.

Table 1. Total acres within the Ramapo Mountain Open Space System for each Land Use/Land Cover type from 2002 NJDEP data.

TYPE02	LABEL02	ACRES
AGRICULTURE	CROPLAND AND PASTURELAND	20.93
BARREN LAND	ALTERED LANDS	0.62
BARREN LAND	TRANSITIONAL AREAS	4.31
FOREST	CONIFEROUS BRUSH/SHRUBLAND	4.07
FOREST	DECIDUOUS BRUSH/SHRUBLAND	10.22
FOREST	DECIDUOUS FOREST (>50% CROWN CLOSURE)	3,985.81
FOREST	DECIDUOUS FOREST (10-50% CROWN CLOSURE)	90.01
FOREST	MIXED FOREST (>50% CONIFEROUS WITH >50% CROWN CLOSURE)	2.89
FOREST	OLD FIELD (< 25% BRUSH COVERED)	4.16
URBAN	OTHER URBAN OR BUILT-UP LAND	13.61

URBAN	RECREATIONAL LAND	23.82
URBAN	RESIDENTIAL, HIGH DENSITY OR MULTIPLE DWELLING	6.25
URBAN	RESIDENTIAL, RURAL, SINGLE UNIT	30.31
URBAN	RESIDENTIAL, SINGLE UNIT, LOW DENSITY	0.98
URBAN	TRANSPORTATION/COMMUNICATION/UTILITIES	2.23
URBAN	UPLAND RIGHTS-OF-WAY UNDEVELOPED	30.67
WATER	ARTIFICIAL LAKES	20.29
WATER	BRIDGE OVER WATER	0.03
WATER	NATURAL LAKES	28.43
WATER	STREAMS AND CANALS	14.87
WETLANDS	DECIDUOUS SCRUB/SHRUB WETLANDS	0.77
WETLANDS	DECIDUOUS WOODED WETLANDS	283.48
WETLANDS	DISTURBED WETLANDS (MODIFIED)	0.15
WETLANDS	HERBACEOUS WETLANDS	0.44
WETLANDS	MIXED WOODED WETLANDS (CONIFEROUS DOM.)	4.01
WETLANDS	WETLAND RIGHTS-OF-WAY	0.60

Threatened and Endangered Species

The Ramapo Mountain Open Space System is documented habitat for a number of State-listed threatened and endangered species. Threatened and endangered species are identified as such due to rarity within the state. An endangered animal species is defined as "one whose prospects for survival within the state are in immediate danger due to one or many factors – loss of habitat, over exploitation, predation, competition, disease" and requires immediate assistance or extinction or extirpation from the State will likely follow (NJDEP 2008). A threatened animal species is defined as "a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate" (NJDEP 2008). State Endangered plant species are classified under New Jersey's Endangered Plant Species List at N.J.S.A. 131B-15.151 et seq. Such species and their habitats are afforded legal protection through various land use laws in New Jersey, such as the Freshwater Wetlands Protection Act.

Plants

Two mosses and five vascular plants listed as Endangered by the State of New Jersey (Table 2) have been observed/reported from Mahwah Township. At least one of these (Torrey's Mountain Mint) is known from Ramapo Valley County Reservation.

Table 2. State listed threatened, endangered plant and rare species that potentially occur within the Ramapo Mountain Open Space System according to the Natural Heritage Program.

Common Name	Scientific Name	State Status	Regional Status	Global Rank	State Rank	Municipality
Nonvascular Plant						
Sphagnum	*Sphagnum contorum*	E	LP, HL	G5	S1	M
Sphagnum	*Sphagnum majus* ssp. *nonvegicum*	E	LP, HL	G5/GNR	S1.1	M
Vascular Plant						
Small-flower Halfchaff Sedge	*Hemicarpha micrantha*	E	LP, HL	G5	S1	M
Basil Mountain-mint	*Pycnanthemum clinopodioides*	E	LP, HL	G2	S1	M
Torrey's Mountin-mint	*Pycnanthemum torrei*	E	LP, HL	G2	S1	M
Torrey's Mountain-mint	*Pycnanthemum torrei*	E	LP, HL	G2	S1	M
Torrey's Bulrush	*Schoenoplectus torreyl*	E	LP, HL	G5	S1	O
State Status:	*E= endangered*					

Regional Status: LP = taxa listed as endangered or threatened by the Pinelands Commission within the Pinelands
HL = tax or ecological communities protected by the Highlands Water Protection and Planning Act

Global Rank: G2 = imperiled because of rarity or because some factor is making it very vulnerable
G5= demonstrably secure globally, G4= apparently secure globally
GNR = Species has not yet been ranked

State Rank: S1= critically imperiled in NJ because of rarity, S2=imperiled in NJ because of rarity,
S3= rare in state (21-100 occurrences), .1 = elements documented from a single location

Municipality: M= Mahwah, O= Oakland

Animals

Various sources were consulted to identify the potential occurrence of threatened and endangered species and/or their habitats within the Ramapo Mountain Open Space System. The most authoritative list of such species resulted from a database search of the Natural Heritage Program and that of the New Jersey Landscape Project version 3.0 (Lord 2009). Due to the diversity of habitats found throughout the Ramapo Mountain study area, a variety of protected birds, reptiles, mammals and invertebrates have been identified as occurring or potentially occurring within

these managed lands, according to the municipalities in which they are mapped. Table 3 below lists these species, their state and global statuses and the municipality within which they occur.

Table 3. State threatened and endangered species that may potentially occur within the Ramapo Mountain Open Space System (Lord 2009a,b)

Common Name	Scientific Name	State Status	Global Rank	State Rank	Municipality
Barred Owl	*Strix varia*	T/T	G5	S2B, S2N	M, O
Black-Crowned Night-Heron*	*Nycticorax nycticorax*	T/SC	G5	S2B, S3N	M, R
Bobcat	*Lynx rufus*	E	G5	S1	M, O
Cooper's Hawk	*Accipiter cooperii*	T/S	G5	S2B, S4N	M, O, R
Eastern Lampmussel	*Lampsilis radiata*	T	G5	S2	M, O
Grasshopper Sparrow	*Ammodramus savannarum*	T/SC	G5	S2B, S3N	M
Red-headed Woodpecker	*Melanerpes erythrocephalus*	T/T	G5	S2B, S2N	M, R
Red-shouldered Hawk	*Buteo lineatus*	E/T	G5	S1B, S2N	M, O, R
Timber Rattlesnake	*Crotalus h. horridus*	E	G4T4	S1	M, O, R
Triangle Floater	*Alasmidonta undulata*	T	G4	S2	M, O
Wood Turtle	*Glyptemys insculpta*	T	G4	S2	M, O
Yellow-Crowned Night-Heron*	*Nyctanassa violacea*	T/T	G5	S2B	M, R

* indicates mapped foraging habitat only

State Status: E= endangered, T= threatened, SC= special concern, S= stable

(Status separated by / indicates breeding population and non-breeding population, resp.)

Global Rank: G5= demonstrably secure globally, G4= apparently secure globally,

State Rank: S1= critically imperiled in NJ because of rarity, S2=imperiled in NJ because of rarity,

S3= rare in state (21-100 occurrences), S4= apparently secure in state (B= breeding, N= non-breeding)

Municipality: M= Mahwah, O= Oakland, R= Ramsey

Critical Habitats for Threatened and Endangered Species

Critical wildlife habitats serve essential roles in ecosystem functions such as habitats for threatened and/or endangered species, migratory and breeding birds, spawning fish, corridors for wildlife movement, etc. Foraging habitat for Black-crowned Night-Heron (*Nycticorax nycticorax*) and Yellow-crowned Night-Heron (*Nyctanassa violacea*) are noted in the municipalities of Mahwah and Ramsey; however, there are few such suitable wetlands within the study area (Lord 2009). Those wetlands that had been mapped as suitable habitat for the night-herons appear to lie outside of the study area. Similarly, there appear to be no expansive grasslands within the Ramapo Mountain Open Space System suitable for the Grasshopper Sparrow (*Ammodramus savannarum*). This species of grassland bird is more likely to be found

in agricultural portions of Mahwah Township. Despite this, there are still numerous land cover types that can be classified as critical habitat for threatened and endangered species.

Overall, the forested wetlands within the management area are the most likely habitats for Barred Owl (*Strix varia*), Cooper's Hawk (*Accipiter cooperi*) and Red-shouldered Hawk (*Buteo lineatus*). Many of these forested wetlands are contiguous with extensive, relatively unfragmented upland forest, increasing the suitability of these sites for the protected raptors. The streams and rivers may be potential breeding habitat for Wood Turtles (*Glyptemys insculpta*) and the Eastern Lampmussel (*Lampsilis radiata*) and Triangle Floater (*Alasmidonta undulata*), listed species of freshwater mussels. Thus, the forest cover of these wetlands and high water quality of the streams are important factors in maintaining habitat suitable for protected species. Furthermore, Timber Rattlesnake (*Crotalus h. horridus*) and Bobcat (*Felix rufus*) rely on the shelter of rock outcrops on the talus slopes found throughout the Ramapo Mountain Open Space Management System. Thus, mountainous peaks and their steep slopes are important to the continuing existence of these species.

In addition, stands of mature forest, whether wetland or upland, are valuable as habitat for Bobcat, Timber Rattlesnake, Barred Owl, Cooper's Hawk and Red-shouldered Hawk. Older forests are recognized for a greater diversity of structure, providing more cavities, perches, nest sites and shelters (due to the increased presence of large, fallen logs).

Natural Heritage Priority Sites

One Natural Heritage Priority Site is located within the Ramapo Mountain Open Space Management Plan project area. The Ramapo Valley site is located within Mahwah Township, Bergen County, New Jersey. It encompasses approximately 270 acres within the municipality. According to the Natural Heritage Program response, dated April 2, 2009, the Ramapo Valley Natural Heritage Priority Site is mapped due to the presence of a "globally imperiled plant species as well as two other state imperiled and rare plant species" (Lord 2009). In order to protect and respect the rarity of these species, the Natural Heritage Program does not reveal the exact species or the exact location of the endangered species. The overall mapped boundary includes rocky ledges, steep wooded slopes and contiguous wetland communities, as well as adjacent upland and lowland vegetative species (Lord 2009). Refer to the Environmentally Sensitive Features (Map 12) for the location of the Natural Heritage Priority Site located within the Ramapo Mountain Open Space Plan project area.

Important or Unique Geologic Features

The Ramapo Valley County Reservation is characterized by a number of important geologic features, some of the most prominent of which are listed below:

- Bald Mountain
- Ramapo Fault
- Overturned antiform and related "ridge"
- Overturned synform and related "valley"
- Bedrock outcrops

- Glacial erratic

Preservation of these features and the scenic views associated with them is an important element of the conservation of the natural resources of the Reservation.

Fig. 1. Ramapo Valley County Reservation, Geology. View eastward from Monroe Ridge, across the Ramapo Fault, Ramapo River, and Newark Basin Province toward the Coastal Plain Province and Manhattan in New York City. (05-14-09)

Fig. 2. Ramapo Valley County Reservation, Geology. View of bedrock outcrop composed of gneiss belonging to the Losee Metamorphic Suite, located west of McMillan Reservoir (05-21-09)

Fig. 3. Ramapo Valley County Reservation, Geology. View of glacial erratic located on trail north of Bear Swamp Brook. (05-21-09)

Fig. 4. Ramapo Valley County Reservation, Surface Water Feature. View northwestward of seep in glacial till of drainage, Camp Glen Gray. (05-01-09)

Fig. 5. Ramapo Valley County Reservation, Surface Water Feature. View southwestward of vernal pool wetland with characteristic forested wetland vegetation, dominated by Red Maple (*Acer rubrum*) and Sweep Pepper Bush (*Clethra alnifolia*) as the characteristic understory shrub. (05-01-09)

Fig. 6. Ramapo Valley County Reservation, Ramapo River. View southward downstream along river channel, from bridge across river between visitor parking lot and Scarlet oak Pond. (05-14-09)

Fig. 7. Ramapo Valley County Reservation, Surface Water Feature. View northwestward along first order stream and associated glacial till and Eastern deciduous Forest at Camp Glen Gray. (05-01-09)

Fig. 8. Ramapo Valley County Reservation, Surface Water Feature. View northwestward along stream channel of Bear Swamp Brook and associated riparian forest, including forested wetland (floodplain and bank) and forested upland (slope) vegetation (Eastern Deciduous Forest). (05-21-09)

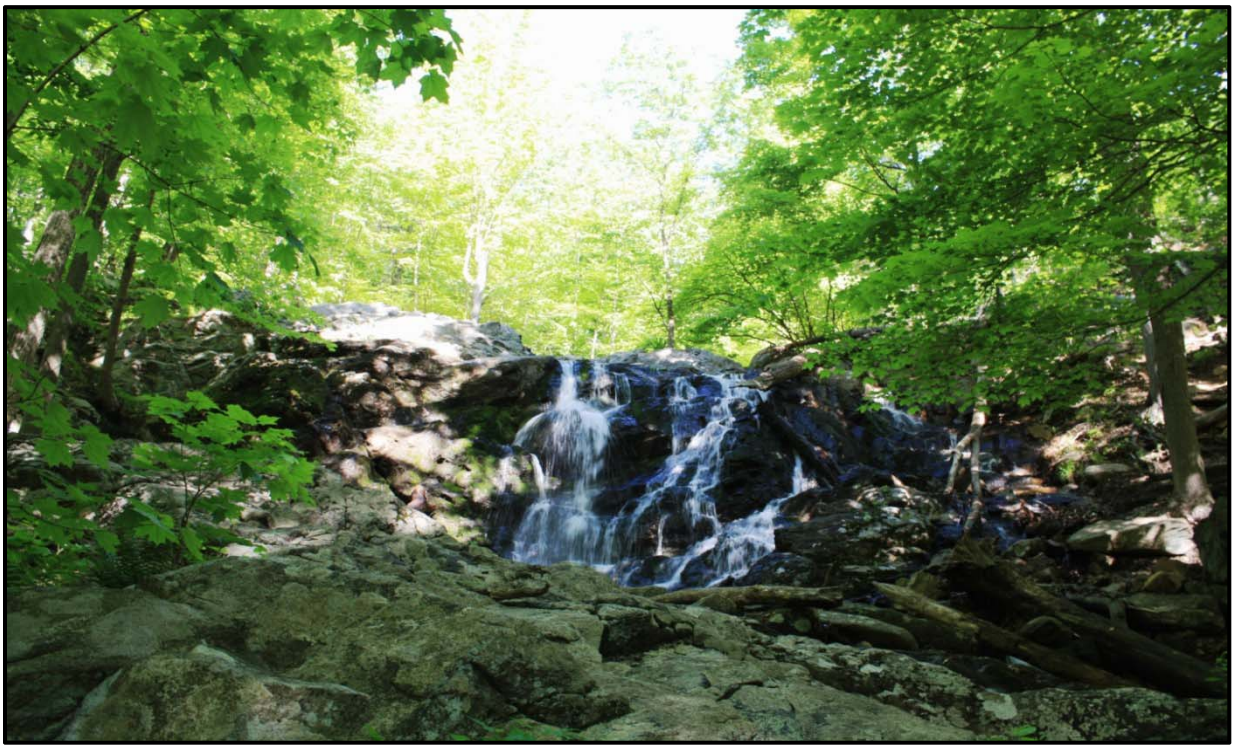


Fig. 9. Ramapo Valley County Reservation, Surface Water Feature. View northward toward waterfall and exposed granitic bedrock of the Byram Intrusive Series in stream channel below McMillan Reservoir. (05-21-09)

Fig. 10. Ramapo Valley County Reservation, Scarlet Oak Pond. View northward across pond, located in the floodplain of the Ramapo River, toward the Ramapo Mountains**.** (05-14-09)

Fig. 11. Ramapo Valley County Reservation, Lake Tamarack. View southeastward across pond toward exposed outcrop of metamorphic rocks covered with Eastern Deciduous Forest. (05-01-09)

Fig. 12. Ramapo Valley County Reservation, Todd Lake. View northwestward across Todd Lake, supporting extensive stand of Spatterdock (*Nuphar lutea*), toward characteristic Eastern Deciduous Forest. (05-01-09)

Fig. 13. Ramapo Valley County Reservation, Upland Vegetation. View southeastward across a Native Perennial Grassland, dominated by Little Bluestem (*Schizachyrium scoparium*), located as a series of "balds" on granitic outcrops, Monroe Ridge in the Ramapo Mountains. (05-14-09)

Fig. 14. Ramapo Valley County Reservation, Upland Vegetation. Herbaceous ruderal vegetation, dominated by Garlic Mustard and other exotic species, along maintained roads and parking areas. (05-01-09)

Fig. 15. Ramapo Valley County Reservation, Upland Vegetation. Upland Scrub occurring as "heath balds" on granitic outcrops, dominated by Black Huckleberry (*Gaylussacia baccata*), Deerberry (*Vaccinium stramineum*), and Blue Ridge Lowbush Blueberry (*Vaccinium pallidum*). (05-14-09)

Fig. 16. Ramapo Valley County Reservation, Upland Vegetation. View southward at Camp Tamarack Area, toward Lake Tamarack and stand of Needle-leaved evergreen Forest, composed of Eastern Hemlock (*Tsuga canadensis*). (05-01-09)

Fig. 17. Ramapo Valley County Reservation, Upland Vegetation. View northward through stand of Eastern Deciduous Forest characterized by a number of trees including Sugar Maple (*Acer saccharum*), Black Birch (*Betula lenta*), Red Oak (*Quercus rubrum*), Red Oak (*Quercus rubrum*), and American Beech (*Fagus grandifolia*). (05-14-09)

Fig. 18. Ramapo Valley County Reservation, Wetland Vegetation. View of typical palustrine wetland in a basin setting with mixed vegetation classes including emergent, scrub/shrub, and forested types in poorly-drained depressional areas of the glaciated landscape, north of Camp Glen Gray. (05-21-09)

Fig. 19. Ramapo Valley County Reservation, Wetland Vegetation. View of typical basin wetland with Palustrine, Scrub-shrub, and Forested Wetland classes of vegetation associated low-lying, poorly drained areas of glaciated landscape, north of Camp Glen Gray. (05-21-09)

Fig. 20. Ramapo Valley County Reservation, Wetland Vegetation. View northward along shoreline of Lake Tamarack, toward a stand of Palustrine Emergent Wetland dominated by Common Reed (*Phragmites australis*), an invasive exotic grass. (05-01-09)

Fig. 21. Ramapo Valley County Reservation, Wetland Vegetation. View westward toward a vernal pool wetland characterized by Palustrine Broadleaved Deciduous Forested Wetland with an understory of Sweep Pepper Bush (*Clethra alnifolia*). (5-01-09)

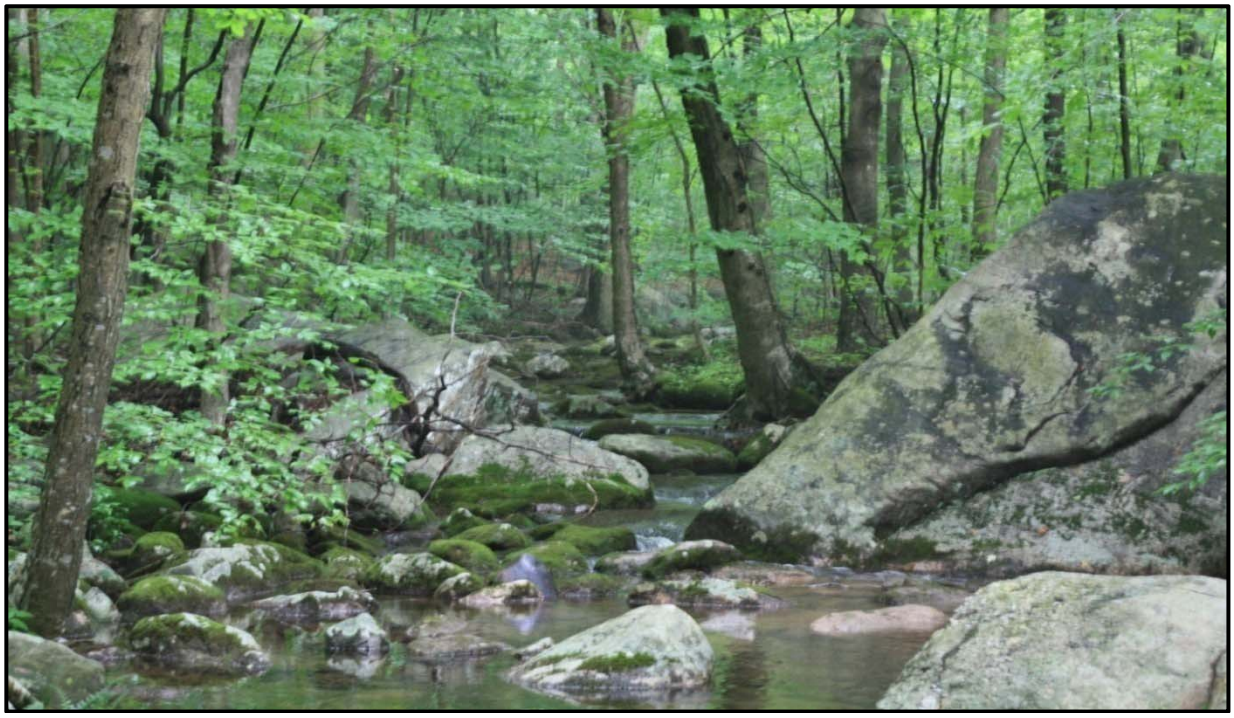


Fig. 22. Ramapo Valley County Reservation, Wetland Vegetation. View northward along Havemeyer Hollow and associated riparian vegetation including Palustrine Broadleaved Deciduous Forested Wetland dominated by Red Maple (*Acer rubrum*). (07-1-09)

Fig. 23. Ramapo Valley County Reservation, Wetland Vegetation. View southward into Palustrine Broadleaved Deciduous Forested Wetland characterized by Red Maple (*Acer rubrum*), River Birch (*Betula nigra*), White Ash (*Fraxinus americana*), and Pin Oak (*Quercus palustris*) on floodplain of the Ramapo River. (05-14-09)

CULTURAL RESOURCES

IV CULTURAL RESOURCES

Methods

A cultural resource inventory was undertaken by Maser Consulting P.A. to compile known historic structures and archaeological sites, both historic and prehistoric within the Ramapo Valley County Reservation and Campgaw Mountain Reservation. All previously identified cultural resources have been included and any information regarding their eligibility for the National or State Register of Historic Places and/or local historical significance is presented. This is intended as an Identification-Level Survey and eligibility statements are preliminary unless based on previous State or Local designations. The following is a summary of the investigations; the complete report is contained in a separate document.

Research included data gathered from a number of sources including: (1) the New Jersey Historic Preservation Office (NJHPO); (2) the New Jersey State Museum (NJSM) and State Library; and, (3) Bergen County Historical Society. New Jersey Historians Paul W. Schopp and T. Robins Brown were also consulted and were especially helpful in providing maps and related research materials.

Background research at NJHPO and NJSM focused on the review of registration, eligibility, and nomination records for previously identified historic and archaeological resources and correspondence related to the evaluation of these identified resources, as well as a review of all related mapping and reporting on these known cultural resources. NJHPO records related to planning surveys and regulatory investigations, as well as information on file in historic context files, were utilized to identify and characterize registered historic and archaeological properties within and surrounding the project area by each resource's location, estimated age and function, and cultural associations. NJHPO copies of regulatory and planning survey reports were also examined, with the locations of these investigations noted on project maps.

Results

A significant number of historic and prehistoric resources have been identified in a planning survey for Bergen County. The Bergen County Historic Sites Survey for Mahwah Township was conducted in 1984-1985. Several archaeological sites were identified in this planning survey but have not been recorded at the NJSM. NJSM records searches included a review of site registration files and maps as well as of published early twentieth century surveys of archaeological resources in New Jersey (Skinner and Schrabish 1913; Spier 1915; Cross 1941). These sources provided information on the types, locations, and sizes of archaeological resources within and surrounding the project area.

Seven recorded prehistoric and contact period archaeological sites were identified within the project area. In the Ramapo Reservation lands, prehistoric archaeological sites show extensive use of rockshelters as habitation sites by Indians during many periods of occupation. There are also several open air camp sites that are recorded. The archaeological evidence within rockshelters and open air campsites indicate a settlement pattern consisting of small camps that were occupied for short periods of time (Lenik 1999). People subsisted from a hunting and gathering economy and sites tend to be small resource procurement or processing camps. These

sites may have been a component of a broader localized settlement pattern focused on the resources of the Ramapo Mountains and various tributaries to the Ramapo River.

Sixteen Historic Sites were identified within the Ramapo and Campgaw Reservations. All periods of Bergen County's development from the historic Contact Period to the estate phase are represented. The majority of historic sites manifested are archaeological components such as building ruins, wall systems, cellar pits and other surface indicators of anthropogenic land use.

The sites identified are as follows:

Table 1. Previously Recorded Resources within the Ramapo Valley County Reservation.

Site Number	Site Name	Site Age/Type	Water Source and Distance (ft)	Eligibility Status
233-136		Prehistoric Contact/ Rockshelter	Halifax Brook, directly west	Previously excavated/ undetermined
233-141		Prehistoric/ Rockshelter	Bear Swamp Brook/ directly southwest	undetermined
28-Be-87	Hohokus Township	Prehistoric/ Rockshelter	Bear Swamp/ unknown	undetermined
28-Be-178	Darlington Rockshelter	Woodland through Contact	Unnamed stream/ 30.0 feet west	Previously excavated/ undetermined
28-Be-179	Darlington Rock House	Late Archaic, Woodland, Contact	Unnamed stream/ 300.0 feet southwest	Previously excavated/ undetermined
32	Darlington Schoolhouse	Historic Building/ c. 1892	N/A	Eligible
233-116	Mountain Cemetery	Historic Site/ 19th and 20th century	N/A	Eligible
233-117	Robert J. Davidson building ruins	Historic Site/ early 20th century	N/A	Eligible
233-118	Jacobus De Groat House	Historic Site/ c. 1800	N/A	undetermined
233-119	Italian Company's Lot	Historic Site/ c. 1860's- late 19th century	N/A	undetermined
233-120	Green Mountain Valley Settlement	Historic Site/ 19th to early 20th century	N/A	undetermined
233-121	Halifax Farm Site	Historic Site/ 19th century	N/A	undetermined
233-122	Nickel Mine	Historic Site/ c.1872-1881	N/A	undetermined
233-123	John C. Demarest/ Cornelius Demarest charcoal production site	Historic Site/ c. 1870's	N/A	undetermined
233-128	MacMillan Reservoir	Historic Site/ c. 1902	N/A	undetermined
233-129	Goat Farm ruins	Historic Site/ 20th century	N/A	undetermined

Prehistoric archaeological sites 233-136 and 233-141 were identified in the Bergen County Historic Sites Survey (1984-85). Site 233-136 is located south of Herman Hill in the Maple Swamp vicinity approximately 200.0 yards south of the Hoeferlin Trail. This shelter is of large size and located in close proximity to three water sources (Halifax Brook, a spring beneath the talus boulders, and the swamp west of the shelter). Musket balls and pipestems were found in the shelter possible evidence of trade with the Dutch settlers (HSS 1984-85). Site 233-141 is located along the north bank of Bear Swamp Brook. This is a small rockshelter with a southwest opening and has close access to fresh water (HSS 1984-85).

Located in former Hohokus, present Mahwah, archaeological site 28-Be-87 was first identified in the Archaeological Survey of New Jersey by Alanson Skinner and Max Schrabisch, 1913. Prehistoric site 28-Be-87 is a rockshelter in the vicinity of MacMillan Reservoir along the northern most end. It is recored as; "A small rock dwelling…1 mile east of Bear Swamp and about 3 miles northwest of Darlington. It occupies a gully in one of the most inaccessible portions of the Ramapo Mountains and it contained but few traces of Indian origin, among them being chips, fire-cracked pebbles and some rejects" (Skinner and Schrabisch 1913;73). These three sites were not inspected during the Bergen County Historic Sites Survey (1984-85). The current condition and eligibility status are undetermined.

Prehistoric sites 28-Be-178 (Darlington Rockshelter) and 28-Be-179 (Darlington Rock House) are both rockshelters located along the Hoeferlin Trail. Both sites show archaeological evidence of the Prehistoric and Contact Period Native Amerian occupation. Darlington Rockshelter (28-Be-178) was inspected during the Bergen County Historic Sites Survey (1984-85) and was give inventory number 233-137. It is located south of Herman Hill in the Maple Swamp vicinity along the Hoeferlin Trail. This site has been tied to historic documentation of Blandina Bayard early settlement of the area (HSS 1984-85). The Darlington Rock House (28-Be-179) was excavated in 1923 by A.H. Heusser and later recorded at the NJSM by Edward Lenik (1988).The condition and eligibility status of these sites is undetermined.

The Darlington School House (NJHPO 32) is located on 600 Ramapo Valley Road. It was constructed in 1892 in the Richardsonian Romanesque style and was designed by Stanford White. The building has been determined to be eligible for listing on the State and National Register of Historic Places (SHPO COE 6/1/04).

Historic sites 233-119 and 233-123 are associated with colliers who produced charcoal for the iron furnace and forge industries of New York State. They were not inspected during the Bergen County Historic Sites Survey (1984-85). Archaeological evidence of these historic sites, would likely manifest as disturbed forest with blackened charcoal depressions. Archaeological evidence may yield information pertaining to historic charcoal production camps.

The historic nickel mine (233-122) is associated with the Hopkins and Dickinson Manufacturing Company which produced metal castings in a factory along the Ramapo also explored the adjacent mountains for viable ore deposits. Nickel bearing rock was found on Monroe Ridge and a mining site (233-122) is still visible today (HSS 1984-85).

The Mountain Cemetery (233-116) is located in the Silver Lake area of the Ramapo Valley County Reservation west of the Mountain Road extension (HSS 1984-85). The cemetery contains 19th and 20th century burials associated with Ramapo Mountain people's community in the Stag Hill area. The cemetery is of irregular shape and on uneven terrain. The boundaries were undetermined by the Bergen County Historic Sites Survey (1984-85) but the site was determined to be of historic significance (HSS 1984-85).

Robert J. Davidson building ruins (233-117) is located to the northwest of Silver Lake, on the southwest edge of Bald Mountain along the Hoeferlin Trail. The archaeological site is recorded as the fieldstone foundation remnants of the main house and barn along with four small outbuilding whose function has not been identified. It was determined to be a significant site pertaining to Mahwah's estate phase of development (HSS 1984-85). Robert J. Davidson was an executive with the American Brakeshoe and Foundry Co. The farm was purchased from Edward J. and Jane DeGroat in 1906.

The Jacobus De Groat House (233-118) is located west of Silver Lake on the east side Lakeview Drive. It was previously the oldest and most intact example of an early log wall cabin in the Silver Lake-Stag Hill area. The house was constructed c. 1800 but recently was destroyed by arson in 1983. It was previously recommended eligible for its architectural integrity. It was stated that little was known about the building methods and ownership histories (HSS 1984-85). This site may have the potential yield information as an archaeological site pertaining to the early settlement period of the Highland region.

The Green Mountain Valley Settlement (233-120) was the home to some of the Ramapo Mountain people in the late 19th century. It is located in the Halifax section northwest of Havemeyer Reservoir along the north side of Halifax Road. The site is manifest as five stone foundation elements of various functions and an extensive stone wall system. Some dwellings and cellar pits have been identified but other structures are of unknown functions. The Ramapo Mountain people worked as domestics and farm laborers around the area estates. The site needs further evaluation and documentation to determine its integrity and/or significance (HSS 1984-85).

The Halifax Farm site (233-121) is located on Monroe Ridge south of the Havemeyer Trail. A small farm building was identified and an extensive rock wall system in the Bergen County Historic Sites Survey (1984-85). The condition and eligibility status of these sites is undetermined.

The MacMillan Reservoir (233-128) is located between the Reservoir Trail and the Silver Trail in the Middle Valley west of the Ramapo River. The reservoir was dug in the early 20th century c. 1902. It is irregularly shaped approximately one mile in length by a quarter mile in width. The reservoir is associated with the estate phase of development. It supplied water to the George Crocker Estate. There is a stone dam and wheelhouse remains present at the south end of the lake and there was an extensive pipe system to carry the water supply (HSS 1984-85). The eligibility status of the site is undetermined.

The Goat Farm ruins (233-129) are located on the north side of Bear Swamp Road, east of the intersection with the Silver-Yellow Trail. The site consists of the stone wall ruins of two buildings associated with the goat breeding farm of Hooker I. Coggeshall in 1927. The eligibility status of the site is undetermined.

Table 2. Previously Recorded Resources within Camp Glen Gray.

Site Number	Site Name	Site Age	Water Source and Distance (ft)	Eligibility Status
233-131	Algiers Farm and Lookout	Historic Site/ 19th century	N/A	undetermined
233-132	Sanders Farm Site	Historic Site/ 19th century	N/A	undetermined
233-133	Peter and Mary Post – Francis Price Home Site	Historic Site/ Mid 19th century	N/A	undetermined
233-134	Moses Edwards Cabin Site	Historic/ Pre-1861	N/A	undetermined

Historic Site 233-131 (Algiers Farm and Lookout) consists of the remains of a rectangular stone foundation. The site is located in Camp Glen Gray on the north end of the Fox Brook crossing. The Yellow Trail passes through the foundation. Additional research is needed to determine the owners of the farm and significance of the site.

Historic Site 233-132 (Sander Farm Site) is located north of Lake Vreeland along the north end of Fox River crossing (Photograph 2). It is manifested as the remains of the 19th century farming occupation by James Sanders. The remains of five buildings and service structures are recorded including the main farm building, a small barn, ice-house, mill building, and wood working troop cabin. Charcoal pits are also discernible throughout the area. The eligibility status of the site has not been determined.

Historic Site 233-133 (Peter and Mary Post-Francis Price Home site) is the site of a non-extant house from the mid-19th century or earlier. It is located northwest of Lake Vreeland along Midvale Mountain Road. The site is of particular local significance for its ties to the Price family. Francis Price lived in the home from 1877-1878. He was the son of Rodman Price the only New Jersey governor to come from Bergen County. Francis Price served as a Lt. Colonel of the N.J. 7th Regiment during Civil War and was wounded in the battle of Gettysburg. He was promoted to Colonel and then brigadier general and also served as the secretary of the Oakland iron mining company. The eligibility of the site is undetermined.

Historic Site 233-134 (Moses Edwards Cabin site) is located on Midvale Mountain Road (Glen Gray Road) along the south side. It consists of the pre 1861 remains of the cabins unmortared stone foundations, rotting framing members, and scattered debris. Several stone walls radiate from the cabin in all directions (HSS 1984-85). The eligibility status is undetermined.

Table 3. Previously Recorded Resources within the Camp Tamarack/Camp Todd.

Site Number	Site Name	Site Age	Water Source and Distance (ft)	Eligibility Status
28-Be-78	Franklin Township	Prehistoric		
28-Be-79	Franklin Township	Prehistoric	Ramapo River/ directly south	undetermined

Prehistoric sites 28-Be-78 and 28-Be-79 were first identified in the 1913 Archaeological Survey of New Jersey by Alanson Skinner and Max Schrabisch. Site 28-Be-78 is described as a rockshelter located in the southwestern part of the Ramapo Mountains, three miles north of Oakland (Skinner and Schrabisch 1913; 73).Site 28-Be-79 is recorded as one of two camp sites occurring in Franklin Township within a distance of 4 miles on the north bank of the Ramapo River (Skinner and Schrabisch 1913; 74). No information about the current condition or eligibility status of these sites is available.

Table 4. Previously Recorded Resources within the Campgaw Mountain Reservation.

Site Number	Site Name	Site Age	Water Source and Distance (ft)	Eligibility Status
233-145	William J. Pulis House	Historic/ 19th century	N/A	undetermined

Historic Archaeological site 233-145 (William J. Pulis House) is located on Fyke Road in the parking lot near the entrance to the Maintenance Garage of the Bergen County Park Commission, Campgaw Reservation. The faint outline of a house foundation can be discerned from evidence of stonework and scattered brick (HSS 1984-85). Other archaeological features such as a stone lined well and outhouse foundation are present on the site. The eligibility status of this site has not been determined.

According to the 1984-85 Bergen County Historic Sites Survey an early log building was known to have existed in the Fyke Road section of the Campgaw Mountain Reservation, but it has since been demolished.

Overview of Sander's Farm Site, Established 1810

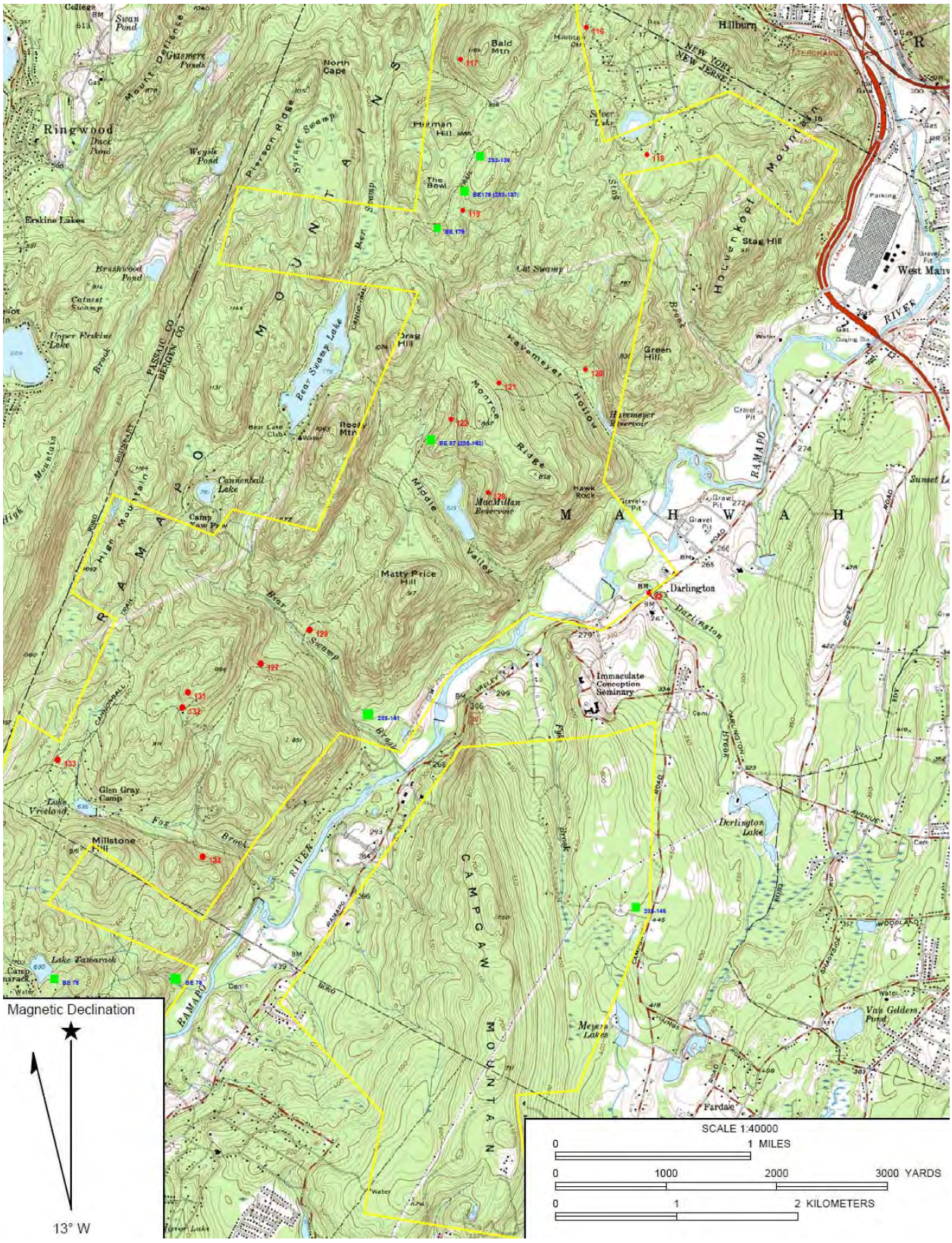
Conclusions

The Cultural Resource Inventory resulted in the identification of a total of twenty three cultural resources. One extant late nineteenth century building is within the project area, the Darlington School House (NJHPO 32), as well as, fifteen historic archaeological sites. Additionally, six prehistoric and contact period archaeological sites have been recorded within the Bergen County Parklands. Formal findings of eligibility cannot be determined for the majority of known sites based on previous cultural resource investigations.

Recommendations

Maser Consulting recommends further evaluation of known cultural resources within project area in order to determine their current condition and determine their eligibility status. Furthermore, site sensitivity modeling should be developed to determine probabilities for encountering undocumented cultural resources within the park lands. Any efforts to expand existing facilities or trail systems should require prior cultural resource investigations before any ground disturbing activities are undertaken.

Existing trail layouts should be considered for impacts to recorded archaeological sites. For example the Yellow Trail Passes directly through the Algiers Farm and Lookout site (233-131) in Camp Glen Gray on the north end of the Fox Brook crossing. Impacts to recorded cultural resources from current land use activities should be evaluated.


Magnetic Declination
13° W
SCALE 1:40000
0 1 MILES
0 1000 2000 3000 YARDS
0 1 2 KILOMETERS
Ringwood
Hillburn
Darlington
Immaculate Conception Seminary
Stag Hill
Green Hill
Bald Mtn
North Cape
Herman Hill
The Bowl
Erskine Lakes
Upper Erskine Lake
Brushwood Pond
Cannonball Lake
Camp Yaw Pee
Matty Price Hill
MacMillan Reservoir
Hawk Rock
Hawmeyer Reservoir
Cat Swamp
Bear Swamp Lake
Bear Lake Club
Rocky Mtn
Glen Gray Camp
Lake Vreeland
Millstone Hill
Lake Tamarack
Meyers Lakes
Van Gelders Pond
Derlington Lake
Fardale
RAMAPO MOUNTAINS
RAMAPO RIVER
CAMPGAW MOUNTAIN
HAWTHORNE
PASSAIC CO
BERGEN CO
NEW YORK
NEW JERSEY

TRANSPORATION AND ACCESS

VI. TRANSPORATION AND ACCESS

INTRODUCTION

This study presents the current transportation and roadway travel conditions in the vicinity of the Ramapo Valley County Reservation and existing areas of both vehicular and pedestrian access. Specific elements included in this study are:

- An inventory and assessment of the roadway facilities in the vicinity of the project, including the existing physical and traffic operating characteristics;
- Determination of the probable routes and the areas of vehicular and pedestrian access to the site;

EXISTING CONDITIONS

A field investigation was conducted adjacent to the project site to obtain an inventory of existing roadway conditions, posted traffic controls, adjacent land uses, lane configurations of the intersections in the study area, and existing vehicular and pedestrian traffic patterns. The following is a brief description of the roadways:

Skyline Drive, Bergen County Route S91 (CR S91), is a north/south oriented two-lane roadway classified as an Urban Minor Arterial under Bergen County jurisdiction. This particular section of CR S91 extends northwest from Interstate-287 (MP 0.73) into Passaic County (MP 2.49), and reenters Bergen County for an additional 0.37 miles, before continuing into Passaic County once again. The pavement width measures twenty-five feet (25') with a shoulder width between one foot (1') and three feet (3'). The posted speed limit in the project vicinity is 40 MPH.

Ramapo Valley Road, US Route 202 (US 202), is a north/south oriented two-lane roadway in the project vicinity classified as an Urban Principal Arterial under Bergen County jurisdiction. This section of roadway extends from CR 84 (MP 72.59) to CR 100 (MP 79.01). The pavement width varies between twenty-six feet (26') and twenty-four feet (24'), with a shoulder width of two-feet (2'). The posted speed limit is 40 MPH for the majority of the roadway, but does increase to 45 MPH north of Darlington Avenue (CR 98).

West Ramapo Road, Bergen County Route 100 (CR 100), is an east/west oriented two-lane roadway classified as an Urban Minor Arterial under Bergen County jurisdiction. The roadway is 0.75 miles in length and provides east/west maneuverability to/from US 202, NJSR 17 and CR 85. This length of roadway measures thirty feet (30') in width, with no shoulders. The posted speed limit is 35 MPH between MP 0.00 and MP 0.60 and 25 MPH between MP 0.61 and MP 0.75.

Ridge Road, New Jersey State Route 17 (NJSR 17), is a north/south oriented roadway classified as an Urban Principal Arterial under state (NJDOT) jurisdiction. NJSR 17 has three

(3) travel lanes in each direction with twelve foot (12') shoulders divided by a twenty-foot (20') median. The roadway has a posted speed limit of 55 MPH.

The above roadways represent the major arterials utilized by motorists traveling to/from the Ramapo Valley Reservation. The majority of trips which currently travel to the site utilize US 202, which runs along the eastern boundary of the Reservation. CR S91 bounds the southern and western borders of the Bergen County owned property. CR 100 and NJSR 17 are both located northeast of the Ramapo Valley Reservation and both provide access to US 202. **Figure 1** on the following page details the location of these arterials in relation to the Ramapo Valley Reservation.

To determine which roadways are the most heavily traveled in the project vicinity, Maser investigated the *NJDOT Interactive Roadway Information and Traffic Counts*[1]. The NJDOT has over 3,000 continuous counting stations located on the public roads throughout New Jersey. The sites are counted at least once every three years, to maintain the database.

In this analysis, Maser examined the surrounding roadway network, determined the stations with the highest influence on the project site and recorded the data included in each counting station. The results determined that nine (9) locations in the project vicinity reflect the site generated traffic volumes. The following table details each station identification, station location and two-way traffic volume.

[1]NJDOT Interactive Roadway Information and Traffic Counts http://www.state.nj.us/transportation/refdata/roadway/traffic.shtm

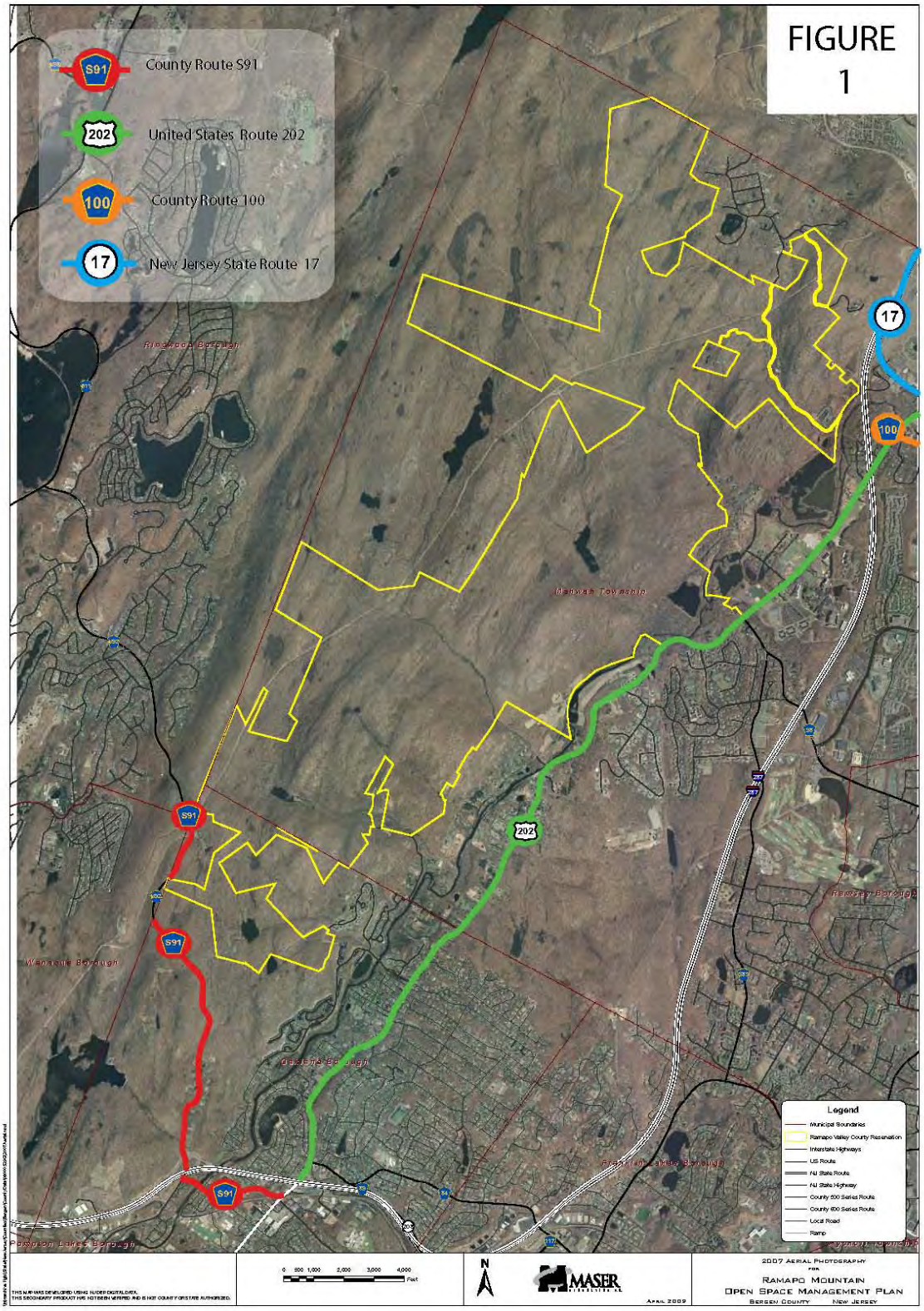


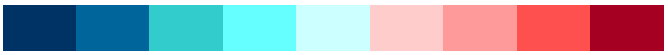
FIGURE 1
S91 County Route S91
202 United States Route 202
100 County Route 100
17 New Jersey State Route 17
Ringwood Borough
Wanaque Borough
Pompton Lakes Borough
Legend
2007 Aerial Photography for
Ramapo Mountain Open Space Management Plan
Bergen County New Jersey
April 2009

Table 1 – Adjacent Network Traffic Volumes

Station ID	Location	Two-way Annual Daily Traffic Volumes		
		NB	*SB*	*Total*
2-8-105	County RT 84 (west of I-287)	3036	2806	5842
5t2-129	US 202 (north of I-287)	6219	6623	12842
2-8-104	County RT 84 (east of I-287)	7888	8309	16197
2-8-106	US 202 (south of I-287)	16297	12453	28750
2-1-026	I-287 (btw US 208 & RT 17)	25867	25928	51795
2-4-307	RT 17 (south of I-287)	37879	34121	72000
2-4-101	I-287 (east of US 202)	51111	44579	95690
2-4-102	I-287 (btw US 202 & US 208)	58872	55906	114778
2-4-104	I-287 (north of RT 17)	65879	70332	136211

Legend

Heavy Volumes



Light Volumes

Table 1 above lists the local roadway traffic volumes from lowest to highest. Based on the results of the data collection, I-287 has the highest daily traffic volumes, followed by NJSR 17, US 202 and CR 84. Examining the roadway network and traffic volumes, it can be stated that the motorists traveling to/from Ramapo Valley Reservation will ultimately travel on US 202, due to the location of the I-287 and NJSR 17 interchanges in the area.

Figure 2 on the following page details the location of the data collection stations and the traffic volumes associated with each station.

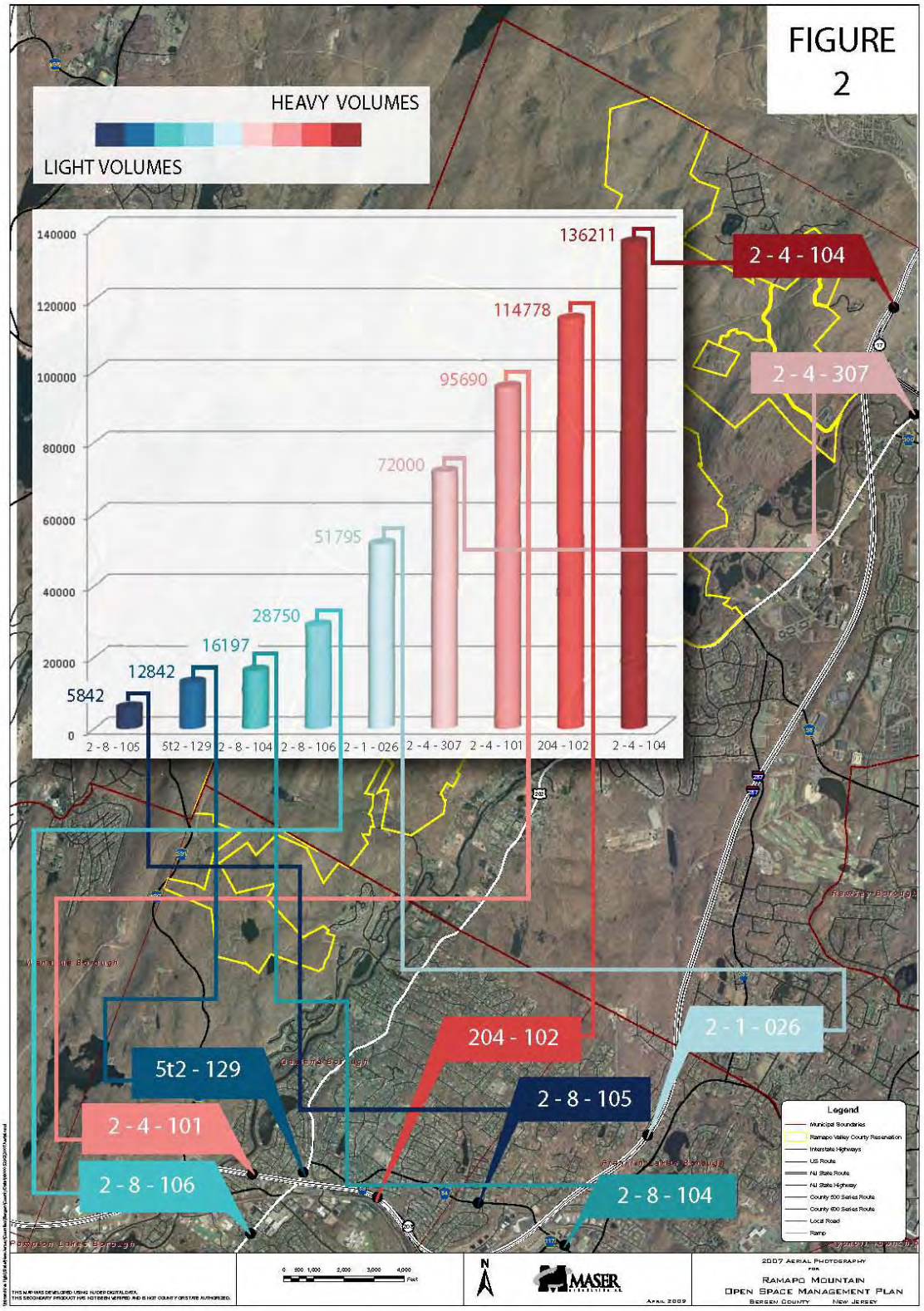


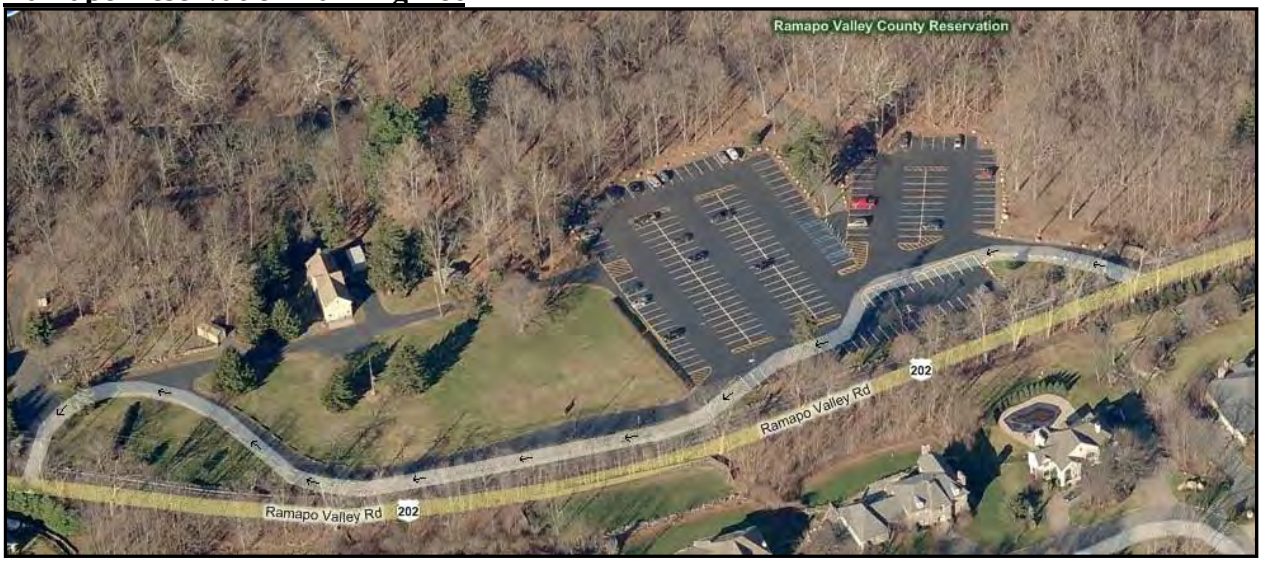
FIGURE 2
HEAVY VOLUMES
LIGHT VOLUMES
140000
120000
100000
80000
60000
40000
20000
0
5842
12842
16197
28750
51795
72000
95690
114778
136211
2 - 8 - 105
5t2 - 129
2 - 8 - 104
2 - 8 - 106
2 - 1 - 026
2 - 4 - 307
2 - 4 - 101
204 - 102
2 - 4 - 104
2 - 4 - 104
2 - 4 - 307
2 - 1 - 026
204 - 102
5t2 - 129
2 - 8 - 105
2 - 4 - 101
2 - 8 - 106
2 - 8 - 104
Legend
Municipal Boundaries
Ramapo Valley County Reservation
Interstate Highways
US Route
NJ State Route
NJ State Highway
County 500 Series Route
County 600 Series Route
Local Road
Ramp
MASER
2007 Aerial Photography
for
Ramapo Mountain
Open Space Management Plan
Bergen County New Jersey
April 2009

RAMAPO VALLEY RESERVATION ACCESS POINT INVENTORY

In addition to documenting the traffic volumes in the project vicinity, Maser performed an on-site field investigation of the Ramapo Valley Reservation and the surrounding roadway network. The purpose of the on-site field inspection was to inventory the existing transportation and pedestrian access points for the Ramapo Valley Reservation and identify potential locations for adding/improving access. The results of the field investigation determined that the only two (2) public access points for the Ramapo Valley Reservation and associated trails are located on US 202 and CR S91. Private access is provided for the Boy Scouts of America (BSA) on Bearswamp Road, which is a local road accessible from US 202. The following summarizes the results of the investigation.

- Ramapo Reservation Parking Lot
  - US Route 202 (MP 77.40)

Ramapo Reservation Parking Lot



This access represents the main parking facility for the trails provided in the Ramapo Valley Reservation. The parking lot has two (2) access points, one (1) each for ingress and egress movements. Left-turn movements are prohibited at the ingress access, limiting access to southbound right-turn movements only. The egress access permits both left and right-turns. The entrance to the lot is signed traveling southbound at Darlington Avenue, 650' prior to the entrance.

- Bearswamp Road
  - US Route 202 (MP 75.76)

Bearswamp Road

Bearswamp Road is a narrow local roadway which provides access to Deerhaven on the Ramapo and the BSA Camp Council 359 Sites. Deerhaven on the Ramapo is a residential housing community accessible via Deerhaven Road, a private road located at the end of Bearswamp Road. Two (2) additional access roads are located at the terminus of Bearswamp Road, both of which are unpaved and gated to prevent public access. These roadways are detailed in the accompanying photograph and in the map above.

Bearswamp Road Gated Trails

The road on the left in the photograph is the through movement detailed in the aerial image and is the trail that leads into BSA Camp Yaw Paw which is not part of the Reservation. The trail is signed as a fire access only roadway. The road on the right is a gated trail with a posted speed limit of 10 MPH with public access being restricted. It leads to a portion of the County Reservation.

In addition, there are three pedestrian trails located on CR S91. While all three (3) pedestrian trails were signed in both directions on CR S91 with MUTCD Sign RL-100 Trail (Hiking), only one was missing a recreational sign indicating the trail name. The following details the conditions of the three trails identified on CR S91, traveling northbound on CR S91.

- Un-Named Trail #1
  - CR S91 - Skyline Drive (MP 0.90)

This is the first of three pedestrian hiking trails located on CR S91 in Bergen County. The trail crosses CR S91 and does not have direct vehicular access. However, north of the trail, a small paved area is provided to accommodate standing, loading and/or unloading vehicles (although this area is not designated as such). The paved area is protected from the nearside vegetation by a chain-link fence and there are no recreational signs designating this area as part of the Ramapo Valley Reservation. Since this trail is not titled, determining the destination is difficult.

Trail Pull-Over Area

- Todd Trail
  - CR S91 - Skyline Drive (MP 1.4)

The second trail, Todd Trail, is located about ½ of a mile north of the initial trail and provides access to the Todd areas. The name of the trail is posted at both entrances and has vehicular accessibility, as an unstriped parking lot is provided at the trail entrance, adjacent to the southbound travel lane (see accompanying photograph). An 'authorized vehicles only' access is also provided north of the trail adjacent to the northbound travel lane.

Todd Trail Parking Lot

- Castle-Point/Cannonball Trail
  - CR S91 - Skyline Drive (MP 1.8)

The final trail was located at the border of Bergen County and Passaic County. Traveling northbound, the trail is signed with MUTCD Sign RL-100 and is titled Cannonball Trail. Adjacent to the roadway traveling southbound similar signage is posted and a vehicular access is provided via a service entrance. This trail enters into Passaic County and is renamed Castle-Point Trail. Cannonball trail, located in Bergen County, leads to BSA Camp Yaw Paw. The trail is shown in the attached photograph.

Cannonball Trail Entrance

Overall, the existing reservation has pedestrian and vehicular access available. However, the pedestrian trails should provide vehicular parking areas and be signed to indicate the location of these areas. Also, each trail should be signed on the adjacent roadway.

Adjacent to the surrounding roadway network, the potential for additional parking areas and vehicular access opportunities are limited. The majority of local roadways which intersect US 202 are already developed with private homes and residential communities. Other areas of potential improvement are limited due to existing environmental conditions, including steep grades, dense vegetation and wetlands. An area where vehicular and pedestrian access should be explored is The Darlington Schoolhouse, located adjacent to the intersection US 202 and Darlington Avenue.

Existing Access off County Reservation Property

- Mahwah Township Recreation Park
  - US Route 202 & Mahwah Township Recreation Park Driveway/Ramapo College Driveway and Lake Henry

Mahwah Township Recreation Park & Parking Lot

The Mahwah Township Recreation Area is accessed via a four-legged full-movement signalized intersection. The eastbound leg represents the main entrance to the Ramapo College of New Jersey; the westbound leg is the access road to the Mahwah Township Recreation Area. Pedestrian facilities are provided for US 202 crossing movements.

The Township Recreation Area consists of a football field, a soccer field, a baseball field, a softball field, a skate park and a playground and a trail around Lake Henry. At the rear of the site, an exclusive parking lot and pedestrian access is provided to the Lake Henry Trail. This area is immediately adjacent to the County

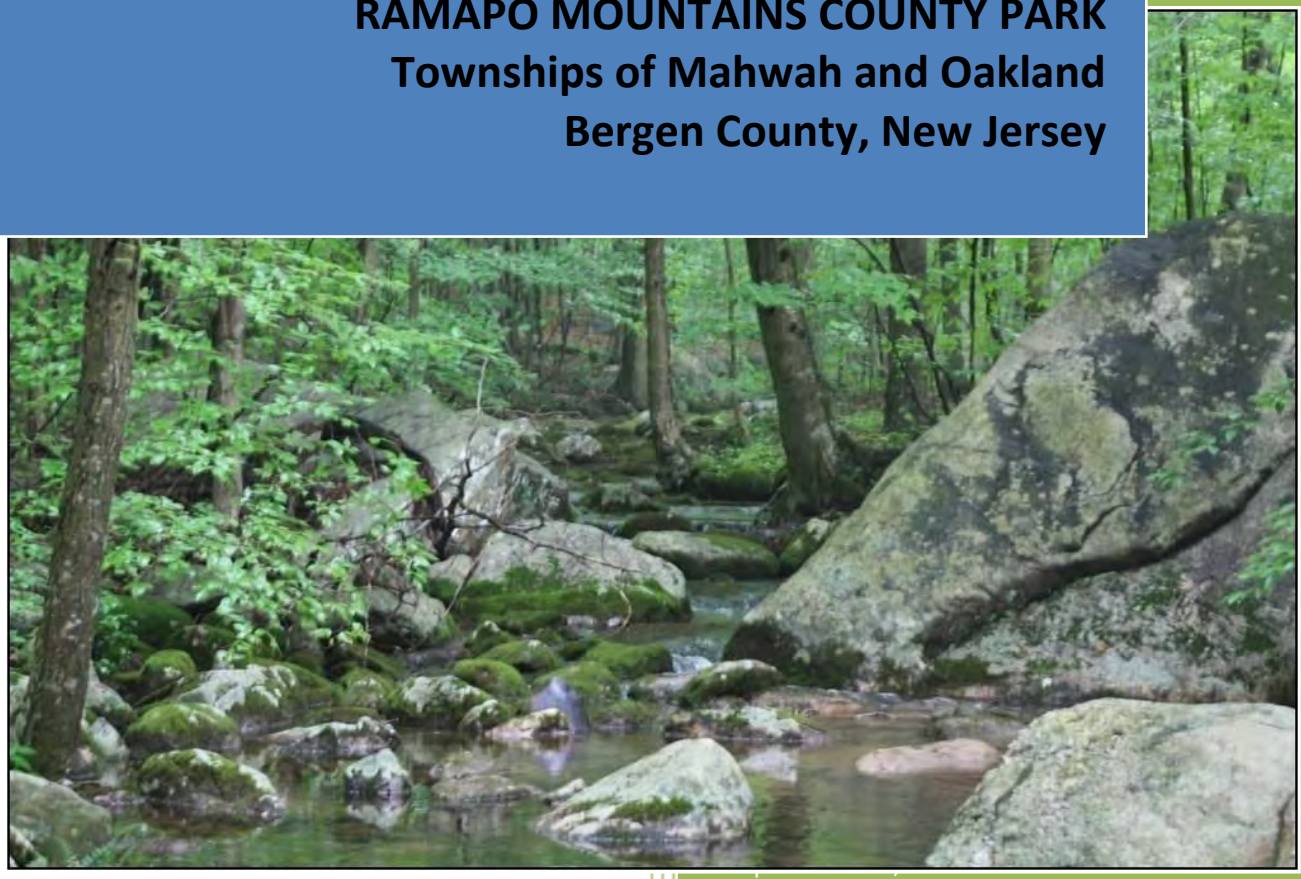
Lake Henry Trail Map

Reservation which lies just beyond Lake Henry and the parking area is no doubt used by those seeking access to the County Reservation.

2010

NATURAL RESOURCE INVENTORY AND ASSESSMENT: RAMAPO MOUNTAINS COUNTY PARK

Townships of Mahwah and Oakland
Bergen County, New Jersey



Prepared for:
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&
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MASER CONSULTING P.A.
Consulting, Municipal & Environmental Engineers
Planners ▪ Surveyors ▪ Landscape Architects

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Natural Resource Inventory and Assessment
Ramapo Mountains County Park

Townships of Mahwah and Oakland
Bergen County, New Jersey

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EXECUTIVE SUMARY

Maser Consulting P.A. along with The Regional Plan Association (RPA) was hired by the Bergen County Planning Department in 2008 to develop an *Ramapo Mountains County Park Management Plan* (RMCPMP) for the Ramapo Mountains County Park (RMCP), including the area of Camp Glen Gray, Tamarack Recreation Area, and Todd Recreation Area. The three were camps once owned and operated by the Boy Scouts of America, Inc. Today only Camp Glen Grey continues to be operated as a camp and is managed by the Friends of Glen Gray (FOGG), although the site is owned by Bergen County (see Section 2.2.2 below). Tamarack Recreation Area and Todd Recreation Area have been abandoned and are now treated as areas within the larger Ramapo Mountains County Park. The four properties total approximately 4,500 acres and are characterized by extensive areas of natural landscape including wetlands, vernal pools, forest, rock outcrops, and rare plant and animal habitat. The County desires that the RMCPMP be "nature-based". Therefore a natural resources inventory and assessment was a fundamental as part of the effort, resulting in the preparation of the *Ramapo Mountains County Park Natural Resource Inventory and Assessment: Ramapo Mountains County Park* (NRIA).

Background information was compiled from online resources and published information as cited throughout the NRIA. Focus was given to particular areas of interest, including the region's geology, soils, surface and groundwater resources, and botanical and wildlife resources. A series of field trips were conducted by team members from Maser Consulting P.A. during which the botanical and wildlife resources, bedrock and surficial geology, and wetlands including vernal pools were identified and located. Information regarding rare plants and animals was obtained from the NJDEP Natural Heritage Program. Additional information on the botanical resources was provided by local botanists, and also obtained from web-based sources.

GIS-based maps of selected natural resources and features including, topography, bedrock geology, surficial geology, soils watersheds, surface water features, aquifers, vegetation, wetlands, and environmentally sensitive features were prepared. The combined knowledge of field and mapped conditions was used to perform a preliminary constraints and opportunities analysis that will serve as a guide for the preparation of the *Ramapo Mountains County Park Management Plan*.

The natural resource inventory provides detailed information covering a broad array of natural resources. This information was applied in an assessment of potential constraints and opportunities for use of the resources as part of the public access and recreational benefits of this public open space. In considering the various approaches that could be used as a basis for the assessment of resources and after review of alternatives, this assessment of constraints and opportunities was based on a subwatershed approach. This approach anchors the assessment in a natural landscape framework, as well as a regulatory framework, resulting in the demarcation of the Reservation into four individual assessment or management areas. These are proposed as the "management zones" for which "management prescriptions" will be identified subsequently in the RMCPMP.

A brief overview of the individual subwatersheds is presented below followed by a list of potential constraints and opportunities based upon field observations and information contained in the inventory. ***Potential constraints*** are defined for the purposes of this

assessment as environmental features (e.g., wetlands and steep slopes) or other features (access) that could impact the placement and use of recreational development such as trails, signs, buildings, parking lots and other manmade structures. ***Opportunities*** are defined as environmental features (e.g., vernal pools and flat topography) and other features (roads, existing structures) that provide one or more favorable circumstances to achieve goals of County open space planning, including goals for recreation and/or education. To facilitate communication regarding the subwatersheds, vernacular names have been applied to them based upon one of the prominent drainages in the subwatershed that drains to the Ramapo River. Each subwatershed management area is illustrated with two maps: (1) a USGS topographic map and related features; and (2) a map of representative environmentally sensitive overlays.

The Ramapo River (above 74d 11m 00s) subwatershed, referred to as the "**Stag Brook**" subwatershed, is located in the northernmost region of the Ramapo Mountains County Park Management Plan project area. This subwatershed encompasses a total of 6,504.18 acres. Approximately 869.85 acres of the project area are included within this project area. The primary waterway present within the subwatershed is Stag Brook, which ultimately flows to the Ramapo River. *Potential constraints* include: remote portions with limited access; lack of maintained trail network; lack of parking at trail heads; there are two non-contiguous portions of the management area; significant topographic relief; riparian corridor in the lower subwatershed; stream crossings; wetlands and buffers in the upper subwatershed; vernal pools and buffers; threatened, endangered, and rare animals and critical habitat; residential community north of and adjacent to the county open spaces; utility corridors and rights-of-way; and views interrupted by utility easements. *Opportunities* include: Bald Mountain, highest elevation (1,164 ft) in the Reservation; wetlands and vernal pools for interpretive program; coordination of resource management with adjacent community; additional area for new trail network; and views: Stag Hill Road – Stag Brook corridor/gorge.

The Ramapo River (above Fyke Brook to 74d 11m 00s) subwatershed, referred to as the "**MacMillan Brook**" subwatershed, includes the largest number of major streams and ponds in the project area. Approximately 1,428.99 acres of the Ramapo Mountains County Park Management Plan project site are included in the 10,809.65 total acres of the subwatershed. Two different water systems are located within the subwatershed: MacMillan Brook and Havemeyer Brook, both of which drain to the Ramapo River. The headwaters of the two waterways begin within the boundary of the Ramapo Mountains County Park Management Plan project area. MacMillan Brook flows entirely within the grounds of the Reservation, while Havemeyer Brook connects to the Ramapo River just outside of the Reservation's boundary. Both waterways have reservoirs, or artificial ponds created with dams for water storage, named after the streams that feed them. Scarlet Oak Pond, located within the eastern portion of the subwatershed, drains directly to the Ramapo River. *Potential constraints* include: steep slopes and rock outcrops; utility corridor and right-of-way; riparian corridors, buffers, and stream crossings; wetlands and buffers; vernal pools and buffers; threatened, endangered, and rare

animals and critical habitat; NJDEP Ramapo Valley Natural Heritage Prioity Site (endangered and rare plants and hiabtat); and flooding along Ramapo River. *Opportunities* include: public parking and restrooms; maintained trails; views of pond, reservoir, and river; trail access to Scarlet Oak Pond and MacMillan Reservoir for education; trail access to the Ramapo River; trail access to wetlands and riparian corridors; educational field trips along Havemeyer Hollow; top rope/bouldering, rock climbing (Green Trail); broad ridge-top views east to Newark Basin and to Manhattan; Views – Hawk Rock; Green Trail to Lake Henry & Ramapo College Campus; Orange trail – waterfall, MacMillan Brook, MacMillan reservoir; Blue trail – Ramapo River Valley; and view of mature forested wetland on floodplain of Ramapo River

The Ramapo River (Bear Swamp Brook through Fyke Brook) subwatershed, referred to as **Bear Swamp Brook** subwatershed, is approximately 13,827.74 acres in size. The park is located within 1,105.59 acres of the subwatershed. Only one main waterway, Bear Swamp Brook, and its associated tributaries, flows through the subwatershed. Bear Swamp Brook briefly flows through a small portion of the Ramapo Mountains County Park Management Plan area before flowing through Bear Swamp Lake located outside the Park's boundaries and reentering the project area. Multiple sources outside the Park contribute to the waterway, including Cannonball Lake. Bear Swamp Brook ultimately drains to the Ramapo River, located just outside the project area's limits. *Potential constraints* include: two non-contiguous portions of the management area separated by state land; no parking access; steep slopes and rock outcrops; utility corridor and right-of-way; pipeline contamination site in Bear Swamp Brook corridor (NJDEP records indicate case is closed); riparian corridors, buffer, and stream crossing; wetlands and buffers; vernal pools and buffers; and threatened, endangered, and rare animals and critical habitat. *Opportunities* include: existing trails; trail access to wetlands, riparian corridors, and vernal pools for education; trail access to and view of large glacial erratic; areas for creating parking off Bear Swamp Road; new trail heads; and top rope/bouldering and rock climbing (Trails: Orange, Yellow, Yellow/Silver).

The Ramapo River (Crystal Lake Brook to Bear Swamp Brook) subwatershed, referred to as "**Fox Brook**" subwatershed, is located in the southernmost region of the project area. The overall subwatershed includes 17,868.95 acres; however, only 1,179.50 acres are included within the project site. Fox Brook is located in the northern portion of the subwatershed and is located within Mahwah Township, Bergen County. The waterway flows in a west to east direction through the project area, and drains to the Ramapo River, located outside of the project area. Lake Vreeland, an artificial lake, is located along the waterway. Located within the same watershed as Fox Brook and Lake Vreeland, but located within Oakland instead of Mahwah are Lake Tamarack and Todd Lake. These two artificial lakes are located along tributaries of the Ramapo River. *Potential constraints* include: several subareas barely contiguous and surrounded by state and private lands; cleanup of abandoned scout campgrounds at Tamarack Recreation Area and Todd Recreation Area; vehicular access to Tamarack and Todd camp areas only from west through easement on state land; Common Reed invasion at Lake Tamarack; shallow water and dense pond vegetation at Todd Lake; riparian corridors, buffers, and stream

crossings; wetlands and buffers; vernal pools and buffers; and threatened, endangered, and rare animals and critical habitat. *Opportunities* include: three open water ponds (Lake Tamarack, Todd Lake, Lake Vreeland; functional scout campground at Glen Gray and Lake Vreeland; vehicular access; underutilized, abandoned scout campgrounds at Tamarack Recreation Area and Todd Recreation Area; trail access to wetlands, riparian corridors, and vernal pools for education; areas for new trail network; areas for creating parking for western portion of the Reservation; more intensive recreation in areas impacted by former uses including camping, boating; expansion of winter camping and group camping at Glen Gray; and views: Yellow and White Trails – Manhattan/Verrazano Bridge; Green Trail – Bear Swamp Lake; Green Trail – Lake Vreeland; Yellow Trail – Ramapo Mountains County Park.

With completion of the natural resource inventory and assessment, a number of **conclusions** can be reached regarding the approach and usefulness of the results. Because this document was prepared to provide information to guide the development of an open space management plan, the preparers provide recommendations regarding how this document can be helpful. The following preliminary conclusions are presented for the process and product of the resource inventory and assessment:

- The combination of inventory and display maps using GIS technology provides an opportunity to present the resources in a clear and useful manner.
- Because the resources are displayed to the same scale and linked for overlay purposes, correlations between and among resources can be identified, which may be helpful regarding development of education programs and management protocols.
- The natural resources of the Ramapo Mountains County Park are rich, relatively intact in spite of long-term and extensive use, and representative of the New Jersey Highlands.
- Selection of the subwatershed approach to resource assessment allows for the creation of management zones based on subwatersheds to be the basis of the Open Space Management Plan.
- The Ramapo Mountains County Park provides an excellent opportunity for the creation of a regionally and nationally significant conservation area that has valuable passive recreation and educational opportunities and is an immense public asset.

The following **recommendations** to be pursued during preparation of the RMCPMP are provided as a result of preparing the Inventory and Assessment:

- *Additional studies* should be conducted using the GIS resource maps to identify correlations among the layers of physical and biological attributes to identify patterns that could be useful for educational and management purposes. For example, there is strong connection among bedrock and structural geology and some aspects of surface water hydrology and habitat.
- *Conduct an additional field day* in each subwatershed area to note additional resources and management constraints and opportunities.

The four subwatershed study areas, identified as a result of the resource inventory and assessment, are proposed herein for use as the *management "zones"* for preparation of the RMCPMP. These zones, based on natural landscape features and regulatory surface water boundaries, are a logical and "nature-based" approach to preparation of the RMCPMP. As part of this Plan, the existing trails system within each management zone, for example, could be assessed for trail coverage, linkage, proximity to sensitive resources, and other attributes. Management "*prescriptions*" for each of the management zones can be developed from a combination of the results of the resource inventory and assessment, additional observations from each subwatershed area, and linkage to the goals for each area identified as part of the planning process. Example prescriptions for a particular management zone may include, for example: eradicate "Common Reed", an invasive exotic plant species associated with Lake Tamarack; control or eradicate "Siltgrass", an invasive exotic grass that invades natural habitat areas along trails; placement of new trails should avoid sensitive vernal pool habitats; existing trail adjacent to sensitive vernal pool habitat should be relocated to avoid impacts but also provide interpretive and educational opportunities regarding importance of vernal pools.

Each of the four subwatershed management zones should have a *zone-specific programmatic management plan*, including identified programs (e.g., administrative, resource management, access, recreation, and education programs) with listed goals, policies, actions, schedules, and estimated costs. This could be accomplished with separate plans for each management zone or with a single, Reservation-wide plan containing portions with common programs and related goals and portions with individual management zone programs and related goals.

A number of *new or rejuvenated projects* or opportunities have been generated or expanded by this Inventory and Assessment - a selection of these include the following: use of the Inventory and GIS overlays to identify landscape patterns for educational and management purposes; watershed/water quality assessment; ecological monitoring opportunities in conjunction with Ramapo College and Rutgers University; field investigations of rare, threatened, and endangered plants and animals identified for the Reservation or known to be in proximity to the Reservation; field investigations of cultural resources; new trail layout, coordinating opportunities with the NY/NJ Trail Conference; impact analysis of potential recreational uses; invasive species assessment via the management plan; and assessing potential land swaps, boundary or adjusting easements to effectuate continuity of County property.

1.0 INTRODUCTION

The Ramapo Mountains County Park (RMCP) consists of a series of open spaces and parks owned and managed by Bergen County, New Jersey. These properties are located in the townships of Mahwah and Oakland and are situated within the Ramapo Mountain portion of the Appalachian Mountains, which in New Jersey is also included within the Highlands Physiographic Province. Maser Consulting P.A. along with The Regional Plan Association (RPA) was retained by Bergen County to develop a *Ramapo Mountains County Park Management Plan (RMCPMP)* for four contiguous parks within the Ramapo Mountains: Ramapo Valley Reservation, Camp Glen Gray, Tamarack Recreation Area, and Todd Recreation Area (Map 1 & 2). The three were camps once owned and operated by the Boy Scouts of America, Inc. Today only Camp Glen Grey continues to operated as a camp and is managed by the Friends of Glen Gray (FOGG), although the site is owned by Bergen County (see Section 2.2.2 below).. Tamarack Recreation Area and Todd Recreation Area are now treated as areas within the larger Ramapo Mountains County Park. The four properties total approximately 4,500 acres and are characterized by extensive areas of natural landscape including wetlands, vernal pools, forest, outcrops, and rare plant and animal habitat. Because the County desires the RMCPMP to be "nature-based", a natural resources inventory was an integral part of the effort, resulting in the preparation of the *Ramapo Mountains County Park Natural Resource Inventory and Assessment: Ramapo Mountains County Park.*

1.1 Background

The RMCPMP should ensure uses of the open spaces are implemented in a responsible manner that does not compromise the ecological uniqueness of the Ramapo Mountains County Park. The management plan also should incorporate opportunities for active recreation, passive recreation, and education.

Objectives to be addressed as part of the development of the management plan include:

- Assemble scientific or scholarly information about the fundamental and other important resources and values of the Bergen County Ramapo Mountains.
- Working with the NY-NJ Trail conference, develop a unified nature-based hiking system connecting with park areas within the system.
- Develop unified nature-based management plan zones for appropriate resource conditions and visitor experiences contained in the project area.
- Develop area-specific management prescriptions for each management area within the project area describing appropriate set of resource conditions and visitor experiences to be achieved and maintained over time.
- Provide a frame work for park and open space management and maintenance.
- Identify opportunities to acquire lands that are adjacent to existing park lands.
- Review implications of the Highlands Act on recreation development.
- Overriding objective of the study is to evaluate how the Ramapo Mountain open space area will be managed to protect the site's ecological and scenic features while providing quality recreational and educational experiences.
- Increase and/or enhance the many opportunities for nature-based education for children from urban communities.
- The RMCPMP will be responsive to the physical and biological geography of the site, emphasizing protection of critical resources, encouraging native species over exotics and maintaining natural processes.
- The more sensitive areas of the property, including wetlands, riparian areas, and significant avian habitats will be managed to protect their resource values, with visitor use guided away from these areas as appropriate.

Management goals are anticipated to include:

- Protect the scenic qualities and cultural resources of the property.
- Conserve the ecosystem functions and natural resources of the property.
- Protect and maintain the wetlands, riparian areas, and special avian habitats.

1.2 Purpose

The purpose of the *Natural Resources Assessment* is to establish baseline information for the development of the Ramapo Mountains County Park Management Plan. The first step of this process included assessment of conditions on the property (natural and cultural resources, access, etc.). The results of this initial inventory of existing conditions are summarized herein. Regulatory constraints are identified including those involving natural environmental features. The report on existing conditions of the natural resources also focuses on site constraints for and opportunities for access to and development of park recreational and educational resources.

The natural resources inventory and assessment includes or considers the following tasks:

- Review literature and other database sources including narrative text and related maps. Categories of relevant information include, for example, bedrock and structural geology, soils, hydrology, vegetation, and wildlife.
- Identify environmentally sensitive resources including wetlands and waters; special status resource areas; important geologic features; and rare, threatened, and endangered plant and animal species and their habitats. Other important features include cultural and aesthetic resources.
- Use existing GIS data, unique layers (e.g., soils, wetlands, etc.) will be stored as individual datasets within the Geodatabase to allow for analysis between layers.
- Conduct field reconnaissance to each area within the Bergen County Ramapo Mountains County Park to identify the habitat areas, confirm patterns identified on aerial photography.
- Prepare lists of dominant and characteristic species and provide photographs of the resources for use in the management plan.

- Prepare a bibliography of maps, papers, books, web sites, and other resources containing information regarding the natural resources of the Ramapo Mountains County Park.
- Prepare a narrative describing the natural and cultural resources of the Ramapo Mountains County Park. The features to be discussed include topography, soils, geology, hydrology, areas of critical water supply concern, habitat types, and unique natural and historic sites.
- Suggest and discuss additional topics for future projects.

The purpose of the narrative is to provide an adequate description of the Reservation to allow the evaluation of resource protection issues. GIS mapping will be developed to assist in the identification of important resources. The results of this overall inventory are integrated into a series of resource based constraints and opportunities maps. The maps identify environmental constraints regarding development, resource protection areas, and site access and interpretive opportunities.

Following the preparation of the resources assessment, the RMCPMP development process will include but not necessarily be limited to the following tasks as related to the natural and cultural resources inventory and assessment:

- Prepare an RMCPMP based on a set of goals, assumptions, and policies to be developed during the preparation of the natural resource assessment.
- Identify major nature-based management plan zones (i.e., sub-watersheds) in the project area that will be the basis for development of the RMCPMP. Special attention will be made to distinguish between wetland and upland areas.
- Rank the various communities or zones based upon their environmental sensitivity. Those areas determined to have the greatest environmental sensitivity will be designated for preservation or low density uses such as hiking trails or education. Those

areas that are determined to have lower environmental sensitivity will be designated for possible active recreational uses.

- Prepare a programmatic management plan for each area within the project area. The administrative, natural resource, and area uses programs will contain area specific management prescriptions based on goals, policies, and actions for the sites and the management plan zones within them. Examples of natural resource programs include maintenance of biodiversity, sensitive species, and exotic species control programs. The overall goal is to establish management protocols for each area that maintain a balance between preservation of natural resources and meaningful public access.
- Refine and as feasible expand the existing system of hiking trails. Unique or unusual community types will be identified, or unique physical features within community types, to establish a hiking trail system that provides the user with the greatest opportunity for experiencing the uniqueness of this area.

1.3 Methods

The Natural Resource Inventory, reported herein as the *Ramapo Mountains County Park Natural Resource Inventory and Assessment: Ramapo Mountains County Park* (NRIA), conducted by the Ecological Services Department at Maser Consulting P.A. (see Appendix-A for participating staff Qualifications), was initiated with the start of the project in April 2009 and with the subsequent tour of the County Parks associated with this study, led by Bergen County staff on May 1, 2009. Background information was compiled from online resources and published information as cited throughout this report (see Section 9.0 Literature Cited). Focus was given to particular areas of interest, including the region's geology, soils, surface and groundwater resources, and botanical and wildlife resources. Additional field work conducted by team members from Maser Consulting P.A. occurred on May 14, May 21, and July 1, 2009 during which the botanical and wildlife resources, bedrock and surficial geology, and wetlands including vernal pools were documented and representative photographs compiled, some of which are provided as report figures in Appendix-B. Information regarding rare plants and

animals was obtained from the NJDEP Natural Heritage Program as reported in correspondence copied in Appendix C. Additional information on the botanical resources was provided by William Standaert, a local botanist, and also obtained from web-based sources cited herein. Checklists of plants compiled for this study are provided in Appendix D.

Maps of selected natural resources and features including, topography, bedrock geology, surficial geology, soils watersheds, surface water features, aquifers, vegetation, wetlands, and environmentally sensitive features were prepared by the Planning Department of Maser Consulting P.A. and are provided in Appendix E. The combined knowledge of field and mapped conditions was used to perform a preliminary constraints and opportunities analysis that will serve as a guide for the preparation of the *Ramapo Mountains County Park Management Plan*, part of a tiered set of documents regarding the status and management of the open spaces and their resources in the region.

2.0 RAMAPO MOUNTAINS COUNTY PARK

The Ramapo Mountains County Park is comprised of four contiguous lands and/or areas owned and managed by Bergen County and include Ramapo Mountains County Park, Camp Glen Gray, Tamarack Recreation Area, and Todd Recreation Area (Maps 1 & 2). The entire System encompasses approximately 4,500 acres of preserved lands, which are also contiguous with other publically owned and preserved lands owned by the State of New Jersey and local municipalities.

2.1 Regional Context

The Ramapo Mountains County Park is included within the New York - New Jersey Highlands physiographic province which is part of a series of geological formations composed mostly of Precambrian igneous and metamorphic rock. Geographically, the region is a component of the Appalachian Mountain chain. The Highlands physiographic province extends from the Delaware River near Musconetcong Mountain, northeast through the Skylands Region of New Jersey crossing over into New York State. As noted, an extensive greenway has been created by

various agencies of which the Ramapo Mountains County Park is an integral part. The greenway is significant in the fact that is located within the most densely populated metropolitan area of the United States. The regional greenway creates an area for aquifer protection, environmentally significant/sensitive habitat preservation, recreational opportunities and aesthetically pleasing view sheds within 25 miles of New York City.

The Ramapo Mountains County Park is a portion of a large preservation area of contiguous lands owned by State, County, Water Authorities and local municipalities located along the New Jersey and New York State boundaries and the County boundaries of Orange, Rockland, Passaic and Bergen. The publically owned and protected lands adjacent to the Ramapo Mountain System are as follows: Mahwah Township Park, Ringwood State Park, Ramapo Mountain State Forest, Wawayanda State Park, Tranquility Ridge County Park, Norvin Green State Forest, Long Pond Iron Works State Park, Wanaque Wildlife Management Area, Wanaque Reserve, lands adjacent to Wanaque Reservoir (North Jersey District Water Supply Commission), Sterling Forest State Park, Palisades Interstate Park and Harriman State Park.

2.2 County Parks Descriptions

The following subsections briefly describe each of the County Park areas included within the Ramapo Mountains County Park owned and managed by Bergen County. A brief description of each Park's amenities, physical attributes and history is included.

2.2.1 Ramapo Valley County Reservation

The Ramapo Valley County Reservation core property, the parking lot for which is located in Mahwah along Ramapo Valley Road (US 202) about two miles south of NJ Route 17, encompasses 3313 acres and offers 19.7 miles of challenging hiking trails, areas for permitted tent camping and casual strolling areas. The Reservation's trails connect with those in Ringwood State Park to the west, Ramapo Mountain State Forest to the southwest, and Camp Glen Gray to the south. The majority of the Reservation has been left in its natural wild state,

and is mostly hilly, forming part of the eastern tier of the Ramapos. Only the strolling areas immediately adjacent to the parking lot on US 202 and Scarlet Oak Pond (a former quarry) have been substantially impacted by past human activities and more recently by intensive recreational use. Restroom facilities and picnic areas are also available in the vicinity of the parking lot. Fishing is permitted with a NJ State license in the Reservation's two reservoirs, Scarlet Oak Pond and McMillan Reservoir, and the Ramapo River located along the park's eastern boundary.

The Reservation was a portion of the former A. B. Darling Estate (circa 1864). As owner of Fifth Avenue Hotel in New York City, Darling used a good portion of the Reservation and adjacent valley areas as a dairy farm. George Crocker purchased the majority of the lands in 1900, and subsequently sold them to Emerson McMillan who then sold the lands to the Roman Catholic Diocese of Newark.

2.2.2 Camp Glen Gray

Camp Glen Gray is a camping facility located along the border of the municipalities of Oakland and Mahwah, located off of State Routes 202 and 208 and Interstate Route 287. It was originally developed as a Boy Scout camp in 1917 and is named for one of its founders, Frank F. Gray.

In January of 2002, the 750-acre wooded camp became part of Bergen County's park system. The park is managed by the Friends of Glen Gray and use of the facilities requires a reservation and applicable use fees. The park offers hiking trails, fishing and boating opportunities on Lake Vreeland and camping. Cabins, lean-tos and tent sites make are available for camping. A sports field, campfire ring and an amphitheater provide places to hold outdoor events. A dining hall (with a kitchen) may be used for indoor events and meals. Bathroom facilities at campsites consist of latrines in keeping with the camp's rustic mode. Toilets (in warm weather) are located off the parking lot.

In the winter, wood stoves are used in the cabins. Many of the cabins also have electricity. Camp Glen Gray is a weekend campground facility. However, day visitors are permitted only if they are coming to participate in a camp or group sponsored weekend event.

2.2.3 Tamarack Recreation Area

The Tamarack Recreation Area was a former Boy Scout camp encompassing 182 acres of mostly unimproved woodlands along a ridgeline of the Ramapo Mountains. The entrance to the former camp is along the eastern side of Skyline Drive in the Borough of Oakland. The camp abuts Camp Glen Gray to the north, Todd Recreation Area to the east and Ramapo Mountain State Forest to the west and south. No facilities are available in the area; however, footprints of the former camp structures are evident. The Tamarack Recreation Area offers hiking trails connected to adjacent State and County owned lands and fishing opportunities in Lake Tamarack.

Lake Tamarack

The New Jersey Department of Environmental Protection declared the site an illegal waste dump in 1993. The dumped material included chemicals, heavy metals and 35,000 tons of demolition debris (including bricks, asphalt, tiles, and wood). The site was remediated shortly thereafter.

2.2.4 Todd Recreation Area

The Todd Recreation Area was a former Boy Scout camp encompassing 73 acres of mostly unimproved woodlands along a ridgeline of the Ramapo Mountains. The entrance to the former camp is along the eastern side of Skyline Drive in the Borough of Oakland. The camp area abuts Oakland parkland to the north, Tamarack Recreation Area to the west and privately owned properties to the east and south. The Todd Recreation Area offers hiking trails connected to adjacent State and County owned lands and fishing opportunities in Todd Lake. The Todd Recreation Area also contains ecologically significant features such a trout production stream and several vernal pools.

2.2.5 Other County Parks

2.2.5.1 Campgaw Mountain County Reservation

Campgaw Mountain Reservation is a 1351 acre park located mostly within Mahwah, but includes some areas of Oakland and Franklin Lakes. The Reservation is bordered by US Route 202 to the west, Interstate 287 to the east and private properties to the north and south. The Reservation includes a ski area located on the Reservation's highest peak, Campgaw Mountain, 735 feet above sea level. The ski area has two 2-person chairlifts and one magic carpet suitable for novice skiers. The Reservation also has opened section of the smaller hill for patrons to rent inner tubes and slide down to the bottom of the hill. The area has a small lodge, snack bar, and equipment rental shop.

The Reservation was originally an U.S. Army Nike Missile station created in 1955 for the defense of the New York Metropolitan Area from strategic bombers. In 1959, the site was upgraded to house Nike-Hercules Missiles with increased range, speed and payload characteristics. The missile site closed in June 1971.

2.2.5.2 Saddle Ridge Riding Stables

This area, which is part of Campgaw Reservation, offers County residents the opportunity to board horses, take riding lessons, and utilize indoor and outdoor riding facilities. The area is situated adjacent to the southeastern boundary of Campgaw Mountain Reservation, and is operated by a concession. As with Campgaw, the facility was originally a portion of the U.S. Army Nike Missile station. The stables are the old barracks.

3.0 ENVIRONMENTAL SETTING

3.1 Topography

Ramapo Mountains County Park, including Tamarack Recreation Area, Todd Recreation Area, and Camp Glen Gray, extends over approximately 4,500 acres of glaciated terrain of the New Jersey Highlands. Elevations extend from the Ramapo Valley floor at approximately 250 ft to the crest of Bald Mountain in the northern portion of the range in New Jersey at approximately 1184 ft (Map 2). The Ramapo Mountains are characterized by a small chain of north-south trending parallel ridges with individual peaks in Bergen and Passaic counties, New Jersey and extending into Rockland County, New York. They are bound on the east by the Ramapo River Valley, where they form the eastern boundary of the Highlands Physiographic Province. In Bergen County, the Ramapo Mountains are fragmented by a series of west to east trending streams that drain to the Ramapo River and form small valleys perpendicular to the trend of the ridges. Several of these streams are dammed to form ponds or reservoirs.

View from Monroe Ridge

3.2 Geology

Geology of the Ramapo Mountains County Park and vicinity is treated in four parts: geologic history; bedrock geology including rock types and formations (Map 3); structural geology including location and influence of faults and folds (Map 3); and surficial geology including outcrops and glacial

deposits (Map 4). The information contained in these four categories is important in the interpretation of other natural resources such as vegetation and location of sensitive natural features such as wetlands including vernal pools.

As a general statement, the Highlands Physiographic Province is a complex expression of folds faults (Fig. 1), and intrusions of igneous material (NJ Highlands Council 2008A). The bedrock is predominantly Proterozoic (Pre-Cambrian) and is composed of erosion-resistant granite, gneiss, and marble. These are the oldest rocks in New Jersey, formed between 1.3 billion and 750 million years ago. In addition to forming the features of the Highlands, these rocks also form the basement material beneath the younger, overlying rocks of the Valley and Ridge Province, the sedimentary rocks of the Piedmont, and the sediments of the Coastal Plain.

The extensive folding and deformation of the rocks is the result of the forces of plate tectonics that cause the separation and collision of continental masses. The Highlands Province has undergone various periods of uplift and erosion. Through differential erosion, ridges are generally formed by rocks that are less susceptible to erosion such as gneisses (Fig. 2), whereas valleys generally follow areas of weakness that weather and erode more easily such as fracture zones along faults and folds and outcrops of rocks that weather and erode faster including limestone, shale, and glacial deposits.

3.2.1 Geologic History

A long and dramatic history is recorded in the rocks and geologic formations of the Highlands Region. A portion of that history is contained within the Ramapo Mountains County Park. The Ramapo Mountains are part of the Appalachian Mountain System, which traverses the eastern United States in a northeast-southwest trending direction. The Appalachians are an ancient mountain system modified over billions of years by periods of uplift and mountain-building (orogeny) and erosion (Stanley 1977).

The gneissic bedrock found throughout the Reservation is often referred to as Precambrian (Proterozioc) in age, which is the time in Earth's history before life is recorded significantly in rocks. The Post-cambrian designation has been refined and divided into three eras: the Paleozoic (interval of old life), the Mesozoic Era (interval of middle life) and the Cenozoic (interval of modern life). The crystalline rock forming the internal structure of the Ramapo Mountains was mainly formed in the Proterozoic Era (Stanley 1977).

The development of the geology of the Highlands Regions involved four separate orogenies or mountain building episodes: Grenville, Taconic, Acadian and Alleghenian orogenies. A sort of proto-North American continent had formed in the early Precambrian and was undergoing erosion off its continental margins. During the Grenville orogeny, approximately one billion years ago, this proto North America collided with another large continental land mass. The marine sediments on the continental margin were pushed up onto land and metamorphosed from the intense heat and pressure generated by the collision. The metamorphosed sediments were interspersed by intrusions of magma. Mountains, possibly as high as the Himalayas, formed in the Grenville orogeny extended from Canada to Mexico (Paleontologic Research Institute 1Q09).

By 600 million years ago, the Grenville Mountains eroded such that only the core is observed in Highlands Region. This is the crystalline Precambrian rock often referred to. Sea level rose and most deposits surrounding continents consisted of carbonate rock formed from the shells of marine invertebrates. As a proto-European continent approached proto-North America by subducting ocean crust, an island arc, something like Hawaii formed between the continents. The Taconic orogeny involved a collision with the island arc. It pushed the carbonate sediments onto land followed by the igneous rock of the island arc. These rocks are found more westward than the Ramapo Mountains County Park. Most of the island arc rock is found in New England. The Taconic orogeny formed the basis of today's Appalachian Mountain System (Paleontologic Research Institute accessed 2009).

The Acadian orogeny occurred 380 million years ago, when proto-Europe finally collided with proto-North America through further subduction of the ocean crust. Between the Taconic and Acadian orogenies thick layers of sediment were laid down in an inland sea to the west of the east coast mountains. Today's analog would be the Persian Gulf. Acadian orogeny formed another long chain of high mountains similar to the Grenville Mountains. Downwarping in the central portion of the continent accentuated the inland sea and further built the Appalachian Mountain System, which extend from Canada to Alabama. The Acadian Mountains from which the Appalachians have descended were likely as high as the Himalayas.

The Alleghenian orogeny involved a collision with the African continent, when nearly all continental land masses had moved together to form the supercontinent Pangaea about 250 million years ago. Africa and North America directly collided and pushed marine materials upward between the two proto-continents. No subduction was involved (Paleontologic Research Institute, 2009).

When Pangaea pulled apart, beginning about 100 million years ago, a rift basin similar to the East African rift valley began forming. At the easterly edge of the Ramapo Mountains County Park the Newark Basin opened up. In these Triassic rift basins, up to six kilometers of red sediment was laid down. The Ramapo Fault is the edge of this rift basin (Paleontologic Research Institute accessed 2009). Some geologists find evidence that the origins of the Ramapo Fault may extend back to Precambrian times and the complex tectonics of the region (Ratcliffe 1971). The Ramapo Fault is probably the most likely fault in New Jersey to become active.

After the basic bedrock was established, the area was subject to glaciations over the last one and a half million years. This geological time span is referred to as the Pleistocene Epoch. The pre-Illinoisan, the Illinoisan and the Wisconsinan glaciations covered parts of northern New Jersey with ice. High Point, New Jersey was covered with up to 2,000 feet of ice, when these ice ages reached their utmost extent. The Wisconsinan glaciation, which occurred about 21,000

years ago, is responsible for the glacial deposits in the Ramapo Mountains County Park (Witte 1998).

3.2.2 Bedrock Geology

Bedrock formations of the Ramapo Mountains portion of the Highlands Physiographic Province occur west of the Ramapo Fault and are composed largely of older, metamorphosed, Proterozoic intrusive and sedimentary rocks of several series (Map 3). Younger, metamorphosed Mesozoic rocks occur east of the Ramapo Fault in the Piedmont Physiographic Province. The Ramapo Mountains County Park includes bedrock from both regions where the park extends eastward in a few areas across the Ramapo Fault (Map 3).

3.2.2.1 Piedmont Rock Types

East of the Ramapo Fault and adjacent to the Ramapo Mountains, the Newark Basin portion of the Piedmont contains rocks of Late Triassic to early Jurassic age located in a northeast-trending half-graben (basin down-faulted on one side). The Piedmont rocks due bounded on the northwest by normal faults, which are braided, have subordinate splays, and are *en echelon* (off-set series) in many areas (Drake et al. 1996). Examples of these faults are located immediately east of the Ramapo Mountains (Map 3). The Newark Basin is filled with a thick sequence of fluvial (riverine) and lacustrine (lake) deposits and lava flows extending for a total depth of as many as 24,600 ft. Diabase sills, stocks, and dikes (types of intrusive igneous bodies) were intruded at about the time of the earliest lava flows during the early Jurassic. Rocks of the Newark Basin are unconformably overlain by Cretaceous sediments of the Coastal Plain Physiographic Province. Bedrock of the Newark Basin that underlies or crops out within the Ramapo Mountains County Park along the Ramapo River includes the following formations and rock types (Drake et al. 1996; Map 3):

Passaic Formation (JTrpcq)

The Passaic Formation consists of reddish-brown to brownish-purple and grayish-red siltstone and shale (JTrp) with a maximum thickness reaching 11,810 ft. At places it contains sandy mudstone, sandstone, conglomeratic sandstone, and conglomerate containing clasts of quartzite (JTrpcq), or limestone. The Passaic Formation coarsens up section and to the southwest. The quartzite conglomerate unit (JTrpcq) is a reddish-brown pebble conglomerate, pebbly sandstone, and sandstone in upward-fining sequences 3-6 ft thick. Clasts are subangular to subrounded, quartz and quartzite in sandstone matrix. Sandstone is medium to coarse grained, feldspathic (up to 20 percent feldspar), and locally contains pebble and cobble layers. Rocks of the Passaic Formation have been locally thermally metamorphosed to hornfels where in contact with the Orange Mountain Basalt, diabase dikes, and sheetlike intrusions. Total thickness of formation ranges from 11,480-11,810 ft (Drake et al. 1996).

Feltville Formation (Jf)

The Feltville Formation is an interbedded brownish-red to light-grayish-red, fine- to coarse-grained sandstone, gray and black, coarse siltstone in upward-fining cycles, and silty mudstone. Fine-grained sandstone and siltstone are moderately well sorted, commonly cross laminated, and have 15 percent or more feldspar and interbedded with brownish-red, indistinctly laminated, bioturbated calcareous mudstone. The formation is thermally metamorphosed into hornfels where in contact with the intrusive Preakness Basalt. Near the base of the formation are two, thin, laterally continuous beds of black, carbonaceous limestone and gray, calcareous siltstone, each up to 10 ft thick. These contain abundant fish, reptile, anthropod, and diagnostic plant fossils of the Jurassic Period. Three or four thin, gray to black siltstone and mudstone sequences occur in the upper part of the unit. Maximum thickness of the Feltville Formation reaches about 510 ft (Drake et al 1996).

Orange Mountain Basalt (Jo)

The Orange Mountain Basalt is a dark-greenish-gray to greenish-black basalt composed mostly of two minerals, calcic plagioclase and clinopyroxene. The basalt consists of three major flows. The flows are separated in places by a weathered zone or by a thin bed of red siltstone or vocaniclastic rock. The lowest flow is generally massive and has widely spaced curvilinear joints. The middle flow is massive or has columnar jointing. The lower part of the uppermost flow has pillow structures whereas the upper part has pahoehoe flow structures. Tops and bottoms of flow layers are vesicular. The maximum thickness of Orange Mountain Basalt reaches about 597 ft (Drake et al 1996).

Preakness Basalt (Jp)

The Preakness Basalt is a dark-greenish-gray to black, very fine grained, dense, hard basalt composed mostly of two minerals, intergrown calcic plagioclase and clinopyroxene with some feldspar. Small spherical to tubular cavities (gas-escape vesicles) may be filled by zeolite minerals or calcite. The Preakness Basalt consists of at least three major flows. Prominent amygdaloidal zones occur at most contacts between flows. A thin bed of siltstone (Jps) separates the lower flows. The basal 66 ft of the lowest flow is commonly highly vesicular or brecciated. Radiating slender columns, 8-28 inches wide, caused by shrinkage while cooling, are most abundant in the highest flow. Thickness of Preakness Basalt ranges ca. 820 ft to 1,050 ft (Drake et al 1996).

Towaco Formation (Jt)

The Towaco Formation is a reddish-brown to brownish-purple, fine- to medium-grained micaceous sandstone, siltstone, and silty mudstone in upward-fining sequences 3-10 ft thick. Distributed throughout the formation are eight or more sequences of gray to greenish- or brownish-gray, fine-grained sandstone, siltstone, and mudstone containing diagnostic pollen, fish, and dinosaur tracks. The sandstone is commonly trough cross-laminated; the siltstone is

commonly planar-laminated or biotrubated, but can be indistinctly laminated to massive. The formation is thermally metamorphosed into hornfels where in contact with Hook Mountain Basalt. Conglomerate and conglomeratic sandstone with subrounded quartzite and quartz clasts in matrix of light-red sand to brownish-red silt (Jtc) interfingers with rocks of the Towaco Formation north and west of New Vernon. Maximum thickness of the Towaco Formation is about 1,250 ft (Drake et al 1996).

3.2.2.2 Highlands Rock Types

West of the Ramapo Fault, the Ramapo Mountain's portion of the Highlands Physiographic Province contains rocks of Middle and late Proterozoic age including heterogeneous metasedimentary and metavolcanic gneisses and granofels intruded by Byram and Lake Hopatcong Intrusive Suites (Drake et al. 1996). The oldest rocks are the gneiss and associated amphibolites of the Losee Metamorphic Suite, which is a metamorphosed sequence of volcanic rocks. These rocks are unconformably overlain by quartz-feldspar gneisses and volcanic rocks, quartzite, calc-silicate gneiss and marble. Rocks of the Byram and Lake Hopatcong Intrusive Suites intrude all of the rock types. Middle Proterozoic rocks were metamorphosed to amphibolite and hornblende granulite. Diabase dikes attributed to Late Proterozoic age intrude all Middle Proterozoic rocks of the Highlands Physiographic Province. Rock formations and types of the Highlands that underlay or crop out within the Reservation include the following:

Byram Intrusive Series (Ybh)

Hornblende granite, i.e. cimch pinkish-gray- to medium-buff-weathering, pinkish-white or light-pinkish-gray, medium- to coarse-grained, gneissoid to indistinctly foliated granite and sparse granite gneiss composed principally of microcline microperthite, quartz, oligoclase, and hornblende. Some phases are quartz syenite or quartz monzonite. Includes small bodies of pegmatite and amphibolites. Late Proterozoic age approximately 1,090 Ma (Drake et al. 1991b).

Metasedimentary Rocks (Yk, Yb, Ymh, Yp)

Metasedimentary rocks include several types (Drake et al. 1991b). Potassium-feldspar gneiss **(Yk)** is a light-gray, pinkish-white to light-pinkish-gray, fine to medium-grained, moderately foliated gneiss with lesser amounts of granofels composed of quartz, microcline, microcline microperthite, and local accessory amounts of biotite, garnet, sillimanite, and opaque minerals. Biotite-quartz-feldspar gneiss **(Yb)** is a gray-weathering, locally rusty, gray to tan or greenish-gray, fine- to medium-coarse-grained, moderately layered and foliated gneiss that is variable in texture and composition. It is composed of oligoclase, microcline microperthite, quartz, oligoclase, hornblende, and magnetite, and locally contains garnet and biotite. Hornblende-quartz-feldspar gneiss **(Ymh)** is a pinkish-gray to buff-weathering, light-pinkish-white to pinkish-gray, fine- to medium-grained, massive to moderately well layered gneiss containing microcline, quartz, oligoclase, hornblende, and magnetite. It locally contains garnet and biotite. Pyroxene gneiss **(Yp)** is a white to tan-weathering, greenish-gray, fine- to medium-grained, well-layered gneiss containing oligoclase, clinopyroxene, variable amounts of quartz, and trace amounts of opaque minerals and titanite. Some phases contain scapolite and calcite, and it is commonly interlayered with pyroxene amphibolites or marble (Drake et al. 1991b).

Gneiss rock outcrop

Losee Metamorphic Suite (Ylo, Ylb)

The Losee Metamorphic Suite (Fig. 2) consists of several types of gneiss, including quartz-oligoclase gneiss (Ylo), which is white-weathering, light-greenish-gray, medium- to coarse-grained, moderately layered to indistinctly foliated gneiss and lesser amounts of granofels composed of quartz, oligoclase or andesine, and locally, biotite, hornblende, and (or) clinopyroxene (Drake et al. 1991b). Biotite-quartz-oligoclase gneiss (Ylb) is white- to light-gray-weathering, light- to

medium-gray or greenish-gray, fine- to coarse-grained, massive to moderately well layered, foliated gneiss composed of oligoclase or andesine, quartz, biotite, and locally, garnet.

Metamorphic Rocks of Uncertain Origin (Ya)

These rocks (Map 3) include amphibolite (Ya), including gray- to grayish-black, medium-grained amphibolites composed of hornblende and andesine. Some phases contain biotite and (or) clinopyroxene. The group is ubiquitous and associated with almost all other Middle Proterozoic units. Some amphibolites are clearly metavolcanic in origin, some are metasedimentary, and some appear to be metagabbro (Drake et al. 1991b).

3.2.3 Structural Geology

Rocks of the Valley and Ridge, Highlands, and Piedmont Provinces of northern New Jersey consist of a composite of northwest-thinning tectonic wedge formed during several periods of deformation (Herman et al. 1996). Numerous faults and folds are associated with the highly deformed rocks of the Highlands (Fig. 1; Map 3). The Proterozoic rocks characteristic of the Ramapo Mountains portion of the Highlands form the basement material for the younger Paleozoic rocks within the Valley and Ridge and the Highlands provinces and perhaps also the Mesozoic rocks of the Newark Basin within the Piedmont. The Ramapo Fault separates the Ramapo Mountains portion of the Highlands from the adjacent Newark Basin. Folded rocks within the Ramapo Mountains include parallel, north-south, trending overturned synforms and antiforms (Map 3), which as with faults, influence topography, the orientation of streams, and the location of wetlands. For example, the Ramapo River is aligned with the strike of the Ramapo Fault (compare Maps 1 – 3). Correlation of the natural resources with geologic structure is one of the remarkable features of the Reservation.

Mesozoic rocks of the Newark Basin east of the Ramapo Mountains occupy a faulted, half-graben basin, as described below by Herman et al. 1996. Strata dip gently northwest, but are folded locally into open troughs and arches. The coarser-grained alluvial (riverine) facies of the

Passaic Formation in the northeastern part of the basin grade southwestward into finer grained facies and lacustrine (lake) beds. The structure of the Newark Basin is more complex southwestward, where intra-basinal fault systems segment the basin. Most faults of the Newark Basin are strike-slip, but the larger intra-basinal faults also have apparent right-lateral slip. The Passaic Formation directly overlies Paleozoic rocks and the Proterozoic basement along the border fault system.

3.2.4 Surficial Geology including Glacial Deposits

3.2.4.1 Surficial Geology

The Surficial Geology Map (Map 4) prepared for the natural resources assessment depicts the types of geological features cropping out at the surface on the Reservation. The surficial geology can be described as a patchwork of exposed bedrock and glacial till. Bedrock outcrops are extensive at the highest elevations and on steep slopes. The Netcong till is continuous where stream corridors widen and become more level. The remaining areas are characterized by scattered bedrock outcrops within areas with a thin layer of glacial till.

3.2.4.2 Glaciation and Glacial Deposits

Glacial erratic

An important component of the surficial geology of the Reservation are the materials deposited by glaciers long after the mountain-building episodes, which formed the metamorphosed bedrock of the Highlands Regions, but still many millennia in the past. Extensive ice sheets or glaciers extended southward from the subarctic regions of North America as far as New Jersey, during ice ages occurring over the last one and a half million years. This geological time span is referred to as the Pleistocene Epoch. The pre-Illinoisan, the Illinoisan and the Wisconsinan glaciations covered parts of

northern New Jersey with ice. High Point, New Jersey was covered with up to 2,000 feet of ice, when these ice ages reached their utmost extent. The Wisconsinan glaciation, which occurred about 21,000 years ago, is responsible for the glacial deposits in the Reservation (Witte 1998).

As they move across the landscape, glaciers scour and scratch bedrock, capturing and transporting soils and boulders. Grooves in rock, called striations, show the direction in which the glacier moves. Glaciers moving across fractured or jointed bedrock pluck-out large blocks of stone sometimes carrying them long distances. When boulders or large blocks of stone are dropped by a melting glacier far from their original locations, they are called erratics (Kauffman 1990, Witte 1998). Such erratics have been observed in the Reservation (Fig. 3) and are a source of scenic interest.

The general term for all sorts of material deposited by glaciers is drift. Drift can be stratified (sorted) or unstratified (unsorted). Till is the term for unstratified drift directly placed by a glacier (Kauffman 1990). The till of the eastern Highlands is almost entirely derived from gneissic rock. It is characterized by a gritty matrix containing gneissic rock fragments ranging from sand size up through boulder size. The most common size element is stone ranging from pebbles with diameters of less than an inch to boulders eight feet in diameter. According to Salisbury, et al., "*Where the surface remains in its natural state, bow(u)lders are sometimes so abundant that fields may be crossed, almost without stepping off them*" (Salisbury, et al. 1902).

Moraines are landforms composed of till laid down by the glacier. Terminal and end moraines are ridges of till deposited at the utmost edge of a glacier. When the glacier stabilizes for a period of time during melting, ridges called recessional moraines form. Most common are ground moraines, which consist of layers of till dropped by the body of the glacier. The Wisconsinan ice sheet extended as far south as the northeasterly corner of Middlesex County and bisected Morris County (Witte 1998), so no terminal or end moraines are present in the Ramapo Mountains County Park. As depicted on the Glacial Sediments Map, the majority of the

Reservation is covered by a thin veneer of till, interspersed with rock outcrops, typical of ground moraines. Four areas of continuous till are located within the valleys of the streams feeding Havemeyer Reservoir, Macmillan Brook, Bear Swamp Brook and Fox Brook (Maps 4 & 5).

The Reservation is located at the easterly edge of the Highlands. The Ramapo River flows just to the east of the Reservation parallel to the Ramapo Fault. This fault marks the westerly edge of the Newark Basin. The Glacial Sediments Map shows glacial lacustrine deposits overtopped by fluvial sediments. The thickness of these sediments ranges from 50 to 149 feet. These valley fill sediments were laid down in glacial lakes. The ponding of meltwater in the Ramapo Valley behind coarse glacio-fluvial sediments and behind the glacier itself created these lakes as glaciers were retreating (Canace & Hutchinson 1988).

3.2.4.3 Soils and Glaciation

Five major factors influence soil formation and determine a particular soil's characteristics. These factors are: 1) parent material, 2) climate, 3) living organisms (especially native vegetation), 4) topography and 5) time. The bedrock and sediments and organic materials laid down in different depositional environments comprise the parent materials. Within New Jersey, the parent materials along with topography are probably the most important factors differentiating soils in the State. New Jersey is a small state, but varied in its geologic history, which results in a variety of processes that have affected land masses since the beginning of time. The eastern coast of the United States has undergone mountain building with volcanic eruptions followed by weathering from storms and glaciers. The soils within the Ramapo Mountains County Park formed in the granite and gneiss bedrock of Ramapo Mountain and in glacial till, which overlies bedrock to varying degrees on the mountain. Soils are relatively new within the Reservation, since older soils were scoured by glaciers and deposited elsewhere.

3.3 Soils

Soil has been defined as "*…a natural body comprised of solids (minerals and organic matter), liquid, and gases that occurs on the land surface, occupies space, and is characterized by one or both of the following: horizons, or layers, that are distinguishable from the initial material as a result of additions, losses, transfers, and transformations of energy and matter or the ability to support rooted plants in a natural environment*" (NRCS accessed 2009).

The Soil Conservation Act of 1935 led to the establishment of the Soil Conservation Service and with it, a focus on new characteristics. Today we draw on a combination of factors to describe soils. The United States Department of Agriculture (USDA), non the Natural Resources Conservation Service (NRCS), has taken the lead in describing the characteristics of soils in New Jersey. Because of the complexity, soils are described as groups with similar characteristics, often based on location (NRCS, Soil Survey Staff 2009). The soils types found in Bergen County Parks are mapped on the Soils Map and are described below.

Rockaway Soil Series, Map 6

By far, the most abundant soil types within the Ramapo Mountains County Park are soils included within the Rockaway Soil Series. The Rockaway soils are divided into gravelly loams **(RofCb, RofDb, RofEb)** and the rock outcrop complex **(RomC, RomD, RomE)**. The variations among the soils within the two categories can be attributed to variation in slope). All of these soils formed on ground moraines in coarse-loamy glacial till derived from granite and gneiss rock. Ground moraines are layers of glacial till laid down as the main body of a glacier melted (Kauffman 1990).

The **RofCb, RofDb,** and **RofEb** soils are characterized by 8-15 percent, 15-25 percent and 25-35 percent slopes, respectively. Lithic bedrock occurs at depths ranging from 48 to 72 inches. The seasonal high water table can be found between 24 and 36 inches below the surface. The depth to the fragipan is 16 to 40 inches in the RofCb and RofEb soils and from 24 to 40 inches in the

RofDb soils. The hazard of erosion is moderate in the RodCb soils and severe in the RofDb and RofEb soils. All of these soils are moderately well drained. The RofCb soils pose limitation for community development and the RofDb and RofEb soils pose limitations for community development, septic systems and most recreational facilities due to slow permeability in the fragipan, high water table and slope. Downslope movement of water along the fragipan is another factor limiting the use of septic systems or buildings with basements in these soils.

The **RomC, RomD,** and **RomE** soils are characterized by 8-15 percent, 15-25 percent and 25-45 percent slopes, respectively. Rock outcrops account for 25-30 percent of the map units. Cobbles, stones and boulders cover 9 percent of the soil surfaces. Lithic bedrock occurs at depths ranging from 72 to 99 inches in the RomC soils and from 48 to 72 inches in the RomE soils (The soil surveys do not provide depth to bedrock for the RomD soils). The RomC and RomE soils are moderately well-drained and the RomD soils are well-drained. The seasonal high water table can be found between 24 and 36 inches below the surface in each of the soils. The depth to the fragipan is 18 to 30 inches in the RomC and RomD soils, but 16 to 39 inches in the RomE soils. The hazard of erosion is moderate in the RomC soils and severe in the RomD and RomE soils. The RomC, RomD and RomE soils pose limitations for community development, septic systems and most recreational facilities due to slow permeability in the fragipan, high water table, large stones on the soils surface and slope. Downslope movement of water along the fragipan is another factor limiting the use of septic systems or buildings with basements in these soils.

The following soil types only occur sparingly within the Ramapo Mountains County Park in wetlands stream corridors or previously developed land:

Adrian Muck (AdrAt), Map 6

This soil is very frequently flooded. It is very poorly drained and ponding is frequent. The seasonal water table is at the surface. The parent material consists of herbaceous organic

material over deposits of sandy glacial outwash. These soils are limited by the high water table, frequent flooding and low bearing strength for community development, installation of sanitary facilities and recreational facilities. This soil type only occurs in a few locations on County Park lands. It is associated with Bear Swamp and a ponded area on Ramapo Mountain.

Hasbrouck loam, 0-3 percent slopes, very stony (HcsAb), Map 6

The HcsAb soils are limited in areal extent and occur in scattered locations throughout the Reservation, generally associated with the headwaters of streams. These soils were formed in depressions in fine-loamy eroded and redeposited glacial material overlying glacial till. About 1 percent of the surface is covered with cobbles and boulders, a fragipan may occur between 16 and 34 inches below the ground surface. The HcsAb soils are poorly drained and the seasonal high water table ranges from 0 to 6 inches in depth. Ponding occasionally occurs. Erosion hazard is slight. Slow permeability, high seasonal high water table and frost action potential pose limits for community development, installation of sanitary facilities and recreational facilities.

Hibernia loam, 0-8 percent slopes, very stony (HhmBb), Map 6

Like the HcsAb soils, the HhmBb soils are limited in areal extent, occur in scattered locations throughout the Reservation, and are also generally associated with the headwaters of streams. These soils were formed in ground moraines in parent materials composed of coarse-loamy colluviums and/or glacial till. Less than 2 percent of the surface is covered with cobbles stones and boulders. Any restrictive features occur more than 80 inches below the ground surface. The HhmBb soils are somewhat poorly drained and the seasonal high water table ranges from 6 to 16 inches in depth. Erosion hazard is slight. High seasonal high water table and frost action potential pose limits for community development, installation of sanitary facilities and recreational facilities.

Otisville gravelly loamy sand, 15 to 25 percent slopes (OtsD), Map 6

The OtsD soils only occur once within the Reservation along the corridor of the Ramapo River. These soils are formed on kames, which are glacial deposits of stratified drift forming low, steep-sided hills (Kauffman 1990). The parent material consists of glaciofluvial deposits derived from sandstone and shale. The OtsD soils are excessively drained and the depth to the seasonal high water table exceeds 80 inches. Erosion hazard is slight. Rapid permeability and steep slopes pose some limitations of community development and recreational facilities.

Riverhead sandy loams, (RkrB: 3-8 percent slopes) and (RkrC: 8-15 percent slopes), Map 6

These soils are mapped together in a single location near the Ramapo River within the Reservation. The Riverhead soils series were formed at the base of slopes on glacial outwash fans. The deposits were derived from granite and gneiss. Both of these soils are well-drained with the seasonal high water table more than 80 inches from the ground surface. Erosion hazard is moderate in both soil types. Very rapid permeability limits the use of septic systems in these soils. Potential for frost action poses challenges for road construction in both soil types. Slope is a limiting factor for community development and recreational facilities in the RkrC soils.

Udorthents, loamy (UdkttB), Map 6

Occurring only once within the Reservation boundaries, these soils are formed on the side slopes of low hills in loamy material transported by humans (i.e. fill material). The UdkttB soils are well-drained with the depth to the seasonal high water table ranging from 48 to 122 inches. Most of these areas are developed. Limitations are unknown without site-specific soil investigation.

3.4 Hydrology

In the most basic sense, hydrology can be described as water, its characteristics and the effects it has on the chemical and physical world (USGS 2009). Often explained through the hydrologic cycle, water is cycled throughout the Earth's atmosphere and Earth's interior through the processes of precipitation, evaporation and transpiration (Winter 2002). Water is constantly moving.

Hydrology can encompass all aspects of water from different types of surface water and groundwater, to natural drainage and water collection, to stormwater runoff and artificial dams. The hydrology of a specific area can be formed through a range of physical components, including geologic formations, rock type, underlying aquifers, vegetative cover and land use. Water from higher elevations flow down grade within streams and rivers or can pond naturally to form wetlands or swamp. Water flowing overland can also be absorbed through the ground to underlying aquifers. Some streams and rivers can be artificially dammed to form reservoirs. The relationship between surface water and groundwater is highly connected. In certain conditions, surface water recharges groundwater and groundwater provides inflow to surface water.

The detail involved in studying and understanding the hydrology of a region can be overwhelming. As such, areas of hydrology are broken into manageable units, identified as drainage areas and watersheds.

3.4.1 Watersheds

The New Jersey Department of Environmental Protection defines watersheds as "*the area of land that drains into a body of water, such as a river, lake, stream or bay. It is separated from other systems in the area by high points, such as hills or slopes. It includes not only the waterway itself but also the entire land area that drains to it*" (NJDEP Division of Watershed Management 2007). The Natural resource Assessment addresses areas located within the

Pompton, Pequannock, Wanaque, Ramapo Watershed, which is classified as Watershed Management Area #3 (WMA 3) by the NJDEP (NJDEP Division of Watershed Management 2009). The Pompton, Pequannock, Wanaque, Ramapo WMA is located within Passaic, Bergen, Morris and Sussex counties of New Jersey; however, a few of the headwaters of this WMA begin in New York State (NJDEP Division of Watershed Management 2007). The four different watersheds within this management area (Pompton River Watershed, Pequannock River Watershed, Wanaque River Watershed and Ramapo River Watershed) drain to the Pompton River, which ultimately flows to the Upper Passaic River (NJDEP Division of Watershed Management 2009). Please refer to the Watershed Management Areas map (Appendix E) to view the boundaries of the Watershed Management Areas within the subject area.

In addition to the NJDEP Watershed Management Area designation, the United States Geologic Survey (USGS) uses watershed Hydrologic Unit Codes (HUC11 and HUC14) for the purposes of surface water management. Each Watershed (HUC 11) is broken into Subwatersheds (HUC 14) to further classify the areas of importance. These classifications make it easier to monitor and manage the water quality and characteristics of each water system.

The majority of the subject area lies within the Ramapo River Watershed, located primarily in Bergen County. Seven (7) different HUC14 subwatersheds are classified within the Ramapo River Watershed, including Ramapo River (above 74d 11m 00s), Masonicus Brook, Ramapo River (Bear Swamp Brook through Fyke Brook), Ramapo River (above Fyke Brook to 74d 11m 00s), Ramapo River (Crystal Lake bridge to Bear Swamp Brook), Ramapo River (below Crystal Lake bridge) and Crystal Lake/Pond Brook. Only four (4) of the seven (7) subwatersheds are located within the Ramapo Mountains County Park Management Plan Area, as shown on the Watersheds Map (Map 7) and Watershed Management Regions Map (Map 14). The following Section is a break-down of the HUC-14 subwatersheds that are located within the project area.

3.4.2 Ramapo River Subwatersheds

Ramapo R. above 74 11m 00s. ["Stag Brook"]

The Ramapo River (above 74d 11m 00s) subwatershed (Map 7), herein referred to as Stag Brook subwatershed, is located in the northernmost region of the Ramapo Mountains County Park Management Plan project area. This subwatershed encompasses a total of 6,504.18 acres. Approximately 869.85 acres of the project area are included within this subwatershed. The primary waterway present within the subwatershed is Stag Brook and the tributaries to this stream, which ultimately flow to the Ramapo River.

Ramapo R. (above Fyke Bk. to 74 d 11m 00s) ["McMillan Brook"]

The Ramapo River (above Fyke Brook to 74d 11m 00s) subwatershed (Map 7), herein referred to as MacMillan Brook subwatershed, includes the largest number of streams and ponds in the project area. Approximately 1,428.99 acres of the Ramapo Mountains County Park Management Plan project site are included in the 10,809.65 total acres of the subwatershed.

