

# Section 7

## Project Prioritization and Implementation Plan

### 7.1 Introduction

Sections 4, 5 and 6 of this report documented nonstructural actions, policy recommendations and structural projects considered for implementation in the Cub Run and Bull Run Watershed Plan. This section evaluates the effectiveness of these projects in meeting the watershed goals, prioritizes the projects, develops an implementation program and documents the improvements provided by the plan.

The recommended actions will potentially be implemented over the 25-year life of the Cub Run and Bull Run Watershed Management Plan. This plan will be a guide for county agencies and officials in protecting and maintaining the health of the Cub Run and Bull Run watersheds. It will be an active or “living” document that will be revisited and updated regularly as it is implemented.

The plan’s projects are effective solutions for improving water quality and controlling stormwater in the Cub Run and Bull Run watersheds. The plan will be revisited as needed during implementation to assess project effectiveness and implementation sequence. The final scope and design of each project will be determined during implementation, in collaboration with all parties affected, including the Fairfax County Park Authority, homeowner associations, adjacent landowners and others.

The plan identifies the projects to be evaluated and implemented within each of the following five-year implementation phases:

- A - Year 1 - 5
- B - Year 6 - 10
- C - Year 11 - 15
- D - Year 16 - 20
- E - Year 21 - 25

Organizing the projects by the five phases provides a framework for project implementation. The placement of projects within each phase is based primarily on the project priority developed as described in Section 7.3, although other factors are considered. Phase A includes higher-priority projects and Phase E includes lower-priority projects.

As described in Section 1.2, the projects and schedule will change from the recommends in this plan as they undergo further evaluation during implementation.

Work has begun on implementing several of the actions. Work will not be halted because of its priority ranking. Also, low priority actions may be moved forward in the schedule when opportunities and resources become available. Additional factors may affect the projects to be implemented and implementation schedule are describe below:

- Projects, programs and policy items will undergo review by county staff and the Board of Supervisors before implementation. Board adoption of the watershed plan will not mean automatic implementation of the plan recommendations.
- The watershed plan is a master list of recommended nonstructural actions and structural projects. Each fiscal year, staff will prepare and submit to the board a detailed spending plan that will describe the projects and explain their ranking, benefit and need to meet a defined watershed or water quality goal.
- The watershed plan considers visions, goals, issues and needs only within the Cub Run and Bull Run watersheds. Fairfax County will consider stormwater needs and priorities across the entire county when implementing the recommendations included in this plan and other watershed plans.
- Availability of funding and other resources will affect the implementation of projects identified in this watershed plan.
- The initial project implementation phases will include outreach to the community near the proposed projects. Elements of the recommended plan may become infeasible or need to be modified based on comments from local residents during this outreach.
- Projects will be value-engineered at the time of implementation to ensure cost-effectiveness. Using volunteers or alternative funding sources will be considered to reduce the implementation costs.
- Stream crossing improvements not related to protection of streambeds or banks or prevention of structure flooding will not be funded out of the county budget for stormwater improvements.
- Stream restoration and other projects on private land will be evaluated to determine means for cost sharing with the landowners.

## **7.2 Overview of Watershed Vision and Goals**

### **7.2.1 Watershed Plan Vision and Goals**

Section 1.4 documented the watershed plan vision and goals set by the Community Advisory Committee, project team and Fairfax County. These generally state that the watershed plan should preserve, protect and improve the watersheds and streams and largely relate to improving the functions of the watershed, water quality, habitat and aesthetics. The watershed plan recognizes that these watershed functions are

important to residents and should be given a significant weight in selecting projects to be implemented. However, the goals are difficult to measure and therefore cannot be used to prioritize the watershed actions quantitatively using procedures such as cost vs. benefit analyses.

## **7.2.2 Watershed Plan Water Quality Goals**

As discussed in Section 3, the Cub Run and Bull Run watersheds contain many stormwater ponds that provide peak flow and water quality controls for much of the developed land. In addition, the watershed includes significant areas of parkland and other preserved space. Finally, in large portions of the watershed development density is limited to one house per five acres within the rezoned Resource-Conservation District. As a result, the watershed meets the water quality loading goals for the Occoquan Reservoir for both existing and future land use (with future stormwater controls). Section 3.2.6 provided additional information on the Occoquan basin loading goals.

The watershed also meets or exceeds the requirements of the Virginia Chesapeake Bay Nutrient and Sediment Reduction Strategy for the Shenandoah and Potomac River Basin (March 2005). Section 3.2.7 provides additional information on the tributary strategy goals. The tributary strategy assumes that urban stormwater controls will be applied for 42.5 percent of the treatable urban area. Existing and future water quality controls cover 90 percent of the urban development in the Fairfax County portion of the watersheds. The tributary strategy's loading target results in a phosphorus loading of approximately 0.31 lbs/acre/year over the Virginia portions of the Shenandoah and Potomac River basins. This target load is an average for all land uses including forest, agriculture and urban. For future land use with future stormwater controls and plan recommendations, the Fairfax County portion of the watersheds contribute 0.53 lbs/acre/year, which is 71 percent greater than the basin-wide average tributary strategy goal. The Cub Run watershed contains significant urban areas, whereas the tributary average includes significant areas of forest and other undeveloped land.

The Occoquan Reservoir is effective in reducing nutrient loads to the Potomac River. If the 54 percent phosphorus loading reduction produced by the Occoquan Reservoir is applied, the loads from Cub Run watersheds to the Potomac River (0.24 lbs/acre/year) are less than the overall tributary strategy goals (0.31 lbs/acre/year).

The watershed plan structural actions target improving the efficiency of existing stormwater facilities and otherwise improving runoff quality with an overall goal of reducing nutrient loads five percent for future land use. As discussed in Section 7.9.3, the watershed plan reduces phosphorus runoff for future land used from 0.56 lbs/acre/year to 0.53 lbs per acre per year, a 4.5% nutrient reduction.

## 7.3 Prioritization Methodology

The prioritization methodology presented herein is based on procedures developed by the Fairfax County Stormwater Planning Division and has been applied in other watershed management plans. The prioritization provides a guide for preparing the schedule for project implementation. However, additional factors are considered.

The following factors define the project implementation sequence and schedule:

1. Location within the watershed. For example, quantity control projects in the headwaters upstream from erosion areas may be given higher priority. Similarly, water quality controls in areas that do not have stormwater controls may be given higher priorities. Projects to control the peak flows would be implemented before a downstream restoration project. As a final example, projects that may work synergistically to improve conditions in part of a watershed are grouped rather than performed shotgun throughout the watershed. This approach reduces community outreach requirements and limits construction impacts since projects that affect a particular neighborhood are implemented as one project.
2. Effectiveness in meeting project goals, removing pollutants, reducing peak flows, addressing stream erosion and meeting regulatory requirements
3. Ease of implementation based on complexity, land acquisition requirements, permitting needs and other factors
4. Watershed community advisory committee support and recommendations for project sequencing
5. Support by residents near the project
6. Political interest
7. Categories that meet other goals of Fairfax County
8. Funding availability

A weighted set of five prioritization categories was applied to each plan action. The weighting factor assigned is indicated in parentheses:

1. Fairfax County Goals (40%). This category recognizes the effectiveness of the actions in meeting other Fairfax County goals, which were developed in the early 1990s and have been adopted by the Fairfax County Board of Supervisors. They are listed below in order of higher to lower importance.
  - Projects mandated for immediate implementation by state or federal regulations and ones that address safety issues
  - Projects that protect structures from damage by floodwaters or stream erosion

- Projects that achieve stormwater quality improvements in conformance with the county's obligations under the Chesapeake Bay initiatives and the Virginia Pollutant Discharge Elimination System (VPDES) municipal separate storm sewer system (MS4) stormwater discharge permit
  - Projects that alleviate severe stream bank and channel erosion
  - Projects that alleviate moderate and minor stream bank and channel erosion
  - Projects that alleviate yard flooding
  - Projects that alleviate road flooding. Projects that affect road flooding will not be performed with county stormwater program funds but are in this watershed plan for consideration in future road improvement projects.
2. Direct Regulatory Contribution (10%). These include the following project types listed in order of higher to lower importance.
- Hybrid projects that accomplish multiple objectives, including regulatory compliance
  - Projects that directly contribute to the county's Virginia Pollutant Discharge Elimination System permit for storm sewer system discharges and obligations under the Chesapeake Bay initiatives
  - Projects that have indirect water quality benefits
  - Flood mitigation and similar projects
3. Public Support (10%)
- Community advisory committee support
  - Perceived support by residents near the project location based on input provided to date and other public input
4. Effectiveness and Location (25%)
- Quantity control projects are more desirable in headwater areas that lack stormwater management controls.
  - Quality control projects are more desirable in areas that lack existing controls.
  - Projects that address peak flows and velocities should be implemented before downstream stream restoration projects.
  - Project effectiveness in removing pollutants, eliminating stream erosion, meeting project goals, etc.

