



Department of Public Works and Parks

6801 Delmar Boulevard, University City, Missouri 63130, Phone: (314) 505-8560, Fax: (314) 862-0694

**AGENDA
COMMISSION ON STORM WATER ISSUES
SPECIAL MEETING
HEMAN PARK COMMUNITY CENTER
975 PENNSYLVANIA
Monday, June 12, 2023,
3:30 PM**

1. MEETING CALLED TO ORDER

2. ATTENDANCE-ROLL CALL

3. APPROVAL OF AGENDA

4. APPROVAL OF MINUTES

❖ April 4, 2023, April 18, 2023, and May 16, 2023

5. CITIZEN COMMENTS

6. ANNOUNCEMENTS BY COMMISSIONERS

7. SUBCOMMITTEE REPORTS

8. NEW BUSINESS

❖ Discussions on buyout properties due to July 2022 Flooding

9. OLD BUSINESS

❖ Stormwater Master Plan, Continue Discussions

10 COUNCIL LIAISON COMMENTS

11 ADJOURNMENT



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

**Draft: MINUTES OF THE STORMWATER COMMISSION
April 4, 2023**

Call to Order. The thirty-second meeting of the Stormwater Commission (Commission) was called to order at 5:37 PM by Chair Todd Thompson.

1. **Attendance-Roll Call.** The following Commission members were present at the Community Center: Garry Aronberg, Robert Criss, Mark Holly, Eric Karch, Eric Stein, Todd Thompson. Also in attendance were Darin Girdler, Director of Public Works; Mirela Celaj, Assistant Director of Public Works; John Mulligan, City Attorney.

Visitors: Peggy Holly, Chair of Planning Commission and Mary Kennedy City Planner, Tom Sullivan, resident.

2. **Agenda.** The distributed agenda was approved: Call to Order, Attendance, Approval of Minutes, Citizen Comments, Announcements by Commissioners, Subcommittee Reports, New Business (Comprehensive Plan Update), Old Business (Stormwater Mater Plan), Council Liaison Comments, Adjournment. (Aronberg, Holly).

3. **Minutes.** The minutes of the March 7 meeting were approved without changes (Holly, Karch). The minutes of the March 21 meeting were approved (Thompson, Criss).

4. **Citizen Comments.** None.

5. **Announcements by Commissioners.**

- Dr. Criss
 - Visited Desoto recently.
 - The community has an early warning system.
 - City has bought-out some severely flooded residents with only City funds.
 - The downed tree in River des Peres (RdP) upstream of Shaftsbury has been removed.
 - Other creek maintenance not yet completed.

6. **Subcommittee Reports.** None

7. **New Business**

- Ms. Peggy Holly, Chair of Plan Commission and Ms. Mary Kennedy, City Planner, updated the Stormwater Commission on the Comprehensive Plan update with the aid of a power point presentation - attached.
 - Goals include preserving great places and stable affordable housing – stability includes housing that does not flood.
 - Stormwater Commission maps and exhibits of extensive inundation influenced planners to focus on the floodplain and to restrict floodplain use to recreation and residential and commercial use under special conditions.
 - Special conditions advice sought from Stormwater Commissioners and also from Stormwater Plan now under development. Advice sought for Comprehensive Plan team:
 - What development to allow in floodplain.
 - What detention to require and what size development would be required to install detention.
 - Wide ranging discussion occurred. Consensus was continue discussion as part of



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

Stormwater Plan development – threshold to requires detention to be lower than MSD’s 1-acre and generally discourage residential and commercial development in floodplain and reserve floodplain for green space – park and trails.

- Information on the Comprehensive Plan development is in WeMakeUCity.com
- Stormwater Commission should meet more often of provide input to Comprehensive Plan development.
- Mr. Girdler reported on coordination with MSD and debris removal:
 - MSD Executive Director will b invited to address the Council to discuss the roles of the City and MSD to minimize flooding.
 - City Street Department will remove debris above the RdP tunnel entrance during the second week in April, 2023.
 - MSD plans to make repairs to RdP from the Tunnel to 1000 ft upstream. MSD plans to repair the grouted rock channel walls by selective replacement with concrete filled honeycomb. MSD seeks resident comments.
- Stormwater Master Plan Discussions
 - HR Green’s Mr. Aronberg presented a handout, attached, that described MSD benefit point system.
 - MSD and other jurisdictions use benefit points to aid prioritization of projects
 - Comments:
 - U City may wish to consider increasing the differential between basement flooding and first floor flooding. U City and Stormwater Planning consultants to should evaluate recent repair bills for first floor flooding and basement only flooding. FEMA may have aggregate data that may aid evaluation.
 - Consider adding losses of flooded automobiles should be part of benefit point system.
 - U City may wish to include consideration of cost of mitigation compared to value of property mitigated.
 - Definition of Public and Private stormwater problems was discussed briefly with the aid of a handout - attached.
 - Examples of criteria were presented.
 - Commissioners and staff will continue evaluation and discuss and future meetings.
 - Input of council will be crucial.
 - A handout to be considered at future SW Commission meetings: Identify project to consider for detailed analysis. The handout is attached.
 - More frequent meetings to address stormwater planning: next meeting in two weeks: April 18.

8. Adjournment. Motion to adjourn passed at 7:40 PM (Messrs. Stein and Holly).

Minutes Preparation. The minutes were prepared by Garry Aronberg.

C:\Users\lgaron\Dropbox\UCity Stormwater Taskforce\CommissionMinutesDrafts\20230404_StrmWtrCommMin_DRAFT.docx



WeMake UCITY



Resilient. Livable. Prosperous.

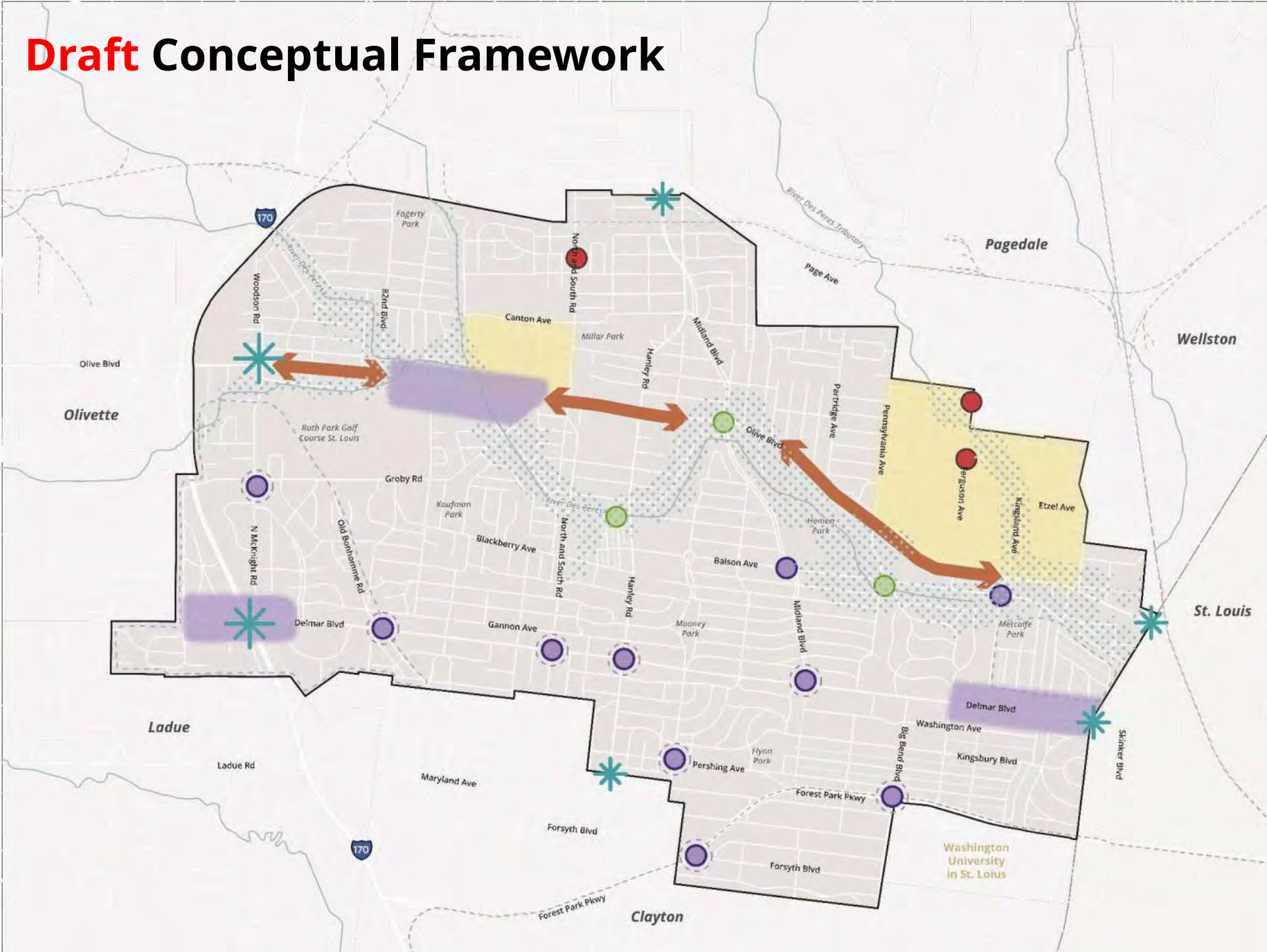
Stormwater Commission Meeting

April 4, 2023

Draft Goal Statements

- 1. Preserve and enhance great places.** Maintain existing character, while encouraging creative development, and building resilient, vibrant places.
- 2. Advance shared prosperity.** Support and expand a diverse local economy, quality education, and a strong workforce that improves opportunities for all residents.
- 3. Connect community.** Invest in community connection to increase mobility options, improve social cohesion, and encourage civic involvement.
- 4. Leverage assets.** Capitalize on University City's diverse cultural, historical, and physical assets while investing in new amenities.
- 5. Strengthen livability.** Enhance neighborhoods as the building block of the community and center of day-to-day life.
- 6. Improve collaboration.** Prioritize commitment to action through responsive governance and strategic partnerships to realize the community's vision.

Draft Conceptual Framework



- Enhanced Corridors
- Community Gateways
- Mixed-Use District
- Existing Neighborhood Activity Nodes
- Potential Neighborhood Activity Nodes
- Potential Civic Activity Nodes
- Focused Growth and Redevelopment
- Community Stabilization
- Flood Mitigation Area

Corridors, Districts, and Nodes



Enhanced Corridors:

- Strengthen the appearance of the corridors
- Neighborhood-serving commercial
- Improved mobility options



Community Gateway:

- Create attractive entries into the City



Mixed-Use District:

- Encourage infill development
- Regional and local draw
- Commercial and residential uses
- Improved mobility options

Corridors, Districts, and Nodes

Neighborhood Activity

Nodes:

- Connect businesses and services to residential areas
- Safe pedestrian and bicycle access

Civic Activity Nodes

- New or expanded parks and open space
- Utilize flood-prone areas
- Stormwater mitigation

Development Strategies

Focused Growth and Redevelopment

- Support higher-density residential and mixed-use redevelopment

Community Stabilization

- Address vacancy and underutilized sites
- Integrate mixed-use development and neighborhood nodes

Flood Mitigation Area

- Address previous flooding impacts and integrate stormwater interventions

Critical Question 1:

Higher density housing within flood prone areas

It's not anticipated that the comprehensive plan will recommend significant new development in the Flood Mitigation area. However, in selected locations previous plans and community members have recommended higher density (multifamily) housing, such as north side of Heman Park. A potential recommendation in these areas is to allow some, limited multifamily residential development in these locations, provided that it includes accommodations such as elevating the building, incorporating barriers, or adding stormwater retention features.

Is this something that should be pursued?

Critical Question 2

Non-structural nodes in flood prone areas

There are some existing development nodes within the Flood Mitigation areas and some others that community members have identified as potential good locations for activity nodes. While significant development may not be appropriate in these areas, the plan could recommend non-structural gathering places (e.g. parks and open spaces).

How should non-structural nodes be developed within these areas and what factors are important to consider in designing them?

Continue Engagement

- Paper surveys available at the University City Hall, the Public Library, and the University City School District Office
- Online activities available at **WeMakeUCity.com**
- Rack cards available for pick-up at City Hall
- Social media images, flyers, and other outreach material available to anyone who can help with outreach



Shape the Future of University City

We Make U City is a special opportunity for everyone to share their ideas about the future of University City through a new comprehensive plan. The plan will address how land is used, how retail and office is developed, the look and feel of neighborhoods, public services and amenities, and more.

Join us for the first round of engagement and help shape your community!

Three Ways to Get Involved!


In-Person Events

Thursday, March 2 6:00 - 7:30 pm Heman Park Community Center <i>Registration Recommended – Visit WeMakeUCity.com</i>	Saturday, March 4 10:00 - 11:30 am Heman Park Community Center <i>Registration Recommended – Visit WeMakeUCity.com</i>
--	--

Online Activities
Complete interactive online activities at WeMakeUCity.com

Paper Surveys
Fill out a paper version of the activities at **City Hall, the Public Library, or the University City Schools District Office**

Learn more, visit: WeMakeUCity.com



WeMake UCITY
Resilient. Livable. Prosperous.

Help shape the future of University City!

There are many ways to get involved!
Visit WeMakeUCity.com for more information.

Questions?



Thank you!

WeMake
UCITY 

Resilient. Livable. Prosperous.



MEMORANDUM

TO: City of University City
FROM: Stormwater Management Plan Team
SUBJECT: University City Stormwater Master Plan – *Prioritization Method* Scope of work Task 2.1
DATE: August 25, 2022

For the Stormwater Master Plan project, we are working to finalize Phase I: identify types of stormwater problems, identify and map the stormwater problems, map watersheds, and map FEMA floodway and floodplain. To transition to Phase II – identify and prioritize 10 stormwater *projects*, we would like to begin our discussion with you on *prioritization methods* which is part of Scope of Work Task 2.2 *Conceptualize and Prioritize Projects*.

During Phase II, we anticipate that over 40 projects may be identified by focused evaluation of the problems identified in Phase I: approximately 40 upland and 4 riverine stormwater improvement projects. In coordination with the City, we will narrow this to a *List of 10* projects that will be studied in detail to generate two ranked lists of stormwater improvement projects: Capital Improvement projects and Operation & Maintenance projects. Determining the *prioritization method* is an important first step for Phase II of the Stormwater Master Plan.

The *prioritization method* will be the basis for the ranking of the *List of 10* projects. The *prioritization method* can then be used by the City for future assessment and ranking of stormwater improvement projects beyond the initial *List of 10*.

This memo provides a recommended *prioritization method*. We look forward to discussions with City officials to modify the method to meet City suggestions.

Background

The University City Stormwater Task Force¹ identified the usefulness of prioritization of stormwater projects in planning:

Metropolitan St. Louis Sewer District (MSD) and some of the neighboring communities use a prioritization process to assign points to each identified project. Ranking projects in an objective way is critical for both political reasons (perception of fairness) and the practical need to plan capital improvements with a budget that is insufficient to address all projects. The assignment of points is typically related to the severity of problem generally categorized into the following key factors:

- Life, Health, Property
- Basement flooding
- Yard erosion
- Street ponding
- Structural damage & number affected
- Yard ponding
- Frequency

¹ University City Stormwater Task Force Report. November 2019. p 21.

Data collected to date show that these factors cover the range of stormwater problems experienced by residents and property owners of University City. This data includes:

- A 2019 survey by the Stormwater Task Force
- A 2022 survey by the Stormwater Master Plan Consulting team
- Field observations and review of available data and reports performed by the Consulting Team
- Additional data is being added into the problem data base from observations of recent flooding, USACE reports, and MSD complaint records.

Prioritization System

MSD's Prioritization System (October 10, 2006) is included as Attachment 1. It assigns benefit points based on the same factors highlighted by the Stormwater Task Force. After benefit points and total cost for each stormwater project are calculated, the projects are objectively ranked based on benefit to cost ratio. Using benefit points rather than benefit dollars avoids inappropriately skewing results to expensive properties.

This system assigns benefit points using objectively assigned weighting factors to stormwater projects (e.g. solutions to problems) that:

1. Solve stream-related erosion and flooding problems
2. Solve storm-sewer and overland flow-related erosion and flooding (not stream-related)
3. Provide benefit regionally by reducing the peak flowrate of stormwater runoff, or by linking two or more related stormwater projects into one project
4. Provide benefit to environmental or water quality concerns
5. Provide miscellaneous benefit by requiring fewer easements, thereby making it easier to implement, or by providing educational benefit.

A key advantage of directly implementing MSD's prioritization system is that City-identified projects could be seamlessly integrated into MSD's current ranked list and hasten their implementation by MSD. The City of Ladue has followed a similar policy.

City-specific overlays to MSD's prioritization system

It is possible to directly implement MSD's system, while also adding overlay adjustments that allow the City to internally adjust the ranked list based on City-specific priorities. For example, the City of Ladue added two overlay adjustments to the MSD-system that include:

- Property Benefit Multiplier: This multiplier is calculated by dividing the number of properties benefitted by the number of properties impacted. This factor emphasizes projects that address larger projects benefitting multiple properties. Properties that do not receive an actual reduction in flooding or erosion from the construction of the storm water improvement project are not a benefitted property.
- Priority WGT Multiplier: This multiplier reflects the City of Ladue's interest in focusing on projects that address structures located outside of the floodplain.

Attachment 2 includes an example of the MSD prioritization system with City-specific overlays applied to a stormwater improvement project.

- Page 1 shows the overall benefit points, cost, benefit-to-cost ratio, and the City-specific overlays.
- Page 2 summarizes the stormwater improvement project's problems and proposed solutions.
- Pages 3 thru 5 show the application of the MSD prioritization system to a project.
- Pages 6 thru 7 show the cost estimate.
- Pages 8 thru 9 show the properties that benefit from the project.
- Page 10 shows an exhibit of the project.



Note that the scope of work for University City's Stormwater Master Plan will develop something similar to Attachment 2 only for the List of 10 stormwater improvement projects.

Conclusion

We recommend implementing a two-part *prioritization method*:

- MSD's Prioritization System (October 10, 2006);
- plus an overlay Property Benefit Multiplier to emphasize University City stormwater needs.

We would be delighted to meet with City officials to discuss the *prioritization method* and your modifications.

ATTACHMENTS

Attachment 1: MSD Stormwater Projects Prioritization System

Attachment 2: Prioritization Overlay Example from the City of Ladue

Attachment 1:
MSD Stormwater Projects
Prioritization System

MSD Stormwater Projects Prioritization System
Revised Benefit Points Allocation Schedule

PROJECT NAME: _____

DATE: _____

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.									
1.0 STREAM	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		
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) <i>Address:</i>	50		25		4		
		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 (allocate 1 lot per 250' of roadway impacted & 2 lots per intersection impacted)		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			

MSD Stormwater Projects Prioritization System
Revised Benefit Points Allocation Schedule

PROJECT NAME: _____

DATE: _____

CONTINUED:

		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			
2.0 STORM SEWER / OVERLAND FLOW		PROBLEM SOLVED CATEGORY, CONT.								
		Note: Problem points are awarded only for those problems solved by the proposed solution.								
		2.1. FLOODING								
		2.1.1. Structure Flooding								
		Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* Address:		350		250		65		
		Basement (1 lot per structure)* Address: 214 Holden Avenue		250		200	1	50		
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* Address:		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						
		Attached Garage (1 lot per structure) Address:		100		75		25		
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) Address:		50		35		12		
		Yard Flooding (1 per lot) Address:		10		6		0		
		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 Address:		200		150		25		
		Traffic obstruction (> 6" of water) on arterial street Address:		50		35		6		
		Traffic obstruction (> 6" of water) on collector street Address:		25		15		2		
		Traffic obstruction (> 6" of water) on residential street Address:		10		6		1		
		Ponding (per ponding area) Address: 214 Holden Avenue		No. Ponds:		1	Points/pond:		5	
		2.2. Moderate Risk Erosion of misc. structures Address:		No. Lots:			Points/lot:		20	
		2.3. Yard Erosion (1 per lot) Address:		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								
		Note: Problem points are awarded only for those problems solved by the proposed solution.		TOTAL PROBLEM POINTS						

MSD Stormwater Projects Prioritization System
Revised Benefit Points Allocation Schedule

PROJECT NAME: _____

DATE: _____

CONTINUED:

SOLUTION BENEFIT CATEGORY					
3.0 REGIONAL	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
4.0 ENVIRONMENTAL / WATER QUALITY	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.)	1	EA	10		
5.0 MISC.	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			
	5.2. Recreational/Educational		Yes = 100, no = 0 pts		
TOTAL SOLUTION POINTS					
TOTAL BENEFIT POINTS					

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

TOTAL COST IN THOUSANDS=

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

Place "X" in one box below:

	MSD Project
	Project by Others

Attachment 2:
Prioritization Overlay Example
from the City of Ladue

City of Ladue

PROJECT IDENTIFICATION INFORMATION SHEET

Storm Water Management Program
 Phase II: Master Plan
 Ladue, Saint Louis County, Missouri

PROJECT NAME: Deerfield/Wakefield
LOCATION: Deerfield/Wakefield Subdivision
PROJECT No: 1601.01

EXAMPLE

STATUS:

DRAFT

Easements Required:	34
Properties Benefited:	39
Properties Impacted:	34
Project Benefit Points:	2802
Property Benefit Multiplier: X	1.15
Priority WGT Multiplier: X	1.10
Adj Prjct Benefit Points:	3535.46
EOPC, thousand:	\$5,257.05
Cost Sharing, MSD:	
Cost Sharing, Other:	
Adj EOPC, thousand:	\$5,257.05
Benefit to Cost Ratio:	0.67

Project Source:

- Citizen Complaint
- Ladue
- MSD
- Other:

Coordination Required:

- MSD
- Corps of Engineers
- MO DNR
- MODOT
- County Highways
- City Streets
- City Parks
- County Parks
- Municipality: City of Ladue
- Railroad:
- Subivision Trustees
- Other: Local Utilities

Problem Categories:

- | <input checked="" type="checkbox"/> WGT | <u>Description</u> |
|---|--|
| <input type="checkbox"/> | 1.15 Habitable structural flooding & erosion from overland flow (non-floodplain) |
| <input type="checkbox"/> | 1.15 Public roadway flooding & erosion |
| <input checked="" type="checkbox"/> | 1.10 Private roadway flooding & erosion |
| <input checked="" type="checkbox"/> | 1.05 Flooding from inadequate sinkhole |
| <input type="checkbox"/> | 1.05 Maintenance of stormwater system facilities |
| <input checked="" type="checkbox"/> | 1.05 Non-habitable structural flooding & erosion |
| <input checked="" type="checkbox"/> | 1.00 Yard erosion & erosion of common ground or unmaintained area |
| <input checked="" type="checkbox"/> | 1.00 Yard flooding |
| <input type="checkbox"/> | 0.85 Structural flooding from creeks or rivers (floodplain) |

Benefited Property Definition:

- 1 A benefited property is one at which flooding and/or erosion is reduced;
- 2 A property that does not receive an actual reduction in flooding or erosion from the construction of storm water improvements is NOT a benefited property; and
- 3 A property that only receives a financial gain from the construction of storm water improvements is NOT a benefited property.

Impacted Property Definition:

- 1 An impacted property is one at which physical disturbance occurs to construct storm water improvements.

MSD/MO American Water Base Map Number(s): 20L; 21L

Laclede Gas Map Number(s): 145-58; 145-68; 155-51; 155-61

FEMA FIRM Map Number(s): 29189C0213K; 29189C0326K

USGS Quadrangle Map(s): Clayton, MO; Webster Groves, MO

Attachments

- Scope of Work
- Benefit Points Calculation
- Engineer's Opinion of Probable Construction Cost
- Property Contact Information
- Improvement Concept Plan

Notes: A sinkhole report is required in areas identified as a sinkhole area (MSD Rules & Regs, 4.020.08).

MSD has an identified project in the area: "Wakefield Subdivision Storm Outfall Sewer 11221".

The project outfall is located in the FEMA floodway. A No-Rise Certificate will be required.

PROJECT NAME: Deerfield/Wakefield
PROJECT No: 1601.01

DRAFT

SCOPE OF WORK

Problem Description:

Many streets in the Deer Creek Subdivision do not have a storm sewer collection system. Runoff flows along the sides of the streets, dumping on the nearest property downstream. There are several sinkholes in the area that drain storm water runoff. During heavy storm events the sinkholes reach capacity and overflow into the next downstream sinkhole. The sinkholes store water and eventually drain over time. The subdivision development, as well as recent infill construction, contribute to the amount of runoff to the sinkholes. In addition, some homes have been built in locations of sinkhole overflow paths.

Not all sinkholes are well maintained with some sinkholes being used for yard waste disposal. In at least one case, a resident claims a sinkhole has been filled in. #41 Deerfield Road is the receptor of much of the subdivision's runoff, particularly from Ellsworth Lane and Woodcrest Drive. #41 Deerfield Road has been completely surrounded with yard flooding due to this high concentration of runoff.

The worst flooding in the Deerfield/Wakefield Subdivision ever recorded was from the extreme event that occurred in late December 2015.

Proposed Solution:

Construct approximately 6,434 linear feet of storm sewer consisting of 12-in to 66-in diameter pipe with appurtenances meeting a level of service of 1:15. At each sinkhole, an overflow structure will be constructed to drain excess stormwater, and alleviate flooding of surrounding homes and roads. The pipe network discharges in a single outlet to Deer Creek located south of the subdivision.

Approximately 40 sinkholes in the vicinity store a significant amount of storm water runoff volume. If the natural storage of the sinkholes is eliminated, that runoff is transferred directly, and at a faster rate, to Deer Creek. In order to prevent a significant increase in the Deer Creek discharge that exits the City limits, the natural sinkhole storage must be maintained.

The solution presented here extends the piping system further upstream into the subdivision allowing collection earlier in the system, which would help alleviate road flooding. The pipe sizes are generally smaller than in MSD's solution since this solution utilizes the storage capacity of the sinkholes, rather than draining them from the bottom.

Commentary:

MSD has an identified project in the area, Project #11221 "Wakefield-Deerfield to Litzsinger Sinkhole Relief Sewer Subdivision Storm Outfall Sewer", at an estimated cost of \$10,100,000. The MSD solution drains the sinkholes from the bottom, whereas the solution presented here allows the sinkholes to fill to near the top prior to discharging. The excess runoff volume overflows into the piped system and is discharged to Deer Creek.

MSD requires preparation of a sinkhole report for locations identified as a sinkhole area (MSD Rules & Reg's, 4.020.08). This project would require a sinkhole report.

The project outfall is located in the FEMA floodway. A No-Rise Certificate will be required.

PROJECT NAME: Deerfield/Wakefield
 PROJECT No: 1601.01

DRAFT

EXAMPLE

BENEFIT POINTS CALCULATION

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.									
1.0 STREAM	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:	200		100		15		
		Attached Garage (1 lot per structure) Address:	100		50		8		
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) Address:	50		25		4		
		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:	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 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)		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) 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			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: Address:		75		50		12			
Collector Road: Address:		35		25		6			
Residential Road: Address:		20		12		3			

CONTINUED:

EXAMPLE

PROBLEM SOLVED CATEGORY, CONT.		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										
2.1.1. Structure Flooding										
2.0 STORM SEWER / OVERLAND FLOW	2.1. FLOODING	Habitable 1st floor, residential; includes spaces with mechanical equipment (1 lot per structure)* Address:	350		250		65			
		Basement (1 lot per structure)* Address:	250		200	9	50		1800	
		Industrial, office, commercial and warehouse (1 lot per 2,500 sf of floor space flooded)* Address:	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) Address:	100		75		25			
		Misc. structures including patio/decks, pools, sheds, tennis courts, detached garages, etc.(1 lot per structure) Address:	50		35	2	12		70	
		Yard Flooding (1 per lot) Address:	10		6	31	0		186	
		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 Address: #30, 34, 38 Deerfield Ter	200		150	3	25		450	
		Traffic obstruction (> 6" of water) on arterial street Address:	50		35		6			
Traffic obstruction (> 6" of water) on collector street Address:	25		15		2					
Traffic obstruction (> 6" of water) on residential street Address:	10		6	6	1		36			
Ponding (per ponding area) Address:	No. Ponds:		4		Points/pond:	5	20			
2.2. Moderate Risk Erosion of misc. structures Address: #41 Deerfield Rd	No. Lots:		1		Points/lot:	20	20			
2.3. Yard Erosion (1 per lot) Address:	No. Lots:		13		Points/lot:	10	130			
2.4. Age of Existing System	>50 yrs (30 pts)		26-50 yrs (15 pts)		<25 yrs (0 pts)					
Points for Age										
Note: Problem points are awarded only for those problems solved by the proposed solution.		TOTAL PROBLEM POINTS						2712		

CONTINUED:

EXAMPLE

SOLUTION BENEFIT CATEGORY							
3.0 REGIONAL	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	
4.0 ENVIRONMENTAL / WATER QUALITY	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)		0	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.)	9	EA	10	90	
5.0 MISC.	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		0	0	0	X	
	5.2. Recreational/Educational		Yes = 100, no = 0 pts		0		
TOTAL SOLUTION POINTS						90	
TOTAL BENEFIT POINTS						2802	

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

TOTAL COST IN THOUSANDS=

\$5,257.05

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

0.53

EXAMPLE

PROJECT NAME:		Deerfield/Wakefield		DRAFT	
PROJECT No:		1601.01			
<u>ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST</u>					
ITEM NUMBER	PAY ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
1	Mobilization	1	Lump Sum	\$87,424.57	\$87,424.57
2	Abandonment - Pipe Fill	8	Cubic Yards	\$425.00	\$3,400.00
3	Bottom Sect. Of Manhole-27" - 36" Pipe	7	Each	\$2,700.00	\$18,900.00
4	Bottom Sect. Of Manhole-42 Inch Pipe	2	Each	\$3,000.00	\$6,000.00
5	Bottom Sect. Of Manhole-48 Inch Pipe	2	Each	\$6,100.00	\$12,200.00
6	Bottom Sect. Of Manhole-60 Inch Pipe	8	Each	\$7,000.00	\$56,000.00
7	Bottom Sect. Of Manhole-66 Inch Pipe	8	Each	\$8,000.00	\$64,000.00
8	Flared End Section 42 Inch Pipe	2	Each	\$3,150.00	\$6,300.00
9	Flared End Section 66 Inch Pipe	1	Each	\$4,950.00	\$4,950.00
10	Inlet (Area,Street, etc.)	10	Each	\$2,500.00	\$25,000.00
11	Inlet Manhole	35	Each	\$3,200.00	\$112,000.00
12	Manhole	1	Each	\$3,000.00	\$3,000.00
13	Pipe Sewer 12-Inch	649	Linear Feet	\$189.30	\$122,857.15
14	Pipe Sewer 15-Inch	49	Linear Feet	\$185.31	\$9,080.35
15	Pipe Sewer 18-Inch	1,090	Linear Feet	\$219.05	\$238,759.96
16	Pipe Sewer 24-Inch	105	Linear Feet	\$245.98	\$25,827.57
17	Pipe Sewer 30-Inch	272	Linear Feet	\$255.03	\$69,367.79
18	Pipe Sewer 36-Inch	711	Linear Feet	\$269.95	\$191,937.82
19	Pipe Sewer 42-Inch	329	Linear Feet	\$242.15	\$79,667.21
20	Pipe Sewer 48-Inch	273	Linear Feet	\$299.68	\$81,813.92
21	Pipe Sewer 60-Inch	1,513	Linear Feet	\$477.07	\$721,801.78
22	Pipe Sewer 66-Inch	1,443	Linear Feet	\$564.92	\$815,172.74
23	Sodding - Bluegrass	14,298	Square Yards	\$13.00	\$185,871.11
24	Street Pavement - Asphaltic Concrete	339	Square Yards	\$85.00	\$28,815.00
25	Vegetated Reinforced Earthen Swale	898	Square Yards	\$35.00	\$31,430.00
26	Protection and Restoration of Site	1	Lump Sum	\$450,237.00	\$450,237.00
27	Utility Relocation (Allowance)	1	Lump Sum	\$60,032.00	\$60,032.00
		SUB-TOTAL - CONSTRUCTION:			\$3,511,845.97
		Estimated MSD Plan Review Submittal Fee: \$ -			
		Estimated MSD Conceptual Review Fee: \$ -			
		Estimated MSD Plan Review Fee: \$ -			
		Estimated MSD Construction Permit Fee: \$ -			
		Estimated MSD Construction Inspection Fee: \$ -			
		<i>Note: MSD fees are waived by reciprocal agreement with the City of Ladue.</i>			
		Estimated Engineering Fee (Design & Construction):			\$357,100.00

*Excavation Class 'C' cost included in unit price

EXAMPLE

			Sinkhole Report:	\$5,000.00
			FEMA No Rise Certification:	\$5,000.00
	Estimated Geotechnical Engineering Fee:	22	Borings @ \$2000/each =	\$44,000.00
			Estimated Property Strip Map Survey Fee:	\$51,000.00
			Estimated Topographic Survey Fee:	\$28,953.00
	Estimated Property Title/Easement Search Report Fee:	34	ESR's @ \$500/each =	\$17,000.00
	Estimated Easement Preparation:	34	Plats @ \$450/each =	\$15,300.00
			Estimated Construction Survey Fee:	\$8,685.90
			SUB-TOTAL:	\$4,043,884.87
			30% Contingency:	\$1,213,165.46
			TOTAL:	\$5,257,050.33

PROJECT NAME: Deerfield/Wakefield
PROJECT No: 1601.01

DRAFT

PROPERTY CONTACT INFORMATION

BENEFITED PROPERTY OWNERS			
Count	Property Address	Contact Name	Phone Number
1	2 DANFIELD RD	KREMS ROBERT B WENDY A	
2	1 DANIEL RD	JOFFRAY JEFF	
3	32 DANIEL RD	HOWARD TODD KEVIN & KATHRYN GARLOCK H/W	
4	29 DEER CREEK WOODS DR	DAHM BROOKE J TR ETAL	
5	30 DEER CREEK WOODS DR	CABBABE SAMER W & AMY ALVAREZ QUALIFIED	cabbabes@yahoo.com 314-520-8000
6	25 DEERFIELD RD	VOGEL PAUL L & LYNN ANN H/W	
7	28 DEERFIELD RD	KNIGHT NEWELL S JR & JANETM H/W	
8	29 DEERFIELD RD	THORNHILL ELIZABETH WILHELM TRUSTEE	
9	41 DEERFIELD RD	WOLFSBERGER CLARK & WENDY H/W	wendygoessling@group360.com
10	47 DEERFIELD RD	WOLFSBERGER CLARK & WENDY H/W	wendygoessling@group360.com
11	30 DEERFIELD TER	MURRAY DAVID & NANCY H/W	
12	34 DEERFIELD TER	MARTIN ANGELA J	
13	38 DEERFIELD TER	UNGACTA LIVING TRUST	felixungacta@gmail.com
14	DEERFIELD TER R/W	DEERFIELD TER TRUSTEES	
15	21 ELLSWORTH LN	KINSELLA MICHAEL J SHARON D H/W	
16	22 ELLSWORTH LN	HENNESSEY JANET DUNSMORE & PETER POLLNOW	
17	24 ELLSWORTH LN	J S B ELLSWORTH L L C	jboudoures@charter.net
18	27 ELLSWORTH LN	BELLAN LINDA K TRUSTEE	
19	ELLSWORTH LN R/W	ELLSWORTH LN SUBDIVISION TRUSTEES	
20	19 LINDWORTH DR	GUPTA ANJU & SURI GAURAV H/W	
21	39 LINDWORTH DR	WENDE ADOLPH H TR	
22	7 TRAILS END LN	SLETTEN BYRON ETAL	
23	4 TRAILS END LN	LONG GEORGE S & LEXIE T H/W	
24	5 TRAILS END LN	THOMPSON JOYCE D TRUSTEE	
25	4 WAKEFIELD DR	TREMAYNE RONALD D & ROBIN M H/W	
26	5 WAKEFIELD DR	OLDANI LOUIS EVELYN H/W	
27	6 WAKEFIELD DR	RYAN JAMES A & MARY LOU S H/W	
28	7 WAKEFIELD DR	BENDON DONNA L REVOCABLE TRUST	
29	8 WAKEFIELD DR	GILBERTSON MATTHEW & BROOKE H/W	
30	9 WAKEFIELD DR	HANLEY MICHAEL J ROSEMARY H/W	
31	10 WAKEFIELD DR	DELANO PHILIP G & ENGELBREIT MARY H/W	
32	11 WAKEFIELD DR	STENSON WILLIAM F & JANET M REVOCABLE	
33	12 WAKEFIELD DR	MCCARTHY KAREN R	
34	WAKEFIELD DR R/W	WAKEFIELD DR SUBDIVISION TRUSTEES	
35	22 WOODCREST DR	MAXEINER JAMES R & ELAINE F TRUSTEES	
36	50 WOODCREST DR	HORN EDWIN W II TRUST ETAL	
37	51 WOODCREST DR	LEE JOAN LI CHUAN	
38	53 WOODCREST DR	ROTHERY DANIEL J JANE E H/W	
39	19 WOODCREST DR	JACOBSON TERESA	
IMPACTED PROPERTY OWNERS			
Count	Property Address	Contact Name	Phone Number
1	2 DANFIELD RD	KREMS ROBERT B WENDY A	
2	1 DANIEL RD	JOFFRAY JEFF	
3	16 DANIEL RD	MACKEY MARIAN MIMI ETAL J/T	
4	20 DANIEL RD	OTOOLE THOMAS J & ANN T H/W	
5	28 DANIEL RD	CORRY MICHAEL CAROLYN H/W	
6	32 DANIEL RD	HOWARD TODD KEVIN & KATHRYN GARLOCK H/W	
7	25 DEERFIELD RD	VOGEL PAUL L & LYNN ANN H/W	
8	29 DEERFIELD RD	THORNHILL ELIZABETH WILHELM TRUSTEE	
9	41 DEERFIELD RD	WOLFSBERGER CLARK & WENDY H/W	
10	47 DEERFIELD RD	WOLFSBERGER CLARK & WENDY H/W	
11	37 DEERFIELD TER	UNGACTA LIVING TRUST	
12	19 LINDWORTH DR	GUPTA ANJU & SURI GAURAV H/W	
13	39 LINDWORTH DR	WENDE ADOLPH H TR	

