

Section 10.0 Stormwater

Project Overview

The subject property is located at the intersection of Saw Mill River Road, Underhill Avenue, and Glenrock Street in the Town of Yorktown, Westchester County, New York. The property is one parcel totaling 13.78 acres and is part of the Yorktown Heights Development Overlay Zone. The location of the project is the former Soundview Preparatory School and prior the Underhill Estate.

There are several existing structures on the site, including the original Underhill mansion. The site is serviced by a common driveway and parking area that circulates through the site. The eastern part of the site is mostly developed with the buildings, driveway system, and open lawn areas. The western side of the site is mostly wooded. There is an existing pond in the center of the site. The outlet for the pond discharges to a culvert extending to the north beyond the limits of the property.

An existing emergency access easement and road connects the Beaver Ridge apartments which is the northerly adjoining site to Underhill Avenue. Currently, stormwater runoff flows east through the site. Glenrock Street borders the western boundary of the site and is the high point topographically. From there the site slopes downward to the east and towards Saw Mill River Road. Stormwater runoff from the surface of Glenrock Street and its drainage system discharges directly onto the property. Much of the surface runoff from Glenrock Street eventually flows to the existing pond. There is an existing drainage collection system throughout on site but it is not certain to as the interconnection of the system or the point of discharge. The pre-development watersheds map is provided as Figure 10-1.

The proposed project will be in the category of a redevelopment of the property. It is proposed to remove all of the existing buildings except for the mansion, as well as some of the other impervious surfaces. These will be replaced with the proposed development of town homes, condominiums, and a mixed-use apartment and retail/office building.

The total disturbance expected for the project is approximately 11 acres. As required by the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-20-001 this project will require the preparation of a Stormwater Pollution Prevention Plan or SWPPP which will detail construction and post-construction stormwater management. The construction will be phased to minimize open disturbance. A construction sequence will be developed to control construction activities and avoid the discharge or transport of sediment offsite. A detailed Erosion and Sediment Control Plan will be developed as part of the SWPPP for the construction phase. The post-development watersheds map is provided as Figure 10-2.

For management of stormwater from the site after construction is complete a series of stormwater practices will be designed and implemented. It is proposed that the stormwater practices will capture and manage all the onsite stormwater generated by the project. Together the stormwater management practices will provide some green infrastructure practices, treat for pollutants to meet water quality standards, and control the peak rate of runoff. The proposed stormwater management practices include a pocket wetland, subsurface infiltration, and rainwater harvesting as well as other methods. As the development shall be entirely residential and commercial, no stormwater discharges associated with industrial activities other than construction are expected.

Regulatory Obligations

The proposed disturbance for this project is greater than one acre. As such, a Notice of Intent must be filed in accordance with the New York State Department of Environmental Conservation (NYS DEC) GP 0-20-001, and at a minimum an Erosion and Sediment Control Plan must be prepared. The project is located in the Hallocks Mill Brook Basin which is a sub-watershed of the Croton River Basin. This basin is not listed as a TMDL Watershed or discharging to an impaired water body.

This project has a disturbance which is more than one acre. It is not located in an Enhanced Phosphorous Watershed (EPW). Therefore, this project requires the preparation of a full Stormwater Pollution Prevention Plan.

The Plan identifies the potential sources of pollution, and a design prepared and implemented to reduce pollutant loadings. This project will be required to prepare the following to be in compliance:

- Notice of Intent registered with the NYS DEC;
- MS4 SWPPP Acceptance Form signed by an authorized representative of the Municipality;
- Prepare an Erosion and Sediment Control Plan;
- Design and implement a stormwater quality treatment system to capture and treat the stormwater runoff volume generated by the 1-year rainfall event.
- Design and implement a stormwater management system to capture and attenuate all storm events up to the 100-year storm.