Two different water systems are located within the subwatershed: MacMillan Brook and Havemeyer Brook, both of which drain to the Ramapo River. The headwaters of the two waterways begin within the boundary of the Ramapo Mountains County Park Management Plan project area. MacMillan Brook flows entirely within the grounds of the park, while Havemeyer Brook connects to the Ramapo River just outside of the park's boundary. Both waters have reservoirs, or artificial ponds created with dams for water storage, named after the streams that feed them. Scarlet Oak Pond, located within the eastern portion of the subwatershed, drains directly to the Ramapo River.

Ramapo R. (Bear Swamp Bk. through Fyke Bk.) ["Bear Swamp Brook"]

The Ramapo River (Bear Swamp Brook through Fyke Brook) subwatershed (Map 7), herein referred to as Bear Swamp Brook subwatershed, is approximately 13,827.74 acres in size. The park is located within 1,105.59 acres of the subwatershed. Only one main waterway, Bear Swamp Brook, and its associated tributaries, flows through the subwatershed. Bear Swamp Brook briefly flows through a small portion of the Ramapo Mountains County Park Management Plan area before flowing through Bear Swamp Lake located outside the Park's boundaries and reentering the project area. Multiple sources outside the Park contribute to the waterway, including Cannonball Lake. Bear Swamp Brook ultimately drains to the Ramapo River, located just outside the project area's limits.

Bear Swamp Brook

Ramapo R. (Crystal Lake Bk. to Bear Swamp Bk.) ["Fox Brook"]

The Ramapo River (Crystal Lake Brook to Bear Swamp Brook) subwatershed (Map 7), herein referred to as Fox Brook subwatershed, is located in the southernmost region of the project area. The overall subwatershed includes 17,868.95 acres; however, only 1,179.50 acres are included within the project site. A portion of the subwatershed, is also located in Passaic County.

Fox Brook is located in the northern portion of the subwatershed and is located within Mahwah Township, Bergen County. The waterway flows in a west to east direction through the project area, and drains to the Ramapo River, located outside of the project area. Lake Vreeland, an artificial lake, is located along the waterway.

Located within the same watershed as Fox Brook and Lake Vreeland, but located within Oakland instead of Mahwah, is Lake Tamarack and Todd Lake. These two artificial lakes are located along tributaries of the Ramapo River.

3.4.3 Surface Water Resources

The project area is located within the New Jersey Highlands Region Area, which is a highly protected area within northern New Jersey focused on preserving these and other important resources. Water resources have long been regarded in the Highlands Region as a valuable and vulnerable ecological resource. State rules and regulations were authorized in 2005 to help the Highlands Council achieve its goals to protect the ecologically, recreationally and aesthetically important resources for the future. The Highlands Regional Master Plan was approved in 2008.

Although a large amount of surface water is collected through precipitation, much of the water available within these resources comes from groundwater inflow (Winter 2002). Water from underground resources feed surface areas through one of three ways: groundwater inflow through the entire bed of the surface water; seepage from groundwater when surface elevation is lower than the water table, or the elevation of the surface water is higher on one side than it is on another, and groundwater flows through the surface water (Winter 2002).

Surface water comes in many forms throughout the Ramapo Mountains County Park Management Plan project area. From the headwaters of streams and the large rivers they flow into, to the ponds and reservoirs artificially formed along these streamlines for recreational and potable water services, surface water provides a basis for ecological functions and provides for the overall well being of the entire community. A description of the surface water resources available within the project area is as follows:

3.4.3.1 Seeps and Springs

Seeps and springs are areas where breaks in rock formations allow groundwater to flow out from the water table to the surface (Fig. 4). The primary difference between seeps and springs is that seeps tend to have a slower flow that stretches out of a larger area and springs tend to have a faster flow out of one singular area (Montana DEQ 2009). The headwaters of many streams are formed from these surface water resources. Additionally, seeps and springs provide habitat for various plants and wildlife species, particularly during the colder months of the year, because the water flowing out of the ground is a higher temperature than the surface (Montana DEQ 2009). Because the area is located within a mountainous part of the State with changing geology formations and rocky types, seeps and springs occur throughout the project area.

Seep located in glacial till

3.4.3.2 Vernal pools

Vernal pools, by definition, are isolated depressions that hold water for at least two months a year and lack breeding fish populations (NJDEP FWS 2008). Because vernal pools only have water for short periods of time, and are either dry or extremely shallow during the majority of the year, fish populations cannot survive. Over time, the lack of predators and the relative safety of the vernal pools have allowed multiple species of amphibians to thrive in these specialized habitats (NJDEP FWS 2008). Because vernal pools provide habitat for a diverse set of species, including multiple threatened and endangered species, the Highlands Region of New Jersey has taken steps to protect these important features through enacting a habitat

protection buffer of 1,000 feet around potential Vernal Pools (Highlands Regional Master Plan 2008). The NJDEP and Rutgers University also maps certified vernal pools and potential vernal pools throughout New Jersey. According to available mapping, approximately 21 potential vernal pools are present within the project limits (Fig. 5) and approximately 3 documented vernal pools are present within the project limits, specifically located within the Bear Swamp Brook subwatershed. The habitat buffer of other actual and potential vernal pools also extends into the Ramapo Mountains County Park Management Plan project area. Refer to the Environmentally Sensitive Features Map (Map 12) for an overall overview of the location of both potential and certified vernal pool buffers, as well as the Stag Brook Management Region – Overlay (Map 16), the MacMillan Brook Management Region – Overlay (Map 18), the Bear Swamp Brook Management Region – Overlay (Map 20) and the Fox Brook Management Region – Overlay (Map 22) for an enlarged view of the vernal pool buffer locations.

3.4.3.3 Rivers and Streams

Rivers and streams are flowing bodies of surface water that originate from surface water runoff or groundwater seeps and springs (Figs. 6-8). Streams are typically smaller than rivers and the term "tributary" is often used to describe streams that flow into rivers. Three different types of streams are present throughout the Ramapo Management Area. These include ephemeral, intermittent, or seasonal streams, and perennial, or streams that are present all year long.

Headwater stream

Rivers and streams can be fast moving or slow moving, which determines the organisms that can inhibit these ecosystems. Slow moving

systems are very similar to lakes and ponds in terms of their plant and animal life. Phytoplankton is dominant and this abundant food source allows a high species diversity due to the higher nutrient loads. Faster waterways push nutrients downstream, decreasing the potential for production (NJDWC 2002).

As discussed previously, not all water from streams comes from surface runoff or precipitation. Groundwater and surface water are tightly intertwined in terms of transfer of water. Streams found within terrain similar to that found in the New Jersey Highlands Region typically lose water to groundwater (USEPA 1992). Groundwater may provide surface water resources with water when groundwater is at a higher elevation than the surface; however, porous soils may cause water to recharge into the groundwater at a faster rate than water is collected.

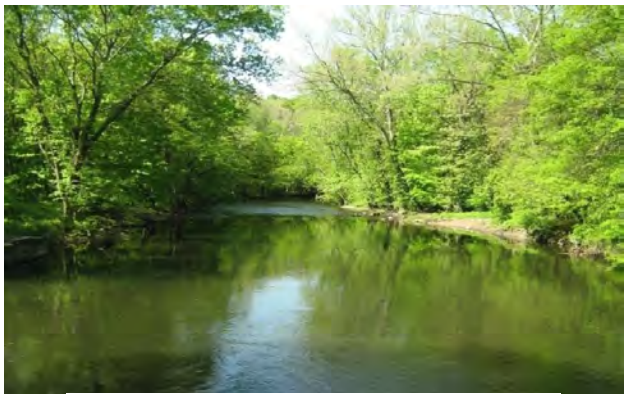
New Jersey classifies waterways according to certain water quality standards addressed within the New Jersey Surface Water Quality Standards (N.J.A.C. 7:9B). Depending on how a water body is classified under these Rules, based on categories such as "clarity, color, scenic setting, other characteristics aesthetic value, unique ecological significance, exceptional recreational significance, exceptional water supply significance or fisheries resources", certain restrictions can be placed on the areas along the waterway in order to protect and enhance surface water resources (NJDEP 2008).

Multiple waterways are located within the project area (Map 8 - Surface Water Features). The primary streams and rivers within the project area include:

Ramapo River

The Ramapo River is the main waterway that receives drainage from all waterways located within the Ramapo Mountains County Park Management Plan project area (Fig. 6). It is located along the eastern edge of the Ramapo Mountains and it flows in a north to south direction along eastern boundary of the project limits. As one of the four main rivers within the

Pompton, Pequannock, Wanaque, Ramapo Watershed, the river begins in New York before flowing into New Jersey and converging with the Pequannock River to form the Pompton River.



Ramapo River near Scarlet Oak Pond

According to the 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9), the Ramapo River is classified as a freshwater, non-trout (FW2-NT) waterway from New Jersey State line until it's confluence with Fox Brook. From its confluence with Fox Brook to Patriots Way bridge, the Ramapo River is classified as a freshwater, non-trout, category 1 (FW-NT/C1) waterway.

Stag Brook

Stag Brook is the northernmost waterway, located in the Stag Brook subwatershed (HUC 14 No. 02030103100010). The 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9) classifies Stag Brook (also known as Clove Brook within the Standards) as a freshwater, trout producing category one (FW2-TP/C1) waterway.

Havemeyer Brook

Havemeyer Brook is located within the MacMillan Brook subwatershed. According to the 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9), the waterway is classified as a freshwater, trout producing category one (FW2-TP/C1) waterway.

MacMillan Brook

MacMillan Brook is located in the MacMillan Brook subwatershed (HUC 14 No. 0230103100030) in addition to Havemeyer Brook. This waterway is not classified by the 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9). In these cases, the waterway is given the

same classification as the receiving waterway. Because MacMillan Brook drains to the Ramapo River and the Ramapo River is classified as a FW2-NT waterway at the location of the confluence, MacMillan Brook is also classified as a FW2-NT waterway. To support this, the NJDEP iMap also classifies the waterway as FW2-NT.

Bear Swamp Brook

Bear Swamp Brook (Fig. 8) is located within the Bear Swamp Brook subwatershed (HUC14 No. 0230103100040). The waterway originates from Cranberry Pond, located in the Village of Sloatsburg, New York The 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9) classify Stag Brook (also known as Clove Brook) as a freshwater, trout producing category one (FW2-TP/C1) waterway.

Fox Brook

Fox Brook is located within the Fox Brook subwatershed and is classified as a Freshwater Non-trout (FW2-NT) waterway, as per the 2008 NJDEP Surface Water Quality Standards (N.J.A.C. 7:9).

3.4.3.4 Waterfalls

Waterfalls, or cascades, are surface water features where flowing surface water drops suddenly in elevation (Fig. 9). As discussed in the Geology section, waterfalls can be formed through a number of geologic changes, including shifts in fault lines, changes in rock type and erosion (Mountain Nature 2005). Overtime, the constant waterflow causes these geologic formations and rock types to erode further, increasing the change in elevation and ultimately forming a waterfall (Mountain Nature 2005).

Waterfall in granitic bedrock

At least three waterfalls are located in the Reservation, including Bear Swamp Brook Falls #1, Bear Swamp Brook Falls #2 and Buttercup Falls (New Jersey Waterfalls 1999).

3.4.3.5 Lakes and Ponds

Lakes and ponds are inland bodies of water that have been formed either by natural means (e.g., glacial lakes) or artificial means (e.g., man-made ponds). According to the United States Environmental Protection Agency (USEPA), the primary distinguishing factor between the two waterbodies is size (2009), although lakes are typically deeper and larger than ponds. Most lakes and ponds located within the New Jersey Highlands Area are artificially created and are used for irrigation or recreational purposes (Highlands Regional Master Plan 2008).

A lake or pond is naturally formed when water draining to a low spot in the topography flows in faster than it is able to leave. Water flowing along the river is suddenly slowed in one specific spot and water backs up behind this spot. Most ponds and lakes located within the Ramapo Mountains County Park Management Plan project area have been created through artificial means. Two of the six artificial waterbodies within the project area limits are utilized as reservoirs, which hold water until it is needed by the owning entity as a potable water source. Please refer to the orthophotography map (Map 1) to view the locations of the surface waterbodies.

Todd Lake

Ponds, lakes and reservoirs located within the project area include the following:

Macmillan Reservoir

This waterbody is a 20-acre lake located along the MacMillan Brook. Once used to supply the Crocker Mansion on the far side of Ramapo Valley Road, the Bergen County Department of Parks-owned reservoir is primarily used for recreational purposes (NYNJTC 2009). The dam

used to create MacMillan Reservoir is a gravity dam constructed out of compacted soil, also a form of embankment dams. It is approximately 21 feet high 265 feet across. Maximum discharge is 408 cubic feet per second. Normal storage is 141 acre feet. It drains an area of 0.75 square miles. (Unknown 2009)

Havemeyer Reservoir

This reservoir is a small waterbody located within the same HUC 14 subwatershed as MacMillan Reservoir along the Havemeyer Brook.

Scarlet Oak Pond

Scarlet Oak Pond

Scarlet Oak Pond (Fig. 10) is located in the MacMillan Brook subwatershed. It is a former gravel quarry (NYNJTC 2009) located in the floodplain of Ramapo River. This pond is classified by the NJDEP Surface Water Quality Standards (2008) as a freshwater, trout maintenance (FW2-TM) waterway.

Lake Vreeland

This artificial lake is located within Camp Glen Gray. It was formed in the early days of the camp when the Kidde-Miller dam was constructed. It is used primarily for recreational purposes (Camp Glen Gray 2009).

Lake Tamarack

Lake Tamarack (Fig. 11) is located along an unnamed tributary of Ramapo River. It is owned by Bergen County and is primarily used for recreational purposes. Created by dam approximately 11 feet high and 200 feet long, the embankment dam holds approximately 98 acre feet.

Maximum discharge is approximately 117 cubic feet per second and drains approximately 0.37 square miles (Unknown 2009)

Todd Lake

Todd Lake (Fig. 12) is located in Todd Recreation Area, a former Boy Scout camp.

3.4.4 Aquifers

Groundwater, located mostly out of sight, is one of our most important resources. Rainfall is able to flow through the pores or empty spaces between the rock and soil components to add to or recharge the existing groundwater supply. Between the rock and within the soil are spaces or openings that store water and allow fresh water, or precipitation, to replenish or recharge the supply. An aquifer is defined as a geologic unit, capable of storing and transmitting groundwater to wells. These geologic units may consist of unconsolidated sands, and gravels, glacial tills, sandstones, limestones and dolomites, basalt flows and fractured igneous and metamorphic rock, (Fetter 1994).

According to NJDEP mapping, depicted on the Aquifer Map, the vast majority of the Ramapo Mountains County Park is underlain by a bedrock aquifer consisting of igneous and metamorphic rock. In the vicinity of Scarlet Oak Pond, the Brunswick Aquifer and a Basalt aquifer are bedrock aquifers. In small areas in the most easterly portions of the Reservation, surficial aquifers consisting of sand and gravel are found.

Within the Reservation, the gneiss bedrock is the primary aquifer. Unweathered gneiss is practically impervious, due to a very low primary porosity. Porosity is the amount of empty space or voids within rock or soil. Weathering and fracturing increase the porosity of crystalline rock formations, such as those within the Reservation (USEPA 1992). Weathering of this type of rock forms a material called saprolite, which has a 40 to 50 percent porosity (Fetter 1994). Fracturing, which can result from faults and joints in the rock mass, creates a secondary

porosity. Water can be stored in the rock fractures. Tree roots and frost action ultimately enlarge the fractures. The fracturing and weathering of gneiss is typically only significant enough to yield well water at depths of 200 to 300 feet. High yield wells, even at these relatively shallow depths are possible, when aquifer recharge rates are high (USEPA 1992). Local water sources, however, are dependent on aquifers of the Ramapo River Valley.

The majority of the aquifers of the highlands region have been designated as Sole Source Aquifers (SSA) under the Safe Drinking Water Act of 1974. A Sole-Source Aquifer is defined as "*…an aquifer, which contributes more than 50 percent of the drinking water to a specific area and its contribution would be impossible to replace if the aquifer were to become contaminated*" (Hoffman 1999). The Ramapo River Basin Aquifer System was designated a sole source aquifer in 1992. While the aquifer system itself extends from Great Border Fault, east to the edge of the Ramapo River Basin (Khorsand 2001), the entire stream-flow source zone of the Ramapo River is included within the jurisdictional limits of the aquifer. This includes the streams draining the Ramapo Mountains County Park (Hoffman 1999). These streams flow into the Ramapo River. Since the Ramapo is a "losing" river, the river waters recharge groundwater (USEPA 1992) in the Ramapo River Basin Aquifer System. Refer to additional information in Section 4.2 Critical Groundwater Concerns.

Although no major wells have been drilled into the crystalline bedrock aquifer (USDA, Forest Service 2002) on the Ramapo Mountains County Park, the Highlands water resources have been recognized as significant in the State of New Jersey (Highlands Water Protection and Planning Council 2008). The Highlands Water Protection and Planning Act (N.J.S.A. 13:20-1 et seq.) was adopted on May 9, 2004 for the purpose of protecting the significant water resources of the Highlands Region. As stated in the Highlands Regional Master Plan:

> "*The Highlands Act emphasizes the protection, enhancement, and restoration of water resources throughout the Highlands Region, including the ground and surface waters that support aquatic ecosystem sustainability and provide*

necessary water supplies for the State" (Highlands Water Protection and Planning Council 2008).

3.5 Botanical Resources

Botanical resources are defined herein as the sum of the native, naturalized, and horticultural plant resources found in the study region. These resources can be organized into vegetation, which is naturally occurring, and introduced. We have confined our discussion for the purposes of this assessment largely to the naturally occurring native and introduced resources, rather than the planted and cultivated types.

3.5.1 Vegetation

Vegetation consists of all of the plant species in a region (the flora) and the pattern of how all those species are spatially or temporally distributed (Barbour et al. 1980). Each vegetation type is characterized by the life form of the dominant species including, for example, herbaceous species, shrubs, and trees. A plant community is a general term applied to any vegetation unit, from the broad and general to the narrow and local. Because of the coarse scale of the study region (over 4000 acres) and general nature of this study, a broad approach to vegetation or community classification is the only practical approach. Individual site detail will reveal more diversity and complexity than can be included herein.

Floodplain wetland along Ramapo River

For the purposes of this study, land use and cover types compiled (Table 1) and mapped (Map 10) by NJDEP (2002) provide an overview of the major vegetation units (Table 1). Regarding vegetation cover types, the following general groups are identified by NJDEP:

- Uplands:
  - Coniferous and Deciduous Brush/Shrubland
  - Deciduous Forest

  - Mixed Deciduous and Coniferous Forest
  - Old Field
- Wetlands:
  - Deciduous Scrub/Shrub Wetlands
  - Deciduous Wooded Wetlands
  - Mixed Wooded Wetlands
  - Herbaceous Wetlands

Table 1. Total acres within the Ramapo Mountains County Park for each Land Use/Land Cover type from 2002 NJDEP data.

TYPE02	LABEL02	ACRES
AGRICULTURE	CROPLAND AND PASTURELAND	20.93
BARREN LAND	ALTERED LANDS	0.62
BARREN LAND	TRANSITIONAL AREAS	4.31
FOREST	CONIFEROUS BRUSH/SHRUBLAND	4.07
FOREST	DECIDUOUS BRUSH/SHRUBLAND	10.22
FOREST	DECIDUOUS FOREST (>50% CROWN CLOSURE)	3,985.81
FOREST	DECIDUOUS FOREST (10-50% CROWN CLOSURE)	90.01
FOREST	MIXED FOREST (>50% CONIFEROUS WITH >50% CROWN CLOSURE)	2.89
FOREST	OLD FIELD (< 25% BRUSH COVERED)	4.16
URBAN	OTHER URBAN OR BUILT-UP LAND	13.61
URBAN	RECREATIONAL LAND	23.82
URBAN	RESIDENTIAL, HIGH DENSITY OR MULTIPLE DWELLING	6.25
URBAN	RESIDENTIAL, RURAL, SINGLE UNIT	30.31
URBAN	RESIDENTIAL, SINGLE UNIT, LOW DENSITY	0.98
URBAN	TRANSPORTATION/COMMUNICATION/UTILITIES	2.23
URBAN	UPLAND RIGHTS-OF-WAY UNDEVELOPED	30.67
WATER	ARTIFICIAL LAKES	20.29
WATER	BRIDGE OVER WATER	0.03
WATER	NATURAL LAKES	28.43
WATER	STREAMS AND CANALS	14.87
WETLANDS	DECIDUOUS SCRUB/SHRUB WETLANDS	0.77
WETLANDS	DECIDUOUS WOODED WETLANDS	283.48
WETLANDS	DISTURBED WETLANDS (MODIFIED)	0.15
WETLANDS	HERBACEOUS WETLANDS	0.44
WETLANDS	MIXED WOODED WETLANDS (CONIFEROUS DOM.)	4.01
WETLANDS	WETLAND RIGHTS-OF-WAY	0.60

For the purposes of this report, upland vegetation types are represented by four major categories: Outcrop Vegetation, Herbaceous Vegetation; Coniferous Evergreen Forest, and Broadleaved Deciduous Forest. Wetland vegetation types within the Reservation are represented by five vegetated classes including Moss/Lichen, Aquatic Bed, Emergent, Scrub/Shrub, and Forested Wetland, all of which are considered herein to belong to the Palustrine System (Cowardin et al. 1979), although minor examples of Aquatic Bed Wetland may occur in riverine environments within stream channels. Because we are considering all ponded water to be situated in palustrine ponds and reservoirs (less than 20 acres) and not lacustrine lakes or reservoirs, none of the wetland vegetation is treated as belonging to the Lacustrine System.

3.5.1.1 Upland Vegetation

Outcrop Vegetation

Vegetation located on bedrock outcrops is generally different that the surrounding dominant vegetation located on richer and deeper soils. The individual plants are often sparsely distributed and often restricted to this habitat. In some situations such as limestone and serpentine and other rocks with chemically-affected substrates, unique and endemic species may occur. Such "edaphic" affinities do not seem to be characteristic of the largely metamorphic and igneous rocks of the Ramapo region. Although this "plant community" may best be treated as a rock outcrop with individual species (shrubs and herbaceous plants) scattered in the bedrock context, it is nonetheless an interesting and characteristic feature of the Ramapo Mountains. Representative

Perennial grassland "bald" plant community

herbaceous species include, for example, Blunt-lobed Cliff Fern (*Woodsia obstusa*), Smooth Rockcress (*Arabis laevigata*), and Sand Bittercress (*Cardamine parviflora*).

Herbaceous Vegetation

Herbaceous vegetation includes plant communities that are dominated by native or introduced species or a combination of both. Although rare within the RVCR, Native Perennial Grassland is one type dominated by native species. It is characteristic, for example, of headlands and other exposed rock outcrops with relatively flat topography and thin soils (Fig. 13). Under these conditions, Little Bluestem (*Schizachyrium scoparium*) is the characteristic and dominant native grass. Native wildflowers also can occur in this setting including, for example, Pale Corydalis (*Corydalis sempervirens*).

Herbaceous vegetation is more commonly represented within RVCR by ruderal types dominated by introduced and often invasive species generally characteristic of disturbed areas (Fig. 14). Common dominants include Stilt-grass (*Microstegium vimineum*) and Garlic Mustard (*Alliaria petiolata*).

Shrublands

"Heath bald" community

Shrublands are generally rare upland vegetation within the RVCR (ca. 14 acres, Table 1), but as with Native Perennial Grassland are characteristic of headlands and other exposed rock outcrops with relatively flat topography and this soils (Fig. 15). Within the forest contact, these can be considered "heath balds", usually dominated by a mixture of ericaceous shrubs such as Black Huckleberry (*Gaylussacia baccata*), Blue Ridge Lowbush Blueberry

Hemlock forest community

(*Vaccinium pallidum*) and Deerberry (*Vaccinium staminium*). When mixed with needle-leaved evergreen species such as Eastern Red Cedar (*Juniperus virginiana*) it has been mapped as "Coniferous Brush/Shrubland" and when mixed with broadleaved deciduous species such as Black Cherry (*Prunus serotina*) and Winged Sumac (*Rhus copallina*) it has been mapped as "Deciduous Brush/Shrubland" (NJDEP 2002).

Coniferous Evergreen Forest
Broadleaved Deciduous Forest

Forests dominated by native evergreen conifers (Needle-leaved Evergreen Forest), including various species of pine, fir, juniper, hemlock and other needle-leaved genera, are rare within the RVCR. Planted groves of introduced coniferous trees (e.g., pine and spruce), however, are common along the Ramapo River and occur as localized stands in proximity to dwellings and other developed areas. One example of a native stand of Eastern Hemlock (*Tsuga canadensis*) occurs at the Tamarack Recreation Area within the Reservation (Fig. 16). Less than 3 acres of Mixed Coniferous and Deciduous Forest has been mapped for the more than 4000 acres of the RVCR (Table 1).

Eastern deciduous forest community

Broadleaved Deciduous Forest (Fig. 17) is the most common vegetation type, which dominates the landscape of the Reservation (Map 10). As mapped by NJDEP, it occurs as

two cover types: > 50% closed canopy and 10-50% closed canopy (Table 1 and Map 1). The former type is estimated to cover 3,985 acres, whereas the later is estimated to cover only 90 acres. The forest cover is successional to extensive logging, which is estimated to have cleared the forested vegetation for production of charcoal and other uses. Many native tree species characterize the upland forested vegetation, as listed in the checklist of native and naturalized species of the RVCR (Appendix D). Examples of representative dominant and characteristic species include the following: Chestnut Oak (*Quercus prinus*), Red Oak (*Quercus rubra*), Black Birch (*Betula lenta*), and American Beech (*Fagus grandifolia*), and White Ash (*Fraxinus americana*). Other representative native species include Scarlet Oak (*Quercus coccinea*), Tulip Tree (*Liriodendron tulipifera*), Hickory (*Carya* spp.), and Sassafras (*Sassafras albidum*). Various dominance types throughout the Reservation are correlated with variations in slope, exposure, depth of soil, and soil moisture.

Many native understory shrubs, small trees, and vines characterize the Broadleaved Deciduous Forest (Appendix D). Examples include but are not limited to the following: American Hazel (*Corylus americana*), Beaked Hazel (*Corylus cornuta*), Greenbrier (*Smilax rotundifolia*), Spicebush (*Lindera benzoin*), Virginia Creeper (*Parthenocissus quinquefolia*), American Bladdernut (*Staphylea trifolia*), Coralberry (*Symphoricarpos orbiculatus*), Poison Ivy (*Toxicodendron radicans*), Deerberry (*Vaccinium stamineum*), Blue Ridge Lowbush Blueberry (*Vaccinium stamineum*), and Viburnum (*Viburnum* spp.).

3.5.1.2 Wetland Vegetation

Aquatic Bed Wetland

Aquatic Bed Wetland includes herbaceous rooted vascular and floating types in ponded and running water habitats. Within the RVCR, Aquatic Bed (Rooted Vascular) Wetland is potentially present in all ponded and flowing water situations that provide inundation of sufficient duration to support the vegetation. It is represented, for example, at Scarlet Oak Pond, where

characteristic species include Curly Pondweed (*Potamogeton crispus*), an introduced species, and Water Milfoil (*Myriophyllum* sp.). Aquatic Bed (Floating) is represented in ponded water along the Ramapo River floodplain, where characteristic species include Lesser Duckweed (*Lemna minor*). Other species characteristic of Aquatic bed Wetlands reported for RVCR include but are not limited to the following (Appendix D): Water Starwort (*Callitriche* sp.), *Ceratophyllum demersum* (Hornwort), Siberian Water Milfoil (*Myriophyllum sibericum*), Robin's Pondweed (*Potamogeton robbinsii*), Greater Duckweed (*Spirodela polyrrhiza*), and Brazilian Watermeal (*Wolffia brasiliensis*).

Emergent Wetland

Palustrine Emergent Wetland (Fig. 18) is dominated by herbaceous species emergent from wetland soils or flooded habitats. Although "herbaceous wetlands" are mapped at less than a half-acre of habitat (Table 1), they and the species they support (Appendix D) are more common and diverse than this figure would suggest. Many emergent wetland communities are small and occur within the context of other vegetation such as mapped upland and wetland forests (Maps 10 & 11), the canopies of which mask the smaller understory habitats within the broader and coarser scale types. Habitats in which Emergent Wetlands are situated include seeps and springs, stream and river channels and floodplains, and isolated basins.

Palustrine emergent wetland along Lake Tamarack dominated by the exotic invasive Phragmites australis

Dominant or characteristic species within the RVCR include but are not limited to the following: ferns such as Lady Fern (*Athyrium filix-femina*), Ostrich Fern (*Matteuccia struthiopteris*), Cinnamon Fern (*Osmunda cinnamomea*), and Eastern Marsh Fern (*Thelyteris palustris*); grasses,

sedges, and rushes such as Tussock Sedge (*Carex stricta*), Blunt Spikerush (*Eleocharis obtusa*), Fowl Manna-grass (*Glyceria striata*), Canada Rush (*Juncus canadensis*), Rice Cutgrass (*Leersia oryzoides*), and Woolgrass Bulrush (*Scirpus cyperinus*); and other herbaceous species including Nodding Bur Marigold (*Bidens cernuua*), Boneset (*Eupatorium perfoliatum*), Orange Jewelweed (*Impatiens capensis*), Northern Blue Flag (*Iris versicolor*), Cardinal Flower (*Lobelia cardinalis*), Allegheny Monkey-flower (*Mimulus ringens*), Southern Pond-lily (*Nuphar lutea* ssp. *advena*), Arrow Arum (*Peltandra virginica*), Arrowhead Tearthumb (*Polygonum sagittatum*), Borad-leaved Dock (*Sagittaria latifolia*), Skunk Cabbage (*Symplocarpus foetidus*), Broad-leaved Cattail (*Typha latifolia*). Common Reed (Phragmites australis), is an occasional dominant, for example at Lake Tamarack (Fig. 20), and is likely an invasive exotic genotype that should be controlled or eradicated so it does not become a dominant element of the landscape.

Scrub/Shrub Wetland

Palustrine Scrub/shrub Wetland (Fig. 19) is dominated by low-growing woody species but can be transitional to Forested Wetland and often grows in the context of other classes of wetland vegetation. Within the RVCR, it is rare based on the NJDEP mapping efforts (Table 1; Maps 10 & 11), which recorded less than one acre of habitat. As with Emergent Wetland, however, there is more within the Reservation than mapped because the individual sites are often small and occur within the context of larger vegetation units such as upland and wetland forests. Scrub/Shrub Wetland occurs in a number of habitats within the RVCR including seeps and springs; pond, stream, and river banks; floodplains; and basins. Dominant or characteristic scrub or shrub species within the RVCR can include but are not limited to Buttonbush (*Cephalanthus occidentalis*), Highbush Blueberry (*Vaccinium corymbosum*), Silky Dogwood (*Cornus amomum*), Spicebush (*Lindera benzoin*), Sweet Pepperbush (*Clethra alnifolia*), Smooth Alder (*Alnus serrulata*), and Poison Ivy (*Toxicodendron radicans*).

Forested Wetland

Palustrine Forested Wetland is the most extensive wetland class within the RVCR as mapped by NJDEP (Table 1, Maps 10 & 11), covering over 280 acres of the landscape. Characteristic habitats include seeps and springs; pond, stream, and river banks; floodplains; and basins such as vernal pools (Figs. 21 – 23). Dominant or characteristic species include Red Maple (*Acer rubrum*), River Birch (*Betula nigra*), Shagbark Hickory (*Carya ovata*), Sour Gum (*Nyssa sylvatica*), American Sycamore (*Platanus occidentalis*), Pin Oak (*Quercus palustris*), and Willow (*Salix* spp.). Refer to Section 4.0 Critical Environmental Resources for additional information on Wetlands and Water including vernal pools.

Riparian Vegetation

Riparian vegetation is situated on banks of waterbodies including rivers and streams (e.g., Figs. 22, 23), ponds and lakes, and estuaries. In the reservation, examples include the riparian "corridors" of the Ramapo River and Stag, Havemeyer, McMillan, Bear Swamp, and Fox brooks (Map 11). Riparian vegetation includes wetland and upland types depending on the surface and groundwater water conditions of the corridor and duration of flooding or saturation and depth to water table. In the New Jersey Highlands, the riparian corridor is equivalent to the 300 ft buffer applied to highlands waters (Map 11). Refer to Section 4.3 Riparian Corridors for additional information.

3.5.2 Flora

A checklist of the native and introduced plants and planted woody species was compiled for the RVCR, other nearby County parks, and the Ramapo State Park (Appendix D). This list includes species observed during this study and listed by other sources cited herein, arranged according to life form and additional informative groups, including the following:

- trees - ca. 70 species;
- shrubs, subshrubs, and vines - ca. 86 species;

- ferns and fern allies - ca. 26 species;
- grasses, sedges, and rushes - ca. 70 species; and
- other herbaceous plants - ca. 307 species.

Over 559 species have been observed in the general region of the Reservation, most of which occur within the Reservation. Several rare and endangered plants are known from the Ramapo Mountains County Park. These species are listed and discussed in Part 4.0, Critical Environmental Resources.

3.6 Zoological Resources

The Ramapo Mountains County Park of Bergen County can support a great diversity of wildlife, including many threatened and endangered species. Many species are present in this mountainous terrain at the southerly limits of their ranges. Because most of the study area is comprised of upland deciduous forest, most of the wildlife observed in these parts will be those species that rely upon mesic hardwood forest for suitable habitat. The zoological resources of the Ramapo Mountain study area can be divided into two categories: the invertebrates (animals lacking a backbone) and the vertebrates (animals with a backbone).

3.6.1 Invertebrates

The invertebrates that inhabit or potentially inhabit the Ramapo Mountains County Park can be divided into two general categories: aquatic and terrestrial invertebrates. For some species, the larvae may fall into one category while the adult stage falls into the other (e.g., dragonfly larvae are aquatic while adults are terrestrial).

Aquatic invertebrates are a diverse group of species that lack a spinal column and also depend upon surface water resources, or moist environments (Ayers et al. 2000). Aquatic invertebrates can include both freshwater and marine species; species experiencing different stages of the

development stage (larvae, nymph, adult); and species that require water for different reasons. Varying in size, behavior and overall habitat requirements (Ayers et al. 2000), species categorized as aquatic invertebrates span a broad range of biological classification. For example, Phylum Annelida includes leeches, Phylum Arthropoda includes crayfish, Phylum Mollusca includes freshwater clams and oysters, all of which are considered to be aquatic invertebrates (Ayers et al. 2000). According to the NJDEP sources, aquatic invertebrates found in abundance within northern New Jersey include mayflies, stoneflies, caddisflies, and riffle beetles (Ayers et al. 2000).

Aquatic invertebrates also can be used as water quality indicators since they exist in areas where they can survive, depending on their tolerance to pollution levels (Ayers et al. 2000). The NJDEP currently samples aquatic invertebrates at 700 different locations throughout the State as part of the Ambient Biomonitoring Network (AMNET) program (USGS 2005).

Many of the terrestrial invertebrates of New Jersey are insects. As the largest class of animals in the study area, there are too many to outline in this document. However, there are two orders of insects that draw particular attention from nature enthusiasts due to their high visibility and striking appearance. These are the butterflies and moths (Order Lepidoptera) and the dragonflies and damselflies (Order Odonata). Dragonflies and damselflies utilize both terrestrial and aquatic habitats as their larval forms are aquatic and adult forms (the flying forms) are terrestrial. Thus, they require an interface between aquatic and terrestrial habitats. Table 2 below lists those species observed in Bergen County.

Table 2. Dragonflies and damselflies of Bergen County (Bangma 2006)

Common Name	Scientific Name	Common Name	Scientific Name
Ebony Jewelwing	*Calopteryx maculata*	Lancet Clubtail	*Gomphus exilis*
Great Spreadwing	*Archilestes grandis*	Ashy Clubtail	*Gomphus lividus*
Amber-winged Spreadwing	*Lestes eurinus*	Southern Pygmy Clubtail	*Lanthus vernalis*
Elegant Spreadwing	*Lestes inaequalis*	Rusty Snaketail	*Ophiogomphus*

			rupinsulensis
Slender Spreadwing	*Lestes rectangularis*	Eastern least Clubtail	*Stylogomphus albistylus*
Swamp Spreadwing	*Lestes vigilax*	Delta-spotted Spiketail	*Cordulegaster diastatops*
Eastern Red Damsel	*Amphiagrion saucium*	Tiger Spiketail	*Cordulegaster erronea*
Blue-fronted Dancer	*Argia apicalis*	Twin-spotted Spiketail	*Cordulegaster maculata*
Violet Dancer	*Argia fumipennis*	Arrowhead Spiketail	*Cordulegaster obliqua*
Powdered Dancer	*Argia moesta*	Stream Cruiser	*Didymops transversa*
Blue-tipped Dancer	*Argia tibialis*	Racket-tailed Emerald	*Dorocordulia libera*
Dusky Dancer	*Argia translata*	Prince Baskettail	*Epitheca princeps*
Aurora Damsel	*Chromagrion conditum*	Common Baskettail	*Epitheca cynosura*
Tule Bluet	*Enallagma carunculatum*	Robust Baskettail	*Epitheca spinosa*
Familiar Bluet	*Enallagma civile*	Uhler's Sundragon	*Helocordulia uhleri*
Northern Bluet	*Enallagma annexum*	Clamp-tipped Emerald	*Somatochlora tenebrosa*
Turquoise Bluet	*Enallagma divagans*	Brush-tipped Emerald	*Somatochlora walshii*
Big Bluet	*Enallagma durum*	Ringed Boghaunter	*Williamsonia lintneri*
Marsh Bluet	*Enallagma ebrium*	Calico Pennant	*Celithemis elisa*
Stream Bluet	*Enallagma exsulans*	Halloween Pennant	*Celithemis eponina*
Skimming Bluet	*Enallagma geminatum*	Banded Pennant	*Celithemis fasciata*
Hagen's Bluet	*Enallagma hageni*	Eastern Pondhawk	*Erythemis simplicicollis*
New England Bluet	*Enallagma laterale*	Seaside Dragonlet	*Erythrodiplax berenice*
Orange Bluet	*Enallagma signatum*	White Corporal	*Ladona exusta*
Slender Bluet	*Enallagma traviatum*	Chalk-fronted Corporal	*Ladona julia*
Citrine Forktail	*Ischnura hastata*	Frosted Whiteface	*Leucorrhinia frigida*
Fragile Forktail	*Ischnura posita*	Dot-tailed Whiteface	*Leucorrhinia intacta*
Eastern Forktail	*Ischnura verticalis*	Belted Whiteface	*Leucorrhinia proxima*
Sphagnum Sprite	*Nehalennia gracilis*	Spangled Skimmer	*Libellula cyanea*
Southern Sprite	*Nehalennia integricollis*	Yellow-sided Skimmer	*Libellula flavida*
Gray Petaltail	*Tachopteryx thoreyi*	Slaty Skimmer	*Libellula incesta*
Canada Darner	*Aeshna canadensis*	Widow Skimmer	*Libellula luctuosa*
Mottled Darner	*Aeshna clepsydra*	Needham's Skimmer	*Libellula needhami*
Lance-tipped Darner	*Aeshna constricta*	Twelve-spotted Skimmer	*Libellula pulchella*
Black-tipped Darner	*Aeshna tuberculifera*	Four-spotted Skimmer	*Libellula quadrimaculata*
Shadow Darner	*Aeshna umbrosa*	Painted Skimmer	*Libellula semifasciata*
Green-striped Darner	*Aeshna verticalis*	Great Blue Skimmer	*Libellula vibrans*
Common Green Darner	*Anax junius*	Blue Dasher	*Pachydiplax longipennis*
Springtime Darner	*Basiaeschna janata*	Wandering Glider	*Pantala flavescens*

Ocellated Darner	*Boyeria grafiana*	Eastern Amberwing	*Perithemis tenera*
Swamp Darner	*Epiaeschna heros*	Common Whitetail	*Plathemis lydia*
Harlequin Darner	*Gomphaeschna furcillata*	Cherry-faced Meadowhawk	*Sympetrum internum*
Cyrano Darner	*Nasiaeschna pentacantha*	White-faced Meadowhawk	*Sympetrum obtrusum*
Lilypad Clubtail	*Arigomphus furcifer*	Band-winged Meadowhawk	*Sympetrum semicinctum*
Unicorn Clubtail	*Arigomphus villosipes*	Autumn Meadowhawk	*Sympetrum vicinum*
Black-shouldered Spinyleg	*Dromogomphus spinosus*	Carolina Saddlebags	*Tramea carolina*
Sable Clubtail	*Gomphus rogersi*	Black Saddlebags	*Tramea lacerata*

Like the damselflies and dragonflies, there is also a diversity of butterflies and moths native to Bergen County. Although not dependent on waterbodies for reproduction, butterflies and moths also inhabit a range of terrestrial habitats. These insects of the order Lepidoptera feed on the nectar of plants as adults, and many species feed on specific plant sources, limiting the areas in which they can be found (Glassberg 1993). Table 3 below lists species of butterflies and moths that can occur in Bergen County.

Table 3. Butterflies and moths of Bergen County (Opler et al. 2009)

Common Name	Scientific Name	Common Name	Scientific Name
Silver-spotted Skipper	*Epargyreus clarus*	American Snout	*Libytheana carinenta*
Hoary Edge	*Achalarus lyciades*	Monarch	*Danaus plexippus*
Northern Cloudywing	*Thorybes pylades*	Variegated Fritillary	*Euptoieta claudia*
Southern Cloudywing	*Thorybes bathyllus*	Great Spangled Fritillary	*Speyeria cybele*
Dreamy Duskywing	*Erynnis icelus*	Aphrodite Fritillary	*Speyeria aphrodite*
Sleepy Duskywing	*Erynnis brizo*	Regal Fritillary	*Speyeria idalia*
Juvenal's Duskywing	*Erynnis juvenalis*	Silver-bordered Fritillary	*Boloria selene*
Horace's Duskywing	*Erynnis horatius*	Meadow Fritillary	*Boloria bellona*
Mottled Duskywing	*Erynnis martialis*	Silvery Checkerspot	*Chlosyne nycteis*
Wild Indigo Duskywing	*Erynnis baptisiae*	Harris' Checkerspot	*Chlosyne harrisii*
Grizzled Skipper	*Pyrgus centaureae*	Pearl Crescent	*Phyciodes tharos*
Common Checkered-Skipper	*Pyrgus communis*	Baltimore	*Euphydryas phaeton*
Common Sootywing	*Pholisora catullus*	Common Buckeye	*Junonia coenia*

Swarthy Skipper	*Nastra lherminier*	Question Mark	*Polygonia interrogationis*
Least Skipper	*Ancyloxypha numitor*	Eastern Comma	*Polygonia comma*
European Skipper	*Thymelicus lineola*	Green Comma	*Polygonia faunus*
Fiery Skipper	*Hylephila phyleus*	Gray Comma	*Polygonia progne*
Leonard's Skipper	*Hesperia leonardus*	Milbert's Tortoiseshell	*Aglais milberti*
Cobweb Skipper	*Hesperia metea*	Compton Tortoiseshell	*Nymphalis vaualbum*
Indian Skipper	*Hesperia sassacus*	Mourning Cloak	*Nymphalis antiopa*
Peck's Skipper	*Polites peckius*	Red Admiral	*Vanessa atalanta*
Tawny-edged Skipper	*Polites themistocles*	Painted Lady	*Vanessa cardui*
Crossline Skipper	*Polites origenes*	American Lady	*Vanessa virginiensis*
Long Dash	*Polites mystic*	Red-spotted Purple or White Admiral	*Limenitis arthemis*
Northern Broken-Dash	*Wallengrenia egeremet*	Astyanax Red-spotted Purple	*limenitis arthemis astyanax*
Little Glassywing	*Pompeius verna*	Viceroy	*limenitis archippus*
Delaware Skipper	*Anatrytone logan*	Hackberry Emperor	*Asterocampa celtis*
Hobomok Skipper	*Poanes hobomok*	Tawny Emperor	*Asterocampa clyton*
Zabulon Skipper	*Poanes zabulon*	Northern Pearly Eye	*Enodia anthedon*
Mulberry Wing	*Poanes massasoit*	Eyed Brown	*Satyrodes eurydice*
Broad-winged Skipper	*Poanes viator*	Appalachian Brown	*Satyrodes appalachia*
Black Dash	*Euphyes conspicua*	Liitle Wood Satyr	*Megisto cymela*
Two-spotted Skipper	*Euphyes bimacula*	Common Wood Nymph	*Cercyonis pegala*
Dun Skipper	*Euphyes vestris*	Luna Moth	*Actias luna*
Pipevine Swallowtail	*Battus philenor*	Cecropia Silkmoth	*Hyalophora cecropia*
Zebra Swallowtail	*Eurytides marcellus*	Orange-tipped Oakworm Moth	*Anisota senatoria*
Black Swallowtail	*Papilio polyxenes*	Walnut Sphinx	*Amorpha juglandis*
Eastern Tiger Swallowtail	*Papilio glaucus*	Elm Sphinx	*Ceratomia amyntor*
Spicebush Swallowtail	*Papilio troilus*	Catalpa Sphinx	*Ceratomia catalpae*
Giant Swallwotail	*Papilio cresphontes*	Ash Sphinx	*Manduca jasminearum*
Checkered White	*Pontia protodice*	Carolina Sphinx	*Manduca sexta*
Cabbage White	*Pieris rapae*	Modest Sphinx	*Pachysphinx modesta*
Falcate Orangetip	*Anthocharis midea*	Blinded Sphinx	*Paonias excaecata*
Clouded Sulphur	*Colias philodice*	Clemen's Sphinx	*Sphinx luscitiosa*
Orange Sulphur	*Colias eurytheme*	Azalea Sphinx	*Darapsa choerilus (pholus)*
Cloudless Sulphur	*Phoebis sennae*	Hummingbird Clearwing	*Hemaris thysbe*
Little Yellow	*Pyrisitia lisa*	Bedstraw Hawkmoth	*Hyles gallii*

Sleepy Orange	*Abaeis nicippe*	Black-spotted Prominent	*Dasylophia anguina*
Harvester	*Feniseca tarquinius*	Furcula occidentalis	*Furcula occidentalis*
American Copper	*Lycaena phlaeas*	Wavy-lined Heterocampa	*Heterocampa biundata*
Bronze Copper	*Lycaena hyllus*	White-blotched Heterocampa	*Heterocampa umbrata*
Juniper Hairstreak	*Callophrys gryneus*	Heterocampa zayasi	*Heterocampa zayasi*
Southern Hairstreak	*Satyrium favonius*	Variable Oakleaf Caterpillar Moth	*Lochmaeus manteo*
Coral Hairstreak	*Satyrium titus*	Mottled Prominent	*Macrurocampa marthesia*
Acadian Hairstreak	*Satyrium acadica*	Plain Schizura	*Schizura apicalis*
Hickory Hairstreak	*Satyrium caryaevorus*	Morning-glory Prominent	*Schizura ipomoeae*
Edwards' Hairstreak	*Satyrium edwardsii*	Black-blotched Schizura	*Schizura leptinoides*
Banded Hairstreak	*Satyrium calanus*	Nais Tiger Moth	*Apantesis nais*
Striped Hairstreak	*Satyrium liparops*	Unexpected Cycnia	*Cycnia inopinatus*
Gray Hairstreak	*Strymon melinus*	Figured Tiger Moth	*Grammia figurata*
White M Hairstreak	*Parrhasius m-album*	Clymene Moth	*Haploa clymene*
Eastern Tailed-Blue	*Cupido comyntas*	Pink-legged Tiger Moth	*Spilosoma latipennis*
Spring Azure	*Celastrina "ladon"*	Leopard Moth	*Zeuzera pyrina*
Appalachian Azure	*Celastrina neglecta-major*	Chickweed Geometer	*Haematopis grataria*

Although not as visible as the vertebrates due to their small size, there is a plethora of invertebrates inhabiting the Ramapo Mountain ecosystem.

3.6.2 Vertebrates

The vertebrate wildlife of Bergen County is oftentimes more easily observed and recognized than its invertebrate counterpart. Many of these animals can be found in the extensive hardwood forests of the Ramapo Mountain study area, and yet, because of the proximity to northern New Jersey suburbs of New York City, it is likely that many terrestrial species of "urban" or "suburban" wildlife will also be present. In addition to the expansive upland forest of the Ramapo Mountain study area, smaller pockets of forested and emergent wetlands can be found at lower elevations, providing a source of water and habitat oasis for those species that require an aquatic component within their home range.

The surface waters of the Ramapo Mountain study area include features such as small creeks, rivulets and ponds as well as larger rivers, and reservoirs. The vertebrate aquatic biota of these waterbodies are the fishes. The State of New Jersey supports the populations of 85 freshwater fish. Some streams in the study area, such as Stag Brook and Havemeyer Brook, are classified as trout production streams in the state of New Jersey. The State stocks Brook trout (*Salvelinus fontinalis*), Brown trout (*Salmo trutta*) and Rainbow trout (*Oncorhynchus mykiss*) in such waters. Table 4 below lists all freshwater fish species of New Jersey that have potential to occur in the permanent waterbodies within the study area.

Table 4. Freshwater fishes of New Jersey (NJDFW 2005)

Common Name	Scientific Name	HP	Common Name	Scientific Name	HP
American Brook Lamprey	*Lampetra appendix*	N	White Sucker	*Catostomus commersoni*	N
Sea Lamprey	*Petromyzon marinus*	N	Creek Chubsucker	*Erimyzon oblongus*	N
Atlantic Sturgeon	*Acipenser oxyrhynchus*	N	Northern Hog Sucker	*Hypentelium nigricans*	N
Shortnose Sturgeon	*Acipenser brevirostrum*	N	White Catfish	*Ameiurus catus*	N
Longnose Gar	*Lepisosteus osseus*	EX	Black Bullhead	*Ameiurus melas*	I
Bowfin	*Amia calva*	I	Yellow Bullhead	*Ameiurus natalis*	N
American Eel	*Anguilla rostrata*	N	Brown Bullhead	*Ameiurus nebulosus*	N
Blueback Herring	*Alosa aestivalis*	N	Channel Catfish	*Ictalurus punctatus*	I
Hickory Shad	*Alosa mediocris*	N	Tadpole Madtom	*Noturus gyrinus*	N
Alewife	*Alosa pseudoharengus*	N	Margined Madtom	*Noturus insignis*	N
American Shad	*Alosa sapidissima*	N	Pirate Perch	*Aphredoderus sayanus*	N
Gizzard Shad	*Drosoma cepedianum*	N	Banded Killifish	*Fundulus diaphanus*	N
Rainbow Trout	*Oncorhynchus mykiss*	I	Mummichog	*Fundulus heteroclitus*	N
Brown Trout	*Salmo trutta*	E	Eastern Mosquitofish	*Gambusia holbrooki*	N
Brook Trout	*Salvelinus fontinalis*	N	Mosquitofish	*Gambusia affinis*	I
Rainbow Smelt	*Osmerus mordax*	N	Fourspine Stickleback	*Apletes quadracus*	N
Eastern Mudminnow	*Umbra pygmaea*	N	Threespine Stickleback	*Gasterosteus aculeatus*	N
Redfin Pickerel	*Esox americanus*	N	Ninespine Stickleback	*Pungitius pungitius*	N
Northern Pike	*Esox lucius*	I	White Perch	*Morone americana*	N
Chain Pickerel	*Esox niger*	N	Striped Bass	*Morone saxatilis*	N
Muskellunge	*Esox masquinongy*	I	Mud Sunfish	*Acantharchus pomotis*	N

Goldfish	*Carassius auratus*	E	Rock Bass	*Ambloplites rupestris*	I
Common Carp	*Cyprinus carpio*	E	Blackbanded Sunfish	*Eleacanthus chaetodon*	N
Quillback	*Carpiodes cyprinus*	N	Bluespotted Sunfish	*Eleacanthus gloriosus*	N
Cutlips Minnow	*Exoglossum maxillingua*	N	Banded Sunfish	*Eleacanthus obesus*	N
Eastern Silvery Minnow	*Hybognathus regius*	N	Green Sunfish	*Lepomis cyanellus*	I
Golden Shiner	*Notemigonus crysoleucas*	N	Pumpkinseed	*Lepomis gibbosus*	N
Comely Shiner	*Notropis amoenus*	N	Bluegill	*Lepomis macrochirus*	I
Satinfin Shiner	*Cyprinella analostana*	N	Redbreasted Sunfish	*Lepomis auritus*	N
Bridle Shiner	*Notropis bifrenatus*	N	Warmouth	*Lepomis gulosus*	I
Ironcolor Shiner	*Notropis chalybaeus*	N	Smallmouth Bass	*Micropterus dolomieu*	I
Common Shiner	*Luxilis cornutus*	N	Largemouth Bass	*Micropterus salmoides*	I
Spottail Shiner	*Notropis husdonius*	N	White Crappie	*Pomoxis alularis*	I
Swallowtail Shiner	*Notropis procne*	N	Black Crappie	*Pomoxis nigromaculatus*	I
Spotfin Shiner	*Cyprinella spiloptera*	N	Swamp Darter	*Etheostoma fusiforme*	N
Fathead Minnow	*Pimephales promelas*	I	Tessellated Darter	*Etheostoma olmstedi*	N
Bluntnose Minnow	*Pimephales notatus*	I	Yellow Perch	*Perca flavescens*	N
Blacknose Dace	*Rhinichthys atratulus*	N	Shield Darter	*Percina peltata*	N
Longnose Dace	*Rhinichthys cataractae*	N	Walleye	*Sander vitreus*	I
Creek Chub	*Semotilus atromaculatus*	N	Slimy Sculpin	*Cottus cognatus*	N
Fallfish	*Semotilus corporalis*	N	Oriental Weatherfish	*Misgurnus anguillicaudatus*	E
Grass Carp	*Ctenopharyngodon idella*	E	Hogchoker	*Trinectes maculatus*	N

HP= Historical Presence: E - Exotic, N - Native, I - Introduced, EX - Extirpated

In addition to the freshwater fish that inhabit aquatic features in the Ramapo Mountain study area, many species of amphibians are also tied to these and other ephemeral wetland habitats. Amphibians, namely salamanders, frogs and toads, are classified as such because they spend part of their life in the water and part on dry land. Many of the amphibians listed in Table 5 below rely on vernal pools for breeding.

Table 5. Amphibians of northern New Jersey (NJDFW 2006, 2007)

Common Name	Scientific Name	Status
American Toad	*Bufo americanus*	S
Fowler's Toad	*Bufo woodhousii fowleri*	SC
New Jersey Chorus Frog	*Pseudacris triseriata kalmi*	S
Northern Gray Treefrog	*Hyla versicolor*	S
Pickerel Frog	*Rana palustris*	S
Upland Chorus Frog	*Pseudacris triseriata feriarum*	U
Bullfrog	*Rana catesbeiana*	S
Green Frog	*Rana clamitans melanota*	S
Northern Cricket Frog	*Acris c. crepitans*	U
Northern Spring Peeper	*Pseudacris c. crucifer*	S
Southern Leopard Frog	*Rana utricularia*	S
Wood Frog	*Rana sylvatica*	S
Red-spotted Newt	*Notophthalmus v. viridescens*	S
Jefferson Salamander	*Ambystoma jeffersonianum*	SC
Marbled Salamander	*Ambystoma opacum*	SC
Northern Red Salamander	*Pseudotriton r. ruber*	D
Northern Spring Salamander	*Gyrinophilus p. porphyriticus*	SC
Redback Salamander	*Plethedon cinereus*	S
Spotted Salamander	*Ambystoma maculatum*	D
Four-toed Salamander	*Hemidactylium scutatum*	D
Longtail Salamander	*Eurycea l. longicauda*	T
Northern Dusky Salamander	*Desmognathus f. fuscus*	S
Northern Slimy Salamander	*Plethedon glutinosus*	S
Northern Two-lined Salamander	*Eurycea bislineata*	S
Blue-spotted Salamander	*Ambystoma laterale*	E

Status: E - Endangered, T - Threatened, D - Decreasing, S - Stable, U - Undetermined, SC - Special Concern

A variety of reptiles can be found in northern New Jersey. These include snakes, lizards and turtles. Table 6 below lists all reptilians that can potentially occur within the Ramapo Mountains County Park.

Table 6. Reptiles of northern New Jersey (NJDFW 2004, 2007)

Common Name	Scientific Name	Status
Black Rat Snake	*Elaphe o. obsoleta*	U
Eastern Hognose Snake	*Heterodon platyrhinos*	D
Eastern Ribbon Snake	*Thamnophis s. sauritus*	S
Northern Black Racer	*Coluber c. constrictor*	U
Northern Copperhead	*Agkistrodon c. contortrix*	U
Northern Ringneck Snake	*Diadophis punctatus edwardsi*	S
Smooth Green Snake	*Opheodrys vernalis*	U
Eastern Milk Snake	*Lampropeltis t. triangulum*	S
Eastern Worm Snake	*Carphophis a. amoenus*	U
Northern Brown Snake	*Storeria d. dekayi*	S
Northern Redbelly Snake	*Storeria o. occipitomaculata*	S
Northern Water Snake	*Nerodia s. sipedon*	S
Timber Rattlesnake	*Crotalus h. horridus*	E
Eastern Garter Snake	*Thamnophis s. sirtalis*	S
Five-lined Skink	*Eumeces fasciatus*	U
Common Musk Turtle	*Sternotherus odoratus*	S
Eastern Box Turtle	*Terrapene c. carolina*	S
Eastern Painted Turtle	*Chrysemys p. picta*	S
Spotted Turtle	*Clemmys guttata*	U
Bog Turtle	*Clemmys muhlenbergii*	E
Common Snapping Turtle	*Chelydra serpentine*	S
Eastern Mud Turtle	*Kinosternon s. subrubrum*	U
Red-eared Slider	*Trachemys scripta elegans*	I
Wood Turtle	*Glyptemys insculpta*	T

Status: E - Endangered, T - Threatened, D - Decreasing, S - Stable, U - Undetermined,
I - Introduced

In addition to the reptiles, amphibians and freshwater fishes that can be found in the Ramapo Mountains County Park, a variety of mammals can also be observed here. Many of these species listed below in Table 7 occur throughout the state. Some of these may be observed less often due to nocturnal activity and/or secretive nature.

Table 7. Mammals of New Jersey (NJDFW 2005)

Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Opossum	*Didelphis marsupialis*	S	Southern Flying Squirrel	*Glaucomys volans*	U
Masked Shrew	*Sorex cinereus*	S	Northern Flying Squirrel	*Glaucomys sabrinus*	U
Tuckahoe Masked Shrew	*Sorex cinereus nigriculus*	U	Beaver	*Castor candensis*	INC
Water Shrew	*Sorex palustris*	U	Nutria	*Myocastor coypus*	I
Smokey Shrew	*Sorex fumeus*	U	Marsh Rice Rat	*Oryzomys palustris*	S
Long-tailed Shrew	*Sorex dispar*	U	White-footed Mouse	*Peromyscus leucopus*	S
Short-tailed Shrew	*Blarina brevicauda*	S	Eastern Wood Rat	*Neotoma floridana*	E
Least Shrew	*Crytotis parva*	U	Red-backed Mouse	*Clethrionomys gapperi*	S
Pygmy Shrew	*Sorex hoyii*	U	Meadow Vole	*Microtus pennsylvanicus*	S
Hairy-tailed Mole	*Parascalops breweri*	U	Pine Vole	*Microtus pinetorum*	S
Eastern Mole	*Scalopus aquaticus*	S	Muskrat	*Ondatra zibethicus*	S
Star-nosed Mole	*Condylura cristata*	U	Southern Bog Lemming	*Synaptomys cooperi*	U
Little Brown Bat	*Myotis lucifugus*	S	Black Rat	*Rattus rattus*	I
Indiana Bat	*Myotis sodalis*	E	Brown Rat	*Rattus norvegicus*	I
Keen Myotis	*Myotis septentrionalis*	U	House Mouse	*Mus musculus*	I
Small-footed Myotis	*Myotis leibii*	U	Woodland Jumping Mouse	*Napaeozapus insignis*	U
Silver-haired Bat	*Lasionycteris noctivagans*	U	Meadow Jumping Mouse	*Zapus hudsonius*	U
Eastern Pipistrel	*Pipistrellus subflavus*	U	Porcupine	*Erethizon dorsatum*	INC
Big Brown Bat	*Eptesicus fuscus*	S	Eastern Coyote	*Canis latrans, var.*	INC
Red Bat	*Lasiurus borealis*	S	Red Fox	*Vulpes vulpes*	S
Northern Yellow Bat	*Lasiurus intermedius*	P	Gray Fox	*Urocyon cinereoargenteus*	S
Hoary Bat	*Lasiurus cinereus*	U	Black Bear	*Ursus americanus*	INC
Eastern Cottontail	*Sylvilagus floridanus*	S	Raccoon	*Procyon lotor*	S
New England Cottontail	*Sylvilagus transitionalis*	U	Ermine	*Mustela erminea*	U
European Hare	*Lepus capensis*	I	Long-tailed Weasel	*Mustela frenata*	S
Black-tailed Jackrabbit	*Lepus californicus*	I	Mink	*Mustela vison*	S
White-tailed Jackrabbit	*Lepus townsendii*	I	Striped Skunk	*Mephitis mephitis*	S
Eastern Chipmunk	*Tamias striatus*	S	River Otter	*Lutra canadensis*	S

Woodchuck	*Marmota monax*	S	Bobcat	*Felix rufus*	E
Gray Squirrel	*Sciurus carolinensis*	S	White-tailed Deer	*Odocoileus virginianus*	D
Red Squirrel	*Tamiasciurus hudsonicus*	S			

Status: E - Endangered, D - Decreasing, INC - Increasing, S - Stable, U - Undetermined, I - Introduced, P - Peripheral

Finally, the largest and most diverse class of vertebrate wildlife present in New Jersey, and likewise, in the Ramapo Mountain study area, consists of the birds. This diversity is partially attributed to their migratory habits, and thus, the species of birds present in the winter and summer months are quite different. During the cold winter months, one can observe birds that are year-round residents as well as birds from the colder regions of North America that seek refuge from extreme cold temperatures at this time of year. In summer, year-round residents are still present as are breeding birds that have returned from winter in the tropics. The list below in Table 8 includes all species that were historically observed in the region.

Table 8. Birds of northern New Jersey (Summit Nature Club 1992, USFWS 2000)

Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Common Loon	*Gavia immer*	S	White-eyed Vireo	*Vireo griseus*	D
Pied-billed Grebe	*Podilymbus podiceps*	E	Yellow-throated Vireo	*Vireo flavifrons*	RP
Horned Grebe	*Podiceps auritus*	RP	Blue-headed Vireo	*Vireo solitarius*	SC
American Bittern	*Botaurus lentiginosos*	E	Warbling Vireo	*Vireo gilvus*	S
Least Bittern	*Ixobrychus exilis*	SC	Philadelphia Vireo	*Vireo philadelphicus*	S
Great Blue Heron	*Ardea herodias*	SC	Red-eyed Vireo	*Vireo olivaceus*	S
Great Egret	*Casmerodius albus*	RP	Blue Jay	*Cyanocitta cristata*	D
Snowy Egret	*Egretta thula*	RP	American Crow	*Corvus brachyrhynchos*	S
Little Blue Heron	*Egretta caerulea*	RP	Fish Crow	*Corvus ossifragus*	S
Cattle Egret	*Bubulcus ibis*	RP	Horned Lark	*Eremophila alpestris*	SC
Green Heron	*Butorides striatus*	RP	Purple Martin	*Progne subis*	S
Black-crowned Night-Heron	*Nycticorax nycticorax*	T	Tree Swallow	*Tachycineta bicolor*	INC
Yellow-crowned Night-Heron	*Nyctanassa violaceus*	T	No. Rough-winged Swallow	*Stelgidopteryx serripennis*	S

Glossy Ibis	*Plegadis falcinellus*	RP	Bank Swallow	*Riparia riparia*	S
Snow Goose	*Chen caerulescens*	INC	Cliff Swallow	*Hirundo pyrrhonota*	SC
Canada Goose	*Branta canadensis*	INC	Barn Swallow	*Hirundo rustica*	S
Brant	*Branta bernicla*	RP	Black-capped Chickadee	*Parus atricapillus*	S
Mute Swan	*Cygnus olor*	I	Tufted Titmouse	*Parus bicolor*	INC
Wood Duck	*Aix sponsa*	RP	Red-breasted Nuthatch	*Sitta canadensis*	S
Gadwall	*Anas Strepera*	S	White-breasted Nuthatch	*Sitta carolinensis*	INC
American Wigeon	*Anas americana*	S	Brown Creeper	*Certhia americana*	INC
American Black Duck	*Anas rubripes*	RP	Carolina Wren	*Thryothorus ludovicianus*	INC
Mallard	*Anas platyrhynchos*	INC	House Wren	*Troglogytes aedon*	S
Blue-winged Teal	*Anas discors*	S	Winter Wren	*Troglodytes troglodytes*	SC
Northern Shoveler	*Anas clypeata*	S	Sedge Wren	*Cistothorus platensis*	E
Northern Pintail	*Anas acuta*	RP	Marsh Wren	*Cistothorus palustris*	RP
Green-winged Teal	*Anas crecca*	S	Golden-crowned Kinglet	*Regulus satrapa*	INC
Canvasback	*Aythya valisineria*	RP	Ruby-crowned Kinglet	*Regulus calendula*	D
Ring-necked Duck	*Aythya collaris*	S	Blue-gray Gnatcatcher	*Polioptila caerulea*	S
Bufflehead	*Bucephala albeola*	RP	Eastern Bluebird	*Sialia sialis*	INC
Common Goldeneye	*Bucephala clangula*	S	Veery	*Catharus fuscescens*	SC
Hooded Merganser	*Lophodytes cucullatus*	S	Gray-cheeked Thrush	*Catharus minimus*	SC
Common Merganser	*Mergus merganser*	S	Swainson's Thrush	*Catharus ustulatus*	S
Red-breasted Merganser	*Mergus serrator*	S	Hermit Thrush	*Catharus guttatus*	D
Ruddy Duck	*Oxyura jamaicensis*	D	Wood Thrush	*Hylocichla mustelina*	RP
Black Vulture	*Coragyps atratus*	INC	American Robin	*Turdus migratorius*	S
Turkey Vulture	*Cathartes aura*	INC	Gray Catbird	*Dumetella carolinensis*	RP
Osprey	*Pandion haliaetus*	T	Northern Mockingbird	*Mimus polyglottos*	D
Bald Eagle	*Haliaeetus leucocephalus*	E	Brown Thrasher	*Toxostoma rufum*	RP
Northern Harrier	*Circus cyaneus*	E	European Starling	*Sturnus vulgaris*	I
Sharp-shinned Hawk	*Accipiter striatus*	SC	American Pipit	*Anthus rubescens*	U
Cooper's Hawk	*Accipiter cooperii*	T	Cedar Waxwing	*Bombycilla cedrorum*	S
Northern Goshawk	*Accipiter gentilis*	E	Blue-winged Warbler	*Vermivora pinus*	RP

Red-shouldered Hawk	*Buteo lineatus*	E	Golden-winged Warbler	*Vermivora chrysoptera*	SC
Broad-winged Hawk	*Buteo platypterus*	SC	Tennesee Warbler	*Vermivora peregrina*	D
Red-tailed Hawk	*Buteo jamaicensis*	INC	Nashville Warbler	*Vermivora reficapilla*	S
Rough-legged Hawk	*Buteo lagopus*	D	Northern Parula	*Parula americana*	SC
Golden Eagle	*Aquila chrysaetos*	S	Yellow Warbler	*Dendroica petechia*	S
American Kestrel	*Falco sparverius*	SC	Chestnut-sided Warbler	*Dendroica pensylvanica*	S
Merlin	*Falco columbarius*	INC	Magnolia Warbler	*Dendroica magnolia*	INC
Peregrine Falcon	*Falco peregrinus*	E	Cape May Warbler	*Dendroica tigrina*	S
Ring-necked Pheasant	*Phasianus colchicus*	D	Black-throated Blue Warbler	*Dendroica caerulescens*	RP
Ruffed Grouse	*Bonasa umbellus*	D	Yellow-rumped Warbler	*Dendroica coronata*	INC
Wild Turkey	*Meleagris gallopavo*	INC	Black-throated Green Warbler	*Dendroica virens*	SC
Northern Bobwhite	*Colinus virginianus*	RP	Yellow-throated Warbler	*Dendroica dominica*	RP
King Rail	*Rallus elegans*	SC	Blackburnian Warbler	*Dendroica fusca*	RP
Virginia Rail	*Rallus limocola*	RP	Pine Warbler	*Dendroica pinus*	RP
Sora	*Porzana carolina*	S	Prairie Warbler	*Dendroica discolor*	RP
Common Moorhen	*Gallinula chloropus*	U	Palm Warbler	*Dendroica palmarum*	INC
American Coot	*Fulica americana*	U	Bay-breasted Warbler	*Dendroica castanea*	S
Black-bellied Plover	*Pluvialis squatarola*	S	Blackpoll Warbler	*Dendroica striata*	D
American Golden-Plover	*Pluvialis dominica*	RP	Cerulean Warbler	*Dendroica cerulea*	SC
Semipalmated Plover	*Charadrius semipalmatus*	S	Black-and-white Warbler	*Miniotilta varia*	RP
Killdeer	*Charadrius vociferus*	S	American Redstart	*Setophaga ruticilla*	INC
Greater Yellowlegs	*Tringa melanoleuca*	RP	Prothonotary Warbler	*Protonotaria citrea*	RP
Lesser Yellowlegs	*Tringa flavipes*	S	Worm-eating Warbler	*Helmitheros vermivorus*	RP
Solitary Sandpiper	*Tringa solitaria*	U	Ovenbird	*Seiurus aurocapillus*	D
Spotted Sandpiper	*Actitis macularia*	SC	Northern Waterthrush	*Seiurus noveboracensis*	S
Upland Sandpiper	*Bartramia longicauda*	E	Louisiana Waterthrush	*Seiurus motacilla*	RP
Hudsonian Godwit	*Limosa haemastica*	RP	Kentucky Warbler	*Oporornis formosus*	SC
Semipalmated Sandpiper	*Calidris pusilla*	RP	Connecticut Warbler	*Oporornis agilis*	D
Least Sandpiper	*Calidris minutilla*	U	Mourning Warbler	*Oporornis*	INC

				philadelphia	
Baird's Sandpiper	*Calidris bairdii*	U	Common Yellowthroat	*Geothlypis trichas*	D
Pectoral Sandpiper	*Calidris melanotos*	U	Hooded Warbler	*Wilsonia citrina*	RP
Buff-breasted Sandpiper	*Tryngites subruficollis*	RP	Wilson's Warbler	*Wilsonia pusilla*	S
Dunlin	*Calidris alpina*	S	Canada Warbler	*Wilsonia canadensis*	SC
Short-billed Dowitcher	*Limnodromus griseus*	U	Yellow-breasted Chat	*Icteria virens*	SC
Common Snipe	*Gallinago gallinago*	S	Summer Tanager	*Piranga rubra*	RP
American Woodcock	*Philohela minor*	RP	Scarlet Tanager	*Piranga olivacea*	RP
Ring-billed Gull	*Larus delawarensis*	INC	Eastern Towhee	*Pipilo erythrophthalmus*	RP
Bonaparte's Gull	*Larus philadelphia*	D	American Tree Sparrow	*Spizella arborea*	U
Herring Gull	*Larus argentatus*	S	Chipping Sparrow	*Spizella passerina*	S
Great black-backed Gull	*Larus marinus*	D	Field Sparrow	*Spizella pusilla*	RP
Rock Dove	*Columba livia*	I	Vesper Sparrow	*Pooecetes gramineus*	E
Mourning Dove	*Zenaida macroura*	S	Savannah Sparrow	*Passerculus sandwichensis*	T
Black-billed Cuckoo	*Coccyzus erythropthalmus*	RP	Grasshopper Sparrow	*Ammodramus savannarum*	T
Yellow-billed Cuckoo	*Coccyzus americanus*	RP	Henslow's Sparrow	*Ammodramus henslowii*	E
Barn Owl	*Tyto alba*	SC	Fox Sparrow	*Passerella iliaca*	INC
Eastern Screech Owl	*Otus asio*	RP	Song Sparrow	*Melospiza melodia*	D
Great Horned Owl	*Bubo virginianus*	S	Lincoln's Sparrow	*Melospiza lincolnii*	INC
Snowy Owl	*Nyctea scandiaca*	U	Swamp Sparrow	*Melospiza georgiana*	D
Barred Owl	*Strix varia*	T	White-throated Sparrow	*Zonotrichia albicollis*	D
Long-eared Owl	*Asio otus*	T	White-crowned Sparrow	*Zonotrichia leucophrys*	D
Short-eared Owl	*Asio flammeus*	E	Dark-eyed Junco	*Junco hyemalis*	S
Northern Saw-whet Owl	*Aegolius acadicus*	S	Lapland Longspur	*Calcarius lapponicus*	U
Common Nighthawk	*Chordeiles minor*	SC	Snow Bunting	*Plectophenax nivalis*	U
Whip-poor-will	*Caprimulgus vociferus*	RP	Northern Cardinal	*Cardinalis cardinalis*	INC
Chimney Swift	*Chaetura pelagica*	RP	Rose-breasted Grosbeak	*Pheucticus ludovicianus*	RP

Ruby-throated Hummingbird	*Archilochus colubris*	D	Blue Grosbeak	*Guiraca caerulea*	INC
Belted Kingfisher	*Ceryle alcyon*	S	Indigo Bunting	*Passerina cyanea*	RP
Red-headed Woodpecker	*Melanerpes erythrocephalus*	T	Dickcissel	*Spiza americana*	RP
Red-bellied Woodpecker	*Melanerpes carolinus*	INC	Bobolink	*Dolichonyx oryzivorus*	T
Yellow-bellied Sapsucker	*Sphyrapicus varius*	U	Red-winged Blackbird	*Agelaius phoeniceus*	S
Downy Woodpecker	*Picoides pubescens*	S	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	
Hairy Woodpecker	*Picoides villosus*	D	Eastern Meadowlark	*Sturnella magna*	SC
Northern Flicker	*Colaptes auratus*	RP	Rusty Blackbird	*Euphagus carolinus*	INC
Pileated Woodpecker	*Dryocopus pileatus*	D	Common Grackle	*Quiscalus quiscula*	D
Olive-sided Flycatcher	*Contopus borealis*	U	Brown-headed Cowbird	*Molothrus ater*	S
Eastern Wood Pewee	*Contopus virens*	RP	Orchard Oriole	*Icterus spurius*	S
Yellow-bellied Flycatcher	*Empidonax flaviventris*	U	Baltimore Oriole	*Icterus galbula*	RP
Acadian Flycatcher	*Empidonax virescens*	RP	Purple Finch	*Carpodacus purpureus*	RP
Alder Flycatcher	*Empidonax alnorum*	INC	House Finch	*Carpodacus mexicanus*	S
Willow Flycatcher	*Empidonax traillii*	RP	Red Crossbill	*Loxia curvirostra*	INC
Least Flycatcher	*Empidonax minimus*	SC	White-winged Crossbill	*Loxia leucoptera*	INC
Eastern Phoebe	*Sayornis phoebe*	S	Common Redpoll	*Carduelis flammea*	U
Great Crested Flycatcher	*Myiarchus crinitus*	RP	Pine Siskin	*Carduelis pinus*	S
Western Kingbird	*Tyrannus verticalis*	U	American Goldfinch	*Carduelis tristis*	INC
Eastern Kingbird	*Tyrannus tyrannus*	RP	Evening Grosbeak	*Hesperiphona vespertinus*	D
Northern Shrike	*Lanius exubitor*	S	House Sparrow	*Passer domesticus*	I
Loggerhead Shrike	*Lanius ludovicianus*	E			

Status: E - Endangered, T - Threatened, SC - Special Concern, D - Decreasing, INC – Increasing,
RP - Regional Priority, S - Stable, U - Undetermined, I - Introduced, P - Peripheral

The above-listed birds can be found in a variety of habitats, from grasslands to mountain forest to the urban interface. Many of these birds are potential migrants through the study area during winter months. Nonetheless, the Ramapo Mountains County Park is obviously a haven for a plethora of mammals, birds, reptiles, amphibians and fishes.

4.0 CRITICAL ENVIRONMENTAL RESOURCES

4.1 Wetlands and Waters

4.1.1 Overview

Wetlands occur between dry uplands and land permanently inundated with water. The water table is close to the surface for at least a portion of the year (Tiner 1985). Activities in wetlands have been regulated under Section 404 of the Clean Water Act, since its passage in 1972. For the purpose of the regulation of wetlands, the Federal definition follows: Wetlands are

> "Those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil condition" (EPA, 40 CFR 230.3 and CE 33 CFR 328.3).

The NJDEP has taken over the regulation of wetlands in the State. Wetlands which are regulated under New Jersey's Freshwater Wetlands Protection Act (N.J.A.C. 7:7A) are identified and delineated using the Army Corps of Engineer's three-parameter approach. Wetlands must exhibit evidence that the seasonal high water table occurs near the surface, wetlands vegetation must be present and evidence that water stands or flows through the area should be evident (Federal Interagency Committee for Wetland Delineation 1989).

The general types of wetlands found in the Highlands Region, according to the U.S Fish and Wildlife Service Cowardin Classification System, include lacustrine, riverine and palustrine wetlands (Kuo 2001). Lacustrine wetlands form in topographic depressions or dammed river systems with areas of more than 20 acres, with less than 20 percent coverage by trees, shrubs or emergent herbaceous vegetation. Smaller waterbodies can be classified as lacustrine systems if the active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depths 6.6 feet (Cowardin et al. 1979). Only Macmillan Reservoir, with a surface water area of approximately 13 acres ms, quality as a lacustrine system. Lake Tamarack, at 7.6 acres, is not large enough to be included in this classification.

Riverine wetlands form along flowing waterbodies, such as rivers, streams and creeks or watercourses connecting standing water bodies (Cowardin et al. 1979). Riverine wetlands have formed along Stag brook, tributaries to and the stream dammed to form the Havemeyer Reservoir, Macmillan Brook and its tributaries, Unnamed tributary to the Ramapo River, Tributaries to Lake Vreeland, Fox Brook and its tributaries and the tributaries associated with Lake Tamarack and Todd Lake.

Palustrine wetlands are dominated by trees, shrubs, persistent, emergents, emergent mosses or lichens, and less than 20 acres in size. These wetlands lack an active wave-formed or bedrock shoreline and water depths are less than 6.6 feet (Cowardin et al. 1979). Remaining wetlands on the Reservation would fall into this category.

The freshwater wetlands (FWW) included in this data set were originally mapped under the Fresh Water Wetlands Mapping Program, an effort undertaken to support the Freshwater Wetlands Protection Act, which was enacted in 1988. Using aerial photography captured in 1986 as the basis, a comprehensive, mapped inventory of non-tidal wetlands within New Jersey was produced. Mapped wetlands were classified according to the U.S Fish and Wildlife Service Cowardin Classification System. While these wetland delineations are not regulatory lines, they represent important resource data in determining potential wetland resources. In 1995, NJDEP acquired aerial imagery, and began updating the Land Use/Land Cover ("LU/LC") layer from 1986. The 1986 layer was examined with the new imagery, and areas of change delineated, with any new line work and land use codes needed to map the changes added to the base data set. This updated LU/LC layer is identified as the 1995/97 LU/LC update. This information is shown on Map 11.

According to this mapping, approximately 244.45 acres or 5.3% of the of total 4,583.94 acre land area in the Ramapo Mountains County Park is occupied by Freshwater Wetlands (see

Map11). Wetlands largely consist of deciduous wooded wetlands with minor areas containing a few other wetland types. Areas of the different mapped wetland types are listed below:

- Deciduous scrub/shrub wetlands - 0.77 acres
- Deciduous wooded wetlands - 283.48 acres
- Disturbed wetlands (modified) - 0.15 acres
- Herbaceous wetlands - 0.44 acres
- Mixed wooded wetlands (coniferous dominated) - 4.01 acres
- Wetlands Rights-of-way acres - 0.60 acres

The United State Environmental Protection Agency (USEPA) has created a Priority Wetland list, which recognizes the most important and vulnerable wetlands in the State. All wetlands within the Passaic River Basin are considered to be USEPA Priority Wetlands (USEPA 1994). Since the Ramapo Mountains County Park is located almost entirely mostly within the Passaic River Basin, nearly all wetland within the Reservation will be considered to be USEPA Priority Wetlands. Ramapo Valley Natural Heritage Program Priority Site includes wetlands and was established to protect some rare and imperiled plant species (Lord 2009a).

Freshwater wetlands in New Jersey are regulated by the NJDEP, under the Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A). Some activities are prohibited in wetlands, while other activities are allowed, but are restricted in areal extent. Activities in freshwater buffers, also referred to as transition areas, are also regulated. The NJDEP determines the size of the wetlands buffer, assigned to freshwater wetlands. Activities in these buffers are also regulated. The buffer assigned is zero feet for human made ditches and swales, stormwater detention facilities and wetlands consisting of strictly open waters. A buffer width of one hundred and fifty feet is assigned to exceptional resource value wetlands.

Since their adoption, however, the Highlands Water Protection and Planning Act Rules (N.J.A.C. 7:38) now regulate wetlands in the Highlands Preservation Area, which includes the Ramapo Mountains County Park. For regulatory purposes, the Highlands Water Protection and Planning

Act Rules (N.J.A.C. 7:38), considers "…all springs, wetlands, intermittent or ephemeral streams, perennial streams, and bodies of surface water, whether natural or artificial, located wholly or partially within the boundaries of the Highlands Region as Highlands Open Waters" (N.J.A.C. 7:38-1.4). With only a few exceptions, major Highlands development is prohibited within a Highlands open water and its adjacent 300-foot buffer. When disturbance is allowed in a Highlands open water, mitigation is always required.

The following are considered a major development, when proposed in the Highlands Preservation Area:

1. Any non-residential development;
2. A residential development, which would require a land use or water permit or would disturb one acre or more of land or add one quarter acre or more of impervious surface;
3. A project proposed by a State entity or local government unit, which would require a land use or water, disturb one acre or more of land or add one-quarter acre or more of impervious surface;
4. Any activity, which would resurf in disturbance of one-quarter acre or more of forested area or that results in a cumulative increase in impervious surface by one quarter acre or more on a lot.

Linear development is permitted in a Highlands open waters and their buffers as long as no feasible alternative for the linear development outside the Highlands open water or Highlands open water buffer exists. Structures or land uses in a Highlands open water buffer existing on August 10, 2004 may remain, provided that the area of disturbance is not increased.

Exemptions, which might be applicable to the development of recreational uses on the Reservation property, as long as the activity is consistent with the goals and purposes of the Highlands Act, are listed below:

- Extension of non-impervious trails;
- Routine maintenance and operations, rehabilitation, preservation, reconstruction, or repair of transportation or infrastructure systems of public roads;
- Transportation safety projects and bicycle and pedestrian facilities;
- Routine maintenance and operations, rehabilitation, preservation, reconstruction, repair, or upgrade of public utility lines, rights-of-way, or systems, by a public utility. The reactivation of rail lines and rail beds existing on August 10, 2004;
- Remediation of any contaminated site pursuant to N.J.S.A. 58:10B-1 seq.

The submission of a Highlands Applicability Determination is the first step in determining if a project requires approval by the Highlands Council. If approval is needed, a Highlands Resource Area Determination request is submitted to determine the extent of protected resources, such as Highlands open waters or forests on a property. Then an application for a Highlands Preservation Area Approval is submitted.

4.1.2 Vernal Pools

As previously discussed, vernal pools are defined as isolated surface water resources that contain water for at least two consecutive months a year and, due to this ephemeral condition, lack breeding fish populations (NJDEP FWS 2008). This absence of fish populations has allowed a number of amphibian species to depend upon these pools to successfully reproduce. Species of amphibians that require these vernal pools as part of their life cycle are called “obligate vernal pool breeders”. Seven (7) amphibian species within New Jersey are placed within this category, including the Eastern tiger salamander (*Ambystoma t. tigrinum*), Marbled salamander (*Ambystoma opacum*), Spotted salamander (*Ambystoma maculatum*), Jefferson salamander (*Ambystoma jeffersonianum*), Blue-spotted salamander (*Ambystoma laterale*), Wood frog

(*Rana sylvatica*), Eastern spadefoot toad (*Scaphiopus holbrookii*). In addition to the obligate vernal pool breeding species, there are "facultative vernal pool breeders" which can breed in vernal pools but can also utilize other habitat types (NJDEP 2001). In New Jersey, fourteen (14) species fall into this category, including, but not limited to, Green frog (*Rana clamitans melanota*), Bullfrog (*Rana catesbiana*), Pine Barrens treefrog (*Hyla andersonii*), Southern leopard frog (*Rana utricularia*), Carpenter frog (*Rana virgatipes*), Northern spring peeper (*Psuedacris crucifer*) and Long-tailed salamander (*Eurycea I. longicauda*) (NJDEP 2001). Other species, such as Wood turtle (*Clemmys insculpta*) and Eastern painted turtle (*Chrysemys p. picta*), also utilize vernal pools as foraging locations (NJDEP 2001).

Vernal pool

Because these pools are utilized by multiple species, some of which are listed as threatened or endangered, the NJDEP incorporated regulations in 2001 to protect these critical resources, as long as they meet certain criteria defined within the New Jersey Freshwater Wetland Protection Act rules (N.J.A.C. 7:7A) (NJDEP 2001, Lathrop et al. 2005). However, most vernal pools have not been identified and certified as such as they do not meet these specific criteria, and are ultimately altered as a result of land development (Lathrop et al. 2005). The Highlands Master Plan, which was approved in 2008, currently requires a 1,000-foot buffer around all certified vernal pools to help protect both the critical resource and the adjacent habitats (Highlands Final Draft Regional Master Plan 2007). Although in-depth surveying and mapping of vernal pools located within New Jersey occurred in 2002, it is critically important to continue accurately identifying these features and continue improving the currently regulations associated with the vernal pools. Refer to the Environmentally Sensitive Features map (Map 12) for an overall overview of the location of both potential and certified vernal pool buffers, as well as the Stag Brook Management Region – Overlay (Map 16), the MacMillan Brook Management Region – Overlay

(Map 18), the Bear Swamp Brook Management Region – Overlay (Map 20) and the Fox Brook Management Region – Overlay (Map 22) for an enlarged view of the vernal pool buffer locations.

4.2 Critical Groundwater Concerns

Groundwater is a critical resource, important for a number of reasons. We depend on the groundwater in aquifers directly was a source of potable water for drinking, irrigation and a multitude of other uses. Groundwater fills the zone of saturation in an aquifer. The top of the zone of saturation in a surficial aquifer is the water table. The depth of the water table varies seasonally and with the physical conditions within the aquifer. Groundwater near the surface can support plant communities, including wetlands, and discharge to streams and springs. Groundwater can comprise a large component in the baseflow of many streams. In some cases, a losing stream will discharge more water to groundwater than is receives.

The quantity and quality of groundwater significantly affects its capacity to perform its critical functions. The quantity of groundwater is affected by the permeability of the surface of the aquifer. When the ground surface is impermeable, due to natural (e.g. clay layer) or anthropogenic conditions (e.g. paving) groundwater recharge is inhibited. The bedrock composed of gneiss in the Ramapo Mountains County Park is relatively impermeable. The degree of fracturing determines the groundwater recharge rate.

The New Jersey Geological Survey modeled groundwater recharge in the Highlands Region. The Passaic River Watershed, which contains the Ramapo Mountains County Park, was estimated to recharge groundwater at a rate of 14.3 inches per year, with normal precipitation levels. Under drought conditions, the recharge rate is reduced to 10.2 inches per year (Hoffman & French 2008). NJ Geological Survey mapping of groundwater recharge rates on the IMapGeology web site indicate no inhibitions to groundwater recharge within the Reservation, except where

wetlands and open waters occur. The groundwater recharge rate is mapped within the Reservation as 16 to 23 inches per year (NJDEP NJGS accessed August 2009).

Groundwater quality can be affected by natural and human sources of contamination. The vulnerability of groundwater in a particular place to contamination depends on a number of site-specific characteristics. The amount of time it takes water to pass through the unsaturated zone affects the speed and degree of contamination. Some contaminants may become trapped or attenuate in the unsaturated zone. A large amount of clay and organic matter in the unsaturated zone materials can limit permeability and trap contaminants in surface materials. The time it takes for a particular contaminant to biodegrade and decompose influences the severity and persistence of groundwater contamination. Precipitation affects recharge and the rate at which contaminants move downward. Evapotranspiration by trees and other vegetation can decrease the amount of water that moves downward to the aquifer, at least seasonally (Tetra Tech EM, Inc. 2008), limiting the rate at which contamination can disperse.

Overall, groundwater in the crystalline rock aquifer of the Ramapo Mountains County Park is more similar to rain water than in other northern New Jersey aquifers. There is little organic matter, so dissolved oxygen levels are fairly high. The level of dissolved major ions and dissolved solids is low. Silica is the most common of the soluble products in the groundwater of the igneous and metamorphic bedrock aquifers (Serfes 2004).

Some naturally occurring constituents degrade groundwater in the igneous and metamorphic rock of the New Jersey Highlands. Serfes (2004) reviewed the groundwater quality in the bedrock aquifers of the Highlands of New Jersey in an attempt to understand the natural state of groundwater, caused by the composition and mineralogy of the aquifer matrix. For some constituents, such as sodium and chloride, it is difficult to separate the influence of the aquifer matrix from human activities like road salting. The study revealed that some violations of groundwater quality standards are not anthropogenic.

During the process of metamorphism of the original rock, uranium and other radioactive elements can concentrate and mineralize and leach into groundwater (Michel 1987). Because of this, these rock formations contain radioactive elements, which can release radionuclides and radon to groundwater. Radon-222 levels generally exceed the USEPA standard of 300 pico curies per liter (piC/L). Iron and manganese levels are also naturally elevated in the crystalline rock aquifers of the Highlands (Serfes 2004).

Naturally-occurring contamination is limited to potential contamination by radioactive constituents in the rocks of the Ramapo Mountains County Park. Mineral water reactions are minimal in the crystalline rock aquifers, because these rock types resist weathering. This also means the buffering capacity of these aquifers is low, creating a vulnerability to contamination (Highlands Water Protection and Planning Council 2008b). Possible sources of human groundwater contamination on the Reservation can be related to septic systems or other discharge of human waste to soils, concentrations of pet waste, roadway deicing, fuel storage and transport, stockpiling of vegetative waste, use and storage of insecticides or pesticides, untreated stormwater runoff from roads and parking lots and other sources. The Tennessee Gas Pipeline crosses the Reservation. The NJDEP maps a contaminated site associated with the pipeline along Bear Swamp Creek. NJDEP records indicate the case is closed. While active, this pipeline could potentially be a source of contamination.

As mentioned, the Highlands Water Protection and Planning Act was adopted on May 9, 2005 for the purpose of protecting the significant water resources of the Highlands Region. As stated in the Act, the New Jersey Legislature recognized the Highlands as "…an essential source of drinking water, providing clean and plentiful drinking water for one-half of the State's population, including communities beyond the New Jersey Highlands…" (N.J.S.A. 13:20-1 et seq). The Ramapo Mountains County Park is located in the Preservation Area, designated in the act and will require approval under the Highlands Water Protection and Planning Act Rules

(N.J.A.C. 7:38) for most construction. Local water sources are associated with the aquifer of the Ramapo River Valley.

4.3 Riparian Corridors

Riparian corridors and buffers provide an important role in preserving water quality as well as maintaining the ecological balance within the watershed systems. Riparian corridors trap sediment and filter runoff from surrounding areas, the provide shade to keep water temperatures low enough to support aquatic life, and they provide food and habitat for both aquatic and terrestrial life that depend on the adjacent waterways (West Virginia Conservation Agency 2003).

The NJDEP has recently adopted the Flood Hazard Area Control Act and associated regulations (N.J.A.C. 7:13, 7:7E), which is intended to incorporate "more stringent standards for development in flood hazard areas and riparian zones adjacent to surface waters throughout the State" (NJDEP DLUR 2008). According to these Rules riparian corridors, or riparian zones, encompasses the land and vegetation along every regulated water, excluding the Atlantic Ocean, manmade lagoons, stormwater management basins or oceanfront barrier islands. These regulated zones can vary in width and are determined as follows: Regulated waterways that are classified as Category-1 waterways, including all upstream tributaries situated within the same HUC-14 watershed as the Category-1 waterway, have a 300-foot wide riparian zone on both sides; and regulated waterways that are associated with trout production and trout maintenance, including waters within one linear mile, regulated waterways that flow through documented habitat for threatened or endangered plant or wildlife species, or habitat of species that are critically dependent on the regulated water, or regulated waterways that flow through areas containing acid-producing soils, have a 150-foot riparian zone on both sides. All other regulated waters, not previously described, have a 50-foot riparian zone on either side (NJDEP 2009a). If there is a discernable bank, then the width of the riparian zone is measured from the top of bank. If there is no discernable bank, then the width of the riparian zone can be measured 1 of 4 different ways: Linear tidal waters are measured from the centerline; non-

linear fluvial waters are measured from the normal water surface limit; Non-linear tidal waters are measured from the mean high water line; and amorphously-shaped features are measured from the centerline (NJDEP 2009a).

In addition to riparian buffers, the State protects surface waters through 300-foot Special Water Resource Protection Areas (SWRPAs), established through the Stormwater Management Rules (N.J.A.C. 7:8). These are typically given to Category-1 waters that are adjacent to development projects increasing more than 0.25 acres of impervious cover or involving disturbance of more than one acre.

The Highlands Regional Master Plan (2008) has also established protocol in protecting water resources and riparian buffers. As part of the Master Plan, riparian zones located within all of the subwatersheds of the Highlands Region were evaluated on specific characteristics, including existing land cover, vegetation, and wildlife habitat. Each riparian zone was then placed within one of three categories describing the integrity of the riparian zone (high integrity, moderate integrity, low integrity) which will later be used to evaluate proposed development projects (Highlands Regional Master Plan 2008). The Highlands Regional Master Plan (2008) is also proposing as part of their goals (Goal 1D) to place a 300-foot buffer along surface waters (Policy 1D4).

4.4 Steep Slopes

The importance of slope, the vertical change in elevation over a given horizontal distance, increases with the steepness of the land surface. Increases in the steepness of terrain are associated with increased erosion, which result in topsoil losses and potential sedimentation in downslope wetlands, surface waters or terrestrial habitats. The Highlands Region, in general, and the Ramapo Mountains County Park, in particular, contain extensive areas with steep slopes, due to the resistant bedrock.

Several factors influence the severity of impacts, resulting from the disturbance of steep slopes. These factors include:

- Soil Erodibility
- Land Cover
- Sediment Delivery
- Soil Capability Class
- Depth to Bedrock

Soil erodibility is the ease with which a soil can be eroded. Silts and very fine sands are most easily eroded. Soils containing larger amounts of organic matter or larger particle sizes are more permeable so runoff is less likely to scour the surface. Land cover, particularly vegetative cover, affects the stability of soils. Forested areas are much less erodible than areas with disturbed or less robust plant communities. Sediment delivery refers to the directness of the pathway eroding soils may take to a resource, such as a wetlands or surface waterbody. Soil Capability Class is a ranking system developed for agricultural usage. Susceptibility to erosions is one of the limiting factors incorporated into the ranking. Depth to bedrock is important, because shallower soils are more prone to erosion than deeper soils (New Jersey Highlands Water Protection and Planning Council 2008b).

State of New Jersey adopted the Soil Erosion and Sediment Control Act (Chapter 251 of the New Jersey Public Laws) to protect soils from erosion. The Act establishes and implements, through the State Soil Conservation Committee and the Soil Conservation Districts, a comprehensive and coordinated erosion and sediment control program. The "Standards for Soil Erosion and Sediment Control" (N.J.A.C 2:90-1) promulgated by the New Jersey State Soil Committee implement the Act. Projects involving the disturbance of more than 5,000 square feet of land (unless such land is used for agricultural, silvicultural or horticultural purposes) require certification of a soil erosion and sediment control plan by the local Soil Conservation District. These rules contain standards for development and treatment of different categories of slopes. Steep slopes should be considered as an important constraint in the future development of the Ramapo Mountains County Park (New Jersey Highlands Water Protection and Planning Council 2008b).

4.5 Threatened and Endangered Species

The Ramapo Mountains County Park is documented habitat for a number of State-listed threatened and endangered species. Threatened and endangered species are identified as such due to rarity within the state. An endangered animal species is defined as "one whose prospects for survival within the state are in immediate danger due to one or many factors – loss of habitat, over exploitation, predation, competition, disease" and requires immediate assistance or extinction or extirpation from the State will likely follow (NJDEP 2008). A threatened animal species is defined as "a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate" (NJDEP 2008). State Endangered plant species are classified under New Jersey's Endangered Plant Species List at N.J.S.A. 131B-15.151 et seq. Such species and their habitats are afforded legal protection through various land use laws in New Jersey, such as the Freshwater Wetlands Protection Act.

4.6 Threatened an Endangered Plants

Two mosses and five vascular plants listed as Endangered by the State of New Jersey (Table 9) have been observed/reported from Mahwah Township. At least one of these (Torrey's Mountain Mint) is known from Ramapo Mountains County Park.

Table 9. State listed threatened, endangered plant and rare species that potentially occur within the Ramapo Mountains County Park according to the Natural Heritage Program.

Common Name	Scientific Name	State Status	Regional Status	Global Rank	State Rank	Municipality
Nonvascular Plant						
Sphagnum	*Sphagnum contorum*	E	LP, HL	G5	S1	M
Sphagnum	*Sphagnum majus* ssp. *nonvegicum*	E	LP, HL	G5/GNR	S1.1	M
Vascular Plant						
Small-flower Halfchaff Sedge	*Hemicarpha micrantha*	E	LP, HL	G5	S1	M
Basil Mountain-mint	*Pycnanthemum clinopodioides*	E	LP, HL	G2	S1	M
Torrey's Mountin-	*Pycnanthemum torrei*	E	LP, HL	G2	S1	M

mint						
Torrey's Mountain-mint	*Pycnanthemum torrei*	E	LP, HL	G2	S1	M
Torrey's Bulrush	*Schoenoplectus torreyl*	E	LP, HL	G5	S1	O
State Status:	*E= endangered*					

Regional Status: LP = taxa listed as endangered or threatened by the Pinelands Commission within the Pinelands
HL = tax or ecological communities protected by the Highlands Water Protection and Planning Act

Global Rank: G2 = imperiled because of rarity or because some factor is making it very vulnerable
G5= demonstrably secure globally, G4= apparently secure globally
GNR = Species has not yet been ranked

State Rank: S1= critically imperiled in NJ because of rarity, S2=imperiled in NJ because of rarity,
S3= rare in state (21-100 occurrences), .1 = elements documented from a single location

Municipality: M= Mahwah, O= Oakland

Contorted Sphagnum

(*Sphagnum contortum*)

Contorted Sphagnum and its several varieties is a widespread moss occurring in Asia, Europe, and North America. In New Jersey it is a State-listed endangered species. It is reported from Mahwah Township and observed/reported as recently as 1998 (Lord 2009a) and should be looked for in the Reservation. It is considered an obligate wetland species and is included by NJDEP (2008) on the List of Threatened and Endangered Species that are Critically Dependent on Regulated Waters for Survival.

Sphagnum

(*Sphagnum majus* ssp. *norvegicum*)

Sphagnum majus ssp. *norvegicum* is another widespread moss, which in New Jersey is listed as endanger. It was last observed/reported in Mahwah Township in 1994 (Lord 2009a) and should

be looked for in the Reservation. It is considered an obligate wetland species and is included by NJDEP (2008) on the List of Threatened and Endangered Species that are Critically Dependent on Regulated Waters for Survival.

Small-flowered Halfchaff Sedge

(Hemicarpha (Lithocarpha) micrantha)

Small-flowered Halfchaff Sedge (also: Common Hemicarpha and Dwarf Bulrush) is a member of the Cyperaceae (Sedge Family), and in North America grows in moist sandy soil from Maine to Minnesota, Florida, Texas, and in California (Gleason 1952). Habitats include moist situations in fields, sand pits, ditches, lake, and pond margins. In New Jersey it is a State-listed endangered species, and is considered endangered or threatened in most of the state in the northeast. It was last observed/reported in Mahwah Township in 2007 (Lord 2009a). It is considered an obligate or facultative wetland species throughout its range in North America, and is included by NJDEP (2008) on the List of Threatened and Endangered Species that are Critically Dependent on Regulated Waters for Survival.

Basin Mountain-mint

(*Pycnanthemum clinopodiodes*)

Basin Mountain Mint is a member of the Lamiaceae (Mint Family) and, occurs from Massachusetts to Maryland in upland woods (Gleason 1952). In New Jersey it is a State-listed Endangered Species, and it is globally rare. It was last observed/reported in Mahwah Township in 2008 (Lord 2009a), where it is known from Campgaw Mountain County Reservation and is not reported from Ramapo Mountains County Park (Local Sources 2009).

Torrey's Mountain-mint

(Pycnanthemum torrei)

Torrey's Mountain Mint is a member of the Lamiaceae (Mint Family) and, occurs from Connecticut to Kansas and Georgia in dry upland woods (Gleason 1952). In New Jersey it is a

State-listed Endangered Species, and it is globally rare. It was last observed/reported in Mahwah Township in 2004 (Lord 2009), where it is known from the vicinity of Scarlet Oak Pond (Local Sources 2009) in the Ramapo Valley Natural Heritage Priority Site.

The site is described as having rocky ledges and steep wooded slopes and contiguous wetland communities (Lord 2009).

Torrey's Bulrush

[Schoenoplectus (Scirpus) torreyi]

Torrey's Bulrush is a member of the Cyperaceae (Sedge Family), which occurs from Maine to Minnesota, Missouri, to New Jersey and Pennsylvania in swamps and muddy shores (Gleason 1952). In New Jersey it is a State-listed Endangered Species. It was last observed/reported in Oakland Borough in 1939. It should be looked for in the Ramapo Mountains County Park.

4.7 Threatened and Endangered Animals

Various sources were consulted to identify the potential occurrence of threatened and endangered species and/or their habitats within the Ramapo Mountains County Park. The most authoritative list of such species resulted from a database search of the Natural Heritage Program and that of the New Jersey Landscape Project version 3.0 (Lord 2009). Due to the diversity of habitats found throughout the Ramapo Mountain study area, a variety of protected birds, reptiles, mammals and invertebrates have been identified as occurring or potentially occurring within these managed lands, according to the municipalities in which they are mapped. Table 10 below lists these species, their state and global statuses and the municipality within which they occur.

Table 10. State threatened and endangered animal species that may potentially occur within the Ramapo Mountain

Open Space System (Lord 2009a,b)

Common Name	Scientific Name	State Status	Global Rank	State Rank	Municipality
Barred Owl	*Strix varia*	T/T	G5	S2B, S2N	M, O
Black-Crowned Night-Heron*	*Nycticorax nycticorax*	T/SC	G5	S2B, S3N	M, R
Bobcat	*Lynx rufus*	E	G5	S1	M, O
Cooper's Hawk	*Accipiter cooperii*	T/S	G5	S2B, S4N	M, O, R
Eastern Lampmussel	*Lampsilis radiata*	T	G5	S2	M, O
Grasshopper Sparrow	*Ammodramus savannarum*	T/SC	G5	S2B, S3N	M
Red-headed Woodpecker	*Melanerpes erythrocephalus*	T/T	G5	S2B, S2N	M, R
Red-shouldered Hawk	*Buteo lineatus*	E/T	G5	S1B, S2N	M, O, R
Timber Rattlesnake	*Crotalus h. horridus*	E	G4T4	S1	M, O, R
Triangle Floater	*Alasmidonta undulata*	T	G4	S2	M, O
Wood Turtle	*Glyptemys insculpta*	T	G4	S2	M, O
Yellow-Crowned Night-Heron*	*Nyctanassa violacea*	T/T	G5	S2B	M, R

* indicates mapped foraging habitat only

State Status: E= endangered, T= threatened, SC= special concern, S= stable

(Status separated by / indicates breeding population and non-breeding population, resp.)

Global Rank: G5= demonstrably secure globally, G4= apparently secure globally,

State Rank: S1= critically imperiled in NJ because of rarity, S2=imperiled in NJ because of rarity,

S3= rare in state (21-100 occurrences), S4= apparently secure in state (B= breeding, N= non-breeding)

Municipality: M= Mahwah, O= Oakland, R= Ramsey

Following are brief descriptions of each of the State-protected species that may occur within the Ramapo Mountains County Park:

Barred Owl

(Strix varia)

Both the breeding and migratory (non-breeding) populations of Barred Owl in New Jersey are considered threatened (NJDFW 2008). Barred Owls have a round head lacking ear tufts and barring markings on the throat and chest (Mazur and James 2000). A year-round resident,

Barred Owls are typically associated with old-growth forested wetlands. Suitable cavities in tree trunks are critical for Barred Owl breeding habitat, and it is expansive forested wetlands that typically contain such large, old trees (Mazur and James 2000). In northern New Jersey, Barred Owls are known to use mixed deciduous riparian or wetland forests and hemlock ravines (NJDFW 2008). The breeding habitats of Barred Owls often coincide with those of other reclusive protected forest raptors such as Cooper's Hawk and Red-shouldered Hawk (NJDFW 2008).

Black-crowned Night-Heron

(Nycticorax nycticorax)

The breeding population of Black-crowned Night-Heron is classified as threatened in the state of New Jersey (NJDFW 2008). It is generally considered a cosmopolitan species as it breeds on several continents worldwide, but its population in New Jersey has been negatively impacted by the loss of maritime forest to accommodate man-made development (NJDFW 2008). The Black-crowned Night-Heron is a nocturnal, stocky, medium-sized wading bird (Davis 1993). These night-herons are known to inhabit a variety of fresh, brackish and salt water habitats (Davis 1993).

Bobcat

(Lynx rufus)

While it is considered a secure species globally, the Bobcat is a State-endangered species due to its rarity in New Jersey (NJDFW 2008). Bobcats are felines found throughout much of North America in a variety of habitats, but are found in forests and in mixed areas of forest and agriculture in the Northeast (NJDFW 2008). In the northern part of the state, Bobcats typically require large expanses of contiguous or fragmented forest with rock outcrops, caves and ledges. These cats maintain a natal den and additional shelter dens that are frequented less often, but occur within their home ranges (Whitaker 1998). Bobcats were thought to have been extirpated from New Jersey by the 1970s, due in large part to hunting and trapping. In

the late 1970s and early 1980s, the species was reintroduced to New Jersey and is continually monitored (NJDFW 2008).

Cooper's Hawk

(Accipiter cooperii)

The Cooper's Hawk breeding population is presently listed as threatened in the state of New Jersey, but with rumors of its potential de-listing in the near future due to increased numbers of breeding birds in the state. Cooper's Hawks are crow-sized woodland raptors known to occur throughout the United States (Curtis et al. 2006). Though widely observed during migration, Cooper's Hawks are more secretive during breeding season when on nests (Curtis et al. 2006). As an accipiter, Cooper's Hawks feed primarily on other smaller birds and are considered stealthy predators. When Cooper's Hawks were first listed as endangered in New Jersey in the 1970s, they were documented in large, contiguous tracts of forest (NJDFW 2008). Since then, the species has been observed breeding in more fragmented forest and in parcels of land closer to human habitation and disturbance (NJDFW 2008).

Eastern Lampmussel and Triangle Floater

(Lampsilis radiata) and (Alasmidonta undulata)

The Eastern Lampmussel is a State-threatened species of freshwater mussel known from parts of the Ramapo, Pequannock and Wallkill Rivers (NJDFW 2008). This species is found in a variety of habitats and prefers medium to coarse sands (NJFDFW 2008). Triangle Floaters are freshwater mussels listed as threatened by the state of New Jersey (NJDFW 2008). They are considered to be habitat "generalists" and can be found in a variety of streams and rivers throughout the state (NJDFW 2008).

Grasshopper Sparrow

(Ammodramus savannarum)

The breeding population of Grasshopper Sparrows, a grassland bird species, is considered threatened in New Jersey (NJDFW 2008). During breeding season, Grasshopper Sparrows

inhabit intermediate grassland habitat that can include pasture, upland meadow, hayfield, grassland and old fields (NJDFW 2008, Vickery 1996). The Grasshopper Sparrow is named for its insect-like song (Vickery 1996). It forages exclusively on the ground and prefers grassland habitats with patches of bare ground (Vickery 1996). The expanding development of open space and the reduction in agriculture contributed to the decline of this species in New Jersey (NJDFW 2008).

Red-headed Woodpecker

(Melanerpes erythrocephalus)

Both the breeding and non-breeding populations of the Red-headed Woodpecker are classified as threatened in New Jersey (NJDFW 2008). Red-headed Woodpeckers are easily identifiable by their distinctive markings of a bold, red head and black and white body. These woodpeckers inhabit open woodlands with sparse understory and dead or dying trees with suitable nest cavities (NJDFW 2008, Smith et al. 2000). In northern New Jersey, Red-headed Woodpeckers are known to use beaver marshes (where there is an abundance of dead or dying trees) as well as upland and wetland forest (NJDFW 2008).

Red-shouldered Hawk

(Buteo lineatus)

The breeding population of Red-shouldered Hawks is State-endangered while the non-breeding population is State-threatened (NJDFW 2008). Like the Cooper's Hawk, Red-shouldered Hawks are crow-sized. They have a rufous breast and shoulder patches, and black-and-white banded tail (Dykstra et al. 2008). Red-shouldered Hawks favor extensive, contiguous old-growth deciduous wetland forest, and are often found in habitats also containing Barred Owl and Cooper's Hawk (NJDFW 2008). These hawks eat a variety of small prey, including reptiles, amphibians, small mammals and, at times, insects (Dykstra et al. 2008). Red-shouldered Hawks are sensitive to human activity and typically nest away from residences and roadways (NJDFW 2008). Habitat loss is the primary threat to this species in New Jersey.

Timber Rattlesnake

(Crotalus h. horridus)

The Timber Rattlesnake is listed as an endangered species in the state of New Jersey (NJDFW 2008). One of two venomous snake species that occur in the state, the Timber Rattlesnake is known to inhabit two distinct habitat types in the northern and southern portions of New Jersey. In the north, Timber Rattlesnakes are associated with rock outcrops and talus slopes in deciduous upland forests (NJDFW 2008). These rattlesnakes use dens to hibernate during the cold winter months, emerging in the spring (Tyning 1990). Female rattlesnakes give birth to live young in late summer, and typically do so in close proximity to the den (Tyning 1990). The Timber Rattlesnake was listed as an endangered species in New Jersey in 1979 due to habitat loss and wanton killings (NJDFW 2008).

Wood Turtle

(Glyptemys insculpta)

The Wood Turtle is a threatened species in New Jersey due to its rarity in the state, though considered secure globally (NJDFW 2008). Wood Turtles are distinguished by their sculpted shell and reddish-orange legs and throat (NJDFW 2008, Tyning 1990). These turtles overwinter in small streams and rivers, emerging in the spring when the males and females mate in the water (Tyning 1990). While streams are important habitat for overwintering and breeding, Wood Turtles also require suitable adjoining upland habitats where the females nest and both genders spend much of the warm summer months. Thus, unlike other turtle species, they require both aquatic and terrestrial habitats (NJDFW 2008). Wood Turtles are threatened by habitat loss and fragmentation, as well as stream degradation (NJDFW 2008).

Yellow-crowned Night-Heron

(Nyctanassa violacea)

Both the breeding and non-breeding populations of Yellow-crowned Night-Heron are classified as threatened in New Jersey (NJDFW 2008). Yellow-crowned Night-Herons are medium-sized

wading birds with yellow-white caps and eye patches (NJDFW 2008). They can appear similar to Black-crowned Night-Herons, also a State-threatened species. Although they do use coastal islands, these night-herons more often inhabit forested wetlands and swamps (Watts 1995). They are known to feed on crustaceans and will nest in mixed species colonies with other herons (NJDFW 2008). Once killed for their plumage, Yellow-crowned Night-Herons are threatened by habitat loss associated with human development (NJDFW 2008).

4.7.1 Critical Habitats for Threatened and Endangered Species

Critical wildlife habitats serve essential roles in ecosystem functions such as habitats for threatened and/or endangered species, migratory and breeding birds, spawning fish, corridors for wildlife movement, etc. Foraging habitat for Black-crowned Night-Heron (*Nycticorax nycticorax*) and Yellow-crowned Night-Heron (*Nyctanassa violacea*) are noted in the municipalities of Mahwah and Ramsey; however, there are few such suitable wetlands within the study area (Lord 2009). Those wetlands that had been mapped as suitable habitat for the night-herons appear to lie outside of the study area. Similarly, there appear to be no expansive grasslands within the Ramapo Mountains County Park suitable for the Grasshopper Sparrow (*Ammodramus savannarum*). This species of grassland bird is more likely to be found in agricultural portions of Mahwah Township. Despite this, there are still numerous land cover types that can be classified as critical habitat for threatened and endangered species.

Overall, the forested wetlands within the management area are the most likely habitats for Barred Owl (*Strix varia*), Cooper's Hawk (*Accipiter cooperi*) and Red-shouldered Hawk (*Buteo lineatus*). Many of these forested wetlands are contiguous with extensive, relatively unfragmented upland forest, increasing the suitability of these sites for the protected raptors. The streams and rivers may be potential breeding habitat for Wood Turtles (*Glyptemys insculpta*) and the Eastern Lampmussel (*Lampsilis radiata*) and Triangle Floater (*Alasmidonta undulata*), listed species of freshwater mussels. Thus, the forest cover of these wetlands and high water quality of the streams are important factors in maintaining habitat suitable for

protected species. Furthermore, Timber Rattlesnake (*Crotalus h. horridus*) and Bobcat (*Felix rufus*) rely on the shelter of rock outcrops on the talus slopes found throughout the Ramapo Mountain Open Space Management System. Thus, mountainous peaks and their steep slopes are important to the continuing existence of these species.

In addition, stands of mature forest, whether wetland or upland, are valuable as habitat for Bobcat, Timber Rattlesnake, Barred Owl, Cooper's Hawk and Red-shouldered Hawk. Older forests are recognized for a greater diversity of structure, providing more cavities, perches, nest sites and shelters (due to the increased presence of large, fallen logs).

4.8 Rare and other Special Concern Species

In addition to those species that are officially listed as protected in the State of New Jersey, the Ramapo Mountains County Park is documented habitat for rare plant and animal species, particularly those that are identified as "Species of Special Concern". The classification of "Species of Special Concern" applies to animals that "warrant special attention because of some evidence of decline, inherent vulnerability to environmental deterioration, or habitat modification that would result in their becoming a Threatened species" (NJDEP 2008). This classification would also be applied to species that "meet the foregoing criteria and for which there is little understanding of their current population status in the state" (NJDEP 2008). Rare plants are classified according to their State rank (e.g. S1, S2, S3, etc.).

4.8.1 Plants

Four plant species recognized by the State of New Jersey as rare (Table 11) have been observed/reported in Mahwah Township or Oakland Borough (Lord 2009a, 2009b).

Table 11. Rare plant species that may potentially occur within the Ramapo Mountains County Park according to the Natural Heritage Program.

Common Name	Scientific Name	Regional Status	Global Rank	State Rank	Municipality
Vascular Plant					
Cornel-leaf Aster	*Doellingeria infirma*	HL	G5	S2	M
Log Fern	*Dryopteris celsa*	HL	G4	S1	M
Winged Monkey-flower	*Mimulus alatus*	HL	G5	S3	M
Black-girdle Woolgrass	*Scirpus atrocinctus*	HL	G5	S1	O

Regional Status HL = tax or ecological communities protected by the Highlands Water Protection and Planning Act
Global Rank: G4= apparently secure globally, G5= demonstrably secure globally
State Rank: S1= critically imperiled in NJ because of rarity, S2=imperiled in NJ because of rarity
Municipality: M= Mahwah, O= Oakland

Cornel-leaved Aster

(Doellingeria infirma)

Cornel-leaved Aster is a member of the Asteraceae (Aster Family), and occurs from Massachusetts to Georgia and Alabama in woodlands (Gleason 1952). In New Jersey it is considered a rare species (S2). It was last observed/reported in Mahwah Township in 1991 (Lord 2009), where it is known from the Hawk Rock area (Local Sources 2009) in the Ramapo Valley Natural Heritage Priority Site within the Reservation.

Log Fern

(Dryopteris celsa)

Log Fern is a member of the Dryopteridaceae (Shield-fern Family), and occurs from New York and Michigan south to South Carolina and Louisiana on seepage slopes, hummocks, and in swamps (Montgomery and Fairbrothers (1992). In New Jersey it is considered rare (S1), where

it is known only from Bergen County and was thought to have been extirpated (Montgomery and Fairbrothers 1992). It has not been reported from the Ramapo Mountains County Park (Local Sources 2009).

Winged Monkey-flower
(Mimulus alatus)

Winged Monkey-flower is a member of the Phrymaceae that occurs from Connecticut and Ontario south to Iowa, Texas, and Florida in wet woods (Gleason 1952). In New Jersey it is considered rare (S3). It was last observed/reported from Mahwah Township in 1994 (Lord 2009a) and is known from the vicinity of Scarlet Oak Pond in the Ramapo Mountains County Park (Local Sources 2009).

Black-girdle Woolgrass
(Scirpus atrocinctus)

Black-girdle Woolgrass is a member of the Cyperaceae (Sedge Family), and occurs through most of Canada and the northern United States from Maine to Washington south to New Jersey and Illinois in marshes, wet meadows, ditches and disturbed areas. In New Jersey it is listed as rare (S1) and was last reported from Oakland Borough in 1939 (Lord 2009b). It should be looked for in the Ramapo Mountains County Park.

4.8.2 Animals

Rare animal species that are not officially listed as threatened or endangered in New Jersey still require a degree of awareness and attention, in order to prevent such species from becoming threatened or endangered. With the exception of one reptile, the rare species and/or their habitat that may occur within the study area consist of invertebrates. Table 12 below lists these species, their state and global statuses and the municipality within which they occur.

Table 12. Rare animal species that may potentially occur within the Ramapo Mountains County Park (Lord 2009a,b)

Common Name	Scientific Name	State Status	Global Rank	State Rank	Municipality
Arrowhead Spiketail	*Cordulegaster obliqua*	SC	G4	S3	M, O
Brush-tipped Emerald	*Somatochlora walshii*	SC	G5	S3	M, O
Creeper	*Strophitus undulatus*	N.A.	G5	S3	M, O
New England Bluet	*Enallagma laterale*	SC	G3	S3	O
Northern Copperhead	*Agkistrodon c. contortrix*	SC	G5T5	S3	M, O
Sable Clubtail	*Gomphus rogersi*	SC	G4	S3	M, O
Tiger Spiketail	*Cordulegaster erronea*	SC	G4	S3	M, O
Williamson's Emerald	*Somatochlora williamsoni*	SC	G5	S3	O

State Status: SC= special concern

Global Rank: G5= demonstrably secure globally, G4= apparently secure globally, G3= very rare and local or found locally in a restricted range

State Rank: S3= rare in state (21-100 occurrences)

Municipality: M= Mahwah, O= Oakland

Northern Copperhead (*Agkistrodon c. contortrix*) is one of two venomous snakes that occur in New Jersey. While the Timber Rattlesnake (*Crotalus h. horridus*) is a State-endangered species, the Northern Copperhead is a Species of Special Concern because little is known about its current population in the State, other than observations that its numbers have declined. In northern New Jersey, the copperhead is often found in similar habitats to the Timber Rattlesnake, on talus slopes and rock outcrops where the species may den together. Northern Copperheads also have an affinity for the forested wetlands at the base of such slopes as they feed primarily on amphibians (McCort 2009).

Arrowhead Spiketail (*Cordulegaster obliqua*), Brush-tipped Emerald (*Somatochlora walshii*), New England Bluet (*Enallagma laterale*), Sable Clubtail (*Gomphus rogersi*), Tiger Spiketail (*Cordulegaster erronea*) and Williamson's Emerald (*Somatochlora williamsonii*) are dragonflies and damselflies, all of the scientific order Odonata. The Arrowhead Spiketail is found in the northernmost counties of New Jersey, including Bergen and Passaic, and is found along slow,

often muddy trickles and streams (Bangma 2006). Tiger Spiketails are equally rare and also limited to the northernmost New Jersey counties; however, the Bergen County population is apparently extirpated (Bangma 2006). The Brush-tipped Emerald inhabits open swamps and bogs in the northwestern portion of the state while Williamson's Emerald has been recorded in only three northern counties (Bangma 2006). The New England Bluet is a damselfly that has been observed in the northernmost New Jersey counties (Bangma 2006). Lastly, the Sable Clubtail is a dragonfly found along small rocky streams in the northern counties of the state (Bangma 2006).

The Creeper (*Strophitus undulatus*) is a freshwater mussel found throughout the eastern half of the United States. It is one of the few North American mussels to occur on both sides of the Appalachian Mountains (NatureServe 2009). This species is a habitat generalist, with a wide distribution and is usually found in streams and rivers in a range of flow conditions (NatureServe 2009).

4.8.3 Critical Habitats for Rare Species

Critical wildlife habitats serve essential roles in ecosystem functions such as habitats for species of special concern, migratory and breeding birds, spawning fish, corridors for wildlife movement, etc. In the case of rare species and Species of Special Concern, their habitat recognition and preservation is important in ascertaining the current population status and means of preventing the species from becoming threatened or endangered. In this sense, it is equally important to protect such critical habitats to prevent the list of threatened and endangered species from expanding.

Within the Ramapo Mountain study area, much of the list of Special Concern animals is comprised of odonates, more commonly known as dragonflies and damselflies. These rare insects are limited to the northern portion of the state, where they can be found in varying habitats linked to surface hydrology. Dragonflies and damselflies are important indicators of

water quality, as they have an aquatic larval stage and terrestrial adult stage as parts of their life cycle (Mass Audubon 2009). Both of these life stages are predatory, feeding on other insects. These rare odonates occur in a variety of wet habitats: along streams, rivers, ponds, wet meadows, and forested wetlands. The larvae of the damselflies and dragonflies are sensitive to changes in water quality and habitat structure (Mass Audubon 2009). Thus, high water quality must be maintained in the study area's streams, rivers and wetlands to provide suitable habitat for these species that have the potential to become threatened or endangered.

Like the dragonflies and damselflies, the somewhat-rare freshwater mussel, the Creeper (*Strophitus undulatus*), also requires good water quality in the streams and rivers it inhabits. Because the Creeper is a habitat generalist, it may utilize fast-moving or slow-moving streams and rivers. Therefore, any of the flowing waters of the Ramapo Mountain study area may provide suitable habitats for this species.

Finally, the Northern Copperhead (*Agkistrodon c. contortrix*) typically requires a combination of wetland and upland habitats within its home range. Copperheads in New Jersey overwinter in dens on rocky hillsides. After emerging in spring, they migrate to lower elevations with a particular affinity for wetlands in the summer months (Tyning 1990). Thu areas where these two different habitats interface is of value to the Northern Copperhead.

4.9 Important, Priority, or Unique Sites

4.9.1 Natural Heritage Priority Sites

One Natural Heritage Priority Site is located within the Ramapo Mountains County Park Management Plan project area. The Ramapo Valley site is located within Mahwah Township, Bergen County, New Jersey. It encompasses approximately 270 acres within the municipality.

According to the Natural Heritage Program response, dated April 2, 2009, the Ramapo Valley Natural Heritage Priority Site is mapped due to the presence of a "globally imperiled plant species as well as two other state imperiled and rare plant species" (Lord 2009). In order to protect and respect the rarity of these species, the Natural Heritage Program does not reveal the exact species or the exact location of the endangered species. The overall mapped boundary includes rocky ledges, steep wooded slopes and contiguous wetland communities, as well as adjacent upland and lowland vegetative species (Lord 2009). Refer to the Environmentally Sensitive Features (Map 12) for the location of the Natural Heritage Priority Site located within the Ramapo Mountains County Park Management Plan project area.

4.9.2 Important or Unique Geologic Features

The Ramapo Mountains County Park is characterized by a number of important geologic features, some of the most prominent of which are listed below:

- Bald Mountain (Map 2)
- Ramapo Fault (Fig. 1, Map 3)
- Overturned antiform and related "ridge" (Map 2 & Map 3)
- Overturned synform and related "valley" (Map 2 & 3)
- Bedrock outcrops (Fig. 2)
- Glacial erratic (Fig. 3)

Preservation of these features and the scenic views associated with them is an important element of the conservation of the natural resources of the Reservation.

5.0 RESOURCE FUNCTIONS AND VALUES

Eugene Odum, one of the founder of the science of ecology, defined an ecosystem as

> "*Any unit that includes all of the organisms (ie: the "community") in a given area interacting with the physical environment so that a flow of energy leads to clearly defined trophic structure, biotic diversity, and material cycles (ie: exchange of materials between living and nonliving parts) within the system is an ecosystem*"(Odum 1971).

Ecosystems are not only valuable in their own right, but perform a variety of functions, some of which contribute of the well-being of the human community. What an ecosystem does constitutes its function. Individual ecosystem functions are the physical, chemical, and biological processes or attributes that contribute to the self-maintenance of an ecosystem.

Side-benefits or services to the human community often result from healthy ecosystem function. These ecosystem services give an ecosystem value in human terms and have value to society (King 2000). Responsible stewardship of ecosystems requires the recognition of and preservation to the greatest extent possible their functions and values. Management of the ecosystem resources of the Ramapo Mountains County Park should conform to the management principles put forth by the Highlands Council. According to the Council, effective ecosystem management "…conserves, restores, and maintains ecosystem integrity, productivity, and biological diversity" (Highlands Water Protection and Planning Council 2008b). Ecosystem functions are natural processes which continue whether humans value them or not. The value society or a community places on ecosystem functions also varies over time as perceptions and priorities are revised. Societal values generally change slowly. Individuals or small groups, however, may quickly and arbitrarily assign value to a previously unappreciated ecosystem function or resource. When changes are counter to existing community values, conflict can develop. Ultimately a community may have to choose among ecosystem functions that benefit or are appreciated by individuals or small groups, that are of value to most of society, or that are intrinsically important to sustain the ecosystem itself. While ecosystems

function regardless of their perceived value to humans they are only likely be preserved only to the extent their functions are valued (Novitzki, Smith and Fretwell 1997).

The Ramapo Mountains County Park contains a few ecosystems with particular value to the human community. These include wetlands and other Highlands open waters, riparian corridors and forests. The functions and values of these ecosystem categories will be discussed below.

5.1 Ecosystem Functions

5.1.1 Wetlands Functions

Wetlands ecosystems, with their abundance of water and ability to capture nutrients are highly productive in an ecological sense. The cycling of wet and dry periods provides a dynamism leading to a diversity of physical, chemical, and biological components and processes or functions. These functions include hydrologic flux and storage, biogeochemical cycling and storage, biological productivity, decomposition and wildlife structure and support (Turner and Gannon, 2009, USDA, NRCS 1996). These broad functions include a number of subfunctions.

Water storage in palustrine wetland

Through the process of hydrologic flux and storage precipitation and tributary surface waters are stored and gradually released to surface waters, groundwater and the atmosphere (USDA, NRCS 1996). Wetlands vary in their capacity to perform these functions, depending on elevation, permeability of soils, density of vegetation and landscape position. A degree of climate control is exerted through evapotranspiration. Approximately two-thirds of wetland

water inputs are released to the atmosphere. Temperature in the vicinity of wetlands is moderated (Turner and Gannon 2009).

Biogeochemical cycling and storage is very active in wetlands. Wetlands may be a sink for, or transform, nutrients, organic compounds, metals, and components of organic matter. Wetlands retain particles of soils washed into them and build up organic matter (USDA, NRCS 1996). Some wetlands store particles and other constituents permanently. Some only provide storage during the growing season and release them in surface waters and into the atmosphere, during other periods.

The fluctuating water levels characteristic of wetlands control the oxidation-reduction (redox) conditions that occur. These redox conditions governed by hydroperiod control nutrient cycling, availability, and export; pH; vegetation composition; sediment and organic matter accumulation; decomposition and export; and metal availability and export. Through the process of dinitrification by bacteria in wetlands, the majority of nitrogen inputs are released to the atmosphere. Wetlands can sequester carbon, since decomposition rates are slowed by anaerobic conditions. Storage of phosphorus and use by wetlands soil communities is another important process performed in wetlands.

