Chapter 3.7: Stormwater Management

A. INTRODUCTION

This chapter describes existing and proposed stormwater runoff conditions of the project site, and assesses the potential significant impacts to surface water as a result of the proposed action. The analysis includes a computation of pre-development and runoff quantities. In addition, this chapter describes the proposed stormwater management system needed to handle additional stormwater runoff resulting from increases in the proposed project's impervious surface areas.

B. METHODOLOGY

Stormwater management computations provided in this report are based upon the U.S. Department of Agriculture Soil Conservation Service (SCS) TR-20 and TR-55 methodologies and recommendations included in the New York State Department of Environmental Conservation's October 2001 *New York State Stormwater Management Design Manual*, and *New York Standards and Specifications for Erosion and Sediment Control*. Pre- and post-development rates of stormwater runoff have been computed for comparison for the 1, 2, 10, 25, and 100-year 24-hour storms events. Stormwater quality has been analyzed in accordance with the guidelines set forth in the *New York State Stormwater Management Design Manual*.

C. EXISTING CONDITIONS

The proposed project is located at the intersection of County Route 416 and Eager Road in the Town of Hamptonburgh, New York. The topography of the central development area south of Eager Road containing the proposed residential development is divided by a ridge that runs north-south, roughly parallel to County Route 416. Surface drainage west of the central ridge at Lazy Lane leads downslope to the west entering forested wetlands and wet meadow habitat at the toe of slope, eventually draining westwards to the Wallkill River via a north-flowing drainageway bordered by hedgerow habitat. Drainage on the eastern portion of the project site also flows downslope from the site's high point towards the central farm pond and wetlands to the east. Surface water flows on the eastern portion of the project site generally lack defined channels instead flow through wet meadow habitat downslope from the central ridge and through forested wetlands bordering the rail line prior to discharging south and east offsite.

Portions of the regulated wetland areas delineated onsite contain intermittent streams. These include the narrow, north/south trending wetland traversing the old field habitat adjacent to Route 416, and the narrow wetland delineated south of Lazy Lane. Linear wetland areas onsite were found to contain surface water and serve as conveyances of flow during storm events and from groundwater. Aside from the Wallkill River and onsite pond, small surface water streams onsite do not exhibit clearly defined stream banks, riffle/pool substrate or other indications of perennial flow. No intermittent streams occur on the project site outside of the boundaries of delineated wetlands shown on project plans and discussed in Chapter 3.4, Wetland Resources.

As shown in Figure 3.7-1, the site contains several surface water bodies; the most prominent is the pond in the center of the site, east of Lazy Lane. The site is divided into 5 drainage areas which govern the flow of surface water during rain events. These are also shown in Figure 3.7-1. Subarea 1 drains from the ridge west-northwest towards the intersection of Eager Road and County Route 416. Subarea 2 drains from the ridge eastwards towards the eastern property line. Subarea 3 drains from the ridge east-southeast towards the southeast corner of the project site. Subareas 4 and 5 are very small sections of the property, draining towards County Route 416 and towards the southeastern corner of the property respectively. The specific details of each of these drainage areas are summarized in Table 3.7-1. Table 3.7.2 also summarizes the predevelopment runoff volumes for the 1, 2, 10, 25 and 100 year storms.

Table 3.7-1
Pre-Development Characteristics

Subarea	Predominant Hydrologic Soil Group	Area (acres)	Tc* values (hrs)	CN* values (adjusted)
Subarea 1	C	117.61	0.5104	70.94
Subarea 2	C	49.85	0.2234	71.82
Subarea 3	C	105.99	0.5586	71.03
Subarea 4	C	4.61	0.1975	70.00
Subarea 5	D	5.34	0.2863	73.00

Notes: **Tc** is "time of concentration" representing the length of time surface runoff takes to travel from the most distant point in a subarea to its discharge point or "design point." **CN** is the "curve number" of a subwatershed, representing the ability of a parcel of land to retain/absorb water prior to generating surface runoff. Generally, the higher the curve number, the greater the watershed imperviousness and the faster runoff will be generated.

