3.2 Soils and Topography

3.2.1. Environmental Setting

According to large scale geologic mapping of New York State (Geologic Map of New York Lower Hudson Sheet, reprinted 1995), at least two bedrock formations occur in the area of the proposed Hidden Creek project. The contact point for these two formations is depicted immediately southeast of the project site, in the vicinity of Freeland Street. Due to the scale at which these geology maps were drafted, this fault line is at best an approximation. The actual location of this contact fault can be either farther north or farther south of the subject property. To date, no on-site investigations have been conducted to confirm the geologic setting of this area.

The major bedrock formation depicted beneath the Hidden Creek site is a unit consisting of metamorphic rock of uncertain origin. The primary minerals within this formation are hornblende granite and granite gneiss. Depicted immediately south of the Hidden Creek site is the Wappinger Group formation. This formation is composed of limestone and other carbonate rock of Cambrian to lower Ordovician origin.

According to the Surficial Geologic Map of New York, Lower Hudson Sheet, 1989, the surficial deposits in the area of the site consist of glacial tills. Tills were outwash material deposited adjacent to melting glaciers. As a result, they tend to be poorly sorted and highly variable in texture (e.g. clay, silt-clay, or boulder clay). The thickness of these deposits is also highly variable, ranging from only three feet to as much as 160 feet thick.

Soils

Soils in the project area have been mapped and described by the USDA Soil Conservation Service in the Soil Survey of Orange County, New York, issued in 1981 and confirmed by a certified soil scientist as described later in this section. Generally, the soils consist of deep, moderately well drained and somewhat poorly drained, medium textured soils on gently sloping uplands. The soils adjacent to Ramapo Creek near the northern extent of the property are derived from recent alluvial deposits and are poorly to very poorly drained.

The soil mapping units found on the Hidden Creek project site are summarized below and are depicted in Figure 3.2-1 Soils, and Figure 3.2-1A Site Specific Soils Map.

- Mardin gravelly silt loam 3 to 8% slopes (MdB) These soils are deep, moderately well drained, slightly sloping and formed in glacial till deposits derived from sandstone, shale, and slate. They have a dense fragipan at 20 to 60 inches. The water table is typically perched above the fragipan in spring and other excessively wet periods. Depth to this seasonal high water table is between 1.5 to 2 feet. These soils are classified as non-hydric according to the Natural Resources Conservation Service. Permeability is moderate in the surface layer and is slow to very slow in the substratum. The depth to bedrock is typically more than 5 feet. This soil comprises a majority of the property south of Ramapo Creek . Typical soil textures are as follows:

A horizon (0 to 8 inches) - Gravely silt loam; weak fine granular structure; 15 % coarse fragments.

B2 horizon (8 to 20 inches) - Gravely silt loam; weak medium granular structure to moderate medium subangular blockystructure; 20-25% coarse fragments.

Bx horizon 20 to 60 inches) - Channery silt loam; weak very coarse prismatic structure parting to weak thin platy; coated with silt films; 30% coarse fragments.

v Erie gravelly silt loam, 3 to 8% slopes (ErA) This unit consists of deep, somewhat poorly drained, nearly level to gently sloping soil derived from glacial till material. It typically occurs on flat hilltops, foot slopes and lower hillsides, and along shallow drainageways of uplands. Depth of soils ranges from 54 to 70 inches. A dense fragipan exists between 10 and 24 inches below the surface. The seasonal high groundwater table is perched above the fragipan in spring and other wet periods. Depth to this water table is between 0.5 and 1.5 feet. These soils are classified as non-hydric according to the Natural Resources Conservation Service. Permeability is moderate in the surface layer and slow to very slow in the substratum. This soil is found in a thin strip just west of the site's center, beneath wetland "A". Typical soil textures are as follows:

A horizon (0 to 9 inches) - gravelly silt loam; moderate fine granular structure; 15% coarse fragments.

B2 horizon (9 to 18 inches) - Channery silt loam to channery fine sandy loam; moderate subangular blocky structure, 15% coarse fragments.

Bx horizon (18 to 54 inches) - Channery silty clay loam to very channery loam; very coarse prismatic structure parting to weak fine subangular blocky; 20% coarse fragments.

C horizon (54 to 70 inches) - Channery silty clay loam to very channery loam; firm; 20 % coarse fragments.