Wetlands can also process and render harmless fecal coliform bacteria and protozoans, which enter wetlands through municipal sewage, urban stormwater, leaking septic tanks, and agricultural runoff. Bacteria attach to suspended solids that are trapped by wetland vegetation and die, deprived of their hosts. These organisms die after remaining outside their host organisms. They are broken down by sunlight, the low pH of wetlands, by protozoan consumption, and from toxins excreted from the roots of some wetland plants (Turner and Gannon 2009).

The function of biological productivity provided by wetlands applies to plant and animal species. Wetlands, in general are among the most productive ecosystems, due to water availability and the abundance of nutrients. While wetlands with significant seasonal pulsing like tidal saltmarshes are the most productive for wildlife and fisheries (Turner and Gannon 2009), the vernal pools of the Ramapo Mountains County Park are highly productive, in comparison to surrounding upland forests (Turner and Gannon 2009).

Decomposition is an important process within wetlands. Rates vary across wetland types with climate, vegetation types, available carbon and nitrogen, and pH. The positive aspect of decomposition is that it breaks down organic matter, forming the detritus important as the base of aquatic and terrestrial food chains. Accelerated decomposition releases carbon dioxide to the atmosphere, offsetting the carbon storage function of wetlands. Decomposition requires oxygen and can reduce dissolved oxygen in surface waters (Turner and Gannon 2009).

The community structure and wildlife support function of wetlands vary in accordance with the size, shape and hydrology of wetlands. The shape of the wetland varies the perimeter to area ratio, which is significant to interior and edge species. Shape is also important for the possibility of movement of animals within the habitat and between habitats. Wetland size is particularly important for larger and wide ranging animals that utilize wetlands for food and refuge, such as black bear or moose, since in many locations wetlands may be the only undeveloped and undisturbed areas remaining. The hydrology of the wetlands controls the types of vegetation communities (emergent, scrub/shrub or forest), which can develop. The structure of these vegetation communities affects the types of species, which can survive and thrive (Turner and Gannon 2009).

The translation of these wetlands functions into socio-economic values for the human community is discussed later in this document.

5.1.2 Riparian Corridor Functions

Riparian buffers are important regulatory tools that help protect an ecologically critical or valuable resource feature (Leavitt 1998). Surface water features, from rivers and streams to freshwater wetlands and vernal pools, have protective buffers that can range from 50 feet to 1,000 feet, depending on the location of the feature and the regulatory branch that oversees it. Most rules and regulations that utilize buffers as a protective element control how much, if any, disturbance can occur within these determined areas. Safeguarding these areas adjacent to actual critical resources provides more than just protection from development and disturbance. Riparian buffers and the vegetation present within the buffer areas, provide multiple functions, including temperature control of the water feature, sediment, nutrient and pollution filtration and water storage (Leavitt 1998, Triangle J Council of Governments 1999). In addition to the protecting the actual surface water resource, buffers also protect vegetative and wildlife species that utilize the habitat adjacent to these resources, as well as provide foraging, breeding and nesting habitat for wildlife species, particularly those that depend upon water sources.

Disturbances to riparian buffers disrupt the overall function and value of the corridor ecosystem. When ecological systems present within the buffer corridor are stressed, the functions provided are also stressed, thus causing a ripple effect throughout the system. For example, the removal of vegetation subsequently allows excess of nutrients and pollutants to enter the waterway, resulting in decreased water quality (NCSU BAE ND). The subsequent decreased water quality impacts the aquatic biota utilizing the waterway, as well as those species that depend on the aquatic biota as a food source. The removal of vegetation also increases sedimentation, due to the lack of natural means of erosion control, which also impacts the waterway and dependent biota (NCSU BAE ND). Decreases in the amount of shade provided by vegetation also increase the water temperature of the waterway, also disrupting the ecology of the corridor (NCSU BAE ND).

5.1.3 Forest Functions

The Highlands Water Protection and Planning Council (2008b) have determined that the forests of the Highlands Region provide essential ecosystem functions. These functions include:

- Surface water filtration
- Stabilization of soils
- Air filtration
- Provide wildlife and plant species habitat

These functions provide an enhanced environment for most plant and animal species. Surface water filtration provides cleaner surface waters, beneficial to both human and ecological endpoints. Stabilization of soils prevents damage to wetlands and surface water communities and enhances water quality and clarity. Air filtration services include the removal of some contaminants from the air and sequestration of carbon. The provision of high quality forest habitat for wildlife and plant species enhances biodiversity and stabilizes forest interior species population, which are threatened or endangered (Highlands Water Protection and Planning Council 2008b).

5.2 Socio-economic Values

5.2.1 Wetlands Value

As mentioned, the major wetlands functions include hydrologic flux and storage, biogeochemical cycling and storage, biological productivity, decomposition and wildlife structure and support (Turner and Gannon, 2009, USDA, NRCS 1996). These overarching functions and some of their subfunctions are valued by human society.

Values of wetlands as a result of the functions of hydrologic flux and storage include water quality, water supply, flood control, erosion control, wildlife support, recreation, culture, and commercial benefits (Turner and Gannon 2009). The trapping of sediment slows erosion and prevents sedimentation in downstream waterbodies enhancing water quality for drinking water

and aquatic life support. The attendant improvement in water clarity is valued aesthetically. The storage of precipitation and surface runoff in wetlands allows for a more modulated release into surface waters, which reduces flooding potential and for some wetlands, allows groundwater water recharge for drinking water aquifers.

Biogeochemical cycling and storage allow wetlands to be both a nutrient source and a nutrient sink and a sediment and organic matter sink. Carbon storage in both live and dead plant materials is beneficial for humans, since the sequestration of carbon lessens global warming. The processing of nutrients, like nitrogen and phosphorus by microorganisms in wetlands improve water quality downstream. Human health is protected by the processing of harmful bacteria, like fecal coliform, and dangerous protozoans. The mineralization and release of nitrogen, sulfur, carbon and phosphorus can provide commercial products (Turner and Gannon 2009).

Biological productivity provides aesthetic, recreational and educational opportunities. Food chain support is provided for valued animal species. This includes rare species appreciated by recreational naturalists and fisheries and game species appreciated by hunters and fishers. Wetlands plants, such as Atlantic White Cedar, are economically valuable. Other plants are appreciated for their rarity and beauty by amateur naturalists and photographers.
Decomposition provides materials for the base level of aquatic and terrestrial food webs. Ultimately species valuable for game, fisheries and wildlife appreciation and study are supported.

The structure and support wetlands offer for wildlife allows species valued by humans for game, fisheries, birdwatching, scientific and educational purposes to survive. Since wetlands are generally protected in the State of New Jersey, particularly in the Highlands Region, wetlands provide an important refuge area. Characteristics, such as the seasonal hydrology of vernal pools, provide an important habitat for amphibian and other species. Structural

variations between emergent, scrub/shrub and forested wetlands provide for varying or specialized habitat requirements of some wildlife species.

Structural variation in a palustrine wetland

As can be seen, wetlands can be valued for a variety of services. An understanding of wetlands functions and the values a particular community attribute to them is critical to ecosystem managers.

5.2.2 Forest Value

Surface water filtration services provided by forests protects drinking water resources (Highlands Water Protection and Planning Council 2008b), provides clean water for fisheries, and other recreational uses of surface waters. Forests remove sediments and capture pollutants before they can reach water bodies. One study found that every 10 percent increase in forest cover in a watershed reduces the cost of treating drinking water by about 20 percent (up to a maximum of 60 percent forest cover) (Forests for Maine's Future 2007).

Undisturbed forest enhances soil stability and minimizes erosion potential. Accelerated erosion is evidence of increased ecosystem disturbance (USFS 1996). The prevention of erosion also prevents sedimentation in water bodies, which reduces clarity and can be harmful to fisheries directly or by smothering macroinvertebrate communities, the fish depend on. This forest function improves the recreational value of surface waters.

The air filtration function of forests helps to alleviate the effects of global warming through carbon sequestration (Highlands Water Protection and Planning Council 2008b). Air quality can also be improved by forests. Leaves and needles have surface area that can allow for removal of

ozone, nitrogen dioxide, and to a lesser extent particulate matter from air (CEPA Air Resources Board 1997). These functions provide benefits to human health, by reducing climate change impacts and diminishing lung problems associated with poor air quality.

Interior or core forest and large tracts of forested land provide important ecological values. As a counterpoint to fragmented forests, large contiguous tracts of forest reduce the occurrence of disturbed forest edges and forest patches, which are diminished in value for many sensitive plant and animal populations, allow the more rapid spread of invasive species and predation by disturbance-adapted species. The preservation of biodiversity afforded by the preservation of forests is intrinsically interesting to humans and provides educational and scientific value. Rare bird and plant enthusiasts will appreciate recreational opportunities to view rare species. Large tracts of contiguous forest may provide economically valuable, yet sustainable forestry options for the future.

6.0 NATURAL RESOURCE CONSTRAINTS AND OPPORTUNITIES

The natural resource inventory presented herein provides detailed information covering a broad array of natural resources. This information has been applied in an assessment of potential constraints and opportunities for use of the resources as part of the public access and recreational benefits of this public open space. The inventory and assessment will be used to provide guidance during preparation of the Ramapo Mountains County Park Management Plan (RMCPMP), which is required to be a nature-based plan that respects the important and sensitive natural resources of the public trust open spaces.

After considering various approaches that could be used to provide the assessment of resources and after review of alternatives, the assessment of constraints and opportunities was based on a subwatershed approach. This approach anchors the assessment in a natural landscape framework, as well as a regulatory framework, resulting in the consideration of the Reservation as four individual assessment or management areas. These are proposed as the "management zones" for which "management prescriptions" will be identified subsequently in the RMCPMP.

The four subwatersheds have been mapped (Maps 7 and 14 – 22) and described herein as part of the Environmental Setting (3.4 Hydrology). In this section of the report, provide a brief overview of the individual subwatersheds followed by a list of potential constraints and opportunities based upon field observations and information contained in the inventory. ***Potential constraints*** are defined for the purposes of this assessment as environmental features (e.g., wetlands and steep slopes) or other features (access) that could impact the placement and use of recreational development such as trails, signs, buildings, parking lots and other manmade structures. ***Opportunities*** are defined as environmental features (e.g., vernal pools and flat topography) and other features (roads, existing structures) that provide one or

more favorable circumstances to achieve goals of the County open space including goals for recreation and/or education. To facilitate communication regarding the subwatersheds, vernacular names have been applied to them based upon one of the prominent drainages in the subwatershed that drains to the Ramapo River. Each subwatershed management area is illustrated with two maps: (1) a USGS topographic map and related features; and (2) a map of representative environmentally sensitive overlays based on information and maps presented previously in this report.

6.1 "Stag Brook" Subwatershed, Maps 15 & 16

The Ramapo River (above 74d 11m 00s) subwatershed, herein referred to as Stag Brook subwatershed, is located in the northernmost region of the Ramapo Mountains County Park Management Plan project area. This subwatershed encompasses a total of 6,504.18 acres. Approximately 869.85 acres of the project area are included within this subwatershed. The primary waterway present within the subwatershed is Stag Brook and the tributaries to this stream, which ultimately flow to the Ramapo River.

6.1.1 Potential Constraints

- Remote portions with limited access.
- Lack of maintained trail network.
- Lack of parking at trail heads.
- Two essentially non-contiguous portions of the management area.
- Significant topographic relief.
- Riparian corridor in the lower subwatershed; stream crossings.
- Wetlands and buffers in the upper subwatershed.
- Vernal pools and buffers.
- Threatened, endangered, and rare animals and critical habitat.
- Residential community north of and adjacent to the county open spaces.
- Utility corridors and rights-of-way.

- Views interrupted by utility easements.

6.1.2 Opportunities

- Bald Mountain, highest elevation (1,164 ft) in the Reservation.
- Wetlands and vernal pools for interpretive program.
- Coordination of resource management with adjacent community.
- Additional area for new trail network.
- Views: Stag Hill Road – Stag Brook corridor/gorge.

6.2 "MacMillan Brook" Subwatershed, Maps 17 & 18

The Ramapo River (above Fyke Brook to 74d 11m 00s) subwatershed, herein referred to as MacMillan Brook subwatershed, includes the largest number of major rivers and ponds in the project area. Approximately 1,428.99 acres of the Ramapo Mountains County Park Management Plan project site are included in the 10,809.65 total acres of the subwatershed.

Two different water systems are located within the subwatershed: MacMillan Brook and Havemeyer Brook, both of which drain to the Ramapo River. The headwaters of the two waterways begin within the boundary of the Ramapo Mountains County Park Management Plan project area. MacMillan Brook flows entirely within the grounds of the park, while Havemeyer Brook connects to the Ramapo River just outside of the park's boundary. Both waters have reservoirs, or artificial ponds created with dams for water storage, named after the streams that flow feeds them. Scarlet Oak Pond, located within the eastern portion of the subwatershed, drains directly to the Ramapo River.

6.2.1 Potential Constraints

- Two drainage systems within one management area.
- Steep slopes and rock outcrops.
- Utility corridor and right-of-way.

- Riparian corridors, buffers, and stream crossings.
- Wetlands and buffers.
- Vernal pools and buffers.
- Threatened, endangered, and rare animals and critical habitat.
- NJDEP Ramapo Valley Natural Heritage Priority Site (endangered and rare plants and habitat).
- Flooding along Ramapo River.

6.2.2 Opportunities

- Public parking and restrooms.
- Maintained trails.
- Views of pond, reservoir, and river.
- Trail access to Scarlet Oak Pond and MacMillan Reservoir for education.
- Trail access to the Ramapo River.
- Trail access to wetlands and riparian corridors.
- Educational field trips along Havemeyer Hollow.
- Top rope/bouldering, rock climbing (Green Trail).
- Broad ridge-top views east to Newark Basin and to Manhattan.
- Views – Hawk Rock; Green Trail to Lake Henry & Ramapo College Campus.
- Orange trail – Waterfall, MacMillan Brook, MacMillan reservoir.
- Blue trail – Ramapo River Valley.
- View of mature Forested Wetland on floodplain of Ramapo River

6.3 "Bear Swamp Brook" Subwatershed, Maps 19 & 20

The Ramapo River (Bear Swamp Brook through Fyke Brook) subwatershed, herein referred to as Bear Swamp Brook subwatershed, is approximately 13,827.74 acres in size. The park is located within 1,105.59 acres of the subwatershed. Only one main waterway, Bear Swamp Brook, and its associated tributaries, flows through the subwatershed. Bear Swamp Brook briefly flows

through a small portion of the Ramapo Mountains County Park Management Plan area before flowing through Bear Swamp Lake located outside the Park's boundaries and reentering the project area. Multiple sources outside the Park contribute to the waterway, including Cannonball Lake. Bear Swamp Brook ultimately drains to the Ramapo River, located just outside the project area's limits.

6.3.1 Potential Constraints

- Two non-contiguous portions of the management area separated by state land.
- No parking access.
- Steep slopes and rock outcrops.
- Utility corridor and right-of-way.
- Riparian corridors, buffer, and stream crossing.
- Wetlands and buffers.
- Vernal pools and buffers.
- Threatened, endangered, and rare animals and critical habitat.

6.3.2 Opportunities

- Existing trails.
- Trail access to wetlands, riparian corridors, and vernal pools for education.
- Trail access to and view of large glacial erratic.
- Areas for creating parking off Bear Swamp Road.
- New trail heads.
- Top rope/bouldering, rock climbing (Trails: Orange, Yellow, Yellow/Silver).

6.4 "Fox Brook" Subwatershed, Maps 21 & 22

The Ramapo River (Crystal Lake Brook to Bear Swamp Brook) subwatershed, herein referred to as Fox Brook subwatershed, is located in the southernmost region of the project area. The overall subwatershed includes 17,868.95 acres; however, only 1,179.50 acres are included

within the project site. A portion of the subwatershed, as well as the project area, is also located in Passaic County.

Fox Brook is located in the northern portion of the subwatershed and is located within Mahwah Township. The waterway flows in a west to east direction through the project area, and drains to the Ramapo River, located outside of the project area. Lake Vreeland, an artificial lake, is located along the waterway.

Located within the same watershed as Fox Brook and Lake Vreeland, but located within Oakland instead of Mahwah, is Lake Tamarack and Todd Lake. These two artificial lakes are located along tributaries of the Ramapo River.

6.4.1 Potential Constraints

- Several subareas barely contiguous and surrounded by state and private lands.
- Cleanup of abandoned scout campgrounds at Tamarack Recreation Area and Todd Recreation Area.
- Vehicular access to Tamarack and Todd camp areas only from west through easement on state land.
- Common Reed (*Phragmites australis*) invasion at Lake Tamarack.
- Shallow water and dense pond vegetation at Todd Lake.
- Portions of two drainages in same management area.
- Riparian corridors, buffers, and stream crossings.
- Wetlands and buffers.
- Vernal pools and buffers.
- Threatened, endangered, and rare animals and critical habitat.

6.4.2 Opportunities

- Three open water ponds (Lake Tamarack, Todd Lake, Lake Vreeland).
- Functional campground at Glen Gray and Lake Vreeland.

- Vehicular access.
- Underutilized, abandoned scout campgrounds at Tamarack Recreation Area and Todd Recreation Area.
- Trail access to wetlands, riparian corridors, and vernal pools for education.
- Areas for new trail network.
- Areas for creating parking for western portion of the Reservation.
- More intensive recreation in areas impacted by former uses including camping, boating.
- Expansion of winter camping and group camping at Glen Gray.
- Views: Yellow and White Trails – Manhattan/Verrazano Bridge; Green Trail – Bear Swamp Lake; green Trail – Lake Vreeland; Yellow Trail – Ramapo Mountains County Park.

7.0 CONCLUSIONS AND RECOMMENDATIONS

With completion of the natural resource inventory and assessment, a number of conclusions can be reached regarding the approach and usefulness of the results. Because this document was prepared to provide information to guide the development of an open space management plan, recommendations are provided regarding how this document can be helpful.

7.1 Conclusions Regarding Resource Inventory and Assessment

The following preliminary conclusions are presented for the process and product of the resource inventory and assessment:

- The combination of inventory and display using GIS technology provides an opportunity to present the resources in a clear and useful manner.
- Because the resources are displayed to the same scale and linked for overlay purposes, correlations between and among resources can be identified, which may be helpful regarding development of education programs and management protocols.
- The natural resources of the Ramapo Mountains County Park are rich, relatively intact in spite of long-term and extensive use, and representative of the New Jersey Highlands.

- Selection of the subwatershed approach to resource assessment allows for the creation of management zones based on subwatersheds to be the basis of the Open Space Management Plan.
- The Ramapo Mountains County Park provides an excellent opportunity for the creation of a regionally and nationally significant conservation area that has valuable passive recreation and educational opportunities and is an immense public asset.

7.2 Recommendations Regarding the Resource Inventory and Assessment

The following recommendations are provided as a result of preparing the Inventory and Assessment:

- Additional studies should be conducted using the GIS resource maps to identify correlations among the layers of physical and biological attributes to identify patterns that could be useful for educational and management purposes. For example, there is strong connection among bedrock and structural geology and some aspects of surface water hydrology and habitat.
- Conduct an additional field day in each subwatershed area to note additional resources and management constraints and opportunities.

7.3 Relationship to the Ramapo Open Space Management Plan

The four subwatershed study areas, identified as a result of the resource inventory and assessment, are proposed herein for use as the management "zones" for preparation of the RMCPMP. These zones, based on natural landscape features and regulatory surface water boundaries, are a logical and "nature-based" approach to preparation of the RMCPMP. As part of this Plan, the existing trails system (Map 23) within each management zone, for example, could be assessed for trail coverage, linkage, proximity to sensitive resources, and other attributes.

7.4 Approach to Proposed Watershed-specific Management Prescriptions

Management "prescriptions" for each of the management zones can be developed from a combination of the results of the resource inventory and assessment, additional observations from each subwatershed area, and linkage to the goals for each area identified as part of the planning process. Example prescriptions for a particular management zone may include, for example:

- Eradicate "Common Reed", an invasive exotic plant species associated with Lake Tamarack.
- Control or eradicate "Siltgrass", an invasive exotic grass that invades natural habitat areas along trails.
- Prepare an invasive exotic plant inventory and Reservation-wide control plan.
- Placement of new trails should avoid sensitive vernal pool habitats.
- Existing trail adjacent to sensitive vernal pool habitat should be relocated to avoid impacts but also provide interpretive and educational opportunities regarding importance of vernal pools.
- Placement of new trails should avoid known sites of cultural importance.

7.5 Approach to Proposed Watershed-specific Programmatic Management Plans

Each of the four subwatershed management zones should have a zone-specific programmatic management plan, including identified programs (e.g., administrative, resource management, access, recreation, and education programs) with listed goals, policies, actions, schedules, and estimated costs. This could be accomplished with separate plans for each management zone or with a single, Reservation-wide plan containing portions with common programs and related goals and portions with individual management zone programs and related goals.

7.6 Suggestions for Future Projects

A number of new or rejuvenated projects or opportunities have been generated or expanded by this Inventory and Assessment - a selection of these include the following:

- Use of the Inventory and GIS overlays to identify landscape patterns for educational and management purposes.
- Watershed/water quality assessment.
- Ecological monitoring opportunities in conjunction with Ramapo College and Rutgers University.
- Field investigations of rare, threatened, and endangered plants and animals identified for the Reservation or known to be in proximity to the Reservation.
- Field investigations of cultural resources.
- New trail layout, coordinating opportunities with the NY/NJ Trail Conference.
- Impact analysis of potential recreational uses (i.e. RV use of Tamarack area).
- Invasive species assessment via the management plan.
- Assessing potential land swaps to effectuate continuity of County property.

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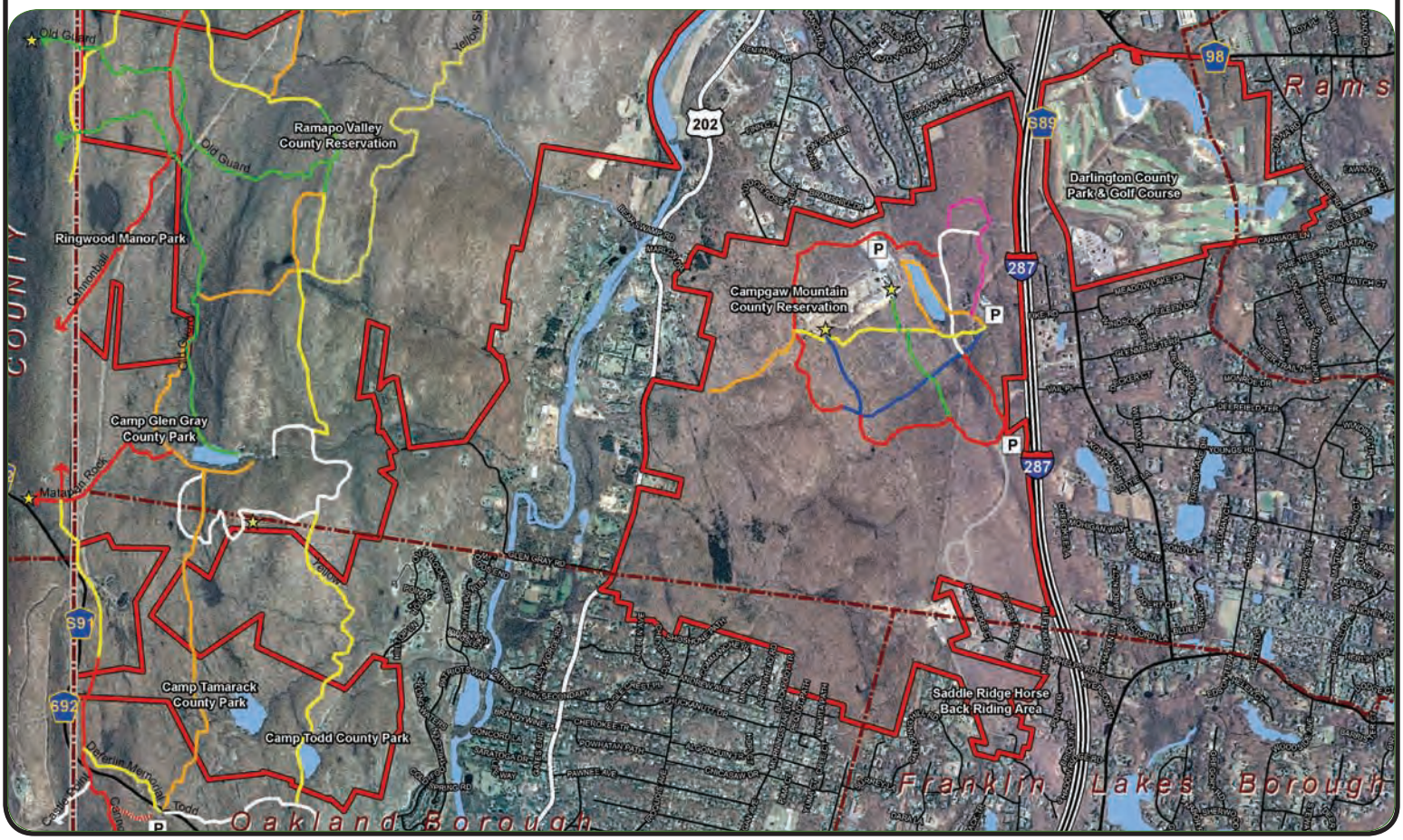
Ramapo Mountains County Park

Visioning Workshop Findings Report

October 19, 2010



Acknowledgments

The effort to develop a Park Management Plan for county-owned land in the Ramapo Mountains grew out of Bergen County's desire to ensure that visitors have enjoyable experiences while maintaining the scenic, natural, cultural and recreational qualities of these important lands.

Key to the success of any management plan is the valuable input of park users and neighbors. Thus, Bergen County has taken a proactive approach in gathering public input, developing a project website to communicate and receive input and along with Maser Consulting and Regional Plan Association, carried out a visioning workshop to solicit public input on the issues that will be covered by the management plan.

Attended by around 100 residents and stakeholders, the workshop provided the shapers of the plan the opportunity to directly interact with park users, neighbors and advocates. The workshop was held from 7-9 pm on October 19, 2010 at the Township of Mahwah Administration Building, Senior Activity Center.

Thanks to all of the facilitators and participants who worked together to envision the future for the Ramapo Mountains County Park.

Facilitators

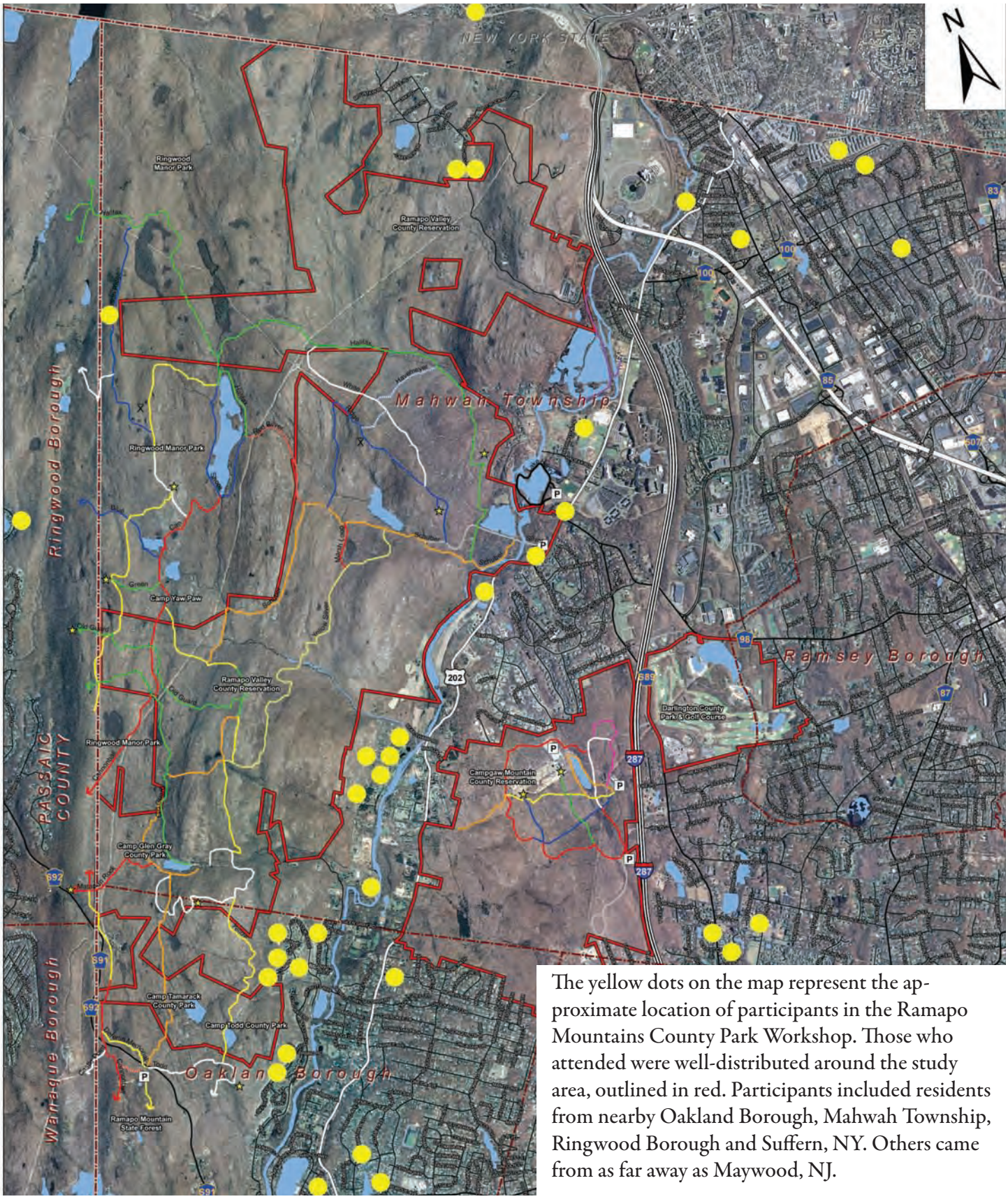
Robert Abbatomarco, Bergen County
Richard Barone, RPA
Brigette Bogart, Burgis Associates
Wayne Ferrin, Maser Consulting
Rob Freudenberg, RPA
Howard Horowitz, Ramapo College of New Jersey
Donna Orbach, Bergen County
Rob Pirani, RPA
Dave Roberts, Maser Consulting

Technical Resources

Farouk Ahmad, Bergen County
Todd Cochran, Bergen County
Adam Strobel, Bergen County
Eileen Swan, NJ Highlands Council

Findings Report prepared by Regional Plan Association

Participants



The yellow dots on the map represent the approximate location of participants in the Ramapo Mountains County Park Workshop. Those who attended were well-distributed around the study area, outlined in red. Participants included residents from nearby Oakland Borough, Mahwah Township, Ringwood Borough and Suffern, NY. Others came from as far away as Maywood, NJ.

Introduction - FAQs

What is the Ramapo Mountains County Park Management Plan?

The park management plan is an active and ongoing process for making choices about how to effectively plan and manage the Bergen County section of the Ramapo Mountains for the next 15 to 20 years.

What is the Bergen County Ramapo Mountains County Park?

The Bergen County Ramapo Mountains County Park total approximately 4,500 acres of parkland. They are a portion of a larger preservation area of contiguous parkland owned and managed by the State of New Jersey, the counties of Passaic, Orange and Rockland, New York, as well as the Borough of Oakland and the Township of Mahwah. The Bergen County Ramapo Mountains County Park encompasses the following park areas: Ramapo Valley County Reservation; Camp Glen Gray; Camp Tamarack; and Camp Todd.

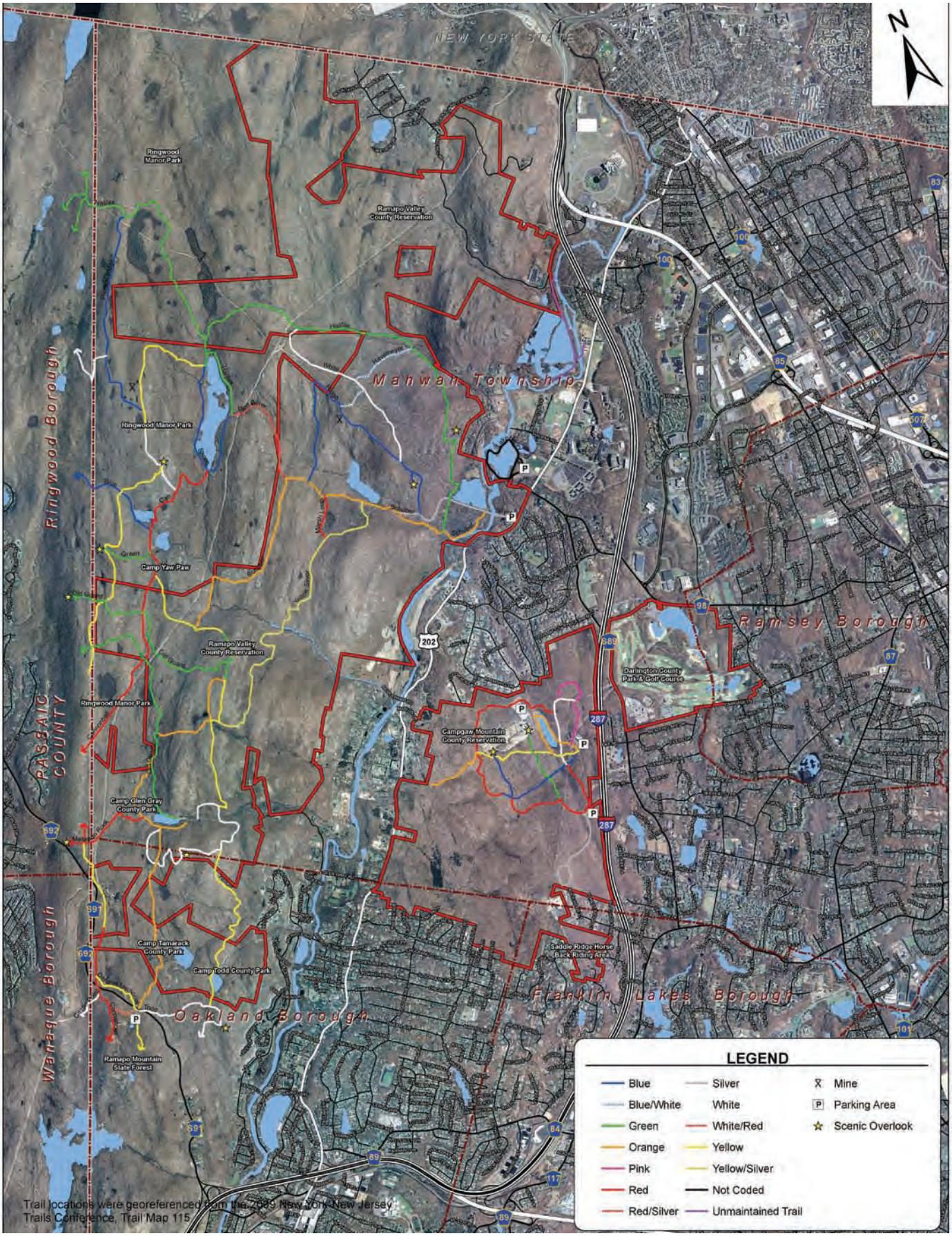
Why is the County of Bergen doing a park management plan now?

After years of acquiring forested lands, the County is now focusing on helping ensure that the park's scenic, natural, cultural and recreational qualities are protected and preserved while providing appropriate visitor experiences. The plan will allow the County to examine the Park's long-range goals and management issues, and chart a course for its future.

What is the Ramapo Mountains County Park Management Planning process?

The planning process is a one and a half year long effort that involves collecting existing park and population data, touring and evaluating the conditions of the nature park areas and facilities, and connecting with the public to gather community interests and needs. Input from park users will help the park planners develop the plan. These findings represent a summary of the public input gathered at the October 19, 2010 Visioning Workshop.

Study Area


NEW YORK STATE
Ringwood Manor Park
Ramapo Valley County Reservation
Mahwah Township
Ringwood Borough
Ringwood Manor Park
Camp Yaw Paw
Ramapo Valley County Reservation
Ringwood Manor Park
PASSAIC COUNTY
Camp Glen Gray County Park
Wanaque Borough
Camp Tamarack County Park
Camp Todd County Park
Oakland Borough
Ramapo Mountain State Forest
Campgaw Mountain County Reservation
Darlington County Park & Golf Course
Ramsey Borough
Saddle Ridge Horse Back Riding Area
Franklin Lakes Borough
LEGEND
Blue
Blue/White
Green
Orange
Pink
Red
Red/Silver
Silver
White
White/Red
Yellow
Yellow/Silver
Not Coded
Unmaintained Trail
Mine
Parking Area
Scenic Overlook
Trail locations were georeferenced from the 2009 New York-New Jersey Trails Conference, Trail Map 115

Issues & Findings

Foundation Statement of the Park

The Foundation Statement is a formal description of the Ramapo Mountains County Park core mission. It provides a shared understanding of what is most important about the park. Participants were asked -both at the wokrshop and online - to provide feedback on the statement below.

Purpose Statement

The purpose of the Bergen County Ramapo Mountains County Park is to protect and maintain the wilderness experience, interpret and learn from this dynamic natural resource, and facilitate the sensible and sustainable human use of the Ramapo Mountains and the surrounding landscape.

Significance Statement

- The Ramapo Mountains County Park offers exceptional opportunities for nature based recreation and enjoyment; cultural and historical related activities.
- The Ramapo Mountains County Park lies at the northeast limits of the New York – New Jersey Highlands and is a component of the Appalachian Mountain chain, contributing to significant biological diversity including habitat for a unique assemblage of plants and animals unparalleled in the region.
- The Ramapo Mountains County Park contains the most rugged and dramatically beautiful mountain scenery in all of Bergen County.

Does the purpose statement reflect your sense of why the park was created and its role in the Bergen County park system? If not, tell us why.

- Eliminate the final sentence of the Significance Statement.
- Hard to comment without fully understanding the words: "wilderness experience;" "sustainable use" what does it mean?
- Statement should emphasize uniqueness of the place
- The statement should reflect the needs and concerns of Bergen County: Health and the human experience; Partnership to Highlands; History
- Yes, I view the Park as a wild (as much as can be in this area) section set aside to enable us to get close to the natural environment that is still left
- Suggest discussion of habitat improvement since there are a lot of invasive species
- Nothing about the cultural significance in the purpose
- Need to define "cultural" – be sure to mention/specify the current native population
- Passive and/or active recreation should be addressed
- Should mention conservation and respect
- What is "nature-based?" Should be better defined
- Preservation of nature should be addressed
- Add something about stewardship and education
- Does not identify a vision or goal
- Is overly general
- What is meant by sustainable?
- The word wilderness could scare away more than attract
- Final line "rugged" sounds like it is inaccessible
- Yes, especially sustainable use
- Not really. I believe we need to preserve and protect the current habitat and do whatever it takes to promote native species of animals and plants (except in cases where they have run amok – ie deer who are destructive to habitat because of excessive numbers)
- Purpose should be to maintain the land as is for passive use only (hiking, photography, nature watching)
- Prohibit commercialization, motorized vehicles and any other activity other than pedestrian activity allowed today
- The only thing that should be added is more park oversight and supervision to enforce the rules and limit hunters to areas far residential communities
- Except for the statement "facilitate the sensible and sustainable human use"

Do the significance statements capture your sense of why the park is important? If not, tell us why you think the park is important.

- Many "yeses"
- The park is unique in Bergen County and New Jersey. It is vital that we have this natural resource preserved for passive recreation specially birding and nature observation
- Activities should be limited to pedestrian activity and maintenance of existing trails
- No pavement, no parking lots; no problem with current parking
- Leave the land virtually unchanged; preserve and protect the land as is
- Used to be a lot of places like this; the opportunity is unique. We should keep it this way

Foundation Statement of the Park (cont'd)

The Foundation Statement is a formal description of the Ramapo Mountains County Park core mission. It provides a shared understanding of what is most important about the park. Participants were asked -both at the wokrshop and online - to provide feedback on the statement below.

What park management issues are you most concerned about?

- There's already a lot of trails; should maintain what's there, why add to it?
- Everyone should use it, but it should be passive, have to work to get to the areas
- Keep garbage locked
- Plants and animals are unique: 200 bird species in the area
- It is a misconception that mountain bikes degrade resources more than other non-motorized uses (ie hiking). If properly managed, bikes can co-exist with hikers
- Lot's of wildlife has come back now, further development might scare them away again
- Inclusion of multi-use (specifically mountain bike riding) in Bergen County parks
- Address infrastructure (parking, access points, etc) which is limited and unmonitored
- Ensure no sports fields
- Enforcement of Park Rules
- Have to deal with access – supply them, maintain them, have the resources for them, determine responsibility, maintainability
- Need for education
- Let people know what wilderness is in the area and how to react
- appropriately
- Define access – some locations have traditionally been abused so how to deal with it? Overuse denigrates the area Would like to see access for mountain bikes in some areas
- Would like to add cycling as a permitted use within the Bergen County trail system
- Resource protection/improvement/restoration should be a focus
- The possibility of allowing ATVs, dirtbikes, etc. into the parks
- I am concerned that the property will be left as is and not considered for additional uses as appropriate
- Need to avoid overuse of certain areas in order to preserve the sense of wilderness; keeping the land natural and preserved
- Managing the wear/tear and deterioration of more people accessing the land; Maintenance leads to respect of property (well-maintained parks are more respected)
- Misuse of park facilities
- Non-native vegetation
- You must protect the safety of the neighborhoods that border the park. Lake Todd and Tamarack offer access to the Ramapo River Reservation neighborhood in Oakland that has already experienced numerous break-ins in the past year alone. Allowing more access to these lakes allows more access to our neighborhood.
- The humans that bring their dogs to the park, leaving bags of feces hanging off tree limbs, along sides of trails, or not picking up dog feces at all, or running their dogs off leashes (allowing their "friendly" dog to jump on unsuspecting hikers muddying their clothes) have ruined the park for carefree enjoyment by hikers and picnickers. BAN ALL DOGS! The audacity of these dog owners to expect park employees to clean up these messes. We live near the park and don't hike there anymore as it is so disgusting. GIVE THE PARK BACK TO THE RESIDENTS TO ENJOY without dog issues. We have dogs in our family but do not allow them to ruin the outdoor experience for others.
- Access points must be supervised
- Need to assess what activities are going on and determine which are positives and which are negatives
- May require additional staff
- Some things need immediate consideration, such as burial site
- Possible overflow parking at Ramapo College on weekends when there are no classes
- I am concerned about continued community participation in the management of the park; can a Steering or Oversight Committee be established?
- It's hard to get people to listen to issues and add in more plans
- Preservation of cultural and historical aspects of the parks
- Increased/linked tourism between Bergen County and the Village of Suffern, NY
- Providing awimming/lifeguarding services at lakes
- More Green Acres land preservation is needed
- Deer hunting should be managed; population is high
- This type of vision and type of assemblage by the County could serve as a model for other types of park systems through-out the highlands region and through-out the tri-state area

Issues & Findings

User Activities: Current

As Bergen County prepares the park management plan, it is vital to understand how the park lands in the study area are currently being used. Knowing how people use the park will enable the county to effectively manage it and ensure continued use into the future. To gain insight into this subject, workshop participants were asked to describe their favorite activities to do in the area. Their responses are listed below.

What are your favorite activities to do in this area?

- Birding (3 tables)
- Botonizing
- Camping (2 tables)
- Community Service
- Discovering
- Dog Walking (2 tables)
- Enjoying nature
- Environmental and Cultural Education
- Experiencing biological "purity"
- Experiencing historical/cultural resources
- Exploring
- Fishing (2 tables)
- Geocaching
- Hiking (7 tables)
- Horseback riding in the vicinity
- Kayaking/Canoeing
- Living in it (Ramapoughs)
- Low impact, sustainable activities
- Mountain biking nearby (4 tables)
- Nature/wilderness appreciation
- Non-motorized activities
- Passive use
- Peace and quiet
- Scenic photography
- School field trips
- Snow shoeing
- Trail running
- Tree identification
- Walking (leisure) (4 tables)
- Wildflower observation
- Wildlife observation

User Activities: Desired

While the county parkland in the study area is used for a variety of activities, the park management plan seeks to address managing those activites that are desired, but not currently allowed. To determine what these uses are, workshop participants were asked what activities they would like to do, but currently could not. Their responses are listed below.

What activities would you like to do, that you can't currently do in this area and why?

- Mountain biking/biking (5 tables)
  - Conflicts with other uses can be avoided by placement of trails far from hiking areas
  - Trails that cover greater distances than hiking trails
- Cross-country skiing (2 tables)
- Canoeing/kayaking access and water trails (4 tables)
- Camping (4 tables)
  - Multiple sections with a pass that can go from park to park
  - Camping permits are currently limited to 2 weeks in length
- Swimming (monitored by lifeguards)
- Directly access park from Ramapo College
- Environmental education incorporated into the uses of the Ramapo park system
  - Cultural/interpretive learning center to educate on use of the land
- Guided tours/organized hikes
- Trail from Darlington Schoolhouse to Reservation
- Dog Park (by Scarlet Oak Pond)
- Benches/picnic tables
- Boy Scout projects throughout the park
- Create shelters
- Horseback riding by Campgaw
- Dog walking in Darlington Park in winter
- Proper trail design is needed to avoid erosion
- Better road access
- Would like more fire towers
- Hawk watches/bird counts
- Use of the trails extended to multi-use

Issues & Findings

User Activities: Impediments

In order to both manage existing uses and consider the potential for new uses in the study area of the Bergen County parklands, it is important to understand what impediments limit use of the land. Workshop participants were asked to name any impediments to using the park. Their responses are listed below.

What are the greatest impediments to using the Park?

- Access to park/Parking (8 tables)
- Boundaries between state and county
- Communications, website ineffective
- Dogs/waste (2 tables)
- Eroding/degrading/poorly marked trails (3 tables)
- Limited opportunities to provide feedback
- Lack of boat launches (2 tables)
- Lack of funding for an interpretive center, etc.
- Lack of maintenance of the park
- Lack of respect from visitors to other users (2 tables)
- Lack of seasonal uses
- Limited space
- Need for more park managers/rangers (2 tables)
- There are no bike lanes on access roads
- No sidewalk between Ramapo College and Reservation
- Not enough room/no clear boundaries for hunters/can make other users feel unsafe and avoid the park (3 tables)
- Trail width too narrow
- Trails not separated by use
- Lack of connection between New York and New Jersey
- Would like to see linkage from Mahwah down to old Pleasureland in Oakland at corner of Route 202 and Long Hill
- Need better mass transit to get to the parks
- Additional signage needed
- A visitor booth with possible satellite kiosks is needed for maps/overview

Issues & Findings

Map Questions

Workshop participants were asked to work on a series of questions using basemaps as reference. In particular, they were asked to identify ecologiclaly sensitive areas and historical/cultural areas that they would like to see preserved. Additionally, they were asked to specifically determne what uses they would like to see throughout the study area - particualrly focusing on the Todd and Tamarack areas. Finally, they were asked to identify additional access points. Their responses are summarized below and on the maps that follow.

On the map, identify areas that you know are ecologically sensitive and that you would prefer to see preserved with little to no activities.

- River valley is ecologically sensitive for bird populations
- Water quality is concern near Camp Todd
- Northern end of park has wood turtles
- Rocks in Camp Todd have timber rattlesnakes
- Well-marked on maps already
- Preserve all ecologically sensitive areas
- Clearly define existing trails
- Prevent deviation from the trail
- Deer exclusion fencing
- Invasive species control (manual removal, no chemicals)
- Everything/entire park
- Should create zoning/designate areas for specific activities:
    - Hiking only
    - Multi-use
    - Horse trails (Campgaw)
- Watershed areas
- Ecologically sensitive management techniques
    - Keep natural, but manage use
    - No chemical pesticides
    - Appropriate cutting of vegetation, impact on water

On the map, identify areas that are historical in nature and that you would like to see preserved and/or interpreted.

- Preserve historical areas, but have identification noting its historical nature
- Protect stone walls/structures
- Old Town of Halifax
- Old foundations on Halifax Trail
- German House
- Root cellar (Halifax Trail)
- Lean-to
- Sanders' Farm House
- 19th century farms
    - Havemeyer by Lake Henry
- Millstone Trail
- Glen Gray Scout Camp
- Repair stone structure by Ramapo Lake

Earlier, you were introduced to two former Scout Camps, Todd and Tamarack. How would you like to see these areas used?

- Restore area/ return to nature/replant trees
- Designate as "no impact" areas
- Keep them isolated
    - Wilderness experience with some access
- Get rid of old, deteriorating structures, make safe for human interaction
- Move recreational activities like camping to Glen Gray
- At least one camp should be an access point
- Would like to see them used
- Parking and access points
- No need for wildlife center
- More access to both
- Parking at Skyline Drive and Hilltop Road
- More trails/multi-use/horses
- School curriculum/field trips
- Skyline Drive greenbelt
- Use existing roads for access, with improvements
- Educational experience
    - Learning center to educate
- Limit parking
    - Arrive early or come back another day
    - Model Harriman State Park pullovers
    - Locate small, low-impact lots/pull-offs along Skyline Drive
- No services, carry-in, carry-out
- Series of low-impact, interconnected nodes

Of the activities you named above, where in the two Camps and the Reservation Area would be the best place to do each?

- Open up mountain biking to public places in the northern reaches
- Limit mountain bike usage near hiking trails
- Explore opportunities at Camp Yaw Paw
- Better access near the old fire tower on Skyline Drive

Issues & Findings

Are additional access points desirable? If so, where should they be and what should they look like?

- Keep dirt roads for skiing area
- Keep dirt roads for specific mountain biking routes
- Keep access limited at Tamarack and Todd
- Skyline Drive
  - Improve access
  - Avoid overcrowding of parking
  - Ensure safe crossing
    - * Underground culvert
    - * Pedestrian bridge
- There are enough access points already
- Better access at Todd and Tamarack
- Bear Swamp Road
  - Begins on private property so County would need to work out arrangement with property owners for access
- Stag Hill area for mountain biking trails to connect with Ringwood SP
- Co-operative agreement with Ramapo College for shared parking and trail access points
- Use the Ringwood Park and Ride to run shuttle buses to the park entrances on weekends
- There should be a park utilization assessment done and that should be geared toward whether a parking study is needed
- Use the parking at Camp Glen Gray during the week when the campsite is not busy
- Large contiguous properties should for the most part remain as is
- Less encroachment equals more preservation of watershed and more preservation of wild life

Tag-line Vision

In one, tag-line sentence, describe your table's vision for the future Ramapo Mountains County Park.

In order to summarize the work they had done, workshop participants were encouraged to develop "tag-line" sentences that captured their vision for what the Ramapo Mountains County Park should be. Their responses are listed below.

Table 1

- "To leave the land unchanged, to preserve and protect it as it is"

Table 2

- "Ramapo Mountain County Park System is an exceptional natural resource with abundant viewscapes, wild life, water resources & trails, worthy of vigilant preservation and environmental stewardship while not disrupting the existing habitats, yet while maintaining non-motorized human utilization of the parks and trail system"

Table 3

- "The future is history"
- "The park where history is tomorrow's future"
- "Nature's footprint for humanity"
- "A circle of respect"

Table 4

- "Ramapo Mountain County Park System is an exceptional natural resource with abundant viewscapes, wildlife, water resources & trails, worthy of vigilant preservation and environmental stewardship while not disrupting the existing habitats, yet while maintaining non-motorized human utilization of the parks and trail system"

Table 5

- "Aggressively protecting the historical and environmentally sensitive areas"
- "Maintaining preexisting trails and replanting eroded areas"
- "Carry-in, carry-out"
- "Restore disturbed areas"
- "The County's best example of wilderness"

Table 6

- "Protect, preserve, and restore"

Table 7

- "If it ain't broke, don't fix it"
- "Where a kid can be a kid with only imagination"

Table 8

- "Take your kid for a hike"
- "Encourage environmental stewardship"

Table 9

- "North Jersey's Harriman"
- "Wilderness in your backyard"

Maps

Table 1

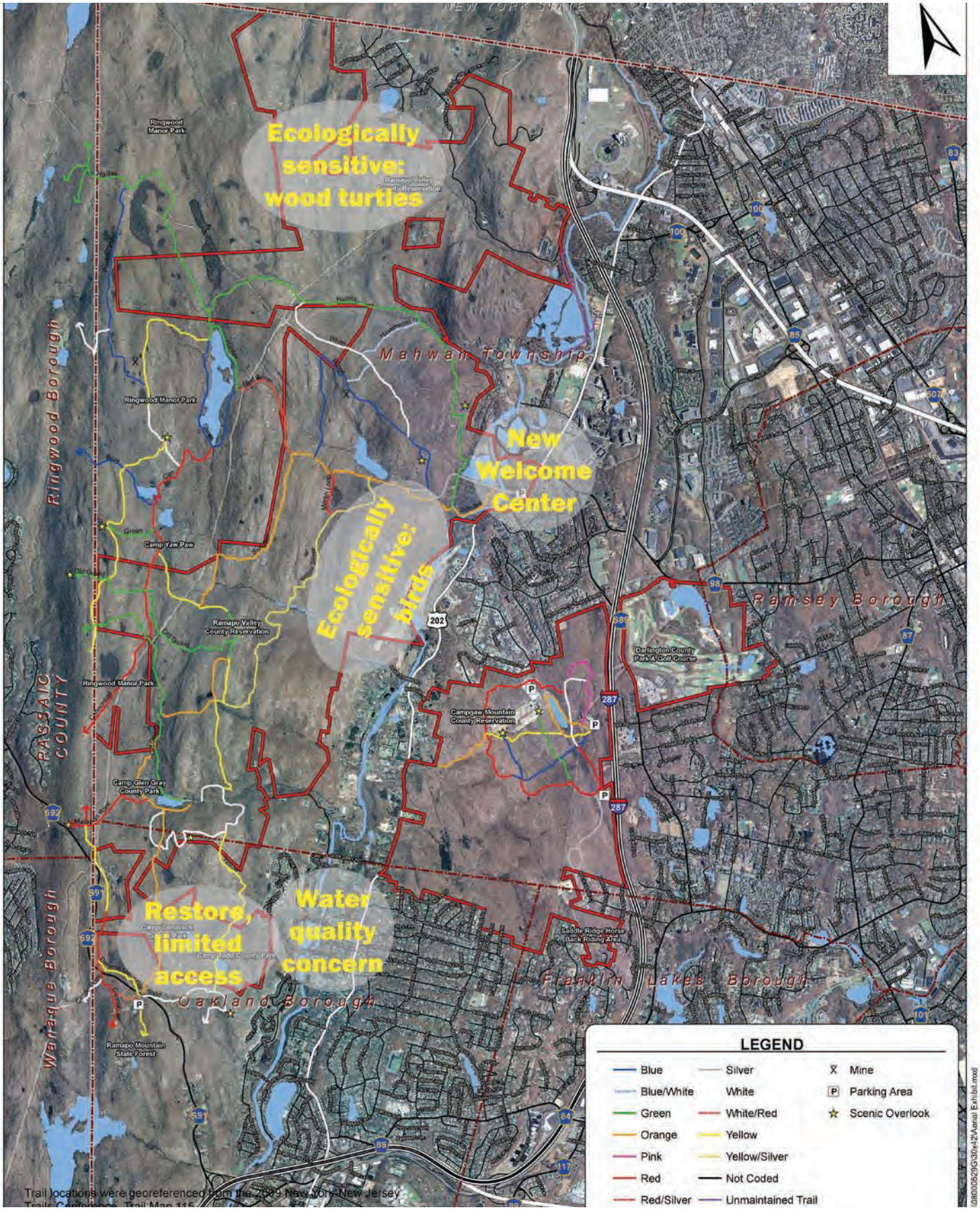
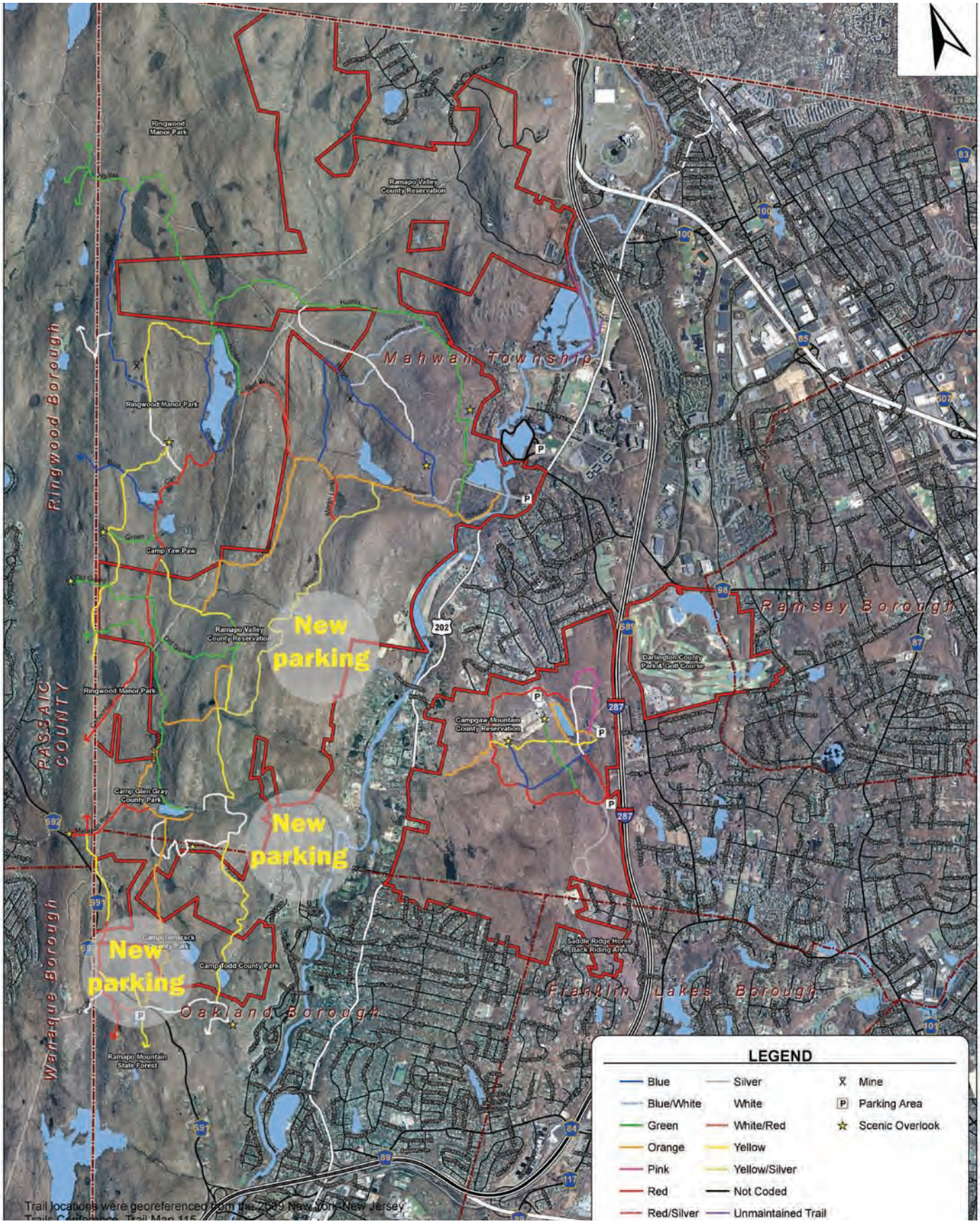

Ecologically sensitive: wood turtles
New Welcome Center
Ecologically sensitive: birds
Restors, limited access
Water quality concern
Ringwood Borough
Mahwah Township
Ramsey Borough
Oakland Borough
Franklin Lakes Borough
Warwick Borough
PASSAIC COUNTY
Ringwood Manor Park
Camp Yaw Paw
Ramapo Valley County Reservation
Darlington County Park & Golf Course
Campgaw Mountain County Reservation
Camp Glen Gray County Park
Ramapo Mountain State Forest
Saddle Ridge Horse Back Riding Area
LEGEND
Blue
Blue/White
Green
Orange
Pink
Red
Red/Silver
Silver
White
White/Red
Yellow
Yellow/Silver
Not Coded
Unmaintained Trail
Mine
Parking Area
Scenic Overlook
Trail locations were georeferenced from the 2009 New York-New Jersey

Table 2


Ringwood Manor Park
Ramapo Valley County Reservation
Mahwah Township
Ringwood Borough
Camp Yaw Paw
New parking
Ramsey Borough
Darlington County Park & Golf Course
Campgaw Mountain County Reservation
PASSAIC COUNTY
Camp Glen Gray County Park
New parking
Camp Todd County Park
New parking
Saddle Ridge Horse Back Riding Area
Franklin Lakes Borough
Wanaque Borough
Oakland Borough
Ramapo Mountain State Forest
LEGEND
Blue
Blue/White
Green
Orange
Pink
Red
Red/Silver
Silver
White
White/Red
Yellow
Yellow/Silver
Not Coded
Unmaintained Trail
Mine
Parking Area
Scenic Overlook
Trail locations were georeferenced from the 2009 New York-New Jersey

Maps

Table 5

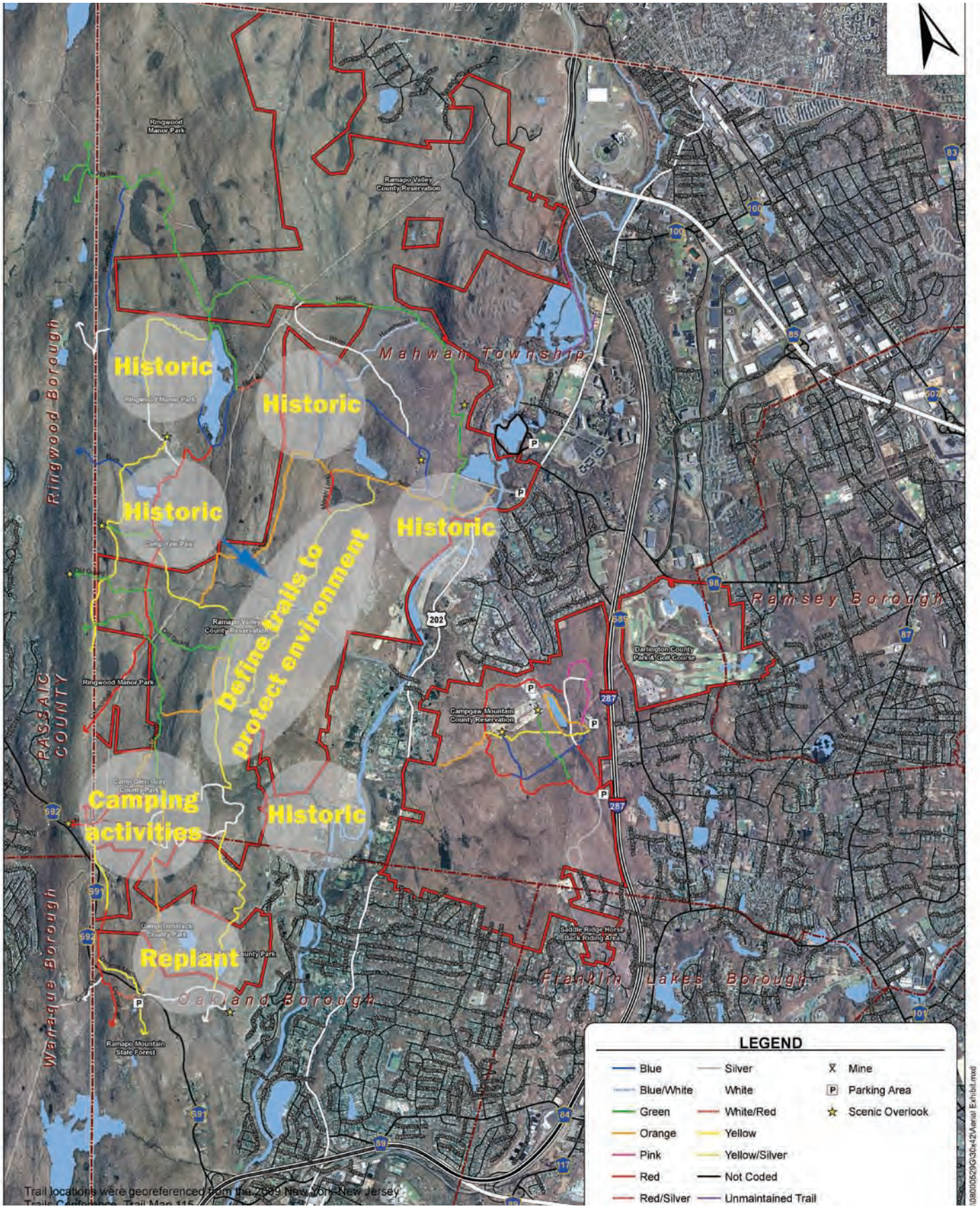
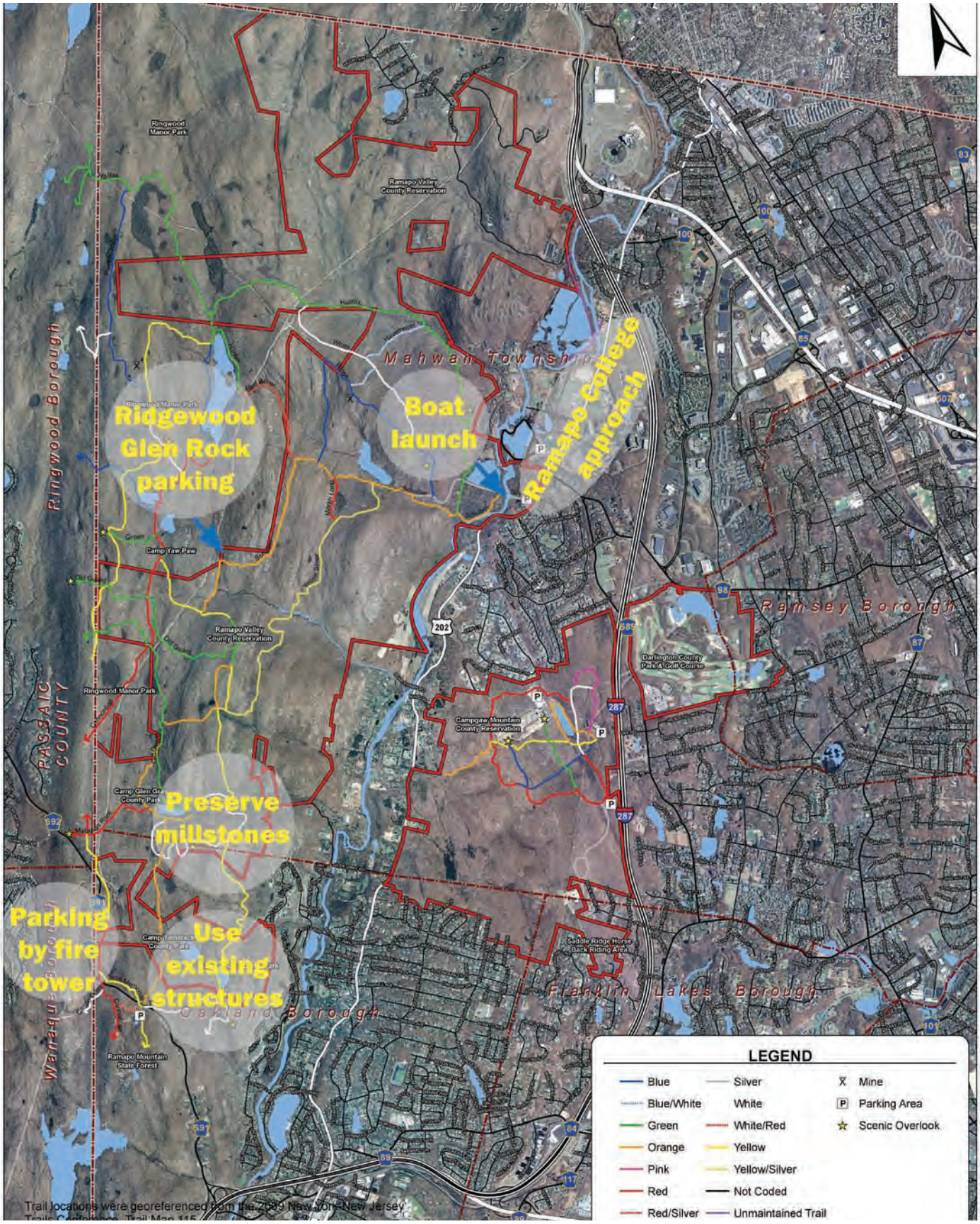

Historic
Historic
Historic
Historic
define trails to protect environment
Camping activities
Historic
Replant
Ringwood Borough
Mahwah Township
Ramsey Borough
Franklin Lakes Borough
Oakland Borough
Warwick Borough
PASSAIC COUNTY
Ringwood Manor Park
Ramapo Valley County Reservation
Darlington County Park & Golf Course
Campgaw Mountain County Reservation
Ramapo Mountain State Forest
Saddle Ridge Horse Back Riding Area
LEGEND
Blue
Blue/White
Green
Orange
Pink
Red
Red/Silver
Silver
White
White/Red
Yellow
Yellow/Silver
Not Coded
Unmaintained Trail
Mine
Parking Area
Scenic Overlook
Trail locations were georeferenced from the 2009 New York-New Jersey

Table 6


Ridgewood Glen Rock parking
Boat launch
Ramapo College approach
Preserve millstones
Parking by fire tower
Use existing structures
Ringwood Borough
Mahwah Township
Ramsey Borough
Franklin Lakes Borough
Oakland Borough
Wanaque Borough
PASSAIC COUNTY
Ringwood Manor Park
Ramapo Valley County Reservation
Camp Yaw Paw
Darlington County Park & Golf Course
Campgaw Mountain County Reservation
Camp Glen Gray County Park
Camp Tamarack County Park
Saddle Ridge Horse Back Riding Area
Ramapo Mountain State Forest
LEGEND
Blue
Blue/White
Green
Orange
Pink
Red
Red/Silver
Silver
White
White/Red
Yellow
Yellow/Silver
Not Coded
Unmaintained Trail
Mine
Parking Area
Scenic Overlook
Trail locations were georeferenced from the 2009 New York-New Jersey Trails Conference Trail Map 115

Maps

Table 7

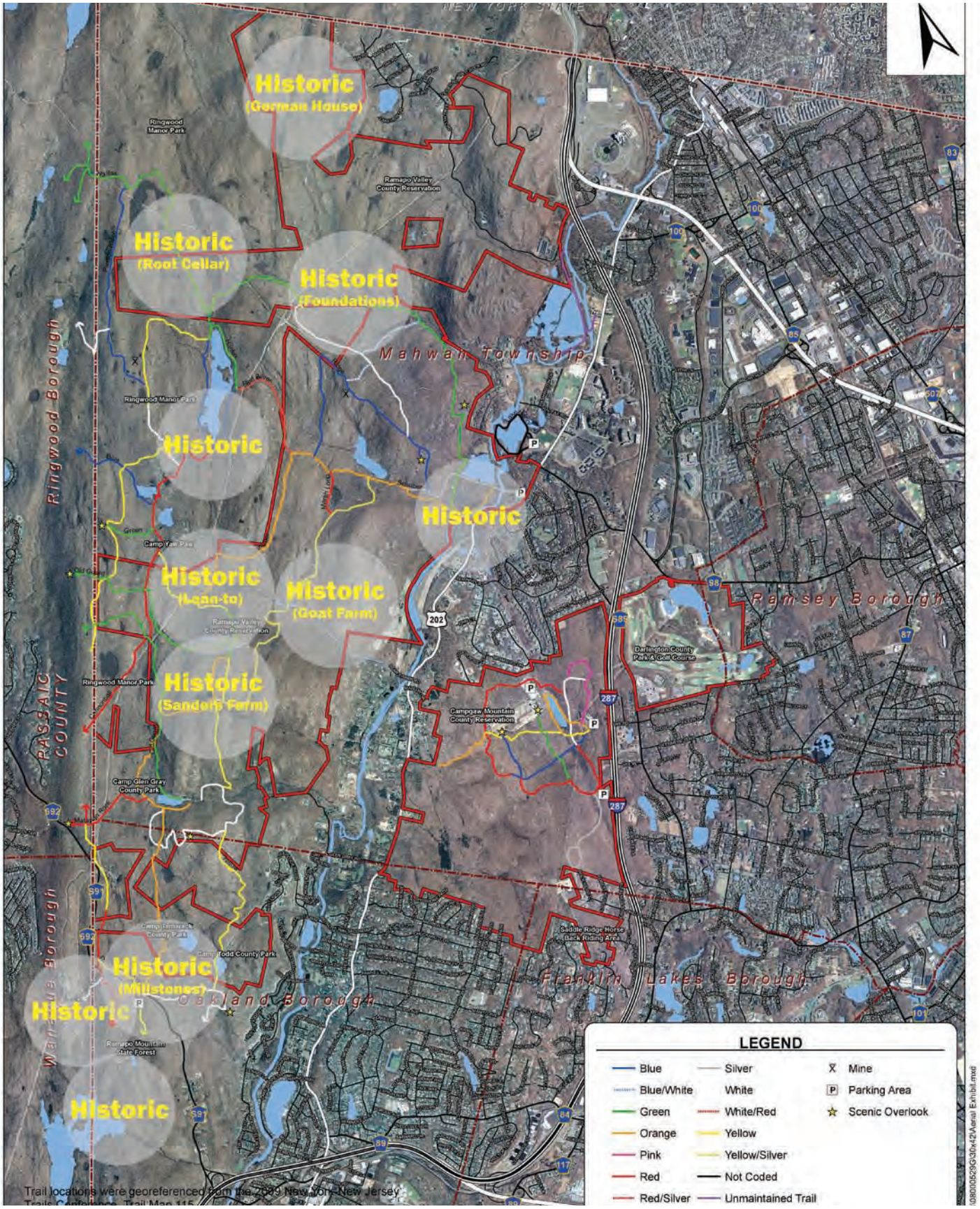
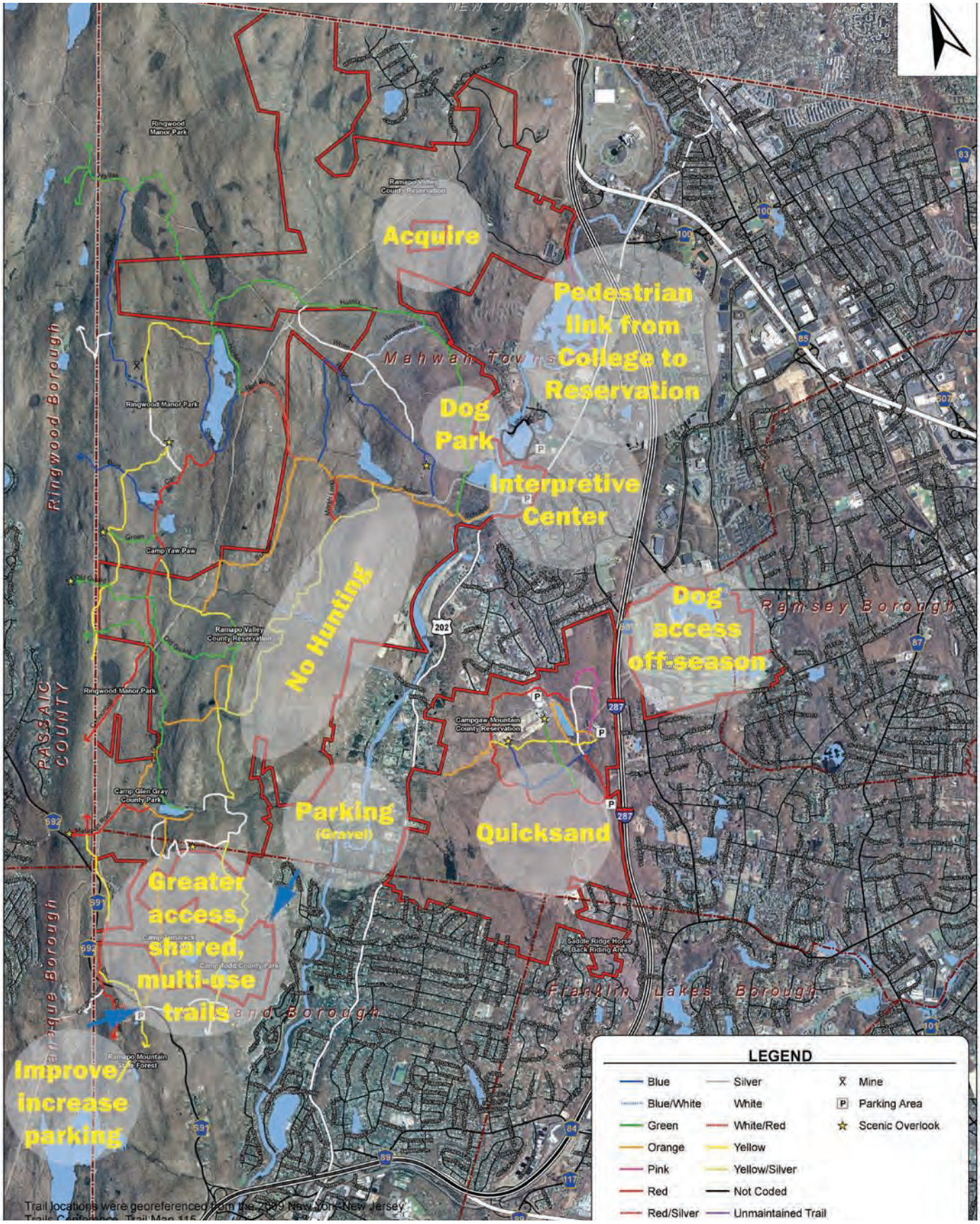

Historic
(German House)
Historic
(Root Cellar)
Historic
(Foundations)
Historic
Historic
Historic
(Lean-to)
Historic
(Goat Farm)
Historic
(Sanders Farm)
Historic
(Millstones)
Historic
Historic
Ringwood Borough
Mahwah Township
Ramsey Borough
Oakland Borough
Franklin Lakes Borough
Wanaque Borough
PASSAIC COUNTY
Ringwood Manor Park
Ramapo Valley County Reservation
Camp Yaw Paw
Campgaw Mountain County Reservation
Darlington County Park & Golf Course
Camp Glen Gray County Park
Camp Todd County Park
Saddle Ridge Horse Back Riding Area
Ramapo Mountain State Forest
LEGEND
Blue
Blue/White
Green
Orange
Pink
Red
Red/Silver
Silver
White
White/Red
Yellow
Yellow/Silver
Not Coded
Unmaintained Trail
Mine
Parking Area
Scenic Overlook
Trail locations were georeferenced from the 2009 New York-New Jersey

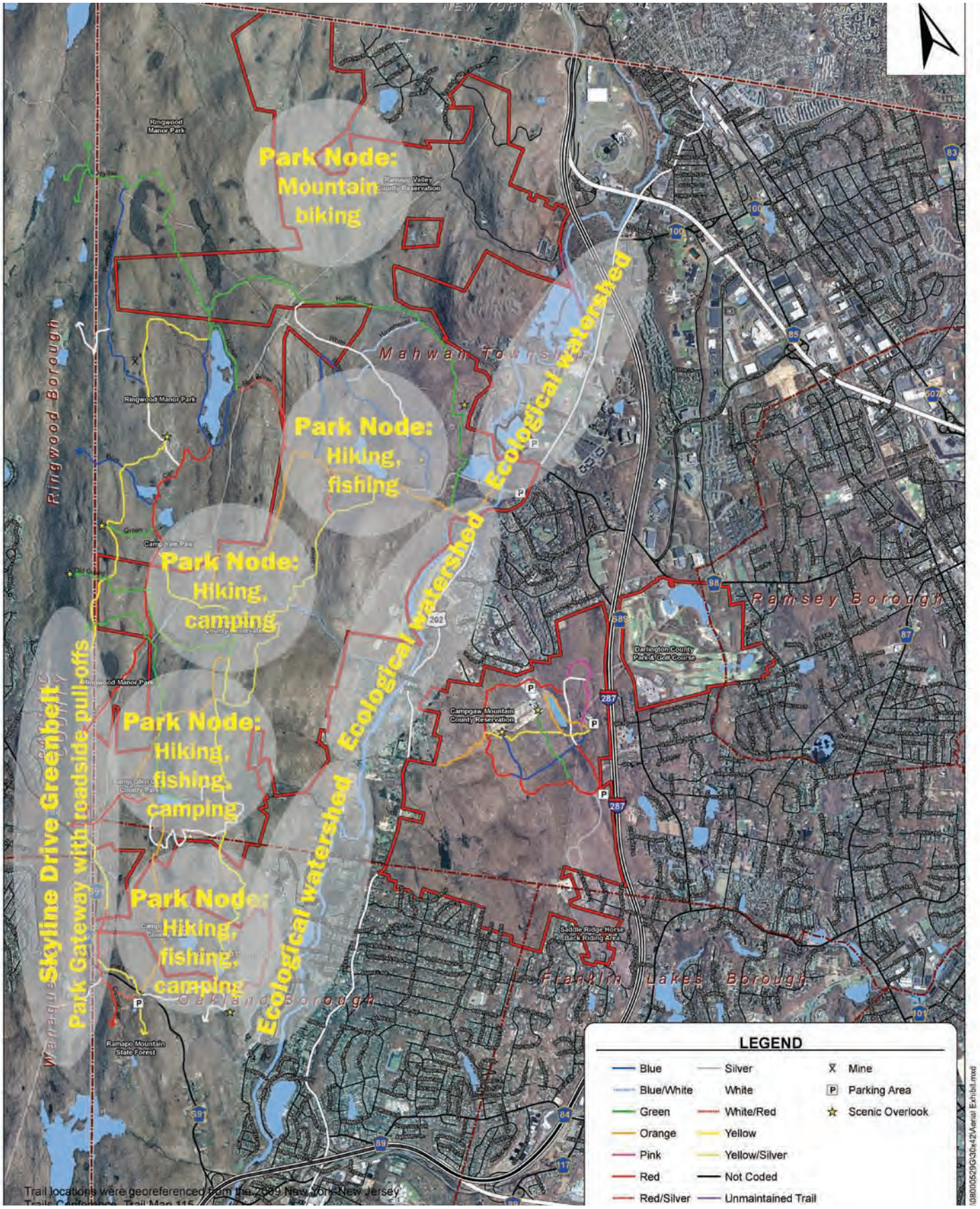
Table 8



Trail locations were georeferenced from the 2009 New York-New Jersey Trails Conference Trail Map 115

Maps

Table 9


Park Node:
Mountain biking
Park Node:
Hiking, fishing
Park Node:
Hiking, camping
Park Node:
Hiking, fishing, camping
Park Node:
Hiking, fishing, camping
Skyline Drive Greenbelt
Park Gateway with roadside pull-offs
Ecological watershed
Ecological watershed
Ecological watershed
Ringwood Borough
Mahwah Township
Ramsey Borough
Oakland Borough
Franklin Lakes Borough
Ringwood Manor Park
Ramapo Valley County Reservation
Darlington County Park & Golf Course
Campgaw Mountain County Reservation
Saddle Ridge Horse Back Riding Area
Ramapo Mountain State Forest
LEGEND
Blue
Blue/White
Green
Orange
Pink
Red
Red/Silver
Silver
White
White/Red
Yellow
Yellow/Silver
Not Coded
Unmaintained Trail
Mine
Parking Area
Scenic Overlook
Trail locations were georeferenced from the 2009 New York-New Jersey

2017 City park facts

THE TRUST FOR PUBLIC LAND

This report was made possible through the generous support of:

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2017 City park facts

April 2017

THE TRUST FOR PUBLIC LAND

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The Trust for Public Land creates parks and protects land for people, ensuring healthy, livable communities for generations to come.

Our Center for City Park Excellence helps make cities more successful through the renewal and creation of parks for their social, ecological, and economic benefits to residents and visitors alike.

tpl.org

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The *2017 City Park Facts* report was created by:

Peter Harnik, Founder, Center for City Park Excellence
Charlie McCabe, Director, Center for City Park Excellence
Alexandra Hiple, Research Associate, Center for City Park Excellence

Why city park facts?

The Trust for Public Land's Center for City Park Excellence works to make cities more successful through the renewal and creation of parks for their social, ecological, and economic benefits to residents and visitors alike. To achieve this mission, we believe that residents, advocates, park professionals, planners, members of the media, decision-makers, and all those who love parks need solid data that elucidates the realities of urban park and recreation systems. Data is knowledge, and knowledge is power.

The 2017 edition of City Park Facts includes photos for the first time, as well as an infographic spread to further highlight some of the data collected herein. It also features an expanded table (Table 6) showing the percentage of residents within a 10-minute (half mile) walk of a park, up from 75 cities in 2016 to 100 cities this year. This metric is generated by the Trust for Public Land's ParkScore analysis, which evaluates how large cities are meeting the need for parks and recreation. The latest rankings are available at **parkscore.tpl.org**, and are updated each year in May.

Additional datasets not included in the printed version of City Park Facts are available at **tpl.org/cityparkfacts**. The Center for City Park Excellence has an extensive library of reports on best practices and trending topics in urban park systems; for a full bibliography, visit **tpl.org/CCPE**.

How to use this booklet

When we say "city," we mean only the municipality, not the metropolitan region. Thus, "Los Angeles" means the city of Los Angeles, not greater Los Angeles, nor Los Angeles County. However, several cities that are included in greater Los Angeles—Long Beach, Anaheim, Santa Ana, and Irvine—happen to be large enough to merit separate inclusion in this booklet and are listed under their own names.

When we say "park" we are referring to publicly owned and operated parks. In Table 1, we count every kind of park within the municipal boundary of the city, including federal, state, county, regional, and municipal parks. We do not include parks in corporate plazas, private clubs, or homeowner association parks in gated communities.

In most reports we combine the data from all the different park agencies in the city. In a few reports we separate parks by their managing agency, sometimes omitting the various smaller, specialized agencies in a city.

When we say "operating spending" we mean year-in, year-out work such as landscape and tree maintenance, facility maintenance, trash removal, recreational programming, planning, administration, policing, lighting, marketing, etc. "Capital spending" refers to one-time items such as land acquisition, construction, and major road or structural repairs. In order to provide greater uniformity between agencies, we do not count the expenses associated with zoos, aquariums, professional sports stadiums, museums, and cemeteries, which exist in some cities' parks but not others'. In Table 7 and Table 8, total spending includes both operational spending and capital spending. As in 2016, we have included separate information (Table 15) on spending by the largest city park conservancies, a growing category of nonprofit groups that support public parks.

For certain tables, we group cities by their average population density (population divided by municipal land area). We exclude airports, railyards, and parkland—the uninhabited portions of a city—from land area when calculating density. The four density categories are based on standard deviations from the mean.

We want to hear from you.

City Park Facts is a collaboration between the many city, county, state and nonprofit parks agencies and conservancies that work with us to submit their data. The staff of the Center for City Park Excellence works to present this information in a thorough yet easy-to-use format, and your feedback is important for future editions. You can contact us at **ccpe@tpl.org** or **617-367-6200**.

1. Parkland by city and agency

2016

CITY	LAND AREA (ACRES)	POPULATION	PARK ACRES WITHIN CITY LIMITS
Albuquerque, New Mexico	120,147	562,215	27,438
Albuquerque Parks and Recreation Department			21,555
National Park Service (within Albuquerque)			5,164
Bernalillo County Parks and Recreation Department (within Albuquerque)			719
Anaheim, California	31,895	353,741	2,618
Orange County Parks (within Anaheim)			1,283
Anaheim Community Services Department			687
California Department of Parks and Recreation (within Anaheim)			648
Anchorage, Alaska	1,090,997	305,439	914,138
Alaska Department of Natural Resources (within Anchorage)			464,318
U.S. Forest Service (within Anchorage)			245,653
National Park Service (within Anchorage)			192,192
Anchorage Parks and Recreation Department			11,454
Alaska Fish and Game (within Anchorage)			521
Arlington, Texas	61,364	378,442	4,714
Arlington, Texas Parks and Recreation Department			4,714
Arlington, Virginia	16,623	227,517	1,787
Arlington County Department of Parks and Recreation			952
National Park Service (within Arlington)			700
Northern Virginia Regional Park Authority (within Arlington)			135
Atlanta, Georgia	85,217	455,045	4,991
Atlanta Department of Parks, Recreation and Cultural Affairs			4,806
National Park Service (within Atlanta)			164
Centennial Olympic Park			21
Aurora, Colorado	99,030	357,801	10,504
Aurora Parks, Recreation and Open Space			10,504
Austin, Texas	190,653	903,753	20,714
Austin Parks and Recreation Department			19,982
Texas Parks and Wildlife Department (within Austin)			732
Bakersfield, California	90,985	376,151	5,362
Bakersfield Department of Recreation and Parks			4,999
Kern County Parks and Recreation Department (within Bakersfield)			185
North of the River Recreation and Park District (within Bakersfield)			178
Baltimore, Maryland	51,804	620,610	4,917
Baltimore City Department of Recreation and Parks			4,874
National Park Service (within Baltimore)			43
Baton Rouge, Louisiana	49,246	231,222	1,252
Recreation and Park Commission for the Parish of East Baton Rouge			1,252
Boise, Idaho	50,793	220,918	4,193
Boise Parks and Recreation			3,878
State of Idaho (within Boise)			315
Boston, Massachusetts	30,897	648,251	5,093
Massachusetts Department of Conservation and Recreation (within Boston)			2,807
Boston Parks and Recreation Department			2,104
Boston Conservation Commission			114
National Park Service (within Boston)			35
Massachusetts Port Authority (within Boston)			33
Buffalo, New York	25,846	260,347	1,913
Buffalo Division of Parks and Recreation			1,842
Erie County Department of Parks, Recreation and Forestry (within Buffalo)			70
National Park Service (within Buffalo)			1
Chandler, Arizona	41,224	257,235	1,544
Chandler Community Services Department			1,544

1. Parkland by city and agency (cont.)

CITY	LAND AREA (ACRES)	POPULATION	PARK ACRES WITHIN CITY LIMITS
Charlotte, North Carolina	**335,259**	**1,042,120**	**13,990**
Mecklenburg County Park and Recreation			13,990
Chesapeake, Virginia	**218,112**	**240,740**	**56,254**
U.S. Fish and Wildlife Service (within Chesapeake)			49,246
Virginia Department of Game and Inland Fisheries (within Chesapeake)			4,558
Chesapeake Department of Parks, Recreation and Tourism			2,450
Chicago, Illinois	**145,686**	**2,772,357**	**12,917**
Chicago Park District			8,773
Forest Preserve District of Cook County (within Chicago)			3,089
Illinois Department of Natural Resources (within Chicago)			613
Illinois International Port District (within Chicago)			442
Chula Vista, California	**31,764**	**263,540**	**2,185**
Chula Vista Public Works Department - Parks Section			2,107
U.S. Fish and Wildlife Service (within Chula Vista)			71
San Diego County Parks and Recreation (within Chula Vista)			7
Cincinnati, Ohio	**49,883**	**304,833**	**6,891**
Cincinnati Park Board			5,076
Cincinnati Recreation Commission			1,347
Great Parks of Hamilton County (within Cincinnati)			465
National Park Service (within Cincinnati)			3
Cleveland, Ohio	**49,726**	**383,989**	**3,002**
Cleveland Metroparks (within Cleveland)			1,509
Cleveland Department of Public Works			1,493
Colorado Springs, Colorado	**124,506**	**445,948**	**11,037**
Colorado Springs Parks, Recreation and Cultural Services			9,085
Colorado Parks and Wildlife (within Colorado Springs)			1,407
El Paso County Parks (within Colorado Springs)			545
Columbus, Ohio	**138,988**	**843,731**	**15,155**
Columbus Recreation and Parks Department			11,633
Columbus and Franklin County Metro Park District (within Columbus)			3,522
Corpus Christi, Texas	**102,791**	**325,942**	**8,610**
Texas Parks and Wildlife Department (within Corpus Christi)			4,774
Corpus Christi Parks and Recreation Department			3,536
Nueces County Coastal Parks (within Corpus Christi)			300
Dallas, Texas	**217,932**	**1,283,763**	**27,038**
Dallas Park and Recreation Department			23,147
Trinity Watershed Management Division			3,891
Denver, Colorado	**97,920**	**668,681**	**6,222**
Denver Parks and Recreation			6,222
Detroit, Michigan	**88,800**	**656,161**	**5,543**
Detroit Recreation Department			5,512
Michigan Department of Natural Resources (within Detroit)			31
Durham, North Carolina	**68,717**	**257,245**	**2,623**
Durham Parks and Recreation Department			1,915
North Carolina State Parks (within Durham)			708
El Paso, Texas	**163,351**	**692,213**	**29,872**
Texas Parks and Wildlife Department (within El Paso)			26,530
El Paso Parks and Recreation Department			2,848
El Paso County Department of Parks and Recreation (within El Paso City)			439
National Park Service (within El Paso)			55
Fort Wayne, Indiana	**70,796**	**261,136**	**2,400**
Fort Wayne Parks and Recreation Department			2,400
Fort Worth, Texas	**217,484**	**827,741**	**11,878**
Fort Worth Park & Recreation Department			11,878

1. Parkland by city and agency (cont.)

CITY	LAND AREA (ACRES)	POPULATION	PARK ACRES WITHIN CITY LIMITS
Fremont, California	49,574	225,815	24,089
U.S. Fish and Wildlife Service (within Fremont)			17,996
East Bay Regional Park District (within Fremont)			5,243
Fremont Recreation Services Division			850
Fresno, California	73,004	520,772	1,921
Fresno Parks, After School, Recreation and Community Services Department			1,329
San Joaquin River Conservancy			592
Garland, Texas	36,534	238,784	2,639
Garland Parks and Recreation			2,440
Dallas County Planning and Development Department (within Garland)			199
Gilbert, Arizona	43,496	246,336	1,308
Gilbert Parks and Recreation			1,308
Glendale, Arizona	38,385	241,019	2,149
Glendale Parks and Recreation Department			2,149
Greensboro, North Carolina	80,970	282,215	7,582
Greensboro Parks and Recreation Department			7,328
National Park Service (within Greensboro)			250
Greensboro Downtown Parks			4
Henderson, Nevada	68,948	281,647	9,173
Bureau of Land Management (within Henderson)			6,167
Henderson Department of Public Works, Parks and Recreation			2,975
Clark County Parks and Recreation Department (within Henderson)			31
Hialeah, Florida	13,728	227,656	204
Hialeah Parks and Recreation Department			204
Honolulu, Hawaii	38,720	351,720	12,006
Hawaii Division of Forestry and Wildlife (within Urban Honolulu)			10,054
Honolulu Department of Parks and Recreation (within Urban Honolulu)			1,055
Hawaii Division of State Parks (within Urban Honolulu)			897
Houston, Texas	383,737	2,268,295	53,134
Houston Parks and Recreation Department			33,651
Harris County Parks (within Houston)			14,565
Texas Parks and Wildlife Department (within Houston)			2,883
Fort Bend County Parks and Recreation Department (within Houston)			2,023
Discovery Green Conservancy (within Houston)			12
Indianapolis, Indiana	231,317	852,380	11,464
Indianapolis Department of Parks and Recreation			11,214
White River State Park Development Commission (within Indianapolis)			250
Irvine, California	42,308	241,102	9,427
Irvine Community Services Department			9,082
Orange County Parks (within Irvine)			345
Irving, Texas	42,891	232,637	1,920
Irving Parks and Recreation			1,865
Dallas County Planning and Development Department (within Irving)			55
Jacksonville, Florida	478,082	867,227	64,603
Jacksonville Parks, Recreation, and Community Services Department			33,382
Florida Forest Service (within Jacksonville)			9,781
National Park Service (within Jacksonville)			8,400
Florida Park Service (within Jacksonville)			8,195
St. Johns River Water Management District (within City of Jacksonville)			4,845
Jersey City, New Jersey	9,468	265,718	1,677
New Jersey Division of Parks and Forestry (within Jersey City)			1,188
Hudson County Division of Parks (within Jersey City)			283
Jersey City Division of Parks and Forestry			206

1. Parkland by city and agency (cont.)

CITY	LAND AREA (ACRES)	POPULATION	PARK ACRES WITHIN CITY LIMITS
Kansas City, Missouri	201,568	479,367	17,683
Kansas City, Missouri Parks and Recreation			12,293
Jackson County Parks and Recreation (within Kansas City)			5,390
Laredo, Texas	56,901	259,051	1,412
Laredo Parks and Leisure Services Department			1,041
Texas Parks and Wildlife Department (within Laredo)			371
Las Vegas, Nevada	86,921	627,249	16,700
Bureau of Land Management (within Las Vegas)			11,596
Las Vegas Department of Parks and Recreation			4,775
Privately operated public parks			326
Nevada Division of State Parks (within Las Vegas)			3
Lexington, Kentucky	181,536	312,390	4,434
Lexington-Fayette Urban County Government Division of Parks and Recreation			4,415
Kentucky Department of Parks (within Lexington)			19
Lincoln, Nebraska	57,033	276,654	3,657
Lincoln Parks and Recreation Department			3,657
Long Beach, California	32,188	476,253	3,124
Long Beach Department of Parks, Recreation and Marine			3,124
Los Angeles, California	299,949	3,937,901	37,405
Los Angeles Department of Recreation and Parks			16,150
California Department of Parks and Recreation (within Los Angeles City)			10,465
Mountains Recreation and Conservation Authority (within Los Angeles City)			5,960
U.S. Forest Service (within Los Angeles City)			3,696
Los Angeles County Department of Parks and Recreation (within Los Angeles City)			659
Los Angeles Department of Water and Power (within Los Angeles City)			288
Port of Los Angeles			187
Louisville, Kentucky	243,466	759,909	17,608
Louisville Metro Parks			13,010
21st Century Parks (within Louisville)			4,000
Kentucky State Parks (within Louisville)			513
Waterfront Development Corporation			85
Lubbock, Texas	78,343	246,435	2,228
Lubbock Parks and Recreation			2,228
Madison, Wisconsin	49,145	243,967	6,372
Madison Parks Division			4,547
University of Wisconsin - Madison Arboretum			935
Dane County Parks Division (within Madison)			890
Memphis, Tennessee	201,635	666,723	9,145
Memphis Division of Parks and Neighborhoods			4,552
Shelby Farms Park Conservancy			3,200
Tennessee State Parks (within Memphis)			1,143
Riverfront Development Corporation			250
Mesa, Arizona	87,330	475,274	2,480
Mesa Parks, Recreation and Commercial Facilities Department			2,480
Miami, Florida	22,957	435,622	1,500
Miami Department of Parks and Recreation			958
Miami-Dade County Park and Recreation Department (within Miami)			405
Virginia Key Beach Park Trust			82
Bayfront Park Management Trust			55
Milwaukee, Wisconsin	61,518	592,535	6,116
Milwaukee County Department of Parks, Recreation and Culture (within Milwaukee City)			5,406
Milwaukee Recreation			315
Wisconsin Department of Natural Resources (within Milwaukee City)			307
Milwaukee Department of Public Works			88

1. Parkland by city and agency (cont.)

CITY	LAND AREA (ACRES)	POPULATION	PARK ACRES WITHIN CITY LIMITS
Minneapolis, Minnesota	**34,543**	**408,326**	**5,064**
Minneapolis Park and Recreation Board			5,064
Nashville, Tennessee	**322,581**	**653,352**	**33,966**
Nashville/Davidson Metropolitan Board of Parks and Recreation			15,144
U.S. Army Corps of Engineers (within Nashville/Davidson)			11,599
Tennessee Department of Environment and Conservation (within Nashville/Davidson)			4,303
Tennessee Wildlife Resource Agency (within Nashville/Davidson)			2,920
New Orleans, Louisiana	**108,431**	**388,540**	**27,689**
U.S. Fish and Wildlife Service (within New Orleans)			24,293
New Orleans City Park Improvement Association			1,300
New Orleans Recreation Development Commission			576
Audubon Nature Institute			528
New Orleans Department of Parks and Parkways			482
Non-Flood Protection Asset Management Authority (within New Orleans)			351
Louisiana Office of State Parks (within New Orleans)			105
Municipal Yacht Harbor			30
French Market Corporation			24
New York, New York	**193,692**	**8,567,986**	**39,859**
New York City Department of Parks and Recreation			29,921
National Park Service (within New York City)			7,726
New York State Department of Environmental Conservation (within New York City)			1,300
New York State Office of Parks, Recreation and Historic Preservation (within New York City)			912
Newark, New Jersey	**15,480**	**279,660**	**847**
Essex County Department of Parks, Recreation and Cultural Affairs (within Newark)			758
Newark Department of Parks and Grounds			89
Norfolk, Virginia	**34,637**	**246,062**	**1,781**
Norfolk Department of Recreation, Parks and Open Space			1,781
North Las Vegas, Nevada	**64,861**	**237,252**	**16,731**
Bureau of Land Management (within North Las Vegas)			15,872
North Las Vegas Department of Neighborhood and Leisure Services			859
Oakland, California	**35,703**	**414,215**	**3,865**
Oakland Office of Parks and Recreation			1,940
East Bay Regional Park District (within Oakland)			1,664
Port of Oakland			261
Oklahoma City, Oklahoma	**388,103**	**649,058**	**26,004**
Oklahoma City Parks and Recreation Department			25,987
Myriad Botanical Gardens			17
Omaha, Nebraska	**81,337**	**441,703**	**10,648**
Omaha Department of Parks, Recreation and Public Property			10,648
Orlando, Florida	**65,533**	**272,010**	**2,947**
Orlando Families, Parks and Recreation Department			2,923
Orange County Parks and Recreation Division (within Orlando)			24
Philadelphia, Pennsylvania	**85,825**	**1,571,860**	**10,830**
Philadelphia Department of Parks and Recreation			10,169
U.S. Fish and Wildlife Service (within Philadelphia)			300
Pennsylvania Department of Conservation and Natural Resources (within Philadelphia)			282
National Park Service (within Philadelphia)			55
University of Pennsylvania – Penn Park			24
Phoenix, Arizona	**330,690**	**1,555,635**	**49,254**
Phoenix Parks and Recreation Department			47,612
Maricopa County Parks and Recreation Department (within Phoenix)			1,642
Pittsburgh, Pennsylvania	**35,435**	**309,111**	**3,683**
Pittsburgh Departments of Public Works and Parks & Recreation			3,647
Pennsylvania Department of Conservation and Natural Resources (within Pittsburgh)			36

1. Parkland by city and agency (cont.)

CITY	LAND AREA (ACRES)	POPULATION	PARK ACRES WITHIN CITY LIMITS
Plano, Texas	45,812	280,326	4,275
Plano Parks and Recreation Department			4,275
Portland, Oregon	85,393	620,564	14,504
Portland Parks and Recreation			11,712
Metro Regional Parks and Greenspaces (within Portland)			2,330
Oregon Parks and Recreation Department (within Portland)			462
Raleigh, North Carolina	91,458	444,271	13,619
Raleigh Parks, Recreation and Cultural Resources Department			7,365
North Carolina State Parks (within Raleigh)			5,579
Wake County Parks, Recreation and Open Space (within Raleigh)			225
Reno, Nevada	65,926	243,942	3,382
Reno Parks, Recreation and Community Services Department			2,630
Washoe County Regional Parks and Open Space (within Reno)			752
Richmond, Virginia	38,278	222,071	2,027
Richmond Department of Parks, Recreation and Community Facilities			2,027
Riverside, California	51,930	315,146	3,531
Riverside Parks, Recreation and Community Services Department			2,984
Riverside County Regional Park and Open-Space District			297
California Department of Parks and Recreation (within Riverside)			250
Sacramento, California	62,666	485,187	4,959
Sacramento Department of Parks and Recreation			3,183
Sacramento County Department of Regional Parks (within Sacramento City)			1,746
California Department of Parks and Recreation (within Sacramento City)			30
San Antonio, Texas	294,997	1,417,364	29,692
San Antonio Parks and Recreation Department			15,544
Texas Parks and Wildlife Department (within San Antonio)			11,992
National Park Service (within San Antonio)			990
San Antonio River Authority			935
Bexar Heritage Department (within San Antonio)			231
San Diego, California	208,120	1,370,646	47,817
San Diego Park and Recreation Department			41,743
San Diego County Parks and Recreation (within San Diego City)			4,094
California Department of Parks and Recreation (within San Diego City)			1,508
San Diego Unified Port District			252
National Park Service (within San Diego City)			160
U.S. Fish and Wildlife Service (within San Diego City)			60
San Francisco, California	29,999	847,576	5,888
San Francisco Recreation and Parks Department			3,669
Presidio Trust (within San Francisco)			1,104
National Park Service (within San Francisco)			863
California Department of Parks and Recreation (within San Francisco)			252
San Jose, California	112,977	1,017,232	16,085
U.S. Fish and Wildlife Service (within San Jose)			6,143
Santa Clara County Parks and Recreation (within San Jose)			3,910
San Jose Department of Parks, Recreation and Neighborhood Services			3,503
Santa Clara Valley Open Space Authority			2,529
Santa Ana, California	17,453	338,961	746
Santa Ana Parks, Recreation and Community Services			515
Orange County Parks (within Santa Ana)			231
Scottsdale, Arizona	117,709	231,829	28,817
Scottsdale Parks and Recreation Division			28,817
Seattle, Washington	53,723	670,511	6,591
Seattle Parks and Recreation			6,411
The Port of Seattle			180

1. Parkland by city and agency (cont.)

CITY	LAND AREA (ACRES)	POPULATION	PARK ACRES WITHIN CITY LIMITS
St. Louis, Missouri	39,622	318,722	3,721
St. Louis Department of Parks, Recreation and Forestry			3,254
Tower Grove Park Commission			289
National Park Service (within St. Louis)			91
The Great Rivers Greenway District (within St. Louis)			87
St. Paul, Minnesota	33,266	297,110	4,937
St. Paul Parks and Recreation Department			3,471
Ramsey County Parks and Recreation Department (within St. Paul)			1,232
Minnesota Department of Natural Resources (within St. Paul)			234
St. Petersburg, Florida	39,515	252,408	6,159
Pinellas County Parks & Conservation Resources (within St. Petersburg)			3,190
St. Petersburg Parks & Recreation Department			2,969
Stockton, California	39,469	305,721	1,157
Stockton Public Works Department			1,157
Tampa, Florida	72,582	361,564	5,212
Tampa Parks and Recreation Department			3,543
Hillsborough County Conservation and Environmental Lands Management (within Tampa)			1,161
Tampa Sports Authority			453
Hillsborough County Parks and Recreation Department (within Tampa)			55
Toledo, Ohio	51,643	279,217	3,128
Toledo Division of Parks, Recreation and Forestry			2,177
Metroparks of the Toledo Area			951
Tucson, Arizona	145,094	537,532	4,687
Tucson Parks and Recreation Department			3,776
Pima County Natural Resources, Parks and Recreation Department (within Tucson)			753
Kino Sports Complex			158
Tulsa, Oklahoma	125,923	411,880	9,401
Tulsa Park and Recreation Department			8,035
River Parks Authority			1,066
Tulsa County Parks (within Tulsa City)			300
Virginia Beach, Virginia	159,370	453,947	24,916
U.S. Fish and Wildlife Service (within Virginia Beach)			9,997
Virginia Department of Conservation and Recreation (within Virginia Beach)			7,211
Virginia Beach Department of Parks and Recreation			6,162
Virginia Department of Game and Inland Fisheries (within Virginia Beach)			1,546
Washington, D.C.	39,071	659,110	8,525
National Park Service (within Washington, D.C.)			6,852
District of Columbia Department of Parks and Recreation			924
National Arboretum			446
Smithsonian's National Zoo (within Washington, D.C.)			163
Architect of the Capitol			140
Wichita, Kansas	101,949	395,358	4,737
Wichita Park and Recreation Department			4,737
Winston-Salem, North Carolina	84,767	241,804	3,688
Winston-Salem Recreation and Parks			3,688
Total	**11,455,651**	**63,576,249**	**2,055,324**

Many city agencies, such as Denver Parks and Recreation and Albuquerque Parks and Recreation Department, have parkland that falls outside the limits of their city. A table detailing this external acreage can be found at ***tpl.org/cityparkfacts****.*

2. Parkland as percentage of adjusted city area

2016

Parkland includes city, county, metro, state, and federal parkland within the city limits.
Adjusted city area subtracts airport and railyard acreage from total city land area.

CITY	ADJUSTED CITY AREA (ACRES)	PARKLAND (ACRES)	PERCENT PARKLAND
HIGH-DENSITY CITIES			
Washington, D.C.	38,955	8,525	21.9%
New York	187,946	39,859	21.2%
San Francisco	29,980	5,888	19.6%
Jersey City	9,261	1,677	18.1%
Boston	29,175	5,093	17.5%
Minneapolis	33,958	5,064	14.9%
Philadelphia	82,913	10,830	13.1%
Los Angeles	295,015	37,405	12.7%
Seattle	52,765	6,591	12.5%
Oakland	33,181	3,865	11.6%
Arlington, Virginia	15,878	1,787	11.3%
Long Beach	31,066	3,124	10.1%
Baltimore	51,318	4,917	9.6%
Chicago	136,796	12,917	9.4%
Miami	22,949	1,500	6.5%
Newark	14,054	847	6.0%
Santa Ana	17,453	746	4.3%
Hialeah	13,666	204	1.5%
Median, HIGH-DENSITY CITIES:			**12.1%**
MEDIUM-HIGH-DENSITY CITIES			
Honolulu	36,329	12,006	33.0%
St. Paul	32,363	4,937	15.3%
San Jose	111,953	16,085	14.4%
Pittsburgh	35,349	3,683	10.4%
Milwaukee	59,126	6,116	10.3%
St. Louis	39,090	3,721	9.5%
Denver	74,797	6,222	8.3%
Anaheim	31,890	2,618	8.2%
Buffalo	25,308	1,913	7.6%
Chula Vista	31,764	2,185	6.9%
Cleveland	46,880	3,002	6.4%
Stockton	38,918	1,157	3.0%
Median, MEDIUM-HIGH-DENSITY CITIES:			**8.9%**
MEDIUM-LOW-DENSITY CITIES			
Fremont	49,516	24,089	48.6%
Albuquerque	116,051	27,438	23.6%
San Diego	205,918	47,817	23.2%
Irvine	42,308	9,427	22.3%
Las Vegas	86,921	16,700	19.2%
Portland	81,625	14,504	17.8%
St. Petersburg	39,375	6,159	15.6%
Phoenix	327,729	49,254	15.0%
Raleigh	91,399	13,169	14.4%
Houston	370,271	53,134	14.4%
Cincinnati	48,724	6,891	14.1%
Omaha	78,087	10,648	13.6%
Madison	47,519	6,372	13.4%
Dallas	215,676	27,038	12.5%
Columbus	133,309	15,155	11.4%
Austin	186,902	20,714	11.1%
San Antonio	292,298	29,692	10.2%
Plano	45,812	4,275	9.3%
Boise	48,343	4,193	8.7%
Sacramento	61,972	4,959	8.0%

CITY	ADJUSTED CITY AREA (ACRES)	PARKLAND (ACRES)	PERCENT PARKLAND
MEDIUM-LOW-DENSITY CITIES continued			
Arlington, Texas	60,876	4,714	7.7%
Tampa	70,089	5,212	7.4%
Garland	36,520	2,639	7.2%
Oklahoma City	378,472	26,004	6.9%
Lincoln	53,666	3,657	6.8%
Riverside	51,568	3,531	6.8%
Detroit	87,844	5,543	6.3%
Toledo	51,169	3,128	6.1%
Atlanta	84,250	4,991	5.9%
Glendale	38,196	2,149	5.6%
Orlando	54,494	2,947	5.4%
Norfolk	33,186	1,781	5.4%
Richmond	38,278	2,027	5.3%
Irving	37,060	1,920	5.2%
Chandler	40,580	1,544	3.8%
Gilbert	43,496	1,308	3.0%
Mesa	83,578	2,480	3.0%
Fresno	71,486	1,921	2.7%
Baton Rouge	48,353	1,252	2.6%
Laredo	55,391	1,412	2.5%
Median, MEDIUM-LOW-DENSITY CITIES:			**7.9%**
LOW-DENSITY CITIES			
Anchorage	1,086,019	914,138	84.2%
North Las Vegas	63,941	16,731	26.2%
Chesapeake	216,639	56,254	26.0%
New Orleans	107,655	27,689	25.7%
Scottsdale	117,089	28,817	24.6%
El Paso	159,763	29,872	18.7%
Virginia Beach	159,341	24,916	15.6%
Jacksonville	467,298	64,603	13.8%
Henderson	68,542	9,173	13.4%
Nashville	318,562	33,966	10.7%
Aurora	98,788	10,504	10.6%
Greensboro	80,844	7,582	9.4%
Colorado Springs	118,043	11,037	9.3%
Kansas City	195,245	17,683	9.1%
Corpus Christi	100,553	8,610	8.6%
Tulsa	123,993	9,401	7.6%
Louisville	240,264	17,608	7.3%
Bakersfield	90,527	5,362	5.9%
Fort Worth	214,065	11,878	5.5%
Reno	63,001	3,382	5.4%
Indianapolis	225,965	11,464	5.1%
Wichita	98,973	4,737	4.8%
Memphis	196,098	9,145	4.7%
Winston-Salem	83,917	3,688	4.4%
Charlotte	332,295	13,990	4.2%
Durham	68,678	2,623	3.8%
Fort Wayne	69,318	2,400	3.5%
Tucson	144,488	4,687	3.2%
Lubbock	76,929	2,228	2.9%
Lexington	180,899	4,434	2.5%
Median, LOW-DENSITY CITIES:			**8.1%**
Median, ALL CITIES:			**9.3%**

3. Parkland per 1,000 residents by city

2016

Parkland includes city, county, metro, state, and federal acres within city limits.

CITY	PARKLAND (ACRES)	PARK ACRES PER 1,000 RESIDENTS
HIGH-DENSITY CITIES		
Washington, D.C.	8,525	12.9
Minneapolis	5,064	12.4
Seattle	6,591	9.8
Los Angeles	37,405	9.5
Oakland	3,865	9.3
Baltimore	4,917	7.9
Boston	5,093	7.9
Arlington, Virginia	1,787	7.9
San Francisco	5,888	6.9
Philadelphia	10,830	6.9
Long Beach	3,124	6.6
Jersey City	1,677	6.3
Chicago	12,917	4.7
New York	39,859	4.7
Miami	1,500	3.4
Newark	847	3.0
Santa Ana	746	2.2
Hialeah	204	0.9
Median, HIGH-DENSITY CITIES:		**6.9**
MEDIUM-HIGH-DENSITY CITIES		
Honolulu	12,006	34.1
St. Paul	4,937	16.6
San Jose	16,085	15.8
Pittsburgh	3,683	11.9
St. Louis	3,721	11.7
Milwaukee	6,116	10.3
Denver	6,222	9.3
Chula Vista	2,185	8.3
Cleveland	3,002	7.8
Anaheim	2,618	7.4
Buffalo	1,913	7.3
Stockton	1,157	3.8
Median, MEDIUM-HIGH-DENSITY CITIES:		**9.8**
MEDIUM-LOW-DENSITY CITIES		
Fremont	24,089	106.7
Albuquerque	27,438	48.8
Oklahoma City	26,004	40.1
Irvine	9,427	39.1
San Diego	47,817	34.9
Phoenix	49,254	31.7
Raleigh	13,169	29.6
Las Vegas	16,700	26.6
Madison	6,372	26.1
St. Petersburg	6,159	24.4
Omaha	10,648	24.1
Houston	53,134	23.4
Portland	14,504	23.4
Austin	20,714	22.9
Cincinnati	6,891	22.6
Dallas	27,038	21.1
San Antonio	29,692	20.9
Boise	4,193	19.0
Columbus	15,155	18.0
Plano	4,275	15.3

CITY	PARKLAND (ACRES)	PARK ACRES PER 1,000 RESIDENTS
MEDIUM-LOW-DENSITY CITIES continued		
Tampa	5,212	14.4
Lincoln	3,657	13.2
Arlington, Texas	4,714	12.5
Riverside	3,531	11.2
Toledo	3,128	11.2
Garland	2,639	11.1
Atlanta	4,991	11.0
Orlando	2,947	10.8
Sacramento	4,959	10.2
Richmond	2,027	9.1
Glendale	2,149	8.9
Detroit	5,543	8.4
Irving	1,920	8.3
Norfolk	1,781	7.2
Chandler	1,544	6.0
Laredo	1,412	5.5
Baton Rouge	1,252	5.4
Gilbert	1,308	5.3
Mesa	2,480	5.2
Fresno	1,921	3.7
Median, MEDIUM-LOW-DENSITY CITIES:		**14.8**
LOW-DENSITY CITIES		
Anchorage	914,138	2,992.9
Chesapeake	56,254	233.7
Scottsdale	28,817	124.3
Jacksonville	64,603	74.5
New Orleans	27,689	71.3
North Las Vegas	16,731	70.5
Virginia Beach	24,916	54.9
Nashville	33,966	52.0
El Paso	29,872	43.2
Kansas City	17,683	36.9
Henderson	9,173	32.6
Aurora	10,504	29.4
Greensboro	7,582	26.9
Corpus Christi	8,610	26.4
Colorado Springs	11,037	24.7
Louisville	17,608	23.2
Tulsa	9,401	22.8
Winston-Salem	3,688	15.3
Fort Worth	11,878	14.3
Bakersfield	5,362	14.3
Lexington	4,434	14.2
Reno	3,382	13.9
Memphis	9,145	13.7
Indianapolis	11,464	13.4
Charlotte	13,990	13.4
Wichita	4,737	12.0
Durham	2,623	10.2
Fort Wayne	2,400	9.2
Lubbock	2,228	9.0
Tucson	4,687	8.7
Median, LOW-DENSITY CITIES:		**24.0**
Median, ALL CITIES:		**13.1**

4. Parkland per 1,000 daytime occupants by city

2016

Daytime occupants are people present in a city during normal business hours, including workers. This is in contrast to the resident population present during the evening and nighttime hours.

CITY	ACRES PER 1,000 RESIDENTS	PERCENT DAYTIME POP. GROWTH	ACRES PER 1,000 DAYTIME OCCUPANTS
Albuquerque	48.8	8%	45.2
Anaheim	7.4	16%	6.4
Anchorage	2992.9	4%	2,890.1
Arlington, Texas	12.5	-8%	13.6
Arlington, Virginia	7.9	25%	6.3
Atlanta	11.0	59%	6.9
Aurora	29.4	-16%	34.9
Austin	22.9	15%	19.9
Bakersfield	14.3	-1%	14.5
Baltimore	7.9	17%	6.8
Baton Rouge	5.4	28%	4.2
Boise	19.0	24%	15.3
Boston	7.9	40%	5.6
Buffalo	7.3	19%	6.2
Chandler	6.0	-8%	6.6
Charlotte	16.2	16%	14.0
Chesapeake	233.7	-9%	256.5
Chicago	4.7	3%	4.5
Chula Vista	8.3	-21%	10.5
Cincinnati	22.6	38%	16.3
Cleveland	7.8	28%	6.1
Colorado Springs	24.7	8%	22.9
Columbus	18.0	16%	15.5
Corpus Christi	26.4	3%	25.8
Dallas	21.1	19%	17.7
Denver	9.3	25%	7.5
Detroit	8.4	13%	7.5
Durham	10.2	18%	8.6
El Paso	43.2	3%	42.1
Fort Wayne	9.2	13%	8.2
Fort Worth	14.3	5%	13.6
Fremont	106.7	4%	102.3
Fresno	3.7	11%	3.3
Garland	11.1	-15%	13.1
Gilbert	5.3	-20%	6.7
Glendale	8.9	-4%	9.3
Greensboro	26.9	24%	21.7
Henderson	32.6	-12%	37.0
Hialeah	0.9	-8%	1.0
Honolulu	34.1	40%	24.4
Houston	23.4	33%	17.6
Indianapolis	13.4	20%	11.2
Irvine	39.1	50%	26.1
Irving	8.3	34%	6.2
Jacksonville	74.5	9%	68.5
Jersey City	6.3	-3%	6.5
Kansas City	36.9	20%	30.8
Laredo	5.5	1%	5.4
Las Vegas	26.6	-5%	27.9
Lexington	14.2	10%	13.0
Lincoln	13.2	5%	12.6
Long Beach	6.6	-5%	6.9
Los Angeles	9.5	-1%	9.6
Louisville	23.2	12%	20.8
Lubbock	9.0	6%	8.5
Madison	26.1	28%	20.4
Memphis	13.7	15%	11.9
Mesa	5.2	-10%	5.8
Miami	3.4	12%	3.1
Milwaukee	10.3	5%	9.8
Minneapolis	12.4	23%	10.1
Nashville	52.0	23%	42.4
New Orleans	71.3	14%	62.4
New York	4.7	7%	4.3
Newark	3.0	17%	2.6
Norfolk	7.2	27%	5.7
North Las Vegas	70.5	-14%	81.8
Oakland	9.3	-3%	9.6
Oklahoma City	40.1	7%	37.4
Omaha	24.1	19%	20.2
Orlando	10.8	52%	7.2
Philadelphia	6.9	7%	6.5
Phoenix	31.7	7%	29.7
Pittsburgh	11.9	41%	8.5
Plano	15.3	11%	13.8
Portland	23.4	20%	19.5
Raleigh	29.6	19%	24.8
Reno	13.9	15%	12.1
Richmond	9.1	32%	6.9
Riverside	11.2	4%	10.7
Sacramento	10.2	20%	8.5
San Antonio	20.9	10%	19.1
San Diego	34.9	13%	30.7
San Francisco	6.9	20%	5.8
San Jose	15.8	-4%	16.5
Santa Ana	2.2	2%	2.2
Scottsdale	124.3	54%	80.8
Seattle	9.8	20%	8.2
St. Louis	11.7	38%	8.5
St. Paul	16.6	14%	14.5
St. Petersburg	24.4	4%	23.5
Stockton	3.8	-4%	3.9
Tampa	14.4	44%	10.0
Toledo	11.2	6%	10.5
Tucson	8.7	9%	8.0
Tulsa	22.8	22%	18.8
Virginia Beach	54.9	-8%	59.4
Washington	12.9	74%	7.4
Wichita	12.0	9%	11.0
Winston-Salem	15.3	20%	12.8
Median, ALL CITIES:	**13.1**	**12%**	**11.6**

5. Parks per 10,000 residents by city

2016

Parks include all city, county, metro, state, and federal parkland within city limits.

