Phase I Village-wide Flood Study for the Village of Hastings-on-Hudson Flood Study

December 2023

Prepared by
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Presented by
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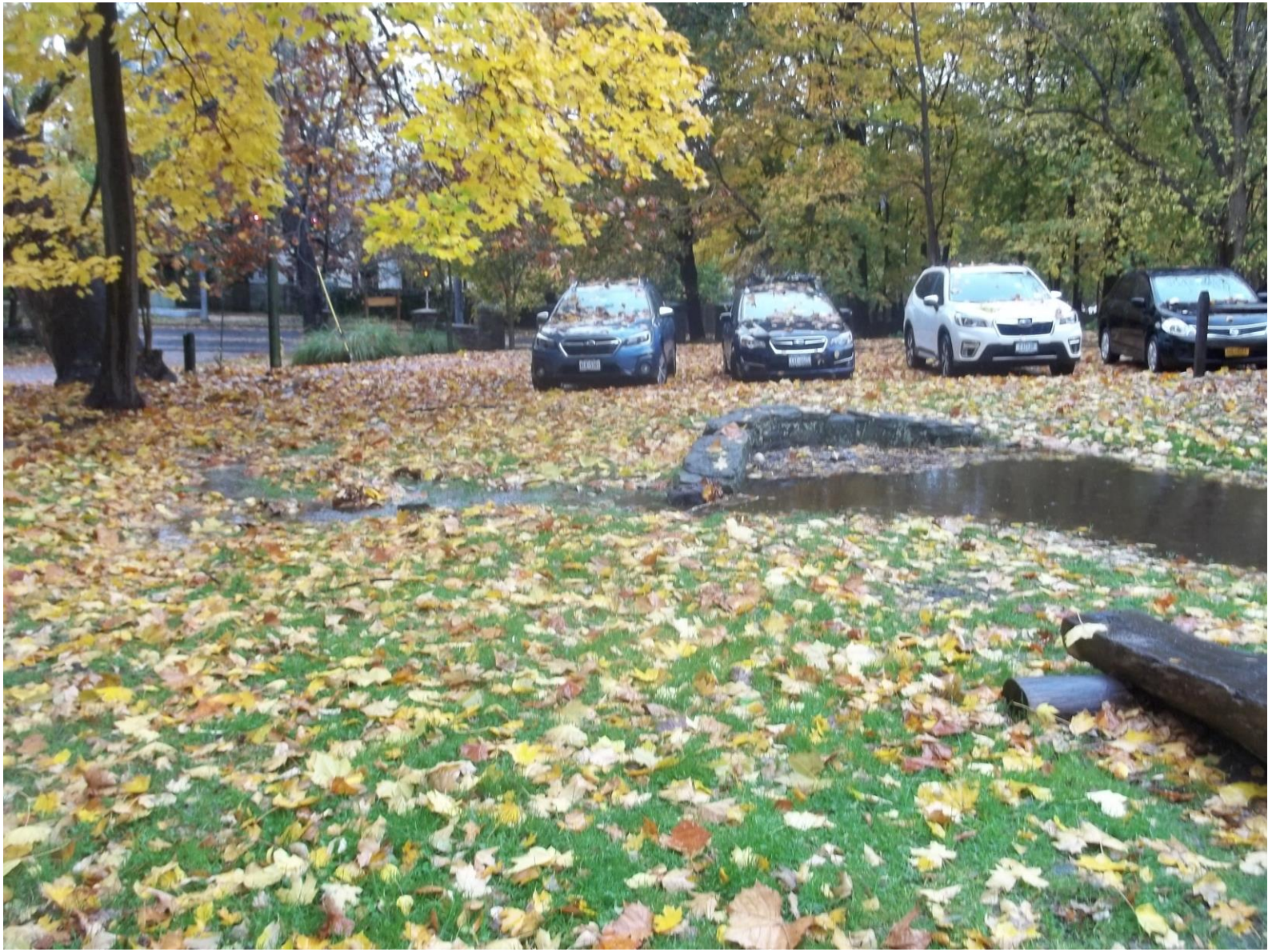

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METHODOLOGY

- Phase I
  - Compile available information to identify drainage infrastructure and hydrology
  - Prepare long-term plan to alleviate flooding
- Phase II
  - Fieldwork
- Phase III
  - Detailed analysis
- Phase IV
  - Final design and construction

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OBJECTIVES (Phase I):

- Prepare a preliminary watershed map to outline drainage areas and flow paths
- Identify problematic flooding areas throughout the Village
  - Develop an initial list of drainage projects and flood locations
  - Develop conceptual plans and preliminary costs for major flood-prone areas
- Develop long-term strategy to alleviate flooding Village-wide
  - Determine information necessary to model each watershed using the most up-to-date computer technology.

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- RESOURCES UTILIZED FOR PHASE I
  - Westchester County GIS topography
  - National Resources Conservation Service (NRCS) Soil Survey
  - Aerial imagery
  - Village Stormwater Sewer and Surface Drainage 1934 map
  - Village personnel
  - Field inspections

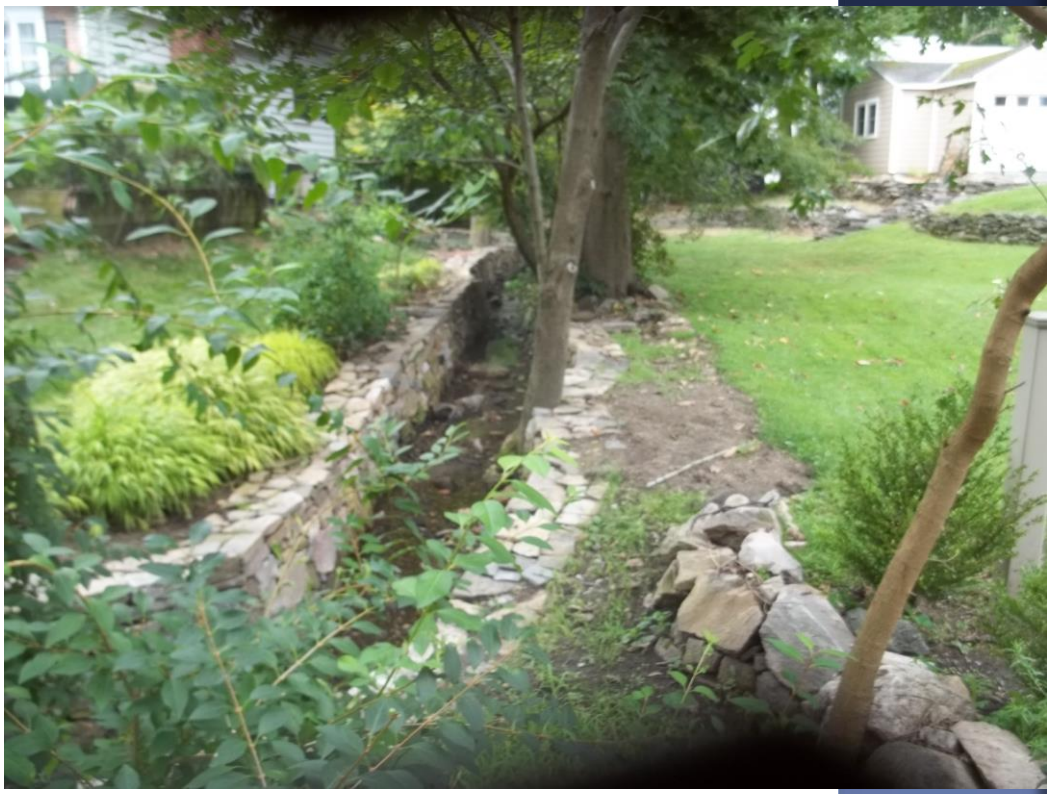
- LIMITED OR UNAVAILABLE INFORMATION
  - Drainage infrastructure mapping
    - Culvert sizes, elevations, conditions
    - Channel/brook profile and sections
  - Property ownership (public/private)
  - Utility crossings