- Wayland silt loam (Wd) This unit is deep, poorly drained and very poorly drained soil formed in silty alluvial deposits. They occur on low floodplains adjacent to streams that periodically overflow. Although such flooding is common in the spring, the water table is between 0 and 0.5 feet from the surface for prolonged periods during the rest of the year. These soils are classified as hydric according to the Natural Resources Conservation Service. Permeability is moderate to moderately slow in the surface layer and slow in the subsoil. This alluvial soil is found along the nearly level floodplain associated with Ramapo Creek, and is contained entirely within the Ramapo Creek floodplain. Typical soil textures are described below:

  A horizon (0 to 9 inches) - Silt loam to silty clay loam; moderate fine granular structure.

  B2 horizon (9 to 17 inches) - Silt loam to silty clay loam; moderate fine granular structure.

  C horizon (17 to 60 inches) - silt loam or silty clay loam to fine sandy loam; weak medium subangular blocky structure.

In May of 2003, a soil scientist from Soil Science and Environmental Services conducted a site inspection for soils identification. This resulted in a site specific soil survey (Figure 3.2-1A). The Soils Report is attached to this DEIS as Appendix F. *The field map generated from this survey is generally consisted with the County Soil Survey, but also included areas of Chippewa soils, a very deep, poorly to very poorly drained soil formed in compact till deposits. Chippewa soils are described as follows:*

- Chippewa silt loam (Ch) This unit is deep, poorly drained and very poorly drained soil formed in compact till deposits. They occur in upland depressions. A dense fragipan is present in the subsoil. Permeability is moderate above the fragipan and slow or very slow in the fragipan and substratum. Slope ranges from 0 to 8 percent. Bedrock is greater than 60 inches. This soil is found within the depressional wetlands identified as Wetlands A and B and along the Ramapo Creek in the southwest corner of the site. Typical soil textures are described below:

  A horizon (0 to 6 inches) - Silt loam; medium to granular structure, friable, coarse

  Bg1 horizon (6 to 12 inches) - Silt loam; weak fine and medium subangular blocky structure; friable, slightly sticky.

Bg2 horizon (12 to 18 inches) - Silt loam; weak fine and medium subangular blocky structure; friable, slightly sticky

C horizon (18 to 72 inches) - silt loam; massive; friable; firm in place, slightly plastic.

Suitability of Soils for Use

The Soil Survey of Orange County provides a general overview of certain restrictive features as related to building site development for each of the different soil units. A detailed listing of soil limitations for those units found on the proposed Hidden Creek site is found in Table 3.2-1. Development limitations are considered *slight* where soil properties are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties are less favorable for the indicated use and special planning, design or maintenance may be needed to overcome or minimize the limitations; and *severe* if soil properties require special design and will necessitate increased costs to construct and possibly increased maintenance.

As noted in Table 3.2-1 the SCS identifies these soils as possessing potential limitations for development of roads, buildings, excavations, and lawns and landscaped areas due to their characteristics. Such limitations require planning consideration prior to development. The presence of these constraints does not mean the land is undevelopable, nor are they a rating of construction potential. The ratings reflect the difficulty and relative costs of corrective measures that may be necessary (e.g. erosion controls, footing drains or other drainage improvements) for development. The limiting characteristics of these soils may be overcome by careful project planning, design and management.

Table 3.2-1
Soil Characteristics and Limitations

Soil Series	Hydrologic Group[1]	Permeability (in./hr.)	Erosion Factor K[2]	Potential Limitations for:			
				Local Roads and Streets	Dwellings without basements	Dwellings w/ basements	Lawns and Landscaping
Erie (ErA)	C	0.6-2.0 (0-18" deep) <0.2 (18-70" deep)	0.24 - 0.28	Severe: frost	Severe: wetness frost action	Severe: wetness	Moderate: small stones, wetness
Mardin (MdB)	C	0.6-2.0 (8-20" deep) <0.2 (20-60"deep)	0.24 - 0.28	Moderate frost,	Moderate: frost wetness	Severe: wetness	Moderate: small stones
Wayland (Wd)	D	0.2 - 2.0 (0-9" deep) 0.06 - 0.2 (9-60" deep)	0.49	Severe: wetness, floods, frost action	Severe: wetness, floods, frost action	Severe: floods, wetness	Severe: wetness, floods

[1] Hydrologic groups are used to estimate runoff from precipitation; they range from high infiltration (A) to low infiltration (D).
[2] Erosion Factor K indicates susceptibility to sheet and rill erosion by water measured in tons/acre/year. K values range from 0.05 to 0.69. Higher values indicate greater susceptibility
Source: Soil Survey of Orange County, New York, USDA SCS

In general, the upland soils found on the Hidden Creek site have limitations related to wetness and frost action. Soils associated with the site's wetland features have limitations related to wetness and flooding. Project proposals to overcome those limitations associated with the site's upland soils are provided in section 3.2.3 Proposed Mitigation.