CITY	PARKS	PARKS PER 10,000 RESIDENTS
Madison	282	11.6
Arlington, Virginia	210	9.2
Cincinnati	272	8.9
Atlanta	405	8.9
St. Petersburg	218	8.6
Las Vegas	512	8.2
Buffalo	208	8.0
St. Paul	223	7.5
Anchorage	228	7.5
Pittsburgh	214	6.9
Norfolk	168	6.8
Seattle	457	6.8
Lincoln	188	6.8
Baltimore	421	6.8
Virginia Beach	298	6.6
Boston	419	6.5
Greensboro	178	6.3
Corpus Christi	203	6.2
Washington, D.C.	409	6.2
New Orleans	239	6.2
Boise	133	6.0
Denver	384	5.7
Omaha	248	5.6
Portland	334	5.4
Tampa	192	5.3
Irving	122	5.2
Columbus	440	5.2
Albuquerque	291	5.2
Raleigh	218	4.9
Richmond	108	4.9
Sacramento	232	4.8
Kansas City	229	4.8
Chesapeake	115	4.8
Jacksonville	412	4.8
Detroit	307	4.7
Reno	114	4.7
Mesa	222	4.7
Toledo	130	4.7
Colorado Springs	207	4.6
Orlando	123	4.5
Nashville	291	4.5
Minneapolis	179	4.4
Oakland	166	4.0
Baton Rouge	92	4.0
San Francisco	337	4.0
Glendale	95	3.9
Honolulu	136	3.9
Milwaukee	224	3.8
El Paso	261	3.8
Laredo	97	3.7

CITY	PARKS	PARKS PER 10,000 RESIDENTS
Austin	330	3.7
St. Louis	113	3.5
Newark	99	3.5
Long Beach	168	3.5
Miami	153	3.5
Lexington	106	3.4
Wichita	133	3.4
Tulsa	137	3.3
Fort Worth	274	3.3
Fort Wayne	86	3.3
San Diego	451	3.3
Lubbock	81	3.3
Aurora	116	3.2
Cleveland	122	3.2
Winston-Salem	76	3.1
Riverside	98	3.1
Memphis	205	3.1
Tucson	165	3.1
Dallas	388	3.0
Plano	84	3.0
Charlotte	243	2.8
Chicago	767	2.8
Garland	66	2.8
Irvine	66	2.7
Durham	70	2.7
Jersey City	71	2.7
New York	2,263	2.6
Fremont	59	2.6
Houston	580	2.6
Chandler	65	2.5
Indianapolis	211	2.5
Oklahoma City	160	2.5
San Jose	248	2.4
Arlington, Texas	92	2.4
Philadelphia	371	2.4
Henderson	66	2.3
Chula Vista	60	2.3
Stockton	67	2.2
North Las Vegas	50	2.1
San Antonio	291	2.1
Bakersfield	73	1.9
Anaheim	66	1.9
Scottsdale	42	1.8
Louisville	126	1.7
Los Angeles	604	1.5
Gilbert	37	1.5
Phoenix	231	1.5
Santa Ana	46	1.4
Fresno	69	1.3
Hialeah	28	1.2

Total	**22,764**	
Median		**3.7**

6. Percent of city population with walkable park access

2016

Park access is the ability to reach a publicly owned park within a half mile walk on the road network, unobstructed by freeways, rivers, fences, and other obstacles. For methodology, detailed analysis, and maps of cities' park-poor areas, visit ***parkscore.org****.*

CITY	RESIDENTS WITHIN 1/2 MILE OF A PARK	RESIDENTS BEYOND 1/2 MILE OF A PARK	PERCENT OF POPULATION WITH WALKABLE PARK ACCESS
CITIES WITH 90–99% ACCESS			
San Francisco	836,769	10,807	99%
Boston	634,333	13,918	98%
Arlington, Virginia	222,562	4,955	98%
Washington, D.C.	641,696	17,414	97%
New York	8,312,489	255,497	97%
St. Paul	286,004	11,106	96%
Minneapolis	388,359	19,967	95%
Philadelphia	1,464,502	107,358	93%
Seattle	623,877	46,634	93%
Chicago	2,549,099	223,258	92%
Jersey City	243,023	22,695	91%
Newark	253,229	26,431	91%
St. Louis	286,694	32,028	90%
Madison	218,899	25,068	90%
CITIES WITH 80–89% ACCESS			
Milwaukee	519,292	73,243	88%
Lincoln	237,469	39,185	86%
Aurora	306,911	50,890	86%
Denver	572,658	96,023	86%
Baltimore	528,958	91,652	85%
Buffalo	221,165	39,182	85%
Oakland	351,147	63,068	85%
Portland	525,463	95,101	85%
Pittsburgh	259,449	49,662	84%
Honolulu	294,059	57,661	84%
Albuquerque	461,286	100,929	82%
Long Beach	382,388	93,865	80%
CITIES WITH 70–79% ACCESS			
Miami	345,570	90,052	79%
Cleveland	304,565	79,424	79%
Sacramento	381,803	103,384	79%
Omaha	344,603	97,100	78%
San Diego	1,065,979	304,667	78%
Detroit	509,955	146,206	78%
New Orleans	297,132	91,408	76%
Toledo	211,998	67,219	76%
Irvine	181,608	59,494	75%
Richmond	164,197	57,874	74%
Plano	206,746	73,580	74%
St. Petersburg	183,165	69,243	73%
Corpus Christi	235,467	90,475	72%
Glendale	173,970	67,049	72%
San Jose	729,315	287,917	72%
Cincinnati	217,843	86,990	71%
Norfolk	175,799	70,263	71%
Reno	173,396	70,546	71%
Anchorage	216,990	88,449	71%
Stockton	217,105	88,616	71%
Santa Ana	238,917	100,044	70%
Las Vegas	437,199	190,050	70%

CITY	RESIDENTS WITHIN 1/2 MILE OF A PARK	RESIDENTS BEYOND 1/2 MILE OF A PARK	PERCENT OF POPULATION WITH WALKABLE PARK ACCESS
CITIES WITH 50–69% ACCESS			
Colorado Springs	309,876	136,072	69%
Atlanta	299,829	155,216	66%
Kansas	311,646	167,721	65%
Mesa	302,379	172,895	64%
Fremont	139,533	86,282	62%
Hialeah	140,609	87,047	62%
Anaheim	215,304	138,437	61%
Boise	132,878	88,040	60%
Tampa	215,315	146,249	60%
Greensboro	167,376	114,839	59%
Virginia Beach	264,529	189,418	58%
North Las Vegas	137,409	99,843	58%
Dallas	743,068	540,695	58%
Orlando	157,298	114,712	58%
Irving	133,013	99,624	57%
Tucson	302,770	234,762	56%
Garland	133,311	105,473	56%
Tulsa	228,791	183,089	56%
Chandler	142,873	114,362	56%
Arlington, Texas	207,795	170,647	55%
Los Angeles	2,162,026	1,775,875	55%
Fort Worth	453,859	373,882	55%
Fresno	280,269	240,503	54%
Raleigh	238,720	205,551	54%
Lubbock	130,667	115,768	53%
Chula Vista	136,176	127,364	52%
Columbus	434,648	409,083	52%
Lexington	158,282	154,108	51%
Wichita	199,253	196,105	50%
Baton Rouge	116,009	115,213	50%
CITIES WITH LESS THAN 50% ACCESS			
Henderson	138,714	142,933	49%
El Paso	340,569	351,644	49%
Laredo	126,676	132,375	49%
Houston	1,091,367	1,176,928	48%
Austin	432,852	470,901	48%
Durham	122,876	134,369	48%
Riverside	145,638	169,508	46%
Phoenix	705,014	850,621	45%
Bakersfield	159,289	216,862	42%
Oklahoma City	272,624	376,434	42%
Fort Wayne	108,625	152,511	42%
Memphis	276,563	390,160	41%
Nashville	250,149	403,203	38%
Chesapeake	91,606	149,134	38%
Scottsdale	86,493	145,336	37%
San Antonio	511,442	905,922	36%
Winston-Salem	83,476	158,328	35%
Louisville	125,357	241,978	34%
Indianapolis	276,955	575,425	32%
Jacksonville	279,715	587,512	32%
Charlotte	224,181	600,681	27%
Gilbert	65,033	181,303	26%

City park facts at a glance

Total spending on parks in the 100 largest US cities

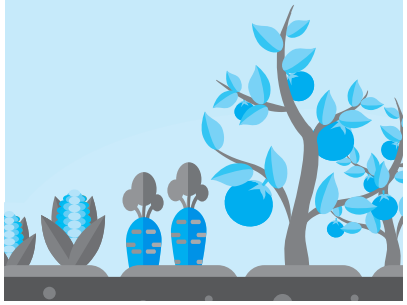
$7,091,697,899

Total off-leash dog parks

731

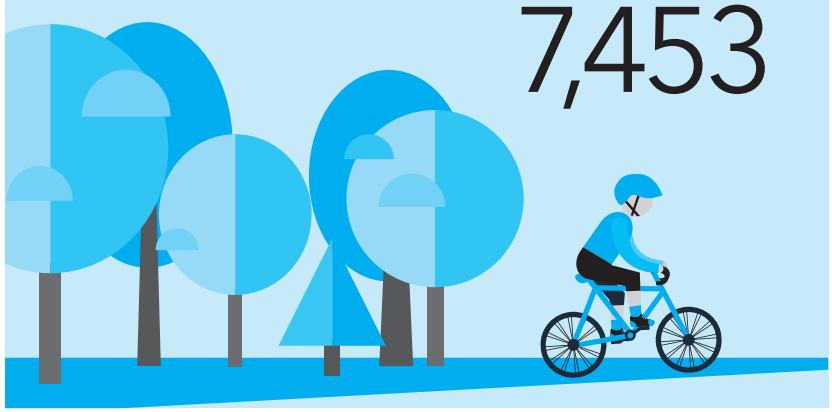
Total community garden plots

23,883



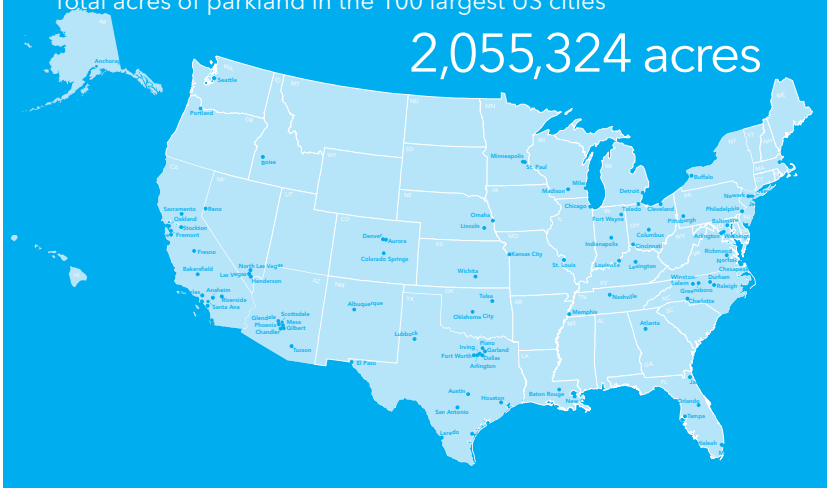
Total miles of bikeway managed by park agencies

7,453



Total acres of parkland in the 100 largest US cities

2,055,324 acres



Total basketball hoops

17,555

City park facts at a glance

Median size of a city park

3.8 acres

Total playgrounds

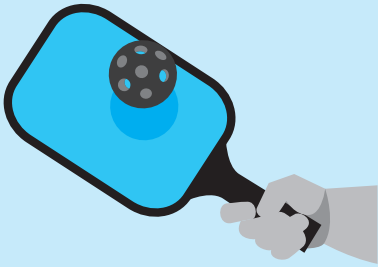
13,554

Percent of people living in the 100 largest US cities that are within a 10-minute walk to a park

69%

Total pickleball courts

420

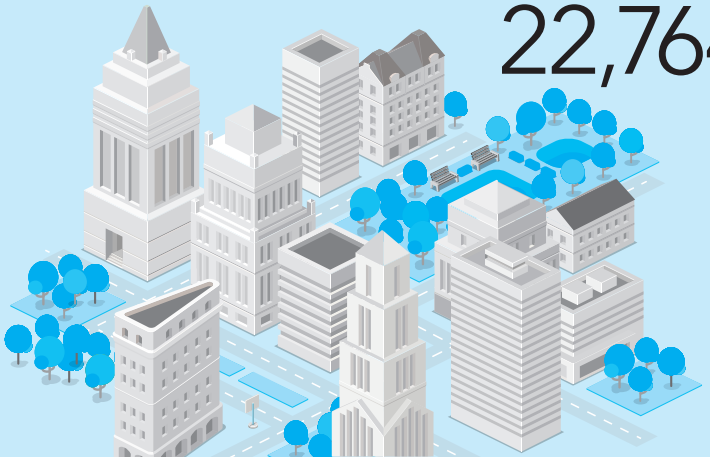


Total skate parks

365

Total number of parks in the 100 largest US cities

22,764



The 100 most populous cities

DARCY KIEFEL

A woman walks her dogs along Erie Park in Chicago, IL

PHIL SCHERMEISTER

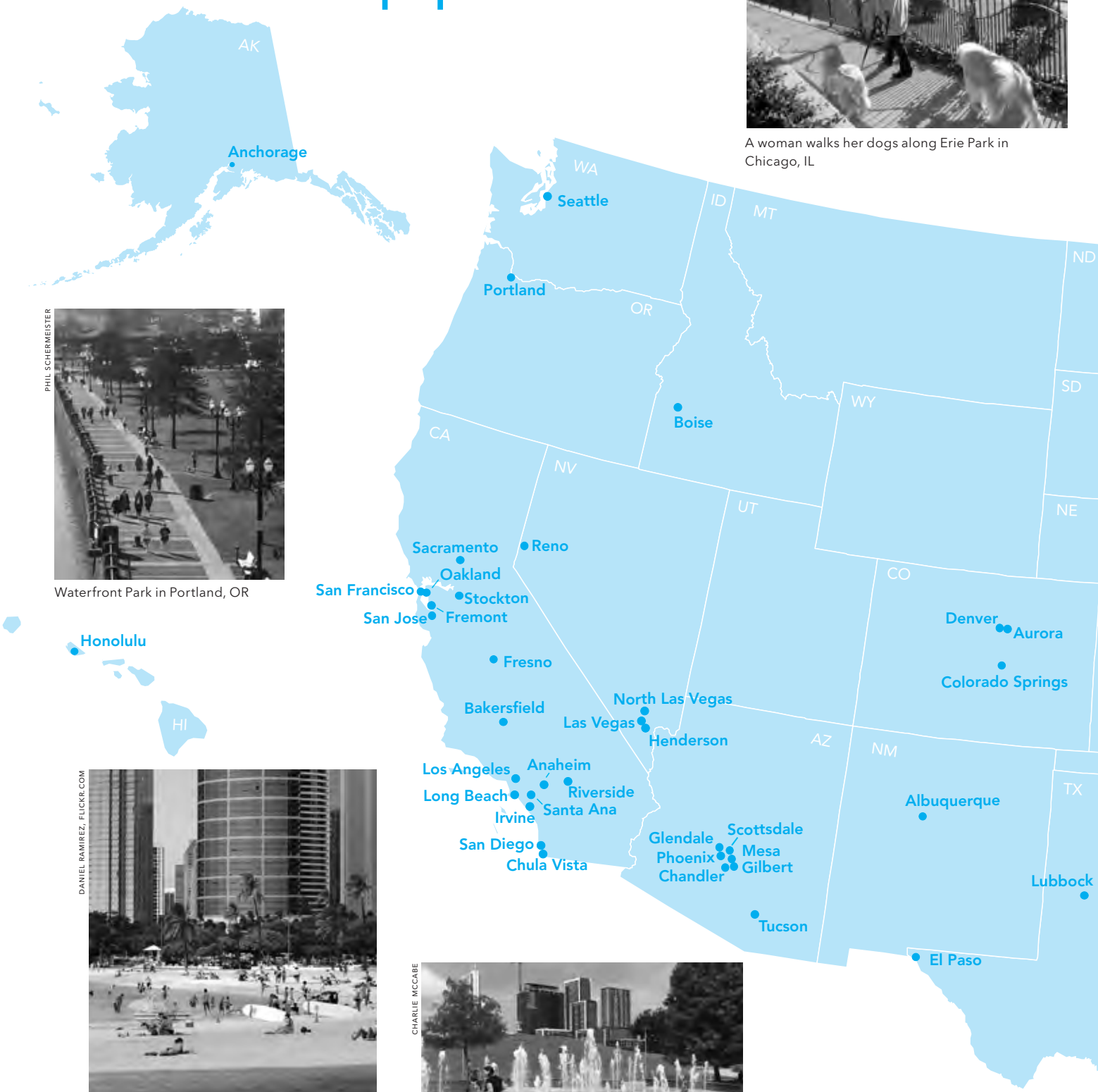
Waterfront Park in Portland, OR

DANIEL RAMIREZ, FLICKR.COM

Ala Moana Regional Park in Honolulu, HI

CHARLIE MCCABE

Butler Park in Austin, TX

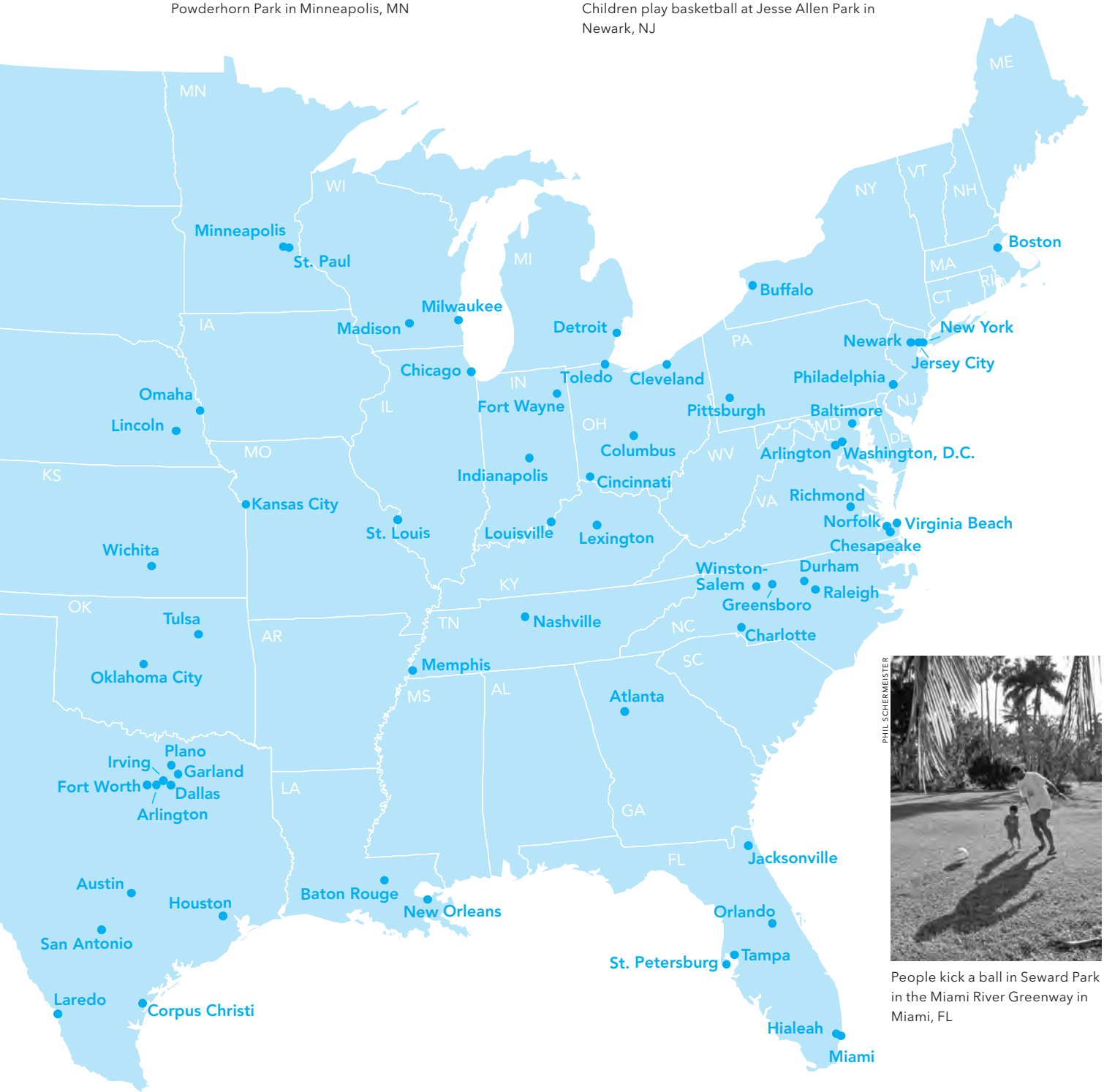


MICHAEL HICKS, FLICKR.COM

Powderhorn Park in Minneapolis, MN

ERIN MAGUIRE

Children play basketball at Jesse Allen Park in Newark, NJ



PHIL SCHERMEISTER

People kick a ball in Seward Park in the Miami River Greenway in Miami, FL

7. Spending on parks and recreation per resident by city

MOST RECENTLY REPORTED FISCAL YEAR

Total spending includes both operating and capital spending of all park agencies in the city, but excludes professional stadiums, zoos, museums, aquariums, and cemeteries. If a city has more than one agency, expenditures are combined.
For a more detailed listing of fiscal year data by city, visit ***tpl.org/cityparkfacts****.*

CITY	TOTAL SPENDING	OPERATING SPENDING PER RESIDENT	CAPITAL SPENDING PER RESIDENT	TOTAL SPENDING PER RESIDENT
St. Louis	$152,346,599	$96	$382	$478
Irvine	63,821,241	215	50	265
Raleigh	114,444,690	114	144	258
Seattle	168,833,508	204	47	252
Long Beach	119,089,218	134	116	250
San Francisco	204,544,270	196	46	241
Arlington, Virginia	54,763,324	205	36	241
Minneapolis	98,011,172	190	50	240
Washington, D.C.	156,754,222	169	69	238
St. Paul	65,739,838	165	56	221
Cincinnati	63,615,728	142	67	209
Plano	53,349,348	104	86	190
Virginia Beach	85,656,248	141	48	189
Portland	109,500,536	158	19	176
Chicago	479,537,059	139	34	173
New York*	1,430,320,643	120	47	167
Boise	36,497,258	126	40	166
New Orleans*	60,747,440	108	49	156
Oakland	63,789,085	119	35	154
Milwaukee	88,161,012	98	51	149
Fremont*	32,941,523	116	30	146
Aurora	51,885,286	103	42	145
San Jose	145,671,531	72	71	143
Atlanta	61,319,669	123	12	135
St. Petersburg	33,847,909	134	0	134
Henderson	36,269,046	124	5	129
Miami	55,556,652	53	74	128
San Diego	173,221,629	112	14	126
Madison	30,277,947	91	34	124
Sacramento	59,566,563	108	15	123
Kansas City	58,214,300	92	29	121
Anchorage	36,565,914	89	31	120
Dallas	149,488,193	93	23	116
Nashville	76,054,310	57	59	116
Orlando	31,625,502	110	7	116
Las Vegas	72,845,787	88	28	116
Denver	77,379,491	90	26	116
Scottsdale	26,200,000	113	0	113
Tampa*	39,533,786	86	24	109
San Antonio	149,783,488	70	36	106
Columbus	84,324,879	56	44	100
Pittsburgh*	30,484,661	73	26	99
Cleveland	37,332,315	81	16	97
Austin	85,182,254	72	22	94
Colorado Springs	40,974,890	54	38	92
Chesapeake	21,467,896	77	12	89
Fort Wayne	22,651,197	75	11	87
Lincoln	23,984,829	62	25	87
Gilbert	20,689,566	66	18	84
Arlington, Texas	31,354,312	70	13	83

7. Spending on parks and recreation per resident by city (cont.)

CITY	TOTAL SPENDING	OPERATING SPENDING PER RESIDENT	CAPITAL SPENDING PER RESIDENT	TOTAL SPENDING PER RESIDENT
Boston	$ 53,605,173	$56	$26	$83
Anaheim	28,597,483	61	20	81
Lexington	24,844,066	73	7	80
Omaha	34,783,264	62	17	79
Oklahoma City	50,844,757	54	24	78
Los Angeles	305,987,230	62	16	78
Bakersfield	28,366,679	63	13	75
Phoenix	116,275,049	60	14	75
Richmond*	16,489,444	74	0	74
Chandler	18,985,474	53	21	74
Fort Worth	60,853,844	44	29	74
Garland	17,227,197	45	27	72
Corpus Christi	23,379,351	67	5	72
Norfolk	17,637,239	67	5	72
Mesa	33,601,000	63	7	71
Baltimore	41,909,871	67	1	68
Durham	16,631,925	56	9	65
Greensboro	18,139,667	63	1	64
Tucson	33,851,752	62	1	63
Riverside	19,059,275	57	3	60
Irving	13,500,000	56	2	58
Baton Rouge	13,014,955	39	18	56
Tulsa	22,793,093	48	7	55
Albuquerque	30,640,515	47	8	54
North Las Vegas*	12,775,731	54	0	54
Louisville	40,656,663	39	15	54
Wichita	21,020,887	46	7	53
Philadelphia*	82,215,849	52	0	52
Memphis*	34,499,101	46	6	52
Indianapolis*	42,843,767	41	9	50
Reno	12,235,141	47	3	50
Buffalo	11,977,478	30	16	46
Charlotte	46,437,562	35	10	45
Fresno*	22,801,309	24	20	44
Hialeah	9,812,101	43	0	43
Lubbock	10,600,550	43	0	43
Santa Ana	14,107,952	37	4	42
Honolulu	14,451,797	40	1	41
Toledo	11,415,747	38	3	41
Chula Vista	10,680,841	41	0	41
Winston-Salem	9,496,295	39	0	39
Stockton	11,187,336	33	3	37
Jacksonville	31,605,219	33	3	36
Houston	74,624,150	30	3	33
El Paso	21,747,063	31	0	31
Detroit	19,177,000	29	1	29
Newark	7,641,876	8	19	27
Glendale	5,500,417	23	0	23
Jersey City	4,950,000	14	5	19
Laredo	N.A.	N.A.	N.A.	N.A.
Total, All Cities	**$7,091,697,899**			
Median, All Cities		**$66**	**$16**	**$83**

N.A.= not available *Cities for which some spending is calculated based on prior-year information.

8. Spending on parks and recreation by city, reflecting primary agency spending and price of living

MOST RECENTLY REPORTED FISCAL YEAR

Total spending includes both operating and capital spending by all park agencies in the city, but excludes professional sports stadiums, zoos, museums, aquariums, and cemeteries. If a city has more than one agency, expenditures are combined. For a more detailed listing of fiscal year data by city, visit ***tpl.org/cityparkfacts.***

The adjusted spending reflecting price of living is calculated using the Center for Neighborhood Technology Housing and Transportation Affordability Index. Price of living is based on median housing and transportation costs.

Boston, Cincinnati, New Orleans, and Washington, D.C. have two primary city park agencies.

CITY	PRIMARY AGENCY SPENDING AS PERCENT OF TOTAL PARK SPENDING	TOTAL SPENDING PER RESIDENT	SPENDING PER RESIDENT, ADJUSTED TO REFLECT PRICE OF LIVING
St. Louis	16%	$478	$590
Raleigh	100%	258	248
Cincinnati	99%	209	244
Minneapolis	100%	240	241
St. Paul	100%	221	227
Seattle	100%	252	217
Long Beach	100%	250	210
Washington, D.C.	100%	238	208
San Francisco	87%	241	194
Arlington, Virginia	82%	241	179
Boise	100%	165	174
Milwaukee	82%	149	174
Irvine	95%	265	174
New York*	92%	167	174
Chicago	98%	173	173
Portland	88%	176	167
New Orleans*	34%	156	161
Plano	100%	190	157
Virginia Beach	96%	189	154
Aurora	100%	145	141
St. Petersburg	100%	134	138
Miami	84%	128	137
Oakland	85%	154	133
Atlanta	87%	135	131
Cleveland	68%	97	130
Kansas City	96%	121	128
Pittsburgh	96%	99	124
Madison	98%	124	122
Orlando	98%	116	119
Nashville	96%	116	119
Dallas	65%	116	119
Denver	100%	116	115
Sacramento	85%	123	114
San Antonio	90%	106	111
Columbus	95%	100	110
Las Vegas	100%	116	109
Tampa*	91%	109	107
Henderson	100%	129	106
Fort Wayne	100%	87	102
Lincoln	100%	87	95
San Diego	90%	126	95
San Jose	79%	143	94
Fremont*	67%	146	93
Anchorage	100%	120	92
Colorado Springs	97%	92	90
Austin	99%	94	87
Scottsdale	100%	$113	$86

8. Spending on parks and recreation by city, reflecting primary agency spending and price of living (cont.)

CITY	PRIMARY AGENCY SPENDING AS PERCENT OF TOTAL PARK SPENDING	TOTAL SPENDING PER RESIDENT	SPENDING PER RESIDENT, ADJUSTED TO REFLECT PRICE OF LIVING
Lexington	99%	80	85
Oklahoma City	92%	78	83
Arlington, Texas	100%	83	83
Omaha	100%	79	81
Boston	81%	83	80
Richmond*	100%	74	77
Baltimore	91%	68	75
Corpus Christi	96%	72	74
Phoenix	100%	75	73
Tucson	89%	63	72
Fort Worth	100%	74	72
Greensboro*	85%	64	72
Chesapeake	95%	89	71
Mesa	100%	71	71
Norfolk	100%	72	71
Garland	100%	72	71
Durham	100%	65	69
Bakersfield	81%	75	68
Gilbert	100%	84	68
Chandler	100%	74	65
Los Angeles	91%	78	64
Buffalo	98%	46	63
Philadelphia*	70%	52	63
Anaheim	100%	81	62
Baton Rouge	100%	56	61
Tulsa	65%	55	60
Irving	100%	58	59
Wichita	100%	53	59
Albuquerque	67%	54	58
Louisville	75%	54	57
Indianapolis*	97%	50	56
Memphis*	84%	52	56
Riverside	100%	60	50
Toledo	96%	41	49
North Las Vegas*	100%	54	49
Reno	86%	50	49
Lubbock	100%	43	47
Hialeah	100%	43	45
Winston-Salem	100%	39	44
Fresno*	100%	44	43
Charlotte	100%	45	43
Jacksonville	87%	36	36
Santa Ana	95%	42	36
Detroit	100%	29	35
El Paso	96%	31	35
Stockton	100%	37	34
Honolulu	96%	41	34
Houston	99%	33	33
Newark	100%	27	32
Chula Vista	97%	41	30
Jersey City	11%	19	18
Glendale	100%	23	18
Laredo	N.A.	N.A.	N.A.
Median		**$83**	**$83**

*Cities for which some spending is calculated based on prior-year information.

9. Designed and natural parkland by city

2016

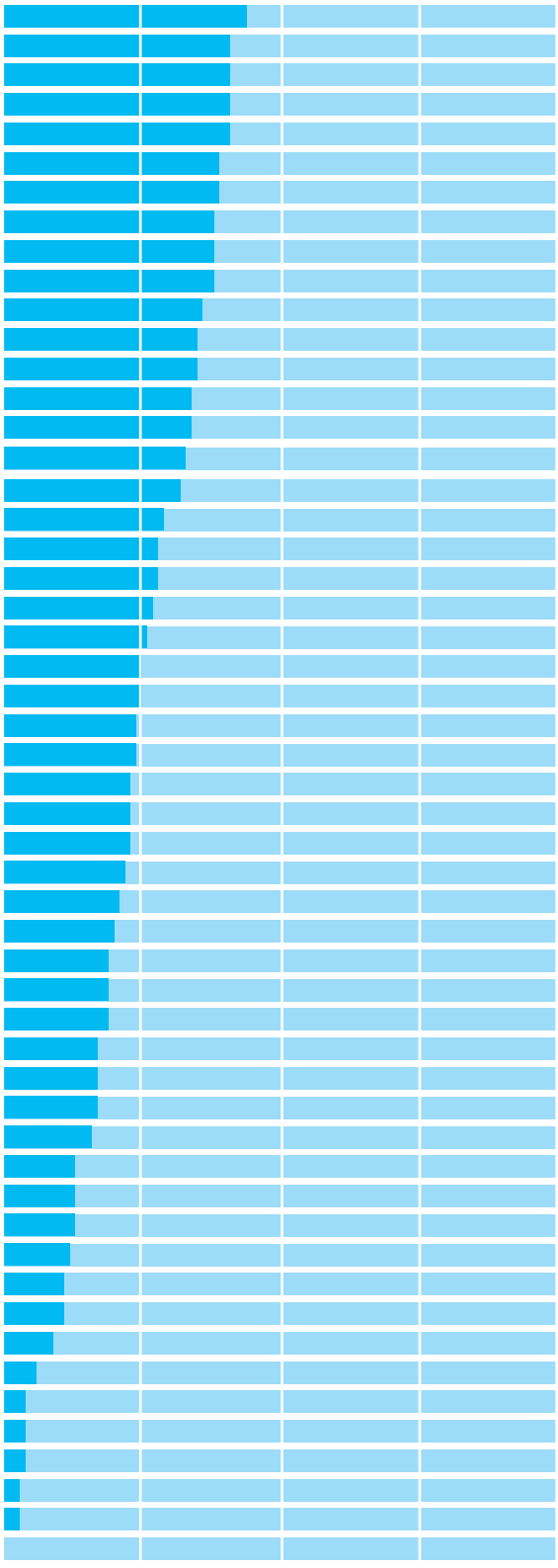
Designed areas are parklands that have been created, constructed, planted, and managed primarily for human use. They include playgrounds, neighborhood parks, sports fields, plazas, boulevards, municipal golf courses, municipal cemeteries, and all areas served by roadways, parking lots, and service buildings.

Natural and undeveloped areas are either pristine or reclaimed lands that are left largely undisturbed and managed for their ecological value (i.e., wetlands, forests, deserts). While they may have trails and occasional benches, they are not developed for any recreation activities beyond walking, running, and cycling.

CITY	DESIGNED PARKLAND (ACRES)	NATURAL PARKLAND (ACRES)
Hialeah	204	0
Newark	847	0
Richmond	2,027	0
Detroit	5,512	31
Stockton	1,129	28
Baton Rouge	1,171	81
Minneapolis	4,530	534
Winston-Salem	3,266	422
Norfolk	1,553	228
Orlando	2,538	409
St. Louis	3,154	567
Seattle	5,567	1,024
Lubbock	1,877	351
Buffalo	1,609	304
Lincoln	3,069	588
Omaha	8,613	2,035
Chandler	1,242	302
Long Beach	2,424	700
Irving	1,475	445
Tucson	3,532	1,155
Atlanta	3,687	1,304
Laredo	1,041	371
Denver	4,572	1,650
Mesa	1,624	856
Santa Ana	479	267
Fresno	1,213	708
Baltimore	3,079	1,838
Fort Wayne	1,500	900
Fort Worth	7,308	4,570
Greensboro	4,574	3,008
Plano	2,552	1,723
Toledo	1,727	1,401
Lexington	2,440	1,994
Wichita	2,601	2,136
Chicago	7,083	5,834
Durham	1,430	1,193
Garland	1,397	1,242
Columbus	7,943	7,212
Boston	2,549	2,544
Cleveland	1,493	1,509
Milkwaukee	3,038	3,078
San Francisco	2,795	3,093
New York	18,715	21,144
Miami	701	799
Cincinnati	3,209	3,682
Austin	9,330	11,384
Glendale	964	1,185

9. Designed and natural parkland by city (cont.)

CITY	DESIGNED PARKLAND (ACRES)	NATURAL PARKLAND (ACRES)
Indianapolis	4,997	6,467
Philadelphia	4,455	6,375
Washington, D.C.	3,499	5,026
Madison	2,612	3,760
Dallas	10,974	16,064
Arlington, Virginia	701	1,086
Tampa	2,036	3,176
Corpus Christi	3,310	5,300
Sacramento	1,886	3,073
Kansas City	6,673	11,010
St. Paul	1,761	3,176
Boise	1,438	2,650
Arlington, Texas	1,654	3,060
Oklahoma City	8,793	17,211
St. Petersburg	2,069	4,090
Oakland	640	1,300
Gilbert	423	885
Memphis	2,661	6,484
Louisville	4,977	12,631
San Antonio	8,209	21,483
Los Angeles	10,100	27,305
Tulsa	2,438	6,963
Pittsburgh	921	2,762
Chula Vista	540	1,645
Portland	3,539	10,965
Aurora	2,557	7,947
Reno	790	2,592
Riverside	809	2,722
Jersey City	383	1,294
Houston	11,506	41,628
Irvine	1,944	7,483
Colorado Springs	2,212	8,825
Raleigh	2,474	10,695
Charlotte	2,612	11,378
San Diego	8,893	38,924
Anaheim	456	2,162
Bakersfield	911	4,451
Las Vegas	2,798	13,902
Nashville	5,410	28,556
San Jose	2,082	14,003
Virginia Beach	3,181	21,735
Jacksonville	8,116	56,487
Henderson	1,096	8,077
Phoenix	5,644	43,610
Albuquerque	3,094	24,344
Honolulu	1,055	10,951
El Paso	1,927	27,945
New Orleans	1,058	26,631
Fremont	850	23,239
Chesapeake	1,982	54,272
Scottsdale	974	27,843
North Las Vegas	441	16,290
Anchorage	2,417	911,721



10. Playgrounds per 10,000 residents

2016

Park playgrounds do not include school playgrounds. If a city has more than one park agency, their playgrounds are combined.

CITY	PARK PLAYGROUNDS	PLAYGROUNDS PER 10,000 RESIDENTS
Madison	173	7.1
Cincinnati	152	5.0
Detroit	309	4.7
Omaha	193	4.4
Norfolk	103	4.2
Virginia Beach	189	4.2
Corpus Christi	135	4.1
Pittsburgh	128	4.1
Glendale	97	4.0
Sacramento	193	4.0
Greensboro	104	3.7
Cleveland	141	3.7
Arlington, Virginia	80	3.5
Boise	77	3.5
Jacksonville	285	3.3
Lincoln	90	3.3
Irving	75	3.2
Baltimore	200	3.2
St. Petersburg	78	3.1
Henderson	86	3.1
Colorado Springs	136	3.0
Atlanta	138	3.0

CITY	PARK PLAYGROUNDS	PLAYGROUNDS PER 10,000 RESIDENTS
Bakersfield	111	3.0
Chula Vista	77	2.9
Boston	187	2.9
Albuquerque	161	2.9
Baton Rouge	66	2.9
Las Vegas	179	2.9
Richmond	63	2.8
Toledo	79	2.8
Irvine	67	2.8
Anchorage	84	2.8
Minneapolis	112	2.7
Milwaukee	162	2.7
Tulsa	112	2.7
El Paso	187	2.7
St. Paul	78	2.6
San Jose	267	2.6
Plano	70	2.5
New Orleans	97	2.5
Orlando	67	2.5
Lubbock	60	2.4
Louisville	185	2.4
Kansas City	116	2.4

11. Basketball hoops per 10,000 residents

2016

Basketball hoops do not include hoops on school grounds. If a city has more than one park agency, their basketball hoops are combined.

CITY	BASKETBALL HOOPS	HOOPS PER 10,000 RESIDENTS
Madison	239	9.8
Norfolk	203	8.2
St. Paul	220	7.4
Richmond	146	6.6
Buffalo	165	6.3
Cleveland	230	6.0
Milwaukee	339	5.7
Honolulu	200	5.7
Raleigh	243	5.5
Omaha	234	5.3
Baton Rouge	117	5.1
Cincinnati	152	5.0
Orlando	134	4.9
Tampa	176	4.9
Glendale	112	4.6
St. Petersburg	107	4.2
Arlington, Virginia	94	4.1
Philadelphia	640	4.1
Washington, D.C.	265	4.0
Colorado Springs	178	4.0
Chicago	1,076	3.9
Lexington	121	3.9

CITY	BASKETBALL HOOPS	HOOPS PER 10,000 RESIDENTS
Reno	94	3.9
Portland	237	3.8
New York	3,110	3.6
Pittsburgh	112	3.6
Henderson	100	3.6
Stockton	108	3.5
Minneapolis	143	3.5
Boston	219	3.4
Virginia Beach	151	3.3
Lincoln	92	3.3
Chandler	84	3.3
Miami	142	3.3
Detroit	208	3.2
Hialeah	71	3.1
Nashville	202	3.1
Riverside	96	3.0
Memphis	188	2.8
Atlanta	128	2.8
San Diego	385	2.8
Mesa	130	2.7
Corpus Christi	89	2.7
Sacramento	129	2.7

12. Off-leash dog parks per 100,000 residents

2016

If a city has more than one park agency, their dog parks are combined.

CITY	OFF-LEASH DOG PARKS	OFF-LEASH DOG PARKS PER 100,000 RESIDENTS
Boise	15	6.8
Henderson	15	5.3
Portland	33	5.3
Norfolk	12	4.9
Las Vegas	26	4.1
Madison	10	4.1
San Francisco	32	3.8
Arlington, Virginia	8	3.5
Tampa	12	3.3
St. Petersburg	6	2.4
Albuquerque	13	2.3
Anchorage	7	2.3
Sacramento	11	2.3
Pittsburgh	7	2.3
Jersey City	6	2.3
Bakersfield	8	2.1
Seattle	14	2.1
Chesapeake	5	2.1
Long Beach	9	1.9
Colorado Springs	8	1.8
Minneapolis	7	1.7
Washington, D.C.	11	1.7

CITY	OFF-LEASH DOG PARKS	OFF-LEASH DOG PARKS PER 100,000 RESIDENTS
Lexington	5	1.6
St. Louis	5	1.6
Chandler	4	1.6
New York	133	1.6
Denver	10	1.5
Tucson	8	1.5
Lincoln	4	1.4
St. Paul	4	1.3
Austin	12	1.3
Cincinnati	4	1.3
Scottsdale	3	1.3
Riverside	4	1.3
Glendale	3	1.2
San Diego	16	1.2
Durham	3	1.2
Fresno	6	1.2
Chula Vista	3	1.1
Orlando	3	1.1
Atlanta	5	1.1
Boston	7	1.1
Nashville	7	1.1
San Jose	10	1.0

13. Recreation and senior centers per 20,000 residents

2016

If a city has more than one park agency, their recreation and senior centers are combined.

CITY	RECREATION AND SENIOR CENTERS	CENTERS PER 20,000 RESIDENTS
Baton Rouge	33	2.9
Minneapolis	51	2.5
Washington, D.C.	75	2.3
Cincinnati	34	2.2
Philadelphia	163	2.1
Norfolk	25	2.0
Tampa	34	1.9
Honolulu	33	1.9
Chicago	245	1.8
St. Paul	26	1.8
Richmond	19	1.7
Pittsburgh	26	1.7
Raleigh	37	1.7
Hialeah	18	1.6
Miami	34	1.6
Orlando	21	1.5
Arlington, Virginia	17	1.5
Atlanta	34	1.5
Irvine	18	1.5
Jacksonville	61	1.4
Winston-Salem	17	1.4
Baltimore	41	1.3

CITY	RECREATION AND SENIOR CENTERS	CENTERS PER 20,000 RESIDENTS
St. Petersburg	16	1.3
Oakland	26	1.3
Cleveland	22	1.1
Riverside	18	1.1
Long Beach	27	1.1
Los Angeles	219	1.1
Albuquerque	30	1.1
San Jose	54	1.1
Boise	11	1.0
Sacramento	24	1.0
Jersey City	13	1.0
San Diego	67	1.0
Boston	31	1.0
Memphis	31	0.9
Milwaukee	27	0.9
Denver	30	0.9
Santa Ana	15	0.9
Irving	10	0.9
Newark	12	0.9
Greensboro	12	0.9
Chesapeake	10	0.8
Nashville	27	0.8

14. Snapshot tables

2016

*If a city has more than one agency, their facilities are combined. For the full tables, visit **tpl.org/cityparkfacts**.*

Ball diamonds per 10,000 residents

CITY	BALL DIAMONDS	BALL DIAMONDS PER 10,000 RESIDENTS
St. Paul	159	5.4
Minneapolis	195	4.8
Pittsburgh	128	4.1
Cincinnati	119	3.9
St. Louis	120	3.8
Cleveland	142	3.7
Omaha	158	3.6
Chesapeake	86	3.6
Norfolk	86	3.5
Tampa	125	3.5

Ball diamonds include both baseball and softball diamonds.

Beaches per 100,000 residents

CITY	BEACHES	BEACHES PER 100,000 RESIDENTS
Madison	12	4.9
Virginia Beach	14	3.1
Minneapolis	12	2.9
Corpus Christi	7	2.1
St. Petersburg	5	2.0
San Diego	26	1.9
Long Beach	9	1.9
Boston	12	1.9
Seattle	9	1.3
Cleveland	5	1.3

CATHERINE WINT

Sherman Avenue Community Garden in the Bronx, NY

Community garden plots per 1,000 residents

CITY	COMMUNITY GARDEN PLOTS	PLOTS PER 1,000 RESIDENTS
Portland	2,246	3.6
Washington, D.C.	2,300	3.5
Madison	739	3.0
Milwaukee	1,078	1.8
Seattle	1,113	1.7
San Francisco	1,384	1.6
Arlington, Virginia	301	1.3
Long Beach	574	1.2
San Jose	1,014	1.0
Baltimore	550	0.9

Disc golf courses per 100,000 residents

CITY	DISC GOLF COURSES	COURSES PER 100,000 RESIDENTS
Tulsa	7	1.7
Durham	4	1.6
Charlotte	14	1.3
Lexington	4	1.3
Fort Wayne	3	1.1
Orlando	3	1.1
Kansas City	5	1.0
Cincinnati	3	1.0
Anchorage	3	1.0
Richmond	2	0.9

Nature centers per 100,000 residents

CITY	NATURE CENTERS	NATURE CENTERS PER 100,000 RESIDENTS
Cincinnati	6	2.0
Fremont	4	1.8
Colorado Springs	6	1.3
Arlington, Virginia	3	1.3
Irvine	3	1.2
St. Petersburg	3	1.2
Anaheim	4	1.1
Portland	7	1.1
Raleigh	5	1.1
Virginia Beach	5	1.1

14. Snapshot tables (cont.)

Pickleball courts per 20,000 residents

CITY	PICKLEBALL COURTS	PICKLEBALL COURTS PER 20,000 RESIDENTS
St. Paul	30	2.0
Madison	21	1.7
Omaha	31	1.4
Chesapeake	16	1.3
Albuquerque	37	1.3
Baton Rouge	12	1.0
Minneapolis	19	0.9
Virginia Beach	18	0.8
Colorado Springs	16	0.7
Cincinnati	10	0.7

MICHAEL D. MARTIN, FLICKR.COM

A pickleball tournament

Skateboard parks per 100,000 residents

CITY	SKATEBOARD PARKS	SKATEBOARD PARKS PER 100,000 RESIDENTS
Chula Vista	8	3.0
Sacramento	13	2.7
Henderson	7	2.5
Las Vegas	11	1.8
Long Beach	8	1.7
Seattle	11	1.6
Reno	4	1.6
El Paso	11	1.6
Colorado Springs	7	1.6
Minneapolis	6	1.5

Swimming pools per 100,000 residents

CITY	SWIMMING POOLS	POOLS PER 100,000 RESIDENTS
Cleveland	42	10.9
Cincinnati	24	7.9
Pittsburgh	19	6.1
Washington, D.C.	35	5.3
Atlanta	23	5.1
Omaha	22	5.0
Philadelphia	74	4.7
Tucson	25	4.7
Henderson	13	4.6
Denver	29	4.3

Swimming pools include both indoor and outdoor pools, four-foot minimum depth.

Tennis courts per 10,000 residents

CITY	TENNIS COURTS	TENNIS COURTS PER 10,000 RESIDENTS
Richmond	136	6.1
Norfolk	143	5.8
Winston-Salem	109	4.5
Omaha	189	4.3
Greensboro	111	3.9
Atlanta	175	3.8
Arlington, Virginia	87	3.8
Boise	81	3.7
St. Louis	116	3.6
Virginia Beach	161	3.5

ERIN MAGUIRE

A boy does tricks at a skate park in Jesse Allen Park, Newark, NJ

15. Spending by selected urban park conservancies

2016

Conservancies, nonprofit organizations that financially support public parks, are an increasingly popular park management model. Spending data for this sample is taken from a Trust for Public Land survey and the organizations' 2016 IRS filings. It includes both operating and capital expenditures.

PRIVATE GROUP	CITY	PARKS	ACRES	SPENDING
Piedmont Park Conservancy	Atlanta	1	185	$2,567,799
Historic Fourth Ward Park Conservancy	Atlanta	2	17	$26,000
Mount Vernon Place Conservancy	Baltimore	1	6	$4,508,108
Emerald Necklace Conservancy	Boston	5	835	$1,343,395
Friends of Post Office Square	Boston	1	2	$680,213
Friends of the Public Garden	Boston	3	82	$1,848,578
Rose Fitzgerald Kennedy Greenway Conservancy	Boston	6	15	$2,553,879
Buffalo Olmsted Parks Conservancy	Buffalo	6	850	$3,507,795
Garfield Park Conservatory Alliance	Chicago	1	12	$1,187,696
Millennium Park Foundation	Chicago	1	25	$1,750,005
Woodall Rodgers Park Foundation*	Dallas	1	5	$3,904,961
Civic Center Conservancy	Denver	1	12	$521,847
Detroit Riverfront Conservancy	Detroit	4	100	$4,300,000
Discovery Green Conservancy	Houston	1	12	$6,629,612
Herman Park Conservancy	Houston	1	445	$13,772,477
Katy Prairie Conservancy*	Houston	14	13,000	$3,237,407
Willow Waterhole Greenspace Conservancy*	Houston	1	280	$459,999
Overton Park Conservancy	Memphis	1	184	$380,725
Shelby Farms Park Conservancy	Memphis	1	3,200	$18,970,769
Broadway Mall Association	New York	-	11	$404,634
Bronx River Alliance	New York	10	640	$893,513
Brooklyn Bridge Park Conservancy	New York	1	20	$2,435,482
Central Park Conservancy	New York	1	843	$63,539,143
Fort Greene Park Conservancy	New York	1	30	$72,407
Friends of the High Line*	New York	1	7	$15,772,710
Madison Square Park Conservancy*	New York	1	6	$4,290,932
Prospect Park Alliance	New York	1	585	$9,324,014
The Battery Conservancy*	New York	1	25	$2,388,362
Van Cortlandt Conservancy*	New York	1	1,146	$285,666
Myriad Gardens Foundation	Oklahoma City	1	17	$3,176,841
Fairmount Park Conservancy	Philadelphia	163	2,250	$1,570,780
Pittsburgh Parks Conservancy	Pittsburgh	12	1,957	$13,136,902
Western Pennsylvania Conservancy	Pittsburgh	62	7	$771,559
The Forest Park Conservancy	Portland	1	5,171	$498,906
Brackenridge Park Conservancy	San Antonio	1	246	$84,398
Balboa Park Conservancy	San Diego	1	1,200	$1,950,796
Golden Gate National Parks Conservancy*	San Francisco	37	80,600	$44,586,622
Guadalupe River Park Conservancy	San Jose	1	240	$527,612
Forest Park Forever	St. Louis	1	500	$3,657,665
Trust for the National Mall*	Washington, D.C.	1	146	$7,120,167

* Indicates 2015 expenditures

16. Largest parks

2016

These are the largest parks located within the boundaries of the 100 largest U.S. cities. Most are owned by the municipality, but some are owned by a state, a county, a regional agency, or the federal government. If a park extends beyond the boundary of the city, only the acreage within the city is noted here.

The largest city parks

PARK	CITY	ACRES
McDowell Sonoran Preserve	Scottsdale	30,500
South Mountain Preserve	Phoenix	16,306
Sonoran Preserve	Phoenix	9,487
Cullen Park	Houston	9,270
Mission Trails Regional Park	San Diego	6,932
Jefferson Memorial Forest	Louisville	6,218
Lake Stanley Draper	Oklahoma City	6,190
Forest Park	Portland	5,172
Lake Houston Wilderness Park	Houston	4,787
Shooting Range Park	Albuquerque	4,596
Eagle Creek Park	Indianapolis	4,284
Griffith Park	Los Angeles	4,282
Loblolly Mitigation Preserve	Jacksonville	4,201
Mission Bay Park	San Diego	4,108
Far North Bicentennial Park	Anchorage	3,924
Piestewa Peak	Phoenix	3,766
Fort Worth Nature Center and Refuge	Fort Worth	3,630
Rio Grande Valley State Park	Albuquerque	3,186

The largest regional and county parks within a city

PARK	CITY	ACRES
George Bush Park	Houston	8,043
Longview Lake Park	Kansas City	3,308
Shelby Farms Park	Memphis	3,200
Bear Creek Park	Houston	3,067
Calero County Park	San Jose	2,474
Mission Creek Regional Preserve	Fremont	2,086
Percy Warner Park	Nashville	1,978
Smith and Bybee Wetlands Natural Area	Portland	1,837
American River Parkway	Sacramento	1,746
Tijuana River Valley Regional Park	San Diego	1,710

The largest state parks located within a city

PARK	CITY	ACRES
Chugach State Park	Anchorage	464,318
Franklin Mountains State Park	El Paso	25,809
Honolulu Watershed Forest Reserve	Honolulu	9,951
Topanga State Park	Los Angeles	8,873
Cary State Forest	Jacksonville	8,322
William B. Umstead State Park	Raleigh	5,571
False Cape State Park	Virginia Beach	4,321
Mustang Island State Park	Corpus Christi	4,219
Pumpkin Hill Creek Preserve	Jacksonville	3,994
Cavalier Wildlife Management Area	Chesapeake	3,770

16. Largest parks (cont.)

The largest federal parks located within a city

PARK	CITY	ACRES
Chugach National Forest	Anchorage	245,653
Lake George Natural Landmark	Anchorage	192,192
Great Dismal Swamp National Wildlife Refuge	Chesapeake	50,469
Timucuan Ecological and Historic Preserve	Jacksonville	31,486
Bayou Sauvage National Wildlife Refuge	New Orleans	25,361
Back Bay National Wildlife Refuge	Virginia Beach	9,180
Gateway National Recreation Area	New York	7,683
Don Edwards San Francisco Bay National Wildlife Refuge	San Jose	6,800
Petroglyph National Monument	Albuquerque	5,164
Angeles National Forest	Los Angeles	3,696

17. Oldest city parks

These are the oldest U.S. city parks within the 100 largest cities. The date refers to the year of initial creation or acquisition; in the case of parks whose names have changed, the modern name is given. For a longer list of oldest parks, visit ***tpl.org/cityparkfacts.***

PARK	CITY	YEAR ESTABLISHED
Boston Common	Boston	1634
Military Park	Newark	1667
Washington Park	Newark	1669
Franklin, Logan, Rittenhouse, Washington Squares	Philadelphia	1682
Jackson Square	New Orleans	1721
San Pedro Springs Park	San Antonio	1729
Main Plaza	San Antonio	1731
Bowling Green	New York City	1733
Columbus, Pittman-Sullivan Parks	San Antonio	1733
El Pueblo De Los Angeles Historical Monument	Los Angeles	1781
National Mall	Washington, D.C.	1791
Garfield Park, Lafayette Square	Washington, D.C.	1792
Public Square, Settlers Landing Park	Cleveland	1796
Duane Park	New York City	1797
Hamilton, Paulus Hook Park	Jersey City	1804
Tribeca Park	New York City	1810
Gravois, Laclede, Mount Pleasant Parks	St. Louis	1812
Battle Monument, Mount Vernon Square Park	Baltimore	1815
Centennial Regional Park	Santa Ana	1816
Jackson Place Park	St. Louis	1816
Brinkley Park, Colonial Park, Confederate Park, Court Square	Memphis	1819
Unity Island	Buffalo	1823
Broderick Park	Buffalo	1825
Ahearn Park	New York City	1825
Franklin Square, Patterson Parks	Baltimore	1827
Washington Square Park	New York City	1827
Cooper Triangle	New York City	1828
Market Square	Buffalo	1830
Abingdon Square	New York City	1831
Palmer Park	New Orleans	1833
Union Square Park	New York City	1833

18. Most-visited city parks by city

This list includes only the most heavily visited park in a city. For a longer list of most-visited parks, including other parks within these cities, visit ***tpl.org/cityparkfacts****.*

CITY	PARK	ACRES	ANNUAL VISITATION
Atlanta	Piedmont Park	185	4,000,000
Austin	Zilker Park	255	3,500,000
Boston	Boston Common	47	2,980,000
Chicago	Lincoln Park	1,216	20,000,000
Colorado Springs	Garden of the Gods	1,327	2,000,000
Dallas	Fair Park	263	5,515,000
Denver	City Park	263	2,000,000
Detroit	Belle Isle Park	981	2,600,000
Houston	Hermann Park	445	5,364,715
Jacksonville	Drew Field	26	2,500,000
Kansas City	Swope Park	1,805	2,339,213
Los Angeles	Griffith Park	4,282	12,000,000
Milwaukee	Veterans Park	104	5,000,000
Minneapolis	Chain of Lakes Regional Park	1,557	5,476,400
New York	Central Park	843	42,000,000
Oakland	Lakeside Park	75	4,000,000
Orlando	Lake Eola	46	2,260,000
Phoenix	South Mountain Park/Preserve	16,306	3,000,000
San Antonio	San Antonio Riverwalk	15	11,500,000
San Diego	Mission Bay Park	4,232	17,000,000
San Francisco	Golden Gate Park	1,032	14,500,000
Seattle	Green Lake Park	324	3,650,000
St. Louis	Forest Park	1,293	15,000,000
St. Paul	Como Regional Park	384	4,350,000
Washington, D.C.	National Mall and Memorial Parks	725	33,500,000

19. Most-visited city parks per acre

This list includes only the most heavily visited park per acre in a city. For a longer list of popular parks, including other parks within these cities, visit ***tpl.org/cityparkfacts****.*

CITY	PARK	ACRES	ANNUAL VISITORS PER ACRE
San Francisco	Union Square	3	1,776,923
New York	High Line	7	1,129,272
Detroit	Campus Martius Park	3	800,000
Boston	Norman B. Leventhal Park	2	235,294
San Antonio	San Antonio Riverwalk	15	200,000
Dallas	Klyde Warren Park	5	192,308
Chicago	Millennium Park	24	166,667
Atlanta	Centennial Olympic Park	21	152,381
Pittsburgh	Point State Park	20	124,062
Houston	Discovery Green	12	100,000
Philadelphia	Independence National Historical Park	55	64,836
Oakland	Lakeside Park/Lake Merritt	75	53,333
Milwaukee	Veterans Park	104	48,297
Orlando	Lake Eola Park	46	48,288
Washington, D.C.	National Mall and Memorial Parks	725	46,207

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The Trust for Public Land
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San Francisco, CA 94104
415.495.4014

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Back: J. Avery Wham Photography.

tpl.org

The First National Study of Neighborhood Parks

Implications for Physical Activity

Deborah A. Cohen, MD,[1] Bing Han, PhD,[1] Catherine J. Nagel, MLA,[2] Peter Harnik, BA,[3] Thomas L. McKenzie, PhD,[4] Kelly R. Evenson, PhD,[5] Terry Marsh, MPH,[1] Stephanie Williamson, BA,[1] Christine Vaughan, PhD,[1] Sweatha Katta, MPH[2]

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Introduction: An extensive infrastructure of neighborhood parks supports leisure time physical activity in most U.S. cities; yet, most Americans do not meet national guidelines for physical activity. Neighborhood parks have never been assessed nationally to identify their role in physical activity.

Methods: Using a stratified multistage sampling strategy, a representative sample of 174 neighborhood parks in 25 major cities (population >100,000) across the U.S. was selected. Park use, park-based physical activity, and park conditions were observed during a typical week using systematic direct observation during spring/summer of 2014. Park administrators were interviewed to assess policies and practices. Data were analyzed in 2014–2015 using repeated-measure negative binomial regressions to estimate weekly park use and park-based physical activity.

Results: Nationwide, the average neighborhood park of 8.8 acres averaged 20 users/hour or an estimated 1,533 person hours of weekly use. Walking loops and gymnasia each generated 221 hours/week of moderate to vigorous physical activity. Seniors represented 4% of park users, but 20% of the general population. Parks were used less in low-income than in high-income neighborhoods, largely explained by fewer supervised activities and marketing/outreach efforts. Programming and marketing were associated with 37% and 63% more hours of moderate to vigorous physical activity/week in parks, respectively.

Conclusions: The findings establish national benchmarks for park use, which can guide future park investments and management practices to improve population health. Offering more programming, using marketing tools like banners and posters, and installing facilities like walking loops, may help currently underutilized parks increase population physical activity.

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Introduction

Neighborhood parks with large open spaces constitute infrastructure to support adherence to national recommendations for moderate to vigorous physical activity (MVPA)—at least 60 minutes/day for youth and 150 minutes/week for adults.[1] Because fewer than half of Americans meet these guidelines,[2] physicians are being encouraged to routinely counsel patients about physical activity and to offer "park prescriptions," identifying nearby parks and recommending regular visits.[3,4] Yet, the degree to which parks are designed or managed to optimize physical activity for all age groups and genders has not been examined at the national level.[5,6] Many urban parks were created before climate-controlled indoor spaces and electronic visual media existed, when work required more physical activity and labor-saving devices were less available. Parks were originally designed for leisure, recreation, and a chance to make contact with nature, not to specifically promote physical activity.[7] Given high levels of inactivity and associated chronic diseases, like heart disease, diabetes, and cancer,[1] it is timely to

From the [1]RAND Corporation, Santa Monica, California; [2]City Parks Alliance, Washington, District of Columbia; [3]Trust for Public Land, Washington, District of Columbia; [4]School of Exercise and Nutritional Sciences, San Diego State University, San Diego, California; and [5]Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina- Chapel Hill, Chapel Hill, North Carolina

Address correspondence to: Deborah A. Cohen, MD, RAND Corporation, 1776 Main Street, Santa Monica CA 90407. E-mail: dcohen@rand.org.

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reconsider parks and their potential to improve the nation's health.

Across the U.S., more than 9,000 local park and recreation departments and organizations manage more than 108,000 public park facilities and 65,000 indoor facilities.[8] Parks have been categorized by size and facilities into different types, including very small parks (under 2 acres, also called mini-parks, pocket parks, or parklets), neighborhood parks, community and large urban parks, sports complexes, and natural resource areas.[9] Neighborhood parks are considered the backbone of park systems. They often contain multiple diverse facilities—playgrounds, picnic tables, basketball courts, green spaces, and shade trees—allowing residents of all ages to recreate there on a routine basis. Neighborhood parks are usually between 2 and 20 acres, have more facilities than mini-parks, and are intended to serve local residents living within a 1-mile radius around parks.[9]

Funding for park programming, maintenance, and capital improvements is typically allocated from city budgets, which also vary across jurisdictions. Many cities employ staff to develop, monitor, and market programs for parks, including classes and special events. It is plausible that local park management practices and policies could influence population-level physical activity.

Prior studies indicate that sociodemographics, size, facilities, aesthetics, and proximity are all important factors contributing to park use,[10–19] but most studies are local and have limited generalizability.[20] To that end, the authors conducted a national observational study of 174 parks from 25 cities in the U.S. with a population of more than 100,000. The goals were to determine how neighborhood park systems support population-level physical activity; to identify factors associated with park use and park activities, including facilities, management practices, and disparities between parks in high- and low-income neighborhoods; and to understand how park administrators currently measure park use and the potential usefulness of such measures.[21]

Methods

Study Design

A two-stage stratified sampling strategy was used to select a representative sample of neighborhood parks in the U.S. cities with a population 100,000 or more according to the 2010 Census. The total 289 cities were divided into nine strata, with eight strata based on population (200,000–1,000,000 and 100,000–200,000) and region (West, Northeast, Midwest, and South), and the ninth stratum comprising cities with a population of more than 1 million. In the first sampling stage, 25 cities were randomly drawn from the nine strata (Appendix Figure 1, available online; Tables 1 and 2). All states were in the sampling frame and, by chance, all sampled cities were in the 48 contiguous states. In each of the 25 selected cities, a list of public parks was retrieved, either supplied directly by the city's Department of Recreation and Parks or from their website. The selection was restricted to avoid parks in close proximity (<1 mile from each other) and to ensure distributions of chosen parks were similar with regard to sizes and local poverty rates for all neighborhood parks within each city. Parks between 3 and 20 acres were initially targeted,[9] but in nearly half the cities, large numbers of neighborhood parks were slightly less than 3 acres or just more than 20 acres. As a result, the selection criteria were relaxed to include ten parks less than 3 acres (between 2.2 and 2.9 acres) in eight cities and five parks more than 20 acres (between 20.1 and 23.0 acres) in five cities.

One hundred and seventy-four parks were included, representing an approximately 10% sample of all eligible neighborhood parks in the sampled cities. Excluded parks were located in a Census tract with no or very few residents (e.g., airport, prison, military base, hospital, industry facility), pocket parks (<2 or 3 acres), regional parks (>20 or 23 acres in some cities), parks used as school fields during business hours, and parks serving special purposes only (e.g., parkways, boxing gyms). Two parks were replaced because police said they were unsafe for staff to visit.

Measurement Protocol

Data collection was conducted on clement days between April and August 2014 using the System of Observing Play and Recreation in Communities (SOPARC), a validated observational tool.[22] SOPARC uses momentary time sampling and direct observation methods to assess aggregated physical activity levels, demographic characteristics of park users, and contextual information. From each selected city, two to four local field staff were recruited and trained.

Each park was mapped and divided into subareas called target areas that could be observed in one scan and typically included one type of facility (e.g., play equipment, basketball court, lawn) or supported only one type of activity (e.g., tennis). All of the target areas were numbered so that every single observation occurred in exactly the same order. Observations generally took <1 hour to cover the entire park. Based upon a previous study indicating that 12 observations selected on different days and different times of day were sufficient to reliably estimating weekly park use,[23,24] each park was observed according to the following schedule: Tuesday, 8 AM, 11 AM, and 2 PM; Thursday, 12 PM, 3 PM, and 6 PM; Saturday, 9 AM, 12 PM, and 3 PM; and Sunday, 11 AM, 2 PM, and 5 PM. During each hourly observation, all target areas were assessed for specific characteristics, including whether it was accessible, usable, or supervised (i.e., a person was in charge to manage and direct activities like a lifeguard, park staff, or coach). Staff tried to observe a park during a single week, but when the weather was inclement, the observation was rescheduled for the next available day (same time of day and day of week) that was not raining.

Each park user in a target area was categorized into one of 24 groups defined by gender (male, female), age group, (child, teen, adult, senior), and physical activity level (sedentary [e.g., seated, standing], moderate [e.g., walking], vigorous [e.g., running, climbing]). At the end of each day, staff completed an assessment of the park conditions, including weather, noise, marketing materials (e.g., banners, posters), amount of litter and graffiti,

Table 1. Descriptive Characteristics of the 174 Study Parks

Characteristic	M (SD)	Median (IQR)
Park size (acres)	8.8 (5.5)	7.7 (8.5)
Population (1-mile radius)	24,200 (33,500)	12,400 (16,000)
Households in poverty (1-mile radius) (%)	19.8 (11.2)	17.8 (16.5)
Activity facilities (*n*)	9.6 (8.4)	7 (8)
Accessible target areas (*n*)[a]	20.4 (13.9)	16 (12)
Accessible target areas (%)	96.8 (6.2)	99.5 (4.6)
Target areas with supervised activities (*n*)[b]	5.2 (10.0)	0 (5)
Onsite marketing materials such as banners, signage, posters (% parks)	28 (0.45)	—
Moderate or more litter in parks observed at least once (% parks)	38 (0.49)	—
Homeless people observed at least once (% parks)	28 (0.45)	—
Food vendor observed at least once (% parks)	27 (0.45)	—
Dogs off leash observed at least once (% parks)	60 (0.49)	—
Moderate or more graffiti observed at least once (% parks)	9 (0.29)	—
Maximum temperature (°F)[b]	78.7 (10.3)	80 (15)
Minimum temperature (°F)[b]	56.4 (10.4)	57 (14)
Mean temperature (°F)[b]	67.6 (9.6)	69 (14)

[a]During an hourly measurement.
[b]During 12 hourly measurements.
IQR, interquartile range.

and presence of apparently homeless individuals, people appearing threatening or engaged in altercations, and park staff, food vendors, or special events.

During visits, park features and amenities were also documented, including signage and marketing for park activities, adapted from previously validated park assessment tools.[25–27] To better understand how systems measure park use, the authors conducted interviews with park administrators.

Statistical Analysis

Data were analyzed in 2014–2015. Estimates of total weekly park use were based on the assumption that, a park was, on average, usable at least 11 hours/day (between 8 AM and 7 PM), 7 days/week. Because field staff missed roughly 1% of scheduled target area observations by scan hour level, the mean imputation method was used to impute missing data.[28] To adjust for the complex sampling strategy, design-based estimators were applied to estimate average weekly park use in person hours/week (Appendix, available online).

Moderate and vigorous activity were combined into one category to match the national recommendations for physical activity. To identify factors associated with hourly park use and park activities, repeated-measure generalized linear models were fit. Negative binomial distribution was used for the outcome due to variance inflation. Binary indicators were used for different days of a week and different hours of a day to allow for a flexible temporal trend and also included daily weather variables (maximum, minimum, and mean temperature), park size, population density, park facilities, accessibility of facilities, presence of supervised activities, and the observed park conditions described.

Associations with predictors were tested by the robust generalized estimation equation method,[29] which accounted for temporal correlations within a park and spatial correlations within a city. Neighborhood demographics and socioeconomic data were drawn from the U.S. Census 2010 and the American Community Survey 2012.[30,31] All analyses were done in SAS, version 9.4 and Stata, version 13.1.

Results

Considering all 174 study parks, the median local population within a 1-mile radius of a park was 12,400 people and the median percentage of households in poverty was 17.8%. The mean park size was 8.8 (range, 2.2–23.0) acres and parks had a median of 17 (range, 3–101) target areas and five (range, 1–11) different facility types (Table 1). Although staff observed a mean of five supervised activities in park target areas over the 12 observation periods, the median was zero—more than half the parks had no supervised programming at all.

Table 2 shows the most common facilities in neighborhood parks and how much each contributed to MVPA for children and teens or adults and seniors. The most common park facilities were lawns (97%) and

Table 2. Estimated Average Weekly Use and Average MVPA Time (Person Hours) Among Target Area Facility Types[a,b]

Target area facility type	Parks with the facility, %	Total weekly use (person hours)[b]	Weekly MVPA person hours among children and teens[b]	Weekly MVPA person hours among adults and seniors[b]
Lawn	96.6	**55*****	6	7
Play area	88.5	139	**41*****	9
Basketball court (outdoor)	52.9	138	**45*****	**24*****
Picnic area	43.1	164	11	**12****
Baseball field	49.4	**183*****	**36*****	**24*****
Sports fields	35.1	158	**30*****	**28*****
Bleachers	40.2	113	6	5
Tennis	31.0	**58****	8	**20*****
Walking loop	28.7	**345*****	**72*****	**149*****
Seating area	20.0	68	7	6
Pool	12.1	**301*****	**72*****	**39*****
Dog park	4.6	139	4	**36****
Skate park	5.2	**282****	**72*****	13
Exercise area	7.5	150	6	**51*****
Gymnasium	9.2	**688*****	**137*****	**84*****
Fitness zone	2.3	**193****	**28*****	**61*****

Note: Boldface indicates statistical significance ($^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$).
[a]Assumes that a park is usable 7 days a week and 11 hours a day. All estimates have adjusted for the multistage survey sampling design. Estimates for bleachers were the marginal means across all parks. Estimates for other facility types controlled for park size, local population, poverty, observation time, and temporal correlation and were based on the comparisons with respect to bleachers.
[b]Significance level based on comparisons with bleachers.
MVPA, moderate to vigorous physical activity.

play areas (89%). Nearly half the parks had outdoor basketball courts (53%) and baseball fields (49%), 31% had tennis courts, and 29% had a walking loop. Almost all facilities (97%) were rated usable and 98% were accessible.

On average, the park facility that generated the most MVPA time for adults and seniors was a walking loop, where 9% of users were seniors versus 4% in other park areas (data not shown). Children and teens accrued similar amounts of MVPA on walking loops as they did in a pool or skate park. After walking loops and gymnasiums, fitness zones and exercise areas generated the next-highest amounts of MVPA for adults and seniors.

Across the 174 parks, staff counted 77,300 people during 2,088 hourly observations. Assuming a park is usable at least 77 hours/week (11 hours/day between 8 AM and 7 PM, 7 days/week), adjusting for survey design, it was estimated that the national average park use was 1,533 person hours per week (95% CI=930, 2,140). Weekly park use varied greatly across the parks (range, 0–26,260 person hours), and the estimated average hourly use was 20 people/park. Seventy-five percent of target area–level observations recorded no users.

Table 3 shows significant disparities by gender and age group in park use and park-based MVPA. Overall, more park users were male (57%) and they accounted for 60% of estimated MVPA person hours. The gender disparity was the greatest for teens. Male teens accounted for 65% of teen visitors and 68% of teen MVPA person hours ($p<0.05$). Park visitation by age group was significantly different than that in the general population ($p<0.0001$). The distribution of park users included 38% children and 13% teens, but of the total U.S. population, children and teens represent 20% and 7%, respectively. Seniors (aged $\geq$60 years) represented only 4% of observed park visitors but comprise 20% of the general population.

There were significant disparities in park use and park characteristics by SES (data not shown). Within the same city, parks in high-poverty neighborhoods (identified as above the median of the local poverty levels of all parks in the city) tended to be smaller than those in low-poverty neighborhoods (7.8 vs 10.0 acres, p=0.003). However,

Table 3. Estimated Average Weekly Park Use and Time Spent in MVPA by Age Group and Gender in Person Hours[a]

Variable	Weekly person hours in park use			
	Male person hours in parks, % (Total $n = 867$ [SE = 153])	**Males by age group in U.S. population (2010), %**	**Female person hours in parks, % (Total $n = 664$ [SE = 135])**	**Females by age group in U.S. population (2010), %**
Children	**40.4**	17.9	**35.8**	16.3
Teens	**15.2**	10.0	**10.8**	9.2
Adults	**40.2**	54.5	**49.2**	53.9
Seniors	**4.2**	17.7	**4.2**	20.4
	Weekly person hours of MVPA in parks			
	Males, M (SE)	**Gender within age group, %**	**Females M (SE)**	**Gender within age group, %**
All	361 (60)	**59.9**	242 (55)	**40.1**
Children	170 (34)	**59.2**	117 (31)	**40.8**
Teens	65 (11)	**68.4**	30 (5)	**31.6**
Adults	114 (18)	**56.7**	87 (18)	**43.3**
Seniors	12 (2)	**60.0**	8 (2)	**40.0**

Note: Boldface indicates statistical significance ($p < 0.0001$); *p*-values are based on chi-square tests (df=3).
[a]Assumes that a park is usable 7 days a week and 11 hours a day. All estimates have adjusted for the multistage survey sampling design.
MVPA, moderate to vigorous physical activity.

there was no difference in the number of accessible facilities. Parks in high-poverty areas were used less than parks in low-poverty neighborhoods (1,380 vs 1,690 person hours/week, $p<0.0001$) and they had significantly fewer supervised areas (average of 2.1 vs 4.5, $p=0.012$). Litter was observed more often in low-income area parks, but not more graffiti. There was no difference in the presence of homeless people or dogs off leash in high- versus low-income area parks.

None of the weather variables were associated with park use or physical activity in any model, so these were eliminated. Three basic factors associated with the number of observed park users were first examined—park size, local population density, and local neighborhood household poverty levels (Model 1 in Table 4). On average, keeping the other two predictors constant, 1 additional acre was associated with 9% increase in park use ($\beta=0.09$, $p<0.0001$), 10,000 additional population living in a 1-mile radius was associated with an 13% increase in park use ($\beta=0.12$, $p<0.0001$), and a 10-percentage point increase in the local household poverty level was associated with a 12% decrease in park use ($\beta=-0.01$, $p=0.04$). The pattern of relationships between these factors and the amount of MVPA person hours occurring in the parks was similar to the model predicting the number of park users (bottom of Table 4).

Model 2 includes multiple other observed park characteristics. Park size was not significant after controlling for other related factors in the model. Supervised activities and onsite marketing were significantly related to increased park use and MVPA person hours. Every additional supervised activity increased mean park use by 48% ($\beta=0.39$, $p<0.0001$) and the mean MVPA time by 37% ($\beta=0.37$, $p<0.0001$). The presence of marketing materials, such as banners, posters, and signs was associated with a 62% ($\beta=0.48$, $p=0.003$) increase in the number of park users and 63% ($\beta=0.49$, $p<0.001$) increase in MVPA person hours. Each additional accessible target area (e.g., basketball court, tennis court, play area) was associated with 2% more person hours of park use ($\beta=0.02$, $p=0.03$) and 2% more minutes of MVPA ($\beta=0.02$, $p=0.006$).

Staff interviewed senior administrators from all 25 city park systems in the study. None routinely measured park use, other than by tracking whether people registered for specific programs or sports leagues. Although two park systems reported doing annual resident surveys and using population-level results to inform programming decisions, most provided "user-driven" recreational services by responding to requests of vocal citizens. All administrators said that park measurements would be useful to guide management decisions, targeting, and programming, but they currently lacked the necessary skills and resources. Limitations in resources were also a major barrier to park improvements; among

Table 4. Negative Binomial Regression Models Predicting Total Park Use and MVPA Time in Parks[a]

	Model 1		Model 2	
	β (SE)	exp(β)	β (SE)	exp(β)
Factors	**Total park use (person hours)**			
Park size in acres	**0.09 (0.01)*****	1.09	0.01 (0.01)	1.01
Population density (per 10,000 in 1-mile radius)	**0.12 (0.02)*****	1.13	**0.06 (0.03)***	1.07
% Households in poverty	**−0.01 (0.01)***	0.99	−0.01 (0.01)	0.99
Litter in parks	—	—	**0.25 (0.12)** *	1.29
Homeless people in parks	—	—	0.20 (0.16)	1.22
Vendors in parks	—	—	**0.57 (0.12)*****	1.77
Dogs unleashed in parks	—	—	0.09 (0.13)	1.09
Graffiti in parks	—	—	−0.08 (0.24)	0.92
No. of accessible target areas	—	—	**0.02 (0.01)****	1.02
No. of target areas with supervised activities	—	—	**0.39 (0.03)*****	1.48
Onsite marketing (banners, signage, posters)	—	—	**0.48 (0.16)****	1.62
	MVPA time in parks (person hours of MVPA)			
Park size in acres	**0.08 (0.01)*****	1.08	0.00 (0.01)	1.00
Population density (1-mile radius)	**0.11 (0.02)*****	1.11	**0.05 (0.02)***	1.05
% Households in poverty	−0.01 (0.01)	0.99	−0.01 (0.01)	0.99
Litter in parks	—	—	0.15 (0.12)	1.16
Homeless people in parks	—	—	0.08 (0.15)	1.08
Vendors in parks	—	—	**0.52 (0.11)*****	1.68
Dogs unleashed in parks	—	—	0.12 (0.13)	1.13
Graffiti in parks	—	—	0.12 (0.24)	1.12
No. of accessible target areas	—	—	**0.02 (0.01)****	1.02
No. of target areas with supervised activities	—	—	**0.31 (0.03)*****	1.37
Onsite marketing (banners, signage, posters)	—	—	**0.49 (0.14)*****	1.63

Note: Boldface indicates statistical significance ($^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$).
[a]Other variables controlled in the models included indicators for cities, days of a week, and hours in a day. Within-park correlations were adjusted by generalized estimation equation.
MVPA, moderate-to-vigorous physical activity.

administrators of 119 parks (68%) who answered survey questions about resources, roughly 50% indicated their parks had budget and staff decreases in the past 2 years and 40% indicated no changes. Only 10% reported budget increases.

Discussion

Conditions in local neighborhood parks can potentially support or limit physical activity. The mere presence of a park does not guarantee its use, even when many facilities are usable. This study identified multiple disparities in park use, especially low use among adults, seniors, girls, and women, and lower use in higher-poverty neighborhoods, suggesting efforts to improve services for these subpopulations are necessary. Although it is critically important for adults and seniors to engage in routine physical activity, most parks are geared toward serving youths rather than adults. Few programmed activities were documented that specifically targeted adults and seniors. Given that physical activity may have more immediate benefits for adults and seniors as far as preventing or mitigating the impact of chronic diseases, park systems should consider adding enhancements, like

walking loops, and more programming that would appeal to older age groups. Neighborhood parks may not be adequately serving low-income groups, even though their parks have similar facilities to those serving higher income groups. These models suggest that disparities in these neighborhoods might be largely overcome by offering more supervised activities and engaging in greater marketing/outreach efforts.

Limitations

This first national observational study of neighborhood parks is cross-sectional, so it cannot be concluded that the associations between park features, programming, and physical activity are causal. However, many other longitudinal studies have shown that investments in outreach, programming, and park improvements do increase park-based physical activity.[32–36] Because the observations were limited to the spring and early summer, a time when parks may be used more than in other seasons, and all observations for a park were conducted over a short period (usually within 1 week), it may not be possible to estimate annual use based on these data. Weather did not appear related to park use, in part because these models already controlled for city, which is correlated with temperature. These estimates, however, do provide a snapshot of park use by age, gender, and activity level. In addition, given limited resources, researchers did not interview park users or local residents to assess their perspectives on park use and which features they considered more attractive or the degree to which their perceptions on park safety might have influenced use of neighborhood parks. It is likely that some of the lower use of parks in high-poverty neighborhoods might be explained by concerns about personal safety. However, the models suggest that park size, supervised activities, and marketing materials each have a comparable or larger effect size than the local poverty level, which has been correlated with safety concerns.[37] Also, parks were observed only between 8 AM and 7 PM, and cannot estimate park use that occurs before or after these hours. Previous research observing parks 14 hours/day suggest that 8 AM to 7 PM is when parks are typically used most.[23]

Conclusions

The current investment in urban parks across the U.S. is relatively small, considering the potential benefits they may yield in health. Physical inactivity contributes to a high proportion of chronic diseases and is directly responsible for 11% of all deaths.[38] Yet, among the 100 largest U.S. cities, the average annual per capita expenditure for parks in 2013 was $73 (range, $9–$247),[39] less than 0.8% of the $9,146 per capita expenditure on health care in the same year.[40] Neighborhood parks are challenged by being financed at the local level, although limited federal dollars are sometimes available through Community Development Block Grants and the Land and Water Conservation Fund. Private philanthropy can help, although it rarely occurs in lower-income neighborhoods. Relatively modest investments may improve neighborhood park conditions to make them conducive to physical activity for everyone, regardless of age, gender, or income level.

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DC is the Principal Investigator and took the lead in designing the study and writing the manuscript. BH is the statistician and also helped design the study and data collection protocol. CN supervised the fieldwork and, along with PH, KE, CV, and TLM, assisted in protocol development, data analysis, and manuscript preparation. TLM also assisted in training field staff. TM was responsible for fieldwork, training, and quality control. SW was the project programmer. SK was responsible for field staff, quality control, and conducting park director surveys. All authors discussed the results and reviewed multiple drafts of the manuscript.

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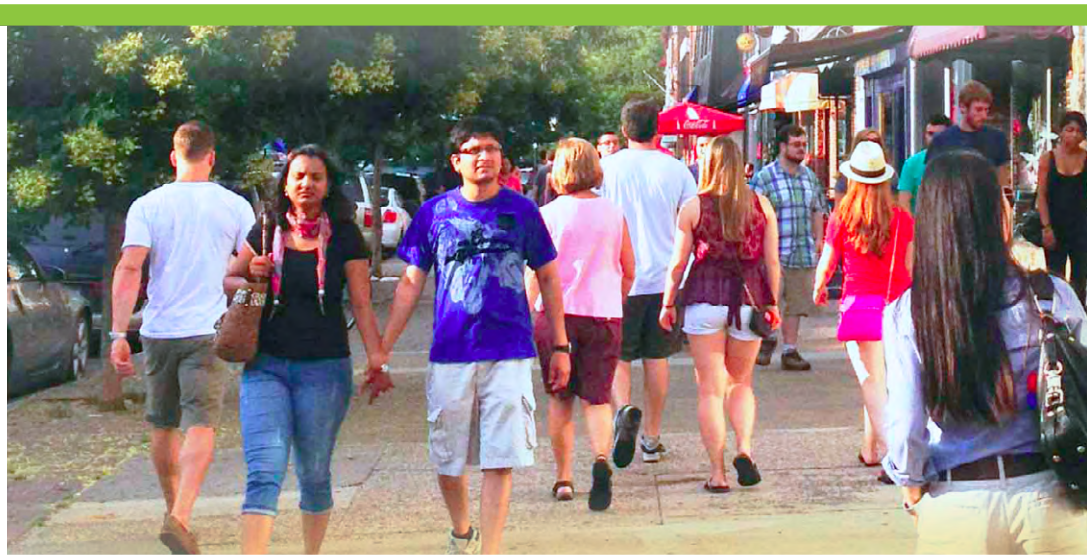
Appendix

Supplementary data

Supplementary data associated with this article can be found at http://dx.doi.org/10.1016/j.amepre.2016.03.021.

NEW JERSEY

BICYCLE & PEDESTRIAN MASTER PLAN.



November 2016

DEPARTMENT OF TRANSPORTATION
THE STATE OF NEW JERSEY

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Message from the Commissioner

The New Jersey Department of Transportation (NJDOT) is pleased to present the *New Jersey Bicycle & Pedestrian Master Plan.* NJDOT is committed to improving our quality of life by integrating bicycling and walking into the fabric of our transportation system. This master plan presents a vision, goals, and actions to do just that.

Our comprehensive transportation system is more than cars, trucks, buses, and trains. Walking and bicycling are smart transportation solutions that conserve energy, promote public health, protect the environment, provide access to public transit, contribute to our economies, and connect people across our communities. By investing in walking and bicycling, we are investing in clean and healthy transportation that is equitable for all New Jersey citizens.

The *New Jersey Bicycle & Pedestrian Master Plan* recognizes that the many decisions we face and actions to be accomplished in improving our pedestrian and bicycle transportation environment will take place in a dynamic setting and rely upon the diverse input of our citizens, transportation professionals, and government agencies. For that reason, this master plan is designed to bring people together through a series of annual summits, leverage their creativity and expertise, and foster the communication and collaboration that is necessary to achieve the master plan's goals.

NJDOT will continue working to improve pedestrian and bicycle transportation in communities throughout New Jersey. We value your input, perspective, and creativity, so please let us know if you have any ideas to share. You can reach us at BIKEPED@dot.nj.com.

Sincerely,

Richard T. Hammer
Commissioner, New Jersey Department of Transportation

In Memoriam

Jack M. Nata
1968 - 2016

Jack M. Nata worked for the City of Newark Department of Engineering for over 27 years, rising through its ranks to serve as the Manager of the Division of Traffic and Signals. As a well-known transportation leader in New Jersey and staunch advocate for improving safety, Mr. Nata recognized that meeting the needs of bicyclists and pedestrians was vital to improving the livability, economy, and equity of the city. Under his leadership, he helped the City of Newark advance numerous bicycle and pedestrian programs and projects.

This plan is dedicated to the memory of our friend and colleague, Jack Nata.

Acknowledgements

The project team would like to recognize and express appreciation to the numerous contributors and participants that took part in the development of the *New Jersey Bicycle & Pedestrian Master Plan.*

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- Camden County Government
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- Cooper's Ferry Partnership
- D&R Greenway Land Trust
- East Coast Greenway Alliance
- Lawrence Hopewell Trail Corporation
- New Jersey Bicycle & Pedestrian Advisory Council
- New Jersey Bike & Walk Coalition
- New Jersey Conservation Foundation
- New Jersey Police Traffic Officers Association
- New Jersey Society of Municipal Engineers
- New Jersey TransAction Conference & Expo
- NJ TRANSIT
- Pleasant Valley Civic Association
- Rails-to-Trails Conservancy
- Rutgers School of Public Health
- Sustainable Jersey
- Tri-State Transportation Campaign
- Contributors from New Jersey's eight Transportation Management Associations and three Municipal Planning Organizations
- ... and numerous individuals

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Plan prepared for:

New Jersey Department of Transportation

Office of Bicycle and Pedestrian Programs

P.O. Box 600
Trenton, NJ 08625-0600

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Plan prepared by:

NV5 Formerly The RBA Group

WSP | PARSONS BRINCKERHOFF

URBAN ENGINEERS

SGB Susan G. Blickstein, AICP/PP, Ph.D.

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Chapter 1

Purpose and Process

Walking and bicycling are healthy and economical modes of transportation that should be safe, secure, and convenient for all travelers. This chapter describes the purpose of the master plan, the policy and planning context, and the public input process. It ends with an overview of the many benefits of walking and bicycling.

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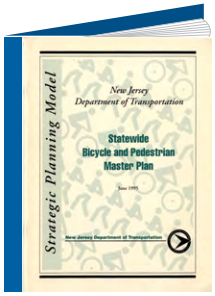
Introduction

Walking and bicycling are healthy, affordable, and environmentally-friendly modes of transportation that should be safe, secure, and convenient. For over 25 years, the New Jersey Department of Transportation (NJDOT) has been working to integrate walking and bicycling into the transportation system and has recognized the importance of nonmotorized modes as part of a comprehensive solution to the state's transportation needs.

NJDOT adopted its first *Statewide Bicycle and Pedestrian Master Plan* in 1995. This first plan provided a collective vision, policy, and actions for improving bicycling and walking environments throughout the state. Nine years later, NJDOT issued the *NJ Statewide Bicycle & Pedestrian Master Plan, Phase 2 (2004).* The *Phase 2 Plan* reiterated the vision and policy components of the *1995 Plan* and incorporated new analytical tools to better allocate resources for pedestrian and bicyclist improvements. The purpose of the *2016 New Jersey Bicycle & Pedestrian Master Plan* is to revisit and update the vision, goals, and implementation strategies to successfully advance bicycling and walking over the coming decade. The master plan is intended to be a living document and will require ongoing coordination among NJDOT, other state agencies, MPOs, counties, municipalities, nonprofits, consultants, developers, advocates, and the general public.

By working together, **we can** make New Jersey better for walking and bicycling.



1995

2004

2016

Plan Organization

This master plan is organized into the following chapters:

Chapter 1: *Purpose and Process* describes the purpose of the master plan, the public input process, and the benefits of walking and bicycling.

Chapter 2: Current Conditions and Needs provides a snapshot of current conditions and identifies key needs to be addressed by the master plan.

Chapter 3: Vision, Goals, and Strategies defines the critical framework and presents the vision, goals, and strategies to drive this master plan.

Chapter 4: Implementing the Master Plan identifies the entities responsible for initiating the strategies and achieving the goals. It also includes guidance on performance measures and identifies initial steps to advance the master plan.

The ***Appendix*** include an overview of funding sources and a description of related policies, plans, and programs.

New Jersey is well positioned for growth in walking and bicycling. It has the highest population density, the highest percentage of urban land, and the third highest percentage of commuters walking, bicycling, or taking public transit to work.

Context

Since the *NJ Statewide Bicycle & Pedestrian Master Plan, Phase 2 (2004)*, there have been significant changes in bicycle and pedestrian transportation. Complete Streets has become the overarching paradigm for considering and addressing bicycle and pedestrian travel. Innovative bicycling and pedestrian programs and networks have emerged and a number of New Jersey's municipalities are stepping forward to become bicycling and pedestrian friendly communities. There have been new developments in design solutions, studies revealing the economic impacts of improved bicycling and walking conditions, and interest in bicycle and pedestrian travel has grown. There are over 300 active Safe Routes to School (SRTS) programs statewide.

NJDOT has kept pace with and been a part of this change. NJDOT has joined other states in the Towards Zero Deaths initiative, a national vision for zero deaths on our nation's highways, and has been recognized as a national leader in advancing Complete Streets. NJDOT has been proactive in providing training on best practice bicycle and pedestrian design to staff and technical assistance to municipalities and counties regarding Complete Streets policy development, design, and implementation. This master plan builds on the successes and advances that have taken place since the *Phase 2 Plan* to provide a path forward over the next decade.

This master plan supports broader efforts to improve safety and reduce pedestrian and bicyclist fatalities. New Jersey is classified by the Federal Highway Administration (FHWA) as a Pedestrian-Bicycle Focus State for exceeding specific crash thresholds. Pedestrian fatalities account for 31% of fatal crashes in the state, averaging about 150 per year from 2005-2014, with incoming figures suggesting that percentage is on the rise. Bicyclist fatalities, though not of the same magnitude as the pedestrian crash problem, averaged about 15 per year from 2005-2014.

This plan is consistent with and supportive of other state plans. Each state is mandated by the United States Department of Transportation (USDOT) to develop a Strategic Highway Safety Plan to guide the allocation of safety funding and resources to reduce highway fatalities and serious injuries on public roadways. The *2015 New Jersey Strategic Highway Safety Plan* (SHSP) identifies pedestrians and bicyclists as a 1st priority safety emphasis area. The *New Jersey Highway Safety Plan* (2016), prepared by the New Jersey Division of Highway Traffic Safety (DHTS), also includes strategies that address pedestrian and bicycle safety.

Integrating the NJDOT Complete Streets Policy and design frameworks into a long-term vision for New Jersey is another goal of this master plan. Adopted in 2009, the Complete Streets Policy is the basis for the NJDOT's efforts to plan and provide for pedestrian and bicycle travel needs as part of the project development process. The tools and methods for designing Complete Streets, with facilities that benefit pedestrians and bicyclists, are included in NJDOT's *Complete Streets Design Guide* (2016).

Walking and bicycling continue to be recognized as healthy and essential modes of transportation that enhance quality of life. Since 2010 it has been USDOT policy to incorporate safe and convenient walking and bicycling facilities into transportation projects and encourage transportation agencies to go beyond minimum standards to provide safe and convenient facilities for these modes. In addition, the United States Centers for Disease Control and Prevention (CDC) *Healthy Community Design Initiative* promotes nonmotorized transportation systems to increase physical activity, improve air quality, lower the risk of injury, enhance social connections, and mitigate the impacts of climate change.

Achieving healthy, equitable, and sustainable communities through walking and bicycling, and fostering a cultural shift to support the mutual respect among all travel modes are goals of this master plan. Recent studies show that demographic trends and cultural attitudes are shifting in ways that require

a renewed focus on the needs of nonmotorized transportation users and the transportation system necessary to serve them. The percentage of 16 to 44-year olds with a driver's license has been steadily declining.[1.1] This is consistent with the characterization of Millennials as a multimodal generation, who prefer to live in communities with a range of transportation choices.[1.2] Relevant demographic and associated transportation behavioral shifts are not limited to Millennials. Older adults have expressed a strong desire to age in place and benefit greatly from access to transportation systems that keep them connected without being dependent on car ownership.[1.3]

New Jersey's population will continue to become older and more racially and ethnically diverse over the coming decades.[1.4] The state 65-and-older population will increase by almost half by 2032, comprising almost one fourth of the state population. The state non-Hispanic white population is anticipated to decline gradually, while Hispanic, Asian, and Black populations will grow. In addition to these demographic shifts, there is also a long overdue recognition of equity issues in the provision and safety of transportation systems. For example, minority communities that have historically been overlooked in transportation decision-making processes are leading contributors to the growth of bicycle travel in the US, yet suffer from higher fatality rates than white bicyclists.[1.5]

Since the *NJ Statewide Bicycle & Pedestrian Master Plan, Phase 2 (2004)*, many improvements have been made to address bicycling and walking. NJDOT is the main agency for many of these efforts, and the Office of Bicycle and Pedestrian Programs (OBPP) plays a leading role in addressing bicycle and pedestrian needs and safety programs and projects. OBPP's primary efforts include the Complete Streets Initiative, the Local Bicycle and Pedestrian Planning Assistance Program, and the Safe Routes to School Program. NJDOT's accomplishments since 2004 are listed in this chapter in the table "NJDOT Milestones & Successes Since 2004."

While the focus of this master plan is on state agencies, others including Metropolitan Planning Organizations (MPOs), counties, municipalities, nonprofits, consultants, developers, and advocates have been working to make New Jersey's streets safer and more accessible for pedestrians and bicyclists. Examples of local and regional success stories are highlighted throughout the plan and an overview of significant policies, plans, and programs can be found in the Appendix.

Step it Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities

The purpose of this 2015 Call to Action is to increase walking across the United States by calling for improved access to safe and convenient places to walk and wheelchair roll and by creating a culture that supports these activities for people of all ages and abilities. The Call to Action includes five strategic goals to promote walking and walkable communities: 1) make walking a national priority; 2) design communities that make it safe and easy to walk for people of all ages and abilities; 3) promote programs and policies to support walking where people live, learn, work, and play; 4) provide information to encourage walking and improve walkability; and 5) fill surveillance, research, and evaluation gaps related to walking and walkability.

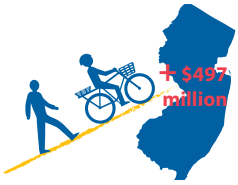
1.1: Sivak, M. & Schoettle, B. (2016)
1.2: American Public Transportation Association (2014)
1.3: Farber, N., Shinkle, D., Lynott, J., Fox-Grage, W., & Harrel, R. (2011)
1.4: New Jersey Department of Labor and Workforce Development. (2012)
1.5: League of American Bicyclists. (2013)

Why are Walking and Bicycling Important?

Transportation is a basic need, enabling people to go to work and school, shop, visit friends and family, and participate in civic or worship communities. Walking and bicycling are essential components of the transportation system. Walking is the most fundamental of all transportation modes and part of nearly every trip people make. Bicycling also holds potential to increase mobility options for the relatively short trips that make up the majority of daily travel. Although progress has been made and many communities in New Jersey recognize the value of walking and bicycling, there remains a need to articulate the wide range of individual and community benefits of nonmotorized transportation, as noted below.

Walking and bicycling are important to New Jersey because they...

... are healthy.



... contribute to the economy.

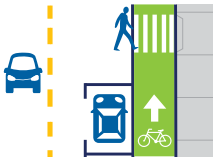
... promote equity.

... are good for the environment.

... improve access to schools.

... improve access to public transit.

... help enhance transportation systems to better serve disabled persons.



... are at the heart of Green, Smart, and Complete Streets.

... are fiscally attainable.

... are good for personal finances.

... are growing in acceptance, legitimacy, and preference.

... contribute to placemaking and quality of life in New Jersey.

NJDOT Milestones & Successes Since 2004

2004 - 2016	Provided technical assistance to 65 communities through the Local Bicycle & Pedestrian Planning Assistance Program	2012	Ranked strongest in the nation by National Complete Streets Coalition for NJDOT Complete Streets Policy
2004 - 2016	Conducted 16 senior mobility workshops	2012	Developed the *New Jersey Safety along Railroads Short-Term Action Plan* with NJ TRANSIT
2004	Completed the East Coast Greenway Route Development Study through New Jersey	2012	Developed the *New Jersey Bicycle Map and Resource Guide*
2005 - 2016	Funded 153 Safe Routes to School grants totaling $25.6 million in 116 municipalities	2012	Geocoded all of NJDOT's bicycle tour guides for use on mobile devices
2005	Published *Pedestrian Safety Management in New Jersey: A Strategic Assessment*	2012	Constructed a shared use path on the Route 52 Causeway
2006	Announced the Governor's Pedestrian Safety Initiative	2012	Installed a pedestrian hybrid beacon (HAWK signal) on Route 27 to improve access to Metropark Station
2006	Assigned a full-time SRTS Coordinator to the Office of Bicycle & Pedestrian Programs	2012	Completed a road diet of Route 45 in the City of Woodbury
2006	Created the Pedestrian Safety Management System	2012	Included sidewalk and bicycle accommodations in the Route 72 Manahawkin Bay Bridges Project
2009	Adopted a Complete Streets Policy	2013	Held the second New Jersey Complete Streets Summit
2009	Developed the *New Jersey Trails Plan Update* with NJ Trails Council and NJDEP	2013	Developed the Pedestrian Safety Analysis to assist NJDOT in focusing investments in areas of high need
2010 - 2016	Performed four Pedestrian Road Safety Audits	2013	Reconstructed Route 35 with sidewalks, bike lanes, and ADA ramps
2010	Published the *New Jersey Bicycling Manual*	2013	Installed bike lanes on 3.5 miles of Route 47 in Gloucester County
2010	Held the first New Jersey Complete Streets Summit	2014	Developed the *New Jersey Pedestrian Safety Action Plan & Toolbox*
2010	Replaced the Route 36 Highlands Bridge, including bike lanes, sidewalks, and two pedestrian overpasses	2014	Developed the *New Jersey School Zone Design Guide*
2011	Integrated the Complete Streets checklist into project delivery	2014	Revamped the New Jersey Bicycle & Pedestrian Advisory Council (BPAC) with establishment of Executive Council and Subcommittees
2011	Published *Making Complete Streets a Reality: A Guide to Policy Development*	2015	Held the third New Jersey Complete Streets Summit
2011	Implemented the SRTS non-infrastructure program through NJ's eight TMAs with assistance from the NJ SRTS Resource Center at Rutgers VTC	2015	Completed the routing study for the September 11th National Memorial Trail across New Jersey
2012	Published *A Guide to Creating a Complete Streets Implementation Plan*	2016	Developed the *New Jersey Complete Streets Design Guide*
2012 - 2015	Hosted a series of 18 Complete Streets training workshops across the state	2016	Developed the *New Jersey Bicycle Safety Action Plan & Toolbox*

Outreach Process

The development of the *New Jersey Bicycle & Pedestrian Master Plan* was guided by stakeholder and public input. Public outreach efforts included development of a project website and survey, participation at conferences and professional events, and interviews with stakeholders. A Steering Committee provided oversight and input on draft documents. The findings of these efforts helped identify needs, challenges, and priorities to improving walking and bicycling in New Jersey.

Steering Committee

The Executive Council of the New Jersey Bicycle and Pedestrian Council (BPAC) functioned as the Steering Committee for the master plan. BPAC members include a cross section of transportation, safety, and public health professionals representing FHWA, NJDOT, NJ Division of Highway Traffic Safety, NJ Motor Vehicle Commission, NJ TRANSIT, NJ Department of Environmental Protection (Trails Council), NJ Department of Health, Voorhees Transportation Center, South Jersey Transportation Planning Organization (SJTPO), Delaware Valley Regional Planning Commission (DVRPC), North Jersey Transportation Planning Authority (NJTPA), NJ Bike & Walk Coalition, and the Tri-State Transportation Campaign. The development of master plan content and the findings from the outreach processes were presented to the BPAC at quarterly public meetings in December 2015, March 2016, and June 2016. Through these presentations and feedback, BPAC helped develop the master plan vision, goals, and strategies.

Outreach Events

NJ American Planning Association Conference, January 2016

New Jersey Bike & Walk Summit, February 2016

TransAction Conference, April 2016

Project Webinar, April 2016

New Jersey Police Traffic Officers Association, April 2016

New Jersey Society of Municipal Engineers, April 2016

Rutgers University Public Health Symposium, April 2016

Sustainable Jersey Funding Walk and Bike Friendly Communities Workshops, May 2016

Environmental Justice Outreach, May – July 2016

Circuit Trails Coalition Steering Committee, June 2016

NJDOT Inreach, June 2016

Public Outreach

Public involvement was an important part of the planning process for this master plan. Public outreach efforts included developing and maintaining a project website, administering an online survey, and conducting targeted interviews to reach traditionally underserved communities.[1.6]

The project website was hosted at www.njbikepedplan.com. It was used to post information and updates, to present a draft of the master plan for public review and comment, and to solicit feedback on pedestrian and bicyclist success stories throughout the state. The website also hosted an electronic survey to gain insight on bicyclist and pedestrian experiences, perceptions, and needs. The online survey was conducted over six weeks in April and May 2016 and resulted in over 450 responses.

The study team also reached out to organizations that serve or advocate for the needs of low income and minority residents in New Jersey, to gain their perspectives on bicycle and pedestrian needs and concerns affecting their constituencies. The team identified an initial list of environmental justice, public health, and social service organizations serving areas of the state with concentrations of low income and minority residents, including Camden, Trenton, Newark, New Brunswick, Paterson, and Atlantic City. Each organization was contacted to request a telephone interview, which included questions on barriers to bicycling and walking, the most important actions needed to improve mobility, and other concerns and suggestions for the master plan. The interview findings, as well as a joint response received from members of the Circuit Trails Coalition, helped to shape the master plan and highlighted the following issues:

- the lack of bicycle and pedestrian facilities in low-income urban areas;
- the need for ADA improvements for wheelchair users;
- concerns about safety and personal security while walking or bicycling;
- poor communication between local governments and minority neighborhoods around the installation of bicycle facilities; and,
- a variety of funding challenges that are obstacles to improving transportation infrastructure.

Outreach to Planning, Design, and Health Professionals

From the early stages of master plan development, the professional communities of planning, engineering, safety, public health, and transportation advocacy were identified as key resources for pedestrian and bicyclist issues, as well as essential agents and partners in achieving the master plan's vision. Outreach to these professional communities was conducted through presentations and participation at meetings and conferences. In addition, a webinar for professional stakeholders was held to solicit input on this master plan and the *New Jersey Bicycle Safety Action Plan*.

Outreach to professional communities also included a series of interviews with NJDOT employees from the following areas within NJDOT - Capital Program Support, Traffic Engineering, Project Management, Local Aid & Economic Development, Transportation Systems Management, and Rights of Way and Access Engineering. These interviews focused on how NJDOT can better address the needs of pedestrians and bicyclists through changes to internal program and departmental processes and improved coordination. While internal discussions celebrated the success of NJDOT's Complete Streets Policy, they revealed a need to improve communication, education, and collaboration among NJDOT personnel related to pedestrian and bicyclist improvements.

1.6: Traditionally underserved populations are defined using FHWA's definition, which includes persons or communities fitting one or more of the following descriptions: low income, minority, older adults, limited English proficiency, and persons with disabilities.

Outreach Key Takeaways

The vision statement would benefit from additional language to emphasize that people of all ages and abilities walk and bicycle and that respect among all travel modes is very important.

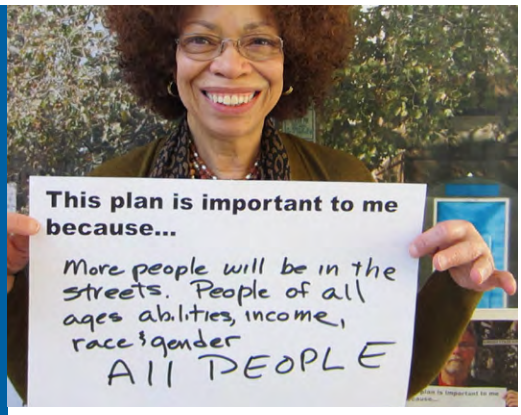
The master plan should identify collaborative actions with other state agencies, counties, municipalities, and non-governmental organizations to effect positive change for pedestrians and bicyclists.

Survey respondents identified improved facilities, slower traffic, and education for motorists and pedestrians as top improvements for pedestrian travel.

Survey respondents identified more on-road and off-road facilities, better accommodation at intersections, and increased enforcement and education of traffic laws as top improvements for bicycle travel.

Environmental justice interviews revealed a lack of bicycle, pedestrian, and ADA-compliant facilities in low-income urban areas, concerns about safety and personal security, and a variety of funding challenges.

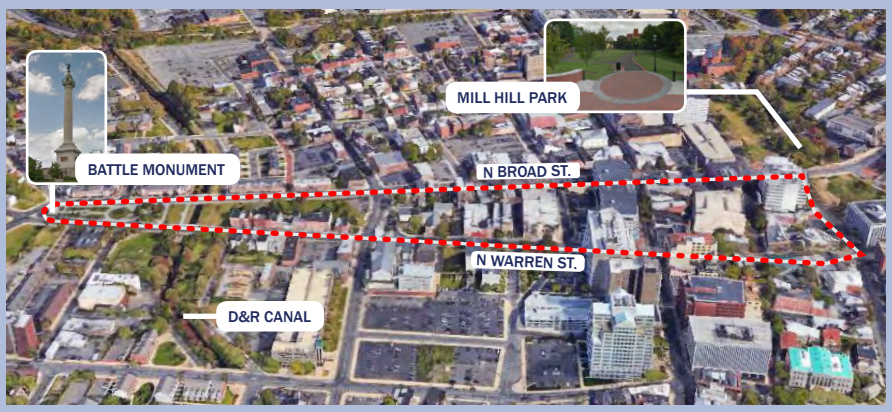
NJDOT 'inreach' interviews revealed a high regard for Complete Streets policy, but also the need for improved intra-departmental communication, collaboration, and education to overcome engineering and operational challenges to multi-modal improvements.



Success Stories

Camden GreenWay Circuit Trails Plan

With the support of NJDOT, Cooper's Ferry Partnership, and the City of Camden, the Camden GreenWay Circuit Trails Plan advances development of an active transportation network with regional connectivity throughout the City of Camden. The plan identifies proposed routes that will close gaps in the city's trails system and bicycle network, as well as integrate the Camden GreenWay (within the City of Camden) with the Circuit (Greater Philadelphia Regional Trails Network). Upon completion, the network will connect over 128 miles of bicycle and pedestrian facilities, with Camden acting as a hub for South Jersey.



Trenton Wellness Loop

The Wellness Loop serves Trenton citizens in a number of ways. It links Battle Monument and the D&R Canal trail system with Mill Hill Park and downtown Trenton, providing a safe opportunity for bicycle commuting, recreational use, and children traveling to and from school. In June of 2016, the project was awarded funding through a Phase IV Regional Trails Program Grant (DVRPC).

New Brunswick Ciclovia

The first of its kind in New Jersey, the New Brunswick Ciclovia is an open streets event where streets are closed to vehicular traffic and open to bicyclists and pedestrians. First held in 2013, the event draws thousands of residents, students, and visitors to downtown New Brunswick for a day of walking, bicycling, and festivities. Ciclovia strives to show the positives of walking and bicycling and how these modes of transportation help bring a community together. (Photo credit: nj.com).

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Chapter 2

Current Conditions and Needs

Walking and bicycling conditions have evolved in New Jersey since the *NJ Statewide Bicycle & Pedestrian Master Plan, Phase 2* (2004). This chapter provides a snapshot of current conditions and identifies key needs to be addressed by the master plan, beginning with a look at the facilities available for bicycling and walking, the people who are using them, and safety statistics.

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Walking and Bicycling in New Jersey

New Jersey's pedestrians and bicyclists reflect the state's diverse population. As workers, they range from lower income service workers and others without access to automobiles to affluent commuters who walk or bicycle to a rail station for their trip to Newark, New York City, or Philadelphia. As shoppers, they include both suburban residents and city dwellers who walk or bicycle to run errands and accomplish daily tasks, whether by choice or necessity. Still others walk or bicycle for recreation, fitness, or entertainment.

Relatively little data is available on the rates of walking and bicycling. However, the use of these modes tends to be concentrated in areas with relatively high population density and high transit use, and highest among households with limited access to automobiles.

Figure 2-1 shows the concentration of zero car households, according to 2014 American Community Survey (ACS) data. In 2014, this accounted for 11.7% of New Jersey households (373,136 households), with significant concentrations in Hudson, Union, Essex and parts of Bergen, Passaic and Camden counties.

Data on household income can also indicate areas with more limited access to vehicles and where bicycling and walking is a necessity for daily transportation. In 2014, nearly one million New Jersey residents (934,665, 10.7% of NJ population) were living below

11.7%

of NJ Households Do Not Have a Car

10.7%

of NJ Residents Live Below the Poverty Line

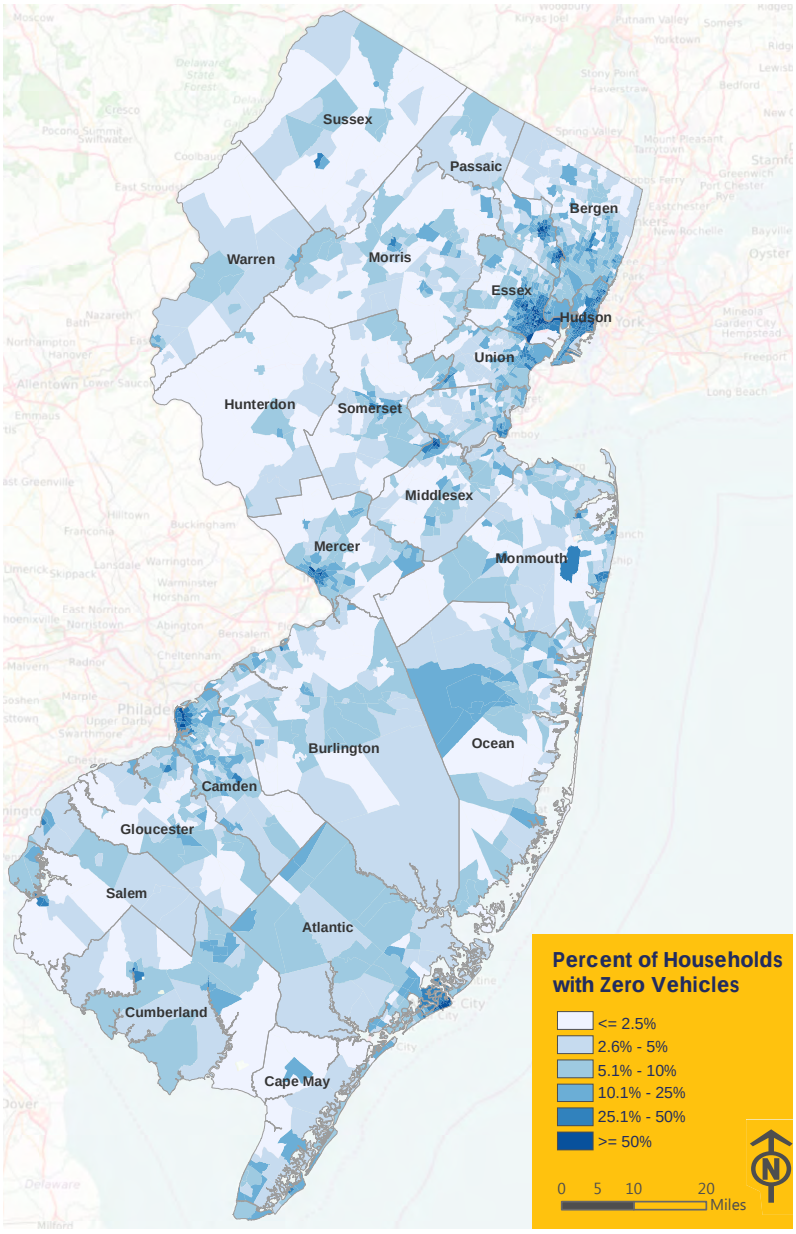


Figure 2-1. *Zero Car Households in New Jersey by Census Tract (ACS 2014)*

the poverty level. Incomes are lowest in several large, dense municipalities, such as Newark, Paterson, Camden, Trenton, and New Brunswick. These municipalities also have some of the highest rates of public transit use and households with limited or no access to autos.

The 2014 ACS provides a breakdown of transportation modes for the work trip. In New Jersey, walking accounts for 3% of work trips and bicycling accounts for 0.3%. This compares with 2.8% and 0.6%, respectively, for the nation as a whole. New Jersey ranks 20th out of 51 states, including Washington, D.C., in the percentage of workers walking to work, and 33rd in the percentage bicycling to work.

Since the ACS commutation data is only for the primary mode used, these figures do not reflect the use of walking and bicycling to access public transit services. As of 2014 ACS reporting, 11% of New Jersey workers used transit to commute to work, the third highest usage in the country behind only Washington, D.C. and New York State. The statewide transit share reflects recent ridership growth at NJ TRANSIT, which hit record levels in 2015.[2.1] Figure 2-2 illustrates the concentration of New Jersey residents who use public transit, walk, or bicycle to work.

Transit, walking, and bicycling are often complementary modes of transportation. All transit passengers must use another mode of travel to get to and from their station stops, and walking is a common element of at least one leg of the journey. This makes walking an integral part of the transit system. An interconnected pedestrian network and safe, comfortable, and convenient pedestrian access to transit are critical to support and encourage transit ridership in the state.

2.1: Driving to work alone accounts for nearly 72% of all households in New Jersey. Carpooling accounts for an additional 8%, and 4% work at home.

Meeting Needs: Most Vulnerable Users

While all pedestrians and bicyclists are vulnerable users of the roadway system, strategies that reduce risk for the most vulnerable are especially needed. These include persons in low-income communities, particularly those who depend on walking and transit, and those most at risk of injury from crashes, including youth, the elderly, and the disabled. Chapter 3 outlines strategies to improve conditions and reduce risks to the most vulnerable users.

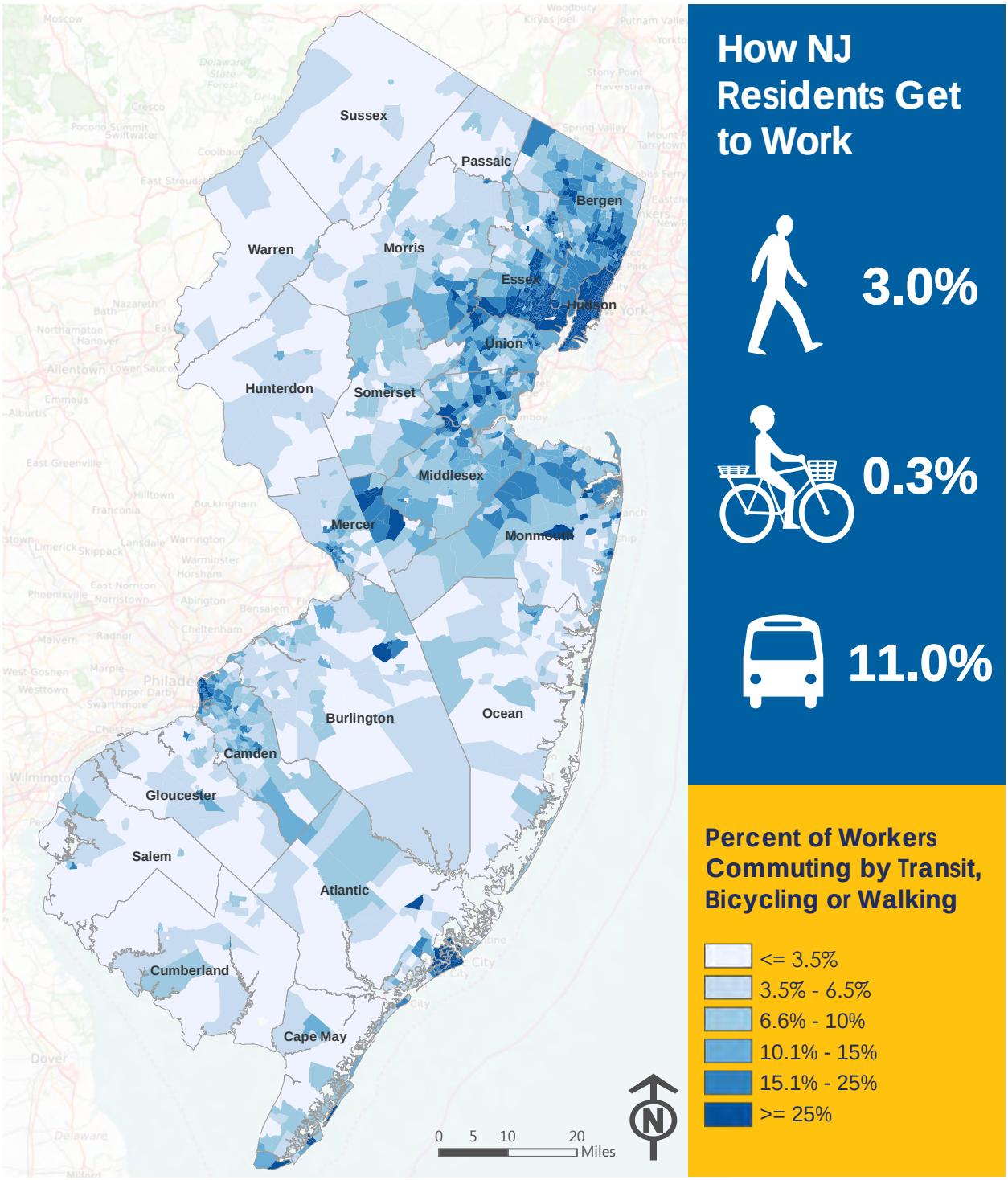


Figure 2-2. *Modeshare in New Jersey by Census Tract (ACS 2014) illustrating the concentration of New Jersey residents who use public transit, walk, or bicycle to work. Hudson, Bergen, and Essex Counties have the highest concentrations. Communities along the Northeast Corridor and the North Jersey Coast transit lines also have higher concentrations.*

Types of Pedestrian and Bicycle Facilities

Pedestrian Facilities

Pedestrians rely principally on sidewalks and crossing facilities to complete their trips. Since the *NJ Statewide Bicycle & Pedestrian Master Plan, Phase 2 (2004)*, the construction and improvement of pedestrian facilities has been a priority for many New Jersey communities and for NJDOT, as the level of interest in walkable environments continued to rise and Complete Streets policies began to take hold. There is also more widespread recognition of the need for enhanced pedestrian protection at crosswalks, particularly at midblock locations, and greater use of new technologies to increase awareness, visibility and compliance. In addition, national practice on pedestrian signal timing has changed to better accommodate the walking pace of senior pedestrians.

Lack of a sidewalk network, particularly along busy roadways, creates difficult and unfriendly conditions for pedestrians.

Pursuant to the Americans with Disabilities Act (ADA), curb ramp improvements are also an integral part of roadway improvement projects. Properly designed curb ramps improve access and mobility for all pedestrians, and particularly those with mobility or vision impairments, young families with strollers, and New Jersey's growing senior population. NJDOT's reconstruction of Route 35 following damage from Superstorm Sandy, for example, included installation of over 700 ADA-compliant curb ramps over a 12.5-mile corridor, as well as bicycle lanes and improved pedestrian crossings.

Streetscape and sidewalk improvements benefit pedestrians, but maintaining safe mobility should be considered during construction operations.

NJDOT's Complete Streets Policy has resulted in the inclusion of walkways along state highways and bridges that might otherwise lack pedestrian accommodation. Similarly, Complete Streets policies at the county and local level are promoting construction of new sidewalks and projects to fill gaps in existing sidewalks.

However, there are still many places in New Jersey where pedestrians must travel without the benefit of consistent sidewalks or convenient, protected crossings. Examples include numerous arterial highways with developments designed for auto access that are also utilized by pedestrians. Substandard pedestrian conditions persist at many bus stops and around other major pedestrian generators, such as schools. Inadequate pedestrian lighting is another systemic issue affecting the mobility, safety, and security of pedestrians in many areas. Aging and older infrastructure, such as deteriorating sidewalk and missing or substandard curb ramps, are also common throughout the state and create barriers to mobility and access for wheelchair users, older adults, and those with limited mobility.

Bicycle Facilities

Bicycle facilities are critical to accommodate cycling as an essential form of transportation and encouraging more people to bicycle. New Jersey's bicycle network is composed primarily of bicycle lanes, shared lanes, and shared use paths spanning a multitude of jurisdictions, ownership conditions, and maintenance responsibilities. Bicycle facilities also include bicycle parking, bike share programs, transit integration, and crossing treatments, such as bike boxes, traffic signal detectors, and intersection striping to improve the visibility of bicycle facilities and guide bicyclists across intersections. Newer types of bicycle facilities, such as physically separated bicycle lanes and bicycle boulevards, are also starting to be used in New Jersey.

In response to demand for more and better bicycle facilities, bicycling planning and design has advanced significantly since the *NJ Statewide Bicycle & Pedestrian Master Plan, Phase 2 (2004).* Guidebooks by FHWA and the National Association of City Transportation Officials (NACTO) reflect this evolution and current best practices. Nationally, there has been a rise in the use of separated bicycle lanes to more effectively separate bicyclists from other vehicles. The number of miles of separated bicycle lanes has doubled since 2011, and the number of streets in the U.S. with separated bicycle lanes has increased nearly ten-fold, from 28 in 2003 to 270 by winter 2016.[2.1]

New Jersey's shared use paths range from short, local facilities to larger regional trail corridors, such as the East Coast Greenway. They are used extensively by recreational riders as well as for basic transportation. Many shared use paths are prized local assets that provide fitness benefits, connect local destinations, and help attract visitors. According to research by the Voorhees Transportation Center, there are approximately 214 miles of shared use paths in New Jersey.

Bicycle lanes designate space for bicyclists through use of striping, pavement markings, and signs. They enable bicyclists to ride at their preferred speed without interference from motor vehicle traffic conditions and facilitate predictable behavior and movements among bicyclists and motorists.

Middlesex Greenway is a 3.5-mile off-road shared use path in Middlesex County. Roughly 6,000 feet of the Middlesex Greenway is designated as East Coast Greenway.

2.1: People for Bikes, 2016

Since the *Phase 2 Plan* (2004), bicycles are also now accommodated on a greater proportion of transit vehicles. As of 2015, roughly half of NJ TRANSIT's bus fleet is bicycle-friendly, including all bus services in the Southern Division (Princeton and south). In addition, bicyclists with nonfolding bicycles can now board NJ TRANSIT commuter trains at any station, as well as SEPTA rail and PATH rail services, subject to peak period and holiday restrictions. Bicycles are permitted on PATCO rail services at any time. PATCO also provides bicycle parking behind the turnstiles, providing a covered and more secure parking option with 24 hour access. Long haul commuter buses permit bicycles in the under carriage storage area. On New Jersey ferry services, there is a surcharge for nonfolding bicycles.

Roll-on bicycle access allows better integration of transit and bicycle trips (Left: New Brunswick station. Right: NJ TRANSIT's RiverLine service (photo credit: Sue Prant).

Personal Security in the Walking Environment

In many of New Jersey's urban neighborhoods, concerns about personal security are paramount in the decision of whether to walk or allow a child to walk. Moreover, concerns about crime significantly affect the walking experience and overall quality of life for those who depend on walking. A lack of security also inhibits access to parks and other recreational facilities, thereby limiting opportunities for physical activity.

In interviews conducted for this master plan with community-based urban organizations, participants mentioned property maintenance as a significant security issue; abandoned or vacant properties and overgrown vegetation contribute to a lack of security. Suggested improvements included implementing Crime Prevention through Environmental Design (CPTED) measures to create safer environments, so that residents are comfortable using sidewalks and parks.

Bike share is another new bicycle program emerging in the United States and New Jersey since the *Phase 2 Plan*. Bike share further integrates bicycling into the transportation network. It improves mobility options and makes bicycling a more convenient and accessible transportation choice for residents and visitors. It also makes bicycling a more visible part of the transportation system and encourages higher ridership. Bike share stations can also be paired with transit stops to help extend the reach of transit services, providing another alternative for the "last mile" transit connection. Several bike share systems are currently operating in New Jersey, including Collingswood, Hoboken, Jersey City, and Princeton.

Bike exchanges also help to promote bicycling by making bicycles available at low cost. The New Jersey Bike Exchange currently operates exchanges in Plainfield, New Brunswick, and Trenton. At the Trenton facility, donated bicycles are repaired by teens who gain skills through the program. Proceeds of bicycle sales are donated to the Boys & Girls Clubs of each community.

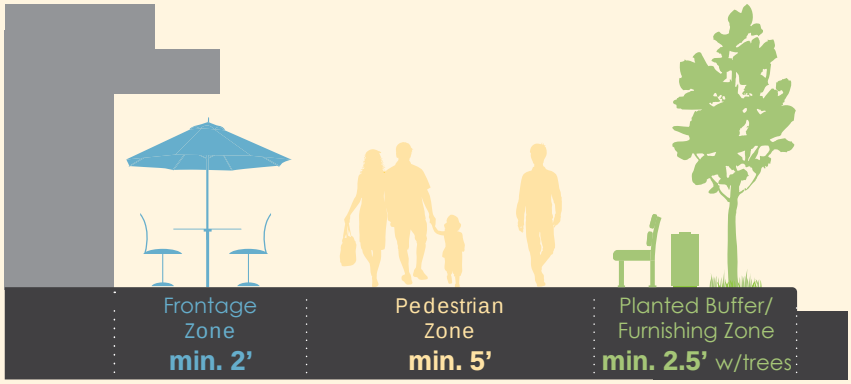
Clockwise from top left, bike share stations in Hoboken, Jersey City, and Princeton

Pedestrian Facilities

Pedestrian facility design focuses on creating a safe and comfortable walking environment for people of all ages and abilities. Pedestrian features cover a range of design elements, from sidewalks and paths, to crossing treatments, lighting, street furniture, and amenities to enhance the streetscape. The design resources listed below provide standards and guidelines that should be adhered to, ensuring that appropriate and accessible pedestrian facilities are provided.

Sidewalks

The primary objective in designing sidewalks is to provide continuous, safe, and accessible pathways for pedestrians. Sidewalks should be designed to follow as much as possible the natural path of travel. In some cases, it is more desirable for a sidewalk to divert from that path to provide a more adequate facility or a greater degree of separation between the sidewalk and the roadway.



This sample sidewalk cross section, from the NJDOT Complete Streets Design Guide, illustrates how different sections of the sidewalk space are allocated to different uses to ensure a comfortable and accessible walking environment.

Pedestrian Crossings

A well-designed pedestrian crossing facilitates visibility and predictability for all users. A multitude of different treatments and strategies are available to help designers enhance pedestrian crossings and mitigate potential conflicts with motor vehicles, including signing and striping options, traffic calming, and pedestrian beacons and traffic signals. Accessible curb ramps are essential to any crossing.

This sample pedestrian crossing treatment, from the NJDOT Complete Streets Design Guide, illustrates how effective striping and a center crossing island create a shorter and more visible pedestrian crossing.

Design Guidance

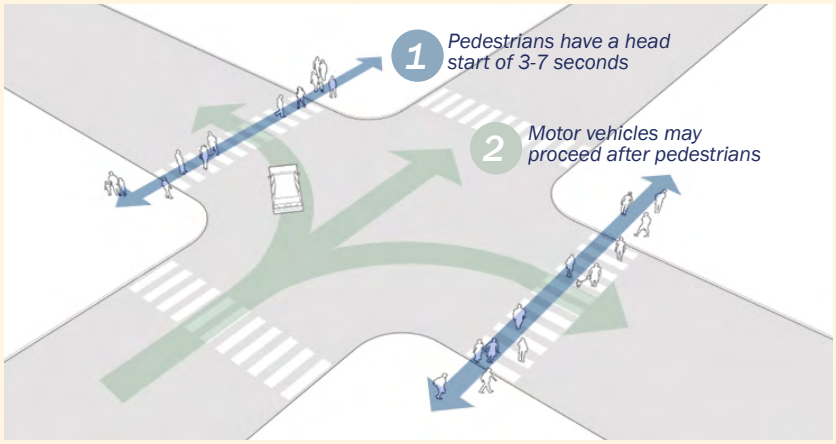
- NJDOT *Complete Streets Design Guide*
- AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities*
- NACTO *Urban Street Design Guide*
- *Americans with Disabilities Act Accessibility Guidelines* (ADAAG)
- *Manual on Uniform Traffic Control Devices* (MUTCD)
- ITE *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*

Signal Accommodations

At signalized intersections, design must take into account the needs of all users and all abilities. This includes providing pedestrian signal heads to clearly indicate when it is safe to cross and ensuring sufficient time for pedestrians to safely cross the street. Depending on the context of the intersection and the amount of pedestrian traffic, the "walk" signal can be manually actuated by pedestrian push buttons, or it can be integrated into the timing plan and automatically occur during each cycle of the traffic signal.

Signal heads with countdown timers clearly indicate when it is safe to cross the street and how much time pedestrians have to complete the crossing.

The leading pedestrian interval (LPI) is one signal timing strategy to help mitigate conflicts between pedestrians and turning vehicles. LPIs give pedestrians a head start, providing a few seconds (typically 3 – 7 seconds) to begin their crossing before vehicles have a green light. This lead time helps reduce the risk of collisions by increasing the visibility of pedestrians, establishing them in the crossing before vehicles begin their turning movements.



A leading pedestrian interval increases pedestrian visibility. (Image credit: NACTO, modified for this document.)

Curb ramps must be provided at all crosswalks. Ramps and pedestrian push buttons must be accessible to all users and meet the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG), which include standards on ramp width and slope.

Accessibility

Streets and trails must accommodate safe travel for everyone, including those with disabilities. Designing for accessibility not only benefits those with disabilities, limited mobility, or parents with strollers, but helps create a more complete and mobility-supportive built environment for all users. Complete and maintained sidewalk networks, accessible transit stops, properly placed and designed curb ramps and pedestrian push buttons, and other accessible design features make walking easier for everyone and create a more pedestrian friendly environment.

Bicycle Facilities

Many communities in New Jersey are taking the lead and applying design strategies to better accommodate bicycling, both on local streets and off-road paths. NJDOT's *Complete Streets Design Guide* provides information on bicycle facilities that can be combined to create a safe, comfortable, and connected bicycle network. Bicycle facilities should be selected based on local context and needs of the community, bearing in mind that the majority of the population prefers cycling where there are slower traffic speeds and/or separate space for cyclists. Common types of bicycle markings or facilities include:

- Standard Bicycle Lane
- Buffered Bicycle Lane
- Separated Bicycle Lane
- Bicycle Boulevard
- Shared Lane Markings
- Shared Use Path
- Bike Box
- Intersection Striping
- Bicycle Signal

Shared Use Paths

Shared use paths are travel ways that are physically separated from motorized vehicular traffic and provide travel accommodation for bicyclists, pedestrians, inline and roller skaters, skateboarders, and kick scooter users. A shared use path may operate within a roadway right-of-way or within an independent right of way. Shared use paths are appropriate in a range of contexts, from urban to rural, and are an efficient way to build out bicycle and pedestrian networks that may operate independently of established motor vehicle rights-of-way.

This shared use path at Sandy Hook is part of a five-mile paved network shared by bicyclists, hikers, and in-line skaters.

Bicycle boulevard on Haven Avenue in Ocean City, NJ, has a 15 mph speed limit and uses curb extensions and a raised median to slow traffic and reduce cut-through traffic.

Bicycle Boulevards

Bicycle boulevards are linear corridors of interconnected, traffic-calmed streets where bicyclists are afforded an enhanced level of safety and comfort. Key features include a reduced speed limit (25 mph or less), wayfinding signage and pavement markings, traffic calming features, and traffic volume management strategies.

Separated Bicycle Lanes

Separated bicycle lanes are bikeways that are at street level and use a variety of methods for physical separation from passing traffic, such as bollards, planters, on-street parking, curbing, or medians. Unlike a conventional or buffered bicycle lane, a separated bicycle lane provides vertical separation to prevent encroachment, improve safety, and deter double-parking. The vertical separation of the bicycle lane from motor vehicle traffic makes a separated bicycle lane more attractive for bicyclists of all ages and abilities.

Two-way separated bicycle lane in Hoboken, NJ, with bollards and on-street parking separate bicyclists from motor vehicle travel lanes. Local preference can determine the use of a colored pavement treatment, as shown.

