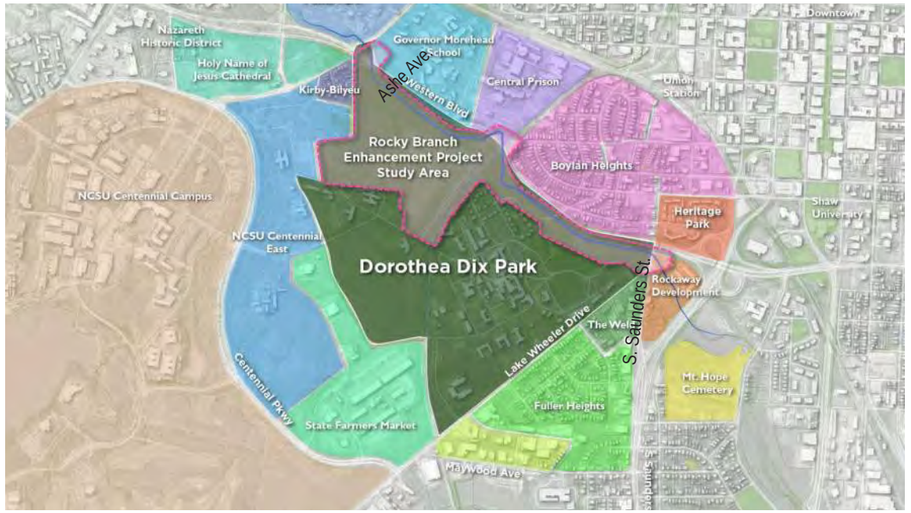
1. EXECUTIVE SUMMARY & INTRODUCTION TO TASK 2

PROJECT INTRODUCTION AND BACKGROUND

The Creek, as referenced within the Dix Park Master Plan, refers to the project that will restore the Rocky Branch, a key natural element of Dix Park that has been neglected for decades. The restoration of the Rocky Branch corridor is vital to the vision for Dix Park. The vision of The Creek project is to create a Raleigh waterfront, a place that is a truly unique community resource and a regional destination that educates and instills a sense of wonder into those who visit and experience it.

The project study area stretches from the northernmost corner of Dix Park near Western Boulevard and Ashe Avenue southeastward to the corner of the park at Western Boulevard and South Saunders Street. The overall length of this study area is approximately one mile and consists of approximately 50 acres.



(Above) Rocky Branch Enhancement Project Area and Context.

PROJECT PURPOSE

This Rocky Branch Enhancement Project feasibility study was broken into two tasks. Task 1 of the feasibility study was completed in October 2022. The intent of Task 1 was to establish a comprehensive foundation for the next phases of the feasibility study. The primary objectives of Task 1 included:

1. Review and Evaluate the Available Data and Identify Scope of Investigation Needed for Task 2,
2. Identify Key Agencies and Stakeholders that the Rocky Branch Project Will Coordinate With,
3. Identify Key Adjacent Property Owners and Concurrent Projects that the Rocky Branch Project Will Coordinate With, and
4. Develop a Strategy for Grant Management Reporting and Meet with Grant Agency Representatives.

Task 2 of The Rocky Branch Enhancement Project evaluates the feasibility of transforming the degraded urban Rocky Branch into an engaging, vibrant, and resilient waterfront amenity. The primary objectives of Task 2 were to evaluate the proposed plan for The Creek landscape presented in the Dix Park Master Plan which includes a meandering channel, improved floodplain bench, adjacent stormwater wetlands and ponds, park program spaces, fields and meadows, native riparian vegetation, Western Boulevard land bridge crossing, and a greenway system. Task 2 evaluates three different scenarios that meet the goals of the Master Plan, yet vary in terms of level of intervention and cost.

PROJECT GOALS

The intent of this project is to identify feasible scenarios that successfully navigate combined efforts of stream restoration and landfill reuse, as well as land bridge scenarios, to create spaces that are reflecting the Core Principles of the Dix Master Plan: “Open up and connect”, “Build from what is there” and “Offer something for everyone”. Within these Core Principles are further specified goals for The Creek:

1) Open Up and Connect
- Leverage proximity to adjacent assets
- Enhance gateway potential
- Enliven park edge
- Promote connectivity

2) Build From What is There
- Restoration
- Reuse
- Rehabilitation
- Resiliency
- Reflect the region’s ecosystems

3) Offer Something for Everyone
- Celebrate Dorothea Dix Park’s cultural landscapes
- Create ‘Nature Escapes’
- Create dynamic and flexible spaces

A series of landscape improvement goals specific to the Rocky Branch Enhancement Project were identified within the Dix Master Plan. This feasbility study ensures that these goals are carried through within all the established design Scenarios A, B and C.

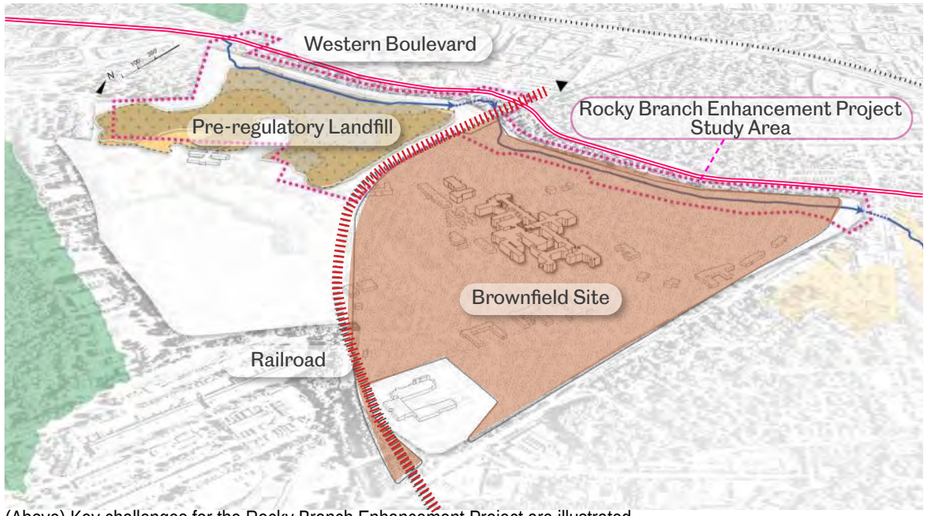
Goals:
- Restore Habitat
- Improve Ecological Function
- Showcase Piedmont Ecology
- Widen Creek Floodplain
- Mitigate Flood Impacts on Site and Downstream
- Improve Water Quality

KEY CHALLENGES

There are several key challenges to the Rocky Branch Enhancement project. The proximity of Rocky Branch to the existing pre-regulatory landfill is a key challenge to the project. Redevelopment within the landfill will be regulated under the North Carolina Department of Environmental Quality (NCDEQ), Division of Waste Management (DWM), Inactive Hazardous Sites Branch (IHSB), and Superfund Section Pre-Regulatory Landfill Unit (PRLU). The eastern portion of the Rocky Branch Enhancement Project (area east of the Norfolk Southern Railway) occurs within the Dorothea Dix Brownfield Property (Dorothea Dix Park and South Saunders Street Assemblage). Redevelopment within the Brownfield Property portion of the site will be regulated by NCDEQ, DWM, and the Brownfield Redevelopment Section (BRS).

Another key challenge of this project is the proximity of the stream to Norfolk Southern Railroad. This includes both physical and regulatory barriers to the project’s design opportunities.

Western Boulevard, the (4) lane road that runs parallel to Rocky Branch along the entire northern boundary,



(Above) Key challenges for the Rocky Branch Enhancement Project are illustrated.

has a substantial impact on the project. This close proximity limits the ability of the stream to be restored to its more natural shape and form. In addition to the physical constraints, there are also stormwater impacts to the stream including water quality and stormwater runoff volume from Dix Park, as well as upstream and adjacent conditions.

SYNTHESIS PROCESS

Stream Conditions Assessment

A thorough stream conditions assessment was performed by Wildlands Engineering, Inc. to evaluate the stream’s geology, soils, and geomorphic conditions within the extents of Dix Park. The findings within the existing stream conditions assessment inform key considerations within the proposed design scenarios developed for the restoration of Rocky Branch. Specific detailed findings can be found within this report and the Appendix B.