Topography and Slopes

Overall, the site contains a gently to moderately sloping topography that is characteristic of an out wash terrace landscape. Except for a small portion of the property in the very southwestern end, most of the site slopes to the north towards Ramapo Creek. The site's existing topography with two-foot contours is provided in Figure 3.2-2. Elevations above mean sea level range from approximately 656 feet at a low point along Ramapo Creek to approximately 716 feet in the southeast corner of the site. Topography varies approximately 60 feet across the site.

Unique features such as large boulders, ledges, or rock outcrops are not found on the Hidden Creek site. Three dilapidated stone walls were observed on the subject property. One of these stone walls forms the southern property boundary of the site. A second stone wall runs in a northeasterly to southwesterly direction behind the existing residence on the property. These stone features are best classified as an undefined mound of small stone and rock rather than an intact wall.

Figure 3.2-2 depicts the spatial distribution on the Hidden Creek site of slopes with the following slope categories: 1 to 10%, 10 to 15%, 15 to 25% and greater than 25%. Table 3.2-2 presents the total area (acres) and relative percent that each slope class currently occupies at this site.

Table 3.2-2
Slope Analysis for Hidden Creek
Existing Conditions

Slope Class	Area (acres)	Percent of site
1-10%	23.02	79%
10 - 15%	3.93	13%
15 - 25%	1.57	5%
>25%	0.78	3%

Source: Pietrzak and Pfau, Engineering and Surveying, 2002

As Table 3.2-2 indicates, the vast majority of the site has slopes of 10 percent or less. Only 6.28 acres, or 21.4 percent, of the Hidden Creek site has slopes greater than 10 percent with the greatest portion of this attributed to the 10 to 15 percent range. Most of these more sloping areas are associated with a hill side that bisects the central region of the site. Given the minimal amount of steep slopes on the subject property, building limitations related to topography are not anticipated for this project.

3.2.2. Potential Impacts

Soil Erosion Impacts

As a result of soil disturbance and vegetation removal, there is an increased potential for siltation to occur in areas downgradient of the subject site during site construction and as a result of changes to drainage patterns and concentration times. Changes in runoff velocities as a result of increased impervious surfaces may contribute to accelerated streambank erosion and scouring of existing channels within the Ramapo Creek if not mitigated. Sedimentation of the creek bottom could also result from exposed soils during the construction phase.

To estimate the quantities of long term soil erosion and sedimentation loading, the project engineers have utilized the protocols described in the New York State Department of Environmental Conservation Stormwater Management Design Manual to estimate the annual Total Suspended Solids (TSS) loading that would occur as a result of this project (see Table 3.2-3 and the Stormwater Pollution Prevention Plan, Appendix C). Although TSS can include particles washed off of impervious surfaces, a vast majority of TSS can be attributed to eroded sediment.

The existing drainage basins are shown in Figure 3.2-3. A total of four (4) drainage basins would be created on the Hidden Creek site as a result of this development. The location of the Proposed Drainage Basins is depicted in Figure 3.2-4. The estimated annual TSS loading within these proposed drainage basins is summarized in Table 3.2-3 below. As stated in the Stormwater Pollution Prevention Plan (Appendix C). These TSS values estimate the quantity and location of increased long-term erosion upon completion of the Hidden Creek development.

Table 3.2-3 Estimated Annual Sediment Loading Hidden Creek		
Location	**Basin Size (acres)**	**Potential TSS loading (lbs./yr)**
Basin 1S	2.84	372.5
Basins 2S and 3S	12.26	3,175.5
Basin 4S	20.08	2,277.4
Source: Pietrzak and Pfau, Engineering and Surveying, 2002		

Proposed drainage basin 1S would drain in a southerly direction toward a culvert under Forshee Street. Development has not been proposed in this drainage basin to avoid impacts to existing homes along this road. Proposed drainage basins 2S and 3S would drain toward two created detention ponds before ultimately discharging into Ramapo Creek via a single control structure. Basin 4S would drain in a westerly direction via overland flow before discharging directly into Ramapo Creek.

The three (3) proposed drainage basins that would drain into Ramapo Creek (basins 2S, 3S, and 4S) are predicted to generate an annual total suspended solid loading rate of 5,452.9 lbs/yr. This is higher than the TSS loading rate that is estimated for the portion of the Hidden Creek site that drains into Ramapo Creek under existing conditions (1385.6 lbs/yr).