Illustration of a bike box, from the NJDOT Complete Streets Design Guide, used to mitigate conflicts between bicycle and motor vehicle traffic at signalized intersections and improve the visibility of bicyclists.

Bike Boxes

A bike box is a designated area at the head of a traffic lane at a signalized intersection, providing bicyclists with a safe and visible way to position themselves ahead of queuing traffic during the red signal phase. This can help mitigate potential conflicts between bicyclists and vehicles, making it easier for bicyclists to make left turns and helping through-bicyclists avoid right turning vehicles ("right hook" crashes).

Design Resources

- NJDOT *Complete Streets Design Guide*
- AASHTO *Guide for the Development of Bicycle Facilities*
- NACTO *Urban Bikeway Design Guide*
- FHWA *Separated Bike Lane Planning and Design Guide*
- *Manual on Uniform Traffic Control Devices* (MUTCD)

Major Roadway Retrofits

One of the major challenges pedestrians and bicyclists face in New Jersey is navigating along or across multi-lane, high speed roadways. The combination of high traffic speeds, high volumes, and wide cross section on many of New Jersey's arterial roadways creates an inhospitable environment for walking and biking. These roadways also form barriers that divide communities and disconnect neighborhoods from schools, local businesses, and job centers.

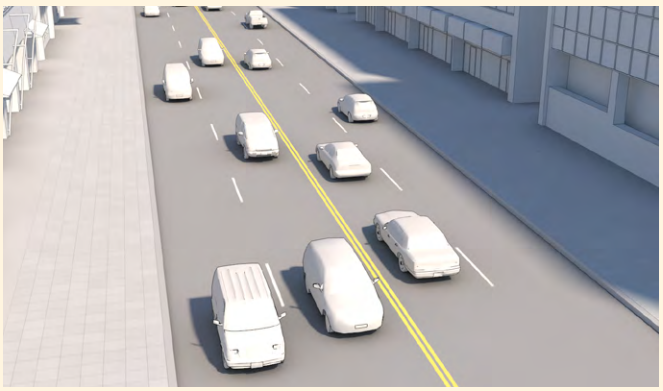
A promising approach for retrofitting major roadways is to reallocate roadway space or adjust the character of the roadway to better meet the needs of all modes. Examples include road diets and other traffic calming measures, such as curb extensions.

Road Diet

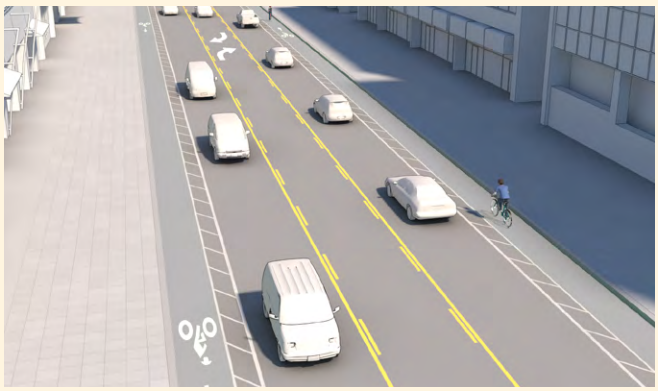
Where there is excess capacity, a road diet can be used to reduce the number of travel lanes and reallocate space for other modes of travel, often bicycle lanes. In addition to reallocating space to other modes, road diets have numerous benefits that improve conditions for bicyclists and pedestrians. Road diets are endorsed by FHWA as a proven safety countermeasure. Removing travel lanes to provide a dedicated turn lane reduces the number of potential conflict points, lowers motor vehicle speeds, and shortens pedestrian crossings. Road diets have been implemented on major roadways throughout New Jersey to help improve safety and create streets that are more bicycle and pedestrian friendly. In the last five years, more than 47 road diets have been undertaken on New Jersey roadways. Recent projects include NJ 45 in downtown Woodbury, Main Street in Avon-by-the-Sea, County Road 656 in Ocean City, and County Road 529 in Green Brook.

Road diet implemented on CR 656 in Ocean City integrates bicycle lanes and curb extensions.

Road Diet - Before



Road Diet - After



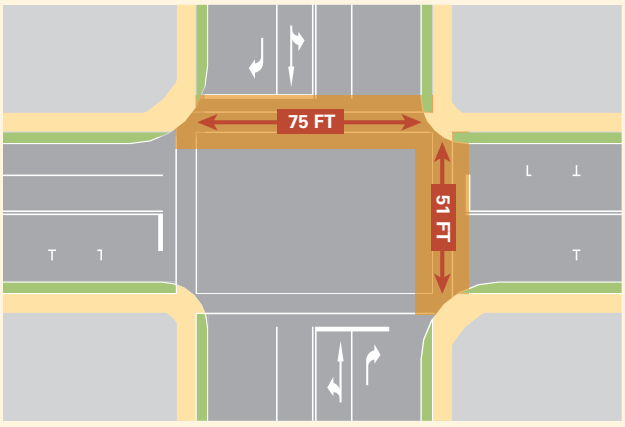
A road diet is a reduction in the number of travel lanes on a roadway. In the above example, a four-lane roadway is converted to a three-lane roadway, including a center turning lane and the addition of buffered bicycle lanes.

Traffic Calming

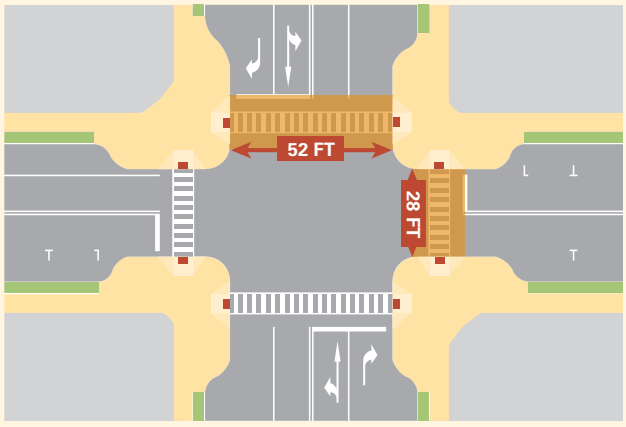
Where implementing a road diet is not feasible, other traffic calming techniques can be used to retrofit major roadways and create a more attractive and safe environment for bicyclists and pedestrians. Some techniques alter the configuration of the roadway, while others change how people psychologically perceive and respond to a street. Different techniques are appropriate for different contexts.

A curb extension, also referred to as a bulb-out or bump-out, is one technique that can be applied to major roadways to improve the quality and safety of the pedestrian environment at intersections and midblock crosswalks. The benefits of curb extensions include improving visibility for drivers and pedestrians, shortening the pedestrian crossing distance, narrowing the roadway to slow traffic, and shielding on-street parking from encroaching traffic. They also create opportunities for pedestrian amenities such as street furniture, bicycle parking, as well as space for green stormwater treatments such as rain gardens.

Curb Extension - Before



Curb Extension - After



In the above example, the addition of curb extensions significantly shortens the pedestrian crossing distances, while also improving visibility and reducing traffic speeds.

Design Resources

NJDOT has developed several resources to support the implementation of road diets, traffic calming, and other Complete Streets design treatments throughout the New Jersey:

- NJDOT *Complete Streets Design Guide* - compilation of best practices, design standards, and strategies to integrate Complete Streets into new and existing roadway projects
- Road Diet video - informational guide on how road diets work, benefits, and examples of implementation in a variety of contexts across NJ *http://www.state.nj.us/transportation/eng/completestreets/roaddiet.shtm*

Success Stories

Division Street

Division Street in Somerville became a pedestrian-only street in 2013. The street has attracted new businesses, serves as a focal point for the community, and provides a flexible public space for community events.

Crossing Guard Training

The Safe Routes To School Resource Center (SRTSRC) compiles research and tools to support school crossing guards and conducts training programs for the municipal police traffic safety officers that supervise school crossing guards. The SRTSRC has released a Crossing Guard Training Manual detailing topics ranging from post routines to incident reporting. The training program, which has proven to be a major success, is offered regionally throughout the state and is open to any municipality. The SRTSRC offers other vital resources on their website, such as New Jersey traffic laws and legislation, crossing guard placement considerations and gap assessment, and a crossing procedures tip sheet.

Montclair Bike Depot

With support from the NJ Bike & Walk Coalition, Montclair opened a bike depot at the Bay Street NJ TRANSIT commuter rail station in 2014. The first of its kind in New Jersey, the depot features 24 indoor bike parking spaces, storage lockers, key card access control, and 24/7 security camera monitoring (photo credit: nj.com).

Success Stories

Route 23 Bicycle Lanes

NJDOT completed the reconstruction and realignment of Route 23 in Sussex Borough in 2015. The project predated NJDOT's Complete Streets policy and the final design did not initially include bicycle accommodations. However, public comments during the preconstruction phase indicated a need for bicycle accommodations, and the final striping plans were revised to convert the shoulder to a buffered bicycle lane. The project was awarded a 2015 engineering excellence award by the American Council of Engineering Companies of New Jersey.

Rt 52 Causeway

Completed in 2012, NJDOT's Route 52 bridge replacement project is an example of synergy between local and state Complete Streets policies to create a more robust, complete network. The bridge project links Ocean City with its mainland neighbors and features a separated shared use path for pedestrians and bicyclists. Since a permanent count station was installed in 2014, over 250,000 people used the shared use path between August 2014 and September 2015, with an average of over 1,400 people per day in July and August.

The Ironbound, Newark

The City of Newark developed BIKE IRONBOUND, a bicycle master plan for the Ironbound neighborhood, with a vision to create a safe, comfortable, and convenient environment for cyclists of all ages and abilities. The plan's principal goal is to increase bicycle ridership in the Ironbound and foster more widespread bicycle usage citywide through the implementation of high quality bicycle infrastructure improvements. The plan's proposed bicycle network, improvement strategies, and design guidelines provides a blueprint to achieve these goals, not only for the Ironbound neighborhood, but through strategies and designs that can be replicated across the entire city. The City of Newark identified pilot projects within the plan and began to implement elements of the network within months of the plan's adoption, quickly demonstrating the impacts of the improvements and building momentum and support to advance the plan.

Crash Data Analysis

One of the most important elements to any successful transportation network is safety. Analysis of crash data can help focus on specific needs, identify areas with a history of safety issues, better understand common factors associated with crash occurrence, and prioritize improvement projects. While many New Jersey residents walk and bicycle safely everyday, New Jersey is categorized as a Pedestrian-Bicycle Focus State by FHWA, placing an increased emphasis on bicycle and pedestrian safety across the state.

Between 2010 and 2014, 36,468 crashes involving bicyclists or pedestrians were documented in New Jersey. Of these, 26,548 (72.8%) involved pedestrians while the remaining 9,920 (27.2%) involved bicyclists. The number of bicycle and pedestrian crashes occurring each year has been trending downwards. Crashes that resulted in fatalities or serious injuries (KSI crashes) accounted for 5.3% of all bicycle and pedestrian crashes, or an average of 363 serious pedestrian crashes and 57 serious bicycle crashes each year. As with all crashes, KSI crashes have also trended downwards since 2010, as shown in Figure 2-3.

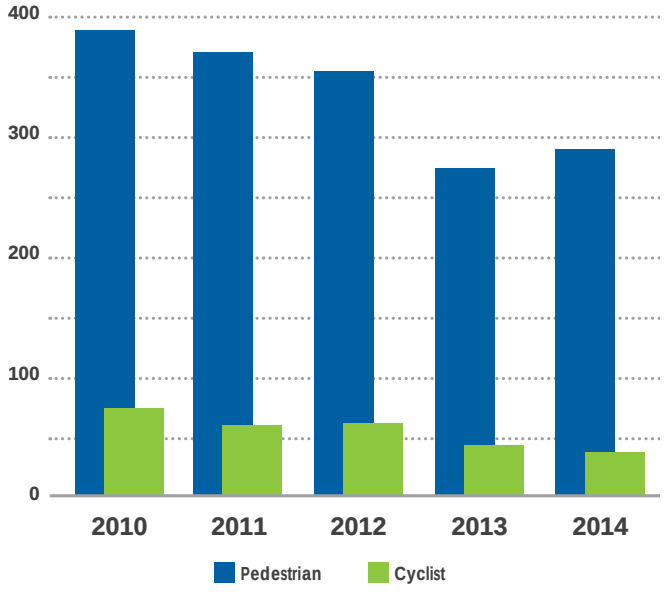


Figure 2-3. *Number of bicycle and pedestrian fatal and severe injury (KSI) crashes by year*

How Does New Jersey Compare to National Trends?

Within the national context, in 2014 New Jersey's pedestrian fatality rate exceeded the national average and ranked as the 10th highest pedestrian fatality rate among the 50 states and the District of Columbia. Pedestrian fatalities also accounted for a much higher proportion of all fatal crashes than the national average.

For bicycle safety, New Jersey stood in a slightly better position than the national average. Bicycle fatalities also accounted for a slightly lower proportion of all fatal crashes than the national average (NHTSA, 2014).

Bicycle & Pedestrian Fatality Rates (2014)		New Jersey	National
Pedestrian	Fatality Rate	1.88	1.53
	% of All Traffic Fatalities	30.3%	16.3%
Bicyclist	Fatality Rate	0.12	0.23
	% of All Traffic Fatalities	2.1%	2.4%

Where Are Bicycle and Pedestrian Crashes Occurring?

As shown in Figure 2-4, fatal and severe injury bicycle and pedestrian crashes tend to be most prevalent in the more urban and densely populated parts of New Jersey, including the northeast counties and the Trenton and Camden metropolitan areas, as well as smaller clusters around Asbury Park, Atlantic City, and Lakewood.

The location of crashes can also be examined in terms of crash rate per 100,000 residents. Normalizing the crash data by population is one way to account for different development patterns and to compare crash risk in different parts of the state. When viewed at the census tract level, areas of high crash rates are dispersed throughout the state (Figure 2-5). Similar to the distribution of crashes by location, there are pockets of higher crash rates in the northeast counties and near Trenton, Camden, and Atlantic City. Additionally, there are areas of higher crash rates in Cape May County, and some of the more rural areas in the south and west.

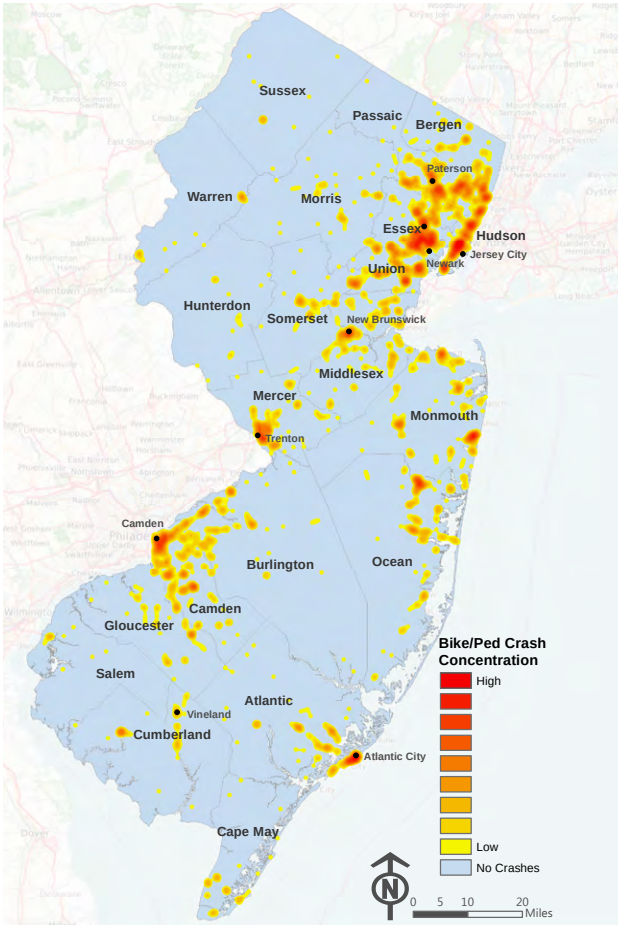


Figure 2-4. *Bicyclist and pedestrian crash hot spots in New Jersey [crashes involving serious injury or fatality, Plan4Safety 2010-2014]*

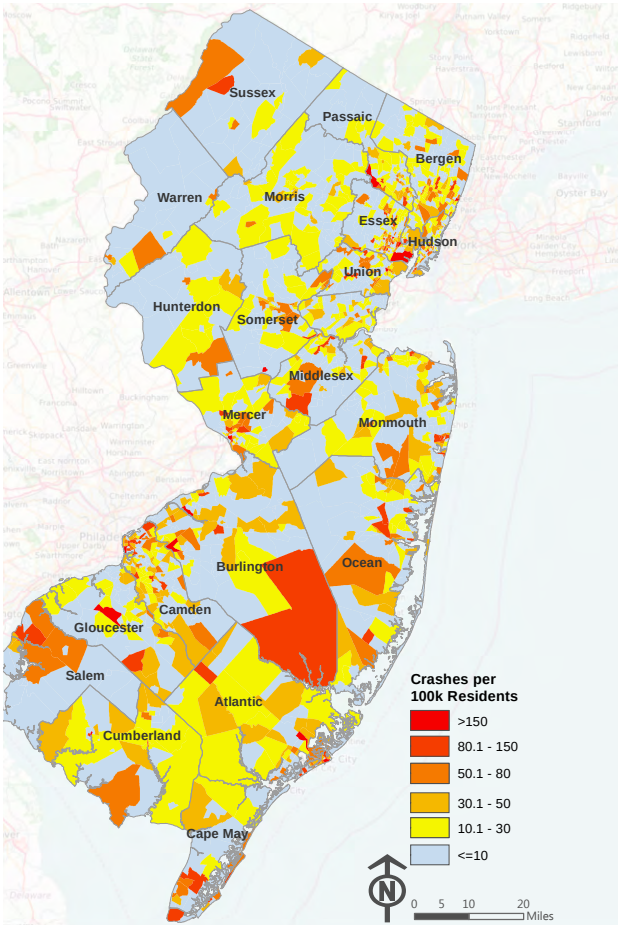


Figure 2-5. *Bicyclist and pedestrian crashes per 100,000 residents in New Jersey, by census tract [crashes involving serious injury or fatality, Plan4Safety 2010-2014]*

Safety Action Plans

The *New Jersey Pedestrian Safety Action Plan* and *New Jersey Bicycle Safety Action Plan* both conducted an in-depth analysis of crash data, examining various crash, demographic, roadway, and temporal factors to better understand pedestrian and bicycle safety issues throughout the state. These plans paid particular attention to fatal and severe injury (KSI) crashes in order to identify ways to mitigate the most severe safety issues. Among the findings include:

Severe pedestrian crashes:

- 72% of fatal and severe injury crashes occur away from intersections
- 29% of fatal and severe injury crashes occur along principal arterials (7.29 crashes per 1 billion VMT)
- 68% of fatal crashes occur under dark conditions
- Fatal pedestrian crash rates increase with pedestrian age, with those over 84 having the highest rate (3.23 pedestrian fatalities per 100,000 population)
- When also accounting for severe injuries (KSI crashes), young people ages 15-17 and 18-24 also have a high crash rate (6.30 and 5.91, respectively)
- Males are involved in two-thirds of fatal pedestrian crashes

Severe bicyclist crashes:

- 55% of fatal crashes occur at intersections
- 24% of fatal and severe injury crashes occur along principal arterials (1.03 crashes per 1 billion VMT)
- 42% of fatal crashes occur under dark conditions
- Bicycle crash rates are highest for those aged 15-17 for all levels of crash severity (0.54 bicycle fatalities per 100,000 population)
- Males are involved in 85% of fatal bicycle crashes

The two action plans include detailed recommendations and targets for improvement over a five-year period. These recommendations are integrated into the strategies outlined in this plan in Chapter 3.

Land Use Patterns, Bicycling, and Walking

Land use, community design, and development patterns have a direct influence on transportation options and choices. Traditional towns with residential neighborhoods in close proximity to major destinations, such as shopping, parks, schools, or jobs provide more opportunities for walking and bicycling. However, as a result of the decentralized development patterns that began in the mid-20th Century, bicycling and walking to destinations has become increasingly difficult for those living outside dense urban cores and older communities.

Demographic and land use trends are shifting, however. Over the past 15 years, there has been a renewed interest in smart growth, mixed use, and new urbanism development patterns. Young people and empty nesters, in particular, are returning to cities and large towns, seeking places to live that are not reliant on a car to get to work, shop, or visit friends. Developers have followed the market demand, increasingly focusing on mixed use or new "town center" development. This, in turn, has sparked a renewed interest in walking and bicycling, particularly in tandem with the revitalization of older urban communities, as well as a growing need to improve access, network connectivity, and safety for these modes.

Local zoning ordinances shape the way communities develop and impact how people and goods move around the community. Factors such as block length, mix of land uses, lot size, floor-area ratio, and parking requirements can all influence how accessible and convenient walking and bicycling is in a municipality. These zoning issues can affect development density, network connectivity, and how close residents live to key destinations.

Many other local decisions affect the ability to bicycle and walk for basic transportation needs, including planning and zoning for mixed use development, school location decisions, the location of housing in relation to other land uses, on-street parking configurations, particularly in downtowns, and provisions for affordable housing. Some municipalities use design guidelines to help promote pedestrian-friendly development and redevelopment. Other communities have experimented with on-street parking configurations, such as head-out angle parking, that improve safety for nonmotorized travelers.

Along with adequate facilities, safety, and accessible destinations, the overall quality of the walking environment is a large factor affecting people's willingness to walk. Visual interest, shade trees, plants, benches, lighting, cleanliness, and an absence of litter are design elements that contribute to the quality of the walking environment, along with a sense of security. In the survey conducted for this plan, a "more appealing pedestrian environment" ranked among the top three improvements that could help promote walking in respondents' communities.

Parking Ordinances

Most local parking ordinances set a minimum or maximum standard for automobile parking but do not require developers to provide bicycle parking. Adding a bicycle parking requirement to the ordinance helps communities establish this much-needed infrastructure. Chatham, Jersey City, and Montclair have all enacted parking ordinances that require bicycle parking.

Short Trip Opportunity Analysis

A high-level analysis of land use and demographic patterns can help illustrate where bicycle and pedestrian travel is more likely to occur in New Jersey. Figure 2-7 illustrates areas of the state that have a higher potential for short trips (shown in red). In this analysis, six key criteria (Figure 2-6) were used: population density, employment density, proximity to public transportation, density of zero car households, population below the poverty level, and proximity to schools. Overlaying these variables revealed areas in New Jersey where short trips are more likely to be taken, and hence where bicycle and pedestrian travel may be a viable, preferred, or necessary transportation option. Large concentrations of short trip potential exist throughout Bergen, Hudson, Essex, Union, Mercer, and Camden Counties, as well as urban nodes throughout the state.

The short trip opportunity analysis can also be correlated with bicycle and pedestrian crash data. The highest potential for short trips is found in approximately 12% of New Jersey's land area. Nearly 70% of all documented serious bicycle and pedestrian crashes between 2010 and 2014 occurred within these areas. These are high priority areas where investment is likely to have the largest return.

Criteria	Weight	Description
Population Density	25%	Areas with high population density have shorter distances between origins and destinations, leading to more frequent walking and bicycling trips.
Employment Density	25%	Commuter trips are a significant portion of all traffic. Areas with high employment density provide greater opportunities for people to walk or bicycle to work.
Proximity to NJ TRANSIT Bus or Rail Station	15%	Walking and bicycling are an integral part of transit trips, and the most common way to get to and/or from a transit stop.
Proximity to Schools	15%	Schools are a major generator of walking and bicycling trips. Most students cannot drive, and walking and bicycling provides a way for them to get to and from school independently.
Population Below Poverty Level	10%	Low income populations may not be able to afford the costs associated with car ownership, and may rely more frequently on walking, bicycling, and transit options.
Percent of Households with No Motor Vehicle Access	10%	Households without access to a car depend on walking, bicycling, and transit options for travel.

Figure 2-6. *Short trip analysis criteria*

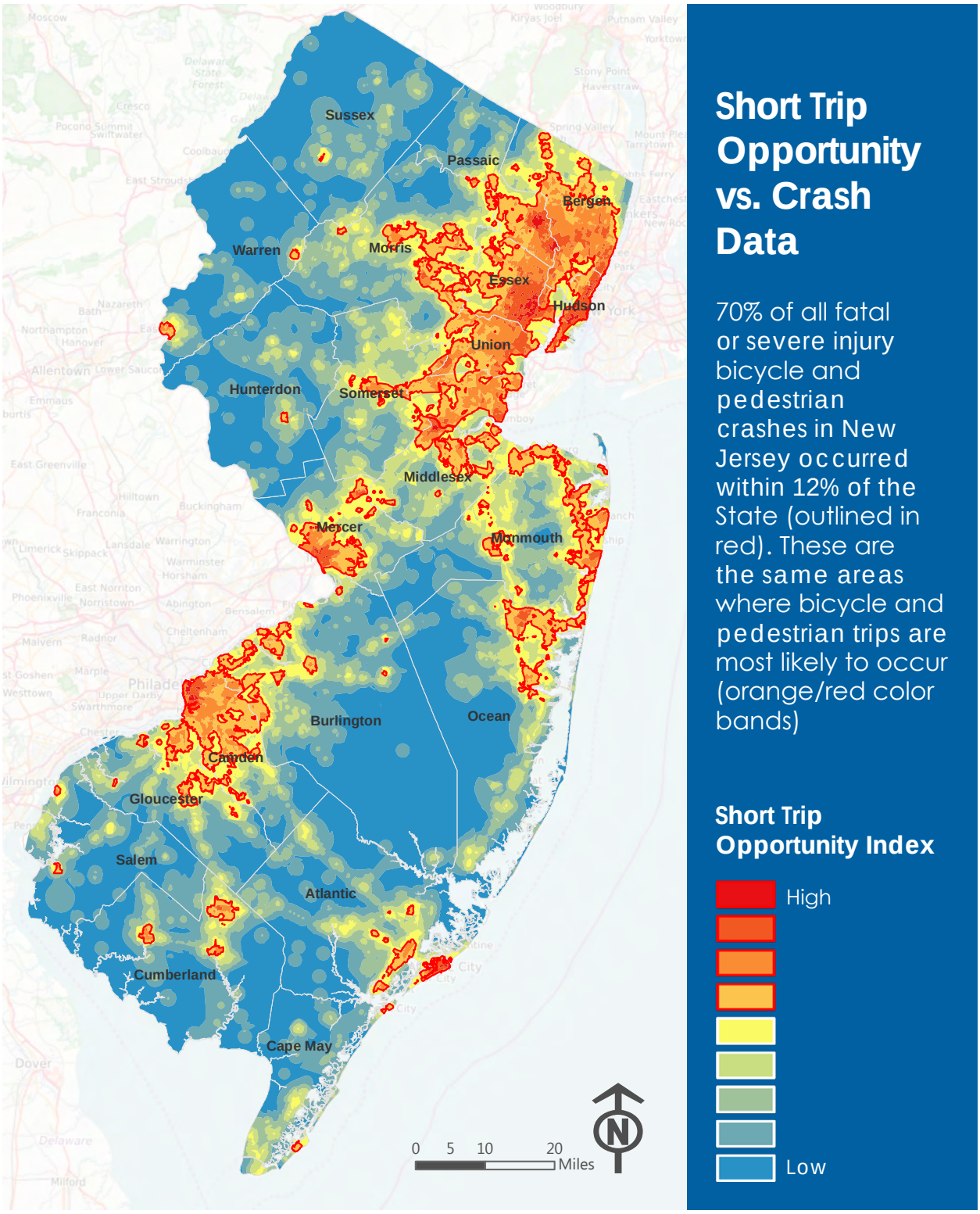


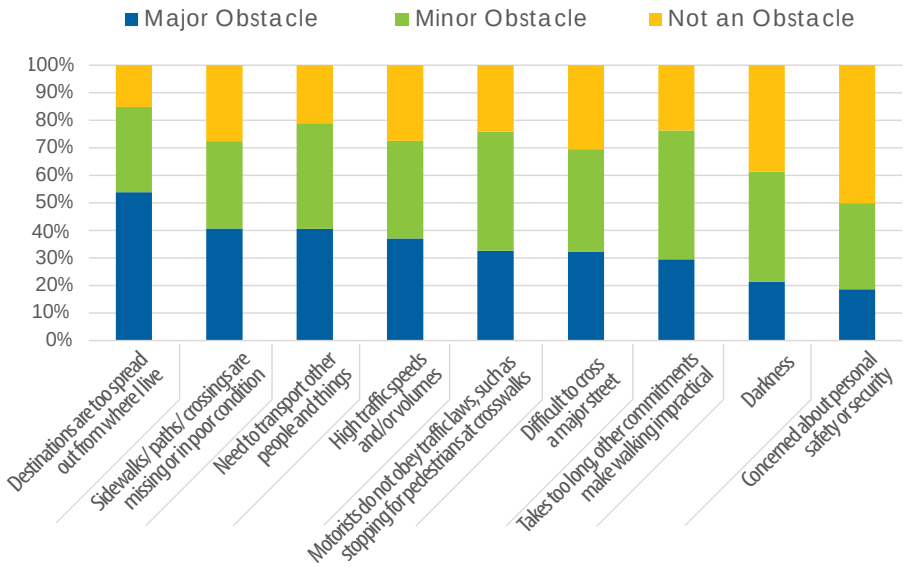
Figure 2-7. *Short trip opportunity analysis*

Survey Results

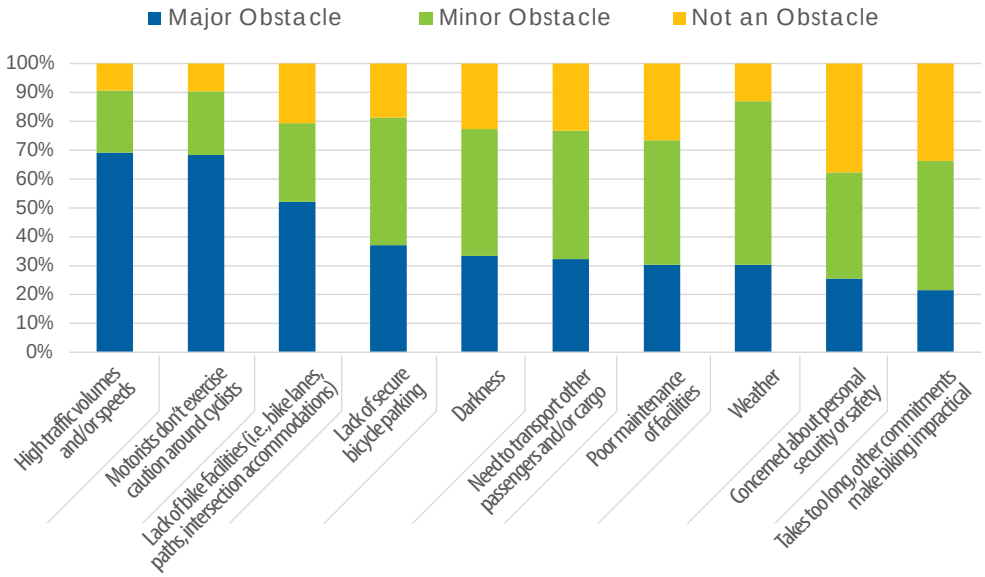
As one element of the outreach process, the *New Jersey Bicycle & Pedestrian Master Plan* included an online survey to gauge interest in bicycling and walking and factors that influence transportation choices. Open for a six-week period, over 450 respondents completed the survey. In general, the demographics of the survey respondents tended to be less racially diverse, older, and more highly educated than New Jersey residents as a whole. Respondents also tended to be more experienced bicyclists than the general population. These differences should be kept in mind in interpreting the results.

The survey included questions on the factors that prevent people from walking or bicycling more often for short trips. For walking, land use patterns with destinations too spread out was the leading barrier, identified as a "major obstacle" by 54% of respondents. Other key issues were a lack of/poor condition of pedestrian infrastructure (41%), need to transport people or things (41%), and high traffic speeds and/or volumes (37%). For bicycle trips, the "major obstacles" cited were high traffic speeds and/or volumes (69%), the lack of caution by motorists around bicyclists (68%), and the lack of bicycle facilities (52%).

What keeps you from walking more often for short trips?



What keeps you from bicycling more often for short trips?



Bicyclists' Perceptions of Facilities, Safety, and Comfort

There are many opportunities to expand and improve New Jersey's bicycle facilities over the next ten years. Different types of facilities will be needed to accommodate different types of cyclists. As was shown in the data on the previous page, concerns related to safety and interacting with automobiles are a common barrier that deters people from bicycling more often. To help address these concerns, the survey data also indicate the need for increased separation between bicyclists and motorists in order to be attractive to the largest potential ridership base and significantly increase ridership.

The survey included a question to rate comfort level for different types of bicycle facilities. Among all responses to the question (352), 82% indicated they would be very comfortable in a separated bicycle lane, compared to 55% in a standard bicycle lane and 40% on a low speed (25mph) street with shared-lane markings.

However, compared to national surveys characterizing different types of bicyclists, the survey respondents included an over-representation of experienced bicyclists (58%). When experienced bicyclists are removed from the survey sample, the remaining responses (134) indicate an even higher relative preference for increased separation (see Figure 2-8). Among those respondents identifying as "less confident" or "casual" bicyclists, 66% would be "very comfortable" in a separated bicycle lane, compared to 26% in a standard bicycle lane and only 8% on a low speed (25mph) street with shared-lane markings.

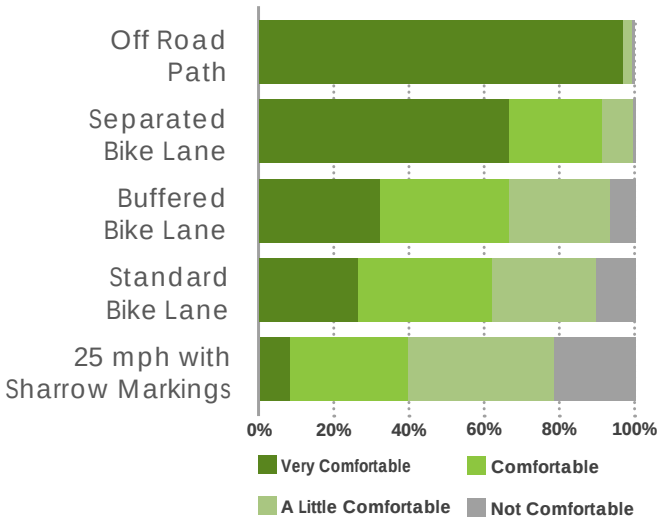
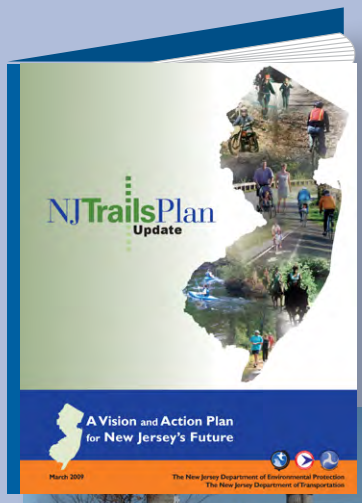


Figure 2-8. *Responses by those self-identifying as not "experienced" cyclists to survey question: "Please rate how comfortable you would be using the following types of bicycle infrastructure"*

Level of Traffic Stress Metric

Bicycle Level of Traffic Stress (LTS) is an analysis tool used to quantify a bicyclist's comfort level relative to the prevailing conditions of a roadway. Because different bicyclists have different tolerances for stress created by volume, speed, and proximity of automobile traffic, the LTS method identifies four levels of stress. Each stress level correlates to a different type of bicyclist and ranges from a facility that is comfortable for all riders, including children (LTS 1), to a facility for the most experienced, confident, and assertive vehicular bicyclists (LTS 4). LTS analysis provides a framework for developing a bicycle network that is accessible to the largest number of riders, and follows the Complete Streets principle of accommodating all ability levels.

Success Stories



New Jersey Trails Plan Update (2009)

This update of the *New Jersey Trails Plan,* developed in coordination among NJDOT, NJDEP, and the New Jersey Trails Council, presents a renewed vision, goals, and strategic actions to help guide and coordinate the efforts of all those who plan, build, operate and maintain New Jersey's trails. The *Trails Plan* reaffirms the importance of providing trails for all and emphasizes the value of trails in supporting a wide range of benefits.

Liberty Water Gap Trail

The Liberty Water Gap trail is a 130-mile long pedestrian trail that connects two national landmarks at each end: the Delaware Water Gap and the Statue of Liberty. The trail is comprised of six individual, interlinked trails. The segment of the trail towards the eastern terminus that passes through the City of Newark, Kearny, and into Jersey City is known as the East Coast Greenway.

Lawrence Hopewell Trail

The Lawrence Hopewell Trail (LHT) is a 22-mile bicycle and pedestrian recreational trail and transportation corridor through public and private lands in Lawrence and Hopewell Townships, Mercer County, New Jersey. Through public-private partnerships, trail segments have been added over time to create a robust trail system that connects neighboring communities, parks, employment hubs, and schools.

East Coast Greenway

The East Coast Greenway is a 3,000-mile urban trail from northern Maine to southern Florida. The Greenway covers 93 miles in New Jersey, passing through urban centers, suburban settings, and rural landscapes. More than half of the Greenway in New Jersey is off-road, the second highest rate of completed trail in any Greenway state.

Chapter 3

Vision, Goals, and Strategies

The vision, goals, and strategies constitute a critical framework of actions and initiatives for the master plan to move forward. This chapter defines the critical framework and presents the vision, goals, and strategies that will drive this master plan.

By working together, **we can** make New Jersey better for walking and bicycling.

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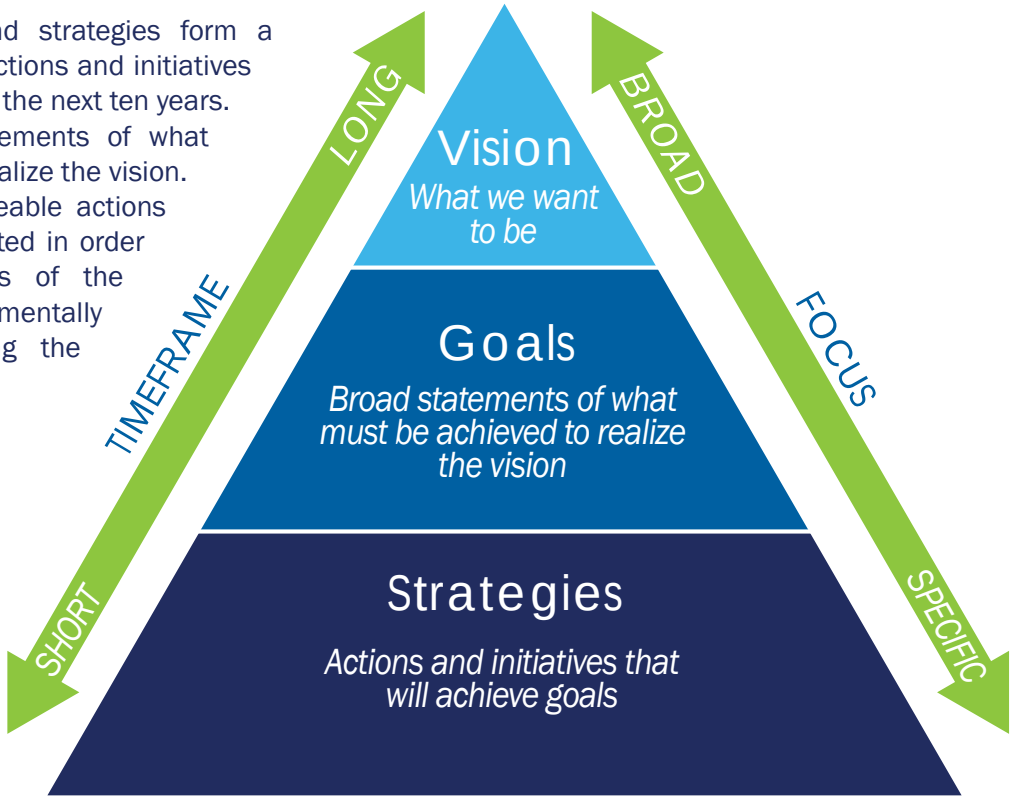
Vision for Walking and Bicycling in New Jersey

The vision statement is an aspirational description of desired future conditions for walking and bicycling in New Jersey that guides the development and execution of all goals and strategies.

Vision Statement

New Jersey is a place where people of all ages and abilities are able to bicycle and walk. Those who live, work, or visit are able to conveniently walk and bicycle with confidence, a sense of security in every community, and with the respect of all modes. Both activities are a routine part of the transportation and recreation systems.

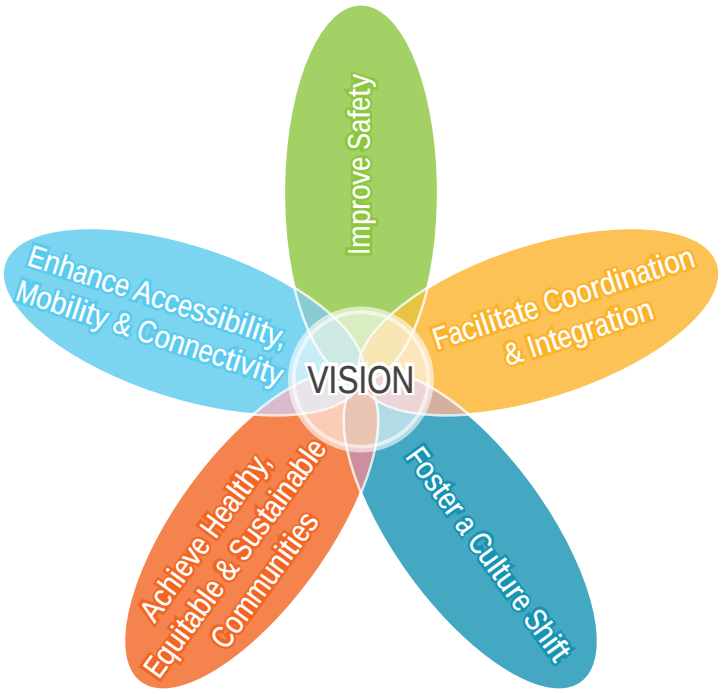
The vision, goals, and strategies form a critical framework of actions and initiatives to be undertaken over the next ten years. Goals are broad statements of what must be achieved to realize the vision. Strategies are manageable actions that can be implemented in order to achieve the goals of the master plan and incrementally contribute to realizing the vision.



Goals and Strategies

Using federal policy and guidance as a framework, the issues and trends identified in previous chapters, and synthesizing what we have heard in the public process, the master plan identifies five broad goals to achieve the Vision: (1) Improve Safety; (2) Enhance Accessibility, Mobility & Connectivity; (3) Achieve Healthy Sustainable Communities; (4) Foster a Culture Shift and (5) Facilitate Coordination & Integration.

In the pages that follow, each goal is defined with a nest of strategies to achieve it, identifying those who will be instrumental in a leadership or support capacity to fulfill that strategy. Goals are not mutually exclusive, nor are strategies. For example, improving safety will help enhance accessibility, and enhancing accessibility will help achieve healthy sustainable communities. Strategies, while organized under the most relevant goal, many times benefit other goals.



Who are the most vulnerable of vulnerable users?

This master plan acknowledges the importance of equity in transportation policy and infrastructure investment decision-making. As such, there is a focus on the needs of disadvantaged/high risk populations – specifically youth, seniors, low-income, disabled, and minority populations.

GOAL #1: IMPROVE SAFETY

Eliminate pedestrian and bicycle fatalities and serious injuries, and improve the sense of safety experienced by all who bike or walk.

As a FHWA designated Pedestrian-Bicycle Focus State, New Jersey has adopted the national vision for highway safety, which calls for reducing the number of traffic fatalities by half by the year 2030. New Jersey's crash reduction goal is to reduce the 5-year rolling average of serious injuries and fatalities by 2.5% annually. NJDOT has a Pedestrian Safety Management System (PSMS), and a number of statewide plans have been developed to address safety, with set goals and targets. These include the *Highway Safety Plan*, the *Strategic Highway Safety Plan*, the *Bicycle Safety Action Plan* and the *Pedestrian Safety Action Plan*.

The strategies for this goal are designed to achieve the targets established in these plans by undertaking measures to improve data collection, so that a data driven approach in the longer term can be achieved.

Strategies

1. Prioritize the most vulnerable (disadvantaged/high-risk groups — youth, seniors, low-income, disabled and minority populations) of vulnerable user needs in projects and decision-making.

A. Develop a data-driven approach to the project prioritization process for bicycle and pedestrian safety and mobility needs.

B. Develop a Short Trip Opportunity Analysis tool to help inform mobility needs in projects under consideration, using six criteria (population density, employment density, proximity to a NJ TRANSIT bus or rail station, proximity to schools, population below Poverty Level, and percent of households with no motor vehicle access). Over time, refine and use this tool to reflect and inform other goals with respect to health, equity and sustainability.

2. Maximize use of HSIP funding for ADA, pedestrian, and bicyclist safety projects.

A. Adopt project prioritization criteria that create incentives for bicycle and pedestrian projects or establish minimum set-asides.

3. Improve data collection and data management systems.

A. Reduce the incidence of null records and, over the longer-term, customize crash reports for crashes involving pedestrians and for crashes involving bicyclists. This should occur in conjunction with training the enforcement community on crash report completion.

B. With improved data and land use criteria, continue to identify high-risk locations and populations needing targeted improvements.

C. Establish an online tool and mobile application (with geolocation capability) where the public can report bicycle and pedestrian problem locations – "near misses", etc.

D. Develop bicycle and pedestrian safety performance measures as part of the new FHWA rules for implementing MAP-21 and the FAST Act.

4. Implement the *Pedestrian Safety Action Plan* and the *Bicycle Safety Action Plan*.

A. Review priority actions and recommendations of the *Pedestrian Safety Action Plan* (2014) and *Bicycle Safety Action Plan* (2016) and integrate implementation efforts with this master plan.

GOAL #2: ENHANCE ACCESSIBILITY, MOBILITY, AND CONNECTIVITY

Provide a connected and accessible network for bicyclists and pedestrians throughout New Jersey.

A connected and accessible network helps to make walking and bicycling more efficient, effective, and attractive for traveling. By expanding pedestrian and bicycle infrastructure in a fashion that considers safety, public input, transit access, development patterns, and proper maintenance, more citizens will have the opportunity to walk or bicycle to meet their everyday transportation needs.

Strategies

1. Continue to move Complete Streets from policy to implementation.

A. Maximize Complete Streets Implementation through education, training, funding support, tools and best practices.

B. Develop and fund pilot projects in communities that have adopted Complete Streets implementation plans.

C. Test and evaluate innovative concepts, new practices and technological advances.

2. Improve and expand the transportation infrastructure for bicyclists and pedestrians throughout the state.

A. Develop a data-driven approach to the project prioritization process for bicycle and pedestrian safety and mobility needs.

B. Adopt NACTO *Urban Bikeway Design Guide, Urban Street Design Guide,* and *Transit Street Design Guide* at the state, MPO, county, and local levels.

C. Update guidance on the evaluation of bicycle and pedestrian facility types to include user need, comfort, and perceptions of safety.

D. Identify and complete trail system gaps.

E. Improve access to transit.

F. Improve maintenance of facilities to ensure safety of users.

G. Support construction of bicycle facilities to improve connectivity and mobility of non-motorized transportation networks to attract the widest range of potential users.

3. Collaborate with counties, municipalities, and school boards on land use and transportation decisions.

A. Using the *PSAP* (2014), *BSAP* (2016), and *New Jersey Complete Streets Design Guide* (2016) as framework, develop a training tool for local officials and municipal planning and zoning board members who review and approve site plans. Include issues such as aging in place, ADA and other relevant topics. Consider infographics and video as elements of the training program.

B. Train and coordinate municipal engineers for funding and prioritization.

C. Collaborate with school boards to support and coordinate SRTS efforts.

D. Conduct training via a coordinated, geographically informed strategy to bring together local, county, and NJDOT liaisons on resources including the NJDOT *Complete Streets Design Guide* (2016) and NACTO *Urban Bikeway Design Guide, Urban Street Design Guide,* and *Transit Street Design Guide.*

GOAL #3:
ACHIEVE HEALTHY, EQUITABLE, SUSTAINABLE COMMUNITIES

Provide opportunities for people to become more healthy and active through walking and bicycling.

Healthy, sustainable communities provide opportunities for walking and bicycling, which in turn supports more active and healthy lifestyles, and achieves healthier communities. People are more active when they live in communities that have sidewalks, open space, bicycle lanes and safe streets that are well maintained in all seasons. But healthy and sustainable communities must also be equitable. They must provide opportunity and choice for all people, with particular consideration for the most vulnerable (disadvantaged/at-risk populations) of vulnerable users.

Strategies

1. Continue to educate the public on the benefits of and safe practices for walking and bicycling.

A. Create and publicize a pilot program for safe walking practices and coordinate dissemination with partners.

B. Support efforts to improve community/local enforcement relationships through educational programs/outreach based on positive reinforcement of safe bicycling and walking practices.

C. Create a multilingual Public Service Announcement (PSA) or video for safe bicycling in underserved communities.

2. Continue and prioritize all Safe Routes To School initiatives.

A. Continue to promote and encourage schools and municipalities to support and implement SRTS programs, including education and encouragement programs and policies, and school travel plans.

B. Leverage SRTS networks to achieve complementary goals around community health and wellness.

3. Continue to partner and build relationships outside of traditional transportation circles to strengthen communities, particularly those at high risk and with health concerns.

A. Collaborate with health, enforcement, business, and environmental partners (NJ Department of Health, NJ Conservation Foundation, NJ Prevention Network, New Jersey Partnership for Healthy Kids, Rails-to-Trails Conservancy, NJ Healthy Communities Network, NJ Bike Walk Coalition, Sustainable Jersey & Sustainable Jersey for Schools, and others).

B. Collaborate with equity and environmental justice partners (NJ Department of Environmental Protection (NJDEP) Office of Environmental Justice, NJ Department of Labor, and MPOs (including DVRPC's Equity through Access Program), New Jersey Environmental Justice Alliance, and others).

C. Collaborate with community design and placemaking partners (American Planning Association New Jersey Chapter (APA NJ), AARP, Active Living Network, National Consortium for Creative Placemaking, Project for Public Spaces, Main Street New Jersey, and others).

D. Re-evaluate NJ BPAC membership and amend bylaws to add one or two additional seats to NJ BPAC Executive Council to expand formal representation of equity and/or community health and sustainability partner agencies.

E. Support development of job training opportunities through support of bicycle co-operatives and other community-based programs that provide training opportunities for youth and underserved communities.

GOAL #4:
FOSTER A CULTURE SHIFT

Considering the needs of all users becomes the default way of doing business, with Complete Streets integrated into everyday practice.

Creating a safe and enjoyable walking and bicycling environment cannot be achieved only through providing infrastructure. The strategies for this goal recognize that education, encouragement and enforcement are also needed to increase public awareness of the benefits of bicycling and walking, and create a culture of confidence, responsibility, and respect among all users of the system now, and in the future.

Strategies

1. Increase public awareness of the benefits of bicycling and walking.

A. In concert with education, employment, equity, health, housing and other partners, conduct an alternating year bicycle and pedestrian survey. Add questions about cultural acceptance of bicycling and walking so that change over time can be studied.

2. Improve bicyclist, pedestrian, and driver behavior.

A. Adopt Safe Passing legislation.

B. Increase compliance with Stop and Stay Stopped crosswalk law.

C. Support/expand pedestrian safety enforcement training tools, including development of a pilot pedestrian safety campaign.

D. Develop a statewide public campaign to foster respect among modes.

E. Partner and build relationships outside of traditional circles to build awareness and understanding of the need to improve safe driving and road sharing practices. Partners include those organizations and entities that address the needs of New Jersey's aging population, insurance companies, cellular companies, driver's education companies, and others.

F. Launch a joint initiative among agencies such as NJDOT, NJDHTS, and NJMVC to educate the public on existing rules that govern how pedestrians, bicyclists, and motor vehicle operators share the roadway.

3. Address emerging technologies, such as electric bikes and bike share.

A. Develop a White Paper on emerging technologies and identify critical education, enforcement and other issues.

GOAL #5: FACILITATE COORDINATION AND INTEGRATION

No one entity alone can achieve the goals of this master plan — a partnership of public, private, and nonprofit partners is needed.

The opportunities for growth in walking and bicycling are expansive and dependent upon many agencies, jurisdictions, and organizations throughout New Jersey. This master plan recognizes that sensible partnerships must be developed, maintained, and leveraged for the vision of pedestrian and bicycle travel to come to fruition.

Strategies

1. **Conduct a comprehensive review and evaluation of bicycle and pedestrian legislation, regulations, plans and policies at the state, regional and county level to understand what exists and where there are gaps.**
2. **Monitor and track progress for adoption and implementation of state funded bicycle and pedestrian local technical assistance projects.**
   - A. Conduct an annual scorecard, and a mid-horizon (Year 5) more detailed evaluation of progress toward master plan implementation.
3. **Partner with the public, private, and nonprofit communities in the education, employment, environment, enforcement, equity, health, and housing sectors to integrate Complete Streets, Safe Routes to School, Safe Streets to Transit and bicycle and pedestrian initiatives.**
   - A. Continue to improve internal coordination and collaboration within NJDOT. Hold an internal partners Summit at NJDOT for units that have a role in implementing bicycle and pedestrian projects in the state.
   - B. Hold an external partners summit to share data, analysis/trends, and to kick off master plan implementation and partnership efforts.
   - C. Review and assess NJ BPAC membership.

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Chapter 4

Implementing the Master Plan

Implementation is a cooperative effort among NJDOT and a number of stakeholders. Recognizing that this master plan is a living document, this chapter describes a path forward that builds momentum through outreach, collaboration, and transparency.

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Coordinate and Collaborate

NJDOT has long functioned as the state's leader and main resource for encouraging routine, convenient, and secure nonmotorized travel in New Jersey. It has done so through project delivery, research, county and municipal funding and planning assistance, design guidance, and policy development.

In spearheading this master plan, NJDOT will act as a transformational leader, providing direction and guidance to its partner entities and functioning as a resource to all those involved in achieving the vision and goals. As part of this leadership, NJDOT will continue to improve coordination among its programs and its units responsible for planning, designing, and constructing bicycle and pedestrian projects.

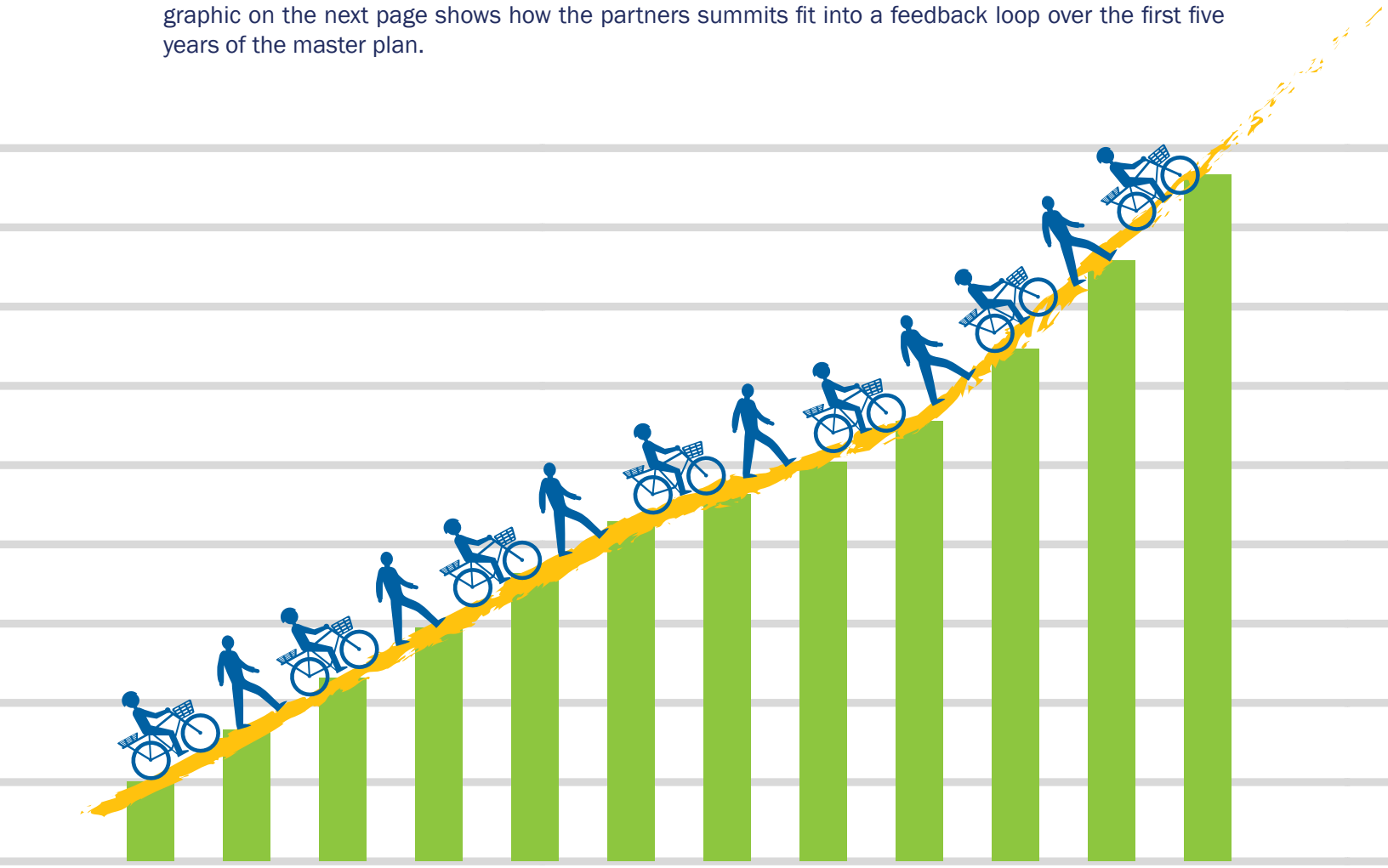
Collaboration and coordination are instrumental to realizing this master plan. Along with NJDOT, a number of entities must embrace the roles and responsibilities identified in the master plan and earnestly pursue the goals and strategies in support of the vision. Strengthening existing relationships and forging new relationships with partners across the state will be an important part of successful implementation. To achieve the goals, NJDOT will lead from the front, with a collaborative effort among NJDOT, other state agencies, Metropolitan Planning Organizations (MPOs), counties, municipalities, nonprofits/NGOs, consultants, developers, advocates, and the general public in implementing the strategies identified in Chapter 3. Periodic outreach efforts, such as surveys, annual assessments, and website updates, will help to track progress towards implementation and keep the master plan current.

Lay the Groundwork in Years 1-3

This master plan is intended to be a living document. As relationships develop and collaboration occurs, data is gathered and analyzed, trends are understood (including those that may change or are new) and projects are implemented, the master plan and its implementation measures must be evaluated and re-evaluated as needed. Implementing the master plan over the next ten years will require flexibility and transparency. To begin this process, a series of steps with feedback loops has been identified for the first three years. The focus of these early years will be on actions that will help address the challenges of jurisdictional authority, data collection and analysis, and reaching and engaging the public. These actions will help lay the groundwork for developing other strategies, and track how progress on the master plan is being made.

In its role as a transformational leader, NJDOT will initiate two key initiatives to provide the framework. A series of internal and external partners summits will be held each year over the first three years of the master plan. The purpose of each summit is to share knowledge and data in a two-way information exchange, and identify specific opportunities for collaboration.

At the conclusion of each of the first three years, a scorecard on progress will be developed and reviewed with internal and external summit partners, and reported out to the public. In Year 4, the effort will be to assess where we are and what actions are needed as the plan approaches mid-horizon. These scorecards will inform an overall master plan implementation progress report in Year 5. The graphic on the next page shows how the partners summits fit into a feedback loop over the first five years of the master plan.



Internal Partners Summits

NJDOT will conduct a series of internal partners summits as an important first step towards an improved collaborative environment. NJDOT units responsible for planning, designing, and constructing bicycle and pedestrian facilities should:

- meet to review the master plan's goals and strategies,
- exchange knowledge about trends, critical issues, and best practices (including performance measures), and
- develop a collaborative approach to identifying, planning, designing, and constructing future projects.

One outcome of the internal partners summits should be to identify future activities that will help all NJDOT staff and their consultants, such as training sessions and opportunities for collaborative project development. A specific outcome of the internal partners summits should be to lay the groundwork for developing a Bicycle and Pedestrian Management System.

External Partners Summits

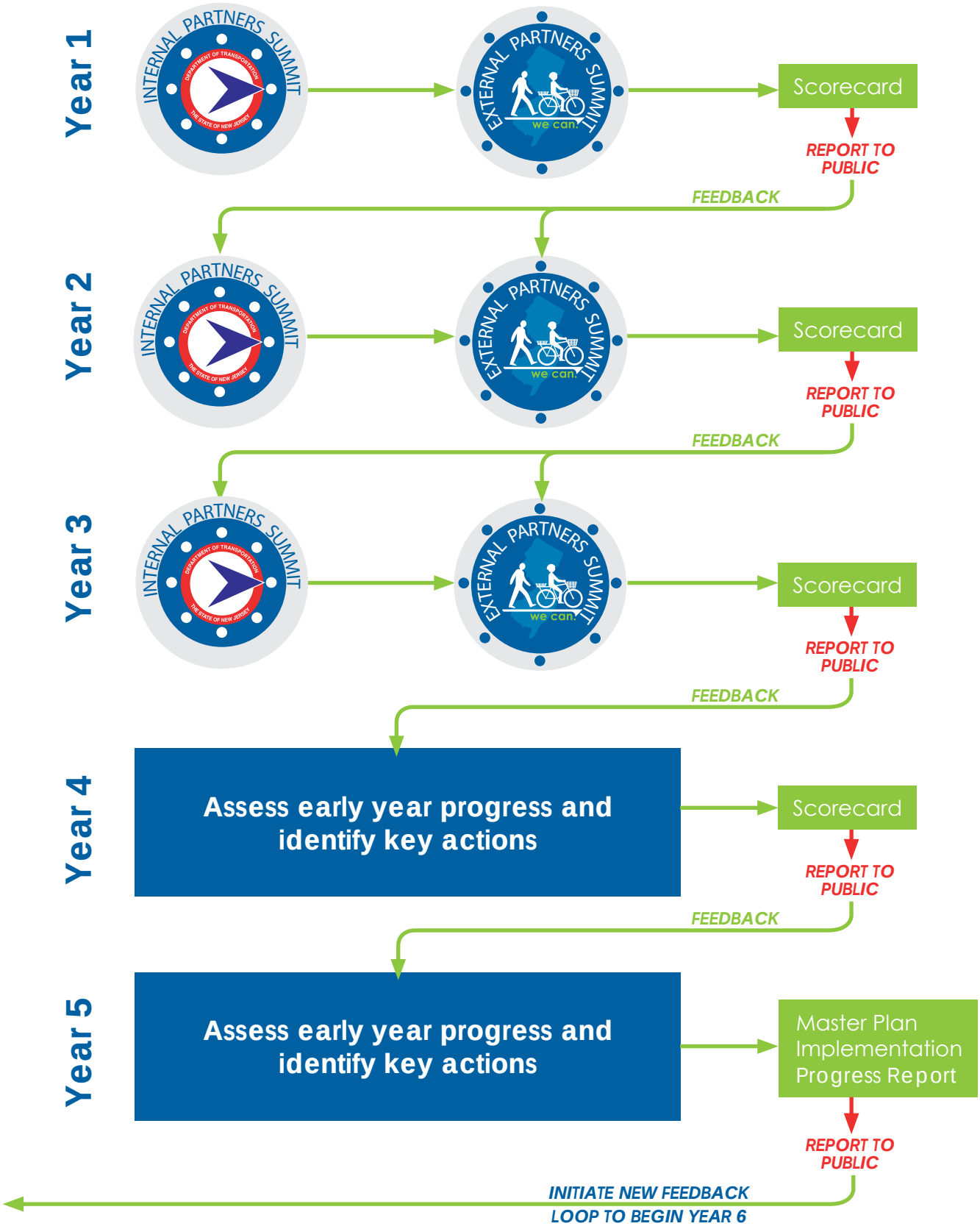
NJDOT will convene a series of external partners summits to bring together entities external to NJDOT who are directly involved in pedestrian and bicycling projects, programs, and activities. Participants will include BPAC members, along with nontransportation entities from fields such as health, environmental justice and equity, education, or development. These partners include other state agencies, institutions, counties, municipalities, NGOs, developers, and others. The purpose of the external partners summits will be to not only to develop an understanding of the range of plans and activities underway and how they could inform each other, but also a two-way information exchange.

The external partners summits will be held after the internal partners summits. The external partners summits should:

- review the master plan,
- review outcomes of the internal partners summits, and
- coordinate plans, policies, available data and analysis to lay the groundwork for implementing the master plan and measuring progress.

The outcome of the external partners summits should include how to collaborate on broad objectives (to address key issues such as outreach to disadvantaged and vulnerable populations) as well as address specific needs (data sharing).

Partners Summits Feedback Loop



Improve Data Collection

Several data collection and analysis activities are also envisioned in the early years. These include:

1. Conducting a public survey to assess attitudes and perceptions about walking and biking, and to track changes to behavior and use over time.

2. Developing and publicizing an online reporting tool for the public to report problem locations for pedestrians and bicyclists.

3. Conducting a Complete Streets Local Planning Assistance survey to develop a database of what has been accomplished in Complete Streets plan adoption and implementation. With an eye towards continuing to increase the number of Complete Streets plans in the state, the survey will also be used to identify problems in implementation that must be addressed.

4. Developing a short trip opportunity analysis tool as part of creating a project selection process.

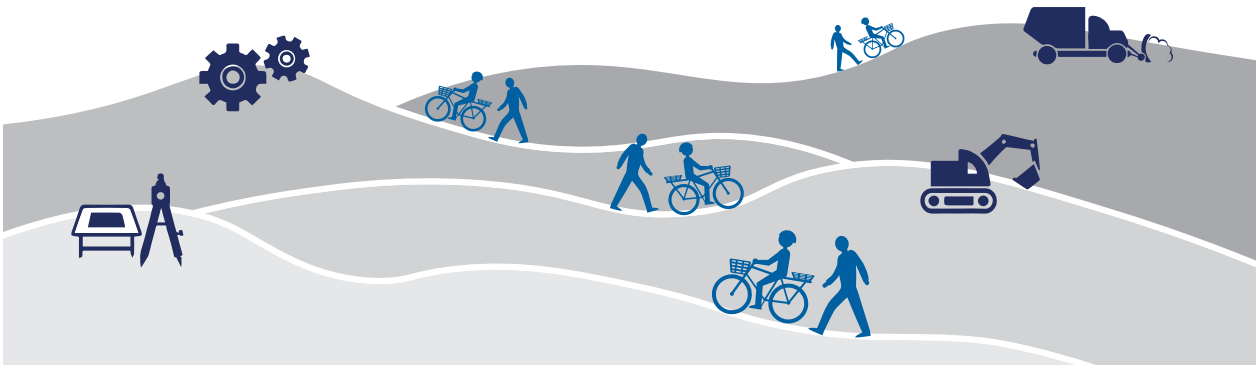
Each of these activities are interrelated in that they provide structure for future actions. For example, the summits, Bicycle and Pedestrian Management System, online reporting tool, and short trip opportunity analysis tool all will be helpful to identify needed projects, achieving the strategy of defining a more rational project selection process. The Complete Streets Local Planning Assistance survey results will help future plans have a greater likelihood of being adopted and successfully implemented.

Opportunities and Challenges

Jurisdictional Authority, Responsibility, and Coordination

In New Jersey, there are many different transportation entities responsible for planning, building, and maintaining walking and biking infrastructure. Many develop and implement plans and policies that directly or indirectly affect bicycle and pedestrian modes. Often they operate in their own silos, making unique decisions within their authority that impact the continuity and seamlessness of the walking and biking system.

Since the *Phase 2 Plan* in 2004, the many benefits of biking and walking are being recognized by a broader landscape and as a result, are being incorporated into the plans and actions of others. Many nontransportation entities have a role in New Jersey's vision for bicycle and pedestrian modes in the future, including those who lead education, health policy and advocacy, community planning and placemaking, or development in the state. Better coordination and communication between all of these entities is essential to establish consistent objectives, priorities, and projects.



Data Collection, Analysis, and Performance Management

The move towards planning and delivering a more performance-based transportation system provides a great opportunity to gauge how well plans are achieving goals. There are two key challenges to performance management. While there are many performance measures designed to evaluate programs and outcomes, the practice is still evolving. Data to support performance measures is often unavailable, inconsistently collected, incomplete (or unavailable at a statewide level). Data collection is often cost prohibitive, particularly at a statewide level. The many entities directly and indirectly involved, and the silos noted above further complicate data collection, sharing and analysis efforts.

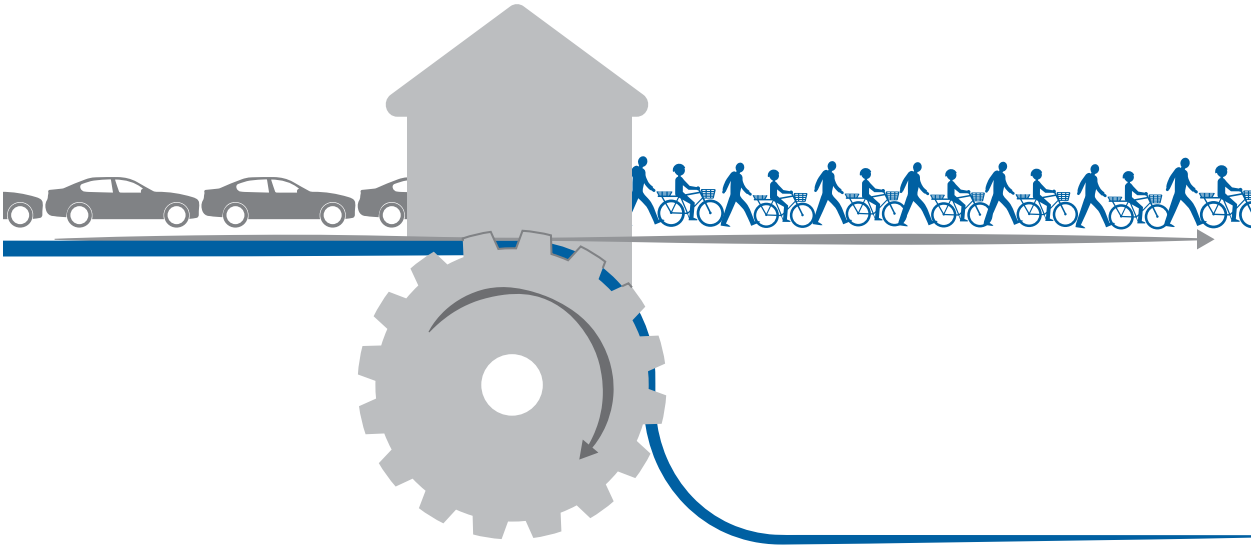
Reach and Engage the Public

While public engagement is important in the implementation of any plan, reaching, informing, educating, and providing meaningful opportunities for input is a challenge, especially with disadvantaged segments of the population which are difficult to reach yet have the most profound needs.

Implementing the master plan will require specific actions to successfully reach all segments of the public, and flexibility in plan implementation to learn from and address issues as they arise, including bringing new actors into the process.

Available Resources

Implementing a plan requires consistent and dedicated resources to gather and analyze data, communicate and coordinate information, develop plans and projects, and measure and report results. An overview of funding sources is provided in the appendix.



New Jersey Bicycle & Pedestrian Master Plan

Key Actions for Years 1-3

Goal	Within One Year	Within Two Years	Within Three Years
Goal 1: Improve Safety	Develop and publicize an online reporting tool for the public to report problem locations	Develop and test a training program for crash reporting Develop and test a short trip opportunity analysis tool for the project prioritization process	Develop and test bicycle and pedestrian crash reporting templates
Goal 2: Enhance Accessibility, Mobility, and Connectivity	Conduct a Local Planning Assistance survey to inventory Complete Streets plan adoption and implementation Identify critical issues for increasing the number of adopted Complete Streets plans Establish a yearly tracking system	Develop and fund pilot projects in communities with adopted Complete Streets implementation plans	Develop a data-driven management system for the project prioritization process
Goal 3: Achieve Healthy, Equitable, Sustainable Communities		Create a bilingual public service announcement for safe bicycling Create a pilot program for safe walking (identify and implement in three pilot communities; conduct before and after surveys	
Goal 4: Foster A Culture Shift	Conduct a public survey on travel, attitudes, and perceptions about walking and bicycling Identify and conduct pedestrian/bicycle safety enforcement and educational training and events on annual basis		Develop a statewide campaign: Respect for All Modes
Goal 5: Facilitate Coordination and Integration	Conduct Internal Summit (conduct survey; develop joint action plan) Conduct External Summit (share plans and data, collaborate)	Conduct Internal Summit (conduct survey; assess progress of joint action plan) Conduct External Summit (review progress and findings)	Conduct Internal Summit (conduct survey; assess progress of joint action plan) Conduct External Summit (review progress and findings)
Reporting Progress	Year One Scorecard	Year Two Scorecard	Year Three Scorecard

Appendix

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Related Policies, Plans, and Programs

In order to provide a blueprint for improving bicycle and pedestrian safety and mobility in New Jersey, it is necessary to understand related policies, plans, and programs at the federal, state, and local levels. While the focus of this master plan is on state agencies, bicycle and pedestrian safety and mobility has been an important part of other federal, regional, and private efforts. The following section provides an overview of significant policies, plans, and programs related to walking and bicycling, including:

Federal

General overview of recent federal guidance and legislation related to pedestrian and bicycle transportation.

State

General overview of the actions and initiatives of state agencies and affiliated organizations, including:

- New Jersey Department of Transportation
- New Jersey Division of Highway Traffic Safety (DHTS)
- NJ TRANSIT
- New Jersey Department of Environmental Protection (NJDEP)
- New Jersey Department of Community Affairs (NJDCA)
- New Jersey Department of Health (NJDOH)
- Rutgers Center for Advanced Infrastructure and Transportation
- Alan M. Voorhees Transportation Center (VTC) at Rutgers University

Regional

General overview of the actions and initiatives of transportation-related entities with a regional focus, including:

- Metropolitan Planning Organizations (MPOs)
- Counties
- Transportation Management Associations (TMAs)
- Private Foundations and Non-Profit Organizations

Plans

General overview of related transportation plans in New Jersey, including:

- NJDOT: *New Jersey Complete Streets Design Guide* (2016), *Bicycle Safety Action Plan & Toolbox* (2016), *Pedestrian Safety Action Plan & Toolbox* (2014), *New Jersey School Zone Design Guide* (2014)
- NJDOT & NJ TRANSIT: *New Jersey Long Range Transportation Plan* (2008)
- NJDHTS: *New Jersey Highway Safety Plan* (2016)
- NJDEP: *New Jersey Trails Plan Update* (2009)
- Together North Jersey: *The Plan* (2015)

Federal

Federal guidance and policies inform how goals, strategies, and performance measures should be considered and developed for this master plan. The USDOT 2010 policy statement in support of walking and bicycling marked a shift in federal policy from meeting minimum accommodation standards to recognizing the value and importance of safe and convenient facilities for walking and bicycling:

> *The [US]DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes.*[1]

In recent legislation and policies, there has been an emphasis placed on nonmotorized transportation and performance measures related to safety. In 2012, Moving Ahead for Progress in the 21st Century Act (MAP-21) created a performance-based surface transportation program that included National Goals of Safety supported by a planning process that applies performance based approaches to decision-making. In March of 2016, FHWA issued the *Safety Performance Management Final Rule* (23 CFR 490) and the *Guidebook for Developing Pedestrian and Bicycle Performance Measures*. The former includes a nonmotorized safety performance measure, encouraging states and Metropolitan Planning Organizations (MPOs) to address bicycle and pedestrian safety through annual targets for the reduction of non-motorized fatalities and serious injuries on all public roads.

In 2013, FHWA released a memo encouraging and supporting flexibility in the design of pedestrian and bicycle facilities. FHWA asserts that the AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities* (2004) and *Guide for the Development of Bicycle Facilities, 2012, Fourth Edition* bicycle and pedestrian design guides are the primary national resources for planning, designing, and operating bicycle and pedestrian facilities, and that the ITE *Designing Urban Walkable Thoroughfares* guide and NACTO *Urban Bikeway Design Guide* build upon the flexibilities provided in the AASHTO guides. FHWA supports the use of these resources to further develop nonmotorized transportation networks, particularly in urban areas. Planners and project managers must also be cognizant of evolving requirements of the Americans with Disabilities Act (ADA) and requirements of the Manual on Uniform Traffic Control Devices (MUTCD).

USDOT has also launched multiple policy initiatives in support of enhancing bicyclist and pedestrian accessibility and safety. In October 2015, USDOT launched the Safer People, Safer Streets: Pedestrian and Bicycle Safety Initiative to address nonmotorized safety issues and help communities create safer, better connected bicycling and walking networks. As part of the USDOT's Livability Initiative, FHWA works within the HUD/DOT/EPA interagency Partnership for Sustainable Communities to coordinate and leverage Federal housing, transportation, water, and other infrastructure policies and investments to provide more transportation choices. As part of this effort, the FHWA produced the *Livability in Transportation Guidebook* to illustrate how livability principles have been incorporated into transportation planning, programming, and project design. In 2015, USDOT along with the CDC developed the Transportation and Health Tool (THT) to provide data on a set of transportation and public health indicators for each U.S. state and metropolitan area that describe how the transportation environment affects safety, active transportation, air quality, and connectivity to destinations.

1: United States Department of Transportation. (2010).

State

A number of New Jersey agencies are engaged in a variety of programs to improve bicycle and pedestrian conditions. NJDOT is the lead agency for many of these efforts. While NJDOT's main focus is on engineering improvements, NJDOT and its partner agencies and organizations also have implemented education and enforcement programs as part of a holistic 5E (Engineering, Education, Encouragement, Enforcement, and Evaluation) approach to improving pedestrian and bicyclist safety.

New Jersey Department of Transportation

Since the *NJ Statewide Bicycle & Pedestrian Master Plan, Phase 2* (2004), NJDOT has worked to incorporate the needs of bicyclists and pedestrians into the Department's everyday project development activities and to encourage and support the efforts of others. The Office of Bicycle and Pedestrian Programs (OBPP) plays a leading role in addressing bicycle and pedestrian needs and safety programs and projects in New Jersey. OBPP's primary efforts include the Complete Streets Initiative, the Local Bicycle and Pedestrian Planning Assistance Program, and the Safe Routes to School Program.

Complete Streets Policy

The NJDOT Complete Streets Policy institutionalizes the needs of bicyclists and pedestrians into everyday operations. After adopting its policy in 2009, NJDOT updated each phase of its Capital Project Delivery Process to be consistent with Complete Streets principles, designated OBPP staff as Complete Streets Subject Matter Experts, and developed a checklist to assist project engineers and consultants in developing and designing projects that are in compliance with the policy. NJDOT has also promoted Complete Streets statewide through training workshops.

Local Bicycle and Pedestrian Planning Assistance Program

For almost 20 years, the OBPP has worked with local NJ communities to develop bicycle and pedestrian plans through a Local Bicycle/Pedestrian Planning Assistance Program. Through this program, the NJDOT has provided technical planning assistance to more than 80 municipalities and counties to develop plans which will help make their communities better and safer places to bike and walk. The program provides these services to local jurisdictions that express a strong desire to improving or enhancing bicycle and pedestrian travel within their communities.

Safe Routes to School Program

The New Jersey Safe Routes to School (SRTS) Program is administrated jointly by the SRTS Coordinator within NJDOT's OBPP and by the Division of Local Aid and Economic Development. Since 2005, NJDOT has overseen grant proposals and awarded millions of dollars to local communities to develop and implement infrastructure projects which enable safe and more accessible walking and bicycling environments and non-infrastructure activities to promote more walking and bicycling to and from school. In 2011 the non-infrastructure program was expanded to incorporate regional SRTS coordinators through New Jersey's eight Transportation Management Associations (TMAs), overseen by the NJ SRTS Resource Center. Regional SRTS coordinators offer technical assistance in starting or expanding a variety of education and encouragement programs in communities in all 21 counties.

New Jersey Division of Highway Traffic Safety (DHTS)

The DHTS is responsible for developing and implementing the *New Jersey State Highway Safety Plan* (HSP), with the ultimate goal of moving toward zero fatalities. Using federal funding provided by the National Highway Traffic Safety Administration (NHTSA), DHTS administers the State and Community Highway Safety Grant Program (Section 402 program), which provides funding for a variety of state and local projects. These projects address the national priority areas of NHTSA and FHWA, which include pedestrian and bicycle safety.

Major DHTS activities and programs that relate to bicycle and pedestrian initiatives include pedestrian decoy programs (Cops in Crosswalks), crossing guard training and resources, programs to promote bicycle helmet distribution and proper fittings, and funding a specialty course on pedestrian/bicycle crash investigation for police officers.

NJ TRANSIT

NJ TRANSIT implements several initiatives to improve bicycle and pedestrian access to stations and transit stops, promote walkability, and improve safety at rail crossings. Efforts include Safe Routes to Transit studies and support for bicycle access to transit through station parking infrastructure and policies to support bicycles on-board buses and trains. NJ TRANSIT has also appointed a "Bicycle Advocate" to serve as a liaison between their organization and the biking community.

New Jersey Department of Environmental Protection (NJDEP)

The NJDEP's Green Acres Program administers the Federal Highway Administration's Recreational Trails Program (RTP) in New Jersey. Projects are reviewed and recommended for funding by the New Jersey Trails Council and approved by the Federal Highway Administration under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users. The Trails Council comprises interest groups for hiking, mountain biking, horseback riding, motorized trail use and canoeing/kayaking, as well as several general trail advocates and state government representatives.

NJDOT and NJDEP have collaborated on planning projects including the *New Jersey Trails Plan Update* (2009) and the routing study for the September 11th National Memorial Trail across New Jersey (2015).

New Jersey Department of Community Affairs (NJDCA)

As part of the New Jersey Department of Community Affairs, the Main Street New Jersey program provides technical assistance and training to revitalize historic downtowns. The program helps municipalities improve the economy, appearance and image of their central business districts through the organization of local citizens and resources. Focus areas of the Main Street New Jersey program have a comprehensive approach which includes pedestrian, bicycling, and streetscape improvements as economic generators for local businesses.

New Jersey Department of Health (NJDOH)

New Jersey Department of Health administers several programs that address chronic disease prevention. The ShapingNJ Program is the state partnership for nutrition, physical activity, and obesity prevention. The goal of this partnership is to prevent obesity and improve the health of populations that are at risk for poor health outcomes in New Jersey by making "the healthy choice, the easy choice." The partnership's work takes place where New Jerseyans live, work and play including child care centers, schools, communities, worksites and businesses, and healthcare facilities. In addition, members of the Governor's cabinet formed the Population Health Action Team to work on creating and advancing health in all policies initiatives that build healthy communities and improve health outcomes.

Rutgers Center for Advanced Infrastructure and Transportation

Rutgers Center for Advanced Infrastructure and Transportation (CAIT) is one of five National University Transportation Centers, part of a consortium of academic research institutions sanctioned and supported by the Research and Innovative Technology Administration (RITA) of the USDOT.

With funding provided by the NJDOT through the Bureau of Transportation Data and Safety, CAIT has pursued research and developed programs related to pedestrian and bicycle safety in New Jersey. The Transportation Safety Resource Center (TSRC) provides technical assistance, training, data analysis and traffic safety programs to state/ local transportation and law enforcement agencies, including DOTs, state police, MPOs, county engineers, municipal administrators, and others. TSRC created Plan4Safety, a web-based platform for querying, analyzing, and displaying query results from NJDOT's crash database, and assists the NJDOT with crash data analysis and the development of safety programs by other federal, state and local agencies. TRSC provides training workshops and webinars, many of which focus on analyzing and reducing crashes, crash data collection and best practices in the design of bicycle facilities and infrastructure. TSRC also participates in Road Safety Audits.

Alan M. Voorhees Transportation Center (VTC) at Rutgers University

Located within the Edward J. Bloustein School of Planning and Public Policy at Rutgers, the Alan M. Voorhees Transportation Center's primary activities include applied and academic research, education and training, and service to the state and region on a variety of transportation planning and policy topics. VTC collaborates with NJDOT to conduct a number of programs related to bicycle and pedestrian issues and improving mobility statewide. These include operating two resource centers that assist public officials, transportation and health professionals, and the general public in creating a safer and more accessible walking and bicycling environment through primary research, education, and dissemination of information about best practices in policy and design.

New Jersey Bicycle & Pedestrian Resource Center serves as a clearinghouse for technical and educational information and resources. It supports the New Jersey Bicycle and Pedestrian Advisory Council (NJ BPAC) and runs the Ambassadors in Motion (AIM) program, which conducts education and outreach campaigns to promote safety and active transportation in New Jersey.

New Jersey SRTS Resource Center (NJ SRTSRC) works with NJDOT to support SRTS programming, including assisting schools, municipalities, and community groups with education, encouragement, enforcement, evaluation, planning and other non-infrastructure related SRTS activities. The NJ SRTSRC also conducts training programs, provides direct technical assistance, and produces primary research reports on best practices for program implementation.

Both Centers are supported by NJDOT through funds provided by FHWA.

Regional

Metropolitan Planning Organizations (MPOs)

New Jersey's MPOs — North Jersey Transportation Planning Authority (NJTPA), South Jersey Transportation Planning Organization (SJTPO), and Delaware Valley Regional Planning Commission (DVRPC) — are all active in identifying bicycle and pedestrian needs and supporting improvement projects. The MPOs prioritize bicycle and pedestrian safety and mobility as an integral part of their planning activities. Their programs include a variety of initiatives, including education and encouragement campaigns, road safety audits, evaluation and monitoring activities, and technical assistance and funding to support bicycle and pedestrian projects.

Counties

Counties in New Jersey have jurisdiction over 17% of the roadway network statewide, including many major and minor arterials, and play an important role in improving bicycle and pedestrian mobility. Many counties are actively incorporating bicycle and pedestrian needs into the planning process, whether as part of the circulation element of the master plan or as independent initiatives. Eight counties have adopted Complete Streets policies, and Essex and Sussex Counties developed Complete Streets implementation plans. Bergen County completed the Central Bergen County Bicycle and Pedestrian Plan in 2015, which identified infrastructure improvements in an eight-municipality study area to create a more robust bicycle and pedestrian network. Ocean County is advancing the planning and phased-construction of the Barnegat Branch Trail, a 15.6 mile "rail-to-trail" between Barnegat Township and Toms River Township. Over ten miles of trail have been completed since its inception in 2007.

Transportation Management Associations (TMAs)

Transportation Management Associations (TMAs) are private, non-profit, member-controlled organizations established to work with employers, local governments, and state agencies to help provide effective and efficient transportation options and commuter information. There are eight TMAs covering all 21 counties throughout New Jersey. Each has SRTS Regional Coordinators to assist schools and communities with events, education, travel plans, and surveys. The TMAs are also involved in other activities to support and promote bicycling and walking. Hunterdon Area Rural Transit TMA, for example, offers presentations to encourage senior citizens to walk regularly. Cross County Connection TMA has promoted Complete Streets in southern New Jersey through training workshops, and assisted Burlington County in developing the *Burlington County Bicycle Master Plan*.

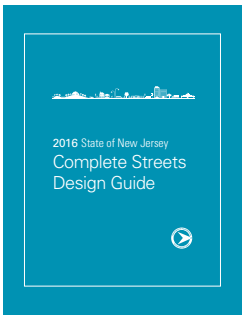
Private Foundations and Non-Profit Organizations

A variety of private sector and non-profit organizations are also active in supporting bicycle and pedestrian programs in New Jersey. For example, the New Jersey Bike & Walk Coalition provides bicycle education each year to third grade students in the Freehold Borough and Rutherford school districts, with funding from the Freehold Borough Education Foundation and Sustainable Jersey (Rutherford). The following organizations all promote the needs of bicyclists and pedestrians through research, advocacy, education programs, and/or grant funding:

- The Robert Wood Johnson Foundation (RWJF)
- American Association for Retired Persons (AARP)
- AAA Foundation for Traffic Safety
- Sustainable Jersey & Sustainable Jersey for Schools
- Rails-to-Trails Conservancy
- New Jersey Bike & Walk Coalition
- Brain Injury Alliance of New Jersey (BIANJ)
- Bicycle Coalition of Greater Philadelphia
- Tri-State Transportation Campaign
- Cooper's Ferry Partnership

Plans

NJDOT



New Jersey Complete Streets Design Guide (2016)

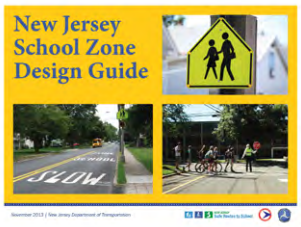
This guide will provide planners and engineers with strategies, design guidelines, and illustrative street typologies to support implementation of complete streets throughout New Jersey.

Bicycle Safety Action Plan & Toolbox (2016)

This data-driven study analyzes bicycle crash trends and current bicycle safety initiatives and identifies a broad range of targeted strategies to improve bicycle safety in New Jersey over the next five years.

Pedestrian Safety Action Plan & Toolbox (2014)

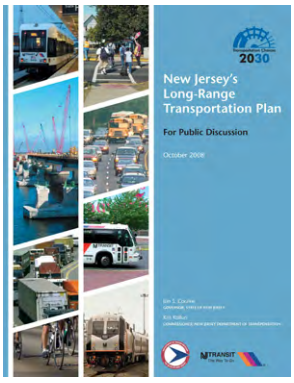
This data-driven study analyzes pedestrian crashes and presents strategies to reduce pedestrian fatalities and serious injuries in New Jersey by 20% in five years.



New Jersey School Zone Design Guide (2014)

This guide provides design recommendations to support safe and accessible school environments that encourage and enable students to safely walk and bike to school.

NJDOT & NJ TRANSIT



New Jersey Long Range Transportation Plan (2008)

New Jersey's most recent Long Range Transportation Plan, *Transportation Choices 2030*, recognizes the integration of transportation and land use planning, via the Smart Growth lens. Smart Growth refers to concentrating growth in existing centers that support public transit, walking, and bicycling, and is essential to achieving a sustainable transportation system.

NJ Division of Highway Traffic Safety

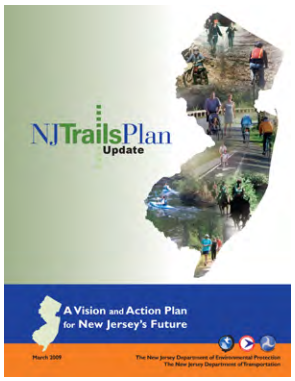
New Jersey Highway Safety Plan (2016)

The mission of the Highway Safety Plan is "the safe passage of all roadway users as we move toward zero fatalities." The plan supports NJDOT's *Pedestrian Safety Action Plan* and includes specific educational, enforcement and safety outreach strategies to reduce pedestrian and bicyclist injuries and fatalities.

NJ Department of Environmental Protection

New Jersey Trails Plan Update (2009)

Produced in coordination by the NJ Department of Environmental Protection (NJDEP) and NJDOT, the *New Jersey Trails Plan Update*, "presents a renewed vision, goals and strategic actions to help guide and coordinate the efforts of all those who plan, build, operate and maintain New Jersey's trails... to benefit New Jersey citizens and visitors of all ages and abilities, for whom t can provide access to nature and to community destinations, serving both recreation and transportation needs."



Together North Jersey

The Plan (2015)

Together North Jersey (TNJ) was created in 2011 to help develop a regional plan, *The Plan*, for North Jersey. Funded by a nearly $10 million federal grant and leveraged funds from members, TNJ formed a coalition of nearly 100 diverse partners—counties, municipalities, educational institutions, nonprofits, businesses and other groups—to develop the first comprehensive plan for sustainable development for the 13 northern New Jersey counties: Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union and Warren.

Bicycle and Pedestrian Funding Sources

Projects that benefit bicyclists and pedestrians are funded through federal and state programs, private sector investment, and Nonprofit initiatives. Current funding sources and their requirements are discussed in more detail in this section. Federal funding sources include the Fixing America's Surface Transportation (FAST) Act, Congestion Mitigation and Air Quality Improvement (CMAQ) Program, Transportation Alternatives (TA), Safe Routes to School (SRTS) Infrastructure Program, and the Local Safety Program/Highway Safety Improvement Program (HSIP). State funding streams are provided primarily through NJDOT, NJ TRANSIT or NJDEP. A small number of Nonprofit and NGO funding sources provide grants for tools, programs and projects.

Federal Funding Sources

Fixing America's Surface Transportation (FAST) Act

- *Congestion Mitigation and Air Quality Improvement (CMAQ) Program*
- *Transportation Alternatives (TA)*
- *Safe Routes to School (SRTS) Infrastructure Program*
- *Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant Program*
- *Recreational Trails Program (RTP)*
- *Local Safety Program/Highway Safety Improvement Program (HSIP)*

State Funding Sources

Bikeway Grant Program
Municipal Aid Program
County Aid Program
Local Aid Infrastructure Fund (LAIF)
Local Bridges, Future Needs
Transit Village Grant Program
Green Acres Program

Nonprofit/NGO Funding Sources

Association of New Jersey Environmental Commissions (ANJEC) Grant Program
Kodak American Greenways Program
New Jersey Healthy Communities Network
New Jersey Prevention Network
PeopleForBikes Community Grants
Sustainable Jersey and Sustainable Jersey for Schools Small Grant Programs
Robert Wood Johnson Foundation
William Penn Foundation

Federal Funding Sources

Federal funding for transportation projects is primarily provided by programs established under the latest surface transportation legislation.

Fixing America's Surface Transportation (FAST) Act

In 2015, Congress adopted the first long-term surface transportation law in more than a decade. Known as the FAST Act, the bill provides federal transportation policy and funding for five years, authorizing $226.3 billion in Federal funding for fiscal years 2016 through 2020 for road, bridge, bicycling, and walking improvements.

The previous program, Moving Ahead for Progress in the 21st Century Act (MAP-21), made a number of reforms to the metropolitan and statewide transportation planning processes, including incorporating performance goals, measures, and targets into the process of identifying priority transportation improvements and project selection. The FAST Act includes provisions to support and enhance these reforms, with public involvement remaining a hallmark of the planning process. The FAST Act continues to develop requirements for a long range plan and a short-term transportation improvement program (TIP), with the long range statewide and metropolitan plans now mandated to include facilities that support intercity transportation, such as intercity buses. The statewide and metropolitan long range plans must describe the performance measures and targets that will be used to assess system performance and progress in achieving the performance targets. The FAST Act also requires the planning process to consider projects/strategies to improve the resilience and reliability of the transportation system, stormwater mitigation, and enhance travel and tourism.

A significant part of the reforms made by MAP-21 included transitioning to a performance-based program of establishing national performance goals for Federal-Aid Highway Programs. The FAST Act supports and continues this overall performance management approach, within which individual states invest in projects that will collectively make progress toward national goals. The FAST Act includes new performance management provisions, including a shortened time frame for states and MPOs to make progress toward meeting performance targets under the National Highway Performance Program (NHPP), and clarifies the significant progress timeline for the Highway Safety Improvement Program (HSIP) performance targets.

Programs under the FAST Act are summarized below. Safety throughout all transportation programs remains USDOT's number one priority. Consistent with this, the FAST Act continues to support the HSIP and the requirement that states pursue a data-driven, strategic, and performance-focused approach to improving highway safety on all public roads. The FAST Act clarifies the range of eligible HSIP projects, limiting eligibility to activities listed in statute (most of which are related to infrastructure safety). It also adds several activities to the list, including certain pedestrian safety improvements.

Congestion Mitigation and Air Quality Improvement (CMAQ) Program

CMAQ is a federal program that funds projects and programs that improve air quality and reduce traffic congestion. The construction of bicycle and pedestrian facilities that are not exclusively recreational (as they must reduce vehicle trips and therefore vehicle emissions), outreach promoting safe bicycle use, and other bicycle and pedestrian programs are eligible for funding.

The CMAQ program, continued in the FAST Act at an estimated average annual funding level of $2.4 billion, provides a funding source to state and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas), as well as former nonattainment areas that are now in compliance (maintenance areas).

Highlighted CMAQ eligibilities include public transit, bicycle and pedestrian facilities, travel demand management strategies, alternative fuel vehicles, and facilities serving electric or natural gas-fueled vehicles.

Transportation Alternatives (TA Set-Aside, or TA)

Created under Map-21, the Transportation Alternatives Program, or TAP, was designed to foster more livable communities and promote alternative modes of transportation, such as bicycling and walking, and encompassed activities that were previously funded separately by Transportation Enhancements (TE), Safe Routes to School (SRTS), and the Recreational Trails (RTP) programs. The FAST Act eliminated the MAP-21 TAP and replaced it with a set-aside of funds under the Surface Transportation Block Grant Program, referred to as the TA Set-Aside, or TA. These set-aside funds include all projects and activities that were previously eligible under TAP, encompassing a variety of smaller scale transportation projects such as pedestrian and bicycle facilities, recreational trails, Safe Routes to School (SRTS) projects, community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity. The FAST Act sets aside an average of $844 million per year for TA. Unless a state opts out, it must use a specified portion of its TA funds for recreational trails projects.

Similar to MAP-21, after the set-aside for the Recreational Trails Program, the FAST Act requires FHWA to distribute 50 percent of TA funds to areas based on population (suballocated), with the remainder available for use anywhere in the state.

States and MPOs for urbanized areas with more than 200,000 people conduct a competitive application process for the use of TA funds; eligible applicants include tribal governments, local governments, transit agencies, school districts, and a new eligibility for nonprofit organizations responsible for local transportation safety programs.

The NJDOT Division of Local Aid and Economic Development administers the TA funds. Eligible projects for TA funds include the provision of bicycle and pedestrian facilities and the preservation of abandoned rail corridors, including the conversion and use thereof for trails. While TE funded safety and education programs, these activities are no longer eligible candidates for TA funding.

Safe Routes to School (SRTS) Infrastructure Program

SRTS funds are intended to enable and encourage children in grades K-8 to walk or bicycle to school. Eligible infrastructure projects include the design and construction of sidewalks, crosswalks, signals, traffic calming, and bicycle facilities within two miles of a K-8 school. SRTS also has a noninfrastructure component, which consists of programing to educate children about safe walking and bicycling practices and encouragement activities, such as walk to school days.

The NJDOT Division of Local Aid and Economic Development administers the SRTS Program, and awards funds for SRTS projects through a competitive process. Local and regional governments, school districts and individual schools are eligible to be project sponsors and receive direct funding. Nonprofit organizations are not eligible to receive direct funding; however, they may partner with a Local Public Agency (LPA) that obtains and administers the grant.

Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant Program

While known primarily as a mechanism to build and repair critical pieces of freight and passenger transportation networks, an intention of the program is to fund multimodal, multijurisdictional projects that would not be eligible for funding through traditional DOT programs.

To date, seven rounds of TIGER grants have been conducted. Eligible applicants for TIGER grants include state, local, and county governments, transit agencies, and metropolitan planning organizations (MPOs). Applicants must detail the benefits their project would deliver for five long-term outcomes: safety, economic competitiveness, state of good repair, livability, and environmental sustainability. A 20% match is required for urban areas; however, no match is required for applicants from rural areas as defined by the U.S. Census.

Recreational Trails Program (RTP)

The New Jersey Department of Environmental Protection administers the RTP under the Green Acres Program. The Recreational Trails program funds the development and maintenance of trails, including bicycle paths. Project costs may be funded up to an 80% federal share with a 20% local match.

Local Safety Program/Highway Safety Improvement Program (HSIP)

The purpose of the Local Safety Program is to achieve a significant reduction in fatalities and serious injuries on all public roads through a data-driven, strategic approach to improving highway safety. The program is implemented through the state's three MPOs. Applications for highway safety improvement projects must address priorities in the *New Jersey Strategic Highway Safety Plan* (SHSP) with project improvements selected based on a data-driven process.

Proposals must demonstrate a location's crash history (using multiyear data) and clearly show a relationship between the types of crashes and the proposed improvements. FHWA's proven safety countermeasures, which include road diets, are recommended to be considered in all HSIP projects. Road diets may include the installation of bicycle lanes. Assistance from SJTPO is available for several steps of the data-driven approach, including problem identification, countermeasure selection, and benefit-cost analysis. In FY 2015, $1 million is available in HSIP funds through NJDOT, with additional funding through the NJDHTS.

State Funding Sources

State funding for bicycle projects is provided primarily through NJDOT's Local Aid Program, which is funded by New Jersey's Transportation Trust Fund (TTF). Funds that may be spent on the planning, design, and construction of bikeways are primarily distributed through the programs listed below.

Bikeway Grant Program

To promote bicycling as an alternative mode of transportation and to further New Jersey's goal of creating 1,000 new miles of dedicated bike paths, NJDOT Division of Local Aid and Economic Development provides dedicated funds to construct bikeways. These funds can also be used for the preliminary and final design of bicycle facilities in municipalities that are eligible for Urban Aid or are Depressed Rural Centers according to the Transportation Trust Fund Authority Act.

The construction of bicycle paths that are physically separated from motorized vehicle traffic are given priority in the selection process; however, the proposed construction of any bicycle facility will be considered for funding. Proposals are also evaluated based on the creation of new bikeway mileage, connectivity to existing bikeways, and community support. Additional consideration is given to communities that have adopted a Complete Streets policy, are designated Transit Villages or Urban Coordinating Council (UCC) communities, or formally participate in the implementation of the *New Jersey State Development and Redevelopment Plan* (*NJ SDRP*).

Municipal Aid Program

Municipal Aid funds are distributed by NJDOT Division of Local Aid & Economic Development to help municipalities advance a variety of transportation projects without burdening local property taxpayers. Each county is appropriated funds for their constituent municipalities based on a formula. A municipality must submit an application, detailing a potential project, to their local NJDOT District Office. NJDOT has set a goal to distribute 10% of the competitive Municipal Aid funding to bicycle and pedestrian projects. Municipal Aid funds are also often used for routine roadway resurfacing and restriping, which can incorporate bikeways to maximize the effectiveness of these funds at little additional cost.

When evaluating municipal aid grant applications, NJDOT gives an additional credit to municipalities that have adopted Complete Streets policies.

County Aid Program

NJDOT Division of Local Aid and Economic Development distributes funds for the construction of roadway and bridge improvements on county roads through the County Aid Program. These funds are distributed on a formulaic basis, which considers factors such as population and county roadway mileage.

A project must be included in a county's Annual Transportation Program (ATP) to be considered for funding. The ATP is an annual list of transportation projects that are eligible for funding and includes a brief summary of the project and the estimated cost of construction. The ATP is approved by the County's Board of Chosen Freeholders before it is submitted to the local NJDOT District Office. County Aid funds are often used for routine roadway resurfacing and restriping. Incorporating bikeways into these projects can maximize the effectiveness of these funds at little additional cost.

Local Aid Infrastructure Fund (LAIF)

The Local Aid Infrastructure Fund is administered by NJDOT Division of Local Aid and Economic Development to address emergency and regional needs throughout New Jersey. Projects are selected at the discretion of the NJDOT Commissioner, and applications for funding may be submitted at any time.

High volume arterial and collector roadways that serve as bus routes are given the highest priority for funding, whereas dead end streets, parking lots, street lighting, and nonroadway related projects receive the lowest priority. Counties and municipalities may apply for funding for pedestrian safety and bikeway projects under this program.

Local Bridges, Future Needs

NJDOT Division of Local Aid and Economic Development provides funds for the improvement of bridges under county jurisdiction, including preventative maintenance, rehabilitation, and replacement. The construction of a bikeway on a county-owned bridge could be incorporated into a project that is funded by the Local Bridges, Future Needs program.

Transit Village Grant Program

New Jersey's Transit Village Initiative is a joint program between NJDOT and NJ TRANSIT to incentivize transit-oriented development and revitalization around New Jersey rail stations. Municipalities that are designated Transit Villages may apply for funds to be used for the construction and design of bicycle and pedestrian projects within the Transit Village area (within ½ mile of a transit station). Municipalities that are committed to TOD may be eligible for NJDOT Transit Village designation. Division of Local Aid and Economic Development administers the program.

Green Acres Program

Through the NJDEP, the Green Acres Program provides grants and loans for the acquisition and development of land for preservation and recreation. Funds from this program can be used to acquire open space that will be used for public outdoor recreation or conservation purposes and to build recreational facilities, such as bike paths, trails, and boardwalks.

Funding amounts vary depending on the type of project and other factors, such as whether a municipality has an open space tax. Projects are divided into the following categories:

Land Acquisition

- Planning Incentive: Local governments with an open space tax and Open Space and Recreation Plan (OSRP) are eligible for a 50% matching grant for land acquisition.
- Standard Acquisition: Local governments without an open space tax may qualify for a 25% grant and the balance as loan, at 2% interest over 30 years.
- Urban Aid: Acquisition projects in designated Urban Aid municipalities may qualify for a 75% grant with the balance as a 30-year, 0% interest loan.

Development Projects

- Standard Development: For local governments in rural, less developed municipalities and counties, funding is available for the development projects in the form of 20-year, 2% interest loan.
- Dense/Highly Populated: For local governments in more urbanized municipalities and counties, funding is available for development projects in the form of a 25% matching grant with the balance as a 2% interest loan.
- Urban Aid: Development projects in designated Urban Aid municipalities may be eligible to receive a 50% matching grant with the balance as a 20-year, 0% interest loan.
- Nonprofit Funding: Nonprofit organizations may be eligible for 50% matching grants for land acquisition or recreation development.

Nonprofit/NGO Funding Sources

Association of New Jersey Environmental Commissions (ANJEC) Grant Program

ANJEC is a statewide, nonprofit organization that provides leadership, education, grants and other support to environmental commissions and others to advocate for strong state and regional environmental policy. Grants are available for open space/greenways and trails assessments, including trail building, multitown efforts to link open spaces or trails, and programs to engage stakeholders.

Kodak American Greenways Program

Administered by the Conservation Fund, in partnership with Kodak and the National Geographic Society, this program provides grants of $500 to $2,500 to local greenways projects. These grants can be used for activities such as:

- Mapping,
- Conducting ecological assessments,
- Surveying land,
- Hosting conferences,
- Developing brochures,
- Producing interpretive displays and a/v material,
- Incorporating land trusts, and
- Building trails.

Grants cannot be used for academic research, general institutional support, lobbying or political activities. The submission period for grant applications is September 1st to December 31st.

New Jersey Healthy Communities Network

The New Jersey Healthy Communities Network (NJHCN) brings together local, regional and statewide leaders to support communities in developing healthy environments for people to live, work, learn and play. NJHCN began when ShapingNJ and New Jersey Partnership for Healthy Kids assembled leadership, resources, capacity, and collaborators to support healthy eating and active living through enhancement of the built environment. A funding collaborative that includes New Jersey Department of Health, Atlantic Health System, New Jersey Partnership for Healthy Kids, New Jersey YMCA State Alliance, Partners for Health Foundation, and Salem Health and Wellness Foundation provides grants to communities to enhance the built environment and advance policy to support healthy eating and active living. Grantees include health departments, non-profit organizations, parks and recreation departments, school boards, and more. The Community Grants Program has awarded $2 million in grants through 2017.

New Jersey Prevention Network

Through funding from the New Jersey Department of Health, New Jersey Prevention Network's "GET ACTIVE NJ" program provides technical assistance, training and incentives to assist municipalities to find ways to educate stakeholders on different policies that can help promote walking and the many benefits that this can have on their communities. New Jersey Prevention Network (NJPN) is a public health agency working to prevent substance abuse, addiction and other chronic diseases by building capacity among professionals, fostering positive collaboration among providers, and strengthening the field of prevention through the use of evidence-based practices and strategies. NJPN offers financial assistance to NJ communities to help them evaluate their current policies and educate stakeholders on potential policy changes. In addition to financial resources, NJPN provides technical assistance and trainings to municipalities as they move though the policy change process in order to help them navigate its complexities. NJPN's Walkability Toolkit includes the steps for identifying community needs, building capacity to address those needs, and explaining who makes policy at the local level.

PeopleForBikes Community Grants

The PeopleForBikes (formerly "Bikes Belong") Community Grant Program provides funding for important and influential projects that leverage federal funding and build momentum for bicycling in communities across the U.S. These projects include bike paths and rail trails, as well as mountain bike trails, bike parks, BMX facilities, and large-scale bicycle advocacy initiatives.

Since 1999, the program has awarded 356 grants to non-profit organizations and local governments in all 50 states and the District of Columbia. The PeopleForBikes Community Grant Program is funded by PeopleForBikes and partners in the bicycle industry, including Fuji, Giant, Shimano, Specialized, and Trek.

Sustainable Jersey and Sustainable Jersey for Schools Small Grant Programs

Sustainable Jersey is a nonprofit organization that provides tools, training and financial incentives for sustainable community initiatives. Their statewide certification program helps municipalities take steps to sustain their quality of life over the long term. In 2014, the Sustainable Jersey for Schools certification program was launched for New Jersey public schools interested in going green and conserving resources.

Participating local governments and schools voluntarily complete and document actions to earn points toward certification. Sustainable Jersey offers small grants ranging from $2,000 to $20,000 to assist communities and schools with completing Sustainable Jersey and Sustainable Jersey for Schools actions . To be eligible for a Sustainable Jersey or Sustainable Jersey for Schools Small Grant, a community or school must be registered or certified with Sustainable Jersey or Sustainable Jersey for Schools and have an active Green Team. The funds can only be used to implement actions that earn points in the Sustainable Jersey or Sustainable Jersey for Schools program.

Several Sustainable Jersey action items help provide sustainable transportation options. Safe Routes to School, Complete Streets Programs, Bicycle and/or Pedestrian Audits, and Bicycle and/or Pedestrian Plans can be funded. Sustainable Jersey for Schools actions related to active transportation include Pedestrian and Bicycle Safety Promotion Initiatives, Safe Routes to School District Policy, and School Travel Plan for Walking and Bicycling.

Robert Wood Johnson Foundation

The Robert Wood Johnson Foundation (RWJF) invests in grantees (e.g., public agencies, universities, and public charities) that are working to improve the health of all Americans. Current or past projects in the topic area "walking and biking" include greenway plans, trail projects, advocacy initiatives, and policy development.

RWJF funds a wide range of activities, including but not limited to:

- Planning and demonstration projects,
- Research and evaluations,
- Policy and statistical analysis,
- Learning networks and communities,
- Public education and strategic communications,
- Community engagement and coalition-building,
- Training and fellowship programs, and
- Technical assistance.

New Jersey Health Initiatives (NJHI) is the statewide grantmaking program of the Robert Wood Johnson Foundation. New Jersey Health Initiatives supports innovations and drives conversations to build healthier communities through grantmaking across New Jersey.

William Penn Foundation

A family foundation with roots firmly planted in Philadelphia, the William Penn Foundation has been committed to improving the quality of life in the city and the region for the last 70 years. The foundation's mission is to help improve education for low-income children, ensure a sustainable environment, foster creative communities that enhance civic life, and advance philanthropy in the Greater Philadelphia region.

One key ingredient of a vibrant city is access to high-quality public spaces that provide opportunities for outdoor recreation and play, and serve as gathering places for people of all backgrounds to come together and build community. More than ever, high-quality public amenities such as parks, trails, bikeways and open spaces are essential to retain and attract residents, businesses and visitors.

List of Acronyms

23 CFR 490	FHWA Safety Performance Management Final Rule
5E Approach	Engineering, Education, Encouragement, Enforcement, and Evaluation
AARP	Formerly the American Association of Retired Persons
AASHTO	American Association of State Highway Transportation Officials
ACS	American Community Survey
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ANJEC Grant Program	Association of New Jersey Environmental Commissions Grant Program
APA NJ	American Planning Association New Jersey Chapter
ATP	Annual Transportation Program
BIANJ	Brain Injury Alliance of New Jersey
BSAP	Bicycle Safety Action Plan (2016)
CAIT	Rutgers Center for Advanced Infrastructure & Transportation
CMAQ Program	Congestion Mitigation and Air Quality Improvement Program
CPTED	Crime Prevention Through Environmental Design
DVRPC	Delaware Valley Regional Planning Commission
FAST Act	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
GIS	Geographic Information Systems
HSIP	Highway Safety Improvement Program
ITE	Institute of Transportation Engineers
KSI	Fatal and severe injury crashes
LAIF	Local Aid Infrastructure Fund
LPA	Local Public Agency
LTS	Level of Traffic Stress
MAP-21	Moving Ahead for Progress in the 21st Century Act
MPO	Metropolitan Planning Organization
MUTCD	Manual on Uniform Traffic Control Devices
NACTO	National Association of City Transportation Officials
NGO	Non-governmental Organization
NHPP	National Highway Performance Program
NHTSA	National Highway Traffic Safety Administration
NJ BPAC	New Jersey Bicycle and Pedestrian Advisory Council
NJ BPRC	New Jersey Bicycle & Pedestrian Resource Center
NJ SDRP	New Jersey State Development and Redevelopment Plan
NJAIM	New Jersey Ambassadors in Motion
NJDCA	New Jersey Department of Community Affairs
NJDEP	New Jersey Department of Environmental Protection

NJDHTS	New Jersey Division of Highway Traffic Safety
NJDOH	New Jersey Department of Health
NJDOT	New Jersey Department of Transportation
NJEJA	New Jersey Environmental Justice Alliance
NJHCN	New Jersey Healthy Communities Network
NJHI	New Jersey Health Initiatives
NJPN	New Jersey Prevention Network
NJTPA	North Jersey Transportation Planning Authority
OBPP	Office of Bicycle and Pedestrian Programs (NJDOT)
OSRP	Open Space and Recreation Plan
PSA	Public Service Announcement
PSAP	Pedestrian Safety Action Plan (2014)
PSMS	Pedestrian Safety Management System
RITA	Research and Innovative Technology Administration
RTP	Recreational Trails Program
RWJF	Robert Wood Johnson Foundation
SJTPO	South Jersey Transportation Planning Organization
SRTS	Safe Routes to School
SRTSRC	Safe Routes to School Resource Center
TA	Transportation Alternatives (part of FAST Act)
TAP	Transportation Alternatives Program (part of MAP-21)
TE	Transportation Enhancements
THT	Transportation and Health Tool
TIGER Grant Program	Transportation Investment Generating Economic Recovery Discretionary Grant Program
TIP	Transportation Improvement Program
TMA	Transportation Management Associations
TNJ	Together North Jersey
TOD	Transit-Oriented Development
TSRC	Transportation Safety Resource Center
TTF	Transportation Trust Fund
UCC	Urban Coordinating Council
USDOT	United States Department of Transportation
VMT	vehicle miles traveled
VTC	Alan M. Voorhees Transportation Center at Rutgers University

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New Jersey Bicycle & Pedestrian Master Plan

November 2016

Audubon International

Fact Sheet

Environmental Management Practices for Golf Courses

Since its inception in 1991, the Audubon Cooperative Sanctuary Program for Golf Courses (ACSP) has been assisting golf courses in their efforts to blend environmentally responsible maintenance practices into day-to-day golf course operations. Drawing upon the expertise and experience of golf course superintendents, golf industry experts, university researchers, and environmental professionals from diverse backgrounds, Audubon International has developed Standard Environmental Management Practices that are generally applicable to all golf courses. These practices form the basis for the ACSP's certification guidelines.

Environmental Planning

Evaluation and planning helps course managers to balance the demands of golf with their responsibility to the natural environment. An initial site assessment and environmental plan, followed by yearly review and goal setting, helps golf course superintendents and others to responsibly care for the land, water, wildlife, and natural resources upon which the course is sustained.

- Conduct a site assessment to evaluate current environmental management practices, and identify strengths and liabilities.
- Develop a map of the course that highlights wildlife habitats, water resources, and management zones to use for planning and project implementation.
- Set goals and priorities and assign responsibilities to staff.
- Evaluate progress toward goals and objectives at least once per year.
- Train employees regarding the importance of environmental performance and specific techniques for ensuring environmental quality.
- Communicate regularly to employees, customers, stakeholders, and community members about environmental goals, issues, project implementation, and progress.
- Document environmental activities and results to assist with planning and to track progress.

> *"When I first came to Sumner Meadows the golf course was mowed wall to wall. Everything was expected to be kept 'short and green'. Being involved with Audubon International has helped to change that perception. Not only have naturalized areas increased habitat, it has also reduced maintenance costs. The changes we have made have added an important new dimension, aesthetically, to the course. Areas that were once just more rough, are now a sharp contrast to the green fairways and greens. The tall golden grass is visually appealing along with providing habitat for birds and other animals."*
>
> - Mark Seman, Sumner Meadows Golf Links, Sumner, WA

Wildlife and Habitat Management

Implementing environmental management practices enhances existing natural habitats and landscaping on the golf course to promote wildlife and biodiversity conservation. The great variation in golf course location, size, and layout, as well as special wildlife species and habitat considerations, must be accounted for when planning and implementing appropriate practices.

A diversity of wildlife and habitats add to the nature of the game such as these young American kestrels at Stone Creek Golf Club in Oregon City, OR.

General Knowledge

- Identify core habitats, such as mature woodlands, wetlands, or stream corridors, and special habitat concerns, such as endangered or threatened species, on the property.
- Train staff to understand that management practices may positively enhance or adversely impact wildlife species and habitats on the property.
- Identify the dominant native plant community and ecological region in which the golf course is located.
- Maintain an on-going written inventory of at least bird and mammal species to document and track wildlife use of the property.

Wildlife Habitat Enhancements

- Maintain natural wildlife habitat in at least 50% of all minimally used portions of the property.
- Connect small and large natural areas as much as possible to improve wildlife movement throughout the golf course and from the course to neighboring natural areas. For instance, connect woods, meadows, stream corridors, and ponds with corridors of natural vegetation.
- Maintain or plant varying heights and types of plants, from ground cover to shrub and tree layers in habitat areas such as woods, desert, or prairie (*e.g.,* leave understory in woodlands; maintain grasses and herbaceous plants in tall grass areas).
- Leave dead trees standing when they do not pose a safety hazard.
- Maintain a water source for wildlife with aquatic plants and shrubbery or native landscaping along the shoreline (*i.e.,* not turfgrass). This could be a pond, stream, wetland, or river corridor. On smaller properties, this may also include a birdbath or created “backyard” pool.
- Naturalize at least 50% of out-of-play shorelines with emergent aquatic and shoreline plants. Give special attention to shallow water areas (<2ft. deep) since wildlife is most abundant when shallow water includes emergent aquatic vegetation.
- Choose flowers for gardens or container plants that will provide nectar for hummingbirds or butterflies.
- Maintain nesting boxes or other structures, when appropriate, to enhance nesting sites for birds or bats.

Habitat Protection and Biodiversity Conservation

- Complete any mitigation projects required by permit.
- Protect wildlife habitats, and any endangered or threatened wildlife or plant species, from disturbance by golfers and maintenance activities. Use buffers, mounted signs, fencing, or designated “environmentally-sensitive zones” (per USGA rules) as needed.
- Establish and maintain at least 80% of the landscaped trees, shrubs, and flowers, excluding turfgrass, with plants that are indigenous to the native plant community of the ecological region of the property.
- Purchase landscape plants from locally-grown sources, whenever possible, to support the genetic integrity of local native plant communities.
- Avoid disturbing known bird nests or den sites until after young have dispersed. Stake or flag such areas when needed (*e.g.,* rope killdeer nests; avoid removing shrubs or trees during bird nesting season if nests are present; do not mow fields until after bird nesting season).
- Restore degraded habitats, such as eroded slopes, compacted soils, polluted water sources, or areas overrun with invasive exotic species.
- Clean up trash from habitat areas when necessary.
- Confine roads, cart paths, trails, and necessary vegetation removal to the edges of existing habitats to minimize habitat disturbance and fragmentation.

Chemical Use Reduction and Safety

Golf courses must employ best management practices and integrated pest management techniques to ensure safe storage, application, and handling of chemicals and reduce actual and potential environmental contamination associated with chemical use.

Environmental management practices begin at the maintenance facility with staff training and the proper storage and handling of equipment and chemicals.

General Knowledge

- Meet applicable state/provincial and federal regulations for chemical storage, handling, application, and disposal.
- Train maintenance staff in the basic tenets of integrated pest management.
- Educate maintenance staff about the risks to human health and the environment associated with chemical manufacturing, use, storage, and disposal, including: acute and chronic health problems, degraded water quality and soil health, and negative impacts to wildlife and habitats.

Cultural Practices and IPM Techniques

- Maintain green, tee, and fairway mowing heights at levels that can be reasonably maintained on a day-to-day basis without continually stressing turf or maximizing chemical inputs.
- Inventory soil types for all playing surfaces and assess conditions such as soil structure, nutrient levels, organic content, compaction, and water infiltration.
- Regularly work to improve soil health. This may include: amending organic content, aerating, and improving water infiltration to cultivate a diverse, living biotic soil community.
- Base fertilizer applications upon soil test information.
- Maximize turf health and minimize resource inputs by improving turf conditions.
- Plant pest-resistant or stress-tolerant cultivars on playing surfaces and in landscaping. Select plant species/cultivars best suited for climate, soils, and growing conditions.
- Designate and train key staff to monitor plant health and pest populations as part of the IPM program.
- Identify and record turf “hot spots” where disease or insect outbreaks first occur. Identify other areas where poor growing conditions often lead to problems.
- Use scouting forms to record the type, severity, location, and treatment of pest problems.
- Establish aesthetic and functional thresholds for *insects*, *fungal diseases, and weeds* for all managed areas.
- Evaluate potential control measures, including alterations in cultural management, biological, physical, and mechanical controls, and chemical methods.
- Consider the environmental impact of pest control measures, *e.g,* leaching and runoff potential, toxicity to non-target organisms, soil absorption capacity, pesticide persistence, water solubility, effects on soil microorganisms.
- Actively work to reduce turf stresses and change cultural practices or other conditions to prevent or discourage recurrence of problems.
- Maintain records of treatments employed and their effectiveness and use them to guide future pest control decisions.

Proper turf management ensures healthy turf and a healthy environment.

Best Management Practices for Chemical Use

- Pesticides are applied by a trained, licensed applicator or as directed by law.
- Maintain a current Material Safety Data Sheet (MSDS) for each chemical at the facility.
- Read and follow label directions when using chemical products.
- Apply pesticides only when and where scouting indicates that pest threshold levels have been exceeded.
- Treat problems at the proper time and under the proper weather conditions to maximize effectiveness and minimize harmful environmental impacts.
- Employ practices and use products that reduce the potential for contamination of ground and surface water, *e.g.,* curtains on application equipment, spoon-feeding, slow-release products, selected natural organic products.
- Eliminate potential chemical runoff and drift by avoiding applications during high winds or prior to heavy rains.
- Establish “no spray zones” and buffer areas, particularly around water features and other environmentally sensitive areas.

Communication and Education

- Train and encourage continuing education for maintenance staff, including state/provincial licensing, professional association training, and IPM certification. If applicable, provide non-English speaking employees with training in their native languages.
- Communicate with employees and clientele regarding the IPM program to maintain a dialogue regarding thresholds, epidemics, and control measures in relation to environmental quality.
- Communicate with the green committee, club manager, and club pro, as appropriate, to coordinate and assure support for needed golf maintenance activities.

Reminding golfers to replace divots and repair ball marks raises awareness of the importance of proper turf care. Above, a tee marks the spot of each unrepaired ball mark on a green at an event at North Shore Country Club in Glenview, IL.

Maintenance Facility and Equipment

- Chemical storage structure should be secure, well ventilated, and allow limited personnel access.
- Organize maintenance facility for efficient and proper storage of equipment and supplies.
- Properly calibrate all equipment used to apply materials.
- Prevent gasoline, motor oil, brake and transmission fluid, solvents, and other chemicals used to operate and maintain equipment and vehicles from contaminating soils, surface waters, or ground water.
- Clean and maintain equipment in ways that prevent wash water from draining directly into surface waters (*e.g.,* lake, pond, stream).
- Properly store all chemicals. Pesticides and fertilizers are stored on plastic or metal shelving to keep them off the floor.
- Store liquid products below dry materials.
- Handle all pesticides over an impermeable surface.
- Keep a spill containment kit readily available and follow spill containment procedures.
- Triple rinse, puncture, and properly dispose of empty chemical containers.

Additional Maintenance Facility Standards

NOTE: The following maintenance facility specifications are considered standard for environmentally-responsible chemical storage and handling. Because they involve *infrastructure* standards, we strongly recommend them, but do not require them for certification in the ACSP for Golf Courses.

- Fuel is stored on an impervious surface that has spill containment and a roof.
- Chemical storage structure is fire proof.
- Explosion-proof lights are used in chemical storage and maintenance areas.
- Chemical storage area has a sealed metal or concrete floor, and spills are contained by a sump located near the middle of the floor, and a lip along the edges.
- Grass clippings are blown off equipment with compressed air instead of, or prior to, washing with water.
- A catch basin to collect grass clippings, grease, and oils is installed and maintained.

Water Conservation

Water conservation on the golf course involves maintaining irrigation equipment to maximize efficiency and minimize waste, as well as employing water conserving irrigation practices.

Hand watering dry spots often saves water by eliminating the need to run the entire irrigation system.

General Knowledge

- Prioritize water conservation and train employees to employ conservation techniques.
- Identify water sources used for irrigation and drinking water.
- Train key staff to operate and manage the irrigation system correctly.

Proper Installation and Maintenance of Irrigation Equipment, Retention Structures, and Plumbing Fixtures

- Eliminate uncontrolled releases of water out of water retention structures.
- Design, install, and test the performance of the irrigation system to maximize the efficient use of water.
- Inspect the irrigation system for proper water distribution in all irrigated areas at least once per year.
- Adjust rotation speed and operating pressure to match sprinkler spacing to nozzle performance.
- Check all irrigation equipment daily and maintain the system on a regular schedule.
- Fix leaks in a timely manner.
- Eliminate non-target watering (*e.g.,* sidewalks, ponds, habitats).
- Maintain the pump station regularly to ensure efficient operation.
- Upgrade the irrigation system, or components of system (*e.g.,* valves, sprinkler heads, nozzles, computer software), to reduce inefficiency and malfunction and reduce water use.
- Install part-circle irrigation heads where possible, to save water.

Proper Watering Practices and Turf Care

- Incorporate evapotranspiration rates or weather data into daily irrigation decisions.
- Avoid running the irrigation system at peak evapotranspiration times.
- Water “hot spots” to target needed areas only, rather than running the entire irrigation system during the peak of the day.
- Maintain soils and turfgrass to maximize water absorption and reduce runoff and evaporation, including: maintain soil cover, improve soil structure, add or maintain natural organic matter in the soil, and improve drainage).
- Reduce or eliminate irrigation on all unused or minimally used portions of the property.
- Monitor daily water use, tally monthly usage, and set targets for yearly improvement.
- Use turfgrass on greens, tees, and fairways that is appropriate for the local climate and growing conditions.

Water Quality Management

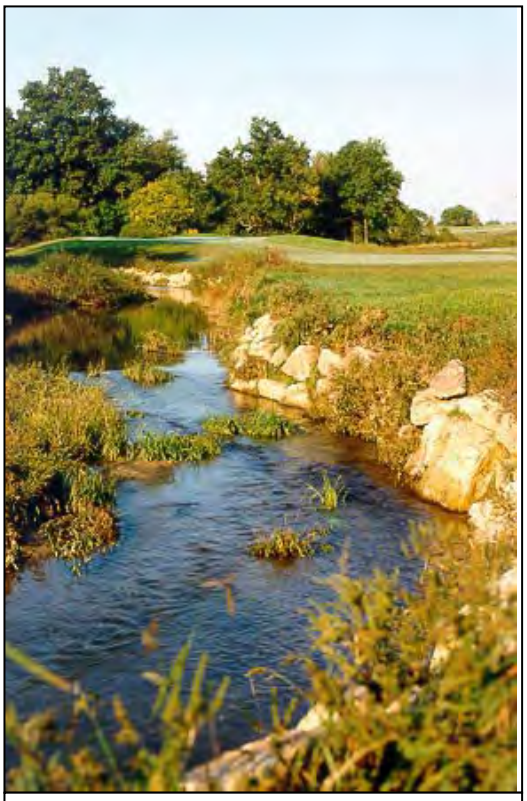
The use of best management practices helps golf courses to protect the health and integrity of water resources. Water quality monitoring provides a valuable tool for evaluating whether management practices are working.

General Knowledge

- Prioritize the protection of water quality, both on and off the golf course, and train staff to use BMPs to prevent pollution.
- Identify the specific watershed in which the property is located, including where wastewater and runoff go after leaving the property.

