3.1 Geology, Soils and Topography

3.1.1 Existing Conditions

Geology, soils, and topography were addressed extensively in the DEIS. This Existing Conditions section summarizes the information provided previously to the Board.

Geology

The Minisceongo Park property lies within the Triassic Lowlands of the New England Upland physiographic province. The site is underlain by the Brunswick Formation, which extends throughout the central portion of Rockland County and eastward towards the Hudson River. The Brunswick Formation is part of the Newark Group and is characterized by sandstone, siltstone and mudstone.

Topography

The property has very gently sloping to nearly level topography, except along the easterly and northeasterly periphery of the site, which slopes up to Quaker Road and the Palisades Interstate Parkway ramp. The topography of the site has been heavily disturbed due to prior sand and gravel removal in the "upland" portion of the property. Topography in the vicinity of the property is generally flat to gently sloping with a small area of steeper slopes located in the northeast quadrant as shown on Figure 3.1-1 Local Topography.

On-site slopes are shown on Figure 3.1-2 - Existing Slopes Map. The upland portion of the site gradually slopes up to the east. Slopes in excess of 20 percent comprise a small portion of the property, 0.386 acres of a 53.3 acre site, and are located along the northeasterly and easterly boundaries of the site.

The highest elevations on the Minisceongo Park site are found along the easterly boundary at an approximate elevation of 430 feet. The lowest elevations on the site are located in the wetland area at an approximate elevation of 390 feet. There are no prominent or unique geologic or topographic features on the project site. Table 3.1-1 summarizes the amount of slopes found on-site by slope.

Table 3.1-1
Existing Slopes

Slope Category	*Approximate Acres*
20% to 25%	0.039
25% to 30%	0.013
30% to 35%	.005
>35%	.329

Source - Atzl, Scatassa, & Zigler, P.C., 2005.

Soil Types

The soils on the Minisceongo Park property have been identified using the soil classifications of the USDA Soil Conservation Service (SCS). Descriptions of soils are taken from the *Soil Survey of Rockland County* (SCS, October 1990). The property is underlain primarily by three (3) soil types: Pits, gravel, which is found in the central portion of the site; Hinckley gravely loamy sand, which is found on the eastern boundary of the site; and Carlisle muck, which is found on western boundary of the site. "Urban land" is also located on the site. The distribution of the soil types on the property is shown on Figure 3.1-3, Soils Map. The characteristics of each soil type are described in the DEIS.

Soil Characteristics

Rockland County Soil Survey

Soil characteristics are described in Table 3.1-2, below. The degree and kind of soil limitations that may affect typical building site development are also described in Table 3.1-2. This information has been compiled from data in the SCS *Soil Survey of Rockland County*. 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. The presence of constraints does not mean the land is undevelopable. The ratings reflect the difficulty and relative costs of corrective measures that may be necessary.

Table 3.1-2
Soil Characteristics and Limitations

Soil Series	Hydrologic Group[1]	Permeability (in./hr.)	Erosion Factor	Potential Limitations for:		
			K[2]	Local Roads, and Streets	Buildings w/ basements	Lawns and Landscaping
Pits, Gravel (Pt)	Not described by the Soil Survey of Rockland County					
Hinckley (HcA)	A	0.6-2.0 (0-17 in) >20 (17-60 in)	0.17-0.10	Slight	Slight	Severe: drought.
Carlisle Muck (Ca)	C	0.2-6.0 (0-80 in)	---	Severe: subsides, ponding, and frost action.	Severe: subsides, ponding, and low strength.	Severe: ponding, and excess humus.
Urban Land (Ux)	Not described by the Soil Survey of Rockland County					

[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 (expressed in tons/acre/year). K values range from 0.05 to 0.69.
Source: Soil Survey of Rockland County, New York, USDA SCS, 2005.

Subsurface Investigations

Various geotechnical surveys have been performed on the project site and provide data on subsurface conditions that are prevalent. According to a Geotechnical Report (see Appendix C of the DEIS), results of subsurface investigations indicate that the subsurface consists of miscellaneous fill underlain by glacial materials which consist of sands and silty sands with varying amounts of gravel, silt and clay throughout the site. However, the available subsurface data indicate that the fill material on the western portion of the site is underlain by a layer of highly compressible organic material followed by a layer of clay and silt prior to encountering glacial materials.