WATERCOURSES

- Shecklers Brook
  - Billie Burke Brook (tributary)
- Boutilliers Brook
- Rowleys Brook
- Zinsser Brook

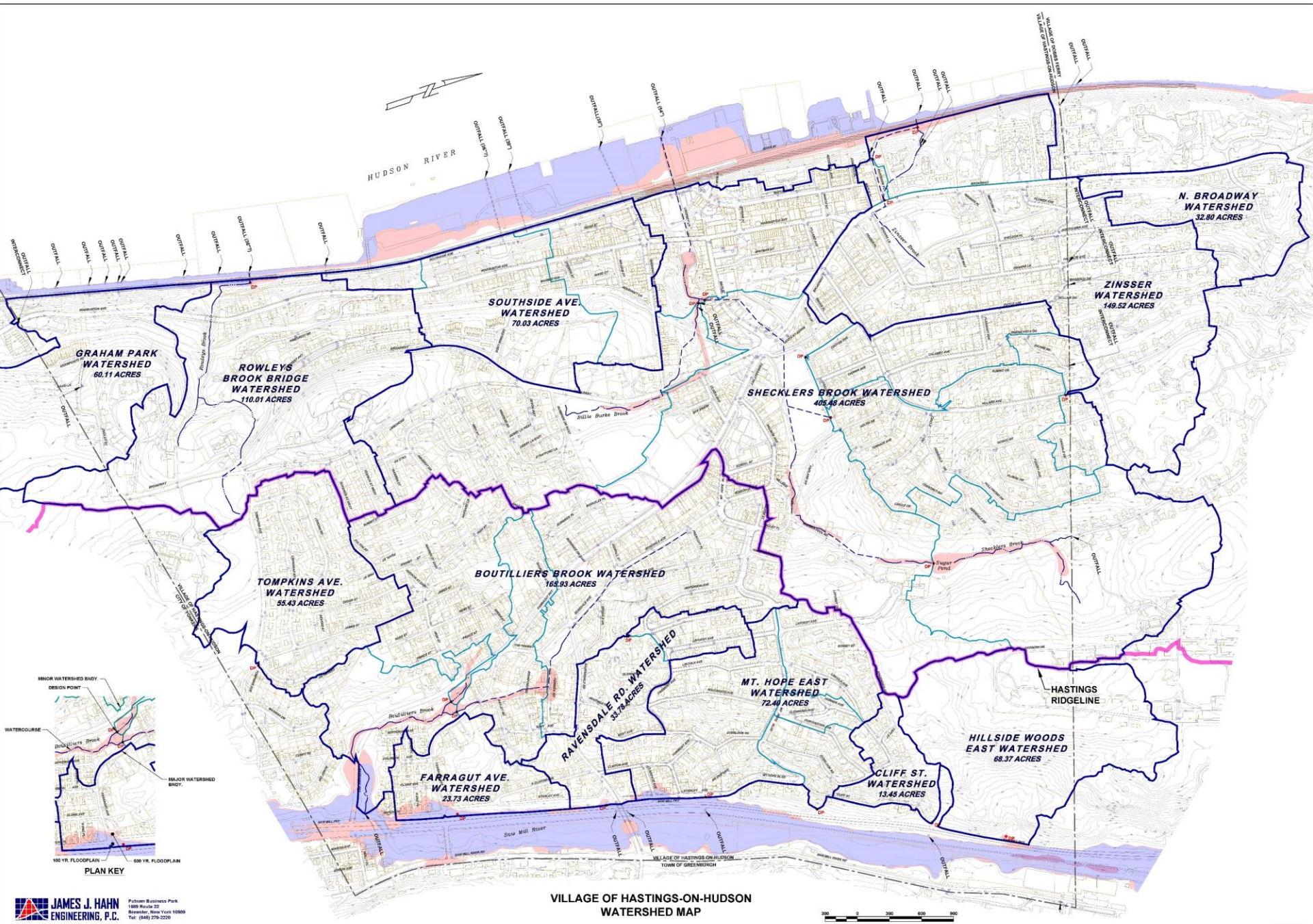
Also

- Hudson River
- Saw Mill River



WATERSHEDS

- Shecklers Brook Watershed (406 ac)
  - Billie Burke Brook Watershed(tributary)
- Boutilliers Brook Watershed (166 ac)
- Zinsser Brook Watershed (150 ac)
  - N. Broadway Watershed (+32.8 ac)
- Rowleys Brook Watershed (110 ac)
- Mt.Hope East Watershed (72 ac)
- Southside Avenue Watershed (70ac)
- Hillside Woods East Watershed (68 ac)
- Graham Park Watershed (60 ac)
- Tompkins Avenue Watershed (55 ac)
- Ravensdale Watershed (34 ac)
- Farragut Avenue Watershed (24 ac)
- Cliff Street Watershed (13 ac)



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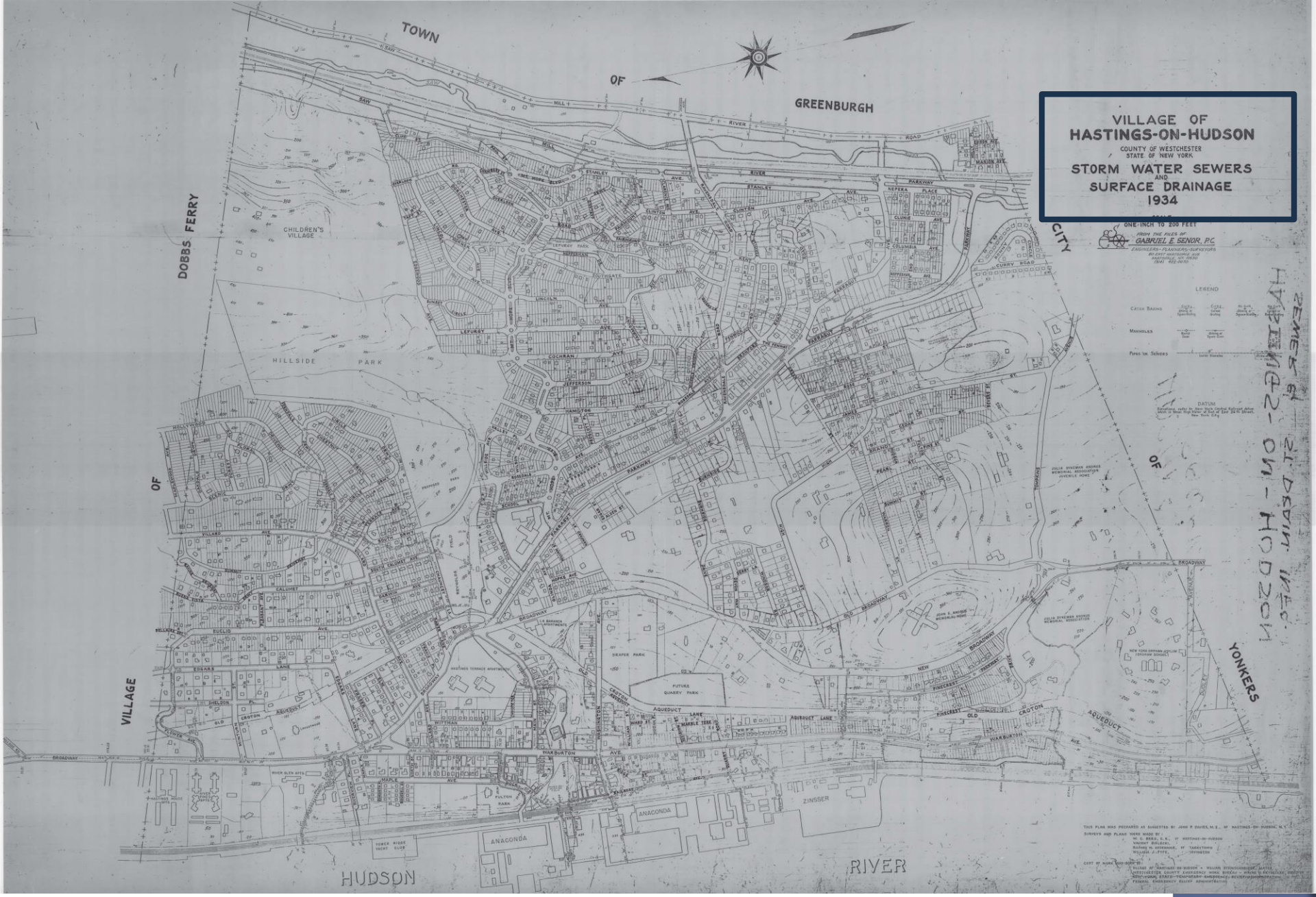
VILLAGE OF HASTINGS-ON-HUDSON WATERSHED MAP