- Project effectiveness related to the cost of project implementation. Projects that have high cost relative to benefit provided receive lower scores.

5. Ease of Implementation (15%)

- Project location
- Land acquisition requirements

The plan actions are given a score from 1 to 5 for each prioritization category with 5 being the highest score and 1 the lowest. The assigned scores are based on both qualitative and quantitative measures. The weighting factors are applied to a total score used to rank the projects.

## **7.4 Nonstructural Project Prioritization and Implementation Program**

Table 7-1 shows the priority rankings, based on the procedures described in Section 7.3, for the nonstructural actions listed in Section 4. This table provides the implementation phase, assuming that all nonstructural actions are considered for implementation within the first 15 years of the 25-year program.

Many of the nonstructural actions will be considered with similar recommendations from other watershed plans and will potentially be implemented across all watersheds. Also, many of the actions involve coordination with other agencies such as the Northern Virginia Soil and Water Conservation District, Fairfax County Health Department and Virginia Department of Conservation and Recreation. County staff may complete portions of these actions. Outside consultants may be used when specific areas of expertise are required.

Funds and staff resources will be required to implement these recommendations. These resources will be estimated at the time a nonstructural action is being evaluated for implementation as part of the annual budget process. The watershed plan recommends that the county continues to use existing resources, partnerships and allocate adequate funds to implement these nonstructural policy recommendations.

Table 7-1  
Nonstructural Project Prioritization and Implementation Program

Number	Description	Priority Score	Implementation Phase
Action C 1.2	TMDL support for bacteria	4.60	A
Action A 2.5	Public education on fertilizer and pesticides	4.25	A
Action A 1.3	Education on Occoquan Reservoir	4.15	A
Action A 1.5	Education on stormwater runoff	4.15	A
Action A 6.1	Outreach and education for commercial and industrial establishments	4.10	A
Action C 1.3	Coordinate with park agencies on watershed and parkland planning	4.10	A
Action D 1.1	Signs for pet waste	4.10	A
Action D 3.1	Partner with golf courses	4.10	A
Action D 3.2	Turf management outreach	4.10	A
Action D 3.3	Lawn maintenance company outreach and certification	4.10	A
Action D 6.2	Inspect and sample privately owned and maintained stormwater management facilities	4.10	A
Action E 1.1	Update Public Facilities Manual	4.10	A
Action E 1.2	Reference sources for LID implementation	4.10	A
Action A 2.3	Education on pet wastes	4.00	A
Action A 2.4	Education on disposal of chemicals and paints	4.00	A
Action B 1.4	Annual interjurisdictional summit	4.00	A
Action E 2.2	Dulles development requirements and backup facilities plan	4.00	A
Action A 4.2	Develop LID guidance for homeowners	3.90	A
Action D 2.1	LID design guidance for property owners	3.85	A
Action E 4.1	Restoration project banking and funding mechanism	3.85	B
Action A 4.1	Outreach to builders to implement LID	3.75	B
Action D 5.5	Create spill and dumping reporting hotline	3.75	B
Action E 1.3	LID implementation review criteria	3.75	B
Action A 1.4	Promote Buffer maintenance and restoration	3.75	B
Action A 1.8	School education programs	3.75	B
Action A 2.2	Education and actions to reduce trash and dumping	3.75	B
Action D 4.2	Eliminate access and place signs at dump sites	3.75	B
Action D 6.3	Brownfield sites	3.65	B

Table 7-1  
(continued)  
Nonstructural Project Prioritization and Implementation Program

Number	Description	Priority Score	Implementation Phase
Action E 4.2	Education on mitigation close to impact sites	3.65	B
Action A 1.6	Multi lingual outreach programs	3.60	B
Action E 2.1	Monitor upstream development and stormwater controls	3.60	B
Action F 1.1	Preserve open space	3.60	B
Action F 1.2	Create open space preservation plan	3.60	B
Action A 1.9	Library education programs	3.50	B
Action A 5.2	Create and distribute reference information for common stormwater problems	3.50	B
Action D 6.1	Inventory hazardous material users	3.50	B
Action E 3.1	Coordinate with agencies regarding transportation improvements	3.45	B
Action A 1.1	Stormwater ombudsman	3.35	B
Action A 1.2	Promote Adopt-a-Stream program	3.35	B
Action A 3.1	Update county website	3.35	B
Action A 5.1	Outreach to home owner associations, civic associations and property owners on watershed planning program	3.35	B
Action B 1.1	Interjurisdictional pollution control goals and evaluation criteria	3.35	B
Action B 1.2	Share data among jurisdictions	3.35	B
Action B 1.3	Coordinate regulations among jurisdictions	3.35	B
Action D 1.2	Non-native and invasive species	3.35	B
Action D 4.1	Eliminate existing dumps	3.35	B
Action D 5.6	Support source water protection study	3.35	B
Action C 2.1	Identify and protect historic, cultural and ecologic resources	3.30	C
Action C 3.1	Education and outreach at FCPA parks	3.10	C
Action C 3.2	Education and outreach at NVRPA parks	3.10	C
Action D 5.2	Volunteer benthic sampling coordination and reporting	2.95	C
Action A 1.7	Signs on stream crossings	2.75	C
Action A 2.1	Mosquito education	2.75	C
Action D 5.3	Publicize water quality sampling results	2.60	C
Action D 5.1	Inspect county stormwater facilities more frequently	2.55	C
Action D 5.4	Inspect private facilities more frequently	2.55	C
Action D 4.3	Provide an approved dump location or promote community cleanup days	2.45	C
Action D 4.4	Trash receptacles at high impact areas	2.45	C
Action C 1.1	Create interconnect trail system	2.30	C

## 7.5 Policy Recommendation Prioritization and Implementation Program

Policy recommendations described in Section 5 are ranked and sorted by their assigned priority in Table 7-2. This table also provides the implementation phase for these projects with all recommendations being considered within the first 15 years of the 25-year program.

Funds and staff resources will be required to implement these recommendations. These resources will be estimated at the time a policy recommendation is being evaluated for implementation as part of the annual budget process. Existing resources and partnerships will be used when available. The watershed plan recommends that the county implement the recommended changes in policy and allocate adequate funds as needed.

Table 7-2  
Policy Recommendation Prioritization and Implementation Program

Number	Description	Priority Score	Implementation Phase
E 4.1	Tree planting in buffers and near ponds	3.7	A
A 1.1	Include LID at county construction projects	3.65	A
D 2.1	Incentives for LID on private property	3.6	A
D 2.2	Grants for stormwater improvements	3.6	A
E 4.2	Prevent deforestation and promote forest restoration and protection in sensitive areas	3.6	A
E 1.2	Coordinate strategy for new development	3.5	A
F 1.1	Funding for open space	3.45	A
F 1.2	Conservation easements	3.45	A
F 1.3	Policies regarding open space in public property	3.45	A
E 3.2	Design and build road projects that minimize watershed impacts	3.35	A
E 5.1	Encourage use of smaller stormwater facilities	3.2	B
B 1.3	Present plan to Loudoun board of supervisors	3.15	B
D 3.1	Fines and penalties for dumping and littering	3.15	B
D 3.2	Enforce existing regulations regarding dumping and littering	3.15	B
B 1.1	Stormwater regulations in other jurisdictions	3.1	B
B 1.2	Cross-border cooperation	3.1	B
E 5.3	Evaluate and implement alternative stormwater controls	3.1	B
E 6.2	Adequate room for proper stormwater management	3	B

Table 7-2  
 (continued)  
 Policy Recommendation Prioritization and Implementation Program

<b>Number</b>	<b>Description</b>	<b>Priority Score</b>	<b>Implementation Phase</b>
E 1.4	Procedures to provide stormwater controls greater than required by public facilities manual	2.95	B
C 1.2	Integrate recreation and education into new and proposed stormwater facilities	2.85	B
D 1.2	Control of native wildlife	2.85	B
E 3.1	Recommendation regarding Tri-County Parkway and Battlefield Bypass	2.85	B
E 3.3	Promote stream and wetland mitigation in the same watershed	2.85	B
E 2.1	Dulles development requirements and backup facilities plan	2.8	C
C 2.1	Parkland should be developed to have minimum impact on streams	2.75	C
E 5.2	Modify adequate outfall policy	2.75	C
E 1.3	Streamline procedures for LID review for new development projects	2.7	C
E 6.1	Inspect new facilities for compliance with county standards	2.7	C
E 1.5	Design stormwater facilities to be more aesthetic	2.6	C
E 1.1	Promote alternatives to paved surfaces	2.55	C
D 1.1	Dead wildlife	2.5	C
C 1.1	Create fishing opportunities in existing and new wet ponds	2.05	C

## 7.6 Structural Project Prioritization and Implementation Program

Structural projects are ranked and sorted in Table 7-3. Dry pond wetland retrofit projects provide similar benefits based on this prioritization scheme and, therefore, are not listed separately. A separate analysis prioritized the dry pond retrofit projects, as described in Section 6.3.