A description of each strata in descending order from the ground surface is provided below. For a detailed description, refer to the report in Appendix C of the DEIS.

Miscellaneous Fill - The fill layer generally consists of brown to greenish brown coarse to fine sand and silty sand with varying amounts of silt, gravel, cobbles, boulders, and debris. The fill layer is approximately 2 to 13 feet in thickness, and is thickest on the western portion of the site.

Organic Layer - The fill material on the western portion of the site is underlain by a layer of highly compressible organic material which ranges in thickness from approximately 1 to 6 feet. The organic layer generally consists of a combination of both highly compressible brown fibrous peat and brown to black organic silts. The moisture content within this layer ranged from as low as 21 percent in the organic silts to as high as 53 percent in the peat.

Silt and Clay Layer - The organic layer in the southwestern portion of the site is underlain by a layer of silt and clay which generally consists of silty clay to clayey silt with trace amounts of fine sand, gravel and vegetation. The silt and clay layer ranges in thickness from approximately 4 to 29 feet, averaging approximately 14 feet, with the layer thickness increasing towards the southwestern most portion of the site. The moisture content for this layer ranged from approximately 22 to 32 percent.

Glacial Materials - The underlying glacial materials generally consist of medium dense to dense sand to silty sand with varying amounts of gravel, and silt and clay seams, throughout the site. The glacial material was encountered at depths ranging from 2 to 39 feet.

Groundwater - Below the above mentioned layers, groundwater was encountered at depths ranging from one to 10 feet across the site.

The implications of these subsurface soil investigations on the use of the site for a mixed use development are described in the impact section below.

3.1.2 Potential Impacts

Geology

No impacts to bedrock geology are anticipated as a result of geotechnical investigations summarized in a Geotechnical Engineering Report dated November 5, 2003 (see Appendix C of the DEIS). According to that report, bedrock was not encountered in any of the borings

conducted on the site, the deepest of which extended to 82.5 feet. Thus, no rock removal or blasting is anticipated.

Slopes

Soil erosion during construction is related in part to the amount of disturbance to steep slopes which would be susceptible to erosion. As described previously, less than one percent (1%) of the entire site consists of slopes greater than 20 percent. Impacts to slopes would be minimal for the Minisceongo Park development because of the general flatness of the site and the limited areas of steep slopes to be disturbed.

Soil Impacts

Suitability of Soils Based on Rockland County Soil Survey

The majority of the commercial, residential road and parking construction will occur within soils previously disturbed and mapped as "pit, gravel" soils. Fill is needed to make this site suitable for the proposed project. Suitable fill has been brought to these areas to construct the development.

Subsurface Improvement Program

As a result of the subsurface investigations conducted for the project site, a subgrade improvement program is necessary to construct the Minisceongo Park development. The existing subsurface conditions include uncontrolled fill and underlying compressible organic soils. Without a subgrade improvement program, construction on the existing soils would result in settlement of structures. Upon completion of the proposed subgrade improvement program, the proposed residential buildings would be constructed on shallow foundations resting in the engineered fill material. While post-settlements may still occur, the magnitude of such settlement is expected to be under two inches and relatively uniform.

A two phase improvement program will occur. The program will consist of a combination of a surcharge program in the area of the western portion of the site which has not been previously surcharged, combined with surface compaction throughout the site. Areas to be surcharged are shown in Figure 3.11-1, Surcharge Plan, in the Construction-Related Effects section of the DEIS.

Surcharge plates have been installed to monitor settlement of the fill; monitoring will occur over a period of approximately 4 months. If all permits and approvals have been secured, there is no overlap between the surcharge phase, and the site work and building construction phase. Acceptable compaction and settlement must be demonstrated in order to proceed to the site work phase.

Surcharge Program

The proposed surcharge program would involve areas of roadway and building construction west of the proposed entrance to the development on Route 202, except the area which was previously surcharged as a result of previous proposed site development. The extent of the proposed surcharge area, along with the previously surcharged area are shown in Figure

3.11-2. A description of the proposed surcharge program in both building and roadway/parking areas is as follows:

Preload Areas - Preload areas will be brought to proposed grade by placing fill in these areas.