Scale 1" = 300'

DATE: 12/10/23



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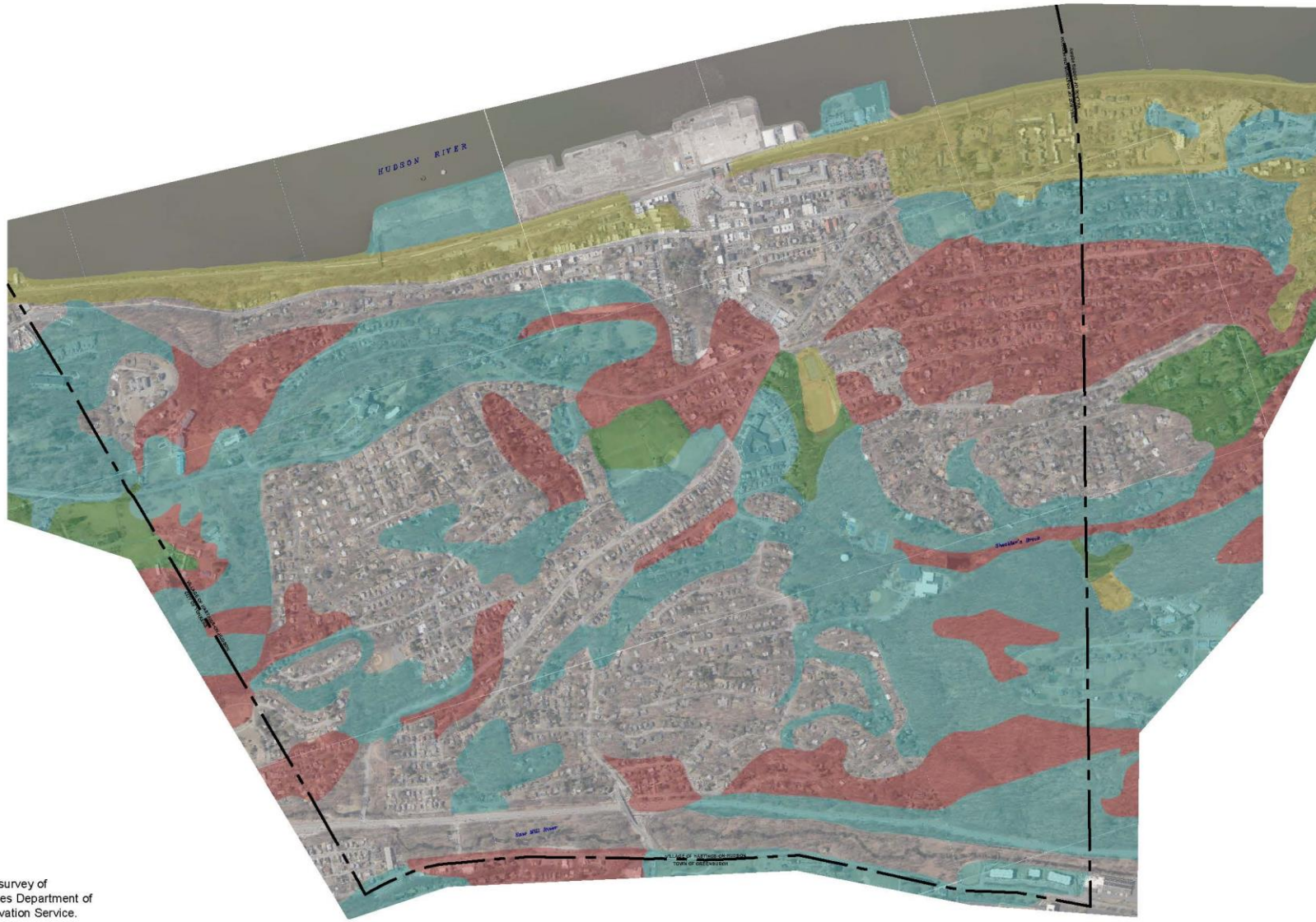

LEGEND

- GROUP A SOIL
- GROUP B SOIL
- GROUP C SOIL
- GROUP D SOIL
- URBAN LAND

NOTE:
Soil classifications are based on a soil survey of Westchester County by the United States Department of Agriculture, Natural Resources Conservation Service.

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VILLAGE OF HASTINGS-ON-HUDSON
SOILS MAP

DATE: 8/31/23

1000 0 1000 2000

Scale 1" = 1000'

Drainage design information

Storm Criteria:

Amount of rainfall expected to fall in a period of time; 24 hours is typically used for design in NYS.

- **10-Year has a 10% chance of occurring**
- **25-Year has a 4% chance of occurring**
- **50-Year has a 2% chance of occurring**
- **100-Year has a 1% chance of occurring**

STORM EVENT (24Hr)	RAINFALL DEPTH (INCHES)
1-Year	2.8
2-Year	3.5
5-Year	4.5
10-Year	5.0
25-Year	6.5
50-Year	7.5
100-Year	9.0

Rainfall December 17th/18th	
Buchanan	4.1" (~5-Year)
Westchester Airport	2.9" (+1-Year)
Westchester Airport 6-Hour storm	2.12" (~2-Year)

TROPICAL STORM IDA

September 1st-2nd 2021

Recorded rainfall depth in 24 hours

Scarsdale - 8.09 inches

New Rochelle - 7.79 inches

Tarrytown - 6.97 inches

Ossining - 6.48 inches

White Plains - 6.16 inches

Scarsdale was the closest location to Hastings. Based on that rainfall depth Hastings was subject to a storm event between the 50- and 100-year storm event.

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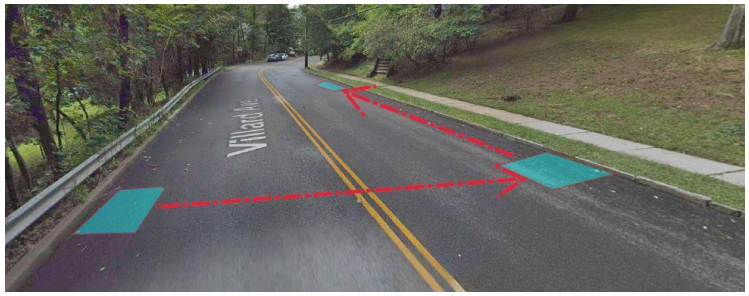
Drainage design information



"Drainage pipe" parallel with Minor/Major roadways

10-Year, 25-Year

"Culvert" perpendicular to Minor/Major roadways

50-Year, 100-Year

"Culvert" perpendicular to Major obstacle

100-Year, 500-Year

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Evaluation approach per watershed

- Model watercourse and channels/culverts in flood model. MUST HAVE SURVEY OF WATERCOURSES.
- Run model with various storm events. Select design storm for channel/culvert section.
- Identify undersized sections (compare with known flood locations).
- Determine channel/culvert sizes to pass design storm event.
- Replace sections starting from lowest point to avoid exacerbating downstream flooding.