The potential for soil erosion and run-off will be minimized during project construction by adhering to the proposed *Soil Erosion Control Plan.* A full sized drawing of this plan is located at the rear of this DEIS (Sheet 5 of 8, with details of proposed erosion controls shown on Sheet 8 of 8). Areas available for temporary material stockpiling have been identified on the Soils Erosion Control Plan. These areas would be primarily used for material stockpiling during road construction. The BMP's proposed are summarized below in Section 3.2.3, Mitigation Measures. It is anticipated that the erosion control measures proposed for this project, developed consistent with Best Management Practices and NYS DEC protocol, are sufficient to insure that there are no adverse impacts to downstream areas.

On-site Grading

Grading is required to build the internal road network, install site utilities and prepare level areas for the building units. Proposed grading is shown on the *Site Grading and Utility Plan,* full size drawing in the rear of the DEIS, and in Figure 3.2-5, Proposed Site Grading. The proposed topography, based on the slope categories of 0 to 10%, 10 to 15%, 15 to 25% and greater than 25%, is presented in Figure 3.2-6.

Approximately 17.3 acres, or 59 percent of the site must be graded to accommodate the proposed development. Based upon engineering estimates, total earth movement will involve approximately 51,510 cubic yards of material. Of this, approximately 26,609 cubic yards will be attributable to cuts and 24,901 cubic yards attributable to fill activities. Given these estimates, it is anticipated that a surplus of approximately 1700 cubic yards of material will be generated as a result of the proposed project. All excess fill will be used for on-site grading.

If it is determined after site evaluation that cut materials are not suitable for use as roadbed fill, it will be necessary to import up to 5,000 cubic yards of suitable material to construct the roadbeds. Such material will be evaluated for environmental cleanliness and adequacy for

their intended use. This volume is based on a cut/fill analysis of the proposed roadway as provided in Appendix I of this document. Any excess material remaining will be utilized on site as clean fill.

As Figure 3.2-1A indicates, the Mardin soils occupy the portion of the Hidden Creek site that would be graded. The site generated fill material would therefore be comprised of this soil unit. According to the US Department of Agriculture Soil Survey of Orange County, Mardin soils have a fair suitability for use as fill material. With properly built foundations, and sub grades, the possible frost action that is sometimes associated with this soil type is not expected to create a problem at the Hidden Creek site.

As shown in the Cut and Fill Plan (Figure 3.2-7), the bulk of the earth cuts would be located in the central portion of the property, along the proposed access road, and along elevated terrain in the western end of the site. Fill activities would mainly be located along the low areas up-gradient of Ramapo Creek and along a depressional valley just west of the site's center. The most significant grading would be required for the stormwater detention pond, located at the north-central region of the property. Between 10 to 15 feet of cut is anticipated to create these water quality control structures.

Slope Disturbances

Given that more than 23 acres of this 29.3 acre site have slopes that are less than 10%, impacts from this development to steep slopes are expected to be minimal on a total area basis. Table 3.2-4 indicates the total area and relative percent of each slope category for both pre construction and post construction conditions.

Table 3.2-4
Slope Analysis for Hidden Creek, Pre- and Post Construction Conditions

Slope Class	Pre Construction		Post Construction	
	Area (acres)	Percent of site	Area (acres)	Percent of Site
1-10%	23.02	79	19.34	66
10 - 15%	3.93	13	3.35	12
15 - 25%	1.57	5	2.47	8
>25%	0.78	3	4.15	14

Source: Pietrzak and Pfau, Engineering and Surveying

The Hidden Creek site currently contains 2.35 acres of slopes that are 15 percent or greater. An estimated 1.02 acres of such slopes will be impacted by the proposal. Figure 3.2-8, Slope Disturbance, identifies the areas of disturbance to slopes that are greater than 15 percent. The greatest portion of this disturbance is attributable to a hillside feature that arcs through the central and northeastern reaches of the property.

As illustrated in Figure 3.2-6 and as Table 3.2-4 suggests, 4.27 acres with slopes that are greater than 15 percent would be created upon completion of this project. These created areas of steep slopes are associated with the banks of two (2) proposed water quality detention basins.

The greatest potential impact due to the proposed steep slope disturbances is an increased risk of erosion during the construction phase of the project. By utilizing a number of sediment

and erosion control practices, it is anticipated that the potential erosion impacts will be minimized to the greatest extent possible.