Building Surcharge Program - A surcharge program will be conducted for the proposed buildings and will consist of approximately 7 feet of surcharge above the finished elevations of the residential buildings for a period of approximately 3-4 months.

Settlement plates will be installed and monitored by the Geotechnical Engineer retained to oversee the surcharge program to ensure that the majority of the settlement has been completed prior to construction of utilities and surface features.

Surface Compaction

Throughout the site, footing subgrades must be surface compacted with at least six passes of a smooth drum vibratory roller having a minimum static drum weight of 7 tons. This will compact loose areas with uncontrolled fill and improve the overall engineering properties of the material. Any soft or wet areas exhibiting excessive pumping, rutting, or other evidence of poor subgrade must be removed to competent material and replaced with granular fill.

Fill Placement

Based on proposed site grading, fill is required to raise grades within the site. The fill would be granular material, with no more than 15 percent fines and no pieces larger than 6 inches. The fill would not contain wood, metal, or other deleterious materials.

As discussed in Section 3.11 - Construction Effects, the construction fill phase will require fill suitable for the surcharge and surface compaction program. The amount of fill to be imported is to be determined. It is expected that soils excavated for the residential buildings, cuts for roads, and other excavated materials can be used to raise the site to final grade.

Grading Plan

After the surcharge and surface compaction occurs, final grading and recontouring of soils will be required. Areas of proposed grading and soil disturbance for the site will be shown on a detailed grading plan.

Soil Erosion during Construction

The potential for soil erosion will be greatest during the initial surcharge and surface compaction phase, and then during site work and grading, when soils are exposed. These construction-related impacts would be temporary and would be mitigated by a Soil Erosion and Sediment Control Plan (see mitigation section below). As final grades are achieved, disturbed areas will be stabilized, seeded and landscaped.

Cut and Fill

The site would be filled during the construction fill phase. The proposed plan requires clean fill to be brought onto the site. This fill will be imported onto the site during the surcharge and site work phases described in Section 3.11 of the SEIS.

Construction and Demolition Debris

Site debris from the previous use for automotive repair exists on site. According to a letter report by Henningson, Durham & Richardson Architecture and Engineering P.C./ Lawler, Matusky & Skelly Engineers LLP (HDR|LMS), dated April 28, 2006 (See Appendix F), construction and demolition materials containing asphalt, concrete, and bricks were described and metal, wood, cut stone and roofing shingles were observed in certain test pits. Soil samples were collected for semi-volatile organic compounds, metals, pesticides, and PCBs and submitted as required to the New York State Department of Health.

Three distinct "Areas of Concern" (AOC) on site were noted and described in the report. The New York State Department of Conservation has stated that the existing construction and debris materials may remain in place without any further remediation except in locations within the footprint of a building or structure. Because of geotechnical reasons the material within the footprint would be removed, and the applicant would be permitted to handle it on site with a deed restriction and engineering controls to limit potential future human contact with it. The material would be removed and relocated outside of the footprint, but within the AOC.

HDR/LMS met with NYSDEC in February 2008 to determine whether the site would be regulated in accordance with one of NYSDEC's monitoring or remedial programs. Although NYSDEC acknowledges that the site has been filled with construction and demolition debris material, the agency has determined that the extent of the deposited materials is not significant enough to require that it enter one of the NYSDEC's regulatory programs, based on the sampling results and test pit investigation.

HDR/LMS was consulted during preparation of this SEIS to check again on status of any NYSDEC review. The agency has grandfathered the existing "landfill" under Solid Waste regulations. The project site is not in any regulatory program, either state or county.

Upon the Lead Agency's acceptance of the SEIS document as complete for public review, the SEIS will be transmitted to the NYSDEC for any comments it may have with regard to the foregoing.

3.1.3 Mitigation Measures

The development will require a NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities (Permit No. GP-0-08-001) as it proposes to disturb more than one (1) acre of land. In addition, the project must conform to the Soil Erosion and Sediment Control Law of the Town of Haverstraw (Chapter 140 of the Code of the Town of Haverstraw). The Town's law requires that the applicant obtain a land disturbance permit from the Town Engineering Department. These approvals ensure that all potential soil erosion impacts are mitigated through the preparation of an erosion and sediment control plan. The Town of Ramapo does not have a separate local law regulating Soil Erosion and Sediment Control. This is addressed through site plan review and approval.

