3.2 Surface and Groundwater Resources

3.2.1 Existing Conditions - Drainage

Stormwater runoff on the project site is currently controlled by natural topography, soils and vegetation. There are three existing home sites on the property and an existing access road which also play a part in the runoff pattern. Three watershed areas have been mapped on the property (DP#1, DP#2, and DP#3), shown in Figure 3.2-1, Pre-Development Watershed Map.

An unnamed tributary of the Pascack Brook flows from west to east through the site, entering via a culvert under Red Schoolhouse Road. This drainage flows in a man-made channel around the perimeter of the commercial portion of the site (in the northwest corner) before it enters the undeveloped part of the site and becomes the stream channel. This stream flows through a deep and well defined channel to a large headwall at the eastern edge of the site (Design Point #1). Drainage Catchment 10 includes 30.52 acres of the site and drains to the tributary.

The runoff in Catchment Area 20 (encompassing 24.14 acres in the southeast corner of the site) flows from west and south to north, to a culvert under Gary Drive and into a series of channels and pipes. Design Point #2 was considered to be a culvert under Loescher Lane.

The runoff in Catchment Area 30 (10.43 acres) flows from west to northeast in the northeastern corner of the site. The design point is an existing surface channel near Ironwood Road (Design Point #3.

Langan Engineering conducted a detailed analysis of the existing drainage conditions and the post-development drainage conditions. A Stormwater Management report for the proposed plan is provided in Appendix D. The methodology utilized to conduct the stormwater analysis is described in the report. Table 3.2-1 summarizes the existing condition flow rates as calculated in the report.

Table 3.2-1
Pre-development Peak Discharge Rates
Existing Conditions

Design Point	**Storm Event**			
	2 yr.	**10 yr.**	**25 yr.**	**100 yr.**
	(cfs)	(cfs)	(cfs)	(cfs)
Design Point 1 (CA 10)	43.48	82.85	115.30	181.19
Design Point 2 (CA 20)	25.34	50.08	70.38	112.58
Design Point 3 (CA 30)	9.52	18.47	25.77	40.89

3.2.2 Future Drainage Conditions

The introduction of pavement and buildings, vegetative clearing and stormwater control measures will result in a change to the project site's existing land cover that will alter drainage patterns from their current condition. Generally, an increase in impervious surfaces on a site has the potential to result in a higher rate and volume of stormwater runoff leaving the site if there are no controls installed. The proposed stormwater plan will manage runoff such that these potential impacts are mitigated.

Future Drainage Conditions

Under the proposed plan, the road layout will change significantly. New access roads, townhouse units, commercial buildings and amenities will result in an increase in the amount of impervious surface on the site from 3.5 acres to 13.8 acres, and the disturbance of 31.6 acres of the site. Rather than using the existing road bed, a new, wider road would be constructed to meet Town standards (entirely within the limits of the subject property) that would add new areas of impervious surface. The old road bed would be abandoned, the pavement removed and where appropriate replaced by vegetative cover. Overall drainage patterns to the established design point are not expected to change.

The changes in surface cover and the increase in impervious surfaces would cause a potential increase in the rate and volume of stormwater runoff.

Table 3.2-2
Post-development Peak Discharge Rates
Proposed Conditions

Design Point	**Storm Event**			
	2 yr.	**10 yr.**	**25 yr.**	**100 yr.**
	(cfs)	(cfs)	(cfs)	(cfs)
Design Point 1 (CA 100 - 119)	34.08	78.76	111.73	176.22
Design Point 2 (CA 200 - 211)	19.64	37.27	51.50	80.83
Design Point 3 (CA 300)	8.85	16.87	23.36	36.75

Flow rates and volumes to all of the design points will increase following development (without mitigation) due to the creation of larger areas of impervious surface. As can be seen by a comparison of Figure 3.2-1 to Figure 3.2-2, the size of the catchment area that will flow to Design Point 1 increases significantly, as a large portion of Catchment 20 will be developed with townhomes that will drain to Design Point 1 after grading. As more of the water will be diverted to DP 1, there will be a decrease in the size of CA-20 post-development with only a small increase in impervious surfaces.

