

East Branch of the Rahway River

Rhodeside & Harwell, Incorporated

Master Plan

Village of South Orange, New Jersey

February 2007





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East Branch of the Rahway River Master Plan

Prepared by: Rhodeside & Harwell, Incorporated with
Professional Planning & Engineering
PK Environmental

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East Branch of the Rahway River Corridor

Executive Summary ¹

Village of South Orange, New Jersey



Executive Summary

This Master Plan is the result of efforts by the Village of South Orange, the River Greenway Committee and Main Street South Orange, Inc. to revitalize and strengthen the physical, ecological and hydrological elements of the East Branch of the Rahway River in South Orange, New Jersey.

Early settlers of the Parish of Orange recognized the value of the East Branch; farmers, who were among the first settlers in the area, located farms along the river's banks, and the Village Center was constructed just above the river's floodplain. By the late 19th Century, industrialization threatened the river, and in the Early 20th Century, the Meadowland Society purchased lands along the banks of the East Branch, preserving these lands in perpetuity for recreational and scenic purposes.

In the 1970's the US Army Corps of Engineers channelized the East Branch in an effort to control flooding that occurred as a result of increased development within the river's watershed. Today we realize the ecological benefits of the initial 1920's preservation effort of the East Branch and the ecological, aesthetic and public access compromises that were made in the 1970's in the name of flood control. This Master Plan proposes beneficial modifications to the

existing channelized river, in the spirit of the Meadowland Society's vision, by improving the aesthetic character of the river; enhancing access to recreational opportunities adjacent to the river; increasing public access along the river corridor and to the river itself; improving ecological value of the river and its adjacent riparian flora; providing programmatic opportunities to engage the Village Center, South Orange residents, and adjacent schools, and creating an off-road bike and pedestrian path to key destinations. These improvements can be made without compromising the hydrological character of the river - many proposals are likely to increase flood storage capacity, thereby lowering flood risks.

In 2003 the Village of South Orange issued a Request for Proposals from consultants to assist the Village in development of this Master Plan. The Village narrowed the list of bidders to twelve, and Rhodeside & Harwell, Incorporated was selected as the landscape architecture and planning firm to lead this effort, with the assistance of Professional Planning and Engineering and PK Environmental. Public participation was a key component of the Master Plan process. Key findings of the public participation process were the need for expanded recreational opportunities and

preservation of existing recreational facilities; the opportunity to engage the adjacent South Orange Middle School science curriculum; opportunities to enhance scenic and historic resources; and a desire for significantly improved pedestrian and bicycle transportation in all parts of the study area. River corridor enhancements were noted as especially important to the continuing revitalization of the South Orange Village Center.

The Master Plan proposes three thematic zones for treatment within the corridor, based on native geology, hydrology and vegetation, the heritage of the Village, and intended user experiences within the corridor. The Master Plan also addresses key design elements that should serve as the basis for development of design guidelines. Recommendations regarding the implementation and management are included within the Objectives and Conclusions sections of the report, as this document should not be viewed as an end result - rather as the beginning of the river's rehabilitation.

Proposals contained within this Master Plan require further design study, and implementation of proposals will take several years. This document provides a preliminary phasing strategy and opinions of probable construction costs

to guide the Village in planning for implementation. Permit requirements for many of the proposed improvements could prove to be extensive and should be planned for accordingly.

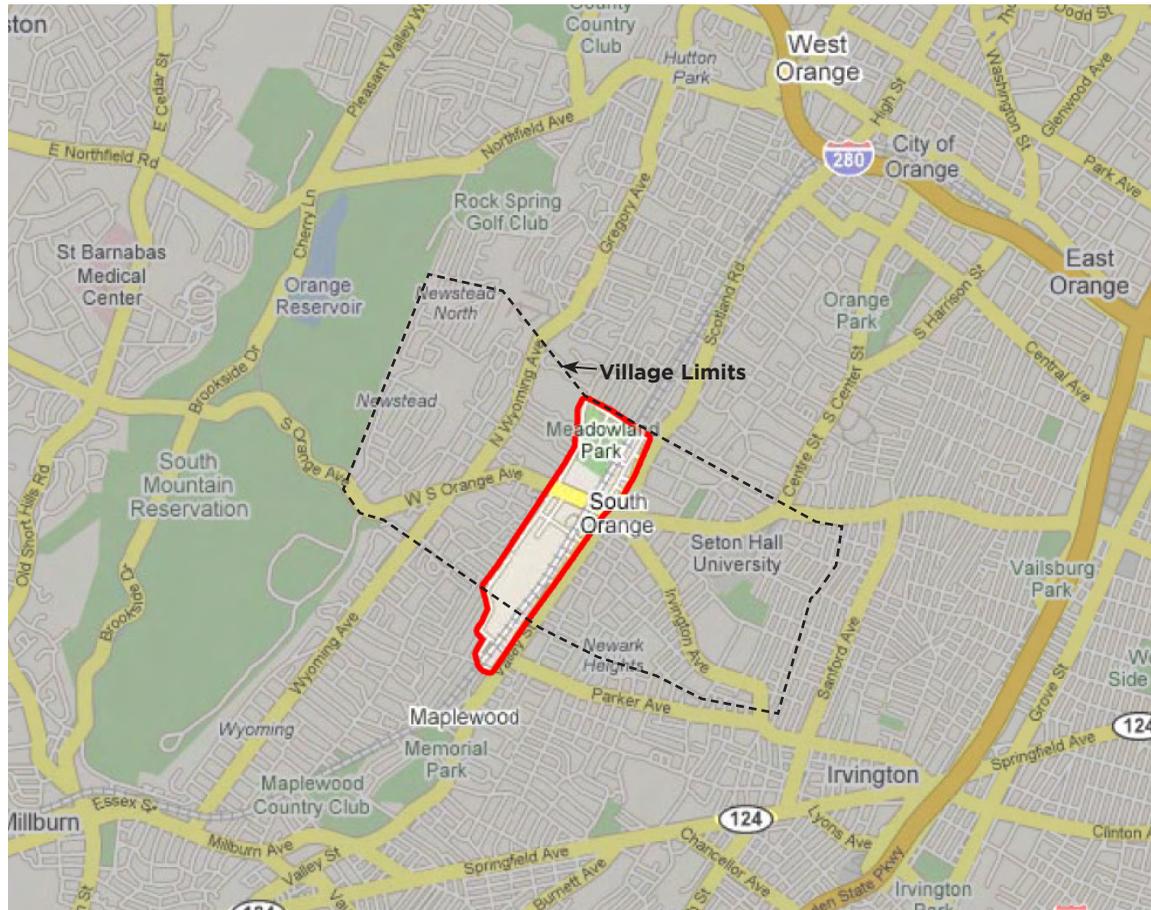
The East Branch of the Rahway River has great potential to be reclaimed by the Village of South Orange as the Village's signature open space. The rehabilitation of this river corridor into a vibrant, ecologically productive open

space will undoubtedly become an example for other stream restoration projects throughout New Jersey and beyond.





East Branch of the Rahway River Corridor



2.01 Regional location map, showing the project area in red (Google Maps, 2006).

Context

Covering an area of 2.9 square miles within Essex County, New Jersey, the Village of South Orange straddles the East Branch of the Rahway River between West Orange and Maplewood. South Orange is bounded by the South Mountain Reservation to the west and the city of Newark to the east.

In many ways, South Orange is a model American community. Its wealth of assets makes it a unique and desirable place to live. Its architecture, its walkable and charming streets lined with trees and gas lamps and its convenient location along transit lines underscore the Village's rich history and tradition as well as its future potential. Moreover, South Orange's diverse population, direct linkages to New York City and ample green spaces have helped establish the Village as a popular destination for newcomers in search of a small town character within a large metropolitan region. Nevertheless, South Orange has not fully capitalized on one of its greatest assets, the East Branch of the

Rahway River, which runs through the center of the village.

Although the East Branch of the Rahway River runs through the core of the Village and was a source of civic pride for much of the Village's history, its value as an urban amenity has been all but forgotten today. Following channelization as part of a 1970's flood control effort, and subsequent years of neglect, the river's visual appeal has been marred by the stark concrete walls lining its banks and by a general lack of maintenance. Still, enough of its natural beauty and ecology remain intact to enable the East Branch of Rahway to reemerge as an attractive village focal point of aesthetic, ecological and recreational value. As part of the Village's redevelopment efforts, a reclaimed river can serve as a catalyst for the revitalization of South Orange's Village Center. The potential synergy of these efforts presents a unique opportunity to lay the foundation for a new chapter in the village's history.



2.02 View down South Orange Avenue (RHI, 2004).



2.03 The Duck Pond (RHI, 2004).



2.04 South Orange Fire Headquarters (South Orange Record Corp. c. 1940).



2.05 View along the banks of the East Branch (RHI, 2004).



2.06 Historic Gas-light (RHI, 2004).



2.07 Lackawanna Railroad Station, (South Orange Record Corp. c.1940)

Background

History

Prior to English settlement, the tract of land that is now the Village of South Orange was inhabited by the Lenape Tribe and was considered fertile hunting and fishing grounds until it was purchased by Robert Treat in 1666 as part of the territory that would become the city of Newark. Joseph and Thomas Brown first settled in 1677 near the present intersection of South Orange Avenue and Ridgewood Road, approximately one modern block from the river. In 1680, The Wheeler and Riggs families were granted land “by Rahway River near the stone house [of the Brown family],” (Beatrice P. Herman *The Trail to Upland Plantations: Worrall*, 1976). These three properties extended east to the river, comprising the Village Center’s present location.

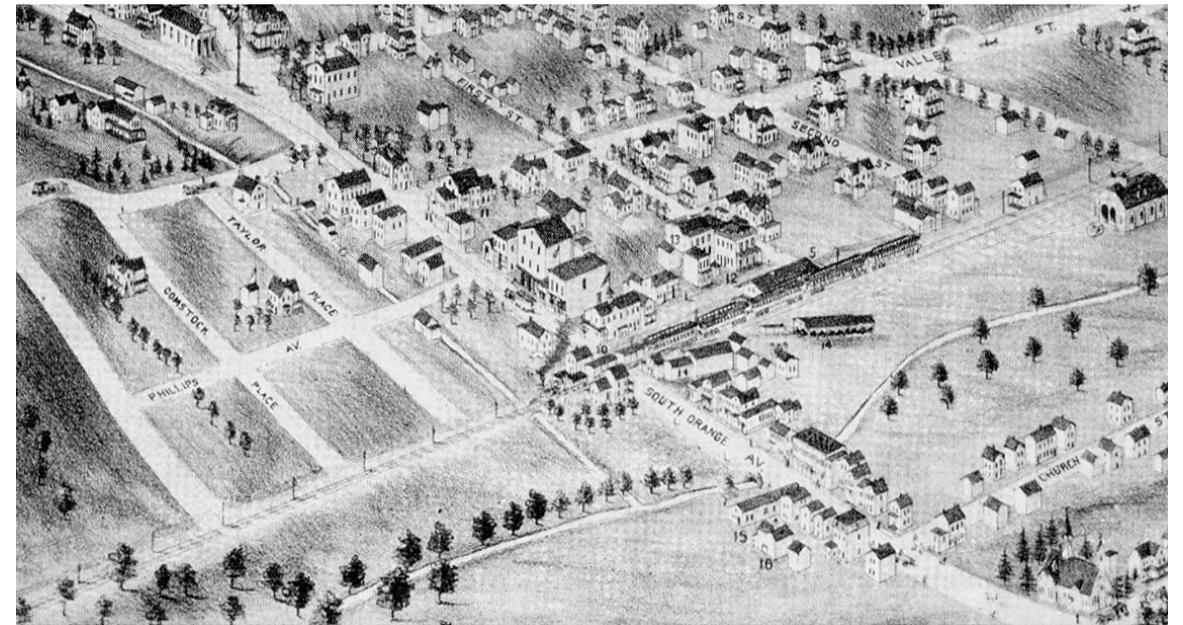
By 1795, this tract along the East Branch of the Rahway River was widely referred to as the Parish of Orange, after the ruler of England, William of Orange, and, in 1806, Orange Township officially became a separate entity from Newark. In 1861, an act of the New Jersey Legislature created the South Orange Township. The Legislature separated the Village of South Orange from the Township in 1904.

Originally a farming community, South Orange developed into a suburb of Newark with the opening of the Morris and Essex Railroad in 1837. The village

continued to be developed throughout the 19th Century with the draining of swamps, construction of roads, and installation of sewer, gas and water lines. In 1860, gas service replaced the Village’s sperm oil-powered street lamps. Although the Village received electric power in 1888, gas street lamps are still used, representing a symbol of South Orange’s unique identity today.

By the latter part of the 19th Century, industrialization began to reshape neighboring communities, as the proximity of the railroad to the Rahway River made this corridor ideal for waste dumping and industrial operations. Concerned South Orange residents began to organize efforts to block the development of the Rahway River corridor for industrial uses. In the early 20th Century, The Meadowland Society acquired tracts of land along the river and sold the land back to the Village with deed restrictions, ensuring the banks of the river could only be used for recreational and scenic purposes. These key land acquisitions set the stage for the construction of a number of parks and playgrounds that define the character of the Village of South Orange today.

The preservation efforts of the Meadowland Society, combined with good transportation links, made South Orange an attractive location for wealthy families from Newark and New York



2.08 (top) 1877 Axonometric view of South Orange, looking west. Note the East Branch of the Rahway River in the lower right hand portion of the image (D. Brenner & Company, courtesy of Amy Dahn).

2.09 (bottom left) Aerial view of South Orange, project area in red (Fairchild Aerial Surveys, Inc. c.1935).

2.10 (bottom right) Aerial photograph of South Orange, looking south (South Orange Public Library, 1902).



2.11 Town Hall and Roth Building (F.G.. Temnie Publishing c.1920).



2.14 Trolleys along South Orange Avenue (South Orange Public Library, C.1910).



2.12 East Side of Town Hall (South Orange Public Library c. 1930).



2.15 View along South Orange Avenue, looking east (Seton Hall University, 1920).



2.13 South Orange Avenue in Winter, looking west (Amy Dahn, 1909).



2.16 View along South Orange Avenue, looking east (Jewitt, C. 1920).

City to build large weekend homes. In response to these new residents, tennis and golf clubs were opened, and gained much attention. The Orange Lawn Tennis Club was home to early U.S. National Tennis Championships, and a popular nine hole golf course once encompassed Meadowlands Park; the course's clubhouse later became the Baird Community Center.

In the early 1900's a trolley line, called the Swamp Line ran from the Village Center along Meadowbrook Lane to West Orange. The greenway and bicycle path proposed later in this report replicates, to some extent, this early transportation route. In the 1920's the Village became a popular bedroom community for America's emerging middle class. By the 1930's, nearly all developable land within South Orange contained houses ranging from the simple Foursquare houses to Victorian mansions. Situated on the foothills of the Watchung Mountains to the west, South Orange was considered the fringe of urban development around Newark and New York City until the 1950's, when construction of the US Interstate highway system led to sprawling development over the Watchung Mountains.

Today, the majority of South Orange residents commute to work in New York City, Newark or elsewhere in New Jersey, as they have since the transforma-

tion of South Orange into a bedroom community dating back to the 1920's and 30's. Besides local retail and some small office buildings, Seton Hall University constitutes the only large-scale employer within South Orange, enrolling nearly 10,000 students annually. Originally opened in 1856, Seton Hall is America's oldest Diocesan university.

In 1974, the U.S. Army Corps of Engineers undertook a flood control project along the East Branch of the Rahway River. The Corps constructed a concrete channel along the banks of the river and reinforced steep slopes with riprap. In 1978, the Village acquired land from the Lackawanna Railway Company in a bankruptcy suit. The Village later used the land – previously a waterworks and well fields – to develop the New Waterlands and Old Waterlands parks, completing the Village's park system; however, The meandering river, once lush with plantings and wildlife, that ran through the village had been replaced with an engineerd channel.

What we see in the Township of South Orange Village today is a model of a quintessential American town: recognizable boundaries; a bustling village center; easy access to major cities; comfortable homes on tree-lined, gas lit streets; beautiful parks and significant, historic, picturesque publicly-held and privately-owned buildings.

Study Area Description

The Village of South Orange combines a variety of attractive natural and built features with a proximity to transit and retail centers to create a strong civic identity and provide a desirable place to live. With a population of 16,694 residents (according to 2000 census data), South Orange comprises one of just four recognized villages within the state of New Jersey.

The range of recreational amenities on both sides of the river provide a variety of opportunities for active and passive recreation. The Duck Pond and adjacent Floods Hill Park anchor the western side of the river and serve as places of leisure; the Duck Pond is used for ice skating when frozen. The Baird Community Center is the hub for a larger area of active recreation east of the river, including the Peter S. Connor Memorial Pool, playground, tennis courts and sports fields at Meadowland Park and Cameron Field, as well as many theater, music and other arts classes and presentations. Active recreation is also available farther downstream at Waterlands Park, Chyzowych Field and Farrell Field.

Transportation linkages and the variety of activities clustered within walking distance of the Village Center and neighborhoods further enhance the corridor. Walkable, tree-lined streets and picturesque residential neighbor-



hoods allow for convenient access to the adjacent Village Center and commercial district. The South Orange Train Station, at the heart of the Village Center, provides direct connections to New York City and Newark through its Midtown Direct service. The train station also serves as a commercial and retail hub within the Village Center. The South Orange Middle School and the

Baird Community Center are adjacent to the river and within walking distance of the Village Center.

The East Branch of the Rahway River and the Duck Pond are the most significant surface water features within the Village of South Orange. As such, these resources warrant special attention, as provided in this Master Plan.



Key

- 1. Baird Community Center (2.18)
 - 2. Peter S. Connor Memorial Pool (2.19)
 - 3. South Orange Middle School
 - 4. South Orange Train Station (2.20)
 - 5. South Orange Village Center (2.21)
 - 6. Montrose School
 - 7. Mountain Train Station
 - 8. DPW Warehouse
 - 9. Fire Station (2.22)
 - 10. Pumphouse (2.23)
 - 11. Cameron Field
 - 12. Third Street Playground
- Project Limits

2.17 Aerial photograph with key landmarks (photograph from Google Earth (2006) project limits and labels by RHI (2006)).



2.18 Baird Community Center (RHI, 2004).



2.22 Historic Firehouse at Sloan Street and First Street (RHI, 2004).



2.19 Peter S. Connor Memorial Pool (RHI, 2004).



2.23 Historic Pumphouse next to DPW grounds (RHI, 2004).



2.20 South Orange Train Station (RHI, 2004).



2.24 The Duck Pond (RHI, 2004).



2.21 South Orange Village Center (RHI, 2004).



2.25 Floods Hill Park (RHI, 2004).

Land Use

- Residential
- Commercial
- Institutional
- Utility (DPW Site)
- Railroad
- Public Parking
- Recreation
- Open Space
- Forest
- Water
- Project Limits
- Access Road
- Bridge Crossing – Pedestrian
- Bridge Crossing – Vehicular



2.26 Existing land use map (RHI, 2006)





Land use characteristics adjacent to East Branch speak to the area's history: the commercial areas of the Village Center are the same areas that were densely developed by the end of the 19th Century (see images 2.08, 2.09 and 2.10), and areas that were preserved by the Meadowlands Society in the early 20th Century remain today as recreational lands and passive open space. The South Orange Department of Public Works (DPW) site in the southern portion of the study area occupies historically industrial land. Surrounding land uses are predominantly residential, as they were when South Orange became a bedroom community for Newark and New York City in the 1920's and 1930's.

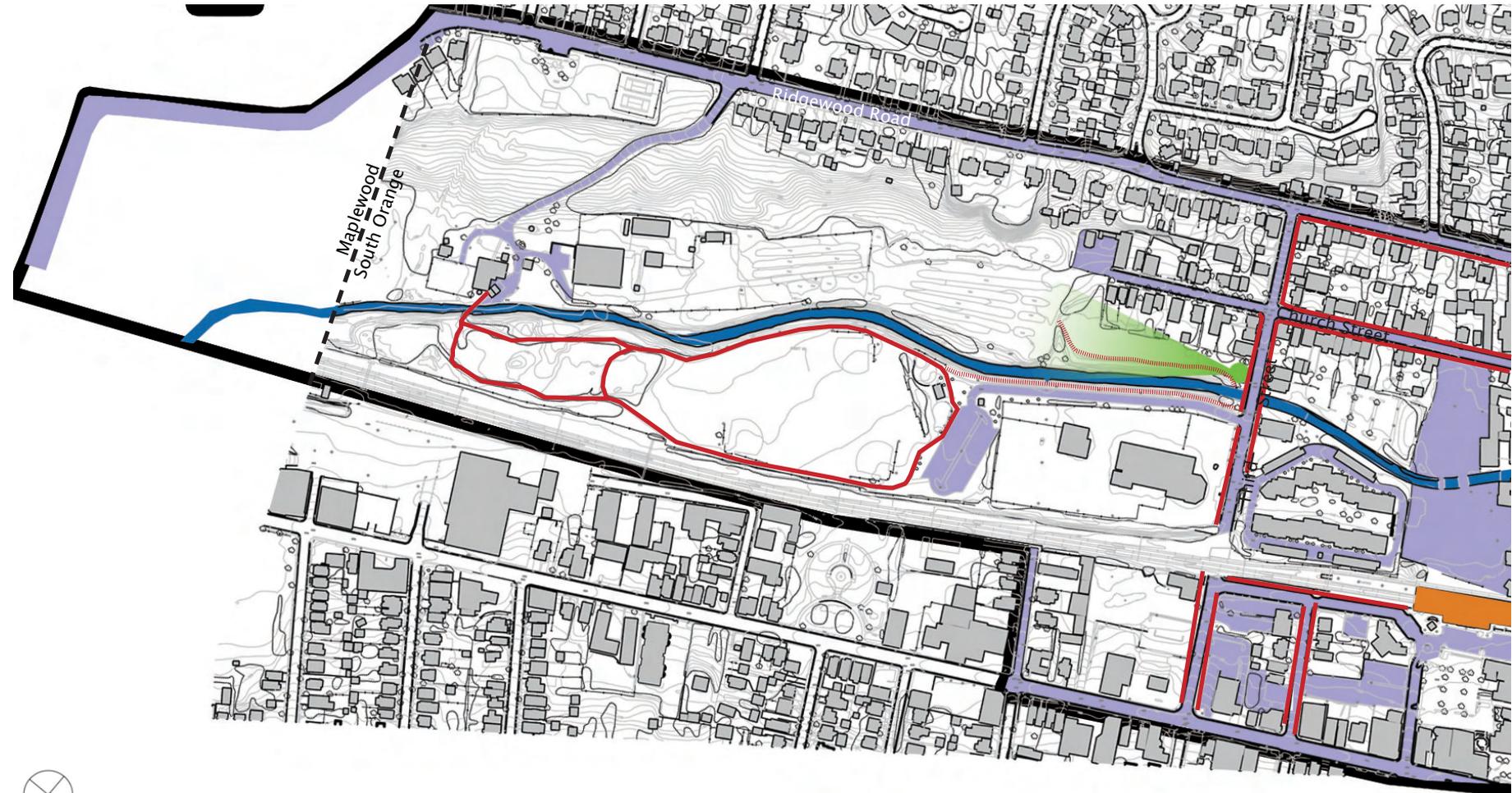
The Village Center (shown as "Commercial," in red), nearby public parking for the South Orange Train Station, and the adjacent South Orange Middle School constitute a dense, walkable core. Many nearby residences are within walking or biking distance of the Village Center or Middle School, but existing pedestrian and bicycle access do not fully capitalize upon this proximity of land uses.

Transportation & Access

-  Road/Parking
-  Pedestrian Trail or Sidewalk: Paved
-  Pedestrian Trail: Unpaved or degraded paving
-  Bike Trail
-  Rahway River
-  Significant View From Roadway
-  Train Station

Bicycle and pedestrian trips in South Orange are not only recreational, but they eliminate the need for residents to drive to the Village Center for shopping, dining, entertainment or access to the South Orange Train Station at the congested Village Center.

Based on current and historic land use patterns, the study area is highly capable of providing pedestrian and bicycle access between adjacent residential areas, the Village Center and Middle School area. However, current pedestrian access along the river is discontinuous and there are no off-road bicycle paths in the village north of Third Street.