Evaluation approach: replacing upstream flood condition before downstream.

- Must avoid exacerbating downstream condition.
- Using larger upstream channel section, run model with existing downstream channels.
- No impact; replace section.
- Negative impact; consider alternatives or replace downstream sections first.

Consider performing a cost-benefit analysis

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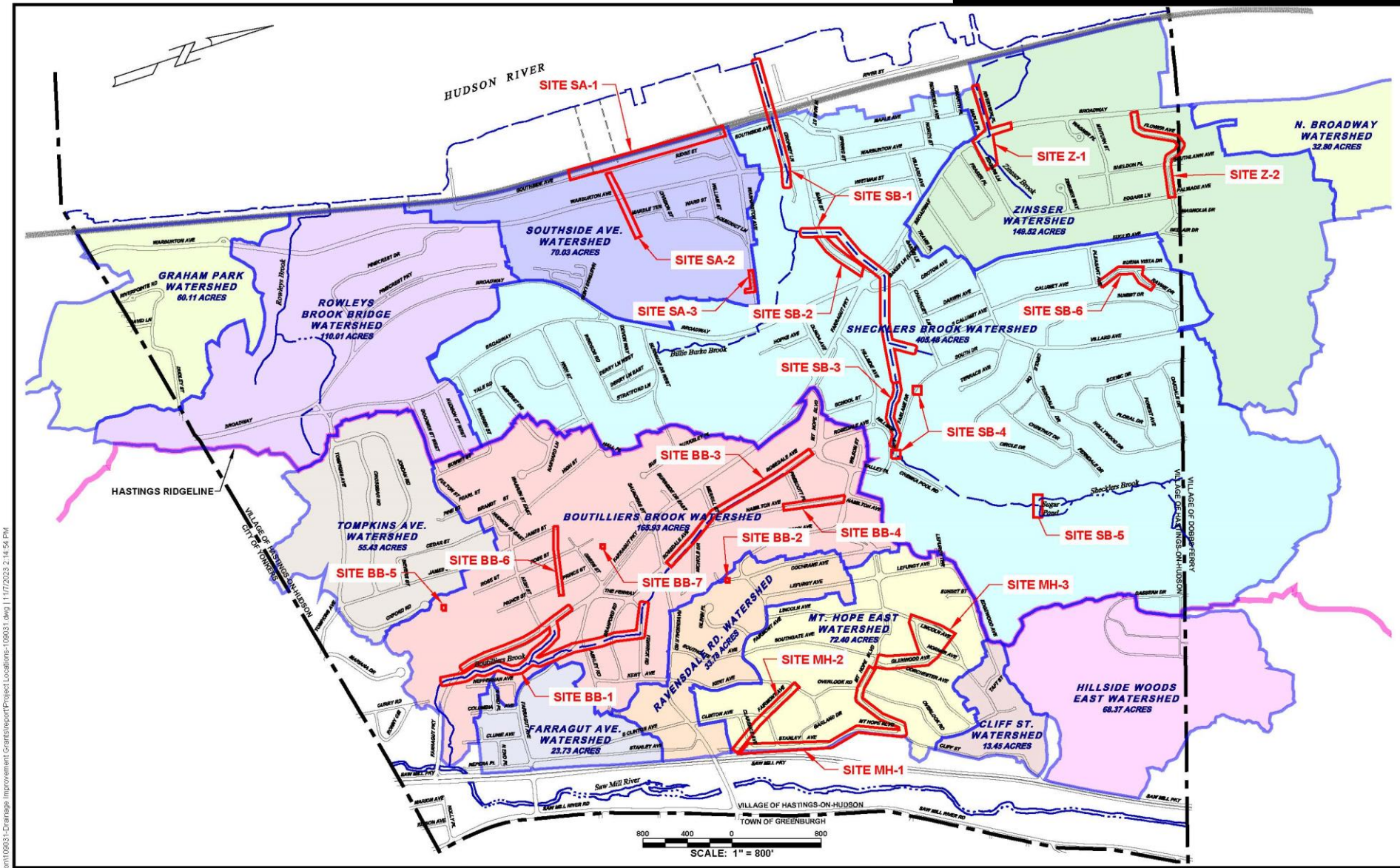
SITE LOCATION MAP



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REV.	DATE	DESCRIPTION

TITLE	SITE LOCATIONS MAP
PROJECT	HASTINGS-ON-HUDSON FLOOD STUDY
	VILLAGE OF HASTINGS-ON-HUDSON, WESTCHESTER COUNTY, NY
SCALE	1" = 800'
DRAWING NO.	-
DATE	11/6/23
SHEET NO.	1 OF 1

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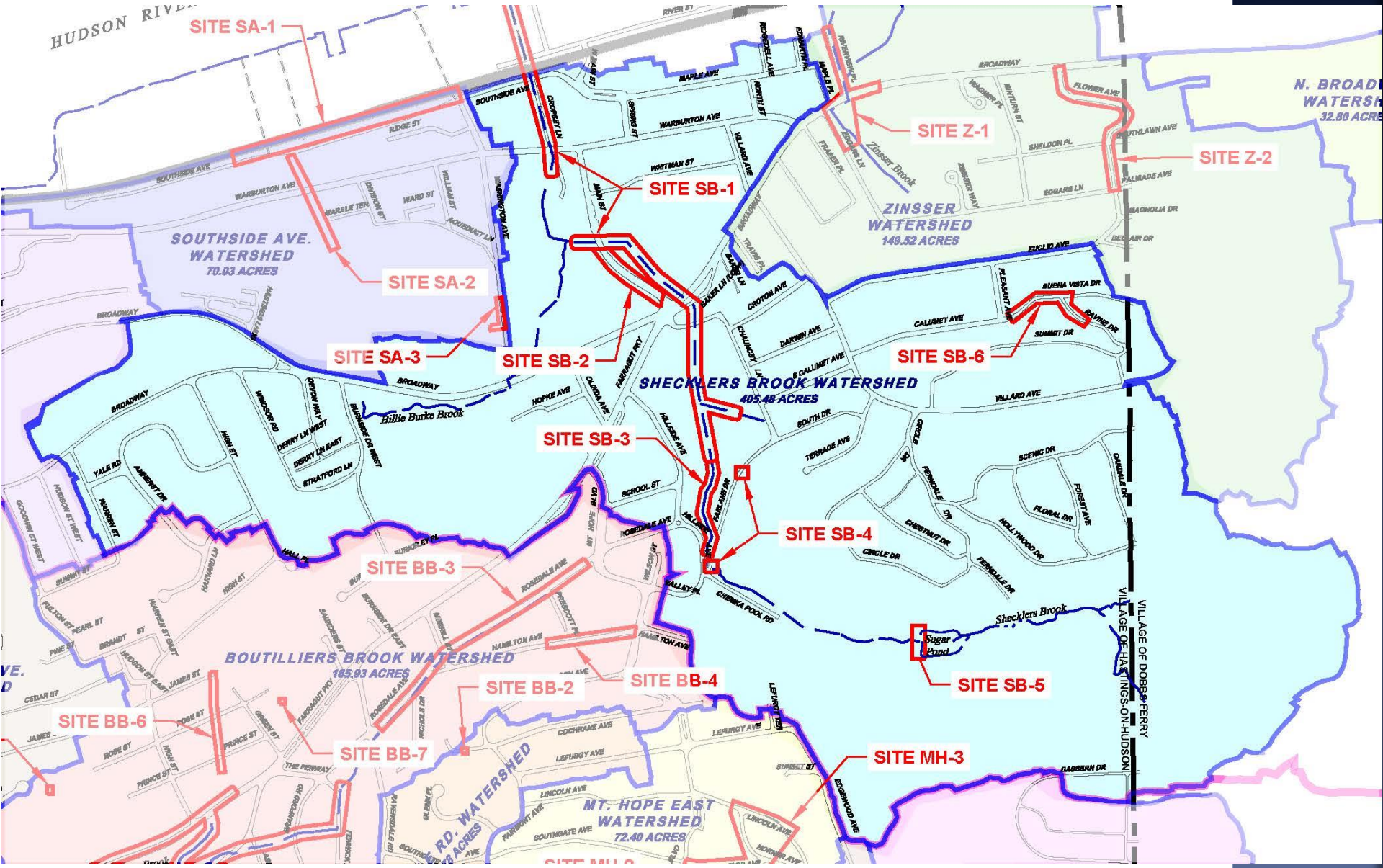

