BLOCK 46 AND 47 REDEVELOPMENT INVESTIGATION

HARRISON TOWNSHIP, NEW JERSEY

Preliminary Investigation
Non-Condemnation
DRAFT: 09/19/18

BLOCK 46
LOTS 2
BLOCK 47
LOTS 1, 2, 3, 3.01 AND 4

Acknowledgements

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Louis Manzo

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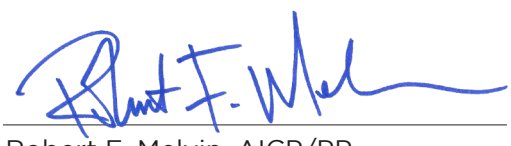
Prepared by:



Robert F. Melvin, AICP/PP
NJ Planner License No. 04018

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1.0 Introduction

1.1. Study Authorization

Harrison Township, through Resolution No. 151-2018 and 159-2018 (Appendix A), has requested that Group Melvin Design perform a Preliminary Investigation into the following parcels to ascertain whether this area qualifies under N.J.S.A. 40A:12A-5 as an "Area in Need of Redevelopment":

Block 46, Lots 2; Block 47, Lots 1, 2, 3, and 4 (Resolution 151-2108) and Block 47, Lot 3.01 (Resolution 159-2018)

Figure 1 identifies the location and surrounding environs of the Investigation Parcels.

1.2. Summary of Findings

1.2.a. Block 46, Lots 2; Block 47, Lots 1, 2, 3, and 4: Criterion C

The analysis presented within this document serves as the basis for the recommendation that the Study Parcels of Block 46, Lot 2, and Block 47 Lots 1, 2, 3, 3.01, and 4 qualify as an Area in Need of Redevelopment.

It is the determination of this report that the Study Parcels of Block 46, Lot 2 and Block 47 Lots 1, 2, 3, and 4 meet Criterion C. These parcels are not likely to be developed through the instrumentality of private capital because of the soils' acidity (pH level) or potential for acidification, corrosive qualities, and developmental imitation corrosion of concrete, corrosion of steel, as well as issues for lawns, landscaping, and golf fairways. Criterion C only applies to publicly owned land, or unimproved privately owned that has remained as unimproved vacant land for a period of at least 10 years. Block 46, Lot 2 and Block 47 Lots 1, 2, 3, and 4 are privately-owned and have been vacant and unimproved for over 10 years.

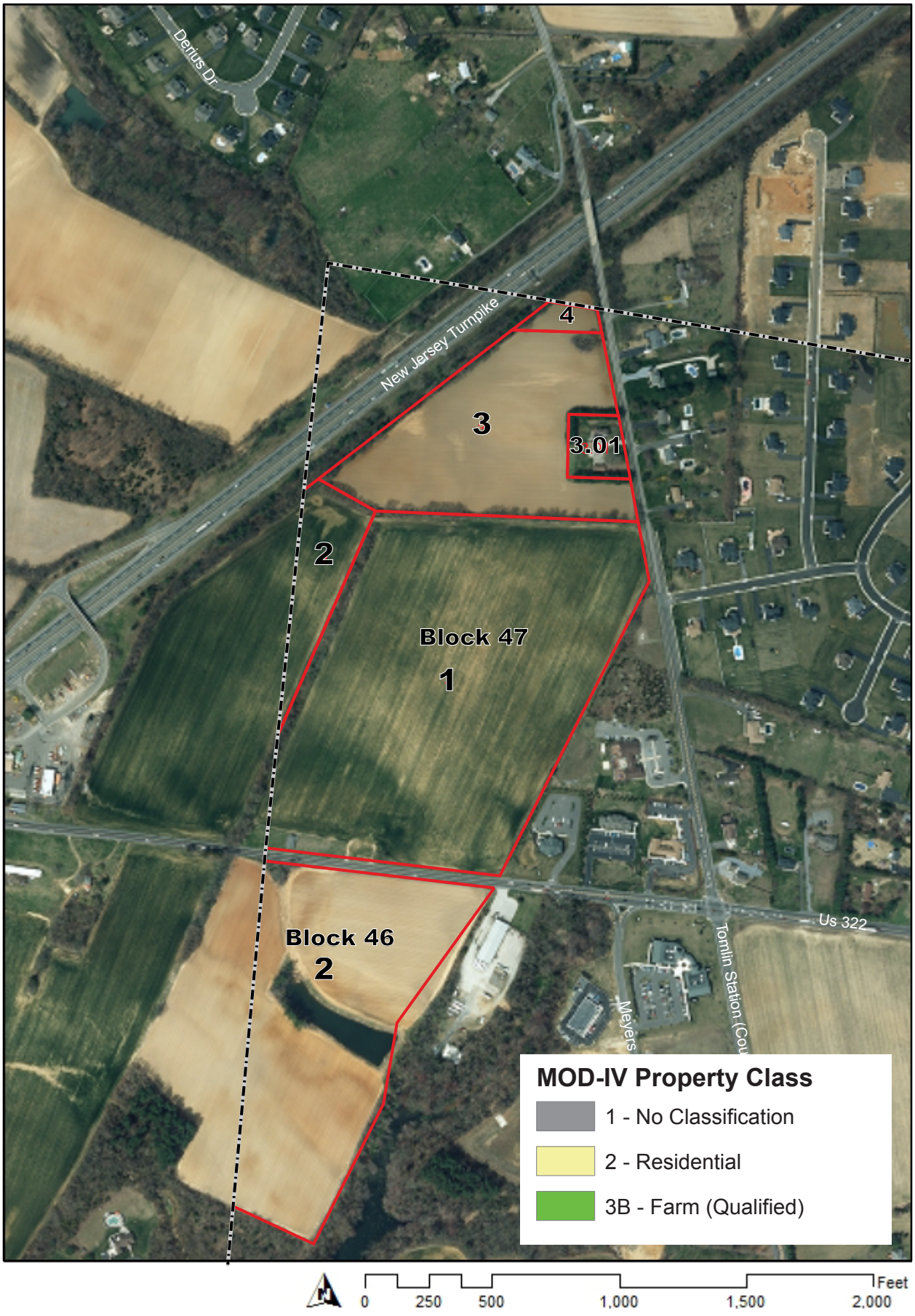
This report also finds that Block 47, Lot 3.01 is found necessary for the effective development of the area and should be included in the designation under the "Section 3" criterion. Lot 3.01 is enclosed on three sides by Lot 3 and its exclusion would limit the development potential of the area.

1.3. Non-Condemnation

As of 2013, the Legislature requires that Preliminary Investigations state whether the redevelopment area determination shall authorize the municipality to use all those powers provided by the Legislature for use in a redevelopment area, including eminent domain.

Resolution #159 - 2018 states that if the Study Area qualifies as an Area in Need of Redevelopment, the Township of Harrison is authorized to further qualify the area as a "Non-condemnation Redevelopment Area," such that the municipality may use all those powers provided in the Legislature for the use in the designated area in need of redevelopment excluding only the use of eminent domain pursuant to N.J.S.A. 40A: 12A-1 et seq.

Figure 1. Redevelopment Parcels Blocks and Lots



2.0 Redevelopment Law

2.1. Purpose of the Act

New Jersey's Local Redevelopment and Housing Law (LRHL), empowers municipalities and local governments with the ability to initiate a process that transforms underutilized or poorly designed properties into healthier, more vibrant, or economically productive land areas. The process has been used successfully across New Jersey to creatively improve properties meeting statutory redevelopment criteria. Projects approved for redevelopment are often eligible for certain types of technical and financial assistance from the State.

2.2. Redevelopment Procedure

The LRHL requires municipalities to perform a number of steps before it may exercise its Redevelopment powers. This process is meant, in part, to ensure that the Governing Body acts in concert with the goals and objectives of the Township's Master Plan. Recognizing the Planning Board's role as the steward of the Master Plan, these steps require the Planning Board to make recommendations to the Township Council. The required steps are as follows:

A. The Governing Body must adopt a resolution directing the Planning Board to perform a preliminary investigation to determine whether a specified area is in need of redevelopment according to criteria set forth in the LRHL (N.J.S.A. 40A:12A-5). The Township Council has adopted Resolution No. 2013-6-14.

B. The Planning Board must prepare and make available a map delineating the boundaries of the proposed redevelopment area, specifying the parcels to be included in it. This map should be accompanied by a statement setting forth the basis of the investigation.

C. The Planning Board must then conduct the investigation and produce a report presenting the findings. The Board must also hold a duly noticed hearing to present the results of the investigation and to allow interested parties to give testimony. The Planning Board then may adopt a resolution recommending a course of action to the Governing Body.

D. The Governing Body may act on this recommendation by adopting a resolution designating the area an "Area in Need of Redevelopment". The Governing Body must make the final determination as to the Redevelopment Area boundaries.

E. A Redevelopment Plan must be prepared establishing the goals, objectives, and specific actions to be taken with regard to the "Area in Need of Redevelopment."

F. The Governing Body may then act on the Plan by passing an ordinance adopting the Plan as an amendment to the Township's Zoning Ordinance.

Only after completion of this process is the Township able to exercise the powers granted to it under the State Redevelopment Statute.

3.0 Statutory Criteria

A study area qualifies as being an "Area in Need of Redevelopment" if it meets at least one of the eight statutory criteria listed in Section 40A:12A-5 of the Local Redevelopment and Housing Law:

A. The generality of buildings are substandard, unsafe, unsanitary, dilapidated, or obsolescent, or poses any of such characteristics, or are so lacking in light, air, or space, as to be conducive to unwholesome living or working conditions.

B. The discontinuance of the use of buildings previously used for commercial, manufacturing, or industrial purposes; the abandonment of such buildings; or the same being allowed to fall into so great a state of disrepair as to be untenable.

C. Land that is owned by the municipality, the county, a local housing authority, redevelopment agency or redevelopment entity, or unimproved vacant land that has remained so for a period of ten years prior to adoption of the resolution, and that by reason of its location, remoteness, lack of means of access to developed sections or portions of the municipality, or topography, or nature of the soil, is not likely to be developed through the instrumentality of private capital.

D. Areas with buildings or improvements which, by reason of dilapidation, obsolescence, overcrowding, faulty arrangement or design, lack of ventilation, light and sanitary facilities, excessive land coverage, deleterious land use or obsolete layout, or any combination of these or other factors, are detrimental to the safety, health, morals, or welfare of the community.

E. A growing lack or total lack of proper utilization of areas caused by the condition of the title, diverse ownership of the real properties therein or other similar conditions which impede land assemblage or discourage the undertaking of improvements, resulting in a stagnant and unproductive condition of land potentially useful and valuable for contributing to and serving the public health, safety and welfare, which condition is presumed to be having a negative social or economic impact or otherwise being detrimental to the safety, health, morals, or welfare of the surrounding area or the community in general.

F. Areas, in excess of five contiguous acres, whereon buildings or improvements have been destroyed, consumed by fire, demolished or altered by the action of storm, fire, cyclone, tornado, earthquake or other casualty in such a way that the aggregate assessed value of the area has been materially depreciated.

G. In any municipality in which an enterprise zone has been designated pursuant to the "New Jersey Urban Enterprise Zones Act," P.L. 1983, c.303 (C.52:27H-60 et seq.) the execution of the actions prescribed in that act for the adoption by the municipality and approval by the New Jersey Urban Enterprise Zone Authority of the zone development plan for the area of the enterprise zone shall be considered sufficient for the determination that the area is in need of redevelopment pursuant to sections 5 and 6 of P.L. 1992, c.79 (C.40A:12A-5 and 40A:12A-6) for the purpose of granting tax exemptions within the enterprise zone district pursuant to the provisions of P.L. 1991, c.431 (C.40A:20-1 et seq.) or the adoption of a tax abatement and exemption ordinance pursuant to the provisions of P.L. 1991, c.441 (C.40A:21-1 et seq.). The municipality shall not utilize any other

redevelopment powers within the urban enterprise zone unless the municipal governing body and planning board have also taken the actions and fulfilled the requirements prescribed in P.L. 1992, c.79 (C.40A:12A-1 et al.) for determining that the area is in need of redevelopment or an area in need of rehabilitation and the municipal governing body has adopted a redevelopment plan ordinance including the area of the enterprise zone.

