Stormwater Infrastructure Assessment and Capital Improvement Plan

Town of Esopus, NY

September 2019

Tighe&Bond
Engineers | Environmental Specialists

Services provided in New York by T&B Engineering, PC

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Executive Summary

This intent of this report is to guide the Town in meeting its long-term stormwater quantity, stormwater quality, and operations and maintenance goals. This Capital Improvement Plan (CIP) was developed for the purpose of identifying, prioritizing, and budgeting for stormwater infrastructure improvements. The plan intends to establish a baseline of information regarding the stormwater system, provide recommendations to support long-term, cost-effective, and comprehensive stormwater management in Esopus. The plan documents the:

- **Stormwater infrastructure inventory** undertaken to first understand the scope and condition of the existing stormwater system
- **Evaluation of the reported flooding issues** affecting residents for the purpose of categorizing flooding problems to effectively develop remedial solutions
- **Flooding capacity analyses** performed to assess identified flooding issues that may be related to system capacity deficiencies and propose a conceptual improvement alternative
- **Recommendations for future stormwater infrastructure investment** to outline the level of funding that should be considered for future improvements to the system

Stormwater Infrastructure Inventory

Tighe & Bond prepared an inventory of the existing stormwater infrastructure within the Town of Esopus through several weeks of field work to collect data and digitizing of available record drawings from the State Route 9W (Broadway) corridor. No record drawings of the Town owned drainage system were available. Ulster County owned stormwater infrastructure was generally not inventoried. Due to budgetary limitations Tighe & Bond was not able to traverse every road within the Town of Esopus to inventory drainage structures but focused on the most densely populated portions of the Town and areas were flooding was reported. Condition assessments of the stormwater infrastructure were made on the visible portions of the system.

A geographic information system (GIS) was developed to digitally record the information collected through the inventory and serve as a management tool for Town staff into the future.

Evaluation of the Reported Flooding Issues

Tighe & Bond conducted site visits to 54 areas reported by residents to have flooding issues. Notes and photos regarding each property were taken to help Tighe & Bond perform a desktop analysis and discuss potential solutions. Given the number of flooding issues and the cost of repairs it is not fiscally possible for the Town to address all of these issues simultaneously. Tighe & Bond worked with the Town staff to review the flooding issues and help prioritize and categorize each identified property.

Common contributing factors to flooding issues throughout the Town included the following:

- High groundwater tables
- Failing/end of service life stormwater infrastructure

- Undersized stormwater infrastructure
- Failed drainage on private property

After reviewing the various flooding issues from the site visits, properties experiencing flooding were grouped into the following five categories:

- Capacity Analysis Priorities
- County Drainage Issues
- Town Maintenance Issues
- Further Investigation Required
- No Further Action Warranted at this Time

Available drainage easements were researched associated with properties reporting flooding to investigate ownership of stormwater infrastructure inventoried on private property. In the past there have reportedly been instances where Town staff have installed stormwater infrastructure on private property without drainage easements but with verbal permission from residents to address drainage issues. This possess a problem for the Town to legally have access to maintain the infrastructure on private property, despite certain cases where the infrastructure on private property conveys flow from one catch basin within the Town right-of-way to another. In certain areas of the Town, it was uncertain if easements exist for the Town to maintain drainage facilities or whether responsibilities for maintenance rest with residents.

Flooding Capacity Analyses

Following the site visits, Tighe & Bond performed capacity analyses on six areas of the stormwater system categorized as capacity analysis priorities, through discussions with the Town. A conceptual improvement alternative recommended to mitigate the risk and impact of flooding was developed for each area, with a concept opinion of probable cost to implement the alternative. Costs assume that a contractor, hired by the Town, performs the work. If the Town can use its own staff to install some of the stormwater infrastructure, there could be a potential overall savings.

Recommendations for Future Stormwater Infrastructure Investment

In 2019 the Town of Esopus budgeted $41,050.00 for drainage improvements. This amount was split between two lines items: "1 Pers Serv" and "4 Contractual". In addition to the Town budget amount, funding for stormwater related improvements also comes from the Town's Highway Department, which is responsible for managing roadway drainage. The funding for this type of work is not specified in the Town's budget but is included in the Highway Department budget line item 5110.4 – General Budget but not broken out.

Future stormwater infrastructure investment recommendations have been grouped into three categories including:

- **Category A** items require improvements to address critical conditions, critical system needs, have the most impact on mitigating reoccurring flooding issues that that result in major property damage or health concerns. If financial resources allow, these items should be considered for completion within 5 years.
- **Category B** items require improvements that are less critical but address deficiencies, have an impact on mitigating reoccurring flooding issues that result in minor property damage, or may require preliminary engineering to develop the

specific scope of the project. If financial resources allow, these items should be considered for completion in 6 to 10 years.

- **Category C** items that may require improvements to address less critical deficiencies or future conditions. Monitor these projects over the next five years and reprioritize as needed.

The tables below summarize the budgetary costs for Category A and Category B and presents and annualized cost over two five-year periods or one ten-year period.

Summary of Capital Improvement Plan Costs

	Total Cost	**Annualized Cost Per Year**
Category A (0-5 years)	$2,136,900	$430,000
Category B (6-10 years)	$1,410,800	$280,000
Category A + B (0-10 years)	**$3,547,700**	**$360,000**

There are other projects planned in the Town of Esopus that are not reflected in the budgetary costs presented in the above CIP table but may include or overlap with potential stormwater and/or drainage improvement projects and should be considered part of implementation of this CIP, as a cost-effective way for the Town to improve the stormwater system.

Completing facilities, roadway, water, and/or drainage projects simultaneously would benefit the Town by reducing engineering and construction costs that would be required for separate projects. Requiring private developers do their share of stormwater management also lessens the burden on the Town.

There are some grant funding opportunities that exist to offset portions of the stormwater management costs that municipalities face. However, there are not currently grants that fund overall stormwater management, mitigating localized flooding, or stormwater system capacity improvements. The current available grant opportunities focus on MS4 Permit compliance assistance and stormwater quality improvements.

The Town has already applied for funding under the WQIP MS4 Mapping grant program. Other current grant program opportunities could address some portions of the recommended improvement included in this capital improvement plan that specially address stormwater quality.

Grant funding is a good way to supplement funding for stormwater management, as available, but The Town of Esopus should consider a more consist source of funding to ensure proper management of the Town's stormwater systems. Municipalities typically fund the majority of their stormwater management expense through property taxes and the Town's Annual Budget. Stormwater infrastructure is an asset that needs to be proactively managed to optimize the Town's expenditures, staff time, and overall effort.

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SECTION 1

Section 1
Introduction

This report represents the Town of Esopus's Stormwater Infrastructure Assessment and Capital Improvement Plan that will guide the Town in meeting its long-term stormwater quantity, stormwater quality, and operations and maintenance goals. This Capital Improvement Plan (CIP) was developed for the purpose of identifying, prioritizing, and budgeting for stormwater infrastructure improvements. The plan intends to establish a baseline of information regarding the stormwater system, provide recommendations to support long-term, cost-effective, and comprehensive stormwater management in Esopus. The plan documents the:

- **Stormwater infrastructure inventory** undertaken to first understand the scope and condition of the existing stormwater system
- **Evaluation of the reported flooding issues** affecting residents for the purpose of categorizing flooding problems to effectively develop remedial solutions
- **Flooding capacity analyses** performed to assess identified flooding issues that may be related to system capacity deficiencies and propose a conceptual improvement alternative
- **Recommendations for future stormwater infrastructure investment** to outline the level of funding that should be considered for future improvements to the system

An important component of this CIP is consideration of stormwater infrastructure as an asset that needs to be proactively managed to optimize the Town's expenditures, staff time, and overall effort.

1.1 Stormwater Systems

Stormwater infrastructure serves several important functions which can be broadly organized into two groups: drainage and water quality. The original goal of stormwater infrastructure was to remove water from roadways and other improved surfaces to prevent icing and flooding. The systems were designed to collect runoff and quickly discharge it to the nearest water course. Now that we better understand the role of stormwater as a transport mechanism for non-point source pollution, the scope of stormwater infrastructure design has expanded to include water quality treatment, groundwater infiltration, and peak flow attenuation.

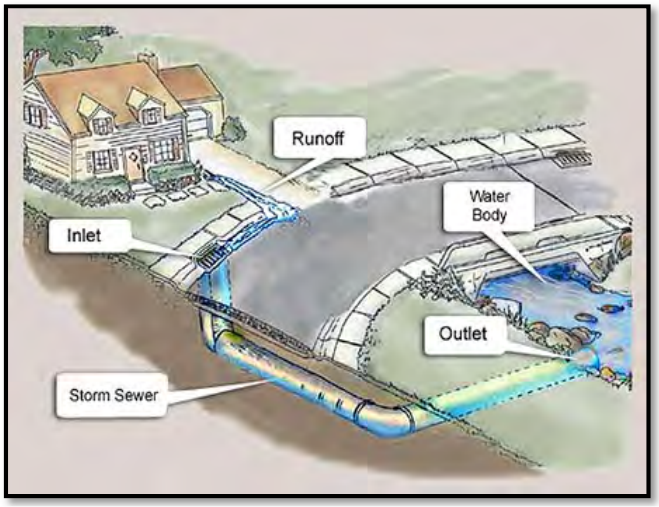

Figure 1-1 Stormwater Runoff Transports Pollutants into Nearby Waterbodies
Photo source: City of Kent, Washington at http://kentwa.gov/stormwater/

1.2 Project Background and History

The Town of Esopus has experienced more frequent stormwater drainage flooding in recent years. There is stormwater infrastructure (e.g. catch basins, manholes, drainage pipes, swales, and outfalls) within the Town boundaries that are State and County owned and maintained. Stormwater infrastructure in the right-of-way for State Route 9W (Broadway) and State Route 213 (Main Street) is owned by New York State. Stormwater infrastructure in the right-of-way for County Route 24 (Union Center Road/River Road), County Route 25 (New Salem Road), and County Route 16 (Old Post Road) is owned by Ulster County. Stormwater infrastructure within the local Town road rights-of-way and within drainage easements held by the Town is owned by the Town of Esopus.

There is a significant amount of stormwater infrastructure within the Town boundaries that exists outside of the State, County, and Town rights-of-way or drainage easements. Some of this "off-road" stormwater infrastructure connects and conveys stormwater from one right-of-way to another through private property. Some of the infrastructure is more isolated in nature and only serves to convey stormwater from one or two private properties.

From discussions with Town staff and residents much of the off-road stormwater infrastructure was installed by the Town in an attempt to alleviate historic flooding problems on resident's private properties. Often times there was a discussion and verbal agreement with the resident, but no formal drainage easement filed to legally allow the Town to maintain or improve off-road stormwater infrastructure after it was installed. In certain areas of the Town, it was uncertain if easements exist for the Town to maintain drainage facilities or whether responsibilities for maintenance rest with residents.

In addition, the Town of Esopus meets the regulatory threshold to be a Municipal Separate Storm Sewer System (MS4) community. New York State regulates the discharge of stormwater runoff that is transported into local water bodies through the State Pollution Discharge Elimination System (SPDES) General Permit for MS4s. The Town is required to meet certain permit criteria to address water quality of stormwater runoff. The purpose of the MS4 permit program is to reduce the amount of pollutants carried by stormwater during storm events to waterbodies, to the maximum extent practicable.

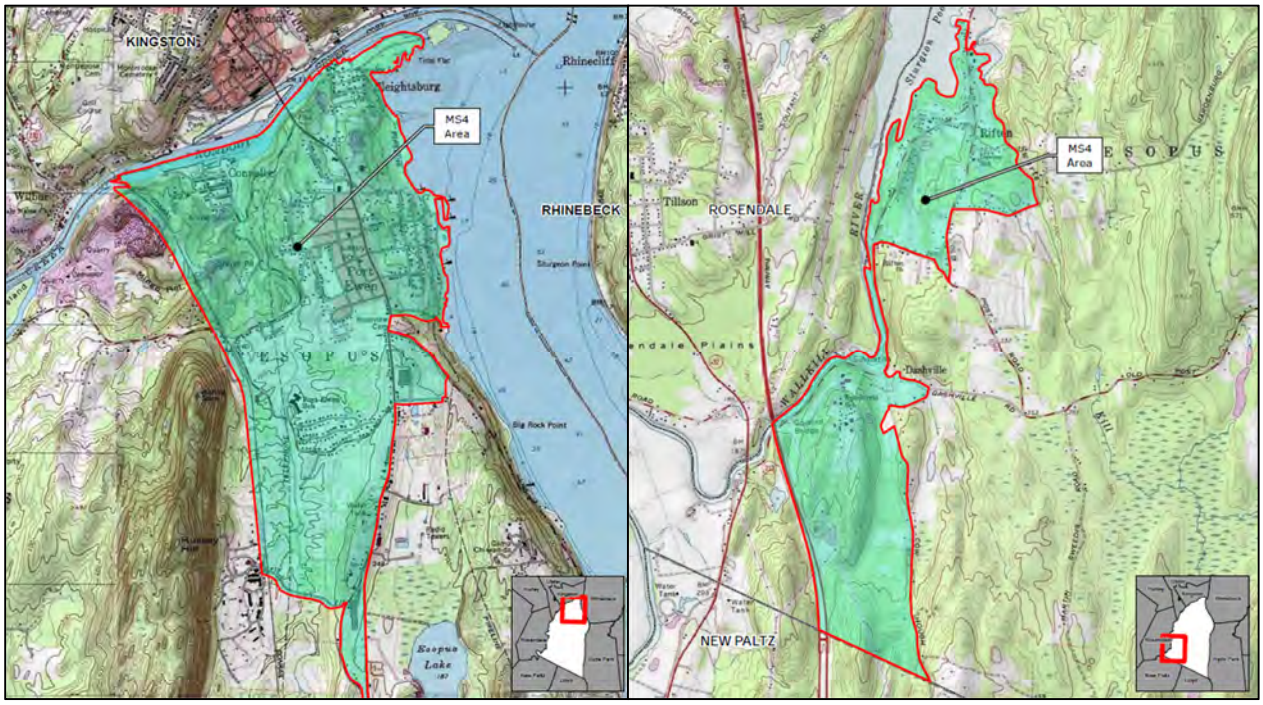

Figure 1-2 Town of Esopus MS4 Areas

1.3 Site Information

The Town of Esopus is bounded by the Wallkill River and Rondout Creek to the north and west and the Hudson River to the east. The topography of the Town rises steeply from the water courses that bound it on three sides. Portions of the Town are located within floodplains, but generally development is outside of the floodplain areas. See Appendix A for FEMA floodplain maps for the Town of Esopus.

The majority of soil in the Town of Esopus can be categorized into rock outcrops and C and D hydrologic soil groups. Group C soils typically have a moderately fine or finely textured soil layer that impedes the downward movement of water, creating a moderately high runoff potential. This is typically a silt or silty loam. Group D soils chiefly consist of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. As such, group D soils have a slow infiltration rate and high runoff potential. Another large portion of the Town contains rock outcrop formations, which also have high runoff potential. While better draining soils, group A and group B, are dispersed throughout the Town, the residences that reported flooding conditions are predominately located in areas with group C or D soils, or in urbanized areas with increased impervious ground cover, such as buildings or pavement. See Appendix A for USGS Soil Survey Map.

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SECTION 2

Section 2
Inventory of Stormwater Infrastructure and Site Visits

The extent of the existing Town owed stormwater system needed to be determined in order for the Town to mitigate future flooding issues and appropriately manage the stormwater system. For this purpose, Tighe & Bond conducted an inventory and assessment of the stormwater infrastructure and conducted research into potential easements for off-road infrastructure. A geographic information system (GIS) was developed to digitally record the information collected through the inventory and serve as a management tool for Town staff into the future.

2.1 Inventory Methodology

The inventory of stormwater infrastructure in Esopus was performed by Tighe & Bond staff over the course of several weeks during the spring of 2019. Structures logged in the inventory include catch basins, drain pipes, drain manholes, roadway culverts, driveway culverts, swales, and outfalls. Each structure was logged directly into a GIS collection application with information on each structure's location, measurements, and condition. Available record drawings from the State Route 9W (Broadway) stormwater system were digitized and added to the GIS system, as well for continuity. Tighe & Bond was not able to traverse every road within the Town of Esopus to inventory drainage structures but focused on the most densely populated portions of the Town and areas were flooding was reported.

Locations of structures were recorded in the GIS system based on their proximity to buildings and roads visible on satellite imagery. Horizontal measurements were taken using a measuring tape and vertical measurements were taken using a stadia rod. Ground surface elevations were taken from available Ulster County LiDAR contour data and used for the rim or top elevation of catch basins and manholes to establish invert elevations for these structures and inventoried drainage pipes. It is important to note that this inventory is not a land survey and should not be construed to have the same precision as a survey map developed by a land surveyor. The accuracy of the inventory developed is sufficient for planning purposes and conceptual evaluations.

By creating the inventory in a GIS system, the Town staff can actively update stormwater inventory data in real time and add notes regarding maintenance activities conducted on segments of the stormwater system. Included in the GIS system is a photograph of each structure that was field located.

Figure 2-1 Sample catch basin photograph
Photo source: Tighe & Bond

2.1.1 Condition Assessments

Condition assessments for stormwater structures inventoried were made based on the Federal Highway Administration (FHWA) Culvert Assessment Guide. This guide assigns a rating code to each culvert based on the overall material and the condition of various elements. These elements include the culvert's invert, joints, cross section deformation and others that vary on material. The lowest rating assigned to any element was considered the overall rating for the culvert. For consistency and simplicity, the FHWA Assessment Guide was adapted to rate the condition of catch basins and drain manholes. For these structures, each structure was assigned an overall rating rather than examining the condition of the specific elements of the structures. See Appendix B for the full FHWA Culvert Assessment Guide. The general format of these rating codes are as follows in Table 2-1.

TABLE 2-1
Federal Highway Administration (FHWA) Condition Assessment Guide

Designation	Description
Good	Like new, with little or no deterioration, structurally sound and functionally adequate.
Fair	Some deterioration, but structurally sound and functionally adequate.
Poor	Significant deterioration and/or functional inadequacy, requiring repair action that should, if possible, be incorporated into the planned project.
Critical	Very poor conditions that indicate possible imminent failure that could threaten public safety, should be given the highest priority for repair.
Unknown	All or part of the culvert is inaccessible for assessment or a rating cannot be assigned.

Condition ratings were only assigned to culverts, catch basins, and drain manholes. The condition of drainage pipes was not inventoried due to the inability to see down a pipe that is located within catch basins and manholes and buried many feet under the ground surface. Use of a closed-circuit television (CCTV) inspection is needed to assess the condition of buried drainage pipes but was beyond the scope of this inventory.

2.2 Inventory Findings

In total, the stormwater infrastructure inventory included mapping and a data collection for:

- 45 outfalls
- 378 catch basins
- 14 drain manholes
- 71 roadside swales
- 44 driveway culverts
- 202 roadway culverts
- 41,000± linear feet (7.7 miles) of drain pipe

These inventory numbers include the 158 roadway culverts included in the NAAC (North Atlantic Aquatic Connectivity Collaborative) Stream Crossing Inventory previously collected, of which approximately 126 are owned by the Town of Esopus. Also included in the inventory numbers above are approximately 5 outfalls, 91 catch basins, 5 drain manholes, 4,600 LF of drainage pipe that are owned by the State of New York. County-owned stormwater infrastructure was generally not included in the inventory.

2.2.1 Stormwater Assets by Category

The following sections break out the quantity of stormwater assets. Condition of drainage pipes and State-owned stormwater infrastructure are listed as unknown.

2.2.1.1 Outfalls

The distribution of outfalls inventoried diameters is categorized in Table 2-2 and Figure 2-2. Outfalls are discharge point from the piped drainage system to a receiving stream or swale.

TABLE 2-2
Outfalls Inventoried

Outfall Pipe Diameter	Quantity Inventoried	Percent of Total Inventoried
10"	1	2%
12"	15	33%
15"	7	16%
16"	2	4%
18"	8	18%
20"	1	2%
24"	6	13%
Unknown	5	11%
Total	**45**	**100%**

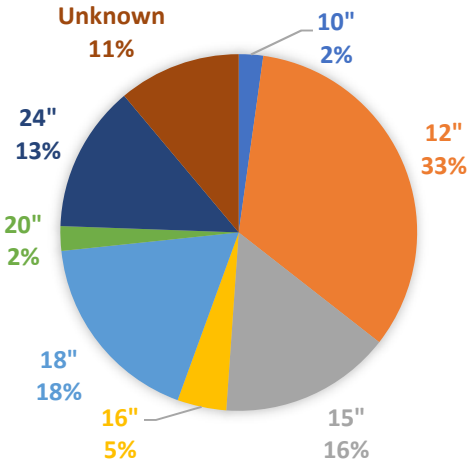

Figure 2-2 Distribution of Outfalls Inventoried

2.2.1.2 Catch Basins

The distribution of catch basins inventoried condition is categorized in Table 2-3 and Figure 2-3. Some of the catch basins of unknown condition exist in the Route 9W corridor which was digitized from record drawings and not field inventoried.

TABLE 2-3
Catch Basins Inventoried

Catch Basin Condition	Quantity Inventoried	Percent of Total Inventoried
Good	59	16%
Fair	151	40%
Poor	50	13%
Critical	13	3%
Unknown	105	28%
Total	**378**	**100%**

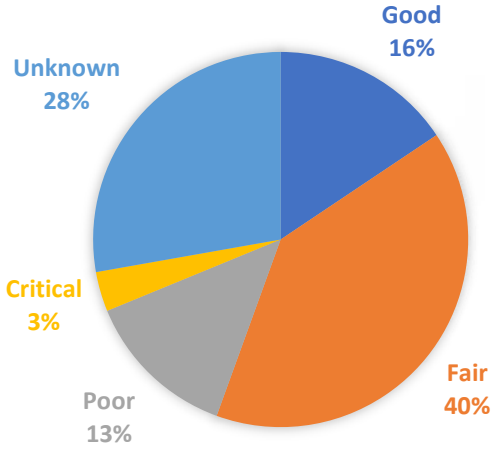

Figure 2-3 Distribution of Catch Basins Inventoried

2.2.1.3 Drain Manholes

The distribution of drain manholes inventoried condition is categorized in Table 2-4 and Figure 2-4. The majority of drain manholes inventoried exist in the Route 9W corridor which was digitized from record drawings and not field inventoried, therefore the condition is unknown.

TABLE 2-4
Drain Manholes Inventoried

Drain Manhole Condition	Quantity Inventoried	Percent of Total Inventoried
Good	0	0%
Fair	5	36%
Poor	0	0%
Critical	0	0%
Unknown	9	64%
Total	**14**	**100%**

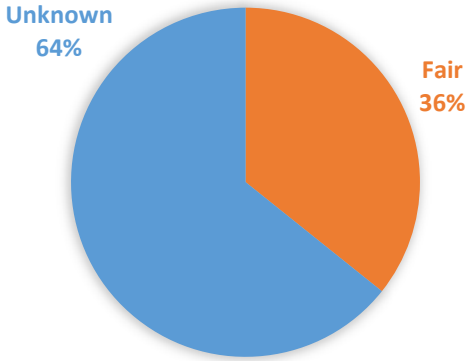

Figure 2-4 Distribution of Drain Manholes Inventoried

2.2.1.4 Driveway Culverts

The distribution of driveway culverts inventoried condition is categorized in Table 2-5 and Figure 2-5. The distribution of driveway culverts inventoried material is categorized in Table 2-6 and Figure 2-6. Driveway culverts are those culverts that convey water from one side to another of a driveway within the right-of-way. It does not account for culverts on private property.

TABLE 2-5
Driveway Culverts Inventoried Condition

Driveway Culvert Condition	Quantity Inventoried	Percent of Total Inventoried
Good	4	9%
Fair	27	61%
Poor	12	27%
Critical	1	2%
Total	**44**	**100%**

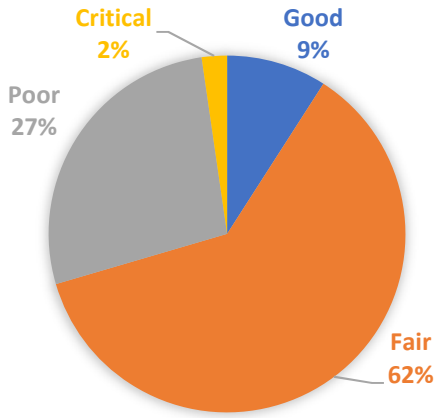

Figure 2-5 Distribution of Driveway Culvert Inventoried Condition

TABLE 2-6
Driveway Culverts Inventoried Material

Driveway Culvert Material	Quantity Inventoried	Percent of Total Inventoried
Corrugated Steel	22	50%
Polyethylene	12	27%
Steel	2	5%
Other	8	18%
Total	**44**	**100%**

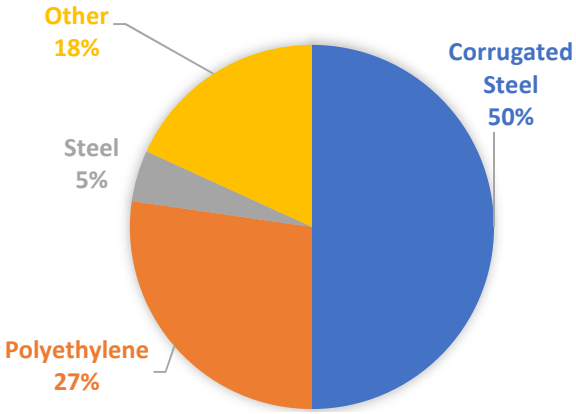

Figure 2-6 Distribution of Driveway Culvert Inventoried Material

2.2.1.5 Roadway Culverts

The distribution of roadway culverts inventoried condition is categorized in Table 2-7 and Figure 2-7. The distribution of roadway culverts inventoried material is categorized in Table 2-8 and Figure 2-8. Roadway culverts are those culverts that convey water from one side to another of a roadway within the right-of-way.

TABLE 2-7
Roadway Culverts Inventoried Condition

Roadway Culvert Condition	Quantity Inventoried	Percent of Total Inventoried
Good	3	1%
Fair	138	68%
Poor	45	22%
Critical	4	2%
Unknown	12	6%
Total	**202**	**100%**

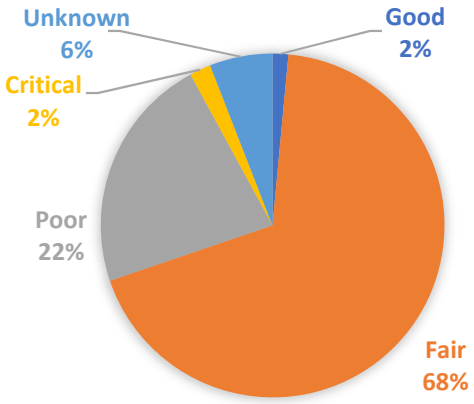

Figure 2-7 Distribution of Roadway Culvert Inventoried Condition

TABLE 2-8
Roadway Culverts Inventoried Material

Roadway Culvert Material	Quantity Inventoried	Percent of Total Inventoried
Corrugated Steel	87	43%
Polyethylene	48	24%
Steel	2	1%
Concrete	24	12%
Rock/Stone	1	0%
Combination	20	10%
Other	2	1%
Unknown	18	9%
Total	**202**	**100%**

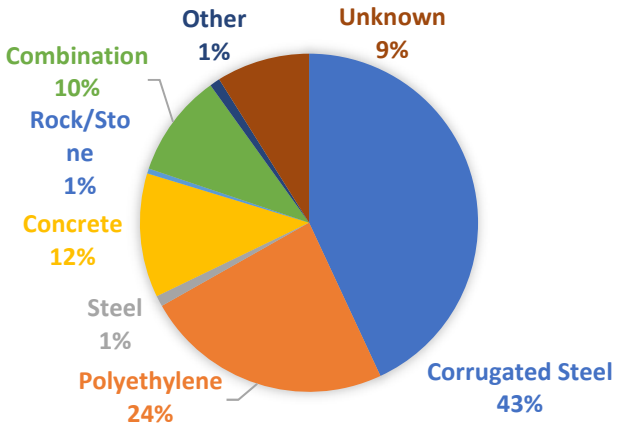

Figure 2-8 Distribution of Roadway Culvert Inventoried Material

2.2.1.6 Drain Pipes

The distribution of drain pipes inventoried material is categorized in Table 2-9 and Figure 2-9a. The distribution of drain pipes inventoried size is categorized in Table 2-10 and Figure 2-9b. The majority of the unknown pipe material and diameter inventoried exists in the Route 9W corridor which was digitized from record drawings.

TABLE 2-9
Drain Pipe Inventoried Material

Drain Pipe Material	Linear Feet Inventoried	Percent of Total Inventoried
Corrugated Steel	16,347	40%
Polyethylene	8,092	20%
Steel	1,738	4%
Concrete	1,099	3%
Other	3,761	9%
Unknown	9,623	24%
Total	**40,660**	**100%**

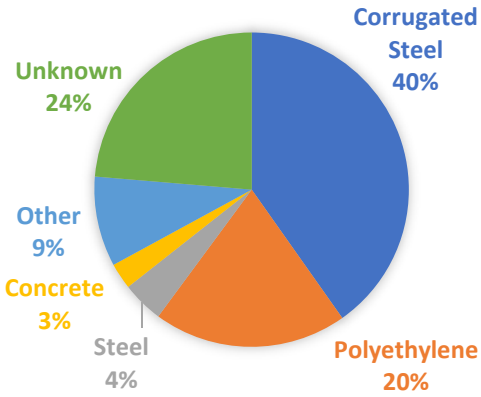

Figure 2-9a Distribution of Drain Pipe Inventoried Material

TABLE 2-10
Drain Pipe Inventoried Size

Drain Pipe Size	Linear Feet Inventoried	Percent of Total Inventoried
1.5"	16	0%
2"	59	0%
3"	295	1%
3.5"	6	0%
4"	945	2%
6"	3,068	8%
8"	1,936	5%
10"	1,619	4%
12"	8,339	21%
15"	4,312	11%
16"	726	2%
18"	5,345	13%
20"	19	0%
24"	3,498	9%
28"	230	1%
30"	623	2%
Unknown	9,623	24%
Total	**40,660**	**100%**

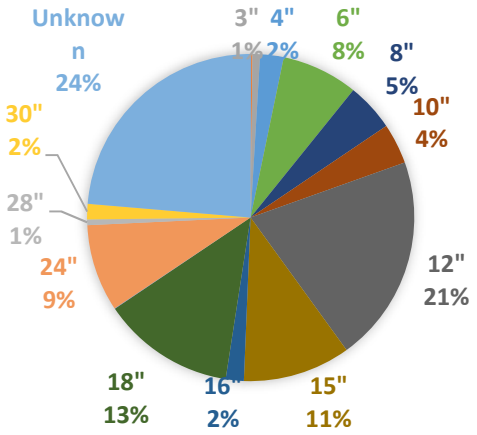

Figure 2-9b Distribution of Drain Pipe Inventoried Diameter

Figure 2-10 – Figure 2-26 show the extent of stormwater infrastructure inventoried as part of this project and provides a general scope of the stormwater system in the Town of Esopus; however, not all portions of the Town have been inventoried.

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Stormwater Mapsheet
- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- Drain Pipe
- NAAC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP

N

0 2,000 4,000 Feet

1:24,000

NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-10

Stormwater System Inventory
Esopus, New York

August 2019

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ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
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- Catch Basin
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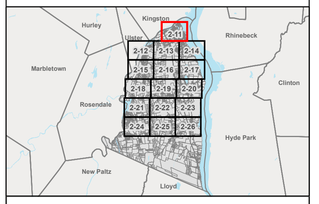
LOCUS MAP



N

0 300 600 Feet

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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-11

Stormwater System Inventory
Esopus, New York

August 2019

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Services provided in New York by T&B Engineering, P.C.

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ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
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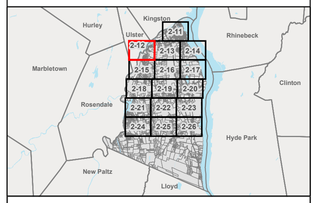
LOCUS MAP



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Feet

1:3,600

NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-12

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

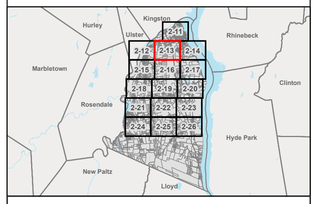
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



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0 300 600
Feet

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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-13

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

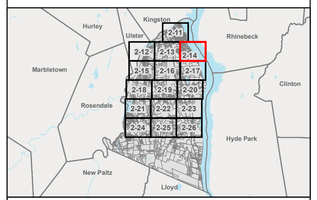
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-14

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
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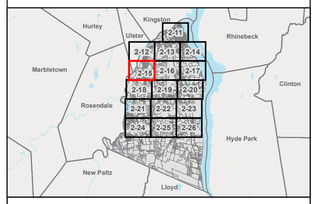
ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-15

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

Ulster
Rosendale
Decker St
Main St
State Route 213
Pokonole Rd
Union Center Rd
Buzdygan Ct
Van Wagner Rd
William White Rd
Highland Rd
Valley Rd
48944
48941
48942
CB_923
CB_919
CB_920
CB_927
CB_922

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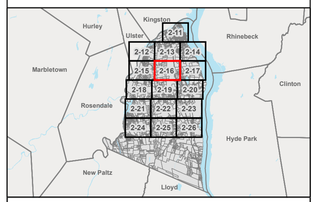
ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-16

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
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Services provided in New York by T&B Engineering, P.C.

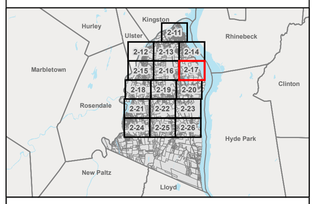
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



N

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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-17

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

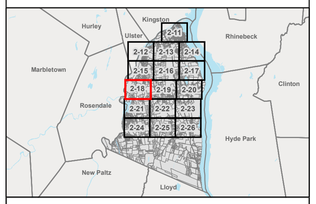
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



N

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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-18

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
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Services provided in New York by T&B Engineering, P.C.

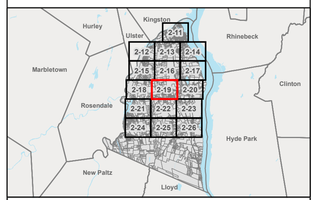
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



N

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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-19

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

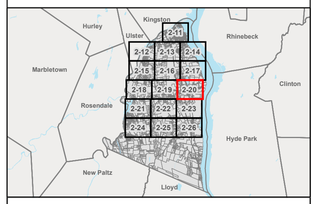
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-20

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

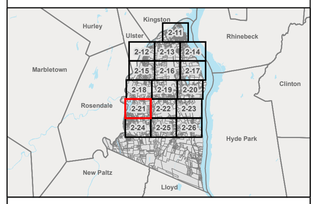
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



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0 300 600 Feet

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NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-21

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

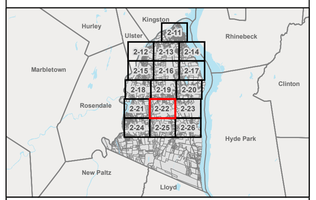
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



0 300 600 Feet

1:3,600

NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-22

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

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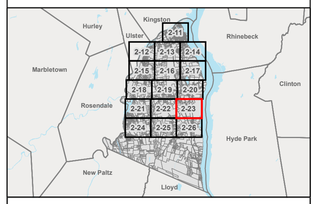
ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



N

0 300 600 Feet

1:3,600

NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-23

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP

N

0 300 600 Feet

1:3,600

NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-24

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

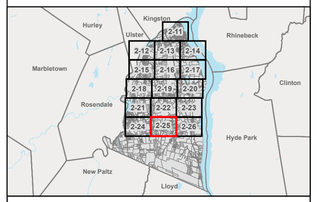
G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP



N

0 300 600 Feet

1:3,600

NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-25

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Outfall
- Drainage Manhole
- Catch Basin
- NYSDOT Catch Basin
- Roadway Culvert
- Driveway Culvert
- Swale
- DrainPipe
- NAACC Culvert
- Waterbodies
- Watercourse
- Parcel Boundary

LOCUS MAP

N

0 300 600 Feet

1:3,600

NOTES

Stormwater system data developed by Tighe & Bond based on information provided by Town of Esopus, NY & and field investigations performed by Tighe & Bond, May, 2019

Figure 2-26

Stormwater System Inventory
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

G:\GIS\NY\EsopusNY\avproj\DrainageMapsheets_22x34.mxd

2.3 Site Visits to Reported Flooding Areas

Following a storm event on September 12, 2018, the Town identified 62 reported flooding areas where they received reports of flooding from residents. Tighe & Bond conducted investigations in areas over the course of several weeks during the spring and summer of 2019 to identify flooding causes. Tighe & Bond staff typically completed the following tasks at each site:

- Talked with resident(s) or neighbor(s) if available to better understand the flooding concerns around the property
- Reviewed stormwater flow on the property by assessing the prevailing grades to try to identify the origin of stormwater causing the issue
- If applicable, reviewed the stormwater structures in the area to identify potential failure and maintenance issues
- Walked and/or drove around the surrounding area to identify the general direction of stormwater run-off and assess potential solutions
- Identified restrictive features that may cause a high groundwater table, such as a nearby wetland or stream and observed groundwater level where possible via wells

Notes and photos regarding each property were taken to help Tighe & Bond perform a desktop analysis and discuss potential solutions. Given the number of flooding issues and the cost of repairs it is not fiscally possible for the Town to address all of these issues simultaneously. Tighe & Bond worked with the Town staff to review the flooding issues and help prioritize and categorize each identified property. While discussing the findings from site visits and potential solutions with the Highway Department, Tighe & Bond deprioritized properties which the Highway Department said they were already working on in summer of 2019.

Figure 2-27 Site Visit Photo of Catch Basin Not Draining

The following priority selection criteria was developed, and flooding issues that satisfied more of the criteria were deemed to be a higher Town priority:

- Public Safety
- Major Property Damage
- Critical Condition Pipe/Structures
- Town Owned Drainage Facilities
- Formalized Easements for "off-road" drainage
- Flooding impacts to multiple properties

After reviewing the various flooding issues from the site visits, properties experiencing flooding were grouped into the following five categories:

- **Capacity Analysis Priorities –** Properties that appear to be connected to potential capacity issues that require engineering capacity analyses and have been identified as priorities
- **County Drainage Issues** – Properties where flooding appears to be caused by County-owned drainage issues and should be referred to Ulster County to address
- **Town Maintenance Issues** – Properties for which Town maintenance can likely address flooding without the use of engineering analysis or properties that are already being managed by the Town Highway Department
- **Further Investigation Required** – Properties that require further investigation to identify the flooding cause but do not seem to have a capacity issue requiring engineering capacity analyses or could potentially have capacity issues but were not identified as the top six capacity priorities
- **No Further Action Warranted at this Time** – Properties that experience flooding that appear unrelated to the Town-owned drainage system

See Figure 2-28 for an overview of the 62 reported flooding areas investigated.

ESOPUS STORMWATER SYSTEM INVENTORY AND EVALUATION

LEGEND

- Reported Flooding Issue
- Waterbodies
- Parcel Boundary

LOCUS MAP

N

0 2,000 4,000 Feet

1:24,000

NOTES

1. Based on data provided by Town of Esopus NY

Figure 2-28
Reported Flooding Areas
Esopus, New York

August 2019

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

G:\GIS\NY\EsopusNY\avproj\DrainageParcelOverview_22x34.mxd

2.4 Findings of Site Visits

The information obtained through Tighe & Bond's site visits indicates that many of the flooding issues had a common thread and that many of issues were consistent throughout an individual drainage watershed. Often times if one resident had an issue in a drainage watershed, residents adjacent and further downstream in the same watershed reported similar issues. Common threads of issues allowed Tighe & Bond to take a more comprehensive look at stormwater system issues rather than making recommendations to address one property at a time. There were 20 properties (32%) with reported flooding issues that fell into the Capacity Analysis Priorities category.

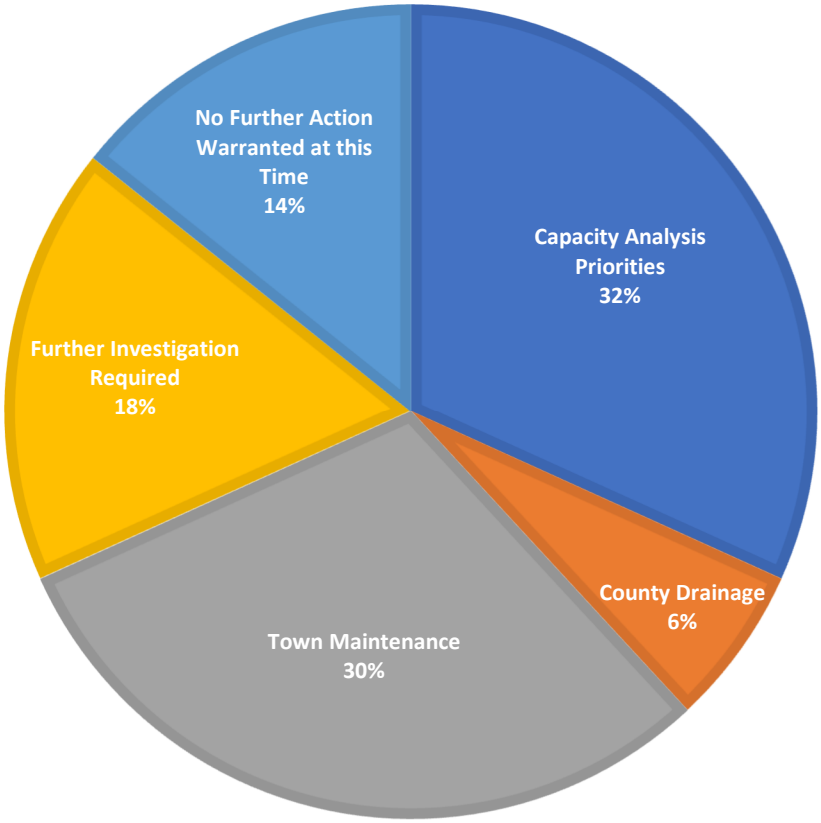


Figure 2-29 Reported Flooding Area Categorization

See Appendix C for results from site visits and recommendations for the 62 reported flooding areas reported.

Common contributing factors to flooding issues throughout the Town included the following:

- High groundwater tables
- Failing/end of service life stormwater infrastructure
- Undersized stormwater infrastructure
- Failed drainage on private property

In general, Tighe & Bond observed that the majority of the residents who had flooding issues reported increased groundwater elevation. While groundwater level is not typically controlled or managed by Towns it is important to make sure that the Town owned stormwater infrastructure is not contributing to the groundwater issues in a negative way. Negative impacts to groundwater can include failed pipe segments that allows upstream surface water runoff to influence the groundwater table, runoff from roadways that is not managed appropriately, or a lack of drainage system that causes ponding and prohibits stormwater flow away from private property.

It should be noted that the 62 parcels evaluated only represent a small portion approximately 3,500 households in the Town of Esopus. While all 3,500 households do not have flooding issues, it is safe to assume that additional households not included in this report are also having flooding concerns. This process of evaluating and reprioritizing should occur on a regular basis within the Town.

2.4.1 Available Existing Easements

In order that the Town has the legal ability to maintain stormwater infrastructure not within the Town right-of-way or Town owned properties, easements granting access to private property are required. A drainage easement allows the Town to maintain and make improvements to stormwater infrastructure on private property. In the past there have reportedly been instances where Town staff have installed stormwater infrastructure on private property without drainage easements but with verbal permission from residents to address drainage issues.

This presents a problem for the Town to legally have access to maintain the infrastructure on private property, despite certain cases where the infrastructure on private property conveys flow from one catch basin within the Town right-of-way to another. In addition, New York State will not fund projects for which the municipality receiving the funding does not control the infrastructure improvement by means of owning the property, right-of-way, or possessing a written easement filed on the land records.

The following properties were found to have existing drainage easements recorded on the Ulster County Land Records. Easement research was focused on the properties with reported flooding areas. Other drainage easements may exist other than those listed below. See Appendix D for unofficial copies of the available easement documents.

- 5 River Road, Port Ewen
- 166 First Street, Connelly
- 190 Lindorf Street, Ulster Park
- 204 Lindorf Street, Ulster Park
- 225 Lindorf Street, Ulster Park
- 227 Lindorf Street, Ulster Park
- 229 Lindorf Street, Ulster Park
- 233 Lindorf Street, Ulster Park
- 235 Lindorf Street, Ulster Park
- 205 Rogers Street, Ulster Park
- 186 Eugene Street, Port Ewen
- 184 Doris Street, Port Ewen
- 3 Valley Road, Ulster Park

Where the Town plans to make stormwater infrastructure improvements in the future, property owners should grant drainage easements to be filed on the Ulster County Land Records that provide the Town legal access to install and maintain any new stormwater infrastructure.

Tighe&Bond

SECTION 3

Section 3
Flooding Capacity Analyses

During the site visits to the flooding areas identified by the Town and resident, Tighe & Bond categorized flooding issues into several groups outlined in Section 2. One of the groups were flooding areas that appeared to be connected to potential structural capacity issues requiring engineering analysis. This section describes the capacity analysis conducted on those areas of the stormwater system and a conceptual improvement alternative recommended to mitigate the risk and impact of flooding.

The evaluation was limited to six areas of the stormwater system that the Town selected as priorities based on the criteria presented in Section 2. The information used to conduct the capacity analysis is approximate in nature and based on the inventory data collected, along with some assumptions of stormwater system connectivity based on the best available information. If the Town decides to move forward with the improvement alternatives identified, a land survey of the corridor should be completed along with a more detailed engineering design. Some of the concept improvements may also require the acquisition of drainage easements.

3.1 Capacity Analyses Methodology

The capacity analyses were performed by calculating the contributing stormwater flow to the mainline stormwater pipes or channels under various design storm rainfall event. The stormwater flow was then routed through the mainline stormwater pipes to the outfall of the system. The capacity and occurrence of surcharging, or flooding, of the stormwater system was analyzed. The following methodologies and inputs were used in development of the capacity analyses.

- United States Department of Agriculture (USDA) Technical Release 55 (TR-55) *Urban Hydrology for Small Watersheds* Method used for hydrologic calculations
- Time of Concentration (Tc) calculated for larger watersheds, smaller watersheds minimum 5 min. for impervious and 10 min. for grass was used
- National Oceanic and Atmospheric Administration (NOAA) Atlas 14 precipitation design storms used

TABLE 3-1
Design Storm Probability and Precipitation Amount

Design Storm	Probability of Occurring in any one year	Precipitation over 24 hours (inches)[1]
1-Year	100%	2.55
2-Year	50%	3.16
5-Year	20%	4.17
10-Year	10%	5.00
25-Year	4%	6.14
50-Year	2%	6.98

[1] Precipitation data from NOAA Atlas 14 for Esopus, NY, refer to Appendix E.

It is not economically feasible to design a stormwater system to pass every possible rainfall event; therefore, we use benchmark design storms to size stormwater systems. Design storms are based on past rainfall data and have a statistical probability of occurring in any given year. For example, a 10-year design storm has a 10% chance of occurring any year and represents 5.00 inches of rainfall occurring over a 24-hour period in the Town of Esopus.

For reference, municipalities typically design their stormwater collection system for a 10-year or 25-year storm event. Existing capacity analyses were conducted for the 2-year, 5-year, 10-year, 25-year, and 50-year design storm events. Concept improvement alternatives were sized to pass the 25-year design storm event without flooding.

See Appendix E for information regarding capacity analyses modeling input and output data.

3.2 Concept Improvement Opinion of Probable Cost Methodology

The conceptual Opinions of Probable Costs are based on Class 5 level construction cost estimates, as defined by the Association for the Advancement of Cost Engineering (AACE) International Recommended Practices and Standards. According to AACE International Recommended Practices and Standards, the estimate class designators are labeled Class 1, 2, 3, 4, and 5, where a Class 5 estimate is based on the lowest level of project definition and a Class 1 estimate is closest to full project definition and maturity. The end usage for a Class 5 estimate is project screening or feasibility purposes. The expected accuracy range of a Class 5 estimate is between +50% to -30%.

The total project cost includes the cost of the project to construct, 15% general conditions to cover costs such as mobilization, demobilization, bonds, insurance, etc. and 40% engineering and contingency to cover engineering fees, legal fees, and contingency for scope items that may not have been fully developed during this conceptual level. The costs are based upon recently completed project bids and RSMeans Construction Cost Data. Construction costs assume that a contractor hired by the Town performs the work.

This is an engineer’s opinion of probable cost. Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the estimates of probable construction costs are made on the basis of the Tighe & Bond’s professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from this estimate of the Opinion Probable Cost.

3.3 Salem Street to Sentar Lane Capacity Analyses

The Salem Street to Sentar Lane area of the stormwater system consists of the pipe drainage network that connect a large portion of Port Ewen between Salem Street and Sentar Lane. Runoff from Hasbrouck Avenue and surrounding hillsides is collected in a piped drainage system that runs in two parallel mains, one along Bayard Street and the other through private properties. These two lines converge at a manhole on private property between Horton Lane and Sentar Lane from which stormwater is discharged into an existing stream. Drainage easements reportedly exist for portions of this stormwater system on private property. Flooding in this area is reported to affect the following properties, but others may also be impacted:

- 186 Hasbrouck Avenue
- 182 Hasbrouck Avenue
- 183 Schryver Street
- 179 Horton Lane
- 173 Horton Lane
- 170 Horton Lane
- 169 Sunset Drive
- 169 Sentar Lane

Figure 3-1 shows the extent of the portion of the stormwater system for which the capacity analysis was performed.

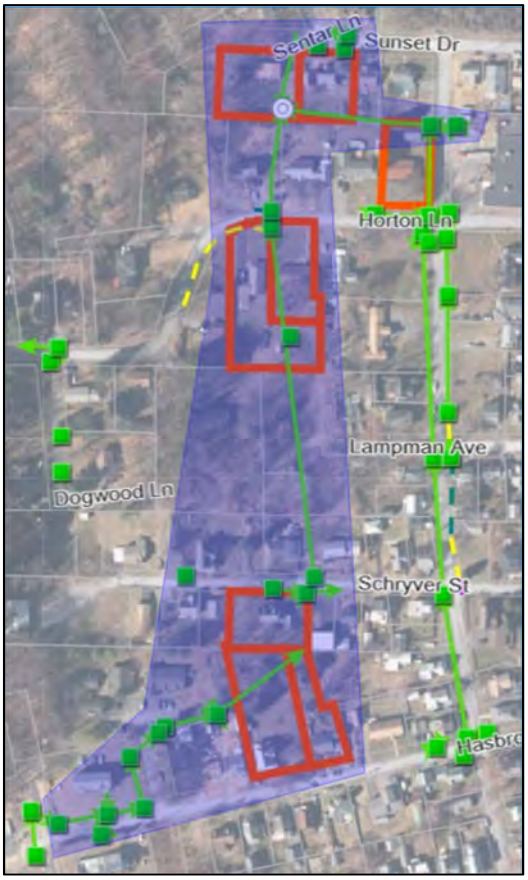


Figure 3-1
Salem-Sentar Modeling Extent

3.3.1 Existing Conditions Analysis

The existing conditions analysis indicates 5 structures become surcharged in the Salem-Sentar system during the 2-year and higher intensity storms. The model indicates that flooding is caused by undersized drainage pipes.

3.3.2 Concept Improvement Alternative

A concept improvement alternative was developed to convey stormwater through the system during a 25-year storm without surcharging. The concept improvement includes replacement of approximately 2,200 feet of existing undersized pipe, 11 catch basins, and 1 manhole. The proposed replacement pipe diameters vary from 12-inch to 48-inch diameter, including 85 feet of 24-inch replacement pipe from the Bayard Street system to the convergence manhole with the Salem-Sentar System. Table 3-2 details the opinion of probable cost to design and construct the concept improvement alternative.

TABLE 3-2

Salem Street to Sentar Lane Concept Improvement Alternative OPC

Item No.	Item	Quantity	Unit	Unit Price	Cost
1	12" HDPE Pipe	75	LF	$ 70	$ 5,250
2	18" HDPE Pipe	50	LF	$ 149	$ 7,450
3	24" HDPE Pipe	275	LF	$ 163	$ 44,825
4	30" HDPE Pipe	475	LF	$ 240	$ 114,000
5	36" HDPE Pipe	500	LF	$ 267	$ 133,500
6	48" HDPE Pipe	750	LF	$ 314	$ 235,500
7	Precast Concrete Catch Basins	11	EA	$ 5,000	$ 55,000
8	Precast Manhole	1	EA	$ 5,000	$ 5,000
		Drainage Infrastructure Subtotal			$ 601,000
9	General Conditions (15%)				$ 90,200
		Construction Cost Subtotal			$ 691,200
		Engineering and Contingency (40%)			$ 276,500
		Concept Improvement Alternative OPC			**$ 967,700**

3.4 Eugene Street to Doris Street Capacity Analyses

The Eugene Street to Doris Street area of the stormwater system consists of the watershed through George Ross Memorial Park and connecting, Park Lane, West Stout Avenue, Eugene Street, and Doris Street. Runoff from West Main Street collects into a piped drainage system that travels through Ross Park and properties on West Stout Avenue before running along Doris Lane where it ultimately discharges through an outfall that is picked up by channel that conveys flow to Mill Brook. Easements exist for a portion of the system on private property. Flooding in this area is reported to affect the following properties, but others may also be impacted:

- 187 Doris Street
- 227 Park Lane
- 192 West Stout Lane
- 188 Eugene Street

Figure 3-2 shows the extent of the portion of the stormwater system for which the capacity analysis was performed.

Figure 3-2 Eugene-Doris Modeling Extent

3.4.1 Existing Conditions Analysis

The existing conditions analysis indicates 2 structures are surcharged in the Eugene Street System during the 2-year and higher intensity storms. The model indicates that flooding is caused by undersized pipes. Pipe sizes in this system vary

between 6 and 18 inches but have sections where larger pipes discharge to smaller pipes. The convention for gravity drainage piped systems is to have pipe sizes increase moving downstream as more and more drainage watershed contribute to the collection system.

3.4.2 Concept Improvement Alternative

A concept improvement alternative was developed to convey stormwater through the system during a 25-year storm without surcharging. The concept improvement includes replacement of 1,125 linear feet of existing undersized pipe and 7 catch basins. Proposed pipe sizes vary from 24-inch to 36-inch diameter. Because the stormwater system passes through Ross Park, a Town owned property, the concept improvement also includes the addition of a bioretention basin to treat stormwater quality from the watershed upstream of Ross Park. A **bioretention basin** is a **stormwater management practice** that use filtering and adsorption to remove pollutants. Bioretention basins utilize landscaping and soils to treat urban stormwater runoff by collecting before filtering through a fabricated planting soil media. Table 3-3 details the opinion of probable cost to design and construct the concept improvement alternative.

TABLE 3-3

Eugene to Doris Concept Improvement Alternative OPC

Item No.	Item	Quantity	Unit	Unit Price	Cost
1	24" HDPE Pipe	250	LF	$ 163	$ 40,750
2	36" HDPE Pipe	875	LF	$ 267	$ 233,625
3	Precast Concrete Catch Basins	7	EA	$ 5,000	$ 35,000
4	Bioretention Basin	4,000	CF	$ 12	$ 48,000
				Drainage Infrastructure Subtotal	$ 358,000
5	General Conditions (15%)				$ 53,700
				Construction Cost Subtotal	$ 411,700
				Engineering and Contingency (40%)	$ 164,700
				Concept Improvement Alternative OPC	**$ 576,400**

3.5 Tilden Street Capacity Analyses

The Tilden Street area of the stormwater system consists of the watershed in the southern portion of Tilden Street that contributes to a drainage pipe that traverses 253 Tilden Street to an outfall at the Hudson River. Runoff from a watershed extending uphill to Hoyt Street collects on Tilden Street where it travels south via an asphalt swale and driveway culvert to two catch basins at the southern end of the street. These catch basins collect runoff and convey flow to the Hudson River through an outfall on private property. No easement was found associated with this system. Flooding in this area is reported to affect the following properties, but others may also be impacted:

- 238 Tilden Street (Not in Flood Assessment)
- 240 Tilden Street
- 253 Tilden Street

Figure 3-3 shows the extent of the portion of the stormwater system for which the capacity analysis was performed.

3.5.1 Existing Conditions Analysis

The existing conditions analysis indicates that the Tilden piped system under all assessed storm events (2, 5, 10, 25, and 50-Year) has sufficient capacity. However, the amount off runoff that is generated during the higher intensity storms exceeds the inlet capacity of the two catch basins that exist in Tilden street. In addition, the existing shallow swale does not have sufficient capacity during heavy rainfall events. It was reported that a natural gas main runs under the swale on the west side of Tilden, prohibiting deepening of the existing swale.

Figure 3-3 Tilden Street Modeling Extent

3.5.2 Concept Improvement Alternative

A concept improvement alternative was developed to provide sufficient inlet capacity so that runoff can enter the adequately sized piped drainage system during a 25-year storm without resulting in roadway and property flooding. The concept improvement includes the addition of a new catch basin in Tilden Street, immediately north of the driveway for 240 Tilden Street, and 150 feet of 15-inch drainage pipe to convey flow to the existing catch basins in Tilden Street. While the model indicates the piped drainage system has adequate capacity through the 50-year storm event, there is the possibility that the existing piping has a condition issue or blockage that restricts the amount of water it can convey. The concept improvement also includes CCTV inspection to confirm the condition of the existing buried system. Table 3-4 details the opinion of probable cost to design and construct the concept improvement alternative.

TABLE 3-4

Tilden Street Concept Improvement Alternative OPC

Item No.	Item	Quantity	Unit	Unit Price	Cost
1	CCTV Inspection	325	LF	$ 4	$ 1,300
2	15" HDPE	150	LF	$ 73	$ 10,950
3	Precast Concrete Catch Basins	1	EA	$ 5,000	$ 5,000
				Drainage Infrastructure Subtotal	$ 18,000
4	General Conditions (15%)				$ 2,700
				Construction Cost Subtotal	$ 20,700
				Engineering and Contingency (40%)	$ 8,300
				Concept Improvement Alternative OPC	**$ 29,000**

3.6 Lindorf Street Capacity Analyses

The Lindorf Street area of the stormwater system consists of the watershed that contributes stormwater to the piped drainage system on Lindorf Street. Runoff from properties on Lindorf and Rogers Streets is collected in a piped drainage system on Lindorf Street and is conveyed to a discharge point on Mountain View Avenue that feeds into a naturally formed stream. The existing drainage system runs through multiple private properties. A drainage easement exists for the installed portions of the existing drainage system on private property. Figure 3-4 shows the extent of the portion of the stormwater system for which the capacity analysis was performed.

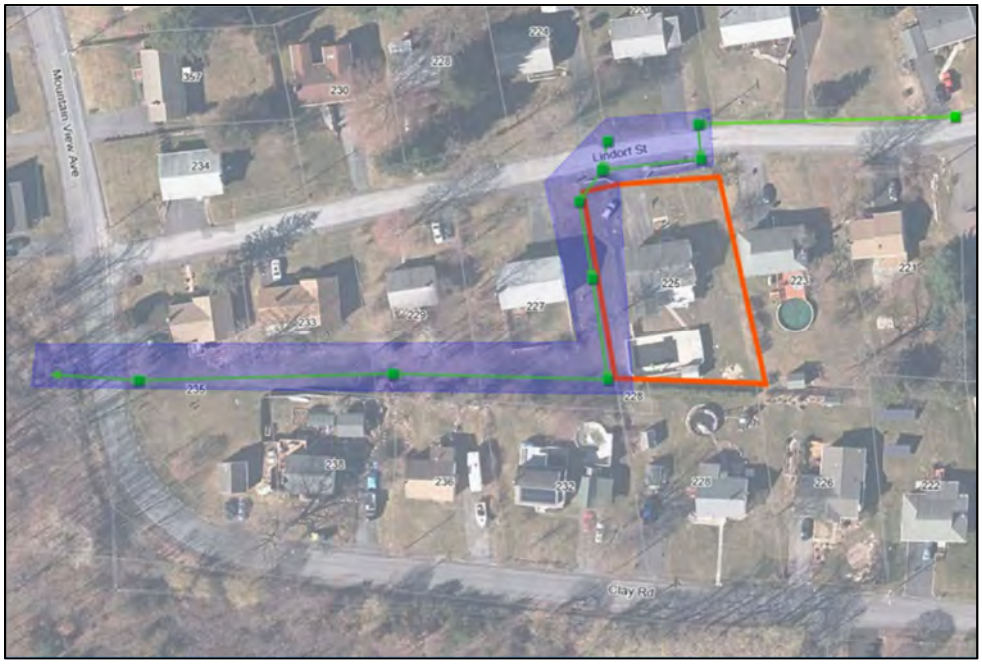


Figure 3-4 Lindorf Street Modeling Extent

Flooding in this area is reported to affect the following properties, but others may also be impacted:

- 190 Lindorf Street
- 204 Lindorf Street
- 205 Lindorf Street
- 225 Lindorf Street
- 205 Rogers Street

3.6.1 Existing Conditions Analysis

The existing conditions analysis indicates that 6 structures in the Lindor Street System are surcharged during the 2-year and higher intensity storms. The model indicates that flooding is caused by undersized pipes. Site visits to the area also indicates that some catch basins are set higher than the surrounding grade, restricting runoff from entering the piped system. All existing drainage pipes in this system are 12-inch diameter.

3.6.2 Concept Improvement Alternative

A concept improvement alternative was developed to convey stormwater through the system during a 25-year storm without surcharging. The concept improvement includes the replacement of portions of the existing 12-inch piped system with increasing sized pipes further downstream. The proposed replacement includes the most downstream eight structure-to-structure segments of pipe with portions of 36-inch and 48-inch diameter pipe. In addition, the improvement alternative includes replacement of the structures along this length of replaced pipe to accommodate the large size pipes and provide positive slope. If the Town decides to extend the existing stormwater system further upstream along Lindorf Street to receive flow from resident's sump pumps; however, this system extension is not included in the concept improvement alternative. As previously mentioned in this report, managing groundwater is not typically the responsibility of municipalities.

Table 3-5 details the opinion of probable cost to design and construct the concept improvement alternative.

TABLE 3-5

Lindorf Street Concept Improvement Alternative OPC

Item No.	Item	Quantity	Unit	Unit Price	Cost
1	36" HDPE Pipe	300	LF	$ 267	$ 80,100
2	48" HDPE Pipe	450	LF	$ 314	$ 141,300
3	Precast Concrete Catch Basins	8	EA	$ 5,000	$ 40,000
		Drainage Infrastructure Subtotal			$ 262,000
4	General Conditions (15%)				$ 39,300
				Construction Cost Subtotal	$ 301,300
				Engineering and Contingency (40%)	$ 120,500
				Concept Improvement Alternative OPC	**$ 421,800**

3.7 Clay Road Capacity Analyses

The Clay Road area of the stormwater system drainage watershed consists of a swale that contributes runoff to a screened end of a pipe, which conveys stormwater around several residential structures and discharges to another downstream swale. Water enters the upstream screened end of the first pipe segment at a skewed angle. Runoff from a watershed extending up to Route 9W, but not directly impacted by Route 9W drainage system, collects in a pond on private property on Clay Road. From there, the water is conveyed through the Clay Road system until its discharge in the downstream swale The Town reportedly installed this drainage system to alleviate flooding in the area; however, no easement was found filed on the land records. Figure 3-5 shows the extent of the portion of the stormwater system for which the capacity analysis was performed.

Figure 3-5 Clay Road Modeling Extent

Flooding in this area is reported to affect the following properties, but others may also be impacted:

- 203 Clay Road
- 205 Clay Road
- 207 Clay Road
- 213 Clay Road

3.7.1 Existing Conditions Analysis

The existing conditions analysis indicates that both drainage structures in the system are surcharged during the 2-year and higher intensity rainfall storms. The model indicates that flooding is caused by undersized swales and pipes. All pipes in this system are 12-inch diameter.

3.7.2 Concept Improvement Alternative

A concept improvement alternative was developed to convey stormwater through the system during a 25-year storm without surcharging. The concept improvement includes diverting the flow from the open swale behind 195 and 203 Clay Road to the downstream outfall of the existing piped drainage system outfall with a vegetated wet swale. This will reduce the flow significantly to the existing piped portions of the system, but not completely. The proposed improvement also includes replacing the existing piped drainage system with a 24-inch diameter pipe in the same alignment as the existing with a new catch basin at start and replacing the existing drain manhole to collect and convey the portion of runoff not picked up in the proposed vegetated wet swale. A **vegetated bioswale** is a **stormwater management practice** designed retain intercept and retain stormwater for water quality treatment. Bioswales utilize soils to treat urban stormwater

runoff by collecting before filtering through a fabricated planting soil media. Table 3-6 details the opinion of probable cost to design and construct the concept improvement alternative.

TABLE 3-6

Clay Road Concept Improvement Alternative OPC

Item No.	Item	Quantity	Unit	Unit Price	Cost
1	24" HDPE Pipe	200	LF	$ 163	$ 32,600
2	Precast Concrete Catch Basins	1	EA	$ 5,000	$ 5,000
3	Precast Manhole	1	EA	$ 5,000	$ 5,000
4	Vegetated Bioswale	130	CY	$ 240	$ 31,200
				Drainage Infrastructure Subtotal	$ 74,000
5	General Conditions (15%)				$ 11,100
				Construction Cost Subtotal	$ 85,100
				Engineering and Contingency (40%)	$ 34,000
				Concept Improvement Alternative OPC	**$ 119,100**

3.8 Valley Road Capacity Analyses

The Valley Road area of the stormwater system consists of drainage watershed that contributes stormwater to the piped drainage system on Valley Road. Runoff from Highland Road and the watershed that contributes to Valley Road is collected in a piped drainage system on Valley Road and conveys runoff to a discharge point under Union Center Road to a downstream water course. One segment of the existing drainage system runs between private property. No sumps exist on the existing catch basins and they are smaller, there is also a buried manhole along the stormwater system. A drainage easement exists for the system on 3 Valley Road. Flooding in this area is reported to affect the following properties, but others may also be impacted:

- 4 Valley Road
- 6 Valley Road
- 7 Valley Road
- 9 Valley Road
- 6 Highland Road

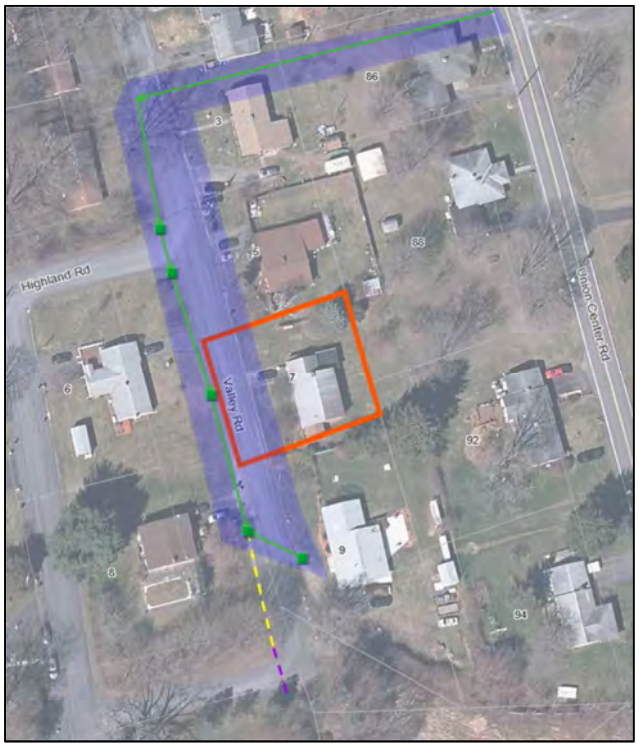


Figure 3-6 Valley Road Modeling Extent

Figure 3-6 shows the extent of the portion of the stormwater system for which the capacity analysis was performed.

3.8.1 Existing Conditions Analysis

The existing conditions analysis indicates that 4 catch basins surcharge during the 2-year and higher intensity storm. The model indicates that the flooding is caused by undersized pipes in the drainage system. Drainage pipes in the Valley Road stormwater system are either 6-inch or 12-inch diameter.

3.8.2 Concept Improvement Alternative

A concept improvement alternative was developed to convey stormwater through the system during a 25-year storm without surcharging. The concept improvement includes replacement of a portion of the existing drainage pipes so that they increase in size from upstream to downstream. The proposed improvement includes replacement of seven structure-to-structure segments of pipe in the system along Valley Road and Highland Road and replacing them with new pipes of larger sizes (24 inches and 30 inches). Additionally, the proposed improvement includes replacing the existing structures along this length of pipe and replacing the existing two segments of pipe on Highland Road that connect to the Valley Road system. The proposed drainage pipe that currently runs through private property is proposed to be rerouted along Valley Road to William White Road then east to Union Center Road to its current outfall. Table 3-7 details the opinion of probable cost to design and construct the concept improvement alternative.

TABLE 3-7

Valley Road Concept Improvement Alternative OPC

Item No.	Item	Quantity	Unit	Unit Price	Cost
1	24" HDPE Pipe	125	LF	$ 163	$ 20,375
2	30" HDPE Pipe	800	LF	$ 240	$ 192,000
3	Precast Concrete Catch Basins	5	EA	$ 5,000	$ 25,000
4	Precast Concrete Manholes	1	EA	$ 5,000	$ 5,000
		Drainage Infrastructure Subtotal			$ 243,000
5	General Conditions (15%)				$ 36,500
		Construction Cost Subtotal			$ 279,500
		Engineering and Contingency (40%)			$ 111,800
		Concept Improvement Alternative OPC			**$ 391,300**

Tighe&Bond

SECTION 4

Section 4
Capital Improvement Plan

This CIP presents stormwater infrastructure and other capital improvements along with associated budgets identified through the planning and evaluation process described throughout this report. In addition, the CIP includes recommendations and associated budgets to address SPDES MS4 permit compliance, capital programs, and operation and maintenance. Recommendations may be for one-time costs or annual costs.

This Long-Term CIP goes beyond the scope of a typical drainage system CIP and provides recommendations for not only capital projects, but also for non-capital stormwater compliance to address stormwater management needs.

Development of this CIP consisted of numerous steps that included of inventorying stormwater assets, identifying existing capital improvements, assessing condition and performance of drainage infrastructure including reported problem areas, and prioritizing capital improvements and preparing an implementation schedule.

This CIP provides the Town with the ability to further rank expenditures, plan for and normalize expenditures over the planning period, and minimize operating and maintenance cost spikes.

4.1 Service Life for Stormwater Assets

The Town's stormwater infrastructure varies in age and condition. It is important to understand the generally expected service life for each infrastructure component. We rely on our experience and on manufacturer recommendations and guidance from professional organizations to determine the expected service life. Table 4-1 summarizes the expected service life for a variety of infrastructure in Esopus's stormwater system.

Table 4-1 Estimated Service Life for Drainage Assets[1]

Asset	Estimated Service Life (years)
Gravity Main/Culvert *(Concrete, Brick, Vitrified Clay, Ductile Iron)*	100
Gravity Main *(Polyethylene, HDPE, PVC, Truss Pipe, Cast Iron)*	75
Gravity Main/Catch Basin Lateral/Culvert *(Corrugated Metal)*	50
Catch Basin Lateral *(Concrete, Brick, Vitrified Clay, Ductile Iron, HDPE, PVC, Truss Pipe)*	50
Manhole/Catch Basin (Brick, Concrete, Block, Precast, Fieldstone)	100
Outfall	50
Detention Basin	50

[1] Infrastructure Optimization (IO) Toolset software developed by Woolpert, Inc. (ESRI® ArcGIS extension package), documented in the City of Grand Rapids, MI Environmental Protection Services Department, "Stormwater Asset Management and Capital Improvement Plan," May 2013.

It must be noted that some infrastructure components have longer or shorter useful lives depending on the original quality of the infrastructure, the specific environment and conditions, and notable O&M difficulties.

While the stormwater system has been installed and evolved over time, a great deal of development occurred within the more densely populated areas of the Town between the 1950's and 1970's. Infrastructure installed during this time period is anticipated to be between 50 and 70 years old.

Tighe & Bond performed a visual assessment of the condition of the visible stormwater system components as described in Section 2 of this report. Condition assessments were made for catch basins, manholes, driveway culverts, roadway culverts. Pipe material was inventoried for buried drainage pipes. Without CCTV inspections, the condition of buried drainage pipes is not definitively known. However, given the service life is lowest (65 years) for corrugated metal pipes and the visible evidence of corrugated metal pipe deterioration in portions of the system, we can make some assumptions about drainage pipe condition and remaining service life based on pipe material.

4.2 Current Costs

In 2019 the Town of Esopus budgeted $41,050.00 for drainage improvements. This amount was split between two lines items: "1 Pers Serv" and "4 Contractual". In addition to the Town budget amount, funding for stormwater related improvements also comes from the Town's Highway Department, which is responsible for managing roadway drainage. Whenever the Highway Department is repaving a road, they will perform maintenance on stormwater structures in critical condition on that road. The funding for this type of work is not specified in the Town's budget but is included in the Highway Department budget line item 5110.4 – General Budget but not broken out.

4.3 Recommendations and Future Costs

Various capital and programmatic expenditures are identified as part of this report. The expenditures address both one time and annual costs associated with the following capital and programmatic needs:

- General stormwater management
- Drainage improvements
- Areas that are in need of additional investigation
- Compliance with SPDES MS4 General Permit
- Ongoing maintenance

There are other projects planned in the Town of Esopus that are not reflected in the budgetary costs but may include or overlap with potential stormwater and/or drainage improvement projects and should be considered part of implementation of this CIP.

- Roadway projects: Many roadway improvement projects include drainage system improvements and are a cost-effective way to design and constructed needed drainage improvements.

- Water system projects: Water system projects, such as water main replacements, present an opportunity to improve existing drainage system components in the area of the water project.
- Facilities maintenance and/or upgrades: Improvement plans for town buildings provide an excellent opportunity to consider improving water quality or reducing runoff quantity through reduction of impervious cover and installation of structural stormwater Best Management Practices (BMPs), and also are optimal sites for installation of educational information.
- New development and redevelopment projects: Private entities that develop or redevelop land in Esopus will be required to manage stormwater on the site-level.

Drainage projects should also improve water quality to the maximum extent possible. Appendix F includes information for stormwater best management practices (BMPs) that address specific water quality issues in Esopus.

As each year progresses, additional improvement projects are identified by the Town, and are added to the Capital Plan for the next year's budget development. Completing facilities, roadway, water, and/or drainage projects simultaneously would benefit the Town by reducing engineering and construction costs that would be required for separate projects. Requiring private developers do their share of stormwater management also lessens the burden on the Town.

4.3.1 Recommendations

The recommendations for stormwater infrastructure system have been grouped into three categories including:

- **Category A** items require improvements to address critical conditions, critical system needs, have the most impact on mitigating reoccurring flooding issues that that result in major property damage or health concerns. These items should be completed within 5 years.
- **Category B** items require improvements that are less critical but address deficiencies, have an impact on mitigating reoccurring flooding issues that result in minor property damage, or may require preliminary engineering to develop the specific scope of the project. These items should be completed in 6 to 10 years.
- **Category C** items that may require improvements to address less critical deficiencies or future conditions. Monitor these projects over the next five years and reprioritize as needed.

4.3.2 Category A Recommended Improvements

There are several recommendations for management of the stormwater system that should be considered for completion within 5 years. The Category A recommended improvements include:

1. **Town Maintenance**

   Town maintenance items should be prioritized as soon as possible. Some of them are routine and reoccurring and some are one-time expenses. The Town should continue to perform their catch basin cleaning program and other routine maintenance activities. Town maintenance items are currently included in staff

salary and general fund line items and would presumably be paid for in the same manner they are today. However, some of the Town maintenance recommendations included in Section 2 will require equipment rental and materials to implement. A portion of the costs total costs associated with Town maintenance are included in this recommendation item, so that they are included in future budgeting.

2. County Drainage Issues

Coordination with Ulster County regarding the reported flooding issues that have been categorized as related to County-owned stormwater infrastructure should occur. The Town can help facilitate this discussion, but the responsibility to address any issues would be under the County. No cost was included for this item.

3. Replacement of Critical Condition Inventoried Stormwater Assets

It is recommended to replace in kind the inventoried catch basins, manholes, driveway culverts, and roadway culverts that were found to be in critical condition during the inventory. Replacement should be sized to current standards for structures and existing critical condition catch basins should be replaced with structure that have a minimum of 2-foot-deep stumps. Cost for replacement of critical condition culverts are budgetary numbers assuming replacement with a 48-inch corrugated HDPE pipe and is not representative of a box culvert or otherwise larger sized culvert designed to pass infrequent rainfall events.

It should be noted that portions of the Town remain to be inventoried, and additional critical condition stormwater assets may exist and need to be added to the Category A items. Additionally, condition of assets will continue to degrade over time and the list of critical assets should be reassessed and reprioritized over the next five years.

4. Replacement of 10% of Corrugated Metal Drain Pipes

Due to the approximate age, anticipated service life, and observed condition of visible portions of buried corrugated metal drainage pipes, it is recommended that some budget be included to replace existing pipes. After the CCTV inspections have been performed as recommended in Section 2.

5. Salem Street to Sentar Lane Concept Improvement Alternative

See Section 3 for more detail regarding the concept improvement alternative for the stormwater system between Salem Street and Sentar Lane.

6. Eugene Street Concept Improvement Alternative

See Section 3 for more detail regarding the concept improvement alternative for the stormwater system associated with Eugene Street.

7. Clay Road Concept Improvement Alternative

See Section 3 for more detail regarding the concept improvement alternative for the stormwater system associated with Clay Road.

8. MS4 Outfall Inspection (20% per year)

The SPDES MS4 General Permit requires each community to meet 6 Minimum Control Measures (MCMs). The most labor intensive of the MCMs is the Illicit Discharge Detection and Elimination. Under the permit, MS4 communities are required to visit each of their permitted outfalls (Esopus has 87 permitted outfalls) at least once every five years, with reasonable progress each year. If the Town inventories at least 20% of their outfalls each year they will have visited each outfall within five years. Outfall Reconnaissance Inventory Field Sheets should be completed for each outfall, see Appendix F for a copy of the field sheets.

9. CCTV Drain Pipe Video Inspection

Some of the flooding issues identified in Section 2 were categorized as issues requiring further investigation. Closed circuit television (CCTV) drain pipe video inspection was recommended for the flooding issue reported at 5 River Road and 211 Tilden Street. This item should be completed to determine potential condition or blockage issues causing flooding.

10. **Further Investigations**

Some of the flooding issues identified in Section 2 were categorized as issues requiring further investigation. Several of the further investigations were identified to be performed by Town staff and would presumably be paid for in the same manner they are today from staff and general fund line items. Other further investigations included future capacity analysis and additional engineering, or investigation support may be necessary to complete these items. The cost for these non-Town staff investigation supports is included in this recommendation item.

Table 4-2 summarizes the Category A Recommended Improvement Costs.

TABLE 4-2

Category A Recommended Improvement Cost

Item	Quantity	Unit	Unit Price	Cost
Town Maintenance	1	LS	$50,000	$50,000
Replacement of Critical Condition Catch Basin/Manholes	13	EA	$5,000	$65,000
Replacement of Critical Condition Driveway Culverts	1	EA	$5,000	$5,000
Replacement of Critical Condition Roadway Culverts	4	EA	$40,000	$160,000
Replacement of 10% of Corrugated Metal Drain Pipes *	1,700	LF	$70	$118,500
Salem to Sentar Concept Improvement Alternative**	1	LS	$967,700	$967,700
Eugene Street Concept Improvement Alternative**	1	LS	$576,400	$576,400
Clay Road Concept Improvement Alternative**	1	LS	$119,100	$119,100
MS4 Outfall Inspection (20% per year)***	1	LS	$20,000	$20,000
CCTV Drain Pipe Video Inspection	1,300	LF	$4	$5,200
Further Investigation***	1	LS	$50,000	$50,000
			Category A Total Cost	**$2,137,000**

*Assumed replacement with 12-inch HDPE drain pipe

**Refer to Section 3 for more detailed cost breakdown

***Can be performed by Town staff or a consultant

4.3.3 Category B Recommended Improvements

There are several recommendations for management of the stormwater system that should be considered for completion within 6 to 10 years. The Category B recommended improvements include:

1. **Replacement of 20% of Poor Condition Inventoried Stormwater Assets**

   It is recommended to replace in kind a portion of the inventoried catch basins, manholes, driveway culverts, and roadway culverts that were found to be in poor condition during the inventory. Replacement should be sized to current standards for structures and existing critical condition catch basins should be replaced with structure that have a minimum of 2-foot-deep stumps. Cost for replacement of critical condition culverts are budgetary numbers assuming replacement with a 48-inch corrugated HDPE pipe and is not representative of a box culvert or otherwise larger sized culvert designed to pass infrequent rainfall events.

   Condition of assets will continue to degrade over time and the list of poor assets should be reassessed and reprioritized as necessary.

2. **Replacement of 10% of Corrugated Metal Drain Pipes**

   Due to the approximate age, anticipated service life, and observed condition of visible portions of buried corrugated metal drainage pipes, it is recommended that some budget be included to replace existing pipes.

3. Valley Road Concept Improvement Alternative

See Section 3 for more detail regarding the concept improvement alternative for the stormwater system between Salem Street and Sentar Lane.

4. Lindorf Street Concept Improvement Alternative

See Section 3 for more detail regarding the concept improvement alternative for the stormwater system associated with Eugene Street.

5. Tilden Street Concept Improvement Alternative

See Section 3 for more detail regarding the concept improvement alternative for the stormwater system associated with Clay Road.

6. MS4 Outfall Inspection (20% per year)

If the Town inventories at least 20% of their outfalls each year they will have visited each outfall within each five-year period. Outfall Reconnaissance Inventory Field Sheets should be completed for each outfall, see Appendix F for a copy of the field sheets.

7. **Further Investigations**

Several of the further investigations were identified to be performed by Town staff and would presumably be paid for in the same manner they are today from staff and general fund line items. Other further investigations included future capacity analysis and additional engineering, or investigation support may be necessary to complete these items. The cost for these non-Town staff investigation supports is included in this recommendation item.

Table 4-3 summarizes the Category B Recommended Improvement Costs.

TABLE 4-3

Category B Recommended Improvement Cost

Item	Quantity	Unit	Unit Price	Cost
Replacement of 20% of Poor Condition Catch Basin/MHs	10	EA	$5,000	$50,000
Replacement of 20% of Poor Condition Driveway Culverts	3	EA	$5,000	$15,000
Replacement of 20% of Poor Condition Roadway Culverts	9	EA	$40,000	$360,000
Replacement of 10% of Corrugated Metal Drain Pipes *	1,700	LF	$70	$118,500
Valley Road Concept Improvement Alternative**	1	LS	$391,300	$391,300
Lindrof Street Concept Improvement Alternative**	1	LS	$421,800	$421,800
Tilden Street Concept Improvement Alternative**	1	LS	$29,000	$29,000
MS4 Outfall Inspection (20% per year)***	1	LS	$20,000	$20,000
Further Investigation***	1	LS	$50,000	$50,000
			Category B Total Cost	**$1,456,000**

*Assumed replacement with 12-inch HDPE drain pipe

**Refer to Section 3 for more detailed cost breakdown

***Can be performed by Town staff or a consultant

4.3.4 Category C Recommended Improvements

There are several items that may require improvements to address less critical deficiencies or future conditions. Monitor these projects over the next five years and reprioritize as needed. There are also flooding issues that exist but appear to be un-related to Town-owned drainage system and do not require further action by the Town at this time.

Table 4-4 provides a summary of Category A and Category B Recommended Improvement Costs and annualizes the costs over a 5-year period and 10-year period for budgeting purposes.

TABLE 4-4

Summary of Capital Improvement Plan Costs

	Total Cost	Annualized Cost Per Year
Category A (0-5 years)	$2,137,000	$430,000
Category B (6-10 years)	$1,456,000	$290,000
Category A +B (0-10 years)	**$3,593,000**	**$360,000**

4.4 Funding Opportunities

There are some grant funding opportunities that exist to offset portions of the stormwater management costs that municipalities face. However, there are not currently grants that fund overall stormwater management, mitigating localized flooding, or stormwater system capacity improvements. The current available grant opportunities focus on MS4 Permit compliance assistance and stormwater quality improvements. Below is a table of the available potential grants the Town should consider pursing for portions of the stormwater improvements recommended.

TABLE 4-5

Funding Opportunities

Grant Program	Description	Maximum Funds Available	Town Match Required
WQIP MS4 Mapping	Projects to complete comprehensive, stormwater system maps for MS4 Communities	$500,000 (per project)	25%
WQIP Culvert Repair and Replacement	Projects to address erosion and erosion risks caused by failing or inadequately sized culverts through culvert repair or replacement	$1,000,000 (per project)	25%
EFC Green Innovation Grant Program (GIGP)	Projects that improve water quality and implement green infrastructure, including bioretention systems	$15,000,000 (statewide)	10%-60%

The Town has already applied for funding under the WQIP MS4 Mapping grant program. The other two grant program opportunities could address some portions of the recommended improvement included in this capital improvement plan.

Grant funding is a good way to supplement funding for stormwater management, as available, but The Town of Esopus should consider a more consist source of funding to ensure proper management of the Town's stormwater systems. Municipalities typically fund the majority of their stormwater management expense through property taxes and the Town's Annual Budget. Stormwater infrastructure is an asset that needs to be proactively managed to optimize the Town's expenditures, staff time, and overall effort.

J:\E\E5006 Town of Esopus\004 - Esopus Stormwater Infrastructure Assessment\Report_Evaluation\Capital Improvement Plan.docx

Tighe&Bond

APPENDIX A

NOTES TO USERS

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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Silver Spring, MD 20910–3282

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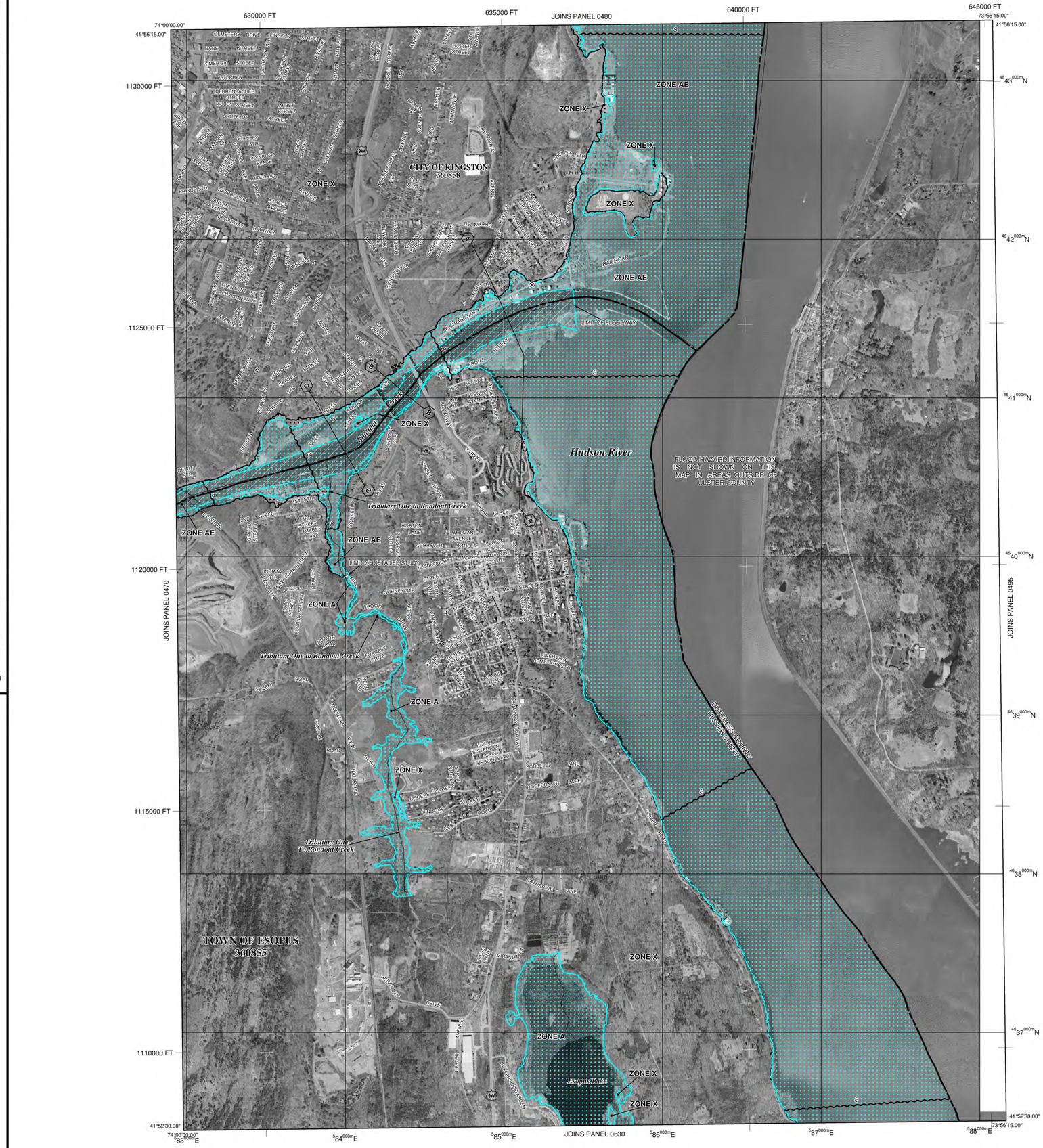

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A Cross section line
23 — 23 Transect line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN 1000-meter Universal Transverse Mercator grid values, zone 18
6000000 FT 5000-foot grid ticks: New York State Plane coordinate system, east zone (FIPSZONE 3101), Transverse Mercator
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 25, 2009
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1–800–638–6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0490E

FIRM
FLOOD INSURANCE RATE MAP

ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

PANEL 490 OF 910
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESOPUS, TOWN OF	360855	0490	E
KINGSTON, CITY OF	360858	0490	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36111C0490E

EFFECTIVE DATE
SEPTEMBER 25, 2009

Federal Emergency Management Agency

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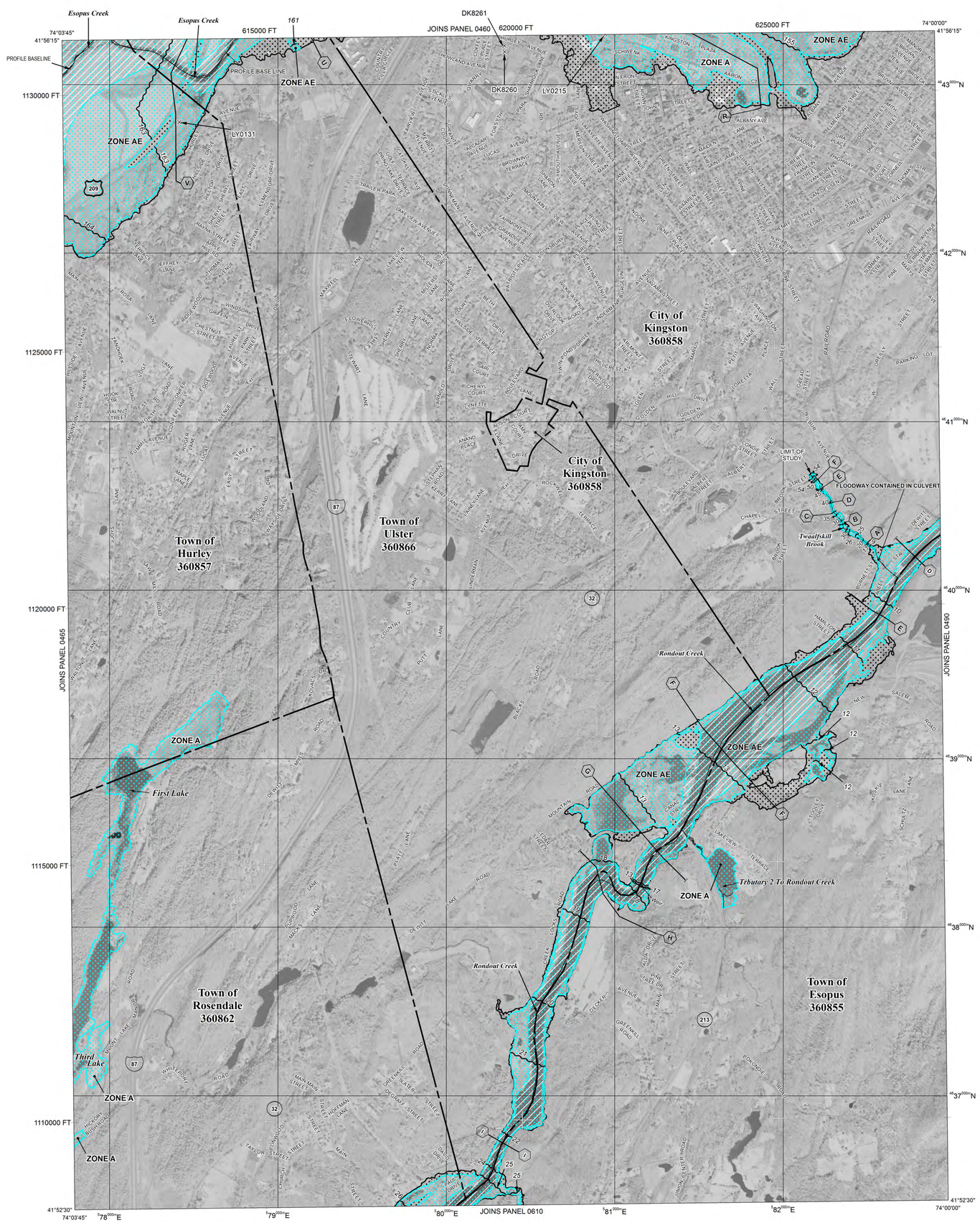

LEGEND

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ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
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ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
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* Referenced to the North American Vertical Datum of 1988

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- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- ● M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
September 25, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
November 18, 2016 - to change Base Flood Elevations, and to change Special Flood Hazard Areas

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NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0470F

FIRM

FLOOD INSURANCE RATE MAP

for ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

CONTAINS:

COMMUNITY	NUMBER
ESOPUS, TOWN OF	360855
HURLEY, TOWN OF	360857
KINGSTON, CITY OF	360858
ROSENDALE, TOWN OF	360862
ULSTER, TOWN OF	360866

PANEL 470 OF 910
MAP SUFFIX: F
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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MAP NUMBER
36111C0470F

MAP REVISED
NOVEMBER 18, 2016

Federal Emergency Management Agency

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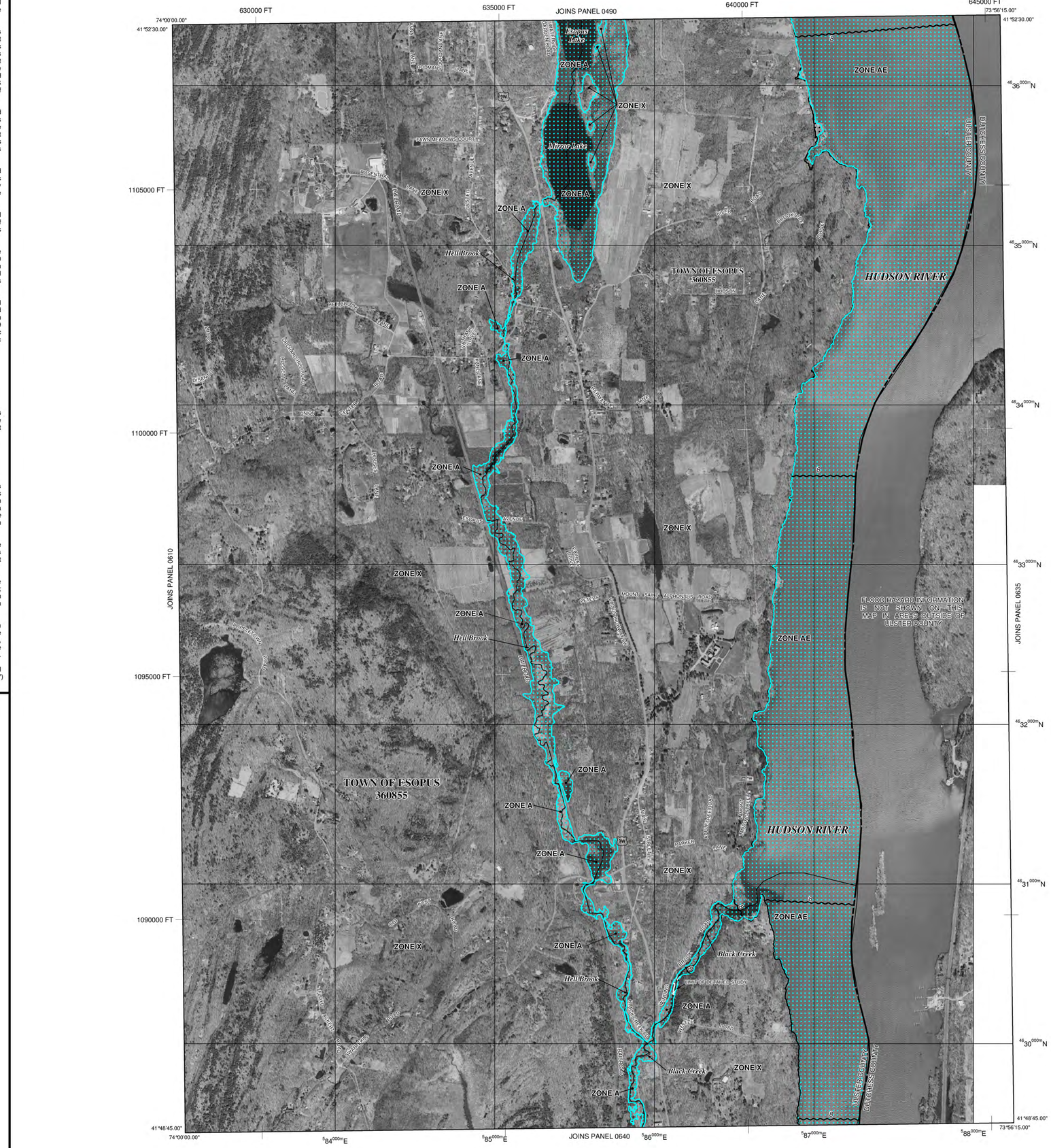

LEGEND

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FLOODWAY AREAS IN ZONE AE

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	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid values, zone 18
6000000 FT	5000-foot grid ticks: New York State Plane coordinate system, east zone (FIPSZONE 3101), Transverse Mercator
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 25, 2009
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0630E

FIRM
FLOOD INSURANCE RATE MAP
ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

PANEL 630 OF 910
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESOPUS, TOWN OF	360855	0630	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36111C0630E

EFFECTIVE DATE
SEPTEMBER 25, 2009

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC–3, #9202
1315 East–West Highway
Silver Spring, MD 20910–3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713–3242,** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from digital orthophotography provided by the NY Office of Cyber Security & Critical Infrastructure Coordination from photography dated April 2004.