3.2.3 Mitigation Measures

The greatest potential impact associated with this project relative to soils disturbance would be from erosion and sedimentation during construction. An Erosion Control plan is provided in the set of submitted site plans. The written portion of the Soil Erosion Control Plan is provided as part of the Stormwater Pollution Prevention Plan in Appendix C.

The primary aim of this plan is to reduce soil erosion from areas exposed during construction and prevent silt from reaching the on-site wetlands and areas downstream. All soil erosion and sedimentation control practices have been designed according to the New York State Department of Environmental Conservation Stormwater Management Design Manual. These devices would be installed and maintained in accordance with the approved plans, manufacturers' recommendations, and as directed by Village representatives including the Village engineer, highway superintendent, and building inspector.

The main objectives of the Soil Erosion and Sediment Control Plan are the following:

- control erosion at its source with temporary control structures,
- minimize the amount of sediment-laden runoff from areas of disturbance, and control the runoff prior to discharge to off-site areas.
- deconcentrate and distribute stormwater runoff through natural vegetation or structural means before discharge to critical zones such as streams or wetlands.

Prior to the commencement of any phase of this project that would result in the disturbance of soils, erosion and sediment control measures would be established in accordance with the specifications attached to final construction drawings. The installation of these control features would begin with the most down stream device and progress up gradient in order to minimize the migration of sediment off site.

A number of Best Management Practices were chosen to be used as part of this project, to help mitigate against possible erosion impacts. Details of these measures are shown on Sheet 8 of 8 with the attached plan set. Temporary measures to be used during construction include filter fabric silt fence, diversion swales, sediment traps, and existing vegetated filter strips. To stabilize areas of steep slopes and drainage channels, a combination of seed, straw mulch, jute netting, and riprap will be utilized. These would be left in place until permanent vegetative cover is established. A crushed stone tracking pad will be installed on the upper entrance to the Hidden Creek site to protect roadways from dust accumulation during construction. The strategic placement of all these features is depicted in the attached Erosion Control Plan (Sheet 5 of 8).

Full erosion and sediment control measures will be incorporated into the project construction. These practices will be in accordance with those set forth in the New York State Department of Environmental Conservation publication entitled "Stormwater Management Design Manual".

Erosion Control Measures:

The following erosion control measures will be incorporated to minimize erosion potential:

Filter fabric silt fence: Silt fence shall be used to control erosion from sheet flow on slopes not to exceed two horizontal to one vertical. Concentrated flows shall not be directed toward silt fence and spacing shall vary from 50' to 200' depending on slope steepness.

Permanent and temporary seeding mixtures: Permanent and temporary seeding, mulch, fertilizer, soil amendments, and slope stabilization will be used on seeded areas. Land that is stripped of vegetation will be left bare for the shortest time possible. Any area that will remain cleared, but not under construction for 20 days or longer, will be seeded with a temporary mixture. Topsoil shall be stockpiled, stabilized with temporary seeding, and saved for reuse on the site.

Slope Stabilization: All slopes shall be stabilized to minimize erosion. Slopes shall be stabilized with temporary seeding mixtures and straw mulch. Slopes in excess of four horizontal to one vertical shall be stabilized with jute netting and hydro-seed. Existing vegetation, which is not to be removed, will also act as filter strips to protect down-slope areas. Runoff will be diverted from newly graded areas to prevent erosion until a permanent ground cover has been established.

Dust Control: Measures for dust control during construction shall be implemented as needed (daily water sprays will be used during dry conditions and Calcium Chloride will be used only if necessary). In addition to water sprays, temporary plantings will aid in minimizing dust.

Temporary Diversion Swales: Temporary diversion swales shall be constructed to either divert clean storm water runoff from newly graded areas or direct sediment laden runoff to a sediment trapping device.

Channel Stabilization:Drainage channels and temporary diversion swales shall be stabilized with seed, jute netting or riprap, as specified, to minimize deterioration of the channel bed.

Sediment Traps: Sediment traps shall be constructed in the location, and be of size and type specified to collect sediment from sediment laden storm water runoff. Sediment traps shall be constructed downstream of disturbed areas and be in place prior to disturbance within the contributory area.

Stabilized Construction Entrance: Village and county roads will be protected by installation of crushed stone blanket for cleaning construction vehicle wheels. Blankets shall be placed at any intersection of a construction road with a paved or publicly owned road. Stabilized construction entrances shall be installed in the location and be of size and type specified.