Regarding future development in the area, the Corporate Commerce Park that is proposed on Red Schoolhouse Road to the north of the project site is in a different subwatershed to the Pascack Brook, and will not affect or be affected by drainage changes at the Equestrian Estates site. As described below, in “Proposed Mitigation Measures”, individual projects are required by federal and State law to capture and treat increases in stormwater runoff for both quantity and quality. A project must be designed so that post-development flow rates are lower than or equal to existing conditions, so as not to create or exacerbate any downstream flooding or erosion problems. In most cases the stormwater management plan ultimately reduces the flow rate of water leaving a development site, resulting in incremental improvements to downstream conditions.

If no mitigation practices were utilized, there would be a significant increase in both runoff rate and runoff volume following construction. However, the project engineer has developed a plan using bioretention basins, subsurface infiltration practices and a number of volume reduction practices to offset the changes in perviousness. Overall, the stormwater management plan designed for this project would reduce the peak flow of runoff from the site compared to the existing condition, so no flooding or other issues would be expected. The concept plan shows stormwater detention basins and other practices for each of the post-development subcatchments for this purpose. The developed condition is further described in Appendix D, as well as shown on Figure 3.2-2, Post-Development Watershed Map.

Table 3.2-3
Comparison of Peak Discharge Rates
Existing vs. Proposed Conditions

Storm Event	Design Point	Pre (cfs)	Post (cfs)	Diff (cfs)
2 year	1	43.48	34.08	-9.40
	2	25.34	19.64	-5.70
	3	9.52	8.85	-0.67
10 year	1	82.82	78.76	-4.09
	2	50.08	37.27	-12.81
	3	18.47	16.87	-1.60
25 year	1	115.30	111.73	-3.57
	2	70.38	51.50	-18.88
	3	25.77	23.36	-2.41
100 year	1	181.19	176.22	-4.97
	2	112.58	80.83	-31.75
	3	40.89	36.75	-4.14

3.2.3 Proposed Mitigation Measures

Pursuant to Section 402 of the Federal Clean Water Act, stormwater discharges from certain construction activities to waters of the United States are unlawful unless they are authorized by a national or state permit program. New York's State Pollutant Discharge Elimination System (SPDES) is a federally-approved program which permits such discharges when they occur in strict accordance with New York State Environmental Conservation Law. Discharges of pollutants to all other "waters of New York State" such as wetlands and groundwater are also unlawful unless authorized by a SPDES permit. Operators of construction activities that propose to disturb one acre or more require a SPDES permit. An applicant is required to prepare a Stormwater Pollution Prevention Plan (SWPPP) which is a detailed, site-specific plan for controlling runoff and pollutants from a site during and after construction. The final SWPPP must be prepared in order to submit a Notice of Intent (NOI) and gain coverage under a NYSDEC SPDES General Permit.

Design features have been incorporated into the project plans in order to minimize off-site water quality impacts from the project, as per the requirements of the applicable NYSDEC General Permit for Stormwater Discharges from Construction Activity.

Adding pavement and impervious surfaces to the project area has the potential to increase pollutant contributions to local water resources, such as sand, silt, salts, oil, grease, pesticides and fertilizers. The addition of pavement and stormwater collection systems also has the potential to increase the rate of stormwater flow from the site. These potential impacts are being avoided or mitigated by structural stormwater controls and "best management practices".

The project engineer proposes the use of bioretention basins and underground infiltration systems in conjunction with extended detention basins to mitigate the increases in stormwater quantity and address the water quality volume. These practices are distributed throughout the site and will reduce flow rates to below that of current conditions.

Stormwater drainage from the site during construction will be strictly managed to avoid off-site impacts. A key aspect in the maintenance of stormwater quality and the control of soil erosion is the proper sequencing of construction. All structural sediment and erosion control features will be installed prior to the commencement of grading and earthwork.