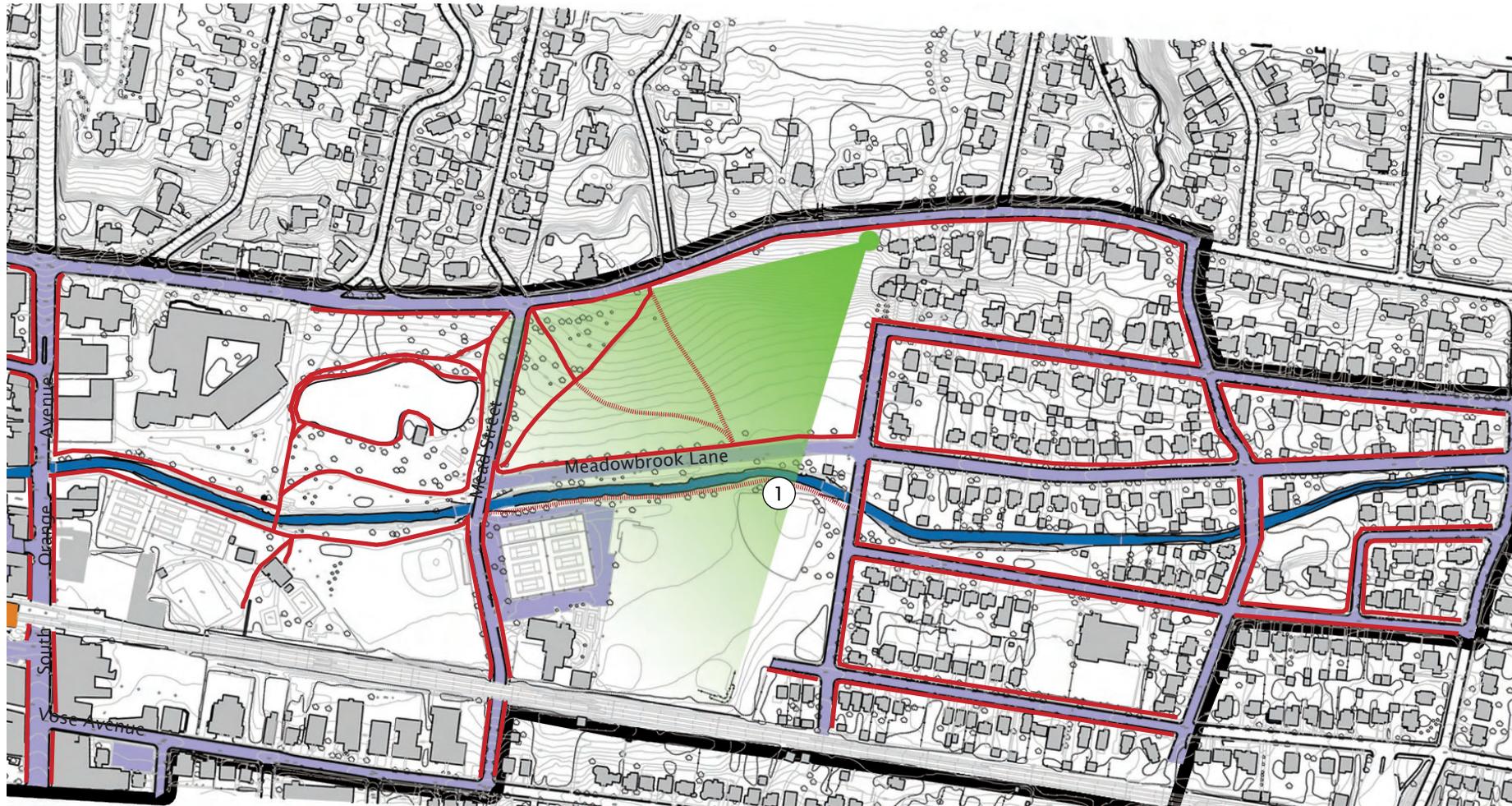
 2.27 Site Access Map (RHI, 2006).

Note on image 2.27 that the paved pedestrian paths at Waterlands Park are not connected to the Village Center (also image 2.28); also, no pedestrian or bike paths exist along the river within the Village Center. Residential

neighborhoods north of Meadowlands Park and east of the river have no pedestrian or bicycle link directly to the river, Baird Community Center, South Orange Train Station, or Village Center. On-street Bicycle lanes are virtu-



2.28 The River corridor lacks dedicated pedestrian connections in key areas (RHI, 2004).



river. Many of these trails, however, are in a state of decay; a problem remedied by resurfacing the pathway and completing minor trail upgrades. Pedestrian safety could also be enhanced (image 2.29) with redesigned intersections and crosswalks, which would also help slow down, or calm, vehicular traffic. Main Street South Orange, Inc., Essex County and the Village government have already initiated such improvements to the pedestrian corridor along South Orange Avenue. Furthermore, several of South Orange's streets have sufficient right-of-way to support shared use with bikes.

Parking availability is a key issue that needs to be addressed within the study area. The Middle School and several recreational facilities currently have dedicated parking lots and/or utilize on-street parking to meet their parking needs. Opportunities exist for some of these facilities to share parking to maximize use of limited space. Parking needs can be reduced in part through enhanced bicycle and pedestrian access.



2.29 Pedestrian safety and connections could use improvement (RHI, 2004).

ally nonexistent within the entire study area.

Both the Village Center and South Orange's various recreation areas contain a network of pedestrian trails, mak-

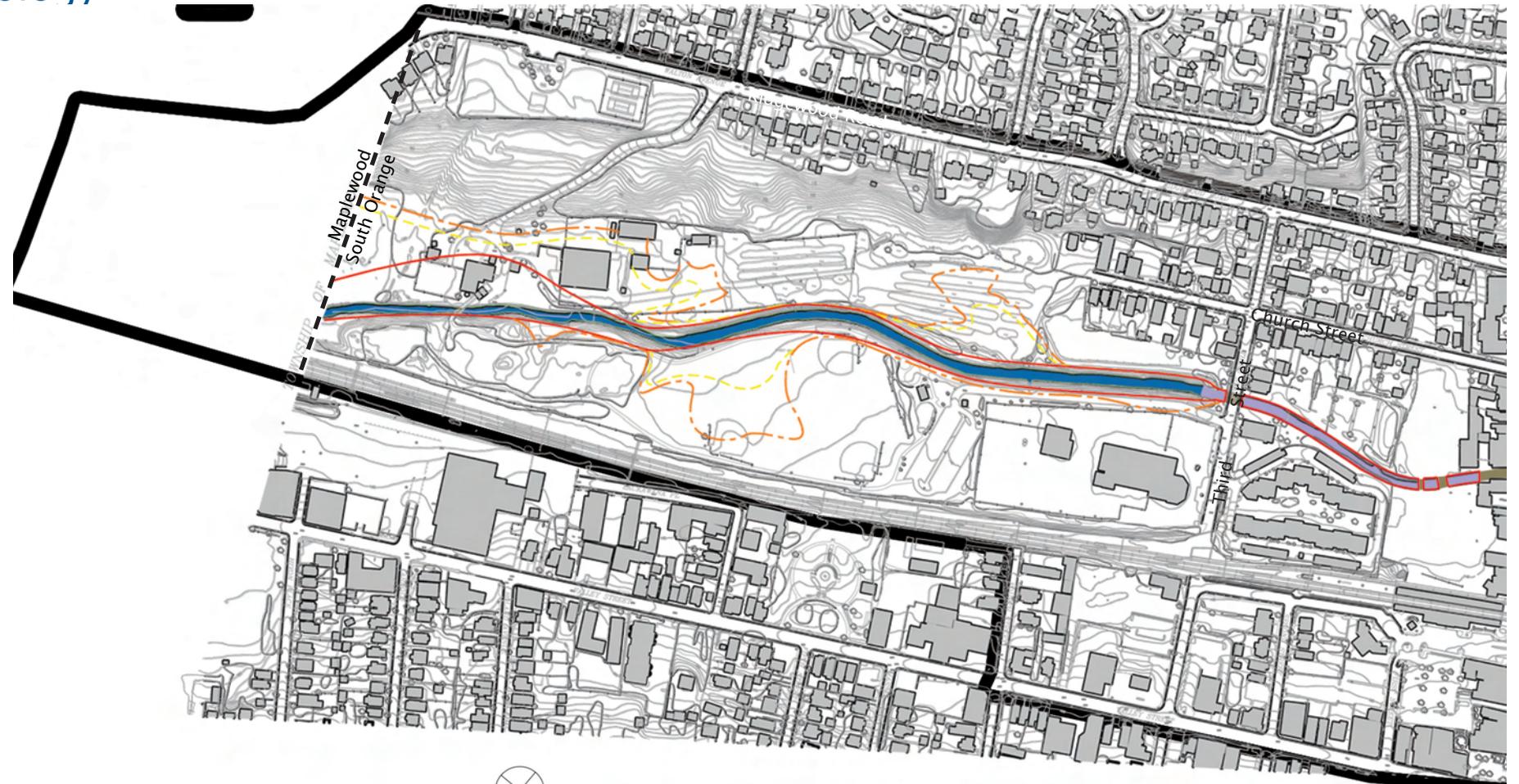
ing access to, from and between these amenities easy for pedestrians. A maintenance easement is located along the river banks for flood control improvements; many existing trails are located within the easement, paralleling the

Geomorphology and Hydrology

- River: Vegetated Banks, Natural Bed
- River: Concrete Walls, Natural Bed*
- River: Concrete Walls, Concrete Bed*
- River: Piped
- Floodway*
- New Jersey Flood Hazard Area*
- 100 Year Flood Plain*
- Vehicular and Pedestrian Bridge
- Pedestrian Bridge

*Along the portions of the river that have been enclosed by concrete walls, the Floodway, New Jersey Flood Hazard Area and 100 Year Flood Plain exist in the same location. In these instances, all three lines are represented by the red Floodway line.

South Orange is located on the western edge of the Newark Basin, an aborted rift that formed during the Late Triassic Period (about 220 million years ago) when the African and American continents began to separate from the supercontinent, Pangaea due to a series of rifts that ultimately expanded to create the Atlantic Ocean. The Newark Basin, which stretches from Rockland



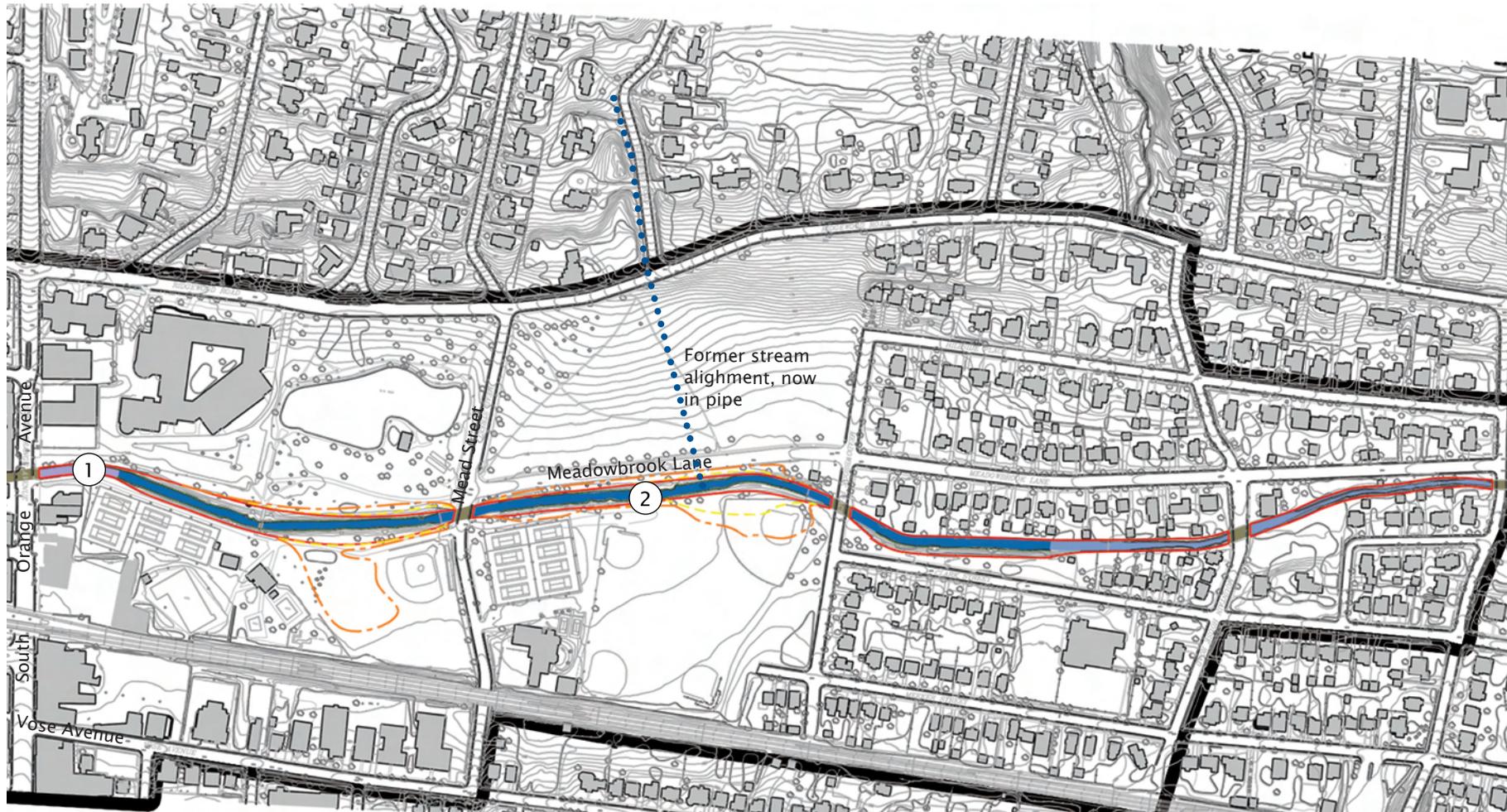
2.30 Existing Hydrology Map (PPE, 2005, RHI, 2006).

County, New York well into southeastern Pennsylvania, includes a wide swath of land across the center of New Jersey, covering most of Essex County. Sedimentary conglomerates of fine-grained sandstones and iron-rich red or brown

colored mudrocks (commonly referred to as brownstone) are abundant, often in boulder form, especially nearer to the base of the Watchung Mountains; these rocks were formed by sediment from the erosion of nearby mountains



2.31 Concrete retaining walls topped with chain link fencing (RHI, 2004).



2.32 Frequent bank erosion jeopardizes watershed quality (RHI, 2004).

when the Newark Basin ceased to expand. The specific soils that comprise the East Branch within South Orange are classified as Urban Land – Boonton Wethersfield soils, which are well drained, deep gravelly loams, created

from acidic, reddish sandstone, and glacially tilled shales and basalts.

Lining the western edge of the Newark Basin, the Watchung Mountains are a volcanically formed series of long, low

ridges, consisting primarily of hard, mineral rich basalt, which was thrust upwards at the genesis of the Newark Basin when the North American plate separated from Pangaea.

The Rahway River is approximately 30 miles in total length, draining much of Essex County before emptying into the Arthur Kill. The river begins as two separate branches that meet near Interstate 78 in Springfield.

The West Branch of the Rahway River begins in Verona, flowing along the west side of the First Watchung Mountain, ultimately reaching the glacially carved Millburn Gap, between the South Orange Reservation and the Watchung Reservation atop the Second Watchung Mountain in Union County.

The headwaters of the East Branch are near Eagle Rock reservation, situated on the First Watchung Mountain. From there, the East Branch continues to flow south, through South Orange and Maplewood, draining communities east of the Second Watchung Mountain as it flows toward Millburn Gap.

Although the East Branch provides drinking water for some communities

downstream, it must be heavily treated before becoming potable. Non-point and industrial sources of pollution, such as runoff from construction sites, roads, urban surfaces, storm sewers and combined sewer overflows contribute to high nutrient levels, presence of dissolved solids and presence of fecal coliform bacteria from animal waste. This pollution also contributes to higher stream temperatures, periodic low dissolved oxygen levels and fishkills.

Because much of the East Branch of the Rahway River within the study area was channelized (2.31), the river's hydrology has already been studied and delineated by the State of New Jersey. Image 2.31 illustrates the floodway (the portion of the river actively flowing during a flood), the 100 year flood plain (the horizontal extent of flooding during a 100-year flood), and the Flood Hazard Line.

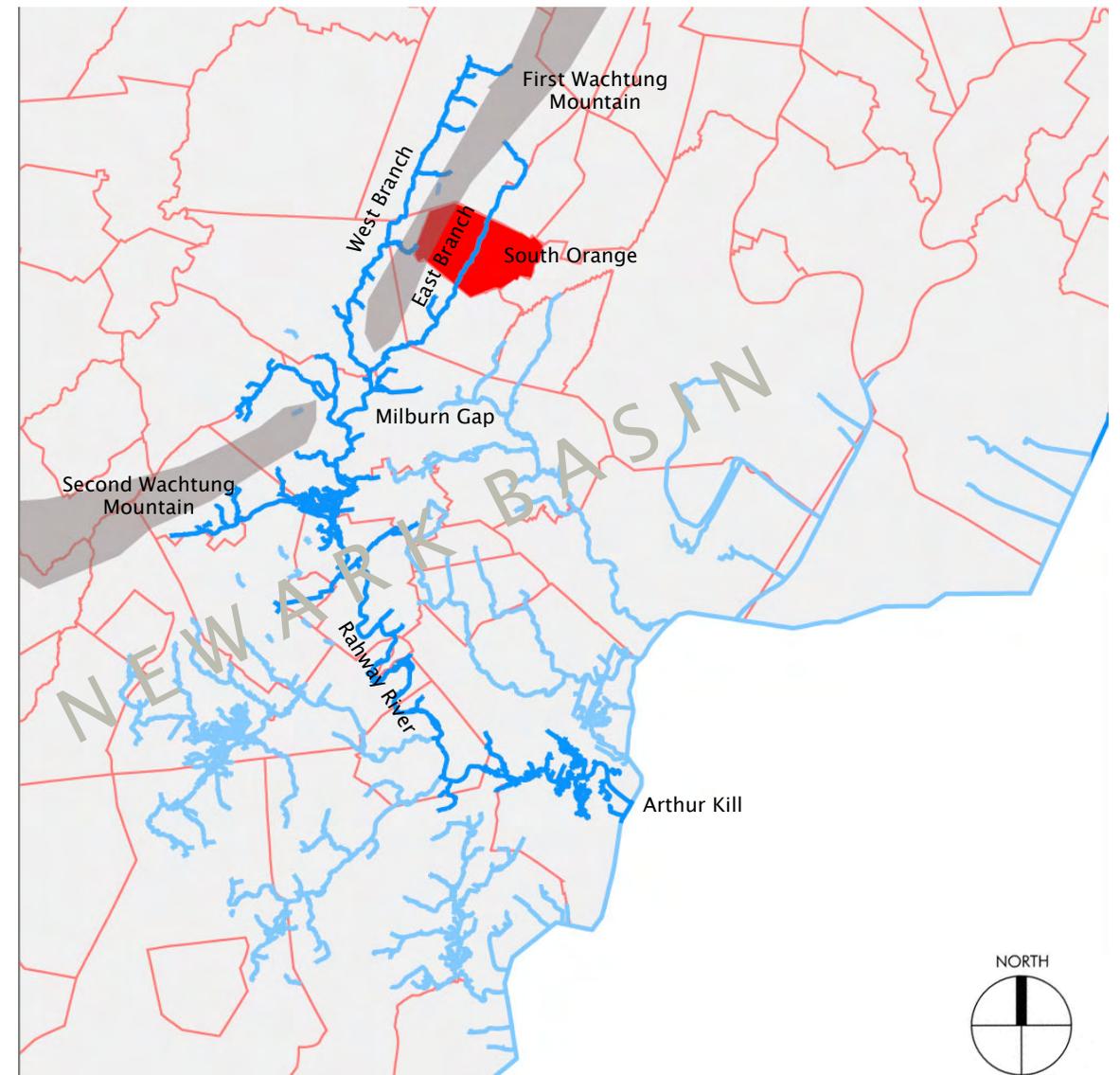
The Village of South Orange has a maintenance agreement with the Army Core of Engineers to ensure that the river channel continues to function as designed in the 1970's, minimizing or preventing flooding of or damage to adjacent structures. The channel has deteriorated in places, as slopes

have begun to erode or scour and silt is deposited in the river (image 2.32). The Village must pay for the river to be dredged of silt annually, which is both an expensive and unsustainable process.

Spatial constraints limit the Village's ability to alter the river's banks, particularly near the Village Center. Opportunities do exist, however, to modify the floodway to reduce the velocity of water flow, which will create a more ecologically sound river.

Within the study area, the river is traversed by six vehicular bridges and two pedestrian bridges, each of which was designed as a flood control device. As bridges have potential to restrict floodwaters, any new bridges must be designed to accommodate occasional flooding of the river. This can be achieved either by designing a bridge whose deck is higher than the elevation of a 100-year storm, or by building a bridge that allows water to "overtop" during storms, a condition in which floodwaters pass freely over bridges, unobstructed by heavy railings.

The water of the East Branch has not risen past the height of the concrete



2.33 Map of the Rahway River corridor. The Village of South Orange is colored red.



2.34 Drainage outlet in the highly channelized portion of the East Branch (RHI, 2004).



2.34 Typical headwall along the bank of the East Branch (RHI, 2004).



2.35 Invasive plant species covered much of the river's banks (RHI, 2004).

walls within the channelized portion of the East Branch since the Army Corps of Engineers completed its work in the 1970's. As illustrated by image 2.30, flooding is limited to relatively small areas immediately adjacent to the river, most of which are parks or open spaces. Any proposed changes must respect the existing floodway and limit potential flooding to uninhabited lands (natural areas, parks and recreational facilities).

Refer to the Infrastructure and Permitting Section of this report for regulatory information regarding hydrology.



2.37 Typical view of the East Branch with vegetated banks and a natural bed (RHI, 2004).



2.36 Historic postcard depicting a scenic view along the Rahway River around the turn of the 20th Century (Montrose Park Historic District private collection).



2.38 Typical view of the channelized stream bed in the Village Center (RHI, 2004).



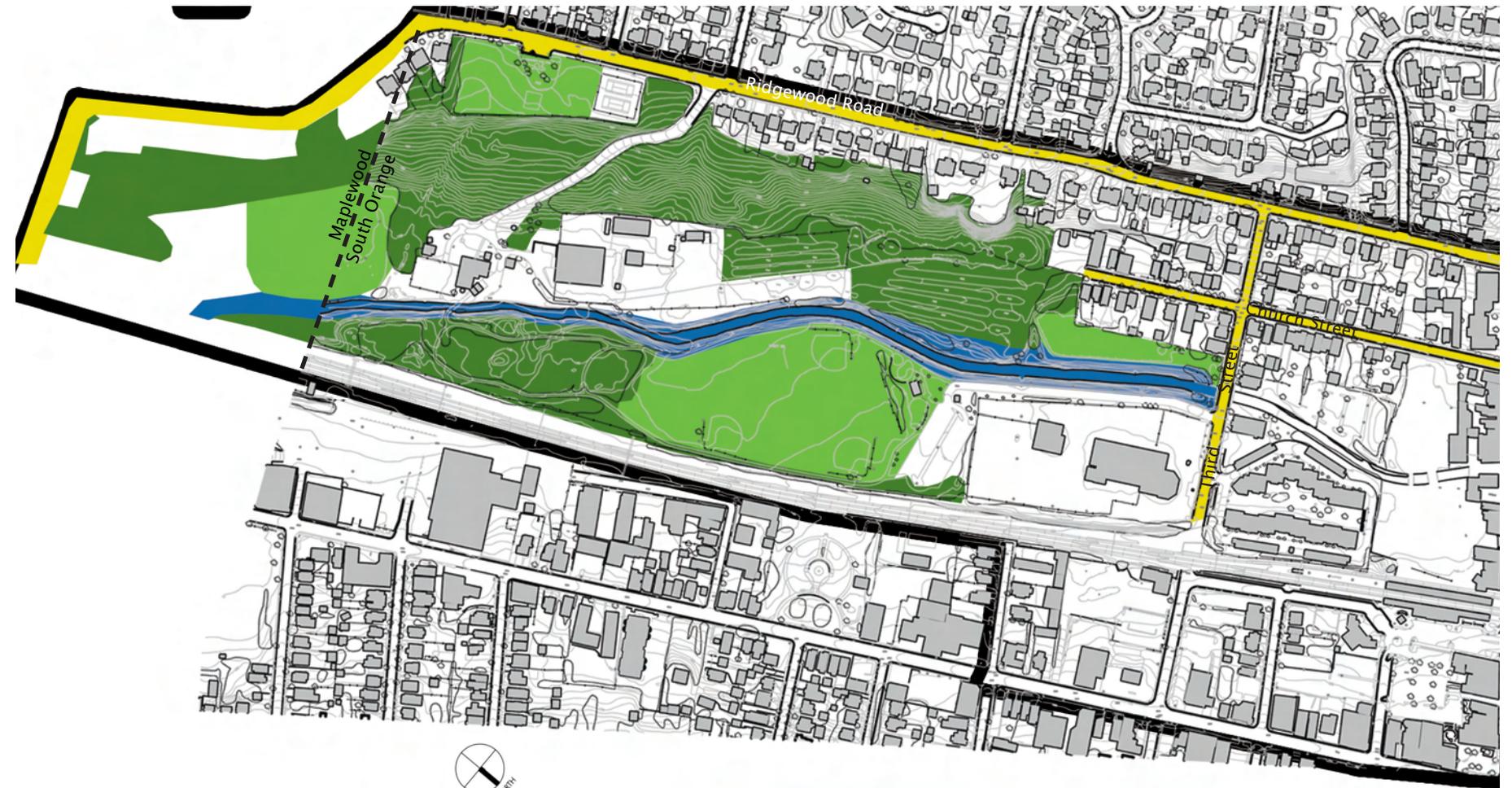
2.39 View of the East Branch in Maplewood with stone walls and a natural streambed (RHI, 2004).