SHECKLERS BROOK WATERSHED

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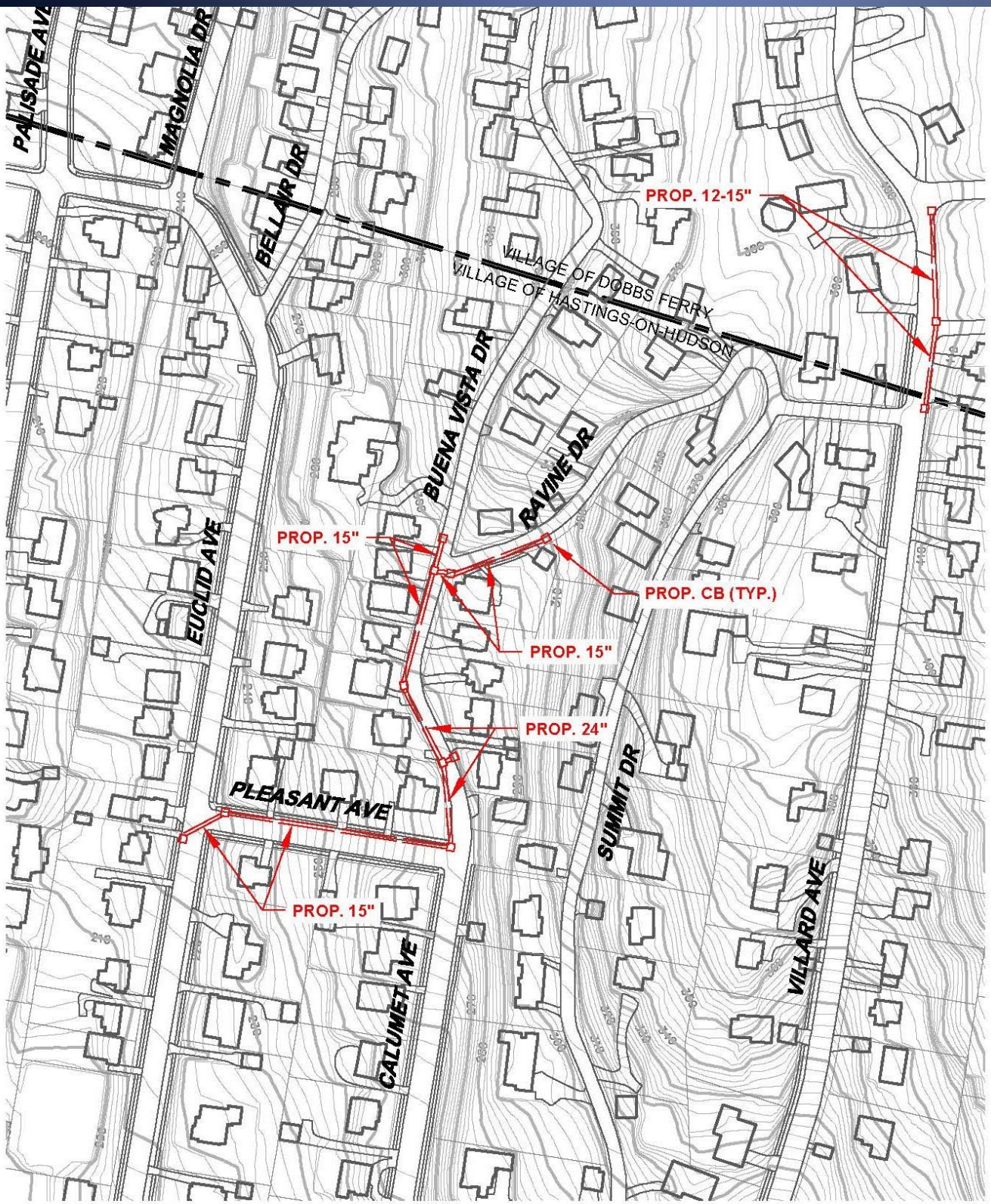

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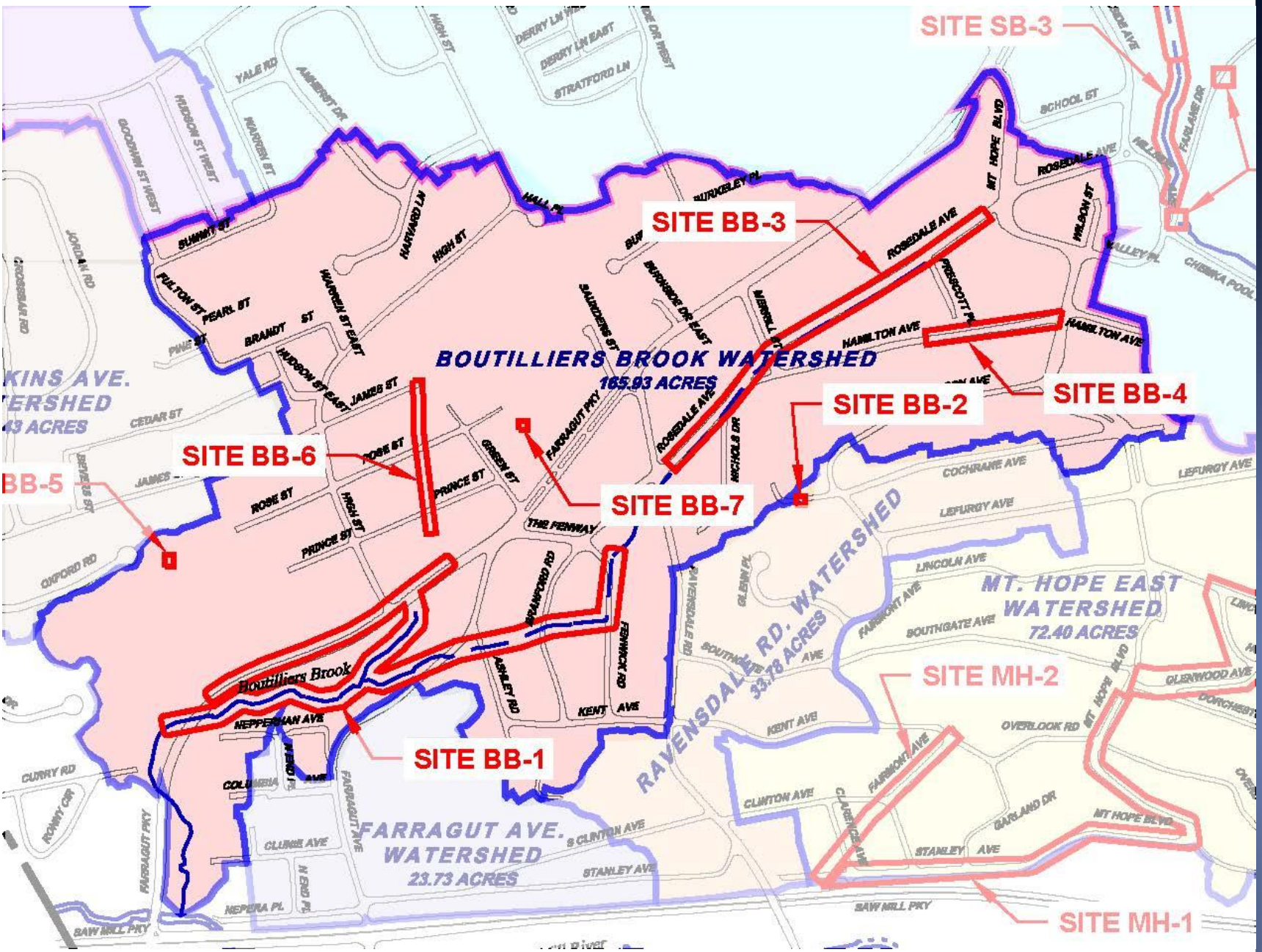

