City of Fitchburg Catalytic Project – No Increase in Post-Development Runoff Volumes

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EOR water ecology community

FITCHBURG Planning/Zoning

City of Fitchburg Catalytic Project – No Increase in Post-Development Runoff Volumes

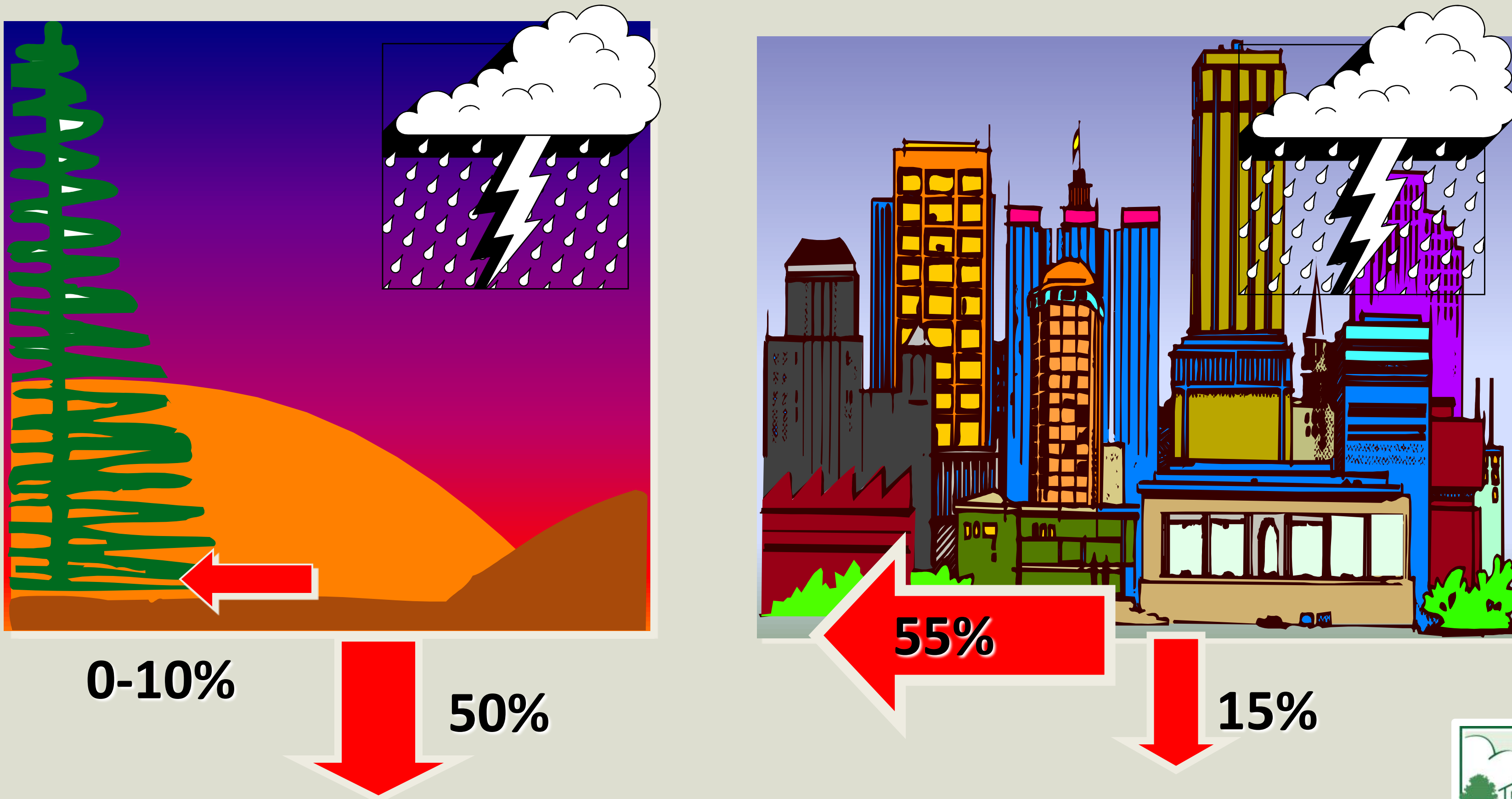
Project Overview

- Review of McGaw Neighborhood Plan
- Why Stormwater Matters
- Literature Review: State-of-the-Art of Stormwater Management
- Modeling Analysis: Development of Concept Plans
- Charrette
- Final Report and Guidance Tools




Why Stormwater Matters

Development Impacts on the Water Cycle



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Impervious Surfaces

Materials like cement, asphalt, roofing, and compacted soil that prevent percolation of runoff into the ground.

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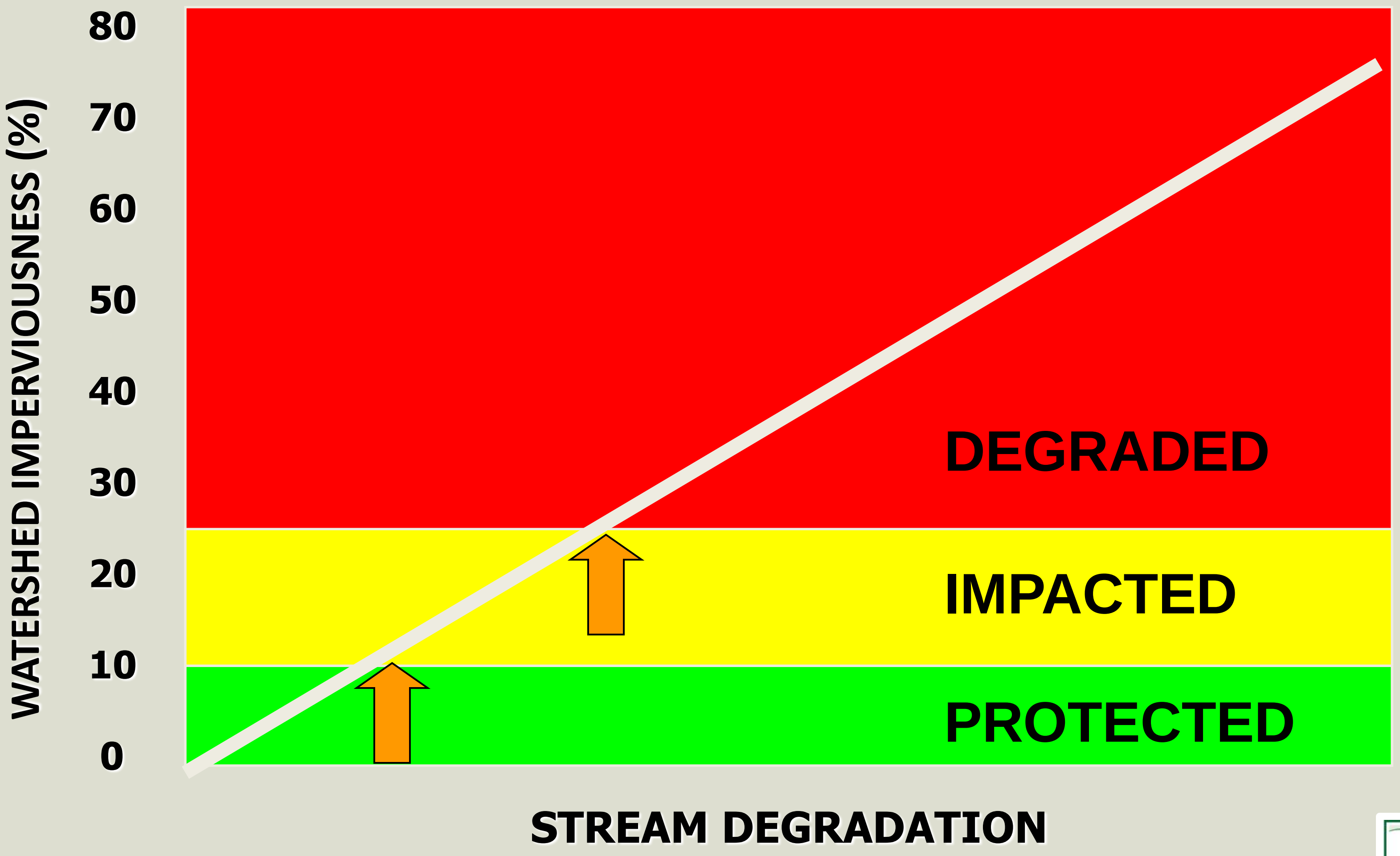
Waterway Health & Imperviousness