Existing Vegetation

- Forest/Woodland
- Field/Lawn
- Specimen Trees in Lawn
- Tree Lined Streets
- Riparian Vegetation

South Orange is fortunate to have a substantial canopy of trees within the Village, especially a large wooded area near the DPW site. Areas with a more open canopy structure can be found in the open fields immediately adjacent to the river and in the Village Center. Shade trees are an often overlooked form of stormwater management: tree leaves delay rainwater from landing on the ground, and tree roots absorb groundwater. Urban trees, such as the iconic Sycamores that line many of South Orange's streets, also serve to mitigate urban heat gain. The urban forest of the Village of South Orange contributes greatly to the river's ecological health.

The slopes along much of the river corridor in the northern portion of the study area were designed to be mown, grassy slopes. As the Army Corps of Engineers designed the river channel to



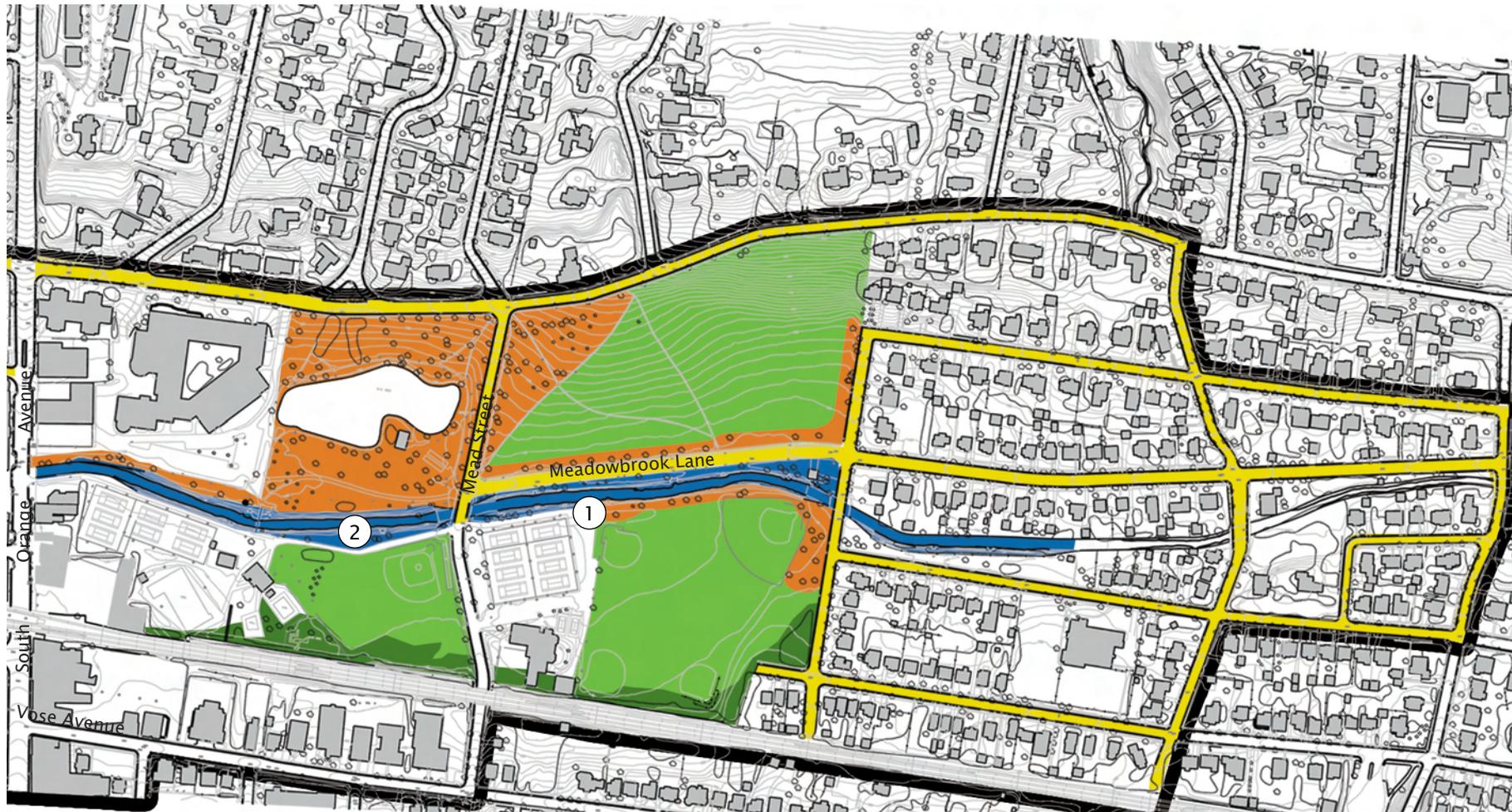
2.40 Existing Vegetation Map (RHI, 2006).

have a trapezoidal section (image 5.10), many of these slopes were set at grades generally considered to be too steep to mow (these slopes are approximately two horizontal feet for every foot of vertical rise, while the maximum accepted mowable slope is approximate

three-to-one). The steep grade of the slopes and lack of appropriate permanent bank vegetation has led to the conditions present today: infestation of Japanese knotweed and other invasive species. Extremely invasive knotweed thrives in full sun and disturbed soil



2.41 Lack of vegetation along the river corridor (RHI, 2004).



2.42 Sparse vegetation along the river creates an uninviting space (RHI, 2004).

(such as the existing eroded banks); knotweed is vigorous enough to choke out most other vegetation, and mowing further encourages its spread. Knotweed eradication is critical to the eventual ecological recovery of these areas. Appropriate permanent vegetation must

be established and the soil stabilized to prevent conditions that might lead to a return of invasive plant species.

Some river embankments, particularly in the southern portion of the study area, support a sustainable mix of ri-

parian species typical to a forest edge. These conditions contribute to an ecologically sound river by filtering rainwater, providing habitat and food for fish and animals and cooling the water's temperature.

Highly channelized portions of the river (with concrete walls and a concrete river bed) are not able to support any significant vegetation. In limited areas, walls may eventually be removed or lowered, but in most areas, wall removal is not feasible due to spatial constraints. In such areas, particularly the Village Center, containerized plants and overhanging vines may be utilized to enhance the aesthetic quality of the river. Shade trees and flowering trees may also be planted within vicinity of the tops of walls for benefits of reduced stormwater runoff and creation of shade.

The East Branch of the Rahway River is classified as an open water within the state of New Jersey. No known wetlands or vernal pools are present within the study area, but a full wetland delineation is required; wetlands may be present in the Southern Section. Additionally, the NJDEP Office of Natural Land Management, Natural Heritage Program Database has no record of threatened or endangered species (plant or animal) within the corridor.

Existing Infrastructure

Sanitary Sewer Main, Direction of Flow Indicated

Sanitary Sewer Lateral

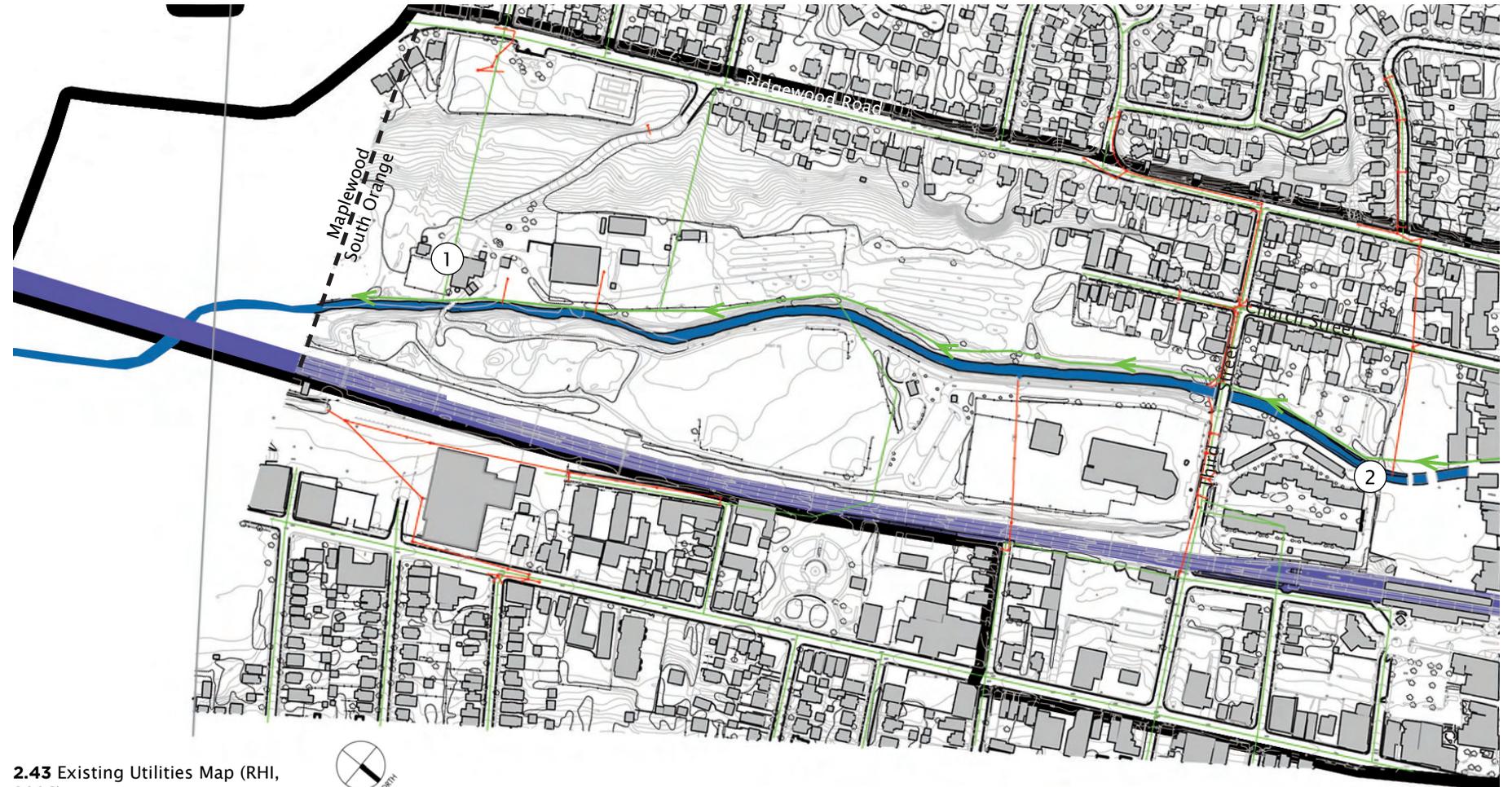
Storm Sewer Line

River Channel

Rail Line

A town's infrastructure—sanitary sewers, water and gas mains, electrical and telecommunication utilities and storm drainage systems—is vital to the health and quality of life of its residents and businesses, and it becomes an important factor when evaluating the feasibility of opportunities for development and improvement within the study area. Interruption of any of these services can spark strong public opposition, while relocation of existing infrastructure can be cost prohibitive.

At the very end of the 19th Century, South Orange received its first sewer system, constructed along the banks of the East Branch, as its corridor follows the lowest elevation and provides a logical location for a gravity-fed sewer to drain higher elevation areas of the Village. The sanitary main present



2.43 Existing Utilities Map (RHI, 2006).

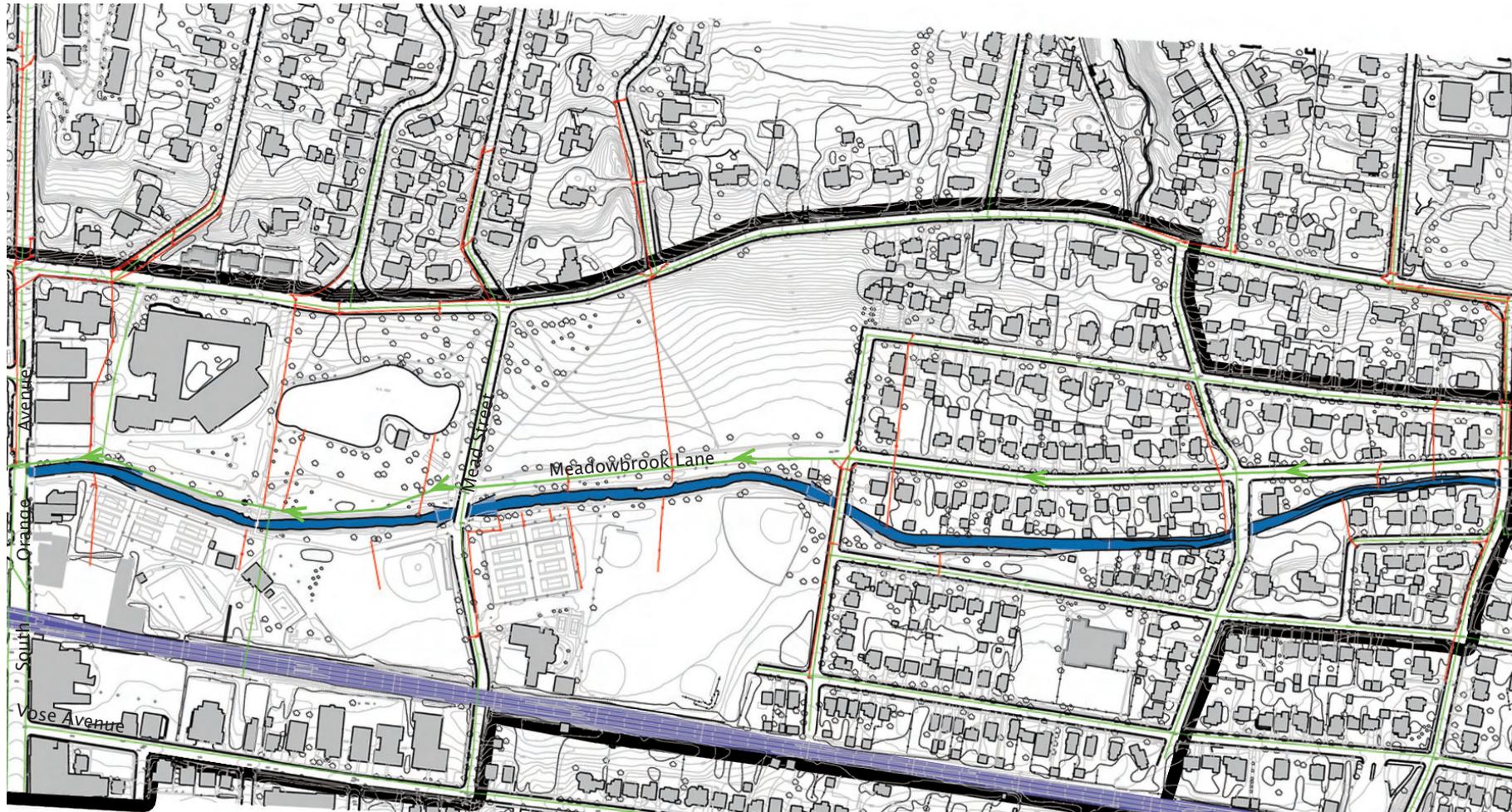
today also closely follows the west bank of the river.

Most sanitary lateral lines flow within street rights-of-way, as shown in image 2.43. Water, electrical, and gas

utilities are not shown in the plan, but in most cases, those utilities are also within the street rights-of-way. Sanitary lateral lines cross the river in at least six locations, either under bridges or below the river bottom.



2.44 Pump House (RHI, 2004).



pipes. Several storm drain outfalls are outfitted with “flap” type valves to prevent high volume flows from entering into storm drains. There are no known improvements along the river corridor that address water quality; in most cases, stormwater flows directly from roofs, streets and other urban surfaces into catch basins and then through pipes into the river, without any form of treatment.

In highly channelized portions of the river, there are no known structural defects of existing concrete walls and fencing or railing, but a detailed structural analysis should be included as part of planning and design for any improvements in the vicinity of walls and railings.



2.45 Storm drain outfall outfitted with a “flap valve”. (PPE, 2005).

The large existing sanitary sewer main line presents a challenge in any concept that involves relaxing the western banks of river, while the eastern banks have comparatively fewer obstacles in the way of improving the slopes.

Stormwater throughout the village empties into the East Branch via storm drainage system outfalls, some of which are anchored with headwalls as required by the Army Corps of Engineers, and some of which are bare

Permitting

Any improvements inside the floodplain limits or within the immediate vicinity of the East Branch will most likely require Stream Encroachment Permits from the NJDEP; for minor improvements, the Village may request a Jurisdictional Determination from NJDEP clarifying whether minor improvements are subject to permit review or not. Any Stream Encroachment Permit application would require completion of the Stream Encroachment Administrative Checklist that incorporates:

- Public Notices
- Forms
- Fees
- Environmental reports
- Hydrologic and hydraulic calculations
- Statements addressing wetland implications
- Restrictions on grading
- Changes within the 25' buffer beyond the river's outer banks
- Stormwater management plans
- Stability analyses
- Net fill calculations
- Field surveys
- Potential public hearings
- Photographs
- Other pertinent materials and actions

Potential General Permits (GP) that may be required include:

- GP1 – Maintenance and repair of existing features
- GP2 – Underground utility lines
- GP3 – Discharge of return water
- GP11 – Outfalls and intake structures
- GP12 – Surveying and investigating
- GP14 – Water monitoring devices
- GP15 – Mosquito control activities
- GP16 – Habitat creation and enhancement activities
- GP 17 – Trails and boardwalks
- GP 20 – Bank stabilization
- GP 21 – Above ground utility lines
- GP 26 – Minor channel or stream cleaning for local government agencies
- GP 27 – Redevelopment of previously disturbed areas

Each of the above General Permits has a specific set of criteria that must be met prior to application. Many potential phases of improvements will require more than one of the above General Permits. In some cases, projects may not meet the requirements of any General Permit, and might require an Individual Permit, which involves a longer and more detailed review for projects that do not fit into any one category listed above.

Stormwater management rules in effect

may require treatment of new impervious surfaces for removal of total suspended solids (TSS). TSS removal may be accomplished via on-site features such as detention basins or vegetated swales, or through below-grade methods such as stormwater filtration cartridges. As spatial constraints present challenges to accommodating stormwater treatment systems or devices adjacent to the river, the Village may consider overtreating existing stormwater runoff upstream from the river as a way of meeting NJDEP stormwater quality requirements resulting from improvements made within the river's vicinity.

The NJDEP may also require Transition Area Waivers, Individual Freshwater Wetlands and Open Water Fill permits. The USACE has maintained an interest in the corridor since they channelized the river in the 1970's; a clear definition of potential overlapping jurisdiction with the NJDEP should be clarified.

Any improvements associated with Essex County drainage systems or roadways will require their approval. The Essex County Soil Conservation District would require an approval for soil erosion and sediment control, and compliance with South Orange Village standards would also be necessary.



East Branch of the Rahway River Corridor

Public Process

The process of developing this Master Plan was informed by feedback received in a series of meetings with Village project staff, trustees, the River Corridor Steering Committee and the general public between July 2004 and September 2005. The comments received during these meetings were reflected in subsequent planning and design stages.

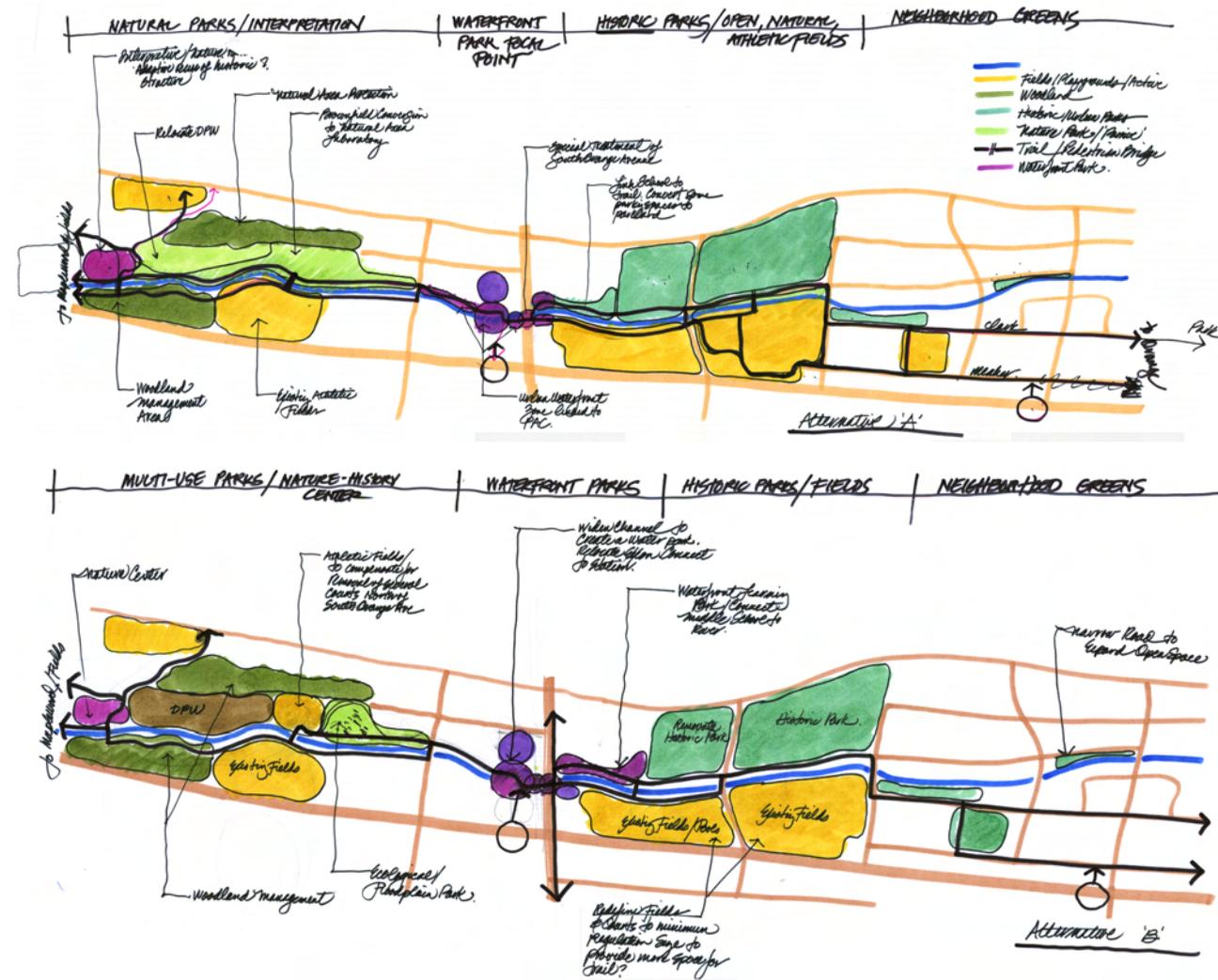
The general public's first opportunity to provide input on the Master Plan was at a community meeting on July 27, 2004. The purpose of this meeting, which included a brief presentation on the project and facilitated group breakout session, was to solicit comments and ideas for the future of the East Branch and identify other issues and concerns that the public wished to have addressed. Based on these comments, the consultant team worked with the Village project staff and the Steering Committee to develop and refine a series of alternative concepts for the river corridor that highlights the range of recreational, environmental and aesthetic options. These alternatives were presented and discussed with the general public during a second public workshop on September 28, 2004. Based on the feedback received during this meeting, the consultant team developed the preferred concept described in this Master Plan, which it presented to a combined meeting of the River Corridor Steering Committee, the Village Trustees and the Recreation and Cultural Affairs Committee in December, 2004.



3.01-3.03 (top to bottom) Photographs taken from the July 27th, 2004 community meeting (RHI, 2004).

The River Corridor Steering Committee approved the plan on February 7, 2005. Additional public meetings were held after the formation of a larger group to steer the river project, made up of a

cross-section of residents representing business, recreation, open space and other interests. Meetings of this advisory group are public and quarterly meetings began in June, 2005.



