

D. Surface Drainage and Water Resources

1. Existing Conditions

The existing 198.3 acre site is divided by Winterton Road. The property on the east side or uphill side of Winterton Road is gently rolling formerly farm lands, wetlands and wooded areas. This portion of the site consists of fields previously used for farming and wooded areas that include wetlands and streams. The wetlands include both New York State wetlands and Federal Wetlands. One of the streams is designated as a tributary to the Shawangunk Kill and is protected by the NYSDEC. The uphill portion of the site is bordered to the south by residential dwellings, to the southwest by a residential dwelling, to the west by vacant wooded lands, to the north by vacant wooded land, and to the east by Winterton Road

The property on the eastern side of Winterton Road or lower side of the site includes the farm house, barns; farm related structures, and a large farm field with wetlands and woods on the perimeter of the site. This portion of the site is bordered to the south by vacant wooded land, to the east by the Shawangunk Kill, to the north by residential dwellings and to the west by Winterton Road. The wetland along the Shawangunk Kill is a New York State Wetland.

2. Proposed Stormwater Management

2.1 Stormwater Management and Methodology

The basis for the stormwater management design for this site has been developed through the use of sound engineering practice, the stormwater requirements of the Village of Bloomingburg and the requirements of the NYSDEC Stormwater Management Design Manual. Analysis of the pre- and post-development stormwater runoff from the site was modeled utilizing the Soil Conservation Service TR-55 Urban Hydrology for Small Watersheds and the Hydrocad computer program. The stormwater basins have been designed in accordance with the NYSDEC Stormwater Regulations for the 1, 10 and 100 year storm events. The roadway drainage channels and culverts have been designed for the ten (10) year storm event.

The runoff curve number (CN) is based upon soil types, vegetative cover, land use and the amount of impervious area within the drainage area. The run-off curve number value increases as a result of land development due to increased impervious area, as well as a reduction in quantity of vegetative areas and therefore different

values are calculated for pre and post development curve numbers. Utilizing the Soil Survey of Sullivan County, the soils groups found on the site are classified into their respective Soil Conservation Survey (SCS) hydrologic soils groups; A, B, C or D. The SCS classification system indicates runoff potential based on the hydrologic soil groups. Type A hydrologic soil groups have a low runoff potential while Type D soil groups have a very high runoff potential. Soils in the study area for this site include all of the Hydrologic Soil Group "A, B, C and D" soils.

The time of concentration (t_c) is the time required for runoff from the hydraulically most distant point in the watershed to reach the point of interest. The time of concentration influences the peak flow rate and the duration of the hydrograph.

The SCS methodology generates a hydrograph representative of the watershed characteristics such as drainage area, curve number (CN), and time of concentration. This hydrograph will indicate a peak flow, the time of the peak flow, the duration of the storm event and the volume of runoff.

2.1.1 Pre-Development Watershed Analysis

The existing conditions or pre-development conditions have been analyzed as six (6) drainage areas. A total of 62.71 acres were included in the study area for the project. The existing conditions stormwater map is attached in Appendix K. The following is a brief description of the characteristics of the existing drainage areas.

Drainage Area 1

This drainage area is approximately 45.15 acres in size and is tributary to the Shawangunk Kill Stream.

Drainage Area 2

This drainage area is approximately 4.43 acres in size and is tributary to the 8'x8' box culvert under Winterton Road.

Drainage Area 3

This drainage area is approximately 3.00 acres in size and is tributary to the 8'x8' box culvert under Winterton Road.

Drainage Area 4

This drainage area is approximately 2.99 acres in size and is tributary to the 60" diameter culvert under Winterton Road.

Drainage Area 5

This drainage area is approximately 4.66 acres in size and is tributary to the 60” diameter culvert under Winterton Road.

Drainage Area 6

This drainage area is approximately 2.32 acres in size and flows to the “tributary” of the Shawangunk Kill downstream of the existing Farm Pond.

2.1.2 Post-Development Watershed Analysis

Seven (7) drainage areas were modeled for the post-development watershed conditions. These drainage areas will continue to discharge to their pre-development locations. A total of 62.71 acres were included in the study area for the post development model. The post development drainage area map is attached in Appendix K . Calculations from the computer model for the post development conditions are presented in Appendix K. The following is a brief description of the characteristics of each area.

Drainage Area 1: This drainage area is approximately 21.87 acres in size, is on the east side of Winterton Road and flows into Stormwater Basin 1.

Drainage Area 2: This drainage area is approximately 23.28 acres in size, is on the east side of Winterton Road and is tributary to Stormwater Basin 2.

Drainage Area 3: This drainage area is approximately 4.43 acres in size, is on the west side of Winterton Road and is tributary to Stormwater Basin 3.

Drainage Area 4: This drainage area is approximately 4.56 acres in size, is on the west side of Winterton Road and is tributary to Stormwater Basin 4.

Drainage Area 5: This drainage area is approximately 1.43 acres in size and is tributary to Stormwater Basin 5.

