ACWA 2018 National Stormwater Roundtable:
Feb. 23, 2018

EPA United States Environmental Protection Agency

U.S. EPA National Stormwater Calculator: Cost Module & Mobile Web App

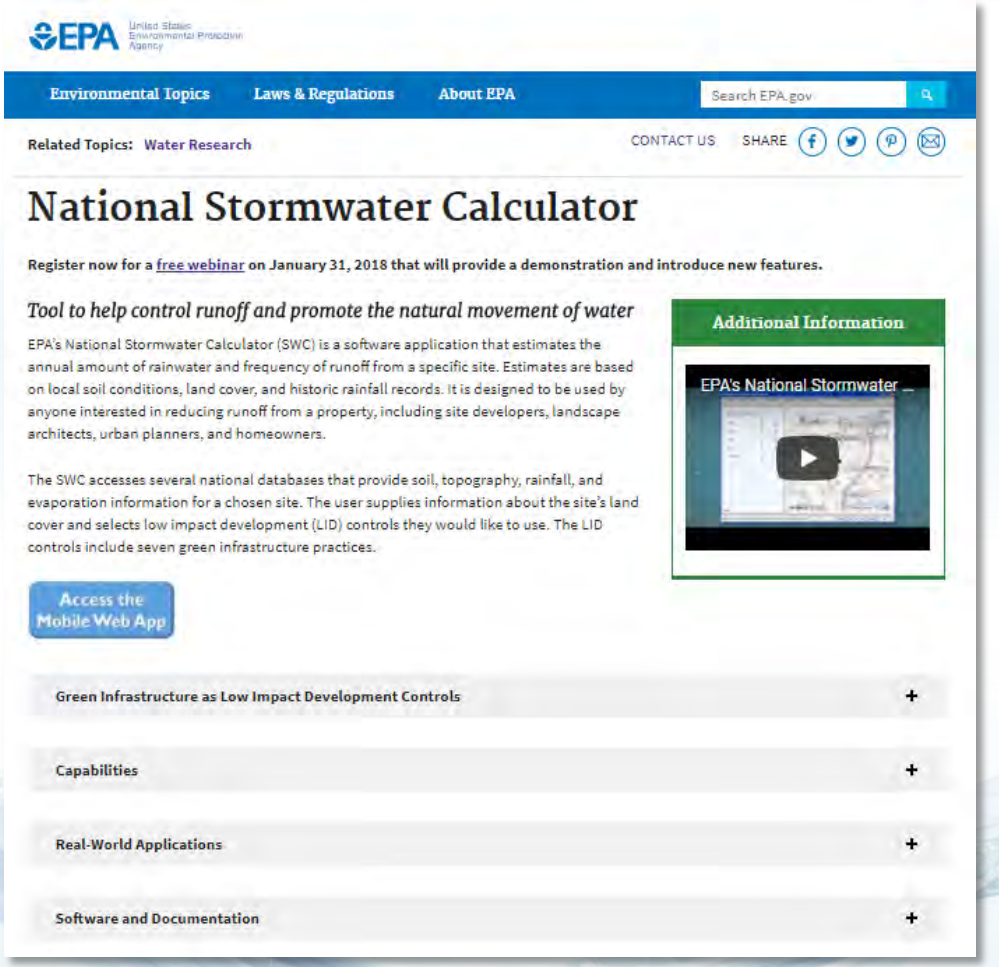
Jason Bernagros
U.S. EPA's Office of Research and Development

Outline

U.S. EPA National Stormwater Calculator

- Stormwater Calculator (SWC) Background Information
- Low Impact Development (LID) Cost Estimation Module
- SWC Web Application
- Example Application: Northport, MI
- Interpreting Results
- Training & Outreach
- Discussion & Questions

National Stormwater Calculator Website



http://www2.epa.gov/water-research/national-stormwater-calculator

What We Developed and Why?

A Stormwater Management (Green Infrastructure/LID) Design and Planning Tool

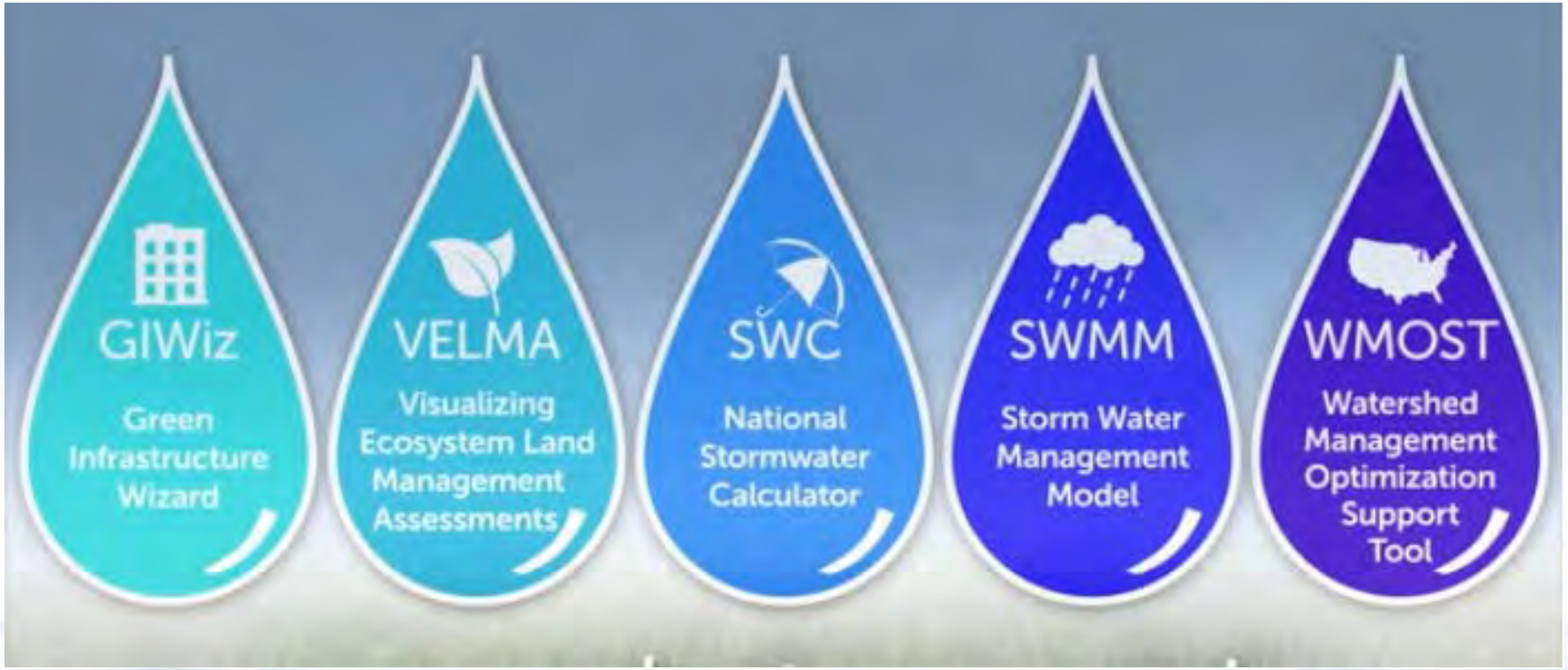
—To estimate post-construction urban stormwater runoff discharges

—Screening-level stormwater runoff reduction and cost analyses of various green infrastructure/LID practices, including:

- Green roofs, rain gardens, cisterns, etc. throughout the U.S.

—Allow non-technical professionals to conduct screening level stormwater runoff for small to medium sized (less than 1 - 12 acres) sites

Green Infrastructure Modeling Toolkit



Toolkit website: https://www.epa.gov/water-research/green-infrastructure-modeling-toolkit

***Toolkit video:** https://www.youtube.com/watch?time_continue=2&v=xHp-OeUneqQ

Potential Applications

- State or MS4 (Municipal Separate Storm Sewer System) Post Construction Stormwater Design Standards
- Voluntary Stormwater Retrofits for private property owners
- LID/Green Infrastructure Design Competitions: DC Water Green Infrastructure Challenge, etc.
- Climate Resiliency Planning: Rockefeller Foundation's 100 Resilient Cities
- Green Building Programs: LEED (U.S. Green Building Council) and Sustainable Sites Initiative stormwater credits

Recent Examples of Urban Stormwater Management Projects: Great Lakes Region

- **Wisconsin:**
  - Manitowoc: rain garden along Blue Rail Marina Beach
  - Oak Creek: porous pavement parking area and bioretention along lakeside bluff

- **Michigan:**
  - Northport: pervious pavement, rain gardens, and tree box filters for Grand Traverse Bay

- **Indiana:**
  - Michigan City: green infrastructure streetscape (rain gardens & bioswales)

Communities using the SWC

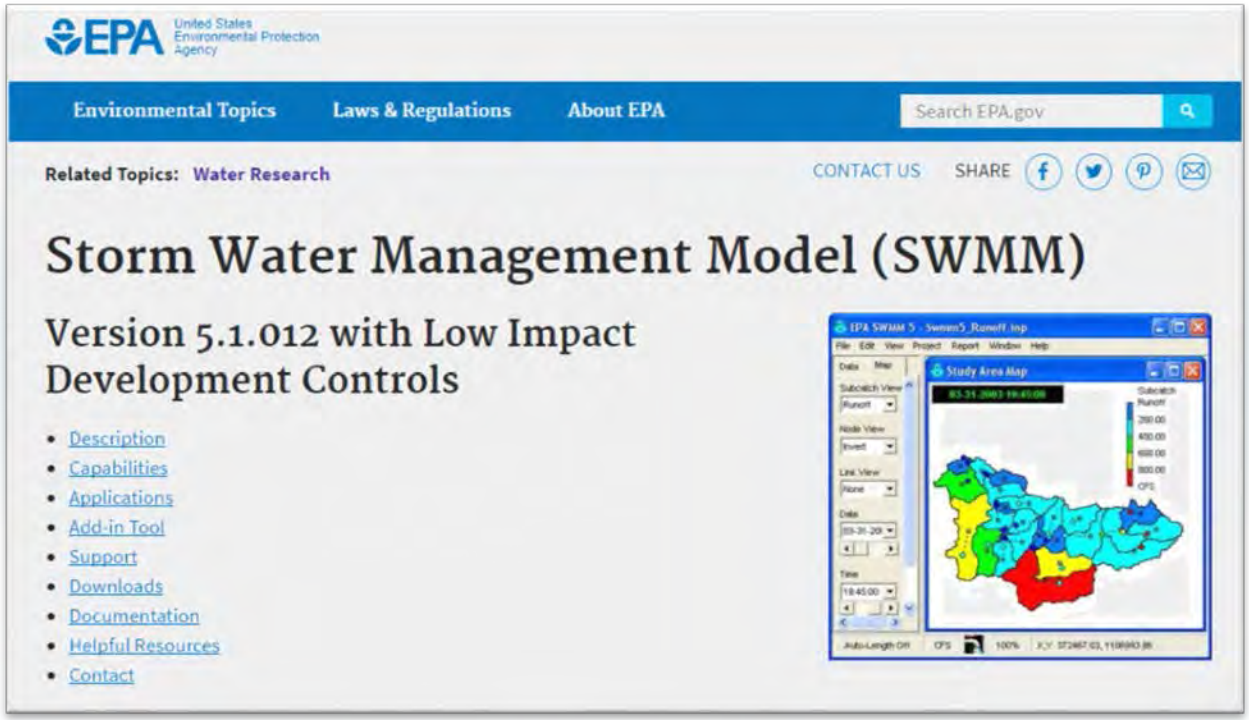
- Northeastern Regional Ohio Sewer District (Cleveland, OH):

https://www.neorsd.org/stormwater-2/green-infrastructure-grant-program

- EPA's Green & Complete Streets Building Blocks Program Recipients (2016- 2017):
  - Manatee County, FL
  - Baltimore, MD
  - Central Falls, RI

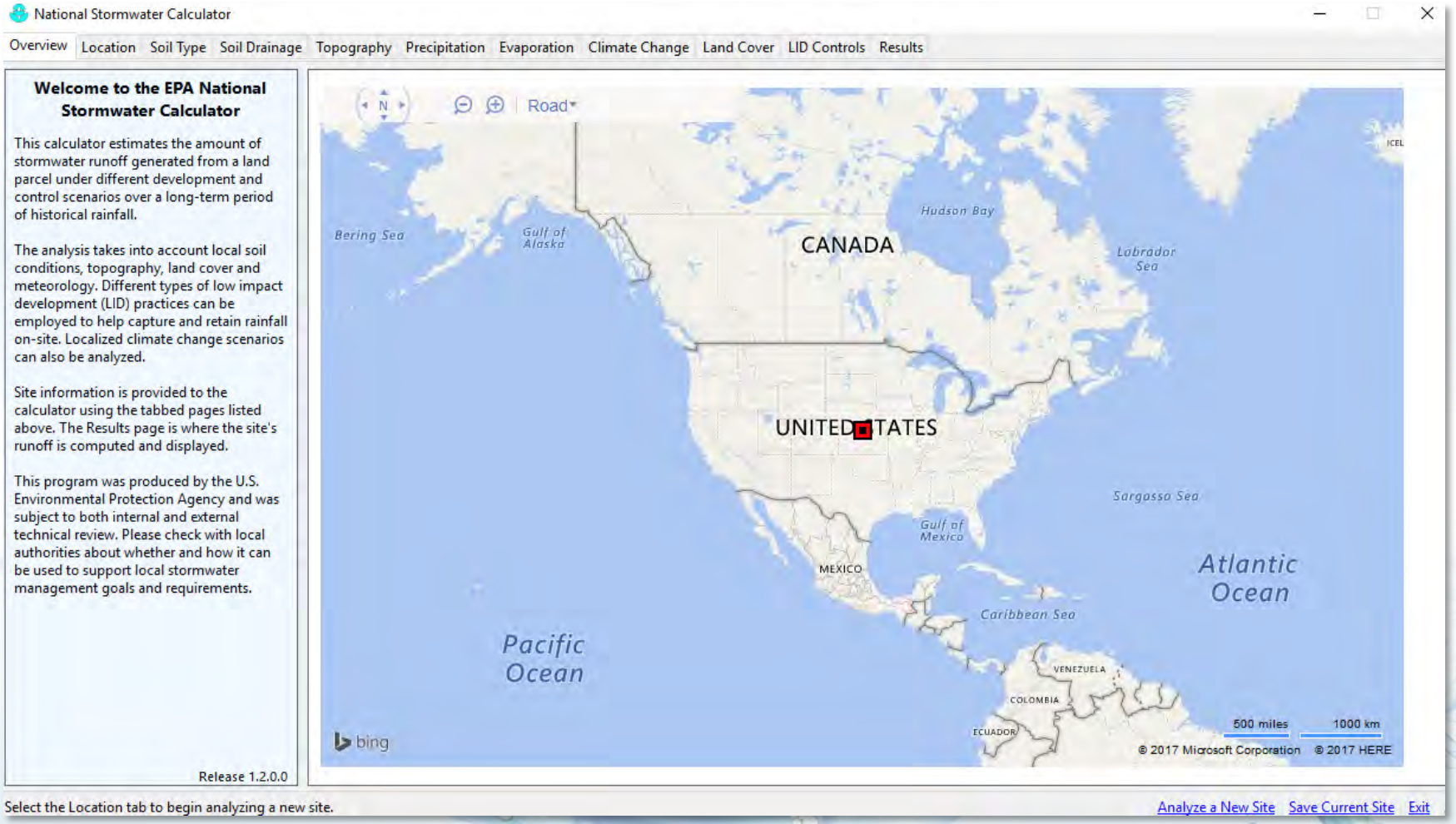
https://www.epa.gov/smartgrowth/building-blocks-sustainable-communities

Storm Water Management Model (SWMM)

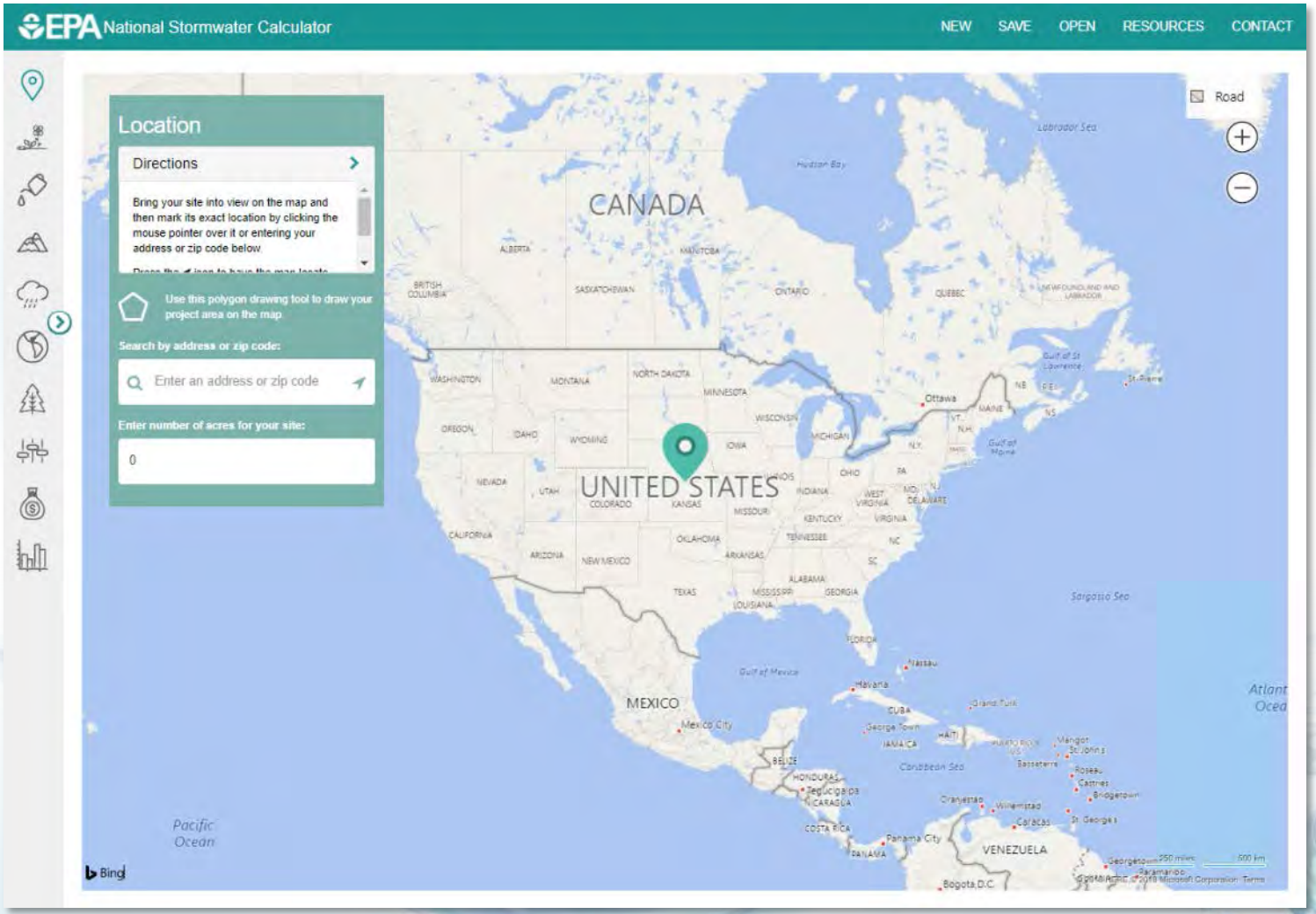


- SWC is based on SWMM: dynamic rainfall-runoff simulation model for long-term simulation of runoff quantity
- SWMM produces stormwater runoff estimates in the background of the SWC

National Stormwater Calculator (SWC) Desktop Application



SWC Mobile Web App



Web App Link: https://swcweb.epa.gov/stormwatercalculator

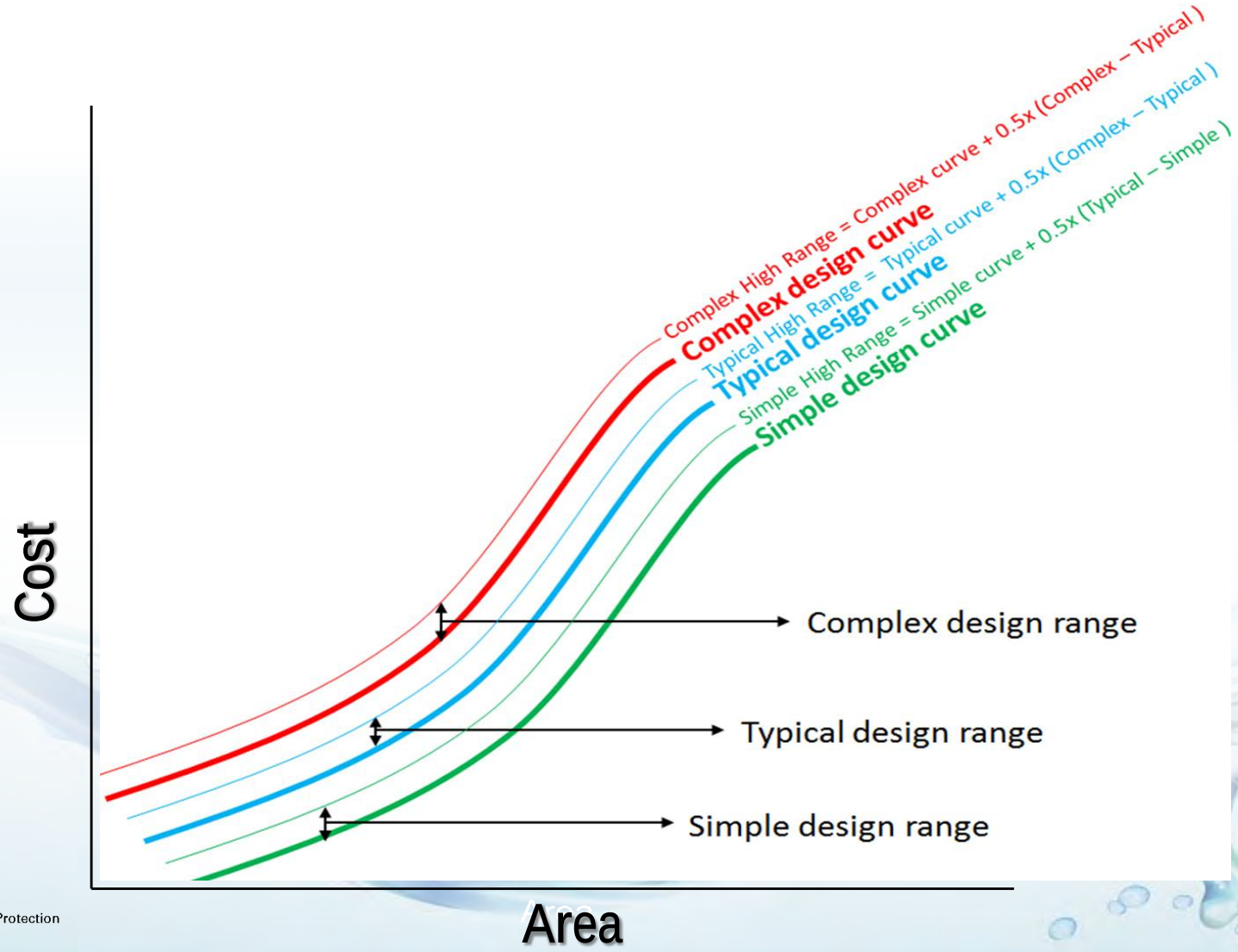
LID Cost Estimation Module (Released May 2017):

- **Intended Uses:**
  - Planning level cost estimates (magnitude of costs between planning scenarios)

- **Limitations:**
  - Doesn't provide final construction costs
  - Doesn't provide lifecycle costs (gives annual operation and maintenance (O & M) costs, not replacement costs)
  - Regional costs not available for all areas of the US (many of the Western states)

LID Cost Estimation Module:

Accounting for Uncertainty with Cost Estimates (Regression Cost Curves)

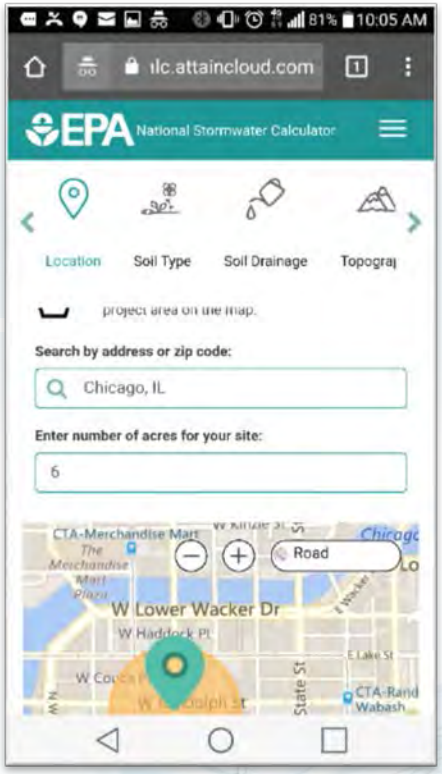


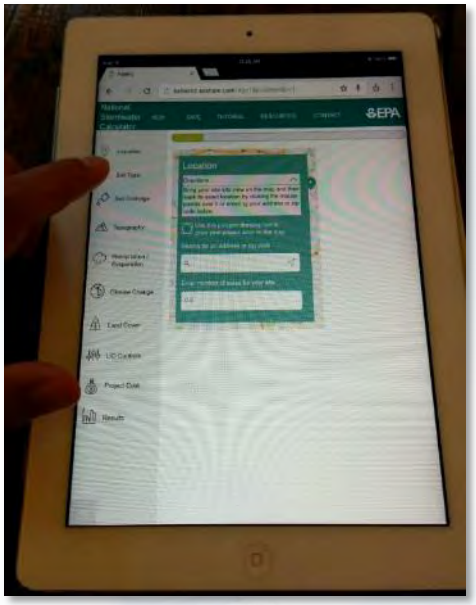
LID Cost Estimation Module:
Development of Regionalized LID/Green Infrastructure Costs

- **Utilization of Bureau of Labor Statistics (BLS) Data for regional costs**
  - *National Producer Price Index*: outputs of service, construction, utilities, and other goods producing entities
    - Examples include: concrete storm sewer pipe, construction sand and gravel, etc.
  - *Consumer Price Index*: regional/city data (23 major US cities)
    - Examples include: fuels and utilities, energy, and diesel fuel
- **Data easily updated and maintained annually by EPA**
- **Development of regional costs comparable to Engineering News Record (ENR) and RS Means**

Release of SWC Web App Sept. 2017

- **Ability to function on any web browser**
- **Mobile friendly design (tablets and smartphones)**
- **Platform neutral: functions on Windows, Apple, and Linux computers**
- **Not found in an "app store" (Google Play or Apple Store)**
  - **Save it as a "favorite" website**
- ***Requires a live Internet connection***

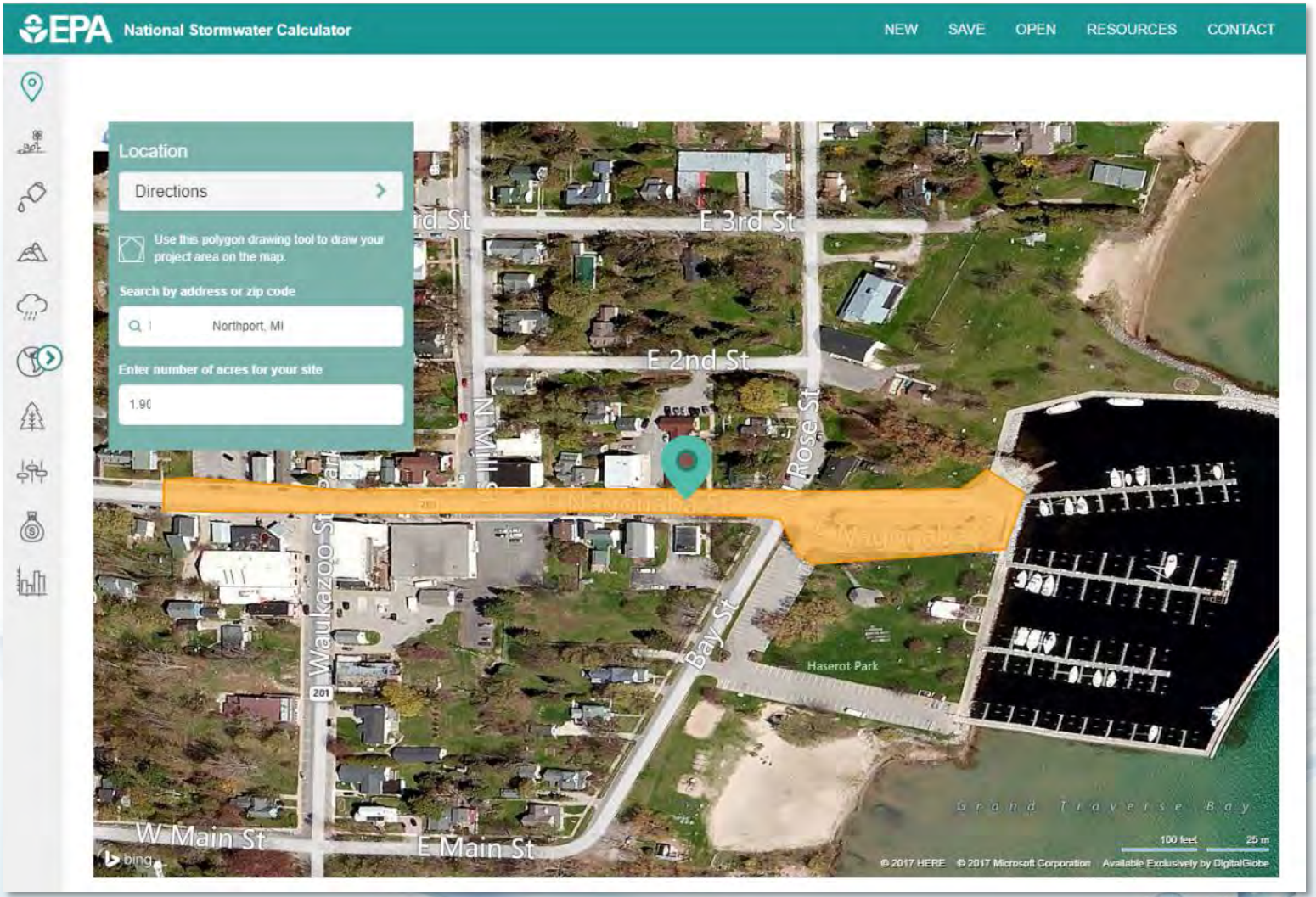




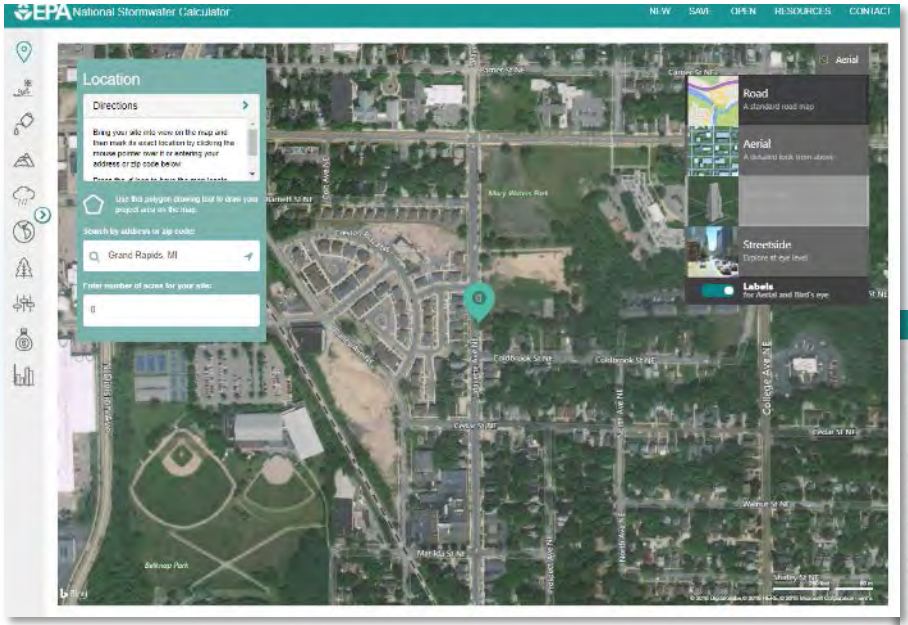
Example views from smartphone and tablet

SWC Mobile Web App Application (Northport, MI)

Location:

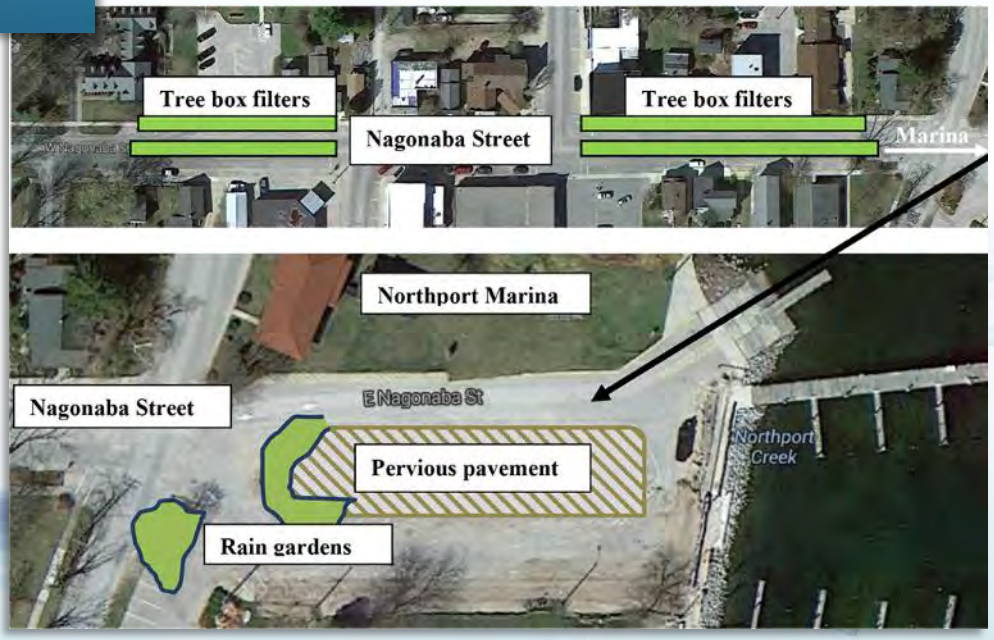


Bing Maps:
*new streetside view for major urban areas



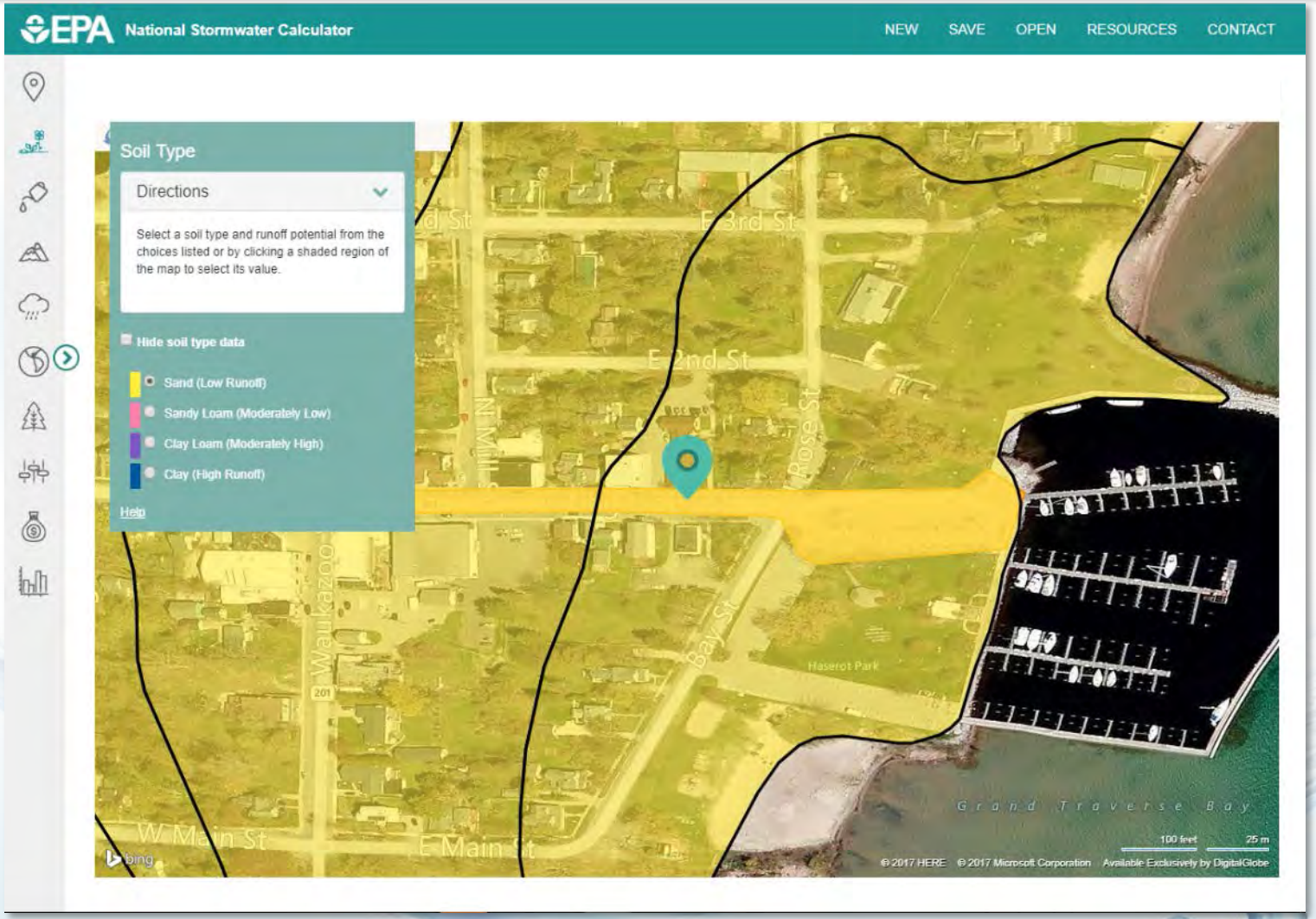
SWC Mobile Web App Application (Northport, MI)

The Watershed Center Grand Traverse Bay (2016)

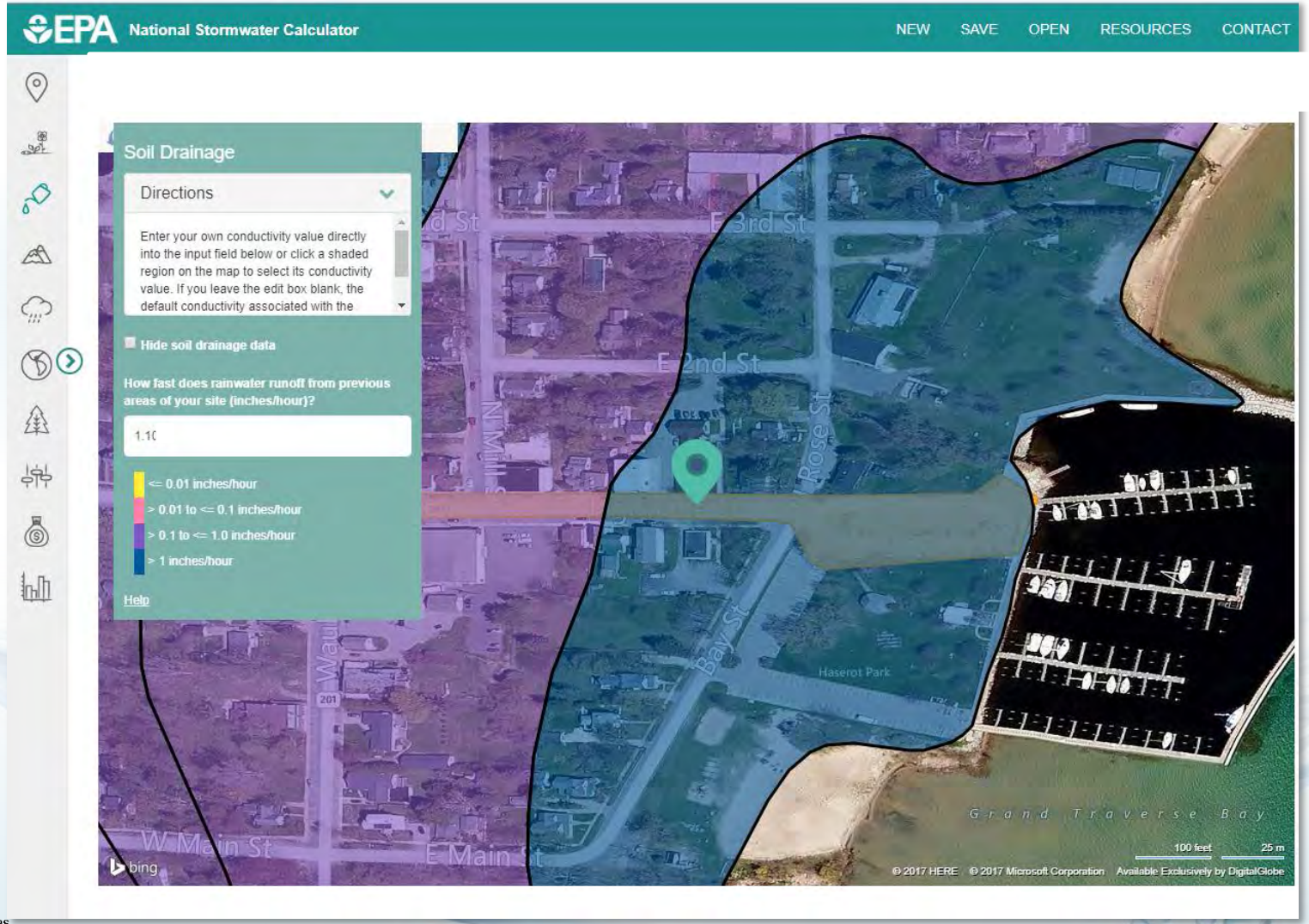


EPA United States Environmental Protection Agency

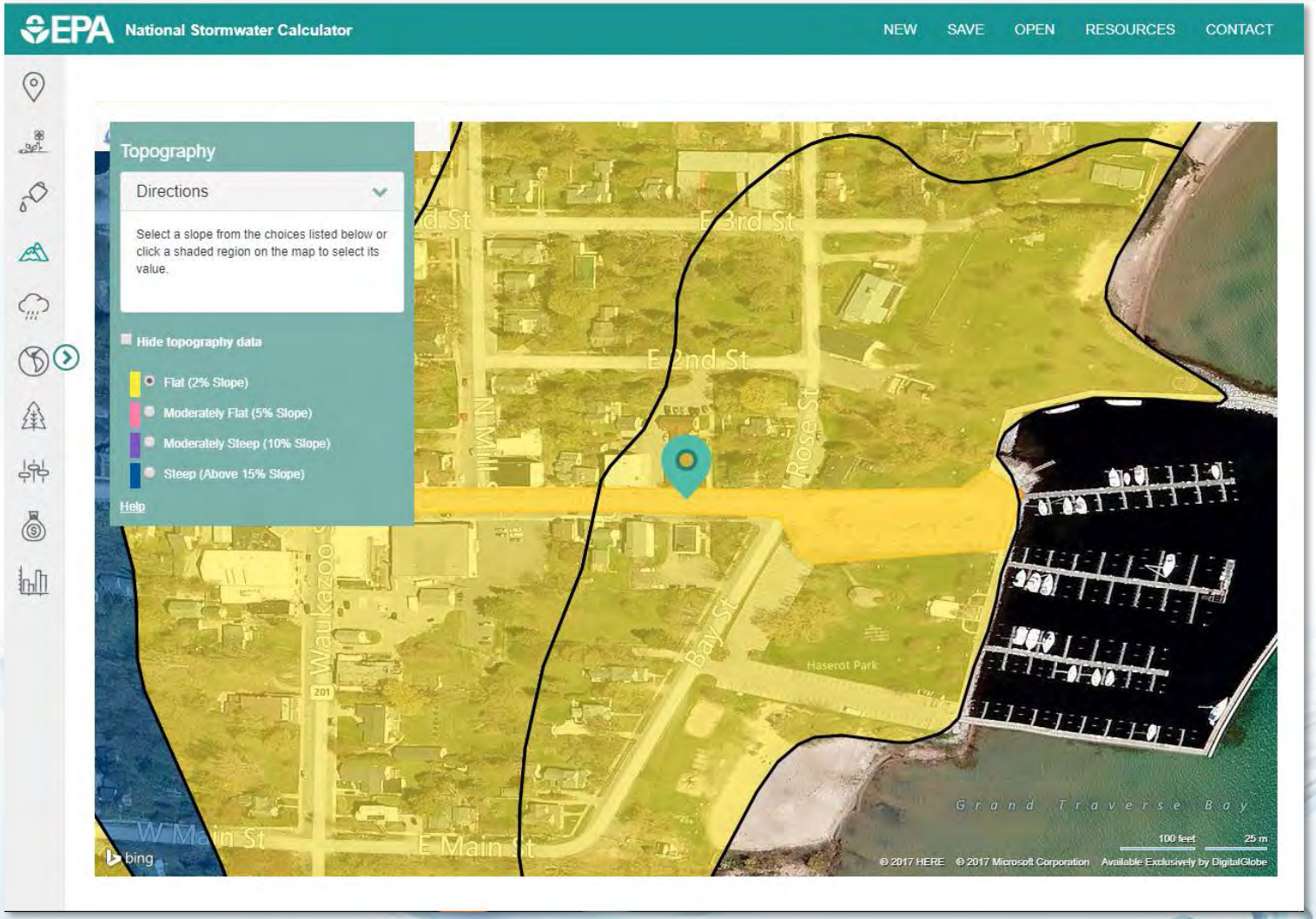
Soil Runoff Potential:



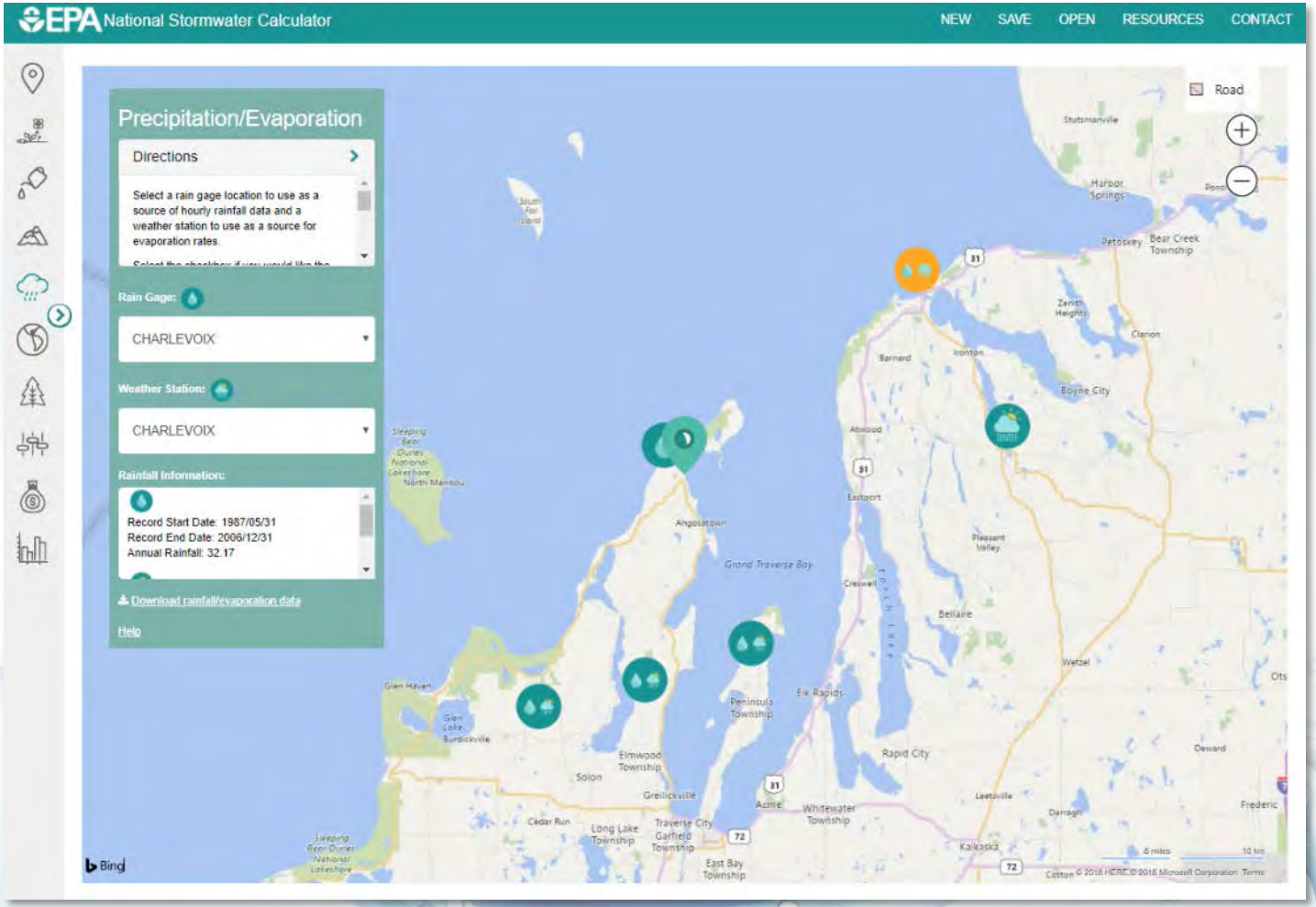
Soil Infiltration Capacity:



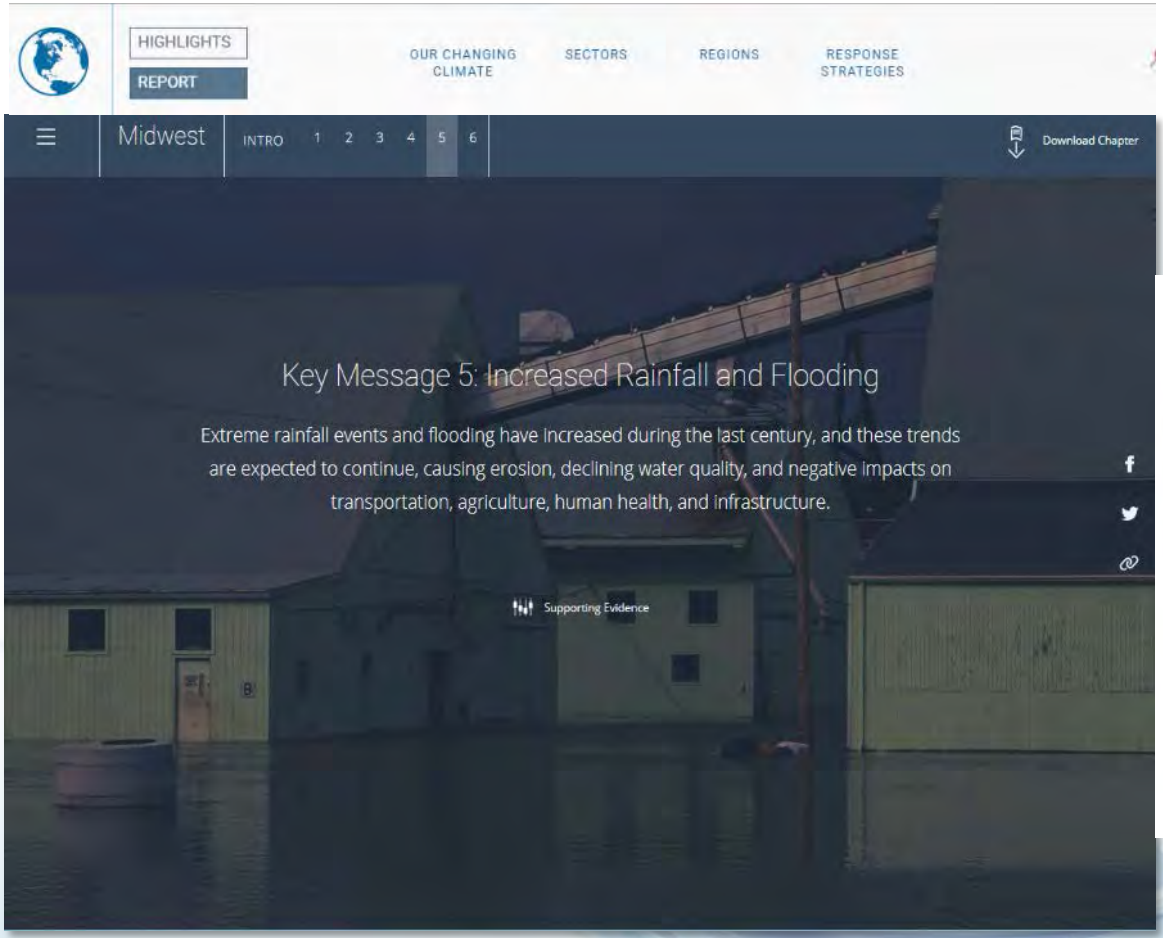
Topography/Slope:

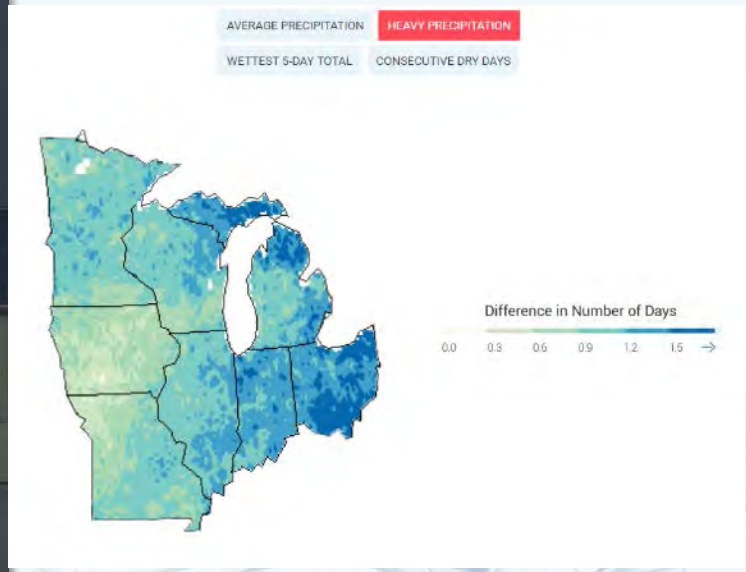


Historical Weather (precipitation & evaporation):



Climate Change Scenarios & Extreme Storm Events:





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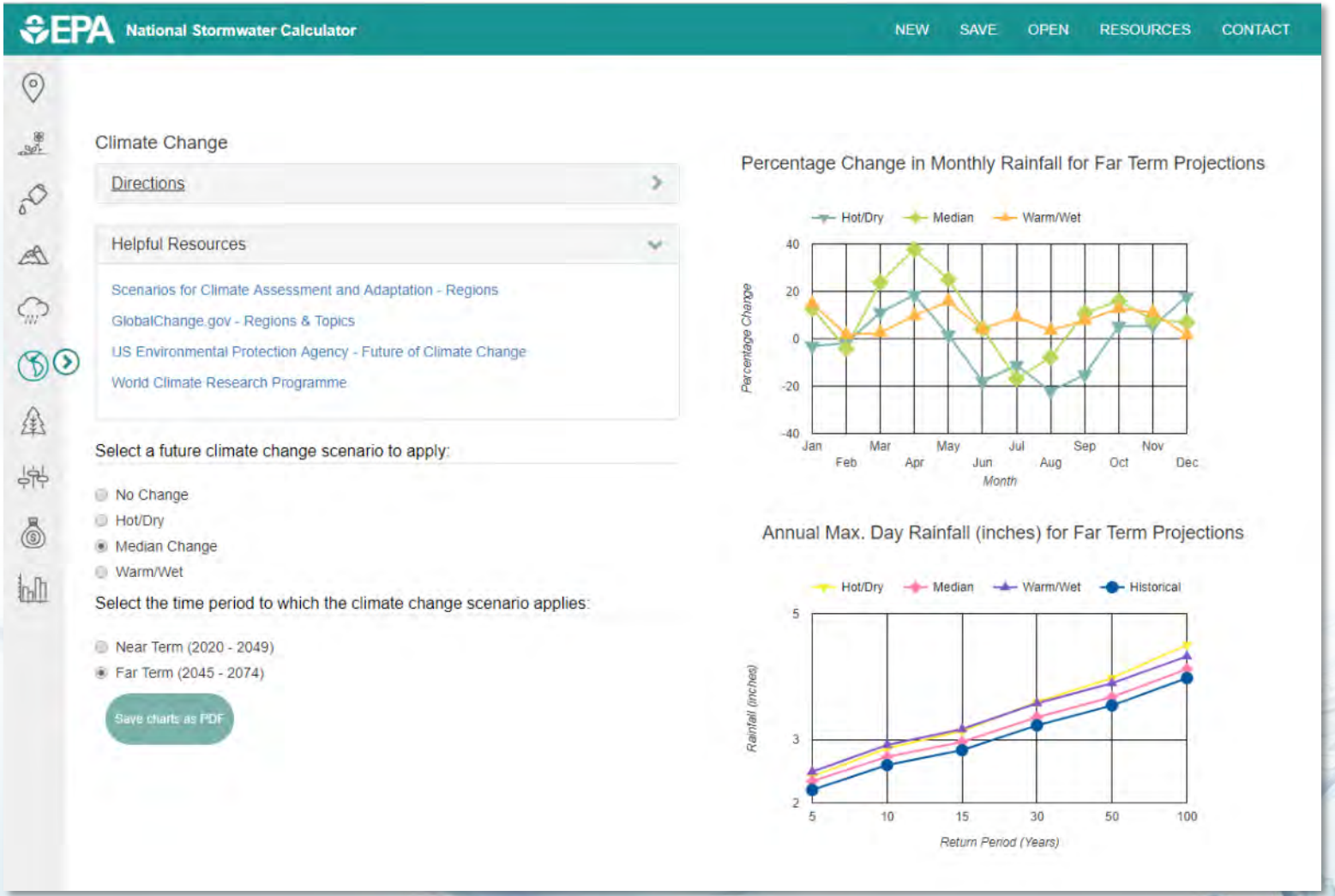
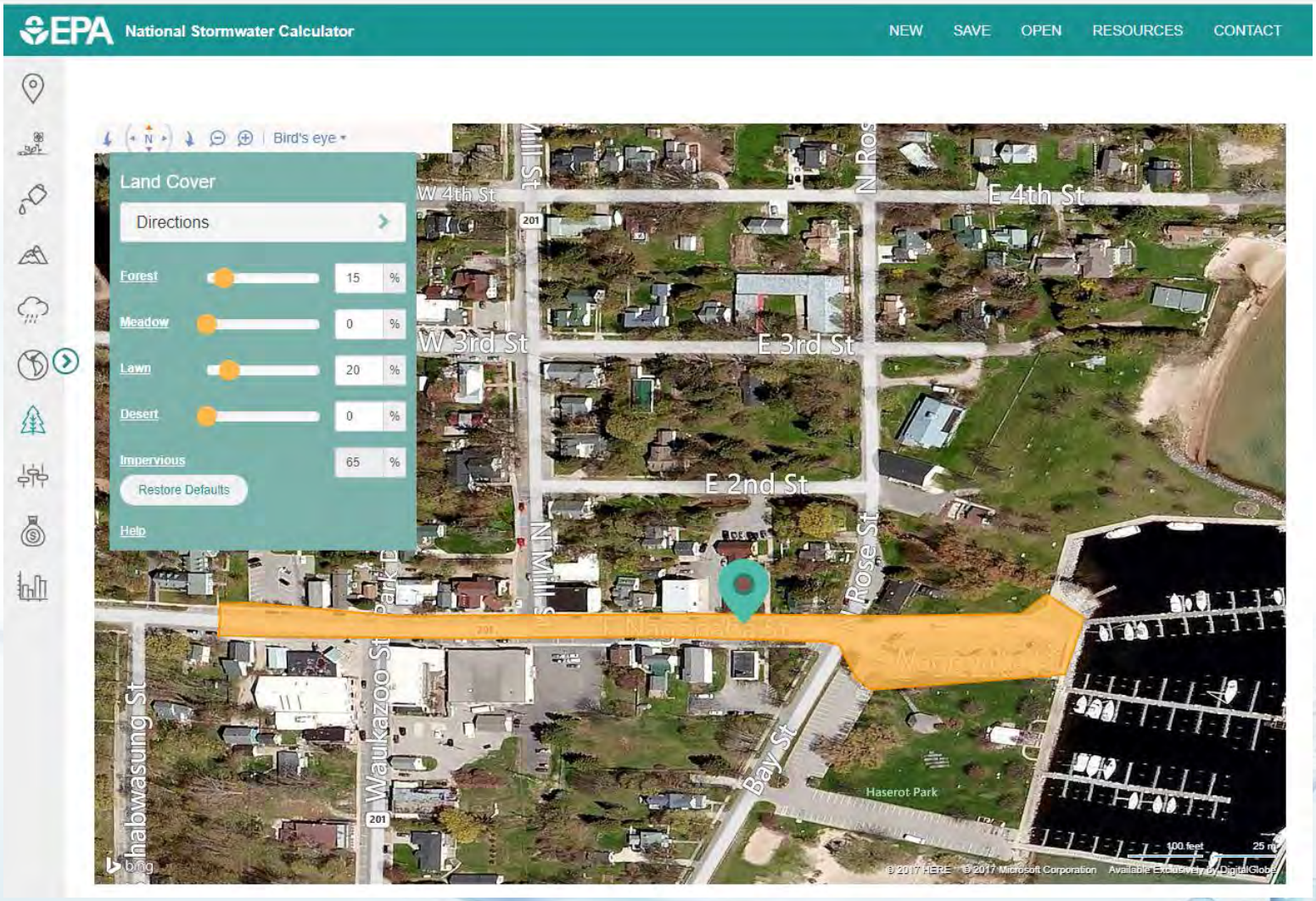
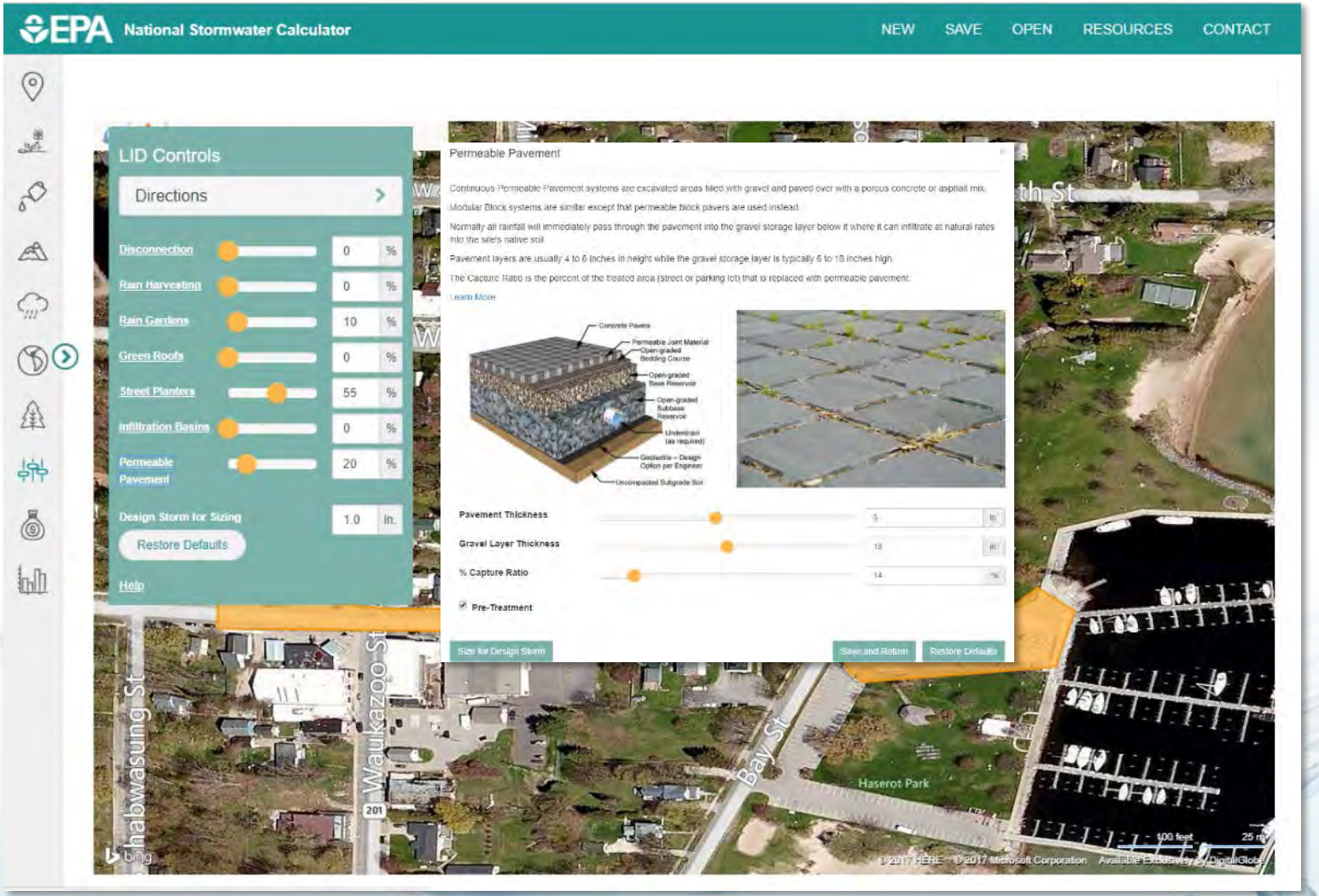


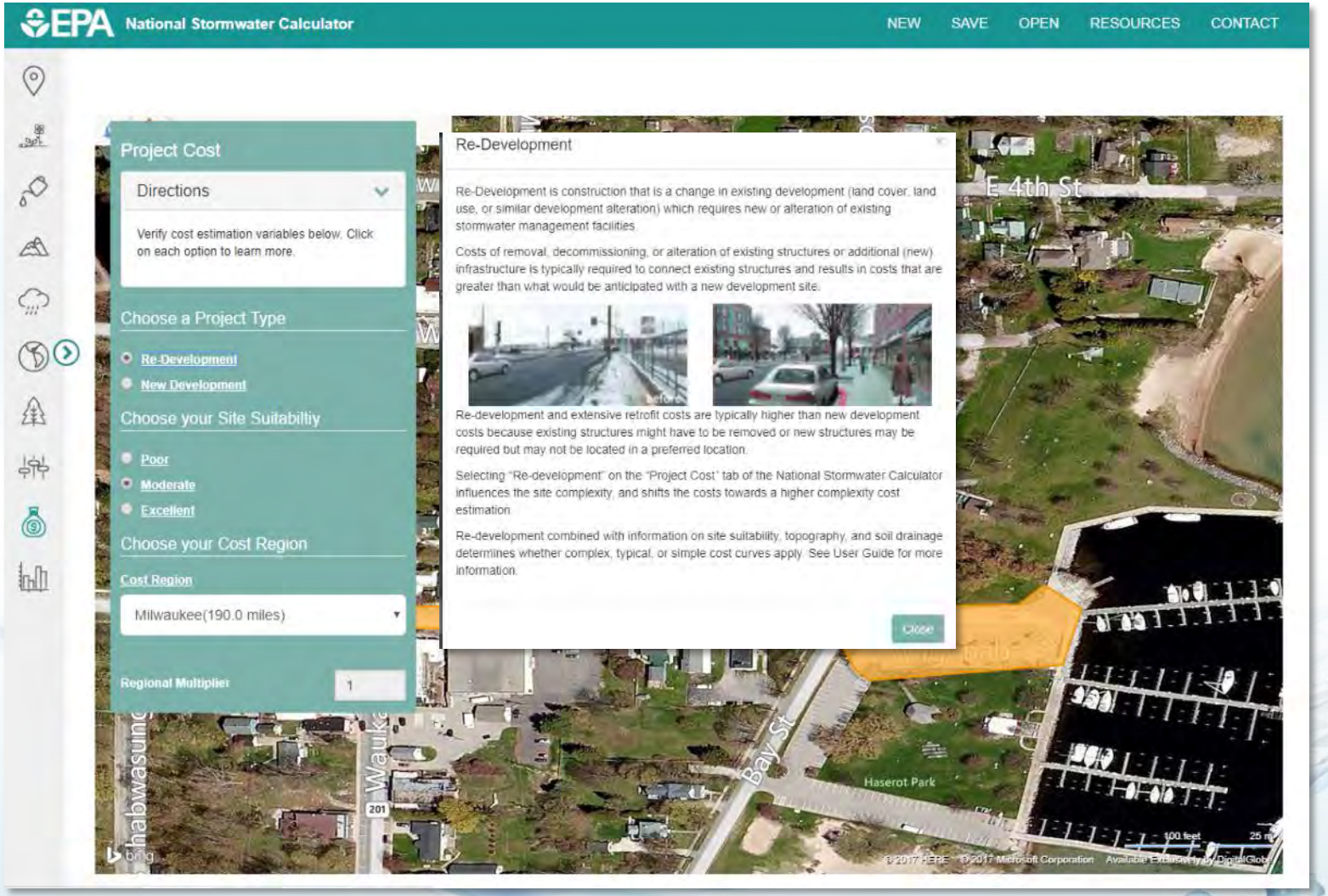
Land Cover:


EPA National Stormwater Calculator
NEW
SAVE
OPEN
RESOURCES
CONTACT
Bird's eye
Land Cover
Directions
Forest 15 %
Meadow 0 %
Lawn 20 %
Desert 0 %
Impervious 65 %
Restore Defaults
Help
W 4th St
E 4th St
W 3rd St
E 3rd St
E 2nd St
N Rose St
Waukazoo St
Bay St
Haserot Park
201
100 feet
25 m
© 2017 HERE © 2017 Microsoft Corporation

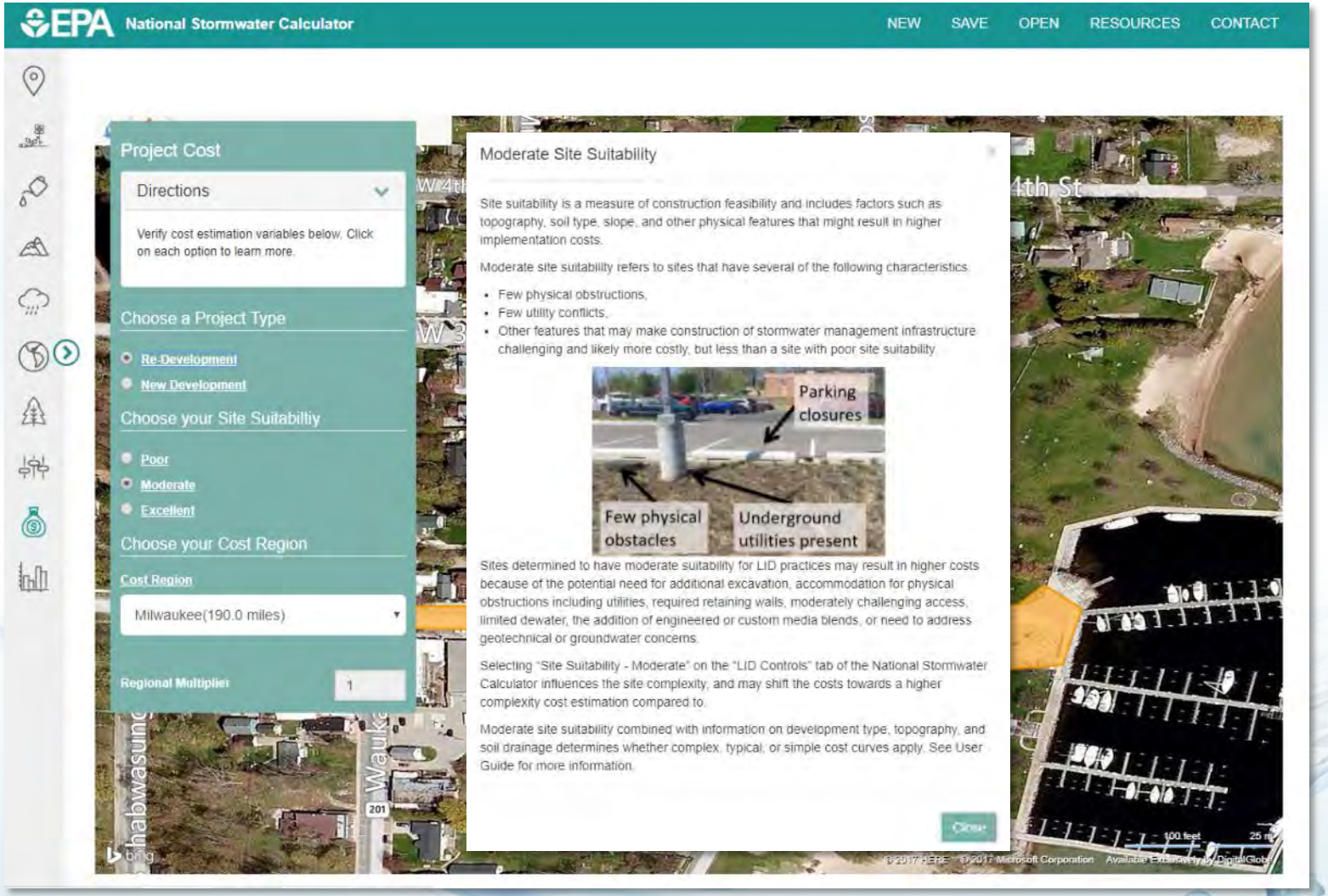
LID Controls:



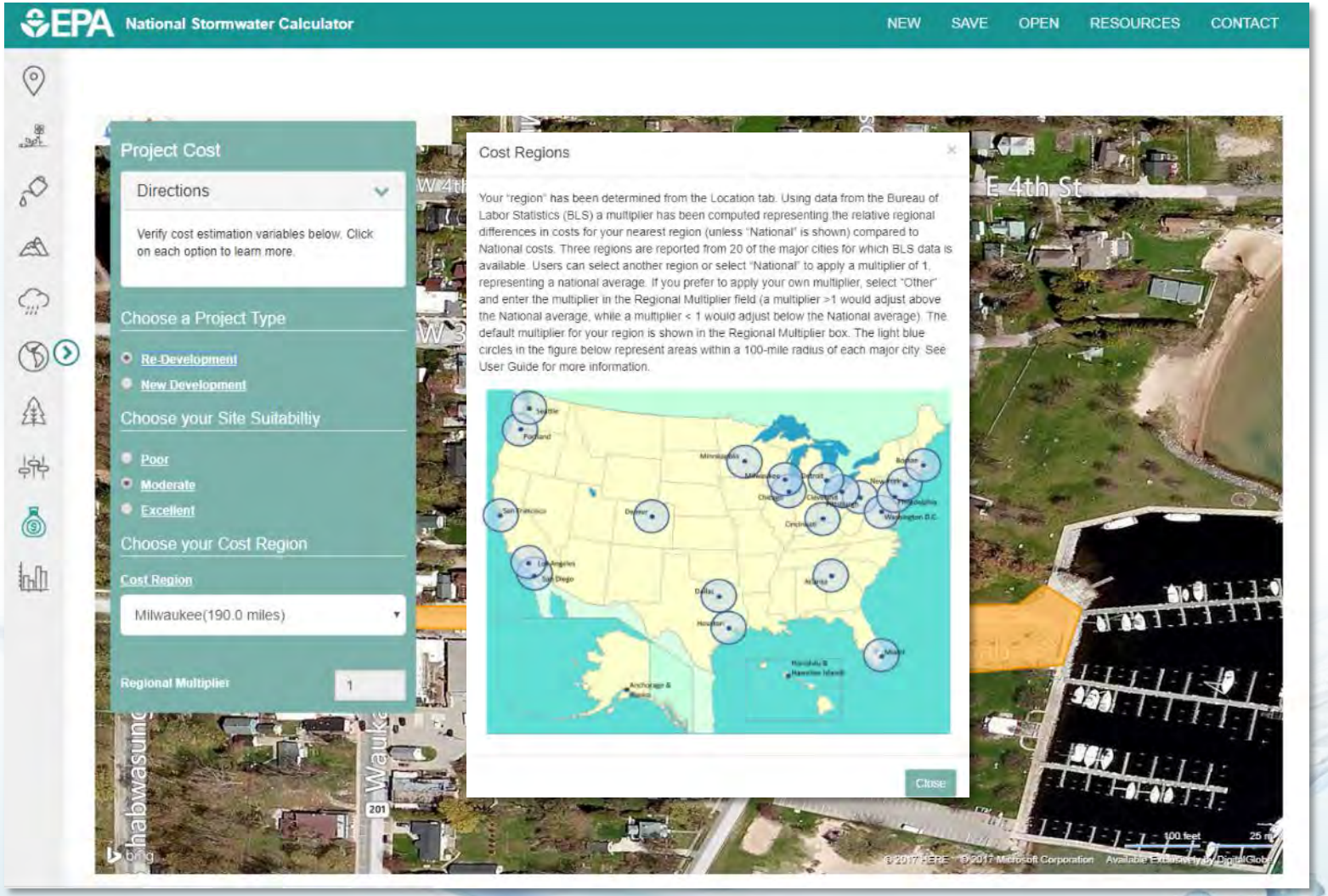
Project Cost (Development Type):



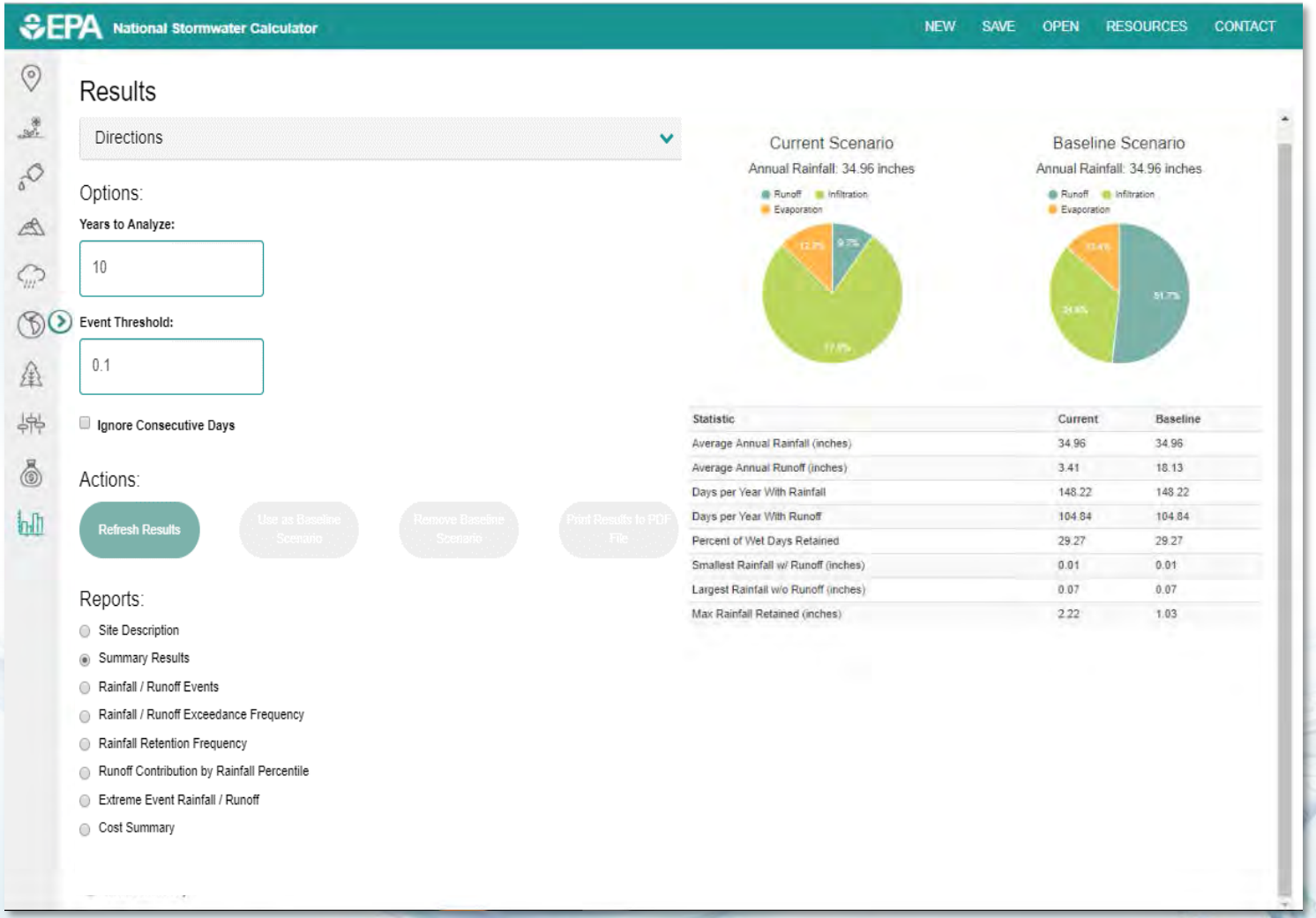
Project Cost (Site Suitability):



Project Cost (Bureau of Labor Statistics Cost Region):

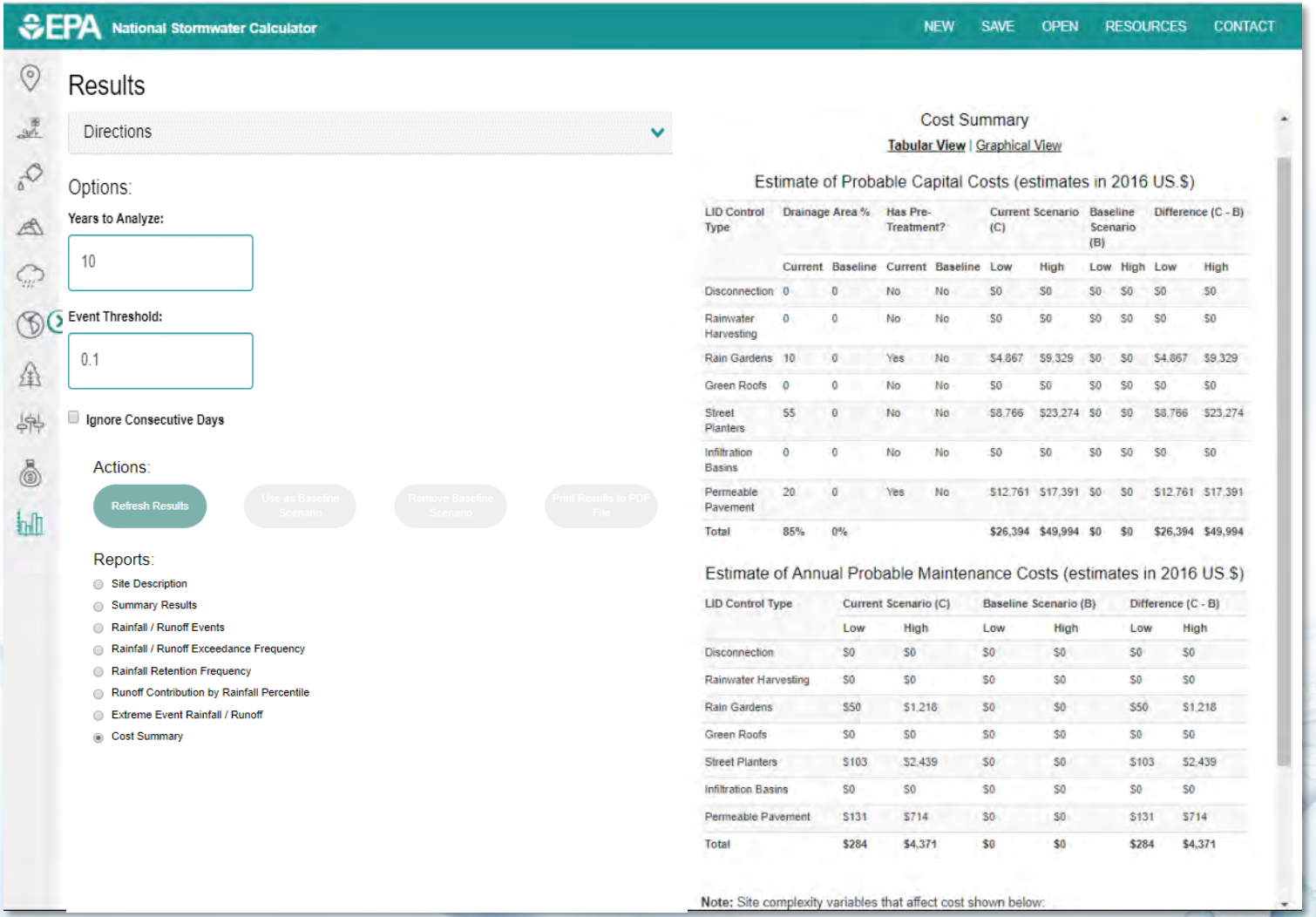


Results (Summary):



Statistic	Current	Baseline
Average Annual Rainfall (inches)	34.96	34.96
Average Annual Runoff (inches)	3.41	18.13
Days per Year With Rainfall	148.22	148.22
Days per Year With Runoff	104.84	104.84
Percent of Wet Days Retained	29.27	29.27
Smallest Rainfall w/ Runoff (inches)	0.01	0.01
Largest Rainfall w/o Runoff (inches)	0.07	0.07
Max Rainfall Retained (inches)	2.22	1.03

Results (Cost Summary):



Interpreting the Results

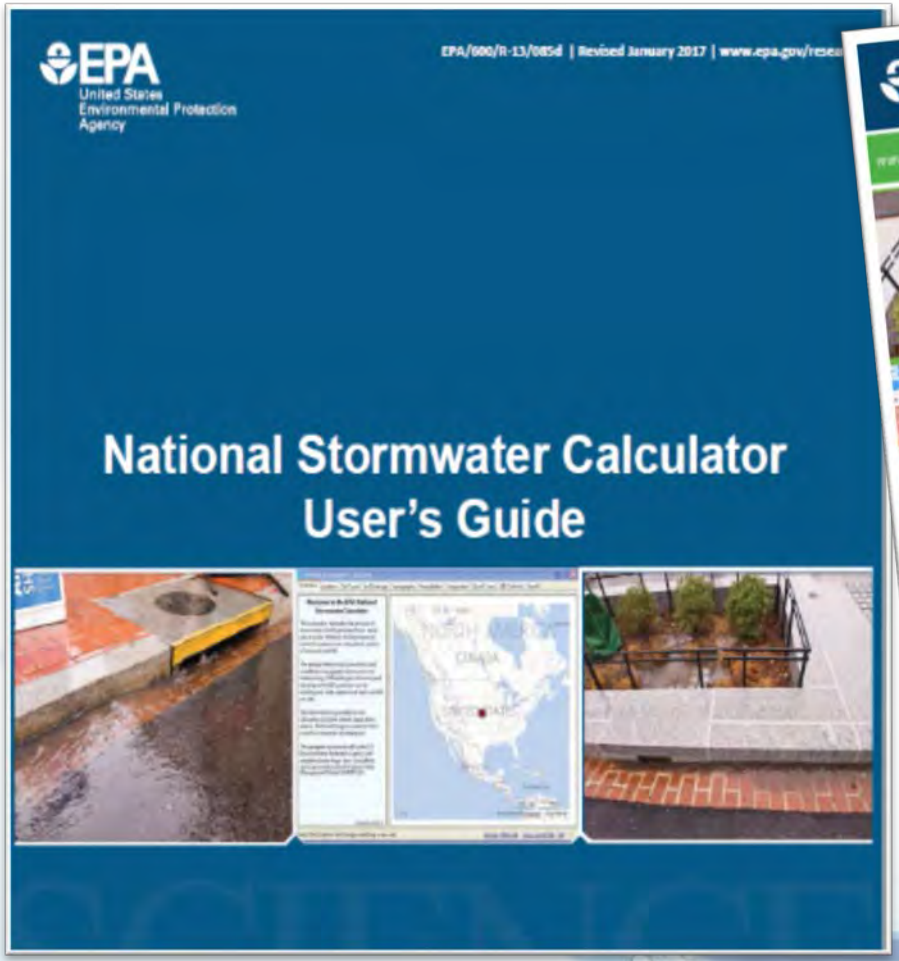
- Informing next steps for finalizing costs of stormwater projects and construction plans/designs
- Comparing the relative magnitude of planning level costs for different stormwater management solutions
  - —Finding least cost option(s) while meeting performance goals
- Comparisons may be made between national and regional cost estimates:
  - —Using local knowledge in selection of regional BLS cost multipliers

SWC Analysis: Potential Next Steps

- Sharing planning results with decision-makers
- Applying for funding
- Developing construction plans/designs

http://news.maryland.gov/dnr/2017/06/29/over-800000-announced-to-support-local-green-infrastructure-projects-to-improve-communities-and-provide-jobs/

Training and Outreach Materials: User's Guide & Fact Sheet



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Discussion and Questions
Thank You!

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National Stormwater Calculator Website:
https://www.epa.gov/water-research/national-stormwater-calculator

Contact: SWC@epa.gov

SWC:
Site Parameters and Embedded GIS Data-sets

- **Location:** Bing Maps
- **Soils:** NRCS SSURGO *(web service)*
- **Slope:** NRCS SSURGO
- **Hydraulic Conductivity:** NRCS SSURGO
- **Precipitation and Temperature:** National Climate Center (NCDC)-NOAA *(EPA's BASINS Model)*
- **Evaporation:** Calculation based on meteorological data
- **Climate Change Future Scenarios:** Precipitation & evaporation *(EPA's CREAT 2.0)*
- **Land-Cover/Use:** User provided
- **LID Practices (*new costing module available*):** User provided