PROJECT NAME: Deerfield/Wakefield
PROJECT No: 1601.01

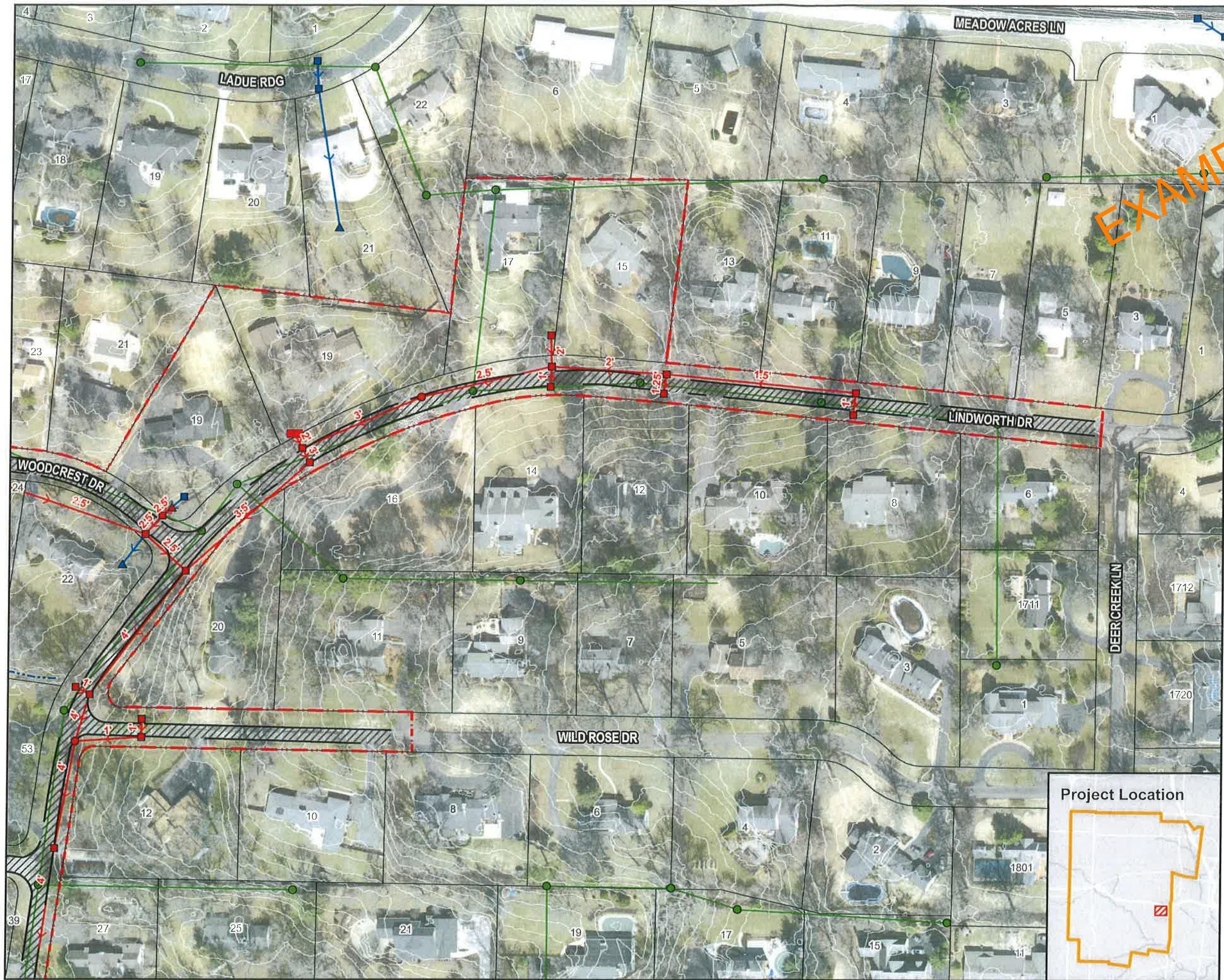
DRAFT

PROPERTY CONTACT INFORMATION

14	1299 LITZINGER WOODS LN A	UNION ELECTRIC COMPANY
15	21 OVERBROOK DR	HUFFMAN WILLIAM E DAWN L H/W TRUSTEES
16	6 TRAILS END LN	SLETTEN BYRON ETAL
17	4 WAKEFIELD DR	TREMAYNE RONALD D & ROBIN M H/W
18	5 WAKEFIELD DR	OLDANI LOUIS EVELYN H/W
19	6 WAKEFIELD DR	RYAN JAMES A & MARY LOU S H/W
20	7 WAKEFIELD DR	BENDON DONNA L REVOCABLE TRUST
21	8 WAKEFIELD DR	GILBERTSON MATTHEW & BROOKE H/W
22	9 WAKEFIELD DR	HANLEY MICHAEL J ROSEMARY H/W
23	10 WAKEFIELD DR	DELANO PHILIP G & ENGELBREIT MARY H/W
24	11 WAKEFIELD DR	STENSON WILLIAM F & JANET M REVOCABLE
25	12 WAKEFIELD DR	MCCARTHY KAREN R
26	19 WOODCREST DR	JACOBSON TERESA
27	22 WOODCREST DR	MAXEINER JAMES R & ELAINE F TRUSTEES
28	24 WOODCREST DR	PLIAKOS HARRY G GEORGIANA
29	26 WOODCREST DR	KLOTZ ELIZABETH C
30	50 WOODCREST DR	HORN EDWIN W II TRUST ETAL
31	51 WOODCREST DR	LEE JOAN LI CHUAN
32	53 WOODCREST DR	ROTHERY DANIEL J JANE E H/W
33	DEERFIELD TER R/W	DEERFIELD TER TRUSTEES
34	ELLSWORTH LN R/W	ELLSWORTH LN SUBDIVISION TRUSTEES

EASEMENTS REQUIRED

Count		Contact Name	Phone Number
1	2 DANFIELD RD	KREMS ROBERT B WENDY A	
2	1 DANIEL RD	JOFFRAY JEFF	
3	16 DANIEL RD	MACKEY MARIAN MIMI ETAL J/T	
4	20 DANIEL RD	OTOOLE THOMAS J & ANN T H/W	
5	28 DANIEL RD	CORRY MICHAEL CAROLYN H/W	
6	32 DANIEL RD	HOWARD TODD KEVIN & KATHRYN GARLOCK H/W	
7	25 DEERFIELD RD	VOGEL PAUL L & LYNN ANN H/W	
8	29 DEERFIELD RD	THORNHILL ELIZABETH WILHELM TRUSTEE	
9	41 DEERFIELD RD	WOLFSBERGER CLARK & WENDY H/W	
10	47 DEERFIELD RD	WOLFSBERGER CLARK & WENDY H/W	
11	37 DEERFIELD TER	UNGACTA LIVING TRUST	
12	19 LINDWORTH DR	GUPTA ANJU & SURI GAURAV H/W	
13	39 LINDWORTH DR	WENDE ADOLPH H TR	
14	1299 LITZINGER WOODS LN A	UNION ELECTRIC COMPANY	
15	21 OVERBROOK DR	HUFFMAN WILLIAM E DAWN L H/W TRUSTEES	
16	6 TRAILS END LN	SLETTEN BYRON ETAL	
17	4 WAKEFIELD DR	TREMAYNE RONALD D & ROBIN M H/W	
18	5 WAKEFIELD DR	OLDANI LOUIS EVELYN H/W	
19	6 WAKEFIELD DR	RYAN JAMES A & MARY LOU S H/W	
20	7 WAKEFIELD DR	BENDON DONNA L REVOCABLE TRUST	
21	8 WAKEFIELD DR	GILBERTSON MATTHEW & BROOKE H/W	
22	9 WAKEFIELD DR	HANLEY MICHAEL J ROSEMARY H/W	
23	10 WAKEFIELD DR	DELANO PHILIP G & ENGELBREIT MARY H/W	
24	11 WAKEFIELD DR	STENSON WILLIAM F & JANET M REVOCABLE	
25	12 WAKEFIELD DR	MCCARTHY KAREN R	
26	19 WOODCREST DR	JACOBSON TERESA	
27	22 WOODCREST DR	MAXEINER JAMES R & ELAINE F TRUSTEES	
28	24 WOODCREST DR	PLIAKOS HARRY G GEORGIANA	
29	26 WOODCREST DR	KLOTZ ELIZABETH C	
30	50 WOODCREST DR	HORN EDWIN W II TRUST ETAL	
31	51 WOODCREST DR	LEE JOAN LI CHUAN	
32	53 WOODCREST DR	ROTHERY DANIEL J JANE E H/W	
33	DEERFIELD TER R/W	DEERFIELD TER TRUSTEES	
34	ELLSWORTH LN R/W	ELLSWORTH LN SUBDIVISION TRUSTEES	



Legend

- 2-ft Contours
- City Boundary
- Parcels
- Approx. Drainage Path

Proposed Improvements

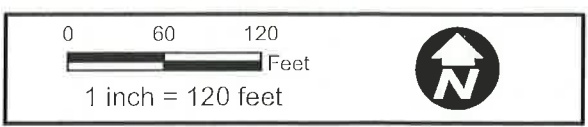
- Stormwater Double Inlet
- Stormwater Inlet
- Stormwater Intake/Outfall
- Stormwater Manhole
- Curb
- Stormwater Pipe
- Replace Road
- Strip Map Limits

Existing Stormwater Network

- Gravity Main
- Inlet
- Intake/Outfall

Existing Sanitary Network

- Gravity Main
- Manhole



Easements Required	42
Properties Benefited	56
Properties Impacted	42
Project Benefit Points	10,281.00
Conceptual Project Cost	\$10,154,016.33
Benefit to Cost Ratio	1.013

Problem Description
Yard and roadway flooding due to an inadequate drainage system that relies on sinkholes.

Proposed Solution Description
Storm sewer improvements to alleviate flooding from sinkholes not draining fast enough.





Legend

- 2-ft Contours
- City Boundary
- Parcels
- Approx. Drainage Path

Proposed Improvements

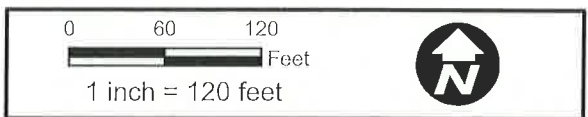
- Stormwater Double Inlet
- Stormwater Inlet
- Stormwater Intake/Outfall
- Stormwater Manhole
- Curb
- Stormwater Pipe
- Replace Ex. Stormwater Line
- Bank Stabilization
- Replace Road
- Strip Map Limits

Existing Stormwater Network

- Gravity Main
- Inlet
- Intake/Outfall

Existing Sanitary Network

- Gravity Main
- Manhole

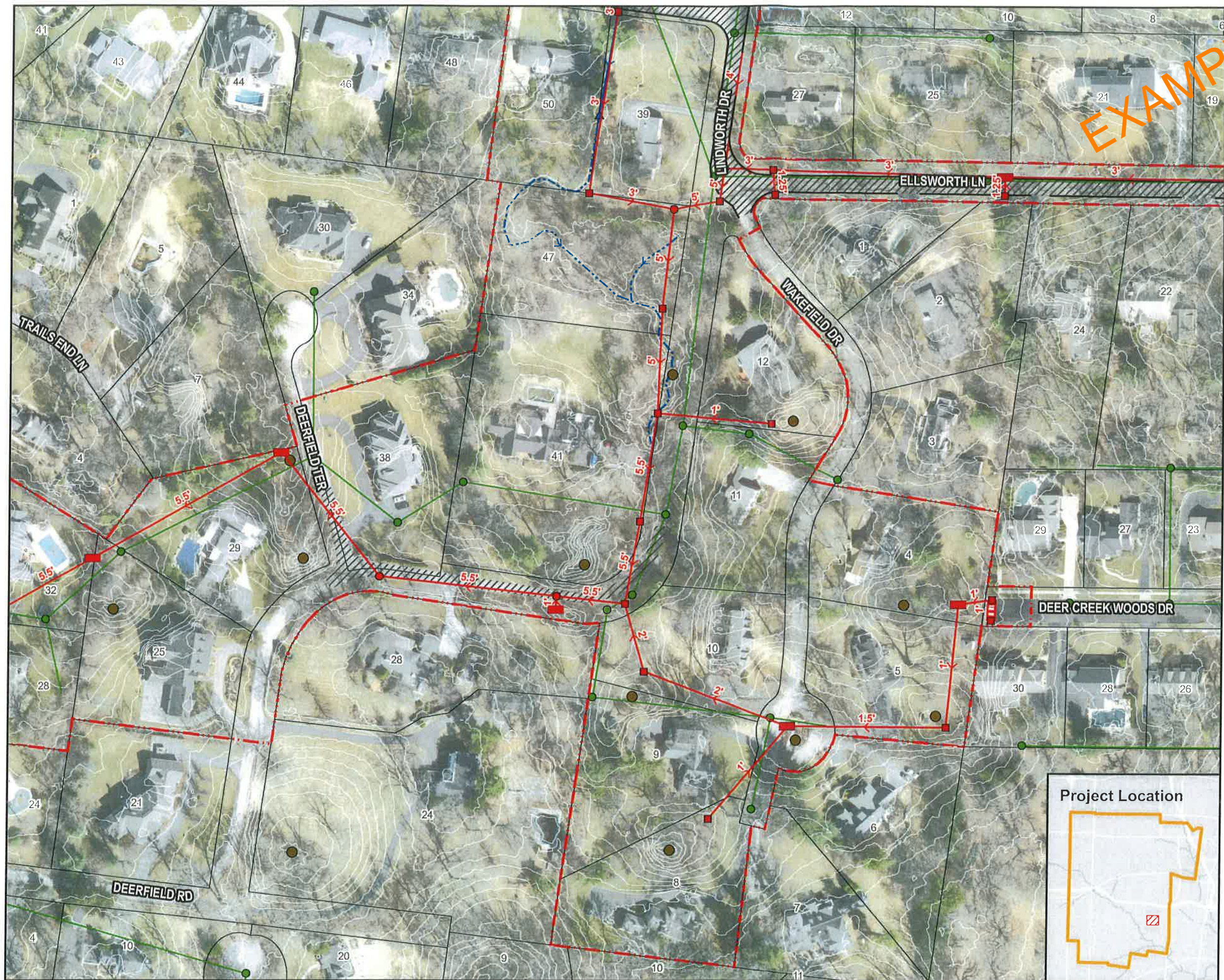


Easements Required	42
Properties Benefited	56
Properties Impacted	42
Project Benefit Points	10,281.00
Conceptual Project Cost	\$10,154,016.33
Benefit to Cost Ratio	1.013

Problem Description
Yard and roadway flooding due to an inadequate drainage system that relies on sinkholes.

Proposed Solution Description
Storm sewer improvements to alleviate flooding from sinkholes not draining fast enough.





Legend

- 2-ft Contours
- City Boundary
- Parcels
- Approx. Drainage Path

Proposed Improvements

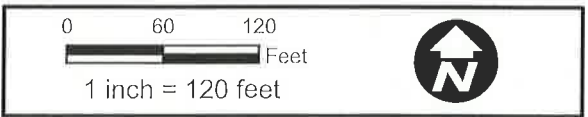
- Stormwater Double Inlet
- Stormwater Inlet
- Stormwater Manhole
- Curb
- Stormwater Pipe
- Replace Ex. Stormwater Line
- Trench Drain
- Replace Road
- Strip Map Limits

Existing Stormwater Network

- Gravity Main
- Inlet
- Intake/Outfall
- Existing Sinkhole

Existing Sanitary Network

- Gravity Main
- Manhole



Easements Required	42
Properties Benefited	56
Properties Impacted	42
Project Benefit Points	10,281.00
Conceptual Project Cost	\$10,154,016.33
Benefit to Cost Ratio	1.013

Problem Description
Yard and roadway flooding due to an inadequate drainage system that relies on sinkholes.

Proposed Solution Description
Storm sewer improvements to alleviate flooding from sinkholes not draining fast enough.





Legend

- 2-ft Contours
- City Boundary
- Parcels
- Approx. Drainage Path

Proposed Improvements

- Stormwater Double Inlet
- Stormwater Inlet
- Stormwater Manhole
- Curb
- Stormwater Pipe
- Replace Road
- Strip Map Limits

Existing Stormwater Network

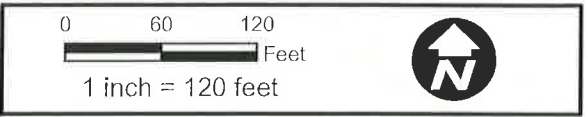
- Gravity Main
- Inlet
- Manhole
- Intake/Outfall
- Existing Sinkhole

Existing Sanitary Network

- Gravity Main
- Manhole

FEMA Flood Zones

- Regulatory Floodway
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

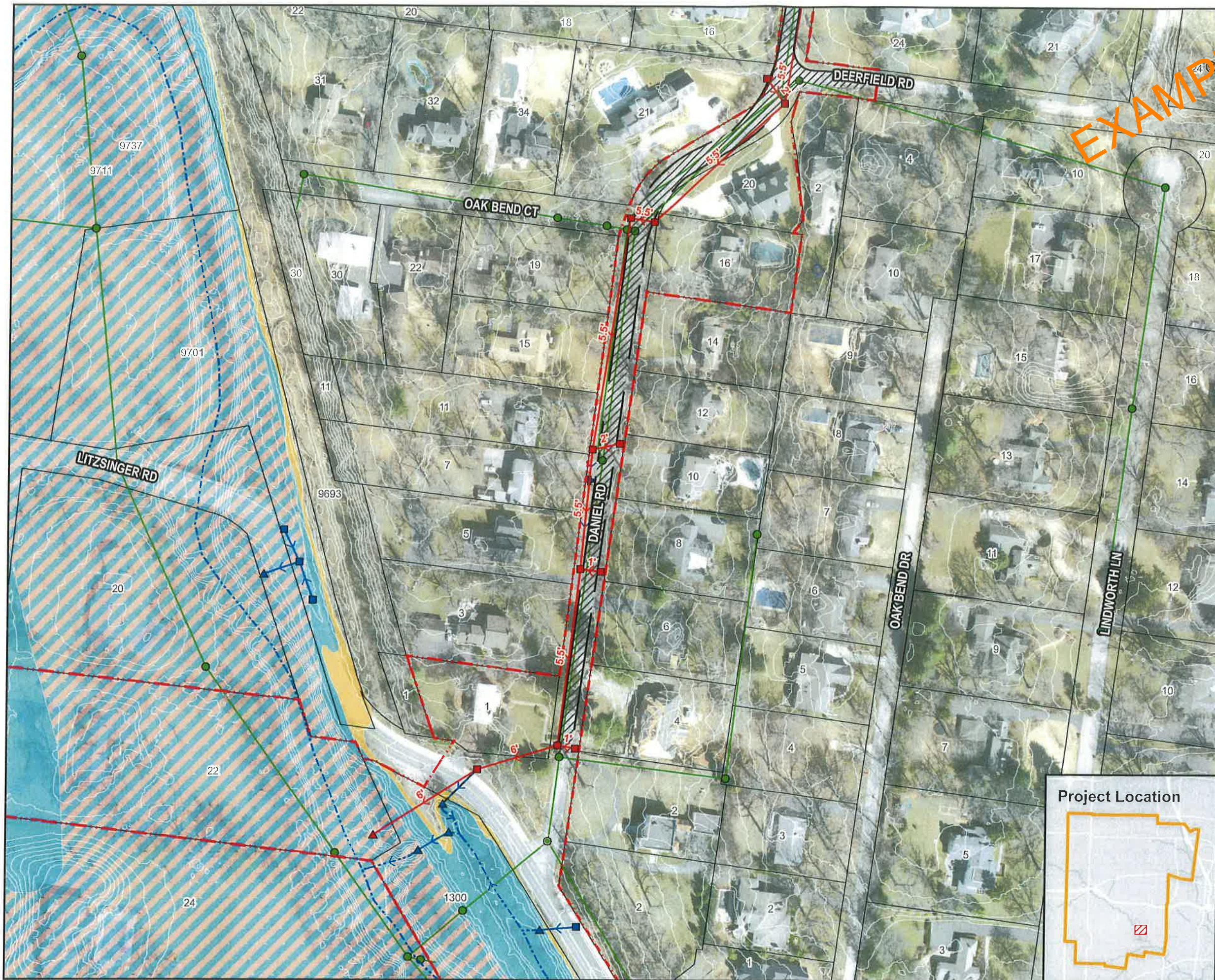


Easements Required	42
Properties Benefited	56
Properties Impacted	42
Project Benefit Points	10,281.00
Conceptual Project Cost	\$10,154,016.33
Benefit to Cost Ratio	1.013

Problem Description
Yard and roadway flooding due to an inadequate drainage system that relies on sinkholes.

Proposed Solution Description
Storm sewer improvements to alleviate flooding from sinkholes not draining fast enough.





Legend

- 2-ft Contours
- City Boundary
- Parcels
- Approx. Drainage Path
- Proposed Improvements**
 - Stormwater Inlet
 - Stormwater Intake/Outfall
 - Abandon Pipe
 - Curb
 - Stormwater Pipe
 - Replace Road
 - Strip Map Limits
- Existing Stormwater Network**
 - Gravity Main
 - Inlet
 - Manhole
 - Intake/Outfall
 - Fitting
 - Existing Sinkhole
- Existing Sanitary Network**
 - Gravity Main
 - Manhole
- FEMA Flood Zones**
 - Regulatory Floodway
 - 1.0% Annual Chance Flood Hazard
 - 0.2% Annual Chance Flood Hazard



Easements Required	42
Properties Benefited	56
Properties Impacted	42
Project Benefit Points	10,281.00
Conceptual Project Cost	\$10,154,016.33
Benefit to Cost Ratio	1.013

Problem Description
Yard and roadway flooding due to an inadequate drainage system that relies on sinkholes.

Proposed Solution Description
Storm sewer improvements to alleviate flooding from sinkholes not draining fast enough.



City of Ladue Storm Water Management Program



Project 1601.01

Deerfield/Wakefield





EXAMPLE

Legend

- 2-ft Contours
- City Boundary
- Parcels

Proposed Improvements

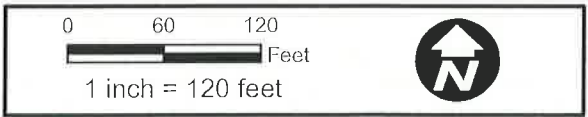
- Stormwater Double Inlet
- Stormwater Inlet
- Stormwater Intake/Outfall
- Curb
- Stormwater Pipe
- Trench Drain
- Replace Road
- Strip Map Limits

Existing Stormwater Network

- Gravity Main
- Inlet
- Manhole
- Intake/Outfall
- Existing Sinkhole

Existing Sanitary Network

- Gravity Main
- Manhole





Easements Required	42
Properties Benefited	56
Properties Impacted	42
Project Benefit Points	10,281.00
Conceptual Project Cost	\$10,154,016.33
Benefit to Cost Ratio	1.013

Problem Description
Yard and roadway flooding due to an inadequate drainage system that relies on sinkholes.

Proposed Solution Description
Storm sewer improvements to alleviate flooding from sinkholes not draining fast enough.



City of Ladue Storm Water Management Program

Project 1601.01

Deerfield/Wakefield



MEMORANDUM

TO: Darren Girdler, Director of Public Works
 Mirela Celaj, CFM, Assistant Director of Public Works
 FROM: Stormwater Master Plan Team (HR Green and Reitz & Jens)
 SUBJECT: University City Stormwater Master Plan
Public versus Private – Recommended Definition Scope of work Task 2.2
 DATE: February 28, 2023

An important piece of our work to develop a Stormwater Master Plan for University City is to assist in developing a definition of a public stormwater project versus a private stormwater project. Phase II of the Master Plan development will develop a list of stormwater Capital Improvement Projects (CIP) and stormwater Operation & Maintenance (O&M) projects. A clear definition of public versus private projects is needed so that the Stormwater Master Plan focuses on projects that are considered in the public interest and worthy of public funding. Other municipalities have determined the difference between public and private problems – either in practice or through a set of criteria. Our experience and observations of other municipalities have informed the proposed criteria which follows.

We propose utilizing a series of criteria to determine whether a stormwater project should be considered public. We recommend that public stormwater projects meet at least two of the following criteria:

1. Two or more private properties would benefit
2. Required improvements extend to at least two private properties
3. The drainage area is greater than or equal to 1 acre
4. Flooding or erosion to a public or private building occurs
5. Frequent flooding or erosion to a roadway occurs
6. Repair or upgrade to existing publicly-owned stormwater handling system is needed
7. Repair of publicly-owned retaining wall is needed
8. High-flow overland path for runoff from the backyard to the street is blocked by soil or other obstruction and is causing structural flooding. Repair would require work on neighboring yard.
9. Project cost exceeds 10% of the total appraised value of the property

The paragraphs and table below present examples of public and private stormwater problems.

- Some stormwater problems are clearly public. They reduce ongoing operating costs or minimize losses to public infrastructure.
- Some stormwater problems are clearly private. The source of the stormwater concern and the project needed to address the stormwater concern both occur within a single private property.

Below are examples of projects evaluated against each criterion. Note that a public project requires a positive response to at least two of these criteria.

Criteria	Example
1 Two or more private properties would benefit	At 7591 Amhurst (at North and South Rd), a creek bank has eroded to within 9 ft of home. Mitigation would involve stabilizing the creek bank and would benefit multiple properties. The creek bank erosion is caused by runoff from scores of properties. (See Erosion Project 1 attached.)



2	Required improvements extend to at least two private properties	Street flow exceeds gutter capacity at two driveways and runs into basement garages at Old Bonhomme east of Alanson Drive. MSD has studied the problem and recommends upsizing the existing storm sewer which crosses at least 4 properties (See Street Project 2.)
3	The drainage area is greater than or equal to 1 acre	Runoff from nearby commercial property flows through several residential backyards in the Grenville Subdivision. The drainage area to the backyard of 1561 Westmont Place through 1573 Westmont Place is approximately 3.3 acres. (See Backyard Project 3.)
4	Flooding or erosion to a public or private building occurs	Several basement garages along Amherst Ave flood from street drainage which escapes the gutter and flows down the driveways. (See Street Project 1.)
5	Frequent flooding or erosion to a roadway occurs	The erosion of River Des Peres threatens Mona Drive. The top of the bank is 16 ft high and 5 ft from the curb. (See Erosion Project 2.)
6	Repair or upgrade to existing publicly-owned stormwater handling system is needed.	An MSD-owned area inlet in the backyard of 7353 Milan Ave clogs easily and may also have inadequate capacity. Water frequently backs up, flooding the entire yard, back patio, and basement. (See Backyard Project 2.)
7	Repair of a publicly-owned retaining wall is needed	At 7425 Shaftesbury Ave a privately-owned wood tie wall protects a yard from River Des Peres (RDP) bank erosion. Flow in the RDP drains a large area. This would <u>not</u> meet the criteria in question and therefore might not be considered a public project. (See Erosion Project 5.)
8	High-flow overland path for runoff from the backyard to the street is blocked by soil or other obstruction and is causing structural flooding. Repair would require work on neighboring yard.	Runoff from yards on Stanford Ave flow into several backyards at 7842 through 7820 Balson Ave. Inadequate overland flow path causes flooding of at least two homes. (See Backyard Project 1.)
9	Project cost exceeds 10% of the total appraised value of the property	

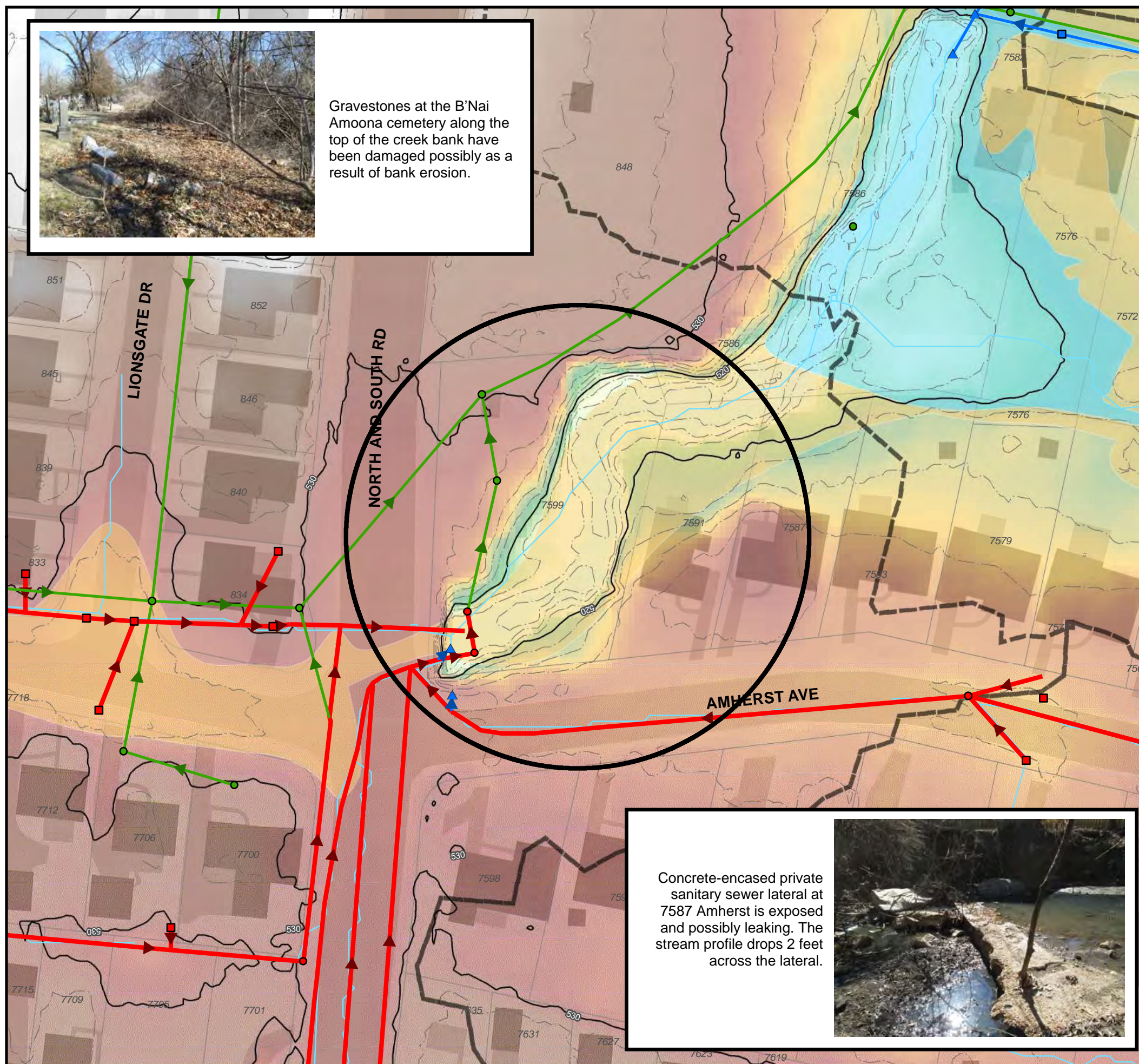
We would be delighted to meet with City officials to discuss these recommendations.

Attachments:

- Erosion Project 1: Tributary to River Des Peres Between Amherst Ave and Blackberry Ave
- Erosion Project 2: River Des Peres at Mona Dr
- Erosion Project 5: River Des Peres at 7425 Shaftesbury Ave
- Street Project 1: Amherst Ave
- Street Project 2: Old Bonhomme Rd
- Backyard Project 1: Balson Ave
- Backyard Project 2: Milan Ave
- Backyard Project 3: Grenville Subdivision



Gravestones at the B'Nai Amoona cemetery along the top of the creek bank have been damaged possibly as a result of bank erosion.



Concrete-encased private sanitary sewer lateral at 7587 Amherst is exposed and possibly leaking. The stream profile drops 2 feet across the lateral.

Problem Description:

An un-named tributary to the River des Peres flows from a closed storm sewer outfall at Amherst and North & South. A 500-foot reach of the creekbank is over-steepened and actively eroding. MSD and the City initially identified this bank erosion in 1988, and MSD confirmed the issue and developed a conceptual solution and cost estimate in 2007.

The 13-foot high eroding bank at 7591 Amherst is 20 feet from the home (measured from the toe of bank), and has not advanced significantly since 2006, but is considered severe by MSD's bank erosion rating ($V/H=1.46$). The July 26, 2022 flood was above the basement floor of 7591 Amherst and collapsed their fence.



The 13-foot high eroding bank at 7591 Amherst is 9 feet from the home (measured from the top of bank).

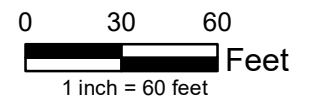


Creek erosion along 7587 Amherst is undermining their fence. The erosion rating at 7587 Amherst is considered a threat to the home ($V/H=0.25$).



