



Corporate Headquarters
295 South Water Street, Suite 300
Kent, OH 44240
800-828-8312

Local Office
4 Walter E. Foran Blvd., Suite 209
Flemington, NJ 08822
908-788-9676

Environmental Impact Statement

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01, Lot 9
2500 Ridgeway Boulevard
Manchester Township, Ocean County, NJ
January 19, 2024

Prepared for:
Rioux Engineering, L.L.C.
13 Dayton Avenue
Toms River, NJ 08735
Attn: Timothy Rioux, PE

P.ENV0000468

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1.0 PROJECT DESCRIPTION

Wickberg Marine Contracting, Inc. (WMC) and 605 Toms River Road, LLC (hereafter collectively referred to as “WMC”) is proposing the construction of a new pre-fabricated 46 feet x 10 feet office trailer, a 60 feet x 90 feet prefabricated metal building and associated soil stabilization between the two structures (hereafter referred to as the “Project”) on the approximately 8.9-acre property known as Block 72.01, Lot 9 and located at 2500 Ridgeway Boulevard (hereafter referred to as the “Site”) in Manchester Township, Ocean County, NJ (**Appendix A, Figure 1 – Location Map**).

This Environmental Impact Statement (EIS) Report has been prepared for review by the Manchester Township Planning Board in accordance with Township Code Chapter 245 Section 50.

1.1 Project Details

The aforementioned improvements will facilitate the use of the Site as WMC’s primary office location. The principal building will consist of a prefabricated 46 feet x 10 feet X 12 feet tall office trailer. The office trailer will serve as the principal office for WMC. An accessory building will consist of a 60 feet x 90 feet x 20 feet tall prefabricated metal building that will be constructed on a concrete slab floor and foundation. The accessory building will serve as a shop for the repair and storage of equipment and materials and will also include a 20 feet x 60 feet concrete apron at either end of the building so that there is additional workspace and storage space. An approximately 20 feet x 177 feet gravel (or recycled concrete aggregate) driveway will provide soil stabilization between the principal office building and the accessory building.

The installation of the proposed office trailer includes the blocking and leveling of the trailer at the correct elevation, the anchoring of the trailer and the installation of an underground electric service. The erection of the proposed prefabricated metal building includes the following:

- Leveling of the soils for the concrete foundation and pad;
- Excavation for footings;
- Trenching for and installation of utility service conduits to the building;
- Installation of a stone pad;
- Installation of formwork for the concrete foundation and pad;
- Installation of reinforced concrete footings and pad;
- Removal of formwork;
- Installation of the steel building frame;
- Installation of the metal roof, building skin and doors;
- Final installation of utilities;
- Final grading around building and stabilization of soils; and
- Inspection of building for certificate of occupancy and other applicable final inspections.

1.2 Alternatives

The following four alternatives were considered during the planning process. The alternative that was selected (Alternative 4) provides WMC the tools they need to run their business effectively while having a minimal impact on the ecology of the Site. All alternatives considered below involve placement of these structures outside of mature forest and outside of aquatic features in areas that already experience regular disturbance by Site activities. Thus, the environmental impact of these four alternatives is similar and minimal.

Alternative 1: This alternative involves the removal of the existing trailer. This option would not be feasible because then WMC would not have a primary office location, which is required to run their operations. For this reason, this alternative was rejected.

Alternative 2: This alternative includes only building and permitting the office trailer, without the construction of the accessory building. The current use of the Site for outdoor storage is currently restricting WMC's ability to maintain equipment and store materials in a manner that is not negatively impacted by the weather. Thus, the construction of a new facility is crucial to the future development of their business.

Alternative 3: A third alternative considered building the office trailer within the prefabricated accessory metal building. This alternative would involve less overfall ground disturbance at the Site, but would reduce the space available for equipment and materials, thus requiring a larger metal accessory building. Therefore, it was preferred to maintain a separate office trailer and smaller size prefabricated metal accessory building.

Alternative 4: The final and chosen alternative is to maintain a separate office trailer with an additional accessory prefabricated building, both occurring within an actively disturbed area of the Site. This provides WMC the space required for their business needs with a minimal environmental effect.

2.0 EXISTING ENVIRONMENTAL CONDITIONS

The Site is located within a well-developed corridor of the New Jersey Coastal Plain (NJ-GeoWeb, 2023) physiographic province. The Site is immediately surrounded by forest, with dense residential development and commercial/industrial areas immediately beyond that. The Lakehurst Naval Air Station is situated to the northwest of the Site.

An inventory of existing environmental conditions was conducted at the Site on September 27, 2023 by William Macholdt, PWS and Jamie Morgan, CSE, CPSS of Davey Resource Group (DRG). Resumes of these individuals qualified to recognize the evidence and presence of flora and fauna are included in **Appendix B**. A desktop review of available databases regarding characteristics of the Site was also reviewed and that information is presented in the sections below.

2.1 Air Quality

The New Jersey Department of Environmental Protection (NJDEP) Bureau of Air Monitoring (BAM) operates a number of ambient air monitoring stations across the State. The monitoring stations vary in the number and type of monitors operating at each site. New Jersey's air monitoring program is primarily focused on the measurement of pollutants for which National Ambient Air Quality Standards (NAAQS) have been established, also known as criteria pollutants. Criteria pollutant monitoring is regulated by the United States Environmental Protection Agency (USEPA), which prescribes the design and siting of the monitoring networks, the acceptable monitoring methods, and the minimum quality assurance activities. Only data which meet USEPA requirements can be used to determine compliance with the NAAQS. There are six criteria air

pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), sulfur dioxide (SO₂), and particulate matter (PM). Although air concentrations of pollutants have been dropping over the past few years, the U.S. Environmental Protection Agency (USEPA) periodically reviews the NAAQS to make sure that they are protective of public health and adjusts them accordingly in response to new research.

The results of air quality monitoring for pollutants measured at the Statewide stations were compared to the NAAQS. The Air Quality Index (AQI) is a national air quality rating system based on the NAAQS. Numerical values that represent AQI levels and associated health impacts have been established. The AQI levels range from 1-500; 1-50 is considered good air quality, 51-100 is considered moderate air quality, 101-150 is considered unhealthy for sensitive groups, 151-200 is considered unhealthy, 200-300 is considered very unhealthy, and 301-500 is considered hazardous.

The closest Air Quality Monitoring Site to the Site is located in Colliers Mills, New Jersey. According to the 2022 New Jersey Air Quality Index Exceedance Days report (as of 1/4/2023) (NJDEP, 2023), the only pollutant to exceed an AQI value of 100 at the Colliers Mills location was ozone, which exceeded the “unhealthy for sensitive groups” level three times in 2022 with a maximum AQI value of 105 on three separate dates.

2.2 Water Quality

The Site is located within the Union/Ridgeway Branch (Toms River) (HUC-12 020403010303). The subwatershed of the Site is Manapaqua Brook, which has a NJDEP Water Quality Classification of Freshwater 2, Non Trout (FW2-NT) (**Appendix A, Figure 2 – Wetlands, Streams, and Watershed Map**). This stream is also included in the National Hydrography Dataset (NHD) mapping (**Appendix A – Figure 2**). No waterways or State open waters were observed on the Site during the field inventory conducted by DRG.

2.3 Water Supply

Per the NJGeoweb mapping sources (NJ-GeoWeb, 2023), no Water Source Areas of New Jersey are present within or near the Site. Surface Water Source Areas represent the active source water areas for each public community and non-community surface water intake.

The Site occurs within the Kirkwood-Cohansey sole-source aquifer (NJ-GeoWeb, 2023) (**Appendix A, Figure 3 – Sole Source Aquifer Map**) and has a B-A ranking (yielding 250 to more than 500 gallons per minute (NJGS, 2023). A sole-source aquifer is defined by the Environmental Protection Agency (EPA) as an aquifer that contributes more than 50% of the drinking water to a specific area and would be irreplaceable if contaminated. This aquifer covers approximately 3000 square miles across the New Jersey Coastal Plain (NJGS, 2009). The majority of the water withdrawn from this aquifer is used for potable consumption, followed by agricultural irrigation, and then for mining (mineral extraction from sand pits).

2.4 Hydrology

The Federal Emergency Management Agency (FEMA) floodplain mapping was reviewed to preliminarily determine the presence or absence of flood zones within at the Site (**Appendix A, Figure 4 – FEMA Floodplain Map**). No FEMA 100-year floodplains were identified on the Site. The nearest is associated with Manapaqua Brook to the south.

Wetlands are defined as areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions; or areas that are defined and delineated in accordance with the USACE guidelines.

The United States Fish and Wildlife Service (USFWS) National Wetlands Inventory and NJDEP mapping were reviewed to preliminarily determine the presence or absence of wetlands within the Site. Based on these mapping tools, no wetland areas were identified within the Site boundary (**Appendix A, Figure 2**). Additionally, no wetlands were observed on-Site during the inventory conducted by DRG.

On the opposite side of Ridgeway Blvd, a mapped NHD waterbody occurs and is classified as an artificial lake. This lake is associated with the River Point Homeowner Association, which is a large residential development occurring immediately northwest of the Site.

2.5 Geology

The bedrock geology at the Site is comprised of the Cohansey Formation, which contains medium to coarse grained quartz sand (NJ-GeoWeb, 2023) (**Appendix A, Figure 5 – Bedrock Geology Map**). The surficial geology contains non-glacial, upper stream terrace deposits, approximately 20 to 50 feet above the modern floodplain (**Appendix A, Figure 6 – Surficial Geology Map**). The deposits contain sand and pebble gravel with minor silt and cobble gravel particle components. The surficial deposits are as much as 20 feet thick with a yellow, reddish yellow to yellowish brown color (NJ-GeoWeb, 2023).

2.6 Soil Properties

The soils underlying the Site are classified as the Lakewood Sand (**Appendix A, Figure 7 – SSURGO Soils Map**). The Lakewood series consists of “very deep, excessively drained, rapidly permeable soils on marine terraces” (USDA-NRCS, 2023). These soils consist of single grain, loose sand, with a small layer of plant material consisting of pine needles and oak leaves at the surface when occurring in naturally vegetated forest communities. In these areas, a dark black A horizon is present, followed by a white E (eluviated) horizon, with hues of 10YR or 2.5Y, values of 5 to 7 and chromas 1 to 2. The sesquioxide enriched B horizon below typically has colors ranging from hues of 10YR to 5YR, values of 4 to 6, and chromas of 3 to 8.