Table 7-3  
Structural Project Prioritization

Project Type	Number	Description	Priority Score
Dry Pond Wetland Retrofit Projects	-	94 Identified High Priority Dry Pond Projects	4.5
Regional Pond or Alternative Projects	CU9002	Pond C18 Cain Branch near Centreville Road	4.2
Regional Pond or Alternative Projects	CU9001	Pond C39 Flatlick Branch Tributary in Foxfield	4.2
Riparian Wetland Study	CU9915	Perform Wetland Study to identify riparian wetland restoration opportunities	4.15
LID Projects at County Facilities	1 - 22	Various	3.95
Neighborhoods without Stormwater Controls	CU9911	Greenbriar and Birch Pond	3.65
Neighborhoods without Stormwater Controls	CU9912	Brookfield	3.65
Neighborhoods without Stormwater Controls	CU9910	Country Club Manor	3.65
Neighborhoods without Stormwater Controls	CU9913	Pleasant Valley	3.65
Headwater drainage system improvements	CU9914	Implement headwater drainage system improvements	3.65
Stream Restoration	CU9217	Flatlick Branch Tributary downstream from Oxon Road	3.45
Stream Restoration	CU9216	Flatlick Branch Tributary in Franklin Glenn	3.45
Stream Restoration	CU9204	Big Rocky Run tributary in the Meadows upstream from I-66	3.45
Stream Restoration	BR9204	Bull Run tributary below quarry	3.45
Stream Restoration	CU9215	Oxlick Branch headwaters upstream from Alder Woods Drive in Fair Oaks Estates	3.45
Stream Restoration	CU9210	Big Rocky Run Tributary Upstream from Ox Hill Road in Fair Oaks Estates	3.45
Stream Restoration	CU9212	Round Lick Branch upstream from Sully Park Drive	3.45
Stream Restoration	CU9209	Big Rocky Run Tributary in Oaks Chase	3.45
Stream Restoration	CU9221	Dead Run Tributary Upstream from Stonecroft Blvd.	3.2

Table 7-3  
(continued)

Structural Project Prioritization

<b>Project Type</b>	<b>Number</b>	<b>Description</b>	<b>Priority Score</b>
Stream Restoration	CU9219	Cain Branch upstream from Route 50	3.2
Stream Restoration	CU9214	Flatlick Branch between Route 50 and Route 28	3.2
Stream Restoration	CU9220	Cain Branch Between Route 28 and Centreville Road	3.2
Stream Restoration	CU9213	Flatlick Branch upstream and downstream from Stonecroft Blvd.	3.2
Stream Restoration	CU9205	Big Rocky Run Below Awbrey Patent Drive	3.2
Stream Restoration	CU9206	Big Rocky Run Tributary below Braddock Road	3.2
Stream Restoration	CU9207	Big Rocky Run between Route 28 and Braddock Road	3.2
Buffer Restoration	CU9331	Unnamed Tributary to Elklick Run adjacent to Pleasant Valley Road south of Elklick Run	3.1
Buffer Restoration	CU9335	Cain Branch downstream from Centreville Road	3.1
Buffer Restoration	CU9320	Flatlick Branch main stem upstream from Rt. 50	3.1
Buffer Restoration	CU9322	Oxlick Branch downstream from Stringfellow Road	3.1
Buffer Restoration	CU9329	Flatlick Branch tributary within Franklin Manor	3.1
Buffer Restoration	CU9330	Unnamed Tributary to Elklick Run near Pleasant Valley Road	3.1
Buffer Restoration	CU9336	Cain Branch upstream from Lees Corner Rd.	3.1
Buffer Restoration	CU9328	Flatlick Branch upstream from Thompson Road	3.1
Buffer Restoration	CU9327	Flatlick Branch upstream from Fairfax County Parkway	3.1
Buffer Restoration	CU9326	Flatlick Branch tributary adjacent to Fairfax County Parkway	3.1
Buffer Restoration	CU9324	Flatlick Branch upstream from Lees Corner Rd.	3.1
Buffer Restoration	CU9332	Cub Run at Old Lee Road	3.1
Buffer Restoration	CU9318	Frog Branch at Lees Corner Rd	3.1
Buffer Restoration	CU9301	Cub Run downstream from Big Rocky Run	3.1
Buffer Restoration	BR9301	Tributary to Bull Run	3.1
Buffer Restoration	BR9303	Tributary to Bull Run	3.1
Buffer Restoration	BR9304	Tributary to Bull Run near Fairfax National Estates	3.1
Buffer Restoration	CU9339	Dead Run upstream from Stonecroft	3.1
Buffer Restoration	CU9338	Dead Run at Stonecroft Blvd	3.1
Buffer Restoration	CU9337	Cub Run tributary near Pleasant Valley Neighborhood	3.1

Table 7-3  
(continued)

Structural Project Prioritization

<b>Project Type</b>	<b>Number</b>	<b>Description</b>	<b>Priority Score</b>
Buffer Restoration	CU9333	Schneider Branch upstream from Cub Run	3.1
Buffer Restoration	CU9334	Cain Branch tributary at Centreville Road	3.1
Buffer Restoration	CU9325	Flatlick Branch downstream from Fairfax County Parkway	3.1
Buffer Restoration	CU9321	Oxlick Branch downstream from Stringfellow Road	3.1
Buffer Restoration	CU9317	Flatlick Branch upstream from Braddock Road	3.1
Buffer Restoration	CU9323	Oxlick Branch downstream from Fairfax County Parkway	3.1
Buffer Restoration	CU9312	Tributary to Big Rocky Run downstream from Stringfellow Road	3.1
Buffer Restoration	CU9310	Big Rocky Run downstream from Stringfellow Road	3.1
Buffer Restoration	CU9311	Tributary to Big Rocky Run downstream from Point Pleasant Drive	3.1
Buffer Restoration	CU9313	Big Rocky Run upstream from Stringfellow Road	3.1
Buffer Restoration	CU9314	Tributary to Big Rocky Run	3.1
Buffer Restoration	CU9315	Big Rocky Run	3.1
Buffer Restoration	CU9319	Frog Branch downstream from Stringfellow Road	3.1
Buffer Restoration	CU9316	Tributary to Cub Run within Virginia Run downstream from Pleasant Valley Rd.	3.1
Buffer Restoration	CU9305	Big Rocky Run downstream from Braddock Road	3.1
Buffer Restoration	CU9306	Tributary to Big Rocky Run upstream from Braddock Road	3.1
Buffer Restoration	CU9304	Big Rocky Run at Awbrey Patent Dr.	3.1
Buffer Restoration	CU9303	Tributary to Big Rocky Run near I-66 / Route 28 Interchange	3.1
Buffer Restoration	CU9309	Tributary to Big Rocky Run upstream from Northbourne Dr.	3.1
Buffer Restoration	CU9302	Tributary to Cub Run upstream from I-66	3.1
Buffer Restoration	CU9308	Tributary to Big Rocky Run downstream from Northbourne Drive - Regional pond C30	3.1
Buffer Restoration	CU9307	Tributary to Big Rocky Run near Ellicott Court	3.1
Buffer Restoration	BR9302	Tributary to Bull Run	3.1
Stream Restoration	CU9218	Cub Run main stem including lower reaches of Schneider Branch and Cain Branch.	2.95

Table 7-3  
(continued)