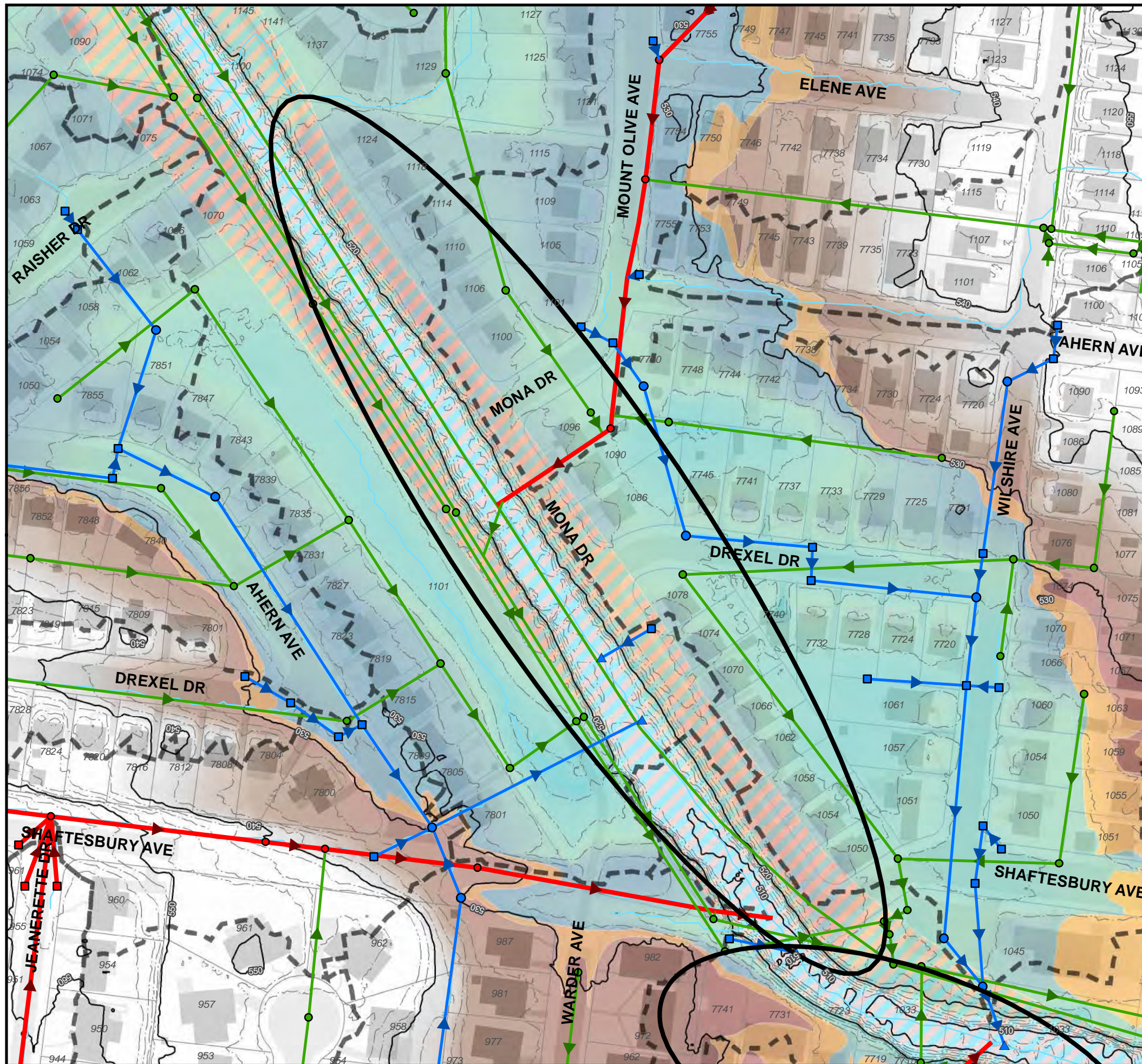
Legend

- Stormwater Problem Point
- Problem Location
- Flow Path Line
- ▭ Watershed Boundary
- Existing MSD System
 - Combined Inlet
 - Storm Inlet
 - ▲ Storm Intake-Outfall
 - Combined Manhole
 - Sanitary Manhole
 - Storm Manhole
 - Combined Sewer
 - Sanitary Sewer
 - Storm Sewer
- Flood Hazard Zone**
 - 1.0% Annual Chance Flood Hazard
 - 0.2% Annual Chance Flood Hazard
 - Regulatory Floodway



**Tributary to River Des Peres
Between Amherst Ave and
Blackberry Ave**

Ranked #1 in the Erosion Category



Problem Description:

A 700-foot reach of the River des Peres is over-steepened and actively eroding. The top of bank is 16-feet high and has eroded to within 5 feet of the curb line of Mona Drive. The north end of Mona Drive is the only road access/egress for six homes. Using MSD's erosion rating, the street is more severely threatened (V/H=0.44) than the homes (V/H=0.18). MSD installed riprap along portions of Mona Drive in approximately 2017, but most of this riprap has since eroded and slid off the bank. An additional 600-foot reach of bank along the downstream end of Mona Drive is somewhat more stable. The homes along Mona Drive flooded on July 26, 2022.

Over-steepened channel banks threaten Mona Drive which provides the only access to 6 houses.



Over-steepened channel banks, and the remains of riprap placed by MSD that has since eroded and slid off the bank.

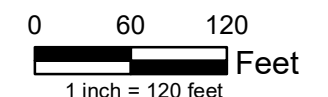


Channel bottom contains riprap, some of which slid off the bank from a previously installed MSD project.

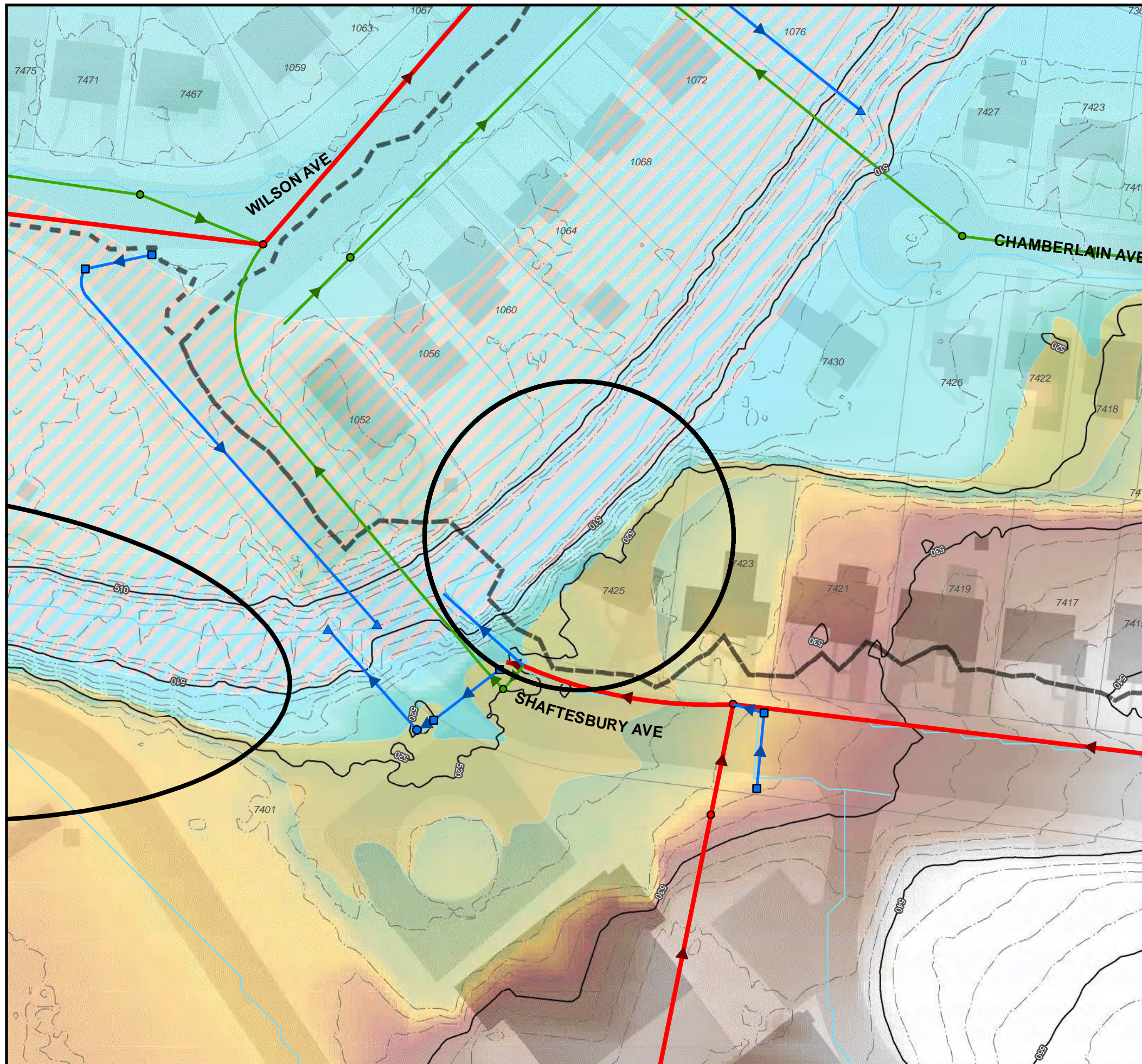


Legend

- Stormwater Problem Point
- ▭ Problem Location
- Flow Path Line
- ▭ Watershed Boundary
- ▭ Flood Hazard Zone
 - ▭ 1.0% Annual Chance Flood Hazard
 - ▭ 0.2% Annual Chance Flood Hazard
 - ▭ Regulatory Floodway
- Existing MSD System
 - ▭ Combined Inlet
 - ▭ Storm Inlet
 - ▲ Storm Intake-Outfall
 - Combined Manhole
 - Sanitary Manhole
 - Storm Manhole
 - Combined Sewer
 - Sanitary Sewer
 - Storm Sewer



River Des Peres at Mona Dr
Ranked #2 in the Erosion Category



Problem Description:

A 16-foot high bank with a combination of public and private walls is compromised and a house located only 7 feet from the top of wall is at risk. The wood tie wall is compromised, but the lower 6-feet of the bank of the Rider des Peres at this location is a WPA hand-placed stone wall, which appears stable.



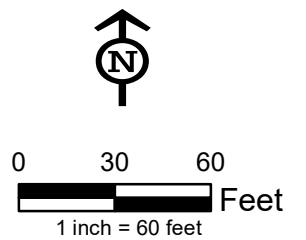
Wood tie wall and WPA block wall. 7425 Shaftesbury Ave is the house behind the wall in the photo.



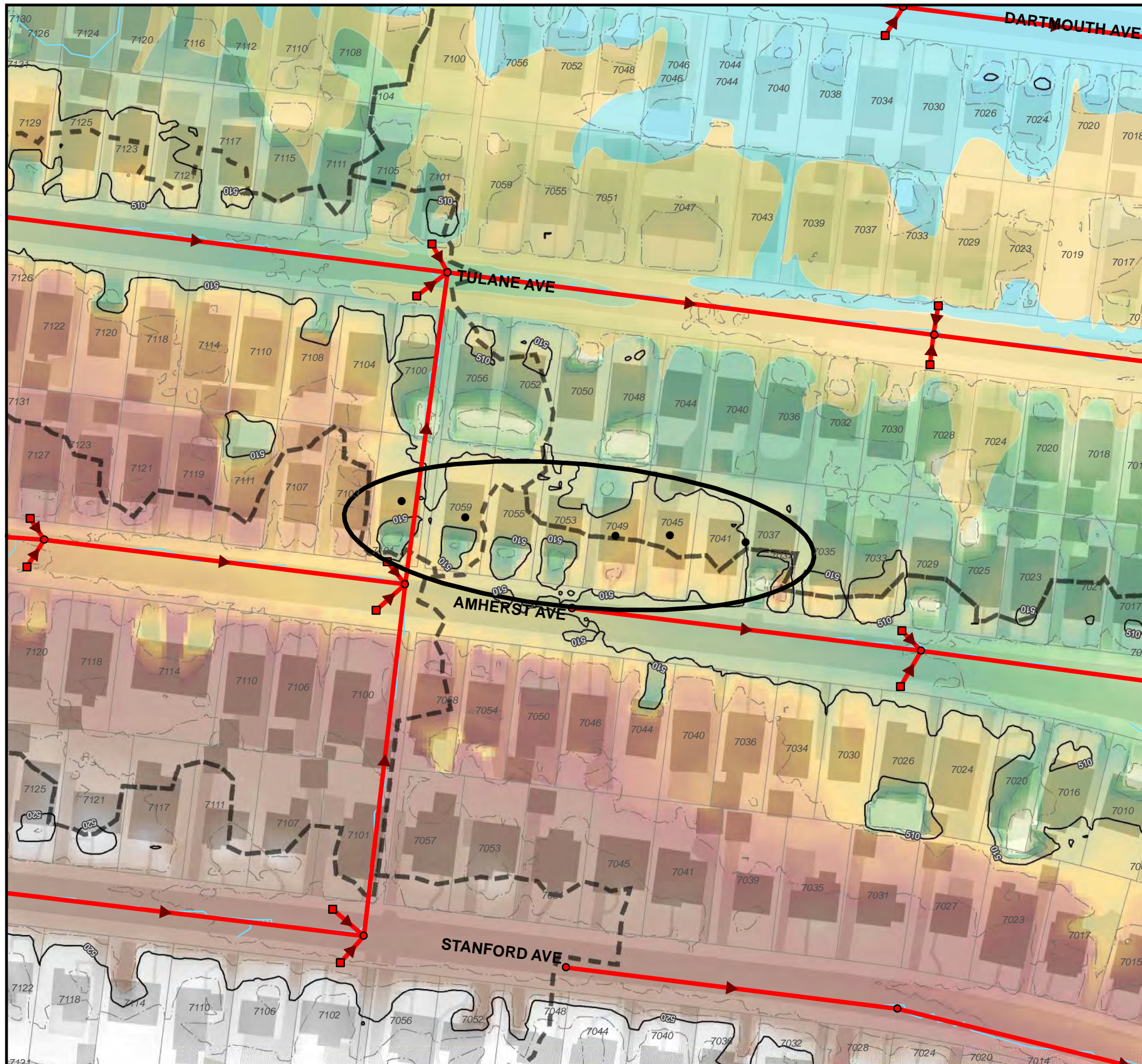
Wood tie wall and WPA block wall, looking downstream.

Legend

- Stormwater Problem Point
- ▭ Problem Location
- Flow Path Line
- ▭ Watershed Boundary
- Flood Hazard Zone**
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Regulatory Floodway
- Existing MSD System**
- Combined Inlet
- Storm Inlet
- Storm Intake-Outfall
- Combined Manhole
- Sanitary Manhole
- Storm Manhole
- Combined Sewer
- Sanitary Sewer
- Storm Sewer



River Des Peres at 7425 Shaftesbury Ave
Ranked #5 in the Erosion Category



Problem Description:

Several basement garages along Amherst Avenue flood from street drainage. Combined sewers with street inlets exist on the street. Amherst Ave is very flat, which reduces inlet capacity.

Although not all of these residents responded, it is likely that 7101, 7059, 7055, 7053, and 7037 Amherst Ave have frequent basement flooding due to water escaping the street and flowing down the driveway.

Grated drains were observed near each garage door. It is likely that each of these are connected into the nearby combined sewer. Therefore, it is possible the flooding is due to backup from the combined sewer main.

The driveway at 7101 Amherst Ave.



The driveway at 7037 Amherst Ave.

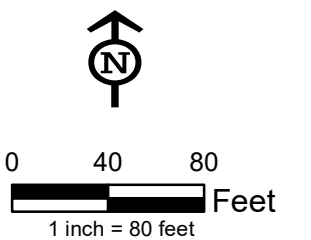


Looking east along Amherst Ave towards the inlets between 7033/7029 Amherst Ave.

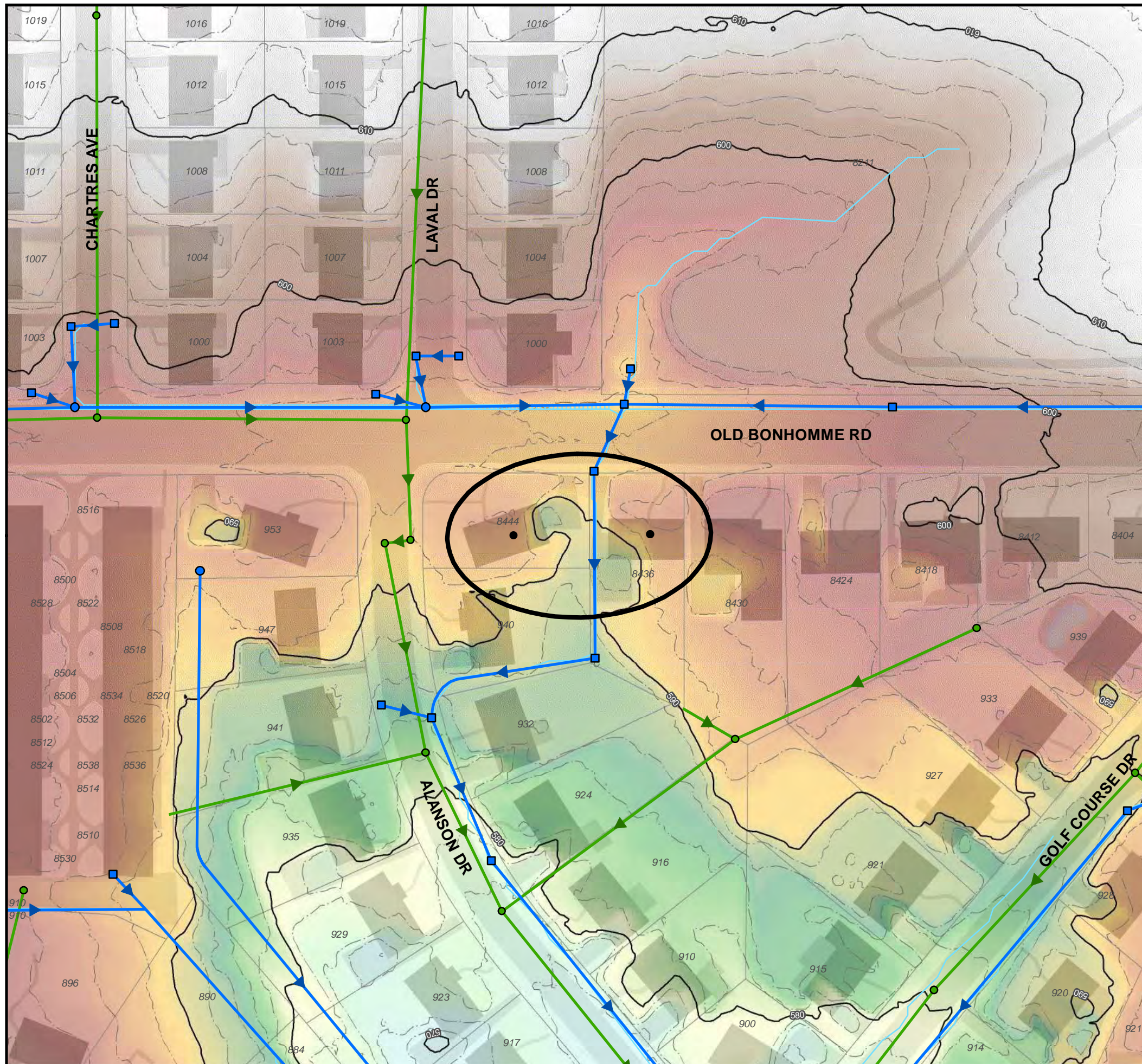


Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Amherst Ave
Ranked #1 in the Street Category



Problem Description:

Basement garages at 8444 and 8436 Old Bonhomme Rd flood frequently from water which comes down the driveway at 8436 from the street. There is a triple curb inlet in front of 8436 Old Bonhomme Rd which accepts water from about 1,200 feet of Old Bonhomme Rd. The downstream pipe is 24" in diameter.

MSD has studied the problem and identified storm sewer upsizing as a solution. It may also be beneficial to investigate other opportunities for improvement, such as: A) increase inlet capacity at the street by adding inlets east of the triple inlet, B) raise a portion of the driveway at 8436 to keep water in the street, or C) provide a conveyance path down driveway and towards the at the property corner between #8436 and 940/932 Alanson Dr.



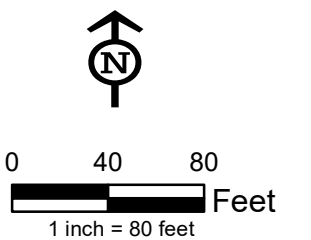
Looking south across Old Bonhomme Rd. #8436 is on the left and #8444 is on the right.



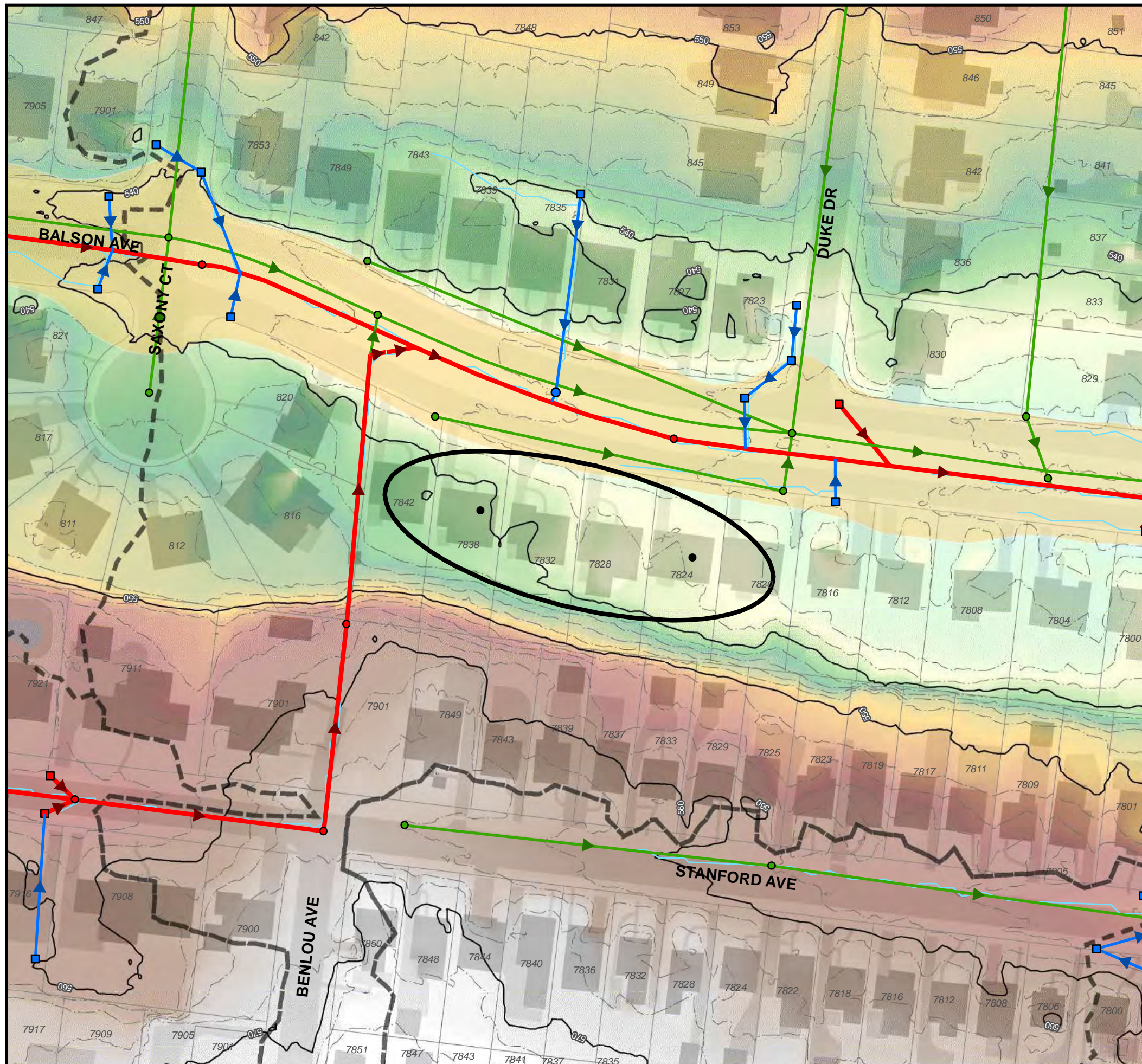
Looking at the ground in front of the driveway at 8436 Old Bonhomme Rd.

Legend

- | | |
|----------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| ▭ Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| Light Blue Box | ● Combined Manhole |
| Light Orange Box | ● Sanitary Manhole |
| Light Green Box | ● Storm Manhole |
| Light Blue Box | → Combined Sewer |
| Light Green Box | → Sanitary Sewer |
| Light Blue Box | → Storm Sewer |



Old Bonhomme Rd
Ranked #2 in the Street Category



Problem Description:

The homes on Stanford Avenue sit about 18 feet higher than the homes on Balson Ave. Between the houses is at a 3:1 slope. The flow path from the backyards to the front yards on Balson Ave is inadequate, causing frequent flooding to at least two of the homes on Balson Ave. The drainage area to the back of the homes is about 1.3 acres.

The basement stairwell at 7838 Balson Ave. Sand bags and sump pumps have been added to try to keep the basement from flooding.



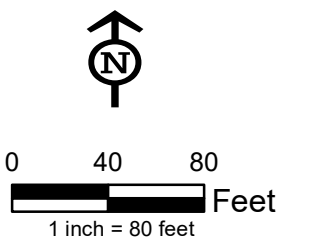
Looking west in the backyard of 7838 Balson Ave. The house is on the right.



Looking east towards the backyards of two homes; 7832 Balson Ave is the house with the fence and 7828 Balson Ave is the house with the retaining wall.

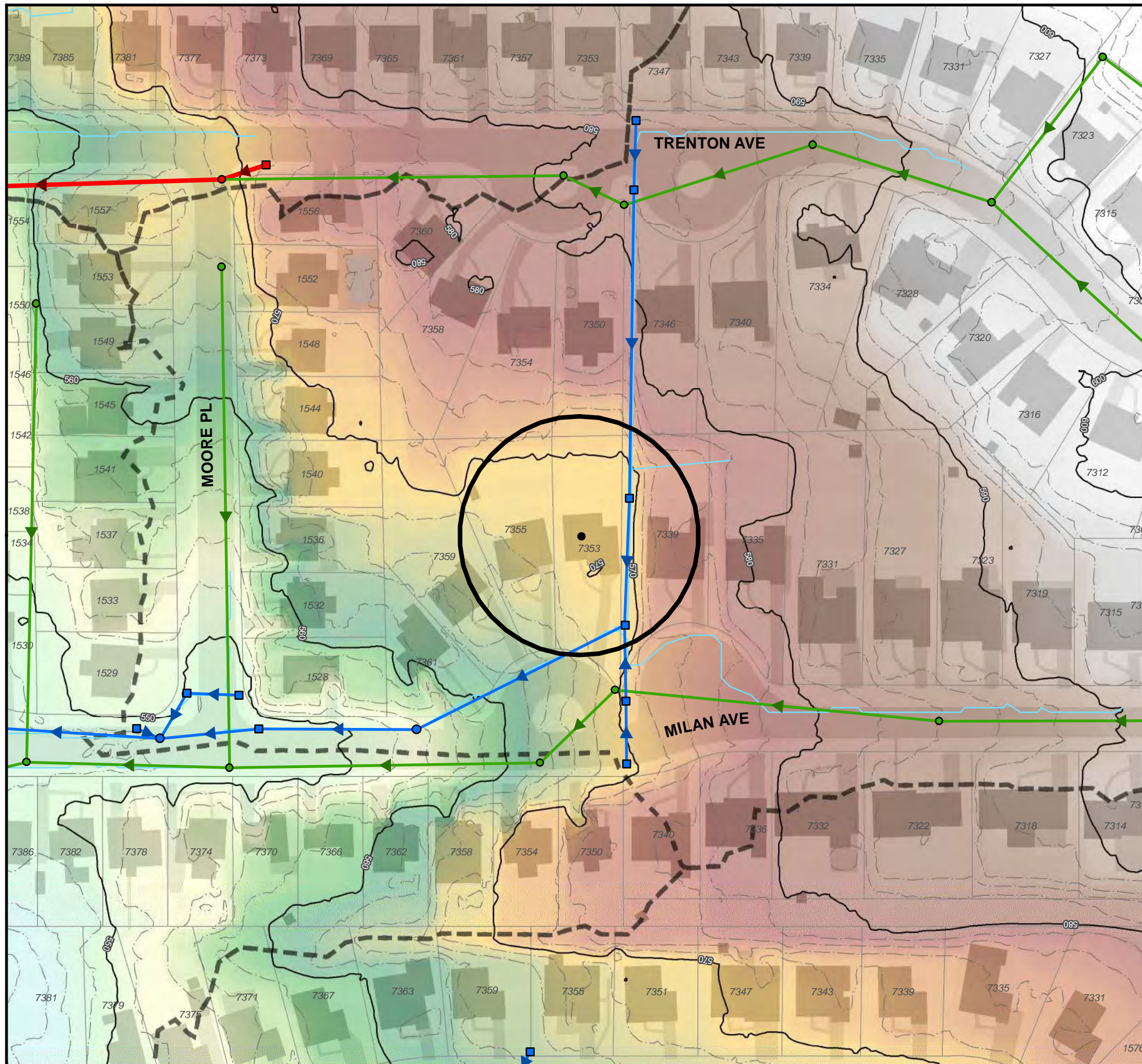
Legend

- | | |
|----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| --- Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| Light Blue Box | ● Combined Manhole |
| Yellow Box | ● Sanitary Manhole |
| Light Blue Box with Red Border | ● Storm Manhole |
| Light Blue Box with Blue Border | — Combined Sewer |
| Light Blue Box with Green Border | — Sanitary Sewer |
| Light Blue Box with Blue Border | — Storm Sewer |



Balson Ave

Ranked #1 in the Backyard Category



Problem Description:

About 3 acres of drainage flows to the backyard at 7353 Milan Ave. An area inlet just east of the backyard clogs easily and may also have inadequate capacity. Water backs up, flooding the entire yard until it can flow east. Water has nearly reached the threshold of the back door to the house. The basement has flooded from both seepage and overland flow in 2014, 2015, and 2022.

Looking south along the property line between #7353 and 7339.



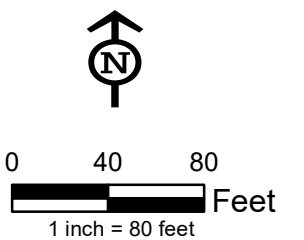
Looking towards the back patio at #7353. Ponded water has nearly reached the threshold of the door into the house (not the door to the screened in patio).

Looking north towards the area inlet in the backyards. #7353's backyard is on the left.

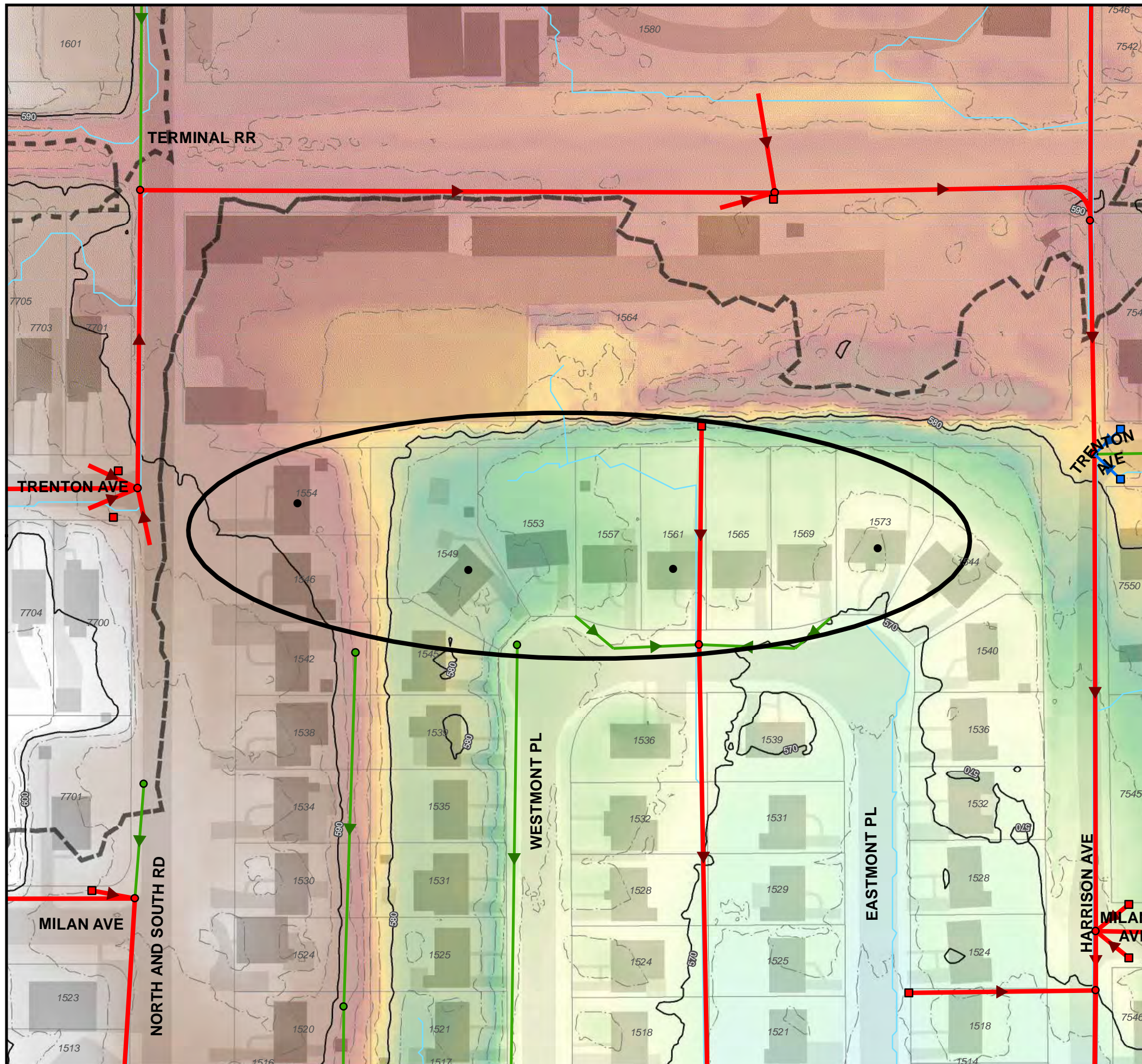


Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Milan Ave
Ranked #2 in the Backyard Category



Problem Description:

The property north of the Grenville Subdivision sits about 6-10 feet above the backyards of several houses. About 3.3 acres of drainage reaches the backyards of 1561 to 1573 Westmont Place.

The backyards are relatively flat; there is no adequate conveyance which carries water from the backyards to the street, so the yards flood frequently. Seepage occurs into the basements of some of the homes.

There is an inlet behind 1561, but only about half of a side is able to accept water due to grading issues. Note the inlet appears to be in a strip of ROW between the houses and business.

Looking northwest towards the strip of ROW between homes (on the left) and the business to the north (on the right).



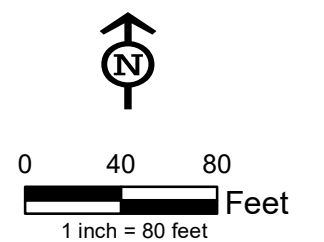
Looking towards the inlet north of #1561. Due to grading, the inlet does not appear to collect much runoff.



Looking south towards the backyard at #1561.

Legend

- Stormwater Problem Point
- Problem Location
- Flow Path Line
- ⬮ Watershed Boundary
- Flood Hazard Zone**
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Regulatory Floodway
- Existing MSD System
- Combined Inlet
- Storm Inlet
- Storm Intake-Outfall
- Combined Manhole
- Sanitary Manhole
- Storm Manhole
- Combined Sewer
- Sanitary Sewer
- Storm Sewer



Grenville Subdivision
Ranked #3 in the Backyard Category



▶ 16020 Swingley Ridge Road | Suite 205
Chesterfield, MO 63017
Main 636.519.0990 + **Fax** 713.965.0044
▶ HRGREEN.COM

December 30, 2022

Mr. Darren Dunkle, CPRP
Director of Parks, Recreation and Forestry
Acting Director of Public Works
City of University City
6801 Delmar Boulevard
University City, MO 63130

RE: Selection of Stormwater Projects for Further Study – Stormwater Master Plan
Via: FTP transfer and USPS

HR Green is completing a Stormwater Master Plan for University City to identify and prioritize stormwater problems in the community. We have nearly completed **Phase I: Data Collection and Analysis to Identify Stormwater Problems**. We have collected data from many sources, including residents, the Metropolitan St. Louis Sewer District (MSD), the Stormwater Task Force Report, the Army Corps of Engineers, and site visits. We have analyzed the data to determine the types of stormwater problems in the City, as well as the locations with the highest need for mitigation.

We are transitioning to **Phase II: Conceptual Development and Prioritization of Stormwater Projects**. This is a natural checkpoint to seek feedback to ensure the planning process is appropriate. We are contracted to study ten stormwater problems in detail to determine a conceptual solution, cost, and benefit assessment.

As you know, there are many more than ten stormwater problems in the City. We have identified nineteen stormwater problems which stand out as higher in severity, frequency, or pervasiveness. See attached table for the list of nineteen problems. Also attached are exhibits for each problem which shows the location, a brief description of the problem, and photos.

Of the nineteen stormwater problems, we have highlighted ten that appear to be the most significant problems. However, the differences between all nineteen problems are subtle, so your input is important.

Please let us know when you are ready to discuss and we would be delighted to meet in person at your convenience.

Sincerely,

HR GREEN, INC

A handwritten signature in black ink that reads 'Garry Aronberg'.