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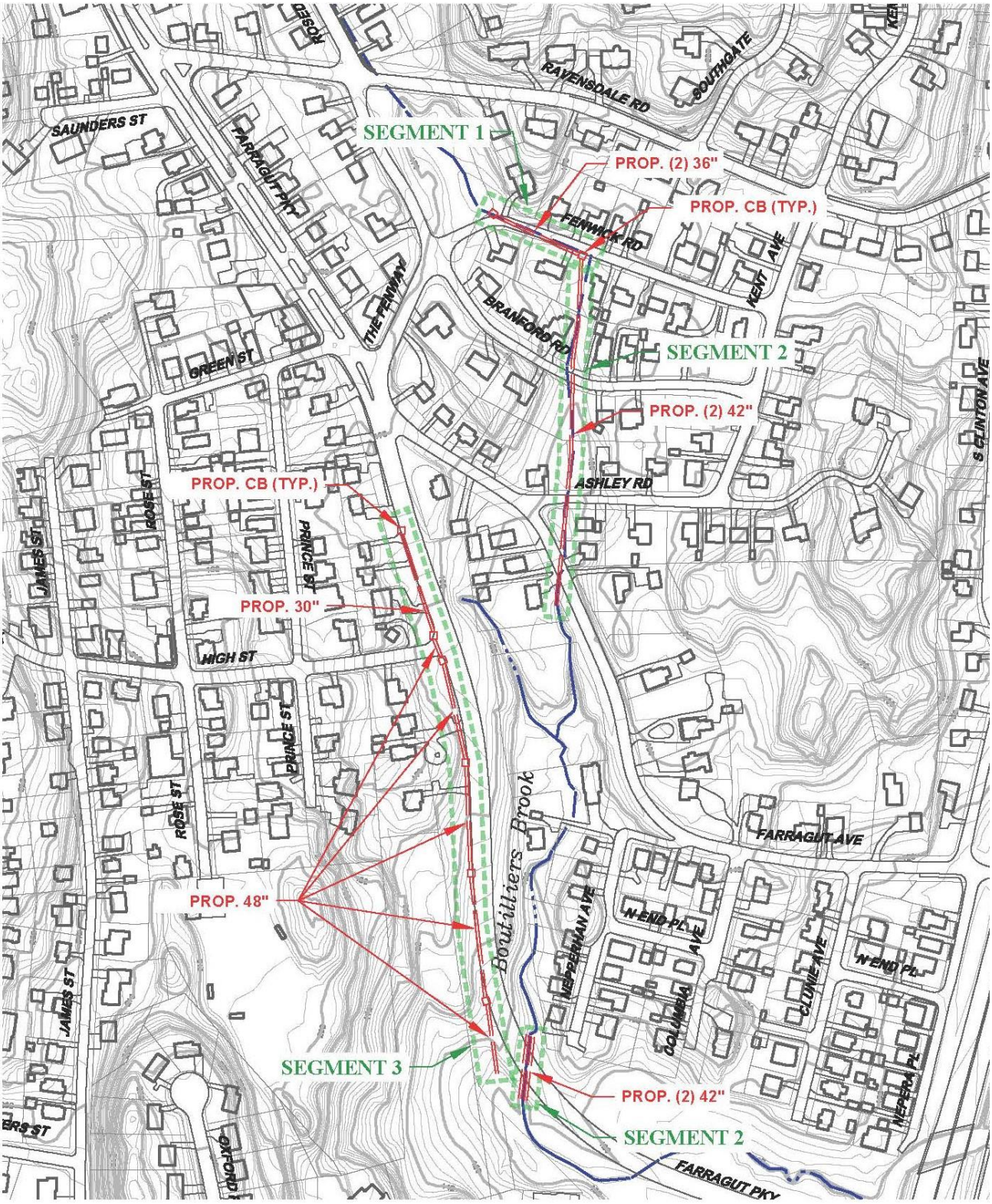
BOUTILLIERS BROOK WATERSHED



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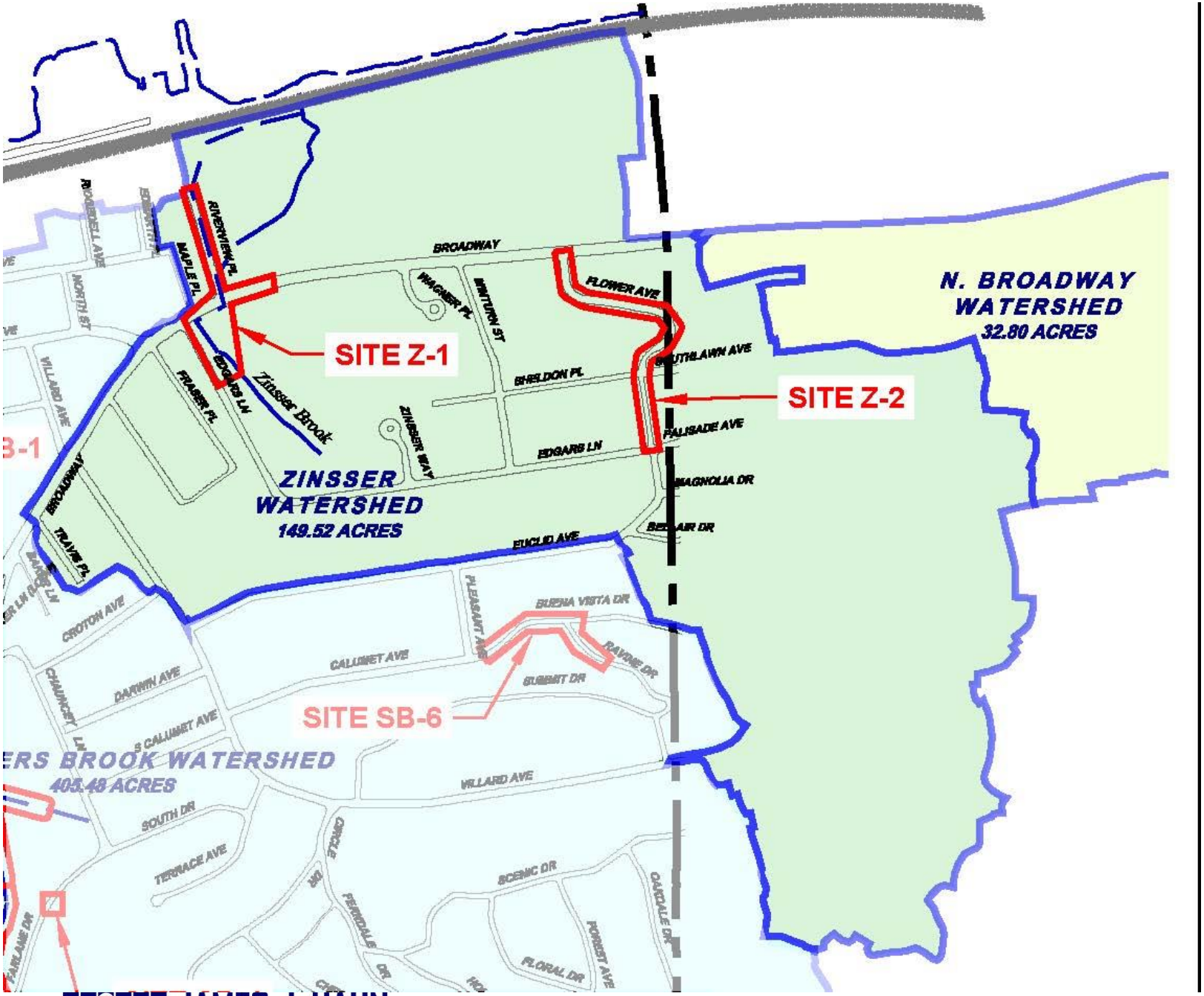