Soil Erosion and Sediment Control Plan

Erosion and sedimentation will be controlled during the construction period by temporary devices in accordance with the Erosion Control Plan to be developed for this project.

An erosion control plan will be prepared by Atzl, Scatassa, & Zigler, P.C., and Ray Ahmadi, PhD, P.E., to address erosion control and slope stabilization during all construction phases of the project. These plans will be developed in accordance with the Erosion and Sediment Control Guidelines in the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities (Permit No. GP-0-08-001). The plans will includes limitations on the area of disturbance and devices to be used to help control soil erosion such as silt fencing, storm inlet protection and a stabilized construction entrance.

Best Management Practices (BMPs)

The following best management practices will be followed in the development of the erosion control plan:

- divert clean surface water before it reaches the construction area;
- control erosion at its source with temporary and permanent soil protection measures;
- capture sediment-laden runoff from areas of disturbance and filter the runoff prior to discharge; and,
- decelerate and distribute storm water runoff through natural vegetative buffers or structural means before discharge to off-site areas.

These objectives will be achieved by utilizing a collective approach to managing runoff, i.e. Best Management Practices (BMPs).

Divert clean runoff - Diversion of runoff from off-site or stabilized areas will be accomplished through surface swales and erosion control barriers in order to keep clean water clean.

Time grading and construction to minimize soil exposure - To the extent practical, the development will be phased to limit the area of disturbed soil at any particular time. One phase of construction, for example, will be temporarily stabilized until the preceding phase is substantially complete.

Retain existing vegetation wherever feasible - Silt fencing will be used to physically define the limits of work. Wooded and wetland areas not to be developed (regraded), will be retained in the existing condition until the developed areas are completed and stabilized. Substantial buffers of existing vegetation also will be provided along the perimeter of the site and near existing wetland areas.

Stabilize disturbed areas as soon as possible - In areas where work will not occur for periods longer than 15 days , soil will be stabilized by seeding or mulching. Following completion of grading operations, level areas will be immediately seeded and mulched. Sloped areas, such as fill slopes may be seeded or stabilized depending upon weather conditions at the time of carrying out the work.

Minimize the length and steepness of slopes - The steepness and length of slopes will be designed to minimize runoff velocities and to control concentrated flow. Where concentrated (swale) flow from exposed surfaces is expected to be greater than 3 feet per second, haybale or stone check dams will be installed in the swale. The check dams will be placed so that unchecked flow lengths will not be greater than 100 feet.

Maintain low runoff velocities - To protect disturbed areas from storm water runoff, haybale diversion berms and/or soil diversion berms and channels will be installed wherever runoff is likely to traverse soils. Rough grading for the temporary and permanent swales and ponds will take place. The swales will direct runoff so that it can be checked or impounded.

Trap sediment on-site and prior to reaching critical areas such as wetlands - Silt fences, hay bale check dams, filter strips, ponds, sediment traps (in areas where no ponds are proposed), and catch basin filters will be used to either impound sediment-carrying runoff and or to filter the runoff as it flows through an area. Silt fencing, augmented by haybale barriers installed on the upgradient side of the silt fencing, will be used wherever land disturbance occurs within 100 feet of the on-site NYSDEC wetlands. A stabilized construction entrance will be installed at the single construction entrance to prevent construction vehicles from tracking soil onto public roads. All temporary erosion control devices will be installed prior to the commencement of construction. The permanent storm water management systems will be installed in conjunction with the residential construction.

Establish a thorough maintenance and repair program - Erosion control measures will be inspected frequently, particularly prior to and following storms, and repaired as needed to ensure that they function properly. In addition to inspections by Town of Ramapo and Haverstraw officials, the applicant will be responsible for monitoring and maintaining the soil erosion and sediment controls at all times.

Assign responsibility for the maintenance program - The responsibility for the monitoring and maintenance of the Erosion Control Plan will be detailed in the project specifications and construction drawings.

With these controls in place, the applicant anticipates that there will be no significant impacts that result from site disturbances to soils and topography.