



Binding Communities  
Improving Lives.

March 3, 2026



# Draft Stormwater Master Plan

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HR Green Project Number: **2202571**

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## Appendix

### Appendix A: Data Collection and Generation

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## Executive Summary

The City of Sunset Hills Stormwater Management Program is a three-phased initiative to alleviate stormwater concerns in the community. The three phases of the Program are:

- ▶ Phase 1: Data Collection and Analysis to Identify Stormwater Problems
- ▶ Phase 2: Conceptual Development and Prioritization of Stormwater Projects
- ▶ Phase 3: Implementation

The objective of the Program is to identify stormwater problems (Phase 1), determine approximate costs and benefits to specific projects (Phase 2), and design and construct those projects (Phase 3). This report summarizes the efforts completed for Phase 1 and 2 of the Program. Phase 1 occurred from July 2025 through December 2025. Phase 2 followed and was completed in **March 2026**.

## Background

Stormwater runoff is collected and conveyed in street gutters, ditches, swales, and storm sewers. The storm sewer system is largely owned and maintained by the Metropolitan St. Louis Sewer District (MSD). MSD is the stormwater utility for St. Louis City and St. Louis County, including the City of Sunset Hills. Other entities, including MoDOT, St. Louis County, the City of Sunset Hills, Homeowners Associations, and private landowners also own stormwater infrastructure in the City of Sunset Hills.

**Watersheds.** The City of Sunset Hills is located in three watersheds: Lower Meramec River, Gravois Creek, and Mattese Creek. Besides the Meramec River and its floodplain, most of Sunset Hills lies near the “top” of the watershed, meaning the contributing drainage area largely comes from runoff within Sunset Hills. See Figure 1.

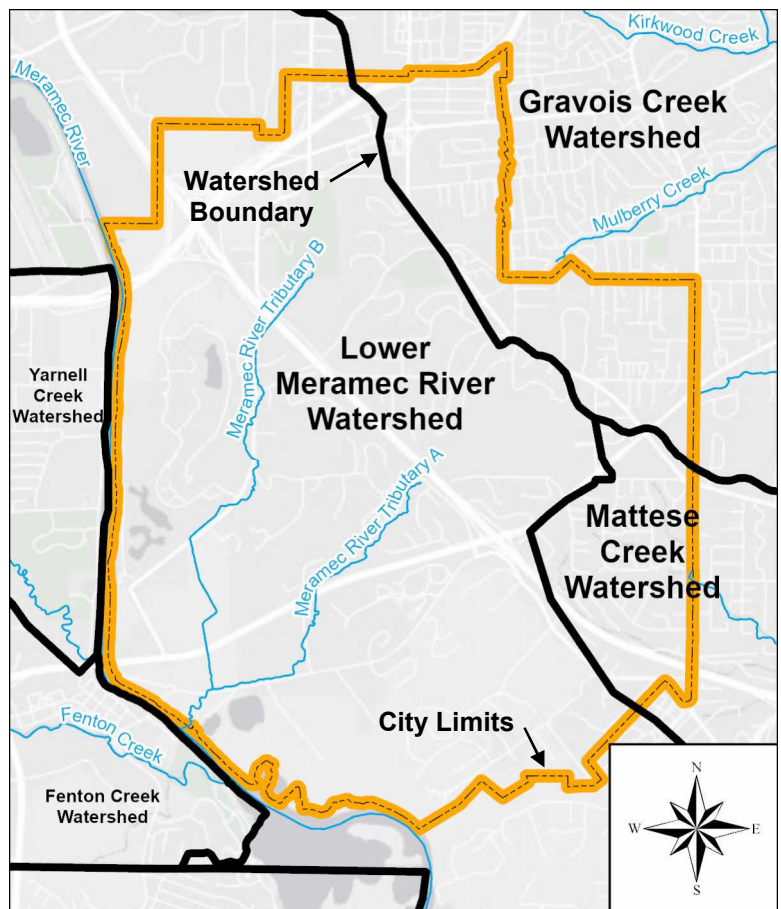


Figure 1: Sunset Hills Watersheds

## Phase 1: Data Collection and Analysis to Identify Stormwater Problems

**Existing Data.** Phase 1 focused on collecting and reviewing data to better understand the nature, severity, and frequency of stormwater issues. Information was compiled from existing sources, including:

- ▶ Metropolitan St. Louis Sewer District (MSD): basemap data of storm and sanitary facilities, studied storm and sanitary projects
- ▶ FEMA/SEMA: current effective floodplain maps, preliminary floodplain maps and models
- ▶ City Staff: known problem areas, existing City-owned detention basins

**Additional Mapping.** HR Green produced the following mapping using publicly available topographic elevation data:

- ▶ Flow paths
- ▶ Watersheds
- ▶ Stream buffers

Appendix A details the significance of each data source and mapping; it also includes maps showing the data collected within Sunset Hills.

**Public Outreach.** Phase 1 included collecting information from the public regarding stormwater concerns. This work included a website for the program, online and paper forms of a survey, public open houses, and direct communication with residents. Seventy-five survey responses were received from the public. Appendix B details the public outreach efforts and results.

**Problem Investigation.** The data was analyzed to determine areas with the greatest need for further evaluation during Phase 2; Appendix C elaborates on those efforts. HR Green engineers reviewed all available information and visited over 20 areas of concern to validate and understand the problems. From that analysis, ten locations were selected for the development of capital improvement projects in Phase 2.

## Phase 2: Conceptual Development and Prioritization of Stormwater Projects

**Selection of Capital Improvement Projects.** Following the desktop analysis and site visits, the highest priority problem areas were selected for capital improvement projects through discussions with City staff. All the selected problem areas had one or more of the following:

- ▶ Overland flooding to a home or business
- ▶ Significant street flooding that is dangerous or restricts emergency access to homes
- ▶ Erosion near a home or business

Ten capital improvement projects were created. A workbook was completed for each project which includes:

- ▶ **Project Summary.** The project summary includes a description of the problem, the proposed conceptual solution, and noteworthy information.
- ▶ **Project Exhibit.** This shows an aerial view of the project area with proposed project improvements sketched in red.
- ▶ **Opinion of Probable Cost (OPC).** This is an itemized breakdown of expected construction costs to complete the project. Unit costs are in 2026 dollars and utilize the current MSD unit costs with a 10% increase. Engineering, survey, and geotechnical estimates are included.

- ▶ **Benefit Point Calculation.** A benefit point calculation using MSD's methodology was completed so that each project can be easily brought into MSD's capital improvements projects list.

The ten capital improvement projects are listed by Project Number and briefly described in Table 1. Figure 1 follows, which shows the location of each project.

*Table 1: Identified Stormwater Capital Improvement Projects*

Project Number	Project Name	Problem Description	Project Description
2601	Rotherwood Ct Storm Sewer	Garage, driveway, and yard flooding occurs due to runoff from the street flowing down driveways.	Extend the storm sewer to collect street runoff upstream of driveways. Improve collection by existing inlets.
2602	Woodpark Dr Storm Improvements	Yard and basement flooding occurs at the corner of Woodpark Drive. Pipe capacity downstream is insufficient and causes this flooding.	Upsize the storm sewer to provide sufficient capacity. Increase capture by inlets with grading improvements.
2603	Shadow Ln Storm Improvements	Basement flooding occurs frequently due to an undersized culvert under Nanell Ln.	Install a parallel culvert under Nanell Ln and provide 8.6 acre-feet of storage in the common ground to offset peak flows.
2604	Weber Hill Rd Storm Improvements	Flooding occurs frequently at the sag on Weber Hill Road due to runoff bypassing an existing 30" culvert and insufficient inlet capacity.	Improve conveyance to the existing 30" culvert and increase inlet capacity at the sag.
2605	Hadley Hill Rd Storm Improvements	Water from the north of Hadley Hill Road flows onto and across the street, causing flooding and debris buildup.	Grade a swale on the north side of Hadley Hill Road. Install a new storm system to collect runoff periodically.
2606	Meppen Dr Storm Improvements	The culvert under Meppen Drive is undersized, causing street flooding. Downstream of the culvert, channel erosion is threatening a house and sheds.	Replace the undersized culvert and stabilize the stream banks.
2607	Oleander Ct Storm Improvements	Garage flooding occurs due to street runoff bypassing existing grated inlet. Erosion of creek in backyards threatening yards and sheds.	Extend the storm sewer system to more efficiently capture street runoff. Stabilize the creek bank with a rock toe, grading, and native vegetation.
2608	Doverhill Dr Channel Upstream Improvements	Erosion of the channel is threatening yards and homes.	Stabilize the banks of the channel with regrading and installing rock and plantings.
2609	Tioga Ct Storm Improvements	Runoff from the southwest overwhelms the sinkholes in the common ground for Tioga Court, flooding the nearby yards and street.	Extend the storm sewer system up Tioga Court and to the common ground. Provide grading improvements on the common ground to improve capture of inlets.
2610	Forest Path Dr Storm Sewer	The sag on Forest Path Drive floods due to lack of inlets, pipe capacity, and backwater from the Meramec River.	Improve inlet and pipe capacity to reduce flooding in the street.

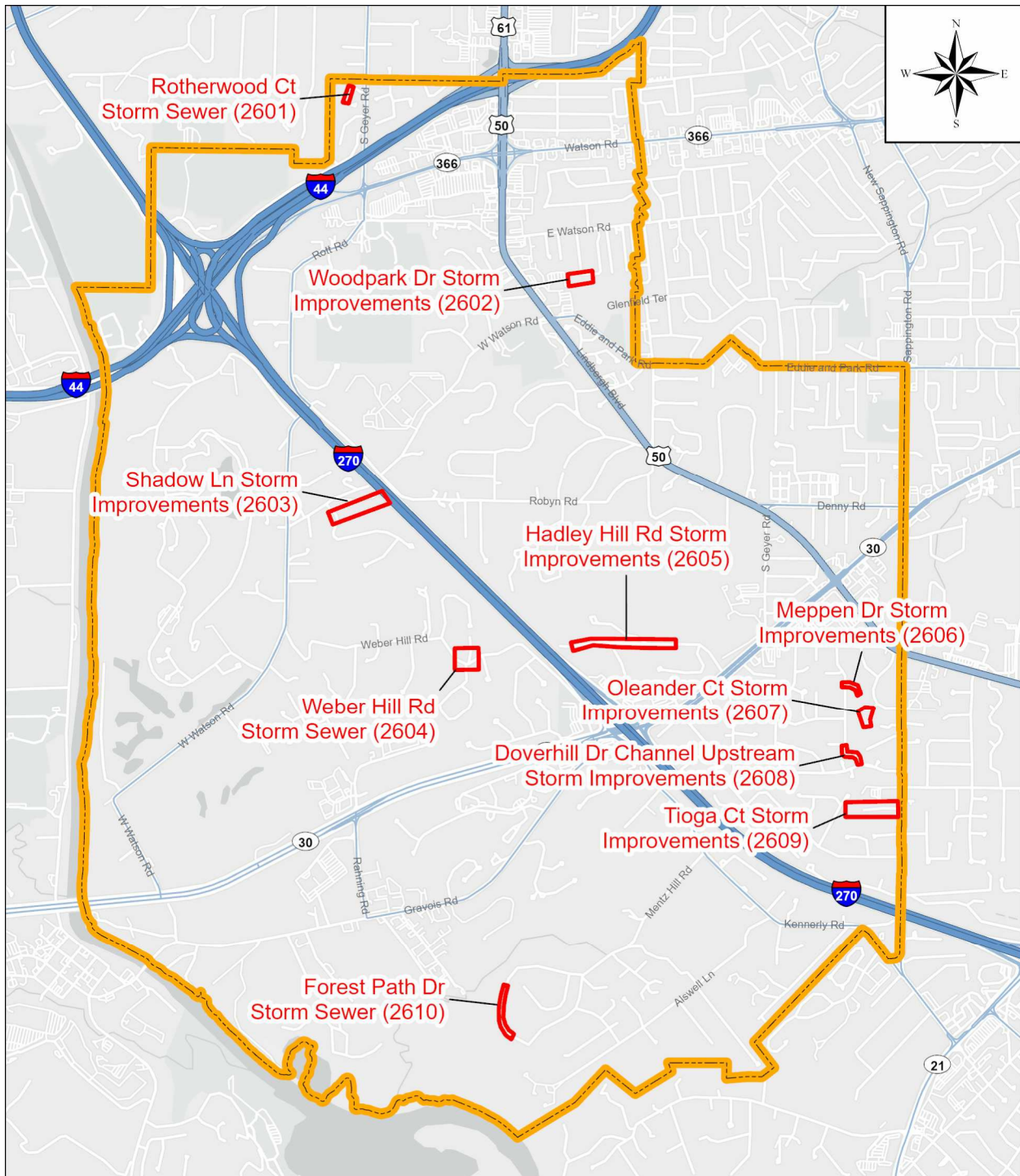


Figure 2: Map of Identified Stormwater Capital Improvement Projects

The projects were ranked by benefit to cost ratio, which is calculated by dividing the project benefit points by the OPC in thousands. Table 2 shows the prioritized list of capital improvement projects. Project workbooks are included directly following this executive summary.

*Table 2: Capital Improvement Projects Listed by Benefit to Cost Ratio*

Rank	Project Name	Project Number	Opinion of Probable Construction Cost	Project Benefit Points	Benefit to Cost Ratio
1	Rotherwood Ct Storm Sewer	2601	\$204,542	490	2.40
2	Weber Hill Rd Storm Improvements	2604	\$131,700	255	1.94
3	Oleander Ct Storm Improvements	2607	\$300,050	438	1.46
4	Forest Path Dr Storm Sewer	2610	\$688,155	942	1.37
5	Woodpark Dr Storm Improvements	2602	\$342,538	410	1.20
6	Meppen Dr Storm Improvements	2606	\$422,525	379	0.90
7	Doverhill Dr Channel Upstream Improvements	2608	\$243,740	165	0.68
8	Shadow Ln Storm Improvements	2603	\$1,604,899	950	0.59
9	Hadley Hill Rd Storm Improvements	2605	\$687,220	180	0.26
10	Tioga Ct Storm Improvements	2609	\$725,928	70	0.10
<b>TOTAL</b>			<b>\$5,347,018</b>		

**Additional Stormwater Concerns and Opportunities.** Not every stormwater concern could be addressed with the ten capital improvements projects. The remaining issues were identified and documented for future consideration. In addition, HR Green outlined potential opportunities for the City to achieve further stormwater benefits. Refer to Appendix D for a summary of additional concerns and opportunities.

**Funding.** There are various sources of funding for stormwater projects, including local, state, and federal sources. Table 3 lists funding sources.