Garry Aronberg, PE, CFM
Senior Engineer

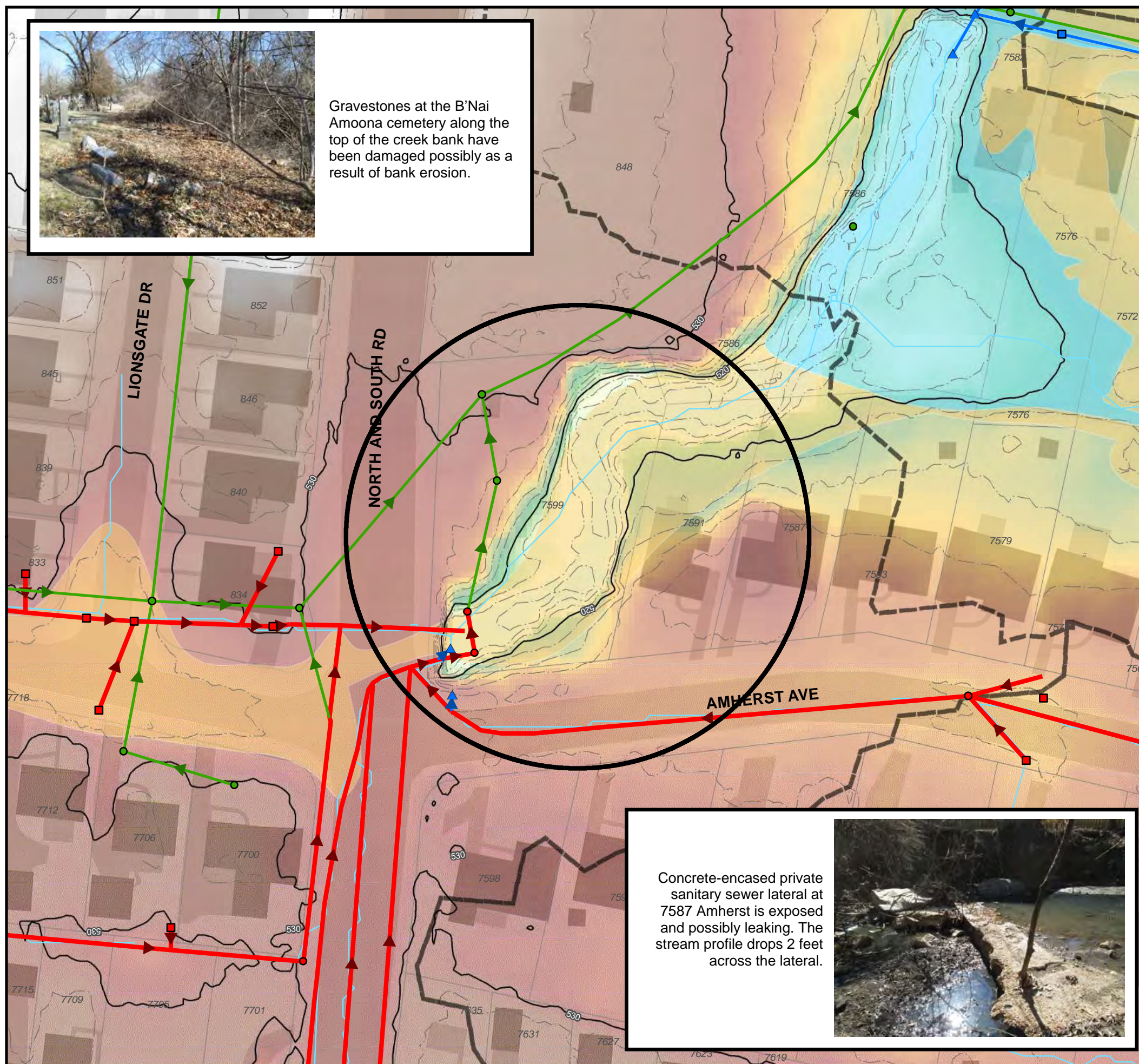
University City Stormwater Master Plan
Suggested Problems for Detailed Study

12/22/2022

Page Number	Name	Category Rank	Description	Recommended	Ward
Category: Erosion					
1	Tributary to River Des Peres Between Amherst Ave and Blackberry Ave	1	Erosion of a tributary to the River Des Peres threatens a house. The bank is 13' high and 20' from the house.	*	2
2	River Des Peres at Mona Dr	2	Erosion of the River Des Peres threatens the street (Mona Dr). The bank is 16' high and 5' from the curb.	*	2
3	River Des Peres at Wild Plum Ln	3	Creek erosion is threatening a parking lot and apartment buildings. The bank is 18' high.	*	2
4	River Des Peres at 7401 Balson Ave (University City High School)	4	Creek erosion is threatening the University City High school track and field.		2
5	River Des Peres at 7425 Shaftesbury Ave	5	A tall stone and wood tie wall near a residential structure is at risk of collapse.		2
6	Tributary to River Des Peres at Olive Blvd	6	A concrete lined channel has been undermined and is threatening a parking lot and MSD infrastructure.		2
Category: Street					
7	Amherst Ave	1	Several basement garages along Amherst Ave flood from street drainage. Combined sewer inlets exist on the street.	*	2
8	Old Bonhomme Rd	2	Flow from Ruth Park and Old Bonhomme Rd flows down driveways and floods two basement garages at houses on Old Bonhomme Rd.	*	1
9	Midland Blvd and Balson Ave	3	Inlets backup and flood the commercial building. Owner marked frequency as 'Often'.	*	2
10	W Point Ct	4	Constant ponding in street at low point. Three residents have complained.		1
Category: Backyard					
11	Balson Ave	1	All flooding types marked - yard, street, nonhab, hab, and first floor. Drainage area is 1.3 acres.	*	2
12	Milan Ave	2	About 3 acres of drainage through the yard at 7353 Milan Ave. There is already public storm sewer at 7353; may need to be upsized or make inlet more efficient.	*	3
13	Grenville Subdivision	3	Commercial property to north releases drainage to backyards of homes that are close together. There is no overland flow path to the front yard.	*	3
14	Wellington Ave	4	Four houses on Wellington Ave receive runoff from behind and there is no overland path to the street. About 2 acres of drainage comes to these backyards.		3
15	Clayton Gardens Subdivision	5	About 2.3 ac of drainage flows to the backyards of 3-4 houses, causing flooding to yards and basements. There is no flow path out to street. Note there are also basement garages.		1
16	Forsyth Place Subdivision	6	Homes on Forsyth Blvd drain to backyards of Lindell Blvd. Houses are close together so there is no easy path for runoff past Lindell Blvd houses. Overall DA is about 2.3 acres.		1
17	Cornell Ct	7	1.8 ac of drainage reaches backyard with no outlet point. Basement and yard flooding at 8128 Cornell Ct.		1
18	Northmoor Park Subdivision	8	Yard and basement flooding from drainage area behind houses reaching backyards. 1 to 1.5 acres reaching backyards in a couple of places.		1
Category: Common Problems throughout City					
19	River Des Peres Flooding		Estimate number of homes in 10-yr, 50-yr, 100-yr floodplain. Estimate <u>typical</u> buyout cost. Develop <u>typical</u> B:C ratio ... maybe use Corps report.	*	2,3
20	Basement backups		A common problem that will be addressed in report, but will not be a listed project. Estimate number of basement backup problems and determine a " <u>typical</u> " B:C ratio		1,2,3



Gravestones at the B'Nai Amoona cemetery along the top of the creek bank have been damaged possibly as a result of bank erosion.



Concrete-encased private sanitary sewer lateral at 7587 Amherst is exposed and possibly leaking. The stream profile drops 2 feet across the lateral.

Problem Description:

An un-named tributary to the River des Peres flows from a closed storm sewer outfall at Amherst and North & South. A 500-foot reach of the creekbank is over-steepened and actively eroding. MSD and the City initially identified this bank erosion in 1988, and MSD confirmed the issue and developed a conceptual solution and cost estimate in 2007.

The 13-foot high eroding bank at 7591 Amherst is 20 feet from the home (measured from the toe of bank), and has not advanced significantly since 2006, but is considered severe by MSD's bank erosion rating (V/H=1.46). The July 26, 2022 flood was above the basement floor of 7591 Amherst and collapsed their fence.



The 13-foot high eroding bank at 7591 Amherst is 9 feet from the home (measured from the top of bank).

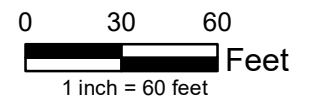


Creek erosion along 7587 Amherst is undermining their fence. The erosion rating at 7587 Amherst is considered a threat to the home (V/H=0.25).



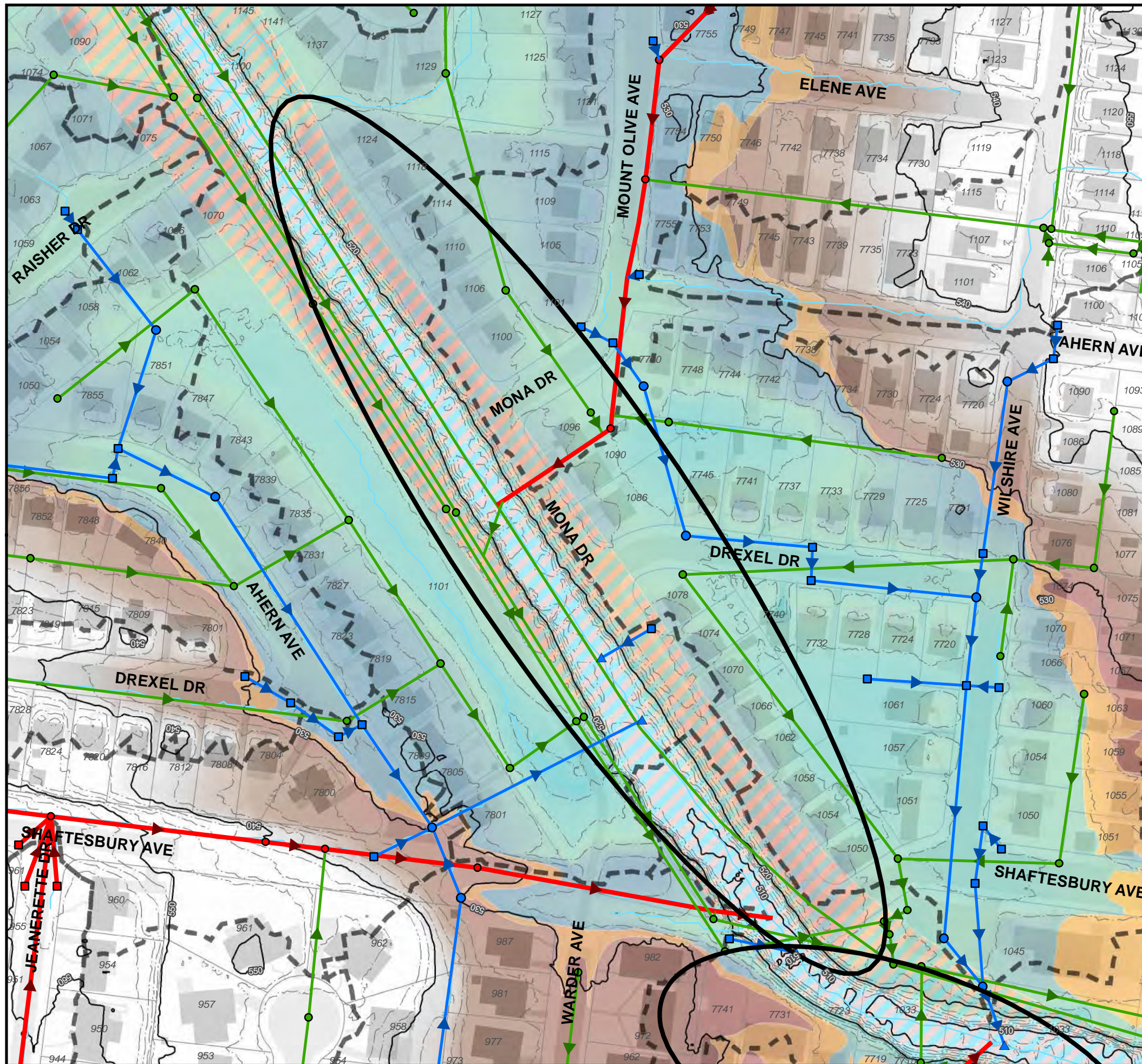
Legend

- | | |
|-----------------------------------|----------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| ⊞ Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



**Tributary to River Des Peres
Between Amherst Ave and
Blackberry Ave**

Ranked #1 in the Erosion Category



Problem Description:

A 700-foot reach of the River des Peres is over-steepened and actively eroding. The top of bank is 16-feet high and has eroded to within 5 feet of the curb line of Mona Drive. The north end of Mona Drive is the only road access/egress for six homes. Using MSD's erosion rating, the street is more severely threatened (V/H=0.44) than the homes (V/H=0.18). MSD installed riprap along portions of Mona Drive in approximately 2017, but most of this riprap has since eroded and slid off the bank. An additional 600-foot reach of bank along the downstream end of Mona Drive is somewhat more stable. The homes along Mona Drive flooded on July 26, 2022.

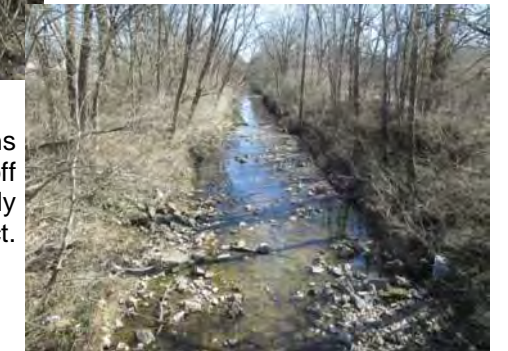
Over-steepened channel banks threaten Mona Drive which provides the only access to 6 houses.



Over-steepened channel banks, and the remains of riprap placed by MSD that has since eroded and slid off the bank.

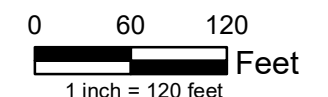


Channel bottom contains riprap, some of which slid off the bank from a previously installed MSD project.

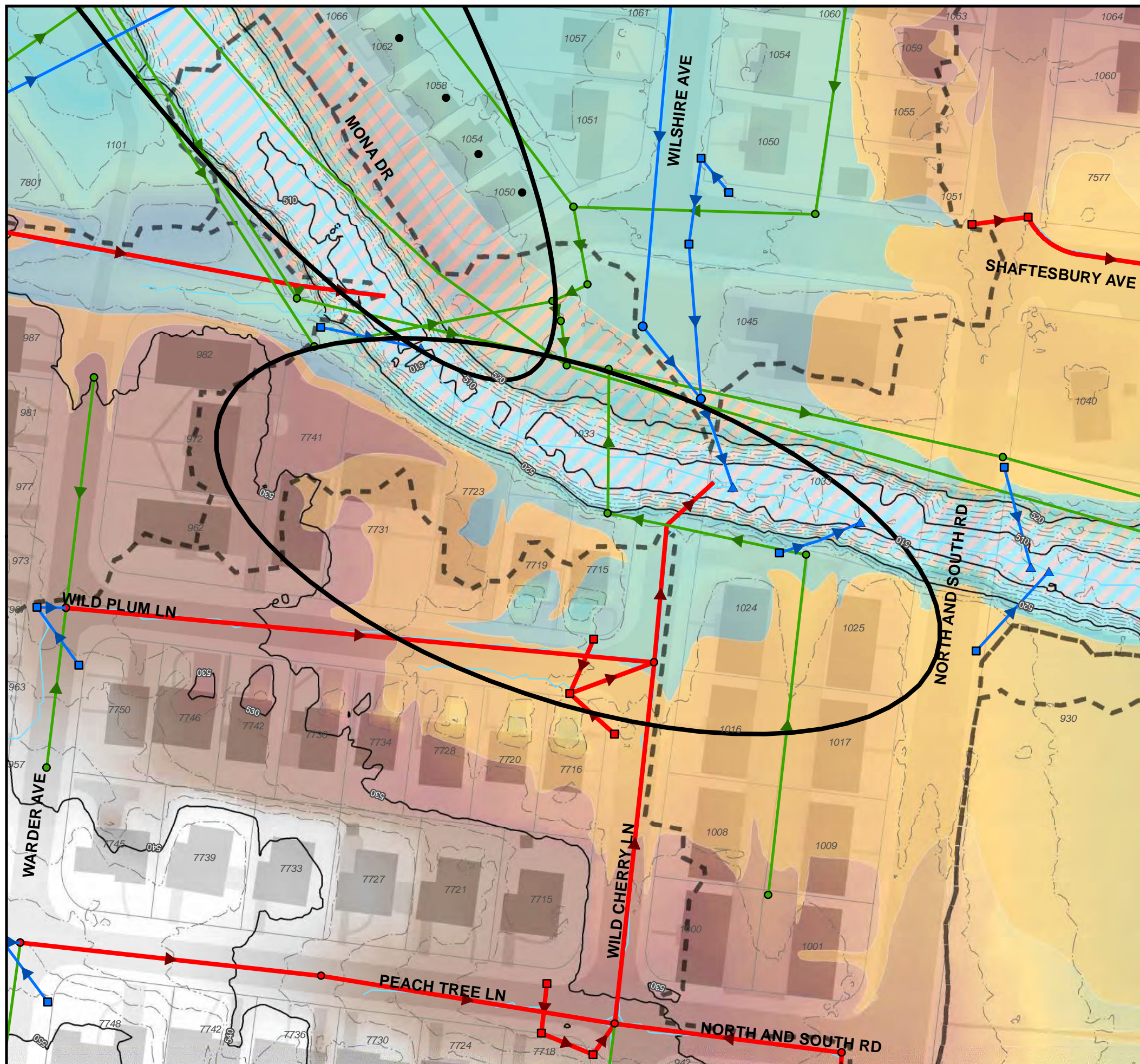


Legend

- Stormwater Problem Point
- ▭ Problem Location
- Flow Path Line
- - - Watershed Boundary
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- ▨ Regulatory Floodway
- Existing MSD System
- Combined Inlet
- Storm Inlet
- ▲ Storm Intake-Outfall
- Combined Manhole
- Sanitary Manhole
- Storm Manhole
- Combined Sewer
- Sanitary Sewer
- Storm Sewer



River Des Peres at Mona Dr
Ranked #2 in the Erosion Category



Problem Description:

A 500-foot reach of the River des Peres is actively eroding. The top of bank is 18-feet high is threatening residential buildings and parking lots located along Wild Cherry and Wild Plum Lanes. Using MSD's erosion rating, the parking lot is more severely threatened (V/H=0.56) than the apartment buildings (V/H=0.2 to 0.4).

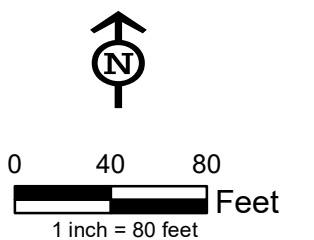
An approximately 175-foot reach of the right-descending river bank is lined with a concrete slab, but the integrity of the concrete is compromised by a 3-foot deep scour pool along the toe of bank. Failure of slab will likely cause failure in the parking lot.



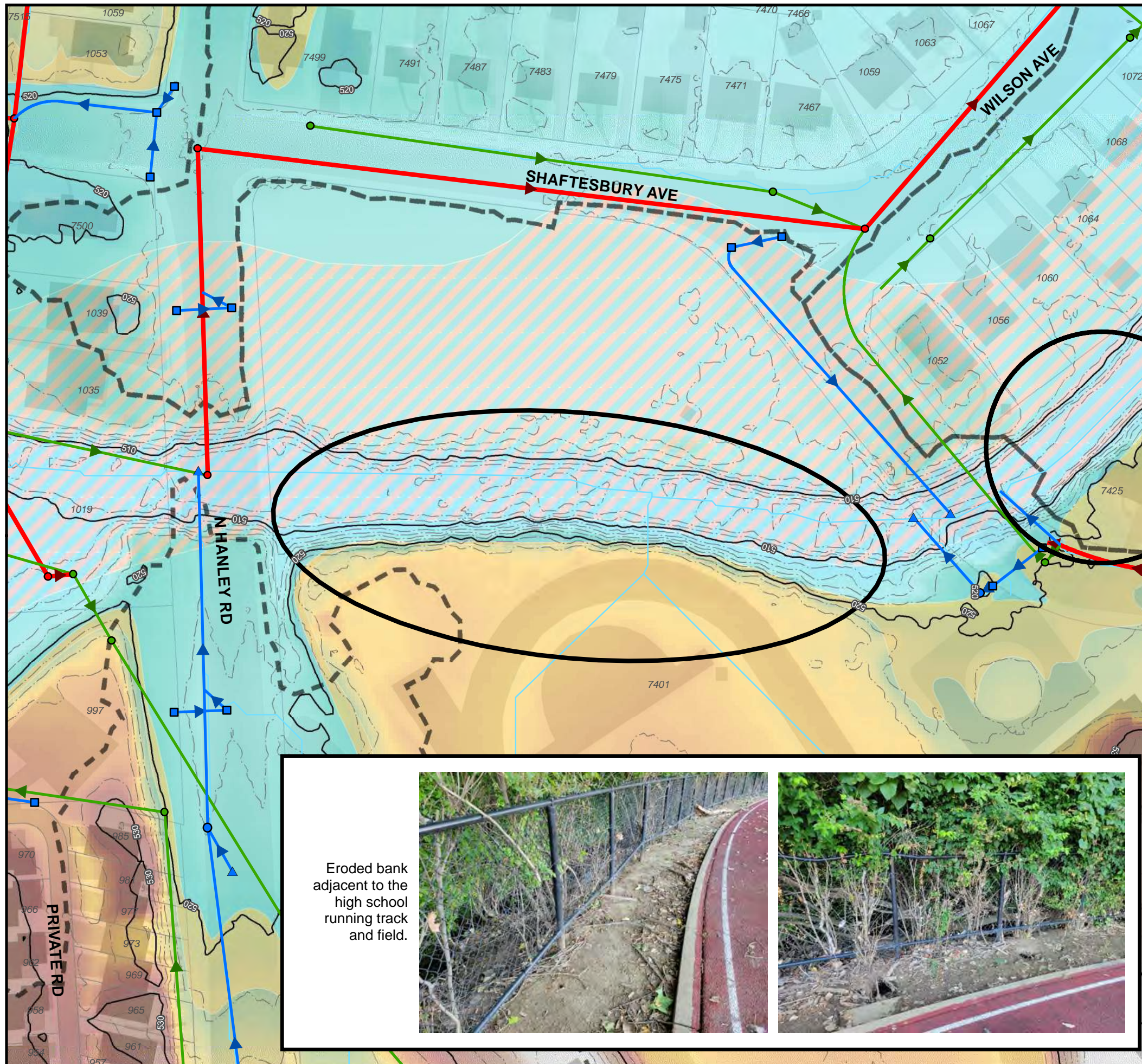
MSD infrastructure along the right-descending river bank is threatened by bank erosion including a combined sewer manhole, a combined sewer overflow (CSO) structure, and a storm sewer outflow structure.

Legend

- Stormwater Problem Point
- ▭ Problem Location
- Flow Path Line
- ▭ Watershed Boundary
- Flood Hazard Zone**
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Regulatory Floodway
- Existing MSD System
- Combined Inlet
- Storm Inlet
- Storm Intake-Outfall
- Combined Manhole
- Sanitary Manhole
- Storm Manhole
- Combined Sewer
- Sanitary Sewer
- Storm Sewer



River Des Peres at Wild Plum Ln
Ranked #3 in the Erosion Category



Problem Description:

Erosion on the South bank of the River des Peres has destabilized the bank leading up to the University City High School track and field. These features are located immediately adjacent to a 3.5-foot high fence along the top of the eroding bank, and are at risk.

The foundation of a 6-foot high mid-slope fence is eroded and the fence is collapsing. It appears that riprap was added from the top of slope to address an area of gulley erosion, but this riprap is sliding down the bank. The weight of this riprap is contributing to the fence failure.



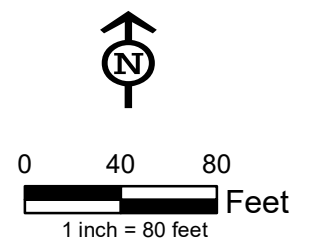
On the right descending bank are the eroding bank, collapsing fence, and sliding riprap.



On the right descending bank are the eroding bank, collapsing fence, and sliding riprap.

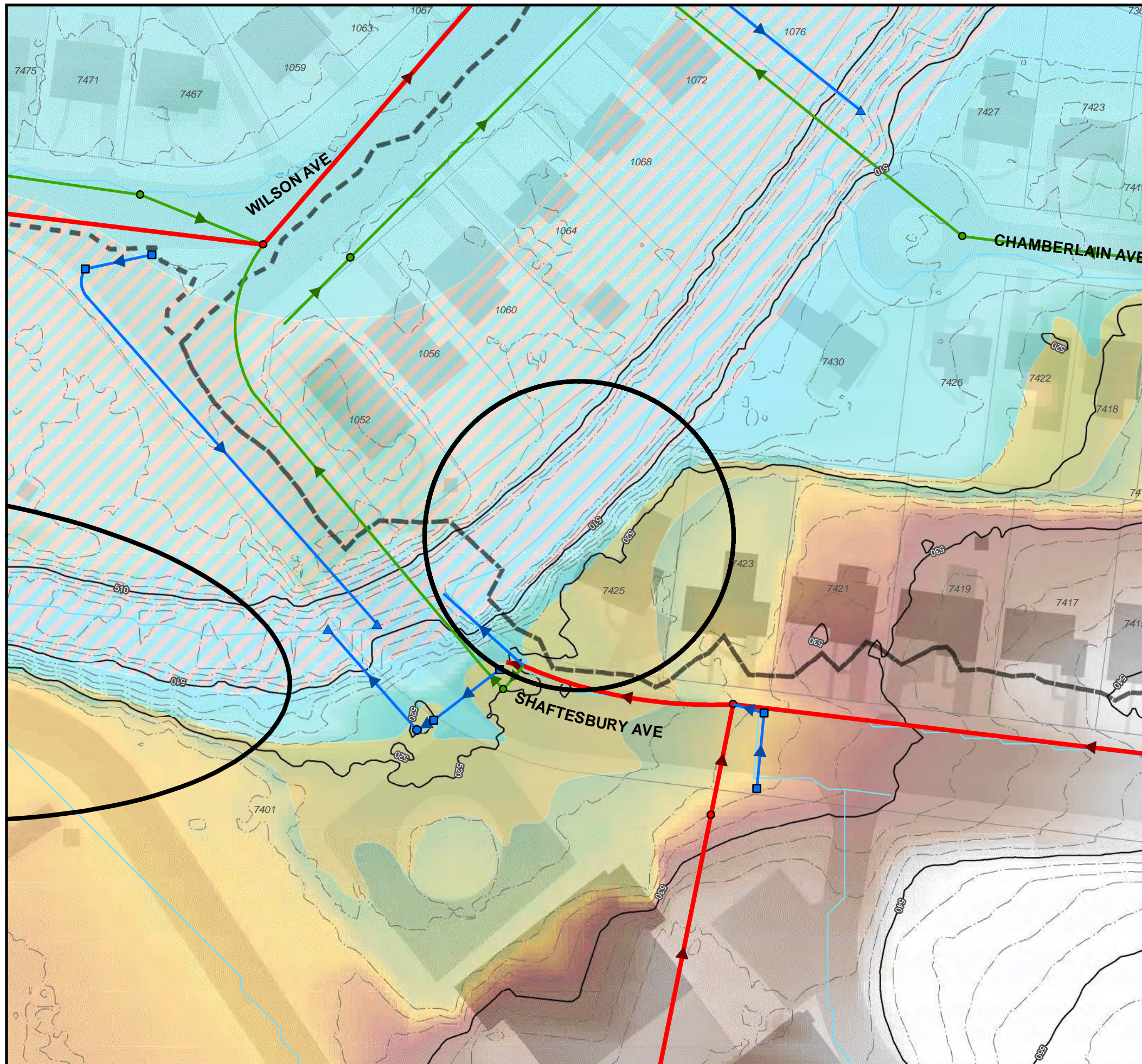
Legend

- Stormwater Problem Point
- Problem Location
- Flow Path Line
- Watershed Boundary
- Flood Hazard Zone**
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Regulatory Floodway
- Existing MSD System**
- Combined Inlet
- Storm Inlet
- Storm Intake-Outfall
- Combined Manhole
- Sanitary Manhole
- Storm Manhole
- Combined Sewer
- Sanitary Sewer
- Storm Sewer



River Des Peres at 7401 Balson Ave (University City High School)

Ranked #4 in the Erosion Category



Problem Description:

A 16-foot high bank with a combination of public and private walls is compromised and a house located only 7 feet from the top of wall is at risk. The wood tie wall is compromised, but the lower 6-feet of the bank of the Rider des Peres at this location is a WPA hand-placed stone wall, which appears stable.



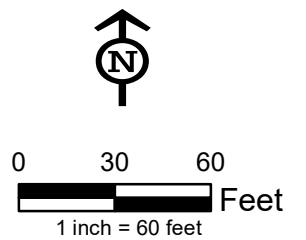
Wood tie wall and WPA block wall. 7425 Shaftesbury Ave is the house behind the wall in the photo.



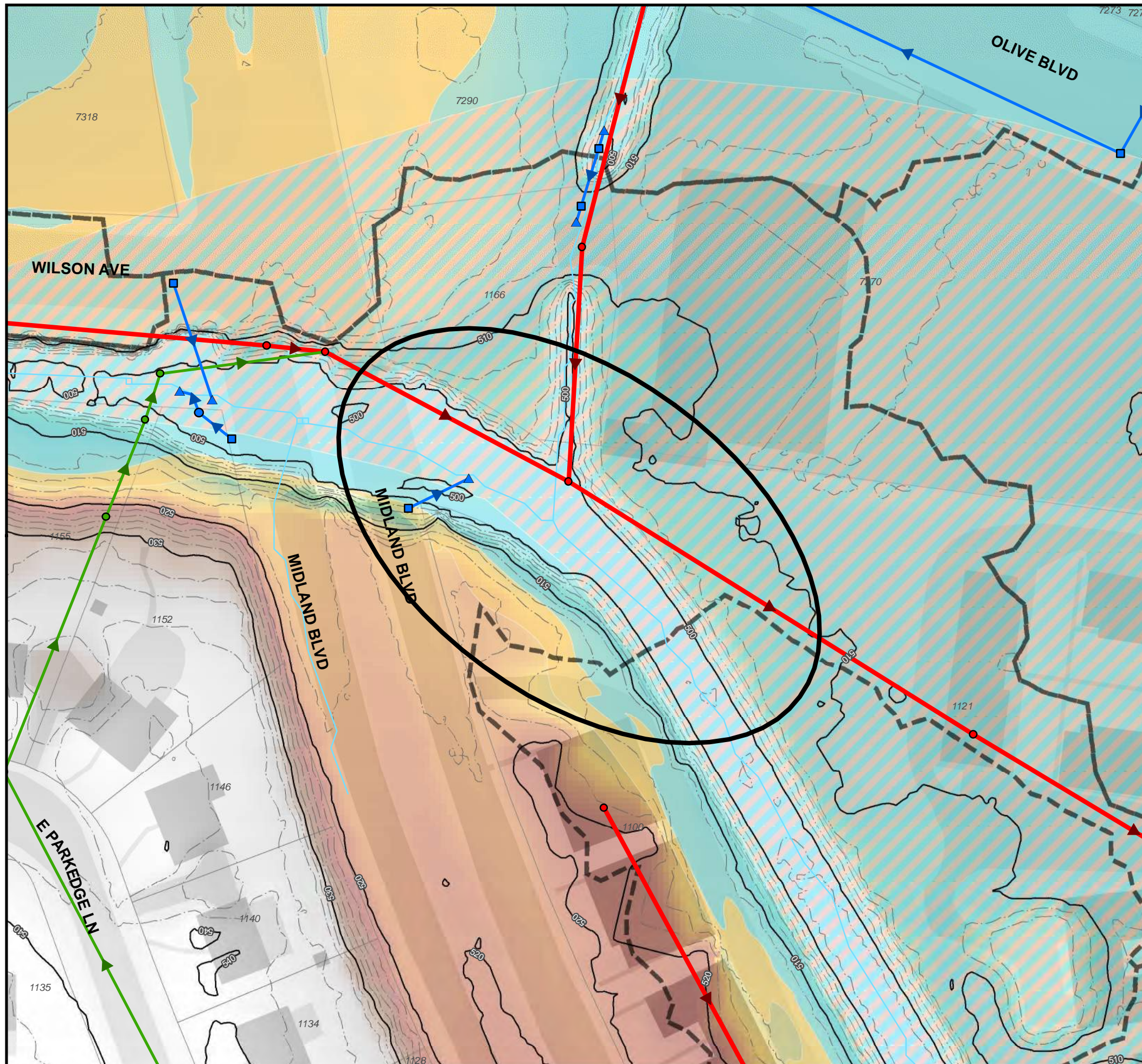
Wood tie wall and WPA block wall, looking downstream.

Legend

- | | |
|---------------------------------|----------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| --- Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | ● Combined Manhole |
| 1.0% Annual Chance Flood Hazard | ● Sanitary Manhole |
| 0.2% Annual Chance Flood Hazard | ● Storm Manhole |
| Regulatory Floodway | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



River Des Peres at 7425 Shaftesbury Ave
Ranked #5 in the Erosion Category



Problem Description:
Concrete slabs lining a tributary to the River des Peres are undermined and have failed, looking upstream. The foundation of the concrete-curb adjacent U-Haul parking lot is exposed on the east side of the channel. At-risk infrastructure includes the commercial parking lot, an inlet manhole, and a pipe outfall.


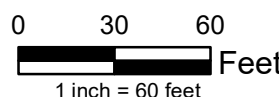


Undermined concrete slabs with adjacent at-risk infrastructure, looking upstream. The concrete box culvert under Olive Boulevard (background) appears stable.

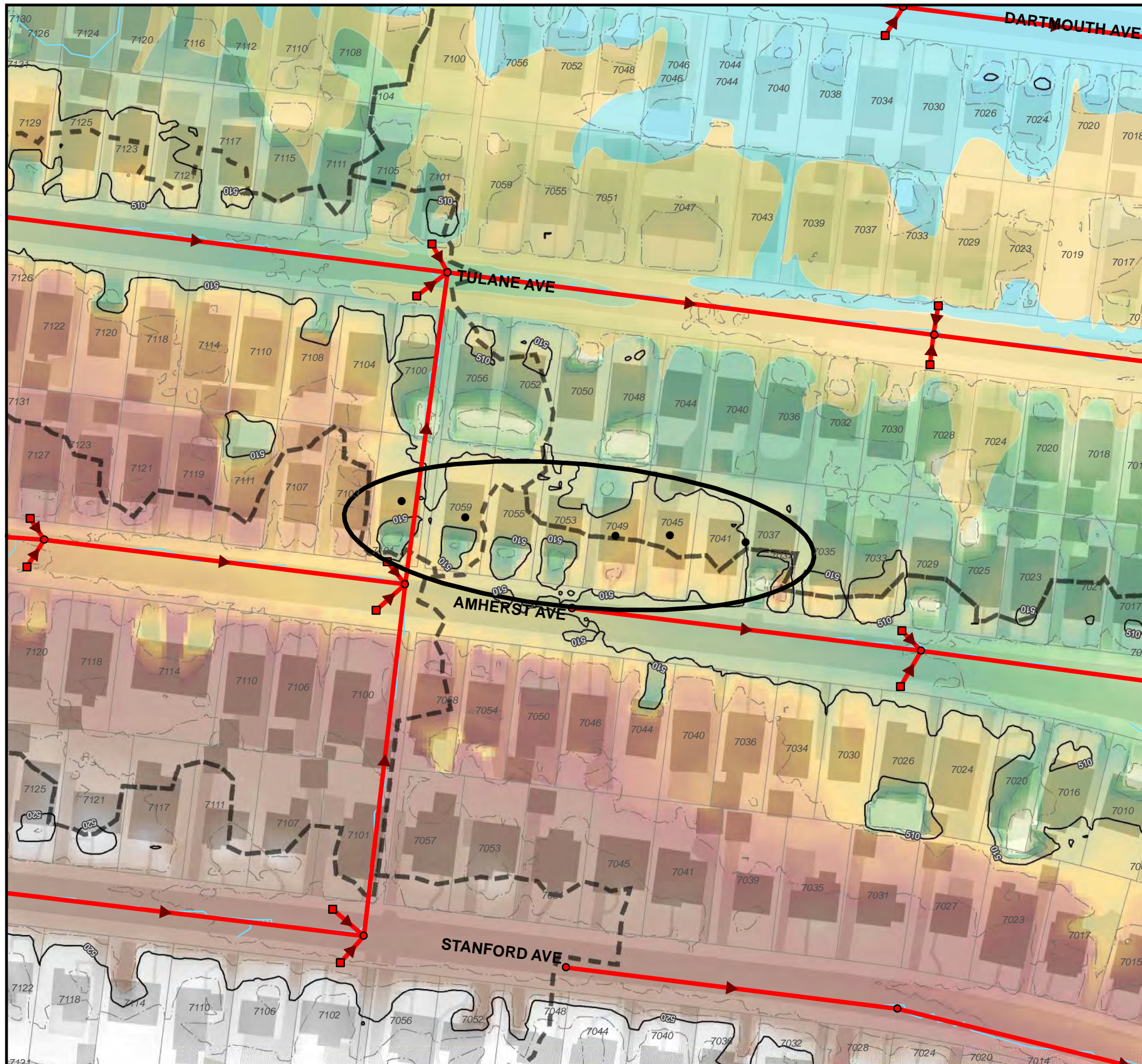
Exposed foundation of the adjacent parking lot.

Legend

● Stormwater Problem Point	Existing MSD System
▭ Problem Location	■ Combined Inlet
— Flow Path Line	■ Storm Inlet
▭ Watershed Boundary	▲ Storm Intake-Outfall
Flood Hazard Zone	● Combined Manhole
Light Blue 1.0% Annual Chance Flood Hazard	● Sanitary Manhole
Yellow 0.2% Annual Chance Flood Hazard	● Storm Manhole
Pink Regulatory Floodway	— Combined Sewer
	— Sanitary Sewer
	— Storm Sewer



 1 inch = 60 feet

Tributary to River Des Peres at Olive Blvd
Ranked #6 in the Erosion Category



Problem Description:
 Several basement garages along Amherst Avenue flood from street drainage. Combined sewers with street inlets exist on the street. Amherst Ave is very flat, which reduces inlet capacity.