Source: Schoor DePalma, 2005

Table 3.7-2
Pre-Development Stormwater Runoff Volumes

Subarea	1Year Storm (ac-ft)	2 Year Storm (ac-ft)	10 Year Storm (ac-ft)	25 Year Storm (ac-ft)	100 Year Storm (ac-ft)
Subarea 1	6.9	10.43	24.52	32.41	44.88
Subarea 2	3.11	4.66	10.76	14.15	19.5
Subarea 3	6.21	9.39	22.09	29.21	40.45
Subarea 4	0.25	0.38	0.93	1.23	1.72
Subarea 5	0.35	0.53	1.19	1.56	2.14

Source: Schoor DePalma, 2005

D. THE FUTURE WITHOUT THE PROPOSED PROJECT

In the future without the Proposed Action, no changes to the project site are expected to occur and it would remain in its current condition.

E. POTENTIAL IMPACTS OF THE PROPOSED PROJECT

Stormwater management calculations are based on development of a 300 unit active-adult, age-restricted community. The community will be a combination of townhouses (22%) and single-family homes (78%). Approximately 17,803 linear feet of roadway will be constructed to provide access through the proposed project.

The stormwater collection system is designed based on a 10-year, 24-hour storm event. It is designed to collect runoff from all developed areas through a series of catch basins and a piping network to convey this runoff to onsite detention ponds. These improvements, including roads, buildings, utilities, and other improvements are shown on the large scale plans prepared by Schoor DePalma, Inc, which accompany this DEIS.

To conform to New York State stormwater requirements, detention basins have been sized to capture and treat runoff from the entire disturbed area of the site - all areas that would be cleared of vegetation and/or regraded. Roof leaders would be connected by pipes to the site drainage system.

As shown in Figure 3.7-2, drainage from the site is contained within 9 subareas. The time of concentration (Tc) for each of these subareas are represented in Table 3.7-3. The cover types and areas of each of these subareas are provided in Table 3.7-4.

Table 3.7-3
Characteristics

Subarea	Type of Soil	Area (acres)	Tc values (hrs)	CN values (adjusted)
Subarea 1A	C	65.100	0.5781	70.74
Subarea 1B	C	61.760	0.4279	80.03
Subarea 2A	C	30.200	0.2298	71.65
Subarea 2B	C	19.466	0.9954	81.95
Subarea 3A	C	60.660	0.5570	71.44
Subarea 3B	C	23.800	0.4180	81.34
Subarea 3C	C	12.464	0.3421	78.07
Subarea 4	C	4.610	0.1975	70.00
Subarea 5	D	5.340	0.2863	73.00

Source: Schoor DePalma, 2005

Table 3.7-4
Land Cover

Subarea	Grass (acres)	Woods (acres)	Lawns (acres)	Impervious (acres)	Total Area (acres)
Subarea 1A	49.040	16.060	0.0	0.0	65.100
Subarea 1B	0.0	0.0	45.695	16.065	61.760
Subarea 2A	13.590	16.610	0.0	0.0	30.200
Subarea 2B	0.0	0.0	13.015	6.451	19.466
Subarea 3A	31.543	29.117	0.0	0.0	60.660
Subarea 3B	0.0	0.0	16.716	7.274	23.800
Subarea 3C	0.0	0.0	10.348	2.116	12.464
Subarea 4	4.610	0.0	0.0	0.0	4.610
Subarea 5	0.0	5.340	0.0	0.0	5.340

Source: Schoor DePalma, 2005

Drainage in the condition closely follows pre-development flow patterns. Subareas 1A and 1B discharge to design point 1. Subareas 2A and 2B discharge to design point 2. Subareas 3A, 3B, and 3C discharge to design point 3. Subareas 4 and 5 remain unchanged by the proposed project.