Site Analysis

A site analysis studied: Soils, Topography, Landfill Extents and Composition, Hydrology, Vegetation Characteristics, Microclimate, Wildlife, Circulation, Sensory Experience, and Cultural Significance. These findings were then layered to begin to identify particular constraints and opportunities that would be instrumental in developing the design scenarios for the restoration of Rocky Branch.

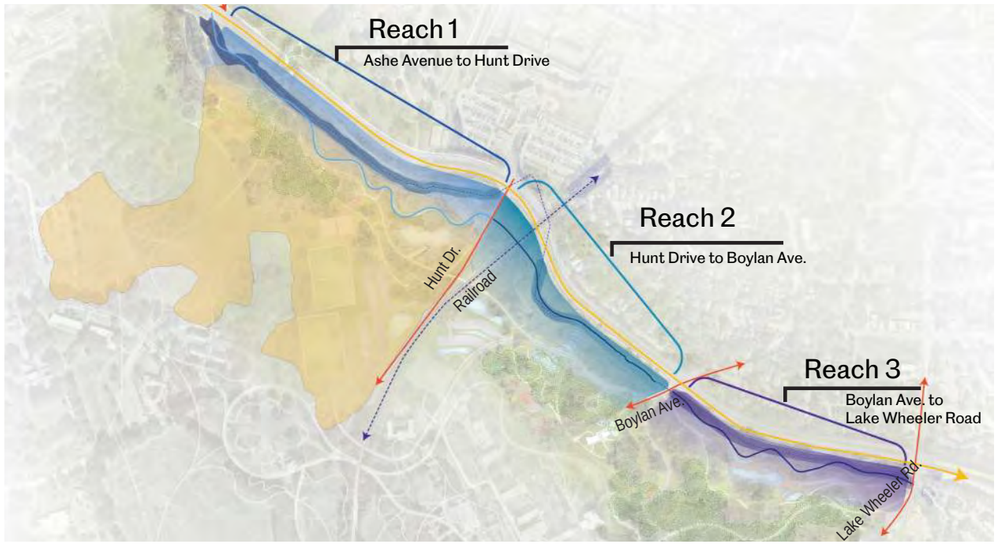
Stream Reach Delineation & Overview

Along the course of Rocky Branch, varying streambed and bank conditions exist. Existing conditions such as topography, valley width, infrastructure and built conditions help to naturally delineate three different Reaches or sections of the stream. For purposes of this study, the stream alignments developed will refer to Reach 1, Reach 2, and Reach 3 for each of the three Scenarios. In addition to providing distinguishable sections in which the stream alignments can be evaluated, these Reaches provide opportunities for

considering how the Rocky Branch restoration could be implemented in a series of phases. Below are the general extents defining the scope of the three reaches of Rocky Branch discussed in this report.

Reach Extents of Rocky Branch within Project Extents

Reach 1 – Ashe Avenue to Hunt Drive
Reach 2 – Hunt Drive to Boylan Avenue
Reach 3 – Boylan Avenue to South Saunders Street



(Above) Map identifying reach or section delineation of Rocky Branch within Dix Park as related to this feasibility study.

DESIGN SCENARIOS

Preliminary Stream Alignment Scenarios

Key to the successful implementation of The Rocky Branch Enhancement Project will be the carefully orchestrated design of stream restoration and management of landfill waste, soil, and associated contamination. Development of soil management and cleanup plans that meet regulatory requirements, managing ongoing settlement of the landfill surface from natural degradation of the landfill waste, and strategically balancing the site earthwork within the respective regulatory boundaries of both the landfill and the broader brownfield site will be critical steps in navigating the design and construction of this scope of work.

Each scenario meets the project goals but varies in terms of level of intervention and cost. Scenario A represents a design most consistent with the Master Plan and carries the highest project costs, while Scenario C represents the lowest cost design. Scenario B falls between A and C.

