3.1 Geology, Soils and Topography

The purpose of this section of the DGEIS is to identify whether there are any on-site geologic, soil or topographic conditions that would preclude construction of the residential development, what potential impacts may arise from grading activities associated with construction of the project, and what mitigation measures are necessary to reduce said impacts.

3.1.1 Existing Conditions

Geology

The site is underlain by Normanskill Formation, which is made up of shale, argillite and siltstone, as shown on the Geologic Map of New York Lower Hudson Sheet, Fisher, 1970. The property is located in the southeastern part of Ulster County, which is located in the Hudson Lowland area, where shale and siltstone predominate. Most of the property, located on the north side of Dock Road, was mined for sand and gravel. These activities did not receive a permit from the New York State Department of Environmental Conservation (NYSDEC) because no more than 750 cubic yards (1,000 tons) of material were removed from the site during any one year. Mining operations stopped several years ago, according to Ms. Halina Duda with NYSDEC[1].

Soils

As stated above, much of the site has been mined. The soil descriptions below are based on soil map data reported in the Soil Survey of Ulster County, New York (Soil Conservation Service, June 1979) which may reflect pre-mining soil conditions. According to the Soil Survey, on-site soils include:

- Hoosic soils very steep (HSF);
- Riverhead fine sandy loam, 0-3 percent slopes (RvA);
- Chenango gravelly silt loam, 3-8 percent slopes (CnB);
- Raynham silt loam (Ra);
- Hoosic gravelly loam, 15 to 25 percent slopes (HgD);
- Freshwater Marsh (FW);
- Cut and Fill Land (CF); and
- Made Land (ML).

The distribution of soil types is shown on Figure 3.1-3, Soils Map. The characteristics for each soil mapping unit is described below - the narrative is taken from the Ulster County Soil Survey.

Hoosic soils, very steep (HSF)

This soil unit includes deep, somewhat excessively drained soils which have been formed in glacial outwash. Slopes range from 35 to 55 percent. The water table is found greater than 6 feet below the ground surface. Permeability is moderately rapid in the surface layer and subsoil and is rapid or very rapid in the substratum. Available water capacity is very low to low while the runoff is very rapid. Depth to bedrock is greater than 60 inches below the ground surface. This soil is not a hydric (i.e., a soil indicative of wetlands) soil. This soil type is considered a fair source of sand and good source of gravel if needed for construction.

[1] *Phone conversation held on June 30, 2011.*

HSF soils constitute approximately 12.4 acres of the project site, as shown on Figure 3.1-1, Soils Map.

Riverhead fine sandy loam (RvA)

This soil unit includes deep, well drained, nearly level soils with slopes of 0-3 percent. This soil is mainly formed from water-laid deltaic deposits from streams that entered glacial lakes and is found on the top of deltas. The water table is typically greater than 6 feet below the ground surface and this soil is susceptible to drought in the summer time. Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is moderate while runoff is slow. Depth to bedrock is greater than 60 inches below the ground surface. This soil is not a hydric soil. It is normally considered not to be good to use as roadfill but can be used as topsoil in areas, although it is considered clayey and too thin.

Riverhead fine sandy loam soils are mapped within the central portion of the site extending to the north and east over approximately 7.5 acres, as shown on Figure 3.1-1, Soils Map.

Chenango gravelly silt loam (CnB)

This soil unit includes deep, well drained and somewhat excessively drained soils that have a slope category of 3 to 8 percent. These soils are formed in glacial outwash and are normally found on the undulating parts of outwash plains. The water table is typically found at greater than 6 feet below the ground surface. Permeability is moderate or moderately rapid in the surface layer and subsoil and is rapid in the substratum. Available water capacity is low to moderate while the runoff is medium. Depth to bedrock is greater than 60 inches below the ground surface. The soil is not considered a hydric soil according to the USDA NRCS. This soil is considered a fair source of sand and a good source of gravel, if needed for construction.

Chenango gravelly silt loam is mapped in the central northwestern section of the property across approximately 2.9 acres, as shown on Figure 3.1-1, Soils Map.

