

# TABLE OF CONTENTS

## **1.0 INTRODUCTION**

- 1.1 Purpose

## **2.0 GENERAL WATERSHED DESCRIPTIONS**

- 2.1 Creve Coeur Creek
  - 2.1.1 Terrain
  - 2.1.2 Topography
  - 2.1.3 Soil Types & Properties
  - 2.1.4 Jurisdiction (Area of City w/in Watershed)
- 2.2 Deer Creek
  - 2.2.1 Terrain
  - 2.2.2 Topography
  - 2.2.3 Soil Types & Properties
  - 2.2.4 Jurisdiction (Area of City w/in Watershed)

## **3.0 DATA DEVELOPMENT**

- 3.1 Previous Studies
  - 3.1.1 1999 Master Plan
  - 3.1.2 2010 Questionnaire
- 3.2 Field Reconnaissance

## **4.0 DEVELOPMENT AND EVALUATION OF ALTERNATIVES**

- 4.1 Introduction
- 4.2 Projects to Remove
- 4.3 Projects Pending to Remove
  - 4.3.1 No Visible Issue
  - 4.3.2 Issue Appears Resolved
- 4.4 Remaining Projects
  - 4.4.1 Problem Designation
  - 4.4.2 Alternative Analysis
  - 4.4.3 Descriptions

## **5.0 PRIORITIZATION**

- 5.1 Methodology
  - 5.1.1 Current Prioritization Method
  - 5.1.2 Other Methodologies
    - 5.1.2.1 Prioritization Formula
    - 5.1.2.2 Value Matrix
    - 5.1.2.3 Benefit vs. Cost
  - 5.1.3 Conclusion
- 5.2 Cost Estimates
- 5.3 Benefit Points

5.4 Benefit-Cost Analysis

**6.0 Geographic Information System (GIS)**

6.1 Description and Capabilities

**LIST OF FIGURES**

**Figure**

- 2-1 Watersheds within the City of Creve Coeur**
- 3-1 Previous Study Locations**
- 4-1 Current Problem Locations**

**LIST OF TABLES**

**Table**

- 3-1 Remaining Concerns from 1999 Master Plan**
- 3-2 Concerns from 2010 Questionnaire**
- 5-1 City of Creve Coeur- Original Stormwater Priority Ranking Scale**
- 5-2 Ranking a Project Using a Value Matrix- City of Columbus, Ohio**
- 5-3 Benefit Point Table- Maryland Heights**
- 5-4 Creve Coeur Benefit Points**
- 5-5 Prioritization of Creve Coeur Creek and Deer Creek Watersheds (Sorted by Project Number)**
- 5-6 Prioritization of Creve Coeur Creek and Deer Creek Watersheds (Sorted by Priority Ranking)**
- 5-7 Prioritization of Creve Coeur Creek and Deer Creek Watersheds (Sorted by Original Classification ID-1999 Study/2010 Questionnaire)**

## LIST OF APPENDICIES

### **Appendix**

- A**                    **Field Observations, Maps, & Photos  
(Standalone Binder)**
  
- B**                    **Supplemental References to Smith Creek Problem Area SC-1**
  
- C**                    **Supplemental References to Fernridge Creek Problem Area FC-1**
  
- D**                    **Applicable MSD Pay Items**
  
- E**                    **Alternative Cost Estimates**

## **1.0 INTRODUCTION**

---

The City of Creve Coeur experiences multiple stormwater problems within its boundaries. To benefit its citizens, the City has identified the need to assess the multitude of drainage related problems by updating its last Watershed Plan done in 1999 to develop a new path to implement comprehensive and technically sound solutions to these problems.

Many of the problems stem from increased runoff from development. Changes in land use have a major effect on both the quantity and quality of stormwater runoff. Urbanization, if not properly planned and managed, can dramatically alter the natural hydrology of an area because it increases impervious cover. Impervious cover decreases the amount of rainwater that can naturally infiltrate into the soil and increases the volume and rate of stormwater runoff. These changes lead to more frequent and severe flooding, streambank erosion, and therefore potential damage to public and private property.

One solution that helps mitigate these effects is to enacting ordinances requiring elements of low-impact development (LID). LID is a stormwater management system that works by utilizing the natural processes of the water cycle. LID treatment networks are designed not to exceed the carrying capacity of a site's landscape and can incorporate a number of stormwater best management practices such as rain gardens, vegetated filter strips, bioswales, pervious pavement, and green roofs.

The scope of the Watershed Management Plan Update has been to review the existing Master Plan, collect the available watershed information (including a stormwater questionnaire distributed to citizens in 2010), evaluate known problems, develop appropriate project alternatives to solve them and prioritize the projects in a fair and equitable manner.

### **1.1 Purpose**

The purpose of this report is to develop a current, prioritized master plan that incorporates any concerns from the previous master plan, problem areas identified in the recent stormwater questionnaire, and any other issues brought to the City's attention. In addition, the report will serve as a tool to determine appropriate stormwater funding and help determine which projects receive this funding.

## **2.0 GENERAL WATERSHED DESCRIPTIONS**

The City of Creve Coeur consists of two primary watersheds: Creve Coeur Creek and Deer Creek as illustrated in Figure 2-1. Each is comprised of smaller sub-watersheds. Within the Creve Coeur Creek watershed are: Creve Coeur Creek, Fernridge Creek, Smith Creek, and Maryville Creek. Contained by the Deer Creek Watershed are: Deer Creek Main Branch, Windrush Creek, Monsanto Sunswept, Pebble Creek, Tributary 4, Tributary 5, Black Creek, Hampton Branch, Claytonia Creek, Two Mile Creek, Sebago Drainage, and Shady Grove Creek.

### **2.1 Creve Coeur Creek**

The Creve Coeur Creek Watershed is 16,888 acres in size and is located in west St. Louis County as shown in Figure 2-1. It lies between Dorsett Road to the north, Clarkson Road to the west, Clayton Road to the south, and Interstate 270 to the east. The watershed drains to the northeast with the main branch of Creve Coeur Creek running through Creve Coeur Lake and discharging to the Missouri River.

#### **2.1.1 Terrain**

The watershed is composed almost entirely of gently to moderately sloping terrain, with a few areas of steep slopes. In addition, there are significant portions of level ground lying along the main branch of Creve Coeur Creek and its tributaries.

#### **2.1.2 Topography**

General topographic data for the Creve Coeur Creek watershed can be obtained from the following USGS 7.5 minute quadrangle maps:

- Creve Coeur
- Chesterfield
- Kirkwood
- Manchester

#### **2.1.3 Soil Types & Properties**

Approximately thirty percent of the watershed consists of uplands, which are classified as the Menfro-Windfield-Urban land association by the USDA - SCS. Soils in this classification have the following characteristics:

- Gently sloping to very steep (slopes from 2 to 45 percent)
- Well drained and moderately well drained (Hydrologic class B)

Path: N:\115500\GIS\115500\_CreveCoeur\_Figure2-1.mxd Date Saved: 3/27/2012 1:16:42 PM

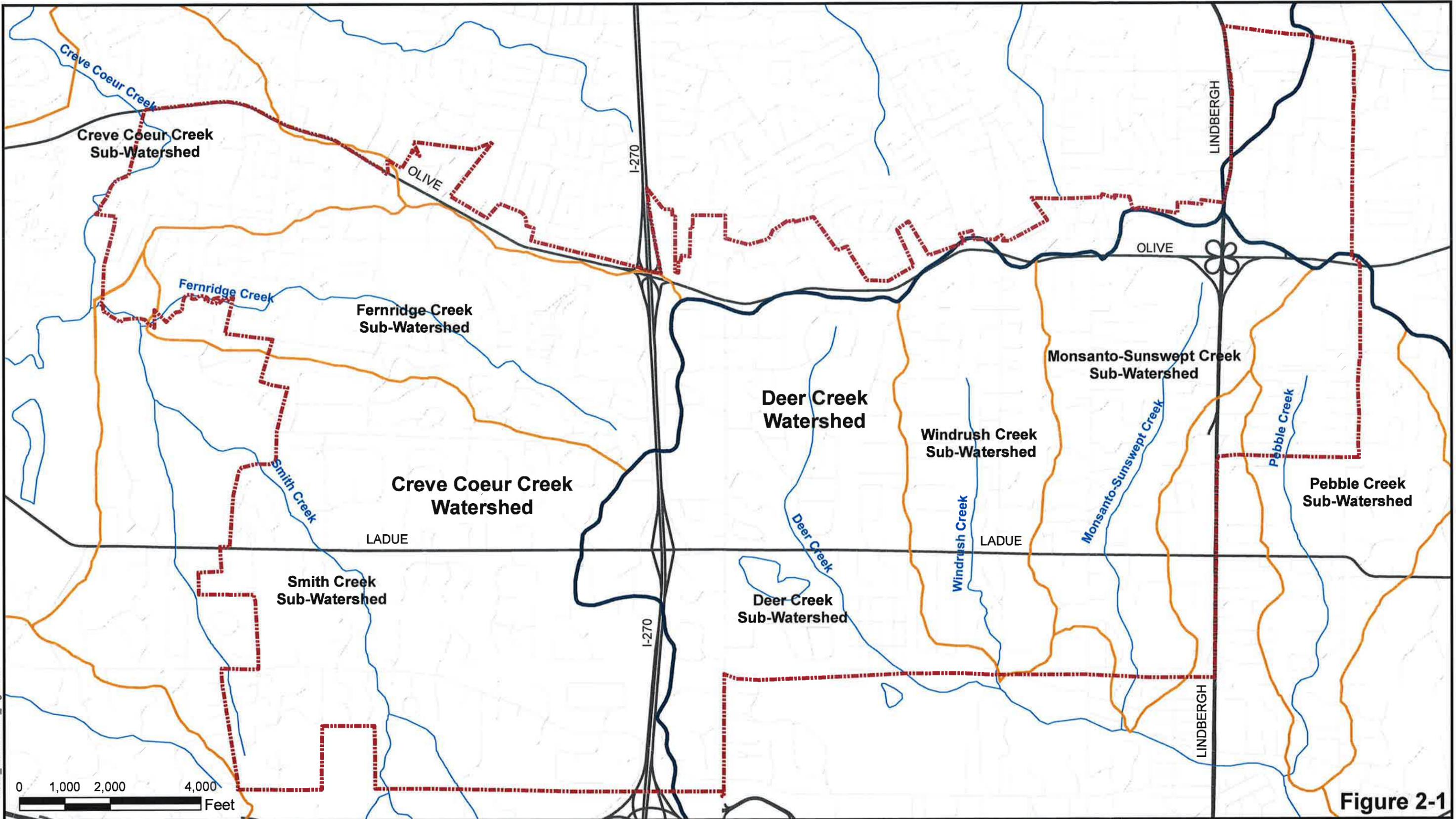


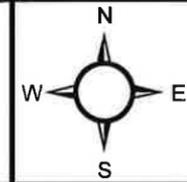
Figure 2-1



Legend	
	Creve Coeur Boundary
	Streams
	Major
	Sub-Watershed
	Minor

## City of Creve Coeur by Watershed

### City of Creve Coeur, Missouri



Approximately sixty percent of the watershed is comprised of uplands, terraces and bottom lands, classified as the Urban land-Harvester-Fishpot association, and are defined with the following characteristics:

- Nearly level to moderately steep (slopes from 0 to 20 percent)
- Moderately well drained and somewhat poorly drained (Hydrologic class B and C)

The bottomland found along the main branch of Creve Coeur Creek, classified as the Wilbur-Haymond-Elsah association, comprises less than ten percent of the watershed and is defined with the following characteristics:

- Nearly level to gently sloping (slopes from 0 to 2 percent)
- Moderately well drained to somewhat excessively drained (Hydrologic class B and C)

Additional information about soil hydrologic properties is provided in The United States Department of Agriculture (USDA) - Soil Conservation Service (SCS) Soil Survey of St. Louis and St. Louis County.

#### **2.1.4 Jurisdiction (Area of City w/in Watershed)**

Approximately 45% of the City lies within the Creve Coeur Creek Watershed.

## **2.2 Deer Creek**

The Deer Creek watershed is 23,539 acres in size as shown in Figure 2-1. The watershed is located in Central St. Louis County. It lies between Olive Boulevard to the north, I-270 to the west, I-44 and Essex to the south, and Big Bend Road to the east. The watershed drains to the southeast, with the main branch of Deer Creek discharging into River Des Peres. The southwestern portion of the watershed was formerly known as the Two Mile Creek watershed and the northeastern portion was formerly known as the Black Creek watershed.

### **2.2.1 Terrain**

The watershed is comprised almost entirely of sloping terrain with a few areas of flat ground and a few moderate slopes. There are several significant sections of level ground lying along the main branch of Deer Creek. The watershed's drainage network is comprised of a main branch and eleven major tributaries. The average slope of the creek is 19 feet per mile.

### **2.2.2 Topography**

General topographic data for the Deer Creek watershed can be obtained from the following USGS 7.5 minute quadrangle maps:

- Kirkwood
- Webster Groves
- Clayton
- Creve Coeur

### **2.2.3 Soil Types & Properties**

Approximately fifty to sixty percent of the watershed consists of uplands, which are classified as the Menfro-Windfield-Urban land association by the USDA - SCS. Soils in this classification have the following characteristics:

- Gently sloping to very steep (slopes from 2 to 45 percent)
- Well drained and moderately well drained (Hydrologic class B)

The remaining forty to fifty percent of the watershed is comprised of Urban land-Harvester-Fishpot association, and are defined with the following characteristics:

- Nearly level to moderately steep (slopes from 0 to 20 percent)
- Moderately well drained and somewhat poorly drained (Hydrologic class B and C)

Additional information about soil hydrologic properties is provided in The United States Department of Agriculture (USDA) - Soil Conservation Service (SCS) Soil Survey of St. Louis and St. Louis County.

### **2.2.4 Jurisdiction (Area of City w/in Watershed)**

Approximately 55% of the City lies within the Deer Creek Watershed.

## **3.0 DATA DEVELOPMENT**

This section discusses the methodology used to gather information about the current stormwater issues and concerns in the City of Creve Coeur. Data from previous studies was used and current site visits were conducted.

### **3.1 Previous Studies**

The City of Creve Coeur seeks to maintain a current account of stormwater issues and concerns within the City's limits. The City developed a stormwater master plan in 1986 and an update to this plan in 1999. Additional stormwater concerns have been brought to the City's attention through the issuance of a stormwater questionnaire in the fall of 2010. Site locations are outlined in Figure 3-1.

#### **3.1.1 1999 Master Plan**

The 1999 Master Plan was developed by distributing a stormwater questionnaire to all City residents. Residents could express a stormwater concern by identifying the location and nature of problem on the questionnaire. Field crews visited the sites to verify the conditions. Of the 385 responses, 294 were deemed problem areas. The 294 responses were grouped together into 100 project areas made up of locations reporting related complaints.

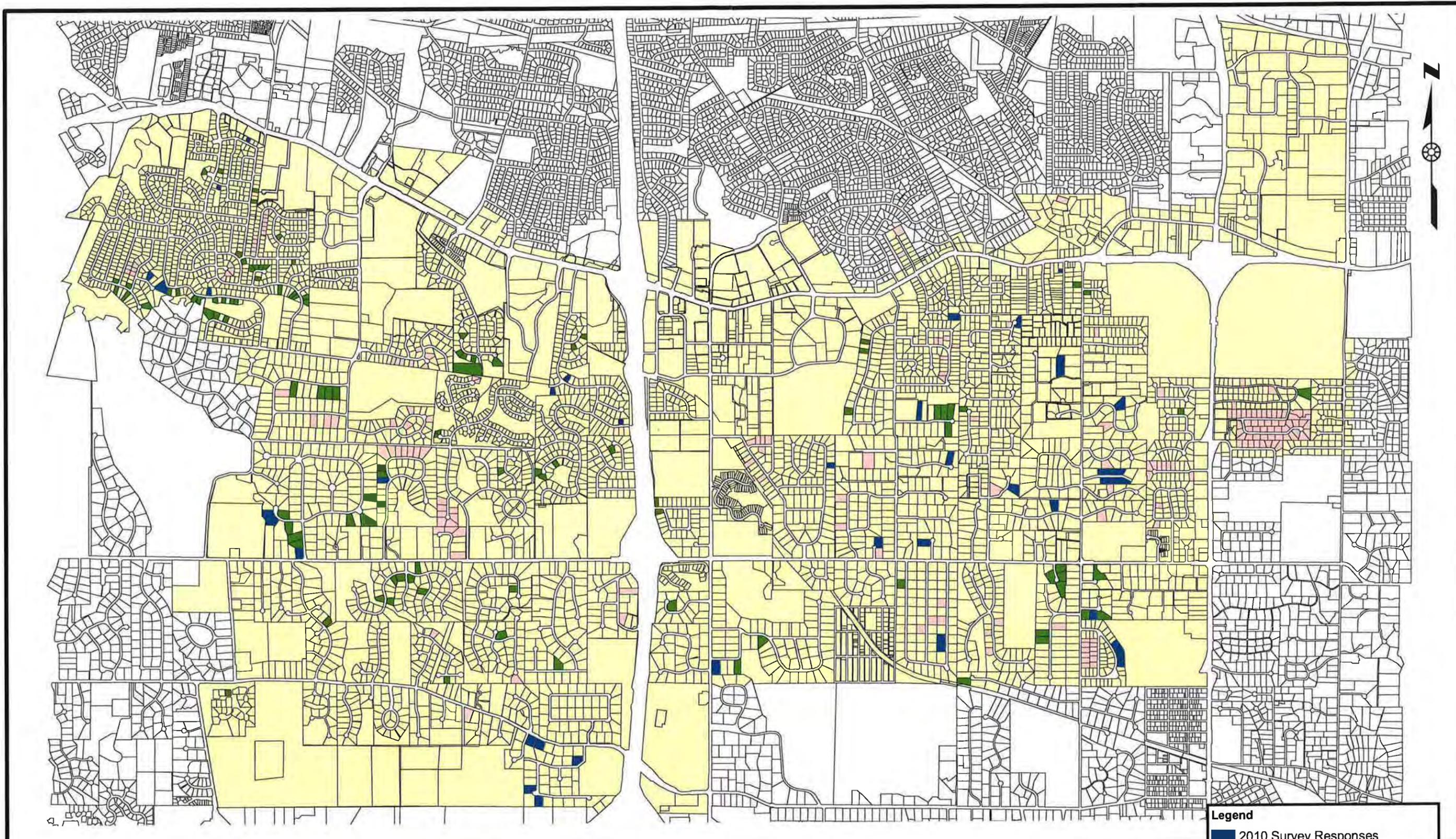
The City has reviewed the 1999 Master Plan and *44 projects* remain a concern as listed in Table 3-1.

#### **3.1.2 2010 Questionnaire**

As similarly done for the 1999 Master Plan, a stormwater questionnaire was issued in the fall of 2010 for residents to report current issues.

The result was *33 projects* as listed in Table 3-2.

In some cases, projects from the 2010 questionnaire were related to a similar problem identified in the 1999 Master Plan. If there was a correlation, it was noted in both Table 3-1 and Table 3-2.



**Legend**

- 2010 Survey Responses
- Unresolved Issues from 1999 Plan
- 1999 Master Plan Sites Evaluated
- Creve Coeur Properties
- Other properties

**Storm Water Evaluation Sites**  
 Storm Water Master Plan Update  
 City of Creve Coeur, Missouri



Figure 3-1

**Remaining Concerns from 1999 Master Plan  
Table 3-1**

Count	Orig. ID #	Project Name	Issue/Problem	Project Corresponding to 2010 Questionnaire
1	13-1	Beauvais Court	Terraced subdivisions - water entering home	
2	13-4	Fernridge Creek - Mason to D'Artagnan	Creek flooding and erosion - water entering homes	1, 15
3	13-6	Litchford Court	Terraced subdivisions - water entering home	
4	13-9	Chasselle-Chamblee Lane	Creek flooding and erosion - water entering homes	5, 6, 8
5	11-1	Royal Gate-Royal Manor Drive	Damaged or inadequate storm sewers - ponding in street	
6	11-3	North Walling Drive	Inadequate curb, gutter and inlets - ponding in street	
7	11-6	Emerald Green & Emerson Intersection	Inadequate curb, gutter and inlets - ponding in street	
8	11-7	Montauben Drive	Damaged or inadequate storm sewers - ponding in street	
9	7-1	Mosely Acres	Dam failure or overtopping - threatens building	
10	5-1	Winrock Drive	Inadequate curb, gutter and inlets - damaging landscaping	
11	5-3	Ridgecorde Place #485	Creek flooding and erosion - damaging landscaping	
12	5-4	Tealwood North #47	Creek flooding and erosion - damaging driveway retaining wall	
13	5-5	Stratford Ridge Court	Creek flooding and erosion - threatens yards and landscaping	
14	5-6	Balcon Estates #7	Creek flooding and erosion - damaging landscaping	2
15	5-7	Ladue Woods Drive	Terraced subdivisions	
16	5-8	Fernview Drive #1009 and #1020	Creek flooding and erosion - threatens fences	
17	4-2	Broadview Farm #9	Minor yard flooding and erosion - threatens maintained area	
18	4-4	Royal Manor Drive	Creek flooding and erosion - threatens maintained area	
19	4-5	Booth Bay Lane	Creek flooding and erosion - threatens maintained area	
20	4-6	Spoeede Acres	Creek flooding and erosion - threatens maintained area	28
21	4-7	Spoeede View Court #10667	Creek flooding and erosion - threatens maintained area	
22	4-8	Tarrytown-Lakeshore Drive	Creek flooding and erosion - threatens maintained area	29
23	4-9	Somerton Court	Creek flooding and erosion - threatens maintained area	
24	4-10	Clion and Chamblee Lane	Creek flooding and erosion - threatens maintained area	
25	4-11	Laduemont Drive	Creek flooding and erosion - threatens maintained area	
26	3-2	Fenway - 900 Block	Terraced subdivisions - ponding in yards	
27	3-7	Fairways Circle - 600 Block	Inadequate drainage swales - ponding in yards	
28	3-10	Hibler Court	Terraced subdivisions - ponding in yards	
29	3-20	Country View Drive #10671	Terraced subdivisions - ponding in yards	12
30	3-24	Foxbrook Drive	Terraced subdivisions - ponding in yards	
31	3-27	Spoeede Road at Ramblewood	Inadequate curb, gutter and inlets	
32	3-30	Sackston Ridge Lane	Inadequate curb, gutter and inlets - ponding in yards	
33	3-32	Conway Homes Circle	Minor yard flooding and erosion - ponding in yards	
34	2-1	Hibler Oaks	Inadequate drainage swales - minor yard erosion	
35	2-4	Villa Coublay Drive	Creek flooding and erosion - erosion in ravine	
36	2-5	Fairways Circle - 500 Block	Creek flooding and erosion - erosion in ravine	
37	1-1	Haverton Drive #812	Damaged or inadequate storm sewers - sinkhole	
38	1-2	Robinview Court	Damaged or inadequate storm sewers - sinkhole	
39	1-3	D'Artagnan Court	Damaged or inadequate storm sewers - sinkhole	
40	1-6	Ladue Estates Dr. #5	Minor yard flooding and erosion - erosion in yard	
41	1-7	Oak Park Drive	Minor yard flooding and erosion - erosion in yard	
42	1-8	Oak Park Court	Inadequate curb, gutter and inlets - ponding in street	
43	0-3	Ambois Drive Sewers	Sewer backups due to high groundwater and leaky joints	
44	0-5	Ramblewood Lane	Sewer backups due to high groundwater and leaky joints	

**Concerns from 2010 Questionnaire  
Table 3-2**

<b>ID No.</b>	<b>Location</b>	<b>Issue/Problem</b>	<b>Project Corresponding to 1999 Master Plan</b>
1	12995 Ambois	Creek flooding threatens residential street	13-4
2	7 Balcon Estates	Creek flooding and erosion	5-6
3	24 Balcon Estates	Creek flooding and erosion	
4	26 Balcon Estates	Creek flooding and erosion	
5	13 Chamblee	Creek flooding and erosion	13-9
6	15 Chamblee	Creek flooding and erosion	13-9
7	12-17 Chaminade	Creek erosion threatens pedestrian bridge	
8	1 Chasselle	Creek flooding and erosion	13-9
9	77 Colonial Hills	Inadequate drainage swales-yard erosion and flooding	
10	12410 Conway Road	Yard ponding	
11	12295 Country Manor	Yard erosion at discharge of storm pipe	
12	10671 Country View	Yard erosion	3-20
13	12970 Ferntop	Creek flooding and erosion	
14	12921 Fernway	Yard ponding and erosion	
15	13119 Gascogne	Creek erosion	13-4
16	11076 Graeser	Inadequate curb, gutter, inlets- yard flooding	
17	12318 Halsgame	Yard erosion	
18	73 Ladue Estates, East	Yard ponding	
19	287 Ladue Lake	Terraced subdivisions-yard erosion and flooding	
20	104 Ladue Meadows	Terraced subdivisions-yard erosion	
21	859 Larkin	Inadequate drainage swales-yard erosion and flooding	
22	3-6 Middlebrook Lane	Creek erosion threatens residential culvert	
23	16 Mosley Acres	Inadequate curb and gutter-yard erosion	
24	121 Mystic Meadows	Terraced subdivisions-yard erosion and flooding	
25	10835 Rondelay Drive	Yard erosion	
26	12121 Royal Valley Drive	Yard erosion	
27	434 Runnymede Drive	Terraced subdivisions-yard flooding	
28	2 Spoede Acres Street	Yard ponding and erosion	4-6
29	11732 Tarrytown	Creek erosion	4-8
30	11205 Tureen Drive	Yard erosion	
31	6 Wedgewood Lane	Yard ponding and erosion	
32	7 Wedgewood Lane	Yard ponding and erosion	
33	6 Windrush Creek, East	Creek erosion	

## **3.2 Field Reconnaissance**

Field crews performed site visits on the 77 problem areas from both the 1999 Master Plan and the 2010 questionnaire. Site observations were photographed and documented to help evaluate each problem description. Property, aerial, and MSD maps were obtained to supplement and substantiate field observations. In addition to site observations, both in person and phone conversations with home owners were employed to gain a better understanding of the issue. Complete field observations are found in standalone Appendix A.

Field crews assessed current site conditions and determined if the problem areas still existed. Projects were combined if the same problem affected multiple properties and if a common solution was possible. Projects that have been resolved were documented and removed from the list.

## **4.0 DEVELOPMENT AND EVALUATION OF ALTERNATIVES**

This section discusses the observations obtained from the site visits and recommends solutions to each current identified problem.

### **4.1 Introduction**

Erosion and flooding problems exist within the City's limits as evident from the 1999 Master Plan and the 2010 questionnaire. In addition to the 77 projects previously identified, three projects have been added since the beginning of field investigations. They include two identified in a Stormwater Committee Meeting from October 2011 and another identified by a home owner encountered during the site visits.

- 10 projects were removed due to home owner indicating there was no issue
- 14 projects are pending to be removed once home owner verification is received
- 8 projects were combined with other projects that had common issue

A total of 48 projects have a current stormwater issue.

### **4.2 Projects to Remove**

After site visit and verification with home owners, a total of 10 projects can be removed from the list of City concerns. Each project is described below.

× **0-5 (1999 Master Plan)**

**Location:** 830 and 833 Spoede Road

**Comments:** No issue with sewer backups per phone discussion with home owner.

× **0-3 (1999 Master Plan)**

**Location:** 12944 - 13006 Ambois Drive

**Comments:** No issue with sewer backups per discussion with home owners. MSD has installed new trunk sewer to eliminate sewer backups.

× **1-3 (1999 Master Plan)**

**Location:** 13138, 13143, 13203, 13200 Dartagnan Court

**Comments:** No issue with sink holes in area per phone discussion with home owners.

× **1-2 (1999 Master Plan)**

**Location:** 12521, 12529 Robinview Court

**Comments:** No issue with sink holes in area per phone discussion with home owners.

× **1-1 (1999 Master Plan)**

**Location:** 812 Haverton Drive

**Comments:** No issue with sink holes in area per phone discussion with home owner.

× **3-27 (1999 Master Plan)**

**Location:** 830 and 833 Spoede Road

**Comments:** No issue with sewer backups or street flooding per phone discussion with home owner.

× **3-24 (1999 Master Plan)**

**Location:** 432 Foxbrook Drive

**Comments:** No erosion or flooding issue per discussion with home owner.

× **4-9 (1999 Master Plan)**

**Location:** 12226, 12206 Sommerton Court

**Comments:** No erosion or flooding issue per phone discussion with home owners.

× **5-3 (1999 Master Plan)**

**Location:** 485 Ridgecorde Place

**Comments:** No erosion or flooding issue per discussion with home owner.

× **13-6 (1999 Master Plan)**

**Location:** 228 Litchford Court

**Comments:** Home owner has installed inlet and drainage pipe along retaining wall to control runoff. After a follow-up visit with home owner, it was confirmed that there are no stormwater issues present.

## 4.3 Projects Pending to Remove

Nine projects appear to have no visible issue and five appear to have issue resolved as observed during site visits. Contact with the home owners of these issues was attempted by phone and during site visit, however all residents were unavailable. Further verifying is required to ensure no stormwater concern exists. Each project is described in the following section.

### 4.3.1 No Visible Issue

This section lists all projects that had no apparent issue at the time of field investigation.

× **1-7 (1999 Master Plan)**

**Location:** 33, 34 Oak Park Drive

**Comments:** Runoff from street and yards drain to grate inlet located on west and east side of Oak Park Drive. Street has been resurfaced and there appears to be no areas for flooding to occur.

× **3-30 (1999 Master Plan)**

**Location:** 11967 Sackston Ridge Lane

**Comments:** No visible flooding or erosion observed at culdesac. Street appears to have adequate curb and gutter.

× **4-2 (1999 Master Plan)**

**Location:** 9 Broadview Farm Drive

**Comments:** Backyard does not appear threatened by creek flooding or street runoff.

× **11-7 (1999 Master Plan)**

**Location:** Intersection of Montauban and Nimes

**Comments:** No visible yard damage observed in area. Street appears to have adequate slopes, curbs, and gutters. Per discussion with home owner of 742 Montauban, there is no street flooding present. Could not reach other home owners in the area.

× **11-6 (1999 Master Plan)**

**Location:** 11982, 11995 Emerald Green Drive

**Comments:** No evidence of flooding visible.

× **11-3 (1999 Master Plan)**

**Location:** 21, 22, 23, 27 North Walling Drive

**Comments:** Street appears to have adequate slope to drain. No sink holes observed along storm line.

× **11-1 (1999 Master Plan)**

**Location:** 12459, 12466, 12518 Royal Manor Drive/ 111 Royal Gate/ 131 Petite Royal

**Comments:** Street appears to have sufficient inlets and slopes. Home owner of 12518 Royal Manor had no knowledge of current flooding issues in area. Could not reach other home owners in the area.

× **10 (2010 Questionnaire)**

**Location:** 12410 Conway Road

**Comments:** Minimal tributary area appears to be contributing to site runoff. Home appears elevated and flooding does not seem possible. Could not reach home owner to discuss.

× **Extra Project Identified During Stormwater Committee Meeting**

**Location:** 12535, 12542, 12550 Mason Forest Drive

**Comments:** There appears to be adequate inlets and a cross-pavement grated trench drain to collect runoff. Steep sloping street and yards sloping to street may cause large amount of water on pavement during a storm.

#### **4.3.2 Issue Appears Resolved**

This section lists all projects where the issue appears to have been resolved.

× **3-32 (1999 Master Plan)**

**Location:** 12534 Conway Holmes Circle

**Comments:** Erosion in southwest corner of yard appears to be controlled by the rip rap placed along hillside and around inlet.

× **5-6 (1999 Master Plan) / 2 (2010 Questionnaire)**

**Location:** 7 Balcon Estates

**Comments:** Grouted rip rap has been placed upstream of bridge and standard rip rap has been placed downstream of bridge. Creek banks appear stable. No evidence of flooding or erosion observed.

× **5-5 (1999 Master Plan)**

**Location:** 12402, 12414, 12420, 12443 Stratford Ridge Court / 12380 Whitworth Terrace/ 665 Questover Lane

**Comments:** Grouted rip rap has been constructed along creek banks behind Stratford Ridge Court. 12443 Stratford Ridge is not impacted by creek and has no drainage issue visible. 12380 Whitworth Terrace has visible creek erosion, but rip rap has been placed to mitigate issue.

× **5-1 (1999 Master Plan)**

**Location:** 12248, 12283, 12290 Winrock Drive

**Comments:** New curb has been installed at 12283 and 12290 which appears adequate to control street runoff.

## 4.4 Remaining Projects

This section discusses are current problem areas within the City of Creve Coeur assorted by watershed.

### 4.4.1 Problem Designation

Each current problem has been given a new project number based on the watershed in which the problem area is located. A letter prefix designates the problem watershed as follows:

- CC: Creve Coeur Creek Main Branch
- SC: Smith Creek
- FC: Fernridge Creek
- DC: Deer Creek Main Branch
- WC: Windrush Creek
- MS: Monsanto Sunswept Creek
- PC: Pebble Creek

The watersheds and problem areas are illustrated in Figure 4-1. Where feasible, some problem areas have been combined into a single project when a solution is mutual.

Path: N:\11 JO\GIS\115500\_CreveCoeur\_Figure4-1.mxd Date Saved: 2/3/2012 11:38:32 AM

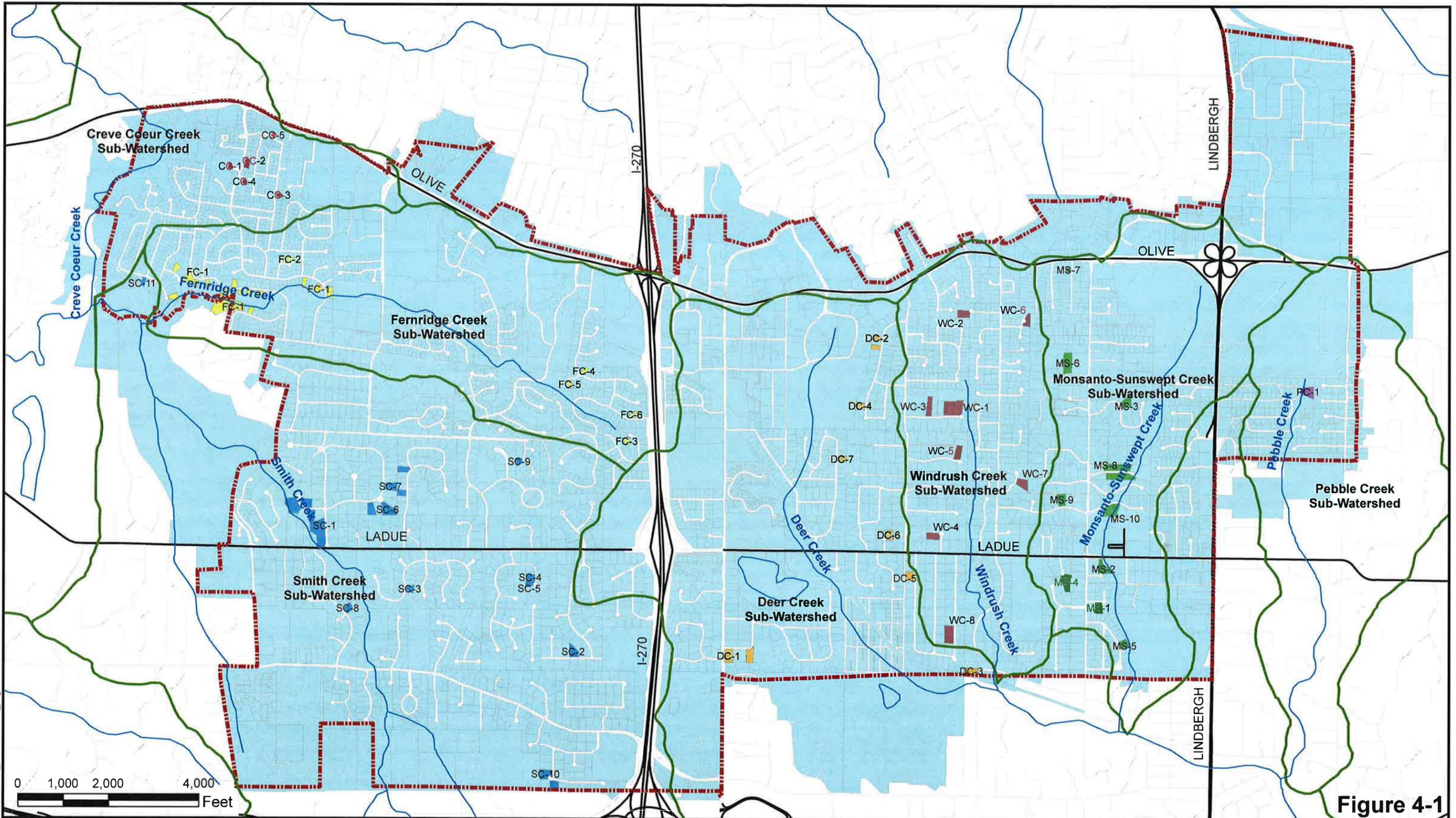
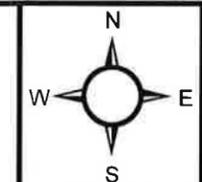


Figure 4-1

**Legend**

CC	SC	Creve Coeur Boundary	Streams
DC	PC	Sub-Watershed	Minor Roads
FC	WC	Creve Coeur Parcels	Major Roads
MS			

## Problem Areas by Watershed City of Creve Coeur, Missouri



#### **4.4.2 Alternative Analysis**

Rehab and repair alternatives were explored for each problem site. Each alternative met the applicable requirements of the current Metropolitan St. Louis Sewer District (MSD) and Missouri Department of Natural Resources (DNR) guidelines. Two solutions were developed for each site unless otherwise noted. The preferred solution is the most effective option that best corrects the problem. Where both solutions were equally effective, the preferred solution was decided by lowest cost. In some cases it was suggested that a watershed wide approach be taken to analyze the issues to recommend a better solution.

For residential yard erosion and flooding, alternatives varied from reconstructing natural swales to constructing new storm systems. For creek erosion, alternatives included providing a creek biostabilization method or constructing vegetated gabions. Biostabilization refers to the use of soil blankets and plantings. Vegetated gabions refer to gabion baskets that incorporate vegetation. For creek flooding, alternatives included constructing berms and planting vegetation along the banks.

#### **4.4.3 Descriptions**

The following lists all problem areas that lie within the City of Creve Coeur. Location, problem description, and solutions are provided for each. The original problem designations (from 1999 Master Plan and/or 2010 Questionnaire) are cited for reference. A complete site assessment for each can be found in Appendix A and a detailed cost estimate is provided in Appendix D.

➤ **CC-1 - Fernview Drive #1009**

**LOCATION:** Fernview Drive is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 5-8 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Erosion at discharge of pipe at north section of backyard. Discharge of pipe was covered with yard waste and debris.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion- yard erosion	10	Field Investigation	1	10
<b>TOTAL</b>			<b>10</b>	<b>10</b>

**PREFERRED SOLUTION:** Construct reno mattress at end of discharge pipe to allow for dissipation of energy at outlet.

**COST ESTIMATE: \$52,000**

**ALTERNATE SOLUTION:** Place rip rap at end of discharge of pipe and along drainage path.

**COST ESTIMATE: \$35,000**

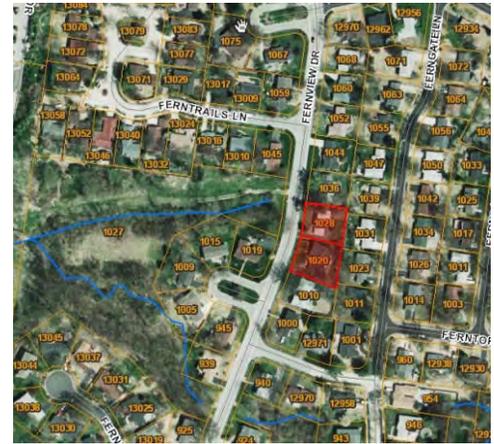


➤ **CC-2 - Fernview Drive #1020, 1028**

**LOCATION:** Fernview Drive is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 5-8 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Yard erosion observed in backyard of lot 1020 and 1028 Fernview due to runoff from homes behind on Ferngate Lane. Resident at lot 1028 has placed rocks along drainage path in an attempt to divert flow.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	2	20
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Construct grass swale using turf reinforcement mat.

**COST ESTIMATE:** \$39,000

**ALTERNATE SOLUTION:** Construct a new storm system in place of the existing grass swale to collect surface runoff and connect to existing storm sewer. The system would include 1 area inlet and 180' of 12" RCP.

**COST ESTIMATE:** \$52,000



➤ **CC-3 - Fernway Lane #928**

**LOCATION:** Fernway Lane is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 3-2 (1999 Master Plan)

**PROBLEM DESCRIPTION:** The original problem had two addresses affected. Per phone discussion with home owner at 952 Fernway Lane, yard has been regraded and an area inlet has been constructed to prevent ponding. Ponding still occurs at bottom of hillside of lot 928. Runoff is contributed from properties to the east. There is an area inlet located in backyard, but is not functioning properly because the sides of inlet have become backfilled. Home owner explained that water ponds in backyard and threatens patio.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
Infrequent Structural Flooding-miscellaneous structure-patio	7	Field Investigation	1	7
			<b>TOTAL</b>	<b>17</b>

**PREFERRED SOLUTION:** Clear openings of inlet and regrade backyard to allow runoff to be collected at area inlet.

**COST ESTIMATE:** \$63,000

**ALTERNATE SOLUTION:** Construct a double area inlet in place of existing inlet. Regrade yard as required.

**COST ESTIMATE:** \$68,000

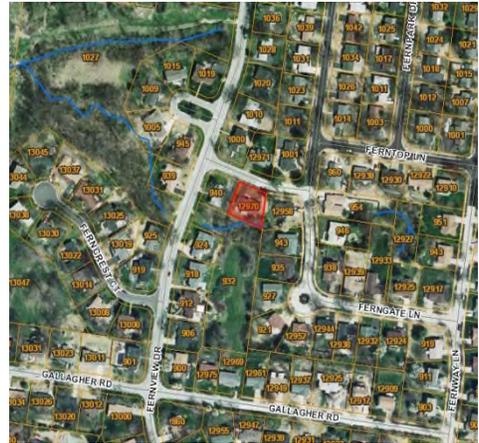


➤ **CC-4 - Ferntop Lane #12970**

**LOCATION:** Ferntop Lane is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 13 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Creek erosion observed behind backyard. The most noticeable signs of erosion are along banks on south side. Creek banks are relatively shallow and are susceptible to flooding. There is fair amount of vegetation along creek. Pockets of standing water were present.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
<b>TOTAL</b>				<b>20</b>

**PREFERRED SOLUTION:** Place rip rap along channel to prevent further erosion. Build up creek banks to mitigate flooding.

**COST ESTIMATE: \$71,000**

**ALTERNATE SOLUTION:** Provide a MSD creek biostabilization method consisting of a soil blanket and plantings. Build up creek banks to mitigate flooding.

**COST ESTIMATE: \$61,000**



➤ **CC-5 - Fernway Lane #12921**

**LOCATION:** Fernway Lane is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 14 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Existing swale has been disturbed. Runoff from upstream is rotting away wood retaining wall. Backyard has potential areas to pond if runoff flows over or through wall. There is an area inlet as well as curb along parking lot behind home which appears to control runoff.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Reconstruct swale to existing condition by regrading yard. Resident’s retaining wall will need to be removed.

**COST ESTIMATE: \$45,000**

**ALTERNATE SOLUTION:** Construct a new storm system to collect surface runoff and connect to existing system. The system would include 1 area inlet and 160’ of 12” RCP. Resident’s retaining wall will need to be removed.

**COST ESTIMATE: \$63,000**



➤ **SC-1 - Chasselle Lane # 1,3,5 and Chamblee Lane #9,13,15,25**

**LOCATION:** Chasselle and Chamblee are residential streets west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 13-9 (1999 Master Plan) / 5, 6, 8 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Severe creek erosion observed. There were several fallen tree limbs and trunks. Utility poles are threatened. Creek has been rehabbed with gabion walls and rip rap at erosion locations. However, many areas along the creek remain affected by localized erosion. Backyards along creek have been disturbed by construction activity of a new sanitary sewer line so it was difficult to find evidence of flooding by field observation. Resident at 1 Chasselle has not experienced any issues within last few years, but no changes were made since the widespread flooding of August 1996. All homes along creek, with exception of lot 1, are distant from creek.



**PREFERRED SOLUTION (Erosion):** Place rip rap at locations along creek affected by erosion.

**PREFERRED SOLUTION\* (Flooding):** Construct an earth berm to mitigate flooding issues.

\* Chamblee Ct. Flooding along Smith Creek has no “preferred solution” *per se*.

The solutions examined in the MSD Stormwater System Master Improvement Plan for Creve Coeur Watershed included methods to prevent flooding by increasing stream capacity, and were projected to cost over \$3.4 M, and to floodproof individual homes at a combined cost of approximately \$335K at the time of the Master Plan (ca 1998). The creek improvements would require additional improvements to the Mason Road bridge, which belongs to St. Louis County (and as of 2012 is still only in the planning stages). Individual home floodproofing would have significant effects on aesthetics and accessibility for the homeowners.

In the summer of 1999, the City staff and the Stormwater Committee were asked to look into possible solutions to flooding of homes between Chamblee Lane and Smith Creek.

An alternate was considered by the committee, that of a berm constructed to serve as a levee to protect these homes from up to a 100-year flood. The berm would vary from one foot to three feet high, with the greatest portion about 18 inches high. This height would match the 100-year flood elevation but without freeboard; therefore the nominal level of protection would be approximately 50-year flood frequency. The earth berm would be sloped at a maximum of 3:1 (horizontal to vertical), and have approximately a four-foot wide top. This would require a total width of 10 to 22 feet wide, and would be grass covered or planted with shrubs. A variation using a low floodwall would require very little width, constructed much the same as a concrete retaining wall, and could be faced with brick or other material for aesthetics. Cost for a 4-foot wall (without allowance for facing) would range from \$100 to \$200 per lineal foot.

Stormwater inlets and drainpipes would be required to collect rainfall on the protected yards and convey it under the berm or wall, into the creek, using one-way valves to prevent high water in the creek from flowing backwards into the yards.

An on-site meeting was held in September 1st with homeowners in the affected area, to describe the above approach to flood prevention and get their impressions, objections and opinions. In general the response was favorable. Some homeowners wanted to know if the proposal would work without 100% participation. The answer is that while it could be made to work, it would be more expensive on a per-house basis, and it might be impractical for houses at certain locations. There were concerns with aesthetics, and the amount of space that would either be lost to or hidden by the berm. They wanted see the actual location of the berm to have a better idea of its effects on their property.

At the subsequent stormwater committee meeting it was decided to conduct a preliminary investigation of the berm alignment and design. The city engaged a firm to perform an on-ground elevation survey which would locate and mark (flag in field) the floodway, ground and house elevations, and the proposed location, height and width of the berm (or where a berm would exceed 3' high also show an alternate floodwall for planning purposes.

Another meeting was held with residents after the survey and field layout was completed. After seeing the height and width of the proposed facility in place, residents decided that they did not want it in their yards, and the issue was not advanced any further. It is unlikely that the flood protection will be pursued again.

*Floodproofing of the individual homes is doable and could prevent a repeat of the damage incurred in 1996. The issue that remains is determination of what, if any, degree of participation there would be from the city. There is a logical reluctance to spend public funds on private property. However if the city does at times pay for channel and bank protection with the acknowledgment that such projects serve primarily to protect homes from flooding, then it maybe be to the city's fiscal advantage to participate in individual floodproofing at far less cost than expensive channel improvements. Unlike channel and bank improvements that require easements and 100% participation by property owners, individual owners could opt-in or –out of such a program.*

Refer to Appendix B for past references in regards to this problem area.

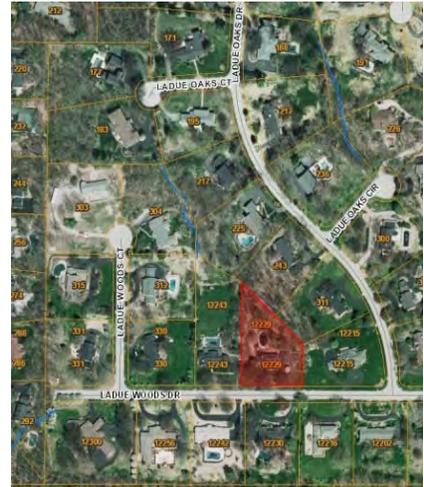


➤ **SC-2 - Ladue Woods Drive #12229**

**LOCATION:** Ladue Woods is a residential street west of Interstate 270 between Ladue and Interstate 64/40.

**ORIGINAL ID:** 5-7 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Runoff from homes on Ladue Oaks Drive causing yard erosion in backyard. Original swale has been disturbed by subsequent development. Silt fence and undersized drain has been installed. Home owner experiences no flooding into house, however driveway has been replaced to due runoff damage.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
Infrequent Structural Flooding-miscellaneous structures (pool)	7	Field Investigation	1	7
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>27</b>

**PREFERRED SOLUTION:** Construct a new storm system to collect surface runoff and connect to existing storm sewer. The system would include 1 area inlet, 230' of 12" RCP, and 135' of 15" RCP.

**COST ESTIMATE: \$87,000**

**ALTERNATE SOLUTION:** Reestablish existing grass swale to intercept runoff and route to curb at Ladue Woods Drive. Install turf reinforcement mat to prevent erosion and regrade yard as needed.

**COST ESTIMATE: \$59,000**



➤ **SC-3 - Royal Manor #12554**

**LOCATION:** Royal Manor is a residential street west of Interstate 270 between Ladue and Interstate 64/40.

**ORIGINAL ID:** 4-4 (1999 Master Plan)

**PROBLEM DESCRIPTION:** The original problem had two addresses affected. Per observation and discussion with home owner at 12553 Royal Manor Drive, creek has been rehabbed with rip rap and vegetation. Area is well maintained. Creek located along east side of lot 12554 has erosion at banks. Resident’s yard is being loss. Honeysuckle is prevalent along creek banks.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Provide a MSD creek biostabilization method consisting of a soil blanket and plantings at 12554 Royal Manor. Clear all honeysuckle.

**COST ESTIMATE: \$45,000**

**ALTERNATE SOLUTION:** Construct rip rap along creek bank to prevent further erosion. Clear all honeysuckle.

**COST ESTIMATE: \$43,000**

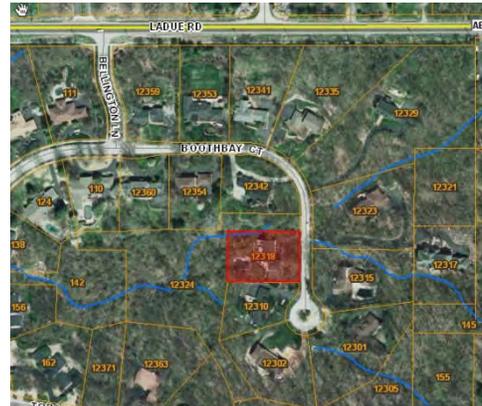


➤ **SC-4 - Booth Bay Lane #12318**

**LOCATION:** Booth Bay is a residential street west of Interstate 270 between Ladue and Interstate 64/40.

**ORIGINAL ID:** 4-5 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Creek erosion at discharge of 18" RCP. There is a small section of concrete flume downstream of discharge pipe, however it only extends approximately 25'.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
<b>TOTAL</b>			<b>10</b>	<b>10</b>

**PREFERRED SOLUTION:** Construct vegetated gabions to prevent further erosion.

**COST ESTIMATE:** \$104,000

**ALTERNATE SOLUTION:** Provide a MSD creek biostabilization method consisting of a soil blanket and plantings.

**COST ESTIMATE:** \$33,000

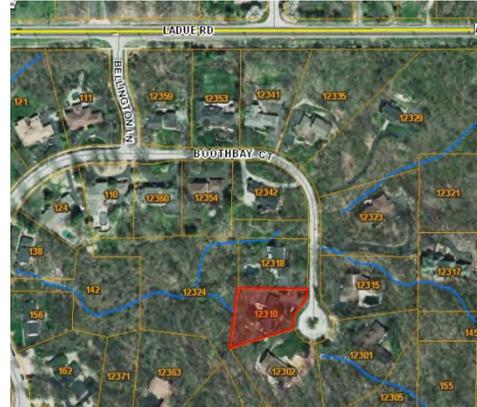


➤ **SC-5 - Booth Bay Lane #12310**

**LOCATION:** Booth Bay is a residential street west of Interstate 270 between Ladue and Interstate 64/40.

**ORIGINAL ID:** 4-5 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Gully erosion present in backyard. Resident reported that he has seen storm manhole lid (MSD 1804-074D) blown off. Resident also reported that street flooding occurs in culdesac.



➤ **SC-6 - Chamblee Lane #606, 622**

**LOCATION:** Chamblee Lane is a residential street west of Interstate 270 between Ladue and Olive.

**ORIGINAL ID:** 4-10 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Creek erosion observed in backyards of Chamblee Lane. Tree limbs and trunks have been exposed. Resident’s homes are greater than 100’ from creek.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	2	20
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Construct vegetated gabions to stabilize the creek banks and prevent further erosion.

**COST ESTIMATE: \$265,000**

**ALTERNATE SOLUTION:** Regrade creek bank and provide a MSD creek biostabilization method consisting of a soil blanket and plantings.

**COST ESTIMATE: \$143,000**

\*These solutions are spot repairs. It is suggested that a watershed wide approach be taken to address the issues, however this is beyond the scope of work.

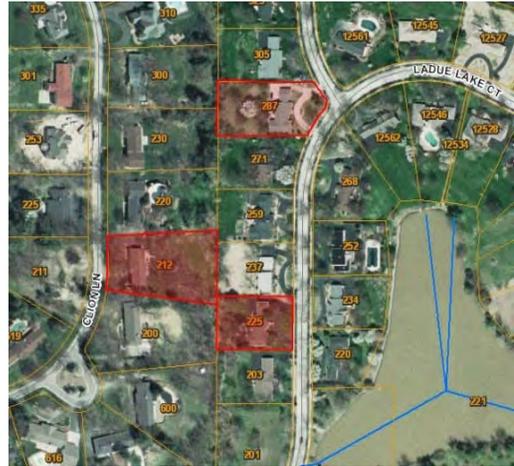


➤ **SC-7 - Clion Lane #212 & Ladue Lake Drive #225, 287**

**LOCATION:** Clion and Ladue Lake are residential streets west of Interstate 270 between Ladue and Olive.

**ORIGINAL ID:** 4-10 (1999 Master Plan) / 19 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Gully erosion observed along grass swale in backyards of 212 Clion and 225, 287 Ladue Lake. Resident of 287 Ladue Lake explained that water runs like a creek through backyard and will pond in spots.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	3	30
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>40</b>

**PREFERRED SOLUTION:** Improve existing swale using turf reinforcement mat. At 287 Ladue Lake, regrade yard and plant vegetation to prevent ponding.

**COST ESTIMATE: \$58,000**

**ALTERNATE SOLUTION:** Construct a new storm system in place of the existing grass swale to collect surface runoff and discharge to nearby creek. The system would include 3 area inlets, 390' of 15" RCP, and 600' of 18" RCP.

**COST ESTIMATE: \$208,000**



➤ **SC-8 - Laduemont Drive #240**

**LOCATION:** Laduemont Drive is a residential street west of Interstate 270 between Ladue and Interstate 64/40.

**ORIGINAL ID:** 4-11 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Severe erosion at creek located in north section of backyard. A storm pipe discharges at this location, forming the start of creek. Although a part resident’s backyard is being eroded, there is no threat to home or pool.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Place rip rap at end of discharge pipe and along drainage path.

**COST ESTIMATE:** \$40,000

**ALTERNATE SOLUTION:** Construct reno mattress at end of discharge pipe and extend along drainage path.

**COST ESTIMATE:** \$41,000

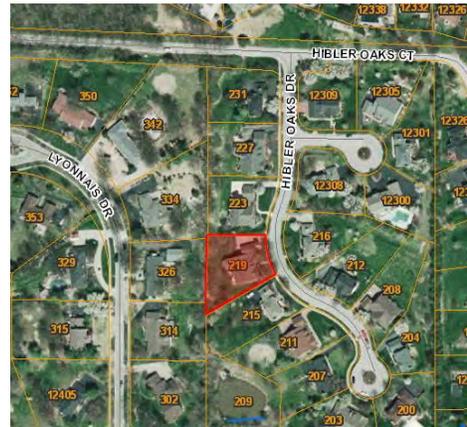


➤ **SC-9 - Hibler Oaks #219**

**LOCATION:** Hibler Oaks is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 2-1 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Minor erosion observed in backyard. Tree roots have been exposed from erosion. Tributary area upstream has steep slopes. Yard has been recently seeded along drainage path.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Construct an area inlet at the property line of 219 and 223 Hibler Oaks to intercept runoff. The area inlet would then be connected to the existing MSD inlet using 190' of 15" RCP.

**COST ESTIMATE: \$58,000**

**ALTERNATE SOLUTION:** Reconstruct grass swale using a turf reinforced mat.

**COST ESTIMATE: \$44,000**



➤ **SC-10 - Balcon Estates #24,26**

**LOCATION:** Balcon Estates is a residential street west of Interstate 270 between Ladue and Interstate 64/40.

**ORIGINAL ID:** 3, 4 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** 24 Balcon Estates- There is severe creek erosion at banks. Erosion is threatening yard, but not house. There is a gabion wall downstream of bridge which appears to have been washed away. There is no erosion protection available at banks.



26 Balcon Estates- Gabion wall has been installed along creek banks. There is an upstream section of creek with no gabion walls. This section has heavy erosion and trees uprooted. In backyard, runoff collects from hillside and ponding occurs. Resident has built temporary ditch to collect this runoff and convey to creek. Resident explained that creek reaches high water levels causing flooding of bridge and property. History and more info on issues are available from home owner.

**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	2	20
Frequent Roadway Flooding-residential street	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
<b>TOTAL</b>				<b>40</b>

**PREFERRED SOLUTION:** Construct vegetated gabion walls upstream and downstream of existing gabion walls where erosion occurs. Construct swale with French drain to collect runoff in backyard and route to creek.

**COST ESTIMATE: \$123,000**

**ALTERNATE SOLUTION:** It is recommended to conduct a watershed analysis to better understand flow rates and volumes passing through creek.

\*These solutions are spot repairs and do not resolve creek flooding. It is suggested that a watershed wide approach be taken to address the issues, however this is beyond the scope of work.



➤ **SC-11 - Dartagnan Court #13200**

**LOCATION:** Dartagnan Court is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** N/A (Added based on discussion with home owner)

**PROBLEM DESCRIPTION:** Per phone discussion with home owner, there is erosion at end of discharge pipe which is located on hillside. Dirt has been washed away from under pipe. Issue has been reported to MSD, but not the City of Creve Coeur



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Place rip rap at end of discharge of pipe and along drainage path.

**COST ESTIMATE: \$42,000**

**ALTERNATE SOLUTION:** Construct reno mattress at end of discharge pipe to allow for dissipation of energy at outlet.

**COST ESTIMATE: \$36,000**

➤ **FC-1 - Fernridge Creek between Dartagnan Court and Bellerive Estates Drive**

**LOCATION:** This reach of Fernridge Creek runs through a residential area near Ambois Drive.



**ORIGINAL ID:** 13-4 (1999 Master Plan) / 1, 15 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Several properties are affected by flooding and erosion along Fernridge Creek. Many homes are located in a 100-year flood plain. Mild to severe erosion occurs along creek banks.

**PREFERRED SOLUTION (Erosion):** Construct vegetated gabions along the property banks affected by erosion.

**PREFERRED SOLUTION\* (Flooding):**

\* Fernridge Creek Flooding along Ambois Drive has no “preferred solution” *per se*.

A storm event that occurred in that location on August 23<sup>rd</sup>, 1996 flooded approximately 34 homes. The actual flooding was caused by a combination of circumstances. Following the entry of surface floodwater through basement windows and flooding basements (many of which were finished as recreation rooms etc.) the water in those basements with depths of up to 6’ entered floor drains and laundry drains, pressurizing the sanitary trunk and emerging into basements of homes that did not have openings below the floodwater elevation. In addition to the water entering the trunk sewer in that way, much apparently infiltrated through cracks or bad joints in the aging trunk sewer. In the years subsequent to the flood, MSD replaced the trunk sewer; that has likely reduced the chances of infiltration but there remains the issue of surface flooding. The “footprint” of the flood very closely followed the floodplain that is depicted on the effective Flood Insurance Rate Map (FIRM) for the area.

The solutions examined in the MSD Stormwater System Master Improvement Plan (SSMIP) for Creve Coeur Watershed included methods to prevent flooding by increasing stream capacity and to construct a major detention basin at the northwest quadrant of Mason Road and Mason Manor Drive. The costs of the proposed solutions were respectively estimated at that time (ca 1998) as \$4,611,000 and \$1,614,000. Additional studies as found in Appendix C were performed for the City of Creve Coeur following the SSMIP, but in all cases the remedies are extremely expensive.

While the cost to reduce the flood elevation is likely to remain prohibitive, floodproofing individual homes remains a alternative that may be viable.

*Floodproofing of the individual homes is doable and could prevent a repeat of the damage incurred in 1996. The issue that remains is determination of what, if any, degree of participation there would be from the city. There is a logical reluctance to spend public funds on private property. However if the city does at times pay for channel and bank protection with the acknowledgment that such projects serve primarily to protect homes from flooding, then it maybe be to the city's fiscal advantage to participate in individual floodproofing at far less cost than expensive channel improvements. Unlike channel and bank improvements that require easements and 100% participation by property owners, individual owners could opt-in or –out of such a program.*

Refer to Appendix C for past references in regards to this problem area.

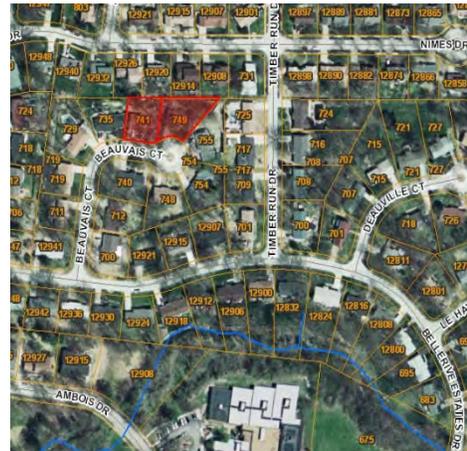


➤ **FC-2 - Beauvais Court #741, 749**

**LOCATION:** Beauvais Court is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 13-1 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Original problem had five addresses affected. Per discussion and observation, Lot 735 has a new swale and area inlet constructed to collect runoff. Lot 712 and 729 have no current stormwater issue per discussion with home owners. Runoff from Nimes Drive is flooding and eroding backyards of 741 and 749. Lot 741 has greatest concern due to flooding endangering house.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	2	20
Frequent Structural Flooding-yard flooding	10	Field Investigation	2	20
Infrequent Structural Flooding-habitable first floor	45	Field Investigation	1	45
			<b>TOTAL</b>	<b>85</b>

**PREFERRED SOLUTION:** Construct a berm and area inlet to collect runoff and connect to nearby storm sewer with 200’ of 12” RCP. Restore existing landscaping.

**COST ESTIMATE: \$80,000**

**ALTERNATE SOLUTION:** Construct a berm and swale to collect runoff and route to nearby storm sewer. Restore existing landscaping.

**COST ESTIMATE: \$55,000**

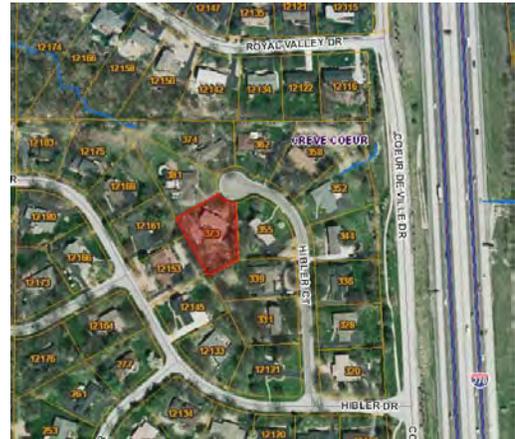


➤ **FC-3 - Hibler Court #373**

**LOCATION:** Hibler Court is a residential street west of Interstate 270 between Ladue and Olive.

**ORIGINAL ID:** 3-10 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Concrete flume does not properly control runoff from neighboring subdivision. Flume was clogged with leaves. Home owner has placed rocks on side of flume as a barrier when water exceeds flume. Filter fabric placed in corner of yard to prevent further washout of yard.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
<b>TOTAL</b>				<b>20</b>

**PREFERRED SOLUTION:** Construct an area inlet near the beginning of each concrete flume to reduce the flow in each flume. A berm would be constructed around inlet to contain runoff to either inlet or flume.

**COST ESTIMATE: \$51,000**

**ALTERNATE SOLUTION:** Construct a berm along entire concrete flume to control runoff.

**COST ESTIMATE: \$44,000**

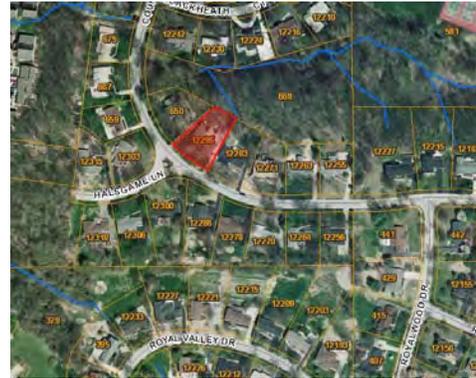


➤ **FC-4 - Country Manor Lane #12295**

**LOCATION:** Country Manor Lane is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 11 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Significant erosion at end of discharge pipe. Resident has placed rocks and leaves in an attempt to mitigate issue. Erosion threatens nearby utility pole.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Construct reno mattress at end of discharge pipe to allow for dissipation of energy at outlet. Place heavy revetment at base of utility pole for protection.

**COST ESTIMATE: \$49,000**

**ALTERNATE SOLUTION:** Place rip rap at end of discharge of pipe and along drainage path. Place heavy revetment at base of utility pole for protection.

**COST ESTIMATE: \$42,000**



➤ **FC-5 - Halsgame Lane #12318**

**LOCATION:** Halsgame Lane is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 17 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Minimal erosion observed along backyard fence line. Site was mostly covered in leaves and debris. Most noticeable yard erosion was evident in southwest corner of yard. Erosion does not threaten house or any structure.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Reconstruct grass swale with turf reinforcement mat and route to creek.

**COST ESTIMATE: \$42,000**

**ALTERNATE SOLUTION:** Construct a new storm system to collect surface runoff and discharge to nearby creek. The system would include 1 area inlet and 260' of 18" RCP.

**COST ESTIMATE: \$75,000**



➤ **FC-6 - Royal Valley Drive #12121, 12135**

**LOCATION:** Royal Valley is a residential street west of Interstate 270 between Olive and Ladue.

**ORIGINAL ID:** 26 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Rill erosion observed in backyard of 12121 Royal Valley. Yard has eroded most near fence line on west side of property. Surrounding tributary area appears relatively flat. Resident has placed railroad ties to mitigate erosion. Backyard of lot 12135 has also been affected by runoff causing yard damage.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	2	20
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Reconstruct grass swale with turf reinforcement mat to prevent erosion.

**COST ESTIMATE: \$47,000**

**ALTERNATE SOLUTION:** Construct a new storm system to collect surface runoff and connect to existing storm sewer. The system would include 3 area inlets and 520' of 12" RCP.

**COST ESTIMATE: \$117,000**



➤ **DC-1 - Tarrytown Drive #11732, 11700**

**LOCATION:** Tarrytown is a residential street east of New Ballas Road between Ladue and Interstate 64/40.

**ORIGINAL ID:** 4-8 (1999 Master Plan) / 29 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Original problem had three addresses affected. Per discussion and observation at 11600 Lakeshore Drive, no stormwater issue present. Evidence of severe creek erosion behind backyard fence of 11732 Tarrytown. Tree branches and other yard waste have been placed on the banks to prevent further creek erosion. Flooding appears to be main concern at 11700 Tarrytown. Resident explained that creek floods upstream and downstream of culvert. Water ponds causing a potential health issue. Resident has planted vegetation in an attempt to mitigate issue.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	2	20
Frequent Structural Flooding-yard flooding	10	Field Investigation	2	20
<b>TOTAL</b>				<b>40</b>

**PREFERRED SOLUTION:** Clear downstream area of culvert located at 11700 Tarrytown. Regrade creek bottom to ensure adequate slope. Construct heavy revetment 20’ upstream and downstream of culvert. Provide a MSD creek biostabilization method consisting of a soil blanket and plantings at 11732 Tarrytown.

**COST ESTIMATE: \$56,000**

**ALTERNATE SOLUTION:** It is recommended to conduct a watershed analysis to better understand flow rates and volumes passing through creek.

\*These solutions are spot repairs. It is suggested that a watershed wide approach be taken to address the issues, however this is beyond the scope of work.



➤ **DC-2 - Fairways Circle #631, 647**

**LOCATION:** Fairways Circle is a residential street east of New Ballas Road between Olive and Ladue.

**ORIGINAL ID:** 3-7 (1999 Master Plan)

**PROBLEM DESCRIPTION:** The original problem had three addresses affected. Per discussion and observation of 639 Fairways Circle, a French drain has been installed in backyard to mitigate runoff. Issues still present at 631 and 647 Fairways Circle. Runoff from hillside behind commercial properties drains to backyards where it ponds and causes yard erosion. Hillside has steep slope. Embankment at top of hill controls runoff from parking lot. Home owner at lot 647 explained that backyard runs full of water during a storm event, but has not experienced house flooding. Home owner of lot 631 has placed rock along drainage path to mitigate erosion damage.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	2	20
Frequent Structural Flooding-yard flooding	10	Field Investigation	2	20
			<b>TOTAL</b>	<b>40</b>

**PREFERRED SOLUTION:** Construct an area inlet in the backyard of both lot 631 and 647. The area inlets would be routed to the existing curb inlet located at lot 631. Pipe required includes 250' of 12" RCP and 130' of 15" RCP. An additional manhole may be required between the two inlets to avoid an in ground pool.

**COST ESTIMATE: \$92,000**

**ALTERNATE SOLUTION:** Construct an area inlet in the backyard of both lot 631 and 647 that are not interconnected. Each area inlet would be connected to the existing storm sewer located along Fairways Circle. System would include 2 area inlets, 260' of 12" RCP, and possible addition of a new curb inlet.



**COST ESTIMATE: \$71,000**

➤ **DC-3 - Villa Coublay Drive #60**

**LOCATION:** Villa Coublay Drive is a residential street west of Spoeede Road between Ladue and Interstate 64/40.

**ORIGINAL ID:** 2-4 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Significant creek erosion observed along old railroad right-of-way. Backyard surface elevation of lot 60 is approximately 25' above the creek.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

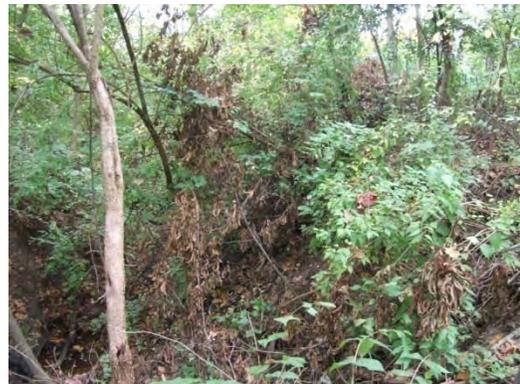
**PREFERRED SOLUTION:** Construct vegetated gabions to stabilize the tall, steep banks and prevent further erosion.

**COST ESTIMATE: \$491,000**

**ALTERNATE SOLUTION:** Regrade creek bank and provide a MSD creek biostabilization method consisting of a soil blanket and plantings.

**COST ESTIMATE: \$267,000**

\*These solutions are spot repairs. It is suggested that a watershed wide approach be taken to address the issues, however this is beyond the scope of work.



➤ **DC-4 - Fairways Circle #527**

**LOCATION:** Fairways Circle is a residential street east of New Ballas between Olive and Ladue.

**ORIGINAL ID:** 2-5 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Erosion has occurred at top of bank from runoff from backyard. The eroded surface has been filled in with yard clippings. Creek along golf course discharges along side of headwall causing erosion. Stagnant water is present at headwall discharge. No evidence of damage to home owner’s yard.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
<b>TOTAL</b>			<b>10</b>	<b>10</b>

**PREFERRED SOLUTION:** Provide a MSD creek biostabilization method consisting of a soil blanket and plantings.

**COST ESTIMATE: \$32,000**

**ALTERNATE SOLUTION:** Construct a berm along the top of the bank to divert runoff to a new area inlet. Construct 60’ of 12” RCP to then convey water to creek.

**COST ESTIMATE: \$39,000**



➤ **DC-5 - Ladue Estates Drive #5**

**LOCATION:** Ladue Estates is a residential street west of Spoeede Road between Ladue Road and Interstate 64/40.

**ORIGINAL ID:** 1-6 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Minor erosion observed along backyard near landscaping. Landscaping does not appear damaged. Home owner has placed yard waste in backyard to possibly alleviate problem. Honeysuckle vegetation is present.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
<b>TOTAL</b>			<b>10</b>	<b>10</b>

**PREFERRED SOLUTION:** Install turf reinforcement mat and restore vegetation along back slope of property.

**COST ESTIMATE: \$28,000**

**ALTERNATE SOLUTION:** Construct a berm along the top of the bank to divert runoff to a new area inlet. Construct 220' of 12" RCP to then convey water to existing curb inlet.

**COST ESTIMATE: \$66,000**

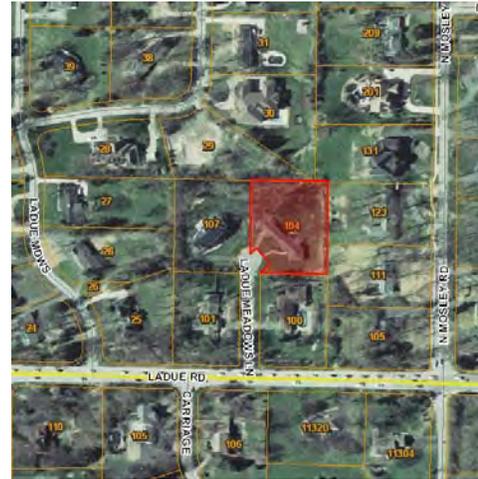


➤ **DC-6 - Ladue Meadows Lane #104**

**LOCATION:** Ladue Meadows Lane is a residential street east of New Ballas between Olive and Ladue.

**ORIGINAL ID:** 20 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Rill erosion observed along west side of property line contributed from runoff of Ladue Meadows. Yard damage observed in backyard, but unable to determine if caused from ponding water. It may be a result from area inlets in backyards of Mosley not being capable of handling flow. Base of MSD inlet at southwest corner of property has eroded.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Construct an area inlet to collect runoff from Ladue Meadows and connect to the existing curb inlet. Piping would include 150' of 12" RCP.

**COST ESTIMATE: \$48,000**

**ALTERNATE SOLUTION:** Reconstruct grass swale using a turf reinforced mat.

**COST ESTIMATE: \$39,000**

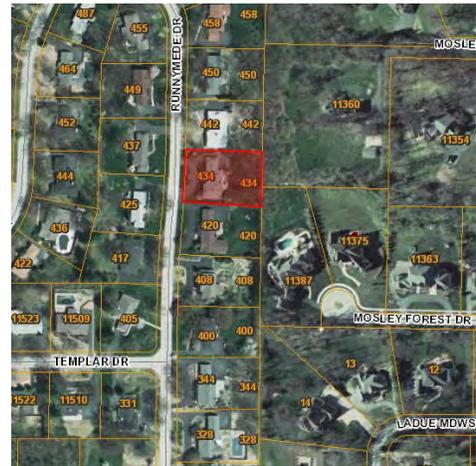


➤ **DC-7 - Runnymede Drive #434**

**LOCATION:** Runnymede Drive is a residential street east of New Ballas between Olive and Ladue.

**ORIGINAL ID:** 27 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Runoff from neighboring subdivision appears to be flowing down south side of property causing minor rill erosion and marshy ground conditions. Home owner has installed a drain to mitigate issue. Ponding may also be possible on north side of property near driveway, although not evident during site visit.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Structural Flooding-yard flooding	10	Field Investigation	2	20
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Construct 2 area inlets in the backyard of lot 434. The area inlets would be routed to the existing storm inlet. Pipe required includes 300’ of 12” RCP.

**COST ESTIMATE: \$74,000**

**ALTERNATE SOLUTION:** Regrade backyard and construct a swale to convey runoff to street. Plant vegetation in and around swale to reduce potential for ponding.

**COST ESTIMATE: \$49,000**



➤ **WC-1 - Mosely Acres Drive #10, 11, 12**

**LOCATION:** Mosely Acres is a residential street east of Mosley between Olive and Ladue.

**ORIGINAL ID:** 7-1 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Overtopping of dam causing flooding at lot 10. Spillway (overflow) of dam is covered with debris and vegetation. Earth dam on east side of Mosley Lake covered in vegetation. Shore erosion along south side of lake.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	2	20
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>30</b>

**PREFERRED SOLUTION:** Clear spillway area of debris and vegetation to allow overflow to function properly. Raise dam embankment to prevent flooding. Place rip rap along areas of dam that have been affected by shore erosion.

**COST ESTIMATE: \$49,000**

**ALTERNATE SOLUTION:** There is no other feasible alternative.



➤ **WC-2 - Graeser Lane #11076**

**LOCATION:** Graeser Lane is a residential street west of Spoede between Olive and Ladue.

**ORIGINAL ID:** 16 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Flooding occurs in front yard, despite the rip rap channel that exists, intended to collect flow. Water has entered through home's foundation according to resident. Resident explained that newly remodeled homes on Graeser Lane have created additional runoff. Resident has installed drain in sidewalk as well as French drain around front of house.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
<b>TOTAL</b>			<b>10</b>	<b>10</b>

**PREFERRED SOLUTION:** Construct a new curb along resident's property to contain street runoff. Portion of street may need to be replaced to allow runoff to discharge through rip rap channel.

**COST ESTIMATE: \$61,000**

**ALTERNATE SOLUTION:** Install a trench grate in street to collect runoff. The trench grate would be routed to the nearby rip rap channel.

**COST ESTIMATE: \$49,000**



➤ **WC-3 - Mosley Acres #16**

**LOCATION:** Mosley Acres is a residential street east of Mosley Road between Olive and Ladue.

**ORIGINAL ID:** 23 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Mosley Acres has been resurfaced (asphalted) causing the curb and gutter not to function properly. Minor erosion damage observed 1'-2' next to street curb. Resident has seeded area. Other properties along Mosley Acres have similar problem.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	3	30
<b>TOTAL</b>			<b>30</b>	<b>30</b>

**PREFERRED SOLUTION:** Remove and replace approximately 400' of curb and gutter. Seed resident's yards that have been damaged by erosion.

**COST ESTIMATE:** \$53,000

**ALTERNATE SOLUTION:** There is no other feasible alternative.



➤ **WC-4 - Mystic Meadows Lane #121**

**LOCATION:** Mystic Meadows is a residential street east of Mosley between Olive and Ladue.

**ORIGINAL ID:** 24 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Erosion observed along south and north property line (with most severe along south side). Evidence of ponding on south side. Home owner has constructed a berm to control water. Gully erosion at upstream side of property. Home owner has built a wall along driveway to prevent water from flowing onto driveway. A drain has also been installed in attempt to collect a portion of runoff, however, it is undersized. Priority shall be given to the south side of property.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Moderate Risk Structural Erosion-miscellaneous structures	25	Field Investigation	1	25
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
<b>TOTAL</b>				<b>35</b>

**PREFERRED SOLUTION:** Construct two area inlets in the backyard to collect runoff from adjacent properties. Each area inlet would be routed to the existing storm sewer. The system would include two area inlets and approximately 500' of 15" RCP.

**COST ESTIMATE: \$136,000**

**ALTERNATE SOLUTION:** Construct two grass swales to intercept runoff from the north and south side of property and discharge to street of Mystic Meadows.

**COST ESTIMATE: \$74,000**



➤ **WC-5 - Tureen Drive #11205**

**LOCATION:** Tureen Drive is a residential street east of Mosley Road between Olive and Ladue.

**ORIGINAL ID:** 30 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Backyard has slight erosion. The site had been disturbed by recent construction of a new retaining wall and was difficult to assess erosion conditions in backyard. Erosion observed at base of MSD area inlet. Resident explained that erosion in backyard has been worse in years past. Resident also explained that a sink hole is present in backyard along berm. Additional photos and history of the issues are available from home owner if needed.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Reconstruct natural swale to convey overland flow to area inlet. Install turf reinforcement mat along swale to prevent erosion. Further investigation is needed to verify if a sink hole exists.

**COST ESTIMATE: \$45,000**

**ALTERNATE SOLUTION:** Create a natural stream/pool environment in place of existing storm system and swale. However, this alternative was deemed uneconomical.



➤ **WC-6 - Wedgewood Lane #6, 7**

**LOCATION:** Wedgewood Lane is a residential street west of Spoede between Olive and Ladue.

**ORIGINAL ID:** 31, 32 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Per discussion with home owner of 6 Wedgewood, runoff from new homes on Deaver and Colonial Hills Parkway is adversely flooding backyard of 6 and 7 Wedgewood after every rain event. Water ponds for several days before draining. Resident explained that water has never entered home, but could if his French drain system ever clogged. Resident also explained that slight erosion occurs on the hillside of backyard.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Structural Flooding-yard flooding	10	Field Investigation	2	20
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>30</b>

**PREFERRED SOLUTION:** Construct a new storm system to collect surface runoff and discharge to the existing storm system. The system would include 2 area inlets, 1 manhole, 170' of 12" RCP, and 170' of 15" RCP.

**COST ESTIMATE: \$96,000**

**ALTERNATE SOLUTION:** Construct a grass swale with turf reinforcement mat and route to street curb of Wedgewood.

**COST ESTIMATE: \$54,000**



➤ **WC-7 - Windrush Creek East #6**

**LOCATION:** Windrush Creek East is a residential street west of Spoede between Olive and Ladue.

**ORIGINAL ID:** 33 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Severe channel erosion observed in front yard. Resident explained that second pipe culvert was added after new home construction was completed upstream of creek. To relieve street flooding, new curb inlets have been constructed. This contributed additional flow to channel. Resident explained that creek has reached water levels up to top of bank. Erosion was visible on north side of headwall.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Improve existing swale by increasing width and installing turf reinforcement mat. Remove the existing two pipe culverts and replace with one box culvert.

**COST ESTIMATE: \$114,000**

**ALTERNATE SOLUTION:** Construct two parallel 24" RCP pipes to replace the existing open channel. Remove and replace the existing culverts and regrade yard as needed.

**COST ESTIMATE: \$100,000**



➤ **WC-8 - Ladue Estates Drive #71, 73**

**LOCATION:** Ladue Estates Drive is a residential street west of Spodee between Ladue and Interstate 64/40.

**ORIGINAL ID:** 18 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Backyard between lot 71 and 73 was soggy during site visit. No erosion was observed. Resident of lot 71 explained that water runs through backyards and certain areas pond due to insufficient slope of land. At times, runoff diverts from backyard path and drains between the houses. Resident of lot 73 placed rock landscaping around trees as a possible measure to protect trees from flooding.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Structural Flooding-yard flooding	10	Field Investigation	2	20
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Regrade backyards to provide adequate slope for drainage. Seed lawns after grading is complete.

**COST ESTIMATE: \$52,000**

**ALTERNATE SOLUTION:** Construct a storm sewer system to collect runoff and route to existing storm inlet. The system would include 2 area inlets and 300' of 12" RCP.

**COST ESTIMATE: \$74,000**

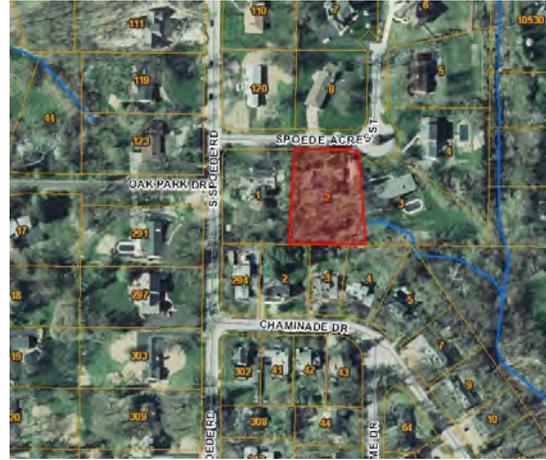


➤ **MS-1 - Spoede Acres Street #2**

**LOCATION:** Spoede Acres is a residential street east of Spoede between Ladue and Interstate 64/40.

**ORIGINAL ID:** 4-6 (1999 Master Plan) / 28 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Yard on west side of lot 2 has been damaged from runoff. Backyard has been eroded from runoff from adjacent yards. An area inlet exists in backyard, but runoff does not drain properly according to resident. Backyard of lot 1 has same issue in which runoff drains into yard.



Home owner has installed a drain to alleviate problem. Lot 3 has no evidence of erosion issues in backyard.

**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Reconstruct natural swale to convey overland flow to area inlet. Install reinforcement mat along swale to prevent erosion. To mitigate erosion on west side of property, construct a curb along Spoede Acres to contain street runoff.

**COST ESTIMATE: \$67,000**

**ALTERNATE SOLUTION:** Create a natural stream/pool environment in place of existing storm system and swale. However, this alternative was deemed uneconomical.

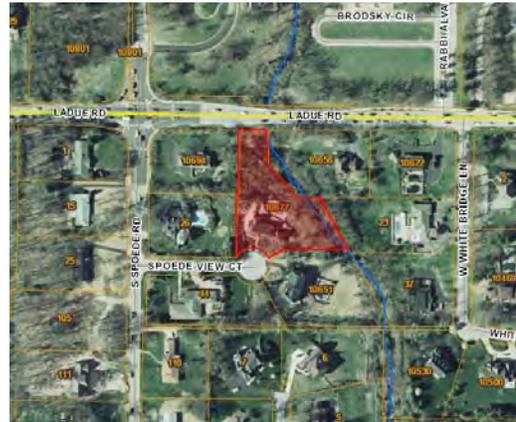


➤ **MS-2 - Spoede View Court #10677**

**LOCATION:** Spoede View Court is a residential street east of Spoede Road between Ladue and Interstate 64/40

**ORIGINAL ID:** 4-7 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Creek erosion evident along banks behind 10677 Spoede View Court. Severe creek erosion was observed along east side of creek, immediately downstream of culvert headwall. Baffle structures exist at culvert discharge.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Construct vegetated gabions to stabilize the creek banks and prevent further erosion. Heavy revetment is recommended on the east side of creek just downstream of culvert.

**COST ESTIMATE: \$214,000**

**ALTERNATE SOLUTION:** Regrade creek bank and provide a MSD creek biostabilization method consisting of a soil blanket and plantings. Heavy revetment is recommended on the east side of creek just downstream of culvert.

**COST ESTIMATE: \$106,000**

\*These solutions are spot repairs. It is suggested that a watershed wide approach be taken to address the issues, however this is beyond the scope of work.



➤ **MS-3 - Country View Drive #10671**

**LOCATION:** Country View Drive is a residential street east of Spode Road between Olive and Ladue.

**ORIGINAL ID:** 3-20 (1999 Master Plan) / 12 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** After discussion with home owner, flooding and ponding occurs in backyard after every rainfall event. There is an insufficient drainage path for runoff from adjacent properties. Home owner installed six drains in an attempt to mitigate problem. Original swale has been disturbed by subsequent development. Swale is no longer functional. Home owner experiences no flooding into house.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Construct grass swale to intercept runoff and discharge to street of Country View Drive.

**COST ESTIMATE: \$47,000**

**ALTERNATE SOLUTION:** Construct a new storm system to convey water directly to creek. The system would consist of an area inlet, manhole, and 525' of 12" RCP.

**COST ESTIMATE: \$115,000**



➤ **MS-4- Oak Park Court #3**

**LOCATION:** Oak Park Court is a residential street west of Spoede Road between Ladue Road and Interstate 64/40.

**ORIGINAL ID:** 1-8 (1999 Master Plan)

**PROBLEM DESCRIPTION:** End of street has potential to flood. Curb and gutter upstream of grate inlet covered with debris and leaves. A non-standard grate inlet was completely covered with debris and leaves when arriving at site. Runoff is collected at bottom of street before it exits through either the inlet or paved flume. The grate inlet discharges to the side of yard #3 before entering nearby creek. Side yard #3 appears to drain properly to creek. Riprap has been placed along drainage path.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Roadway Flooding-traffic obstruction on residential streets	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>10</b>

**PREFERRED SOLUTION:** Construct new curb and gutter. Replace existing grate inlet with a new curb inlet. Construct 90’ of 12” RCP to convey runoff to creek.

**COST ESTIMATE: \$47,000**

**ALTERNATE SOLUTION:** Remove existing grate inlet. Construct grass swale to convey runoff to creek.

**COST ESTIMATE: \$36,000**



➤ **MS-5 - Chaminade Drive #13, 14**

**LOCATION:** Chaminade Drive is a residential street east of Spodee between Ladue and Interstate 64/40.

**ORIGINAL ID:** 7 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** The problem area is located near the pedestrian bridge leading to Chaminade High School. Creek retaining wall upstream of pedestrian bridge has collapsed. Retaining wall downstream of bridge is cracked and eroded at bottom. There is significant creek erosion along upstream and downstream banks. Many tree roots have been exposed. Concrete slabs appear to have been placed under bridge to protect bridge piers.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Moderate Risk Structural Erosion-miscellaneous structures-bridge	25	Field Investigation	1	25
<b>TOTAL</b>				<b>25</b>

**PREFERRED SOLUTION:** Clear and demolish damaged retaining wall. Install rip rap 50' upstream and downstream of bridge.

**COST ESTIMATE: \$63,000**

**ALTERNATE SOLUTION:** Clear and demolish damaged retaining wall. Provide a MSD creek biostabilization method consisting of a soil blanket and plantings 50' upstream and downstream of bridge.

**COST ESTIMATE: \$60,000**

\*These solutions are spot repairs. It is suggested that a watershed wide approach be taken to address the issues, however this is beyond the scope of work.



➤ **MS-6 - Colonial Hills Drive #77**

**LOCATION:** Colonial Hills is a residential street west of Spode between Olive and Ladue.

**ORIGINAL ID:** 9 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Resident’s yard has visible erosion damage. There is gully erosion along west side of property line. Significant channel erosion was observed on downstream side of culvert. Three drainage pipes from neighboring property discharge onto resident’s yard. Marshy and soft ground conditions were present after a week with no rainfall. Location of damage is greater than 100 feet from house.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Construct a pipe system in place of the existing swale. Route the system to a nearby MSD inlet.

**COST ESTIMATE: \$169,000**

**ALTERNATE SOLUTION:** Reconstruct the existing grass swale with a heavy turf reinforcement mat. Plant vegetation in areas susceptible to ponding.

**COST ESTIMATE: \$74,000**



➤ **MS-7 - Larkin Avenue #859**

**LOCATION:** Larkin Avenue is a residential street west of Spoede between Olive and Ladue.

**ORIGINAL ID:** 21 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Yard ponding and erosion. Driveway culvert and existing swale filled with dirt. Loss of capacity causing erosion on south side of property from runoff diverted from swale and culvert.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Improve existing swale adjacent to Larkin Avenue by installing turf reinforcement mat. Remove and replace existing pipe culvert.

**COST ESTIMATE: \$43,000**

**ALTERNATE SOLUTION:** Construct a storm system in place of existing swale. The system would include 3 curb inlets, 400' 12" RCP, and 550' 15" RCP. New curb and gutter would also be constructed to control street runoff.

**COST ESTIMATE: \$350,000**



➤ **MS-8 - Middlebrook Lane #3 - 6**

**LOCATION:** Middlebrook Lane is a residential street east of Spoeche between Olive and Ladue.

**ORIGINAL ID:** 22 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Bank washout was observed on both upstream and downstream of culvert. Street runoff from Middlebrook Lane has washed away dirt around culvert, exposing tree roots. North side of culvert was full of debris and tree limbs. Rip rap has been placed near street to prevent further erosion.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
High Risk Roadway Erosion-residential	25	Field Investigation	1	25
			<b>TOTAL</b>	<b>25</b>

**PREFERRED SOLUTION:** Improve upstream and downstream approach by placing rip rap. Place rip rap along street surface as well.

**COST ESTIMATE: \$53,000**

**ALTERNATE SOLUTION:** Improve upstream and downstream approach with a MSD creek biostabilization method consisting of a soil blanket and plantings.

**COST ESTIMATE: \$50,000**



➤ **MS-9 - Rondelay Drive #10835**

**LOCATION:** Rondelay Drive is a residential street west of Spoede between Olive and Ladue.

**ORIGINAL ID:** 25 (2010 Questionnaire)

**PROBLEM DESCRIPTION:** Channel erosion observed upstream of MSD inlet. Home owner explained that runoff from adjacent properties has increased over the years causing erosion damage to yard. Home owner has installed two drains to alleviate flooding from street. Street has been overlaid with asphalt causing runoff to spill over street curb.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
Low Risk Structural Erosion-yard erosion	10	Field Investigation	1	10
Frequent Structural Flooding-yard flooding	10	Field Investigation	1	10
			<b>TOTAL</b>	<b>20</b>

**PREFERRED SOLUTION:** Improve existing swale by installing turf reinforcement mat.

**COST ESTIMATE: \$34,000**

**ALTERNATE SOLUTION:** Construct 2 area inlets upstream of existing MSD inlet to intercept runoff. Connect the 2 new inlets to the existing storm sewer with 200' of 12" RCP.

**COST ESTIMATE: \$70,000**

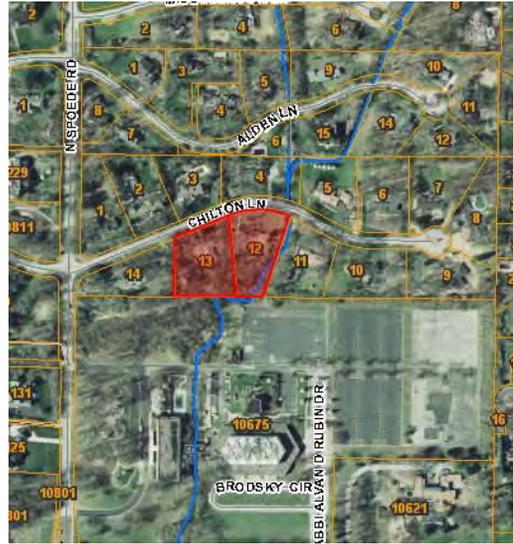


➤ **MS-10 - Chilton Lane #12 - 13**

**LOCATION:** Chilton Lane is a residential street east of Spoede between Olive and Ladue.

**ORIGINAL ID:** N/A (Added based on issue identified in Stormwater Committee Meeting)

**PROBLEM DESCRIPTION:** Erosion at culvert is threatening roadway. Active erosion on south side of Chilton Lane at culvert observed. There are no headwalls. The pipe outlet is damaged. There are several large tree branches/trunks in stream. The pipe appears to be a 24" CMP.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
High Risk Roadway Erosion-residential	25	Field Investigation	1	25
			<b>TOTAL</b>	<b>25</b>

**PREFERRED SOLUTION:** Replace existing culvert with a new 3' x 3' box culvert. Install headwalls and place rip rap 10' upstream and downstream.

**COST ESTIMATE: \$69,000**

**ALTERNATE SOLUTION:** Replace existing culvert with a new 36" CMP. Install headwalls and place rip rap 10' upstream and downstream.

**COST ESTIMATE: \$64,000**



➤ **PC-1 - Tealwood North Drive #47**

**LOCATION:** Tealwood is a residential street in the Tealwood subdivision east of Lindbergh between Ladue and Olive.

**ORIGINAL ID:** 5-4 (1999 Master Plan)

**PROBLEM DESCRIPTION:** Slight erosion at culvert headwall and outlet. Timber bracing on upstream side. Resident says it was put there to help shore-up the headwall. According to resident, there are no flooding problems. Washout on right descending bank (looking downstream) approximately 60' upstream of culvert. Banks generally well-vegetated except for washout area.



**MSD-CREVE COEUR WATERSHED  
PROJECT BENEFIT POINTS – DOCUMENTATION**

Category	Pts.	Documentation	Lots Affected	Points Allotted
High Risk Roadway Erosion-residential	25	Field Investigation	1	25
			<b>TOTAL</b>	<b>25</b>

**PREFERRED SOLUTION:** Replace existing culvert.

**COST ESTIMATE:** \$62,000

**ALTERNATE SOLUTION:** Construct heavy revetment 20' upstream and downstream of culvert to prevent erosion. This solution helps with erosion, but does not improve the structural integrity of the culvert.

**COST ESTIMATE:** \$23,000



## 5.0 PRIORITIZATION

---

Problem areas were further analyzed using a benefit-cost system to determine the cost-effectiveness of each.

### 5.1 Methodology

One of the goals of the City's Stormwater Master Plan update is to evaluate the existing prioritization methodology and to recommend improvements to the system. To determine the best prioritization plan, the City's current prioritization system was compared to other methods being used. In general, most of the methods fell into one of the categories listed below.

- prioritization formula
- value matrix
- benefit vs. cost

In the sections that follow each methodology is described in more detail along with their advantages and disadvantages.

#### 5.1.1 Current Prioritization Method

The City's existing prioritization methodology is a simple numeric rating system using a scale of 13-1 to prioritize stormwater problems. The rankings are based primarily on threats to property or vehicular access. Table 5-1 is the original City prioritization list.

**Table 5-1 - City of Creve Coeur -Original Stormwater Priority Ranking Scale**

Rank	Description
13	Flooding where water enters a habitable building
12	Flooding which causes damage to public or private streets
11	Flooding which causes obstruction of traffic on public streets
10	Flooding where water enters a garage or outbuilding
9	Flooding which causes obstruction of traffic on private streets

**Table 5-1 (cont.) - City of Creve Coeur - Original Stormwater Priority Ranking Scale**

<b>Rank</b>	<b>Description</b>
8	Flooding which causes damage to public or private utilities
7	Stream flow causing significant erosion or sedimentation problems and threatening a habitable building
6	Stream flow causing significant erosion and threatening a garage or outbuilding
5	Stream flow causing significant erosion and threatening a fence, wall or landscaping
4	Stream flow causing significant erosion and threatening a maintained grassed area
3	Flooding or ponding on yards and lots only
2	Stream flow that causes minor erosion or sedimentation problems in maintained areas or appreciable erosion in unmaintained areas, i.e. wooded ravines
1	Minor isolated drainage problems such as clogged or inadequate street inlets

Although this type of scale is the easiest to understand and explain to the public, it does have several drawbacks. For instance this type of ranking does not take into account the number of structures affected nor does it address the costs associated with resolving the problem. Furthermore it does not give a relative merit between projects since several projects can have the same priority ranking.

### **5.1.2 Other Methodologies**

As mentioned above, the other methods considered for comparison fell into one of the categories listed below.

- prioritization formula
- value matrix
- benefit vs. cost

Each is discussed in more detail on the following page.

### 5.1.2.1 Prioritization Formula

Salt Lake City, Utah prioritized their stormwater projects using the following “prioritization formula”:

$$\text{priority score} = (B+C+D+E+F+G) - (A/H)$$

where: A = cost

B = damage estimate (high-2, medium-1, low-0)

C = potential loss of life (yes-5, no-0)

D = commercial building inundation (high-2, medium-1, low-0)

E = residential building inundation (high-2, medium-1, low-0)

F = inundation of streets > 2' (yes-1, no-0)

G = water quality objectives met (yes-1, no-0)

H = approximate area of flooding reduced by project (acres)

The variables included in this formula were selected by a stormwater committee based on what they thought was important to the citizens of Salt Lake City. The formula ranks each project based on the amount of flooding damage estimated without the project, the possibility of the loss of life if the project is not built, the amount of commercial and residential building inundation, the amount of street inundation, whether water quality objectives are met by the project, and a factor that accounts for the cost of the project. Each of the factors (B-G) are added together and then the cost factor (A/H) is subtracted from the value to determine the prioritization value. In this way the cost is considered a negative factor. The total project cost is divided by the approximate area of flooding that would be eliminated by implementing the proposed improvements so that large projects that reduce large areas of flooding would not be penalized by their high cost.

The main problem with this method is that it is complicated and difficult to explain to the public. Many citizens have an aversion to mathematics and the need to deal with a mathematical equation is antagonizing. To some people this type of formula would lead to a feeling of having something to hide. Another drawback is that their criteria are too vague. High, medium, and low need to be further defined. Also this formula only deals with flooding and it would be further complicated by adding variables to include erosion.

**5.1.2.2 Value Matrix**

A value matrix is a common way to rank projects. Criteria are chosen to prioritize the projects. Each of these is given a weight that reflects their importance in the community. Then each project is given a rating within the project ranking criteria. The rating is based on a set of parameters under each criterion. An example is shown in Table 5-2, from the stormwater prioritization matrix used in Columbus, Ohio.

**Table 5-2 - Ranking a Project Using a Value Matrix - City of Columbus, Ohio**

	Health & Safety	No. of People Affected	Size of Area Affected	Years Problem Has Existed	Damage	Leverage of Dollars
<b>Weight</b>	5	4	3	2	4	1
<b>Project Rating</b>	10	7	3	5	6	1
<b>Wt. x Rating</b>	50	28	9	10	24	1
<b>Project Score</b>	(equals the sum of wt. x rating) = 122					

In the example, the category “Years Problem has Existed” was given a “weight” of 2; the ratings within that category were as follows: greater than 40 years, 10 points; 20 to 40 years, 7 points; 10 to 19 years, 5 points; 1 to 9 years, 3 points; and less than one year, 1 point. The project being ranked in this example had existed for 14 years, therefore it was given a rating of 5 points.

This is a method that ranks projects objectively and fairly. It has the capability of allowing the community to select criteria that reflect their priorities. However, this method can be difficult to explain and hard for the public to understand.

**5.1.2.3 Benefit vs. Cost**

In this type of system an attempt is made to assess the benefits of each project and compare those to its cost of construction. Benefits are usually assigned by a point system that can be modified by the community doing the ranking. The benefit point assignment example shown in Table 5-3 on the next page is taken from a prioritization plan used in Maryland Heights.

		Severe	High	Moderate
	Type of structure threatened	Risk	Risk	Risk
	habitable structures, attached garages, office, commercial, or warehouses	600	150	25
	misc. structure-includes patio, deck, pool, detached garage, paved surface	50	13	5
	fences, sheds	25	6	2
	<b>Yard erosion - top of bank (last five years)</b>		> 4 ft.	2 to 4 ft.
	Points are allotted for yard erosion - top-of-bank based upon the amount of yard lost to creek erosion in the past five years		100	25
	<b>Yard erosion - drainage flow path (ruts, rivulets, kills vegetation)</b>		Yes	No
	Points are allotted for yard erosion-drainage flow path based upon whether or not this process is evident		2	0
<b>1.4 Erosion Threatening Roadway</b>				
	Points are allotted for each 250 ft length of road affected			
	Single intersections count as two length of road affected			
	Severe erosion risk is defined as actively eroding bank within 10 feet of roadway			
	High erosion risk is defined as actively eroding bank within 11 to 40 feet of roadway			
	Moderate erosion risk is defined as actively eroding bank within 41 to 75 feet of roadway			
		Severe	High	Moderate
	Type of roadway threatened	Risk	Risk	Risk
	arterial	1000	250	50
	collector	800	200	25
	residential	600	150	10
<b>1.5 Erosion Threatening Utility</b>				
	Points are allotted for each type of structure threatened			
	Severe erosion risk is defined as actively eroding bank within 25 feet of structure			
	High erosion risk is defined as actively eroding bank within 26 to 50 feet of structure			
	Moderate erosion risk is defined as actively eroding bank within 51 to 100 feet of structure			
		Severe	High	Moderate
	Type of structure threatened	Risk	Risk	Risk
	utility pole, sanitary sewer, gas, or water main	50	25	10
<b>2.0 SECONDARY BENEFITS OF STORMWATER PROJECTS</b>				
			Unit Size	Points
	<b>2.1 Public Multi-use Parks and/or Recreational Facility</b>		min. 1 acre	10
	<b>2.2 Intangible/Miscellaneous Factors</b>		maximum of	
	other safety/health concerns addressed		200 points to be	
	increase in tax base		assigned by	
	reduction in O&M costs		evaluator and	
	aesthetic improvements		approved by the	
			stormwater	
			committee	
<b>3.0 PREVENTIVE POINTS</b>				
	Points are allotted according to the above point system only when long-term damage is both predictable and preventable. That point total is then discounted 50%			

To assign a ranking, the benefit points are divided by the cost of the project (in thousands of dollars). Below is a sample benefit point criteria table for a project in Maryland Heights that illustrates how it is used in prioritization.

**Sample Benefit Point Allocation**

**STORMWATER IMPLEMENTATION PLAN  
PROJECT BENEFIT POINTS – DOCUMENTATION**

<b>PROJECT:</b> Alan Shepard/Saturn (Midland Creek N. Trib Flooding)				
Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Basement Flooding	50	Field Investigation	3	150
Yard Flooding within 25' of a habitable structure	10	Field Investigation	10	100
Occasional Flooding – Residential Street	50	Field Investigation	2	100
Preventive Points	125	“Conservation Stormwater Management Reconnaissance”	see below	125
<b>TOTAL</b>				<b>475</b>

**Remarks/Assumptions:**

Preventive points were added for the installation of grade controls and bank restoration upstream of the culvert. Opening the culvert will increase velocities in this reach and cause instability in that section of the creek. Points were allocated for Moderate Risk Erosion affecting 10 lots (25 x 10 = 250 points) discounted 50% as outlined in the Maryland Heights Stormwater Implementation Plan Benefit Points Table.

**Sample Project Prioritization**

PROJECT	STORM WATER COSTS (in thousands)	BENEFIT POINTS	BENEFITS PER THOUSAND \$	RANK
Venus Lane	333	325	0.98	1
11021 Saturn	155	150	0.97	2
Alan Shepard/Saturn (N. Trib flooding)	730	475	0.65	3
11767 Lackland	146	75	0.51	4
Midland Ck. w/ of Fee Fee Rd.	656	188	0.29	5
Vago Park Drainage	128	12	0.09	8
12022 Weshill	139	12	0.09	9
12014 Glenpark	150	10	0.07	10
Essex Tributary Flooding	1306	20	0.02	11

To assign a ranking, the benefit points are divided by the cost of the project (in thousands of dollars). Below is a sample benefit point criteria table for a project in Maryland Heights that illustrates how it is used in prioritization.

**Sample Benefit Point Allocation**

**STORMWATER IMPLEMENTATION PLAN  
PROJECT BENEFIT POINTS – DOCUMENTATION**

<b>PROJECT:</b> Alan Shepard/Saturn (Midland Creek N. Trib Flooding)				
Category	Pts.	Documentation	Lots Affected	Points Allotted
Frequent Basement Flooding	50	Field Investigation	3	150
Yard Flooding within 25' of a habitable structure	10	Field Investigation	10	100
Occasional Flooding – Residential Street	50	Field Investigation	2	100
Preventive Points	125	“Conservation Stormwater Management Reconnaissance”	see below	125
<b>TOTAL</b>				<b>475</b>

**Remarks/Assumptions:**

Preventive points were added for the installation of grade controls and bank restoration upstream of the culvert. Opening the culvert will increase velocities in this reach and cause instability in that section of the creek. Points were allocated for Moderate Risk Erosion affecting 10 lots (25 x 10 = 250 points) discounted 50% as outlined in the Maryland Heights Stormwater Implementation Plan Benefit Points Table.

**Sample Project Prioritization**

PROJECT	STORM WATER COSTS (in thousands)	BENEFIT POINTS	BENEFITS PER THOUSAND \$	RANK
Venus Lane	333	325	0.98	1
11021 Saturn	155	150	0.97	2
Alan Shepard/Saturn (N. Trib flooding)	730	475	0.65	3
11767 Lackland	146	75	0.51	4
Midland Ck. w/ of Fee Fee Rd.	656	188	0.29	5
Vago Park Drainage	128	12	0.09	8
12022 Weshill	139	12	0.09	9
12014 Glenpark	150	10	0.07	10
Essex Tributary Flooding	1306	20	0.02	11

### **5.1.3 Conclusion**

It is our recommendation that the City of Creve Coeur adopt a benefit/cost approach to rank their stormwater projects. The system is being used with great success by both the City of Maryland Heights and the Metropolitan St. Louis Sewer District. Project benefits are assigned by a point system that can be selected by the community doing the ranking and, as a result, reflect the City of Creve Coeur's values.

This type of methodology minimizes subjective factors and prioritizes projects in an equitable and cost-effective manner that produces consistent results independent of the evaluator. This prioritization scheme is easily understood and accepted by the community and its objectivity eliminates concerns that socio-political factors would influence the actual implementation of projects. This transparency insulates staff and government officials from pressures unrelated to project merit and pre-empts charges of favoritism.

## **5.2 Cost Estimates**

A cost estimate was computed for each proposed solution. The cost estimate provides an itemized breakdown of each item (i.e. area inlet, excavation, compacted backfill). Unit prices were based on MSD's current unit prices as found in Appendix D. Furthermore, contingency costs were applied to each alternative to account for unanticipated costs. Cost estimates for each project are found in Appendix E.

## **5.3 Benefit Points**

After evaluation of other methods, it was decided that the benefit point system from the Metropolitan St. Louis Sewer District be implemented to provide a means of prioritizing each problem site. This was done, in part, because MSD is the jurisdictional authority for stormwater in the St. Louis Metropolitan Area and a sometimes partner in stormwater projects. As such, a plan compatible with theirs seemed prudent.

As seen in Table 5-4, points were awarded to each site based on the severity and frequency of the flooding and/or erosion. For example, frequent habitable first floor flooding receives 300 points/unit whereas infrequent yard flooding receives 2 points/lot.

## **5.4 Benefit-Cost Analysis**

After reviewing benefit points and cost estimates of each problem, a prioritization of the sites was determined. The benefit-cost ratio was computed by dividing the benefit points

**Table 5-4**  
**Creve Coeur Creek Watershed**  
**Benefit Points**

	<u>Points</u>	<u>Units</u>
<b>Frequent Structural Flooding (15 Year Flood)</b>		
Habitable first floor	300	Unit
Basements	200	Unit
Miscellaneous structures including patios/decks, pools, sheds, tennis courts, etc.	50	Unit
Yard flooding	10	Lot
Industrial building	300	2500 sf
<b>Frequent Roadway Flooding (15 Year Flood)</b>		
Emergency access restricted to any habitable structure	200	Lot
Traffic obstruction on arterial streets	50	250 ft
Traffic obstruction on collector streets	25	250 ft
Traffic obstruction on residential streets	10	250 ft
<b>Infrequent Structural Flooding (100 Year Flood)</b>		
Habitable first floor	45	Unit
Basements	30	Unit
Miscellaneous structures including patios/decks, pools, sheds, tennis courts, etc.	7	Unit
Yard flooding	2	Lot
Industrial building	45	2500 sf
<b>Infrequent Roadway Flooding (100 Year Flood)</b>		
Emergency access restricted to any habitable structure	30	Lot
Traffic obstruction on arterial streets	7	250 ft
Traffic obstruction on collector streets	4	250 ft
Traffic obstruction on residential streets	2	250 ft
<b>High Risk Structural Erosion (within 25 feet of structure)</b>		
Habitable structures	200	Unit
Miscellaneous structures including patios/decks, pools, sheds, tennis courts, etc.	100	Unit
Industrial buildings	200	2500 sf
<b>High Risk Roadway Erosion (within 25 feet of structure)</b>		
Arterial	100	250 ft
Collector	50	250 ft
Residential	25	250 ft
<b>Low Risk Structural Erosion (greater than 100 feet from structure)</b>		
Yard Erosion	10	Lot
<b>Moderate Risk Structural Erosion (within 26 to 100 feet of structure)</b>		
Habitable structures	50	Unit
Miscellaneous structures including patios/decks, pools, sheds, tennis courts, etc.	25	Unit
Industrial buildings	50	2500 sf
<b>Moderate Risk Roadway Erosion (within 26 to 100 feet of structure)</b>		
Arterial	25	250 ft
Collector	13	250 ft
Residential	6	250 ft

by the cost, in thousands of dollars. The most cost-effective project will have the highest ratio value. Table 5-5 lists each project, its cost, benefit points, and benefit cost per thousand dollars. Table 5-6 sorts the projects in descending order from highest benefit cost ratio to lowest. The highest ranked project is FC-2 because it was the most efficient in terms of most benefits per the cost. Table 5-7 sorts the projects by original classification ID number pertaining to the 1999 Study or 2010 Questionnaire.

**City of Creve Coeur  
 Prioritization of Creve Coeur Creek and Deer Creek Watersheds  
 (Sorted by Project Number)**

**Table 5-5**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
CC-1	5-8	Fernview Drive #1009	Erosion at discharge pipe that drains to creek.	Construct reno mattress at end of discharge pipe to allow for dissipation of energy.	\$52,000	10	0.19
CC-2	5-8	Fernview Drive #1020, 1028	Yard erosion in backyard of 1020 and 1028 Fernview Drive.	Construct grass swale using turf reinforcement mat.	\$39,000	20	0.51
CC-3	3-2	Fernway Lane #928	Ponding in backyard of 928 Fernway Lane at bottom of hillside.	Clear openings of area inlet and regrade backyard.	\$63,000	17	0.27
CC-4	13	Ferntop Lane #12970	Creek flooding and erosion behind backyard of 12970 Ferntop Lane.	Place rip rap along channel and build up creek banks.	\$71,000	20	0.28
CC-5	14	Fernway Lane #12921	Ponding in backyard of 12921 Fernway Lane; runoff is rotting wood retaining wall.	Reconstruct swale to existing conditions; regrade yard and remove retaining wall.	\$45,000	10	0.22
SC-1	13-9, 5, 6, 8	Chasselle Lane #1,3,5 and Chamblee Lane #9,13,15,25	Creek flooding and severe erosion - affecting seven homes along Chasselle and Chamblee Lane.	Construct a berm and place rip rap in areas affected by erosion.	N/A	N/A	N/A
SC-2	5-7	Ladue Woods Drive #12229	Flooding and erosion in backyard of 12229 Ladue Woods Drive; driveway has been previously damaged from runoff.	Construct storm system consisting of 1 area inlet, 230' of 12" RCP and 135' of 15" RCP.	\$87,000	27	0.31
SC-3	4-4	Royal Manor Drive #12554	Creek erosion along side property of 12554 Royal Manor Drive.	Creek biostabilization.	\$43,000	10	0.23
SC-4	4-5	Booth Bay Lane #12318	Creek erosion in backyard of 12318 Booth Bay Lane.	Vegetated gabions.	\$104,000	10	0.10
SC-5	4-5	Booth Bay Lane #12310	Gully erosion in backyard of 12310 Booth Bay Lane.	Replace existing storm manhole with an area inlet.	\$68,000	12	0.18
SC-6	4-10	Chamblee Lane #606, 622	Creek erosion behind homes on Chamblee Lane.	Creek biostabilization.	\$265,000	20	0.08
SC-7	4-10, 19	Clion Lane #212 and Ladue Lake Drive #225, 287	Gully erosion in backyards of 212 Clion Lane and 225, 287 Ladue Lake Drive; ponding in yard of 287 Ladue Lake Drive.	Improve existing swale using turf reinforcement mat; regrade and plant vegetation at ponding locations.	\$58,000	40	0.69
SC-8	4-11	Laduemont Drive #240	Creek erosion in backyard of 240 Laduemont Drive.	Place rip rap at end of discharge pipe.	\$40,000	20	0.50
SC-9	2-1	Hibler Oaks #219	Minor erosion in backyard of 219 Hibler Oaks.	Construct storm system consisting of 1 area inlet and 190' of 15" RCP.	\$58,000	10	0.17
SC-10	3, 4	Balcon Estates #24, 26	Severe Creek Erosion in yards of 24 and 26 Balcon Estates; flooding occurs in yard of 24 Balcon Estates; residential street flooding occurs.	Vegetated gabion walls.	\$123,000	40	0.33
SC-11	extra #2	Dartagnan Court #13200	Erosion at end of discharge pipe which is located on hillside of 13200 Dartagnan Court.	Place rip rap at end of discharge pipe.	\$42,000	10	0.24

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Project Number)**  
**Table 5-5**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
FC-1	13-4, 1, 15	Fernridge Creek between Dartagnan Court and Bellerive Estates Drive	Several properties are affected by flooding and erosion along Fernridge Creek. Many homes are located in a 100-year flood plain. Mild to severe erosion occurs along creek banks.	Construct vegetated gabions along the property banks affected by erosion. Construct an earth berm to mitigate flooding issues.	N/A	N/A	N/A
FC-2	13-1	Beauvais Court #741, 749	Erosion and flooding in backyards of 741 and 749 Beauvais Court; flooding endangers home at 741 Beauvais Court.	Construct a berm and area inlet along with 200' of 12" RCP.	\$80,000	85	1.06
FC-3	3-10	Hibler Court #373	Erosion and flooding in backyard of 373 Hibler Court due to inadequate concrete flume.	Construct an area inlet and berm.	\$51,000	20	0.39
FC-4	11	Country Manor Lane #12295	Significant erosion at end of discharge pipe behind 12295 Country Manor Lane.	Construct reno mattress at end of discharge pipe to allow for dissipation of energy.	\$49,000	10	0.20
FC-5	17	Halsgame Lane #12318	Minimal erosion along backyard fence line of 12318 Halsgame Lane.	Reconstruct grass swale with turf reinforcement mat.	\$42,000	10	0.24
FC-6	26	Royal Valley Drive #12121, 12135	Erosion in backyard of 12121 and 12135 Royal Valley Drive.	Reconstruct grass swale with turf reinforcement mat.	\$47,000	20	0.43
DC-1	4-8, 29	Tarrytown Drive #11732, 11700	Severe creek erosion behind backyard fence of 11732 Tarrytown Drive; creek flooding upstream and downstream of culvert at 11700 Tarrytown Drive.	Creek biostabilization at 11732 Tarrytown Drive; clear and regrade creek bottom at 11700 Tarrytown Drive.	\$56,000	40	0.71
DC-2	3-7	Fairways Circle #631, 647	Erosion and flooding in backyards of 631 and 647 Fairways Circle.	Construct storm system consisting two area inlets, 250' of 12" RCP, and 130' of 15" RCP.	\$92,000	40	0.43
DC-3	2-4	Villa Coublay Drive #60	Severe creek erosion in ravine behind backyard of 60 Villa Coublay Drive.	Vegetated gabion wall.	\$491,000	10	0.02
DC-4	2-5	Fairways Circle #527	Erosion at backyard hillside of 527 Fairways Circle.	Creek biostabilization.	\$32,000	10	0.31
DC-5	1-6	Ladue Estates Drive #5	Minor erosion in backyard of 5 Ladue Estates Drive.	Construct turf reinforcement mat.	\$28,000	10	0.36
DC-6	20	Ladue Meadows Lane #104	Rill erosion at side property of 104 Ladue Meadows Lane.	Construct area inlet and 150' of 12" RCP.	\$48,000	20	0.42
DC-7	27	Runnymede Drive #434	Ponding water in backyard of 434 Runnymede Drive.	Construct storm system consisting two area inlets and 300' of 12" RCP.	\$74,000	20	0.27
WC-1	7-1	Mosely Acres Drive #10, 11, 12	Overtopping of dam causing flooding of 10 Mosely Acres Drive; shore erosion along lake at 11 and 12 Mosely Acres Drive.	Clear spillway area of debris and vegetation to allow to function properly; rip rap areas of lake affected by shore erosion.	\$49,000	30	0.61

**City of Creve Coeur  
 Prioritization of Creve Coeur Creek and Deer Creek Watersheds  
 (Sorted by Project Number)**

**Table 5-5**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
WC-2	16	Graeser Lane #11076	Flooding in front yard of 11076 Graeser Lane; resident reported water entering foundation in years past, however no flooding has occurred since installation of French drain.	New curb along street at 11076 Graeser Lane.	\$61,000	10	0.16
WC-3	23	Mosley Acres #16	Insufficient curb and gutter causing minor yard erosion on Mosley Acres .	Remove and replace approximately 400' of curb and gutter.	\$53,000	30	0.57
WC-4	24	Mystic Meadows Lane #121	Erosion at south and north property line of 121 Mystic Meadows Lane.	Construct storm system consisting of two area inlets and 500' of 15" RCP.	\$136,000	35	0.26
WC-5	30	Tureen Drive #11205	Erosion in backyard of 11205.	Reconstruct natural swale with turf reinforcement mat.	\$45,000	10	0.22
WC-6	31, 32	Wedgewood Lane #6, 7	Flooding in backyard of 6 and 7 Wedgewood Lane; minor erosion on hillside of 6 Wedgewood Lane.	Construct storm system consisting of two area inlets, 1 manhole, 170' of 12" RCP, and 170' of 15" RCP.	\$96,000	30	0.31
WC-7	33	Windrush Creek East #6	Severe channel erosion in front yard of 6 Windrush Creek East.	Improve existing swale by increasing width and installing turf reinforcement mat; remove existing culverts and replace with one box culvert.	\$114,000	10	0.09
WC-8	18	Ladue Estates Drive #71, 73	Ponding water in backyards of 71 and 73 Ladue Estates Drive.	Regrade backyards to provide adequate slope for drainage.	\$52,000	20	0.38
MS-1	4-6, 28	Spoeede Acres Street #2	Ponding and erosion in backyard of 2 Spoeede Acres Street; moderate erosion on west side of property.	Reconstruct natural swale to convey overland flow to inlet; construct curb along Spoeede Acres to contain street runoff .	\$67,000	20	0.30
MS-2	4-7	Spoeede View Court #10677	Creek erosion behind 10677 Spoeede View Court.	Vegetated gabion walls.	\$214,000	10	0.05
MS-3	3-20, 12	Country View Drive #10671	Original swale disturbed by subsequent development; ponding in backyard of 10671 Country View Drive.	Construct grass swale and regrade backyard.	\$47,000	10	0.21
MS-4	1-8	Oak Park Court #3	Street flooding. Non-standard grate inlet completely covered w/ debris and leaves.	Construct new curb and gutter. Replace existing grate inlet with a new curb inlet. Construct 90' of 12 inch RCP to convey runoff to creek.	\$47,000	10	0.21
MS-5	7	Chaminade Drive #13, 14	Creek erosion threatening pedestrian bridge; retaining wall upstream and downstream of bridge has collapsed.	Clear and demolish damaged retaining wall; install rip rap 50' upstream and downstream of bridge.	\$63,000	25	0.40
MS-6	9	Colonial Hills Drive #77	Gully erosion in front yard of 77 Colonial Hills Drive.	Construct storm system in place of existing swale.	\$169,000	20	0.12

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Project Number)**

**Table 5-5**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
MS-7	21	Larkin Avenue #859	Yard ponding and erosion. Driveway culvert and existing swale filled with dirt. Loss of capacity causing erosion on south side of property from runoff diverted from swale and culvert.	Improve existing swale adjacent to Larkin Avenue by installing turf reinforcement mat. Remove and replace existing pipe culvert.	\$43,000	20	0.47
MS-8	22	Middlebrook Lane #3-6	Street runoff eroding area around culvert; culvert crosses under Middlebrook Lane.	Improve upstream and downstream approach by placing rip rap; place rip rap along street surface as well.	\$53,000	25	0.47
MS-9	25	Rondelay Drive #10835	Channel erosion in backyard of 10835 Rondelay Drive upstream of MSD inlet; home owner has experienced flooding in years past.	Improve existing swale with turf reinforcement mat.	\$34,000	20	0.59
MS-10	extra #1	Chilton Lane #12-13	Erosion at culvert is threatening roadway; pipe outlet damaged.	Replace existing culvert with a new 3' x 3' box culvert.	\$69,000	25	0.36
PC-1	5-4	Tealwood North #47	Erosion at culvert headwall and outlet.	Construct heavy reventment 20' upstream and downstream of culvert.	\$62,000	25	0.40

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Priority Ranking)**

**Table 5-6**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
FC-2	13-1	Beauvais Court #741, 749	Erosion and flooding in backyards of 741 and 749 Beauvais Court; flooding endangers home at 741 Beauvais Court.	Construct a berm and area inlet along with 200' of 12" RCP.	\$80,000	85	1.06
DC-1	4-8, 29	Tarrytown Drive #11732, 11700	Severe creek erosion behind backyard fence of 11732 Tarrytown Drive; creek flooding upstream and downstream of culvert at 11700 Tarrytown Drive.	Creek biostabilization at 11732 Tarrytown Drive; clear and regrade creek bottom at 11700 Tarrytown Drive.	\$56,000	40	0.71
SC-7	4-10, 19	Clion Lane #212 and Ladue Lake Drive #225, 287	Gully erosion in backyards of 212 Clion Lane and 225, 287 Ladue Lake Drive; ponding in yard of 287 Ladue Lake Drive.	Improve existing swale using turf reinforcement mat; regrade and plant vegetation at ponding locations.	\$58,000	40	0.69
WC-1	7-1	Mosely Acres Drive #10, 11, 12	Overtopping of dam causing flooding of 10 Mosely Acres Drive; shore erosion along lake at 11 and 12 Mosely Acres Drive.	Clear spillway area of debris and vegetation to allow to function properly; rip rap areas of lake affected by shore erosion.	\$49,000	30	0.61
MS-9	25	Rondelay Drive #10835	Channel erosion in backyard of 10835 Rondelay Drive upstream of MSD inlet; home owner has experienced flooding in years past.	Improve existing swale with turf reinforcement mat.	\$34,000	20	0.59
WC-3	23	Mosley Acres #16	Insufficient curb and gutter causing minor yard erosion on Mosley Acres .	Remove and replace approximately 400' of curb and gutter.	\$53,000	30	0.57
CC-2	5-8	Fernview Drive #1020, 1028	Yard erosion in backyard of 1020 and 1028 Fernview Drive.	Construct grass swale using turf reinforcement mat.	\$39,000	20	0.51
SC-8	4-11	Laduemont Drive #240	Creek erosion in backyard of 240 Laduemont Drive.	Place rip rap at end of discharge pipe.	\$40,000	20	0.50
MS-8	22	Middlebrook Lane #3-6	Street runoff eroding area around culvert; culvert crosses under Middlebrook Lane.	Improve upstream and downstream approach by placing rip rap; place rip rap along street surface as well.	\$53,000	25	0.47
MS-7	21	Larkin Avenue #859	Yard ponding and erosion. Driveway culvert and existing swale filled with dirt. Loss of capacity causing erosion on south side of property from runoff diverted from swale and culvert.	Improve existing swale adjacent to Larkin Avenue by installing turf reinforcement mat. Remove and replace existing pipe culvert.	\$43,000	20	0.47
DC-2	3-7	Fairways Circle #631, 647	Erosion and flooding in backyards of 631 and 647 Fairways Circle.	Construct storm system consisting two area inlets, 250' of 12" RCP, and 130' of 15" RCP.	\$92,000	40	0.43
FC-6	26	Royal Valley Drive #12121, 12135	Erosion in backyard of 12121 and 12135 Royal Valley Drive.	Reconstruct grass swale with turf reinforcement mat.	\$47,000	20	0.43
DC-6	20	Ladue Meadows Lane #104	Rill erosion at side property of 104 Ladue Meadows Lane.	Construct area inlet and 150' of 12" RCP.	\$48,000	20	0.42

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Priority Ranking)**

**Table 5-6**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
PC-1	5-4	Tealwood North #47	Erosion at culvert headwall and outlet.	Construct heavy reventment 20' upstream and downstream of culvert.	\$62,000	25	0.40
MS-5	7	Chaminade Drive #13, 14	Creek erosion threatening pedestrian bridge; retaining wall upstream and downstream of bridge has collapsed.	Clear and demolish damaged retaining wall; install rip rap 50' upstream and downstream of bridge.	\$63,000	25	0.40
FC-3	3-10	Hibler Court #373	Erosion and flooding in backyard of 373 Hibler Court due to inadequate concrete flume.	Construct an area inlet and berm.	\$51,000	20	0.39
WC-8	18	Ladue Estates Drive #71, 73	Ponding water in backyards of 71 and 73 Ladue Estates Drive.	Regrade backyards to provide adequate slope for drainage.	\$52,000	20	0.38
MS-10	extra #1	Chilton Lane #12-13	Erosion at culvert is threatening roadway; pipe outlet damaged.	Replace existing culvert with a new 3' x 3' box culvert.	\$69,000	25	0.36
DC-5	1-6	Ladue Estates Drive #5	Minor erosion in backyard of 5 Ladue Estates Drive.	Construct turf reinforcement mat.	\$28,000	10	0.36
SC-10	3, 4	Balcon Estates #24, 26	Severe Creek Erosion in yards of 24 and 26 Balcon Estates; flooding occurs in yard of 24 Balcon Estates; residential street flooding occurs.	Vegetated gabion walls.	\$123,000	40	0.33
DC-4	2-5	Fairways Circle #527	Erosion at backyard hillside of 527 Fairways Circle.	Creek biostabilization.	\$32,000	10	0.31
WC-6	31, 32	Wedgewood Lane #6, 7	Flooding in backyard of 6 and 7 Wedgewood Lane; minor erosion on hillside of 6 Wedgewood Lane.	Construct storm system consisting of two area inlets, 1 manhole, 170' of 12" RCP, and 170' of 15" RCP.	\$96,000	30	0.31
SC-2	5-7	Ladue Woods Drive #12229	Flooding and erosion in backyard of 12229 Ladue Woods Drive; driveway has been previously damaged from runoff.	Construct storm system consisting of 1 area inlet, 230' of 12" RCP and 135' of 15" RCP.	\$87,000	27	0.31
MS-1	4-6, 28	Spoede Acres Street #2	Ponding and erosion in backyard of 2 Spoede Acres Street; moderate erosion on west side of property.	Reconstruct natural swale to convey overland flow to inlet; construct curb along Spoede Acres to contain street runoff.	\$67,000	20	0.30
CC-4	13	Ferntop Lane #12970	Creek flooding and erosion behind backyard of 12970 Ferntop Lane.	Place rip rap along channel and build up creek banks.	\$71,000	20	0.28
DC-7	27	Runnymede Drive #434	Ponding water in backyard of 434 Runnymede Drive.	Construct storm system consisting two area inlets and 300' of 12" RCP.	\$74,000	20	0.27
CC-3	3-2	Fernway Lane #928	Ponding in backyard of 928 Fernway Lane at bottom of hillside.	Clear openings of area inlet and regrade backyard.	\$63,000	17	0.27
WC-4	24	Mystic Meadows Lane #121	Erosion at south and north property line of 121 Mystic Meadows Lane.	Construct storm system consisting of two area inlets and 500' of 15" RCP.	\$136,000	35	0.26

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Priority Ranking)**

**Table 5-6**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
SC-11	extra #2	Dartagnan Court #13200	Erosion at end of discharge pipe which is located on hillside of 13200 Dartagnan Court.	Place rip rap at end of discharge pipe.	\$42,000	10	0.24
FC-5	17	Halsgame Lane #12318	Minimal erosion along backyard fence line of 12318 Halsgame Lane.	Reconstruct grass swale with turf reinforcement mat.	\$42,000	10	0.24
SC-3	4-4	Royal Manor Drive #12554	Creek erosion along side property of 12554 Royal Manor Drive.	Creek biostabilization.	\$43,000	10	0.23
CC-5	14	Fernway Lane #12921	Ponding in backyard of 12921 Fernway Lane; runoff is rotting wood retaining wall.	Reconstruct swale to existing conditions; regrade yard and remove retaining wall.	\$45,000	10	0.22
WC-5	30	Tureen Drive #11205	Erosion in backyard of 11205.	Reconstruct natural swale with turf reinforcement mat.	\$45,000	10	0.22
MS-3	3-20, 12	Country View Drive #10671	Original swale disturbed by subsequent development; ponding in backyard of 10671 Country View Drive.	Construct grass swale and regrade backyard.	\$47,000	10	0.21
MS-4	1-8	Oak Park Court #3	Street flooding. Non-standard grate inlet completely covered w/ debris and leaves.	Construct new curb and gutter. Replace existing grate inlet with a new curb inlet. Construct 90' of 12 inch RCP to convey runoff to creek.	\$47,000	10	0.21
FC-4	11	Country Manor Lane #12295	Significant erosion at end of discharge pipe behind 12295 Country Manor Lane.	Construct reno mattress at end of discharge pipe to allow for dissipation of energy.	\$49,000	10	0.20
CC-1	5-8	Fernview Drive #1009	Erosion at discharge pipe that drains to creek.	Construct reno mattress at end of discharge pipe to allow for dissipation of energy.	\$52,000	10	0.19
SC-5	4-5	Booth Bay Lane #12310	Gully erosion in backyard of 12310 Booth Bay Lane.	Replace existing storm manhole with an area inlet.	\$68,000	12	0.18
SC-9	2-1	Hibler Oaks #219	Minor erosion in backyard of 219 Hibler Oaks.	Construct storm system consisting of 1 area inlet and 190' of 15" RCP.	\$58,000	10	0.17
WC-2	16	Graeser Lane #11076	Flooding in front yard of 11076 Graeser Lane; resident reported water entering foundation in years past, however no flooding has occurred since installation of French drain.	New curb along street at 11076 Graeser Lane.	\$61,000	10	0.16
MS-6	9	Colonial Hills Drive #77	Gully erosion in front yard of 77 Colonial Hills Drive.	Construct storm system in place of existing swale.	\$169,000	20	0.12
SC-4	4-5	Booth Bay Lane #12318	Creek erosion in backyard of 12318 Booth Bay Lane.	Vegetated gabions.	\$104,000	10	0.10

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Priority Ranking)**

**Table 5-6**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
WC-7	33	Windrush Creek East #6	Severe channel erosion in front yard of 6 Windrush Creek East.	Improve existing swale by increasing width and installing turf reinforcement mat; remove existing culverts and replace with one box culvert.	\$114,000	10	0.09
SC-6	4-10	Chamblee Lane #606, 622	Creek erosion behind homes on Chamblee Lane.	Creek biostabilization.	\$265,000	20	0.08
MS-2	4-7	Spoede View Court #10677	Creek erosion behind 10677 Spoede View Court.	Vegetated gabion walls.	\$214,000	10	0.05
DC-3	2-4	Villa Coublay Drive #60	Severe creek erosion in ravine behind backyard of 60 Villa Coublay Drive.	Vegetated gabion wall.	\$491,000	10	0.02
SC-1	13-9, 5, 6, 8	Chasselle Lane #1, 3, 5 and Chamblee Lane #9, 13, 15, 25	Creek flooding and severe erosion - affecting seven homes along Chasselle and Chamblee Lane.	Construct a berm and place rip rap in areas affected by erosion.	N/A	N/A	N/A
FC-1	13-4, 1, 15	Ferridge Creek between Dartagnan Court and Bellerive Estates Drive	Several properties are affected by flooding and erosion along Ferridge Creek. Many homes are located in a 100-year flood plain. Mild to severe erosion occurs along creek banks.	Construct vegetated gabions along the property banks affected by erosion. Construct an earth berm to mitigate flooding issues.	N/A	N/A	N/A

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Original Classification ID- 1999 Study/2010 Questionnaire)**

**Table 5-7**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
FC-2	13-1	Beauvais Court #741, 749	Erosion and flooding in backyards of 741 and 749 Beauvais Court; flooding endangers home at 741 Beauvais Court.	Construct a berm and area inlet along with 200' of 12" RCP.	\$80,000	85	1.06
FC-1	13-4, 1, 15	Ferridge Creek between Dartagnan Court and Bellerive Estates Drive	Several properties are affected by flooding and erosion along Ferridge Creek. Many homes are located in a 100-year flood plain. Mild to severe erosion occurs along creek banks.	Construct vegetated gabions along the property banks affected by erosion. Construct an earth berm to mitigate flooding issues.	N/A	N/A	N/A
SC-1	13-9, 5, 6, 8	Chasselle Lane #1,3,5 and Chamblee Lane #9,13,15,25	Creek flooding and severe erosion - affecting seven homes along Chasselle and Chamblee Lane.	Construct a berm and place rip rap in areas affected by erosion.	N/A	N/A	N/A
WC-1	7-1	Mosely Acres Drive #10, 11, 12	Overtopping of dam causing flooding of 10 Mosely Acres Drive; shore erosion along lake at 11 and 12 Mosely Acres Drive.	Clear spillway area of debris and vegetation to allow to function properly; rip rap areas of lake affected by shore erosion.	\$49,000	30	0.61
PC-1	5-4	Tealwood North #47	Erosion at culvert headwall and outlet.	Construct heavy reventment 20' upstream and downstream of culvert.	\$62,000	25	0.40
SC-2	5-7	Ladue Woods Drive #12229	Flooding and erosion in backyard of 12229 Ladue Woods Drive; driveway has been previously damaged from runoff.	Construct storm system consisting of 1 area inlet, 230' of 12" RCP and 135' of 15" RCP.	\$87,000	27	0.31
CC-1	5-8	Fernview Drive #1009	Erosion at discharge pipe that drains to creek.	Construct reno mattress at end of discharge pipe to allow for dissipation of energy.	\$52,000	10	0.19
CC-2	5-8	Fernview Drive #1020, 1028	Yard erosion in backyard of 1020 and 1028 Fernview Drive.	Construct grass swale using turf reinforcement mat.	\$39,000	20	0.51
SC-3	4-4	Royal Manor Drive #12554	Creek erosion along side property of 12554 Royal Manor Drive.	Creek biostabilization.	\$43,000	10	0.23
SC-4	4-5	Booth Bay Lane #12318	Creek erosion in backyard of 12318 Booth Bay Lane.	Vegetated gabions.	\$104,000	10	0.10
SC-5	4-5	Booth Bay Lane #12310	Gully erosion in backyard of 12310 Booth Bay Lane.	Replace existing storm manhole with an area inlet.	\$68,000	12	0.18
MS-1	4-6, 28	Spoede Acres Street #2	Ponding and erosion in backyard of 2 Spoede Acres Street; moderate erosion on west side of property.	Reconstruct natural swale to convey overland flow to inlet; construct curb along Spoede Acres to contain street runoff.	\$67,000	20	0.30
MS-2	4-7	Spoede View Court #10677	Creek erosion behind 10677 Spoede View Court.	Vegetated gabion walls.	\$214,000	10	0.05
DC-1	4-8, 29	Tarrytown Drive #11732, 11700	Severe creek erosion behind backyard fence of 11732 Tarrytown Drive; creek flooding upstream and downstream of culvert at 11700 Tarrytown Drive.	Creek biostabilization at 11732 Tarrytown Drive; clear and regrade creek bottom at 11700 Tarrytown Drive.	\$56,000	40	0.71

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Original Classification ID- 1999 Study/2010 Questionnaire)**

**Table 5-7**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
SC-6	4-10	Chamblee Lane #606, 622	Creek erosion behind homes on Chamblee Lane.	Creek biostabilization.	\$265,000	20	0.08
SC-7	4-10, 19	Clion Lane #212 and Ladue Lake Drive #225, 287	Gully erosion in backyards of 212 Clion Lane and 225, 287 Ladue Lake Drive; ponding in yard of 287 Ladue Lake Drive.	Improve existing swale using turf reinforcement mat; regrade and plant vegetation at ponding locations.	\$58,000	40	0.69
SC-8	4-11	Ladue Drive #240	Creek erosion in backyard of 240 Ladue Drive.	Place rip rap at end of discharge pipe.	\$40,000	20	0.50
CC-3	3-2	Fernway Lane #928	Ponding in backyard of 928 Fernway Lane at bottom of hillside.	Clear openings of area inlet and regrade backyard.	\$63,000	17	0.27
DC-2	3-7	Fairways Circle #631, 647	Erosion and flooding in backyards of 631 and 647 Fairways Circle.	Construct storm system consisting two area inlets, 250' of 12" RCP, and 130' of 15" RCP.	\$92,000	40	0.43
FC-3	3-10	Hibler Court #373	Erosion and flooding in backyard of 373 Hibler Court due to inadequate concrete flume.	Construct an area inlet and berm.	\$51,000	20	0.39
MS-3	3-20, 12	Country View Drive #10671	Original swale disturbed by subsequent development; ponding in backyard of 10671 Country View Drive.	Construct grass swale and regrade backyard.	\$47,000	10	0.21
SC-9	2-1	Hibler Oaks #219	Minor erosion in backyard of 219 Hibler Oaks.	Construct storm system consisting of 1 area inlet and 190' of 15" RCP.	\$58,000	10	0.17
DC-3	2-4	Villa Coublay Drive #60	Severe creek erosion in ravine behind backyard of 60 Villa Coublay Drive.	Vegetated gabion wall.	\$491,000	10	0.02
DC-4	2-5	Fairways Circle #527	Erosion at backyard hillside of 527 Fairways Circle.	Creek biostabilization.	\$32,000	10	0.31
DC-5	1-6	Ladue Estates Drive #5	Minor erosion in backyard of 5 Ladue Estates Drive.	Construct turf reinforcement mat.	\$28,000	10	0.36
MS-4	1-8	Oak Park Court #3	Street flooding. Non-standard grate inlet completely covered w/ debris and leaves.	Construct new curb and gutter. Replace existing grate inlet with a new curb inlet. Construct 90' of 12 inch RCP to convey runoff to creek.	\$47,000	10	0.21
SC-10	3, 4	Balcon Estates #24, 26	Severe Creek Erosion in yards of 24 and 26 Balcon Estates; flooding occurs in yard of 24 Balcon Estates; residential street flooding occurs.	Vegetated gabion walls.	\$123,000	40	0.33
MS-5	7	Chaminade Drive #13, 14	Creek erosion threatening pedestrian bridge; retaining wall upstream and downstream of bridge has collapsed.	Clear and demolish damaged retaining wall; install rip rap 50' upstream and downstream of bridge.	\$63,000	25	0.40

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Original Classification ID- 1999 Study/2010 Questionnaire)**

**Table 5-7**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1000</b>
MS-6	9	Colonial Hills Drive #77	Gully erosion in front yard of 77 Colonial Hills Drive.	Construct storm system in place of existing swale.	\$169,000	20	0.12
FC-4	11	Country Manor Lane #12295	Significant erosion at end of discharge pipe behind 12295 Country Manor Lane.	Construct reno mattress at end of discharge pipe to allow for dissipation of energy.	\$49,000	10	0.20
CC-4	13	Ferntop Lane #12970	Creek flooding and erosion behind backyard of 12970 Ferntop Lane.	Place rip rap along channel and build up creek banks.	\$71,000	20	0.28
CC-5	14	Fernway Lane #12921	Ponding in backyard of 12921 Fernway Lane; runoff is rotting wood retaining wall.	Reconstruct swale to existing conditions; regrade yard and remove retaining wall.	\$45,000	10	0.22
WC-2	16	Graeser Lane #11076	Flooding in front yard of 11076 Graeser Lane; resident reported water entering foundation in years past, however no flooding has occurred since installation of French drain.	New curb along street at 11076 Graeser Lane.	\$61,000	10	0.16
FC-5	17	Halsgame Lane #12318	Minimal erosion along backyard fence line of 12318 Halsgame Lane.	Reconstruct grass swale with turf reinforcement mat.	\$42,000	10	0.24
WC-8	18	Ladue Estates Drive #71, 73	Ponding water in backyards of 71 and 73 Ladue Estates Drive.	Regrade backyards to provide adequate slope for drainage.	\$52,000	20	0.38
DC-6	20	Ladue Meadows Lane #104	Rill erosion at side property of 104 Ladue Meadows Lane.	Construct area inlet and 150' of 12" RCP.	\$48,000	20	0.42
MS-7	21	Larkin Avenue #859	Yard ponding and erosion. Driveway culvert and existing swale filled with dirt. Loss of capacity causing erosion on south side of property from runoff diverted from swale and culvert.	Improve existing swale adjacent to Larkin Avenue by installing turf reinforcement mat. Remove and replace existing pipe culvert.	\$43,000	20	0.47
MS-8	22	Middlebrook Lane #3-6	Street runoff eroding area around culvert; culvert crosses under Middlebrook Lane.	Improve upstream and downstream approach by placing rip rap; place rip rap along street surface as well.	\$53,000	25	0.47
WC-3	23	Mosley Acres #16	Insufficient curb and gutter causing minor yard erosion on Mosley Acres.	Remove and replace approximately 400' of curb and gutter.	\$53,000	30	0.57
WC-4	24	Mystic Meadows Lane #121	Erosion at south and north property line of 121 Mystic Meadows Lane.	Construct storm system consisting of two area inlets and 500' of 15" RCP.	\$136,000	35	0.26
MS-9	25	Rondelay Drive #10835	Channel erosion in backyard of 10835 Rondelay Drive upstream of MSD inlet; home owner has experienced flooding in years past.	Improve existing swale with turf reinforcement mat.	\$34,000	20	0.59
FC-6	26	Royal Valley Drive #12121, 12135	Erosion in backyard of 12121 and 12135 Royal Valley Drive.	Reconstruct grass swale with turf reinforcement mat.	\$47,000	20	0.43

**City of Creve Coeur**  
**Prioritization of Creve Coeur Creek and Deer Creek Watersheds**  
**(Sorted by Original Classification ID- 1999 Study/2010 Questionnaire)**

**Table 5-7**

<b>New ID #</b>	<b>Orig. ID #</b>	<b>Project Name</b>	<b>Project Description</b>	<b>Recommended Alternative</b>	<b>Total Cost</b>	<b>Benefit Points</b>	<b>Benefit Points/\$1,000</b>
DC-7	27	Runnymede Drive #434	Ponding water in backyard of 434 Runnymede Drive.	Construct storm system consisting two area inlets and 300' of 12" RCP.	\$74,000	20	0.27
WC-5	30	Tureen Drive #11205	Erosion in backyard of 11205.	Reconstruct natural swale with turf reinforcement mat.	\$45,000	10	0.22
WC-6	31, 32	Wedgewood Lane #6, 7	Flooding in backyard of 6 and 7 Wedgewood Lane; minor erosion on hillside of 6 Wedgewood Lane.	Construct storm system consisting of two area inlets; 1 manhole, 170' of 12" RCP, and 170' of 15" RCP.	\$96,000	30	0.31
WC-7	33	Windrush Creek East #6	Severe channel erosion in front yard of 6 Windrush Creek East.	Improve existing swale by increasing width and installing turf reinforcement mat; remove existing culverts and replace with one box culvert.	\$114,000	10	0.09
MS-10	extra #1	Chilton Lane #12-13	Erosion at culvert is threatening roadway; pipe outlet damaged.	Replace existing culvert with a new 3' x 3' box culvert.	\$69,000	25	0.36
SC-11	extra #2	Dartagnan Court #13200	Erosion at end of discharge pipe which is located on hillside of 13200 Dartagnan Court.	Place rip rap at end of discharge pipe.	\$42,000	10	0.24

## **6.0 Geographic Information System (GIS)**

This section discusses the use of a web-based GIS that was created to input field observations.

### **6.1 Description and Capabilities**

A comprehensive database of property parcel, aerial imagery, and field observation data was developed for the use of the City of Creve Coeur utilizing ESRI ArcGIS software. Initial background data for the GIS utilized Aerial and property data obtained from the St. Louis County GIS services. Creeks and watershed boundaries were obtained from the Missouri Spatial Data Information Service.

Current problem areas within the City of Creve Coeur were entered into the GIS. Attributes such as property address, previous source ID, current project ID, problem description, recommended solution and cost estimate are included for each area.

A web-based read-only version of the GIS was created to provide the City easily accessible data from any computer with an Internet connection. The site can be accessed through the following address: <http://maps.hornershifrin.com/CreveCoeurStormwater/>. The web-based system provides all data attributes from each problem as well as field observations and photos. The system displays a color-coded visualization of each stormwater problem according to watershed location. Future problem areas can be easily added in the GIS by a consultant GIS Analyst to provide an up-to-date map of stormwater concerns. All GIS data attributes within the system are secure since the system only allows read-only and print capability via the Internet.