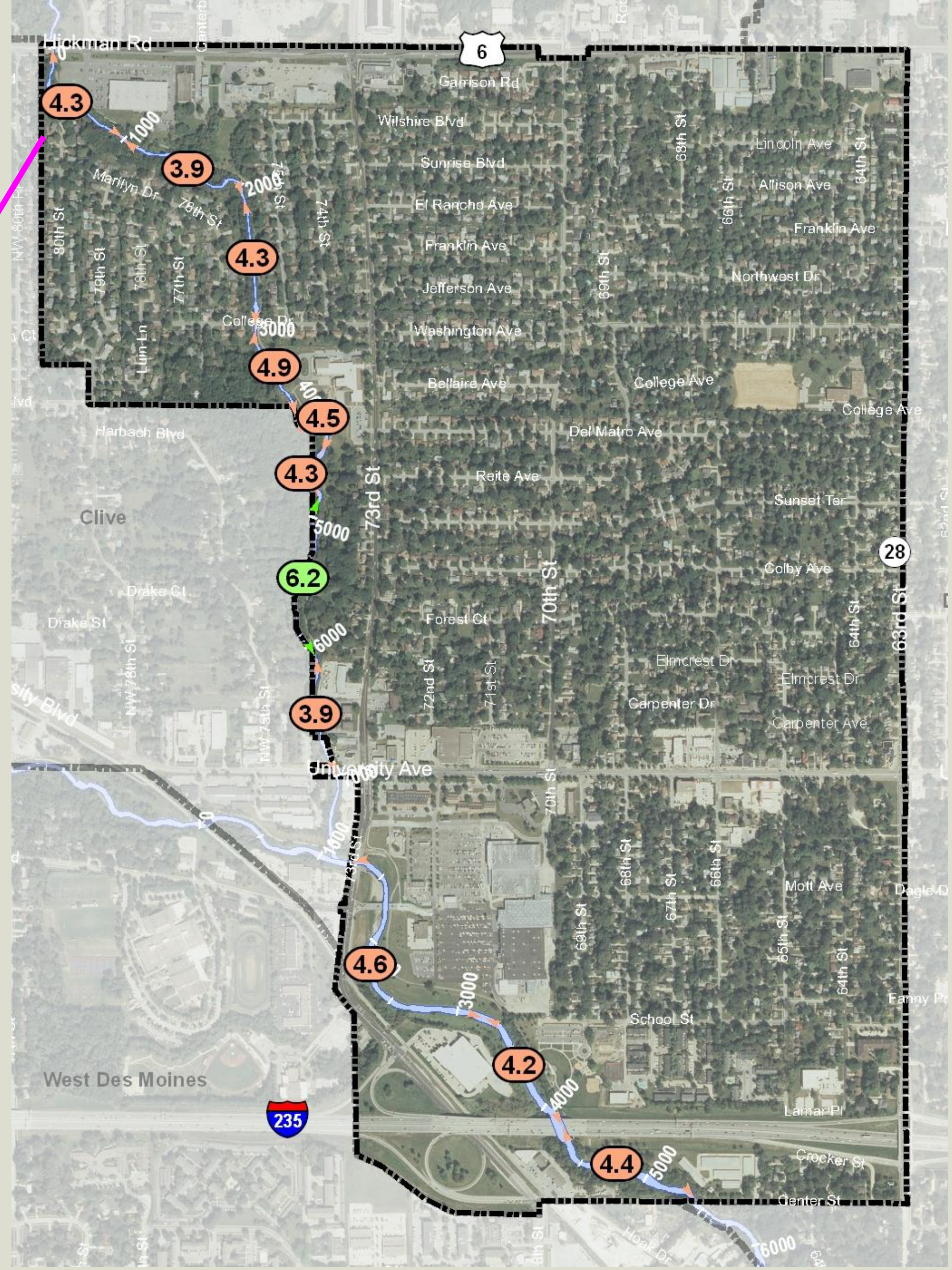
ADAPTED FROM SCHUELER, ET. AL., 1992

Water Quantity Impacts

- Disruption of Natural Water Balance
- Increased Flood Peaks
- Increased Duration of Flows
- Streambank Erosion
- Habitat Loss
- Lower Summer Base Flows

North Walnut Creek / Walnut Creek Stream Assessment

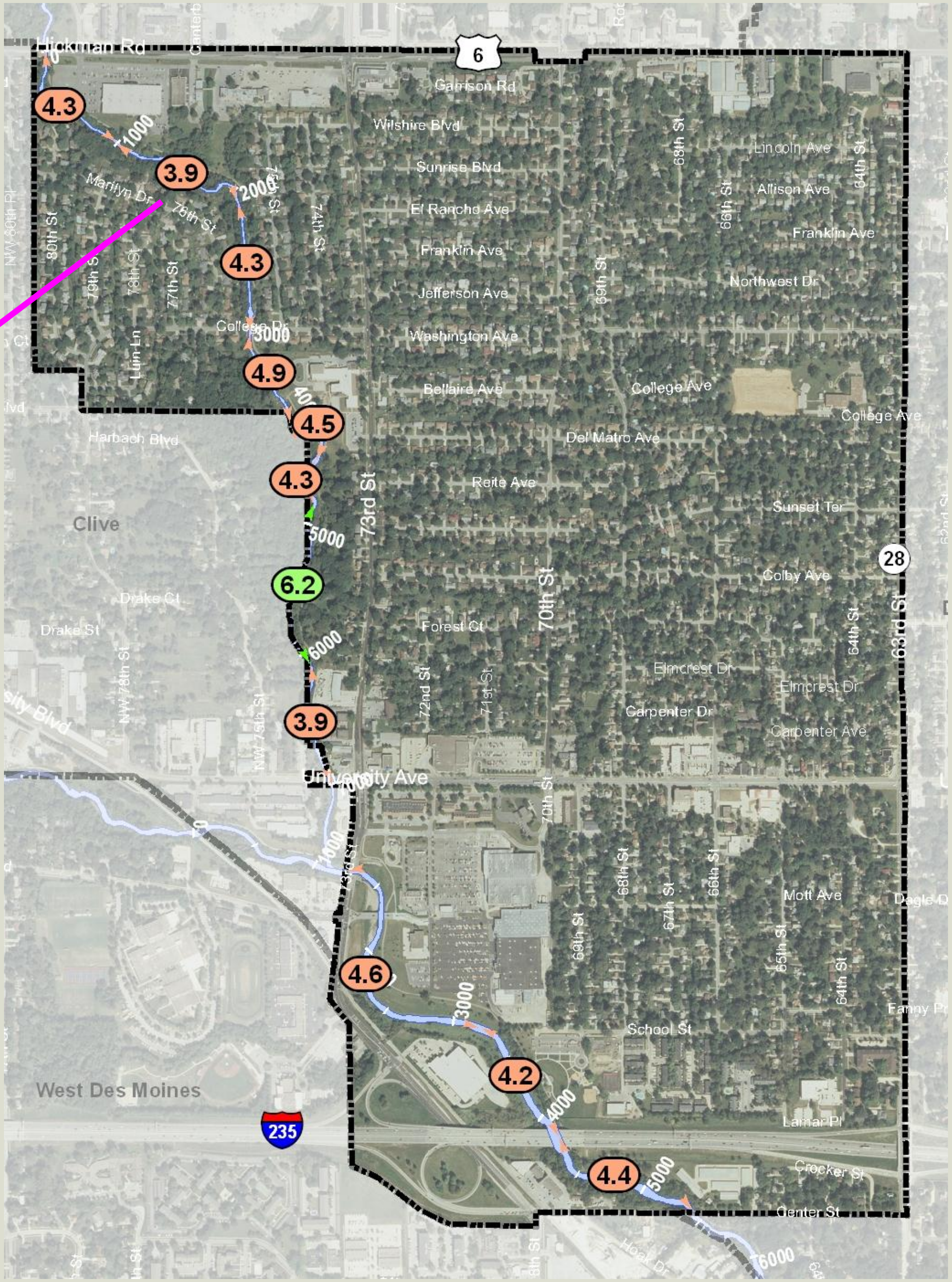
Area of Photo




North Walnut Creek – Sta0000-1000

North Walnut Creek / Walnut Creek Stream Assessment

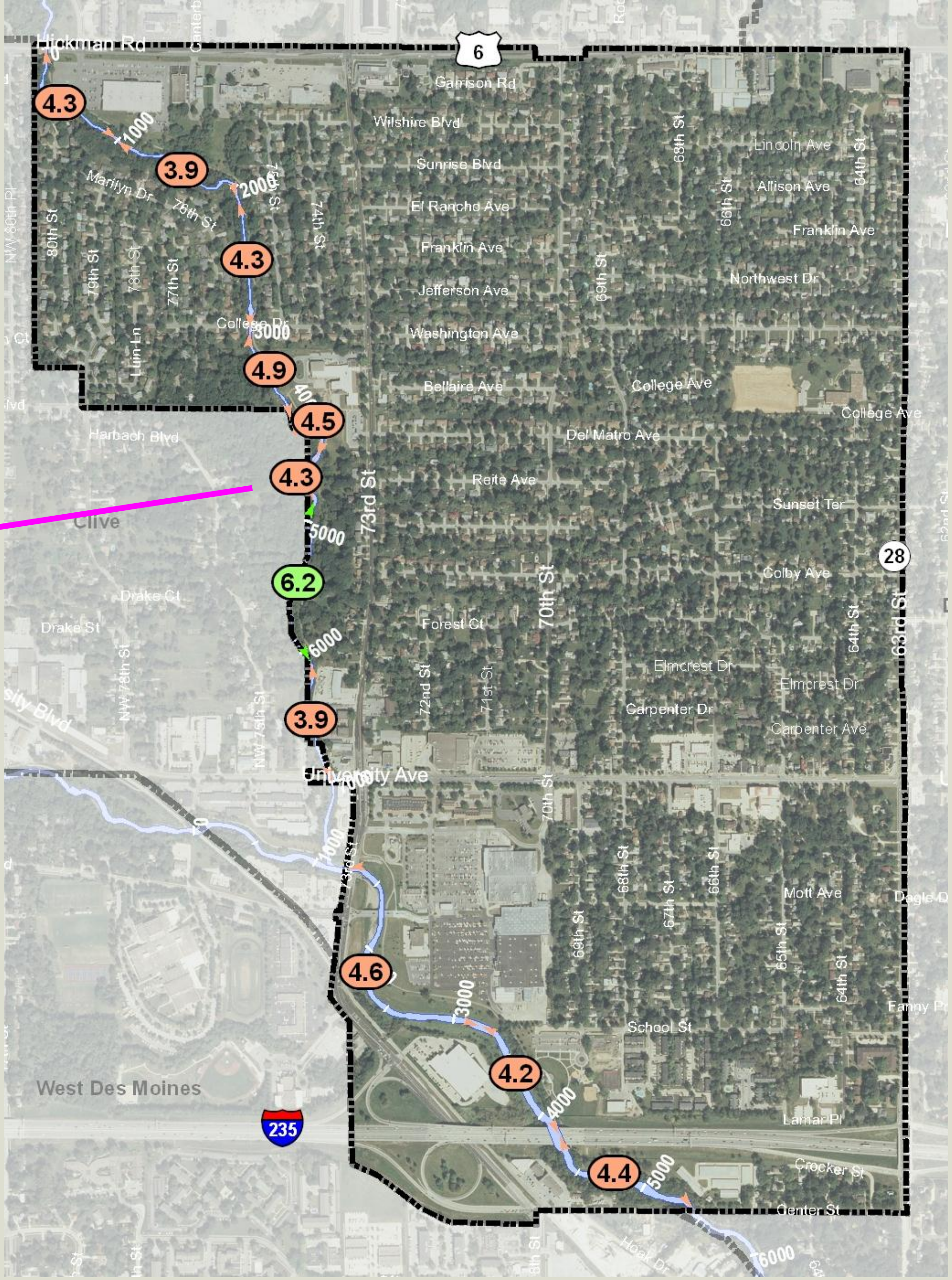
Area of Photo



North Walnut Creek – Sta1000-2100

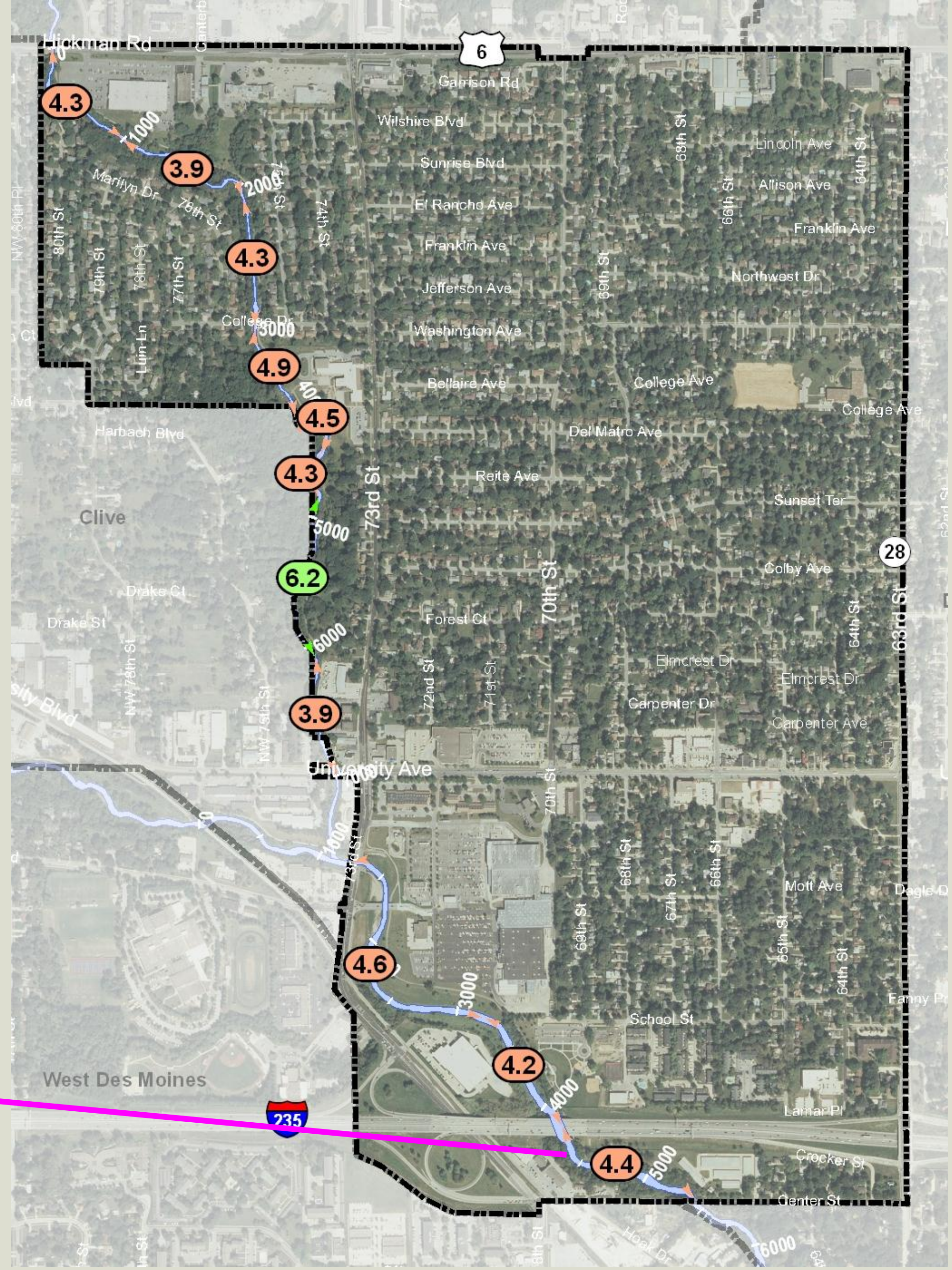
North Walnut Creek / Walnut Creek Stream Assessment