1. **Scenario A - Rocky Branch Realignment**
   This scenario for the stream realignment reflects a design most consistent with the vision of the Dix Park Master Plan, It provides the most significant realignment and introduces new stream meanders as well as raised stream elevations by approximately 5 feet in the upper Reach 1. Additionally, Scenario A proposes relocating Rocky Branch fully onto Dix Park property from its existing culverted course on Central Prison property. In lieu of crossing beneath Western Boulevard to and from Central Prison property, Rocky Branch would flow through a new, shorter culvert beneath the active railway embankment, remaining entirely on the Dix Park property. The upper and lower reaches of Rocky Branch would be fully restored with ideal meanders, stream bed and bank conditions, improved buffers, and widened floodplains. Additionally, Scenario A includes significant site grading and optimizes amenities; including pedestrian circulation and connectivity, overlooks and engagement with adjacent park features, and stormwater management opportunities.

Considering the maximized approach to all aspects of the realignment and design, Scenario A also presents the most significant potential hurdles.

- The raised elevation of Reach 1 requires considerable further exploration to ensure there are no adverse flooding or flood plain impacts to Dix Park or neighboring properties, adding a level of complexity to potential permitting.
- The considerable realignment of the stream in Reach 1 presents the most significant landfill impact and will require extensive environmental, geotechnical, and soil management work.
- The relocation of Rocky Branch to remove it from the Central Prison site entirely onto Dix Park involves significant coordination and permitting with Department of Transportation and Norfolk Southern Railway, while simultaneously increasing anticipated construction costs considerably.

(Above) Proposed Scenario A Design

2. Scenario B - Rocky Branch Realignment

This scenario for the stream realignment shares many features of Scenario A but simplifies the design and reduces the order of magnitude of costs. Scenario B still meets the established goals for the project with a transformative design for Rocky Branch and Dix Park. Scenario B proposes to maintain the elevation of Rocky Branch in Reach 1 as well as maintain the stream's current alignment where it crosses Western Boulevard onto the Central Prison site, before returning to Dix Park east of the railway crossing. These are key differentiating factors that separate Scenario A from Scenario B. Similar to Scenario A, in Scenario B, Reach 1 and 3 of Rocky Branch would be fully restored. Reach 2 would receive considerable stream enhancements except for the section remaining on Central Prison, as potential improvements to that section would need to be further evaluated. Floodplain improvements are still proposed for the entire length of Rocky Branch within Dix Park. Scenario B still includes significant site grading as well as significant opportunities for park program. Only slight reductions are proposed for pedestrian circulation and connectivity, overlooks and engagement, and stormwater management opportunities.

Considering the reduced elevation of Reach 1 and the proposed alignment at the railway, Scenario B has fewer potential project hurdles.

- By maintaining Rocky Branch nearer its existing elevations, the potential for adverse flood impacts is greatly reduced, allowing for simplified permitting, and ensuring feasibility of the proposed design.
- There is still considerable realignment of the stream in Reach 1 and maintaining the lower stream elevations while still providing more ideal floodplain widths will likely increase landfill disturbance slightly. These in combination still present significant environmental, geotechnical, and soil management impacts.
- By maintaining Rocky Branch on the Central Prison site, Scenario B simplifies coordination and permitting with the Department of Transportation and Norfolk Southern Railway while simultaneously reducing anticipated construction costs for culvert infrastructure.

3. Scenario C - Rocky Branch Realignment

This scenario for the stream realignment again meets the established goals for the project but proposes some additional measures to potentially reduce construction costs and ease permitting challenges. Scenario C simplifies the stream realignment in both reach 1 and 3 compared to the previous two scenarios. In both cases, these reaches would receive stream enhancements, but no longer full restorations. The alignments are simplified and generally remain closer to the current course they run today. Similar to Scenario B, Scenario C proposes that Rocky Branch maintain its current alignment at Central Prison. While the stream is an enhancement project ensuring improved stream bed and bank stability within its current channel, the flood plain is still proposed to be widened significantly in all three reaches within Dix Park. While site grading is still significant to account for proposed adjacent park improvements, the reduced scale of stream realignment, particularly in Reach 1, has the potential to greatly simplify the environmental impacts and management requirements of the project compared to the designs represented in Scenario A and B.

Considering the significant adjustments to proposed realignment, Scenario C carries reduced potential hurdles.

- By reducing the meander and simplifying the stream realignment, particularly in Reach 1, Scenario C further reduces landfill disturbance and therefore, reduces environmental, geotechnical and soil management impacts compared to previous scenarios.