The Lakewood series is further classified as “excessively drained”, with a “very low” runoff class. The depth to hydrologic restrictive features is noted as more than 80 inches and the frequency of flooding and ponding is listed as “none” (**Appendix C – Soil Report for Ocean County**).

During the Site inventory, observed soils closely met the description of the Lakewood Series, and thus matched the Site mapping. Exposed soils were observed in the area of the proposed building, and evidence of both the E and B horizons were noted.

2.7 Sewerage Systems

The Site falls within the Statewide Sewer Service Area for New Jersey (NJ-GeoWeb, 2023), but no sewer connections currently exist at the Site. Additionally, the entire Site occurs within the New Jersey Pinelands Commission “Regional Growth Area”, which are “areas of existing growth and adjacent lands capable of accommodating regional growth influences while protecting the essential character and environment of the Pinelands” (NJPC, 2023). Permitted residential densities range from two to six homes per acre with sewers. Sewered commercial and industrial uses are also permitted.

2.8 Topography and Slope

The topography of the Site is flat (approximately 0 to 5 percent slope) and occurs between 50 and 60 feet above mean sea level (msl) per the USGS topographic mapping (**Appendix A, Figure 8 – USGS Topographic Map**).

2.9 Vegetation

The forest cover within the Site is typical of a New Jersey Coastal Plain forest community, consisting of a canopy dominated by oak and pine trees. Specifically, trees species observed included pitch pine (*Pinus rigida*), blackjack oak (*Quercus marilandica*), post oak (*Quercus stellata*), sassafras (*Sassafras albidum*), black cherry (*Prunus serotina*), American holly (*Ilex opaca*), eastern red cedar (*Juniperus virginiana*) and tree-of-heaven (*Ailanthus altissima*). The shrub understory varied and contained dwarf chinquapin oak (*Quercus prinoides*), high-bush blueberry (*Vaccinium corymbosum*), low-bush blueberry (*Vaccinium pallidum*), winged sumac (*Rhus glabra*), and whiplash dewberry (*Rubus flagellaris*).

Dominant plant species in the wooded understory included spotted wintergreen (*Chimaphila maculata*), anise-scented goldenrod (*Solidago odora*), hairy bedstraw (*Galium pilosum*), teaberry (*Gaultheria procumbens*) and sawbrier (*Smilax glauca*). Canopy openings contained wild senna (*Senna hebecarpa*), prickly pear cactus (*Opuntia humifusa*), low cudweed (*Pseudognaphalium obtusifolium*), wooly panicgrass (*Dichanthelium acuminatum*), switchgrass (*Panicum virgatum*), common milkweed (*Asclepias syriaca*), Chinese wisteria (*Wisteria sinensis*), gray goldenrod (*Solidago nemoralis*), and ebony spleenwort (*Asplenium platyneuron*).

The interior forest margins within and surrounding the equipment laydown yard additionally contained sheep sorrel (*Rumex acetosella*), Spanish needles (*Bidens bipinnata*), common mullein (*Verbascum thapsus*), common yellow woodsorrel (*Oxalis stricta*), Chinese lespedeza (*Lespedeza cuneata*), Canada frostweed (*Crocianthemum canadense*), Indian tobacco (*Lobelia inflata*), nettle-leaved vervain (*Verbena urticifolia*), Japanese stiltgrass (*Microstegium vimineum*), Oriental lady's thumb (*Persicaria longisetia*), common dandelion (*Taraxacum officinale*), common yarrow

(*Achillea millefolium*), purple lovegrass (*Eragrostis spectabilis*), white snakeroot (*Ageratina altissima*), common burnweed (*Erechtites hieraciifolium*), spotted beebalm (*Monarda punctata*), hairy old-field aster (*Symphyotrichum pilosum*), rough buttonweed (*Hexasepalum teres*), nodding spurge (*Euphorbia nutans*), and late boneset (*Eupatorium serotinum*).

The fallow area where the proposed pre-fabricated building would be located and the forest canopy opening contained varying amounts of green bristle grass (*Setaria viridis*), crabgrass (*Digitalis sanguinalis*), American pokeweed (*Phytolacca americana*), common mugwort (*Artemisia vulgaris*), wild senna, anise-scented goldenrod, switchgrass, and huckleberry (*Gaylussacia baccata*).

The USFWS IPaC report (**Appendix D**), dated October 11, 2023 lists three Federally endangered and/or threatened plant species that should be considered as part of an effect's analysis for this Site, including the American chaffseed (*Schwalbea americana*), Knieskern's beaked-rush (*Rhynchospora knieskernii*), and swamp pink (*Helonias bullata*). American chaffseed is often found in fire-maintained acidic, sandy or peaty soils in open pine flatwoods, longleaf pine/oak sandhills, streamhead pocosins, pitch pine lowland forests, seepage bogs, or palustrine pine savannahs (NJNHP, 2018), often on the boundary between peaty wetlands and dry sandy soils (USFWS, 2023), whereas both Knieskern's beaked-rush and swamp pink are located within wetland habitats (USFWS, 2023).

The New Jersey Natural Heritage Program plant grid map indicates the presence of Puerto Rico Sphagnum (*Sphagnum portoricense*) within 1.5 miles of the Site. This species is found in wetlands and heavily inundated areas (McQueen and Andrus, 2023).

Of these rare species, no habitat would be suitable for Knieskern's beaked-rush, swamp pink, or Puerto Rico sphagnum and similarly, it is very unlikely that American chaffseed would be found at the Site due to a lack of ecotonal areas between adjacent wetlands.

2.10 Wildlife Habitat and Aquatic Organisms

2.1.1 NJDEP Landscape Project

The NJDEP Landscape Project is a landscape level approach to imperiled species conservation. The database uses species location data and land cover data to depict critical wildlife habitat throughout New Jersey. The Landscape Project Version 3.3 was consulted for the Site and indicates the Site contains Rank 4 habitat for northern pine snake (*Pituophis melanoleucus*) and timber rattlesnake (*Crotalus horridus*), both as "occupied habitat" (**Appendix A, Figure 9 – NJDEP Landscape Project Map**).

Northern pine snake - The northern pine snake is a constrictor snake species that is tan to cream-colored with darker brown saddles and markings. Its population in New Jersey is limited to a narrow fringe of Pinelands habitat and its population is isolated from pine snake populations in other portions of the eastern United States (NJDEP, 2023). Pine snakes require dry oak-pine forests on infertile soils (e.g. the Lakehurst or Lakewood sands) (Burger and Zappalorti, 1988). They are good at burrowing and spend the cooler months of the year (mid-October to mid-April) in underground hibernacula (NJDEP, 2023).

Timber rattlesnake - The timber rattlesnake is a large (up to approximately five feet) venomous viper varying in color and having a tail that is equipped with a rattle. Within New Jersey, there are two distinct populations of timber rattlesnakes with distinctive habitat conditions. Southern New Jersey populations are currently limited to oak-pine forest environments in portions of Burlington and Ocean Counties (NJDEP, 2013) and they den in cedar swamps and along streambanks. The snakes may disperse up to two miles or further from the den site during their active season (April to October). Although forests are typically utilized, rattlesnakes may utilize emergent or other wetland environments during the active season (typically summer) (NJDEP, 2013). Timber rattlesnakes feed on a variety of small mammals including cottontail rabbits (*Sylvilagus floridanus*), chipmunks (*Tamias striatus*), and other small rodents.

The numbers of both rattlesnakes and pine snakes have dropped in portions of their range due to habitat fragmentation and destruction, collection, and indiscriminate killing (Shaw, 2019).

The Site could be utilized as transient habitat for both northern pine snake and timber rattlesnake since they are documented in the area surrounding the Site. It is unlikely that the Site would have hibernacula for pine snakes as no large open sandy areas were observed, nor were any ground cavities noted. The lack of wetland and state open waters at the Site makes it unlikely that it is used by timber rattlesnakes for denning.

2.1.2 USFWS IPaC Report

The USFWS IPaC report (**Appendix D**), dated October 11, 2023 lists three Federally endangered (including proposed endangered) and threatened wildlife species and one candidate insect that should be considered as part of an effect's analysis for this Site. The wildlife species include the Federally-listed threatened bog turtle (*Glyptemys muhlenbergii*), the Federally-listed threatened (proposed endangered) northern long-eared bat, and the Federally-proposed endangered tricolored bat (*Perimyotis subflavus*). The monarch butterfly (*Danaus plexippus*) is also listed as it is a candidate species with the USFWS. Additionally, the IPaC report discusses compliance with the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940, which requires evaluation of potential impacts to migratory birds, eagles and their habitats.

Bog turtle - Bog turtles occupy open-canopy herbaceous sedge bogs or fens that lack shade and have adequate hummocks for basking and nesting (USFWS, 2023). Their habitat preferences include soft mucky substrates for burrowing and hibernation; an interspersal of wet and dry areas within sites, often with the presence of muskrat (*Ondatra zibethicus*) and meadow vole (*Microtus pennsylvanicus*) runways for travel corridors and cryptic basking sites; a mosaic of habitats present such as uplands, shallow water and muck, and deeper water; and a predominantly open canopy, with scattered areas of shrubs and small trees (USFWS, 2023). Bog turtle populations have declined significantly due to restrictive habitat preferences limiting areas where they colonize, loss of those habitats due to development and forest succession and for collection purposes (NJDEP, 2023).

Since no wetlands were observed at the Site, it is not anticipated the Site contains any habitat for bog turtle.

Tri-colored bat – The tri-colored bat is one of the smallest bats in North America, at about 3.5 inches long with a wingspan of just over 9 inches (KDFWR, 2023). The range of the tri-colored bat includes much of the eastern and central United States, southern Canada, Mexico and Central America. Wintering habitat (hibernacula) tricolored bats are found in caves and mines, and have also been observed in road culverts in the Southern United States. During the spring, summer and fall they occur in forest habitats where they roost in trees among the leaves (USFWS, 2023).