Area of Photo



North Walnut Creek – Sta4300-4850

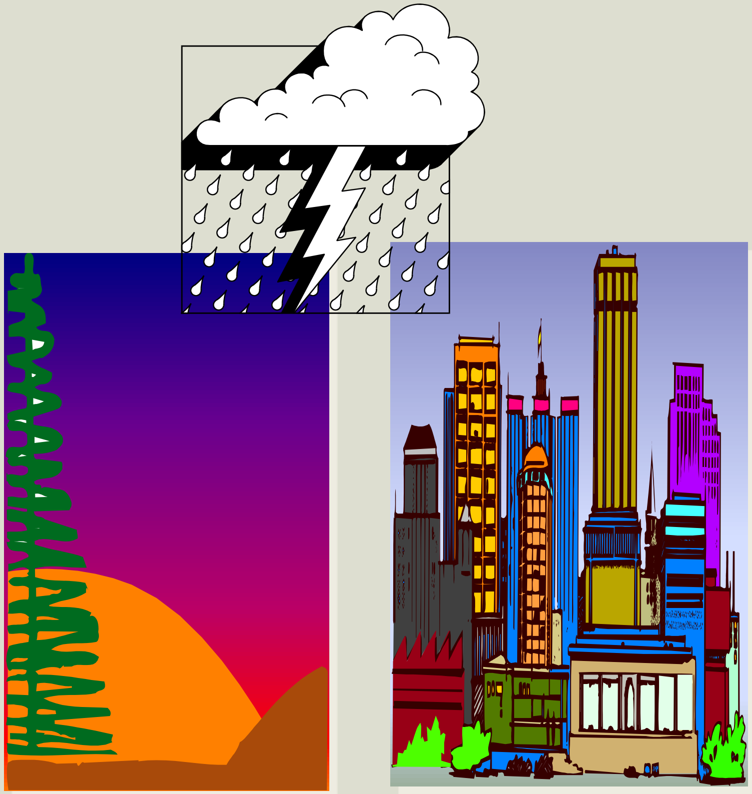
North Walnut Creek / Walnut Creek Stream Assessment



Area of Photo

Walnut Creek – Sta4200-5350

Development Impacts on Water Quality



Nutrients

Pathogens

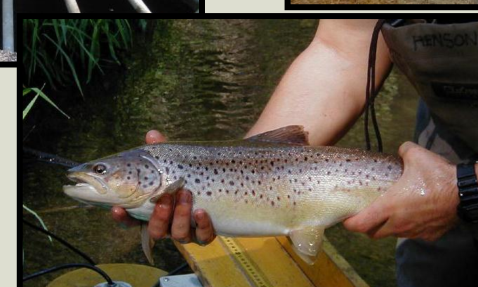
Sediment

Toxic Contaminants

Debris

Thermal Stress

Increased quantity
Decreased quality



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The Pollutants in Polluted Runoff

Nutrients

Pathogens
Sediment
Toxic Contaminants
Debris
Thermal Stress

Improper application of nutrients such as nitrogen and phosphorus can cause a health hazard in drinking water *and* stimulate excessive aquatic plant growth, which can ultimately lower dissolved oxygen levels.

Sources: animal waste, septic systems, fertilizers

The Pollutants in Polluted Runoff

Nutrients

Pathogens

Sediment
Toxic Contaminants
Debris
Thermal Stress

***Pathogens* are disease-causing bacteria and viruses associated with the presence of fecal matter.**

Sources: failing septic systems, animal waste

The Pollutants in Polluted Runoff

Nutrients
Pathogens

Sediment

Toxic Contaminants
Debris
Thermal Stress

Sediment **is eroded soil or sand which smothers aquatic habitat, carries pollutants, and reduces water clarity.**

Sources: construction sites, agricultural fields, disturbed areas and road sanding

The Pollutants in Polluted Runoff

Nutrients
Pathogens
Sediment

Toxic Contaminants

Debris
Thermal Stress

Toxic contaminants **are compounds like heavy metals and pesticides that can threaten the health of both aquatic and human life, and are often resistant to breakdown.**

Sources: industrial, commercial, household and agricultural chemicals; auto emissions

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The Pollutants in Polluted Runoff

Nutrients
Pathogens
Sediment
Toxic Contaminants

Debris

Thermal Stress

Debris **includes plastics and other trash that threaten aquatic life and detract from recreational and aesthetic values.**

Sources: illegal dumping, street litter

The Pollutants in Polluted Runoff

Nutrients
Pathogens
Sediment
Toxic Contaminants
Debris

Thermal Stress

Thermal stress **is an elevation in water temperature that can harm some fish species such as trout and can alter the overall community of aquatic life.**

Sources: runoff from heat-absorbing impervious surfaces, removal of streamside vegetation, shallow water impoundments, decreased base flow