Western Boulevard Bridge Scenarios

The Land Bridge at Dix Park is a major element of the Dix Master Plan and is envisioned to cross Western Boulevard and Rocky Branch stream just south of Ashe Avenue. The Land Bridge will provide pedestrian and bicycle circulation at Rocky Branch Trail connecting Pullen Park and the broader city with Dix Park.

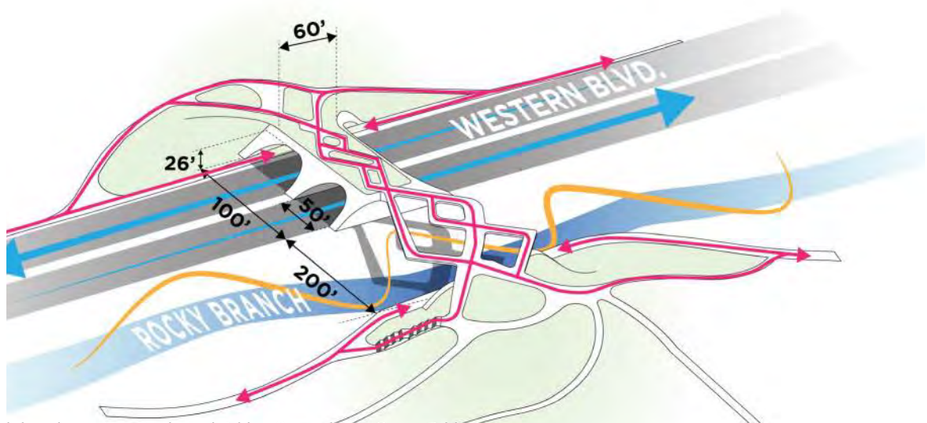
Taking cues and considerations from precedents, the Design Team developed a range of pedestrian crossing options for the Western Boulevard crossing. The team analyzed the bridge options based on how they interact with current traffic modes including vehicular, bike and pedestrians, as well as the future, planned Western Boulevard Bus Rapid Transit (BRT).

The Western Boulevard Bridge will be the primary pedestrian and bicycle connection on the north end of the park, enhancing safety by separating pedestrian and bicycle circulation from vehicle traffic. The bridge scenarios identify a range of potential scope that will provide flexible cost and permitting considerations to be factored as the project moves forward. Those bridge options include:

1. **Scenario A - Landbridge**
   - The Land Bridge design reflected in Scenario A is most consistent with the vision of the Dix Park Master Plan. The tunnels will be for vehicle traffic only. The Land Bridge will mimic the piedmont prairie in providing habitat, food source for pollinator species and a habitat corridor for migratory species. The Land Bridge will act as a vegetated roof for this section of Western Boulevard, mitigating the effects of stormwater by capturing and cleaning runoff and decreasing the effects of urban heat island temperatures, serving as an icon for a greener and more resilient future.

2. **Scenario B - Green Bridge**
   - This bridge design has many similar features to the Land Bridge but with one clear difference – the stream crossing will be open and not tunneled. The northern section of the bridge remains very similar to the Land Bridge concept, only reducing in width, while the southern section of the bridge is noticeably different. The vegetated portion of the Green Bridge exists only across Western Boulevard, transitioning to a steel pedestrian bridge across Rocky Branch. The stream is more open to sunlight and precipitation, providing opportunities for improved flora and fauna. This open structure will also create a safe environment for pedestrians accessing the stream beneath the crossing.

3. **Scenario C - Pedestrian and Bicycle Bridge**
   - This bridge is a more traditional pedestrian and bicycle bridge. It provides for safe pedestrian crossing with no additional structure for plant material. Scenario C provides the optimum structure over Rocky Branch similar to Scenario B, with sunlight, precipitation and animal migration along the stream remaining uninterrupted.



(Above) Western Boulevard Bridge Scenario B - Green Bridge

KEY FINDINGS & RECOMMENDATIONS

The development of a project phasing plan should be guided by the principles established in the Master Plan and identified within this document. Referring to those principles throughout the decision-making process will allow the City of Raleigh to foster collaboration among key stakeholders, identify priorities and set goals for each phase. The three Scenarios and subsequent three Reaches provide decision makers with flexibility and alternatives in determining which Reach and Scenario to proceed with. This adaptability will allow the City of Raleigh to best match funding with project priorities. The design team's recommendations are anchored in the findings of this report and listed by Reach below.