H. The designation of the delineated area is consistent with smart growth planning principles adopted pursuant to law or regulation.

N.J.S.A. 40A:12A-3 further states that "A redevelopment area may include lands, buildings, or improvements which of themselves are not detrimental to the public health, safety or welfare, but the inclusion of which is found necessary, with or without change in their condition, for the effective development of the area of which they are a part." This is commonly referred to as the "Section 3 Criteria."

According to the Redevelopment Handbook, this section allows for the inclusion of properties that do not meet the statutory criteria but are,"essential to be included in the designation to effectively redevelop the area." Examples of such properties include properties located within and surrounded by otherwise blighted area, property that are needed to provide access to an area to be redeveloped, areas needed for infrastructure or utilities, or properties that otherwise could be determined to be critical to the area's successful redevelopment.

4.0 Applicability of Statutory Criterion "C"

4.1. Statutory Language: Criterion C

Land that is owned by the municipality, the county, a local housing authority, redevelopment agency or redevelopment entity, **or unimproved vacant land that has remained so for a period of ten years prior to adoption of the resolution, and that by reason of its** location, remoteness, lack of means of access to developed sections or portions of the municipality, or topography, or **nature of the soil, is not likely to be developed through the instrumentality of private capital.** (Emphases added.)

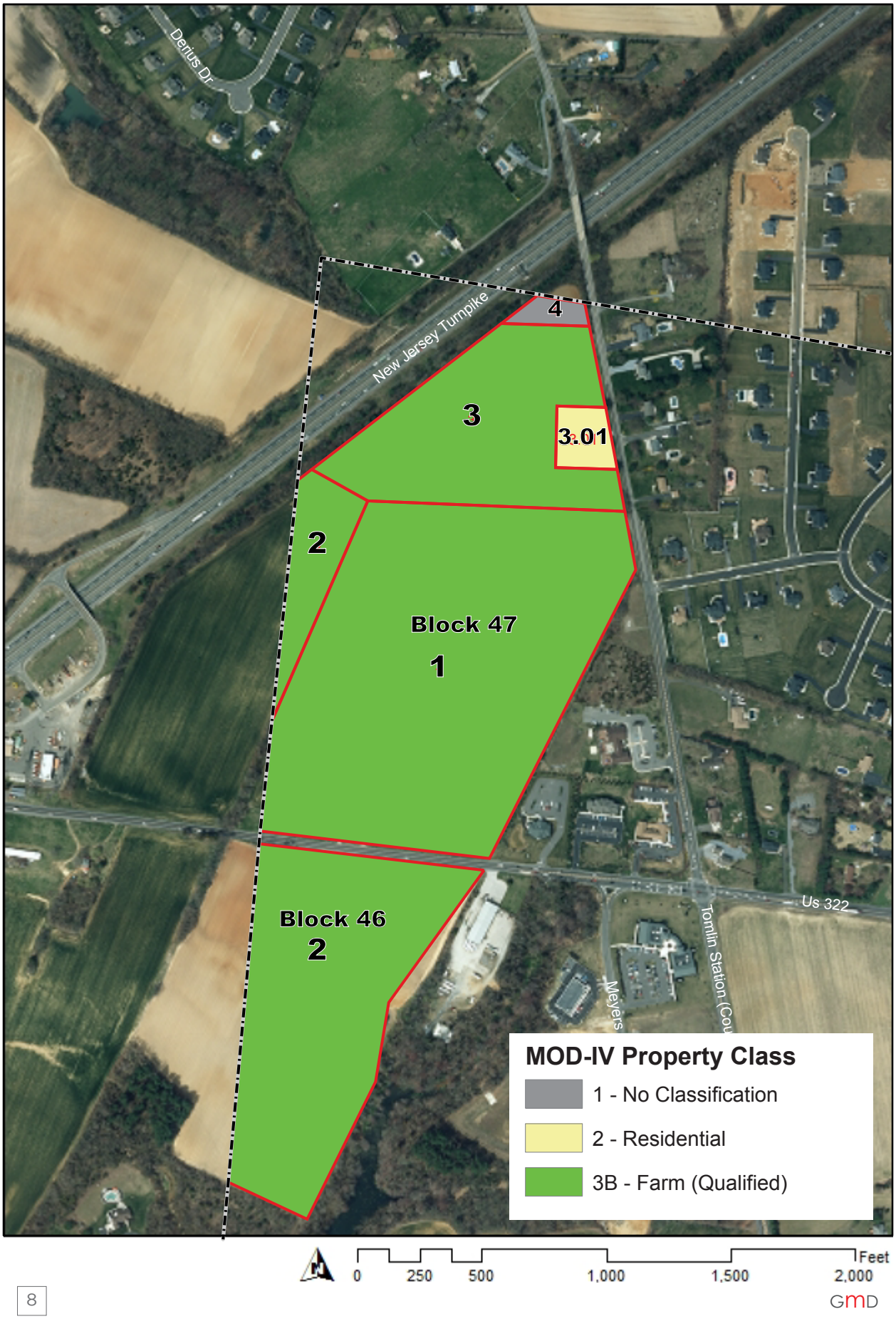
4.1.a. Ownership and Vacancy

In order to meet Criterion C, an investigation property must be publicly owned (i.e. public property) or unimproved, vacant privately-owned land, which has remained unimproved and vacant for at least ten years.

Lots 1, 2, 3 and 4 are privately owned, but are substantially unimproved vacant land that has remained so for a period of ten years prior to adoption of the Resolution authorizing this investigation (205 - 2017). Figure 2 illustrates the MOD-IV property classifications for the study area parcels. Lots 1, 2, and 3 are identified as Qualified Farms. There is no information provided for Lot 4.

Because of the nature of the soil, as described below, these parcels are not likely to be developed through the instrumentality of private capital alone.

Figure 2. MOD-IV Land Use Classifications



GMD

4.1.b. Sediment with Potential to Form Acid (Sulfate) Soils

As displayed in Figure 3, a wide band of coastal plain sediments with the potential to form acid (sulfate) soils, runs across the state of New Jersey. The entirety of Block 46 in Harrison Township is within the Lower Member of Kirkwood Formation (Tkl), a sedimentary unit with the potential to produce acidic soils.

Soil pH is the measure of the pH of soil water, which depends on the hydrogen ion (H+) activity in solution. Soils become naturally acidic for three major reasons: rainfall and leaching, acidic parent material, and decay of organic matter which produces hydrogen ions. Sulfide-bearing (pyritic) Cretaceous and Paleogene (formerly the Tertiary period) marine and estuarine sediments, such as the Lower Member of Kirkwood Formation (Tkl), are potential acid-soil producers. The development of acid-sulfate soils occurs when sulfide minerals oxidize upon air exposure during construction, drainage, or earth-moving operations. The overall acid-sulfate, soil-forming process involves a complex chain of reactions that connect the oxidation of iron sulfides to the release of iron oxyhydrates and sulfuric acids.

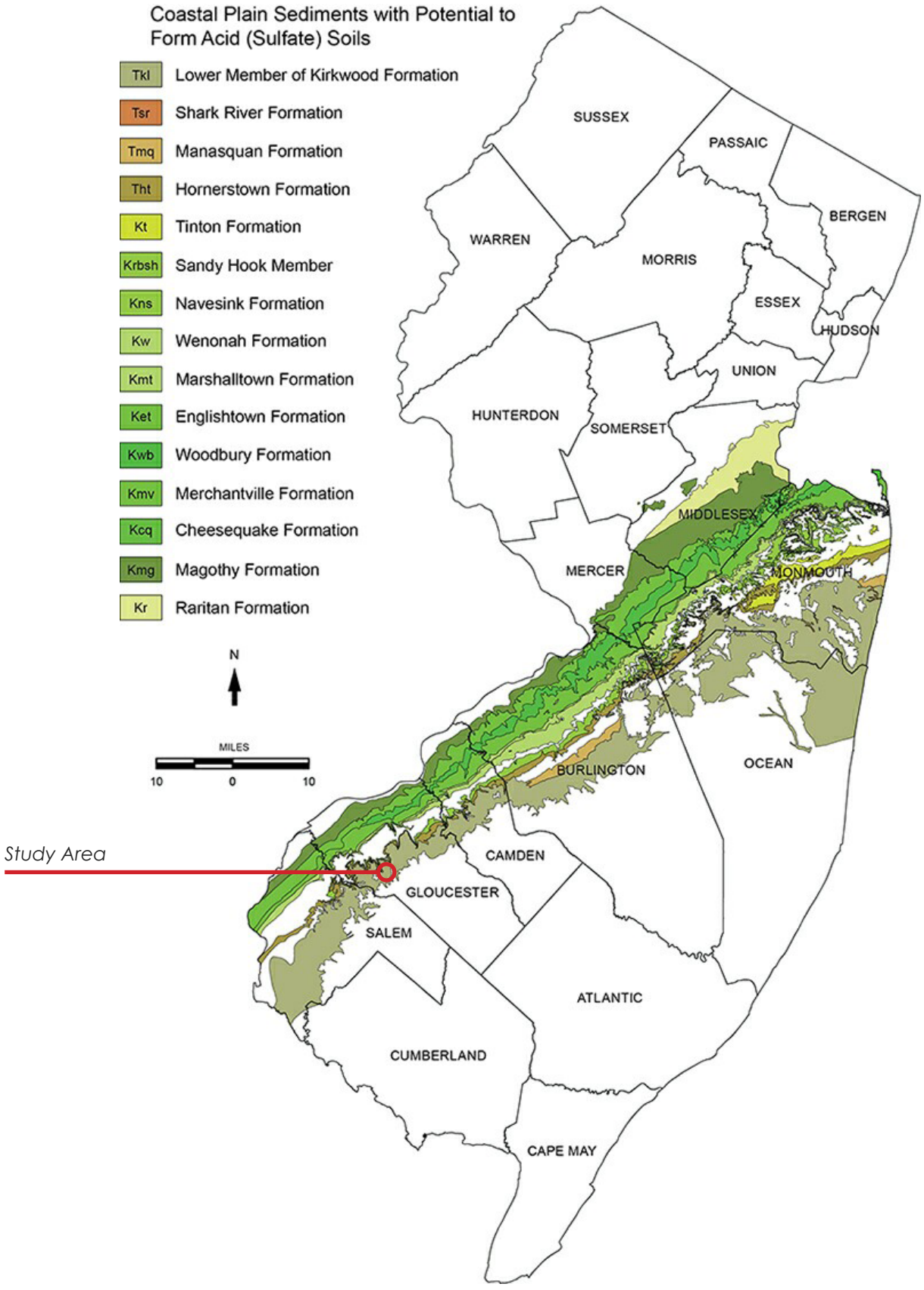
Acid-sulfate soil formation occurs if the reduced sulfur components exceed the acid-neutralizing capacity of adsorbed bases and easily weatherable silicate and carbonate minerals. Natural Resource Conservation Service reports (such as the Soil Resource Report included as Appendix B of this investigation) demonstrate that soils developed on these sulfidic, non calcareous, marine sediments are strongly (pH < 5.5) to extremely acid (pH < 4.5).

4.1.c. NRCS Custom Soil Resource Report

Upon discovery that the redevelopment investigation area falls within a sedimentary unit with the potential to produce acidic soils, a Custom Soil Resource Report for the study parcels was generated via the Natural Resources Conservation Service's Web Soil Survey. The Natural Resources Conservation Service, formerly known as the Soil Conservation Service, is an agency of the United States Department of Agriculture that provides technical assistance to farmers and private landowners. The Custom Soil Resource Report generated for Block 46 of Harrison Township is included in this Investigation as Appendix B.

The Report provides relevant soil information including soil acidity (pH level), as well as suitabilities and limitations for developmental and agricultural uses based on specific soil properties. The findings of this Report are described n the following sections.