Best Management Practices (BMP) and Structural Controls

- Eliminate/mitigate erosion to water bodies, such as streams, lakes, and ponds.
- Employ environmentally-sensitive plant management techniques within 25 feet of all water bodies and well heads to minimize nutrient and chemical inputs.
- Eliminate potential chemical runoff and drift near water bodies by designating “no spray” zones, using spot treatments, increasing thresholds for pest problems, using covered booms, and taking the weather into account prior to application.
- Raise mowing heights along in-play shorelines to slow and filter runoff. (Research has shown that, on a slight slope, a 25- foot buffer of 3-inch turf provides filtering benefits.)
- Reduce the potential for nutrient loading to water bodies by employing BMPs, such as: using slow-release fertilizers, spoonfeeding, and filtering drainage through vegetative or mechanical filters prior to entering water bodies.
- Calibrate and adjust fertilizer and pesticide equipment to prevent misapplication.
- Maintain and clean maintenance equipment in a manner that eliminates the potential for on-site or off-site contamination of water bodies.
- Store all chemicals in a manner that eliminates the potential for onsite or off-site contamination of water bodies.
- Mix and load pesticides in an area that guarantees spill containment.
- Handle and apply fertilizers, pesticides, and other chemicals in a manner that eliminates potential on-site or off-site contamination of water bodies.
- Dispose of all chemical containers and all waste materials in a manner that eliminates the potential for on-site or off-site contamination of water bodies.



Streams add beauty and challenge to golf courses, as well as valuable wildlife habitat. Employing BMPs protects water quality both on and off the course.

- Reduce/eliminate the need for chemical algae control in ponds through proper aeration, nutrient reduction, bio-filters, vegetation management, or bio-controls.
- When aquatic weed management is required, seek a physical solution (*e.g.,* hand removal of plants) first, and then seek the least toxic method of chemical weed control. Address any underlying causes of the problem.

Water Quality Management: Monitoring

- Visually monitor water bodies for water quality problems, such as erosion, algae, aquatic “weed” growth, fish kills, sediment buildup, *etc*., as part of regular IPM scouting activities.
- Report water quality problems immediately to supervisors and, if required, regulatory agencies for appropriate action.
- Establish baseline data for representative water bodies and water sources that may be adversely affected by golf course operations. Testing practices may include:
    - If there is a creek/stream/river that flows through the golf course, water is tested where water enters and exits the property
    - Physical characteristics: dissolved oxygen, pH, temperature, and specific conductivity
    - Nutrients- nitrogen (nitrate and ammonia) and total phosphorus
    - Macroinvertebrates- surveys for aquatic organisms to determine water quality in streams
    - Baseline tests conducted 4x/year for at least a year
    - Re-test water sources at least one time per year, or sooner if problems occur
- Keep written records of monitoring activities, results, and control measures taken if needed.

Outreach and Education

Golfer support for the environmental management program is essential to its long-term success. A variety of education and outreach activities assist golf course maintenance staff in communicating with patrons and community members and invite participation where appropriate. The ACSP for Golf Courses requires that golf courses form a *Resource Advisory Group* to help plan and implement environmental projects and educational efforts. Representatives from the golf course, as well as the local community, often participate to offer advice or volunteer assistance.

Community groups often welcome opportunities to participate in golf course environmental projects, such as stream water monitoring, wildlife surveys, and nest box construction.

Communication, Education, and Involvement

- Communicate environmental goals, objectives, and projects to patrons, staff, and company decision makers.
- Provide regular updates about progress and accomplishments. Activities may include: one-on-one communication, presentations to the board and committees, environmental display board, newsletter articles, special brochures, signage, posters, scorecard information, course tours, and workshops.
- Invite employees, patrons, and community members to help with stewardship projects, as appropriate. For instance, monitoring nest boxes, inventorying wildlife species, hosting workshops or tours.
- Communicate with neighboring property owners, homeowners' associations, and community groups to inform them of the course's involvement in the various environmental stewardship projects (*e.g.,* letters to neighbors; press releases; presentations at workshops, seminars, committee meetings).

Letting individuals know the who, what, where, how, and why of projects is important to gain acceptance and, thus, the continued success of different projects such as naturalizing shorelines. Keller Golf Course in Maplewood, MN uses signs as part of their education efforts.

Wanting to create a garden that could be enjoyed by all members of the club, the staff at Cattail Creek Country Club in Glenwood, MD partnered with a local elementary school to create a butterfly garden off the back patio of the clubhouse.

2017 State of New Jersey

Complete Streets Design Guide

Prepared for:
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Prepared by:
WSP | Parsons Brinckerhoff

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NJDOT Office of Bicycle and Pedestrian Programs
Debbie Kingsland
Elise Bremer-Nei, AICP, PP
Joseph Powell
Nipa Maniar
William Riviere
Khalid Shaikh

WSP | Parsons Brinckerhoff
Daniel Turner, AICP
Reed Sibley, AICP
Peter Kremer, AICP, PP
Jessie Jones
Steve Johnson

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How to Use This Guide

ABOUT THIS GUIDE

This guide is the third in a series of Complete Streets guides developed by the New Jersey Department of Transportation:

- *Making Complete Streets a Reality: A Guide to Policy Development*
- *A Guide to Creating a Complete Streets Implementation Plan*
- *Complete Streets Design Guide*

The New Jersey Complete Streets Design Guide presents tools and methodologies for designing Complete Streets in a variety of settings, with attention to the specific needs of each community. The guide can be used by municipal and state agency staff, design professionals, private developers, community groups, and others involved in the planning and design of streets in New Jersey. The guide is intended to inform all projects that impact the public right-of-way, including the construction of new streets and improvements to existing streets. Standards in this guide are a compilation of current best practice guidance and do NOT supersede any existing federal, state, or city laws, rules, or regulations.

CHAPTERS IN THIS GUIDE

Chapter 1: Complete Streets in New Jersey
Defines Complete Streets and the benefits that come from following the Complete Streets approach.

Chapter 2: Integrating Complete Streets into the Planning and Design Process
Provides guidance on adopting and implementing a Complete Streets policy, public policy changes that can help facilitate implementation, and strategies for integrating Complete Streets into the planning and design process.

Chapter 3: Complete Streets Toolbox—Policy and Design Guidance for Implementing Complete Streets
Provides guidance on a range of tools and treatment options that can be used to enhance a street's safety, mobility, access, and vitality. Where applicable, resources are cited for additional design guidance.

Chapter 4: Street Typologies
Describes the common types of streets found in New Jersey and provides guidance on how the toolbox fits into the context of these different streets.

NAVIGATING THIS GUIDE

Information Box

Supplemental information relating to the primary topic

Design Guidance

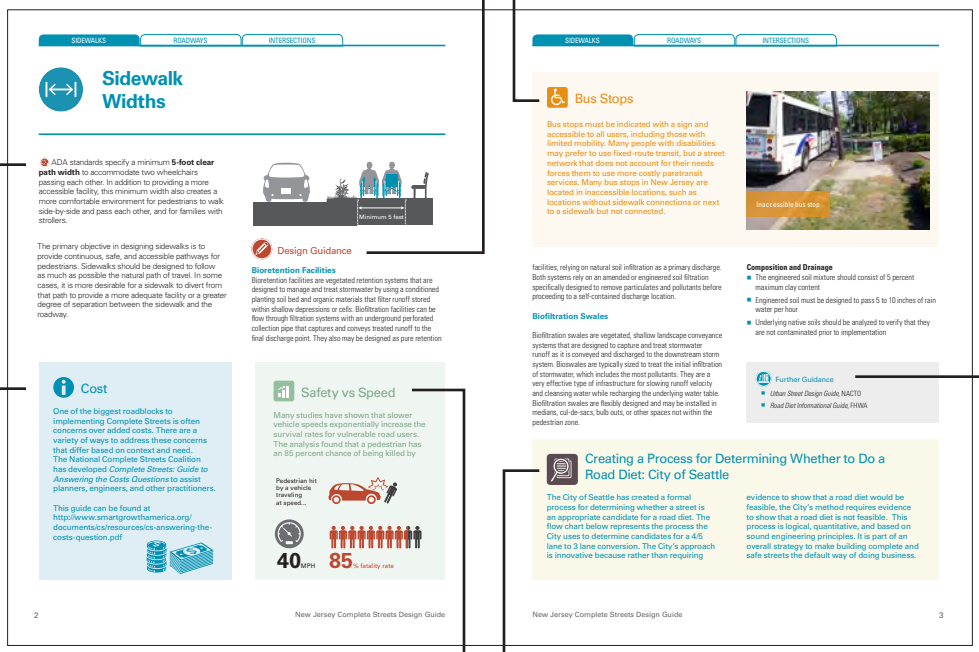
Quantitative and qualitative guidance for Complete Streets designs

Design Standard

In-text call-out for quantitative design standard

ADA Accessibility

Guidance on accessible design standards



Sample Spread

Further Guidance

References to relevant guidelines and design manuals

Data

Data supporting Complete Streets approach

Case Study

Example application of Complete Streets practice

START HERE!

NJDOT Staff

- Integrate Complete Streets into project development (Chapter 2)
- Identify design options for new streets (Chapter 3)
- Identify design options for existing street resurfacing or reconstruction projects (Chapter 3)
- Understand how context influences the needs and design applications for each street (Chapter 4)

Local Engineers, Planners, Developers, and Design Professionals

- Understand the purpose and benefits of Complete Streets (Chapter 1)
- Understand municipal priorities, policies, and programs that promote Complete Streets (Chapter 2)
- Identify available design options that are appropriate to meet your goals (Chapter 3)
- Understand how context influences the needs of each street (Chapter 4)
- Explore funding resources to help turn your vision into reality (Chapter 5)

Community Groups

- Learn why Complete Streets is a growing and important movement in New Jersey (Chapter 1)
- Learn about programs that can help promote Complete Streets in your community (Chapter 2)
- Understand the toolbox of Complete Streets design options and how they might benefit your community (Chapter 3)
- Learn how different treatments can be applied to different types of streets in your town (Chapter 4)
- Identify funding sources and grants that are available to help your town implement projects (Chapter 5)

FLEXIBILITY IN DESIGN

A flexible approach to design is a critical component of Complete Streets. The preeminent design manuals (including AASHTO's *A Policy on Geometric Design of Highways and Streets Sixth Edition*, commonly referred to as the "*Green Book*") emphasize the need for flexibility, and many engineers and designers adopt this strategy. However, street designs often adhere to the maximum and most auto and highway-oriented designs and standards. Because of this, FHWA developed a guide called *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts* that is focused on the need and opportunities for design flexibility.

The key to achieving greater flexibility is understanding all the guidance documents available (including this one) and applying appropriate designs to achieve desired outcomes. For example, the AASHTO "*Green Book*" (where many engineers and designers derive the "standard" 12-foot lane) recognizes the need for flexibility and states that lane width can be tailored to fit the roadway environment.

AASHTO states that lane widths may vary from 10 to 12 feet on most arterials rather than stating that 12 feet is the recommended width for all roads. For lower classification roadways, narrower widths may be appropriate.

Another example of flexibility is the design of separated bicycle lanes. The AASHTO *Guide for the Development of Bicycle Facilities* does not include design guidance for these facilities; however, the NACTO *Urban Bikeway Design Guide* and the FHWA *Separated Bike Lane Planning and Design Guide* do. The lack of guidance in one guide does not mean that a design is not safe or free from liability. Nor does it provide an excuse to not implement a particular design. Engineers and designers should take advantage of all the guiding documents available when considering a particular treatment. **Designs should be considered that help achieve the desired outcomes of a project.**

FHWA Revised Rules

In May 2016, the FHWA revised its criteria for the 10 rules* controlling the design of projects on the National Highway System (NHS). Prior to the rule change, all 10 controlling criteria applied to ALL NHS facility types.

Under the new rule, ONLY "Design Loading Structural Capacity" and "Design Speed" apply to all NHS facility types. The remaining eight criteria are applicable only to "high-speed" NHS roadways.

This new rule provides greater flexibility in designing most roadways to the local context rather than rigid adherence to standards of highway design.

* *The 10 rules are: Design Speed, Lane Width, Shoulder Width, Horizontal Curve Radius, Superelevation Rate, Stopping Sight Distance, Maximum Grade, Cross Slope, Vertical Clearance, and Design Loading Structural Capacity.*

Streets for All Users: Accessible Design

Streets must accommodate safe travel for everyone, including those with disabilities. Many streets, however are difficult to access, navigate, cross, or do not provide adequate accommodations for people who use wheelchairs, have diminished vision or hearing, limited mobility, or even parents with strollers. Most people will face at least one of these challenges in their lifetime.

When a street is incomplete, it lacks adequate accommodations for users of all abilities. An incomplete street might feature unpaved, disconnected, narrow, or deteriorated sidewalks that not only impede travel for those with limited mobility but also makes wheelchair use almost impossible. The lack of a curb ramp or an incorrectly placed one can force a pedestrian into the street or significantly reduce mobility. Wide intersections that are designed for the quick movement of motorized traffic might not provide enough time for someone with a disability to cross safely.

Pedestrian signals that only use visual cues (or no pedestrian signal) can lead to challenging and/or dangerous situations for the visually impaired. Bus stops that are not connected to a sidewalk are not accessible to many pedestrians with disabilities, and might prevent them from getting to where they need to go. A construction project that closes a sidewalk and does not make alternate accommodations not only creates a new barrier for those with disabilities, but can lead to confusing or dangerous situations for the visually impaired. Many people with disabilities rely on sidewalks or public transit to travel (including for doctors' appointments, groceries, and exercise), and incomplete streets can make this almost impossible. As a result, many people with disabilities must rely on costly paratransit service or are unable to travel where they need to go.

Designing for accessibility not only benefits those with disabilities, limited mobility, or parents with baby strollers, but helps create a more complete and mobility-supportive built environment for all users. Complete and well-maintained sidewalk networks, accessible transit stops, properly placed and designed curb ramps, and other accessible features make it easier for all people to travel and provide a more dignified and aesthetically pleasing built environment.

Accessibility is not only a matter of good planning, it is also required by law that new and reconstruction projects be accessible to all users. This guide provides design standards for accessible design relating to sidewalks, intersections, signage, and transit, as well as resources for further information.

LEGISLATING DOCUMENTS

Pedestrian facility design and operation must comply with the following acts of Congress:

- Architectural Barriers Act (ABA) of 1968
- The Rehabilitation Act of 1973 (Section 504)
- The Americans with Disabilities Act (ADA) of 1990

Look for this symbol throughout this guide for accessibility information.

Beyond This Guide

This design guide has been developed to supplement existing manuals and standards, including the *Manual on Uniform Traffic Control Devices* (MUTCD) and guidance issued by the National Association of City Transportation Officials (NACTO), the American Association of State Highway Transportation Officials (AASHTO), and the Federal Highway Administration (FHWA).

(Clockwise from top-left)
NACTO *Urban Street Design Guide*
NACTO *Urban Bikeway Design Guide*
MUTCD for Streets and Highways 2009
FHWA *Separated Bike Lane Planning and Design Guide*
AASHTO *Guide for the Development of Bicycle Facilities*
NACTO *Transit Street Design Guide*

Additional Guidance Documents

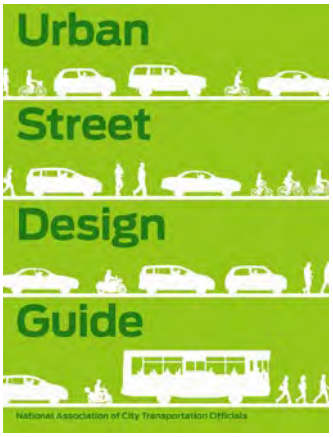
AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities*

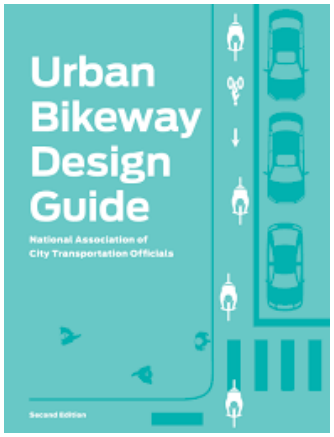
FHWA *Small Town and Rural Multimodal Networks*

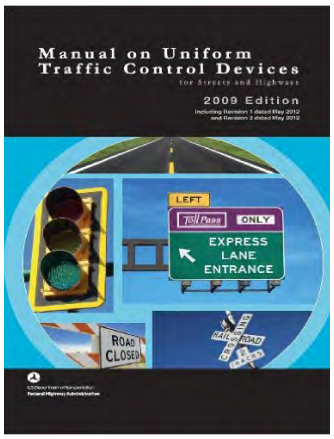
Institute of Transportation Engineers (ITE) *Designing Walkable Urban Thoroughfares*

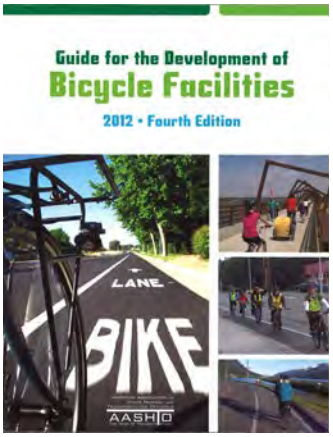
NJ Department of Transportation *New Jersey School Zone Design Guide*

NJ Department of Transportation *Roadway Design Manual*









01

Complete Streets in New Jersey

Complete Streets are streets designed for all users, all modes of transportation, and all ability levels. They balance the needs of drivers, pedestrians, bicyclists, transit riders, emergency responders, and goods movement based on local context.

The New Jersey Department of Transportation (NJDOT) adopted a Complete Streets policy in 2009, which can be found at **njbikeped.org** (along with an updated list of municipal and county policies). The policy requires that roadway improvement projects include safe accommodations for all users, including bicyclists, pedestrians, transit riders, and the mobility impaired. In its analysis of Complete Streets policies nationwide, the National Complete Streets Coalition has consistently ranked NJDOT's policy among the strongest in the nation (2010 through 2014), both overall and at the state level, out of the hundreds of jurisdictions that have adopted formal Complete Streets policies.

NJDOT has jurisdiction over less than 10 percent of roadway lane-miles in New Jersey. Therefore, to make an appreciable difference on the mobility and safety of all users, New Jersey's municipalities and counties must join the Complete Streets movement. With encouragement from NJDOT, over 130 local and county governments throughout New Jersey have also adopted Complete Streets policies as of February 2016. These policies are changing the way we design and use our streets and communities. This guide provides planning and design guidelines to support policy advancement and implementation of Complete Streets in New Jersey.

What are Complete Streets?

Increasingly, planners, engineers, decision makers, and citizens are recognizing the importance of designing and building Complete Streets. As defined by the National Complete Streets Coalition:

"Complete streets are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across a complete street."

NJDOT adopted its nationally recognized policy in 2009 with the purpose of "[providing] safe access for all users by designing and operating a comprehensive, integrated, connected multi-modal network of transportation options." Through this policy, NJDOT seeks to make well-planned, well-designed, context-based streets an integral part of its transportation network. While there is no template for a Complete Street, typical elements may include accessible sidewalks and crosswalks, bicycle facilities, appropriate street widths and speeds, and transit facilities.

A critical component in the design of a Complete Street is that its accommodations be provided with the same level of detail and attention that has been afforded to the movement of automobiles and heavy vehicles. This means that sidewalks, bicycle lanes, and other elements be both comprehensive and interconnected. Complete Streets design elements emphasize safety, mobility, and accessibility for all modes and users. Under the Complete Streets policy, any new or retrofit projects must consider all modes and users in the design. Although Complete Streets may initially be designed and built as disconnected segments, the intent of the policy is to incrementally grow and develop community-wide networks of Complete Streets over time.

Complete Streets mean designing a street based on its unique context, including surrounding land use patterns, who uses the street, and user needs. Highways serve an important function in our transportation network, providing the highest level of efficiency for moving high traffic volumes over longer distances. However, the purpose and function of a street is different from that of a highway. Street design practices and principles should therefore also differ from those that guide highway development. This guide provides direction on how to implement street design principles that fit local context and support more livable, sustainable, and resilient communities.

Why Complete Streets?

The adoption of NJDOT's Complete Streets policy represented a significant shift in the Department's approach to street design. Central to this shift is the understanding that an auto-centric approach to street design has led to unfriendly (and at times unsafe) conditions for both motorized and non-motorized users in many locations in New Jersey. Fundamentally, this approach often reduces the function of a street exclusively to the movement of automobiles and trucks. However, our streets play a vital role in communities, connecting people of all ages, abilities, and modes, and supporting commerce and social interaction. How a street is designed has an underlying impact on the quality of life and economic vitality of its surroundings and the people that use it.

A Complete Streets approach to transportation planning has many benefits for all who live, work, and play in New Jersey:

- Health
- Safety
- Equity
- Economic Vitality
- Transportation Choices
- Environment
- Mobility
- Livability

Pedestrian mall on Washington Street in Cape May, NJ

Health

Street design has a major impact on health. Each additional hour spent driving per day is associated with a 6 percent increase in obesity, while each additional kilometer walked is associated with a 5 percent reduction in this likelihood.[1]

Complete Streets provide opportunities for active transportation by integrating features into street designs that facilitate and encourage walking, cycling, and transit use. One study found that residents are 65 percent more likely to walk in a neighborhood with sidewalks.[2] Other studies have shown similar effects where bicycle, pedestrian, and transit infrastructure correlate with higher rates of physical activity and lower rates of obesity.

Streets that are designed only for cars discourage other modes of transportation, including walking and bicycling. Even where sidewalks do exist, large gaps in the sidewalk network, wide intersection crossings, speeding traffic, poor maintenance, and the lack of adequate accommodations for the mobility impaired can make walking unpleasant or unsafe.

Obesity

"sitting is the new smoking"

According to the Centers for Disease Control and Prevention (CDC), more than one-third (34.0 percent) of U.S. adults are obese, with a related estimated annual medical cost of $147 billion in 2008 dollars. Childhood obesity is also a serious problem in the U.S., affecting about 17 percent[3] or 12.7 million U.S. children 2 to 19 years of age. According to the U.S. Department of Health and Human Services (HHS), one big factor in high obesity levels is inactivity. About 55 percent of the U.S. adult population falls short of recommended activity guidelines.[4]

34%
Obese Adults

$147 billion*
Medical Cost

17%
Obese Children
(Ages 2—19)

55%
Adults do not get enough exercise

* In 2008 dollars

Safety

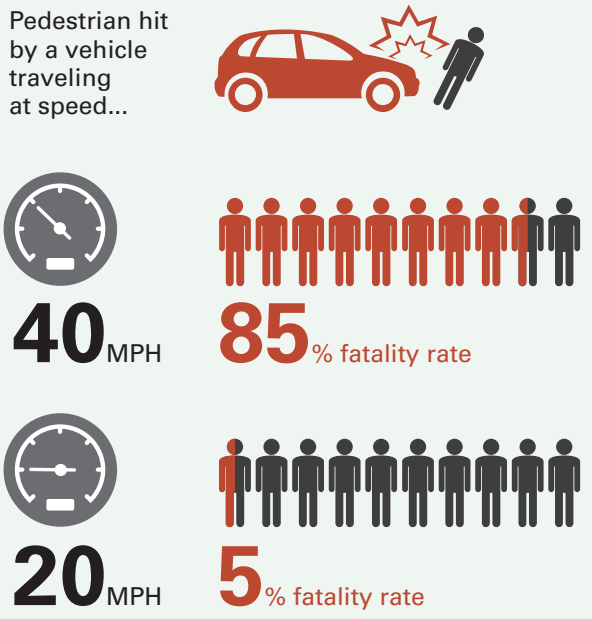
Street design can also have a significant impact on health from a safety perspective. Over the past 10 years in New Jersey, there has been an average of 140 fatal pedestrian crashes and 13 fatal cyclist crashes each year, accounting for 25 percent and 2 percent, respectively, of all fatal crashes in New Jersey.[5] One FHWA report demonstrates that pedestrian crashes are more than twice as likely to occur in places without sidewalks, while locations with sidewalks on both sides of the road have the fewest crashes.[6] In 2007 and 2008, more than 50 percent of all pedestrian fatalities in the U.S. occurred on arterial roadways, which are typically designed for the efficient movement of large volumes of automobiles.[7] However, in the United States, retail, commercial, and job centers are often located along these arterials and frequently lack appropriate pedestrian or bicycle infrastructure. More than 40 percent of these crashes occurred where there was no crosswalk available.[8] When retail, commercial, and job centers locate along these arterial roadways, there is a built-in demand (and sometimes necessity) for people to access these sites, regardless of whether they have access to a motor vehicle.

Fears over safety also discourage those with automobiles from using alternate modes of transportation and prevent many people without automobiles from accessing these sites. This is particularly prevalent among senior citizens and those with disabilities. For them, these stores and businesses are effectively inaccessible without an automobile.

Complete Streets design can improve pedestrian safety. The FHWA found that certain measures—sidewalks, raised medians, bus stop placement, traffic-calming measures, and treatments for those with limited mobility—all improve pedestrian safety.[9] One study found that installing raised medians and redesigning intersections and sidewalks reduced pedestrian risk by 28 percent.[10]

Safety vs Speed

Many studies have shown that slower vehicle speeds exponentially increase the survival rates for vulnerable road users. The analysis found that a pedestrian has an 85 percent chance of being killed by a vehicle traveling at 40 mph, but only a 5 percent chance of being killed by a vehicle traveling at 20 mph.[11]



Equity

One-third of Americans do not drive.[12] This group relies on alternate modes of transportation to reach their destinations, which is often critical for their livelihood. When suitable transportation options are not available, many residents are unable to access vital services and economic opportunity. For example, studies show that seniors may forgo doctor visits when they do not have access to a car. When transportation planners and engineers treat facilities for these users as optional add-ons or unnecessary expense, an unequal transportation system is created that ignores the needs of major segments of the population. Safe, comfortable, and affordable transportation options create a more equitable and economically mobile society.

The fundamental principle of Complete Streets is to design streets that are safe and comfortable for everyone, regardless of age, ability, ethnicity, income, or chosen travel mode. Incomplete streets have disproportional impacts on minorities, older adults, children, and low-income communities. These populations are often cut off from jobs, healthcare, friends, and family by incomplete streets. The pedestrian fatality rate for Latinos is over 60 percent higher than that of whites, while the rate for African-Americans is almost 75 percent higher.[13]

Low-income communities are also at a higher risk of pedestrian injury due to unsafe streets. The pedestrian fatality rate for counties where more than 20 percent of households have incomes below the federal poverty line is 80 percent higher than the national average.[14] Older adults also suffer disproportionate impacts. Nationally, adults over 65 represented 22 percent of all pedestrian fatalities from 2000 to 2009 despite only making up 13 percent of the total population.[15] Similarly, in New Jersey 14 percent of the population is over 65 (2009—2014 ACS), yet this age group accounts for 22 percent of all pedestrian fatalities.

New Brunswick, NJ

Economic Vitality

A growing body of data is increasing our understanding of the positive economic impact that Complete Streets can have on a community. Statewide, active transportation-related infrastructure, businesses, and events contributed an estimated $497 million to the New Jersey economy in 2011—nearly eight times the $63 million invested in infrastructure—supporting several thousand jobs and generating millions in tax revenue.[16]

Making streets more accommodating to walking, biking, or riding transit can stimulate local economic activity in a variety of ways. Residents of Dallas save an average of $9,026 per year by riding transit, while residents of Cleveland save an average of $9,576.[17] For large cities, the total savings for using alternate modes of transportation saves residents a lot of money each year, with a $2.3 billion total savings for residents of Chicago[18] and $19 billion for residents of New York City.[19] Money that is not spent on transportation can be spent in other ways, such as at restaurants and businesses, recapturing this money for local economies.

Local Business and Property Values

Improving access for pedestrians, bicyclists, and transit riders can benefit local businesses and property values. In one example, businesses along Valencia Street in San Francisco saw their sales increase by 60 percent following the addition of a bicycle lane.[20] In Washington, D.C., street design improvements along Barracks Row helped attract 40 new businesses and nearly 200 new jobs.[21] In Mountain View, California, the addition of sidewalk cafes and pedestrian space was followed by private investment of $150 million.[22] In Indianapolis, property values within one block of the 8-mile-long Cultural Trail increased nearly 150 percent between 2008 and 2015, which translates to an increase of $1 billion[23] in assessed property value. In New Jersey, Complete Streets improvements along South Park Street in Montclair supported an influx of new businesses and revitalization of the downtown.

South Park Street, Montclair, NJ (photo credit: Montclair Farmers Market)

Transportation Choices

One of the fundamental goals of Complete Streets is to facilitate and encourage a variety of transportation choices beyond the personal automobile. Research shows that while many people might want to walk, bike, or take transit to their destinations, the lack of appropriate infrastructure or service makes these trips difficult or impossible. In fact, a national survey found that bicycle lanes were available for less than 5 percent of bicycle trips, and more than one-quarter of pedestrian trips were taking place on roads with neither sidewalks nor shoulders.[24] Other surveys have found that a lack of sidewalks and safe places to bike are a primary reason people give when asked why they don't walk or bicycle more.[25]

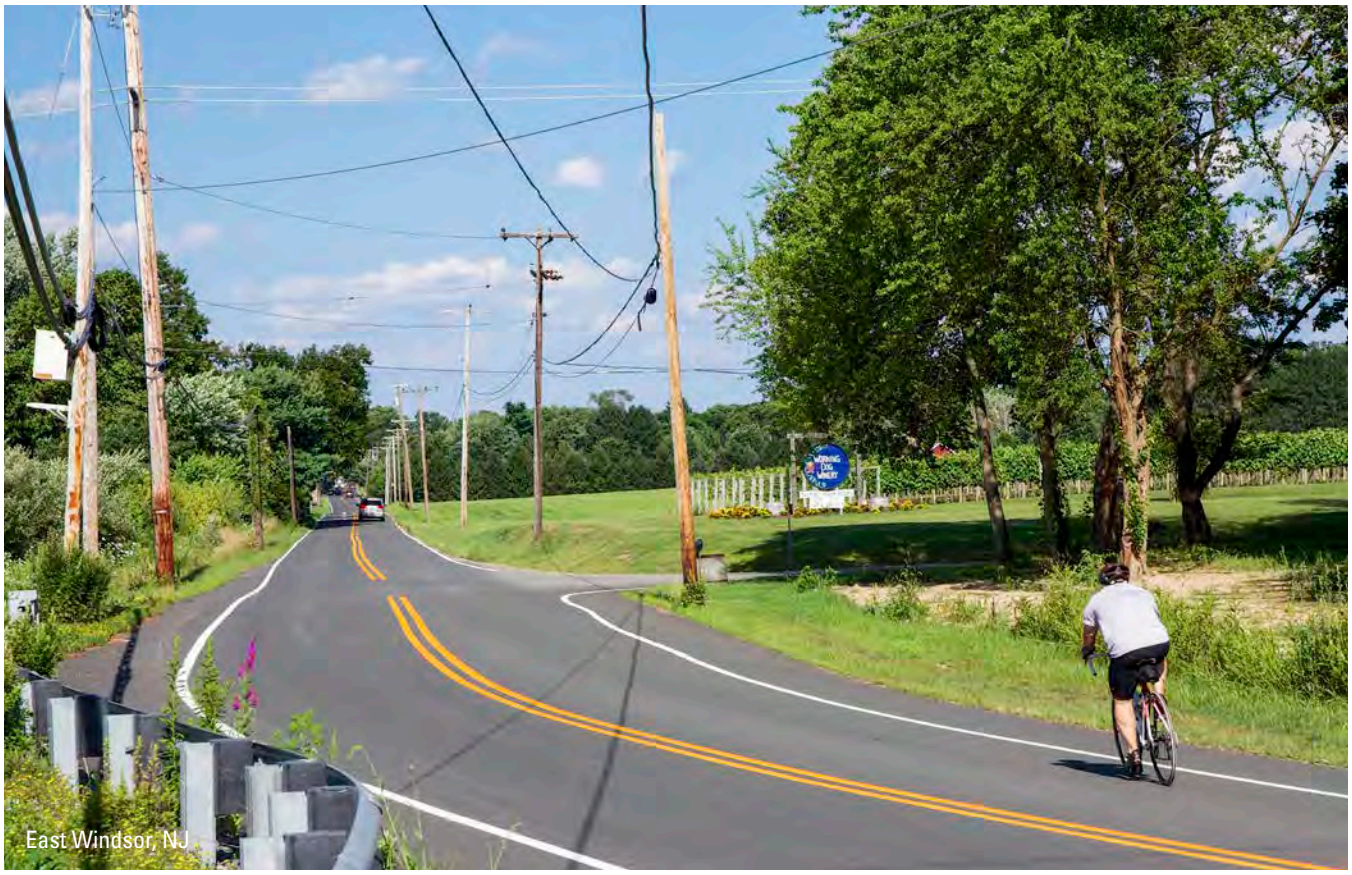
A Complete Street provides transportation choices not only to those who desire to travel by different modes but also for those that cannot drive and must use an alternate mode. Complete Streets make it possible for New Jersey's residents to drive less and use our streets to get around more easily on foot, bike, and public transit. The 2001 National Household Transportation Survey found that 50 percent of all trips in metropolitan areas are 3 miles or less and 28 percent of all metropolitan trips are 1 mile or less—distances easily traversed by foot or bicycle. Yet 72 percent of trips under 1 mile are now made by automobile, in part because of incomplete streets that make it unsafe or unpleasant to walk, bicycle, or take transit.[26] Complete Streets can help convert many of these short automobile trips to multi-modal travel.

Hamilton Train Station in Hamilton, NJ

Environment

Building Complete Streets can help create a more sustainable and healthier natural environment by facilitating more environmentally friendly modes of transportation and by as integrating sustainable infrastructure into street design. Even small changes in transportation behavior can have enormous impacts on the environment. More carbon dioxide (CO_2) is emitted in the United States' transportation sector than any other nation's entire economy except for China.[27] The 260,000 miles bicyclists ride daily in Philadelphia saves 747,450 tons of CO_2 from being emitted by cars.[28] Interestingly, when car travel restrictions reduced morning traffic by 23 percent during the 1996 Olympics in Atlanta, ozone concentrations decreased 28 percent and acute care visits for asthma decreased 41 percent.[29]

In addition to the environmental benefits a community may experience by encouraging the use of sustainable transportation modes for more trips (walking, bicycling, and transit), a Complete Streets approach emphasizes the integration of sustainable infrastructure into the design of a street. These elements include stormwater management techniques (such as rain gardens) that help reduce the impact of stormwater runoff (including pollutants) entering the water system and mitigate long-term capital infrastructure costs. Other sustainable design elements, such as street trees, help create cleaner air, provide shade that reduces energy consumption, reduce the heat island effect, and create a pleasant environment for all street users.



East Windsor, NJ

Mobility

Streets that are "complete" provide everyone with a choice of mobility options, allowing all users to travel to and from work, school, and other destinations with the same level of safety and convenience, whether or not they have mobility, vision, or cognitive disabilities. Many streets, however, are difficult to navigate, dangerous, or do not provide adequate accommodations for people who use wheelchairs, have diminished vision or hearing, limited mobility, or even parents with strollers. Most people will face at least one of these challenges in their lifetime.

Along incomplete streets, unpaved surfaces and disconnected, narrow, or deteriorated sidewalks discourage wheelchair travel, and the lack of a curb ramp can force a pedestrian into the street. Wide intersections designed to quickly move motorized traffic may not provide enough time for someone with a disability to cross safely. Pedestrian signals that use only visual cues can lead to dangerous situations for those with limited vision. A recent study found that blind pedestrians waited three times longer to cross the street and made many more dangerous crossings than sighted pedestrians.[30] Installing a bus stop sign in a patch of grass provides information to passengers, but without sidewalks and necessary curb ramps, these stops are inaccessible and an uncomfortable place to wait. Many people with disabilities may prefer to use fixed-route transit, but a street network that does not account for their needs forces them to use more costly paratransit service.

Complete and maintained sidewalk networks, accessible transit stops, properly placed and designed curb ramps, and other accessible designs make it easier for all people to travel and provide a more dignified and aesthetically pleasing built environment.

Livability

Complete Streets help create livable communities. Wide, attractive sidewalks and well-defined bicycle routes encourage healthy and active lifestyles. Creative re-purposing of street space helps connect the community by providing fun and attractive public space for residents and visitors to gather. A Complete Street enhances opportunities for people to participate in the social, cultural, and economic life of the community without using a car. Streets that are attractive and accessible for all users help define a community's identity, encourage a vibrant street life, and provide a sense of pride for residents and visitors.

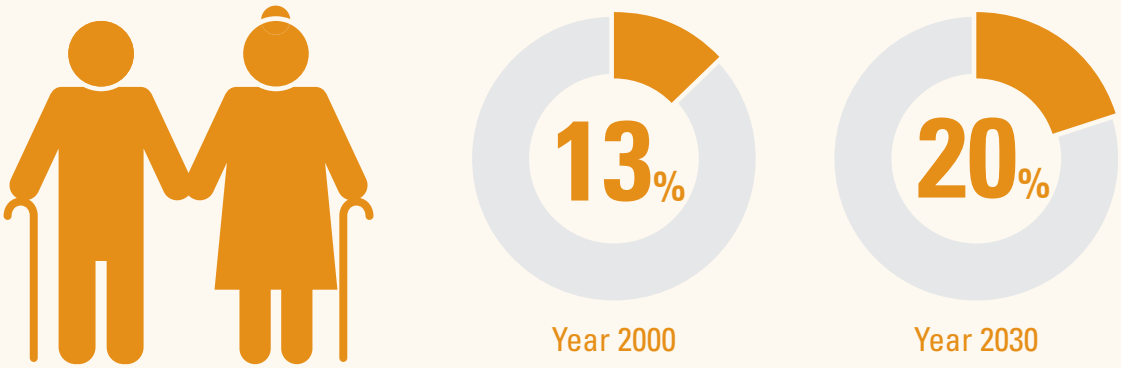
Communiversity, Princeton, NJ

Mobility

In New Jersey, the percentage of seniors in the population is projected to grow 51 percent between 2000 and 2030, from 13 percent to 20 percent of the state population.[31] As the population ages, the transportation system needs to adapt to maintain access and mobility for shifting demographics. Seniors are less likely to drive and often live in communities with few transportation alternatives. Combined with physical limitations, these factors can cause seniors to feel trapped in their homes and communities. Improving senior mobility is essential to maintaining a high quality of life for older adults. It ensures that seniors have safe access to their daily needs and activities, and enables seniors to "age in place" by maintaining independence and staying in their homes and communities.

The effects of aging amplify the impacts of physical barriers that may otherwise appear minor to younger, able-bodied pedestrians. As we age, walking speed and reaction time decrease, and physical mobility, vision, hearing, and cognition can deteriorate, causing various physical barriers to become insurmountable obstacles. The effects of aging can also leave seniors more vulnerable to severe pedestrian crashes. While seniors are involved in fewer total pedestrian crashes per capita in New Jersey, the fatality rate among seniors is significantly higher than the state average.

Percentage of senior population of the state population between 2000 and 2030*



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02

Integrating Complete Streets into the Planning and Design Process

Integrating Complete Streets principles into planning and design procedures can be a complex and challenging process. While there is no perfect, one-size-fits-all method to achieve successful integration, a number of tools are available to planners, engineers, and policy makers to make this process more straightforward and successful. Adopting a Complete Streets policy is a good first step to begin to change the transportation planning process. However, it is just that—the beginning. Much work remains to be done and additional actions may be necessary to fully implement the policy. This chapter discusses some of the actions that can be taken to achieve more consistent, effective, and long-term implementation of Complete Streets.

Ocean City, NJ

Implementing Complete Streets at the State Level

Since adopting its policy in 2009, NJDOT has worked hard to integrate the policy into its project development and delivery processes, effectively making Complete Streets the default way of doing business. NJDOT has updated its Capital Project Delivery process to include Complete Streets at every step, including revising wording to include "all roadway users," developing checklists for concept development and preliminary engineering, and requiring Office of Pedestrian and Bicycle Projects Subject Matter Expert sign off on all projects. The following strategies can assist NJDOT in continuing to implement its policy statewide.

Integrated Design from Project Inception

Integrating Complete Streets principles into design from project inception is critical to efficient and cost-effective project delivery and creating an optimal street design. Changes to the design late in the process can lead to contract change orders, costly rework, and a less cohesive overall design. Any design changes also need to be analyzed and go through regulatory review to avoid potential liability issues.

NJDOT's process of involving Subject Matter Experts (SMEs) at project kick-off is a vital element of integrated design. All relevant disciplines should be involved in problem (statement) screening and project scoping so that the process adequately assesses and captures the needs of all users and all modes and Complete Streets are integrated into the Project Statement.

As the project advances to Concept Development, a multi-disciplinary group of SMEs should continue to be involved to define the purpose and need so that it appropriately identifies the needs of all modes. Defining the needs of all users at this first step helps mitigate the potential for changes in scope at later phases. With a clear definition of the project purpose and need in place, the project team can develop integrated, multi-modal design alternatives that fit the context and address the needs of all users.

NJDOT's use of Complete Streets checklists also helps integrate Complete Streets principles into the capital project delivery process. Required for every project, these checklists help project managers evaluate the context of the project area and assess and understand the needs of different travel modes, ensuring the needs of all users are appropriately addressed as the project moves through design.

Ultimately, the Complete Streets checklist is one of many methods to achieve better integration of Complete Streets designs into project delivery. The primary consideration for any project at its inception should be how the project meets the community's needs and fits its context. This will help ensure that Complete Streets designs are more than just a series of elements but are part of an approach to create a project that best meets the needs of the local community.

Developing Complete Networks

Implementation of Complete Streets is not a uniform, one-size fits all process. Project needs and appropriate design treatments are driven by the unique context of each street and each community; therefore, each street may look slightly different depending on its function, surrounding land uses and development character, the needs and desires of the community it serves, and design constraints. Taking a network-based approach

Passaic County, NJ

to Complete Streets allows planners and engineers greater flexibility to work within project constraints. For example, in areas with space constraints and limited public right-of-way, it may not be feasible to adequately accommodate all users on all streets.

By viewing a street as part of a larger network, planners and engineers can identify parallel streets where a different balance of transportation modes helps provide mobility for all users and improve overall network efficiency. Effectively implementing the network approach requires coordination among local, county, and state jurisdictions in order develop a network plan, define the role of each street, and create appropriate accommodations for each mode.

Working with Limited Scope Projects

Limited scope projects provide a mechanism for NJDOT to effectively address deficiencies and extend the functional and structural life of the Department's assets. Unlike full-scope projects, limited scope projects do not have a preliminary engineering phase, creating a more streamlined project delivery process that supports quicker implementation. Limited scope projects include pavement resurfacing, bridge deck/superstructure replacement, sign structure installation, and drainage improvements, among others. These projects are typically limited to the exiting curb-to-curb width and by definition do not involve permitting, right-of-way, or utility impacts.

Limited scope projects require a different approach. The Complete Streets checklists used in the full scope projects are not applicable to limited scope projects due to the more focused issues and needs being addressed, tighter timeline, and spatial constraints. To fill this gap

Ocean City, NJ

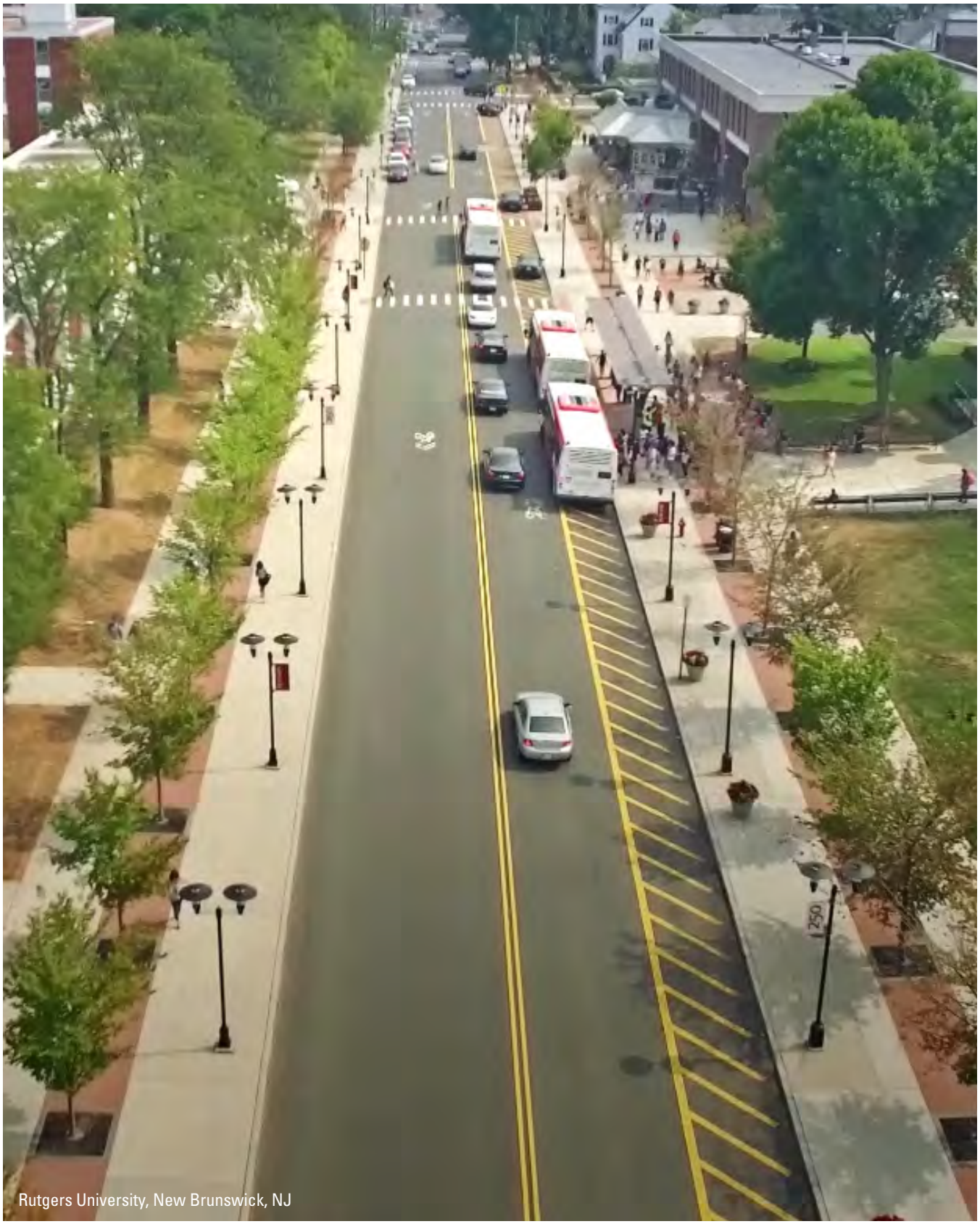
in the Complete Streets implementation process, a variation of the Complete Streets checklist should be developed that accommodates the unique needs and constraints of the limited scope project delivery process.

The refined checklist can still achieve Completes Streets goals, but within a more limited scope. It can help the project team identify opportunities for simple multi-modal improvements that do not impact the schedule or constraints of limited scope projects. This could include repairs to existing, deteriorating sections of sidewalk or incorporating bicycle lane projects into repaving projects.

A Complete Streets checklist for limited scope projects can also be used to identify additional project needs that can only be addressed outside of that project. These projects can be advanced through a new Problem Statement and graduate to the full-scope project delivery process, or broken out as separate, smaller projects with their own individual problem statements and advanced through the capital project delivery process.

Integrating with the NJDOT Project Prioritization Process

NJDOT's project prioritization process is driven largely by management systems data and quantitative information. Existing metrics capture many needs related to automobile travel. In order to incorporate the needs of pedestrians and bicyclists and associated projects into the project prioritization process, metrics for these modes should also be developed. These metrics might reflect safety issues or potential demand for improved bicycle or pedestrian access. Coordination with NJ TRANSIT can also incorporate the needs of transit riders into the process. The location of transit stops or bus routes, for example, may be factors in the prioritization of pedestrian or roadway improvements, respectively.



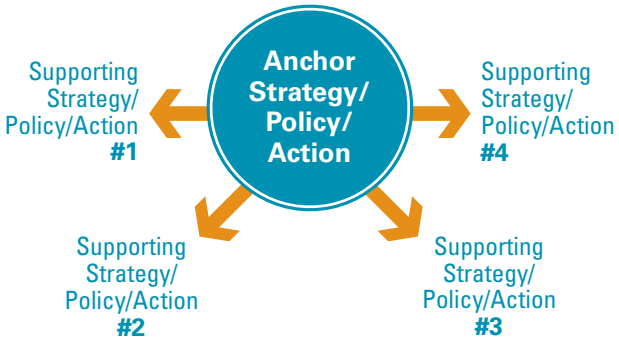
Rutgers University, New Brunswick, NJ

Implementing Complete Streets in Your Local Community

Implementation: There is No Silver Bullet!

Many communities interested in or actively trying to implement Complete Streets want to know: "What is the best or most effective action we can take to make our streets complete?" The answer is that there isn't any one action or policy that can fix every problem or even effectively change the status quo. Everything starts with context and the unique needs of the community. A multi-pronged strategy ensures effective and systematic implementation of Complete Streets. The strategies discussed in this section can be used to create a connected and coordinated effort to implement Complete Streets.

If it seems overwhelming to consider the many actions that need to be taken to do this, consider developing an anchor strategy or policy, and coordinating other strategies and policies around that anchor. For example, this anchor strategy can be the adoption of a Complete Street Policy, an update to a Comprehensive Plan, or both.



Crafting an Effective Complete Streets Policy

An effective Complete Streets policy lays the foundation for the implementation process. Policy adoption formally acknowledges the benefits and importance of planning, designing, and maintaining a street network that balances the needs of all users and all modes. It marks an institutional shift in how the state, county, municipality, or other entity views its streets and integrates and codifies Complete Streets principles into daily business and operations.

A strong and effective Complete Streets policy has six key elements:

- Statement of purpose and intent, describing the goals, visions, and desired outcome of the policy
- Definition of users and modes, stipulating whose needs are to be considered in the implementation of Complete Streets
- Stipulation of the types of improvements covered by the policy
- Reference to design standards that will be followed when implementing the policy
- Definition of the exemptions process, clearly identifying legitimate instances when the policy would not be applied
- Implementation plan to provide guidance on how the plan will be put into practice

Additional guidance on creating and adopting a Complete Streets policy, including a model policy template, can be found in NJDOT's *Making Complete Streets a Reality: A Guide to Policy Development*.

Beyond the Policy: Integrating Complete Streets into the Planning and Design Process

The adoption of a Complete Streets policy is intended to ensure that future street projects consider the needs of all travelers, regardless of age, ability, or mode of transportation. But what happens after a policy is adopted? The transportation planning process can be complex, and existing procedures are reflective of an entrenched method of doing business. Because of this, implementation of a Complete Streets policy can often be very difficult in many communities. Three key actions should be considered in order to achieve more effective and consistent implementation of the Complete Streets policy:

I. Change the way decisions are made

II. Involve stakeholders and members of the community

III. Redefine how you measure success

I. Change the Way Decisions are Made

Complete Streets is a process, not a specific product. Complete Streets provides an approach to identifying, analyzing, and developing solutions to transportation issues. Changing the everyday processes that guide decision-making lies at the heart of successful Complete Streets initiatives. While changing these processes can be challenging, it is essential to successful implementation.

The following are strategies to help integrate Complete Streets into the decision-making process:

- Develop a Complete Streets Checklist
- Integrate it into the Comprehensive Plan and Zoning
- Align Plans, Programs, and Funding
- Create a Formal Implementation Plan
- Review and Update Roadway Design Guidance

Cost

One of the biggest roadblocks to implementing Complete Streets is often concerns over added costs. There are a variety of ways to address these concerns that differ based on context and need. The National Complete Streets Coalition has developed *Complete Streets: Guide to Answering the Costs Questions* to assist planners, engineers, and other practitioners.

This guide can be found at http://www.smartgrowthamerica.org/documents/cs/resources/cs-answering-the-costs-question.pdf

Develop a Complete Streets Checklist

A Complete Streets Checklist is intended to ensure that projects comply with the Complete Streets policy. Development and implementation of a checklist should be included as a requirement of the policy. The Complete Streets Checklist reinforces the policy by formalizing a multimodal approach to roadway planning, design, and construction. It assists planners and engineers in evaluating the current and future functions of a street, the needs of all users of the street, the street's context, and existing conditions and facilities for all modes.

The Complete Streets Checklist should be used during the Concept Development and Preliminary Engineering phases to ensure that the developed alternatives comply with the policy. NJDOT's checklists are available online (www.state.nj.us/transportation/eng/completestreets/implementation.shtm) and additional examples are available through the National Complete Streets Coalition (www.smartgrowthamerica.org/complete-streets). Any checklist should include a list of design elements to be addressed, a place to indicate whether the element was included, and a description of how it was included or, if there was an exemption, why this exemption was made. The checklist should be signed off by the project manager.

Integrate it into the Comprehensive Plan and Zoning

A Comprehensive Plan represents and outlines the goals and priorities of a community. Integrating Complete Streets into the Comprehensive Plan is an absolutely essential step for implementation. Most traditional master plans include a Circulation Element, which often focuses almost exclusively on vehicular circulation. The Comprehensive Plan should be updated to reflect the goals of the Complete Streets policy. This includes taking a more comprehensive approach to the transportation element. The Town of Morristown did this when it updated its Comprehensive Plan in 2014, replacing the Circulation Element with a Mobility Element. This updated section included detailed goals, objectives, and strategies for achieving more livable streets. The plan also coordinated the Land Use and Mobility Elements to more accurately and effectively address this important relationship.

Zoning ordinances and building codes should also be updated to reflect the needs of all roadway users. The purpose of this is to ensure that new developments, parks, and other facilities are built, retrofitted, or maintained in such a way that integrates Complete Streets and the overarching goals of the community. For example, where site planning and design standards stipulate requirements for vehicle parking and vehicular access, provisions should also be required for bicycle parking and bicycle and pedestrian access. The development review process ensures that these standards are adhered to, Complete Streets principles are followed, and accommodations for all users are included in new infrastructure.

Align Plans, Programs, and Funding

Complete Streets integration does not stop with the Comprehensive Plan. All guiding documents of a community should be aligned and coordinated—including those focusing on bicycle and pedestrian mobility, the Comprehensive Plan, and, importantly, the Transportation Improvement Plan, which guides funding priorities. Complete Streets priorities should also be integrated into other plans, including housing, recreation, and redevelopment plans, as well as any other guiding documents that influence how things are built or maintained.

Vision Zero

Vision Zero is a road safety policy developed in Sweden in the mid-1990s. The guiding principle of this policy is that no traffic-related deaths are acceptable and that safety should be the top priority of the transportation system. Many cities in the United States have adopted Vision Zero policies, setting goals and strategies for achieving zero traffic-related fatalities. Common strategies for achieving the goals of Vision Zero include lowering travel speeds through design and lower speed limits, increasing penalties for reckless driving, and implementing many of the other strategies found in this guide. Vision Zero is based on the principle that traffic fatalities are preventable and not inevitable and it is the responsibility not only of roadway users but also designers and engineers to prevent these unnecessary tragedies.

Further Guidance

More information on the Vision Zero initiative can be found at http://www.visionzeroinitiative.com/

Create a Formal Implementation Plan

An implementation plan is an effective tool that can maintain momentum generated during policy development and formalize a process for implementation of Complete Streets. The creation of an implementation plan should involve staff and decision makers who are involved in the planning, design, construction, and maintenance of the jurisdiction's streets. This may include planners, engineers, maintenance and public works staff, and other key stakeholders. An implementation plan provides an opportunity to assess current decision-making practices; review relevant documents (including subdivision codes, design guidance, checklists, decision trees, etc.); and to assign responsibility and timelines for integrating Complete Streets into those existing documents and procedures.

An implementation plan should include:

- An assessment of the street design process, transportation infrastructure, and network gaps
- Guidance on street design, including standards, best practices, and an evaluation of how street users are served by different design elements
- Complete Streets Checklist

There are many good examples of Complete Streets implementation plans available. The National Complete Streets Coalition has recommended the following as model examples for Complete Streets implementation plans:

- California Department of Transportation: *Complete Streets Implementation Action Plan*
- Minnesota Department of Transportation: *Complete Streets Implementation Work Plan*
- Vermont Agency of Transportation: *Complete Streets Guidance Document*
- Saint Paul, Minnesota: *Complete Street Plan*

In New Jersey, Essex County developed its Complete Streets Implementation Action Plan in 2014. This plan focuses on the transportation planning process and the process for applying the Complete Streets Checklist. The City of Newark developed its Complete Streets Design Guidelines and Implementation Plan in 2016, which focuses on providing street design guidance and the Complete Streets Checklist. The Borough of Chatham adopted its Complete Streets Policy Plan in 2012 along with its Complete Streets policy. The plan includes a Complete Streets Checklist; performance measures for evaluating implementation; guidelines on street design elements to retrofit the municipal street network with Complete Streets in mind; and information on education, public involvement, and funding strategies and resources to support implementation. These guides are good local examples of implementation plans that fit the needs of different-sized jurisdictions.

How to Prioritize Project Funding

The National Cooperative Highway Research Program (NCHRP) Report 803 presents the "ActiveTrans Priority Tool (APT)," a step-by-step methodology for prioritizing improvements to pedestrian and bicycle facilities, either separately or together as part of a "Complete Streets" evaluation approach. The methodology is flexible, allowing the user to assign goals and values that reflect those of the agency and the community. It is also transparent, breaking down the process into a series of discrete steps that can be easily documented and communicated to the public.

The report is useful to planners and other staff responsible for the most effective allocation of scarce resources to where they will provide the most benefit. The report can be found at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_803.pdf

Review and Update Roadway Design Guidance

An outdated design manual is often the most significant barrier to implementing Complete Streets. In many jurisdictions, the highway design manual is the go-to reference for all transportation projects. Some common strategies that are often used to overcome outdated or automobile-focused design guidance includes:

- Writing or rewriting street design guidelines
- Choosing existing guidance documents that reflect national best practices
- Adopting NACTO or similar design guidance
- Updating subdivision and zoning codes

Developing a community-specific design manual might be appropriate for some communities. The process of writing design guidelines can become an educational process for all involved, helping local officials and staff better understand the needs of their community. Many innovative design manuals go beyond traditional roadway functional classifications to create new street typologies based on surrounding land-use context. This sort of approach can help local planners and engineers better understand context and design need.

Writing a design manual is not necessary for many communities and may not be feasible. A variety of national and state design resources are already available that local municipalities can apply to achieve desired outcomes on a given street. Chapter 3 of this design guide provides guidance on best practices for a variety of design elements and focus areas, as well as suggested resources for further guidance. This guide, along with the guides listed below, should be considered acceptable design guidance and applied where appropriate:

- *A Policy on Geometric Design of Highways and Streets*, 6th Edition, AASHTO
- *Guide for the Development of Bicycle Facilities*, 4th Edition, AASHTO
- *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, 1st Edition, AASHTO
- *Manual on Uniform Traffic Control Devices*, FHWA
- *Bicycle Facilities and the Manual on Uniform Traffic Control Devices*, FHWA
- *Separated Bike Lane Planning and Design Guide*, FHWA
- *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts*, FHWA
- *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach: An ITE Recommended Practice*, ITE
- *Public Rights of Way Accessibility Guidelines*, U.S. Access Board
- *Urban Bikeway Design Guide*, National Association of City Transportation Officials
- *Urban Street Design Guide*, National Association of City Transportation Officials
- *Transit Street Design Guide*, National Association of City Transportation Officials

Do We Need to Write a Design Manual?

Many communities assume that they must re-write their design manuals; however, such re-writes can be expensive and time-consuming. Ultimately, determining exact design specifications is less important than achieving clarity in how design decisions are made. Focus should be given to introducing more flexibility in design practices than might already be in place. No design manual can be completely applicable to each unique situation or challenge, and there are often multiple design options and design tools to achieve the same goal for a street.

II. Involve Stakeholders and Members of the Community

Decisions about transportation and other public works projects are guided by public input and feedback from different community stakeholder groups. A lack of broad support can hinder or obstruct Complete Streets implementation. The key to this challenge is to formalize an inclusive decision-making process. In many communities, Complete Streets projects become derailed or delayed by silos within and between different agencies. Often a project will even make it far along in the process before running up against opposition from a key decision maker or stakeholder. It is of utmost importance to create an inclusive process involving decision makers and stakeholders at the outset of a project, conduct outreach to these groups on the overall and continuing goals and benefits of Complete Streets, and explain how a specific project fits into the larger network and needs of the community.

The following are a few methods that have proven successful in involving the community in the decision-making process and building support for Complete Streets:

- Complete Streets Committee
- Workshops
- Road Safety Audits
- Education and Training
- Advocates, Volunteers, and Community Action
- Engage the Creative Community

Complete Streets Committee

One common method for formalizing an inclusive implementation process is the establishment of a Complete Streets Committee. The intention of this Committee is to involve relevant stakeholders throughout the entire transportation planning and decision-making process and achieve more buy-in, support, and coordination between various actors. A Complete Streets Committee should be comprised of representatives and officials from various local agencies, including planning, engineering, police, fire, public works, elected officials, and other stakeholders and decision makers. While it may include several members who participate on a voluntary basis, a Complete Streets Committee should not be a purely volunteer committee. Participants should include those who are directly involved in the transportation planning process and have the authority to make decisions. The Complete Streets Committee should be directly involved in the preparation and review of requests for proposals, review of roadway projects, and ensure that the Complete Streets checklist is appropriately administered. If an exemption was made to the Complete Streets policy, the Committee should document how and why this occurred.

Workshops

Workshops provide a forum to both educate and collect input from the general public, decision makers, and/or project stakeholders. Conducting workshops throughout the life cycle of a project is an effective tool for:

- Developing plans that are reflective of community needs
- Demonstrating an open process and support for plan outcomes
- Involving decision makers, stakeholders, and other contributors in an on-going process

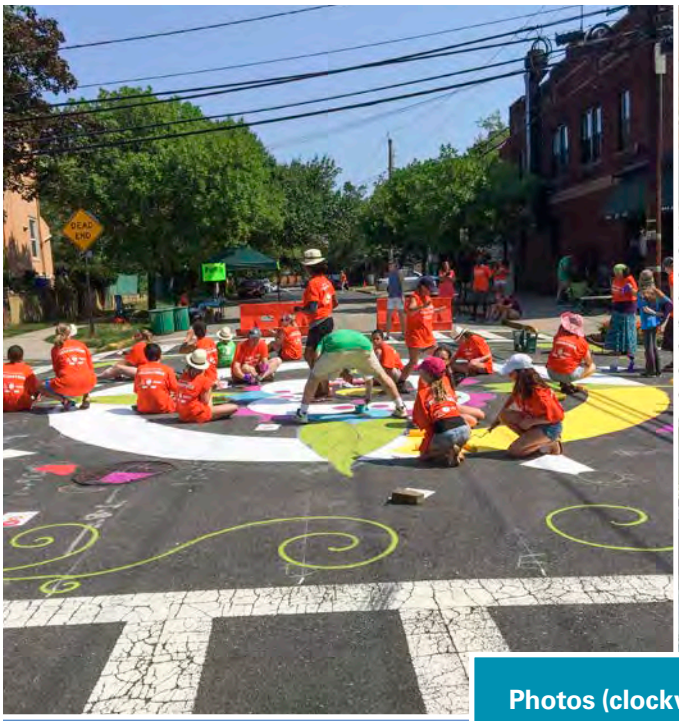
Workshops may serve several purposes and be structured in different formats. Some workshops are primarily an educational tool to share information on best practices for design or on the benefits and implementation of Complete Streets, such as NJDOT's Complete Streets workshop series. Other workshops may include a design charrette or field walk of the project area, which allows stakeholders to view and assess the project area firsthand; collaborate and share ideas with the project team, other stakeholders, and decision makers; brainstorm potential design solutions; and provide input on design concepts developed by the project team.

Workshops might not be appropriate for every project or community. An extensive public involvement process that is conducted in conjunction with the development of a redevelopment plan, bicycle and/or pedestrian plan, or other Complete Streets planning document can also demonstrate community input and support for future initiatives. Regardless of the size or context of the project, workshops provide an opportunity to communicate directly with those who have influence on or interest in a project.

Road Safety Audits

A road safety audit is a community-driven process that can generate momentum and support for action. It provides an opportunity for a diverse group of decision makers and stakeholders to jointly visit a problem spot or corridor and assess existing conditions. A checklist is often used during the audit for participants to keep track of problem areas, deficient or missing infrastructure, and other observations. The audit is an effective educational and outreach tool. Participants are given the opportunity to not only observe deficiencies, but understand why it might be imperative to take action. It is a collaborative process that helps participants and decision makers see and experience the problem spot or corridor from the perspective of other participants, revealing issues they might not otherwise detect.

The end product of an audit is data and information that documents existing deficiencies and the participation of a wide cross-section of stakeholders. This information can help document project need and build consensus and support for action.



Photos (clockwise)

"Montclair Community Street Quilt" project in Montclair, NJ (photo credit: Project for Public Spaces)

Parklet in Princeton, NJ

Trenton "Fresh Jam" in Trenton, NJ (photo credit: nj.com)

Creative "Bike Fence" in Lambertville, NJ

Education and Training

Education is an extremely important component of a successful Complete Streets program. Planners, engineers, consultants, decision makers and agencies need a thorough understanding of new procedures. Officials should receive on-going education to understand the community benefits of Complete Streets and how the general Complete Streets goals will be translated into built projects. Educating the public about design options they can consider to improve or transform their streets, as well as how changes to their streets fit into the larger street network and impact and benefit the community as a whole, is essential for successful implementation. Common education strategies include, but are not limited to, the following activities:

- Host Complete Streets workshops for staff and consultants, with auxiliary sessions for community leaders and the public
- Take advantage of professional development training opportunities and webinars offered by NJDOT, Metropolitan Planning Organizations, professional organizations, and transportation non-profits
- Provide on-the-job training for staff, including informal and interdepartmental activities such as brown bag lunch presentations
- Lead walking audits and bicycle rides for decision-makers, staff, and the public
- Engage the community through formal public engagement activities and project-based meetings

Advocates, Volunteers, and Community Action

Interested residents and stakeholders are effective allies in building community support for a project and advocating with decision makers. Working with these stakeholders and involving them throughout the process can help advance a project more quickly and efficiently. On smaller-scale projects, such as minor park improvements or trail projects, advocates and volunteers can also assist with implementation. They may be able to provide private funding resources to support construction or volunteer labor to reduce project costs.

Engage the Creative Community

Good streets are the outdoor living room for many communities. Engaging the creativity and passion of a community can enliven streets and give residents a sense of ownership and pride. There are many examples throughout New Jersey where residents have transformed their community through collective creativity and action. In Princeton, a parklet along Witherspoon Street was designed and built by local artists in conjunction with the Princeton Arts Council and the mayor. In Montclair, a neighborhood came together to help improve safety by creating the "Montclair Community Street Quilt," a patchwork of painted intersections throughout the community. From artist built parklets, to painted intersections, to art along trails, to painted trash bins, to building murals, a community can create unique and exciting places in many different ways.

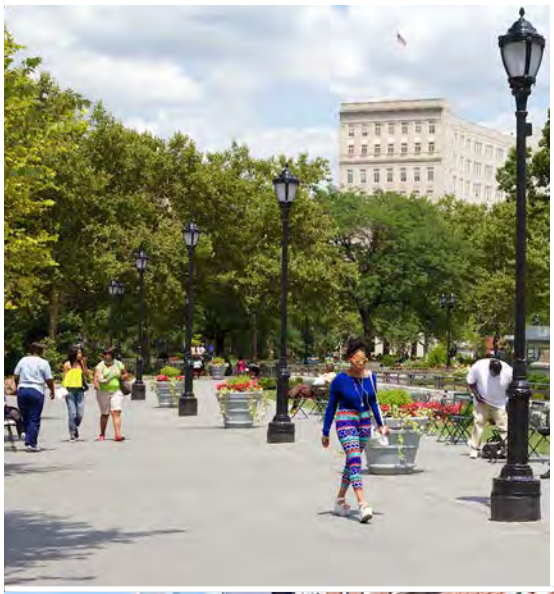
Further Guidance

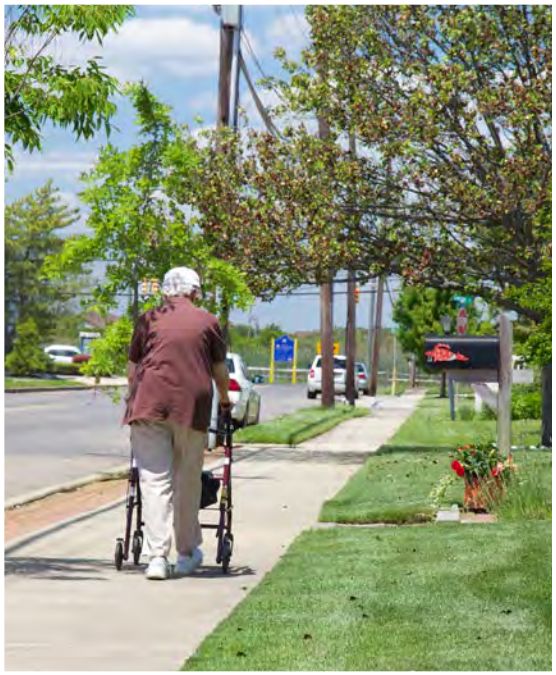
ArtPride New Jersey—ArtPride New Jersey advances, promotes, and advocates for the arts as essential to the quality of life of every citizen and to the economic vitality of New Jersey.

Creative New Jersey—Creative New Jersey is dedicated to fostering creativity, innovation, and sustainability by empowering cross-sector partnerships in commerce, education, philanthropy, government, and culture in order to ensure dynamic communities and a thriving economy.

The National Consortium for Creative Placemaking—The National Consortium for Creative Placemaking is led by a national steering committee that includes leaders from a wide variety of organizations in the fields of arts, community, and economic development and is dedicated to building the capacity of artists, public officials, citizen activists, planners, researchers, and everyone who seeks to achieve high-quality creative placemaking.

Project for Public Spaces—Project for Public Spaces is a nonprofit planning, design, and educational organization dedicated to helping people create and sustain public spaces that build stronger communities.





Photos (clockwise)

Military Park, Newark, NJ

Camden, NJ

Ocean City, NJ

NJ Route 52 Bridge, Ocean City, NJ

"Parking Day", New Brunswick, NJ

III. Redefine How You Measure Success

Creating new ways to measure success for transportation projects, and of the transportation system as a whole, is essential to not only ensure that projects are on the right track but that future Complete Streets investments are made based on this success. While traditional performance measures tend to focus primarily on vehicle throughput (level of service), an updated metric might look at crash reduction, reduced vehicle miles traveled, or shifts in mode share to walking, biking, and/or transit trips as measures of success. Common activities to measure success include:

- Count the number of new or repaired facilities each year (e.g., blocks of sidewalks)
- Track crashes and injuries for all types of roadway users
- Track use of street facilities by different modes (e.g., number of people walking)
- Conduct project-level "before" and "after" studies

A Complete Streets approach means shifting the focus of transportation projects from being concerned primarily with vehicle flow to a broader view of all current and potential users of a street and how the function of a street influences is influenced by surrounding land uses, economic factors, and travel behavior. Performance measures should be established that reflect and therefore incentivize taking this broader view. For example, the City of San Francisco has switched from using level of service to measure project success to using reduction in vehicle miles traveled. This switch changes the focus of future improvement projects from improving traffic by maximizing vehicle throughput to improving traffic by reducing private automobile use.

A Complete Streets approach also means thinking beyond the street itself and how the community as a whole functions. Metrics that are not directly tied to transportation can therefore be used to measure the success of a project. Potential indicators include:

- Stakeholder satisfaction (e.g., user and resident feedback)
- Public health (childhood obesity, diabetes)
- Economic vitality (sales tax revenue, property values)
- Environmental benefits (e.g., trees planted, reduction in impervious cover, decrease in stormwater flow into street sewer system)

Winning Funding

A well-defined process can improve success for winning grants and other available funding sources.

Identify Potential Funding Sources

Demonstrate Planning Process

Leverage Funding Opportunities

Demonstrate Local Consensus

New Brunswick, NJ

03

Complete Streets Toolbox

Policy and Design Guidance for Implementing Complete Streets

This chapter describes the building blocks that make up a street and how they work together to transform our streets into vibrant places and activity centers. The operation, look, and feel of a street are the product of a series of design decisions for each street element, as well as considerations about how those elements relate to each other.

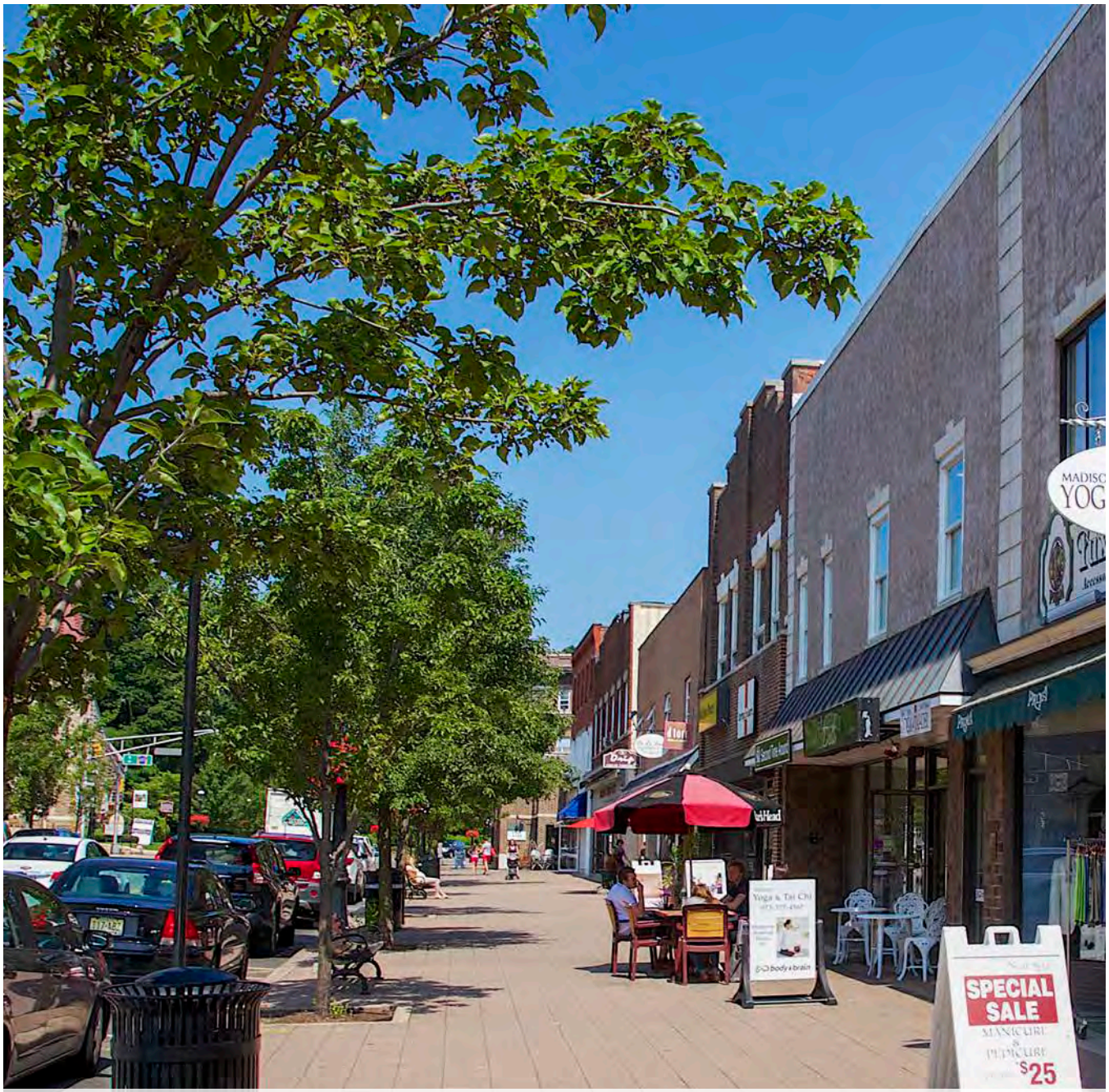
The toolbox is organized into three sections that reflect the primary physical spaces of a street network:

SIDEWALKS

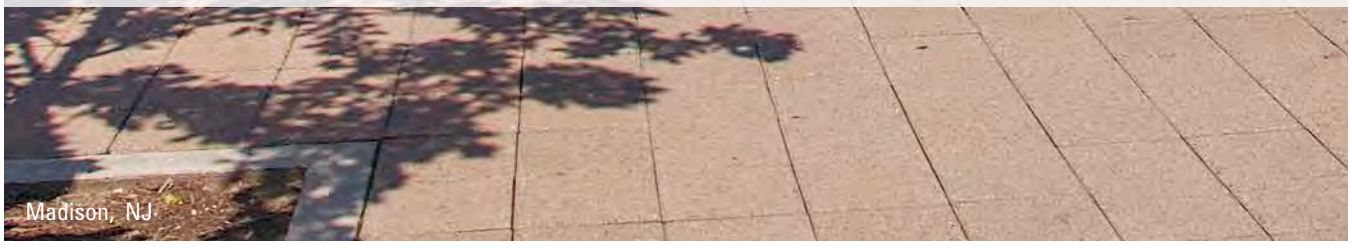
ROADWAYS

INTERSECTIONS

Within each area of the street network, a myriad of treatments are available to planners, engineers, and designers. The toolbox provides a primer on common design treatments and their typical applications, design considerations, and how they impact different modes.



Sidewalks should be part of a continuous network and connected with crosswalks at roadway intersections. They should be safe, comfortable, and attractive facilities that provide accommodations for people of all ages and abilities.



Madison, NJ

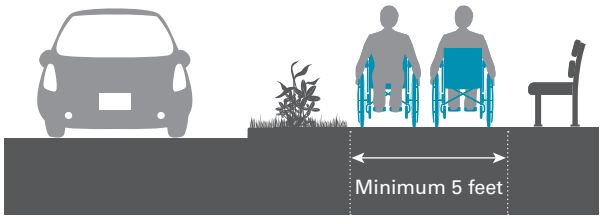
SIDEWALKS

Sidewalks are an extension of the street system. They are the primary conduit for pedestrian travel and fundamental to facilitating residential, commercial, and social activity in urban, suburban, and rural communities. Sidewalks provide access between buildings and provide space for dynamic street life. Sidewalks, particularly in commercial and downtown areas, form the foundation for a vibrant community. Lively sidewalks are venues for people to participate in face-to-face activities and support businesses. Sidewalks should be part of a continuous network and connected with crosswalks at roadway intersections. They should be safe, comfortable, and attractive facilities that provide accommodations for people of all ages and abilities.

The choice of sidewalk form, material, and width is determined by its context, surrounding density, mix of activities, and travel needs. While ubiquitous in urban environments, sidewalks in rural areas are less common, often more informal and fragmented, and serve a specific function, such as linking neighborhoods to a school or village center.

Sidewalk Widths

ADA standards specify a minimum **5-foot clear path width** to accommodate two wheelchairs passing each other. In addition to providing a more accessible facility, this minimum width also creates a more comfortable environment for pedestrians to walk side-by-side and pass each other, and for families with strollers.



Sidewalks should be constructed as wide as possible to accommodate foot traffic and improve pedestrian comfort, given available street right-of-way. Sidewalk width should support the surrounding street context, land uses, and current and future pedestrian demand—the greater the density, demand, and mix of activities, the wider the sidewalks should be. Downtown and commercial areas, for example, generally require wider sidewalks. No existing sidewalk should be reduced in width in the course of street widening projects. Opportunities for widening sidewalks and narrowing cartway width should always be considered whenever roads are reconstructed.

Sidewalks

The sidewalk is the basic unit of mobility within our transportation system. Every sidewalk should be accessible and well maintained. In order to maintain accessibility, a sidewalk must be:

- Accessible by ALL users
- Adequate width
- Safe to use
- Continuous and connected

PEDESTRIAN ZONE

The pedestrian zone is the area of the sidewalk that is reserved for pedestrian travel. This area should be free of all obstacles, protruding objects, or vertical obstructions. The pedestrian zone should be at least 6 to 10 feet wide in high pedestrian volume areas, which allows pedestrians to walk side by side or pass one another. The pedestrian zone should never be less than 4 feet wide, which is the minimum width required for people using a guide dog, crutches, and walkers. Wheelchair users need about 4 feet to turn around or 5 feet to pass another wheelchair. If a pedestrian zone is 4 feet wide, additional space should be provided to allow passing at intervals no greater than 200 feet.

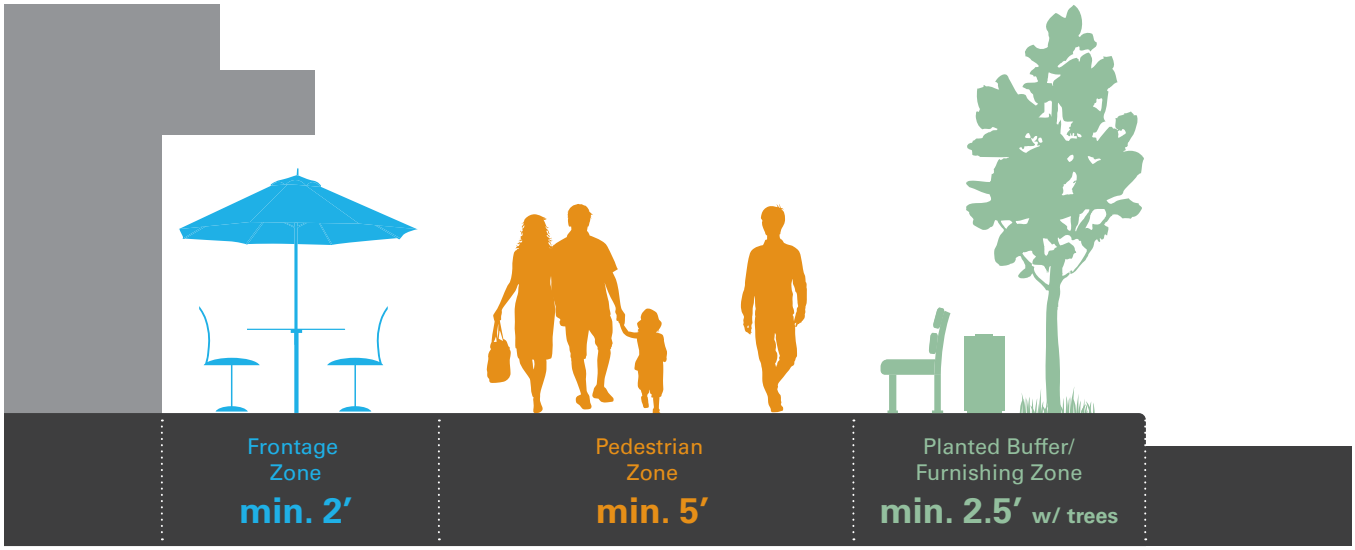
Montclair, NJ

Sidewalk Zones

The primary objective in designing sidewalks is to provide continuous, safe, and accessible pathways for pedestrians. Sidewalks should be designed to follow as much as possible the natural path of travel. In some cases, it is more desirable for a sidewalk to divert from that path to provide a more adequate facility or a greater degree of separation between the sidewalk and the roadway.

Design Guidance

Many reference guides describe the sidewalk as having three distinct elements or functions: the **Frontage Zone**, the **Pedestrian Zone**, and the **Planted Buffer/Furnishing Zone**. Given the diversity of contexts throughout New Jersey, the needs and therefore design standards differ greatly around the state.



Frontage Zone

In locations where buildings are adjacent to the sidewalk, the frontage zone provides a buffer between passing pedestrians and opening doors and other architectural elements. The frontage zone keeps the pedestrian zone safe and clear of obstacles and obstructions.

Pedestrian Zone

The pedestrian zone is the area of the sidewalk that is intended specifically for pedestrian travel. The pedestrian zone should be free of any physical obstructions, including street furniture, plantings, and surface utilities. The quality of the sidewalk surface in the pedestrian zone is extremely important and must meet accessibility standards referenced on page 34. The material should be smooth, level, and have minimal gaps or rough surfaces.

Planted Buffer/Furnishing Zone

Where there is sufficient space, a planted buffer/furnishing zone should be established to delineate space for objects that would otherwise obstruct pedestrian movement, as well as provide a buffer for pedestrians from the adjacent roadway. This zone is where street trees, stormwater elements, street lights, signage, hydrants, benches, trash and recycling receptacles, parking meters, signal and lighting control boxes, utility poles, and other potential obstructions should be located.

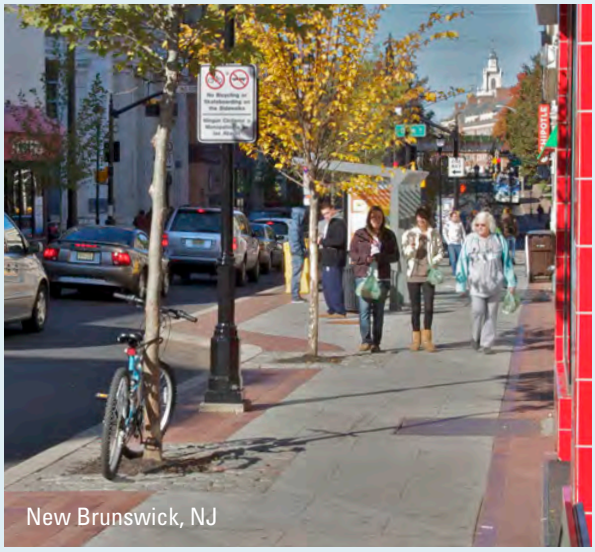
Sidewalk Context and Width

The desired width of the various sidewalk zones depends on the context of the facility. In many contexts in New Jersey, a sidewalk is not adjacent to a building and therefore does not require a "frontage zone." However, where there are utilities or furnishing elements on a sidewalk, they should always be placed out of the pedestrian zone.

Where the sidewalk zones do exist, they should adhere to the following minimums:

- Frontage zone—**min 2 feet**
- Pedestrian zone—**min 5 feet**
- Planted buffer/furnishing zone—**2.5 feet (with trees)**

The above dimensions are recommended minimums. In many contexts, sidewalks require greater width to accommodate all users. In locations with high pedestrian volumes, sidewalk widths of **8 feet or greater** should be considered. The examples to the right demonstrate well designed sidewalks in a variety of contexts.



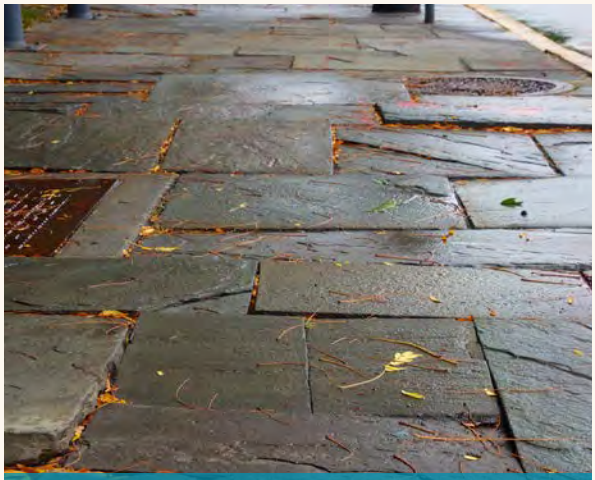
New Brunswick, NJ

Morristown, NJ

Surface Materials

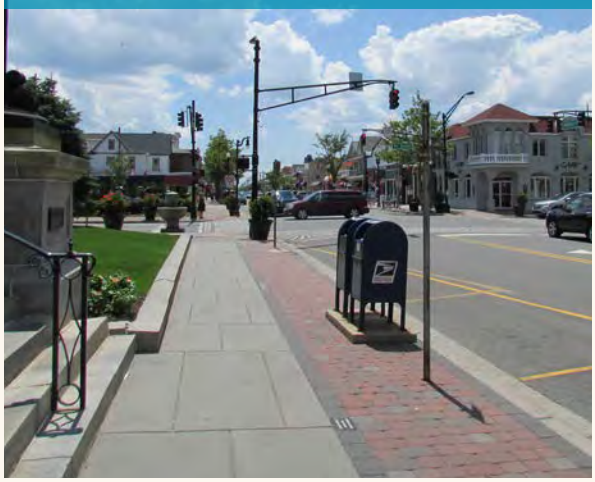
The choice of surface materials for sidewalks, plazas, or other spaces where pedestrians walk can have a significant impact on accessibility. Sidewalk materials generally consist of concrete or asphalt; however, tile, stone, and brick are also frequently used. Although these materials provide an aesthetic benefit, they can lead to grooves or odd spacing that can catch wheelchair castors or create a tripping hazard for pedestrians, especially those with vision or mobility disabilities. Decorative surfaces may also create a vibrating, bumpy ride that can be uncomfortable or painful for those in wheelchairs.

- Brick or cobblestone are not recommended surface materials for the pedestrian zone. Creative alternatives include using these materials as trim or decorative elements in the furnishing zone or using colored concrete.
- Surface materials should be slip resistant. A broom finish on concrete can help increase slip resistance.
- Causes of vertical rises in texture include:
  - Tree roots pushing upward
  - Uneven transitions from street to gutter to ramp
  - Heaving or settling due to frost
  - Buckling due to improper sub-base preparation
- Surface texture should not include more than a ¼-inch rise for every 30 inches.
- A ¼ to ½ -inch rise should be beveled with a maximum grade of 50 percent.
- If there is a greater than ½-inch rise, the surface should be leveled or a ramp should be installed with a maximum grade of 8.3 percent.



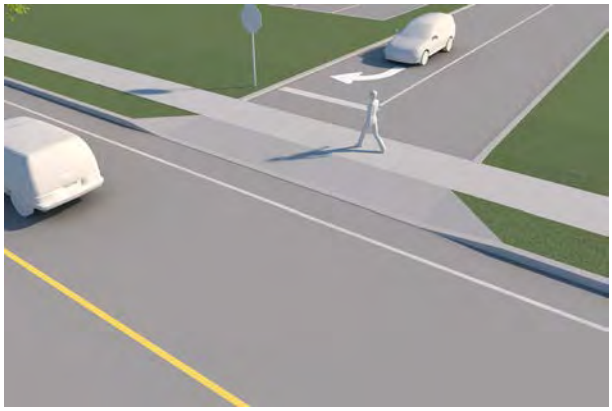
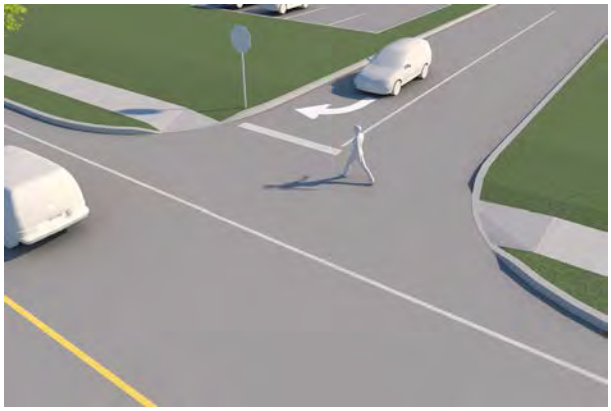
While materials such as slate (as shown here) or cobblestone are aesthetically appealing, they can lead to tripping hazards, becomes slippery when wet, and/or impede mobility for those using a wheelchair.

A preferred treatment (shown in this photo from Ocean City, NJ) is to provide a level concrete pedestrian zone and use brick as a decorative treatment in the furnishing zone.



Driveways

Drivers must yield to pedestrians, and proper driveway design should reinforce, not hinder, this hierarchy. The design of driveways should provide a continuous and level pedestrian zone across the vehicular path, encouraging drivers to stop for pedestrians on the sidewalk. Driveways should not be designed as intersections, where the sidewalk is interrupted by the driveway. The public sidewalk has the right-of-way over private crossings. Pedestrians are the vulnerable user in their relationship with motor vehicles. As with other types of intersections and crossings where pedestrians must interact with motor vehicles, design should make pedestrian right-of-way clear and obvious to motorists.

Driveway—Good	Driveway—Bad
	

Driveways should be designed for continuous and level pedestrian passage. Proper driveway design, such as in the above left, increases the visibility of pedestrians, encouraging drivers to stop. Driveways designed as intersections, such as in the above right, feature an interrupted crosswalk. This can reduce pedestrian visibility and increase the likelihood that drivers will not stop for pedestrians.

Slope

Steep grades and cross slops can be hazardous for all users but particularly those with limited mobility. Both powered and manual wheelchairs can become unstable or difficult to control on sloped surfaces. Sidewalk design should avoid steep grades and cross slopes where possible.

GRADE

While grades are often difficult to control along the sidewalk because of environmental factors, designers should make every effort to provide as level a surface as possible.

- Sidewalk grade should not exceed 5 percent.
- Building ramps permit a maximum rise of 30 inches for each run, with a maximum slope of 8.3 percent. Where exceeded, a level landing should be provided. The level landing should not exceed 2 percent in any direction. Landings should be at least 5 feet by 5 feet to allow wheelchair users to stop without blocking pedestrians.

CROSS SLOPE

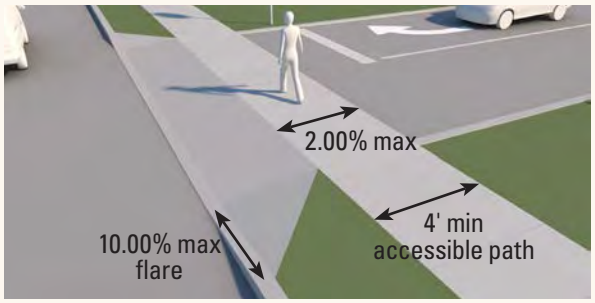
Severe cross slopes require wheelchair users and other pedestrians to work against gravity to maintain their balance and can cause wheelchair users to veer toward the curb and onto the street.

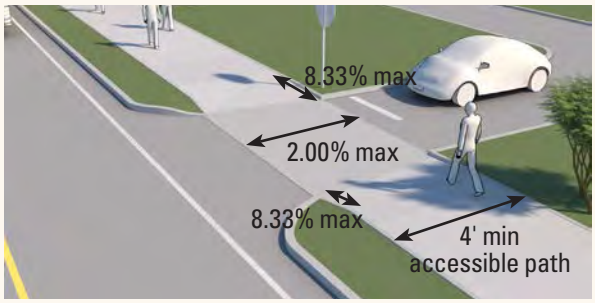
- The maximum cross slope permitted by ADA Accessibility Guidelines (ADAAG) is 2 percent.
- For sidewalks with steep cross slops, designers can create a level area of at least 3 feet within the pedestrian zone OR increase the height of the curb (which might require more complex curb ramp design).
- Cross slope is often an issue where driveways are built into the sidewalk.

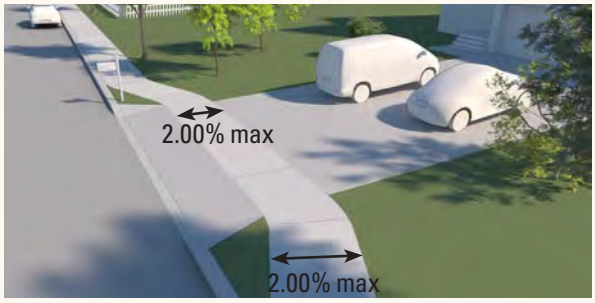
DRIVEWAYS

Driveways that intersect with a sidewalk must be designed to not compromise good pedestrian design practice. Pedestrians using wheelchairs and other walking aids can be put at risk of becoming unstable and falling because of poorly designed driveways. According to ADAAG, driveways should be designed with the following guidance:

- Cross slope should not exceed 2 percent.
- Changes in level or grade should be flush with a ¼-inch maximum gap in surface rise.
- The slope of the driveway apron flare should not exceed 10 percent.







Street Trees

Trees, shrubs, and other landscape plantings play an important role in making a street complete. Tree canopies can help make a street comfortable and sustainable, help to define the character of the street and provide shade, act as a buffer from traffic, reduce the heat island effect and energy consumption, and help to absorb and cleanse stormwater. Trees and other landscape plantings also absorb greenhouse gases and help filter airborne pollutants, while enhancing not only the visual aesthetic character of a street, but also by dramatically improving the physical environment of the corridor.

Tree selections and planting locations for Complete Streets projects must be performed by a registered landscape architect or botanist with the requisite knowledge and experience with establishing trees in urban environments. Depending upon available above-grade space, the landscape architect will select trees based upon their known performance characteristics and forms, ranging from tree crowns that may be narrow to wide spreading.

While plant material is an integral component of streetscape character, landscape plantings must be well planned and maintained to prevent obstructions for motorists or pedestrians, interference with building facades or roadway appurtenances, or impacts to underground utilities. The reality is also that some locations should not be planted due to space restrictions. These restrictions include space for the tree's crown development and adequate soil volume, including good soil structure for root development to support desired tree growth.

Tree roots do not successfully establish in highly compacted soils due to poor soil structure, which limits access to air and water, thus resulting in the tree's diminished growth and eventual mortality. It is vital that the landscape architect, often along with a soil scientist, evaluate and test existing soils during the design process, and certainly in advance of tree plantings.

Two potential scenarios can occur with existing soils:

- They may be readily modified by the incorporation of organic material, such as composted leaves
- They may need to be removed in their entirety and replaced with a designed planting soil

Following the evaluation of soil testing results, planting soil is often needed to provide adequate soil volumes and proper soil structure to enable trees to grow to their typical and desired sizes. The planting soil will also benefit installation of shrubs and ground covers if included in the Complete Streets design.

An additional consideration during the design process is the inclusion of subsurface drainage to facilitate the removal of excess water from the tree planting soil. It is possible that water will move through the planting soil but not through the soil beneath the planting soil zone because of its denser and/or compacted nature, thus potentially causing root decay and mortality. This subsurface drainage, running the length of the planting soil zone, and accomplished with a perforated pipe, can be connected to the existing storm sewer system of the street.

Design Guidance

Research during the past 25 to 30 years regarding the performance of street trees and trees planted in urban environments has resulted in methods and innovations in tree planting design to support root growth, thus resulting in improved tree growth and performance. These methods and innovations increase the volume and quality of the soil and can physically support sidewalks.

Open Soil Trench

An open soil trench is a continuous trench filled with planting soil. The width and depth of the trench will vary based upon the horizontal space available and the height of the tree root balls to be planted. Tree trenches can be located within a sidewalk's furnishings zone or within street medians.

Sidewalks should be flush with the edges of soil trenches to avoid tripping hazards. The adjacent sidewalk can be pitched toward the open soil trench to provide a stormwater benefit. However, the landscape architect should consider the quality of the potential stormwater runoff in light of deleterious materials, such as deicing salts, which could have a very negative impact upon plant growth.

Open soil trenches are typically used in residential environments where foot traffic is low and crossing of the soil trench surface is minimal. An open soil trench is not recommended in areas with high-turnover curbside parking.

Open soil trenches can provide trees with a large amount of uncompacted soil and the best chance of thriving in the urban environment. These planting zones also provide opportunities to include shrubs and ground covers, and to use mulch to increase moisture retention and minimize volunteer growth.

Covered Soil Trench

A covered soil trench follows similar design guidance to the open soil trench but features a structural support. This design allows the soil trench to support a large canopy while also accommodating pedestrian traffic on the paved surface. Covered tree trenches should be covered with pavement but allow passive irrigation to reach the soil. Permeable pavement is a common treatment option to allow infiltration of rainfall.

Whether a permeable or impermeable pavement surface is selected for a particular design, the landscape architect will need to consider a means to support the pavement for pedestrian and, in some instances, vehicle use for periodic maintenance. Current support systems in use include concrete structures, structural soil, and plastic structural cells.

Tree Pits

Tree pits should be used where space would not allow the use of an open or covered soil trench or individual "bump-outs" within on-street parking locations. A tree pit should be generous in size. Tree pits have historically been constructed at 4 feet by 4 feet and 5 feet by 5 feet, and the result in many cases is that the trees rapidly outgrow the soil volume and the pavement opening, creating upheavals of adjacent pavement surfaces. However, many communities are now constructing tree pits 4 or 5 feet wide by 8 or 12 feet long, or even larger when space allows.

Soil volumes provided for tree pits should be generous (at least the size of the tree pit opening), and every attempt should be made to increase this soil volume when practicable, following current tree soil volume guidelines.

Other Considerations

Soil Panels and Break-Out Zones

When planting trees in urban conditions, it is important to provide adequate rooting space for the tree's ultimate crown development. Soil panels and break-out zones should be investigated as they can provide this necessary rooting space.

Soil panels are contiguous volumes of soil, connected to the tree pits, into which tree roots can penetrate, grow, and extend themselves. Soil panels can be placed beneath sidewalks and paving. As tree roots grow through these soil panels they may enter a break-out zone or a large volume of soil some distance from, but adjacent to, the sidewalk tree pit or soil trench. These break-out zones can be included in the site design or occur in an adjacent open lawn or planting bed. Break-out zones provide additional soil volumes for tree root growth and establishment.

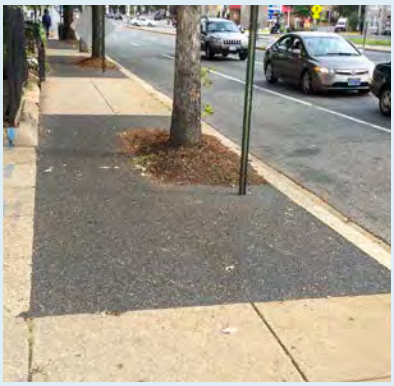
Ground Cover Plantings

It is recommended that hardy ground covers be planted upon the surface of tree pits and fully mulched. These plantings will enhance the appearance and minimize volunteer growth within the tree pit, as well as provide a visual and physical queue that the tree pit is not part of the pedestrian walking surface.

An additional element to further protect the tree pit from pedestrians and dogs is the introduction of an 18-inch to 24-inch height ornamental metal element around three of the tree pit's sides when immediately adjacent to a roadway curb, and all four sides when the curb is at least 2 feet away from the closest edge of the tree pit. It is imperative to preclude soil compaction and deleterious materials/liquids within these tree planting zones.

Flexible Pavement

Flexible pavement is a flexible porous paving technology that is a cost-effective solution for keeping more level surfaces in constrained areas near trees. Flexible pavement bends but does not crack, making it an ideal treatment near tree roots. Washington D.C., has used flexible pavement effectively in hundreds of locations in situations such as those shown in the photo. Flexible pavement is an appropriate treatment for many constrained areas to maintain a passable surface and prevent cracking. While the cost of installing flexible pavement can be three to five times as high as traditional concrete, installation generally occurs in limited segments and costs can be recouped over time through reduced need for maintenance or replacement.



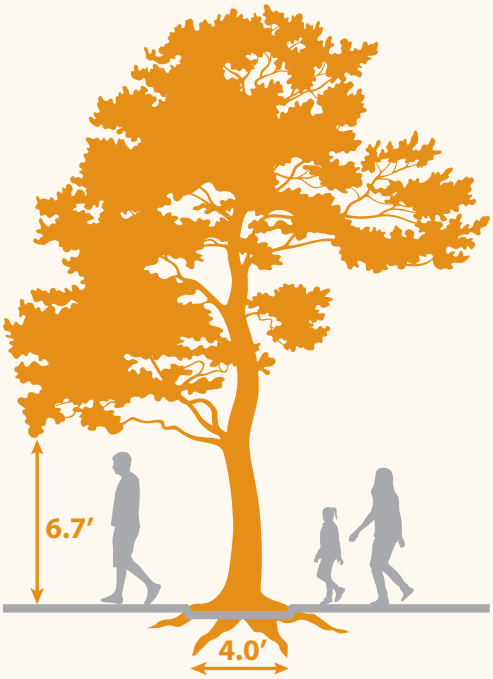
Further Guidance

- National Complete Streets Coalition, http://www.smartgrowthamerica.org/complete-streets
- *High Performance Infrastructure Guidelines: Best Practices for the Public Right-of-Way*, New York City Department of Design + Construction and the Design Trust for Public Space, 2005.
- *Philadelphia Complete Streets Design Handbook*, www.philadelphiastreets.com
- *Urban Street Design Guide*, National Association of City Transportation Officials, Island Press, 2013.
- *Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses, Sixth Edition*, Michael A. Dirr, Stipes Publishing, 2009.
- *Up By Roots: Healthy Soils and Trees in the Built Environment*, James Urban, International Society of Arboriculture, 2008.
- *Urban Soil in Landscape Design*, Phillip J. Craul, John Wiley & Sons, 1992.
- *Urban Soils: Applications & Practices*, Phillip J. Craul, John Wiley & Sons, 1999.
- *Trees in the Urban Landscape: Site Assessment, Design, and Installation*, Peter J. Trowbridge & Nina L. Bassuk, John Wiley & Sons, 2004.
- *Soil Design Protocols for Landscape Architects and Contractors*, Timothy A. Craul and Phillip J. Craul, John Wiley & Sons, 2006.
- *Principles and Practice of Planting Trees and Shrubs*, Gary W. Watson & E.B. Himlick, International Society of Arboriculture, 1997.
- *The Landscape Below Ground: Proceedings of an International Workshop on Tree Root Development in Urban Soils*, Edited by Dr. Gary W. Watson & Dr. Dan Neely, International Society of Arboriculture, 1994.
- *The Landscape Below Ground: Proceedings of an International Workshop on Tree Root Development in Urban Soils*, Edited by Dr. Gary W. Watson & Dr. Dan Neely, International Society of Arboriculture, 1998.
- *A Guide for Maintaining Pedestrian Facilities for Enhanced Safety*, FHWA.

Street Trees

Street trees generally improve the pedestrian experience, enhance the streetscape, provide shade and a buffer between pedestrians and motor vehicle traffic, and can have a traffic-calming effect. However, improperly planted and maintained trees can cause sidewalk cracks and changes in level that can make the sidewalk impassible. When trees do not get enough water or do not have enough space to grow, their roots will seek new water sources and expand up into the sidewalk. Low-hanging branches and lack of tree maintenance can also be a hazard for pedestrians, particularly those with vision impairments.

- Most trees need a minimum area of 4 feet by 4 feet
- Tree branches should be maintained to hang no lower than 6.7 feet



Street Furniture

Street furniture encompasses a variety of amenities that can enhance the aesthetics and functionality of the sidewalk environment. Well designed and placed street furniture makes the sidewalk a more comfortable, convenient, and inviting place. Benches and other seating options can facilitate gathering, provide a place for rest, or create an attractive spot to have lunch or coffee from a nearby business. Well distributed and maintained trash bins help keep a street clean. Appropriately located bicycle parking encourages more people to bicycle by making parking more convenient. Conversely, improperly laid out street furniture can obstruct and clutter the sidewalk environment and impede pedestrian mobility and accessibility. Street furniture should generally be installed in the furnishing zone or in a curb extension, and should not protrude into or hinder circulation within the pedestrian zone.

Madison, NJ

Seating

Seating comes in a variety of temporary and permanent forms, including chairs, benches, seating walls, or planters. Seating helps create a more inviting environment and encourages active public spaces.

Design Guidance

Permanently installed seating should not interfere with building entrances, loading zones, parked vehicles, access to fire hydrants, or other potential conflicts.

ADA requirements for seating include:

- 3-foot minimum on each side of the bench
- 5-foot minimum from fire hydrants
- 1-foot minimum from any other amenity, utility, or fixture
- 5-foot minimum clear path in front of the bench located at the back of the sidewalk, facing the curb
- 5-foot minimum clear path behind a bench when located at the front of the sidewalk facing the curb

Further Guidance

- *Boston Complete Streets Design Guide*
- *Philadelphia Complete Streets Design Guide*
- *Newark Complete Streets Design Guidelines and Implementation Plan*

Bicycle Parking

Providing adequate, secure bicycle parking is an important measure to accommodate and encourage cycling as an alternative travel mode. Proper parking facilities increase the convenience of cycling for commuting, utilitarian, or recreational purposes while also alleviating the threat of theft.

Design Guidance

The typical parked bicycle is 6 feet long and 2 feet wide, making bicycle parking space efficient and easy to locate. Parking should be conveniently located, well lit, and easily visible for cyclists arriving at a destination. A variety of bicycle parking racks are available. Based on guidelines from the Association of Pedestrian and Bicycle Professionals (APBP), a bicycle rack should meet the following requirements:

- Be intuitive to use
- Support the bicycle upright by its frame in two locations
- Enable the frame and one or both wheels to be secured
- Support bicycles without a diamond-shaped frame and horizontal top tube (e.g., step-through frames)
- Allow both front-in and back-in parking with a U-lock through the frame and front or rear wheel
- Resist the cutting or detaching of any rack element with hand tools

Older style racks, such as the "comb"/"schoolyard," "toast," and "wave" are not recommended because they do not properly support the bicycle frame, generally do not facilitate locking of the frame to the rack, and frequently cause interference between the handlebars of adjacent bicycles when the rack is near capacity. Recommended racks include the "inverted U," "A," and "post and loop."

Bicycle racks should also be properly spaced to allow easy, independent access to each bicycle.

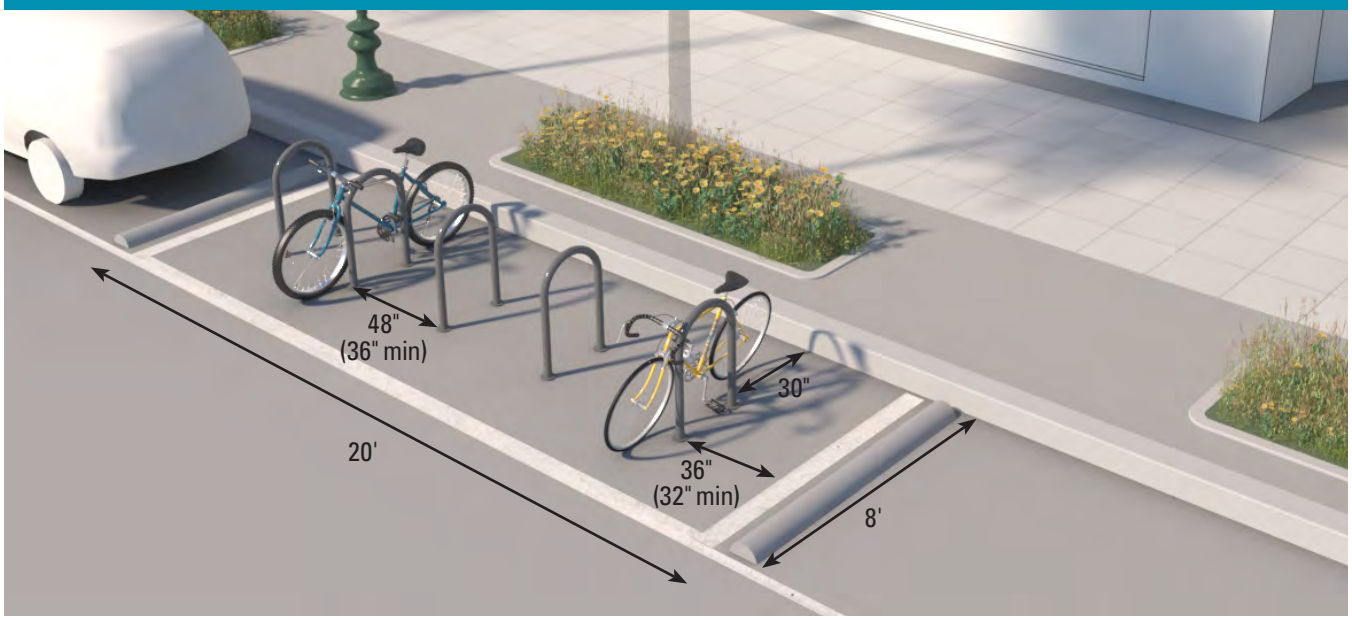
Bicycle Corrals

Bicycle corrals are rows of bicycle racks installed in the curbside lane of the street instead of the sidewalk. Bicycle corrals provide ample bicycle parking without occupying sidewalk space and are a good treatment in locations where bicycle parking is desired but sidewalk space is limited. Bicycle corrals can also help "daylight" an intersection by preventing motor vehicles from parking close to intersections, beyond designated spaces.

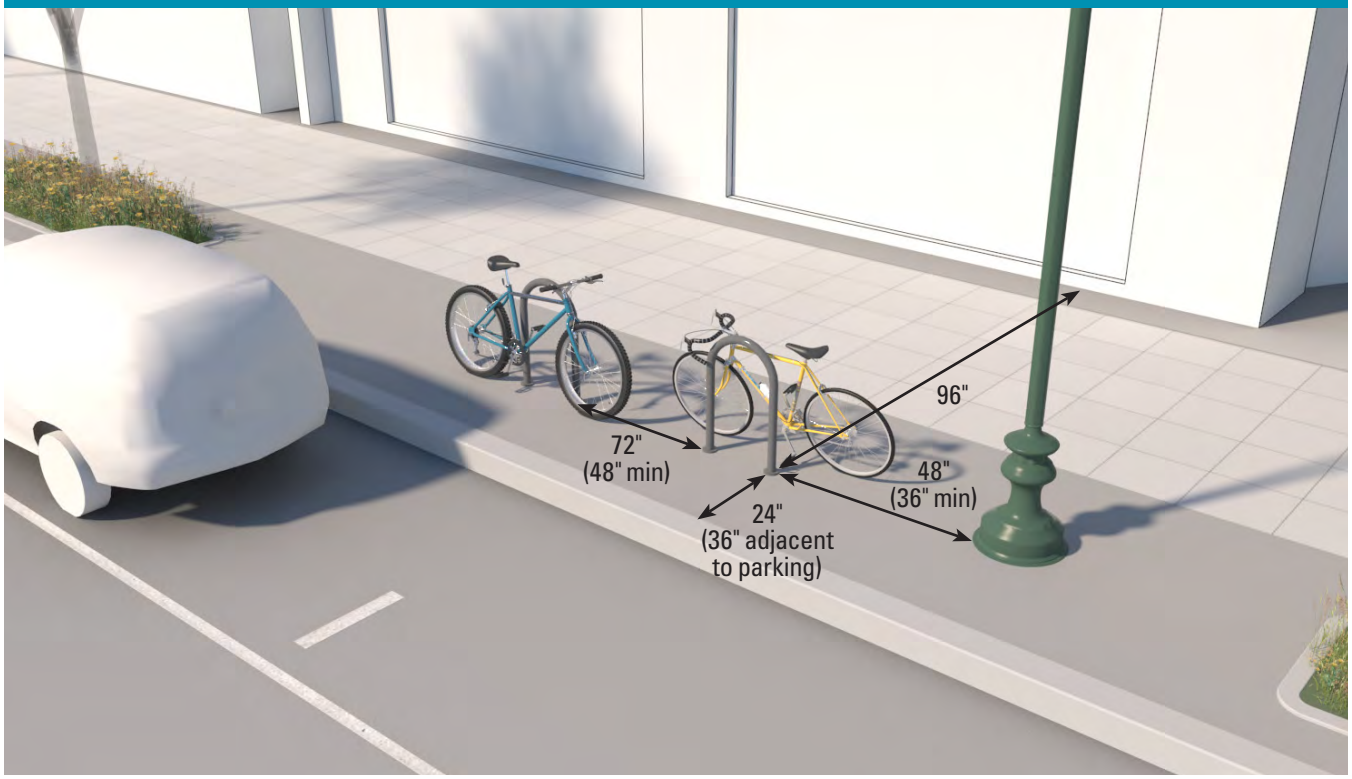
Further Guidance

- *Essentials of Bicycle Parking,* APBP
- *Bicycle Parking: Standards, Guidelines, Recommendations,* San Francisco Municipal Transportation Agency

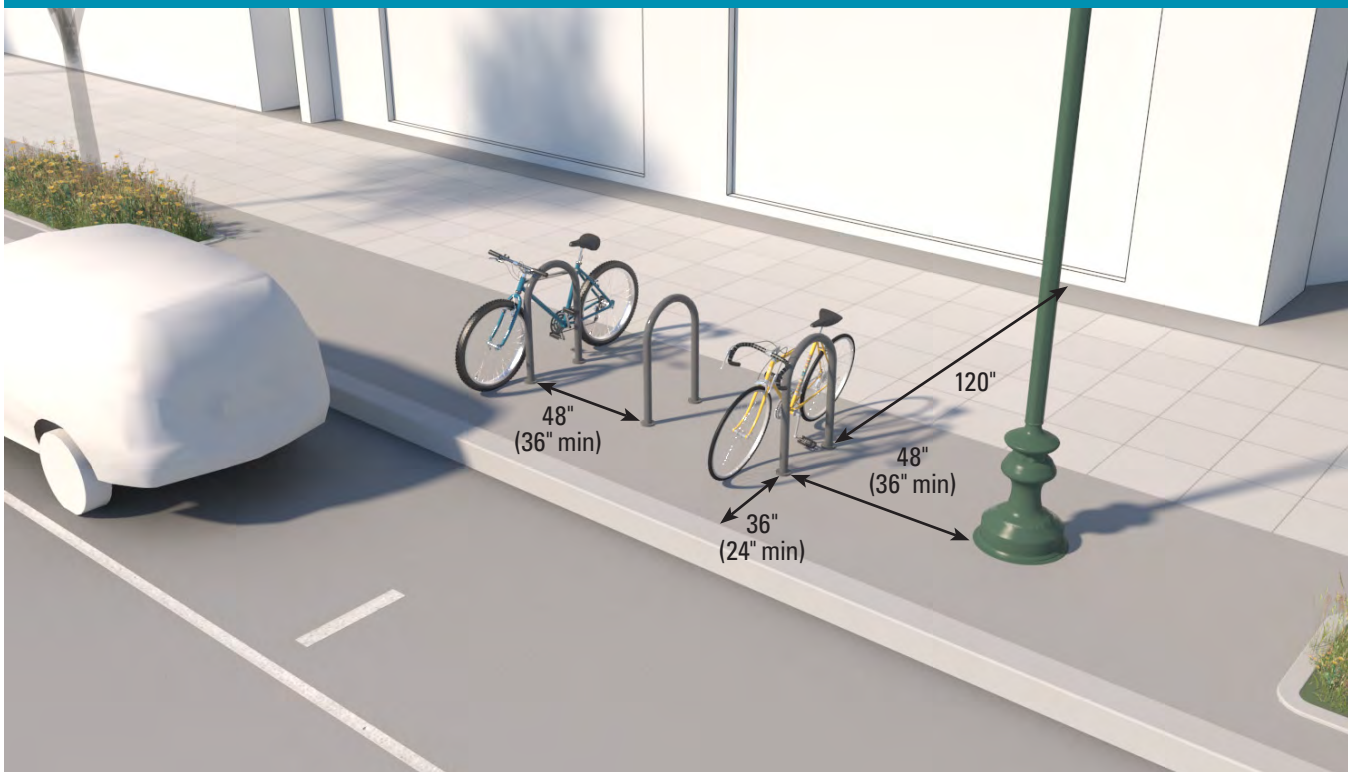
Recommended Dimensions for Bicycle Corrals



Recommended Dimensions for Racks Parallel to Curb



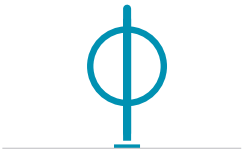
Recommended Dimensions for Racks Perpendicular to Curb



Recommended Bicycle Rack Designs

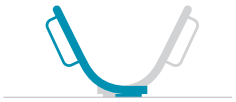
Inverted U

Common style appropriate for many uses; two points of ground contact. Can be installed in series on rails to create a free-standing parking area in variable quantities. Available in many variations.



Post and Ring

Common style appropriate for many uses; one point of ground contact. Compared to inverted-U racks, these are less prone to unintended perpendicular parking. Products exist for converting unused parking meter posts.



Wheelwell Secure

Includes an element that cradles one wheel. Design and performance vary by manufacturer; typically contains bikes well, which is desirable for long-term parking and in large-scale installations (e.g., campuses); accommodates fewer bicycle types and attachments than the other two styles.

Racks to Avoid

Wave

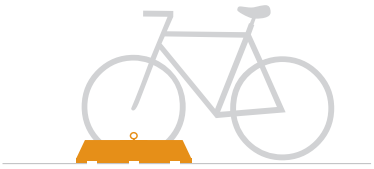
Not intuitive or user-friendly; real-world use of this style often falls short of expectations; supports bicycle frame at only one location when used as intended.

Schoolyard (comb)

Does not allow locking of frame and can lead to wheel damage. Inappropriate for most public uses but useful for temporary attended bicycle storage at events and in locations with no theft concerns.

Spiral

Despite possible aesthetic appeal, spiral racks have functional downsides related to access, real-world use, and the need to lift a wheel to park.



Wheelwell

Racks that cradle bicycles with only a wheelwell do not provide suitable security, pose a tripping hazard, and can lead to wheel damage.

Coathanger

This style has a top bar that limits the types of bicycles it can accommodate.

Bollard

This style typically does not appropriately support a bicycle's frame at two separate locations.

Images and descriptions courtesy of APBP *Essentials of Bicycle Parking*

Bus Shelters

Bus shelters provide a place for passengers to wait and sit in comfort and security, protected from the elements. Quality bus shelters are necessary for maintaining a high quality level of transit service that is attractive and dignified for passengers. While bus shelters may not be necessary at every bus stop, seating and route information should be considered at all stops.

Highland Park, NJ

Design Guidance

- Bus shelters should include seating, lighting, and travel information.
- Travel information is a very important amenity for riders and should include, at a minimum, route and schedule information. Where possible, real-time arrival and departure information should be included, as well as local area maps and wayfinding information.
- Bus shelters should be maintained regularly and kept free of debris and graffiti.
- All bus stops should be ADA-compliant and accessible for all users.
- Stops should provide ample room for riders to gather while providing a clear path for pedestrians.
- Stops should not impede pedestrian flow while maintaining ADA-compliant access.
- Transit stops may be located on curb extensions or floating islands but must be accessible by a level surface or ADA-compliant curb ramp.

Further Guidance

- *Transit Street Design Guide,* NACTO

Bus Stops

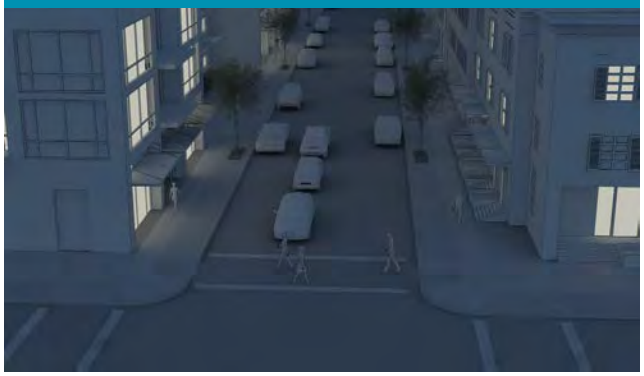
Bus stops must be indicated with a sign and accessible to all users, including those with limited mobility. Many people with disabilities may prefer to use fixed-route transit, but a street network that does not account for their needs forces them to use more costly paratransit services. Many bus stops in New Jersey are located in inaccessible locations, such as locations without sidewalk connections or next to a sidewalk but not connected.

Inaccessible bus stop

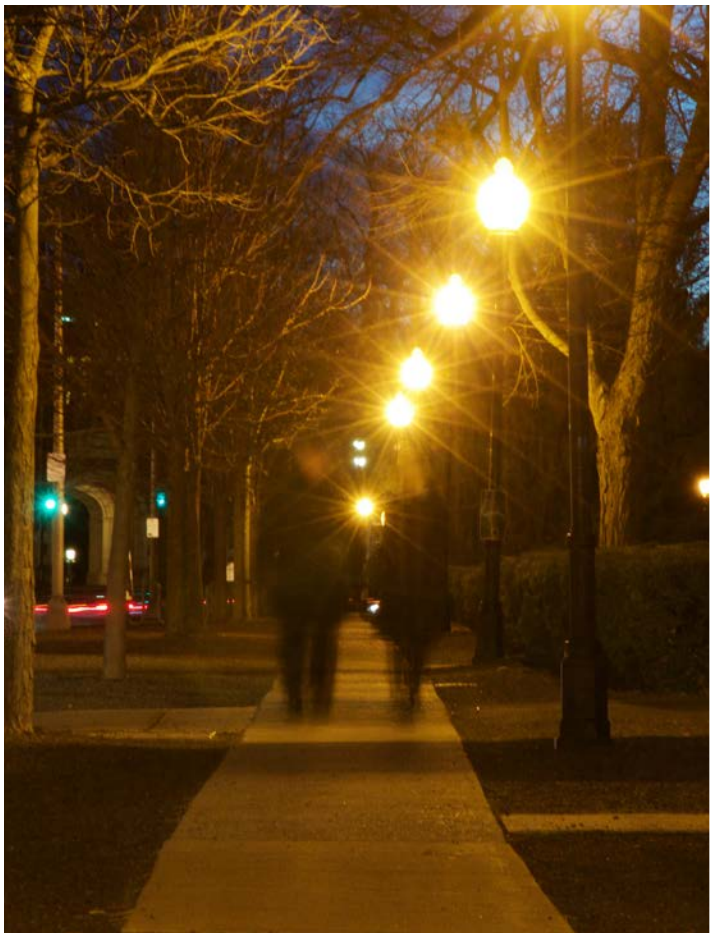
Street Lights

Pedestrian-scale lighting should be provided near transit stops, crossings, commercial areas, or other locations where night-time pedestrian activity is likely. Pedestrian-scale lighting, such as street lamps, help to illuminate a sidewalk and improve pedestrian safety, security, and comfort. Street lights should be energy efficient, evenly spaced, and focused downward to reduce light pollution. Lighting fixtures should reflect the character and urban design of the street type. Properly designed and installed pedestrian-scale lighting can both help define a streetscape and create a sense-of-place in a community.

Crosswalk without Street Lights



Crosswalk with Street Lights



Pedestrian-scale lighting (shown on the left in Princeton, NJ) helps create a pleasant and safe place to walk at all times of day.

Different variations of pedestrian-scale lighting (shown here on the right, also in Princeton, NJ) can be used to lessen the impact of ambient light.

Sidewalk Maintenance

Sidewalks are prone to damage caused by environmental conditions as well as overgrowth from vegetation within and outside of the public right-of-way. Keeping sidewalks in a state of good repair is an essential part of maintaining accessibility. Sidewalks in poor repair can limit access for many users and can be a health and safety issue for pedestrians, especially those with limited mobility. When sidewalks are in poor condition, tripping hazards can develop and pedestrians can be compelled to travel in the street.

Stormwater Management

A variety of sustainable stormwater management techniques help to collect, treat, and slow runoff from impervious roadways, sidewalks, and building surfaces. Urban development generally includes a generous amount of pollution-generating and non-pollution-generating impervious surfaces that change natural drainage patterns. This often results in flooding issues and the need for expensive drainage flow control storage and water quality treatment facilities. Impervious surfaces, such as concrete and asphalt, prevent rainwater from being absorbed at the source. As a result, stormwater flows (including pollutants) enter the pipe network and are discharged into receiving water bodies or become an additional burden to municipal wastewater systems.

Innovative stormwater management techniques can help reduce the impact of development by managing stormwater at the source and mimicking natural or pre-development conditions. These techniques are sustainable, generally less expensive, and can add aesthetic and ancillary social benefits to the built environment. In addition, these techniques can help reduce pollution to rivers and other water bodies, decrease flooding, increase groundwater recharge, and reduce energy consumption. The following are examples of stormwater management techniques that can easily be implemented and should be considered as primary best management practices (BMPs) where technically feasible. They can be used within the public right-of-way or as part of a private development to offset the impacts of impervious development.

Highland Park, NJ

Design Guidance

Bioretention Facilities

Bioretention facilities are vegetated retention systems that are designed to manage and treat stormwater by using a conditioned planting soil bed and organic materials that filter runoff stored within shallow depressions or cells. Biofiltration facilities can be flow-through filtration systems with an underground perforated collection pipe that captures and conveys treated runoff to the final discharge point. They also may be designed as pure retention facilities, relying on natural soil infiltration as a primary discharge. Both systems rely on an amended or engineered soil filtration specifically designed to remove particulates and pollutants before proceeding to a self-contained discharge location.

Biofiltration Swales

Biofiltration swales are vegetated, shallow landscape conveyance systems that are designed to capture and treat stormwater runoff as it is conveyed and discharged to the downstream storm system. Bioswales are typically sized to treat the initial infiltration of stormwater, which includes the most pollutants. They are a very effective type of infrastructure for slowing runoff velocity and cleansing water while recharging the underlying water table. Biofiltration swales are flexibly designed and may be installed in medians, cul-de-sacs, bulb outs, or other spaces not within the pedestrian zone.

Composition and Drainage

- The engineered soil mixture should consist of 5 percent maximum clay content.
- Engineered soil must be designed to pass 5 to 10 inches of rain water per hour.
- Underlying native soils should be analyzed to verify that they are not contaminated prior to implementation.

Slope

Biofiltration swales must be designed to allow water to move along the surface at a specific velocity and treatment surface area. Ideal slopes are 4:1 with a maximum 3:1 slope and a maximum velocity of 2 to 3 feet per second.

Curbs

Curb cuts should be at least 18 inches wide. Cuts may be spaced from 3 to 15 feet apart depending on tributary areas and the profile of the roadway gutter. Curb cut systems should allow for a drop in grade between the street and the finished grade of the biofiltration swale that prevents runoff surcharge and blockage and is sized for the expected sediment storage depth.

Flow-Through Planters

Flow-through planters may also be considered small bioretention facilities. These are hard-edged stormwater management facilities with an impermeable base. Flow-through planters treat water by allowing runoff to soak through its soil and filter into an underdrain system that conveys filtered runoff to a downstream discharge point.

Composition and Drainage

- The engineered soil mixture should consist of 5 percent maximum clay content and 10 percent organic matter by weight.
- Planters must be designed to drain within 24 hours.

Location

Flow-through planters should not be located in constrained areas next to buildings, areas with limited setbacks, poorly draining soils, steep slopes (>4 percent), or areas with contaminated soils.

Pervious Strips

Pervious strips are long, linear landscaped areas of permeable pavement or gravel that capture and slow runoff. Pervious strips provide some infiltration but far less than a biofiltration swale. Pervious strips are an inexpensive step in stormwater management but are less effective than other BMPs for treating a street's full water event. They are also subject to a much higher maintenance cycle due to the lack of ability to incorporate an upstream pre-settlement chamber that prevents clogging of permeable and gravel voids.

Locations

- Pervious strips can be integrated with sidewalks, medians, curbs, and other features
- Pervious strips require long, continuous spaces to treat and filter pollutants
- Pervious strips require a maintenance plan that is specific to the location of the strip to account for numerous outside factors that will affect performance and frequency of maintenance

Slopes

A maximum 2 percent gentle side slope should be used to direct flow into the facility. Additionally, facilities greater than 5 percent typically are not suitable to pervious applications unless specific design criteria are used that are unique to the geography and topography.

Rain Gardens

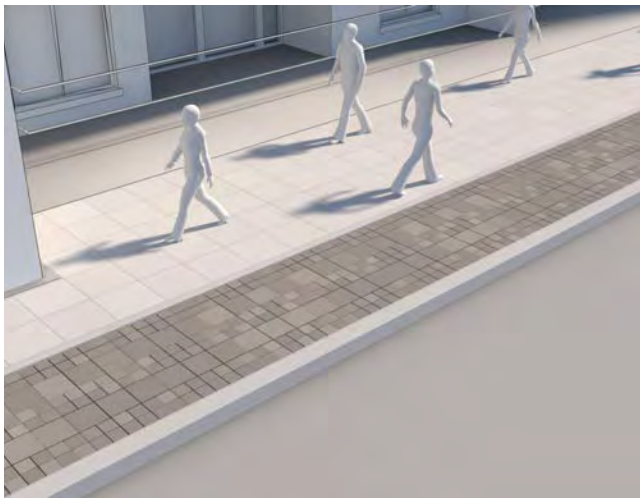
Rain gardens are planted depressions or holes that allow rainwater runoff from impervious surfaces to be absorbed. Native plants are recommended for rain gardens because of their tolerance for local climate, soil, and water conditions. Native plants also have deep and variable root systems that enhance water filtration.

Location

A rain garden requires an area where water can collect and infiltrate.

Composition

The bioretention mixture should typically contain 60 percent sand and 40 percent compost (Washington State University Studies).



Permeable Pavement

Permeable paving materials allow stormwater runoff to infiltrate through the material into the ground instead of being diverted as runoff into the storm drain systems. In addition to reducing runoff, permeable pavement traps pollutants, reducing the environmental impact of runoff and the need for expensive filtration and water conveyance systems. Permeable, or porous, paving can be used on roads, walking paths, and even lots that are subject to light vehicular traffic. Permeable pavement is typically laid on top of an infiltration bed and subgrade soil. Examples of permeable materials are described below.

Permeable Asphalt

Permeable asphalt is produced and placed using the same methods as conventional asphalt concrete; it differs in that fine aggregates are omitted from the asphalt mixture. The remaining large, single-sized aggregate particles leave open voids that give the material its porosity and permeability. Generally, porous asphalt pavements are designed with a subsurface reservoir that holds water that passes through the pavement, allowing it to evaporate and/or percolate slowly into surrounding soils. Permeable asphalt is best suited in lower traffic areas, such as parking lots or residential streets. Site placement can always have a large impact on operations and maintenance. When placed near a landscaped hill or any other area with high debris movement, permeable asphalt can easily become clogged and require frequent maintenance or replacement.

Permeable Concrete

Permeable concrete is similar to permeable asphalt and is designed to have more void spaces that allow air and water to pass through the material.

Interlocking Concrete Pavers

Interlocking concrete pavers are concrete (or stone) units with open, permeable spaces between the units. They can bear both light and heavy traffic.

Maintaining Permeable Stormwater Pavement

Permeable pavement requires different levels of maintenance and may include:

- Annual inspection of materials
- Periodic replacement of sand, gravel, or vegetation
- Periodic vacuuming of pavement to unclog sand or debris

Maintenance is extremely important to the life of the asset and should be considered prior to installation. Once permeable surfaces become clogged, they lose their effectiveness and can become unrecoverable. This is particularly true with permeable asphalt. Planted treatments can have far less operations and maintenance costs than permeable paving; however, they require additional space for placement.

Construction Testing and Materials

ASTM provides guidance on the type of testing for material density, placement, and durability. However, standard industry testing of in place materials continues to be developed.

Further Guidance

- *Urban Streets Design Guide,* NACTO

Parklet on Witherspoon Street in Princeton, NJ

Parklets

A parklet is a sidewalk extension that provides more space and amenities for people using the street. Parklets are typically installed in parking lanes and use one or more on-street parking spaces. A parklet re-purposes part of the street into a public space for people and is intended as an aesthetic enhancement to the streetscape. Parklets also provide public amenities such as seating, bicycle parking, art, and plantings. They are often funded and maintained by local businesses, residents, and/or community organizations because they can provide both a public amenity and a benefit to local businesses by offering outdoor seating for customers.

Further Guidance

- *San Francisco Parklet Manual*
- *Urban Street Design Guide,* NACTO

Recommended Dimensions for Parklets

"Emphasis has been placed on the joint use of transportation corridors by pedestrians, cyclists, and public transit vehicles. Designers should recognize the implications of this sharing of the transportation corridors and are encouraged to consider not only vehicular movement, but also movement of people, distribution of goods, and provision of essential services."

—AASHTO 2011 "Green Book" Foreword, pg xliv

Sussex, NJ

ROADWAYS

Road design is governed by detailed and comprehensive guides and standards, such as the *Manual of Uniform Traffic Control Devices* (MUTCD) and AASHTO's *A Policy on Geometric Design of Highways and Streets Sixth Edition* (referred to in this document as the *"Green Book"*). The FHWA emphasizes that a flexible approach to bicycle and pedestrian facility design is needed to achieve increased implementation. FHWA encourages agencies to appropriately use these guides and other resources to help fulfill the aims of the 2010 *US DOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations,* which states:

" ...DOT encourages transportation agencies to go beyond the minimum requirements, and proactively provide convenient, safe, and context-sensitive facilities that foster increased use by bicyclists and pedestrians of all ages and abilities, and utilize universal design characteristics when appropriate."

Planning and engineering guidance can and should enhance, not impede, multimodal safety and mobility. Complete Streets seeks to bring vehicular flow and throughput into balance with safety, mobility, and access considerations.

Design Speed

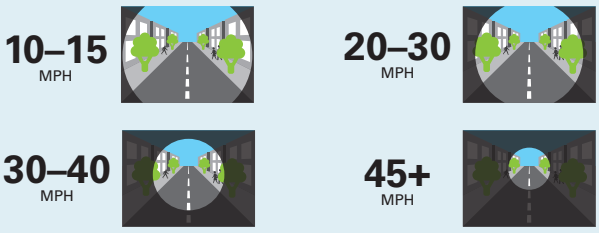
Speed is a critical factor in the occurrence of crashes and the severity of their outcomes. Street design in the latter half of the 20th century was grounded in highway design principles that focused on forgiving driver error and accommodating higher travel speeds. The highway design approach bases design speed and posted speed on the 85th-percentile of how fast drivers are driving rather than how fast they should drive. Designing for faster speed increases the frequency of crashes and their severity. This approach accommodates and encourages speeding and reckless driving behavior, and puts drivers who are driving the speed limit and other roadway users at greater risk. Higher design speeds also have a very negative impact on urban areas and degrade the pedestrian environment by mandating larger curb radii, wider travel lanes, and generous clear zones to accommodate higher vehicular speeds. Designing for desired travel speed can help lower travel speeds, reduce crash severity, and otherwise improve the built environment for all users.

Design speed should be selected based on the context, and roadway elements should be selected and designed to support that speed. Where there are higher volumes of pedestrians, bicyclists, and transit users, roadway design should encourage a lower speed differential between modes. On most urban roads, a target speed of between 10 and 30 mph is appropriate.

Speed and Safety

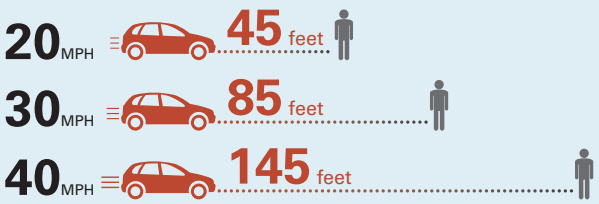
Motor vehicle speed has a dramatic impact on pedestrian fatalities. A pedestrian struck by a motor vehicle traveling 40 mph has an 85 percent chance of death. At 30 mph, this chance falls to 45 percent. At 20 mph, the fatality rate drops to just 5 percent.

VISIBILITY
TRAVELING AT...



HIT BY A VEHICLE
TRAVELING AT...

STOPPING DISTANCE FOR A VEHICLE
TRAVELING AT...



Traffic Calming Features

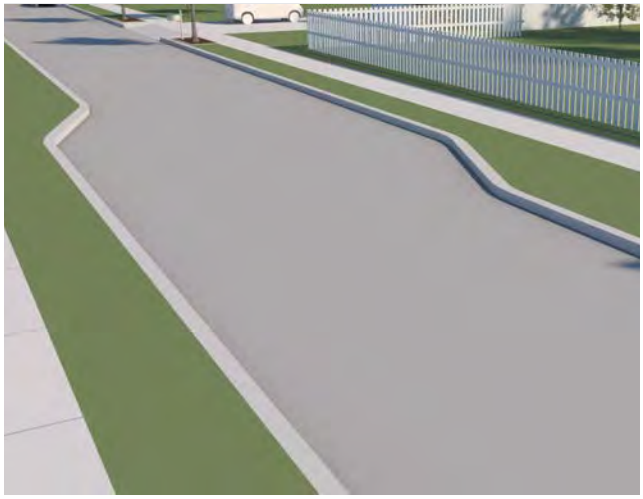
The following design techniques can help achieve lower travel speeds and safer motor vehicle traffic. Some of these techniques alter the configuration of the roadway, while others change how people psychologically perceive and respond to a street. These techniques should be considered in appropriate contexts.

Curb Extensions

Curb extensions visually and physically narrow the roadway at intersections and mid-block locations. Curb extensions are generally used where there is on-street parking to shorten the pedestrian crossing distance. A curb extension should generally be **1 to 2 feet narrower** than the parking lane, and the length at least the width of the crosswalk (but preferably extended to the advanced stop bar).

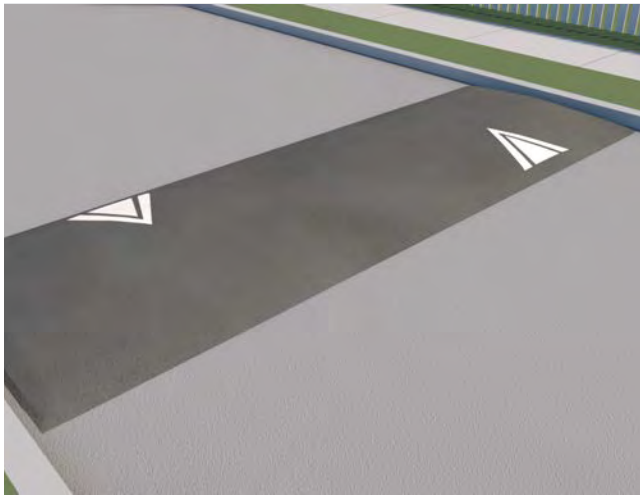
Neckdowns

Neckdowns create pinch points by extending the curbline to narrow the roadway, which deters motorists from operating at high speeds on local streets and significantly expands the sidewalk realm for pedestrians.



Chicanes

Chicanes are a series of raised or delineated curb extensions, edge islands, or parking bays that are placed on alternating sides of a street to form an S-shaped bend in the roadway. Chicanes reduce vehicle speeds by requiring drivers to shift laterally through narrow travel lanes.

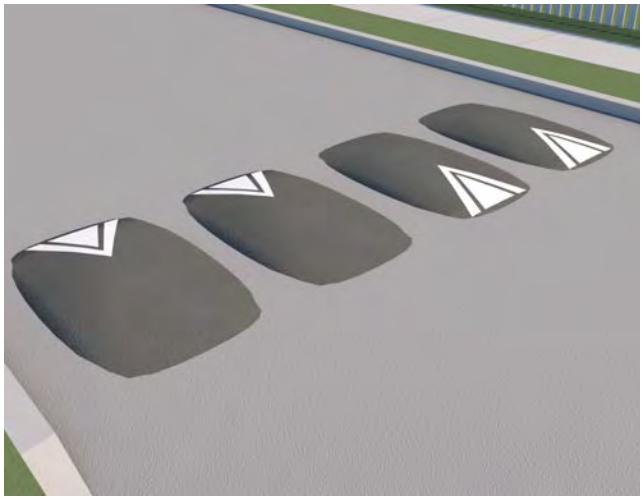


Speed Humps

Speed humps are typically **3 to 4 inches high** and **12 to 14 feet long**, and are designed with an intended vehicle speed of 15 to 20 mph. Humps are often referred to as "bumps" on signage and by the general public.

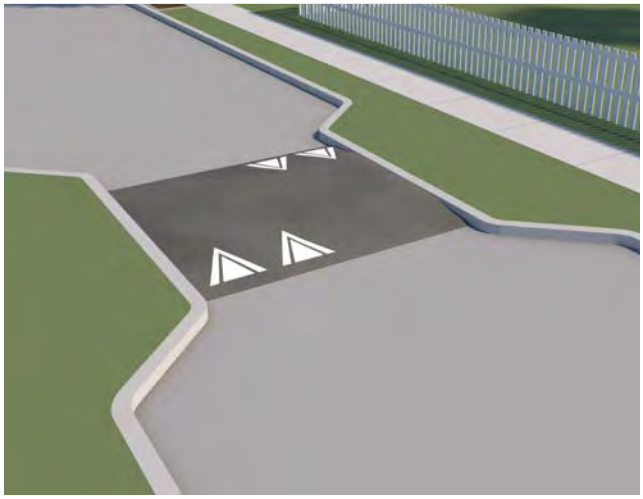
Center Islands

Center islands create pinch points for traffic by narrowing the width of the travel lanes and reducing pedestrian crossing distances. A center island causes a small amount of deflection without blocking driveway access. Center islands impede high-speed left turns and keep drivers in the correct receiving lane.



Speed Cushions

Speed cushions are speed humps or speed tables that include wheel cutouts that allow larger vehicles to pass unaffected but reduce passenger vehicle speeds. They are often used on key emergency response routes to allow emergency vehicles to pass unimpeded while causing the typical passenger vehicle to slow down. Speed cushions should be used with caution, however, as drivers will often seek out the space in between the humps.



Speed Tables

Speed tables are longer than speed humps and have a flat top, with a **height of 3 to 3.5 inches** and a **length of 22 feet**. Intended vehicle operating speeds range from 25 to 35 mph, depending on the spacing. Speed tables may be used on collector streets, transit, and/or emergency responder routes.

Signal Progression

Traffic signals timed to a street's target speed can create lower and more consistent speeds along a corridor with less frequent stops and starts.

On-Street Parking

On-street parking narrows the street and slows traffic by creating friction for moving vehicles.

Further Guidance

- *Urban Street Design Guide,* NACTO
- *Urban Bikeway Design Guide,* NACTO
- *Roadway Design Manual,* NJDOT

"Won't reducing speed limits increase the length of my commute?"

Probably not. Travel time is primarily determined by factors such as traffic signals, congestion, double-parked vehicles, and turning vehicles. In other words, intersections and traffic conditions determine travel time in most situations, not speed limits. In many cases, reduced speed limits can lead to improved travel times and reduced congestion by reducing stacking and bottlenecks at intersections. Signals should be timed appropriately to encourage lower and more moderate speeds in developed areas.

Travel Lanes

Travel lane width has a large impact on the design speed of a roadway. Traditionally, roads have been designed with wider travel lanes (11 to 13 feet) to create a forgiving buffer for drivers, particularly in high-speed environments where narrower lanes might feel uncomfortable. However, the unintended consequence of this is that wider lanes actually encourage higher travel speeds, which has a negative impact on safety and the urban environment. A growing body of research has shown wider travel lanes to correlate with higher vehicle speeds. Many engineers and planners have also assumed that lanes narrower than 12 feet decrease traffic flow. However, recent research has demonstrated that there is no measurable difference in urban street capacity between a 10- or 12-foot lane. **Lane widths of 10 feet** are appropriate in urban areas and have a positive impact on the safety of a street without impacting traffic operations. Along routes that have high truck and/or bus volumes, 11-foot travel lanes may be used. For multi-lane roadways where transit or freight are present, the wider lane should be the curbside lane while the inside lane is designed at the minimum possible width.

Research has shown that narrower travel lanes can effectively manage speeds without decreasing safety. Narrower lanes also decrease crossing distances for pedestrians at intersections and mid-block crossings, are cheaper to construct, and require less impervious pavement, therefore reducing the need for additional stormwater management.

Further Guidance

- *Urban Street Design Guide,* NACTO

Know how to use the "Green Book": Understand your context!

> "The intent of this policy is to provide guidance to the designer by referencing a recommended range of values for critical dimensions. It is not intended to be a detailed design manual that could supersede the need for the application of sound principles by the knowledgeable design professional. Minimum values are either given or implied by the lower value in a given range of values. The larger values within the ranges will normally be used where the social, economic, and environmental (S.E.E.) impacts are not critical."
>
> —AASHTO 2011 "*Green Book" Foreword,* pg xliii

Allocating Use of Street Space

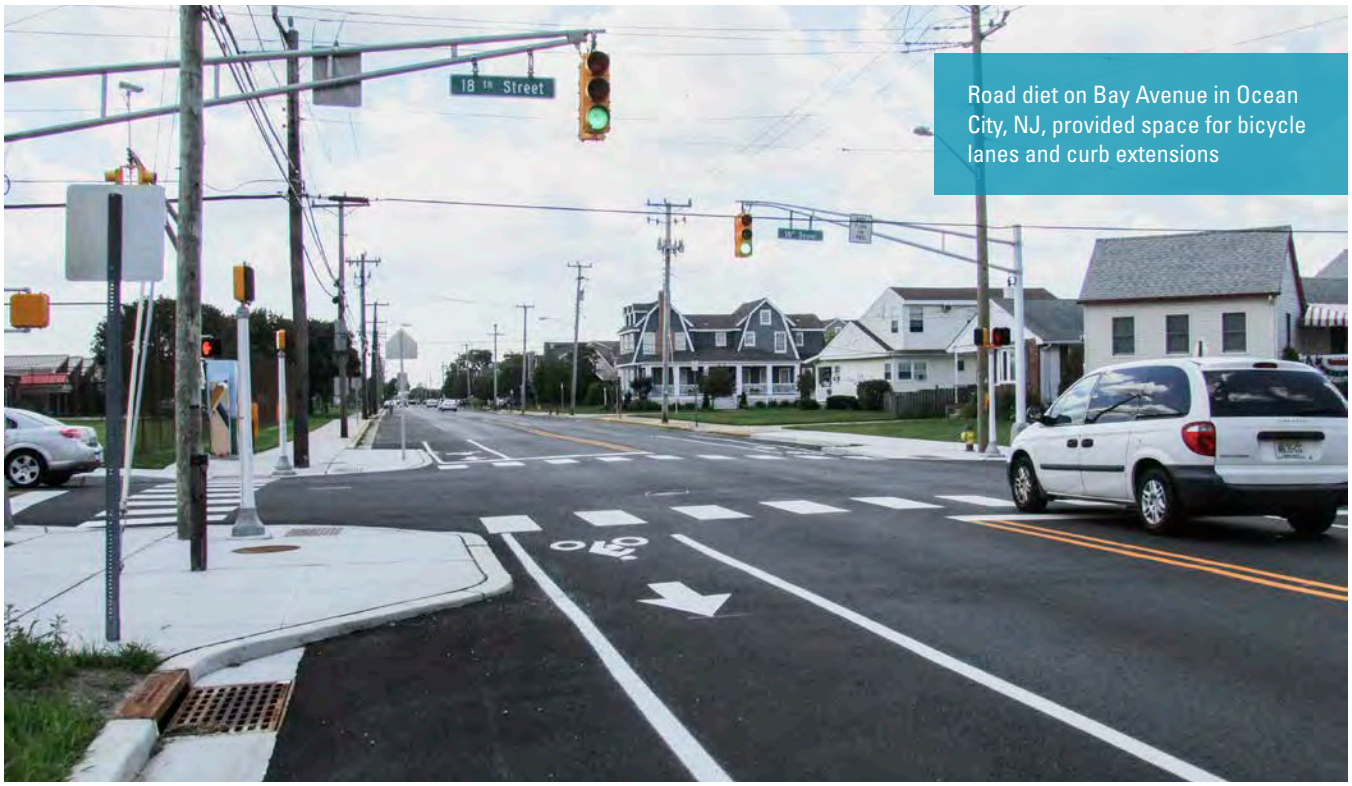
The configuration, width, and allocation of space to travel, parking, and bicycle lanes have a large impact on how New Jersey's streets meet the mobility needs of the state's residents, visitors, and businesses. The primary goal of Complete Streets is to equitably accommodate users of all modes and abilities. Decisions made regarding the allocation of space on a roadway impact how the street accommodates these various modes. A Complete Streets policy requires that during road reconstruction and resurfacing projects, an assessment is conducted to ensure that the design appropriately accommodates all users. This assessment should include examining the feasibility of reallocating space in the roadway to better accommodate pedestrians, bicycles, and transit vehicles.

Two basic methods should be reviewed during a road reconstruction or resurfacing project to optimize the allocation of street space:

- Road Diet
- Lane Diet

Further Guidance

- *Urban Street Design Guide,* NACTO
- *Road Diet Informational Guide,* FHWA



Road diet on Bay Avenue in Ocean City, NJ, provided space for bicycle lanes and curb extensions

Road Diet—Before

Road Diet—After

A road diet is a reduction in the number of lanes on a roadway. In the above example, a four-lane roadway is converted to a three-lane roadway, including a center turning lane and the addition of buffered bicycle lanes.

Road Diet

Where there is excess capacity, a road diet is used to reduce the number of travel lanes and reallocate space for other modes of travel, often bicycle lanes. An analysis should be conducted to determine whether excess capacity exists. Road diets generally occur on roadways with extra capacity and therefore should not have a negative impact on traffic.

Benefits

- Lower and more consistent vehicle speeds
- Reduced crash rates
- Improved pedestrian safety
- Accommodation of other modes of travel

Applications

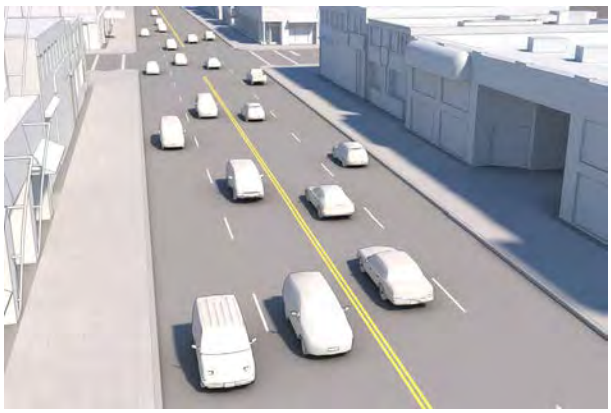
Typical applications of a road diet occur on four-lane undivided roadways, which can be converted to a three-lane cross section (one lane in each direction with a center turn lane or center median), or multi-lane streets with extra capacity where one or more lanes could be removed.

Researchers have found that road diets can reduce overall crash frequency by 19 to 43 percent.[32] Road diets can help reduce crashes by removing travel lanes and reallocating the space to accommodate turning vehicles in separate lanes or turn bays, which makes driver behavior more predictable and reduces weaving.

Reallocation of Space

Space that is captured by the reduction in lanes can be re-purposed for a variety of uses, including the implementation of bicycle lanes or on-street parking. For reconstruction projects, a road diet provides an opportunity to widen sidewalks, create curb extensions, plant street trees, implement stormwater management treatments, or install street furniture.

Lane Diet—Before



Lane Diet—After

A lane diet is a reduction in travel lane width. In the above example, four wide lanes are narrowed to provide space for the addition of a standard bicycle lane.

Lane Diet

In cases where there are wide travel lanes (12 feet or greater), a lane diet should be considered to narrow the lanes to 10 to 11 feet. On a four-lane roadway, for example, a lane diet can recapture 10 feet of space by reducing 12.5-foot lanes to 10 feet, enough for two 5-foot bicycle lanes. Reduced lane widths can also encourage slower vehicle speeds and reduce pedestrian crossing widths without reducing vehicle capacity.

Benefit

- Reduce vehicle speeds
- Reduce pedestrian crossing distances
- Provide space for other modes of travel, including bicycle lanes or wider sidewalks

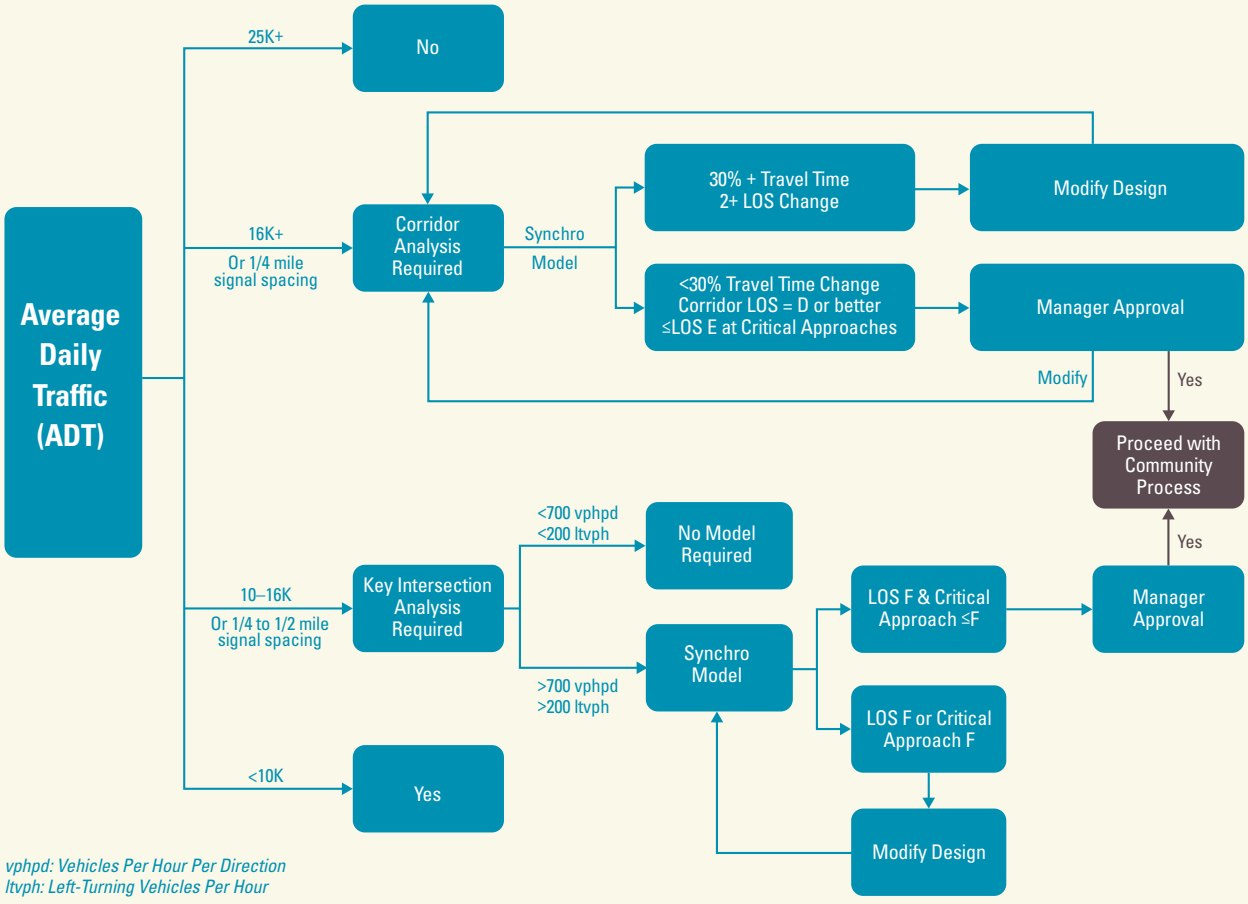
Applications

Typical applications of a lane diet are on streets with lanes wider than 10 feet, streets with wide parking lanes, or streets with wide center turn lanes.

Creating a Process for Determining Whether to Do a Road Diet: City of Seattle

The City of Seattle has created a formal process for determining whether a street is an appropriate candidate for a road diet. The flow chart below represents the process the City uses to determine candidates for a 4/5 lane to 3 lane conversion. The City's approach is innovative because rather than requiring evidence to show that a road diet would be feasible, the City's method requires evidence to show that a road diet is not feasible. This process is logical, quantitative, and based on sound engineering principles. It is part of an overall strategy to make building complete and safe streets the default way of doing business.

City of Seattle Modeling Flow Chart for Road Diets (from 4 or 5 lanes to 3 lanes)



vphpd: Vehicles Per Hour Per Direction
ltvph: Left-Turning Vehicles Per Hour

On-Street Parking

On-street parking can enhance a street by providing a buffer element between vehicles and the pedestrian realm. For streets with bicycle lanes or cycle tracks, on-street parking can separate motorists from cyclists, increasing the sense of safety for both cyclists and pedestrians. On-street parking provides convenient access to adjacent land uses and offers a desirable parking option for visitors arriving by car since it offers the shortest possible time between stopping and shopping.

Design

The inclusion of on-street parking in the design of a Complete Street provides an opportunity to increase the number of available parking spaces across the municipality while simultaneously narrowing the roadway. It is important that the benefits of on-street parking are only implemented using appropriate design elements that avoid negative consequences, such as reduced sight lines and blocked crosswalks.

Parallel Parking

Parallel parking is the traditional arrangement for on-street parking that requires the least amount of roadway space and is the most compatible for streets with higher speeds. Road diets, which are often employed on roads that have excess travel lanes for the level of vehicle traffic volume and often have safety issues for people traveling by bicycle or on foot, are easily implemented through the incorporation of parallel parking.

Head-out Angle Parking

Head-out angle parking is acceptable on low-speed collector streets as long as the extra curb-to curb width is not achieved at the expense of sidewalk width. Head-out angle parking enhances the safety of the street because when exiting the space, drivers have an increased line of site of oncoming vehicles, bicyclists, and pedestrians when reentering the travel lane. In addition, head-out angle parking eliminates the risk of dooring cyclists on roads where bicycle traffic is frequent. This design approach is useful in narrowing the width of the roadway.

Parking Management

The space that is dedicated to parking cannot be used for bicycle lanes and the very presence of parking encourages driving; therefore, parking needs to be carefully managed and incorporated into policies and programs to effectively maintain the principles of Complete Streets.

Pricing

One important management tool is ensuring, wherever appropriate, that on-street parking be properly priced through meters, kiosks, or residential parking permits. Metered or time-restricted parking should be used to provide short-term parking for retail customers and visitors while discouraging long-term parking.

Temporary Zones and Uses

Space that is specifically allocated for commercial loading and unloading activities allows the movement of deliveries and goods to operate smoothly, regardless of the street function. Designated loading zones are one approach to providing convenient access to storefronts, reducing the likelihood of double parking, which causes obstructions to other users on the street. Furthermore, parking spaces may provide more than just storage areas for cars. Alternative curbside uses can transform the space for temporary uses, such as food trucks and market stands.

Shared Parking

Shared parking, or parking utilized jointly among different businesses and facilities in the area, can be used to take advantage of peak parking characteristics that vary by time of day, day of week, and/or season of year. Since the majority of parking spaces are only used part time, shared parking arrangements significantly reduce the amount of land devoted to meeting parking needs.

Application

The presence of on-street parking is not a requirement nor does it make a street more or less complete. Rather, on-street parking should be seen as a possible consideration for Complete Streets and should be properly designed to maintain the safety and accessibility benefits that on-street parking can provide.

On-street parking should be located based on the characteristics of the street, the needs of adjacent land uses, and applicable local policies and plans for parking management. While on-street parking generally supports retail businesses and slows and buffers people from vehicle traffic, each parking space is valuable real estate that can be used for other design elements, such as curb extensions, landscaping, and bus and bicycle facilities, including bicycle parking. These alternate uses can often provide a greater mobility or economic benefit than on-street parking.

Minimum Parking Requirements

Most municipalities throughout New Jersey (and the United States) set minimum parking requirements for new buildings. This practice, which has been commonplace since the 1950s, is intended to ensure that new development doesn't overwhelm the public parking supply (either on-street or a public parking lot). However, requiring all new buildings to provide ample off-street parking has many negative impacts on cities and towns. Minimum parking requirements:

- Spread development over a larger area, reducing density, and encouraging or even necessitating car ownership and use
- Subsidize car ownership by transferring the cost of parking away from the user
- Degrade urban design by encouraging people to build surface lots and garages rather than inviting storefront and residential facades
- Reduce walkability by reducing density and encouraging active driveways and curb cuts rather than other street features such as trees and street furniture
- Increase the costs of development, which is passed on to consumers through higher prices for goods from commercial establishments and higher housing costs (recent research estimates that in 12 U.S. cities in 2012, the average cost of an above-ground parking structure was $24,000 per space and for an underground structure, $34,000 per space[33])

Fundamentally, minimum parking requirements are based on the assumption that the demand for parking does not depend on its price and therefore the supply of parking should not depend on the cost. By decoupling the cost of parking from the user, the demand for parking is inflated and justifies further increases to the supply of parking. As a result, a number of cities across the United States have been considering the removal of minimum parking requirements, and in some cases, replacing these with maximum parking allowances. In some cities, building developers provide amenities such as transit passes, on-site car sharing services, and bicycle parking in lieu of off-street parking spaces.

Further Guidance

More information on the impacts of off-street parking requirements can be found in *The High Cost of Free Parking* by Donald Shoup.

Design Vehicle

Engineers and planners should prioritize the mobility needs of a street's most vulnerable users (including pedestrians, bicyclists, or senior citizens) rather than the largest possible vehicle. While it is important to account for the challenges of moving larger vehicles (especially emergency vehicles), these infrequent challenges should not supersede the safety and comfort of the majority of daily street users. By designing for the largest vehicle, overall and everyday street safety is reduced by creating streets that accommodate and encourage higher vehicle speeds and longer pedestrian crossing distances.

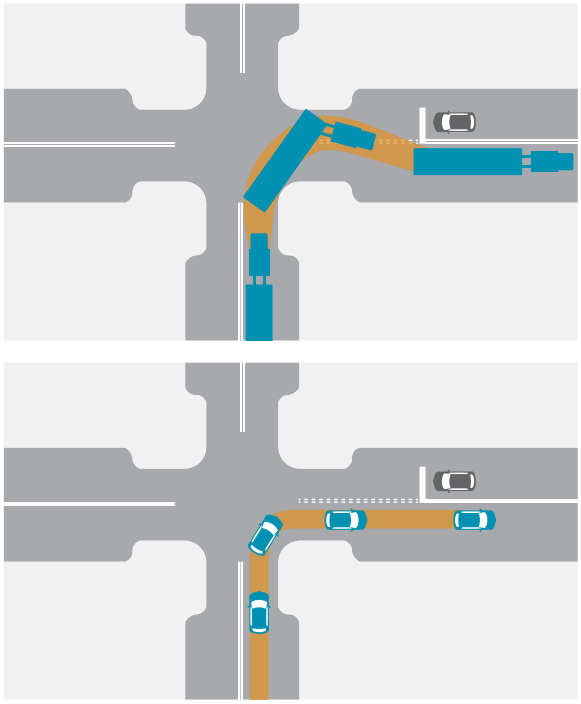
Strategies

- Larger vehicles can be accommodated at intersections with narrower turning radii by moving the stop bar on the receiving street back to allow for wider turns.
- As municipalities and other jurisdictions replace their fleet vehicles, they should consider purchasing smaller or more appropriate vehicles that match the context of their streets.

Further Guidance

- *Urban Street Design Guide,* NACTO

Controlling Turn Speeds and Recessed Stop Bars



Allowing vehicles that infrequently make turning movements to use the whole intersection allows the entire intersection to become more compact, reducing turning speeds of regular vehicles to 12 to 15 mph. A recessed stop bar prevents conflicts with opposing traffic.

Design Hour

Similar to the principles of the design vehicle, streets are often designed for a peak demand only present for an hour or two of the entire day. A street's uses, demands, and activities, however, change throughout the course of a day. A street at rush hour has different needs than a street at lunch hour. While it is important to understand the needs of the peak period, the design of a street should seek to balance the needs and functions of different time periods.

Vibrant urban areas are active throughout the entire day. When a street is designed purely to accommodate peak-hour vehicle volumes it might fail to provide a safe and attractive environment throughout the remainder of the day, resulting in a street that is overbuilt and not reflective of the surrounding context. The following strategies should be considered when evaluating and designing a street.

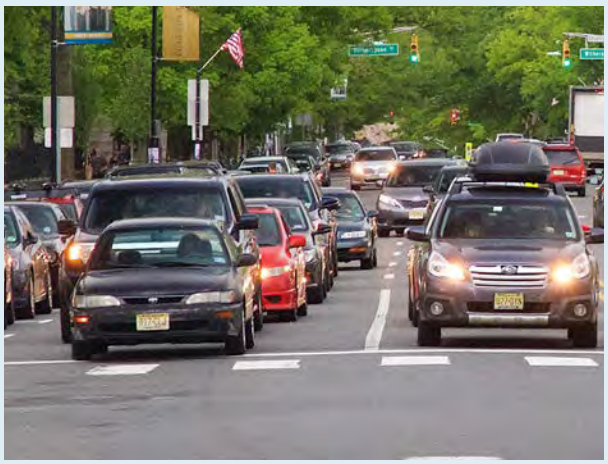
Strategies

- Travel times between origins and destinations tend to be similar across different routes within the network, meaning that if one route becomes congested, users will often choose a different route. Consider the ability of a whole network to move and diffuse traffic at the peak period and throughout the day.
- Consider strategies to channel and disperse traffic throughout the network toward preferred routes. This can include turn restrictions and 1-way to 2-way conversions.
- Consider the peak-hour activities of pedestrians and bicyclists in addition to motor vehicles. In New Jersey's more urban areas, the volumes of non-motorized modes might be similar to motorized modes, yet are often not considered when planning for peak-hour travel.
- Collect multi-modal data over the 2 to 3 hours of peak traffic to better understand traffic behavior throughout the entire peak period.
- Use performance measures that demonstrate overall corridor travel times rather than specific intersection peak level of service.
- If using ITE's Trip Generation standards, ensure that trips are assigned to multiple modes based on existing mode splits or anticipated mode splits. Consider using multi-modal level-of-service to more accurately understand and plan for travel impacts of development (discussed in detail on page 143).

Congestion

For many residents of New Jersey, roadway congestion is a daily concern that impacts their lives in many ways. These impacts can range from when and where trips are made, time spent commuting, lost productivity, and overall frustration. Designing streets only for the automobile discourages the use of different modes of travel and increases roadway congestion. According to the FHWA, half of all trips in metropolitan areas are 3 miles or less and over a quarter are 1 mile or less. In rural areas, 30 percent of all trips are less than 2 miles, yet the vast majority of these trips are made by automobile.[34]

A Complete Streets approach increases transportation choices—walking, bicycling, and transit—and encourages the use of alternate modes of transportation. According to the U.S. Department of Transportation (USDOT), about 44 percent of all vehicle trips made during the morning peak are not commuting trips but are rather for shopping, going to the gym or school, or running errands.[35] These trips are often short and could be made by alternate forms of transportation. A Complete Street provides a safe and comfortable environment to accommodate these alternate modes.



Design Year

Public officials, transportation planners, and engineers routinely make investments and recommendations that consider how infrastructure will respond to future growth and development. These investments and recommendations should reflect a set of goals and intended outcomes, coordinated with land use controls. The design year often used for roadway projects represents an estimation of future traffic demand and volume based on travel demand models and methods that often assume steady traffic growth. These projections often stand at odds with recent policy, demographic, and travel trends. While travel demand projections are an evolving field, their estimates should be qualified by intended outcomes and goal-driven policies.

Strategies

Traffic Growth Projections

In most places, traffic projections are based on a regional transportation model, which is calibrated to estimate existing and future transportation levels based on land use, transportation investments, and other factors. A recent study referenced by NACTO that investigated the post-construction accuracy of traffic forecasts found that traffic on roads in urban settings (arterials and collectors) was often significantly overestimated.[36]

Long-term trends have indicated that traffic volumes have leveled off following years of steady growth. Despite this, many travel models assume 1 to 2 percent annual growth in vehicle volumes. Many models also underestimate the potential benefits of improved land use decisions, growth in other modes, and overall shifts in mobility choices. Future analysis should therefore begin with a vision for the future function of the street or area and identify design treatments (or land use decisions, if applicable) that will achieve that goal.

Induced Demand

A study conducted by ITE found that between 50 and 100 percent of new roadway capacity is absorbed by traffic three or more years after expansion. The *Handbook of Transportation Engineering* notes that urban highway capacity expansion often fails to significantly improve travel times or speeds due to latent demand.[37]

The principle of induced demand means that the addition of roadway capacity along a particular route induced travelers to choose that route, thereby utilizing most or all of the additional capacity. Further, expanded roadways can degrade the pedestrian environment and increase space between land uses, which reduce the propensity of people to walk to destinations and makes transit services less viable. According to NACTO, if a project is determined to require an increase in roadway capacity, induced-demand should be considered a negative externality and other strategies should be considered to mitigate the projected demand.

Mode Targets

Many different U.S. cities and states have developed mode targets to achieve within a set time frame. The Massachusetts Department of Transportation has established a goal of tripling the number of trips taken by transit, bicycle, and walking. New Jersey municipalities should consider adopting mode goals and developing programs and strategies to achieve them.

Parking Minimums

The provision of free parking is one of the largest factors that influences travel demand. A growing body of research continues to demonstrate the effect that parking can have on vehicle miles traveled (VMT), both making it easier to drive a car and making it harder to use other modes by increasing the distances between land uses. The provision of parking is often a goal of municipalities that consider parking beneficial and require minimum parking requirements for most development. Removing these parking requirements can equalize the supply of parking with a more accurate representation of demand. More information on the effect of parking on travel demand and development cost can be found on page 70.

Further Guidance

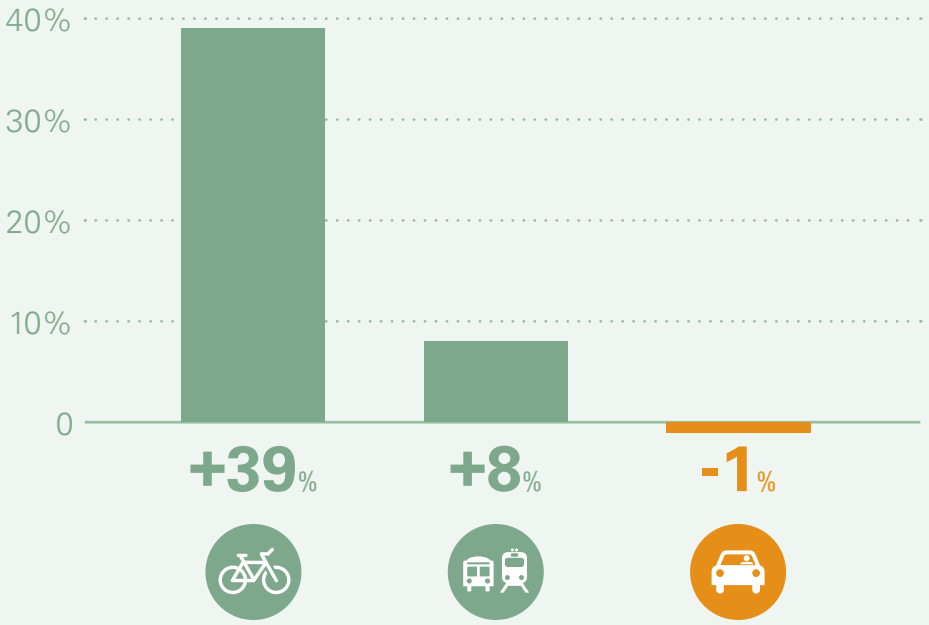
- *Urban Street Design Guide,* NACTO

Mode Share

Retrofitting streets for pedestrians, cyclists, and transit may sometimes require reducing or reallocating roadway vehicle capacity. While conventional perception is that reduced vehicular capacity leads to congestion, research suggests that the opposite is often true. This is related to the inverse of induced demand, known as "traffic evaporation," which means that when road capacity is reduced, vehicle volumes can actually respond by decreasing in similar proportion. Research suggests that displaced traffic either is absorbed by the surrounding street network, shifts to another mode, or the trip is altered. In essence, travel behavior reflects the conditions of the transportation system.

Investments made in making it easier to use transit, walk, or bicycle can influence changes in mode share. Recent data has shown dramatic increases in mode share for bicycling and public transportation.

Percentage Change in Mode Share (2005—2011)



Source: USDOT Bureau of Transportation Statistics and the League of American Bicyclists

Photos (clockwise)

Crosswalk near the Morristown Green in Morristown, NJ

NJ Transit Passengers in Hamilton, NJ

NJ Passenger unloading bicycle in Passaic, NJ

Outside Morristown train station in Morristown, NJ

Is This a Good Investment?

Decisions we make regarding transportation investments have a direct influence on travel behavior, future transportation investment needs, and the overall cost of maintaining and operating our transportation system. When roads are expanded and supply is increased, often at no direct cost to the user, the demand for that road goes up. This principle, commonly referred to as "induced demand," significantly reduces the benefits of roadway expansions, particularly when it seeks to reduce congestion.

The graphic below demonstrates this concept. Traffic grows when roads are uncongested, but the growth rate declines as congestion develops, reaching a self-limiting equilibrium. If capacity increases, traffic grows until it reaches a new equilibrium.

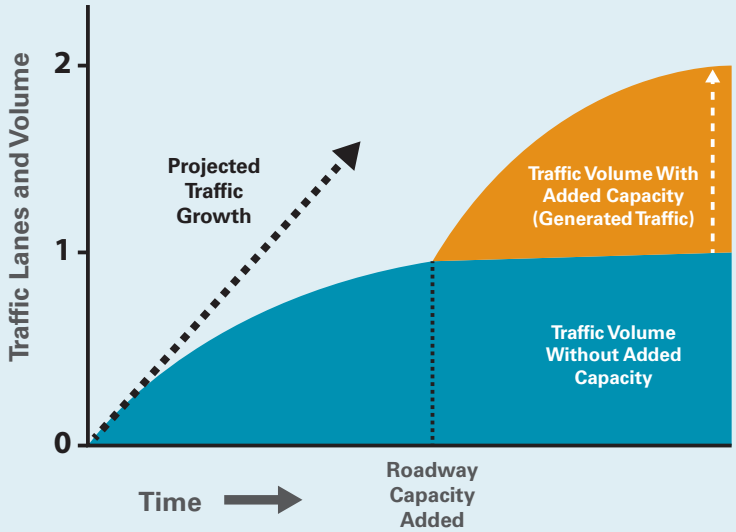
ARE ROADWAY CAPACITY IMPROVEMENTS A GOOD INVESTMENT?

The answer is that it depends on the situation. Planners, policymakers, and engineers, however, should always consider the impact that their transportation decisions will have on travel behavior, and therefore the long-term efficacy of their investment. Providing a good (such as road capacity) at no cost to the user will generate demand for that good. An investment in increased road capacity will often lead to marginal improvements in conditions over the long-term while carrying significant initial and long-term costs (as well as significant land use impacts).

WHAT'S THE SOLUTION?

Complete Streets! The Complete Streets approach prioritizes transportation choices. This means building a transportation system that not only accommodates and encourages multi-modal travel options, but also seeks to disperse motor-vehicle traffic through a well-connected roadway network with many travel options rather than funnel traffic toward higher-capacity roadways where driving is the only choice. This strategy is more cost effective and can better improve performance of the transportation system.

How Road Capacity Expansion Generates Traffic



Source: VTPI. "Smart Congestion Relief." 2013.

Transit

Efficient and cost-effective public transportation is essential for the continued growth and quality of life in a dense state like New Jersey. New Jersey has the highest population density of any state in the country and also has one of the most extensive public transportation networks, providing service in both urban and suburban areas. Despite this network, New Jersey has the third-highest average commute to work time in the United States at 30.4 minutes.[38] This is partly because of roadway congestion in New Jersey, which is some of the worst in the United States, particularly in urban areas.

New Jersey residents rely on public transportation far more than the typical U.S. resident. According to the U.S. Census Bureau, nearly 35 percent of workers in the New York/New Jersey/Long Island metropolitan area commute to work on public transportation, which is over twice as high as the next highest metropolitan area. The State of New Jersey overall has the second-highest percentage of residents (11 percent) who commute to work via public transportation.[39]

While many of New Jersey's transit riders take advantage of the state's extensive rail network, the majority of transit riders using NJ Transit ride the bus. For Fiscal Year 2014, NJ Transit reported over 530,000 average daily weekday boardings on its bus systems compared with over 295,000 on commuter rail and an additional 73,000 on light rail (this does not include privately operated bus trips). This means that in New Jersey, the bus network plays an integral role in the daily transportation needs of residents. Better accommodations for bus service on New Jersey's streets is an important goal of Complete Streets and also critical to the future mobility of New Jersey's residents. Compared with single-occupancy vehicles, buses consume far less public space per passenger and can help relieve congestion, improve air quality, and reduce greenhouse gas emissions.

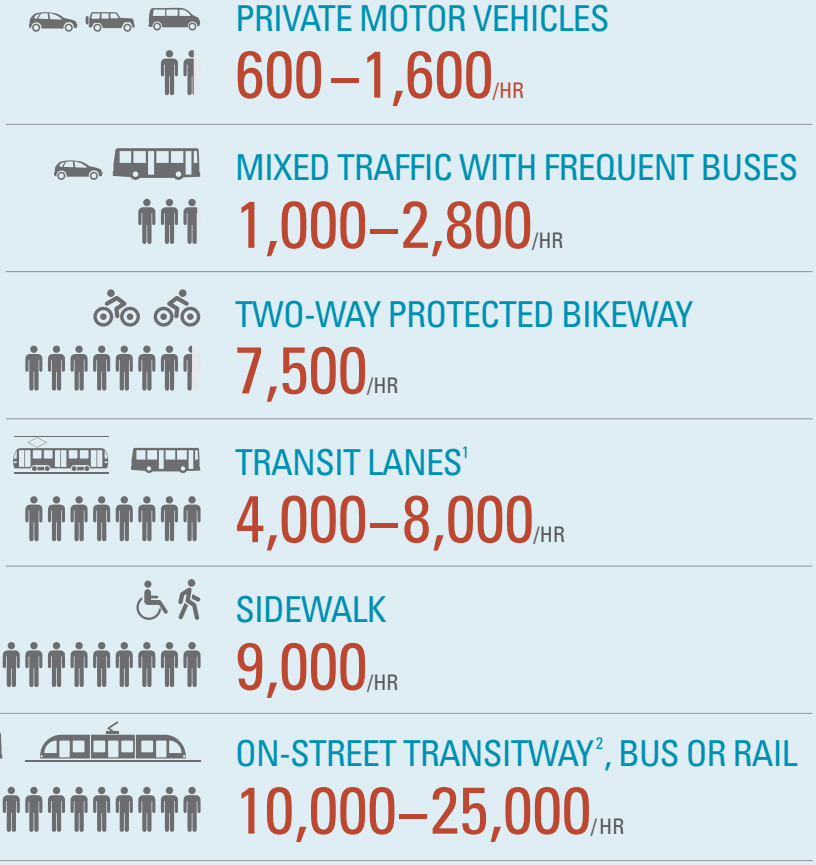
Improving the frequency, speed, comfort, and reliability of transit is critical to supporting growth and encouraging mode shift away from private automobiles. These guidelines outline two basic types of transit facilities that can help achieve this goal: bus lanes, which are demarcated with color but no physical separation, and Bus Rapid Transit, which generally provides some level of physical separation along with other service enhancements to make bus transit more efficient, reliable, and attractive.

Every transit passenger is a pedestrian before and after their transit trip. Safe, comfortable, and convenient pedestrian connections are therefore critical to an effective transit service and encouraging higher ridership. The toolbox elements discussed in the Sidewalk section provide strategies to integrate transit stops into the pedestrian network and enhance pedestrian access to transit.

Travel Mode and Capacity

The capacity of a single 10-foot lane (or equivalent width) by mode at peak conditions with normal operations

Source: NACTO Transit Street Design Guide



1. **TRANSIT LANES:** Transit lanes are a portion of the street designated by signs and markings for the preferential or exclusive use of transit vehicles, sometimes permitting limited use by other vehicles. Transit lanes, unlike on-street transitways, are not physically separated from other traffic.

2. **TRANSITWAYS:** Transitways are running ways dedicated to the exclusive use of transit vehicles and protected from incursion by physical separation. Transitways are typically used for Bus Rapid Transit (BRT) or Light Rail Transit (LRT) systems.

Bus Lanes

Marked bus lanes provide a dedicated space for buses in the street, distinguished by colored pavement, different pavement material (such as concrete), bus-only pavement markings, and/or other signage. Curbside bus lanes, also called Business Access and Transit (BAT) lanes, are generally open to private vehicles at intersections or driveways as turning lanes.

In constrained urban environments, a contra-flow bus lane can be used to provide bus service counter to the flow of general traffic on one-way streets. Contra-flow lanes are generally used on short segments of connector streets to provide a continuous transit network. Because other users might be unaccustomed to looking both ways on a one-way street, contra-flow lanes should be well marked and separated from opposing traffic lanes.

Design Guidance

- Bus lanes should be at least 11 feet wide when there is no buffer beside the lane. Buffers can include striped shoulder, gore strips, bicycle-lane buffers, or other clear zones. When a buffer is present, bus lanes can be designed at a narrower width.
- Curbside parking adjacent to the bus lane should be avoided where possible.
- For contra-flow lanes, separation can be achieved with double yellow lines as well as flexible bollards, if necessary.

Further Guidance

- *Urban Street Design Guide,* NACTO
- *Transit Street Design Guide,* NACTO

Bus Rapid Transit

Bus rapid transit (BRT) is a high-capacity, lower-cost alternative to fixed-route rail that can dramatically improve transit mobility and transform communities from auto-centric to multimodal friendly. While there is a wide range of BRT systems that have been implemented in this country, including some that operate primarily in mixed-traffic, the higher-end BRT system generally includes dedicated lanes as well as other infrastructure designed to improve system quality and reduce delay.

A BRT system aims to provide the capacity and quality of service of a light rail or subway system at a lower cost and higher degree of flexibility. The features, characteristics, and quality of BRT systems typically make them more attractive to potential riders than conventional bus services, which can help encourage a mode shift toward transit. Because of its flexibility, BRT can support multi-nodal corridors, as opposed to traditional hub-focused rail systems.

While there are currently no higher-end BRT systems in New Jersey, many projects have been undertaken to provide enhanced and higher quality bus service using some of the elements of a BRT system. Moving forward, BRT can be implemented to improve mobility in New Jersey in both urban settings and suburban corridors. When undertaking BRT projects, efforts should be made to provide as many of the design features described below as possible, particularly those that improve the reliability of service to the highest degree (including dedicated lanes and bus priority at intersections).

Elements of Bus Rapid Transit

BRT systems typically include some or all of the following features:

Dedicated Lanes

Bus-only lanes improve system reliability by accommodating faster travel and ensuring that buses are not delayed by traffic congestion. Bus right-of-way can be demarcated using a variety of methods, including a change of grade, curbing, bollards, or lane markings. Dedicated lanes are a critical component of a high-end BRT system, facilitating faster and more reliable service and making the bus a more attractive and usable travel option.

Transit Signal Priority at Intersections

Bus priority can improve service and reduce delay at intersections controlled by traffic signals by extending the green phase or reducing the red phase in the required direction. Bus priority can be implemented by installing a detection system for the traffic signal and a transmitter on the transit vehicle. Bus priority strategies include green extension, where the green interval is extended up to a preset value if the transit vehicle is approaching; early green, where the conflicting phase is shortened when a bus arrives at an intersection; early red, where the green phase is shortened when a bus is on approach to cycle through the red phase earlier; phase rotation, where the order of phases at the intersection can be shuffled so that transit vehicles arrive during the phase they need; and actuated transit phases, which are phases that are called if a transit vehicle is present and allows transit vehicles to make movements that are generally not allowed for mixed traffic.

BRT Funding

For a BRT project to qualify for federal (FTA) funding, it must have:

- **Transit Signal Priority**
- Defined **stations with shelters** and **passenger information**
- **Branding**
- **Short headways** (10 minute peak or 15 minute all day)

Frequent Service

BRT service should have a minimum 15-minute service frequency throughout a weekday or a combination of 10-minute peak service and 20-minute off-peak service frequencies. High service frequencies add greatly to the convenience of the system and eliminate the need for riders to consult schedules.

Intersection Treatment

In addition to bus priority, installing queue-jump lanes that allow a bus to avoid the queue and access an intersection can have major benefits.

Off-Board Fare Collection

Off-board fare collection allows passengers to pay their fare at the station, or stop, instead of on the bus. This allows riders to board any door, reducing the delay caused by passengers funneling through the front door and paying on board. Off-board fare collection is particularly useful at busy stations or stops.

Platform-Level Boarding

Passenger platforms at stations or stops should be approximately level with the bus floor to provide for easy access and boarding. Making boarding fully accessible for wheelchairs, disabled passengers, and baby strollers reduces delay and provides a higher quality of service for all passengers. Platform-level boarding can be accomplished through raised platforms (to approximately 12 to 14 inches) combined with low-floor buses.

High-Capacity Vehicles

Higher-capacity vehicles, such as articulated (60-foot) buses, may be used to provide additional capacity on more popular routes.

Branding or System Identity

Creating an identifiable and attractive system identity is critically important to the attractiveness of the BRT system for passengers and to increase ridership. Branding should apply to the buses, the stops/stations, and to passenger information materials. A distinct BRT identity helps passengers distinguish and identify the BRT system from other BRT lines in the system and from conventional bus services.

Photo credit: flickr user Embarqe Brasil

Higher Quality Stations

Providing improved bus stops and stations is essential to creating a successful BRT system. Many BRT systems include enhanced stops that feature attractive shelters, ticket vending machines, raised platforms, well designed and visible signage, and enhanced informational displays, including real-time bus schedule information.

Further Guidance

- Transit *Bus Rapid Transit Service Design Guidelines,* VTA
- *Bus Rapid Transit Planning Guide,* Institute for Transportation and Development Policy
- *Transit Street Design Guide,* NACTO

Quality of Transit Service

Reliable, frequent, and comfortable transit service is critical to the utility and success of transit systems. Transit modes in New Jersey include commuter rail, light rail, subway, and buses. These modes serve different purposes and meet the needs of many different users. Some transit services, such as commuter rail or subways (including NJ TRANSIT and PATH service), run exclusively along dedicated right-of-way. Light rail service (including the Hudson-Bergen Light Rail and River Line) runs primarily on dedicated right-of-way but interacts with other modes at at-grade intersections and shares the roadway with vehicular traffic where dedicated right-of-way is not available. Buses in New Jersey run primarily in mixed traffic, and as a result, the quality of service is generally dependent on traffic and other street conditions.

Strategies

Designing streets for transit access can improve the quality of service and encourage more people to use the service. Quality transit includes many components, as described below.

Reliable and On-time Service

Reliable and on-time service is a key component to a successful transit system. This is more easily achieved on dedicated right-of-way. Greater frequency of transit service helps improve reliability and the number of options available for transit riders. In denser urban areas of New Jersey, high-frequency transit service is typical and often has a variety of connected transit routes. For less dense suburban or rural areas, service is often less frequent. Bus service is critical in these locations for filling gaps in rail transit service, but long headways and unpredictable schedules can limit the usability and attractiveness of the system. More reliable service is an integral element to quality transit service.

Well-designed and Accessible Stations and Stops

Stations and stops should be comfortable and accessible for all users. In New Jersey, bus stops are often located in very hard to reach locations (such as a jug-handle) and/or do not have shelters, benches, or signs. By making stations and stops accessible and comfortable for passengers, transit service becomes a more attractive option for potential users and a more dignified option for those who already rely on the system. Quality station or stop design should include the following (depending on context):

Posted Schedules and Routes

The availability of posted schedules and route maps is an essential component of transit service. Schedules should be kept up to date and include any special advisories.

Seating

In locations that include a bus shelter, seating can improve the experience of waiting for a bus. Seating generally includes one or more benches.

Lighting

Lighting enhances the visibility of a transit stop and can improve the sense of safety and security at a stop.

Signage

Signage is an essential element of quality transit. Signs indicate that there is a stop, as well as the routes servicing that stop. Signage should be bright, well lit, and kept clean to maintain a high level of service.

Facilitated Access from All Modes, Particularly Pedestrians and Bicyclists

This includes providing bicycle parking at stops and stations and facilitating the ability of passengers to carry bicyclists on buses or trains. Passengers often use bicycles to get to a transit stop, and once they arrive at their destination stop, their bicycle might be critical for the last leg of their journey.

Quality Wayfinding to Stations and for Navigating the System

Stations and stops must be easy to locate. Once at a station or stop, passengers should be able to easily navigate the transit systems. Facilitating this requires quality and easy-to-understand wayfinding to stations and stops, and easy-to-understand maps and schedules at the station or stop. The availability of real-time information indicating the location of vehicles is an important innovation that dramatically improves the quality of transit service—particularly for buses, which often run outside of their schedule. This information is available on many systems via smartphone and online applications. This information can, and should, be included at more heavily used stops as well.

Further Guidance

- *Transit Streets Design Guide,* NACTO

Photos (clockwise)

NJ Transit's River Line light rail (shown in Palmyra, NJ) serves many towns between Trenton, NJ and Camden, NJ

Bus stop on George Street in New Brunswick, NJ features clear signage and a comfortable and accessible bus shelter

NJ Transit commuter rail platform in Morristown features bicycle parking and a downtown location

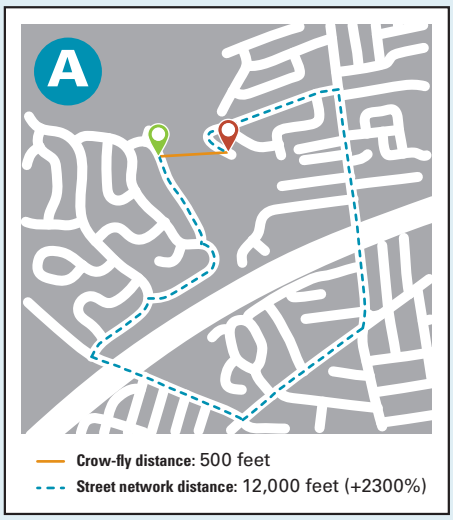
Walkability, Connectivity, and Land Use

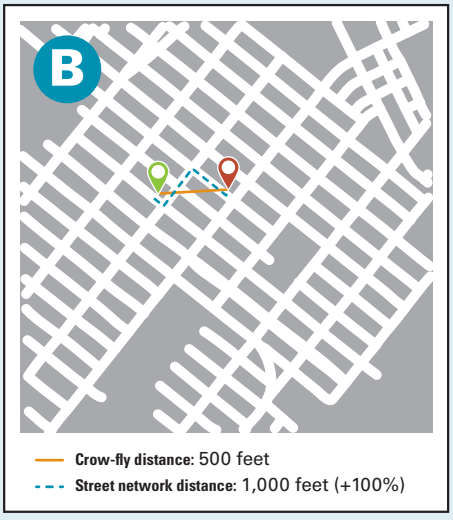
One of the most important factors that influences mobility is the mix and layout of the land uses of an area. The relationship between transportation and land use is symbiotic. Diffuse land use patterns necessitate investments in transportation that provide access to these areas. Similarly, an auto-centric transportation system necessitates automobile use and therefore increased roadway capacity and parking availability, which can further diffuse land uses.

Because of the closeness of this relationship, land use decisions are a critical component that determines transportation needs and costs. In this way, what are often private decisions (e.g., how to develop a lot, where to develop) become public concerns (e.g., roadway widening, new traffic signals, expanded utilities). It is in the public's interest for land use and transportation decisions to be planned together.

Development patterns impact the needs of a transportation system, user behavior, and the viability of different modes. The development pattern shown in **Example A** is characteristic of typical suburban development patterns seen in New Jersey following World War II. In this example, retail is located in a separate section of town from residential areas. Furthermore, the residential area features a winding street pattern that discourages through traffic. The result is that a trip from one residence to a store is 2,300 percent longer on the street than the physical distance. Additionally, there is only one possible path to the store—funneling all traffic onto one road, placing increased burdens on this roadway. The long distances discourage non-motorized transportation, and the lack of central nodes makes transit difficult to operate.

Example B shows a more traditional grid street pattern found in many older communities in New Jersey. In this example, residential areas are either next to or mixed within commercial areas. A trip from one residence to a store can take many different paths, and the distance between these locations is far shorter than in Example A, encouraging the use of non-motorized modes such as walking or bicycling. Additionally, because this development pattern features centralized nodes, transit service is more viable and more easily administered. These examples demonstrate how development decisions affect the mobility and mode options (and choices) of a community.





Access during Construction

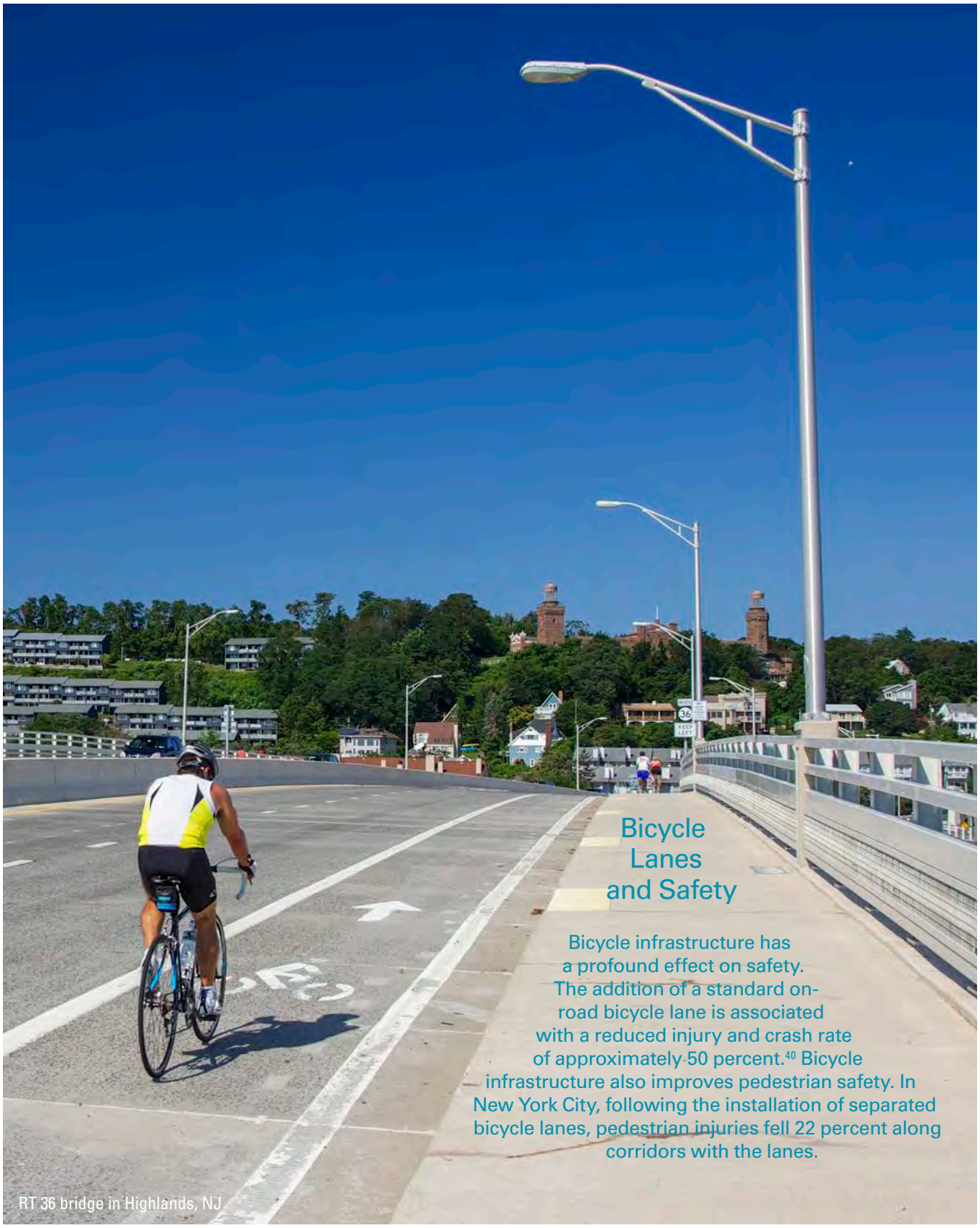
When construction occurs within or adjacent to the public right-of-way, public accessibility must be provided for people of all ages and abilities. While construction can disrupt mobility for all pedestrians, changes to the sidewalk travel flows and infrastructure can be particularly troublesome or hazardous for those with limited mobility. A closed sidewalk can cause hardship for pedestrians and someone in a wheelchair by forcing a long detour. This can be even more problematic for the visually impaired if there is not proper advanced warning signage and guidance. Such individuals might be used to navigating along a particular route and a disruption to this route can be dangerous. The following accommodations should be considered when laying out construction sites:

- Advanced warning and guidance signs
- Adequate illumination and reflectors
- Use of temporary walkways
- Channeling and barricading to separate pedestrians from traffic
- Adequate barricading to prevent visually impaired pedestrians from entering work zones
- Wheelchair accessible alternate pedestrian circulation routes with appropriate signage

Local construction ordinances should be updated to define accessibility requirements.

Further Guidance

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/pdf.cfm



RT 36 bridge in Highlands, NJ

Bicycle Lanes and Safety

Bicycle infrastructure has a profound effect on safety. The addition of a standard on-road bicycle lane is associated with a reduced injury and crash rate of approximately 50 percent.[40] Bicycle infrastructure also improves pedestrian safety. In New York City, following the installation of separated bicycle lanes, pedestrian injuries fell 22 percent along corridors with the lanes.

Bicycle Facilities

The provision of bicycle facilities is critical to accommodating cycling as an essential form of transportation and encouraging increased cycling rates. However, bicycle facilities must be properly designed and implemented in order to ensure that they are safe, comfortable, and useful to the largest segment of the population. The guiding principles to achieve effective implementation is to follow the "Five Cs:"

Further Guidance

- *Urban Bikeways Design Guide,* NACTO
- *Guide to the Development of Bicycle Facilities,* AASHTO
- *Separated Bicycle Lane Design Guide,* FHWA
- *Small Town and Rural Multimodal Networks,* FHWA

Continuous

Many bicycle lanes disappear at intersections and other stressful locations. To be successful, bicycle lanes must be continuous through these locations.

Connected

Gaps in a bicycle network can discourage potential riders. Bicycle routes should be interconnected to create a robust network that connects where people live and where they want to go.

Convenient

Bicycle networks must conveniently and directly connect cyclists to key destinations in order to encourage higher rates of cycling.

Complete

A successful network takes into account what happens when a bicycle ride ends. This means considering how complete a street is, including the presence of sidewalks, bicycle parking, and access to transit.

Comfortable

A bicycle network should be comfortable and inviting for riders of all ages and abilities, providing the sense that cycling is a safe and convenient activity.

Bicycle Lanes

Bicycle lanes provide an exclusive space for bicyclists through the use of pavement markings and signage. Bicycle lanes are intended for one-way travel and are typically located on both sides of a two-way street and on one side of a one-way street. Bicycle lanes enable bicyclists to ride at their preferred speed, free from interference from motorists. Bicycle lanes help facilitate predictable behavior between bicyclists and motorists. Bicyclists may leave the bicycle lane to pass other bicyclists, make left turns, or avoid obstacles and conflicts. Motorists may pass through the bicycle lane to access parking or make other turning movements, but they may not stand or park in the lane.

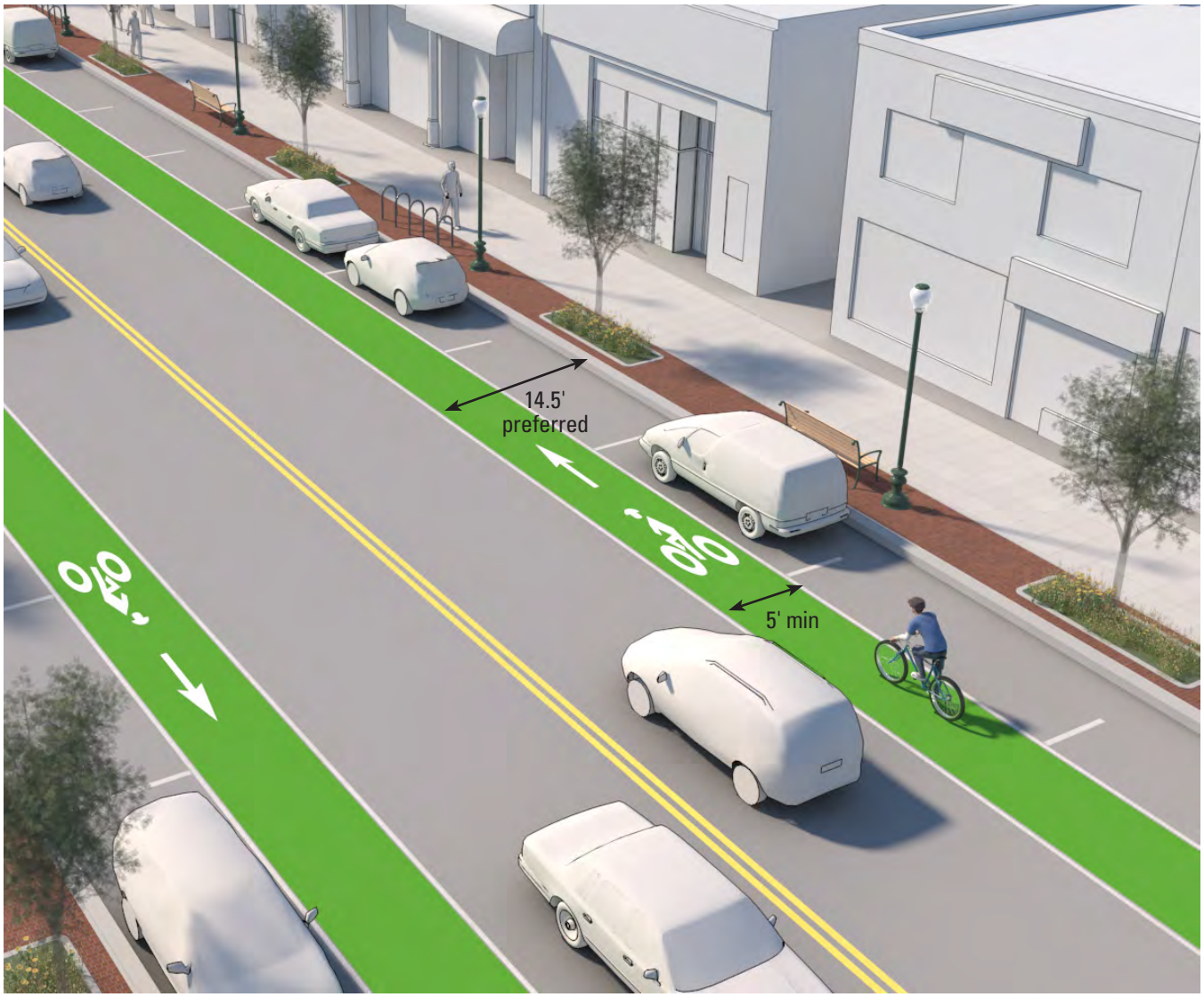
The preferred location for bicycle lanes on a one-way street is on the left side of the roadway. Left-side bicycle lanes can result in fewer conflicts between bicyclists and motor vehicles, particularly on streets with heavy right-turn volumes or frequent bus stops. Left-side bicycle lanes can also increase the visibility of bicyclists to motorists at intersections. On one-way streets with parking on the right side, a left-side bicycle lane will result in fewer conflicts with parked cars. Additionally, due to higher frequency of single-occupant vehicles, on one-way streets with parking on both sides, bicyclists riding on the left will have fewer conflicts with car doors opening on the passenger side.

Design Standards

- The minimum bicycle lane width with no on-street parking is 5 feet adjacent to a curb, 4 feet with no curb.
- The desirable bicycle lane width adjacent to parking is 7 feet. The minimum width permitted is 5 feet.
- When placed next to a parking lane, the desirable reach from the curb face to the edge of the bicycle lane is 14.5 feet. Wherever possible, parking width should be minimized in favor of increased bicycle lane width.

Applications and Use

- Bicycle lanes are recommended on streets with a posted speed limit of 25 to 35 mph. Where additional space is available, consider providing a buffered bicycle lane.
- On constrained corridors with high parking turnover, consider including pavement markings to guide bicyclists out of the door zone of parked vehicles.
- Bicycle lane striping should use the following standards: a 6- to 8-inch solid white line next to the travel lane, and a 4-inch solid white line next to the parking lane.
- Bicycle lane placement should be intuitive and visible for drivers *and* bicyclists.
- Left-side bicycle lanes have the same design requirements as right-side bicycle lanes.
- Left-side bicycle lanes are recommended on most one-way streets.
- On one-way streets where there is a dramatically higher frequency of left turns to right turns, a right-side bicycle lane may be the appropriate treatment.
- Left-side placement may not be appropriate on streets that transition from one-way to two-way.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Buffered Bicycle Lanes

Buffered bicycle lanes are conventional bicycle lanes that are paired with a marked buffer space to horizontally separate the bicycle lane from the adjacent motor vehicle travel lane. While buffers are typically used between bicycle lanes and travel lanes to increase bicyclist comfort, they can also be used between bicycle lanes and parking lanes where there is high parking turnover to discourage cyclists from riding too close to parked vehicles, decreasing the risk of conflicts with drivers opening their car door.

Buffered bicycle lanes on a one-way street should follow the same guidelines as one-way conventional bicycle lanes. Buffered bicycle lanes on a one-way street should be placed on the left side of the roadway when possible and follow the same guidelines for right-side buffered bicycle lanes.

Design Standards

- The preferred (and minimum) width of a buffered bicycle lane is 5 feet.
- The preferred width of a buffer is 3 feet (minimum 1.5 feet).

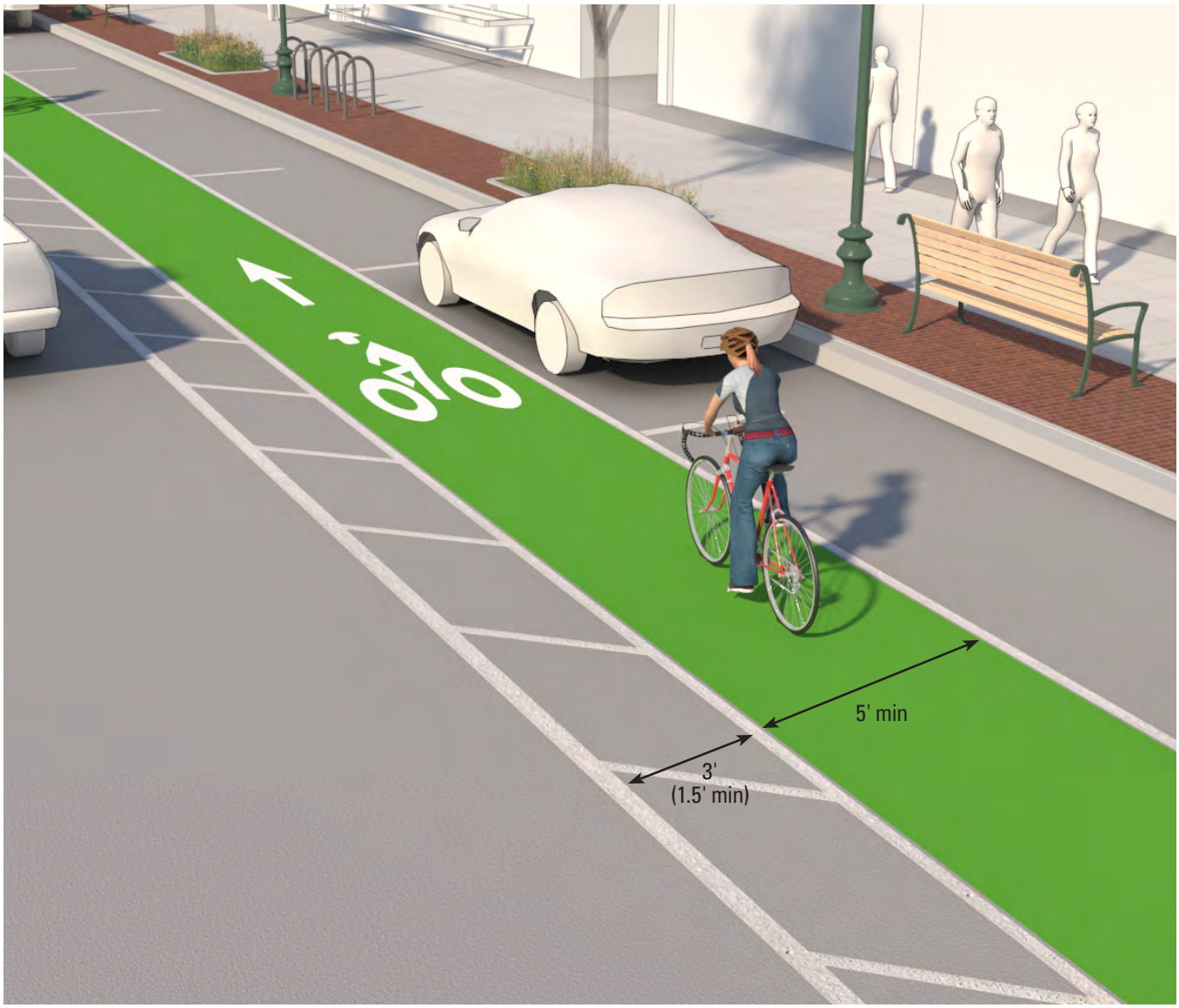
Applications and Use

- Buffered bicycle lanes are appropriate on streets with a posted speed limit between 25 and 35 mph.
- Where only one buffer can be installed on a constrained corridor with on-street parking, the buffer should typically be placed between the bicycle lane and the travel lane.
- Buffer striping should use the following standards: a 6- to 8-inch solid white line next to the travel lane, and a 4-inch solid white line next to the parking lane.
- Buffer striping should have interior diagonal cross hatching or chevron markings if 3 feet in width or wider.
- On wide one-way streets with a buffered bicycle lane, consider adding a buffer to the opposite side parking lane to further narrow the motor vehicle lanes and encourage lower travel speeds.
- Where existing cartway width allows, buffered bicycle lanes should be considered anywhere a conventional bicycle lane is recommended, particularly on streets with high travel speeds and volumes or on-street parking. On streets with extra width and on-street parking, a second buffer should be considered between the bicycle lane and the parking lane.

Benefits

- Buffered bicycle lanes provide additional separation between bicyclists and motor vehicles.
- Buffers provide space for bicyclists to pass one another without encroaching into the adjacent motor vehicle travel lane.
- The buffer encourages bicyclists to ride outside of the door zone when the buffer is placed between the bicycle lane and the parking lane.
- Buffered bicycle lanes increase the perception of safety on the roadway and therefore encourage increased bicycle use.

According to a 2011 Portland State University study, cyclists indicated that they feel a lower risk of being "doored" in a buffered bicycle lane, nearly nine in ten cyclists **preferred a buffered lane over a conventional lane**, and seven in ten indicated that they would go out of their way to ride in a buffered lane rather than a conventional lane.


5' min
3'
(1.5' min)

Separated Bicycle Lanes

Separated bicycle lanes are bikeways that are at street level and use a variety of methods for physical separation from passing traffic. Unlike a conventional or buffered bicycle lane, a separated bicycle lane provides vertical separation to prevent vehicle encroachment, improve safety, and deter double-parking. The separation of the bicycle lane from motor vehicle traffic makes the facility more attractive for bicyclists of all ages and abilities. Separated bicycle lanes also have a reduced risk of "dooring" compared to conventional bicycle lanes.

A separated bicycle lane on a one-way street should follow the same guidance for a buffered bicycle lane on a one-way street. Separated bicycle lanes on a one-way street should be placed on the left side of the roadway when possible and follow the same guidelines for right-side separated bicycle lanes.

Design Standards

- The preferred width of a separated bicycle lane is 6 feet. The minimum width permitted is 5 feet.
- The preferred and minimum width of the buffer with on-street parking is 3 feet. The minimum width permitted without parking is 1.5 feet.
- The minimum width between any vertical separation and the curb is 7 feet.

Applications and Use

- Separated bicycle lanes should be used along streets with high motor vehicle volumes and/or speeds.
- Separated bicycle lanes should be designed to allow bicyclists to pass other bicyclists.
- Typical forms of separation include removable or permanent bollards, raised curbs or medians, or planters.
- Where on-street parking is present, the parking lanes should be located adjacent to the travel lane, creating a physical separation for the bicycle lane.
- Parking should be prohibited a minimum of 20 feet from an intersection to increase the visibility of bicyclists.
- Similar to guidance for conventional bicycle lanes and buffered bicycle lanes on one-way streets, separated bicycle lanes on one-way streets should typically be placed on the left side of the road because of the increased visibility of cyclists to drivers.
- Separated bicycle lanes are preferred treatments on streets with on-street parking, frequent parking turnover, high traffic volumes or speeds, and along streets with high bicycle volumes. Separated bicycle lanes might not be feasible on streets with frequent intersections or driveways. Where separated bicycle lanes are feasible, they are the preferred design option.

Benefits

- Separated bicycle lanes encourage increased cyclist use among users who do not like riding with traffic.

According to a 2015 study by Portland State University, protected (or separated) bicycle lanes increase the number of adults who say they would be "very comfortable" biking on the road from 9 percent to 29 percent. This compares to 12 percent of adults who say they would be "very comfortable" biking on a street with a painted bicycle lane but no physical separation.

7' min
6'
(5' min)
3' min

Two-way Separated Bicycle Lanes

Two-way separated bicycle lanes are physically separated bicycle lanes that allow bicycle movement in both directions on one side of the road. Two-way separated bicycle lanes share many of the same design characteristics as one-way separated bicycle lanes, but might require additional considerations at driveway and side-street crossings. Two-way separated bicycle lanes reduce the detour length for bicyclists by providing contra-flow movement and permitting more convenient and direct routes. Research indicates that two-way separated bicycle lanes are more attractive to bicyclists of all ages and abilities.

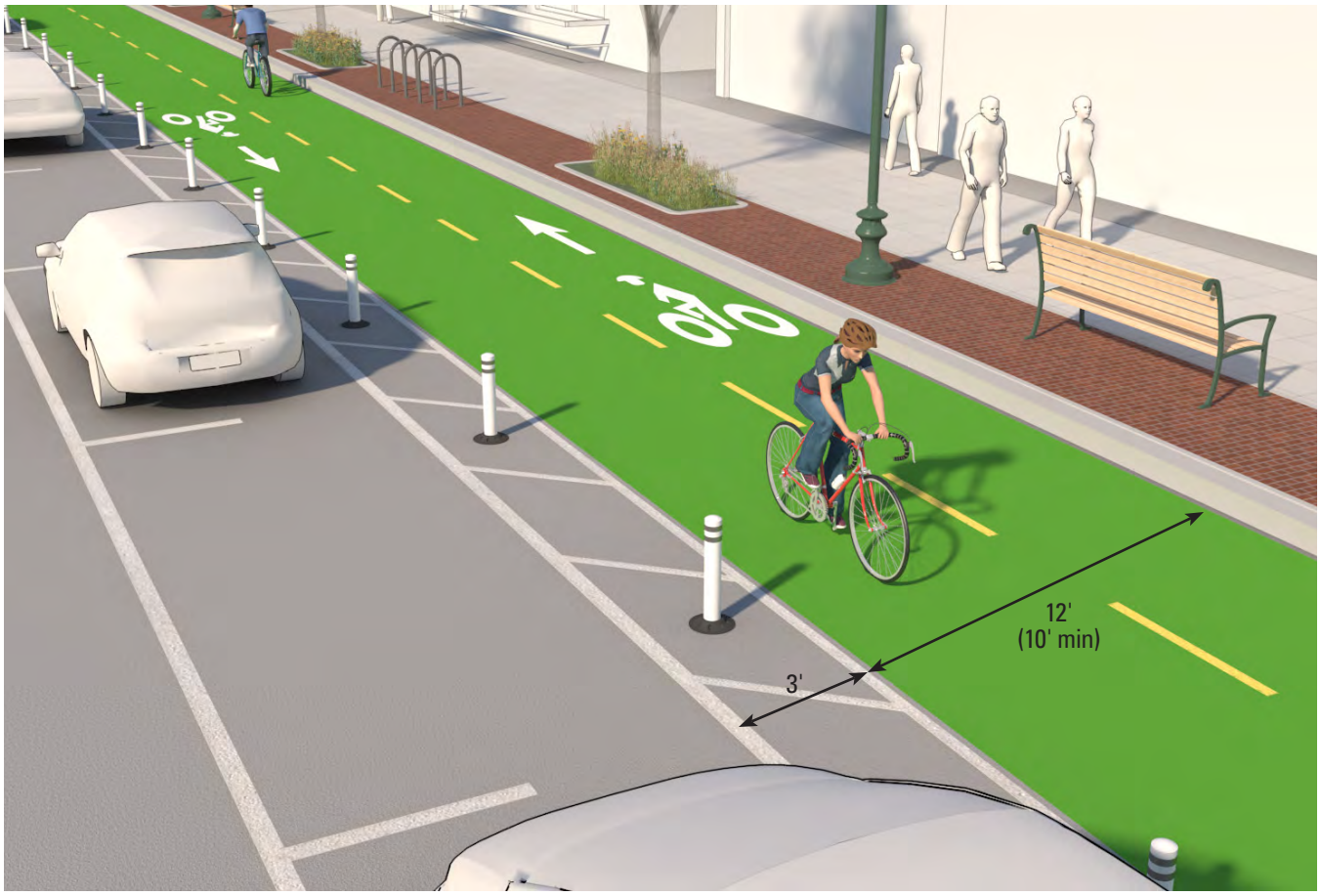
Design Standards

- The preferred width of two-way separated bicycle lanes is 12 feet. The minimum width permitted is 10 feet.
- The preferred and minimum width of the buffer with parking is 3 feet. The minimum width permitted without parking is 1.5 feet.

Applications and Use

Two-way separated bicycle lanes are typically located on:

- Streets with few driveway or cross-street conflicts
- Streets where there is not enough room for one-way separated bicycle lanes on both sides of the street
- One-way streets where contra-flow bicycle travel is desired
- Streets with extra cartway width
- Streets where high traffic speeds and/or volumes could create high levels of stress for bicyclists



Contra-flow Bicycle Lanes

Contra-flow bicycle lanes are bicycle lanes that are designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. In many locations throughout New Jersey, particularly dense urban settings, the configuration of a roadway network (including the layout of one- or two-way streets) can make bicycling to specific destinations and points within the network difficult. A contra-flow bicycle lane can help solve this problem by converting a one-way street into a two-way street for cyclists: one direction for motor vehicles and bicycles and the other for bicycles only. Contra-flow lanes should be separated with yellow center lane striping.

Design Standards

Dimensions of a contra-flow lane should follow the guidance of bicycle lanes (or buffered bicycle lanes where possible).

Applications and Use

- Bicycle lane word, symbol, and arrow markings (MUTCD Figure 9C-3) should be used to define the bicycle lane direction and designate space for cyclists.
- "One-Way" sign (MUTCD R6-1, R6-2) with "Except Bikes" plaque should be posted along the facility and at intersecting streets and driveways.
- "Do Not Enter" sign (MUTCD R5-1) with "Except Bikes" plaque should be posted along the facility to only permit use by bicycles.
- A solid double-yellow lane line marking should be used to demarcate the lane from opposing traffic.
- If sufficient space exists, a buffered bicycle lane design should be used.
- Contra-flow lanes are for use on one-way streets that provide more convenient connections for bicyclists where other routes are less desirable.
- Contra-flow lanes are less desirable on streets with frequent and/or high-volume driveways on the side with the proposed lane.
- Contra-flow bicycle lanes are typically used on one-way streets where:
  - There is already a high number of cyclists riding the wrong way
  - The contra-flow lane provides direct access to a major destination
  - The contra-flow lane provides a network connection that reduces the trip length and improves the convenience of cycling
  - The contra-flow lane provides an alternative to high speed or high volume roadways

Benefits

- Provide connectivity and access to bicyclists traveling in both directions
- Reduce dangerous wrong-way riding and the frequency of bicyclists riding on the sidewalk
- Reduce bicyclist trip distance while accommodating bicyclists on safer and less heavily traveled streets

Shared Lanes

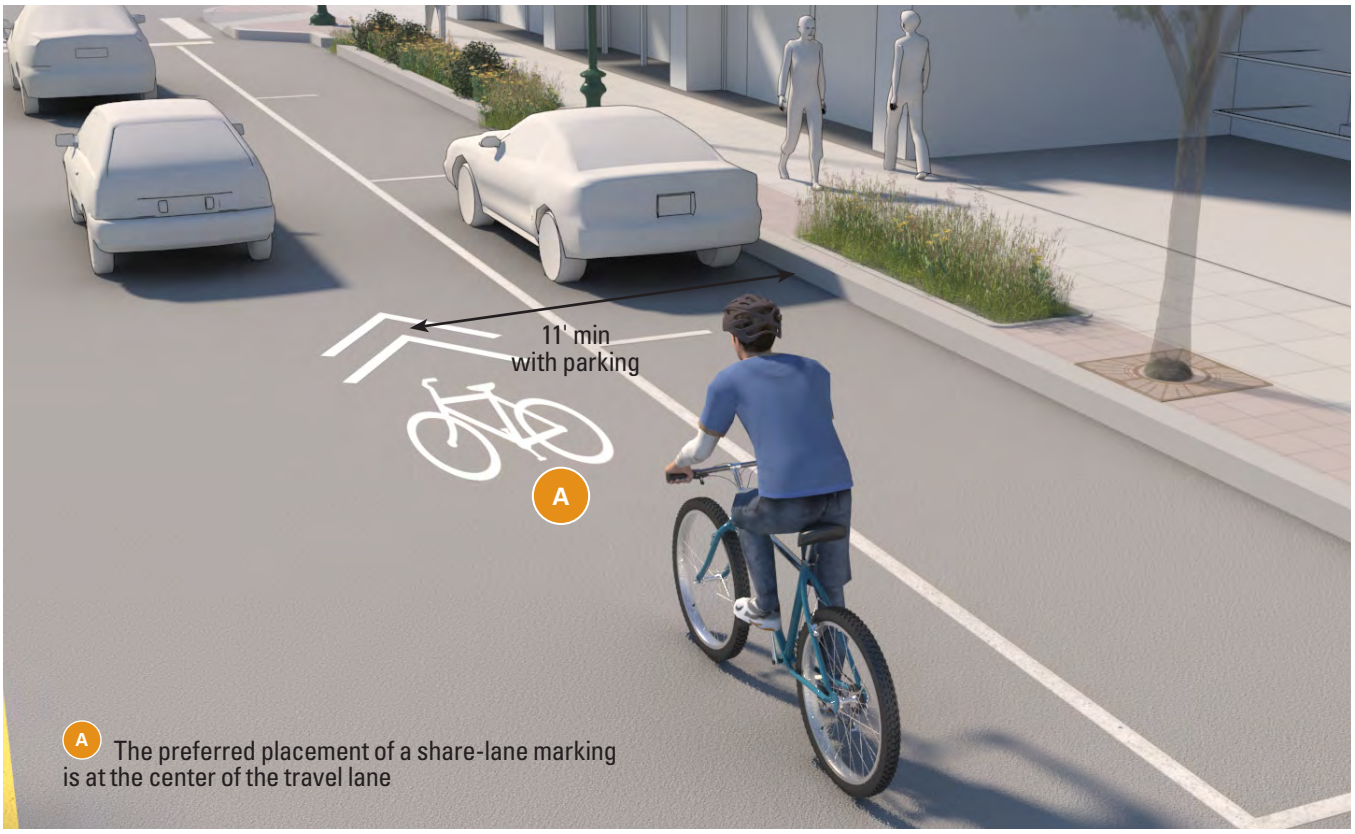
On roadways where it is not feasible or appropriate to provide dedicated bicycle facilities, shared-lane markings (also known as "sharrows") may be used to indicate a shared environment for bicycles and automobiles. Shared-lane markings should be used to connect and provide a designated route to dedicated bicycle facilities. A shared-lane marking is not a facility type but can be used to assert the legitimacy of bicyclists on the roadway and offer directional and wayfinding guidance. Shared-lane markings help direct bicyclists to ride in the most appropriate location on the roadway and provide motorists with visual cues to anticipate the presence of bicyclists.

Design Standards

- When adjacent to parking, shared-lane markings should be placed a minimum of 11 feet from the curb (4 feet without parking).
- The preferred placement of a shared-lane marking is at the center of the travel lane.

Applications and Use

- Shared-lane markings should only be used on streets with a posted speed of 25 mph or less and where traffic volumes are low enough that it is desirable for bicyclists to ride in traffic.
- Shared-lane markings should be used in conjunction with traffic-calming measures to encourage and reinforce appropriate vehicular speeds for shared-lane conditions.
- Shared-lane markings may be used at intersections where the roadway is too constrained for a continuous dedicated facility.
- Shared-lane markings are more appropriate on single-lane rather than multi-lane roadways.



A The preferred placement of a share-lane marking is at the center of the travel lane

Bicycle Boulevard

Bicycle boulevards are linear corridors of interconnected, traffic-calmed streets where bicyclists are afforded an enhanced level of safety and comfort. Many local streets that have existing low motorist travel speeds and volumes create the basic components of a safe and comfortable bicycling environment. These streets can be enhanced by a variety of design treatments that discourage high vehicle speeds and volumes to create a bicycle boulevard. Many of these treatments benefit not only bicyclists, but all users of the street by creating a safe and quiet environment.

Bicycle boulevard treatments include signs, pavement markings, and other traffic-calming measures to discourage through trips by motor vehicles while accommodating local access. Some bicycle boulevards also include links for bicyclists that are not open to vehicular through traffic.

Applications and Use

According to NACTO's *Urban Bikeway Design Guide*, streets developed as bicycle boulevards should have 85th percentile speeds at 25 mph or less (20 mph preferred). A variety of tools are available to help manage vehicle travel speeds and create a comfortable environment for bicyclists and pedestrians.

Toolkit

The following treatment types can be used (where applicable) to create a bicycle boulevard:

- Reduced speed limits
- Signage and markings
- Speed management
- Volume management

Reduced Speed Limits

Bicycle boulevards should have a maximum posted speed limit of 25 mph. Speed limits below 25 mph should be considered. Speed limit adjustments and signage alone may do little to reduce vehicle travel speeds and should be considered in conjunction with physical infrastructure improvements as a method for reducing vehicle travel speeds.

Signage and Markings

Signs and pavement markings are important elements of a bicycle boulevard. While signs and markings alone do not create a safe and effective environment, they indicate and reinforce the concept that a roadway/corridor is intended as a shared, slow street. The NACTO *Urban Bikeway Design Guide* provides additional guidance on sign and marking types and applications.

Speed Management

Speed management treatments aim to reduce motor vehicle speeds closer to those of bicyclists. Reducing vehicle speeds is a critical feature of the bicycle boulevard. Lower speeds improve the bicycling environment by reducing instances of vehicles overtaking bicyclists, enhancing the drivers' ability to see and react to bicyclists, and reducing the severity of crashes if they occur. Speed management treatments can be divided into two types: horizontal and vertical deflection. These treatments can be implemented individually or in combination to increase their effectiveness. Traffic-calming measures are also discussed in more detail on page 61.

Speed Management Techniques:

- Decrease motor vehicle speeds
- Decrease crash likelihood
- Decrease chances of injury resulting from crash
- Improve bicyclist comfort
- Benefit pedestrians and residents by reducing vehicle speeds
- Establish and reinforce bicycle priority on bicycle boulevard
- Provide an opportunity for landscaping and other community features such as benches, communal space, and artistic painted intersections, benefiting all roadway users and residents

Horizontal Deflection

Horizontal speed control devices are used to slow motorists by either visually narrowing the roadway or deflecting motorists through an artificial curve. Where possible, sufficient space should be provided for bicyclists to pass around the outside of the elements.

The following are examples of horizontal deflection:

- Curb extensions
- Chicanes
- Center islands
- Neighborhood traffic circles

Vertical Deflection

Vertical speed control measures are composed of wide, slight pavement elevations that self-enforce a slower speed for motorists. Narrow and abrupt speed bumps that are often used in private driveways and parking lots are not recommended for public streets and are hazardous to bicyclists.

The following are examples of vertical deflection:

- Speed humps
- Speed tables
- Speed cushions
- Raised crosswalk

Volume Management

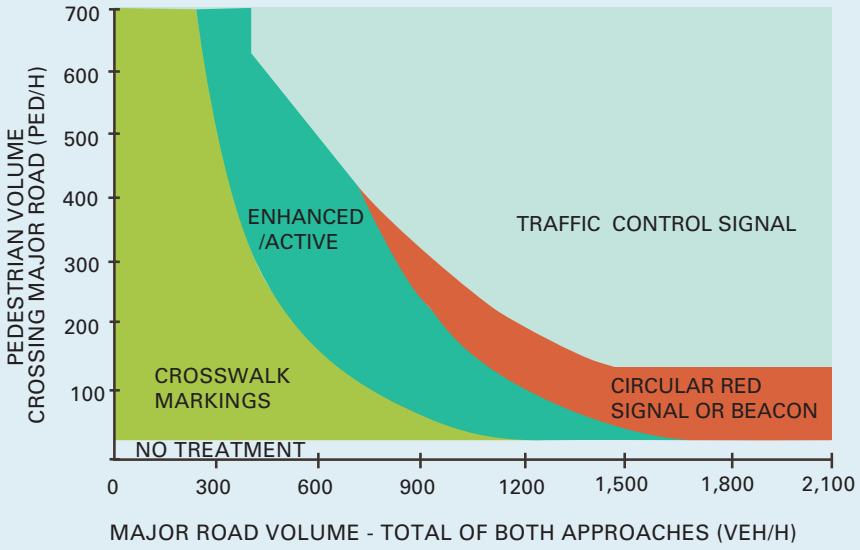
Volume management techniques reduce or discourage through traffic on designated bicycle boulevards by physically reconfiguring select intersections. Bicycle boulevards should be designed for motor vehicle volumes under 1,500 vehicles per day.

Volume management techniques include:

- **Forced Turn at Intersection**—Restriction on through movements for motor vehicles using signage. This can allow passage by buses and emergency vehicles but can lead to reduced compliance.
- **Channelized Right-In/Right-Out Island**—Forces motor vehicles to turn right while bicyclists can continue straight through.
- **Median Islands/Diverters**—Used to close one direction of traffic at an intersection while allowing full bicycle passage.

FHWA GUIDANCE ON BICYCLE BOULEVARDS

FHWA's guide, *Small Town and Rural Multimodal Networks,* provides robust guidance on the design and implementation of bicycle boulevards. The chart below, taken from the guide, is a helpful tool for deciding appropriate crossing treatments for a bicycle boulevard in a given context. The guide provides additional guidance for other contexts as well and should be used as a reference in a addition to professional judgment.



Example Guidelines for Pedestrian Crossing Treatments adapted from NCHRP 562 (Fig. A-5). Calculations assume 34 ft (10.4 m) Pavement, 35 mi/h 5 km/h), 3.5 ft/s (1.1 m/s) Walking Speed.

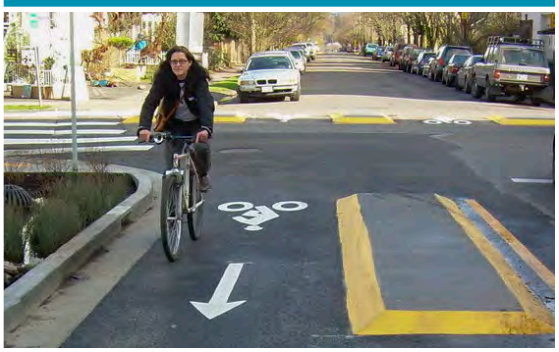
Credit: FHWA *Small Town and Rural Multimodal Networks*

Photos (clockwise)

Photosimulation of potential "shared-street" concept in Princeton, NJ creates more comfortable and usable space for all street users and encourages slower motor vehicle speeds

Traffic diverter in Portland, OR helps reduce motor vehicle volumes while accommodating bicycle access

The Haven Avenue Bicycle Boulevard in Ocean City, NJ uses curb extensions to slow motor vehicle traffic and medians to reduce volumes on many residential side streets



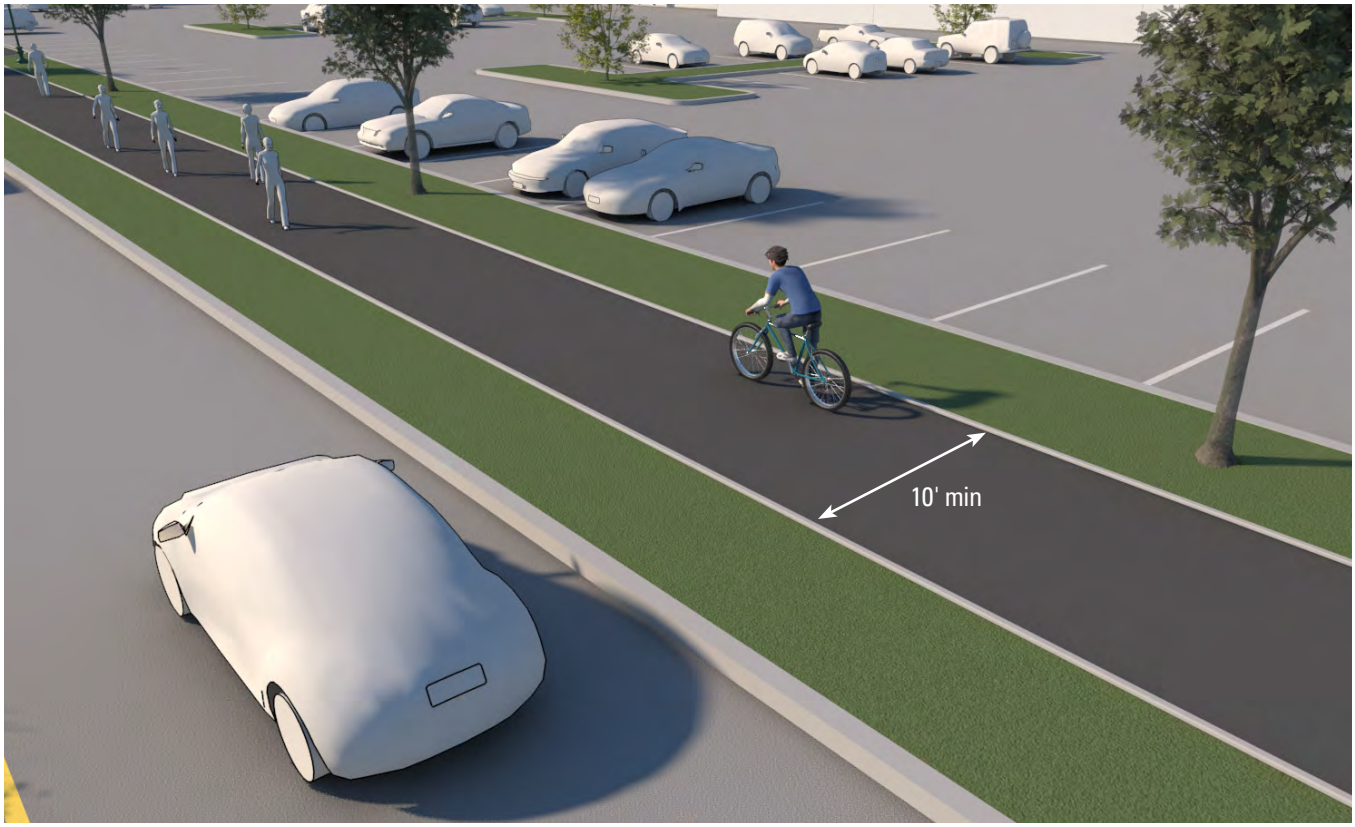
Shared-use Paths

Shared-use paths are bikeways that are distinctly separate from the roadway. Located outside of the cartway, they are separated physically from motorized traffic by either open space or a barrier. Shared-use paths are sometimes referred to as "trails." However, the term "trail" often refers to an unimproved recreational facility. Shared-use paths are designed to facilitate both utilitarian and recreational trips. Intended users may include bicyclists, pedestrians, roller skaters, skateboarders, and other non-motorized users.

Shared-use paths are typically designed for two-way travel. They can help provide low-stress bicycle accommodations in a variety of circumstances: a shortcut through residential neighborhoods, a commuting route from residential to commercial centers, a recreation route in a park or greenway, or as a side path along a roadway in lieu of (or in addition to) an on-road bicycle facility. Shared-use paths should be built as a system of off-road transportation routes that complements and enhances the on-road bicycle network.

Design Standards

- The minimum width for a shared-use path is 10 feet, although the recommended width differs based on the context, volume, and mix of users of a path. Typical shared-use paths range from 10 to 14 feet wide, with wider paths for higher-volume paths.
- A path may be reduced to an 8-foot width in certain circumstances:
  - For a short distance due to physical constraint
  - Where bicycle traffic is expected to be low
  - Where pedestrian use is not expected to be frequent
  - Where there are frequent passing opportunities
- Wider paths (11 to 14 feet) are advised where there are steep grades to provide additional passing area.



Applications and Use

- Using a sidewalk as a shared-use path is generally undesirable. Additionally, it is not appropriate to sign a sidewalk as a shared-use path if this prevents the use or development of preferable bicycle facilities. Sidewalks are not intended for use by bicycles. If there is an intention for bicyclists to ride along the same right-of-way used by pedestrians, the facility should be designed to accommodate bicycle use and follow the design guidelines for a shared-use path.
- Shared-use paths should generally receive priority at driveways and minor cross streets.
- At intersections and driveways, motorists might not expect bicyclists traveling at higher speeds. Signage and pavement markings should be used to indicate the potential presence of bicyclists and remind drivers to approach the intersection with caution.

Benefits

- Provides low-stress facility that accommodates multiple types of users
- Provides connections between important origins and destinations and increase bicycle network connectivity where roadway space or context might make implementation of an on-road bicycle facility infeasible
- Helps improve bicycle mode share for commuting and recreational trips

Accessibility

Because shared-use paths are designed for both bicyclist and pedestrian use, they fall under the accessibility requirements of the ADA and should be designed as fully accessible facilities. The United States Access Board provides guidelines for the design of accessible shared-use paths.

Further Guidance

- *Guide for the Development of Bicycle Facilities,* AASHTO

Gaps, Grates, and Other Openings

Wheelchair casters, bicycle wheels, and walking aids such as canes and crutches can get caught in grates and gaps. Grates should be placed within the furnishing zone away from the pedestrian travel area and away from the bottoms of curb ramps and crosswalks. Gaps and grate design should use the following guidance:

- Wheelchair casters, inline skating wheels, or bicycle wheels can get caught in openings and gaps wider than one-half inch. Therefore, gaps and grate openings should not allow the passage of a one-half-inch sphere
- The long dimension of the grate opening should be perpendicular or diagonal to the dominant direction of travel.

Older style drainage grates can be hazardous for bicyclists

Bicycle Level of Traffic Stress

Analysis tools and methodologies provide performance indicators to measure the quality of a transportation service or infrastructure. Recent research and development of newer metrics related to cycling recognize the need to provide a wider range of bicycle facilities types in order to accommodate the diversity of cyclists' needs, abilities, and experience levels.

The Bicycle Level of Traffic Stress (LTS) analysis is a tool used to quantify a cyclist's comfort level given the current conditions of the roadway. The LTS metric, developed by the Mineta Transportation Institute, is based on the Dutch concept of low-stress bicycle facilities, which has proven influential in the advancement of bicycle planning in the United States. Because different bicyclists have different tolerances for stress created by volume, speed, and proximity of automobile traffic, the LTS method identifies four levels of stress:

- **Level of Stress 1:** The level most users can tolerate (including children and seniors)
- **Level of Stress 2:** The level tolerated by most adults
- **Level of Stress 3:** The level tolerated by "enthusiastic" riders who might still prefer dedicated space
- **Level of Stress 4:** The level tolerated by the most experienced riders

In general, lower stress facilities have increased separation between cyclists and vehicular traffic and/or have lower speeds and lower traffic volumes. Higher stress environments generally involve cyclists riding in close proximity to traffic, multi-lane roadways, and higher speeds or traffic volumes.

Basis for Criteria

Extensive research into cycling behavior has made clear what many cyclists, and potential cyclists, might already know implicitly: most users do not feel comfortable sharing the road with motor vehicles when the prevailing speed of traffic is above 25 mph. High vehicle volumes add further complications to sharing the road, even at lower speeds. This discomfort manifests itself in a couple of ways. A street network built only to accommodate motor vehicles will discourage many bicyclists from riding, particularly if there are perceived barriers between the origin and the destination. Further, those who do choose to ride will typically be adults who feel more confident riding in mixed traffic, which often excludes the majority of the population.

Methodology

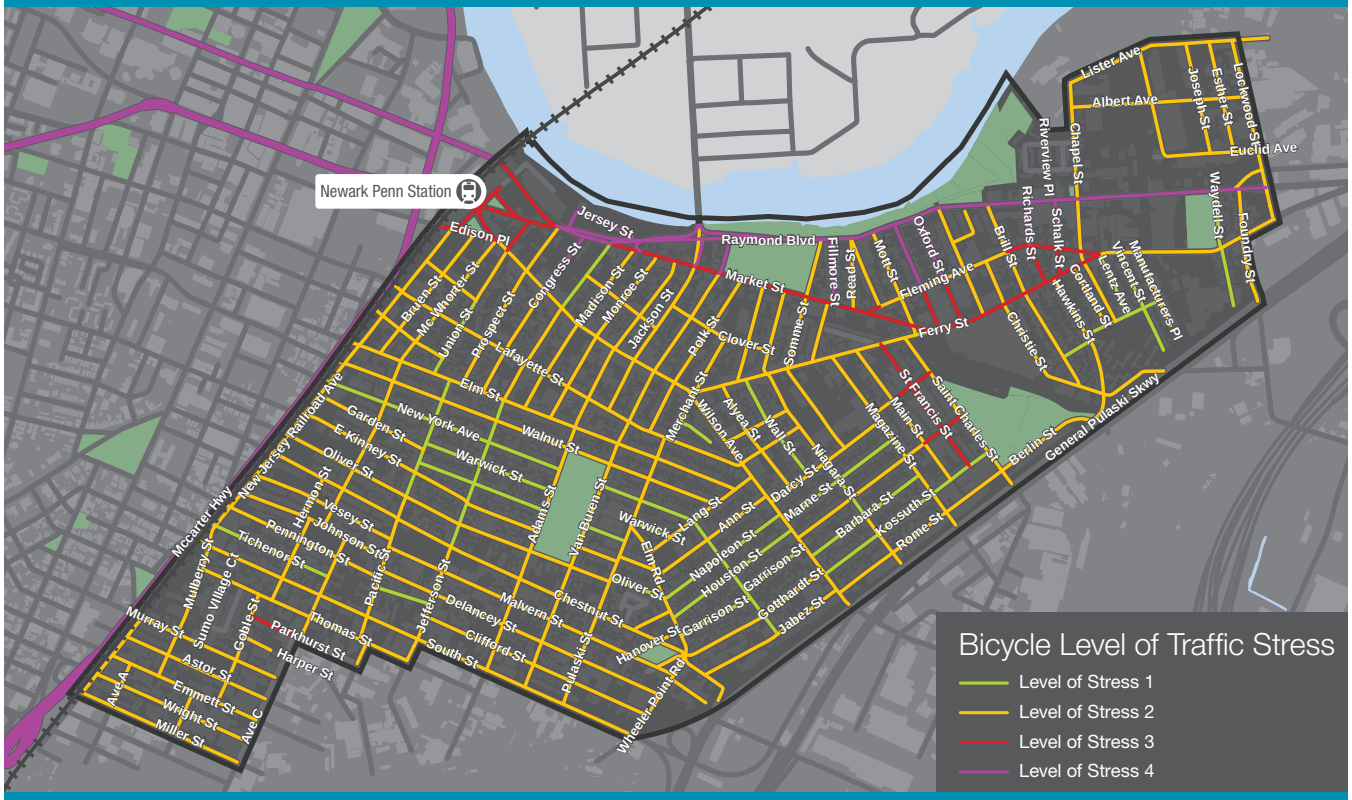
The LTS analysis is based on the Mineta Transportation Institute's research on low-stress bicycling and network connectivity. The LTS metric analyzes roadways in two ways: as segments between two points, and at intersections, where conditions often vary from the leading segment. For segments, roads are primarily rated based on their number of lanes and prevailing traffic speed. At intersections, stress level is determined based on the number and character of turning lanes, the presence or absence of traffic signals, and the level of stress of the roadway being crossed.

The intersection analysis is conducted because of the importance of connectivity in bicycle networks (and transportation networks in general). For many cyclists, a high stress intersection in a network can discourage them from riding or significantly limit the destinations and routes they feel comfortable biking to. When thought of in terms of automobiles, this principle becomes clearer. The vast majority of roadways accommodate automobile travel. If there were gaps in the roadway network where cars couldn't drive, the usefulness of the automobile would be severely limited. The same is true for bicycles.

Further Guidance

- *Low-Stress Bicycling and Network Connectivity,* Mineta Transportation Institute

Bicycle Level of Traffic Stress Map from the *Bike Ironbound: Bicycle Plan for the City of Newark*



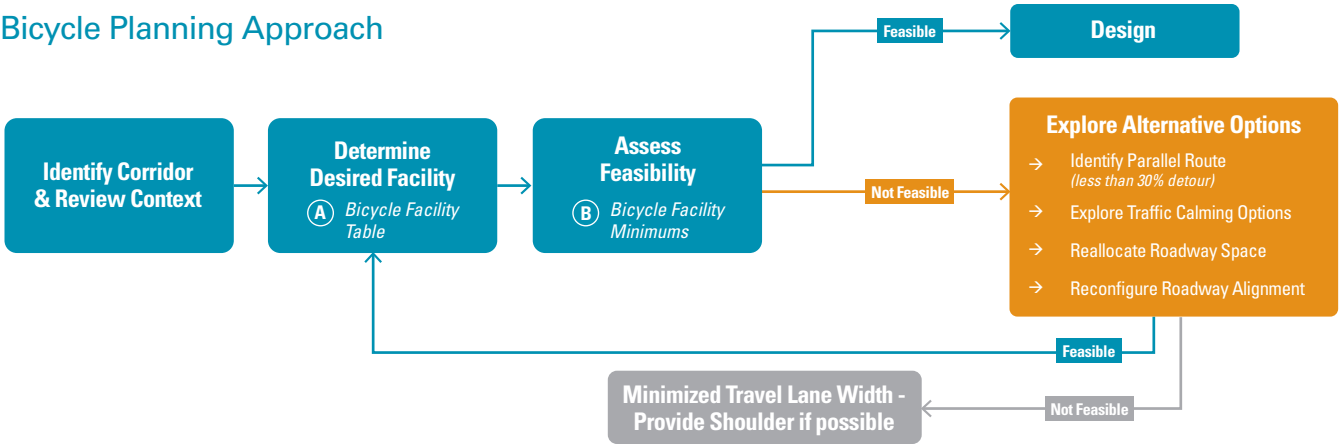
The Bicycle Level of Traffic Stress (LTS) Analysis was used as part of the *Bike Ironbound: Bicycle Plan for the City of Newark* to demonstrate barriers to comfortable and continuous bicycling in Newark's Ironbound neighborhood. The existing LTS is shown in the map above. The analysis was also run for the network assuming full implementation of the Plan's recommendations. This was useful to demonstrate the impact the recommendations would have on low-stress bicycle connectivity in the neighborhood.

Bikeway Selection Guidance

Selecting the appropriate bicycle facility is a process that requires an understanding of context, roadway characteristics, the types of cyclists expected to use the facility, and how the facility fits within the overall roadway and cycling network. The flow chart below outlines a basic bicycle planning approach for engineers and planners in New Jersey. The process requires the user to determine which bicycle facility is appropriate for the roadway using the Bicycle Facility Table.

The table below uses 85th percentile motor vehicle speeds (if not available, use posted speed) and average daily traffic to determine which bicycle facility is appropriate and comfortable for most adults (generally a bicycle level of traffic stress of 2 or better). Additional factors, such as truck volumes, should also be considered. Design options with lower speeds or greater separation are more attractive for most bicyclists. As with most design guidance, flexibility through professional judgment is essential in applying the guidelines.

Bicycle Planning Approach



A Bicycle Facility Table

ADT	85TH PERCENTILE SPEED[1]						
	≤ 20	25	30	35	40	45	≥50
≤ 2,500	A B C D E F	A[2] B C D E F	C D E F	C D E F	C D E F	D E F	F
2,500–5,000	B C D E F	B C D E F	C D E F	C D E F	D E F	D E F	F
5,000–10,000	B[3] C D E F	B[3] C D E F	C D E F	D E F	D E F	E F	F
10,000–15,000	D E F	D E F	D E F	D E F	E F	E F	F
≥15,000	D E F	D E F	D E F	E F	E F	F	F

A: Shared Street/Bicycle Boulevard **B:** Shared-lane Markings **C:** Bicycle Lane **D:** Buffered Bicycle Lane
E: Separated Bicycle Lane **F:** Shared-use Path

[1] If data not available, use posted speed
[2] Bicycle boulevards are preferred at speeds ≤25 mph
[3] Shared-lane markings are not a preferred treatment with truck percentages greater than 10%

B Bicycle Facility Minimums

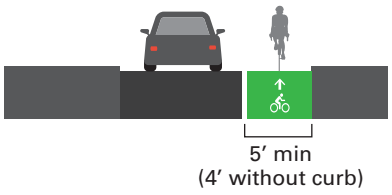
The following guidelines should be used to determine whether the selected facility can be implemented along a given corridor. More detailed guidance on these facilities is provided on pages 90-103 of this guide. The following considerations should be made in addition to the guidance provided below:

- General purpose travel lanes for motor vehicles in most contexts should be 10 to 11 feet wide.
- Shared-streets have no minimum width requirements.
- Shared-lane markings are not appropriate on multi-lane streets.
- Separated bicycle lanes can be striped at a different grade than street level and be considered "off-road."

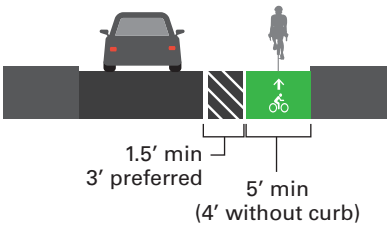
Further Guidance

- *Urban Bikeway Design Guide,* NACTO
- *Small Town and Rural Multimodal Networks,* FHWA

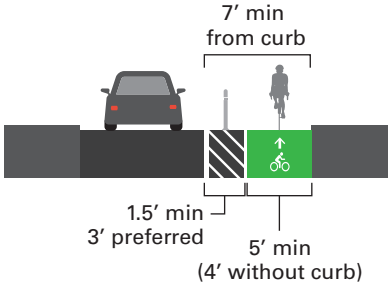
Bikeway Treatments and Minimum Requirements



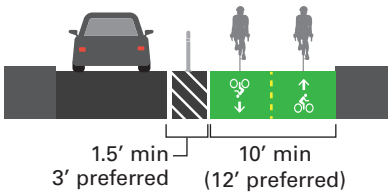
Standard Bicycle Lane



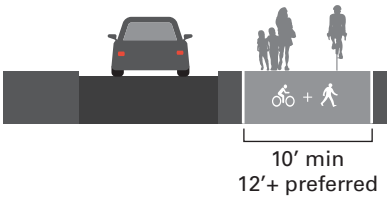
Buffered Bicycle Lane



One-way Separated Bicycle Lane



Two-way Separated Bicycle Lanes



Shared-use Path

Wayfinding

Pedestrian and bicycle wayfinding systems provide navigational aids that help pedestrians and bicyclists orient themselves within their surroundings and determine the best route to reach a destination. Wayfinding systems also help create a sense of place within a community or corridor, knitting it together through consistent treatments to help residents and visitors navigate between points of interest. Wayfinding signage should clearly identify the locations of key destinations, such as businesses, recreational areas, historical or cultural landmarks, bicycling routes, transit, and connections to nearby areas of interest.

Wayfinding systems can be designed and implemented formally by municipalities or business improvement districts. In many cases, walking and biking advocates have organized informal wayfinding systems to promote active transportation.

Signage should be flexible and fit its context and need. Types of wayfinding signage are shown in the graphic on the following page, including sidewalk signs with area maps, decision point signs at intersections showing directions and distances to nearby destinations, and bicycle route signs used to indicate where the cyclist is and directions/distances to other paths or destinations.

Wayfinding has many benefits for a community. By helping pedestrians and bicyclists overcome the hurdle of distance perception (where the time needed to walk or bike tends to be over-estimated), wayfinding can help encourage different transportation choices, including improving access to transit.

Many transit agencies have found that one of the simple, yet critical ways to increase transit ridership is to improve the communication of information to passengers. Real-time bus or rail information (on a smartphone, computer, or at a transit-stop) and improved route planning are among the ways that transit agencies have improved service and made transit a more attractive option. Similarly, a comprehensive wayfinding system for a bicycle network has many benefits that can help increase bicycle ridership, including the following:

- Familiarizes cyclists with the bicycle network
- Improves awareness of the bicycle network and the presence of bicyclists among motorists
- Identifies the preferred routes to key destinations
- Makes bicycling and the bicycle network more accessible and convenient for visitors and casual users
- Minimizes the tendency to overestimate the amount of time it takes to travel via bicycle by including information on mileage and/or travel time to destinations

A comprehensive and coordinated wayfinding system can contribute to a community's distinct identity while improving mobility for many different types of street users

Design Guidance

In order to be as effective as possible, a wayfinding system should be implemented in a consistent and deliberate manner. The following guidelines should be followed, when possible, when implementing or retrofitting a wayfinding system:

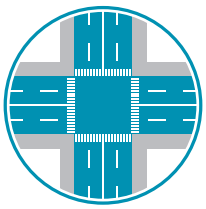
- Signage should maintain a clean, visible, and consistent design.
- Signs should be posted on both sides of the street or trail along major walking or bicycling routes.
- Maps should be oriented so that the direction the user is facing is at the top; indicate the orientation with the underlined phrase "You Are Here" where the pedestrian is within the map, and place an upward arrow under it.
- Distances should be defined by the time needed to reach them (e.g., "It's a 15-minute walk away" or circles encompassing destinations within a 5-, 10-, or 15-minute walk).
- A standard prioritization system should be used on maps to limit the number of landmarks identified.
- The facades of important landmarks should be illustrated on maps to help orient pedestrians.
- Indexes of major landmarks should be included.
- Public data should be made available to private organizations to develop smartphone applications ("apps") at no cost to governmental agencies. QR codes can be incorporated to improve information delivery and reduce visual clutter.

Further Guidance

- *Urban Bikeways Design Guide,* NACTO
- *Urban Street Design Guide,* NACTO

A well-designed intersection facilitates visibility and predictability for all users, reduces motor vehicle travel speeds, and makes complex movements feel safe and intuitive. An intersection should promote eye contact between all street users, allowing the street space to be effectively shared by pedestrians, drivers, and bicyclists.

Hoboken, NJ



INTERSECTIONS

Intersections are critical parts of the transportation network and streetscape. They are key decision points for all users as they navigate the street network and important activity nodes for community life as well as transportation. Intersections often account for the most serious and frequent conflicts between pedestrians, bicyclists, and drivers. Poorly designed intersections can dramatically reduce mobility and safety for all of these modes. However, a well-designed intersection can reduce crashes, improve mobility, enhance public spaces, and tap civic and economic potential.

A well-designed intersection facilitates visibility and predictability for all users, reduces motor vehicle travel speeds, and makes complex movements feel safe and intuitive. An intersection should promote eye contact between all street users, allowing the street space to be effectively shared by pedestrians, bicyclists, and drivers.

The strategies described in this section enable practitioners to build intersections that safely and effectively accommodate all users.

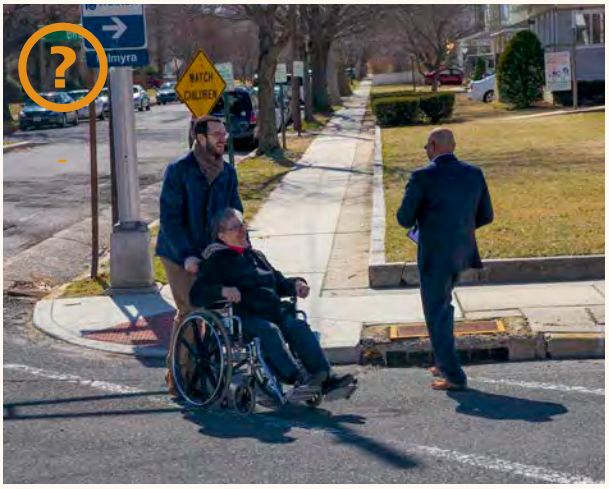
Accessible Intersections

Intersections can be very challenging or hazardous for those with disabilities or limited mobility. Improperly designed intersections have the potential of either putting people in harm's way as they try to cross the street or creating an impenetrable barrier that severely limits the mobility of many street users.

Small differences in design can have a large impact on the safety and usability of an intersection for users with various levels of mobility.

Many design decisions influence the accessibility of an intersection. Small differences in design can have a large impact on the safety and usability of an intersection for users with various levels of mobility. An improperly aligned curb ramp can lead a blind person into the middle of the street rather than the crosswalk. The lack of curb ramps or a moderate rise in the level between the ramp and street can prevent a wheelchair user from accessing the sidewalk or street. It is important to design intersections that at least meet the minimum standards for accessibility, but it is preferable to design intersections with the intention of maximizing the safety and accessibility of all roadway users.

The photos to the right show three intersections with varying degrees of accessibility. The intersection at the top, while not perfect, provides reasonable accessibility to all users with minimal sloped ramps that are oriented toward each crosswalk. The middle intersection provides an ADA-compliant curb ramp; however, there is only one ramp for the corner and it orients the user to neither crosswalk. The final intersection is not accessible for those with limited mobilities because there is no curb ramp provided.



Placemaking at Intersections

As the junction between people traveling along two or more streets, intersections are nodes of activity. Not only do they serve an important transportation function, but they often play an important role in community life as crossroads of social activity, commerce, and public space. Particularly in downtowns and along main streets, they are places for people to gather, interact, and enjoy. Intersections are also important for wayfinding. They are typically key waypoints in the transportation network as travelers navigate to their destinations, often featuring notable landmarks or public buildings. These functions should be reflected in intersection design to create a more pedestrian-friendly environment reflective of the context.

Design Guidance

Intersection design should reflect the multiple functions that an intersection can serve and the context that it lies within. The following placemaking and wayfinding strategies can be integrated into the design to create a more pedestrian-friendly environment:

- Reclaim space at intersections into the pedestrian realm by creating additional public space for people to gather and interact using such tools as curb extensions or reducing curb radii, which are discussed in more detail later in this chapter
- Create a more welcoming environment with street furniture, public art, planters, kiosks, pedestrian-scale lighting, parklets, or small plazas
- Define the space using street trees, buildings, art, or other features that help enclose the area
- Enhance access to public buildings or local amenities, such as libraries, post offices, schools, and businesses
- Integrate access to transit stops and bike share stations
- Provide wayfinding signage using a consistent theme for the community that identifies nearby destinations

This curb extension in Highland Park, NJ creates an "outdoor living room" where residents and visitors can relax or gather with friends

Gateways

Major intersections often serve as gateways within a community, delineating a change in community context or street typology, or serving as a de facto entrance to a downtown, historic district, or public square. For example, an intersection might mark a transition from a higher speed, auto-oriented context to a quiet residential street or to a denser, lower-speed, downtown environment with greater pedestrian activity. By alerting users of the change in character and context of the roadway, gateway treatments are intended to trigger and enforce a change in user behavior, such as for drivers to reduce speed or be aware of a higher level of pedestrian and bicyclist activity.

This proposed gateway treatment for Raymond Boulevard in Newark, NJ is intended to transition drivers entering from nearby highways to a slower, community-oriented speed

Design Guidance

Gateway treatments incorporate visual cues to alert users of a change in street typology or context. Strategies may include a variety of traffic calming, placemaking, and wayfinding tools, such as the following:

- Vertical cues can make a roadway feel more confined, triggering a higher state of alertness among users and a greater awareness of their surroundings. Tools include:
  - Massing and height of buildings near corners, such as for the gateway to a main street business district; building entrances facing the corners help frame the intersection
  - Unique, decorative signage welcoming users to a neighborhood or district, either at the curbside or an overhead banner
  - Specialty light fixtures
  - Prominent street trees near the intersection
  - Public art installations, such as sculptures or murals
  - Radar speed signs to highlight a change in speed limit
  - Raised crosswalk or raised intersection
  - Wayfinding kiosks, signage, or map displays
- Horizontal cues include a physical narrowing of the roadway or features of visual interest, such as a change in color or texture. Tools include:
  - High-visibility crosswalk striping or a unique crosswalk striping design distinctive of the district or neighborhood
  - Textured pavement or a painted intersection using a mural design representative of the district or neighborhood
  - Curb extensions to narrow the intersection

The visual cues used at the gateway should be context sensitive and reflect the surrounding neighborhood, street typology, and vernacular design. Features introduced at the gateway do not need to be restricted to the gateway itself and may also be incorporated into the streetscape design of the neighborhood and street typology, or appropriately scaled and used at subsequent, smaller intersections.

In addition to roadway intersections, trail crossings present the opportunity to create a gateway that achieves multiple purposes: a gateway entrance, an enhanced trail crossing, and traffic calming.

Corners and Curb Radii

Corner treatments and curb radii have a significant impact on the safety, operation, and comfort of an intersection for all modes of travel. Selection of an appropriate curb radius should reflect the context and needs of the typical users of the street and be based on an appropriate design speed and design vehicle (see **p. 60** and **p. 71**). A large curb radius allows vehicles to make a turn more quickly and makes it easier for truck movements, but this comes at the expense of a longer crossing and less comfortable environment for pedestrians. Conversely, a small curb radius shortens the pedestrian crossing, improves pedestrian visibility, and slows vehicular turning traffic but could impinge access for large vehicles. Smaller curb radii also enable designers to incorporate more public space into the pedestrian realm. This provides more room for pedestrians to wait at crossings; streetscape features; positioning of lighting, traffic signal equipment, or signage; and flexibility in design and location of ADA-compliant curb ramps.

The two key elements of curb radius design are the actual curb radius and the effective curb radius. Actual curb radius refers to the physical curve of the curb, while effective curb radius refers to the path that vehicles follow when making a turn. The effective curb radius is affected by the presence of other street elements, such as on-street parking, bicycle lanes, adjacent travel lanes, medians, and other features, which may increase the curvature of the path that a vehicle takes around a corner.

Designing curb radii for the largest vehicle and adjusting design when necessary is common practice in many communities. Instead, engineers and planners should default to designing curb radii to create shorter crossings for pedestrians and lower and safer turning speeds for vehicles. If large vehicles must be accommodated, designs should be modified off of that default.

Mountable curb in Portland, OR creates tighter curb radius and slower turning speeds for most vehicles while allowing larger vehicles to mount the curb and negotiate the turn

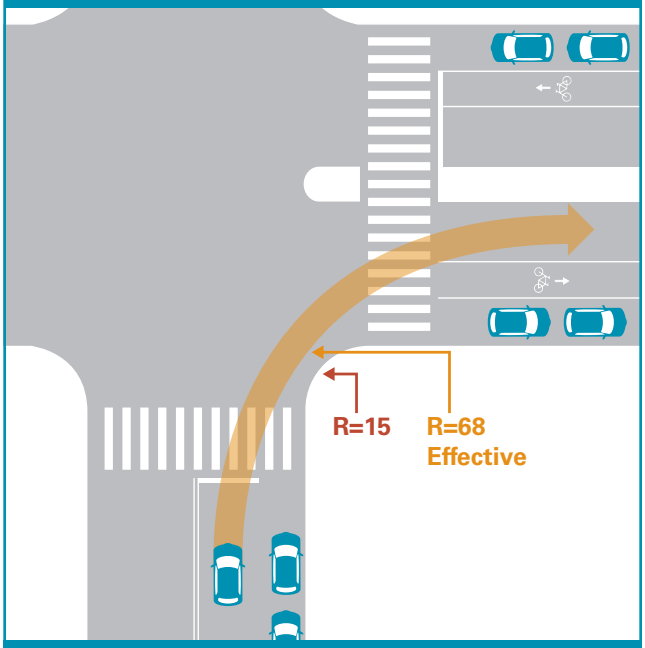
(Photo: Central Seattle Greenways)

Design Guidance

Design should seek to optimize the curb radii to best fit the context, allowing safe and practical operation by typical vehicles while also minimizing vehicular turning speed and maximizing pedestrian safety and comfort. Key concepts include the following:

- Minimize the actual curb radii in locations with higher densities, where there is more pedestrian activity, or where traffic calming is desired, such as downtown and residential environments
- Maintain an adequate effective curb radius to accommodate larger vehicles, as necessary, such as along bus routes or designated truck routes
- Select the smallest possible desired design vehicle, taking into account traffic volumes and how often larger vehicles are expected to access the street
- Include all roadway elements and geometry in the evaluation of the effective curb, such as the angle of the intersection, curb extensions, the number of receiving lanes, on-street parking, bicycle lanes, medians, the number of travel lanes, and lane width
- Implement a variety of mitigation measures to increase the effective curb radius, helping to balance the needs of pedestrians (desiring a small actual curb radius) with those of larger vehicles (desiring a larger effective curb radius), such as:
  - Integrate other features such as bicycle lanes or on-street parking into street design
  - Utilize an advanced stop bar adjacent to the receiving lanes
  - Prohibit parking at least 20 feet from an intersection to increases the effective turn radius for vehicles and to "daylight" the intersection to improve visibility for pedestrians, bicyclists, and drivers
  - Provide an apron on medians or mountable curbs to better accommodate large vehicles
  - Allow the use of adjacent travel lanes on multi-lane streets and use of the full street width on low volume, local roadways

Effective Turning Radius



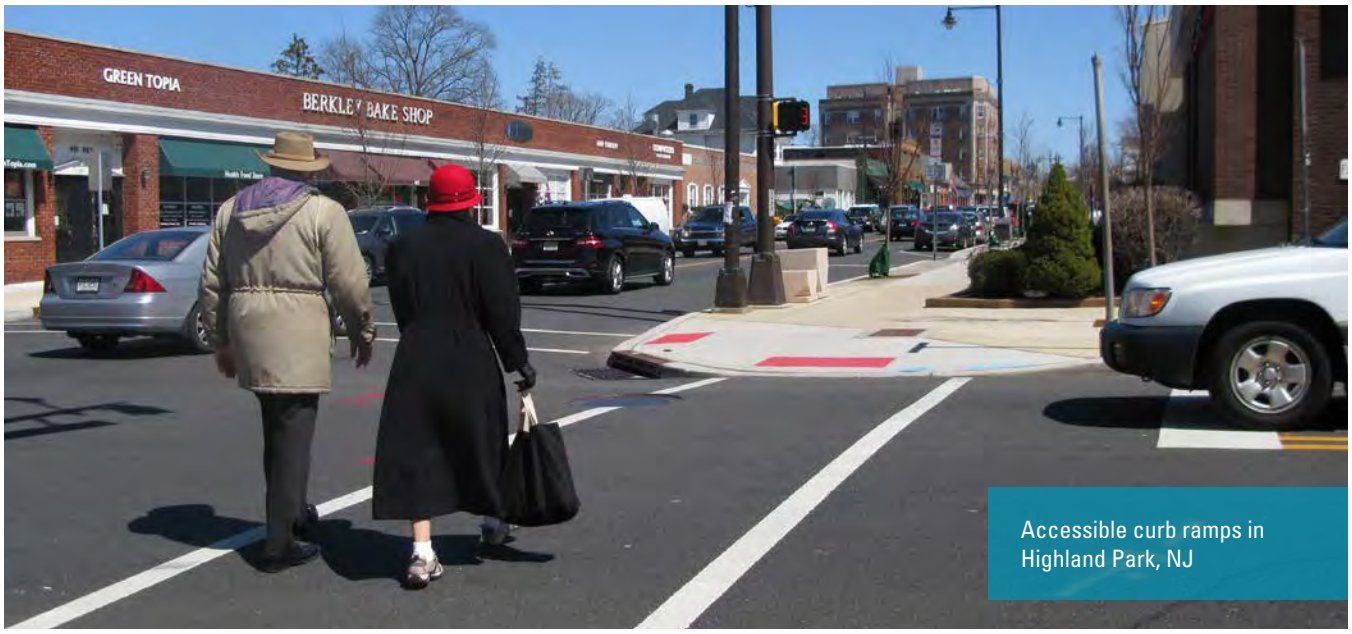
It is important for designers to account for the distinction between the corner radius and the effective turning radius. Curb radii are often designed based solely on the intersection geometry and overlook the effective radius, which is the result of the presence of on-street parking, bicycle lanes, the number of travel lanes, medians, and traffic control devices. As a result, curb radii are often larger than necessary and drivers routinely turn as wide as possible to maintain travel speeds.

Curb Ramps

ADA guidelines require appropriately designed curb ramps at all pedestrian crossings. Curb ramps are essential to provide easy access to crossings for pedestrians of all ages and abilities, benefiting not only those with mobility or visibility disabilities, but also children, seniors, or those with strollers, carts, bicycles, or delivery dollies. Curb ramps enable a smooth transition from the sidewalk level to street level at intersections and mid-block crossing locations.

Design Guidance

- Curb ramp placement should reflect the desired pedestrian path through an intersection.
- Directional curb ramps (i.e., typically two curb ramps per corner) are preferred over a single curb ramp located at the apex of the corner. The directional curb ramps provide direct access to their associated crossing along the pedestrian's direction of travel, whereas a single diagonal curb ramp attempts to accommodate pedestrians on different travel paths by opening toward the center of the intersection.
- Drainage design should prevent water and debris from accumulating at the bottom of a curb ramp.
- Drainage grates, utility access covers, and other appurtenances should not be placed on curb ramps, landings, or along the pedestrian crossing.
- Curb ramp width should generally be the same as that of the pedestrian zone on the sidewalk approach.
- Curb ramps must be designed to meet ADA requirements, including a:
  - Stable, firm, and slip-resistant surface
  - Detectable warning surface to alert the visually impaired of the transition from the sidewalk to the roadway that extends across the full width of the curb ramp and includes a series of raised, truncated domes in a high contrast color relative to the surrounding sidewalk
  - Maximum sidewalk cross slope of 2 percent
  - Maximum ramp slope of 8.33 percent
  - Maximum running slope of 5 percent along the crosswalk



Accessible curb ramps in Highland Park, NJ

Curb Ramps

According to Title II of the ADA, curb ramps are requirements for existing facilities as well as all new construction. For existing facilities, curb ramps must be included in transition plans. Curb ramps are critical to providing access between the sidewalk and the street for people who use wheelchairs or have limited mobility. Curb ramps are also essential for those with vision impairments who rely on the curb to identify the transition point between the sidewalk and the street. Curb ramps must be designed with special care to accommodate these two user groups.

An accessible connection between the sidewalk and the street can be provided through a variety of curb ramp designs. To maximize accessibility and safety for all pedestrians, curb ramp design should adhere to the following best practices:

- Provide a level maneuvering area or landing at the top of the curb ramp
- Clearly identify the boundary between the bottom of the curb ramp with a detectable warning surface
- Design ramp grades that are perpendicular to the curb
- Place the curb ramp within the marked crosswalk area
- Avoid changes of grade that exceed 11 percent over a 24-inch interval
- Design the ramp so that it does not require turning or maneuvering on the ramp surface
- Provide a curb ramp grade that can be easily distinguished from surrounding terrain; otherwise, use detectable warning surfaces
- Design the ramp with a grade of 7.1 +/- 1.2 percent. Do not exceed 8.33 percent (1:12)
- Design the ramp and gutter with a cross slope of 2.0 percent
- Provide adequate drainage to prevent the accumulation of water or debris on or at the bottom of the ramp; do not place gutter at bottom of ramp
- Make transitions from ramps to street flush and free of level changes
- Align the curb ramp with the crosswalk so there is a straight path of travel from the top of the ramp to the center of the roadway to the curb ramp on the other side
- Provide clearly defined and easily identified edges or transitions on both sides of the ramp to contrast with the sidewalk

Further Guidance

- https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/pdf/08chapter7.pdf
- http://www.ada.gov/pcatoolkit/app1curbramps.pdf
- https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/guidance-and-research/accessible-public-rights-of-way-planning-and-design-for-alterations/chapter-6%E2%80%94curb-ramp-examples

DETECTABLE WARNING SURFACES

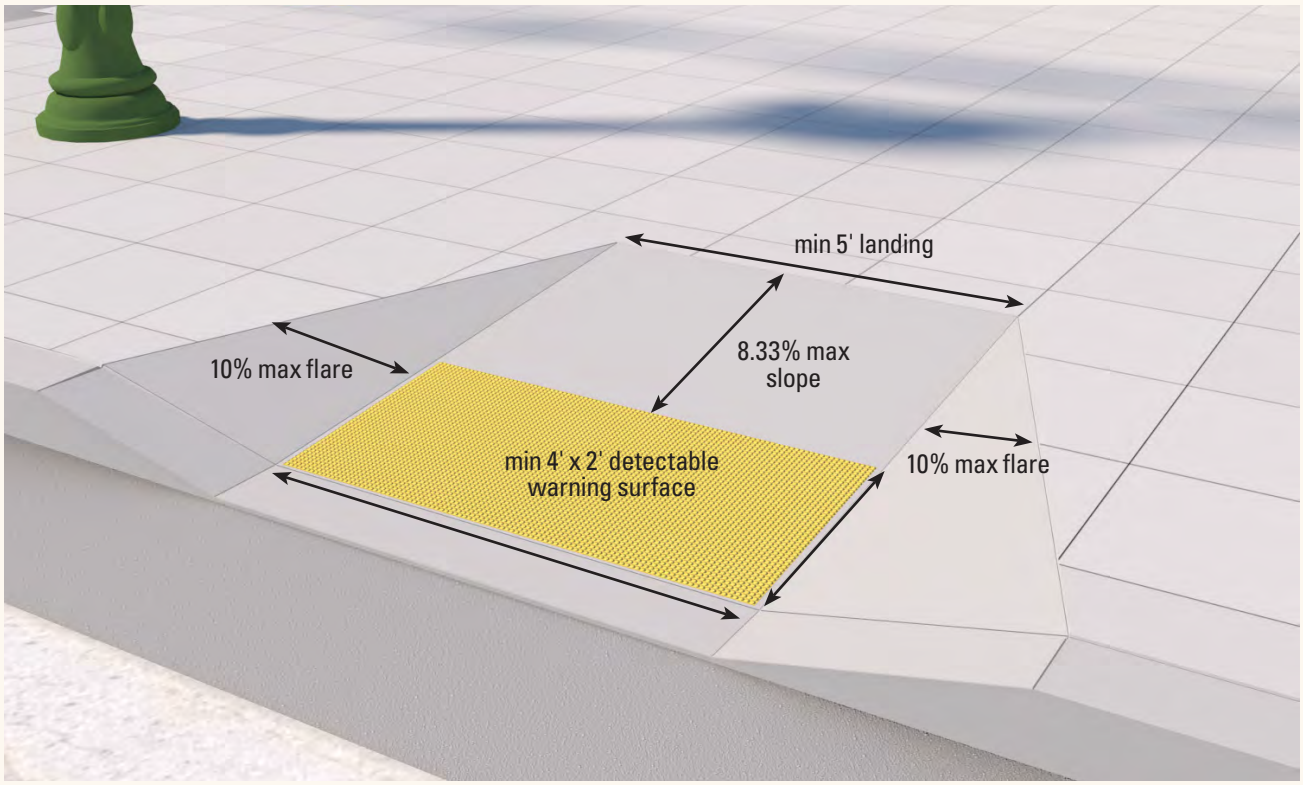
A detectable warning surface is defined in ADAAG Section 3.5 as, "a standardize surface feature built in or applied to walking surfaces or other elements to warn visually impaired people of hazards on a circulation path" (ADAAG, U.S. Access Board, 1991). Research shows that detectable warning surfaces designed according to ADAAG are highly detectable by people with visual impairments, and their guidelines should be followed. According to ADAAG, detectable warnings should consist of raised truncated domes with a:

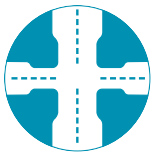
- Bottom diameter of 0.9 inch
- Top diameter of 0.4 inch
- Height of 0.2 inch
- Center-to-center spacing of 2.35 inches
- Visual contrast

Further Guidance

More information on detectable warning surface design can be found in Chapter 6 of the FHWA guide *Designing Sidewalks and Trails for Access Part II of II: Best Practices Design Guide* (pages 6-05 to 6-11).

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/pdf/07chapter6.pdf





Curb Extensions

Curb extensions, also referred to as bulb-outs or bump-outs, can improve the quality and safety of the pedestrian environment at intersections. As denoted by its name, curb extensions extend the curb line and sidewalk into the roadway, expanding the pedestrian realm. Use of curb extensions is often referred to as "daylighting" an intersection due to the significant improvement in visibility at the intersection. Curb extensions have a variety of benefits, including improving visibility for pedestrians and drivers, reducing the pedestrian crossing distance, calming traffic, and shielding on-street parking at intersection approaches. They also expand the pedestrian realm, providing more opportunities for public space, such as street furniture, as well as more flexibility in placement of curb ramps, lighting, traffic signal control equipment, and signage. Curb extensions are also an opportunity to incorporate green stormwater treatments, such as rain gardens, as well as bicycle parking.

Curb Ramp Drainage

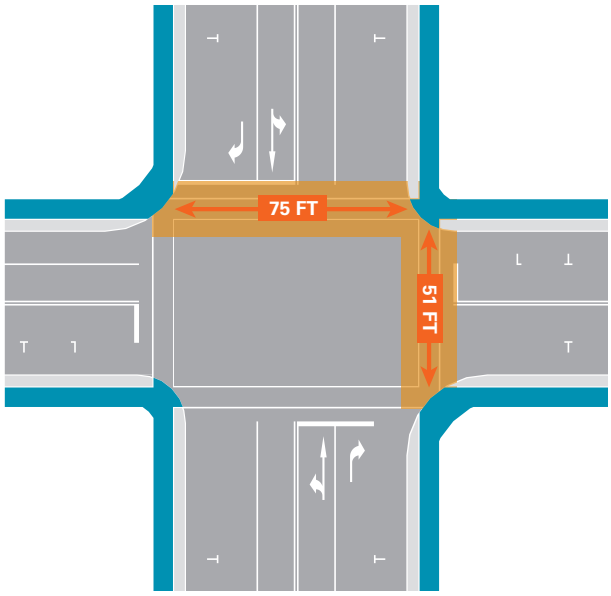
Poor drainage at the bottom of a curb ramp can be a nuisance for all pedestrians but is particularly problematic for those who cannot avoid the area. When the water dries up, debris often remains at the base of the ramp, further impeding access. In cold weather, water can turn to ice or slush creating a more hazardous situation.

Because many drainage systems focus on channeling water to the corner of the street, care should be taken when developing the grading plan to ensure that drainage of the sidewalk is directed across and down toward the bottom of a curb ramp and then away from the curb ramp. A grading plan should specify:

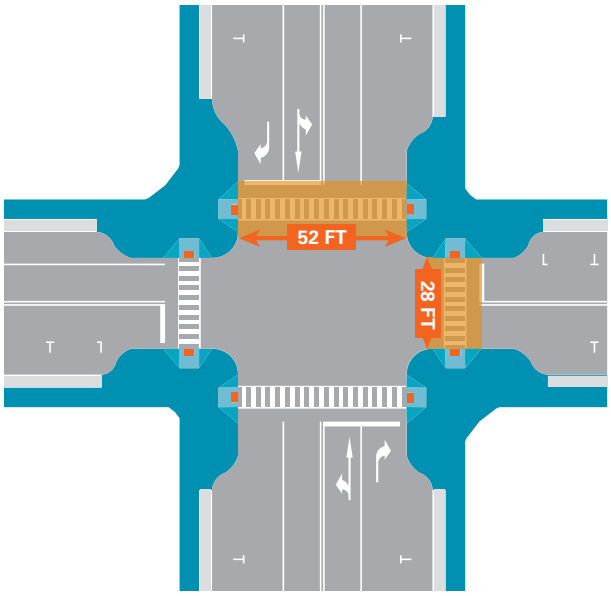
- Dimensioned distances, elevations, and inlet/catch basin locations
- Curb/gutter elevation (the ends, center, and quarter points are normally needed in each curve)
- Sidewalk, pavement, ramp, and gutter slopes

Drainage grates should be located adjacent to the uphill side of the curb ramp and not the bottom of the ramp. Gutter slopes should be designed specifically to guide water away from the bottom of the ramp. Maintenance programs should be established to periodically remove gutter debris.

Curb Extension—Before



Curb Extension—After



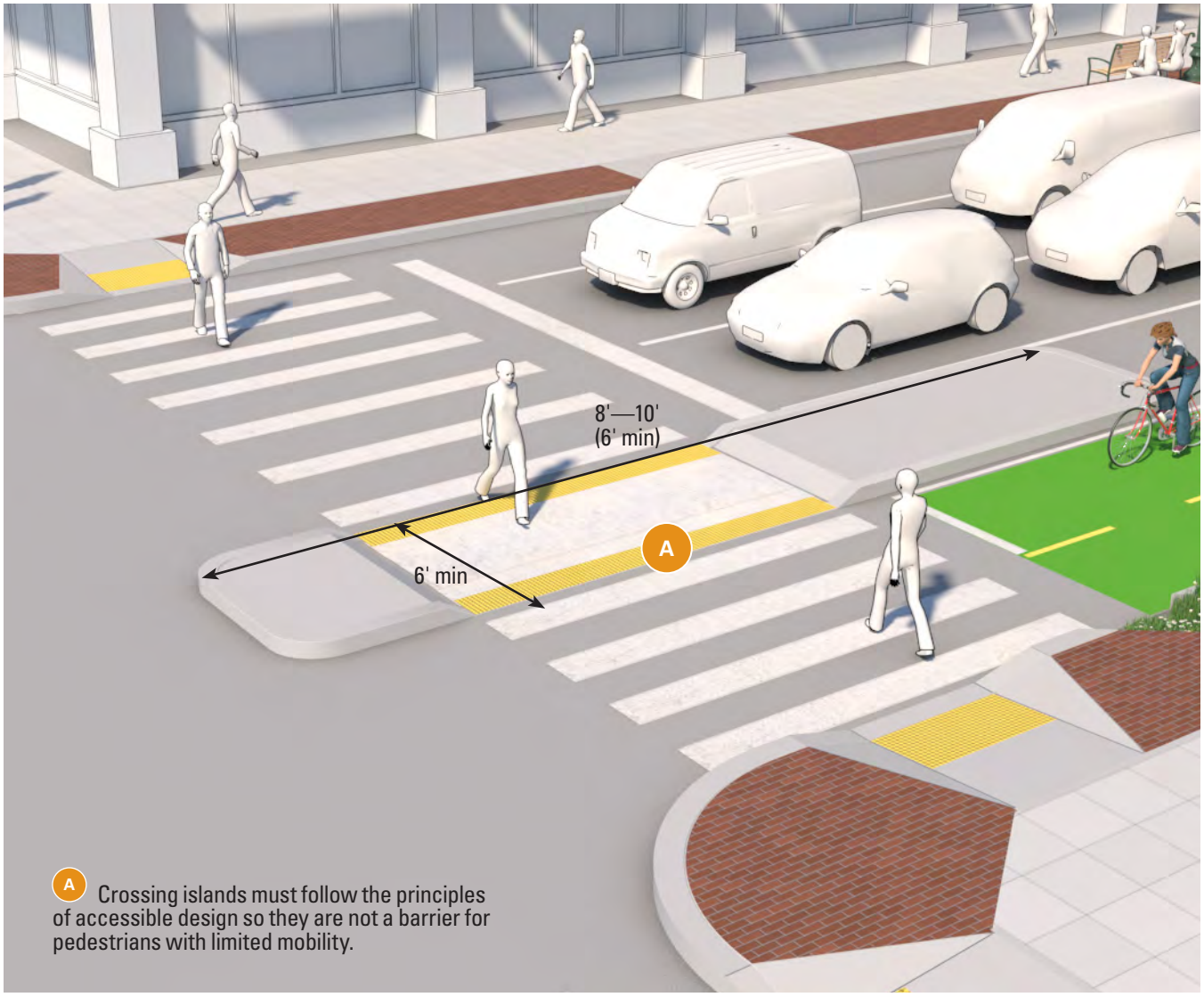
Curb extensions improve visibility for pedestrians and drivers, reduce the pedestrian crossing distance, calm traffic, and shield on-street parking at intersection approaches. In the above example, the addition of curb extensions shortens pedestrian crossing distances from 75 feet to 52 feet in one direction and 51 feet to 28 feet in the other direction without reducing the number of travel lanes.

Design Guidance

- Curb extensions are typically used at intersections or mid-block locations on streets with on-street parking.
- Curb extensions are well-suited for areas with significant pedestrian activity, wide intersections, intersections with high traffic volumes and/or speeds, or near schools or pedestrian routes to other major destinations.
- Curb extensions should not extend into the travel lane or bicycle lane.
- There is no prescribed width for curb extensions, but typically they extend the width of a parked vehicle, approximately 6 feet. The selected width is intended to achieve an effective curb radius that is compatible with the context and the street's desired design speed and design vehicle.
- The minimum length of a curb extension is the width of the crosswalk (minimum of 6 feet). The designer should consider extending the length to 20 feet—the minimum setback for on-street parking near an intersection (per the MUTCD).
- The designer should consider the impact of curb extensions on the effective curb radius and, particularly, potential impacts to larger turning vehicles. A narrower curb extension width may be used, as needed, to reduce the impact.

Crossing Islands

Crossing islands, or pedestrian refuge islands, are a means to calm traffic and improve pedestrian safety. They enable pedestrians to make a crossing in two stages—crossing one direction of vehicular travel lanes, pausing at the island, and then completing the crossing. This reduces the exposure time of pedestrians to vehicular traffic.



A Crossing islands must follow the principles of accessible design so they are not a barrier for pedestrians with limited mobility.

Medians

Medians separate traffic flows heading in opposite directions. Medians can be used to provide pedestrians refuge while crossing the road. At wide intersections, medians can help people with slower walking speeds cross the street safely. Medians can also serve as traffic-calming devices and green space.

Medians should be raised to separate pedestrian and motorists but must follow the principles of accessible design so they are not a barrier for pedestrians with limited mobility, people in wheelchairs, and people with strollers. Raised medians should be designed with a cut-through at street level or a ramp. Detectable warning surfaces should be placed at the edge of both ends of the median in order for the street to be recognized by the visually impaired. If the corner includes a pedestrian-actuated control device, one should also be located at the median.

If the median is ramped, the slope of the ramps must not exceed 8.33 percent. Additionally, a level area at least 36 inches wide and 48 inches long is required (60 inches by 60 inches is preferred). If a raised median has a cut-through level with the street, it should be at least 36 inches wide and 48 inches long (60-inch width preferred). The median width should be at least 72 inches for pedestrian safety.

Design Guidance

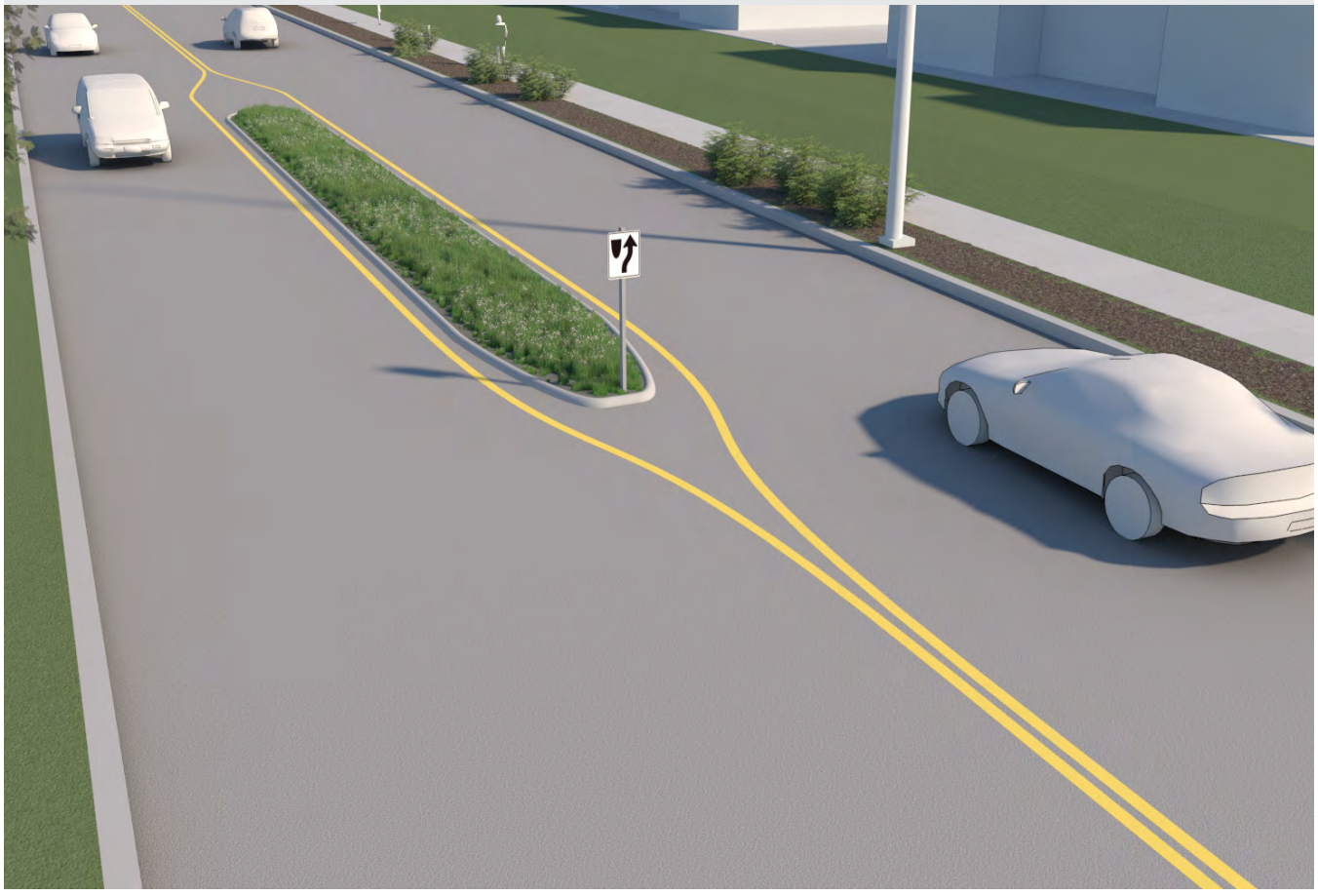
- Crossing islands are typically in locations where pedestrian crossings feel unsafe because of exposure to vehicular traffic. This often occurs on multi-lane roadways, where pedestrians must cross more than three lanes of traffic, and/or on roadways with high traffic volumes or speeds.
- Crossing islands may be used at intersections or mid-block pedestrian crossings.
- Where intersections require slip lanes to accommodate turning vehicles, either because of geometry or operational issues, the resulting "pork chop" islands should be designed as pedestrian crossing islands.
- Roadways with an existing median space provide an opportunity to retrofit the median as a crossing island.
- Crossing islands must meet ADA requirements for pedestrian access.
- Crossing islands should be a minimum of 6 feet wide, with a preferred width of 8 to 10 feet, and a minimum of 6 feet long.
- Crossing islands should have a "nose" that extends beyond the crossing to protect pedestrians from turning vehicular traffic.
- Impacts to the effective curb radius for turning vehicles and the street design vehicle should be considered.

Splitter Islands

Similar to crossing islands, splitter islands provide a means to calm traffic and more formally separate vehicle movements. They provide a raised median or barrier that reduces the effective curb radius and prevents turning vehicles from "cutting the corner" and encroaching into an oncoming travel lane as they complete a turn. Unlike crossing islands, splitter islands are not wide enough to accommodate a pedestrian refuge area.

Design Guidance

- Splitter islands are used only where the available cartway width is insufficient to provide a full crossing island with a pedestrian refuge.
- Splitter islands are used to separate vehicle lanes at roundabouts or where the intersection design requires a slip lane to accommodate turning vehicles.
- Impacts to the effective curb radius for turning vehicles and the street design vehicle should be considered.



Raised Crossings and Intersections

Raised crossings prioritize pedestrian movement through an intersection or mid-block crossing. They improve the visibility of pedestrians and force vehicular traffic to slow down as they pass through the crossing. They also increase the rate at which motorists comply with the "stop for pedestrians law." Raised crossings may be implemented for an individual crossing or expanded to cover an entire intersection to create a wide public space level with the sidewalk.

Design Guidance

- Raised crossings and intersections should be flush with the sidewalk.
- ADA-requirements must be followed for pedestrian access.
- Vertical deflection should be gradual, following similar design guidance as a speed hump.
- Raised crossings and intersections calm traffic and are typically applied on minor streets with access to major pedestrian destinations, such as routes to school.

Highlands, NJ

Roundabouts

The modern roundabout has been gaining in popularity in the past decade and offers an alternative to a traditional signal- or stop-controlled intersection design. The modern roundabout differs significantly from its predecessor, the traffic circle. Unlike a traffic circle, the modern roundabout is designed with a much smaller diameter and yield control on all entries, leading to a reduction in vehicular speed and significant safety and operational improvements.

Compared to a traditional four-way intersection, roundabouts reduce the total number of vehicle conflicts points by 75 percent and eliminate conflicts with crossing traffic, which are often associated with more severe crashes. As a result, roundabouts generally have a lower number of crashes and lower injury crash rate for motor vehicle occupants. However, consideration must be given to accommodations for bicyclists and pedestrians, as they are often involved in a relatively higher proportion of injury crashes compared to other intersection designs.

Roundabouts can also improve the operation of the roadway. Since vehicles do not need to come to a complete stop at a roundabout, vehicles typically experience less delay than other intersection designs, particularly at off-peak times. All approaches have equal priority in roundabout design, as all vehicles must yield to traffic when entering the roundabout. Therefore, it is also important to consider the comparative volumes on each approach and the potential undesired delay for the major movements.

In addition to safety and operational improvements, other benefits associated with roundabouts include:

Operation and maintenance costs: Roundabouts do not have as many on-going maintenance costs compared to signalized intersections. Roundabouts typically have a service life of 25 years, compared to 10 years for a signalized intersection.

Traffic calming: By requiring all approaches to yield, a roundabout or series of roundabouts can have a traffic-calming effect on a street network

Aesthetics: The central island of a roundabout provides opportunities to create signature entries or centerpieces of a community.

Environment: The reduction in vehicle delay and the number and duration of vehicle stops have a positive impact on fuel consumption, carbon dioxide emissions, and noise and air quality impacts.

Spatial Requirements: The spatial advantages and disadvantages of a roundabout vary by the alternative intersection design. While roundabouts generally require more land area than a typical four-way stop-controlled intersection, they can be more space-efficient than intersections with jug-handles, highway interchanges with large infield areas, or signalized intersections with several turn lanes on multiple approaches.

Roundabouts can be scaled to fit a wide range of contexts and street typologies. Mini-roundabouts and neighborhood traffic circles can be used on local residential streets to provide traffic calming and efficient vehicle flow; urban compact roundabouts can balance efficient vehicle flow with the needs of bicyclists and pedestrians; and multi-lane urban and rural roundabouts can provide safe and efficient operation on higher-volume streets.

Design Guidance

Roundabout design should create conditions that reduce vehicle speed and provide a consistent speed into, through, and out of the roundabout. Lower speeds reduce crash frequency and severity for all roadway users, allow safer and easier merging of traffic, provide more reaction time for drivers, and make the facility more accessible for novice users. The diameter chosen for the roundabout must balance safety with the capacity demand of the intersection. Maximum entry design speeds range from 15 mph for mini-roundabouts to 30 mph for a rural double-lane roundabout.

Design considerations include the following:

- Design entry points that require vehicles to deflect around the central island. Entry points that enable a path tangent to the central island support faster vehicle speeds.
- Provide pedestrian crossings at all approaches. Raised crossing islands with high-visibility striping at each approach create a more comfortable crossing for pedestrians, reduce vehicle speeds, and improve driver awareness of pedestrians as they enter/exit the roundabout. Pedestrian crossings should generally be located one car length from the roundabout entry/exit point, which both minimizes vehicular speed and improves pedestrian visibility at the crossing point.
- Minimize vehicle speed to allow more comfortable navigation of the roundabout by bicyclists. On larger roundabouts or multi-lane roundabouts, deflect bicycle routes to a shared-use path around the perimeter of the roundabout to allow bicyclists to navigate the roundabout as pedestrians. This provides separation from vehicular traffic, creates a more comfortable environment for most bicyclists, and enables them to use the pedestrian crossings.
- Provide truck aprons to accommodate freight traffic and emergency vehicles on roundabouts with a smaller diameter and/or on designated truck routes.
- If the roundabout is on a transit route, ensure that the design comfortably accommodates operation of the transit vehicle without the need to use the truck apron.

Further Guidance

- FHWA's *Roundabouts: An Informational Guide*

Channelized Right-Turn Lane

Channelized right-turn lanes, also referred to as slip lanes, facilitate right-turn movements for motorists. They may be necessary to enable right turns when the intersection geometry would otherwise make the turn infeasible, such as an acute angle. Channelized right-turn lanes can also be used to improve the operation of an intersection for motorists, particularly where there is a high volume of right-turn movements.

By widening the intersection and enabling higher turning speeds, channelized right-turn lanes generally create a less inviting environment for bicyclist and pedestrians. They are therefore best suited for contexts that need to prioritize truck movements and auto-centric corridors, and should be avoided in areas with higher levels of bicycle and pedestrian activity. The drawbacks of channelized right-turn islands, however, can be mitigated through proper design, including minimizing curb radii and integrating pedestrian refuge islands into the turn island.

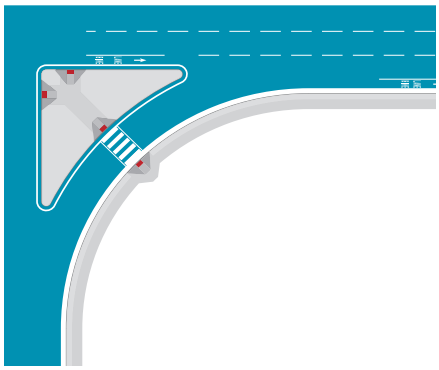
Design Guidance

- Channelized right-turn lanes are most appropriate where:
  - Geometric constraints make right turns difficult, such as an acute angle intersection
  - There is high demand for right-turn movements, particularly by large vehicles
- Channelized right-turn lanes should be avoided in areas with high levels of bicycle and pedestrian activity, such as downtowns, mixed-use areas, and residential neighborhoods
- Design features:
  - Minimize the angle at which the right-turn lane intersects the cross street (e.g., 110 degrees)
  - Minimize the curb radius (depending on the design vehicle) to slow vehicle speeds and improve visibility
  - Minimize the width of the turn lane using edge and gore striping to narrow the perceived roadway width while still accommodating larger vehicles, if necessary
  - Locate the crosswalk one car length back from the curb line
  - Orient the crosswalk perpendicular to the flow of traffic
  - Design the turn island as a pedestrian crossing island
  - Do not provide an acceleration lane coming out of the turn which encourages motorists to take the turn quickly and not stop or yield at the intersection

Channelized Right Turns

Where channelized right turns are necessary, they should be designed to slow driver turning speed and improve visibility of pedestrians, bicyclists, and on-coming motor vehicle traffic for the turning driver.

Before



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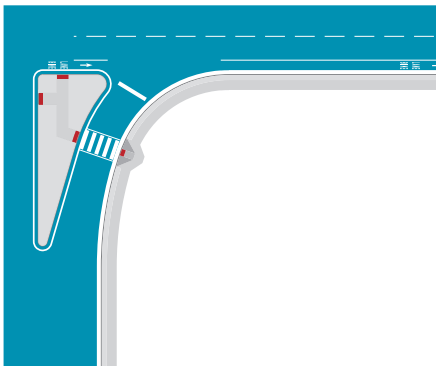
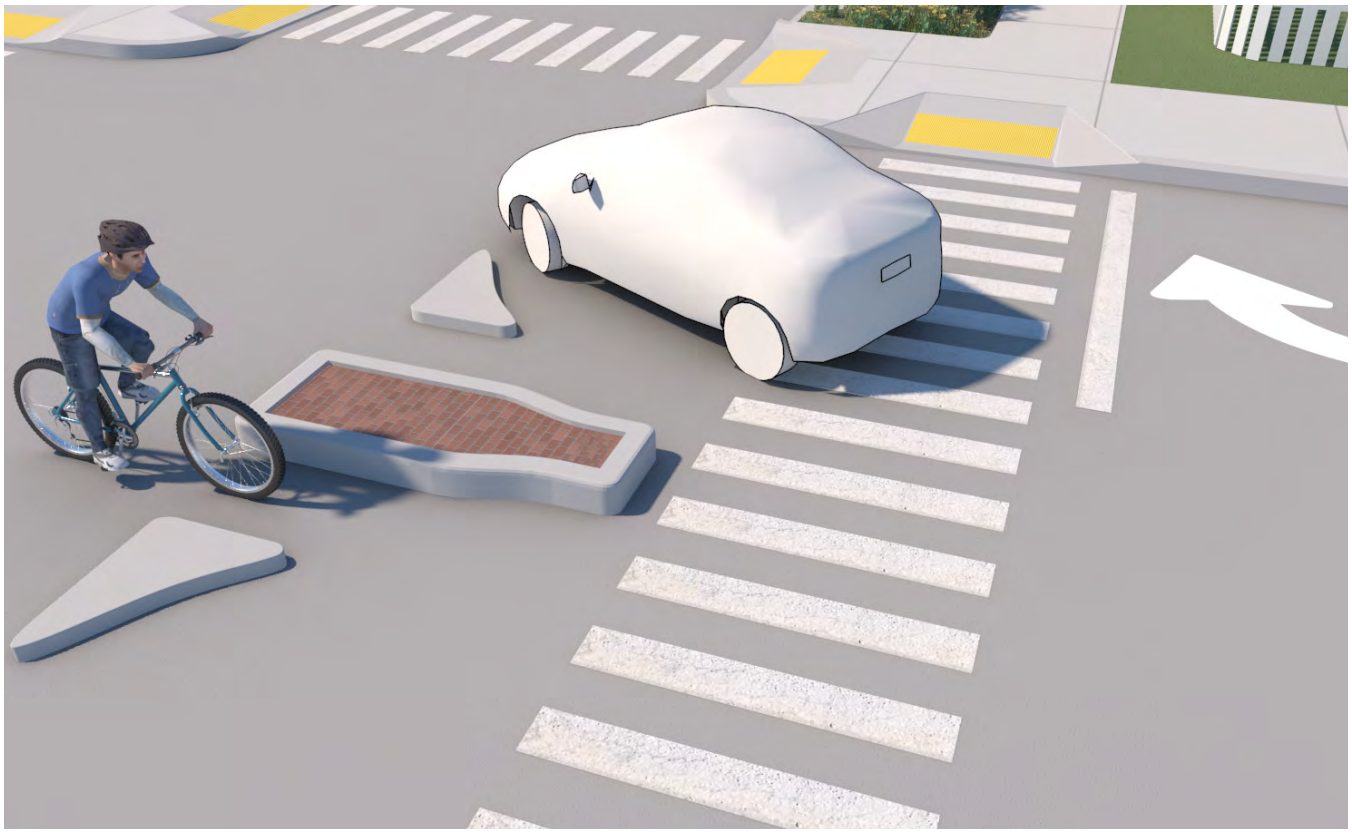


Diverters

Diverters are a tool for traffic volume management. They are used to restrict the movement of vehicles onto a given street and deter its use as a "cut through" by regional traffic. Diverters reduce traffic volumes and speeds, creating a friendlier environment for bicyclists and pedestrians. Diverters can take a variety of forms, such as curb extensions, medians, or islands.

Design Guidance

- Diverters may prohibit through traffic or a particular turning movement.
- Implementation of a diverter should be part of a larger strategy for traffic calming and traffic routing.
- Diverters should restrict vehicular movement while still accommodating pedestrian and bicycle access.
- Typical applications are along local roadways, either to discourage through traffic on a residential street or to support a bicycle boulevard.
- Consideration should be given to emergency vehicles; designs that allow access by emergency vehicles are preferred.

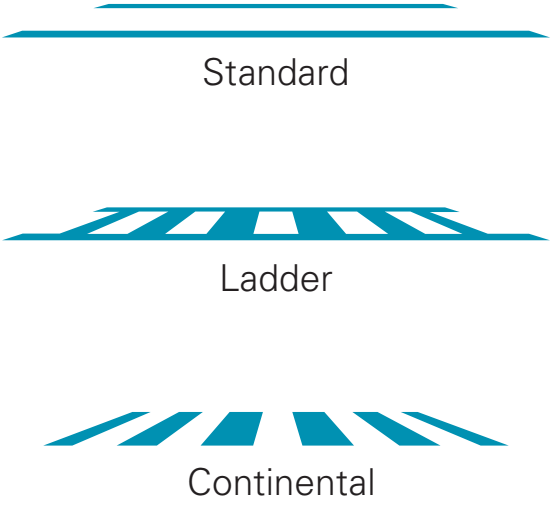


Crosswalk Design

Marked crossings are a critical component of a Complete Street. Crosswalks delineate a clear path for pedestrians, connecting sidewalk segments to create a complete pedestrian network and a more walkable environment. Effective crosswalk striping improves pedestrian safety, enhances visibility of the crossing to motorists, improves motorist awareness and creates an expectation of potential pedestrian activity, and indicates to pedestrians a preferred crossing location.

Striping design can significantly impact the visibility of a crosswalk. Transverse striping, typically a pair of parallel lines oriented perpendicular to the driver, has a very limited visual profile to motorists. Conversely, longitudinal striping (often referred to as "continental" striping) is oriented parallel to motor vehicle travel, which significantly improves the visibility of the crossing to motorists. On low volume and low speed roadways, crosswalk striping alone is often sufficient. However, on higher volume and higher speed roadways, additional pedestrian treatments are recommended to enhance the crossing and supplement crosswalk striping.

Types of Crosswalk Designs



Standard crosswalk striping, shown at top, often has very poor visibility to motorists, particularly on higher-speed roadways or where the striping has faded. Ladder or Continental striping is preferable in most situations because it significantly improves the visibility of the crossing to motorists and maintains this visibility better as it ages.

Design Guidance

- Crosswalks should typically be marked at all crossings of a signalized intersection. Crosswalk placement should also consider other aspects of the intersection design, such as signal phasing and sight lines.
- At uncontrolled crossings and mid-block locations, a crosswalk alone should not be used on streets with:
  - » Vehicle speeds greater than 40 mph
  - » Four or more lanes without a raised median or pedestrian refugee island and an average daily traffic (ADT) of 12,000 or greater
  - » Four or more lanes with a raised median or pedestrian refugee island and an ADT of 15,000 or greater

  On these roadways, additional supplemental design tools should be used to enhance the visibility of the crossing, improve pedestrian safety, and/or slow vehicular traffic.
- On streets with low volumes (ADT less than 3,000), low speeds (less than 20 mph), and few lanes (1 or 2 lanes), crosswalks may not always be necessary at uncontrolled intersections. They should, however, be provided at major pedestrian destinations, such as schools, parks, transit stops, and major public buildings.
- Crosswalks should be marked to create the shortest pedestrian crossing distance, but also consider pedestrians desire lines. This is particularly an issue at skewed intersections.
- Crosswalk design should reflect the street context. High-visibility striping should be used to enhance pedestrian crossings and is preferable on crossings with significant pedestrian activity, crossings that provide access to major destinations (e.g., walking routes to schools and transit stops), and at mid-block locations.
- Transverse crosswalks must be a minimum of 6 feet wide (measured as the gap between the parallel lines). Crosswalks should be at least as wide as the paths they are connecting. This enables pedestrians moving in opposite directions to comfortably pass each other.
- Stop bars should be placed a minimum of 4 feet from the edge of a crosswalk. A larger buffer is preferred to create a more welcoming pedestrian environment.

Further Guidance

- NCHRP Report 600 *Human Factors Guidelines for Road Systems*

Signage

MUTCD guidance should be followed for signs. Signs should not be placed within the pedestrian zone. For font recommendations, the MUTCD references the Standard Alphabets for Highway Signs and Pavement Markings, which permits a series of six letter types on signs. ADAAG Section 4.30 also provides guidelines for signage. ADAAG specifications are targeted at indoor facilities and might not be applicable to all outdoor spaces. According to ADAAG, "letters and numbers on signs shall have a width-to-height ratio between 3:5 and 1:1 and a stroke width-to-height ratio between 1:5 and 1:10" (ADAAG, U.S. Access Board, 1991). MUTCD requirements for size and stroke meet, and may even exceed, ADAAG specifications. ADAAG Section 4.30 also provides guidelines for character height, raised and brailled characters and pictorial symbol signs, finish and contrast, mounting location and height, and symbols of accessibility.

Signalized Intersections

The allocation of time at a signalized intersection is equally important as the allocation of space. In combination, time and space determine the quality of a street and transportation network, how it operates, and how it meets the mobility, safety, and public space needs of its users and the community. Signal timing should reflect the context and needs of the street. Just as the distribution of space within an intersection geometry and cross-section can make a street feel more or less welcoming to a given mode, the way in which time is distributed by a traffic signal has a similar impact: an inadequate pedestrian crossing time or lack of pedestrian signals can create a barrier to walking and discourage walking; transit priority signaling can improve the performance of a transit service and encourage higher ridership; and excessive delay at an intersection for any mode can create a bottleneck and cause users to violate the signal or take unsafe risks.

The following discussion highlights some key principles, tools, and design considerations for signalized intersections.

Pedestrian Signal Heads

Per MUTCD requirements, signalized intersections should include pedestrian signal heads with countdown timers. These accommodations provide clarity to pedestrians and increase safety by clearly indicating when it is appropriate to cross the intersection and how long they have to do so.

Pedestrian Clearance Time

The pedestrian clearance time is the amount of time a pedestrian has to cross the intersection and should provide adequate time for a pedestrian leaving the curb at the end of the "walk" interval to reach the opposite curb before the traffic signal changes to green for on-coming traffic. The minimum crossing time for the signal timing is a function of the width of the crossing and the pedestrian walk speed. For most locations, a **walk speed of 3.5 feet per second** is used (per MUTCD). However, in locations commonly used by pedestrians who walk more slowly or those in wheelchairs, a slower walk speed should be used.

Princeton, NJ

Pedestrian Push Buttons

The use of actuated pedestrian detection, typically through the use of push buttons, is discouraged. In downtowns and business districts, the pedestrian phase should be provided for all crossings during each cycle.

In the case that pedestrian actuation is deemed appropriate, typically where pedestrian volumes are low on suburban and rural streets, the following strategies can be considered to reduce pedestrian delay while limiting impacts to vehicle traffic:

- Provide the pedestrian phase during each cycle when pedestrian volumes are expected to be high, such as commuting times
- Eliminate the need for actuation by reducing the crossing length (and therefore time) through the use of curb extensions
- Reduce the cycle length

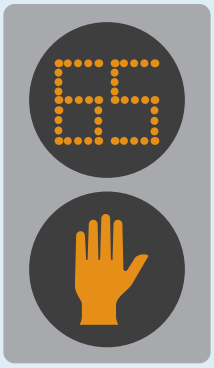
For semi-actuated signals, typically used where a high-volume street meets a lower-volume street, the pedestrian interval should always be provided with the higher-volume green phase. For the minor crossing, effort should be made to reduce wait times.

Cycle Length

Shorter cycle lengths reduce pedestrian wait times, which encourage walking and discourage unsafe pedestrian crossing behavior.

A single long wait time for pedestrians can be frustrating, and multiple long waits can discourage walking altogether. Additionally, pedestrians are more likely to not comply with a pedestrian signal when faced with very long wait times at a signal.

NACTO recommends cycle lengths that are 60 to 90 seconds.



Signal Timing

In areas with closely spaced signals, timing of adjacent traffic signals should be designed to balance the needs of all users of the road. This may mean not designing signal progression for typical vehicle-based metrics, such as maximum vehicle throughput or minimum vehicle delay.

Signal progression for vehicles can be used as a tool to limit vehicle speeds, which can in turn decrease both the risk and severity of collisions with pedestrians. Proper coordination can encourage drivers to travel at or below posted speeds by providing a progression of green lights that encourages drivers to travel at those speeds. NACTO recommends cycle lengths that are **60 to 90 seconds**.

Where there is a high density of signals, such as with a downtown grid, effort should be made to ensure that the coordination does not cause pedestrians to experience delays at consecutive crossings along the same street. Both block length and typical walking speed in an area would need to be considered to effectively implement this strategy.

Coordinated Signals

Traffic signal coordination, where traffic signal progression manages and synchronizes traffic flow across a corridor or network, has a variety of purposes. Traditionally used to increase vehicular throughput during the peak hour, it can also be used to slow vehicular traffic speeds in urban or downtown contexts, creating a friendlier environment for bicyclists and pedestrians. Optimizing the network for slower speeds, for example, can ensure the typical cyclist gets a consistent green signal at each intersection. Signals can also be coordinated to prioritize transit service on a corridor, leading to more reliable and faster transit service.

Adaptive Signal Control Technology (ASCT):

Unlike conventional signal equipment, ASCT processes real-time data and adjusts signal timing to accommodate changing traffic patterns and mitigate congestion. The technology responds to fluxes in daily traffic flow and events, such as crashes, construction, or special events, creating smoother traffic flow and improved travel time reliability. Compared to traditional signal equipment, average ASCT improves travel time by more than 10 percent, and in areas with particularly outdated signal timing, improvements can exceed 50 percent.

High Volumes

High volumes of pedestrians and turning vehicles can present both safety and congestion issues. Three strategies can be implemented to improve safety and operations when high volumes of pedestrians or turning vehicles exist:

Leading Pedestrian Interval

This treatment is best for intersections with high vehicular turning volumes. This interval provides a few seconds of pedestrian crossing time before vehicle traffic is provided a green light. This lead time allows for increased visibility of pedestrians, reducing the risk of collisions. NACTO recommends **3 to 7 seconds** for the leading interval before the corresponding vehicle interval begins.

Signalized Turns

This treatment is best applied for turning movements with high volumes where pedestrian volumes are high enough to severely limit turning capacity for vehicles. A short protected turning phase can be provided for right-turning vehicles from one-way or two-way streets, or for left-turning vehicles on a one-way street each cycle or when a long queue is detected. This protected turning phase should be just before the end of the green phase (not at the start) in order to prioritize pedestrian movement.

Pedestrian Scramble

This is sometimes referred to as an exclusive pedestrian phase. This treatment is best implemented at intersections with high pedestrian volumes that make turning prohibitive. During each signal cycle, a phase exclusive to pedestrians is provided, allowing pedestrians to cross between any corner in the intersection. The timing of this pedestrian phase should reflect the crossing distance from diagonal corners; this longer time required does not allow this treatment to be used on wide intersections. In a typical implementation, no pedestrian movements are permitted during the vehicular phases, therefore long cycle lengths are discouraged to increase pedestrian compliance.

Accessible Pedestrian Signals (APS)

Pedestrian signals are used to control pedestrian traffic and indicate pedestrian right-of-way to turning vehicles. Signal indications consist of the illuminated symbols of a walking person (symbolizing walk) and an upraised hand (indicating don't walk). Many signals use a flashing upraised hand to indicate a clearance interval for pedestrians who are already crossing to complete their crossing and that no pedestrians should enter the intersection. A preferred treatment is to use a countdown timer simultaneously with the flashing upraised hand to indicate how much time is left on the pedestrian phase.

CROSSING TIMES

The necessary times needed for a pedestrian to cross an intersection varies based on walking pace, visual impairments, disability, age, and mobility limitations. The MUTCD standard identifies a "normal" walking speed as 3.5 feet per second. However, according to FHWA, a majority of pedestrians walk at speeds slower than this. This group includes those with limited mobility and older adults. As the population of New Jersey ages, this group will grow larger.

It is required that crossing times be based on a walking speed of no more than 3.5 feet per second at all crossings. A slower walking speed should be considered near senior centers, rehabilitation centers, or other locations where a higher proportion of potential users may have a slower walking speed.

If crossing times cannot be reduced, crossing distance should be decreased (through either a curb extension or a median refuge) to benefit pedestrians who need more time or at particularly long or complex crossings.

DEVICE PLACEMENT

Where a pedestrian signal is actuated by a push button, the device should meet certain criteria for accessibility:

- Locate the device as close as possible to the curb ramp without interfering with the clear space
- Install the device so that it can be operated from a level segment of the sidewalk rather than on the curb ramp itself
- Provide a level (less than 2 percent slope) clear space at least 36 inches by 48 inches, or 60 inches by 60 inches if pedestrians will be required to turn or maneuver in order to use the device
- Mount the device no higher than 42 inches above the sidewalk so that children, people who use a wheelchair, or shorter individuals can easily operate it
- Place the device no closer than 30 inches to the curb and no more than 5 feet from the crosswalk
- Locate the control face of the button so that it is parallel to the direction of the marked crosswalk
- Design the device activation button so that it can be easily operated by people with limited hand function—larger buttons are preferred
- Design the activation button to require a minimum amount of force, no greater than 15.5 Newton (N) for people with limited hand and arm strength
- Avoid button designs that activate through conductivity

PROVIDING INFORMATION IN MULTIPLE FORMATS

People with vision impairments are at a disadvantage at an intersection if they are unaware of the presence of a pedestrian-actuated signal device. Signal information needs to be accessible and usable by all pedestrians, including those with vision impairments. Pedestrian-actuated signal device information can be provided in audible, vibrotactile, and visual formats.

Audible

The audible component of the pedestrian signal includes a tone or verbal information throughout the "Don't Walk" phase and a tone or verbal information during the "Walk" phase. Often, the longer a button is pressed, the louder the information is given. This can assist a pedestrian who is blind in a louder environment.

Vibrotactile

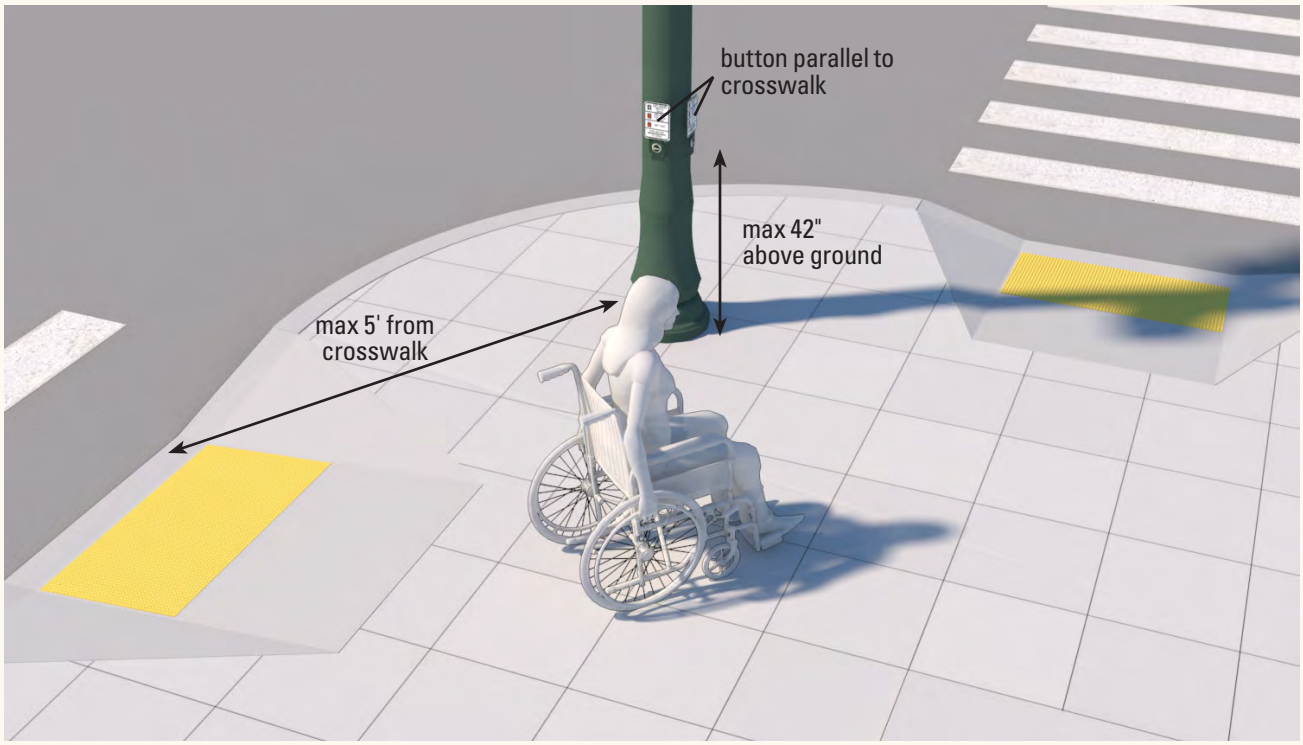
The tactile component of the pedestrian signal can be provided by a raised arrow on the pedestrian actuated signal device. This indicates which street is controlled by the push button. A vibrotactile component vibrates synchronously with the slow or fast repeating tone or tick.

Visual

The visual component of the pedestrian-actuated signal is provided on the actuation device and through the illuminated visual signal.

Further Guidance

MUTCD standards for signals
http://mutcd.fhwa.dot.gov/htm/2009/part4/part4e.htm



Bicycle Facilities

Intersections can be a confusing and stressful environment for bicyclists. In New Jersey, the majority of bicycle crashes (56 percent) occur at intersections. An inherent mixing of traffic occurs at intersections, creating conflicts between vehicular and bicycle traffic. This can be exacerbated when bicycle lanes appear to temporarily end at intersections and intersection approaches, or the roadway widens to provide turning lanes for vehicles.

Intersection design can create a more comfortable environment for bicyclists and reduce conflicts with motorists and pedestrians. Design for bicycles should focus on several key principles:

- Reduce conflict points between bicyclists, motorists, and pedestrians
- Improve the visibility of bicyclists to motorists
- Denote a clear right-of-way and path through the intersection for bicyclists

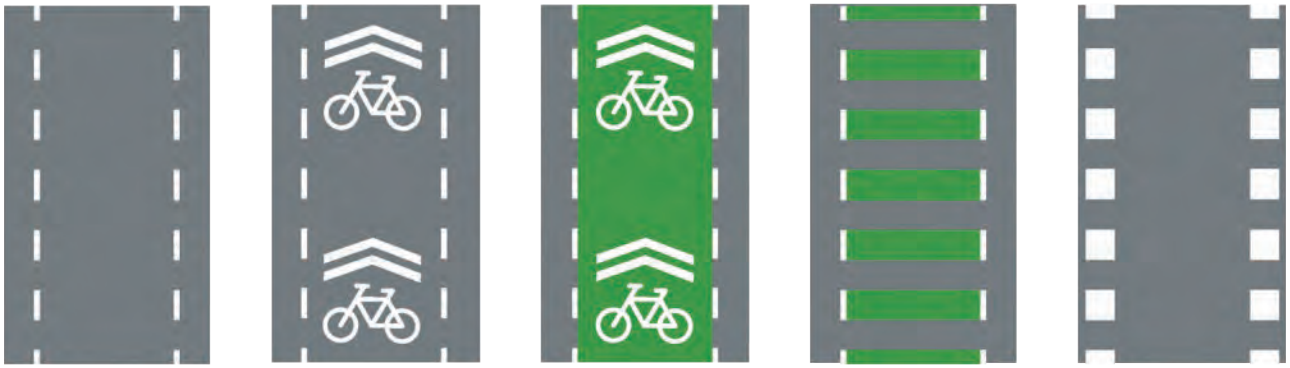
Photos (clockwise)

Rectangular Rapid Flashing Beacon (RRFB) and high-visibility continental crosswalk striping help create a safe and visible crossing for people on the D&R Canal Trail crossing Alexander Street in Princeton, NJ

Bicycle lane intersection markings along Dr. Martin Luther King Jr. Boulevard in Newark, NJ improve the visibility of bicyclists in the intersection

An RRFB improves the visibility of Lawrence-Hopewell Trail users as they cross Federal City Road in Hopewell Township, NJ

Bicycle Lane Intersection Markings



Dotted Line Extensions | Pavement Markings | Colored Bicycle Lane | Dashed Colored Bicycle Lane | Elephant's Feet Markings

Bicycle Lanes and Intersection Markings

Bicycle markings should be extended through intersections and major driveways to enhance the continuity of the bicycle facility, guide bicyclists through the intersection, and mitigate bicyclist stress.

This treatment has several benefits:

- Increases the visibility of bicyclists
- Reduces bicyclist stress by clearly delineating roadway space for bicyclists and guiding them through the intersection in a direct path
- Reinforces that through bicyclists have priority over turning vehicles or vehicles entering the roadway
- Helps bicyclists position themselves within the intersection
- Improves driver awareness of bicycle activity and movement through a high conflict area
- Makes bicyclist movement at intersections more predictable to motorists

Design Guidance

There are several common treatment types for intersection markings. The standard treatment is a white dotted line extension of the bicycle lane, which maintains the continuity of the bicycle lane through the intersection. The MUTCD contains guidance on this treatment in Section 3B.08.

This treatment may be enhanced to improve the visibility of the bicycle facility through various combinations of pavement markings, colored pavement, or higher visibility striping. Several treatment options are illustrated above. The use of colored pavement helps improve the visibility of the bicycle facility and increases awareness of potential conflict areas between bicyclists and motorists.

Further Guidance

- *Urban Bikeway Design Guide,* NACTO

Bike Boxes

A bike box provides a designated area for bicyclists at the front of a travel lane at signalized intersections. It allows bicyclists to move to the front of the queue during a red light, increasing their visibility to motorists. Bike boxes also reduce signal delay for bicyclists, help prioritize bicycle movement, mitigate the potential for "right-hook" crashes at the start of the green signal, facilitate left-turn positioning for bicyclists when the box extends across the entire intersection approach, and create an additional buffer from motor vehicles for pedestrians.

Bike boxes have several applications, including:

- At signalized intersections with significant bicycle and/or motor vehicle traffic, and where there are conflicts between turning movements
- To mitigate conflicts between through-bicycle movements and vehicle right turns
- To better accommodate left-turning bicycle traffic, particularly where there is a high volume of bicycle turning traffic, a designated bicycle route turns left, or a bicycle lane shifts from the right side of the street to the left side

Design Guidance

- Bike boxes should be 10 to 16 feet in length.
- The motor vehicle stop bar for the intersection is placed at the end of the bike box farthest from the intersection. It may be placed up to 7 feet in advance of the bike box to reduce motor vehicle encroachment. Optionally, a post-mounted "Stop Here on Red" sign (MUTCD R10-6A) and/or "Wait Here" pavement marking can be used to reinforce the stop bar and deter encroachment into the bike box.
- "No Turn on Red" signage (MUTCD R10-11) should be installed to prohibit vehicles from entering the bike box.
- A bike symbol pavement marking should be centered in the bike box. Aligning it outside of the wheel path increases the longevity of the marking.
- Colored pavement may be used to increase the visibility of the facility and encourage compliance by motorists.
- A "Yield to Bikes" sign may be used to reinforce that bikes have the right-of-way passing through the intersection and turning vehicles must yield.

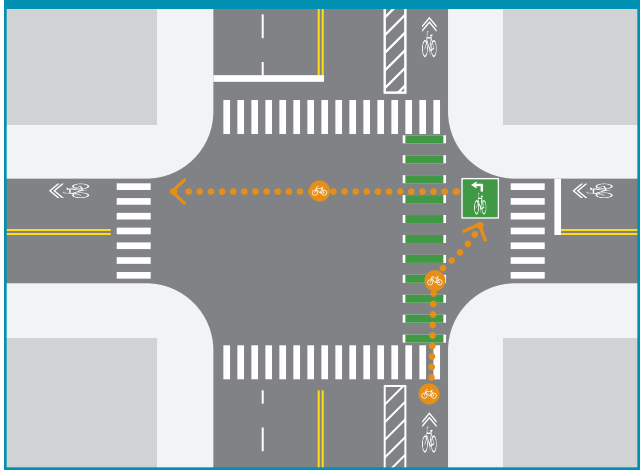
Further Guidance

- *Urban Bikeway Design Guide,* NACTO

Two-Stage Bike Turn Box

A two-stage bike turn box provides a more comfortable and safe way for bicyclists to cross multi-lane streets with high vehicle speeds or volumes. Similar to a jug-handle for motor vehicles, bicyclists complete a left turn by dividing it into two movements. Bicyclists first proceed through the intersection with traffic to a bike box on the far side of the intersection, where they position themselves in front of the traffic queue on the cross street. When the traffic signal turns green for the cross street, they cycle across the intersection with traffic, completing the left turn.

Two-Stage Bike Turn Box Process



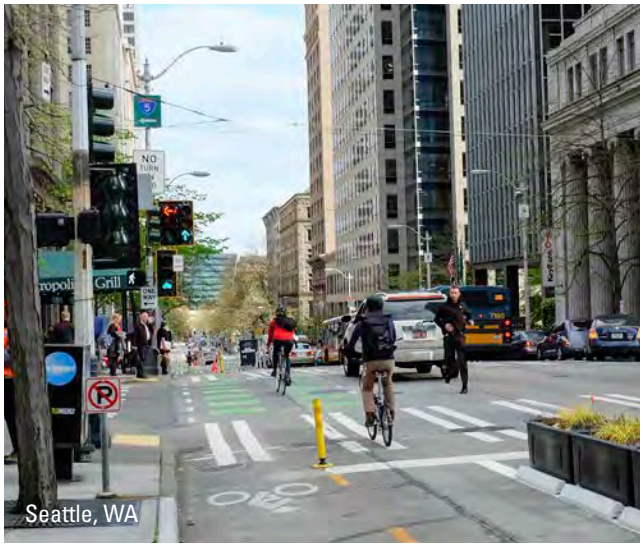
Design Guidance

- A two-stage bike turn box is typically used with conventional or separated bicycle lanes to facilitate left-turn movements, particularly on multi-lane streets.
- The queue box should be placed in a protected area. Different configurations may be used based on the geometry of the intersection, design of the bicycle lane, the presence of on-street parking, etc.
- "No Turn on Red" signage (MUTCD R10-11) should be installed to prohibit vehicles from entering the turn box.
- The turn box should be marked with a bicycle symbol and turn arrow.
- Colored pavement may be used to increase the visibility of the facility and encourage compliance by motorists.
- The box should be positioned laterally in the cross street to improve the visibility of bicyclists.

Further Guidance

- *Urban Bikeway Design Guide,* NACTO

Additional Bicycle Accommodation Tools



Seattle, WA

Salt Lake City, UT

Bicycle Signals

Bicycle signal heads and bicycle-specific timing strategies may be required with the provision of bicycle lanes or separated bicycle lanes. Bicycle signals can simplify bicycle movements at complex intersections, clarify navigation of the intersection for bicyclists, separate motor vehicle and bicycle movements to reduce conflicts, and prioritize bicycle movements. Bicycle signals are also necessary on two-way separated bicycle lanes, where the contra-flow movement typically requires its own signal phase and signal head to resolve conflicts with other movements.

Protected Intersections

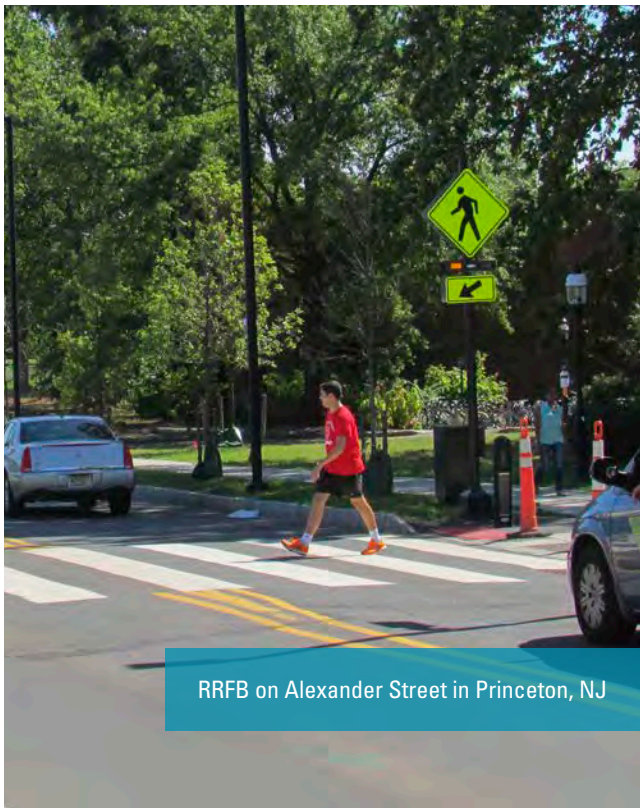
A "protected intersection," also referred to as a "Dutch junction," is the current state-of-the-art design for intersections to more safely accommodate pedestrians, bicyclists, and motorists. A standard practice in The Netherlands, the design has now been implemented in the United States in Davis, CA, and Salt Lake City, UT, with other locations currently under design. The protected intersection helps maintain separation between motorists and bicycles at the intersection, creating a lower stress environment for all modes. It is often used when all intersection approaches have a bicycle lane or separated bicycle lane. Built around similar principles as a curb extension, the design incorporates curbed islands at each corner. These islands force motorists to make turns more slowly, maintain separation between motorists and bicyclists, and reduce bicyclist exposure time to vehicles. They also slightly offset bicycle traffic from the intersection and move the conflict point between through cyclists and turning motorists so that the two modes cross paths where motorists have better visibility of the cyclists and motorists are at their lowest speed as they come through the turn. Protected intersections also facilitate two-stage left-turn movements for cyclists.

Rectangular Rapid Flashing Beacons

Rectangular Rapid Flashing Beacons (RRFBs) can be used to enhance a pedestrian crossing. The combination of signage and irregular flash pattern of the amber LED lights increases the visibility of a crossing, and studies show that they improve driver compliance with stopping for pedestrians at a marked crosswalk. A study in St. Petersburg, FL, found an increase in driver yielding behavior from 18 percent for a marked crossing with no beacon, to 81 percent with the installation of two beacons, and 88 percent with the installation of four beacons.

Design Guidance

- RRFBs should be used in conjunction with a marked crosswalk and curb ramps. They may be combined with other pedestrian crossing enhancements, such as curb extensions.
- RRFBs can be used on single-lane or multi-lane roadways. They are often used at unsignalized locations with significant pedestrian activity, such as mid-block crossings near major destinations or trail crossings, or where high traffic volumes, speeds, and/or driver behavior make pedestrian crossings challenging.
- Designers should consider the surrounding context. Existing sign clutter or visual noise, particularly in an urban area, may decrease the visual impact of the RRFB.
- RRFBs can be installed with active or passive actuation.
- On divided roadways, RRFBs can be included in the median or center island to further increase visibility and driver yielding behavior.
- RRFBs are typically freestanding and powered by a solar panel unit. They are therefore easily implementable at trail crossings or other locations without easy access to a traditional power source.



RRFB on Alexander Street in Princeton, NJ

Further Guidance

- MUTCD, FHWA

Pedestrian Hybrid Beacons

A pedestrian hybrid beacon, also known as a high intensity actuated crosswalk (HAWK), is a pedestrian-actuated traffic control device for mid-block pedestrian crossing locations. They enable pedestrians to cross high-speed and high-volume roadways while traffic is stopped. As the name implies, it is essentially a hybrid between a RRFB and a full traffic signal. It provides planners and engineers with an intermediary option for locations that do not meet requirements for a traffic signal warrant, but where traffic conditions exceed the limitations of an RRFB.

A pedestrian hybrid beacon consists of an overhead mast arm with two red lights and one yellow light, as well as pedestrian signal heads. When actuated by a pedestrian, the beacon goes through a sequence of flashing and steady yellow light intervals, followed by a steady red light to stop vehicular traffic, at which point a "walk" signal is indicated to pedestrians. At the conclusion of the "walk" phase, the pedestrian signal switches to a flashing orange hand, and the hybrid beacon switches to alternating flashing red lights. The beacon goes dark at the conclusion of the cycle, and traffic resumes as normal.

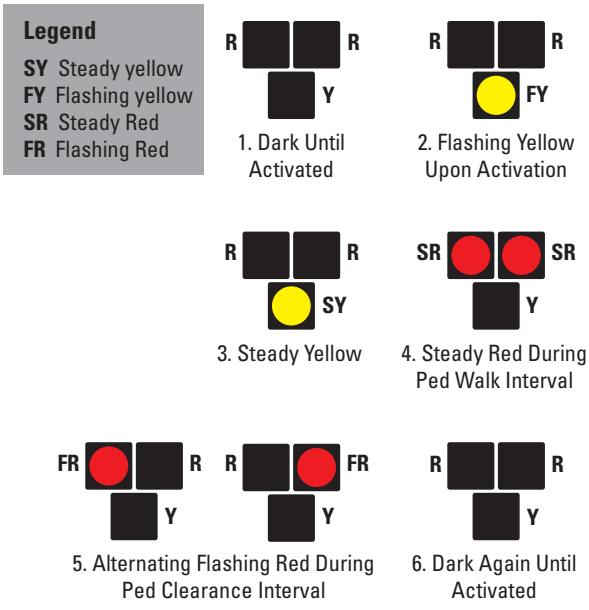
HAWK signal along NJ 27 improves access to the Metropark Train Station in Iselin, NJ

Design Guidance

- Pedestrian hybrid beacons should be used in conjunction with a marked crosswalk and curb ramps. They may be combined with other pedestrian crossing enhancements, such as curb extensions.
- Pedestrian hybrid beacons are typically installed at mid-block locations and roadways with heavy traffic volumes, wide cross-sections, or high traffic speeds that create difficult pedestrian crossings. They are a useful tool where gaps in traffic are insufficient to allow pedestrian crossings or where there is excessive pedestrian delay.
- Pedestrian hybrid beacons are often installed near schools, transit stops, or near major pedestrian destinations.

Display Sequence for HAWK Signal

Legend
SY Steady yellow
FY Flashing yellow
SR Steady Red
FR Flashing Red



Further Guidance

- MUTCD, FHWA

Metrics

Multimodal LOS

Level of service (LOS) is a metric used to quantify the quality of a transportation service. It is an indicator of the traveling public's general satisfaction with the performance of the service under typical demand and operation conditions. LOS is presented on a scale from "A" to "F," representing from best to worst condition, respectively.

Traditionally, LOS has typically focused on conditions for automobiles, which is a function of average travel speed and number of stops per mile. To improve the auto LOS, improvements such as signal timing adjustments, additional exclusive left-turn lanes, or creating additional capacity may be proposed. However, focusing on this one indicator does not account for potential adverse effects on other users of the intersection, such as longer crossings or additional crossing delay for pedestrians.

Multimodal LOS (MMLOS) provides a broader snapshot of the quality of the transportation system, allowing a Complete Streets approach to transportation analysis. MMLOS generates separate LOS indicators for four modes of travel: automobile drivers, bus passengers, pedestrians, and bicyclists. This enables transportation planners, analysts, and engineers to assess how various design changes impact each mode differently, weigh the potential trade-offs in performance for each mode, and seek a balance appropriate to the context of the study area and user needs.

MMLOS is included in the 2010 update to the *Highway Capacity Manual*. The metric was developed for urban streets, which the methodology defines as a street with a traffic signal control device at least once every 2 miles. It is typically applied in more urban environments where there is more multimodal need and activity, and not in rural settings or on residential streets.

Further Guidance

- *2010 Highway Capacity Manual*, Transportation Research Board

ENDNOTES

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04

Street Typologies

The character and usage patterns of New Jersey's streets has evolved over centuries, influenced by changing technology, shifting land use patterns, and population growth. Streets that were built as rural farm routes between and through downtowns are often now highways or arterials, carrying thousands of cars every day. Urban streets, which once carried carriages, then streetcars, were transformed by the rise of the automobile, often to the detriment of other modes of transportation and local residents.

The Complete Streets approach prioritizes context as a critical factor in street design. Because of this, it is important to recognize the unique history and function of New Jersey's streets, both in land use and transportation contexts, and understand how decisions made today will influence the future function and economic viability of a street, community, and ultimately the State.

The following street typologies represent a cross section of typical road types in New Jersey. They reflect not only the transportation needs of the street, which are often captured in a traditional functional classification hierarchy, but also the community context. The purpose of generating these typologies is to apply best practices in Complete Streets design to streets with different contexts and needs. The needs of any particular street, whether suburban residential or urban commercial, change depending on density and other contextual factors. These differences are addressed in this chapter through different applications of design considerations and minimum standards.

The street typologies presented in this chapter are not exhaustive, but the Complete Streets application principles behind them can be applied to other street typologies. Street typologies are not necessarily continuous along the entire length of a street; a single street may change typology as the surrounding land uses or functions of the roadway changes.

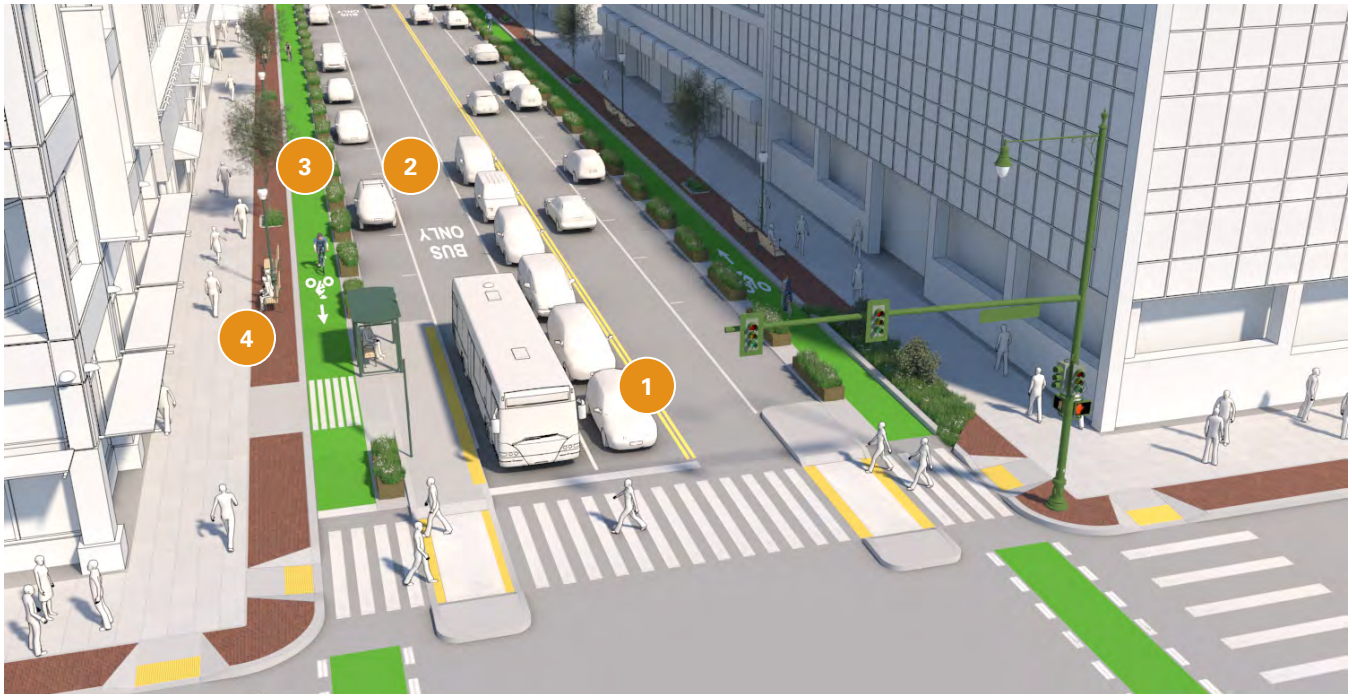
Downtown Urban Core

Downtown urban streets are often challenging for cities to reconfigure and retrofit. They typically have multi-modal needs and surrounding buildings, and the built environment creates a constrained environment. Design solutions often have to balance high motor vehicle volumes, commercial goods movement, heavy turn volumes, and other high-intensity uses with the needs of other street users. These streets often provide insufficient accommodations for bicyclists and pedestrians, and can be challenging and uninviting places to cycle or walk. Constrained streets can often be retrofitted using lane diets and conventional bicycle lanes or road diets to add higher quality bicycle, pedestrian, and transit facilities and improved vehicular safety.

Existing Conditions

The above illustration depicts a wide four-lane urban thoroughfare. This street only features accommodations for automobiles. This configuration can lead to weaving motor vehicles, double-parked cars, and obstruction of buses, which can make for an unsafe environment for motorists, pedestrians, and cyclists.

Undifferentiated street space and wide travel lanes can result in higher travel speeds and an uninviting environment for bicyclists, who often feel uncomfortable riding between fast-moving traffic and parked cars. Double-parked vehicles can cause bicyclists to weave into traffic unpredictably, creating an unsafe environment for all users.



Recommendations

1 A road diet allows the reorganization of the street space to provide accommodations for non-motorized users and transit vehicles.

2 Along high frequency transit routes, a dedicated bus lane can improve transit service and reliability and the overall attractiveness of the service. In conventional four-lane to three-lane road diets, the third lane is often used as a turning lane for motor vehicles.

3 A separated bicycle lane significantly reduces conflicts between bicyclists and motorists and creates an inviting and comfortable facility for bicyclists of all ages and abilities. Special attention must be given to separated bicycle lanes at intersections. Conflict areas should be highlighted using intersection crossing markings. Bicycle signals may be needed to allow bicycle traffic to operate safely along the corridor.

4 Better delineation of the sidewalk space allows for the provision of pedestrian amenities such as street furniture and pedestrian-scale lighting. Stormwater management techniques can provide additional greenery and reduce stormwater runoff.

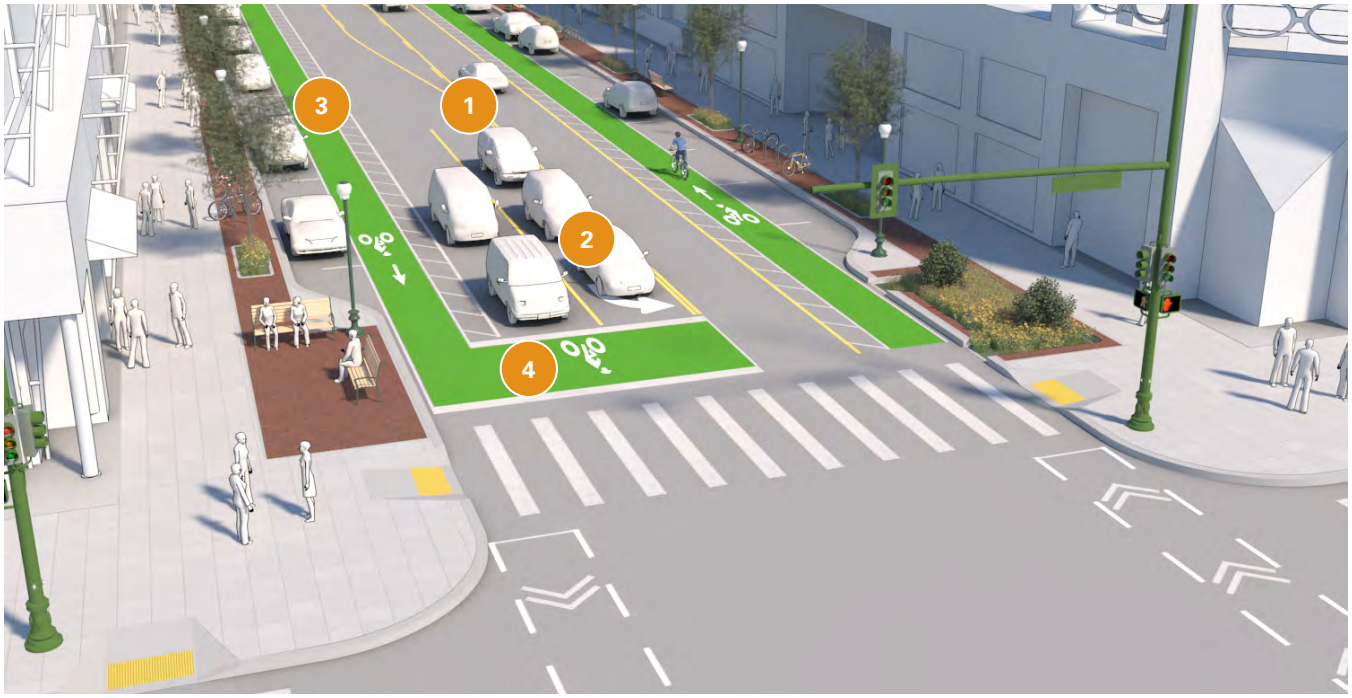
In constrained environments where the provision of a separated bicycle lane is impractical, a buffered bicycle lane is an appropriate treatment. A buffered bicycle lane provides cyclists dedicated space; however, in high-volume urban environments these facilities can often be blocked by double-parked vehicles or freight delivery vehicles. Policy and enforcement are critical to ensure that bicycle lanes remain clear and safe for cyclists.

Main Street

Main streets are the center of neighborhood life, with high volumes of pedestrians, transit vehicles/passengers, bicyclists, and motorists vying for limited space. New Jersey's main streets, in both suburban and rural contexts, feature many similar characteristics. While the needs and challenges of a main street differ based on context and scale, most main streets need to balance the needs of local and through travel while maximizing livability and economic vitality. In New Jersey, many main streets are located on roadways that provide regional connectivity, which presents challenges in balancing local community needs with regional transportation concerns. Main street design should limit traffic speeds, encourage safe and comfortable pedestrian activity, facilitate commerce, and support inviting public spaces.

Existing Conditions

The existing conditions shown in the illustration above are typical of many main streets in New Jersey. The illustration depicts a main street with four motor vehicle travel lanes. Four-lane configurations have been shown to increase incidents of rear-end and sideswipe vehicle crashes. Many main streets that carry regional commuter traffic have been designed for peak-period travel and remain significantly below capacity at other times of the day.



Recommendations

1 Road diets are not appropriate on all four-lane cross sections. Generally, streets carrying up to 25,000 vehicles per day can function effectively with three lanes while providing extra space for non-motorized users. Road diets can improve traffic flow and reduce conflicts with turning vehicles and dangerous weaving movements. More information on Road Diets can be found on Page 66.

2 Turn lanes help eliminate weaving conflicts that are common on a four-lane road. Alternative treatments can incorporate pedestrian safety islands or a median with turn bays at key locations.

3 Buffered bicycle lanes provide dedicated space for cyclists with more distance from motor vehicles than a conventional bicycle lane. On streets with frequent deliveries or double parking, special accommodations and extra enforcement should be provided to ensure that the bicycle lane is not blocked.

4 Bike boxes help cyclists make left or right turns by placing them in front of traffic at a red light. On streets with higher volumes of traffic, cyclists may prefer to make a two-stage turn.

A raised, separated bicycle lane provides a low-stress facility that is comfortable for users of all ages and abilities. It allows for one-way or two-way travel, provides increased separation from motor vehicles than an on-street lane, and has lower maintenance costs due to limited motor vehicle wear.

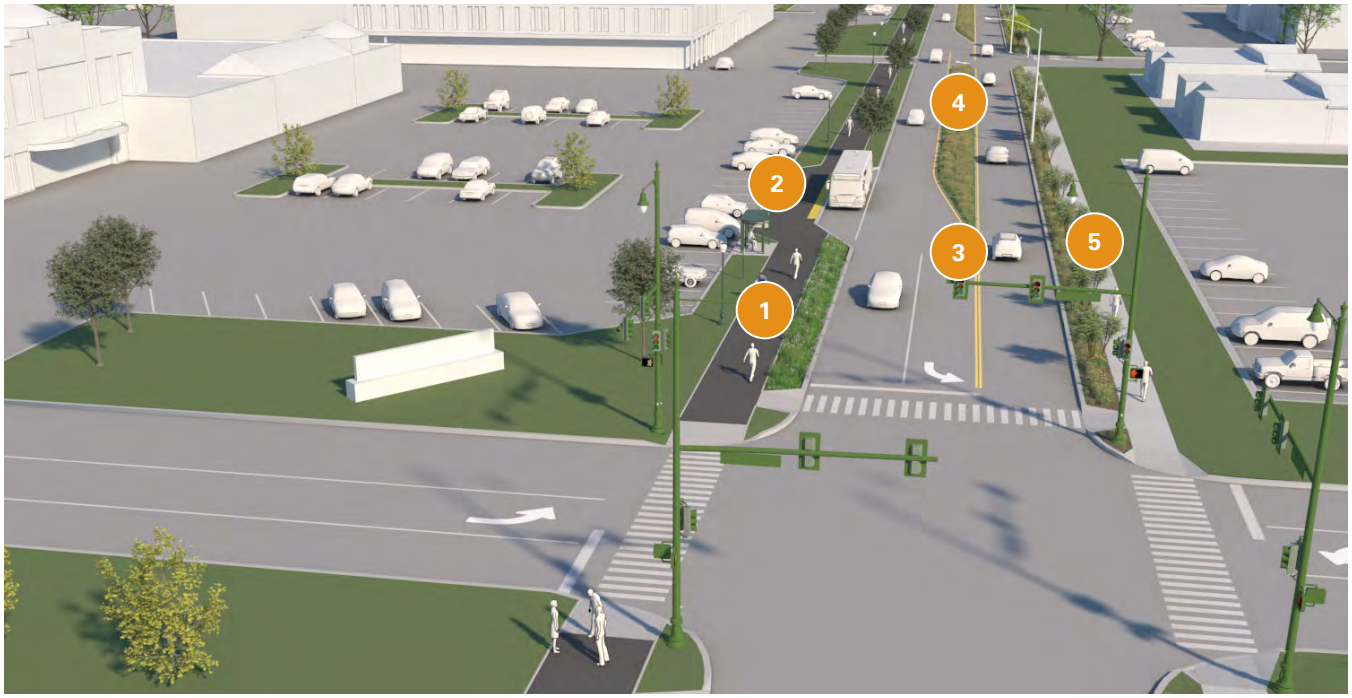
Commercial Strip Corridor

Commercial strip corridors are typical of suburban development patterns after World War II. These corridors, often along arterial roadways in suburban or exurban locations, were generally designed almost exclusively to accommodate automobile access. Pedestrian and bicycle mobility is often restricted along these corridors by disperse development patterns, high traffic speeds and volumes, and a lack of accommodations for non-motorized modes. While transit service, primarily bus, is often available along many of these corridors in New Jersey, the lack of adequate pedestrian facilities reduces the accessibility and usability of these services in many locations.

The lack of mobility and accessibility for pedestrian, bicycle, and transit modes has disproportionate negative impacts on low-income and minority populations who often work at or need access to commercial properties along these corridors. The lack of accommodations for non-motorized users reduces the economic mobility and opportunity for large parts of the population in New Jersey. Commercial strip corridors can also be some of the most dangerous for pedestrians and bicyclists, often ranking among the most frequent locations for severe or fatal bicycle and/or pedestrian crashes in New Jersey. These design solutions tend to focus less on street features that would be found in a downtown environment (e.g., street trees, public seating areas) and more on improving access and mobility for non-motorized road users.

Existing Conditions

The existing conditions shown in the illustration above are typical of many commercial strip corridors in New Jersey. The illustration depicts two travel lanes and one bi-directional turning lane. Wide travel lanes encourage higher speeds for motorists. The lack of sidewalks or accommodations for bicyclists forces many users to ride or walk in the roadway or to create informal worn paths in the planted area. Frequent driveways create many conflicts between motorists and non-motorized users. Many commercial areas in New Jersey feature more lanes for motor vehicles, wide shoulders, no shoulder, or other configurations that differ from the above illustration.



Recommendations

1 A multi-use path can be installed in the wide planted area to provide accommodations for bicyclists and pedestrians. Paths should feature lighting and be well marked at intersections and driveways.

2 A bus pull-out, while not ideal in an urban setting, is appropriate along an arterial corridor to reduce weaving from motorists. Bus stops should always be accessible for all users.

3 Narrowing travel lanes can help reduce travel speeds while maintaining vehicle capacity.

4 Defined turning lanes are preferable to bi-directional turning lanes (where possible). A curbed median can also provide a pedestrian refuge.

5 If insufficient space exists for a multi-use path, the addition of continuous sidewalk in a strip commercial corridor can dramatically improve pedestrian safety and mobility. Sidewalks/paths should be provided on both sides of the roadway if possible.

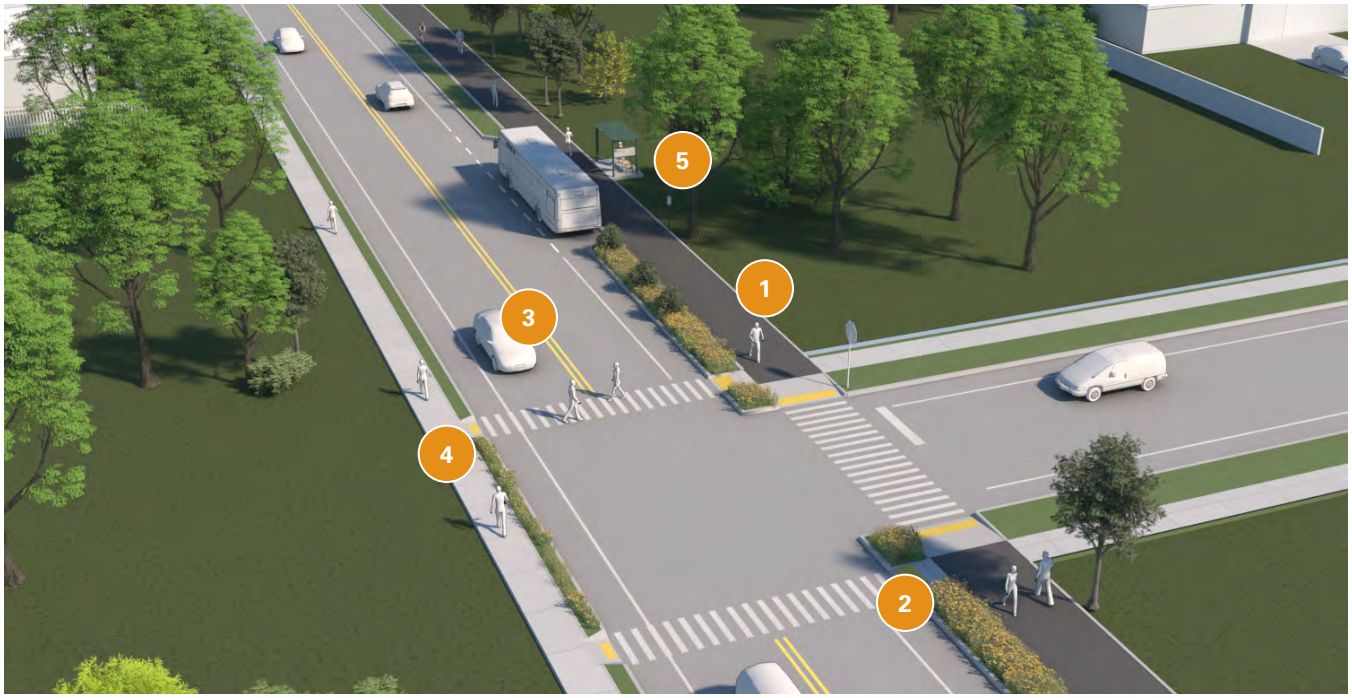
A buffered bicycle lane is an appropriate treatment for commercial strip corridors that feature travel speeds under 40 mph. With higher speeds and volumes (particularly on multi-lane roadways) a striped bicycle lane does not provide a low-stress facility that is comfortable for all users.

Low Density State/County Highway

New Jersey features many historic highways that have provided connections between municipalities since before the automobile. These roads still play a critical role in the state's transportation system, connecting communities, jobs centers, commercial areas, and residential development. Land uses along these roadways are often disparate while the roadways themselves generally carry higher speed traffic (>40 mph). The roadways often need to balance the needs of high volumes of regional automobile traffic with the needs of residents and other roadway users (including recreational and commuting cyclists).

Existing Conditions

The above illustration depicts a two-way highway in a low-density area. The roadway features two travel lanes with shoulders and vegetated areas on each side. While the shoulders may be used by bicycles, they are not marked as such and may often be obstructed by debris or other impediments. While many similar roadways in New Jersey have a more constrained cartway, there is often space within the public right-of-way that is not used. In this configuration, a bus stop is signed but there is no connecting sidewalk, which leaves this stop inaccessible to those with limited mobility.



Recommendations

1 A multi-use path can be installed in the wide planted area to provide accommodations for bicyclists and pedestrians. The path should feature lighting and be well marked at intersections and driveways.

2 Shoulders marked as bicycle lanes should be kept free of debris and other impediments. The Public Works department should be aware of maintenance needs of all bicycle facilities. The marking of a shoulder as a bicycle lane does not preclude the occasional need to use the shoulder for emergencies or broken-down vehicles.

3 Narrower travel lanes discourage speeding and provide more space for shoulder/bicycle lane.

4 A continuous sidewalk provides a pedestrian facility at key locations along the corridor between various land uses.

5 The installation of a bus shelter with seating, in conjunction with the inclusion of a continuous sidewalk, creates an accessible and comfortable bus stop for all users. Bus shelters are particularly important along lower frequency routes where passengers might wait for significant amounts of time.

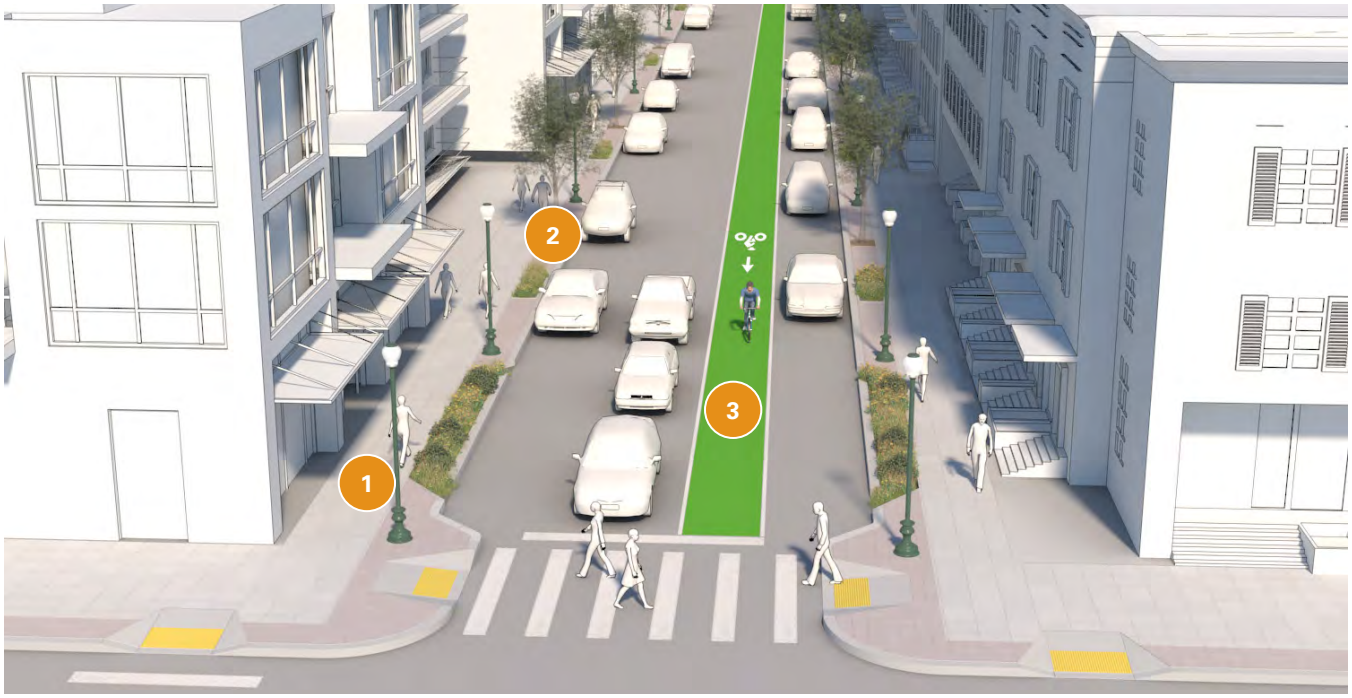
Bicycle lane markings should continue through intersections along low-density highways, even if the shoulder is not marked as a bicycle lane or the bicycle lane features infrequent markings. Intersections are the largest point of conflict between motorists and bicyclists. Intersection markings increase the awareness of the bicycle facility or the potential for bicycle activity that a motorist might not otherwise look for.

Urban Residential

Local streets in urban residential neighborhoods are often underutilized as spaces for play and leisure. Urban neighborhoods support a high demand for multimodal access, and the streets should provide safe and inviting places for people to walk and bike. Design features can include stormwater management techniques, curb extensions, vertical speed control elements, and bicycle facilities. Many of these streets in New Jersey feature narrower cartway widths and high demands for on-street parking.

Existing Conditions

The above illustration depicts a typical one-way urban residential street in New Jersey. This street features narrow sidewalks that have been uprooted by tree roots. A 16-foot-wide single travel lane leads to frequent double parking.



Recommendations

1 A wider sidewalk and narrower furnishing zone provides more room for pedestrians and increases accessibility for those with mobility limitations.

2 The addition of a tree pit with a metal grate covering provides more room for tree roots to grow, which minimizes sidewalk disruption. The metal grate creates a wider effective walking area and reduces tripping hazards for pedestrians.

3 The addition of a bicycle lane in this context provides dedicated space for bicyclists on a lower-stress street while reducing propensity for motor vehicle speeding and double parking. Increased enforcement might accompany this addition to deter double parking in the bicycle lane. Where space allows, the addition of a separated bicycle lane would remove the ability to double park and provide a more comfortable bicycle facility.

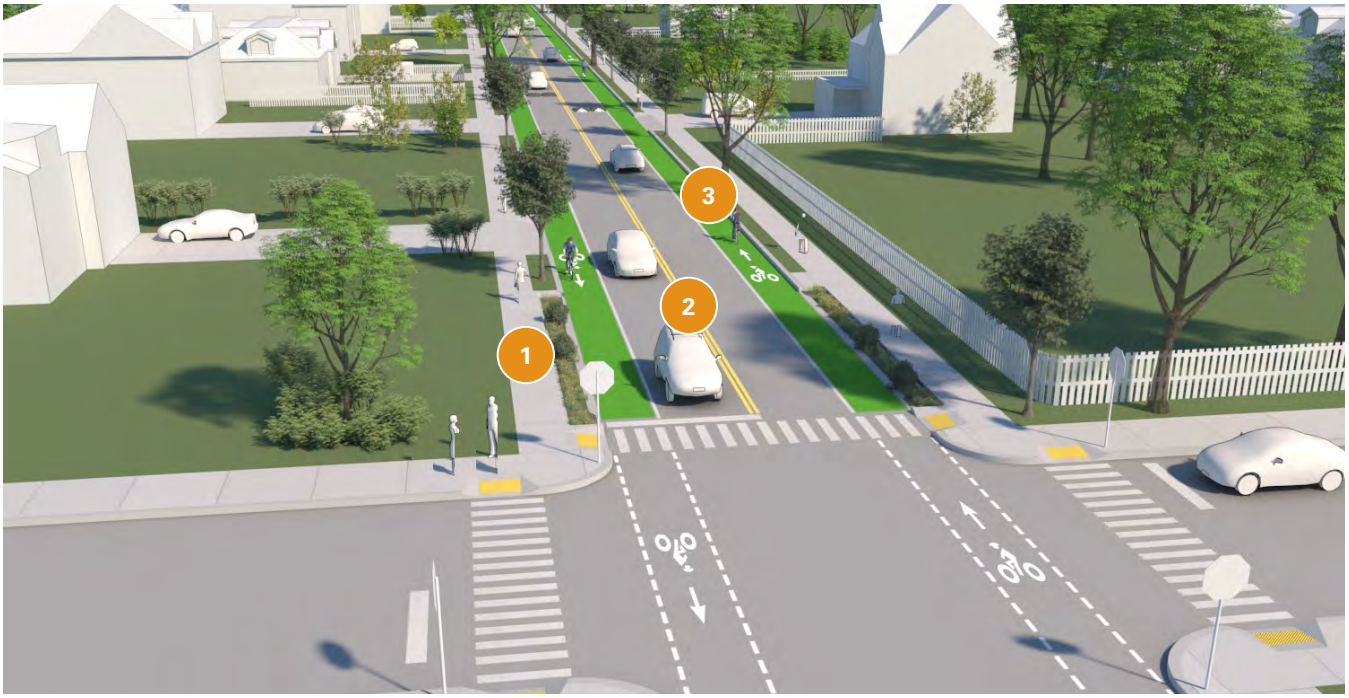
If space does not allow for the creation of a dedicated bicycle facility, shared-lane markings are generally appropriate on lower-volume, lower-speed residential streets to create critical connectivity within a bicycle network.

Suburban/Rural Residential (High-Volumes)

Suburban or rural residential streets often have very similar needs with differences based on the context and scale. Suburban/rural residential streets with higher traffic volumes generally feature a center line and often serve as connector roadways within the larger street network, in addition to providing local residential access. Many of these types of streets in New Jersey facilitate higher motor vehicle travel speeds. Design should generally favor separation of uses rather than shared spaces and focus on increasing safety and mobility for residents through a mixture of traffic calming and pedestrian and bicycle accommodations.

Existing Conditions

The illustration above depicts a typical suburban/rural residential street with higher traffic volumes. The street features two 12-foot travel lanes and parking allowed on one side. With off-street parking available at each residence, the on-street parking is rarely used. Sidewalks are narrow, which causes issues for pedestrians with limited mobility and can force pedestrians passing each other into the planting strip.



Recommendations

1 A wider sidewalk and narrower planting zone provides more room for pedestrians and increases accessibility for those with mobility limitations.

2 Narrower travel lanes (10 feet) and the removal of the rarely used on-street parking allows for the striping of two standard 6-foot bicycle lanes.

3 Speed cushions provide traffic calming benefits (in addition to narrower lanes) while allowing easier passage for emergency vehicles.

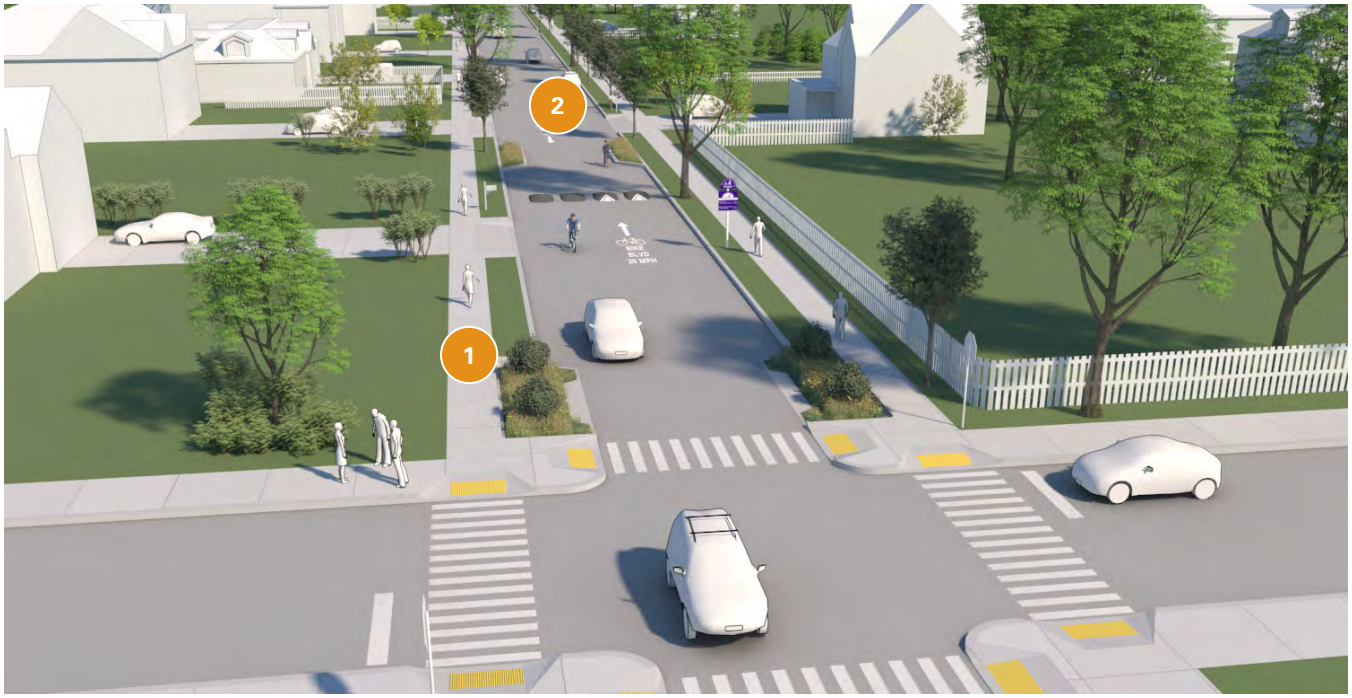
While separation is generally favored between bicyclists and motorists on a higher-volume roadway, if space does not allow for the striping of a minimum 5-foot bicycle lane, shared-lane markings are an appropriate treatment in conjunction with other traffic-calming measures, such as curb-extensions.

Suburban/Rural Residential (Low-Volumes)

Many low-volume residential streets in New Jersey feature constrained cartways that cannot accommodate dedicated space for all modes. Instead, design of the streets should focus on creating safe and comfortable shared spaces with design and posted speeds of 25 mph or less. In certain contexts, bicycle boulevard treatments are appropriate to discourage through traffic and/or high vehicle speeds. Many of these streets in New Jersey can be considered what NACTO refers to as a "Two-Way Yield Street," where a narrow cartway width and 40 to 60 percent on-street parking utilization allows drivers in opposite directions to yield to and pass one another.

Existing Conditions

The above illustration depicts a typical low-volume suburban/rural residential street in New Jersey. The street features a narrow sidewalk, wide planting strip, and an unstriped street where two directions of traffic and on-street parking share the 30-foot cartway. While these streets are typically low stress, an unmarked and straight roadway can encourage higher vehicle travel speeds when there are no or few parked cars.



Recommendations

1 A wider sidewalk and narrower planting zone provides more room for pedestrians and increases accessibility for those with mobility limitations.

2 A bicycle boulevard with traffic-calming features such as curb extensions, speed cushions, chicanes, and lower speed limits create a more comfortable environment for bicyclists and pedestrians at all times of day.

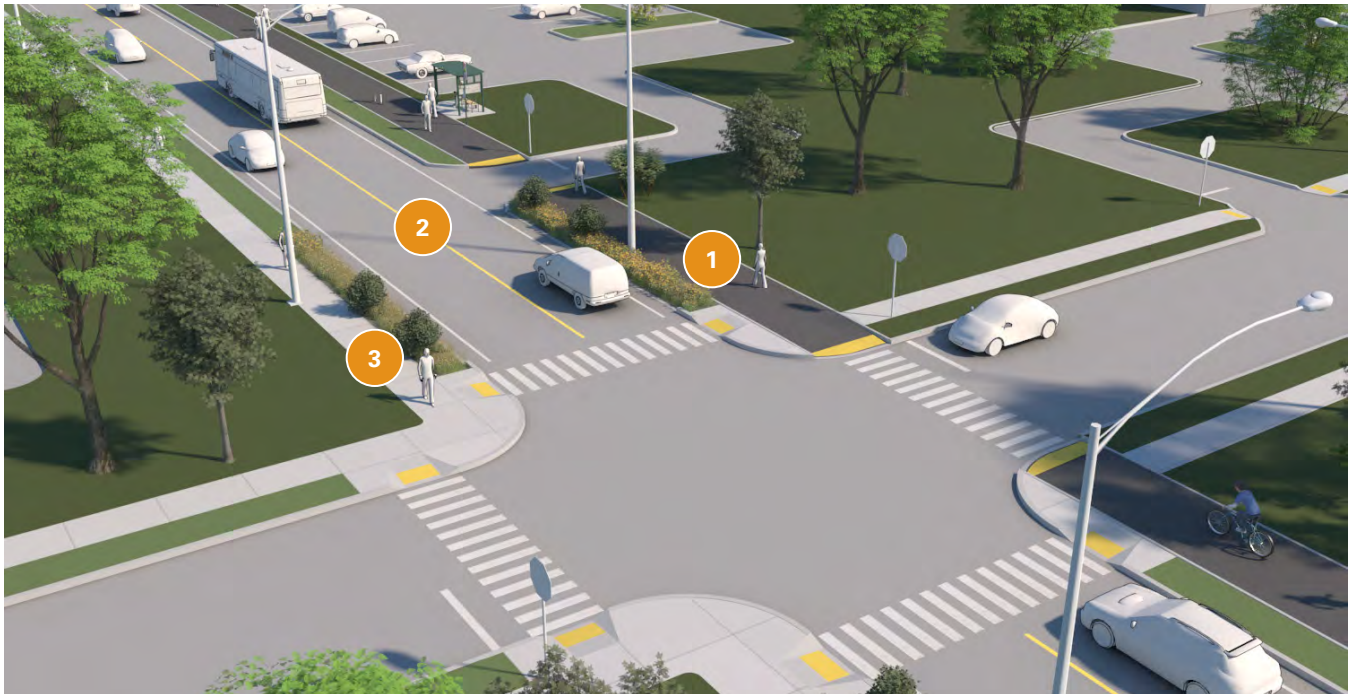
When creating a bicycle boulevard, a traffic diverter is an effective treatment for reducing motor vehicle volumes along the designated route.

Office/Light Industrial Center

Many (if not most) office/light industrial developments in New Jersey are designed and oriented for automobile access. This often leads to very wide streets and a lack of pedestrian or bicycle infrastructure. This design restricts access to those who wish to or need to arrive by other means of transportation, including nearby public transportation. While office/light industrial centers will typically continue to be auto-centric due to their surrounding land use patterns and need to accommodate deliveries or truck traffic, they should also incorporate the needs of other modes in order to support more transportation options and improved internal circulation. Design treatments should focus on creating streets with appropriate travel lane width and internal circulation for pedestrians and bicyclists, as well as connections to nearby bicycle, pedestrian, and transit networks.

Existing Conditions

The above illustration depicts a typical office/light industrial center street. The street features a 27-foot cartway with no striping that carries two directions of traffic. Grass areas on each side of the cartway are often used by employees to walk around the development or to nearby destinations outside of the development. The lack of sidewalks or facilities for cyclists discourages this type of use and does not provide any accessible facility for non-motorized users with limited mobility.



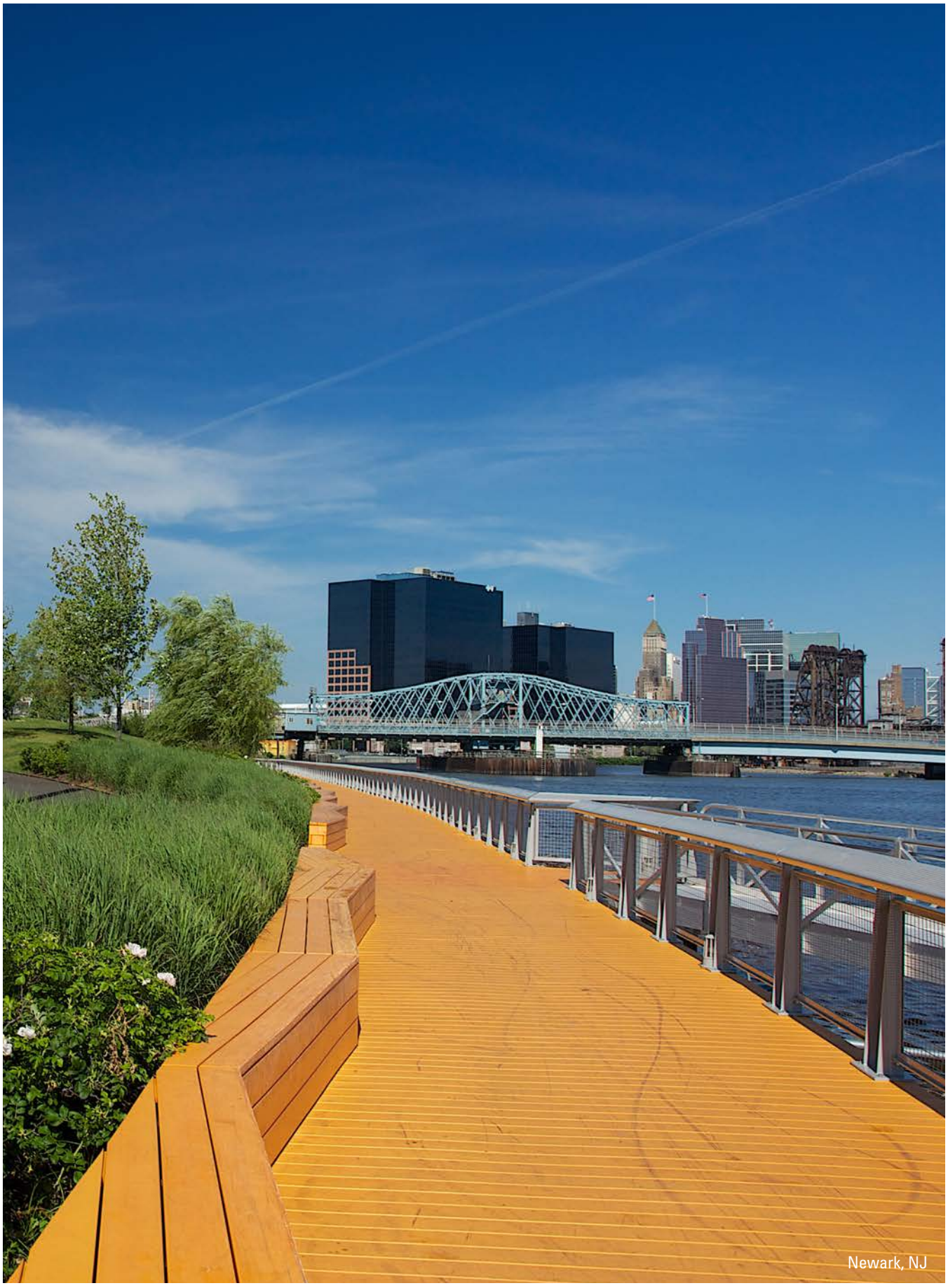
Recommendations

1 A multi-use path can be installed in the wide planted area to provide accommodations for bicyclists and pedestrians. The path should feature lighting and be well marked at intersections and driveways.

2 Narrower travel lanes discourage speeding.

3 A continuous sidewalk provides an accessible pedestrian facility throughout the development.

Where space allows in the cartway, or insufficient space exists within the planting strip, on-street bicycle lanes are an appropriate treatment within an office/light industrial center development.



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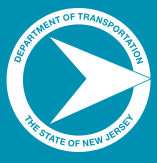

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