Northern long-eared bat - The northern long-eared bat is a medium-sized bat about 3 to 3.7 inches but with a wingspan of 9 to 10 inches (USFWS, 2023). The range of the northern long-eared bat includes much of the eastern and northcentral United States, and all Canadian provinces from the Atlantic Ocean west to the Southern Yukon Territory and Eastern British Columbia. Wintering habitat (hibernacula) is restricted to areas that support caves or underground cave-like structures. Hibernacula typically have large open areas with cracks or crevices for roosting. Hibernacula have consistent cool temperatures with very high humidity and minimal air currents (USFWS, 2014). During summer, roosting habitat includes live or dead trees of ≥ 3 " DBH under flaking bark, or in bark cracks and crevices. Males and non-reproductive females may also roost in cooler places, like caves and mines. The species also occasionally roosts under or within manmade structures such as barns and bridges. Isolated roost trees are considered suitable when they are within 1,000 feet of other suitable roost trees.

Both tri-colored and northern long eared bats feed exclusively on insects identified through echolocation. Insects may be captured on the wing or gleaned from water or vegetation surfaces. Foraging areas include forested wetlands and upland woodlots and linear forested corridors. Adjacent emergent wetlands, old fields, and pastures may also be utilized. Summer habitat is typically occupied from mid-May through mid-August (USFWS, 2014).

Bat populations have decreased significantly, largely driven by habitat destruction, and "white nose syndrome", and infection caused by the fungus *Pseudogymnoascus destructans* (USGS, 2022).

Tree species typical of developing ideal bark cracks and crevices used by roosting bats (e.g. shagbark hickory (*Carya ovata*), white oak (*Quercus alba*), and/or sugar maple (*Acer saccharinum*)) were not observed in the forest at the Site. Additionally, no potential caves or mines were observed. Therefore, the Site may be utilized by transient bat species but does not likely support a significant roosting or hibernating population.

Monarch butterfly – Monarch butterflies occur in open habitats where milkweed (*Asclepias* spp.), and other wildflowers are available. Monarchs have declined throughout portions of their range due to loss of host and nectar plants, as well as illegal logging and forest fragmentation in their wintering grounds (Colella, 2015), leading to it being a candidate for listing by the USFWS.

Several *Asclepias syriaca* plants were observed at the Site in either canopy openings in the forest or in cleared areas along the margins of the forest. Although the host species for the monarch butterfly is present, it is in limited quantities in fragmented and actively disturbed habitat. Therefore, it is unlikely that the Site supports significant populations of monarch butterflies.

Bald and Golden Eagle Protection Act - Bald eagles live near rivers, lakes and marshes where they can find their main food source of fish, but they will also eat waterfowl, turtles, rabbits, snakes and other small mammals, etc. They nest primarily in the tops of large trees but also use cliffs, the ground and man-made towers. Bald eagles were decimated by the 1990s due to habitat destruction, poaching, and contamination of their food source by dichlorodiphenyltrichloroethane (DDT). Their populations have made a significant comeback in response to protection afforded under the Endangered Species Act (USFWS, 2023).

The large pond that occurs to the north of the property could support bald eagle foraging, which means transient individuals could be found at the Site. This body of water is likely too small and the tree species surrounding it too short to support a nesting population. No bald eagles or their nests were observed during the field inventory.

Migratory Bird Treaty Act - The Migratory Bird Treaty Act of 1918 makes it illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid Federal permit. A migratory bird species is one that “occurs in the United States or U.S. territories as the result of natural biological or ecological processes and is currently, or was previously listed as, a species or part of a family protected by one of the four international treaties or their amendments, and revised taxonomy results in it being newly split from a species that was previously on the list, and the new species occurs in the United States or U.S. territories as the result of natural biological or ecological processes or new evidence exists for its natural occurrence in the United States or U.S. territories resulting from natural distributional changes and the species occurs in a protected family” (USFWS, 2023).

Mature forest with varying shrub understory was observed around the perimeter of the Site. Therefore, migratory bird species could utilize these areas during portions of their life cycles.

2.1.3 Aquatic Organisms

The Site does not contain any wetlands or state open waters, thus no aquatic organisms are anticipated to depend on the Site for their continued existence.

2.11 Noise Characteristics and Levels

The Site experiences noise from the adjacent road (Ridgeway Blvd), adjacent industrial properties, including the Lakehurst Naval Air Station and from its own operations involving construction equipment.

2.12 Demography

Based on the United States 2020 Census, Manchester Township had a population of 45,115 and a land area of 81.42 square miles. The population density was 554.1 persons per square miles. It is estimated that the population has increased by 2.1% as of 2023. Seniors aged 65 and older made up 48.6% of the population, whereas minor children under the age of 18 made up 8.6%. The majority of the residents identified as white alone (85.9%), followed by Hispanic (6.1%), black

(3.4%) and Asian (2.8%). The median household income from 2017 to 2021 was \$51,081. Approximately 8.1% of the people in the township fell at or below the poverty level.

Per the Environmental Justice Mapping, Assessment and Protection Tool (EJMAP), the Site is in a municipality with an overburdened community, but the Site does not fall within this community (**Appendix A, Figure 10 – Environmental Justice Map**).

2.13 Land Use

The Site is currently used as a storage and lay-down yard for heavy construction equipment and materials. The Site is immediately surrounded by forest, with dense residential development and commercial/industrial areas immediately beyond that. The Lakehurst Naval Air Station occurs to the northwest of the Site. An approximately 175-foot forested buffer exists between Ridgeway Boulevard and the disturbed portion of the Site. The currently developed and/or disturbed portion of the Site makes up approximately 55% of the whole site, and the remainder is forest or fallow areas/canopy openings.

The NJDEP Land Use/Land Cover mapping classifies the northwestern and southeastern portions of the Site as “coniferous forest” with greater than 50% canopy and the southern border as “coniferous forest” with 10-50% canopy. The center of the Site is classified as “industrial”, where forest had been cleared for Site activities (**Appendix A, Figure 11 – Land Use Map**).

The aforementioned classifications have been confirmed during the field inventory. The interior of the Site has been cleared of woody vegetation for industrial use. A portion of the cleared area appears fallow and contains herbaceous vegetation. The peripheral boundary of the Site consists of forest and canopy openings as described in Section 2.9 (**Appendix A, Figure 12 – Vegetation Communities and Photograph Location Map**).

2.14 Aesthetics

The improved portion of the Site sits approximately 175 feet back from Ridgeway Boulevard, and therefore does not have high visibility from the road. Please refer to the photographs in **Appendix E**, which documents the current appearance of the Site. Locations and directions of where the photographs were taken are displayed on **Figure 12 – Vegetation Communities and Photograph Location Map** in **Appendix A**.

2.15 History

Historic properties are buildings, structures, objects, sites or historic districts that are important historically, architecturally, or archeologically in the history of the County, the State, or the nation. Per the NJDEP Historic Properties and Historic Districts of New Jersey Database (which includes Nationally recognized historic landmarks or places), no historic resources are present in the Site boundary. Three historic areas are noted in the vicinity: The New Jersey Southern Railroad Historic District [INV ID # 4836 (eligible)] is located 90 feet east, the Lighter-Than-Air Historic District [INV ID # 2899 (eligible)] is located 1130 feet west, and the Lakehurst Historic District [(Identified)] is

located 1765 feet southwest of the Site (**Appendix A, Figure 13 – SHPO Historic Resources Map**). During the Site inventory, no additional historic buildings or resources were observed.

3.0 POTENTIAL ADVERSE ENVIRONMENTAL CONDITIONS

The following section summarizes the potential adverse effects and anticipated effects by the Project to the existing conditions discussed in Section 2.

3.1 Air

It is anticipated that there will be a temporary decrease in air quality during construction due to the increase in emissions from construction vehicles and other equipment, and from dust generated from vehicular and construction activities. However, the future use of the Site as an office facility with the maintenance of large equipment within a new indoor storage building is not anticipated to impact or be detrimental to local air quality. No activities are planned that would require an air permit. No adverse impacts to air quality are anticipated.

3.2 Water/Hydrology

As no wetlands, streams or other water bodies are located on the Site, no adverse impacts to water quality or hydrology are anticipated.

3.3 Soil/Sedimentation

The soil erosion and sediment control measures that will be implemented during construction will conform with the requirements of the Ocean County Soil Conservation District. Post construction, the proposed structures and the Site will be maintained in manners that are consistent with the Federal, State and local requirements; therefore, no adverse impacts caused by storm drainage, sedimentation, or siltation, etc. are anticipated.

3.4 Sewer

Although the area is noted as a Sewer Service Area, no sewer connections are proposed. An application for a septic permit will be filed. No adverse impacts to sewer systems are anticipated.

3.5 Topography

Since the Site is relatively flat, no changes in topography will occur due to the Project. Thus, no adverse impacts on topography are anticipated.

3.6 Flora and Fauna

The Project will not require the removal of any trees or otherwise impact mature forest as the area within the construction limit of disturbance does not contain trees and is currently actively disturbed by Site operations.

As previously noted, the following federal and/or state candidate, threatened, and endangered (or otherwise tracked and/or protected) plant and animal species have been noted as potentially occurring within the Project Area: pine snake, timber rattlesnake, bog turtle, monarch butterfly, tricolored bat, northern long-eared bat, swamp pink, American chaffseed, and Knieskern's beaked rush. Additionally, potential impacts to bald eagle and other birds protected under the Migratory Bird Treaty Act must be reviewed and evaluated.

No habitat is present for the wetland ecotone and wetland dependent species, including bog turtle, timber rattlesnake, American chaffseed, swamp pink, Knieskern's beaked rush and Puerto Rico sphagnum; therefore, no adverse impacts are anticipated for the species.

Overall, very minimal monarch butterfly habitat is currently present at the Site. Although several *Asclepias syriaca* plants were observed, these few plants resided mostly in canopy openings outside of where the proposed construction will take place or in areas that experience regular disturbance by current Site activities. Therefore, no significant adverse effects to monarch butterfly are anticipated.

The waters surrounding the Site provide marginal suitable foraging habitat for bald eagle, although no bald eagles or their nests were observed during the Site evaluation. If the species was present it is unlikely that the disturbance during or after construction would present a significant change from the disturbance that the Site already experiences. Additionally, since no trees require removal, no adverse impacts to bald eagle are anticipated.

As the location of the new buildings will be cited within existing cleared areas and thus will not require tree or shrub removal, it is not anticipated that there will be adverse impacts to bats or migratory bird species.

Transient pine or timber rattlesnakes could be impacted by chance encounters with vehicles and construction equipment, but this would not present much of a greater risk than the Site already experiences due to existing disturbances. Therefore, no adverse impacts are anticipated for pine or timber rattlesnakes.