3.04-3.05 (Top and above) Diagrams of alternatives generated from the July 27th, 2004 community meeting (RHI, 2004)

Aesthetic and Connections Opportunities

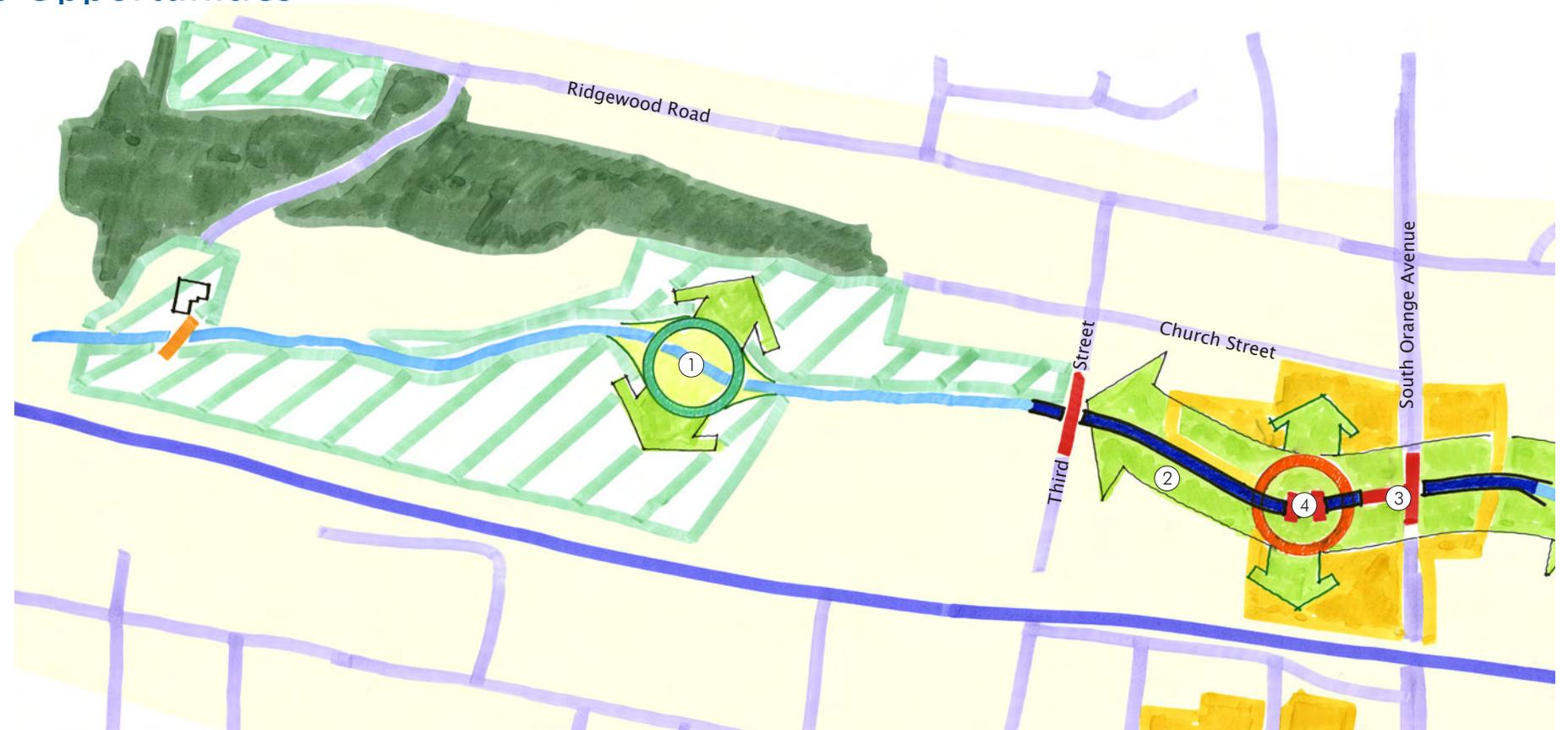
Throughout the Master Plan process, South Orange residents have expressed an overwhelming desire to “reconnect” with the East Branch. Although physical access to the river is impeded by the concrete retaining walls, providing improved visual access to these portions of the river offers a comparatively less expensive yet effective means of reconnecting. Where the banks of the river are not prohibitively steep or walled, however, slopes can be relaxed to make the river visible from a farther distance; in some cases, the waters edge can be physically accessible.

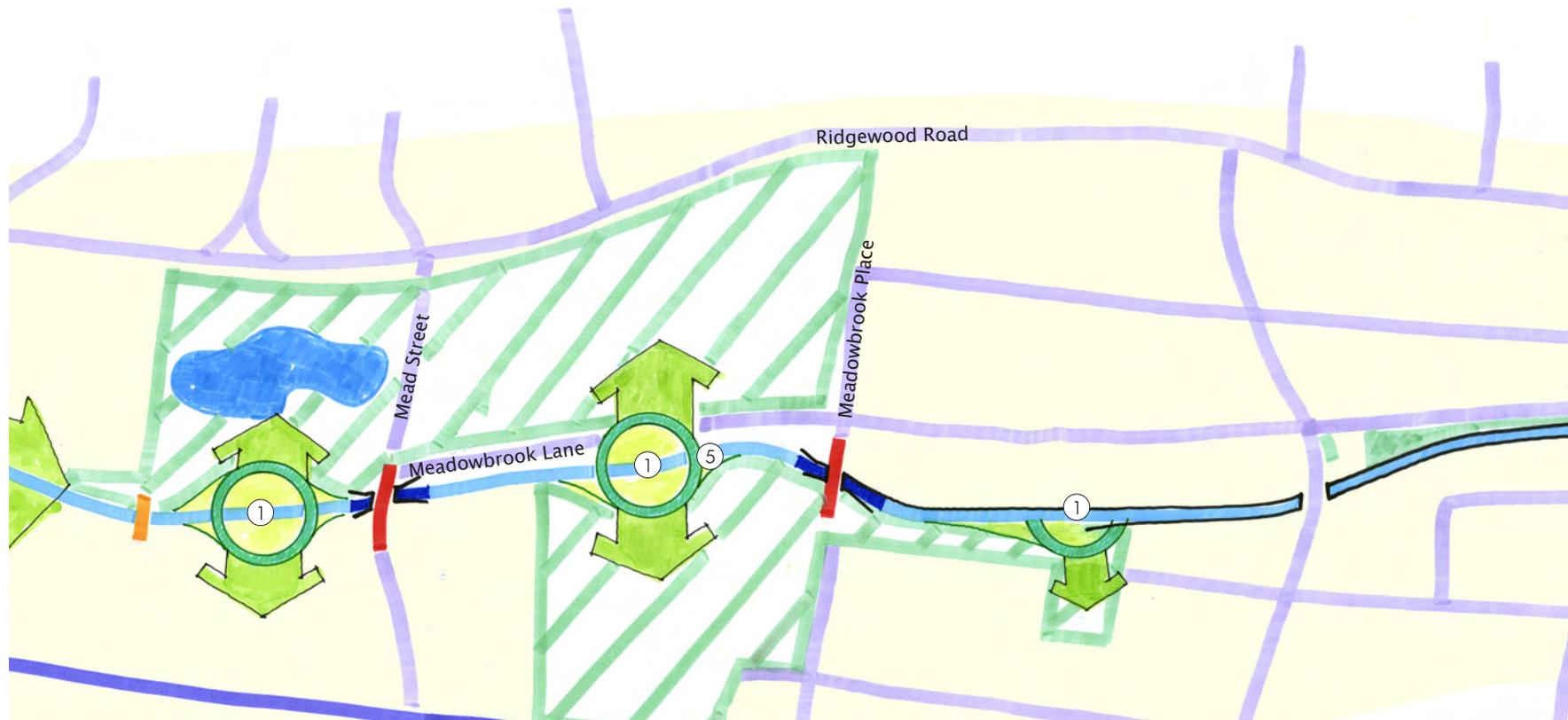
In the Village Center, there is an opportunity to improve connections across the river and to foster new activities that would bring people closer to the water’s edge. In the Village Center, there is great potential to enhance the river edge through the use of in-ground and containerized plants, decorative wall finishes, upgraded railings, new lighting and specially paved surfaces to create a walkable promenade close to shops and restaurants. This vision is consistent with current revitalization efforts currently underway in the Village Center, including the South Orange Performing Arts Center (SOPAC). In the vicinity of the performing arts center, there is the potential to create a focal point public open space that builds upon the themes of the Village Center

and performing arts. Another specific opportunity for improvement is at the point where the river crosses under a gas station at South Orange Avenue. By opening up, or “daylighting” the river at this point, the corridor would have an opportunity to reach its full potential as an aesthetic amenity for the Village. This is a major endeavor, however, and long-term study would need to be undertaken prior to acquisition and con-

struction. Given the long-term nature of this goal, interim solutions will be pursued.

Outside of the Village Center, the river weaves through various neighborhoods of South Orange, offering excellent opportunities for pedestrian and bicycle connections along the river banks, provided the waterway can be easily crossed. Fortunately, many areas





Opportunities

- Enhance existing open space
- Preserve existing woodland
- Enhance ecological and aesthetic value of vegetated river banks
- Improve appearance of concrete walls along river
- Improve appearance of channelized river bed
- Replace or upgrade existing bridge
- Enhance existing vehicular bridge
- Existing Road
- Open space connection opportunity

1. Relax levee slopes and create a gentle, inviting approach to the river bank.
2. Enhance green connection from urban core to open space, drawing pedestrians to the river.
3. Open the water channel to attract pedestrians to the river edge.
4. Create a focal point urban open space with visual access to the river.
5. Create a new pedestrian and bicycle bridge to improve access from parking to the Baird Community Center.

of the river are traversed by vehicular bridges with pedestrian sidewalks. In places where river crossings are lacking, pedestrian and bicycle bridges should be constructed, specifically between Waterlands Park and open space near the DPW site. A pedestrian and bicycle bridge should also be considered to connect the tennis courts and fields at Baird Community Center with open spaces and street parking along

Meadowbrook Lane. The existing pedestrian bridge between South Orange Middle School parking lot and the pool should also be replaced as a long-term opportunity to enhance aesthetics and barrier-free access. Throughout the corridor, provide ADA-compliant, barrier free circulation routes and access to amenities.

3.06 Aesthetic and Connections Opportunity Plan (RHI, 2004).



Land Use Opportunities

Historically, land uses within the Village of South Orange have been logically organized in relation to one another as well as the river corridor itself, a trend that continues today. The Village Center, train station and Middle School are located within a compact urban core that is easily accessible from adjacent residential neighborhoods. Recreational and utilitarian spaces are located around the edges of the study area and within the floodplain of the river, taking advantage of space that cannot be built upon.

Although South Orange currently has an effective land use framework in place, opportunities exist to evolve the current land uses that will serve to enhance one's experience within the river corridor:

- Portions of the Village Center are ripe for infill development, specifically around the existing train station and the Performing Arts Center, with mixed use development and structured parking on undeveloped sites.
- The underutilized DPW site presents a unique opportunity to consolidate public works operations in order to dedicate the remaining land for passive open space, nature study and/or active recreation.

- Trails and other safe and accessible connections are also necessary for the overall success of land use enhancements throughout the corridor.

In addition to the few major enhancements proposed in image 3.07, various minor modifications to existing land uses can be made to improve one's experience along the river corridor:

- Creation of park gateways provide direction for users and emphasizes entrances into various parts of the corridor.
- Certain historic structures may be rehabilitated to better serve recreational facilities.
- Riverbank treatments can be rehabilitated.
- Access to various public spaces along the corridor can be improved.
- Focal points and overlooks can be created for visual interest along the river.
- Existing access and parking can be better integrated into the existing land uses.



Opportunities

1. Reuse pumphouse as 'Nature Center'
2. Develop pedestrian/bicycle river crossing
3. Consolidate DPW site
4. Create focal point area
5. Utilize for recreation
6. South Orange Middle School
7. Create Park gateway
8. Relocate recreation building, retain play area
9. Provide access from Church Street



- Existing Woodland
- Existing Passive Recreation
- Existing Ballfield
- Existing Tennis Court
- Recreation Area
- Existing Institutional Uses
- Mixed Use Above Parking
- Focal Point
- Existing Road
- Urban Revitalization District Boundary
- Proposed Trail Connection
- Strengthen Existing Trail Connection
- Enhance Park Gateway
- Enhance River Connection to Urban Core/Create Urban Gateway

- 10. Define pedestrian access to train station and Sloan Street.
- 11. Consider mixed use/structured parking
- 12. Beautify river edge
- 13. Create greenway and bicycle/pedestrian path to Thrid Street
- 14. Performing Arts Center
- 15. South Orange Train Station
- 16. Improve sight lines/connections

- 17. Create park gateway and new pedestrian bridge
- 18. Reconfigure and beautify parking lot to allow for a trail along the river
- 19. Create river focal point area
- 20. Create an interpretive center in the historic structure
- 21. Park gateway/scenic overlook to Floods Hill

3.07 Land use opportunities plan (RHI, 2004).

Program Opportunities

A wide range of recreational, environmental and educational activities occur within the study area, however opportunities still exist to create a more dynamic river corridor. Current land use patterns, resource allocation and historic land use patterns give rise to three major programmatic opportunity zones within the study area.

The southern portion of the study area has many opportunities related to recreation, ecological preservation and interpretation. Existing recreational facilities in this area are Chyzowych Field, Waterlands Park, and Farrell Field. This area is also the most densely forested and least developed portion of the corridor, creating a suitable area for ecological interpretation via a new nature center. Underutilized lands at the DPW site further enhance this opportunity, offering the possibility to study wetlands at the river's edge.

Major programmatic improvements within the Village Center are primarily related to enhancing the "sense of place;" an opportunity exists to create a livelier, more comfortable and memorable setting within the rich historic urban context. Additional retail and commercial space can be created to

supplement existing shops, restaurants and cafés. The Performing Arts Center can further enhance the user's experience and provide connections to other programmatic opportunities throughout the river corridor. The creation of a river-oriented public plaza could anchor this redevelopment in the Village Center.

The northern portion of the study area presents opportunities for preservation and rehabilitation of historic landscapes as well as maintaining existing modern recreational resources. Further opportunities within the northern portion of the study area include engaging the South Orange Middle School in educational programs related to riparian habitats, ecology, local history and open space, so that future generations of residents may understand the many natural and cultural resources extant in South Orange. Additionally, removing some existing programmed recreation space in this area creates the potential to improve access and relax stream bank slopes in certain areas.

Corridor-wide programmatic opportunities include prospects for volunteers and organizations to become involved in the rehabilitation and maintenance



of public spaces and ecological habitats along the river corridor. With leadership and coordination from public agencies or private, nonprofit groups, stream restoration projects, park clean-up days, or environmental education sessions can be organized to benefit both the residents of South Orange and the natural and public spaces they use.



- Existing Woodland
- Existing Passive Recreation
- Existing Ballfield
- Existing Ball Court
- Potential Recreation Area
- Institutional Use
- Existing Buildings
- Potential Buildings
- Existing Road
- Existing Trail
- Potential Trail
- Improve Crosswalk
- Park Boundary
- Focal Point

Opportunities

1. River interpretive area
2. Nature/interpretive center
3. Ecological/conservation area
4. Relocated shelter/picnic facility
5. Reconfigure parking for more open space
6. Gateway features
7. Pedestrian access to Chyzowych Field
8. Tennis courts adjacent to Chyzowych Field
9. Urban plaza
10. Existing train station
11. Performing Arts Center
12. Urban infill with ground floor retail
13. Mixed use above parking
14. Existing Baird Recreation Center
15. Urban gateway feature
16. River-oriented focal point
17. Historic Duck Pond
18. Accessible parking
19. Interpretive facility
20. Existing recreation field
21. Existing Floods Hill Park
22. Existing Montrose School
23. Remove Existing Tennis Courts

3.08 Program opportunities plan (RHI, 2004).



East Branch of the Rahway River Corridor

Goals

1. Provide safe and continuous pedestrian and bicycle connections along the corridor.
2. Improve connections from adjacent neighborhoods and land uses; preserve and enhance access to recreation.
3. Make the river edges accessible, turning the slopes into an amenity.
4. Expand opportunities for active and passive recreation.
5. Lead the way for other communities seeking to reclaim waterfronts.
6. Create a unified project aesthetic while balancing urban and natural characteristics.
7. Preserve and enhance historical features along the corridor; rehabilitate the historic character of the corridor.
8. Improve the ecological and hydrological value of the river corridor.
9. Create a learning environment by maximizing educational opportunities.

Vision Statement

The East Branch of the Rahway River is the heart of the Village of South Orange, and the rehabilitation of its physical, ecological and hydrological health will evidence its importance to our community.

We, the residents of South Orange will no longer feel a barrier between ourselves and our river. We will be able to walk up to the banks of our river and touch the water. As often as possible, we will daylight our underground waterways, exposing our river for all to see. Where walls must remain, they will serve as promontories and promenades, offering views along the watershed and focal points to the watershed.

The river will be a thriving ecosystem, filled with native grasses and flowering trees and shrubs, rather than invasive plant species.

The banks of our river will no longer erode; a dense mat of roots from native plants will protect our soil, and the water of our river will be clear.

The river and our parks will not appear as utilitarian, leftover spaces, but will be beautifully designed with plantings, pathways, lighting, signage and comfortable places to sit.

Vistors to South Orange will remember times that they spent strolling the banks of the river after seeing a performance downtown, or after coffee, dinner or drinks from one of the restaurants nearby.

Our children will grow up learning to treasure their river, having learned about fish and birds, trees and reeds along its banks. They will play along its banks knowing what a wonderful resource with which they are blessed, and they will teach their children to treasure the river as well.



4.01 View from the top of Floods Hill (RHI, 2004).



4.02 River view (RHI, 2004).



4.03 Southern Trail (RHI, 2004).

Concept

Analysis of existing ecological and physical resources of the river corridor combined with input received during the public process resulted in a framework concept to guide the planning and design of the river corridor. This concept consists of three main areas (4.04): the Northern Segment of the corridor will emphasize history and recreation, with the historic Duck Pond and Baird Community Center serving as focal points; the Village Center area will be shaped by its relationship with the town center and will be more urban in character; the Southern Segment of the corridor will emphasize the intermingling of ecological uses and recreation including a potential nature center. This concept, which draws on the master plan goals, focuses on the continuation of a variety of user experiences along the corridor.

Southern Segment

Despite the Meadowland Society's effort to save as many acres of riverfront property as possible from industrial development, much of the land along the river south of the Village Center was used as railroad switching yards, pumping stations and Public Works maintenance facilities. Although some of this land has been reclaimed for recreational uses, much of the old, industrial fabric from the early 20th Century still exists today.

The master plan calls for reforestation and wetlands reconstruction throughout much of the southern portion of the river corridor (outside of the existing ballfields and a consolidated DPW yard). To provide continuity of the entire open space system, built elements should take on the rustic aesthetic commonly used in public parks of the early 20th

Century. Plantings should be ecologically appropriate reconstructions of native wetlands, fields, forest edges and old growth forests typical of the region. A contaminated site north of the recycling center must be remediated before any new uses can be built.



4.05 Pre-industrialization postcard view along the Rahway River. The master plan calls for the river corridor to be restored to conditions similar to these (Montrose Park Historic District private collection).



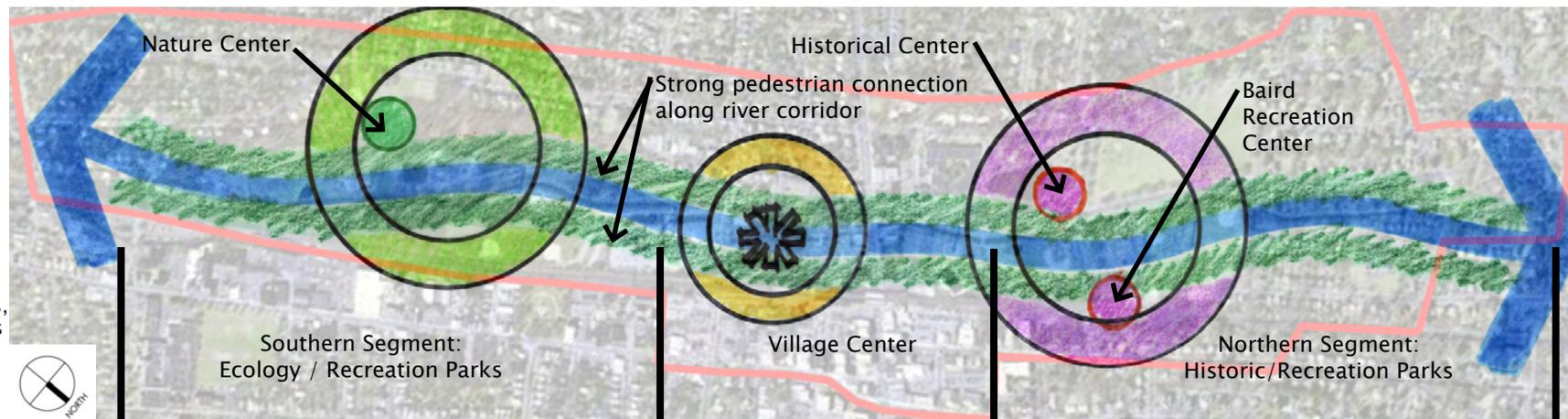
4.06 Stone bridge through naturalized area in Central Park (Shannon Flores, 2006).



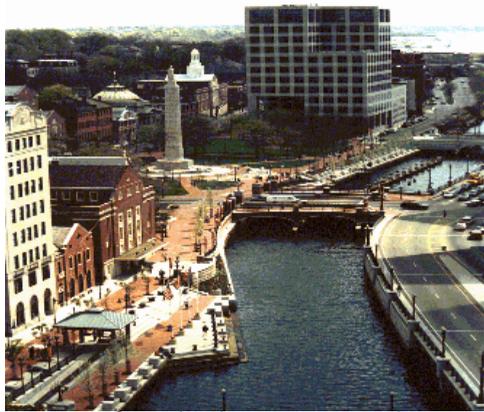
4.07 Boardwalk through wetlands in Vancouver, Canada (Russ S. 2006).



4.08 Magnolia Swamp in West Side Park, Newark, NJ, designed by the Olmsted Brothers in the early 1900's (F.H. Tucker, ca 1921).



4.04 Concept Diagram illustrating the three main elements of the master plan: the Southern Segment focuses on ecology and recreational parks, the Village Center acts as the urban core and the Northern Segment provides historic and recreational parks.



4.09 Riverfront development in Providence, Rhode Island (Carol Patton, 2006).



4.10 One of Amsterdam's many bridges in the city (Han Van Gool, 2006).



4.11 San Antonio's River Walk: activities exist at the river's edge, below the rest of San Antonio's urban fabric (Al Rendon, 2006).

Village Center

Currently, most commercial structures that define the edge between South Orange's urban core and the Rahway River are oriented with their backs to the river, largely ignoring a potentially character-defining resource within the Village Center. Without dechannelizing the river within this urban district, the Master Plan seeks to highlight the river among the built environment, finding its architectural precedence from the only two major structures that face the river corridor.

New Jersey Transit's historic Morris and Essex Line station, built in the 1920's is a textbook example of early 20th Century American Arts and Crafts architecture. Its horizontal brickwork, broad arches and hip roofs clad in terra cotta tile could serve as inspiration for urban infill construction or smaller site structures and furnishings along the river.

The South Orange Performing Arts Center is a metal-clad building whose architectural statement would be appropriately punctuated if surrounded by elegant buildings featuring quiet brickwork and tile roofs. The surrounding plaza presents the opportunity for modern, sculptural design using the metal and brick used in the older train station as a design precedent. Creation of a plaza east of the river can be integrated with a parking deck to accommodate more commuters, SOPAC patrons and others.



4.12 Arts and Crafts style architecture at the New Jersey Transit rail station (South Orange Record Corp. c.1940).



4.13 The metal and brick-clad South Orange Performing Arts Center (RHI, 2006).



4.14 Victorian style house in South Orange (from *Images of America., South Orange Revisited* by Naoma Welk, c.1880).



4.15 The Duck Pond has an Olmsted-like aesthetic. (RHI, 2004).



4.16 "Romantic" park design at Central Park (www.striptom.com 2006).

Northern Segment

Romantic park design of the late 19th Century and early 20th Century should be the thematic basis of design for restoration and rehabilitation of the Northern Segment. Initial major development occurred in the northern portion of South Orange during that time, concurrent with the Public Parks and City Beautiful movements in American urban design. Victorian and various revival styles popular at the end of the 19th Century dominate the Architectural design of homes in neighborhoods adjacent to the Northern Segment.