Although not all of these residents responded, it is likely that 7101, 7059, 7055, 7053, and 7037 Amherst Ave have frequent basement flooding due to water escaping the street and flowing down the driveway.

Grated drains were observed near each garage door. It is likely that each of these are connected into the nearby combined sewer. Therefore, it is possible the flooding is due to backup from the combined sewer main.

The driveway at 7101 Amherst Ave.



The driveway at 7037 Amherst Ave.



Looking east along Amherst Ave towards the inlets between 7033/7029 Amherst Ave.

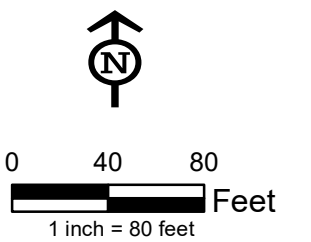


Legend

- Stormwater Problem Point
- Problem Location
- Flow Path Line
- Watershed Boundary
- Combined Inlet
- Storm Inlet
- ▲ Storm Intake-Outfall
- Combined Manhole
- Sanitary Manhole
- Storm Manhole
- Combined Sewer
- Sanitary Sewer
- Storm Sewer

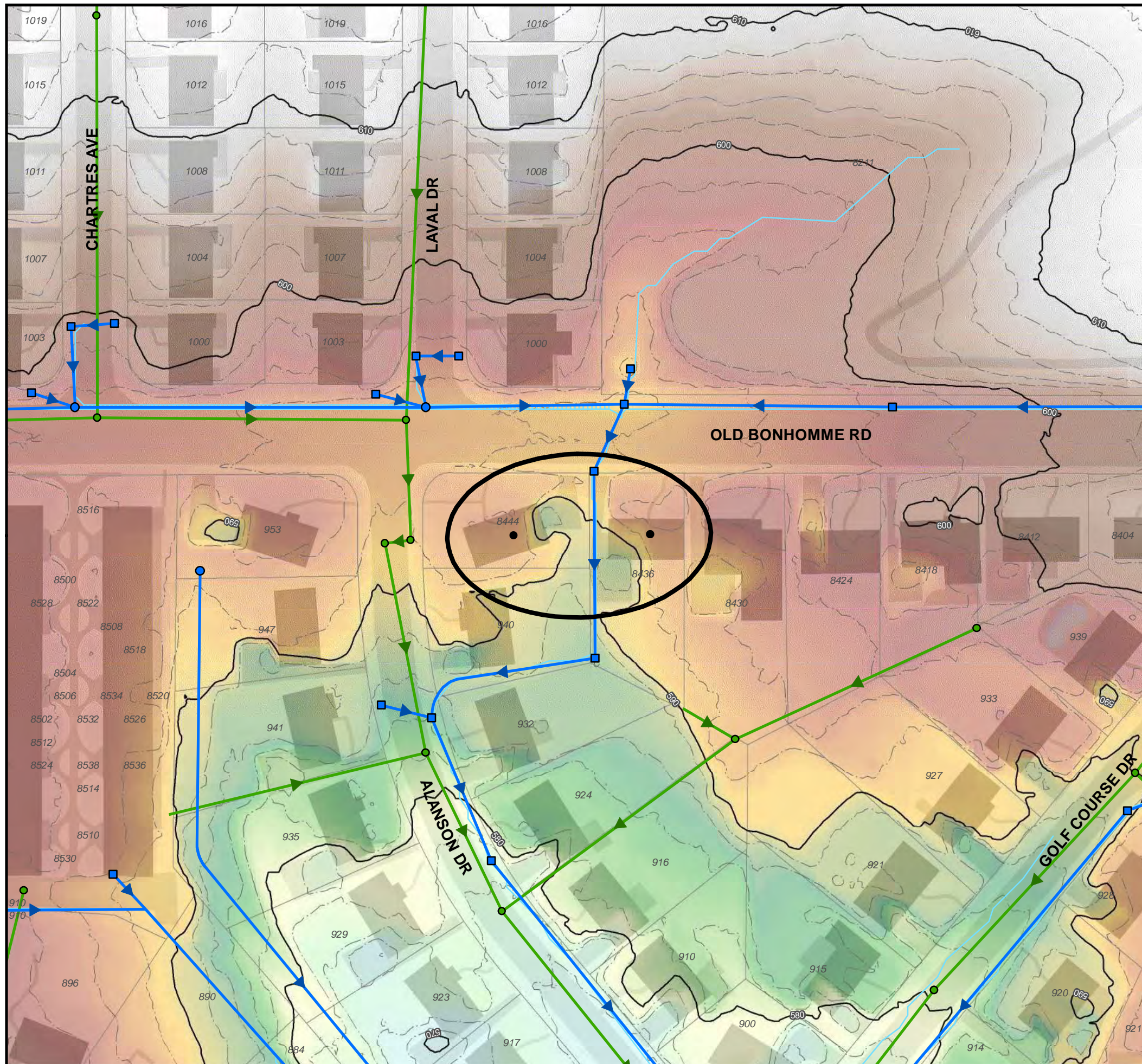
Flood Hazard Zone

- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Regulatory Floodway



Amherst Ave

Ranked #1 in the Street Category



Problem Description:

Basement garages at 8444 and 8436 Old Bonhomme Rd flood frequently from water which comes down the driveway at 8436 from the street. There is a triple curb inlet in front of 8436 Old Bonhomme Rd which accepts water from about 1,200 feet of Old Bonhomme Rd. The downstream pipe is 24" in diameter.

MSD has studied the problem and identified storm sewer upsizing as a solution. It may also be beneficial to investigate other opportunities for improvement, such as: A) increase inlet capacity at the street by adding inlets east of the triple inlet, B) raise a portion of the driveway at 8436 to keep water in the street, or C) provide a conveyance path down driveway and towards the at the property corner between #8436 and 940/932 Alanson Dr.



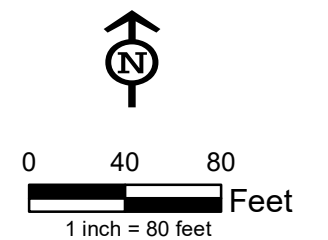
Looking south across Old Bonhomme Rd. #8436 is on the left and #8444 is on the right.



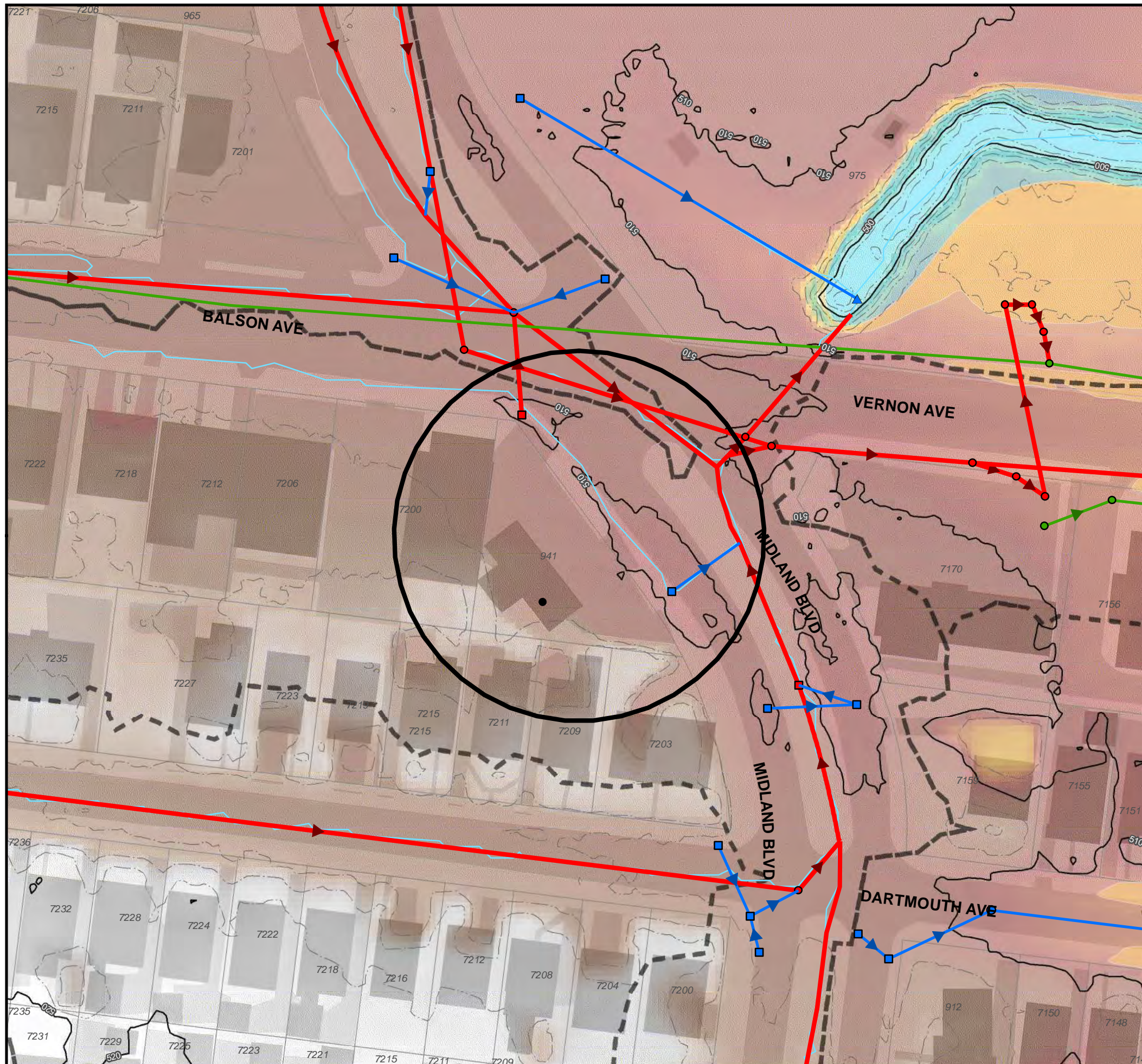
Looking at the ground in front of the driveway at 8436 Old Bonhomme Rd.

Legend

- | | |
|----------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| ▭ Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| Light Blue Box | ● Combined Manhole |
| Light Orange Box | ● Sanitary Manhole |
| Light Green Box | ● Storm Manhole |
| Light Blue Box | ▶ Combined Sewer |
| Light Green Box | ▶ Sanitary Sewer |
| Light Blue Box | ▶ Storm Sewer |



Old Bonhomme Rd
Ranked #2 in the Street Category



Problem Description:
 The commercial building at 941 Midland Blvd has been flooded by ponded water in the street. The owner indicated that when this happens, the inlets won't drain. Investigation is necessary to determine if the flooding issue is due to inlet capacity, pipe capacity, or high tailwater from the River Des Peres, or a combination of these issues.



The parking lot in front of 941 Midland Blvd.



Looking north towards the inlet at the southwest corner of Midland Blvd and Balson Ave.



Looking southeast along Midland Blvd at the inlet east of 941 Midland Blvd.

Legend

● Stormwater Problem Point	Existing MSD System
□ Problem Location	■ Combined Inlet
— Flow Path Line	■ Storm Inlet
- - - Watershed Boundary	▲ Storm Intake-Outfall
Flood Hazard Zone	
Light Blue Box	● Combined Manhole
Yellow Box	● Sanitary Manhole
Blue Box	● Storm Manhole
Red Box	→ Combined Sewer
Pink/Blue Hatched Box	→ Sanitary Sewer
	→ Storm Sewer

0 30 60 Feet
1 inch = 60 feet

Midland Blvd and Balson Ave
Ranked #3 in the Street Category



Problem Description:

Residents say that the low point on W Point Ct floods constantly. The street does not have a distinct crown. Asphalt patching has made the street uneven in some places. There are 4 inlets near the low point, but non appear very efficient. There is not a well-defined sag and inlets appear to clog easily with leaves.



Looking towards the grated curb inlet with side intake between #416 and 414. The side intake is rather narrow and the grate is clogged with leaves.



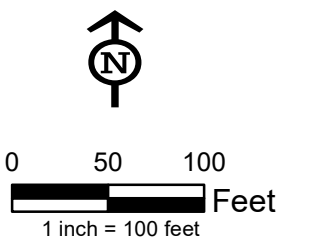
Looking south towards the inlets in front of #414 and 415. Both of these inlets are grated with a side intake.



Looking north towards the northern two inlets on W Point Ct. Both are grated inlets with side intakes.

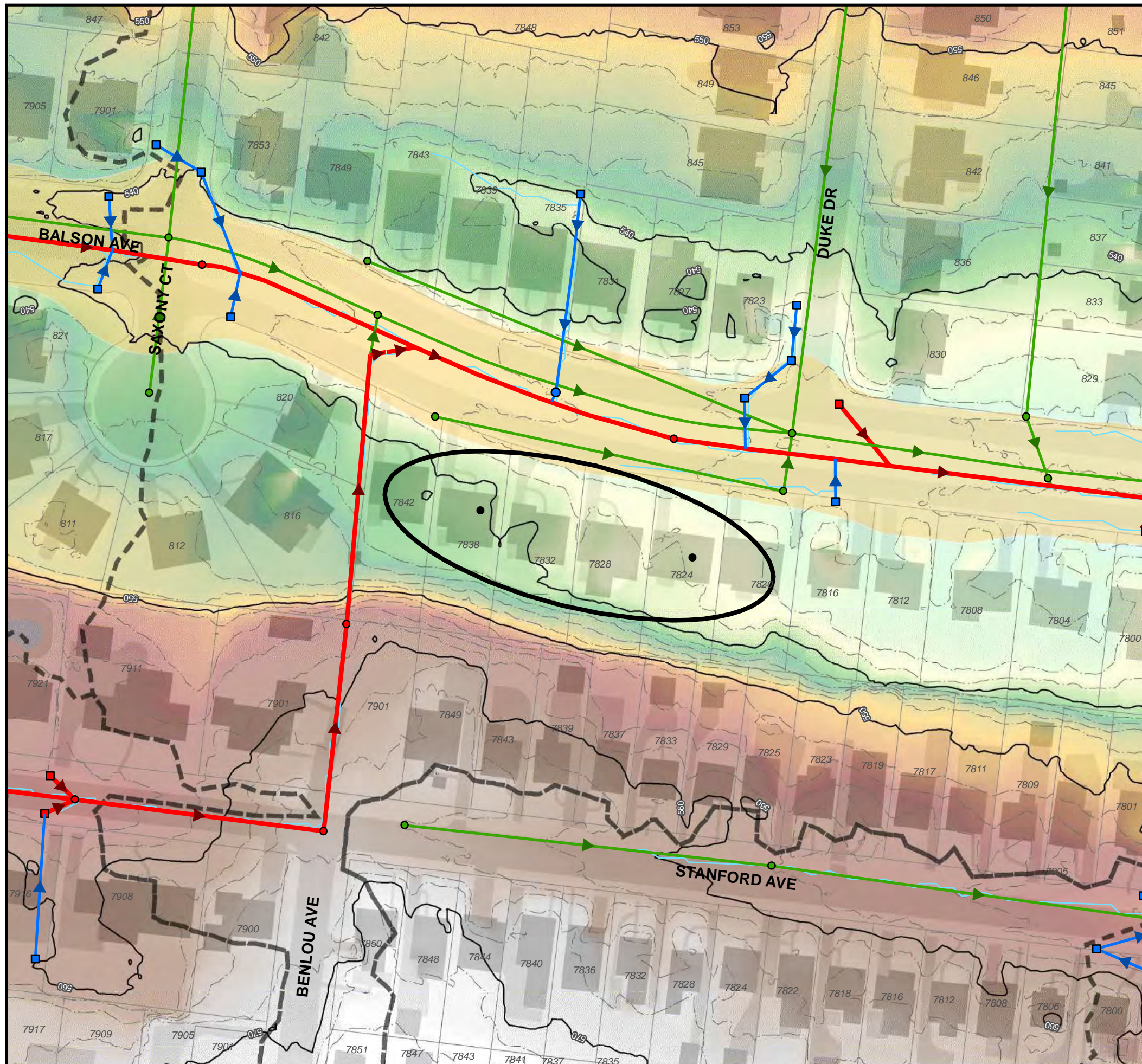
Legend

- Stormwater Problem Point
 - Problem Location
 - Flow Path Line
 - Watershed Boundary
 - Combined Inlet
 - Storm Inlet
 - ▲ Storm Intake-Outfall
 - Combined Manhole
 - Sanitary Manhole
 - Storm Manhole
 - Combined Sewer
 - Sanitary Sewer
 - Storm Sewer
- Flood Hazard Zone**
- 1.0% Annual Chance Flood Hazard
 - 0.2% Annual Chance Flood Hazard
 - Regulatory Floodway
- Existing MSD System**



W Point Ct

Ranked #4 in the Street Category



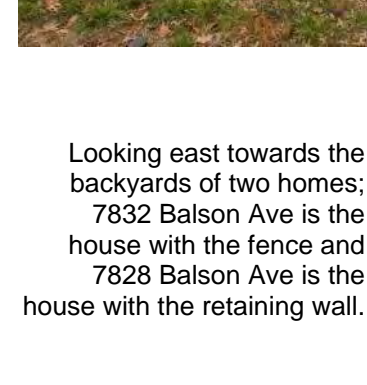
Problem Description:

The homes on Stanford Avenue sit about 18 feet higher than the homes on Balson Ave. Between the houses is at a 3:1 slope. The flow path from the backyards to the front yards on Balson Ave is inadequate, causing frequent flooding to at least two of the homes on Balson Ave. The drainage area to the back of the homes is about 1.3 acres.

The basement stairwell at 7838 Balson Ave. Sand bags and sump pumps have been added to try to keep the basement from flooding.



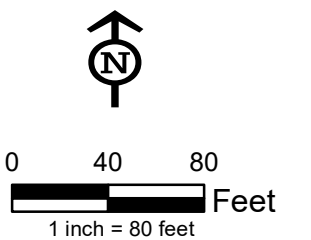
Looking west in the backyard of 7838 Balson Ave. The house is on the right.



Looking east towards the backyards of two homes; 7832 Balson Ave is the house with the fence and 7828 Balson Ave is the house with the retaining wall.

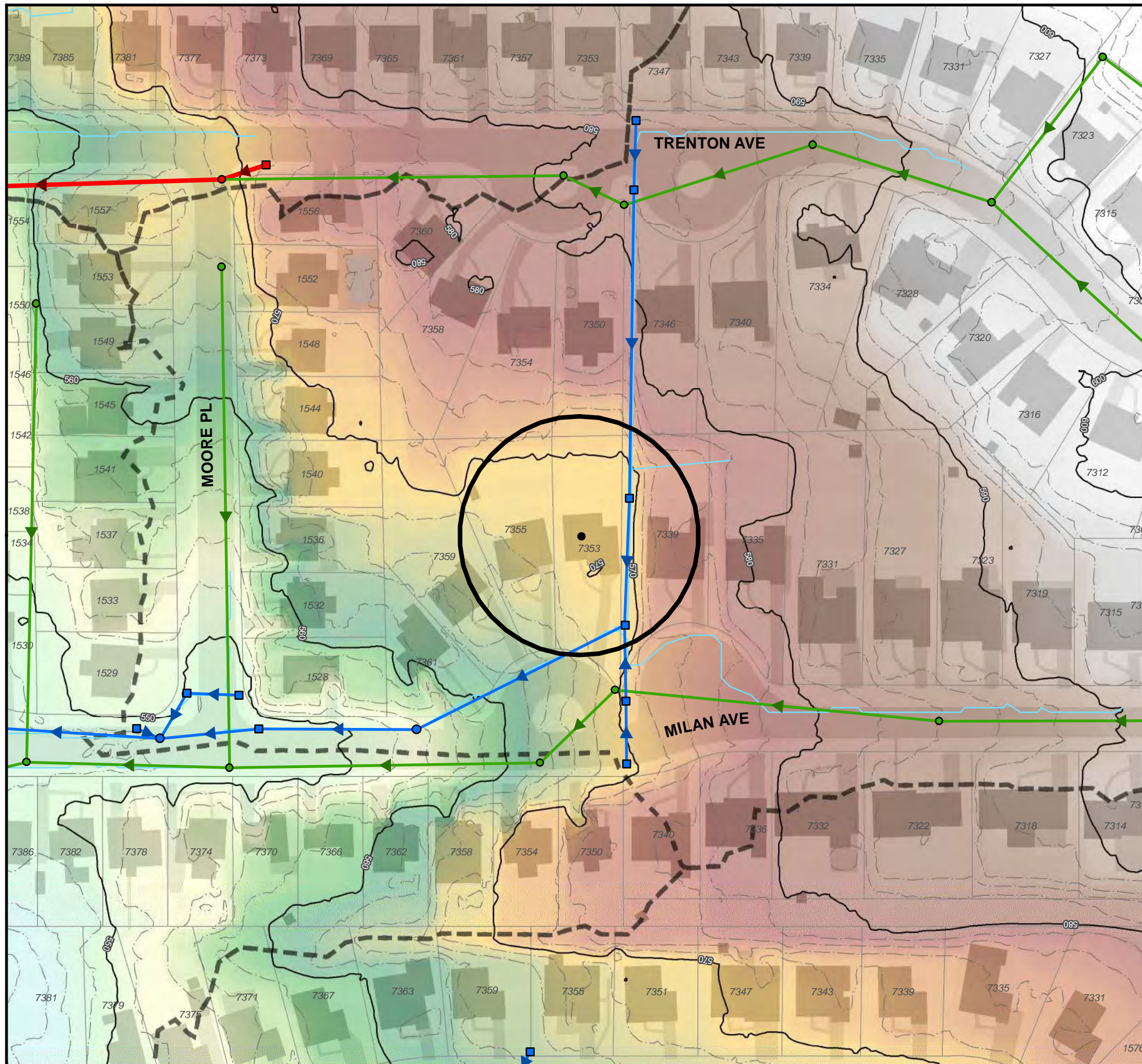
Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| --- Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



Balson Ave

Ranked #1 in the Backyard Category



Problem Description:

About 3 acres of drainage flows to the backyard at 7353 Milan Ave. An area inlet just east of the backyard clogs easily and may also have inadequate capacity. Water backs up, flooding the entire yard until it can flow east. Water has nearly reached the threshold of the back door to the house. The basement has flooded from both seepage and overland flow in 2014, 2015, and 2022.

Looking south along the property line between #7353 and 7339.



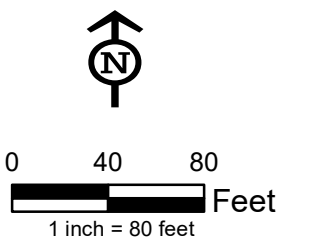
Looking towards the back patio at #7353. Ponded water has nearly reached the threshold of the door into the house (not the door to the screened in patio).

Looking north towards the area inlet in the backyards. #7353's backyard is on the left.

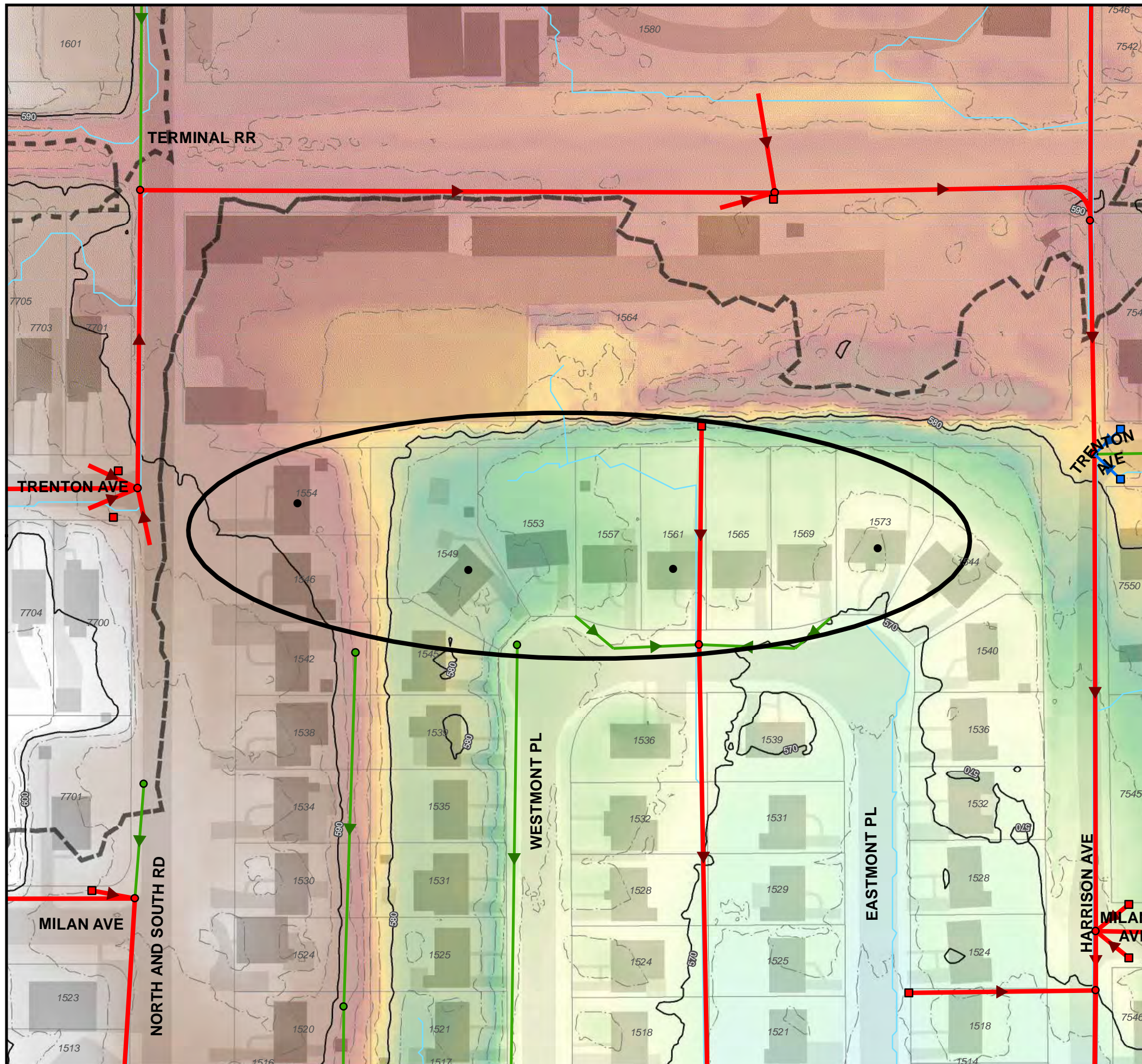


Legend

- | | |
|---------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| Regulatory Floodway | ● Storm Manhole |
| | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Milan Ave
Ranked #2 in the Backyard Category



Problem Description:

The property north of the Grenville Subdivision sits about 6-10 feet above the backyards of several houses. About 3.3 acres of drainage reaches the backyards of 1561 to 1573 Westmont Place.

The backyards are relatively flat; there is no adequate conveyance which carries water from the backyards to the street, so the yards flood frequently. Seepage occurs into the basements of some of the homes.

There is an inlet behind 1561, but only about half of a side is able to accept water due to grading issues. Note the inlet appears to be in a strip of ROW between the houses and business.

Looking northwest towards the strip of ROW between homes (on the left) and the business to the north (on the right).



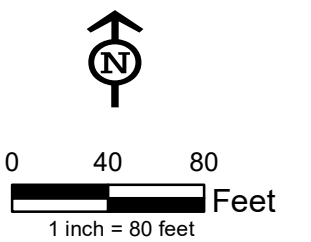
Looking towards the inlet north of #1561. Due to grading, the inlet does not appear to collect much runoff.



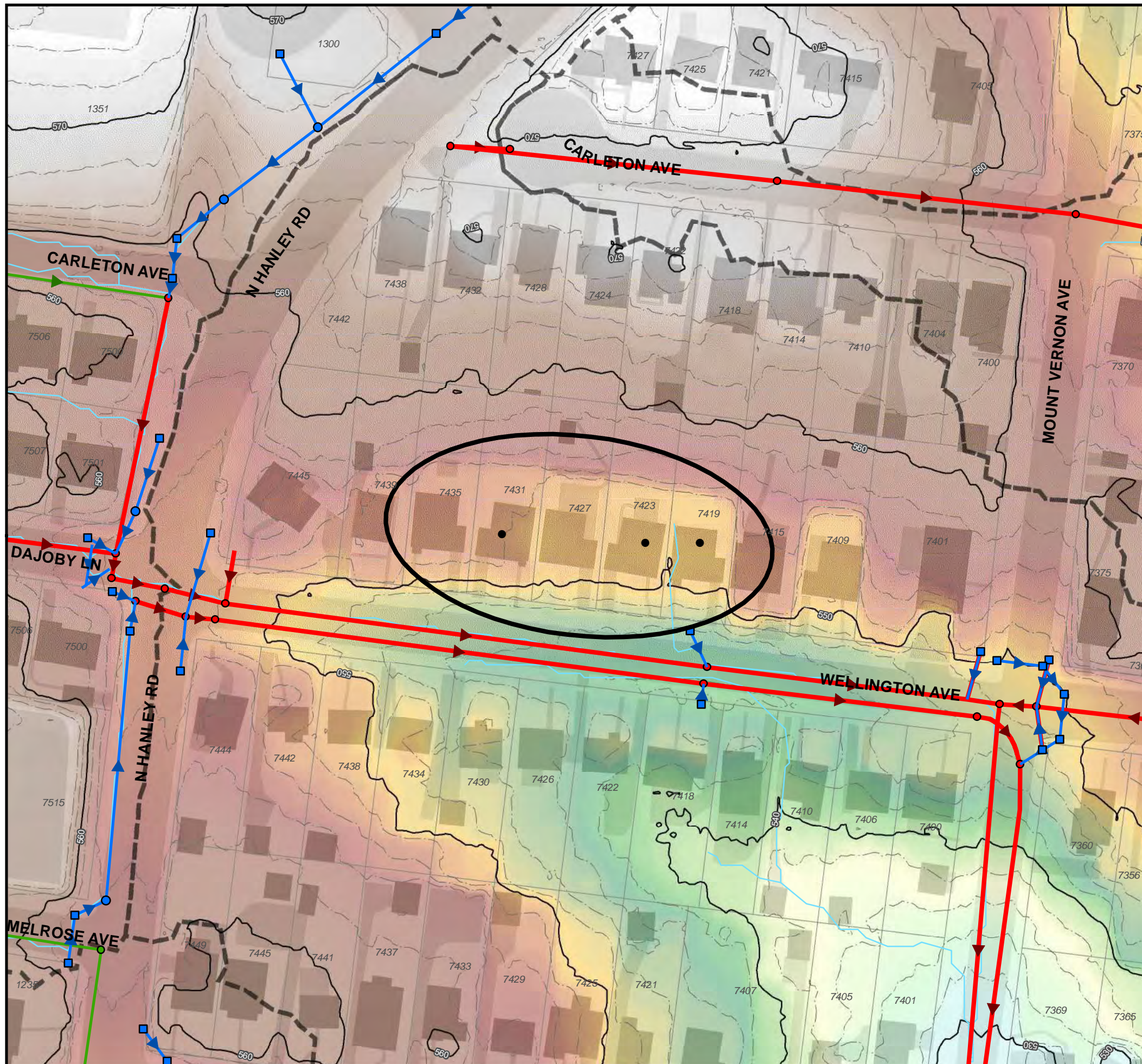
Looking south towards the backyard at #1561.

Legend

- | | |
|---------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| ⋯ Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | ● Combined Manhole |
| 1.0% Annual Chance Flood Hazard | ● Sanitary Manhole |
| 0.2% Annual Chance Flood Hazard | ● Storm Manhole |
| Regulatory Floodway | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



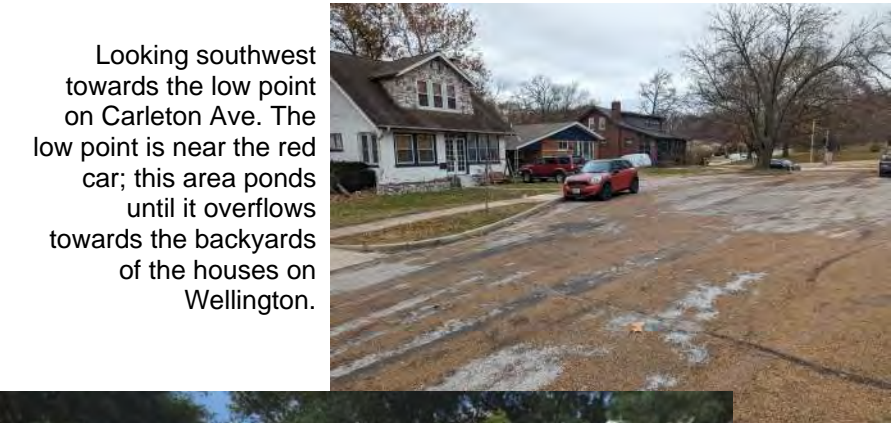
Grenville Subdivision
Ranked #3 in the Backyard Category



Problem Description:

About 2 acres of drainage reach the backyards between 7427-7419 Wellington Ave. There is not an adequate route for runoff to get past the houses and to the street, which is about 6 feet lower than the homes. As a result, the yards and basements of homes flood frequently.

It should be noted that there is a low point on the south end of the cul-de-sac for Carleton Ave which contributes to the drainage area; however, this area is not as significant as the contributing drainage area which includes the yards and homes of the surrounding properties.



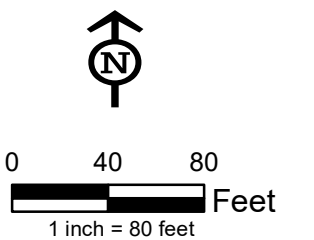
Looking southwest towards the low point on Carleton Ave. The low point is near the red car; this area ponds until it overflows towards the backyards of the houses on Wellington.



Looking north between #7423 (on the left) and #7419 (on the right). The space between houses may convey some of the runoff from the backyards, but the grading and available space is insufficient.

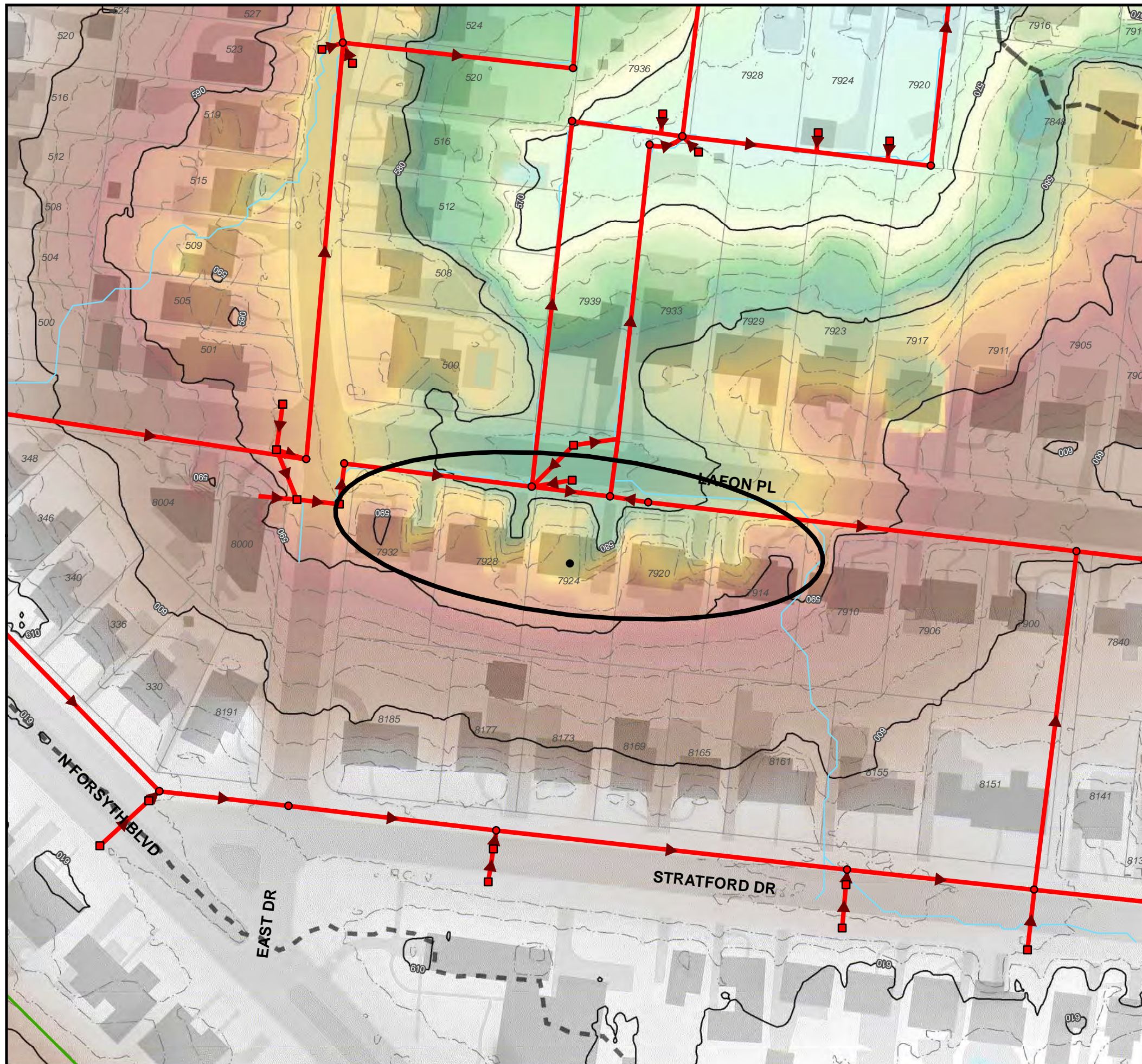
Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| --- Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Wellington Ave

Ranked #4 in the Backyard Category

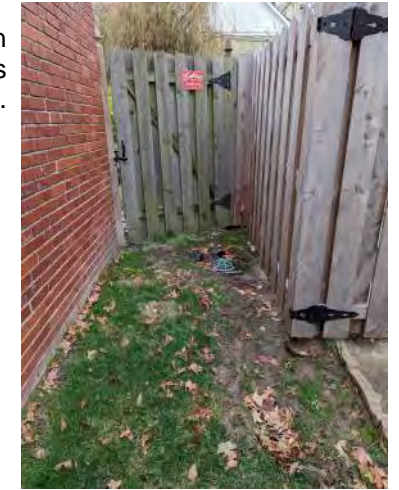


Problem Description:

About 2.3 acres of drainage flows to the backyards of three houses, causing flooding to yards and basements. There is no flow path to carry runoff past the houses and to the inlets in the street.