3.7 Noise

It is anticipated that the noise generated during the proposed construction activities will include:

- Dump trucks delivering gravel or recycled concrete aggregate for the proposed driveway;
- Excavators or bulldozers spreading driveway material;
- Excavators and bulldozers excavating for the building foundation and pad;
- Crane and excavator use during the erection of the building;
- Air impact tools utilized to tighten structural connections; and
- Hammers/sledgehammers impacting steel when making structural connections.

It is not anticipated that the presence of the office trailer or the accessory use building will have an adverse impact on the noise that is generated at the Site after construction.

3.8 Township Services and Tax Structure

The Site is currently zoned as "Pinelands Office, Research and Light Industrial (POR-LI)" (Manchester, 2017). Thus, it is not anticipated that the Project will conflict with the current zoning. The Site will not require any additional Town resources beyond its current use. An application for a septic system is being submitted and no sewer connections will be required, nor

will town water connections be required. It is not anticipated that the Project will incur adverse impacts to Township Services or Tax Structure.

3.9 Traffic

Neither the primary use of the Site with the office trailer or the accessory use of the Site with the prefabricated metal building will require or cause an increase in traffic flow to the Site. It is anticipated that on a typical day there may be 5 – 6 people working at the Site and that this will fluctuate throughout the year. Prior to its purchase, the Site had a long access driveway that WMC has maintained. As such, the proposed construction of the concrete foundation and pad for the prefabricated metal building and the building's erection are planned for a location within the Site that will not impact the traffic flows along Ridgeway Boulevard. As such, traffic control measures will not be required. Thus, no adverse impacts are anticipated to traffic patterns in or around the Site.

3.10 Aesthetics

The aesthetics of the Site will only be minimally altered. New buildings will now exist within the grounds. However, since these areas are already in use for equipment storage, the new buildings will not change the existing industrial nature of the Site. Additionally, the Site operations are set back from the road and buffered from the road by a forested area which will remain intact. Therefore, the aesthetics of the Site from the road will not change and there will be no adverse impacts to aesthetics.

4.0 AVOIDANCE AND MINIMIZATION

Adverse impacts to water quality and sedimentation will be avoided by adhering to the requirements of the Ocean County Soil Conservation District. Currently, the Project is not expected to require the removal of trees or shrubs, and therefore no adverse impacts to rare wildlife are anticipated. However, the following timing restrictions should be considered to reduce unintended impacts, particularly if tree or shrub removal becomes necessary:

- If a bald eagle is observed nesting or foraging within or near the Site, follow the National Bald Eagle Management Guidelines (USFWS, 2007) to protect the species from disturbance.
- To maintain compliance with the Federal Migratory Bird Treaty Act, disturbance to trees or shrubs should take place outside of the general migratory bird breeding season, which extends from April 1 to August 31.
- To protect rare bat species, tree removal should occur outside of the active roosting and foraging months, which range from April 1 to November 15.

5.0 CONCLUSION

This EIS Report has been prepared for review by Manchester Township in accordance with Township Code Chapter 245 Section 50. Information contained herein was obtained from existing, published information from State and Federal agencies, as well as field investigations performed by DRG on September 27, 2023. As described in this report, the construction of the new building will not impact wetlands, or State open waters and no forest will need to be removed. It will not contribute to a long-term decline in air quality, water quality (including hydrological patterns), noise generation, or township resources and as planned, will not cause further harm to rare plants or wildlife than the Site already experiences with its current use.

The topography of the Site will not be altered, and based on the existing conditions, land use will not be altered since the area is already actively disturbed for equipment storage. During construction, proper erosion and sediment controls will be utilized to reduce water quality impacts to the greatest extent practicable.

6.0 REFERENCES

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Environmental Impact Statement
Wickberg Marine Contracting, Inc.
Manchester Township, Ocean County, New Jersey

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<https://www.usgs.gov/news/featured-story/creatures-night-frightening-threats-bats>

Appendix A – Figures



Legend

 Site Location

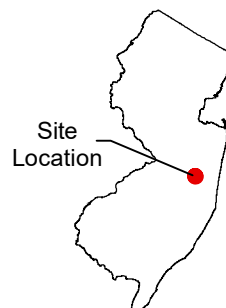
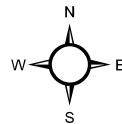


Figure 1 Location Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

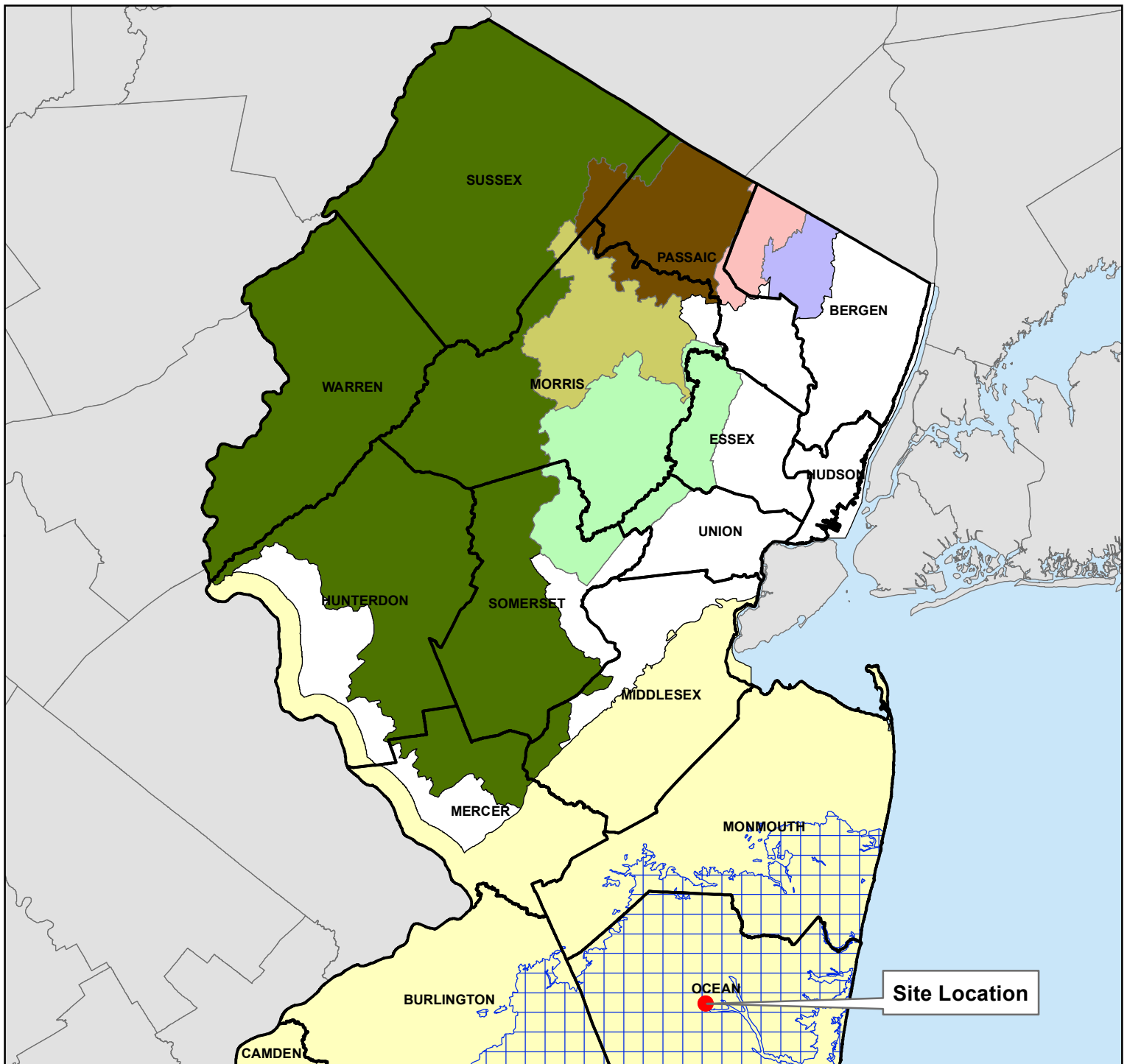
3,000

Feet



Source:
OpenStreetMap, a collaborative project to create a free editable map of the world,
OpenStreetMap Foundation, released as a GIS basemap under a Creative Commons
Attribution-ShareAlike license through ESRI® Data & Maps, Redlands, California, 2023.





Legend

- Site Location
- Kirkwood-Cohansey aquifer system

Sole Source Aquifers

- | | |
|--|---|
| Buried Valley | Not a SSA |
| Coastal Plain | Ramapo |
| Highlands | Ridgewood |
| Northwest New Jersey | Rockaway |

Sources:
 NJDEP Sole-Source Aquifers in New Jersey, Department of Environmental Protection (NJDEP), New Jersey Geological Survey, Jeffrey L. Hoffman (ed.), vector digital data, New Jersey Geological Survey, Trenton, NJ, December 2008.
 Bedrock Aquifers of New Jersey, Series DGS98-5, Edition 20050810 (Geol_bedrock_aquifer), New Jersey Department of Environmental Protection (NJDEP), New Jersey Geological Survey (NJGS), Trenton, NJ, August 2005.
 Counties of New Jersey, New Jersey State Plane NAD83, NJ Office of Information Technology (NJGIT), Office of Geographic Information Systems (OGIS), vector digital data, Trenton, NJ, February 2022.