Implementation of detailing used in the original construction of the historic Duck Pond is a logical starting point for developing a design aesthetic most appropriate for this section of the river corridor. Key design elements should include decorative floral plantings; ornamental metalwork; smooth, gentle grading schemes; long, sinuous, flowing curvilinear forms such as the edge of the current Duck Pond; and large, open areas of turf with shade trees and groupings of lush plantings at entrances, borders and along the river. Although urbane in feel, this area should contrast with the more urban Village Center treatments and provide a very different experience from the Southern Segment's rustic, woody feel.

The Master Plan

The Master Plan provides a vision, as well as a set of tools and strategies for improving the cultural, physical, ecological and hydrological quality of the river corridor. The plan places particular emphasis on opportunities to revegetate the banks and relax the slopes leading down to the river's edge. The rehabilitation of a more natural floodway, with relaxed slopes, and the addition of flood water storage facilities is a principal feature to the rehabilitation project. These new conditions will help prevent erosion while making the river more inviting for people to venture closer to the water. Moreover, the plan emphasizes opportunities to enhance the corridor with new open space attractions and to improve pedestrian and bicycle access and connections throughout. The plan also highlights ways in which the river can become a central element in continuing efforts to revitalize the Village Center.

To create a consistent identity throughout the corridor, the Master Plan incorporates two underlying design principles. First, native, non-invasive plant materials will be added to both river slopes and open spaces, contributing to plant and wildlife diversity within the



river zone and fostering a sequence of buffered and enclosed spaces with a distinct identity. Second, site elements throughout the corridor—such as walls, lighting, fencing, benches, and

path materials—will be selected with a consistent design language in mind to further establish the corridor's identity.





4.17 Village of South Orange Master Plan (RHI, 2005)

Objectives

Goal 1: Provide safe and continuous pedestrian and bicycle connections.

- Define a network of proposed pedestrian and bike routes; all proposed routes must be considered within the context of a larger network. This will reduce the need for parking and improve access (see Goal 2).
- Upgrade existing trails by resurfacing, improving grading and drainage and meeting safety guidelines such as AASHTO.
- Install new trails, sidewalks, bridges and other elements to link currently disconnected routes.
- Upgrade lighting to improve safety and security; utilize “Dark Sky” lighting techniques.
- Upgrade pedestrian street crossings by installing crosswalks, narrowing intersections in key locations, installing curb cut ramps and implementing traffic calming measures.
- Negotiate rights-of-way or acquire key parcels of land, such as the two service stations in the Village Center, to Create critical pedestrian and bicycle connections the length of the Village.

Goal 2: Improve connections from adjacent neighborhoods and land uses; preserve and enhance access to recreation.

- Maintain the existing road network; improve sidewalks and add sidewalks where needed.
- Upgrade existing parking lots with plantings, pervious paving and other improvements; maintain current amounts of parking; create better access routes from parking areas to recreational facilities.
- Focus pedestrian and bike improvements on connections to and within the Village Center and to the South Orange Middle School.
- Connect all recreation facilities with the continuous pedestrian and bike trail network.
- Connect bike routes within the corridor to bike routes beyond the corridor, such as the on-street bike lanes in adjacent Maplewood.

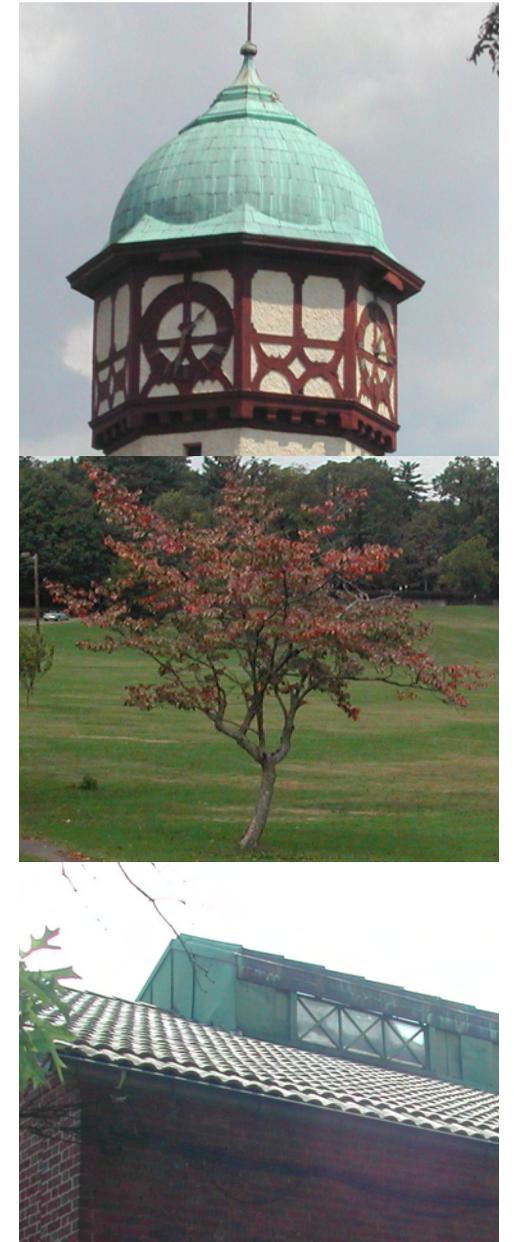
Goal 3: Make the river edges accessible, turning the slopes into an amenity.

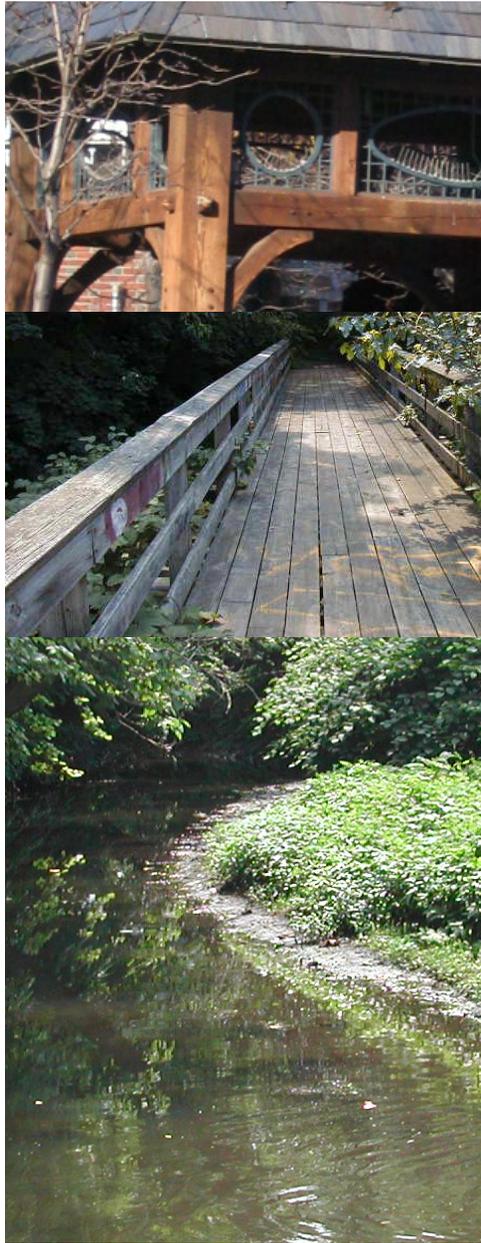
Urban Conditions

- Create promenades with attractive railings and quality paving.
- Add plantings near the top of wall, such as shade trees, raised planters or overhanging vines.
- Improve existing lighting.
- Add overlooks, benches and other opportunities for gathering.
- Improve wall aesthetics with a finish that will not impede floodwaters.
- Create a river-oriented plaza and compatible development within the Village Center.
- Mitigate the appearance of concrete outflows.

Slope Conditions

- Relax the river banks by grading slopes to a gentler gradient.
- Install permanent native vegetative cover on banks appropriate to the gradient of the bank.
- Add boardwalks and other trails to permit access near the water’s edge.
- Add pathways near the water’s edge in select locations.
- Construct bridges in limited locations to serve as both connections and overlooks.
- Avoid construction of new retaining walls along the river’s edge.





Goal 4: Expand opportunities for active and passive recreation.

- Maintain existing recreation facilities and improve access to those areas.
- Make the best use of existing active recreation facilities; as existing facilities are upgraded, determine the best use of each facility and design to maximize land use while preserving the open quality of the corridor.
- Consolidate inefficient land uses to create new areas for active or passive recreation.
- Preserve natural areas for use as passive recreation areas.
- Improve passive recreation opportunities of all types; add shade trees, benches and walkways to enhance the usability of recreation areas.
- Construct active recreation facilities where appropriate; do not construct active recreation facilities in a location whose natural character lends itself to ecological preservation.

Goal 5: Lead the way for other communities seeking to reclaim waterfronts.

- Identify a manageable phasing plan and establish an organizational structure, including a fundraising structure to support phasing.
- Revisit phasing and available funding to determine the best way to move the plan forward, given changing economic, social and political conditions; phases may need to be adjusted.
- Maintain a consistent vision for the future of the river corridor; as changes occur during implementation, constantly weigh changes against the overriding vision that was publicly supported in the Master Plan.
- Construct demonstration projects that can quickly generate interest. Begin with smaller projects and progress toward larger ones.
- Plan phasing to maintain momentum.
- Publicize the rehabilitation of the corridor.

Goal 6: Create a unified project aesthetic, while balancing urban and natural characteristics.

- Establish a set of design guidelines for the river corridor, identifying elements that should be consistent throughout the corridor, and elements that may be different in various zones (for example, urban-style paving such as brick or concrete in the Village Center versus historically sensitive paving such as cobble or stone dust in the Northern Segment). Guidelines should address fences, railings, paving and crosswalks, walls, plantings, signage, lighting and furnishings, such as benches and trash receptacles.
- Prior to or during the first demonstration project, identify and adopt a set of design guidelines to be implemented immediately.
- With each phase of the project, consistently adhere to established design guidelines.
- Encourage adjacent private development to utilize the design guidelines as appropriate.

Goal 7: Preserve and enhance historical features along the corridor; rehabilitate the historic character of the corridor.

- Develop a working partnership between the Village, South Orange Historic Preservation Society the Montrose Park Historic District Association and other Key Stakeholders to agree upon a unified vision regarding historic preservation and rehabilitation in South Orange.
- Install markers for historic sites and events as part of a corridor-wide interpretive program.
- Undertake studies to determine measures needed to stabilize, restore and/or rehabilitate historic structures.
- Stabilize historic buildings facing immediate threats such as structural instability, insect or water damage. Incorporate other historic rehabilitation or restoration work into the phasing plan as appropriate.
- Ensure that the design guidelines, especially for the Village Center and Northern Segment of the corridor, address the historic characteristics of those areas.
- Relocate above-ground power lines to underground conduits throughout the corridor.

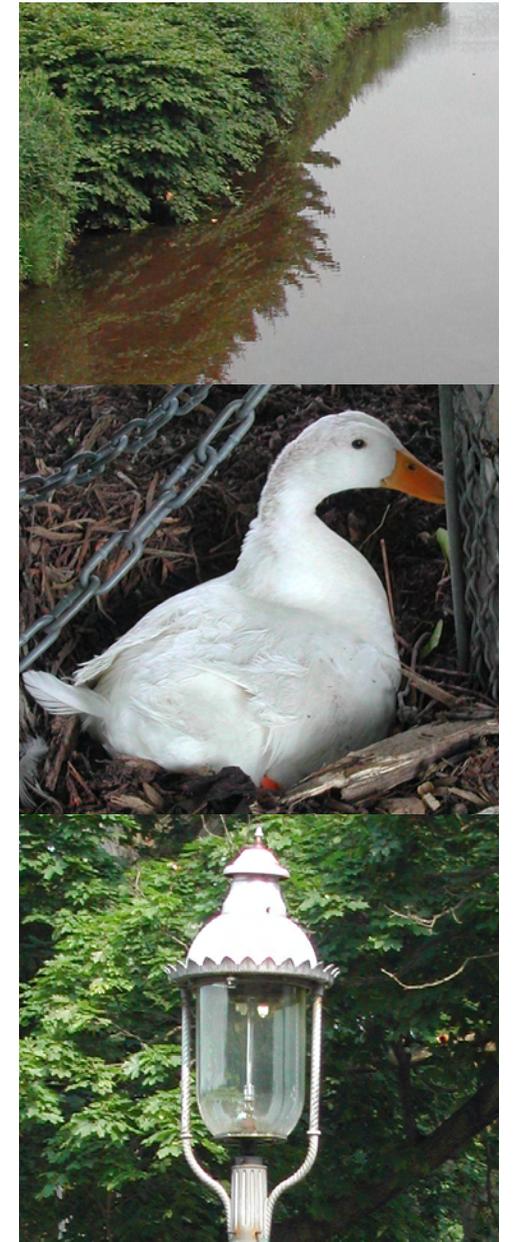
Goal 8: Improve the ecological and hydrological value of the river corridor.

Ecological

- Immediately stabilize stream banks that face the greatest threats of erosion, leading to cleaner, clearer water.
- Identify the presence of invasive plant species throughout the corridor. Implement a systematic plan to eradicate invasive species, especially Japanese knotweed; eradication may be required prior to implementation of other proposed improvements.
- Establish a permanent vegetative cover for all streambanks within the corridor, scaled to the gradient of the streambank. Timing of this will need to be closely coordinated with the eradication of invasive species to prevent further bank erosion.
- Preserve and protect healthy shade trees throughout the corridor and Village. Plant new shade trees wherever appropriate. Shade trees lessen stormwater runoff and mitigate urban heat gain.
- Create continuous natural habitats along the corridor. Study highly channelized areas to determine how to create habitats in these areas;

study the feasibility of removing the concrete river bottom along the channelized portion of the river to create these habitats.

- Create wetlands and vernal pools along the river's edges to improve habitats for fish, birds and other animals. Wetlands also cleanse the waters of the river and create habitats for microorganisms that are the basis of the river's ecosystem. Vernal pools create habitats for fairy shrimp, salamanders and frogs.
- Filter stormwater before it enters the river to prevent silt, oil, gas and other impurities from polluting the river. As projects are implemented, retrofit existing storm drainage systems to meet or exceed New Jersey stormwater management guidelines.
- Work with other communities within the watershed of the East Branch to collectively enhance the ecological quality of the river.
- Remediate known NJDEP contaminated sites within the corridor
- Sequence construction operations to avoid disturbance to nesting habitats including those of the red winged blackbirds and swallows.
- Implement water quality improvements consistent with the intent of the South Orange Village Stormwater Management Plan (Ordinance #6-





2005). Consider over-treating runoff from existing development as a condition to provide stormwater quality measures as required by NJDEP.

Hydrological

- Many of the ecological objectives above will have a cumulative effect of lowering the amount of sediment that enters the river (allowing floodwaters to flow as designed by the Army Corps of Engineers), slowing down floodwaters and lowering the intensity of flow during and after storms.
- Provide routine maintenance as agreed to by the USACE by regularly removing sediments.
- Reduce the need to dredge the river by mitigating erosion factors . Provide a defined toe of bank with boulders and plants. Dissipate force from heavy volumes of water after storms with boulders or other appropriate treatments.
- Reinforce slopes where vegetation alone is not sufficient for slope stabilization; utilize bioengineering methods or joint planting, whereby plants are intermingled with large boulders.
- Minimize impervious surfaces and maximize groundwater recharge.

Goal 9: Create a learning environment by maximizing educational opportunities.

- Partner with local educational institutions to determine how those groups can better utilize the river as a learning resource and to determine how those groups can contribute to ongoing river rehabilitation and maintenance.
- Create outdoor classrooms for use by neighboring schools. Potential activities include stations for water sampling, examination of vegetation, bird identification, geological and hydrological observation.
- Create a river-oriented plaza in the Village center that can provide a venue for lectures, Earth Day celebrations and other events that educate the public on the river's natural and cultural value. Invite the public to learn by participating in the river's rehabilitation.
- Establish a nature center in the Southern Segment of the corridor. Provide spaces for ecological interpretation. Provide programs that focus on the unique ecology, hydrology and history of the East Branch of the Rahway River.

The South Segment

4.19 Master Plan – South Segment



- ① *Connect trail to Farrell Field*
- ② *Chyzowych Field recreation area*
- ③ *New pedestrian bridge connection to future nature center building*
- ④ *Consolidate DPW facilities*
- ⑤ *Waterlands Park*
- ⑥ *New riparian education area with boardwalk connections and informational nodes*
- ⑦ *New pedestrian bridge*
- ⑧ *New buffer area between DPW yard and river*
- ⑨ *Reconfigure parking and playground at Waterlands Park*
- ⑩ *New ecological park gateway*
- ⑪ *New promenade plaza area*

The southern portion of the river corridor presents the greatest potential for developing new land uses which correspond most immediately to the needs of the Village community. Core elements of the plan include the consolidation of the DPW compound in order to improve circulation and buffering from the river edge. In addition, new trails will provide connections to Chyzowych Field and Farrel Field along Ridgewood Road.

The existing pumphouse building next to the DPW compound will be adaptively reused as a new nature center, operated by either the Village or a community-based organization. A large portion of the existing, underutilized open space on DPW land will be rede-

signed and rehabilitated as a wetland environment. The riparian improvements to the river bank (6) will provide educational opportunities and an “outdoor classroom” to allow students to study the ecology of the river corridor. Boardwalks will provide access to the wetland, and informational panels will provide environmental interpretation and guidance for leisure activities (6). This effort will allow the Village of South Orange to serve as an ecological model for other communities seeking to reclaim riverfronts as educational assets.

A proposed pedestrian bridge (7) will connect the active recreation areas at Waterlands Park with the passive recreation and educational areas on the

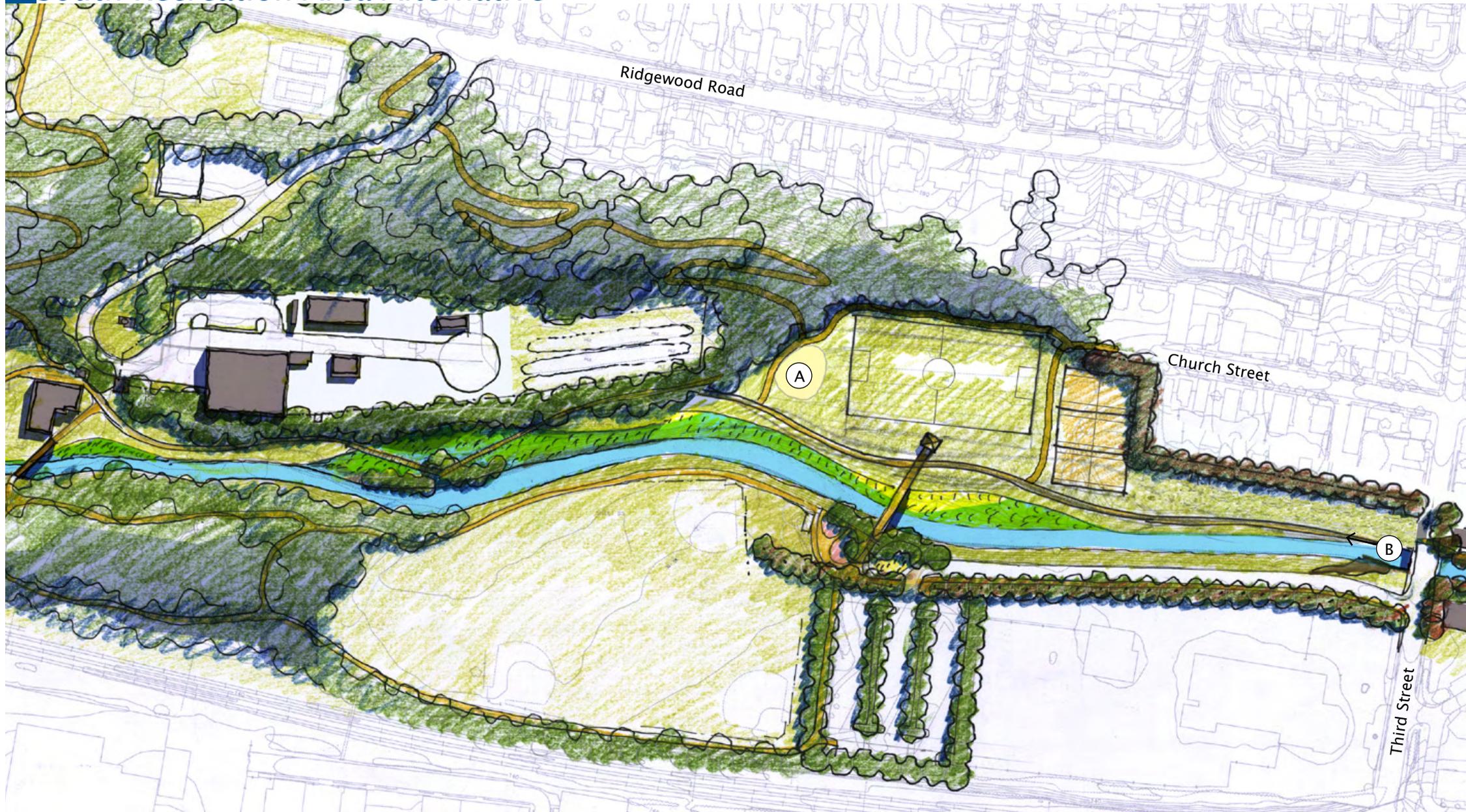
opposite side of the river (5,12). As a result of all the proposed improvements to the southern recreation field area, Third Street will become an important gateway by providing access to the existing playground area and the new ecological learning areas.

Remediation of known hazardous materials is required prior to any new construction in or near the north end of the DPW yard.

4.20 Section A: Section at proposed Riparian Education Area, looking north.



South Recreation Area Alternative



4.21 Site plan showing the addition of a youth soccer field and three new tennis courts.



A

4.22 (A) Underutilized open space (looking north).

4.23 (B) Entrance to existing play area/ open space (looking south)

The plan in Figure 4.21 shows a second scheme for the underutilized open space located to the north of the existing DPW grounds (images 4.22 and 4.23), as an alternative to the ecological area shown in the Master Plan (image 4.02). This open space represents a potentially valuable recreational resource in South Orange given its access and proximity to both the surrounding neighborhood and adjacent



B

existing recreation fields. In light of national trends indicating an increase in the popularity of active field sports, such as soccer and lacrosse, and the local popularity of tennis, the plan at left includes the addition of three tennis courts and a youth soccer field to help accommodate the expansion of recreational sports leagues; other types of fields could be installed based on changing local needs. A proposed

pedestrian bridge would provide access from the existing baseball fields located to the east. Riparian improvements in select areas will supplement educational opportunities at the proposed nature center. Proposed woodland trails will increase safe access to activities in this recreation area and to the adjacent parks and fields, including a trail connection to Chyzowytz Field, located to the south.

The Village Center

With direct regional train service between South Orange and New York City, and with a performing arts center, the Village Center has great potential as a commercial and entertainment district with vibrant public spaces. New redevelopment opportunities give the Village an opportunity to create a unique design language that will add cohesiveness to corridor as a whole. In this context, the river has the opportunity to become a “front door” to the Village and, as a restored amenity, to serve as a catalyst for revitalization. Image 4.24 illustrates the potential for public space adjacent to mixed-use development as well as cafes and restaurants. The South Orange Performing Arts Center (SO-PAC) is a key focal point driving this redevelopment.

Currently, the river is highly channelized (concrete river bed, concrete walls, and - in one place - passing through a tunnel) as it passes through the Village Center (see images 4.25 & 4.26); consequentially, a major goal of the corridor plan is to soften the river edges to foster opportunities for both leisurely enjoyment and recreational activities. Softening the edges will encourage Village residents and others to approach and access the river more comfortably and effectively, thus enabling the enjoyment of the amenities and activities that water can provide. It is important



⑩ *New Ecological park gateway*

⑪ *New promenade area*

⑫ *Town Center/redevelopment area*

⑬ *Performing Arts Center*

⑭ *New river-oriented plaza*

4.24 Master Plan - Village Center





4.25 Existing channel at South Orange Avenue (RHI, 2004).



4.26 Existing pathway adjacent to channel at South Orange Avenue (RHI, 2004).

that the Village embraces the river at its most urban and most natural by understanding the full range of assets it offers to residents and visitors.

The plan highlights improved connections designed to facilitate the transitions between the urban and the natural. Urban promenades will provide a connection between the urban center and ecological areas, adding continuity to the currently fragmented access along the river corridor and especially into the Village Center. Moreover, the promenade plaza area will provide a pedestrian connection across South

Orange Avenue to the river corridor's northern portion. Infill development along this promenade will strengthen the edge of the promenade and facilitate the creation of new activities, such as outdoor cafes and retail. As it moves farther north from South Orange Avenue, the pathway on the eastern side of the river will transition to a more park like character, passing alongside the existing tennis courts and continuing in the direction of the community pool. On the opposite side of the river, the corresponding pathway transitions to a park-like character as it passes alongside the reconfigured alley

and parking lot, which are to be connected with the South Orange Middle School parking lot to provide additional open space, a more efficient land use and improved access to the river and park at the existing Duck Pond.