Various measures have been incorporated into project plans which are intended to offset potential impacts to surface water resources. These relate specifically to the temporary mitigation practices during construction period and to the constructed project elements as long term mitigation, incorporated into the following:

1. Erosion control measures appropriate to the proposed construction activities shall be specified in accordance with the *NY Standards and Specifications for Erosion and Sediment Control* so as to minimize erosion during the construction phase.

2. Stormwater quantity and quality control measures designed in accordance with the *NYS Stormwater Design Manual* so as to appropriately manage stormwater in the built project. These measures are specified in the project-specific Stormwater Management Plan (Appendix D).

Structural sediment and erosion control features include: the construction of temporary swales, earthen dikes and use of temporary sediment basins for control of stormwater. Temporary construction accesses will be provided, and a sequencing plan that includes the use of silt fence, inlet protection, temporary soil stockpiles and other practices is described in the SWPPP. At the conclusion of construction, the sediment basins will be cleaned and all sediment will be properly disposed.

3.2.4 Groundwater

Groundwater is the subsurface water found that is in saturated zones within the soil profile and underlying rock mantle of the earth. The saturated zones of unconsolidated material and fractured bedrock that are capable of yielding a usable quantity of water are referred to as an aquifer. Locally, groundwater is found in joints, fractures and other spaces contained in the hard gneissic bedrock.

Geologically, the project site is located in the Palisades diabase which consists of igneous and meta-igneous rocks within the Newark group formation of bedrock. The relatively recent rock formations are associated with the Upper Triassic period of the Mesozoic Era. Bedrock groundwater resources occur in the fractures and joints of this bedrock unit (secondary permeability). The number and location of the bedrock fractures (fractures typically contain greater quantities of usable water than joints) is dependent on the degree of deformation that the bedrock has undergone through its formation.

Depth to water table (surficial groundwater elevations) varies on the site and during seasonally wet periods. Based on data in the USDA's *Soil Survey for Rockland County*, the on-site soils are identified as Wethersfield gravelly silt loams of various slopes (WeB, WeC and WeD). Wethersfield soils tend to have a relatively high seasonal groundwater table due to a restrictive layer at 18” – 30”. However, below this level the soil is mapped as a gravelly fine sandy loam, and is considered to be well drained. Shallow lateral groundwater flow is presumed to generally following the topography of the site. Because the proposed project is to be served by municipal sewer and water, no test drilling for depth to the bedrock aquifer was completed, although generally in this area that water is located at 500 to 800 feet below the surface.

The primary source of water that recharges the groundwater is precipitation which infiltrates through the surface of the ground and percolates into the aquifer. The majority of precipitation is "lost" to surface water runoff and evapo-transpiration. Depending on the physical characteristics of the recharge area, between 15 and 40 percent of the annual precipitation can recharge the aquifer.

Evaluation of groundwater recharge with respect to a specific project or land use is usually done by evaluation of projected water demand and the ability of the local watershed to recharge the aquifer. Generally, the groundwater table in an unconfined aquifer will loosely follow the surface topography of the land. Groundwater would be expected to flow from drainage boundaries, such as ridges, toward points topographically lower in the watershed. Groundwater in storage and recharge "collected" within the natural drainage basin area would be available to replenish or recharge the aquifer. Due in part to the anisotropic (irregular) nature of the bedrock aquifer, however, only a portion of total basin recharge could transmit water to any given pumping area. The rate of aquifer recharge would also depend on other specific hydrogeological conditions present at each location. For example, heavily faulted and fractured bedrock zones are capable of transmitting larger quantities of water to recharge the bedrock aquifer than are less fractured zones.

<u>Potential Impacts</u>

As the proposed project is planned to be served by existing municipal sewer and water, no impacts to groundwater are expected. Some of the stormwater management practices will utilize infiltration and will serve to recharge the groundwater, offsetting the impacts of the new impervious surfaces that will be created.