Raynham silt loam (Ra)

This soil unit includes deep, somewhat poorly drained soil located in water-laid deposits and is considered nearly level. The slopes in this soil unit typically range from 0 to 3 percent. The water table is considered seasonally high and rises to approximately 6 to 18 inches below the ground surface in the spring. Permeability is moderate in the surface layer and is moderate or moderately slow in the subsoil and slow in the substratum. Available water capacity is moderate while the runoff slow. Depth to bedrock is greater than 60 inches below the ground surface. The soil unit is not considered a hydric soil according to the USDA NRCS. This soil is considered poor for use as sand, gravel or roadfill but is a good source for topsoil, if needed for construction use.

Raynham silt loam is mapped in the northwestern corner of the property adjacent to NYS Route 9W across approximately 1.9 acres, as shown on Figure 3.1-1, Soils Map.

Hoosic gravelly loam (HgD)

This soil unit includes deep, somewhat excessively drained soil which was formed by glacial outwash. The slopes associated with this soil are typically 15 to 25 percent, also considered

moderately steep. The water table is typically found at greater than 6 feet below the ground surface. Permeability is moderately rapid in the surface layer and subsoil and is rapid or very rapid in the substratum. Available water capacity is very low to low while the runoff is rapid to very rapid. Depth to bedrock is greater than 60 inches below the ground surface. The soil unit is not a hydric soil. This soil is a good source for gravel and a fair source for sand, if needed for construction.

Hoosic gravelly loam is mapped with the northwestern portion of the property across approximately 1.6 acres, as shown on Figure 3.1-1, Soils Map.

Freshwater Marsh (FW), Made Land (ML) and Cut and Fill Land (CF)

Freshwater Marsh (FW), Made Land (ML) and Cut and Fill Land (CF) make up the remainder of the Dockside property. These soil units comprise less then one acre of the property and are located in areas that are not proposed to be developed. Freshwater Marsh (FM) are found at the toe of a slope immediately along Dock Road and are comprised of gravelly loam and silt loam. There is frequent ponding with the water table found at the surface during most of the year. The drainage is found to be poor while the water capacity is very high.

Cut and fill land (CF) can have a slope of 0 to 8 percent and is made up of gravelly sandy loam and very gravelly sandy loam. The water table can be found approximately 36 inches below the ground surface. The drainage is found to be somewhat excessive while the water capacity is low. Made Land (ML) can have a slope of 0 to 5 percent and is made up of channery loam and very gravelly sandy loam. The water table can be found 24 to 36 inches below the ground surface. The drainage is considered somewhat excessive while the water capacity is low.

These miscellaneous soil units (FW, CF, and ML) are found the eastern portion of the site near the boundaries of the property, as shown on Figure 3.1-1, Soils Map.

As noted in Table 3.1-1, the SCS has identifies soils according to their “usefulness” as construction material, i.e., for development of roads, buildings and excavations as per their general characteristics. Any limitations require planning consideration prior to development. The presence of these limitations does not mean the land cannot be developed nor are they a rating of construction potential. The ratings merely 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. 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 limiting characteristics of these soils may be overcome by careful project planning, design and management.

Table 3.1-1
Soil Characteristics and Limitations

Soil Series	Hydrologic Group[1]	Permeability (in./hr) at depth (in.)	Erosion Factor	Potential Limitations for:		
			K[2]	Roads, Parking Lots	Buildings with basements	Shallow excavations
Hoosic soils, very steep (HSF)	A	2.0-6.0 @ 0-20" >6.0 @ 20-80"	0.17 (0-80")	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Riverhead fine sandy loam (RvA)	B	0.2-0.6 @ 0-8" 0.06-0.2 @ 8-50"	0.49 (0-8") 0.28 (8-50")	Moderate: frost action	Slight------	Severe: cutbanks cave.
Chenango gravelly silt loam (CnB)	A	0.6-6.0 @ 0-35" 6.0-20 @ 35-80"	0.24 (0-9") 0.20 (9-35") 0.17 (35-80")	Moderate: frost action.	Slight-----	Severe: small stones.
Raynham silt loam (Ra)	C	6.0-2.0 @ 0-8" 0.2-2.0 @ 8-37" 0.06-0.2 @ 37-56"	0.49 (0-8") 0.64 8-56"	Severe: frost action.	Severe: wetness.	Severe: wetness.
Hoosic gravelly loam (HgD)	A	2.0-6.0 @ 0-20" >6.0 @ 20-80"	0.17 (0-80")	Severe: slope.	Severe: slope.	Severe: slope, small stones.