STORMWATER MANAGEMENT PLAN

The extended detention ponds designed for the proposed project will perform the dual function of mitigating peak runoff rates as well as provide the necessary pollutant attenuation to meet the criteria set forth in the New York State Phase II Stormwater Management regulations. The location of these basins is shown in Figure 3.7-2. All five basins have contributing areas greater than 10.0 acres and are designed to meet the criteria for a P-1 micropool extended detention pond as set forth in the *New York State Stormwater Management Design Manual*. Runoff is directed overland and through a piping system to the detention basins. These facilities have been designed to capture and treat small and large storm events in accordance New York State regulations (SPDES General Permit # GP-02-01). Stormwater management facilities have been sized to hold the entire volume of runoff generated by the water quality storm event (WQv) and slowly meter the flow out over a period of time in excess of 24 hours. The basins are also designed to control runoff for storms up to and including the 100-year storm event such that the rate of discharge from the basins does not exceed pre-development rates.

Detention basin forebays are designed to store 10% of the water quality volume (WQv) and the micropools are designed to store 20% of the water quality volume in a permanent pool in accordance with New York State regulations. Table 3.7-5 summarizes the sizes of these components for each of the four detention basins proposed onsite.

Table 3.7-5
Pond Design Volumes

Description	Forebay		Micropool	
	Proposed	Required	Proposed	Required
Pond 1B	10,078 ft³	8,670 ft³	53,578 ft³	17,340 ft³
Pond 2B	5,011 ft³	1,654 ft³	8,959 ft³	3,308 ft³
Pond 3B	17,808 ft³	8,054 ft³	45,953 ft³	16,107 ft³
Pond 3C	2,941 ft³	1,987 ft³	10,428 ft³	3,975 ft³
Source: Schoor DePalma, 2005				

The total required runoff volume for the water quality event would be detained in the onsite detention basins for an extended period (in excess of 24 hours) producing a high level of pollutant removal and treatment of suspended solids. In addition to controlling the water quality event, the detention basin outlet structures have been designed to control the rate of runoff from the 1, 2, 10, 25, and 100-year 24-hour storm events. Capture and treatment of these storm events will satisfy New York State requirements for "Stream Channel Protection, Cp," "Overbank Flood, Qp" and "Extreme Storm, Qf" as specified in the *New York State Stormwater Management Design Manual*. These criteria have been adopted by New York State to prevent detrimental changes in stream morphology and downstream flooding. Each detention basin has been designed to insure that the post-development rate of discharge for each of the storm events is less than the discharge rates found in the pre-development condition.

The specific design detail of each of the outlet structures is included in the large scale plans that accompany this DEIS. Velocity dissipaters are specified at each inlet point into a basin. These dissipaters are designed as riprap pads per *New York Guidelines for Urban Erosion & Sediment Control*. Where required, the open sections of the stormwater conveyance system and culvert outlets would be stabilized with riprap.

As shown on the large scale plans, the sewer treatment facility on the west side of Route 416 shall be developed with a 15 foot paved access driveway and a paved parking area and access road around the building to provide adequate circulation for maintenance vehicles to service the facility. The storm water runoff along the driveway and the parking area and circulation road will be directed via overland flow into an open channel and catch basins and into an underground detention system. Underground detention will consist of drywells or low profile infiltrators along the access driveway and a perforated 48 inch-pipe surrounded by 1 inch to 1½ inch crushed stone under the pavement surface in the facility parking area. The system is designed to capture and treat the water quality volume for the new impervious area. The overflow will be directed to a level spreader swale and discharged to the south, maintaining the existing drainage pattern in the pre-developed condition.

STORMWATER RATE OF RUNOFF ANALYSIS

Modeling of the rate of stormwater runoff has been performed for the pre and post-development conditions. For both conditions the peak rates of runoff have been calculated for each of the 1 (Cp), 2, 10 (Qp), 25, and 100-year (Qf) storm events, the results are summarized in tables 3.7-6 to 3.7-10. Table 3.7.11 summarizes the Post Development discharge volumes for the various

storm events. Detailed routing computations for both pre-development and conditions are provided in Appendix D.

