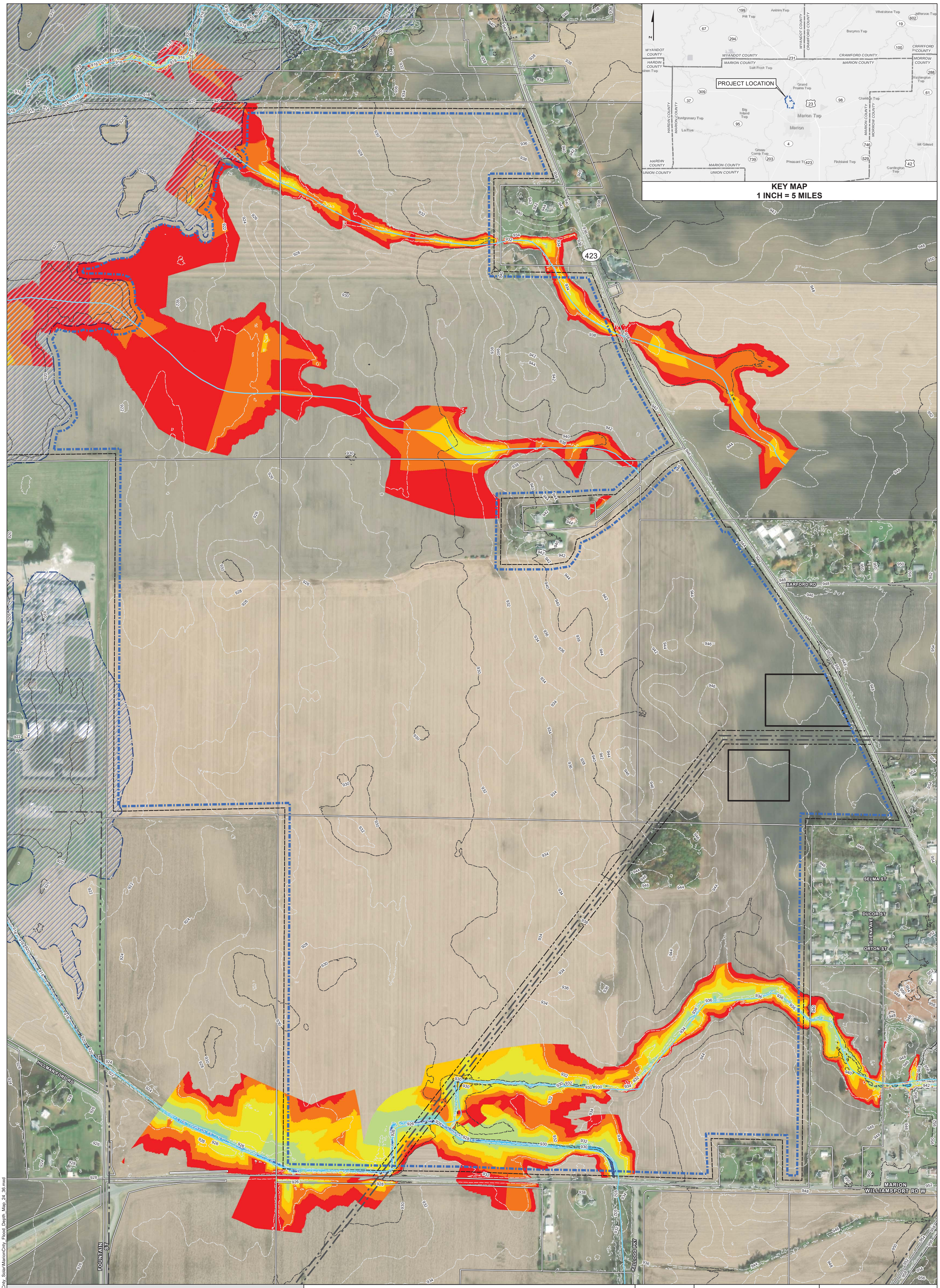


LEGEND

- LEASE AREA
- EXISTING WATERCOURSE
- OVERHEAD TRANSMISSION LINE
- SUBSTATION AREA
- PROPERTY SETBACK
- ASSUMED EASEMENT
- PROPERTY LINE
- EXISTING MINOR CONTOUR - 2' INTERVAL
- EXISTING MAJOR CONTOUR - 10' INTERVAL
- FEMA 100 YEAR FLOODPLAIN

FLOOD DEPTH
MINIMUM - MAXIMUM (FEET)

- 0.0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0
- 5.0 - 6.0
- 6.0 - 7.0

MARION COUNTY SOLAR PROJECT
FLOOD DEPTH ANALYSIS
MARION COUNTY, OHIO

300 0 300 600 FEET

N W E S

ABSOLUTE SCALE: 1:3,600

REFERENCE SCALE: 1 IN = 300 FT

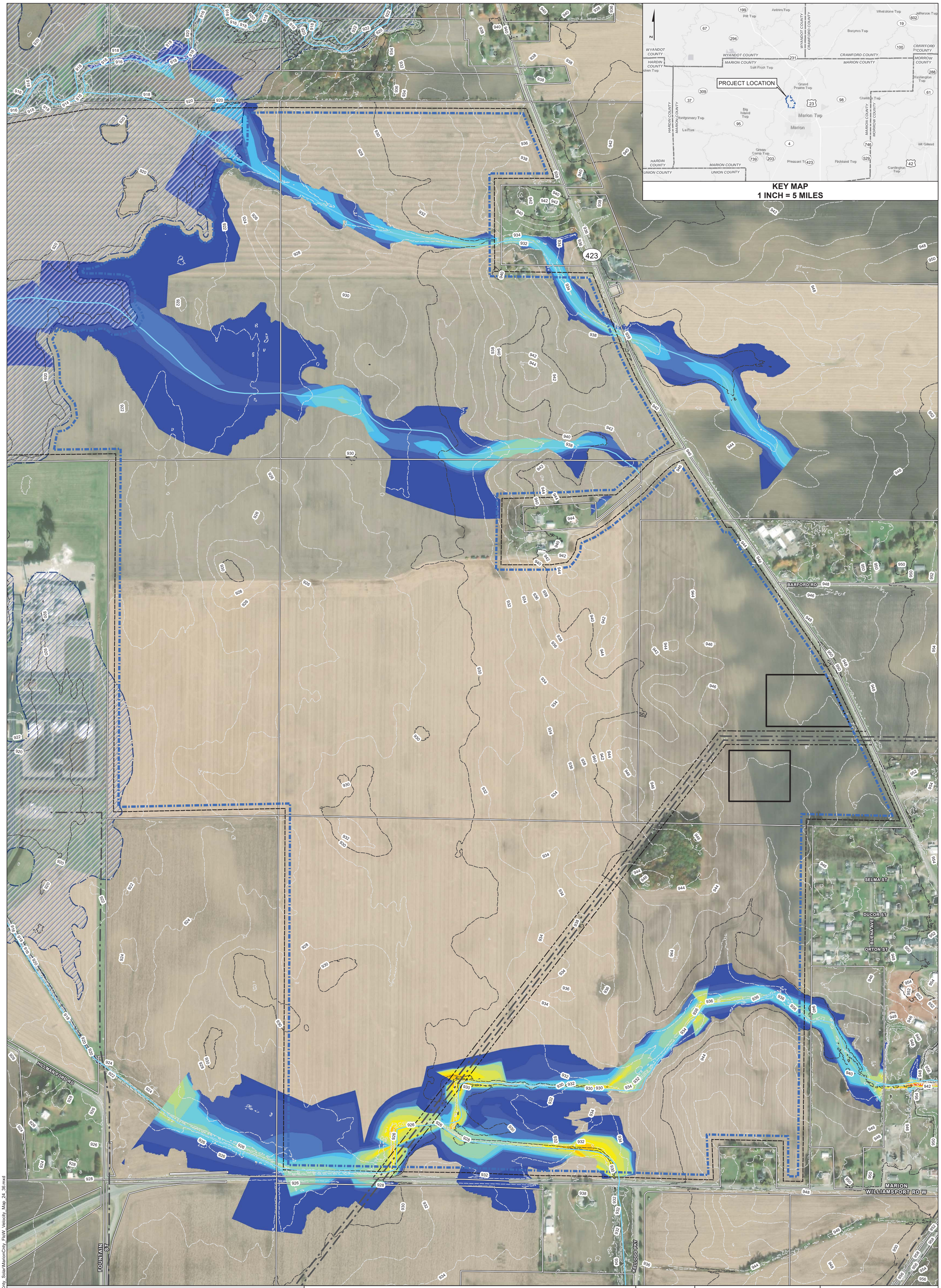
SAVION A RENEWABLE ENERGY COMPANY

MOTT MACDONALD

DRAWN BY:	MM 02/2021
CHECKED BY:	MM 02/2021
APPROVED BY:	MM 02/2021
REV. DATE:	02/2021
REVISION:	0
DESC:	ISSUED FOR REVIEW
PAGE:	1 OF 1

G:_HMM\Design\GIS\GIS\Misc_Project\Savion\2021_01_25_MarionCnty_Solar\MarionCnty_Flood_Depth_Map_24_36.mxd

Exhibit E. Peak Flow Velocity & Scour Depth Maps



LEGEND

- LEASE AREA
- EXISTING WATERCOURSE
- OVERHEAD TRANSMISSION LINE
- SUBSTATION AREA
- PROPERTY SETBACK
- ASSUMED EASEMENT
- PROPERTY LINE
- EXISTING MINOR CONTOUR - 2' INTERVAL
- EXISTING MAJOR CONTOUR - 10' INTERVAL
- FEMA 100 YEAR FLOODPLAIN

FLOW VELOCITY
MINIMUM - MAXIMUM (FEET PER SECOND)

- 0.0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0
- 5.0 - 6.0
- 6.0 - 7.0
- 7.0 - 8.0
- 8.0 - 9.0
- 9.0 - 10.0
- 10.0 - 11.0

MARION COUNTY SOLAR PROJECT
FLOW VELOCITY ANALYSIS
MARION COUNTY, OHIO

300 0 300 600 FEET

N W E S

ABSOLUTE SCALE: 1:3,600

REFERENCE SCALE: 1 IN = 300 FT

SAVION
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DRAWN BY:	MM 02/2021
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REVISION:	0
DESC:	ISSUED FOR REVIEW
PAGE:	1 OF 1

G:_HMM\Design\GIS\GIS\Misc_Project\Savion\2021_01_25_MarionCnty_SolarMarionCnty_FloW_Velocity_Map_24_36.mxd

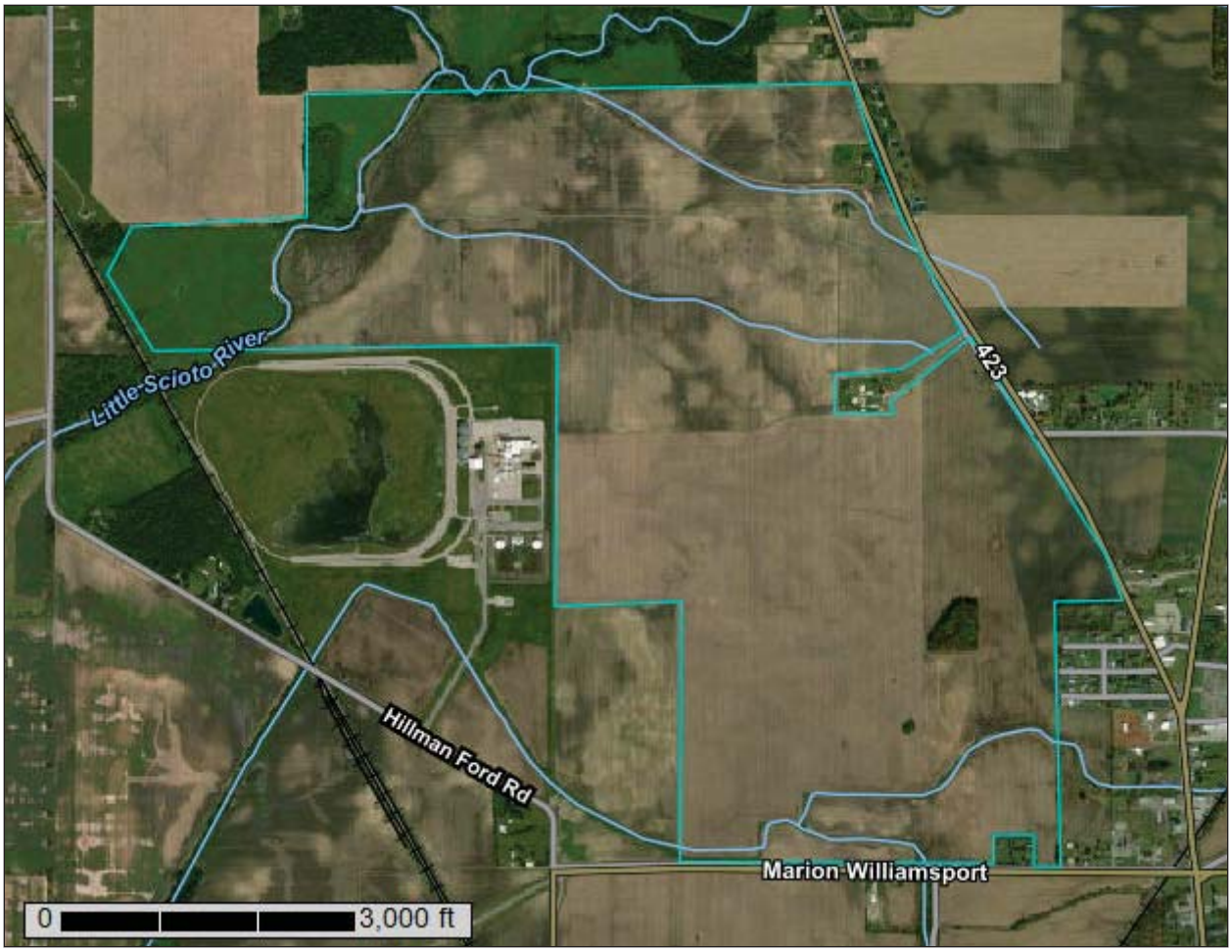
Exhibit F. Soils Map and Descriptions

United States Department of Agriculture

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 Marion County, Ohio



January 28, 2021

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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Pk—Pewamo silty clay loam, 0 to 1 percent slopes.....34
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SkA—Sleeth loam, 0 to 3 percent slopes.....37
So—Sloan silty clay loam, 0 to 1 percent slopes, occasionally flooded.....38
W—Water.....40
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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

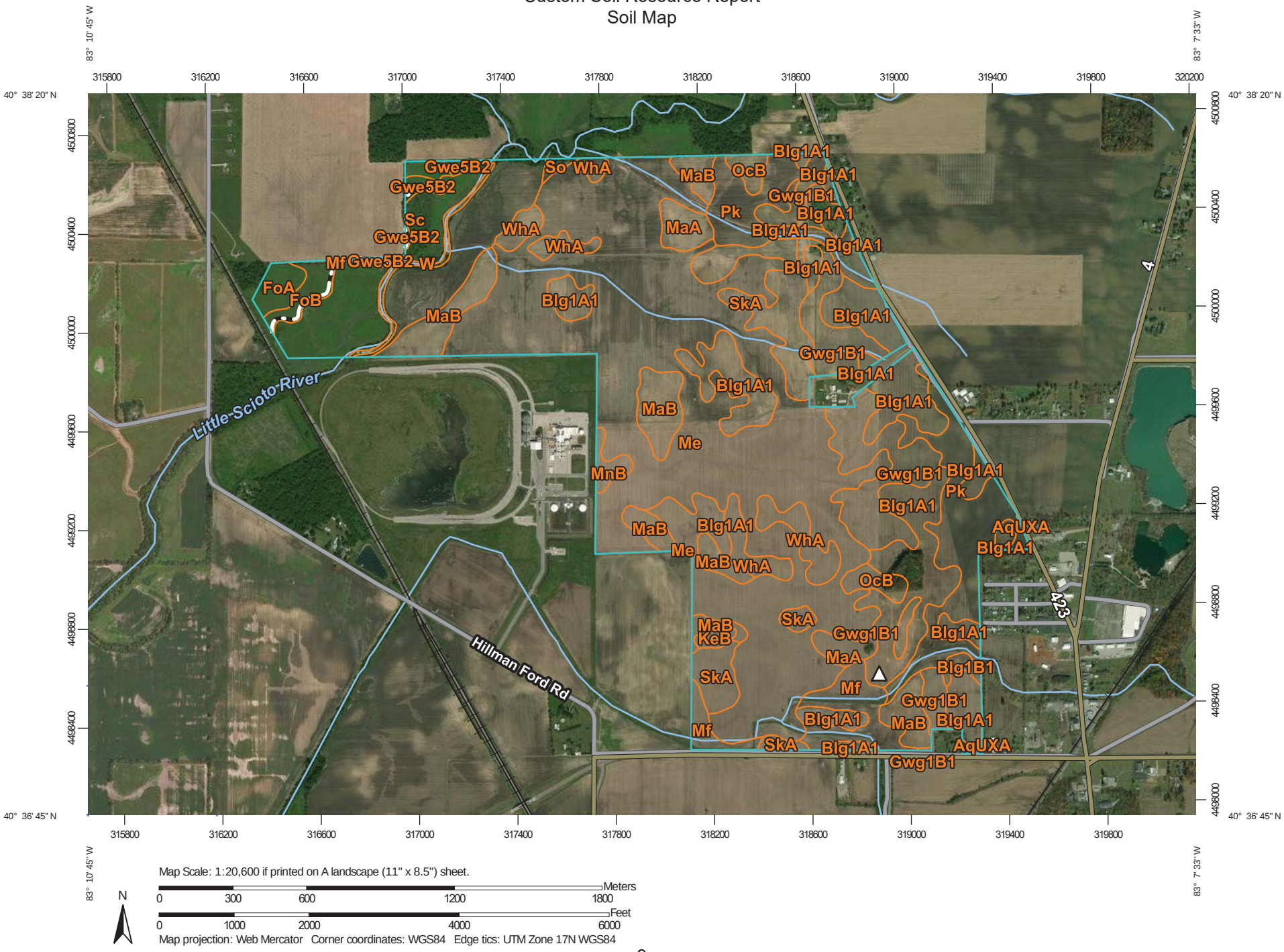
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:20,600 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N 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: Marion County, Ohio
Survey Area Data: Version 22, Jun 11, 2020

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

Date(s) aerial images were photographed: Nov 12, 2009—Aug 27, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AqUXA	Aquents, clayey-Urban land complex, 0 to 3 percent slopes	0.1	0.0%
Ble1B1	Blount silt loam, end moraine, 2 to 4 percent slopes	2.8	0.3%
Blg1A1	Blount silt loam, ground moraine, 0 to 2 percent slopes	142.4	14.9%
Blg1B1	Blount silt loam, ground moraine, 2 to 4 percent slopes	2.1	0.2%
FoA	Fox loam, till plain, 0 to 2 percent slopes	7.4	0.8%
FoB	Fox loam, till plain, 2 to 6 percent slopes	7.7	0.8%
Gwe5B2	Glynwood clay loam, end moraine, 2 to 6 percent slopes, eroded	5.1	0.5%
Gwg1B1	Glynwood silt loam, ground moraine, 2 to 6 percent slopes	65.7	6.9%
KeB	Kendallville loam, 2 to 6 percent slopes	2.5	0.3%
MaA	Martinsville loam, 0 to 2 percent slopes	14.4	1.5%
MaB	Martinsville loam, 2 to 6 percent slopes	56.2	5.9%
Me	Medway clay loam, rarely flooded	358.8	37.5%
Mf	Milford silty clay loam, 0 to 2 percent slopes	25.9	2.7%
MnB	Milton silt loam, 1 to 4 percent slopes	4.3	0.5%
OcB	Ockley loam, 2 to 6 percent slopes	10.1	1.1%
Pk	Pewamo silty clay loam, 0 to 1 percent slopes	82.6	8.6%
Sc	Saranac silty clay loam, 0 to 2 percent slopes, frequently flooded	84.8	8.9%
SkA	Sleeth loam, 0 to 3 percent slopes	46.1	4.8%
So	Sloan silty clay loam, 0 to 1 percent slopes, occasionally flooded	1.6	0.2%
W	Water	4.9	0.5%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
WhA	Whitaker loam, 0 to 3 percent slopes	30.4	3.2%
Totals for Area of Interest		**955.8**	**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.

Marion County, Ohio

AqUXA—Aquents, clayey-Urban land complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2qhvt
Elevation: 750 to 1,200 feet
Mean annual precipitation: 34 to 42 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Aquents, clayey, and similar soils: 65 percent
Urban land, commercial/industrial: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aquents, Clayey

Setting

Landform: Depressions, till plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Human transported material over wisconsin till derived from limestone and shale

Typical profile

^C - 0 to 40 inches: clay loam
Btgb - 40 to 57 inches: clay
Cg - 57 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 0 to 12 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 capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Hydrologic Soil Group: C/D
Ecological site: F111BY203IN - WET ALLUVIUM FOREST
Hydric soil rating: Yes

Description of Urban Land, Commercial/industrial

Setting

Landform: Till plains

Minor Components

Pewamo, urban

Percent of map unit: 5 percent
Landform: Depressions, till plains, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F111BY501IN - TILL DEPRESSION
Hydric soil rating: Yes

Ble1B1—Blount silt loam, end moraine, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2s1j5
Elevation: 700 to 1,300 feet
Mean annual precipitation: 34 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Blount, End Moraine

Setting

Landform: End moraines on till plains
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wisconsin till derived from limestone and shale

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 32 inches: silty clay
BC - 32 to 37 inches: clay loam
Cd - 37 to 79 inches: clay loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: 30 to 56 inches to densic material
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F111BY502IN - WET TILL RIDGE
Hydric soil rating: No

Minor Components

Glynwood, end moraine

Percent of map unit: 9 percent
Landform: End moraines on till plains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F111BY503IN - TILL RIDGE
Hydric soil rating: No

Pewamo, end moraine

Percent of map unit: 6 percent
Landform: End moraines on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F111BY501IN - TILL DEPRESSION
Hydric soil rating: Yes

Blg1A1—Blount silt loam, ground moraine, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2skcv
Elevation: 700 to 1,300 feet
Mean annual precipitation: 34 to 42 inches
Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Blount, Ground Moraine

Setting

Landform: Ground moraines on till plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wisconsin till derived from limestone and shale

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 33 inches: silty clay
BC - 33 to 39 inches: clay loam
Cd - 39 to 79 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 31 to 54 inches to densic material
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: D
Ecological site: F111BY502IN - WET TILL RIDGE
Hydric soil rating: No

Minor Components

Pewamo, ground moraine

Percent of map unit: 9 percent
Landform: Ground moraines on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: F111BY501IN - TILL DEPRESSION
Hydric soil rating: Yes

Glynwood, ground moraine

Percent of map unit: 6 percent
Landform: Ground moraines on till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F111BY503IN - TILL RIDGE
Hydric soil rating: No

Blg1B1—Blount silt loam, ground moraine, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2s1j6
Elevation: 700 to 1,300 feet
Mean annual precipitation: 34 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Blount, Ground Moraine

Setting

Landform: Ground moraines on till plains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wisconsin till derived from limestone and shale

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 32 inches: silty clay
BC - 32 to 37 inches: clay loam
Cd - 37 to 79 inches: clay loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: 30 to 54 inches to densic material
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F111BY502IN - WET TILL RIDGE
Hydric soil rating: No

Minor Components

Pewamo, ground moraine
Percent of map unit: 9 percent
Landform: Ground moraines on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F111BY501IN - TILL DEPRESSION
Hydric soil rating: Yes

Glynwood, ground moraine
Percent of map unit: 6 percent
Landform: Ground moraines on till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F111BY503IN - TILL RIDGE
Hydric soil rating: No

FoA—Fox loam, till plain, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2t6ms
Elevation: 620 to 1,150 feet
Mean annual precipitation: 36 to 41 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 155 to 175 days
Farmland classification: All areas are prime farmland

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

Description of Fox

Setting

Landform: Outwash terraces, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest, tread
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Loamy glaciofluvial deposits over sandy and gravelly outwash

Typical profile

Ap - 0 to 9 inches: loam
Bt1 - 9 to 27 inches: sandy clay loam
Bt2 - 27 to 33 inches: gravelly loam
2C - 33 to 79 inches: stratified sand to gravel

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 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 (0.60 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: 55 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F111BY404IN - DRY OUTWASH UPLAND
Hydric soil rating: No

Minor Components

Homer

Percent of map unit: 6 percent
Landform: Outwash terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F111BY403IN - OUTWASH UPLAND
Hydric soil rating: No

Westland

Percent of map unit: 4 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave

Across-slope shape: Concave, linear
Ecological site: R111BY401IN - WET OUTWASH MOLLISOL
Hydric soil rating: Yes

FoB—Fox loam, till plain, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2t6mt
Elevation: 620 to 1,150 feet
Mean annual precipitation: 36 to 41 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 155 to 175 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Fox

Setting

Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest, tread
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Loamy glaciofluvial deposits over sandy and gravelly outwash

Typical profile

Ap - 0 to 9 inches: loam
Bt1 - 9 to 27 inches: sandy clay loam
Bt2 - 27 to 33 inches: gravelly loam
2C - 33 to 79 inches: stratified sand to gravel

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 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 (0.60 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: 55 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F111BY404IN - DRY OUTWASH UPLAND
Hydric soil rating: No

Minor Components

Homer

Percent of map unit: 6 percent
Landform: Outwash terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F111BY403IN - OUTWASH UPLAND
Hydric soil rating: No

Westland

Percent of map unit: 4 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear, concave
Ecological site: R111BY401IN - WET OUTWASH MOLLISOL
Hydric soil rating: Yes

Gwe5B2—Glynwood clay loam, end moraine, 2 to 6 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2t6lj
Elevation: 720 to 1,320 feet
Mean annual precipitation: 34 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 140 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Glynwood, End Moraine

Setting

Landform: End moraines on till plains
Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Wisconsin till derived from limestone and shale

Typical profile

Ap - 0 to 7 inches: clay loam
Bt - 7 to 26 inches: clay
BC - 26 to 30 inches: clay loam
Cd - 30 to 79 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 24 to 42 inches to densic material
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F111BY503IN - TILL RIDGE
Hydric soil rating: No

Minor Components

Blount, end moraine

Percent of map unit: 9 percent
Landform: End moraines on till plains
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111BY502IN - WET TILL RIDGE
Hydric soil rating: No

Pewamo

Percent of map unit: 6 percent
Landform: End moraines on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F111BY501IN - TILL DEPRESSION
Hydric soil rating: Yes

Gwg1B1—Glynwood silt loam, ground moraine, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2v4bl
Elevation: 700 to 1,300 feet
Mean annual precipitation: 34 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 140 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Glynwood, Ground Moraine

Setting

Landform: Ground moraines on till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Wisconsin till derived from limestone and shale

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 29 inches: clay
BC - 29 to 34 inches: clay loam
Cd - 34 to 79 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 28 to 45 inches to densic material
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F111BY503IN - TILL RIDGE

Hydric soil rating: No

Minor Components

Blount, ground moraine

Percent of map unit: 9 percent
Landform: Ground moraines on till plains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Linear
Ecological site: F111BY502IN - WET TILL RIDGE
Hydric soil rating: No

Pewamo

Percent of map unit: 6 percent
Landform: Ground moraines on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F111BY501IN - TILL DEPRESSION
Hydric soil rating: Yes

KeB—Kendallville loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 5r4k
Elevation: 700 to 1,210 feet
Mean annual precipitation: 30 to 42 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Kendallville

Setting

Landform: Kames, eskers, outwash terraces, moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over outwash over till

Typical profile

H1 - 0 to 9 inches: loam

H2 - 9 to 40 inches: gravelly clay loam
H3 - 40 to 60 inches: silt loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 45 percent
Available water capacity: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F111BY503IN - TILL RIDGE
Hydric soil rating: No

Minor Components

Glynwood

Percent of map unit: 5 percent
Landform: Ground moraines, end moraines
Ecological site: F111BY503IN - TILL RIDGE

Somewhat poorly drained soils

Percent of map unit: 5 percent

Ockley

Percent of map unit: 5 percent
Landform: Terraces
Ecological site: F111BY404IN - DRY OUTWASH UPLAND

MaA—Martinsville loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 5r4n
Elevation: 360 to 1,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 130 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Martinsville and similar soils: 90 percent
Minor components: 10 percent

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

Description of Martinsville

Setting

Landform: Terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Outwash

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 32 inches: loam
H3 - 32 to 70 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Ecological site: F111BY404IN - DRY OUTWASH UPLAND
Hydric soil rating: No

Minor Components

Fitchville

Percent of map unit: 4 percent
Landform: Lake plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F111BY102IN - LACUSTRINE FOREST

Whitaker

Percent of map unit: 3 percent
Landform: Till plains, valley trains, stream terraces, outwash plains, lake plains
Ecological site: F111BY403IN - OUTWASH UPLAND

Rarely flooded areas

Percent of map unit: 3 percent

MaB—Martinsville loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 5r4p
Elevation: 360 to 1,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 130 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Martinsville

Setting

Landform: Terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Outwash

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 32 inches: loam
H3 - 32 to 70 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F111BY404IN - DRY OUTWASH UPLAND
Hydric soil rating: No

Minor Components

Whitaker

Percent of map unit: 10 percent
Landform: Outwash plains, lake plains, till plains, valley trains, stream terraces
Ecological site: F111BY403IN - OUTWASH UPLAND

Me—Medway clay loam, rarely flooded

Map Unit Setting

National map unit symbol: 5r4q
Elevation: 900 to 1,100 feet
Mean annual precipitation: 27 to 42 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Medway

Setting

Landform: Flood plains
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 15 inches: clay loam
H2 - 15 to 50 inches: clay loam
H3 - 50 to 60 inches: stratified sandy loam to silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Available water capacity: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: C

Ecological site: F111BY202IN - DRY ALLUVIUM FLOODPLAIN
Hydric soil rating: No

Minor Components

Sloan

Percent of map unit: 7 percent
Landform: Drainageways, depressions
Ecological site: F111BY201IN - WET ALLUVIUM FLOODPLAIN
Hydric soil rating: Yes

Milford

Percent of map unit: 7 percent
Landform: Drainageways, depressions
Ecological site: F111BY101IN - LACUSTRINE FLATWOOD
Hydric soil rating: Yes

Ockley

Percent of map unit: 6 percent
Landform: Terraces
Ecological site: F111BY404IN - DRY OUTWASH UPLAND

Mf—Milford silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2wp28
Elevation: 640 to 1,150 feet
Mean annual precipitation: 29 to 40 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Milford

Setting

Landform: Lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Lacustrine deposits

Typical profile

Ap - 0 to 13 inches: silty clay loam
Bg1 - 13 to 28 inches: silty clay
Bg2 - 28 to 50 inches: silty clay loam
Cg - 50 to 79 inches: stratified silt loam to silty clay loam to silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 6 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 capacity: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F111BY101IN - LACUSTRINE FLATWOOD
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Minor Components

Del rey

Percent of map unit: 7 percent
Landform: Lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: F111BY102IN - LACUSTRINE FOREST
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Houghton, undrained

Percent of map unit: 3 percent
Landform: Lake plains
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R111BY003IN - DEEP MUCK
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

MnB—Milton silt loam, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 5r4s
Elevation: 800 to 1,000 feet
Mean annual precipitation: 27 to 42 inches

Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Milton

Setting

Landform: Till plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess over till over residuum weathered from limestone and dolomite

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 29 inches: clay
H3 - 29 to 31 inches: unweathered bedrock

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F111BY303IN - DRY BEDROCK FOREST
Hydric soil rating: No

Minor Components

Glynwood

Percent of map unit: 8 percent
Landform: Ground moraines, end moraines
Ecological site: F111BY503IN - TILL RIDGE

Somewhat poorly drained soils

Percent of map unit: 7 percent

OcB—Ockley loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 5r4y
Elevation: 400 to 1,000 feet
Mean annual precipitation: 34 to 45 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 130 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ockley and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ockley

Setting

Landform: Terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Outwash

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 26 inches: clay loam
H3 - 26 to 60 inches: gravelly sandy clay loam
H4 - 60 to 70 inches: stratified sand to very gravelly loamy sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water capacity: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F111EY404OH - Dry Outwash Upland
Hydric soil rating: No

Minor Components

Fox

Percent of map unit: 3 percent
Landform: Terraces
Ecological site: F111EY404OH - Dry Outwash Upland

Kendallville

Percent of map unit: 2 percent
Landform: Outwash terraces, moraines, kames, eskers
Ecological site: F111EY503OH - Till Ridge

Pk—Pewamo silty clay loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t6lv
Elevation: 700 to 1,300 feet
Mean annual precipitation: 32 to 42 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Pewamo

Setting

Landform: Drainageways on till plains, depressions on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Parent material: Wisconsin till derived from limestone and shale

Typical profile

Ap - 0 to 11 inches: silty clay loam
Btg1 - 11 to 34 inches: silty clay
Btg2 - 34 to 47 inches: silty clay
BCg - 47 to 57 inches: clay loam
Cg - 57 to 79 inches: clay loam

Properties and qualities

Slope: 0 to 1 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 (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 12 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 capacity: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F111BY501IN - TILL DEPRESSION
Hydric soil rating: Yes

Minor Components

Blount

Percent of map unit: 9 percent
Landform: Ground moraines on till plains, end moraines on till plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111BY502IN - WET TILL RIDGE
Hydric soil rating: No

Minster

Percent of map unit: 6 percent
Landform: Depressions on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F111BY101IN - LACUSTRINE FLATWOOD
Hydric soil rating: Yes

Sc—Saranac silty clay loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2z6cx
Elevation: 640 to 1,150 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 165 to 175 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

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

Description of Saranac, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

Ap - 0 to 7 inches: silty clay loam
Bg - 7 to 44 inches: silty clay
Cg - 44 to 69 inches: clay 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 (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Available water capacity: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: F111BY201IN - WET ALLUVIUM FLOODPLAIN
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Minor Components

Sloan, occasionally ponded

Percent of map unit: 8 percent
Landform: Depressions on flood-plain steps
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F111BY201IN - WET ALLUVIUM FLOODPLAIN
Hydric soil rating: Yes

Shoals, occasionally flooded

Percent of map unit: 7 percent
Landform: Flood-plain steps
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: F111BY203IN - WET ALLUVIUM FOREST
Hydric soil rating: No

SkA—Sleeth loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 5r58
Elevation: 400 to 1,000 feet
Mean annual precipitation: 34 to 45 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 130 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Sleeth

Setting

Landform: Outwash plains, outwash terraces, stream terraces
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 41 inches: clay loam
H3 - 41 to 60 inches: gravelly sandy loam
H4 - 60 to 80 inches: stratified sand to very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Available water capacity: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Ecological site: F111BY403IN - OUTWASH UPLAND
Hydric soil rating: No

Minor Components

Blount

Percent of map unit: 3 percent
Landform: Rises on ground moraines, rises on end moraines, flats on ground moraines, flats on end moraines
Landform position (two-dimensional): Summit, shoulder
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111BY502IN - WET TILL RIDGE

Bennington

Percent of map unit: 3 percent
Landform: Flats on ground moraines, flats on end moraines, rises on ground moraines, rises on end moraines
Landform position (two-dimensional): Summit, shoulder
Down-slope shape: Linear
Across-slope shape: Linear

Westland

Percent of map unit: 3 percent
Landform: Drainageways, depressions
Ecological site: R111BY401IN - WET OUTWASH MOLLISOL
Hydric soil rating: Yes

Rarely flooded areas

Percent of map unit: 3 percent

Moderately well drained soils

Percent of map unit: 3 percent

So—Sloan silty clay loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2ydcx
Elevation: 520 to 1,340 feet
Mean annual precipitation: 31 to 42 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Sloan, Occasionally Flooded

Setting

Landform: Depressions on flood-plain steps
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy alluvium

Typical profile

Ap - 0 to 12 inches: silty clay loam
Bg - 12 to 42 inches: silty clay loam
Cg - 42 to 79 inches: stratified gravelly sandy loam to silty clay loam

Properties and qualities

Slope: 0 to 1 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 (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 10.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F111BY201IN - WET ALLUVIUM FLOODPLAIN
Hydric soil rating: Yes

Minor Components

Shoals

Percent of map unit: 6 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111BY203IN - WET ALLUVIUM FOREST
Hydric soil rating: No

Sloan, frequently flooded, long duration

Percent of map unit: 4 percent
Landform: Depressions on flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F111BY201IN - WET ALLUVIUM FLOODPLAIN
Hydric soil rating: Yes

W—Water

Map Unit Composition

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

WhA—Whitaker loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 5r5f
Elevation: 360 to 1,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Whitaker

Setting

Landform: Outwash plains, lake plains, till plains, valley trains, stream terraces
Parent material: Outwash

Typical profile

H1 - 0 to 14 inches: loam
H2 - 14 to 41 inches: clay loam
H3 - 41 to 60 inches: stratified coarse sand to silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water capacity: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: C
Ecological site: F111BY403IN - OUTWASH UPLAND
Hydric soil rating: No

Minor Components

Pewamo
Percent of map unit: 3 percent
Landform: Drainageways, depressions
Ecological site: F111BY501IN - TILL DEPRESSION
Hydric soil rating: Yes

Milford
Percent of map unit: 3 percent
Landform: Drainageways, depressions
Ecological site: F111BY101IN - LACUSTRINE FLATWOOD
Hydric soil rating: Yes

Bennington
Percent of map unit: 3 percent
Landform: Flats on end moraines, rises on ground moraines, rises on end moraines, flats on ground moraines
Landform position (two-dimensional): Summit, shoulder
Down-slope shape: Linear
Across-slope shape: Linear

Rarely flooded areas
Percent of map unit: 2 percent

Martinsville
Percent of map unit: 2 percent
Landform: Terraces
Ecological site: F111BY404IN - DRY OUTWASH UPLAND

Moderately well drained soils
Percent of map unit: 2 percent

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Exhibit G. NOAA Atlas 14 Point Precipitation & USDA Curve Numbers

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.
2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.
3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2]	Hydrologic condition [3]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S
[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.
[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4]	48	65	73
Woods—grass combination (orchard or tree farm). [5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1 Average runoff condition, and $I_a = 0.2S$.
2 *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.
3 *Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.
4 Actual curve number is less than 30; use CN = 30 for runoff computations.
5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.
6 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

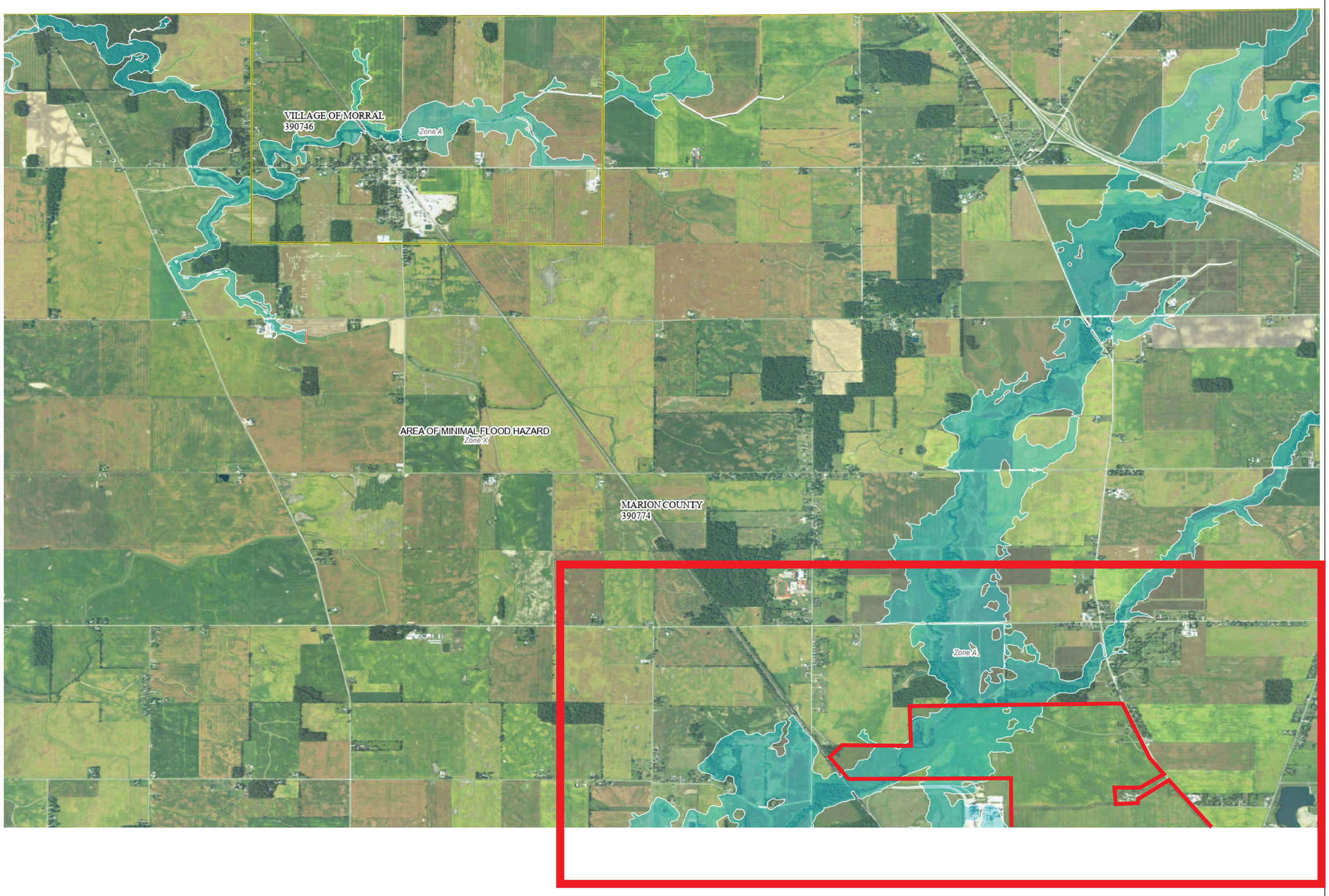
Table 2-2d Runoff curve numbers for arid and semiarid rangelands [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition [2]	A [3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

1 Average runoff condition, and I_a, = 0.2S. For range in humid regions, use table 2-2c.
2 Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: > 70% ground cover.
3 Curve numbers for group A have been developed only for desert shrub.

Exhibit H. FEMA FIRM

83°15'1.73"W 40°44'1.4"N



83°7'28.3"W 40°35'38.69"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **1/28/2021 4:27 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: No elevation features on this FIRM
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 2,000 feet 1:24,000

0 1,000 2,000 4,000 6,000 8,000 Feet

0 210 420 840 1,260 1,680 Meters

FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

MARION COUNTY, OHIO AND INCORPORATED AREAS

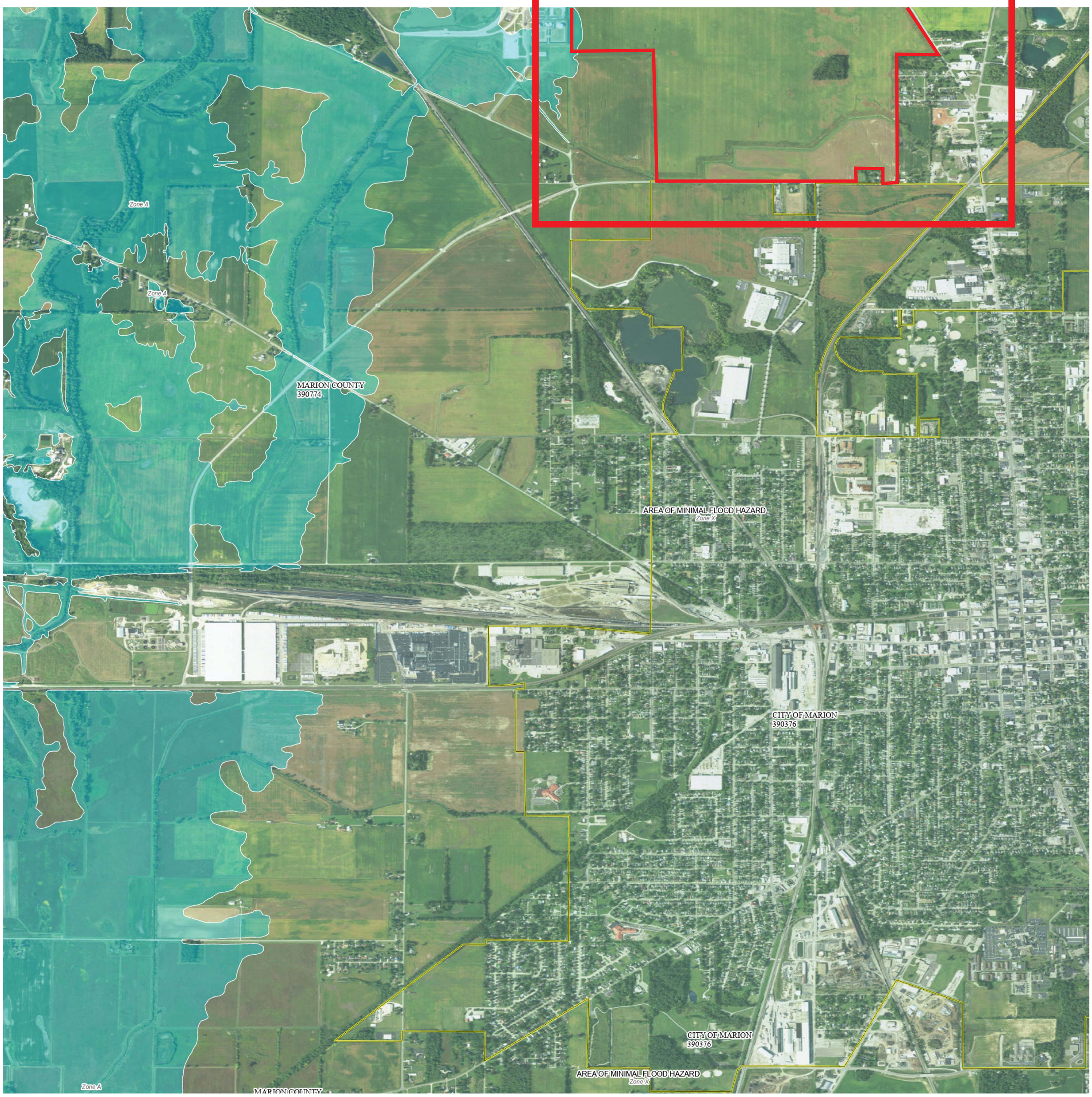
PANEL 75 OF 325

Panel Contains:

COMMUNITY	NUMBER	PANEL
MARION COUNTY	390774	0075
VILLAGE OF MORRAL	390746	0075

MAP NUMBER
39101C0075D
EFFECTIVE DATE
July 06, 2010

83°11'15.87"W 40°37'43.21"N



83°7'29.16"W 40°33'31.85"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **1/28/2021 4:24 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: No elevation features on this FIRM
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 3,000 4,000 Feet

0 105 210 420 630 840 Meters

FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

MARION COUNTY, OHIO AND INCORPORATED AREAS

PANEL 210 OF 325

Panel Contains:

COMMUNITY	NUMBER	PANEL
CITY OF MARION	390376	0210
MARION COUNTY	390774	0210

MAP NUMBER
39101C0210D
EFFECTIVE DATE
July 06, 2010

Exhibit I. Pre-Development Project Hydrology Inputs & Outputs

Pre-development Summary (100-yr / 24-hr)				
Hydrologic Element	Drainage Area (SM)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA-1	0.064688	96.8	01Feb2021, 12:35	3.47
DA-2	0.024219	65.2	01Feb2021, 12:10	3.38
DA-3	0.122969	144.2	01Feb2021, 12:45	3.36
DA-4	0.027656	57.1	01Feb2021, 12:20	3.75
DA-5	0.082031	89.6	01Feb2021, 12:50	3.32
DA-6	0.051094	105.1	01Feb2021, 12:20	3.57
DA-7	0.370469	248.5	01Feb2021, 13:45	3.43
DA-8	0.183438	205.9	01Feb2021, 12:50	3.32
DA-9	0.081563	110.4	01Feb2021, 12:45	3.66
DA-10	0.090000	94.8	01Feb2021, 12:55	3.26
DA-11	0.037969	68.2	01Feb2021, 12:25	3.49
DA-12	0.036563	67.3	01Feb2021, 12:25	3.49
DA-13	0.017031	34.5	01Feb2021, 12:20	3.65
DA-14	0.001563	6.2	01Feb2021, 12:05	3.46

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Basin - CN - Tc Calculations
Page 1 of 2

**(Using SCS TR-55 Tc Calculations)*

Basin	Total Area (ac)	COMP CN	Area (sm)
DA 1 Pre	41.40	82.3	0.064688
DA 2 Pre	15.50	81.3	0.024219
DA 3 Pre	78.70	81.3	0.122969
DA 4 Pre	17.70	85.0	0.027656
DA 5 Pre	52.50	80.9	0.082031
DA 6 Pre	32.70	83.2	0.051094
DA 7 Pre	237.10	82.5	0.370469
DA 8 Pre	117.40	80.9	0.183438
DA 9 Pre	52.20	84.3	0.081563
DA 10 Pre	57.60	80.3	0.090000
DA 11 Pre	24.30	82.5	0.037969
DA 12 Pre	23.40	82.5	0.036563
DA 13 Pre	10.90	84.0	0.017031
DA 14 Pre	1.00	82.0	0.001563

Basin	Sheet Flow, SF				Shallow Concentrated Flow, SCF					Channel Flow-1, SCF				
	n	Lf	S, ft/ft	Tc, hrs	Lf	S, ft/ft	k	V	T, hrs	Lf	S, ft/ft	k	V	T, hrs
DA 1 Pre	0.1	10	0.01	0.03	2150	0.006	10	0.77	0.77	720	0.004	10	6.00	0.03
DA 2 Pre	0.1	10	0.02	0.02	695	0.02	10	1.41	0.14	1577	0.004	10	6.00	0.07
DA 3 Pre	0.1	10	0.01	0.03	3380	0.007	10	0.84	1.12	450	0.002	10	6.00	0.02
DA 4 Pre	0.1	10	0.01	0.03	1330	0.006	10	0.77	0.48	310	0.003	10	6.00	0.01
DA 5 Pre	0.1	10	0.01	0.03	2475	0.003	10	0.55	1.26	0	0.006	10	6.00	0.00
DA 6 Pre	0.1	10	0.01	0.03	1650	0.01	10	1.00	0.46	0	0.010	10	6.00	0.00
DA 7 Pre	0.1	10	0.01	0.03	6075	0.004	10	0.63	2.67	0	0.004	10	6.00	0.00
DA 8 Pre	0.1	10	0.01	0.03	3370	0.006	10	0.77	1.21	0	0.006	10	6.00	0.00
DA 9 Pre	0.1	10	0.01	0.03	2840	0.006	10	0.77	1.02	366	0.003	10	6.00	0.02
DA 10 Pre	0.1	10	0.01	0.03	2950	0.004	10	0.63	1.30	0	0.004	10	6.00	0.00
DA 11 Pre	0.1	10	0.01	0.03	1650	0.007	10	0.84	0.55	700	0.002	10	6.00	0.03
DA 12 Pre	0.1	10	0.01	0.03	1900	0.009	10	0.95	0.56	0	0.009	10	6.00	0.00
DA 13 Pre	0.1	10	0.01	0.03	1290	0.006	10	0.77	0.46	536	0.003	10	6.00	0.02
DA 14 Pre	0.1	10	0.067	0.01	60	0.067	10	2.59	0.01	830	0.004	10	6.00	0.04

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Basin - CN - Tc Calculations

Page 2 of 2

Sheet Flow Table	
0.011	Smoth Surface
0.05	Fallow (no residye)
	Cultivated
0.06	Residue Cover < 20%
0.17	Residue Cover >20%
	Grass
0.15	Short grass, prairie
0.24	Dense grasses
0.41	Bermudagrass
0.13	Range (natural)
	Woods
0.4	Light underbrush
0.8	Dense underbrush

Shallow Concentrated Flow Table	
k	**Description**
2.4934	Forest w/ heavy ground litter
4.9869	Woodland
6.9882	Short grass pasture
8.9895	Cultivated short row
10.007	Nearly bare & untilled
14.993	Grassed
16.109	Unpaved
20.308	Paved

2-yr 24-hr RF=	**2.53**

Basin	Sum			
	Tc, hrs	Tc, min	Lag, hrs	**Lag, min**
DA 1 Pre	0.83	49.93	0.50	**30.0**
DA 2 Pre	0.23	13.83	0.14	**8.3**
DA 3 Pre	1.17	70.25	0.70	**42.1**
DA 4 Pre	0.52	31.14	0.31	**18.7**
DA 5 Pre	1.28	76.98	0.77	**46.2**
DA 6 Pre	0.49	29.17	0.29	**17.5**
DA 7 Pre	2.70	161.76	1.62	**97.1**
DA 8 Pre	1.24	74.18	0.74	**44.5**
DA 9 Pre	1.06	63.79	0.64	**38.3**
DA 10 Pre	1.32	79.41	0.79	**47.6**
DA 11 Pre	0.61	36.48	0.36	**21.9**
DA 12 Pre	0.58	35.05	0.35	**21.0**
DA 13 Pre	0.52	30.91	0.31	**18.5**
DA 14 Pre	0.06	3.47	0.03	**2.1**

Exhibit J. Post-Development Project Hydrology Inputs & Outputs

Post-development Summary (100-yr / 24-hr)				
Hydrologic Element	Drainage Area (SM)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA-1	0.064688	77.3	01Feb2021, 12:35	2.78
DA-2	0.024219	43.3	01Feb2021, 12:10	2.31
DA-3	0.122969	102.4	01Feb2021, 12:50	2.41
DA-4	0.027656	46.9	01Feb2021, 12:25	3.06
DA-5	0.082031	62.9	01Feb2021, 12:55	2.37
DA-6	0.051094	82.9	01Feb2021, 12:20	2.82
DA-7	0.370469	160.4	01Feb2021, 13:50	2.28
DA-8	0.183438	139.8	01Feb2021, 12:50	2.31
DA-9	0.081563	102.5	01Feb2021, 12:45	3.38
DA-10	0.090000	66.6	01Feb2021, 12:55	2.33
DA-11	0.037969	48.5	01Feb2021, 12:25	2.51
DA-12	0.036563	44.5	01Feb2021, 12:25	2.34
DA-13	0.017031	27.2	01Feb2021, 12:25	2.88
DA-14	0.001563	4.9	01Feb2021, 12:05	2.75

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Basin - CN - Tc Calculations
Page 1 of 2

*(Using SCS TR-55 Tc Calculations)

Basin	Total Area (ac)	COMP CN	Area (sm)
DA 1 Post	41.40	75.0	0.064688
DA 2 Post	15.50	69.5	0.024219
DA 3 Post	78.70	71.0	0.122969
DA 4 Post	17.70	78.0	0.027656
DA 5 Post	52.50	70.5	0.082031
DA 6 Post	32.70	75.4	0.051094
DA 7 Post	237.10	69.8	0.370469
DA 8 Post	117.40	69.8	0.183438
DA 9 Post	52.20	81.5	0.081563
DA 10 Post	57.60	70.1	0.090000
DA 11 Post	24.30	72.0	0.037969
DA 12 Post	23.40	70.0	0.036563
DA 13 Post	10.90	76.0	0.017031
DA 14 Post	1.00	74.5	0.001563

Basin	Sheet Flow, SF				Shallow Concentrated Flow, SCF					Channel Flow-1, SCF				
	n	Lf	S, ft/ft	Tc, hrs	Lf	S, ft/ft	k	V	T, hrs	Lf	S, ft/ft	k	V	T, hrs
DA 1 Post	0.1	10	0.01	0.03	2150	0.006	10	0.77	0.77	720	0.004	10	6.00	0.03
DA 2 Post	0.1	10	0.02	0.02	695	0.02	10	1.41	0.14	1577	0.004	10	6.00	0.07
DA 3 Post	0.1	10	0.01	0.03	3380	0.007	10	0.84	1.12	450	0.002	10	6.00	0.02
DA 4 Post	0.1	10	0.01	0.03	1330	0.006	10	0.77	0.48	310	0.003	10	6.00	0.01
DA 5 Post	0.1	10	0.01	0.03	2475	0.003	10	0.55	1.26	0	0.006	10	6.00	0.00
DA 6 Post	0.1	10	0.01	0.03	1650	0.01	10	1.00	0.46	0	0.010	10	6.00	0.00
DA 7 Post	0.1	10	0.01	0.03	6075	0.004	10	0.63	2.67	0	0.004	10	6.00	0.00
DA 8 Post	0.1	10	0.01	0.03	3370	0.006	10	0.77	1.21	0	0.006	10	6.00	0.00
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DA 10 Post	0.1	10	0.01	0.03	2950	0.004	10	0.63	1.30	0	0.004	10	6.00	0.00
DA 11 Post	0.1	10	0.01	0.03	1650	0.007	10	0.84	0.55	700	0.002	10	6.00	0.03
DA 12 Post	0.1	10	0.01	0.03	1900	0.009	10	0.95	0.56	0	0.009	10	6.00	0.00
DA 13 Post	0.1	10	0.01	0.03	1290	0.006	10	0.77	0.46	536	0.003	10	6.00	0.02
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Basin - CN - Tc Calculations

Page 2 of 2

Sheet Flow Table	
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k	**Description**
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2-yr 24-hr RF=	**2.53**

Basin	Sum			
	Tc, hrs	Tc, min	Lag, hrs	**Lag, min**
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DA 4 Post	0.52	31.14	0.31	**18.7**
DA 5 Post	1.28	76.98	0.77	**46.2**
DA 6 Post	0.49	29.17	0.29	**17.5**
DA 7 Post	2.70	161.76	1.62	**97.1**
DA 8 Post	1.24	74.18	0.74	**44.5**
DA 9 Post	1.06	63.79	0.64	**38.3**
DA 10 Post	1.32	79.41	0.79	**47.6**
DA 11 Post	0.61	36.48	0.36	**21.9**
DA 12 Post	0.58	35.05	0.35	**21.0**
DA 13 Post	0.52	30.91	0.31	**18.5**
DA 14 Post	0.06	3.47	0.03	**2.1**

Exhibit K. Regression Equations and HEC-RAS Hydrology Outputs

The following documentation was taken from:

U.S. Geological Survey Water-Resources Investigations Report 94-4002: *Nationwide summary of U.S. Geological Survey regional regression equations for estimating magnitude and frequency of floods for ungaged sites, 1993*

OHIO

STATEWIDE RURAL

Summary

Ohio is divided into three regions (fig. 1). The regression equations developed for these regions are for estimating peak discharges (QT) having recurrence intervals T that range from 2 to 100 years. The explanatory basin characteristics used in the equations are drainage area (A), in square miles; main channel slope (S), in feet per mile; and the percentage of the basin occupied by lakes, ponds, and swamps (St). The constant 1 is added to St in the computer application of the regression equations. The user should enter the actual value of St. These variables can be measured from topographic maps. The regression equations were developed from peak-discharge records for 275 gaging stations and are applicable to rural, unregulated streams having less than 30 percent of the drainage basin strip mined. The standard errors of prediction for the regression equations range from 33 to 41 percent.

Procedure

Topographic maps, the hydrologic regions map (fig. 1), and the following equations are used to estimate the needed peak discharges QT, in cubic feet per second, having selected recurrence intervals T.

$$Q2 = (RC)A^{0.782}\,S^{0.172}\,(St+1)^{-0.297}$$
$$Q5 = (RC)A^{0.769}\,S^{0.221}\,(St+1)^{-0.322}$$
$$Q10 = (RC)A^{0.764}\,S^{0.244}\,(St+1)^{-0.335}$$
$$Q25 = (RC)A^{0.760}\,S^{0.264}\,(St+1)^{-0.347}$$
$$Q50 = (RC)A^{0.757}\,S^{0.276}\,(St+1)^{-0.355}$$
$$Q100 = (RC)A^{0.756}\,S^{0.285}\,(St+1)^{-0.363}$$

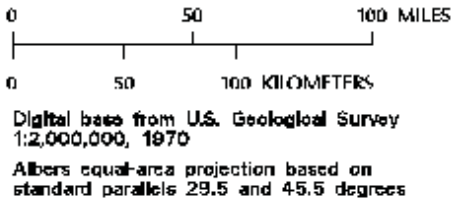
where

RC is the regression constant for a region from the following matrix:

Region	Q2	Q5	Q10	Q25	Q50	Q100
A	56.1	84.5	104	129	148	167
B	40.2	58.4	69.3	82.2	91.2	99.7
C	93.5	133	159	191	214	236

Reference

Koltun, G.F., and Roberts, J.W., 1989, Techniques for estimating flood-peak discharges of rural, unregulated streams in Ohio: U.S. Geological Survey Water-Resources Investigations Report 89-4126, 68



Digital base from U.S. Geological Survey
1:2,000,000, 1970

Albers equal-area projection based on
standard parallels 29.5 and 45.5 degrees

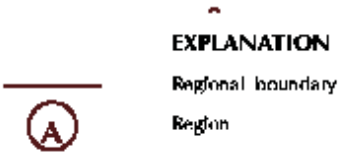
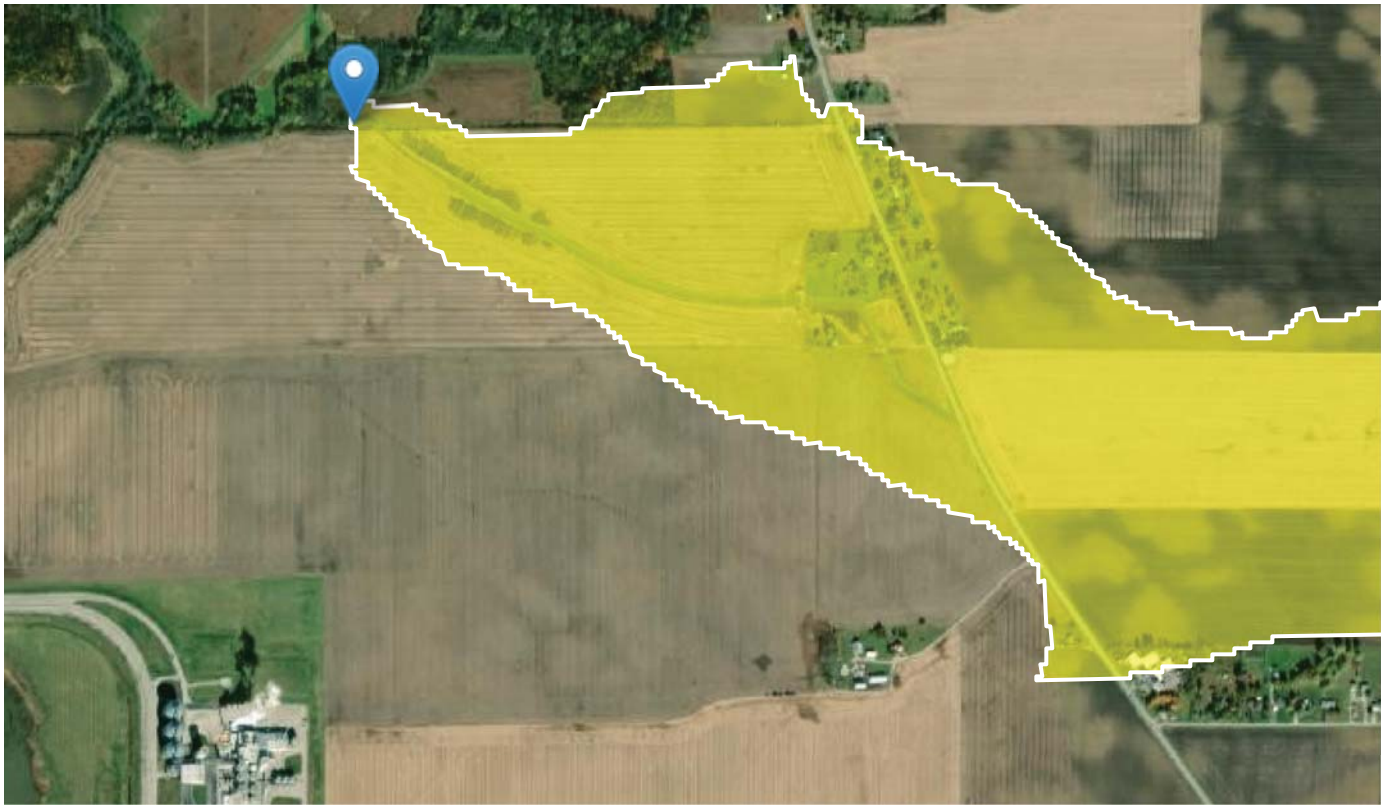


Figure 1. Flood-frequency region map for Ohio.

StreamStats Report

Region ID: OH
Workspace ID: OH20210120144004659000
Clicked Point (Latitude, Longitude): 40.63682, -83.15414
Time: 2021-01-20 08:40:23 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.53	square miles
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	0	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	29.8	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	0	percent

Parameter Code	Parameter Description	Value	Unit
FOREST	Percentage of area covered by forest	1.34	percent
PRECIP	Mean Annual Precipitation	39.3	inches
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	4.93	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	16.4	percent

Peak-Flow Statistics Parameters[Peak Flow Full Model Reg B SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.53	square miles	0.04	6309
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	0	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	29.8	feet per mi	1.21	457
LC92STOR	Percent Storage from NLCD1992	0	percent	0	7.1

Peak-Flow Statistics Flow Report[Peak Flow Full Model Reg B SIR2019 5018]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
50_percent_AEP_flood	49.2	ft^3/s	25.7	94.1	40.1
20_percent_AEP_flood	85.5	ft^3/s	46.7	156	37.2
10_percent_AEP_flood	114	ft^3/s	61.9	210	37.6
4_percent_AEP_flood	154	ft^3/s	82.9	286	38.1
2_percent_AEP_flood	186	ft^3/s	99	349	37.8
1_percent_AEP_flood	220	ft^3/s	116	418	39.6
0_2_percent_AEP_flood	305	ft^3/s	159	586	40.3

Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

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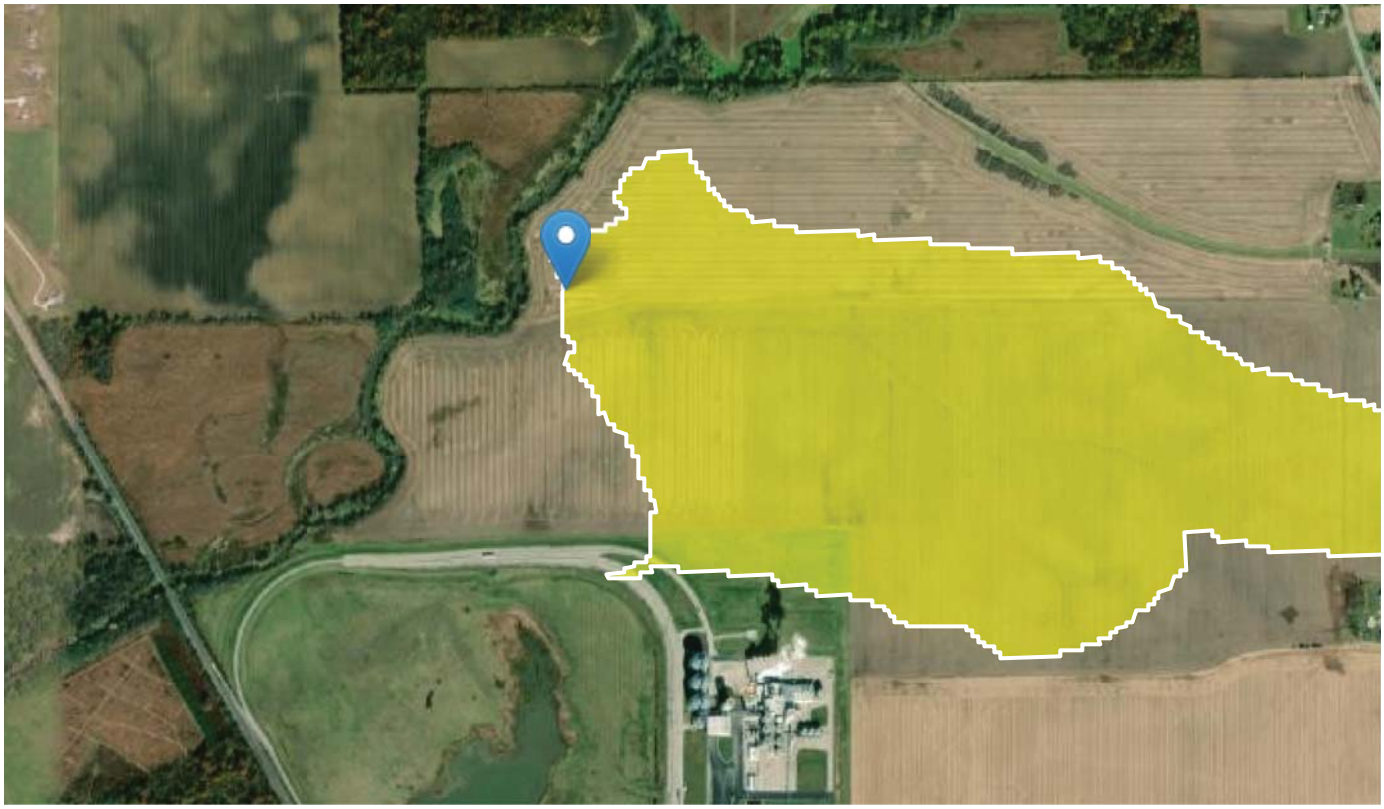
USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.4.0

StreamStats Report

Region ID: OH
Workspace ID: OH20210120144345319000
Clicked Point (Latitude, Longitude): 40.63337, -83.16097
Time: 2021-01-20 08:44:03 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.35	square miles
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	0	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	20.1	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	0	percent

Parameter Code	Parameter Description	Value	Unit
FOREST	Percentage of area covered by forest	0.39	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	8.1	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	2.75	percent
PRECIP	Mean Annual Precipitation	39.3	inches

Peak-Flow Statistics Parameters[Peak Flow Full Model Reg B SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.35	square miles	0.04	6309
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	0	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	20.1	feet per mi	1.21	457
LC92STOR	Percent Storage from NLCD1992	0	percent	0	7.1

Peak-Flow Statistics Flow Report[Peak Flow Full Model Reg B SIR2019 5018]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
50_percent_AEP_flood	33.4	ft^3/s	17.4	64.2	40.1
20_percent_AEP_flood	57.4	ft^3/s	31.2	105	37.2
10_percent_AEP_flood	76.1	ft^3/s	41.1	141	37.6
4_percent_AEP_flood	102	ft^3/s	54.7	190	38.1
2_percent_AEP_flood	123	ft^3/s	65.1	232	37.8
1_percent_AEP_flood	146	ft^3/s	76.4	279	39.6
0_2_percent_AEP_flood	202	ft^3/s	104	391	40.3

Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

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Application Version: 4.4.0

StreamStats Report

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Workspace ID: OH20210120144646212000
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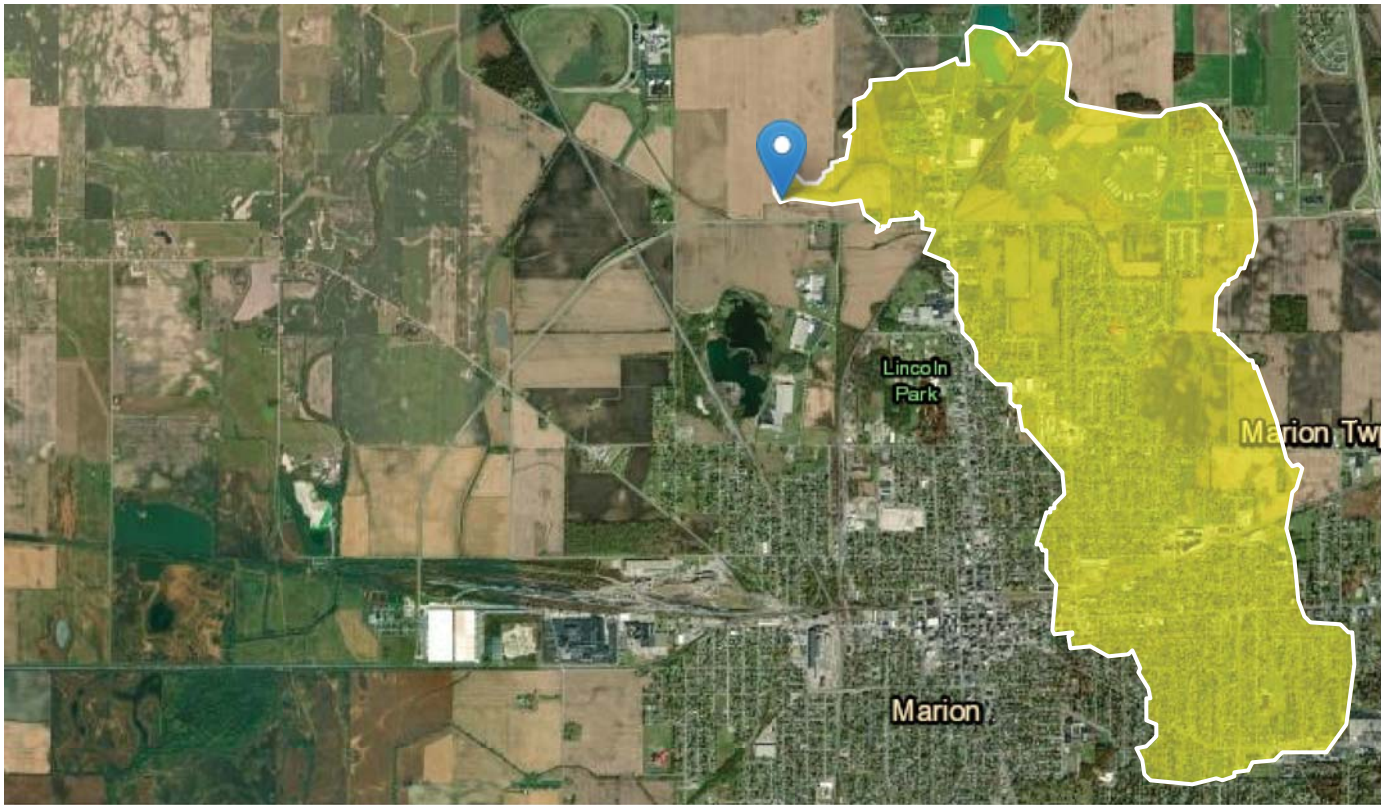
Time: 2021-01-20 08:47:04 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	3.9	square miles
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	0	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	12.2	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	0.54	percent

Parameter Code	Parameter Description	Value	Unit
FOREST	Percentage of area covered by forest	5.8	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	71.6	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	31.4	percent
PRECIP	Mean Annual Precipitation	39.3	inches

Peak-Flow Statistics Parameters[100 Percent (3.9 square miles) Peak Flow Full Model Reg B SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.9	square miles	0.04	6309
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	0	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	12.2	feet per mi	1.21	457
LC92STOR	Percent Storage from NLCD1992	0.54	percent	0	7.1

Peak-Flow Statistics Flow Report[100 Percent (3.9 square miles) Peak Flow Full Model Reg B SIR2019 5018]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
50_percent_AEP_flood	191	ft^3/s	NaN	364	40.1
20_percent_AEP_flood	306	ft^3/s	168	558	37.2
10_percent_AEP_flood	391	ft^3/s	213	717	37.6
4_percent_AEP_flood	506	ft^3/s	274	935	38.1
2_percent_AEP_flood	596	ft^3/s	319	1110	37.8
1_percent_AEP_flood	689	ft^3/s	365	1300	39.6
0_2_percent_AEP_flood	918	ft^3/s	481	1750	40.3

Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

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Application Version: 4.4.0

Exhibit L. Site Visit Report

Marion Solar Site Photos

Author: Henry Fournier

Date: December 8th 2020

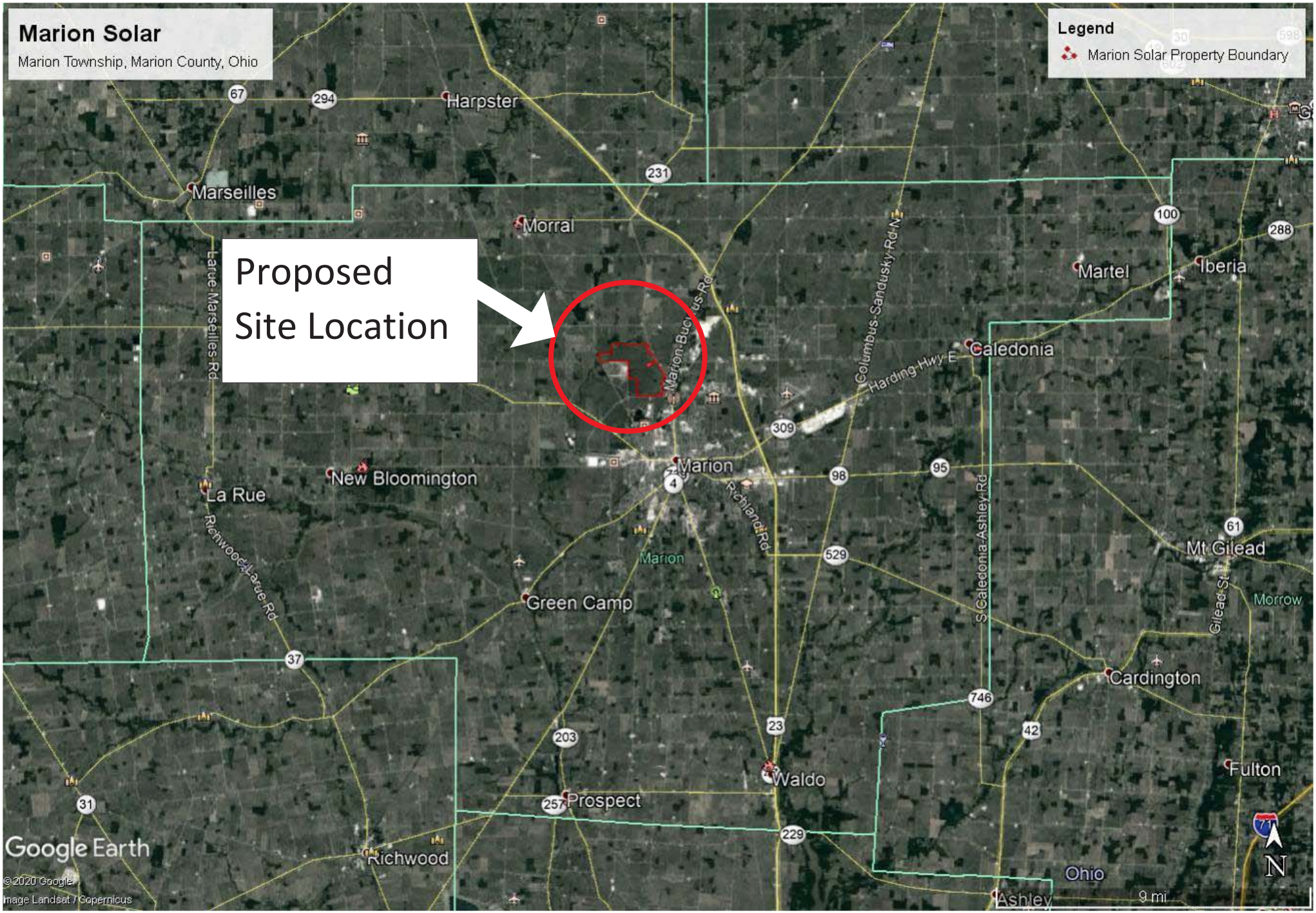
Site Location: Marion Township, Marion County Ohio

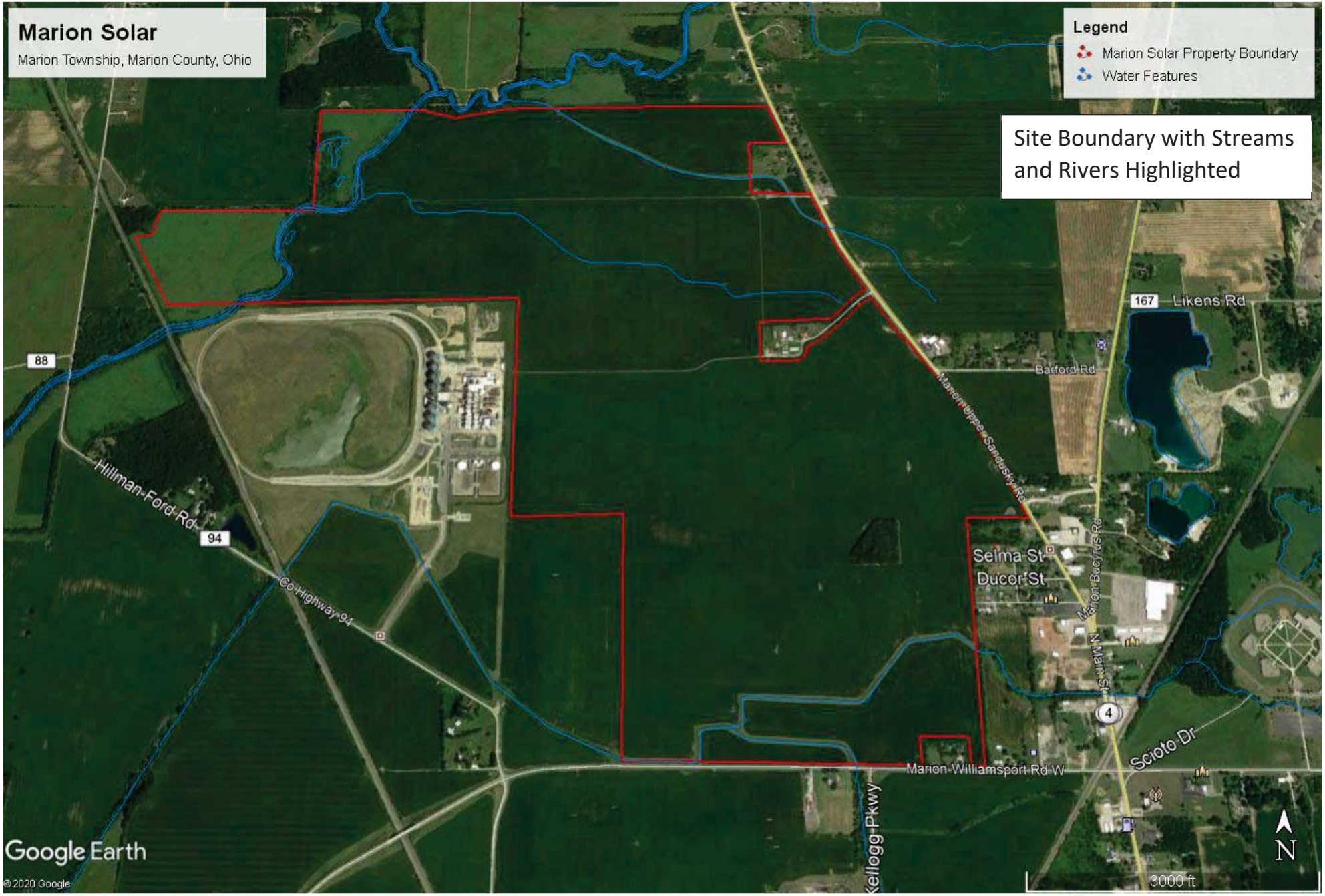
Date of Site Visit: Monday, December 7th

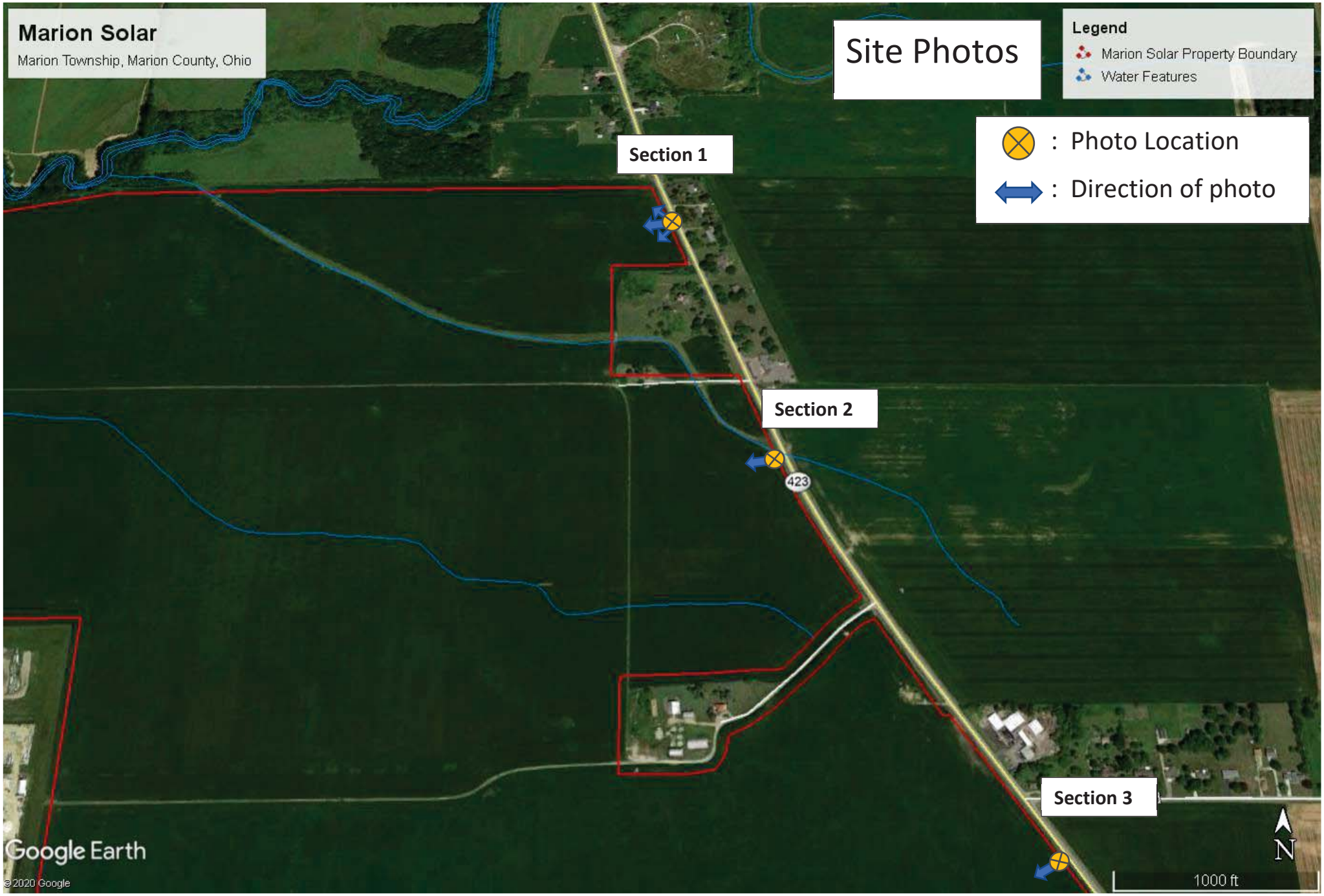
Weather Conditions: Overcast 31°F, Snow Flurries, Ground was saturated

Field Observations: Marion solar site is just outside the main city Marion in Marion County. Marion-Upper Sandusky Rd (State Route 423) borders most of the north east side of the property boundary, while the southern part of the property borders Marion-Williamsport Rd W. Both these roads are heavy in traffic and service a lot of large industrial trucks. To the West of the property boundary sits POET Biorefining which has access to one of the railroads that runs through Marion. North west of the property runs the Little Scioto River. All drainage features seem to run into the Little Scioto River that then merges with the Scioto River about 6 miles south of site. There are 2 drainage features in the north of the site that run directly into the north part of the Little Scioto River. Southern part of the site drains into a stream label as Rock Swale. This stream takes runoff from the east of the property, where there is a bridge outside of property boundary on N Main St (State Route 423 and Ohio State Route 4). Rock Swale Stream also takes runoff south of the property boundary, within site the east and south streams merge and leave site flowing westward. This stream then drains into the Little Scioto River about 3 miles south. There are 3 main culverts that were located on site, these are labeled as Culvert 1, Culvert 3, and Culvert 5. These culverts are under roads and leads runoff through the site to the Little Scioto River.

Marion Solar
Marion Township, Marion County, Ohio
Legend
Marion Solar Property Boundary
Proposed
Site Location
Detroit
Lake Erie
Cleveland
Pittsburgh
Ohio
Indiana
Indianapolis
Columbus
Cincinnati
Louisville
West Virginia
Google Earth
© 2020 Google
Image NOAA
Image Landsat / Copernicus
100 mi
N


Marion Solar
Marion Township, Marion County, Ohio
Legend
Marion Solar Property Boundary
Proposed
Site Location
Harpster
Marseilles
Morral
Martel
Iberia
Caledonia
Marion
New Bloomington
La Rue
Green Camp
Mt Gilead
Morrow
Cardington
Fulton
Waldo
Prospect
Richwood
Ohio
Ashley
Larue-Marselles Rd
Richwood-Larue Rd
Marion-Bucyrus Rd
Columbus-Sandusky Rd N
Harding Hwy E
Richland Rd
S Caledonia-Ashley Rd
Gilead St
67
294
231
100
288
309
98
95
4
61
529
37
746
42
23
203
257
229
31
9 mi
N
Google Earth
© 2020 Google
Image Landsat / Copernicus


Marion Solar
Marion Township, Marion County, Ohio
Legend
Marion Solar Property Boundary
Water Features
Site Boundary with Streams and Rivers Highlighted
Likens Rd
167
88
Barford Rd
Marion-Upper Sandusky Rd
Hillman-Ford Rd
94
Co Highway 94
Selma St
Ducor St
Marion-Berry Rd
N Main St
4
Scioto Dr
Marion-Williamsport Rd W
Kellogg Pkwy
Google Earth
©2020 Google
N
3000 ft


Marion Solar
Marion Township, Marion County, Ohio
Site Photos
Legend
Marion Solar Property Boundary
Water Features
: Photo Location
: Direction of photo
Section 1
Section 2
Section 3
423
Google Earth
© 2020 Google
N
1000 ft

Section 1

NW

SW

Section 2

Section 3

Marion Solar
Marion Township, Marion County, Ohio
: Photo Location
: Direction of photo
Site Photos
Legend
Marion Solar Property Boundary
Water Features
423
Selma St
Brent Ave
Orton St
Marion-Williamsport Rd W
Section 7
Section 6
Section 5
Section 4
Google Earth
©2020 Google
N
1000 ft

Section 4

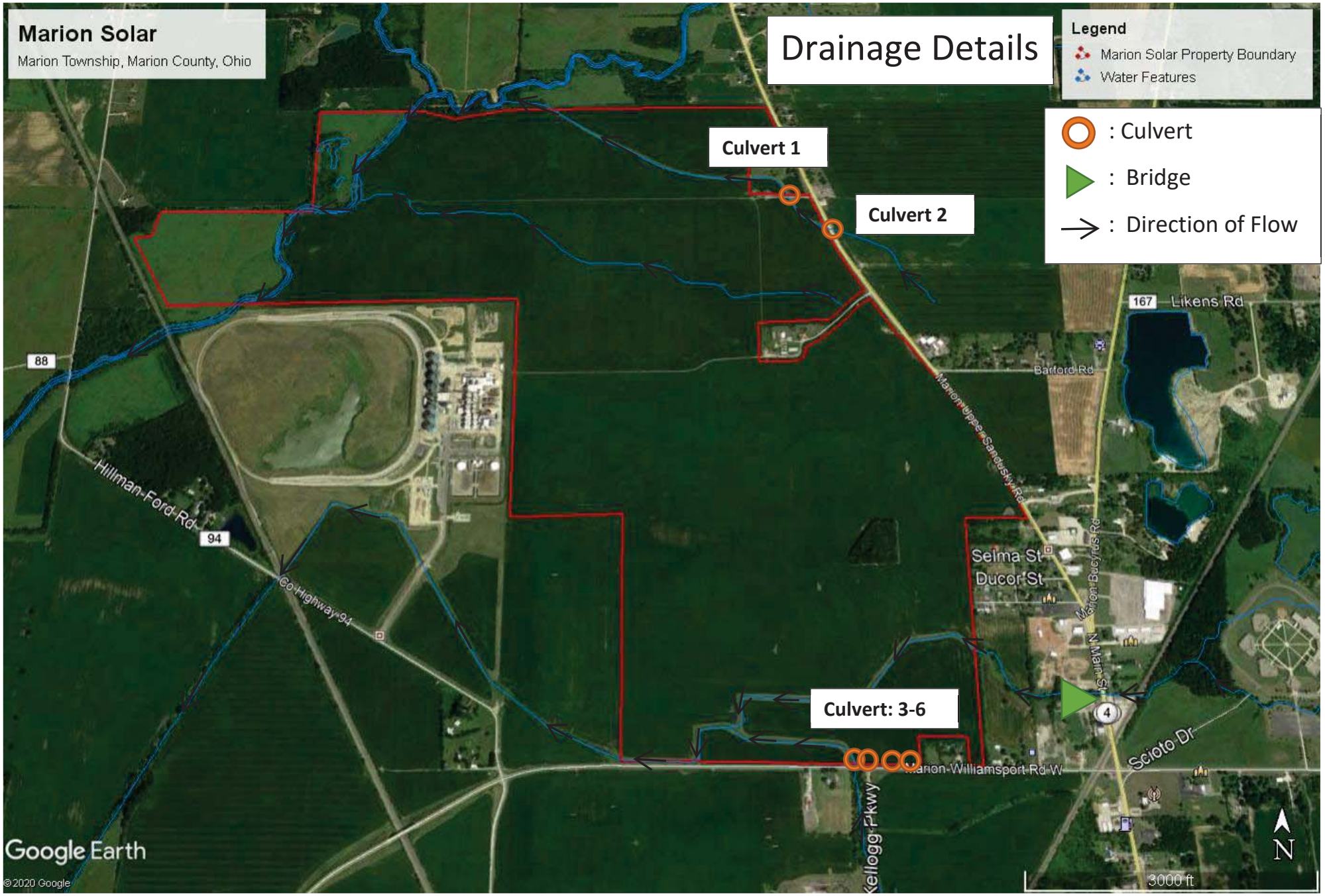
Section 5

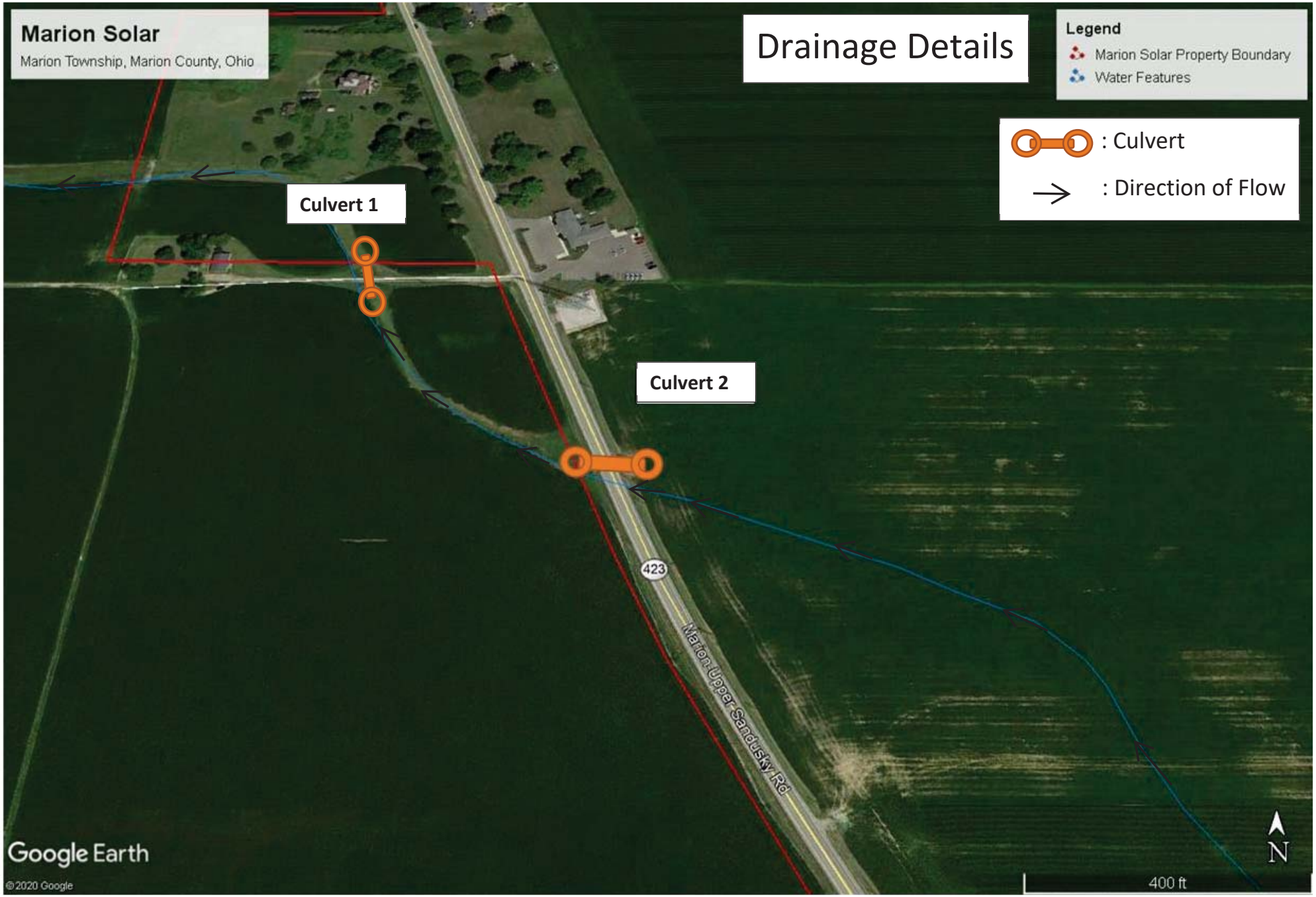
NW

Section 6

Section 7

NW


Marion Solar
Marion Township, Marion County, Ohio
Drainage Details
Legend
Marion Solar Property Boundary
Water Features
: Culvert
: Bridge
: Direction of Flow
Culvert 1
Culvert 2
Culvert: 3-6
167
Likens Rd
Barford Rd
88
Hillman-Ford Rd
94
Co Highway 94
Selma St
Ducor St
N Main St
Scioto Dr
Marion-Williamsport Rd W
Kellogg Pkwy
4
N
3000 ft
Google Earth
©2020 Google

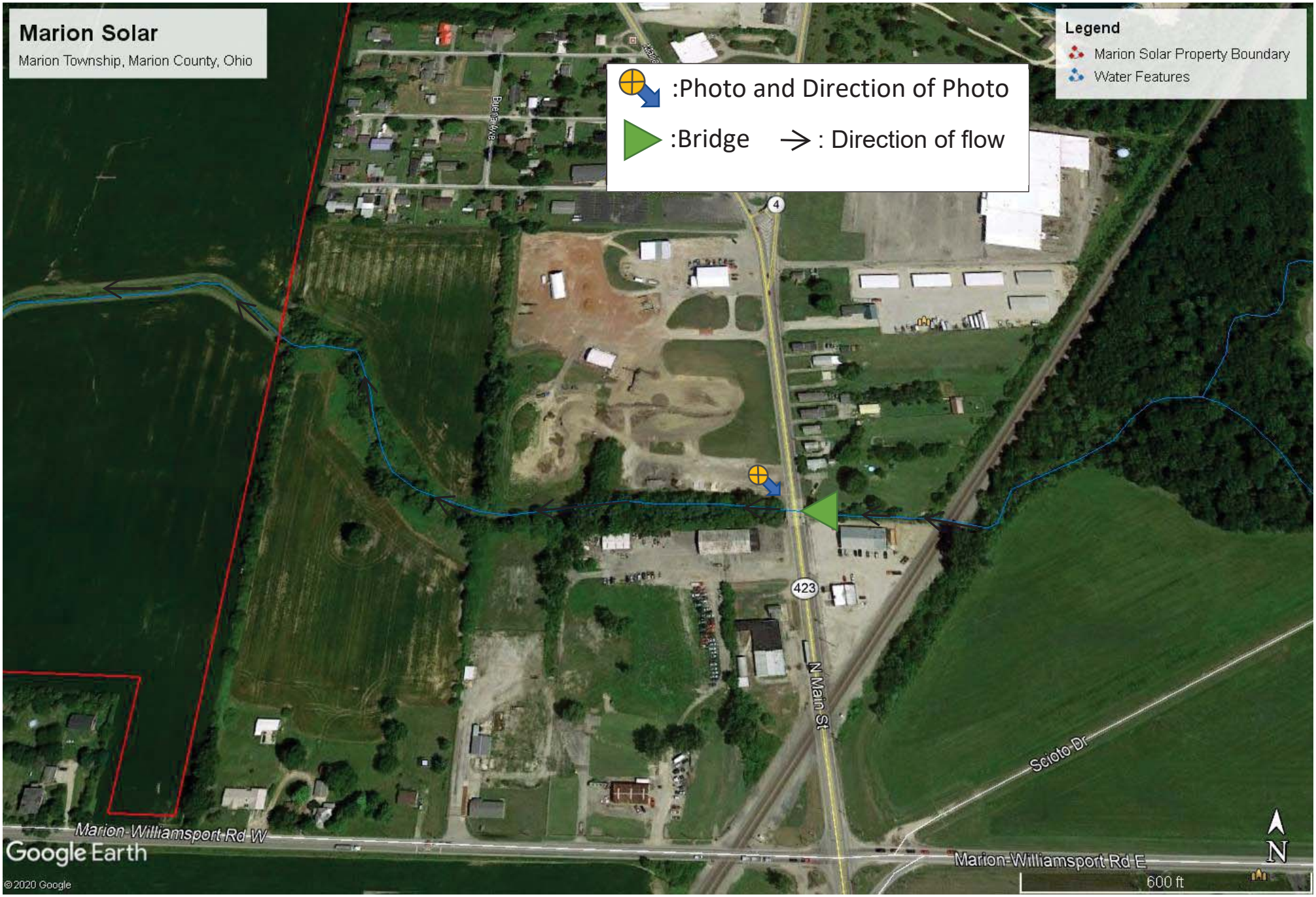

Marion Solar
Marion Township, Marion County, Ohio
Drainage Details
Legend
Marion Solar Property Boundary
Water Features
: Culvert
: Direction of Flow
Culvert 1
Culvert 2
423
Marion Upper Sandusky Rd
Google Earth
©2020 Google
N
400 ft

Culvert 1

Note this Culvert was not measured

Culvert 2

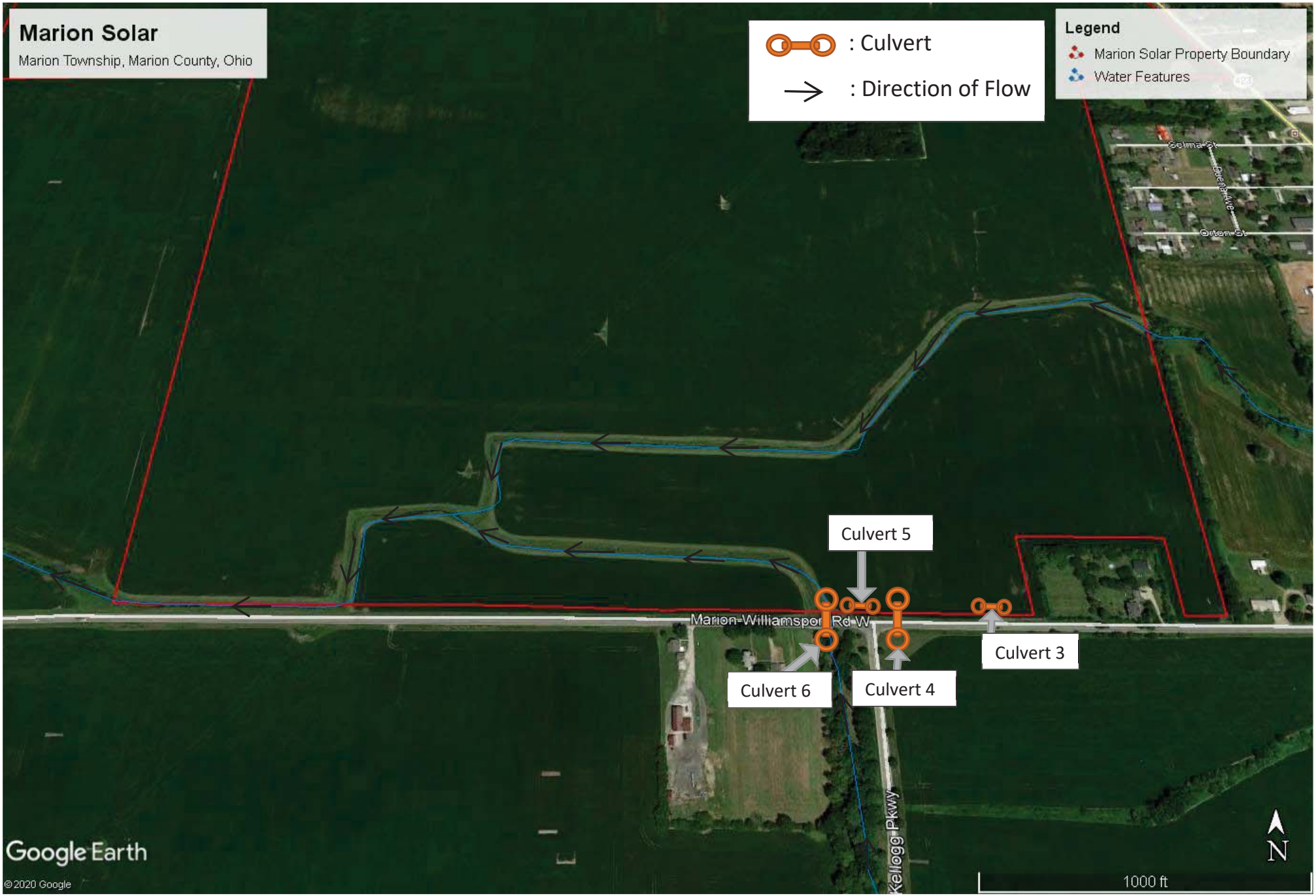
This culvert connects to a ditch on the other side of Marion-Upper Sandusky Road. This ditch connects to little Scioto River.


Marion Solar
Marion Township, Marion County, Ohio
Legend
Marion Solar Property Boundary
Water Features
:Photo and Direction of Photo
:Bridge
: Direction of flow
4
423
N Main St
Scioto Dr
Marion-Williamsport Rd W
Marion-Williamsport Rd E
Google Earth
©2020 Google
600 ft
N

Bridge

Note: This bridge is outside of the project boundary, the span of this bridge is ≈ **20ft**

Direction of flow


Marion Solar
Marion Township, Marion County, Ohio
: Culvert
: Direction of Flow
Legend
Marion Solar Property Boundary
Water Features
Culvert 5
Culvert 3
Culvert 6
Culvert 4
Marion-Williamsport Rd W
Kellogg Pkwy
Google Earth
©2020 Google
N
1000 ft

Culvert 3

Farmers Culvert for access to the field

Culvert 4

Culvert 5

This Culvert is also for site access

Culvert 6

Culverts				
ID/Name	Lat	Long	Diameter	Material
Culvert 1	40°37'59.44"N	83° 8'34.24"W	Unknown	Unknown
Culvert 2	40°37'55.57"N	83° 8'28.71"W	60"	Galvanized
Culvert 3	40°36'53.79"N	83° 8'20.73"W	12"	Galvanized
Culvert 4	40°36'53.90"N	83° 8'25.49"W	24"	Concrete
Culvert 5	40°36'53.89"N	83° 8'26.13"W	28"	Concrete
Culvert 6	40°36'53.96"N	83° 8'28.67"W	10'	Galvanized

mottmac.com

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3/5/2021 10:17:24 AM

in

Case No(s). 21-0036-EL-BGN

Summary: Application - 17 of 30 (Exhibit N – Part 2 of 2 - Hydrology Report) electronically filed by Christine M.T. Pirik on behalf of Marion County Solar Project, LLC