[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.
FW, CF and ML were not discussed above because these soils are not anticipated to be disturbed for the property development.
Source: Soil Survey of Ulster County, New York, USDA SCS.

Hoosic soils and Riverhead fine sandy loam soils are the majority of the soils on the property, and are rated with slight to severe limitations for the construction of local roads, buildings with basements, and shallow excavations associated with utilities. These limitations are due primarily to wetness and slopes. Chenango soils are rated with slight, moderate and severe limitations for the construction of roads, buildings with basements, and for shallow excavations, respectively. Such limitations are due to the wetness of the soil and the presence of small stones. Raynham soils are rated with severe limitations for the construction of roads, buildings without basements, and for shallow excavations. Such limitations are due to the wetness of the soils. The limitations of the above mentioned soils do not preclude development on these soils, but may require a greater degree of engineering and construction costs.

Topography

The entire property, 27.19 acres, consists of a combination of flat to moderate to steeply sloping terrain. At the northwestern corner of the property, the site slopes down towards the southeast then levels out in the center of the site where mining had occurred. The site slopes steeply down along the southeastern boundaries of the site adjacent to Dock Road. Topography in the general vicinity is shown on Figure 3.1-2, Local Topography. In general, existing grades on the

project site are at an elevation of approximately 184 feet above mean sea level in the northwestern portion of the property to 20 feet above mean sea level in the southeastern portion of the property. The existing condition of the site and its topography is shown on Figure 3.1-3, Existing Slopes.

Environmentally Sensitive Lands

Environmentally "sensitive" lands, as per the Scoping Document, would include sensitive ecological habitat, wetlands, watercourses, and similar features. The most sensitive areas of the site are found on the south side of Dock Road adjacent to and including Lattintown Creek. Regulated wetlands and the creek are present on this parcel.

3.1.2 Potential Impacts

In general, geologic and soil conditions do not pose constraints to building development on the subject property. The primary limitations are the existing slope conditions which arise from previous activities, i.e., mining. The proposed development has been designed to work with the existing on-site grades to the maximum extent practicable.

Grading Activities

Of the 27.19-acre site, grading, excavation and filling will occur on 15.35 acres of the total site. Figure 3.1-4 illustrates the amount and locations of cut and fill that will occur on the project site. As shown in the drawing, the construction will involve cuts that range from 1 to 40 feet below the existing grade and fills that range from 1 to 26 feet above existing grade. The deepest areas of fill will occur in the southcentral portion of the site and the most substantial areas requiring cut are located within the northwestern portion of the site. The proposed grading plan for the Project Site is presented on Figure 3.1-5 and shows the proposed grades of the property. The existing on-site slopes are being altered to accommodate the proposed residential buildings and accessory structures and utilities.

Based on calculations provided by the project engineer, approximately 127,500 cubic yards of material will be cut on the site and 137,000 cubic yards of fill is required to construct the foundation of the proposed buildings and the road network. Approximately 9,500 cubic yards of material are needed to be brought to the site. The required fill includes the material to be imported for construction of the roads and driveways, totaling approximately 8,000 cubic yards which makes the site statistically balanced (1,500 yards of fill is about 1% of the total fill needed).

On-site soils will be used as fill material per the cut and fill analysis. As described in the SCS Soil Survey of Ulster County, some soils have a rating of poor to fair for use as road fill, sand, gravel, and topsoil. These soils can be used but are not recommended for structural fill under roads or for the foundations of buildings. Crushed rock will be imported to add strength to the road base and building foundations.

The soil survey indicates that bedrock is not within 60 inches of the surface and rock outcrops have not been observed onsite. Therefore, bedrock is unlikely to be encountered during construction of the development.

Potential Soil Erosion

As a result of soil disturbance there is an increased potential for siltation to occur in areas downgradient of the site. Soil erosion and sediment control during construction is critical to minimize potential impacts to the Hudson River and the local watershed. Existing steep slopes are stabilized with brush and tree vegetation - these areas located along the northern and southern boundaries are not anticipated to be disturbed and therefore will remain stabilized.

As described above, the site slopes down towards the southeast, generally towards the Hudson River. The project engineer has developed a Construction Phasing and Erosion Control Plan, Figure 3.1-6 (as well as Sheet C-4), which is described below. The potential for soil erosion and runoff will be minimized during project construction by adhering to this Phasing Plan and the Erosion Control Plan.

Mined Land Reclamation Concept

The NYSDEC was contacted and Ms. Halina Duda was reached to discuss the mining operations at the site. Ms. Duda stated that the property was used as a sand and gravel mine previously. It never received a mining permit from the NYSDEC because it could not be determined that more than 750 cubic yards (1,000 tons) of material was removed from the site during any one year. Mining operations stopped several years ago and at that point the site was graded to eliminate excessive slopes, and seeding was completed to stabilize the mined area. A formal reclamation plan is not required by the NYSDEC since the site did not require a permit.[2]

Environmentally Sensitive Lands

The project, by design, avoids environmentally sensitive features. Specifically, except for the construction of a stormwater basin on the south side of Dock Road, regulated wetlands and Lattintown Creek will not be disturbed. The isolated wetlands located on the north side of Dock Road will be disturbed. However, these isolated wetlands which were likely created as a result of the on-site mining activities have limited ecological function, and disturbance of these areas through grading and filling does not represent a significant impact.

3.1.3 Mitigation Measures

Soil Erosion and Sediment Control Plan

An Erosion Control Plan and Phasing Plan, Figure 3.1-6, has been prepared to control soil movement in areas that will be disturbed - the plan is included in the site plan set as Drawing C-3. The plan specifies that not more then 4.21 acres (less than 5 acres) will be disturbed at any one time.

The Soil Erosion and Sediment Control Plan indicates that the controls are to be used in conjunction with the Stormwater Pollution Prevention Program document (SWPPP) as required for the NYSDEC General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001). The SWPPP is provided in Appendix C. Erosion and sediment control measures have been devised consistent with the NYSDEC “Guidelines for Urban Erosion and Sediment Control”.

[2] Phone Conversation with Ms. Halina Duda, NYSDEC Regional Mined Land Reclamation Specialist, June 30, 2011.

The 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 structural means before discharge to critical zones such as the Hudson River; and
- Maintain erosion control features in order that they properly function, as designed.

Following construction and disturbance of the 15.35 acres, noted above, soils will be stabilized by the introduction of 7.33 acres of impervious surfaces, vegetation, and by the stormwater management devices shown on the site plan. Areas to remain vegetated include landscaped areas and natural open space, which will total 19.86 acres. Of this total, 8.02 acres of the site will be landscaped, and 11.84 acres will remain in its natural vegetative state. Construction of the permanent stormwater management system will commence as part of the initial earthwork for the project so that the system is functional as early as possible in the construction period.

Slope Stabilization

Limited areas of steep slope on the site will be graded and retaining walls will be used. These areas include an existing slope between the northern property boundary and Building 3, and at the project entrance at Dock Road. These slopes will be graded to a 2 on 1 slope and will be stabilized with vegetation. Seed mixes recommended for steep slopes include Ernst "Crownvetch Seeding Mix (Naturalized)", or Ernst "Native Steep Slope Mix with Annual Ryegrass", or similar mixture.

Once seeded, the slopes will be mulched with straw, hydromulch or fiber mats to protect the seeds and further stabilize the slopes until germination.

In certain areas of the site, retaining walls will be used to stabilize post-development slopes. Retaining walls are proposed behind Buildings 14, 15, 16, 17, and 18 as shown on Figure 3.1-5. Also, a retaining wall will be constructed along a segment of Road A near the site's property boundary with the wastewater treatment plant site. The largest area of fill is behind Building 18, which requires approximately 16 feet of fill to bring the backyard up to a flat grade. A retaining wall is proposed to provide level ground in the backyards of the building.

Nonstructural grading techniques and structural retaining walls will stabilize post-development slopes where necessary.

USDA Natural Resources Conservation Service

Site Property Boundary

N
W E
S

0 50 100 200 300 Meters

0 250 500 1,000 1,500 Feet

Web Soil Survey
National Cooperative Soil Survey

Figure 3.1-1: Soils Map

Dockside at Marlborough
Town of Marlborough, Ulster County, New York
Source: NCSS Web Soil Survey
Scale: Graphic Scale as shown

File 11013 07/01/11
JS/11013

Tim Miller Associates, Inc.,10 North Street, Cold Spring, New York 10516 (845) 265-4400 Fax (845) 265-4418

Site Property Boundary

N
W E
S

Figure 3.1-2: Local Topography
Dockside at Marlborough
Town of Marlborough, Orange County, New York
Map: USGS 7.5-minute Topographic Map, Wappingers Falls Quad
Scale: 1" = 1,000'

File 11013 07/01/11
JS:\11013

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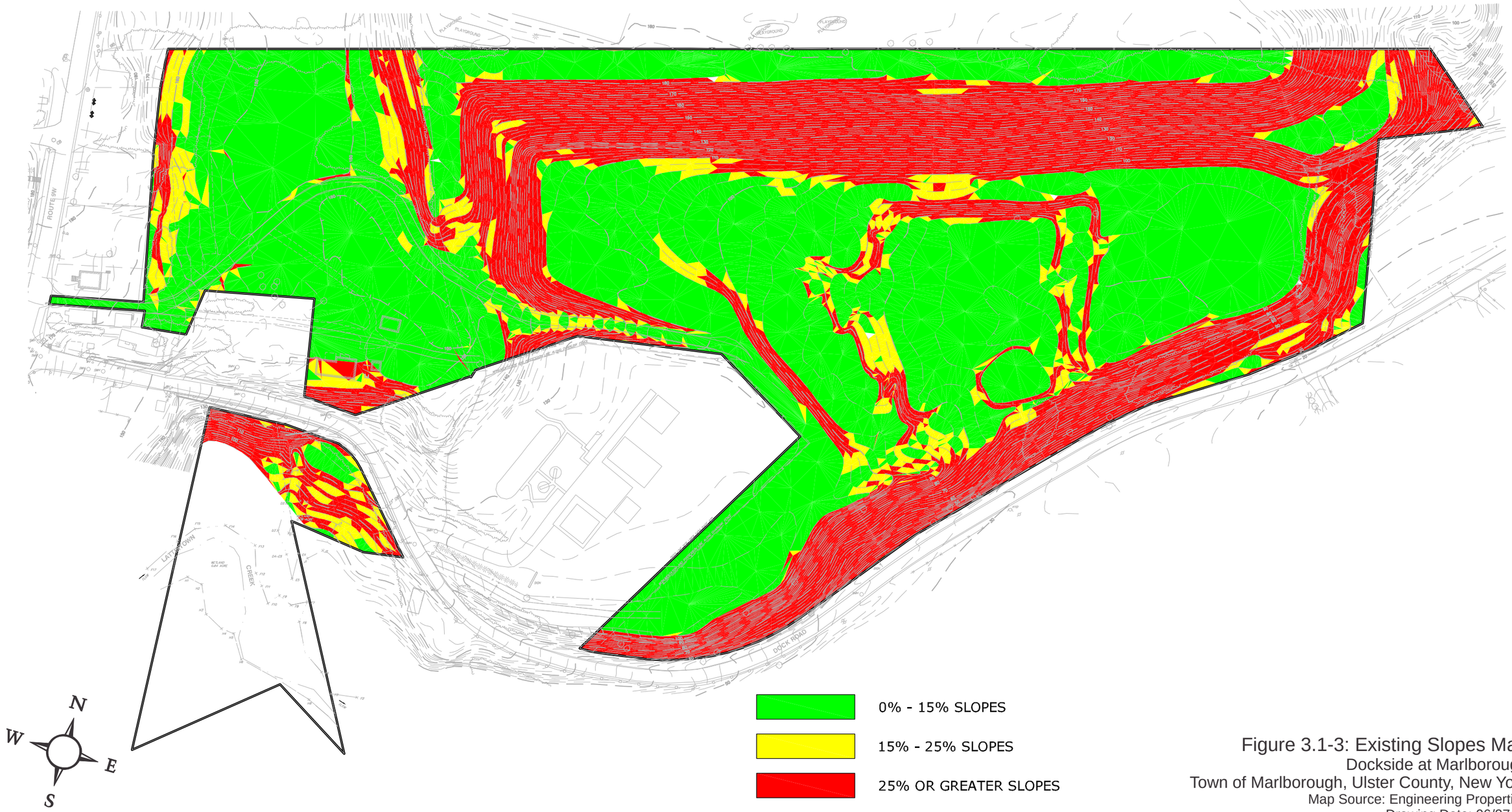

0% - 15% SLOPES

15% - 25% SLOPES

25% OR GREATER SLOPES

Figure 3.1-3: Existing Slopes Map

Dockside at Marlborough

Town of Marlborough, Ulster County, New York

Map Source: Engineering Properties

Drawing Date: 06/27/11

Scale: 1" = 150'

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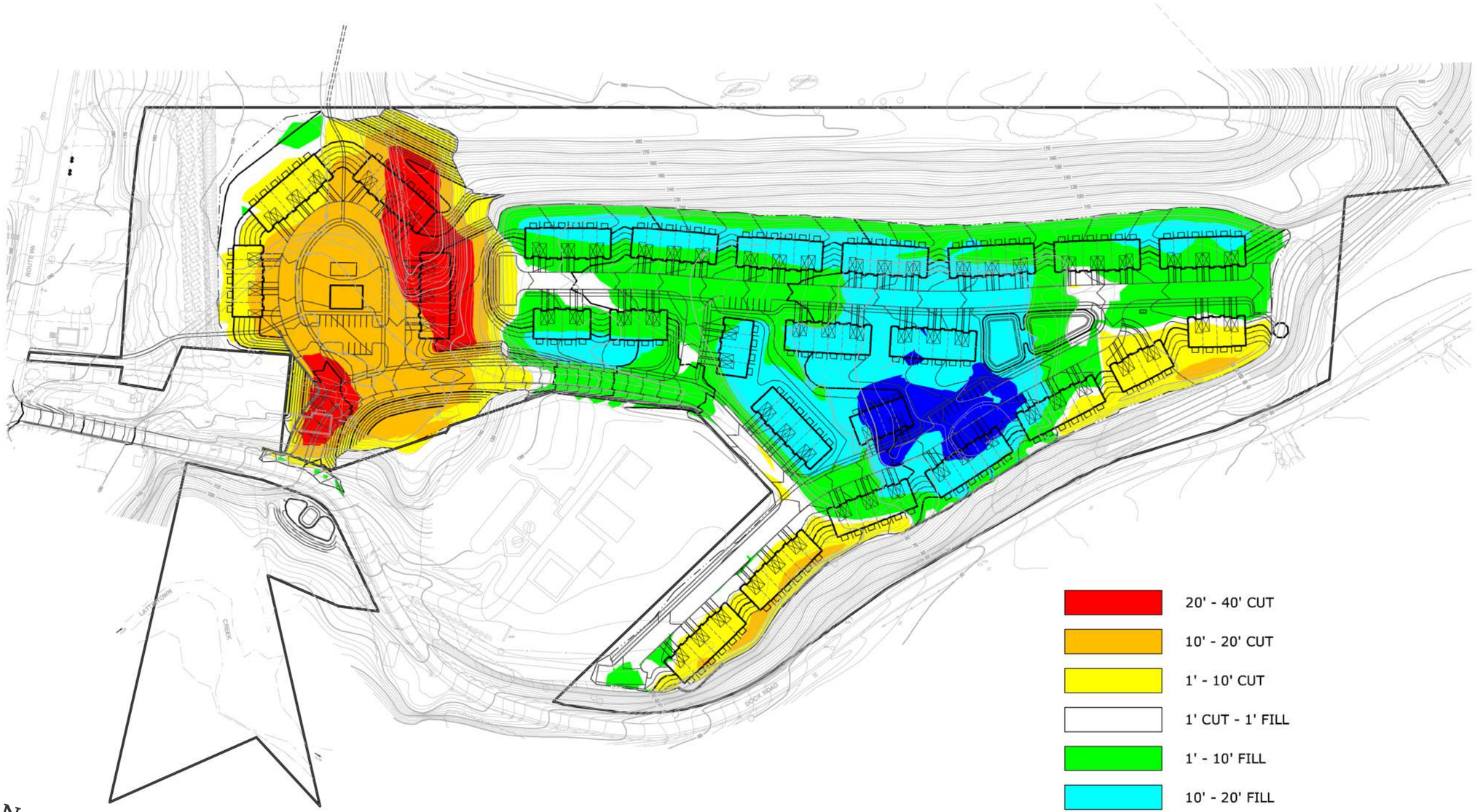

Figure 3.1-4: Cut and Fill Analysis
Dockside at Marlborough
Town of Marlborough, Ulster County, New York
Map Source: Engineering Properties
Drawing Date: 06/27/11
Scale: 1" = 150'

File 11013 07/01/11
JS/11013

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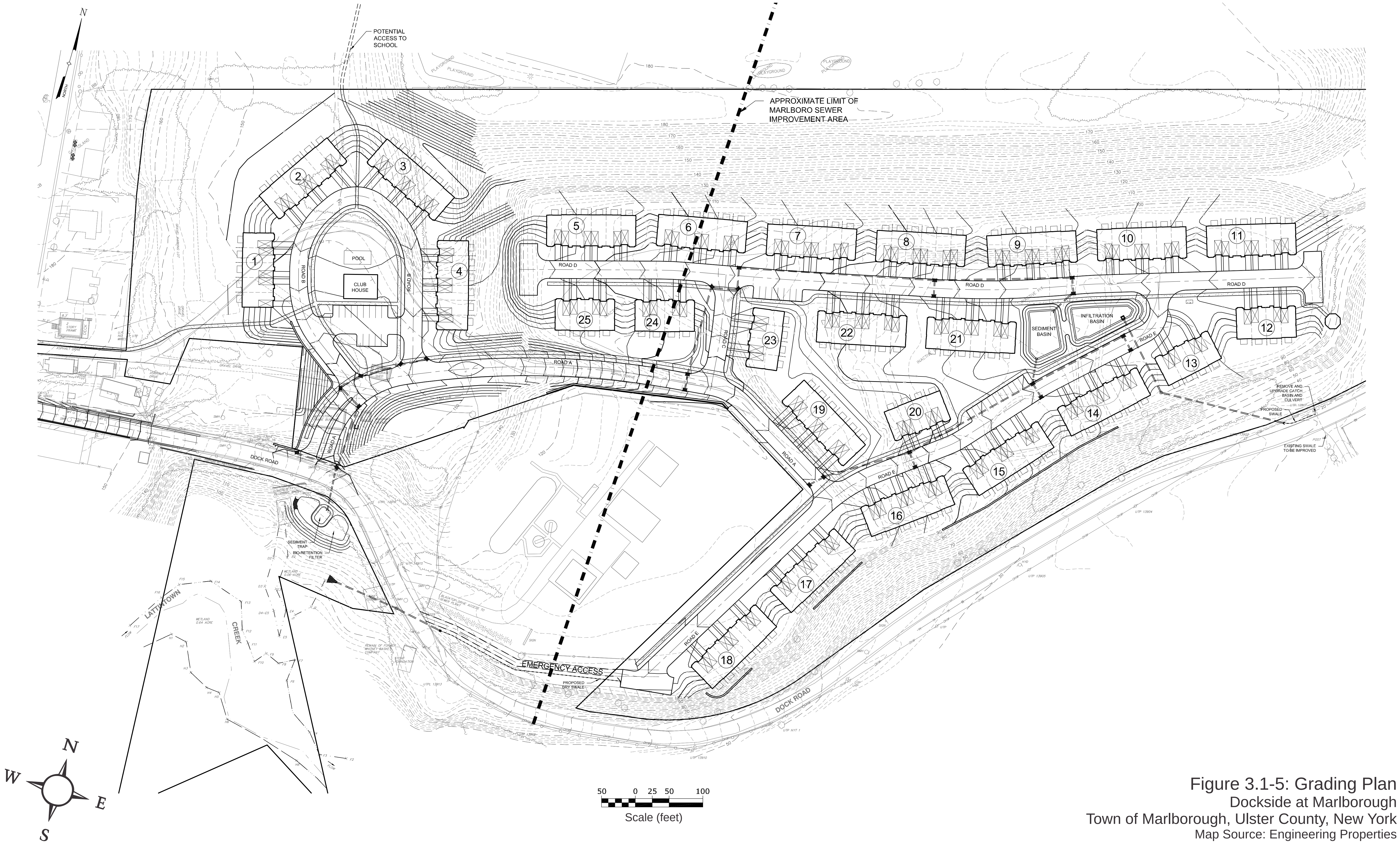

50 0 25 50 100

Scale (feet)

Figure 3.1-5: Grading Plan

Dockside at Marlborough

Town of Marlborough, Ulster County, New York

Map Source: Engineering Properties

Drawing Date: 06/27/11

Scale: 1" = 170'