Table 3.7-6
Stormwater Runoff 1-Year Storm Event - cubic feet per second (cfs)

Description	Pre- Development Rate	Post-Development Rate	Reduction in Runoff
Design Point 1	47.24	37.49	21%
Design Point 2	29.52	17.81	40%
Design Point 3	40.85	27.67	32%
Design Point 4	2.40	2.40	0%
Design Point 5	3.15	3.15	0%
Source: Schoor DePalma, 2005			

Table 3.7-7
Stormwater Runoff 2-Year Storm Event - cubic feet per second (cfs)

Description	Pre- Development Rate	Post-Development Rate	Reduction in Runoff
Design Point 1	75.73	69.71	8%
Design Point 2	46.49	27.98	40%
Design Point 3	65.55	48.76	26%
Design Point 4	3.93	3.93	0%
Design Point 5	4.89	4.89	0%
Source: Schoor DePalma, 2005			

Table 3.7-8
Stormwater Runoff 10-Year Storm Event (Qp) - cubic feet per second (cfs)

Description	Pre-Development Rate	Post-Development Rate	Reduction in Runoff
Design Point 1	189.10	183.42	3%
Design Point 2	112.93	77.14	32%
Design Point 3	163.16	126.81	22%
Design Point 4	10.00	10.00	0%
Design Point 5	11.58	11.58	0%
Source: Schoor DePalma, 2005			

Table 3.7-9
Stormwater Runoff 25-Year Storm Event - cubic feet per second (cfs)

Description	Pre-Development Rate	Post-Development Rate	Reduction in Runoff
Design Point 1	251.64	133.62	7%
Design Point 2	149.14	105.08	29%
Design Point 3	216.83	164.91	24%
Design Point 4	13.39	13.39	0%
Design Point 5	15.23	15.23	0%
Source: Schoor DePalma, 2005			

Table 3.7-10
Stormwater Runoff 100-Year Storm Event (Qf) - cubic feet per second (cfs)

Description	Pre-Development Rate	Post-Development Rate	Reduction in Runoff
Design Point 1	349.01	301.48	14%
Design Point 2	105.22	144.31	29%
Design Point 3	301.05	221.35	27%
Design Point 4	18.69	18.69	0%
Design Point 5	20.89	20.89	0%
Source: Schoor DePalma, 2005			

Table 3.7-11
Post-Development Characteristics – Stormwater Runoff Volumes

Subarea	1Year Storm (ac-ft)	2 Year Strom (ac-ft)	10 Year Storm (ac-ft)	25 Year Storm (ac-ft)	100 Year Storm (ac-ft)
Subarea 1	8.8	13.10	29.61	38.62	44.88
Subarea 2	3.63	5.35	11.87	15.42	20.95
Subarea 3	6.29	9.50	21.88	28.67	39.3
Subarea 4	0.25	0.39	0.93	1.23	1.72
Subarea 5	0.35	0.53	1.19	1.56	2.14
Source: Schoor DePalma, 2005					

As shown in the stormwater runoff tables above, peak flow rates have been controlled to ensure that the rate of runoff from the site will not exceed pre-development rates for 1, 2, 10, 25, and 100-year 24-hour storm events. Most storms show a substantial reduction in the condition - 24% is the average reduction in post-development flow rates. These reductions in post-development discharge rates ensure that no down stream properties, watercourse or drainage systems will be adversely affected by the proposed project.

Emergency discharges are controlled. All ponds have an emergency spillway designed to handle the 100-year storm event that directs flows away from the proposed residences.

STORMWATER QUALITY ANALYSIS

The stormwater management system is designed in accordance with the NYS DEC design manual and modeled as P-1 ponds. Based on the *New York State Stormwater Management Design Manual*, the type of detention basins proposed for the Four Seasons project are the P-1 "micro pool extended detention pond." These facilities have published removal rates of 80% for total suspended sediment (TSS), 50% for total phosphorus (TP), 50% for total nitrogen (TN), 60% for Metals and 70% for Bacteria. Thus they will treat the primary runoff pollutants in accordance with the latest New York State guidance. In addition, the proposed basins will comply with NYS regulations by detaining the water quality volume (WQv) storm event for a minimum of 24 hours.