In addition, this project requires approval under Chapter 248, Stormwater Management and Erosion and Sediment Control, of the Town of Yorktown Code. The Code requires compliance for projects with a land disturbance activity of 5,000 s.f. or more. The Code requires compliance with the NYS DEC GP-0-20-001

The New York City Department of Environmental Protection is also an involved agency in this action. This site is located within a Main Street Designated Area as set forth by the New York State City Department of Environmental Protection. Therefore, the project is required to comply with Section 18-39 (a) (11) (i) of "Rules and Regulations for the Protection from Contamination, Degradation, and Pollution of the New York City Water Supply and its Sources." The Regulations require mitigating construction activities increasing impervious areas. This project is a redevelopment of an already disturbed area. This result will be a change in the pollutant loadings. Therefore, requiring the capture and treatment of the 1-year, 24-hour storm. In order to provide a positive benefit to downstream surface waters, a treatment component must be designed into the project. The Design must also show proper Erosion and Sediment Controls during the construction of the project.

The technical standards providing guidance in the preparation of the E&SC and SWPPP are the latest revisions of the following:

- "New York Standards & Specifications for Erosion and Sediment Control" (NYSSESC) published by the Empire State Chapter of the Soil and Water Conservation Society; and;
- "New York State Stormwater Management Design Manual" prepared by the Center of Watershed Protection, for the NYS DEC;
- Town of Yorktown – Town Code Chapter 248 Stormwater Management and Erosion and Sediment Control;

- NYC DEP Watershed – Chapter 18 of Title 15 of the Rules of the City of New York – Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Sources.

Site Characteristics

Soils

On-site soils were classified by using the USDA Natural Resources Conservation Service (NRCS) Websoil survey for Westchester County, NY.

The predominant soil types for this project are Paxton a fine Sandy Loam. This soil is a poor to well-drained soil that are subject to seasonal groundwater. The Hydrologic classification of all this soil is “C”. The erosion hazard level for these soils are slight to moderate. These soil properties are essential in the design and proper construction management of the site. Independent soil tests were performed.

Hydrology

The proposed improvements will not significantly change the surface runoff patterns. Currently, the surface runoff pattern is in one of two directions. Runoff is either collected in the existing pond on the site, or it is directed towards Saw Mill River Road. The surface runoff pattern is a combination of sheet flow and concentrated flow. The majority of the site is lawn or woods with slight slope.

Under the proposed condition the general direction of the surface runoff will not be altered. Almost the entire amount of surface runoff from the impervious areas will be collected and treated. The proposed improvements as shown will result in an increase in the imperviousness of the drainage areas. Therefore, there will be an increase in the volume of runoff as well as the pollutant loads generated by the site for a given rainfall event. This will be mitigated with stormwater management practices. Runoff from Glenrock Street, which currently enters the site uncontrolled at a number of locations, will be captured and conveyed to the municipal system in Underhill Avenue, thereby alleviating an existing problem.

There are currently three distinct drainage areas on the site. Drainage area 1 contains a portion of the western half of the site and parts of Underhill Avenue. Runoff flow onto the site and into the pond located on site. There is an existing outlet to this pond that historical maps show flowing to design point 2, but we have analyzed the flow to the pond directly to ensure this outlet is not overloaded with new flows. Drainage area 2 is the remainder of the site not included in Drainage areas 1 and 3. It includes the majority of the driveways, buildings, and other site improvements. Runoff flows to the east towards Saw Mill River Road. It then follows the gutter to a headwall where runoff flows under the road. This headwall is the design point for this drainage area. Drainage area 3 is the remaining portion of the site that flows into a catch basin within Underhill Avenue. It includes the main entrance and a portion of the driveway. The only change in surface conditions will be the proposed impervious surfaces of the house and driveways. The remainder will continue to be lawn and wooded. Therefore, the analysis for stormwater increases has been done for these individual impervious components.

Proposed Drainage areas 1, 2, and 3 are similar in the post-developed condition. The changes to the drainage areas include the removal of the on-site areas being developed. The flow paths of these remain the same. The entire stormwater management system has been revised. Sub Areas 4, 5, and 6 are a further breakdown of DA's 1, 2, and 3.

Drainage area 4 includes the apartment building, the condo building, and the existing Underhill House, and the majority of the driveways, parking areas, and accessory impervious surfaces on the site. The drainage system is split so as not to capture the roadway that extends to the row of townhomes on the western portion of the site. Runoff will be captured through a proposed drainage system that will collect runoff from sheet flow over impervious areas and roof drain connections from the proposed buildings. It will be directed to the eastern portion of the site and treated in sub-surface Stormtech MC-3500 infiltrator chambers. Pretreatment will be provided by a Downstream Defender unit. A bypass has been included that will direct flows in excess of the 1-year storm to another system of MC-3500 chambers to be used as detention. Street trees will also be planted along the roadway as a means of impervious reduction.