Drainage Area 6: This drainage area is approximately 4.66 acres in size and is tributary to Stormwater Basin 6.

Drainage Area 7: This is the drainage area that includes the proposed clubhouse. This drainage area is approximately 2.48 acres in size and is tributary to Stormwater Basin 7.

2.1.3 Stormwater Management Facilities

Stormwater will be managed in accordance with the NYSDEC Stormwater Management Requirements. Stormwater will be managed in the Post Construction condition by the seven proposed Stormwater Management Basins.

Proposed Stormwater Basins

Seven (7) stormwater basins are included in the proposed project. The stormwater basins have been designed as “Pocket Ponds (P-5)” in accordance with the New York State Stormwater Management Design Manual. In accordance with the NYSDEC Regulations, the peak stormwater flow rate from the drainage areas upslope of Winterton Road after construction must be equal to or less than the existing peak stormwater flow rates for the 10 year and 100 year 24 hour rainfall events (Drainage Areas 3, 4, 5 and 6). The drainage areas downslope of Winterton Road are directly tributary to the Shawangunk Kill (Drainage Areas 1 and 2). The Shawangunk Kill is a fourth order stream. Therefore, in accordance with the NYSDEC Regulations, these drainage areas do not need to be equal to or less than the existing peak stormwater flow rates for the 10 year and 100 year 24 hour rainfall events.

Channel Protection Volumes

Except for very small drainage areas, NYSDEC Regulations require stream channel protection volumes (CPv). The provision of channel protection volumes are designed to protect stream channels from erosion. This is accomplished by providing extended detention of the one year, 24 hour storm event. Channel protection volumes were provided in the seven basins designed for the site. Channel Protection Volumes calculations are presented in SWPPP report within the DEIS Appendix K.

Where required, the channel protection volume will be provided above the normal water elevation in the basins. The results of the calculations are as follows:

Basin Basin Number	Basin Normal Water Elev. (ft)	Required CPv (ac-ft)	Elevation CPv Volume achieved (ft)
1	444.0	1.07	445.0
2	444.0	1.14	445.0
3	480.0	0.23	482.0
4	470.0	0.25	472.0
5	472.0	0.10	473.5
6	472.0	0.30	474.5
7	456.5	0.17	458.0

10 –yr and 100 –yr Analysis

The stormwater basins and watersheds were analyzed and modeled using the Hydrocad computer software, which utilizes a level pool pond routing method, for the 10 yr and 100 yr, 24 hour design storms. The comparison of pre-development to post-development flows for all drainage areas, are shown in the tables below. The results of the modeling indicate that basins can effectively control post construction peak discharge rates for the site areas to less than pre-development peak discharge rates. Therefore, the NYSDEC quantity control requirements have been met.

3. Post-Construction Inspection, Operations and Maintenance

The post construction erosion measures are the responsibility of the Home Owner's Association (HOA). The following measures shall be implemented following the completion of construction:

- The stormwater collection and conveyance systems need to be inspected to maintain proper operation.
- All catch basin sumps should be cleaned when they have filled to 50% of their capacity.
- Silt or sediment accumulations will be removed from culverts, drainage channels and detention basins, annually or more often if required.
- All drainage areas damaged by erosion should be repaired and re-stabilized with vegetation and/or appropriately sized rip-rap.
- Any slopes or embankments which have cracks, erosion rilling and damaged vegetation will be repaired and reseeded as necessary.

The post-construction inspection and report preparation of all of the site stormwater pollution prevention measures should occur quarterly and after each significant storm event. During site inspections, the inspector should note the quantity of sediments accumulated within all sediment traps and basins. Detention basins should be dredged as needed, and culverts cleared of accumulated sediment when their capacity has been significantly reduced or the function of the basin or inlet has been compromised. Also, drainage swales will be cleared of any debris or obstruction to maintain proper flow or maintained, repaired or re-constructed as needed. Suggested operation and maintenance checklists for stormwater basins and open channels are presented in Appendix K.

4. Stream and Wetland Impacts

Open bottom culverts are proposed at stream crossings to minimize impacts to adjacent wetland bodies. The culverts were designed to span the stream to above the ordinary high water mark as well as the wetland, thereby posing no disturbance to the regulated resource. The proposed culverts at stream and wetland crossings were designed by utilizing the Hydrocad stormwater software to obtain the peak flow rate for the 10 year and 100 year, 24 hour storm. The software program "HY-8" FHWA