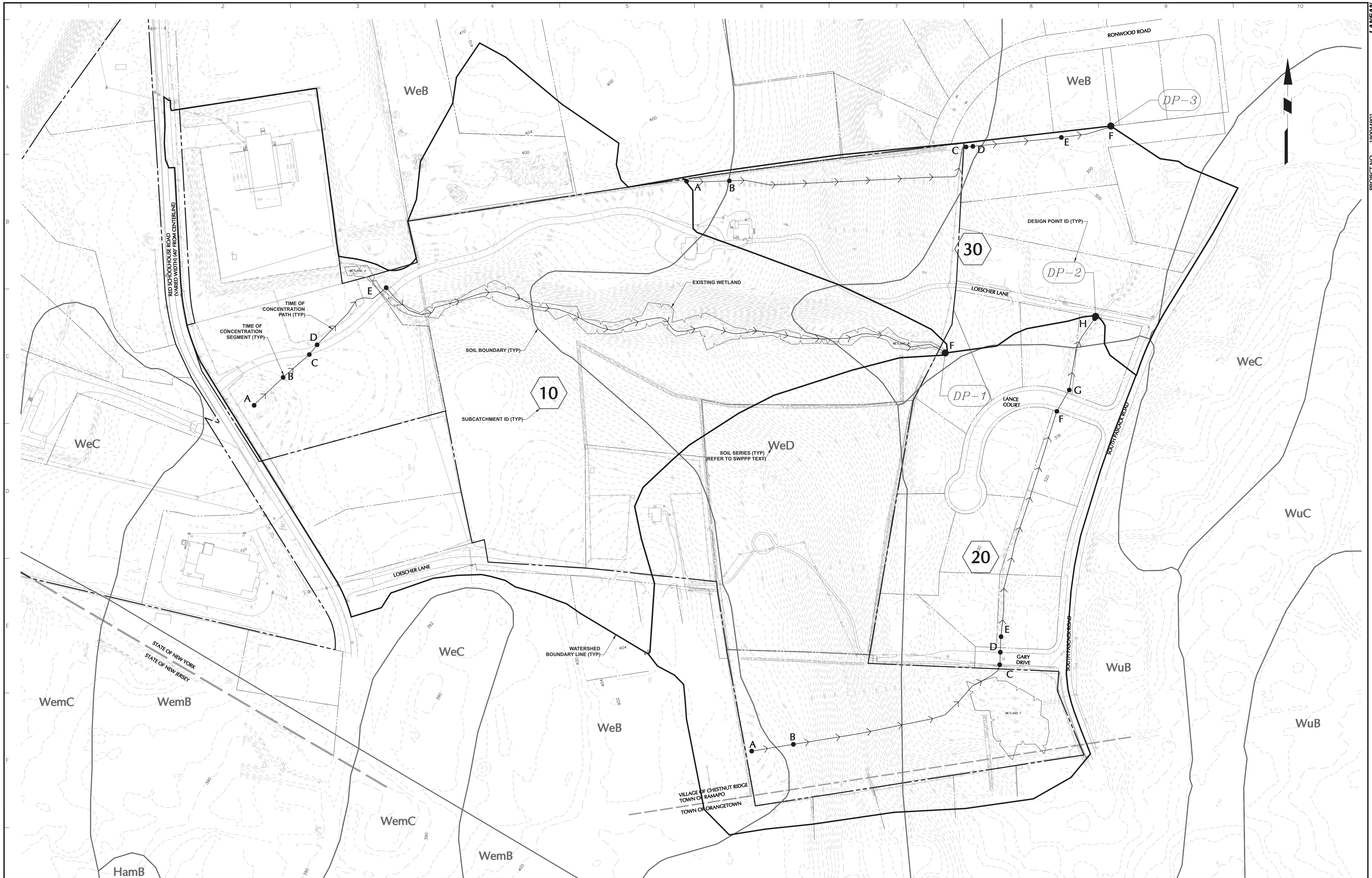

Figure 3.2-1: Pre-Development Watershed Map
Equestrian Estates DEIS
Village of Chestnut Ridge
Source: Langan Engineering