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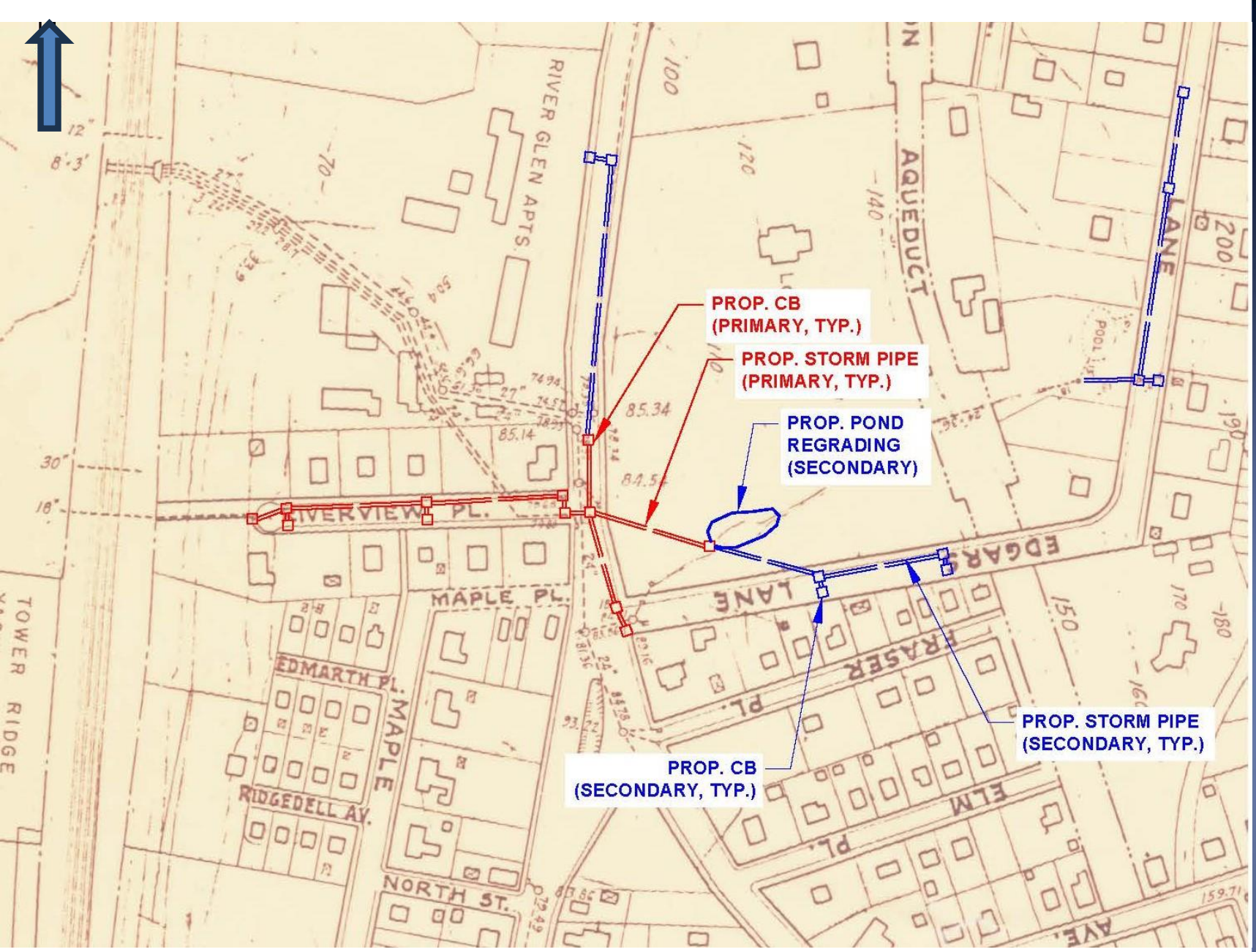
ZINSSER WATERSHED



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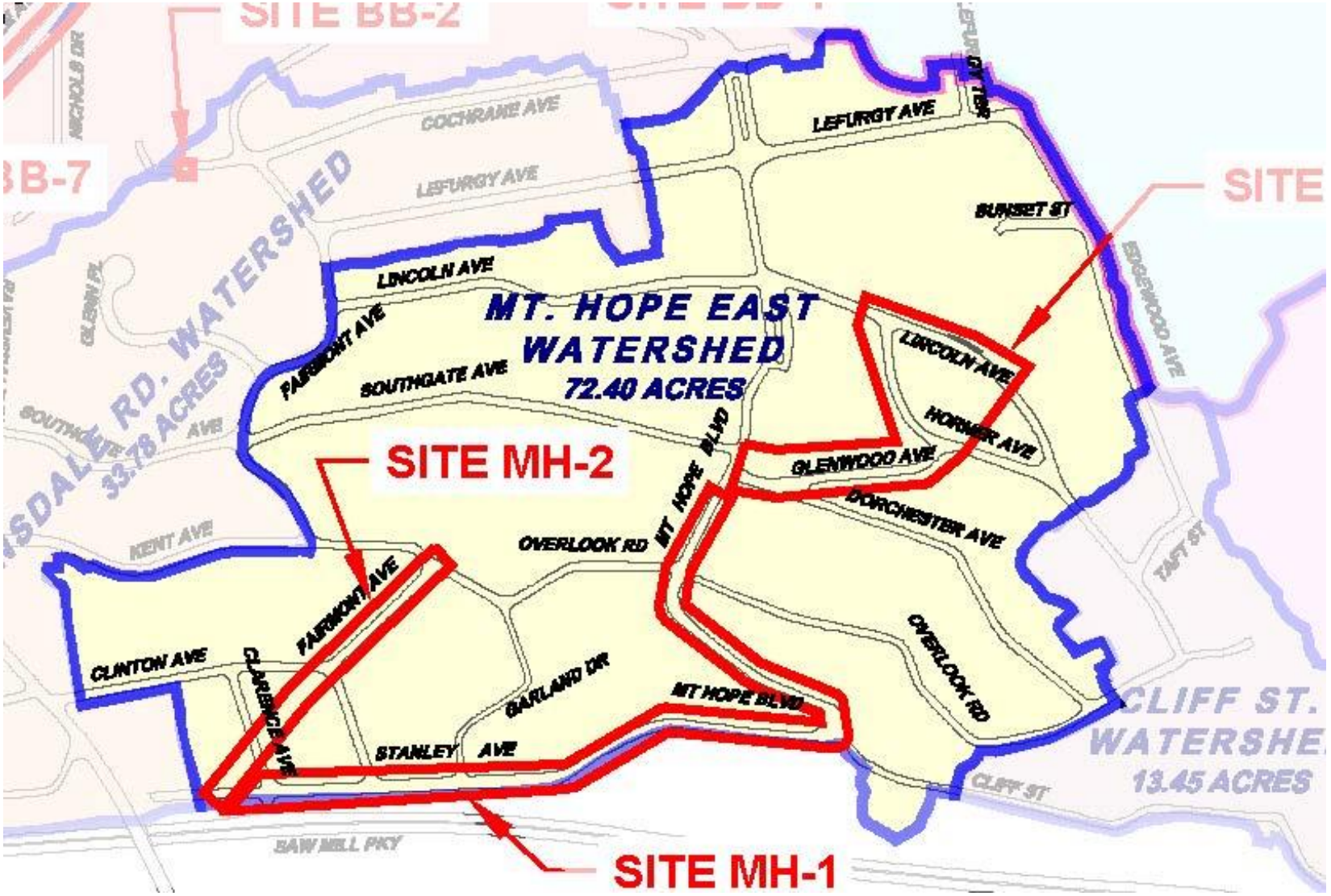

