



Green Infrastructure in the Greater Lansing Area

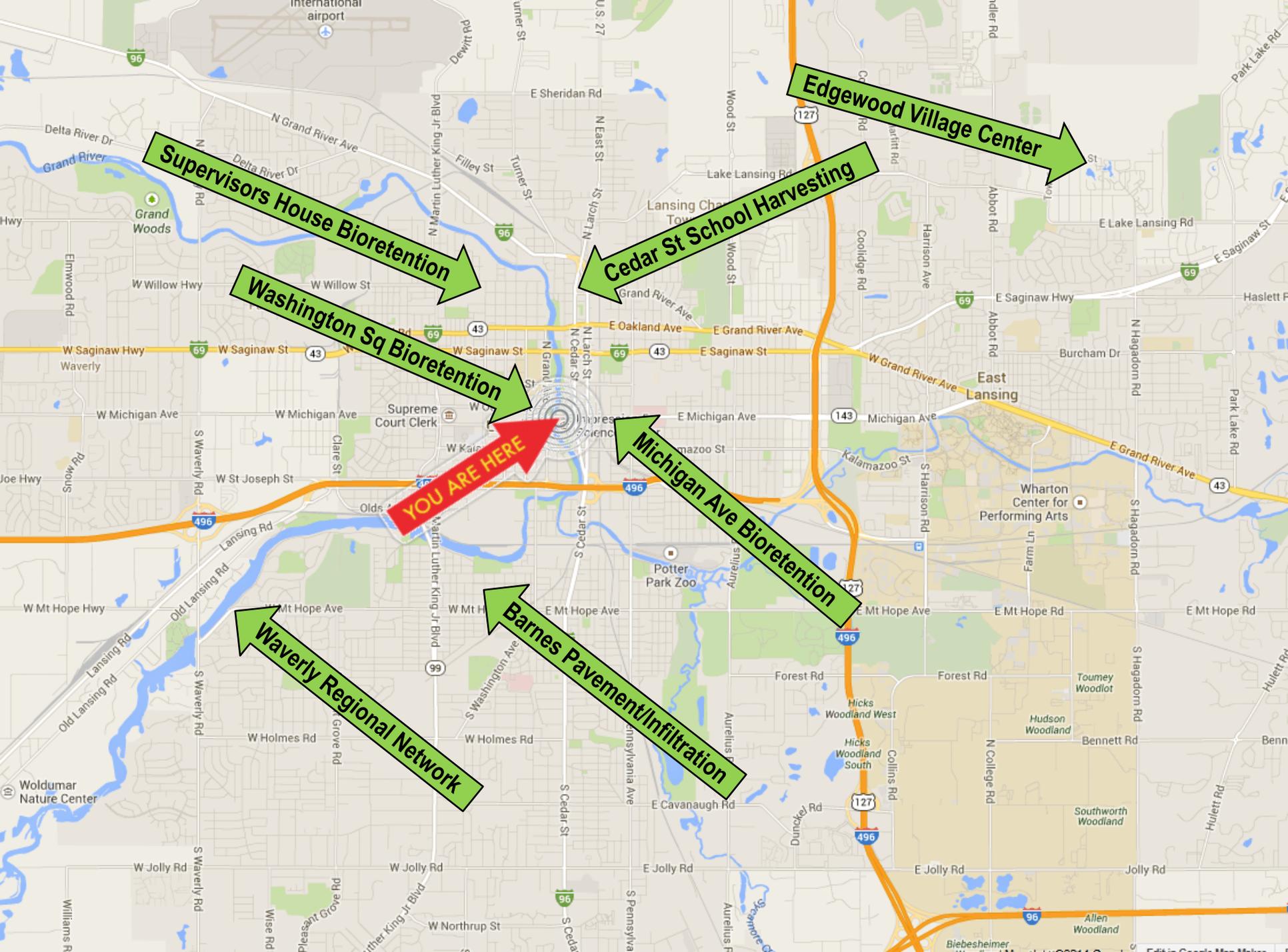
Friday May 9, 2014

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Supervisors House Bioretention

