Southland Corridor Green Infrastructure Feasibility Study



Southland ASSOCIATION
A Community Service Organization

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GRAY GREEN
SOUTHLAND DRIVE

July 20, 2017

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Ludwig Mies van der Rohe: “less is more”

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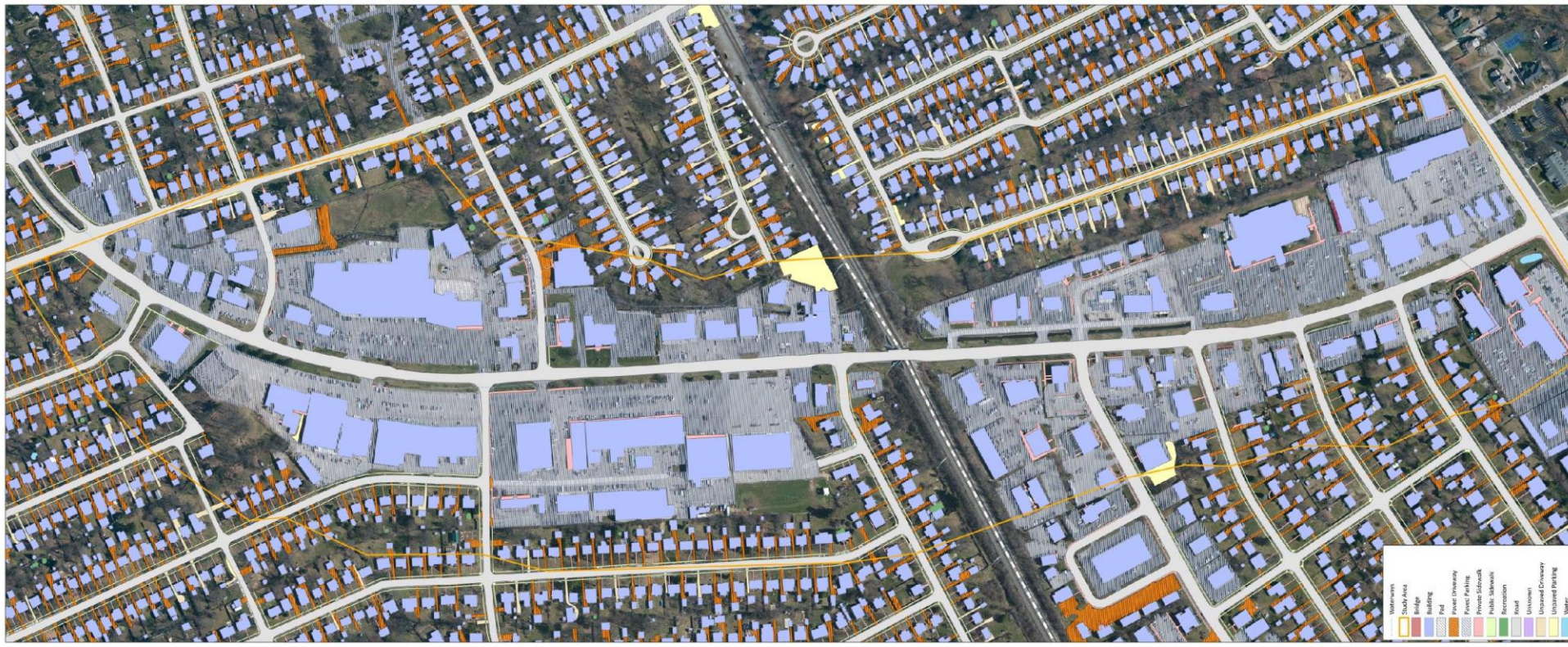
Southland Corridor Green Infrastructure Feasibility Study

Agenda:

- Background
- Site Selection for Case Studies
- Case Studies
- Hidden Cost of Pavement
- Recommendations



Goals for Study:

- Provide educational information to business & property owners
- Identify opportunities to reduce water quantity runoff
- Identify opportunities to improve water quality with GI/LID
- Develop two representative property - site conceptual designs
  - Short Term Options
  - Intermediate Term Options
  - Long Term Options
- Serve as GI practices model for other commercial areas in Lexington
- Provide economic/retail models for implementing GI

What is Green Infrastructure (GI)?

- At the scale of a city or county, GI refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water.
- At the scale of a neighborhood or site, GI refers to stormwater management systems that mimic nature by soaking up and storing water.

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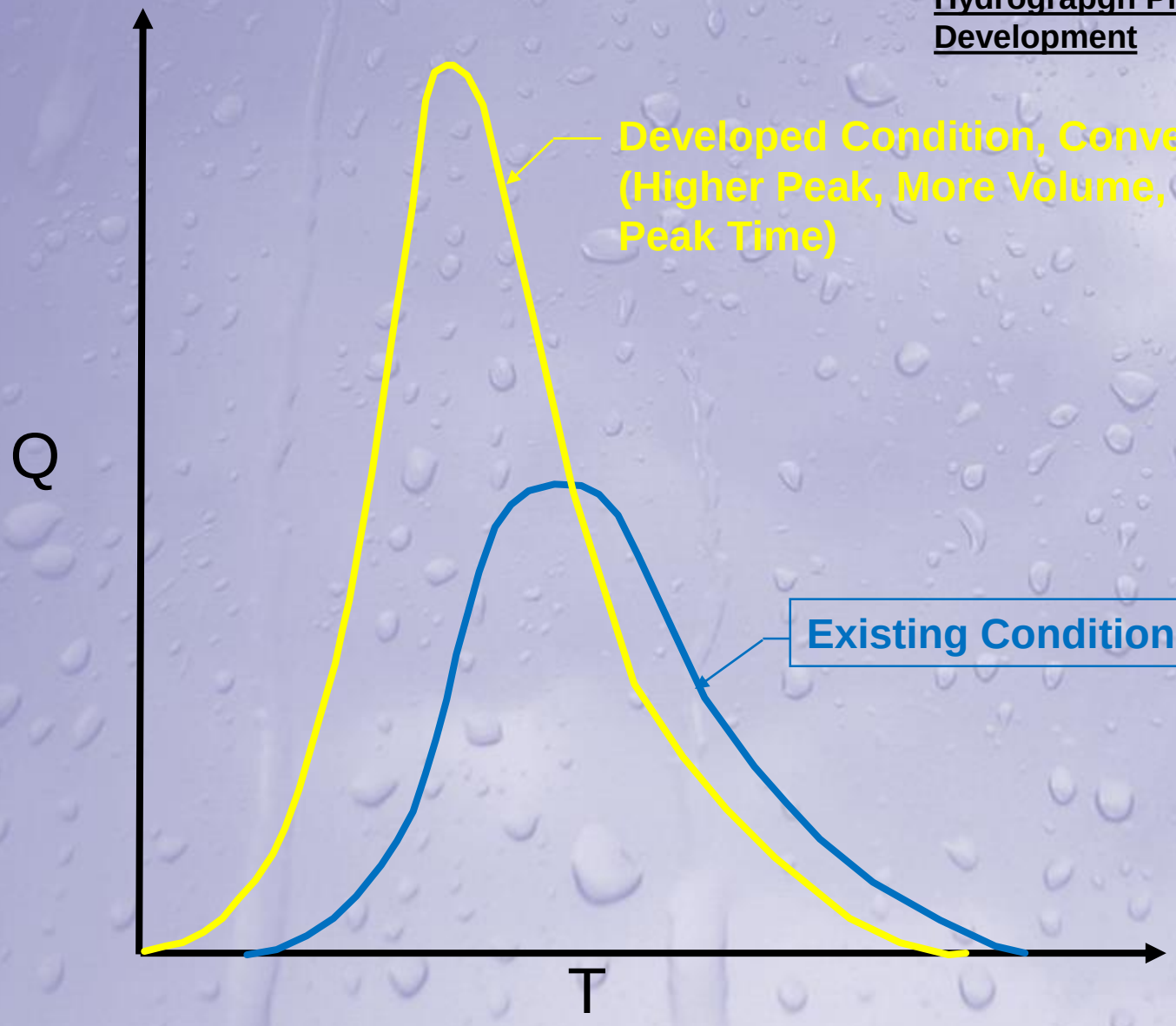
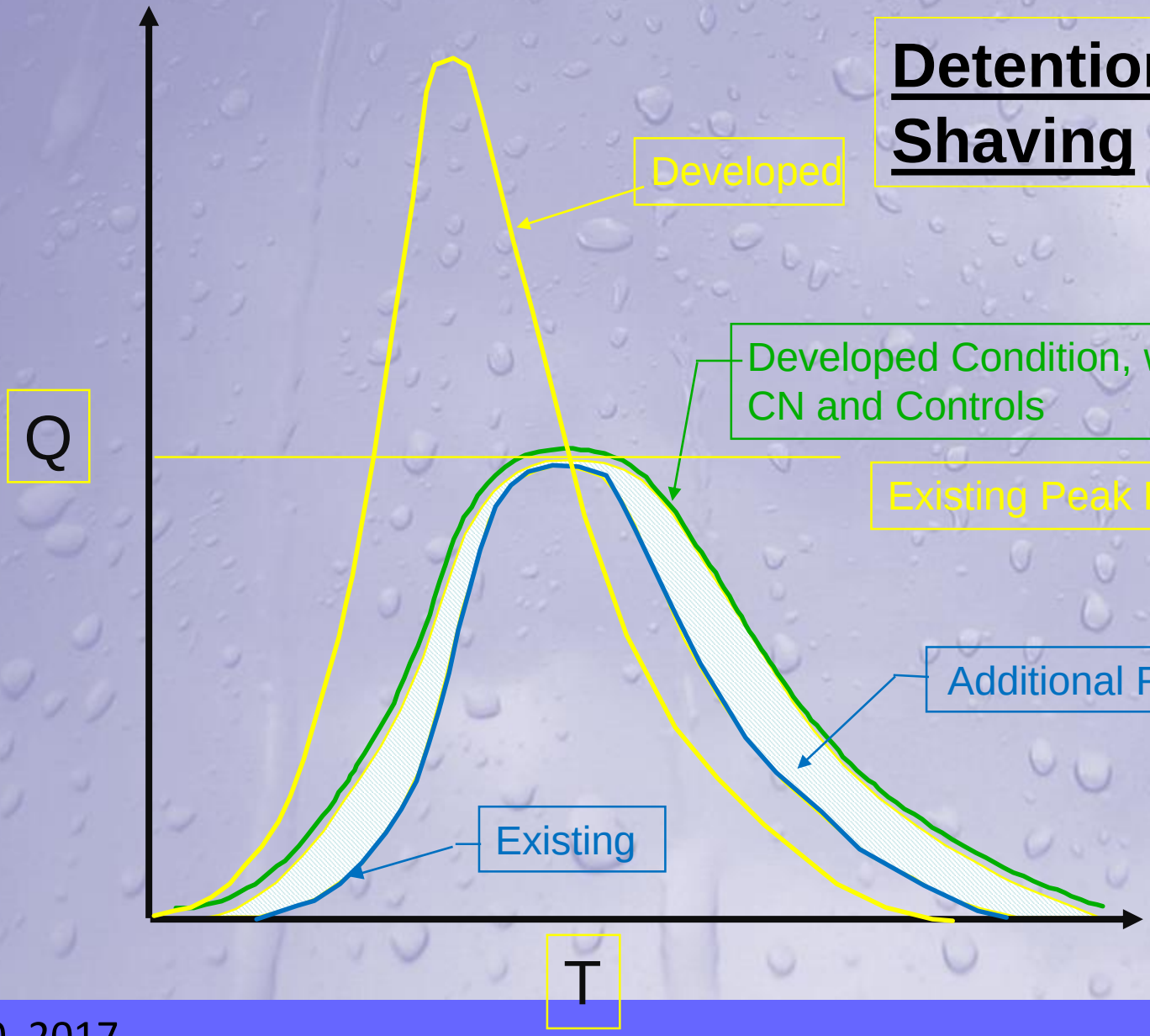
- At the scale of a neighborhood or site, GI refers to stormwater management systems that mimic nature by soaking up and storing water.

Hydrograpgh Pre/ Post Development




Detention Peak Shaving
Developed
Developed Condition, with Conventional CN and Controls
Existing Peak Runoff Rate
Additional Runoff Volume
Existing
Q
T

Benefits of Green Infrastructure:

Water Quality: Stormwater from urban areas delivers many pollutants to our streams, lakes, and beaches - including pathogens, nutrients, sediment, and heavy metals. In cities with combined sewer systems, high stormwater flows can also send untreated sewage into our waters.

Flood Reduction: Conventional stormwater infrastructure quickly drains stormwater to rivers and streams, increasing peak flows and flood risk. Green infrastructure can mitigate flood risk by slowing and reducing stormwater discharges.

Water supply: Rainwater harvesting and infiltration-based practices increase the efficiency of our water supply system. Water collected in rainwater harvesting systems can be used for outdoor irrigation and some indoor uses and can significantly reduce municipal water use. Water infiltrated into the soil can recharge groundwater, an important source of water in the United States.

Private and Public Cost Savings: When stormwater management systems are based on green infrastructure rather than gray infrastructure, developers often experience lower capital costs. These savings derive from lower costs for site grading, paving, and landscaping, and smaller or eliminated piping and detention facilities.

Benefits of Green Infrastructure:

Air Quality: **Ground Level Ozone:** Ground level ozone or smog, is created when nitrogen oxides (NOx) and volatile organic compounds (VOCs) interact in the presence of heat and sunlight. Smog conditions are usually worst in the summer and can lead to respiratory health problems. Vegetation can reduce ground level ozone by reducing air temperatures, reducing power plant emissions associated with air conditioning, and removing air pollutants.

Particulate Pollution: Particulate matter refers to the tiny bits of dust, chemicals, and metals suspended in the air we breathe. Because particulate matter is so small, it can enter into the lungs and cause serious health effects. Trees, parks, and other green infrastructure features can reduce particulate pollution by absorbing and filtering particulate matter.

Health Effects: Breathing ground level ozone and particulate pollution can cause respiratory ailments including chest pain, coughing, aggravation of asthma, and even premature death. In their triple bottom line study on the benefits of green infrastructure, the City of Philadelphia found that increased tree canopy would reduce ozone and particulate pollution levels enough to significantly reduce mortality, hospital admissions, and work loss days.

Benefits of Green Infrastructure:

Urban Heat Island: Urban heat islands form as cities replace natural land cover with dense concentrations of pavement, buildings, and other surfaces that absorb and retain heat. Trees, green roofs, and other green infrastructure features can cool urban areas by shading building surfaces, deflecting radiation from the sun, and releasing moisture into the atmosphere.

Energy Use: By reducing local temperatures and shading building surfaces, green infrastructure lessens the cooling and heating demand for buildings, reducing energy needs and decreasing emissions from power plants.

Water/Energy Nexus: Treating and moving drinking water and wastewater takes a lot of energy. By reducing stormwater inflow into sewer systems, recharging aquifers, and conserving water, green infrastructure can significantly reduce energy use.

Habitat Improvement: Vegetation in the urban environment provides habitat for birds, mammals, amphibians, reptiles, and insects. Even small patches of vegetation such as green roofs can provide habitat for a variety of insects and birds.

Green jobs:

Health Benefits:

Recreation space:

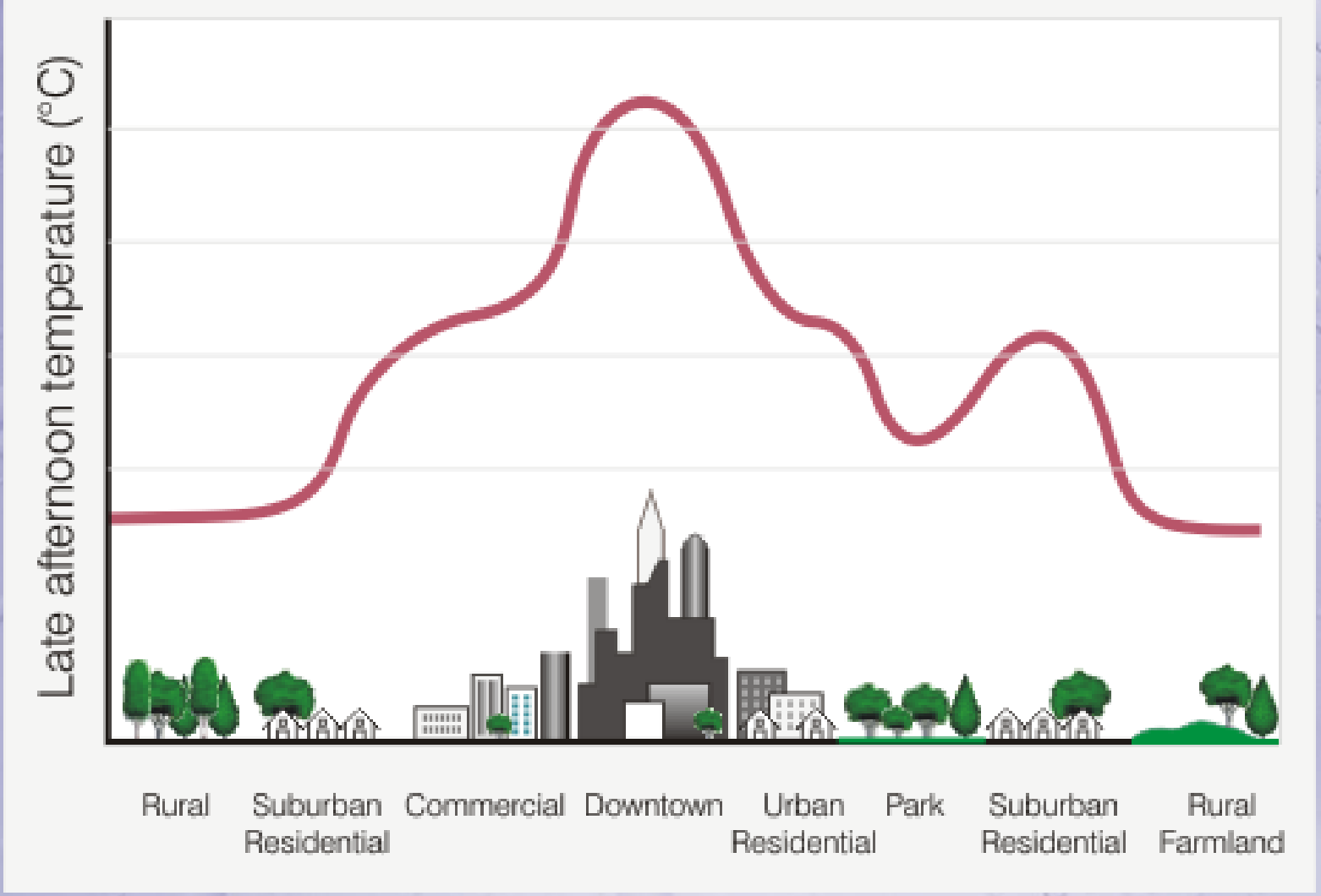
Property values:

GI Site Planning Process

- Green mentality
  - Collect stormwater and use it on-site
  - Less water down the drain is better
- Response
  - More water for your use
  - Less water down the drain
  - Mother Nature's soaker hose
- Utilize or mimic mother nature
  - Rainwater is free – why not keep it?

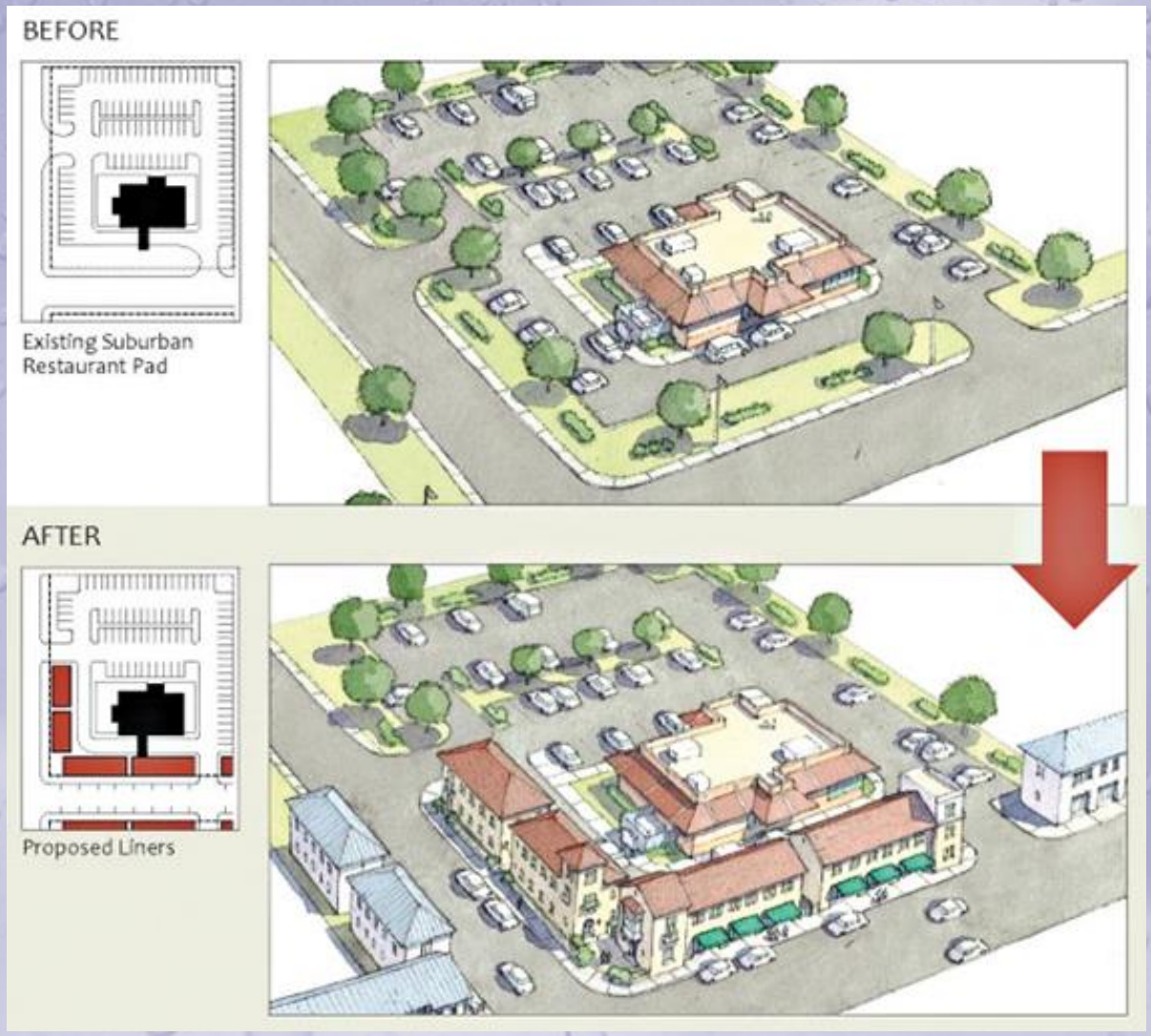
Cost of Sustainability:

Reduction in Heat Island Effect



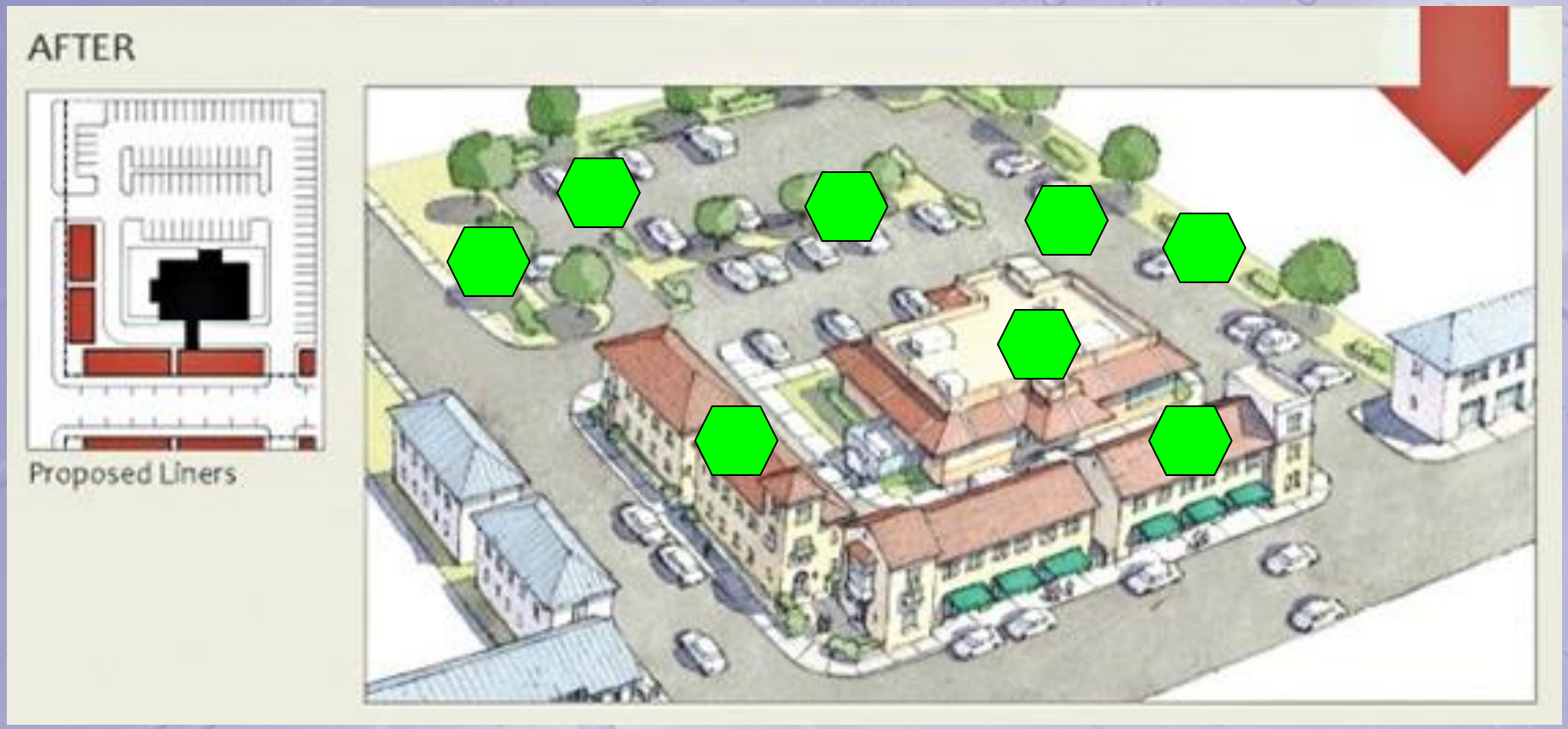
GI/LID Site Planning Process

- Neighborhood Scale;
- Increase in building density
- Reduction in autocentric design
- Opportunity for rain water harvesting
- Work with the landscape – architecture in harmony



"Fixing the Mess We Made" *By Emily Talen, AICP, Planning 2010*

GI/LID Site Planning Process



- Site Planning Objectives:
  - Opportunities abound

"Fixing the Mess We Made" *By Emily Talen, AICP, Planning 2010*

Examples of Green Infrastructure:

Rain Gardens		Planter Boxes		Grass Swale
	Infiltration Swale		Dry Wells	
Permeable Pavements		Green Roof		

Examples of Green Infrastructure:

Green Streets

Grass Swale

Capture

Rain Barrels & Cisterns

Disconnection

Downspouts & Pavement Removal

Case Studies

Green Infrastructure Benefits and Practices

This section, while not providing a comprehensive list of green infrastructure practices, describes the five GI practices that are the focus of this guide and examines the breadth of benefits this type of infrastructure can offer. The following matrix is an illustrative summary of how these practices can produce different combinations of benefits. Please note that these benefits accrue at varying scales according to local factors such as climate and population.

Benefit	Reduces Stormwater Runoff											Improves Community Livability						
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding	Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO_2	Reduces Urban Heat Island	Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture	Improves Habitat	Cultivates Public Education Opportunities
Practice																		
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◒	●	◒	◒	●	●
Tree Planting	●	●	●	●	○	◒	○	●	●	●	●	●	●	●	●	◒	●	●
Bioretention & Infiltration	●	●	●	●	◒	◒	○	○	●	●	●	●	●	◒	◒	○	●	●
Permeable Pavement	●	●	●	●	○	◒	●	◒	●	●	●	○	○	●	○	○	○	●
Water Harvesting	●	●	●	●	●	◒	○	◒	◒	◒	○	○	○	○	○	○	○	●

● Yes ◒ Maybe ○ No

Center for Neighborhood Technology - www.cnt.org/

GI Integrated Management Practices

Water as a resource:

1” rain over 1000 sf = 623 gals

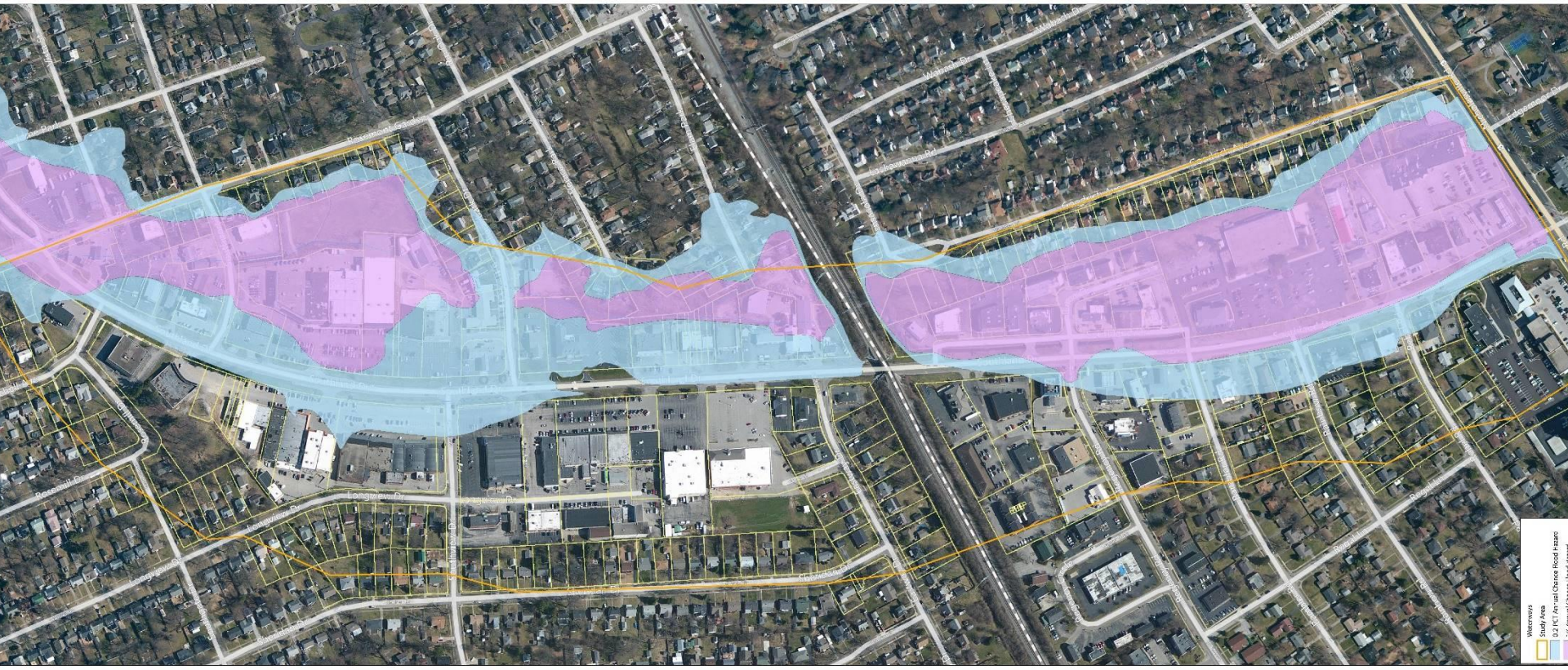
Southland Corridor Green Infrastructure Feasibility Study

Southland Drive: circa 1950

Southland Corridor Green Infrastructure Feasibility Study

Southland Drive: circa 1950

Southland Corridor Green Infrastructure Feasibility Study



Southland Drive: Floodplain

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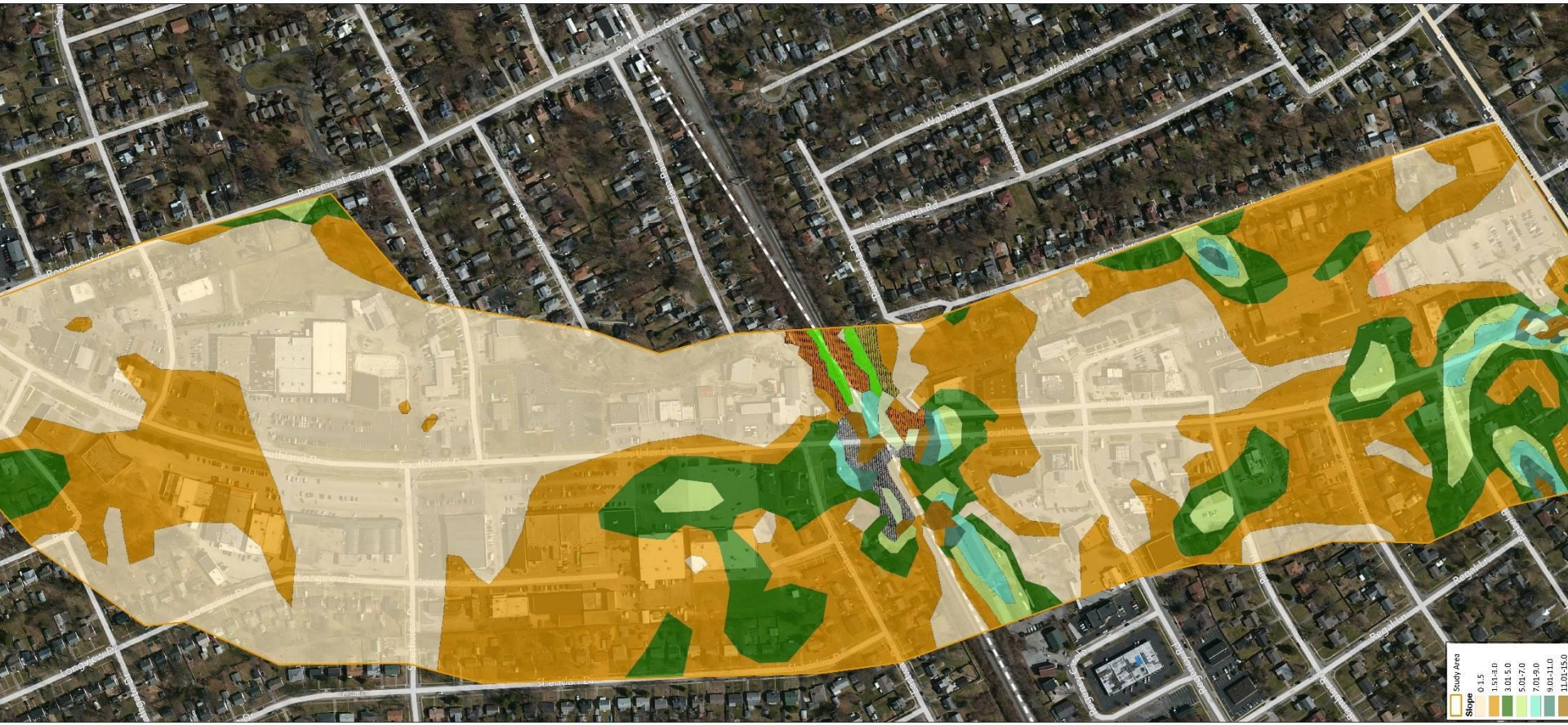

Southland Drive: Soil

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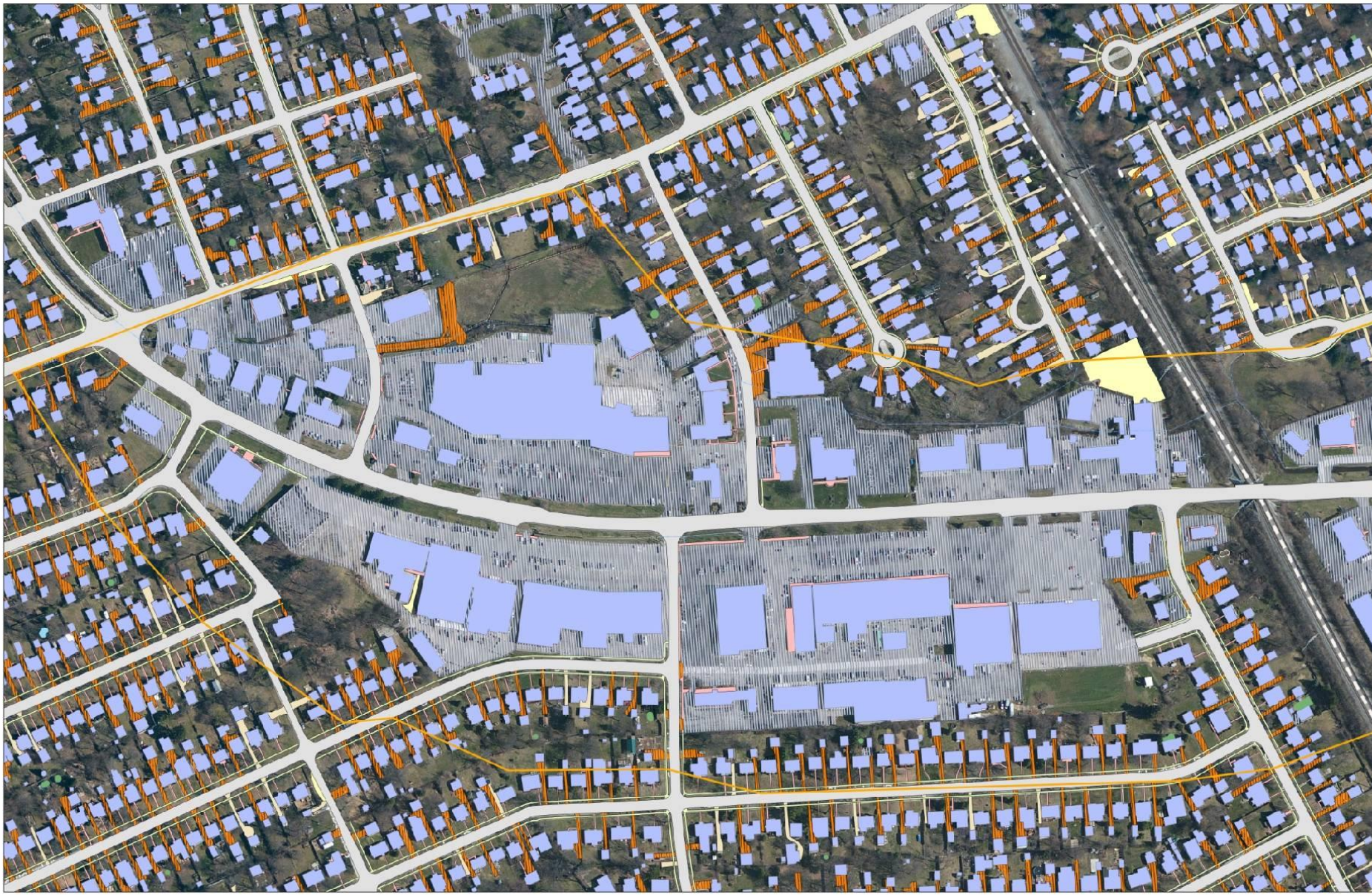

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By the Numbers:

Wolf Run Watershed – 10.18 square mile (6514 acre) watershed

Watershed Plan – Retail, Trade & Personal Service & Professional Service / Office = 9.51% of the watershed or 619.48 acre

Within the Wolf Run Watershed – impervious surface accounts for 40%

Southland Drive accounts for about 16.66% of this land use type

Southland Drive Study Area – 115.5 acres

Total Impervious Area – 84 acres or 83% of study area

Southland Corridor Green Infrastructure Feasibility Study

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MIND BODY STUDIO
mindbodystudio.org
ARGENTINE TANGO
MINDFULNESS
MEDITATION ZEN DANCE
YOGA FELDENKRAIS
John A. Patterson MD MSPH
Preventive Behavioral Integrative Medicine
Board Certified Family Practice
Board Certified Holistic Medicine
Cypress Community Services
Ten Kids
527

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9 MINIT LUBE
MIDAS
Good Foods Market & Cafe
The Pharm

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Green Infrastructure Portfolio Standard – GIPS

The Green Infrastructure Portfolio Standard (GIPS) is an adaptation to stormwater management of the "renewable energy portfolio standards" adopted by over 30 U.S. states. The goal of renewable energy portfolio standards is to gradually but deliberately increase the use of electricity from renewable sources over twenty or thirty years.

While increasing growth and redevelopment, decrease water runoff, improve water quality

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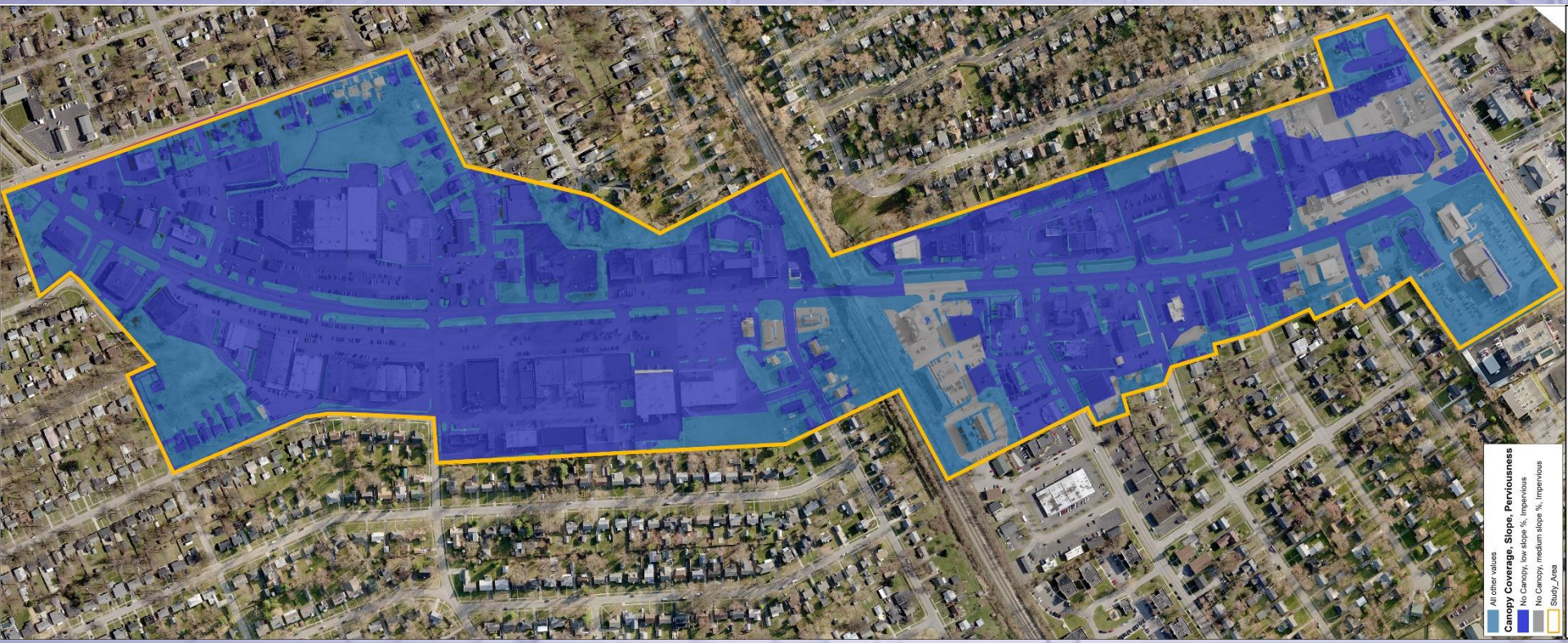
Southland Corridor Green Infrastructure Feasibility Study

Composite Analysis:

- Slope, Tree Coverage & Impervious Area
- Dark & Light Blue areas are very favorable for GI

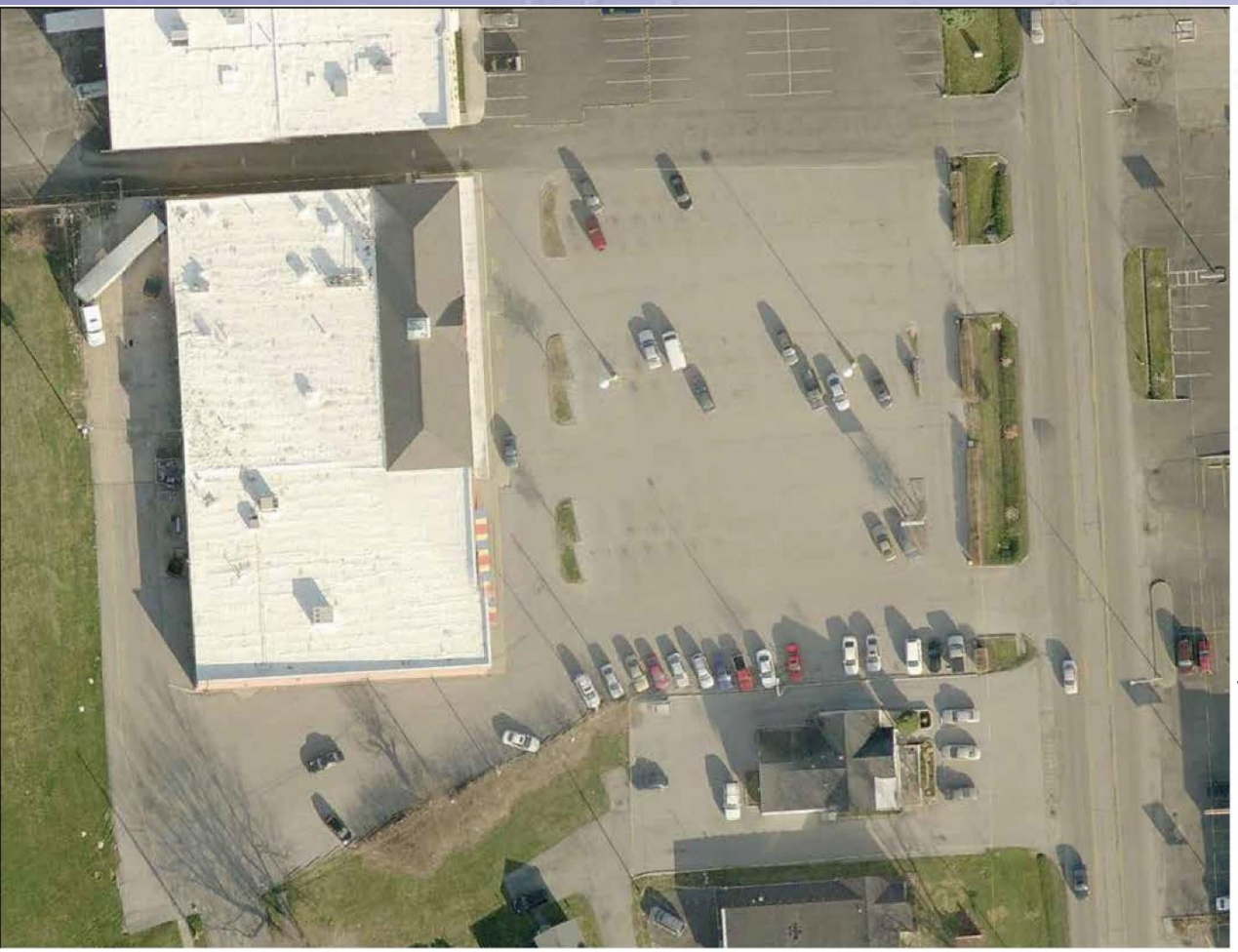


Site Selection for Case Studies:

- 110+ parcels along the mile corridor
- Large parcel – over an acre in size – Dollar General/Incredipet
- Small parcel – under an acre in size – 2011 Rambler Road

Southland Corridor Green Infrastructure Feasibility Study

Case Study – Site #1 - Dollar General / IncrediPet



Existing Condition: Site 1 - Dollar General Store/IncrediPet - 306 Southland Drive

Site Area: 2.3 Acres (100,626 square feet)

Zoned: Neighborhood Business (B-1)

Building: 27,500 square feet (27% of site)

Impermeable Area (parking lot, driveways, sidewalk): 68,591 square feet (68% of site)

Permeable/Vegetated Area: 4,535 square feet (4% of site)

Required Parking Spaces by Zoning: 96

Parking Spaces: 120

Trees: 0

ERU's: 96,091/2500 = 38 x $4.63/month = $175.94/month

Summary:

Vegetated Area: 4%

No Trees

ERU fee: $175.94 / month*

* ERU fee based on GIS mapping

Case Study – Site #1: Dollar General / IncrediPet – Scenario 1

Concept: Site 1 - Scenario 1

Total Area: 2.3 Acres (100,626 square feet)

Zoned: Neighborhood Business (B-1)

Building: 27,500 square feet (27% of site)

Impermeable Area (parking lot, driveways, sidewalk): 61,241 square feet (60% of site)

Permeable/Vegetated Area: 11,885 square feet (12% of site) (+ 8%)

Required Parking Spaces by Zoning: 96

Parking Spots: 109 (-7)

Trees: 0

ERU's: 88,741/2500 = 36 x $4.63/month = $166.68/month (-$9.26/month)

Summary:

Addition of landscape island

Eliminated excess pavement

Reduced 7 parking spaces

Reduced pavement x 7,350sf = 24 parking spaces

Case Study – Site #1: Dollar General / IncrediPet – Scenario 2

Concept: Site 1 - Scenario 2

Total Area: 2.3 Acres (100,626 square feet)

Zoned: Neighborhood Business (B-1)

Building: 27,500 square feet (27% of site)

Impermeable Area (parking lot, driveways, sidewalk): 61,241 square feet (60% of site)

Permeable/Vegetated Area: 11,885 square feet (12% of site) (+ 8%)

Required Parking Spaces by Zoning: 96

Parking Spots: 109 (-7)

Trees: 24

Improvements: BMPs added - Native landscaping, rain gardens, tree canopy.

ERU's: 88,741/2500 = 36 x $4.63/month = $166.68/month (-$9.26/month)

Summary:

Addition of landscape island

Eliminated excess pavement

Reduced 7 parking spaces

Reduced pavement x 7,350sf

= 24 parking spaces

24 Canopy Trees

GRAY GREEN
SOUTHLAND DRIVE

Case Study – Site #1: Dollar General / IncrediPet – Scenario 3

Concept: Site 1 - Scenario 3

Total Area: 2.3 Acres (100,626 square feet)

Zoned: Neighborhood Business (B-1)

Building: 27,500 square feet (27% of site)

Impermeable Area (parking lot, driveways, sidewalk): 40,670 square feet (40% of site)

Vegetated Area: 14,308 square feet (14% of site) (+ 10%)

Permeable Pavement Area: 18,150 square feet (18% of site) (+18%)

Required Parking Spaces by Zoning: 96

Parking Spots: 121 (+5)

Trees: 22

Improvements: BMPs added - porous pavement, native landscaping, rain gardens, tree canopy.

ERU's: 68,170/2500 = 27 x $4.63/month = $125.01/month (-$50.93/month)

Summary:

Revised parking lot layout

Eliminated excess access

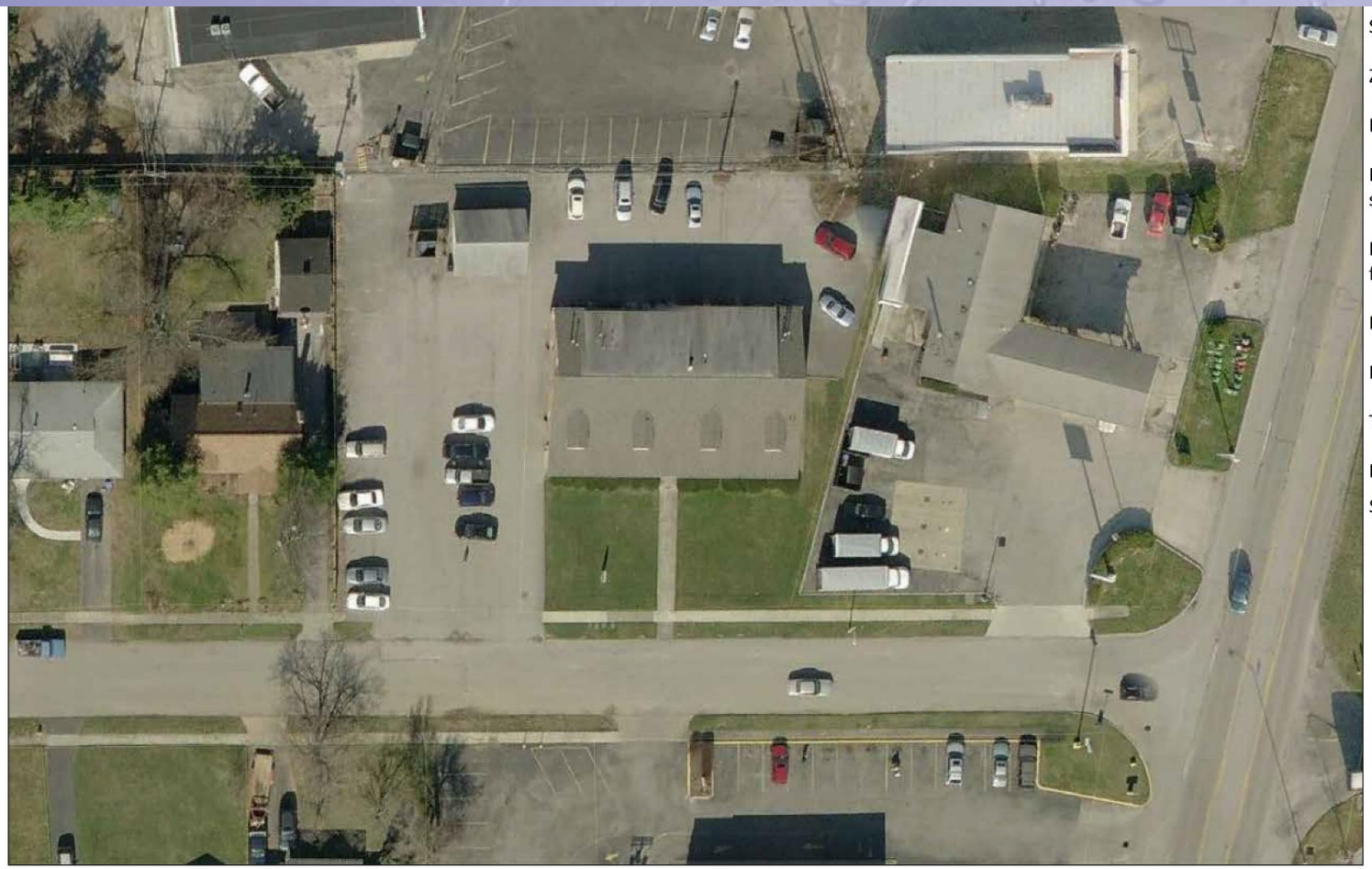
Increase 5 parking spaces

Reduced pavement x 9,773sf

= 28 parking spaces

22 Canopy Trees

Case Study: Site #2: 2011 Rambler Road



Existing Condition: Site 2 - Office Building - 2011 Rambler Road

Site Area: .72 Acres (31,334 square feet)

Zoned: Neighborhood Business (B-1)

Building: 5,800 square feet (19% of site)

Impermeable Area (parking lot, driveways, sidewalk): 19,164 square feet (61% of site)

Permeable/Vegetated Area: 6,370 square feet (20% of site)

Required Parking Spaces by Zoning: 15

Parking Spaces: 38

Trees: 0

ERU's: 24,964/2500 = 10 x $4.63/month = $46.30/month

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SOUTHLAND DRIVE

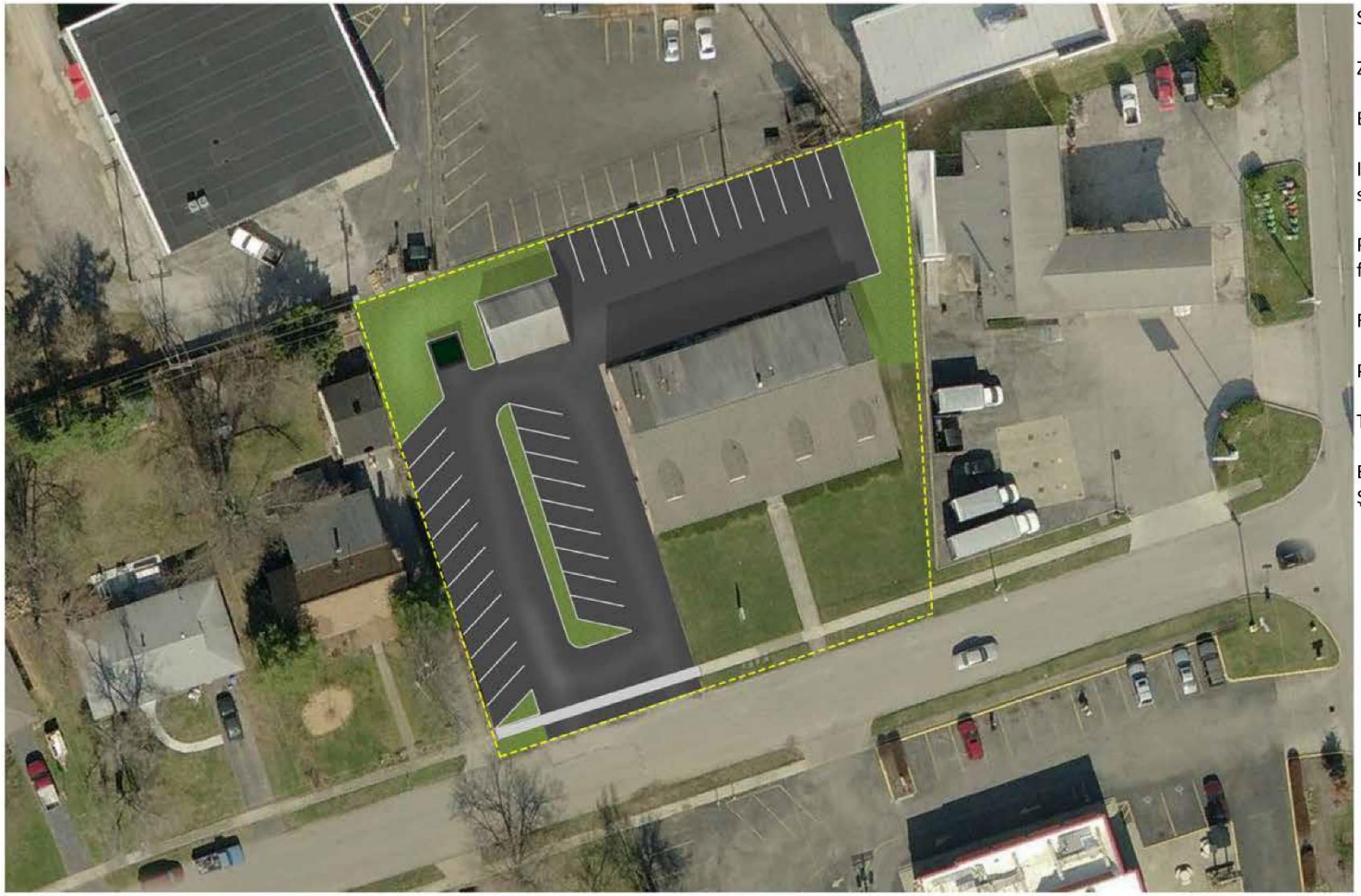
Summary:

250% more parking then required

ERU Fee = $46.30/month*

* ERU fee based on GIS mapping

Case Study: Site #2: 2011 Rambler Road - Scenario 1



Concept: Site 2 - Scenario 1

Site Area: .72 Acres (31,334 square feet)

Zoned: Neighborhood Business (B-1)

Building: 5,800 square feet (19% of site)

Impermeable Area (parking lot, driveways, sidewalk): 15,474 square feet (49% of site)

Permeable/Vegetated Area: 10,060 square feet 32% (+12%)

Required Parking Spaces by Zoning: 15

Parking Spaces: 34 (-4)

Trees: 0

ERU's: 21,274/2500 = 9 x $4.63/month = $41.67/month (-4.63/month)

Summary:

Addition of landscape island

Eliminated excess pavement

Reduced 4 parking spaces

Reduced pavement x 3,690 sf = 8 parking spaces

* ERU fee based on GIS mapping

Case Study: Site #2: 2011 Rambler Road - Scenario 2

Existing Condition: Site 2 - Scenario 2

Site Area: .72 Acres (31,334 square feet)

Zoned: Neighborhood Business (B-1)

Building: 5,800 square feet (19% of site)

Impermeable Area (parking lot, driveways, sidewalk): 15,474 square feet (49% of site)

Permeable/Vegetated Area: 10,060 square feet 32% (+12%)

Required Parking Spaces by Zoning: 15

Parking Spaces: 34 (-4)

Trees: 16

ERU's: 21,274/2500 = 9 x $4.63/month = $41.67/month (-4.63/month)

Improvements: BMPs added - Native landscaping, rain gardens, tree canopy.

GRAY GREEN
SOUTHLAND DRIVE

Summary:

Addition of landscape island

Eliminated excess pavement

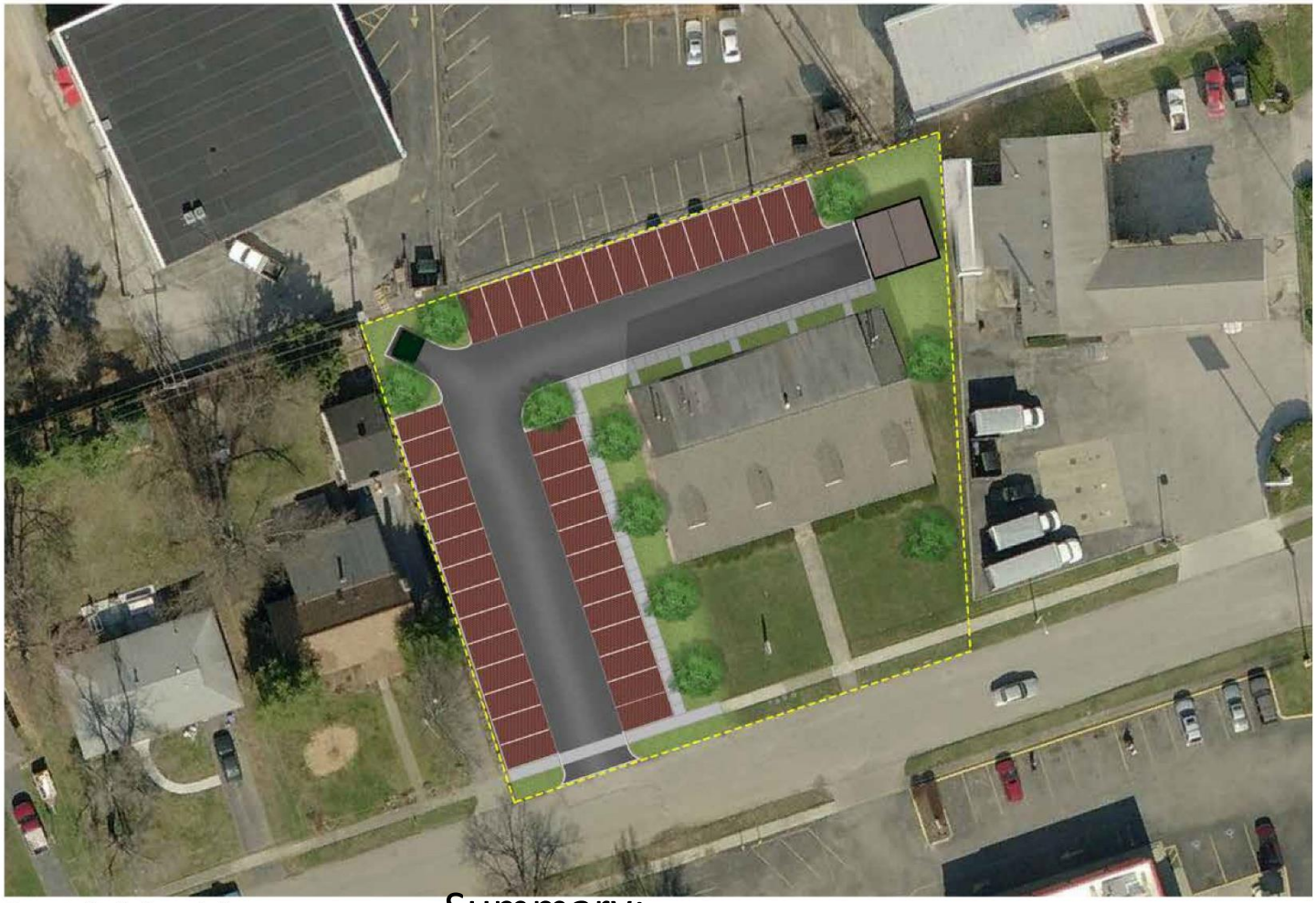
Reduced 4 parking spaces

Reduced pavement x 3,690 sf = 8 parking spaces

16 Canopy Trees

* ERU fee based on GIS mapping

Case Study: Site #2: 2011 Rambler Road - Scenario 3



Concept: Site 2 - Scenario 3

Site Area: .72 Acres (31,334 square feet)

Zoned: Neighborhood Business (B-1)

Building: 5,800 square feet (19% of site)

Impermeable Area (parking lot, driveways, sidewalk): 8,694 square feet (28% of site)

Permeable Pavement: 6,150 square feet (20% of site) (+20%)

Vegetated Area: 10,690 square feet (34% of site) (+14%)

Required Parking Spaces by Zoning: 15

Parking Spaces: 40 (+2)

Trees: 10

ERU's: 14,494/2500 = 6 x $4.63/month = $27.78/month (-18.52/month)

Improvements: BMPs added - porous pavement, native landscaping, rain gardens, tree canopy. The parking lot layout was redesigned with added sidewalks, and the storage building was moved.

Summary:

Addition of landscape island

Eliminated excess pavement

Increase 2 parking spaces

Reduced pavement x 4,320 sf = 8 parking spaces

10 Canopy Trees

* ERU fee based on GIS mapping

The hidden cost of pavement:

- Balance between too little parking & too much parking
- Key for businesses: More foot traffic in the door
- Each parking space: initial cost + O&M cost = life-cycle cost

Table 2 **Typical Costs Per Space** (Parking Evaluation)

Location & Type	Land Costs	Land Costs	Construction Costs	O & M Costs	Total Annualized Cost
	Per Acre	*Per Space*	*Per Space*	*Annual, Per Space*	*Annual, Per Space*
Suburban, Surface, Free Land	$0	$0	$1,500	$100	$242
Suburban, Surface	$50,000	$455	$1,500	$100	$284
Suburban, 2-Level Structure	$50,000	$227	$6,000	$200	$788
Urban, Surface	$250,000	$2,083	$2,000	$150	$535
Urban, 3-Level Structure	$250,000	$694	$8,000	$250	$1,071
Urban, Underground	$250,000	$0	$20,000	$350	$2,238
CBD, Surface	$1,000,000	$7,692	$2,500	$200	$1,162
CBC, 4-Level Structure	$1,000,000	$1,923	$10,000	$300	$1,425
CBD, Underground	$1,000,000	$0	$22,000	$400	$2,288

This table illustrates typical parking facility costs. Also see the Parking Cost Spreadsheet.

Table Source: Victoria Transport Policy Institute – www.vtpi.org

The hidden cost of pavement:

Tangible cost of parking = $535/space/year

- Land Cost
- Construction Cost
- Resealing
- Repairs/Maintenance
- Snow Removal
- Sweeping/Cleaning

Plus ERU Fee $55.56/ERU/year or $5.50/space/year

Table Source: Victoria Transport Policy Institute – www.vtpi.org

The hidden cost of pavement:

- (In)tangible or indirect cost of parking:
  - Heat Island Impact
  - Curb appeal (lacking)
  - Environmental (resealing)
  - Stormwater
  - Property Value – decrease
  - Improve Air Quality
  - Reduce Salt use
  - Reduce carbon emissions

Case Study: Site #1: Dollar General / IncrediPet – Scenario 1

Summary:

Reduced pavement x 7,350sf

= 24 parking spaces x $550/space = $13,200/year cost

Construction Cost: $58,800 - $69,825

Return On Investment(ROI): 4.5 – 5.3 years

Landscape Maintenance Cost: $550/year

Case Study: Site #1: Dollar General / IncrediPet – Scenario 2

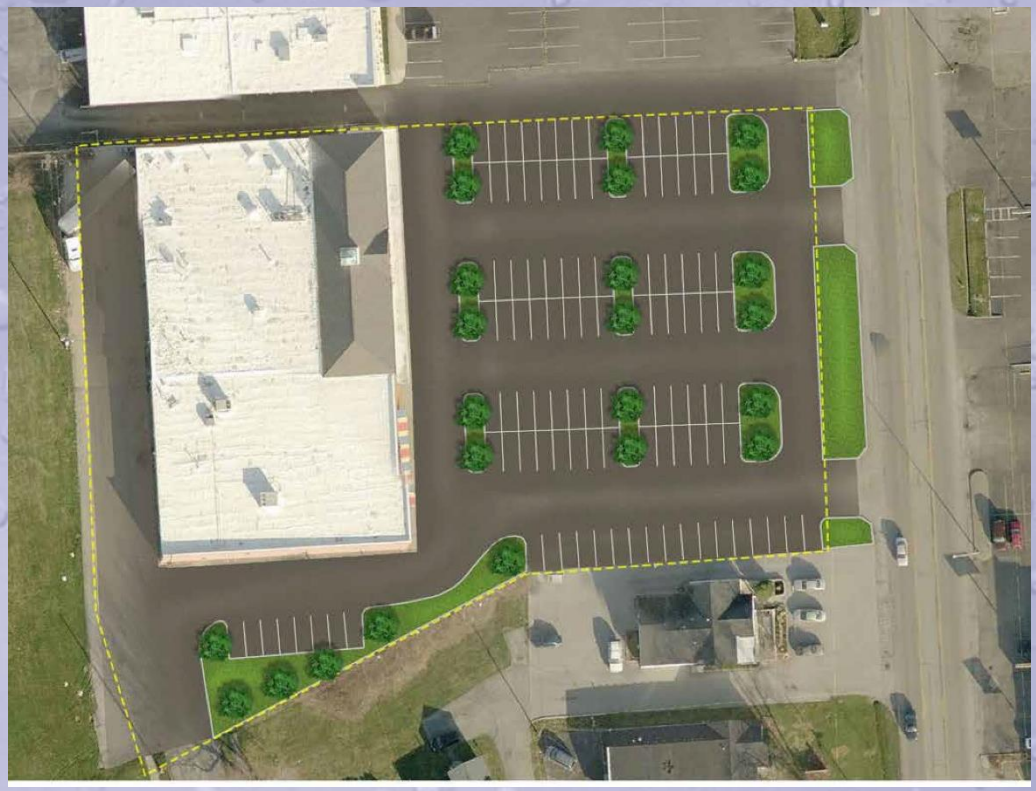
Summary:

Reduced pavement x 7,350sf

= 24 parking spaces x $550/space =

$13,200/year cost

24 Canopy Trees



Construction Cost: $64,800 - $75,825

Return On Investment(ROI): 5.2 – 5.7 years

Landscape Maintenance Cost: $750/year

Tree value 24 x $22/year = $528/1st year

Tree Value Website: http://www.treebenefits.com/calculator/ReturnValues.cfm?climatezone=Lower Midwest

Case Study: Site #1: Dollar General / IncrediPet – Scenario 3

Summary:

Reduced pavement x 9,773sf

= 28 parking spaces x $550/space =

$15,400/year savings

22 Canopy Trees

Construction Cost: $425,000 - $475,000

LFUCG Water Quality Grant: $350,000

Return On Investment(ROI): 4.8 – 8.3 years

Landscape Maintenance Cost: $750/year

Permeable Pavement Maintenance: $750/yr

Tree value 22 x $22/year = $484/1st year

ERU Fee savings = $50.93/month or $611.16/year

Summary:

Increase Retail Sales: 8-12%

25,700 sf x $150*/sf/year=$3,855,000

$3,855,000 x .08 = $308,000 increase

Tree Value Website: http://www.treebenefits.com/calculator/ReturnValues.cfm?climatezone=Lower Midwest

Case Study: Site #1: Dollar General / IncrediPet – Scenario 3

Summary:

Reduced pavement x 9,773sf = 28 parking spaces x $550/space = $15,400/year savings

Ave. Retail Sales $100 - $150 /sf/yr - 9,773 sf x retail $100 sf/yr = $977,300/yr

Why should I be interested in GI?

- Business Owner:
  - Pass-on cost
  - Increase curb appeal = increase sales
- Property Owner:
  - Increase rent value
  - Stable tenants
  - Reduced maintenance cost
- Southland Association
  - Branding
  - Resiliency


DOLLAR GENERAL
DOLLAR GENERAL
TOBACCO
OLEIKA


DOLLAR GENERAL
TOBACCO

Native Landscape

July 20, 2017

Recommendations:

Business Owner:

- Talk w/ Owner & other Property Owners
  - Share parking
  - Reduce pavement
  - Increase curb appeal
- LFUCG Water Quality Incentive Grant

Property Owner:

- Talk w/ Business & other Property Owners
  - Share parking
  - Reduce pavement
  - Increase curb appeal -
- LFUCG Water Quality Incentive Grant

Recommendations:

Southland Association:

- Set target for reducing pavement & other impervious surfaces
- Expand Infill & Redevelopment Boundary to include Southland Drive
- Continue promote & support alternative transportation options on the corridor – walk, bike, transit
- Marketing / Branding – Gray 2 Green
- Grants -

Recommendations:

Full Report:

http://www.cdpengineers.com/blog/southland-drive-green-infrastructure-feasibility-study/

Footnote:

Footnote:


Ground cover

Green Infrastructure Resources:

EPA Benefits:
http://water.epa.gov/infrastructure/greeninfrastructure/
EPA National Stormwater Calculator:
http://www2.epa.gov/water-research/national-stormwater-calculator
Milwaukee, WI – GI calculator - H2OCapture:
http://www.h2ocapture.com/
National Tree Benefit Calculator:
http://www.treebenefits.com/calculator/
Center for Neighborhood Technology:
http://www.cnt.org/water/projects/green-infrastructure/
LFUCG LID Guidelines:
http://www.lexingtonky.gov/index.aspx?page=2677
LFUCG Water Quality Grant:
http://www.lexingtonky.gov/index.aspx?page=2119

Keep Southland Local!

Thank You

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