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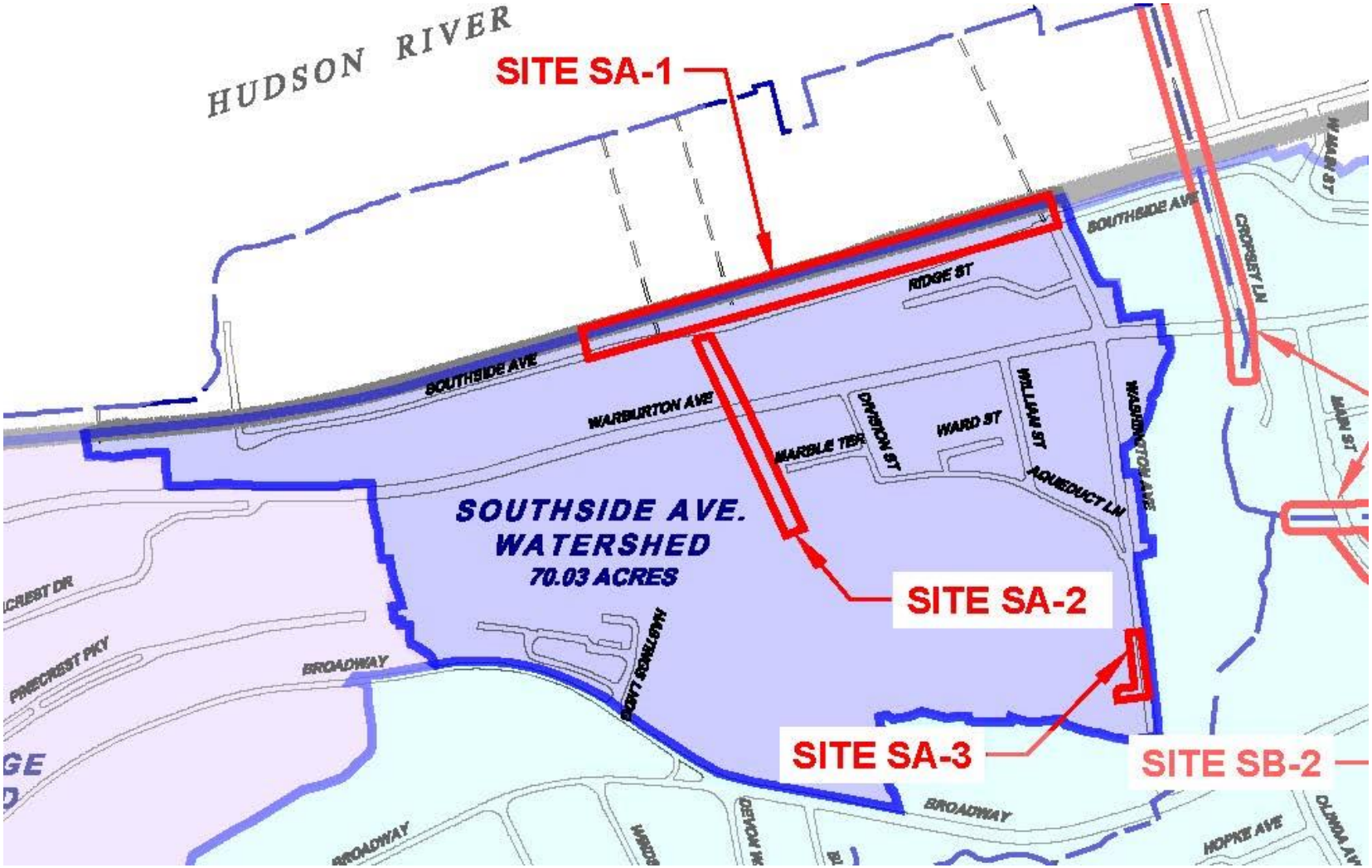
MT.HOPE EAST WATERSHED



SOUTHSIDE AVENUE WATERSHED

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Phase II – Field Work

1. Update/complete a new drainage infrastructure map.
   - This includes the location and elevation of all drainage structures, piping, and outlets. This will also require outfalls along the Hudson River and tidal information.

2. Closed circuit television (CCTV) pipes and structures necessary to complete drainage infrastructure map.

3. Survey centerline profile of brooks and watercourses. At this time this appears necessary for Shecklers Brook, Boutilliers Brook, Zinsser Brook, and Billie Burke Brook.

4. Locate and survey outfalls along the Hudson River.

Coordination between entities to access properties and/or obtain information (e.g. other municipalities, schools, Metro North, private property owners, etc.).

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Phase III – Detailed analysis

1. Update the Village Watershed Map based on an updated drainage map.
2. Prepare Hydrologic Engineering Center's River Analysis System (HEC-RAS) model for Shecklers Brook, Boutilliers Brook, Zinsser Brook, and Billie Burke Brook.
   - Identify flooding locations for various storm events.
   - Determine design storm event requirements.
   - Determine culvert or channel sizing for undersized sections of brook.
3. Update the list of drainage projects and add additional sites as needed. Separate them based on size, scope, and cost. Complete cost-benefit analysis if needed.
4. Review results of Phase II and Phase III with the Village. Determine which projects to complete at that time and how to phase.

Phase IV – Final design and construction

- Complete site specific projects as funding becomes available.

Additional Recommendations to complete throughout all phases

1. Grant funding opportunities.
2. Develop minimum standards for development and public improvements for use by the Village Department of Public Works and Building Department.
3. Village should continue stormwater requirements of the 100 year storm event for new development and redevelopment projects. Standard and Green infrastructure projects should be encouraged where possible.
4. Add stormwater projects to the list as they arise.
5. CCTV has been performed for many culverts and pipes in the Village. These inspections should be listed with the date of each inspection. Annual CCTV should continue for critical culverts and piping as determined by Village DPW.
6. Complete a full topographic survey of projects that may need to be "shovel ready."

COMMENTS & QUESTIONS?

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