



MICHIGAN DEPARTMENT OF  
ENVIRONMENT, GREAT LAKES, AND ENERGY

WATER RESOURCES DIVISION  
NONPOINT SOURCE PROGRAM  
STORMWATER RUNOFF CALCULATOR INSTRUCTIONS

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## Acronyms

AOI – Area of Interest

BMP – Best Management Practice

EGLE – Michigan Department of Environment, Great Lakes, and Energy

NOAA – National Oceanic and Atmospheric Administration

NPS – Nonpoint Source

USDA – United States Department of Agriculture

WRD – Water Resources Division

WSS – Web Soil Survey

## 1.0 INSTRUCTIONS

### Using the NPS Stormwater Calculator

1. At the top of the spreadsheet, enter the site name and the total drainage area of the site in acres.
2. Enter the design rainfall event in inches in the space provided. Follow the guidance on the Rainfall tab or in Section 2.0 of the "NPS Stormwater Calculator Manual" for determining local rainfall amounts (often the 2-year 24-hour storm). It is important to note that this is the total amount of rainfall and not runoff for the site.
3. In the presettlement table, enter the area of each applicable land cover and soil combination for the presettlement condition in acres. The total area must add up to the total drainage area recorded at the top of the spreadsheet. Note here the runoff volume for each land use cover and soil type must be calculated separately and then summed for the entire site. No composite curve number (CN) can be used. Consult with NPS technical staff if a land cover at the site is not represented to determine an appropriate CN. For guidance on identifying presettlement land cover and soils, please see the "Presettlement Land Cover" and "Soils" tabs of the spreadsheet or Sections 3.0 and 4.0 of the "NPS Stormwater Calculator Manual", respectively.
4. In the post-development table enter the proposed cover type and soil type and the amount of impervious area. The total area at the bottom of the table must match the total drainage area recorded at the top of the spreadsheet. Similarly, the total area for each soil group should be equal to or less (depending on the amount of impervious surface added) to the values reported in the presettlement table, unless new soils are being brought to the site. Cover and soil type can be copied from the presettlement table and pasted to the post-development table if applicable. A CN for each new cover type must be selected but composite CNs should not be used. Consult with NPS technical staff if a land cover at the site is not represented to determine an appropriate CN.
5. The spreadsheet automatically calculates the Runoff Volume Increase in cubic feet, and it's shown in the blue cell near the bottom of the spreadsheet. This is the volume of Stormwater runoff that must be controlled.
6. For additional guidance on how to use this spreadsheet please see the "Example Scenario" tab or Section 5.0 of the "NPS Stormwater Calculator Manual" for a filled-out example of how to use this spreadsheet.

Note: If the goal for the site is to treat the Water Quality Volume generated by one (1) inch of runoff over the entire site the cell on the lower right of the spreadsheet performs that calculation based on the value provided for the "Total Drainage Area" at the top of the spreadsheet.

## 2.0 RAINFALL

### Obtaining Rainfall Data from NOAA ATLAS 14

Go to the [NOAA ATLAS 14 Website](#)

The image below shows the load page, follow the instructions on the website to select the site location, this can be done by entering latitude/longitude, address, or on the interactive map.

#### NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: MI

##### Data description

Data type:  Units:  Time series type:

##### Select location

###### 1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude:  Longitude:

b) By station (list of MI stations):

c) By address

2) Use map (if ESRI interactive map is not loading, try adding the host: <https://js.arcgis.com/> to the firewall, or contact us at [hdsc.questions@noaa.gov](mailto:hdsc.questions@noaa.gov)):

Terrain


a) Select location  
Move crosshair or double click

b) Click on station icon  
 Show stations on map

**Location information:**  
Name: Charlotte, Michigan, USA\*  
Latitude: 42.5532°  
Longitude: -84.9492°  
Elevation: 923.63 ft \*\*

\* Source: ESRI Maps  
\*\* Source: USGS

After selecting your site location scroll down the web page below the map to the POINT PRECIPITATION FREQUENCY (PF) ESTIMATES and select the "PF tabular" option. It should look like the image below:




## POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION  
NOAA Atlas 14, Volume 8, Version 2

PF tabular

PF graphical

Supplementary information

 Print page

**PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup>**

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.296 (0.233-0.381)	0.346 (0.272-0.445)	0.431 (0.339-0.558)	0.506 (0.398-0.654)	0.616 (0.468-0.819)	0.705 (0.524-0.943)	0.799 (0.574-1.08)	0.898 (0.620-1.24)	1.04 (0.688-1.45)	1.15 (0.740-1.61)
10-min	0.433 (0.342-0.557)	0.506 (0.399-0.651)	0.631 (0.496-0.814)	0.741 (0.579-0.958)	0.902 (0.688-1.20)	1.03 (0.787-1.38)	1.17 (0.840-1.59)	1.32 (0.908-1.81)	1.52 (1.01-2.12)	1.68 (1.08-2.38)
15-min	0.528 (0.417-0.680)	0.617 (0.488-0.794)	0.770 (0.605-0.993)	0.904 (0.708-1.17)	1.10 (0.837-1.46)	1.26 (0.935-1.68)	1.43 (1.02-1.94)	1.60 (1.11-2.21)	1.85 (1.23-2.59)	2.05 (1.32-2.88)
30-min	0.755 (0.598-0.972)	0.881 (0.694-1.13)	1.10 (0.883-1.42)	1.29 (1.01-1.67)	1.57 (1.20-2.09)	1.80 (1.34-2.41)	2.05 (1.47-2.78)	2.31 (1.59-3.18)	2.67 (1.77-3.74)	2.96 (1.91-4.18)
60-min	0.953 (0.752-1.23)	1.13 (0.893-1.48)	1.44 (1.13-1.86)	1.71 (1.34-2.22)	2.11 (1.61-2.81)	2.43 (1.81-3.26)	2.77 (1.99-3.78)	3.13 (2.18-4.32)	3.63 (2.41-5.09)	4.03 (2.60-5.67)
2-hr	1.15 (0.920-1.48)	1.39 (1.11-1.78)	1.79 (1.42-2.27)	2.14 (1.69-2.72)	2.65 (2.04-3.48)	3.06 (2.30-4.04)	3.50 (2.55-4.68)	3.96 (2.77-5.38)	4.59 (3.10-6.38)	5.10 (3.34-7.09)
3-hr	1.26 (1.01-1.59)	1.53 (1.23-1.92)	1.99 (1.59-2.51)	2.39 (1.91-3.02)	2.98 (2.31-3.88)	3.46 (2.62-4.52)	3.95 (2.90-5.28)	4.48 (3.18-6.06)	5.21 (3.54-7.18)	5.79 (3.83-8.00)
6-hr	1.51 (1.23-1.87)	1.80 (1.48-2.23)	2.30 (1.87-2.88)	2.76 (2.22-3.43)	3.43 (2.70-4.41)	3.98 (3.08-5.15)	4.57 (3.40-6.01)	5.20 (3.73-6.95)	6.08 (4.20-8.27)	6.79 (4.68-9.27)
12-hr	1.84 (1.52-2.25)	2.10 (1.73-2.58)	2.58 (2.12-3.15)	3.02 (2.47-3.71)	3.71 (2.98-4.73)	4.30 (3.37-5.51)	4.94 (3.74-6.43)	5.64 (4.11-7.47)	6.65 (4.67-8.95)	7.48 (5.10-10.1)
24-hr	2.17 (1.82-2.62)	2.44 (2.04-2.94)	2.95 (2.45-3.55)	3.42 (2.83-4.13)	4.15 (3.38-5.21)	4.78 (3.79-6.03)	5.46 (4.20-7.01)	6.21 (4.60-8.11)	7.30 (5.20-9.70)	8.18 (5.67-10.9)
2-day	2.48 (2.10-2.93)	2.84 (2.40-3.38)	3.48 (2.93-4.12)	4.05 (3.40-4.82)	4.89 (4.02-6.02)	5.60 (4.49-6.94)	6.35 (4.93-8.00)	7.15 (5.35-9.17)	8.27 (5.98-10.8)	9.18 (6.45-12.1)
3-day	2.73 (2.33-3.20)	3.10 (2.65-3.64)	3.77 (3.20-4.43)	4.37 (3.69-5.15)	5.25 (4.34-6.40)	5.98 (4.84-7.35)	6.76 (5.30-8.45)	7.60 (5.74-9.88)	8.78 (6.40-11.4)	9.72 (6.90-12.7)
4-day	2.94 (2.52-3.43)	3.32 (2.85-3.87)	3.99 (3.41-4.68)	4.60 (3.91-5.39)	5.50 (4.58-6.87)	6.25 (5.09-7.83)	7.06 (5.57-8.78)	7.92 (6.02-10.0)	9.14 (6.71-11.8)	10.1 (7.23-13.1)
7-day	3.46 (3.00-3.98)	3.87 (3.35-4.45)	4.58 (3.98-5.28)	5.22 (4.49-6.04)	6.18 (5.20-7.39)	6.98 (5.74-8.41)	7.83 (6.25-9.61)	8.75 (6.73-11.0)	10.0 (7.48-12.8)	11.1 (8.02-14.2)
10-day	3.92 (3.42-4.47)	4.36 (3.80-4.97)	5.12 (4.48-5.88)	5.81 (5.03-6.68)	6.82 (5.77-8.07)	7.65 (6.34-9.14)	8.54 (6.88-10.4)	9.48 (7.35-11.8)	10.8 (8.10-13.7)	11.9 (8.68-15.2)
20-day	5.28 (4.68-5.93)	5.83 (5.18-6.55)	6.76 (5.98-7.81)	7.56 (6.63-8.53)	8.70 (7.44-10.1)	9.61 (8.05-11.3)	10.5 (8.59-12.6)	11.5 (9.08-14.1)	12.9 (9.78-16.0)	13.9 (10.3-17.5)
30-day	6.49 (5.79-7.21)	7.14 (6.38-7.94)	8.21 (7.30-9.15)	9.10 (8.05-10.2)	10.3 (8.90-11.8)	11.3 (9.53-13.1)	12.3 (10.1-14.5)	13.2 (10.5-16.0)	14.6 (11.1-17.9)	15.5 (11.6-19.4)
45-day	8.08 (7.27-8.99)	8.87 (7.97-9.77)	10.1 (9.07-11.2)	11.1 (9.94-12.3)	12.5 (10.8-14.1)	13.5 (11.5-15.4)	14.5 (12.0-16.9)	15.4 (12.3-18.4)	16.7 (12.9-20.3)	17.6 (13.3-21.8)
60-day	9.48 (8.58-10.4)	10.4 (9.39-11.4)	11.8 (10.7-13.0)	12.9 (11.6-14.2)	14.4 (12.5-16.1)	15.4 (13.2-17.5)	16.4 (13.6-19.0)	17.3 (13.9-20.5)	18.5 (14.3-22.3)	19.2 (14.7-23.7)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).  
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.  
 Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format:

From the PF Estimates table, identify the recurrence (column) and duration (row) of the design storm (e.g. 2-year 24-hour) and find where they meet. This is the rainfall generated by the design storm and should be used on in the "Runoff Volume" tab as the "Design Rainfall Event".

### POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION  
NOAA Atlas 14, Volume 8, Version 2

PF tabular

PF graphical

Supplementary information

Print page

#### PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup>

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.296 (0.233-0.381)	0.346 (0.272-0.445)	0.431 (0.339-0.558)	0.506 (0.398-0.654)	0.616 (0.488-0.819)	0.705 (0.524-0.943)	0.799 (0.574-1.08)	0.898 (0.620-1.24)	1.04 (0.688-1.45)	1.15 (0.740-1.61)
10-min	0.433 (0.342-0.557)	0.506 (0.399-0.651)	0.631 (0.495-0.814)	0.741 (0.579-0.958)	0.902 (0.686-1.20)	1.03 (0.787-1.38)	1.17 (0.840-1.59)	1.32 (0.908-1.81)	1.52 (1.01-2.12)	1.68 (1.09-2.36)
15-min	0.528 (0.417-0.680)	0.617 (0.486-0.794)	0.770 (0.605-0.993)	0.904 (0.708-1.17)	1.10 (0.837-1.46)	1.26 (0.935-1.68)	1.43 (1.02-1.94)	1.60 (1.11-2.21)	1.85 (1.23-2.59)	2.05 (1.32-2.88)
30-min	0.755 (0.599-0.972)	0.881 (0.694-1.13)	1.10 (0.863-1.42)	1.29 (1.01-1.67)	1.57 (1.20-2.09)	1.80 (1.34-2.41)	2.05 (1.47-2.78)	2.31 (1.59-3.18)	2.67 (1.77-3.74)	2.96 (1.91-4.18)
60-min	0.953 (0.752-1.23)	1.13 (0.893-1.46)	1.44 (1.13-1.86)	1.71 (1.34-2.22)	2.11 (1.61-2.81)	2.43 (1.81-3.26)	2.77 (1.99-3.78)	3.13 (2.16-4.32)	3.63 (2.41-5.09)	4.03 (2.60-5.67)
2-hr	1.15 (0.920-1.46)	1.39 (1.11-1.76)	1.79 (1.42-2.27)	2.14 (1.69-2.72)	2.65 (2.04-3.48)	3.06 (2.30-4.04)	3.50 (2.55-4.68)	3.96 (2.77-5.38)	4.59 (3.10-6.36)	5.10 (3.34-7.09)
3-hr	1.26 (1.01-1.59)	1.53 (1.23-1.92)	1.99 (1.59-2.51)	2.39 (1.91-3.02)	2.98 (2.31-3.88)	3.46 (2.62-4.52)	3.95 (2.90-5.26)	4.48 (3.16-6.06)	5.21 (3.54-7.16)	5.79 (3.83-8.00)
6-hr	1.51 (1.23-1.87)	1.80 (1.48-2.23)	2.30 (1.87-2.88)	2.76 (2.22-3.43)	3.43 (2.70-4.41)	3.98 (3.06-5.15)	4.57 (3.40-6.01)	5.20 (3.73-6.95)	6.08 (4.20-8.27)	6.79 (4.56-9.27)
12-hr	1.84 (1.52-2.25)	2.10 (1.73-2.58)	2.58 (2.12-3.15)	3.02 (2.47-3.71)	3.71 (2.98-4.73)	4.30 (3.37-5.51)	4.94 (3.74-6.43)	5.64 (4.11-7.47)	6.65 (4.67-8.95)	7.48 (5.10-10.1)
24-hr	2.17 (1.82-2.62)	2.44 (2.04-2.94)	2.95 (2.45-3.55)	3.42 (2.83-4.13)	4.15 (3.38-5.21)	4.78 (3.79-6.03)	5.46 (4.20-7.01)	6.21 (4.60-8.11)	7.30 (5.20-9.70)	8.18 (5.67-10.9)
48-hr	2.48 (2.10-2.93)	2.84 (2.40-3.36)	3.48 (2.93-4.12)	4.05 (3.40-4.82)	4.89 (4.02-6.02)	5.60 (4.49-6.94)	6.35 (4.93-8.00)	7.15 (5.35-9.17)	8.27 (5.99-10.8)	9.18 (6.45-12.1)
72-hr	2.73 (2.33-3.20)	3.10 (2.65-3.64)	3.77 (3.20-4.43)	4.37 (3.69-5.15)	5.25 (4.34-6.40)	5.98 (4.84-7.35)	6.76 (5.30-8.45)	7.60 (5.74-9.68)	8.78 (6.40-11.4)	9.72 (6.90-12.7)
10-day	2.94 (2.52-3.43)	3.32 (2.85-3.87)	3.99 (3.41-4.66)	4.60 (3.91-5.39)	5.50 (4.58-6.67)	6.25 (5.09-7.63)	7.06 (5.57-8.78)	7.92 (6.02-10.0)	9.14 (6.71-11.8)	10.1 (7.23-13.1)
7-day	3.46 (3.00-3.98)	3.87 (3.35-4.45)	4.58 (3.95-5.28)	5.22 (4.49-6.04)	6.18 (5.20-7.39)	6.98 (5.74-8.41)	7.83 (6.25-9.61)	8.75 (6.73-11.0)	10.0 (7.48-12.8)	11.1 (8.02-14.2)
10-day	3.92 (3.42-4.47)	4.36 (3.80-4.97)	5.12 (4.48-5.86)	5.81 (5.03-6.66)	6.82 (5.77-8.07)	7.65 (6.34-9.14)	8.54 (6.88-10.4)	9.48 (7.35-11.8)	10.8 (8.10-13.7)	11.9 (8.68-15.2)
20-day	5.28 (4.68-5.93)	5.83 (5.16-6.55)	6.76 (5.95-7.61)	7.56 (6.63-8.53)	8.70 (7.44-10.1)	9.61 (8.05-11.3)	10.5 (8.59-12.6)	11.5 (9.08-14.1)	12.9 (9.78-16.0)	13.9 (10.3-17.5)
30-day	6.49 (5.79-7.21)	7.14 (6.36-7.94)	8.21 (7.30-9.15)	9.10 (8.05-10.2)	10.3 (8.90-11.8)	11.3 (9.53-13.1)	12.3 (10.1-14.5)	13.2 (10.5-16.0)	14.6 (11.1-17.9)	15.5 (11.6-19.4)
45-day	8.08 (7.27-8.89)	8.87 (7.97-9.77)	10.1 (9.07-11.2)	11.1 (9.94-12.3)	12.5 (10.8-14.1)	13.5 (11.5-15.4)	14.5 (12.0-16.9)	15.4 (12.3-18.4)	16.7 (12.9-20.3)	17.6 (13.3-21.8)
60-day	9.48 (8.58-10.4)	10.4 (9.39-11.4)	11.8 (10.7-13.0)	12.9 (11.6-14.2)	14.4 (12.5-16.1)	15.4 (13.2-17.5)	16.4 (13.6-19.0)	17.3 (13.9-20.5)	18.5 (14.3-22.3)	19.2 (14.7-23.7)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format:

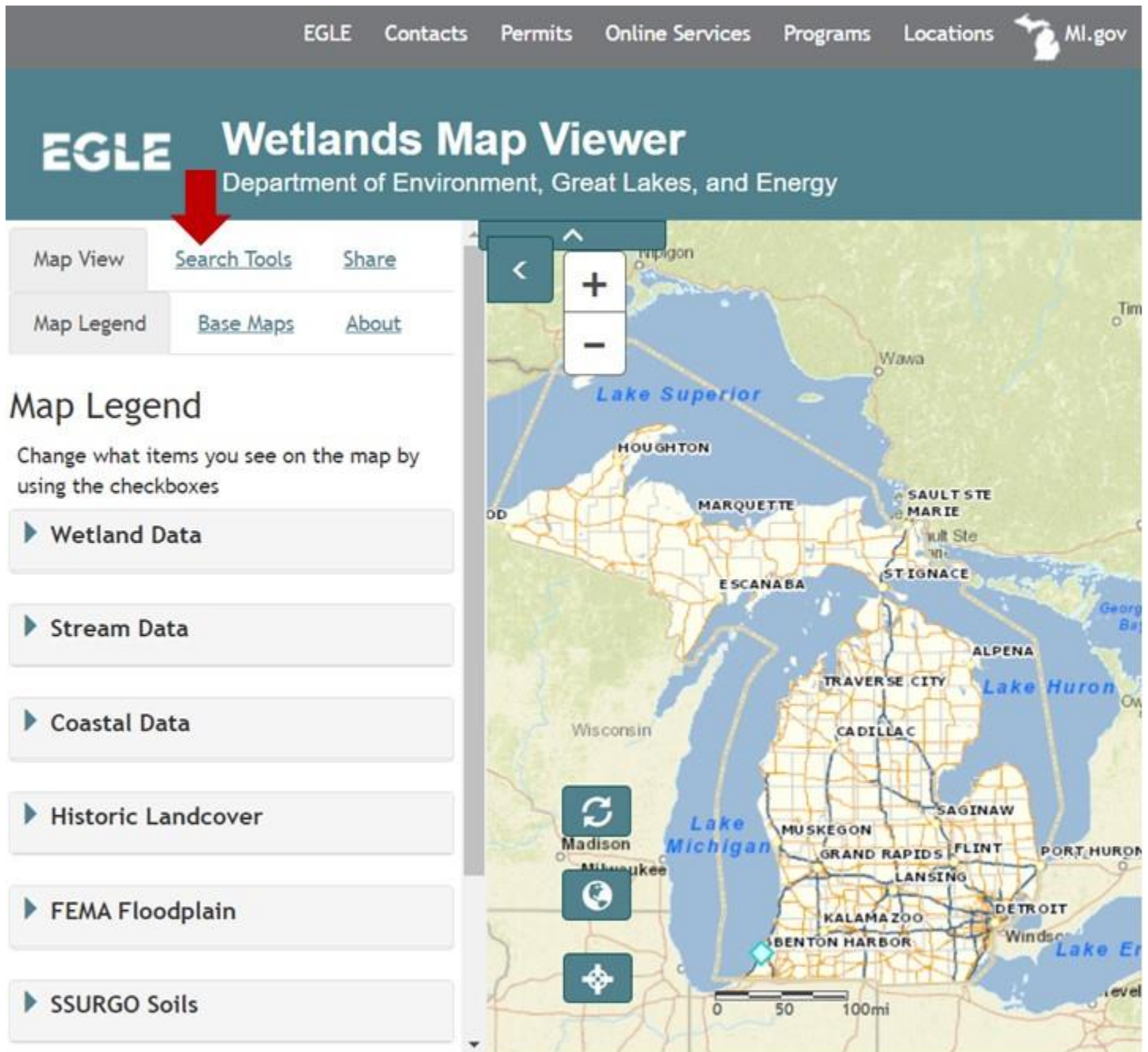
### 3.0 PRESETTLEMENT LAND COVER

#### Obtaining presettlement land use data from the EGLE Wetlands Map Viewer

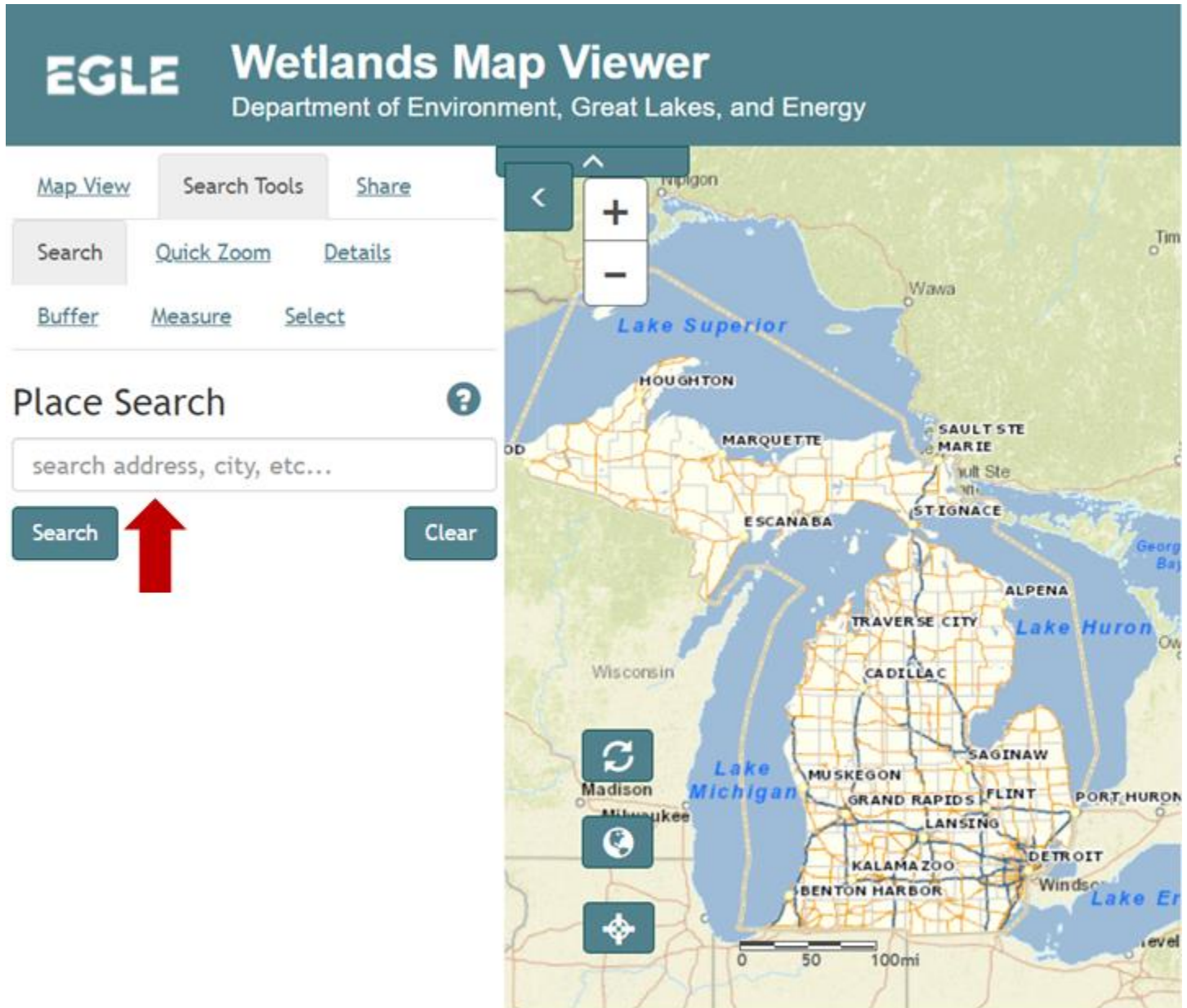
There are a number of ways to collect presettlement land use data for sites. The following steps highlight one (1) possible approach using the EGLE Wetland Map Viewer.

Go to the [EGLE Wetland Map Viewer](#).

The image below shows the load page.



To locate a given site, click on the "Search Tools" tab and use the search bar to find the design site (second image).

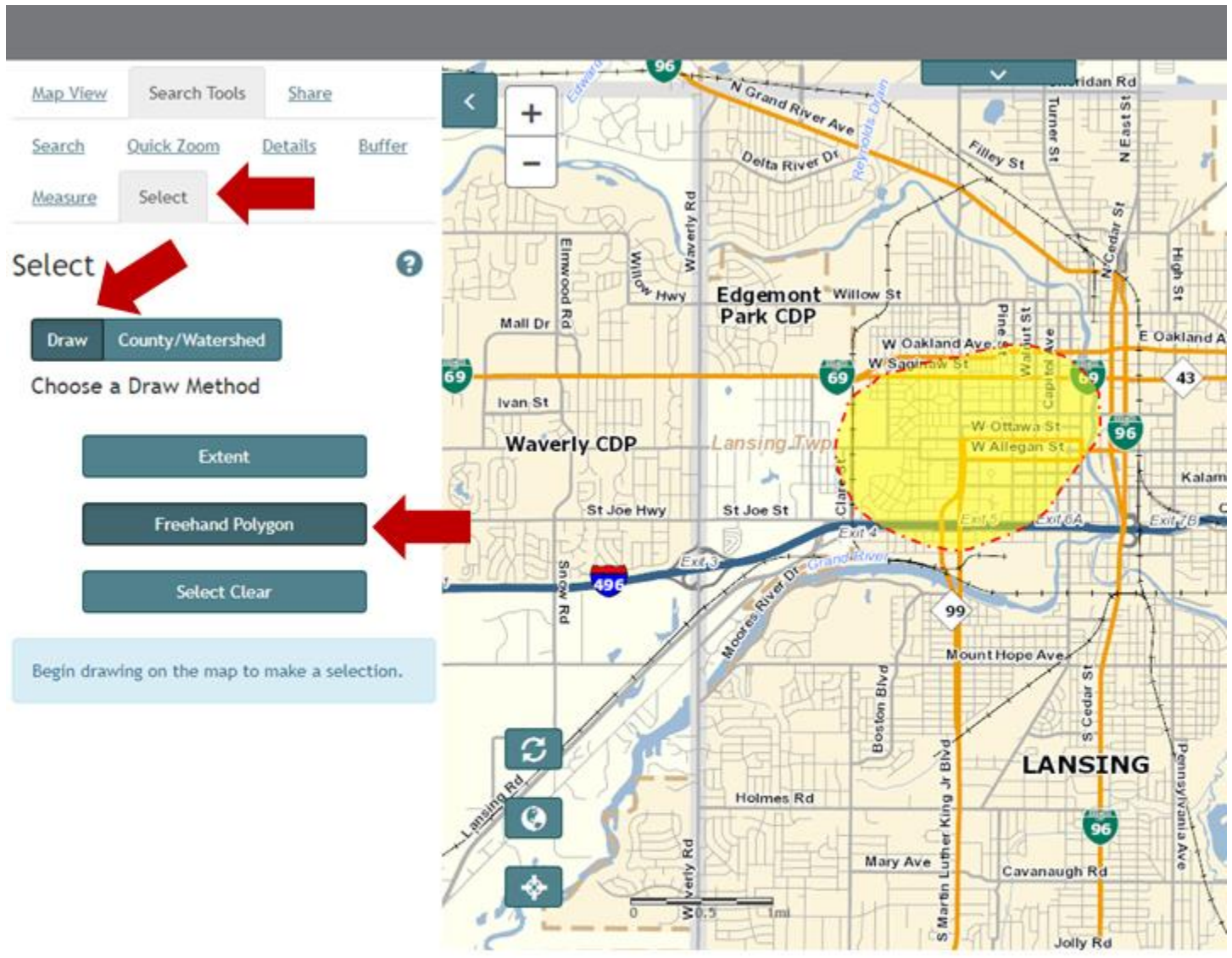




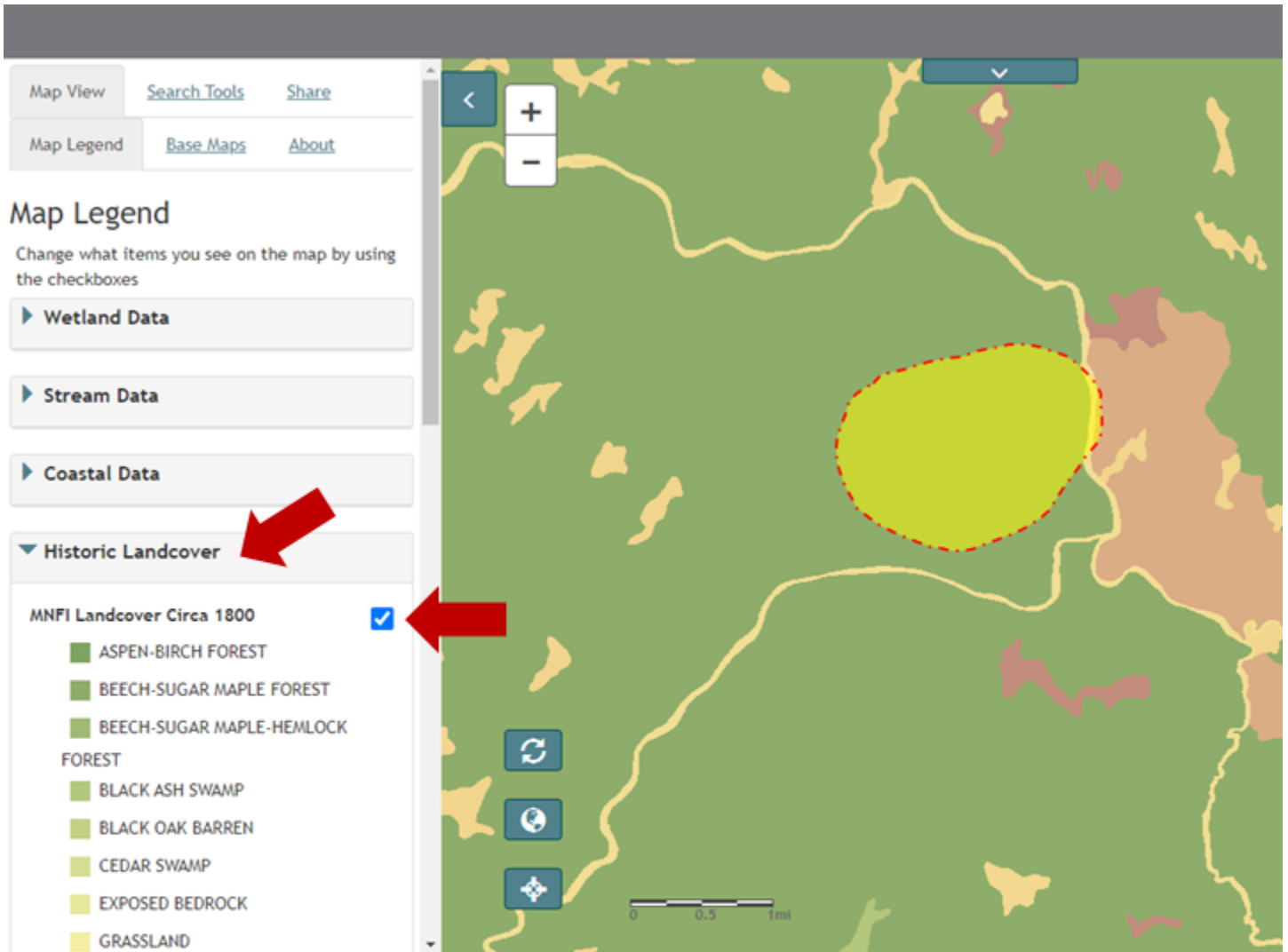
After locating the site, return to the "Map View" tab and on the left-hand panel, under "Map Legend" turnoff the "Part 303 Final Wetlands Inventory" layer under the "Wetland Data" drop down menu.

The screenshot shows the EGLE web application interface. At the top, there is a navigation bar with links for EGLE, Contacts, Permits, Online Services, Programs, and Locations, along with the MI.gov logo. Below this is a secondary navigation bar with 'Map View' (selected), Search Tools, and Share. Under 'Map View', there are links for Map Legend, Base Maps, and About. The main content area is titled 'Map Legend' and includes the instruction: 'Change what items you see on the map by using the checkboxes'. A dropdown menu for 'Wetland Data' is expanded, showing several layers with checkboxes. A red arrow points to the 'Wetland Data' header. The 'Part 303 Final Wetlands Inventory' layer is checked, and another red arrow points to its checkbox. Below it, there are three sub-layers: 'Wetlands as identified on NWI and MIRIS maps', 'Soil areas which include wetland soils', and 'Wetlands as identified on NWI and MIRIS maps and soil areas which include wetland soils'. The map in the background shows a street grid with various wetland areas highlighted in orange and yellow. A scale bar at the bottom indicates 0 to 0.1 miles.

At this point you can add the site drainage area to the map. This can be done by going back to the "Search Tools" tab and then choosing "Select". If you know your drainage area you can use the "Freehand Polygon" under the "Draw" option to sketch in the drainage area.



After adding the drainage area, return to the "Map View" tab and turn on the "MNFI Landcover Circa 1800" layer under the "Historic Landcover" drop down menu.



Once the landcover layer loads, clicking on the map will open the map details in the left-hand panel. Scroll down to the "Map Information" section to find the Historic Landcover for that point.

**Place:** Lansing **Highlight**

**County:** Ingham **Highlight**

**TRS:** 04N02W16 **Highlight**

### Identify Coordinates

**Long:** -84.55929

**Lat:** 42.73536

### HUC Data

▶ 3 Result(s) Found

### Map Information

**Mitigation Watersheds:** 14 GRAND

**Eco-Region:** VI.4.1

**Historic Landcover:** BEECH-SUGAR MAPLE FOREST

### Part 303 Wetland Data

No Wetland layers are present at the map point.

**Clear**

This can be repeated for each land use within the drainage area. It is important to note that presettlement runoff on the "Runoff Volume" tab is calculated based on both presettlement land use and soil type. Therefore, the map of presettlement land uses should be compared to a soil properties map to determine the acres of land for each row in the presettlement table on the "Runoff Volume" tab. In most cases one (1) or two (2) land uses will make up a region.

## 4.0 SITE SOIL DATA

### Obtaining Soil Data from the USDA Web Soil Survey

Go to the [USDA Web Soil Survey Site](https://websoilsurvey.scisearch.nrcs.usda.gov/).

Launch the site by clicking on the "START WSS" button at the top of the page.

**USDA** United States Department of Agriculture  
Natural Resources Conservation Service

**Web Soil Survey**

Home About Soils Help Contact Us

You are here: Web Soil Survey Home

The simple yet powerful way to access and use soil data.

**START WSS**

**Search**  
Enter Keyword   
All NRCS Sites

**Browse by Subject**

- Soils Home
- National Cooperative Soil Survey (NCSS)
- Archived Soil Surveys
- Status Maps
- Official Soil Series Descriptions (OSD)
- Series Extent Explorer
- Geospatial Data Gateway
- eFOTG
- National Soil Characterization Data
- Soil Health
- Soil Geography

**Welcome to Web Soil Survey (WSS)**



Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

Soil surveys can be used for general farm, local, and wider area planning. Onsite investigation is needed in some cases, such as soil quality assessments and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center at the following link: [USDA Service Center](#) or your NRCS State Soil Scientist at the following link: [NRCS State Soil Scientist](#)

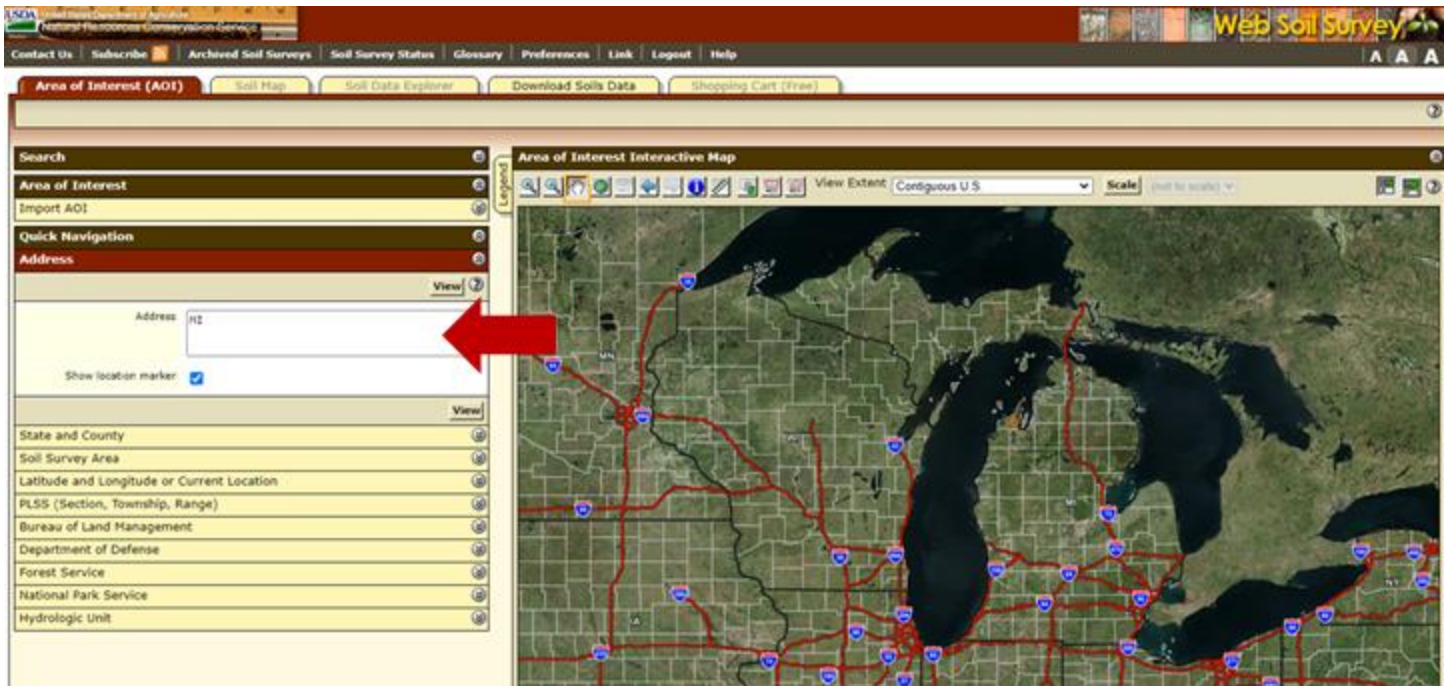
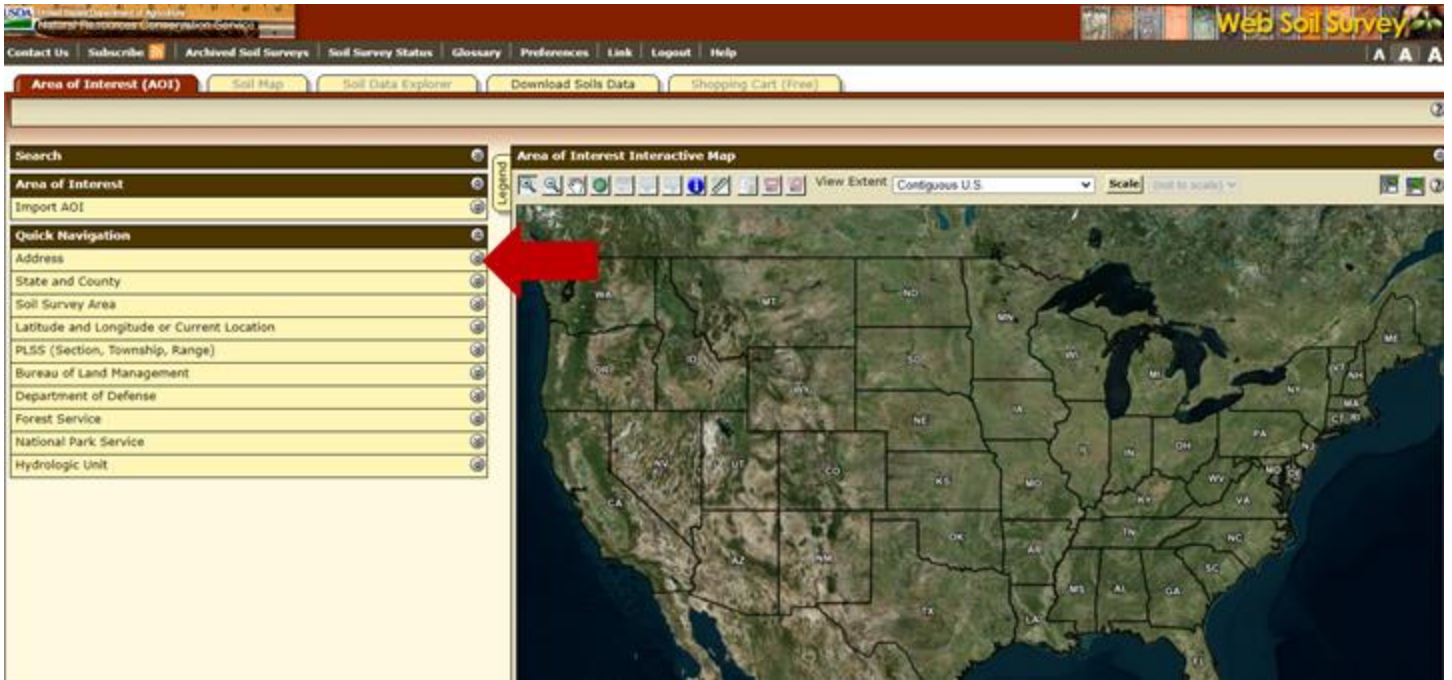
**I Want To...**

- Start Web Soil Survey (WSS)
- Know Web Soil Survey Requirements
- Know Web Soil Survey operation hours
- Find what areas of the U.S. have soil data
- Find information by topic
- Know how to hyperlink from other documents to Web Soil Survey
- Know the SSURGO data structure
- Use Web Soil Survey on a mobile device

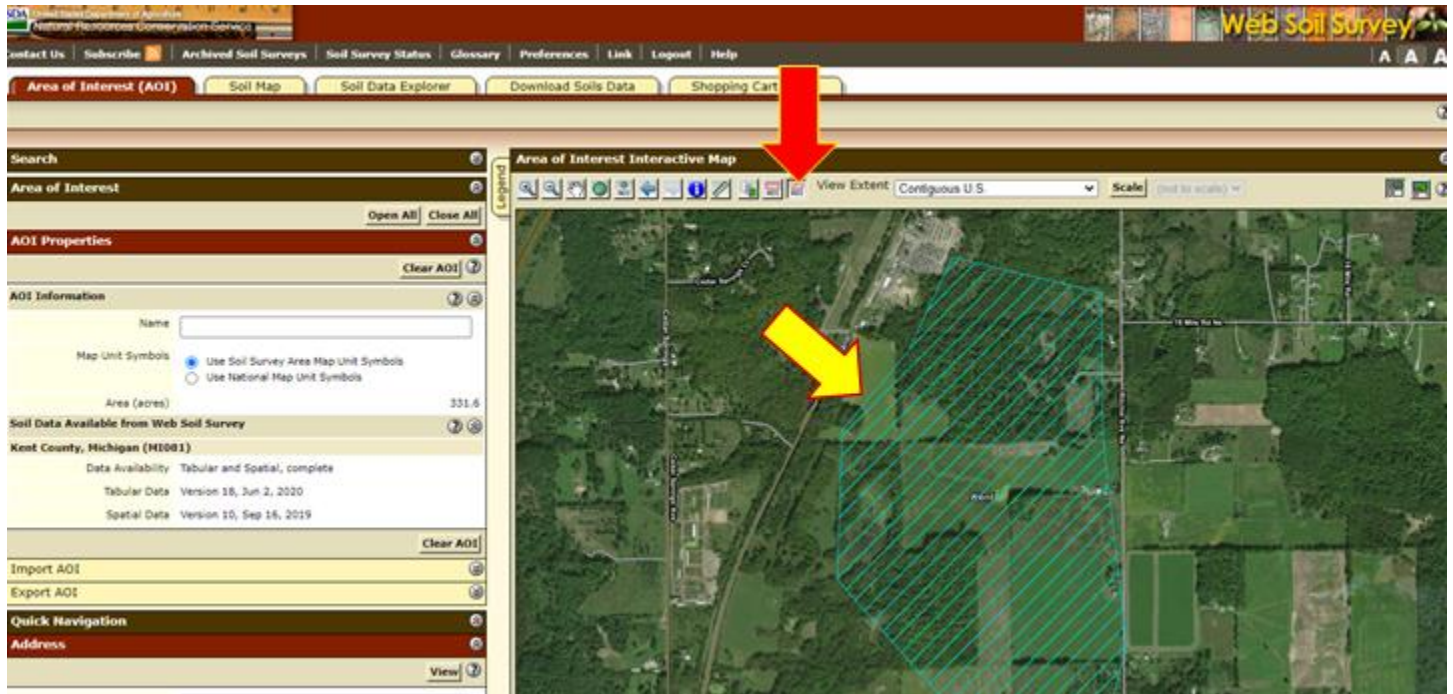
**Announcements/Events**

- Web Soil Survey 3.4.0 has been released! [View](#)

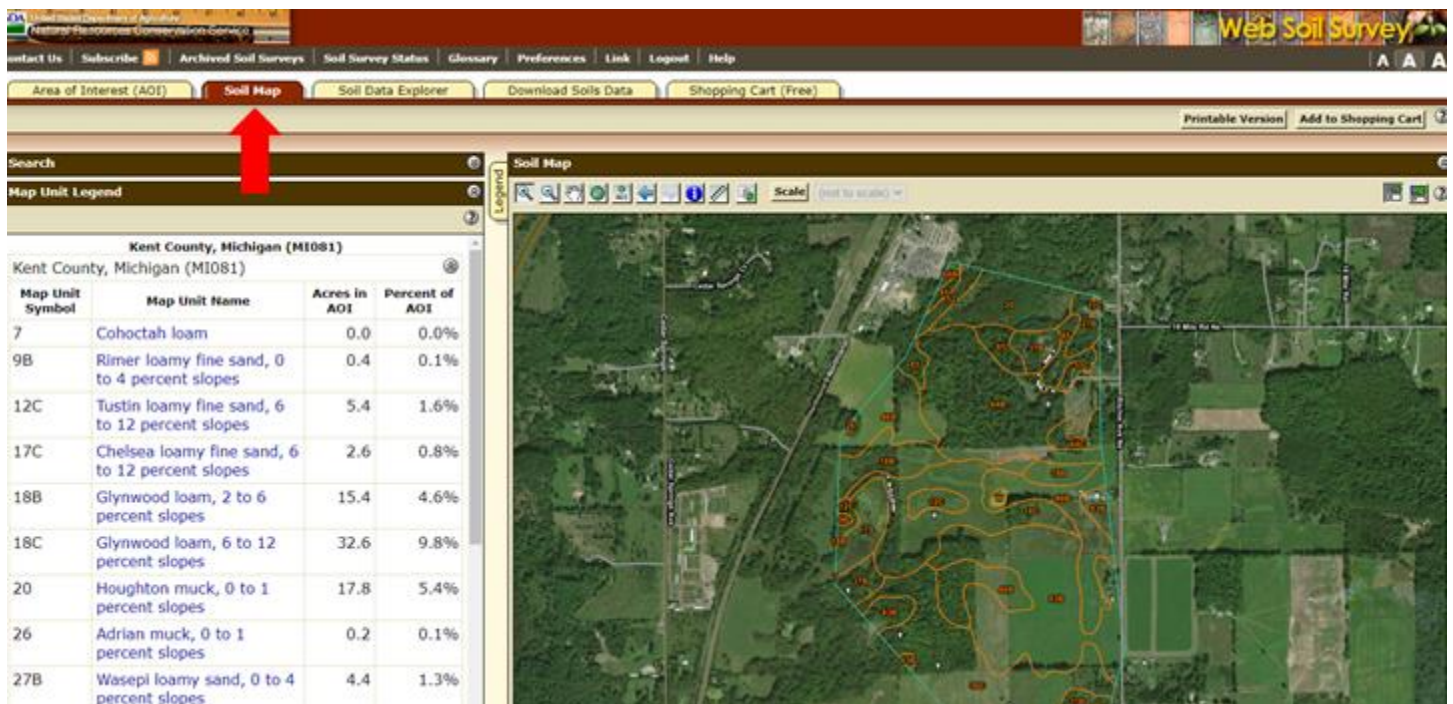
Once launched the Web Soil Survey will open on the Area of Interest Tab. Here site locations can either be uploaded or searched using a number of options. Clicking on the drop-down arrows next to any of the search options expands that search option and allows you to enter information regarding the site.



After locating the site, you can use the Create AOI (Area of Interest) tool above the map to select the entire drainage area for the site. These toggles will allow you to draw the drainage area on the map.



Once you have identified the drainage area with the AOI, click on the "Soil Map" tab. This will load all of the soil types within the drainage area both on the map and in a table on the left hand of the screen. The table will display the acres and percentage of the total area for each soil type.



To determine the soil type (A,B,C, and D) referenced on the "Runoff Volume" tab of this workbook, click on the name of each soil in the table on the left hand of the screen. This will open a pop-up window that displays information about the selected soil.

The screenshot shows the Web Soil Survey interface. On the left, a table lists soil types for Kent County, Michigan (MI081). A red arrow points to the 'Cohoctah loam' entry. On the right, a 'Map Unit Description' window is open for '7-Cohoctah loam', showing detailed information about the soil's setting, composition, and properties.

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
	Cohoctah loam	0.0	0.0%
9B	Rimer loamy fine sand, 0 to 4 percent slopes	0.4	0.1%
12C	Tustin loamy fine sand, 6 to 12 percent slopes	5.4	1.6%
17C	Chelsea loamy fine sand, 6 to 12 percent slopes	2.6	0.8%
18B	Glynwood loam, 2 to 6 percent slopes	15.4	4.6%
18C	Glynwood loam, 6 to 12 percent slopes	32.6	9.8%
20	Moughton muck, 0 to 1 percent slopes	17.8	5.4%
26	Adrian muck, 0 to 1 percent slopes	0.2	0.1%
27B	Wasepi loamy sand, 0 to 4 percent slopes	4.4	1.3%

**Map Unit Description**  
**7-Cohoctah loam**  
**Map Unit Setting**  
 National map unit symbol: 68sl  
 Elevation: 340 to 1,000 feet  
 Mean annual precipitation: 30 to 36 inches  
 Mean annual air temperature: 45 to 46 degrees F  
 Frost-free period: 140 to 150 days  
 Farmland classification: Not prime farmland  
**Map Unit Composition**  
 Cohoctah and similar soils: 90 percent  
 Minor components: 10 percent  
 Estimates are based on observations, descriptions, and transects of the mapunit.  
**Description of Cohoctah**  
**Setting**  
 Landform: Flood plains  
 Landform position (three-dimensional): Talf  
 Down-slope shape: Linear  
 Across-slope shape: Linear  
 Parent material: Loamy alluvium  
**Typical profile**  
 H1 - 0 to 10 inches: loam  
 H2 - 10 to 31 inches: sandy loam  
 H3 - 31 to 60 inches: fine sandy loam  
**Properties and qualities**  
 Slope: 0 to 2 percent  
 Depth to restrictive feature: More than 80 inches  
 Drainage class: Poorly drained  
 Runoff class: Very low  
 Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)  
 Depth to water table: About 0 to 12 inches  
 Frequency of flooding: Frequent, None  
 Frequency of ponding: None

Scroll down to the section labeled "Interpretive groups" and look for the "Hydrologic Soil Group". This will list the soil type. It is important to note that if two (2) letters are listed, for example A/D, this means that the soils behave like an A soil if there is an onsite drainage practice (for example an underdrain or tile drain) and behave like a D soil when there is no active drainage practice.

#### Description of Cohoctah

##### Setting

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

##### Typical profile

H1 - 0 to 10 inches: loam  
 H2 - 10 to 31 inches: sandy loam  
 H3 - 31 to 60 inches: fine sandy loam

##### Properties and qualities

Slope: 0 to 2 percent  
 Depth to restrictive feature: More than 80 inches  
 Drainage class: Poorly drained  
 Runoff class: Very low  
 Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)  
 Depth to water table: About 0 to 12 inches  
 Frequency of flooding: Frequent, None  
 Frequency of ponding: None  
 Available water capacity: High (about 9.5 inches)

##### Interpretive groups

Land capability classification (irrigated): None specified  
 Land capability classification (nonirrigated): 5w  
 Hydrologic Soil Group: A/D  
 Ecological site: F098XA004M1 - Wet Floodplains  
 Hydric soil rating: Yes

It is important to note that on the "Runoff Volume" tab runoff is calculated based on a combination of land use and soil types. Therefore, the information collected on the Web Soil Survey should be compared to land-use maps and linked to determine the amount of area to put under each category.



## 5.0 Example Scenario

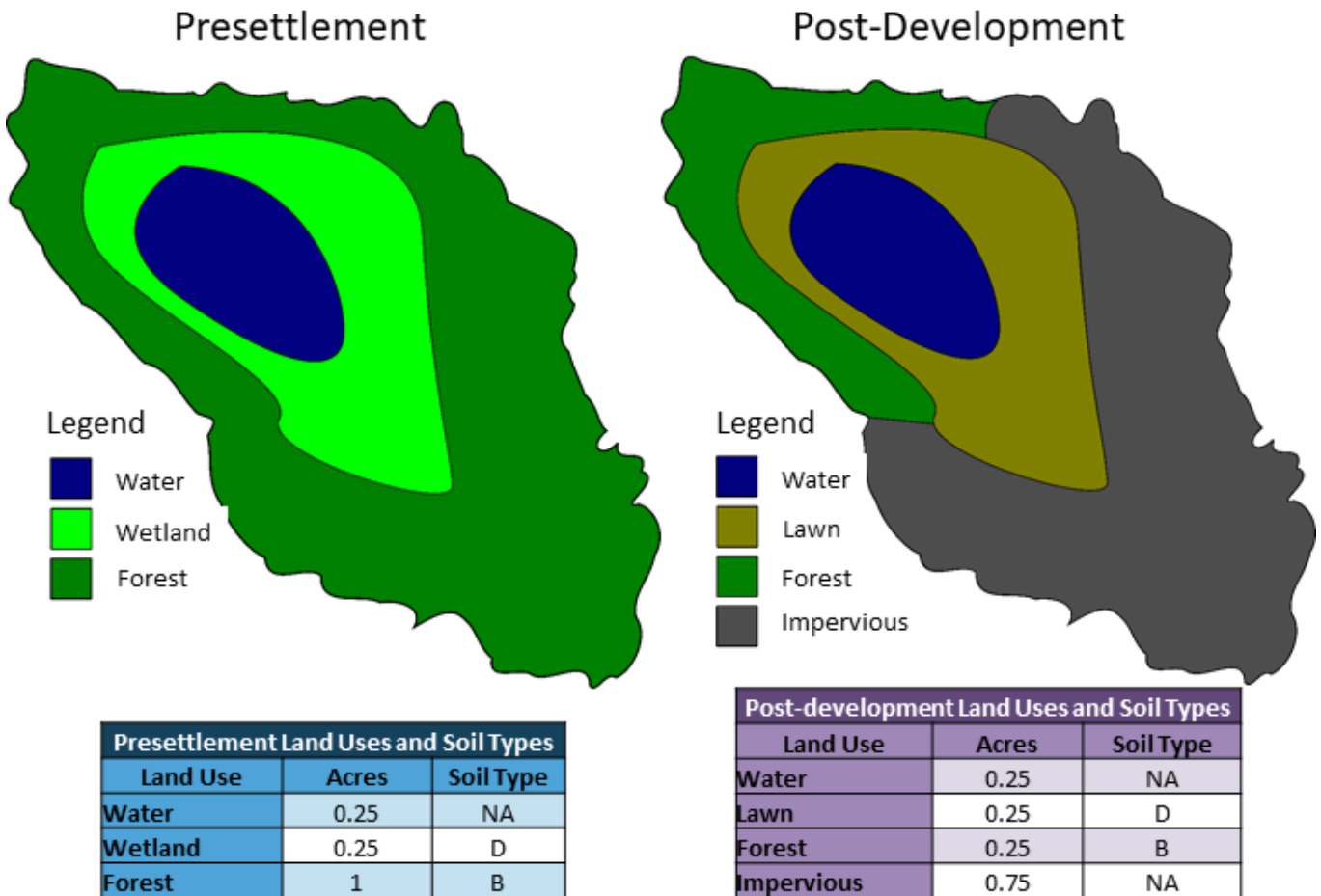
### Setting

A region has been experiencing flashy flows. And in order to address this issue a series of BMPs are being proposed. In order to determine how much runoff needs to be captured the NPS runoff calculator will be used. The first step to accomplish this is to collect information about the pre-settlement and post-development conditions of the site.

- Drainage Area:** The total drainage area is roughly 1.5 acres.
- Design Storm:** To address the flashy flows the 2-year 24-hour storm event will be used. For this region this equates to 2.40 inches of rainfall.
- Presettlement:** Looking at the presettlement condition, the region was covered by a mix of forest and wetlands with a small pond. Soil types for the region were distributed between the land uses with the forests having B soils and the wetlands having D soils.
- Post-Development:** Looking at the post-development condition, while the pond has remained the wetland area has been replaced with lawn and much of the forest has been replaced by impervious areas. There has been no change in the types of soil present at the site.

### Maps and Site Data

The maps below show a rough representation (not drawn to scale) of the pre-settlement and post-development conditions for the region and the Table below each map summarize land uses and soils for each map.



# NPS Stormwater Runoff Volume Calculator

Below is an example of how this information would be entered into the NPS Stormwater Runoff Volume Calculator.

**Calculations for Stormwater Runoff Volume Control**

**SITE NAME:** Example Site

**Total Drainage Area:** 1.5 acres

**Design Rainfall Event:** 2.4 in  
(see Rainfall Tab for aid in using ATLAS 14 for determining local or site specific rainfall events)



**Presettlement Conditions**

Land Cover Type	Soil Type	Area (sf)	Area (ac)	CN (from TR-55)	S	Q Runoff <sup>1</sup> (in)	Runoff Volume <sup>2</sup> (ft <sup>3</sup> )
					$\frac{1000}{CN} - 10$	$\frac{(P - 0.2S)^2}{(P + 0.8S)}$	$Q \times 1/12 \times A$
Woods	A	0		30	23.3	0	0.0
Grassland / Meadow	A	0		30	23.3	0	0.0
Woods	B	43560	1.00	55	8.2	0.0651885	236.6
Grassland / Meadow	B	0		58	7.2	0.1105538	0.0
Woods	C	0		70	4.3	0.4084034	0.0
Grassland / Meadow	C	0		71	4.1	0.4421975	0.0
Woods	D	0		77	3.0	0.6784179	0.0
Grassland / Meadow	D	0		78	2.8	0.723845	0.0
Impervious / Bedrock	N/A	0		98	0.2	2.1713506	0.0
Wetland / Open Water	N/A	21780	0.50	100	0.0	2.4	4,356.0
Other:		0			0.0	2.4	0.0
Other:		0			0.0	2.4	0.0
<b>TOTAL:</b>	<b>N/A</b>	<b>65340</b>	<b>1.50</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>4,592.6</b>

**Post-Development Conditions**

Land Cover Type	Soil Type	Area (sf)	Area (ac)	CN*	S	Q Runoff <sup>1</sup> (in)	Runoff Volume <sup>2</sup> (ft <sup>3</sup> )
Impervious	N/A	32670	0.75	98	0.2	2.1713506	5,911.5
Wetland / Open Water	N/A	10890	0.25	100	0.0	2.4	2,178.0
Open Space / Lawn	A	0		39	15.6	0	0.0
Open Space / Lawn	B	0		61	6.4	0.1673161	0.0
Open Space / Lawn	C	0		74	3.5	0.5528541	0.0
Open Space / Lawn	D	10890	0.25	80	2.5	0.8204545	744.6
Other: Woods	B	10890	0.25	55	8.2	0.0651885	59.2
Other:		0			0.0	2.4	0.0
Other:		0			0.0	2.4	0.0
Other:		0			0.0	2.4	0.0
<b>TOTAL:</b>	<b>N/A</b>	<b>65340</b>	<b>1.50</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>8,893.2</b>

**Runoff Volume Increase (ft<sup>3</sup>):** 4,301

Runoff Volume Increase = (Post-Dev. Runoff Volume) MINUS (Pre-Dev. Runoff Volume)

1. **Runoff (in) = Q = (P - Ia)² / (P - Ia) + S**  
Ia = 0.2S therefore;

**Runoff (in) = Q = (P - 0.2S)² / (P + 0.8S)**

2. **Runoff Volume (ft<sup>3</sup>) = Q x 1/12 x Area**

Where: P = 2-Year, 24-Hour Rainfall (in)

S = 1000/ CN - 10

CN = Curve Number

Q = Runoff (in)

Area = Area of specific land cover (ft<sup>2</sup>)

\* Runoff Volume must be calculated separately for pervious and impervious areas (without using a weighted CN)

If you need this information in an alternate format, contact [EGLE-Accessibility@Michigan.gov](mailto:EGLE-Accessibility@Michigan.gov) or call 800-662-9278.

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