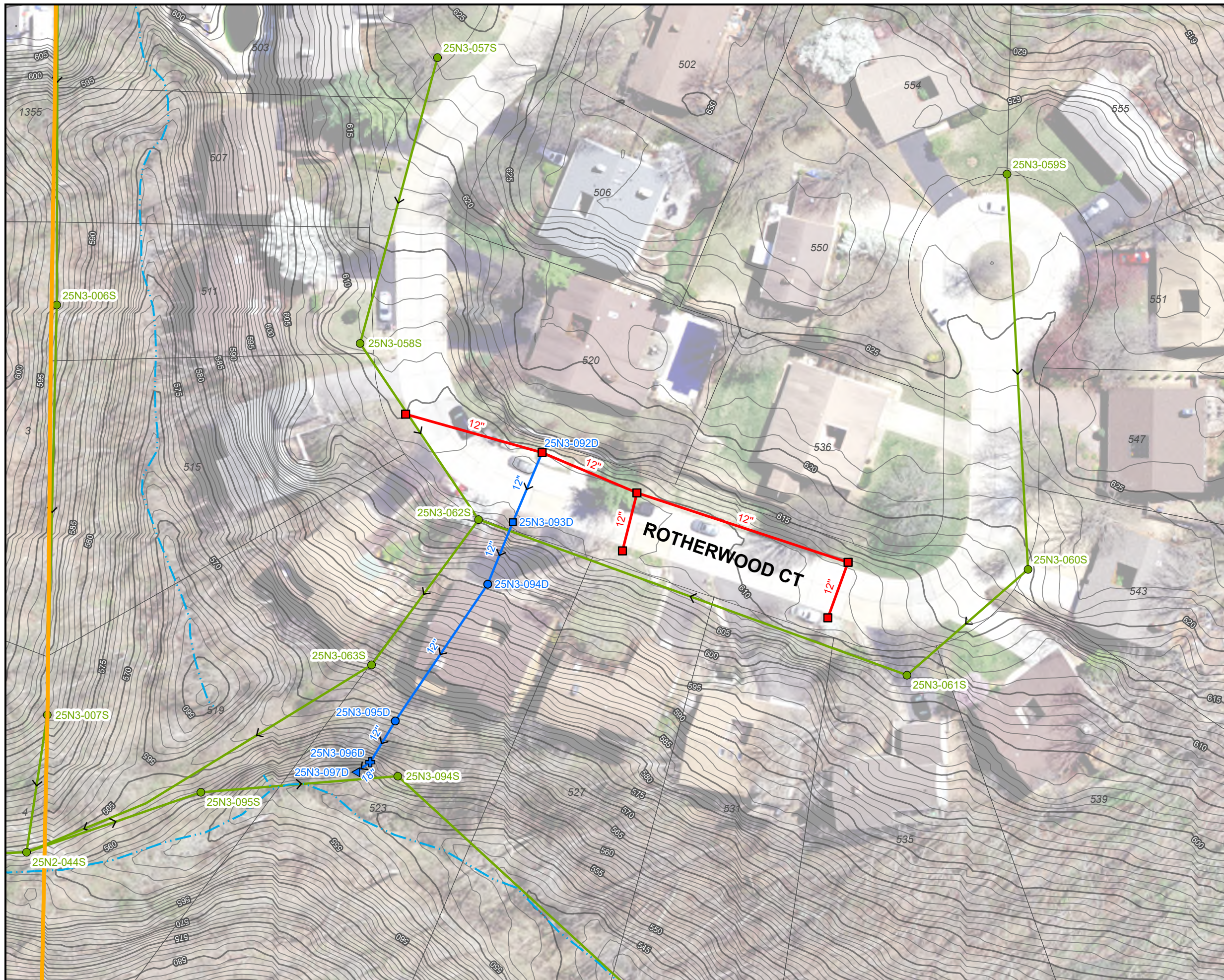
Table 3: Potential Funding Sources for Stormwater Projects

Funding Name	Funding Organization	Funding Amount	Match Required	Project Type
Parks and Stormwater Sales Tax	City of Sunset Hills	Varies	n/a	Stormwater flooding and erosion
Operation Maintenance Construction Improvement (OMCI) District*	Metropolitan St. Louis Sewer District	Remaining balance of \$38,000	No	Stormwater flooding, erosion, or maintenance in the Gravois Creek Watershed
Municipal Stormwater Grant Program (Proposition S)	Metropolitan St. Louis Sewer District	\$100,000 per year	No	Stormwater drainage, flooding, and erosion
Section 319 Nonpoint Source Subgrants	Missouri Department of Natural Resources	Varies, but likely >\$50,000	60% federal 40% non-federal	Requires a nine-element watershed based plan to be developed and approved by DNR
Hazard Mitigation Assistance ( <a href="https://www.fema.gov/grants/mitigation/learn">https://www.fema.gov/grants/mitigation/learn</a> )	FEMA, SEMA	Varies, but likely >\$50,000	75% federal 25% non-federal	Projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program

\* MSD is no longer collecting funds through the Gravois Creek OMCI district; however, there is an outstanding balance of approximately \$38,000 available to Sunset Hills for reimbursement.

## Capital Project Workbooks

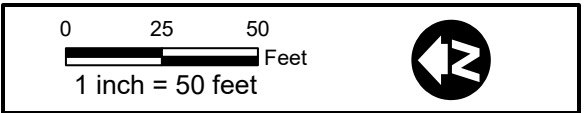
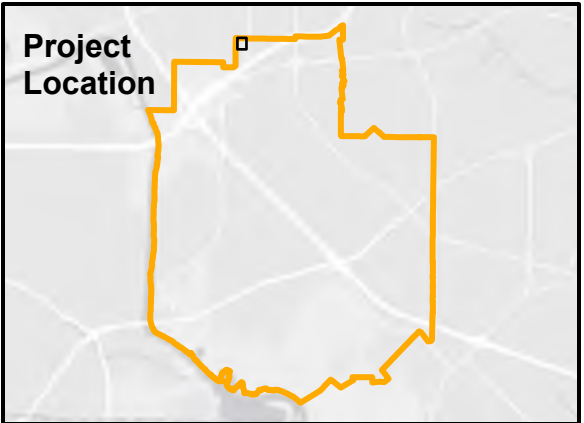
2601 – Rotherwood Ct Storm Sewer.....	9
2602 – Woodpark Dr Storm Improvements.....	15
2603 – Shadow Ln Storm Improvements.....	21
2604 – Weber Hill Rd Storm Improvements.....	27
2605 – Hadley Hill Rd Storm Improvements.....	33
2606 – Meppen Dr Storm Improvements.....	39
2607 – Oleander Ct Storm Improvements.....	45
2608 – Doverhill Dr Channel Upstream Improvements.....	51
2609 – Tioga Ct Storm Improvements.....	57
2610 – Forest Path Dr Storm Sewer.....	63



### Legend

<b>Proposed Improvements</b>	<b>Existing Sanitary Network</b>
■ Single Inlet	→ Gravity Main
— Storm Sewer	● Manhole
<b>Existing Storm Network</b>	<b>Preliminary Floodplain</b>
→ Gravity Main	▨ Regulatory Floodway
■ Inlet	■ 1.0% Annual Chance Flood Hazard
● Manhole	■ 0.2% Annual Chance Flood Hazard
▲ Intake/Outfall	■ Reduced Flood Risk Due to Levee
⊕ Fitting	

### Easement Expected to Be Needed from Property Owner



<b>Project Benefit Points</b>	490
<b>Conceptual Project Cost</b>	\$204,542.00
<b>Benefit to Cost Ratio</b>	2.4

**Problem Description**  
Garage, driveway, and yard flooding occurs due to runoff from the street flowing down driveways.

**Proposed Solution Description**  
Extend the storm sewer to collect street runoff upstream of driveways. Improve collection by existing inlets.

Sunset Hills City of Sunset Hills Stormwater Master Plan HRGreen

**Project #2601**  
**Rotherwood Ct Storm Sewer**

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# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



<b>Project Name:</b> <u>Rotherwood Ct Storm Sewer</u>	<b>Project Number:</b> <u>2601</u>
<b>Number of Properties Impacted:</b> <u>0</u>	<b>Opinion of Probable Construction Cost:</b> \$ <u>204,542</u>
<b>Number of Easements Required:</b> <u>0</u>	<b>Project Benefit Points:</b> <u>490</u>
<b>Number of Properties Benefited:</b> <u>4</u>	<b>Benefit to Cost Ratio:</b> <u>2.40</u>

**Problem Description:**

Homes west of Rotherwood Court sit 5 to 10 feet lower than the street. Rotherwood Court has rolled curb and gutter with inlets at the sag in front of #523 and #520. Runoff in the street escapes the gutter and flows down some of the driveways on the west side of the street, causing garage and house flooding.

The worst flooding occurs at #523 Rotherwood Court. During larger events, the existing sag inlet is unable to keep up with the runoff in the street, and water flows down the driveway. There is a channel drain in front of the driveway that is unable to keep up with the flow from the street, so the garage floods. Garage flooding happens multiple times a year.

Additionally, a low spot in the street was observed between the driveways of #523 and #527. Street ponding likely occurs in this location.

**Proposed Solution:**

Extend the storm sewer along Rotherwood Court to collect street runoff upstream of driveways. Make grading improvements near the existing inlet in front of #523 to improve collection.

**Commentary:**

Driveway humps are often considered when runoff escapes the street. In this case, driveway humps are not recommended due to the steep driveways; it is not likely a car could drive over a driveway hump without scraping.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Rotherwood Ct Storm Sewer

**Project Number:** 2601

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$3,334	\$3,334
2	Curb - Concrete Rem. and Rep.	281	LF	\$55	\$15,455
3	Excavation Class "C"	143	CY	\$31	\$4,433
4	Granular Backfill	114	SY	\$61	\$6,954
5	Inlet - Street	6	EA	\$3,457	\$20,742
6	Pipe Sewer 12 Inch (Storm)	308	LF	\$92	\$28,336
7	Street Pavement - Concrete Rem. and Rep.	400	SY	\$88	\$35,200
8	Protection and Restoration of Site	1	LS	\$14,446	\$14,446
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$128,900</b>
Estimated Engineering Fee:					\$26,000
Estimated Geotechnical Engineering Fee:					\$0
Estimated Property Survey/Strip Map Preparation Fee:					\$1,000
Estimated Property Title/Easement Search Report Fee:					\$0
Estimated Topographic Survey Fee:					\$940
Estimated Property Rights Acquisition Document Preparation Fee:					\$0
Estimated Cost of Easements:					\$0
Estimated Construction Survey Fee:					\$500
<b>SUB-TOTAL - DESIGN:</b>					<b>\$28,440</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$157,340</b>
30% Contingency:					\$47,202
<b>TOTAL:</b>					<b>\$204,542</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Rotherwood Ct Storm Sewer

**Project Number:** 2601

1.0 STREAM	PROBLEM SOLVED CATEGORY	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points	
		Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected		
		Note: Problem points are awarded only for those problems solved by the proposed solution.							
1.1. FLOODING	1.1.1. Structure Flooding								
	Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>	300		150		25			
	Basement (1 lot per structure) <i>Address:</i>	200		100		15			
	Attached Garage (1 lot per structure) <i>Address:</i>	100		50		8			
	Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>	300		150		25			
	Yard Flooding (1 per lot) <i>Address:</i>	10		5		0			
	1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)								
	Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		100		15			
	Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		25		4			
	Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		12		2			
Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		5		1				
1.2. EROSION	1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)								
	Habitable structures, residential (1 lot per structure) <i>Address:</i>	300		200		50			
	Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc. (1 lot per structure) <i>Address:</i>	150		100		25			
	Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>	300		200		50			
	1.2.2. No. of lots (from 1.2.1) on outside of bend			lots	10 points per lot				
	1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)								
	Arterial Road: <i>Address:</i>	Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
	Collector Road: <i>Address:</i>	75		50		12			
Residential Road: <i>Address:</i>	35		25		6				
Residential Road: <i>Address:</i>	20		12		3				



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		<b>2.1.1. Structure Flooding</b>							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65		
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* <i>Address:</i>	300		200		50		
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N				N		
		Attached Garage (1 lot per structure) <i>Address: #519, 523, 527, and 531 Rotherwood Ct</i>	100	4	75		25		400
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12		
		Yard Flooding (1 per lot) <i>Address: #519, 523, 527, and 531 Rotherwood Ct</i>	10	4	6		0		40
		<b>2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted &amp; 2 lots per intersection impacted)</b>							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		150		25		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address: #523 Rotherwood Ct</i>	10	1	6		1		10
		Ponding (per ponding area) <i>Address: Between driveways at #523 and #527 Rotherwood Ct</i>	No. Ponds:		1	Points/pond:		5	5
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:			Points/lot:		20	
		2.3. Yard Erosion (1 per lot) <i>Address:</i>	No. Lots:			Points/lot:		10	
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)		
		Points for Age			15				15
<b>TOTAL PROBLEM POINTS</b>									<b>470</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



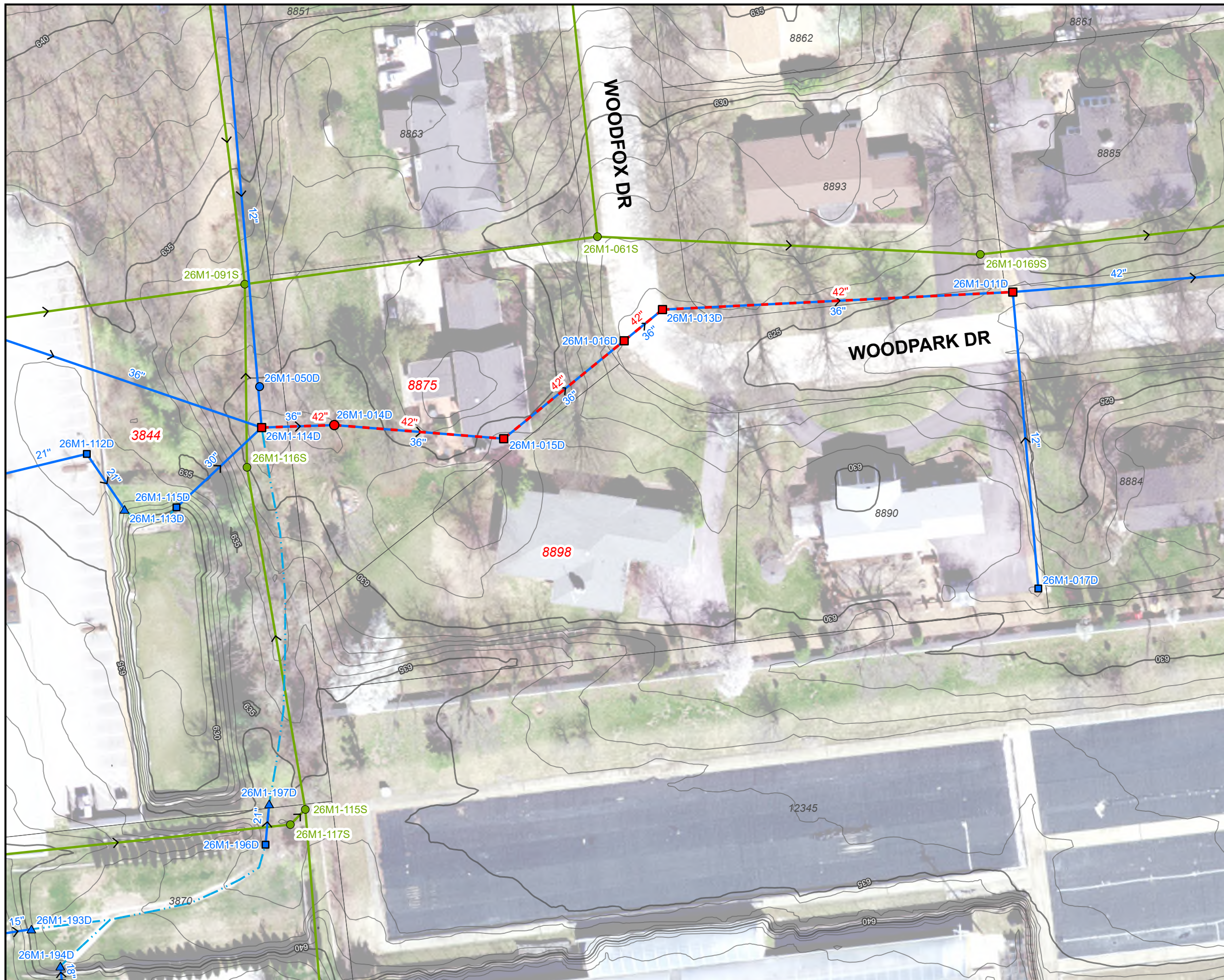
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SOLUTION BENEFIT CATEGORY					
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit	
	Bioswales		PER 100 LF	10	
	Forebays		AC	200	
	Wet Ponds		AC	100	
	Wetlands		AC	50	
	Biostabilization of banks (per bank)		PER 100 LF	10	
	Riffle Pool Complex		PER 100 LF	10	
	4.2. Eliminates combined sewer (per project)		EA	100	
	4.3. Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)		EA	10	
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)
	Points for Easements	20			20
	5.2. Recreational/Educational	Yes = 100, no = 0 pts		0	
<b>TOTAL SOLUTION POINTS</b>					<b>20</b>
<b>TOTAL BENEFIT POINTS</b>					<b>490</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

**TOTAL COST IN THOUSANDS =** **\$204.54**

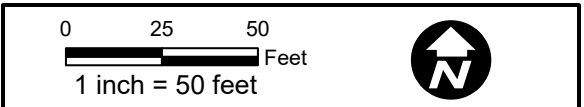
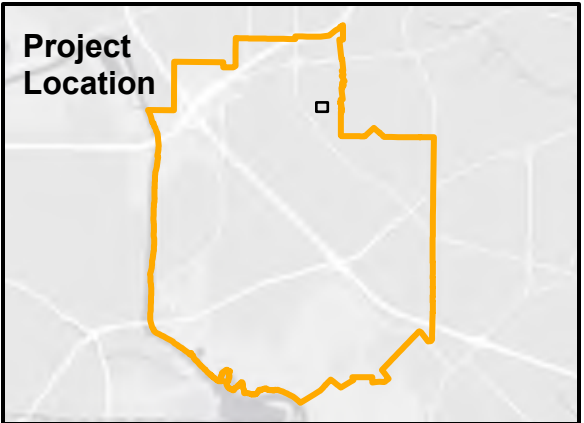
**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **2.40**



### Legend

<b>Proposed Improvements</b>	<b>Existing Sanitary Network</b>
■ Single Inlet	→ Gravity Main
● Manhole	● Manhole
- - Upsize Storm Sewer	<b>Preliminary Floodplain</b>
<b>Existing Storm Network</b>	▨ Regulatory Floodway
→ Gravity Main	■ 1.0% Annual Chance Flood Hazard
■ Inlet	■ 0.2% Annual Chance Flood Hazard
● Manhole	■ Reduced Flood Risk Due to Levee
▲ Intake/Outfall	

### Easement Expected to Be Needed from Property Owner



<b>Project Benefit Points</b>	410
<b>Conceptual Project Cost</b>	\$342,538.00
<b>Benefit to Cost Ratio</b>	1.2

**Problem Description**  
Yard and basement flooding occurs at the corner of Woodpark Drive. Pipe capacity downstream is insufficient and causes this flooding.

**Proposed Solution Description**  
Upsize the storm sewer to provide sufficient capacity. Increase capture by inlets with grading improvements.

Sunset Hills City of Sunset Hills Stormwater Master Plan

Project #2602  
Woodpark Dr Storm Improvements

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# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Woodpark Dr Storm Improvements **Project Number:** 2602

**Number of Properties Impacted:** 3 **Opinion of Probable Construction Cost:** \$ 342,538

**Number of Easements Required:** 3 **Project Benefit Points:** 410

**Number of Properties Benefited:** 3 **Benefit to Cost Ratio:** 1.20

**Problem Description:**

Flooding occurs at 8875 and 8898 Woodpark Drive. An existing 36-inch storm sewer extends between the yards, carrying runoff generally east. The storm sewer carries runoff from the commercial buildings to the west. Flooding affects the yards of both properties frequently - one or more times every year. Overland basement flooding also occurs. Since December of 2020, the basement at #8898 has flooded twice due to overland flow into the basement windows. Since then, the homeowner has replaced the windows with glass blocks.

A homeowner indicated that when flooding occurs, it usually begins at the existing area inlet 26M1-114D. Preliminary modeling of the 15-year existing conditions indicate that the 36-inch storm sewer from 26M1-114D to 26M1-011D is undersized, and that water surcharges out of 26M1-114D. This surcharged water then overflows to the yard and basement of 8898 Woodpark Drive.

Inlet capture was also evaluated. Inlet capacity calculations indicate that 26M1-114D should be able to capture the 15-year local storm without overflowing towards 8898 Woodpark Drive. Our analysis found that 26M1-015D also should be able to capture the 15-year storm without flooding the basement; however, the basement is in a vulnerable position. Therefore, increasing inlet capacity should be considered as a factor of safety.

**Proposed Solution:**

Upsize the existing 36-inch storm sewer from 26M1-114D to 26M1-011D to a 42-inch diameter pipe. Replace the existing structures in place. Perform grading improvements near the inlets to improve capture of the local runoff.

Lastly, grade a swale between 8898 Woodpark Drive and 8875 Woodfox Drive to carry the 100-year event to the street.

**Commentary:**



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Woodpark Dr Storm Improvements

**Project Number:** 2602

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$4,585	\$4,585
2	Curb - Concrete Rem. and Rep.	47	LF	\$55	\$2,585
3	Excavation Class "C"	530	CY	\$31	\$16,430
4	Granular Backfill	45	SY	\$61	\$2,745
5	Inlet - Area	2	EA	\$3,527	\$7,054
6	Inlet - Street	3	EA	\$3,457	\$10,371
7	Manhole - Standard Construction	7	LF	\$461	\$3,227
8	Pipe Sewer 42 Inch (Storm)	419	LF	\$253	\$106,007
9	Street Pavement - Concrete Rem. and Rep.	50	SY	\$88	\$4,400
10	Vegetated Reinforced Earthen Swale	89	SY	\$39	\$3,471
11	Protection and Restoration of Site	1	LS	\$19,866	\$19,866
12	Utility Relocation	1	AL	\$30,000	\$30,000
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$210,741.00</b>
Estimated Engineering Fee:					\$43,000.00
Estimated Geotechnical Engineering Fee:					\$0.00
Estimated Property Survey/Strip Map Preparation Fee:					\$1,000.00
Estimated Property Title/Easement Search Report Fee:					\$1,200.00
Estimated Topographic Survey Fee:					\$2,700.00
Estimated Property Rights Acquisition Document Preparation Fee:					\$1,350.00
Estimated Cost of Easements:					\$3,000.00
Estimated Construction Survey Fee:					\$500.00
<b>SUB-TOTAL - DESIGN:</b>					<b>\$52,750.00</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$263,491</b>
30% Contingency:					\$79,047
<b>TOTAL:</b>					<b>\$342,538</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Woodpark Dr Storm Improvements

**Project Number:** 2602

1.0 STREAM	1.1. FLOODING	PROBLEM SOLVED CATEGORY	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
			Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		Note: Problem points are awarded only for those problems solved by the proposed solution.							
		1.1.1. Structure Flooding							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>	300		150		25		
		Basement (1 lot per structure) <i>Address:</i>	200		100		15		
		Attached Garage (1 lot per structure) <i>Address:</i>	100		50		8		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>	300		150		25		
		Yard Flooding (1 per lot) <i>Address:</i>	10		5		0		
		1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		100		15		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		25		4		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		12		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		5		1		
	1.2. EROSION	1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)							
		Habitable structures, residential (1 lot per structure) <i>Address:</i>	300		200		50		
		Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc. (1 lot per structure) <i>Address:</i>	150		100		25		
		Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>	300		200		50		
		1.2.2. No. of lots (from 1.2.1) on outside of bend		lots	10 points per lot				
		1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)							
		Arterial Road: <i>Address:</i>	Pts. for Ratio > 0.70 75	No. Lots	Pts. for Ratio 0.36 - 0.70 50	No. Lots	Pts. for Ratio 0.15- 0.35 12	No. Lots	
		Collector Road: <i>Address:</i>	35		25		6		
		Residential Road: <i>Address:</i>	20		12		3		



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	PROBLEM SOLVED CATEGORY, CONT.		Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected		
		2.1.1. Structure Flooding								
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65			
		Basement (1 lot per structure)* <i>Address: 8898 Woodpark Dr</i>	250	1	200		50			250
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* <i>Address:</i>	300		200		50			
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N				Y	50		50
		Attached Garage (1 lot per structure) <i>Address:</i>	100		75		25			
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12			
		Yard Flooding (1 per lot) <i>Address: 8875 Woodfox Dr, 8898 Woodpark Dr, 3844 S Lindbergh Blvd</i>	10	3	6		0			30
		2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)								
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		150		25			
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6			
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2			
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		6		1			
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:		Points/pond:		5			
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:		Points/lot:		20			
		2.3. Yard Erosion (1 per lot) <i>Address: 8875 Woodfox Dr</i>	No. Lots:		1	Points/lot:		10		10
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)			
		Points for Age	30							30
		<b>TOTAL PROBLEM POINTS</b>								<b>370</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



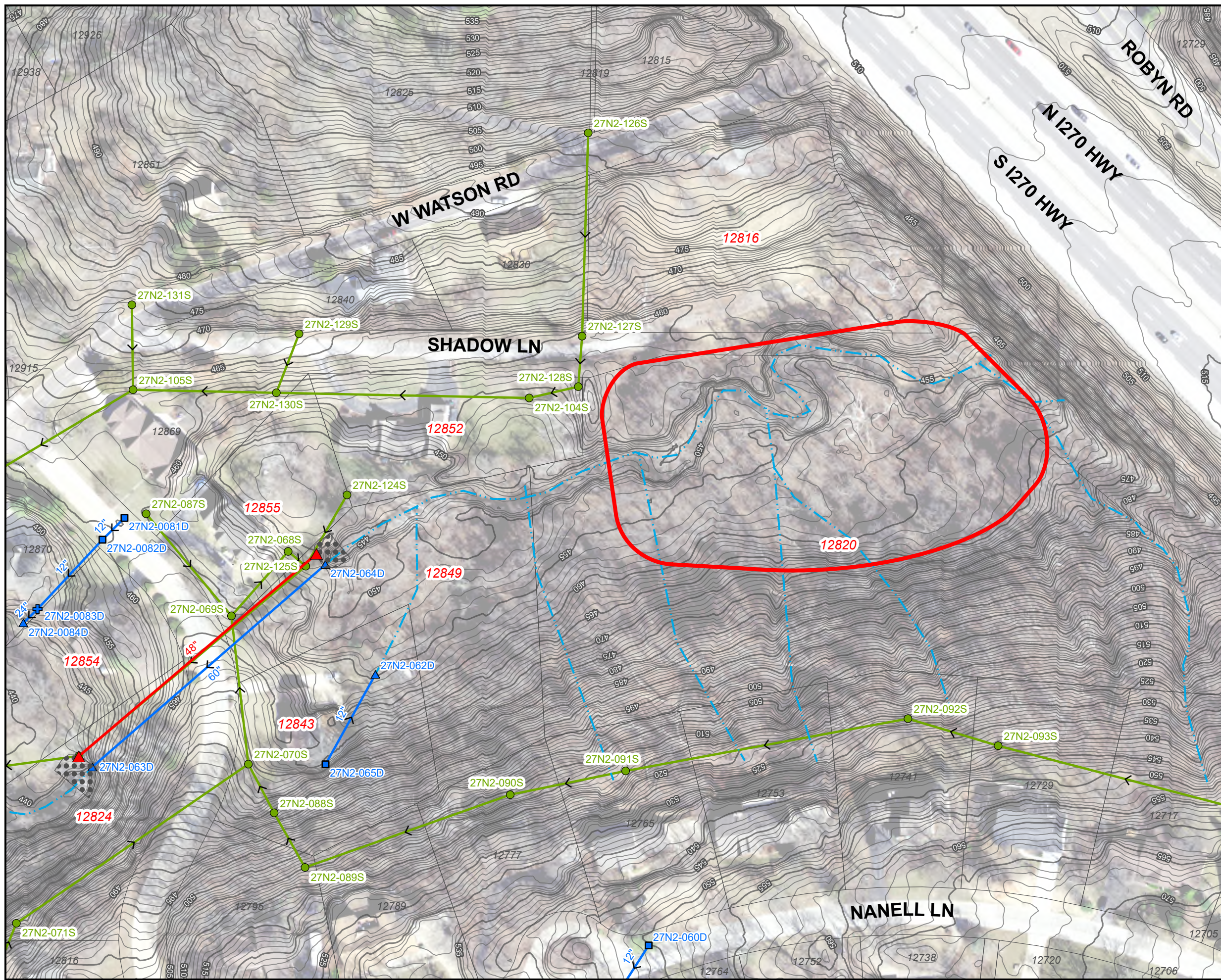
**CONTINUED:**

SOLUTION BENEFIT CATEGORY						
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000	
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50	
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit		
	Bioswales		PER 100 LF	10		
	Forebays		AC	200		
	Wet Ponds		AC	100		
	Wetlands		AC	50		
	Biostabilization of banks (per bank)		PER 100 LF	10		
	Riffle Pool Complex		PER 100 LF	10		
	4.2. Eliminates combined sewer (per project)		EA	100		
4.3	Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)	2	EA	10		20
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)	
	Points for Easements	20	0	0	0	20
	5.2. Recreational/Educational	Yes = 100, no = 0 pts		0		
<b>TOTAL SOLUTION POINTS</b>						<b>40</b>
<b>TOTAL BENEFIT POINTS</b>						<b>410</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

**TOTAL COST IN THOUSANDS =** **\$342.54**

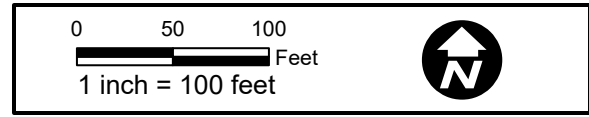
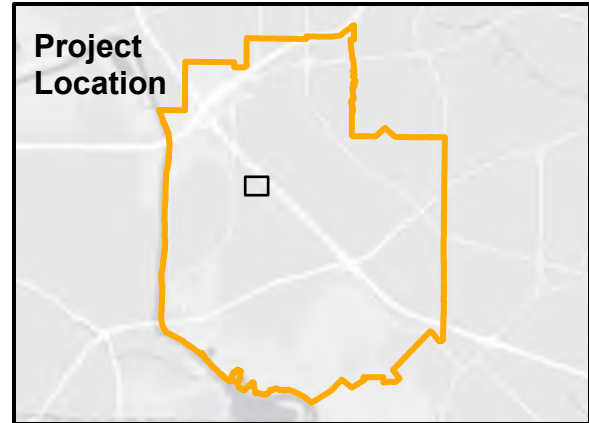
**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **1.20**



### Legend

<b>Proposed Improvements</b>	<b>Existing Sanitary Network</b>
▲ Outfall	→ Gravity Main
— Storm Sewer	● Manhole
⬢ Rock Blanket	<b>Preliminary Floodplain</b>
▭ Storage	▨ Regulatory Floodway
<b>Existing Storm Network</b>	▨ 1.0% Annual Chance Flood Hazard
→ Gravity Main	▨ 0.2% Annual Chance Flood Hazard
■ Inlet	▨ Reduced Flood Risk Due to Levee
▲ Intake/Outfall	
⊕ Fitting	

### Easement Expected to Be Needed from Property Owner



<b>Project Benefit Points</b>	950
<b>Conceptual Project Cost</b>	\$1,604,899.00
<b>Benefit to Cost Ratio</b>	0.59

**Problem Description**  
Basement flooding occurs frequently due to an undersized culvert under Nanell Ln.

**Proposed Solution Description**  
Install a parallel culvert under Nanell Ln and provide 8.6 acre-feet of storage in the common ground to offset peak flows.

Sunset Hills City of Sunset Hills Stormwater Master Plan

HRGreen

**Project #2603**  
**Shadow Ln Storm Improvements**

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# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Shadow Ln Storm Improvements **Project Number:** 2603

**Number of Properties Impacted:** 7 **Opinion of Probable Construction Cost:** \$ 1,604,899

**Number of Easements Required:** 7 **Project Benefit Points:** 950

**Number of Properties Benefited:** 7 **Benefit to Cost Ratio:** 0.59

**Problem Description:**

Basement flooding occurs frequently at 12852 Shadow Lane due to overflow from water in the adjacent creek. The basement sits at a low elevation at the top of the creekbank. A resident said that any rain that results in 2-3 inches in an hour causes flooding; this would equate to a 10-year to 100-year event.

Just downstream of #12852 is an existing 6' tall x 5' wide box culvert under Nanell Lane. The box culvert is undersized; backup occurs in the 2- to 5-year storm. 12852 Shadow Lane's basement is at about the same elevation as the top of the Nanell Lane culvert, so once the culvert is surcharging, flooding to the basement occurs.

Much of the property surrounding #12852 is HOA-owned. The resident said the HOA is open to allowing improvements such as detention on their property to address the problem.

**Proposed Solution:**

Install a new culvert under Nanell Lane, parallel to the existing box culvert. The parallel culvert should be 48" in diameter. Additionally, provide 8.6 acre-feet of storage in the common ground upstream of 12852 Shadow Lane.

Since the culvert is restrictive, it is providing some benefit to the properties downstream of Nanell Lane. Therefore, the proposed improvements include both increasing the capacity under Nanell Lane and providing detention upstream. The detention will offset the increase in flow due to the additional parallel culvert. These improvements were modeled to confirm that no increase in flow or water surface elevation will be experienced downstream.

**Commentary:**

The site is not in the current effective or preliminary floodplain.

MSD has studied the problem under Oracle Project number 14033. Proposed improvements include constructing a parallel sewer adjacent to the existing crossroad culvert under Nanell Lane. The project includes 360 feet of 78" diameter culvert.