The houses in this area have basement tuck-under garages. The street and sidewalk flood but the basement garages have not flooded.

Looking north between #7924 and 7928 towards erosion and a yard drain.



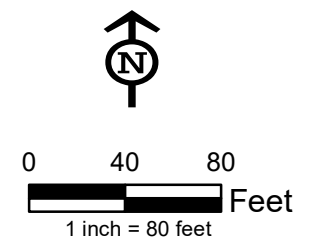
Looking west in the backyard of 7924 Lafon Pl. The house is out of frame on the right. The yard slopes towards the back of the house.



Looking east along the back of 7924 Lafon Pl. A yard drain was installed in an attempt to reduce ponding near the house.

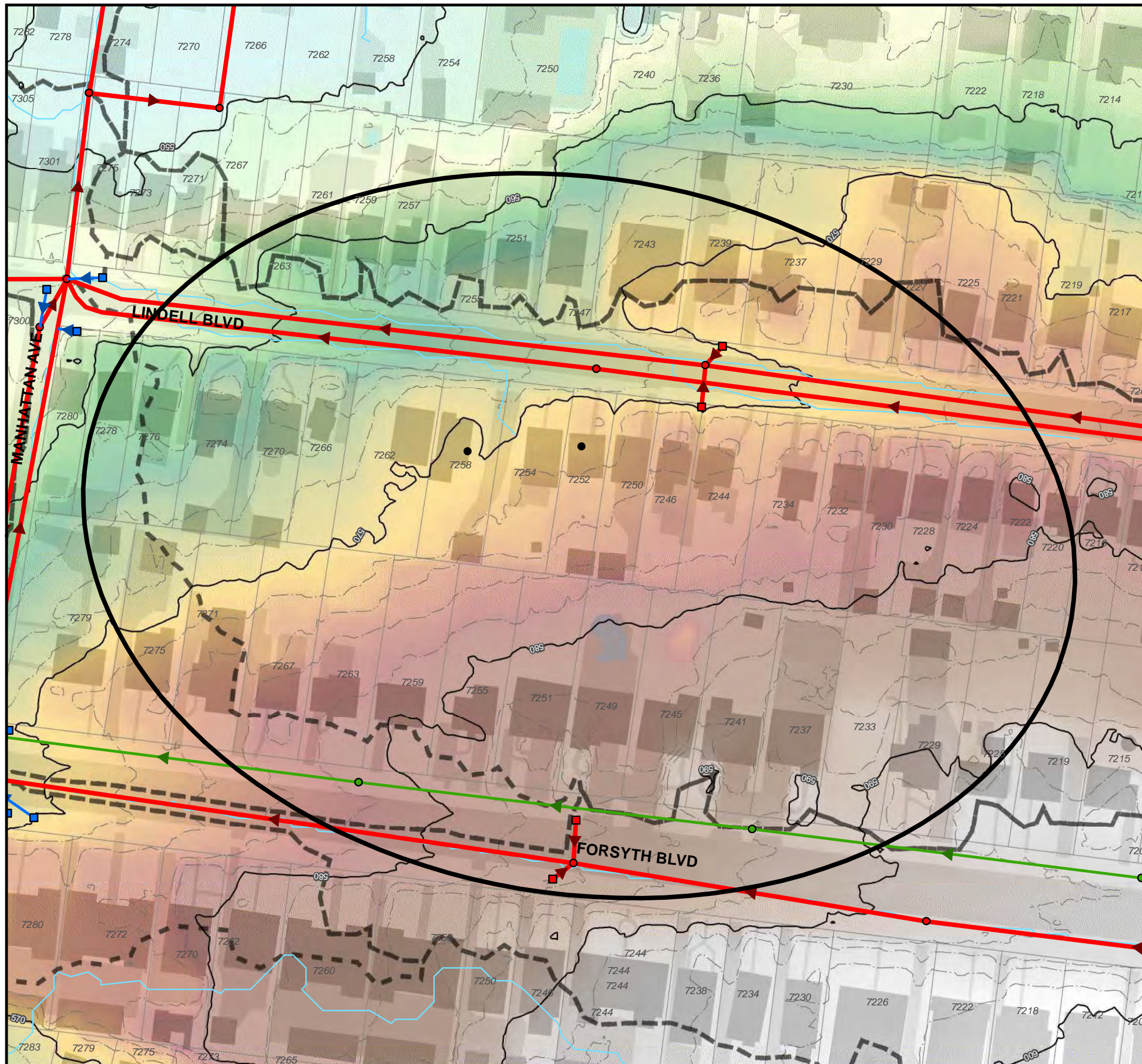
Legend

- | | |
|--|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| --- Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| Light Blue 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| Yellow 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| Light Blue Regulatory Floodway | ● Storm Manhole |
| | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



Clayton Gardens Subdivision

Ranked #5 in the Backyard Category



Problem Description:
 The homes on Forsyth Blvd drain to the backyards of Lindell Blvd. There is no defined path for runoff to continue flowing to the street, so the yards, detached garages, and basements have frequent flooding. The drainage area to the back of the homes is about 2.3 acres.

Looking west towards the backyard at 7258 Lindell Blvd. The stairwell to the basement is under the porch.



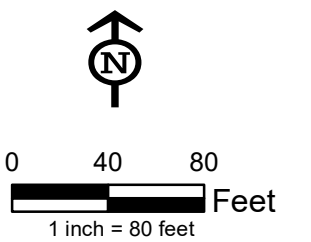
Looking north between #7252 (on the left) and #7250 (on the right). Basement windows are within 1-3 inches of the driveway - a potential source of flooding to the basements.



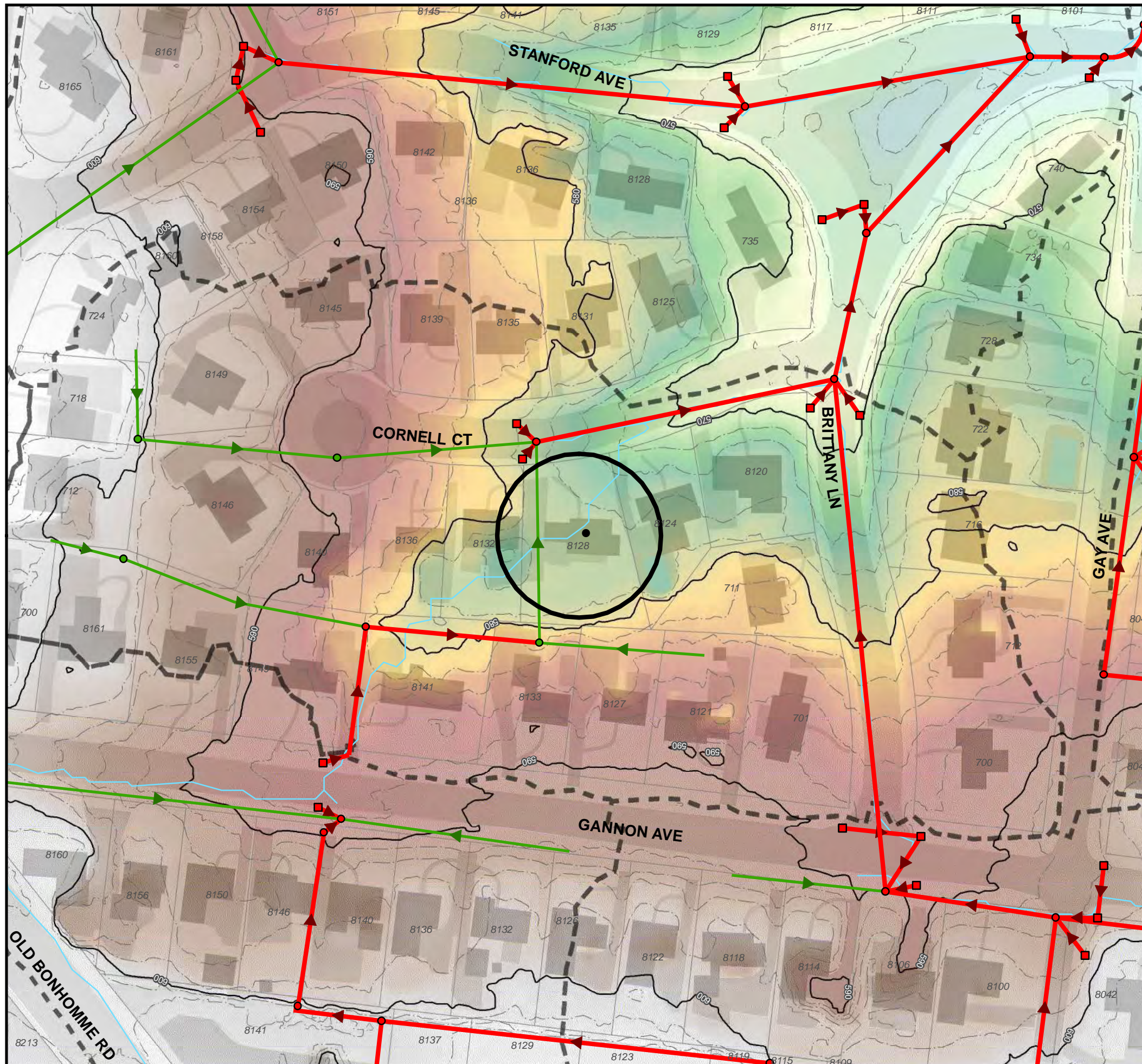
Looking west towards the backyard at 7252 Lindell Blvd. Ponding occurs near the steps to the patio. There is a stairwell to the basement under the porch.

Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Forsyth Place Subdivision
Ranked #6 in the Backyard Category



Problem Description:

About 1.8 acres of drainage reaches the backyards of 8132 and 8128 Cornell Ct. #8132 has a basement garage which flooded significantly in the July 2022 events. #8128 has frequent yard flooding as well as basement seepage.

Looking towards the backyard of 8132 Cornell Ct; the basement garage has flooded since it is the low point of about 1.8 acres.



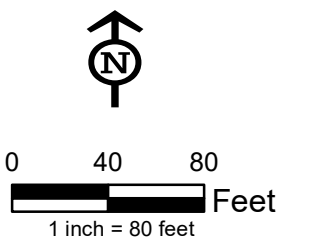
Looking west towards the backyard of #8132.



Looking southeast towards the backyard of 8128. The yard is sloped towards the house.

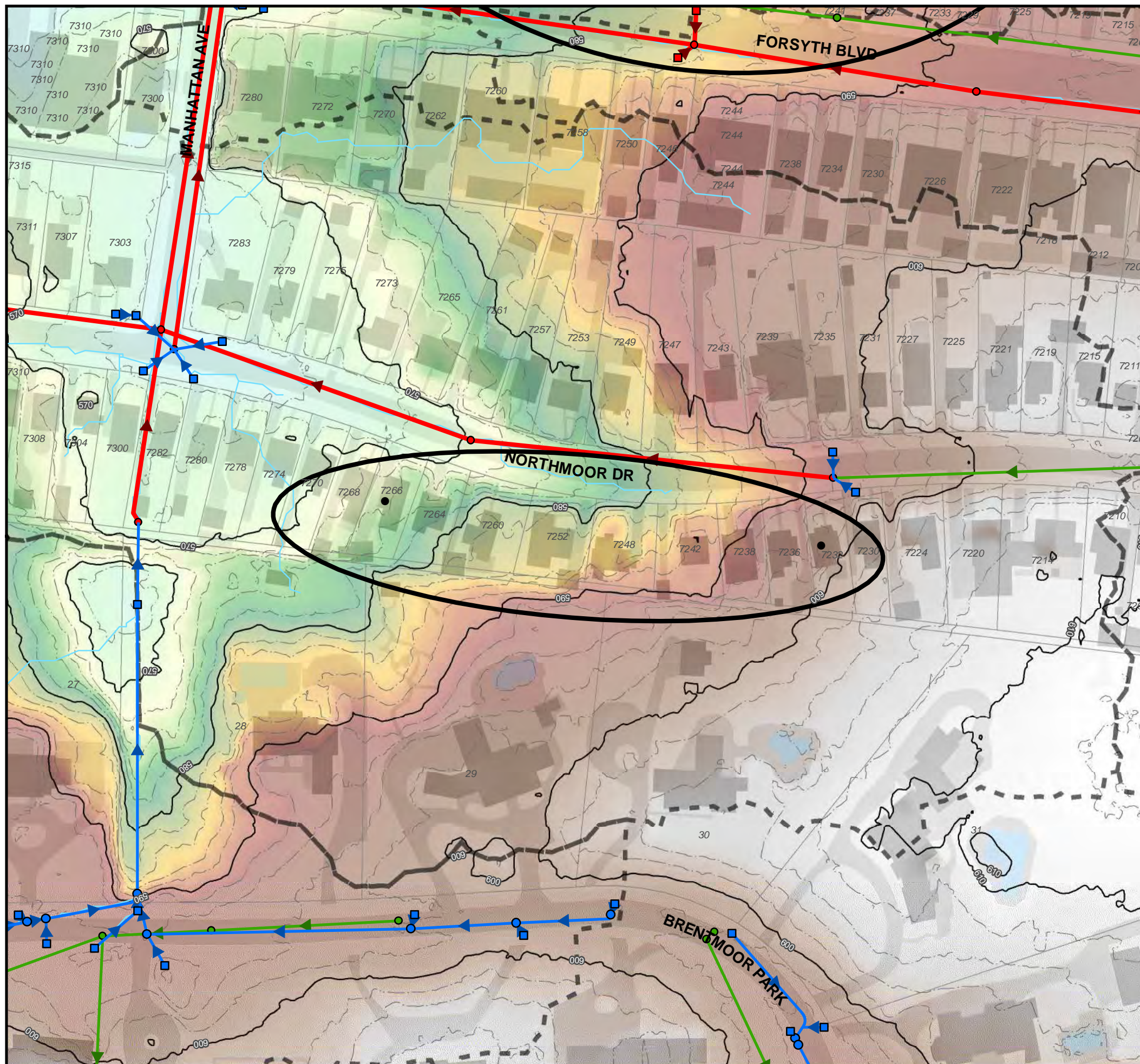
Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



Cornell Ct

Ranked #7 in the Backyard Category



Problem Description:

The homes on Brentmoor Park drain to the backyards on Northmoor Dr. The backyards of some homes receive about 1 to 1.5 acres of drainage. The drainage path past the houses varies; some homes have ineffective conveyance past the house, causing yard and basement flooding.

A slotted drain was installed by the homeowner at 7232 Northmoor Dr to reduce ponding against the house. This type of private drainage is common in the area.



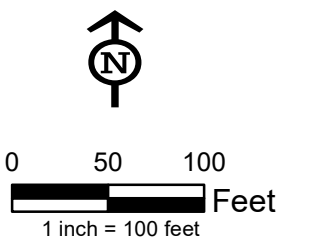
Looking north between #7236 (on the left) and #7232 (on the right). The tuck-under garage is at risk of flooding since the main flow path for water in the backyards is to flow down this driveway.



Looking east towards the backyard of 7236. The yard slopes towards the house; this is typical of the backyards in this area.

Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| --- Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



Northmoor Park Subdivision

Ranked #8 in the Backyard Category



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

Draft: MINUTES OF THE STORMWATER COMMISSION
April 18, 2023

Call to Order. The thirty-third meeting of the Stormwater Commission (Commission) was called to order at 3:02 PM by Chair Todd Thompson.

- 1. Attendance-Roll Call.** The following Commission members were present at the Community Center: Garry Aronberg, Robert Criss, Mark Holly, Eric Stein, Todd Thompson. Also in attendance were; Darin Girdler, Director of Public Works; Mirela Celaj, Assistant Director of Public Works; and John Mulligan, City Attorney.

The meeting was a special meeting to consider stormwater management report development.

Visitors: Tom Sullivan.

- 2. Agenda.** The following modified agenda was approved by voice vote (Messrs. Aronberg, Thompson): Attendance-Roll Call; Approval of Agenda; New Business: stormwater report development.

- 3. New Business**

- Presentations were made by the HR Green-Reitz & Jens team of Garry Aronberg and Eric Karch on three components of the plan:
 - Public-Private Project definition – a policy question;
 - Prioritizing projects;
 - Projects for detailed benefit : cost analysis.
- After wide-ranging discussion, key points for public – private problem no definite definition was reached but the following key points should be included in the policy definition:
 - Identification of cause of stormwater problem –
 - public use or controlled property – public works caused problem;
 - private use property even if stormwater crosses property lines.
 - Private property purchase price usually reflects existing stormwater problems;
 - Private property must accept runoff from higher property;
 - Property owners cannot exacerbate stormwater problems;
 - It is poor public policy for a jurisdiction to take responsibility for private problems.
 - Other communities have taken expansive approaches to public problems but University need not take an expansive approach. Expansive approaches have been inconsistently applied by both restrictive policy and expansive policy jurisdictions. The expansive approaches feature the following features:
 - Stormwater crossing property lines;
 - Flooding of structures occurs;
 - Mitigation requires public works improvements;
 - Mitigation is very costly.
 - Policy recommendations of the report will be considered by Pulbic Works staff as the Stormwater Master Plan Report develops for review.
- Prioritization points adjustment will consider differential costs of repairs to houses with basement-only flooding and houses that also included first floor flooding. Eric Karch is



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

gathering aggregate information on repair costs from FEMA records for “63130” and “University City”. Mr. Karch is also preparing direct contact with volunteer home owners to gather local recent flood repair costs.

- Project for detailed benefit cost analysis discussion identified the following key points:
 - Very high cost and disruptive damage from River Des Peres flooding is not poorly represented in the list of study projects presented by HR Green. Projects should be added such as:
 - Undersized bridge and culverts at Groby and Pennsylvania Ave.
 - Debris and silt accumulation in the channel particularly at bridges and the MSD tubes.
 - Other problems as listed by HR Green are also appropriate for study even if City determines they are private. Study now will give staff information to advise property owners on private mitigation. Those other problems include channel erosion at 7500 block of Amherst (at North & South), flow through terraced neighborhoods,
 - Planning commission concerns about increased use of detention and continued development in the floodplain.
 - HR Green will send an updated list to Mr. Girdler and Ms. Celaj.
- Other discussion:
 - Mr. Holly continues development of a Web based flood inspection forms to make data gathering for PW inspectors easier and data gathered more useful for planning mitigation.
 - MSD will attend an upcoming Council meeting to discuss MSD’s role and responsibilities. The representatives will be Mr. Hoelscher, executive director or Rich Unverferth, Director of Engineering.

4. Adjournment. Motion to adjourn passed at 5:13 PM (Messrs. Holly and Aronberg).

Minutes Preparation. The minutes were prepared by Garry Aronberg.

C:\Users\garon\Dropbox\UCity Stormwater Taskforce\CommissionMinutesDrafts\20230418_StrmWtrCommMin_DRAFT.docx



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

**Draft: MINUTES OF THE STORMWATER COMMISSION
May 16, 2023**

Call to Order. The thirty-fifth meeting of the Stormwater Commission (Commission) was called to order at 3:30 PM by Chair Todd Thompson.

- 1. Attendance-Roll Call.** The following Commission members were present at the Community Center: Garry Aronberg, Robert Criss, Mark Holly, Eric Karch, Eric Stein, Todd Thompson. Also in attendance were Darin Girdler, Director of Public Works; Mirela Celaj, Assistant Director of Public Works; and John Mulligan, City Attorney.

The meeting was a special meeting to consider stormwater management report development. The May 2 meeting was cancelled.

Visitors: Tom Sullivan - resident, Monica Obradovic – journalist (River Front Times)

- 2. Agenda.** The following modified agenda was approved by voice vote (Messrs. Aronberg, Criss):
Attendance-Roll Call; Approval of Agenda; New Business: stormwater report development.

- 3. New Business**

- Master plan progress - Projects for detailed study.
 - Garry Aronberg and Eric Karch, of HR Green and Reitz & Jens, City's stormwater master plan consultants, presented an updated list of projects to be studied in detail. The updated list is attached to these minutes. A wide-ranging discussion occurred:
 - The updated list of projects includes seven typed of projects:
 - creek bank erosion
 - basement flooding from street drainage,
 - backyard and basement flooding from overland stormwater runoff flow,
 - floodplain buyouts,
 - bridge constrictions in floodplain,
 - impact of upland detention,
 - impact of change of imperviousness,
 - basement backup prevention.
 - Commission agreed that the updated list of projects is appropriate and considers the most important stormwater problems. The Commission encourages Public Works Director Girdler to use the updated list as the basis for his instructions to the consultants.
 - Other discussion:
 - Two property owners have agreed to give the Commission information about the extent of damage during the July 2022 flood. The data would be used to evaluate the weighting of benefits.
 - Commission renewed suggestion to City to obtain elevations of all the first floors in the floodplain to augment assessments of buyouts.
 - "Detention" discussed by MSD at recent Council Study Session is for sanitary wastewater overflowing from combined sewers, not stormwater runoff.



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

4. **Council Liaison Comments.** Councilman Fuller reported that a recording of the MSD comments made at a Council Work Session will be distributed to the Commissioners.
5. **Adjournment.** Motion to adjourn passed at 5:06 PM (Messrs. Holly and Thompson).

Minutes Preparation. The minutes were prepared by Garry Aronberg.

U:\UniversityCity\20230516_StrmWtrCommMin_DRAFT.docx

DRAFT

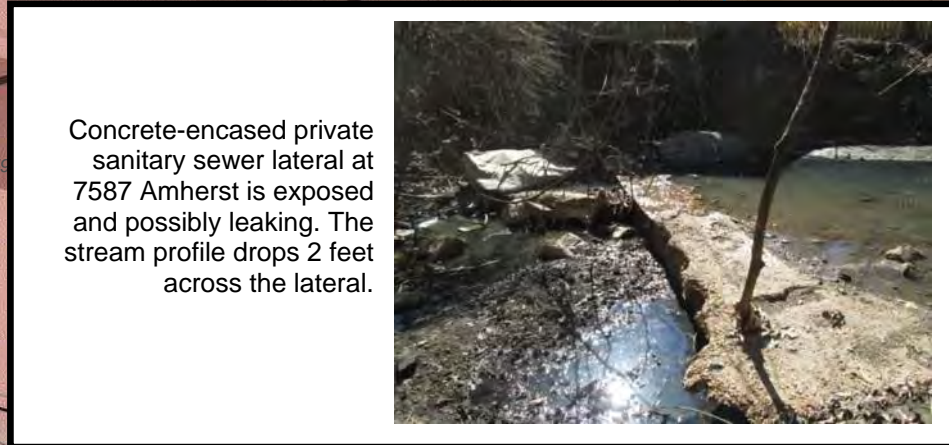
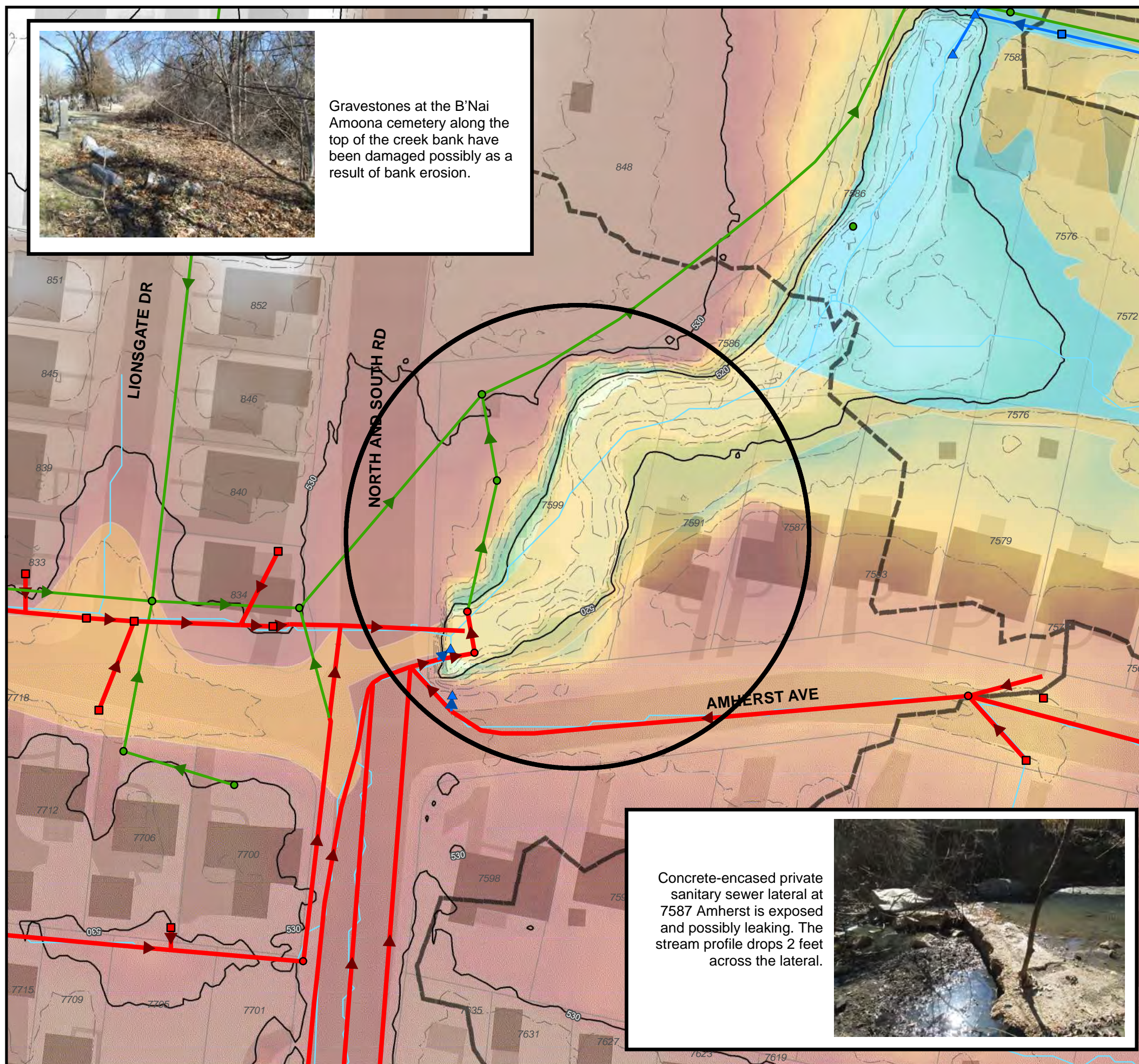
University City Stormwater Master Plan
Suggested Problems for Detailed Study

5/1/2023

Number	Name	Category Rank	Description	Recommended	Ward
Category: Erosion					
1	Tributary to River Des Peres Between Amherst Ave and Blackberry Ave	1	Erosion of a tributary to the River Des Peres threatens a house. The bank is 13' high and 20' from the house.	*	2
2	River Des Peres at Mona Dr	2	Erosion of the River Des Peres threatens the street (Mona Dr). The bank is 16' high and 5' from the curb.	*	2
	River Des Peres at 7401 Balson Ave (University City High School)	4	Creek erosion is threatening the University City High school track and field.		2
	River Des Peres at 7425 Shaftesbury Ave	5	A tall stone and wood tie wall near a residential structure is at risk of collapse.		2
Category: Street					
3	Amherst Ave	1	Several basement garages along Amherst Ave flood from street drainage. Combined sewer inlets exist on the street.	*	2
	Old Bonhomme Rd	2	Flow from Ruth Park and Old Bonhomme Rd flows down driveways and floods two basement garages at houses on Old Bonhomme Rd.		1
	Midland Blvd and Balson Ave	3	Inlets backup and flood the commercial building. Owner marked frequency as 'Often'.		2
	W Point Ct	4	Constant ponding in street at low point. Three residents have complained.		1
Category: Backyard					
	Balson Ave	1	All flooding types marked - yard, street, nonhab, hab, and first floor. Drainage area is 1.3 acres.		2
4	Milan Ave	2	About 3 acres of drainage through the yard at 7353 Milan Ave. There is already public storm sewer at 7353; may need to be upsized or make inlet more efficient.	*	3
5	Grenville Subdivision	3	Commercial property to north releases drainage to backyards of homes that are close together. There is no overland flow path to the front yard.	*	3
	Wellington Ave	4	Four houses on Wellington Ave receive runoff from behind and there is no overland path to the street. About 2 acres of drainage comes to these backyards.		3
	Clayton Gardens Subdivision	5	About 2.3 ac of drainage flows to the backyards of 3-4 houses, causing flooding to yards and basements. There is no flow path out to street. Note there are also basement garages.		1
	Forsyth Place Subdivision	6	Homes on Forsyth Blvd drain to backyards of Lindell Blvd. Houses are close together so there is no easy path for runoff past Lindell Blvd houses. Overall DA is about 2.3 acres.		1
	Cornell Ct	7	1.8 ac of drainage reaches backyard with no outlet point. Basement and yard flooding at 8128 Cornell Ct.		1
	Northmoor Park Subdivision	8	Yard and basement flooding from drainage area behind houses reaching backyards. 1 to 1.5 acres reaching backyards in a couple of places.		1
Category: Common Problems throughout City					
6	Buyouts in RdP floodplain		Estimate number of homes in 10-yr, 50-yr, 100-yr floodplain. Estimate typical buyout cost. Develop typical B:C ratio. (Modified from USACE report and models.)	*	2,3
7	Bridge constrictions		Examine Groby Rd bridge: B:C for three alternatives (1) wider, taller, approach profile, houses impacted; (2) No change in bridge + house buyout; (3) no change in bridge, road, housing.	*	
8	Upland detention volume needed to lower RDP 100-yr elevation 1 ft		Give guidance to planners for updating the comprehensive plan. -Determine Q to lower WSE 1 ft and estimate upland detention to accomplish. Complements Corps report regarding near stream dtn.	*	2,3
9	Impact of change in imperviousness		Planners discussed impervious reduction. Residents interested.	*	1,2,3
10	Basement backup prevention		Very common problem during July 2023 flood. City officials should have guidance and policy regarding this type of floodproofing - does City Code allow disconnection of plumbing from basement floor drain and sanitary grinder pumps? What is typical cost or range of cost. Licensed plumpers or homeowner?	*	1,2,3



Gravestones at the B'Nai Amoona cemetery along the top of the creek bank have been damaged possibly as a result of bank erosion.



Concrete-encased private sanitary sewer lateral at 7587 Amherst is exposed and possibly leaking. The stream profile drops 2 feet across the lateral.

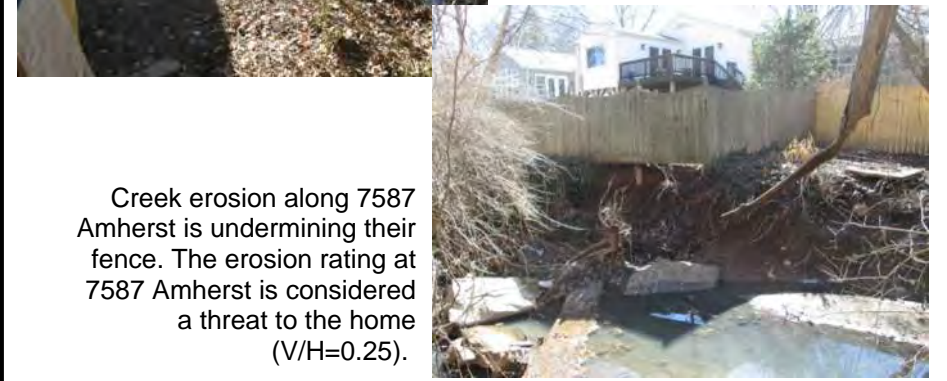
Problem Description:

An un-named tributary to the River des Peres flows from a closed storm sewer outfall at Amherst and North & South. A 500-foot reach of the creekbank is over-steepened and actively eroding. MSD and the City initially identified this bank erosion in 1988, and MSD confirmed the issue and developed a conceptual solution and cost estimate in 2007.

The 13-foot high eroding bank at 7591 Amherst is 20 feet from the home (measured from the toe of bank), and has not advanced significantly since 2006, but is considered severe by MSD's bank erosion rating (V/H=1.46). The July 26, 2022 flood was above the basement floor of 7591 Amherst and collapsed their fence.



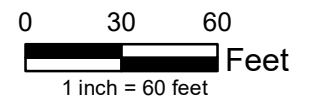
The 13-foot high eroding bank at 7591 Amherst is 9 feet from the home (measured from the top of bank).



Creek erosion along 7587 Amherst is undermining their fence. The erosion rating at 7587 Amherst is considered a threat to the home (V/H=0.25).