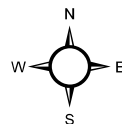


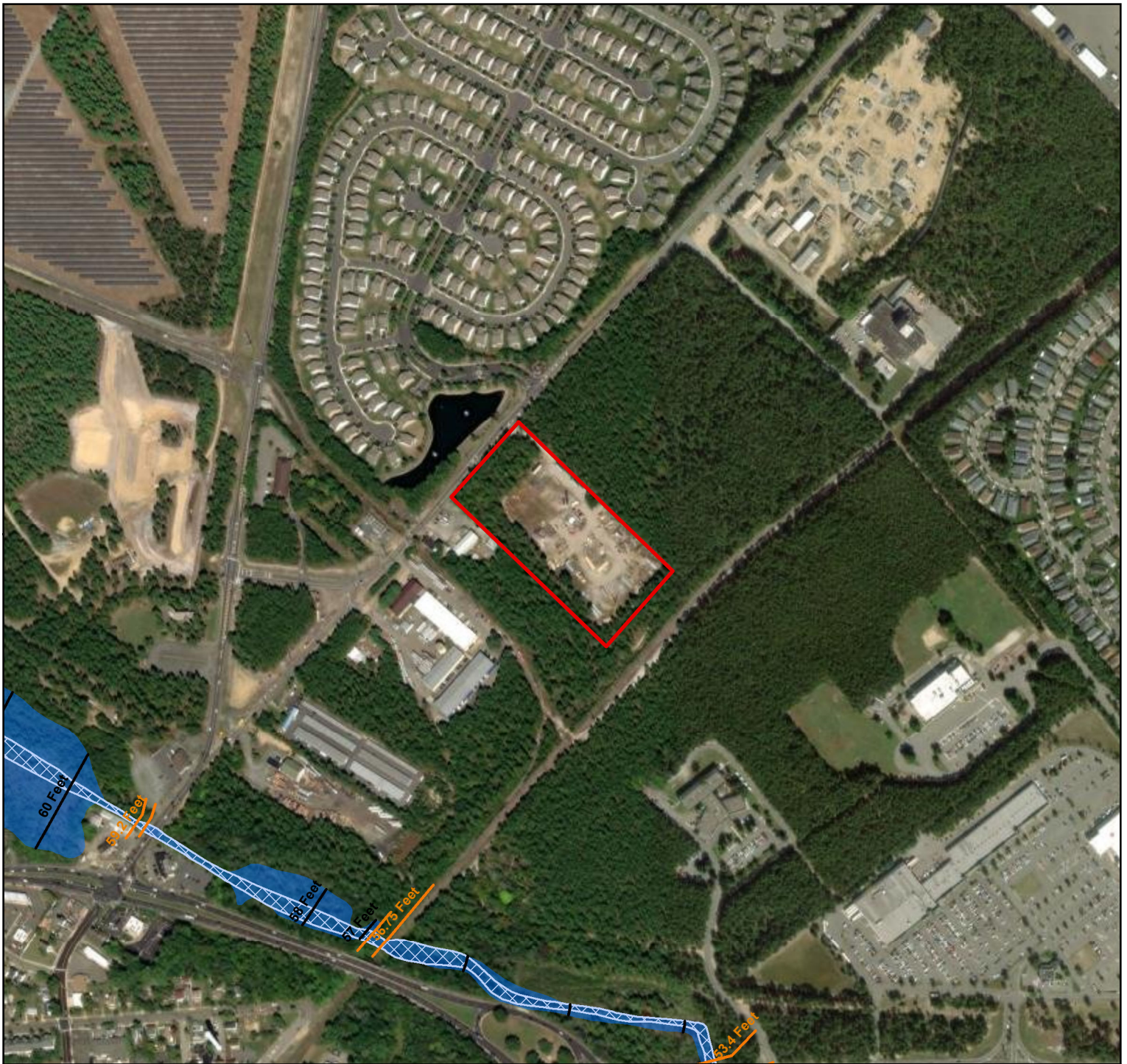
Figure 3
Sole Source Aquifer Map

Wickberg Marine Contracting, Inc.
 Pre-Engineered Building Installation
 Block 72.01; Lot 9
 Manchester Township
 Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

70,000
 Feet

DAVEY 
 Resource Group



Legend

- Site Location
- 100-year FEMA Floodplain
- Floodway
- Base Flood Elevation
- Cross Section Elevation

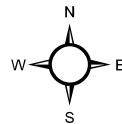


Figure 4 FEMA Floodplain Map

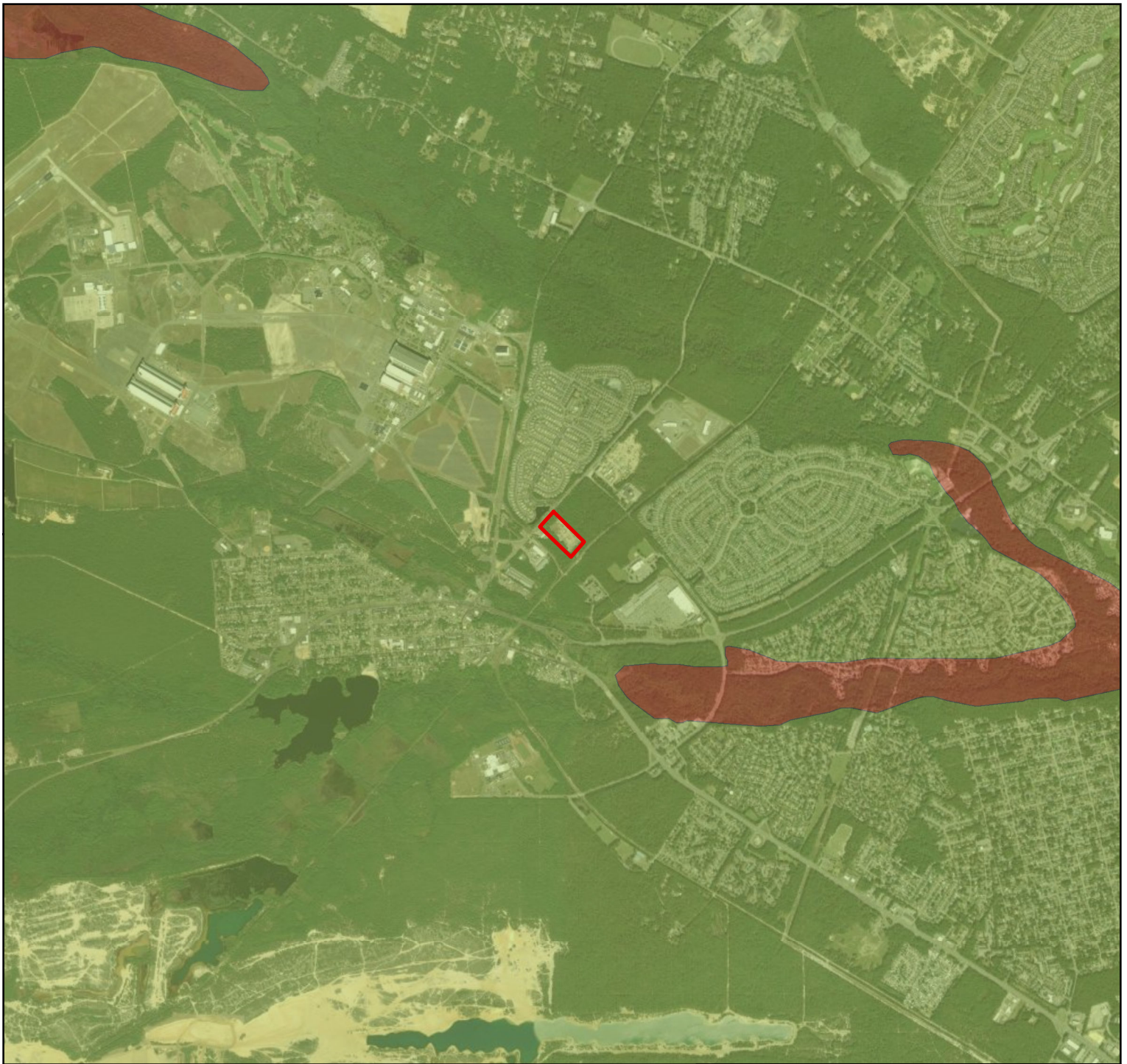
Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

600
Feet

DAVEY 
Resource Group

Sources:
Federal Emergency Management Agency (FEMA) County Flood Hazard Layer,
a compilation of all Digital Flood Insurance Rate Map (DFIRM) databases for Ocean
County, NJ, distributed by FEMA Map Service Center, Washington DC, March 2022.
World Imagery, latest imagery currently available utilizing satellite imagery acquired September 2022 by
Maxar released as a web mapping service distributed by ESRI® Data & Maps, Redlands, California, 2023.



Legend

- Site Location
- Cohansey Formation
- Lower Member Kirkwood Formation

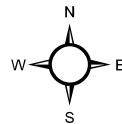
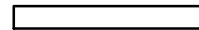


Figure 5 Bedrock Geology Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

3,000



Feet



Sources:
Bedrock Geology for New Jersey 1:100,000 Scale, New Jersey Department of Environmental Protection (NJDEP), New Jersey Geological Survey (NJGS), Trenton, NJ, February 2023.
World Imagery, latest imagery currently available utilizing satellite imagery acquired September 2022 by Maxar released as a web mapping service distributed by ESRI® Data & Maps, Redlands, California, 2023.



Legend

- Site Location
- Alluvium
- Lower Stream Terrace Deposits
- Swamp and Marsh Deposits
- Upland Gravel, Lower Phase
- Upper Stream Terrace Deposits

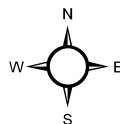


Figure 6
Surficial Geology Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

1,000

Feet



Sources:
Surficial Geology for New Jersey, New Jersey Department of Environmental Protection (NJDEP), New Jersey Geological Survey (NJGS), Trenton, NJ, January 2006.
World Imagery, latest imagery currently available utilizing satellite imagery acquired September 2022 by Maxar released as a web mapping service distributed by ESRI® Data & Maps, Redlands, California, 2023.



Legend

Site Location

SOILS LIST:

LasB - Lakewood sand, 0 to 5 percent slopes [HI]

Sources:
Soil Survey Geographic (SSURGO) Database for Ocean County, New Jersey, U.S. Department of Agriculture, Natural Resources Conservation Service, Fort Worth, Texas, August 2022.
World Imagery, latest imagery currently available utilizing satellite imagery acquired September 2022 by Maxar released as a web mapping service distributed by ESRI® Data & Maps, Redlands, California, 2023.

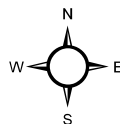


Figure 7 SSURGO Soils Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

200
Feet

DAVEY 
Resource Group



Legend

Site Location

New Jersey State Plane Coordinates in NAD83 for the approximate center of site -
North: 431,831' // East: 546,806'

Latitude and Longitude Coordinates in NAD83 for the approximate center of site -
N: 40° 01' 07.763" / W: 74° 18' 17.105"

Source:
National Geographic Society (NGS) USA Topographic Maps, seamless, scanned images of United States Geological Survey (USGS) paper topographic maps, Lakehurst NJ & Keswick Grove NJ Quadrangles, copyright 2013, distributed as a web mapping service by ESRI® Data & Maps, Redlands, California, 2023.