File 11013 11/28/11
JS/11013

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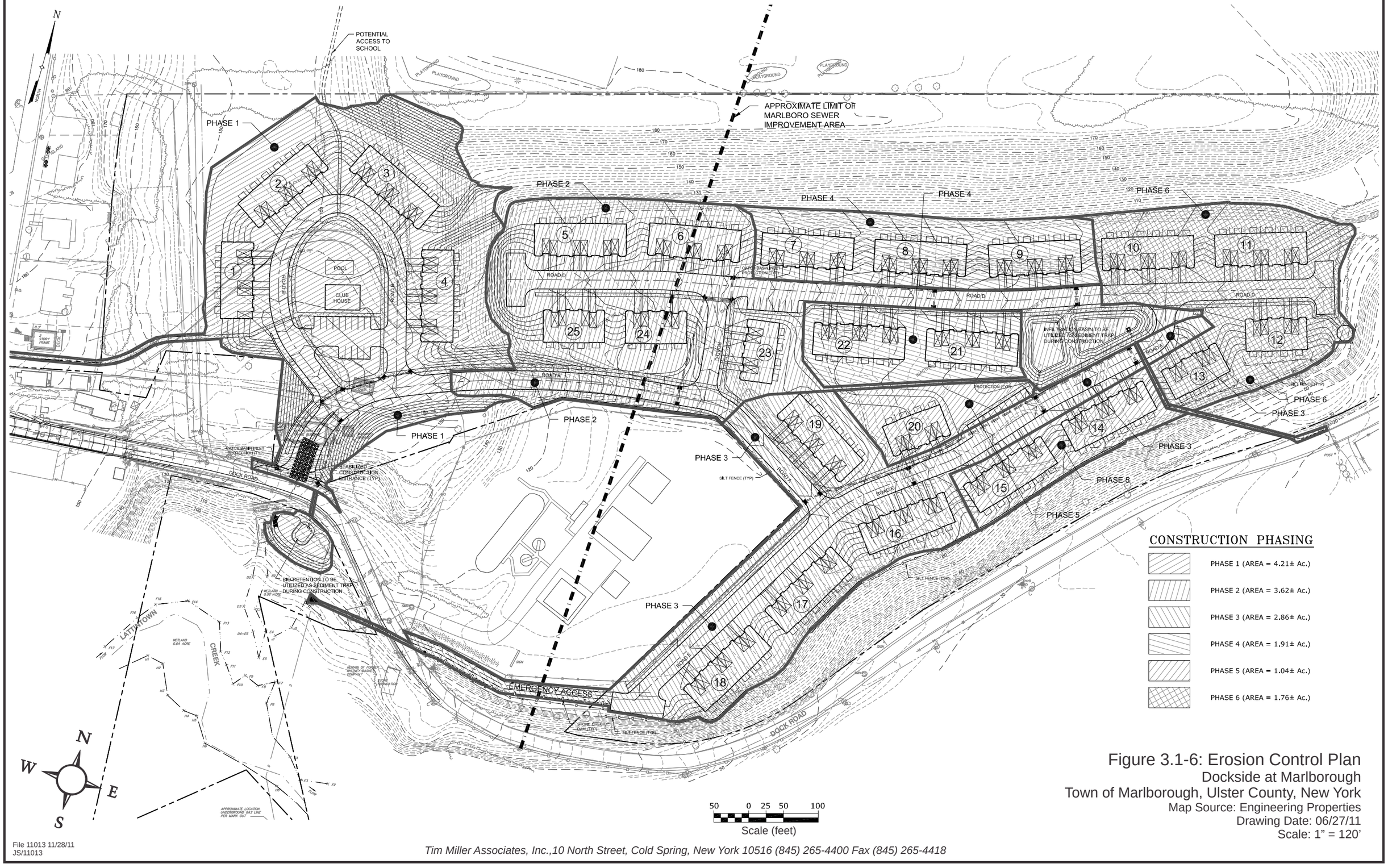

Figure 3.1-6: Erosion Control Plan

Dockside at Marlborough
Town of Marlborough, Ulster County, New York
Map Source: Engineering Properties
Drawing Date: 06/27/11
Scale: 1" = 120'

File 11013 11/28/11
JS/11013

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