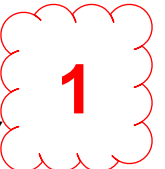
Legend

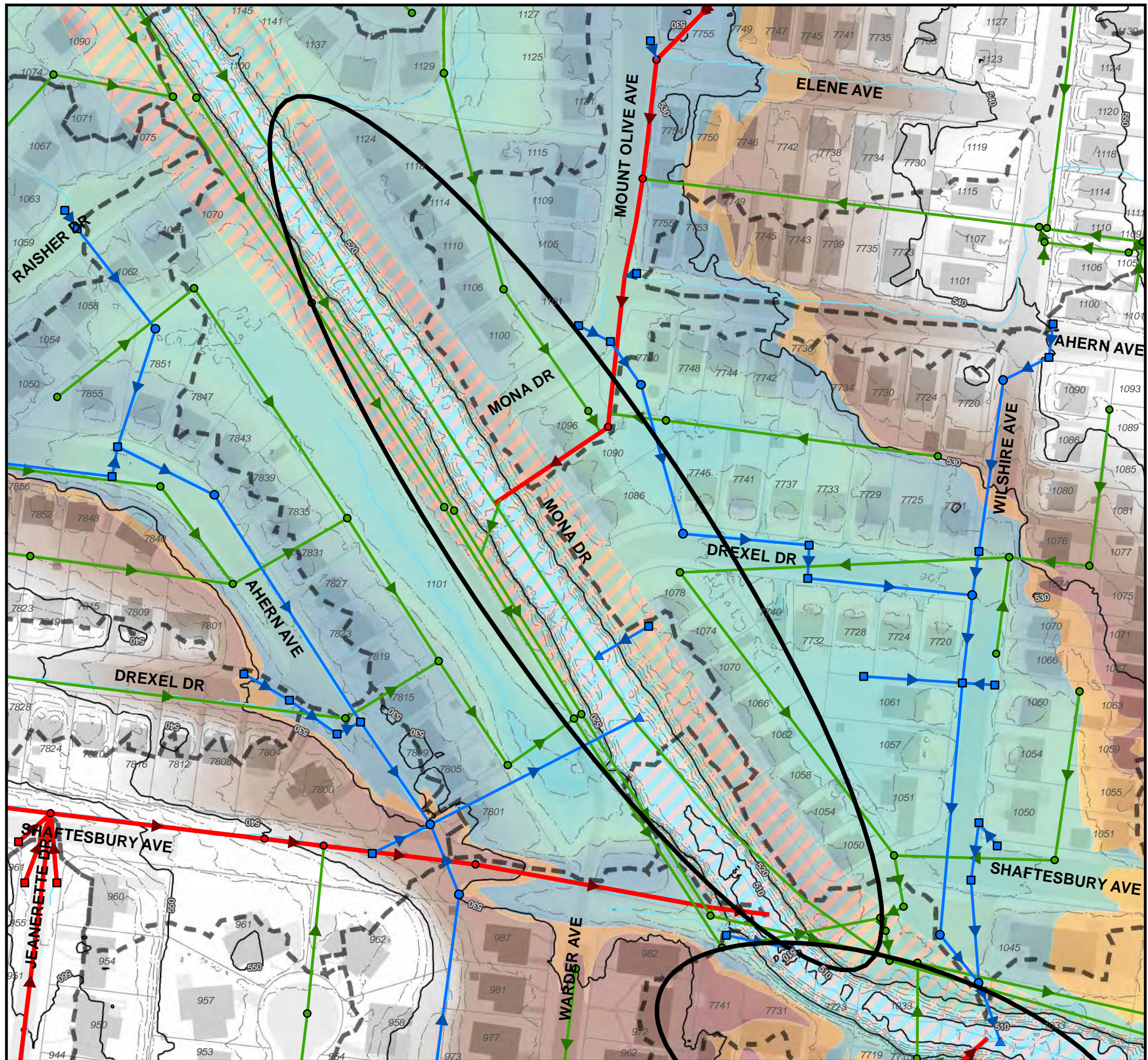
- Stormwater Problem Point
- Problem Location
- Flow Path Line
- ▭ Watershed Boundary
- Existing MSD System
 - Combined Inlet
 - Storm Inlet
 - ▲ Storm Intake-Outfall
 - Combined Manhole
 - Sanitary Manhole
 - Storm Manhole
 - Combined Sewer
 - Sanitary Sewer
 - Storm Sewer
- Flood Hazard Zone
 - 1.0% Annual Chance Flood Hazard
 - 0.2% Annual Chance Flood Hazard
 - Regulatory Floodway



**Tributary to River Des Peres
Between Amherst Ave and
Blackberry Ave**

Ranked #1 in the Erosion Category





Problem Description:
 A 700-foot reach of the River des Peres is over-steepened and actively eroding. The top of bank is 16-feet high and has eroded to within 5 feet of the curb line of Mona Drive. The north end of Mona Drive is the only road access/egress for six homes. Using MSD's erosion rating, the street is more severely threatened (V/H=0.44) than the homes (V/H=0.18). MSD installed riprap along portions of Mona Drive in approximately 2017, but most of this riprap has since eroded and slid off the bank. An additional 600-foot reach of bank along the downstream end of Mona Drive is somewhat more stable. The homes along Mona Drive flooded on July 26, 2022.

Over-steepened channel banks threaten Mona Drive which provides the only access to 6 houses.



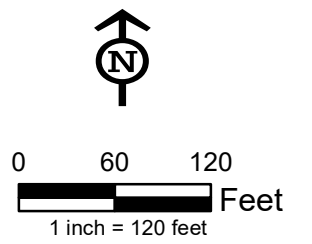
Over-steepened channel banks, and the remains of riprap placed by MSD that has since eroded and slid off the bank.



Channel bottom contains riprap, some of which slid off the bank from a previously installed MSD project.

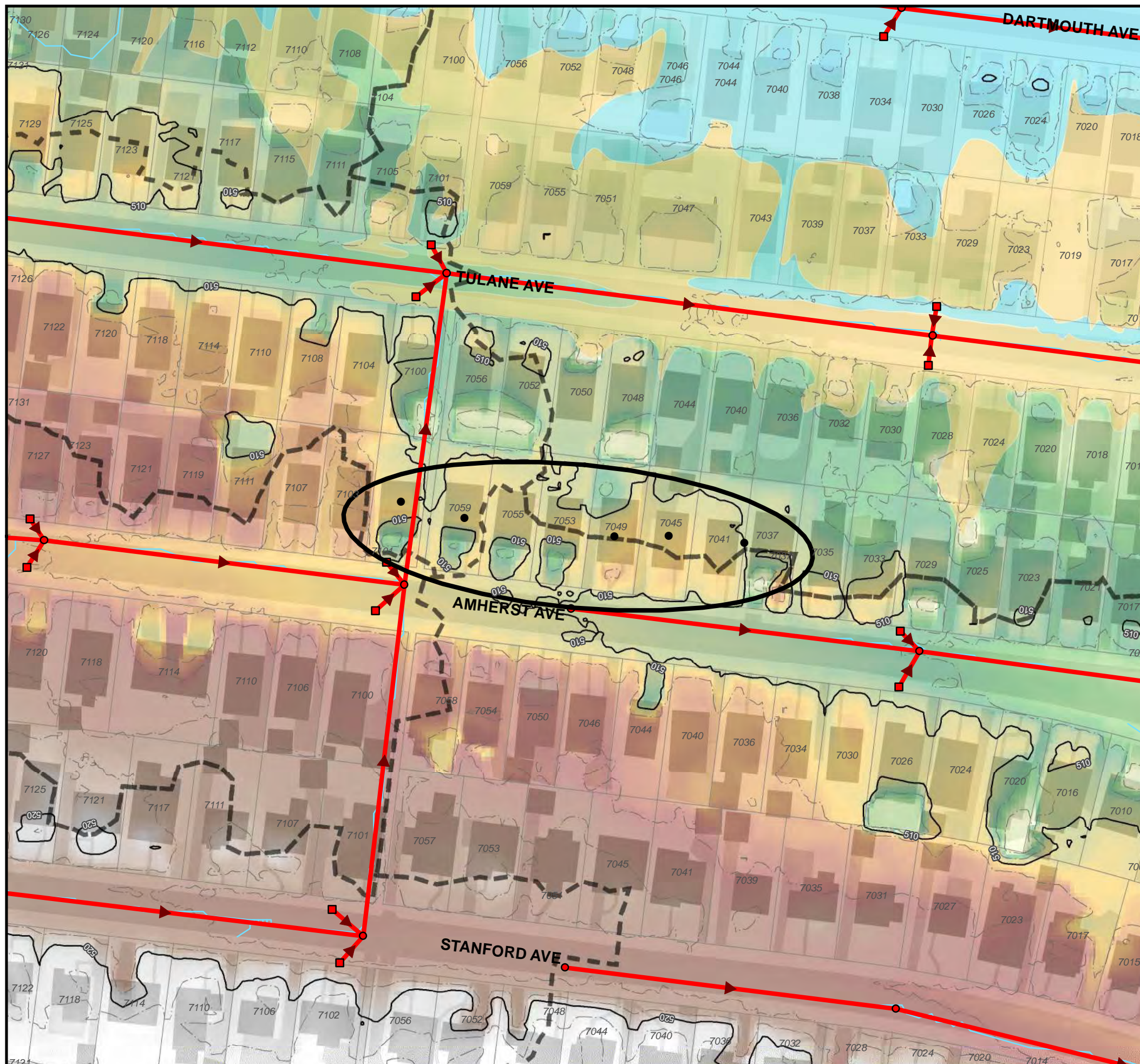


- Legend**
- Stormwater Problem Point
 - Problem Location
 - Flow Path Line
 - Watershed Boundary
 - Existing MSD System
 - Combined Inlet
 - Storm Inlet
 - ▲ Storm Intake-Outfall
 - Combined Manhole
 - Sanitary Manhole
 - Storm Manhole
 - Combined Sewer
 - Sanitary Sewer
 - Storm Sewer
 - Flood Hazard Zone
 - 1.0% Annual Chance Flood Hazard
 - 0.2% Annual Chance Flood Hazard
 - Regulatory Floodway



River Des Peres at Mona Dr
Ranked #2 in the Erosion Category





Problem Description:

Several basement garages along Amherst Avenue flood from street drainage. Combined sewers with street inlets exist on the street. Amherst Ave is very flat, which reduces inlet capacity.

Although not all of these residents responded, it is likely that 7101, 7059, 7055, 7053, and 7037 Amherst Ave have frequent basement flooding due to water escaping the street and flowing down the driveway.

Grated drains were observed near each garage door. It is likely that each of these are connected into the nearby combined sewer. Therefore, it is possible the flooding is due to backup from the combined sewer main.

The driveway at 7101 Amherst Ave.



The driveway at 7037 Amherst Ave.

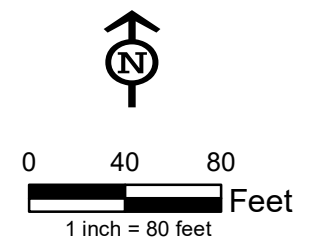


Looking east along Amherst Ave towards the inlets between 7033/7029 Amherst Ave.



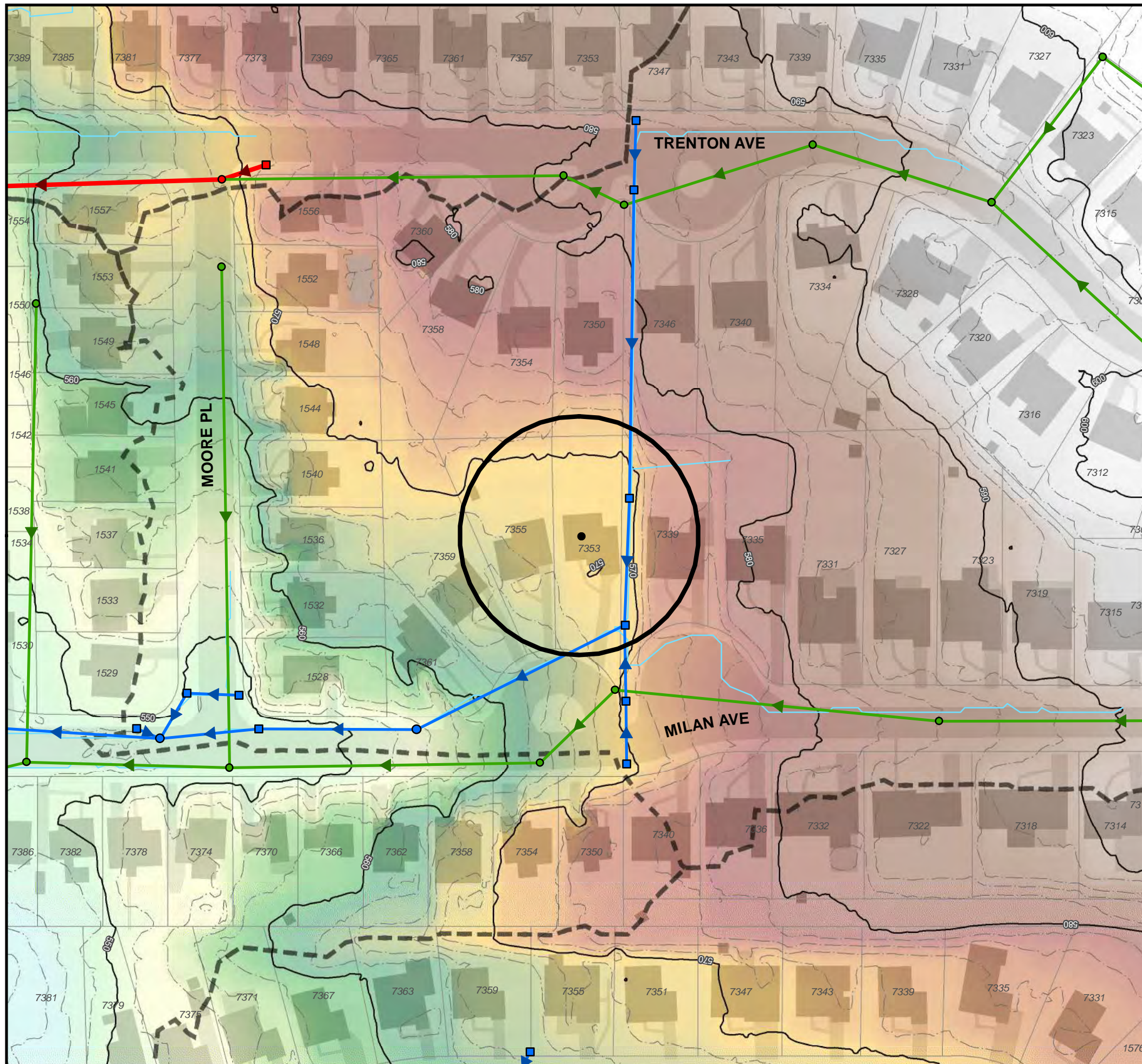
Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Amherst Ave
Ranked #1 in the Street Category





Problem Description:

About 3 acres of drainage flows to the backyard at 7353 Milan Ave. An area inlet just east of the backyard clogs easily and may also have inadequate capacity. Water backs up, flooding the entire yard until it can flow east. Water has nearly reached the threshold of the back door to the house. The basement has flooded from both seepage and overland flow in 2014, 2015, and 2022.

Looking south along the property line between #7353 and 7339.



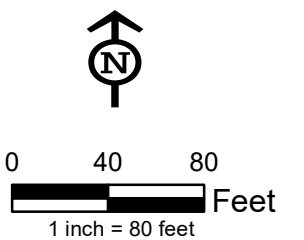
Looking towards the back patio at #7353. Ponded water has nearly reached the threshold of the door into the house (not the door to the screened in patio).

Looking north towards the area inlet in the backyards. #7353's backyard is on the left.



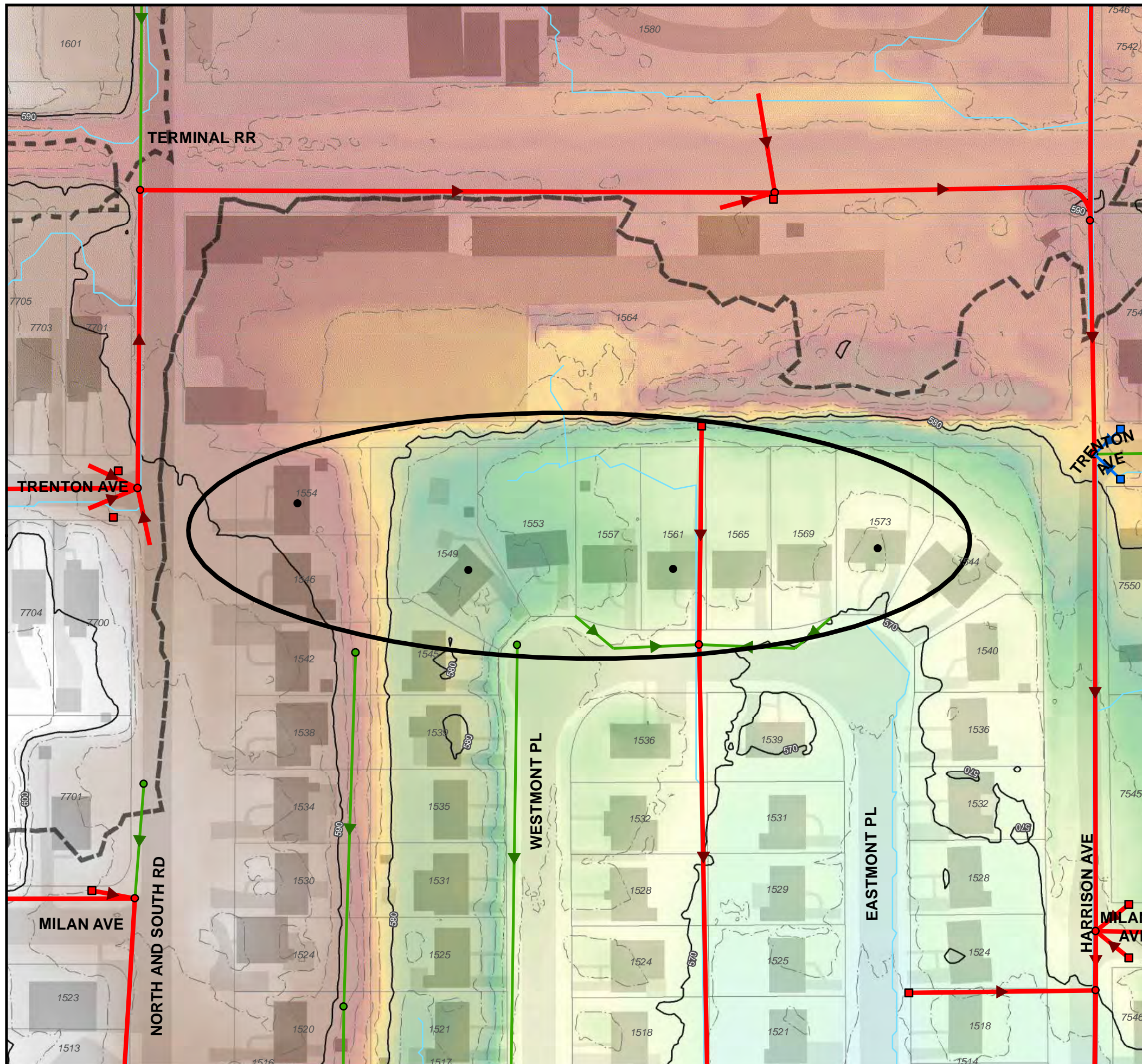
Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Milan Ave
Ranked #2 in the Backyard Category





Problem Description:

The property north of the Grenville Subdivision sits about 6-10 feet above the backyards of several houses. About 3.3 acres of drainage reaches the backyards of 1561 to 1573 Westmont Place.

The backyards are relatively flat; there is no adequate conveyance which carries water from the backyards to the street, so the yards flood frequently. Seepage occurs into the basements of some of the homes.

There is an inlet behind 1561, but only about half of a side is able to accept water due to grading issues. Note the inlet appears to be in a strip of ROW between the houses and business.

Looking northwest towards the strip of ROW between homes (on the left) and the business to the north (on the right).



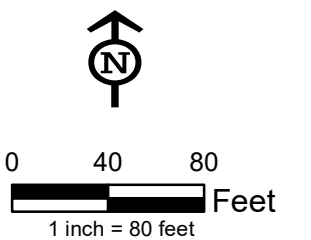
Looking towards the inlet north of #1561. Due to grading, the inlet does not appear to collect much runoff.



Looking south towards the backyard at #1561.

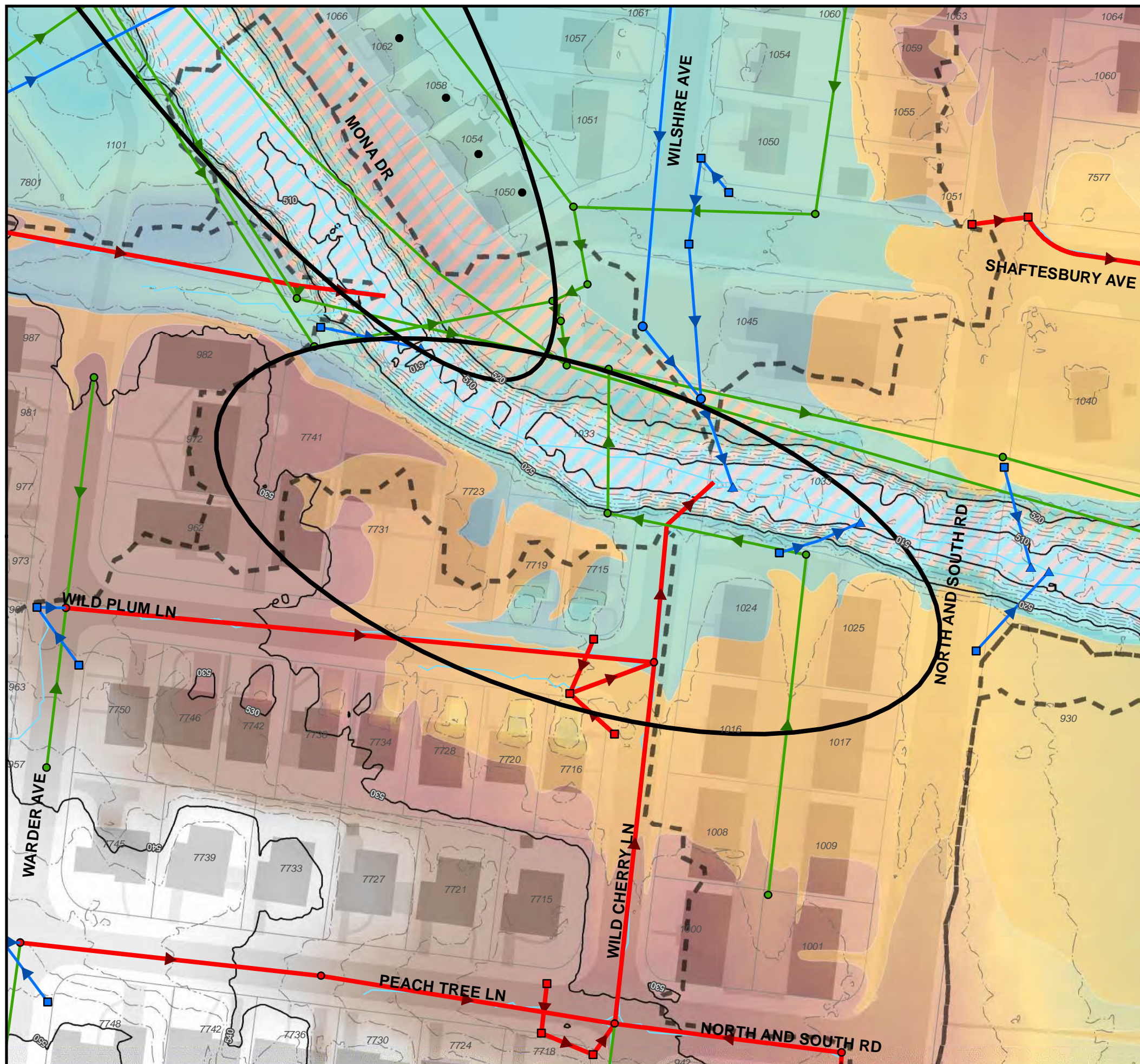
Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| ⋯ Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Grenville Subdivision
Ranked #3 in the Backyard Category





Problem Description:

A 500-foot reach of the River des Peres is actively eroding. The top of bank is 18-feet high is threatening residential buildings and parking lots located along Wild Cherry and Wild Plum Lanes. Using MSD's erosion rating, the parking lot is more severely threatened (V/H=0.56) than the apartment buildings (V/H=0.2 to 0.4).

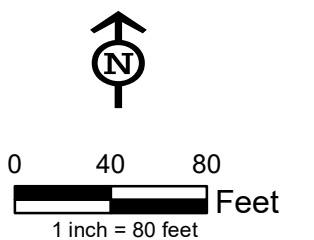
An approximately 175-foot reach of the right-descending river bank is lined with a concrete slab, but the integrity of the concrete is compromised by a 3-foot deep scour pool along the toe of bank. Failure of slab will likely cause failure in the parking lot.



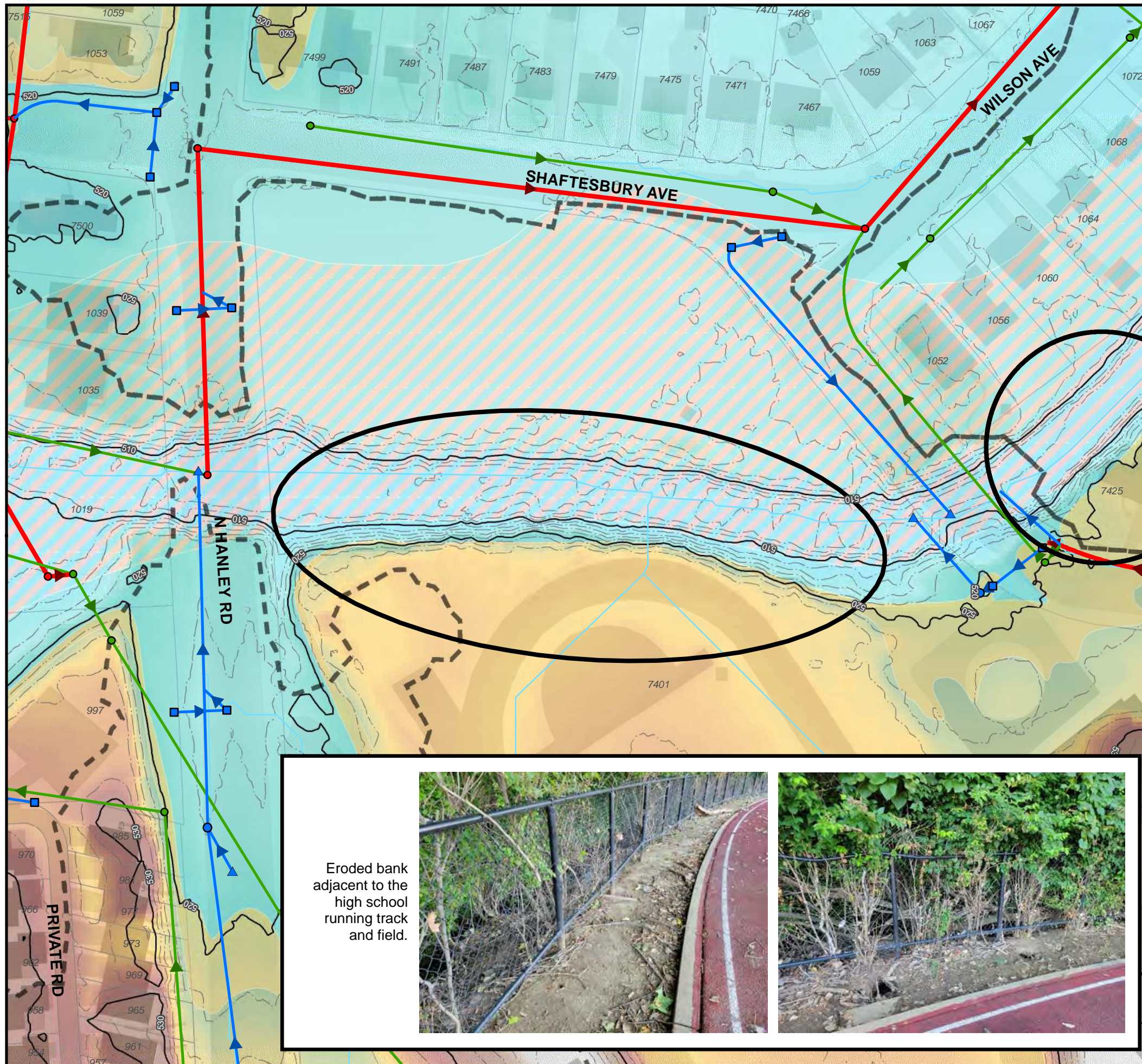
MSD infrastructure along the right-descending river bank is threatened by bank erosion including a combined sewer manhole, a combined sewer overflow (CSO) structure, and a storm sewer outflow structure.

Legend

- | | |
|---------------------------------|----------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| ▭ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| ⋯ Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | ● Combined Manhole |
| 1.0% Annual Chance Flood Hazard | ● Sanitary Manhole |
| 0.2% Annual Chance Flood Hazard | ● Storm Manhole |
| Regulatory Floodway | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



River Des Peres at Wild Plum Ln
Ranked #3 in the Erosion Category



Problem Description:

Erosion on the South bank of the River des Peres has destabilized the bank leading up to the University City High School track and field. These features are located immediately adjacent to a 3.5-foot high fence along the top of the eroding bank, and are at risk.

The foundation of a 6-foot high mid-slope fence is eroded and the fence is collapsing. It appears that riprap was added from the top of slope to address an area of gulley erosion, but this riprap is sliding down the bank. The weight of this riprap is contributing to the fence failure.



On the right descending bank are the eroding bank, collapsing fence, and sliding riprap.



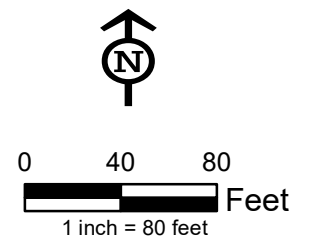
On the right descending bank are the eroding bank, collapsing fence, and sliding riprap.



Eroded bank adjacent to the high school running track and field.

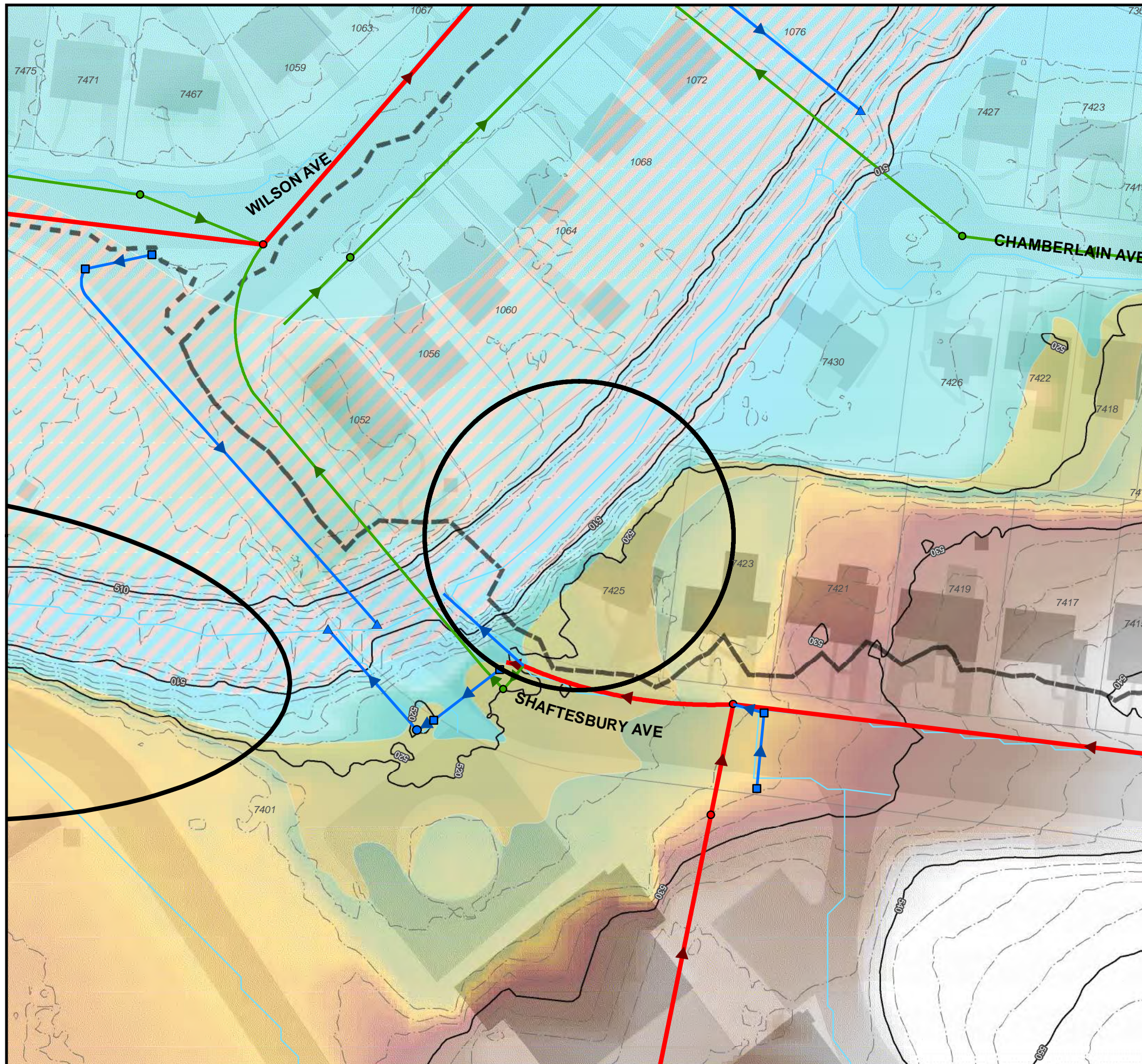
Legend

- Stormwater Problem Point
- Problem Location
- Flow Path Line
- Watershed Boundary
- Flood Hazard Zone**
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Regulatory Floodway
- Existing MSD System**
- Combined Inlet
- Storm Inlet
- Storm Intake-Outfall
- Combined Manhole
- Sanitary Manhole
- Storm Manhole
- Combined Sewer
- Sanitary Sewer
- Storm Sewer



River Des Peres at 7401 Balson Ave (University City High School)

Ranked #4 in the Erosion Category



Problem Description:

A 16-foot high bank with a combination of public and private walls is compromised and a house located only 7 feet from the top of wall is at risk. The wood tie wall is compromised, but the lower 6-feet of the bank of the Rider des Peres at this location is a WPA hand-placed stone wall, which appears stable.



Wood tie wall and WPA block wall. 7425 Shaftesbury Ave is the house behind the wall in the photo.

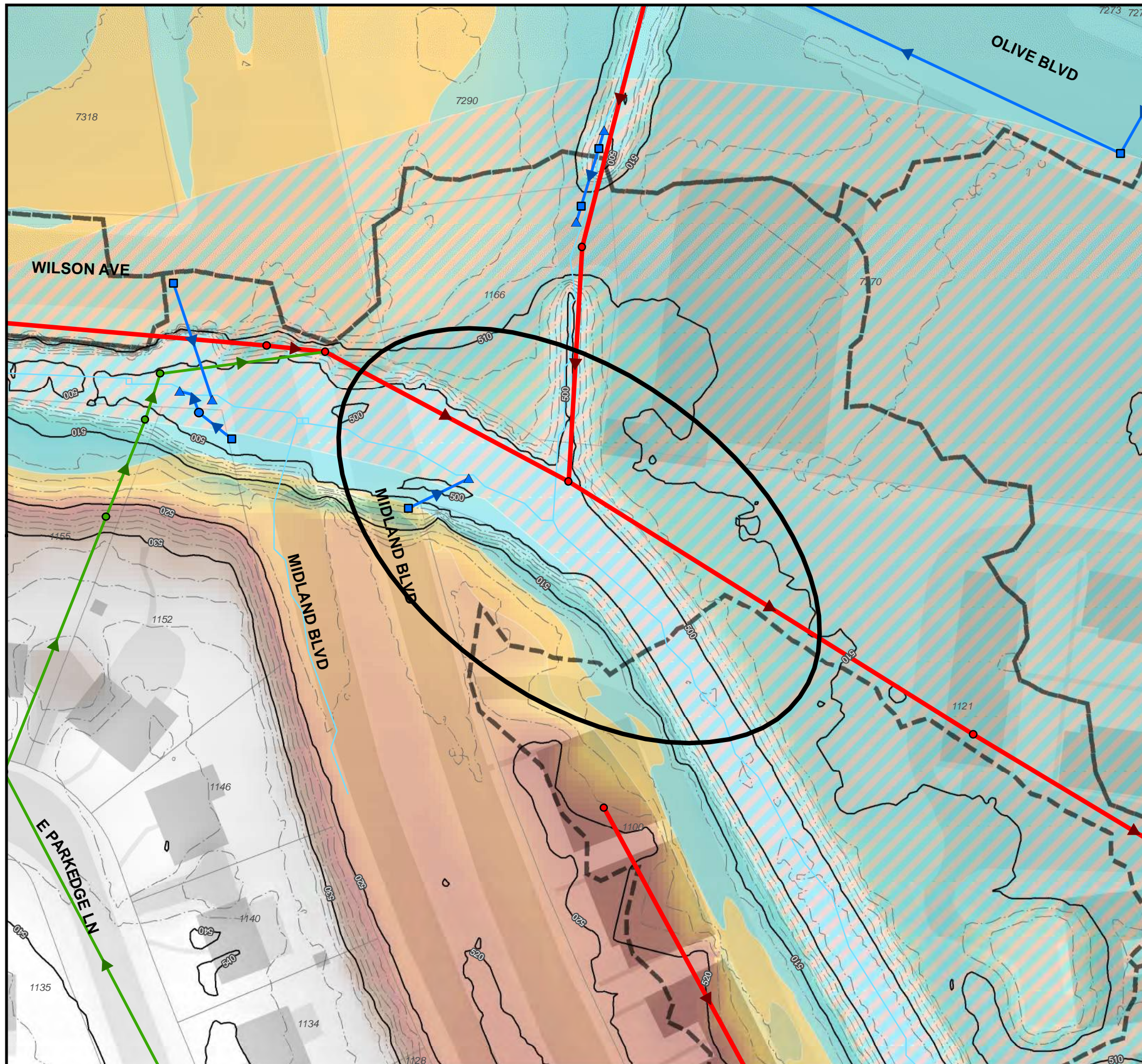


Wood tie wall and WPA block wall, looking downstream.

Legend

● Stormwater Problem Point	Existing MSD System
□ Problem Location	■ Combined Inlet
— Flow Path Line	■ Storm Inlet
⊞ Watershed Boundary	▲ Storm Intake-Outfall
Flood Hazard Zone	● Combined Manhole
■ 1.0% Annual Chance Flood Hazard	● Sanitary Manhole
■ 0.2% Annual Chance Flood Hazard	● Storm Manhole
■ Regulatory Floodway	— Combined Sewer
	— Sanitary Sewer
	— Storm Sewer

River Des Peres at 7425 Shaftesbury Ave
Ranked #5 in the Erosion Category



Problem Description:
 Concrete slabs lining a tributary to the River des Peres are undermined and have failed, looking upstream. The foundation of the concrete-curb adjacent U-Haul parking lot is exposed on the east side of the channel. At-risk infrastructure includes the commercial parking lot, an inlet manhole, and a pipe outfall.




Undermined concrete slabs with adjacent at-risk infrastructure, looking upstream. The concrete box culvert under Olive Boulevard (background) appears stable.



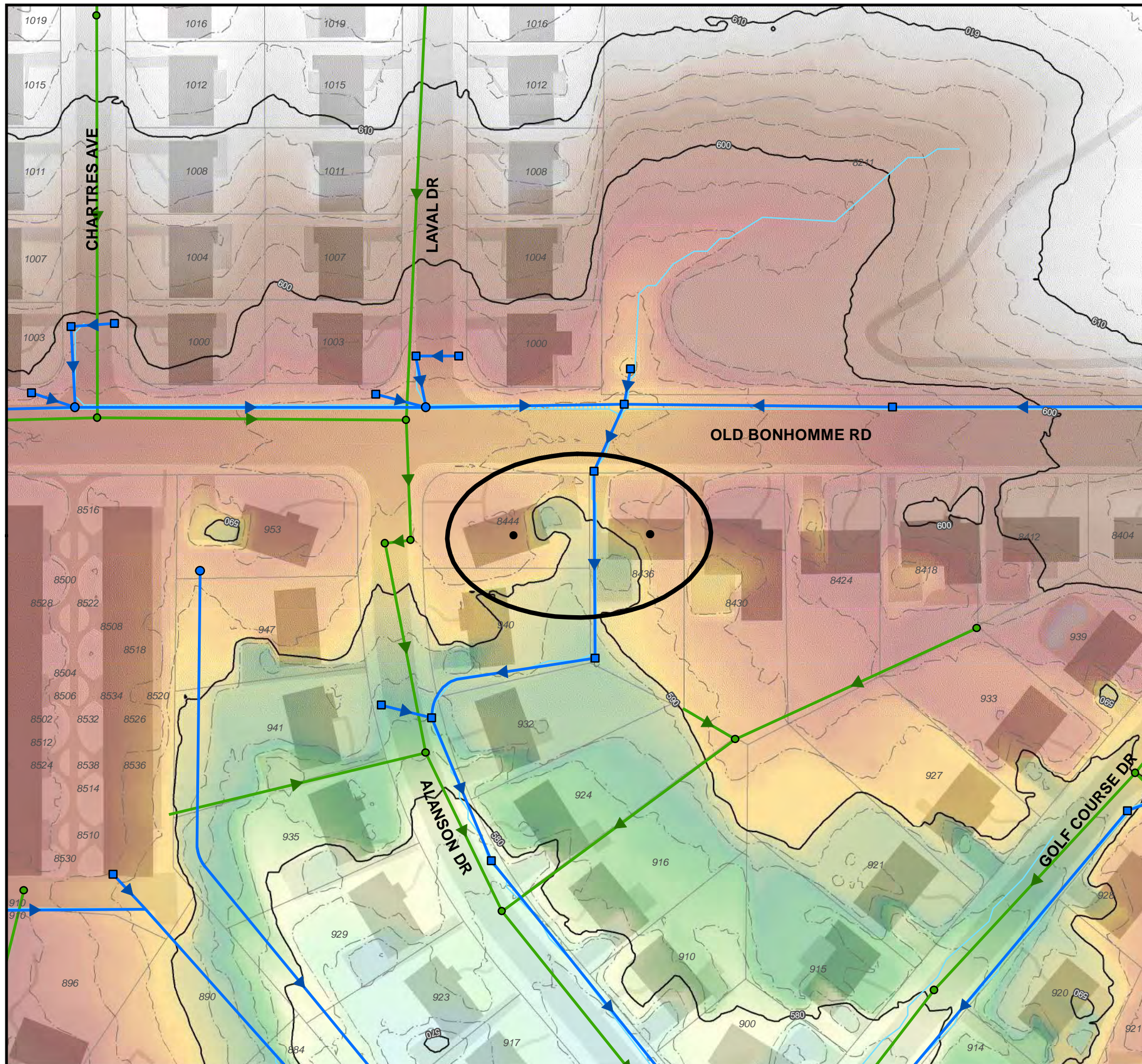
Exposed foundation of the adjacent parking lot.

Legend

● Stormwater Problem Point	Existing MSD System
▭ Problem Location	■ Combined Inlet
— Flow Path Line	■ Storm Inlet
⋯ Watershed Boundary	▲ Storm Intake-Outfall
Flood Hazard Zone	● Combined Manhole
Light Blue 1.0% Annual Chance Flood Hazard	● Sanitary Manhole
Yellow 0.2% Annual Chance Flood Hazard	● Storm Manhole
Pink/Blue Regulatory Floodway	— Combined Sewer
	— Sanitary Sewer
	— Storm Sewer


 0 30 60 Feet
 1 inch = 60 feet

Tributary to River Des Peres at Olive Blvd
Ranked #6 in the Erosion Category



Problem Description:

Basement garages at 8444 and 8436 Old Bonhomme Rd flood frequently from water which comes down the driveway at 8436 from the street. There is a triple curb inlet in front of 8436 Old Bonhomme Rd which accepts water from about 1,200 feet of Old Bonhomme Rd. The downstream pipe is 24" in diameter.

MSD has studied the problem and identified storm sewer upsizing as a solution. It may also be beneficial to investigate other opportunities for improvement, such as: A) increase inlet capacity at the street by adding inlets east of the triple inlet, B) raise a portion of the driveway at 8436 to keep water in the street, or C) provide a conveyance path down driveway and towards the at the property corner between #8436 and 940/932 Alanson Dr.



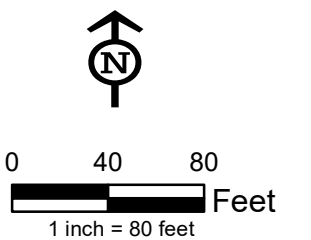
Looking south across Old Bonhomme Rd. #8436 is on the left and #8444 is on the right.



Looking at the ground in front of the driveway at 8436 Old Bonhomme Rd.

Legend

- | | |
|----------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| ▭ Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| Light Blue Box | ● Combined Manhole |
| Light Orange Box | ● Sanitary Manhole |
| Light Green Box | ● Storm Manhole |
| Light Blue Box | ▶ Combined Sewer |
| Light Green Box | ▶ Sanitary Sewer |
| Light Blue Box | ▶ Storm Sewer |



Old Bonhomme Rd
Ranked #2 in the Street Category



Problem Description:

Residents say that the low point on W Point Ct floods constantly. The street does not have a distinct crown. Asphalt patching has made the street uneven in some places. There are 4 inlets near the low point, but non appear very efficient. There is not a well-defined sag and inlets appear to clog easily with leaves.



Looking towards the grated curb inlet with side intake between #416 and 414. The side intake is rather narrow and the grate is clogged with leaves.



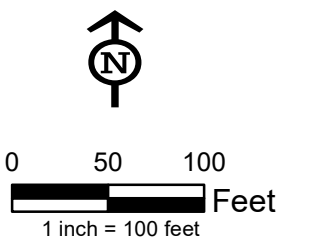
Looking south towards the inlets in front of #414 and 415. Both of these inlets are grated with a side intake.



Looking north towards the northern two inlets on W Point Ct. Both are grated inlets with side intakes.

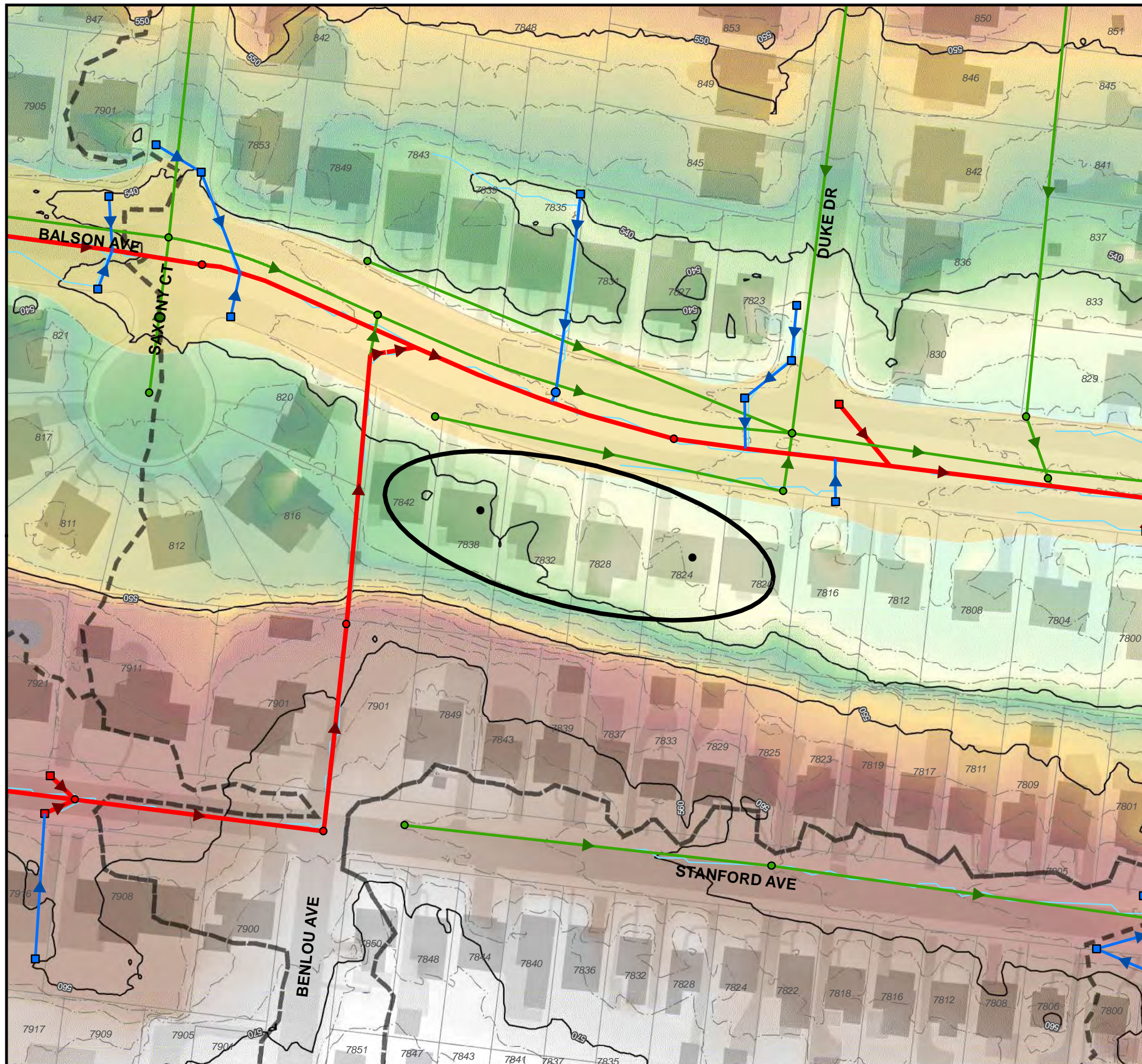
Legend

- Stormwater Problem Point
 - Problem Location
 - Flow Path Line
 - Watershed Boundary
 - Combined Inlet
 - Storm Inlet
 - ▲ Storm Intake-Outfall
 - Combined Manhole
 - Sanitary Manhole
 - Storm Manhole
 - Combined Sewer
 - Sanitary Sewer
 - Storm Sewer
- Flood Hazard Zone**
- Light Blue: 1.0% Annual Chance Flood Hazard
 - Light Orange: 0.2% Annual Chance Flood Hazard
 - Light Blue/Orange: Regulatory Floodway



W Point Ct

Ranked #4 in the Street Category



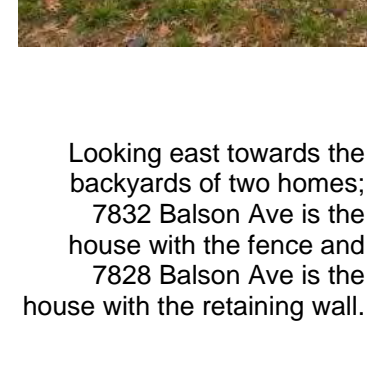
Problem Description:

The homes on Stanford Avenue sit about 18 feet higher than the homes on Balson Ave. Between the houses is at a 3:1 slope. The flow path from the backyards to the front yards on Balson Ave is inadequate, causing frequent flooding to at least two of the homes on Balson Ave. The drainage area to the back of the homes is about 1.3 acres.

The basement stairwell at 7838 Balson Ave. Sand bags and sump pumps have been added to try to keep the basement from flooding.



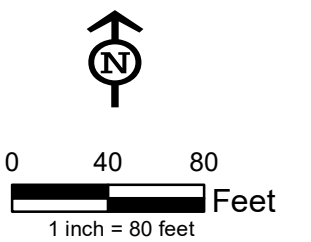
Looking west in the backyard of 7838 Balson Ave. The house is on the right.



Looking east towards the backyards of two homes; 7832 Balson Ave is the house with the fence and 7828 Balson Ave is the house with the retaining wall.

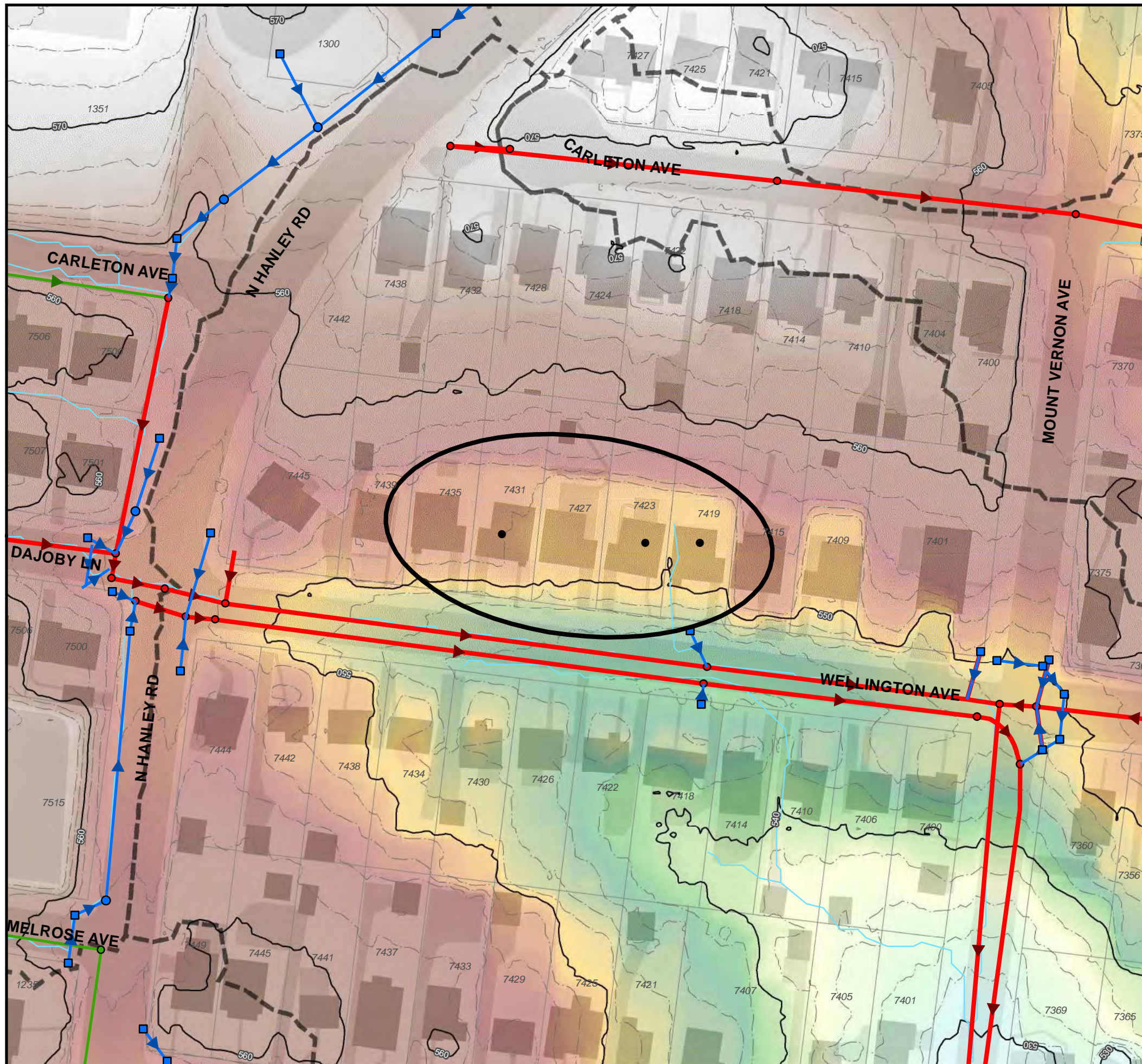
Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



Balson Ave

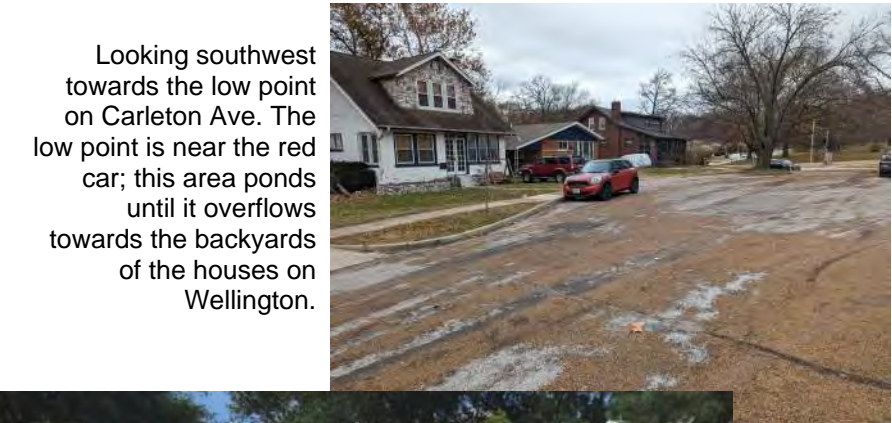
Ranked #1 in the Backyard Category



Problem Description:

About 2 acres of drainage reach the backyards between 7427-7419 Wellington Ave. There is not an adequate route for runoff to get past the houses and to the street, which is about 6 feet lower than the homes. As a result, the yards and basements of homes flood frequently.

It should be noted that there is a low point on the south end of the cul-de-sac for Carleton Ave which contributes to the drainage area; however, this area is not as significant as the contributing drainage area which includes the yards and homes of the surrounding properties.



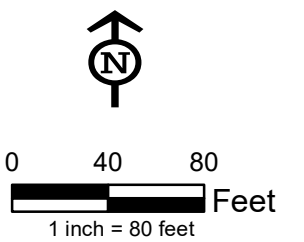
Looking southwest towards the low point on Carleton Ave. The low point is near the red car; this area ponds until it overflows towards the backyards of the houses on Wellington.



Looking north between #7423 (on the left) and #7419 (on the right). The space between houses may convey some of the runoff from the backyards, but the grading and available space is insufficient.

Legend

- Stormwater Problem Point
- Problem Location
- Flow Path Line
- Watershed Boundary
- Existing MSD System
 - Combined Inlet
 - Storm Inlet
 - ▲ Storm Intake-Outfall
 - Combined Manhole
 - Sanitary Manhole
 - Storm Manhole
 - Combined Sewer
 - Sanitary Sewer
 - Storm Sewer
- Flood Hazard Zone**
 - 1.0% Annual Chance Flood Hazard
 - 0.2% Annual Chance Flood Hazard
 - Regulatory Floodway



Wellington Ave

Ranked #4 in the Backyard Category

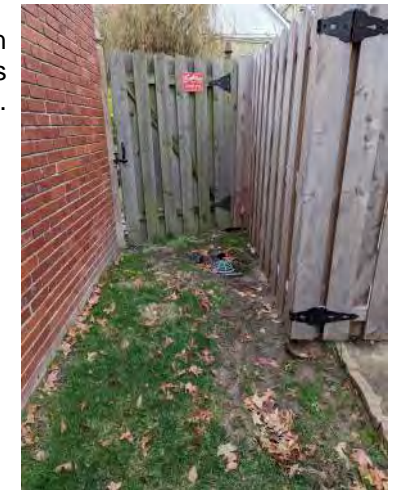


Problem Description:

About 2.3 acres of drainage flows to the backyards of three houses, causing flooding to yards and basements. There is no flow path to carry runoff past the houses and to the inlets in the street.

The houses in this area have basement tuck-under garages. The street and sidewalk flood but the basement garages have not flooded.

Looking north between #7924 and 7928 towards erosion and a yard drain.



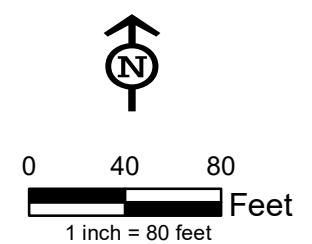
Looking west in the backyard of 7924 Lafon Pl. The house is out of frame on the right. The yard slopes towards the back of the house.



Looking east along the back of 7924 Lafon Pl. A yard drain was installed in an attempt to reduce ponding near the house.

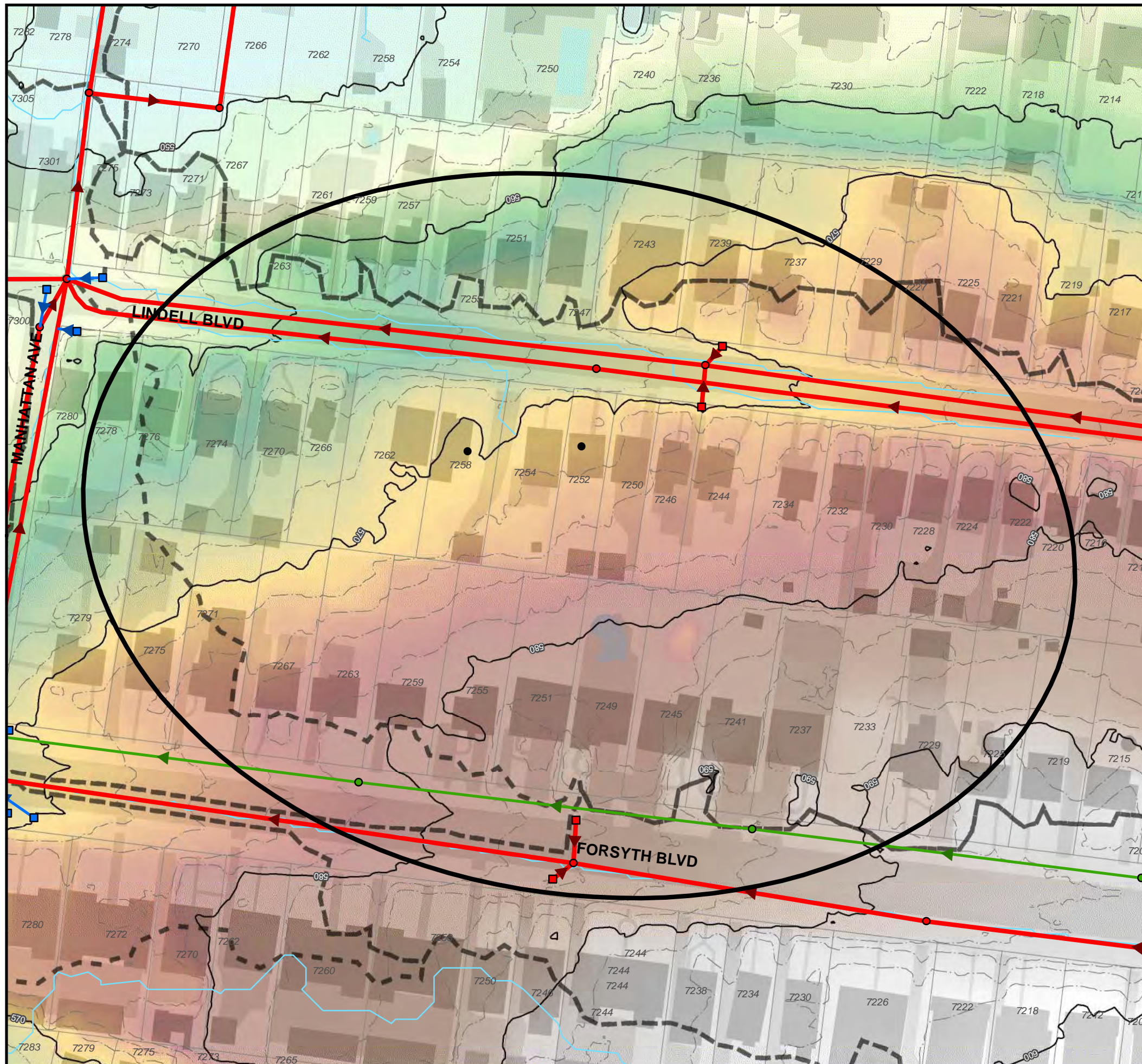
Legend

- | | |
|----------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| --- Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| Light Blue Box | ● Combined Manhole |
| Yellow Box | ● Sanitary Manhole |
| Light Blue Box | ● Storm Manhole |
| Light Blue Box | → Combined Sewer |
| Light Blue Box | → Sanitary Sewer |
| Light Blue Box | → Storm Sewer |



Clayton Gardens Subdivision

Ranked #5 in the Backyard Category



Problem Description:

The homes on Forsyth Blvd drain to the backyards of Lindell Blvd. There is no defined path for runoff to continue flowing to the street, so the yards, detached garages, and basements have frequent flooding. The drainage area to the back of the homes is about 2.3 acres.

Looking west towards the backyard at 7258 Lindell Blvd. The stairwell to the basement is under the porch.



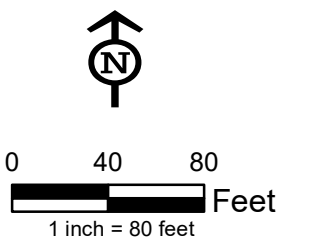
Looking north between #7252 (on the left) and #7250 (on the right). Basement windows are within 1-3 inches of the driveway - a potential source of flooding to the basements.



Looking west towards the backyard at 7252 Lindell Blvd. Ponding occurs near the steps to the patio. There is a stairwell to the basement under the porch.

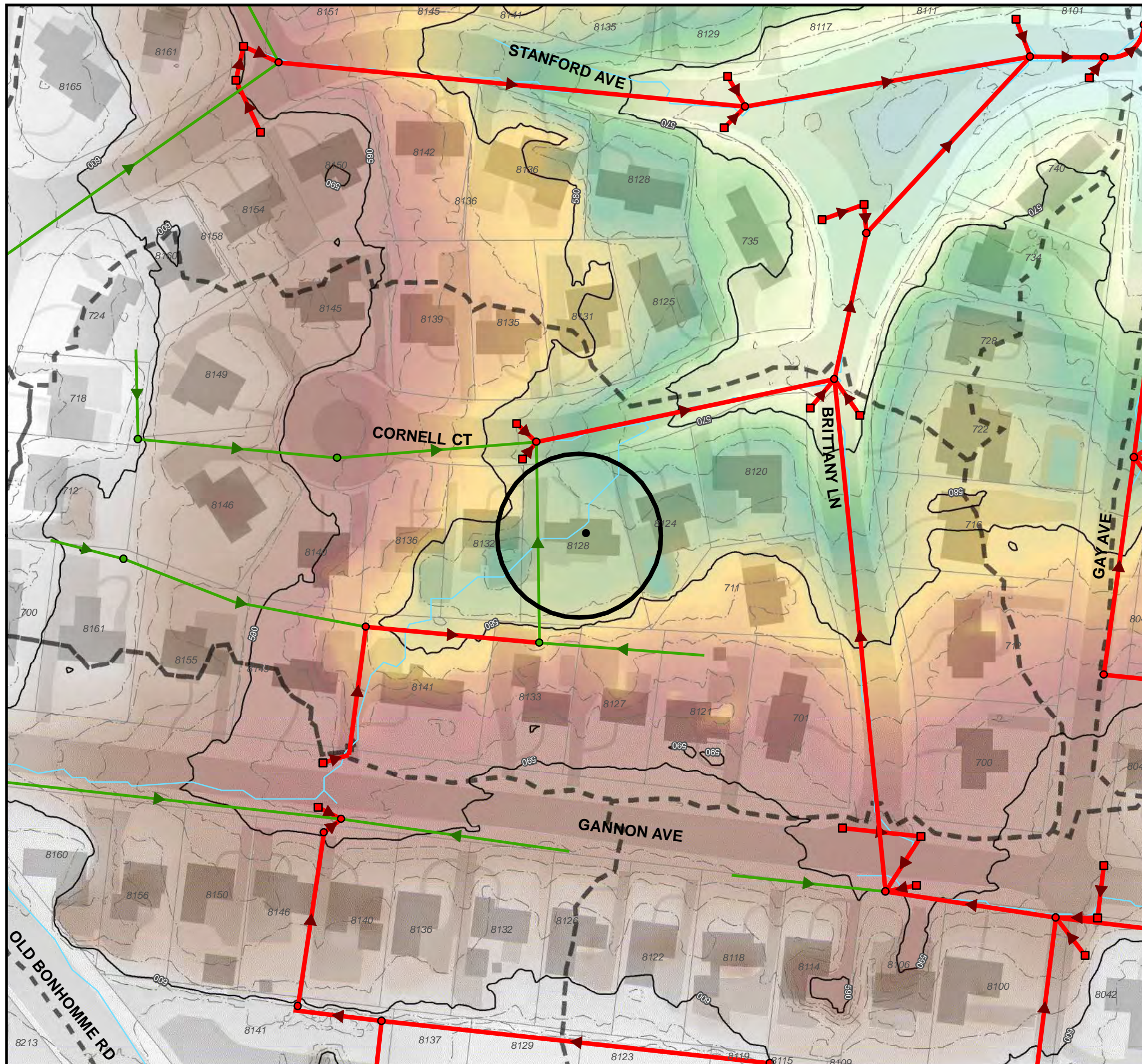
Legend

- | | |
|---------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| Light Blue Box | ● Combined Manhole |
| Yellow Box | ● Sanitary Manhole |
| Light Blue Box with Red Border | ● Storm Manhole |
| Light Blue Box with Blue Border | → Combined Sewer |
| | → Sanitary Sewer |
| | → Storm Sewer |



Forsyth Place Subdivision

Ranked #6 in the Backyard Category



Problem Description:

About 1.8 acres of drainage reaches the backyards of 8132 and 8128 Cornell Ct. #8132 has a basement garage which flooded significantly in the July 2022 events. #8128 has frequent yard flooding as well as basement seepage.

Looking towards the backyard of 8132 Cornell Ct; the basement garage has flooded since it is the low point of about 1.8 acres.



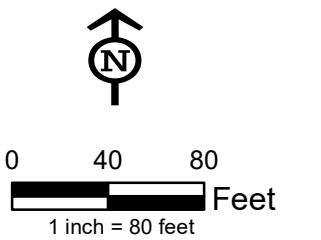
Looking west towards the backyard of #8132.



Looking southeast towards the backyard of 8128. The yard is sloped towards the house.

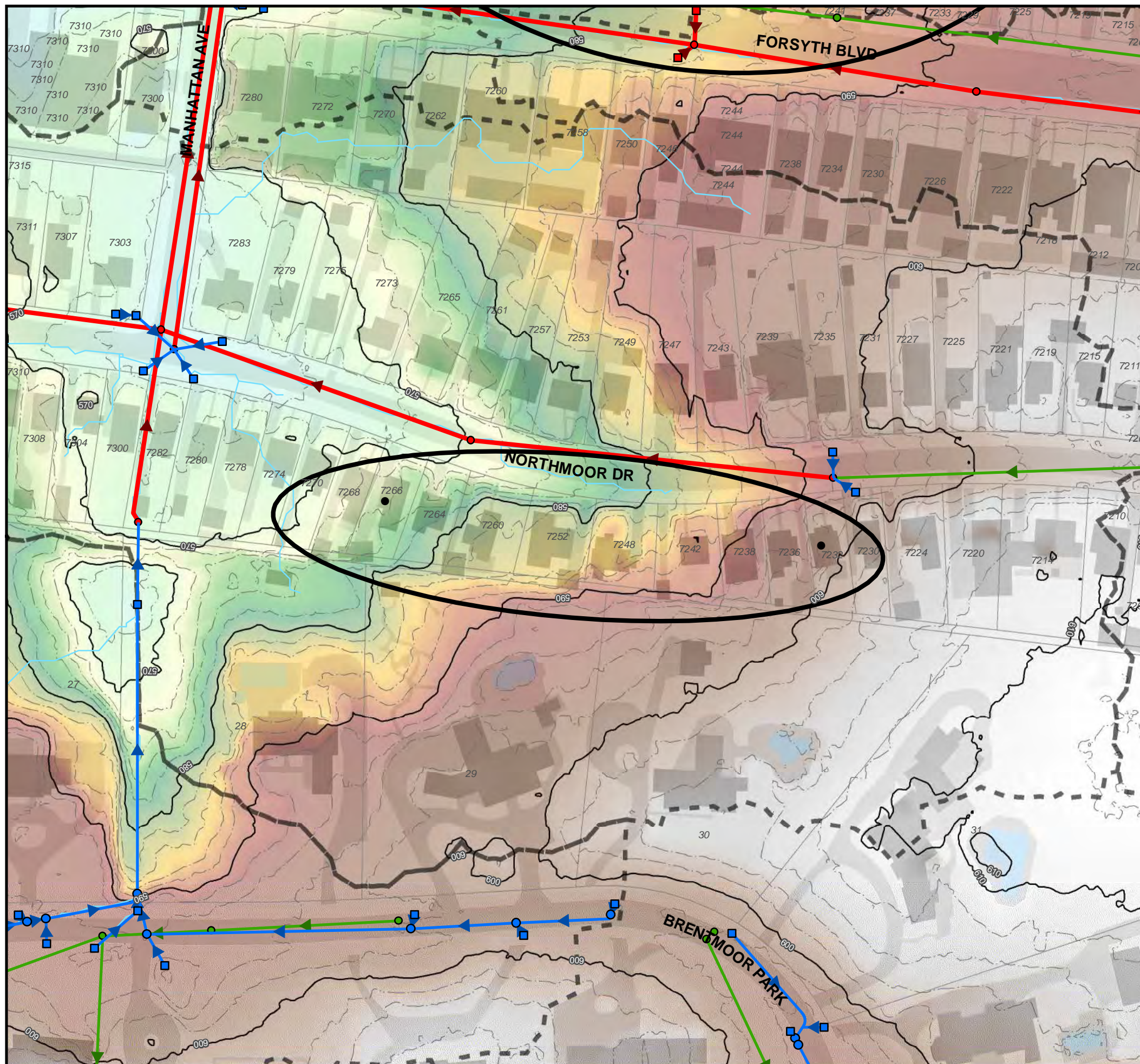
Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



Cornell Ct

Ranked #7 in the Backyard Category



Problem Description:

The homes on Brentmoor Park drain to the backyards on Northmoor Dr. The backyards of some homes receive about 1 to 1.5 acres of drainage. The drainage path past the houses varies; some homes have ineffective conveyance past the house, causing yard and basement flooding.

A slotted drain was installed by the homeowner at 7232 Northmoor Dr to reduce ponding against the house. This type of private drainage is common in the area.



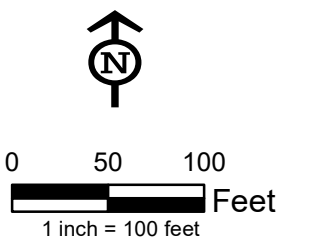
Looking north between #7236 (on the left) and #7232 (on the right). The tuck-under garage is at risk of flooding since the main flow path for water in the backyards is to flow down this driveway.



Looking east towards the backyard of 7236. The yard slopes towards the house; this is typical of the backyards in this area.

Legend

- | | |
|-----------------------------------|------------------------|
| ● Stormwater Problem Point | Existing MSD System |
| □ Problem Location | ■ Combined Inlet |
| — Flow Path Line | ■ Storm Inlet |
| - - - Watershed Boundary | ▲ Storm Intake-Outfall |
| Flood Hazard Zone | |
| ■ 1.0% Annual Chance Flood Hazard | ● Combined Manhole |
| ■ 0.2% Annual Chance Flood Hazard | ● Sanitary Manhole |
| ■ Regulatory Floodway | ● Storm Manhole |
| | — Combined Sewer |
| | — Sanitary Sewer |
| | — Storm Sewer |



Northmoor Park Subdivision

Ranked #8 in the Backyard Category