Drainage area 5 includes most of the proposed townhomes and the proposed roadway to service them. Runoff is collected using catch basins and roof drains and directed to a subsurface rainwater harvesting system. Pretreatment is provided with a metal debris screen. The system has been design to capture a portion of the WQv of drainage area 4. A bypass has been provided to direct runoff to a pocket wetland which will provide the remainder of the treatment as well as detention of larger storm events. It will overflow into the existing pond. Street trees will also be planted along the roadway as a means of impervious reduction.

Drainage area 6 is the proposed walking path around the pond. These areas will be directed to rain garden along the path for treatment and will overflow into the pond. Additionally, trees will be planted along the path for impervious area reduction.

In the planning, design, and construction of the development, stormwater will be managed to minimize or eliminate potential off-site impacts. The proper implementation of temporary sediment and erosion control measures are used to achieve this goal. An Erosion and Sediment Control Plan has been established and will be implemented during all phases of construction until the completion of the project. The Erosion and Sediment Control Plan incorporates the sequence of construction and designed measures to be installed, operated, and maintained during all aspects of each phase. The erosion and sediment controls are designed in accordance with the NYS Standards and Specifications for Erosion and Sediment Control.

Water Quality Volume (WQv)

The Treatment volumes are determined as prescribed by the standard methods as outlined in the NYS DEC Stormwater Management Design Manual. This Water Quality Volume WQv requirement is normally based on the 90% rainfall event. This equates to 90% of the average rainfall for the specific region. However, for this project, the treatment volumes exceed that requirement by treating the 1-year storm event. This site is located in the Croton Watershed which is an enhanced phosphorous basin. This requires implementation of the enhanced phosphorus standards for the capture and treatment of the runoff from the 1-year, 24-hour rainfall event, which represents the water quality volume.

The 1-year, 24-hour runoff volume required to be captured and treated has been further defined as the runoff volume from the contributing drainage areas for the proposed project. The volume proposed to be captured will be that volume generated by a 1-year, 24-hour storm or greater. With the design provided, this entire volume will be captured and retained for an extended period of 24-hours for pollutants to settle out of the contained runoff. Excess stormwater above the water quality volume will be diverted to subsurface storage for larger storm events. The volumes to be treated have been calculated as shown in the following table.

Water Quality Volume

Drainage Sub Area	WQv based on 90% Rainfall Event	WQv based on 1-year Rainfall Event	Pretreatment Provided	WQv Provided	RRv Provided	Storm Year Treated
4	17,872 cf	31,232 cf	Downstream Defender Unit	---	31,232 cf	1 year
5	12,922 cf	22,215	Forebay/ Metal Screen	15,245	6,969 cf	1 year
6	199 cf	392 cf	n/a	400 cf	220 cf**	1-year

*WQv has been reduced as follows:

Drainage Area 4: 1700 sf impervious reduced by 18 tree plantings

Drainage Area 5: 300 sf impervious reduced by 3 trees

Drainage Area 6: 200 sf impervious reduced by 2 tree plantings

These volumes meet the requirements of the NYS DEC and Town of Yorktown for the limitation of phosphorous export.

Hydrologic Analysis

The method used to compute project runoff was the Soil Conservation Service TR-55. The basis for the analysis was the Type III, 24-hour storm, for the 1 year, 2 year, 10 year, 25 year, and 100-year storm event. The rainfall depth for the respective storm events are 2.8, 3.3, 5.0, 6.4, and 9.0. The runoff coefficient "CN" and Time of Concentration for existing and post-development conditions were computed using Standard TR-55 criteria.

