



# Volume III Technical Appendices

August 2021

## New Hope Creek and Little Creek Watershed Improvement Plan

Durham, North Carolina

PREPARED FOR:



**City of Durham**  
Public Works Department  
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Durham, North Carolina 27701

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# **New Hope Creek and Little Creek Watershed Improvement Plan**



City of Durham  
Stormwater & GIS Services Division  
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# Acknowledgments

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# Introduction

The New Hope Creek and Little Creek Watershed Improvement Plan (WIP) is divided into three volumes, similar to previous City of Durham (City) watershed studies. The three volumes and supporting reports are:

- [Volume I: Executive Summary](#). Project goals, watershed evaluation methods, results of the watershed improvement scenarios, recommended projects, high-priority project fact sheets, and next steps in evaluating progress.
- [Volume II: Improvement Plan](#). Summary of the approach used to develop the WIP, data used to develop watershed models, stream and SCM inventory and assessments, watershed improvement scenarios, watershed improvement project evaluation and prioritization, public outreach and involvement efforts, recommendations, implementation schedule, and measurable milestones.
- [Volume III: Technical Appendices](#). Reports and memoranda with more detailed information on the technical approach used in the development of the WIP than in Volume II, including field surveys and the development of modeling.
- [Watershed Assessment Report](#). The New Hope Creek and Little Creek Watershed Assessment Report presents an analysis of the City of Durham's water quality monitoring data, existing and future land use, results of field assessments for streams and SCMs, and identification of impacts and sources to watershed functions. Pilot Study Areas and preliminary project opportunities are also identified.
- [Critical Area Protection Plan \(CAPP\)](#). The Critical Area Protection Plan (CAPP) identifies and prioritizes high-quality riparian preservation projects on private property throughout Durham. Properties were evaluated based on criteria that would enhance water quality and watershed health. The CAPP covers the entire city and provides an evaluation and summary of high-quality privately owned riparian buffer areas in Ellerbe Creek, Third Fork Creek, Northeast Creek, Crooked Creek, Little Lick Creek, Eno River, New Hope Creek, and Little Creek.
- [Riparian Area Management Plan \(RAMP\)](#). The purpose of the Riparian Area Management Plan (RAMP) is to identify, describe, and encourage maintenance practices that protect or enhance these areas to improve water quality and watershed health. The RAMP focuses on property that is either owned by the city or maintained by the city, such as utility easements, greenways, parks, trails, and facilities. The recommendations contained in the RAMP are intended for City maintenance staff who routinely operate in or maintain these areas; however, the recommendations may be useful to other, non-city groups who own or maintain land along streams or other riparian areas.

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## Appendix A: Data Control Plan

The purpose of the Data Control Plan is to describe the plan for managing the collection and use of the extensive amount of data required to support the development of the New Hope Creek and Little Creek WIP. The plan addresses the management and use of Geographic Information Systems (GIS), databases, spreadsheets, and web applications that were used to prepare the WIP and other project deliverables.

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## Appendix B: Stream Assessment Field Plan

The Stream Inventory and Assessment Plan is a detailed work plan developed to guide field-based stream reach assessments that were used to support the development of the New Hope Creek and Little Creek WIP. The plan describes the methods for Level 1 and 2 stream assessments, data management, and quality control.

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## Appendix C: Stormwater Control Measure Inventory and Assessment Field Plan

The Stormwater Control Measure Inventory and Assessment Field Plan is a detailed work plan developed to guide field-based stormwater control measure (SCM) evaluations that were used to support the development of the New Hope Creek and Little Creek WIP. The plan focuses on acquiring data to meet the New Hope Creek and Little Creek WIP goals, including the acquisition of pertinent SCM data to develop a watershed model, the identification of retrofits to existing SCMs to improve stormwater treatment, and the evaluation of potential new SCM locations to treat areas that are not currently served by an SCM.

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# Appendix D:

## Pilot Study Area Fact Sheets

Pilot Study Area (PSA) fact sheets are two-page descriptions of areas in the New Hope Creek and Little Creek watersheds that were selected for detailed field investigations and modeling to support the development of the New Hope Creek and Little Creek WIP. The PSAs represent typical subwatershed conditions (e.g., land use, imperviousness, soil type, future development plans, presence of existing SCMs). The PSAs are evaluated to determine water quality benefits associated with the implementation of SCMs, stream restoration, and other water quality improvement strategies.

The following five final PSAs were recommended for detailed field evaluation and modeling:

- Parks and Open Space – Poorly Drained: NHC40\_SC
- Low Density – Poorly Drained: NHC24\_LNHC
- Low Medium Density Residential – Poorly Drained: NHC04\_LC, NHC47\_MC
- High Density Residential and Commercial: NHC30\_LNHC
- Commercial: NHC32\_LNHC
- Institutional: NHC45\_SC

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## Appendix E:

# New Hope Creek and Little Creek Watershed Assessment Report

The New Hope Creek and Little Creek Watershed Assessment Report presents an analysis of water quality monitoring data, existing and future land use, results of field assessments for streams and SCMs, and identification of impacts and water quality concerns. Pilot Study Areas and preliminary project opportunities are also identified.

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## Appendix F: Critical Area Protection Plan

The Critical Area Protection Plan (CAPP) identifies and prioritizes high-quality riparian preservation projects on private property throughout the City of Durham (City) that could be prioritized for conservation or protection to preserve water quality and watershed health. The CAPP covers the entire City and provides an evaluation and summary of high-quality privately owned riparian buffer areas in Ellerbe Creek, Third Fork Creek, Northeast Creek, Crooked Creek, Little Lick Creek, Eno River, New Hope Creek, and Little Creek.

