



NOAA Northeast Regional Climate Center:  
Climate & Weather Information for  
New England Water Utilities & Stormwater Managers Workshop



# U.S. EPA National Stormwater Calculator (SWC)

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Center for Environmental Solutions and Emergency Response

Water Infrastructure Division, Stormwater Management Branch



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# National Stormwater Calculator (SWC)

EPA National Stormwater Calculator

NEW | SAVE | OPEN | RESOURCES | CONTACT

Help prevent pollution by controlling stormwater runoff.  
It's one of the greatest threats to clean water in America today.

Whether you're an urban planner, developer, landscape architect, or homeowner, this tool can help you balance land developments and landscaping with the right amount of green infrastructure.

Name Your Site (Optional)

Load Stormwater

The SWC web app works best with the following browsers: Microsoft Edge, Google Chrome, Mozilla Firefox, and Apple Safari.

Please contact [SWC@epa.gov](mailto:SWC@epa.gov) with any questions, suggestions, or problems with this application.

Last updated on: December 15, 2018

<https://www.epa.gov/water-research/national-stormwater-calculator>

# What is the SWC?



- **Stormwater Management (Green Infrastructure/Low Impact Development (LID)) Design and Planning Tool**
  - Allow for screening-level analysis of various green infrastructure (GI) practices, including planning level costs (green roofs, rain gardens, cisterns, etc.) throughout the U.S.
  - Model post-construction urban stormwater runoff discharges
    - Effects of alternative GI controls
    - Effects of changes in weather/climate
  - Allow non-technical professionals to conduct screening level stormwater runoff for small to medium sized ( less than 1 - 12 acres) urban sites

# Storm Water Management Model (SWMM)

- SWMM: A dynamic rainfall-runoff simulation model for long-term simulation of runoff quantity. Is an industry standard for urban stormwater modeling.
- SWMM produces stormwater runoff estimates in the background of the SWC

**EPA** United States Environmental Protection Agency

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## Storm Water Management Model (SWMM)

### *Helps predict runoff quantity and quality from drainage systems*


EPA's Storm Water Management Model (SWMM) is used throughout the world for planning, analysis, and design related to stormwater runoff, combined and sanitary sewers, and other drainage systems. It can be used to evaluate gray infrastructure stormwater control strategies, such as pipes and storm drains, and is a useful tool for creating cost-effective green/gray hybrid stormwater control solutions. SWMM was developed to help support local, state, and national stormwater management objectives to reduce runoff through infiltration and retention, and help to reduce discharges that cause impairment of waterbodies.

#### Software, Compatibility, Manuals, and Other Documents

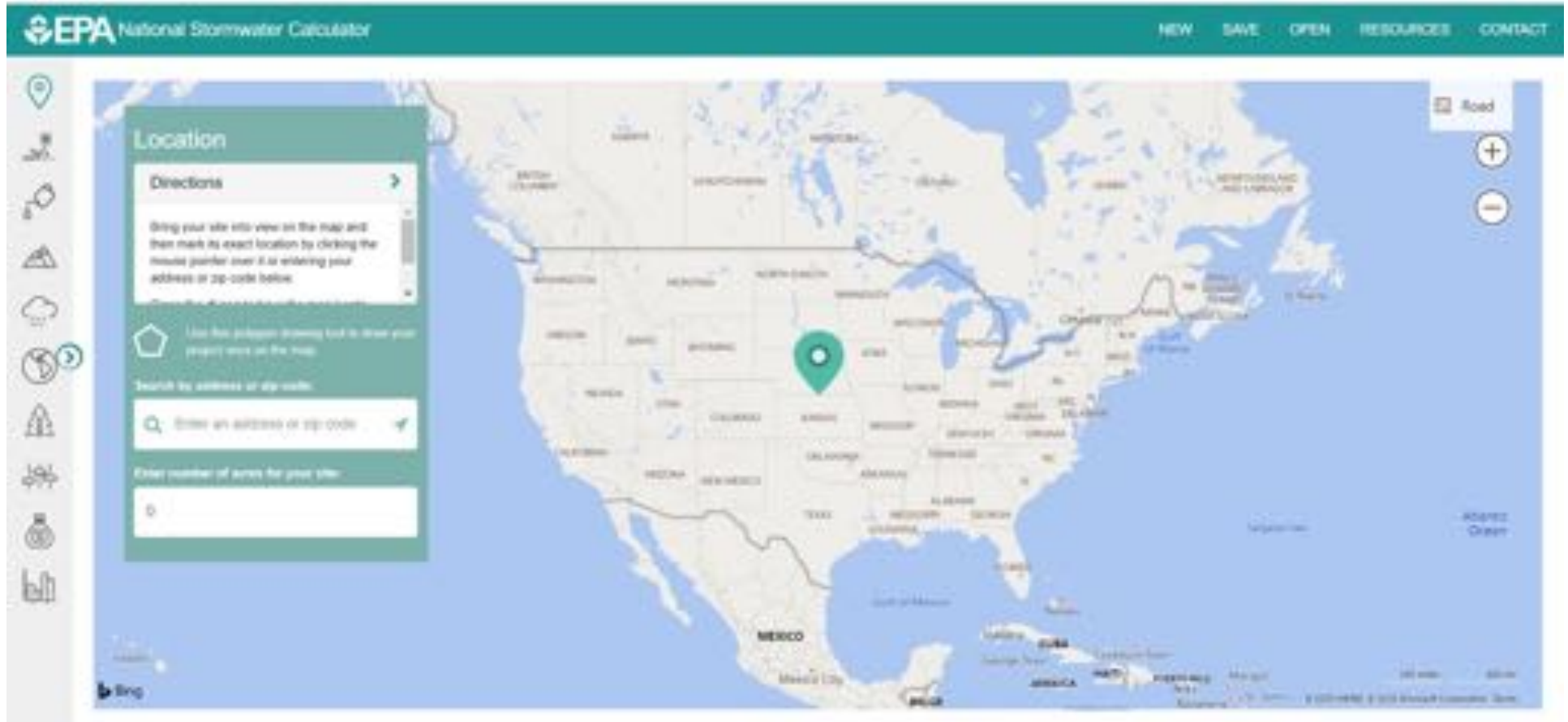
SWMM is a Windows-based desktop program. It is open source public software and is free for use worldwide. SWMM 5 was produced in a joint development effort with CDM, Inc., a global consulting, engineering, construction, and operations firm.

**On this Page**

- [Software, Compatibility, and Manuals](#)
- [Capabilities](#)
- [Applications](#)
- [Green Infrastructure as LID Controls](#)
- [Technical Support](#)
- [Resources](#)



# SWC Web Application



<https://swcweb.epa.gov/stormwatercalculator/>

## SWC:

### Site Parameters and Embedded Data-sets

- **Location:** Bing Maps
- **Soils:** NRCS SSURGO
- **Slope:** NRCS SSURGO
- **Hydraulic Conductivity:** NRCS SSURGO
- **Precipitation and Temperature:** National Climate Center (NCDC)-NOAA from EPA's BASINS Model
- **Potential Evapotranspiration:** Calculation based on meteorological data
- **Climate Change Future Scenarios:** Precipitation & potential evapotranspiration
- **Land-Cover/Use:** Menu driven by user
- **LID Practices & Costs:** Menu driven by user



# SWC Application: Northeast Ohio Regional Sewer District (NEORS D) Green Infrastructure Grants Program Kamm's Corners Public Parking Lot Retrofit Project

- SWC used by grant applicants for quantifying stormwater runoff reductions of proposed projects

NEORS D Green Infrastructure Grants Program Storymap

NEORS D Awarded Green Infrastructure Grants Projects | NEORS D Appendix 3 Green Infrastructure | Other Green Infrastructure Projects

### 24 2018 Kamm's Corners Public Parking Lot Retrofit

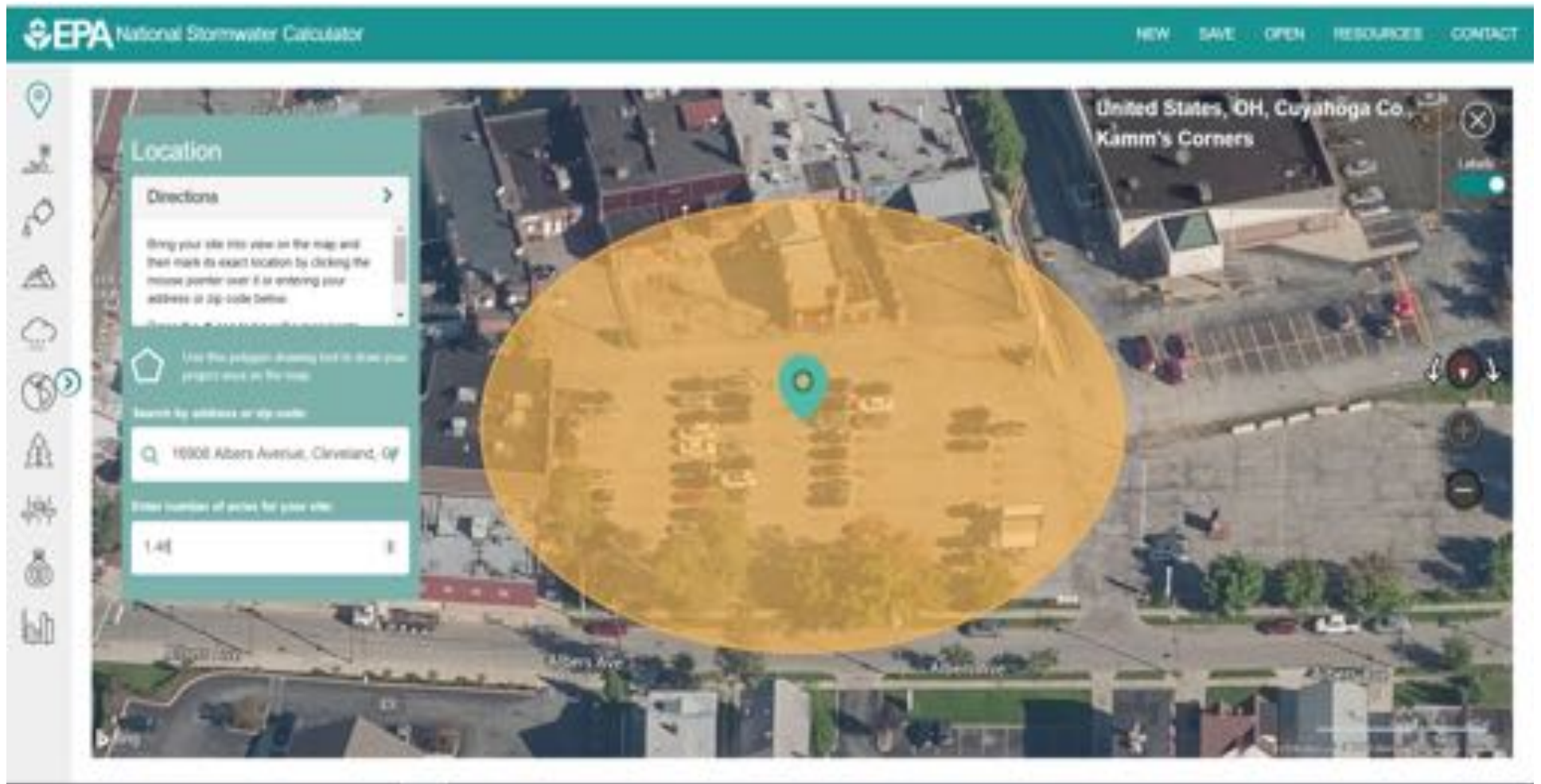


Applicant: City of Cleveland  
Location: 16906 Albers Avenue  
Community: Cleveland - Kamm's Corner Neighborhood  
GI Project Type: Green Infrastructure Grants Program  
Grant Award: \$240,583  
Subwatershed: Rocky River  
Summary: Bioretention cells

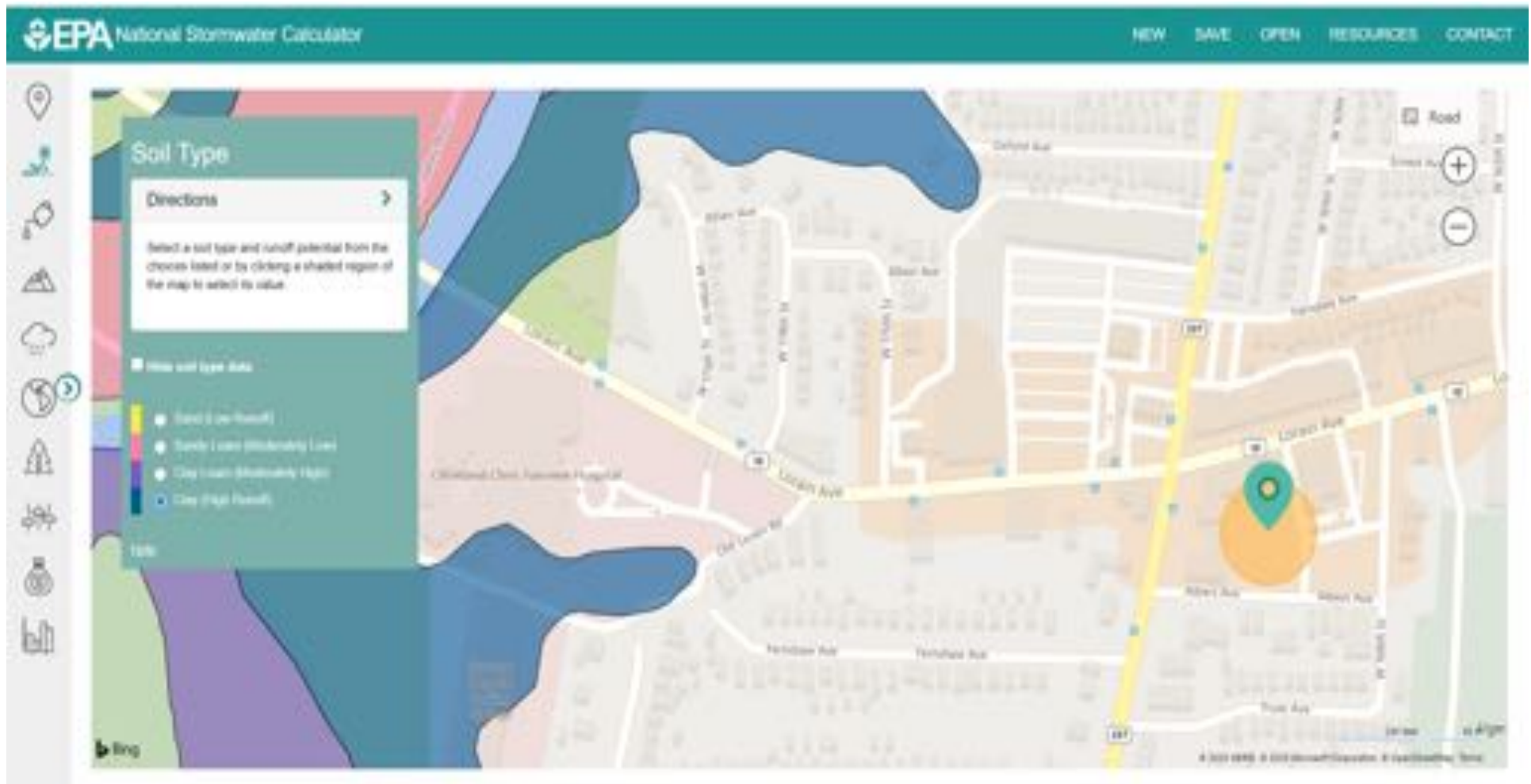
<https://neorsd.maps.arcgis.com/apps/Shortlist/index.html?appid=efd0ff60d52f4860978c5bb4098cb3d9>



# SWC Analysis: Project Location



# SWC Analysis: Soil Type: Rainfall Runoff Potential



# SWC Analysis: Soil Drainage (infiltration rate)

**EPA National Stormwater Calculator** NEW SAVE OPEN RESOURCES CONTACT

### Soil Drainage

**Directions**

Enter your own conductivity value directly into the input field below or click a shaded region on the map to select its conductivity value. If you leave the edit box blank, the default conductivity associated with the

Show soil type data

- 0.01 inches/hour
- 0.01 to 0.1 inches/hour
- 0.1 to 1.0 inches/hour
- 1 inches/hour

How fast does rainwater runoff from pervious areas of your site (inches/hour)?

Map

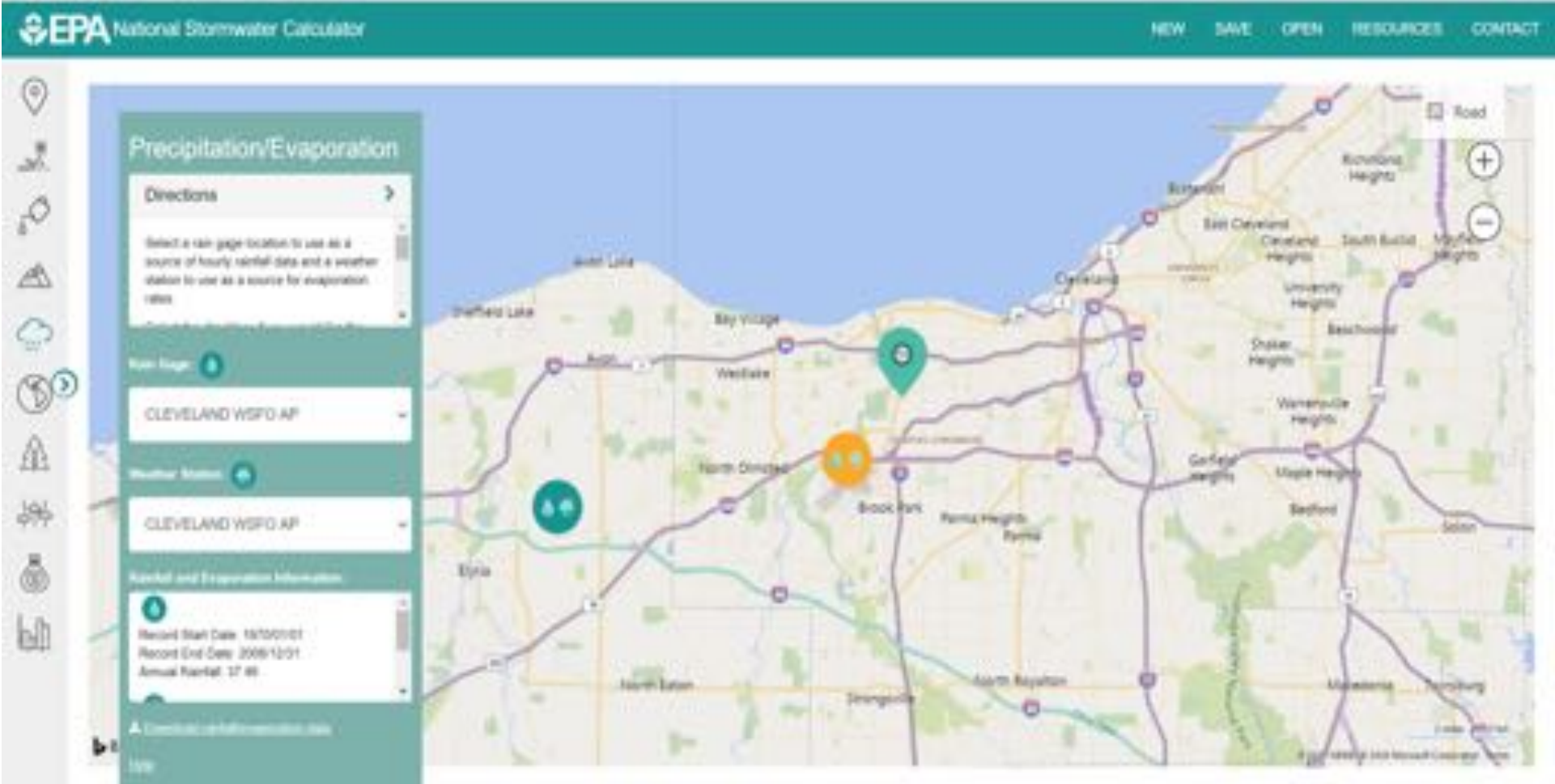
© 2011-2015, © 2016 Microsoft Corporation. All rights reserved. Terms

# SWC Analysis: Topography

The screenshot displays the EPA National Stormwater Calculator interface. At the top, the EPA logo and the text "National Stormwater Calculator" are visible on the left, and navigation links "NEW", "SAVE", "OPEN", "RESOURCES", and "CONTACT" are on the right. The main area features a map with a topography overlay. A "Topography" settings panel is open on the left side of the map. This panel includes a "Directions" section with a right-pointing arrow and a text prompt: "Select a slope from the choices listed below or click a shaded region on the map to select its value." Below this, there is a checkbox labeled "Show land type data" which is currently checked. A legend lists four slope categories with corresponding color swatches: "Flat (0% Slope)" in light blue, "Moderately Flat (1% Slope)" in yellow, "Moderately Steep (10% Slope)" in orange, and "Steep (More than 10% Slope)" in dark blue. The map shows a residential area with streets like "Alton Ave" and "Lorain Ave", and a large blue area representing a water body. A location pin is placed on the map, and a scale bar is visible in the bottom right corner.

# SWC Analysis:

## Historical Precipitation & Potential Evapotranspiration



# SWC Analysis: Existing Land Cover



# SWC Analysis:

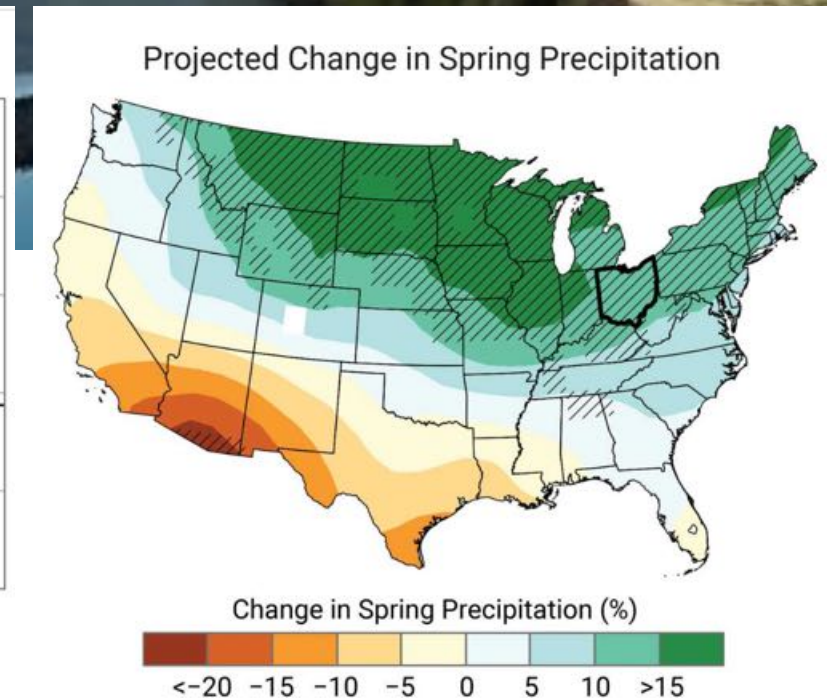
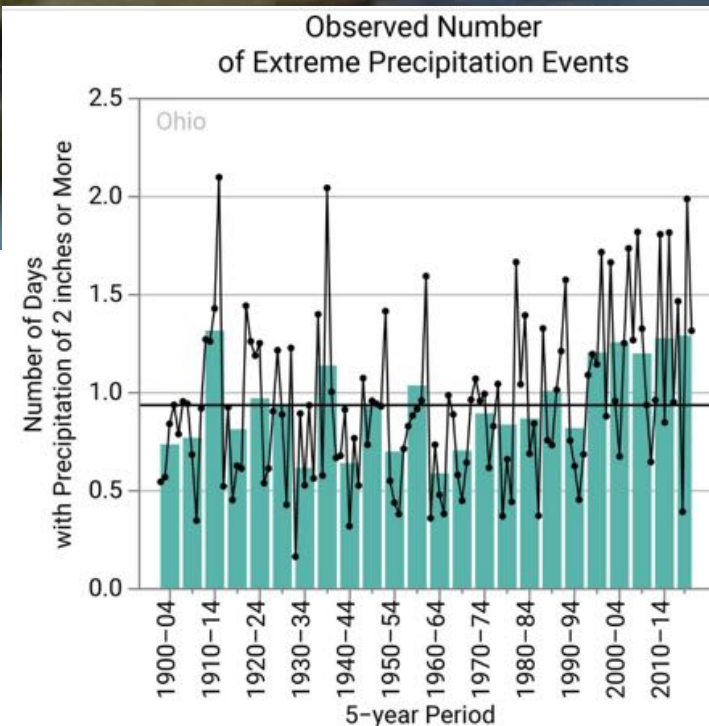
## Extreme Weather Impacts: State of Ohio – 2019

NOAA State Climate Summaries:

<https://statesummaries.ncics.org/chapter/oh/>

### KEY MESSAGE 2

Ohio has experienced a significant increase in heavy rain events. Increases in winter and spring precipitation are projected and will raise the risk of springtime flooding.



# ***Extreme Weather Scenario Data: U.S. EPA's Climate Resilience Evaluation & Awareness Tool (CREAT) 2.0***



- Climate scenarios derived from a range of outcomes of the World Climate Research Programme's CMIP3 multi-model dataset.
- Contains a database of climate change effects across the US localized to a grid of 0.5 degrees in latitude and longitude (about 30 by 30 miles).

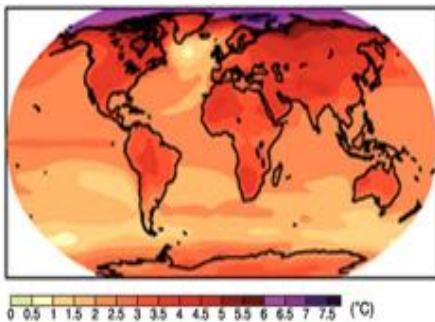
<https://creat.epa.gov/creat/>



# Extreme Weather Scenario Data Sources: U.S. EPA's Climate Resilience Evaluation & Awareness Tool (CREAT) 2.0

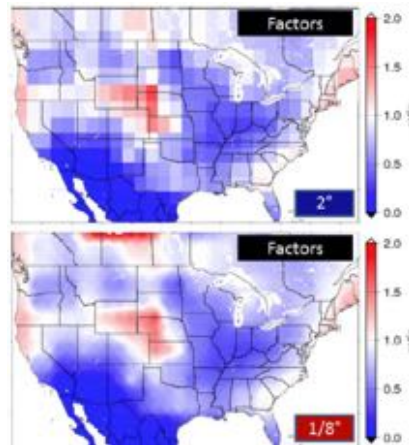
## IPCC/WCRP CMIP3

Daily climate projections for 2020-2074 from 9 GCM models at a coarse (2-5°) scale.



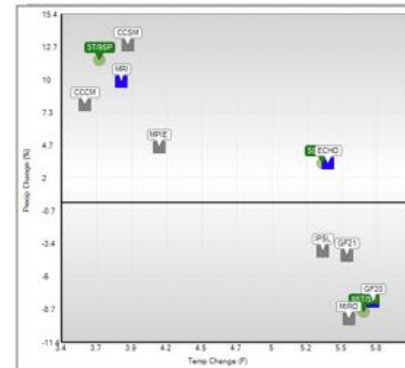
## BOR/LLNL

Downscaled projections of monthly averages to 1/2 degree grid cells.



## EPA-CREAT

Select Warm/Wet, Median, & Hot/Dry outcomes for each cell.



## SWC & SWMM-CAT

Mapping of monthly CREAT scenarios (including PET and extreme events) to 7,000 NWS stations.



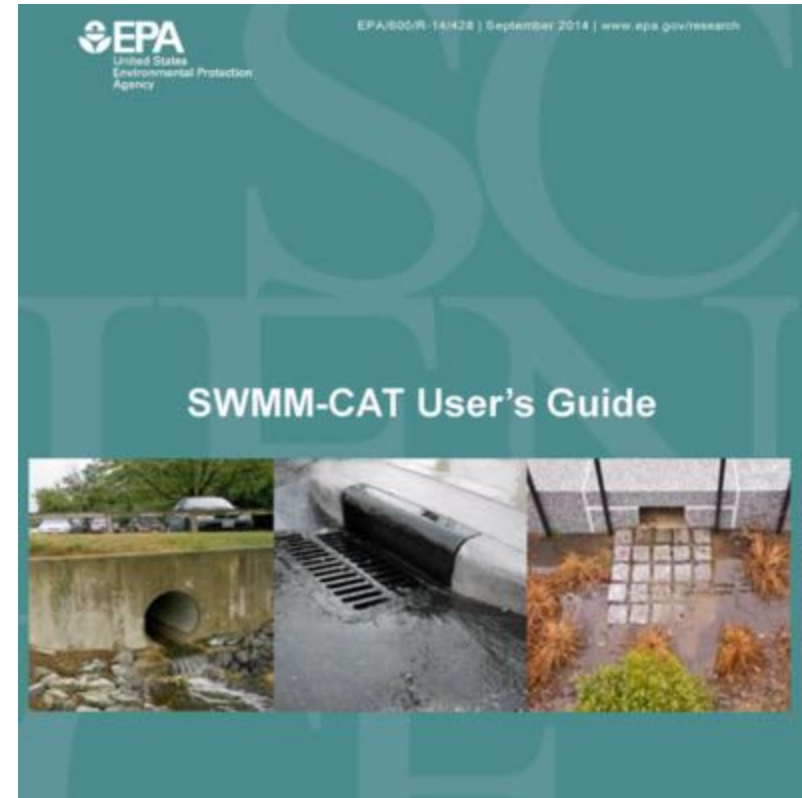
IPCC – International Program for Climate Change; WCRP – World Climate Research Program;

CMIP3 – 3<sup>rd</sup> Coupled Model Intercomparison Project;

BOR – Bureau of Reclamation; LLNL – Lawrence Livermore National Laboratory

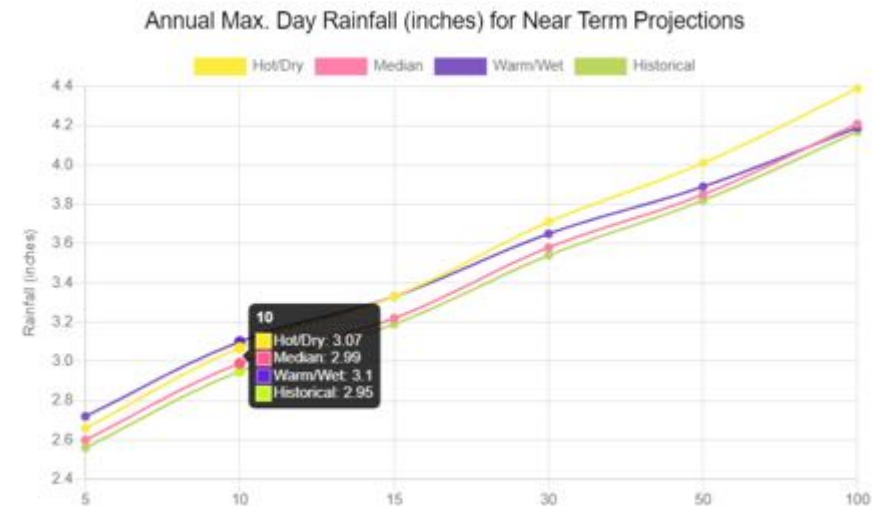
# SWMM Climate Adjustment Tool (CAT): Climate Change Scenarios & Extreme Storm Events

- Provides an add-in tool to SWMM and the SWC to identify seasonal changes in precipitation and temperature, as well as changes in extreme design events, at a localized level.
- Uses EPA-CREAT's localized seasonal adjustment factors derived from GCM runs that can be applied to historical meteorological records.
- Allows the user to apply their own climate adjustments if they so choose.



<https://www.epa.gov/water-research/storm-water-management-model-swmm>

# SWC Analysis: Climate Change Scenarios & Extreme Storm Events



- CREAT 2.0 regional grid results encompass each of the SWC's rain gage and weather station locations.

# SWC Analysis: Baseline Results

EPA National Stormwater Calculator

Summary Results  
Current Scenario  
Annual Rainfall: 38.63 in.

Legend: Runoff (dark teal), Infiltration (light green), Evaporation (orange)

Statistics

Statistics	Current Scenario
Average Annual Rainfall (inches)	38.63
Average Annual Runoff (inches)	25.64
Days per Year with Rainfall	81.25
Days per Year with Runoff	68.77
Percent of Total Days Retained	21.24
Smallest Rainfall w/ Runoff (inches)	0.10
Largest Rainfall w/ Runoff (inches)	0.20
Max Rainfall Retained (inches)	0.40

Results

Directions: [Dropdown]

Options:

Years to Analyze: 20

Event Threshold: 0.1

ignore consecutive days

Actions:

Reports:

- Site Description
- Summary Results**
- Rainfall / Runoff Events
- Rainfall / Runoff Occurrence Frequency
- Rainfall Retention Frequency
- Runoff Contribution by Rainfall Percentile
- Extreme Event Rainfall / Runoff
- Grid Summary

# LID Controls:

## Fact Sheet

### Kamm's Corners Public Parking Lot Retrofit Project (NEORSRD)



**Kamm's Corner Green Infrastructure Parking Lot Retrofit**

**Green Infrastructure 2018 Project Awarded**

GI Technology: Bioretention  
Drainage Area: 1.46 acres  
GI Feature Area: 2,700 sq. ft.

Stormwater Capture: 690,457 gal/yr.  
Total Project Cost: \$249,583  
Grant Awarded: \$249,583

**Opportunities & Benefits:**

- Demonstration project at public parking lot
- Local Community Development Corporation programs parking lot for public events; farmers market, etc.

**Challenges & Constraints:**

- Delays caused by site control & project coordination
- Incorporating maintenance requirements into City standard maintenance protocols

*Before*

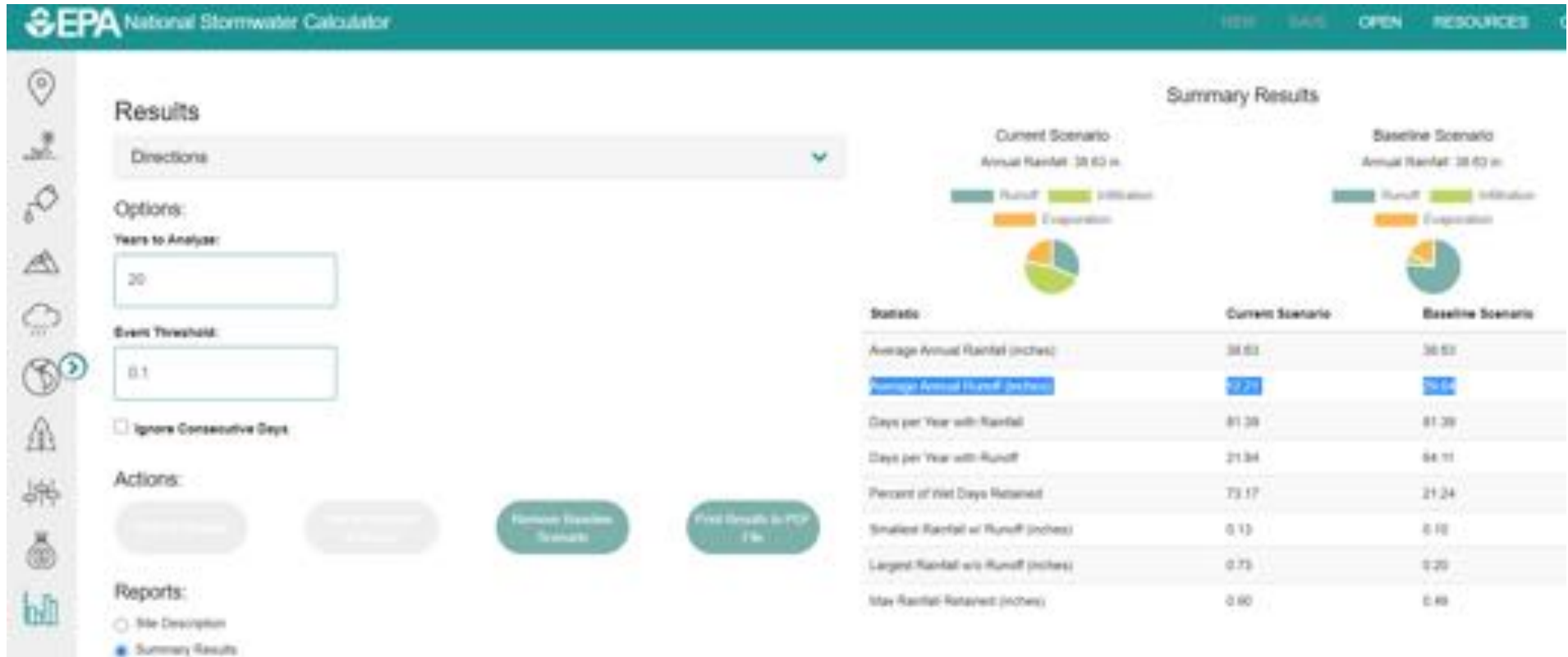
# SWC Analysis: LID: Redevelopment Project

The screenshot displays the EPA National Stormwater Calculator interface. The top navigation bar includes the EPA logo, the text "National Stormwater Calculator", and links for "NEW", "SAVE", "OPEN", "RESOURCES", and "CONTACT".

The main interface is divided into several sections:

- LID Controls Panel (Left):** A vertical sidebar with a "Directions" dropdown menu and sliders for various LID controls: Stormwater, Rain Harvesting, Rain Gardens, Green Roofs, Street Planters, Infiltration Basins, Detachable Pavement, and Design Storm for Testing. A "Link" button is at the bottom.
- Map (Center):** An aerial view of a residential area with a large yellow circular overlay indicating a selected area. Street names "Larkin Ave" and "Alden Ave" are visible, along with the number "237".
- Rain Gardens Panel (Right):** A detailed configuration window for Rain Gardens. It includes:
  - A photograph of a rain garden next to a house.
  - A cross-sectional diagram of a rain garden showing soil layers and vegetation.
  - Text description: "Rain Gardens are shallow depressions filled with an engineered soil mix that supports vegetative growth. They are usually used on individual home lots to capture roof runoff. Typical soil depths range from 6 to 18 inches. The Capture Ratio is the ratio of the rain garden's area to the impervious area that drains onto it." and a "Learn More" link.
  - Adjustable parameters:
    - Ponding Height: 6 in.
    - Soil Media Thickness: 12 in.
    - Soil Media Conductivity: 10 in./hr.
    - % Capture Ratio: 5 %.
  - A checked checkbox for "Pre-Treatment".
  - Buttons at the bottom: "Save for Design Storm", "Save and Return", and "Restore Defaults".

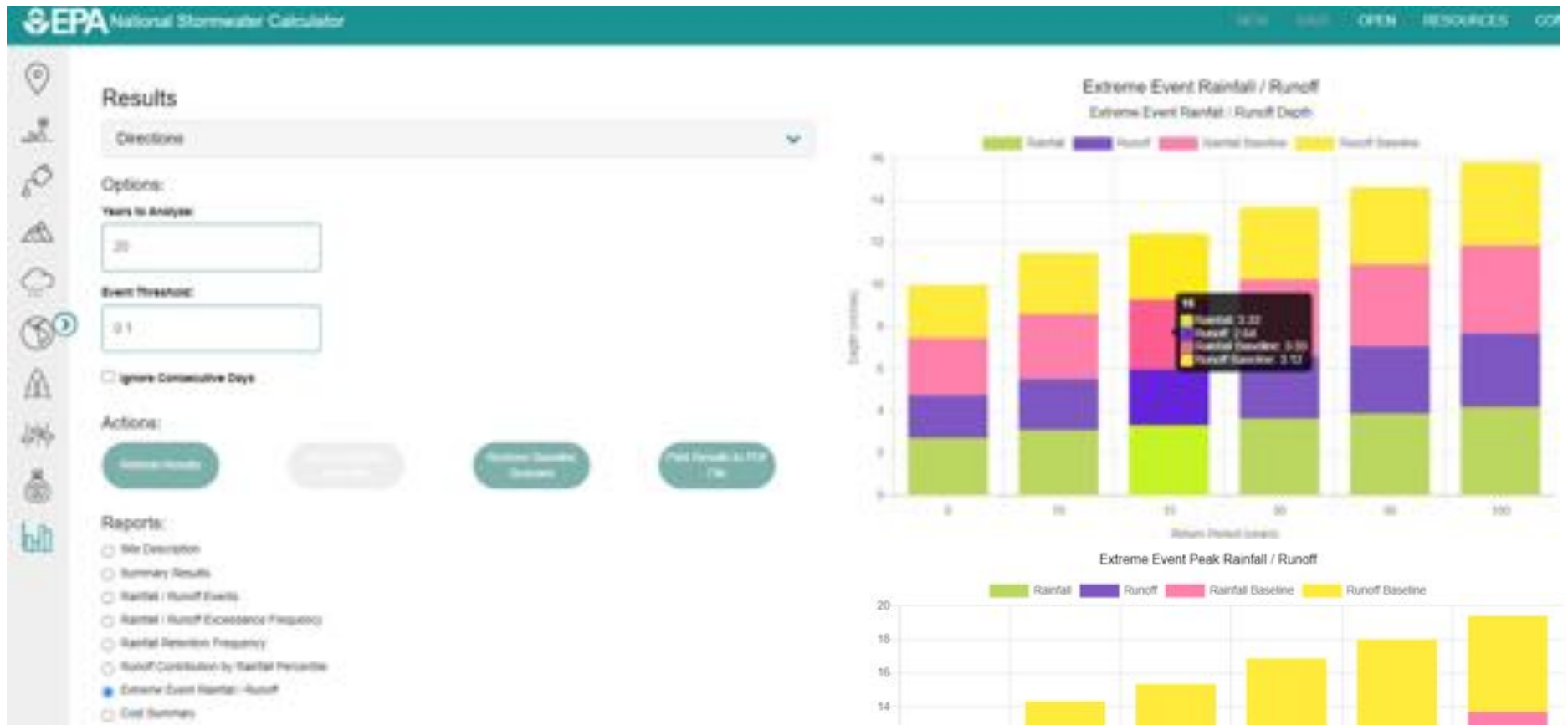
# SWC Analysis: Runoff Reduction Results



**Estimated runoff reduction of 17.43 inches/year ~ 690,457 gal./year**

# SWC Analysis:

## Runoff Results: Extreme Storm Events





# Discussion and Questions

## Thank You!

### **National Stormwater Calculator Website:**

<https://www.epa.gov/water-research/national-stormwater-calculator>

**Contact:** [SWC@epa.gov](mailto:SWC@epa.gov)

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