By applying the expected removal rates of the proposed Best Management Practices (BMP's), the ultimate stormwater pollutants generated by the proposed project will be minimized and any potential adverse downstream impacts will be avoided.

EROSION AND SEDIMENT CONTROL PLAN

In order to prevent the transport of sediment in runoff during project construction, a Sediment and Erosion Control Plan has been prepared in conformance with NYSDEC SPDES General Permit #GP-02-01. Part of the overall Stormwater Pollution Prevention Plan (SPPP) for the proposed project includes details of the permanent and temporary stormwater and erosion control practices. These are provided in the large scale plans that accompany this analysis.

All erosion control practices have been designed in accordance with the following publications:

- *New York State Guidelines for Urban Erosion and Sediment Control*, October 1992.
- New York State General Permit for Stormwater Discharges Associated with Construction Activities, GP-02-01 (General Permit) criteria as summarized in the NYSDEC *Stormwater Management Design Manual*
- *Reducing the Impacts of Stormwater Runoff from New Development*, published by the New York State Department of Environmental Conservation, second edition, April 1993.

Proposed soil erosion and sediment control devices include, protective earthmoving procedures and grading practices, vegetated cover, hay bale checks, silt fencing, and temporary silt traps. The approach of the plan is to control sedimentation, and re-establish vegetation as soon as practicable and to limit the amount of cleared land through project phasing. The Sediment and Erosion Control Plan will be implemented prior to commencement of earthmoving activities.

The primary goal of the soil erosion and sediment control measures is to reduce soil erosion from areas stripped of vegetation during and after construction, and to prevent discharge of silt offsite. Erosion control barriers shall be placed around exposed areas during construction. As shown in the Sediment and Erosion Control Plan, barriers shall consist of staked hay bales or silt fence. Temporary sediment basins will be used at stormwater collection points to allow sediment removal prior to releasing the stormwater offsite.

As shown in Figure 4-1, found in Chapter 4, "Construction Impacts," the proposed project would conform to a construction phasing plan which will limit the amount of actively disturbed land (bare soil) to no more than 5.0 acres at any one time, as required by New York State. All areas not under active construction shall be temporarily stabilized with mulch or seed within 14 days.

Any topsoil removed during construction will be temporarily stockpiled for future use in grading and landscaping. A stockpile location has been provided on the Erosion Control Plan and will be contained within a silt fence barrier. Temporary vegetation will be established to protect exposed soil areas during construction. If growing conditions are not suitable for the temporary vegetation, mulch will be used. Materials that may be used for mulching include: straw, hay, salt hay, wood fiber, synthetic soil stabilizers, mulch netting, and sod. Permanent vegetative cover will be established upon completion of construction of those areas that have been brought to finish grade.

A temporary stabilized construction entrances comprised of three inches of clean stone will be constructed at the entrances to the site. The purpose of a stabilized entrance is to remove as much soil from the construction vehicle tires prior to exiting the site to prevent tracking on area roadways. During construction, inlet protection will be installed at each storm sewer inlet to minimize the conveyance of silt and sediment through the storm sewer system.

GROUNDWATER

The proposed stormwater detention basins are designed in accordance with the New York State Stormwater Design Manual as design P-1, micropool extended detention basin. This practice treats runoff via extended detention. As such, infiltration to groundwater is not a primary component of the proposed basins. Instead, stormwater will be detained and treated in these vegetated surface basins and discharged as surface water at reduced rates. Therefore, no impacts to groundwater would occur as a result of the proposed stormwater management system. Minimizing new impervious surface through a clustered development layout and preservation of undeveloped lands on the project site will ensure that infiltration to groundwater will be sustained in the future with the project. Underground water resources and the results of onsite subsurface investigations and pump testing are described in full in Chapter 3.6, Groundwater Resources and in Appendix G, Hydrogeological Technical Report.

STORMWATER MANAGEMENT FACILITIES MAINTENANCE PROGRAM

Following completion of construction, an ongoing maintenance program will be undertaken to maintain the proper function of all stormwater control facilities. The program will be carried out by a homeowners association (HOA). The maintenance program will include the following:

- The side slopes and bottom of the pond will be mowed, as necessary, to maintain their appearance, but not less than twice a year. If necessary, invasive woody vegetation around and in the pond will be removed to prevent it from becoming established within the pond.
- During mowing operations, litter and debris will be removed from vegetated swale, micropool extended detention pond, and the outlet control structures.
- During the construction of the project, the site erosion and sediment control measures as well as basin embankments and outlet structures will be inspected once a week and/or immediately following a rainstorm. Any repairs required shall be performed in a timely manner. All sediment removal and/or repairs will be followed immediately by re-vegetation.
- All disturbed areas will be stabilized, and the sediment build-up in the pond removed before the pond is fine-graded and landscaped. After the construction is completed, any disturbed areas shall be stabilized immediately after the required work is completed.

- The HOA will inspect the stormwater management facilities once a month, and once a year by a Professional Engineer. A report by the Professional Engineer shall be submitted to the HOA and the Town of Hamptonburgh in the event deficiencies are found. In addition, the HOA will inspect the system after each major storm event to ensure the small orifices and inlets remain open. Specific attention will be paid to the following:
    - Evidence of clogging of outlet control device;
    - Erosion of the flow path through the detention facility;
    - Subsidence, erosion, cracking or tree growth on the embankments; and
    - Accumulation of sediment.
- Silt will be cleaned from catch basins and other drainage structures regularly, but not less than twice a year. Sediment will be removed from detention basins as required, but a minimum of every five years. A rubber-tired backhoe with a minimum reach of 25' will be used to remove silt accumulation. Laborers with hand tools will maintain the embankment slopes, repair minor erosion problems, and remove minor accumulations of silt. The use of hand labor will also minimize the disturbance of stabilized areas and the established vegetation. A PW170ES-6 a rubber-tired backhoe has the reach and maneuverability to maintain these ponds from the adjacent parking lots.
- Use of road salt for maintenance of parking areas will be minimized.
- Eroded areas and gullies will be restored and re-seeded as soon as possible.

WEST NILE VIRUS

The stormwater detention basin proposed for the project is NYSDEC Pond designated P-1. This is an extended detention basin that would discharge the entire volume of larger storms well before mosquitoes would have an opportunity to breed. Only a very small portion of the basin would contain a permanent pool, sufficient to contain only 20% of the water quality volume (WQv) storm event. This is the smallest storm volume considered in NYSDEC's Uniform Stormwater Sizing Criteria. Thus the vast majority of stormwater captured by these basins would not be retained in a permanent pool resulting in a basin that remains dry between rain events. Recent field observations conclude that constructed wetlands and stormwater management ponds actually pose a low risk in spreading the West Nile Virus since the mosquito species that are found in wetlands and stormwater management ponds tend not to be the variety that are known to carry the West Nile Virus. Within a healthy aquatic ecosystem, other aquatic invertebrates (dragonfly larvae and other species) prey on mosquito larvae thereby reducing mosquito populations. The Stormwater Pollution Prevention Plan that is approved by the NYSDEC will include a regular maintenance schedule to be executed by the homeowner's association. This may include the stocking of the basins with species to feed on potential mosquito larvae, and possible aeration systems to be exercised during periods of minimal flow through the ponds.

MITIGATION

The proposed project incorporates stormwater management practices that would treat runoff from the proposed project. These practices, designed in accordance with the regulations established by NYSDEC, would include water quality treatment, peak flow attenuation, and temporary and permanent erosion and sediment control measures. The proposed facilities would

be sufficient to mitigate the potential impacts of the proposed project related to the quantity and quality of stormwater runoff.