Date	Description	No.
12/08/20	REV. PER UPDATED SITE LAYOUT	1

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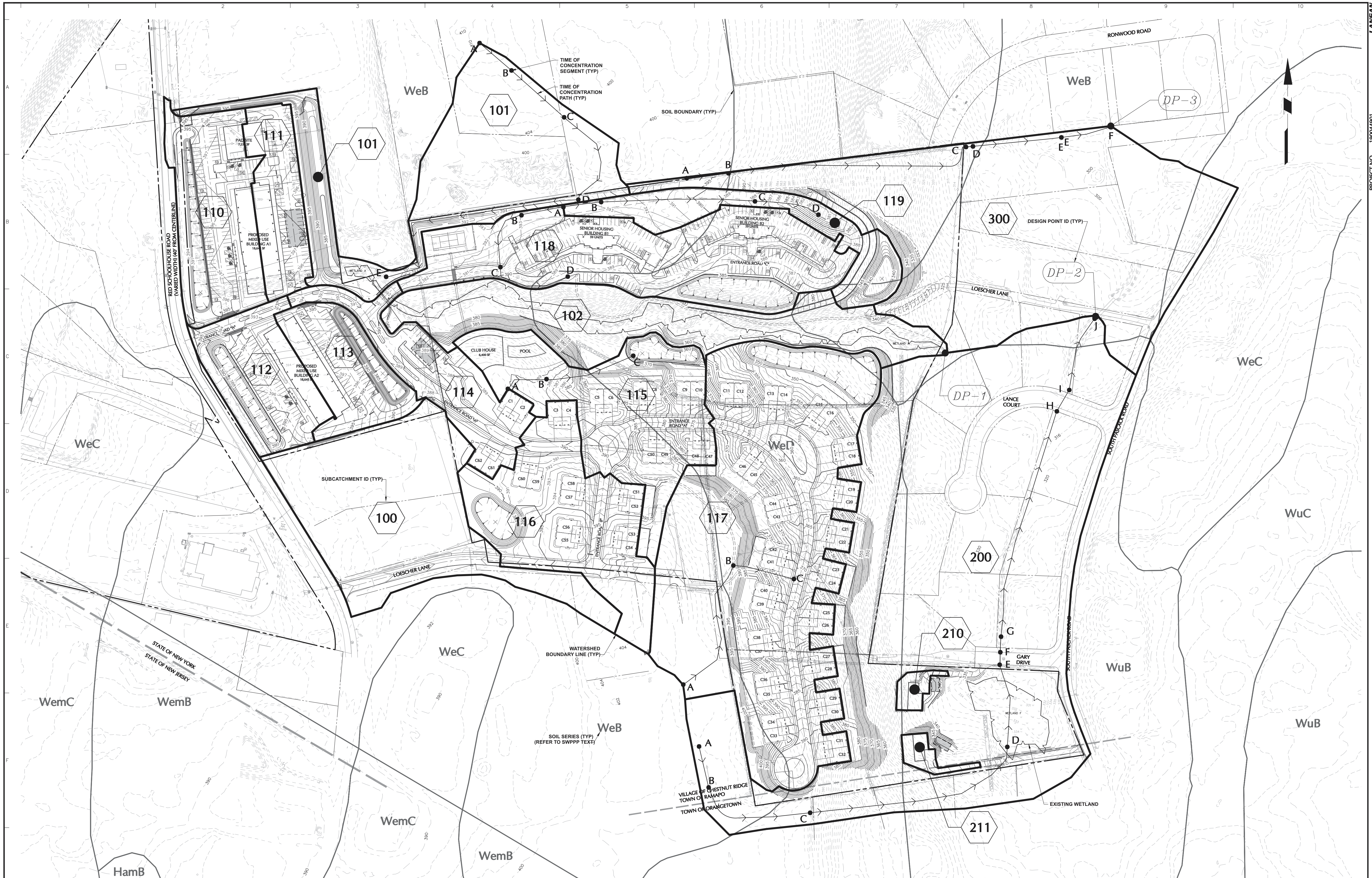

Figure 3.2-2: Post-Development Watershed Map
Equestrian Estates DEIS
Village of Chestnut Ridge
Source: Langan Engineering

Date	Description	No.
12/08/20	REV. PER UPDATED SITE LAYOUT	1

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