Reach 1 Summary

- **Green Bridge (Recommend Scenario B)**
  - The Green Bridge balances pedestrian circulation, and stream ecology by providing a safe circulation system and daylight to the stream, still worthy of being an icon for a resilient future.

- **Stream (Recommend Scenario C)**
  - The concept study details the ecological benefits of Reach 1 for Concepts A and B; however, the cost associated with excavation of the landfill material likely outweighs these benefits.
  - Higher risk of flooding for Scenario A due to raised stream elevations will likely complicate the design and operation of remedial engineering controls. This likely would require an even more robust soil cover design, toe-slope retaining wall and engineered stream bed systems to mitigate erosion and water infiltration concerns during increased potential flooding.
  - The stream alignment suggested in Scenario C represents a stream enhancement as opposed to a full restoration. More specifically, it includes significant stream improvements, bank stabilization, stream buffers and flood plain improvements. By maintaining an alignment nearest existing conditions, it does not eliminate landfill impacts, but likely reduces them significantly.
  - Avoids impacts to Rocky Branch at the Central Prison site and Norfolk Southern Railroad.

- **Earth/Environmental (Recommend Scenario C)**
  - Raising the stream bed as suggested in Scenario A may still require undercutting the area to remove all landfill waste and as such, there is a risk for increased soil and landfill waste management.
  - Realignments suggested in Scenario A and B will likely result in increased soil and landfill waste management compared to Scenario C.
  - Scenario C will likely be the least complicated in terms of design and operation of remedial engineering controls.

- **Stormwater (Recommend Scenario C)**
  - Recommend the reduced stormwater improvements represented in Scenario C. This will enable a stormwater amenity on the Dix Park side of Rocky Branch.
  - Stormwater systems could be identified in this Reach, allowing for future integration and installation.
  - Stormwater educational opportunities are highlighted along the greenway.

- **Circulation (Recommend Scenario C)**
  - Recommend the reduced circulation improvements represented in Scenario C be integrated into the stream alignment and design.
  - Enhanced pedestrian and bicycle experience, safety and engagement with stream and natural systems.
  - Provides views to adjacent City of Raleigh Skyline.
  - Provides safe and accessible connections to Pullen Park, Western Boulevard and Dix Park.

- **Engagement (Recommend Scenario C)**
  - Recommend the reduced educational and engagement opportunities represented in Scenario C be integrated into the stream alignment and design.
  - Additional opportunities could be incorporated in the future with additional funding sources.

(Above) Proposed Rocky Branch Looking Westward Towards Land Bridge

Reach 2 Summary

- **Stream (Recommend Scenario B)**
  - Represents a stream enhancement and maintains existing stream alignment and elevations.
  - Follows existing culverts at Hunt Drive and Western Boulevard, avoiding impacts to Norfolk Southern Railway.

- **Earth/Environmental (Recommend Scenario B)**
  - Reduces earthwork at railway, disturbance of landfill waste and soils from Scenario A design.
  - Reduces impact to groundwater from Scenario A design.
  - Simplifies Environmental Management strategy from Scenario A design.
  - Reduces impact to existing woodland east of railway from Scenario A design.
  - Presents opportunities for reforestation along stream, pathways, and stormwater systems.

- **Stormwater (Recommend Scenario B)**
  - Stormwater treatment for Reach 2 is similar in all scenarios.
  - Stormwater systems constructed in this phase, based on future parking and future master plan program such as botanical gardens.
  - Stormwater systems could be identified in this Reach, allowing for future integration and installation.
  - Stormwater educational opportunities are highlighted along greenway.

- **Circulation (Recommend Scenario B)**
  - Recommend the slightly reduced circulation improvements represented in Scenario B be integrated into the stream alignment and design.
  - Provides pathways on both sides of Rocky Branch.
  - Provides enhanced pedestrian and bicycle experience, safety and engagement with stream and natural systems.
  - Provides at grade crossings at Boylan Avenue.
  - Provides safe and accessible connections to Dix Park.

- **Engagement (Recommend Scenario B)**
  - Recommend the slightly reduced educational and engagement opportunities represented in Scenario B
  - Additional opportunities could be incorporated in the future with additional funding sources.

Reach 3 Summary

- **Stream (Recommend Scenario B)**
- Optimizes stream alignment and significantly increases meander of stream.
  - Provides full restoration of the stream channel.
  - Maximizes floodplain improvements.

- **Earth/Environmental (Recommend Scenario B)**
  - Slightly reduced soil impacts due to the number of reduced stormwater systems from what is represented in Scenario A.

- **Stormwater (Recommend Scenario B)**
  - Significant opportunity for treatment south of Rocky Branch, opportunity for an educational large-scale stormwater amenity.
  - Reduced number of terraced stormwater wetlands from Scenario A design.
  - Additional stormwater systems could be identified in this Reach, allowing for future integration and installation with additional funding sources.
  - Stormwater educational opportunities highlighted along greenway.

- **Circulation (Recommend Scenario B)**
  - Recommend the slightly reduced circulation improvements represented in Scenario B be integrated into the stream alignment and design.
  - Provides enhanced pedestrian and bicycle experience, safety and engagement with stream and natural systems.
  - Provides views to adjacent City of Raleigh Skyline.
  - Provides safe and accessible connections to S. Saunders Street, Lake Wheeler, and Dix Park.

- **Engagement(Recommend Scenario B)**
  - Significant educational and engagement opportunities within a variety of site ecotones.
  - Additional opportunities could be incorporated in the future with additional funding sources.

PHASING AND IMPLEMENTATION RECOMMENDATIONS

The recommendation is that the City should prioritize the design and construction for Reach 3 of Scenario B as a first phase. Reach 3 is essentially the same in both scenarios A and B, representing a realignment and full stream restoration within this stream Reach. Work within Reach 3 is relatively unconstrained; however, it will impact subsurface utilities, such as sewer and stormwater. Environmental soil management likely will be required to an extent considering the Brownfield aspect of the site, although it is greatly simplified and less expensive from what considerations will be necessary to address the landfill at the western end of the site.

Implementation of Scenario B in this lower Reach 3 can provide a wonderful representation of what the full Rocky Branch Enhancement Project could aspire to. History shows that the first phase of any project is critical to generate excitement and community support, demonstrate the possibility of what could occur along the entire length within the park, and encourage donors and grant support. We think it has the potential to generate a tremendous amount of early excitement around Rocky Branch, maintain momentum, and doing so at a fraction of the cost and risk associated with the more difficult and complicated Reach 1.

** General Considerations:*
Options that disturb a greater area of the footprint of the landfill have a higher risk due to the inherent uncertainties about subsurface landfill conditions encountered during construction. Greater volumes of landfill waste encountered during construction increase risk for managing costs and schedule.

Building Reach 3 first should have no effect or constraint on the selected approach to Reaches 1 and 2. The only potential risk to constructing Reach 3 first is the possibility of future sedimentation. This should be addressed with a combination of extra protective measures to be implemented during future Reach 1 and 2 construction, and potential minor remedial rework in Reach 3 as needed.

(Above) Perspective - Improved Floodplains Provide Flexible Amenity Lawn Along the Banks of Rocky Branch.

COST OPINION SUMMARY

The following cost opinion outlines the anticipated construction costs to implement the recommended Scenario for each reach of Rocky Branch. These phases are representative of the order in which design and construction is recommended to proceed.

First Phase Design and Construction
- Project Area = Reach 3 (Boylan Street to S. Saunders Street)
- Recommend Scenario B Design
- Anticipated Project Costs = $10,000,000 - 12,500,000

Second Phase Design and Construction
- Project Area = Reach 2 (Hunt Drive to Boylan Street)
- Recommend Scenario B Design
- Anticipated Project Costs = $11,000,000 - 13,500,000

Third Phase Design and Construction
- Project Area = Reach 1 (Ashe Avenue to Hunt Drive)
- Recommend Scenario B Design (Green Bridge)
- Recommend Scenario C Design (All other scope implementation)
- Anticipated Project Costs = $65,000,000 - 80,000,000

Additional details regarding projected cost for implementation of Scenario designs are included in Appendix K of this report.