Figure 3. Sediments with Potential to Form Acid Soils in New Jersey



4.2. Soil Acidity (pH)

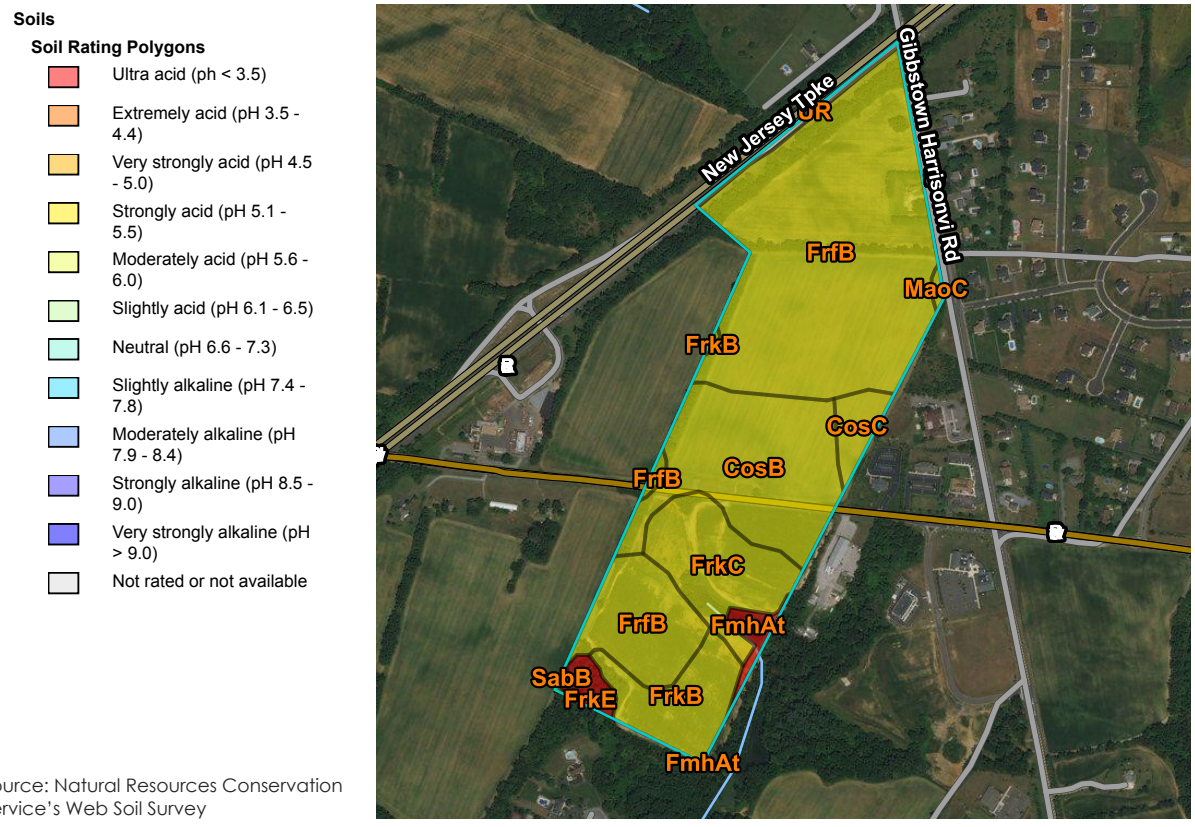
Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion. In general, soils that are either highly alkaline or highly acid are likely to be very corrosive to steel.

Soils within the investigation area fall within the categories of "Extremely acid (pH 3.5 - 4.4)", "Very Strongly Acid (pH 4.5 - 5.0)", and Slightly acid (pH 6.1 - 6.5)." Figure 44 displays the pH levels of the surface lay of soil for the study area parcels. All soil is between a 4 ("extremely acid") and a 5.8 ("moderately acid"). Further details can be found in the custom soil resource report in the appendix.

According to *Standards for Solid Erosion and Sediment Control in New Jersey,* published by the New Jersey Department of Agriculture, State Soil Conservation Committee and promulgated as "Standards" pursuant to the Soil Erosion and Sediment Control Act of 1975 as amended (N.J.S.A. 4:24-39 et seq.) and New Jersey Administrative Code (N.J.A.C. 2:90-1.1 et seq.), soils with a pH of 4.0 or less or those which contain iron sulfide are considered high acid-producing soils. Such soils are subject to strict standards, "to prevent or limit exposure area, time, and spreading by equipment or rainfall on- and off-site and to minimize erosion, sedimentation and acid leachate-related damages."

Soils and sediment containing iron sulfide, characterized by pyrite or marcasite nuggets or greensands, are chemically oxidized when exposed to air, producing sulfuric acid and result in soil pH levels falling to pH 4.0 and lower. Soils within the sedimentary Lower Member of Kirkwood Formation (Tkl) are known to become acidic. Thus, portions of the study area which are not currently considered "high acid-producing soils" have a high risk of acidification from ground disturbances via construction or development.

Figure 4. pH levels of investigation area soils.



Source: Natural Resources Conservation Service's Web Soil Survey

4.3. Site Development Limitations

Site Development Limitations are to be used as tools for evaluating soil suitability and identifying soil limitations for various development or construction purposes. Soils' potential to corrode concrete or steel, and soils' limitations for construction or development of numerous uses are presented herein. Each of the site development limitations applies to the soils in their current condition, and do not consider present land use.

Risk of corrosion for concrete or steel is expressed as "low," "moderate," or "high." Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete or uncoated steel. **Soils with moderate or high risk of corrosion may require special site examination and design, significantly increasing site development costs.**

The concrete or steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer. The study area contains multiple soils and are thus intersected by soil boundaries.

4.3.a. Corrosion of Concrete

Figure 55 illustrates that the entire Investigation Area, except for a small portion on lot 1, is comprised of soils with a high risk of concrete corrosion. Soil boundaries intersecting these parcels further increase the risk of corrosion.

As concrete is an essential material in the construction of building foundations, **it is highly likely that the soils' corrosive nature will increase development costs,** as soil remediation or special design considerations may be necessary, and/or limit the types of development which could occur on site.

The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil.

4.3.b. Corrosion of Steel

Figure 7 illustrates that all of the study area is comprised of soils with a moderate risk of steel corrosion. Soil boundaries intersecting these parcels further increase the risk of corrosion.

As steel is an essential material in the construction of building frames, it is highly likely that the soils' corrosive nature will increase development costs, as soil remediation or special design considerations may be necessary, and/or limit the types of development which could occur on site.

The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil.

4.3.c. Lawns, Landscaping, and Golf Fairways

The study area is comprised of soils with "Very Limited" or "Somewhat Limited" development potential for lawns, landscaping, or golf fairways. These limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Increased development costs, poor performance and high maintenance can be expected. This increase in construction and maintenance costs has deterred development through the instrumentality of private capital.

Figure 5. Risk of Corrosion of Concrete in investigation area soils.

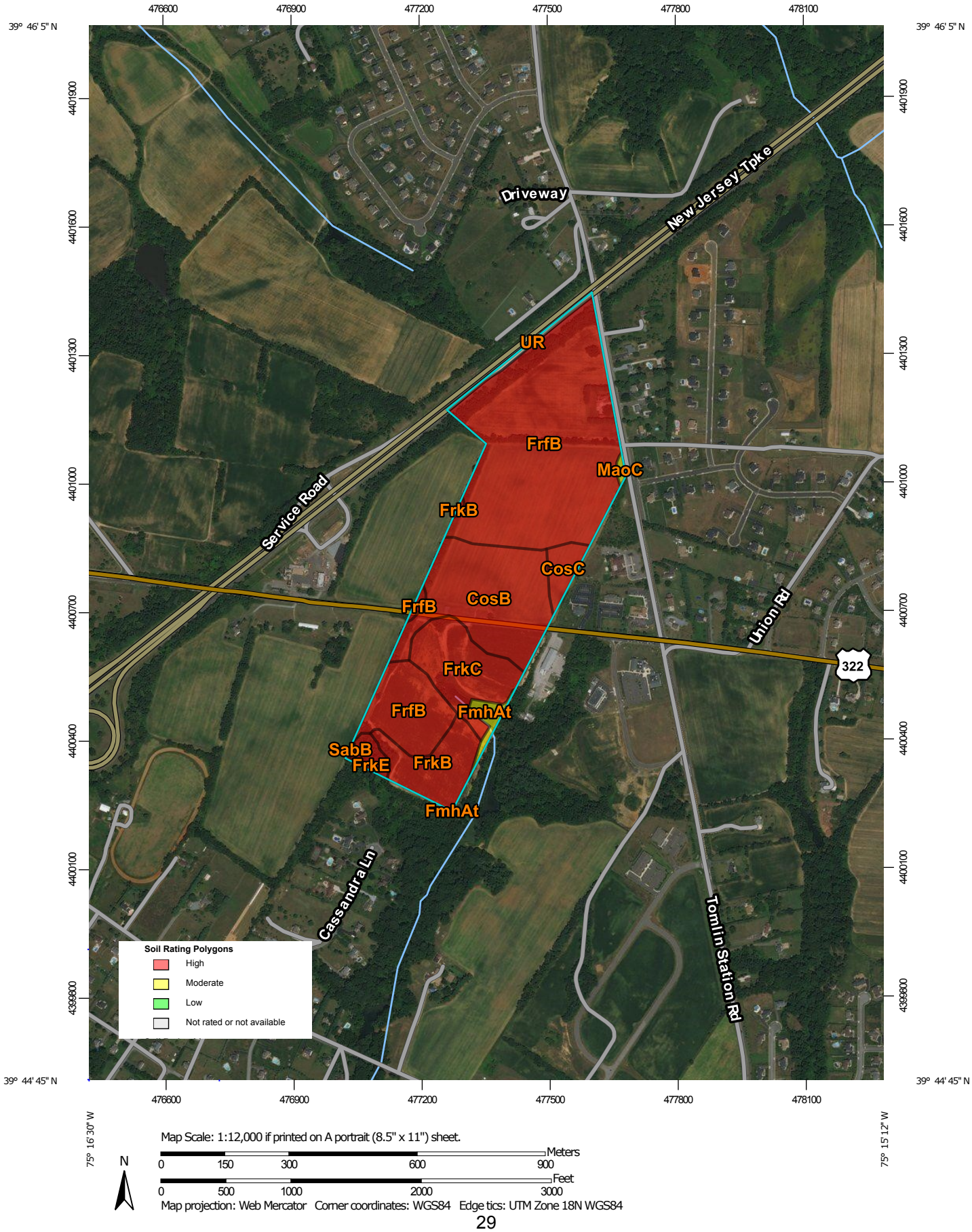


Figure 6. Risk of Corrosion of Steel in investigation area soils.