This plan provides an opportunity to daylight the river at this location, capitalizing on a prominent resource within the Village Center. Given the long range nature of these improvements, interim recommendations are included in the Access Solutions section of the report.



4.27 Section B: Section through the Rahway River near the South Orange Performing Arts Center.

The North Segment



4.28 Master Plan – North Segment

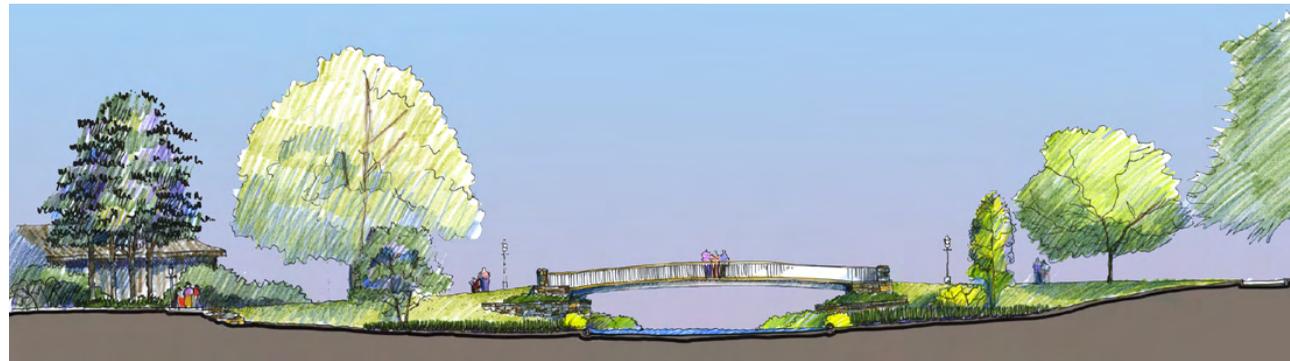
- ⑮ *Improve tennis court edge; add plantings and quality paving*
- ⑯ *New pedestrian bridge*
- ⑰ *Relax slopes to provide access to river channel*
- ⑱ *Reconfigure pathways to connect to existing duck pond paths*
- ⑲ *Improve pedestrian crossing*
- ⑳ *Relax slope area, add new pedestrian bridge*
- ㉑ *Improve connection to Montrose School and adjacent neighborhood*
- ㉒ *Improve pathway along river*
- ㉓ *Improve Path connection from Baird Center to pool*
- ㉔ *Reconfigure paths adjacent to pool*
- ㉕ *Improve path connection along Baird center vehicular access and minimize conflicts between vehicles and bicycles/pedestrians*
- ㉖ *Reconfigure parking lot for more efficient use, improved access and additional open space.*

Located along the river corridor opposite Floods Hill, the Baird Community Center serves as an important focal point for a variety of recreational activities in the Northern Segment. This area's many attractions and existing connections can be maximized by reconfiguring the existing pathways and pedestrian bridge, providing improved connections and creating a gathering space (along the relaxed slope area) for leisure activities (17). More space can be available for improved path-

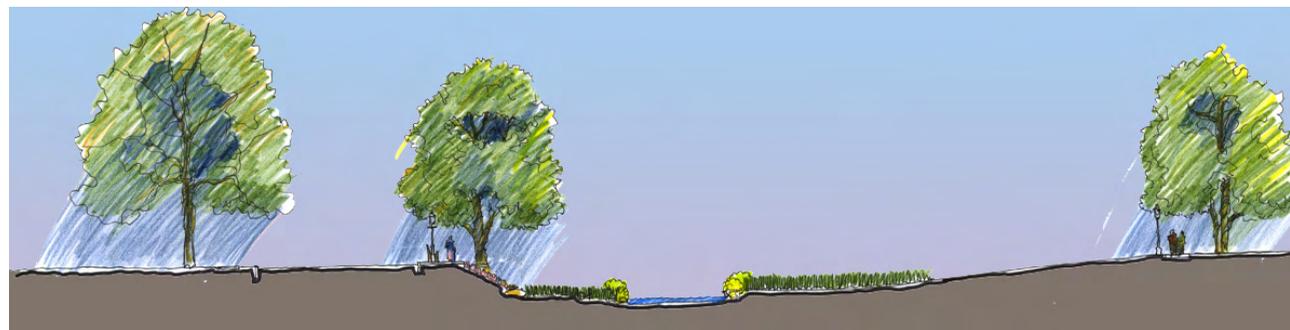
ways, new park gateways and improved parking access (26) by reconfiguring the existing Middle School parking area and adjacent parking lot and alley at South Orange Avenue. This area will be connected to the opposite side of Mead Street by an improved pedestrian crossing. Pathways will also improve connections between the Baird Center and the existing ball fields, tennis courts, and playground adjacent to the community pool.

In addition, new pathways will be added along both sides of the river corridor, adjacent to both the Baird Recreation Center parking lot and Meadowbrook Lane. The pathway alongside the parking lot will have a character similar to the one that connects the community pool and pedestrian bridge, and will provide a link to leisure activities along the relaxed slopes of the river. Moreover, a small pedestrian bridge will be added here to connect Floods Hill to the activities in the vicinity of The Baird Center. The path will continue between the existing residential area, Montrose School, and the baseball fields alongside the commuter rail line. Removal of several tennis courts immediately adjacent to the river has been identified as an opportunity to create a buffer between the river and programmed recreation space, however the Village residents strongly favored retaining existing recreational facilities, especially the tennis courts. Therefore, all existing tennis courts shall remain and the roadway and river bank will be adjusted to include a pedestrian path.

4.29 Section C: Meadowbrook Lane between Mead Street and South Orange Avenue (looking south).



4.30 Section D: Stream corridor at Meadowbrook Lane (looking north).

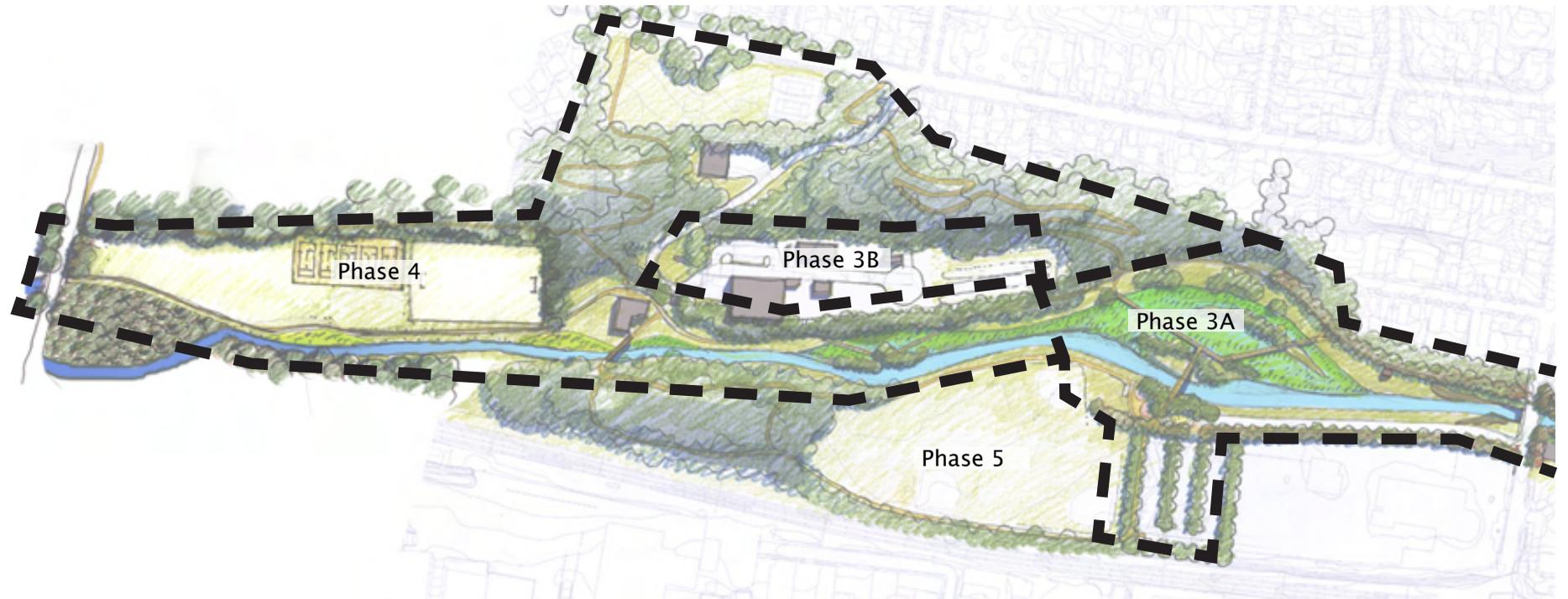


Phasing

The work proposed in this Master Plan will take several years and several million dollars to complete, and attempting to manage, fund and construct every aspect of the plan at once is not realistic. Phasing for a river and urban park rehabilitation project of this magnitude is crucial when fundraising, planning, design and construction considerations are taken into account.

This Master Plan is broken down into four major phases (image 4.31), organized to spread costs proportionally over a number of years. Some phases can be further separated to create demonstration projects, which consist of smaller tasks that are planned and executed within a relatively short time frame and a manageable budget to demonstrate the quality and character of the overall improvements, on a small scale. Demonstration projects can spark public interest as well as gain attention from funding agencies, creating the potential for the Village to secure funds for future, larger phases.

The first phase proposed has the most potential to provide short term impact on the river corridor. Focusing on recreational spaces in the northeast portion of the study area, it provides the opportunity to be broken down into demonstration projects which can



serve as a catalyst for fundraising and publicity for future phases. The remaining phases are organized from north to south of the project area, but do not contain any major sequencing constraints. Phases can be initiated as opportunities present themselves. One important note to consider when planning phases, however, is that permit requirements and hydrologic studies must be taken into account to avoid unnecessary delays and expenses.

Phase 1: Baird Center/Duck Pond

The first phase consists of improvements to the recreation areas north of the Village Center and east of the river. The main themes of this phase include creating connections to the surrounding residential areas, reorienting specific recreation spaces to help improve circulation and relaxing the river slopes to allow direct access to the river banks. Phase 1 can be divided along Mead Street to create two separate demonstration projects.

4.31 Phasing Plan





Phase 2: Village Center

Phase two involves improvements to the Village Center. The South Orange Performing Arts Center serves as a catalyst for development of arts activities, public spaces, shops and restaurants within South Orange’s urban core. Existing resources, such as Seton Hall University, historic buildings and café spaces

will be utilized for public functions such as concerts, art displays, festivals and markets. Improving public spaces, consolidating parking to structures and opening the river to the Village will create a vibrant Village Center.

Phase 3: Riparian Boardwalk

The existing open space, recreational fields and waterworks building presents a great opportunity to transform the southern portion of the Rahway River corridor into an ecological learning center. The existing open space needs heavy excavation, and so this presents a great opportunity to bolster the existing landscape and ensure the ecological future of the corridor. This phase will take long term planning due to intricacies with wetland creation, hydrology, waterfowl habitat, and environmental education affiliates. A strong component of this phase’s implementation is Phase 3B and the reconfiguration of facilities for DPW.

Phase 4: Recreation / Nature Center

Phase 4 will include future improvements to existing recreation fields and connections to the adjacent residential communities and the ecological/wetland areas created in Phase 3. This should be facilitated with the reconfiguration of Phase 3B in order to ensure the adequate future trail connections from the nature center areas to the ecologically restored areas.

Phase 5: Miscellaneous Improvements:

Phase 5 will include upgrading paths, signage, lighting, planting and other site elements throughout the corridor. These improvements can be consolidated with other phases or implemented as feasible between phases.

Village Center Access Solutions

The urbanized block between South Orange Avenue and Third Street, and Church Street and Sloan Street, presents special challenges in terms of continuing the connection of the bicycle and pedestrian path along the river, as well as “daylighting” the river itself. Yet access to the river greenway through this block, and leading to the many uses on this block (such as SOPAC, restaurants, commuter and public parking and retail shopping) is critical to fully realize the Master Plan’s vision and goals from transportation and a river restoration points of view. This block is almost entirely paved, and the river is contained in a box culvert. To free the river from this culvert would require extra space to accommodate the floodway, and might be cost-prohibitive. Land acquisition would also be costly and time-consuming. Due to the timeframes associated with this project, interim solutions for access, which may become permanent, will be put into place so that pedestrian and bicycle access along the river corridor can be provided in advance of daylighting and plaza development.

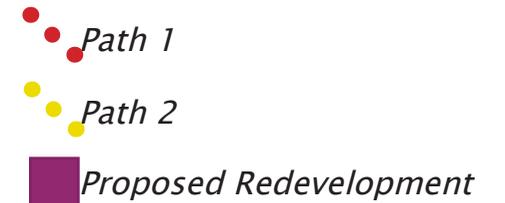
Land acquisition will not be necessary if access easements with appropriate capital improvements to ensure safety and ease of use can be successfully negotiated with developers and owners for a greenway path to be established along the river. Permanent daylighting improvements, as well as a more accessible and expansive greenway, may require taking of the gasoline station on the south side of South Orange Avenue.

Therefore, the Master Plan calls for a 10–12 foot wide greenway strip to be developed now along the river through the middle of the block, along the west side of the river. This path will be wide enough to accommodate pedestrian and bicycle travel to and from the destinations on this block, as well as through-travel. This greenway path will preserve nearly all parking spaces, minimize disruption of current uses and maximize, to the extent possible, access to these positive uses along the river.

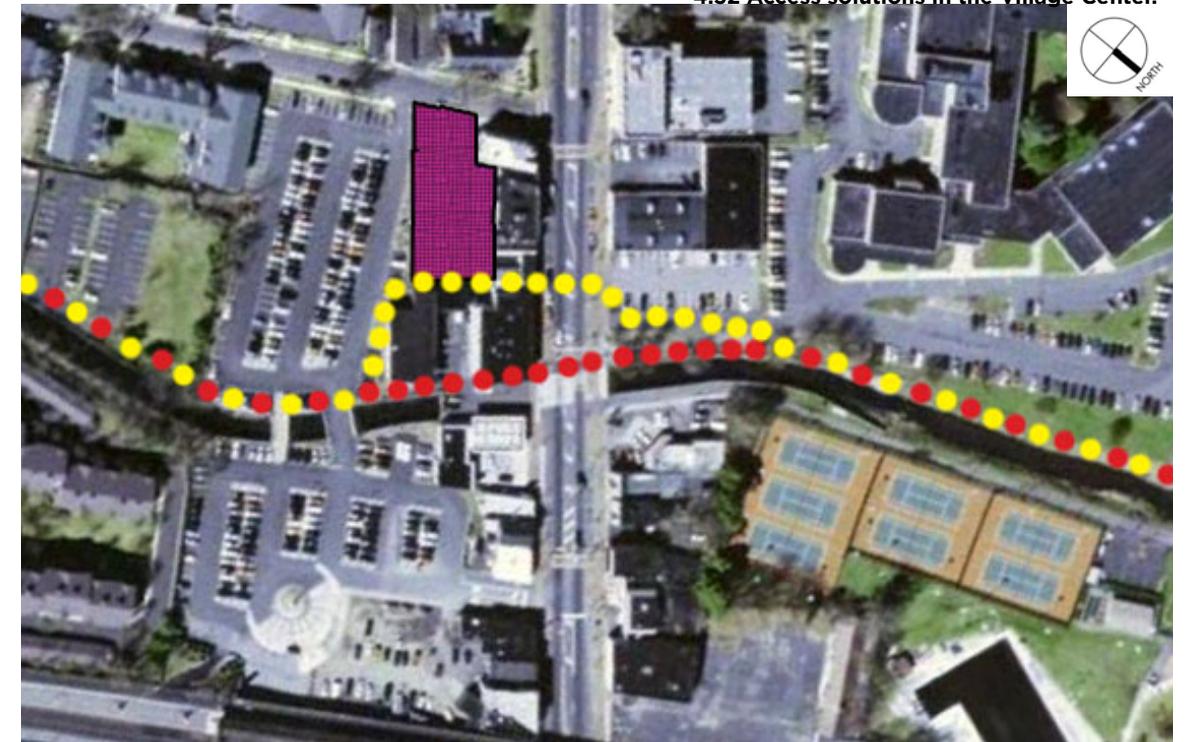
Two immediate solutions to construct the river greenway through this block have been identified on the plan at right. The solutions involve the grant of access easements by property owners in favor of the Village for public use, public access and for bicycle and pedestrian travel – rather than acquiring the land outright. One accessway (path 1) would run along the river just to the west of the existing culvert, adjacent to the building located at 102 West South Orange Avenue currently owned by B & T Realty and currently housing Gelman Plumbing and the Reservoir Restaurant, through the NJTransit parking lot and upon the access road for guest parking in the Village Mews. The other accessway (path 2) runs along the east side of a currently proposed development site on South Orange Avenue’s south side known as 110 West South Orange Avenue and owned by Saiyd Nagim, part of which is now vacant. The accessway would presumably run at grade-level through part of the building

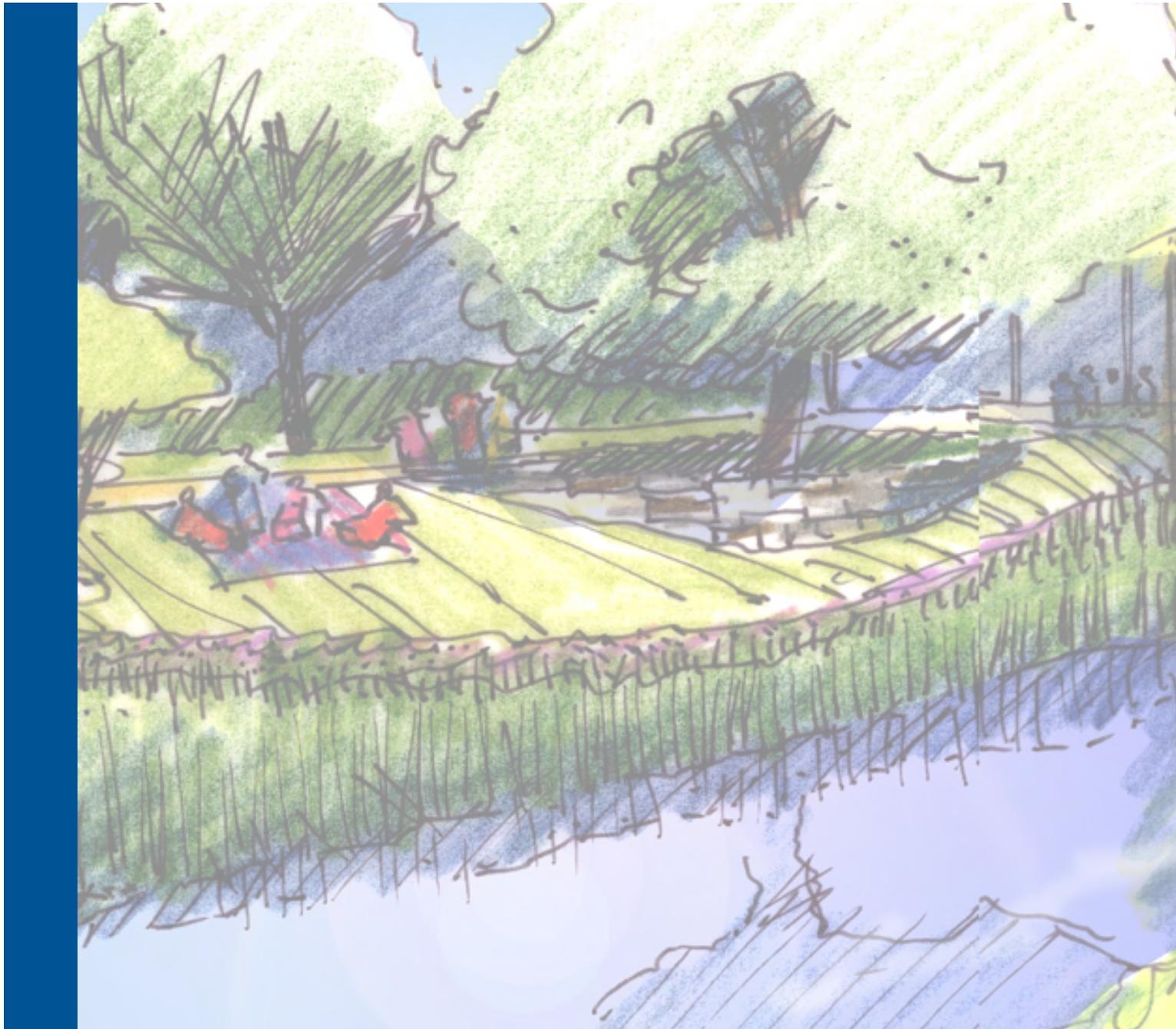
proposed for this site. One of the buildings currently at this site has an open alleyway through it. Therefore replacing this accessway to the rear (and the NJTransit lot) would be in keeping with the character of the original buildings, slated to be demolished.

Both solutions indicate connections from the future river-oriented plaza to Third Street via permanent access as shown in the Master Plan, via trail access along the west bank of the river. Both solutions are desirable and complementary, and should be investigated.



4.32 Access solutions in the Village Center.

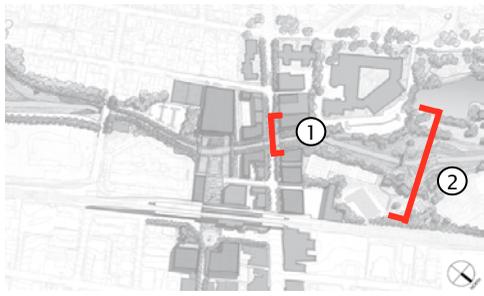




East Branch of the Rahway River Corridor

Key Design Elements ⁵⁷

Village of South Orange, New Jersey



5.01 (above) Plan showing the location of Sections 1 and 2.

5.02 (below) Section 1: View of the river within Urban promenade gateway. By replacing the chain link fence with ornamental handrails and adding decorative features, the river will become visible and inviting aesthetic feature for pedestrians.

5.03 (right) Section 2: View of the river in a park setting. Relaxed bank slopes allows visitors direct physical contact with the river, turning it into a destination, rather than an obstacle.



Key Design Elements

Through careful selection of details, the Village of South Orange can take on a unique flavor characteristic of its heritage and its future. Select design elements are covered in this section, as the implementation of design details will be crucial to the ultimate success of the rehabilitation of the East Branch.

This section includes general design guidelines that should serve as the basis for development of detailed designed guidelines. The Village should develop detailed and thorough design guidelines as one of the first steps of project implementation. Items such as lighting, railings, benches, trash receptacles and bollards should be designed or selected to coordinate corridor-wide and should be consistent within each of the three thematic zones. Aesthetics, along with ease of maintenance, dura-

bility and budgetary constraints should be key concerns in selection of details.

Recent revitalization efforts within the Village Center provide an excellent starting point for design guidelines in that area. While some details used in the Village Center may be applicable to the Northern or Southern segments of the corridor, others may require adaptation.

Conditions along the East Branch can be divided into two general categories: urban core and parkland slopes. These two conditions serve to define the character of the river and require different yet harmonious design treatments to best utilize the corridor. The sections below illustrate how these different conditions might respond to the river edge while maintaining a consistent identity throughout.

River Bank Types

Section 1 shows an urban promenade typical of the river edge at the Village Center. Existing chain-linked fence will be replaced with ornamental fencing, stone faced walls, and piers that also act as gateway elements in key locations. Existing wall faces should be made more aesthetically pleasing as discussed in the following pages.

Section 2 is located near Cameron Field and its adjacent passive open space. Materials used along parkland slopes of the river corridor should match or coordinate with those use in the Village Center, resulting in a consistent design language throughout the corridor. This section also illustrates the proposed revegetation and relaxation of slopes. This effect is intended to make the river more accessible to the public, and offer a place for leisure, relaxation, and appreciation of the river.