The next culvert upstream is under Highway 270. The culvert was not modeled with this analysis. That said, it is possible that the 270 culvert is also restrictive. If that is the case, these improvements are more conservative than what is necessary to reduce the risk of flooding. Detailed design should determine whether the culvert under Highway 270 affects the flow rate through the project area.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Shadow Ln Storm Improvements

**Project Number:** 2603

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$25,782	\$25,782
2	Bank Protection - Biostabilization	1,178	CY	\$27	\$31,806
3	Basin Storage - Excavation and Haul Off	13,875	CY	\$28	\$388,500
4	Clearing	1	LS	\$75,000	\$75,000
5	Curb - Concrete Rem. and Rep.	40	LF	\$55	\$2,200
6	Excavation Class "C"	1,156	CY	\$31	\$35,836
7	Flared End Section 48 Inch Pipe	2	EA	\$4,334	\$8,668
8	Granular Backfill	249	CY	\$61	\$15,189
9	Pipe Sewer 48 Inch (Storm)	328	LF	\$242	\$79,376
10	Revegetation Blanket	6,000	SY	\$24	\$144,000
11	Rock Blanket	220	SY	\$88	\$19,360
12	Rock Toe Protection	354	SY	\$127	\$44,958
13	Street Pavement - Concrete Rem. and Rep.	165	SY	\$88	\$14,520
14	Protection and Restoration of Site	1	LS	\$111,724	\$111,724
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$996,919</b>
Estimated Engineering Fee:					\$200,000
Estimated Geotechnical Engineering Fee:					\$8,000
Estimated Property Survey/Strip Map Preparation Fee:					\$3,175
Estimated Property Title/Easement Search Report Fee:					\$2,800
Estimated Topographic Survey Fee:					\$12,700
Estimated Property Rights Acquisition Document Preparation Fee:					\$3,150
Estimated Cost of Easements:					\$7,000
Estimated Construction Survey Fee:					\$794
<b>SUB-TOTAL - DESIGN:</b>					<b>\$237,619</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$1,234,538</b>
30% Contingency:					\$370,361
<b>TOTAL:</b>					<b>\$1,604,899</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Shadow Ln Storm Improvements

**Project Number:** 2603

1.0 STREAM	PROBLEM SOLVED CATEGORY	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		Note: Problem points are awarded only for those problems solved by the proposed solution.						
1.1. FLOODING	1.1.1. Structure Flooding							
	Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) Address:	300		150		25		
	Basement (1 lot per structure) Address: <i>Chronic-12852 Shadow Ln, Frequent-12855 Nanell Ln</i>	200	1	100	1	15		300
	Attached Garage (1 lot per structure) Address:	100		50		8		
	Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) Address:	300		150		25		
	Yard Flooding (1 per lot) Address: <i>Chronic-12852 Shadow Ln, 12843, 12849, 12855 Nanell Ln, Frequent-12869 Nanell Ln, 12820 Shadow Ln</i>	10	4	5	2	0		50
	1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)							
	Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure Address:	200		100		15		
	Traffic obstruction (> 6" of water) on arterial street Address:	50		25		4		
	Traffic obstruction (> 6" of water) on collector street Address:	25		12		2		
Traffic obstruction (> 6" of water) on residential street Address:	10		5		1			
1.2. EROSION	1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)							
	Habitable structures, residential (1 lot per structure) Address:	300		200		50		
	Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc. (1 lot per structure) Address:	150		100		25		
	Industrial, office, commercial and warehouse (1 lot per structure) Address:	300		200		50		
	1.2.2. No. of lots (from 1.2.1) on outside of bend	2	lots	10 points per lot				20
	1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)							
	Arterial Road: Address:	75		50		12		
Collector Road: Address:	35		25		6			
Residential Road: Address: <i>Road near 12816 W Watson Rd</i>	20	1	12		3		20	



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>		Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points	
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected			
		<b>2.1.1. Structure Flooding</b>									
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65				
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50				
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* <i>Address:</i>	300		200		50				
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N					N			
		Attached Garage (1 lot per structure) <i>Address:</i>	100		75		25				
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12				
		Yard Flooding (1 per lot)	10		6		0				
		<b>2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted &amp; 2 lots per intersection impacted)</b>									
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		150		25				
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6				
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2				
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		6		1				
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:			Points/pond:		5			
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:			Points/lot:		20			
		2.3. Yard Erosion (1 per lot) <i>Address:</i>	No. Lots:			Points/lot:		10			
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)				
		Points for Age									
			<b>TOTAL PROBLEM POINTS</b>							<b>390</b>	



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



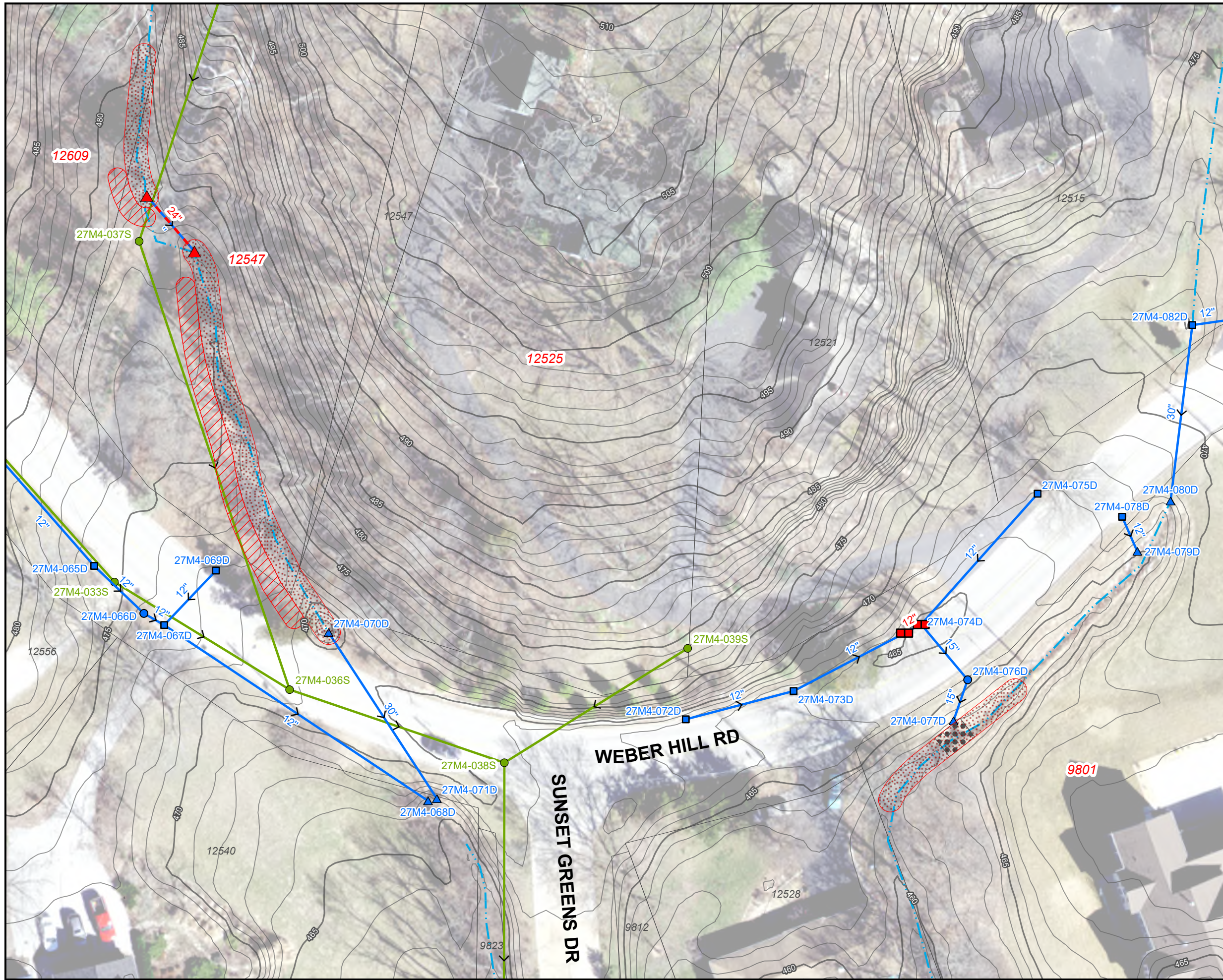
**CONTINUED:**

SOLUTION BENEFIT CATEGORY						
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :	<b>45%</b>	Max points:	1000	<b>450</b>
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50	
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit		
	Bioswales		PER 100 LF	10		
	Forebays		AC	200		
	Wet Ponds		AC	100		
	Wetlands		AC	50		
	Biostabilization of banks (per bank)	<b>10</b>	PER 100 LF	10		<b>100</b>
	Riffle Pool Complex		PER 100 LF	10		
4.2. Eliminates combined sewer (per project)		EA		100		
4.3	Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)		EA	10		
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)	
	Points for Easements		<b>10</b>			<b>10</b>
	5.2. Recreational/Educational		Yes = 100, no = 0 pts	<b>0</b>		
<b>TOTAL SOLUTION POINTS</b>						<b>560</b>
<b>TOTAL BENEFIT POINTS</b>						<b>950</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

**TOTAL COST IN THOUSANDS =** **\$1,604.90**

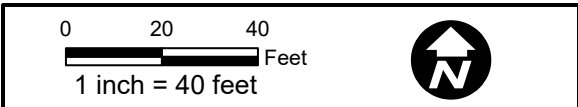
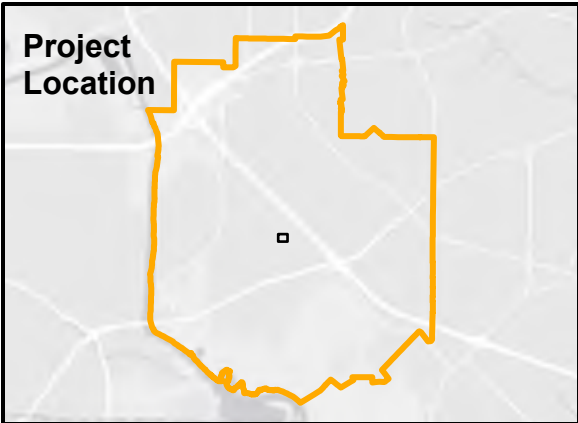
**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **0.59**



### Legend

<b>Proposed Improvements</b>	<b>Existing Sanitary Network</b>
■ Double Inlet	→ Gravity Main
▲ Outfall	● Manhole
- - Upsize Storm Sewer	<b>Preliminary Floodplain</b>
▨ Berm	▨ Regulatory Floodway
▩ Rock Blanket	▨ 1.0% Annual Chance Flood Hazard
▤ Swale	▨ 0.2% Annual Chance Flood Hazard
<b>Existing Storm Network</b>	▨ Reduced Flood Risk Due to Levee
→ Gravity Main	
■ Inlet	
● Manhole	
▲ Intake/Outfall	

### Easement Expected to Be Needed from Property Owner



<b>Project Benefit Points</b>	255
<b>Conceptual Project Cost</b>	\$131,700.00
<b>Benefit to Cost Ratio</b>	1.94

**Problem Description**  
 Flooding occurs frequently at the sag on Weber Hill Road due to runoff bypassing an existing 30" culvert and insufficient inlet capacity.

**Proposed Solution Description**  
 Improve conveyance to the existing 30" culvert and increase inlet capacity at the sag.

Sunset Hills City of Sunset Hills Stormwater Master Plan HRGreen HRGreen

**Project #2604**  
**Weber Hill Rd Storm Sewer**

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# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Weber Hill Rd Storm Improvements **Project Number:** 2604

**Number of Properties Impacted:** 6 **Opinion of Probable Construction Cost:** \$ 131,700

**Number of Easements Required:** 4 **Project Benefit Points:** 255

**Number of Properties Benefited:** 6 **Benefit to Cost Ratio:** 1.94

**Problem Description:**

Flooding occurs frequently at the sag on Weber Hill Road just east of Sunset Greens Drive. The City has to close the road at least once per year because of the deep flooding. In 2025, the road was closed three times due to flooding.

The inlets on Weber Hill Road are mostly two grate inlets with a side intake. A resident shared that the grated inlets clog easily due to the many nearby trees.

To the east of the sag and north of Weber Hill Road, a large drainage area is supposed to be picked up by a 30" culvert under Weber Hill Road. We observed that water likely bypasses this culvert and instead flows into the street, especially during larger storm events. This bypass occurs for two reasons: the ditch directing water to the 30" culvert is not well-defined, and the driveway culvert at 12547 Weber Hill Road. We observed that if the driveway culvert is overwhelmed, water will overtop south along the driveway and towards Weber Hill Road.

Pipe capacity calculations indicate that the storm sewers on Weber Hill Road are sized for the 15-year, 20-minute storm assuming the 30" culvert is not bypassed. If the culvert is bypassed, as is occurring in existing condition, then the storm sewers near the sag on Weber Hill Road are not able to carry the additional flow. Additionally, the pipe outfall 27M4-077D, which is downstream of the sag, may not be functioning fully. We observed that the outfall was partially buried and the pipe was filled with water.

**Proposed Solution:**

Replace the driveway culvert at 12547 Weber Hill Road with a 24" culvert. The new culvert should be deeper to better capture runoff. Regrade the swale upstream and downstream of the driveway culvert and add a berm to better keep water within the swale. Near the existing flared end section 27M4-070D, add a curb cut to allow any bypass from 27M4-069D to also enter the flared end section.

At the sag on Weber Hill Road, replace the existing grated inlet with two double curb inlets. This will provide better inlet capacity that is less susceptible to clogging.

Lastly, regrade the swale near existing inlet 27M4-077D. Install rock blanket at the outfall to protect from erosion.

**Commentary:**

MSD has studied a storm project nearby, called Weber Hill Road 12515 Storm Sewer (14144) which addresses yard flooding and erosion at 12505 and 12515 Weber Hill Road. Proposed improvements include extending the storm sewer system north from existing inlet 27M4-082D. The flooding and erosion addressed by this project is not directly related to the problems in the street. Our calculations indicate that 27M4-082D can collect the 15-year, 20-minute storm from the large drainage area reaching it without bypass affecting Weber Hill Road. Therefore, the improvements proposed by the MSD project were not included in the scope of this project.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Weber Hill Rd Storm Improvements

**Project Number:** 2604

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$1,568	\$1,568
2	Additional Fill	42	CY	\$24	\$1,008
3	Compaction of Fill	42	CY	\$24	\$1,008
4	Curb - Concrete Rem. and Rep.	20	LF	\$55	\$1,100
5	Excavation Class "C"	17	CY	\$31	\$527
6	Flared End Section 24 Inch Pipe	2	EA	\$2,838	\$5,676
8	Granular Backfill	30	SY	\$61	\$1,830
9	Inlet - Double	2	EA	\$4,835	\$9,670
10	Pipe Sewer 15 Inch (Storm)	8	LF	\$105	\$840
11	Pipe Sewer 24 Inch (Storm)	31	LF	\$154	\$4,774
12	Rock Blanket	16	SY	\$88	\$1,408
13	Sidewalks & Driveways - Asphaltic Concrete - Rem. &	58	SY	\$178	\$10,324
14	Vegetated Reinforced Earthen Swale	362	SY	\$39	\$14,118
15	Protection and Restoration of Site	1	LS	\$6,797	\$6,797
16	Utility Relocation	1	AL	\$10,000	\$10,000
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$70,648</b>
Estimated Engineering Fee:					\$15,000
Estimated Geotechnical Engineering Fee:					\$4,000
Estimated Property Survey/Strip Map Preparation Fee:					\$1,000
Estimated Property Title/Easement Search Report Fee:					\$1,600
Estimated Topographic Survey Fee:					\$2,760
Estimated Property Rights Acquisition Document Preparation Fee:					\$1,800
Estimated Cost of Easements:					\$4,000
Estimated Construction Survey Fee:					\$500
<b>SUB-TOTAL - DESIGN:</b>					<b>\$30,660</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$101,308</b>
30% Contingency:					\$30,392
<b>TOTAL:</b>					<b>\$131,700</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Weber Hill Rd Storm Improvements

**Project Number:** 2604

1.0 STREAM	1.1. FLOODING	<b>PROBLEM SOLVED CATEGORY</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
			Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		Note: Problem points are awarded only for those problems solved by the proposed solution.							
		1.1.1. Structure Flooding							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>	300		150		25		
		Basement (1 lot per structure) <i>Address:</i>	200		100		15		
		Attached Garage (1 lot per structure) <i>Address:</i>	100		50		8		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>	300		150		25		
		Yard Flooding (1 per lot) <i>Address:</i>	10		5		0		
		1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		100		15		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		25		4		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		12		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		5		1		
	1.2. EROSION	1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)							
		Habitable structures, residential (1 lot per structure) <i>Address:</i>	300		200		50		
		Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc. (1 lot per structure) <i>Address:</i>	150		100		25		
		Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>	300		200		50		
		1.2.2. No. of lots (from 1.2.1) on outside of bend		lots	10 points per lot				
		1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)							
		Arterial Road: <i>Address:</i>	75		50		12		
		Collector Road: <i>Address:</i>	35		25		6		
		Residential Road: <i>Address:</i>	20		12		3		