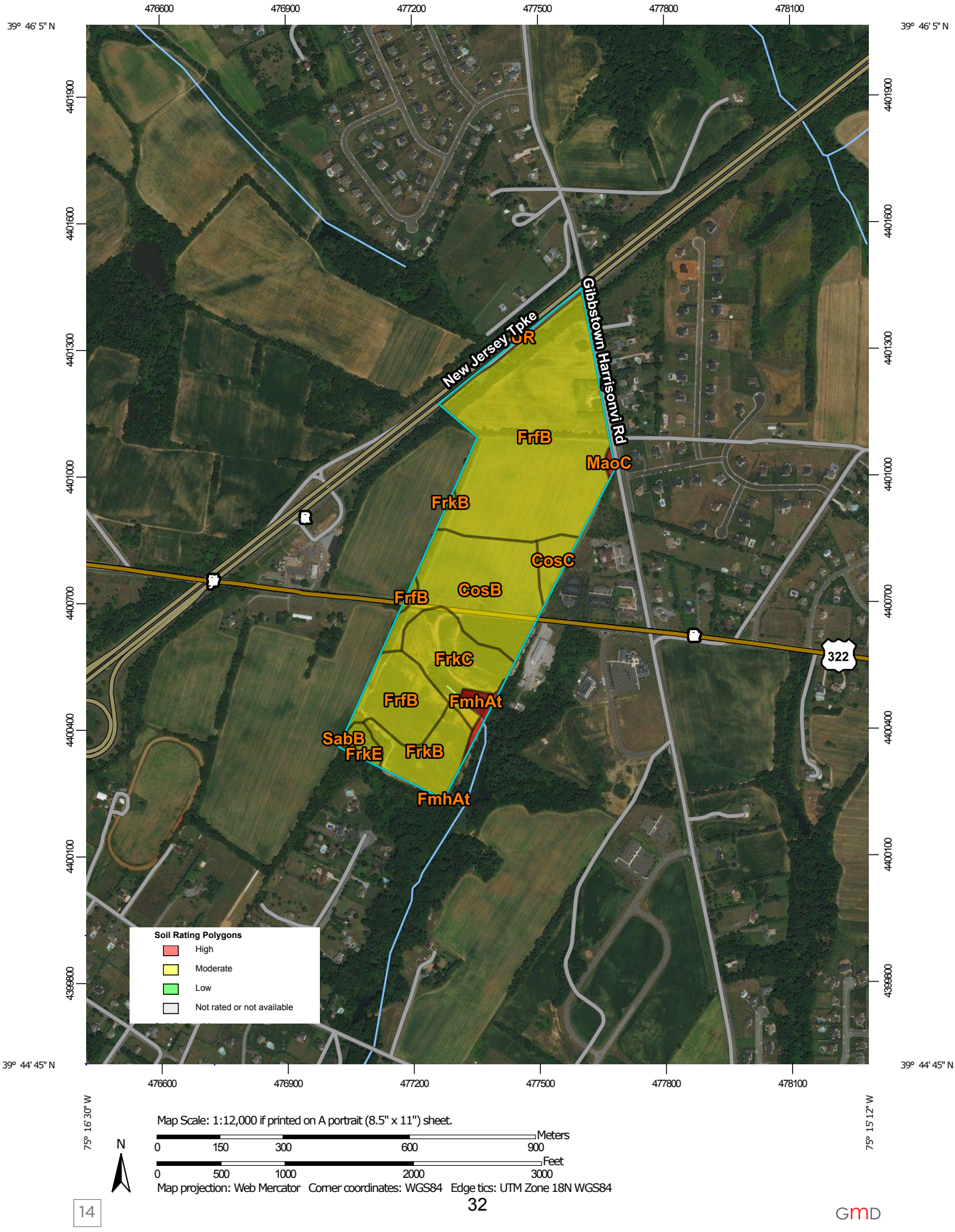
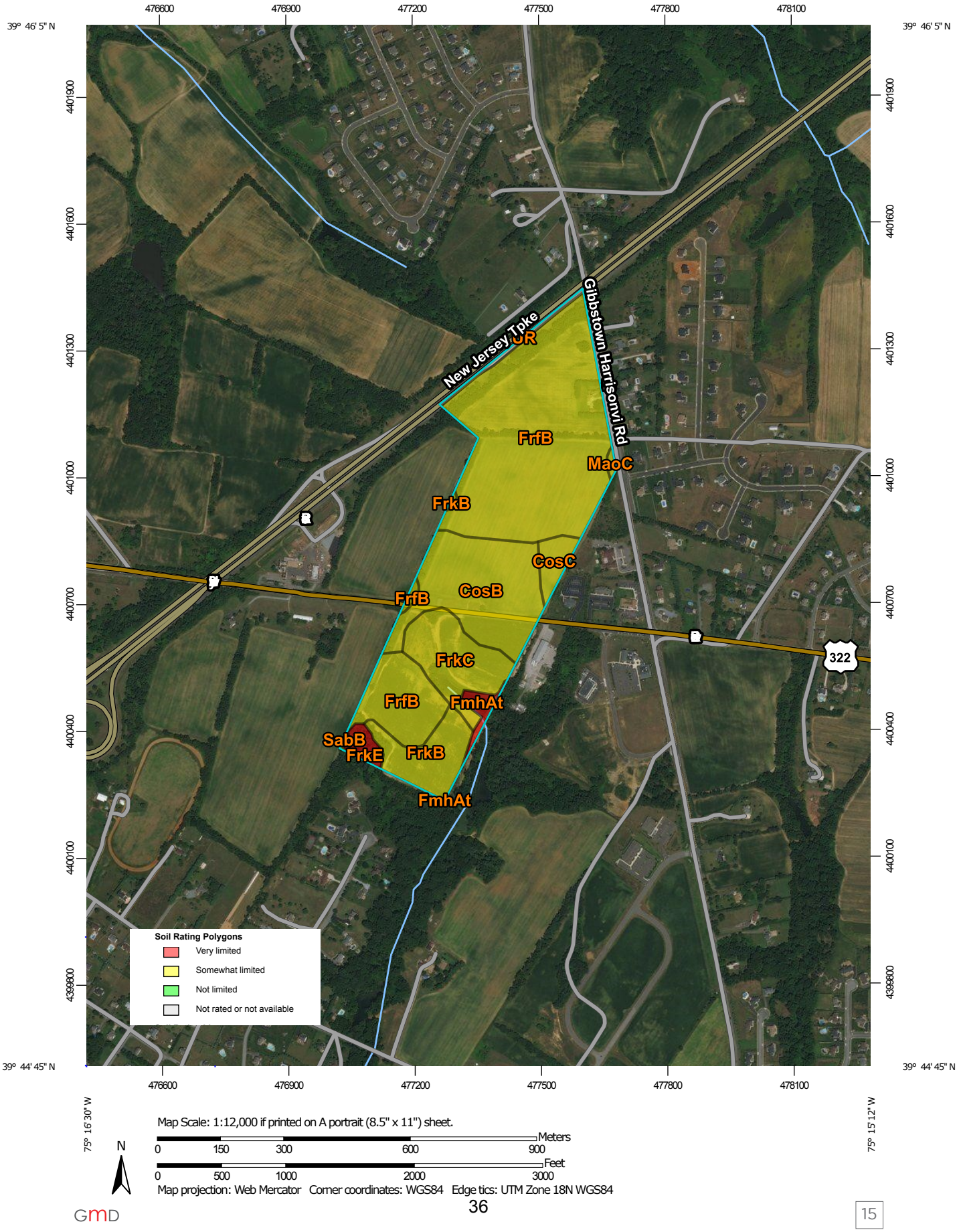


Figure 7. Risk of Corrosion of Steel in investigation area soils.



This evaluation rates soils for their use in establishing and maintaining turf for lawns and golf fairways and ornamental trees and shrubs for residential or commercial landscaping. Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required.

The ratings are based on the use of soil material at the site, which may have been altered by some land smoothing. Irrigation may or may not be needed and is not a criterion in rating. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

4.4. Conclusion

Because of the nature of the soil of the study area, namely the soils' acidity (pH level) or potential for acidification and corrosive qualities, these parcels are not likely to be developed through the sole instrumentality of private capital.

The soil has been identified as current and potential high acid-producing soils; are highly corrosive to both concrete and steel (two essential construction materials); and display properties which make the development and maintenance of dwellings and lawns difficult and costly. Soils within these parcels will likely require special site examination, design, and potential remediation, and the soils' limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures significantly increasing site development costs. Expensive remediation, planning, design, and construction considerations have deterred development through the instrumentality of private capital in development.

These parcels thus qualify as an "Area in Need of Redevelopment" in accordance with Statutory Criterion "C."

5.0 Applicability of Section 3 Criteria

5.1. Introduction

5.1.a. Statutory Language: Section 3

A redevelopment area may include lands, buildings, or improvements which of themselves are not detrimental to the public health, safety or welfare, but the inclusion of which is found necessary, with or without change in their condition, for the effective development of the area of which they are a part.

5.1.b. Applicability

The following analysis of the Section 3 Criteria is applicable to:

- Block 47, Lot 3.01

5.1.c. Background

Block 47, Lot 3.01 is located along Tomlin Station Road and is occupied by a 2.5 story home with accessory garages. As documented in Section 4.0 of this investigation, Lot 4 shares many of the detrimental soil issues as the other lots in this study. These conditions make development on Lot 4 much more costly, and will likely limit the instrumentality of private capital toward its development. However, because Lot 4 is privately owned and features a house on the property (i.e. the lot is not vacant and unimproved) it does not qualify as an Area in Need of Redevelopment under Criterion C.

5.2. Necessary Inclusion for Effective Redevelopment

Block 47, Lot 3.01 is surrounded by Block 47, Lot 3 on three sides and Tomlin Station Road on the fourth. The numbering of the parcel suggest that it was at one point subdivided from Lot 3 for residential use. Lot 3 was found to be in Need of Redevelopment in the preceding chapter. The exclusion of Block 47, Lot 3.01 would be significantly detrimental to the redevelopment potential of the area. Lot 3.01 is north in the study area, close to the New Jersey Turnpike. Its exclusion would make it more difficult to productively develop this section of the study because it would create a section of lot that was cut off from the rest of the area. Moreover, the continued residential use on the same side of the street as the new redevelopment would also likely create conflicts with new development: all other residential properties are across Tomlin Station Road. Finally, the exclusion of Lot 3.01 would reduce and break up the amount of "frontage" any redevelopment would have on Tomlin Station Road. For redevelopment purposes, visibility is incredibly important and the exclusion of Lot 3.01 would likely increase development costs in order to compensate for the loss of visibility.

For these reasons, this report finds that the inclusion of Block 47, Lot 3.01 is found necessary for the effective development of the area of which it is a part.

Appendix A - Resolution

RESOLUTION NO. -2018

RESOLUTION OF THE MAYOR AND COMMITTEE OF THE TOWNSHIP OF HARRISON AUTHORIZING THE JOINT LAND USE BOARD TO CONDUCT A PRELIMINARY INVESTIGATION TO DETERMINE WHETHER LOT 2 IN BLOCK 46 AND BLOCK 47, LOTS 1, 2, 3 AND 4 ON THE OFFICIAL TAX MAP OF THE TOWNSHIP OF HARRISON QUALIFY AS AN AREA IN NEED OF REDEVELOPMENT

WHEREAS, the Local Redevelopment and Housing Law, N.J.S.A. 40A:12A-1, et seq., provides a mechanism to empower and assist local governments in efforts to promote programs of redevelopment; and

WHEREAS, the Local Redevelopment and Housing Law sets forth a specific procedure for establishing an area in need of redevelopment; and

WHEREAS, N.J.S.A. 40A:12A-6 authorizes the governing body of the municipality by Resolution, to cause its Planning Board to conduct a preliminary investigation to determine whether the proposed area is an area in need of redevelopment according to the criteria set forth in N.J.S.A. 40A:12A-5; and

WHEREAS, the proposed Redevelopment Area (Block 46, Lot 2 and Block 47, Lots 1, 2, 3 and 4) determination shall authorize the municipality to use all those powers provided by the Legislature for use in a Redevelopment Area, other than the use of eminent domain; and, as such, the Redevelopment Area shall be established and be referred to as a "Non-Condemnation Redevelopment Area"; and

WHEREAS, the Township Committee of the Township of Harrison, Gloucester County, has determined that an investigation and inquiry should be made to see if said area is in need of redevelopment pursuant to the aforementioned State Statute; and

WHEREAS, the Township of Harrison governing body wishes to direct the Joint Land Use Board to undertake a preliminary investigation to determine whether the following property identified as and consisting of Block 46, Lot 2 and Block 47, Lots 1, 2, 3 and 4 qualifies as an area in need of redevelopment pursuant to N.J.S.A. 40A:12A-5; and

WHEREAS, the Township Committee considers it to be in the best interest of the Township to directs its Joint Land Use Board to conduct such an investigation regarding said area/property.