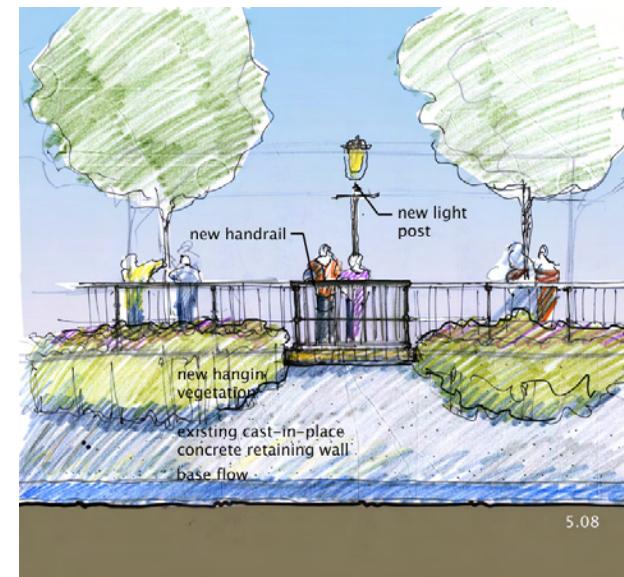
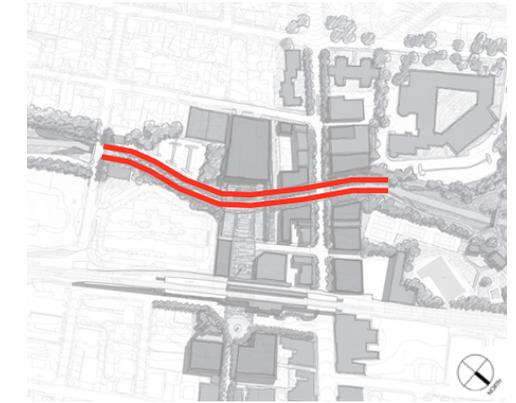
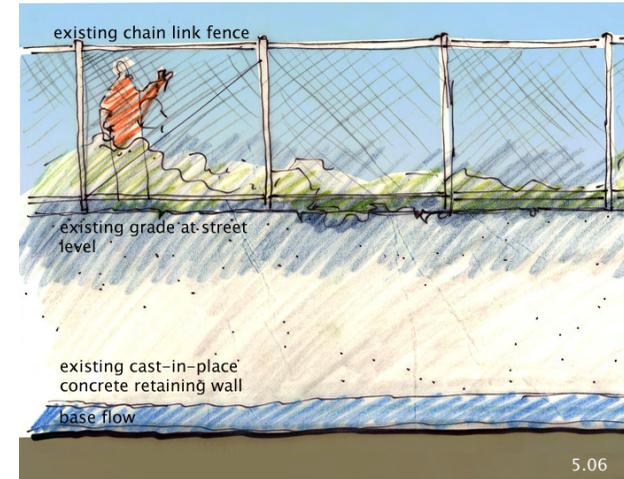
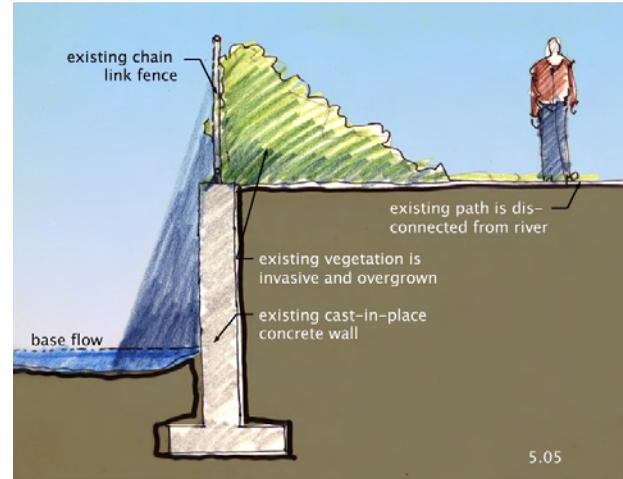
Treatments for Existing Urban Walls

The plan, at right, illustrates the areas along the urban corridor where existing walls are present; in most or all conditions, removal of the walls is not feasible due to spatial constraints.

The existing walls are visually unappealing and their current treatment is inconsistent with both the historical aesthetic of the Village and the Village's current revitalization efforts, particularly in the Village Center, where most walls are present.

The addition of ornamental fencing, benches, and vegetation will improve the aesthetics of the corridor and encourage pedestrian access to various park and Village Center activities. By creating cantilevered overlooks on top of the river wall, pedestrians are provided with areas to stop and enjoy views along the river.

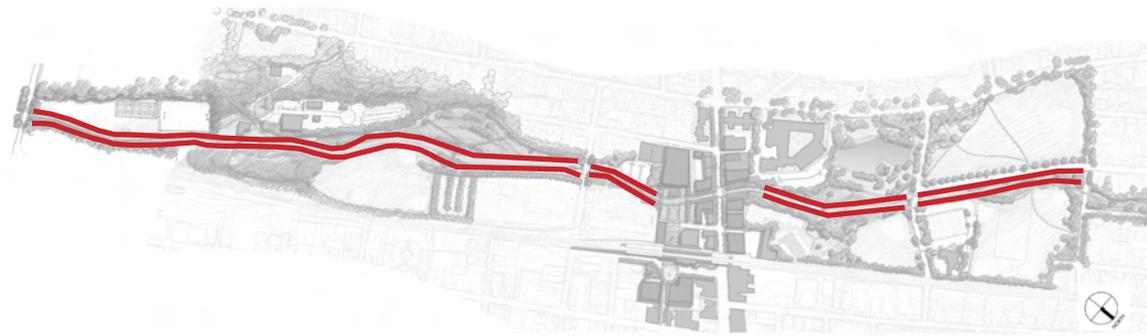
Wall facades should receive a surface treatment that will be more consistent with the Village Center's identity, but will not obstruct flood waters. Potential solutions involve a high performance finish, such as Tnemec (painted on), stucco or a thin stone or brick veneer.



5.04 (above) Plan showing the locations of urban edges along the river corridor.

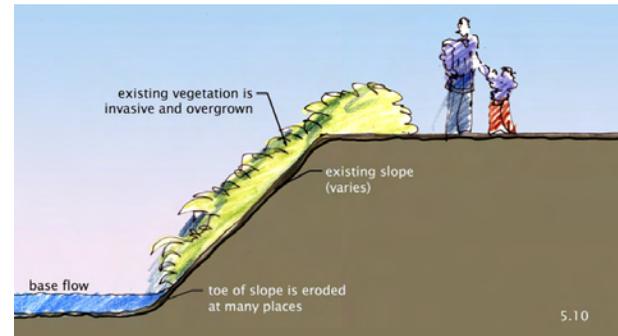
5.05 and 5.06 Existing concrete retaining wall along the river. Chain link fencing and overgrown vegetation makes the river edge uninviting in some places, and completely inaccessible in others.

5.07 and 5.08 Proposed retaining wall improvements. The river walls are left in place, but the chain link fence is replaced with ornamental handrails. Formal plantings are added and maintained and various niches and overlooks are added to create stopping points along the corridor.

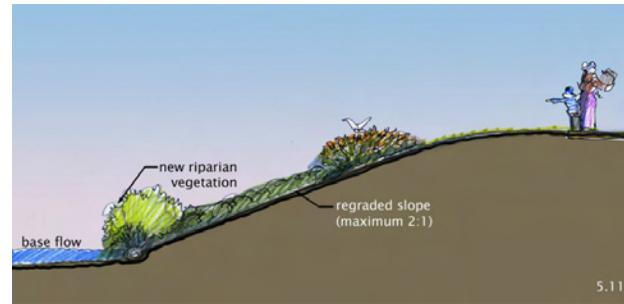


5.09 (above) Plan showing the location of sloped banks along the river corridor.

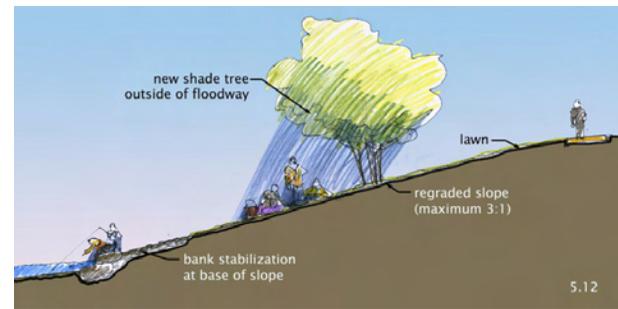
5.10 (top right) Typical existing vegetated slope along the river corridor. Although existing slopes along the river vary greatly, banks are typically too steep and too densely vegetated (often with invasive plant species) to provide access to the river.



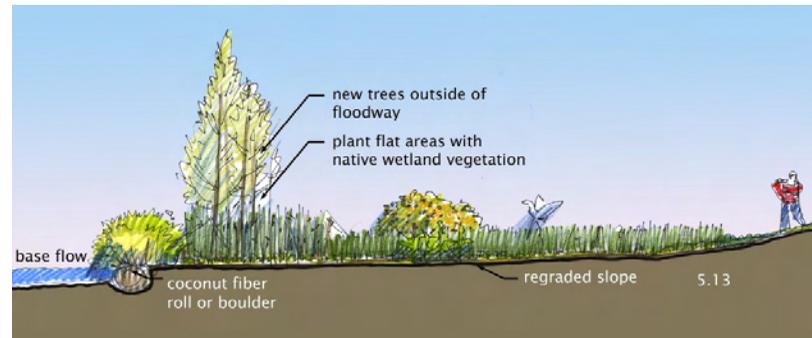
5.11 (middle, near right) Proposed vegetative treatment for a moderate slope (maximum 3:1). A variety of native shrubs, grasses and perennials will provide new habitats for wildlife along the river corridor.



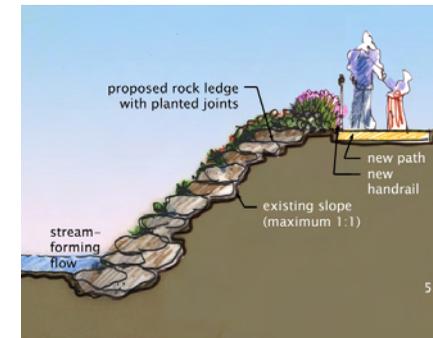
5.12 (middle, far right) Proposed lawn treatment for a moderate slope (maximum 2:1). By pulling back the slope and planting grass and shade trees, an opportunity exists for passive recreation and access to the water's edge.



5.13 (bottom, near right) Proposed wetland creation at flat or slightly sloping areas of the river's edge. Newly created wetlands can provide wildlife habitats along the river.



5.14 (bottom, far right) Proposed rock ledge treatment for steep slopes (maximum 1:1). Masses of boulders often prove to be a more attractive, less expensive alternative to retaining walls for slope retention. Depending on the proximity to a walking path, decorative handrails may be placed along the ledge, continuing a theme from the urban wall treatments.

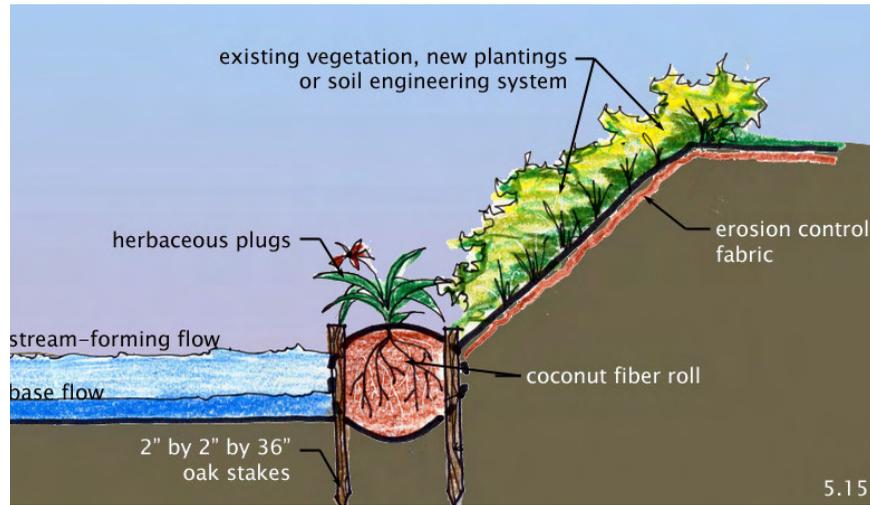


Bank Treatments

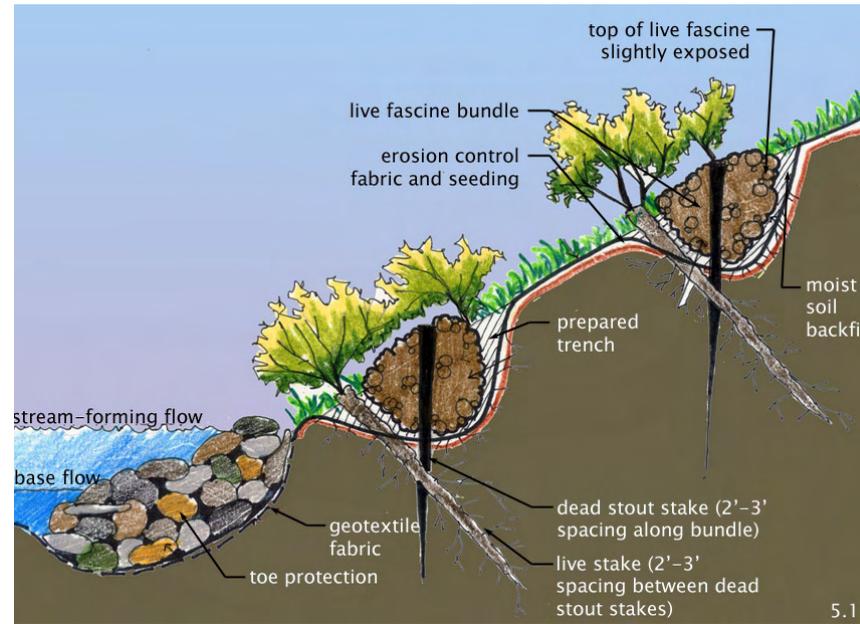
The sections at left illustrate river conditions in areas that are adjacent to parks, open space and recreation facilities. The proposed sections shown here add a variety of textures and experiences to the river corridor while responding to different slope conditions along the banks of the river.

Section 5.10 shows the existing slope typical along the vegetated sections of the corridor. The remaining four sections show treatment alternatives based on various slope conditions, and the space available in which to relax steep slopes. Areas requiring moderate slopes can be addressed either by creating natural habitats through native plantings or by providing direct pedestrian access to the river's edge with lawn and shade trees (5.11 and 5.12, respectively). Areas with little or no slopes provide opportunity for the creation of wetlands (5.13), while areas with steep slopes could be protected from heavy erosion by constructing rock ledges that provide visual interest and allow for pockets of vegetation along the edges (5.14).

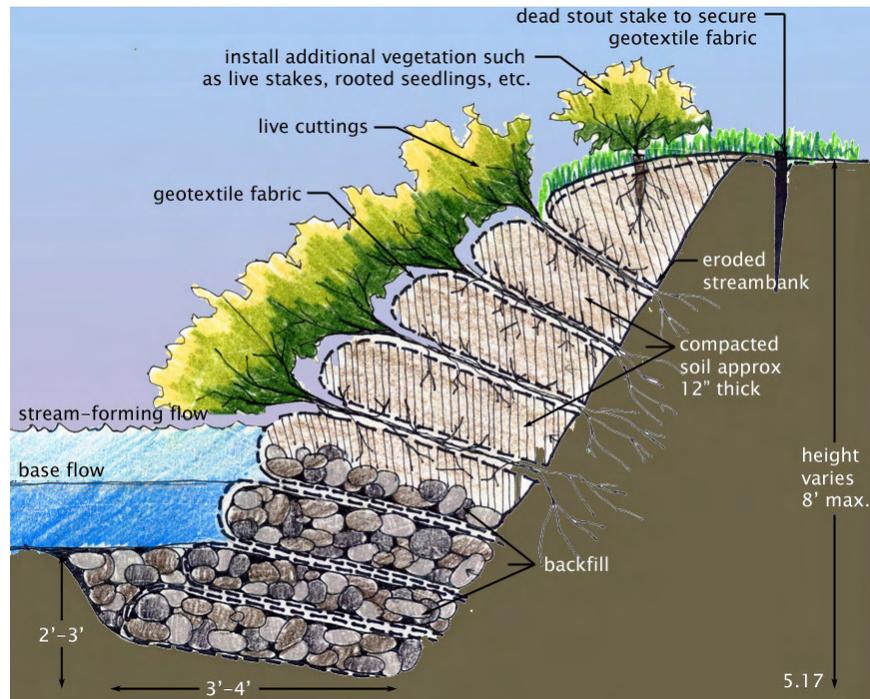
Although these sections cover a wide range of conditions along the river's edge, further study would be required at each location along the river to determine specific treatments.



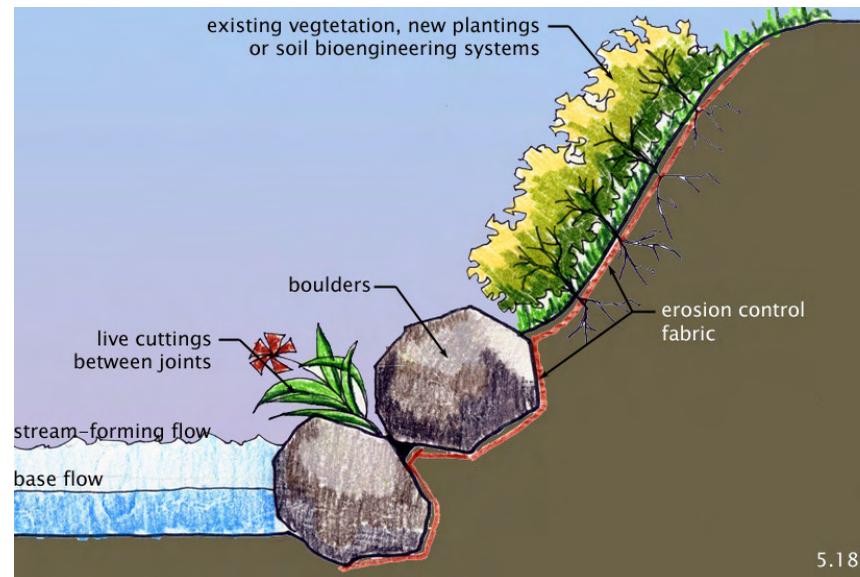
5.15



5.16



5.17



5.18

Toe-Of-Bank Treatments

The sections at left provide additional detail regarding methods available for stream bank stabilization. Each of these sections demonstrate methods for stabilizing the toe-of-bank, as scour is a particularly acute problem in several areas of the river. Additionally, spatial constraints and existing channelization prevent the opportunity for the water's path to meander. A clear delineation of the toe-of-bank, such as the use of boulders with joint plantings, provides an effective and attractive means for controlling any natural tendency for the river to deviate from its current path.

As the sections at left are general recommendations; specific methods for bank stabilization must be determined through hydrologic and soil studies for each portion of the river.

5.15 (top far left) Coconut Fiber Roll stream edge treatment.

5.16 (top near left) Live Fascine stream slope treatment.

5.17 (bottom far left) Vegetative Geogrid at eroded streambank.

5.18 (bottom near left) Joint Plantings at boulder stabilization.



5.19 *Platanus acerifolia* – London plane tree (RHI stock photo).

Vegetative Treatments

Vegetation is arguably the most important component of the river restoration, as vegetation has such significant ecological, hydrological and aesthetic impacts. Vegetative treatments within the three thematic zones of the corridor should be designed according to the theme of each zone as well as in response to the microclimatic requirements of each zone.

Future plantings within the corridor should respond to two guiding principles: re-establishment of the native (pre-development) species that grew along the forest banks, and rehabilitation of historic landscapes.

The Southern Segment should retain its forested character; exotic ornamental plantings should not be introduced in that area. Rather, the area should provide a beautiful place for experiencing the natural flora of the East Branch.

Native forest tree species, such as oaks, hickories, beeches, ashes, maples and tulip poplars should form the forest canopy. The same species should also be planted as specimen trees within lawn areas of the Northern Segment, consistent with historic landscape design. Ornamental plantings should be planted at gateways, borders and focal point areas within the Northern Segment; appropriate ornamental flowering trees and shrubs include Japanese cherry trees, hawthorns, crabapples, viburnums, hydrangeas, and azaleas. Existing London Plane street trees should be preserved, and infill plantings should be installed to ensure that South Orange maintains its stock of signature street trees.

River banks should be planted with low-growing and moderate-height shrubs, perennials and grasses, consistent with the ornamental or naturalistic

character of each portion of the corridor. Bank planting species should tolerate periods of drought and brief periods of flooding. The section on Bank Treatments details potential methods for implementation of plantings along banks.

Small-scale plantings, such as potted annuals within the Village Center, are also important, economical ways to improve multiple aspects of the river. Large and small trees should be incorporated within the Village Center as space allows, utilizing modern technologies for cultivating healthy trees in tight urban spaces.

Corridor-wide, invasive species should be removed posthaste according to a detailed, consistent regimen for control and eradication.



5.20 Existing native forest stand in the Southern Segment (RHI, 2004).



5.21 *Acer saccharum* – sugar maple leaves in fall (RHI stock photo).



5.22 *Hydrangea* in bloom (RHI, stock photo).



5.23 Potted annuals in Annapolis, MD (RHI stock photo).

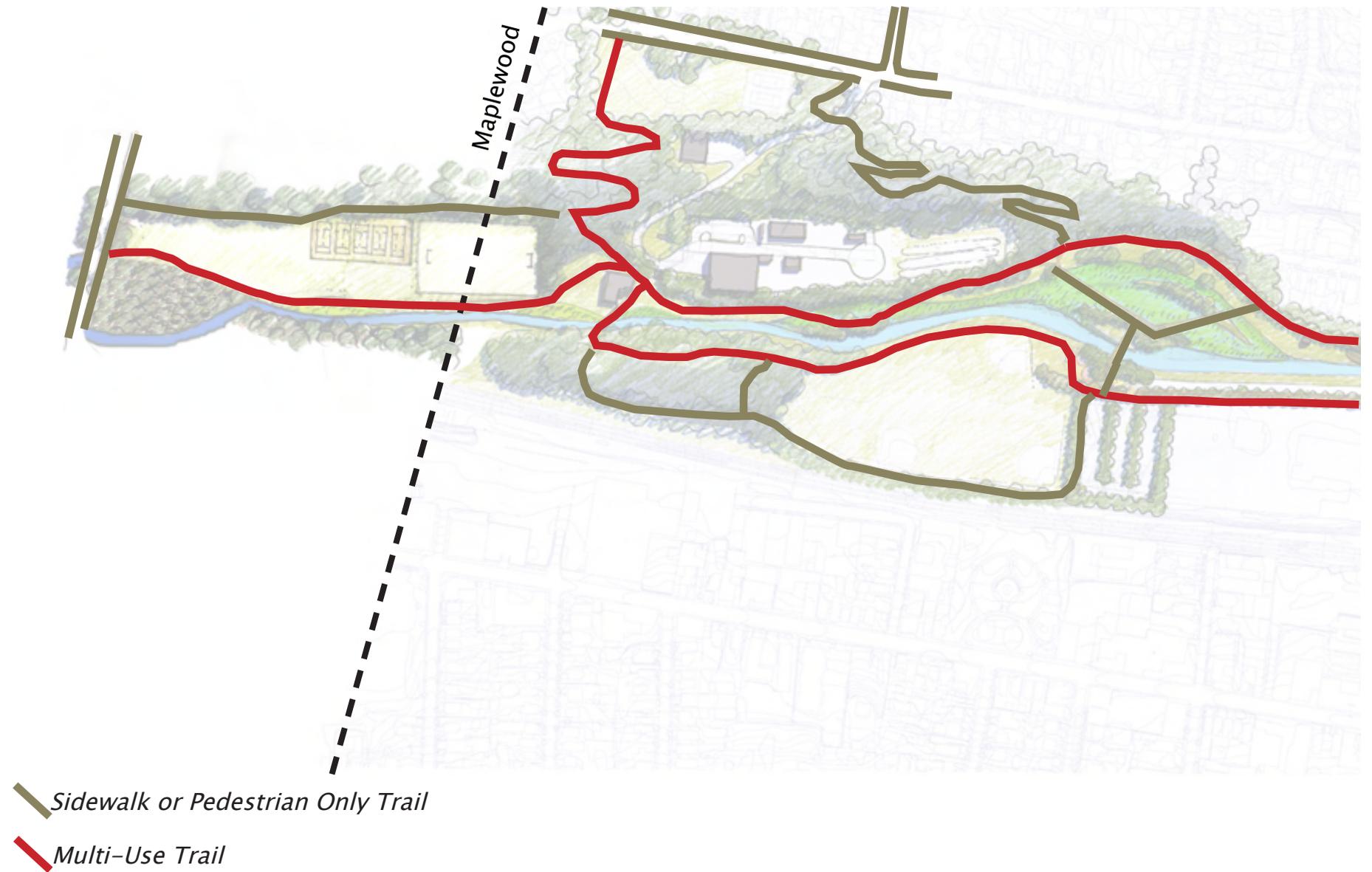


5.24 Existing street trees in the Northern Segment (RHI, 2004).

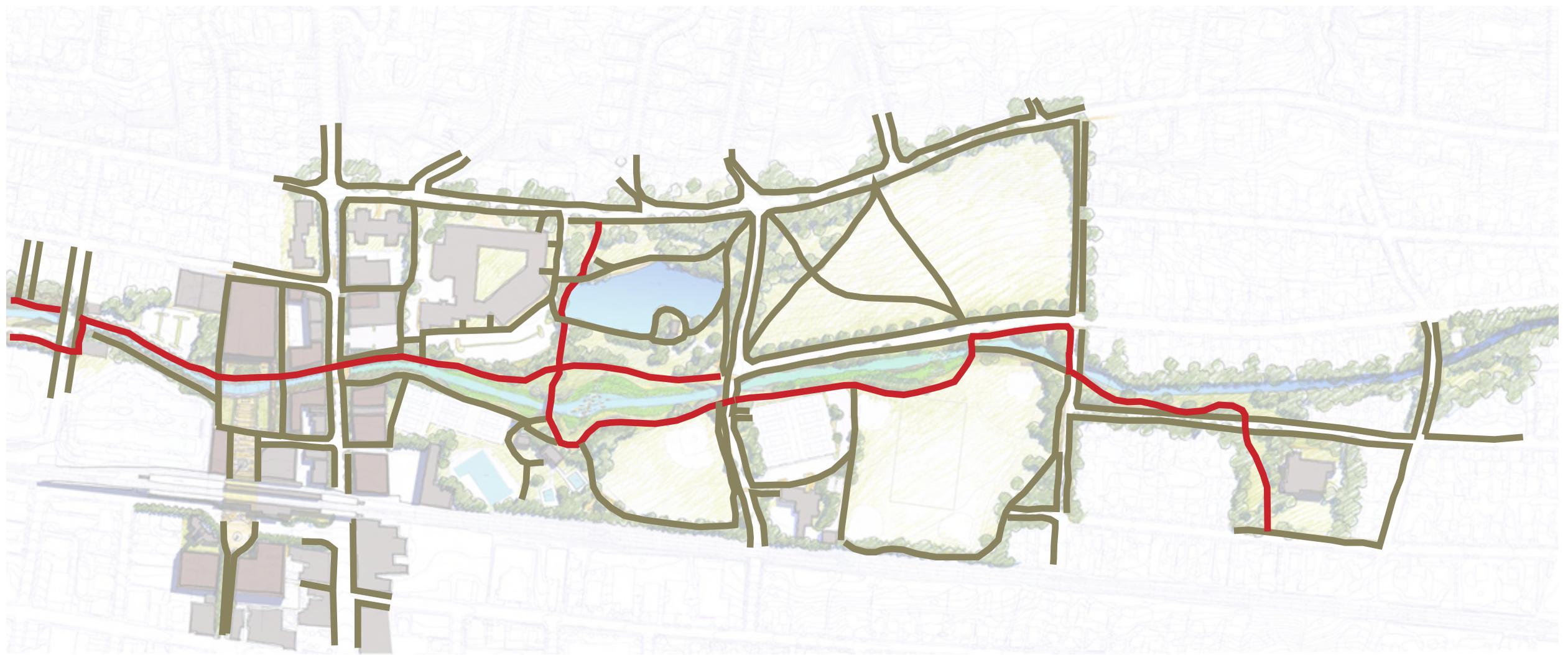
Trail Connections

The first three goals of the Master Plan (page 37) directly address circulation and access, making it a key component to successful implementation of the Master Plan. In order to create an effective circulation and access system, specific attention is paid to the relationship of pedestrian and bicycle uses to other, concurrent uses within the corridor including handicap access, in-line skating, skateboarding and adjacent active and passive recreational uses; these relationships must be specifically managed to minimize conflicts with one another and with motorized vehicles.