Washington Sq Bioretention

Cedar St School Harvesting

Edgewood Village Center

YOU ARE HERE

Michigan Ave Bioretention

Waverly Regional Network

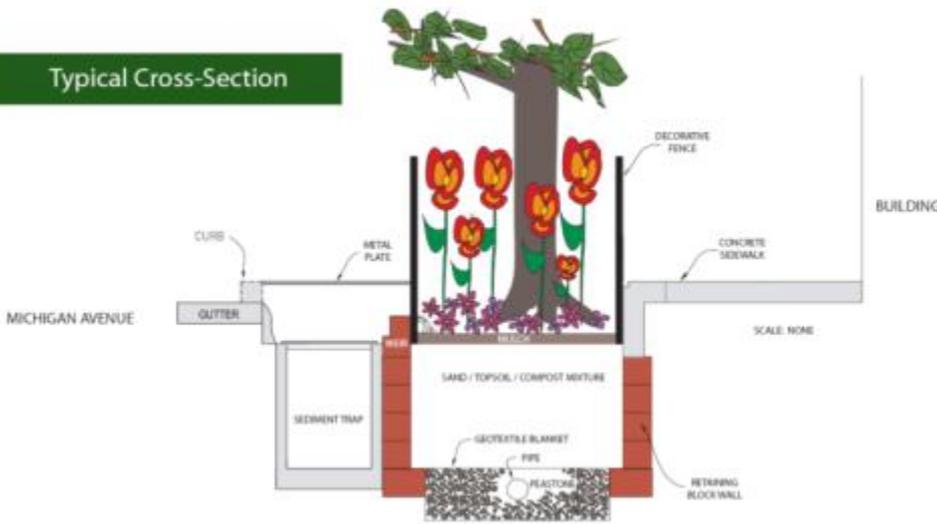
Barnes Pavement/Infiltration

Michigan Avenue Planter Box Bioretention



Design

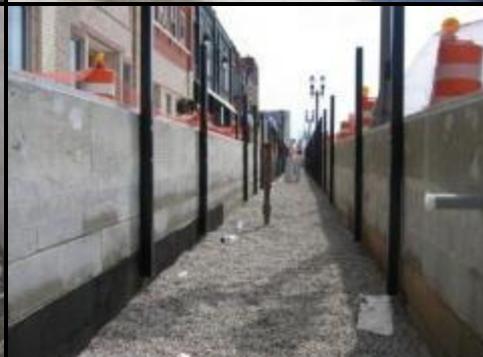
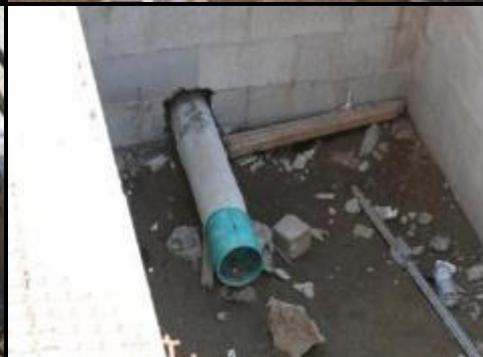
Typical Cross-Section



- Ultra-Urban
- 5-ft wide planter box style bioretention
 - 30 bioretention gardens
 - 7,631 square feet
 - 4.1 acre tributary area
- 4 blocks, both sides
- ADA compliant
- Adaptable to community needs



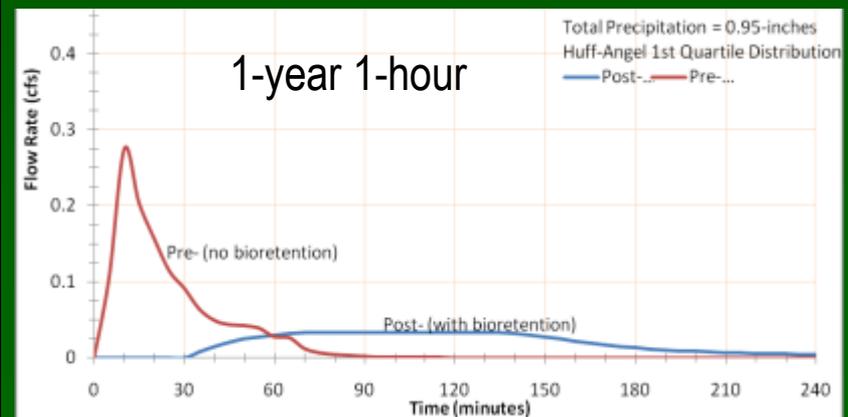
Construction 2007 to 2008



Final Product

- Cost \$122/sf (\$30/sf without urban constraints)
- Storage Volume 1.5 cf/sf
- Cost \$81/cf of storage
- 90% Storm Design (+/-)
- 75% decrease in average annual runoff volume

This planter box bioretention treats the 25-year storm event (4.1-inches)

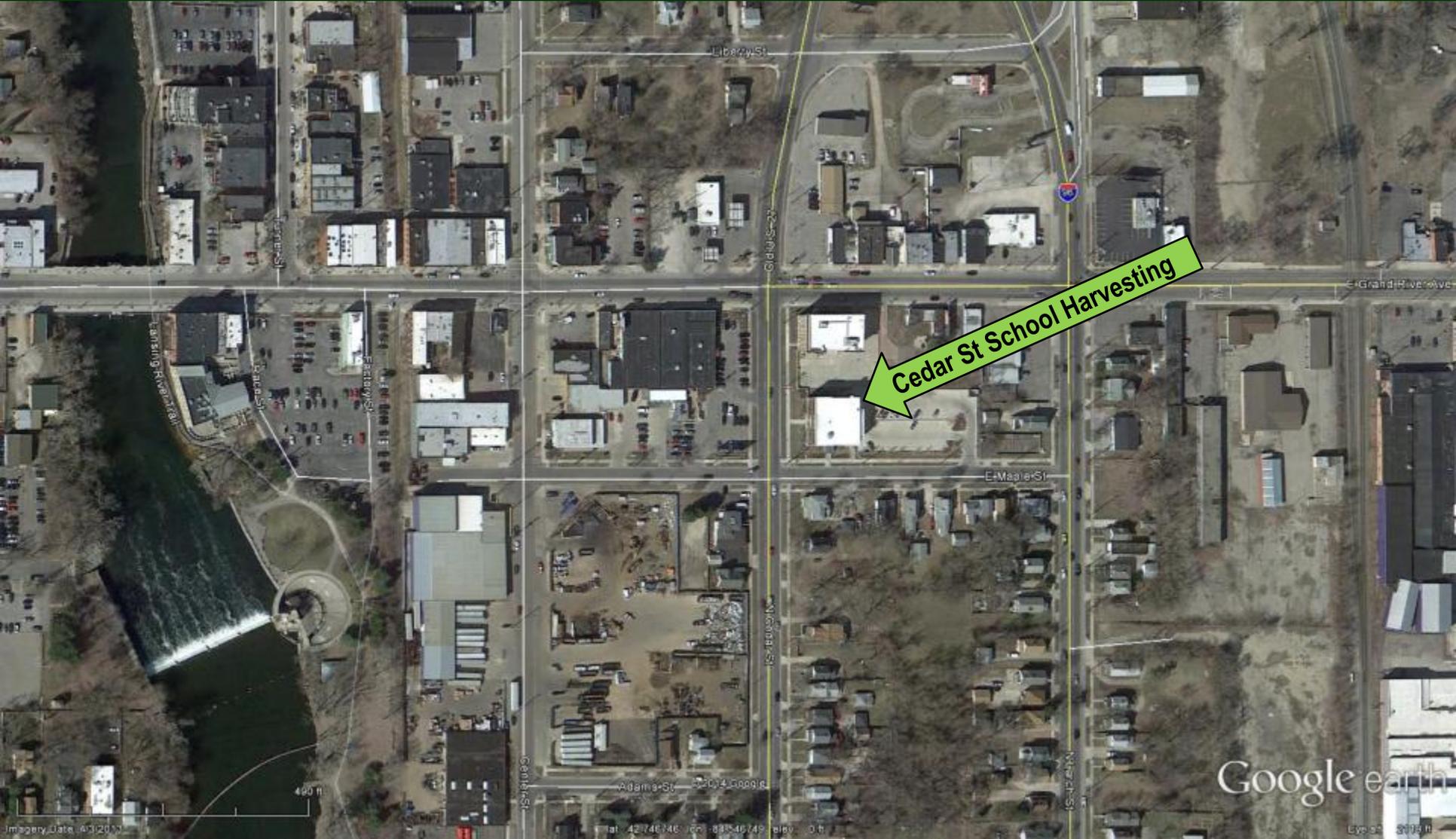


Challenges and Lessons Learned

- Trash/debris
 - Collection
 - Cigarette butts
 - Dog poop
 - Wind blown trash
- Education
 - Local businesses
 - Maintenance
- Design-Construction
 - Plant now, don't wait
 - Geotextile
 - Detailed grading plans
 - Cars hitting the fence
- Monitoring
 - Low flows
 - Simulated rainfall event



Cedar Street School (aka Old Town Medical Arts Building)



Cedar St School Harvesting

Rain Water Harvesting

Cedar Street School

Project: Repurposing vacant school building. Now medical office, gymnasium, and commercial lease space

Storm Water Components

- Rain water harvesting
 - 6,500 sft Roof Area
 - 1,200 gal Cistern
- Swirling concentrator
- Subsurface detention and infiltration

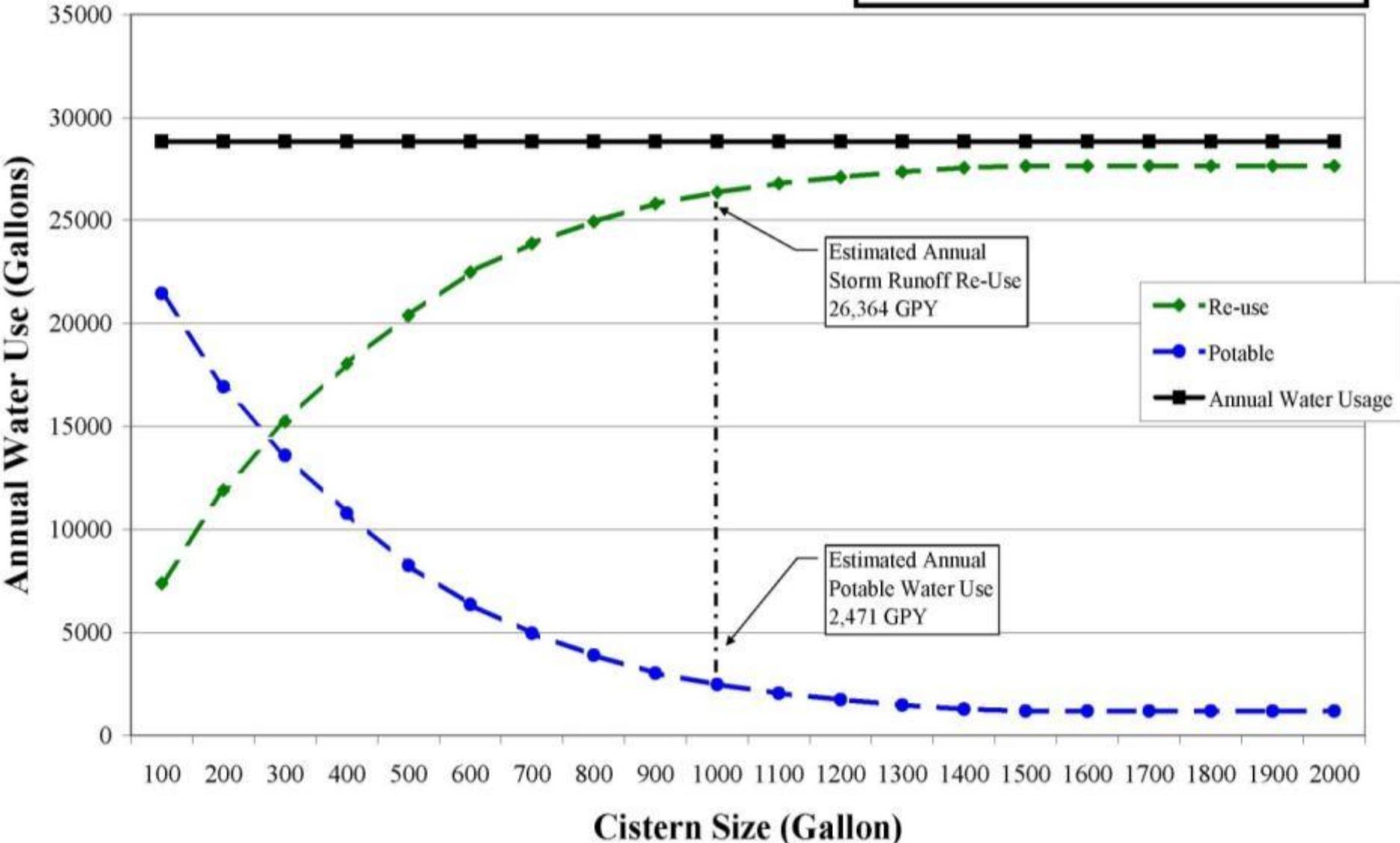
Captures and treats 90% average annual rainfall



Cedar Street School Water Re-use/Potable-use @ Demand of 79 GPD

**WE Credit 3.1 & 3.2
Water Use Reduction
Provided:**

- 1. Water Saving Plumbing Fixtures**
- 2. Storm Runoff Water Re-Use**



Rain Water Harvesting

Cedar Street School

Cistern Fill Lines



Rain Water Harvesting

Cedar Street School

Water Distribution



Rain Water Harvesting

Cedar Street School

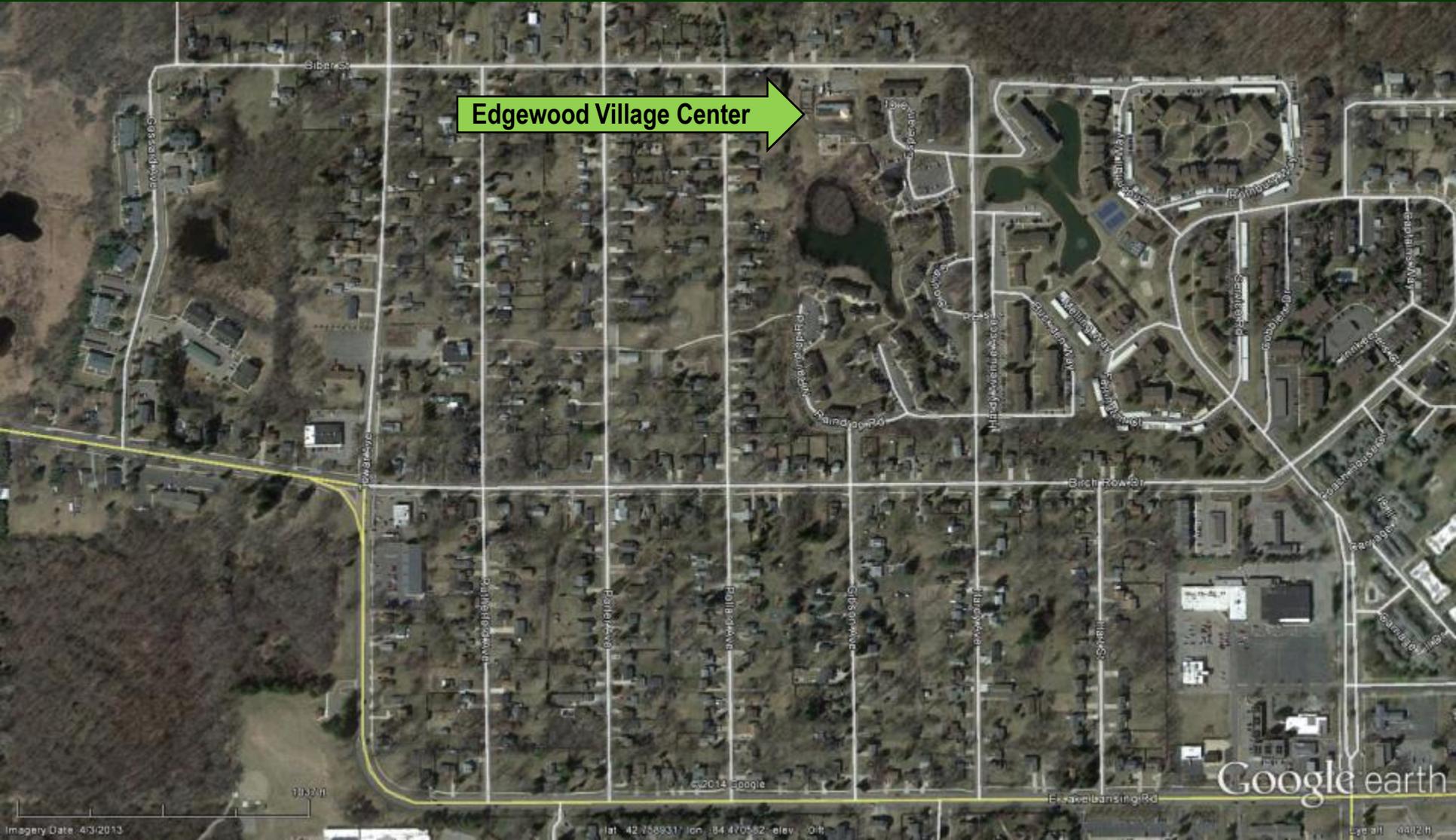


Lessons

- Non-standard plumbing permit request, plan for extra time
- Filter requires regular cleaning
- Rainwater harvesting provides
 - 91% of non-potable water demand
 - 4% of the annual rainfall on site
 - 20% of annual rainfall on roof

Rain Water Harvesting and Site Infiltration

Edgewood Village Community Center



Edgewood Village Center

Google earth

lat: 42.758931, lon: -84.470552, elev: 0ft

Imagery Date: 4/3/2013

Eye alt: 6682 ft

Rain Water Harvesting and Site Infiltration

Edgewood Village Community Center

Project: New Community Center for Apartment Complex with Active Community Garden

Storm Water Components

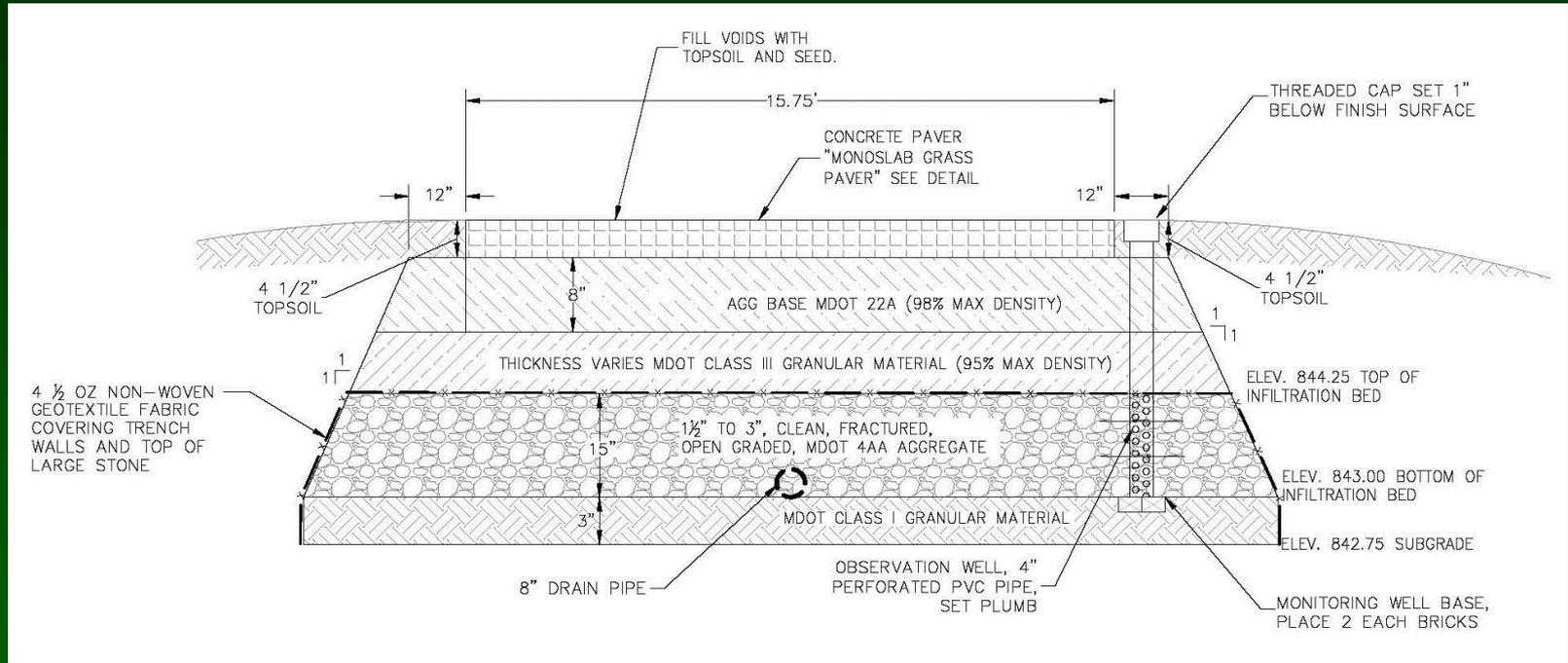
- Rain water harvesting 3320 gallon tank (Garden Irrigation, seasonal use)
- Pervious grass pavement
- Subsurface infiltration bed, 1062 cft storage capacity
- No positive drainage until system is full

Captures and infiltrates 90% average annual rainfall



Rain Water Harvesting and Site Infiltration

Edgewood Village Community Center



Design

- Pervious grass pavement
- Subsurface infiltration bed, 1062 cft storage capacity

Rain Water Harvesting and Site Infiltration

Edgewood Village Community Center



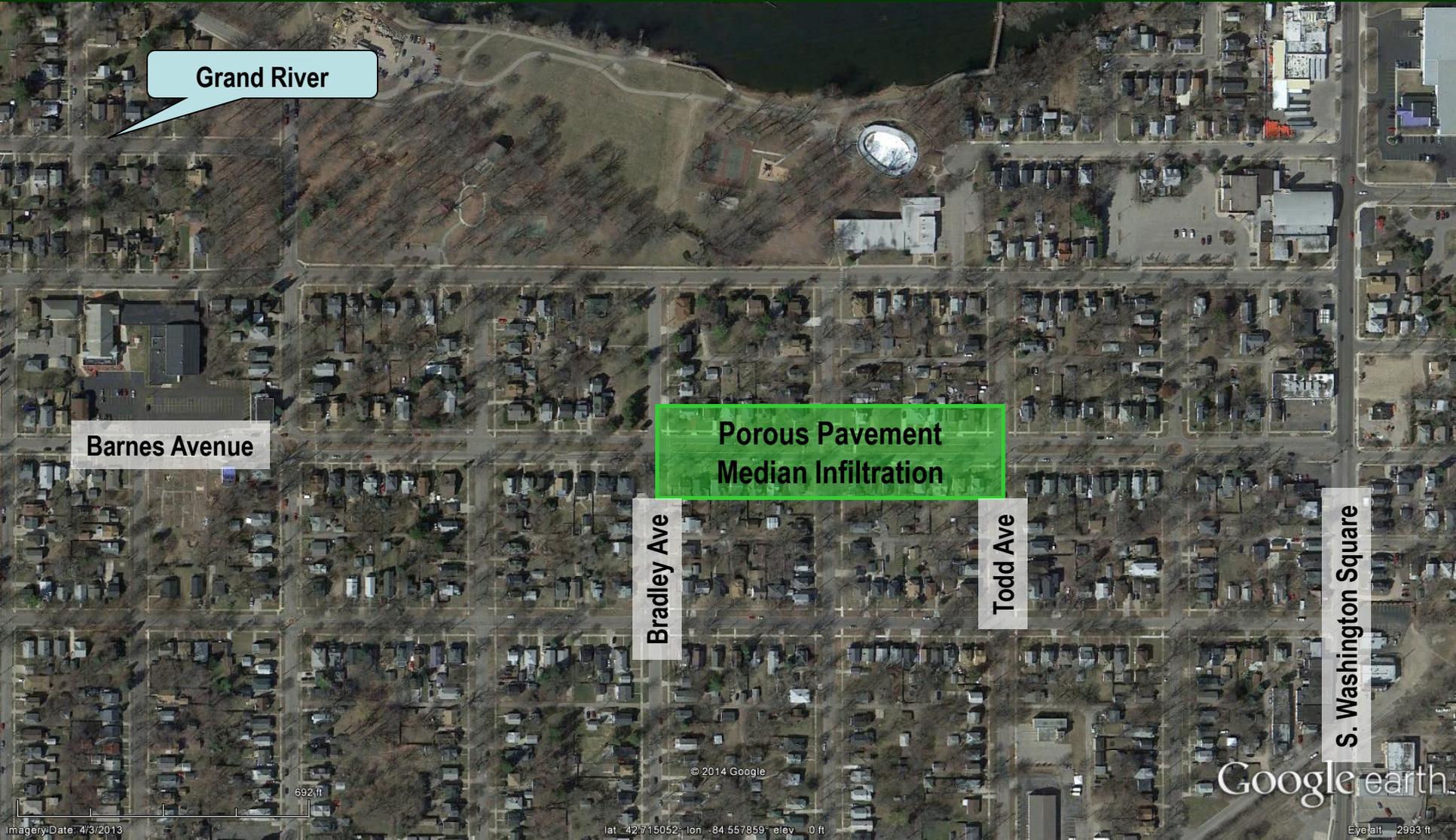
Rain water harvesting

- \$37/cft storage within infiltration and collection system
- \$18/cft cistern storage and distribution

Project Challenges

- High ground water
- No standing water allowed

Barnes Avenue Porous Pavement and Median Infiltration



Grand River

Barnes Avenue

Bradley Ave

Todd Ave

S. Washington Square

Porous Pavement
Median Infiltration

© 2014 Google

Google earth

lat 42.715052; lon -84.557859; elev 0 ft

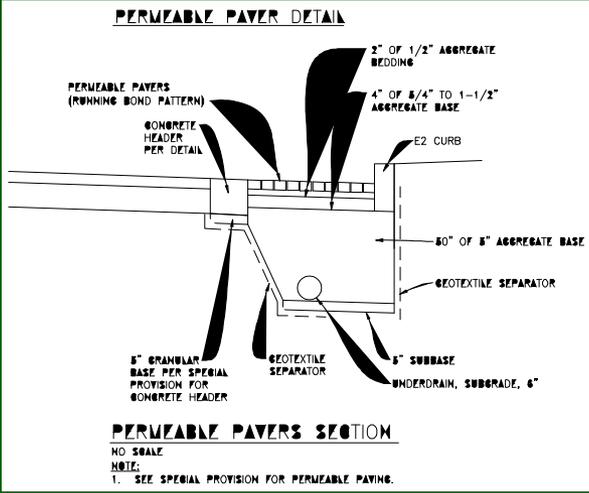
Eye alt 2993 ft

Imagery Date: 4/3/2013

692 ft

Permeable Pavers Parking Lane Barnes Ave

- Residential road
- Permeable paver strip in parking lane
- Residents excited
- Storage volume 4.7 cf / sf



Boulevard Median Infiltration

Barnes Ave

- Median depression in select areas
- Targeted tree removal and replacement
- 2-ft soil amendments / replacement
- Construction challenges
- Storage volume 2.0 cf/sf



Curb Extension Bioretention Washington Square



Ionia St

Grand River

Bioretention Area

Ottawa St

Radisson Inn

Washington Square

YOU ARE HERE

Google earth

Imagery Date: 4/3/2013

lat: 42.735070 lon: -84.552077 elev: 0 ft

Eye alt: 297.7 ft

Curb Extension Bioretention

Washington Square



Storm water components

- 2 acre runoff area @ 100% impervious
- 12 Rain Gardens with total 8300 cft storage.
 - Triple shredded bark mulch
 - 3' Engineered soil
 - Aggregate layer with underdrain
- Ultra urban setting

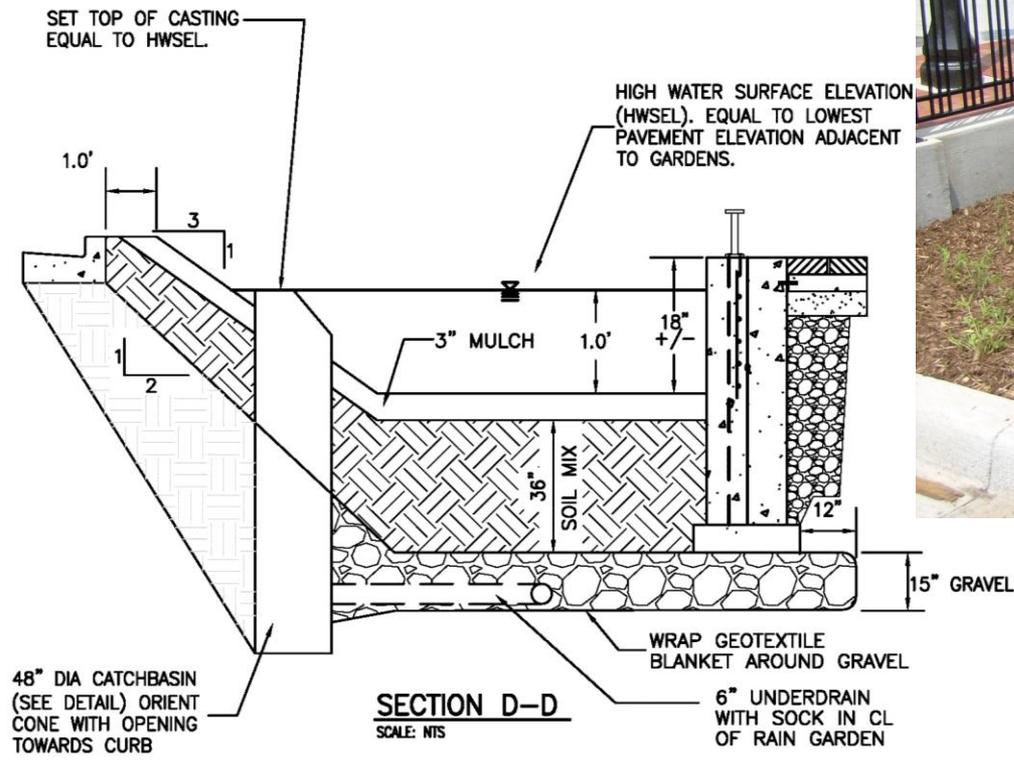
Captures and treats 90% annual rainfall

Curb Extension Bioretention Washington Square



Curb Extension Bioretention

Washington Square



Curb Extension Bioretention

Washington Square

Installation Cost

- \$32/cft storage

Lessons

- Pre-treatment not required in all locations
- Riprap spillway needs support
- Maintenance needs vary with age of garden
 - Year One, 20 hours/garden
 - Year Two, 6 hours/garden



Constructed Wetland Waverly Road Regional Network Connector



Constructed Wetland

Waverly Road Regional Network Connector

Project: Non-motorized trail project currently under construction. Impervious surface reduction of 32%

Storm Water Components

- Three rain gardens
- One constructed wetland

Captures and treats 90% annual rainfall



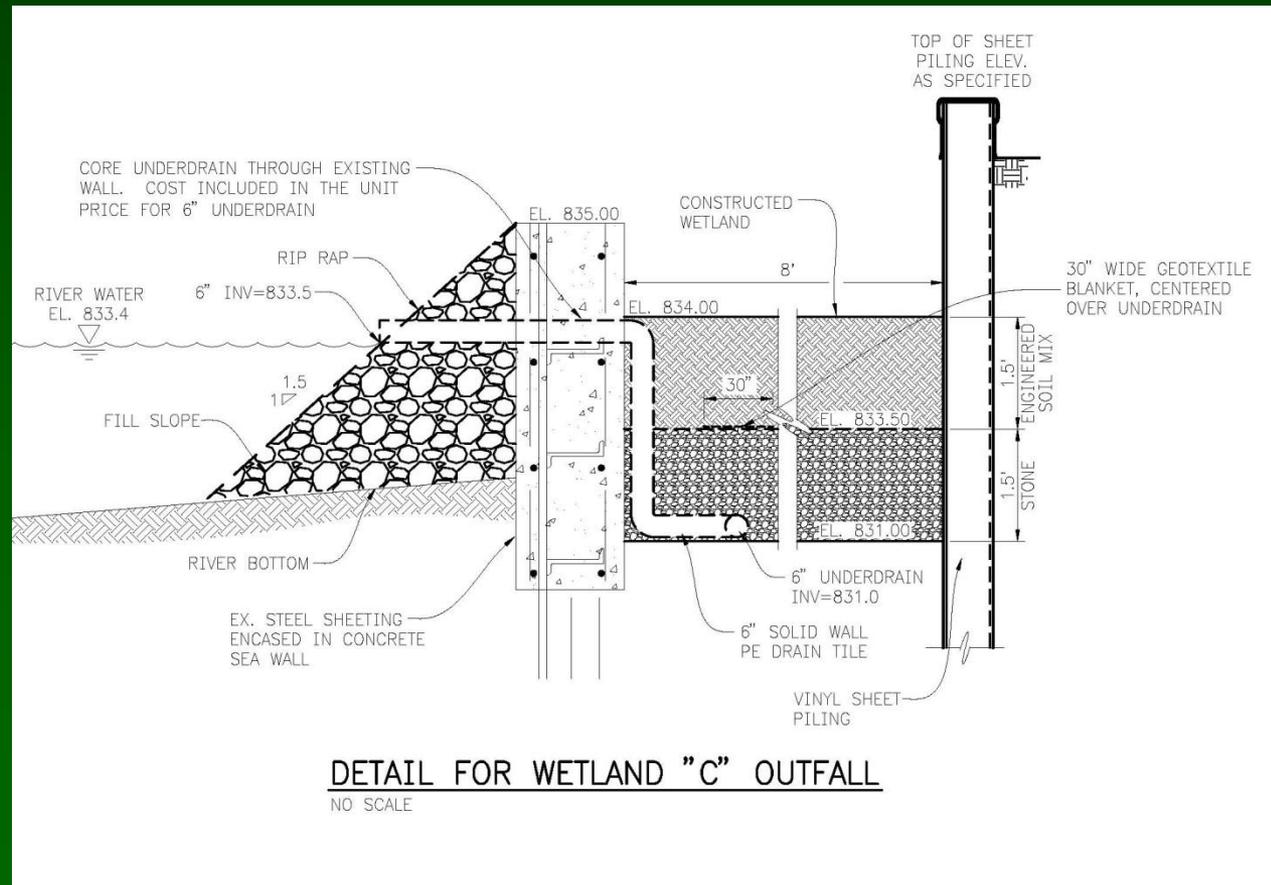
Before Picture

Constructed Wetland

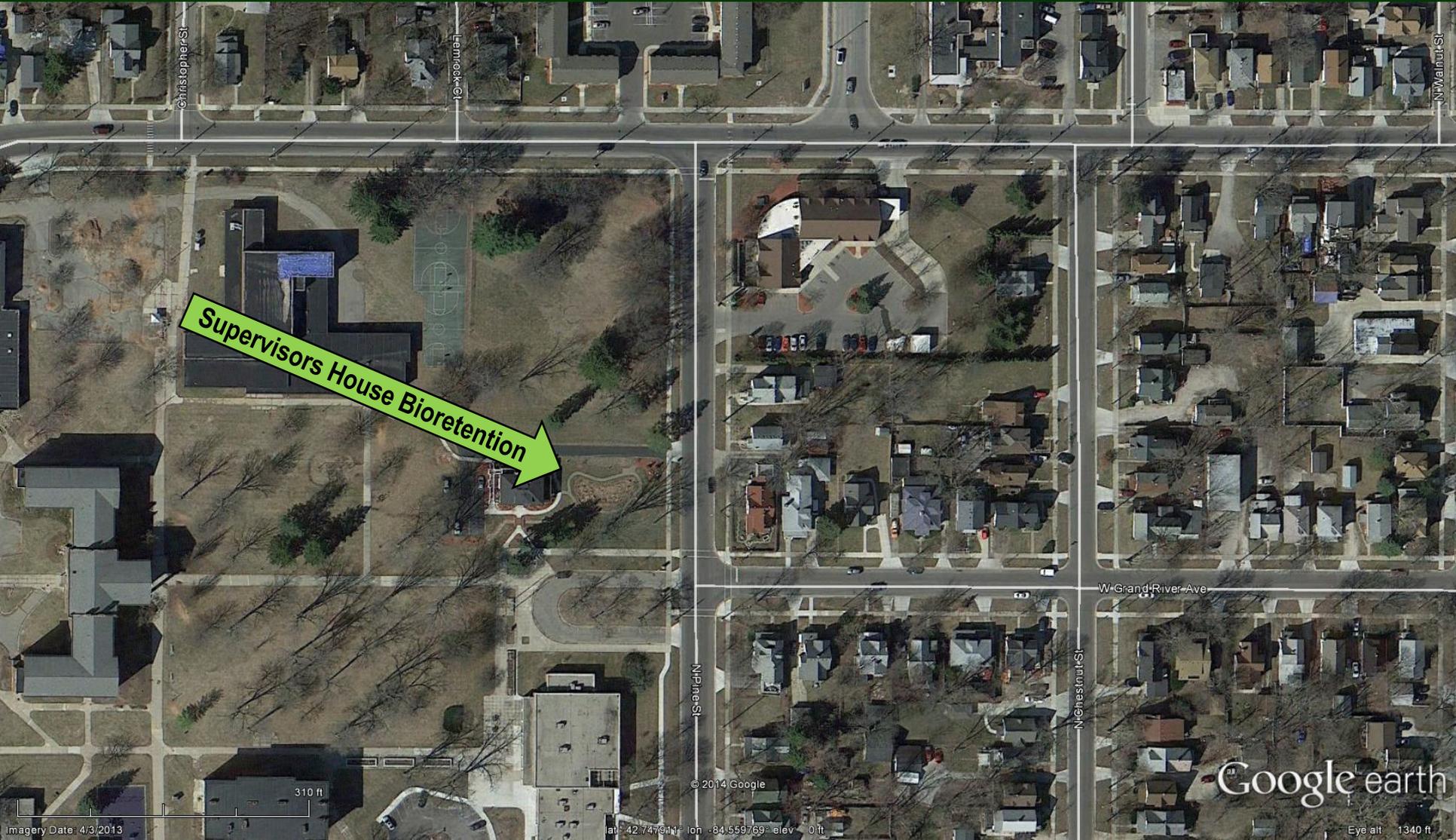
Waverly Road Regional Network Connector

Design

- 7" separation from normal ground water elevation
- Downward water draw
- Wetland Plant Selection



Bioretention Supervisors House



Supervisors House Bioretention

Christopher St

Lemrock Ct

N Walnut St

W Grand River Ave

N Grand St

N Chestnut St

Google earth

Imagery Date: 4/3/2013

© 2014 Google

lat: 42.747641° lon: -84.559769° elev: 0 ft

Eye alt: 1340 ft

Bioretention

Supervisors House



Storm water components

- Disconnected impervious surfaces
- Permeable walking path
- Rain garden
 - 24" Engineered Soil Mix
 - Aggregate layer with underdrain
 - Orifice controlled outlet

Captures and treats 90% annual rainfall

Bioretention Supervisors House

Lessons

- A lot of subsurface water can flow through “dry creek bed”
- Aesthetics of Green Infrastructure is an asset to property



Thanks and Questions

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