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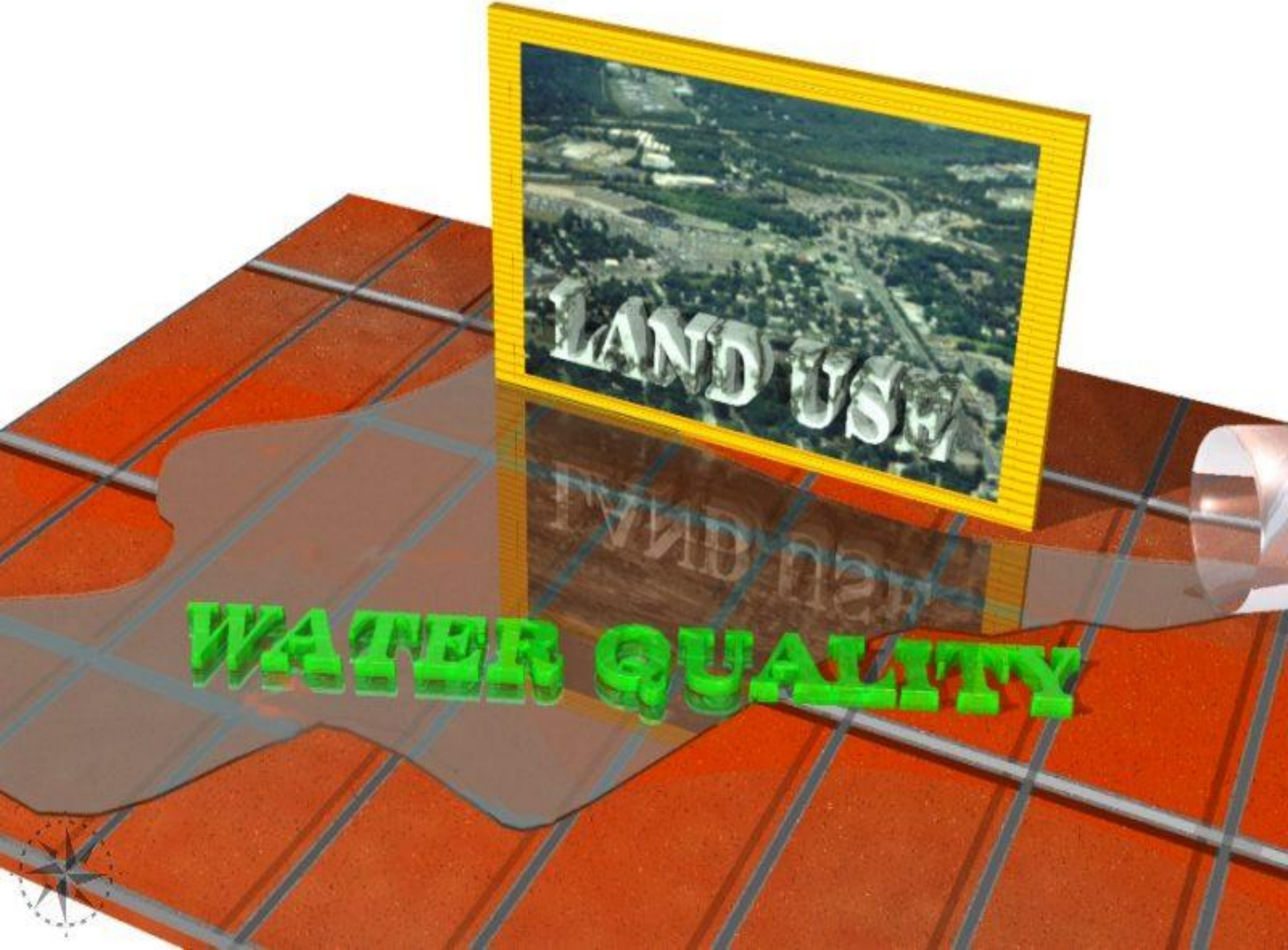
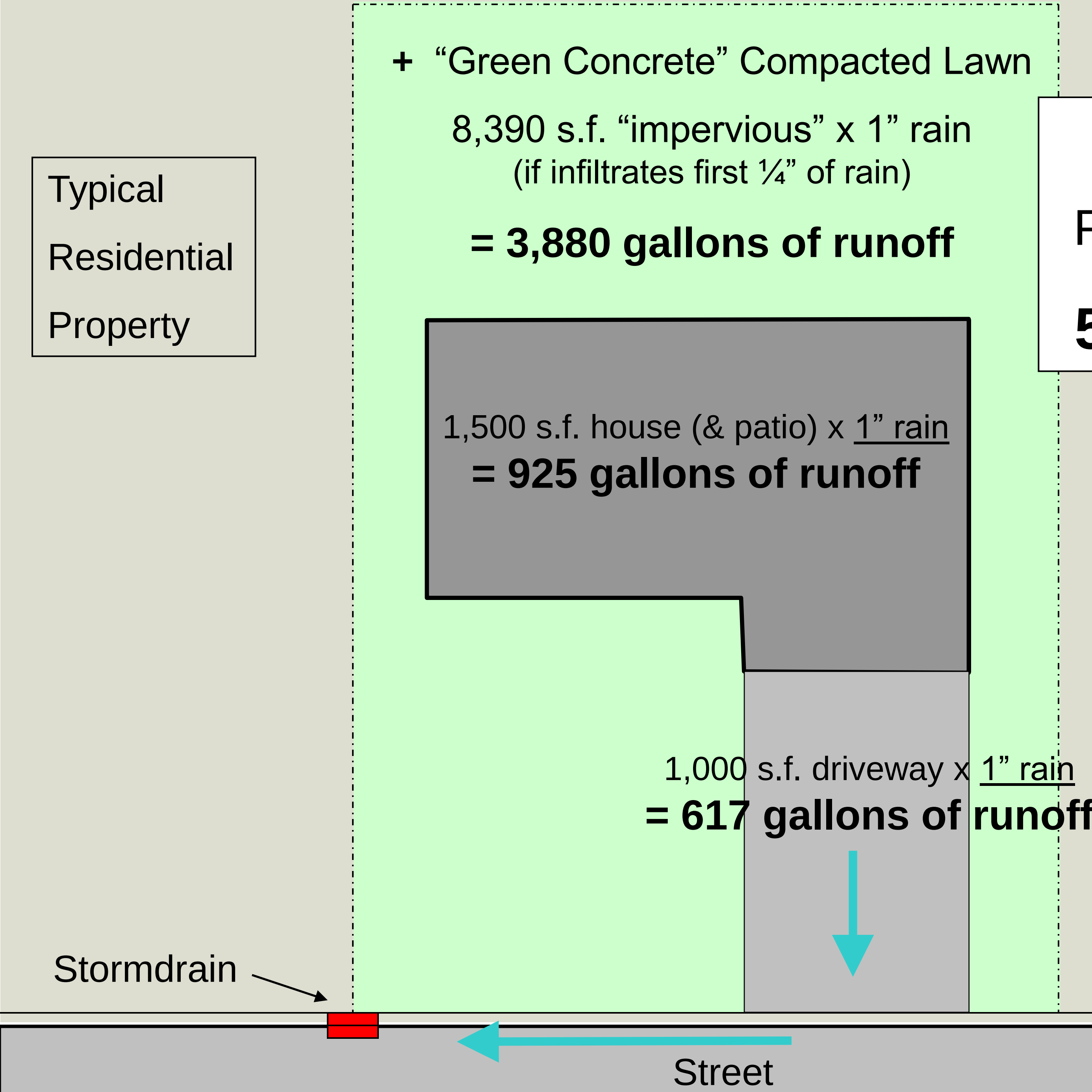

LAND USE
WATER QUALITY

Typical Residential Property



In a 1" rainfall

Potential Runoff:

5,422 gallons

with 30" yearly precipitation

Potential Runoff:

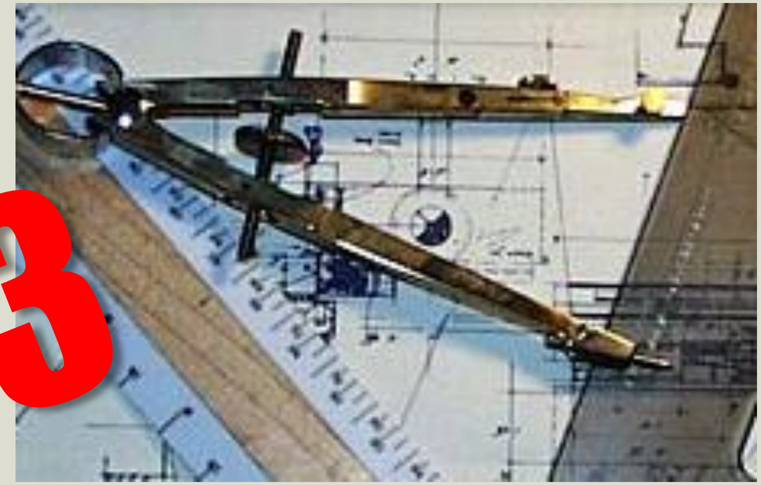
171,532 gallons/yr

Mike Isensee, Dakota SWCD
Home in St. Paul, MN

Overview of Stormwater Management

National Urban Runoff Program

1983



- Technical studies that compiled data about urban runoff
- Resulted in treatment recommendations and easy to apply standards for design and review
- Led to proliferation of ponds

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THE NATIONAL ACADEMIES

REPORT IN BRIEF

Urban Stormwater Management in the United States

The rapid conversion of land to urban and suburban areas has profoundly altered how water flows during and following storm events, putting higher volumes of water and more pollutants into the nation's rivers, lakes, and estuaries. These changes have degraded water quality and habitat in virtually every urban stream system. The Clean Water Act regulatory framework for addressing sewage and industrial wastes is not well suited to the more difficult problem of stormwater discharges. This report calls for an entirely new permitting structure that would put authority and accountability for stormwater discharges at the municipal level. A number of additional actions, such as conserving natural areas, reducing hard surface cover (e.g., roads and parking lots), and retrofitting urban areas with features that hold and treat stormwater, are recommended.

Stormwater has long been regarded as a major culprit in urban flooding, but only in the past 30 years have policymakers appreciated its significant role in degrading the streams, rivers, lakes, and other waterbodies in urban and suburban areas. Large volumes of rapidly moving stormwater can harm species habitat and pollute sensitive drinking water sources, among other impacts. Urban stormwater is estimated to be the primary source of impairment for 13 percent of assessed rivers, 18 percent of lakes, and 32 percent of estuaries—significant numbers given that urban areas cover only 3 percent of the land mass of the United States.