As outlined in many places throughout the Master Plan, pedestrian and bicycle circulation is vital to providing access to recreation, improving commutes from adjacent neighborhoods to the Village Center, alleviating parking demands (both in the Village Center and at various recreational centers), engaging adjacent schools with the river, connecting to neighboring Maplewood and allowing residents to “reconnect” with the river. All access and circulation related improvements should be ADA compliant to provide access for all park users. This section of the report focuses on general trail types and strategies for minimizing conflicts between various modes of access.



5.25 Village of South Orange Master Plan with trail connection overlay (RHI, 2005).



Paving Treatments

As the river corridor is relatively densely populated and supports a variety of uses, the Village should anticipate that once trail, sidewalk and path linkages are improved, already heavy usage levels will continue to increase. Fortunately, several resources exist to guide new trail design and construction, including ADA, AASHTO guidelines, the New Jersey Department of Transportation (NJDOT) Bike Compatible Roadways and Bikeways manual, and the NJDOT Flexible Design of New Jersey's Main Streets manual. Additionally, other communities have considerable experience in managing heavily traveled recreational corridors within densely populated areas. The Washington and Old Dominion Trail (W&OD) in Arlington, Loudoun and Fairfax counties, Virginia, managed by the Northern Virginia Regional Park Authority (NVRPA), is one trail that has begun to experience "rush hour traffic." Trail traffic is managed through education, signage and effective design. Lessons that the Village can glean from NVRPA's experience with the W&OD trail is that current guidelines (such as the aforementioned documents) provide effective strategies for managing multi-use trails if design criteria are diligently adhered to. Additionally, particular attention must be paid to bike/pedestrian and vehicular crossings, which often present the most dangerous conditions along multi-use trail routes.

Trail Design

Detailed design of each trail segment must be carefully considered and weighed against the best currently accepted guidelines; this Master Plan does not provide detailed information regarding the design of each trail segment. For the purposes of master-planning, general trail widths and general trail locations are addressed. Key considerations incorporated into image 5.25 are as follows, consistent with the aforementioned standards:

- Bicycle, pedestrian and other non-motorized modes of transportation should extend to all parts of the corridor and connect to adjacent circulation routes, such as city streets, on-street bicycle lanes, and sidewalks.
- Trail use should be clearly differentiated for different types of trails; image 5.25 shows three distinct, primary types of trails. Usage enforcement should begin with effective design, augmented by signage and education, monitored only as needed.
- Bicycle routes should not include sidewalks or trails that closely parallel streets; in such cases, on-street bike lanes should be implemented.
- Bicycle routes should avoid densely congested areas where crowds are likely to form, such as along the sidelines of recreational fields.

Trail Widths

Trail widths are assumed to be four feet (4') minimum for pedestrian-only trails, eight feet (8') minimum for multi-use trails in low- to moderate-use areas, and twelve feet (12') maximum for multi-use trails in high-use areas. Specific widths must be determined for each segment as those segments are designed; trail widths should be designed to transition smoothly to connect with existing trail widths.

Maintenance

Maintenance vehicle access to recreation areas is a trail use that presents a potential conflict and warrants additional discussion. Maintenance trucks should only access trails that are wide enough and have sufficient turning radii. Maintenance staff should be trained to only drive on specific trails, and to park in designated places to avoid blocking trail traffic. Detailed design of trails should take into account maintenance access and allow adequate pull-off or temporary parking for maintenance vehicles in key locations. Maintenance access should also be scheduled to avoid peak trail use times to the extent possible.

Trail Surfaces

Selection of trail surfaces must be weighed against goals and objectives related to use, aesthetics, historic preservation, ecology and hydrology. Trail surface selection criteria related to use is straightforward: bicyclists and



5.26 Stabilized soil paved path (Soil Stabilization Products Company, 2006).



5.27 Stone pavers in the Village Center (RHI, 2006).



5.28 Brick pavers in the Village Center (RHI, 2004).



5.29 Recycled plastic boardwalk (©1997, Trex, reprinted with permission).

in-line skaters require a rigid, smooth pavement while pedestrians may use looser forms of paving such as mulch or stone dust. Other concerns are more complicated, and involve criteria such as appropriateness with the thematic concepts of the three zones (Southern Segment, Village Center, Northern Segment), durability of materials, ease of maintenance, economy or construction cost of installation, the effect of the materials on the local ecology (including urban heat gain and effects on the

soil water regime), and the effect of the materials on global ecology (such as mining, production wastes and pollutants); evaluation of these criteria is summarized below for fourteen common trail paving surfaces.

The table below assigns a relative “grade” to each material in order to support selection of four predominant paving materials to be used throughout the river corridor.

Material	Appropriate Segment	Durability	Maintenance	Economy	Local Ecology	Global Ecology
Asphalt (NJDOT standard mix)	N/S	B	A	B	C	D
Asphalt (pervious)	N/S	C	C	C	B	D
Concrete (untinted, unpatterned)	N	B	A	C	C	C
Concrete (pervious)	N	B	C	D	B	C
Concrete (exposed aggregate)	N	B	A	D	C	C
Stone Dust	VC/N	D	C	A	B	C
Stabilized Soil*	N/S	C	B	B	B	A
Supported Turf**	N/S	C	B	A	A	B
Unit Pavers (precast concrete)	VC/N	B	A	D	B	C
Unit Pavers (stone)	VC/N	A	A	F	B	C
Unit Pavers (brick)	VC/N	A	A	D	B	C
Boardwalk (wood)	S	C	B	C	A	B
Boardwalk (recycled plastic)	S	B	B	C	A	B
Wood Chips	S	F	D	A	A	A

* A resin modified emulsion stabilizer, made from tree resin, applied to local aggregates. Road Oyl is a common trade name.

** High Density Polyethylene (HDPE) rings through which turf grows; often used for applications such as emergency fire lanes

Based on the table (left) and supporting documents, recommended paving materials are as follows:

Southern Section (S):

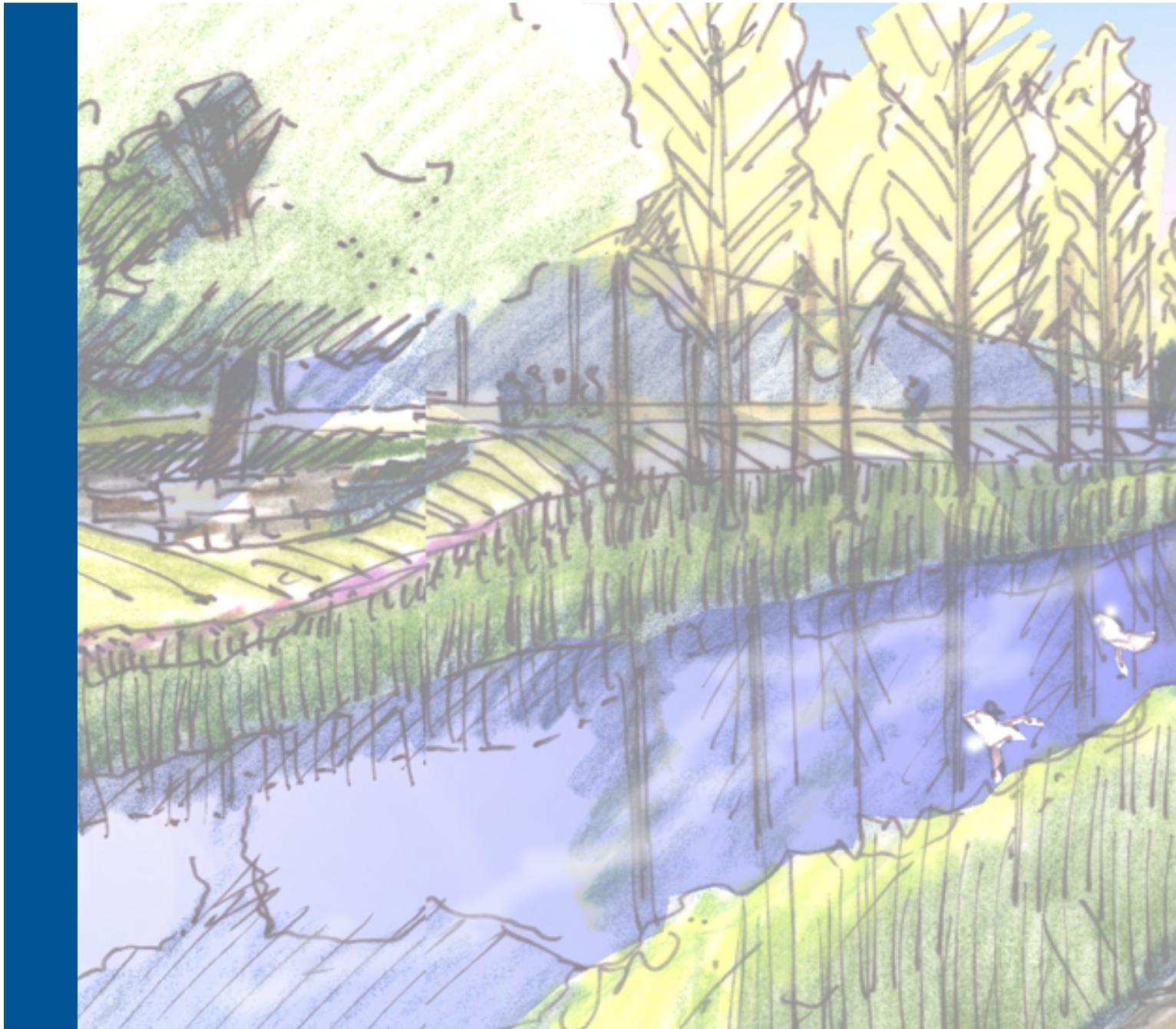
- Stabilized soil or Asphalt (primary for multi-use trails and pedestrian-only paths)
- Stone dust (secondary for pedestrian-only paths)
- Recycled Plastic Boardwalk (wetlands area)
- Supported turf (limited applications)

Village Center (VC):

- Combination brick unit pavers and exposed aggregate concrete (primary for plazas and sidewalks)
- Stone unit pavers (secondary for accent applications)

Northern Section (N):

- Stabilized soil or Asphalt (primary for multi-use trails and pedestrian-only paths)
- Stone dust (secondary for pedestrian-only paths)
- Stone unit pavers or exposed aggregate concrete (secondary for accent applications)
- Supported turf (limited applications)



East Branch of the Rahway River Corridor



Conclusions

Vision

The river and adjacent lands within the Village Center represent significant opportunities to revitalize the economy, ecology and quality of life in South Orange.

Adaptation

This Master Plan represents a beginning, not an end. Changes and requests for changes are inevitable. Evaluate potential changes to the Plan against the concepts and treatments upon which the Master Plan is predicated: pre-development conditions (vegetation, hydrology and geology), the Village’s heritage, the Village’s current and anticipated future needs. Measure potential changes against the thematic concepts for each of the three major zones.

Management

Use the Master Plan, and update the Master Plan when needed. Ensure that the Master Plan is available, and known to, the Village leadership, residents, merchants, maintenance workers, park users, and any other stakeholders. Maintain and adapt an organizational structure to consistently implement the Master Plan, guide fundraising, con-

struction, education and public relations opportunities

Design

Develop and implement design guidelines concurrent with the first phase of implementation. Ensure that all new work adheres to the accepted design guidelines; do not implement “temporary” work that is not consistent with the design guidelines. Design guidelines are not only effective for large projects, but they are also vital to effective maintenance; parks maintenance staff and management must be familiar with design guidelines in order to implement “quick fixes” and to make needed repairs. Be mindful that relatively small elements, such as trash receptacles and signs, cumulatively have a large impact.

Advancement

Strategically plan, adjust and refine steps for implementation, seizing opportunities as they become available. In defining implementation phases, refer to both the phasing plan included in the Master Plan, and objectives listed for each goal; many objectives can be met independent of implementing construction projects.

Focus energy on key areas: the Village Center is arguably the most challenging, yet potentially most rewarding, area that requires improvements. In advance of funding availability for improvements, begin to lay the groundwork for improvements, identifying incremental steps that can be undertaken, including improving access, acquiring land, and programming

Concentrate energy and resources on corridor-wide access that offers the greatest user benefits. Increased use may translate into increased interest in implementation of future projects. Start with small projects to gain credibility with residents and with potential funding agencies. Starting with small projects also allows management teams to work together toward tackling larger projects.

Time

Many of the noted improvements will take several years. The Village leaders and stakeholders must work together for incremental improvements via each project undertaken, large and small. Momentum must be maintained to sustain interest: schedule improvements to be immediately consecutive to the

extent feasible. Due to the complexities of river corridor rehabilitation, and due to the ambitious nature of some projects, patience will be needed at times. During “lean” times, implement small, inexpensive improvements noted in the Master Plan to maintain momentum.

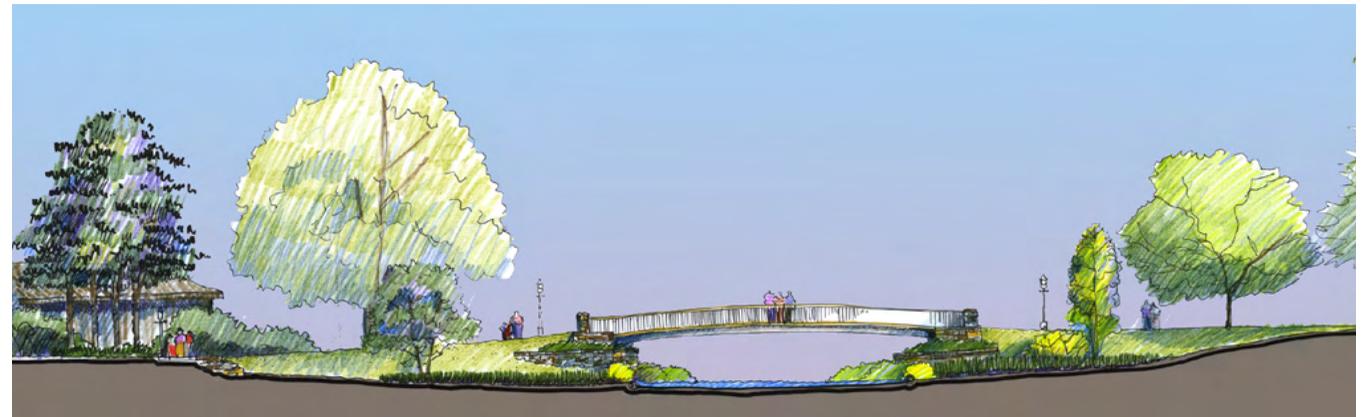
Complexities & Regulations/Permits

Do not underestimate the complexities of the permitting process. The Master Plan views the river corridor holistically, balancing history, aesthetics and user needs with hydrology and ecology. NJ DEP permit reviews often focus on specific criteria, which can be a challenge in attempting to implement a holistically balanced Master Plan. Many or all phases of the Master Plan may not exactly meet NJDEP permit requirements, so individual Permit applications will be required to implement river rehabilitation projects. Individual Permits are more time-consuming and costly than general permits, but may prove to be necessary for implementation consistent with the Master Plan vision. Fundraising timeframes should take into account the length of time required for design, permitting and construction of each phase of work. River rehabilitation is not a quick process; the community

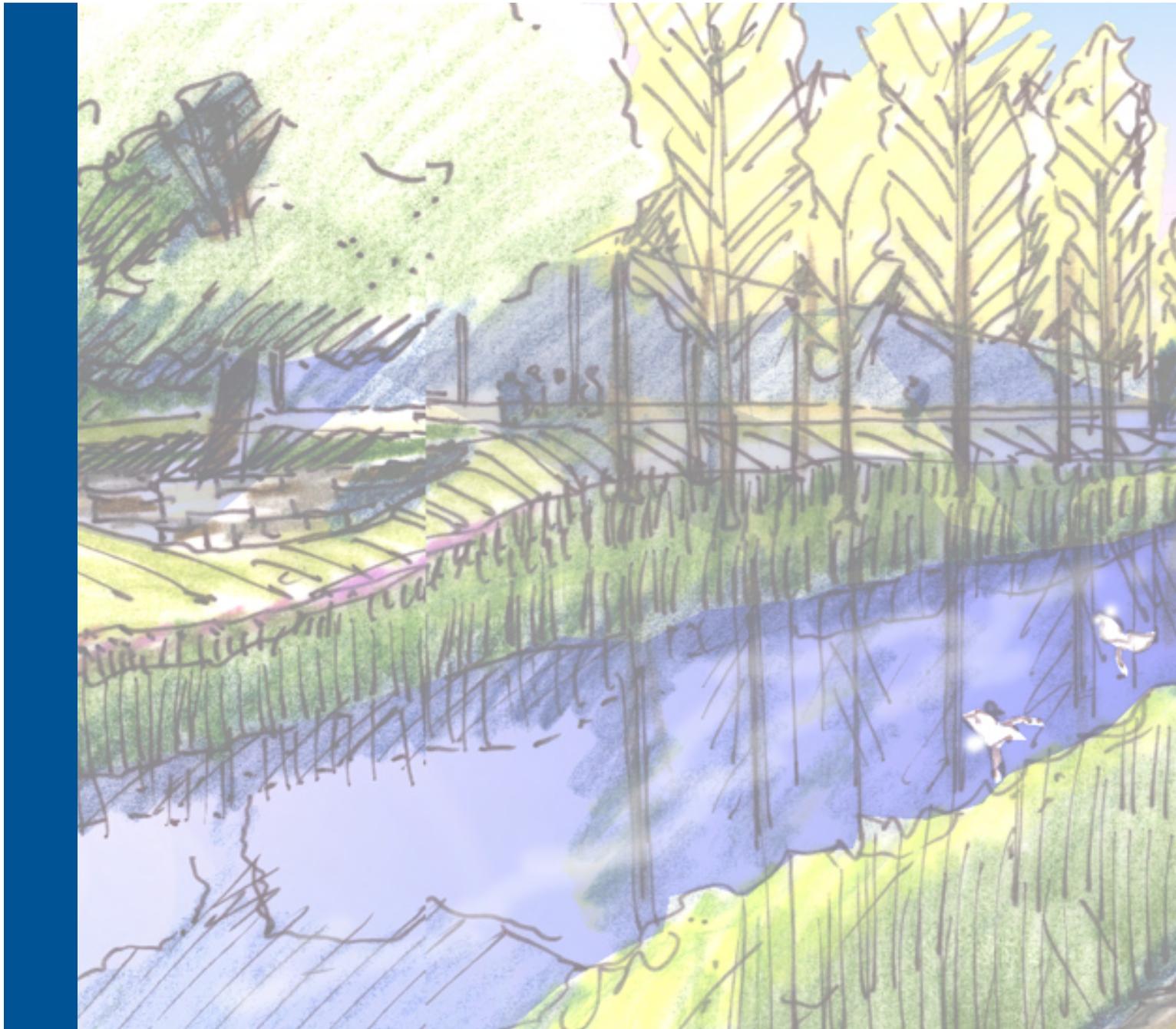
should become educated as to the time requirements, and public “buy-in” to the long-term benefits is essential. Other complexities may include infrastructure, hazardous materials, the political climate, and numerous unforeseen construction conditions.

Rehabilitation of the East Branch of the Rahway River corridor is a tremendous undertaking that will produce profound benefits for the Village and its residents. The rehabilitated river will fulfill and expand upon the Meadowland Society’s original open space vision for the corridor, and will provide a legacy for the Village of South Orange for generations to come.





6.01 (top left) View of the Rahway River in an urban setting, as it currently exists (RHI, 2006).
6.02 (top right) View of the Rahway River in an urban setting, once the proposed modifications have been made (RHI, 2006).
6.03 (left) View of the Rahway River in a park setting, as it currently exists (RHI, 2006).
6.04 (above) View of the Rahway River in a park setting, once the proposed modifications have been made (RHI, 2006).



East Branch of the Rahway River Corridor

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Schematic Design

Schematic design for Phase 1 began concurrently with the final stages of the Master Plan. The Schematic Design shown at right is included as an example of how the Master Plan drawings may evolve into more defined forms as designs for project phases are studied in greater detail.





Based on July 2005 Schematic Design Documents

NOTE: Costs shown are in 2005 dollars. Amounts should be adjusted to current year to reflect inflation / construction cost escalation.

PROJECT AREA	ITEM	SUBTOTAL
Phase 1		
	SUBTOTAL-CONSTRUCTION:	\$1,108,475
	10% Design Contingency:	\$110,847
	10% Mobilization & General Conditions:	\$121,932
	15% GC Overhead & Profit:	\$201,188
	Opinion of Probable Cost Phase 1	\$1,542,442
Bridges		
Phase 1A - Bridge North of Meade Street	SUBTOTAL-CONSTRUCTION:	\$125,000
	10% Design Contingency:	\$12,500
	10% Mobilization & General Conditions:	\$13,750
	15% GC Overhead & Profit:	\$22,687
	Opinion of Probable Cost Phase 1A Bridge	\$173,937
Phase 1 B - Bridge & Retaining Walls, South of Meade Street	SUBTOTAL-CONSTRUCTION:	\$330,875
	10% Design Contingency:	\$33,087
	10% Mobilization & General Conditions:	\$36,396
	15% GC Overhead & Profit:	\$60,053
	Opinion of Probable Cost Phase 1B Bridge	\$460,411