NOW, THEREFORE, BE IT RESOLVED by the Mayor and Committee of the Township of Harrison, County of Gloucester and State of New Jersey as follows:

1. The Joint Land Use Board of the Township of Harrison is hereby directed to undertake a preliminary investigation to determine whether Block 46, Lot 2 and Block 47, Lots 1, 2, 3 and 4 is a "Non-Condemnation Redevelopment Area such that the municipality may use all those powers provided by the Legislature for use in a Redevelopment Area", other than the use of eminent domain, according to the criteria set forth in N.J.S.A. 40A:12A-1, et seq.; and

2. The staff of the Joint Land Use Board and its consultants are hereby directed to assist the Joint Land Use Board in conducting the area in need of redevelopment investigation; and

3. The Township Clerk shall forward a copy of this Resolution to the Chairman and Secretary of the Joint Land Use Board for immediate action; and

4. The preliminary investigation, once completed, shall be submitted to the Township Committee for review and approval in accordance with the provisions of the Redevelopment and Housing Law, N.J.S.A. 40A:12A-1, et seq.

ADOPTED at a regular meeting of the Mayor and Township Committee of the Township of Harrison, County of Gloucester, State of New Jersey held on August 6, 2018.

TOWNSHIP OF HARRISON

BY:_____
LOUIS F. MANZO, MAYOR

ATTEST:

_____
DIANE L. MALLOY
Clerk

ROLL CALL VOTE				
COMMITTEE MEMBER	**AYES**	**NAYS**	**ABSTAIN**	**ABSENT**
Manzo				
DeLaurentis				
Heim				
Gangemi				
Jacques				

CERTIFICATION

I hereby certify that the above resolution is a true copy of a resolution adopted by the Township Committee of the Township of Harrison, County of Gloucester, State of New Jersey, at a meeting held by the same on August 6, 2018 in the Harrison Township Municipal Building, 114 Bridgeton Pike, Mullica Hill, New Jersey 08062.

_____
DIANE L. MALLOY
Clerk

RESOLUTION NO. 159-2018

RESOLUTION OF THE MAYOR AND COMMITTEE OF THE TOWNSHIP OF HARRISON AMENDING RESOLUTION NO. 151-2018 AUTHORIZING THE JOINT LAND USE BOARD TO CONDUCT A PRELIMINARY INVESTIGATION TO DETERMINE WHETHER LOT 2 IN BLOCK 46 AND BLOCK 47, LOTS 1, 2, 3 AND 4 ON THE OFFICIAL TAX MAP OF THE TOWNSHIP OF HARRISON QUALIFY AS AN AREA IN NEED OF REDEVELOPMENT TO INCLUDE BLOCK 47, LOT 3.01

WHEREAS, on August 6, 2018, the Mayor and Committee of the Township of Harrison, via Resolution No. 151-2018, authorized the Joint Land Use Board to conduct a preliminary investigation to determine whether Lot 2 in Block 46 and Block 47, Lots 1, 2, 3 and 4 on the Official Tax Map of the Township of Harrison qualify as an area in need of redevelopment; and

WHEREAS, it is the request of the Harrison Township Committee that Block 47, Lot 3.01 also be investigated to determine if said Block/Lot qualifies as an in need of redevelopment; and

WHEREAS, N.J.S.A. 40A:12A-6 authorizes the governing body of the municipality by Resolution, to cause its Planning Board to conduct a preliminary investigation to determine whether the proposed area is an area in need of redevelopment according to the criteria set forth in N.J.S.A. 40A:12A-5; and

WHEREAS, the proposed Redevelopment Area (Block 46, Lot 2 and Block 47, Lots 1, 2, 3, 3.01 and 4) determination shall authorize the municipality to use all those powers provided by the Legislature for use in a Redevelopment Area, other than the use of eminent domain; and, as such, the Redevelopment Area shall be established and be referred to as a "Non-Condemnation Redevelopment Area"; and

WHEREAS, the Township Committee of the Township of Harrison, Gloucester County, has determined that an investigation and inquiry should be made to see if said area is in need of redevelopment pursuant to the aforementioned State Statute; and

WHEREAS, the Township of Harrison governing body wishes to direct the Joint Land Use Board to undertake a preliminary investigation to determine whether the following property identified as and consisting of Block 46, Lot 2 and Block 47, Lots 1, 2, 3, 3.01 and 4 qualifies as an area in need of redevelopment pursuant to N.J.S.A. 40A:12A-5; and

WHEREAS, the Township Committee considers it to be in the best interest of the Township to directs its Joint Land Use Board to conduct such an investigation regarding said area/property.

NOW, THEREFORE, BE IT RESOLVED by the Mayor and Committee of the Township of Harrison, County of Gloucester and State of New Jersey as follows:

1. The Joint Land Use Board of the Township of Harrison is hereby directed to undertake a preliminary investigation to determine whether Block 46, Lot 2 and Block 47, Lots 1, 2, 3, 3.01 and 4 is a "Non-Condemnation Redevelopment Area such that the municipality may use all those powers provided by the Legislature for use in a Redevelopment Area", other than the use of eminent domain, according to the criteria set forth in N.J.S.A. 40A:12A-1, et seq.; and

2. The staff of the Joint Land Use Board and its consultants are hereby directed to assist the Joint Land Use Board in conducting the area in need of redevelopment investigation; and

3. The Township Clerk shall forward a copy of this Resolution to the Chairman and Secretary of the Joint Land Use Board for immediate action; and

4. The preliminary investigation, once completed, shall be submitted to the Township Committee for review and approval in accordance with the provisions of the Redevelopment and Housing Law, N.J.S.A. 40A:12A-1, et seq.

ADOPTED at a regular meeting of the Mayor and Township Committee of the Township of Harrison, County of Gloucester, State of New Jersey held on August 20, 2018.

TOWNSHIP OF HARRISON

BY: _____
DON HEIM, DEPUTY MAYOR

ATTEST:

_____
CYNTHIA QUAST
Deputy Clerk

ROLL CALL VOTE				
COMMITTEE MEMBER	**AYES**	**NAYS**	**ABSTAIN**	**ABSENT**
Manzo				✓
DeLaurentis	✓			
Heim	✓			
Gangemi				✓
Jacques	✓			

CERTIFICATION

I hereby certify that the above resolution is a true copy of a resolution adopted by the Township Committee of the Township of Harrison, County of Gloucester, State of New Jersey, at a meeting held by the same on August 20, 2018 in the Harrison Township Municipal Building, 114 Bridgeton Pike, Mullica Hill, New Jersey 08062.

_____
CYNTHIA QUAST
Deputy Clerk

Appendix B - Soil Resource Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Gloucester County, New Jersey

August 7, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

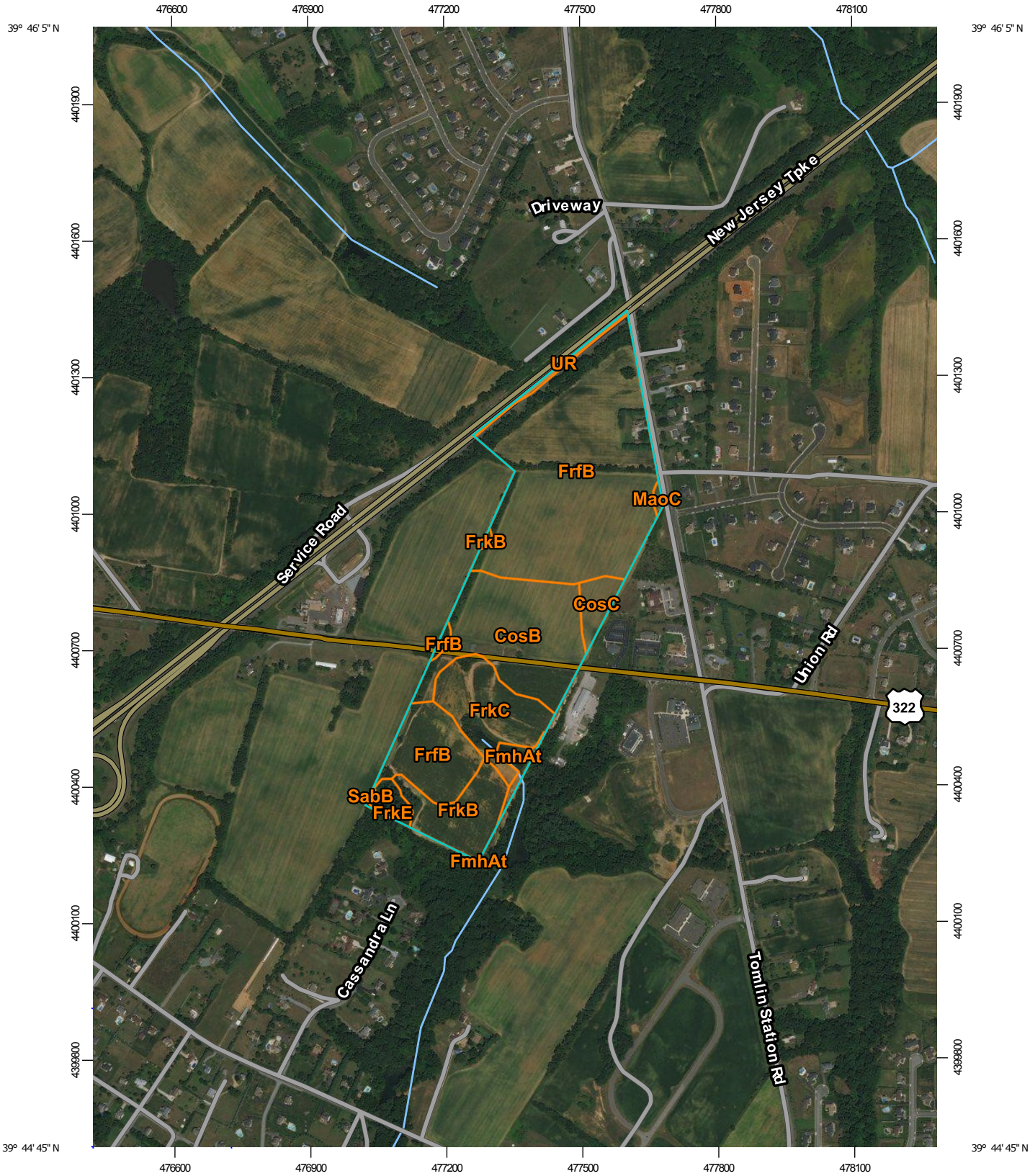
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:12,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 150 300 600 900

Feet
0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Gloucester County, New Jersey
Survey Area Data: Version 15, Oct 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CosB	Colts Neck sandy loam, 2 to 5 percent slopes	16.9	19.6%
CosC	Colts Neck sandy loam, 5 to 10 percent slopes	2.2	2.5%
FmhAt	Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded	1.2	1.4%
FrfB	Freehold loamy sand, 0 to 5 percent slopes	47.9	55.3%
FrkB	Freehold sandy loam, 2 to 5 percent slopes	6.8	7.8%
FrkC	Freehold sandy loam, 5 to 10 percent slopes	9.1	10.5%
FrkE	Freehold sandy loam, 15 to 25 percent slopes	1.5	1.7%
MaoC	Marlton sandy loam, 5 to 10 percent slopes	0.3	0.3%
SabB	Sassafras loamy sand, 0 to 5 percent slopes	0.1	0.1%
UR	Urban land	0.7	0.8%
Totals for Area of Interest		**86.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties

and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Gloucester County, New Jersey

CosB—Colts Neck sandy loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 15km6
Elevation: 40 to 110 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Colts neck and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colts Neck

Setting

Landform: Knolls, low hills
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Glauconite bearing loamy and channery marine deposits and/or glauconite bearing loamy and channery fluviomarine deposits

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 25 inches: sandy loam
Bt2 - 25 to 41 inches: sandy clay loam
BC - 41 to 46 inches: channery sandy loam
C1 - 46 to 65 inches: channery loamy sand
C2 - 65 to 70 inches: loamy coarse sand
C3 - 70 to 74 inches: channery loamy sand
C4 - 74 to 80 inches: loamy sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Freehold

Percent of map unit: 5 percent
Landform: Knolls, low hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Collington

Percent of map unit: 5 percent
Landform: Knolls, low hills
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

CosC—Colts Neck sandy loam, 5 to 10 percent slopes

Map Unit Setting

National map unit symbol: 15km7
Elevation: 40 to 110 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Colts neck and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colts Neck