Tree Protection: Trees to be preserved within areas of construction shall be protected. In areas of concentrated construction activity temporary fencing will be placed around the driplines. In all other areas, construction workers will be directed to avoid the storing of equipment or soil under trees to be preserved, in order to prevent soil compaction. If necessary, trees will be preserved with tree wells in fill areas, and retaining walls in cut areas.

Erosion Control Sequence

Prior to any site disturbance, the developer should thoroughly review and familiarize the approved erosion control plan. The installation of erosion control measures should begin with the most downstream device, then working upstream. When installing erosion control measures, the sequence should generally be as follows:

Prior to commencing construction activities, the limits of clearing and grading shall be clearly marked. Perimeter silt fence and stabilized construction entrances shall be put in place.

Upon completion of clearing and grubbing activities, topsoil shall be stripped from all areas to be disturbed and stockpiled. Stockpiled topsoil shall be stabilized by temporary seeding and surrounded with a perimeter silt fence.

Temporary erosion control devices shall be installed prior to commencing earth moving activities. This includes the installation of sediment traps, diversion swales, and check dams beginning at the most downstream portions of the site and then working upstream.

Immediately after completion of rough grading, remaining temporary erosion control shall be installed as specified, including additional silt fence, diversion swales, and check dams. Any areas not requiring further earth work shall be fine graded topsoiled and stabilized as early as possible.

Maintenance of Erosion Control Devices

The maintenance of erosion control devices will be the responsibility of the developer. A critical part of an effective erosion control plan is a conscientious maintenance program. All erosion control devices will be cleaned and restored throughout construction to maintain their effectiveness. The Job Superintendent will monitor the condition of all devices and clean or replace them as conditions require. All erosion control devices shall be installed and maintained in accordance with the approved plans, manufacturer's recommendations, and as directed by Village representatives including the Village engineer, highway superintendent, and building inspector.

Specific maintenance shall include:

- Maintaining seeded areas including reseeding weak areas, regrading wash outs and fertilizing.
- Maintaining mulched areas including replacement of disturbed mulched areas.
- All devices shall be inspected after each rain and repaired as needed.
- Sediment shall be removed from behind silt fence when bulges start to occur and fencing reset to original condition.
- Outlets in sediment basins shall be free of silt and debris by hand raking and cleaning after each rain storm.
- Construction equipment shall not unnecessarily cross drainage swales. Crossing of drainage channels shall be by means of bridges, culverts or other approved methods.
- Culverts shall be maintained free of silt or debris.
- Tree protection fencing to be inspected daily during grading and finish grading operations.

- Daily water sprays will be used as needed or as directed by the Consulting Engineer or Village representatives. Water sprays will be used to prevent pollution from dust until construction is completed and soil cover is established.

Removal of Erosion Control Devices:

No erosion control structures shall be removed until all work upstream has been completed, stabilized, and approved by the Consulting Engineer and Village Representatives.

The removal of erosion control devices should generally be as follows:

After construction, the temporary erosion control structures are to be removed in reverse order with the most upstream structure removed first and thence proceeding downstream.

All hay bales shall be removed and properly disposed of off-site.

All tree protection fencing shall be removed after adjacent areas have been graded, topsoiled, seeded, and vegetation has been established.

All temporary construction culverts shall be removed and areas graded, topsoiled, and seeded.

Any washouts shall be re-topsoiled and seeded.

Following construction, erosion and siltation will be prevented by the established vegetation and by the permanent stormwater management devices shown on the plans. The principal stormwater management and sediment control device is the detention basins proposed for the north-central portion of the property. Two such detention basins would be constructed as part of a staged treatment plan. It is anticipated that the two ponds acting in series will provide adequate treatment of run-off for the discharge into Ramapo Creek. Construction of the permanent stormwater management systems will commence as part of the initial earthwork for the project so that these systems are functional as early as possible in the construction period.

The regular maintenance of these erosion control features will be key to their efficiency and long term success. During the construction phase of the project, the job superintendent will be responsible for monitoring the condition of these devices and cleaning and replacing them as needed. Such maintenance would include reseeding, maintaining mulched areas, removing accumulated sediment from basins and silt fence, replacing silt fence, and upkeep of culverts and drainage channels.

Long term maintenance of all drainage structures, pipes, and treatment devices would be the responsibility of the HOA for the Hidden Creek Development. Such maintenance would include the regular inspection of these features as well as the periodic removal of accumulated sediment in the detention basins and the stabilization of any areas with eroding soils.