This map reflects more detailed and up–to–date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

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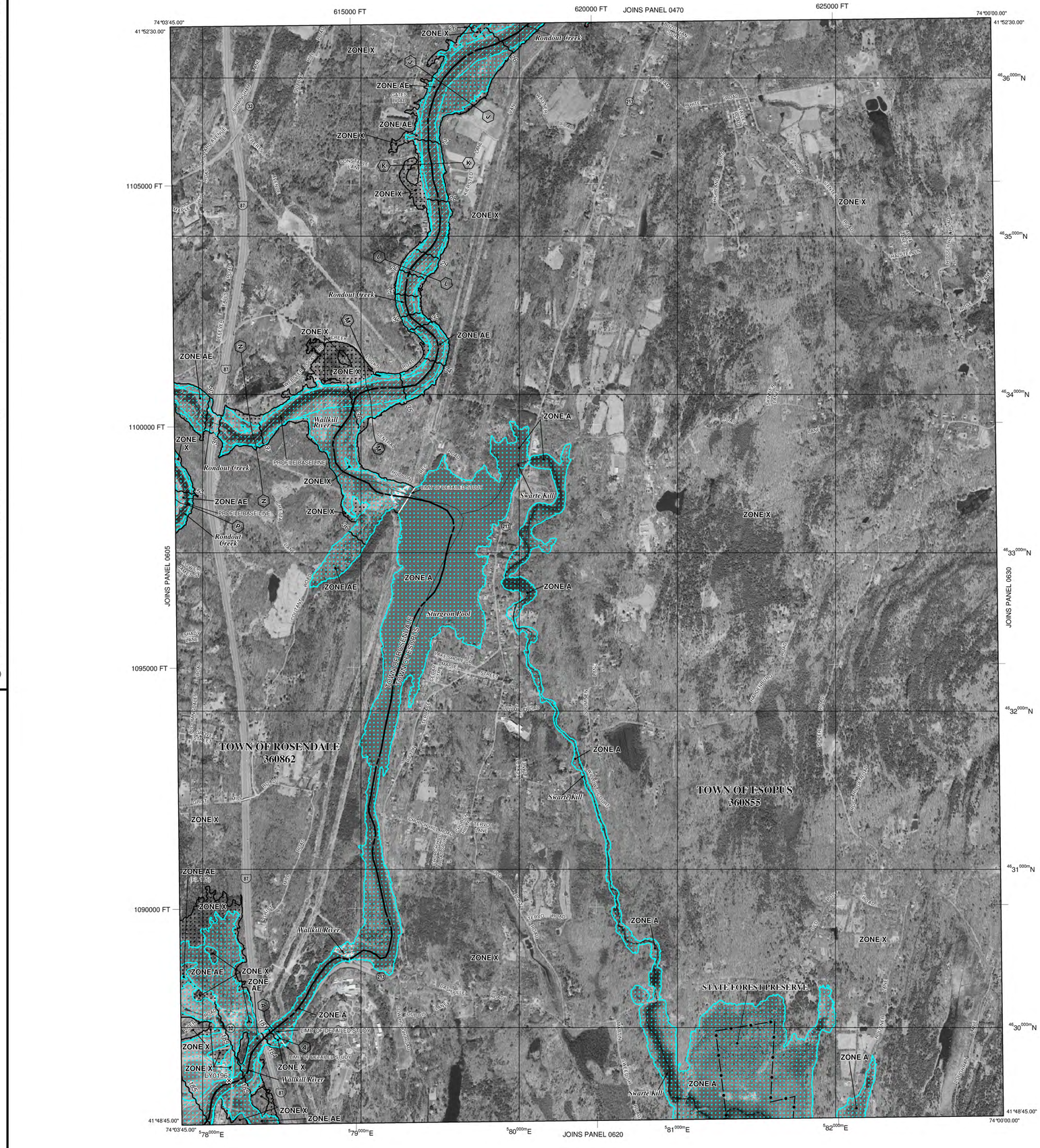

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 42 75 000m N — 1000-meter Universal Transverse Mercator grid values, zone 18
- 6000000 FT — 5000-foot grid ticks: New York State Plane coordinate system, east zone (FIPSZONE 3101), Transverse Mercator
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 25, 2009
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0610E

FIRM
FLOOD INSURANCE RATE MAP

ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

PANEL 610 OF 910
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESOPUS, TOWN OF	360855	0610	E
ROSENDALE, TOWN OF	360862	0610	E

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MAP NUMBER
36111C0610E

EFFECTIVE DATE
SEPTEMBER 25, 2009

Federal Emergency Management Agency

NOTES TO USERS

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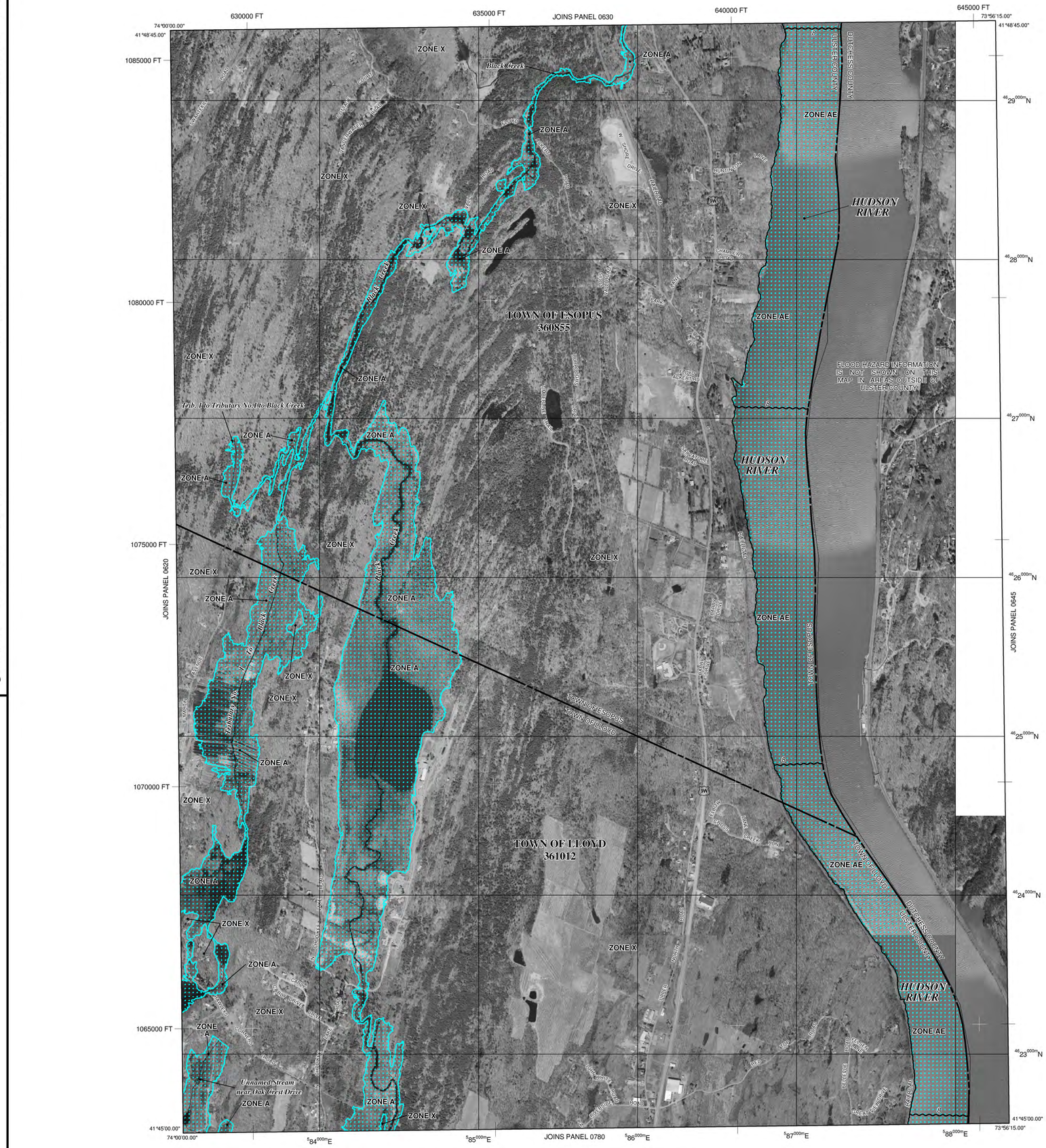

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
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* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

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97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 25, 2009
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0640E

FIRM
FLOOD INSURANCE RATE MAP
ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

PANEL 640 OF 910
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESOPUS, TOWN OF	360855	0640	E
LLOYD, TOWN OF	361012	0640	E

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MAP NUMBER
36111C0640E

EFFECTIVE DATE
SEPTEMBER 25, 2009

Federal Emergency Management Agency

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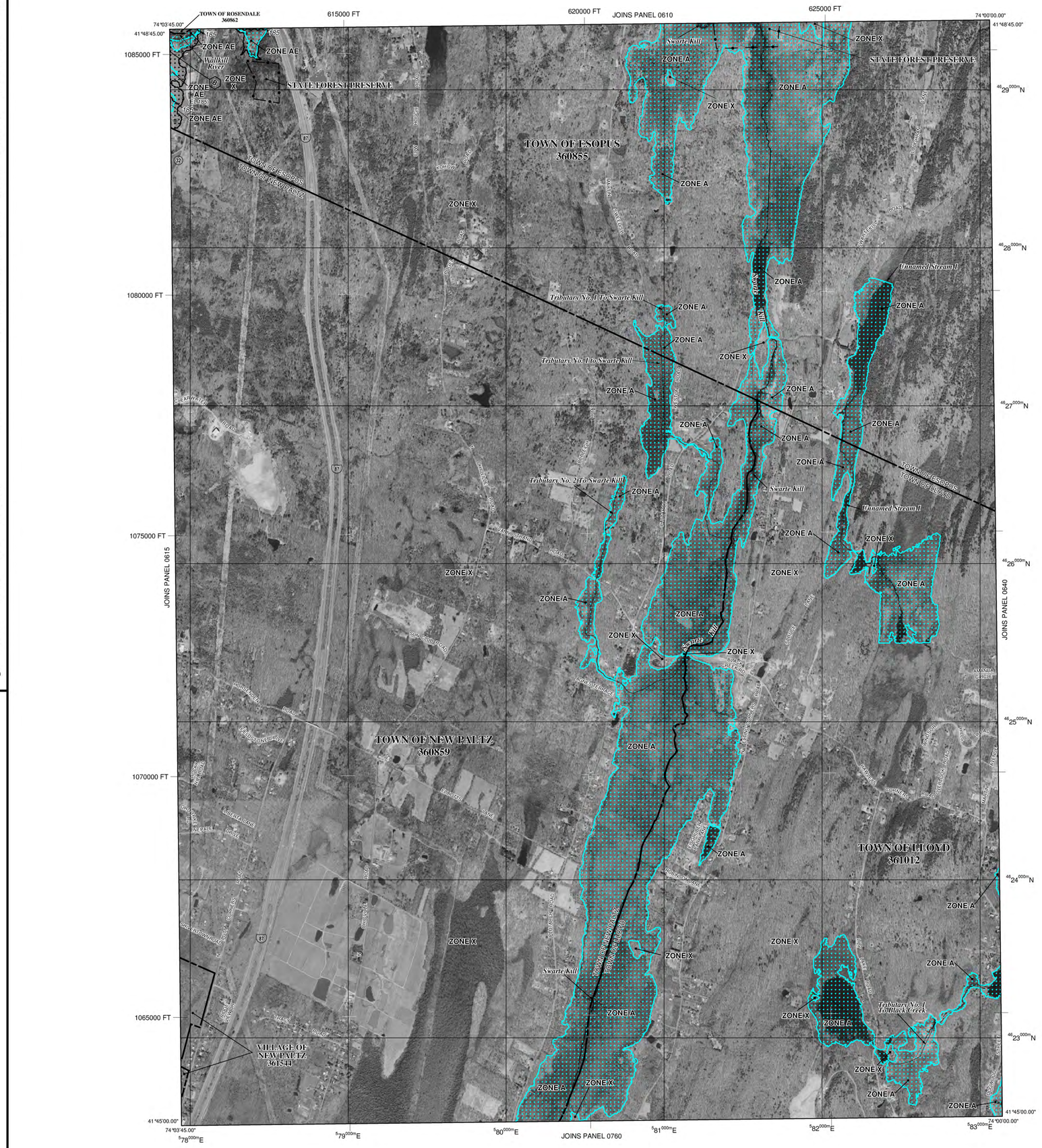

LEGEND

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ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

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ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

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OTHER AREAS

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FLOOD INSURANCE RATE MAP
September 25, 2009
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NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0620E

FIRM
FLOOD INSURANCE RATE MAP

ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

PANEL 620 OF 910
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESOPUS, TOWN OF	360855	0620	E
LLOYD, TOWN OF	361012	0620	E
NEW PALTZ, TOWN OF	360859	0620	E
NEW PALTZ, VILLAGE OF	361544	0620	E
ROSENDALE, TOWN OF	360862	0620	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36111C0620E

EFFECTIVE DATE
SEPTEMBER 25, 2009

Federal Emergency Management Agency

NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC–3, #9202
1315 East–West Highway
Silver Spring, MD 20910–3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713–3242,** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from digital orthophotography provided by the NY Office of Cyber Security & Critical Infrastructure Coordination from photography dated April 2004.

This map reflects more detailed and up–to–date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

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Contact the **FEMA Map Service Center** at 1–800–358–9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report,* and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1–800–358–9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1–877–FEMA MAP** (1–877–336–2627) or visit the FEMA website at http://www.fema.gov/.

CTP Cooperating Technical Partners

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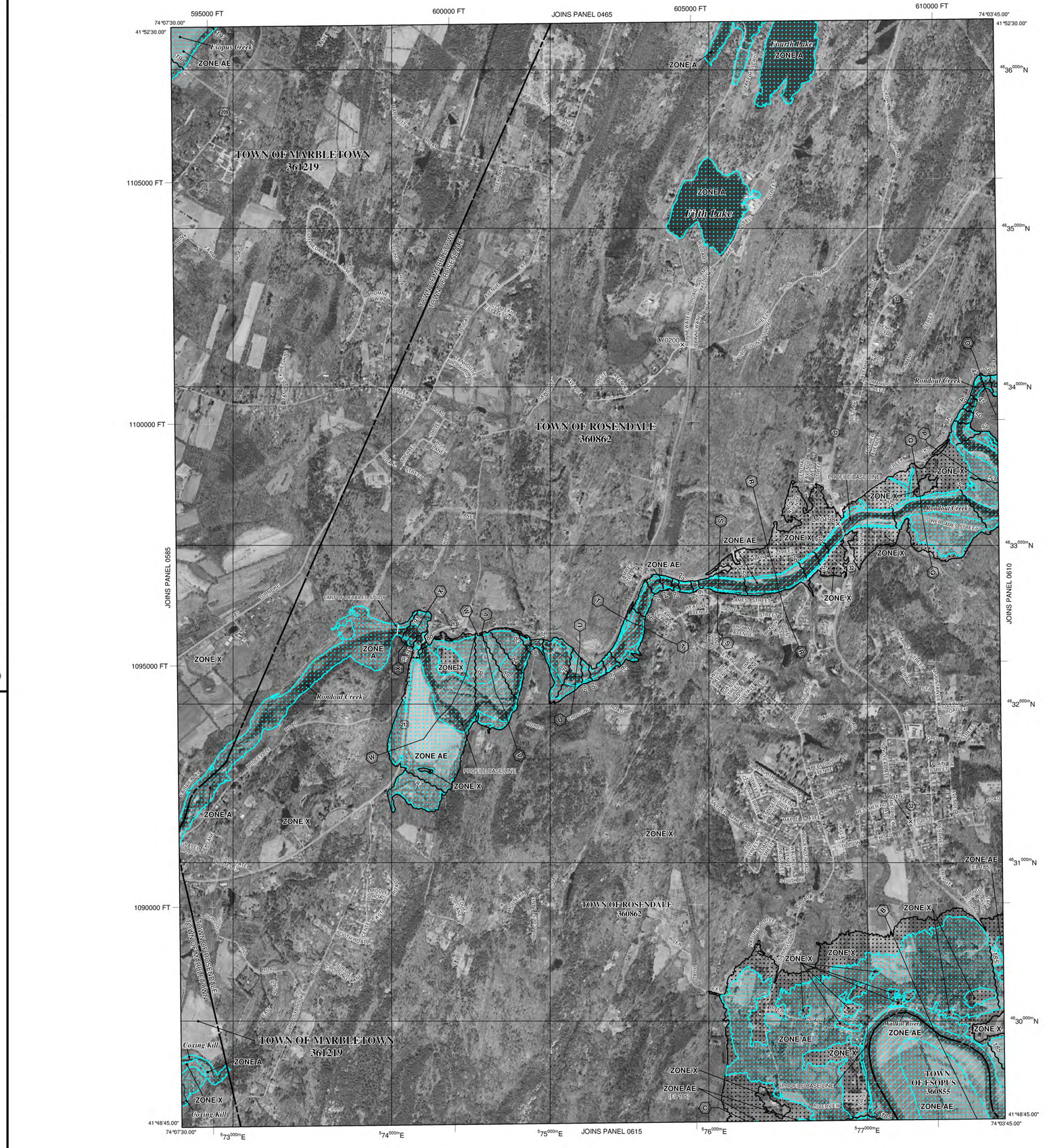

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A–A — Cross section line
- 23–23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid values, zone 18
- 6000000 FT — 5000-foot grid ticks: New York State Plane coordinate system, east zone (FIPSZONE 3101), Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 25, 2009
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1–800–638–6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0605E

FIRM
FLOOD INSURANCE RATE MAP

ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

PANEL 605 OF 910
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESOPUS, TOWN OF	360855	0605	E
MARBLETOWN, TOWN OF	361219	0605	E
ROSENDALE, TOWN OF	360862	0605	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36111C0605E

EFFECTIVE DATE
SEPTEMBER 25, 2009

Federal Emergency Management Agency

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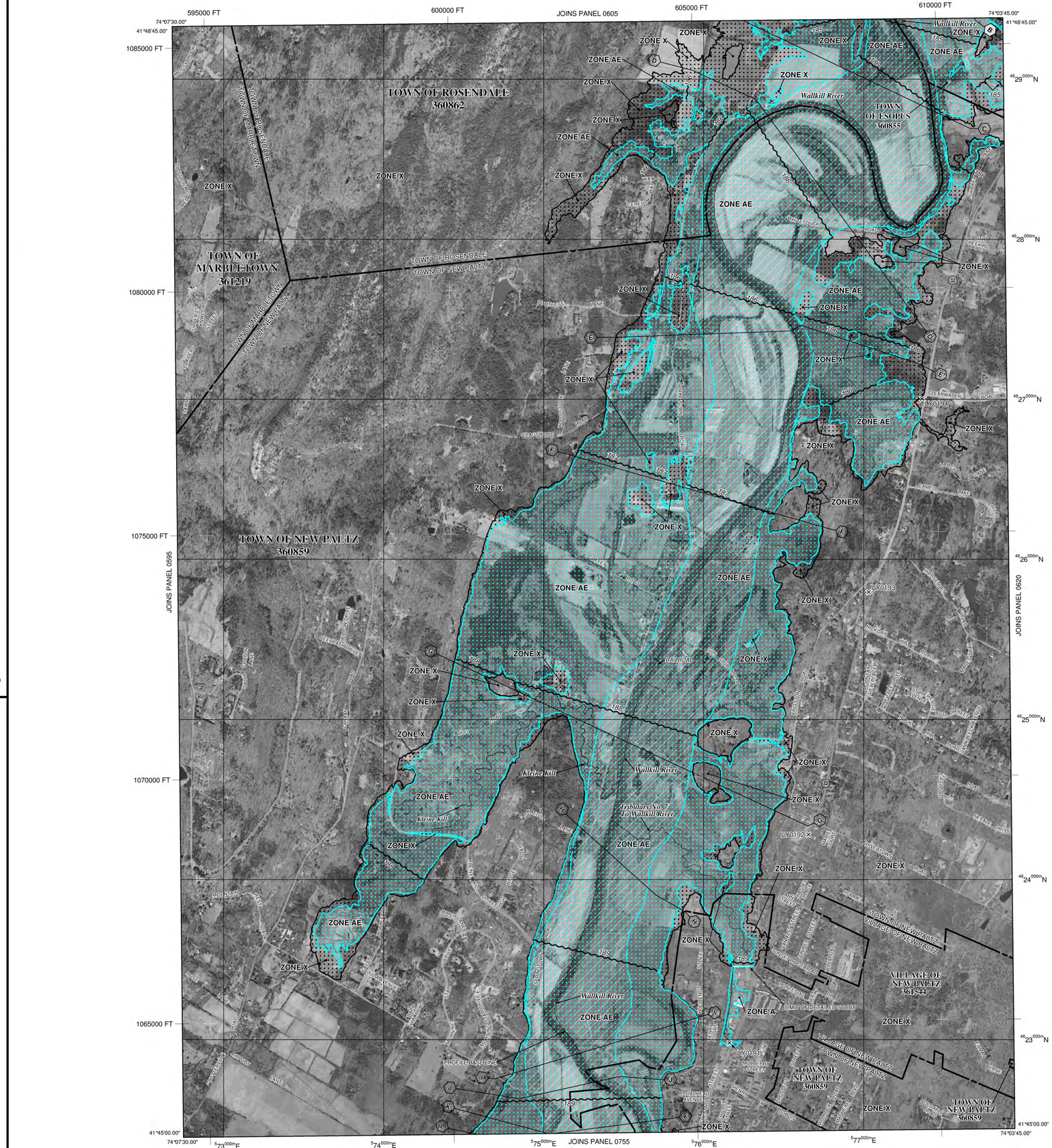

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NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0615E

FIRM
FLOOD INSURANCE RATE MAP
ULSTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

PANEL 615 OF 910
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

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MAP NUMBER
36111C0615E

EFFECTIVE DATE
SEPTEMBER 25, 2009

Federal Emergency Management Agency

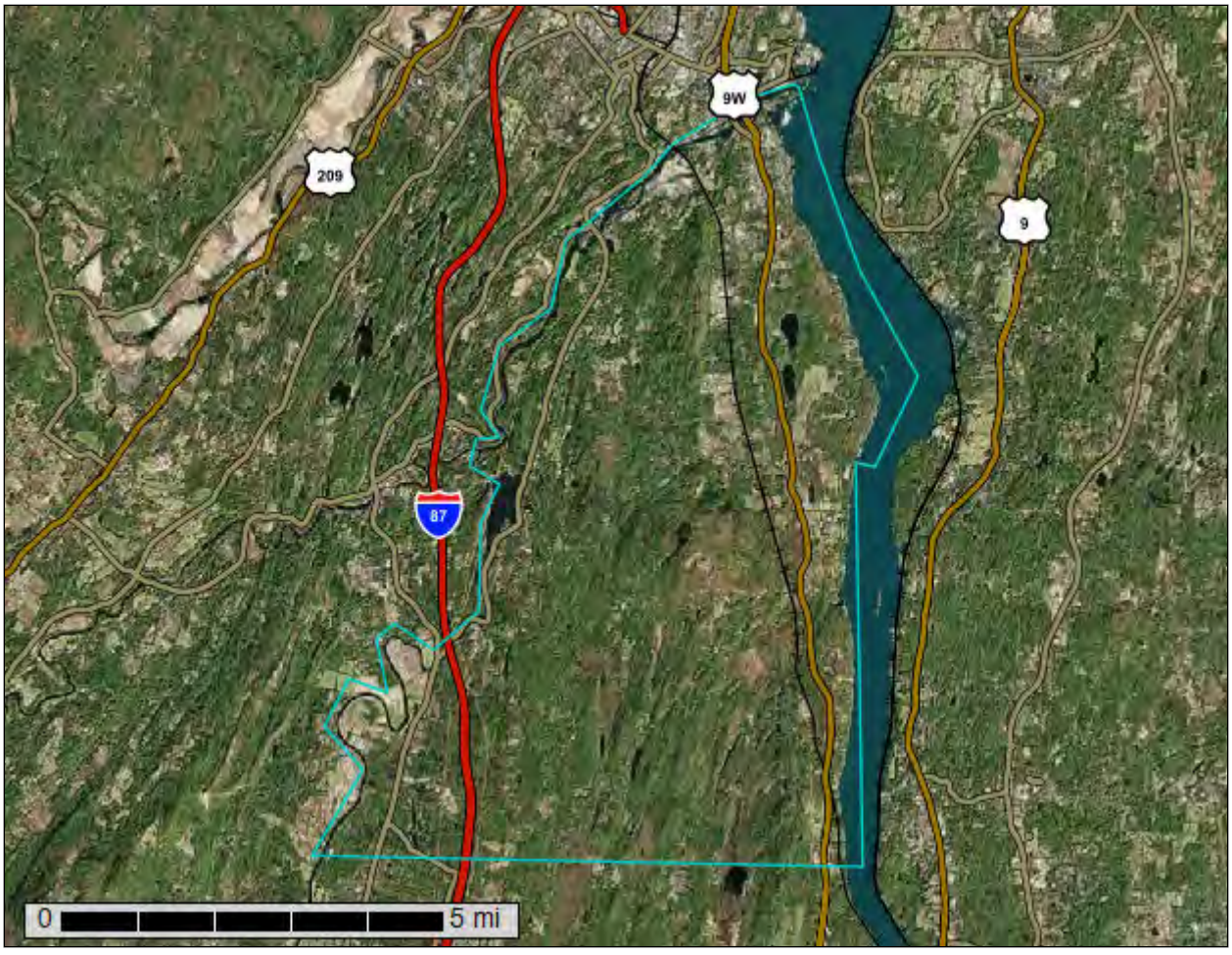
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Ulster County, New York



August 15, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

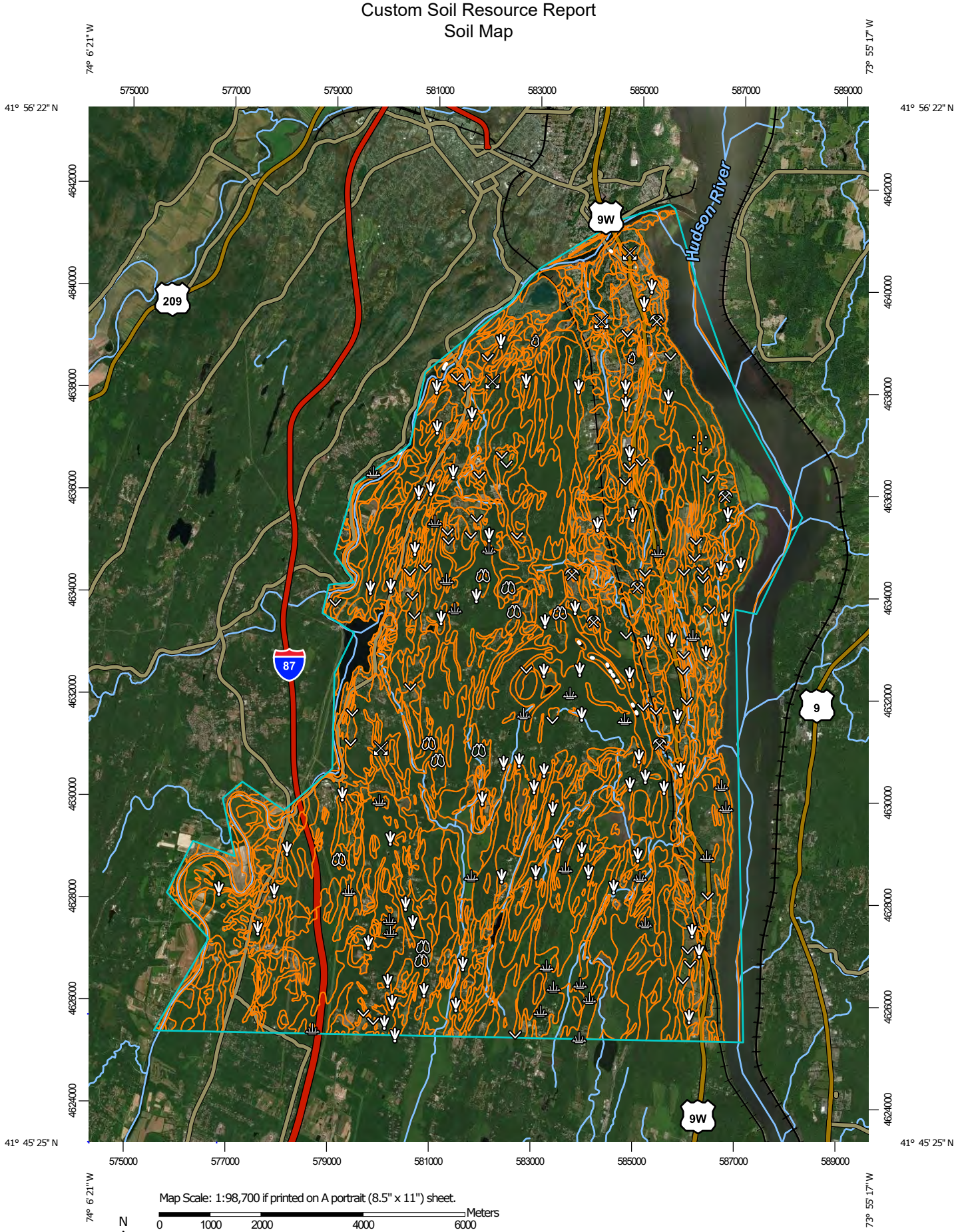
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:98,700 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 1000 2000 4000 6000

Feet
0 4500 9000 18000 27000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:15,800 to 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dutchess County, New York
Survey Area Data: Version 15, Sep 2, 2018

Soil Survey Area: Ulster County, New York
Survey Area Data: Version 17, Sep 3, 2018

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 7, 2013—Sep 3, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
W	Water	154.9	0.5%
Subtotals for Soil Survey Area		**154.9**	**0.5%**
Totals for Area of Interest		**31,569.8**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AA	Alluvial land	85.0	0.3%
At	Atherton silt loam	47.4	0.2%
BgC	Bath gravelly silt loam, 8 to 15 percent slopes	203.4	0.6%
BgD	Bath gravelly silt loam, 15 to 25 percent slopes	178.9	0.6%
BHE	Bath very stony soils, steep	120.4	0.4%
BnC	Bath-Nassau complex, 8 to 25 percent slopes	2,569.5	8.1%
BOD	Bath-Nassau-Rock outcrop complex, hilly	8,749.6	27.7%
BP	Borrow pit	0.7	0.0%
BRC	Bath and Mardin soils, sloping, very stony	36.7	0.1%
Cc	Canandaigua silt loam	824.7	2.6%
Cd	Canandaigua silt loam, till substratum	347.2	1.1%
Ce	Catden muck, 0 to 2 percent slopes	935.6	3.0%
CF	Cut and fill land	179.0	0.6%
CgA	Castile gravelly silt loam, 0 to 3 percent slopes	3.7	0.0%
CnA	Chenango gravelly silt loam, 0 to 3 percent slopes	14.5	0.0%
CnB	Chenango gravelly silt loam, 3 to 8 percent slopes	79.8	0.3%
CnC	Chenango gravelly silt loam, 8 to 15 percent slopes	33.5	0.1%
FAE	Farmington-Rock outcrop complex, steep	13.1	0.0%
FW	Fresh water marsh	63.6	0.2%
GP	Gravel pit	44.5	0.1%
Ha	Hamlin silt loam	126.0	0.4%
He	Haven loam	23.2	0.1%
HgA	Hoosic gravelly loam, 0 to 3 percent slopes	4.0	0.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HgB	Hoosic gravelly loam, 3 to 8 percent slopes	81.0	0.3%
HgC	Hoosic gravelly loam, rolling	134.6	0.4%
HgD	Hoosic gravelly loam, 15 to 25 percent slopes	87.6	0.3%
HSF	Hoosic soils, very steep	13.7	0.0%
HuB	Hudson silt loam, 3 to 8 percent slopes	18.8	0.1%
HuC	Hudson silt loam, 8 to 15 percent slopes	63.7	0.2%
HwD	Hudson and Schoharie soils, 15 to 25 percent slopes	121.2	0.4%
HXE	Hudson and Schoharie soils, 25 to 55 percent slopes	13.9	0.0%
Lm	Lamson fine sandy loam	185.7	0.6%
LY	Lyons-Atherton complex, very stony	313.9	1.0%
Ma	Madalin silty clay loam	163.6	0.5%
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	151.0	0.5%
MgB	Mardin-Nassau complex, 3 to 8 percent slopes	1,898.1	6.0%
ML	Made land	17.0	0.1%
Mr	Middlebury silt loam	40.4	0.1%
NBF	Nassau-Bath-Rock outcrop complex, very steep	4,178.7	13.2%
NOD	Nassau-Rock outcrop complex, hilly	263.9	0.8%
OdA	Odessa silt loam, 0 to 3 percent slopes	261.7	0.8%
OdB	Odessa silt loam, 3 to 8 percent slopes	132.5	0.4%
Pa	Palms muck	344.8	1.1%
Pb	Palms muck, bedrock variant	52.3	0.2%
PlB	Plainfield loamy sand, 0 to 8 percent slopes	138.9	0.4%
PlC	Plainfield loamy sand, 8 to 15 percent slopes	111.2	0.4%
PmD	Plainfield-Riverhead complex, moderately steep	142.4	0.5%
PmF	Plainfield-Riverhead complex, very steep	218.8	0.7%
PrC	Plainfield-Rock outcrop complex, rolling	939.9	3.0%
Pt	Pompton fine sandy loam	66.7	0.2%
QU	Quarry	126.5	0.4%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ra	Raynham silt loam	401.3	1.3%
Re	Red Hook gravelly silt loam	12.0	0.0%
RhB	Rhinebeck silt loam, 3 to 8 percent slopes	407.4	1.3%
RvA	Riverhead fine sandy loam, 0 to 3 percent slopes	98.5	0.3%
RvB	Riverhead fine sandy loam, 3 to 8 percent slopes	370.2	1.2%
RvC	Riverhead fine sandy loam, 8 to 15 percent slopes	187.0	0.6%
RXC	Rock outcrop-Arnot complex, 3 to 15 percent slopes	7.6	0.0%
RXF	Rock outcrop-Arnot complex, 25 to 70 percent slopes	420.8	1.3%
SaB	Schoharie silt loam, 3 to 8 percent slopes	204.9	0.6%
SaC	Schoharie silt loam, 8 to 15 percent slopes	47.4	0.2%
Sc	Scio silt loam	30.1	0.1%
STD	Stockbridge-Farmington-Rock outcrop complex, hilly	38.2	0.1%
Te	Teel silt loam	199.5	0.6%
Un	Unadilla silt loam	3.3	0.0%
VoA	Volusia gravelly silt loam, 0 to 3 percent slopes	26.7	0.1%
VoB	Volusia gravelly silt loam, 3 to 8 percent slopes	97.3	0.3%
VSB	Volusia channery silt loam, 0 to 8 percent slopes, very stony	167.9	0.5%
W	Water	2,819.8	8.9%
Wa	Walpole fine sandy loam	48.6	0.2%
Wb	Wayland soils complex, non-calcareous substratum, 0 to 3 percent slopes, frequently flooded	309.8	1.0%
Wc	Wayland mucky silt loam	35.6	0.1%
WsA	Williamson silt loam, 0 to 3 percent slopes	31.7	0.1%
WsB	Williamson silt loam, 3 to 8 percent slopes	482.9	1.5%
Subtotals for Soil Survey Area		**31,414.9**	**99.5%**
Totals for Area of Interest		**31,569.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas

shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

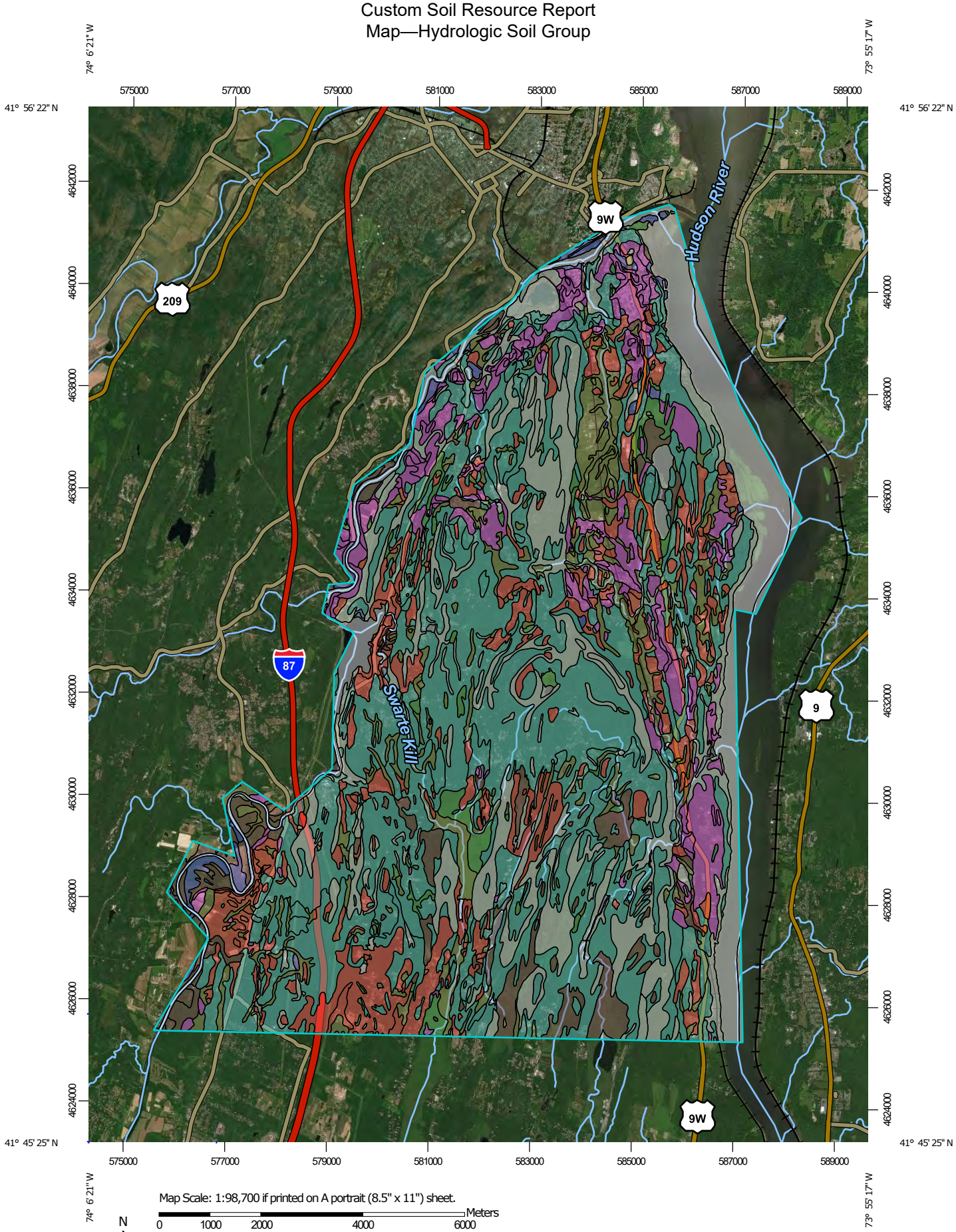
Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group



Map Scale: 1:98,700 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 1000 2000 4000 6000

Feet
0 4500 9000 18000 27000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:15,800 to 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dutchess County, New York
Survey Area Data: Version 15, Sep 2, 2018

Soil Survey Area: Ulster County, New York
Survey Area Data: Version 17, Sep 3, 2018

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 7, 2013—Sep 3, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
W	Water		154.9	0.5%
Subtotals for Soil Survey Area			**154.9**	**0.5%**
Totals for Area of Interest			**31,569.8**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AA	Alluvial land	B/D	85.0	0.3%
At	Atherton silt loam	B/D	47.4	0.2%
BgC	Bath gravelly silt loam, 8 to 15 percent slopes	C	203.4	0.6%
BgD	Bath gravelly silt loam, 15 to 25 percent slopes	C	178.9	0.6%
BHE	Bath very stony soils, steep	C	120.4	0.4%
BnC	Bath-Nassau complex, 8 to 25 percent slopes	C	2,569.5	8.1%
BOD	Bath-Nassau-Rock outcrop complex, hilly	C	8,749.6	27.7%
BP	Borrow pit		0.7	0.0%
BRC	Bath and Mardin soils, sloping, very stony	D	36.7	0.1%
Cc	Canandaigua silt loam	C/D	824.7	2.6%
Cd	Canandaigua silt loam, till substratum	C/D	347.2	1.1%
Ce	Catden muck, 0 to 2 percent slopes	B/D	935.6	3.0%
CF	Cut and fill land	B	179.0	0.6%
CgA	Castile gravelly silt loam, 0 to 3 percent slopes	A/D	3.7	0.0%
CnA	Chenango gravelly silt loam, 0 to 3 percent slopes	A	14.5	0.0%
CnB	Chenango gravelly silt loam, 3 to 8 percent slopes	A	79.8	0.3%
CnC	Chenango gravelly silt loam, 8 to 15 percent slopes	A	33.5	0.1%
FAE	Farmington-Rock outcrop complex, steep		13.1	0.0%
FW	Fresh water marsh	A/D	63.6	0.2%
GP	Gravel pit		44.5	0.1%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ha	Hamlin silt loam	B	126.0	0.4%
He	Haven loam	B	23.2	0.1%
HgA	Hoosic gravelly loam, 0 to 3 percent slopes	A	4.0	0.0%
HgB	Hoosic gravelly loam, 3 to 8 percent slopes	A	81.0	0.3%
HgC	Hoosic gravelly loam, rolling	A	134.6	0.4%
HgD	Hoosic gravelly loam, 15 to 25 percent slopes	A	87.6	0.3%
HSF	Hoosic soils, very steep	A	13.7	0.0%
HuB	Hudson silt loam, 3 to 8 percent slopes	C/D	18.8	0.1%
HuC	Hudson silt loam, 8 to 15 percent slopes	C/D	63.7	0.2%
HwD	Hudson and Schoharie soils, 15 to 25 percent slopes	D	121.2	0.4%
HXE	Hudson and Schoharie soils, 25 to 55 percent slopes	D	13.9	0.0%
Lm	Lamson fine sandy loam	A/D	185.7	0.6%
LY	Lyons-Atherton complex, very stony	C/D	313.9	1.0%
Ma	Madalin silty clay loam	C/D	163.6	0.5%
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	D	151.0	0.5%
MgB	Mardin-Nassau complex, 3 to 8 percent slopes	D	1,898.1	6.0%
ML	Made land	B	17.0	0.1%
Mr	Middlebury silt loam	B/D	40.4	0.1%
NBF	Nassau-Bath-Rock outcrop complex, very steep		4,178.7	13.2%
NOD	Nassau-Rock outcrop complex, hilly	D	263.9	0.8%
OdA	Odessa silt loam, 0 to 3 percent slopes	D	261.7	0.8%
OdB	Odessa silt loam, 3 to 8 percent slopes	D	132.5	0.4%
Pa	Palms muck	A/D	344.8	1.1%
Pb	Palms muck, bedrock variant	B/D	52.3	0.2%
PlB	Plainfield loamy sand, 0 to 8 percent slopes	A	138.9	0.4%
PlC	Plainfield loamy sand, 8 to 15 percent slopes	A	111.2	0.4%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PmD	Plainfield-Riverhead complex, moderately steep	A	142.4	0.5%
PmF	Plainfield-Riverhead complex, very steep	A	218.8	0.7%
PrC	Plainfield-Rock outcrop complex, rolling	A	939.9	3.0%
Pt	Pompton fine sandy loam	B/D	66.7	0.2%
QU	Quarry		126.5	0.4%
Ra	Raynham silt loam	C/D	401.3	1.3%
Re	Red Hook gravelly silt loam	B/D	12.0	0.0%
RhB	Rhinebeck silt loam, 3 to 8 percent slopes	C/D	407.4	1.3%
RvA	Riverhead fine sandy loam, 0 to 3 percent slopes	A	98.5	0.3%
RvB	Riverhead fine sandy loam, 3 to 8 percent slopes	A	370.2	1.2%
RvC	Riverhead fine sandy loam, 8 to 15 percent slopes	A	187.0	0.6%
RXC	Rock outcrop-Arnot complex, 3 to 15 percent slopes	D	7.6	0.0%
RXF	Rock outcrop-Arnot complex, 25 to 70 percent slopes		420.8	1.3%
SaB	Schoharie silt loam, 3 to 8 percent slopes	D	204.9	0.6%
SaC	Schoharie silt loam, 8 to 15 percent slopes	D	47.4	0.2%
Sc	Scio silt loam	B/D	30.1	0.1%
STD	Stockbridge-Farmington-Rock outcrop complex, hilly		38.2	0.1%
Te	Teel silt loam	B/D	199.5	0.6%
Un	Unadilla silt loam	B	3.3	0.0%
VoA	Volusia gravelly silt loam, 0 to 3 percent slopes	D	26.7	0.1%
VoB	Volusia gravelly silt loam, 3 to 8 percent slopes	D	97.3	0.3%
VSB	Volusia channery silt loam, 0 to 8 percent slopes, very stony	D	167.9	0.5%
W	Water		2,819.8	8.9%
Wa	Walpole fine sandy loam	A/D	48.6	0.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Wb	Wayland soils complex, non-calcareous substratum, 0 to 3 percent slopes, frequently flooded	B/D	309.8	1.0%
Wc	Wayland mucky silt loam	C/D	35.6	0.1%
WsA	Williamson silt loam, 0 to 3 percent slopes	D	31.7	0.1%
WsB	Williamson silt loam, 3 to 8 percent slopes	D	482.9	1.5%
Subtotals for Soil Survey Area			**31,414.9**	**99.5%**
Totals for Area of Interest			**31,569.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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Tighe&Bond

APPENDIX B

FHWA FLH CULVERT ASSESSMENT GUIDE

CONDITION ASSESSMENT RATING CODES

Good	Like new, with little or no deterioration, structurally sound and functionally adequate.
Fair	Some deterioration, but structurally sound and functionally adequate.
Poor	Significant deterioration and/or functional inadequacy, requiring repair action that should, if possible, be incorporated into the planned roadway project.
Critical	Very poor conditions that indicate possible imminent failure that could threaten public safety, requiring immediate repair action.
Unknown	All or part of the culvert is inaccessible for assessment or a rating cannot be assigned.

Notes:

- In general, the lowest elemental rating for the culvert determines the overall rating.
- Culvert conditions are assigned the above ratings, while failing culvert performance parameters are indicated by a check box if present.
- This guide is used for the rating of culverts with spans less than 20 feet as measured along the centerline of the roadway, as defined by NBIS. (1)
- Due to the varied background and experience of the assessors, and variety of structures and deterioration modes, there is some inherent subjectivity to assigning the ratings in this guide.

FHWA FLH CULVERT ASSESSMENT GUIDE

CONCRETE & RCP CONDITIONS

Refer to Photographic Guide for further assistance with rating assignments.

	Good	Fair	Poor	Critical
Invert Deterioration	Little or no abrasion, with light scaling and exposed aggregate	Moderate abrasion and scaling with minor aggregate loss but no exposure of steel reinforcement	Heavy abrasion and scaling with exposed steel reinforcement	Holes or section loss with extensive voids beneath and embankment or roadway damage
Joints	Smooth, tight joints with minor chips, cracks	Open or displaced with minor infil/exfil of water and/or soil	Open or displaced with significant infil/exfil of soil and/or water and voids visible	Broken open or separated > 4" gap with extensive voids and embankment or roadway damage
Cross-Section Deformation	None observed	Cracks present, but no perceptible cross-section deformation	Longitudinal cracks in crown, invert and/or haunches, with perceptible cross-section deformation	Deformation and cracking has led to extensive infiltration of backfill soil, structural failure or embankment and/or roadway damage
Cracking	Boxes and Arches: Minor hairline or map cracks due to shrinkage <=1/8" wide at isolated areas, not at the crown or spring lines, with <25% cross-section coverage RCP: No cracks	Boxes and Arches: Minor cracks <= 1/4" wide, with minor spalls and infil/exfil of water or soil, along crown or haunches, <50% cross-section coverage any size RCP: Few hairline cracks, not at crown or haunches	Boxes and Arches: Open cracks >1/4" wide with significant infil/exfil and voids, or >50% cross-section coverage any size RCP: Cracks >1/8" wide, or any along crown or haunches, or >25% cross-section coverage any size	Resultant displacement at cracks has led to extensive infiltration of backfill soil, structural failure and/or resultant embankment and/or roadway damage
Corrosion/ Chemical	Boxes and Arches: Efflorescence present for boxes & arches RCP: No efflorescence	Boxes and Arches: Rust staining at cracks and spalls RCP: No rust staining	Boxes and Arches: Exposed steel reinforcement RCP: Rust staining or exposed steel reinforcement	Significant section loss of steel reinforcement that causes pipe deformation, holes in pipe walls and embankment and/or roadway damage

Notes:

- If the structure is open-bottomed and the side of a footing is exposed, a Level 2 assessment is required.
- If the structure is open-bottomed and rated in Poor or Critical condition, a Level 2 assessment is required.
- If the structure is known to have deteriorated from New/Good condition to Poor or Critical due to invert abrasion or corrosion/chemical attack in 5 years or less, a Level 2 assessment is required.
- See Level 2 Disciplines Matrix in Decision-Making Tool for guidance on Level 2 assessments.

FHWA FLH CULVERT ASSESSMENT GUIDE

CORRUGATED METAL PIPE CONDITIONS

Refer to Photographic Guide for further assistance with rating assignments.

	Good	Fair	Poor	Critical
Corrosion (Above Invert)	Little or no surface rust above the invert Little or no coating loss if coated above the invert	Minor surface rust and limited pitting above the invert Connection hardware corroded but intact	Perforations visible or easily made by hammer test strike above the invert Connection hardware failing	Significant section loss resulting in extensive infiltration of backfill soil, voids and embankment and/or roadway damage
Cross-section Deformation	None	Slight perceptible deformation at worst section, or local bulging	Deformation with accompanying longitudinal cracking or crushing in crown, invert and/or spring lines	Excessive deformation resulting in extensive infiltration of backfill soil, voids and piping with resultant embankment and/or roadway damage
Invert Deterioration	Little or no coating loss, and/or light rust staining, but no metal section loss	General corrosion, scaling or pitting with coating loss, but significant remaining metal section	Perforations visible or easily made by hammer test strike in invert area	Significant section loss in invert beyond perforations resulting in extensive voids beneath invert and/or embankment and/or roadway damage
Joints & Seams	Minor damage with no separation gaps	Open or displaced with minor infil/exfil of water and/or soil	Open or displaced with significant infil/exfil of soil and/or water and voids visible	Open or displaced with significant infiltration of backfill soil, and accompanying embankment and/or roadway damage

Notes:

- If the structure is open-bottomed and the side of a footing is exposed, a Level 2 assessment is required.
- If the structure is open-bottomed and rated in Poor or Critical condition, a Level 2 assessment is required.
- If the structure in known to have deteriorated from New/Good condition to Poor or Critical due to abrasion or corrosion in 5 years or less, a Level 2 assessment is required.
- See Level 2 Disciplines Matrix in Decision-Making Tool for guidance on Level 2 assessments.

FHWA FLH CULVERT ASSESSMENT GUIDE

PLASTIC PIPE CONDITIONS

Refer to Photographic Guide for further assistance with rating assignments.

	Good	Fair	Poor	Critical
Liner/ Corrugation Wall Condition	Liner is smooth with no signs of re-corrugation (rippling in smooth liner) No splits, tears, cracking or localized bulging	Slight re-corrugation of inner liner or wall buckling Splits, tears, and cracks <=6" long at limited locations	Significant re-corrugation of inner liner or wall buckling Splits, tears and cracks at several locations >6" long	Excessive tears, splits and/or bulges resulting in extensive infiltration of backfill soil, voids and piping with resultant embankment and/or roadway damage
Invert Deterioration	None	Minor wear or abrasion	Significant wear and perforations	Significant section loss in invert through outer wall of pipe resulting in voids beneath invert and/or embankment and/or roadway damage
Joints	Minor damage with no separation gaps	Open or displaced with minor infil/exfil of water and/or soil	Open or displaced with significant infil/exfil of soil and/or water and voids visible	Open or displaced with significant infiltration of backfill soil, and accompanying settlement of, or sinkholes in, embankment and/or roadway damage
Cross-section Deformation	No cross-section deformation	Slight perceptible deformation and/or few bulges	Significant perceptible deformation	Excessive deformation resulting in embankment and/or roadway damage and/or significant loss of conveyance

Notes:

- If the structure is known to have deteriorated from New/Good condition to Poor or Critical due to abrasion in 5 years or less, a Level 2 assessment is required.
- See Level 2 Disciplines Matrix in Decision-Making Tool for guidance on Level 2 assessments.

FHWA FLH CULVERT ASSESSMENT GUIDE

TIMBER CONDITIONS

Refer to Photographic Guide for further assistance with rating assignments.

	Good	Fair	Poor	Critical
Invert Deterioration	None	Minor section loss with no perforations	Significant section loss and/or perforations present with accompanying infiltration and voids	Complete loss of section at invert resulting in extensive voids beneath invert and/or embankment and/or roadway damage
Joints & Seams	Minor damage with no separation gaps Surface rusting of connection hardware	Displaced or separated with minor infil/exfil, but no visible voids Connection hardware corroded but intact Perceptible deformation and/or warping, with minor cracks	Displaced or separated with significant infil/exfil and visible voids Connection hardware failing Significant warping and cracking/breaking	Excessive deformation, displacement or separated with accompanying embankment and/or roadway settlement/ sinkholes Connection hardware failure resulting in joint and seam damage and infiltration of backfill soil and roadway damage
Rot and Borer Attack	None	Minor, local damage or section loss	Significant section loss, crushing and/or cracks and holes with significant infil/exfil of soil and water with voids visible	Severe deformation due to section losses and/or crushing, with embankment and/or roadway damage

Notes:

- If the structure is open-bottomed and the side of a footing is exposed, a Level 2 assessment is required.
- If the structure is open-bottomed and rated in Poor or Critical condition, a Level 2 assessment is required.
- If the structure has deteriorated from New/Good condition to Poor or Critical in 5 years or less, a Level 2 assessment is required.
- See Level 2 Disciplines Matrix in Decision-Making Tool for guidance on Level 2 assessments.

FHWA FLH CULVERT ASSESSMENT GUIDE

MASONRY CONDITIONS

Refer to Photographic Guide for further assistance with rating assignments.

	Good	Fair	Poor	Critical
Cross-section Deformation	None	Minor cracking visible, but no perceptible deformation	Perceptible deformation, and longitudinal cracks in crown, invert and/or spring lines	Holes and gaps have led to extensive infiltration of backfill soil and resultant embankment and/or roadway damage
Invert Deterioration	Minor scaling of joint material or blocks in invert area	Significant scaling with loose mortar and/or blocks in invert area	Displaced mortar and/or blocks, holes in invert area	Significant holes and section loss at invert resulting in extensive voids beneath invert and/or embankment and/or roadway damage
Mortar and Masonry	Isolated, minor mortar deterioration All blocks in place and stable No infil/exfil of soil	Mortar/block crushing and loss, loose blocks Minor infil/exfil of soil	Missing and/or displaced blocks Infiltration and voids	Widespread holes have led to extensive infiltration of backfill soil, voids, and piping with resultant embankment and/or roadway damage

Notes:

- If the structure is open-bottomed and the side of a footing is exposed, a Level 2 assessment is required.
- If the structure is open-bottomed and rated in Poor or Critical condition, a Level 2 assessment is required.
- If the structure has deteriorated from New/Good condition to Poor or Critical in 5 years or less, a Level 2 assessment is required.
- See Level 2 Disciplines Matrix in Decision-Making Tool for further guidance on Level 2 assessments.

FHWA FLH CULVERT ASSESSMENT GUIDE

APPURTENANCES CONDITIONS

Refer to Photographic Guide for further assistance with rating assignments.

	Good	Fair	Poor	Critical
Headwall/ Wingwall	Little or no cracking, rotation, or displacement Light concrete scaling, timber rot, metal corrosion or other surface deterioration No footing exposed	Minor cracks and spalls in concrete Minor rotation and/or displacement with gap in barrel seam Minor footing exposure	Area affected by cracking and spalling is >50% and/or rebar exposed Significant displacement at cracks or wall rotation causing a gap at the wall-to-barrel interface >4". Footing exposed and undermined	Partially or totally collapsed, with resultant damage to embankment and/or roadway damage
Apron	No cracking, piping or undermining	Minor cracking but no visible piping or undermining	Significant cracking affects >50% of apron Significant piping or undermining	Partially or totally collapsed, significantly effecting performance and/or causing embankment and/or roadway damage
Flared End Section or Pipe End	Little or no visible cracking, deterioration, or deformation No undermining	Minor cracking, deterioration, or deformation Minor undermining	Significant cracks, piping or undermining affects >50% of appurtenance End crushed or separated from barrel	Deterioration is significantly effecting performance and/or causing embankment and/or roadway damage
Scour Protection	Little or no displacement or undermining of individual rip rap or armor units Tight interface with culvert structure	Localized displacement of individual rip rap or armor units, undermining or deterioration Slight separation at culvert interface	Significant displacements, undermining or deterioration effecting the performance of the counter measure and culvert structure	Partially or totally failed, significantly effecting performance and/or causing embankment and/or roadway damage

Notes:

- If the apron has deteriorated from New/Good condition to Poor or Critical in 5 years or less due to aggressive abrasion, a Level 2 assessment is required.
- See Level 2 Disciplines Matrix in Decision-Making Tool for guidance on Level 2 assessments.

Tighe&Bond

APPENDIX C

Results from Site Visits & Recommendations for Reported Flooding Areas

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

2019 Esopus Flooding Assessment Study

Capacity Analysis Priorities

20 of 62 Properties or 32%

	Resident Name	Address	Hamlet	Date of Site Investigation	Capacity Analysis	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
1	Gloria VanVilet & Craig Johnston	187 Doris Street	Port Ewen	4/29/2019	Eugene to Doris Street	Resident States: Doris and Eugene Street and Lee Road (intersection) catch basin constantly overflows in this location. Town States: Potential issue with capacity in system. Floods during larger storm events.	Tighe & Bond observed debris in catch basins and light debris on top of catch basin grates along Eugene Street. Changes in water elevation within the system suggest there may be a blockage within the system is limiting the system's capacity.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
2	Brian VanVliet	188 Eugene Street	Port Ewen	8/9/2019	Eugene to Doris Street	Resident States: The back and side yards flood during storm events. Town states that water can be as deep a 3'.	Tighe & Bond observed that the stormwater system from Park Lane cuts through the residents back yard to a catch basin. Stormwater line turns at catch basin and goes thru another resident's property. Resident says that stormwater over flows catch basin and overtop roads in front yard during large stormwater events.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
3	N/A	Corner of West Stout Lane Park Lane	Port Ewen	5/23/2019	Eugene to Doris Street	Town States: The intersection of West Stout Ave and Park Lane experiences flooding	Tighe & Bond observed light debris on the grate of the south catch basin. It appears that the system takes a large amount of runoff from the park including runoff from north side of the park.15-inch culverts may be undersized given the apparent area contributing stormwater to the system.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
4	N/A	203 – 207 Clay Road	Ulster Park	5/8/2019	Clay Road	Residents States: Town has attempted to assist them with flooding condition by recently replacing pipe but flooding still exists. Back yard of 203 Clay Road floods, garage of 205 Clay Road garage floods, 207 Clay Road basement floods and 213 Clay Road has added drainage structures to protect house but still has issues with groundwater in yard. Tighe & Bond spoke with resident from 203 & 205 Clay Road at the time of investigation	Tighe & Bond observed a small stream, coming from a pond upgradient, discharging through the back yard of 203 Clay Road and at the back of the garage located at 205 Clay Road. The Town attempted to directed it around the garage using a 12-inch pipe and concrete structures. A grate is placed over the 12-inch pipe to keep debris from entering the structure. The system appears undersized and prone to clogging.	Perform a capacity analysis of pipe and channel size for flow from Rt. 9W. Swale could be rerouted as necessary to relocate the channel away from structures and allow peak flows to pass without over toping banks and jeopardizing structures. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
5	David & Cynthia Berryan	183 Schryver Street	Port Ewen	4/29/2019	Salem Street to Sentar Lane	Resident States: That the back yard has become increasingly wet and that the groundwater table appears to have risen. Neighboring properties have holes in ground that they keep filling. Holes appear to be created on top of where there is believed to be stormwater pipes	Tighe & Bond observed the ground to be moderately wet and observed holes and depressions in the ground where stormwater pipes appeared to be in ground. Pipes are observed to be CMP and potentially at the end of service life. A hole in pipe could cause soil to enter the pipe and be carried away by water causing depressions and holes. In addition, a hole in a CMP pipe can introduce water from upstream to the immediate groundwater table causing a localized increase to the groundwater table. Resident has not identified a flooding condition due to the stormwater system but due to upstream development and age of system capacity should be checked.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
6	Guy Brought	170 Horton Lane	Port Ewen	5/23/2019	Salem Street to Sentar Lane	Resident States: That the front yard is subject to flooding during storm events and often takes longer than expected to dry back out.	Tighe & Bond observed that appropriate ditches and drainage appear to be provided at the front yard of 170 Horton Lane. However, the Towns stormwater water system surrounds the property on the north, east, and south sides of the property. Pipes are observed to be CMP and potentially at the end of service life. A hole in a CMP pipe can introduce water from upstream the immediate groundwater table causing a localized increase to the	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.

Results from Site Visits & Recommendations for Reported Flooding Areas

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2019 Esopus Flooding Assessment Study

Capacity Analysis Priorities

20 of 62 Properties or 32%

	Resident Name	Address	Hamlet	Date of Site Investigation	Capacity Analysis	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
							groundwater table. Due to upstream development and age of system capacity is recommended to be checked.	
7	Maria Cristina Brusca	186 Hasbrouck Ave.	Port Ewen	4/29/2019	Salem Street to Sentar Lane	Resident States: That they have noticed depressions forming in the back yard making it difficult to maintain.	Tighe & Bond observed what appears to be the depressions forming in the yard. Nearby manhole had a CMP pipe that extended into the back yard of 186 Hasbrouck Ave. Resident stated that they do not know what purpose it serves and could be part of the cause for the depressions. A hole in pipe could cause soil to enter the pipe and be carried away by water causing depressions and holes. While the condition of the existing drainage pipes and structures appears to be a cause of flooding and saturated ground conditions, there may also be a system capacity issue due to increase development in the contributing watershed.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow. If it is determined that the CMP pipe extending from the manhole is no longer in use, it could be dug removed or properly abandoned.
8	Nancy Cericola	169 Sunset Drive	Port Ewen	4/29/2019	Salem Street to Sentar Lane	Resident States: Back yard is increasingly wet making the yard unusable. Resident also has issues with water at the front of the house during winter when snow piles are plowed on top of catch basin, blocking the grates.	Tighe & Bond observed that the properties back yard was wet, and the ground was soft under foot. The property has a 24-inch CMP pipe running along the back yard. The CMP pipe was observed at a nearby manhole and showed deterioration at the invert. Several properties along this line are also experiencing groundwater issues. A hole in a CMP pipe can introduce water from upstream to the immediate groundwater table causing a localized increase to the groundwater table. While the condition of the existing drainage pipes and structures appears to be a cause of flooding and saturated ground conditions, there may also be a system capacity issue due to increase development in the contributing watershed.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
9	Mike Dauner	182 Hasbrouck	Port Ewen	4/29/2019	Salem Street to Sentar Lane	Resident States: There is a drainage issue causing holes in the vicinity of the drain. Drain was installed in the 1950s, Resident is concerned the pipe may be collapsing in this area.	Tighe & Bond observed what appears to be the depressions forming in the yard near the CMP pipes that run through the back yard. A number of properties in the area are experiencing the same problem. While the condition of the existing drainage pipes and structures appears to be a cause of flooding and saturated ground conditions, there may also be a system capacity issue due to increase development in the contributing watershed.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
10	Brittany Miller	169 Sentar Lane	Port Ewen	4/29/2019	Salem Street to Sentar Lane	Resident States: Back yard is increasingly wet making the yard unusable and difficult to maintain. Areas of back yard are ponding up and not infiltrating into the ground due to high water table.	Tighe & Bond observed the ground to be wet and show evidence of ponding. A larger stormwater structure exists in the back yard and appears to be a convergence point for two systems and an outlet pipe that heads to the west. From observation at the stormwater structure there is deterioration at the invert of all the CMP pipes. Several properties along this line are also experiencing groundwater issues. A hole in a CMP pipe can introduce water from upstream to the immediate groundwater table causing a localized increase to the groundwater table While the condition of the existing drainage pipes and structures appears to be a cause of flooding and saturated ground conditions, there may also be a system capacity issue due to increase development in the contributing watershed.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.

Results from Site Visits & Recommendations for Reported Flooding Areas

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2019 Esopus Flooding Assessment Study

Capacity Analysis Priorities

20 of 62 Properties or 32%

	Resident Name	Address	Hamlet	Date of Site Investigation	Capacity Analysis	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
11	Frank & Christine Sessler	173 Horton Lane	Port Ewen	4/29/2019	Salem Street to Sentar	Resident States: Water shoots out the top of pipe in back yard and runs down back yard and into house. Backyard is consistently wet groundwater table appears to be rising	Tighe & Bond observed that there has been a hole cut in existing CMP pipe in the resident's back yard and a grate put on top for the water to enter the pipe. During large storm events, surcharging within the pipe reportedly caused the pipe to overflow and flood the resident's yard. Also found that the CMP pipe appears to be at the end of service life. A hole in a CMP pipe rom deterioration or alteration can introduce water from upstream the immediate groundwater table causing a localized increase to the groundwater table.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
12	Darin Dekoskie	240 Tilden Street	Port Ewen	5/3/2019	Tilden Street	Resident States: A large amount of runoff from upstream comes down the hill side to the Tilden Street. It flows over land till it reaches the gutter line along west side of Tilden where it is channeled toward a catch basin at the end of Tilden. During storm events the catch basin is subject to flooding. Town recently added a catch basin to help with flooding	Tighe & Bond observed water flowing out of the ground on a dry day and following the gutter to the catch basin. High groundwater means water has little to no opportunity to infiltrate into the ground. Moderate amount debris was observed around the catch basin. The additional catch basin that the town has added discharges flow back to existing catch basin meaning little to no gain in capacity was added. Outlet of the catch basin is a CMP pipe that runs under private property and out to river. CMP pipe shows signs of age and may be at the end of its service life	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
13	Alexandra Pappas & Chad Gomes	253 Tilden Street	Port Ewen	5/3/2019	Tilden Street	Resident States: In the past the stormwater system has flooded and caused damage to the dirt and driveway all of the water went over the guard rail and caused a sinkhole because of storm drain clogged.	Tighe & Bond observed water flowing out of the ground on a dry day and following the gutter to the catch basin. High groundwater means water has little to no opportunity to infiltrate into the ground. Moderate amount debris was observed around the catch basin. The additional catch basin that the town has added flows back to existing catch basin meaning little to no gain in capacity was added. Outlet of basin is a CMP pipe that runs under resident's property and out to river. CMP pipe shows signs of age and may be at the end of its service life.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
14	Meredith Hughes	190 Lindorf Street	Ulster Park	5/8/2019	Lindorf Street	Resident States: That they believe ground water elevation has recently risen causing issues with water in the basement. Resident hired a contractor to manage roof runoff and provide footing drains to try to keep water away from house however is still having issues with water at basement and in front yard.	Tighe & Bond observed that a stream exists at the east property line which the Town drainage system discharges to. Stream appears to be appropriately sized and does not appear to be contributing to the issue. The resident stated during Tighe & Bond's observation that the stream does not flood and overtop. Water was observed in front yard in multiple locations. Also, checked an onsite well on the resident's property which showed groundwater in proximity to surface of front lawn. A large portion of the surrounding properties appear to have ground water related issues.	Perform a capacity analysis and repair of the downstream stormwater system which should yield a reduction in the amount of surface water contributing to groundwater. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow. If the Town is financially able to extend the stormwater system and allow basement foundation drains and sump pumps to be connected to the stormwater system, it could help with the groundwater level in the area.
15	Madeline Korth	204 Lindorf Street	Ulster Park	4/29/2019	Lindorf Street	Resident States: That they believe ground water elevation has recently risen causing issues with water in the basement. Resident hired a contractor to manage roof runoff and provide footing drains to try to keep water away from house however is still having issues with water.	Tighe & Bond observed high groundwater in the back yard particularly where footing drains and roof runoff was being channeled. Resident has created a micro swale to help move the water downstream (toward another resident's back yard). A large portion of the surrounding properties appear to have ground water related issues.	Perform a capacity analysis and repair of the downstream stormwater system which should yield a reduction in the amount of surface water contributing to groundwater. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow. If the Town is financially able to extend the stormwater system and allow basement foundation drains and sump pumps to be connected to the stormwater system, it could help with the groundwater level in the area.

Results from Site Visits & Recommendations for Reported Flooding Areas

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2019 Esopus Flooding Assessment Study

Capacity Analysis Priorities

20 of 62 Properties or 32%

	Resident Name	Address	Hamlet	Date of Site Investigation	Capacity Analysis	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
16	Joyce Pade	205 Rodgers Street	Ulster Park	4/29/2019	Lindorf Street	Resident States: That they believe ground water elevation has recently risen causing issues with water in the basement. Resident has a sump pump that runs almost continuously keep water out of the basement.	Tighe & Bond observed high groundwater in the back yard particularly where footing drains and roof runoff was being channeled. Resident has created a small swale to help move the water downstream. A large portion of the surrounding properties appear to have ground water related issues.	Perform a capacity analysis and repair of the downstream stormwater system which should yield a reduction in the amount of surface water contributing to groundwater. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow. If the Town is financially able to extend the stormwater system and allow basement foundation drains and sump pumps to be connected to the stormwater system, it could help with the groundwater level in the area.
17	Alicia Barnes	187 Lindorf Street	Ulster Park	5/30/2019	Lindorf Street	Resident States: That they believe ground water elevation has recently risen causing issues. Resident has issues maintaining front yard due to ponding water. Also stated that the Town has recently had water push out of cracks in the road due to high groundwater.	Tighe & Bond observed that the ground was soft underfoot while walking in front yard and the grading of the road and front lawn causes a low spot for water to pond. Resident regrading of their front lawn could prevent ponding issues. A large portion of the surrounding properties appear to have ground water related issues.	Perform a capacity analysis and repair of the downstream stormwater system which should yield a reduction in the amount of surface water contributing to groundwater. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow. If the Town is financially able to extend the stormwater system and allow basement foundation drains and sump pumps to be connected to the stormwater system, it could help with the groundwater level in the area.
18	Harry & Gina VanVliet	225 Lindorf Street	Ulster Park	4/29/2019	Lindorf Street	Resident States: That the stormwater system on the west side of the property is not working and causing groundwater issues in the basement. Contractors that perform basement water proofing work have advised Resident that they will not perform work until theTtown fixes stormwater system.	Tighe & Bond observed that the stormwater system is not collecting stormwater and is allowing it to pond and run along the property on top of the ground. The running water has begun to create its own channel around the stormwater system creating a flooding condition in back yards between 225 Lindorf and back yard and Clay Road.	Perform a capacity analysis and repair of the stormwater system which should yield a reduction in the amount of surface water contributing to groundwater. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow. If the Town is financially able to extend the stormwater system and allow basement foundation drains and sump pumps to be connected to the stormwater system, it could help with the groundwater level in the area.
19	Ann Roschelle	7 Valley Road	Ulster Park	5/8/2019	Valley Road	Resident States: There has been an ongoing issue for 12-14 years as rain water runs over the pipes and the ground floods causing issues in the front yard and house. Resident believes the system needs larger pipes and catch basin water runs over instead of into it. In the winter the drains freeze.	Tighe & Bond observed that on a dry day the system was taking on flow from up stream. This steady flow reduces the capacity of the stormwater system. In addition, the well for the resident's property was pushing water out of the well head which indicates high ground water. When flooding of the system occurs the high groundwater prevents the water from infiltrating compounding the issue.	Tighe & Bond recommends that a capacity analysis of the drainage network be performed. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.
20	Joanne Auffarth	6 Highland Road	Ulster Park	08/09/2019	Valley Road	Resident States: Water comes off the hill from Highland Road and the stormwater system cannot keep up during storm events. Water sometime pushes up out of the basins. Being at the bottom of the hill the resident struggles with groundwater level causing flooding in the basement. In 2011 the resident lost everything in the basement to flooding water elevation was 6' deep in the basement. Resident also states the road has been raised up over the years causing an impoundment.	Tighe & Bond observed a catch basin in front of the resident's property with a 6" PVC outlet pipe. Given the observed contributing area this pipe appears to be under sized and prone to clogging. Tighe & Bond also observed the water mark in the resident basement which appeared to be approximately 6' from the floor of the basement. The resident currently was working on reconstructing the sump pump to provide better drainage in basin. Tighe & Bond also observed a dry stream in the back yard of the resident's property. Resident stated that the stream flows during storm events.	Perform a capacity analysis of drainage network within the roadway. Given the results from the capacity analysis, consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow.

Results from Site Visits & Recommendations for Reported Flooding Areas

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2019 Esopus Flooding Assessment Study

County Drainage

4 of 62 Properties or 6%

	Resident Name	Address	Hamlet	Date of Site Investigation	Maintenance / Repair	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
1	John Bell	5 River Road	Port Ewen	5/3/2019	Repair	Resident States: Backyard is often saturated weeks after heavy rainfall. Many issues with culvert and drainage pipe (cannot take the volume of water it receives) sends 6 inches of water with garbage through the backyard. Front yard and basement are flooded due to runoff from River Road	Tighe & Bond observed that the current drainage configuration of River Road sends stormwater runoff from river road to front yard of the house. The resident has attempted to use some home remedies to fix the issues. Water from river road could be channeled away from house. CMP that diverts a stream under the back yard does appear to be aged. An existing catch basin in back yard and captures surface run off but the ground does appear to be wet.	Tighe & Bond recommends that the Town request the County review stormwater channelization along River Road. The Culvert in back yard is a future candidate for a capacity analysis and potential replacement by the County.
2	Linda Breithaupt	57 Main Street	Esopus	5/8/2019	Repair	Resident states: That runoff from Parker Ave. is causing issues on the property. Runoff has cause flooding in the basement, collapsed wall and is causing a hole in back yard. County has recently fixed the opposite side of Parker Ave but did not channelize water on south side of Parker Ave.	Tighe & Bond observed that the road does channelize water towards the resident's property. Water is not picked up in the catch basin that exists but instead flows along the house foundation and over the back yard to a small pond. The resident has replaced stormwater piping on the property, but the surrounding system is aged and is recommended to be further investigated. In addition, the outfall for the system which is located to the southwest of the resident's property is over-grown with debris.	Tighe & Bond recommends that the Town request the County review stormwater channelization along Parker Ave adjacent to the resident's foundation.
3	Pauline Simon	251 Agnes Street	Port Ewen	4/29/2019	Maintenance	Resident states: During Irene in 2011 their property and abutting property flooded into the house causing major damage. The back yard is always wet and never really drains out. Downstream a culvert that passes under Salem Street is being blocked by fallen vegetation. The stream that runs along the back yard used to be cleaned out by the Town but has not been cleaned out in many years.	Tighe & Bond observed that the back yard of the resident's property is wet. A stream that is on a private abutters land flows along the back yard and converges with another stream at the resident's back yard. Both streams appear to be over-grown with vegetation. The stream is about a foot or two below the resident's yard elevation causing a ground water issue. In addition, Tighe & Bond observed fallen vegetation at the culvert under Salem street. The vegetation debris does not appear to be causing a restriction at this time, but it is recommended to be removed so as not to cause a future restriction.	Tighe & Bond recommends that the Town request the County remove any fallen vegetation from inlet and outlet of the culvert that crosses Salem Street downstream. The stream on private property may have been maintained by the Town at one time but is owned by different land owner and does not appear to be the Town's responsibility to keep clear.
4	Gary & Barbara Wilson	249 Agnes Street	Port Ewen	4/29/2019	Maintenance	Resident states: During Irene in 2011 their property and abutting property flooded into the house causing major damage. The back yard is always wet and never really drains out. Downstream a culvert that passes under Salem Street is being blocked by fallen vegetation.	Tighe & Bond observed that the back yard of the resident's property is wet. A stream that is on a private abutters land flows along the back yard and converges with another stream at the resident's back yard. Both streams appear to be over grown with vegetation. The stream is about a foot or two below the resident's yard elevation causing a ground water issue. In addition, Tighe & Bond observed fallen vegetation at the culvert under Salem street. The vegetation debris does not appear to be causing a restriction at this time, but it is recommended to be removed so as not to cause a future restriction.	Tighe & Bond recommends that the Town request the County remove any fallen vegetation from inlet and outlet of the culvert that crosses Salem Street downstream. The stream on private property may have been maintained by the Town at one time but is owned by different land owner and does not appear to be the Town's responsibility to keep clear.

Results from Site Visits & Recommendations for Reported Flooding Areas

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Town Maintenance — **19 of 62 Properties or 30%**

	Resident Name	Address	Hamlet	Date of Site Investigation	Maintenance / Replacement / or New System Components	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
1	Certified Marina	166 First Street	Connelly	4/29/2019	Maintenance	Resident States: The Town was supposed to maintain system on the property per the easement provided to them. Catch basins grates are not cleaned and causing flooding on the property.	Tighe & Bond observed that the catch basin was cleaned out at the time of inspection but is subject to a lot of vegetation debris as it takes run off from the woods. System was operating appropriately at time of inspection	Tighe & Bond recommends the Town formalizes a plan for maintenance of stormwater structures on the property under existing maintenance agreement.
2	Steve & Elaine Hamilton	179 Horton Lane	Port Ewen	4/29/2019	Maintenance / Replacement	Resident States: Water shoots out the top of pipe in back yard and runs down back yard and into house. Backyard is consistently wet, and the ground water table appears to be rising.	Tighe & Bond observed that there has been a hole cut in existing CMP pipe in the resident's back yard and a grate put on top for the water to enter the pipe. During large storm events, surcharging within the pipe caused the pipe to overflow and flood the resident's yard. Also found that the CMP pipe appears to be at the end of service life. A hole in a CMP pipe rom deterioration or alteration can introduce water from upstream the immediate groundwater table causing a localized increase to the groundwater table.	Tighe & Bond recommends the Town to CCTV line that potentially has clogging issues and clear line. If CMP has failed than the culvert should be replaced. This Resident is also part of a Salem to Sentar capacity analysis, which recommended that the Town consider implementing the proposed concept improvement alternative in Section 3, if financial resources allow and proposes replacement of the pipe in question.
3	Roger and Cynthia Frary	109 Pine Tree Drive	St. Remy	5/8/2019	New System Components	Resident States: That the Town is discharging water on to property causing drainage issues including flooding of the road and flooding of the resident's property.	Tighe & Bond observed a culvert across Main Street that conveys stormwater from the east side of the street to the west side of the street. It appears that the drainage swale on 512 Main Street has been obstructed causing flooding on the resident's property. Historic conveyance of stormwater appears to have been through the culvert, through the drainage swale, and to a catch basin off Decker Ave.	The Town has determined that the obstruction of the drainage swale is not the Town's responsibility to address. If the condition compromises the integrity of the Town-owned road or creates a hazard to motorist using the road, the Town should consider addressing the obstruction of the drainage swale. Discharge of any stormwater facilities associated with the watershed contributing to the culvert should be to the same catch basin that historically received overland stormwater flow, so as not to change the existing drainage pattern.
4	Douglas Navarra	512 Main Street	St. Remy	5/8/2019	New System Components	Resident States: That the Town is discharging water on to property causing drainage issues including flooding of the road and flooding of the resident's property.	Tighe & Bond observed a culvert across Main Street that conveys stormwater from the east side of the street to the west side of the street. It appears that the drainage swale on the property has been obstructed causing flooding on the resident's property and 109 Pine Tree Drive. Historic conveyance of stormwater appears to have been through the culvert, through the drainage swale, and to a catch basin off Decker Ave.	The Town has determined that the obstruction of the drainage swale is not the Town's responsibility to address. If the condition compromises the integrity of the Town-owned road or creates a hazard to motorist using the road, the Town should consider addressing the obstruction of the drainage swale. Discharge of any stormwater facilities associated with the watershed contributing to the culvert should be to the same catch basin that historically received overland stormwater flow, so as not to change the existing drainage pattern.
5	Robert Maher	736 Floyd Ackert Road	Esopus	5/13/2019	Maintenance	Resident States: They measured 10,000 gpd of flow through culvert under Floyd Acker Road originating from upstream property discharge from newly drilled well running past their septic system. Reportedly the water from the tapped aquifer in the upstream property discharges to a catch basin in the gravel driveway on that resident's property and then is piped	Tighe & Bond observed water flowing from upstream property through the culvert across Floyd Ackert road to the resident's property. Outfall of the culvert across Floyd Ackert road has become obstructed with sediment and vegetation causing the water to meander its way back to stream along the resident's back yard. The resident's yard is very wet.	Tighe & Bond recommends the Town maintain the outfall of the culverts crossing the road to the extent practical. Vegetation build up at outlet should be removed to promote a more direct path from the culvert to the receiving stream.

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	Resident Name	Address	Hamlet	Date of Site Investigation	Maintenance / Replacement / or New System Components	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
						downstream to the culvert under the road. Resident has sampled and tested the water and found to have E.Coli and coliforms. When Resident contact DEC and DOH they said that if there is no solid waste in the water that is flowing past their property then they cannot act.		
6	John & Kristie Mazzaccari	95 Hudson Lane	Ulster Park	5/8/2019	New System Components	Resident States: That stormwater runoff flows down Hudson Lane and across the resident's property. Causing damage to driveway and storage shed.	Tighe & Bond observed that the grades of Hudson Lane promote runoff onto the resident's property. While onsite driveway condition and shed condition was noted. Resident was working on small retaining wall and drainage structures in the area of the damaged property. The back yard has standing water in it and a well overflowing at the back of the property is evidence that the property has high groundwater.	It is Tighe & Bonds understanding that the Town intends to provide a swale along roadway to route drainage away from property to a catch basin at the rear of the property. Tighe & Bond recommends a grass lined swale.
7	Julie & Al Robinson	150 Doris Street	Port Ewen	4/29/2019	Replacement	Resident States: The front yard floods frequently due to a catch basin without enough capacity. Resident is cleaning structure often to try and keep it working.	Tighe & Bond observed that the catch basin at the resident's front yard is undersized and has no sump. The small size makes it prone to clogging with debris from the road and lawn mowing activities.	Tighe & Bond recommends that Town replace the catch basin with a deeper structure with sump and enlarge outlet to prevent clogging.
8	Jason Bates	54 Pokonie Road	Ulster Park	5/30/2019	New System Components	Resident States: A culvert passes under Pokonoie road toward the driveway causing erosion of the driveway. Resident is also concerned for septic system in back yard.	Tighe & Bond observed that the culvert is pointing at the resident's driveway and there was evidence of erosion. Septic system appears to be far enough away from culvert that it should not be affected.	It is Tighe & Bonds understanding that the Town Highway Department has already agreed to provide a catch basin and 20 feet of HDPE pipe to route water away from driveway.
9	Patty Kowatch	252 Bowne Street	Port Ewen	08/09//2019	New System Components	Resident States: Back yard floods and stays wet for long periods of time. Resident has constructed french drains and perforated piping in back yard to help remove water quickly, but it still floods and has even threatened to pond up to first floor elevation at house.	Tighe & Bond observed a depression in the residents back yard that holds water. After reviewing upstream stormwater runoff, it appears that the stormwater from Doris Street and Lee Road flow to a catch basin that discharges stormwater thru an outfall in back of the resident's property. Tighe & Bond could not find the out fall for the catch basin, but it is assumed to discharge to the wood.	Tighe & Bond recommends that the Town uncovers the outfall to help understand drainage patterns and identify if the stormwater from Doris and Lee Street can be routed around the resident's property via a surface drainage improvement on the resident's property. By providing surface drainage the Town could push the stormwater to the Bowne Street drainage system around the resident property. If the Town cannot reroute the drainage with surface water improvements Tighe & Bond recommends the Town works with the resident to obtain an easement to tie the existing catch basin to the Bowne street drainage system with pipe.

Results from Site Visits & Recommendations for Reported Flooding Areas

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	Resident Name	Address	Hamlet	Date of Site Investigation	Maintenance / Replacement / or New System Components	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
10	Stephen & Karen Garner	4 Four Sisters Lane	Ulster Park	09/10/2019	Observation/ Replacement	Did not receive any information from Resident.	The residents yard appears to be a low spot between higher topography to the north and Four Sisters Lane to the south. The general topography promotes water runoff to occur thru resident's property. Tighe & Bond noted the potential for multiple curb cuts on 9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community.	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resource allow, and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents.
11	Michael & Elizabeth Manicone	4 Peters Pass	Ulster Park	09/10/2019	Observation/ Replacement	Did not receive any information from Resident.	The resident's property is directly below Route 9W. Tighe & Bond noted the potential for multiple curb cuts on 9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community including the resident's property	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resource allow, and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents.
12	Lu Lien Mei Wang	5 Four Sisters Lane	Ulster Park	09/10/2019	Observation/ Replacement	Resident States: that they have had flooding in their basement since 1991. Resident has installed a french drain and outside sump pump which has decreased the flooding in severity and frequency, but it still occurs during major storm events.	The residents yard appears to be a low spot between Four Sisters Lane and Saint Joseph's Blvd to the south. The general topography promotes water runoff to occur thru resident's property. Tighe & Bond noted the potential for multiple curb cuts on 9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community.	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resource allow, and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents.
13	Jo Ellen Roth	6 St. Joseph Blvd	Ulster Park	09/10/2019	Observation/ Replacement	Resident States: that back yard has water coming out of the hill side constantly and running thru the back of the property. Old stone drain that runs along property line is not being maintained further up the hill causing additional water on property. Resident has added perforated drains but can not dry out back yard.	The residents yard appears to be a low spot between higher topography to the south and St. Joseph Blvd to the north. The general topography promotes water runoff to occur thru resident's property. Tighe & Bond noted the potential for multiple curb cuts on 9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community.	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resources allow, and encourages residents to tie in sump pumps and roof leaders to the piped

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	Resident Name	Address	Hamlet	Date of Site Investigation	Maintenance / Replacement / or New System Components	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
								stormwater system to prevent flooding of downstream residents.
14	Carmela Laterza	7 Four Sisters Lane	Ulster Park	09/10/2019	Observation/ Replacement	Resident States: that water seeps in basement floor and has gotten progressively worse in the last 2-3 years. The other issues the resident has is the amount of water that flows through back yard during a rain storm.	The residents yard appears to be a low spot between Four Sisters Lane and Saint Joseph's Blvd to the south. The general topography promotes water runoff to occur thru resident's property. Tighe & Bond noted the potential for multiple curb cuts on 9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community.	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resources allow, and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents.
15	Aaron & Courtney Hauver	8 Four Sisters Lane	Ulster Park	09/10/2019	Observation/ Replacement	Resident States: they have had flooding in their basement for the last 5 years with the worst event happening in September 2018. Flooding has called mildew and mold and they are unable to finish the basement space.	The resident's property is directly below Route 9W. Tighe & Bond noted the potential for multiple curb cuts on 9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community including the resident's property	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resource allow, and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents.
16	Pat & Carol Rogers	11 Four Sisters Lane	Ulster Park	08/09/2019 & 09/10/2019	Observation/ Replacement	Resident States: Most other residents are having an issue with groundwater in the area. Everyone is pumping groundwater out to keep basements dry. Resident has recently put in new sump pump and it pumps almost every day out to the Town drainage system. Resident also states that during rainstorms water flows like a river along back yards.	Tighe & Bond observed that the resident's sump pump is cycling on and off continuously during on-site observation and that the resident is pumping to road side swale. The community is on a hill and residents upstream have roof leaders and sump pumps that just move the problem downhill. Tighe & Bond also noted that given the grading of the Town road the drainage system may not be capturing all of the stormwater at the top of the hill. Would need to revisit during rain storm to evaluate.	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resource allow, and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents.
17	Thang & My Nguyen	10 Four Sister Lane	Ulster Park	08/09/2019 & 09/10/2019	Observation/ Replacement	Resident States: That Flooding has been a concern since 1987. The resident paid the Town to upsize the pipes to alleviate flooding but are still having flooding concerns. Water floods into garage and along walkway. Resident has put a	The residents yard appears to be a low spot between higher topography to the north and Four Sisters Lane to the south. The general topography promotes water runoff to occur thru resident's property. Tighe & Bond noted the potential for multiple curb cuts on	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to

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	Resident Name	Address	Hamlet	Date of Site Investigation	Maintenance / Replacement / or New System Components	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
						retaining wall in to try and push drainage to storm water system.	9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community.	flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resource allow, and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents
18	Christina Fabbie	12 Four Sisters Lane	Ulster Park	09/10/2019	Observation/ Replacement	Resident States: That flooding is occurring in the road and on the property. Road flooding is a hazard in the winter when it freezes. Resident stated that maintenance of out fall for catch basin has been poor in the past.	The residents yard appears to be a low spot between higher topography to the north and Four Sisters Lane to the south. The general topography promotes water runoff to occur thru resident's property to a catch basin on Four Sisters lane Tighe & Bond noted the potential for multiple curb cuts on 9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community. Tighe & Bond did not note an issue with the catch basin during sit investigation	Tighe & Bond recommends that Town observes stormwater flow during a storm event to confirm that all stormwater from Town & State roads is being captured in the stormwater system and not contributing to flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resource allow, and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents. Town should look into maintaining outfalls for stormwater system.
19	Juan Jerri	18 St. Joseph Blvd.	Ulster Park	09/10/2019	Observation/ Replacement	Resident States: Flooding is occurring in basement. Resident has taken steps to reroute water around house but believes they are getting runoff from Route 9W	The resident's property is directly below Route 9W. Tighe & Bond noted the potential for multiple curb cuts on 9W where runoff could be bypassing the intended stormwater system and running off into the Heavenly Valley Community causing additional runoff to flow thru the community including the resident's property	flooding of private property. To assist with potential ground water issues Tighe & Bond recommends that the Town considers extending the stormwater system, if financial resource, allow and encourages residents to tie in sump pumps and roof leaders to the piped stormwater system to prevent flooding of downstream residents. Town should look into maintaining outfalls for stormwater system.

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Further Investigation Required — **11 of 62 Properties or 17%**

	Resident Name	Address	Hamlet	Date of Site Investigation	Type of Investigation	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
1	John Bell	5 River Road	Port Ewen	5/3/2019	CCTV	Resident States: Backyard is often saturated weeks after heavy rainfall. Many issues with culvert and drainage pipe (cannot take the volume of water it receives) sends 6 inches of water with garbage through the backyard. Front yard and basement are flooded due to runoff from River Road.	Tighe & Bond observed a CMP that diverts a stream under the back yard does appear to be aged. An existing catch basin in back yard and captures surface run off but the ground does appear to be wet. A hole in a CMP pipe can introduce water from upstream to the immediate groundwater table causing a localized increase to the groundwater table. Resident has identified a flooding condition due to the stormwater system capacity of the culvert.	Tighe & Bond recommends that the Town CCTV condition of culvert under back yard for failures in the pipe causing the elevated groundwater table. If pipe needs to be replaced, the Town may want to have capacity analysis completed on pipe. This property is also included in the County Drainage category, but this issue appears to unrelated to the County drainage system.
2	Louis Dekoskie	257 Tilden Street	Port Ewen	5/3/2019	Future Capacity Analysis	Resident states that during larger storm events the culvert overflows and crosses over yard. The flooding does not reach any structures. Tighe & Bond spoke with the resident's son at time of visit.	Tighe & Bond observed a culvert that handles the flow of water from the hill side. The meandering stream makes a change of direction just prior to culvert which could cause it jump over the stream bank in a large storm event.	Tighe & Bond recommends that the Town have a capacity analysis performed on the pipe, so it can be sized correctly.
3	Peter Koelli	142 Sackett Street	Port Ewen	5/8/2019	Stormwater Management Officer / Building Department	Resident States: A swale in the back yard keeps filling up with debris and floods the back yard. The flooding makes the yard tough to maintain. Resident would like the Town to help keep swale clear.	Tighe & Bond observed no Town facilities responsible for the sediment. Traveled upstream to find that a resident located at 134 Legion Court is stockpiling soil on site.	Tighe & Bond recommends that the Stormwater Management Officer to confirm if adequate erosion and sediment control is being provided. It is not the Town's responsibility to maintain swales owned by residents on private property. The Town can also refer this project to the State of New York Highway Department. Runoff from the state ROW is not being controlled by the curb line. It is jumping out of the ROW at the Fire House and Sass electric curb cuts causing erosion of the embankment down to the residents house.
4	Jay Maurer	211 Tilden Street	Port Ewen	5/3/2019 & 5/30/2019	CCTV	Resident States: Have been dealing with a slope failure in the back yard for a number of years. Slope failure is caused by groundwater issues. In addition, lack of drainage on Tilden Street causes water to come down driveway.	Tighe & Bond observed slope failures on the property. The grassed slope is very steep and is seeping groundwater. A natural gas line crosses the property in the area of slope failures. The Town has a large drainage line the crosses the property from the west to the east and discharges to the river. The CMP stormwater line is not located near the slope failures. Water running on Tilden could be channeled better with asphalt gutters.	Tighe & Bond recommends the Town CCTV the stormwater system that crosses the property and continue to CCTV upstream to ensure that the Town's stormwater system is not contributing to groundwater issues and/or erosion of embankment issues.
5	Bernice (Peter) McNeirney	99 East Main Street	Port Ewen	5/30/2019	Highway Department	Resident States: Backyard is flooding with standing water. House is located below the hill behind Stewarts; drainage installed by the State. Problems have been getting worse each year.	Tighe & Bond observed the damp back yard of the property and investigated upstream. It appears that a large amount of impervious area is being discharged toward the resident's property. A church just upstream has a large parking lot with no drainage and has roof drains discharging toward the resident's property. Resident just upstream is having the same problem.	Tighe & Bond recommends that Town work with the church on Hoyt Street to see if roof and parking lot drainage from Hoyt street can be tied into existing storm system and routed around the residence. .
6	Debra DiPietro	199 Hoyt Street	Port Ewen	5/30/2019	Highway Department	Resident States: That front and back yard are flooding from drainage coming off Hoyt Street.	Tighe & Bond observed the damp back yard of the Resident and investigated up stream. It appears that a large amount of impervious area is being discharged toward the resident's property. A church just upstream has a large parking lot with no	Tighe & Bond recommends that Town work with the church on Hoyt Street to see if roof and parking lot drainage from Hoyt street can be tied into existing storm system and routed around the residence.

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							drainage and has roof drains discharging toward the resident's back yard. Resident just downstream is having the same problem.	.
7	Collete Quintero	143 Hoyt Street	Port Ewen	5/3/2019	Highway Department / Town	Resident States: Drainage around park entrance is causing icing condition in the winter. This makes it very slippery to access driveway in the winter.	Tighe & Bond observed a convergence of a few stormwater systems near the park entrance. Failure of pavement in the area of the park entrance indicates ponding of water.	Tighe & Bond recommends that the Town identify this project as potential candidate for a re-route of stormwater off private property and into the ROW. Water could be re-routed starting at Sackett Street down Canal Street to Hudson River. The Town may want to have capacity analysis completed on pipe.
8	Imelda (Mindy) Vanek	105 Canal Street	Port Ewen	5/3/2019	Highway Department / Town	Resident States: Property has become difficult to manage due to flooding. This includes damage to house and back yard.	Tighe & Bond observed that stormwater is being routed under back yard via a 24-inch HDPE pipe. A gap in pipe on the neighbor's property makes the resident's property subject to flooding.	Tighe & Bond recommends that the Town identify this project as potential candidate for a re-route of stormwater off private property and into the ROW. Water could be re-routed starting at Sackett Street down Canal Street to Hudson River. The Town may want to have capacity analysis completed on pipe.
9	Jesse Tyler	8 Pine Street	St. Remy	5/2019	Town	Resident States: A neighbor has blocked off a section of the stream with a small culvert to extend a driveway. During large storm events this has caused major flooding of the property.	Tighe & Bond observed the culvert and the fill placed within the stream to extend the driveway. The culvert is limiting the cross section of the stream and has the potential for causing flooding in larger storm events.	Tighe & Bond recommends the Town have their legal counsel investigate further. The Town may want to have capacity analysis completed on culvert.
10	Jacqueline & Ron (Vladamir)	159 Minturn Street	Port Ewen	5/8/2019	Town / Monitor	Resident States: Ever since a water main failure on Minturn street ground water has been flowing through his property underground causing depression to form and for him to have a wet back yard.	Tighe & Bond observed the property and saw foundation drains running on a dry day. Tighe & Bond cannot comment on how the water main failure would affect ground water flow at this time.	Tighe & Bond recommends that the Town continue to watch if any slope failures occur adjacent to Town-owned drainage. Settlement of roadway in area may indicate water has found a preferential path under the roadway along the repaired water main.
11	Joan Burroughs	25 Riverby Lane	West Park	08/09/2019	Town/State	Resident States: That stormwater comes from 9W over Holly Cross Monastery property flows thru woods washing out the resident's roadway access to the river. Resident has tried to stabilized roadway with stones.	Tighe & Bond observed that stormwater from 9W and the Holy Cross Monastery is being captured in a catch basin which outfalls to a swale and is being directed towards the resident's property. From observation it is unclear if the catch basin is owned by the Monastery or the State.	Tighe & Bond recommends that the Town work with the State and the Monastery to understand who owns this discharge and help calm relocate the discharge to no cause an erosive discharge on another resident's property.

Results from Site Visits & Recommendations for Reported Flooding Areas

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

2019 Esopus Flooding Assessment Study

No Further Action Warranted at this Time

9 of 62 Properties or 14%

	Resident Name	Address	Hamlet	Date of Site Investigation	Private Owner Maintenance / High Groundwater	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
1	Diane Dintruff	150 Minturn Street	Port Ewen	5/3/2019	Owner Maintenance/ High Groundwater	Resident States: Back yard is very wet, and they have experienced erosion of driveway.	Tighe & Bond observed that the back yard was soft under foot and wet at time of the visit. There was little to know evidence of driveway deterioration. Tighe & Bond walked upstream but did not find any evidence of Town owned drainage discharging to the back yard.	It is Tighe & Bond's assessment that the issue is due to locally high groundwater table and is not the responsibility of the Town. Recommend that the Town take no further action at this time.
2	Chris Fusco	71 Main Street	Esopus	5/8/2019	Owner Maintenance	Resident States: That a neighbor has recently changed drainage patterns trapping water in the resident's back yard.	Tighe & Bond observed that the back yard was damp at time of visit. It appears that and abutting neighbor placed an embankment to keep water from passing over their property.	It is Tighe & Bond's assessment that the change in drainage patterns is not due to the Town owned facilities and is not the responsibility of the Town. Recommend that the Town take no further action at this time.
3	The Hills	72 The Hills	Port Ewen	4/29/2019	Owner Maintenance	Town States: Drainage issue occurred, and litigation was pending.	Tighe & Bond observed that all stormwater systems were operating appropriately at the time of visit.	It is Tighe & Bond assessment that the problem was due to a clogged pipe that was cleared. Recommend that the Town take no further action at this time.
4	Rondout Harbor Homeowners	87 Rondout Harbor	Port Ewen	4/29/2019	Abutting Owner Maintenance	Town States: Drainage issue occurred, and litigation was pending.	Tighe & Bond observed that all stormwater systems were operating appropriately at the time of visit.	It is Tighe & Bond assessment that the problem was due to a clogged pipe that was cleared. Recommend that the Town take no further action at this time.
5	Mary Jane Schwark	156 Minturn Street	Port Ewen	5/8/2019	Owner Maintenance/ High Groundwater	Resident States: That back yard and home are flooding due to swale in back yard.	Tighe & Bond observed swale in back yard, and it is full of vegetation and debris. Tighe & Bond also observed evidence of a high ground water table.	It is Tighe & Bond's assessment that the resident has allowed the swale on their private property to grow in with vegetation and they should maintain free of woody vegetation. The Town is not responsible for maintaining swales on private property. Recommend that the Town take no further action at this time.
6	Carrie Bono	1468 State Route 213	St. Remy	5/30/2019	High Groundwater	Resident States: High ground water is causing issues at house and resident is having a hard time keeping up with groundwater in basement. Tighe & Bond spoke with residents' mother.	Tighe & Bond observed that the area has a high groundwater table issue. A pond on an abutting property has a water surface elevation higher than that of the resident's property. Between the pond and the resident's property there is a CMP pipe that has failed and does not appear to be owned by the Town. This failed CMP pipe is potentially Introducing water into the ground.	It is Tighe & Bond's assessment that the resident's problems are caused by a high groundwater table and a failure of a private CMP pipe. Recommend that the Town take no further action at this time.
7	Edith And Robert	2 River Road	Ulster Park	5/30/2019	High Groundwater	Resident States: That runoff from 9W is causing ground to stay wet making it difficult to maintain.	Tighe & Bond observed that all 9W drainage appears to be working appropriately and does not appear to be caused by the State stormwater system.	Tighe & Bond recommends that the Town take no further action at this time.

Results from Site Visits & Recommendations for Reported Flooding Areas

Tighe&Bond
Engineers | Environmental Specialists
Services provided in New York by T&B Engineering, P.C.

2019 Esopus Flooding Assessment Study

No Further Action Warranted at this Time

9 of 62 Properties or 14%

	Resident Name	Address	Hamlet	Date of Site Investigation	Private Owner Maintenance / High Groundwater	Issue as stated by Resident and/or Town	Tighe & Bond Observation	Recommendations
8	Frank Banks	23 Parker Avenue	Esopus	--	--	--	Resident asked to be removed from the study after initially being added to the list.	Tighe & Bond recommends that the Town take no further action at this time.
9	Arlene Post	205 Lindorf Street	Ulster Park	--	--		Resident asked to be removed from the study after initially being added to the list.	Tighe & Bond recommends that the Town take no further action at this time.

Limitations:

Tighe & Bond's observation and recommendations are based on visual assessments of the above ground stormwater system and relative topography. Tighe & Bond was not present at the sites visited during flooding conditions and has relied on input from residents and Town staff to understand historical flooding issues.

Tighe&Bond

APPENDIX D

Ulster County
Nina Postupack
County Clerk
Kingston, NY 12401

Instrument Number: 2006- 00007244
As
D01 - Deed

Recorded On: March 17, 2006
Parties: YAMAWAKI TOMIO II
To
BELL JOHN J
Recorded By: MAIN STREET TITLE
Comment: ESOPUS

Billable Pages: 3
Num Of Pages: 3

** Examined and Charged as Follows: **

D01 - Deed	14.00	RP5217-75			75.00	Tax Affidavit TP 584		5.00
Recording Charge:	114.00							
	Amount	Consideration Amount	RS#/CS#					
Tax-Transfer	568.00	172,000.00	4745	Basic	0.00			
						Special Additional		0.00
				Additional	0.00	Transfer		568.00
Tax Charge:	568.00							

** THIS PAGE IS PART OF THE INSTRUMENT **

I hereby certify that the within and foregoing was recorded in the Clerk's Office For: Ulster County.

File Information:
Document Number: 2006- 00007244
Receipt Number: 397109
Recorded Date/Time: March 17, 2006 03:38:19P
Book-Vol/Pg: Bk-D Vl-4232 Pg-292
Cashier / Station: s smat / Cashier Workstation 4

Record and Return To:
MORRIS DUSSY ALONZO&FALEY
2 RECTOR STREET
22ND FLOOR
NEW YORK NY 10006

Nina Postupack Ulster County Clerk

3 TW. 22

BARGAIN & SALE DEED WITH COVENANT AGAINST GRANTOR'S ACTS

THIS INDENTURE made the 15th day of March, 2006 between

TOMIO YAMAWAKI, II
5 River Road
Ulster Park, New York 12487,

Party of the First Part

and **JOHN J. BELL**
302 Bedford Avenue, #365
Brooklyn, New York 11211,

Party of the Second Part

WITNESSETH:

That the party of the first part in consideration of One ($1.00) Dollar lawful money of the United States, and other good and valuable consideration, paid by the party of the second part, does hereby grant and release unto the party of the second part, the heirs, successors and assigns of the party of the second part forever,

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, with the buildings and improvements thereon erected, situate, lying and being at Port Ewen, Town of Esopus, County of Ulster and State of New York being bounded and described as follows:

BEGINNING at a point marked by an iron rod driven in the ground in the northerly bounds of River Road leading easterly from State Highway Route 9W. Said point marking the southeast corner of lands of Frank Naccarato and runs thence along lands of Frank Naccarato North 31° 07' 10" East 54.16 feet to a point marked by an iron pipe driven in the ground; thence along lands of Riverview Cemetery the following four (4) courses and distances, North 26° 17' 10" East 53.11 feet to a point marked by an iron rod driven in the ground, South 46° 08' 00" East partly along an old stonewall 50.81 feet to a point, South 36° 19' 40" East along a stonewall 18.29 feet to a point, South 59° 38' 40" East 66.90 feet to a point marked by an iron rod driven in the ground; thence along lands of Douglas K. Doyle South 37° 58' 00" West 85.60 feet to a point marked by an iron rod driven in the ground in the northerly bounds of the aforementioned River Road; thence along the northerly bounds of River Road North 62° 04' 50" West 118.83 feet to the point and place of beginning.

CONTAINING 0.265 of an acre of land.

SUBJECT TO an easement granted to the Town of Esopus for the purpose of a drainage easements crossing the rear of said property.

BEING the same premises conveyed by Tomio Yamawaki, II and Deborah L. Yamawaki to Tomio Yamawaki, II by deed dated February 28, 2000 and recorded in the Office of the Ulster County Clerk on July 17, 2000 in Liber 3060 of Deeds at page 0052.

√ main Street Title

TOGETHER with all right, title and interest, if any, of the party of the first part in and to any streets and roads abutting the above described premises to the center lines thereof.

TOGETHER with the appurtenances and all the estate and rights of the party of the first part in and to the premises.

TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, the heirs or successors and assigns of the party of the second part forever.

AND the party of the first part covenants that the party of the first part has not done or suffered anything whereby the said premises have been encumbered in any way whatever, except as set forth herein.

AND the party of the first part in compliance with Section 13 of the Lien Law, covenants that the party of the first part will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

The word "party " shall be construed as if it read "parties" whenever the sense of this Deed so requires.

IN WITNESS WHEREOF, the parties hereto have duly executed this Deed the day and year first above written.

TOMIO YAMAWAKI, II

STATE OF FLORIDA)
ss.:
COUNTY OF Hernando

On the 13 day of March, 2006, before me, the undersigned, a Notary Public in and for said State, personally appeared **TOMIO YAMAWAKI, II** personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his signature on the instrument, the individual or the person upon behalf of which the individual acted, executed the instrument and that such individual made such appearance before the undersigned in the Brooksville FLA (insert the city or other political subdivision and the state or country or other place the acknowledgment was taken).

FLA DL
Y520-800-54-0950

NOTARY PUBLIC

SHERRI L. LUCIER
MY COMMISSION EXPIRES
April 18, 2009
DD 307524
Bonded Thru
Notary Public Underwriters
NOTARY PUBLIC, STATE OF FLORIDA

Record and Return to:

Alana Szemer, Esq.
Morris, Dussy, Alonzo & Faley
2 Rector Street, 22nd Floor
New York NY 10006

CHECKED QC
SCANNED SM
PAYOFF

ULSTER COUNTY – STATE OF NEW YORK
NINA POSTUPACK, COUNTY CLERK
244 FAIR STREET, KINGSTON, NEW YORK 12401

COUNTY CLERK'S RECORDING PAGE
*****THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH*****

BOOK/PAGE: 6400 / 303
INSTRUMENT #: 2019-2255

Receipt#: 20191687819
Clerk: SMM
Rec Date: 02/20/2019 10:04:09 AM
Doc Grp: D
Descrip: DEED
Num Pgs: 8
Rec'd Frm: SUNRISE ABSTRACTING CORP

Party1: JOHN BOY ENTERPRISES LTD
Party2: BURRUANO SAMUEL
Town: ESOPUS

Recording:

Cover Page	5.00
Recording Fee	50.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
RP5217 Residential/Agricu	116.00
RP5217 - County	9.00
Sub Total:	205.00
Transfer Tax	
Transfer Tax - State	1900.00
Sub Total:	1900.00
Total:	2105.00

****** NOTICE: THIS IS NOT A BILL ******

***** Transfer Tax *****
Transfer Tax #: 3332
Transfer Tax
Consideration: 475000.00

Transfer Tax - State	1900.00
Total:	1900.00

Record and Return To:

ALBERT A BURRUANO ESQ
6 NORTH PEARL STREET
BUFFALO NY 14212

WARNING***
*** Information may be amended during the verification process, and may not be reflected on this cover page.

THIS PAGE CONSTITUTES THE CLERK'S ENDORSEMENT, REQUIRED BY SECTION 316-a (5) & 319 OF THE REAL PROPERTY LAW OF THE STATE OF NEW YORK.

Nina Postupack
Ulster County Clerk

Warranty Deed

THIS INDENTURE, made the 21st day of December, 2015

BETWEEN

John Hoy Enterprises, Ltd, with an address located at 166 First Street, Connelly, NY 12417,

Party of the First Part, and

Samuel Burruano with an address located at 5208 NE 24th Terrace- Apt 115-F, Ft. Lauderdale, FL 33308,

Party of the Second Part

WITNESSETH, that the Party of the First Part, in consideration of one dollar ($1.00) and other valuable consideration paid by the Party of the Second Part, does hereby grant and release unto the Party of the Second Part, the heirs or successors and assigns of the Party of the Second Part forever,

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in Ulster county, and described in Schedule "A", attached hereto and made a part hereof, those premises also known as

"160 First Street, Connelly, NY 12417,"
"Section 56.50, Block 1, Lot 3.300"

"166 First Street, Connelly, NY 12417,"
"Section 56.50, Block 1, Lot 3.100"

"168 First Street, Connelly, NY 12417,"
"Section 56.50, Block 1, Lot 3.200"

being the same premises transferred to the Party of the First Part by deed from Marine Midland Bank dated 03/14/79 and duly recorded on 03/19/79 in Liber 1407 at Page 412 in the Ulster County Clerk's Office.

TOGETHER, with all right, title and interest, if any, of the Party of the First Part in and to any streets and roads abutting the above-described premises to the center lines thereof. TOGETHER with the appurtenances and all the estate and rights of the Party of the First Part in and to said premises; TO HAVE AND TO HOLD the premises herein granted unto the Party of the Second Part, the heirs or successors and assigns of the party of the Second Part forever.

AND the Party of the First Part, in compliance with Section 13 of the Lien Law, covenants that the Party of the First Part will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

AND the party of the first part covenants as follows: that said Party of the First Part is seized of the said premises in fee simple, and has good right to convey the same; that the Party of the Second Part shall quietly enjoy the said premises that the said premises are free from encumbrances, except as aforesaid; that the Party of the First Part will execute or procure any further necessary assurance of the title to said premises; and that said Party of the First Part will forever warrant the title to said premises.

The word "party" shall be construed as if it read "parties" whenever the sense of this indenture so requires.

IN WITNESS WHEREOF, the party of the first part has duly executed this Deed the day and year first above written.

IN PRESENCE OF:

_____

Sharon M Jones
John Hoy Enterprises, Ltd

By:
Sharon M. Jones

Standard N.Y.B.T.U. Form 8002 – Warranty Deed With Full Covenants – Uniform Acknowledgment Form 3222

✓ Sunrise Abstracting Corp

State of New York, County of Otsego, ss:

On the 21st day of December in the year 2018, before me, the undersigned, personally appeared

~~John Hoy Enterprises, Ltd. By:~~ Sharon Jones

personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s) or the person upon behalf of which the individual(s) acted, executed the instrument.

Natasha O. Barham

NATASHA O. BARHAM
NOTARY PUBLIC-STATE OF NEW YORK
No. 01BA6210324
Qualified in Ulster County
My Commission Expires August 17, 2021

ACKNOWLEDGEMENT BY SUBSCRIBING WITNESS TAKEN IN NEW YORK STATE

State of New York, County of , ss:

On the day of , in the year , before me, the undersigned, a Notary Public in and for said State, personally appeared , the subscribing witness to the foregoing instrument, with whom I am personally acquainted, who being by me duly sworn, did depose and say that he/she/they reside(s) at

(if the place of residence is in a city, include the street and street number, if any, thereof); that he/she/they know(s)

to be the individual described in and who executed the foregoing instrument; that said subscribing witness was present and saw said

execute the same; and that said witness at the same time subscribed his/her/their name(s) as a witness thereto.

ACKNOWLEDGEMENT TAKEN IN NEW YORK STATE

State of New York, County of , ss:

On the day of , in the year , before me, the undersigned, personally appeared

, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

ACKNOWLEDGEMENT TAKEN OUTSIDE NEW YORK STATE

*State of , County of , ss:

*(Or insert District of Columbia, Territory, Possession or Foreign County)

On the day of in the year , before me the undersigned personally appeared

, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s) or the person upon behalf of which the individual(s) acted, executed the instrument.

(add the city of political subdivision and the state or country or other place the acknowledgment was taken).

Warranty Deed

Title No. SUN18-U-851

Title Co.: Sunrise Abstracting Corp.

John Hoy Enterprises, Ltd.

TO

Samuel Barrasso

SECTION: 59.50

BLOCK: 1

LOTS: 3.300, 3.100, 3.210

COUNTY OF OTSEGO, State

RETURN BY MAIL TO:

Albert A. Barrasso, Esq.
6 North Pearl Street
Buffalo, NY ~~14202~~ 14212

SCHEDULE A
LOT 1

ALL PIECE OR PARCEL OF LAND situate in the Hamlet of [illegible], Town of Esopus, County of Ulster and State of New York described as follows:

BEGINNING at a point on the north bounds of the undeveloped portion of [illegible] Street being South [illegible] West [illegible] from an iron rod marking the intersection of the north bounds of [illegible] Street with the east bounds of Spring Street; thence from said **POINT OF BEGINNING** South [illegible] West along the undeveloped portion of [illegible] Street [illegible] feet to a set iron rod; thence North [illegible] West along a [illegible] acre parcel known as Lot 2 on the herein referenced map [illegible] feet to an iron rod set on the south bounds of a [illegible] acre parcel known as Lot 3 on the herein referenced map; thence along said Lot 3 the following three courses and distances: South [illegible] East [illegible] feet to a point, South [illegible] East [illegible] feet to a point, and South [illegible] East [illegible] feet to the **POINT AND PLACE OF BEGINNING.**

CONTAINING [illegible] Acres

INCLUDING an easement being [illegible] feet wide described as follows: **BEGINNING** at a point on the south bounds of a [illegible] acre parcel known as Lot 3 on the herein referenced map being South [illegible] West [illegible] feet from a [illegible] rod marking the intersection of the north bounds of [illegible] Street with the east bounds of Spring Street; thence from said **POINT OF BEGINNING** South [illegible] West crossing the existing driveway [illegible] feet to a point; thence North [illegible] West along the west edge of the existing driveway [illegible] feet to a [illegible] rod to be set on the southeast bounds of a [illegible] acre parcel known as Lot 1 on the herein referenced map; thence North [illegible] West along said Lot 1 [illegible] feet to a point; thence North [illegible] West along the same [illegible] feet to a set [illegible] rod; thence North [illegible] East crossing the existing driveway [illegible] feet to a point; thence through the lands of said Lot 3 the following three courses and distances: South [illegible] East [illegible] feet, South [illegible] East [illegible] feet and South [illegible] East to the **POINT AND PLACE OF BEGINNING.**

BEING Lot 1 as shown on a subdivision map of John Hoy Enterprises, LTD as prepared by Brewer Land Surveying, PLLC last revised [illegible] and filed in the Ulster County Clerks Office.

BEING a portion of lands conveyed by Marine Midland Bank to John Hoy Enterprises, LTD dated [illegible] and filed in the Ulster County Clerks Office in Liber [illegible] of Deeds page [illegible].

EXCEPTING an easement for a common driveway being 20.00 feet wide described as follows: BEGINNING at a point on the south bounds of a 1.413 acre parcel known as Lot 2 on the herein referenced map being South 78° 17'02" West 1.69 feet from a reinforcement rod marking the intersection of the north bounds of First Street with the east bounds of Spring Street; thence from said POINT OF BEGINNING South 78° 27'02" West crossing the existing driveway 20.11 feet to a point; thence North 38°52'38" West along the west edge of the existing driveway [illegible] feet to a reinforcement rod to be set on the northeast bounds of a 0.7 acre parcel known as Lot 1 on the herein referenced map; thence North 62°12'58" West along said Lot 1 276.25 feet to a point; thence South 49°03'07" West along the same [illegible] feet to a set reinforcement rod; thence North 29°17'17" East crossing the existing driveway 20.00 feet to a point; thence through the lands of said Lot 2 the following three courses and distances: South 69°03'07" East 29.09 feet, South 62°12'58" East 281.96 feet and South 38°52'38" East to the POINT AND PLACE OF BEGINNING.

BEING Lot 2 as shown on a subdivision map of John Hoy Enterprises, LTD as prepared by Brewer Land Surveying, PLLC last revised [illegible] and to be filed in the Ulster County Clerks Office.

BEING a portion of lands conveyed by [illegible] to John Hoy Enterprises, LTD dated [illegible] and filed in the Ulster County Clerks Office in Liber 1407 of deeds page 412.

John [illegible] Enterprises, LTD

[illegible]

ALL PIECE OR PARCEL OF LAND situate in the Hamlet of [illegible], Town of [illegible], County of Ulster and State of New York described as follows:

BEGINNING at an iron rod found on the corner formed by the west bounds of [illegible] Avenue with the north bounds of the undeveloped portion of [illegible] Street; thence from said POINT of BEGINNING South [illegible] East along the said bounds of [illegible] Avenue [illegible] feet to a found iron rod; thence South [illegible] West along lands now or formerly [illegible] (L. [illegible] p. [illegible]) and lands now or formerly [illegible] & [illegible] (L. [illegible] p. [illegible]) [illegible] feet to an "X" found at the bottom of a [illegible] iron pipe; thence North [illegible] West along lands now or formerly [illegible] Company (L. [illegible] p. [illegible]) [illegible] feet to a set iron rod; thence North [illegible] East along a [illegible] acre parcel known as Lot 2 as shown on the herein referenced map [illegible] feet to a set iron rod; thence South [illegible] East along a [illegible] acre lot known as Lot 1 on the herein referenced map [illegible] feet to a set iron rod; thence South [illegible] West along the undeveloped portion of [illegible] Street [illegible] feet to the POINT AND PLACE OF BEGINNING.

CONTAINING [illegible] Acres

EXCEPTING a [illegible] foot wide drainage easement [illegible] of which is described: **BEGINNING** at a point on the north bounds of the undeveloped portion of [illegible] Street [illegible] [illegible] Avenue [illegible] Point Of Beginning [illegible] West through a [illegible] acre parcel known as Lot [illegible] on the herein referenced map and as described above [illegible] feet to a point on the north bounds of said Lot [illegible].

BEING Lot 2 as shown on a subdivision map of John [illegible] Enterprises, LTD as prepared by [illegible] Land Surveying, PLLC last revised [illegible] and to be filed in the Ulster County Clerks Office.

BEING a portion of lands conveyed by [illegible] Bank to John [illegible] Enterprises, LTD dated [illegible] and filed in the Ulster County Clerks Office in Liber [illegible] of deeds page [illegible].

[illegible]

ALL PIECE OR PARCEL OF LAND situate in the Hamlet of Connelly, Town of Esopus, County of Ulster and State of New York described as follows:

BEGINNING at an iron rod set at the corner formed by the east bounds of Spring Street with the north bounds of First Street; thence from said POINT of BEGINNING South [illegible] West [illegible] [illegible] feet to the POINT AND PLACE OF BEGINNING.

CONTAINING [illegible] acres.

EXCEPTING [illegible]

EXCEPTING all that strip of land, being a [illegible] wide drainage easement, described as follows: BEGINNING [illegible] to the POINT AND PLACE OF BEGINNING.

FOR COUNTY USE ONLY

C1. SWIS Code: 512200

C2. Date Deed Recorded: 2 20 19

C3. Book: 6400 C4. Page: 303

2255

New York State Department of **Taxation and Finance**

Office of Real Property Tax Services

RP- 5217-PDF

Real Property Transfer Report (8/10)

PROPERTY INFORMATION

1. Property Location: 166 First Street

Esopus 12417

2. Buyer Name: Burrasno Samuel

3. Tax Billing Address: Indicate where future Tax Bills are to be sent if other than buyer address (at bottom of form)

4. Indicate the number of Assessment Roll parcels transferred on the deed: 3 # of Parcels OR ☐ Part of a Parcel

(Only if Part of a Parcel) Check as they apply:

4A. Planning Board with Subdivision Authority Exists ☐

4B. Subdivision Approval was Required for Transfer ☐

4C. Parcel Approved for Subdivision with Map Provided ☐

5. Deed Property Size: X OR acres 7

6. Seller Name: John Roy Enterprises, Ltd

*7. Select the description which most accurately describes the use of the property at the time of sale:

A. One Family Residential

Check the boxes below as they apply:

8. Ownership Type is Condominium ☐

9. New Construction on a Vacant Land ☐

10A. Property Located within an Agricultural District ☐

10B. Buyer received a disclosure notice indicating that the property is in an Agricultural District ☐

SALE INFORMATION

11. Sale Contract Date: 12/07/2018

*12. Date of Sale/Transfer: 12/21/2018

*13. Full Sale Price: 475,000

(Full Sale Price is the total amount paid for the property including personal property. This payment may be in the form of cash, other property or goods, or the assumption of mortgages or other obligations.) Please round to the nearest whole dollar amount.

*14. Indicate the value of personal property included in the sale: .00

15. Check one or more of these conditions as applicable to transfer:

- ☐ A. Sale Between Relatives or Former Relatives
- ☐ B. Sale between Related Companies or Partners in Business
- ☐ C. One of the Buyers is also a Seller
- ☐ D. Buyer or Seller is Government Agency or Lending Institution
- ☐ E. Deed Type not Warranty or Bargain and Sale (Specify Below)
- ☐ F. Sale of Fractional or Less than Fee Interest (Specify Below)
- ☐ G. Significant Change in Property Between Taxable Status and Sale Dates
- ☐ H. Sale of Business is Included in Sale Price
- ☐ I. Other Unusual Factors Affecting Sale Price (Specify Below)
- ☒ J. None

Comment(s) on Condition:

ASSESSMENT INFORMATION - Data should reflect the latest Final Assessment Roll and Tax Bill

16. Year of Assessment Roll from which information taken(YY): 18

*17. Total Assessed Value: 63,000

*18. Property Class: 210

*19. School District Name: Kingston

*20. Tax Map Identifier(s)/Roll Identifier(s) (If more than four, attach sheet with additional identifier(s)):

56.50-1-3.100 56.50-1-3.300 56.00-1-3.200

CERTIFICATION

I Certify that all of the items of information entered on this form are true and correct (to the best of my knowledge and belief) and I understand that the making of any willful false statement of material fact herein subject me to the provisions of the penal law relative to the making and filing of false instruments.

SELLER SIGNATURE

[signature] 12/21/18

BUYER SIGNATURE

[signature] 12-21-18

BUYER CONTACT INFORMATION

(Enter information for the buyer. Note: If buyer is LLC, society, association, corporation, joint stock company, estate or entity that is not an individual agent or fiduciary, then a name and contact information of an individual/responsible party who can answer questions regarding the transfer must be entered. Type or print clearly.)

Burrasno Samuel

5208 NE 24th Terrace, Apt 115F

Ft. Lauderdale FL 33308

BUYER'S ATTORNEY

Burrasno Albert A.

(716) 883-0500

17A30547

FORM 555X N. Y. DEED—BARGAIN AND SALE

BIV

This Indenture,

Made the 29th *day of* July

Nineteen Hundred and Seventy-seven

Between KARL W. SCHWARZ and GERTRUDE SCHWARZ, husband and wife, both residing at Lindorf Street, Port Ewen, Ulster County, New York,

parties of the first part, and

JEFFREY F. HUGHES and MERIDITH A. HUGHES, husband and wife both residing at 19 Hemlock Lane, Saugerties, New York,

parties of the second part,

Witnesseth *that the parties of the first part, in consideration of*

One and no/100---------- *Dollar* ($ 1.00) *lawful money of the United States,* and other good and valuable consideration *paid by the parties of the second part, do hereby grant and release unto the parties of the second part,* their heirs *and assigns forever* ALL THAT TRACT OF LAND situate in the Town of Esopus, County of Ulster and State of New York, bounded and described as follows:

BEGINNING at a point 259 feet northerly from thenorth side of the Clay Road said point being N 9° 30' East from said northerly side of the Clay Road; being on the northerly side of a proposed street; thence N 9° 30' East for a distance of 225 feet to a stake about 35 feet west of a farm road; thence south 83° east crossing the farm road for a distance of 150 feet more or less; thence S 2° 30' West for a distance of 225 feet more or less to a point on the north side of said proposed street; thence west along the north side of said proposed street for a distance of 135 feet more or less to the point and place of beginning.

BEING a portion of the premises conveyed by Wilson D. Elmendorf to Harry B. Elmendorf by deed dated March 18, 1943 and recorded in the Ulster County Clerk's Office in Liber of Deeds 632 at page 529.

The said premises are conveyed subject to the following restriction:

That the premises hereinbefore described shall be used and occupied only for residential purposes.

BEING the same premises described in a deed from Harry B. Elmendorf to Hugo Carlen and Eva Carlen, his wife, by deed dated June 6th, 1952 and recorded in the Ulster County Clerk's Office on June 7, 1952 in Liber 828 at page 531.

That Hugo Carlen died testate a resident of Ulster County on May 19th, 1969 leaving his wife, Eva Carlen, his only heir at law and next of kin and by his Last Will and Testament he devised his said estate to Eva Carlen.

That Eva Carlen died testate a resident of Ulster County on December 6, 1974 leaving a Last Will and Testament and Codicil devising said property described in this deed to her friends, Karl Schwarz and Gertrude Schwarz.

Together with the appurtenances and all the estate and rights of the part ies of the first part in and to said premises,

To have and to hold the premises herein granted unto the part ies of the second part, their heirs and assigns forever.

AND the parties of the first part covenant that they have not done or suffered anything whereby the said premises have been incumbered in any way whatever.

AND, That in Compliance with Sec. 13 of the Lien Law, the grantors will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

In Witness Whereof, the part ies of the first part ha ve hereunto set their hand s and seal s the day and year first above written.

In Presence of

Karl W. Schwarz
Gertrude Schwarz

State of New York
County of ULSTER } ss. On this 29th day of July Nineteen Hundred and Seventy-seven before me, the subscriber, personally appeared KARL W. SCHWARZ and GERTRUDE SCHWARZ, husband and wife

to me personally known and known to me to be the same person s described in and who executed the within Instrument, and t he y duly acknowledged to me that t he y executed the same.

Notary Public

STEWART T. SCHANTZ
NOTARY PUBLIC IN THE STATE OF NEW YORK
RESIDENT IN AND FOR ULSTER COUNTY
COMMISSION EXPIRES MARCH 30, 19 79

4.00 571

Deed

BARGAIN AND SALE

KARL W. SCHWARZ and GERTRUDE SCHWARZ, husband and wife

TO

JEFFREY F. HUGHES and MERIDITH A. HUGHES, husband and wife
19 Hemlock Lane
Saugerties, N.Y.

Dated, July 29th, 19 77

FILED
1:45 PM
JUL 29 1977
ALBERT SPADA
ULSTER COUNTY CLERK

5370

RECEIVED
$ 39.60
REAL ESTATE
JUL 29 1977
TRANSFER TAX
ULSTER COUNTY

Ulster County, S. S.

Recorded on the 29 day of July 19 77, at 1:51 o'clock P.M. Min. Liber 1377 of Deeds at page 543 and examined

Albert Spada Clerk

1377 543

39.60

LAW OFFICES
STEWART T. SCHANTZ, P.C.
867 MILTON AVENUE
HIGHLAND, NEW YORK 12528

Ulster County
Nina Postupack
County Clerk
Kingston, NY 12401

60 2016 00016485

Volm-6090 Pg-83

Instrument Number: 2016- 00016485

As

Recorded On: November 28, 2016 **D01 - Deed**

Parties: KORTH JOHN C

To

KORTH JOHN C AS TRTEE

Billable Pages: 4

Recorded By: HERZOG LAW FIRM PC **Num Of Pages:** 4

Comment:

**** Examined and Charged as Follows: ****

D01 - Deed	60.00	RP5217-125		125.00	Tax Affidavit TP 584		5.00
Recording Charge:	**190.00**						
	Amount	Consideration Amount	RS#/CS#				
Tax-Transfer	0.00	0.00	1885	Basic	0.00		
ESOPUS				Local	0.00	Special Additional	0.00
				Additional	0.00	Transfer	0.00
Tax Charge:	**0.00**						

**** THIS PAGE IS PART OF THE INSTRUMENT ****

I hereby certify that the within and foregoing was recorded in the Clerk's Office For: Ulster County,

File Information:

Document Number: 2016- 00016485
Receipt Number: 1546605
Recorded Date/Time: November 28, 2016 11:53:22A
Book-Vol/Pg: Bk-D Vl-6090 Pg-83
Cashier / Station: k ktsc / Cashier Workstation 7

Record and Return To:

HERZOG LAW FIRM PC
CORPORATE WOODS
7 SOUTHWOODS BOULEVARD
ALBANY NY 12211

SEAL OF ULSTER COUNTY 1683 STATE OF NEW YORK

Nina Postupack

Nina Postupack Ulster County Clerk

4
tn:22

Quit-Claim Deed - 204 Lindorf Street, Ulster Park, NY 12487
Tax Map ID: 56.83-2-17

THIS INDENTURE

Made the 10th day of November
In the year Two Thousand Sixteen

Between

JOHN C. KORTH a/k/a JOHN KORTH AND MADELINE K. KORTH a/k/a MADELINE KORTH, residing at 204 Lindorf Street, Ulster Park, NY, parties of the first part, and

JOHN C. KORTH AND MADELINE K. KORTH residing at 204 Lindorf Street Ulster Park NY as Trustees of the JOHN C. KORTH and MADELINE K. KORTH REVOCABLE TRUST, dated November 10, 2016, parties of the second part,

Witnesseth that the parties of the first part, in consideration of **TEN AND 00/100 Dollars ($10.00)** lawful money of the United States, and other good and valuable consideration paid by the party of the second part, do hereby remise, release and quitclaim unto the party of the second part, heirs, successors and assigns forever all right, title and interest in and to the premises described in Schedule A:

SCHEDULE "A" ATTACHED HERETO

BEING the same premises conveyed to said parties of the first part by deed dated October 5, 1973 and recorded on October 5, 1973 in the Ulster County Clerk's Office in Book 1307 of Deeds at Page 733.

THIS conveyance is made subject to all enforceable conditions, covenants, easements and restrictions of record, if any.

TOGETHER with all the right, title and interest, if any, of the parties of the first part in and to any streets and roads abutting the above described premises to the center lines thereof,

TOGETHER with the appurtenances and all the estate and right of the parties of the first part in and to said premises.

TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, heirs, successors and assigns forever.

AND, the parties of the first part, in compliance with Section 13 of the Lien Law, will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied for the purpose of paying the cost of any improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purposes.

The word "party" shall be construed as if it read "parties" whenever the sense of this Indenture so requires.

Kindly Record and Return to:

√ **HERZOG LAW FIRM P.C.**
Corporate Woods
7 Southwoods Boulevard
Albany, New York 12211

CHECKED
ENTERED
MARKOFF

IN WITNESS WHEREOF, the parties of the first part have hereunto set their hands and seals the day and year first above written.

IN PRESENCE OF

JOHN C. KORTH A/K/A J. K. L.S.
JOHN C. KORTH A/K/A JOHN KORTH

Madeline K. Korth A/K/A Madeline K. Korth L.S.
MADELINE K. KORTH A/K/A
MADELINE KORTH

STATE OF NEW YORK)
COUNTY OF ULSTER)**ss.:**

On this 10th day of November, in the year 2016, before me, the undersigned, a Notary Public in and for said State, personally appeared JOHN C. KORTH A/K/A JOHN KORTH AND MADELINE K. KORTH A/K/A MADELINE KORTH, personally known to me or proved to me on the basis of satisfactory evidence to be the individuals whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their capacities, and that by their signatures on the instrument, the individuals, or the person upon behalf of which the individuals acted, executed the instrument.

DAVID A. KUSKIAN
Notary Public, State of New York
Qualified in Ulster County
No. 02KU6258363
My Commission Expires 2/27/20

Notary Public

QUITCLAIM DEED

JOHN C. KORTH A/K/A JOHN KORTH AND
MADELINE K. KORTH A/K/A MADELINE KORTH
TO
JOHN C. KORTH AND
MADELINE K. KORTH AS TRUSTEES OF THE
JOHN C. KORTH AND
MADELINE K. KORTH REVOCABLE TRUST,
DATED NOVEMBER 10, 2016

SCHEDULE A

ALL THAT TRACT OR PIECE OR PARCEL OF LAND, situate in the Town of Esopus, County of Ulster, and State of New York, to wit:

Lot No. 11 as described in a map entitled "Map of Subdivision of Lands of Harry Elmendorf, Town of Esopus, Ulster County, New York, dated July 13th, 1955 and filed in the Ulster County Clerk's Office on the 18th day of July, 1955.

BEING the same premises that were conveyed by deed from Russell Terns and Minnie Terns, his wife, to Walter J. Short and Nancy L. Short, his wife on July 3, 1956, filed in the Ulster County Clerk's Office in Liber 978 of Deeds at page 5.

The within conveyance is subject to the following resterictions, and covenants all to run with the land:

1. That the lands as described in this deed shall not be divided into building lots of less than 80' front.

2. That no structure other than a one family residence with not more than a two car gagage shall be erected upon any of the lots into which the parcel first described may hereafter be divided or on any of the lots particularly mentioned in the last described parcel.

3. That the residence structure so erected shall be a a cost of not less than $10,000.00.

4. No trailers, shacks, or ohher temporary structures shall be erected or maintained on any of the lands here and before described.

ALSO ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Esopus, Ulster County and State of New York, and being the westerly half of Lot No. 10 on a map of Sub-division of lands of Harry Elmendorf, Town of Esopus, Ulster County, New York, and filed in the Ulster County Clerk's Office as Map No. 1751 on July 18, 1955, and bounded and described as follows:

BEGINNING at a point on the northerly side of Lindorf Street said point being the southeasterly corner of Lot No. 11 on said map, and thence running along the division line between Lots 10 and 11, North 5° 58' East 150 feet to a point; thence on a course of South 85°516' East 50.335 feet to a point; thence on a course of South 5° 58' West 150 feet to a point on the northerly side of Lindorf Street; thence along the north side of Lindorf Street South 85° 16' West 50.335 feet to the point and place of beginning.

BEING the same premises conveyed by Harry B. Elmendorf to Walter J. Short and Nancy Short, his wife, by deed dated July 18, 1963 and recorded in the Ulster County Clerk's Office on March 16, 1966 in Liber 1179 of Deeds at page 779.

SUBJECT to a ten foot drainage easement across the property herein described with the right of the Town of Esopus to enter in and upon the property herein described for the purposes of repairing or relaying a drainage ditch. The said easement covers lands bounded and described as follows:

BEGINNING at a point on the northerly side of Lindorf Street, said point being south 85 degrees 16 minutes west 5.00 feet from the southeasterly corner of lands of De Palma, and running thence from said point of beginning north 43 degrees 07 minutes west 127 feet more or less to the westerly line of lands hereinbefore described

INSTRUCTIONS: RP-5217-PDF-INSI www.tax.ny.gov

FOR COUNTY USE ONLY

C1. SWIS Code: 5 2 2 0 0

C2. Date Deed Recorded: 11 / 28 / 16

C3. Book: 6 0 9 0 C4. Page: 8 3

16485

New York State Department of Taxation and Finance

Office of Real Property Tax Services

RP- 5217-PDF

Real Property Transfer Report (RPT)

PROPERTY INFORMATION

1. Property Location: 204 Lindorf Street

Ulster Park 12487

2. Buyer Name: Korth John C. - as Trustee of the John C Korth & Korth Madeline K. - as Trustee Madeline K Korth Revocable Trust

3. Tax Billing Address: Indicate where future Tax Bills are to be sent if other than buyer address (bottom of form)

4. Indicate the number of Assessment Roll parcels transferred on the deed: 1 # of Parcels OR ☐ Part of a Parcel

5. Deed Property Size: 130 X 150 OR 0.45

6. Seller Name: Korth John C. a/k/a John

Korth Madeline K. a/k/a Madeline

7. Select the description which most accurately describes the use of the property at the time of sale:

A. One Family Residential

(Only if Part of a Parcel) Check as they apply:

4A. Planning Board with Subdivision Authority Exists ☐

4B. Subdivision Approval was Required for Transfer ☐

4C. Parcel Approved for Subdivision with Map Provided ☐

Check the boxes below as they apply:

8. Ownership Type is Condominium ☐

9. New Construction on a Vacant Land ☐

10A. Property Located within an Agricultural District ☐

10B. Buyer received a disclosure notice indicating that the property is in an Agricultural District ☐

SALE INFORMATION

11. Sale Contract Date:

*12. Date of Sale/Transfer: 11/10/2016

*13. Full Sale Price: .00

(Full Sale Price is the total amount paid for the property including personal property. This payment may be in the form of cash, other property or goods, or the assumption of mortgages or other obligations). Please round to the nearest whole dollar amount.

14. Indicate the value of personal property included in the sale: .00

15. Check one or more of these conditions as applicable to transfer:

- ☐ A. Sale Between Relatives or Former Relatives
- ☐ B. Sale Between Related Companies or Partners in Business
- ☐ C. One of the Buyers is also a Seller
- ☒ D. Buyer or Seller is Government Agency or Lending Institution
- ☐ E. Deed Type was Executor or Guardian and Sale Is Specify Below)
- ☐ F. Sale of Property at Less than Fair Market (Specify Below)
- ☐ G. Significant Change in Property Between Taxable Status and Sale Dates
- ☐ H. Sale of Business is Included in Sale Price
- ☐ I. Other Unusual Factor Affecting Sale Price (Specify Below)
- ☐ J. None

*Comment(s) on Condition: No Consideration/Transfer to Trust

ASSESSMENT INFORMATION - Data should reflect the latest Final Assessment Roll and Tax Bill

*16. Year of Assessment Roll from which information taken(YY): 16

*17. Total Assessed Value: 107,000

*18. Property Class: 210

*19. School District Name: Kingston

*21. Tax Map Identifier(s)/Roll Identifier(s) (If more than four, attach sheet with additional identifiers):

56.65-2-17

CERTIFICATION

I Certify that all of the items of information entered on this form are true and correct to the best of my knowledge and belief and I understand that the making of any wilful false statement of material fact herein subject me to the provisions of the penal law relative to the making and filing of false instruments.

X Madeline K Korth SELLER SIGNATURE

X MCKt

X Madeline K Korth BUYER SIGNATURE

X MCKt

BUYER CONTACT INFORMATION

Korth John C. & Madeline K

204 Lindorf Street

Ulster Park NY 12487

BUYER'S ATTORNEY

Kuhlkian, Esq. David A.

(518) 469-1581

LIBER 2727 PAGE 0195

ULSTER COUNTY CLERK

383

RECORDING PAGE

Type of Document:	DEED	Recorded:	10/17/1997
Recording Charge:	$ 20.00	At:	3:35 PM
Location:	esopus	In Liber:	2727
		Of:	DEED
Control No:	9710170356	On Page:	0195

EXAMINED AND CHARGED AS FOLLOWS:

Transfer Amount:	92,150.00	Mortgage Amount:	.00

Received Tax on Above Deed:

		Exempt
Total:	370.00	NO
TT No.	00001352	

Received Tax on Above Mortgage:

		Exempt
Basic:	.00	NO
Additional:	.00	NO
Special:	.00	NO
Total:	.00	
MT No.		

(THIS PAGE IS A PART OF THE INSTRUMENT)

Party 1: BASSETT, CHARLES JR & OR

Party 2: VANVLIET, HARRY IV & OR

Albert Spada

ALBERT SPADA
ULSTER COUNTY CLERK

William Cleenan Esq
PO Box 3939
Kingston NY 12402

LIBER 2727 PAGE 0196

Cork TN 22nd C# 356

(5)

CONSULT YOUR LAWYER BEFORE SIGNING THIS INSTRUMENT-THIS INSTRUMENT SHOULD BE USED BY LAWYERS ONLY

THIS INDENTURE, made the 7th day of OCTOBER, nineteen hundred and ninety-seven

BETWEEN

CHARLES BASSETT, JR. and DOREEN B. BASSETT, his wife, residing at 225 Lindorf Street, Ulster Park, New York 12487

party of the first part, and

HARRY VAN VLIET, IV and GINA M. VAN VLIET, his wife, residing at 824 First Avenue, Kingston, New York 12401

party of the second part,

WITNESSETH, that the party of the first part, in consideration of ----------ONE AND NO/100 ($1.00)----------dollars, lawful money of the United States, and other good and valuable consideration paid by the party of the second part, does hereby grant and release unto the party of the second part, the heirs or successors and assigns of the party of the second part forever,

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Town of Esopus, County of Ulster and State of New York, further described in Schedule "A" annexed hereto and made part hereof.

THAT CERTAIN LOT OR PARCEL OF LAND, situate on the southerly side of Lindorf Street, in the Town of Esopus, County of Ulster and State of New York, being Lot 23 and a twenty-five foot strip adjoining Lot 23 on the West as shown on Map #1892, Section 2, of lands of Harry Elmendorf filed in the Ulster County Clerk's Office on September 13, 1957, bounded and described as follows:

BEGINNING at a point on the southerly side of Lindorf Street at the northwesterly corner of Lot 22 running thence along the Westerly line of Lot 22, S 0 degrees 11' E for 166.60 feet to a point; thence N 74 degrees 30' W, 90.00 feet to a point; thence S 4 degrees 38' W 25.00 feet to a point; thence N 74 degrees 30' W for 25.46 feet to a point; thence N 4 degrees 38' E 170.98 feet to a point on the southerly side of Lindorf Street; thence along the same S 89 degrees 15' E, 25.1 feet to the most northwesterly corner of Lot 23; thence S 82 degrees 50' E 74.64 feet to the point and place of beginning.

BEING Lot 23 as shown on said map and a twenty-five foot strip adjoining Lot 23 on the West.

SUBJECT TO a drainage easement as described in a deed executed by Kusti Makelin and Aino Makelin, his wife, to the Town of Esopus, dated May 8, 1968 and recorded in the Ulster County Clerk's Office on May 29th, 1968 in Liber 1212 of Deeds at page 939.

Being the same premises conveyed to Nelson Slaughter and Lauralee Slaughter, his wife, parties of the first part hereto, by David J. Roe and Rose Mary Roe, his wife, by deed dated October 18th, 1974 and recorded in the Ulster County Clerk's Office on October 18th, 1974 in Liber 1326 of Deeds at page 988.

TOGETHER with all right, title and interest, if any, of the party of the first part in and to any streets and roads abutting the above described premises to the center lines thereof.

TOGETHER with the appurtenances and all the estate and rights of the party of the first part in and to said premises.

TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, the heirs or successors and assigns of the party of the second part forever.

AND the party of the first part covenants that the party of the first part has not done or suffered anything whereby the said premises have been incumbered in any way whatever, except as aforesaid.

AND the party of the first part, in compliance with Section 13 of the Lien Law, covenants that the party of the first part will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

The word "party" shall be construed as if it read "parties" whenever the sense of this indenture so requires.

IN WITNESS WHEREOF, the party of the first part has duly executed this deed the day and year first above written.

IN PRESENCE OF:

Charles Barrett Jr.
CHARLES BARRETT, JR.

Doreen B. Barrett
DOREEN B. BARRETT

STATE OF MINNESOTA, COUNTY OF Le Sueur ss:

On the 7 day of OCTOBER, 1997, before me personally came

CHARLES BASSETT, JR. and DOREEN B. BASSETT

to me known to be the individuals described in and who executed the foregoing instrument, and acknowledged that they executed the same.

Leland A. Peterson
NOTARY PUBLIC

LELAND A. PETERSON
NOTARY PUBLIC - MINNESOTA
My Commission Expires Jan. 31, 2000

Bargain and Sale Deed
with Covenant Against
Grantor's Acts

Title No.

CHARLES BASSETT, JR. and
DOREEN B. BASSETT,

to

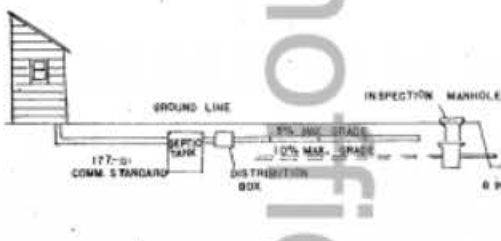
HARRY VAN VLIET, IV and
GINA M. VAN VLIET

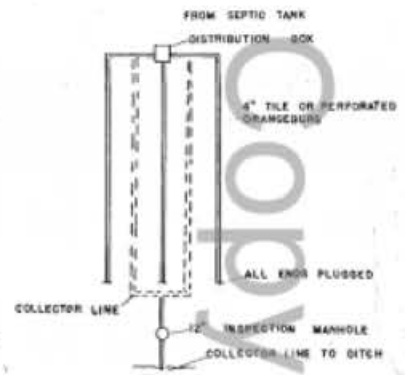
SECTION
BLOCK
LOT
COUNTY OR TOWN

RETURN BY MAIL TO:

WILLIAM CLOONAN, ESQ.
PO BOX 3939
KINGSTON, NEW YORK 12402

HEALTH DEPARTMENT NOTE: THE COMMISSIONER OF HEALTH OF THE ULSTER COUNTY DEPARTMENT OF HEALTH REQUIRES IN HIS APPROVAL OF THIS SECTION THAT THE EFFLUENT COLLECTOR LINE BE INSTALLED IN THE EASEMENT SHOWN ON THE PLAN AS A CONDITION OF SALE FOR ANY LOTS OR PLOTS.





SAND FILTER REQUIREMENTS

BEDRMS.	POPULATION	SQ. FT.	WIDTH 3 LINE	LENGTH	MIN. LIQUID CAP. SEPTIC TANK
2	4	310	12'	26'	750 GAL.
3	6	461	12'	39'	750 "
4	8	627	12'	53'	900 "

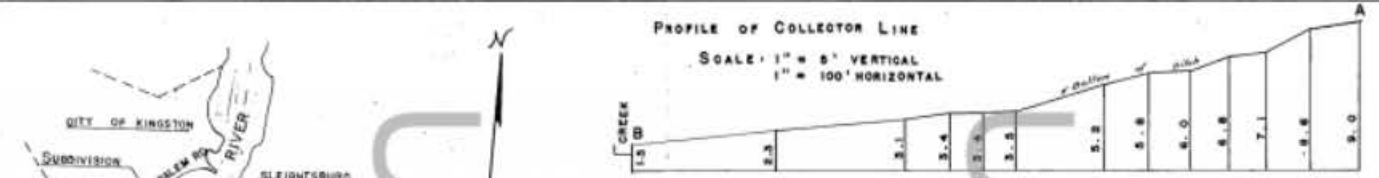
(INCLUDES INSTALLATION OF AUTOMATIC WASHERS)
DESIGN 1.15 GAL. PER. SQ. FT. PER DAY

SAND SPECIFICATIONS
EFFECTIVE SIZE 0.30 - 0.60 MM.
UNIFORMITY COEFFICIENT NOT GREATER THAN 4.0 MM.
#2 WASHED GRAVEL OR CRUSHED STONE

GENERAL SPECIFICATIONS:
LINE DRAINAGE WITH EASEMENT AS SHOWN.
FLOW 60 GALS. PER PERSON PER DAY
2 PERSONS PER BEDROOM
GREASE TRAP 2.5 GALS. PER PERSON PER DAY
FILTER 10' FROM PROPERTY LINE IF LEVEL 15' IF SIDEHILL
INSTALL 6" PIPE FROM INSPECTION MANHOLE TO DRAINAGE DITCH

NOTE:
WIDTH MAY BE INCREASED TO 4 LINE WHEN DESIRABLE TO DECREASE LENGTH
WATER SUPPLIED BY THE PORT EWEN WATER DISTRICT
WHEN HOUSEHOLD GARBAGE GRINDER DISCHARGES INTO SYSTEM:
(A) INCREASE LIQUID CAPACITY OF SEPTIC TANK BY 50%
(B) INCREASE SAND FILTER AREA BY 25%

RECEIVED AND APPROVED March 25 1957
FOR THE ULSTER COUNTY COMMISSIONER OF HEALTH
By H.F. Edinger P.E. P.E.



MAP OF SUBDIVISION
SECTION 2
OF LANDS OF
HARRY ELMENDORF
TOWN OF ESOPUS
ULSTER CO., N.Y.
SCALE = 1" = 50'
SURVEYED BY
AUGUSTUS S. BRINNER
JULY 1955

DESIGN OF INDIVIDUAL SEWAGE SYSTEMS
PROFILE OF COLLECTOR LINE AND MAP PREPARED
BY Bert C. Winne Jr.
BERT C. WINNE JR. L.L.S. REG. NO. 28069

FILED
H M
SEP 13 1957
LAWRENCE CRAIT
COUNTY CLERK

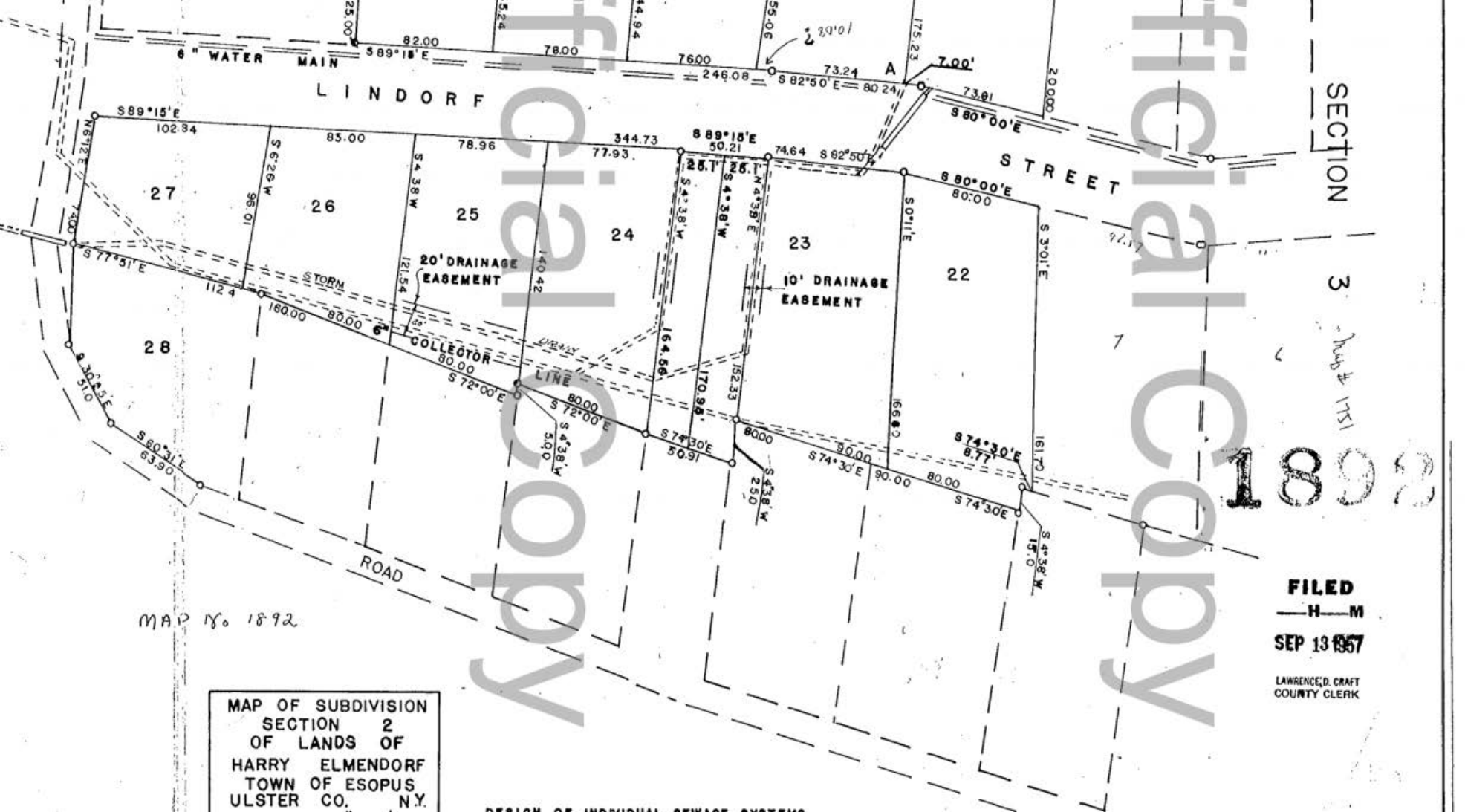
1892

FILED-SEP. 13, 1957

FILED SEP 13 1957

LIBER 054 PAGE 11

1892


LINDORF
STREET
SECTION 3
6" WATER MAIN
S 89°15'E
82.00
78.00
76.00
246.08
S 82°50'E
80.24
73.24
7.00'
A
S 80°00'E
73.81
200.00
102.34
85.00
78.96
77.93
344.73
50.21
74.64
S 82°50'E
80.00
27
26
25
24
23
22
28
20' DRAINAGE EASEMENT
10' DRAINAGE EASEMENT
STORM
6" COLLECTOR LINE
S 77°51'E
112.4
160.00
80.00
121.54
140.42
164.66
170.69'
152.33
S 72°00'E
S 74°30'E
50.91
90.00
8.77'
161.70'
S 30°45'E
510
S 60°31'E
63.90
ROAD
MAP No. 1892
MAP OF SUBDIVISION
SECTION 2
OF LANDS OF
HARRY ELMENDORF
TOWN OF ESOPUS
ULSTER CO. N.Y.
FILED
H M
SEP 13 1957
LAWRENCE D. CRAFT
COUNTY CLERK
1892
Map # 1751
Official Copy
Official Copy

4

Bargain and Sale Deed

THIS INDENTURE, made the 9th day of March, Two Thousand, between

DAVID A. BAIRD and
GAYE C. BAIRD,
155 Sunset Drive
Mt. Juliet, TN 37122,

parties of the first part, and

JOAN M. HALL
344 76th Street
Brooklyn, NY 11209,

party of the second part,

- W I T N E S S E T H -

That the parties of the first part, in consideration of One Dollar and No Cents ($1.00) lawful money of the United States, paid by the party of the second part, and other good and valuable consideration, do hereby grant and release unto the party of the second part, her heirs and assigns forever,

4

ALL THAT CERTAIN TRACT, PIECE OR PARCEL OF LAND, together with the buildings and improvements thereon, situate on the southerly side of Lindorf Street in the in the Town of Esopus, in the County of Ulster, and State of New York, being Lot 24 and a twenty-five foot strip lying east of Lot 24 as shown on Map #1892, Section 2, of lands of Harry Elmendorf filed in the Ulster County Clerk's Office September 13, 1957, more particularly bounded and described as follows:

BEGINNING at a point on the southerly side of Lindorf Street at the northeast corner of Lot 25 now owned by Van Loan, running thence along the easterly line of Lot 25 S. 4° 38' W. 140.42 feet to a point; thence S.72° 00' E. 105.45 feet to a point; thence N. 4° 38' E. 170.98 feet to a point on the southerly side of Lindorf Street; thence along Lindorf Street N. 89° 15' W. 103.03 feet to the point and place of beginning.

Being the same premises described in a Deed from Vincent W. Borges and Lynn C. Borges, his wife, to David A. Baird and Gaye C. Baird, his wife, dated February 6, 1980 and recorded in the Ulster County Clerk's Office on February 6, 1980 in Liber 1424 of deeds at page 449.

Together with the appurtenances and all the estate and rights of the parties of the first part in and to said premises.

To have and to hold the premises herein granted unto the party of the second part, her heirs and assigns forever.

And the parties of the first part covenant that they have not done or suffered anything whereby the said premises have been encumbered in any way whatever.

And, that in compliance with Section 13 of the Lien Law, the grantors covenant that the grantors will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

In witness whereof, the parties of the first part have hereunto set their hands and seals the day and year first above written.

In Presence of

DAVID A. BAIRD

GAYE C. BAIRD

DOUGLAS BERKEHURST, P.C., Attorney At Law, 2655 Main St., P.O. Box 205, Stone Ridge, NY 12484

STATE OF TENNESSEE)
)ss:
COUNTY OF Wilson)

On this 9 day of March, 2000, before me, the undersigned, a Notary Public in and for said State, personally appeared DAVID A. BAIRD and GAYE C. BAIRD, personally known to me or proved to me on the basis of satisfactory evidence to be the individuals whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their capacities, and that by their signatures on the instrument, the individuals, or the person upon behalf of which the individuals acted, executed the instrument, and that same is/are duly made oath to/affirmation before me aforesaid in the County of Wilson and State of Tennessee.

Notary Public
Comm. Exp. 11-9-02

R&R to: Brenda Hagedorn, Esq.
14 Pearl St.
Kingston, NY 12401

CHECKED OC
ENTERED mds
MARKOFF

LIBER 1993 PAGE 0044

T 691

CONSULT YOUR LAWYER BEFORE SIGNING THIS INSTRUMENT—THIS INSTRUMENT SHOULD BE USED BY LAWYERS ONLY

THIS INDENTURE, made the 21st day of July, nineteen hundred and Eighty-nine

BETWEEN (aka Victoria Anne Stevens Closs)

VICTORIA S. CLOSS residing at 229 Lindorf Street, Ulster Park, New York

party of the first part, and

MICHAEL IANNOTTA and LYNNE ARDUS, both residing at, 45 Muckley Road, Highland, New York 12528, as joint tenants

party of the second part,

WITNESSETH, that the party of the first part, in consideration of Ten Dollars and other valuable consideration paid by the party of the second part, does hereby grant and release unto the party of the second part, the heirs or successors and assigns of the party of the second part forever,

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Town of Esopus, County of Ulster, State of New York, and being more particularly described as follows:

BEING Lot No. 25 as set forth and designated and described on a map entitled "Map of Subdivision, Section 2 of Lands of Harry Elmendorf, Town of Esopus, Ulster County, New York" and being Map No. 1892 as filed in the Office of the Clerk, County of Ulster on the 13th day of September, 1957, in Liber of Maps No. 54 at Page 11.

The above described parcel of land is subject to such easements for storm drains and collector lines now running across said premises as may heretofore been granted and as is shown on the aforesaid map.

This conveyance is further made subject to easements of ingress and egress for the repair, maintenance and inspection of said storm drains and collector lines, said easements running to those responsible for said repair, maintenance and inspection.

The easements to which this conveyance is subject shall run with the land.

All that parcel of land situate in the Town of Esopus, County of Ulster and State of New York and being known as Lot #25 as found on a map entitled "Harry Elmendorf, Section 2" said map filed in the Ulster County Clerk's Office as Filed Map #1892, bounded and described as follows:

BEGINNING at a point on the southerly side of Lindorf Street, said point marking the Westerly division line of the herein described parcel and the easterly line of Lot #26, running thence easterly along the southerly side of said Lindorf Street, South 89° 15' 00" East 78.96 feet to a point marking the easterly division line of the herein described parcel and the westerly line of Lot 24, running thence along the same South 04° 38' 00" West 145.42 feet to a point marking the southerly division line of the herein described parcel and the northerly line of lands now or formerly

SEE ATTACHED SCHEDULE A

TOGETHER with all right, title and interest, if any, of the party of the first part in and to any streets and roads abutting the above described premises to the center lines thereof; TOGETHER with the appurtenances and all the estate and rights of the party of the first part in and to said premises; TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, the heirs or successors and assigns of the party of the second part forever.

AND the party of the first part covenants that the party of the first part has not done or suffered anything whereby the said premises have been encumbered in any way whatever, except as aforesaid.

AND the party of the first part, in compliance with Section 13 of the Lien Law, covenants that the party of the first part will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

The word "party" shall be construed as if it read "parties" whenever the sense of this indenture so requires.

IN WITNESS WHEREOF, the party of the first part has duly executed this deed the day and year first above written.

IN PRESENCE OF:

Victoria Anne Stevens Closs
Victoria S. Closs

TT
#352

TR 73.09

STATE OF NEW YORK, COUNTY OF Ulster ss:

On the 25th day of July 19 57, before me personally came

Victoria S. Closs

to me known to be the individual described in and who executed the foregoing instrument, and acknowledged that executed the same.

Joseph Bisson
Notary Public

S. JOSEPH BISSON
Notary Public, State of New York
Qualified in Ulster County
Commission Expires

STATE OF NEW YORK, COUNTY OF ss:

On the day of 19 , before me personally came to me known, who, being by me duly sworn, did depose and say that he resides at No.

that he is the of , the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the board of directors of said corporation, and that he signed h name thereto by like order.

STATE OF NEW YORK, COUNTY OF ss:

On the day of 19 , before me personally came to me known to be the individual described in and who executed the foregoing instrument, and acknowledged that executed the same.

STATE OF NEW YORK, COUNTY OF ss:

On the day of 19 , before me personally came the subscribing witness to the foregoing instrument, with whom I am personally acquainted, who, being by me duly sworn, did depose and say that he resides at No.

that he knows to be the individual described in and who executed the foregoing instrument; that he, said subscribing witness, was present and saw execute the same; and that he, said witness, at the same time subscribed h name as witness thereto.

Bargain and Sale Deed
WITH COVENANT AGAINST GRANTOR'S ACTS

TITLE NO.

SECTION
BLOCK
LOT
COUNTY OR TOWN

TO

RETURN BY MAIL TO:

Zip No.

Reserve this space for use of Recording Office.

1993 PAGE 0046

SCHEDULE A

Genther (Liber 1169, cp 387), running thence along the same in part, North 72 degrees 07' 43" West 80.93 feet to a point marking the westerly division line of the herein described parcel and the easterly line of the aforementioned Lot 26, running thence along the same North 04 degrees 38' 00" East 121.54 feet to the point or place of beginning.

RH 11522 bk

FILED
4 H 32 M
MAR 21 1990
ALBERT SPADA
ULSTER COUNTY CLERK

003735

RECEIVED
$..352.00
REAL ESTATE
MAR 21 1990
TRANSFER TAX
ULSTER
COUNTY

14.00
5.00
19.00 KSR

LH

Ulster County, SS.
Recorded on the 21 day of March A.D. at 4:30 o'clock PM Min. Liber 1993 of Deeds at page 46 and examined.
Albert Spada
Clerk

RHC J. Oliver
PO Box 4237
Kingston NY 12401

TN22 Title Stamps $352-

BARGAIN AND SALE DEED WITH COVENANT AGAINST GRANTOR'S ACTS

THIS INDENTURE, made the 15 day of June, Two Thousand,

between

PATRICK J. FORD, residing at 233 Lindorf Street, Ulster Park, New York 12487,

party of the first part, and

SCOTT R. McCAIN and JENNIFER J. HANNIS-McCAIN, residing at P.O. Box 1184, New Paltz, New York 12561,

party of the second part,

WITNESSETH, that the party of the first part, in consideration of TEN AND ——— 00/100 ($10.00) dollars, lawful money of the United States, paid by the party of the second part, does hereby grant and release unto the party of the second part, the heirs or successors and assigns of the party of the second part forever,

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, with the buildings and improvements thereon erected, situate, lying and being in the Town of Esopus, County of Ulster and State of New York and being more particularly described as follows:

BEING all of Lot No. 26 as set forth and described on a map entitled, "Map of Subdivision, section 2 of lands of Harry Elmendorf, Town of Esopus, Ulster County, New York" and being map no. 1892 as filed in the Office of the Clerk, County of Ulster on the 13th day of September, 1957 in Liber of Maps No. 54 at Page 11.

The above described parcel of land is subject to such easements for storm drains and collector lines now running across said premises as are delineated on said map and as appears in the records of the Ulster County Clerk's Office.

CHECKED ———

ENTERED ———

MAIL ———

RE967.16

This conveyance is further made subject to easements of ingress and egress for the repair, maintenance and inspection of said storm drains and collector lines said easements running to those responsible for said repair, maintenance and inspection. The easements to which this conveyance is subject shall run with the land.

BEING the same premises as conveyed to Chester Allen McCord, Jr. and Diane Lee McCord by deed from Richard P. Myer and Dorothy C. Myer dated September 2, 1989 and recorded September 2, 1989 in Liber 1232 of Deeds at Page 625 in the Ulster County Clerk's Office.

BEING the same premises as conveyed to John Ford, Virginia Ford and Patrick J. Ford by Chester Allen McCord, Jr. and Diane Lee McCord, by deed dated October 30, 1995 and recorded in the Ulster County Clerk's Office on October 30, 1995 in Liber 2535 of Deeds at Page 0072.

BEING the same premises as conveyed to Patrick J. Ford by John Ford, Virginia Ford and Patrick J. Ford by deed dated July 12, 1999 and recorded in the Ulster County Clerk's Office on July 14, 1999 at Liber 02944 of deeds Page 0189.

TOGETHER with all right, title and interest, if any, of the party of the first part in and to any streets and roads abutting the above described premises to the center lines thereof.

TOGETHER with the appurtenances and all the estate and rights of the party of the first part in and to said premises.

TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, the heirs or successors and assigns of the party of the second part forever.

AND the party of the first part, covenants that the party of the first part has not done or suffered anything whereby the said premises have been encumbered in any way whatever, except as aforesaid.

AND the party of the first part, in compliance with Section 13 of the Lien Law, covenants that the party of the first part will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

The word "party" shall be construed as if it read "parties" whenever the sense of this indenture so requires.

IN WITNESS WHEREOF, the party of the first part has duly executed this deed the day and year first above written.

IN PRESENCE OF:

PATRICK J. FORD

STATE OF NEW YORK)
) ss.:
COUNTY OF ULSTER)

On the 15 day of June, 2000, before me, the undersigned personally appeared, PATRICK J. FORD, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity and that by his signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

NOTARY PUBLIC

MICHAEL T. COOK
Notary Public, State of New York
No. 02CO6004205
Qualified in Ulster County
Commission Expires May 3, 20 01

R & R:
Michael F. Jordan, Esq.
Findholt & Jordan
204 Fair Street
P.O. Box 4120
Kingston, New York 12402

Ulster County
Albert Spada
County Clerk
Kingston, NY 12401

60 2004 00036197

Instrument Number: 2004- 00036197

As

Recorded On: December 16, 2004 — **D01 - Deed**

Parties: CARRION DANIEL

To

CERECEDES LAWRENCE S

Billable Pages: 4

Recorded By: TITLE SERVICE CO

Num Of Pages: 4

Comment: ESOPUS

**** Examined and Charged as Follows: ****

D01 - Deed	37.00	RP5217-75		75.00	Tax Affidavit TP 584		5.00
Recording Charge:	117.00						
	Amount	Consideration Amount	RS#/CS#				
Tax-Transfer	860.00	215,000.00	2866	Basic	0.00		
						Special Additional	0.00
				Additional	0.00	Transfer	860.00
Tax Charge:	860.00						

**** THIS PAGE IS PART OF THE INSTRUMENT ****

I hereby certify that the within and foregoing was recorded in the Clerk's Office For: Ulster County.

File Information:

Document Number: 2004- 00036197
Receipt Number: 231892
Recorded Date/Time: December 16, 2004 01:33P
Book-Vol/Pg: Bk-D VI-4001 Pg-330
Cashier / Station: s smar / Cashier Workstation 6

Record and Return To:

JOSEPH MORIELLO
PO BOX 915
HIGHLAND NY 12528

SEAL OF ULSTER COUNTY STATE OF NEW YORK

Albert Spada

ALBERT SPADA, ULSTER COUNTY CLERK

THIS INDENTURE, made the 10th day of December, 2004, by and between **DANIEL CARRION & CAROLE M. CARRION**, husband and wife, residing at 235 Lindorf Street, Ulster Park, NY 12487 grantors.

and

at joint tenants with rights of survivorship

LAWRENCE S. CERECEDES & ROBERT M. BUDREAU RESIDING AT C/O 25 Henry W. Du Bois Dr., Apt. 39, New Paltz, NY 12561, grantees.

WITNESSETH, that the grantor, in consideration of ten ($10.00)dollars, lawful money of the United States, paid by grantee, does hereby grant and release unto the grantee, his heirs and assigns forever.

ALL that certain plot, piece or parcel of real property with the buildings and improvements thereon erected, situate, lying and being in the Town of Esopus, County of Ulster and State of New York more particularly bounded and described as follows:

See Schedule "A" attached

LTR-20452

BEING the same premises conveyed in a deed from JOSEPH W. FLEMING, III and JULIE PATRICIA MURRAY n/k/a JULIE P. FLEMING, husband and wife, to DANIEL P. CARRION and CAROLE M. CARRION, husband and wife, dated August 7, 2003 and recorded in the Ulster County Clerk's Office on August 14, 2003 as Document Number 2003-00023697.

TOGETHER with all right title and interest, if any, of the grantor in and to any streets or roads abutting the above described premises to the center lines thereof; **TOGETHER** with the appurtenances and all the estate and rights of the grantor in and to said premises.

AND THE grantor covenants that she has not done or suffered anything whereby the said premises have been encumbered in any way whatever, except as aforesaid. AND the grantor, in compliance with Section 13 of the Lien Law, covenants that she will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

TO HAVE AND TO HOLD the premises herein granted unto the grantee, his heirs and assigns forever.

In witness whereof, the grantors have hereunto set their hand and seal the day and year first above written.

In the presence of

DANIEL CARRION

CAROLE M. CARRION

CHECKED CC

ENTERED SM

MARK/OFF

State of New York :
: ss.:
County of Ulster :

On 10th day of December, 2004 before me, the undersigned, personally appeared
DANIEL CARRION
personally known to me or proved to me on the basis of satisfactory evidence to be the individuals whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their capacities, and that by their signatures on the instrument, the individuals, or the person upon behalf of which the individuals acted, executed the instrument.

NOTARY PUBLIC

ARTHUR M. KAHN
Notary Public, State Of New York
No. 02KA4613864
Qualified in Ulster County
Commission Expires Oct. 31, 20 05

State of New York :
: ss.:
County of Ulster :

On 10th day of December,2004 before me, the undersigned, personally appeared
CAROLE M. CARRION
personally known to me or proved to me on the basis of satisfactory evidence to be the individuals whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their capacities, and that by their signatures on the instrument, the individuals, or the person upon behalf of which the individuals acted, executed the instrument.

NOTARY PUBLIC

Title No. TJC-20452

ARTHUR M. KAHN
Notary Public, State Of New York
No. 02KA4613864
Qualified in Ulster County
Commission Expires Oct. 31, 20 05

RECORD AND RETURN TO:

JOSEPH MORIELLO, ESQ.
p o Box 915
HIGHLAND, NY 12528

S 56.83
B 3
L 40

- SCHEDULE A -

All that piece or parcel of land situate in the Town of Esopus, County of Ulster and State of New York, being more particularly bounded and described as follows:

Beginning at a set iron bar on the Southerly street line of Lindorf Street at its intersection with the Easterly street line of Clay Road; thence North 85° 59' 50" East, along said street line of Lindorf Street, 102.34 feet to a set iron bar, said iron bar being the Northwesterly corner of lands of Chester Allen and Diane Lee McCord; thence along the Westerly and Southerly bounds of McCord, South 1° 40' 50" West, 96.01 feet to a set iron bar and South 81° 43' 50" East, 5.00 feet to a set iron bar, said iron bar being the Northwesterly corner of lands of Raymond and Carol Schick; thence South 09° 46' 10" West, along the Westerly bounds of Schick, 113.11 feet to a set iron bar on the Northeasterly street line of Clay Road; thence along the Northeasterly and Easterly street line of Clay Road the following four courses and distances: (1) North 63° 33' 30" West, 63.90 feet to a point; thence (2) North 33° 28' 00" West, 51.00 feet to a point; thence (3) North 1° 35' 30" West, 56.06 feet to a point; thence (4) North 1° 26' 50" East, 74.00 feet to the point of beginning.

Being 17,858 square feet or 0.410 acre more or less.

All bearings are magnetic of April 1989 as resurveyed by Michael F. Vetere, Jr., P.L.S.

The above described premises intended to be lot no. 27 and a portion of lot no. 28 as shown on a Map of Subdivision, Section 2, of Lands of Harry Elmendorf as filed in the Ulster County Clerk's Office on September 13, 1957 as map no. 1892.

Ulster County
Nina Postupack
County Clerk
Kingston, NY 12401

60 2012 00006072

Volm-5307 Pg-295

Instrument Number: 2012- 00006072

As

Recorded On: April 24, 2012 — **D01 - Deed**

Parties: PADE THEODORE F

To

VANAKEN PAULA J AS TRTEE

Billable Pages: 4

Recorded By: HERZOG LAW FIRM PC

Num Of Pages: 4

Comment:

**** Examined and Charged as Follows: ****

D01 - Deed	60.00	RP5217-125	125.00	Tax Affidavit TP 584	5.00		
Recording Charge:	**190.00**						
	Amount	Consideration Amount	RS#/CS#				
Tax-Transfer	0.00	0.00	2917	Basic	0.00		
ESOPUS				Local	0.00	Special Additional	0.00
				Additional	0.00	Transfer	0.00
Tax Charge:	**0.00**						

**** THIS PAGE IS PART OF THE INSTRUMENT ****

I hereby certify that the within and foregoing was recorded in the Clerk's Office For: Ulster County,

File Information:

Document Number: 2012- 00006072
Receipt Number: 1142598
Recorded Date/Time: April 24, 2012 11:59:40A
Book-Vol/Pg: Bk-D Vl-5307 Pg-295
Cashier / Station: m mpol / Cashier Workstation 7

Record and Return To:

HERZOG LAW FIRM PC
CORPORATE WOODS
7 SOUTHWOODS BLVD
ALBANY NY 12211

SEAL OF ULSTER COUNTY 1683 STATE OF NEW YORK

Nina Postupack

Nina Postupack Ulster County Clerk

THIS INDENTURE

Made the 15th day of July
In the year Two Thousand Ten

Between

THEODORE F. PADE AND JOYCE A. PADE, residing at 205 Rogers Street, Ulster Park, NY, parties of the first part, and

PAULA J. VAN AKEN, residing at 183 Lindorf Street, Ulster Park, NY, as Trustee of the THEODORE F. PADE and JOYCE A. PADE FAMILY TRUST, dated July 15, 2010, party of the second part,

Witnesseth that the parties of the first part, in consideration of **TEN AND 00/100 Dollars ($10.00)** lawful money of the United States, and other good and valuable consideration paid by the party of the second part, do hereby remise, release and quitclaim unto the party of the second part, heirs, successors and assigns forever all right, title and interest in and to the premises described in Schedule A:

SCHEDULE "A" ATTACHED HERETO

BEING the same premises conveyed to said parties of the first part by deed dated December 7, 2007 and recorded on December 11, 2007 in the Ulster County Clerk's Office in Book 4494 of Deeds at Page 90.

THIS conveyance is made subject to all enforceable conditions, covenants, easements and restrictions of record, if any, and also subject to the terms and conditions more particularly described in the aforementioned Trust Agreement, which terms include a reserved life use in the premises in favor of the parties of the first part.

TOGETHER with all the right, title and interest, if any, of the parties of the first part in and to any streets and roads abutting the above described premises to the center lines thereof,

TOGETHER with the appurtenances and all the estate and right of the parties of the first part in and to said premises.

TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, heirs, successors and assigns forever.

AND, the parties of the first part, in compliance with Section 13 of the Lien Law, will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied for the purpose of paying the cost of any improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purposes.

Kindly Record and Return to:

HERZOG LAW FIRM P.C.
Corporate Woods
7 Southwoods Boulevard
Albany, NY 12211

CHECKED
ENTERED
MARK/OFF

The word "party" shall be construed as if it read "parties" whenever the sense of this Indenture so requires.

IN WITNESS WHEREOF, the parties of the first part have hereunto set their hands and seals the day and year first above written.

IN PRESENCE OF

Theodore F. Pade L.S.
THEODORE F. PADE

Joyce A. Pade L.S.
JOYCE A. PADE

STATE OF NEW YORK)
COUNTY OF ALBANY)**ss.:**

On this 15th day of July, in the year 2010, before me, the undersigned, a Notary Public in and for said State, personally appeared THEODORE F. PADE and JOYCE A. PADE, personally known to me or proved to me on the basis of satisfactory evidence to be the individuals whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their capacities, and that by their signatures on the instrument, the individuals, or the person upon behalf of which the individuals acted, executed the instrument.

Notary Public

HARRY V.B. MILLER
Notary Public, State of New York
No. 02MI4605625
Qualified in Albany County
Commission Expires January 31, 2011

QUITCLAIM DEED

THEODORE F. PADE AND JOYCE A. PADE
TO
PAULA J. VAN AKEN, AS TRUSTEE OF THE
THEODORE F. PADE AND JOYCE A. PADE FAMILY TRUST,
DATED JULY 15, 2010

SCHEDULE A

PARCEL #1. ALL THAT LOT, PIECE OR PARCEL OF LAND, situate on the southerly side of Roger Street, Town of Esopus, Ulster County, New York, and being shown and designated as Lot No. 36 on Map of Subdivision of lands of Harry Elmendorf, Section 3, made by Bert C. Winne, Jr., L.S., in September 1960 and filed in Ulster County Clerk's Office November 10, 1960 as Map No. 2099. Said Lot No. 36 is more particularly bounded and described as follows:

CP

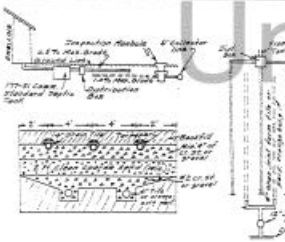
BEGINNING at a point on the southerly side of Roger Street, said point being the northwesterly corner of Lot 37 on said map heretofore conveyed to Serrano, thence from said point of beginning and along the westerly bounds of Lot 37 South 2° 04' West 151.16 feet to a point on the northerly bounds of Lot No. 11 of Section1; thence on a course of South 78° 39' West 99.26 feet to a point being the corner of Lots 11 and 12 of Section 1 and Lots 35 and 36 of Section 3; thence on a course of North 7° 17' West and along the easterly bounds of Lot 35, 173.24 feet to a point on the southerly side of Roger Street; thence along the southerly side of Roger Street North 88° 10' East 86.43 feet and thence continuing along the southerly side of Roger Street South 84° 02' East 38.57 feet and the point and place of beginning.

PARCEL #2. ALSO, ALL THAT LOT, PIECE OR PARCEL OF LAND situate on the southerly side of Roger Street, Town of Esopus, Ulster County, New York, and being shown and designated as Lot No. 35 on Map of Subdivision of lands of Harry Elmendorf, Section 3, made by Bert C. Winne, Jr., L.S., in September 1960 and filed in the Ulster County Clerk's Office November 10, 1960 as Map No. 2099. Said Lot No. 35 is more particularly bounded and described as follows:

BEGINNING at a point on the southerly side of Roger Street, said point being the northwesterly corner of Lot #36 on said map heretofore conveyed to Charles and Frances Anzalone, thence from said point of beginning and along the westerly bounds of Lot #36 South 7° 17' East 173.24 feet to a point; thence on a course of North 87° 56' West 98.14 feet to a point; thence on a course of North 8° 26' West along the easterly bounds of Lot 34, 158.41 feet to the southerly side of Roger Street aforesaid; thence along the southerly side of Roger Street North 83° 06' East 95.37 feet and North 88° 10' East 4.63 feet to the point and place of beginning.

SUBJECT to a drainage easement running along the westerly bounds of the above described premises and the easterly bounds of Lot no. 34 and as shown on said map, said easement having a total width of 10 feet, 5 feet of which are on the westerly bounds of the above described lot,

SAND FILTER REQUIREMENTS
(Includes installation of Automatic Washer)



Number of Bedrooms	Population	Sq. Ft. Area of Sand Filter	Width	Length	Min. Cap. of Septic Tank	Min. Cap. of Dosing Tank	Length of grease trap
2	4	300	10'	30'	750 Gals.	294 Gals.	12'
3	6	450	10'	45'	750 "	294 "	12'
4	8	600	12'	50'	900 "	288 "	24'

Design: 115 gallons per sq. ft per day

Sand Specifications:
- Effective Size 0.2mm - 0.6 mm
- Uniformity Coefficient not greater than 4
- No. 2 crushed stone or washed gravel

General Specifications:
- Line drainage with easement to Classified Stream
- Flow 60 gals per person per day (without Automatic Washer)
- 2 persons per bedroom
- With grease trap design is 25 gals per person per day
- Install 6" pipe from inspection manhole to street with outlet minimum of 4" in elevation above bed of street.

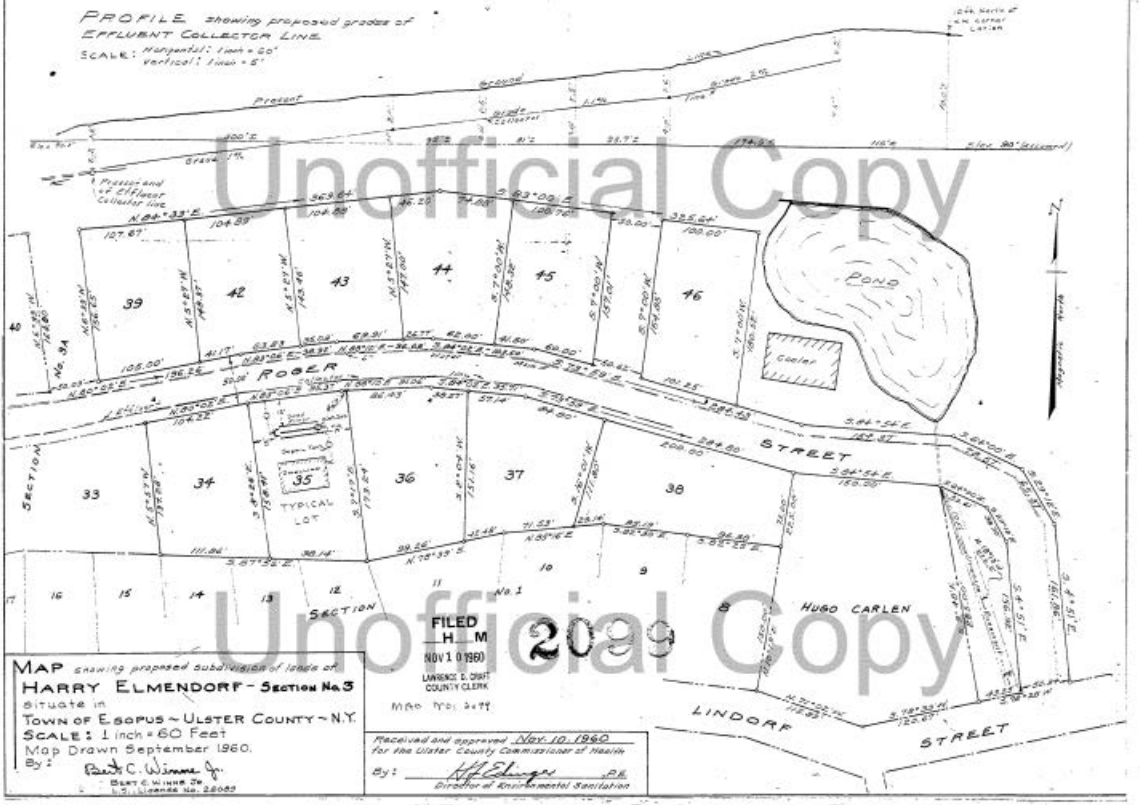
Note: When household garbage grinder discharges into system
(1.) Increase liquid capacity of Septic Tank 50%.
(2.) Increase area of Sand Filter bed 25%.

REQUIREMENTS for Individual Sewage Disposal & Water Supply

Water to be supplied to all lots by Port Ewen Water District

PROFILE showing proposed grades of EFFLUENT COLLECTOR LINE

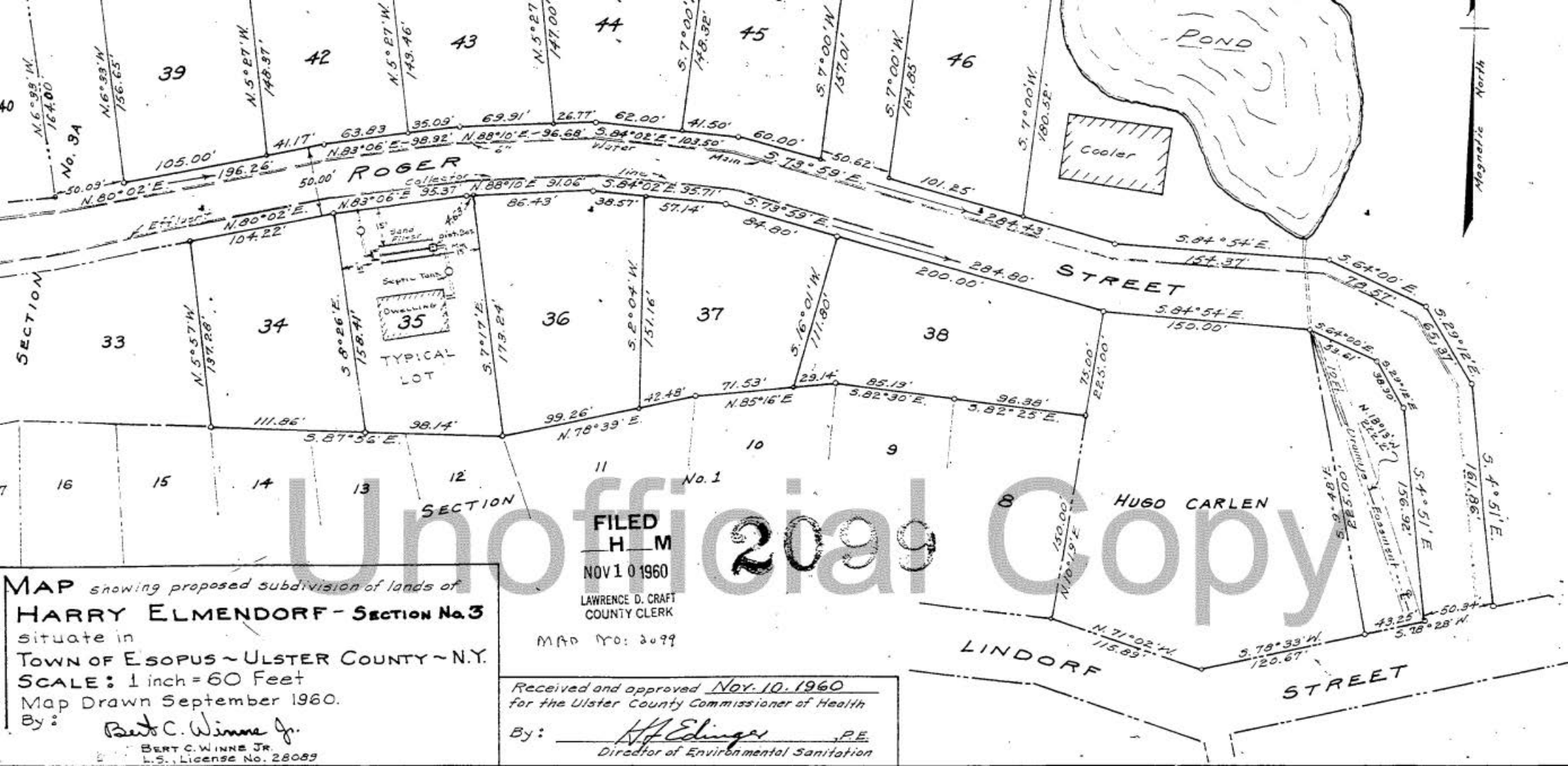
SCALE: Horizontal: 1 inch = 60'
Vertical: 1 inch = 5'



MAP showing proposed subdivision of lands of
HARRY ELMENDORF - SECTION No. 3
situate in
TOWN OF ESOPUS ~ ULSTER COUNTY ~ N.Y.
SCALE: 1 inch = 60 Feet
Map Drawn September 1960.
By: Burt C. Winne Jr.
BURT C. WINNE JR.
L.S. License No. 28083

FILED
NOV 1 0 1960
LAWRENCE D. CRIST
COUNTY CLERK
2099

Received and approved Nov. 10, 1960
for the Ulster County Commissioner of Health
By: H.F. Ellenger P.E.
Director of Environmental Sanitation



MAP showing proposed subdivision of lands of
HARRY ELMENDORF - SECTION No. 3
situate in
TOWN OF ESOPUS ~ ULSTER COUNTY ~ N.Y.
SCALE: 1 inch = 60 Feet
Map Drawn September 1960.
By: Bert C. Winne Jr.
BERT C. WINNE JR.
L.S., License No. 28089

FILED
H M
NOV 10 1960
LAWRENCE D. CRAFT
COUNTY CLERK
MAP NO: 2099

2099

Received and approved NOV. 10. 1960
for the Ulster County Commissioner of Health
By: H.J. Edinger P.E.
Director of Environmental Sanitation

N

MAGNETIC MERIDIAN SEPT. 1957

ADOLPH & BESSIE GODESON
L. 1275 P. 52

JOHN F. SPINNENWEBER AND OTHERS

SET BAR

S 5°54'00"E 222.05'

81.00'

SET BAR

10' WIDE DRAINAGE EASEMENT

LOT 4

SHED

POLE ANCHOR

POLE ANCHOR

LOT 2
SADIE BOCK
L. 1457 — P. 702

12" CMP

154.84'

10'

CATCH BASIN

12" CMP

10'

10'

20' WIDE DRAINAGE EASEMENT

N 82°58'00"E

RECOVERED BAR

8.00'

LOT 5

AREA = 0.773 ACRE

N 0°20'00"W 148.98'

LOT 3
THOMAS & CINDY LENT
L. 1389 — P. 801

LOT 6

SPLIT RAIL FENCE

LOT 5

LOT 6

PATIO

HOUSE

DRIVEWAY

BLACKTOP

FENCE

32.83'

S 39°50'00"W

BLACKTOP DRIVEWAY

N 59°28'00"W

IRON BAR IN CONCRETE AT CORNER OF FENCE

R=67.63' Lc=38.89'

POLE

63.00'

S 87°35'00"W

8.00'

RECOVERED BAR

EDGE OF PAVEMENT

EUGENE STREET

EDGE OF PAVEMENT

DORIS STREET

DEAD END

FREDERICK F. SELLERS
L. 1526 — P. 791

BLACKTOP DRIVEWAY

NOTE

THESE PREMISES ARE SUBJECT TO ANY RIGHTS THAT THE TOWN OF ESOPUS MAY HAVE FOR DRAINAGE PURPOSES.

LOT NUMBERS REFER TO "MAP OF SUBDIVISION OF AVON PARK, INC.," FILED IN THE ULSTER COUNTY CLERK'S OFFICE ON APRIL 25, 1958 AS MAP NO. 1944.

TAX MAP REFERENCE

TOWN OF ESOPUS: SECTION NO. 56.067
BLOCK 7, LOTS 2.1 & 3

DEED REFERENCE

LIBER 1333 - P. 859
LIBER 1526 - P. 787

CERTIFICATION

I HEREBY CERTIFY THIS SURVEY TO:

1. BRIAN D. VAN VLIET.
2. MAEVA B. BURGER.
3. ULSTER SAVINGS BANK, ITS SUCCESSORS AND/OR ASSIGNS.
4. LAWYERS TITLE INSURANCE CORPORATION.

PREPARED IN ACCORDANCE WITH THE MINIMUM STANDARDS FOR TITLE SURVEYS OF THE NEW YORK STATE LAND TITLE ASSOCIATION.

Christopher J. Zell

CHRISTOPHER J. ZELL, P.L.S., N.Y.S. LIC. NO. 49629

LICENSED LAND SURVEYOR
CHRISTOPHER J. ZELL
49629
STATE OF NEW YORK

Guarantees or Certifications indicated hereon signify that this survey was prepared in accordance with the existing Code of Practice for Land Surveys adopted by the New York State Association of Professional Land Surveyors. Said guarantees or certifications shall run only to the person for whom the survey is prepared, and on his behalf to the title company, governmental agency and lending institution listed hereon, and to the assignees of the lending institution. Guarantees or certifications are not transferable to additional institutions or subsequent owners.

BRINNIER & LARIOS, P.C.

MAP

OF LANDS TO BE CONVEYED TO

BRIAN D. VAN VLIET

EUGENE STREET

TOWN OF ESOPUS · ULSTER COUNTY · NEW YORK

MAY 1, 1992 · SCALE: 1" = 20'

U.S. Internal Revenue Stamps Affixed $6.50

FORM 8833½ N. Y. DEED—WARRANTY with Lien Covenant

TUTHILL ABSTRACTING CORPORATION Tuthill Law Print, Publishers, Kingston

LIBER 1148 PG 286

This Indenture,

Made the day of February Nineteen Hundred and SIXTY-FOUR

Between ARTHUR G. LEWIS AND DELORES N. LEWIS, HIS WIFE BOTH RESIDING AT (NO NUMBER) VALLEY ROAD, SAINT REMY, COUNTY OF ULSTER, STATE OF NEW YORK

part IES of the first part, and

PETER N. BLANSCHAN AND MARY M. BLANSCHAN HIS WIFE, BOTH RESIDING AT 486 HASBROUCK AVENUE, CITY OF KINGSTON, COUNTY OF ULSTER, STATE OF NEW YORK, AS TENANTS BY THE ENTIRETY

part IES of the second part,

Witnesseth that the part IES of the first part, in consideration of ONE Dollar ($1.00) lawful money of the United States, OTHER GOOD AND VALUEABLE CONSIDERATION paid by the part IES of the second part, do hereby grant and release unto the part IES of the second part, THEIR DISTRIBUTEES and assigns forever,

ALL THAT TRACT OR PARCEL OF LAND SITUATE IN THE TOWN OF ESOPUS, COUNTY OF ULSTER AND STATE OF NEW YORK, MORE PARTICULARLY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A PIPE SET ON THE EASTERLY BOUNDS OF VALLEY ROAD AS SAID ROAD APPEARS ON A MAP OF SPRING VALLEY ACRES, SECTION "A", ON FILE IN THE ULSTER COUNTY CLERK'S OFFICE, SAID PIPE BEING DISTANT 110.7 FEET MEASURED ALONG THE BOUNDS OF SAID VALLEY ROAD FROM THE INTERSECTION OF SAID EASTERLY BOUNDS OF VALLEY ROAD WITH THE SOUTHERLY BOUNDS OF WILLIAM WHITE ROAD;

THENCE FROM SAID POINT OF BEGINNING NORTH 85° 53' EAST AS THE COMPASS POINTED IN 1955 A DISTANCE OF 109.5 FEET TO A PIPE DRIVEN IN THE GROUND;

THENCE SOUTH 4° 7' EAST A DISTANCE OF 100 FEET TO A PIPE SET IN THE SOUTHEASTERLY CORNER OF THE LOT HEREBY TO BE CONVEYED;

THENCE SOUTH 85° 53' WEST A DISTANCE OF 109.5 FEET TO A PIPE SET ON THE EASTERLY BOUNDS OF VALLEY ROAD AFORESAID;

THENCE ALONG THE EASTERLY BOUNDS OF SAID ROAD NORTH 4° 7' WEST A DISTANCE OF 100 FEET TO THE POINT OF BEGINNING.

ALSO GRANTING TO THE GRANTEES HEREIN, THEIR SURVIVORS AND ASSIGNS, AN UNRESTRICTED RIGHT OF WAY OVER THE PROPOSED ROADS LEADING UP TO AND ADJOINING THE ABOVE PARCEL OF LAND.

THE ABOVE DESCRIBED PARCEL IS KNOWN AS LOT NO. 9 OF "SPRING VALLEY ACRES".

BEING THE SAME PREMISES CONVYED BY JOHN HAWZI, JR. TO ARTHUR G. LEWIS AND DELORES N. LEWIS HIS WIFE BY DEED DATED MAY 7, 1958 AND RECORDED IN THE ULSTER COUNTY CLERK'S OFFICE IN LIBER 1031 OF DEEDS AT PAGE 151 ON MAY 7, 1958.

The above described property is conveyed subject to an easement of the Town of Esopus to enter on that portion thereof, for a width of 10 feet, which extends from Valley Road along Lot 4 for a distance of 109.5 feet for the purpose of maintaining a storn water drain pipe from said lot and to clean and repair and replace the same.

Together *with the appurtenances and all the estate and rights of the part* IES *of the first part in and to said premises,*
To have and to hold *the premises herein granted unto the part* IES *of the second part,* THEIR DISTRIBUTERS *and assigns forever.*

And said PARTIES OF THE FIRST PART *covenant as follows:*

First, *That the part* IES *of the second part shall quietly enjoy the said premises;*

Second, *That said* PARTIES OF THE FIRST PART *will forever* **Warrant** *the title to said premises.*

Third, *That, in Compliance with Sec. 13 of the Lien Law, the grantor s will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.*

In Witness Whereof, *the part* IES *of the first part have hereunto set hands and seals the day and year first above written.*

In Presence of

State of New York
County of ULSTER } ss. *On this* 14 *day of* FEBRUARY *Nineteen Hundred and* SIXTY-FOUR *before me, the subscriber, personally appeared*

ARTHUR G. LEWIS AND DELORES M. LEWIS

to me personally known and known to me to be the same person described in and who executed the within Instrument, and they *acknowledged to me that* they *executed the same.*

NOTARY PUBLIC

65

FILED FEB 14 1964
LAWRENCE D. CRAFT
COUNTY CLERK

LIBER 1148 PG 287

162

ARTHUR G. LEWIS AND DELORES M. LEWIS

TO

M. BLANSCHAN
M. BLANSCHAN

FEBRUARY 14 1964

Ulster County, S.S.

COOMAN & DiDONNA
ATTORNEYS AT LAW
KINGSTON, N. Y.

Tighe&Bond

APPENDIX E

NOAA Atlas 14, Volume 10, Version 3
Location name: Port Ewen, New York, USA*
Latitude: 41.8984°, Longitude: -73.9771°
Elevation: 186.58 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.332 (0.255-0.424)	0.398 (0.306-0.509)	0.506 (0.388-0.649)	0.596 (0.454-0.768)	0.719 (0.531-0.965)	0.813 (0.588-1.11)	0.909 (0.639-1.29)	1.01 (0.680-1.47)	1.15 (0.747-1.74)	1.27 (0.801-1.95)
10-min	0.471 (0.362-0.601)	0.564 (0.433-0.721)	0.717 (0.549-0.919)	0.844 (0.643-1.09)	1.02 (0.752-1.37)	1.15 (0.833-1.58)	1.29 (0.905-1.82)	1.43 (0.963-2.09)	1.64 (1.06-2.46)	1.79 (1.14-2.76)
15-min	0.554 (0.426-0.707)	0.664 (0.510-0.848)	0.844 (0.646-1.08)	0.994 (0.756-1.28)	1.20 (0.885-1.61)	1.36 (0.981-1.85)	1.52 (1.06-2.15)	1.69 (1.13-2.45)	1.92 (1.25-2.90)	2.11 (1.34-3.24)
30-min	0.744 (0.572-0.949)	0.891 (0.685-1.14)	1.13 (0.867-1.45)	1.33 (1.02-1.72)	1.61 (1.19-2.16)	1.82 (1.32-2.49)	2.03 (1.43-2.88)	2.27 (1.52-3.30)	2.58 (1.67-3.89)	2.84 (1.80-4.36)
60-min	0.934 (0.718-1.19)	1.12 (0.860-1.43)	1.42 (1.09-1.82)	1.67 (1.27-2.16)	2.02 (1.49-2.71)	2.28 (1.65-3.12)	2.55 (1.79-3.61)	2.84 (1.91-4.14)	3.24 (2.10-4.89)	3.56 (2.25-5.48)
2-hr	1.21 (0.937-1.54)	1.44 (1.12-1.83)	1.83 (1.41-2.33)	2.14 (1.64-2.74)	2.58 (1.92-3.44)	2.91 (2.12-3.97)	3.25 (2.30-4.59)	3.63 (2.45-5.25)	4.16 (2.71-6.23)	4.59 (2.92-7.02)
3-hr	1.40 (1.09-1.77)	1.67 (1.30-2.11)	2.11 (1.64-2.68)	2.48 (1.91-3.17)	2.99 (2.23-3.98)	3.37 (2.47-4.59)	3.77 (2.69-5.32)	4.23 (2.86-6.09)	4.88 (3.17-7.27)	5.41 (3.44-8.23)
6-hr	1.76 (1.37-2.20)	2.12 (1.66-2.66)	2.71 (2.12-3.42)	3.21 (2.49-4.06)	3.89 (2.92-5.16)	4.39 (3.24-5.96)	4.93 (3.55-6.96)	5.57 (3.77-7.98)	6.52 (4.25-9.65)	7.31 (4.67-11.0)
12-hr	2.15 (1.70-2.68)	2.64 (2.08-3.30)	3.44 (2.70-4.31)	4.10 (3.20-5.17)	5.02 (3.80-6.63)	5.69 (4.24-7.70)	6.42 (4.67-9.06)	7.32 (4.97-10.4)	8.68 (5.68-12.8)	9.86 (6.31-14.8)
24-hr	2.55 (2.03-3.16)	3.16 (2.51-3.92)	4.17 (3.29-5.18)	5.00 (3.93-6.25)	6.14 (4.69-8.08)	6.98 (5.24-9.40)	7.91 (5.79-11.1)	9.04 (6.17-12.8)	10.8 (7.10-15.8)	12.3 (7.92-18.4)
2-day	2.95 (2.36-3.62)	3.65 (2.91-4.49)	4.79 (3.81-5.92)	5.74 (4.54-7.13)	7.05 (5.41-9.20)	8.01 (6.04-10.7)	9.06 (6.67-12.6)	10.4 (7.10-14.6)	12.4 (8.15-18.0)	14.1 (9.09-20.9)
3-day	3.23 (2.59-3.95)	3.96 (3.18-4.86)	5.17 (4.13-6.36)	6.17 (4.90-7.63)	7.54 (5.81-9.80)	8.56 (6.47-11.4)	9.66 (7.13-13.4)	11.0 (7.58-15.4)	13.1 (8.67-19.0)	14.9 (9.64-22.0)
4-day	3.47 (2.79-4.24)	4.23 (3.40-5.17)	5.48 (4.39-6.72)	6.51 (5.19-8.03)	7.94 (6.13-10.3)	8.99 (6.81-11.9)	10.1 (7.48-14.0)	11.5 (7.94-16.1)	13.7 (9.05-19.7)	15.5 (10.0-22.9)
7-day	4.12 (3.34-5.00)	4.94 (4.00-6.01)	6.29 (5.07-7.68)	7.41 (5.94-9.10)	8.96 (6.95-11.5)	10.1 (7.68-13.3)	11.3 (8.37-15.5)	12.8 (8.86-17.8)	15.0 (9.98-21.6)	16.9 (11.0-24.7)
10-day	4.75 (3.87-5.76)	5.63 (4.57-6.82)	7.05 (5.71-8.58)	8.24 (6.63-10.1)	9.87 (7.67-12.6)	11.1 (8.43-14.5)	12.4 (9.14-16.8)	13.9 (9.64-19.2)	16.1 (10.7-23.0)	18.0 (11.7-26.2)
20-day	6.72 (5.50-8.08)	7.70 (6.30-9.27)	9.30 (7.58-11.2)	10.6 (8.61-12.9)	12.5 (9.72-15.7)	13.8 (10.6-17.8)	15.3 (11.2-20.4)	16.8 (11.7-23.0)	19.0 (12.7-26.9)	20.8 (13.5-30.0)
30-day	8.37 (6.89-10.0)	9.43 (7.75-11.3)	11.2 (9.14-13.4)	12.6 (10.3-15.2)	14.6 (11.4-18.3)	16.1 (12.3-20.6)	17.6 (13.0-23.3)	19.2 (13.5-26.2)	21.4 (14.3-30.1)	23.0 (15.0-33.1)
45-day	10.4 (8.63-12.5)	11.6 (9.57-13.9)	13.5 (11.1-16.2)	15.1 (12.3-18.2)	17.2 (13.5-21.5)	18.9 (14.5-24.0)	20.6 (15.1-26.9)	22.2 (15.6-30.1)	24.3 (16.4-34.1)	25.9 (16.9-37.1)
60-day	12.2 (10.1-14.5)	13.4 (11.1-16.0)	15.5 (12.8-18.5)	17.2 (14.1-20.6)	19.5 (15.3-24.2)	21.3 (16.3-26.9)	23.1 (17.0-30.0)	24.8 (17.4-33.4)	26.9 (18.1-37.6)	28.4 (18.6-40.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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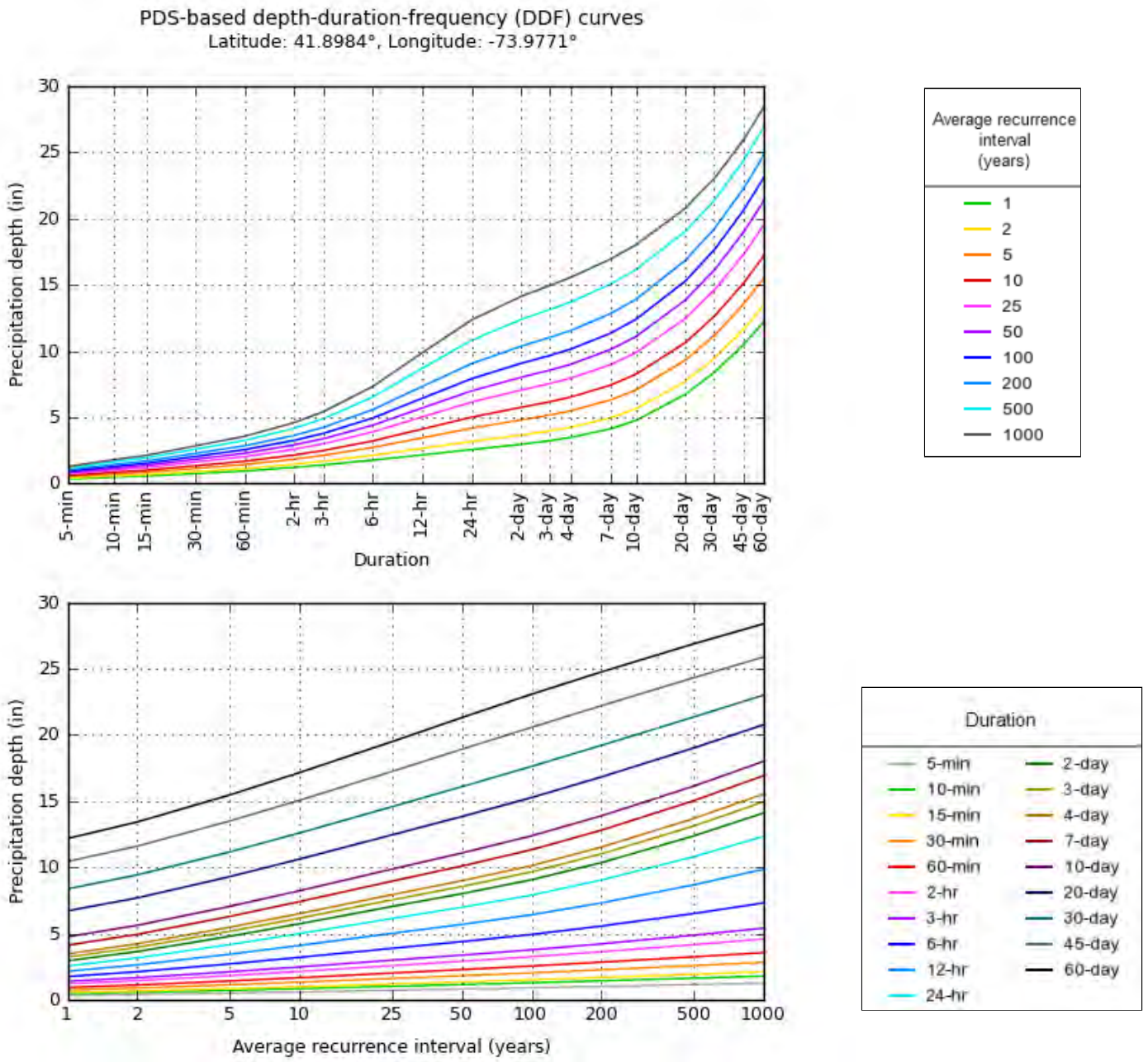
PF graphical



NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Mon Aug 12 14:04:03 2019

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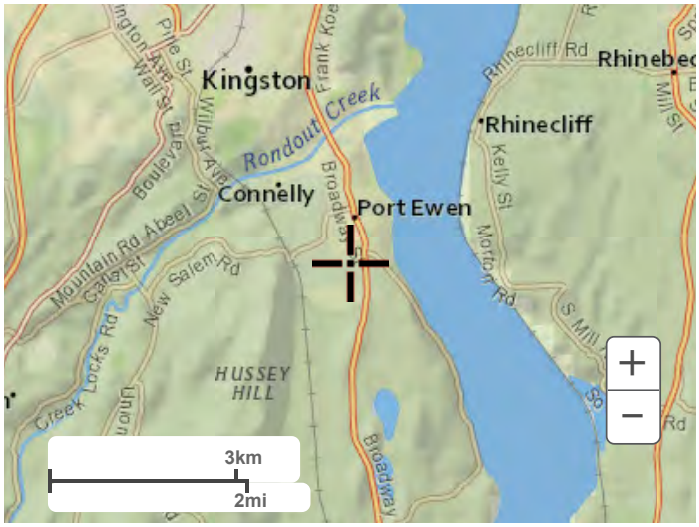
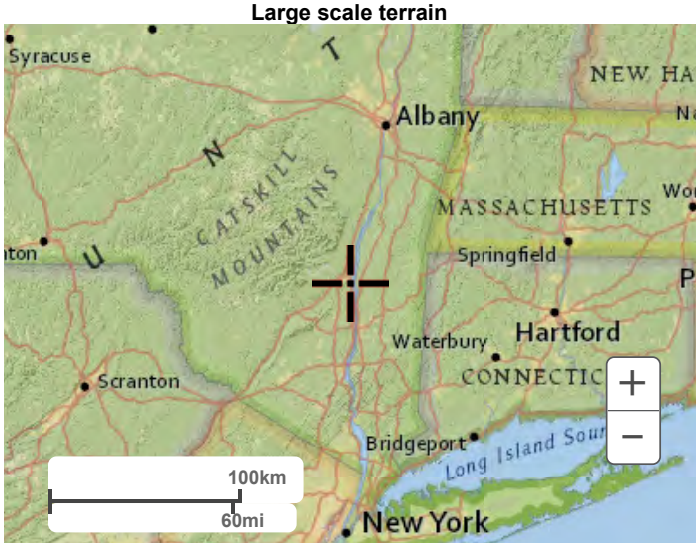
Maps & aerials

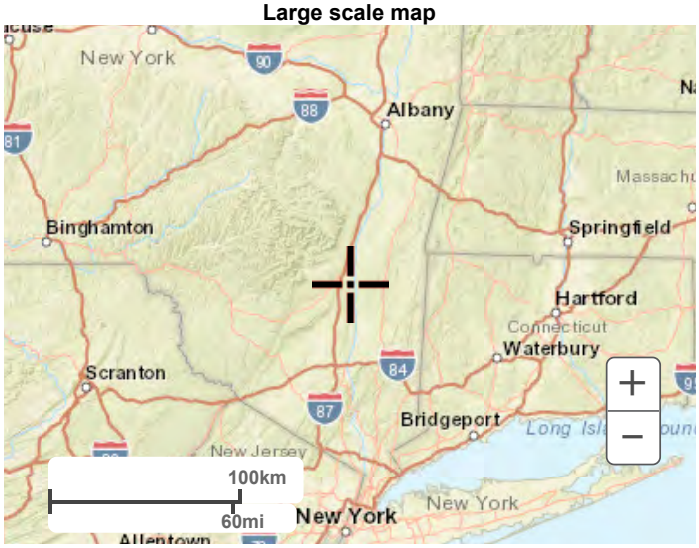
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Clay Road 2-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-427	CB-1	DrainageMH-14	12.0	166.68	166.04	64.7	3.54	4.40
DrainPipe-428	DrainageMH-14	O-4	12.0	166.04	165.79	110.8	1.69	3.22

Clay Road 5-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-427	CB-1	DrainageMH-14	12.0	166.68	166.04	64.7	3.54	3.02
DrainPipe-428	DrainageMH-14	O-4	12.0	166.04	165.79	110.8	1.69	2.97

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA
+1-203-755-1666

Clay Road 10-Year Storm Conduit Report

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-427	CB-1	DrainageMH-14	12.0	166.68	166.04	64.7	3.54	(N/A)
DrainPipe-428	DrainageMH-14	O-4	12.0	166.04	165.79	110.8	1.69	(N/A)

Clay Road 15-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-427	CB-1	DrainageMH-14	12.0	166.68	166.04	64.7	3.54	5.71
DrainPipe-428	DrainageMH-14	O-4	12.0	166.04	165.79	110.8	1.69	3.31

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA
+1-203-755-1666

Clay Road 50-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-427	CB-1	DrainageMH-14	12.0	166.68	166.04	64.7	3.54	5.91
DrainPipe-428	DrainageMH-14	O-4	12.0	166.04	165.79	110.8	1.69	3.32

Clay Road Proposed Improvements 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-427	CB-1	DrainageMH-14	24.0	163.65	163.50	64.7	16.63	16.37
DrainPipe-428	DrainageMH-14	O-4	24.0	163.50	163.25	110.8	10.74	16.39

Eugene Street 2-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-4	POS-1	CatchBasin-161	12.0	180.00	179.79	10.1	5.13	(N/A)
CO-6	O-5	CatchBasin-156	12.0	179.98	180.22	19.7	3.93	(N/A)
DrainPipe-151	CatchBasin-145	CatchBasin-143	12.0	182.35	180.87	44.8	6.48	0.00
DrainPipe-152	CatchBasin-143	CatchBasin-144	10.0	182.67	181.68	43.7	3.29	0.00
DrainPipe-153	CatchBasin-144	CatchBasin-154	12.0	180.98	180.42	177.2	2.01	0.00
DrainPipe-154	CatchBasin-147	CatchBasin-144	12.0	181.99	181.18	115.0	2.98	0.00
DrainPipe-155	CatchBasin-146	CatchBasin-145	12.0	182.44	182.15	51.0	2.69	0.00
DrainPipe-156	CatchBasin-148	CatchBasin-146	8.0	182.44	182.54	38.5	0.62	0.00
DrainPipe-157	MH-142	CatchBasin-147	3.0	183.00	182.89	106.1	0.03	0.00
DrainPipe-158	CatchBasin-149	CatchBasin-145	12.0	183.07	182.05	160.9	2.83	0.00
DrainPipe-159	CatchBasin-165B	CatchBasin-148	8.0	183.14	182.34	107.9	1.04	0.00
DrainPipe-166	CatchBasin-160	CatchBasin-154	12.0	182.16	180.82	190.4	2.99	0.00
DrainPipe-167	MH-69	CatchBasin-154	6.0	182.00	181.42	24.5	0.86	0.00
DrainPipe-168	CatchBasin-154	CatchBasin-155	12.0	180.52	180.62	15.4	2.85	0.04
DrainPipe-169	MH-64	CatchBasin-155	4.0	182.00	181.12	20.6	0.39	0.00
DrainPipe-170	CatchBasin-155	CatchBasin-156	12.0	180.32	180.42	194.6	0.81	0.11
DrainPipe-171	CatchBasin-156	CatchBasin-157	12.0	180.32	180.08	90.7	1.86	0.20
DrainPipe-172	MH-80	CatchBasin-157	4.0	181.00	180.48	29.4	0.25	0.00
DrainPipe-173	MH-57	CatchBasin-157	4.0	181.00	180.48	21.9	0.29	0.00
DrainPipe-174	CatchBasin-157	CatchBasin-161	12.0	180.28	180.09	51.2	2.15	0.33
DrainPipe-175	CatchBasin-161	CatchBasin-162	12.0	179.99	179.54	181.8	1.76	0.53
DrainPipe-176	CatchBasin-162	CatchBasin-165	15.0	179.24	178.72	45.8	6.89	3.80
DrainPipe-178	CatchBasin-161B	CatchBasin-160	12.0	182.88	182.36	32.3	4.51	0.00
DrainPipe-179	CatchBasin-165	CatchBasin-299	15.0	178.42	176.04	283.5	5.92	7.09
DrainPipe-184	CatchBasin-166	CatchBasin-165B	8.0	184.66	183.34	146.2	1.15	0.00
DrainPipe-185	CatchBasin-168	CatchBasin-166	6.0	184.07	184.56	32.0	0.69	0.00
DrainPipe-186	CatchBasin-167	CatchBasin-166	8.0	185.16	184.56	54.2	1.27	0.00
DrainPipe-187	CatchBasin-169	CatchBasin-168	6.0	184.61	184.07	107.2	0.40	0.00
DrainPipe-294	CatchBasin-294	CatchBasin-297	12.0	176.70	175.70	47.7	5.14	3.14
DrainPipe-295	CatchBasin-295	MH-93	6.0	176.00	175.32	36.0	0.77	0.00
DrainPipe-296	CatchBasin-295	CatchBasin-296	12.0	174.42	173.66	30.6	5.60	5.60

Eugene Street 2-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-297	CatchBasin-296	O-4	15.0	170.36	167.53	32.1	19.20	12.53
DrainPipe-298	CatchBasin-297	CatchBasin-296	12.0	172.70	170.96	283.2	2.79	6.69
DrainPipe-299	CatchBasin-299	CatchBasin-297	18.0	176.04	172.70	250.2	12.13	6.80
DrainPipe-446	MH-15	CatchBasin-156	4.0	181.00	180.92	9.7	0.17	0.00
DrainPipe-447	MH-12	CatchBasin-156	4.0	181.00	180.72	9.3	0.33	0.00

Eugene Street 5-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-4	POS-1	CatchBasin-161	12.0	180.00	179.79	10.1	5.13	(N/A)
CO-6	O-5	CatchBasin-156	12.0	179.98	180.22	19.7	3.93	(N/A)
DrainPipe-151	CatchBasin-145	CatchBasin-143	12.0	182.35	180.87	44.8	6.48	0.00
DrainPipe-152	CatchBasin-143	CatchBasin-144	10.0	182.67	181.68	43.7	3.29	0.00
DrainPipe-153	CatchBasin-144	CatchBasin-154	12.0	180.98	180.42	177.2	2.01	0.05
DrainPipe-154	CatchBasin-147	CatchBasin-144	12.0	181.99	181.18	115.0	2.98	0.00
DrainPipe-155	CatchBasin-146	CatchBasin-145	12.0	182.44	182.15	51.0	2.69	0.00
DrainPipe-156	CatchBasin-148	CatchBasin-146	8.0	182.44	182.54	38.5	0.62	0.00
DrainPipe-157	MH-142	CatchBasin-147	3.0	183.00	182.89	106.1	0.03	0.00
DrainPipe-158	CatchBasin-149	CatchBasin-145	12.0	183.07	182.05	160.9	2.83	0.00
DrainPipe-159	CatchBasin-165B	CatchBasin-148	8.0	183.14	182.34	107.9	1.04	0.00
DrainPipe-166	CatchBasin-160	CatchBasin-154	12.0	182.16	180.82	190.4	2.99	0.00
DrainPipe-167	MH-69	CatchBasin-154	6.0	182.00	181.42	24.5	0.86	0.00
DrainPipe-168	CatchBasin-154	CatchBasin-155	12.0	180.52	180.62	15.4	2.85	0.14
DrainPipe-169	MH-64	CatchBasin-155	4.0	182.00	181.12	20.6	0.39	0.00
DrainPipe-170	CatchBasin-155	CatchBasin-156	12.0	180.32	180.42	194.6	0.81	0.20
DrainPipe-171	CatchBasin-156	CatchBasin-157	12.0	180.32	180.08	90.7	1.86	0.40
DrainPipe-172	MH-80	CatchBasin-157	4.0	181.00	180.48	29.4	0.25	0.00
DrainPipe-173	MH-57	CatchBasin-157	4.0	181.00	180.48	21.9	0.29	0.00
DrainPipe-174	CatchBasin-157	CatchBasin-161	12.0	180.28	180.09	51.2	2.15	0.41
DrainPipe-175	CatchBasin-161	CatchBasin-162	12.0	179.99	179.54	181.8	1.76	0.48
DrainPipe-176	CatchBasin-162	CatchBasin-165	15.0	179.24	178.72	45.8	6.89	4.29
DrainPipe-178	CatchBasin-161B	CatchBasin-160	12.0	182.88	182.36	32.3	4.51	0.00
DrainPipe-179	CatchBasin-165	CatchBasin-299	15.0	178.42	176.04	283.5	5.92	7.84
DrainPipe-184	CatchBasin-166	CatchBasin-165B	8.0	184.66	183.34	146.2	1.15	0.00
DrainPipe-185	CatchBasin-168	CatchBasin-166	6.0	184.07	184.56	32.0	0.69	0.00
DrainPipe-186	CatchBasin-167	CatchBasin-166	8.0	185.16	184.56	54.2	1.27	0.00
DrainPipe-187	CatchBasin-169	CatchBasin-168	6.0	184.61	184.07	107.2	0.40	0.00
DrainPipe-294	CatchBasin-294	CatchBasin-297	12.0	176.70	175.70	47.7	5.14	4.62
DrainPipe-295	CatchBasin-295	MH-93	6.0	176.00	175.32	36.0	0.77	0.01
DrainPipe-296	CatchBasin-295	CatchBasin-296	12.0	174.42	173.66	30.6	5.60	8.30

Eugene Street 5-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-297	CatchBasin-296	O-4	15.0	170.36	167.53	32.1	19.20	16.02
DrainPipe-298	CatchBasin-297	CatchBasin-296	12.0	172.70	170.96	283.2	2.79	5.40
DrainPipe-299	CatchBasin-299	CatchBasin-297	18.0	176.04	172.70	250.2	12.13	8.69
DrainPipe-446	MH-15	CatchBasin-156	4.0	181.00	180.92	9.7	0.17	0.00
DrainPipe-447	MH-12	CatchBasin-156	4.0	181.00	180.72	9.3	0.33	0.00

Eugene Street 10-Year Storm Conduit Report

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-4	POS-1	CatchBasin-161	12.0	180.00	179.79	10.1	5.13	(N/A)
CO-6	O-5	CatchBasin-156	12.0	179.98	180.22	19.7	3.93	(N/A)
DrainPipe-151	CatchBasin-145	CatchBasin-143	12.0	182.35	180.87	44.8	6.48	(N/A)
DrainPipe-152	CatchBasin-143	CatchBasin-144	10.0	182.67	181.68	43.7	3.29	(N/A)
DrainPipe-153	CatchBasin-144	CatchBasin-154	12.0	180.98	180.42	177.2	2.01	(N/A)
DrainPipe-154	CatchBasin-147	CatchBasin-144	12.0	181.99	181.18	115.0	2.98	(N/A)
DrainPipe-155	CatchBasin-146	CatchBasin-145	12.0	182.44	182.15	51.0	2.69	(N/A)
DrainPipe-156	CatchBasin-148	CatchBasin-146	8.0	182.44	182.54	38.5	0.62	(N/A)
DrainPipe-157	MH-142	CatchBasin-147	3.0	183.00	182.89	106.1	0.03	(N/A)
DrainPipe-158	CatchBasin-149	CatchBasin-145	12.0	183.07	182.05	160.9	2.83	(N/A)
DrainPipe-159	CatchBasin-165B	CatchBasin-148	8.0	183.14	182.34	107.9	1.04	(N/A)
DrainPipe-166	CatchBasin-160	CatchBasin-154	12.0	182.16	180.82	190.4	2.99	(N/A)
DrainPipe-167	MH-69	CatchBasin-154	6.0	182.00	181.42	24.5	0.86	(N/A)
DrainPipe-168	CatchBasin-154	CatchBasin-155	12.0	180.52	180.62	15.4	2.85	(N/A)
DrainPipe-169	MH-64	CatchBasin-155	4.0	182.00	181.12	20.6	0.39	(N/A)
DrainPipe-170	CatchBasin-155	CatchBasin-156	12.0	180.32	180.42	194.6	0.81	(N/A)
DrainPipe-171	CatchBasin-156	CatchBasin-157	12.0	180.32	180.08	90.7	1.86	(N/A)
DrainPipe-172	MH-80	CatchBasin-157	4.0	181.00	180.48	29.4	0.25	(N/A)
DrainPipe-173	MH-57	CatchBasin-157	4.0	181.00	180.48	21.9	0.29	(N/A)
DrainPipe-174	CatchBasin-157	CatchBasin-161	12.0	180.28	180.09	51.2	2.15	(N/A)
DrainPipe-175	CatchBasin-161	CatchBasin-162	12.0	179.99	179.54	181.8	1.76	(N/A)
DrainPipe-176	CatchBasin-162	CatchBasin-165	15.0	179.24	178.72	45.8	6.89	(N/A)
DrainPipe-178	CatchBasin-161B	CatchBasin-160	12.0	182.88	182.36	32.3	4.51	(N/A)
DrainPipe-179	CatchBasin-165	CatchBasin-299	15.0	178.42	176.04	283.5	5.92	(N/A)
DrainPipe-184	CatchBasin-166	CatchBasin-165B	8.0	184.66	183.34	146.2	1.15	(N/A)
DrainPipe-185	CatchBasin-168	CatchBasin-166	6.0	184.07	184.56	32.0	0.69	(N/A)
DrainPipe-186	CatchBasin-167	CatchBasin-166	8.0	185.16	184.56	54.2	1.27	(N/A)
DrainPipe-187	CatchBasin-169	CatchBasin-168	6.0	184.61	184.07	107.2	0.40	(N/A)
DrainPipe-294	CatchBasin-294	CatchBasin-297	12.0	176.70	175.70	47.7	5.14	(N/A)
DrainPipe-295	CatchBasin-295	MH-93	6.0	176.00	175.32	36.0	0.77	(N/A)
DrainPipe-296	CatchBasin-295	CatchBasin-296	12.0	174.42	173.66	30.6	5.60	(N/A)
DrainPipe-297	CatchBasin-296	O-4	15.0	170.36	167.53	32.1	19.20	(N/A)
DrainPipe-298	CatchBasin-297	CatchBasin-296	12.0	172.70	170.96	283.2	2.79	(N/A)

Eugene Street 10-Year Storm Conduit Report

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-299	CatchBasin-299	CatchBasin-297	18.0	176.04	172.70	250.2	12.13	(N/A)
DrainPipe-446	MH-15	CatchBasin-156	4.0	181.00	180.92	9.7	0.17	(N/A)
DrainPipe-447	MH-12	CatchBasin-156	4.0	181.00	180.72	9.3	0.33	(N/A)

Eugene Street 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-4	POS-1	CatchBasin-161	12.0	180.00	179.79	10.1	5.13	(N/A)
CO-6	O-5	CatchBasin-156	12.0	179.98	180.22	19.7	3.93	(N/A)
DrainPipe-151	CatchBasin-145	CatchBasin-143	12.0	182.35	180.87	44.8	6.48	0.00
DrainPipe-152	CatchBasin-143	CatchBasin-144	10.0	182.67	181.68	43.7	3.29	0.00
DrainPipe-153	CatchBasin-144	CatchBasin-154	12.0	180.98	180.42	177.2	2.01	0.11
DrainPipe-154	CatchBasin-147	CatchBasin-144	12.0	181.99	181.18	115.0	2.98	0.00
DrainPipe-155	CatchBasin-146	CatchBasin-145	12.0	182.44	182.15	51.0	2.69	0.00
DrainPipe-156	CatchBasin-148	CatchBasin-146	8.0	182.44	182.54	38.5	0.62	0.00
DrainPipe-157	MH-142	CatchBasin-147	3.0	183.00	182.89	106.1	0.03	0.00
DrainPipe-158	CatchBasin-149	CatchBasin-145	12.0	183.07	182.05	160.9	2.83	0.00
DrainPipe-159	CatchBasin-165B	CatchBasin-148	8.0	183.14	182.34	107.9	1.04	0.00
DrainPipe-166	CatchBasin-160	CatchBasin-154	12.0	182.16	180.82	190.4	2.99	0.02
DrainPipe-167	MH-69	CatchBasin-154	6.0	182.00	181.42	24.5	0.86	0.00
DrainPipe-168	CatchBasin-154	CatchBasin-155	12.0	180.52	180.62	15.4	2.85	0.28
DrainPipe-169	MH-64	CatchBasin-155	4.0	182.00	181.12	20.6	0.39	0.00
DrainPipe-170	CatchBasin-155	CatchBasin-156	12.0	180.32	180.42	194.6	0.81	0.26
DrainPipe-171	CatchBasin-156	CatchBasin-157	12.0	180.32	180.08	90.7	1.86	0.35
DrainPipe-172	MH-80	CatchBasin-157	4.0	181.00	180.48	29.4	0.25	0.00
DrainPipe-173	MH-57	CatchBasin-157	4.0	181.00	180.48	21.9	0.29	0.00
DrainPipe-174	CatchBasin-157	CatchBasin-161	12.0	180.28	180.09	51.2	2.15	0.35
DrainPipe-175	CatchBasin-161	CatchBasin-162	12.0	179.99	179.54	181.8	1.76	0.35
DrainPipe-176	CatchBasin-162	CatchBasin-165	15.0	179.24	178.72	45.8	6.89	4.51
DrainPipe-178	CatchBasin-161B	CatchBasin-160	12.0	182.88	182.36	32.3	4.51	0.00
DrainPipe-179	CatchBasin-165	CatchBasin-299	15.0	178.42	176.04	283.5	5.92	6.31
DrainPipe-184	CatchBasin-166	CatchBasin-165B	8.0	184.66	183.34	146.2	1.15	0.00
DrainPipe-185	CatchBasin-168	CatchBasin-166	6.0	184.07	184.56	32.0	0.69	0.00
DrainPipe-186	CatchBasin-167	CatchBasin-166	8.0	185.16	184.56	54.2	1.27	0.00
DrainPipe-187	CatchBasin-169	CatchBasin-168	6.0	184.61	184.07	107.2	0.40	0.00
DrainPipe-294	CatchBasin-294	CatchBasin-297	12.0	176.70	175.70	47.7	5.14	6.97
DrainPipe-295	CatchBasin-295	MH-93	6.0	176.00	175.32	36.0	0.77	0.04
DrainPipe-296	CatchBasin-295	CatchBasin-296	12.0	174.42	173.66	30.6	5.60	12.39

Eugene Street 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-297	CatchBasin-296	O-4	15.0	170.36	167.53	32.1	19.20	21.03
DrainPipe-298	CatchBasin-297	CatchBasin-296	12.0	172.70	170.96	283.2	2.79	5.46
DrainPipe-299	CatchBasin-299	CatchBasin-297	18.0	176.04	172.70	250.2	12.13	8.13
DrainPipe-446	MH-15	CatchBasin-156	4.0	181.00	180.92	9.7	0.17	0.00
DrainPipe-447	MH-12	CatchBasin-156	4.0	181.00	180.72	9.3	0.33	0.00

Eugene Street 50-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-4	POS-1	CatchBasin-161	12.0	180.00	179.79	10.1	5.13	(N/A)
CO-6	O-5	CatchBasin-156	12.0	179.98	180.22	19.7	3.93	(N/A)
DrainPipe-151	CatchBasin-145	CatchBasin-143	12.0	182.35	180.87	44.8	6.48	0.00
DrainPipe-152	CatchBasin-143	CatchBasin-144	10.0	182.67	181.68	43.7	3.29	0.00
DrainPipe-153	CatchBasin-144	CatchBasin-154	12.0	180.98	180.42	177.2	2.01	0.09
DrainPipe-154	CatchBasin-147	CatchBasin-144	12.0	181.99	181.18	115.0	2.98	0.01
DrainPipe-155	CatchBasin-146	CatchBasin-145	12.0	182.44	182.15	51.0	2.69	0.00
DrainPipe-156	CatchBasin-148	CatchBasin-146	8.0	182.44	182.54	38.5	0.62	0.00
DrainPipe-157	MH-142	CatchBasin-147	3.0	183.00	182.89	106.1	0.03	0.00
DrainPipe-158	CatchBasin-149	CatchBasin-145	12.0	183.07	182.05	160.9	2.83	0.00
DrainPipe-159	CatchBasin-165B	CatchBasin-148	8.0	183.14	182.34	107.9	1.04	0.00
DrainPipe-166	CatchBasin-160	CatchBasin-154	12.0	182.16	180.82	190.4	2.99	0.03
DrainPipe-167	MH-69	CatchBasin-154	6.0	182.00	181.42	24.5	0.86	0.00
DrainPipe-168	CatchBasin-154	CatchBasin-155	12.0	180.52	180.62	15.4	2.85	0.18
DrainPipe-169	MH-64	CatchBasin-155	4.0	182.00	181.12	20.6	0.39	0.00
DrainPipe-170	CatchBasin-155	CatchBasin-156	12.0	180.32	180.42	194.6	0.81	0.19
DrainPipe-171	CatchBasin-156	CatchBasin-157	12.0	180.32	180.08	90.7	1.86	0.24
DrainPipe-172	MH-80	CatchBasin-157	4.0	181.00	180.48	29.4	0.25	0.00
DrainPipe-173	MH-57	CatchBasin-157	4.0	181.00	180.48	21.9	0.29	0.00
DrainPipe-174	CatchBasin-157	CatchBasin-161	12.0	180.28	180.09	51.2	2.15	0.25
DrainPipe-175	CatchBasin-161	CatchBasin-162	12.0	179.99	179.54	181.8	1.76	0.25
DrainPipe-176	CatchBasin-162	CatchBasin-165	15.0	179.24	178.72	45.8	6.89	4.57
DrainPipe-178	CatchBasin-161B	CatchBasin-160	12.0	182.88	182.36	32.3	4.51	0.00
DrainPipe-179	CatchBasin-165	CatchBasin-299	15.0	178.42	176.04	283.5	5.92	6.32
DrainPipe-184	CatchBasin-166	CatchBasin-165B	8.0	184.66	183.34	146.2	1.15	0.00
DrainPipe-185	CatchBasin-168	CatchBasin-166	6.0	184.07	184.56	32.0	0.69	0.00
DrainPipe-186	CatchBasin-167	CatchBasin-166	8.0	185.16	184.56	54.2	1.27	0.00
DrainPipe-187	CatchBasin-169	CatchBasin-168	6.0	184.61	184.07	107.2	0.40	0.00
DrainPipe-294	CatchBasin-294	CatchBasin-297	12.0	176.70	175.70	47.7	5.14	7.10
DrainPipe-295	CatchBasin-295	MH-93	6.0	176.00	175.32	36.0	0.77	0.02
DrainPipe-296	CatchBasin-295	CatchBasin-296	12.0	174.42	173.66	30.6	5.60	11.99

Eugene Street 50-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-297	CatchBasin-296	O-4	15.0	170.36	167.53	32.1	19.20	20.90
DrainPipe-298	CatchBasin-297	CatchBasin-296	12.0	172.70	170.96	283.2	2.79	5.49
DrainPipe-299	CatchBasin-299	CatchBasin-297	18.0	176.04	172.70	250.2	12.13	8.46
DrainPipe-446	MH-15	CatchBasin-156	4.0	181.00	180.92	9.7	0.17	0.00
DrainPipe-447	MH-12	CatchBasin-156	4.0	181.00	180.72	9.3	0.33	0.00

Eugene Street Proposed Improvements 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-4	POS-1	CatchBasin-161	12.0	178.00	177.98	10.1	22.40	(N/A)
CO-6	O-5	CatchBasin-156	12.0	179.98	180.22	19.7	3.93	(N/A)
DrainPipe-151	CatchBasin-145	CatchBasin-143	12.0	182.35	180.87	44.8	6.48	0.00
DrainPipe-152	CatchBasin-143	CatchBasin-144	10.0	182.67	181.68	43.7	3.29	0.00
DrainPipe-153	CatchBasin-144	CatchBasin-154	12.0	180.98	180.42	177.2	2.01	0.36
DrainPipe-154	CatchBasin-147	CatchBasin-144	12.0	181.99	181.18	115.0	2.98	0.16
DrainPipe-155	CatchBasin-146	CatchBasin-145	12.0	182.44	182.15	51.0	2.69	0.00
DrainPipe-156	CatchBasin-148	CatchBasin-146	8.0	182.44	182.54	38.5	0.62	0.00
DrainPipe-157	MH-142	CatchBasin-147	3.0	183.00	182.89	106.1	0.03	0.00
DrainPipe-158	CatchBasin-149	CatchBasin-145	12.0	183.07	182.05	160.9	2.83	0.00
DrainPipe-159	CatchBasin-165B	CatchBasin-148	8.0	183.14	182.34	107.9	1.04	0.00
DrainPipe-166	CatchBasin-160	CatchBasin-154	12.0	182.16	180.82	190.4	2.99	0.09
DrainPipe-167	MH-69	CatchBasin-154	6.0	182.00	181.42	24.5	0.86	0.00
DrainPipe-168	CatchBasin-154	CatchBasin-155	12.0	180.52	180.62	15.4	2.85	0.47
DrainPipe-169	MH-64	CatchBasin-155	4.0	182.00	181.12	20.6	0.39	0.00
DrainPipe-170	CatchBasin-155	CatchBasin-156	12.0	180.32	180.42	194.6	0.81	0.48
DrainPipe-171	CatchBasin-156	CatchBasin-157	12.0	180.32	180.08	90.7	1.86	0.49
DrainPipe-172	MH-80	CatchBasin-157	4.0	181.00	180.48	29.4	0.25	0.00
DrainPipe-173	MH-57	CatchBasin-157	4.0	181.00	180.48	21.9	0.29	0.00
DrainPipe-174	CatchBasin-157	CatchBasin-161	12.0	180.28	180.09	51.2	2.15	7.04
DrainPipe-175	CatchBasin-161	CatchBasin-162	24.0	175.67	175.27	181.8	10.61	7.16
DrainPipe-176	CatchBasin-162	CatchBasin-165	24.0	174.17	174.07	45.8	10.56	18.36
DrainPipe-178	CatchBasin-161B	CatchBasin-160	12.0	182.88	182.36	32.3	4.51	0.00
DrainPipe-179	CatchBasin-165	CatchBasin-299	36.0	173.97	173.35	283.5	55.59	34.65
DrainPipe-184	CatchBasin-166	CatchBasin-165B	8.0	184.66	183.34	146.2	1.15	0.00
DrainPipe-185	CatchBasin-168	CatchBasin-166	6.0	184.07	184.56	32.0	0.69	0.00
DrainPipe-186	CatchBasin-167	CatchBasin-166	8.0	185.16	184.56	54.2	1.27	0.00
DrainPipe-187	CatchBasin-169	CatchBasin-168	6.0	184.61	184.07	107.2	0.40	0.00
DrainPipe-294	CatchBasin-294	CatchBasin-297	18.0	174.50	174.45	47.7	3.40	7.52
DrainPipe-295	CatchBasin-295	MH-93	6.0	176.00	175.32	36.0	0.77	0.04
DrainPipe-296	CatchBasin-295	CatchBasin-296	12.0	174.42	173.66	30.6	5.60	12.40

Eugene Street Proposed Improvements 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-297	CatchBasin-296	O-4	36.0	170.36	167.53	32.1	198.27	60.34
DrainPipe-298	CatchBasin-297	CatchBasin-296	36.0	172.70	170.96	283.2	52.25	51.00
DrainPipe-299	CatchBasin-299	CatchBasin-297	36.0	173.25	172.70	250.2	35.27	36.13
DrainPipe-446	MH-15	CatchBasin-156	4.0	181.00	180.92	9.7	0.17	0.00
DrainPipe-447	MH-12	CatchBasin-156	4.0	181.00	180.72	9.3	0.33	0.00

Lindorf Street 2-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-267	CatchBasin-278	CatchBasin-279	12.0	139.95	139.23	26.8	5.84	7.86
DrainPipe-268	CatchBasin-280	CatchBasin-281	12.0	139.57	138.96	22.0	5.93	0.90
DrainPipe-269	CatchBasin-279	CatchBasin-281	12.0	139.23	138.96	76.9	2.11	7.75
DrainPipe-270	CatchBasin-281	CatchBasin-282	12.0	138.96	137.71	29.4	7.34	8.26
DrainPipe-271	CatchBasin-282	CatchBasin-283	12.0	137.71	137.46	59.8	2.30	3.33
DrainPipe-272	CatchBasin-283	CatchBasin-284	12.0	137.46	137.84	79.1	2.47	2.93
DrainPipe-273	CatchBasin-284	CatchBasin-285	12.0	137.84	135.06	165.2	4.62	5.22
DrainPipe-274	CatchBasin-285	CatchBasin-286	12.0	135.06	134.20	195.2	2.36	4.40
DrainPipe-275	CatchBasin-286	O-4	12.0	134.20	134.20	65.9	0.00	6.13
DrainPipe-276	CatchBasin-287	CatchBasin-278	12.0	153.67	139.95	196.7	9.41	2.08

Lindorf Street 5-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-267	CatchBasin-278	CatchBasin-279	12.0	139.95	139.23	26.8	5.84	8.34
DrainPipe-268	CatchBasin-280	CatchBasin-281	12.0	139.57	138.96	22.0	5.93	1.35
DrainPipe-269	CatchBasin-279	CatchBasin-281	12.0	139.23	138.96	76.9	2.11	7.40
DrainPipe-270	CatchBasin-281	CatchBasin-282	12.0	138.96	137.71	29.4	7.34	8.65
DrainPipe-271	CatchBasin-282	CatchBasin-283	12.0	137.71	137.46	59.8	2.30	3.30
DrainPipe-272	CatchBasin-283	CatchBasin-284	12.0	137.46	137.84	79.1	2.47	2.86
DrainPipe-273	CatchBasin-284	CatchBasin-285	12.0	137.84	135.06	165.2	4.62	4.75
DrainPipe-274	CatchBasin-285	CatchBasin-286	12.0	135.06	134.20	195.2	2.36	4.30
DrainPipe-275	CatchBasin-286	O-4	12.0	134.20	134.20	65.9	0.00	6.91
DrainPipe-276	CatchBasin-287	CatchBasin-278	12.0	153.67	139.95	196.7	9.41	3.15

Lindorf Street 10-Year Storm Conduit Report

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-267	CatchBasin-278	CatchBasin-279	12.0	139.95	139.23	26.8	5.84	(N/A)
DrainPipe-268	CatchBasin-280	CatchBasin-281	12.0	139.57	138.96	22.0	5.93	(N/A)
DrainPipe-269	CatchBasin-279	CatchBasin-281	12.0	139.23	138.96	76.9	2.11	(N/A)
DrainPipe-270	CatchBasin-281	CatchBasin-282	12.0	138.96	137.71	29.4	7.34	(N/A)
DrainPipe-271	CatchBasin-282	CatchBasin-283	12.0	137.71	137.46	59.8	2.30	(N/A)
DrainPipe-272	CatchBasin-283	CatchBasin-284	12.0	137.46	137.84	79.1	2.47	(N/A)
DrainPipe-273	CatchBasin-284	CatchBasin-285	12.0	137.84	135.06	165.2	4.62	(N/A)
DrainPipe-274	CatchBasin-285	CatchBasin-286	12.0	135.06	134.20	195.2	2.36	(N/A)
DrainPipe-275	CatchBasin-286	O-4	12.0	134.20	134.20	65.9	0.00	(N/A)
DrainPipe-276	CatchBasin-287	CatchBasin-278	12.0	153.67	139.95	196.7	9.41	(N/A)

Lindorf Street 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-267	CatchBasin-278	CatchBasin-279	12.0	139.95	139.23	26.8	5.84	9.00
DrainPipe-268	CatchBasin-280	CatchBasin-281	12.0	139.57	138.96	22.0	5.93	2.25
DrainPipe-269	CatchBasin-279	CatchBasin-281	12.0	139.23	138.96	76.9	2.11	7.43
DrainPipe-270	CatchBasin-281	CatchBasin-282	12.0	138.96	137.71	29.4	7.34	9.43
DrainPipe-271	CatchBasin-282	CatchBasin-283	12.0	137.71	137.46	59.8	2.30	3.24
DrainPipe-272	CatchBasin-283	CatchBasin-284	12.0	137.46	137.84	79.1	2.47	2.83
DrainPipe-273	CatchBasin-284	CatchBasin-285	12.0	137.84	135.06	165.2	4.62	4.84
DrainPipe-274	CatchBasin-285	CatchBasin-286	12.0	135.06	134.20	195.2	2.36	4.29
DrainPipe-275	CatchBasin-286	O-4	12.0	134.20	134.20	65.9	0.00	7.69
DrainPipe-276	CatchBasin-287	CatchBasin-278	12.0	153.67	139.95	196.7	9.41	5.29

Lindorf Street 50-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-267	CatchBasin-278	CatchBasin-279	12.0	139.95	139.23	26.8	5.84	9.23
DrainPipe-268	CatchBasin-280	CatchBasin-281	12.0	139.57	138.96	22.0	5.93	2.64
DrainPipe-269	CatchBasin-279	CatchBasin-281	12.0	139.23	138.96	76.9	2.11	7.44
DrainPipe-270	CatchBasin-281	CatchBasin-282	12.0	138.96	137.71	29.4	7.34	9.74
DrainPipe-271	CatchBasin-282	CatchBasin-283	12.0	137.71	137.46	59.8	2.30	3.22
DrainPipe-272	CatchBasin-283	CatchBasin-284	12.0	137.46	137.84	79.1	2.47	2.82
DrainPipe-273	CatchBasin-284	CatchBasin-285	12.0	137.84	135.06	165.2	4.62	4.95
DrainPipe-274	CatchBasin-285	CatchBasin-286	12.0	135.06	134.20	195.2	2.36	4.29
DrainPipe-275	CatchBasin-286	O-4	12.0	134.20	134.20	65.9	0.00	7.76
DrainPipe-276	CatchBasin-287	CatchBasin-278	12.0	153.67	139.95	196.7	9.41	6.20

Lindorf Street Proposed Improvements 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-267	CatchBasin-278	CatchBasin-279	36.0	139.95	139.23	26.8	109.33	50.53
DrainPipe-268	CatchBasin-280	CatchBasin-281	36.0	139.57	138.96	22.0	110.96	2.23
DrainPipe-269	CatchBasin-279	CatchBasin-281	36.0	139.23	138.96	76.9	39.52	50.69
DrainPipe-270	CatchBasin-281	CatchBasin-282	36.0	138.96	138.00	29.4	120.50	52.00
DrainPipe-271	CatchBasin-282	CatchBasin-283	36.0	138.00	137.00	59.8	86.22	52.71
DrainPipe-272	CatchBasin-283	CatchBasin-284	36.0	137.00	136.00	79.1	74.97	53.06
DrainPipe-273	CatchBasin-284	CatchBasin-285	48.0	136.00	135.06	165.2	108.35	80.47
DrainPipe-274	CatchBasin-285	CatchBasin-286	48.0	135.06	134.20	195.2	95.33	89.14
DrainPipe-275	CatchBasin-286	O-4	48.0	134.20	134.00	65.9	79.13	95.47
DrainPipe-276	CatchBasin-287	CatchBasin-278	12.0	153.67	139.95	196.7	9.41	5.29

Salem Street-Sentar Avenue 2-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	DrainageMH-2	O-4	12.0	158.52	157.52	48.4	5.12	22.36
CO-4	CatchBasin-133	CatchBasin-112	15.0	176.17	177.54	274.2	4.57	4.44
CO-6	CatchBasin-112	CatchBasin-113	15.0	177.54	177.11	32.0	7.48	5.90
CO-8	CatchBasin-113	CatchBasin-128	15.0	177.11	166.91	445.0	9.78	6.85
CO-10	CatchBasin-128	CatchBasin-89	15.0	166.91	162.91	204.9	9.03	8.20
CO-12	CatchBasin-124	CatchBasin-113	15.0	194.10	177.11	236.1	17.33	0.58
CO-16	CatchBasin-131	CatchBasin-132	15.0	176.66	176.27	19.0	9.24	3.38
CO-18	CatchBasin-108	CatchBasin-104	12.0	177.33	173.08	83.4	8.04	(N/A)
DrainPipe-76	CatchBasin-83	CatchBasin-82	6.0	166.46	165.94	19.9	0.91	0.40
DrainPipe-77	CatchBasin-82	CatchBasin-80	12.0	164.94	164.47	35.4	4.09	2.46
DrainPipe-78	MH-89	CatchBasin-82	12.0	165.59	165.66	34.5	1.60	0.00
DrainPipe-79	CatchBasin-81	CatchBasin-80	12.0	165.64	164.67	38.5	5.66	5.29
DrainPipe-80	CatchBasin-87	CatchBasin-80	6.0	165.60	165.07	99.3	0.41	0.25
DrainPipe-81	CatchBasin-80	CatchBasin-85	18.0	164.47	162.48	165.8	11.51	7.98
DrainPipe-82	CatchBasin-84	CatchBasin-81	12.0	166.10	165.74	47.1	3.12	4.93
DrainPipe-83	CatchBasin-106	CatchBasin-84	12.0	167.62	166.40	104.6	3.85	5.55
DrainPipe-84	CatchBasin-85	DrainageMH-2	18.0	162.38	159.52	272.2	10.77	11.48
DrainPipe-85	CatchBasin-86	CatchBasin-85	24.0	164.35	164.25	46.4	10.38	5.35
DrainPipe-86	MH-74	CatchBasin-87	6.0	165.55	165.48	26.2	0.29	0.00
DrainPipe-87	CatchBasin-88	DrainageMH-2	18.0	161.87	158.52	186.7	14.07	14.11
DrainPipe-88	CatchBasin-89	CatchBasin-88	15.0	162.91	163.01	28.4	3.92	13.37
DrainPipe-104	CatchBasin-104	CatchBasin-106	12.0	173.08	168.22	214.3	5.36	6.97
DrainPipe-105	CatchBasin-108	CS-1	12.0	177.53	176.44	35.1	6.27	2.87
DrainPipe-106	CatchBasin-109	CatchBasin-110	8.0	181.00	176.09	250.7	1.69	1.73
DrainPipe-107	CatchBasin-117	CatchBasin-109	8.0	183.15	181.79	264.1	0.87	1.33
DrainPipe-108	CatchBasin-110	CatchBasin-82	10.0	175.89	165.44	414.1	3.48	2.08
DrainPipe-109	CatchBasin-111	CatchBasin-112	6.0	178.79	177.74	61.8	0.73	0.41
DrainPipe-110	MH-50	CatchBasin-112	4.0	179.25	178.74	19.9	0.30	0.00
DrainPipe-111	MH-125	CatchBasin-112	8.0	178.00	177.84	62.3	0.61	0.01
DrainPipe-116	CatchBasin-116	CatchBasin-117	6.0	184.39	183.95	39.3	0.59	1.14
DrainPipe-117	CatchBasin-119	CatchBasin-117	8.0	184.27	183.95	33.8	1.17	0.86

Salem Street-Sentar Avenue 2-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-118	CatchBasin-121	CatchBasin-122	12.0	181.41	180.46	80.3	3.88	0.20
DrainPipe-119	CatchBasin-122	CatchBasin-123	12.0	180.46	179.23	53.7	5.39	0.90
DrainPipe-120	CatchBasin-123	CatchBasin-124	12.0	179.23	177.50	92.4	4.88	2.28
DrainPipe-122	MH-103	CatchBasin-124	4.0	178.00	177.90	43.4	0.09	0.00
DrainPipe-123	CatchBasin-124	CatchBasin-126	12.0	177.50	177.58	67.2	1.24	1.79
DrainPipe-125	CatchBasin-125	CatchBasin-124	15.0	178.01	177.70	37.7	5.89	2.47
DrainPipe-126	MH-37	CatchBasin-125	1.5	178.65	178.61	16.0	0.01	0.00
DrainPipe-127	CatchBasin-126	CatchBasin-130	12.0	177.58	177.76	97.7	1.52	1.80
DrainPipe-129	CB-78	DrainageMH-2	12.0	166.82	160.72	142.8	7.36	1.68
DrainPipe-133	CatchBasin-130	CatchBasin-131	12.0	178.06	176.66	64.4	5.24	3.19
DrainPipe-136	CatchBasin-132	CatchBasin-133	15.0	176.27	176.17	100.9	2.00	3.43
DrainPipe-137	MH-81	CatchBasin-133	12.0	179.00	178.37	29.7	5.17	0.00
DrainPipe-138	MH-72	CatchBasin-133	12.0	179.07	178.37	25.2	5.94	0.00
DrainPipe-437	MH-24	CatchBasin-86	12.0	165.30	165.25	12.8	2.28	0.14
DrainPipe-438	MH-20	CatchBasin-86	6.0	165.90	165.85	11.3	0.38	0.00
DrainPipe-439	MH-17	CatchBasin-89	12.0	163.50	163.37	10.4	4.00	0.00

Salem Street-Sentar Avenue 5-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	DrainageMH-2	O-4	12.0	158.52	157.52	48.4	5.12	15.17
CO-4	CatchBasin-133	CatchBasin-112	15.0	176.17	177.54	274.2	4.57	5.23
CO-6	CatchBasin-112	CatchBasin-113	15.0	177.54	177.11	32.0	7.48	7.94
CO-8	CatchBasin-113	CatchBasin-128	15.0	177.11	166.91	445.0	9.78	9.51
CO-10	CatchBasin-128	CatchBasin-89	15.0	166.91	162.91	204.9	9.03	9.19
CO-12	CatchBasin-124	CatchBasin-113	15.0	194.10	177.11	236.1	17.33	0.86
CO-16	CatchBasin-131	CatchBasin-132	15.0	176.66	176.27	19.0	9.24	3.28
CO-18	CatchBasin-108	CatchBasin-104	12.0	177.33	173.08	83.4	8.04	(N/A)
DrainPipe-76	CatchBasin-83	CatchBasin-82	6.0	166.46	165.94	19.9	0.91	1.09
DrainPipe-77	CatchBasin-82	CatchBasin-80	12.0	164.94	164.47	35.4	4.09	3.79
DrainPipe-78	MH-89	CatchBasin-82	12.0	165.59	165.66	34.5	1.60	0.00
DrainPipe-79	CatchBasin-81	CatchBasin-80	12.0	165.64	164.67	38.5	5.66	5.33
DrainPipe-80	CatchBasin-87	CatchBasin-80	6.0	165.60	165.07	99.3	0.41	0.41
DrainPipe-81	CatchBasin-80	CatchBasin-85	18.0	164.47	162.48	165.8	11.51	9.90
DrainPipe-82	CatchBasin-84	CatchBasin-81	12.0	166.10	165.74	47.1	3.12	5.09
DrainPipe-83	CatchBasin-106	CatchBasin-84	12.0	167.62	166.40	104.6	3.85	5.71
DrainPipe-84	CatchBasin-85	DrainageMH-2	18.0	162.38	159.52	272.2	10.77	13.58
DrainPipe-85	CatchBasin-86	CatchBasin-85	24.0	164.35	164.25	46.4	10.38	8.02
DrainPipe-86	MH-74	CatchBasin-87	6.0	165.55	165.48	26.2	0.29	0.01
DrainPipe-87	CatchBasin-88	DrainageMH-2	18.0	161.87	158.52	186.7	14.07	15.34
DrainPipe-88	CatchBasin-89	CatchBasin-88	15.0	162.91	163.01	28.4	3.92	14.16
DrainPipe-104	CatchBasin-104	CatchBasin-106	12.0	173.08	168.22	214.3	5.36	11.82
DrainPipe-105	CatchBasin-108	CS-1	12.0	177.53	176.44	35.1	6.27	4.79
DrainPipe-106	CatchBasin-109	CatchBasin-110	8.0	181.00	176.09	250.7	1.69	1.87
DrainPipe-107	CatchBasin-117	CatchBasin-109	8.0	183.15	181.79	264.1	0.87	1.34
DrainPipe-108	CatchBasin-110	CatchBasin-82	10.0	175.89	165.44	414.1	3.48	2.49
DrainPipe-109	CatchBasin-111	CatchBasin-112	6.0	178.79	177.74	61.8	0.73	0.68
DrainPipe-110	MH-50	CatchBasin-112	4.0	179.25	178.74	19.9	0.30	0.00
DrainPipe-111	MH-125	CatchBasin-112	8.0	178.00	177.84	62.3	0.61	0.01
DrainPipe-116	CatchBasin-116	CatchBasin-117	6.0	184.39	183.95	39.3	0.59	1.05
DrainPipe-117	CatchBasin-119	CatchBasin-117	8.0	184.27	183.95	33.8	1.17	1.18

Salem Street-Sentar Avenue 5-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-118	CatchBasin-121	CatchBasin-122	12.0	181.41	180.46	80.3	3.88	0.30
DrainPipe-119	CatchBasin-122	CatchBasin-123	12.0	180.46	179.23	53.7	5.39	1.43
DrainPipe-120	CatchBasin-123	CatchBasin-124	12.0	179.23	177.50	92.4	4.88	3.55
DrainPipe-122	MH-103	CatchBasin-124	4.0	178.00	177.90	43.4	0.09	0.01
DrainPipe-123	CatchBasin-124	CatchBasin-126	12.0	177.50	177.58	67.2	1.24	1.81
DrainPipe-125	CatchBasin-125	CatchBasin-124	15.0	178.01	177.70	37.7	5.89	4.59
DrainPipe-126	MH-37	CatchBasin-125	1.5	178.65	178.61	16.0	0.01	0.00
DrainPipe-127	CatchBasin-126	CatchBasin-130	12.0	177.58	177.76	97.7	1.52	1.82
DrainPipe-129	CB-78	DrainageMH-2	12.0	166.82	160.72	142.8	7.36	2.80
DrainPipe-133	CatchBasin-130	CatchBasin-131	12.0	178.06	176.66	64.4	5.24	3.10
DrainPipe-136	CatchBasin-132	CatchBasin-133	15.0	176.27	176.17	100.9	2.00	3.38
DrainPipe-137	MH-81	CatchBasin-133	12.0	179.00	178.37	29.7	5.17	0.00
DrainPipe-138	MH-72	CatchBasin-133	12.0	179.07	178.37	25.2	5.94	0.00
DrainPipe-437	MH-24	CatchBasin-86	12.0	165.30	165.25	12.8	2.28	0.05
DrainPipe-438	MH-20	CatchBasin-86	6.0	165.90	165.85	11.3	0.38	0.00
DrainPipe-439	MH-17	CatchBasin-89	12.0	163.50	163.37	10.4	4.00	0.00

Salem Street-Sentar Avenue 10-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	DrainageMH-2	O-4	12.0	158.52	157.52	48.4	5.12	11.60
CO-4	CatchBasin-133	CatchBasin-112	15.0	176.17	177.54	274.2	4.57	5.37
CO-6	CatchBasin-112	CatchBasin-113	15.0	177.54	177.11	32.0	7.48	8.01
CO-8	CatchBasin-113	CatchBasin-128	15.0	177.11	166.91	445.0	9.78	9.85
CO-10	CatchBasin-128	CatchBasin-89	15.0	166.91	162.91	204.9	9.03	8.86
CO-12	CatchBasin-124	CatchBasin-113	15.0	194.10	177.11	236.1	17.33	1.09
CO-16	CatchBasin-131	CatchBasin-132	15.0	176.66	176.27	19.0	9.24	3.21
CO-18	CatchBasin-108	CatchBasin-104	12.0	177.33	173.08	83.4	8.04	(N/A)
DrainPipe-76	CatchBasin-83	CatchBasin-82	6.0	166.46	165.94	19.9	0.91	1.15
DrainPipe-77	CatchBasin-82	CatchBasin-80	12.0	164.94	164.47	35.4	4.09	4.39
DrainPipe-78	MH-89	CatchBasin-82	12.0	165.59	165.66	34.5	1.60	0.00
DrainPipe-79	CatchBasin-81	CatchBasin-80	12.0	165.64	164.67	38.5	5.66	6.01
DrainPipe-80	CatchBasin-87	CatchBasin-80	6.0	165.60	165.07	99.3	0.41	0.48
DrainPipe-81	CatchBasin-80	CatchBasin-85	18.0	164.47	162.48	165.8	11.51	10.86
DrainPipe-82	CatchBasin-84	CatchBasin-81	12.0	166.10	165.74	47.1	3.12	5.18
DrainPipe-83	CatchBasin-106	CatchBasin-84	12.0	167.62	166.40	104.6	3.85	5.83
DrainPipe-84	CatchBasin-85	DrainageMH-2	18.0	162.38	159.52	272.2	10.77	12.33
DrainPipe-85	CatchBasin-86	CatchBasin-85	24.0	164.35	164.25	46.4	10.38	10.70
DrainPipe-86	MH-74	CatchBasin-87	6.0	165.55	165.48	26.2	0.29	0.02
DrainPipe-87	CatchBasin-88	DrainageMH-2	18.0	161.87	158.52	186.7	14.07	16.11
DrainPipe-88	CatchBasin-89	CatchBasin-88	15.0	162.91	163.01	28.4	3.92	14.59
DrainPipe-104	CatchBasin-104	CatchBasin-106	12.0	173.08	168.22	214.3	5.36	12.22
DrainPipe-105	CatchBasin-108	CS-1	12.0	177.53	176.44	35.1	6.27	6.45
DrainPipe-106	CatchBasin-109	CatchBasin-110	8.0	181.00	176.09	250.7	1.69	1.95
DrainPipe-107	CatchBasin-117	CatchBasin-109	8.0	183.15	181.79	264.1	0.87	1.34
DrainPipe-108	CatchBasin-110	CatchBasin-82	10.0	175.89	165.44	414.1	3.48	2.78
DrainPipe-109	CatchBasin-111	CatchBasin-112	6.0	178.79	177.74	61.8	0.73	0.92
DrainPipe-110	MH-50	CatchBasin-112	4.0	179.25	178.74	19.9	0.30	0.00
DrainPipe-111	MH-125	CatchBasin-112	8.0	178.00	177.84	62.3	0.61	0.20
DrainPipe-116	CatchBasin-116	CatchBasin-117	6.0	184.39	183.95	39.3	0.59	1.19
DrainPipe-117	CatchBasin-119	CatchBasin-117	8.0	184.27	183.95	33.8	1.17	1.23

Salem Street-Sentar Avenue 10-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-118	CatchBasin-121	CatchBasin-122	12.0	181.41	180.46	80.3	3.88	0.39
DrainPipe-119	CatchBasin-122	CatchBasin-123	12.0	180.46	179.23	53.7	5.39	1.88
DrainPipe-120	CatchBasin-123	CatchBasin-124	12.0	179.23	177.50	92.4	4.88	4.63
DrainPipe-122	MH-103	CatchBasin-124	4.0	178.00	177.90	43.4	0.09	0.00
DrainPipe-123	CatchBasin-124	CatchBasin-126	12.0	177.50	177.58	67.2	1.24	1.83
DrainPipe-125	CatchBasin-125	CatchBasin-124	15.0	178.01	177.70	37.7	5.89	5.42
DrainPipe-126	MH-37	CatchBasin-125	1.5	178.65	178.61	16.0	0.01	0.00
DrainPipe-127	CatchBasin-126	CatchBasin-130	12.0	177.58	177.76	97.7	1.52	1.84
DrainPipe-129	CB-78	DrainageMH-2	12.0	166.82	160.72	142.8	7.36	3.77
DrainPipe-133	CatchBasin-130	CatchBasin-131	12.0	178.06	176.66	64.4	5.24	3.04
DrainPipe-136	CatchBasin-132	CatchBasin-133	15.0	176.27	176.17	100.9	2.00	3.29
DrainPipe-137	MH-81	CatchBasin-133	12.0	179.00	178.37	29.7	5.17	0.00
DrainPipe-138	MH-72	CatchBasin-133	12.0	179.07	178.37	25.2	5.94	0.00
DrainPipe-437	MH-24	CatchBasin-86	12.0	165.30	165.25	12.8	2.28	0.04
DrainPipe-438	MH-20	CatchBasin-86	6.0	165.90	165.85	11.3	0.38	0.00
DrainPipe-439	MH-17	CatchBasin-89	12.0	163.50	163.37	10.4	4.00	0.00

Salem Street-Sentar Avenue 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	DrainageMH-2	O-4	12.0	158.52	157.52	48.4	5.12	11.33
CO-4	CatchBasin-133	CatchBasin-112	15.0	176.17	177.54	274.2	4.57	5.44
CO-6	CatchBasin-112	CatchBasin-113	15.0	177.54	177.11	32.0	7.48	8.04
CO-8	CatchBasin-113	CatchBasin-128	15.0	177.11	166.91	445.0	9.78	10.11
CO-10	CatchBasin-128	CatchBasin-89	15.0	166.91	162.91	204.9	9.03	8.80
CO-12	CatchBasin-124	CatchBasin-113	15.0	194.10	177.11	236.1	17.33	1.41
CO-16	CatchBasin-131	CatchBasin-132	15.0	176.66	176.27	19.0	9.24	3.07
CO-18	CatchBasin-108	CatchBasin-104	12.0	177.33	173.08	83.4	8.04	(N/A)
DrainPipe-76	CatchBasin-83	CatchBasin-82	6.0	166.46	165.94	19.9	0.91	1.18
DrainPipe-77	CatchBasin-82	CatchBasin-80	12.0	164.94	164.47	35.4	4.09	5.10
DrainPipe-78	MH-89	CatchBasin-82	12.0	165.59	165.66	34.5	1.60	0.02
DrainPipe-79	CatchBasin-81	CatchBasin-80	12.0	165.64	164.67	38.5	5.66	6.30
DrainPipe-80	CatchBasin-87	CatchBasin-80	6.0	165.60	165.07	99.3	0.41	0.47
DrainPipe-81	CatchBasin-80	CatchBasin-85	18.0	164.47	162.48	165.8	11.51	11.95
DrainPipe-82	CatchBasin-84	CatchBasin-81	12.0	166.10	165.74	47.1	3.12	5.29
DrainPipe-83	CatchBasin-106	CatchBasin-84	12.0	167.62	166.40	104.6	3.85	6.09
DrainPipe-84	CatchBasin-85	DrainageMH-2	18.0	162.38	159.52	272.2	10.77	12.48
DrainPipe-85	CatchBasin-86	CatchBasin-85	24.0	164.35	164.25	46.4	10.38	14.00
DrainPipe-86	MH-74	CatchBasin-87	6.0	165.55	165.48	26.2	0.29	0.03
DrainPipe-87	CatchBasin-88	DrainageMH-2	18.0	161.87	158.52	186.7	14.07	16.64
DrainPipe-88	CatchBasin-89	CatchBasin-88	15.0	162.91	163.01	28.4	3.92	14.87
DrainPipe-104	CatchBasin-104	CatchBasin-106	12.0	173.08	168.22	214.3	5.36	9.55
DrainPipe-105	CatchBasin-108	CS-1	12.0	177.53	176.44	35.1	6.27	7.21
DrainPipe-106	CatchBasin-109	CatchBasin-110	8.0	181.00	176.09	250.7	1.69	1.95
DrainPipe-107	CatchBasin-117	CatchBasin-109	8.0	183.15	181.79	264.1	0.87	1.34
DrainPipe-108	CatchBasin-110	CatchBasin-82	10.0	175.89	165.44	414.1	3.48	3.12
DrainPipe-109	CatchBasin-111	CatchBasin-112	6.0	178.79	177.74	61.8	0.73	1.08
DrainPipe-110	MH-50	CatchBasin-112	4.0	179.25	178.74	19.9	0.30	0.00
DrainPipe-111	MH-125	CatchBasin-112	8.0	178.00	177.84	62.3	0.61	0.18
DrainPipe-116	CatchBasin-116	CatchBasin-117	6.0	184.39	183.95	39.3	0.59	1.09
DrainPipe-117	CatchBasin-119	CatchBasin-117	8.0	184.27	183.95	33.8	1.17	1.31

Salem Street-Sentar Avenue 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-118	CatchBasin-121	CatchBasin-122	12.0	181.41	180.46	80.3	3.88	0.49
DrainPipe-119	CatchBasin-122	CatchBasin-123	12.0	180.46	179.23	53.7	5.39	2.46
DrainPipe-120	CatchBasin-123	CatchBasin-124	12.0	179.23	177.50	92.4	4.88	6.12
DrainPipe-122	MH-103	CatchBasin-124	4.0	178.00	177.90	43.4	0.09	0.01
DrainPipe-123	CatchBasin-124	CatchBasin-126	12.0	177.50	177.58	67.2	1.24	1.85
DrainPipe-125	CatchBasin-125	CatchBasin-124	15.0	178.01	177.70	37.7	5.89	6.20
DrainPipe-126	MH-37	CatchBasin-125	1.5	178.65	178.61	16.0	0.01	0.00
DrainPipe-127	CatchBasin-126	CatchBasin-130	12.0	177.58	177.76	97.7	1.52	1.85
DrainPipe-129	CB-78	DrainageMH-2	12.0	166.82	160.72	142.8	7.36	5.17
DrainPipe-133	CatchBasin-130	CatchBasin-131	12.0	178.06	176.66	64.4	5.24	2.93
DrainPipe-136	CatchBasin-132	CatchBasin-133	15.0	176.27	176.17	100.9	2.00	3.19
DrainPipe-137	MH-81	CatchBasin-133	12.0	179.00	178.37	29.7	5.17	0.00
DrainPipe-138	MH-72	CatchBasin-133	12.0	179.07	178.37	25.2	5.94	0.00
DrainPipe-437	MH-24	CatchBasin-86	12.0	165.30	165.25	12.8	2.28	0.05
DrainPipe-438	MH-20	CatchBasin-86	6.0	165.90	165.85	11.3	0.38	0.00
DrainPipe-439	MH-17	CatchBasin-89	12.0	163.50	163.37	10.4	4.00	0.00

Salem Street-Sentar Avenue 50-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	DrainageMH-2	O-4	12.0	158.52	157.52	48.4	5.12	11.36
CO-4	CatchBasin-133	CatchBasin-112	15.0	176.17	177.54	274.2	4.57	5.49
CO-6	CatchBasin-112	CatchBasin-113	15.0	177.54	177.11	32.0	7.48	7.85
CO-8	CatchBasin-113	CatchBasin-128	15.0	177.11	166.91	445.0	9.78	10.05
CO-10	CatchBasin-128	CatchBasin-89	15.0	166.91	162.91	204.9	9.03	8.85
CO-12	CatchBasin-124	CatchBasin-113	15.0	194.10	177.11	236.1	17.33	1.64
CO-16	CatchBasin-131	CatchBasin-132	15.0	176.66	176.27	19.0	9.24	3.03
CO-18	CatchBasin-108	CatchBasin-104	12.0	177.33	173.08	83.4	8.04	(N/A)
DrainPipe-76	CatchBasin-83	CatchBasin-82	6.0	166.46	165.94	19.9	0.91	1.21
DrainPipe-77	CatchBasin-82	CatchBasin-80	12.0	164.94	164.47	35.4	4.09	5.66
DrainPipe-78	MH-89	CatchBasin-82	12.0	165.59	165.66	34.5	1.60	0.03
DrainPipe-79	CatchBasin-81	CatchBasin-80	12.0	165.64	164.67	38.5	5.66	6.32
DrainPipe-80	CatchBasin-87	CatchBasin-80	6.0	165.60	165.07	99.3	0.41	0.47
DrainPipe-81	CatchBasin-80	CatchBasin-85	18.0	164.47	162.48	165.8	11.51	12.78
DrainPipe-82	CatchBasin-84	CatchBasin-81	12.0	166.10	165.74	47.1	3.12	5.20
DrainPipe-83	CatchBasin-106	CatchBasin-84	12.0	167.62	166.40	104.6	3.85	5.74
DrainPipe-84	CatchBasin-85	DrainageMH-2	18.0	162.38	159.52	272.2	10.77	12.54
DrainPipe-85	CatchBasin-86	CatchBasin-85	24.0	164.35	164.25	46.4	10.38	15.90
DrainPipe-86	MH-74	CatchBasin-87	6.0	165.55	165.48	26.2	0.29	0.02
DrainPipe-87	CatchBasin-88	DrainageMH-2	18.0	161.87	158.52	186.7	14.07	16.82
DrainPipe-88	CatchBasin-89	CatchBasin-88	15.0	162.91	163.01	28.4	3.92	15.05
DrainPipe-104	CatchBasin-104	CatchBasin-106	12.0	173.08	168.22	214.3	5.36	11.79
DrainPipe-105	CatchBasin-108	CS-1	12.0	177.53	176.44	35.1	6.27	7.33
DrainPipe-106	CatchBasin-109	CatchBasin-110	8.0	181.00	176.09	250.7	1.69	1.96
DrainPipe-107	CatchBasin-117	CatchBasin-109	8.0	183.15	181.79	264.1	0.87	1.34
DrainPipe-108	CatchBasin-110	CatchBasin-82	10.0	175.89	165.44	414.1	3.48	3.35
DrainPipe-109	CatchBasin-111	CatchBasin-112	6.0	178.79	177.74	61.8	0.73	1.08
DrainPipe-110	MH-50	CatchBasin-112	4.0	179.25	178.74	19.9	0.30	0.00
DrainPipe-111	MH-125	CatchBasin-112	8.0	178.00	177.84	62.3	0.61	0.01
DrainPipe-116	CatchBasin-116	CatchBasin-117	6.0	184.39	183.95	39.3	0.59	1.10
DrainPipe-117	CatchBasin-119	CatchBasin-117	8.0	184.27	183.95	33.8	1.17	1.35

Salem Street-Sentar Avenue 50-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-118	CatchBasin-121	CatchBasin-122	12.0	181.41	180.46	80.3	3.88	0.58
DrainPipe-119	CatchBasin-122	CatchBasin-123	12.0	180.46	179.23	53.7	5.39	2.96
DrainPipe-120	CatchBasin-123	CatchBasin-124	12.0	179.23	177.50	92.4	4.88	6.31
DrainPipe-122	MH-103	CatchBasin-124	4.0	178.00	177.90	43.4	0.09	0.00
DrainPipe-123	CatchBasin-124	CatchBasin-126	12.0	177.50	177.58	67.2	1.24	1.85
DrainPipe-125	CatchBasin-125	CatchBasin-124	15.0	178.01	177.70	37.7	5.89	6.68
DrainPipe-126	MH-37	CatchBasin-125	1.5	178.65	178.61	16.0	0.01	0.00
DrainPipe-127	CatchBasin-126	CatchBasin-130	12.0	177.58	177.76	97.7	1.52	1.86
DrainPipe-129	CB-78	DrainageMH-2	12.0	166.82	160.72	142.8	7.36	6.23
DrainPipe-133	CatchBasin-130	CatchBasin-131	12.0	178.06	176.66	64.4	5.24	2.89
DrainPipe-136	CatchBasin-132	CatchBasin-133	15.0	176.27	176.17	100.9	2.00	3.17
DrainPipe-137	MH-81	CatchBasin-133	12.0	179.00	178.37	29.7	5.17	0.00
DrainPipe-138	MH-72	CatchBasin-133	12.0	179.07	178.37	25.2	5.94	0.00
DrainPipe-437	MH-24	CatchBasin-86	12.0	165.30	165.25	12.8	2.28	0.04
DrainPipe-438	MH-20	CatchBasin-86	6.0	165.90	165.85	11.3	0.38	0.01
DrainPipe-439	MH-17	CatchBasin-89	12.0	163.50	163.37	10.4	4.00	0.00

Salem Street-Sentar Avenue Proposed Improvements 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	DrainageMH-2	O-4	48.0	157.00	153.00	48.4	0.00	72.18
CO-4	CatchBasin-133	CatchBasin-112	30.0	175.15	173.70	274.2	52.84	35.09
CO-6	CatchBasin-112	CatchBasin-113	30.0	173.60	173.43	32.0	37.65	39.68
CO-8	CatchBasin-113	CatchBasin-128	36.0	173.33	163.91	445.0	80.11	42.08
CO-10	CatchBasin-128	CatchBasin-89	48.0	163.91	159.91	204.9	200.70	46.77
CO-12	CatchBasin-124	CatchBasin-113	15.0	194.10	170.33	236.1	20.50	1.41
CO-16	CatchBasin-131	CatchBasin-132	30.0	175.98	175.88	19.0	168.12	26.96
CO-18	CatchBasin-108	CatchBasin-104	12.0	177.33	173.08	83.4	8.04	(N/A)
DrainPipe-76	CatchBasin-83	CatchBasin-82	6.0	166.46	165.94	19.9	0.91	1.18
DrainPipe-77	CatchBasin-82	CatchBasin-80	12.0	164.94	164.47	35.4	4.09	5.10
DrainPipe-78	MH-89	CatchBasin-82	12.0	165.59	165.66	34.5	1.60	0.02
DrainPipe-79	CatchBasin-81	CatchBasin-80	12.0	165.64	164.67	38.5	5.66	6.30
DrainPipe-80	CatchBasin-87	CatchBasin-80	6.0	165.60	165.07	99.3	0.41	0.47
DrainPipe-81	CatchBasin-80	CatchBasin-85	18.0	164.47	162.48	165.8	11.51	11.95
DrainPipe-82	CatchBasin-84	CatchBasin-81	12.0	166.10	165.74	47.1	3.12	5.29
DrainPipe-83	CatchBasin-106	CatchBasin-84	12.0	167.62	166.40	104.6	3.85	6.09
DrainPipe-84	CatchBasin-85	DrainageMH-2	18.0	162.38	159.52	272.2	10.77	18.15
DrainPipe-85	CatchBasin-86	CatchBasin-85	24.0	164.35	164.25	46.4	10.38	13.75
DrainPipe-86	MH-74	CatchBasin-87	6.0	165.55	165.48	26.2	0.29	0.03
DrainPipe-87	CatchBasin-88	DrainageMH-2	48.0	158.91	158.00	186.7	255.54	61.19
DrainPipe-88	CatchBasin-89	CatchBasin-88	48.0	159.91	159.85	28.4	66.03	61.01
DrainPipe-104	CatchBasin-104	CatchBasin-106	12.0	173.08	168.22	214.3	5.36	9.55
DrainPipe-105	CatchBasin-108	CS-1	12.0	177.53	176.44	35.1	6.27	7.21
DrainPipe-106	CatchBasin-109	CatchBasin-110	8.0	181.00	176.09	250.7	1.69	1.95
DrainPipe-107	CatchBasin-117	CatchBasin-109	8.0	183.15	181.79	264.1	0.87	1.34
DrainPipe-108	CatchBasin-110	CatchBasin-82	10.0	175.89	165.44	414.1	3.48	3.12
DrainPipe-109	CatchBasin-111	CatchBasin-112	6.0	178.79	177.74	61.8	0.73	1.08
DrainPipe-110	MH-50	CatchBasin-112	4.0	179.25	178.74	19.9	0.30	0.00
DrainPipe-111	MH-125	CatchBasin-112	8.0	178.00	177.84	62.3	0.61	0.00
DrainPipe-116	CatchBasin-116	CatchBasin-117	6.0	184.39	183.95	39.3	0.59	1.09
DrainPipe-117	CatchBasin-119	CatchBasin-117	8.0	184.27	183.95	33.8	1.17	1.31

Salem Street-Sentar Avenue Proposed Improvements 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
DrainPipe-118	CatchBasin-121	CatchBasin-122	12.0	181.41	180.46	80.3	3.88	0.49
DrainPipe-119	CatchBasin-122	CatchBasin-123	12.0	180.46	179.23	53.7	5.39	2.52
DrainPipe-120	CatchBasin-123	CatchBasin-124	24.0	179.23	177.50	92.4	30.98	6.11
DrainPipe-122	MH-103	CatchBasin-124	4.0	178.00	177.90	43.4	0.09	0.00
DrainPipe-123	CatchBasin-124	CatchBasin-126	24.0	177.50	177.58	67.2	7.87	15.93
DrainPipe-125	CatchBasin-125	CatchBasin-124	15.0	178.01	177.70	37.7	5.89	10.13
DrainPipe-126	MH-37	CatchBasin-125	1.5	178.65	178.61	16.0	0.01	0.00
DrainPipe-127	CatchBasin-126	CatchBasin-130	24.0	177.58	176.53	97.7	46.63	15.94
DrainPipe-129	CB-78	DrainageMH-2	12.0	166.82	160.72	142.8	7.36	5.17
DrainPipe-133	CatchBasin-130	CatchBasin-131	30.0	176.43	176.08	64.4	30.24	25.87
DrainPipe-136	CatchBasin-132	CatchBasin-133	30.0	175.78	175.25	100.9	29.73	27.37
DrainPipe-137	MH-81	CatchBasin-133	12.0	179.00	178.37	29.7	5.17	0.00
DrainPipe-138	MH-72	CatchBasin-133	12.0	179.07	178.37	25.2	5.94	0.00
DrainPipe-437	MH-24	CatchBasin-86	12.0	165.30	165.25	12.8	2.28	0.10
DrainPipe-438	MH-20	CatchBasin-86	6.0	165.90	165.85	11.3	0.38	0.01
DrainPipe-439	MH-17	CatchBasin-89	12.0	163.50	163.37	10.4	4.00	0.00

Tilden Street 2-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	MH-178	O-4	15.0	40.00	1.38	237.0	26.08	(N/A)
CO-4	CB-1	CatchBasin-138	15.0	69.30	66.00	132.0	10.21	(N/A)
DrainPipe-158	CB-137	CatchBasin-138	10.0	65.60	63.49	76.9	3.63	0.00
DrainPipe-159	CatchBasin-138	MH-178	15.0	63.49	40.00	53.8	42.68	12.55

Tilden Street 5-Year Storm Conduit Report

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	MH-178	O-4	15.0	40.00	1.38	237.0	26.08	(N/A)
CO-4	CB-1	CatchBasin-138	15.0	69.30	66.00	132.0	10.21	(N/A)
DrainPipe-158	CB-137	CatchBasin-138	10.0	65.60	63.49	76.9	3.63	(N/A)
DrainPipe-159	CatchBasin-138	MH-178	15.0	63.49	40.00	53.8	42.68	(N/A)

Tilden Street 10-Year Storm Conduit Report

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	MH-178	O-4	15.0	40.00	1.38	237.0	26.08	(N/A)
CO-4	CB-1	CatchBasin-138	15.0	69.30	66.00	132.0	10.21	(N/A)
DrainPipe-158	CB-137	CatchBasin-138	10.0	65.60	63.49	76.9	3.63	(N/A)
DrainPipe-159	CatchBasin-138	MH-178	15.0	63.49	40.00	53.8	42.68	(N/A)

Tilden Street 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	MH-178	O-4	15.0	40.00	1.38	237.0	26.08	35.46
CO-4	CB-1	CatchBasin-138	15.0	69.30	66.00	132.0	10.21	(N/A)
DrainPipe-158	CB-137	CatchBasin-138	10.0	65.60	63.49	76.9	3.63	0.54
DrainPipe-159	CatchBasin-138	MH-178	15.0	63.49	40.00	53.8	42.68	35.66

Tilden Street 50-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	MH-178	O-4	15.0	40.00	1.38	237.0	26.08	(N/A)
CO-4	CB-1	CatchBasin-138	15.0	69.30	66.00	132.0	10.21	(N/A)
DrainPipe-158	CB-137	CatchBasin-138	10.0	65.60	63.49	76.9	3.63	0.62
DrainPipe-159	CatchBasin-138	MH-178	15.0	63.49	40.00	53.8	42.68	42.39

Tilden Street Proposed Improvements 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	MH-178	O-4	15.0	40.00	1.38	237.0	26.08	16.03
CO-4	CB-1	CatchBasin-138	15.0	69.30	66.00	132.0	10.21	12.81
DrainPipe-158	CB-137	CatchBasin-138	10.0	65.60	63.49	76.9	3.63	0.54
DrainPipe-159	CatchBasin-138	MH-178	15.0	63.49	40.00	53.8	42.68	16.03

Valley Road 2-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	CB-2	CB-288	12.0	222.24	221.98	119.2	1.66	(N/A)
CO-4	CB-1	CB-2	6.0	223.07	222.24	33.5	0.88	(N/A)
DrainPipe-277	MH-146	O-4	12.0	221.00	220.00	260.0	2.21	4.57
DrainPipe-278	CB-292	CB-291	12.0	224.00	223.90	46.2	1.66	0.11
DrainPipe-279	CB-291	CB-290	12.0	223.90	222.02	107.2	4.72	1.38
DrainPipe-280	CB-289	CB-288	12.0	221.99	221.98	34.9	0.60	5.38
DrainPipe-281	CB-290	CB-289	12.0	222.02	221.99	97.7	0.60	0.66
DrainPipe-282	CB-288	MH-146	12.0	221.98	221.00	230.0	2.33	5.42

Valley Road 5-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	CB-2	CB-288	12.0	222.24	221.98	119.2	1.66	1.87
CO-4	CB-1	CB-2	6.0	223.07	222.24	33.5	0.88	1.86
DrainPipe-277	MH-146	O-4	12.0	221.00	220.00	260.0	2.21	3.68
DrainPipe-278	CB-292	CB-291	12.0	224.00	223.90	46.2	1.66	0.21
DrainPipe-279	CB-291	CB-290	12.0	223.90	222.02	107.2	4.72	3.44
DrainPipe-280	CB-289	CB-288	12.0	221.99	221.98	34.9	0.60	2.78
DrainPipe-281	CB-290	CB-289	12.0	222.02	221.99	97.7	0.60	2.26
DrainPipe-282	CB-288	MH-146	12.0	221.98	221.00	230.0	2.33	3.72

Valley Road 10-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	CB-2	CB-288	12.0	222.24	221.98	119.2	1.66	1.73
CO-4	CB-1	CB-2	6.0	223.07	222.24	33.5	0.88	1.67
DrainPipe-277	MH-146	O-4	12.0	221.00	220.00	260.0	2.21	3.61
DrainPipe-278	CB-292	CB-291	12.0	224.00	223.90	46.2	1.66	0.34
DrainPipe-279	CB-291	CB-290	12.0	223.90	222.02	107.2	4.72	4.64
DrainPipe-280	CB-289	CB-288	12.0	221.99	221.98	34.9	0.60	2.89
DrainPipe-281	CB-290	CB-289	12.0	222.02	221.99	97.7	0.60	2.30
DrainPipe-282	CB-288	MH-146	12.0	221.98	221.00	230.0	2.33	3.61

Valley Road 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	CB-2	CB-288	12.0	222.24	221.98	119.2	1.66	(N/A)
CO-4	CB-1	CB-2	6.0	223.07	222.24	33.5	0.88	(N/A)
DrainPipe-277	MH-146	O-4	12.0	221.00	220.00	260.0	2.21	4.12
DrainPipe-278	CB-292	CB-291	12.0	224.00	223.90	46.2	1.66	0.48
DrainPipe-279	CB-291	CB-290	12.0	223.90	222.02	107.2	4.72	4.65
DrainPipe-280	CB-289	CB-288	12.0	221.99	221.98	34.9	0.60	5.56
DrainPipe-281	CB-290	CB-289	12.0	222.02	221.99	97.7	0.60	0.96
DrainPipe-282	CB-288	MH-146	12.0	221.98	221.00	230.0	2.33	4.12

Valley Road 50-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	CB-2	CB-288	12.0	222.24	221.98	119.2	1.66	1.90
CO-4	CB-1	CB-2	6.0	223.07	222.24	33.5	0.88	1.66
DrainPipe-277	MH-146	O-4	12.0	221.00	220.00	260.0	2.21	3.71
DrainPipe-278	CB-292	CB-291	12.0	224.00	223.90	46.2	1.66	0.55
DrainPipe-279	CB-291	CB-290	12.0	223.90	222.02	107.2	4.72	4.88
DrainPipe-280	CB-289	CB-288	12.0	221.99	221.98	34.9	0.60	3.18
DrainPipe-281	CB-290	CB-289	12.0	222.02	221.99	97.7	0.60	2.30
DrainPipe-282	CB-288	MH-146	12.0	221.98	221.00	230.0	2.33	3.77

Valley Road Proposed Improvements 25-Year Storm Conduit Report

Current Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Invert (Start) (ft)	Invert (Stop) (ft)	Length (Unified) (ft)	Capacity (Full Flow) (cfs)	Flow (Maximum) (cfs)
CO-2	CB-2	CB-288	30.0	222.24	221.98	119.2	24.90	23.36
CO-4	CB-1	CB-2	30.0	223.07	222.24	33.5	64.56	23.28
DrainPipe-277	MH-146	O-4	30.0	221.00	220.00	260.0	25.44	30.32
DrainPipe-278	CB-292	CB-291	12.0	224.00	223.90	46.2	1.66	0.53
DrainPipe-279	CB-291	CB-290	24.0	223.90	222.02	107.2	29.96	8.47
DrainPipe-280	CB-289	CB-288	30.0	221.99	221.98	34.9	6.94	10.86
DrainPipe-281	CB-290	CB-289	30.0	222.02	221.99	97.7	7.19	9.29
DrainPipe-282	CB-288	MH-146	30.0	221.98	221.00	230.0	26.77	30.34

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APPENDIX F

OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

Subwatershed:		Outfall ID:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours: Last 48 hours:		
Latitutde:	Longitude:	GPS Unit:	GPS LMK #:
Camera:		Photo #s:	

Land Use in Drainage Area (Check all that apply):

☐ Industrial ☐ Open Space

☐ Ultra-Urban Residential ☐ Institutional

☐ Suburban Residential Other: _____

☐ Commercial Known Industries: _____

Notes (e.g.., origin of outfall, if known):

Section 2: Outfall Description

LOCATION	MATERIAL	SHAPE		DIMENSIONS (IN.)	SUBMERGED
☐ **Closed Pipe**	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: _____	☐ Circular ☐ Eliptical ☐ Box ☐ Other: _____	☐ Single ☐ Double ☐ Triple ☐ Other: _____	Diameter/Dimensions: _____	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully
☐ **Open drainage**	☐ Concrete ☐ Earthen ☐ rip-rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____		Depth: _____ Top Width: _____ Bottom Width: _____	
☐ **In-Stream**	**(applicable when collecting samples)**				
Flow Present?	☐ Yes ☐ No	***If No, Skip to Section 5***			
Flow Description (If present)	☐ Trickle ☐ Moderate ☐ Substantial				

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS				
PARAMETER		**RESULT**	**UNIT**	**EQUIPMENT**
☐Flow #1	Volume		Liter	Bottle
	Time to fill		Sec	
☐Flow #2	Flow depth		In	Tape measure
	Flow width	_____' _____"	Ft, In	Tape measure
	Measured length	_____' _____"	Ft, In	Tape measure
	Time of travel		S	Stop watch
Temperature			°F	Thermometer
pH			pH Units	Test strip/Probe
Ammonia			mg/L	Test strip

Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Overall Outfall Characterization

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Data Collection

1. Sample for the lab?	☐ Yes	☐ No	
2. If yes, collected from:	☐ Flow	☐ Pool	
3. Intermittent flow trap set?	☐ Yes	☐ No	If Yes, type: ☐ OBM ☐ Caulk dam

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

New York State

Stormwater Management Design Manual

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Andrew M. Cuomo, Governor **Joseph Martens, Commissioner**

-

Table 5.7 Green Infrastructure Techniques for Runoff Reduction	
Practice	**Description**
Conservation of Natural Areas	Retain the pre-development hydrologic and water quality characteristics of undisturbed natural areas, stream and wetland buffers by restoring and/or permanently conserving these areas on a site.
Sheetflow to Riparian Buffers or Filter Strips	Undisturbed natural areas such as forested conservation areas and stream buffers or vegetated filter strips and riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.
Vegetated Swale	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.
Tree Planting / Tree Pit	Plant or conserve trees to reduce stormwater runoff, increase nutrient uptake, and provide bank stabilization. Trees can be used for applications such as landscaping, stormwater management practice areas, conservation areas and erosion and sediment control.
Disconnection of Rooftop Runoff	Direct runoff from residential rooftop areas and upland overland runoff flow to designated pervious areas to reduce runoff volumes and rates.
Stream Daylighting	Stream Daylight previously-culverted/piped streams to restore natural habitats, better attenuate runoff by increasing the storage size, promoting infiltration, and help reduce pollutant loads.
Rain Gardens	Manage and treat small volumes of stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression.
Green Roofs	Capture runoff by a layer of vegetation and soil installed on top of a conventional flat or sloped roof. The rooftop vegetation allows evaporation and evapotranspiration processes to reduce volume and discharge rate of runoff entering conveyance system.
Stormwater Planters	Small landscaped stormwater treatment devices that can be designed as infiltration or filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality.
Rain Barrels and /Cisterns	Capture and store stormwater runoff to be used for irrigation systems or filtered and reused for non-contact activities.
Porous Pavement	Pervious types of pavements that provide an alternative to conventional paved surfaces, designed to infiltrate rainfall through the surface, thereby reducing stormwater runoff from a site and providing some pollutant uptake in the underlying soils. When designed in accordance with the design elements in section 5.3.11, the WQv for the contributing drainage area is applied towards the runoff reduction

Stormwater Ponds

Description: Constructed stormwater retention basin that has a permanent pool (or micropool). Runoff from each rain event is detained and treated in the pool through settling and biological uptake mechanisms.

Design Options: Micropool Extended Detention (P-1), Wet Pond (P-2), Wet Extended Detention (P-3), Multiple Pond (P-4), Pocket Pond (P-5)

KEY CONSIDERATIONS

FEASIBILITY

- Contributing drainage area greater than 10 acres for P-1, 25 acres for P-2 to P-4.
- Follow DEC Guidelines for Design of Dams.
- Provide a minimum 2' separation from the groundwater in sole source aquifers.
- Do not locate ponds in jurisdictional wetlands.
- Avoid directing hotspot runoff to design P-5.

CONVEYANCE

- Forebay at each inlet, unless the inlet contributes less than 10% of the total inflow, 4' to 6' deep.
- Stabilize the channel below the pond to prevent erosion.
- Stilling basin at the outlet to reduce velocities.

PREATREATMENT

- Forebay volume at least 10% of the WQ_v
- Forebay shall be designed with non-erosive outlet conditions.
- Provide direct access to the forebay for maintenance equipment
- In sole source aquifers, provide 100% pretreatment for hotspot runoff.

TREATMENT

- Provide the water quality volume in a combination of permanent pool and extended detention (Table 6.1 in manual provides limitations on storage breakdown)
- Minimum length to width ratio of 1.5:1
- Minimum surface area to drainage area ratio of 1:100

LANDSCAPING

STORMWATER MANAGEMENT SUITABILITY

X	Water Quality
X	Channel Protection
X	Overbank Flood Protection
X	Extreme Flood Protection

Accepts Hotspot Runoff: *Yes*

(2 feet minimum separation distance required to water table)

FEASIBILITY CONSIDERATIONS

L	Cost
L	Maintenance Burden

Key: L=Low **M**=Moderate **H**=High

Residential Subdivision Use: Yes

High Density/Ultra-Urban: *No*

Soils: *Hydrologic group 'A' soils may require pond liner*

Hydrologic group 'D' soils may have compaction constraints

Other Considerations:

- *Thermal effects*

- Provide a minimum 10’ and preferably 15’ safety bench extending from the high water mark, with a maximum slope of 6%.
- Provide an aquatic bench extending 15 feet outward from the shoreline, and a maximum depth of 18" below normal water elevation.
- Develop a landscaping plan.
- Provide a 25’pond buffer.
- No woody vegetation within 15 feet of the toe of the embankment, or 25 feet from the principal spillway.

MAINTENANCE REQUIREMENTS

- Legally binding maintenance agreement
- Sediment removal from forebay every five to six years or when 50% full.
- Provide a maintenance easement and right-of-way.
- Removable trash rack on the principal spillway.
- Non-clogging low flow orifice
- Riser in the embankment.
- Pond drain required, capable of drawing down the pond in 24 hours.
- Notification required for pond drainage.
- Provide an adjustable gate valve on both the WQ_v-ED pipe, and the pond drain.
- Side Slopes less than 3:1, and terminate at a safety bench.
- Principal spillway shall not permit access by small children, and endwalls above pipes greater than 48” in diameter shall be fenced.

- *Outlet clogging*
- *Safety bench*

POLLUTANT REMOVAL

G	Phosphorus
G	Nitrogen
G	Metals - Cadmium, Copper,Lead, and Zinc removal
G	Pathogens Coliform, E.Coli, Streptococci removal

Key: G=Good **F**=Fair **P**=Poor

Infiltration Practices

Description: Excavated trench or basin used to capture and allow infiltration of stormwater runoff into the surrounding soils from the bottom and sides of the basin or trench.

Design Options: Infiltration Trench (I-1), Shallow Infiltration Basin (I-2), Dry Well (I-3)

KEY CONSIDERATIONS

FEASIBILITY

- Minimum soil infiltration rate of 0.5 inches per hour
- Soils less than 20% clay, and 40% silt/clay, and no fill soils.
- Natural slope less than 15%
- Cannot accept hotspot runoff, except under the conditions outlined in Section 6.3.1.
- Separation from groundwater table of at least three feet (four feet in sole source aquifers).
- 25' separation from structures for I-1 and I-2; 10' for I-3.

CONVEYANCE

- Flows exiting the practice must be non-erosive (3.5 to 5.0 fps)
- Maximum dewatering time of 48 hours.
- Design off-line if stormwater is conveyed to the practice by a storm drain pipe.

PRETREATMENT

- Pretreatment of 25% of the WQv at all sites.
- 50% pretreatment if fc >2.0 inches/hour.
- 100% pretreatment in areas with fc >5.0 inches/hour.
- Exit velocities from pretreatment must be non-erosive for the 2-year storm.

TREATMENT

- Water quality volume designed to exfiltrate through the floor of the practice.
- Construction sequence to maximize practice life.

STORMWATER MANAGEMENT SUITABILITY

[X] Water Quality
[X] Channel Protection
[ ] Overbank Flood Protection
[ ] Extreme Flood Protection

Accepts Hotspot Runoff: *No*

IMPLEMENTATION CONSIDERATIONS

[H] Capital Cost
[H] Maintenance Burden

Residential
Subdivision Use: Yes

High Density/Ultra-Urban: *Yes*

Drainage Area: *10 acres max.*

Soils: *Pervious soils required (0.5 in/hr or greater)*

Other Considerations:

- *Must not be placed under pavement or concrete*

• Trench depth shall be less than four feet (I-2 and I-3). • Follow the methodologies in Chapter 6 to size practices. LANDSCAPING • Upstream area shall be completely stabilized before flow is directed to the practice. MAINTENANCE REQUIREMENTS • Never serves as a sediment control device • Observation well shall be installed in every trench, (6" PVC pipe, with a lockable cap) • Provide direct maintenance access.	Key: **L**=Low **M**=Moderate **H**=High **POLLUTANT REMOVAL** **G** Phosphorus **G** Nitrogen **G** Metals - Cadmium, Copper, Lead, and Zinc removal **G** Pathogens - Coliform, Streptococci, E.Coli removal **Key: G**=Good **F**=Fair **P**=Poor

Bioretetion Areas (F-5)

Description: Shallow stormwater basin or landscaped area which utilizes engineered soils and vegetation to capture and treat runoff. The practice is often located in parking lot islands, and can also be used to treat residential areas.

KEY CONSIDERATIONS

CONVEYANCE

- Provide overflow for the 10-year storm to the conveyance system.
- Conveyance to the system is typically overland flow delivered to the surface of the system, typically through curb cuts or over a concrete lip.

PRETREATMENT

- Pretreatment consists of a grass channel or grass filter strip, a gravel diaphragm, and a mulch layer, sized based on the methodologies described in Section 6.4.2.

TREATMENT

- Treatment area should have a four foot deep planting soil bed, a surface mulch layer, and a 6" ponding layer.
- Size the treatment area using equations provided in Chapter 6.

LANDSCAPING

- Detailed landscaping plan required.

MAINTENANCE

- Inspect and repair/replace treatment area components
- Stone drop (at least 6") provided at the inlet
- Remulch annually

STORMWATER MANAGEMENT SUITABILITY

- [X] Water Quality
- [ ] Channel Protection
- [ ] Overbank Flood Protection
- [ ] Extreme Flood Protection

Accepts Hotspot Runoff: *Yes*
(requires impermeable liner)

IMPLEMENTATION CONSIDERATIONS

- [M] Capital Cost
- [M] Maintenance Burden

Residential
Subdivision Use: *Yes*

High Density/Ultra-Urban: *Yes*

Drainage Area: *5 acres max.*

Soils: *Planting soils must meet specified criteria; No restrictions on surrounding soils*

Other Considerations:

- *Use of native plants is recommended*

	Key: L=Low **M**=Medium **H**=High **POLLUTANT REMOVAL** **G** Phosphorus **G** Nitrogen **G** Metals - Cadmium, Copper, Lead, and Zinc removal **F** Pathogens – Coliform, Streptococci, E.Coli removal **Key**: **G**=Good **F**=Fair **P**=Poor

Open Channels

Description: Vegetated channels that are explicitly designed and constructed to capture and treat stormwater runoff within dry or wet cells formed by check dams or other means.

Design Options: Dry Swale (O-1), Wet Swale (O-2)

KEY CONSIDERATIONS

FEASIBILITY

- Maximum longitudinal slope of 4%

CONVEYANCE

- Non-erosive (3.5 to 5.0 fps) peak velocity for the 2-year storm
- Safe conveyance of the ten-year storm with a minimum of 6 inches of freeboard.
- Side slopes gentler than 2:1 (3:1 preferred).
- The maximum allowable temporary ponding time of 48 hours

PRETREATMENT

- 10% of the WQ_v in pretreatment, usually provided using check dams at culverts or driveway crossings.

TREATMENT

- Temporary storage the WQ_v within the facility to be released over a minimum 30 minute duration.
- Bottom width no greater than 8 feet, but no less than two feet.
- Soil media as detailed in Appendix H.

MAINTENANCE

- Removal of sediment build-up within the bottom of the channel or filter strip when 25% of the original WQ_v volume has been exceeded.
- Maintain a grass height of 4" to 6" in dry swales.

STORMWATER MANAGEMENT SUITABILITY

- [X] Water Quality
- [ ] Channel Protection
- [ ] Overbank Flood Protection
- [ ] Extreme Flood Protection

Accepts Hotspot Runoff: *Yes*
(requires impermeable liner)

IMPLEMENTATION CONSIDERATIONS

- [L] Capital Cost
- [L] Maintenance Burden

Residential

Subdivision Use: *Yes*

High Density/Ultra-Urban: *No*

Drainage Area: *5 acres max.*

Soils: *No restrictions*

Other Considerations:

- *Permeable soil layer (dry swale)*
- *Wetland plants (wet swale)*

Key: **H**=High **M**=Medium **L**=Low

POLLUTANT REMOVAL

- [G] Phosphorus

Chapter 7: SMP Selection

This chapter presents a series of matrices that can be used as a screening process to select the best SMP or group of SMPs for a development site. It also provides guidance for best locating practices on the site. The matrices presented can be used to screen practices in a step-wise fashion. The screening factors include:

1. Land Use
2. Physical Feasibility
3. Watershed/ Regional Factors
4. Stormwater Management Capability
5. Community and Environmental Factors

The five matrices presented here are not exhaustive. Specific additional criteria may be incorporated depending on local design knowledge and resource protection goals. Furthermore, many communities may wish to eliminate some of the selection factors presented in this section. Caveats for the application of each matrix are included in the detailed description of each.

More detail on the proposed step-wise screening process is provided below:

Step 1 Land Use
Which practices are best suited for the proposed land use at this site? In this step, the designer makes an initial screen to select practices that are best suited to a particular land use.

Step 2 Physical Feasibility Factors
Are there any physical constraints at the project site that may restrict or preclude the use of a particular SMP? In this step, the designer screens the SMP list using Matrix No. 2 to determine if the soils, water table, drainage area, slope or head conditions present at a particular development site might limit the use of a SMP.

Step 3 Watershed Factors
What watershed protection goals need to be met in the resource my site drains to? Matrix No.3 outlines SMP goals and restrictions based on the resource being protected.

Step 4 Stormwater Management Capability
Can one SMP meet all design criteria, or is a combination of practices needed? In this step, designers can screen the SMP list using Matrix No. 4 to determine if a particular SMP can meet water quality, channel protection, and flood control storage requirements. At the end of this step, the designer can screen the SMP options down to a manageable number and determine if a single SMP or a group of SMPs is needed to meet stormwater sizing criteria at the site.

Step 5 Community and Environmental Factors
Do the remaining SMPs have any important community or environmental benefits or drawbacks that might influence the selection process? In this step, a matrix is used to compare the SMP options with regard to cold climate restrictions, maintenance, habitat, community acceptance, cost and other environmental factors.

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