Setting

Landform: Knolls, low hills
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Glauconite bearing loamy and channery marine deposits and/or glauconite bearing loamy and channery fluviomarine deposits

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 25 inches: sandy loam
Bt2 - 25 to 41 inches: sandy clay loam
BC - 41 to 46 inches: channery sandy loam
C1 - 46 to 65 inches: channery loamy sand
C2 - 65 to 70 inches: loamy coarse sand

C3 - 70 to 74 inches: channery loamy sand
C4 - 74 to 80 inches: loamy sand

Properties and qualities

Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Freehold

Percent of map unit: 5 percent
Landform: Knolls, low hills
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Collington

Percent of map unit: 5 percent
Landform: Knolls, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

FmhAt—Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 15kn8
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Fluvaquents, loamy, frequently flooded, and similar soils: 80 percent
Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluvaquents, Loamy, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

A1 - 0 to 5 inches: loam
A2 - 5 to 12 inches: silt loam
C1 - 12 to 18 inches: sandy clay loam
C2 - 18 to 24 inches: sandy clay loam
C3 - 24 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Udifluvents, frequently flooded

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Fluvaquents, loamy, frequently flooded

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

FrfB—Freehold loamy sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 15knk
Elevation: 20 to 160 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Freehold and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freehold

Setting

Landform: Knolls, low hills
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Glauconite bearing loamy eolian deposits and/or glauconite bearing loamy fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: loamy sand
Bt1 - 10 to 14 inches: sandy loam
Bt2 - 14 to 21 inches: sandy clay loam
Bt3 - 21 to 35 inches: sandy loam
C - 35 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Shrewsbury
Percent of map unit: 5 percent
Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Colts neck
Percent of map unit: 5 percent
Landform: Low hills, knolls
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

Collington
Percent of map unit: 5 percent
Landform: Knolls, low hills
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Tinton
Percent of map unit: 5 percent
Landform: Knolls
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

FrkB—Freehold sandy loam, 2 to 5 percent slopes

Map Unit Setting
National map unit symbol: 15knp
Elevation: 40 to 110 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Freehold and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freehold

Setting
Landform: Knolls, low hills
Landform position (three-dimensional): Side slope

Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Glauconite bearing loamy eolian deposits and/or glauconite bearing loamy fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: sandy loam
Bt1 - 10 to 14 inches: sandy loam
Bt2 - 14 to 21 inches: sandy clay loam
Bt3 - 21 to 35 inches: sandy loam
C - 35 to 80 inches: loamy sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Colts neck

Percent of map unit: 5 percent
Landform: Knolls, low hills
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Collington

Percent of map unit: 5 percent
Landform: Knolls, low hills
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Shrewsbury

Percent of map unit: 5 percent
Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

FrkC—Freehold sandy loam, 5 to 10 percent slopes

Map Unit Setting

National map unit symbol: 15knq
Elevation: 40 to 110 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Freehold and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freehold

Setting

Landform: Knolls, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Glauconite bearing loamy eolian deposits and/or glauconite bearing loamy fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: sandy loam
Bt1 - 10 to 14 inches: sandy loam
Bt2 - 14 to 21 inches: sandy clay loam
Bt3 - 21 to 35 inches: sandy loam
C - 35 to 80 inches: loamy sand

Properties and qualities

Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Colts neck

Percent of map unit: 5 percent
Landform: Knolls, low hills
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Collington

Percent of map unit: 5 percent
Landform: Knolls, low hills
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

FrkE—Freehold sandy loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 15knx
Elevation: 20 to 160 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Not prime farmland

Map Unit Composition

Freehold and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freehold

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Glauconite bearing loamy eolian deposits and/or glauconite bearing loamy fluviomarine deposits

Typical profile

A - 0 to 10 inches: sandy loam
Bt1 - 10 to 14 inches: sandy loam
Bt2 - 14 to 21 inches: sandy clay loam
Bt3 - 21 to 35 inches: sandy loam
C - 35 to 80 inches: loamy sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Colts neck

Percent of map unit: 5 percent
Landform: Knolls
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Collington

Percent of map unit: 5 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Westphalia

Percent of map unit: 5 percent
Landform: Knolls, hillslopes
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

MaoC—Marlton sandy loam, 5 to 10 percent slopes

Map Unit Setting

National map unit symbol: 15kqp
Elevation: 20 to 160 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Marlton and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Marlton

Setting

Landform: Knolls, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Glauconitic clayey marine deposits and/or glauconitic clayey fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: sandy loam
Bt1 - 10 to 20 inches: clay
Bt2 - 20 to 28 inches: clay
Bt3 - 28 to 47 inches: clay
C - 47 to 80 inches: stratified sandy loam to sandy clay loam

Properties and qualities

Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Collington

Percent of map unit: 5 percent
Landform: Hillslopes, knolls
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Freehold

Percent of map unit: 5 percent
Landform: Knolls, low hills
Down-slope shape: Convex
Across-slope shape: Linear

Hydric soil rating: No

SabB—Sassafras loamy sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 15krs
Elevation: 0 to 170 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Sassafras and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sassafras

Setting

Landform: Knolls
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy and/or gravelly fluviomarine deposits

Typical profile

Ap - 0 to 12 inches: loamy sand
Bt1 - 12 to 18 inches: sandy loam
Bt2 - 18 to 28 inches: sandy clay loam
BC - 28 to 40 inches: loamy sand
C1 - 40 to 58 inches: sand
C2 - 58 to 80 inches: sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

Hydric soil rating: No

Minor Components

Downer

Percent of map unit: 5 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Aura

Percent of map unit: 5 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Woodstown

Percent of map unit: 5 percent
Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

UR—Urban land

Map Unit Setting

National map unit symbol: 15ksz
Elevation: 0 to 170 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Hydric soil rating: Unranked

Minor Components

Udorthents

Percent of map unit: 5 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

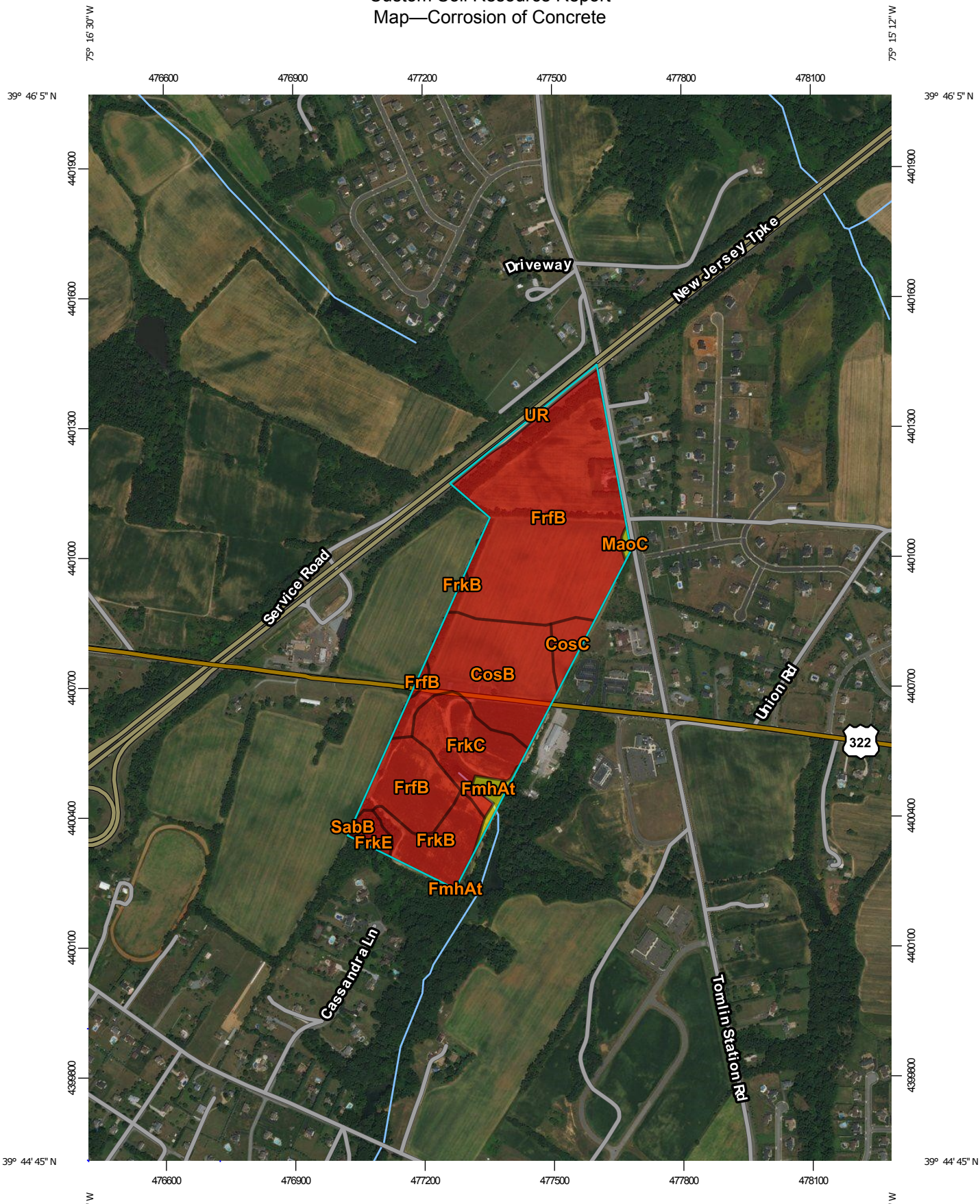
Building Site Development

Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Corrosion of Concrete

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."



Map Scale: 1:12,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 150 300 600 900

Feet
0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Gloucester County, New Jersey
Survey Area Data: Version 15, Oct 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Concrete

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CosB	Colts Neck sandy loam, 2 to 5 percent slopes	High	16.9	19.6%
CosC	Colts Neck sandy loam, 5 to 10 percent slopes	High	2.2	2.5%
FmhAt	Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded	Moderate	1.2	1.4%
FrfB	Freehold loamy sand, 0 to 5 percent slopes	High	47.9	55.3%
FrkB	Freehold sandy loam, 2 to 5 percent slopes	High	6.8	7.8%
FrkC	Freehold sandy loam, 5 to 10 percent slopes	High	9.1	10.5%
FrkE	Freehold sandy loam, 15 to 25 percent slopes	High	1.5	1.7%
MaoC	Marlton sandy loam, 5 to 10 percent slopes	Moderate	0.3	0.3%
SabB	Sassafras loamy sand, 0 to 5 percent slopes	High	0.1	0.1%
UR	Urban land		0.7	0.8%
Totals for Area of Interest			**86.6**	**100.0%**