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# Appendix G:

## Equitable Community Engagement Plan

The Equitable Community Engagement Plan provides a framework to guide the decision-making process of the New Hope Creek and Little Creek Watershed Improvement Plan (WIP) so all residents of Durham have equitable access to the information from, and opportunities to provide input on, the project. The memo discusses the various strategies and aspects of community engagement relating to this WIP, including: the demographics of the New Hope Creek and Little Creek watershed, potential partnerships with community groups who can assist in outreaching to historically underrepresented groups, suggested events for public engagement and participation.

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# Appendix H: Technical Memorandum – New Hope Creek and Little Creek SWMM Model Development

The New Hope Creek and Little Creek SWMM Model Development technical memorandum describes the development and calibration of a Stormwater Management Model (SWMM) watershed model to support development of a WIP for the New Hope Creek and Little Creek watersheds.

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# Appendix I:

## Technical Memorandum – New Hope Creek and Little Creek SWMM Scenario Analysis

The New Hope Creek and Little Creek SWMM Scenario Analysis memorandum describes the application of the SWMM model to assess potential reductions in total nitrogen, total phosphorus, and total suspended solids that could be gained through implementation of improvement measures in the New Hope Creek and Little Creek watersheds. The following ten scenarios were assessed as part of this modeling:

1. Existing land use
2. Future land use and existing stormwater control measure repairs
3. Future land use with stormwater performance standards for new development and redeveloped parcels
4. New SCMs and retrofits
5. Stream restoration
6. Green infrastructure and low impact design
7. Additional treatment for pre-1980 development and commercial land uses
8. Oversizing new SCMs and SCM retrofits
9. Enhanced Street Sweeping
10. Combined nonpoint source pollution projects (combining Scenarios 2-9)

This technical memorandum summarizes the methods and results for those scenarios.

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# Appendix J:

## Technical Memorandum – Prioritization of Proposed Watershed Improvement Projects

The Prioritization of Proposed Watershed Improvement Projects Technical Memorandum presents the evaluation, prioritization, and ranking process for the proposed SCM retrofit and stream restoration projects in the New Hope Creek and Little Creek watershed. As with previous Watershed Improvement Plans, project prioritization criteria were updated to reflect watershed-specific concerns in the New Hope and Little Creek watershed and incorporate current city strategies and priorities of environmental-equity based decision-making. The updates to the prioritization criteria were informed by the Residential Green Infrastructure (ReGI) Analysis, Equitable Community Engagement Plan, City of Durham FY 2019-2021 Strategic Plan, and Sustainability Roadmap. Overall, criteria remain directly comparable to the scores assigned to potential projects in other Durham watersheds (Ellerbe Creek, Third Fork Creek, Northeast Creek, Crooked Creek, Little Lick Creek, and Eno River).

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# Appendix K: Technical Memorandum – Summary of Watershed Improvement Scenarios Used to Support the City of Durham Watershed Improvement Plans

The Summary of Watershed Improvement Scenarios Used to Support the City of Durham Watershed Improvement Plans Technical Memorandum provides a summary of the watershed scenarios that were evaluated during watershed planning studies conducted by the City of Durham in the Ellerbe Creek, Third Fork Creek, Northeast Creek, Crooked Creek, Little Lick Creek, and Eno River watersheds. The scenarios have been used to evaluate the effectiveness of water quality improvement practices, including stormwater control measure retrofits, stream restoration projects, sanitary sewer system rehabilitation, stormwater performance standards for new development and redevelopment, land conservation, and green infrastructure/low impact development (techniques to improve watershed-wide water quality). The memorandum also discusses the scenarios that were selected for evaluation in the New Hope Creek and Litter Creek watersheds, the methodology, and the results.

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# Appendix L:

## Public Education and Outreach Materials

Appendix L presents the materials that were prepared to support the public education and outreach efforts by the City for the New Hope Creek and Little Creek WIP. The materials include:

- Meeting summaries of the three Public Information Sessions held on September 23, 2020, March 16-18, 2021, and June 29, 2021
- Three Project Fact Sheets prepared for each Public Information Session
- Two videos were prepared during this project and are available at:
  - [https://youtu.be/XwBw3\\_TnLlc](https://youtu.be/XwBw3_TnLlc)
  - <https://youtu.be/leiRzHpg7Z0>
- A radio spot was developed in Spanish and broadcasted on the channel La Ley 101.1FM to reach the Spanish-speaking population. The radio message was focused on recycling motor oil and keeping the watershed clean. The recorded message is available at: <https://durhamnc.gov/3766>.

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# Appendix M: North Carolina Nine Element Plan Checklist

Appendix M is a checklist that shows how the New Hope Creek and Little Creek WIP meets the nine elements that are required in watershed plans by Section 319 of the Clean Water Act. The checklist is required if the City applies for grant funding to implement any future projects identified under the plan.

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## Appendix N: Riparian Area Management Plan

The Riparian Area Management Plan (RAMP) identifies maintenance practice opportunities to enhance or extend riparian buffers or to improve existing maintenance practices on city-owned property near and along streams. The RAMP document is reassessed and updated as part of each WIP to reflect the City's goals of supporting an equitable implementation of maintenance practices along riparian areas to support biodiversity and water quality. Updates to the RAMP that were a part of the New Hope Creek and Little Creek WIP included field data collection to determine the width of three existing no mow buffer zones and the identification of four areas of potential new no mow sites. The latest RAMP update also incorporates the City's environmental equity and sustainability goals described in other planning documents including the City's Sustainability Roadmap and Strategic Plan. The RAMP update includes "tool kits" that can be used by City departments to improve riparian areas such as native seed mixes, native tree lists, and planting strategies for buffer areas.

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