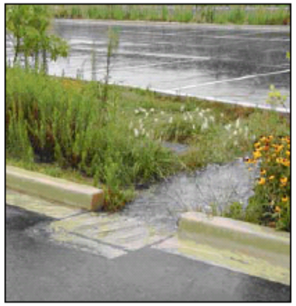

Photo by Roger Bannerman

Urbanization—the conversion of forests and agricultural land to suburban and urban areas—is proceeding at an unprecedented pace in the United States. Stormwater discharges have emerged as a problem because the flow of water is dramatically altered as land is urbanized. Typically, vegetation and topsoil are removed to make way for buildings, roads, and other infrastructure, and drainage networks are installed. The loss of the water-retaining functions of soil and vegetation causes stormwater to reach streams in short concentrated bursts. In addition, roads, parking lots, and other "impervious surfaces" channel and speed the flow of water to streams. When combined with pollutants from lawns, motor vehicles, domesticated animals, industries, and other urban sources that are picked up by the stormwater, these changes have led to water quality degradation in virtually all urban streams.

In 1987 Congress wrote a new section into the Clean Water Act's National Pollutant Discharge Elimination System to help address the role of stormwater in impairing water quality. This system, which is enforced by the U.S. Environmental Protection Agency (EPA), has focused on reducing pollutants from industrial process wastewater and municipal sewage discharges—"point sources" of pollution that are relatively straightforward to regulate. Under the new "stormwater program,"

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"Past practices…have been ineffective at protecting water quality in receiving waters and only partially effective in meeting flood control requirements"

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"Stormwater control measures that harvest, infiltrate, and evaportranspirate stormwater are critical to reducing the volume and pollutant loading of small storms"

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REPORT IN BRIEF

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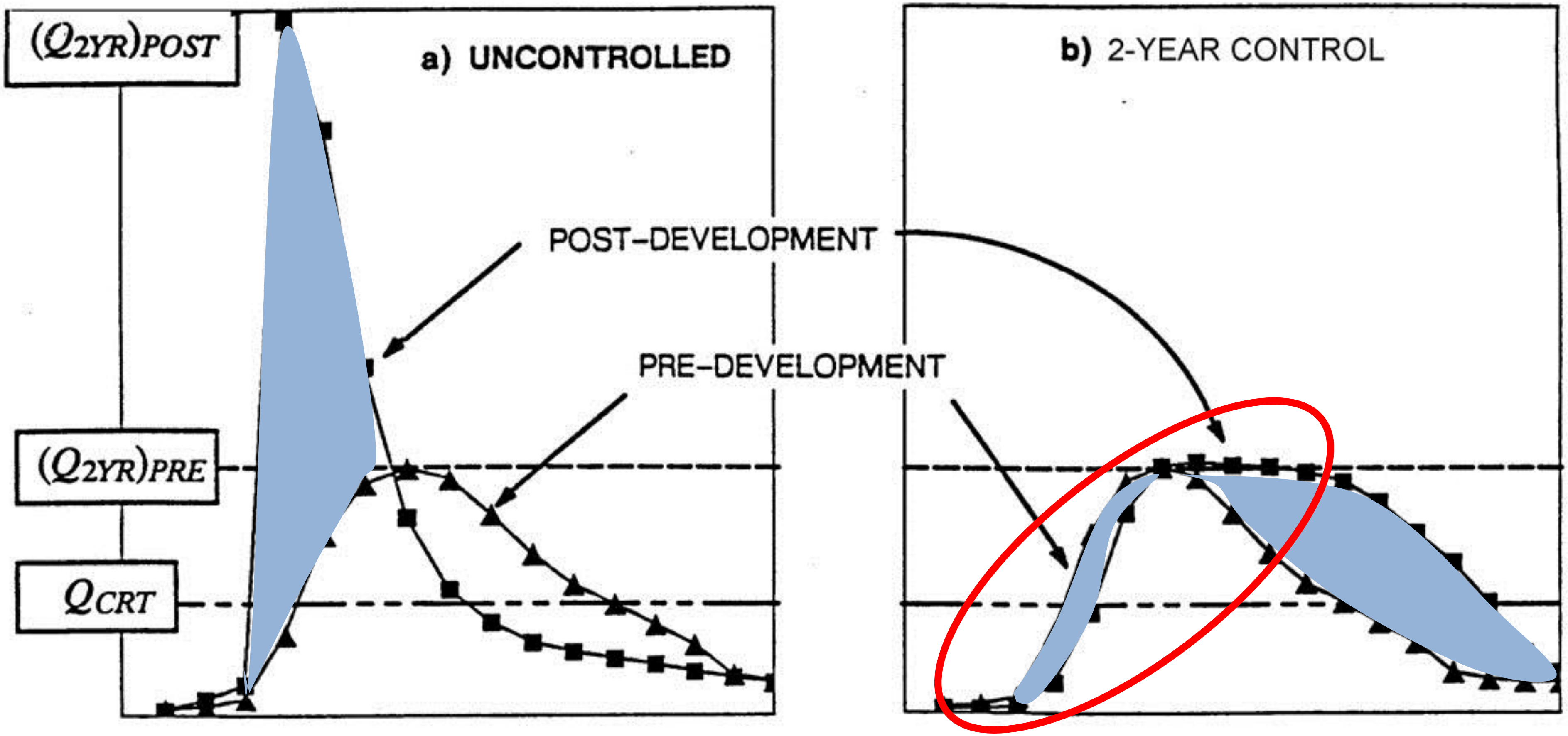
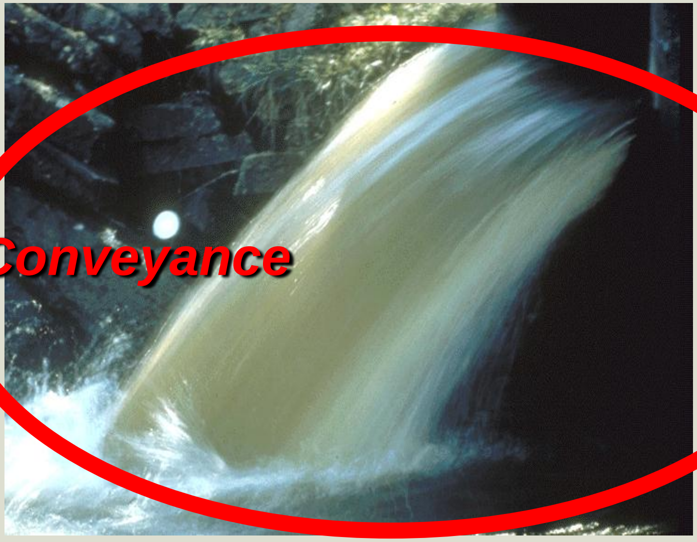
The Issue: Too Much ~~& Too Fast~~



Stormwater Management



Regulations Driving More Effective Stormwater Management

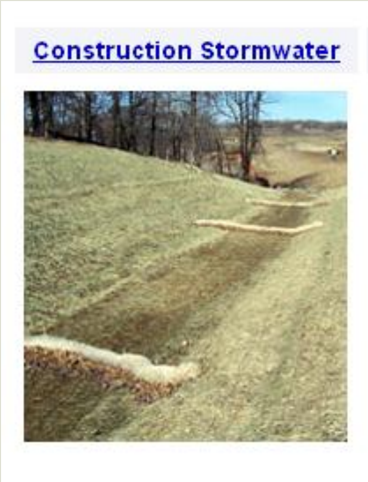
National Pollutant Discharge Elimination System (NPDES)

Total Maximum Daily Loads (TMDL)

Nondegredation

NPDES

National Pollutant Discharge Elimination System



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NPDES MS4

MS4 Six Minimum Control Measures

1. **Public Education and Outreach**
2. **Public Participation/Involvement**
3. **Illicit Discharge Detection and Elimination**
4. **Construction Site Runoff Control**
5. **Post-Construction Runoff Control**
6. **Pollution Prevention/Good Housekeeping**

TMDL

Total Maximum Daily Load

TMDL

303d "Impaired Waters" List

The federal Clean Water Act requires the State to conduct a TMDL study

↓

Total Maximum Daily Loads

Surface water bodies whose water quality are found to be impaired for their designated uses due to a pollutant or combination of pollutant loads.

↓

TMDL Study

A TMDL study identifies both point and nonpoint sources of each pollutant that fails to meet water quality standards

↓

TMDL Plan

Sources must reduce their contribution to assure the water quality standards are met.

Antidegradation

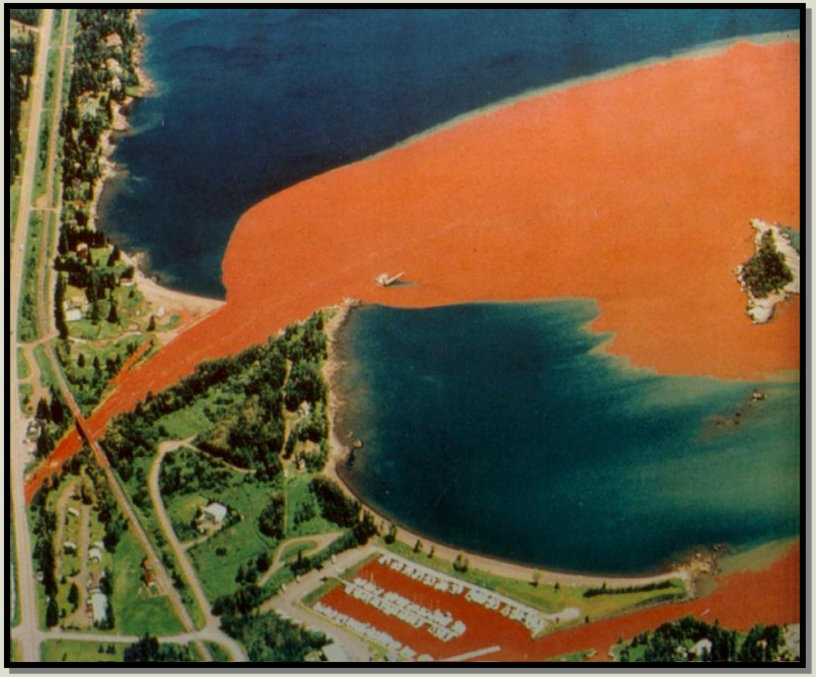
City must demonstrate what past present and future best management practices will be reasonably required to return stormwater runoff to 1988 levels.

300-600 ppb TP

How do you make this…

function like this?

So What Are We Supposed to Do?



"We Cannot Solve The Problems That We Have Created With The Same Thinking That Created Them"

--Albert Einstein--

Research increasingly shows the benefits of:

Vegetated vs. Piped

Open vs. Closed

Infiltration vs. Detention

Low Impact Development

Conserve Natural Areas and maintain natural drainage patterns

Minimize development impacts

Keep soils healthy

Treat stormwater at the source

H.B.Fuller Company Parking Lot

1997 Study by Ramsey Washington Metro Watershed District

Reduced storm water discharge by 73%

Reduced sediment discharge by 94%

Reduced phosphorus loading by 70%

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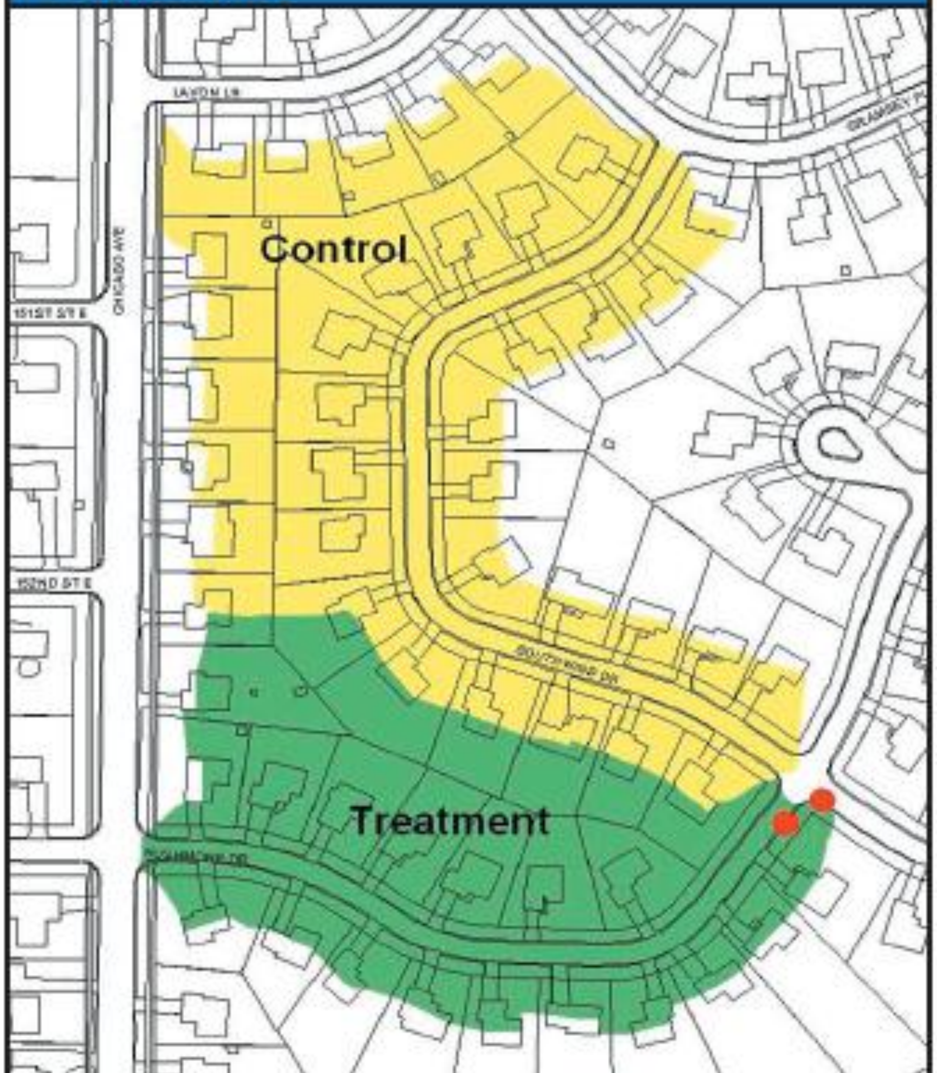
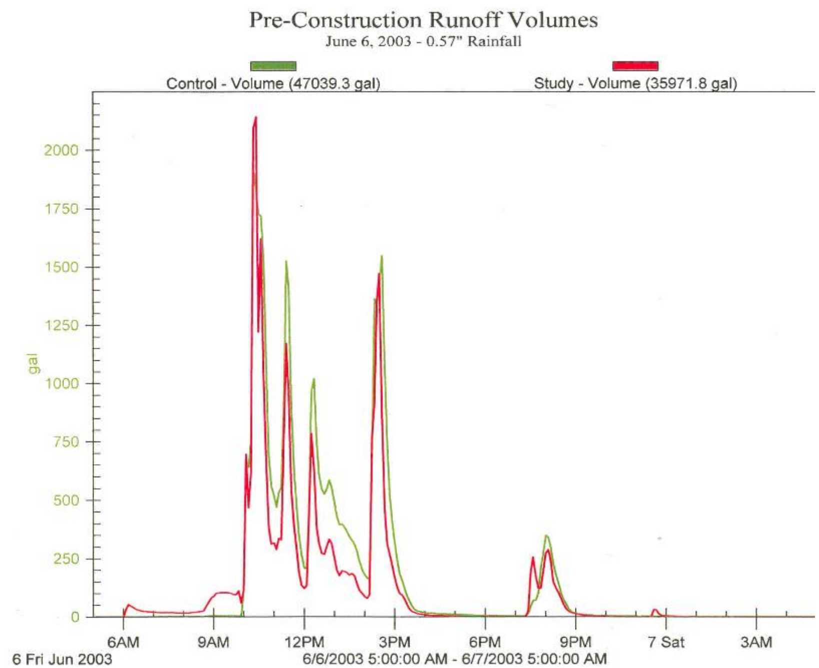
Figure 14.2 Control and Treatment Watersheds



Monitoring Results



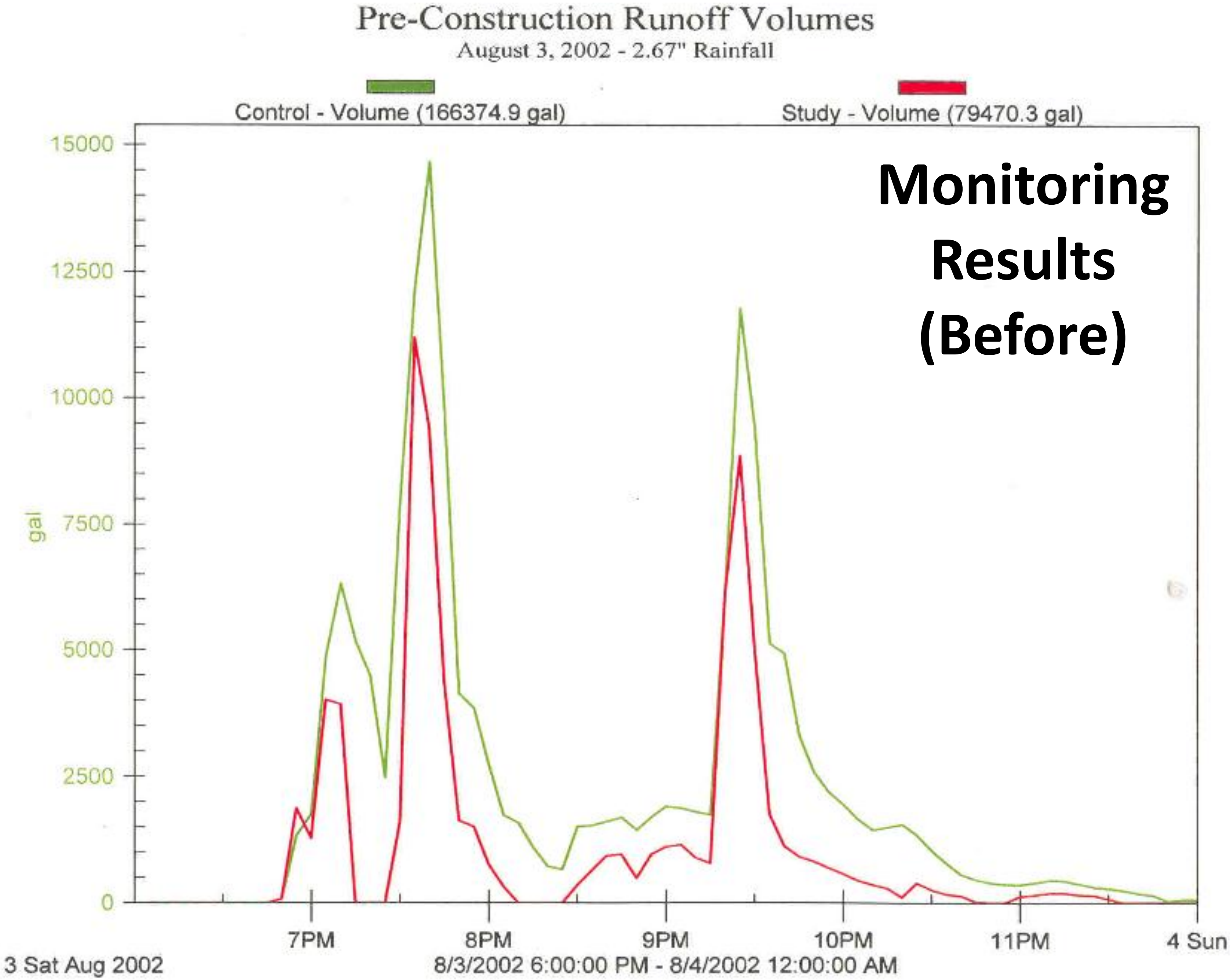
Burnsville Neighborhood Retrofit

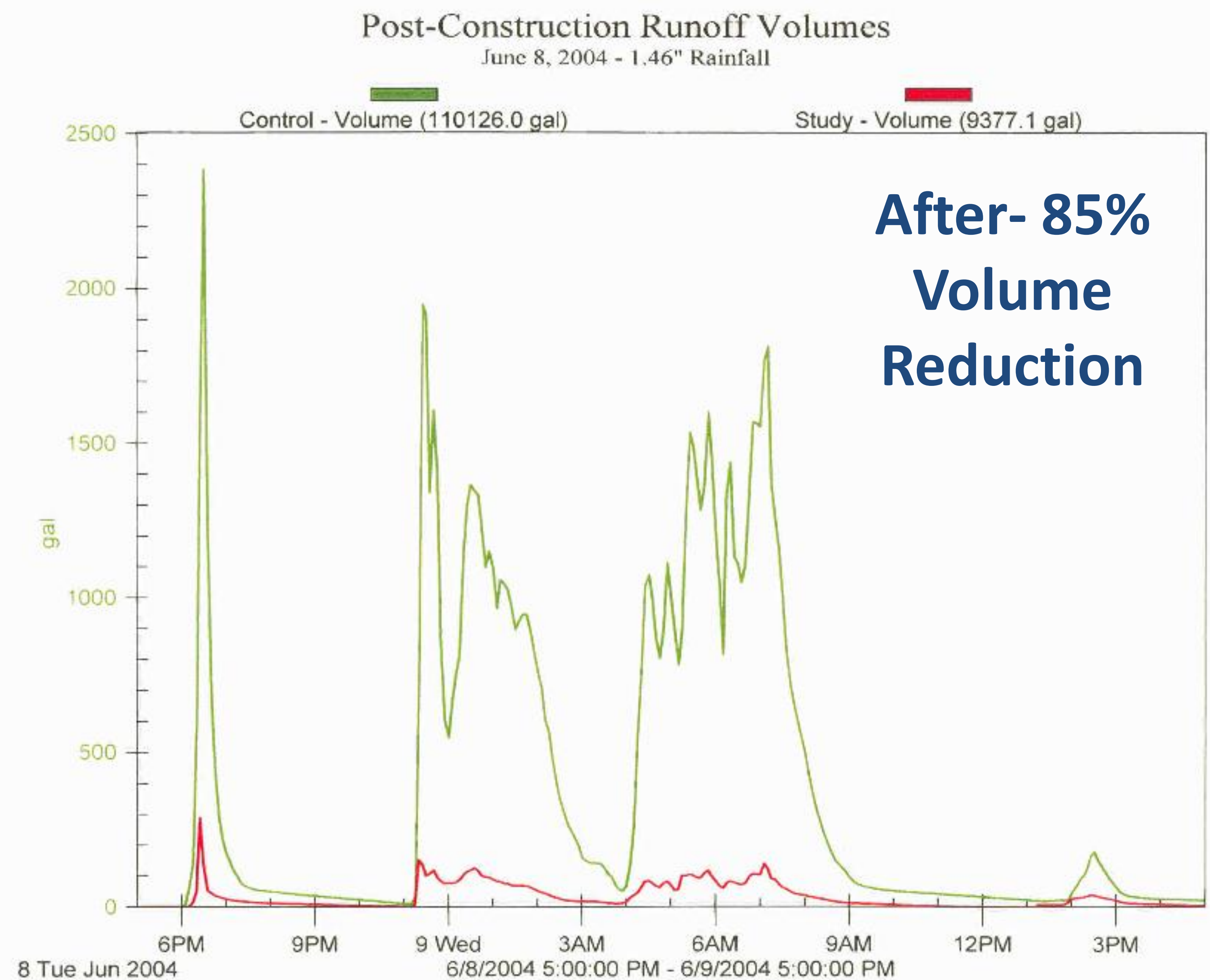
Burnsville – Rushmore Street

5.3 acres – 25 homes – 17 raingardens

Designed by: Barr Engineering

Monitoring Results (Before)





After- 85% Volume Reduction


BEFORE
City of Burnsville
Designed by: Barr Engineering


AFTER
City of Burnsville
Designed by: Barr Engineering

Integrating Water Quality into Development Design

Thank you

Contact Information:

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