Rating Options—Corrosion of Concrete

Aggregation Method: Dominant Condition

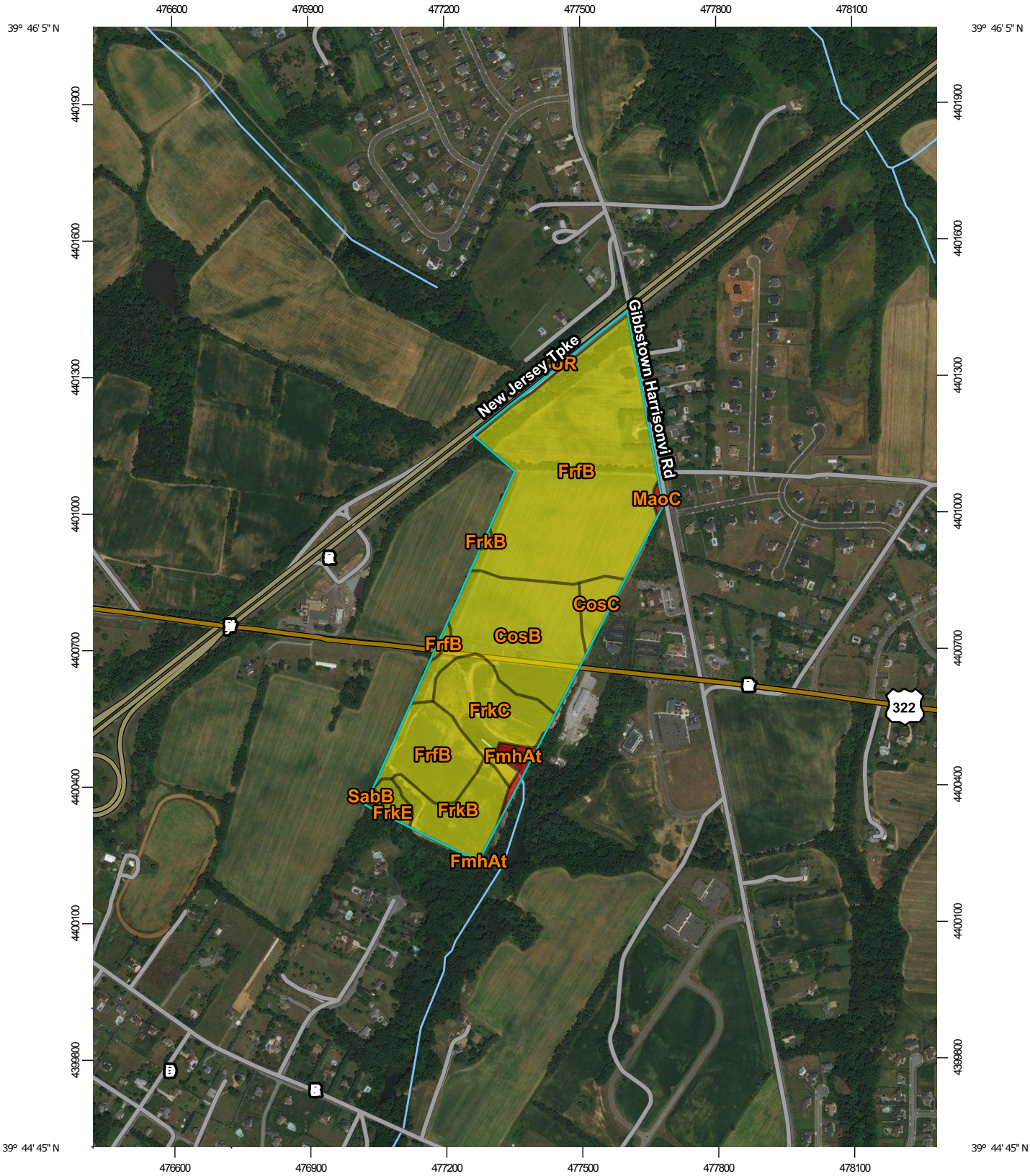
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Corrosion of Steel

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."



Map Scale: 1:12,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 150 300 600 900

Feet
0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

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Table—Corrosion of Steel

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CosB	Colts Neck sandy loam, 2 to 5 percent slopes	Moderate	16.9	19.6%
CosC	Colts Neck sandy loam, 5 to 10 percent slopes	Moderate	2.2	2.5%
FmhAt	Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded	High	1.2	1.4%
FrfB	Freehold loamy sand, 0 to 5 percent slopes	Moderate	47.9	55.3%
FrkB	Freehold sandy loam, 2 to 5 percent slopes	Moderate	6.8	7.8%
FrkC	Freehold sandy loam, 5 to 10 percent slopes	Moderate	9.1	10.5%
FrkE	Freehold sandy loam, 15 to 25 percent slopes	Moderate	1.5	1.7%
MaoC	Marlton sandy loam, 5 to 10 percent slopes	High	0.3	0.3%
SabB	Sassafras loamy sand, 0 to 5 percent slopes	Moderate	0.1	0.1%
UR	Urban land		0.7	0.8%
Totals for Area of Interest			**86.6**	**100.0%**

Rating Options—Corrosion of Steel

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Lawns, Landscaping, and Golf Fairways

This interpretation rates soils for their use in establishing and maintaining turf for lawns and golf fairways and ornamental trees and shrubs for residential or commercial landscaping. Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required.

The ratings are based on the use of soil material at the site, which may have been altered by some land smoothing. Irrigation may or may not be needed and is not a criterion in rating. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of

salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

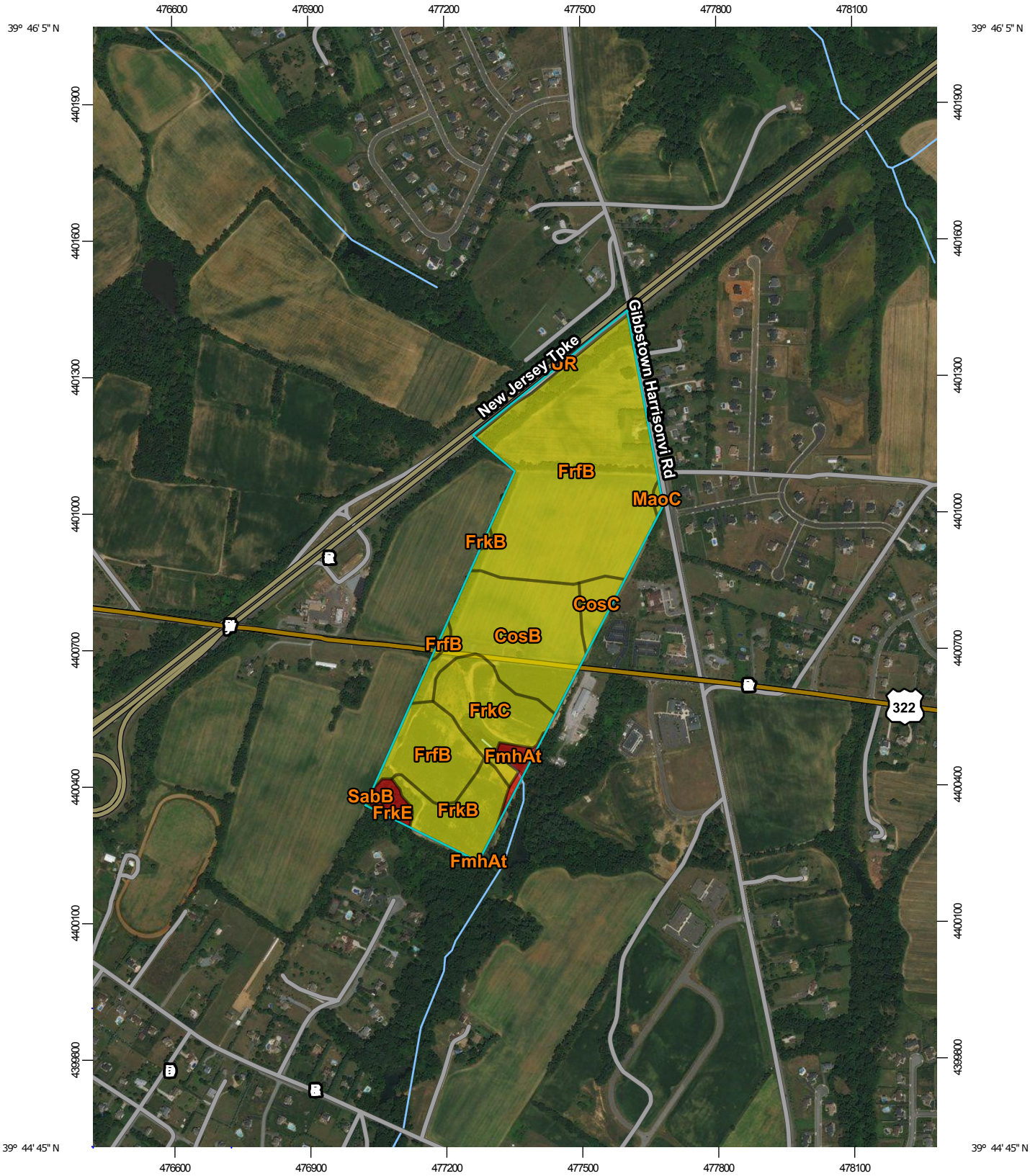
Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. Soils that are subject to flooding are limited by the duration and intensity of flooding and the season when flooding occurs. In planning for lawns, landscaping, or golf fairways, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.



Map Scale: 1:12,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 150 300 600 900

Feet
0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Lines

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Points

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 15, Oct 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Lawns, Landscaping, and Golf Fairways

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
CosB	Colts Neck sandy loam, 2 to 5 percent slopes	Somewhat limited	Colts Neck (90%)	Low exchange capacity (0.75)	16.9	19.6%
				Large stones content (0.01)		
				Dusty (0.01)		
			Freehold (5%)	Low exchange capacity (0.75)		
				Dusty (0.01)		
			Collington (5%)	Low exchange capacity (0.75)		
				Dusty (0.02)		
CosC	Colts Neck sandy loam, 5 to 10 percent slopes	Somewhat limited	Colts Neck (90%)	Low exchange capacity (0.75)	2.2	2.5%
				Large stones content (0.01)		
				Dusty (0.01)		
			Freehold (5%)	Low exchange capacity (0.75)		
				Dusty (0.01)		
			Collington (5%)	Low exchange capacity (0.75)		
				Dusty (0.02)		
FmhAt	Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded	Very limited	Fluvaquents, loamy, frequently flooded (80%)	Ponding (1.00)	1.2	1.4%
				Flooding (1.00)		
				Depth to saturated zone (0.94)		
				Low exchange capacity (0.50)		
				Dusty (0.01)		
			Fluvaquents, loamy, frequently flooded (10%)	Ponding (1.00)		
				Flooding (1.00)		
				Depth to saturated zone (1.00)		
				Low exchange capacity (0.50)		
				Dusty (0.01)		
FrfB	Freehold loamy sand, 0 to 5 percent slopes	Somewhat limited	Freehold (80%)	Low exchange capacity (0.75)	47.9	55.3%
			Colts Neck (5%)	Low exchange capacity (0.75)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Large stones content (0.01)		
				Dusty (0.01)		
			Collington (5%)	Low exchange capacity (0.75)		
				Dusty (0.01)		
FrkB	Freehold sandy loam, 2 to 5 percent slopes	Somewhat limited	Freehold (85%)	Low exchange capacity (0.75)	6.8	7.8%
				Dusty (0.01)		
			Colts Neck (5%)	Low exchange capacity (0.75)		
				Large stones content (0.01)		
				Dusty (0.01)		
			Collington (5%)	Low exchange capacity (0.75)		
				Dusty (0.02)		
FrkC	Freehold sandy loam, 5 to 10 percent slopes	Somewhat limited	Freehold (90%)	Low exchange capacity (0.75)	9.1	10.5%
				Dusty (0.01)		
			Colts Neck (5%)	Low exchange capacity (0.75)		
				Large stones content (0.01)		
				Dusty (0.01)		
			Collington (5%)	Low exchange capacity (0.75)		
				Dusty (0.02)		
FrkE	Freehold sandy loam, 15 to 25 percent slopes	Very limited	Freehold (85%)	Slope (1.00)	1.5	1.7%
				Low exchange capacity (0.75)		
				Dusty (0.01)		
			Colts Neck (5%)	Slope (1.00)		
				Low exchange capacity (0.75)		
				Large stones content (0.01)		
				Dusty (0.01)		
			Collington (5%)	Slope (1.00)		
				Low exchange capacity (0.75)		
				Dusty (0.02)		
			Westphalia (5%)	Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Low exchange capacity (1.00)		
				Dusty (0.00)		
MaoC	Marlton sandy loam, 5 to 10 percent slopes	Somewhat limited	Marlton (90%)	Low exchange capacity (0.75)	0.3	0.3%
				Dusty (0.02)		
			Collington (5%)	Low exchange capacity (0.75)		
				Dusty (0.02)		
			Freehold (5%)	Low exchange capacity (0.75)		
				Dusty (0.01)		
SabB	Sassafras loamy sand, 0 to 5 percent slopes	Somewhat limited	Sassafras (85%)	Low exchange capacity (0.75)	0.1	0.1%
			Woodstown (5%)	Low exchange capacity (0.75)		
UR	Urban land	Not rated	Urban land (95%)		0.7	0.8%
Totals for Area of Interest					**86.6**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Somewhat limited	83.1	96.0%
Very limited	2.7	3.1%
Null or Not Rated	0.7	0.8%
Totals for Area of Interest	**86.6**	**100.0%**