Structural Project Prioritization

Project Type	Number	Description	Priority Score
Stream Restoration	CU9211	Middle Cub Run main stem and tributaries from Flatlick Branch to below Route 29	2.95
Stream Restoration	CU9203	Big Rocky Run upstream from Cub Run confluence	2.95
Stream Restoration	CU9202	Lower Cub Run and unnamed tributaries between Compton Road and I-66	2.7
Stream Restoration	CU9201	Lower Cub Run within Bull Run Regional Park	2.7
Road Crossing Improvements	CU9610	Birch Drive at unnamed tributary to Flatlick Branch.	1.75
Road Crossing Improvements	CU9601	Compton Road at unnamed tributary near UOSA advanced wastewater treatment plant.	1.75
Road Crossing Improvements	CU9606	Heron Drive at unnamed tributary between Cabells Mill Drive and Walney Road.	1.75
Road Crossing Improvements	CU9608	Dorforth Drive at unnamed tributary.	1.75
Road Crossing Improvements	CU9613	Cain Branch at Lees Corner Road.	1.75
Road Crossing Improvements	CU9603	Compton Road at unnamed tributary east of Bull Run Post Office Road.	1.75
Road Crossing Improvements	CU9609	Flatlick Branch at Walney Road.	1.75
Road Crossing Improvements	CU9611	Cub Run at Braddock Road and Old Lee Road.	1.75
Road Crossing Improvements	CU9607	Big Rocky Run at Stringfellow Road.	1.75
Road Crossing Improvements	CU9602	Compton Road at unnamed tributary near Confederate Ridge Lane.	1.75
Road Crossing Improvements	CU9604	Compton Road at unnamed tributary west of Route 66.	1.75
Road Crossing Improvements	BR9601	Bull Run Post Office Road at unnamed tributary (easternmost of three crossings).	1.75
Road Crossing Improvements	BR9602	Bull Run Post Office Road at unnamed tributary (middle of three crossings).	1.75
Road Crossing Improvements	BR9603	Bull Run Post Office Road at unnamed tributary (westernmost of three crossings).	1.75
Road Crossing Improvements	CU9612	Pleasant Valley Road at unnamed tributary near Blue Spring Drive	1.75
Road Crossing Improvements	CU9605	Awbrey Patent Drive at Big Rocky Run	1.75

## 7.7 Structural Project Implementation Program Development

### 7.7.1 Development Procedures

Structural projects were grouped to maximize the benefit to the watershed and limit neighborhood impacts. This will be achieved by implementing projects that affect a neighborhood at one time, either as a single project or as a set of projects. This approach also reduces costs associated with the public outreach programs when the projects are implemented. Finally, by implementing projects in a geographic area at one time, the net benefit to the stream may be greater than the sum of the benefits from individual projects.

The Fairfax County Stormwater Planning Division recognizes that appropriate public outreach and education is key to the successful implementation of these structural projects. The project costs include allowances for such programs.

The general rules used to prepare the project implementation program are described below (in no particular order):

- The projects should be implemented in an upstream to downstream order within a subwatershed. Implementing upstream projects first allows the peak flow reduction and water quality improvements to benefit a longer reach of stream.
- Stream restoration projects will not be implemented until upstream improvements have been completed. This criterion will increase the probability of success of the stream restoration project by stabilizing the flows before restoration occurs.
- Stream restoration projects are implemented on small streams first, starting with upland stream segments and working in a downstream direction. Stream restoration on small streams has a higher probability of success than restoration on larger streams.
- Stream restoration projects will not be implemented by the Fairfax County DPWES where significant future development will occur. Even with the peak flow and water quality control, the changes in flow volumes produced by the development will tend to destabilize the stream and produce additional erosion. Emergency measures in these lower-priority stream segments (outside the projects identified in the watershed plan) may be necessary if severe erosion must be addressed immediately.
- Structural projects are given higher priority where development densities will not change significantly.
- Structural projects will be given a low priority where significant future development is projected. Projects identified in these areas may be implemented by the developers of these properties when appropriate.

- Projects that address conditions that have a significant impact on the stream health are assigned a high priority.

The project team analyzed the overall watershed goals and conditions within the four major subwatersheds to develop each subwatershed's project priorities. The following sections provide an overview of the factors considered in developing the implementation program within the major subwatersheds.

### **7.7.2 Flatlick Branch Subwatershed**

The following describes the watershed plan priorities used to define the project implementation plan within the Flatlick Branch subwatershed:

- The higher-priority projects focus on controlling flows from headwater areas upstream from Walney Road where development has largely stabilized.
- Projects to improve flow from the Brookfield neighborhood, which does not have stormwater controls, are also given a high priority.
- These projects are followed in priority by stream restoration within stream segments with the most severe erosion.
- Projects in the lower reaches of the subwatershed (e.g., below Walney Road) are given a low priority due to ongoing and future development within this area. These projects will be implemented after development has occurred. Opportunities will be sought to implement these projects as this development occurs and share construction costs with the developers.

### **7.7.3 Upper Cub Run and Elklick Branch Subwatersheds**

The following describes the watershed plan priorities used to define the project implementation plan within the Upper Cub Run and Elklick Branch subwatersheds:

- The high-priority projects within these subwatersheds focus on areas upstream from Route 28 where the development has largely stabilized.
- Projects to control flow from the Pleasant Valley neighborhood are also given a higher priority.
- The Fairfax County portions of the Elklick Run subwatershed are within the R-C District and contain significant areas of parkland. Buffer restoration projects in this area will be coordinated with FCPA Sully Woodlands parkland development projects.
- Projects in other areas of the Upper Cub Run subwatershed where growth is ongoing or planned are given a lower priority. These projects will be implemented after development has occurred. Opportunities will be sought to cost share and

reduce watershed impacts by implementing these projects when the nearby properties are developed.

- The plan does not include structural projects that address stormwater flows from other jurisdictions (Dulles Airport and Loudoun County). The plan includes nonstructural actions and policy recommendations to ensure that the flows from these areas are adequately controlled. However, Fairfax County stormwater funds will not be used to construct projects that specifically address these flows.

#### **7.7.4 Lower Cub Run and Bull Run East and West Subwatersheds**

The following describes the general watershed plan priorities used to define the project implementation plan within the Lower Cub Run, Bull Run East and Bull Run West subwatersheds:

- Large portions of these watersheds are within the R-C district where development densities are currently low and will remain so. Stormwater controls are generally given a low priority within these areas unless needed to address specific stream conditions.
- The plan focuses on reducing pollutant loads, flows and erosion in the local streams by optimizing the efficiency of existing stormwater facilities within the more densely developed portions of the subwatershed.
- Stream restoration projects on the smaller tributaries where development has stabilized are given a higher priority. These include streams within the Virginia Run neighborhoods.
- Projects to address runoff from Country Club Manor that does not have stormwater controls are given a higher priority.
- Stream restoration projects on the main stem of Cub Run are given a low priority due to the development in the upstream watershed and potential changes in stream flows.
- Several stream segments within the Bull Run West subwatershed are affected by a lack of stream buffers. These segments are largely located within private property within the R-C district. One segment appears to be affected by flows from the Luck Stone Quarry.

#### **7.7.5 Big Rocky Run and Round Lick Branch Subwatersheds**

The following describes the watershed plan priorities used to define the project implementation plan within the Big Rocky Run and Round Lick Branch subwatersheds:

- The plan focuses on reducing peak flows and pollutant loads, flows and erosion in the local streams by optimizing the efficiency of existing stormwater facilities.

- Projects that address runoff from the Greenbriar and Birch Pond neighborhoods, which do not have stormwater controls, are given high priority.
- Projects in the watershed's headwaters receive higher priority since they benefit the greatest stream length. The projects are subsequently implemented in an upstream to downstream order within the subwatersheds.
- Stream restoration projects in the smaller headwater streams are given a higher priority.
- Stream restoration projects in the lower reaches of the streams receive lower priority and will generally not be implemented until after the upstream projects have been performed.

## 7.8 Structural Project Implementation Program Groupings and Schedule

The following lists the watershed plan project implementation groups in order of decreasing priority. The projects within each implementation phase are indicated. These project groupings are shown in Figures 7-1 through 7-4 for the Flatlick Branch subwatershed, Upper Cub Run and Elklick Branch subwatersheds, Lower Cub Run and Bull Run subwatersheds and Big Rocky Run and Round Lick Branch subwatersheds.

### Implementation Phase A

- FB 1 Flatlick Branch watershed. Includes dry pond retrofit projects CU9195, CU9198, CU9701, CU9702, CU9703 and CU9704, stream restoration project CU9217, and buffer restoration projects CU9326, CU9327, CU9328 and CU9329. This group includes all identified structural projects in the neighborhoods of Franklin Manor, Navy Park and Oakton Ridge that affect the upper reaches of Flatlick Branch north of Route 7100. At the same time, the county will implement local drainage improvements identified through the local public outreach program and otherwise to reduce stream erosion and prevent flooding in these upstream areas.
- FB 2 Flatlick Branch watershed within Franklin Glen. Implement projects near previously proposed regional pond C39 (project CU9001) adjacent to Foxfield Lane as described in Section 6. Field investigations indicate a facility at this location consists of a culvert, a dam and an emergency overflow but lacks an inlet structure. The plan updates this structure to provide an appropriate level of stormwater control and include wetlands to enhance nutrient removal. The stream restoration project (CU9216) for this stream segment will not be fully implemented. Grade control structures will be implemented in the stream reach upstream from the pond location to reduce sediment transport.

Figure 7-1

*Section 7*  
*Project Prioritization and Implementation Plan*

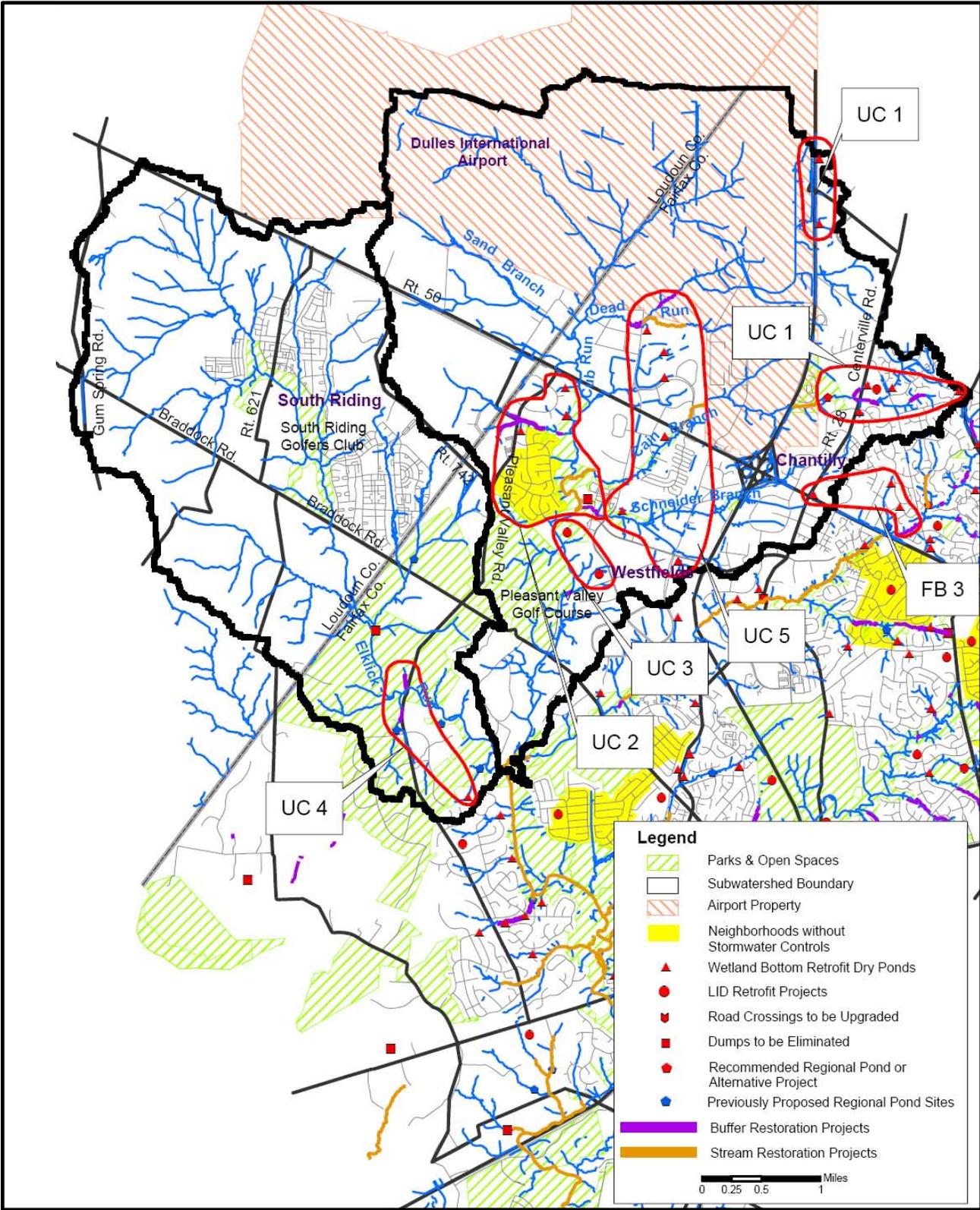


Figure 7-2  
 Structural Projects and Project Implementation Groupings in the  
 Upper Cub Run and Elklick Run Subwatersheds

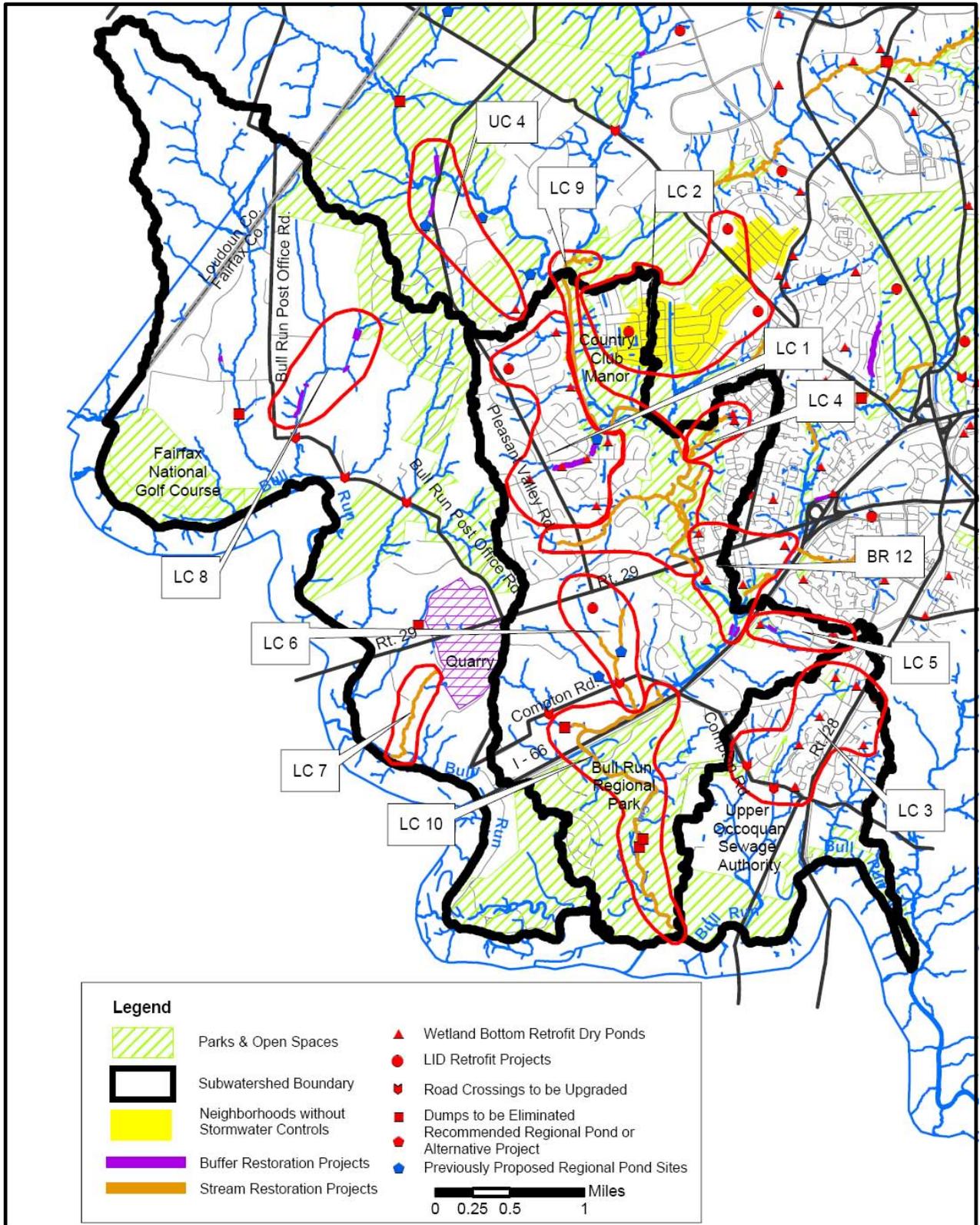


Figure 7-3  
 Structural Projects and Project Implementation Groupings in the Lower Cub Run and Bull Run Subwatersheds



Figure 7-4

*Section 7  
Project Prioritization and Implementation Plan*

- FB 3 Flatlick Branch watershed within Chantilly Estates and Armfield. Perform dry pond retrofit projects CU9185, CU9186 and CU9709 and stream buffer restoration project number CU9320.
  
- UC 1 Headwaters of the Cain Branch and Dead Run upstream from Route 28. Implement dry pond retrofit projects CU9711, CU9712, CU9713, CU9714, CU9721 and CU9722, LID retrofit project at the Franklin Middle School (CU9825) and nearby buffer restoration projects CU9334, CU9335 and CU9336 in the Armfield Farms neighborhood. Implement regional pond C18 or alternative upstream dry ponds (Project 9002) and stream restoration project CU9220.
  
- UC 2 Upper Cub Run watershed. Implement projects near the Pleasant Valley neighborhood without stormwater controls (project CU9913), including promoting LID and culvert outlet retrofit projects. Implement dry pond retrofit projects CU9715, CU9716 and CU9719. Evaluate Cub Run main stem within stream restoration project CU9218 and perform minimal stream restoration to stabilize stream erosion. Perform buffer restoration projects CU9333 and CU9337.
  
- BR 1 Big Rocky Run watershed. Address stormwater runoff from the Greenbriar and Birch Pond neighborhoods that do not have stormwater controls (project 9911). Projects to be performed promoting LID on private property and retrofitting stormwater outfalls. Perform LID retrofit the Greenbriar East Elementary School (CU9811) and implement dry pond retrofit projects CU9136 and CU9138. Perform stream buffer restoration projects CU9313, CU9314 and CU9315.
  
- FB 4 Oxlick Branch watershed projects, including dry pond retrofit projects CU9187 and CU9188, Lees Corner Elementary School LID retrofit project CU9821 and small buffer restoration projects (CU9321, CU9322 and CU9324) within the Foxfield neighborhood.
  
- FB 5 Flatlick Branch watershed. Perform dry pond retrofit projects CU9193 and CU9194 and local buffer restoration project CU9325 within Chantilly Farms downstream from the International Town and Country Club.

## **Implementation Phase B**

- LC 1 Lower Cub Run watershed. This group includes the various projects within the Virginia Run neighborhood. Implement dry pond retrofit projects CU9150, CU9160, CU9161, CU9162, CU9163, CU9164 and CU9165, LID retrofit project at Virginia Run Elementary School (CU9814) and stream buffer restoration project CU9316. Evaluate stream restoration project number CU9211 within the Cub Run main stem adjacent to these neighborhoods and identify stream and buffer restoration opportunities within the Cub Run main stem that can be implemented without major stream and buffer disruption. Evaluate stream restoration projects for stream segment within Virginia Run between Stillfield Place and Wetherburn Drive for opportunities for stream buffer restoration, grade control structures and other spot stream restoration to stabilize this stream segment and prevent further erosion.
- BR 2 Big Rocky Run watershed. This includes projects in the adjacent Flatlick Branch subwatershed. Perform dry pond retrofit projects CU9145, CU9146 and CU9192, evaluate stream segment and perform stream stabilization for stream restoration projects CU9210 and CU9215 and perform local upstream drainage improvements within the Fair Oaks Estates and Fair Chase neighborhoods. Perform LID retrofit at Navy Elementary School (CU9822). Implement buffer restoration project CU9323.
- LC 2 Lower Cub Run and Round Lick Branch watersheds. Retrofit Country Club Manor subdivision (project CU9910) that was constructed before stormwater controls were required in this portion of Fairfax County and that, therefore, does not have existing stormwater controls. Activities include promoting LID within the neighborhood and performing retrofits on the outfalls to reduce erosion and improve habitat conditions. This group overlaps to the neighboring Round Lick Branch subwatershed. In combination with the above actions, LID retrofit should be performed at Deer Park Elementary School (CU9813), Cub Run Elementary School (CU9815) and Stone Middle School (CU9812).
- FB 6 Flatlick Branch and Frog Branch watersheds. Retrofit the Brookfield neighborhood without stormwater controls (project CU9912), including LID promotion and outfall retrofit projects. Perform buffer restoration project CU9318 on lower end of Frog Branch. Perform limited restoration/protection within restoration project CU9214 upstream from Frog Branch and downstream from Route 50 primarily to protect property and implement grade control structures. Evaluate existing dry pond within the stream valley within this area and retrofit (CU9184). Perform LID Retrofit at Brookfield Elementary School (CU9820).

- UC 3 Upper Cub Run watershed. Evaluate and implement LID at Westfield High School (CU9823) and Cub Run Recreation Center (CU9824). Implement small buffer restoration project CU9332.
- BR 3 Big Rocky Run watershed. Perform dry pond retrofit projects at ponds CU9142, CU9143 and CU9144 near Route 50 and Fair Ridge and stream restoration project CU9209.
- BR 4 Big Rocky Run watershed. Perform dry pond retrofit projects CU9139 and stream restoration project CU9208 within Fair Lakes.

### **Implementation Phase C**

- FB 7 Frog Branch watershed headwaters. Implement Chantilly High School (CU9818), Rocky Run Middle School (CU9810), Greenbriar West Elementary School (CU9819) and Chantilly Library (CU9817) LID retrofit projects and nearby dry pond retrofit projects in or near the headwaters of the Frog Branch watershed near Stringfellow Road (CU9182 and CU9134). Perform buffer restoration project CU9311 and CU9312.
- FB 8 Frog Branch watershed. Dry pond retrofit projects in Frog Branch watershed downstream from group 7 projects but upstream from Brookfield Neighborhood (CU9176, CU9177, CU9178 and CU9180). Perform buffer restoration project CU9319. These projects are along Poplar Tree Road west of Stringfellow Road.
- FB 9 Flatlick Branch watershed. Dry pond retrofit projects CU9172, CU9174 and CU9175 near Walney Road.
- UC 4 Elklick Branch buffer restoration projects CU9330 and CU9331 near Pleasant Valley Road as part of parkland development projects. Dry pond retrofit project CU9705.
- LC 3 Bull Run East subwatershed. Include dry pond retrofit projects BR9102, BR9104, BR9105, BR9106, BR9107 and BR9108. Also, perform LID retrofit at the Centreville Elementary School (BR9801).
- LC 4 Lower Cub Run watershed. Implement dry pond retrofit projects CU9151 and CU9152. Also, evaluate and perform stream restoration project CU9211 in the stream segment between these two dry ponds and Cub Run. These projects affect the Stonehenge Community.
- LC 5 Lower Cub Run watershed. Implement dry pond retrofit project CU9103 and LID retrofit at Centre Ridge Elementary School (CU9802). Perform buffer restoration project CU9302 in stream segments upstream from the dry pond. These projects affect Centre Ridge.

- BR 5 Big Rocky Run watershed. Perform dry pond retrofit project CU9132 and LID retrofit improvements at Poplar Tree Park (CU9808) and Poplar Tree Elementary School (CU9809). Implement stream buffer restoration projects CU9309 and CU9310.

### **Implementation Phase D**

- BR 6 Big Rocky Run watershed. Perform dry pond retrofit projects CU9127 and CU9128 and implement stream buffer restoration projects CU9307 and CU9308. Also, implement LID retrofit projects at the FCPA Cabells Mill parking area (CU9806) and Stringfellow Road Commuter Lot (CU9807). These projects are generally located along Northbourne Drive.
- FB 11 Flatlick Branch watershed. Implement dry pond retrofit projects CU9167, CU9169 and CU9170 south of Frog Branch and in lower portion of watershed. Implement LID retrofit project at Sully District Government Center (CU9816). These are in areas with ongoing commercial development and are therefore low priority. Opportunities will be sought to implement these projects when this development occurs and/or share in the costs to implement these projects.
- UC 5 Dead Run, Cain Branch and Schneider Branch. These are low-priority projects in areas of commercial development and opportunities will be sought to implement these projects as part of the development and to share costs. Perform buffer restoration projects CU9338 and CU9339, dry pond retrofit projects CU9706, CU9707, CU9710, CU9717, CU9718 and CU9720 and stream restoration projects CU9219 and CU9221.
- FB 10 Flatlick Branch watershed. Implement dry pond retrofit project CU9171, stream restoration projects CU9213 and CU9214 and buffer restoration project CU9317 downstream from Frog Branch.
- LC 6 Lower Cub Run watershed. Implement LID retrofit project (CU9801) at Bull Run Elementary School. Evaluate stream conditions in the local tributary (project CU9202) and perform stream stabilization and grade control structures to address existing erosion and prevent further erosion.
- LC 7 Bull Run West watershed. Work with Luck Stone to evaluate options for reducing stream erosion and improving habitat conditions downstream from the quarry (Project BR9201).
- LC 8 Bull Run West watershed. Implement buffer restoration projects BR9301, BR9302, BR9303 and BR9304 in the western portion of this watershed near Bull Run Post Office Road.
- BR 7 Big Rocky Run watershed. Perform dry pond retrofit projects CU9124 and CU9125 within Centreville.

## Implementation Phase E

- BR 8 Round Lick Branch watershed. This group includes the structural stormwater controls in the Round Lick Branch subwatershed. This includes dry pond retrofit projects CU9154, CU9155, CU9156, CU9157, CU9158 and CU9159. Evaluate stream restoration project CU9212 and perform stream stabilization to address ongoing erosion and reduce future erosion.
- BR 9 Big Rocky Run watershed. Perform dry pond retrofit projects CU9121 and CU9123. Implement LID retrofit project at the parking lots for the Ellanor C. Lawrence athletic fields west of Route 28 (CU9805). Perform stream buffer restoration project CU9306 and stream restoration project CU9207. These projects are near Sequoia Farms Drive.
- BR 10 Big Rocky Run watershed. Perform structural projects in the lower reaches of Big Rocky Run, including dry pond retrofit projects CU9112, CU9113, CU9115, CU9119 and CU9122. Implement LID project at London Towne Elementary School (CU9803). Perform buffer restoration projects CU9303, CU9304 and CU9305. Evaluate stream erosion within Big Rocky Run main stem identified as stream restoration projects CU9205 and CU9206, and perform stream stabilization and grade control to reduce ongoing erosion and prevent further erosion. Since the upstream projects will have been implemented after project groups BR 1 through BR 9, the peak flows in this reach will have stabilized by the time this restoration project is implemented.
- BR 11 Big Rocky Run watershed. Perform dry pond retrofit projects CU9105, CU9107, CU9111 and CU9109 along with LID retrofit project at Centreville Library (CU9804). Evaluate stream erosion within stream erosion restoration project CU9204, and implement stream stabilization and grade control structures to reduce ongoing erosion and prevent future erosion. These are in the Meadows area of Centreville.
- BR 12 Big Rocky Run watershed. Perform dry pond retrofit projects CU9104, CU9106, CU9147 and CU9148. Implement stream restoration project CU9203 and buffer restoration project CU9301 within Lee Overlook.
- LC 9 Lower Cub Run watershed. Perform stream restoration project CU9211 within the Cub Run main stem between Elklick Run and Route 29 within the Cub Run Stream Valley Park.
- LC 10 Lower Cub Run watershed. Perform stream restoration project CU9201 and CU9202 within the Cub Run main stem below Compton Road, including reaches within Bull Run Regional Park.

## **7.9 Benefits of Plan Actions**

### **7.9.1 Nonstructural Actions and Policy Recommendation**

The watershed plan includes many nonstructural actions and policy recommendations. Many nonstructural actions are education and outreach that will reduce the watershed residents' impact on the Cub Run and Bull Run streams. Policy actions also modify the impacts of new development on the watersheds. While these actions will improve watershed health and reduce nutrient loads, their benefits are difficult to quantify.

### **7.9.2 Stream Condition Index Improvements**

Stream restoration projects will improve stream conditions. The Stream Condition Index (SCI) is a numerical measure of the stream condition. The SCI was computed based on methodologies developed by the Norfolk District of the Corps of Engineers. The condition index considers five indices of stream health:

- Instream habitat
- Channelization
- Riparian Buffer
- Channel Incision
- Bank Erosion

Each index has a score from zero to one with the higher score indicating better stream conditions. The five scores are summed to compute the overall stream condition index, ranging from zero to five.

Table 7-4 documents the existing Stream Condition Index (SCI) and estimated post-rehabilitation indices. These are length-weighted averages for the stream segments included in each project. The existing SCI ranges from 2.10 to 3.98 and averages 3.42. The post-restoration SCI ranges from 3.60 to 4.11 and averages 3.86. On average, the SCI increases by 13 percent. The restoration increases significantly in some reaches while only slightly in others.

Table 7-4

Summary of Existing and Post-Restoration Stream Condition Index

<b>Project Number</b>	<b>Location</b>	<b>Existing Stream Condition Index</b>	<b>Post-Restoration Stream Condition Index</b>	<b>Percent Increase</b>
CU9221	Dead Run Tributary Upstream from Stonecroft Blvd.	2.65	3.90	47%
CU9218	Cub Run main stem, including lower reaches of Schneider Branch and Cain Branch.	3.53	3.83	8%
CU9219	Cain Branch upstream from Route 50	3.12	3.69	18%
CU9220	Cain Branch Between Route 28 and Centreville Road	3.85	4.10	6%
CU9216	Flatlick Branch Tributary in Franklin Glenn	2.19	3.60	64%
CU9217	Flatlick Branch Tributary Downstream from Oxon Road	2.16	3.60	67%
CU9214	Flatlick Branch between Route 50 and Route 28	3.14	3.69	18%
CU9215	Oxlick Branch headwaters upstream from Alder Woods Drive in Fair Oaks Estates	3.55	3.85	8%
CU9213	Flatlick Branch upstream and downstream from Stonecroft Blvd.	3.67	3.96	8%

Table 7-4  
(continued)

Summary of Existing and Post-Restoration Stream Condition Index

<b>Project Number</b>	<b>Location</b>	<b>Existing Stream Condition Index</b>	<b>Post-Restoration Stream Condition Index</b>	<b>Percent Increase</b>
CU9210	Big Rocky Run Tributary Upstream from Ox Hill Road in Fair Oaks Estates	3.36	3.60	7%
CU9211	Middle Cub Run main stem and tributaries from Flatlick Branch to below Route 29	3.54	3.86	9%
CU9212	Round Lick Branch upstream from Sully Park Drive	3.71	4.10	11%
CU9205	Big Rocky Run Below Awbrey Patent Drive	3.55	3.92	10%
CU9206	Big Rocky Run Tributary below Braddock Road	3.70	3.95	7%
CU9207	Big Rocky Run between Route 28 and Braddock Road	3.65	3.80	4%
CU9209	Big Rocky Run Tributary in Oaks Chase	3.25	3.70	14%
CU9208	Big Rocky Run at Fair Lakes	3.59	3.84	7%
CU9204	Big Rocky Run tributary in the Meadows upstream from I-66	2.93	3.79	29%
CU9203	Big Rocky Run upstream from Cub Run confluence	3.20	3.91	22%
BR9201	Bull Run tributary below quarry	2.10	3.60	71%
CU9202	Lower Cub Run and unnamed tributaries between Compton Road and I-66	3.80	4.02	6%
CU9201	Lower Cub Run within Bull Run Regional Park	3.98	4.11	3%

### 7.9.3 Water Quality Improvements

The following documents the water quality improvements provided by the recommended structural projects. These analyses focus on the nutrient phosphorus since it represents the reduction for other pollutants and is the primary concern for protecting the Occoquan Reservoir’s water quality.

These controls produce additional watershed benefits as well, such as improving watershed health, aesthetics and habitat, and reducing peak flows and volumes that are difficult to quantify. As discussed in Section 7.9.1, education, outreach and policy changes will benefit the watershed in ways not quantifiable.

Stream restoration projects reduce pollutant loads by reducing the amount of nutrients washed into the streams. The 20 miles of stream restoration removes 361 pounds of phosphorus per year.

Retrofitting dry ponds to include wetland bottoms improves the nutrient removal efficiency for phosphorus by 10 percent, resulting in 40 to 50 percent annual reduction and nitrogen by 25 percent. The recommended dry pond retrofit projects reduce the average annual phosphorus loads by approximately 342 pounds.

The LID retrofit projects for county and other public facilities produce small changes in total nutrient loads because they serve a relatively small portion (36 acres) of the total watershed area (63 square miles). These controls also benefit the watershed adjacent to the projects. These projects reduce the annual phosphorus load by approximately 24 pounds.

Phosphorus reduction through retrofitting neighborhoods without stormwater controls (Greenbriar, Birch Pond, Brookfield, Country Club Manor and Pleasant Valley) was estimated assuming that LID and other stormwater controls are implemented for one percent of the watersheds.

Table 7-5 presents the estimated annual phosphorus reduction by each watershed plan structural project type.

Table 7-5  
Summary of Phosphorus Reduction Provided by Watershed Plan Structural Actions

Structural Project	Phosphorus (Pounds per Year)
Stream Restoration Projects	361
Dry Pond Wetland Retrofit Projects	365
LID Retrofit	24
Neighborhoods Without Stormwater Controls	17
Total Phosphorus Reduction	767

Stream buffer restoration projects and retrofitting of drainage systems in headwater areas will reduce nutrients, though the amount is difficult to quantify.

The total annual phosphorus reduction equals 767 pounds per year. The total phosphorus load for the 48 square miles of the Fairfax County watershed equals 17,000 pounds per year for future land use conditions with future stormwater controls. The watershed plan produces a documented 4.5 percent phosphorus load reduction from 0.56 to 0.53 lbs/acre/year. The cumulative phosphorus reduction from structural actions, nonstructural actions and policy recommendation will be greater than this amount.

Figure 7-5 presents the percent phosphorus reduction by model basin. The greatest reductions are in the Flatlick Branch watershed and lower reaches of the Cub Run watershed. Nine basins have reductions greater than 30 percent and 38 have reductions greater than 10 percent.

## **7.10 Summary of Structural Project Costs by Implementation Phase**

Table 7-6 summarizes project implementation costs based on the proposed schedule by major project type. The total cost by project type are summarized below:

- Construction of two regional ponds (C18 and C3) at a reduced size and impact from the proposed regional ponds - \$2,070,000. Cost for alternative projects to these and other regional ponds are included in the individual project types.
- Dry pond retrofit projects - \$9,985,000
- Low-impact development projects at public facilities - \$3,402,000
- Stream restoration - \$38,236,000
- Neighborhoods without stormwater controls - \$2,683,000. This cost includes community outreach to implement LID and stormwater outfall retrofit projects. Cost for other projects to be implemented within these neighborhoods are included in separate project types.
- Buffer restoration - \$1,318,000
- Headwater drainage systems - \$3,000,000
- Riparian wetland and stream study - \$100,000
- Dump site removal - \$55,000

The total cost of the identified structural projects equals \$60,849,000. An estimated 4.1 staff year equivalents (SYEs) are needed to implement these projects.

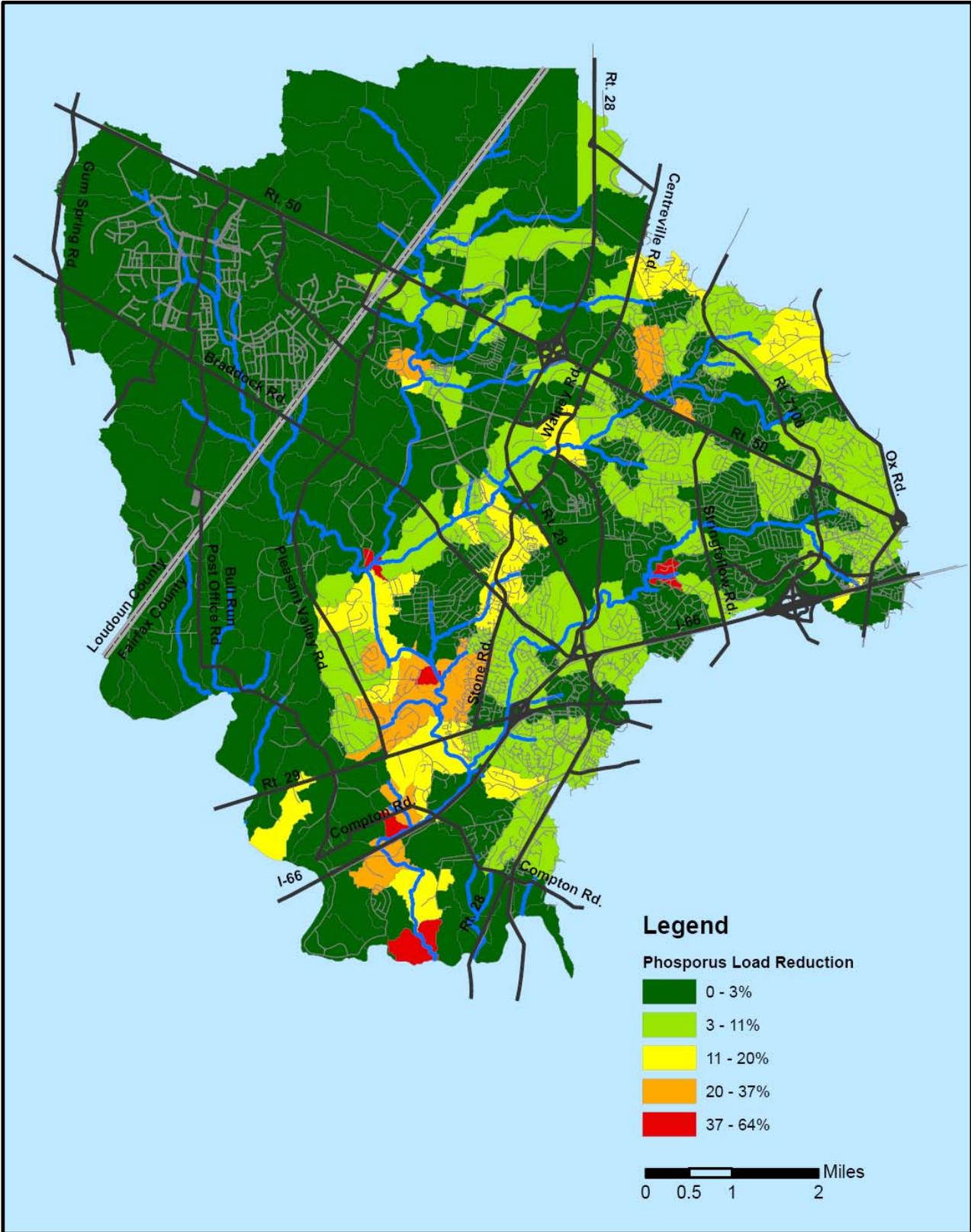


Figure 7-5  
Watershed Structural Plan Percent Phosphorus Reduction

Table 7-6  
Summary of Structural Project Costs by Implementation Phase

Project Type	Estimate Project Cost
<b>Phase A Year 1-5</b>	
Region Ponds or Alternative Projects <sup>(1)</sup>	\$2,070,000
Dry Pond Wetland Retrofit	\$2,686,000
Low Impact Development Retrofit	\$187,000
Stream Restoration	\$3,866,000
Neighborhoods without Stormwater Controls <sup>(2)</sup>	\$1,137,000
Buffer Restoration	\$554,000
Upland Drainage System Improvements	\$600,000
Riparian Wetland Study	\$100,000
Dump Site Removal	\$55,000
<b>Total Phase A</b>	<b>\$11,255,000</b>
<b>Phase B Year 6-10</b>	
Dry Pond Wetland Retrofit	\$1,666,000
Low Impact Development Retrofit	\$908,000
Stream Restoration	\$4,682,400
Neighborhoods without Stormwater Controls <sup>(2)</sup>	\$1,546,000
Buffer Restoration	\$144,000
Upland Drainage System Improvements	\$600,000
<b>Total Phase B</b>	<b>\$9,546,400</b>
<b>Phase C Year 11-15</b>	
Dry Pond Wetland Retrofit	\$2,676,000
Low Impact Development Retrofit	\$1,377,000
Stream Restoration	\$1,101,300
Buffer Restoration	\$213,000
Upland Drainage System Improvements	\$600,000
<b>Total Phase C</b>	<b>\$5,967,300</b>

Table 7-6  
(Continued)  
Summary of Structural Project Costs by Implementation Phase

Project Type	Estimate Project Cost
<b>Phase D Year 16-20</b>	
Dry Pond Wetland Retrofit	\$1,267,000
Low Impact Development Retrofit	\$484,000
Stream Restoration	\$9,390,800
Buffer Restoration	\$238,000
Upland Drainage System Improvements	\$600,000
Total Phase D	\$11,979,800
<b>Phase E Year 21-25</b>	
Dry Pond Wetland Retrofit	\$1,690,000
Low Impact Development Retrofit	\$446,000
Stream Restoration	\$19,195,500
Buffer Restoration	\$169,000
Upland Drainage System Improvements	\$600,000
Total Phase E	\$22,100,500
Total for all Structural Projects	\$60,849,000

1 – Regional pond cost is for the construction of the two regional ponds that remain in the study (C18 and C39) and do not include alternative projects for these or other regional ponds. Costs for these alternative projects are included in the individual project types.

2 – Costs for neighborhoods without stormwater controls include only costs for community outreach for LID implementation and stormwater outfall retrofit projects. Costs of additional projects are included in the individual project types.