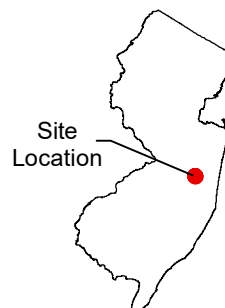
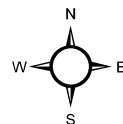


Figure 8
USGS Topographic Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

2,000

Feet

DAVEY 
Resource Group



Legend

- Site Location
- NJ Environmental Justice Overburdened Community

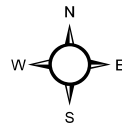


Figure 10 NJ Environmental Justice Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

1,000

Feet



Sources:
Overburdened Communities under the New Jersey Environmental Justice Law, Edition 20230412, NJ Department of Environmental Protection (NJDEP), Environmental Public Health and Safety, NJDEP, Trenton, NJ, April 2023.
World Imagery, latest imagery currently available utilizing satellite imagery acquired September 2022 by Maxar released as a web mapping service distributed by ESRI® Data & Maps, Redlands, California, 2023.



Legend

- | | |
|--|---|
| Site Location | Transitional Areas |
| Artificial Lakes | Coniferous Brush/Shrubland |
| Athletic Fields | Coniferous Forest (10-50% canopy) |
| Commercial/Services | Coniferous Forest (>50% canopy) |
| Industrial | Other Urban or Built-up Land |
| Railroads | Transportation/Utilities |
| Stormwater Basin | Upland ROW - Undeveloped |

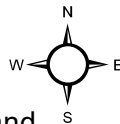
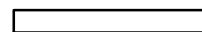


Figure 11
Land Use Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

300



Feet

DAVEY 
Resource Group

Sources:
Land Use/Land Cover 2015 Update, Edition 20190128, New Jersey Department of Environmental Protection,
Division of Information Technology, Bureau of Geographic Information Systems, Trenton, NJ, January 2019.
World Imagery, latest imagery currently available utilizing satellite imagery acquired September 2022 by
Maxar released as a web mapping service distributed by ESRI® Data & Maps, Redlands, California, 2023.



Legend

- Site Location
- Canopy Opening
- Fallow Herbaceous Habitat
- Industrial
- Mature Oak-Pine Forest
- ↗
 Photograph Location (with direction)

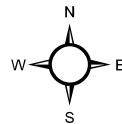
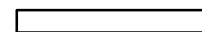


Figure 12 - Vegetation Communities and Photograph Location Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

150



Feet



Sources:
Vegetation Communities and Photograph Locations provided by
Davey Resource Group, Inc., based on fieldwork conducted September 2023.
World Imagery, latest imagery currently available utilizing satellite imagery acquired September 2022 by
Maxar released as a web mapping service distributed by ESRI® Data & Maps, Redlands, California, 2023.



Legend

- Site Location
- Historic District
- Historic Property

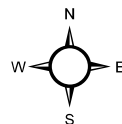


Figure 13 SHPO Historic Resources Map

Wickberg Marine Contracting, Inc.
Pre-Engineered Building Installation
Block 72.01; Lot 9
Manchester Township
Ocean County, New Jersey

DRGNJ Project # P.ENV0000468

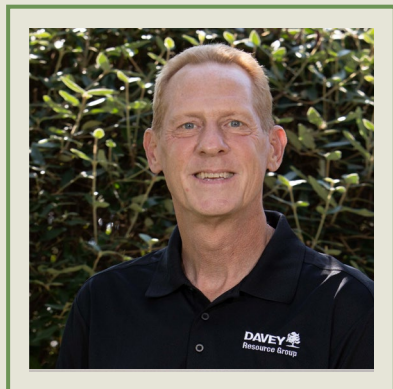
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Sources:
NJDEP Historic Properties and Historic Districts of New Jersey, New Jersey Department of Environmental Protection (NJDEP), Natural and Historic Resources (NHR), Historic Preservation Office, Trenton, NJ, January 2023.
World Imagery, latest imagery currently available utilizing satellite imagery acquired September 2022 by Maxar released as a web mapping service distributed by ESRI® Data & Maps, Redlands, California, 2023.

Appendix B – Resumes of Preparers



William F. Macholdt, PWS

Principal | Department Manager, NJ Permitting & GIS

Mr. Macholdt has extensive experience in management and performance of environmental studies including wetland delineation, wetland permitting, wetland mitigation design, hydrologic and soils investigations, wildlife studies, environmentally sensitive areas mapping, endangered and threatened species surveys, habitat restoration and environmental impact assessment. Mr. Macholdt has provided these services on water supply, wastewater, transportation, dam rehabilitation, drainage, recreation and other capital improvement projects throughout New Jersey.

Mr. Macholdt has an excellent working knowledge of the New Jersey *Freshwater Wetlands Protection Act* as well as the Federal wetlands delineation methodology. He has prepared NEPA documentation in accordance with FTA and FHWA NEPA regulations for Federal projects and has prepared Environmental Impact Assessments in accordance with NJ EO 215 requirements for state capital construction projects. Mr. Macholdt has extensive experience in preparation of State and Federal environmental permit applications including NJDEP Freshwater and Coastal Wetlands Permits; Wetland Transition Area Waivers; Flood Hazard Area Permits; Waterfront Development Permits; NJ Pinelands Public Development Approval; USACE Section 10/404 wetland permits; and PADEP Section 105 Wetlands Permits. Mr. Macholdt is experienced in interaction and consultation with regulatory and resource protection agencies including NJDEP, PADEP, USACE, USFWS, NMFS, NPS, and others.

Relevant Experience

Project: Green Hill Independent Living Facility, West Orange Township, Essex County, NJ.

Client: Green Hill/EwingCole.

Role: Project Manager

Description: Responsible for wetland delineation and documentation, NJDEP Letter of Interpretation application, and preparation of an Environmental Impact Statement in accordance with the West Orange Township Ordinance for the expansion of a previously existing facility on the Green Hill property. Prepared revised Environmental Impact Statement for new facility.

Project: Hunterdon Hills Animal Hospital, Readington Township, Hunterdon County, NJ.

Client: Hunterdon Hills Animal Hospital.

Education

- M.F.A. Visual Art, Bennington College, 2002
- B.S. Environmental Science, East Stroudsburg University, Stroudsburg, PA, 1984

Certifications

- NJ Watershed Institute Green Infrastructure Certification, Chesapeake Bay Landscape Professional, 2021
- NJDEP Bureau of Discharge Prevention, Certified Ecologist, 2020
- Society of Wetland Scientists, Certified Professional Wetland Scientist, 2012 - #2268
- Wetland Training Institute, Wetland Delineation Certification, 1990

Special Training

- Rutgers Cooperative Extension Water Resources Program, Green Infrastructure Champions series, 2021
- Rutgers Univ.: The NJ Agricultural Experiment Station, Office of Continuing Professional Education
 - FHACA Rules: Technical Standards Part II, Oct. 2018
 - FHACA Rules: Technical Standards Part I, Oct. 2018
- NJDOT Permits/NJDEP Regulations: Flood Hazard Area Control Permits – Module 2: Every Day Flood Hazard Permits, ACECNJ & NJDOT, Oct. 2017

Role: Project Manager

Description: Responsible for performance of field investigation, delineation of wetlands, and obtaining a NJDEP Letter of Interpretation to verify the wetland/transition area boundaries on the site. Project also included the preparation of an Environmental Impact Statement (EIS) for the proposed project, which includes the replacement and expansion of an existing, onsite veterinary clinic with a state-of-the-art facility. Testimony in support of the EIS before the Readington Township Planning Board was also provided by Mr. Macholdt.

Project: Proposed Residential Development and Recreational Facilities, Jefferson Township, Morris County, NJ.

Client: Mr. Paul Trendowicz & Hewitts Cove Marina.

Role: Project Manager

Description: Responsible for performance of wetland delineation; preparation of an Environmental Impact Statement and preparation of applications for NJDEP Wetlands General Permits #10, #11 and #19 to obtain authorization for two minor road crossings of wetlands; construction of a stormwater outfall and construction of a boardwalk crossing of wetlands along the shoreline of Lake Hopatcong to access a proposed boat dock and a fishing deck to be constructed within Lake Hopatcong. Also prepared an application for a Wetland Transition Area Waiver Plan to authorize the construction of a roadway cul-de-sac and stormwater water quality basin located near the shoreline of Lake Hopatcong.

Project: Pfizer Global Manufacturing, Parsippany-Troy Hills, Morris County, NJ.

Client: Pfizer Inc.

Role: Project Manager

Description: Responsible for wetland delineations and documentation, of multiple contiguous properties previously owned and recently acquired by Pfizer Inc. Assessed feasibility of acquiring NJDEP regarding wetlands permits for facility expansion. Prepared applications to the NJDEP for Regulatory Line Verification Letters of Interpretation, which have been received. Also prepared an Environmental Assessment Report in compliance with Township ordinance standards for the redevelopment of an existing research laboratory facility; prepared an application to the NJDEP for Freshwater Wetlands General Permits for construction of an access sidewalk through a wetland transition area; and performed a vernal habitat survey of an isolated wetland.

Project: Garden State Parkway Interchange Improvements/Interchange 141 to 157, Multiple Cities, Townships, and Boroughs; Bergen, Essex, Passaic, and Union Counties, NJ.

Client: New Jersey Turnpike Authority/Greenman Pedersen, Inc.

Role: Project Manager

Description: Responsible for field investigations, wetland/open water delineations, evaluation of endangered and threatened species habitat, and environmental permitting for the project. Prepared applications for NJDEP Freshwater Wetlands General Permits and Flood Hazard Area Permits to authorize for Interchange Improvements. Obtained verification from NJDEP regarding the applicability of NJ EO 215. It was determined that several of the projects were exempt from preparation of an EA or EIS under Executive Order 215. Prepared an Environmental Assessment under EO 215 for Interchange 154-155P. Also responsible for coordination of environmental project team performance of Phase 1 Site Assessments for Hazardous Waste, Air Quality and Noise Analyses, Cultural Resources Surveys and public outreach under EO 172.



Jamie M. Morgan

Project Manager

Ms. Morgan is experienced in wetland delineation, botanical surveys/plant identification, tree surveys, soil classification, wetland mitigation design and monitoring, threatened and endangered wildlife species habitat assessment and surveys, and environmental permitting for extensive linear projects as well as individual parcels. She is a Certified Professional Soil Scientist, a Certified Senior Ecologist, and a Certified Wetland Scientist (New Hampshire). She has performed hydrological monitoring with shallow wells and nested piezometers; and water collection from suction lysimeters. Ms. Morgan's laboratory skills include soil sample analysis (pH, texture, exchangeable cations, organic matter, etc.); water analysis (cations, anions, alkalinity, pH, etc.) and plant tissue analysis (major cations).

Ms. Morgan's wetland delineations have supported New Jersey Department of Environmental Protection (NJDEP) Letters of Interpretation and US Army Corps of Engineers (USACE) Jurisdictional Determinations. Ms. Morgan has prepared NJDEP Freshwater Wetlands and Flood Hazard Area permits in New Jersey. She has prepared Wetlands General Permits, Joint Permits and Erosion and Sediment Control General Permits in Pennsylvania. She has prepared USACE Nationwide Permits in West Virginia, Ohio and Delaware. She has prepared State Environmental Quality Review (SEQR) compliance permits in New York. Ms. Morgan has additionally conducted wetland evaluations in compliance with State regulations as well as associated reporting and permitting in Connecticut, Massachusetts, and Indiana. She has prepared designs and carried out monitoring and compliance reporting to NJDEP and USACE regarding wetland mitigation and tree planting/restoration projects.

Relevant Experience

Project: CS Energy, Berkeley Community Solar Project, Berkeley Township Landfill Redevelopment, Berkeley Township, Ocean County, NJ.

Client: CS Energy.

Role: Environmental Scientist

Description: Responsible for conducting a wetland delineation in accordance with the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989), as required by the New Jersey Pinelands Commission in support of the *NJ Freshwater Wetlands Protection Act* and an endangered and threatened species habitat assessment (including a botanical survey for Knieskern's beaked-rush and a callback survey for Pine Barrens Treefrog) for a proposed solar site. Prepared an Environmental Impact Statement for Berkeley Township related to the proposed redevelopment.

Education

- M.S., Plant and Soil Sciences, University of Massachusetts Amherst, September 2005 - January 2008 - Concentrations: Plant Ecology/Nutrition, Wetlands, Hydrology, Soil Science, Chemistry.
- B.A., Ecology and Natural Resource Management and Philosophy, Rutgers University, 1998 - 2002

Certifications

- Certified Wetland Scientist, State of New Hampshire Board of Natural Scientists, December 2019 to Present
- Certified Senior Ecologist (Ecological Society of America) - Awarded June 2019
- Certified Professional Soil Scientist (Soil Science Society of America) - Awarded December 2015

Special Training

- PADCNR Wild Plant Management Permit, March 31, 2021
- 40 Hour HAZWOPER Training, September 2009
- 8 Hour OSHA Refresher Course, 2020-2021
- OSHA 10 Hours Construction Training, 2018

Project: Bridgeboro Road, Delran Township, Burlington County, NJ.

Client: Carroll Engineering.

Role: Environmental Scientist.

Description: Responsible for conducting a wetland delineation in accordance with the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989)* for a proposed development site.

Project: Gloucester Solar I Project, Clayton Borough and Franklin Township, Gloucester County, NJ.

Client: Gloucester Solar I, LLC/Burns and McDonnell.

Role: Project Manager

Description: Responsible for conducting a wetland delineation in accordance with the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989)*, as required by the NJDEP under the *NJ Freshwater Wetlands Protection Act* regulations. Performed a Green Acres tree survey on encumbered parcels in accordance with NJDEP Green Acres Program Rules and performed a habitat assessment for rare, threatened, and endangered (RTE) species in the tree survey area. Species of concern included Barred owl (*Strix varia*), Bald eagle (*Haliaeetus leucocephalus*), Robust baskettail (*Epitheca spinosa*), Banner clubtail (*Gomphus apomyius*), Northern long-eared bat (*Myotis septentrionalis*), American chaffseed (*Schwalbea americana*), Knieskern's beaked-rush (*Rhynchospora knieskernii*), and Swamp pink (*Helonias bullata*).

Project: Sommer Property, Old Bridge Township, Middlesex County, NJ.

Client: ERM.

Role: Project Manager

Description: Responsible for conducting a wetland delineation in accordance with the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989)*, as required by the NJDEP under the *NJ Freshwater Wetlands Protection Act* regulations and the *1987 U.S. Army Corps of Engineers Manual for Delineating Jurisdictional Wetlands* and appropriate supplement, as required by the USACE under the *Federal Clean Water Act* regulations. Currently preparing applications to the NJDEP for Freshwater Wetlands General Permits and for a Flood Hazard Area Individual Permit. Currently preparing a pre-construction notification application to the USACE for a Nationwide Permit #38 (cleanup of hazardous and toxic waste).

Project: Private Residence, East Orange, Essex County, NJ.

Client: Frank Lehr Associates.

Role: Project Manager

Description: Responsible for conducting a wetland delineation for a proposed homesite. The wetland delineation was performed utilizing the routine methodology outlined in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989)*, as required by the NJDEP.

Project: Willow Spring Road, Morris Township, Morris County, NJ.

Client: Morris Township.

Role: Project Manager

Description: Responsible for conducting a wetland delineation for a proposed town park. The wetland delineation was performed utilizing the routine methodology outlined in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989)*, as required by the NJDEP.

Appendix C – Ocean County Soil Survey Report



United States
Department of
Agriculture

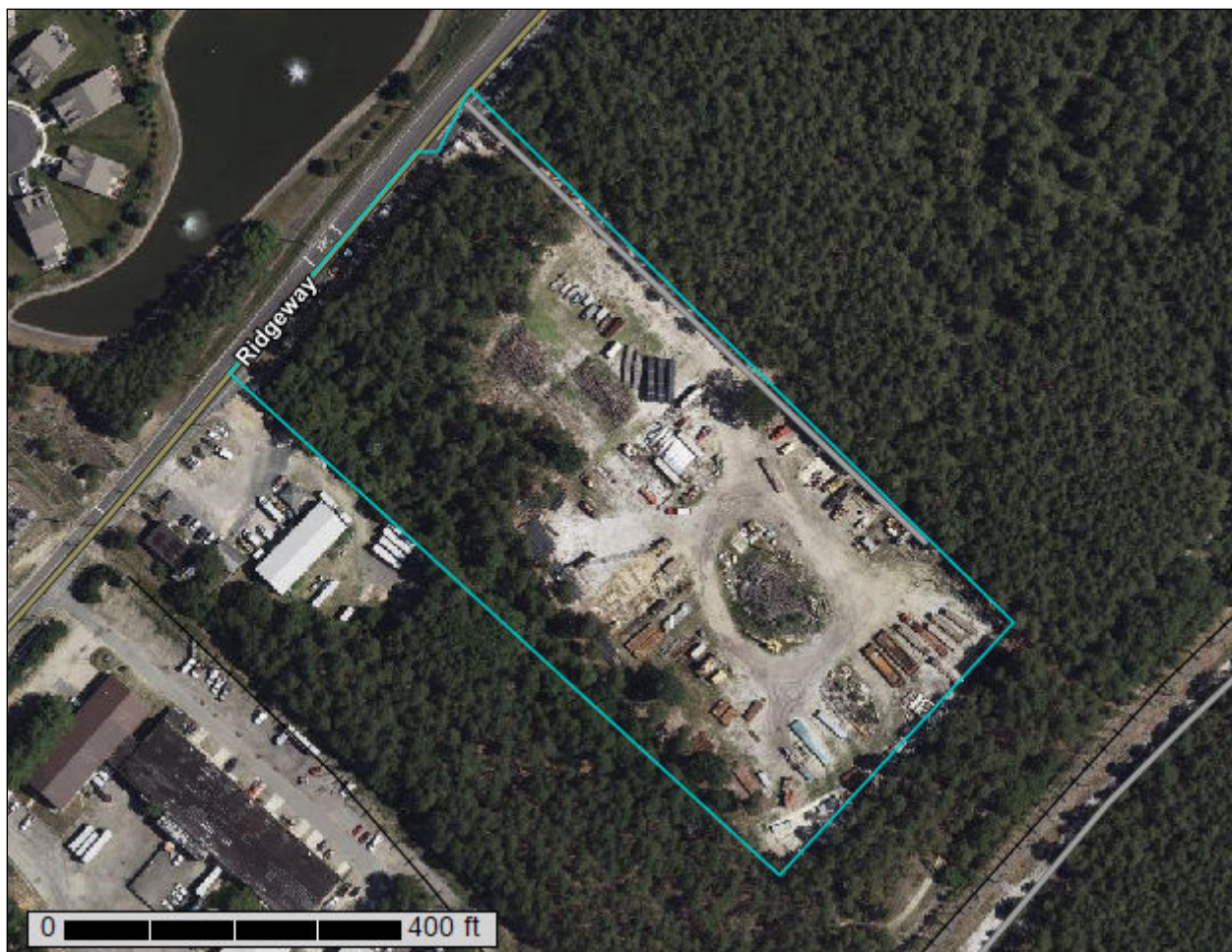
NRCS

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 Ocean County, New Jersey

2500 Ridgeway Boulevard



May 31, 2022

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.

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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

Custom Soil Resource Report

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



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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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Ocean County, New Jersey
Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Apr 13, 2021—Sep 14, 2021

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
LasB	Lakewood sand, 0 to 5 percent slopes	8.7	100.0%
Totals for Area of Interest		8.7	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.

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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.

Ocean County, New Jersey

LasB—Lakewood sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: rdv1

Elevation: 20 to 150 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 local importance

Map Unit Composition

Lakewood and similar soils: 85 percent

Minor components: 15 percent

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

Description of Lakewood

Setting

Landform: Flats, knolls

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Sandy fluviomarine deposits

Typical profile

A - 0 to 3 inches: sand

E - 3 to 11 inches: sand

Bh - 11 to 13 inches: loamy sand

BC - 13 to 30 inches: sand

C1 - 30 to 46 inches: sand

C2 - 46 to 80 inches: sand

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Quakerbridge

Percent of map unit: 5 percent

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Landform: Knolls, flats
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Lakehurst

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

Atsion, rarely flooded

Percent of map unit: 5 percent
Landform: Flats, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, dip, tal
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: "[National Soil Survey Handbook](#)."

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3

Low: 3 to 6

Moderate: 6 to 9

High: 9 to 12

Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology)

from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left

behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasesers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2

Low: 0.2 to 0.4

Moderately low: 0.4 to 0.75

Moderate: 0.75 to 1.25

Moderately high: 1.25 to 1.75

High: 1.75 to 2.5

Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth's crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can

occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent

Low: 0.5 to 1.0 percent

Moderately low: 1.0 to 2.0 percent

Moderate: 2.0 to 4.0 percent

High: 4.0 to 8.0 percent

Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and

promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5

Extremely acid: 3.5 to 4.4

Very strongly acid: 4.5 to 5.0

Strongly acid: 5.1 to 5.5

Moderately acid: 5.6 to 6.0

Slightly acid: 6.1 to 6.5

Neutral: 6.6 to 7.3

Slightly alkaline: 7.4 to 7.8

Moderately alkaline: 7.9 to 8.4

Strongly alkaline: 8.5 to 9.0

Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
 - A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
 - B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
 - C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
 - A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
 - B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where "Rock outcrop" is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which "severely eroded," "very severely eroded," or "gullied" is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1

Moderate: 13-30:1

Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0

Coarse sand: 1.0 to 0.5

Medium sand: 0.5 to 0.25

Fine sand: 0.25 to 0.10

Very fine sand: 0.10 to 0.05

Silt: 0.05 to 0.002

Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated

Prismatic: Vertically elongated and having flat tops

Columnar: Vertically elongated and having rounded tops

Angular blocky: Having faces that intersect at sharp angles (planes)

Subangular blocky: Having subrounded and planar faces (no sharp angles)

Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand

Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field

generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

Appendix D – IPAC Report



United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Ecological Services Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205
Phone: (609) 646-9310



In Reply Refer To:
Project Code: 2024-0003869
Project Name: p14616 Wickberg Marine Contracting, Inc.

October 11, 2023

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

If the enclosed list indicates that any listed species may be present in your action area, please visit the New Jersey Field Office consultation web page as the next step in evaluating potential project impacts: <http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html>

On the New Jersey Field Office consultation web page you will find:

- habitat descriptions, survey protocols, and recommended best management practices for listed species;
- recommended procedures for submitting information to this office; and
- links to other Federal and State agencies, the Section 7 Consultation Handbook, the Service's wind energy guidelines, communication tower recommendations, the National Bald Eagle Management Guidelines, and other resources and recommendations for protecting wildlife resources.

The enclosed list may change as new information about listed species becomes available. As per Federal regulations at 50 CFR 402.12(e), the enclosed list is only valid for 90 days. Please return to the IPaC website at regular intervals during project planning and implementation to obtain an updated species list. When using IPaC, be careful about drawing the boundary of your Project Location. Remember that your action area under the ESA is not limited to just the footprint of the project. The action area also includes all areas that may be indirectly affected through impacts such as noise, visual disturbance, erosion, sedimentation, hydrologic change, chemical exposure,

reduced availability or access to food resources, barriers to movement, increased human intrusions or access, and all areas affected by reasonably foreseeable future that would not occur without ("but for") the project that is currently being proposed.

Additionally, please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of NLEB after the new listing goes into effect this will first need to be addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

We appreciate your concern for threatened and endangered species. The Service encourages Federal and non-Federal project proponents to consider listed, proposed, and candidate species early in the planning process. Feel free to contact this office if you would like more information or assistance evaluating potential project impacts to federally listed species or other wildlife resources. Please include the Consultation Tracking Number in the header of this letter with any correspondence about your project.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New Jersey Ecological Services Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205
(609) 646-9310

PROJECT SUMMARY

Project Code: 2024-0003869
Project Name: p14616 Wickberg Marine Contracting, Inc.
Project Type: New Constr - Above Ground
Project Description: Pre-Engineered Building Installation
Project Location:

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@40.018832700000004,-74.3047545714625,14z>



Counties: Ocean County, New Jersey

ENDANGERED SPECIES ACT SPECIES

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat <i>Perimyotis subflavus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

REPTILES

NAME	STATUS
Bog Turtle <i>Glyptemys muhlenbergii</i> Population: Wherever found, except GA, NC, SC, TN, VA No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6962	Threatened

INSECTS

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
American Chaffseed <i>Schwalbea americana</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1286	Endangered
Knieskern's Beaked-rush <i>Rhynchospora knieskernii</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3280	Threatened
Swamp Pink <i>Helonias bullata</i> Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4333	Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act¹ and the Migratory Bird Treaty Act².

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats³, should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

-
1. The [Bald and Golden Eagle Protection Act](#) of 1940.
 2. The [Migratory Birds Treaty Act](#) of 1918.
 3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are bald and/or golden eagles in your project area.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the **PROBABILITY OF PRESENCE SUMMARY** at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read the supplemental information and specifically the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)

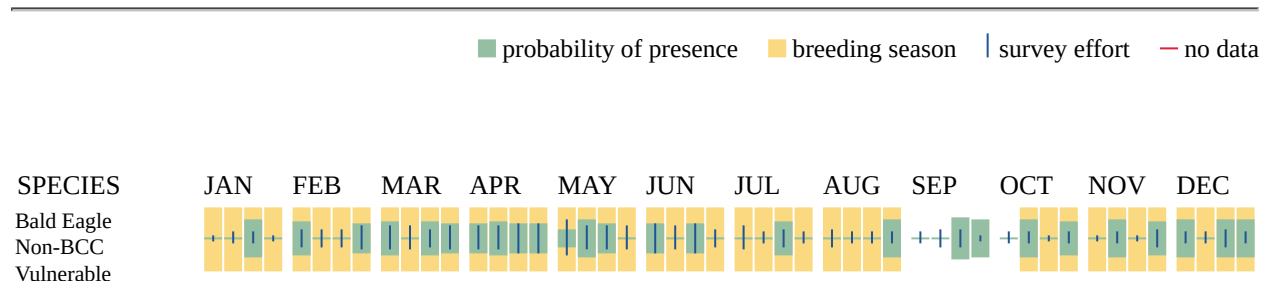
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (—)

A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>

- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide conservation measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC <https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats³ should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

-
1. The [Migratory Birds Treaty Act](#) of 1918.
 2. The [Bald and Golden Eagle Protection Act](#) of 1940.
 3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

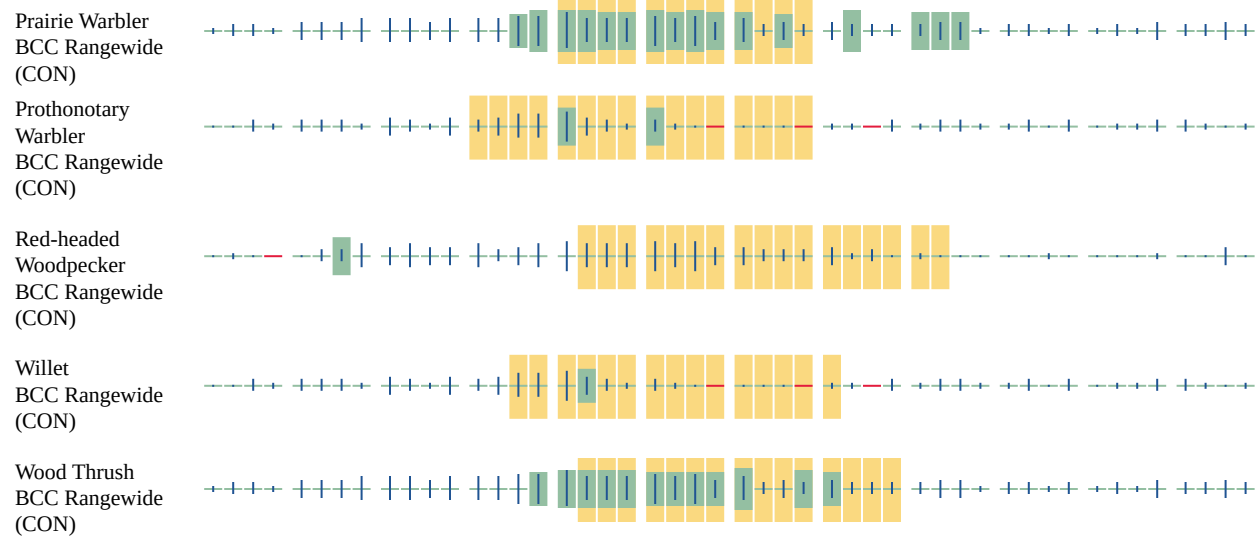
For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Blue-winged Warbler <i>Vermivora pinus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9509	Breeds May 1 to Jun 30

NAME	BREEDING SEASON
Canada Warbler <i>Cardellina canadensis</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10
Chimney Swift <i>Chaetura pelagica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will <i>Antrostomus vociferus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Pectoral Sandpiper <i>Calidris melanotos</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Prairie Warbler <i>Dendroica discolor</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9513	Breeds May 1 to Jul 31
Prothonotary Warbler <i>Protonotaria citrea</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Willet <i>Tringa semipalmata</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10669	Breeds Apr 20 to Aug 5
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read the supplemental



Additional information can be found using the following links:

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- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>
- Nationwide conservation measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC <https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

WETLANDS

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

IPAC USER CONTACT INFORMATION

Agency: Davey Resource Group
Name: John Pabish
Address: Davey Resource Group
Address Line 2: 4 Walter E. Foran Blvd, Suite 209
City: Flemington
State: NJ
Zip: 08822
Email: jpabish@amygreene.com
Phone: 9087889676

Appendix E – Site Photographs
Photo Numbers Correspond to Locations on Figure 12



Photograph 1 – View of the mature oak-pine forest at the northern end of the Site.



Photograph 2 – View northwest toward Ridgeway Blvd from the oak-pine forest. A detention pond on the other side of the road is visible in the background.



Photograph 3 – View of the more shrub dominated sections of the oak-pine forest at the northwestern corner of the Site.



Photograph 4 – View of the vegetation in the fallow areas in the southeast corner of the Site.



Photograph 5 – View southwest of the area where the pre-fabricated building is proposed.



Photograph 6 – View northeast of the area where the pre-fabricated building is proposed.



Photograph 7 – View southeast of the area where the pre-fabricated building is proposed.



Photograph 8 – View of exposed soil within the proposed area of disturbance.