Design Point 1:

Storm Event (year)	Pre-Developed Peak Flow (cfs)	Post-Developed Peak Flow (cfs)	Net Change of Peak Flow (cfs)	Percent Reduction
1	1.25	0.93	-0.32	26%
2	1.80	1.27	-0.53	29%
10	3.96	2.50	-1.46	37%
25	5.88	3.56	-2.32	39%
100	9.58	5.55	-4.03	42%

Design Point 2:

Storm Event (year)	Pre-Developed Peak Flow (cfs)	Post-Developed Peak Flow (cfs)	Net Change of Peak Flow (cfs)	Percent Reduction
1	6.80	2.24	-4.13	60.7%
2	9.72	3.23	-5.74	59.1%
10	20.81	7.02	-10.79	51.9%
25	30.64	10.40	-15.57	50.8%
00	49.45	17.10	-26.48	53.5%

Design Point 3:

Storm Event (year)	Pre-Developed Peak Flow (cfs)	Post-Developed Peak Flow (cfs)	Net Change of Peak Flow (cfs)	Percent Reduction
1	0.73	0.36	-0.37	50.7%
2	0.99	0.51	-0.48	48.5%
10	1.92	1.03	-0.89	46.4%
25	2.72	1.49	-1.23	45.2%
100	4.22	2.35	-1.87	44.3%

As can be seen by the results, peak discharge rates are decreased for all scenarios.

Stormwater Management Practices Selection, Justification, and Design

The current plan utilizes several established practices for the capture and treatment of stormwater runoff. A large pocket wetland is proposed south of the existing pond. Infiltration practices are proposed for under the parking areas north and east of the proposed apartment building. A catchment system for rainwater harvesting will be installed at the west end of the lake, and a number of rain garden, bio-swales, and smaller practices will be used throughout the site.

The stormwater management practices selection process detailed in Chapters 3 and 7 of the NYS Stormwater Management Design Manual was followed to help select the practices chosen. These Chapters provide a series of matrices which allows logical selection of treatment practices based on several factors. The factors are as follows:

1. Land Use – Residential;
2. Physical Feasibility – location, slope, drainage area, groundwater table;
3. Watershed / Regional Factors – near Croton Reservoir;
4. Stormwater Management Capability – can meet all requirements;
5. Community and Environmental Factors – meets all requirements.

Thermal impacts are not a major concern on this project. The most likely location where a rise in the water temperature might occur is within the Pocket Wetland. This, however, will be mitigated by establishing trees and plantings which will provide shade. Further cooling would also take place when the stormwater passes through the subsurface stormwater management system prior to open discharge. Therefore, the stormwater collection and management will not contribute to the heating of stormwater where it will have a downstream thermal impact.

The following practices were chosen for this project.

Infiltration – Subsurface Chambers (I-3) NYS DEC SMDM:

Stormwater Infiltration Practices capture and temporarily store stormwater. The stormwater is then infiltrated into the existing soil strata over an extended period of time allowing recharge into the groundwater.

Rain Garden NYSDEC SMDM:

The selected stormwater treatment practice is a filtered system designed to capture and treat small volumes of surface runoff. The filtering systems are practices found in the NYS Stormwater Management Design Manual. The benefit to these practices is that they work well for this application. This application is most commonly used for residential applications. The rain garden system has a surface feature for containing stormwater and has the appearance of a planted landscape bed. The organic filter media is a shallow sub-surface media through which the stormwater passes. The total detention time is designed for several days. After the treated runoff passes through the filter media it infiltrates into existing soil. The practice in this case is designed for flood storage. Pre-treatment is being provided by discharges overland through a grass filter strip or stone traps before discharging to the rain garden.

Subsurface Stormwater Management Storage (SSMS):

The SSMS for this project has been designed strictly as a means of storage for Rainwater Harvesting or detention. The storage will provide for stormwater volumes of the Water Quality Volume. Pretreatment for rainwater harvesting will be provided by a debris screen located in the bypass structure that directs runoff into the cistern. The system will consist of a series of circular high-density polyethylene pipes interconnected with header pipes. Once stormwater volumes exceed the water quality levels, the water will bypass through an upstream control structure to downstream infiltration and detention. From the SSMS, the stormwater will discharge to detention chambers which will release runoff at a controlled rate of discharge and low velocity. In addition, the SSMS will help reduce thermal impacts by allowing cooling of stormwater.

The selection of the treatment practice was based on evaluating the site to determine what would best fit the conditions providing maximum benefits. The goal was to select practices which would meet treatment and attenuation standards and minimize the disturbance footprint. The selection of Stormwater Practices was based on the surface and subsurface conditions of the site. In addition, the site design concept is to create a natural and environmentally sensitive setting. The well-drained soils made it very conducive to the use of infiltration and the recharge of surface water which provided high-value treatment.

The location of each of the proposed practices is shown on the site plan and grading and utility plan.

Erosion and Sediment Control

Erosion and sediment control practices were selected and designed in accordance with the NYSSESC. Standard details and specifications are typically included in the SWPPP as well as on the Construction Plans. Initial locations of each practice are shown on the Plans as construction progresses it may become necessary to repair, replace or relocate these practices as conditions warrant. The following practices have been assigned to this project.

Stabilized Construction Entrance
Silt / Sediment Fence and Haybales
Soil Stockpile Areas
Temporary and Permanent Vegetative Cover
Storm Drain Inlet Protection
Erosion Blankets
Soil Restoration
Rock Outlet Protection
Water Bars
Temporary Sediment Basin

Descriptions of the practices and maintenance requirements are described in detail in the SWPPP.

Stabilization:

The Contractor shall initiate stabilization measures as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven (7) days after the construction activity in that portion of the site has temporarily or permanently ceased. This requirement does not apply in the following instance:

Where the initiation of stabilization measures by the 7th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable.

All areas not designated as buildings, roads, driveways, parking lots, walks, or aprons shall be established as lawn or vegetative areas. Permanent planting and vegetation shall be provided per approved the landscaping plan.

Construction Sequence

A key objective of the SWPPP is to reduce erosion and sedimentation potentials for the project. As a means to accomplish this, a suggested construction sequence was developed to assist the developer with incorporating, into the project, various controls designed to reduce such potentials. The sequence considers the performance of development activities in a phased approach, in conjunction with the installation, construction, and monitoring of erosion and sedimentation control devices prior to and during construction.

The SWPPP will contain the project-specific "Suggested Construction Sequence". Essentially, the sequence has been broken down into various activities designed to ensure that certain erosion/sedimentation controls are in place, prior to and during construction, in recognition of site development.

Prior to any construction activities, the Owner, Engineer, and any Contactors to perform land-disturbing activities shall meet to review this SWPPP to insure a thorough understanding of its contents and overall intent. Certifications to this effect shall be signed by the Owner and Contractor.

Conclusion

The Stormwater Management Plan will be established for this project in accordance with the requirements of NYS DEC GP-0-20-001 and the Town Code of Yorktown. This plan will effectively control stormwater generated by this project during and after construction. The management of

the stormwater is based on controlling increases in peak runoff as well as water quality. The design of the water quality component not only will treat runoff due to the project, but also that which is currently not treated. Overall it would improve even the existing conditions.

The final design of the project will detail the proposed practices and will establish the method with which they will be constructed. The detail will include layout, grading, plantings, outlet structures, and any other component as required for the design based on the Erosion and Sediment Control established in this Report. These will be part of the project Construction Drawings. The Sequence of Construction and required maintenance will also be set forth as part of the final construction plan. The full Construction Plan shall be considered part of the Stormwater Management Plan or Stormwater Pollution Prevention Plan.

The effectiveness of the stormwater practices selected in design will be insured by implementing a maintenance plan. The maintenance plan details specific activities, safeguards, and provisions to be monitored and performed by specified frequencies. By adhering to the maintenance plan, optimum performance of the stormwater practices can be expected.

Based on the results of the analysis and recommended maintenance practices for the collection and treatment system, the proposed stormwater control designs will provide maximum control efficiency, high effectiveness for removal of pollutants of concern, and the best attainable post-development pollutant loading scenario.

In conclusion, the implementation of the Stormwater Management Plan will not create negative downstream impacts as a result of this project.



Figure 10-1: Pre-Development Watersheds
Underhill Farms
Town of Yorktown

NOTE:
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PRELIMINARY SITE PLAN PREPARED FOR UNDERHILL FARM UNDERHILL AVENUE Town of Yorktown Westchester County, New York	PRE DEV WATERSHED	SCALE: 1" = 40'	DATE: TK	DRAWN BY: TK	DATE: TK
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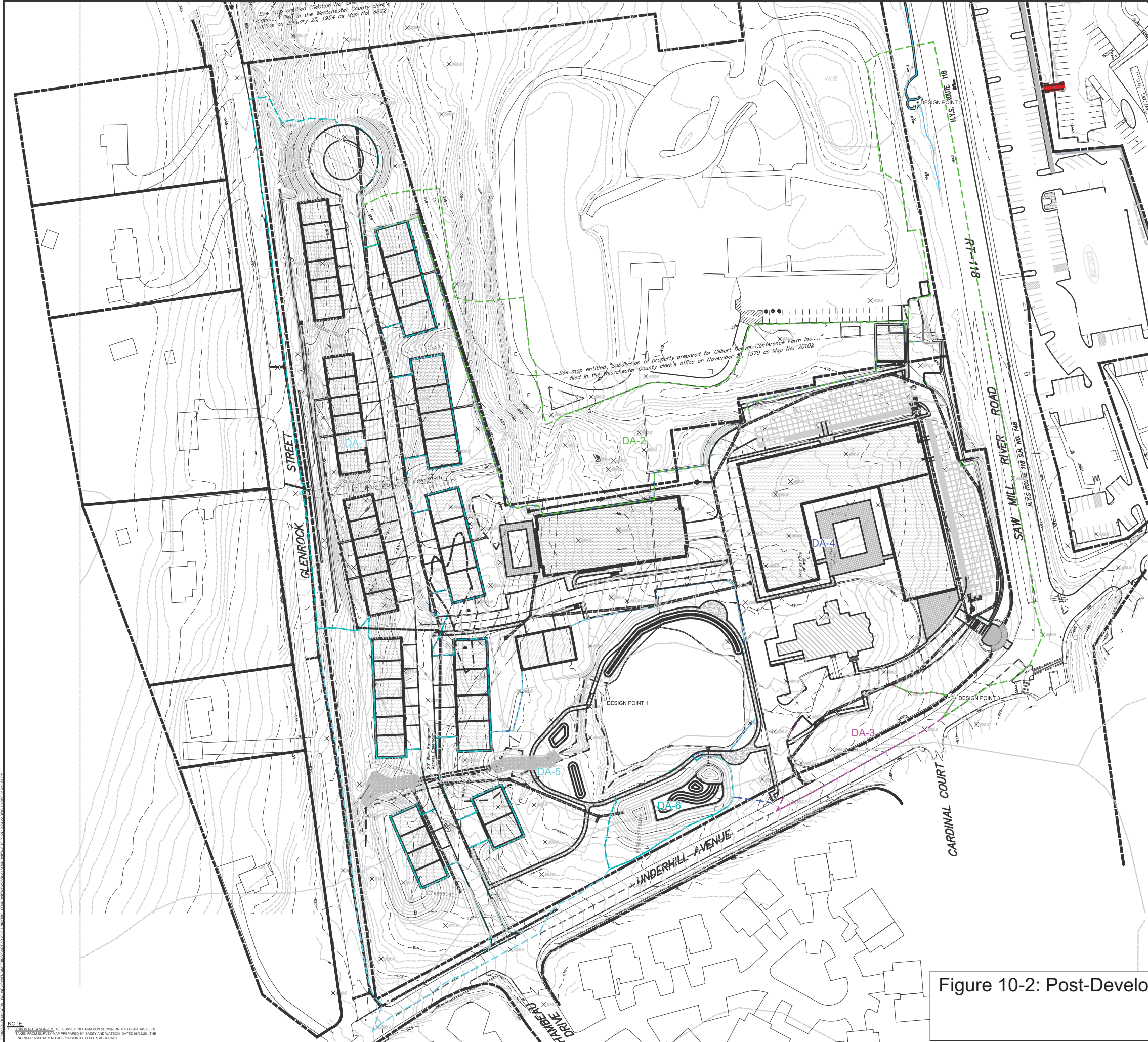



Figure 10-2: Post-Development Watersheds
Underhill Farms
Town of Yorktown

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PRELIMINARY SITE PLAN PREPARED FOR UNDERHILL FARM UNDERHILL AVENUE Yorktown, New York Westchester County, New York	POST DEV WATERSHED
SCALE: 1" = 40' DRAWN BY: TK DATE: 06-23-20	SHEET FIG. 5.2

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