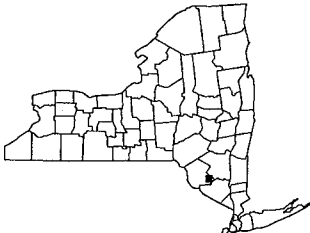
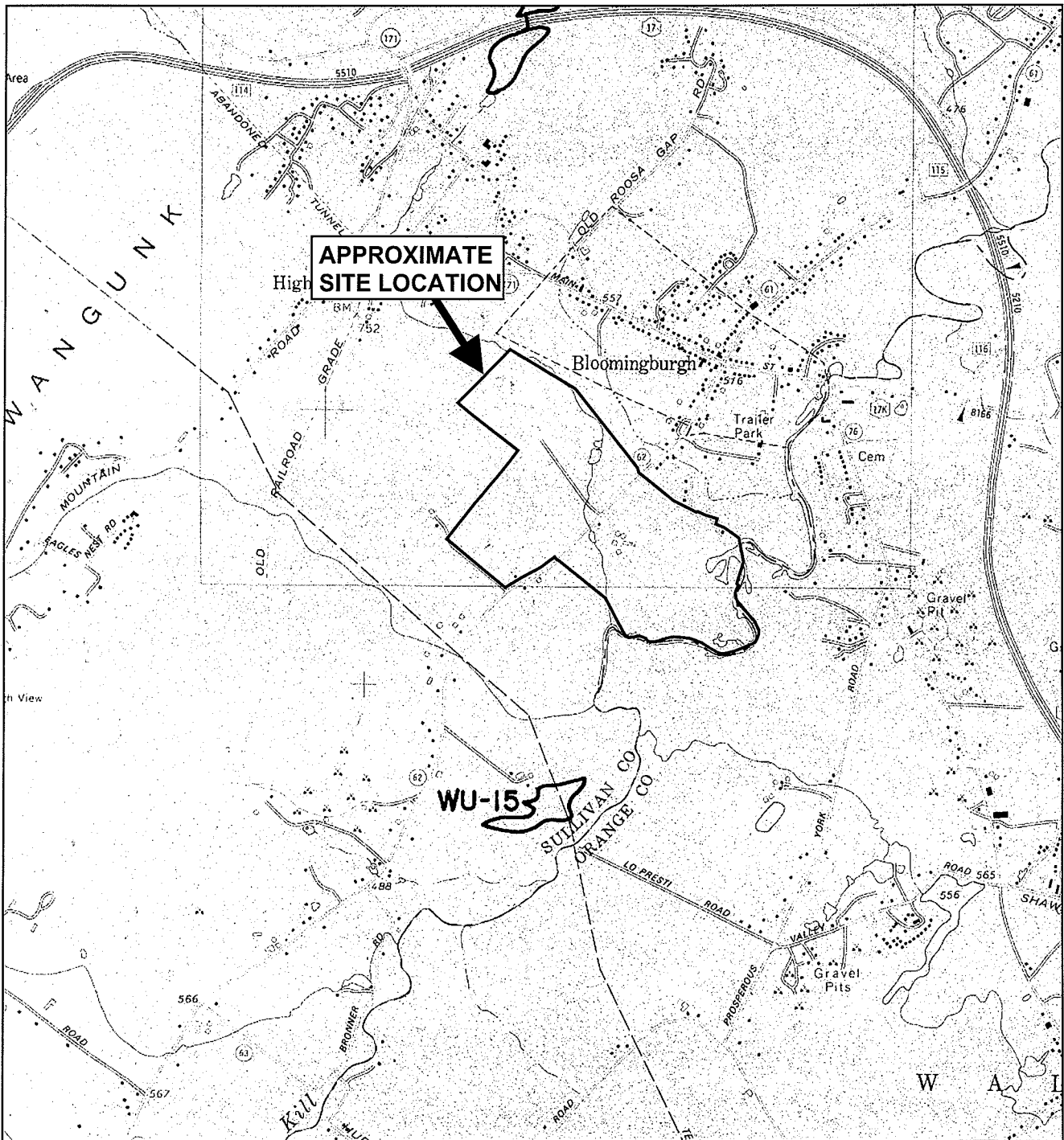
culvert hydraulic computer software was utilized to size the culverts. The peak flow rate for both culverts during the 10 year and 100 year 24 hour storm events are presented below.

STREAM CROSSING ANALYSIS

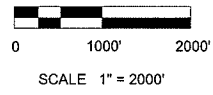
CULVERT	ROAD LOCATION	10 YEAR STORM EVENT (CFS)	100 YEAR STORM EVENT (CFS)	Open Bottom Culvert Size
1	Road B Sta 18+25	936	1612	32'x8'
2	Water Tank Access Road	198	344	13'x5'

Culvert 1, though it will span the wetland proper, will have approximately 0.39 acres of disturbance in the state regulated buffer area. Additionally, Basin 7 will be constructed in the state regulated buffer area with an impacted area of approximately 0.51 acres. Since the existing condition of the buffer area in proximity to Basin 7 is open field, no tree removal is required. The basin bottom and side walls will be grass-lined, thereby having similar properties to the existing buffer area. NYSDEC wetlands buffer permit will be required for the buffer impact areas.

Both culverts will span the stream and wetland but encroach within the floodway of the water courses and will require NYSDEC stream crossing permits.



QUADRANGLE LOCATION



NORTH



NYS Freshwater Wetlands Map

NYS Department of Environmental Conservation

Wurtsboro Quadrangle
1986

Prepared by TERRESTRIAL ENVIRONMENTAL SPECIALISTS, Inc.

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