ECS Midwest, LLC

Geotechnical Engineering Report

Proposed Interurban Trail Phase 3

Interurban Trail (between County Road F and Ski Slide Road)
Jefferson County, Wisconsin

ECS Project Number 42:2334

November 30, 2022

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Mr. Brian M. Udovich, P.E.
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ECS Project No. 42:2334

Reference: Geotechnical Engineering Report
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Jefferson County, Wisconsin

Dear Mr. Udovich:

ECS Midwest, LLC (ECS) has completed the subsurface exploration, field and laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed scope of services. This report presents our understanding of the geotechnical aspects of the project, the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to you on this project. We would like to continue our services during design and provide our services during construction to check the assumptions of subsurface conditions made for this report. Please contact us should you have questions about the information contained in this report, or if we can be of further assistance to you.

Respectfully submitted,

ECS Midwest, LLC

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APPENDICES

EXECUTIVE SUMMARY

This Executive Summary is intended as a very brief overview of the primary geotechnical conditions expected to affect design and construction. Information gleaned from this Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

- Mostly frost susceptible and poorly draining soils with low pavement support characteristics were encountered at the boring locations. Some excavation below subgrade (EBS) of the subgrade soils are expected to be needed to improve pavement support. Undocumented existing fill was also encountered which presents a risk of long-term poor pavement performance.

1.0 INTRODUCTION

The purpose of this report is to provide geotechnical information for the design of pavement and utility lines. The recommendations developed for this report are based on project information supplied by McMahon and Associates.

ECS provided its services in accordance with ECS Proposal No. 42:3235-GP, dated October 31, 2022, as authorized by Mr. Brian Udovich of Jefferson County Highway Department, on November 1, 2022, and includes the Terms and Conditions of Service included therein.

This report contains the procedures and results of the subsurface exploration and laboratory testing programs, a description of existing site conditions, engineering analyses, and geotechnical recommendations for the design and construction.

The report includes the following items.

- A brief description of the field and laboratory test procedures and results.
- A description of the observed surface topographical features and site conditions.
- A description of area and site geologic conditions.
- A description of the interpreted subsurface soil stratigraphy with pertinent available physical properties.
- Records of the subsurface explorations (test boring logs).
- Recommendations for preliminary pavement design based on an assumed CBR value and assumed traffic, which includes pavement subgrade preparation, minimum pavement sections and pavement drainage. WisDOT pavement design parameters (Design Group Index, Frost Index, modulus of subgrade reaction, soil support value, and CBR) will also be estimated based on the soil classification, index properties and engineering judgment.
- Recommendations for site preparation and construction of engineered fills, including an evaluation of on-site soils for use as engineered fills, and delineation of potentially unsuitable soils and/or soils exhibiting excessive moisture at the time of sampling.
- General considerations relative to groundwater.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE/PAST SITE USE

The project site is the Interurban Trail located between County Road F and approximately a half-mile east of Ski Slide Road in Ixonia, Jefferson County, Wisconsin. The site location is shown below, and on the Site Location Diagram in Appendix A.

Site Location (approximate site outlined in red)

The site is currently a grass-covered trail. Overhead utilities run along the trail. At the time this proposal was written, a site-specific topographic survey was not available. The ground surface elevations at the site, estimated from the topographic information on Google Earth, vary from approximately EL. 841 to EL. 895 feet, MSL.

2.2 PROPOSED CONSTRUCTION

We understand the proposed project will include the reconstruction of pavement, and sanitary sewer, water main and storm sewer utilities.

Pavement: The development will include a paved trail. The design traffic was not provided to us. The daily traffic is assumed to consist of pedestrians and maintenance vehicles of less than one 18,000-pound ESAL per day.

Site Grading: It is anticipated less than approximately 2 feet of fill and cut will be needed to develop the site.

If ECS' understanding of the project is not correct or the design changes, especially if the elevations are different, please contact ECS so that we may review these changes and revise our recommendations, as appropriate.

3.0 DESKTOP STUDY

Cursory review of readily available published geology and hydrogeology information was done to help evaluate the potential for geological factors that may not be captured by the subsurface exploration, and to evaluate the significance of these factors on the design and construction.

3.1 SURFICIAL DEPOSITS

Based on the USDA Natural Resources Conservation Service Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm), which provides soil information to a shallow (typically less than 5 feet) depth, the site soils as mapped are described below. The soil is mostly described as loess, silty and loamy drift over sandy and loamy till, lacustrine deposits or sandy and gravelly outwash. An area of herbaceous organic material is also noted just east of the Rock River. Soil mapping of the site vicinity and further description is presented in the Soil Report included in Appendix D.

Glacial soils are often heterogeneous horizontally and vertically due to lack of sorting commonly associated with a glacial environment of deposition. Pre-glacial landforms unapparent from the surface may underlie glacial deposits. Cobbles or boulders may be present within or buried by glacial deposits. Local inclusions of water-deposited, laminated sands, silts and clays are sometimes encountered. Abrupt transitions common between varied glacial materials can impact design, construction and performance of new structures.

3.2 BEDROCK

Well construction reports in the vicinity of the site indicate limestone bedrock may be at an approximate depth of 72 to 149 feet with the depth generally increasing from west to east.

4.0 FIELD EXPLORATION AND LABORATORY TESTING

4.1 FIELD EXPLORATION

The exploration procedures are described in greater detail in Appendix B in the insert titled Subsurface Exploration Procedures: SPT.

ECS used a measuring tape/wheel to field locate the borings relative to existing site features prior to mobilization of the drilling equipment. These locations were then referenced using a handheld GPS. The manufacturer states the typical expected accuracy for this GPS receiver, in an open sky, is 4 meters. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. Ground surface elevations at the boring locations were estimated from the topographic information on the Jefferson County Wisconsin Public GIS Viewer. Ground surface elevations and boring locations determined without professional survey are approximate and may not be appropriate for final design.

Prior to drilling our subcontracted driller contacted the State of Wisconsin Utility One-Call Center, Digger's Hotline, to clear and mark underground utilities in the vicinity of the project site.

After utilities had been located and marked, seven borings were advanced at the site on November 21 and 22, 2022, by a subcontracted driller under the general guidance of ECS. Each boring was advanced to an approximate depth of 5 feet below existing site grade. The drill crew utilized a Geoprobe 7822DT track-mounted rotary drilling rig equipped with continuous flight, hollow stem augers to drill the borings.

The drill crew backfilled the boreholes at completion of drilling. Settlement of borehole backfill can occur over time resulting in a hazard. Monitoring the boreholes after initial drilling activities is not within our scope but should be done by the client.

4.2 SUBSURFACE CHARACTERIZATION

The observed subsurface conditions were generally consistent with published geological mapping. Below is a generalized characterization of the subsurface materials encountered at the boring locations. Refer to the Boring Logs in Appendix B for information at a specific boring location.

GENERALIZED SUBSURFACE STRATIGRAPHY					
Approx. Depth to Stratum Bottom (feet)	**Strata**	**Description**	**SPT [1] N-value Range (bpf)**	**Calibrated Penetrometer Resistance (tsf)**	**Moisture Content (%)**
Surface	--	TOPSOIL (4 to 20 inches ±) GRAVEL (8 inches ±)	--	--	--
3 to 5	I	FILL: (CL) LEAN CLAY, SANDY LEAN CLAY *[B-03, B-06, B-18]*, (CL/ML) SILTY CLAY, SANDY SILTY CLAY *[B-04, B-07, B-08, B-09A, B-11, B-13, B-14]*, (ML/CL) SANDY CLAYEY SILT *[B-05, B-09, B-15, B-18]*, (SM) SILTY SAND *[B-06, B-16]*, (GM) SILTY GRAVEL WITH SAND *[B-13]* (GP-GM) GRAVEL WITH SILT AND SAND*[B-16]*	3 - 37	0.5 - 1.25	9 - 32
3 to 5	II	(SM) SILTY SAND, SILTY SAND WITH GRAVEL loose to medium dense *[B-02]*	10 - 27	--	--
5	III	(CL) LEAN CLAY, LEAN CLAY WITH SAND, firm to stiff *[B-01, B-04, B-17]*	2 - 7	0.5 - 1.25	20 - 27
3 to 5	IV	(CL/ML) SILTY CLAY, firm to stiff *[B-02, B-07A, B-11, B-12]*	4 - 21	0.75 - 1.25	11 - 21
3 to 5	V	(ML) SANDY SILT, medium dense *[B-07, B-10]*	12 - 34	--	10 - 19
5	VI	(ML/CL) CLAYEY SILT, stiff *[B-12]*	6	1.0	24

1. Standard Penetration Test.

A Generalized Subsurface Soil Profile (cross-section) of the borings is also included in Appendix A.

Because the split-spoon sampler has a 1⅜-inch inside diameter, the soil classifications noted on the boring logs may not be representative of the entire soil matrix. Material larger than the 1⅜-inch inside diameter of the split-spoon sampler cannot be collected and observed directly.

4.3 GROUNDWATER OBSERVATIONS

The drillers observed the boreholes for the presence of measurable free water during drilling and at the completion of drilling. No measurable water was encountered at the boring locations during drilling.

Variations in the long-term water table elevation may result because of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors. Perched water conditions may also develop and/or exist at shallower or variable depths seasonally, particularly within more permeable soil underlain by less permeable soil, within existing fill, and within existing utility backfill.

4.4 LABORATORY TESTING

The laboratory services performed by ECS for this project included classification and index property tests on select representative soil samples.

Each soil sample was visually classified based on texture and plasticity using ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) as a general guideline. After classification, the samples were grouped into the major zones noted on the boring logs in Appendix B. The USCS group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the boring logs are approximate; in-situ, the transitions may be gradual.

The results of the laboratory tests are included on the boring logs in Appendix B. These tests included:

- Moisture content (ASTM D2216)
- Calibrated Penetrometer Resistance

The laboratory procedures are described in greater detail in Appendix B including the insert titled Laboratory Procedures. The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded, unless other instructions are received as to their disposal.

5.0 DESIGN RECOMMENDATIONS

5.1 PAVEMENT DESIGN CONSIDERATIONS

The following sections provide recommendations for pavements.

Subgrade Characteristics: The subgrade soils are expected to be variable and appear similar to those described in the Natural Resources Conservation Service Web Soil Survey referred to in the **Surficial Deposits** section.

The recommended pavement design parameters listed below are based on the boring information, and the primary pedological units described in the Web Soil Survey and the WisDOT Geotechnical Manual. Because the soil conditions encountered are variable, a pavement section design based on these parameters may be over-designed in some areas and under-designed in others. In lieu of the design parameters in the table below, the design parameters presented in Appendix D, based on the general soil conditions encountered at the individual boring locations, could be used to refine the pavement design based on location.

PAVEMENT DESIGN PARAMETERS	
Parameter	**Properties**
AASHTO Classification	A-6
Design Group Index	16
Soil Support Value, SSV	3.7
Frost Index, FI	F-3/4
Modulus of Subgrade Reaction	100 psi/in
Resilient Modulus	6,000 psi
California Bearing Ratio (CBR)	4

The design parameters assume that all grading and subgrade preparation will be performed in accordance with the appropriate specifications included in the State of Wisconsin Department of Transportation Standard Specification, current Edition. These values are recommended with the assumption the subgrade will be closely observed and tested; the subgrade will be properly compacted; wet zones will be dried, drained or removed; zones of dissimilar material will be removed, replaced or mixed to achieve a homogeneous subgrade; and adequate subgrade drainage will be provided.

Undocumented existing fill is present. Undocumented fill presents a risk of reduced service life, increased pavement maintenance and associated costs. The risk associated with undocumented fill could be reduced by complete removal or partial removal of the undocumented fill and replacement with engineered fill. A geogrid could also be considered to help reduce the risk and improve pavement performance.

Excavation Below Subgrade (EBS): Some EBS is expected to be needed as noted in the Summary of Generalized Pavement Design Parameters table in Appendix D. The estimated EBS is expected to vary between the boring locations. The estimated EBS noted in the table in Appendix D is based on the subsurface conditions encountered at the boring locations at the time of drilling. EBS will also depend on the conditions at the time of construction and precautions taken to protect the subgrade during construction.

During construction the subgrade soils are often adversely impacted by construction equipment (i.e., traffic disturbance) and/or unfavorable weather (i.e., ponding of water or freeze-thaw). The degree of impact is generally a function of the soil type, presence of groundwater, weather conditions prior to and during construction, and the construction methods and equipment used. For these reasons, some additional EBS could be required during construction. We recommend an undistributed quantity of EBS be included to help account for these potential impacts during construction. Where EBS is needed, an additional foot of lateral excavation is recommended for each vertical foot of EBS to help provide adequate lateral confinement of the backfill fill below the trail pavement.

In areas where unsuitable soils are present to depths deeper than 2 feet below the planned subgrade, the EBS could be reduced with the use of a geogrid. In these areas, the 2 feet of EBS could be followed with placement of a geogrid. The geogrid, where used, is recommended to consist of a biaxial geogrid such as Tensar BX1200 or triaxial geogrid such as Tensar TX160. The geogrid should be placed in accordance with the manufacturer's recommendations. The seams between geogrid strips should be overlapped a minimum of 1 foot or the amount recommended by the manufacturer, whichever is greater, or suitable attached per the manufacturer's recommendations.

Pavement Sections: The recommended minimum pavement sections listed in the table below are based on the anticipated usage of the project site, the assumption at least 16 inches of select material will be placed and a 20-year design service life, but were not developed based on specific traffic patterns, loading and resiliency factors, as those parameters were not provided by the design team. Thicker sections will be needed if at least 16 inches of select material is not used or increased pavement maintenance and a reduced service life will result. ***If the anticipated traffic will exceed that noted in the Proposed Construction section, ECS should be contacted for revised pavement design recommendations; otherwise, increased pavement maintenance and a shortened pavement life should be expected.*** The preliminary pavement sections below are guidelines that may or may not comply with local jurisdictional minimums.

RECOMMENDED MINIMUM FLEXIBLE PAVEMENT SECTION	
Pavement Material	**Compacted Material Thicknesses (Inches)**
Hot Mix Asphalt [2] Surface Course	2½
Hot Mix Asphalt [2] Binder Course	--
Dense Graded Crushed Stone Base [3]	6

1. Section 415 of WisDOT Standard Specification for Highway and Structure Construction (Standard Specs).
2. Section 460 of WisDOT Standard Specs.
3. Section 305 of WisDOT Standard Specs. We recommend dense graded crushed stone. If crushed gravel or some other material is used, the material may have a lower structural coefficient and a thicker base may be required.

Pavement materials and construction should be in accordance with the AASHTO Guide for Design of Pavement Structures, and the WisDOT Standard Specifications for Highway and Structure Construction.

If the pavements will be constructed early during site development to accommodate construction traffic, consideration should be given to the construction of designated haul roads, where thickened pavement sections are provided to accommodate the construction traffic, as well as the future in-service traffic.

Drainage: An important consideration with the design and construction of pavements is surface and subsurface drainage. Based on the estimated groundwater level, we consider surface water infiltration and seasonal perched water to be the main source of water for pavement design.

The pavement surface is recommended to be shaped or crowned to properly direct surface water to suitable on or off-site stormwater drainage infrastructure. The pavement subgrade should be properly sloped to avoid dips or pockets where water may become trapped. Dips in the subgrade can result in a "bathtub" effect, which may trap water. This trapped water can soften the subgrade and potentially heave the pavement during freezing weather. The subgrade in areas requiring undercut and backfill with granular soils are recommended to be graded to drain toward a drainpipe. The drainpipe should be sloped a minimum of ½ to 1 percent to discharge to nearby storm sewers, drainage ditches or other appropriate drainage facilities. Edge drains should be installed where site grades slope toward the pavement edge to reduce the potential for water to enter the base course layer. Edge drains should be sloped to the nearest appropriate drainage facility. Water that ponds on the subgrade surface can lead to deterioration of the subgrade soils, reduction of the base course support characteristics, and result in pavement heave during freezing conditions. Good drainage should help reduce the possibility of the subgrade materials being wet over a long period of time.

Maintenance: A sound maintenance program should be implemented to help maintain and enhance pavement performance and help attain the design service life. A preventative maintenance program should be started early in the pavement life to be effective. The "standard in the industry" supported by research indicates that preventative maintenance should typically begin within 2 to 5 years of the placement of pavement. Failure to perform preventative maintenance will reduce the service life of the pavement and increase the costs for corrective maintenance and full pavement rehabilitation. Seal joints and cracks with elastomeric caulk in a timely manner to help reduce water infiltration thru the pavement section into the base course layer, which may result in softening of the subgrade and

deterioration of the pavement. Pavements should be observed for distresses, such as cracks, depressions and poor drainage, at least twice a year, typically once in the spring and once in the fall.

6.0 SITE CONSTRUCTION CONSIDERATIONS

6.1 SUBGRADE PREPARATION

The method of site preparation will be influenced by some factors not known at the time this report was prepared, which may include weather before and during construction, the possibility of subsurface conditions not revealed by the borings, and the final details of the proposed development.

6.1.1 Stripping and Grubbing

The subgrade preparation should include stripping pavement, vegetation, rootmat, topsoil, and other soft or otherwise unsuitable materials from the 5-foot expanded pavement limits, and 5 feet beyond the toe of engineered fills, where feasible. ECS should be retained to observe and document that topsoil and other unsuitable surficial materials have been removed prior to the placement of engineered fill or construction.

ECS recommends the subgrade not be exposed to the elements or construction traffic for a prolonged time as the subgrade may become disturbed and/or softened. If pavement or other protective coverings are not placed within a few days after exposing the final design subgrade, consideration should be given to leaving the subgrade approximately 1 foot above the final design subgrade, where feasible, to help reduce softening of the design subgrade soil.

6.1.2 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by ECS. The exposed subgrade is recommended to be thoroughly proofrolled with construction equipment having a minimum axle load of 10 tons (e.g., fully loaded tandem-axle dump truck). This procedure is intended to assist identification of yielding subgrade materials.

Unstable or pumping subgrade areas identified during the proofroll should be repaired prior to the placement of subsequent engineered fill or other construction materials. Unstable subgrade repair methods, such as undercutting, or moisture conditioning and recompaction, or chemical stabilization, should be discussed with ECS to determine the appropriate procedures regarding the existing conditions causing the instability. Test pits may be excavated in unstable areas to explore the shallow subsurface materials and to help determine the appropriate remedial action to stabilize the subgrade.

Seasonal reduction of the near surface soil strength can occur during wet times of the year (such as during the spring and fall months) or immediately following extended periods of rain. This may result in additional unstable or pumping subgrade areas. The method of subgrade repair or improvement chosen may be influenced by several factors such as weather and schedule, as well as the area, depth and nature of the unstable subgrade soils. Depending on these and other factors, potential subgrade repair methods are described below, but the actual depth of subgrade undercut and/or stabilization method should be determined at the time of construction. Some common subgrade repair methods include:

Scarification and Compaction: Soils can be scarified, moisture conditioned (i.e., dried or wetted) to within a narrow range of the material's optimum moisture content and compacted. Scarification and compaction are generally most applicable where very shallow unstable conditions are encountered and at times when the soil can be properly dried or wetted to within a narrow range of the material's optimum moisture content.

Undercut and Replacement: We recommend soft or yielding soils be evaluated in approximately 6 to 12-inch intervals to help limit the volume of undercuts. If soft or yielding soils are identified, the contractor should remove only 6 to 12 inches of material at a time in the subject area and then proofroll/evaluate the undercut subgrade to determine if additional undercut is needed. This may take more time but could potentially reduce the removal of more soil than necessary. Use of a geogrid could also be considered to reduce undercut depths but could interfere with future excavations such as for utilities. A geogrid, if used, should be placed after underground work, such as utility construction, is complete. Do not operate equipment on the geogrid until after engineered fill is placed above it. Depending on the conditions at the time of repair, use of an aggregate engineered fill, such as crushed stone, crushed concrete or gravel, may be needed.

Chemical Modification: Alternatively, if these soils cannot be stabilized by conventional methods, chemical modification of the subgrade soils, such as with lime, lime kiln dust, cement, cement kiln dust, or other materials, may be utilized to reduce the moisture content and/or provide additional stabilization. An experienced pre-qualified contractor that has successfully chemically modified similar-sized projects with similar soil conditions is recommended to be used. The soil modification procedure, such as determination of the type and quantity of additive, and mixing and curing procedures, should be evaluated before implementation. This evaluation may include testing the soil to check if an adverse chemical reaction could occur. Chemical modification agents can have caustic effects to humans and property. The contractor should be required to minimize dusting or implement dust control measures, as required. For preliminary estimating purposes, the approximate incorporation rate (based on dry weight of soil) is typically in the range of 4 to 7 percent, by dry weight, for hydrated lime or lime by-products, and 4 to 10 percent, by dry weight, for Portland cement. Typically, the percentage needed is less for hydrated lime than other lime by-products because the available calcium oxide content of lime by-products tends to be lower. Note insufficient mellowing of modified soils could lead to heaving after placement. Subgrade modification can result in the creation of an 'aquiclude' layer which will allow water to pond above the stabilized surface within the base course. Such water, if not drained properly, can freeze in cold weather potentially resulting in significant heave of the pavement. Alterations to the pavement sections to include additional drainage, such as an open-graded drainage aggregate layer, may be needed if a chemically modified subgrade is used.

6.1.3 Site Temporary Dewatering

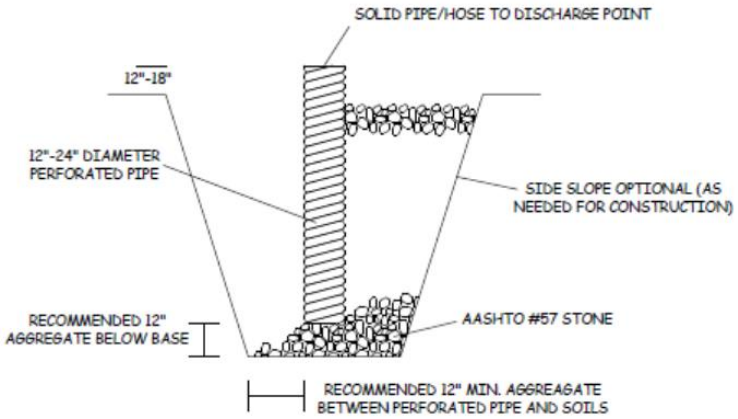
The contractor shall make their own assessment of temporary dewatering needs based upon the limited subsurface groundwater information presented in this report. Soil and groundwater conditions may vary between sampling intervals. If the contractor believes additional subsurface information is needed to assess dewatering needs, they should obtain such information at their own expense. ECS makes no warranties or guarantees regarding the adequacy of the provided information to determine dewatering requirements; such recommendations are beyond our scope of services.

Dewatering systems are a critical component of many construction projects. Dewatering systems must be selected, designed, and maintained by a qualified and experienced (specialty or other) contractor familiar with the geotechnical and other aspects of the project. The failure to properly design and maintain a dewatering system for a given project can result in delayed construction, unnecessary undercuts, detrimental phenomena such as 'running sand' conditions, heaved subgrades, internal erosion (i.e., 'piping'), the migration of 'fines' down-gradient towards the dewatering system, localized settlement of nearby infrastructure, foundations, slabs-on-grade and pavements, etc. Water discharged from site dewatering systems are recommended to be discharged in accordance with all local, state and federal requirements.

Surface Water: The surface of the site should be kept properly graded to enhance drainage of the surface water to appropriate discharge or storage areas during construction. We recommend that an attempt be made to enhance the natural drainage without interrupting its pattern.

Subsurface Water: Groundwater observations are described in the **Groundwater Observations** section of this report. Dewatering, if needed, is expected to be due to surface water runoff or perched water. Strategies for addressing groundwater are discussed below.

Strategies for Addressing Perched Groundwater: The typical strategy for addressing perched groundwater seepage into excavations and where excavations extend typically less than 1 to 2 feet below the water level, especially in areas containing primarily clay soils, is pumping from trench (or French) drains and sump pits with sump pumps which are backfilled with drainage aggregate such as AASHTO Size No. 57 Stone or open-graded bedding material. A typical sump pump drain (found in a sump pit or along a French drain) is depicted below. The inlet of the sump pump is placed at the bottom of the corrugated pipe and the discharge end of the sump is directed to an appropriate stormwater drain.



Sump Pit/Pump Conceptual Sketch

A typical French drain consists of an 18 to 24-inch wide by 18- to 24-inch-deep bed of AASHTO No. 57 aggregate (or similar open graded aggregate) wrapped in a medium duty, non-woven geotextile and (sometimes) containing a 6-inch diameter, Schedule 40 PVC perforated or slotted pipe. Actual dimensions should be determined during construction. After installation, the geotextile should be wrapped over the top of the aggregate and pipe followed by placement of backfill. The top of the drain should be positioned at least 3½ feet below the design subgrade elevation.

Pumping wells or a vacuum system could also be used to address perched groundwater. These techniques often are only effective during the initial depletion of the perched water quantity and may quickly be ineffective at addressing accumulation of water from rain, snow, etc.

6.2 EARTHWORK OPERATIONS

6.2.1 Engineered Fill

Product Submittals: Prior to placement of engineered fill, representative bulk samples (typically at least 50 to 100 pounds) of on-site and off-site borrow per material type should be submitted to ECS for laboratory testing, which may include natural moisture content, organic content, grain-size distribution, Atterberg limits, and moisture-density relationships for compaction. Import material should be tested prior to being hauled to the site to determine if it complies with project specifications. Alternatively, Proctor data from other accredited laboratories can be submitted if the test results are within the last 90 days.

Satisfactory Engineered Fill Materials: Engineered fills should consist of materials free of debris with the following engineering properties.

ENGINEERED FILL INDEX PROPERTIES		
Subject		**Property**
Plasticity	Upper 2 feet	LL ≤ 40, PI ≤ 15
	Below 2 feet	LL ≤ 50, PI ≤ 20
Max. Particle Size		3 inches
Max. Organic Content		5 percent

Open-graded materials, such as coarser sands, and gravels (SP and GP), which contain increased void space in their mass may need to be encapsulated within a filter geotextile. If the fill is to provide low-frost susceptible characteristics, it must be classified as a clean GP or GW (or clean coarser SW or SP) per Unified Soil Classification System (ASTM D-2487) and must be properly drained.

Unsatisfactory Materials: Unsatisfactory fill materials, which do not satisfy the requirements for suitable materials, include topsoil and organic materials (PT, OH, OL), frost susceptible silt (ML), and high plasticity soils elastic silt (MH) and fat clay (CH).

Pea gravel is not recommended to be used as engineered fill. Pea gravel has round/smooth characteristics, no fines and does not interlock when compacted, which makes it more susceptible to future movement and instability resulting in excessive and variable settlement.

On-Site Borrow Suitability: On-site soil used as engineered fill must not contain more than 5 percent organic matter as determined by ASTM D2974, and must be free of frozen matter, deleterious materials, over-sized material (maximum 3-inch particle diameter), or chemicals that may result in the material being classified as "contaminated." The on-site soil may be feasible to use as engineered fill during favorable conditions but should be further evaluated by ECS prior to its use. Several of the soil samples had relatively high moisture contents so some drying of on-site soil prior to reuse as engineered fill is expected to be needed. Some conditions at the time of construction, such as wet or freezing weather,

may preclude the use of on-site soil, and use of an imported less moisture sensitive or less frost susceptible granular material may be needed.

6.2.2 Compaction

Engineered Fill Compaction: Engineered fill is recommended to be placed and compacted in appropriate thickness loose lifts as recommended below. Give as much importance to the moisture content requirements of the material as the density requirements during placement and compaction considering the moisture sensitivity of the soil.

ENGINEERED FILL COMPACTION RECOMMENDATIONS		
Subject		**Recommendation**
Compaction Standard		Modified Proctor, ASTM D1557
Recommended Compaction		≥ 95 percent of Maximum Dry Density
Moisture Content	Fine-grained	-1 to +3 % points of the material's optimum value
	Coarse-grained	-3 to +3 % points of the material's optimum value

Compaction equipment suitable to the material type being compacted should be used. Sheepsfoot compaction equipment is typically used for the fine-grained soils (clays). A vibratory steel drum roller is typically used for compaction of coarse-grained soils (sands and gravels) as well as to help seal compacted surfaces.

The maximum loose lift thickness depends upon the type of compaction equipment used and material being compacted. For isolated excavations around structure locations or within utility excavations, a hand tamper will likely be required. Listed below are generally recommended maximum loose lift thicknesses for compaction based on the utilized compaction equipment.

RECOMMENDED PRELIMINARY LOOSE LIFT THICKNESSES [1]	
Equipment	**Maximum Loose Lift Thickness (inches)**
Large/Heavy, Self-Propelled Equipment	8
Small, Self-Propelled or Remote Controlled (Rammax, etc.)	6 to 8
Hand Operated (Plate Tamps, Jumping Jacks, Wacker-Packers)	4 to 6

1. Density testing during fill placement is important to check and document that the specified compaction is being achieved. In some cases, thinner lifts than noted above and/or more compaction energy may be needed to achieve the required degree of compaction.

In confined areas such as utility trenches, portable compaction equipment and thin lifts of 4 inches or less may be required to achieve specified degrees of compaction.

6.2.3 General Considerations

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, on excessively wet soils, or soils that are otherwise unstable. Borrow fill materials should not contain frozen materials at the time of placement, and frozen or frost-heaved soils should be removed prior to

placement of engineered fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

Excavation Safety: Excavations and slopes should be maintained in accordance with OSHA excavation safety standards. The Contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The Contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. In some cases, the use of shoring, bracing, or trench boxes may be required. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Undocumented Fill Considerations: Existing undocumented fill was encountered at several of the boring locations. Unsuitable materials may be buried beneath the site surface not identified by the borings. Questionable material encountered is recommended to be evaluated by ECS to determine if removal and replacement with engineered fill is necessary. Alteration to the recommendations of this report may be needed, if conditions different than those noted on the boring logs are revealed.

Bidding/Estimating Considerations: Contractors bidding or undertaking work at the site should examine the results of the subsurface exploration, satisfy themselves as to the adequacy of the information for bidding and construction, make their own interpretation of the data, and consider the effect it may have on their cost proposal, construction techniques, schedule, and equipment capabilities. Furthermore, contractors should complete additional fieldwork and exploration they deem necessary to properly prepare a cost proposal for the site work. Soil borings do not provide the same wide-scale view of the subsurface conditions that is obtained during site grading, excavation or other aspects of earthwork construction. Additional scope may be required to obtain more detailed subsurface information needed for earthwork bid preparation, which could include test pits to better understand the lateral and vertical extents of the subsurface materials of concern such as existing undocumented fill. Even with this additional information, budget contingencies should be carried in construction to help cover potential variations in subsurface conditions.

7.0 CLOSING

ECS has prepared this report to guide geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation, express or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS. If this information is inaccurate, either because of our interpretation of the documents provided, or site or design changes that may occur later, ECS should be contacted so that we can review our recommendations and provide additional or alternate recommendations as may be required to reflect the proposed construction.

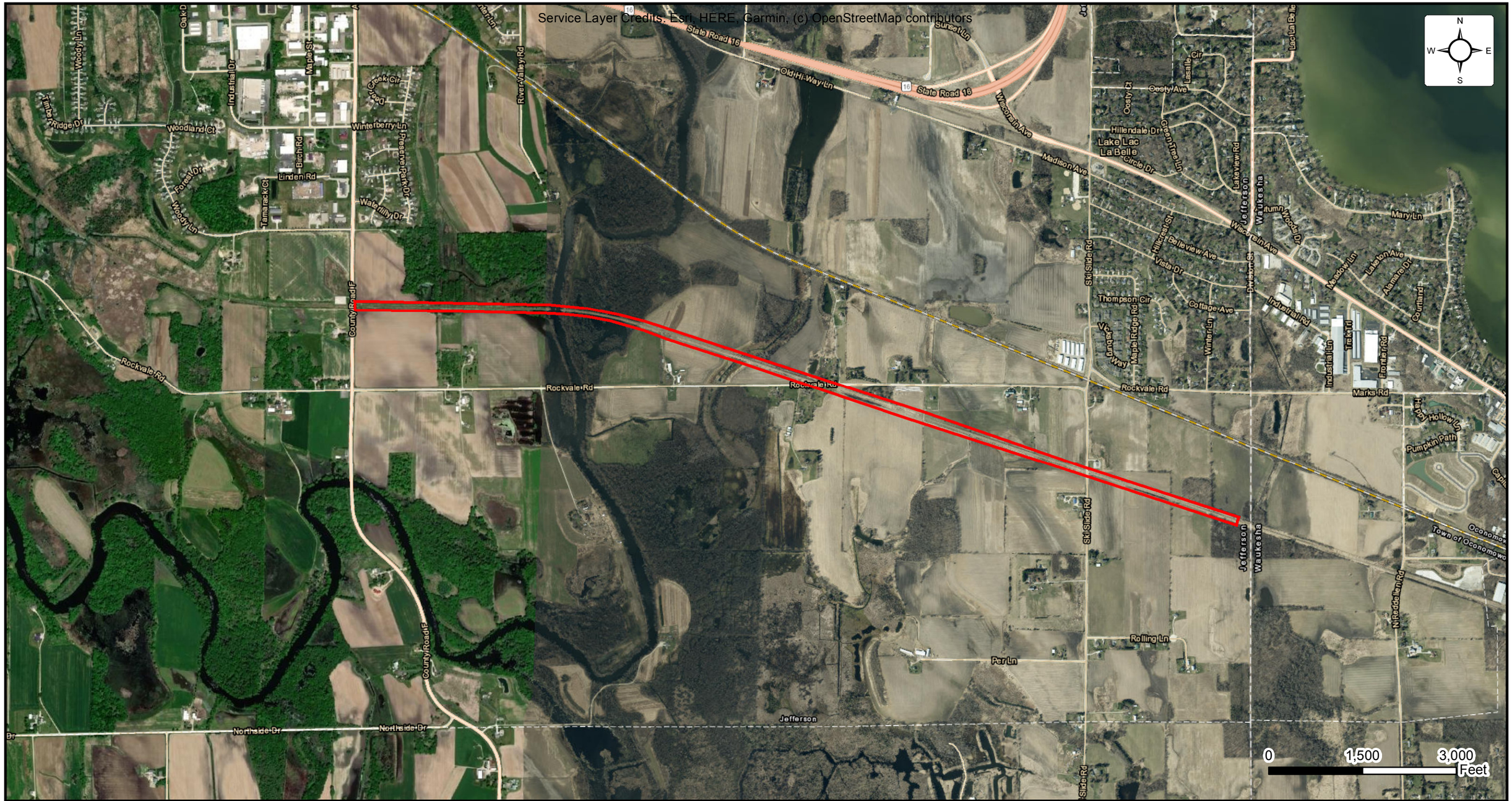
We recommend ECS review the project's plans and specifications so that we may evaluate consistency of those plans/specifications with the intent of the geotechnical report recommendations.

Field observations and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design recommendations. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendations should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A - Diagrams

Site Location Diagram
Boring Location Diagrams
Generalized Subsurface Soil Profiles



Site Location Diagram

JEFFERSON COUNTY HIGHWAY DEPARTMENT

JEFFERSON INTERURBAN TRAIL PHASE 3

INTERURBAN TRAIL, IXONIA, WISCONSIN

ENGINEER	DM1
SCALE	AS NOTED
PROJECT NO.	42:2334
SHEET	1 OF 1
DATE	11/29/2022

BORING LOCATION DIAGRAM
JEFFERSON INTERURBAN TRAIL PHASE 3

INTERURBAN TRAIL, IXONIA, WISCONSIN
JEFFERSON COUNTY HIGHWAY DEPARTMENT

ENGINEER	DM1
SCALE	AS NOTED
PROJECT NO.	42:2334
FIGURE	1 OF 1
DATE	11/29/2022

BORING LOCATION DIAGRAM
JEFFERSON INTERURBAN TRAIL PHASE 3

INTERURBAN TRAIL, IXONIA, WISCONSIN
JEFFERSON COUNTY HIGHWAY DEPARTMENT

ENGINEER	DM1
SCALE	AS NOTED
PROJECT NO.	42:2334
FIGURE	1 OF 1
DATE	11/29/2022

BORING LOCATION DIAGRAM
JEFFERSON INTERURBAN TRAIL PHASE 3

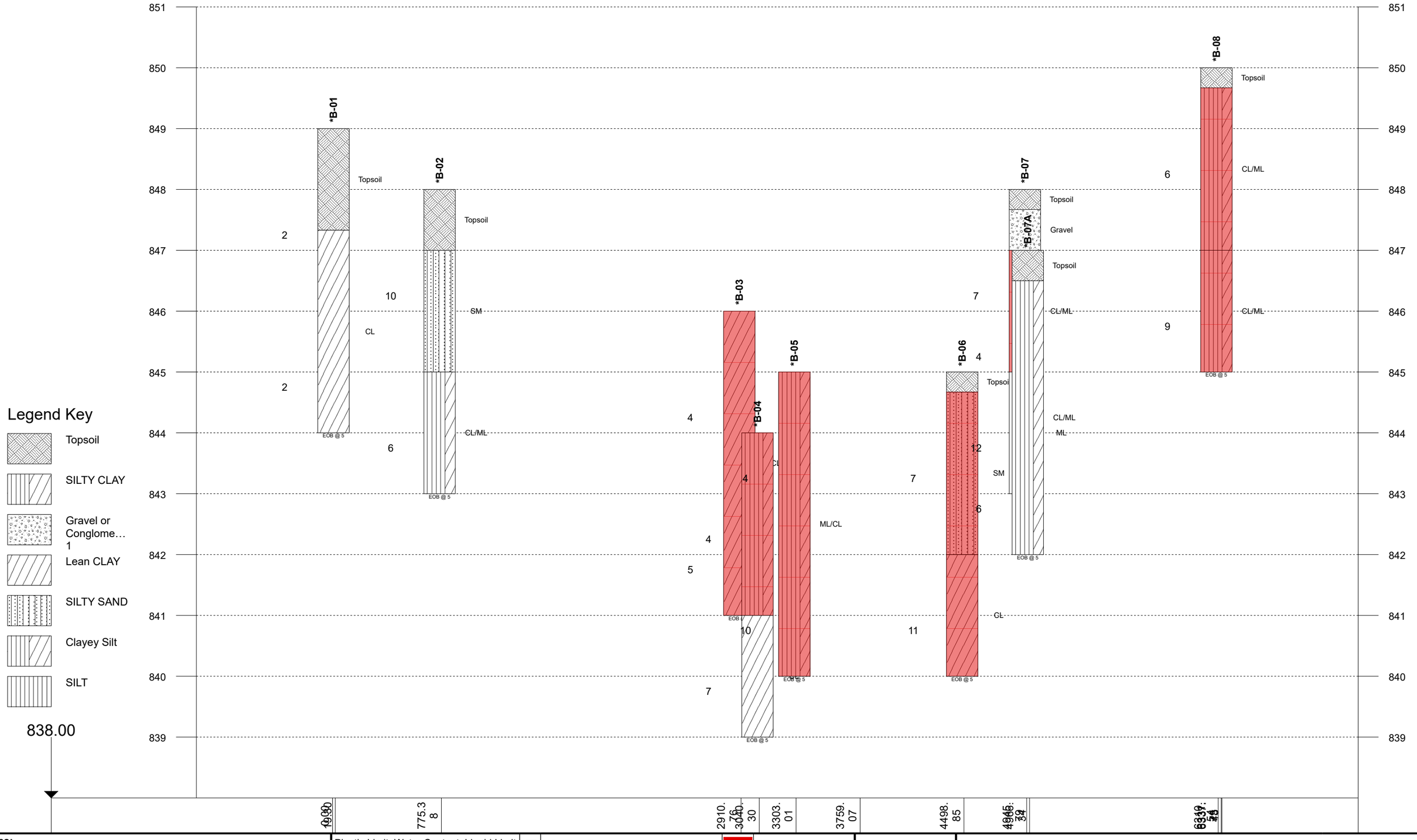
INTERURBAN TRAIL, IXONIA, WISCONSIN
JEFFERSON COUNTY HIGHWAY DEPARTMENT

ENGINEER	DM1
SCALE	AS NOTED
PROJECT NO.	42:2334
FIGURE	1 OF 1
DATE	11/29/2022

BORING LOCATION DIAGRAM
JEFFERSON INTERURBAN TRAIL PHASE 3

INTERURBAN TRAIL, IXONIA, WISCONSIN
JEFFERSON COUNTY HIGHWAY DEPARTMENT

ENGINEER	DM1
SCALE	AS NOTED
PROJECT NO.	42:2334
FIGURE	1 OF 1
DATE	11/29/2022



Notes:

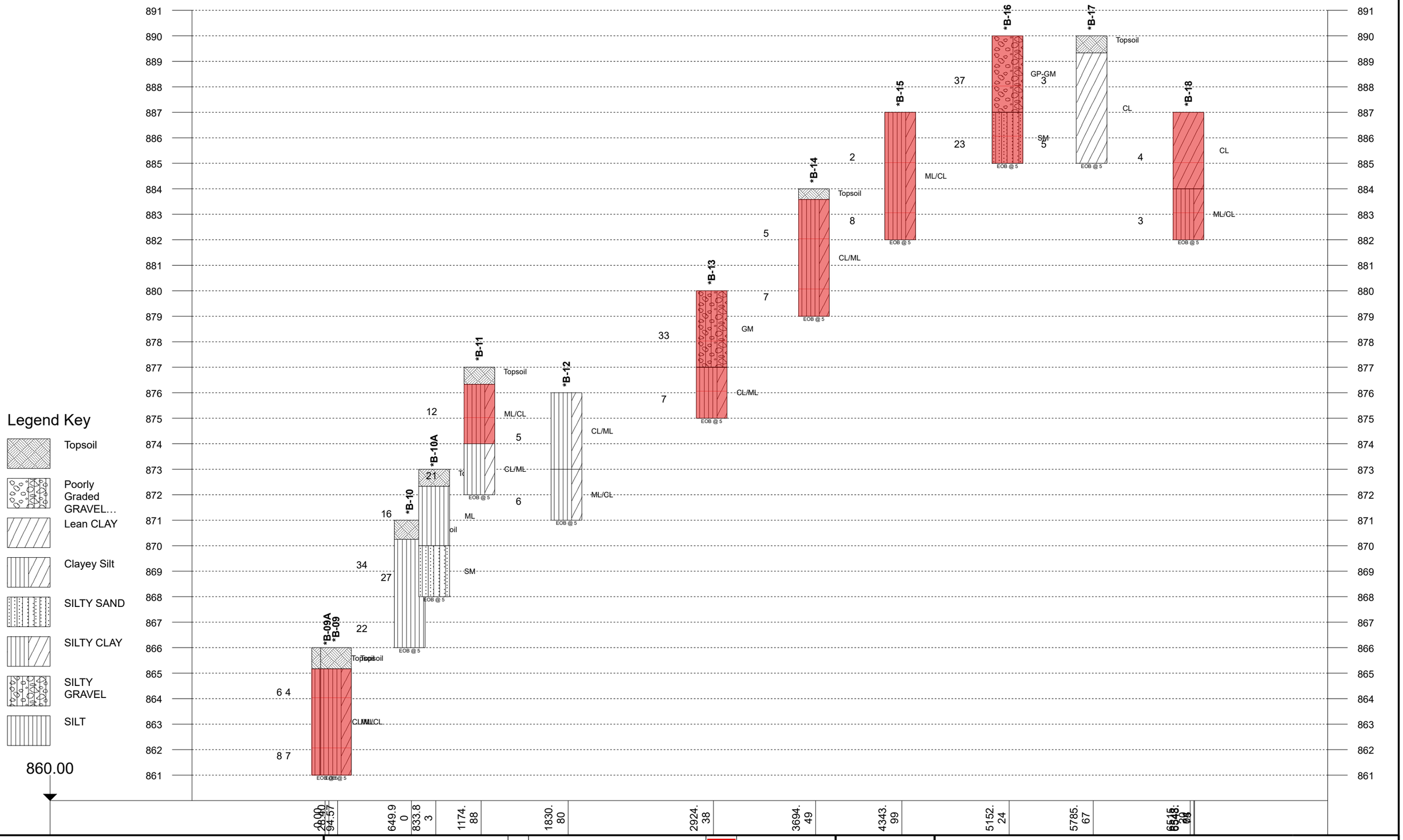
1- EOB: END OF BORING AR: AUGER REFUSAL SR: SAMPLER REFUSAL.
2- THE NUMBER BELOW THE STRIPS IS THE DISTANCE ALONG THE BASELINE.
3- SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL INFORMATION.
4- STANDARD PENETRATION TEST RESISTANCE (LEFT OF BORING) IN BLOWS PER FOOT (ASTM D1586).

Plastic Limit Water Content Liquid Limit X—●—△	WL (First Encountered)	Fill	
[FINES CONTENT %]	WL (Completion)	Possible Fill	
BOTTOM OF CASING	WL (Estimated Seasonal High Water)	Probable Fill	
LOSS OF CIRCULATION	WL (Stabilized)	Rock	

GENERALIZED SUBSURFACE SOIL PROFILE Section line 1

Jefferson Interurban Trail Phase 3
Jefferson County Highway Department
Interurban Trail, Ixonia, Wisconsin, 53036

Project No: 42:2334 Date: 11/29/2022



Legend Key

- Topsoil
- Poorly Graded GRAVEL…
- Lean CLAY
- Clayey Silt
- SILTY SAND
- SILTY CLAY
- SILTY GRAVEL
- SILT

860.00

Notes:

1- EOB: END OF BORING AR: AUGER REFUSAL SR: SAMPLER REFUSAL.
2- THE NUMBER BELOW THE STRIPS IS THE DISTANCE ALONG THE BASELINE.
3- SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL INFORMATION.
4- STANDARD PENETRATION TEST RESISTANCE (LEFT OF BORING) IN BLOWS PER FOOT (ASTM D1586).

Plastic Limit Water Content Liquid Limit
X——●——△
[FINES CONTENT %]
BOTTOM OF CASING
LOSS OF CIRCULATION

WL (First Encountered)
WL (Completion)
WL (Estimated Seasonal High Water)
WL (Stabilized)

Fill
Possible Fill
Probable Fill
Rock

ECS

GENERALIZED SUBSURFACE SOIL PROFILE Section line 2

Jefferson Interurban Trail Phase 3
Jefferson County Highway Department
Interurban Trail, Ixonia, Wisconsin, 53036

Project No: 42:2334 Date: 11/29/2022

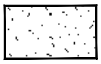
APPENDIX B - Field Operations

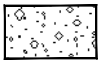
Reference Notes for Boring Logs
Subsurface Exploration Procedures: SPT
Boring Logs

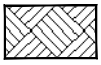
REFERENCE NOTES FOR BORING LOGS

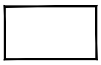
MATERIAL[1,2]

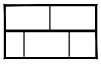

ASPHALT


CONCRETE


GRAVEL

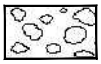

TOPSOIL

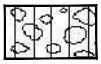

VOID


BRICK

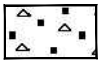

AGGREGATE BASE COURSE

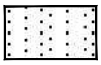

GW **WELL-GRADED GRAVEL**
gravel-sand mixtures, little or no fines

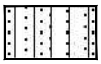

GP **POORLY-GRADED GRAVEL**
gravel-sand mixtures, little or no fines


GM **SILTY GRAVEL**
gravel-sand-silt mixtures

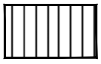

GC **CLAYEY GRAVEL**
gravel-sand-clay mixtures

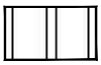

SW **WELL-GRADED SAND**
gravelly sand, little or no fines

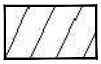

SP **POORLY-GRADED SAND**
gravelly sand, little or no fines


SM **SILTY SAND**
sand-silt mixtures

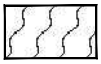

SC **CLAYEY SAND**
sand-clay mixtures

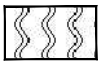

ML **SILT**
non-plastic to medium plasticity

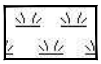

MH **ELASTIC SILT**
high plasticity


CL **LEAN CLAY**
low to medium plasticity


CH **FAT CLAY**
high plasticity


OL **ORGANIC SILT or CLAY**
non-plastic to low plasticity


OH **ORGANIC SILT or CLAY**
high plasticity


PT **PEAT**
highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

WATER LEVELS[6]

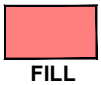

WL (First Encountered)


WL (Completion)


WL (Seasonal High Water)


WL (Stabilized)

FILL AND ROCK


FILL


POSSIBLE FILL


PROBABLE FILL


ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

SUBSURFACE EXPLORATION PROCEDURE:
STANDARD PENETRATION TESTING (SPT)
ASTM D 1586
Split-Barrel (Split-Spoon) Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes as well as a measure of penetration resistance, or N-Value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a 2-inch outside diameter hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30 inches at desired depth
- Recording the number of hammer blows required to drive the split-spoon a distance of 12 inches (in 3 or 4 Increments of 6 inches each)
- Auger is advanced* and an additional SPT is performed
- One SPT test is typically performed every 2½ to 5 feet.
- Obtain a 1⅜-inch diameter soil sample

**Drilling Methods May Vary – The predominate drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.*

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-01**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION:			LOSS OF CIRCULATION
Interurban Trail, Ixonia, Wisconsin, 53036			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
-254398.1	**2344361.8**		**849.00**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[20"]			
	S-1	SS	18	18	(CL) LEAN CLAY, trace sand, gray and brown mottled, moist, stiff to firm, contains (SM) SILTY FINE SAND seams			1-1-1 (2)
	S-2	SS	18	18				1-1-1 (2)
5					**END OF BORING AT 5 FT**		844	
10							839	
15							834	
20							829	
25							824	
30							819	

STANDARD PENETRATION BLOWS/FT: 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY: RQD, REC
LIQUID LIMIT
PLASTIC LIMIT
CALIBRATED PENETROMETER TSF: 1 2 3 4 5
WATER CONTENT % [FINES CONTENT] %: 10 20 30 40 50

1.00
26.8
0.50
23.7

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-02**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**			LOSS OF CIRCULATION
NORTHING: **-254448.9**	EASTING: **2345116.6**	STATION:	SURFACE ELEVATION: **848.00**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[12"]					
	S-1	SS	18	16	(SM) SILTY SAND, trace gravel, brown, moist, loose			2-6-4 (10)	10	
	S-2	SS	18	18	(CL/ML) SANDY SILTY CLAY, trace gravel, brown, moist, stiff			1-2-4 (6)	6	1.00, 11.3
5					**END OF BORING AT 5 FT**		843			
10							838			
15							833			
20							828			
25							823			
30							818			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-03**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION:			LOSS OF CIRCULATION
Interurban Trail, Ixonia, Wisconsin, 53036			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
-254486.6	**2347252.0**		**846.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					(CL FILL) FILL, SANDY LEAN CLAY, brown, moist, firm, mixed with (SM) SILTY SAND					
	S-1	SS	18	16				2-2-2 (4)	4	12.2
	S-2	SS	18	16				2-3-2 (5)	5	15.2
5					**END OF BORING AT 5 FT**		841			
10							836			
15							831			
20							826			
25							821			
30							816			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-04**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Jefferson Interurban Trail Phase 3	**Professional Testing Service**

SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:	BOTTOM OF CASING
-254482.3	**2347381.7**		**844.00**	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
0					(CL/ML FILL) FILL, SANDY SILTY CLAY, trace gravel, brown, moist, stiff		844			
	S-1	SS	18	18				1-2-2 (4)	4	1.00 / 13.8
	S-2	SS	18	18	(CL) LEAN CLAY WITH SAND, black, moist, stiff, contains organic matter, possible buried topsoil			2-3-4 (7)	7	1.25 / 19.7
5					**END OF BORING AT 5 FT**		839			
10							834			
15							829			
20							824			
25							819			
30							814			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-05**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION:			LOSS OF CIRCULATION
Interurban Trail, Ixonia, Wisconsin, 53036			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
-254500.0	**2347644.0**		**845.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					(ML/CL FILL) FILL, SANDY CLAYEY SILT, trace gravel, brown, moist, very loose to loose					
	S-1	SS	18	12				2-2-2 (4)	4	11.6
	S-2	SS	18	14				4-5-5 (10)	10	10.9
5					**END OF BORING AT 5 FT**		840			
10							835			
15							830			
20							825			
25							820			
30							815			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-06**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**			LOSS OF CIRCULATION
NORTHING: **-254719.6**	EASTING: **2348815.8**	STATION:	SURFACE ELEVATION: **845.00**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) ROCK QUALITY DESIGNATION & RECOVERY — RQD — REC	LIQUID LIMIT △ PLASTIC LIMIT ✕ CALIBRATED PENETROMETER TSF (1 2 3 4 5) WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[4"]					
	S-1	SS	18	14	(SM FILL) FILL, SILTY SAND, trace gravel, brown, moist, loose			3-3-4 (7)	11	
	S-2	SS	18	14	(CL FILL) FILL, SANDY LEAN CLAY, trace gravel, brown, moist, stiff			4-5-6 (11)		16.2
5					**END OF BORING AT 5 FT**		840			
10							835			
15							830			
20							825			
25							820			
30							815			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-07**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Jefferson Interurban Trail Phase 3	**Professional Testing Service**

SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:	BOTTOM OF CASING
-254857.0	**2349241.1**		**848.00**	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[4"]					
					Gravel Thickness[8"]					
	S-1	SS	18	14	(CL/ML FILL) FILL, SILTY CLAY, brown and dark brown, very moist, stiff			1-2-5 (7)		1.25
					(ML) SANDY SILT, trace gravel, brown and gray mottled, moist, medium dense, contains (SM) SILTY SAND seams					24.6
5	S-2	SS	18	14			843	4-5-7 (12)	12	
					END OF BORING AT 5 FT					
10							838			
15							833			
20							828			
25							823			
30							818			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-07A**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION:			LOSS OF CIRCULATION
Interurban Trail, Ixonia, Wisconsin, 53036			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
-254854.6	**2349263.3**		**847.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[6"]					
	S-1	SS	18	6	(CL/ML) SILTY CLAY, trace sand, brown, moist, firm			1-2-2 (4)	4	
	S-2	SS	18	18				2-2-4 (6)	6	0.75 / 21.4
5					**END OF BORING AT 5 FT**		842			
10							837			
15							832			
20							827			
25							822			
30							817			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

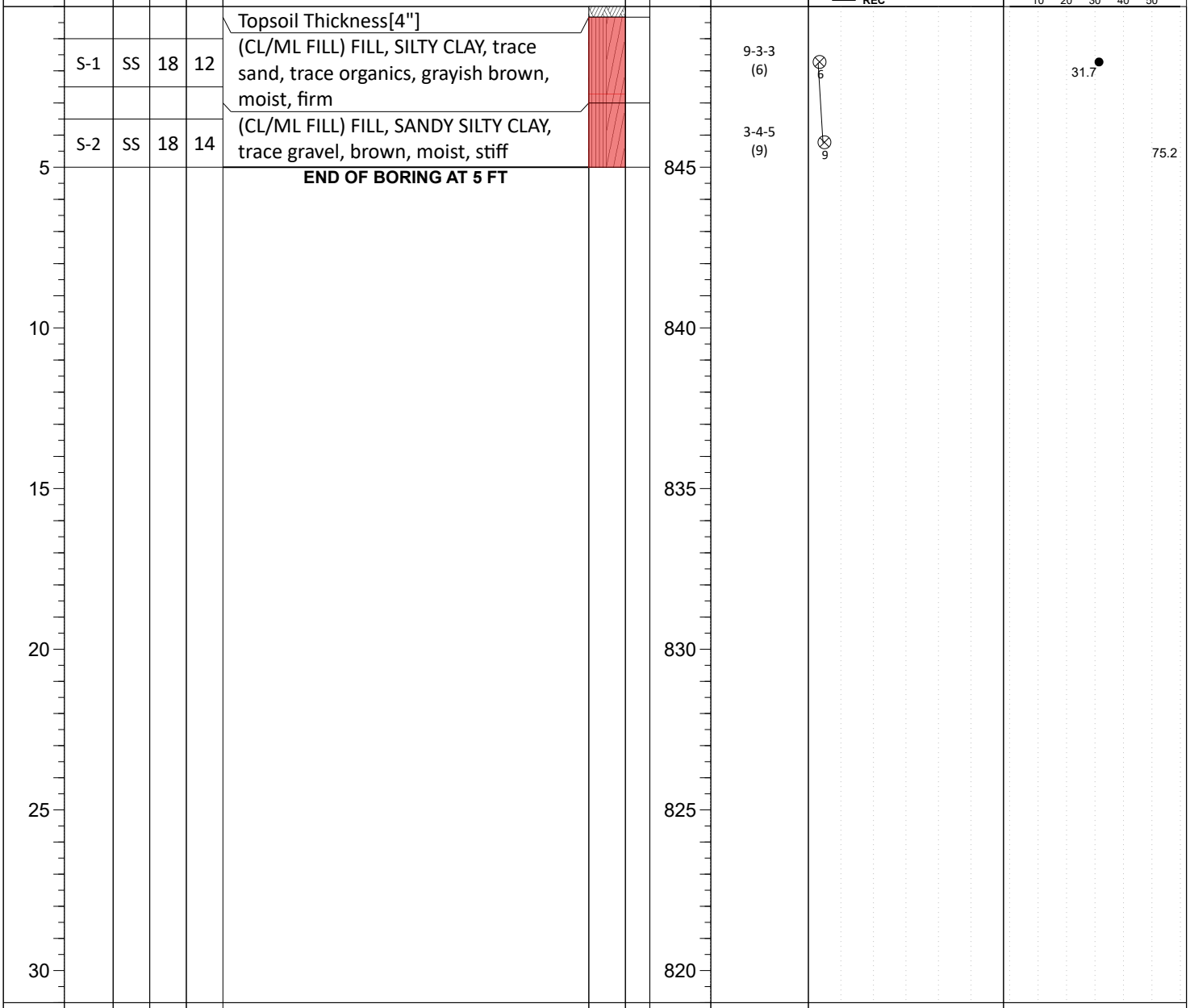
CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-08**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION:			LOSS OF CIRCULATION
Interurban Trail, Ixonia, Wisconsin, 53036			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
-255279.9	**2350538.9**		**850.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[4"]			
	S-1	SS	18	12	(CL/ML FILL) FILL, SILTY CLAY, trace sand, trace organics, grayish brown, moist, firm			9-3-3 (6)
	S-2	SS	18	14	(CL/ML FILL) FILL, SANDY SILTY CLAY, trace gravel, brown, moist, stiff			3-4-5 (9)
5					**END OF BORING AT 5 FT**		845	
10							840	
15							835	
20							830	
25							825	
30							820	

STANDARD PENETRATION BLOWS/FT
20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC

LIQUID LIMIT
PLASTIC LIMIT
CALIBRATED PENETROMETER TSF
1 2 3 4 5
WATER CONTENT %
[FINES CONTENT] %
10 20 30 40 50



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-09**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**			LOSS OF CIRCULATION
NORTHING: **-255795.1**	EASTING: **2352114.5**	STATION:	SURFACE ELEVATION: **866.00**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[10"]					
	S-1	SS	18	16	(ML/CL FILL) FILL, SANDY CLAYEY SILT, trace gravel, tan, moist, very loose to loose			1-2-2 (4)	4	11.0
	S-2	SS	18	16				2-3-4 (7)	7	8.8
5					**END OF BORING AT 5 FT**		861			
10							856			
15							851			
20							846			
25							841			
30							836			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-09A**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Jefferson Interurban Trail Phase 3	**Professional Testing Service**

SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:	BOTTOM OF CASING
-255814.7	**2352038.4**		**866.00**	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
0					Topsoil Thickness[10"]		866			
	S-1	SS	18	18	(CL/ML FILL) FILL, SANDY SILTY CLAY, brown, moist, firm, mixed with (SM) SILTY SAND			2-3-3 (6)	⊗ 5	● 15.8
	S-2	SS	18	16				3-3-5 (8)	⊗ 8	● 16.4
5					**END OF BORING AT 5 FT**		861			
10							856			
15							851			
20							846			
25							841			
30							836			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **none**	BORING STARTED: **Nov 21 2022**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Nov 21 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-10**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Jefferson Interurban Trail Phase 3	**Professional Testing Service**

SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:	BOTTOM OF CASING
-255968.1	**2352642.2**		**871.00**	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[9"]					
	S-1	SS	18	16	(ML) SANDY SILT, trace gravel, tan, moist, dense to medium dense			7-16-18 (34)	34	12.1
	S-2	SS	18	18				10-9-13 (22)	22	18.9
5					**END OF BORING AT 5 FT**		866			
10							861			
15							856			
20							851			
25							846			
30							841			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-10A**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**			LOSS OF CIRCULATION
NORTHING: **-256068.6**	EASTING: **2352802.8**	STATION:	SURFACE ELEVATION: **873.00**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[8"]					
	S-1	SS	18	16	(ML) SANDY SILT, trace gravel, trace clay, brown, moist, medium dense			5-5-11 (16)	16	10 0
	S-2	SS	18	12	(SM) SILTY SAND WITH GRAVEL, brown, moist, medium dense			9-12-15 (27)	27	
5					**END OF BORING AT 5 FT**		868			
10							863			
15							858			
20							853			
25							848			
30							843			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-11**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
Jefferson Interurban Trail Phase 3	**Professional Testing Service**

SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:	BOTTOM OF CASING
-256134.5	**2353140.1**		**877.00**	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[8"]					
	S-1	SS	18	8	(ML/CL FILL) FILL, SANDY CLAYEY SILT, trace gravel, brown, moist, medium dense			2-6-6 (12)	12	10 6
	S-2	SS	18	12	(CL/ML) SILTY CLAY, trace sand, brown, moist, stiff, contains (SM) SILTY FINE SAND seams			5-9-12 (21)	21	14.8
5					**END OF BORING AT 5 FT**		872			
10							867			
15							862			
20							857			
25							852			
30							847			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-12**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION:			LOSS OF CIRCULATION
Interurban Trail, Ixonia, Wisconsin, 53036			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
-256345.3	**2353761.2**		**876.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					(CL/ML) SILTY CLAY, trace sand, brown, moist, stiff			2-2-3 (5)	5	1.25 / 19.9
	S-1	SS	18	14						
	S-2	SS	18	18	(ML/CL) CLAYEY SILT, trace sand, grayish brown, moist, stiff			2-3-3 (6)	6	1.00 / 23.5
5					**END OF BORING AT 5 FT**		871			
10							866			
15							861			
20							856			
25							851			
30							846			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

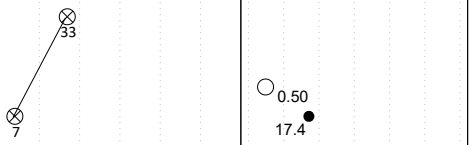
CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-13**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION:			LOSS OF CIRCULATION
Interurban Trail, Ixonia, Wisconsin, 53036			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
-256688.5	**2354799.6**		**880.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	10	(GM FILL) FILL, SILTY GRAVEL WITH SAND, brown, moist, dense		880	9-15-18 (33)
	S-2	SS	18	18	(CL/ML FILL) FILL, SILTY CLAY WITH SAND, trace gravel, brown, moist, firm			2-3-4 (7)
5					**END OF BORING AT 5 FT**		875	
10							870	
15							865	
20							860	
25							855	
30							850	

STANDARD PENETRATION BLOWS/FT
20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC

LIQUID LIMIT
PLASTIC LIMIT
CALIBRATED PENETROMETER TSF
1 2 3 4 5
WATER CONTENT %
[FINES CONTENT] %
10 20 30 40 50



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-14**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION:			LOSS OF CIRCULATION
Interurban Trail, Ixonia, Wisconsin, 53036			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
-256920.6	**2355533.9**		**884.00**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					Topsoil Thickness[5"]					
	S-1	SS	18	3	(CL/ML FILL) FILL, SANDY SILTY CLAY, brown, moist, firm			2-2-3 (5)	5	
	S-2	SS	18	16				2-3-4 (7)	7	0.75 / 12.2
5					**END OF BORING AT 5 FT**		879			
10							874			
15							869			
20							864			
25							859			
30							854			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-15**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**			LOSS OF CIRCULATION
NORTHING: **-257118.2**	EASTING: **2356152.7**	STATION:	SURFACE ELEVATION: **887.00**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) / ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC)	LIQUID LIMIT / PLASTIC LIMIT / CALIBRATED PENETROMETER TSF (1 2 3 4 5) / WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
0					(ML/CL FILL) FILL, SANDY CLAYEY SILT, trace gravel, brown, moist, very loose to loose					
	S-1	SS	18	3				2-1-1 (2)	2	12.1
	S-2	SS	18	10				3-5-3 (8)	8	11.5
5					**END OF BORING AT 5 FT**		882			
10							877			
15							872			
20							867			
25							862			
30							857			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
⧩ WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
⧩ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-16**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**			LOSS OF CIRCULATION
NORTHING: **-257373.9**	EASTING: **2356919.4**	STATION:	SURFACE ELEVATION: **890.00**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	10	(GP-GM FILL) FILL, GRAVEL WITH SILT And SAND, brown, moist, dense		890	12-16-21 (37)
5	S-2	SS	18	14	(SM FILL) FILL, SILTY SAND WITH GRAVEL, brown, moist, medium dense		885	10-10-13 (23)
					END OF BORING AT 5 FT			
10							880	
15							875	
20							870	
25							865	
30							860	

STANDARD PENETRATION BLOWS/FT: 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY: RQD, REC
LIQUID LIMIT
PLASTIC LIMIT
CALIBRATED PENETROMETER TSF: 1 2 3 4 5
WATER CONTENT %
[FINES CONTENT] %: 10 20 30 40 50

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-17**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**			LOSS OF CIRCULATION
NORTHING: **-257569.8**	EASTING: **2357521.8**	STATION:	SURFACE ELEVATION: **890.00**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[8"]			
	S-1	SS	18	16	(CL) LEAN CLAY WITH SAND, trace gravel, brown, moist, stiff to firm			2-1-2 (3)
	S-2	SS	18	14				2-2-3 (5)
5					**END OF BORING AT 5 FT**		885	
10							880	
15							875	
20							870	
25							865	
30							860	

STANDARD PENETRATION BLOWS/FT: 20 40 60 80 100

ROCK QUALITY DESIGNATION & RECOVERY: RQD, REC

LIQUID LIMIT, PLASTIC LIMIT

CALIBRATED PENETROMETER TSF: 1 2 3 4 5

WATER CONTENT % [FINES CONTENT] %: 10 20 30 40 50

1.50

21.5

0.50

20.8

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Jefferson County Highway Department	**42:2334**	**B-18**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Jefferson Interurban Trail Phase 3	**Professional Testing Service**		
SITE LOCATION: **Interurban Trail, Ixonia, Wisconsin, 53036**			LOSS OF CIRCULATION
NORTHING: **-257800.5**	EASTING: **2358213.9**	STATION:	SURFACE ELEVATION: **887.00**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT (20 40 60 80 100) ROCK QUALITY DESIGNATION & RECOVERY — RQD — REC	LIQUID LIMIT △ PLASTIC LIMIT ✕ CALIBRATED PENETROMETER TSF (1 2 3 4 5) WATER CONTENT % [FINES CONTENT] % (10 20 30 40 50)
					(CL FILL) FILL, SANDY LEAN CLAY, trace gravel, brown, moist, soft					
	S-1	SS	18	6				3-2-2 (4)	4	16.1
					(ML/CL FILL) FILL, SANDY CLAYEY SILT, brown, moist, very loose					
	S-2	SS	18	8				2-1-2 (3)	3	12.4
5					**END OF BORING AT 5 FT**		882			
10							877			
15							872			
20							867			
25							862			
30							857			

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **none**	BORING STARTED: **Nov 22 2022**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Nov 22 2022**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Track**	LOGGED BY: **DM1**	DRILLING METHOD: **2-1/4" HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

APPENDIX C - Laboratory Operations

Laboratory Testing Procedures: Index Testing

LABORATORY PROCEDURES:

Index Testing

Moisture content determination was performed on select fine-grained soil samples in accordance with ASTM D 2216.

Calibrated hand penetrometer tests (Qp) were performed on select cohesive soil samples. In the hand penetrometer test, the unconfined compressive strength of a soil sample is estimated, to a maximum of 4.5 or 6 tons per square foot (tsf), depending on the penetrometer model, by measuring the resistance of a soil sample to penetration by a small, calibrated, spring-loaded cylinder.

Atterberg limits determination was performed on select fine-grained soil samples in accordance with ASTM D 4319. The Atterberg limits are a basic measure of the critical water contents of a fine-grained soil: its **liquid limit**, **plastic limit**, and s**hrinkage limit**. Depending on its water content, a soil may appear in one of four states: solid, semi-solid, plastic and liquid. In each state, the consistency and behavior of a soil is different and consequently so are its engineering properties. Atterberg limits can also be used to help distinguish between silt and clay, and to distinguish between different types of silts and clays.

Particle size distribution, also referred to as gradation or sieve analysis, refers to the proportions by dry mass of a soil particles distributed over specified particle-size ranges. The particle size distribution is used to help classify soils for engineering purposes. Particle size distribution determination was performed on select fine-grained soil samples in accordance with ASTM D 421, D 422 and/or D 1140.

A **loss on ignition (LOI)** test is used to estimate the organic content of the soil. In the LOI test a dry sample is heated to 440^{o} C to burn off organic matter within the sample. The lost weight is compared to the initial dry weight to estimate the percentage of organics in the material. LOI determination was performed in accordance with ASTM D 2974.

APPENDIX D - Supplemental Report Documents

Important Information about This Geotechnical-Engineering Report
Generalized Pavement Design Considerations
Soil Survey Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

ECS Project No. 42:2334

SUMMARY OF GENERALIZED PAVEMENT DESIGN PARAMETERS [1]												
Boring	Approximate Topsoil Thickness (inches)	Pedological Name [2]	Subgrade Material	USCS Symbol	AASHTO Classificatin	Potential EBS [3] (inches)	Design Group Index (DGI)	Frost Index	Subgrade Modulus (psi/in)	Soil Support Value (SSV)	California Bearing Ratio [4] (CBR)	Resilient Modulus [5] (psi)
B-01	20	Wacousta silty clay loam (Wa)	Lean clay, stiff to firm	CL	A-6	6 to 12	16	F-3	100	3.7	4.3	6430
B-02	12	Lamartine silt loam (LaB)	Silty Sand, loose	SM	A-2	6	12	F-4	150	4.2	5.8	7910
B-03	--	Wacousta silty clay loam (Wa)	FILL, Sandy Lean Clay	CL	A-6	6 to 12	17	F-3	100	3.5	3.8	5670
B-04	--	Wacousta silty clay loam (Wa)	FILL, Sandy silty clay	CL/ML	A-6	6 to 12	17	F-4	100	3.5	3.8	5670
B-05	--	Wacousta silty clay loam (Wa)	FILL, Sandy clayey silt	ML/CL	A-4	6 to 12	17	F-4	75	3.5	3.8	5670
B-06	4	Fox silt loam (FsB)	FILL, Silty sand	SM	A-2	6 to 12	12	F-4	150	4.2	5.8	7910
B-07	4	Matherton silt loam (MmA)	FILL, Silty clay	CL/ML	A-6	6 to 12	17	F-4	100	3.5	3.8	5670
B-07A	6	Matherton silt loam (MmA)	Silty clay, firm	CL/ML	A-6	6 to 12	16	F-4	100	3.7	4.3	6430
B-08	4	Keowns silt loam (Kb)	FILL, Silty clay	CL	A-6	6 to 12	17	F-3	100	3.5	3.8	5670
B-09	10	Rotamer loam (RtD2)	FILL, Sandy clayey silt	ML/CL	A-4	6 to 12	17	F-4	75	3.5	3.8	5670
B-09A	10	Rotamer loam (RtD2)	FILL, Sandy silty clay	CL/ML	A-6	6 to 12	17	F-4	100	3.5	3.8	5670
B-10	9	Mayville silt loam (MoB)	Sandy silt, medium dense	ML	A-4	12	14	F-4	75	3.9	4.9	7280
B-10A	8	Mayville silt loam (MoB)	Sandy silt, medium dense	ML	A-4	12	14	F-4	75	3.9	4.9	7280
B-11	8	Theresa silt loam (ThB)	FILL, Sandy clayey silt	ML/CL	A-4	6 to 12	17	F-4	75	3.5	3.8	5670
B-12	--	Lamartine silt loam (LaB)	Silty clay, stiff	CL/ML	A-6	6 to 12	16	F-4	100	3.7	4.3	6430
B-13	--	Wacousta silty clay loam (Wa)	FILL, Silty gravel with sand	GM	A-1	6	8	F-2	200	4.8	8.5	10050
B-14	5	Theresa silt loam (ThB)	FILL, Sandy silty clay	CL/ML	A-6	6 to 12	17	F-4	100	3.5	3.8	5670
B-15	--	Virgil silt loam (VwA)	FILL, Sandy clayey silt	ML/CL	A-4	6 to 12	17	F-4	75	3.5	3.8	5670
B-16	--	Theresa silt loam (ThB)	FILL, Gravel with silt and sand	GP-GM	A-1	6	8	F-2	200	4.8	8.5	10050
B-17	8	Rotamer loam (RtB)	Lean clay, stiff to firm	CL	A-6	6 to 12	16	F-3	100	3.7	4.3	6430
B-18	--	Sebewa silt loam (Sm)	FILL, Sandy Lean Clay	CL	A-6	6 to 12	17	F-3	100	3.5	3.8	5670

1. Pavement design parameters were modified as needed to account for existing fill where present.
2. Pedological name based on the USDA - Natural Resources Conservation Service Web Soil Survey (websoilsurvey.ncrs.usda.gov).
3. Excavation below subgrade. The estimated EBS will be a function of the conditions at the time of construtions. ***Deeper EBS is expected to be needed if construction occurs during unfavorable weather and/or the subgrade is subject to excessive construction disturbance. EBS is recommended to be based on a proofroll of the subgrade.*** Engineered fill placed after undercutting is assumed to consist of soil with a similar or better soil support value than the undercut subgrade soil at the test boring location. EBS could be reduced with placement of a geogrid.
4. Estimated based on the relationship between SSV and CBR presented in the AASHTO Interim Guide for Design of Pavement Structures 1972 (Chapter III Revised 1981).
5. Estimated based on the relationship M_R (psi) = 2555 x $CBR^{0.64}$ for CBR > 5 developed by the Transportation and Road Research Laboratory (TRRL), and M_R (psi) = CBR x 1500 for CBR ≤ 5.

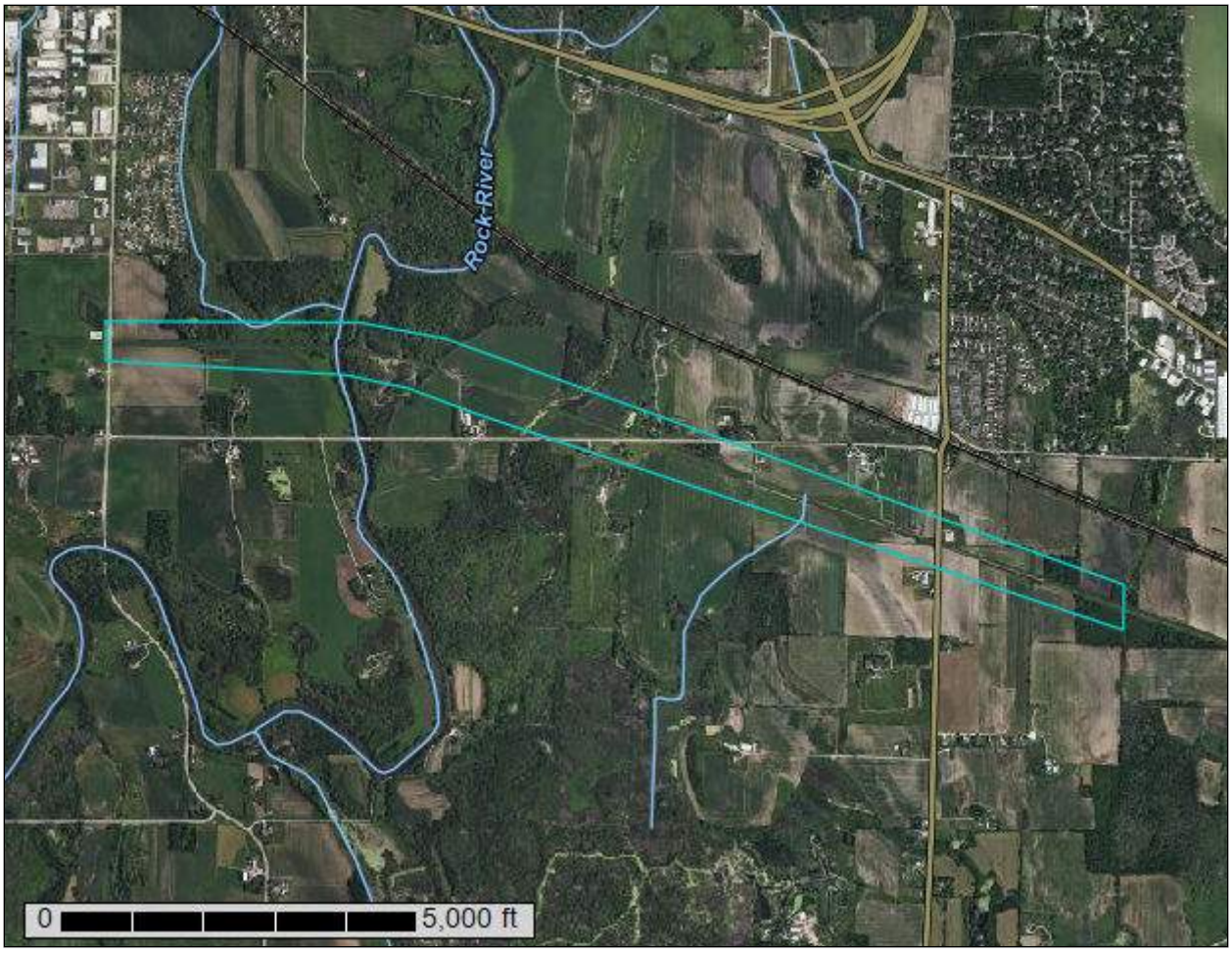
United States Department of Agriculture

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 Jefferson County, Wisconsin, and Milwaukee and Waukesha Counties, Wisconsin



November 29, 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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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

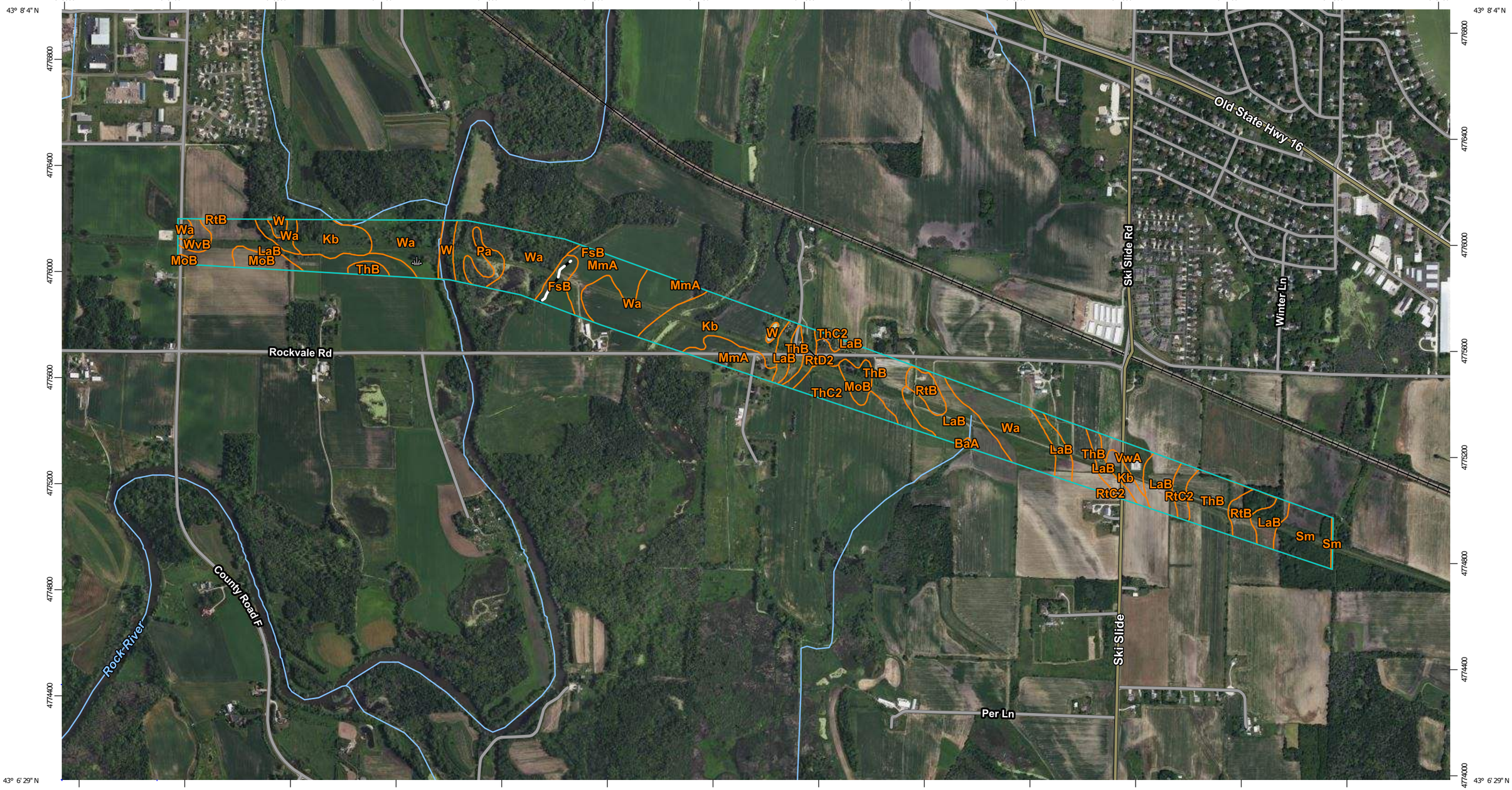
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

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

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

Soil Map

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



Map Scale: 1:14,200 if printed on B landscape (17" x 11") sheet.

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Jefferson County, Wisconsin
Survey Area Data: Version 21, Sep 6, 2022

Soil Survey Area: Milwaukee and Waukesha Counties, Wisconsin
Survey Area Data: Version 18, Sep 7, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Jun 6, 2020—Jun 28, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

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
BaA	Barry silt loam, 0 to 3 percent slopes	0.2	0.1%
FsB	Fox silt loam, 2 to 6 percent slopes	4.6	1.9%
Kb	Keowns silt loam, 0 to 2 percent slopes	30.9	12.5%
LaB	Lamartine silt loam, 2 to 6 percent slopes	45.6	18.5%
MmA	Matherton silt loam, 0 to 3 percent slopes	16.0	6.5%
MoB	Mayville silt loam, 2 to 6 percent slopes	7.5	3.0%
Pa	Palms muck, 0 to 2 percent slopes	3.6	1.5%
RtB	Rotamer loam, 2 to 6 percent slopes, eroded	8.4	3.4%
RtC2	Rotamer loam, 6 to 12 percent slopes, eroded	3.1	1.2%
RtD2	Rotamer loam, 12 to 20 percent slopes, eroded	2.7	1.1%
Sm	Sebewa silt loam, 0 to 2 percent slopes	9.4	3.8%
ThB	Theresa silt loam, 2 to 6 percent slopes	30.5	12.4%
ThC2	Theresa silt loam, 6 to 12 percent slopes, eroded	8.4	3.4%
VwA	Virgil silt loam, gravelly substratum, 0 to 3 percent slopes	4.1	1.6%
W	Water	4.4	1.8%
Wa	Wacousta silty clay loam, 0 to 2 percent slopes	65.0	26.3%
WvB	Wauconda silt loam, 2 to 6 percent slopes	2.3	0.9%
Subtotals for Soil Survey Area		**246.7**	**99.9%**
Totals for Area of Interest		**247.0**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Sm	Sebewa silt loam, 0 to 2 percent slopes	0.3	0.1%
Subtotals for Soil Survey Area		**0.3**	**0.1%**
Totals for Area of Interest		**247.0**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas

shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Jefferson County, Wisconsin

BaA—Barry silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2wspq
Elevation: 790 to 890 feet
Mean annual precipitation: 33 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 136 to 172 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Barry

Setting

Landform: Interdrumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Silty and loamy drift over loamy till

Typical profile

A - 0 to 15 inches: silt loam
Bg - 15 to 25 inches: loam
2Cg - 25 to 79 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Forage suitability group: Mod AWC, high water table (G095BY004WI)
Other vegetative classification: Mod AWC, high water table (G095BY004WI)
Hydric soil rating: Yes

Minor Components

Lamartine

Percent of map unit: 7 percent
Landform: Drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

Palms, muck

Percent of map unit: 5 percent
Landform: Interdrumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB001WI - Mucky Swamp
Hydric soil rating: Yes

Wacousta

Percent of map unit: 3 percent
Landform: Interdrumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Other vegetative classification: Frequently flooded, organics (G095BY010WI)
Hydric soil rating: Yes

FsB—Fox silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2tjx0
Elevation: 570 to 1,150 feet
Mean annual precipitation: 31 to 37 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 124 to 176 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Fox

Setting

Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy glaciofluvial deposits over sandy and gravelly outwash

Typical profile

Ap - 0 to 7 inches: silt loam
Bt1 - 7 to 21 inches: silty clay loam
2Bt2 - 21 to 31 inches: sandy clay loam
3C - 31 to 79 inches: stratified sand to gravel

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 30 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 45 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F095XB010WI - Loamy and Clayey Upland
Forage suitability group: Mod AWC, adequately drained (G095BY005WI)
Other vegetative classification: Mod AWC, adequately drained (G095BY005WI)
Hydric soil rating: No

Minor Components

Casco

Percent of map unit: 8 percent
Landform: Outwash plains
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

St. charles, gravelly substratum

Percent of map unit: 7 percent
Landform: Outwash plains
Ecological site: F095XB010WI - Loamy and Clayey Upland

Hydric soil rating: No

Kb—Keowns silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2tjz0
Elevation: 580 to 1,050 feet
Mean annual precipitation: 29 to 35 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 124 to 190 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Keowns

Setting

Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy and loamy lacustrine deposits

Typical profile

Ap - 0 to 9 inches: silt loam
Eg - 9 to 16 inches: silt loam
Bg - 16 to 32 inches: silt loam
Cg - 32 to 79 inches: stratified silt loam to very fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Forage suitability group: High AWC, high water table (G095BY007WI)

Other vegetative classification: High AWC, high water table (G095BY007WI)
Hydric soil rating: Yes

Minor Components

Palms, muck
Percent of map unit: 15 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB001WI - Mucky Swamp
Hydric soil rating: Yes

LaB—Lamartine silt loam, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: 2tjw4
Elevation: 590 to 1,240 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 135 to 194 days
Farmland classification: Prime farmland if drained

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

Description of Lamartine

Setting
Landform: Drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile
Ap - 0 to 8 inches: silt loam
Bt1 - 8 to 20 inches: silty clay loam
2Bt2 - 20 to 28 inches: clay loam
2C - 28 to 79 inches: gravelly sandy loam

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B/D
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Forage suitability group: High AWC, high water table (G095BY007WI)
Other vegetative classification: High AWC, high water table (G095BY007WI)
Hydric soil rating: No

Minor Components

Theresa

Percent of map unit: 9 percent
Landform: Drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

Pella

Percent of map unit: 6 percent
Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

MmA—Matherton silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: g705
Elevation: 780 to 1,060 feet
Mean annual precipitation: 28 to 35 inches
Mean annual air temperature: 36 to 57 degrees F
Frost-free period: 135 to 170 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Matherton

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy glaciofluvial deposits over stratified sandy and gravelly outwash

Typical profile

Ap,BE - 0 to 13 inches: silt loam
Bt,2Bt - 13 to 29 inches: sandy clay loam
2BC,2B - 29 to 60 inches: gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Forage suitability group: Mod AWC, high water table (G095BY004WI)
Other vegetative classification: Mod AWC, high water table (G095BY004WI)
Hydric soil rating: No

Minor Components

Sebewa

Percent of map unit: 4 percent
Landform: Depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

Wasepi

Percent of map unit: 3 percent
Landform: Terraces

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

Aztalan

Percent of map unit: 3 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

Matherton, clayey substratum

Percent of map unit: 3 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

Fox

Percent of map unit: 2 percent
Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: F095XB010WI - Loamy and Clayey Upland
Hydric soil rating: No

MoB—Mayville silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2szfv
Elevation: 830 to 1,120 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 130 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Mayville

Setting

Landform: Drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 6 inches: silt loam
BE - 6 to 12 inches: silt loam
Bt1 - 12 to 28 inches: silty clay loam
2Bt2 - 28 to 32 inches: clay loam
2C - 32 to 79 inches: gravelly sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 12 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F095XB010WI - Loamy and Clayey Upland
Forage suitability group: High AWC, adequately drained (G095AY008WI)
Other vegetative classification: High AWC, adequately drained (G095AY008WI)
Hydric soil rating: No

Minor Components

Dodge

Percent of map unit: 8 percent
Landform: Drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

Lamartine

Percent of map unit: 2 percent
Landform: Drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

Pa—Palms muck, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2szdc
Elevation: 780 to 1,240 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 43 to 49 degrees F
Frost-free period: 124 to 178 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Palms, muck, and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Palms, Muck

Setting

Landform: Interdrumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Herbaceous organic material over loamy drift

Typical profile

Oap - 0 to 13 inches: muck
Oa - 13 to 30 inches: muck
2Cg - 30 to 79 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 1.98 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 15.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: B/D
Ecological site: F095XB001WI - Mucky Swamp
Forage suitability group: Frequently flooded, organics (G095BY010WI)
Other vegetative classification: Frequently flooded, organics (G095BY010WI)
Hydric soil rating: Yes

Minor Components

Houghton, muck
Percent of map unit: 8 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB001WI - Mucky Swamp
Other vegetative classification: Frequently flooded, organics (G095BY010WI)
Hydric soil rating: Yes

Adrian
Percent of map unit: 5 percent
Landform: Interdrumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB001WI - Mucky Swamp
Hydric soil rating: Yes

RtB—Rotamer loam, 2 to 6 percent slopes, eroded

Map Unit Setting
National map unit symbol: 2wpxt
Elevation: 790 to 1,070 feet
Mean annual precipitation: 33 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 150 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Rotamer, eroded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rotamer, Eroded

Setting
Landform: Drumlins, moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Calcareous loamy till

Typical profile

Ap - 0 to 9 inches: loam
Bt - 9 to 19 inches: clay loam
C - 19 to 79 inches: gravelly sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Forage suitability group: Mod AWC, adequately drained (G095BY005WI)
Other vegetative classification: Mod AWC, adequately drained (G095BY005WI)
Hydric soil rating: No

Minor Components

Kidder

Percent of map unit: 5 percent
Landform: Drumlins, moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F095XB010WI - Loamy and Clayey Upland
Other vegetative classification: Mod AWC, adequately drained (G095BY005WI)
Hydric soil rating: No

Lapeer

Percent of map unit: 3 percent
Landform: Drumlins, moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

Lamartine

Percent of map unit: 2 percent
Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Crest
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

RtC2—Rotamer loam, 6 to 12 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2wpxv
Elevation: 790 to 1,070 feet
Mean annual precipitation: 33 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 150 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rotamer, eroded, and similar soils: 93 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rotamer, Eroded

Setting

Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous sandy and loamy till

Typical profile

Ap - 0 to 8 inches: loam
Bt - 8 to 13 inches: sandy clay loam
C - 13 to 79 inches: gravelly sandy loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Forage suitability group: Mod AWC, adequately drained (G095BY005WI)
Other vegetative classification: Mod AWC, adequately drained (G095BY005WI)
Hydric soil rating: No

Minor Components

Kidder, eroded
Percent of map unit: 4 percent
Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F095XB010WI - Loamy and Clayey Upland
Other vegetative classification: Mod AWC, adequately drained (G095BY005WI)
Hydric soil rating: No

Lapeer
Percent of map unit: 2 percent
Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

Lamartine
Percent of map unit: 1 percent
Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

RtD2—Rotamer loam, 12 to 20 percent slopes, eroded

Map Unit Setting
National map unit symbol: 2wpxw
Elevation: 790 to 1,070 feet
Mean annual precipitation: 33 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 135 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Rotamer, eroded, and similar soils: 94 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rotamer, Eroded

Setting

Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous sandy and loamy till

Typical profile

Ap - 0 to 7 inches: loam
Bt - 7 to 13 inches: sandy clay loam
C - 13 to 79 inches: gravelly sandy loam

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5e
Hydrologic Soil Group: B
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Forage suitability group: Mod AWC, adequately drained (G095BY005WI)
Other vegetative classification: Mod AWC, adequately drained (G095BY005WI)
Hydric soil rating: No

Minor Components

Lapeer

Percent of map unit: 3 percent
Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

Kidder, eroded

Percent of map unit: 2 percent

Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Concave, convex
Ecological site: F095XB010WI - Loamy and Clayey Upland
Other vegetative classification: Mod AWC, adequately drained (G095BY005WI)
Hydric soil rating: No

Griswold

Percent of map unit: 1 percent
Landform: Drumlins, moraines
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F095XB010WI - Loamy and Clayey Upland
Hydric soil rating: No

Sm—Sebewa silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2szfk
Elevation: 780 to 1,140 feet
Mean annual precipitation: 29 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 124 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Sebewa

Setting

Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 11 inches: silt loam
Btg - 11 to 27 inches: clay loam
2Cg - 27 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 24 to 30 inches to strongly contrasting textural stratification
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Forage suitability group: High AWC, high water table (G095BY007WI)
Other vegetative classification: High AWC, high water table (G095BY007WI)
Hydric soil rating: Yes

Minor Components

Adrian

Percent of map unit: 6 percent
Landform: Lakebeds (relict)
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB001WI - Mucky Swamp
Hydric soil rating: Yes

Ionia

Percent of map unit: 3 percent
Landform: Rises
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

Fox

Percent of map unit: 1 percent
Landform: Rises
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F110XY011IL - Dry Glacial Drift Upland Forest
Hydric soil rating: No

ThB—Theresa silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2szd9
Elevation: 700 to 1,240 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Theresa

Setting

Landform: Drumlins
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till and/or calcareous, dense loamy till

Typical profile

Ap - 0 to 8 inches: silt loam
BE - 8 to 14 inches: silt loam
Bt1 - 14 to 18 inches: silty clay loam
2Bt2 - 18 to 34 inches: clay loam
2Cd - 34 to 79 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 32 to 35 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F095XB007WI - Loamy Upland with Carbonates

Forage suitability group: Mod AWC, adequately drained with limitations (G095BY006WI)
Other vegetative classification: Mod AWC, adequately drained with limitations (G095BY006WI)
Hydric soil rating: No

Minor Components

Hochheim
Percent of map unit: 10 percent
Landform: Drumlins
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F095XB006WI - Shallow Upland
Hydric soil rating: No

Lamartine
Percent of map unit: 5 percent
Landform: Drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

ThC2—Theresa silt loam, 6 to 12 percent slopes, eroded

Map Unit Setting
National map unit symbol: 2szd8
Elevation: 660 to 1,290 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 150 to 195 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Theresa, eroded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Theresa, Eroded

Setting
Landform: Drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex

Across-slope shape: Linear
Parent material: Thin loess over loamy till and/or calcareous, dense loamy till

Typical profile

Ap - 0 to 4 inches: silt loam
Bt1 - 4 to 16 inches: silty clay loam
2Bt2 - 16 to 35 inches: gravelly clay loam
2Cd - 35 to 79 inches: gravelly sandy loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Forage suitability group: Mod AWC, adequately drained with limitations (G095BY006WI)
Other vegetative classification: Mod AWC, adequately drained with limitations (G095BY006WI)
Hydric soil rating: No

Minor Components

Hochheim, eroded

Percent of map unit: 8 percent
Landform: Drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F095XB006WI - Shallow Upland
Hydric soil rating: No

Lamartine

Percent of map unit: 2 percent
Landform: Drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Hydric soil rating: No

VwA—Virgil silt loam, gravelly substratum, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2wsqx
Elevation: 750 to 1,150 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 171 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Virgil, Gravelly Substratum

Setting

Landform: Drainageways on outwash plains
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loess over calcareous, stratified sandy and gravelly outwash

Typical profile

Ap - 0 to 9 inches: silt loam
E - 9 to 13 inches: silt loam
Bt - 13 to 44 inches: silty clay loam
2BC - 44 to 49 inches: sandy loam
2C - 49 to 79 inches: stratified gravel to sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Forage suitability group: High AWC, high water table (G095BY007WI)

Other vegetative classification: High AWC, high water table (G095BY007WI)
Hydric soil rating: No

Minor Components

Sebewa
Percent of map unit: 4 percent
Landform: Depressions on outwash plains
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave
Across-slope shape: Concave, linear
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

Drummer, drained
Percent of map unit: 4 percent
Landform: Depressions on outwash plains
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave
Across-slope shape: Concave, linear
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

Sable
Percent of map unit: 2 percent
Landform: Depressions on outwash plains
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave
Across-slope shape: Concave, linear
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

W—Water

Map Unit Setting
National map unit symbol: g718
Elevation: 660 to 980 feet
Mean annual precipitation: 30 to 34 inches
Mean annual air temperature: 39 to 43 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups
Land capability classification (irrigated): None specified
Other vegetative classification: Not Assigned (water) (Nwat)

Hydric soil rating: Unranked

Wa—Wacousta silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2tjx1
Elevation: 690 to 1,020 feet
Mean annual precipitation: 32 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 172 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Wacousta

Setting

Landform: Interdrumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Stratified silty lacustrine deposits

Typical profile

Ap - 0 to 13 inches: silty clay loam
Bg - 13 to 19 inches: silty clay loam
Cg - 19 to 79 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 12.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Forage suitability group: High AWC, high water table (G095BY007WI)

Other vegetative classification: High AWC, high water table (G095BY007WI)
Hydric soil rating: Yes

Minor Components

Sable
Percent of map unit: 8 percent
Landform: Interdrumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

Sebewa
Percent of map unit: 7 percent
Landform: Interdrumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

WvB—Wauconda silt loam, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: g71f
Elevation: 780 to 1,060 feet
Mean annual precipitation: 28 to 35 inches
Mean annual air temperature: 36 to 57 degrees F
Frost-free period: 135 to 170 days
Farmland classification: Prime farmland if drained

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

Description of Wauconda

Setting
Landform: Terraces on lakebeds (relict)
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over stratified silty and sandy lacustrine deposits

Typical profile
Ap,E - 0 to 13 inches: silt loam

Bt - 13 to 32 inches: silty clay loam
BC,2C - 32 to 60 inches: loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland
Forage suitability group: High AWC, high water table (G095BY007WI)
Other vegetative classification: High AWC, high water table (G095BY007WI)
Hydric soil rating: No

Minor Components

Wacousta

Percent of map unit: 4 percent
Landform: Depressions
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

Tuscola

Percent of map unit: 4 percent
Landform: Lakebeds (relict)
Hydric soil rating: No

Keowns

Percent of map unit: 3 percent
Landform: Depressions
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Hydric soil rating: Yes

Grays

Percent of map unit: 2 percent
Landform: Terraces on lakebeds (relict)
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

Juneau

Percent of map unit: 2 percent
Landform: Lakebeds (relict)
Hydric soil rating: No

Milwaukee and Waukesha Counties, Wisconsin

Sm—Sebewa silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2szfk
Elevation: 780 to 1,140 feet
Mean annual precipitation: 29 to 35 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 124 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Sebewa

Setting

Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 11 inches: silt loam
Btg - 11 to 27 inches: clay loam
2Cg - 27 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 24 to 30 inches to strongly contrasting textural stratification
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland
Forage suitability group: High AWC, high water table (G095BY007WI)
Other vegetative classification: High AWC, high water table (G095BY007WI)
Hydric soil rating: Yes

Minor Components

Adrian

Percent of map unit: 6 percent
Landform: Lakebeds (relict)
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F095XB001WI - Mucky Swamp
Hydric soil rating: Yes

Ionia

Percent of map unit: 3 percent
Landform: Rises
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F095XB007WI - Loamy Upland with Carbonates
Hydric soil rating: No

Fox

Percent of map unit: 1 percent
Landform: Rises
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F110XY011IL - Dry Glacial Drift Upland Forest
Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

AOI Inventory

This folder contains a collection of tabular reports that present a variety of soil information. Included are various map unit description reports, special soil interpretation reports, and data summary reports.

Component Text Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the selected area. The component descriptions in this report, 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 associated 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 (components) for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The "Map Unit Component Nontechnical Descriptions" report gives a brief, general description of the soil components that occur in a map unit. Descriptions of nonsoil (miscellaneous areas) and minor map unit components may or may not be included. This description is written by the local soil scientists responsible for the respective

soil survey area data. A more detailed description can be generated by the "Map Unit Description" report.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

Report—Component Text Descriptions

Jefferson County, Wisconsin

Map Unit: BaA—Barry silt loam, 0 to 3 percent slopes

Description Category: GENSOIL

Barry: 85 percent

The Barry component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on interdrumlins on drumlin fields. The parent material consists of silty and loamy drift over loamy till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, November, December. Organic matter content in the surface horizon is about 6 percent. This component is in the F095XB004WI Wet Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 2w. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Lamartine: 7 percent

Generated brief soil descriptions are created for major soil components. The Lamartine soil is a minor component.

Description Category: GENSOIL

Palms, muck: 5 percent

Generated brief soil descriptions are created for major soil components. The Palms, muck soil is a minor component.

Description Category: GENSOIL

Wacousta: 3 percent

Generated brief soil descriptions are created for major soil components. The Wacousta soil is a minor component.

Map Unit: FsB—Fox silt loam, 2 to 6 percent slopes

Description Category: GENSOIL

Fox: 85 percent

The Fox component makes up 85 percent of the map unit. Slopes are 2 to 6 percent. This component is on outwash plains on plains. The parent material consists of loess over loamy glaciofluvial deposits over sandy and gravelly outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 30 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the F095XB010WI Loamy and Clayey Upland ecological site. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Casco: 8 percent

Generated brief soil descriptions are created for major soil components. The Casco soil is a minor component.

Description Category: GENSOIL

St. charles, gravelly substratum: 7 percent

Generated brief soil descriptions are created for major soil components. The St. Charles, gravelly substratum soil is a minor component.

Map Unit: Kb—Keowns silt loam, 0 to 2 percent slopes

Description Category: GENSOIL

Keowns: 85 percent

The Keowns component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions on lake plains. The parent material consists of sandy and loamy lacustrine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is frequently flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 4 percent. This component is in the F095XB004WI Wet Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 3w. This soil meets hydric criteria. The

calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Palms, muck: 15 percent

Generated brief soil descriptions are created for major soil components. The Palms, muck soil is a minor component.

Map Unit: LaB—Lamartine silt loam, 2 to 6 percent slopes

Description Category: GENSOIL

Lamartine: 85 percent

The Lamartine component makes up 85 percent of the map unit. Slopes are 2 to 6 percent. This component is on drumlins on drumlin fields. The parent material consists of loess over loamy till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 20 inches during January, February, March, April, May, December. Organic matter content in the surface horizon is about 5 percent. This component is in the F095XB005WI Moist Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Theresa: 9 percent

Generated brief soil descriptions are created for major soil components. The Theresa soil is a minor component.

Description Category: GENSOIL

Pella: 6 percent

Generated brief soil descriptions are created for major soil components. The Pella soil is a minor component.

Map Unit: MmA—Matherton silt loam, 0 to 3 percent slopes

Description Category: GENSOIL

Matherton: 85 percent

The Matherton component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on terraces on outwash plains. The parent material

consists of loamy glaciofluvial deposits over stratified sandy and gravelly outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 18 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 3 percent. This component is in the F095XB005WI Moist Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 2w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 18 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Sebewa: 4 percent

Generated brief soil descriptions are created for major soil components. The Sebewa soil is a minor component.

Description Category: GENSOIL

Wasepi: 3 percent

Generated brief soil descriptions are created for major soil components. The Wasepi soil is a minor component.

Description Category: GENSOIL

Aztalan: 3 percent

Generated brief soil descriptions are created for major soil components. The Aztalan soil is a minor component.

Description Category: GENSOIL

Matherton, clayey substratum: 3 percent

Generated brief soil descriptions are created for major soil components. The Matherton, clayey substratum soil is a minor component.

Description Category: GENSOIL

Fox: 2 percent

Generated brief soil descriptions are created for major soil components. The Fox soil is a minor component.

Map Unit: MoB—Mayville silt loam, 2 to 6 percent slopes

Description Category: GENSOIL

Mayville: 90 percent

The Mayville component makes up 90 percent of the map unit. Slopes are 2 to 6 percent. This component is on drumlins on drumlin fields. The parent material consists of loess over loamy till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 26 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 2 percent. This component is in the F095XB010WI Loamy and Clayey Upland ecological site. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Dodge: 8 percent

Generated brief soil descriptions are created for major soil components. The Dodge soil is a minor component.

Description Category: GENSOIL

Lamartine: 2 percent

Generated brief soil descriptions are created for major soil components. The Lamartine soil is a minor component.

Map Unit: Pa—Palms muck, 0 to 2 percent slopes

Description Category: GENSOIL

Palms, muck: 87 percent

The Palms, muck component makes up 87 percent of the map unit. Slopes are 0 to 2 percent. This component is on interdrumlins on drumlin fields. The parent material consists of herbaceous organic material over loamy drift. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is very high. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, December. Organic matter content in the surface horizon is about 55 percent. This component is in the F095XB001WI Mucky Swamp ecological site. Nonirrigated land capability classification is 3w. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Houghton, muck: 8 percent

Generated brief soil descriptions are created for major soil components. The Houghton, muck soil is a minor component.

Description Category: GENSOIL

Adrian: 5 percent

Generated brief soil descriptions are created for major soil components. The Adrian soil is a minor component.

Map Unit: RtB—Rotamer loam, 2 to 6 percent slopes, eroded

Description Category: GENSOIL

Rotamer, eroded: 90 percent

The Rotamer, eroded component makes up 90 percent of the map unit. Slopes are 2 to 6 percent. This component is on drumlins on till plains. The parent material consists of calcareous loamy till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F095XB007WI Loamy Upland with Carbonates ecological site. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Kidder: 5 percent

Generated brief soil descriptions are created for major soil components. The Kidder soil is a minor component.

Description Category: GENSOIL

Lapeer: 3 percent

Generated brief soil descriptions are created for major soil components. The Lapeer soil is a minor component.

Description Category: GENSOIL

Lamartine: 2 percent

Generated brief soil descriptions are created for major soil components. The Lamartine soil is a minor component.

Map Unit: RtC2—Rotamer loam, 6 to 12 percent slopes, eroded

Description Category: GENSOIL

Rotamer, eroded: 93 percent

The Rotamer, eroded component makes up 93 percent of the map unit. Slopes are 6 to 12 percent. This component is on drumlins on till plains. The parent material consists of calcareous sandy and loamy till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F095XB007WI Loamy Upland with Carbonates ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Kidder, eroded: 4 percent

Generated brief soil descriptions are created for major soil components. The Kidder, eroded soil is a minor component.

Description Category: GENSOIL

Lapeer: 2 percent

Generated brief soil descriptions are created for major soil components. The Lapeer soil is a minor component.

Description Category: GENSOIL

Lamartine: 1 percent

Generated brief soil descriptions are created for major soil components. The Lamartine soil is a minor component.

Map Unit: RtD2—Rotamer loam, 12 to 20 percent slopes, eroded

Description Category: GENSOIL

Rotamer, eroded: 94 percent

The Rotamer, eroded component makes up 94 percent of the map unit. Slopes are 12 to 20 percent. This component is on drumlins on till plains. The parent material consists of calcareous sandy and loamy till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the F095XB007WI Loamy Upland with Carbonates ecological site.

Nonirrigated land capability classification is 5e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Lapeer: 3 percent

Generated brief soil descriptions are created for major soil components. The Lapeer soil is a minor component.

Description Category: GENSOIL

Kidder, eroded: 2 percent

Generated brief soil descriptions are created for major soil components. The Kidder, eroded soil is a minor component.

Description Category: GENSOIL

Griswold: 1 percent

Generated brief soil descriptions are created for major soil components. The Griswold soil is a minor component.

Map Unit: Sm—Sebewa silt loam, 0 to 2 percent slopes

Description Category: GENSOIL

Sebewa: 90 percent

The Sebewa component makes up 90 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions on outwash plains. The parent material consists of loamy outwash over sandy and gravelly outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 24 to 30 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is frequently flooded. It is frequently ponded. A seasonal zone of water saturation is at 6 inches during March. Organic matter content in the surface horizon is about 2 percent. This component is in the F095XB004WI Wet Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 2w. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Adrian: 6 percent

Generated brief soil descriptions are created for major soil components. The Adrian soil is a minor component.

Description Category: GENSOIL

Ionia: 3 percent

Generated brief soil descriptions are created for major soil components. The Ionia soil is a minor component.

Description Category: GENSOIL

Fox: 1 percent

Generated brief soil descriptions are created for major soil components. The Fox soil is a minor component.

Map Unit: ThB—Theresa silt loam, 2 to 6 percent slopes

Description Category: GENSOIL

Theresa: 85 percent

The Theresa component makes up 85 percent of the map unit. Slopes are 2 to 6 percent. This component is on drumlins on drumlin fields. The parent material consists of loess over loamy till and/or calcareous, dense loamy till. Depth to a root restrictive layer, densic material, is 32 to 35 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the F095XB007WI Loamy Upland with Carbonates ecological site. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Hochheim: 10 percent

Generated brief soil descriptions are created for major soil components. The Hochheim soil is a minor component.

Description Category: GENSOIL

Lamartine: 5 percent

Generated brief soil descriptions are created for major soil components. The Lamartine soil is a minor component.

Map Unit: ThC2—Theresa silt loam, 6 to 12 percent slopes, eroded

Description Category: GENSOIL

Theresa, eroded: 90 percent

The Theresa, eroded component makes up 90 percent of the map unit. Slopes are 6 to 12 percent. This component is on drumlins on drumlin fields. The parent material consists of thin loess over loamy till and/or calcareous, dense loamy till. Depth to a root restrictive layer, densic material, is 24 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the F095XB007WI Loamy Upland with Carbonates ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Hochheim, eroded: 8 percent

Generated brief soil descriptions are created for major soil components. The Hochheim, eroded soil is a minor component.

Description Category: GENSOIL

Lamartine: 2 percent

Generated brief soil descriptions are created for major soil components. The Lamartine soil is a minor component.

Map Unit: VwA—Virgil silt loam, gravelly substratum, 0 to 3 percent slopes

Description Category: GENSOIL

Virgil, gravelly substratum: 90 percent

The Virgil, gravelly substratum component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on drainageways on outwash plains on plains. The parent material consists of loess over calcareous, stratified sandy and gravelly outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is not flooded. It is occasionally ponded. A seasonal zone of water saturation is at 12 inches during March, April, May. Organic matter content in the surface horizon is about 3 percent. This component is in the F095XB005WI Moist Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 2w. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Drummer, drained: 4 percent

Generated brief soil descriptions are created for major soil components. The Drummer, drained soil is a minor component.

Description Category: GENSOIL

Sebewa: 4 percent

Generated brief soil descriptions are created for major soil components. The Sebewa soil is a minor component.

Description Category: GENSOIL

Sable: 2 percent

Generated brief soil descriptions are created for major soil components. The Sable soil is a minor component.

Map Unit: W—Water

Description Category: GENSOIL

Water: 100 percent

Generated brief soil descriptions are created for major soil components. The Water is a miscellaneous area.

Map Unit: Wa—Wacousta silty clay loam, 0 to 2 percent slopes

Description Category: GENSOIL

Wacousta: 85 percent

The Wacousta component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on interdrumlins on drumlin fields. The parent material consists of stratified silty lacustrine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is very high. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 9 percent. This component is in the F095XB004WI Wet Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 3w. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 18 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Sable: 8 percent

Generated brief soil descriptions are created for major soil components. The Sable soil is a minor component.

Description Category: GENSOIL

Sebewa: 7 percent

Generated brief soil descriptions are created for major soil components. The Sebewa soil is a minor component.

Map Unit: WvB—Wauconda silt loam, 2 to 6 percent slopes

Description Category: GENSOIL

Wauconda: 85 percent

The Wauconda component makes up 85 percent of the map unit. Slopes are 2 to 5 percent. This component is on terraces on lakebeds (relict). The parent material consists of loess over stratified silty and sandy lacustrine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 24 inches during March, April, May, June. Organic matter content in the surface horizon is about 3 percent. This component is in the F095XB005WI Moist Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 18 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Tuscola: 4 percent

Generated brief soil descriptions are created for major soil components. The Tuscola soil is a minor component.

Description Category: GENSOIL

Wacousta: 4 percent

Generated brief soil descriptions are created for major soil components. The Wacousta soil is a minor component.

Description Category: GENSOIL

Keowns: 3 percent

Generated brief soil descriptions are created for major soil components. The Keowns soil is a minor component.

Description Category: GENSOIL

Juneau: 2 percent

Generated brief soil descriptions are created for major soil components. The Juneau soil is a minor component.

Description Category: GENSOIL

Grays: 2 percent

Generated brief soil descriptions are created for major soil components. The Grays soil is a minor component.

Milwaukee and Waukesha Counties, Wisconsin

Map Unit: Sm—Sebewa silt loam, 0 to 2 percent slopes

Description Category: GENSOIL

Sebewa: 90 percent

The Sebewa component makes up 90 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions on outwash plains. The parent material consists of loamy outwash over sandy and gravelly outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 24 to 30 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is frequently flooded. It is frequently ponded. A seasonal zone of water saturation is at 6 inches during March. Organic matter content in the surface horizon is about 2 percent. This component is in the F095XB004WI Wet Loamy or Clayey Lowland ecological site. Nonirrigated land capability classification is 2w. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent. There are no saline horizons within 30 inches of the soil surface.

Description Category: GENSOIL

Adrian: 6 percent

Generated brief soil descriptions are created for major soil components. The Adrian soil is a minor component.

Description Category: GENSOIL

Ionia: 3 percent

Generated brief soil descriptions are created for major soil components. The Ionia soil is a minor component.

Description Category: GENSOIL

Fox: 1 percent

Generated brief soil descriptions are created for major soil components. The Fox soil is a minor component.

Soil Chemical Properties

This folder contains a collection of tabular reports that present soil chemical properties. The reports (tables) include all selected map units and components for each map unit. Soil chemical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

Chemical Soil Properties

This table shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable cations plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is 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. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

Chemical Soil Properties–Jefferson County, Wisconsin								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
BaA—Barry silt loam, 0 to 3 percent slopes								
Barry	0-15	7.7-16	—	6.1-7.8	0	0	0.0-2.0	0
	15-25	14-21	—	6.1-7.8	0	0	0.0-2.0	0
	25-79	4.1-11	—	7.4-8.4	20-30	0	0.0-2.0	0
FsB—Fox silt loam, 2 to 6 percent slopes								
Fox	0-7	8.9-15	—	5.1-7.3	0	0	0.0-2.0	0
	7-21	13-27	—	5.1-7.3	0	0	0.0-2.0	0
	21-31	13-27	—	5.1-8.4	0-45	0	0.0-2.0	0
	31-79	0.1-3.8	—	7.4-8.4	5-45	0	0.0-2.0	0
Kb—Keowns silt loam, 0 to 2 percent slopes								
Keowns	0-9	9.3-18	—	6.6-8.4	0	0	0.0-2.0	0
	9-16	8.6-17	—	6.6-8.4	0	0	0.0-2.0	0
	16-32	8.6-14	—	7.4-8.4	2-10	0	0.0-2.0	0
	32-79	4.1-14	—	7.4-8.4	2-40	0	0.0-2.0	0
LaB—Lamartine silt loam, 2 to 6 percent slopes								
Lamartine	0-8	13-22	—	5.6-7.8	0	0	0.0-2.0	0
	8-20	17-30	—	5.6-7.8	0	0	0.0-2.0	0
	20-28	14-27	—	6.6-7.8	0-10	0	0.0-2.0	0
	28-79	4.1-16	—	7.4-8.4	10-30	0	0.0-2.0	0

Chemical Soil Properties–Jefferson County, Wisconsin								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
MmA—Matherton silt loam, 0 to 3 percent slopes								
Matherton	0-13	9.4-16	—	5.1-7.3	0	0	0.0-2.0	—
	13-29	11-19	—	5.1-7.3	0	0	0.0-2.0	—
	29-60	0.0-6.0	—	7.4-8.4	10-25	0	0.0-2.0	—
MoB—Mayville silt loam, 2 to 6 percent slopes								
Mayville	0-6	11-23	—	6.6-7.3	0	0	0.0-2.0	0
	6-12	20-22	—	6.1-6.5	0	0	0.0-2.0	0
	12-28	19-30	—	5.6-6.0	0-1	0	0.0-2.0	0
	28-32	21-31	—	6.6-8.4	10-40	0	0.0-2.0	0
	32-79	5.5-16	—	7.4-8.4	10-40	0	0.0-2.0	0
Pa—Palms muck, 0 to 2 percent slopes								
Palms, muck	0-13	84-152	—	5.8-6.4	0	0	0.0-2.0	0
	13-30	84-152	—	5.8-6.4	0	0	0.0-2.0	0
	30-79	13-24	—	7.0-8.0	0-20	0	0.0-2.0	0
RtB—Rotamer loam, 2 to 6 percent slopes, eroded								
Rotamer, eroded	0-9	3.8-15	—	6.1-7.8	0	0	0.0-2.0	0
	9-19	11-22	—	6.1-7.8	0-5	0	0.0-2.0	0
	19-79	0.5-11	—	7.9-8.4	15-40	0	0.0-2.0	0

Chemical Soil Properties–Jefferson County, Wisconsin								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
RtC2—Rotamer loam, 6 to 12 percent slopes, eroded								
Rotamer, eroded	0-8	3.8-15	—	6.1-7.8	0	0	0.0-2.0	0
	8-13	11-19	—	6.1-7.8	0-5	0	0.0-2.0	0
	13-79	0.5-11	—	7.9-8.4	15-40	0	0.0-2.0	0
RtD2—Rotamer loam, 12 to 20 percent slopes, eroded								
Rotamer, eroded	0-7	3.8-15	—	6.1-7.8	0	0	0.0-2.0	0
	7-13	11-16	—	6.1-7.8	0-5	0	0.0-2.0	0
	13-79	0.5-11	—	7.9-8.4	20-40	0	0.0-2.0	0
Sm—Sebewa silt loam, 0 to 2 percent slopes								
Sebewa	0-11	11-13	—	6.1-7.8	0	0	0.0-2.0	0
	11-27	16-32	—	6.1-7.8	0	0	0.0-2.0	0
	27-79	1.0-3.8	—	7.4-8.4	1-25	0	0.0-2.0	0
ThB—Theresa silt loam, 2 to 6 percent slopes								
Theresa	0-8	11-23	—	6.1-7.8	0	0	0.0-2.0	0
	8-14	10-22	—	6.1-7.8	0	0	0.0-2.0	0
	14-18	19-31	—	5.6-7.3	0	0	0.0-2.0	0
	18-34	19-30	—	6.6-8.4	0-20	0	0.0-2.0	0
	34-79	4.8-19	—	7.9-8.4	40-60	0	0.0-2.0	0

Chemical Soil Properties–Jefferson County, Wisconsin								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
ThC2—Theresa silt loam, 6 to 12 percent slopes, eroded								
Theresa, eroded	0-4	11-23	—	6.1-7.8	0	0	0.0-2.0	0
	4-16	19-31	—	5.6-7.3	0	0	0.0-2.0	0
	16-35	19-30	—	6.6-8.4	0-20	0	0.0-2.0	0
	35-79	2.6-14	—	7.9-8.4	40-60	0	0.0-2.0	0
VwA—Virgil silt loam, gravelly substratum, 0 to 3 percent slopes								
Virgil, gravelly substratum	0-9	13-23	—	6.1-7.8	0-20	0	0.0-2.0	0
	9-13	12-21	—	5.1-7.3	0	0	0.0-2.0	0
	13-44	20-28	—	5.1-7.8	0-20	0	0.0-2.0	0
	44-49	4.3-16	—	5.6-8.4	0-5	0	0.0-2.0	0
	49-79	0.1-1.0	—	6.1-8.4	0-20	0	0.0-2.0	0
W—Water								
Water	—	—	—	—	—	—	—	—
Wa—Wacousta silty clay loam, 0 to 2 percent slopes								
Wacousta	0-13	24-30	—	6.6-7.3	0-15	0	0.0-2.0	0
	13-19	20-25	—	6.6-7.8	0-15	0	0.0-2.0	0
	19-79	13-20	—	7.4-8.4	5-30	0	0.0-2.0	0
WvB—Wauconda silt loam, 2 to 6 percent slopes								
Wauconda	0-13	11-20	—	6.1-7.3	0	0	0.0-2.0	—
	13-32	13-20	—	5.6-7.8	0	0	0.0-2.0	—
	32-60	3.2-11	—	7.4-8.4	5-30	0	0.0-2.0	—

Chemical Soil Properties–Milwaukee and Waukesha Counties, Wisconsin								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
Sm—Sebewa silt loam, 0 to 2 percent slopes								
Sebewa	0-11	11-13	—	6.1-7.8	0	0	0.0-2.0	0
	11-27	16-32	—	6.1-7.8	0	0	0.0-2.0	0
	27-79	1.0-3.8	—	7.4-8.4	1-25	0	0.0-2.0	0

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell

potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

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

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

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Jefferson County, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
BaA—Barry silt loam, 0 to 3 percent slopes														
Barry	85	B/D	0-15	Silt loam	ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	92-95-100	70-75-80	28-36-45	4-7 -11
			15-25	Loam, sandy clay loam, sandy loam	CL	A-6	0- 0- 0	0- 0- 0	92-100-100	91-100-100	78-89-92	56-65-69	29-35-39	12-15-17
			25-79	Sandy loam, gravelly sandy loam	SC	A-4	0- 0- 0	0- 1- 3	81-95-100	80-95-100	57-74-85	27-39-47	0-22 -29	NP-9 -12
FsB—Fox silt loam, 2 to 6 percent slopes														
Fox	85	B	0-7	Silt loam	CL-ML, ML, CL	A-4, A-6	0- 0- 0	0- 0- 0	95-96-100	94-96-100	83-89-98	66-72-81	23-28-34	6-8 -11
			7-21	Silty clay loam, silt loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	90-95-100	90-95-100	84-94-100	72-84-98	28-37-46	12-19-25
			21-31	Sandy clay loam, gravelly loam	CL, GC, SC	A-2, A-6, A-7	0- 0- 0	0- 3- 4	71-85-100	70-84-100	54-73-95	28-43-61	28-37-46	12-18-25
			31-79	Stratified sand to gravel, gravelly sand, very gravelly coarse sand	GP-GM, GP, SP-SM, SM, SP	A-1, A-1-b, A-2, A-3	0- 0- 0	0- 4- 7	51-71-100	49-70-100	30-47-71	4-10- 18	0-0 -16	NP-0 -1

Engineering Properties–Jefferson County, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
Kb—Keowns silt loam, 0 to 2 percent slopes														
Keowns	85	B/D	0-9	Silt loam	ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	88-93-98	70-75-80	27-34-41	6-10-13
			9-16	Silt loam	CL	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	88-93-98	70-75-80	22-28-35	6-9 -13
			16-32	Silt loam	CL	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	89-93-97	71-75-79	22-26-30	5-8 -12
			32-79	Stratified silt loam to very fine sand	CL	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-99-100	69-78-82	16-25-29	1-9 -12
LaB—Lamartine silt loam, 2 to 6 percent slopes														
Lamartine	85	B/D	0-8	Silt loam	ML	A-4, A-6, A-7-6	0- 0- 0	0- 0- 0	98-100-100	98-100-100	93-99-100	85-92-97	32-41-50	9-13-17
			8-20	Silty clay loam, silt loam	CL, CH	A-6, A-7, A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-100-100	88-96-100	35-43-51	17-23-29
			20-28	Clay loam, loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	80-89-100	79-89-100	73-89-100	57-73-91	30-38-46	13-19-25
			28-79	Gravelly sandy loam, fine sandy loam	SC-SM, SC	A-2, A-4, A-6	0- 0- 0	0- 3- 4	61-75-93	60-74-92	51-69-90	30-43-58	16-22-31	1-6 -13
MmA—Matherton silt loam, 0 to 3 percent slopes														
Matherton	85	B/D	0-13	Silt loam	CL	A-4	0- 0- 0	0- 3- 5	90-95-100	75-88-100	70-85-100	50-70-90	26-33-39	7-10-13
			13-29	Sandy clay loam, clay loam, loam	CL	A-6	0- 0- 0	0- 2- 5	85-90-95	60-85-90	50-70-90	30-53-75	31-39-47	13-19-25
			29-60	Gravelly sand, sand	SP-SM	A-1-b	0- 0- 0	0- 5- 10	40-70-100	25-50-75	20-38-55	0- 8- 15	0-17 -23	NP-2 -6

Engineering Properties–Jefferson County, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
MoB—Mayville silt loam, 2 to 6 percent slopes														
Mayville	90	C	0-6	Silt loam	CL	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	91-96-100	82-89-98	25-30-43	7-9 -19
			6-12	Silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	87-94-96	36-39-40	17-18-19
			12-28	Silty clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	89-95-100	37-39-51	19-20-29
			28-32	Clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	77-85-95	76-84-94	66-78-94	47-60-77	37-41-52	19-21-29
			32-79	Gravelly sandy loam, sandy loam	SC	A-2-4	0- 0- 0	0- 1- 2	58-69-84	56-68-84	38-53-84	17-29-49	18-26-31	3-10-13
Pa—Palms muck, 0 to 2 percent slopes														
Palms, muck	87	B/D	0-13	Muck	PT	A-8	0- 0- 0	0- 0- 0	100-100-100	100-100-100	100-100-100	100-100-100	—	—
			13-30	Muck	PT	A-8	0- 0- 0	0- 0- 0	100-100-100	100-100-100	100-100-100	100-100-100	—	—
			30-79	Gravelly silty clay loam, silty clay loam	CL	A-6, A-7, A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	100-100-100	88-88-100	38-43-57	18-21-28

Engineering Properties–Jefferson County, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
RtB—Rotamer loam, 2 to 6 percent slopes, eroded														
Rotamer, eroded	90	B	0-9	Loam	CL, ML	A-4, A-7-6	0- 0- 0	0- 0- 0	94-96-100	94-96-100	75-84-100	51-60-74	22-32-45	3-10-18
			9-19	Clay loam, loam, gravelly loam	CL, CH, GC	A-7-6	0- 0- 0	0- 0- 0	68-89-95	68-89-95	55-81-95	42-63-77	32-42-53	13-20-28
			19-79	Very gravelly sandy loam, gravelly sandy loam	GM, SC-SM, SC	A-1-b, A-2-4	0- 0- 0	1- 4- 13	55-63-78	53-62-78	39-48-72	20-25-43	0-17 -31	NP-7 -13
RtC2—Rotamer loam, 6 to 12 percent slopes, eroded														
Rotamer, eroded	93	B	0-8	Loam	CL, ML	A-4, A-7-6	0- 0- 0	0- 0- 0	94-96-100	94-96-100	75-84-100	51-60-74	22-32-45	3-10-18
			8-13	Sandy clay loam, gravelly sandy clay loam, loam, gravelly loam	CL, SC	A-2-6, A-6, A-7-6	0- 0- 0	0- 0- 0	69-90-95	69-90-95	55-76-90	26-38-50	32-38-48	13-18-25
			13-79	Very gravelly sandy loam, gravelly sandy loam	GM, SC-SM, SC	A-1-b, A-2-4	0- 0- 0	1- 4- 13	55-63-78	53-62-78	39-48-72	20-25-43	0-17 -31	NP-7 -13

Engineering Properties–Jefferson County, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
RtD2—Rotamer loam, 12 to 20 percent slopes, eroded														
Rotamer, eroded	94	B	0-7	Loam	CL, ML	A-4, A-7-6	0- 0- 0	0- 0- 0	95-96-100	94-96-100	75-84-100	51-60-74	22-32 -45	3-10-18
			7-13	Gravelly loam, loam, gravelly sandy clay loam, sandy clay loam	CL, SC	A-2-6, A-6, A-7-6	0- 0- 0	0- 0- 0	69-90-95	69-90-95	55-76-90	26-38-50	32-38 -44	13-17-21
			13-79	Gravelly sandy loam, very gravelly sandy loam	GM, SC-SM, SC	A-2, A-2-4	0- 0- 0	1- 4- 13	55-63-78	53-62-78	39-48-72	20-25-43	0-17 -31	NP-7 -13
Sm—Sebewa silt loam, 0 to 2 percent slopes														
Sebewa	90	B/D	0-11	Silt loam	CL	A-4	0- 0- 0	0- 0- 0	95-97-99	79-85-96	72-78-91	57-62-72	25-28 -32	7-8 -9
			11-27	Gravelly clay loam, clay loam, loam	CL	A-6	0- 0- 0	0- 0- 0	96-97-98	61-83-91	50-74-91	33-55-74	31-39 -52	13-19-29
			27-79	Coarse sand, very gravelly coarse sand, extremely gravelly coarse sand, stratified sand to gravel	SM	A-1-b	0- 1- 2	0- 4- 11	32-85-100	29-84-100	16-50-63	3-13- 18	0-0 -16	NP-0 -1

Engineering Properties–Jefferson County, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
ThB—Theresa silt loam, 2 to 6 percent slopes														
Theresa	85	C	0-8	Silt loam	CL	A-4	0- 0- 0	0- 0- 0	97-98-100	96-98-100	89-93-100	71-75-89	25-29-43	7-10-19
			8-14	Silt loam	CL	A-4	0- 0- 0	0- 0- 0	97-98-100	96-98-100	92-93-100	73-74-91	24-25-41	7-8 -19
			14-18	Silty clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	88-91-100	87-91-100	82-88-100	72-77-95	37-41-52	19-22-29
			18-34	Clay loam, gravelly clay loam	CL	A-6	0- 0- 0	0- 0- 0	88-93-97	75-87-93	69-80-93	52-60-77	36-37-50	19-20-29
			34-79	Loam, gravelly loam	CL	A-4	0- 1- 4	0- 4- 5	71-86-89	71-86-89	58-76-89	39-53-66	17-25-37	2-8 -18
ThC2—Theresa silt loam, 6 to 12 percent slopes, eroded														
Theresa, eroded	90	C	0-4	Silt loam	CL	A-4	0- 0- 0	0- 0- 0	95-98-100	94-98-100	88-93-100	70-75-89	25-29-43	7-10-19
			4-16	Silty clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	94-97-100	82-85-95	37-41-52	19-22-29
			16-35	Gravelly clay loam, clay loam	CL	A-6	0- 0- 0	0- 0- 0	88-88-97	75-76-93	69-70-93	52-53-77	36-37-50	19-20-29
			35-79	Gravelly sandy loam, sandy loam	SC-SM	A-4	0- 1- 4	0- 2- 4	66-72-80	66-72-80	59-65-80	37-41-58	0-16 -31	NP-7 -13

Engineering Properties–Jefferson County, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
VwA—Virgil silt loam, gravelly substratum, 0 to 3 percent slopes														
Virgil, gravelly substratum	90	B/D	0-9	Silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	93-99-100	86-92-98	30-38-45	9-14-18
			9-13	Silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	93-99-100	86-92-98	26-32-38	10-14-19
			13-44	Silty clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	91-95-99	37-42-47	19-22-25
			44-49	Sandy loam	SC	A-6	0- 0- 0	0- 0- 0	79-89-100	78-89-100	54-72-84	29-44-52	16-29-31	2-12-13
			49-79	Stratified gravel to sand, gravelly sand	GP-GM	A-1-a	0- 0- 0	0- 0- 0	36-45-54	33-43-52	19-26-32	4- 6- 9	0-0 -16	NP-0 -2
Wa—Wacousta silty clay loam, 0 to 2 percent slopes														
Wacousta	85	B/D	0-13	Silty clay loam	MH, CL, CL-ML, CH	A-7-5	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-99-100	89-95-100	53-59-64	18-21-24
			13-19	Silty clay loam, silt loam	CL, CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	94-99-100	88-95-100	37-45-53	14-19-25
			19-79	Silty clay loam, silt loam	CL, CL-ML, ML	A-4, A-6	0- 0- 0	0- 3- 5	89-93-100	89-92-100	84-92-100	78-88-100	26-34-42	9-15-21

Engineering Properties–Jefferson County, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
WvB—Wauconda silt loam, 2 to 6 percent slopes														
Wauconda	85	C	0-13	Silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	95-98-1 00	80-90-1 00	29-37 -45	9-14-18
			13-32	Silty clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	90-95-1 00	85-93-1 00	37-42 -47	19-22-2 5
			32-60	Loam, silt loam, sand	CL	A-4	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	70-85-1 00	30-60- 90	16-24 -32	2-8 -13

Engineering Properties–Milwaukee and Waukesha Counties, Wisconsin														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
Sm—Sebewa silt loam, 0 to 2 percent slopes														
Sebewa	90	B/D	0-11	Silt loam	CL	A-4	0- 0- 0	0- 0- 0	95-97- 99	79-85- 96	72-78- 91	57-62- 72	25-28 -32	7-8 -9
			11-27	Gravelly clay loam, clay loam, loam	CL	A-6	0- 0- 0	0- 0- 0	96-97- 98	61-83- 91	50-74- 91	33-55- 74	31-39 -52	13-19-2 9
			27-79	Coarse sand, very gravelly coarse sand, extremely gravelly coarse sand, stratified sand to gravel	SM	A-1-b	0- 1- 2	0- 4- 11	32-85-1 00	29-84-1 00	16-50- 63	3-13- 18	0-0 -16	NP-0 -1

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. 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. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Jefferson County, Wisconsin														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
BaA—Barry silt loam, 0 to 3 percent slopes														
Barry	0-15	26-31- 35	50-56- 66	8-13- 18	1.07-1.13-1.19	4.23-9.17-14.11	0.20-0.21-0.22	0.5- 0.9- 1.5	4.0- 6.0-8.0	.32	.32	5	5	56
	15-25	26-41- 49	26-37- 50	18-22- 25	1.31-1.44-1.57	4.23-9.17-14.11	0.14-0.17-0.19	1.8- 2.7- 3.3	0.3- 1.5-2.0	.32	.32			
	25-79	48-66- 75	7-23- 43	5-12- 18	1.49-1.60-1.70	14.11-28.23-42.34	0.10-0.14-0.17	0.0- 0.9- 1.6	0.0- 0.3-0.5	.28	.28			
FsB—Fox silt loam, 2 to 6 percent slopes														
Fox	0-7	25-31- 40	50-56- 65	10-14- 17	1.35-1.37-1.39	4.23-9.17-14.11	0.17-0.21-0.24	0.9- 1.4- 1.8	1.0- 2.0-3.0	.32	.32	3	5	56
	7-21	1-18- 19	46-55- 72	18-27- 35	1.41-1.46-1.52	4.23-9.17-14.11	0.10-0.16-0.22	1.6- 3.4- 5.1	0.0- 0.3-0.5	.43	.43			
	21-31	46-56- 72	0-18- 36	18-27- 35	1.60-1.62-1.63	4.02-9.17-14.11	0.10-0.15-0.19	1.3- 3.0- 5.1	0.0- 0.3-0.5	.20	.20			
	31-79	85-93- 95	1- 4- 11	0- 3- 4	1.55-1.59-1.63	42.34-91.74-141.14	0.02-0.05-0.07	0.0- 0.2- 0.3	0.0- 0.3-0.5	.02	.02			

Physical Soil Properties–Jefferson County, Wisconsin														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
Kb—Keowns silt loam, 0 to 2 percent slopes														
Keowns	0-9	25-30- 35	50-55- 60	10-15- 20	1.32-1.36-1.39	4.23-9.17-14.11	0.20-0.22-0.24	1.0- 1.6- 2.5	3.0- 4.0-5.0	.32	.32	5	5	56
	9-16	25-30- 35	50-55- 60	10-15- 20	1.39-1.42-1.45	4.23-9.17-14.11	0.20-0.22-0.24	1.0- 1.6- 2.5	0.5- 1.0-2.0	.49	.49			
	16-32	25-30- 40	50-56- 65	10-14- 18	1.41-1.46-1.51	4.23-9.17-14.11	0.12-0.17-0.22	0.9- 1.4- 1.8	0.5- 0.8-1.0	.49	.49			
	32-79	25-36- 45	45-50- 70	5-14- 18	1.39-1.42-1.45	4.23-9.17-14.11	0.08-0.11-0.13	0.3- 1.3- 1.8	0.0- 0.3-0.5	.49	.49			
LaB—Lamartine silt loam, 2 to 6 percent slopes														
Lamartine	0-8	10-11- 20	59-69- 75	15-20- 25	1.28-1.31-1.33	4.00-9.00-14.00	0.22-0.23-0.24	1.6- 2.5- 3.5	3.0- 5.0-7.0	.32	.32	5	6	48
	8-20	5- 7- 15	48-61- 70	25-33- 40	1.46-1.48-1.49	4.00-9.00-14.00	0.13-0.16-0.22	2.9- 4.5- 6.2	0.0- 0.3-0.5	.43	.43			
	20-28	20-27- 43	26-45- 60	20-28- 35	1.48-1.52-1.57	4.00-9.00-14.00	0.13-0.16-0.19	1.8- 3.3- 5.1	0.0- 0.3-0.5	.43	.43			
	28-79	53-54- 60	24-35- 42	5-11- 20	1.48-1.50-1.52	4.00-23.00-42.00	0.06-0.12-0.17	0.2- 0.9- 2.2	0.0- 0.3-0.5	.28	.43			

Physical Soil Properties–Jefferson County, Wisconsin														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
MmA—Matherton silt loam, 0 to 3 percent slopes														
Matherton	0-13	-30-	-54-	12-16- 20	1.30-1.48-1.65	14.00-28.00-42.00	0.15-0.20-0.24	0.0- 1.5- 2.9	2.0- 3.0-4.0	.43	.43	3	5	56
	13-29	-55-	-17-	20-28- 35	1.40-1.55-1.70	4.00-9.00-14.00	0.12-0.15-0.18	3.0- 4.5- 5.9	0.0- 0.5-1.0	.20	.20			
	29-60	-94-	- 1-	0- 5- 10	1.50-1.58-1.65	42.00-92.00-141.00	0.02-0.03-0.04	0.0- 1.5- 2.9	0.0- 0.3-0.5	.02	.05			
MoB—Mayville silt loam, 2 to 6 percent slopes														
Mayville	0-6	5-14- 25	54-71- 83	12-15- 27	1.39-1.41-1.43	4.00-9.00-14.00	0.22-0.23-0.24	1.2- 1.6- 3.8	1.0- 2.0-3.0	.49	.49	5	5	56
	6-12	3- 9- 25	50-65- 72	25-27- 27	1.37-1.40-1.42	4.00-9.00-14.00	0.20-0.22-0.24	3.2- 3.6- 3.7	0.5- 1.0-1.5	.49	.49			
	12-28	2- 7- 20	49-65- 71	27-29- 40	1.46-1.46-1.46	1.40-3.00-4.00	0.18-0.19-0.20	3.2- 3.8- 6.2	0.0- 0.3-0.5	.49	.49			
	28-32	20-34- 45	17-36- 53	27-30- 40	1.31-1.44-1.58	1.40-3.00-4.00	0.14-0.15-0.16	3.0- 3.7- 6.2	0.3- 0.5-1.0	.32	.32			
	32-79	43-63- 85	0-22- 49	7-16- 20	1.41-1.58-1.76	4.00-9.00-14.00	0.11-0.12-0.13	0.4- 1.2- 2.1	0.0- 0.3-0.5	.15	.28			

Physical Soil Properties–Jefferson County, Wisconsin														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
Pa—Palms muck, 0 to 2 percent slopes														
Palms, muck	0-13	0- 0- 0	0- 0- 0	0- 0- 0	0.15-0.28-0.40	1.41-21.88-42.34	0.35-0.37-0.45	—	30.0-55.0-80.0			1	2	134
	13-30	0- 0- 0	0- 0- 0	0- 0- 0	0.15-0.35-0.40	1.41-23.00-42.34	0.35-0.40-0.45	—	30.0-70.0-80.0					
	30-79	5-18- 20	40-52- 66	27-30- 40	1.45-1.60-1.75	1.00-8.00-14.00	0.10-0.14-0.22	1.8- 2.9- 5.2	1.0- 2.0-4.0	.32	.32			
RtB—Rotamer loam, 2 to 6 percent slopes, eroded														
Rotamer, eroded	0-9	23-45- 52	28-40- 50	7-15- 27	1.34-1.40-1.47	4.00-9.00-14.00	0.20-0.21-0.22	0.4- 1.2- 3.0	2.0- 3.0-4.0	.32	.32	5	5	56
	9-19	20-35- 45	15-35- 53	20-30- 40	1.36-1.40-1.44	1.41-6.00-14.00	0.15-0.18-0.19	1.2- 3.3- 5.4	1.0- 1.5-2.0	.28	.28			
	19-79	43-66- 85	0-29- 50	1- 5- 20	1.45-1.60-1.76	14.11-26.00-42.34	0.08-0.11-0.13	0.0- 0.2- 1.3	0.0- 0.3-0.5	.17	.37			
RtC2—Rotamer loam, 6 to 12 percent slopes, eroded														
Rotamer, eroded	0-8	23-45- 52	28-40- 50	7-15- 27	1.34-1.40-1.47	4.00-9.00-14.00	0.20-0.21-0.22	0.4- 1.2- 3.0	2.0- 3.0-4.0	.32	.32	5	5	56
	8-13	45-65- 80	0-10- 35	20-25- 35	1.48-1.53-1.58	1.40-7.00-14.00	0.15-0.17-0.18	1.2- 2.4- 4.4	1.0- 1.5-2.0	.17	.17			
	13-79	43-66- 85	0-29- 50	1- 5- 20	1.45-1.60-1.76	14.11-26.00-42.34	0.08-0.11-0.13	0.0- 0.2- 1.3	0.0- 0.3-0.5	.17	.37			

Physical Soil Properties–Jefferson County, Wisconsin														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
RtD2—Rotamer loam, 12 to 20 percent slopes, eroded														
Rotamer, eroded	0-7	23-45- 52	28-40- 50	7-15- 27	1.34-1.40-1.47	4.00-9.00-14.00	0.20-0.21-0.22	0.4- 1.2- 3.0	2.0- 3.0-4.0	.32	.32	5	5	56
	7-13	45-65- 80	0-10- 35	20-25- 30	1.48-1.53-1.58	4.00-9.00-14.00	0.15-0.17-0.18	1.2- 2.4- 3.5	1.0- 1.5-2.0	.17	.17			
	13-79	43-66- 85	0-29- 50	1- 5- 20	1.45-1.60-1.76	14.11-26.00-42.34	0.08-0.11-0.13	0.0- 0.2- 1.3	0.0- 0.3-0.5	.17	.37			
Sm—Sebewa silt loam, 0 to 2 percent slopes														
Sebewa	0-11	20-33- 35	50-54- 65	12-13- 15	1.44-1.48-1.53	4.00-9.00-14.00	0.22-0.23-0.24	1.1- 1.2- 1.6	1.0- 2.0-3.0	.37	.37	3	5	56
	11-27	20-41- 45	15-32- 53	20-27- 40	1.37-1.46-1.54	4.00-9.00-14.00	0.15-0.17-0.19	1.7- 3.3- 6.0	0.5- 1.0-1.5	.28	.28			
	27-79	85-93- 95	1- 4- 11	1- 3- 4	1.55-1.59-1.63	141.10-282.05-423.00	0.02-0.03-0.04	0.0- 0.2- 0.3	0.0- 0.3-0.5	.02	.02			

Physical Soil Properties–Jefferson County, Wisconsin														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
ThB—Theresa silt loam, 2 to 6 percent slopes														
Theresa	0-8	20-30- 50	38-55- 68	12-15- 27	1.45-1.48-1.52	4.23-9.17-14.11	0.22-0.23-0.24	1.2- 1.5- 3.8	1.0- 2.0- 3.0	.49	.49	3	5	56
	8-14	20-31- 50	38-57- 68	12-12- 27	1.38-1.45-1.52	4.23-9.17-14.11	0.20-0.21-0.23	1.2- 1.3- 3.8	0.5- 1.0- 2.0	.55	.55			
	14-18	5-18- 20	40-52- 66	27-30- 40	1.41-1.43-1.45	4.23-9.17-14.11	0.14-0.15-0.20	3.0- 4.0- 6.3	0.0- 0.8- 1.0	.37	.37			
	18-34	20-35- 45	19-38- 53	27-27- 40	1.48-1.50-1.53	4.23-9.17-14.11	0.13-0.14-0.15	2.7- 3.2- 5.9	0.0- 0.3- 0.5	.37	.37			
	34-79	23-45- 52	28-40- 50	7-15- 27	1.75-1.82-1.89	0.42-0.92-1.41	0.06-0.07-0.08	0.2- 1.1- 3.1	0.0- 0.3- 0.5	.43	.43			
ThC2—Theresa silt loam, 6 to 12 percent slopes, eroded														
Theresa, eroded	0-4	20-30- 50	23-55- 68	12-15- 27	1.45-1.48-1.52	4.23-9.17-14.11	0.22-0.23-0.24	1.2- 1.5- 3.8	1.0- 2.0- 3.0	.49	.49	3	5	56
	4-16	5-18- 20	40-52- 66	27-30- 40	1.41-1.43-1.45	4.23-9.17-14.11	0.16-0.17-0.20	3.0- 4.0- 6.3	0.0- 0.8- 1.0	.37	.37			
	16-35	20-35- 45	19-38- 53	27-27- 40	1.48-1.50-1.53	4.23-9.17-14.11	0.07-0.10-0.19	2.7- 2.9- 5.9	0.0- 0.3- 0.5	.24	.37			
	35-79	43-50- 85	11-45- 50	4- 5- 20	1.70-1.74-1.78	0.42-0.92-1.41	0.05-0.06-0.07	0.0- 0.1- 1.5	0.0- 0.3- 0.5	.32	.64			

Physical Soil Properties–Jefferson County, Wisconsin														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
VwA—Virgil silt loam, gravelly substratum, 0 to 3 percent slopes														
Virgil, gravelly substratum	0-9	5-11- 15	58-68- 79	15-21- 27	1.35-1.37-1.39	4.23-9.17-14.11	0.22-0.23-0.24	1.6- 2.6- 4.1	2.0- 3.0-4.0	.37	.37	4	6	48
	9-13	5-11- 15	58-68- 79	15-21- 27	1.47-1.48-1.48	4.23-9.17-14.11	0.22-0.23-0.24	1.5- 2.5- 3.6	0.2- 0.3-0.5	.43	.43			
	13-44	2- 7- 15	52-62- 71	27-31- 35	1.47-1.48-1.49	4.23-9.17-14.11	0.18-0.19-0.20	3.5- 4.3- 5.2	0.2- 0.6-1.0	.43	.43			
	44-49	53-55- 70	10-27- 40	5-18- 20	1.50-1.55-1.60	4.23-9.17-14.11	0.11-0.12-0.13	0.3- 1.7- 2.2	0.1- 0.3-0.5	.28	.28			
	49-79	85-90- 98	0- 7- 14	1- 3- 5	1.59-1.63-1.67	141.14-423.42-705.00	0.02-0.03-0.04	0.0- 0.0- 0.1	0.0- 0.1-0.1	.02	.02			
W—Water														
Water	—	—	—	—	—	—	—	—	—					
Wa—Wacousta silty clay loam, 0 to 2 percent slopes														
Wacousta	0-13	2- 7- 18	50-62- 71	27-31- 35	1.14-1.18-1.23	4.23-9.17-14.11	0.21-0.22-0.23	2.2- 2.7- 3.3	8.0-9.0-10.0	.24	.24	5	4L	86
	13-19	2- 7- 18	50-64- 74	24-30- 35	1.29-1.32-1.34	4.23-9.17-14.11	0.18-0.19-0.20	2.7- 3.9- 4.9	2.0- 3.0-4.0	.37	.37			
	19-79	2- 7- 20	54-69- 80	18-24- 30	1.34-1.36-1.38	4.23-9.17-14.11	0.20-0.21-0.22	1.3- 2.5- 3.7	0.0- 0.5-1.0	.49	.49			

Physical Soil Properties–Jefferson County, Wisconsin														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
WvB—Wauconda silt loam, 2 to 6 percent slopes														
Wauconda	0-13	-11-	-68-	15-21- 27	1.15-1.23-1.30	4.00-9.00-14.00	0.22-0.23-0.24	0.0- 1.5- 2.9	2.0- 3.0-4.0	.37	.37	5	6	48
	13-32	- 7-	-62-	27-31- 35	1.20-1.33-1.45	4.00-9.00-14.00	0.18-0.19-0.20	3.0- 4.5- 5.9	0.2- 0.6-1.0	.43	.43			
	32-60	-44-	-44-	5-13- 20	1.50-1.63-1.75	4.00-23.00-42.00	0.05-0.14-0.22	0.0- 1.5- 2.9	0.2- 0.3-0.5	.55	.55			

Physical Soil Properties–Milwaukee and Waukesha Counties, Wisconsin														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
Sm—Sebewa silt loam, 0 to 2 percent slopes														
Sebewa	0-11	20-33- 35	50-54- 65	12-13- 15	1.44-1.48-1.53	4.00-9.00-14.00	0.22-0.23-0.24	1.1- 1.2- 1.6	1.0- 2.0-3.0	.37	.37	3	5	56
	11-27	20-41- 45	15-32- 53	20-27- 40	1.37-1.46-1.54	4.00-9.00-14.00	0.15-0.17-0.19	1.7- 3.3- 6.0	0.5- 1.0-1.5	.28	.28			
	27-79	85-93- 95	1- 4- 11	1- 3- 4	1.55-1.59-1.63	141.10-282.05-423.00	0.02-0.03-0.04	0.0- 0.2- 0.3	0.0- 0.3-0.5	.02	.02			

Soil Qualities and Features

This folder contains tabular reports that present various soil qualities and features. The reports (tables) include all selected map units and components for each map unit. Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to

corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Soil Features–Jefferson County, Wisconsin									
Map symbol and soil name	**Restrictive Layer**				**Subsidence**		**Potential for frost action**	**Risk of corrosion**	
	Kind	**Depth to top**	**Thickness**	**Hardness**	**Initial**	**Total**		**Uncoated steel**	**Concrete**
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
		In	*In*		*In*	*In*			
BaA—Barry silt loam, 0 to 3 percent slopes									
Barry		—	—		0	0	High	Moderate	Low
FsB—Fox silt loam, 2 to 6 percent slopes									
Fox	Strongly contrasting textural stratification	30-31-40	39-49	noncoherent	0	0	Moderate	High	Moderate
Kb—Keowns silt loam, 0 to 2 percent slopes									
Keowns		—	—		0	0	High	Moderate	Low
LaB—Lamartine silt loam, 2 to 6 percent slopes									
Lamartine		—	—		0	0	High	High	Low
MmA—Matherton silt loam, 0 to 3 percent slopes									
Matherton		—	—		—	—	High	High	Moderate
MoB—Mayville silt loam, 2 to 6 percent slopes									
Mayville		—	—		0	0	High	High	Moderate

Soil Features–Jefferson County, Wisconsin									
Map symbol and soil name	**Restrictive Layer**				**Subsidence**		**Potential for frost action**	**Risk of corrosion**	
	Kind	**Depth to top**	**Thickness**	**Hardness**	**Initial**	**Total**		**Uncoated steel**	**Concrete**
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
Pa—Palms muck, 0 to 2 percent slopes									
Palms, muck		—	—		4-12	25-32	High	High	Moderate
RtB—Rotamer loam, 2 to 6 percent slopes, eroded									
Rotamer, eroded		—	—		0	0	Moderate	Low	Low
RtC2—Rotamer loam, 6 to 12 percent slopes, eroded									
Rotamer, eroded		—	—		0	0	Moderate	Low	Low
RtD2—Rotamer loam, 12 to 20 percent slopes, eroded									
Rotamer, eroded		—	—		0	0	Moderate	Low	Low
Sm—Sebewa silt loam, 0 to 2 percent slopes									
Sebewa	Strongly contrasting textural stratification	24-27-30	—	noncoherent	0	0	High	High	Low
ThB—Theresa silt loam, 2 to 6 percent slopes									
Theresa	Densic material	32-34-35	43-46	noncoherent	0	0	Moderate	Low	Low

Soil Features–Jefferson County, Wisconsin									
Map symbol and soil name	**Restrictive Layer**				**Subsidence**		**Potential for frost action**	**Risk of corrosion**	
	Kind	**Depth to top**	**Thickness**	**Hardness**	**Initial**	**Total**		**Uncoated steel**	**Concrete**
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
ThC2—Theresa silt loam, 6 to 12 percent slopes, eroded									
Theresa, eroded	Densic material	24-35-40	39-55	noncoherent	0	0	Moderate	Low	Low
VwA—Virgil silt loam, gravelly substratum, 0 to 3 percent slopes									
Virgil, gravelly substratum		—	—		0	0	High	High	Low
W—Water									
Water		—	—		—	—			
Wa—Wacousta silty clay loam, 0 to 2 percent slopes									
Wacousta		—	—		0	0	High	Moderate	Low
WvB—Wauconda silt loam, 2 to 6 percent slopes									
Wauconda		—	—		—	—	High	High	Low

Soil Features–Milwaukee and Waukesha Counties, Wisconsin									
Map symbol and soil name	**Restrictive Layer**				**Subsidence**		**Potential for frost action**	**Risk of corrosion**	
	Kind	**Depth to top**	**Thickness**	**Hardness**	**Initial**	**Total**		**Uncoated steel**	**Concrete**
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
		In	*In*		*In*	*In*			
Sm—Sebewa silt loam, 0 to 2 percent slopes									
Sebewa	Strongly contrasting textural stratification	24-27-30	—	noncoherent	0	0	High	High	Low

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Water Features

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on

observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. The kind of water table, apparent or perched, is given if a seasonal high water table exists in the soil. A water table is perched if free water is restricted from moving downward in the soil by a restrictive feature, in most cases a hardpan; there is a dry layer of soil underneath a wet layer. A water table is apparent if free water is present in all horizons from its upper boundary to below 2 meters or to the depth of observation. The water table kind listed is for the first major component in the map unit.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*		*Ft*				
BaA—Barry silt loam, 0 to 3 percent slopes											
Barry	B/D		Jan-Apr	0.0	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	—	None
			May-Oct	0.0-2.0	6.0	Apparent	—	—	—	—	None
			Nov-Dec	0.0	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	—	None
FsB—Fox silt loam, 2 to 6 percent slopes											
Fox	B	Low	Jan-Dec	—	—	—	—	—	None	—	None
Kb—Keowns silt loam, 0 to 2 percent slopes											
Keowns	B/D		Jan-May	0.0	6.0	Apparent	0.0-1.0	Brief (2 to 7 days)	Frequent	Brief (2 to 7 days)	Frequent
			Jun-Oct	0.0-2.0	6.0	Apparent	—	—	—	—	
			Nov-Dec	0.0	6.0	Apparent	0.0-1.0	Brief (2 to 7 days)	Frequent	Brief (2 to 7 days)	Frequent
LaB—Lamartine silt loam, 2 to 6 percent slopes											
Lamartine	B/D	Very low	Jan-May	1.0-2.0	6.0	Apparent	—	—	None	—	None
			Jun	1.6-3.0	6.0	Apparent	—	—	None	—	None
			Jul-Oct	2.0-4.3	6.0	Apparent	—	—	None	—	None
			Nov	1.6-3.0	6.0	Apparent	—	—	None	—	None
			Dec	1.0-2.0	6.0	Apparent	—	—	None	—	None
MmA—Matherton silt loam, 0 to 3 percent slopes											
Matherton	B/D		Jan-May	1.0-2.0	6.0	Apparent	—	—	None	—	None
			Jun-Oct	—	—	—	—	—	None	—	None
			Nov-Dec	1.0-2.0	6.0	Apparent	—	—	None	—	None

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*		*Ft*				
MoB—Mayville silt loam, 2 to 6 percent slopes											
Mayville	C		Jan-May	1.0-3.3	6.0	Apparent	—	—	None	—	None
			Jun-Oct	1.6-3.5	6.0	Apparent	—	—	None	—	None
			Nov-Dec	1.0-3.3	6.0	Apparent	—	—	None	—	None
Pa—Palms muck, 0 to 2 percent slopes											
Palms, muck	B/D		Jan-May	0.0-0.3	6.0	Apparent	0.0-1.0	Very long (more than 30 days)	Frequent	—	None
			Jun	0.0-0.8	6.0	Apparent	—	—	—	—	None
			Jul-Oct	0.4-2.0	6.0	Apparent	—	—	—	—	None
			Nov	0.0-0.8	6.0	Apparent	0.0-1.0	Very long (more than 30 days)	Frequent	—	None
			Dec	0.0-0.3	6.0	Apparent	0.0-1.0	Very long (more than 30 days)	Frequent	—	None
RtB—Rotamer loam, 2 to 6 percent slopes, eroded											
Rotamer, eroded	B		Jan-Dec	—	—	—	—	—	None	—	None
RtC2—Rotamer loam, 6 to 12 percent slopes, eroded											
Rotamer, eroded	B		Jan-Dec	—	—	—	—	—	None	—	None
RtD2—Rotamer loam, 12 to 20 percent slopes, eroded											
Rotamer, eroded	B		Jan-Dec	—	—	—	—	—	None	—	None

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*		*Ft*				
Sm—Sebewa silt loam, 0 to 2 percent slopes											
Sebewa	B/D	Negligible	Jan-Feb	0.0-1.6	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	—	
			Mar	0.0-1.0	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	Brief (2 to 7 days)	Frequent
			Apr-May	0.0-1.6	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	Brief (2 to 7 days)	Frequent
			Jun	0.8-2.0	6.0	Apparent	—	—	—	—	
			Jul-Aug	1.1-2.1	6.0	Apparent	—	—	—	—	
			Sep-Dec	0.0-1.6	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	—	
ThB—Theresa silt loam, 2 to 6 percent slopes											
Theresa	C		Jan-Dec	—	—	—	—	—	None	—	None
ThC2—Theresa silt loam, 6 to 12 percent slopes, eroded											
Theresa, eroded	C		Jan-Dec	—	—	—	—	—	None	—	None
VwA—Virgil silt loam, gravelly substratum, 0 to 3 percent slopes											
Virgil, gravelly substratum	B/D		Jan-Feb	0.3-3.0	6.0	Apparent	—	—	—	—	None
			Mar-May	0.0-2.0	6.0	Apparent	0.0-0.5	Brief (2 to 7 days)	Occasional	—	None
			Jun-Dec	1.0-3.0	6.0	Apparent	—	—	—	—	None
W—Water											
Water			Jan-Dec	—	—	—	—	—	—	—	
Wa—Wacousta silty clay loam, 0 to 2 percent slopes											
Wacousta	B/D	Negligible	Jan-May	0.0	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	—	None
			Jun-Oct	0.0-2.0	6.0	Apparent	—	—	—	—	None
			Nov-Dec	0.0	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	—	None

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*		*Ft*				
WvB—Wauconda silt loam, 2 to 6 percent slopes											
Wauconda	C		Jan-Feb	—	—	—	—	—	None	—	None
			Mar-Jun	1.0-3.0	6.0	Apparent	—	—	None	—	None
			Jul-Dec	—	—	—	—	—	None	—	None

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*		*Ft*				
Sm—Sebewa silt loam, 0 to 2 percent slopes											
Sebewa	B/D	Negligible	Jan-Feb	0.0-1.6	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	—	
			Mar	0.0-1.0	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	Brief (2 to 7 days)	Frequent
			Apr-May	0.0-1.6	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	Brief (2 to 7 days)	Frequent
			Jun	0.8-2.0	6.0	Apparent	—	—	—	—	
			Jul-Aug	1.1-2.1	6.0	Apparent	—	—	—	—	
			Sep-Dec	0.0-1.6	6.0	Apparent	0.0-1.0	Long (7 to 30 days)	Frequent	—	

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