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	PROBLEM SOLVED CATEGORY, CONT.		Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected		
		2.1.1. Structure Flooding								
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65			
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50			
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* <i>Address:</i>	300		200		50			
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N					N		
		Attached Garage (1 lot per structure) <i>Address: 12528 Weber Hill Rd</i>	100		75	1	25			75
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12			
		Yard Flooding (1 per lot) <i>Address: 12609, 12547, 12528 Weber Hill Rd, 9801 Grandview Estates Dr</i>	10	4	6		0			40
		2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)								
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address: 12515, 12521, 12525 Weber Hill Rd</i>	200		150		25	3		75
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6			
		Traffic obstruction (> 6" of water) on collector street <i>Address: Approx. 250' of Weber Hill Rd</i>	25	1	15		2			25
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		6		1			
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:		Points/pond:			5		
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:		Points/lot:			20		
		2.3. Yard Erosion (1 per lot) <i>Address: 12547 Weber Hill Rd, 9801 Grandview Estates Dr</i>	No. Lots:		2	Points/lot:		10		20
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)			
		Points for Age					0			
		<b>TOTAL PROBLEM POINTS</b>								<b>235</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



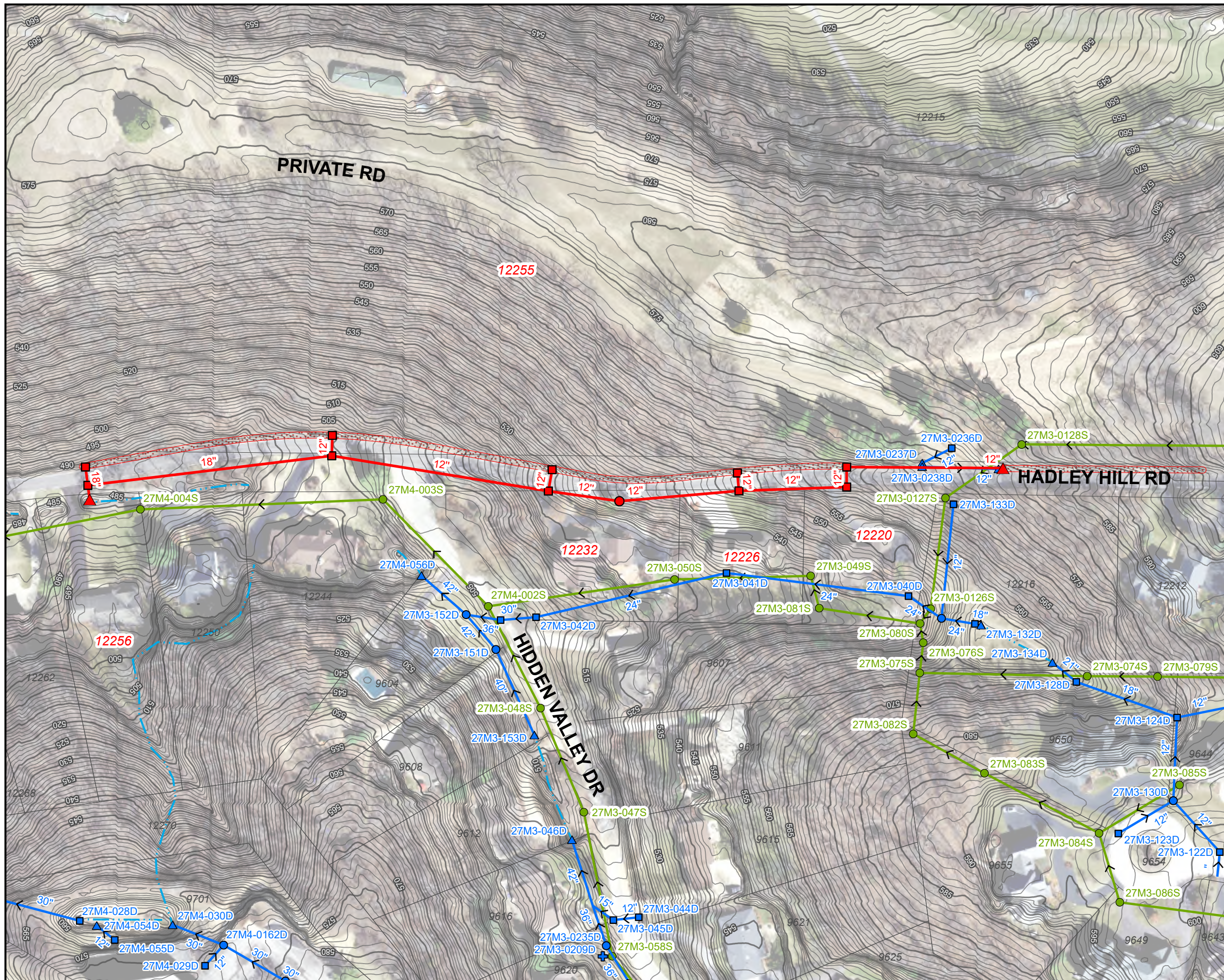
**CONTINUED:**

SOLUTION BENEFIT CATEGORY					
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit	
	Bioswales	PER 100 LF		10	
	Forebays	AC		200	
	Wet Ponds	AC		100	
	Wetlands	AC		50	
	Biostabilization of banks (per bank)	PER 100 LF		10	
	Riffle Pool Complex	PER 100 LF		10	
	4.2. Eliminates combined sewer (per project)	EA		100	
	4.3. Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)	EA		10	
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)
	Points for Easements	<b>20</b>			
	5.2. Recreational/Educational	Yes = 100, no = 0 pts		<b>0</b>	
<b>TOTAL SOLUTION POINTS</b>					<b>20</b>
<b>TOTAL BENEFIT POINTS</b>					<b>255</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

TOTAL COST IN THOUSANDS = \$131.70

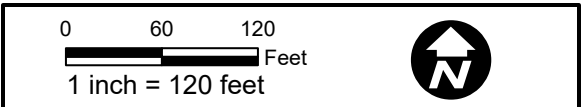
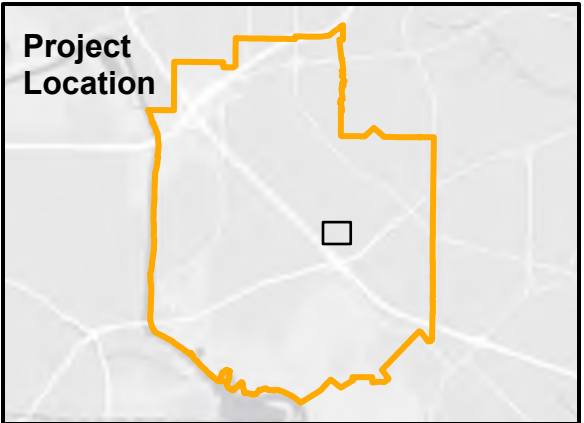
MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS = 1.94



### Legend

<b>Proposed Improvements</b>	<b>Existing Sanitary Network</b>
■ Single Inlet	→ Gravity Main
▲ Outfall	● Manhole
● Manhole	<b>Preliminary Floodplain</b>
— Storm Sewer	▨ Regulatory Floodway
▨ Swale	■ 1.0% Annual Chance Flood Hazard
<b>Existing Storm Network</b>	■ 0.2% Annual Chance Flood Hazard
→ Gravity Main	■ Reduced Flood Risk Due to Levee
■ Inlet	
● Manhole	
▲ Intake/Outfall	
⊕ Fitting	

### Easement Expected to Be Needed from Property Owner



<b>Project Benefit Points</b>	180
<b>Conceptual Project Cost</b>	\$687,220.00
<b>Benefit to Cost Ratio</b>	0.26

**Problem Description**  
Water from the north of Hadley Hill Road flows onto and across the street, causing flooding and debris buildup.

**Proposed Solution Description**  
Grade a swale on the north side of Hadley Hill Road. Install a new storm system to collect runoff periodically.

Sunset Hills City of Sunset Hills Stormwater Master Plan

HRGreen

**Project #2605**  
**Hadley Hill Rd Storm Improvements**

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# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Hadley Hill Rd Storm Improvements                      **Project Number:** 2605

**Number of Properties Impacted:** 7                      **Opinion of Probable Construction Cost:** \$ 687,220

**Number of Easements Required:** 5                      **Project Benefit Points:** 180

**Number of Properties Benefited:** 6                      **Benefit to Cost Ratio:** 0.26

**Problem Description:**

Hadley Hill Road is a residential street is generally situated east-west. The west portion of the road drains west. The land north of the road is steep and wooded; it drains towards Hadley Hill Road.

A subtle ditch exists north of the road to collect and carry water. However, that ditch is inadequate for the amount of runoff that comes from the north, so runoff frequently crosses the street. This causes rock and vegetative debris to frequently cover the road, and leads to runoff entering yards. This issue first impacts 12220, 12226, and 12232 Hadley Hill Road, but the issue also affects properties downstream. Some homeowners have installed curbing on the south side of Hadley Hill Road to keep runoff from flowing into their properties.

Runoff in the area eventually collects in a channel on the south side of Hadley Hill Road, flowing east through the front yards of 12250 through 12268 Hadley Hill Road. At those properties, each property has a private driveway culvert.

**Proposed Solution:**

On the north side of Hadley Hill Road, grade a swale to convey runoff from the hillside. Periodically install inlets in the swale to collect runoff and convey it through new stormsewers to the south side of Hadley Hill Road. Install curb inlets and a curb along the south side of Hadley Hill Road, piping the flow underground to the west. The new system should outlet into the existing channel near the west end of Hadley Hill Road.

**Commentary:**

The issues on Hadley Hill Road have persisted for years. The corridor was studied in 2014 and 2016, culminating in a conceptual design completed in 2017. The conceptual design addressed the stormwater drainage issues as well as some improvements to the safety of the corridor. However, the project did not move forward due to cost.

There are several utilities which will likely be in direct conflict with any improvements. There are existing power poles that cross over from one side of the roadway to the other. A water line exists in the south lane of Hadley Hill Road. Sanitary sewers are largely outside of the Hadley Hill Road corridor, except for a sanitary sewer which crosses the road near the private entrance to #12255. Utility coordination will be necessary with this project and care should be used during the design phase to avoid excessive utility relocation costs and construction delays, if possible.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Hadley Hill Rd Storm Improvements

**Project Number:** 2605

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$8,975	\$8,975
2	Curb - Asphaltic Concrete	535	LF	\$43	\$23,005
3	Excavation Class "C"	509	CY	\$31	\$15,779
4	Flared End Section 12 Inch Pipe	1	EA	\$2,035	\$2,035
5	Flared End Section 18 Inch Pipe	1	EA	\$3,685	\$3,685
6	Granular Backfill	180	SY	\$61	\$10,980
7	Inlet - Area	5	EA	\$3,527	\$17,635
8	Inlet - Street	5	EA	\$3,457	\$17,285
9	Manhole - Standard Construction	5	LF	\$461	\$2,305
10	Pipe Sewer 12 Inch (Storm)	975	LF	\$92	\$89,700
11	Pipe Sewer 18 Inch (Storm)	328	LF	\$129	\$42,312
12	Sidewalks & Driveways - Asphaltic Concrete - Rem. &	125	SY	\$178	\$22,250
13	Sidewalks & Driveways Concrete- Rem. and Rep.	230	SY	\$110	\$25,300
14	Street Pavement - Asphaltic Concrete Rem. and Rep.	286	SY	\$94	\$26,884
15	Vegetated Reinforced Earthen Swale	1,099	SY	\$39	\$42,861
16	Protection and Restoration of Site	1	LS	\$38,890	\$38,890
17	Utility Relocation	1	AL	\$30,000	\$30,000
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$419,881</b>
Estimated Engineering Fee:					\$84,000
Estimated Geotechnical Engineering Fee:					\$8,000
Estimated Property Survey/Strip Map Preparation Fee:					\$1,400
Estimated Property Title/Easement Search Report Fee:					\$2,000
Estimated Topographic Survey Fee:					\$5,600
Estimated Property Rights Acquisition Document Preparation Fee:					\$2,250
Estimated Cost of Easements:					\$5,000
Estimated Construction Survey Fee:					\$500
<b>SUB-TOTAL - DESIGN:</b>					<b>\$108,750</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$528,631</b>
30% Contingency:					\$158,589
<b>TOTAL:</b>					<b>\$687,220</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Hadley Hill Rd Storm Improvements

**Project Number:** 2605

1.0 STREAM	1.1. FLOODING	PROBLEM SOLVED CATEGORY	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
			Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		Note: Problem points are awarded only for those problems solved by the proposed solution.							
		1.1.1. Structure Flooding							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>	300		150		25		
		Basement (1 lot per structure) <i>Address:</i>	200		100		15		
		Attached Garage (1 lot per structure) <i>Address:</i>	100		50		8		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>	300		150		25		
		Yard Flooding (1 per lot) <i>Address:</i>	10		5		0		
		1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		100		15		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		25		4		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		12		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		5		1		
	1.2. EROSION	1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)							
		Habitable structures, residential (1 lot per structure) <i>Address:</i>	300		200		50		
		Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc. (1 lot per structure) <i>Address:</i>	150		100		25		
		Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>	300		200		50		
		1.2.2. No. of lots (from 1.2.1) on outside of bend		lots	10 points per lot				
		1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)							
		Arterial Road: <i>Address:</i>	75		50		12		
		Collector Road: <i>Address:</i>	35		25		6		
		Residential Road: <i>Address:</i>	20		12		3		



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
			Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		<b>2.1.1. Structure Flooding</b>							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65		
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* <i>Address:</i>	300		200		50		
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N				N		
		Attached Garage (1 lot per structure) <i>Address: 12220, 12226 Hadley Hill Rd</i>	100		75		25	2	50
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc. (1 lot per structure) <i>Address:</i>	50		35		12		
		Yard Flooding (1 per lot) <i>Address: 12220, 12226, 12232, 12244, 12250, 12256 Hadley Hill Rd</i>	10	6	6		0		60
		<b>2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted &amp; 2 lots per intersection impacted)</b>							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		150		25		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address: From 12216 to 12256 (approx. 1,200 feet)</i>	10	5	6		1		50
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:		Points/pond:		5		
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:		Points/lot:		20		
		2.3. Yard Erosion (1 per lot) <i>Address:</i>	No. Lots:		Points/lot:		10		
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)		
		Points for Age							
<b>TOTAL PROBLEM POINTS</b>									<b>160</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



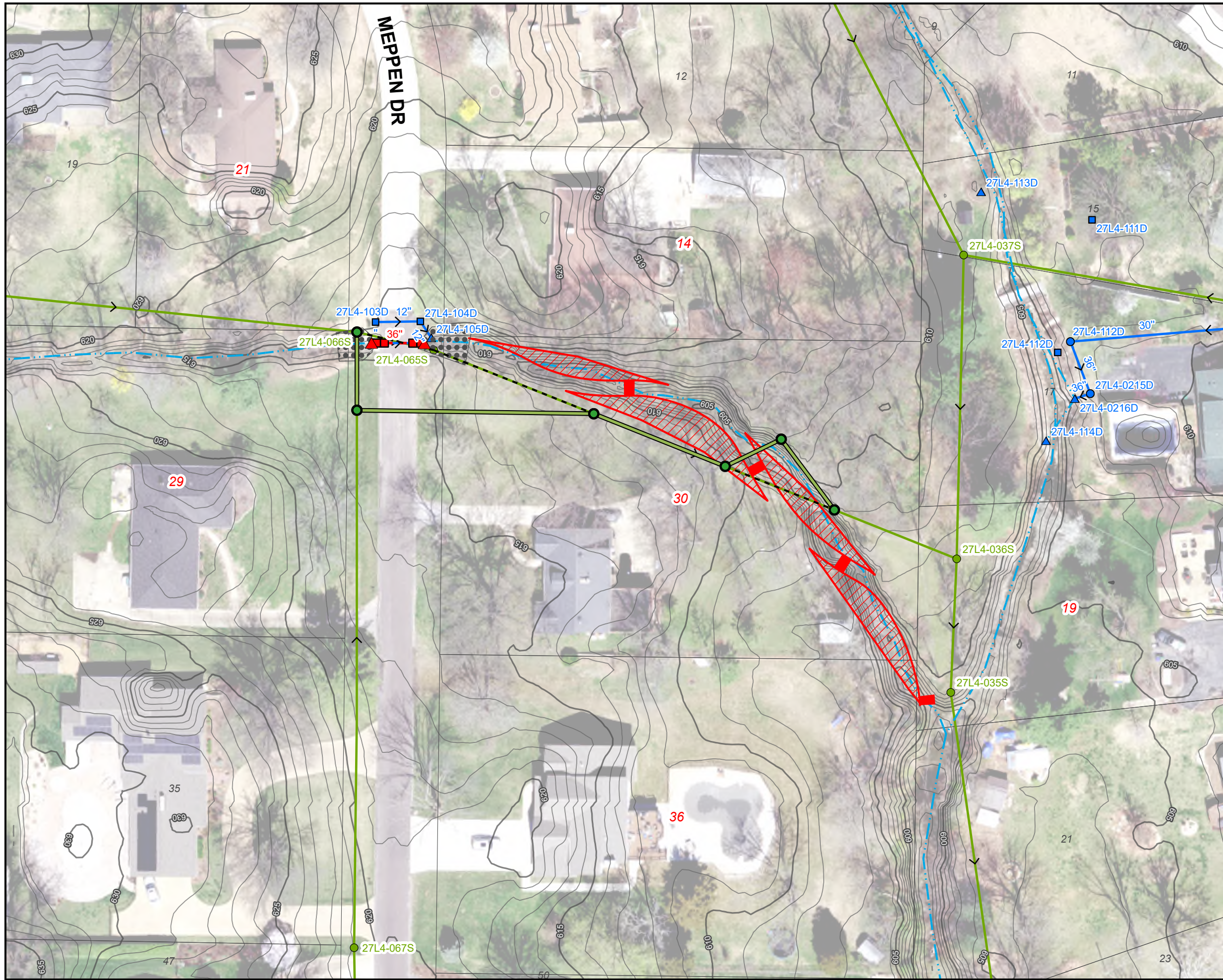
**CONTINUED:**

SOLUTION BENEFIT CATEGORY					
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit	
	Bioswales		PER 100 LF	10	
	Forebays		AC	200	
	Wet Ponds		AC	100	
	Wetlands		AC	50	
	Biostabilization of banks (per bank)		PER 100 LF	10	
	Riffle Pool Complex		PER 100 LF	10	
	4.2. Eliminates combined sewer (per project)		EA	100	
	4.3. Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)		EA	10	
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)
	Points for Easements	20			20
	5.2. Recreational/Educational	Yes = 100, no = 0 pts		0	
<b>TOTAL SOLUTION POINTS</b>					<b>20</b>
<b>TOTAL BENEFIT POINTS</b>					<b>180</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

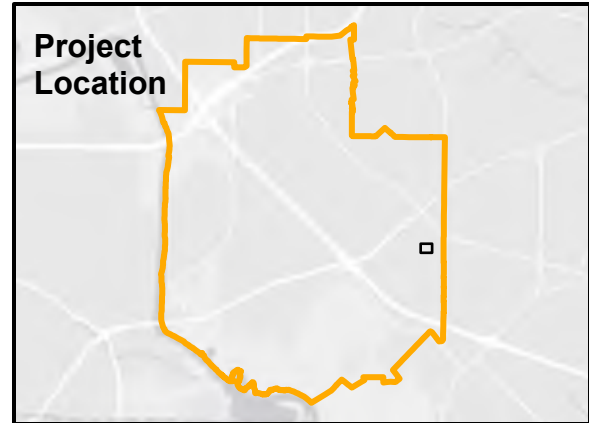
**TOTAL COST IN THOUSANDS =** **\$687.22**

**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **0.26**



### Legend

<b>Proposed Improvements</b>	<b>Existing Sanitary Network</b>
■ Double Inlet	→ Gravity Main
▲ Outfall	● Manhole
● Sanitary Manhole	<b>Preliminary Floodplain</b>
- - - Upsize Storm Sewer	▨ Regulatory Floodway
- - - Abandon Pipe	■ 1.0% Annual Chance Flood Hazard
— Sanitary Sewer	■ 0.2% Annual Chance Flood Hazard
▨ Floodplain Bench	■ Reduced Flood Risk Due to Levee
■ Grade Control	
▨ Rock Blanket	
<b>Existing Storm Network</b>	
→ Gravity Main	
■ Inlet	
● Manhole	
▲ Intake/Outfall	
### Easement Expected to Be Needed from Property Owner	



<b>Project Benefit Points</b>	379
<b>Conceptual Project Cost</b>	\$422,525.00
<b>Benefit to Cost Ratio</b>	0.9

**Problem Description**  
 The culvert under Meppen Drive is undersized, causing street flooding. Downstream of the culvert, channel erosion is threatening a house and sheds.

**Proposed Solution Description**  
 Replace the undersized culvert and stabilize the stream banks.





**Project #2606**  
**Meppen Dr Storm Improvements**

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# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Meppen Dr Storm Improvements **Project Number:** 2606

**Number of Properties Impacted:** 6 **Opinion of Probable Construction Cost:** \$ 422,525

**Number of Easements Required:** 6 **Project Benefit Points:** 379

**Number of Properties Benefited:** 4 **Benefit to Cost Ratio:** 0.90

**Problem Description:**

The culvert under Meppen Drive near #29 and #30 is restrictive. Water overtops the road about once every 1-2 years, according to residents. Depth in the street can reach 1-2 feet when this occurs. Backup from the culvert also causes flooding to the yards of 21 and 29 Meppen Drive. This reach of channel is not in a floodplain.

Downstream of the culvert, the channel is deeply entrenched with steep banks about 10-feet-tall. Erosion is threatening the house at 14 Meppen Drive. The house is approximately 15 feet from the top of bank, putting it in the "infrequent" zone according to MSD's criteria for benefit point calculation. There are also two sheds at 14 Meppen Drive and one shed at 30 Meppen Drive which are threatened by erosion.

Both upstream and downstream of the culvert, tree litter and downed timber obstruct the flow of water. This is a concern of the residents.

**Proposed Solution:**

Replace the undersized culvert with a new 36" storm sewer, and install new double curb inlets at the sag points connected to the new storm sewer.

On 30 Meppen Drive, stabilize the banks by regrading a meandering channel with floodplain benches. Revegetate the side slopes with native vegetation. In straight segments, install grade control structures.

This work will also likely require relocation of the existing sanitary sewer main, since it is currently located very close to the existing culvert under Meppen Drive and has minimal cover at the creek crossing.

**Commentary:**

A previous bank stabilization project was completed on the tributary just to the east of this project.

MSD has identified a bank stabilization project called Meppen - Oleander Channel Improvements (11583), which includes a similar footprint as this project. The MSD project is currently unfunded.

A footbridge exists on 30 Meppen Drive; the cost estimate assumes that a new footbridge will be installed as part of the project.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Meppen Dr Storm Improvements

**Project Number:** 2606

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$6,310	\$6,310
2	Abandonment - Pipe Fill	4	CY	\$468	\$1,872
3	Abandonment - Structure	3	EA	\$1,111	\$3,333
4	Bank Protection - Biostabilization	652	SY	\$66	\$43,032
5	Curb - Asphaltic Concrete Rem. and Rep.	60	LF	\$36	\$2,160
6	Ductile Iron Pipe Sewer 08 Inch Class 52	74	LF	\$182	\$13,468
7	Excavation Class "C"	258	CY	\$31	\$7,998
8	Flared End Section 36 Inch Pipe	2	EA	\$2,970	\$5,940
9	Granular Backfill	28	SY	\$61	\$1,708
10	Inlet - Double	2	EA	\$4,835	\$9,670
11	Manhole - Standard Construction	48	LF	\$461	\$22,128
12	Pipe Sewer 08 Inch (Sanitary/Combined)	246	LF	\$135	\$33,210
13	Pipe Sewer 36 Inch (Storm)	28	LF	\$193	\$5,404
14	Revegetation Blanket	855	SY	\$24	\$20,520
15	Rock Blanket	74	SY	\$88	\$6,512
16	Rock Toe Protection	237	SY	\$127	\$30,099
17	Street Pavement - Asphaltic Concrete Rem. and Rep.	35	SY	\$94	\$3,290
18	Protection and Restoration of Site	1	LS	\$27,345	\$27,345
19	Utility Relocation	1	AL	\$10,000	\$10,000
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$253,999</b>
Estimated Engineering Fee:					\$51,000
Estimated Geotechnical Engineering Fee:					\$4,000
Estimated Property Survey/Strip Map Preparation Fee:					\$1,000
Estimated Property Title/Easement Search Report Fee:					\$2,400
Estimated Topographic Survey Fee:					\$3,420
Estimated Property Rights Acquisition Document Preparation Fee:					\$2,700
Estimated Cost of Easements:					\$6,000
Estimated Construction Survey Fee:					\$500
<b>SUB-TOTAL - DESIGN:</b>					<b>\$71,020</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$325,019</b>
30% Contingency:					\$97,506
<b>TOTAL:</b>					<b>\$422,525</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Meppen Dr Storm Improvements

**Project Number:** 2606

1.0 STREAM	1.1. FLOODING	PROBLEM SOLVED CATEGORY		Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points		
		Note: Problem points are awarded only for those problems solved by the proposed solution.		Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected			
		1.1.1. Structure Flooding										
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>	300		150		25					
		Basement (1 lot per structure) <i>Address:</i>	200		100		15					
		Attached Garage (1 lot per structure) <i>Address:</i>	100		50		8					
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>	300		150		25					
		Yard Flooding (1 per lot) <i>Address: 21, 29 Meppen Dr</i>	10	2	5		0		20			
		1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)										
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		100		15					
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		25		4					
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		12		2					
		Traffic obstruction (> 6" of water) on residential street <i>Address: Sag near #29 and #30 Meppen Dr</i>	10	1	5		1		10			
1.2. EROSION		1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)										
		Habitable structures, residential (1 lot per structure) <i>Address: 14 Meppen Dr</i>		300		200		50	1	50		
		Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc. (1 lot per structure) <i>Address: Chronic-30 Meppen Dr, Infrequent-2 on 14 Meppen Dr</i>		150	1	100		25	2	200		
		Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>		300		200		50				
		1.2.2. No. of lots (from 1.2.1) on outside of bend		1	lots	10 points per lot				10		
		1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)										
		Arterial Road: <i>Address:</i>		75		50		12				
Collector Road: <i>Address:</i>		35		25		6						
Residential Road: <i>Address:</i>		20		12		3						



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		<b>2.1.1. Structure Flooding</b>							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65		
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)*	300		200		50		
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N				N		
		Attached Garage (1 lot per structure) <i>Address:</i>	100		75		25		
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12		
		Yard Flooding (1 per lot) <i>Address:</i>	10		6		0		
		<b>2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted &amp; 2 lots per intersection impacted)</b>							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		150		25		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		6		1		
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:		Points/pond:		5		
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:		Points/lot:		20		
		2.3. Yard Erosion (1 per lot) <i>Address:</i>	No. Lots:		Points/lot:		10		
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)		
		Points for Age							
<b>TOTAL PROBLEM POINTS</b>									<b>290</b>

Note: Problem points are awarded only for those problems solved by the proposed solution.



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

SOLUTION BENEFIT CATEGORY						
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000	
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50	
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit		
	Bioswales		PER 100 LF	10		
	Forebays		AC	200		
	Wet Ponds		AC	100		
	Wetlands		AC	50		
	Biostabilization of banks (per bank)	6.9	PER 100 LF	10		69
	Riffle Pool Complex		PER 100 LF	10		
	4.2. Eliminates combined sewer (per project)		EA	100		
	4.3. Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)		EA	10		
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)	
	Points for Easements	20				20
	5.2. Recreational/Educational	Yes = 100, no = 0 pts		0		
<b>TOTAL SOLUTION POINTS</b>						<b>89</b>
<b>TOTAL BENEFIT POINTS</b>						<b>379</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

**TOTAL COST IN THOUSANDS =** **\$422.53**

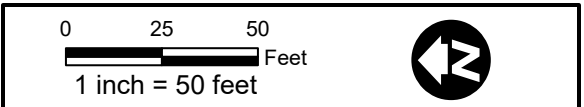
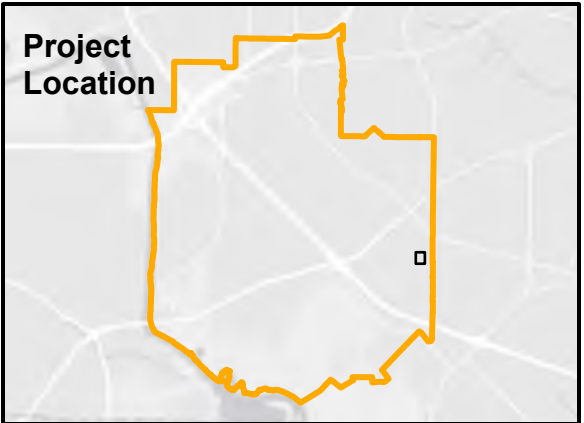
**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **0.90**



### Legend

<b>Proposed Improvements</b>	<b>Existing Sanitary Network</b>
■ Single Inlet	→ Gravity Main
▲ Outfall	● Manhole
■ Grated Inlet	<b>Preliminary Floodplain</b>
— Storm Sewer	▨ Regulatory Floodway
- - Upsize Storm Sewer	■ 1.0% Annual Chance Flood Hazard
▨ BANK_STABIL	■ 0.2% Annual Chance Flood Hazard
<b>Existing Storm Network</b>	■ Reduced Flood Risk Due to Levee
→ Gravity Main	
■ Inlet	
▲ Intake/Outfall	
⊕ Fitting	

### Easement Expected to Be Needed from Property Owner



<b>Project Benefit Points</b>	438
<b>Conceptual Project Cost</b>	\$300,050.00
<b>Benefit to Cost Ratio</b>	1.46

**Problem Description**  
Garage flooding occurs due to street runoff bypassing existing grated inlet. Erosion of creek in backyards threatening yards and sheds.

**Proposed Solution Description**  
Extend the storm sewer system to more efficiently capture street runoff. Stabilize the creek bank with a rock toe, grading, and native vegetation.

Sunset Hills City of Sunset Hills Stormwater Master Plan HRGreen

**Project #2607**  
**Oleander Ct Storm Improvements**

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**PROJECT SUMMARY  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Oleander Ct Storm Improvements **Project Number:** 2607

**Number of Properties Impacted:** 3 **Opinion of Probable Construction Cost:** \$ 300,050

**Number of Easements Required:** 3 **Project Benefit Points:** 438

**Number of Properties Benefited:** 3 **Benefit to Cost Ratio:** 1.46

**Problem Description:**

There are two stormwater issues impacting 27 Oleander Court. First, the garage floods due to runoff from the street. There is an existing grated inlet (27L4-176D) in their driveway within right-of-way which does not sufficiently collect stormwater from the street. Runoff from the street bypasses the inlet and floods the garage at 27 Oleander Court about once per year.

Creek erosion is also a concern at 27 Oleander Court. The bank is eroding at the toe, weakening the soil beneath the overbank. There is a significant risk of bank collapse. Numerous small sinkholes are appearing in the yard over a large area. Currently the yard and sheds at 25 and 27 Oleander Court are threatened.

**Proposed Solution:**

Improve capture of runoff from the street by extending the storm sewer system up Oleander Court and installing new inlets. Direct street runoff towards the grated inlet in the driveway by installing a curb along a portion of Oleander Court.

To address the bank stabilization issue, regrade the channel so that there is a flatter, more stable bank slope. Install rock at the toe of the channel to protect the bank where shear stresses are highest. Replant the disturbed area with native vegetation to further reinforce the creek corridor.

**Commentary:**

This area is outside of the current effective and preliminary floodplain.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Oleander Ct Storm Improvements

**Project Number:** 2607

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$3,870	\$3,870
2	Bank Protection - Biostabilization	379	SY	\$66	\$25,014
3	Curb - Concrete	38	LF	\$46	\$1,748
4	Excavation Class "C"	456	CY	\$31	\$14,136
5	Flared End Section 24 Inch Pipe	1	EA	\$2,838	\$2,838
6	Granular Backfill	59	CY	\$61	\$3,599
7	Inlet - 2 Grate	1	EA	\$3,960	\$3,960
8	Inlet - Area	1	EA	\$3,527	\$3,527
9	Inlet - Street	1	EA	\$3,457	\$3,457
10	Pipe Sewer 18 Inch (Storm)	74	LF	\$129	\$9,546
11	Pipe Sewer 24 Inch (Storm)	193	LF	\$154	\$29,722
12	Rock Toe Protection	77	SY	\$127	\$9,779
13	Sidewalks & Driveways Asphalt - Rem. & Rep.	11	SY	\$178	\$1,958
14	Sidewalks & Driveways Concrete - Rem. and Rep.	145	SY	\$110	\$15,950
15	Street Pavement - Asphaltic Concrete Rem. and Rep.	40	SY	\$94	\$3,760
16	Protection and Restoration of Site	1	LS	\$16,769	\$16,769
17	Utility Relocation	1	AL	\$30,000	\$30,000
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$179,633</b>
Estimated Engineering Fee:					\$36,000
Estimated Geotechnical Engineering Fee:					\$4,000
Estimated Property Survey/Strip Map Preparation Fee:					\$1,025
Estimated Property Title/Easement Search Report Fee:					\$1,200
Estimated Topographic Survey Fee:					\$4,100
Estimated Property Rights Acquisition Document Preparation Fee:					\$1,350
Estimated Cost of Easements:					\$3,000
Estimated Construction Survey Fee:					\$500
<b>SUB-TOTAL - DESIGN:</b>					<b>\$51,175</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$230,808</b>
30% Contingency:					\$69,242
<b>TOTAL:</b>					<b>\$300,050</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



Project Name: Oleander Ct Storm Improvements

Project Number: 2607

1.0 STREAM	1.1. FLOODING	PROBLEM SOLVED CATEGORY		Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.		Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		1.1.1. Structure Flooding								
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>	300		150		25			
		Basement (1 lot per structure) <i>Address:</i>	200		100		15			
		Attached Garage (1 lot per structure) <i>Address:</i>	100		50		8			
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>	300		150		25			
		Yard Flooding (1 per lot) <i>Address:</i>	10		5		0			
		1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)								
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		100		15			
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		25		4			
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		12		2			
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		5		1			
	1.2. EROSION	1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)	Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
		Habitable structures, residential (1 lot per structure) <i>Address:</i>	300		200		50			
		Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address: Chronic-25 Oleander Ct, Infrequent-27 Oleander Ct</i>	150	1	100		25	1	175	
		Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>	300		200		50			
		1.2.2. No. of lots (from 1.2.1) on outside of bend	2	lots	10 points per lot				20	
		1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)	Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
		Arterial Road: <i>Address:</i>	75		50		12			
	Collector Road: <i>Address:</i>	35		25		6				
	Residential Road: <i>Address:</i>	20		12		3				



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
			Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		Note: Problem points are awarded only for those problems solved by the proposed solution.							
		<b>2.1.1. Structure Flooding</b>							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65		
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* <i>Address:</i>	300		200		50		
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N				N		
		Attached Garage (1 lot per structure) <i>Address: 25 &amp; 27 Oleander Ct</i>	100	2	75		25		200
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12		
		Yard Flooding (1 per lot) <i>Address:</i>	10		6		0		
		<b>2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted &amp; 2 lots per intersection impacted)</b>							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		150		25		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		6		1		
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:			Points/pond:		5	
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:			Points/lot:		20	
		2.3. Yard Erosion (1 per lot) <i>Address:</i>	No. Lots:			Points/lot:		10	
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)		
		Points for Age							
<b>TOTAL PROBLEM POINTS</b>									<b>395</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



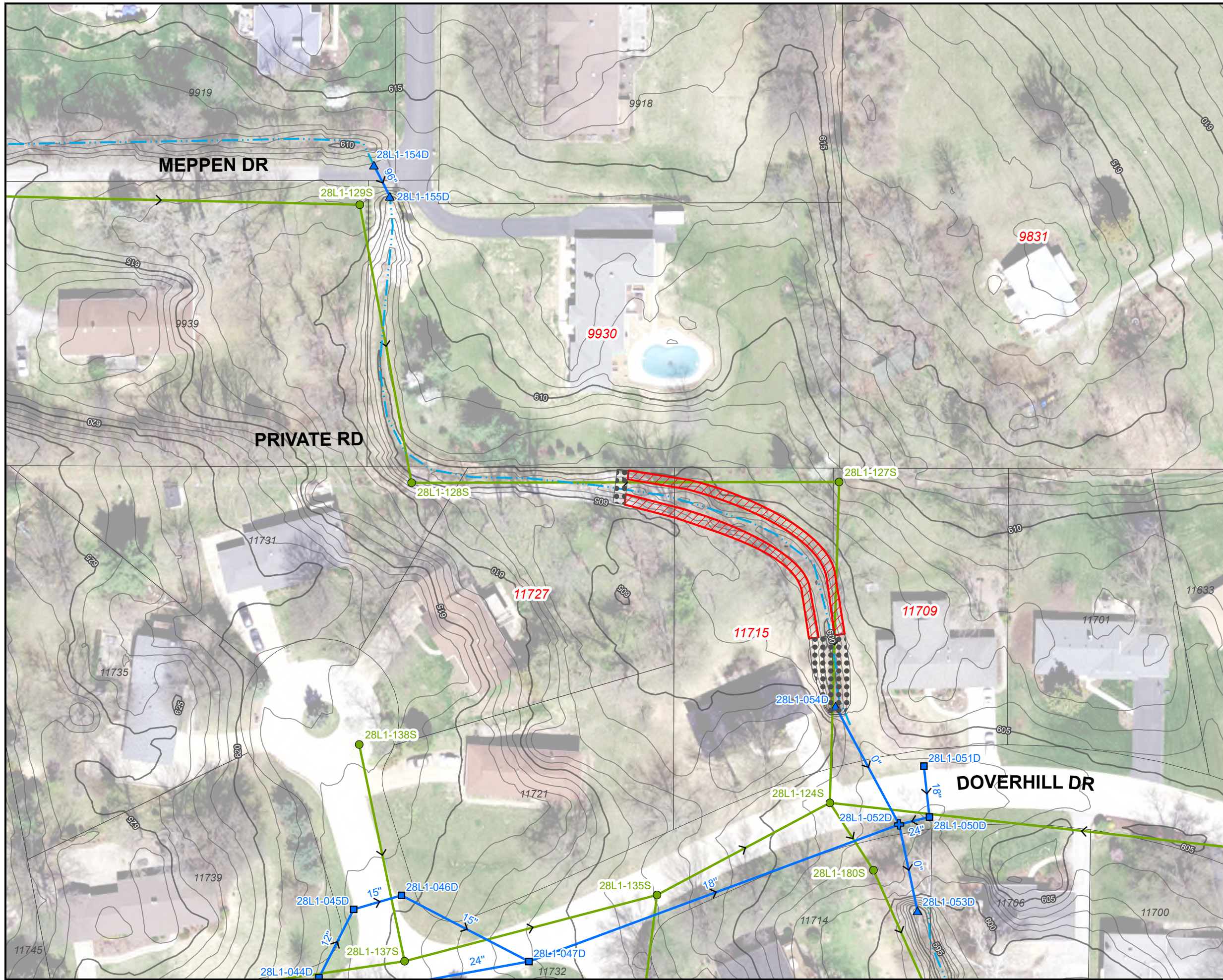
**CONTINUED:**

SOLUTION BENEFIT CATEGORY						
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000	
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50	
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit		
	Bioswales		PER 100 LF	10		
	Forebays		AC	200		
	Wet Ponds		AC	100		
	Wetlands		AC	50		
	Biostabilization of banks (per bank)	2.3	PER 100 LF	10		23
	Riffle Pool Complex		PER 100 LF	10		
	4.2. Eliminates combined sewer (per project)		EA	100		
	4.3. Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)		EA	10		
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)	
	Points for Easements	20				20
	5.2. Recreational/Educational		Yes = 100, no = 0 pts	0		
<b>TOTAL SOLUTION POINTS</b>						<b>43</b>
<b>TOTAL BENEFIT POINTS</b>						<b>438</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

**TOTAL COST IN THOUSANDS =** **\$300.05**

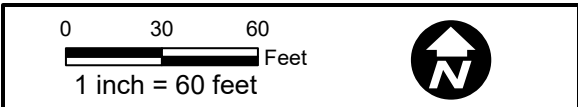
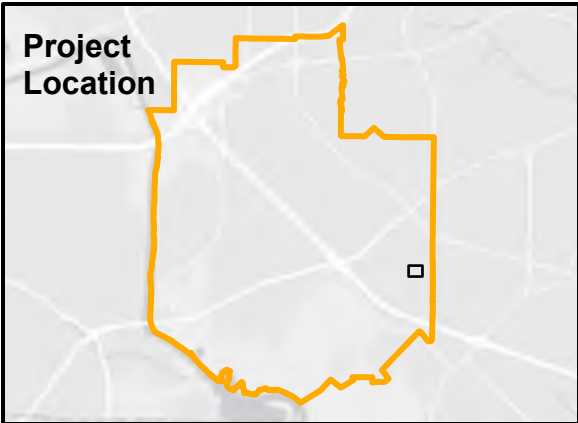
**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **1.46**



### Legend

Floodplain Bench	Existing Sanitary Network Gravity Main
Rock Blanket	Manhole
Existing Storm Network Gravity Main	Preliminary Floodway Regulatory Floodway
Inlet	1.0% Annual Chance Flood Hazard
Intake/Outfall	0.2% Annual Chance Flood Hazard
Fitting	Reduced Flood Risk Due to Levee

Easement Expected to Be Needed from Property Owner



<b>Project Benefit Points</b>	165
<b>Conceptual Project Cost</b>	\$243,740.00
<b>Benefit to Cost Ratio</b>	0.68

**Problem Description**  
Erosion of the channel is threatening yards and homes.

**Proposed Solution Description**  
Stabilize the banks of the channel with regrading and installing rock and plantings.

City of Sunset Hills  
Stormwater Master Plan

HRGreen

**Project #2608**  
**Doverhill Dr Channel Upstream Storm Improvements**

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# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Doverhill Dr Channel Upstream Improvements      **Project Number:** 2608

**Number of Properties Impacted:** 4      **Opinion of Probable Construction Cost:** \$ 243,740

**Number of Easements Required:** 4      **Project Benefit Points:** 165

**Number of Properties Benefited:** 2      **Benefit to Cost Ratio:** 0.68

**Problem Description:**

Erosion is a concern in the channel between Meppen Drive and Doverhill Drive. At Doverhill Drive, the channel enters a box culvert with approximate size of 6' wide by 2' tall. Erosion is impacting yards. The houses at 11709 and 11715 Doverhill Drive are not imminently threatened by erosion, but could be impacted if the erosion accelerates. The banks near the houses are still vegetated; active erosion near the houses appears minimal.

**Proposed Solution:**

At the downstream end, install rock blanket to protect the bank near the upstream end of the Doverhill Drive culvert. Then regrade the channel section to include a floodplain bench to reduce velocities and shear stresses in the creek. Install rock at the toe of the channel to protect the channel where shear stresses are highest. Regrade the upper slopes and plant with vegetation to protect the soil. Lastly, at the upstream end, install a grade control structure in the channel to lock in the channel invert.

**Commentary:**

The project is not within the current effective or preliminary floodplain.

Overland basement flooding has occurred infrequently at 11715 Doverhill Drive due to creek overflow, may have occurred in the past at 11709 Doverhill Drive as well. This project's intent is to address erosion while not making flooding worse.

There is an existing 8" sanitary sewer adjacent to the creek in this area. The sanitary sewer appears low enough to not require relocation during construction; however, an allowance for utility relocation has been included in the cost estimate to account for the possibility.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Doverhill Dr Channel Upstream Improvements

**Project Number:** 2608

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$2,932	\$2,932
2	Bank Protection - Biostabilization	235	SY	\$66	\$15,510
3	Clearing	1	LS	\$20,000	\$20,000
4	Excavation Class "C"	309	CY	\$31	\$9,579
5	Grade Control	18	SY	\$165	\$2,970
6	Revegetation Blanket	660	SY	\$24	\$15,840
7	Rock Blanket	114	SY	\$88	\$10,032
8	Rock Toe Protection	118	SY	\$127	\$14,986
9	Tree Removal	4	LS	\$2,200	\$8,800
10	Protection and Restoration of Site	1	LS	\$12,703	\$12,703
11	Utility Relocation	1	AL	\$30,000	\$30,000
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$143,352</b>
Estimated Engineering Fee:					\$29,000
Estimated Geotechnical Engineering Fee:					\$4,000
Estimated Property Survey/Strip Map Preparation Fee:					\$1,000
Estimated Property Title/Easement Search Report Fee:					\$1,600
Estimated Topographic Survey Fee:					\$2,240
Estimated Property Rights Acquisition Document Preparation Fee:					\$1,800
Estimated Cost of Easements:					\$4,000
Estimated Construction Survey Fee:					\$500
<b>SUB-TOTAL - DESIGN:</b>					<b>\$44,140</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$187,492</b>
30% Contingency:					\$56,248
<b>TOTAL:</b>					<b>\$243,740</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Doverhill Dr Channel Upstream Improvements

**Project Number:** 2608

1.0 STREAM	1.1. FLOODING	PROBLEM SOLVED CATEGORY		Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points	
		Note: Problem points are awarded only for those problems solved by the proposed solution.		Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected		
		1.1.1. Structure Flooding		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>		300		150			25
		Basement (1 lot per structure) <i>Address:</i>		200		100		15			
		Attached Garage (1 lot per structure) <i>Address:</i>		100		50		8			
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>		300		150		25			
		Yard Flooding (1 per lot) <i>Address:</i>		10		5		0			
1.1. FLOODING		1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>		200		100		15	
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>		50		25		4			
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>		25		12		2			
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>		10		5		1			
		1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)		Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
1.2. EROSION		Habitable structures, residential (1 lot per structure) <i>Address: 11715, 11709 Doverhill Dr</i>		300		200		50	2	100	
		Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>		150		100		25			
		Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>		300		200		50			
		1.2.2. No. of lots (from 1.2.1) on outside of bend		1	lots	10 points per lot				10	
		1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)		Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
Arterial Road: <i>Address:</i>		75		50		12					
Collector Road: <i>Address:</i>		35		25		6					
Residential Road: <i>Address:</i>		20		12		3					



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	<b>PROBLEM SOLVED CATEGORY</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
			Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		Note: Problem points are awarded only for those problems solved by the proposed solution.							
		<b>2.1.1. Structure Flooding</b>							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65		
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* <i>Address:</i>	300		200		50		
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N				N		
		Attached Garage (1 lot per structure) <i>Address:</i>	100		75		25		
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12		
		Yard Flooding (1 per lot) <i>Address:</i>	10		6		0		
		<b>2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted &amp; 2 lots per intersection impacted)</b>							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		150		25		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		6		1		
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:			Points/pond:		5	
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:			Points/lot:		20	
		2.3. Yard Erosion (1 per lot) <i>Address:</i>	No. Lots:			Points/lot:		10	
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)		
		Points for Age							
<b>TOTAL PROBLEM POINTS</b>									<b>110</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

SOLUTION BENEFIT CATEGORY						
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000	
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50	
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit		
	Bioswales		PER 100 LF	10		
	Forebays		AC	200		
	Wet Ponds		AC	100		
	Wetlands		AC	50		
	Biostabilization of banks (per bank)	3.5	PER 100 LF	10		35
	Riffle Pool Complex		PER 100 LF	10		
	4.2. Eliminates combined sewer (per project)		EA	100		
	4.3. Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)		EA	10		
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)	
	Points for Easements	20				20
	5.2. Recreational/Educational	Yes = 100, no = 0 pts		0		
<b>TOTAL SOLUTION POINTS</b>						<b>55</b>
<b>TOTAL BENEFIT POINTS</b>						<b>165</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

**TOTAL COST IN THOUSANDS =** **\$243.74**

**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **0.68**





# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Tioga Ct Storm Improvements **Project Number:** 2609

**Number of Properties Impacted:** 20 **Opinion of Probable Construction Cost:** \$ 725,928

**Number of Easements Required:** 3 **Project Benefit Points:** 70

**Number of Properties Benefited:** 20 **Benefit to Cost Ratio:** 0.10

### Problem Description:

Runoff from Kalenda Lane drains to the east through the Tioga Court common ground. Intense storms cause yard flooding at 10664 and 10680 Tioga Court and also cause street flooding in Tioga Court.

The Tioga Court common ground contains numerous deep sinkholes. The visible portion of the sinkholes are 10 ft deep. Drainage in the common ground is drained only by the sinkholes. Flooding occurs when the sinkholes are unable to effectively drain the runoff. The sinkholes overflow every four- to five-years. When the sinkholes overflow, water spills northeast between 10664 and 10680 Tioga Court, flooding both properties and the street. Both overland flow and street conveyance is insufficient.

Flooding depth ranges from 3 feet in the backyards down to 4 inches in the street. The 1000-foot-long Tioga Court has no street inlets.

### Proposed Solution:

The flooding can be mitigated by improving the capture in sinkholes by installing and diverting overflow through a pipe to an existing storm sewer in Sappington Road.

Improve the capture of stormwater by installing a berm on the northeast end of the common ground. Install four-way area inlets at the sinkholes, sumping the ground around each inlet to encourage capture. The inlets must extend downward to the bedrock crevice. The inlets must have a pipe to convey excess flow to the existing sewer at Sappington Road.

### Commentary:

Previous studies of the problem have not been identified.

The site is not a FEMA floodplain

Sinkholes require special development and permitting. Special development involves identification of bedrock, excavation of overlying fine grain soil, and cleaning of the crevice in the surface of the bedrock.

MSD is the permitting agency. MSD requires a geotechnical investigation and report. MSD requires geotechnical engineer observation during construction.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Tioga Ct Storm Improvements

**Project Number:** 2609

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$12,634	\$12,634
2	Connection to Existing Manhole (8" Thru 24" Pipe)	1	PLC	\$3,443	\$3,443
3	Curb and Gutter - Concrete	720	LF	\$44	\$31,680
4	Excavation Class "C"	2,667	CY	\$31	\$82,677
5	Granular Backfill	593	CY	\$61	\$36,173
6	Inlet - Area	1	EA	\$3,527	\$3,527
7	Inlet - Street	5	EA	\$3,457	\$17,285
8	Inlet Manhole - Special	3	EA	\$5,654	\$16,962
9	Inlet Manhole - Top Section	8	EA	\$1,483	\$11,864
10	Manhole - Standard Construction	24	LF	\$461	\$11,064
11	Pipe Sewer 24 Inch (Storm)	920	LF	\$154	\$141,680
13	Sodding - Fescue	4,984	SY	\$13	\$64,792
14	Protection and Restoration of Site	1	LS	\$54,749	\$54,749
15	Utility Relocation	1	AL	\$30,000	\$30,000
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$433,781</b>
Estimated Engineering Fee:					\$87,000
Estimated Geotechnical Engineering Fee:					\$20,000
Estimated Property Survey/Strip Map Preparation Fee:					\$2,300
Estimated Property Title/Easement Search Report Fee:					\$1,200
Estimated Topographic Survey Fee:					\$9,200
Estimated Property Rights Acquisition Document Preparation Fee:					\$1,350
Estimated Cost of Easements:					\$3,000
Estimated Construction Survey Fee:					\$575
<b>SUB-TOTAL - DESIGN &amp; PERMITTING:</b>					<b>\$124,625</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$558,406</b>
30% Contingency:					\$167,522
<b>TOTAL:</b>					<b>\$725,928</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



Project Name:           Tioga Ct Storm Improvements          

Project Number:           2609          

1.0 STREAM	1.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		1.1.1. Structure Flooding	Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>	300		150		25	
	Basement (1 lot per structure) <i>Address:</i>	200		100		15			
	Attached Garage (1 lot per structure) <i>Address:</i>	100		50		8			
	Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>	300		150		25			
	Yard Flooding (1 per lot) <i>Address:</i>	10		5		0			
	1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)								
	Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		100		15			
	Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		25		4			
	Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		12		2			
	Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		5		1			
	1.2. EROSION								
	1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)	Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
	Habitable structures, residential (1 lot per structure) <i>Address:</i>	300		200		50			
	Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	150		100		25			
	Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>	300		200		50			
	1.2.2. No. of lots (from 1.2.1) on outside of bend		lots	10 points per lot					
	1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)	Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
	Arterial Road: <i>Address:</i>	75		50		12			
	Collector Road: <i>Address:</i>	35		25		6			
	Residential Road: <i>Address:</i>	20		12		3			



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
			Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		<b>2.1.1. Structure Flooding</b>							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65		
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)*	300		200		50		
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N				N		
		Attached Garage (1 lot per structure) <i>Address:</i>	100		75		25		
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12		
		Yard Flooding (1 per lot) <i>Address: 10664 and 10680 Tioga Ct</i>	10		6	2	0		12
		<b>2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted &amp; 2 lots per intersection impacted)</b>							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		150		25		
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address: All of Tioga Court (approx. 750')</i>	10		6	3	1		18
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:		Points/pond:		5		
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:		Points/lot:		20		
		2.3. Yard Erosion (1 per lot) <i>Address: 10664 and 10680 Tioga Ct</i>	No. Lots:		2	Points/lot:		10	20
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)		
		Points for Age							
<b>TOTAL PROBLEM POINTS</b>									<b>50</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

SOLUTION BENEFIT CATEGORY					
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit	
	Bioswales		PER 100 LF	10	
	Forebays		AC	200	
	Wet Ponds		AC	100	
	Wetlands		AC	50	
	Biostabilization of banks (per bank)		PER 100 LF	10	
	Riffle Pool Complex		PER 100 LF	10	
	4.2. Eliminates combined sewer (per project)		EA	100	
	4.3. Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)		EA	10	
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)
	Points for Easements	20			20
	5.2. Recreational/Educational	Yes = 100, no = 0 pts		0	
<b>TOTAL SOLUTION POINTS</b>					<b>20</b>
<b>TOTAL BENEFIT POINTS</b>					<b>70</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

**TOTAL COST IN THOUSANDS =** **\$725.93**

**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **0.10**





# PROJECT SUMMARY CITY OF SUNSET HILLS STORMWATER MASTER PLAN



<b>Project Name:</b> <u>Forest Path Dr Storm Sewer</u>	<b>Project Number:</b> <u>2610</u>
<b>Number of Properties Impacted:</b> <u>20</u>	<b>Opinion of Probable Construction Cost:</b> \$ <u>688,155</u>
<b>Number of Easements Required:</b> <u>3</u>	<b>Project Benefit Points:</b> <u>942</u>
<b>Number of Properties Benefited:</b> <u>20</u>	<b>Benefit to Cost Ratio:</b> <u>1.37</u>

**Problem Description:**

Forest Path Drive is a long, flat street with a sag near the middle. There are existing curb inlets at the sag but no additional inlets to collect runoff prior to the sag. Water ponds at the inlets and overtops the curb flooding the side and backyards. Flooding in the street reaches 1-2 feet in depth every 3-4 years.

The Meramec River floodplain is close by. In the current effective maps, the 100-year floodplain is approximately 100-feet west of the Forest Path Drive properties. The current effective base flood elevation in the area is 420, and the outfall sewer which drains Forest Path Drive has an invert at approximately elevation 423. Therefore, if you are using the current effective maps only it would appear that draining of sag is not hampered by Meramec backwater, making inlet and pipe capacity are the problem.

However, the preliminary floodplain mapping shows the Meramec River base flood elevation at elevation 425.1, which would impact the ability of the storm sewer to drain when the Meramec River is high. Unfortunately there is not much that can be done to address this backwater, besides providing an overland flow path from Forest Path Drive sag (at approximate elevation 427) to the Meramec River floodplain.

**Proposed Solution:**

Improve inlet and pipe capacity to reduce ponding in street and nearby yards. Add several curb inlets to the north and south of the sag. Replace the existing single inlets at the sag with double inlets. Lastly upsize the existing 18" storm sewer with a 24" pipe.

**Commentary:**

Previous studies of the problem have not been identified.

The site is a few feet higher than current effective FEMA base flood elevation, but the preliminary floodplain mapping shows the existing outfall for the storm sewer on Forest Path Drive is within the 100-year floodplain.



**OPINION OF PROBABLE COST  
CITY OF SUNSET HILLS  
STORMWATER MASTER PLAN**



**Project Name:** Forest Path Dr Storm Sewer

**Project Number:** 2610

Item Number	Pay Item Description	Estimated Quantity	Units	Unit Price	Extended Price
1	Mobilization	1	LS	\$10,611	\$10,611
	Clearing	1	LS	\$6,000	\$6,000
	Curb - Concrete Rem. and Rep.	434	LF	\$55	\$23,870
	Excavation Class "C"	525	CY	\$31	\$16,275
	Flared End Section 24 Inch Pipe	1	EA	\$2,838	\$2,838
	Granular Backfill	247	CY	\$61	\$15,067
	Inlet - Double	2	EA	\$4,835	\$9,670
	Inlet - Street	6	EA	\$3,457	\$20,742
	Pipe Sewer 12 Inch (Storm)	31	LF	\$92	\$2,852
	Pipe Sewer 15 Inch (Storm)	263	LF	\$105	\$27,615
	Pipe Sewer 18 Inch (Storm)	242	LF	\$129	\$31,218
	Pipe Sewer 24 Inch (Storm)	559	LF	\$154	\$86,086
	Sidewalks & Driveways Concrete- Rem. and Rep.	159	SY	\$110	\$17,490
	Sodding - Fescue	1,672	SY	\$13	\$21,736
	Street Pavement - Concrete Rem. and Rep.	621	SY	\$88	\$54,648
	Tree Removal	8	LS	\$2,200	\$17,600
	Protection and Restoration of Site	1	LS	\$45,982	\$45,982
	Utility Relocation	1	AL	\$15,000	\$15,000
<b>SUB-TOTAL - CONSTRUCTION:</b>					<b>\$425,300</b>
Estimated Engineering Fee:					\$86,000
Estimated Geotechnical Engineering Fee:					\$4,000
Estimated Property Survey/Strip Map Preparation Fee:					\$1,600
Estimated Property Title/Easement Search Report Fee:					\$1,200
Estimated Topographic Survey Fee:					\$6,400
Estimated Property Rights Acquisition Document Preparation Fee:					\$1,350
Estimated Cost of Easements:					\$3,000
Estimated Construction Survey Fee:					\$500
<b>SUB-TOTAL - DESIGN:</b>					<b>\$104,050</b>
<b>SUB-TOTAL - DESIGN AND CONSTRUCTION:</b>					<b>\$529,350</b>
30% Contingency:					\$158,805
<b>TOTAL:</b>					<b>\$688,155</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**Project Name:** Forest Path Dr Storm Sewer

**Project Number:** 2610

1.0 STREAM	1.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
		Note: Problem points are awarded only for those problems solved by the proposed solution.	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		1.1.1. Structure Flooding	Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure) <i>Address:</i>	300		150		25	
	Basement (1 lot per structure) <i>Address:</i>	200		100		15			
	Attached Garage (1 lot per structure) <i>Address:</i>	100		50		8			
	Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded) <i>Address:</i>	300		150		25			
	Yard Flooding (1 per lot) <i>Address:</i>	10		5		0			
	1.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)								
	Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address:</i>	200		100		15			
	Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		25		4			
	Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		12		2			
	Traffic obstruction (> 6" of water) on residential street <i>Address:</i>	10		5		1			
	1.2. EROSION								
	1.2.1. Threatening Structure (Ratio=Height of bank / distance from structure)	Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
	Habitable structures, residential (1 lot per structure) <i>Address:</i>	300		200		50			
	Misc structures including pools, patio/decks, sheds, tennis courts, detached garages, etc. (1 lot per structure) <i>Address:</i>	150		100		25			
	Industrial, office, commercial and warehouse (1 lot per structure) <i>Address:</i>	300		200		50			
	1.2.2. No. of lots (from 1.2.1) on outside of bend		lots	10 points per lot					
	1.2.3. Threatening Roadway (Ratio=Height of bank / distance from road)	Pts. for Ratio > 0.70	No. Lots	Pts. for Ratio 0.36 - 0.70	No. Lots	Pts. for Ratio 0.15- 0.35	No. Lots		
	Arterial Road: <i>Address:</i>	75		50		12			
	Collector Road: <i>Address:</i>	35		25		6			
	Residential Road: <i>Address:</i>	20		12		3			



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	<b>PROBLEM SOLVED CATEGORY, CONT.</b>	Chronic (<=2-Yr) Flooding		Frequent (>2<=15-Yr) Flooding		Infrequent (>15-Yr) Flooding		Total Points
			Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	Points per Category	No. Lots Affected	
		Note: Problem points are awarded only for those problems solved by the proposed solution.							
		<b>2.1.1. Structure Flooding</b>							
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* <i>Address:</i>	350		250		65		
		Basement (1 lot per structure)* <i>Address:</i>	250		200		50		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* <i>Address:</i>	300		200		50		
		* If there is an existing public system and points are taken for any of the 3 items above, add 50 points.	Existing System Y/N				N		
		Attached Garage (1 lot per structure) <i>Address:</i>	100		75		25		
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		35		12		
		Yard Flooding (1 per lot) <i>Address: 10800 and 10808 Forest Path Dr</i>	10		6	2	0		12
		<b>2.1.2. Roadway Flooding (allocate 1 lot per 250' of roadway impacted &amp; 2 lots per intersection impacted)</b>							
		Emergency Access restricted (>12" water over only access route to habitable structure), pts per structure <i>Address: 10757, 10760, 10801, 10800, 10808, 10809, Forest Path Dr</i>	200		150	6	25		900
		Traffic obstruction (> 6" of water) on arterial street <i>Address:</i>	50		35		6		
		Traffic obstruction (> 6" of water) on collector street <i>Address:</i>	25		15		2		
		Traffic obstruction (> 6" of water) on residential street <i>Address: Sag on Forest Path Dr (approx 250')</i>	10	1	6		1		10
		Ponding (per ponding area) <i>Address:</i>	No. Ponds:		Points/pond:		2		
		2.2. Moderate Risk Erosion of misc. structures <i>Address:</i>	No. Lots:		Points/lot:		2		
		2.3. Yard Erosion (1 per lot) <i>Address:</i>	No. Lots:		Points/lot:		2		
		2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)		
		Points for Age							
<b>TOTAL PROBLEM POINTS</b>									<b>922</b>



# BENEFIT POINT CALCULATION CITY OF SUNSET HILLS STORMWATER MASTER PLAN



**CONTINUED:**

SOLUTION BENEFIT CATEGORY					
<b>3.0 REGIONAL</b>	3.1. Reduction of flowrate leaving site	% reduction of peak flowrate :		Max points:	1000
	3.2. Combines smaller projects into regional solution (see note)	No. Add'l Projects:		Points per Add'l Proj.:	50
<b>4.0 ENVIRONMENTAL / WATER QUALITY</b>	4.1. Addresses pollutants:	No. Units		Points per Unit	
	Bioswales		PER 100 LF	10	
	Forebays		AC	200	
	Wet Ponds		AC	100	
	Wetlands		AC	50	
	Biostabilization of banks (per bank)		PER 100 LF	10	
	Riffle Pool Complex		PER 100 LF	10	
	4.2. Eliminates combined sewer (per project)		EA	100	
	4.3. Eliminates inflow into sanitary system (1 each per basement flooded, yard vent overtopped, street inlet or driveway drain connected to sanitary/combined system, etc.)		EA	10	
<b>5.0 MISC.</b>	5.1. Ease of Implementation (No. of Easements)	0-5 (20 pts)	6-10 (10 pts)	11-15 (5 pts)	>15 (0 pts)
	Points for Easements	20			20
	5.2. Recreational/Educational	Yes = 100, no = 0 pts		0	
<b>TOTAL SOLUTION POINTS</b>					<b>20</b>
<b>TOTAL BENEFIT POINTS</b>					<b>942</b>

Note: A regional solution combines several smaller projects into a watershed or subwatershed solution.

**TOTAL COST IN THOUSANDS =** **\$688.16**

**MSD BENEFIT/COST RATIO = TOTAL POINTS / TOTAL COST IN THOUSANDS =** **1.37**



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## Appendix

Appendix A: Data Collection and Generation

Appendix B: Public Outreach

Appendix C: Problem Investigation

Appendix D: Additional Concerns and Opportunities