Rating Options—Lawns, Landscaping, and Golf Fairways

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Small Commercial Buildings

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification of the soil). The properties that

affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

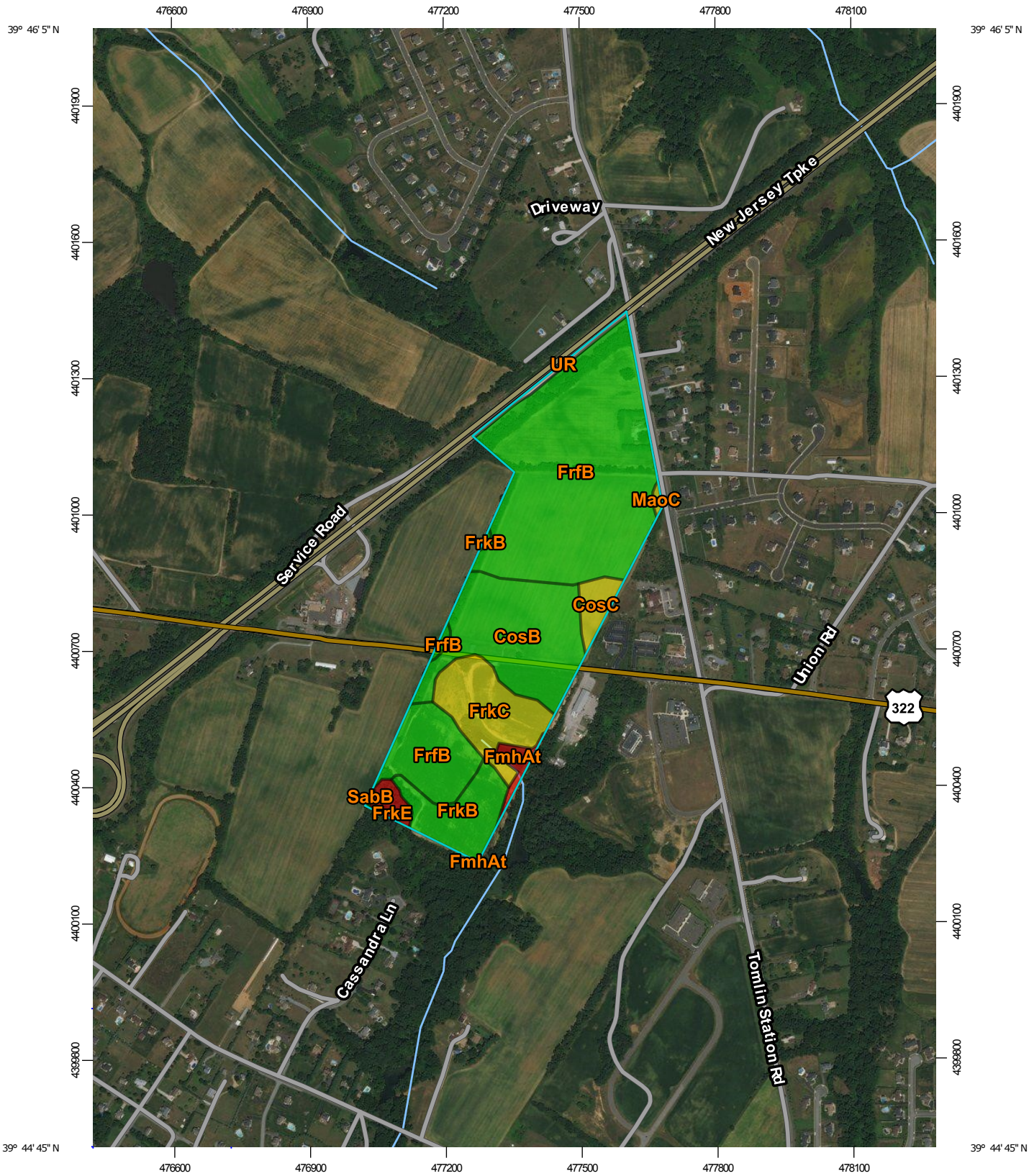
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Small Commercial Buildings



Map Scale: 1:12,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Lines

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Points

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Gloucester County, New Jersey
Survey Area Data: Version 15, Oct 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Small Commercial Buildings

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
CosB	Colts Neck sandy loam, 2 to 5 percent slopes	Not limited	Colts Neck (90%)		16.9	19.6%
			Freehold (5%)			
CosC	Colts Neck sandy loam, 5 to 10 percent slopes	Somewhat limited	Colts Neck (90%)	Slope (0.88)	2.2	2.5%
			Freehold (5%)	Slope (0.88)		
			Collington (5%)	Slope (0.88)		
				Shrink-swell (0.06)		
FmhAt	Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded	Very limited	Fluvaquents, loamy, frequently flooded (80%)	Ponding (1.00)	1.2	1.4%
				Flooding (1.00)		
				Depth to saturated zone (1.00)		
			Fluvaquents, loamy, frequently flooded (10%)	Ponding (1.00)		
				Flooding (1.00)		
				Depth to saturated zone (1.00)		
FrfB	Freehold loamy sand, 0 to 5 percent slopes	Not limited	Freehold (80%)		47.9	55.3%
			Colts Neck (5%)			
			Tinton (5%)			
FrkB	Freehold sandy loam, 2 to 5 percent slopes	Not limited	Freehold (85%)		6.8	7.8%
			Colts Neck (5%)			
FrkC	Freehold sandy loam, 5 to 10 percent slopes	Somewhat limited	Freehold (90%)	Slope (0.88)	9.1	10.5%
			Colts Neck (5%)	Slope (0.88)		
			Collington (5%)	Slope (0.88)		
				Shrink-swell (0.06)		
FrkE	Freehold sandy loam, 15 to 25 percent slopes	Very limited	Freehold (85%)	Slope (1.00)	1.5	1.7%
			Colts Neck (5%)	Slope (1.00)		
			Collington (5%)	Slope (1.00)		
				Shrink-swell (0.06)		
			Westphalia (5%)	Slope (1.00)		
MaoC	Marlton sandy loam, 5 to 10 percent slopes	Somewhat limited	Marlton (90%)	Slope (0.88)	0.3	0.3%
				Shrink-swell (0.66)		
			Collington (5%)	Slope (0.88)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Shrink-swell (0.06)		
			Freehold (5%)	Slope (0.88)		
SabB	Sassafras loamy sand, 0 to 5 percent slopes	Not limited	Sassafras (85%)		0.1	0.1%
			Downer (5%)			
			Woodstown (5%)			
UR	Urban land	Not rated	Urban land (95%)		0.7	0.8%
Totals for Area of Interest					**86.6**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Not limited	71.6	82.7%
Somewhat limited	11.5	13.3%
Very limited	2.7	3.1%
Null or Not Rated	0.7	0.8%
Totals for Area of Interest	**86.6**	**100.0%**

Rating Options—Small Commercial Buildings

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Chemical Properties

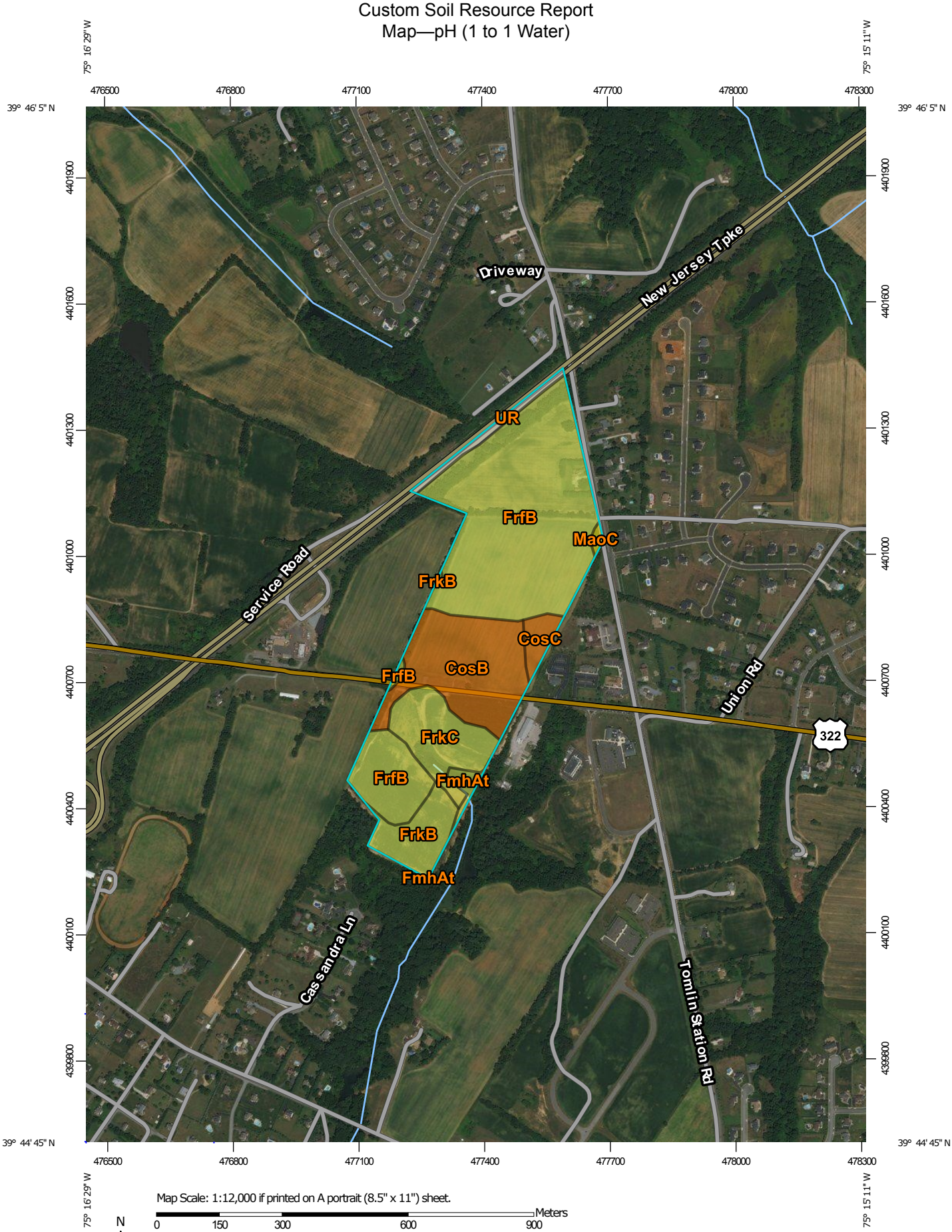
Soil Chemical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

pH (1 to 1 Water)

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion. In general, soils that are either highly alkaline or highly acid are likely to be very corrosive to steel. The most common soil laboratory measurement of pH is the 1:1 water method. A crushed soil sample is mixed with an equal amount of water, and a measurement is made of the suspension.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—pH (1 to 1 Water)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Soil Rating Lines

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Soil Rating Points

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Gloucester County, New Jersey
Survey Area Data: Version 15, Oct 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—pH (1 to 1 Water)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CosB	Colts Neck sandy loam, 2 to 5 percent slopes	4.0	16.6	19.8%
CosC	Colts Neck sandy loam, 5 to 10 percent slopes	4.0	2.0	2.4%
FmhAt	Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded	5.8	1.1	1.3%
FrfB	Freehold loamy sand, 0 to 5 percent slopes	5.8	47.2	56.2%
FrkB	Freehold sandy loam, 2 to 5 percent slopes	5.8	6.1	7.2%
FrkC	Freehold sandy loam, 5 to 10 percent slopes	5.8	9.0	10.8%
MaoC	Marlton sandy loam, 5 to 10 percent slopes	5.5	0.3	0.4%
UR	Urban land		1.6	1.9%
Totals for Area of Interest			**83.9**	**100.0%**

Rating Options—pH (1 to 1 Water)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

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National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf