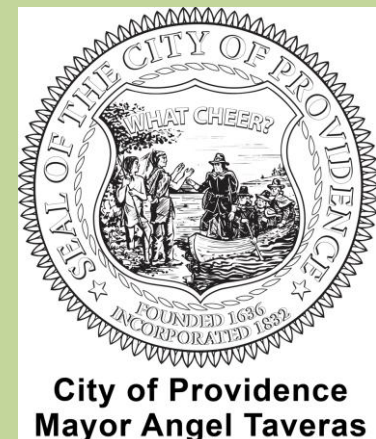


Mashapaug Pond Green Infrastructure Education and Outreach Project

***A collaborative partnership with EPA, City of
Providence, RIDEM, and others!***

April 15, 2014



The Problem - Stormwater Runoff

Stormwater runoff is a major cause of water pollution in urban areas. When rain falls on our roofs, streets, and parking lots – i.e., **Impervious Cover (IC)** - the rain cannot soak into the ground; instead it drains to and through engineered collection systems and is discharged into nearby water bodies delivering trash, bacteria, heavy metals, and other pollutants from the urban landscape, degrading the quality of the receiving waters.

Providence, RI – NASA Satellite Images

Visible Light



Surface Heat

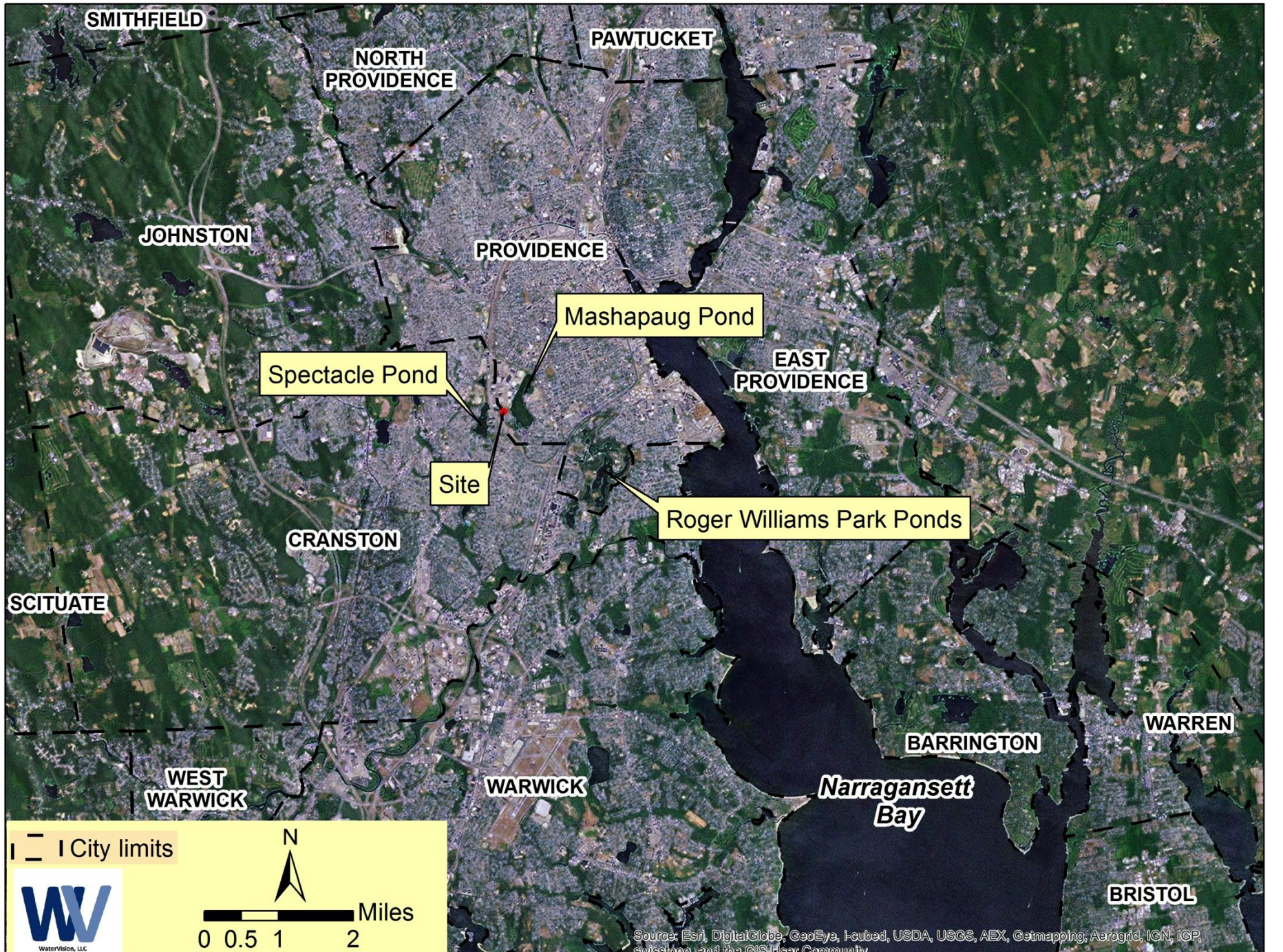


Developed Land



Vegetation Cover





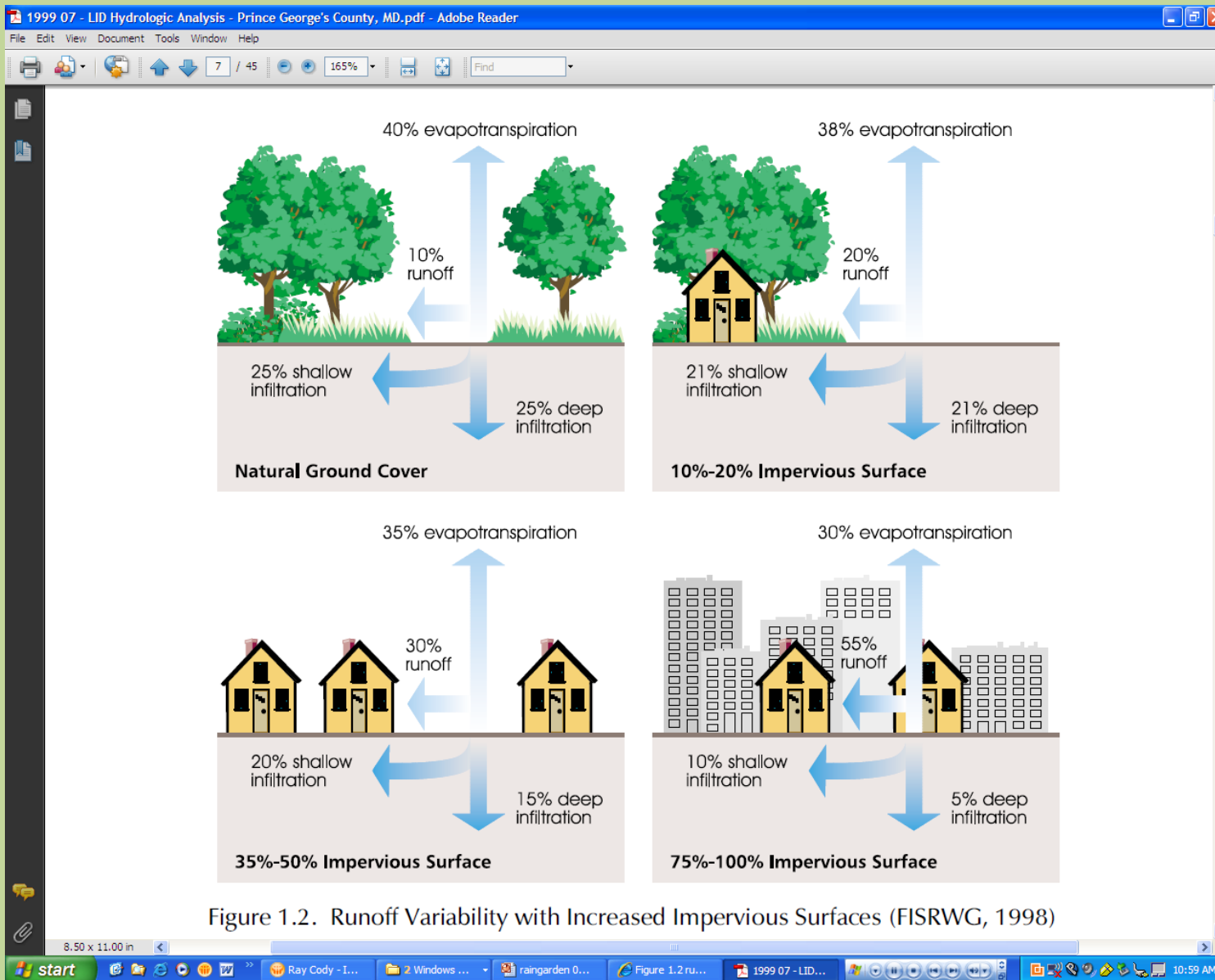
City limits

Miles

0 0.5 1 2

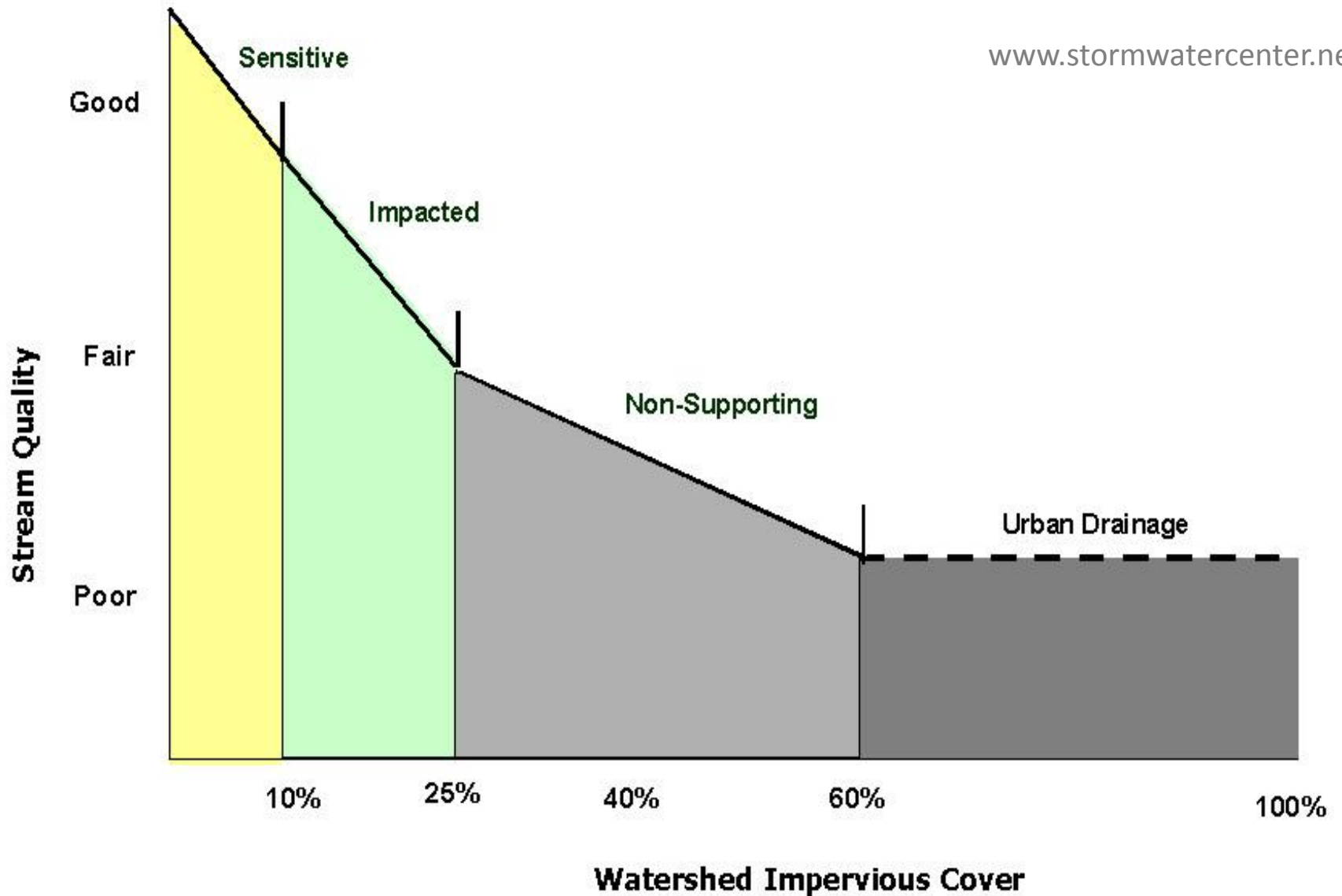
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Why does Impervious Cover matter?



Impact of Impervious Cover

www.stormwatercenter.net



Impervious Cover - More than stream quality . . .

- **Hydrology** – e.g., flooding (frequency and severity)
- **Geomorphology** – e.g., soil and stream bank erosion
- **Nutrients** – e.g., phosphorus, nitrogen → algae blooms
- **Bacteria** – beach closures
- **Chloride** – road salt
- **Thermal Impacts** - stream temperature, ‘Urban Heat Island’ Effect
- **Aquatic habitat** - fish, macroinvertebrates, birds, mammals
- **Groundwater** - aquifer replenishment

Mashapaug Pond

- **Highly developed** and **highly impervious**
- **Impaired** - low dissolved oxygen and excess phosphorus
- **Downstream** Roger Williams Park Ponds received excess nutrient loadings from the upper watershed areas
- Several studies including the 2007 Mashapaug Pond **TMDL** (RIDEM 2007) and the RWPP **Water Quality Management Plan** (HWG, 2013) found that green infrastructure projects (e.g., stormwater system retrofits) are needed to restore the watershed and ponds.



Green Infrastructure – A Solution

Unlike single purpose gray stormwater infrastructure which uses pipes to dispose of rainwater, green infrastructure (GI) **best management practice (BMP)** techniques use vegetation and soil to manage rainwater where it falls.

By weaving natural processes into the built environment, GI provides not only stormwater management, but also flood mitigation, air quality management, and much more.

The Green Infrastructure Approach at Mashapaug Pond

- ‘Disconnect’ the impervious cover (IC)
- Design a BMP to capture a 1 inch storm. Here’s why ...

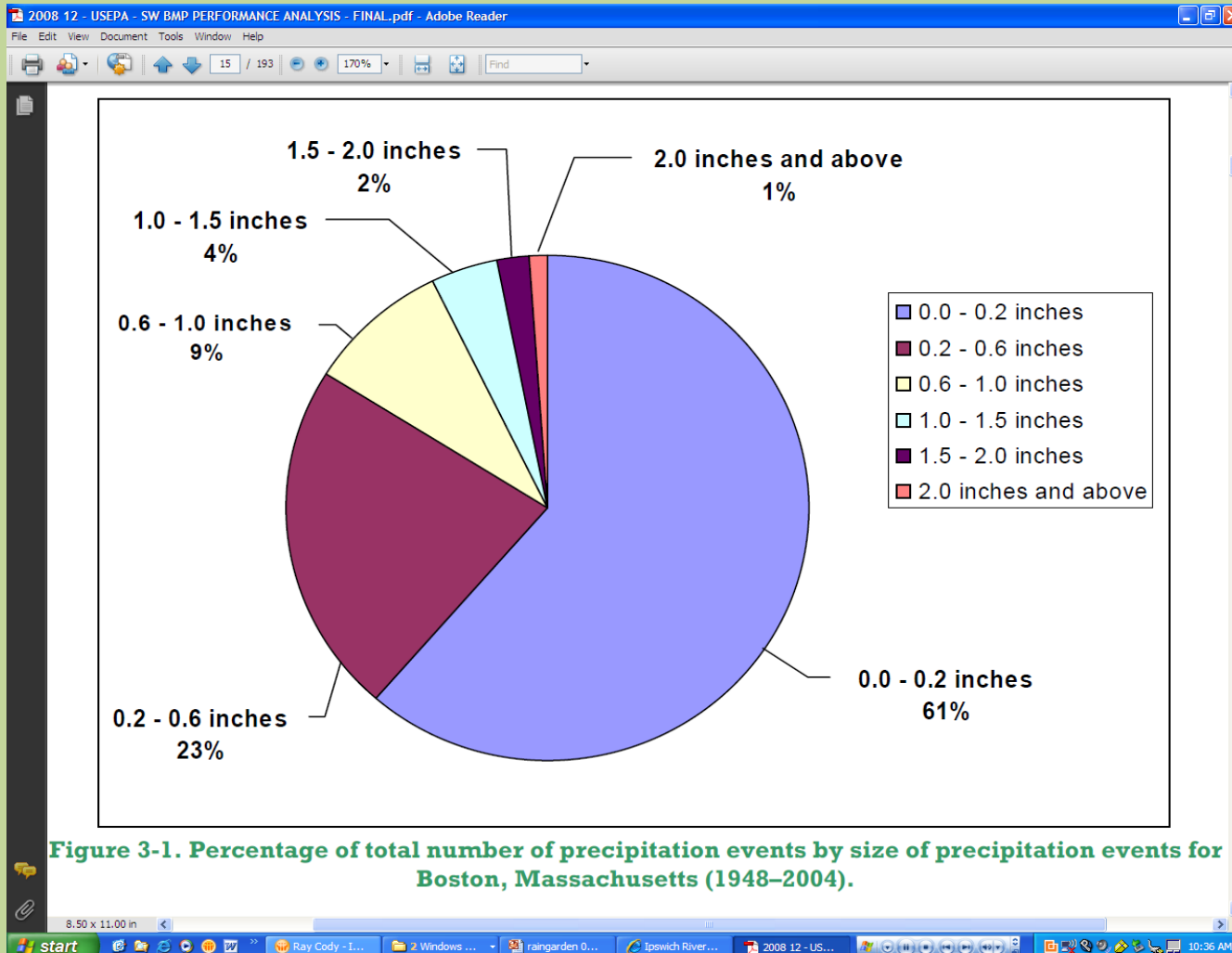


Figure 3-1. Percentage of total number of precipitation events by size of precipitation events for Boston, Massachusetts (1948–2004).

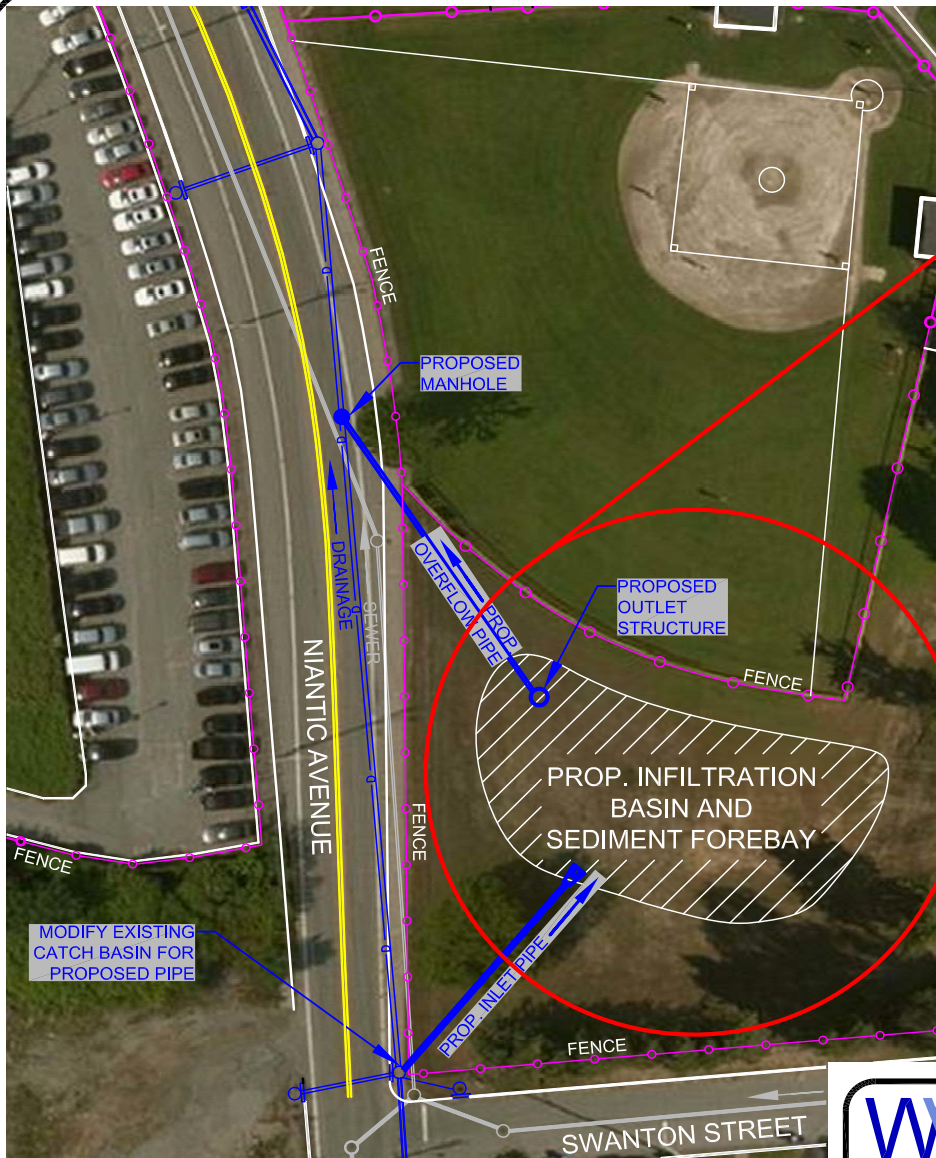
The Green Infrastructure Approach at Mashapaug Pond

- **BMP Type: Bioinfiltration.** One of many types of GI BMPs. This one combines functionality of an infiltration basin with the aesthetics of a rain garden.
- **Subwatershed and Site Characteristics:**
 - 5.9 – 6.5 acre sub-catchment (est); **2.6 acres IC** (est)
 - Soil: **HSC A/B**; Infiltration rate: **6 - 12 in./hr** (est); Depth to GW: **14 ft BG** (est)
- **Anticipated Performance:**
 - Disconnects ~ 2.6 acres of IC (**40 - 44% IC**)
 - Captures and treats an estimated **2.6 million gallons per year** (63,500 gal. / 1" storm) that would ordinarily discharge directly to Mashapaug Pond *
 - Removes and estimated **6 pounds of phosphorus** per year – a nutrient pollutant that contributes to algae blooms
 - Prevents the discharge of other pollutants to Mashapaug Pond, such as **sediment, bacteria, temperature (heat) and nitrogen**
 - Recharges and replenishes **groundwater**

* volumetric estimations adjusted for depression storage and evaporation

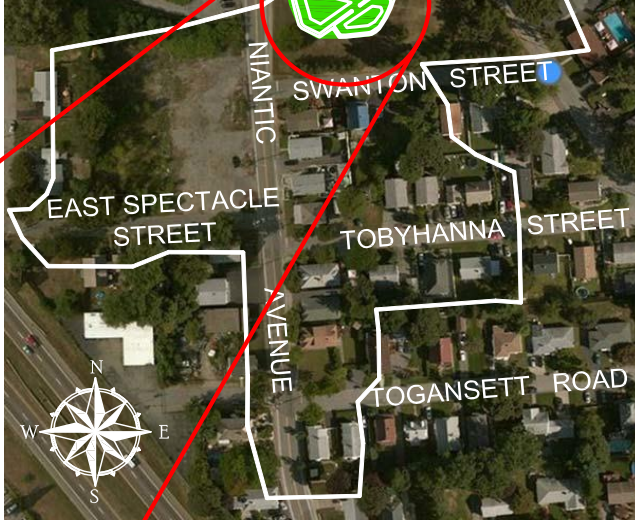
The Green Infrastructure Approach at Mashapaug Pond





Option 2: Construct New Drainage Structure

WATERSHED:
5.92 ACRES TOTAL
44% IMPERVIOUS



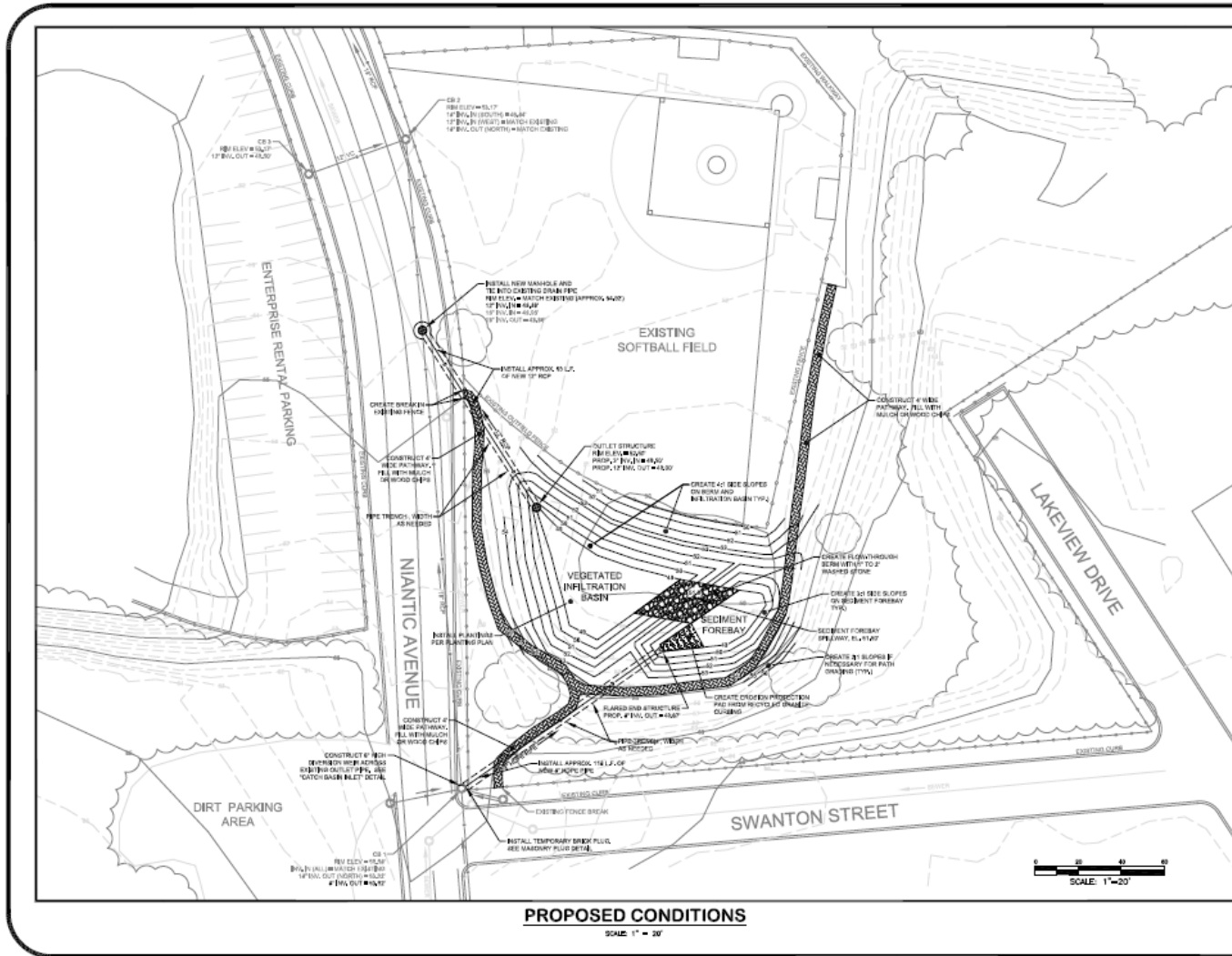
BMP Watershed



WV WaterVision, LLC
481 GREAT ROAD, SUITE 3
ACTON, MA 01720



COMPREHENSIVE ENVIRONMENTAL, INC.
21 DEPOT STREET
MERRIMACK, NH 03054



PROPOSED CONDITIONS
SCALE: 1" = 20'

General Notes

1. THE LOCATION OF UNDERGROUND UTILITIES HAS NOT BEEN VIEWED OR INSPECTED. THE CONTRACTOR PRIOR TO COMMENCEMENT OF CONSTRUCTION SHALL VERIFY THE LOCATION OF ALL UTILITIES AND CONTACT "800-SAFE" AT 1-888-344-7233.
2. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION TO PREVENT ANY CHANGE TO ADJACENT PROPERTIES. ALL AREAS WHICH ARE AFFECTED BY THE CONTRACTOR'S OPERATIONS SHALL BE RETURNED TO THEIR ORIGINAL CONDITION OR BETTER AT NO ADDITIONAL COST TO THE OWNER.
3. ANY CHANGE IN FIELD CONDITIONS SHALL BE REPORTED TO THE ENGINEER TO INSURE THAT ANY MODIFICATIONS TO THE ORIGINAL DESIGN ARE PROPER AND ACCURATE TO SERVE THE PROJECT'S NEEDS AND COMPLY WITH THE APPLICABLE STANDARDS AND REGULATIONS.
4. CONTRACTOR SHALL IMMEDIATELY REPAIR OR FILL ANY POTHOLES THAT OCCUR DUE TO CONSTRUCTION.
5. CONTRACTOR SHALL REPAIR ALL PAVING ON SITE DAMAGED OR HEAVILY SOILED DURING CONSTRUCTION.
6. EROSION CONTROL SUCH AS SILT FENCE AND/OR SWAY SALES SHALL BE INSTALLED TO PREVENT SEDIMENT FROM ENTERING ANY ADJACENT RESOURCE AREAS.
7. REMOVE ALL TEMPORARY EROSION CONTROLS FROM THE SITE AT THE CONCLUSION OF CONSTRUCTION ACTIVITIES.
8. STORMWATER SHALL NOT BE DIRECTED INTO THE BASIN UNTIL ALL PLANTINGS ARE SUCCESFULLY ESTABLISHED. CONTRACTOR SHALL EITHER TIE INTO THE EXISTING CATCH BASIN LAST OR INSTALL A REDUNDANT FLUX.



2	Final Design	04/14
1	Conceptual	02/14
NO.	Revised/Issue	Date

WV Wastwater, LLC
 801 STATE ROAD, SUITE 3
 MIDDLEBURY, VT 05750

COMPROMISEMENT
 ENVIRONMENTAL
 DOCUMENTATION
 21 BENTLEY STREET
 MIDDLEBURY, VT 05754

EPA Green Infrastructure
 City of Providence Education and
 Outreach Project

**MASHAPAUG POND
 STORMWATER BMP
 VEGETATED INFILTRATION BASIN**
 Nantico Avenue & Swanton Street

Project No. 07-1	Sheet
Date: APRIL 2014	C-2
Drawn by: [unintelligible]	Sheet 2 OF 4
Checked by: [unintelligible]	
Scale: 1" = 20'	

Treating Storm Water Through Soil Infiltration

Tratamiento de agua de lluvia a través de infiltración del suelo

When it rains water flows over roads, roofs and walkways picking up oils, grease and other chemicals that pollute Mashapaug Pond. This pollutant control structure will clean the polluted rain water before it reaches Mashapaug Pond. Helping to make Mashapaug Pond cleaner for everyone.

Cuando llueve los flujos de agua sobre los caminos, techos y pasarelas a recoger aceites, grasas y otros productos químicos que contaminan el lago Mashapaug. Esta estructura de control de contaminantes limpiará el agua de lluvia contaminada antes de que llegue el estanque Mashapaug. Ayudando a hacer Mashapaug estanque limpiador para todo el mundo.



For more information:

