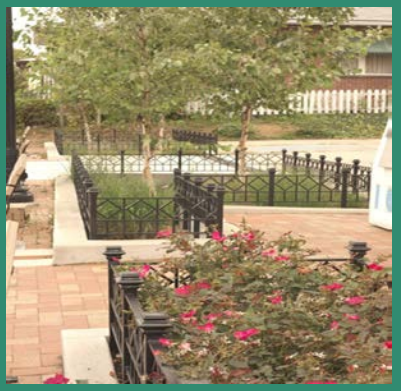

MEDIA STORMWATER MASTER PLAN

BOROUGH OF MEDIA, PA

July 2017 | Prepared by T&M Associates

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ABOUT MEDIA BOROUGH AND GROWING GREENER

In January of 2014, Media Borough received a Growing Greener Watershed Protection grant from the Pennsylvania Department of Environmental Protection (PADEP) for the development of the Media Borough Stormwater BMP Master Plan.

The goals and deliverables identified for the Plan were:

1. Identification and mapping of runoff and flooding problems throughout the Borough.
2. Identification of where green infrastructure and best management practices could be built to help mitigate these issues.
3. Determine the degree to which storm sewers would need to be upgraded.
4. Develop preliminary stormwater management plans that would address eleven (11) identified, acutely effected flood areas within the Borough.
5. A written report or Stormwater Master Plan to accompany preliminary design documents created through this effort.

ACKNOWLEDGEMENTS

- Media Borough Council
- Pennsylvania Department of Environmental Protection
- Delaware County Government
- Chester County Government
- Philadelphia Water Department
- Chester-Ridley-Crum Watersheds Association
- Walt Cressler, Science Librarian at West Chester University
- Media Borough Environmental Advisory Committee

ABOUT PADEP'S GROWING GREENER PROGRAM

DEVELOPMENT OF A STORMWATER MASTER PLAN FOR MEDIA BOROUGH

Growing Greener is the largest single investment of state funds in Pennsylvania's history to address Pennsylvania's critical environmental concerns of the 21st century. Growing Greener reduced the backlog of farmland-preservation projects statewide, protected open space, eliminated the maintenance backlog in state parks, cleaned up abandoned mines and restored watersheds, provided funds for recreational trails and local parks, helped communities address land use, and provided new and upgraded water and sewer systems.

Over the first five years of the program, Growing Greener invested $645.9 million distributed among four state agencies: the Department of Agriculture to administer farmland preservation projects, the Department of Conservation and Natural Resources for state park renovations and improvements, the Pennsylvania Infrastructure Investment Authority for water and sewer system upgrades, and the Department of Environmental Protection (DEP) for watershed restoration/protection, abandoned mine reclamation and oil and gas well plugging.

DEP was authorized to allocate these funds in grants for:

- Watershed restoration and protection
- Abandoned mine reclamation
- Abandoned oil and gas well plugging projects

In 2014, the Borough of Media was awarded $127,192 in Watershed Restoration and Protection funds from the Growing Greener program to *assess stormwater problems in a one-square-mile urban borough, to prepare a Master Plan for addressing stormwater problems, and to prepare ten preliminary designs for stormwater projects*.

FUNDING ACKNOWLEDGEMENT

This project was funded in part by a Growing Greener Grant provided by the Pennsylvania Department of Environmental Protection. The views expressed herein are those of the authors and do not necessarily reflect the views of the Department of Environmental Protection.

EXECUTIVE SUMMARY

Urban nuisance flooding and stream water quality concerns led Media Borough to evaluate their stormwater infrastructure system to identify deficiencies contributing to local flooding and to create a plan to address stormwater problems.

The first step was to inventory and map Media's existing stormwater infrastructure in order to understand the existing system's layout and function. An integrated computer model of the existing stormwater system and Borough land cover was built to support characterization and evaluation of various approaches to fixing local flooding hotspots.

The model evaluated alternatives and strategies that could increase the effectiveness of the stormwater system in reducing the frequency and extent of flooding in the Borough and to determine the best alternatives for correcting deficiencies within the system.

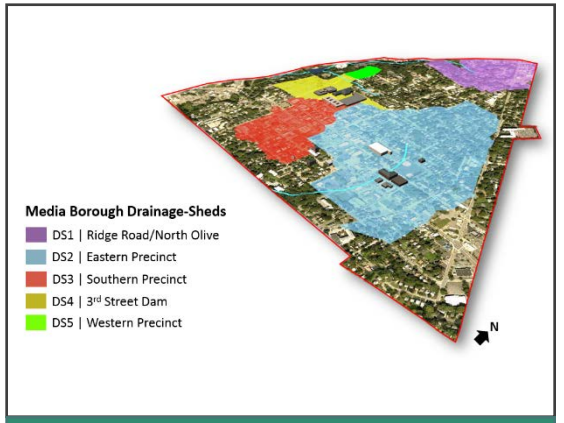
In addition to evaluating 'grey infrastructure' solutions, stormwater BMPs, or 'green infrastructure' strategies, which align with the Borough's goals for flood reduction and water quality improvements to the Borough's impaired waters (Broomall Run and Gayley Run), were also evaluated.

This Stormwater Master Plan presents the preferred alternatives identified for five (5) distinct drainage-sheds and discusses the theoretical benefit and estimated costs of those potential solutions.

A prioritized plan for construction of the improvements was developed. Improvements are proposed over a ten year period and were prioritized for implementation based on factors including overall costs, flood reduction and water quality benefits, ownership, land suitability indexes and fundability.

Potential funding sources for program implementation could include Borough funds, grants, and public-private agreements and incentive zoning as well

Impervious Areas in Borough



Critical Drainage-Sheds in Borough

as revisions to its subdivision and land development ordinances.

With the execution of this plan, a balance of grey and green infrastructure was determined to be the best option for providing an optimal outcome for a variety of planning goals, including the control of urban nuisance flooding and meeting clean water standards (MS4).

Historically, most options considered for alleviating these issues have been limited to 'grey infrastructure' options. In the past few years, through evaluation of a variety of 'green infrastructure' projects in the Borough, the benefits of these interventions have been considered. Consequently, the idea of a blended approach for striking a balance between traditional grey infrastructure improvements, in the form of storm sewer conveyance capacity upgrades, and stormwater management practices (SMPs) as a means of managing rainfall closer to where it falls, became the initially-preferred alternative of this plan. Through a program like this, a variety of goals/outcomes can be addressed, which would not be cost-effective or possible through 'grey infrastructure' options alone.

Based on expense and potential diminished water quality of a 'grey'-only option, the Borough has instead decided to employ a 'balanced' approach of:

1. Increasing the service capacity of stormwater collection to meet standards for urban design.
2. Evaluating a full range of potential 'green infrastructure' interventions which will provide a means to explore a wide-range of options that will allow plan flexibility to suit the Borough's needs and align better with current and future planning goals.

Green infrastructure is a decentralized stormwater approach that seeks to protect, restore or mimic the natural water cycle. This approach can provide a number of co-benefits beyond just stormwater management as it has been shown to provide a greater return on investment than 'grey'-only options.

Flood Incident Example

Known Benefits Include:

1. **Environmental |** Decentralized stormwater approach allows for management of rainfall, closer to where it falls. Increasing the probability of infiltration, groundwater recharge, improved water quality of receiving watercourses, and energy savings (sustainable landscapes)
2. **Social |** Provides opportunity for beautification, particularly for urban corridors, can provide opportunities for recreation (pocket parks), cleaner air and water and better psychological well-being of residents
3. **Economic |** Reduction of future cost (need) for stormwater management as well as evidence showing increase in property value versus unimproved areas

Green infrastructure comes in many different forms. Generally, any type of green infrastructure will provide opportunity for one or more of these general functions:

1. Capture, storage and re-use (rain barrels, cisterns, rainwater harvesting systems)
2. Infiltration (rain gardens, porous surface treatments, Bioretention)
3. Energy and water savings through sustainable landscaping (bioretention planters, green roofs, bio-swales)
4. Evaporation/ Evapotranspiration (blue roofs, green roofs, rain gardens)

Program Mission Statement: Provide a better quality of life for the residents of the Borough by addressing flooding and drainage issues, improving water quality, while enhancing the aesthetics of the Borough's urban core.

Program Goals:

1. Enhance the overall quality of life for the residents by addressing nuisance flooding issues which are common throughout the Borough
2. Address water quality concerns common to urbanized areas
3. Use green infrastructure to address not only resident stormwater concerns, but also the MS4 pollution reduction planning (PRP) goals that go into effect in 2018
4. Utilize a balanced approach to meeting these goals by finding an optimal mix of traditional grey infrastructure improvements with green infrastructure strategies
5. Develop partnerships to take advantage of opportunities for runoff reduction
6. Provide a model for other suburban communities for sustainable redevelopment

Green Infrastructure Feasibility Assessment:

With regards to determining the feasibility of GSI in the Borough an initial analysis was carried out which, among other tasks, included:

1. Evaluate various type of impervious areas within the Borough (roadways, parking lots, buildings)
2. Determine land rights through an analysis of property records for prioritization of potential GSI implementation and partnerships
3. Review with staff redevelopment priorities identified in the Borough's comprehensive plan to determine which GSI types may be considered initially preferred alternatives for this program

As is a common concern with addressing urban stormwater issues, the availability of land can be a hurdle with meeting the goals of this program. The Borough only owns a small portion of overall land in Media. Consequently, the full realization of this plan cannot be met without the help of local residents, businesses and other governmental entities. Building a cooperative framework through outreach will be key to this effort.

Recommendations

Based on the scale of this plan and the financial, administrative and technical challenges with putting it into action, the following recommendations are made under five key areas:

1. Execute Capital Improvements to address immediate flood relief efforts
2. Establish a Stormwater Committee to conduct a Land Use Evaluation
    a. Review Land Use compliance documents for potential incorporation of green infrastructure provision
    b. Review current redevelopment plan strategies
3. Evaluate current strategies to support energy and resource conservation
    a. Evaluate all existing and proposed parks, open space and natural preservation areas
    b. Evaluate opportunities to integrate stormwater improvements into park areas
    c. Examine current open space areas for riparian buffer, streambank restoration and green infrastructure integration
    d. Promote extension of existing shade tree plan
    e. Promote and incentivize at-home green infrastructure development
4. Develop collaborative opportunities through outreach
    a. Service Organizations (DVRPC, DCPD, DCCD & Chester-Ridley- Crum Watershed Association)
    b. Joint planning efforts with Delaware County
    c. Stormwater/Green Infrastructure workshops
    d. Foster public-private partnerships (businesses and residents
    e. Promote networking with other communities through joint MS4 planning

PART 1 | INTRODUCTION & PURPOSE

INTRODUCTION

The Borough of Media is the county seat of Delaware County, Pennsylvania and is located approximately 13 miles west of Philadelphia. Media was incorporated as a municipal government in 1850 and at the same time was named county seat. The lands that make up the modern day Borough were purchased in 1682 by Thomas Minshall, a Quaker and early Media resident in a land deal between him and William Penn. At that time the land mass was made up of four farms. The borders of the Borough have not changed since the purchase.

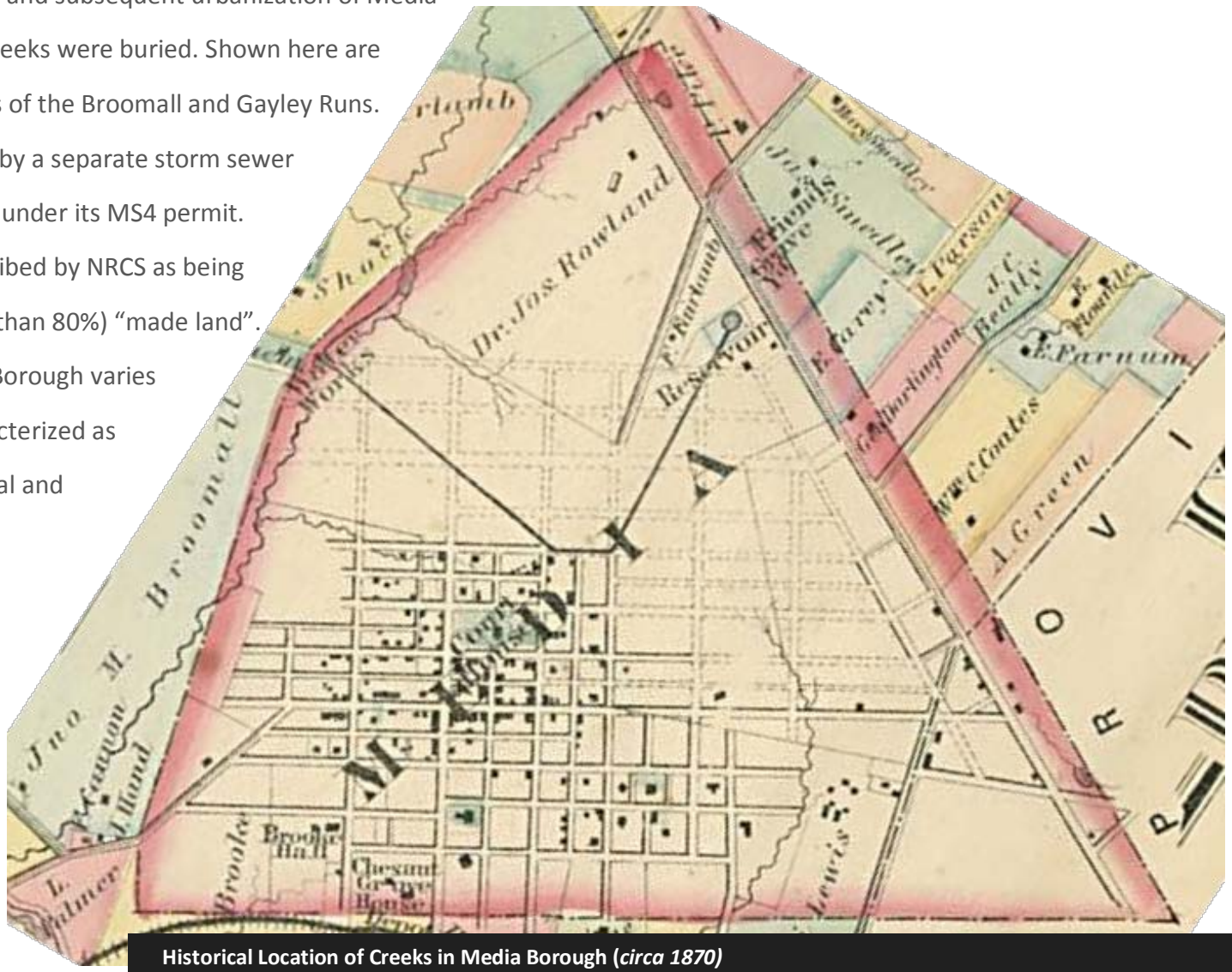
Early development of the farm tracts centered around location of a new courthouse. Streets were plotted in a rectangular grid around what would be the Delaware County Courthouse. In 1854 the West Chester and Philadelphia Railroad was built through Media. At which time development intensity began to increase, starting first with resort and summer homes for Philadelphia residents in the late 19th century and greater still during the early 20th century. In 1928, electrified service was established allowing for up to 50 trains to pass through the Borough each day, including the iconic trolley which is still in service today.

The population total as of a 2010 census is 5,327 residents. Estimated land area is approximately 488 acres (0.76 sq mi).

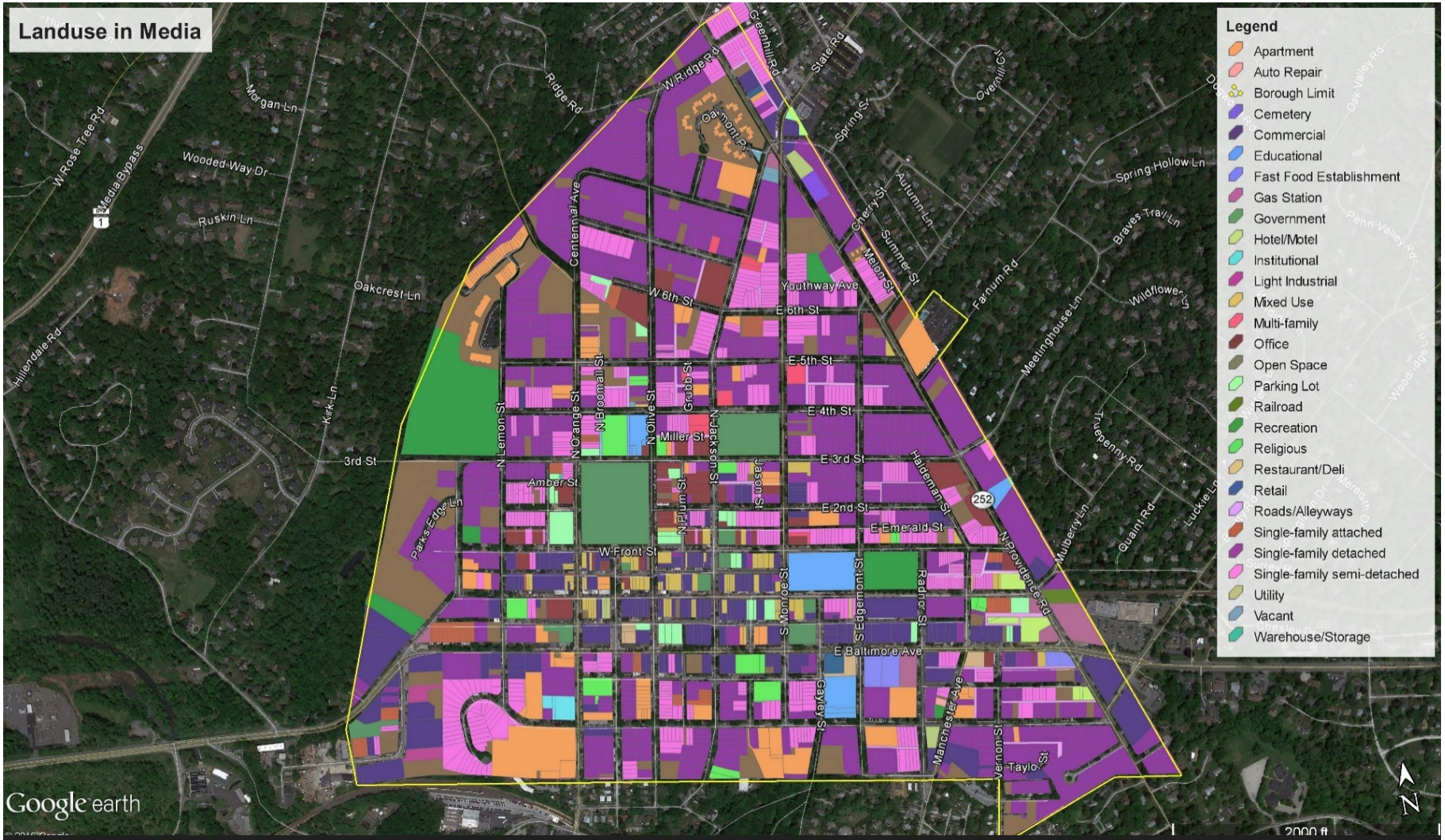
Today much of the Borough has been built out, particularly along the south-west corner, centering around the Delaware County Courthouse. In total, approximately 261 out of 488 acres (or close to 54%) of the Borough is comprised of impervious land area.

Impervious Areas in Media

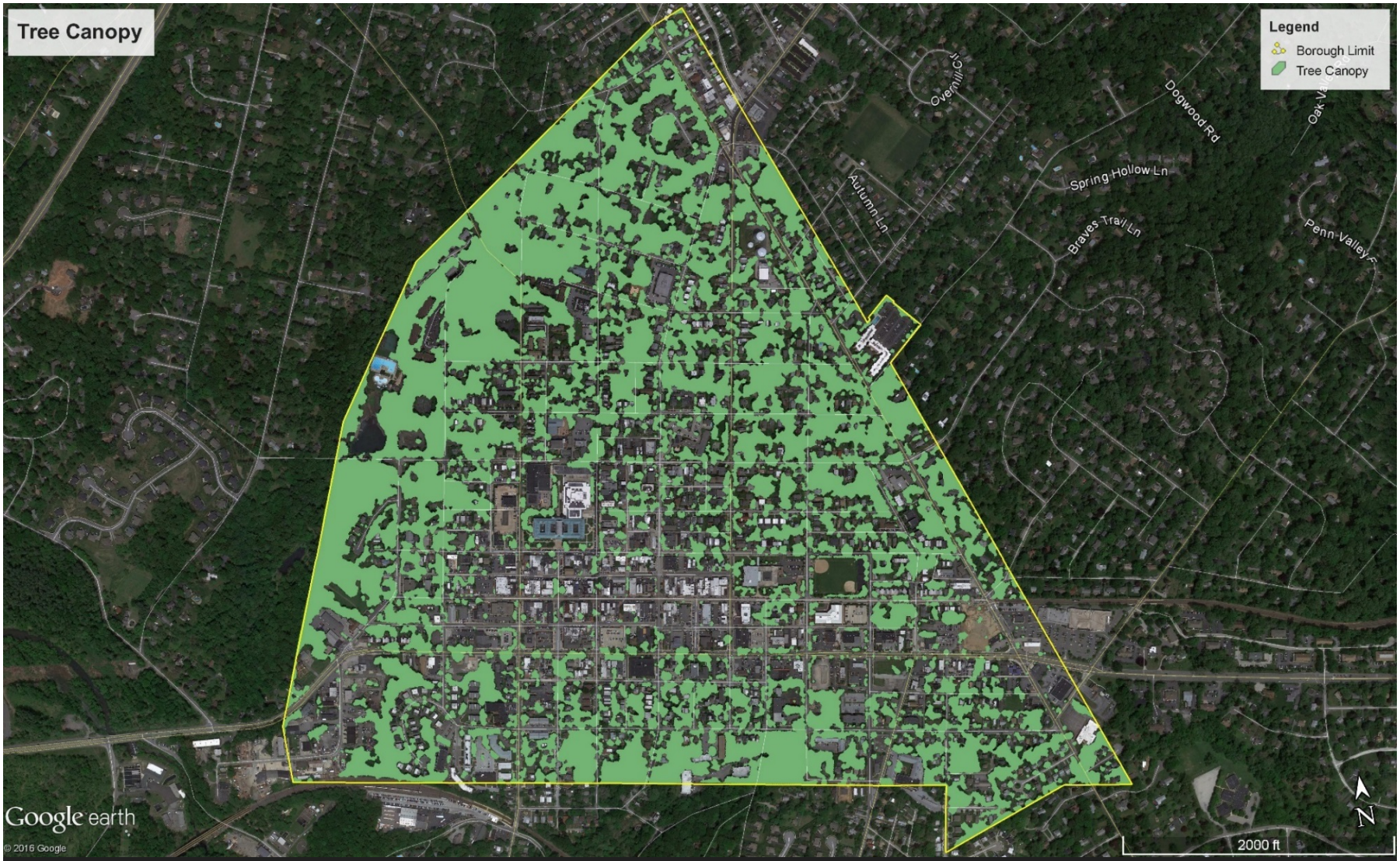
During the development and subsequent urbanization of Media Borough, a number of creeks were buried. Shown here are the historical alignments of the Broomall and Gayley Runs. The Borough is serviced by a separate storm sewer system that is regulated under its MS4 permit. Soil conditions are described by NRCS as being predominantly (greater than 80%) “made land”. Existing land use in the Borough varies greatly but can be characterized as predominately residential and commercial use.



Historical Location of Creeks in Media Borough (*circa 1870)*



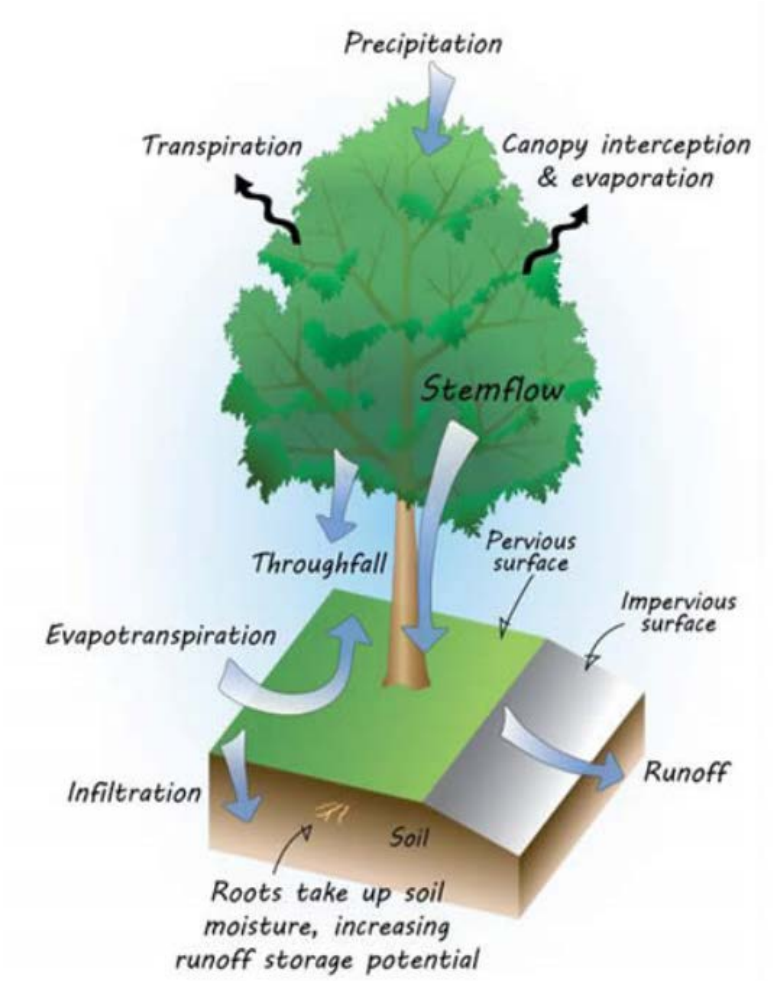
Land Use in Media



Tree Canopy Coverage

Media Borough in the past has won distinction as a Tree City USA award recipient. Shade trees provide great value from a rainfall interception standpoint. In an urban setting, trees provide an undervalued benefit of effectively capturing rainfall in its canopy (interception) and directing rainfall along its trunk to its root zone (stemflow). While the Borough has a great tree canopy coverage index of 44%, there are clear opportunities to increase coverage through shade trees in areas south of the County Courthouse in the Southern & Eastern Precincts of the Borough.

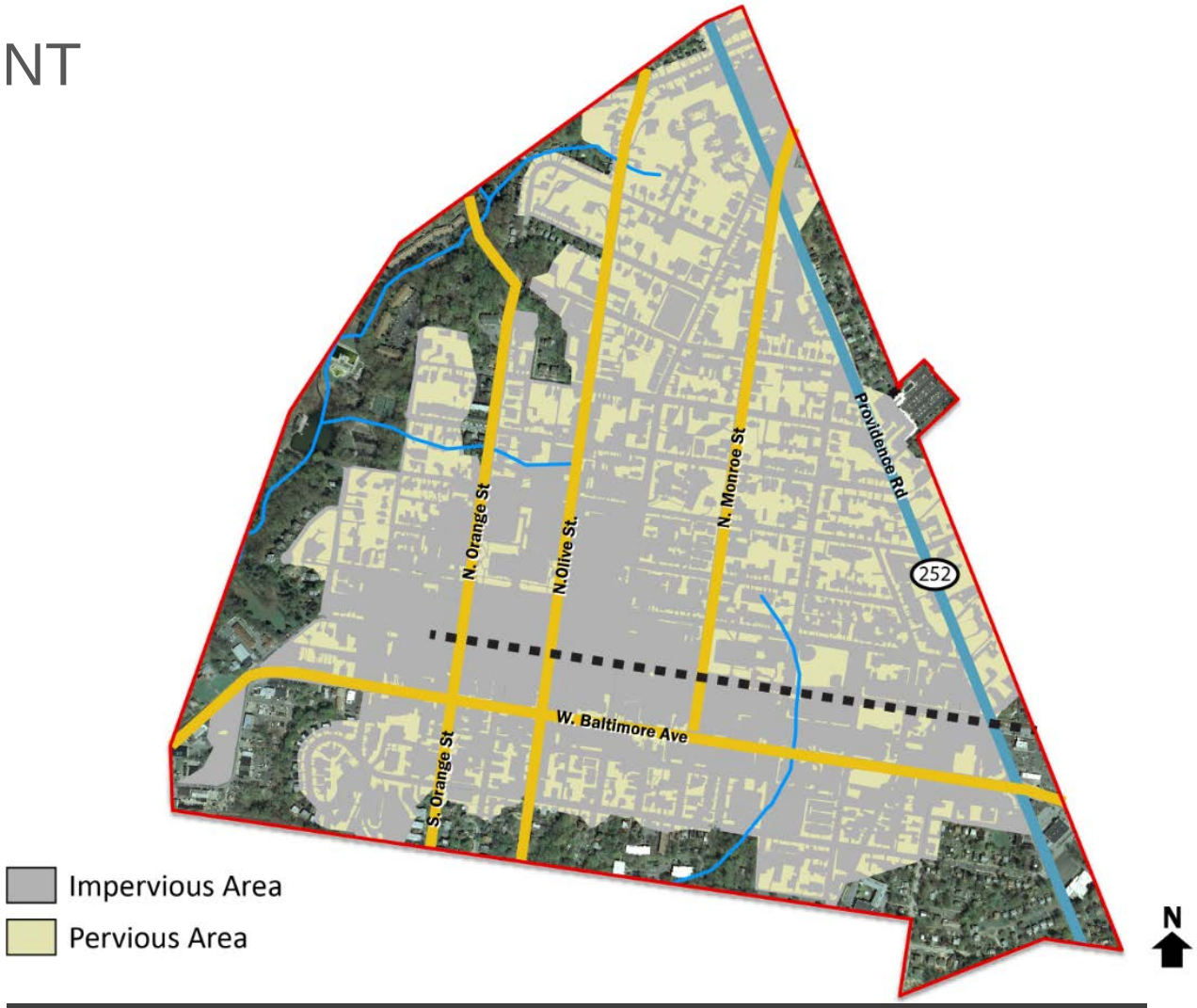
Tree Canopy Coverage Opportunities Region (South & East Precincts)



Canopy Cover Benefit Diagram – Photo Credit *EPA*

NEEDS ASSESSMENT

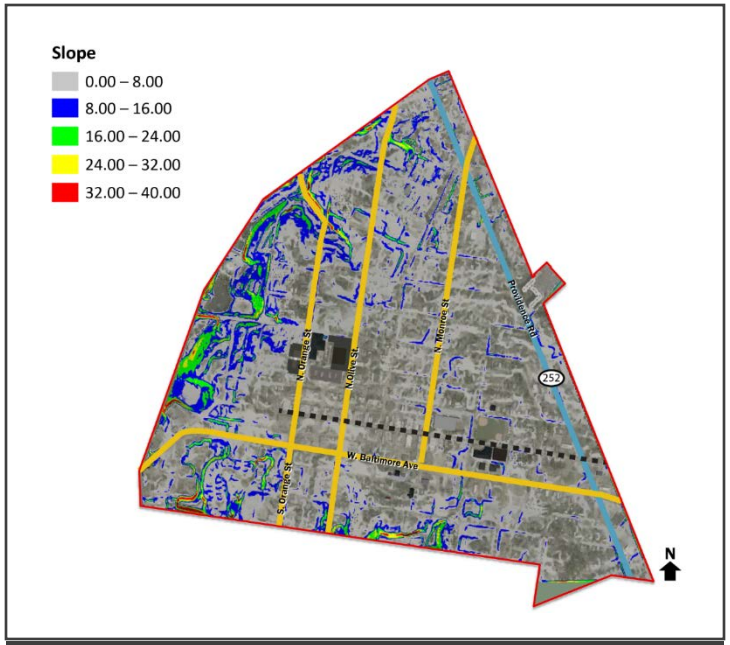
As with many older urban communities, Media Borough was fully built-out before standard practice dictated that runoff from paved surfaces (roads, roofs, parking lots, etc.) should be detained in order to mitigate potential flooding along streets and onto properties. In addition to addressing these issues, a plan needed to be developed that would also position the Borough to comply with upcoming MS4 water quality goals in the form of Pollution Reduction Plans (PRPs). In the method outlined, a holistic approach is recommended as a means of addressing both drainage and water quality issues. The goal in many cases, is to manage rainfall closer to where it falls before introduction into the drainage collection system.



Impervious Areas in Borough

Media Borough is a densely populated urban municipality dating back to the mid-1800s with three preconditions for significant stormwater problems: an antiquated and inadequate storm sewer system; a majority of Borough properties developed before the stormwater mitigation requirements of the 1970's; and little remaining green space for water infiltration. Stormwater that does not infiltrate into the ground becomes surface runoff, which flows directly into Broomall Run and Gayley Run and eventually into Ridley Creek to the west and Crum Creek to the east. In addition, there are challenges presented by the topography of the Borough, particularly on the north and west sides which have very steeply sloping lands, which worsen the effect of unmanaged runoff.

The overall effect of urbanization coupled with inadequate stormwater infrastructure can be clearly observed throughout the Borough even with common storm events. In some parts of the Borough, the storm sewer systems are isolated and not connected to the Borough's main storm sewer trunk-lines – resulting in surcharging from the system, which adds to surface flow volume. The unchecked volume of rainfall runoff has increased, resulting in frequent flooding throughout the Borough, as well as erosion and sedimentation within the Borough's creeks. The Borough is listed as an upstream community to streams listed as impaired by the Pennsylvania Department of Environmental Protection. Media Borough, as part of its MS4 Pollutant Discharge Elimination System (NPDES II) stormwater permit requirements, will be required to reduce its runoff and streambank erosion contributions to pollutant wasteloads in those waters. For the next MS4 permit cycle expected to promulgate in 2018, the Borough will require the development of a separate plan for identifying watershed restoration projects that will reduce pollution to impaired waters. Construction of the BMP/green infrastructure projects identified in this planning document will provide wasteload pollutant reductions that would help the Borough achieve its water quality goals.



Topographical Steepness (Slope)

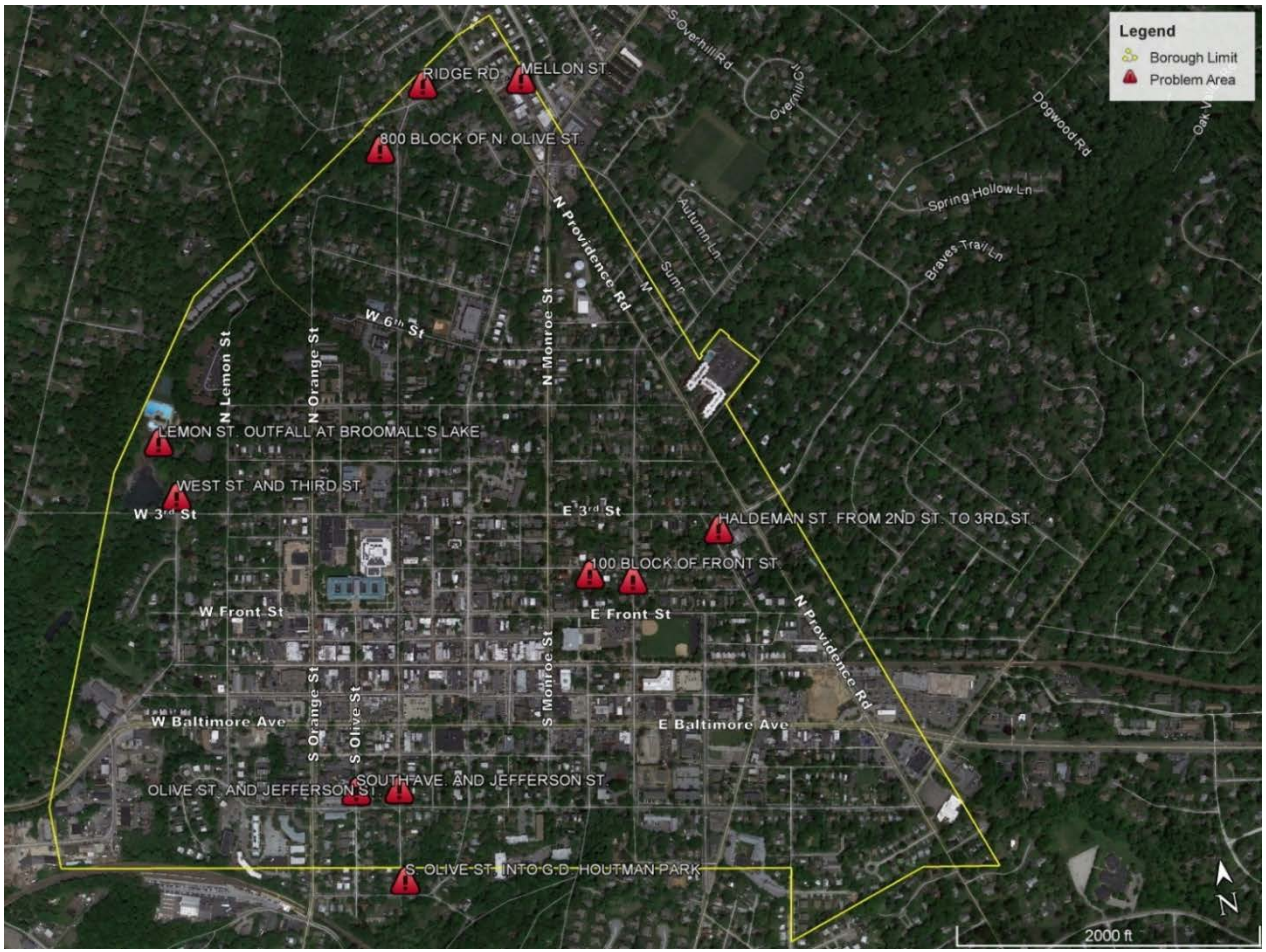
Media Borough, Delaware County (NPDES ID: PAG130115)	
Impaired Downstream Waters	**PRP Requirements**
Vernon Run	Appendix E – Siltation
Ridley Creek	Appendix E – Siltation
Crum Creek	Appendix E – Siltation; Appendix C-PCB
Unnamed Tributaries to Darby Creek	Appendix C – PCB
Dicks Run	Appendix E – Siltation

AREAS OF CONCERN

Eleven (11) areas of persistent flooding were identified for study by the Borough. Drainage issues identified are noted to be symptomatic of other underlying causes for drainage issues.

Initial investigations determined that there were a number of issues that contribute to these issues including, but not limited to:

- Isolated drainage sub-networks (disconnected);
- Pipe capacity issues;
- Buried Streams;
- Lack of Stormwater Management Controls;
- Inadequate or lacking inlet collection systems;
- General increases in runoff associated with dense urbanization (prior to the Clean Water Act).



PART 2 | PROGRAM APPROACH

OBJECTIVES

The need to address flooding and non-point source water quality issues would ideally be accomplished by addressing stormwater infrastructure inefficiencies within the Borough while also identifying key opportunities for integrations of green infrastructure BMPs (GSI).

A balanced approach between upgrading stormwater pipe capacity and installation of green infrastructure opportunities is most desired.

In some drainage-sheds, there are clear-cut opportunities to provide GSI and provide a means of runoff volume control - typically with Borough owned land. In other sheds, there are considerably fewer options for GSI.

The purpose of this plan is to identify stormwater projects that will address urban nuisance flooding while also meeting regulatory requirements to restore the water quality of receiving (impaired) watercourses. Instrumental to this purpose, a community-wide integrated sewer and flood model was developed to mimic existing flooding conditions. Once calibrated, this deterministic tool provides a platform to query the theoretical effects of various stormwater project alternatives – including combinations of volume capture (green infrastructure), detention facilities and conveyance capacity upgrades. A series of analyses were conducted to identify the optimal solutions to community flooding and water quality goals, while also seeking to identify, validate and provide opportunities for savings through cooperative action e.g. public-private partnerships and coordination with other governmental entities.

Program Mission Statement:

Provide a better quality of life for residents of the Borough by addressing flooding and drainage issues, improving water quality, while enhancing the aesthetics of the Borough's urban core.

Program Goals

1. Enhance the overall quality of life for the residents by addressing nuisance flooding issues which are common throughout the Borough
2. Address water quality concerns common with regards to urbanized areas
3. Use green infrastructure to optimize outcomes with regards to addressing (direct) resident concerns but also to establish a basis for addressing MS4 pollution reduction planning (PRP) goals to go into effect in 2018
4. Utilize a balanced approach with meeting these goals by finding an optimal mix of traditional grey infrastructure improvements with green infrastructure strategies

5. Develop partnerships to take advantage of opportunities for runoff reduction
6. Provide a model for other suburban communities for sustainable redevelopment

Green Infrastructure Feasibility Assessment

With regards to determining the feasibility of GSI in the Borough, an initial analysis was carried out that, among other tasks, included:

1. Evaluation of various types of impervious areas within the borough (roadways, parking lots, buildings)
2. Determination of land rights through an analysis of property records for prioritization of potential GSI implementation and partnerships
3. Review with staff redevelopment priorities identified in the Borough's comprehensive plan to determine which GSI types may be considered initially preferred alternatives for this program

As is a common concern with addressing urban stormwater issues, the availability of land can be a hurdle with meeting the goals of this program. The Borough owns only a small portion of overall land in Media (approximately 21%). Consequently, the full realization of this plan cannot be met without the help of local residents, businesses and other governmental entities. Building a cooperative framework through outreach will be key to this effort

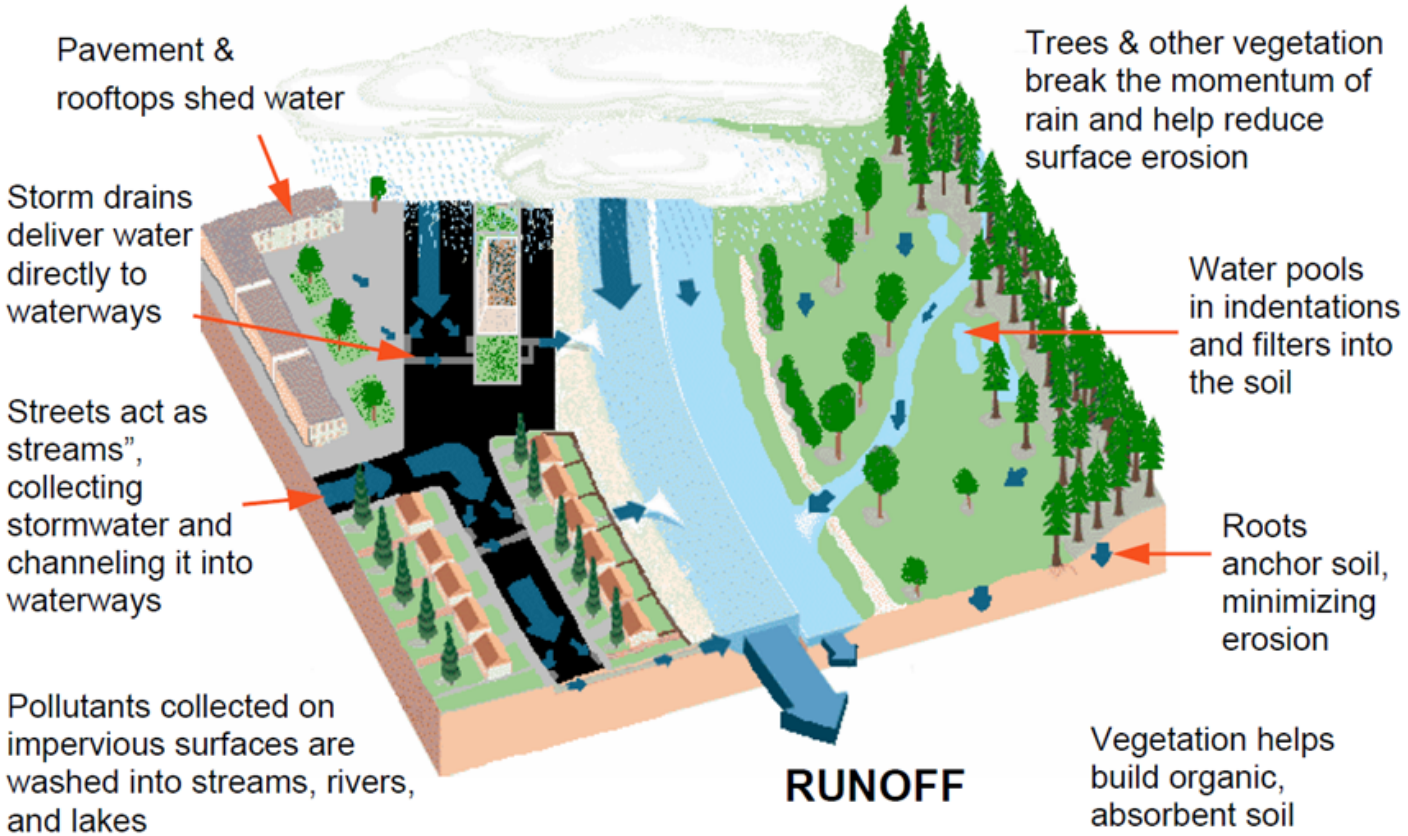
MORE WATER FASTER

DEVELOPED LANDS

Rain pours more quickly off of city and suburban landscapes, which have high levels of impervious cover

NATURAL LANDS

Trees, brush, and soil help soak up rain and slow runoff in undeveloped landscapes



Hydrologic Cycle Diagram – CCC

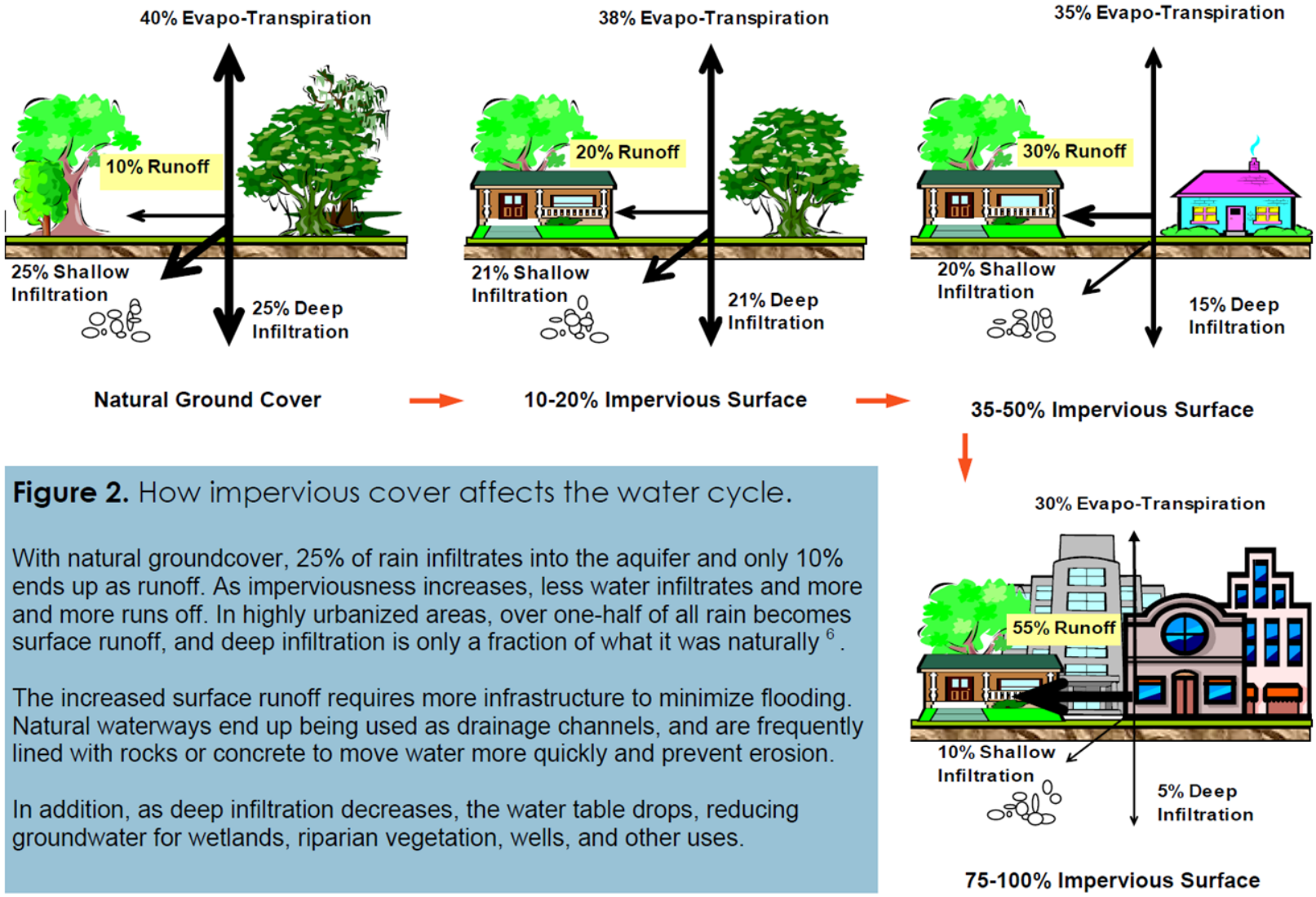


Figure 2. How impervious cover affects the water cycle.

With natural groundcover, 25% of rain infiltrates into the aquifer and only 10% ends up as runoff. As imperviousness increases, less water infiltrates and more and more runs off. In highly urbanized areas, over one-half of all rain becomes surface runoff, and deep infiltration is only a fraction of what it was naturally [6].

The increased surface runoff requires more infrastructure to minimize flooding. Natural waterways end up being used as drainage channels, and are frequently lined with rocks or concrete to move water more quickly and prevent erosion.

In addition, as deep infiltration decreases, the water table drops, reducing groundwater for wetlands, riparian vegetation, wells, and other uses.

Hydrologic Cycle Diagram – CCC

DESIGN APPROACH

The use of Green Infrastructure and BMP techniques will help better manage rainfall closer to where it falls providing a change to the current hydrology of the community.

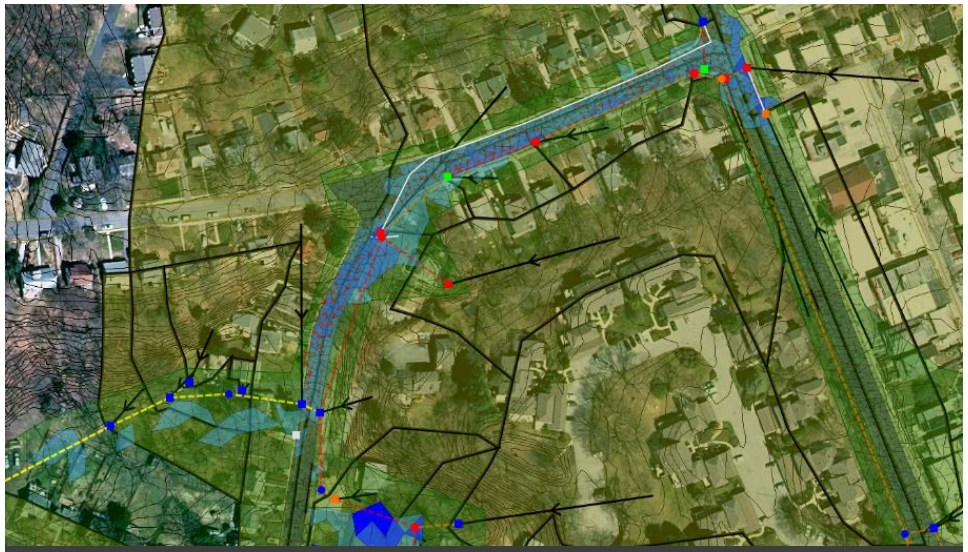
The design strategy selected was to incorporate volume capture and storage opportunities throughout the drainage-shed to mimic more natural hydrology and reduce the rapid concentration of runoff directed downstream. Consequently, a combination of collection system upgrades along with (decentralized) volume storage opportunities were selected to manage the 50-year storm event.

Based on the overall goals discussed within this program, it was impractical to establish a “grey” only approach of using a large collection system, as this presents permitting and water quality concerns. Much of the existing flow paths of runoff is motile, moving in many directions (discharging to watercourses at many points at many locations), because much of the runoff volume is not effectively collected for larger events. Capturing and directing without peak flow attenuation or volume reduction, results in a large increase in directed flows as concentrated point discharges (outfalls) into the receiving watercourses. This would result in a faster deterioration of the Gayley and Broomall runs and would greatly undermine future water quality efforts required by the Borough’s MS4 permit.

An option of capturing the 50-year event entirely by collection system was considered, but based on the small spacing and added amount of inlets and large diameter pipes, in addition to the impracticality of finding large areas within Media to construct massive underground facilities to manage flow before discharging, this idea proved too costly and impracticable to submit as a preferred design option. It was deemed better to develop a more holistic approach following the PennDOT-recommended 10-year design standard (based on current conditions) for the design of storm sewer collection systems in urban areas supplemented with green infrastructure. The emphasis of this design would be using a combination of both green and grey strategies to achieve runoff reductions and volume capture (purposeful for water quality goals) by managing more effectively the overall drainage system to a 50-year design goal.

ANALYTICAL METHODS

Flood Mapping (East Precinct)

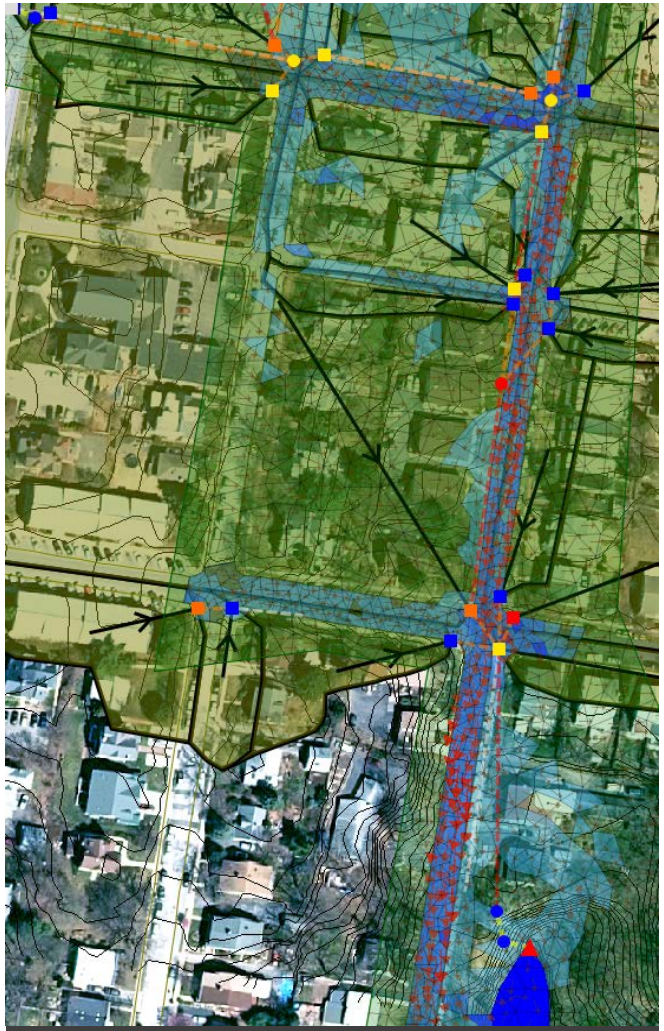


Flood Mapping (Ridge Road/North Olive Precinct)

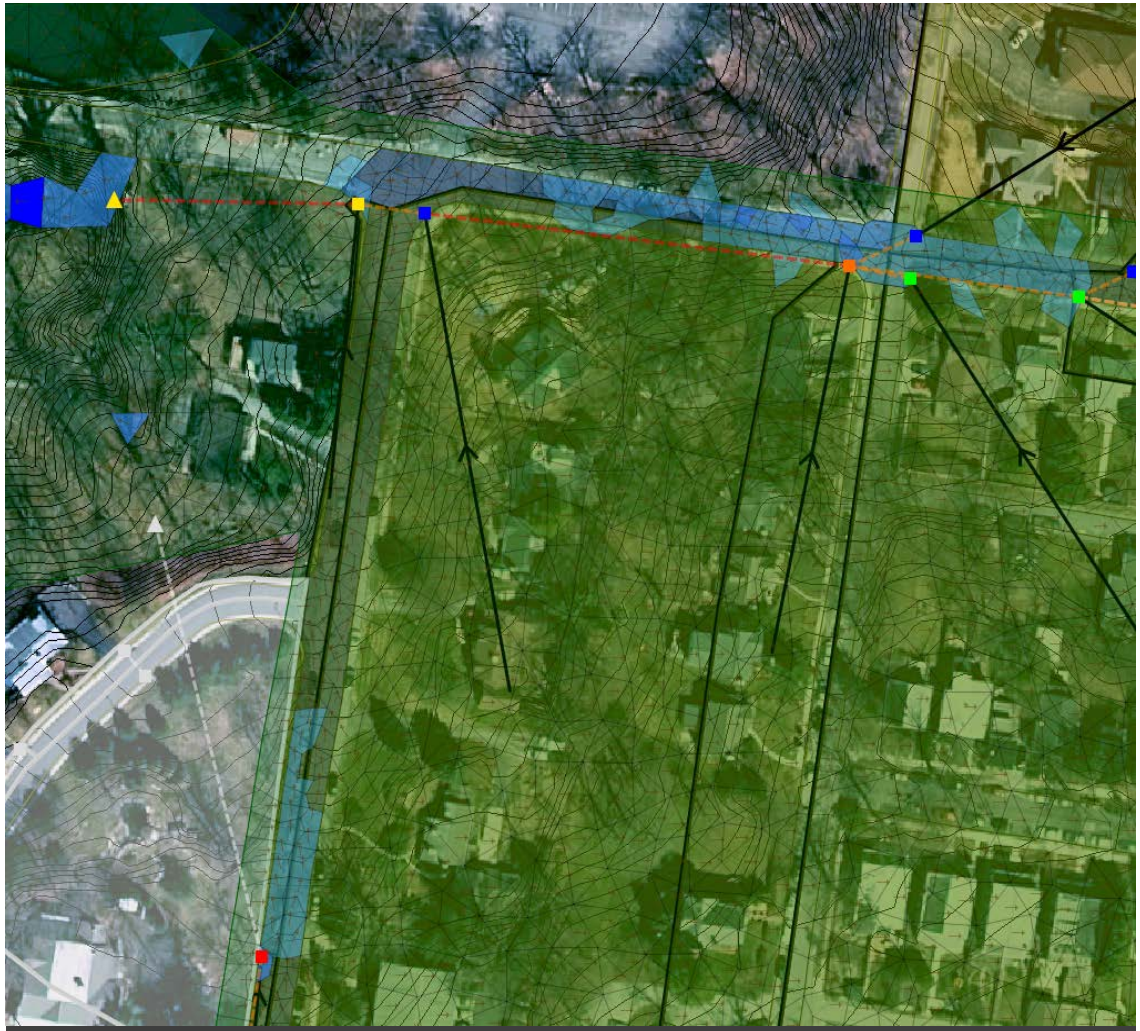
INFOWORKS ICM

Once data collection and survey was complete T&M began creation of a community-wide, real-time, integrated sewer & flood model using InfoWorks ICM by Innovyze, a GIS-integrated state-of-the-art modeling tool which can accurately simulate the interaction of sewer conveyance, stormwater management basins and surface flooding, simultaneously. Having an integrated, time-step model was a great asset with differentiating true system concerns versus occurrences that are more symptomatic of the real causes. Regarding the scale of study, a community-wide model was key to ensuring that investment in truly effective improvements are being made. This approach facilitates solutions that address the real causes of flooding instead of moving the problems downstream (the likely outcome if a more fragmented approach had been selected).

After the model study was completed and verified by the Stormwater Committee, the model then served as a valuable deterministic tool for querying the effect of various scenarios and alternatives throughout a range of storm reoccurrence intervals (storm events). A new collection system alternative could then be formed. In addition, this new collection system was evaluated alongside various green infrastructure interventions in order to determine the magnitude of improvements needed to manage the 50-year storm event.



Flood Mapping (Southern Precinct – Olive Street)

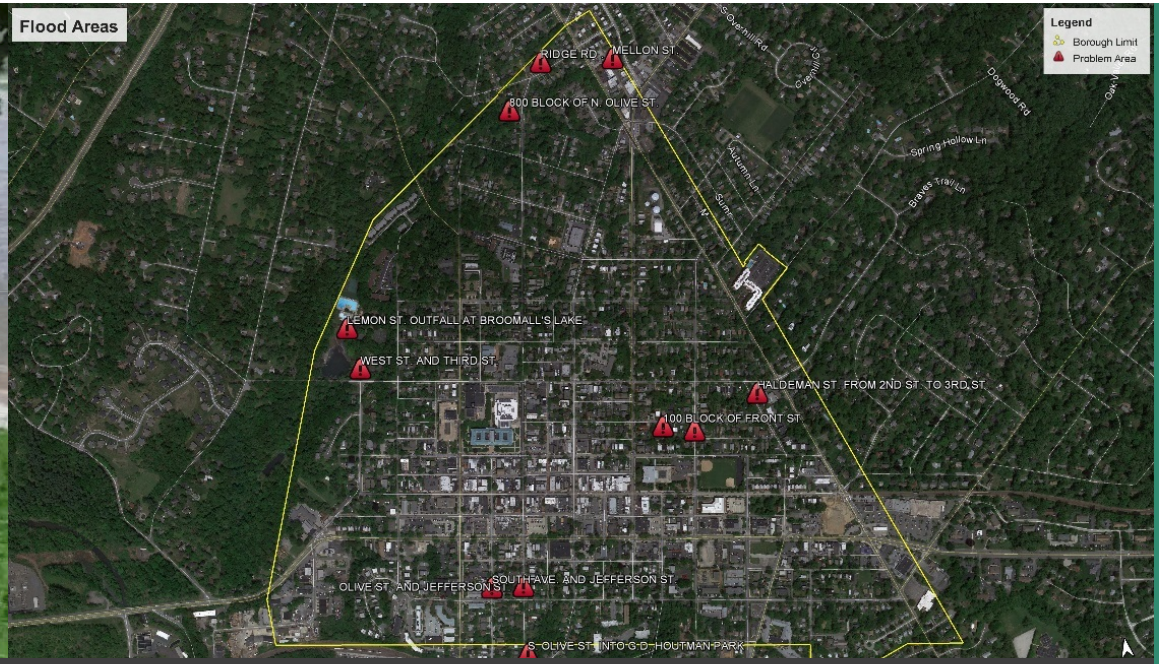


Flood Mapping (3rd Street Dam Precinct – West & 3rd Street)

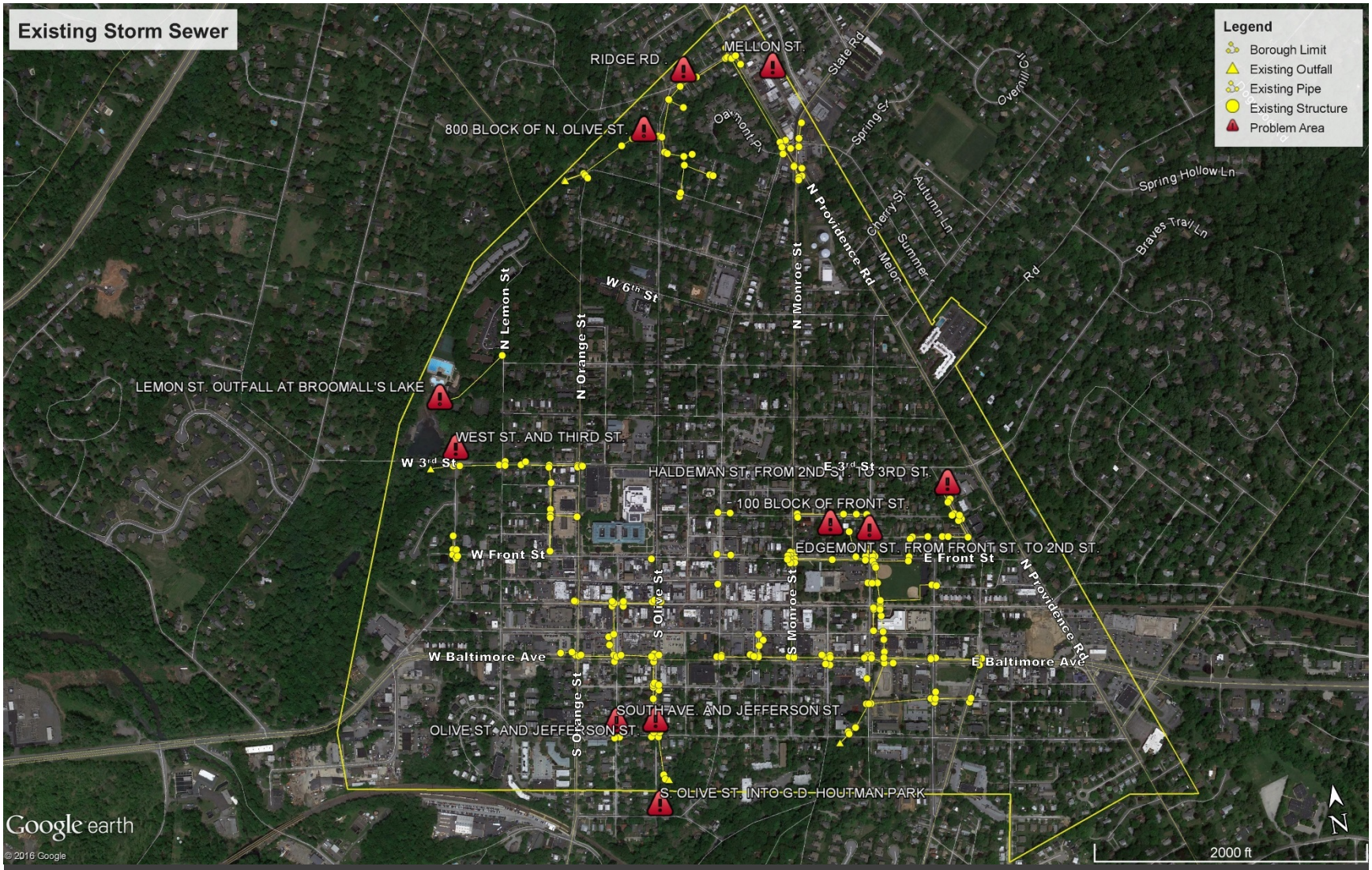
COLLECTION SYSTEM IMPROVEMENTS

Much of the Borough's drainage collection system is over one hundred years old and is grossly under service capacity for adequate conveyance of runoff. Consequently, many portions of the Borough exhibit persistent flooding. As part of this plan, in conjunction with underground detention and green infrastructure techniques, a substantial upgrade to the Borough's drainage collection system is proposed. Including greater conveyance capacity of main drainage trunk-lines as well as additional inlets to collect runoff more efficiently. A combination of underground detention as well as redesign of much of the Borough's drainage collection system is proposed under this plan as an important initial step to addressing the noted drainage deficiencies.

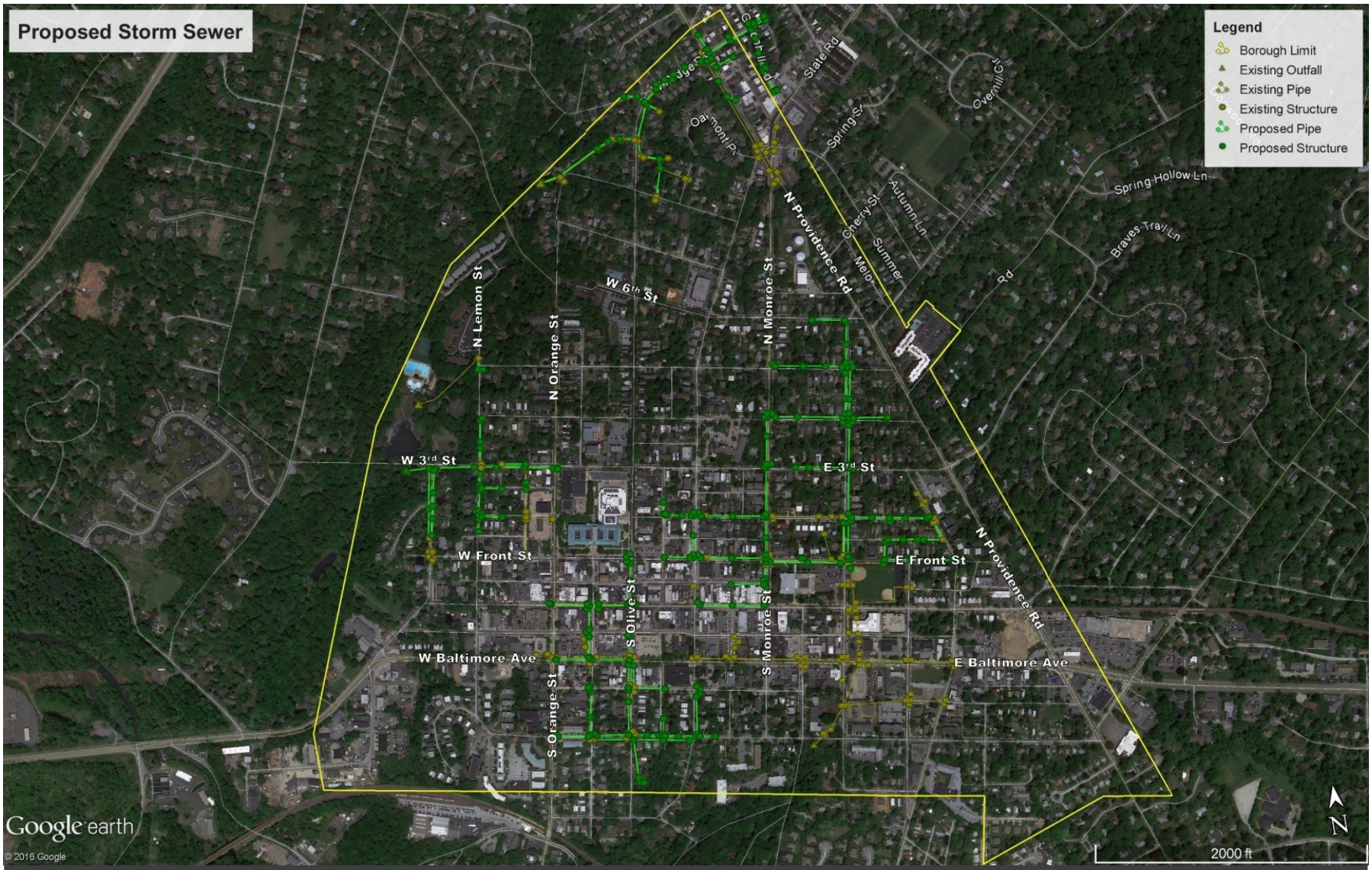
Flood Issue Example



Drainage Problem Area Identification Map

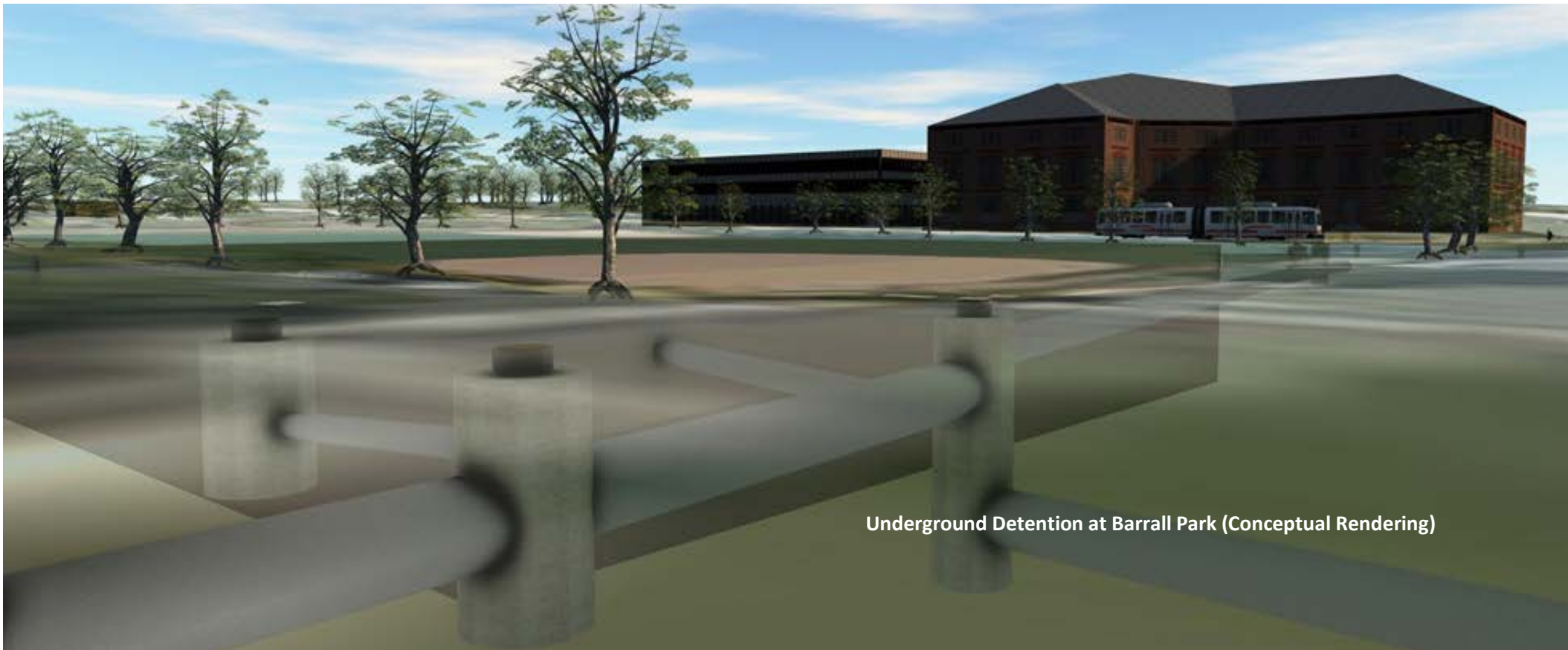


Existing Drainage System of Media Borough



Proposed Drainage System Improvements

Using a 2-D flood and sewer model, a design-by-spread analysis was conducted for the design of a new drainage system. A significant upgrade to the drainage conveyance system is proposed including 238 new inlets and two underground detention facilities. The design goal for the collection system upgrade was to have it meet a PennDOT design goal standard of capturing and conveying the 10-year event. For this, a design-by-spread analysis (HEC-22) was carried out for spacing of the new inlet system, thereby controlling spread of runoff so that it is confined to the shoulder and only allowed to encroach into 50% of the travel lane. This is for the purpose of allowing for safe vehicular travel within the roadways serviced by the collection system. The system-wide goal is to manage the 50-year event without nuisance flooding. This will be accomplished through a combination of collection system upgrades along with transformation of the urban corridors of the Borough with a variety of green infrastructure opportunities which will mimic a more natural hydrological pattern by capturing and storing rainfall and runoff closer to where it falls.



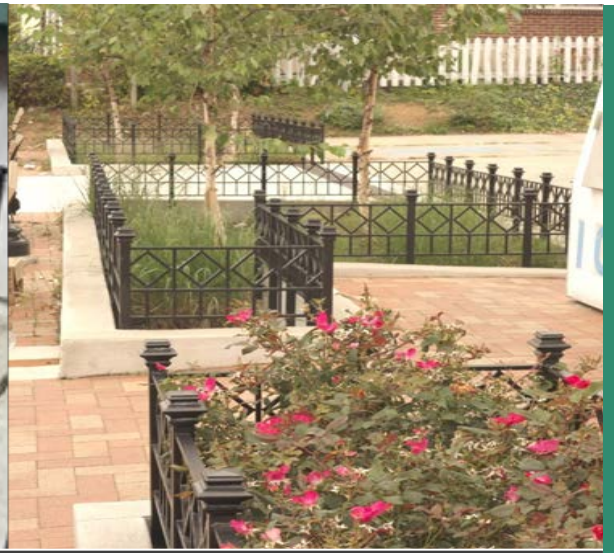
Underground Detention at Barrall Park (Conceptual Rendering)

GREEN INFRASTRUCTURE STRATEGIES

Based on the need to address flooding and non-point source water quality issues a work plan needed to be developed that would provide a substantial improvement to the quality of life of the residents of Media Borough. This would ideally be done by addressing substantial flooding issues within the Borough while identifying key opportunities for integrations of green infrastructure BMPs (GSI).

In addition to runoff reduction, green infrastructure offers a number of co-benefits such as reduction of heat island effect, opportunities for aesthetic enhancement and even habitat creation. For the purposes of this plan no distinction was made in separating what zones within the Borough would be more suitable versus another as soil classification for all areas is listed as “urban” or made land. Therefore, testing for geological conditions is recommended for governing which GSI methods would be suitable.

Rain Garden/Bio-Swale (Hoboken, NJ)



Bioretention Planter (Allentown, PA)

FULL PLAN IMPLEMENTATION

Based on the need to address flooding and non-point source water quality issues a work plan needed to be developed that would provide a substantial improvement to the quality of life of the residents of Media Borough. This would ideally be done by addressing substantial flooding issues within the Borough while identifying key opportunities for integrations of green infrastructure BMPs (GSI).

In addressing flooding, an approach was taken that would balance the need for pipe capacity upgrades with green infrastructure opportunities. In some cases, there are clear-cut opportunities that provide a means of runoff volume control, typically with Borough-owned land. In other regions of the Borough there are considerably fewer options. The Borough should consider future collaborations with other entities to pursue other opportunities for runoff reductions. Drainage-sheds that are acutely affected by excessive runoff or collection system deficiencies are identified as colored regions on this map. These regions have been evaluated to determine the overall volume reduction required to begin providing a substantial benefit towards the water quality of Ridley Creek and Crum Creek.

PART 3 | RECOMMENDED GREEN INFRASTRUCTURE AND BEST MANAGEMENT PRACTICES

GREEN INFRASTRUCTURE FEASIBILITY ASSESSMENT

Green infrastructure is a decentralized stormwater approach that seeks to protect, restore or mimic the natural water cycle. This approach can provide a number of co-benefits beyond just stormwater management as it has been shown to provide a greater return on investment than "grey"-only options.

Known benefits include:

1. Environmental: Decentralized stormwater approach allows for management of rainfall, closer to where it falls. Increasing the probability of infiltration, groundwater recharge, improved water quality of receiving watercourses, and energy savings (sustainable landscapes)
2. Social: Provides opportunity for beautification, particularly for urban corridors, can provide opportunities for recreation (pocket parks), cleaner air and water and better psychological well-being of residents.
3. Economic: Reduction of future cost (need) for stormwater management, as well as, potential increase in property value versus unimproved areas.

Green infrastructure comes in many different forms. Generally, any type of green infrastructure will provide opportunity for one or more of these general functions:

- Capture, storage and re-use (rain barrels, cisterns, rainwater harvesting systems)
- Infiltration (rain gardens, porous surface treatments, Bioretention)
- Energy and water savings through sustainable landscaping (bioretention planters, green roofs, bio-swales)
- Evaporation/ Evapotranspiration (blue roofs, green roofs, rain gardens)

As is a common concern with addressing urban stormwater issues, the availability of land can be a hurdle in meeting the goals of this program. The Borough only owns small portion of overall land in Media. Consequently, the full realization of this plan cannot be met without the help of local residents, businesses and other governmental entities. Building a cooperative framework through outreach will be key to this effort.

In accordance, it was determined that an evaluation of GSI feasibility for all land areas within the Borough be conducted in order to provide a "varied path" approach to allow for design flexibility for evaluating GSI opportunities which may present themselves over the course of plan implementation (land use agreements, incentive zoning, SALDO updates and private land redevelopment, to note a few).

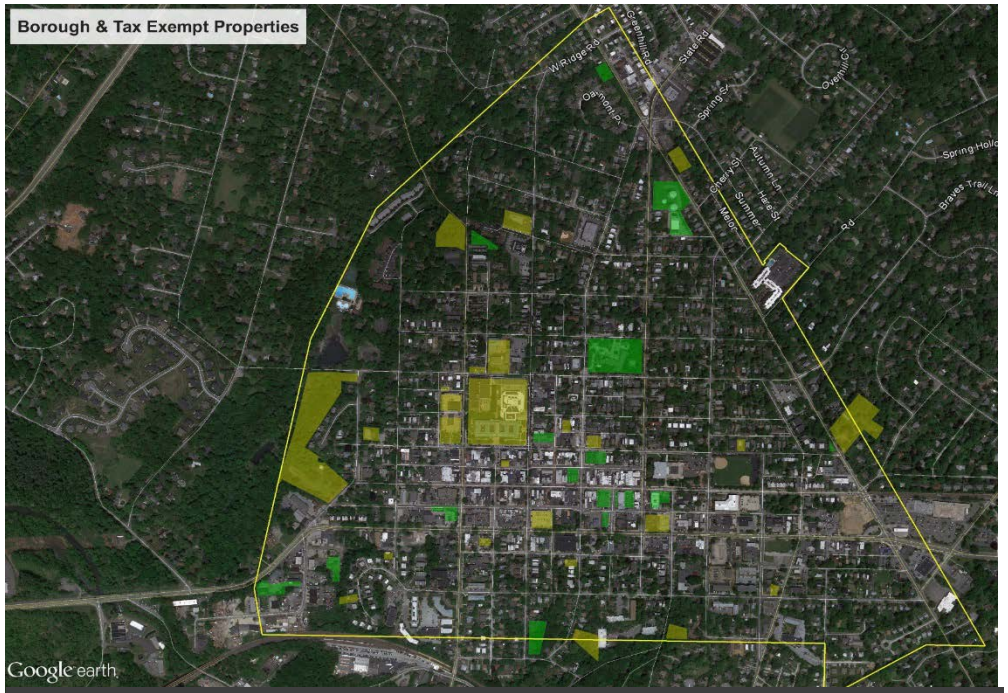
To begin, an analysis of land ownership was conducted, which identified 45 properties either owned by the Borough or by a supportive entity (School, County Government, et al – See Appendix). Based on this analysis, nine projects were identified to be forwarded through a preliminary design process.

Next, an evaluation of potential projects and programs was conducted for lands owned by the Borough, within right-of-ways or on private lands:

1. Identify potential GSI alternatives
2. Identify locations where GSI alternatives could be staged
3. Determine the full potential of volume reduction
4. Discuss the cost per GSI type
5. Estimate a cost for full build out of each BMP type

Evaluation of potential Borough assets includes:

- Borough-Owned Properties
- Transportation Infrastructure (Streets: Residential & Commercial)
- Sidewalks
- Parking Lots, Private Access Drives, Patios, et al
- Rooftops
- Open Space Land & Parks
- Lawns
- Schools
- Other Government-owned properties



Borough & Tax-Exempt Properties in Media

EXAMPLES OF GREEN INFRASTRUCTURE PLANNING

1. Washington Street Streetscape
   Hoboken, NJ
   Rain Gardens

2. West End Theatre District
   Allentown, PA
   Bio Retention Planters

3. Traders Cove Marina
   Brick, NJ
   Porous Pavement

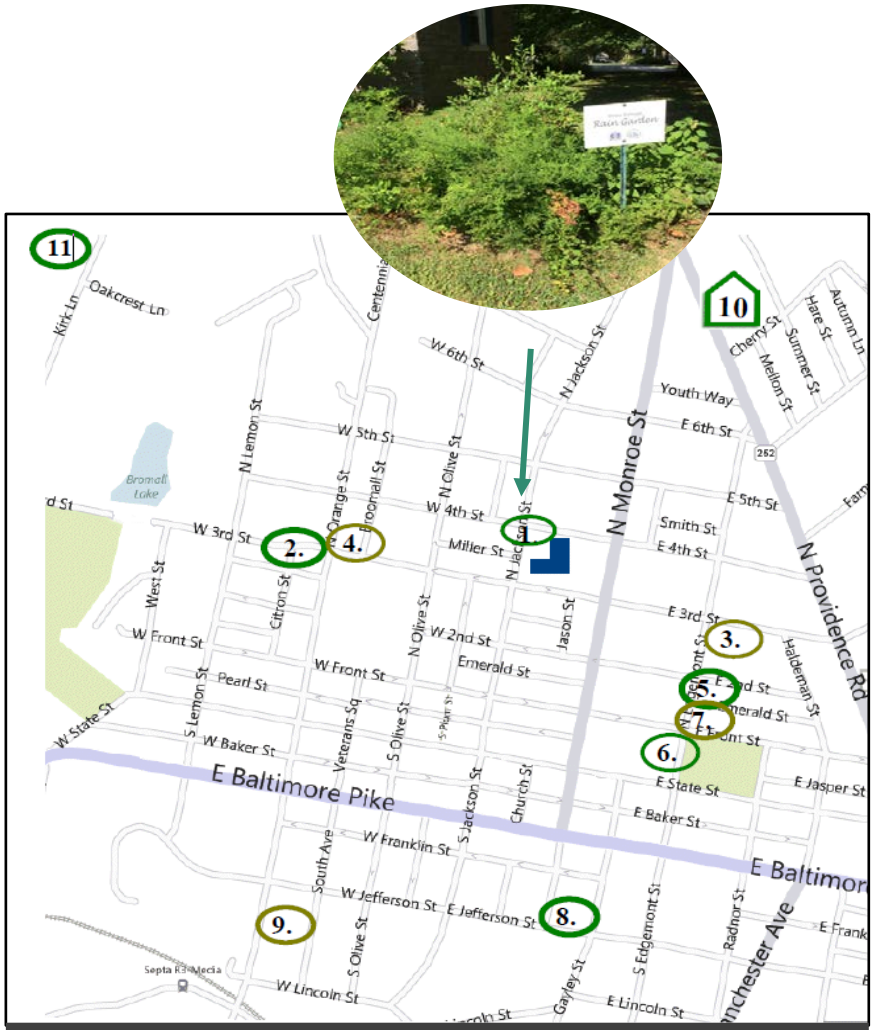
4. 1st Avenue
   Hoboken, NJ
   Bioswale

5. Canal Crossings Redevelopment Area Plan
   Jersey City, NJ
   Rain Gardens, Bio Retention, Stormwater Harvesting

6. Carnegie Bldg. 804
   West Windsor, NJ
   Stormwater Harvesting, Green Roof

CURRENT GREEN INFRASTRUCTURE SITES IN MEDIA BOROUGH

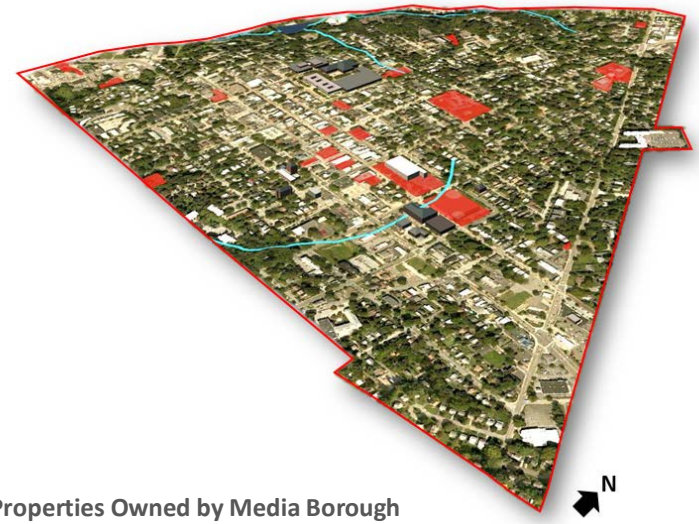
1. Rain Gardens Media Borough Hall and Community Center
2. Rain Garden 319 West Third Street
3. Rain Barrels 200 block E. Third Street/ 200 Block N.Edgmont
4. Rain Garden Media-Upper Providence Friends Schools
5. Rain Garden 121 N. Edgemont Street and Second Street Garden
6. Water Reuse/Rain Barrels Media Elementary School Gardens
7. Solar Roof 201 E. Front Street
8. Porous Surface Retrofit 314 Gayley Street Garden
9. Rain Barrels 400 block of South Avenue
10. Cherry Street LEED Silver House



Properties Owned by Media Borough

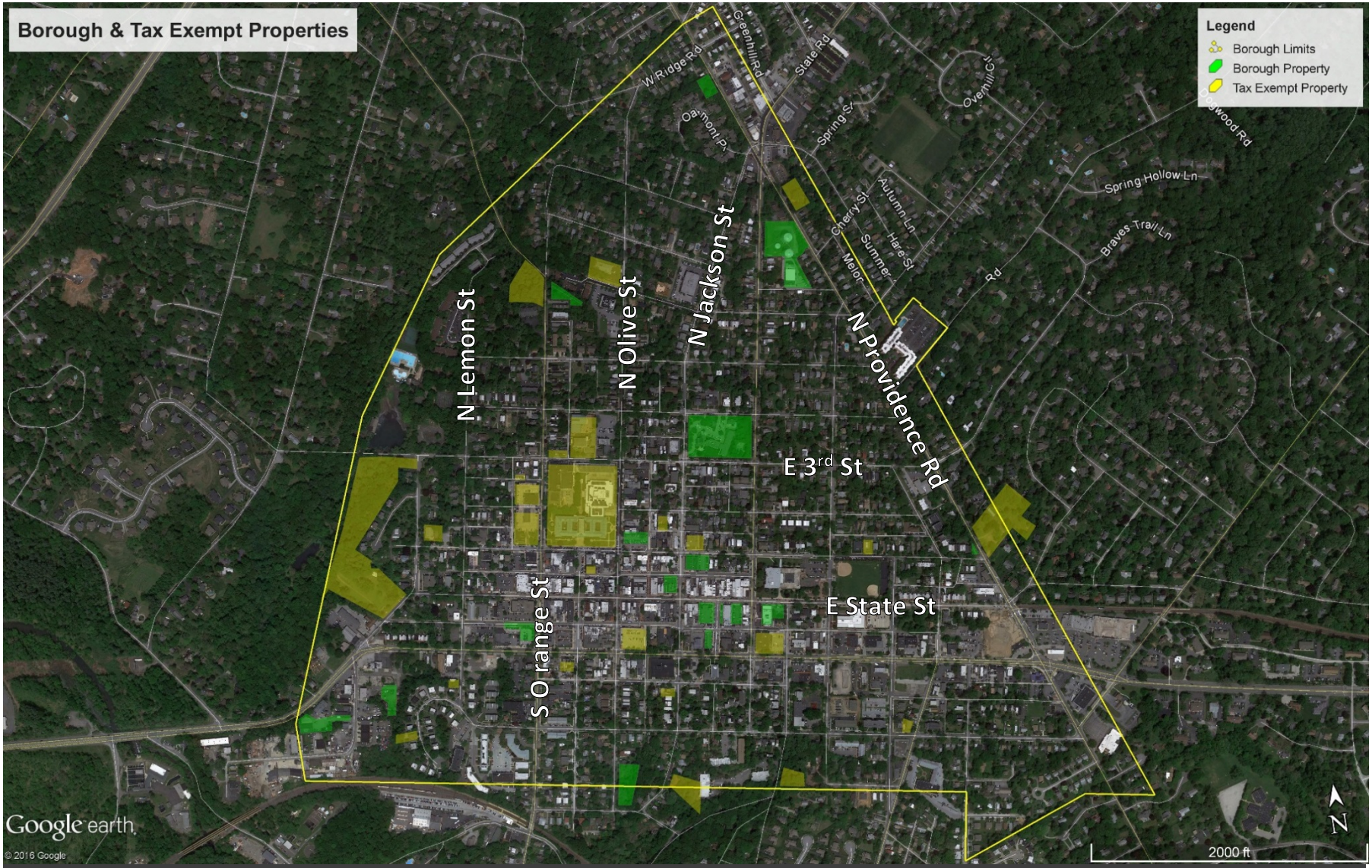
POTENTIAL GREEN INFRASTRUCTURE CANDIDATE SITES

The use of green infrastructure, also known as stormwater best management practices (BMPs), is one way to supplement and enhance the existing drainage network to sustainably manage stormwater. Every opportunity should be taken to develop green stormwater infrastructure throughout the Borough to reduce runoff volume and peak flow rates. Enhancing streets, Borough parks or other public spaces with green infrastructure can be accomplished by the Borough on properties they control. Based on the small amount of land available to the Borough, it is suggested the Borough seek assistance of residents, businesses and other governments through public-private partnerships (P3) as well. Within the Borough, there are a number of institutional/non-profit properties and entities having better than average potential for cooperative action for future P3 opportunities, including churches, school, non-profits, county government, and open space. In addition, reviewing land development ordinances can determine where there might be additional opportunities to capture GSI benefits through private improvements (a listing of Borough-owned and tax exempt properties can be found in the Appendix of this document).



Properties Owned by Media Borough

Properties Owned by Tax Exempt Entities



Currently Identified Properties Owned by Borough and Other Tax Exempt Entities

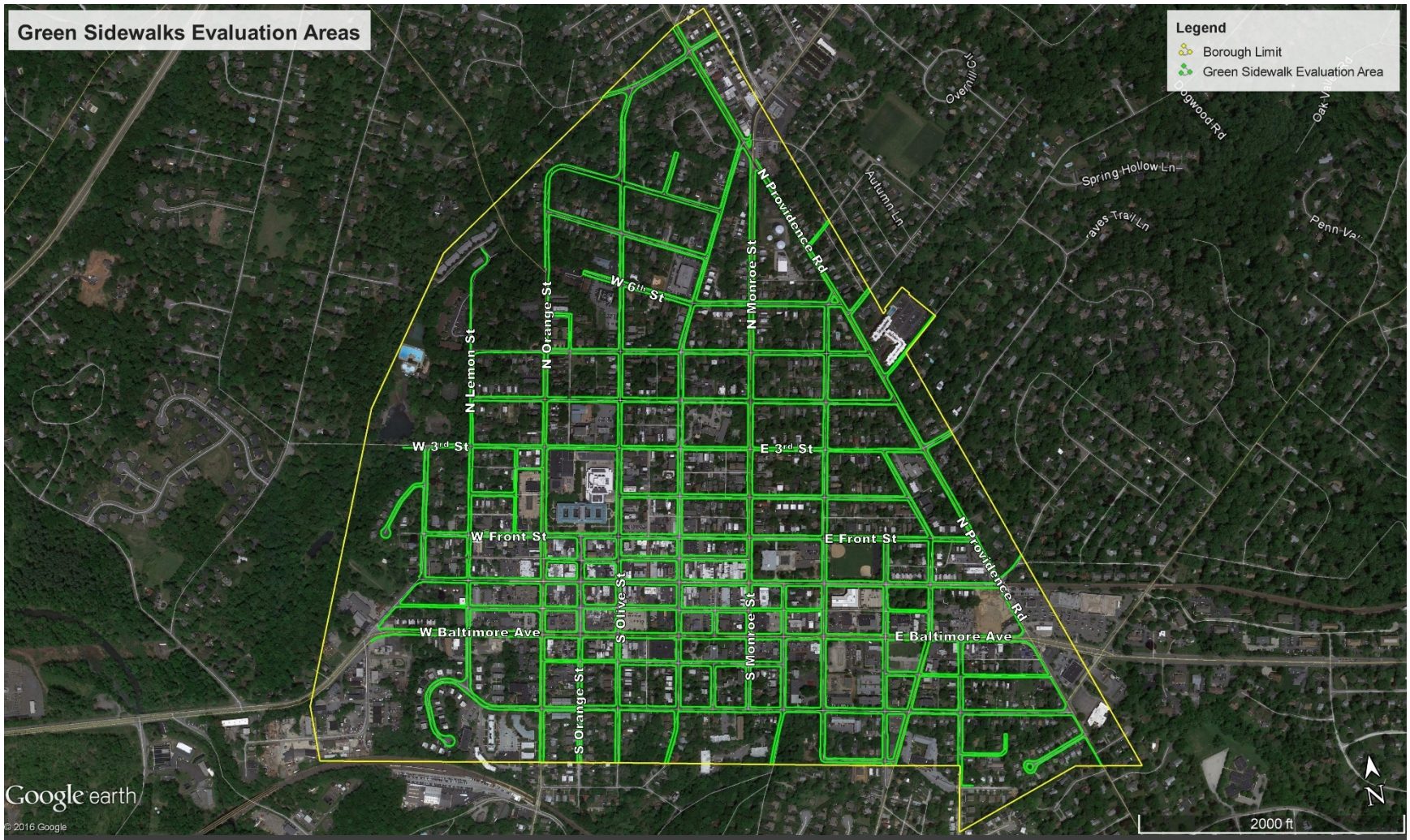
GREEN SIDEWALKS (GREEN STREETS)

Through priorities discussed by staff and officials and in alignment with recommendations with the Borough's Comprehensive Plan, many of the sidewalks within the Borough are slated to be demolished and replaced. With this being a redevelopment priority for the Borough a focus on the integration of green infrastructure in these area is prioritized by this plan. Areas slated for redevelopment are almost always the most cost-effective means of development of GSI, as would be the case with this work which is already slated to address priorities of ADA compliance, pedestrian safety and revitalization of the urban/suburban corridor.

Through the use of porous pavers, aggregate and structural soil it is possible to link many points of runoff capture in one continuous storage volume while meeting the conditions of adequate compaction testing requirements for sidewalks and pavers, volume capture, and viability for plant growth.

- Moderately low cost for construction, if sidewalks are already being replaced
- A low-profile example of GSI with little tradeoff to implement
- Facility will partially exist in the footprint of any area already designated for a tree pit
- Can function with relatively high water tables compared to other GSI practices
- Sidewalk runoff can be captured by using porous pavers or even pavers without mortared joints in the sidewalk fringe
- A "false catch basin" or porous shoulder strip can be used to link capture runoff in the roadway as well as from overland areas
- Depending on limiting zone, supplemental modular storage units can be used to increase the volume capacity of these systems and increase benefit vs. cost of this alternative

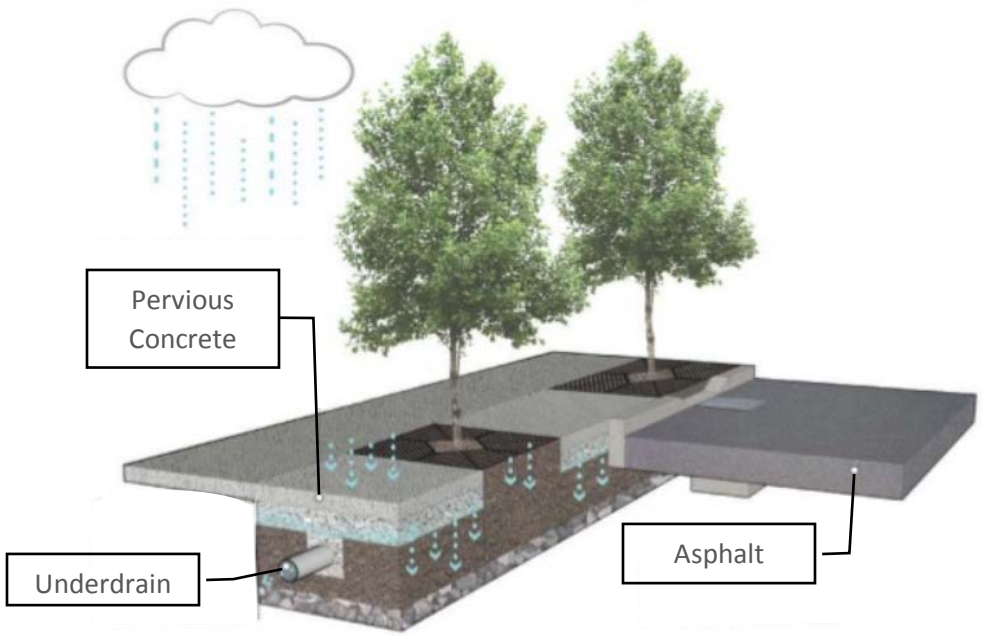
Photo Credit: Philadelphia Green Streets Design Manual



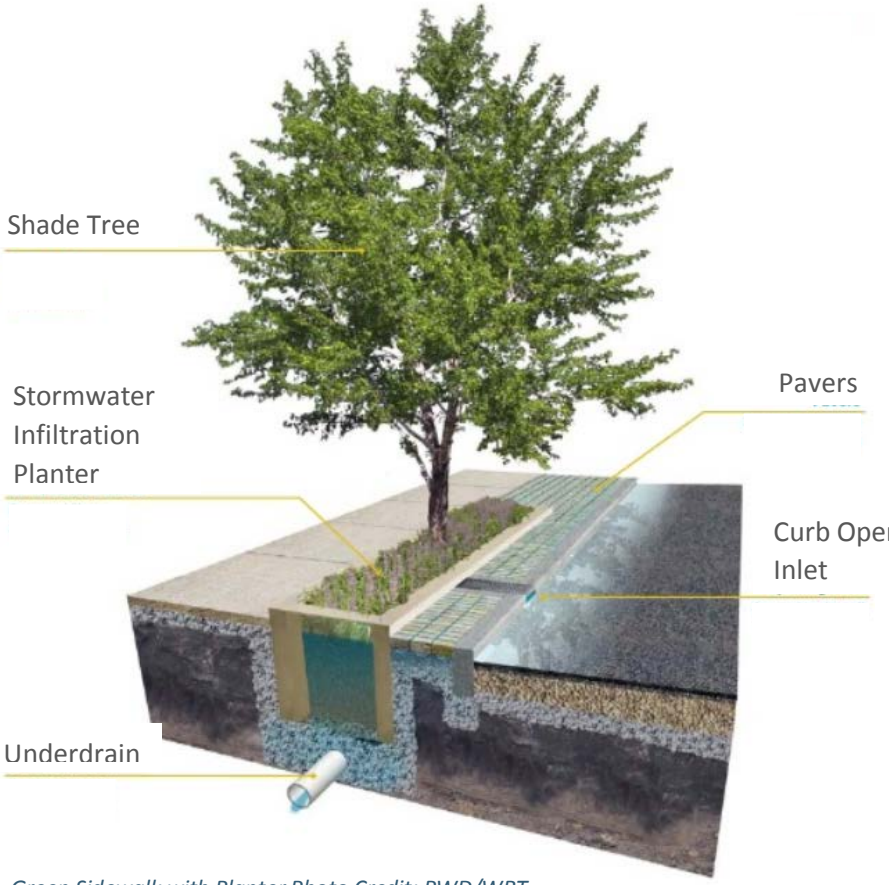
Sidewalk Areas in Media Borough

There are (or are the potential for) 160,908 LF (30.48 miles) of sidewalk in Media Borough. Considering variations of sidewalk, verge and pavement cut, 8' was determined to represent the average width of these GSI facilities totaling approximately 59.10 acre-feet of capture (storage).

Depth of facility is expected to be 5 feet, on average. With a capture (storage) depth of 2.0 feet (accounting for porosity of aggregate and structural soil). A greater savings in material can be realized if modular storage blocks or a similar treatment are used. As with all GSI a full geotechnical evaluation should be conducted in order to ascertain the suitability of the area for retrofit.



Green Sidewalk (Photo Credit: Rutgers)



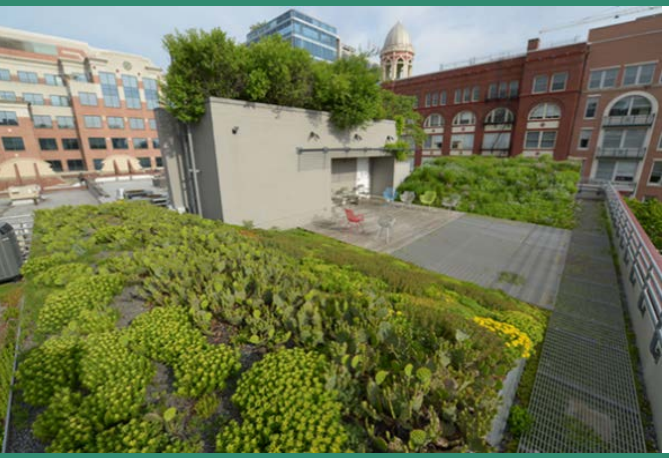
Green Sidewalk with Planter Photo Credit: PWD/WRT

GREEN BUILDINGS

There are a number of useful retrofits that have a great benefit towards reducing runoff from roofs of existing buildings. Including:

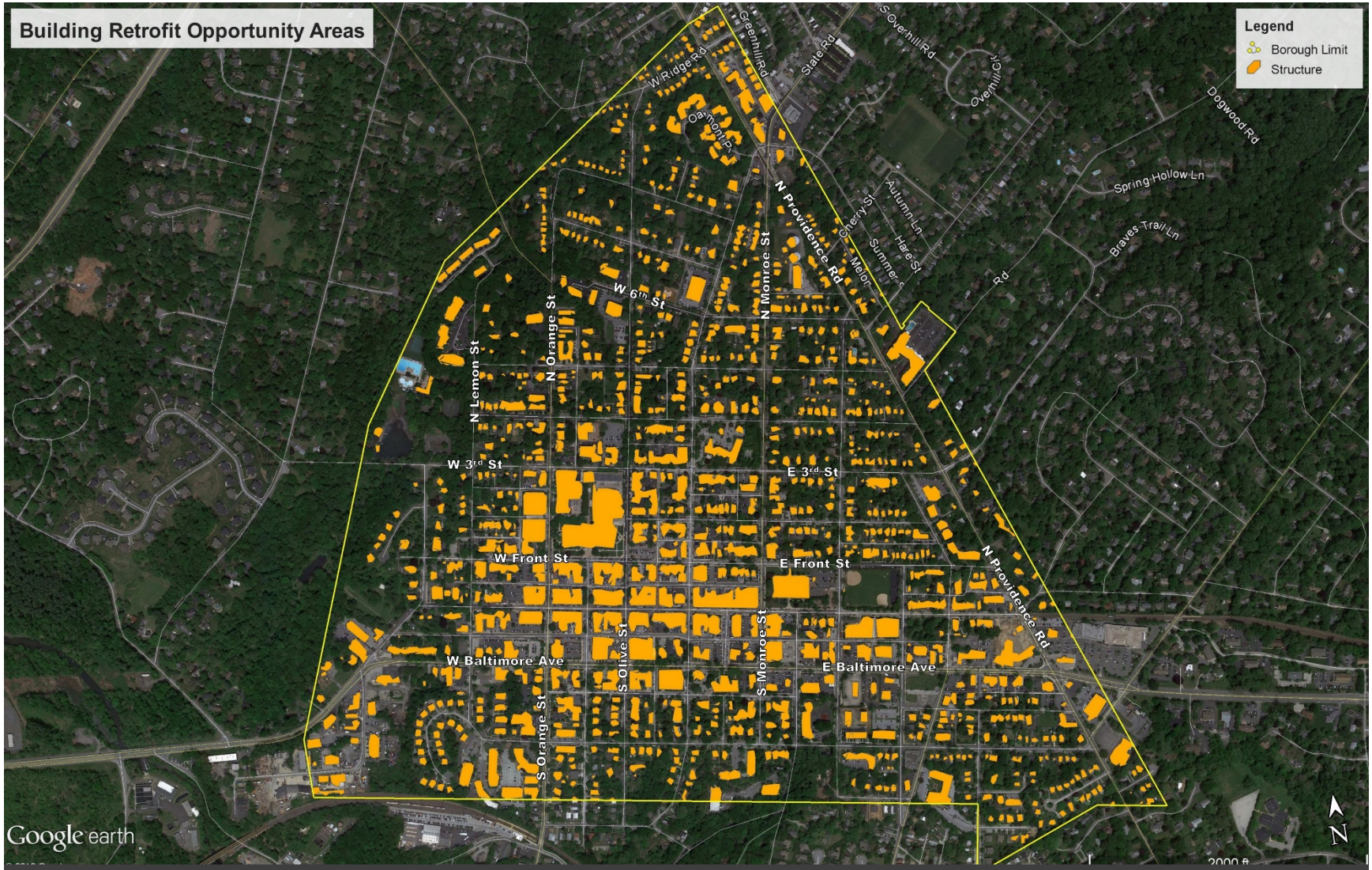
- **Green Roofs**
- **Blue Roofs**
- **Rain Harvesting Systems (Cisterns)**
- **Greywater Systems**
- **Drywells**
- **Downspout Rain Garden**

(see Glossary for definitions)



Green Roof / Blue Roofs (ASLA/Philadelphia Water Department

Rain Harvesting (Vine Street, Seattle, WA)

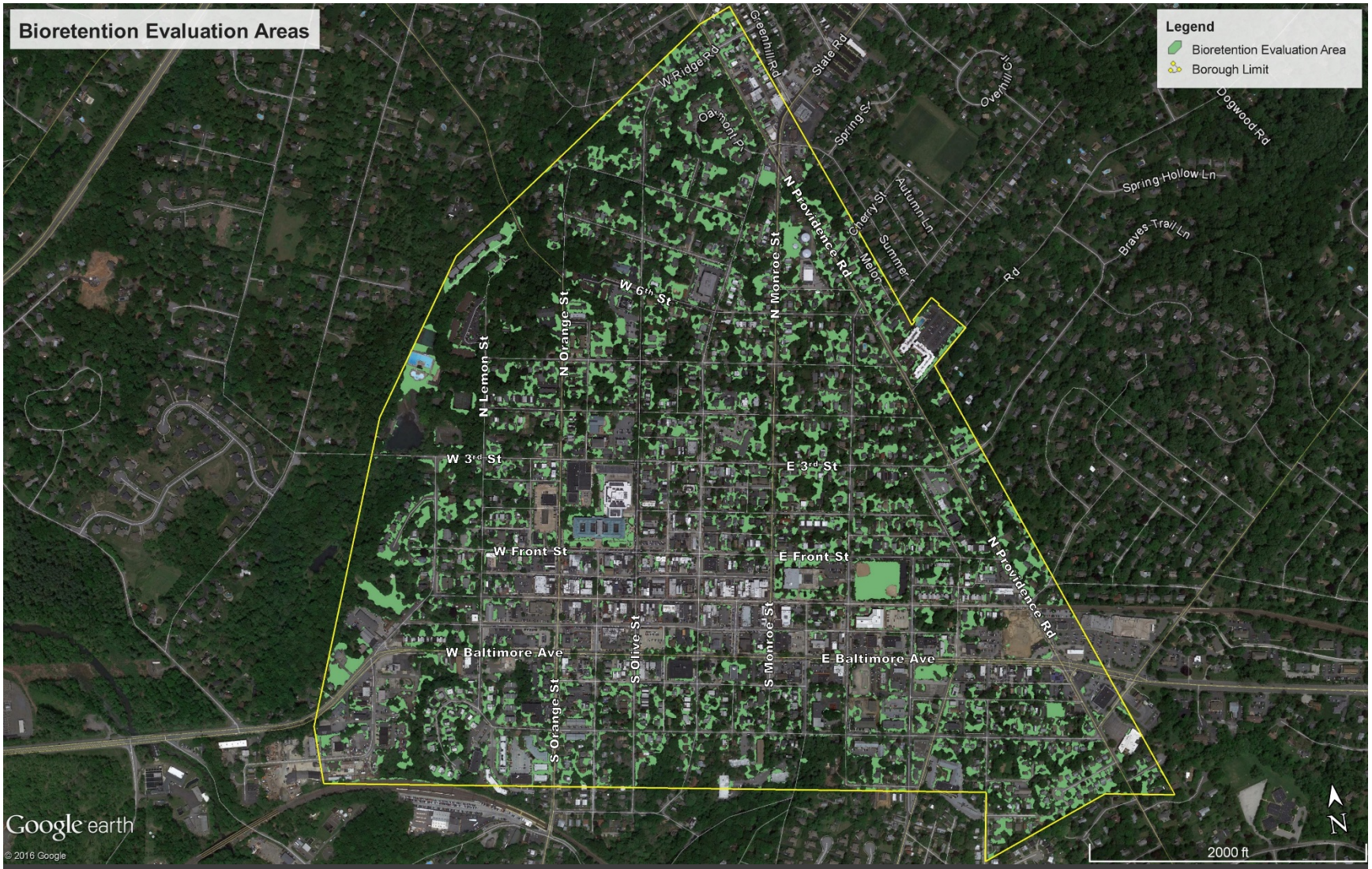


Buildings (Structures) in Media Borough

Currently, Media Borough is estimated to have 3,857,135 square feet (127.47 acres) of roof area. In a scenario whereby the first 1" of rainfall would be managed through a combination of green roofs, blue roofs, drywells, rain barrels and cisterns a runoff volume of approximately 7.38 acre-feet of potential runoff could be managed. For drywells and yard rain gardens, a full geotechnical evaluation should be conducted in order to ascertain the suitability of the area for retrofit. For roof structures, a building engineer should be consulted.

Potential Strategies to Promote On-Lot GSI:

- **Education and Outreach**
- **Rain Barrel Subsidy Program**
- **GSI Landscaping Workshop**
- **First Flush Ordinance**
- **LEED ™ Development Incentive**

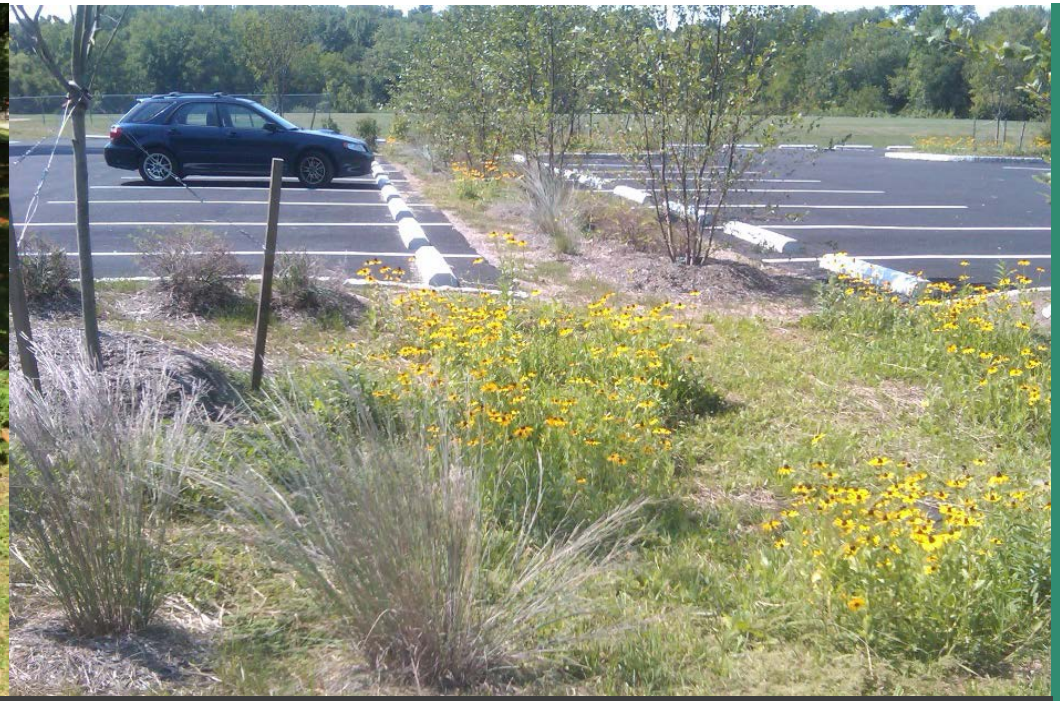


Open Space (Lawn) Areas in Media Borough

In the Borough there exist approximately 62 acres of lawn and open space area. Taking into account a maximum loading ratio of 8:1 for determination of viable area that might be retrofitted with rain gardens, bio-swales or other runoff reduction practice an area of approximately 7.8 acres was determined to be feasible for retrofit into GSI.

Depth of facility is expected to be 3.5 feet, on average, with a capture (storage) depth of 2 feet (accounting for basin impoundment volume and porosity of engineered soil). On a full build-out of bioretention areas, an estimated runoff volume of approximately 15.6 acre-feet of potential runoff could be managed. As with all infiltration GSI, a full geotechnical evaluation should be conducted to ascertain the suitability of the area for retrofit.

Rain Gardens at Media Borough Hall



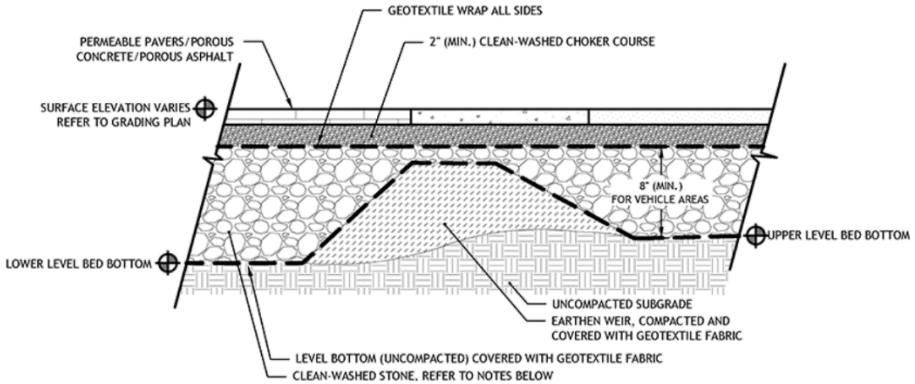
Rain Gardens at Fishers Park (Towamencin, PA)

POROUS SURFACE TREATMENTS

The use of porous pavement either in the form of block units, porous asphalt or porous concrete is recommended throughout the Borough as an effective means to control rainfall closer to where it falls. Specific in parking areas or pedestrian corridor. Generally, appropriate in most situations as long as design guidelines are followed and systems are properly designed to meet the bearing strength of their intended use class.

Approximately, 127.5 acres of the Borough is made up of parking lots, driveways and patios. These areas represent opportunity for conversion to a porous material substitute. These areas often are considered the best candidate for such a retrofit as they tend to be flatter, less traveled and thus, less of a risk for failure.

Cross-section of porous pavement can vary. For the purposes of this evaluation, a depth of one foot of stone underlayment is being proposed. Considering a porosity of 40% an adjusted depth of 0.4 feet for this GSI was used. On a full build-out of porous resurfacing, an estimated runoff volume of approximately 51.0 acre-feet of potential runoff could be managed. As with all infiltration GSI a full geotechnical evaluation should be conducted to ascertain the suitability of the area for retrofit.



Porous Asphalt Cross-Section
Photo Credit: Philadelphia Water Department

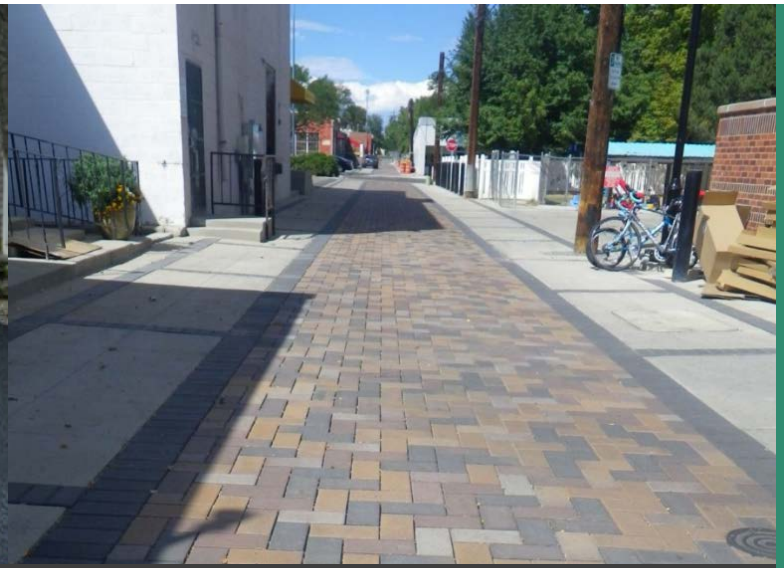
Porous Asphalt Parking Lot (Towamencin, PA)

Porous surface retrofit of low volume roadways

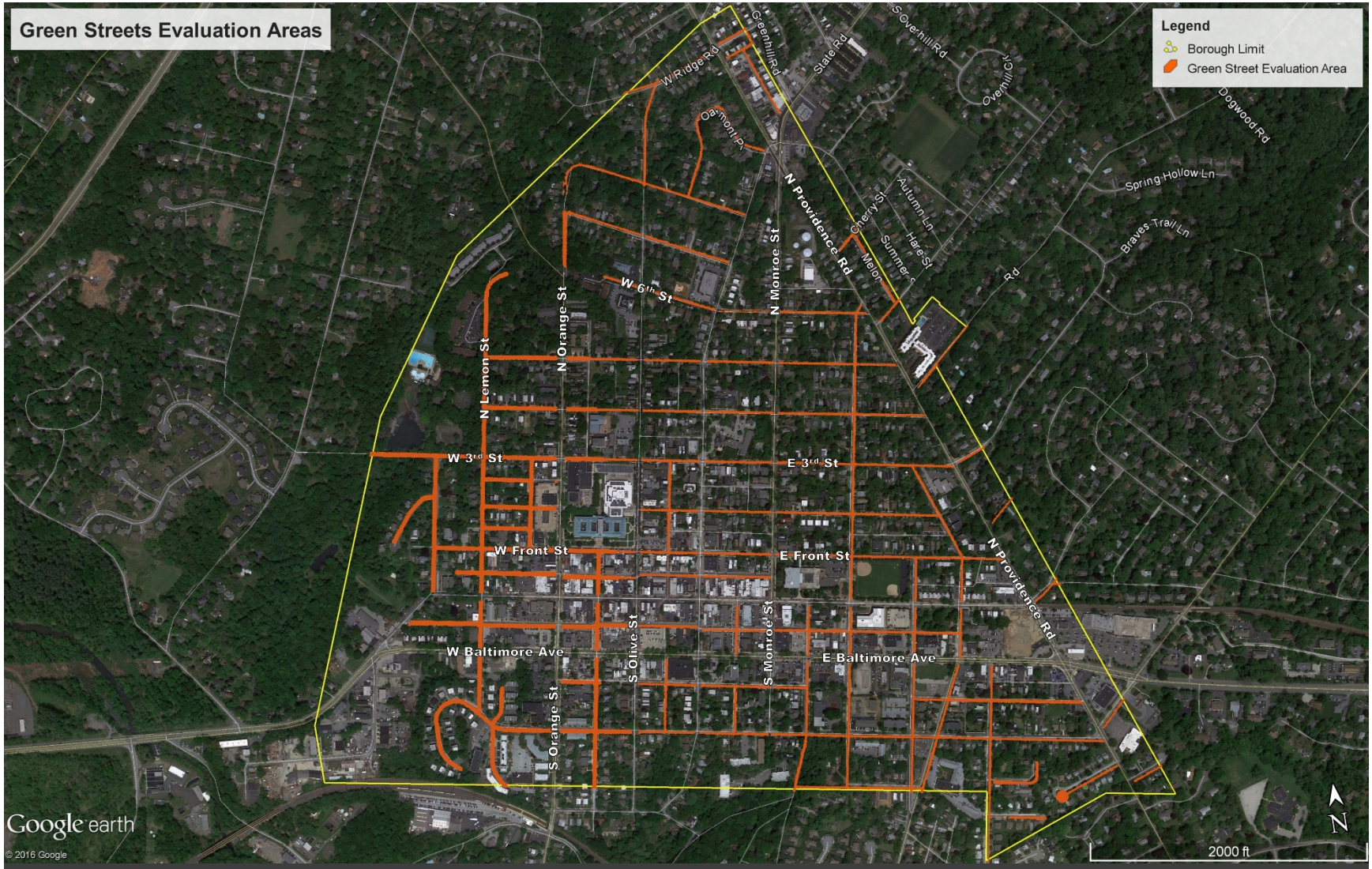
For several decades, porous surface treatments have been used for parking lots, sidewalks, and generally low-volume roadway areas that do not receive a high amount of traffic. One consideration that has been gaining momentum over the last decade is the use of porous asphalt for low to medium volume roadways. Green Alleys are another embodiment of this concept, which have been used in numerous GSI initiatives in Chicago, Philadelphia and Lancaster, to name a few.

In recent case studies, this idea has been tested yielding promising results. While maintenance can be a challenge from the standpoint of requiring new equipment (e.g. vacuum trucks), there are a number of co-benefits with installing porous roadways/parking lots from the standpoint of snow clearing. The openness of a porous asphalt surface allows for vapor and temperature exchange from several feet underground allowing the higher temperature from the ground to melt ice and snow faster than what is typically observed with normal pavement.

Porous Asphalt Roadway - Photo Credit: ASCE (Providencetown, MA)



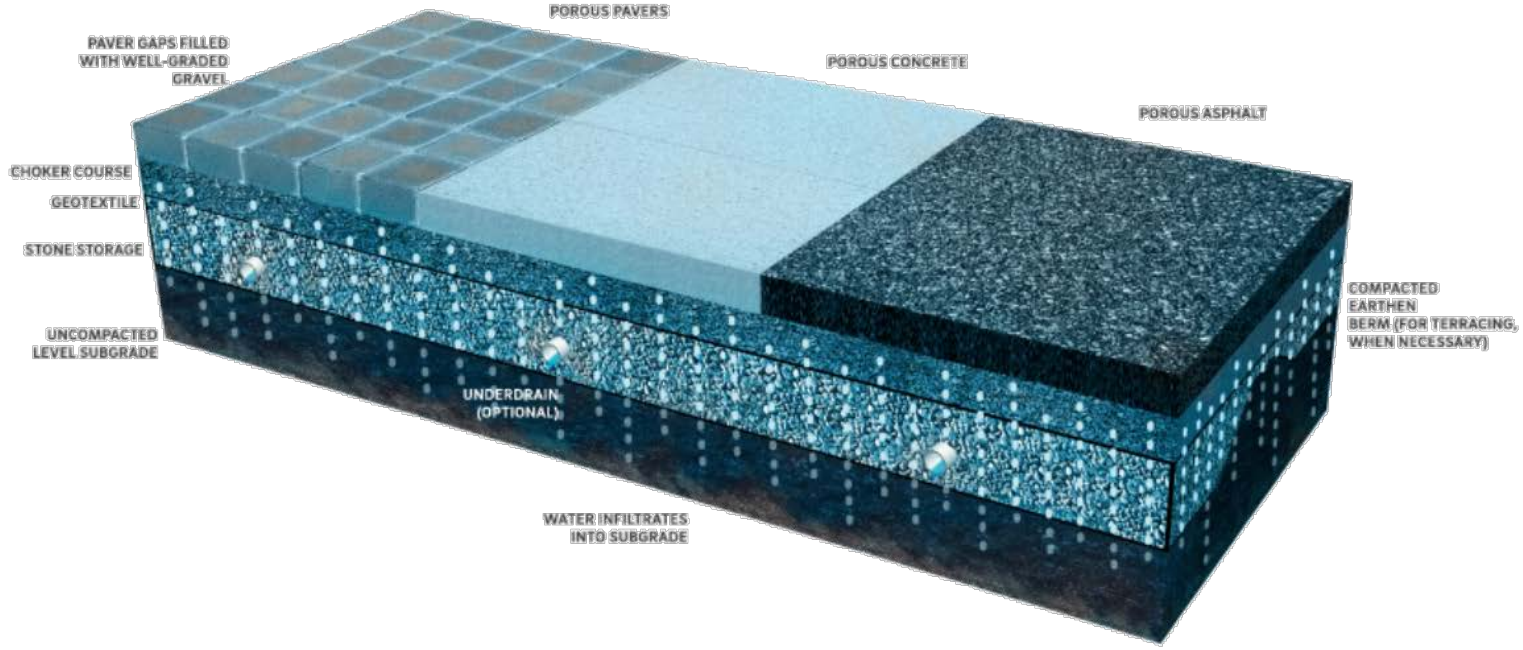
Green Alley – Photo Credit: Longmontian (Longmont, CO)



Low Volume Roadways in Media Borough (Non-Transportation)

The Borough has about 27.0 acres of low volume roadways. While these areas also represent opportunity for conversion to a porous material substitute, they also present an additional benefit of being within Borough right-of-way. While most driving surfaces that are considered for porous materials are parking lots there are extensive examples of low volume roadways and even higher volume routes such as in Providencetown, MA.

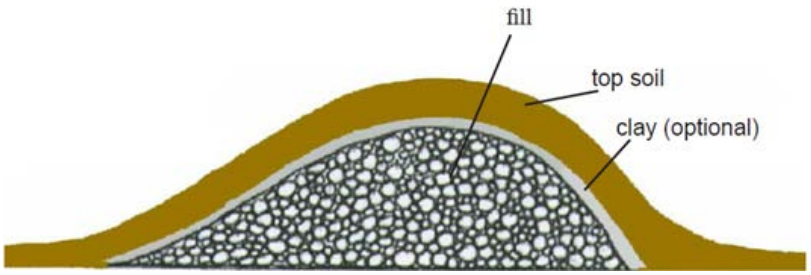
As with parking lots, cross-section of porous pavement can vary. For the purposes of this evaluation, a depth of 18 inches of stone underlayment is being proposed. Considering a porosity of 40% an adjusted depth of 0.6 feet for this GSI was used. On a full build-out (conversion) of low-volume roadways to porous surfaces, an estimated runoff volume of approximately 16.2 acre-feet of potential runoff could be managed. As with all infiltration GSI a full geotechnical evaluation should be conducted to ascertain the suitability of the area for retrofit.



Porous Asphalt Cross-Section – *Photo Credit: Philadelphia Water Department*

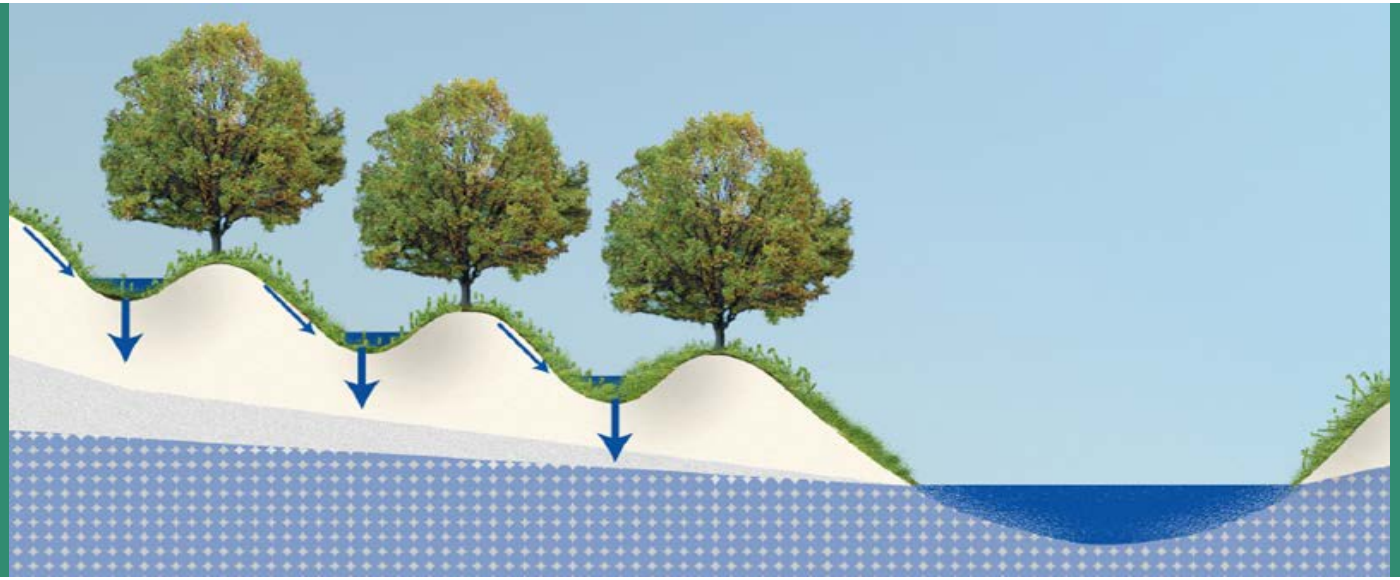
Retentive grading

A shallow depression can be created behind a berm to provide an infiltration area without the need for a more complex stormwater facility. Berms are applicable in many urban settings such as parking, commercial and light industrial facilities, roads and highways, residential developments, and vacant lots. Berms and shallow depressions are well suited for both small and large projects. It can be an inexpensive method of reusing soil on site to manage stormwater. The Borough is made up of many steep open space areas which would provide an ideal alignment with this practice.

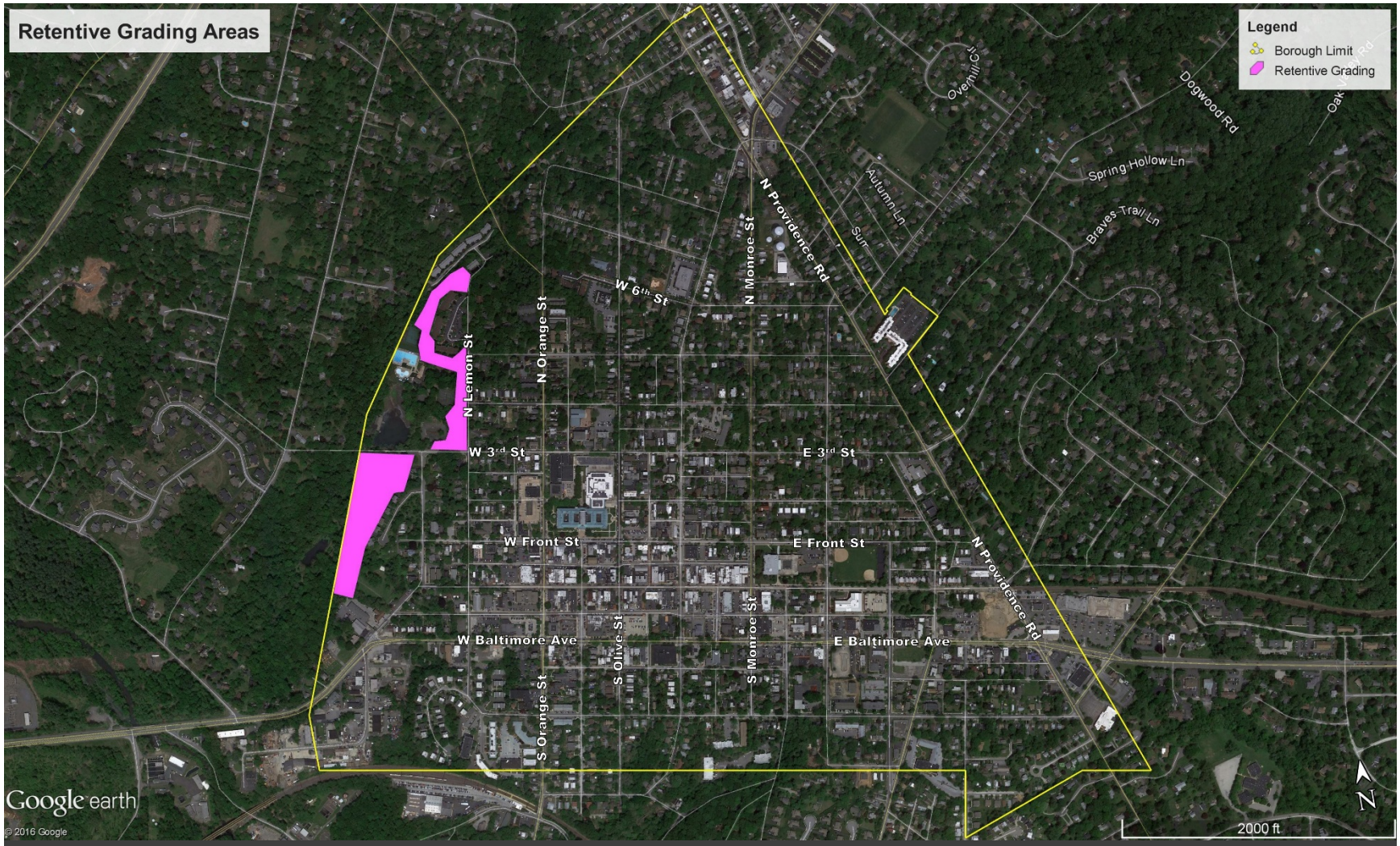


Ideal substrate components of a berm

Pennsylvania Stormwater BMP Manual



Woodland infiltration berms in series



Potential Retentive Grading Areas in Media Borough

There are approximately 19 acres of drainage area tributary to open space area that could be retrofitted with retention berms. Considering a maximum loading ratio of 8:1 for determination of viable area that might be retrofitted as bioretention through retentive grading, an area of approximately 2.4 acres was determined to be feasible for retrofit into GSI.

Depth of facility is expected to be 3.5 feet, on average, with a capture (storage) depth of 1 foot (accounting for impoundment volume and porosity of engineered soil). On a full build-out of bioretention areas, an estimated runoff volume of approximately 2.4 acre-feet of potential runoff could be managed. As with all infiltration GSI, a full geotechnical evaluation should be conducted to ascertain the suitability of the area for retrofit.

Retentive Grading Berm - Valley Forge Recreational Trail Before and After (Upper Merion, PA)

Conclusions

As is a common concern with addressing urban stormwater issues, the availability of land can be a hurdle with meeting the goals of this program. The Borough only owns small portion of overall land in Media. Consequently, the full realization of this plan cannot be met without the help of local residents, businesses and other governmental entities. Building a cooperative framework through outreach will be key to this effort. The forwarding of this plan depends on building consensus of "shared responsibility" within the community. Based on a full buildout analysis of GSI there is the potential for a dramatic enhancement to the Borough's stormwater goals.

Below is a summary of potential storage volume capture by GSI Category:

Green Infrastructure Feasibly Analysis Summary

GSI Type	Acres of Coverage	Average Depth of Runoff Managed (ft)	Volume of Runoff Captured (Ac-ft)	Volume of Runoff Captured (cf)	Cost/CF	Full Buildout Total
Green Sidewalks (Volume Supplementation Only)	29.55	2.00	59.10	2,574,396	$22.00	$56,636,712
Green Buildings (Retrofit)	88.55	0.08	7.38	321,308	$20.00	$6,426,159
Bioretention	7.80	2.00	15.60	679,536	$22.00	$14,949,792
Porous Resurfacing (Parking, Patios & Driveways)	127.5	0.40	51.00	2,221,560	$46.33	$102,924,875
Porous Resurfacing (Low Vol Roadways, Green Alleys)	27.01	0.60	16.21	705,933	$80.82	$57,053,534
Retentive Grading	2.39	0.08	2.39	104,108	$11.00	$936,976

Recommendations

Based on the scale of this plan and the challenges with putting it into action, the following recommendations are made under five key areas:

1. Execute Capital Improvements to the collection system to address immediate flood relief for the 10-year storm event

2. Establish a Stormwater Committee to conduct a Land Use Evaluation
   a) Review Land Use compliance documents for potential incorporation of green infrastructure provision
   b) Consider adopting a "First Flush" Ordinance
   c) Incentive Zoning
   d) Review of current redevelopment planning

3. Evaluate current strategies to support energy and resource conservation
   a) Consider Incentivizing a green building metric such as LEED™ or Envision™
   b) Rain barrel subsidy program

4. Evaluate all existing and proposed parks, open space and natural preservation areas
   a) Evaluate opportunities to integrate stormwater improvements into park areas
   b) Examine current open space areas for riparian buffer, streambank restoration and green infrastructure integration
   c) Promote extension of existing shade tree plan
   d) Promote and incentivize at-home green infrastructure development

5. Develop collaborative opportunities through outreach
   a) Service Organizations (DVRPC, DCPD, DCCD & Chester-Ridley Crum Watershed Association)
   b) Joint planning efforts with Delaware County
   c) Stormwater/Green Infrastructure workshops
   d) Foster public-private partnerships (businesses and residents)
   e) Promote networking with other communities through joint MS4 planning

PART 4 | DESIGN STRATEGIES BY DRAINAGESHED

Overview

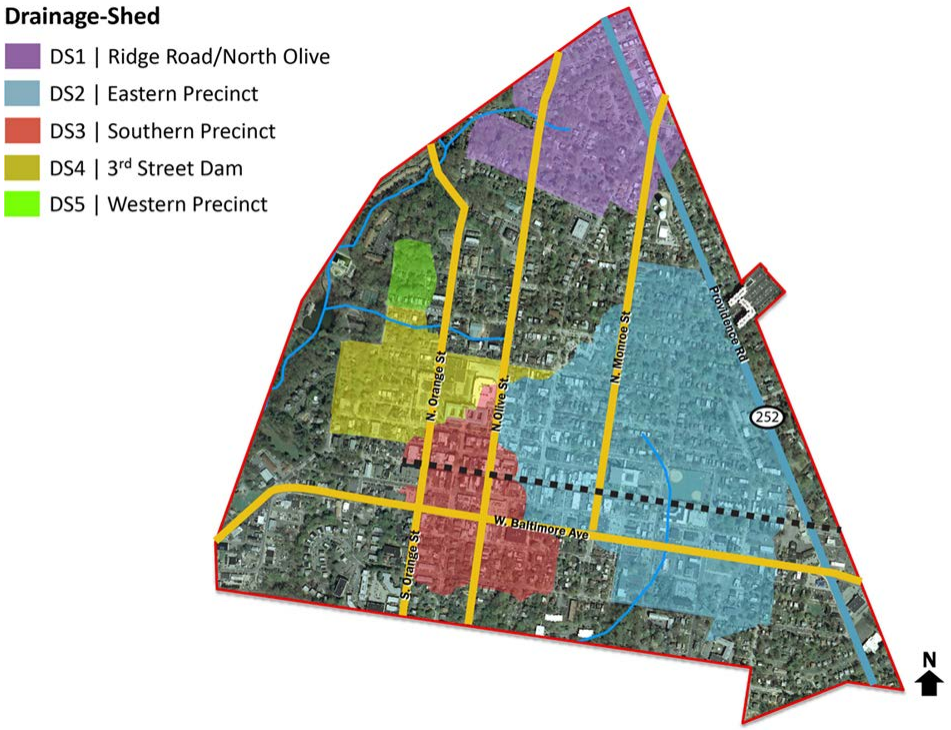
The Borough's eleven (11) problem flooding areas are contained within five (5) distinct 'drainage-sheds'.

Based on the severity of the runoff and flooding issues within the Borough it was decided that an integrated flood and storm sewer model would be developed to evaluate the effectiveness of a number of potential infrastructure interventions. In order to look at drainage and flooding issues more holistically, a focus was put on evaluation of established problem areas on a drainage-shed basis.

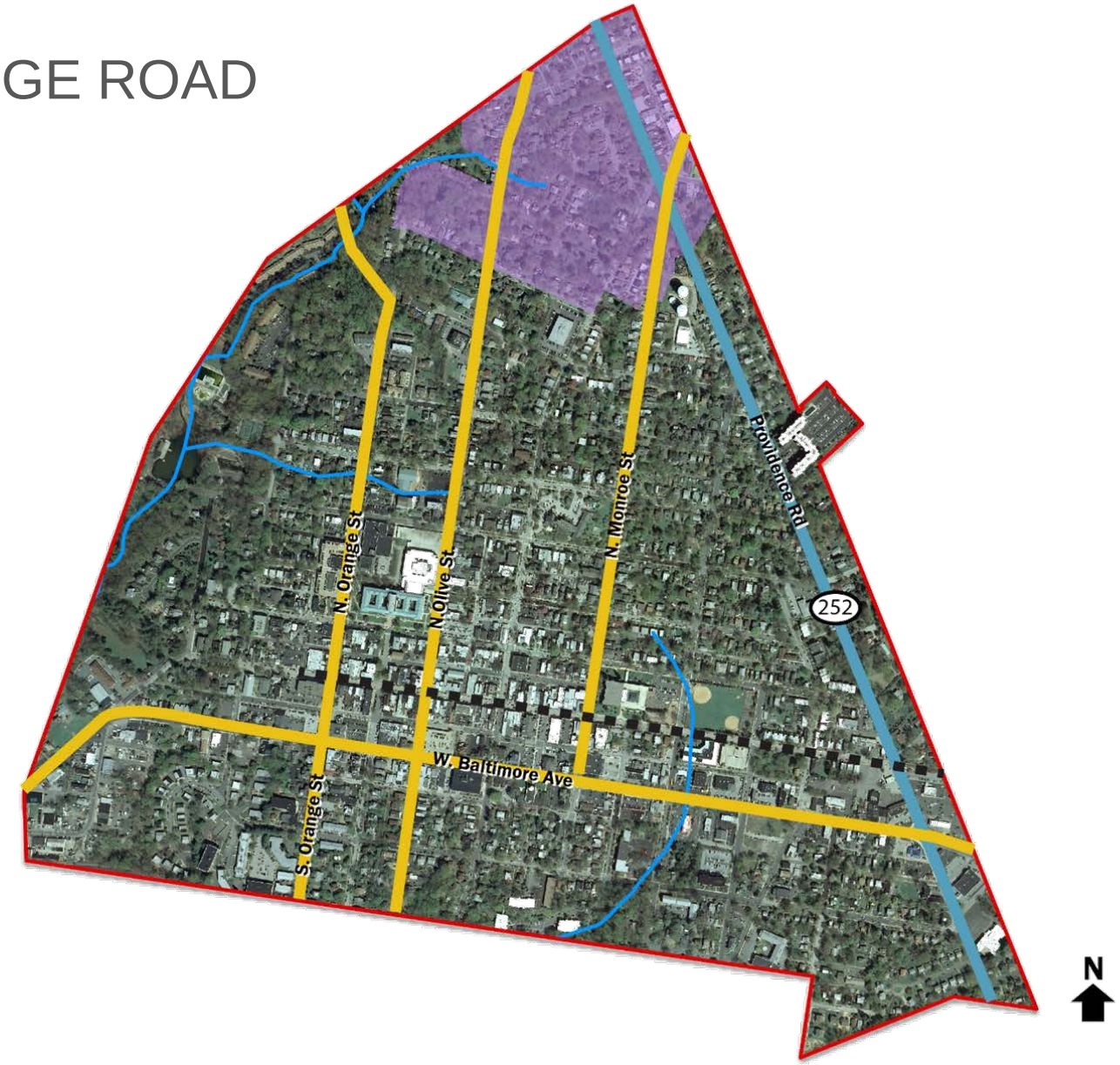
As an initial step it is proposed by this program to address service deficiencies of the existing collection system in order to bring the drainage to current standards and reduce the frequency and extent of flooding. This is a critical first step in meeting the overall goal of improving the quality of life for the residents.

In redesign of the collection system, a number of properties were evaluated for potential GSI retrofit and the theoretical effect of the proposed GSI was evaluated for this system. In total, there were lands available to consider nine (9) new projects:

1. Parkette on Providence
2. Mellon Street Green Alley
3. Ridge & Olive Green Sidewalks (Green Streets)
4. Barrell Park Underground Detention
5. Haldeman Street Rain Gardens
6. Green Sidewalks (Green Streets) - South
7. Front Street Rain Gardens
8. Green Sidewalks (Green Streets) - 3rd & Orange
9. North Orange Street Rain Gardens



DS1 | RIDGE ROAD



DS1 | RIDGE ROAD / NORTH OLIVE DRAINAGE-SHED

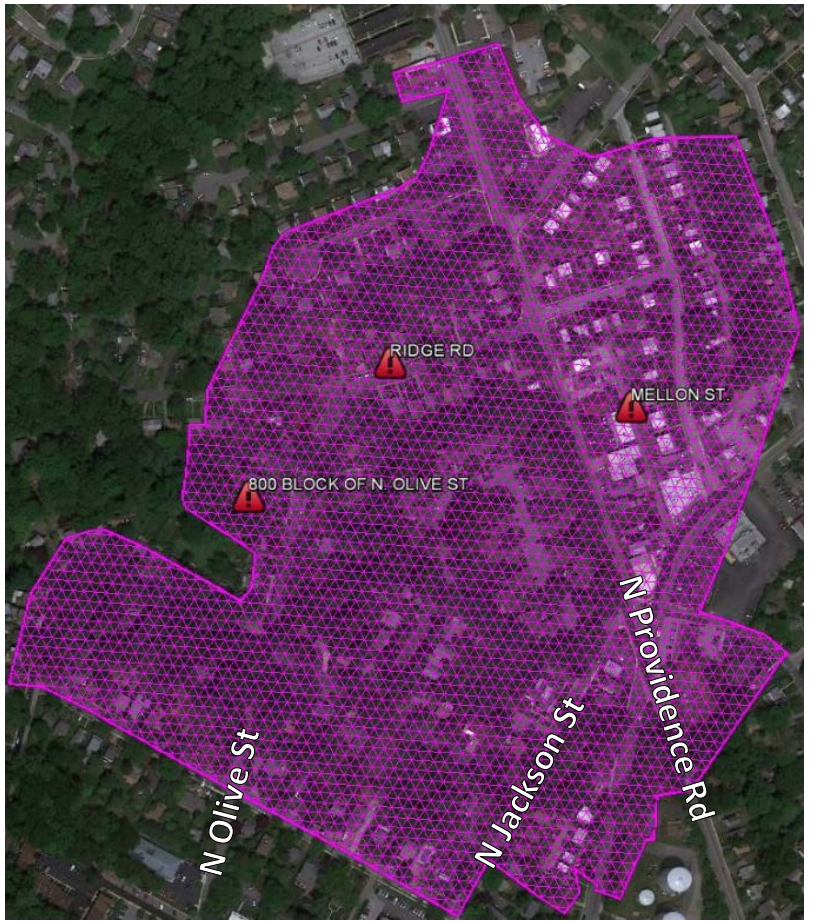
The Ridge Road/North Olive Drainage-Shed is located in the northern-most extent of the Borough.

Causes of flooding are attributed to a number of reasons including, but not limited to:

- Isolated drainage sub-networks (disconnected);
- Pipe capacity issues;
- Lack of stormwater management features (controls);
- Steep topography;
- Lack of an adequate inlet collection systems; and
- General increases in runoff associated with dense urbanization in unmanaged areas.

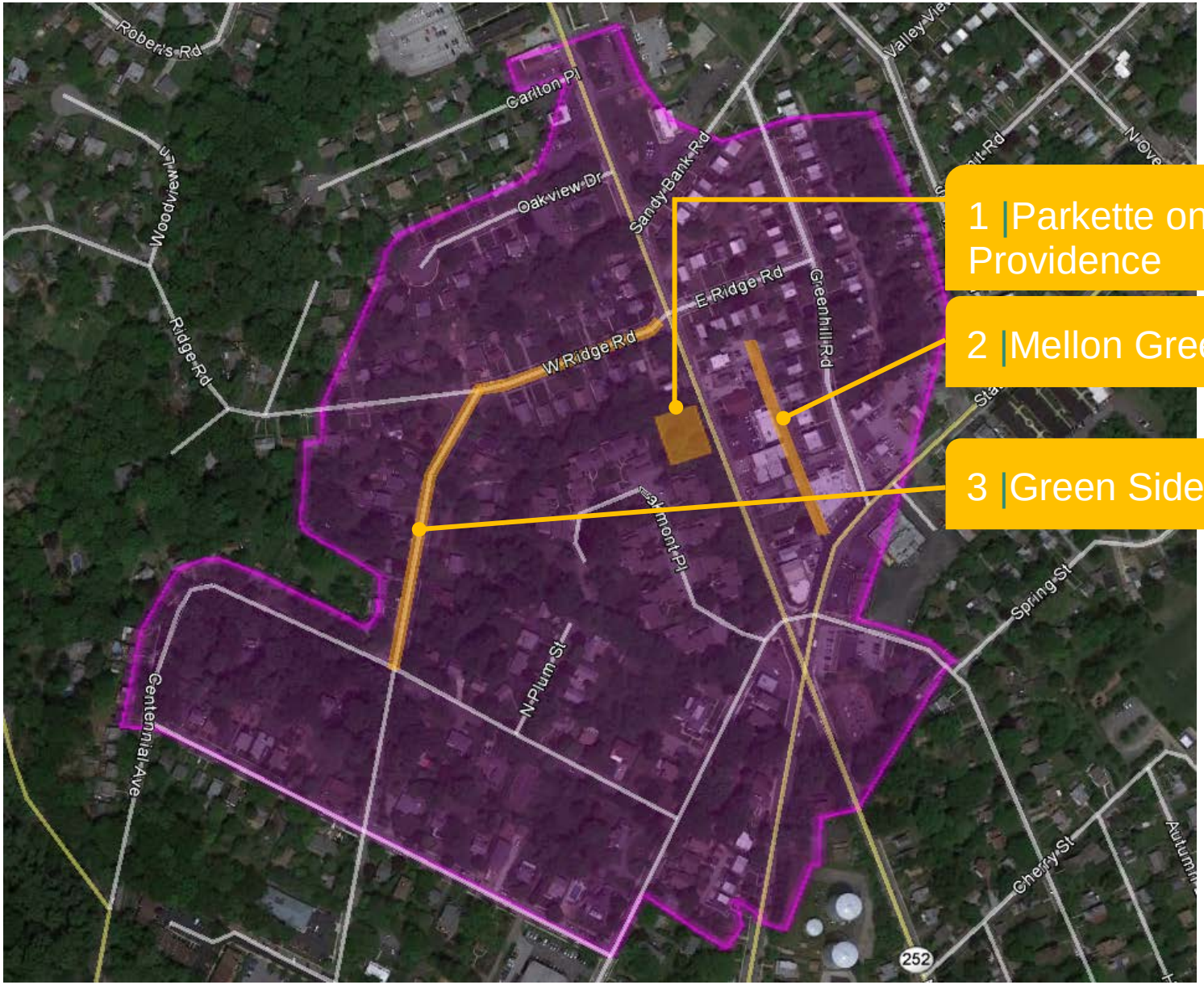
Flood Incident Areas:

- Ridge Road
- 800 Block of N Olive Street
- Mellon Street



DS1 | RIDGE ROAD / NORTH OLIVE DRAINAGE-SHED

GREY INFRASTRUCTURE IMPROVEMENTS | RIDGE ROAD


Robert's Rd
Carlton Pl
Oakview Dr
Sandy Bank Rd
Valley View
Woodview Ln
Ridge Rd
W Ridge Rd
E Ridge Rd
Greenhill Rd
Belmont Pl
N Plum St
Centennial Ave
Spring St
Cherry St
252
1 |Parkette on Providence
2 |Mellon Green Alley
3 |Green Sidewalks

1 | STORMWATER PARKETTE | ON NORTH PROVIDENCE ROAD

LOCATION & DESCRIPTION

Along North Providence Road south of West Ridge Road is a 0.33 acre vacant parcel owned by Media Borough suitable for a green stormwater park. Area tributary to project location is approximately 8 acres of which 77% is impervious.

POTENTIAL APPROACH

The property will be developed with bio-infiltration features with native plantings for capturing, filtering, and conveying runoff into subsurface stone stormwater retention bed to be situated directly beneath for runoff infiltration and volume reduction. Bed will provide adequate capacity for one inch of rainfall representing the first flush of any storm event.

ENVIRONMENTAL BENEFITS

Rate Reduction
Volume Reduction | 3,026 cubic-feet
Reduce Stress on Sewer System
Filters silt, pollutants and debris
Provide habitat for birds and wildlife
Enhances Borough Recreational Amenity

ENGINEER'S OPINION OF COST

$380,133

2 | GREEN ALLEY | AT MELLON STREET

LOCATION & DESCRIPTION

Mellon Street is a paved alley situated between Greenhill Road and North Providence Road. Area tributary to project location is approximately 2.4 acres of which 87% is impervious.

PROPOSED APPROACH

Mellon Street will be reconstructed as a green alley. Alley's features would consist of permeable pavers and/or permeable asphalt, constructed with recycled materials where possible, with concave (reverse crown) grading underlain by a stone stormwater retention bed to provide adequate capacity for one inch of rainfall representing the first flush of any storm event.

ENVIRONMENTAL BENEFITS

Rate Reduction
Volume Reduction | 4,240 cubic-feet
Reduce Stress on Sewer System
Filters silt, pollutants and debris
Community Streetscape Enhancement
Reduce urban heat island effect

ENGINEER'S OPINION OF COST

$342,700

3 | GREEN SIDEWALKS | THROUGHOUT WEST RIDGE STREET AND NORTH OLIVE ST

LOCATION & DESCRIPTION

West Ridge Street and North Olive Street are local roads with ample space for planting between the curb line and sidewalk.

APPROACH

Along West Ridge and North Olive streets, trees can be planted in pockets of soils within a continuous stone trench that stores stormwater until it can infiltrate. Porous pavers can replace the brick sidewalk over the trench and allow runoff from the sidewalk to infiltrate into the trench.

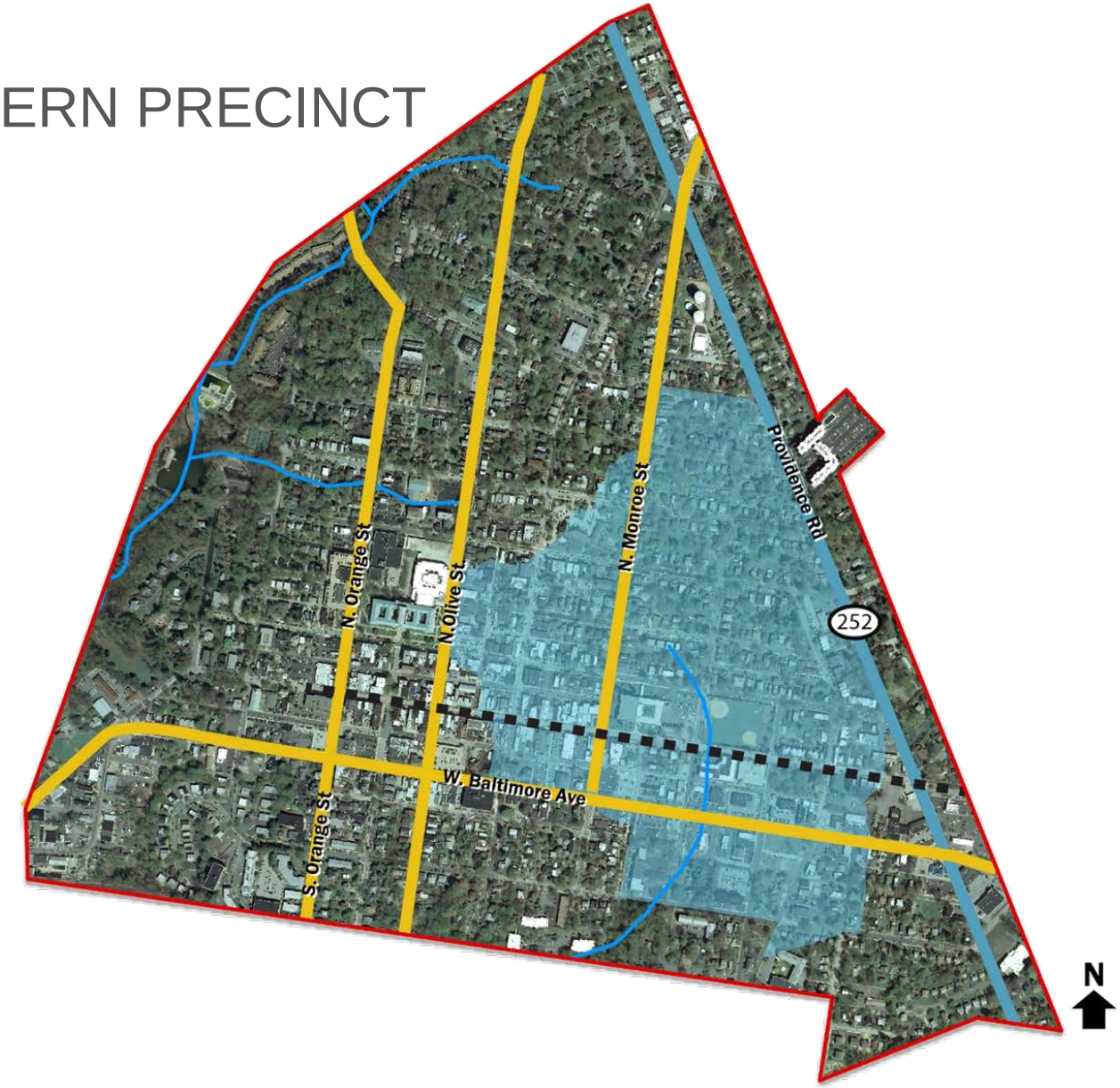
ENVIRONMENTAL BENEFITS

Rate Reduction
Volume Reduction | 227,485 cubic-feet
Reduce Stress on Sewer System
Reduce urban heat island effect
Provide habitat for birds and wildlife
Streetscape Enhancement

ENGINEER'S OPINION OF COST

$5,005,000

DS2 | EASTERN PRECINCT



DS2 | EASTERN PRECINCT DRAINAGE-SHED

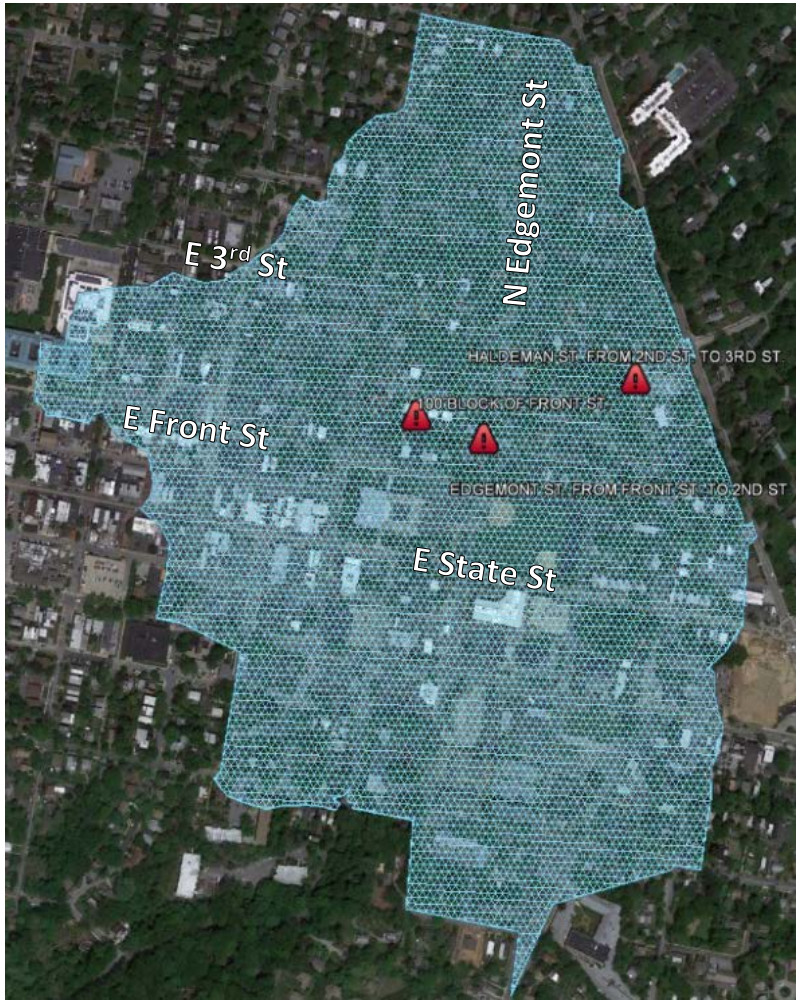
Drainage-Shed 2 is located in the south-east portion of the Borough.

Causes of flooding are attributed to a number of reasons including, but not limited to:

- Orphaned drainage sub-networks (disconnected);
- Pipe capacity issues;
- Lack of stormwater management features (controls);
- Buried stream;
- Lack of an adequate inlet collection systems;
- General increases in runoff associated with dense urbanization.

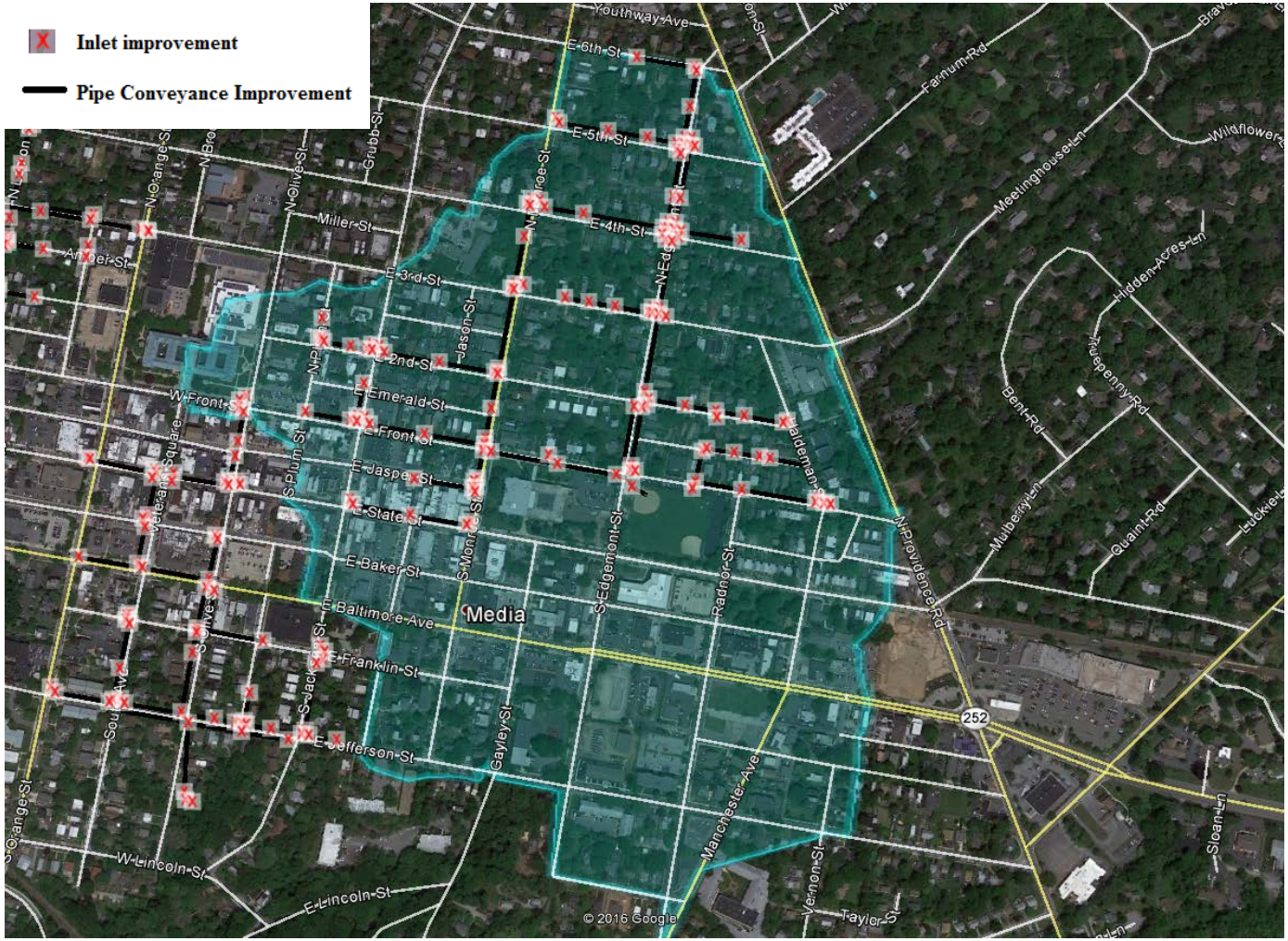
Flood Incident Areas:

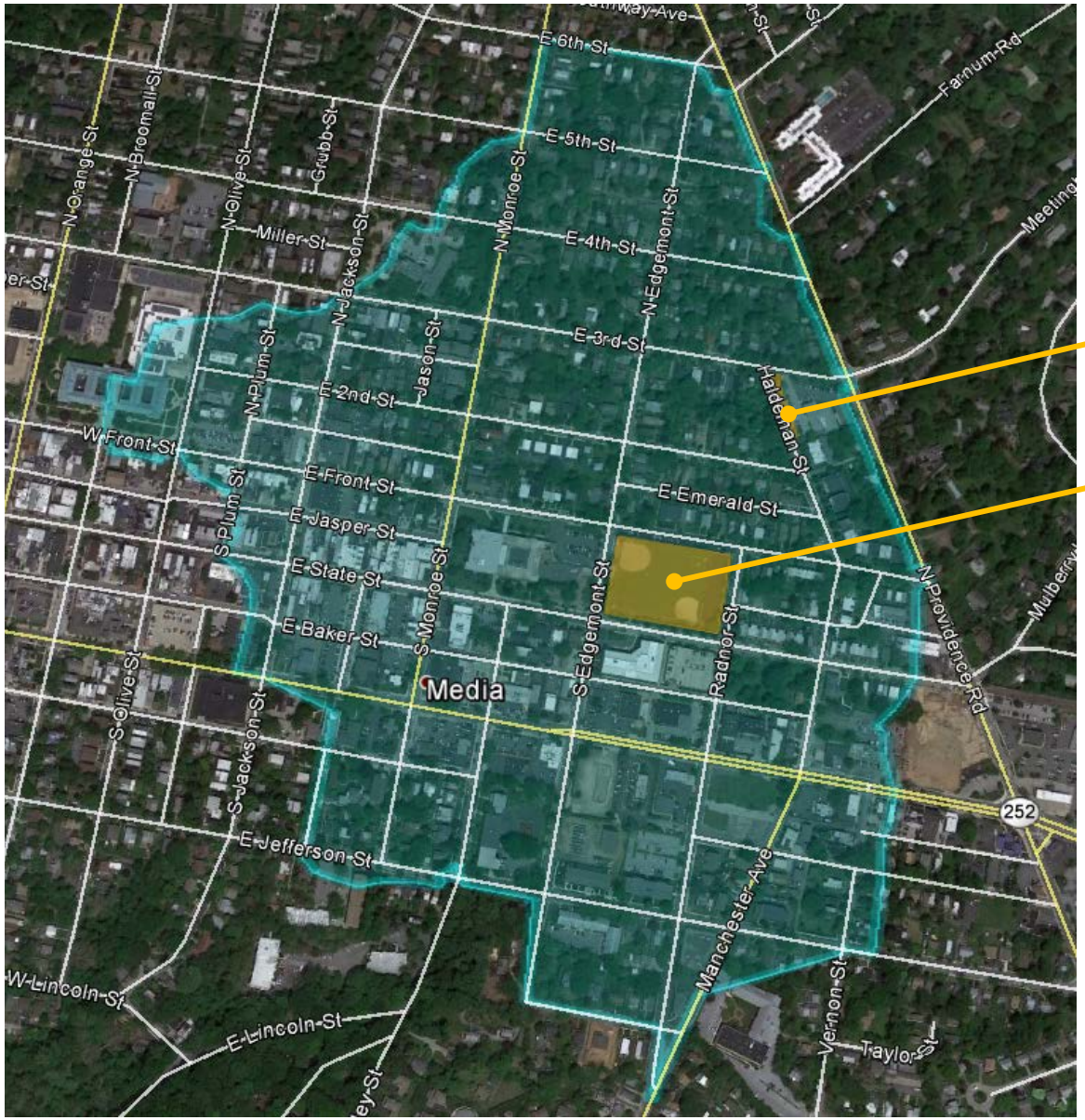
- Haldeman Street from 2nd Street to 3rd Street
- 100 Block of Front Street
- Edgemont from Front Street to 2nd Street



DS2 | EASTERN PRECINCT DRAINAGE-SHED

GREY INFRASTRUCTURE IMPROVEMENTS | EASTERN PRECINCT

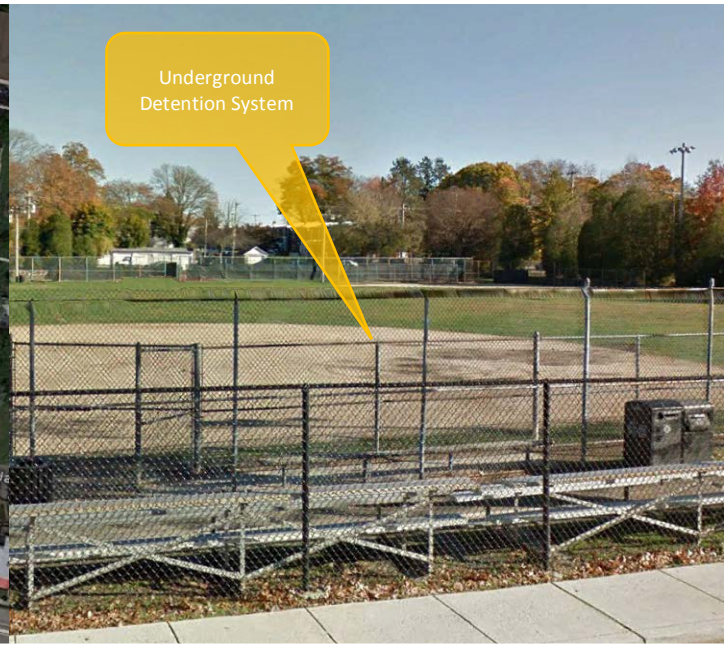




5 | Haldeman Street

4 | Barrall Park

4 | UNDERGROUND DETENTION | AT BARRALL PARK



LOCATION & DESCRIPTION

West Ridge Street and North Olive Street are local roads with ample space for planting between the curb line and sidewalk. Area tributary to project location is approximately 71 acres of which 70% is impervious

APPROACH

Incorporate detention volume structures throughout Barral Park followed by restoration of field to provide a dual benefit from this recreation area.

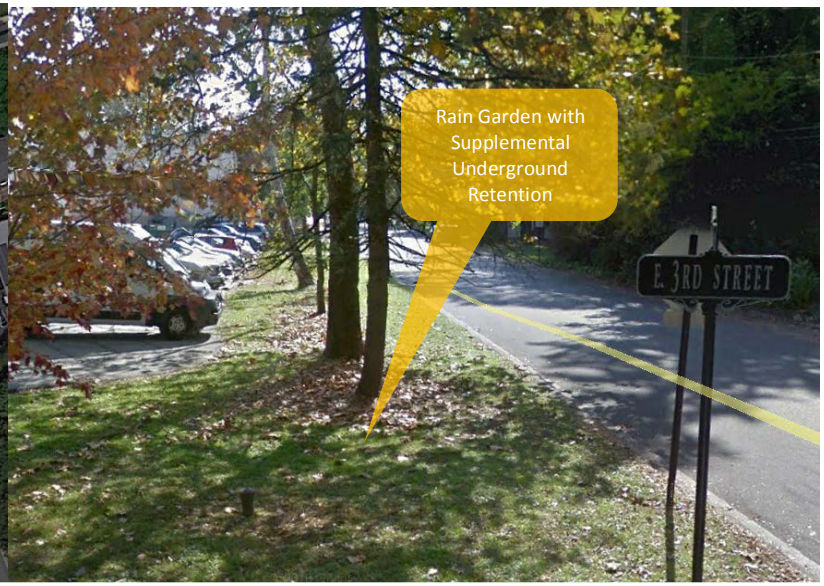
ENVIRONMENTAL BENEFITS

Rate Reduction
Volume Reduction | 81,400 cubic-feet
Reduce Stress on Storm Sewer System
Reduce Runoff Volume

ENGINEER'S OPINION OF COST

$7,982,280

5 | RAIN GARDEN | AT HALDEMAN STREET



LOCATION & DESCRIPTION

The property located at the intersection of 3rd Street and Haldeman Street provides opportunity for green stormwater infrastructure between the parking area and Haldeman Street. Area tributary to the project location is approximately 2.7 acres of which 66% is impervious.

APPROACH

Along Haldeman Street, rain gardens can be placed at frontage of property that will stores stormwater until it can infiltrate.

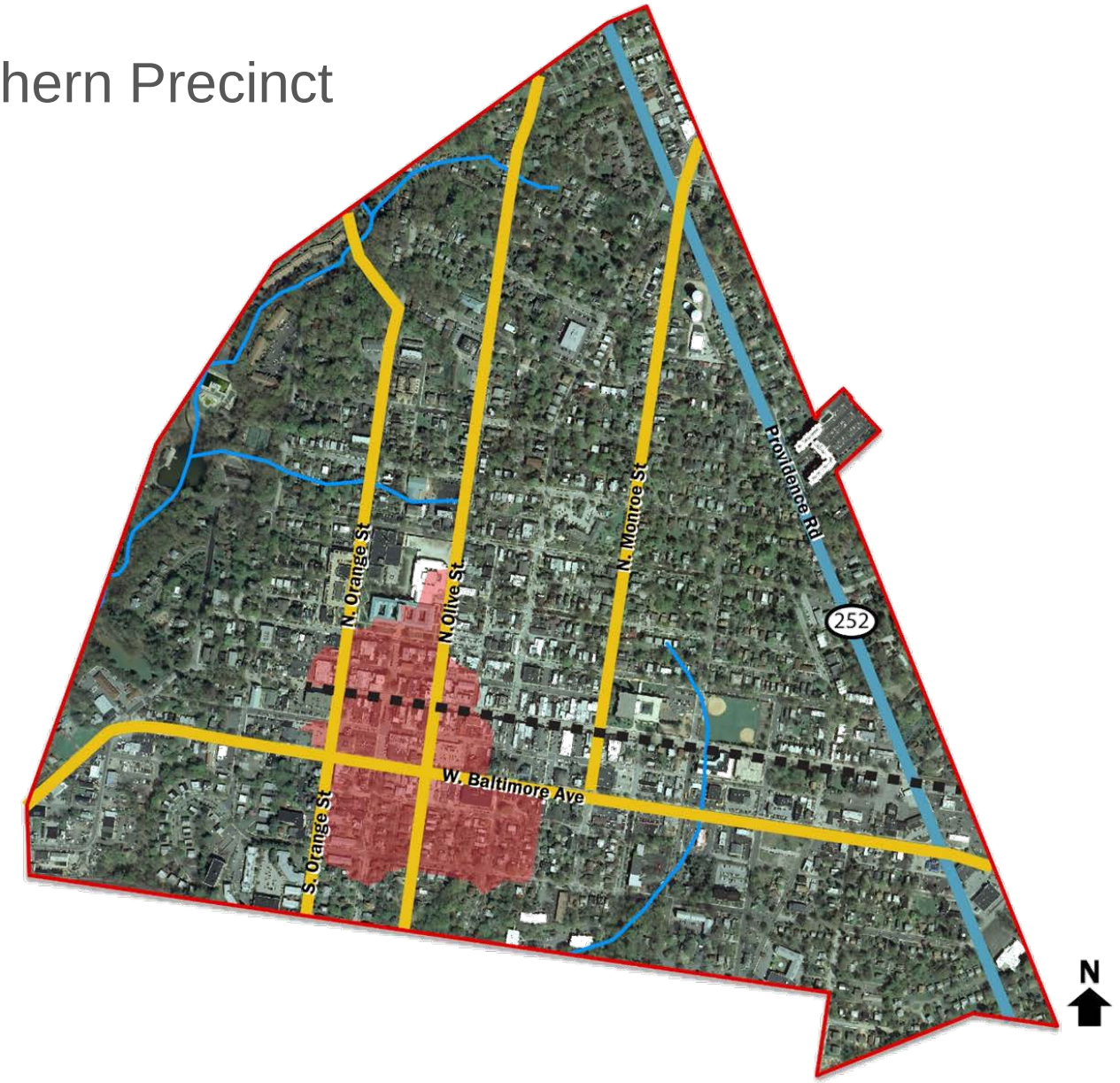
ENVIRONMENTAL BENEFITS

Rate Reduction
Volume Reduction | 3,952 cubic-feet
Reduce Stress on Sewer System
Reduce urban heat island effect
Provide habitat for birds and wildlife
Streetscape Enhancement

ENGINEER'S OPINION OF COST

$105,000

DS3 | Southern Precinct



DS3 | SOUTHERN PRECINCT DRAINAGE-SHED

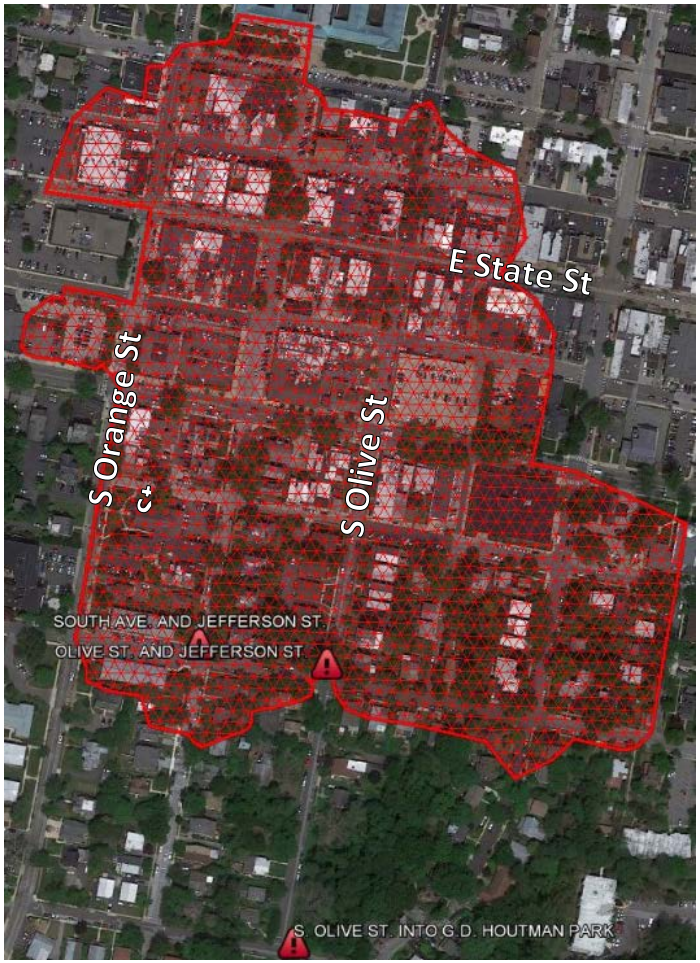
Drainage-Shed 3 is located in the south-western portion of the Borough.

Causes of flooding are attributed to a number of reasons including, but not limited to:

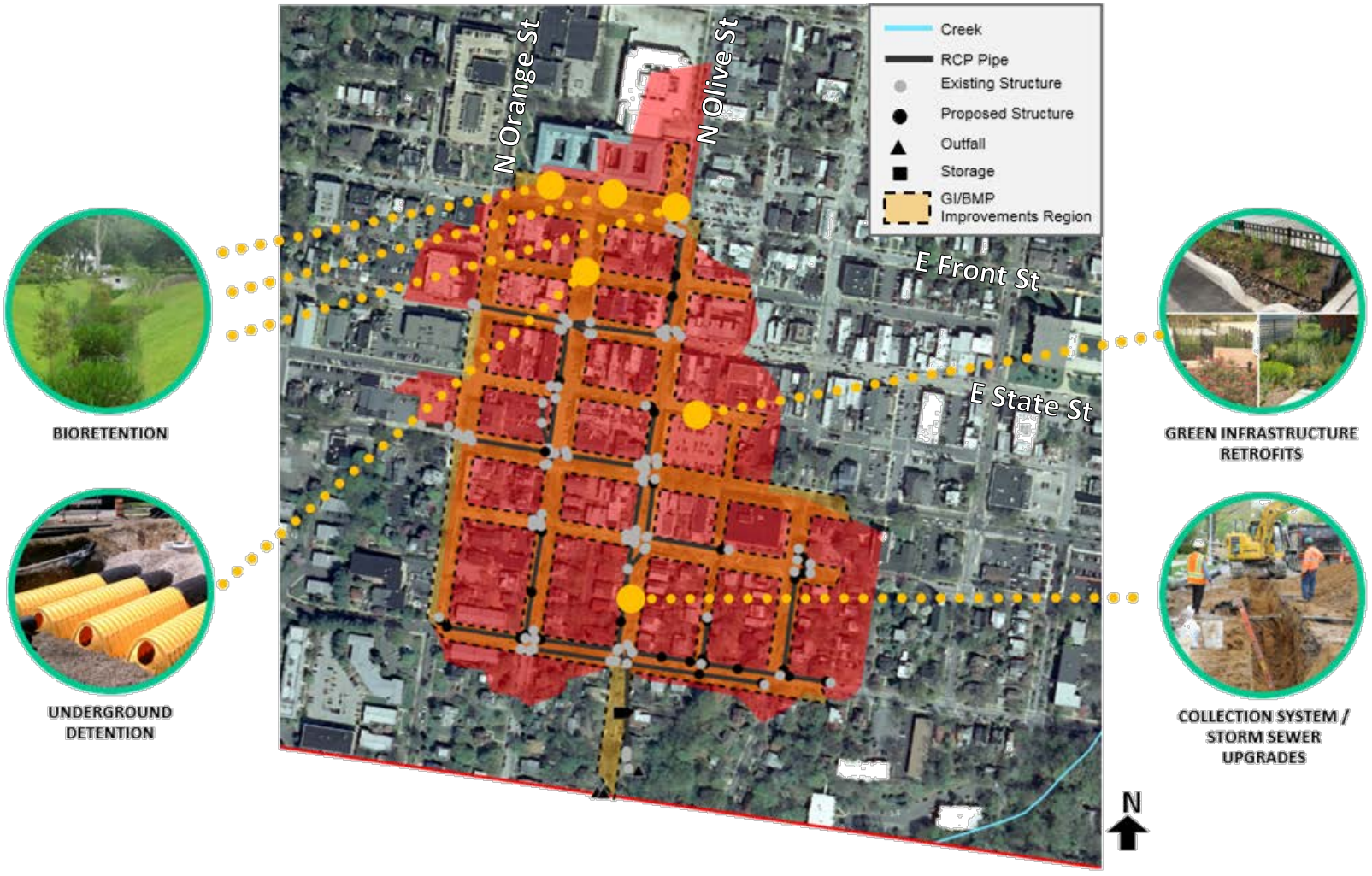
- Orphaned drainage sub-networks (disconnected);
- Pipe capacity issues;
- Lack of stormwater management features (controls);
- Steep Topography;
- Lack of an adequate inlet collection systems;
- General increases in runoff associated with dense urbanization.

Flood Incident Areas

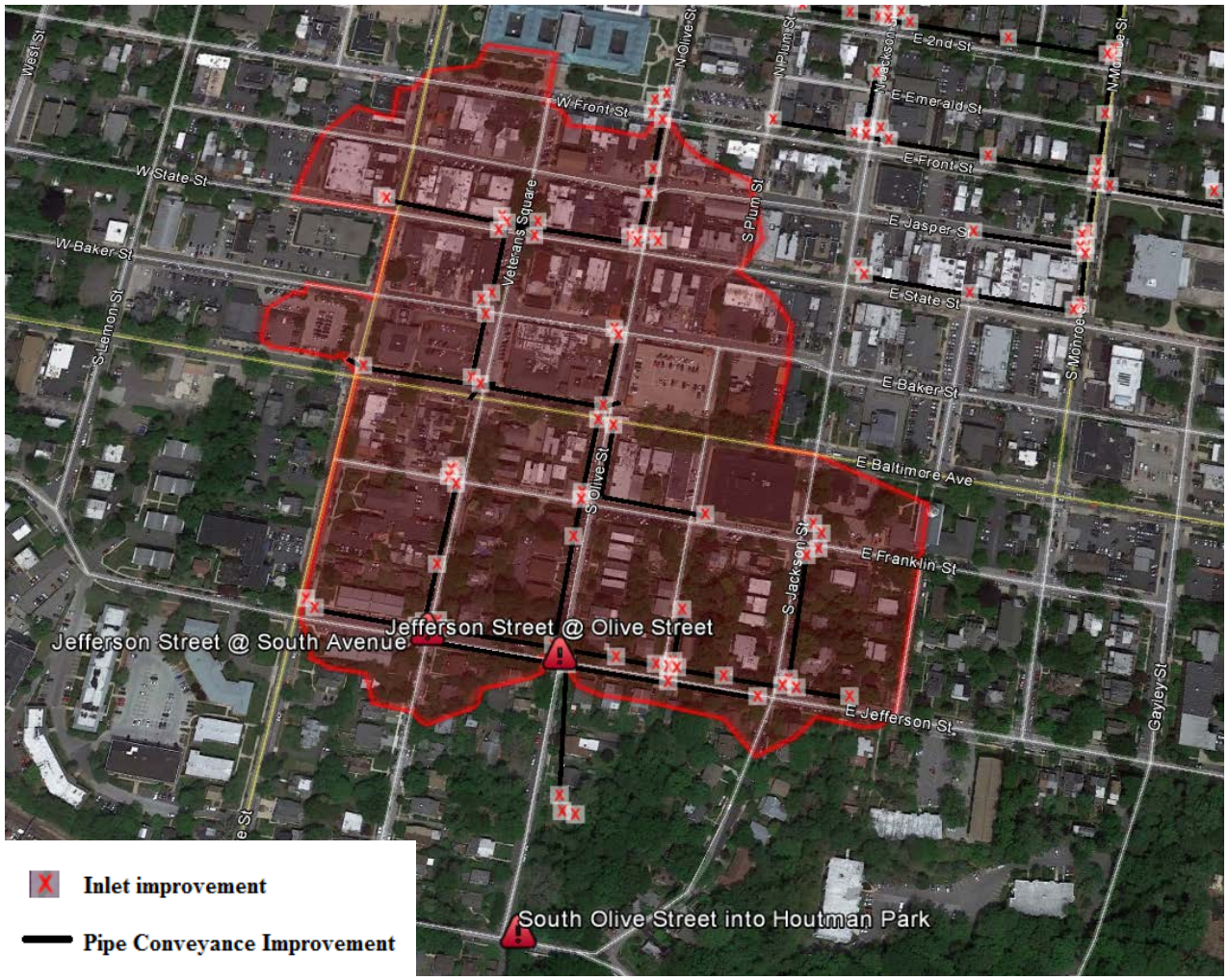
- South Avenue and Jefferson Street
- Olive & Jefferson Street
- S. Olive Street (Houtman Park)

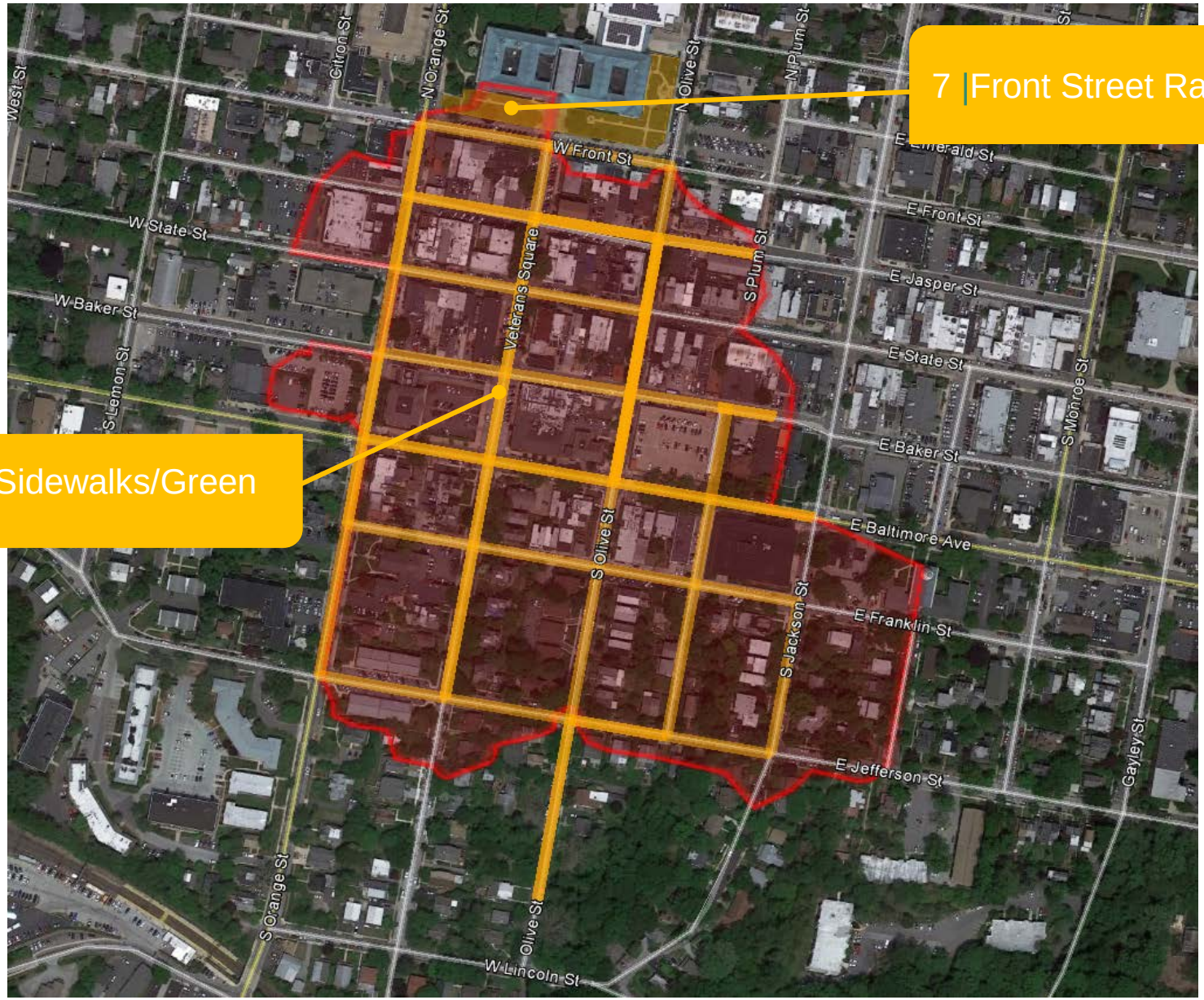


DS3 | SOUTHERN PRECINCT DRAINAGE-SHED



GREY INFRASTRUCTURE IMPROVEMENTS | SOUTHERN PRECINCT




7 |Front Street Rain Garden
6 |Green Sidewalks/Green Streets
W Front St
E Front St
W State St
E State St
W Baker St
E Baker St
E Jasper St
E Emerald St
E Baltimore Ave
E Franklin St
E Jefferson St
W Lincoln St
Veterans Square
S Olive St
N Olive St
S Plum St
N Plum St
S Jackson St
S Monroe St
S Lemon St
S Orange St
N Orange St
Citron St
West St
Gayley St

6 | GREEN SIDEWALKS – GREEN STREETS | SOUTHERN PRECINCT

LOCATION & DESCRIPTION

Throughout the Southern Precinct are local roads with ample space for planting between the curb line and sidewalk.

APPROACH

Trees can be planted in pockets of soils within a continuous stone trench that stores stormwater until it can infiltrate. Porous pavers can replace the brick sidewalk over the trench and allow runoff from the sidewalk to infiltrate into the trench.

ENVIRONMENTAL BENEFITS

Rate Reduction
Volume Reduction | 316,421 cubic-feet
Reduce Stress on Sewer System
Reduce urban heat island effect
Provide habitat for birds and wildlife
Streetscape Enhancement

ENGINEER'S OPINION OF COST

$5,221,000

7 | RAIN GARDENS AND GREEN SIDEWALKS | ALONG FRONT STREET AND N. OLIVE STREET

LOCATION & DESCRIPTION

The grounds and sidewalks of the Delaware County building offer ample space for green sidewalks and raingardens. Area tributary to the project location is approximately 2.3 acres of which 57% is impervious.

APPROACH

Rain gardens can be established along the frontage of the courthouse in addition green sidewalks can be incorporated to add additional storage.

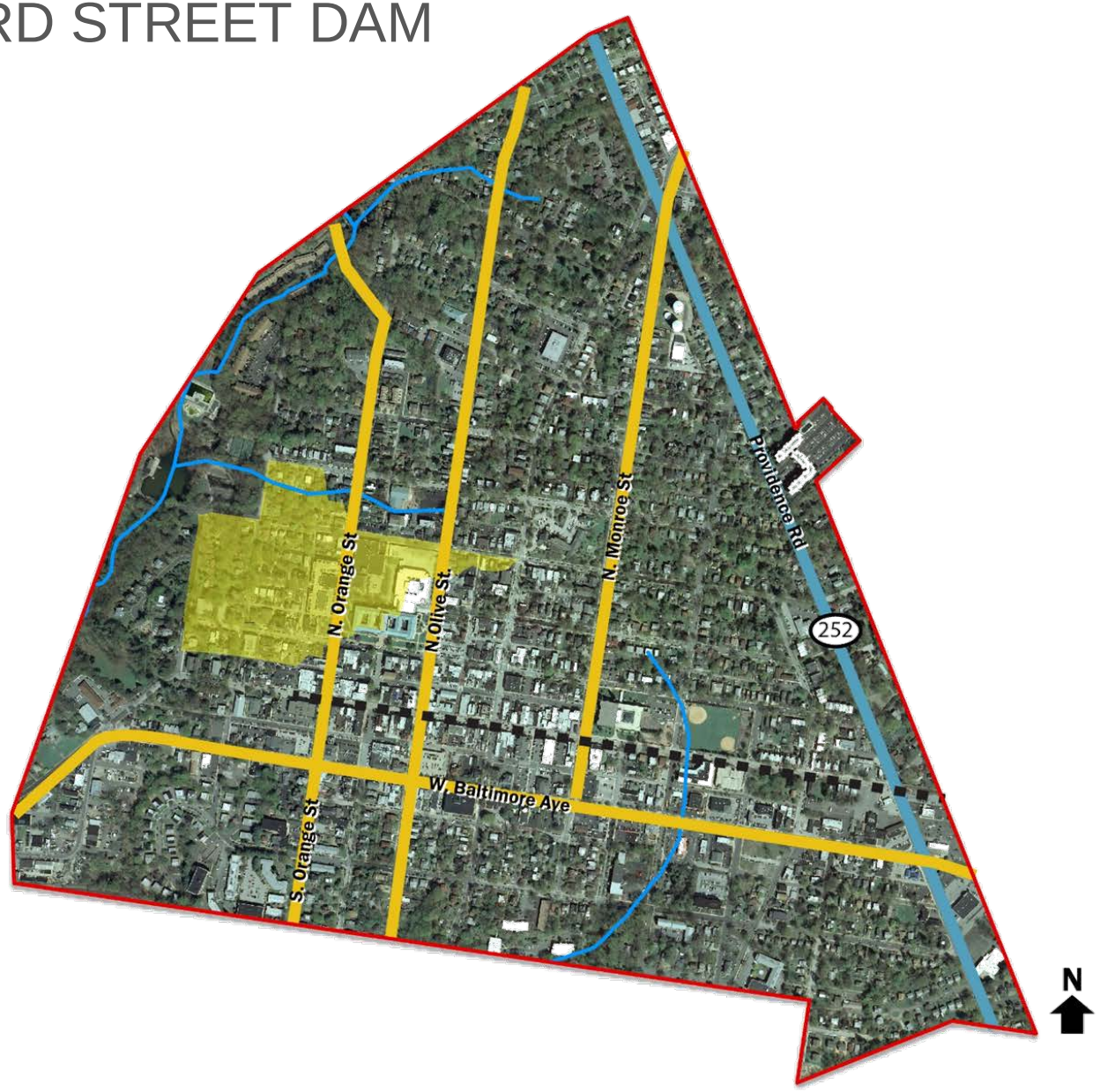
ENVIRONMENTAL BENEFITS

Rate Reduction
Volume Reduction | 36,000 cubic-feet
Reduce Stress on Sewer System
Reduce urban heat island effect
Provide habitat for birds and wildlife
Streetscape Enhancement

ENGINEER'S OPINION OF COST

$792,000

DS4 | 3RD STREET DAM



DS4 | 3RD STREET DAM DRAINAGE-SHED

Drainage-Shed 4 is located on the west-side of the Borough.

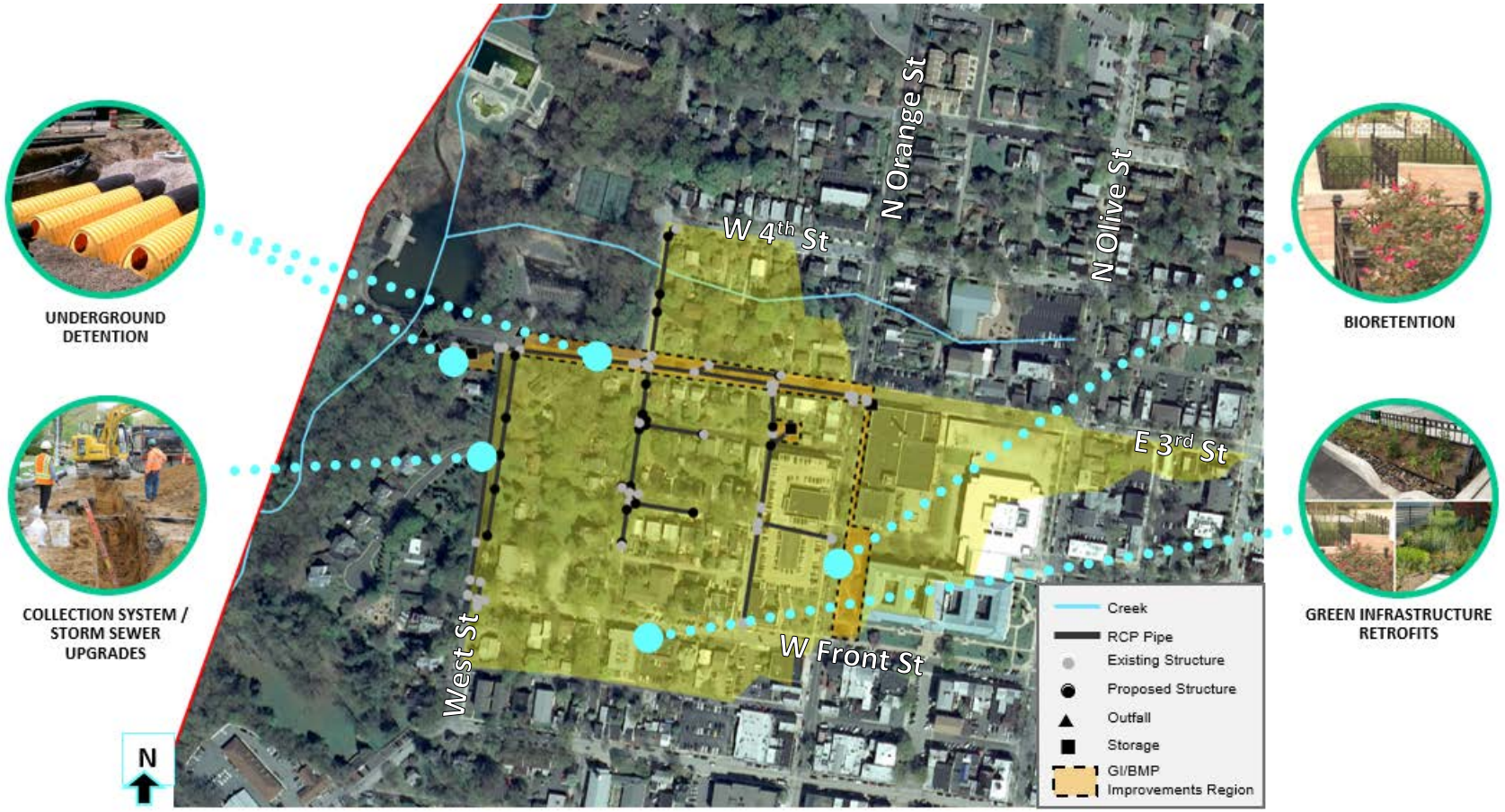
Causes of flooding are attributed to a number of reasons including, but not limited to:

- Orphaned drainage sub-networks (disconnected);
- Pipe capacity issues;
- Lack of stormwater management features (controls);
- Steep topography;
- Lack of an adequate inlet collection systems;
- General increases in runoff associated with dense urbanization.

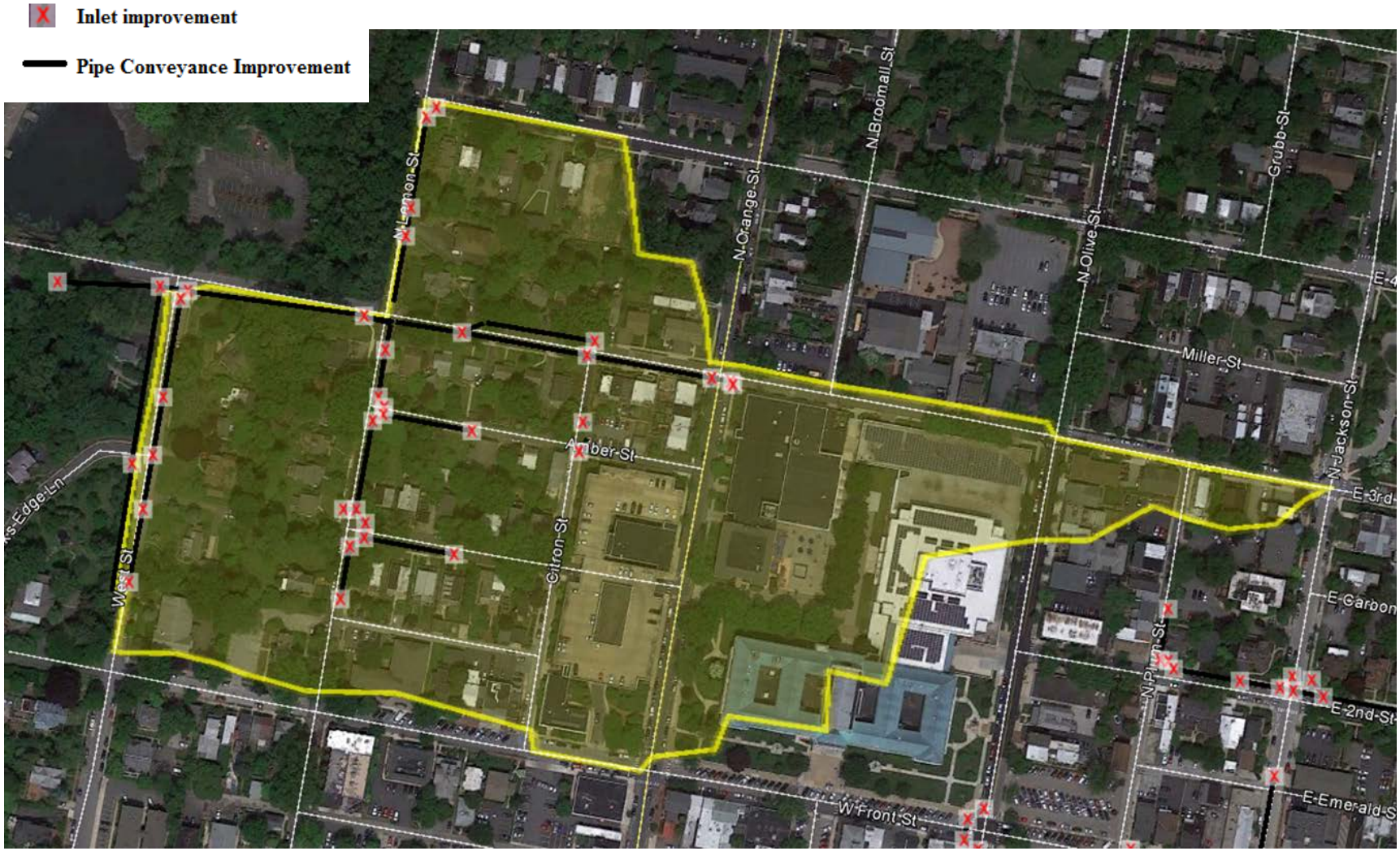
Flood Incident Areas

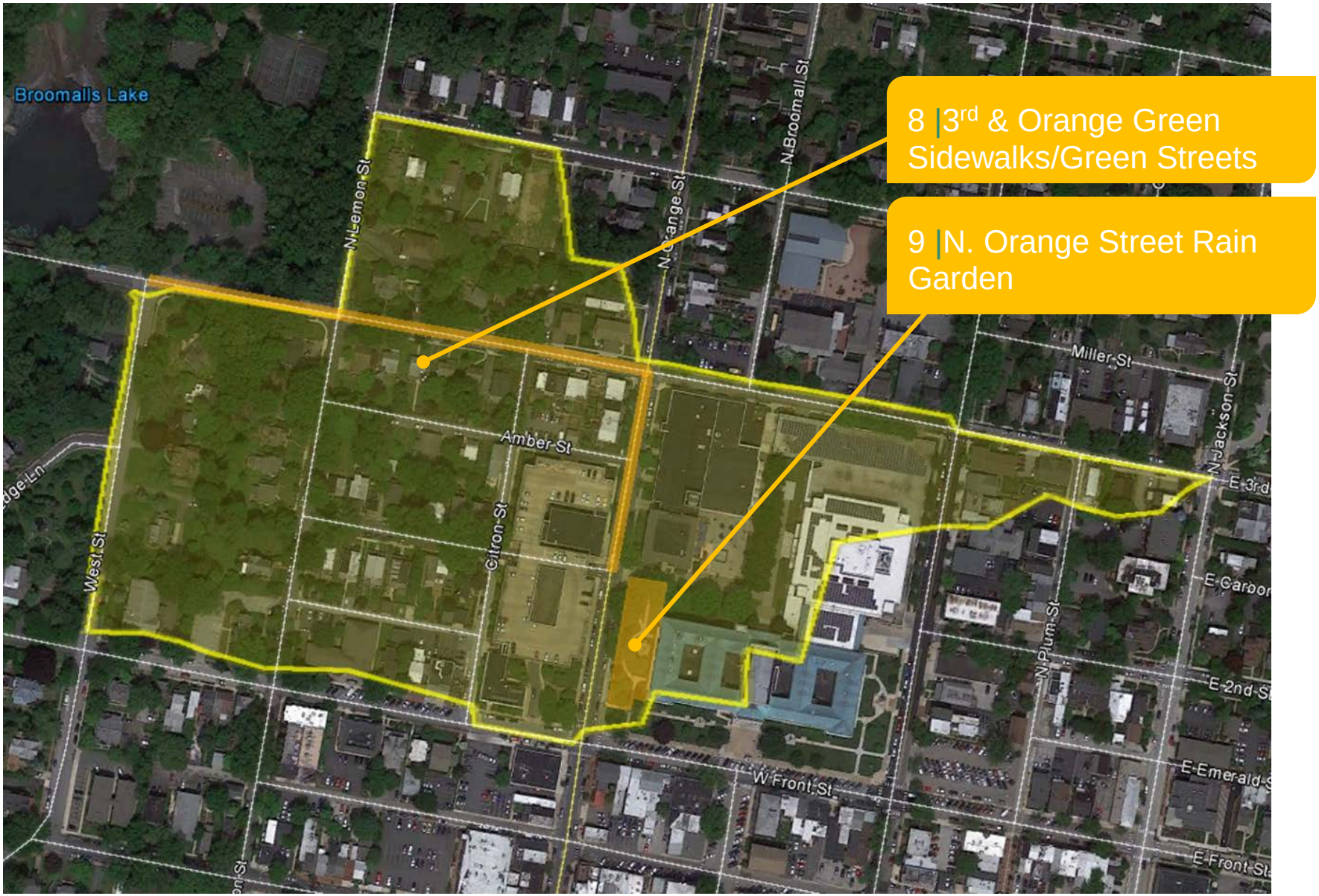
West and 3rd Streets

DS4 | 3RD STREET DAM DRAINAGE-SHED



GREY INFRASTRUCTURE IMPROVEMENTS | 3RD STREET DAM




8 | 3rd & Orange Green Sidewalks/Green Streets
9 | N. Orange Street Rain Garden
Broomalls Lake
N Lemon St
N Orange St
N Broomall St
Miller St
N Jackson St
E 3rd
Amber St
Citron St
West St
E Carbon
N Plum St
E 2nd St
W Front St
E Emerald St
E Front St

8 | GREEN SIDEWALKS (GREEN STREETS) | ALONG 3RD STREET AND N. ORANGE STREET

LOCATION & DESCRIPTION

3rd Street and N. Orange Street are local roads with ample space for planting between the curb line and sidewalk.

APPROACH

Along 3rd and N. Orange streets, trees can be planted in pockets of soils within a continuous stone trench that stores stormwater until it can infiltrate. Porous pavers can replace the brick sidewalk over the trench and allow runoff from the sidewalk to infiltrate into the trench. ***Note:*** *This area may be slated for reconstruction by the County. Coordination with County is suggested.*

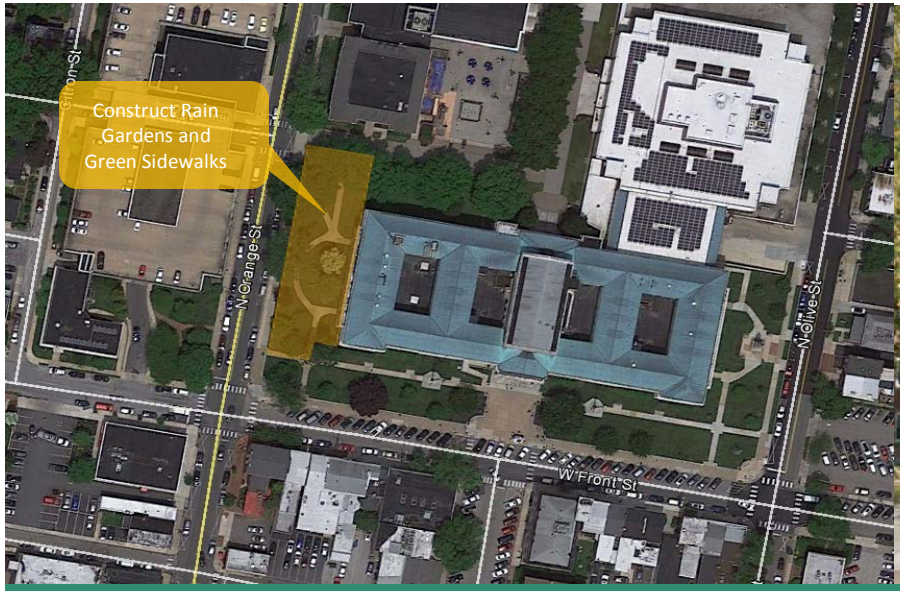
ENVIRONMENTAL BENEFITS

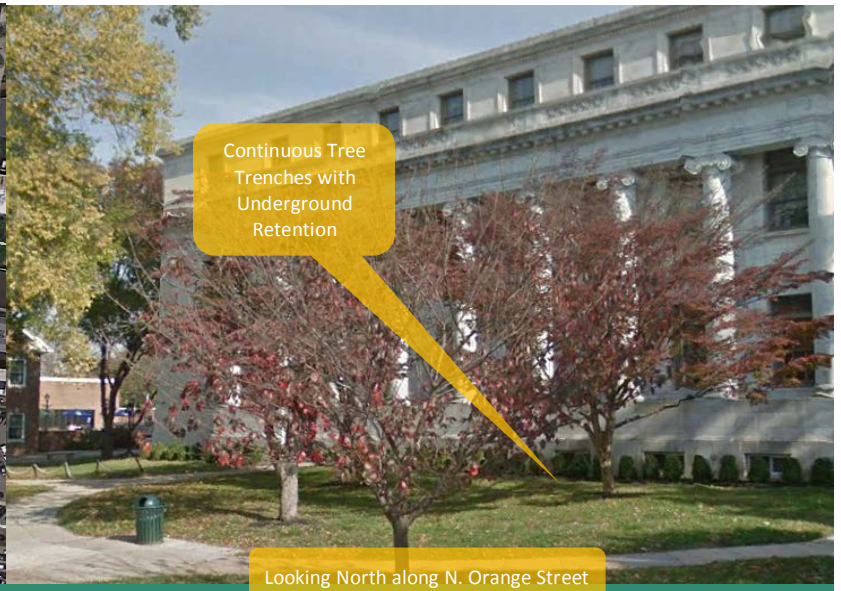
Rate Reduction
Volume Reduction | 184,154 cubic-feet
Reduce Stress on Sewer System
Reduce urban heat island effect
Provide habitat for birds and wildlife
Streetscape Enhancement

ENGINEER'S OPINION OF COST

$4,004,000

9 | RAIN GARDENS AND GREEN SIDEWALKS | ALONG N. ORANGE STREET





LOCATION & DESCRIPTION

Yard area at the Delaware County building along N. Orange Street provides opportunity for green stormwater infrastructure. Area tributary to this location is approximately 4.7 acres of which 83% is impervious.

APPROACH

Along N. Orange Street, rain gardens, as well as, trees can be planted in pockets of soils within a continuous stone trench that stores stormwater until it can infiltrate. Porous pavers can replace the brick sidewalk over the trench and allow runoff from the sidewalk to infiltrate into the trench.

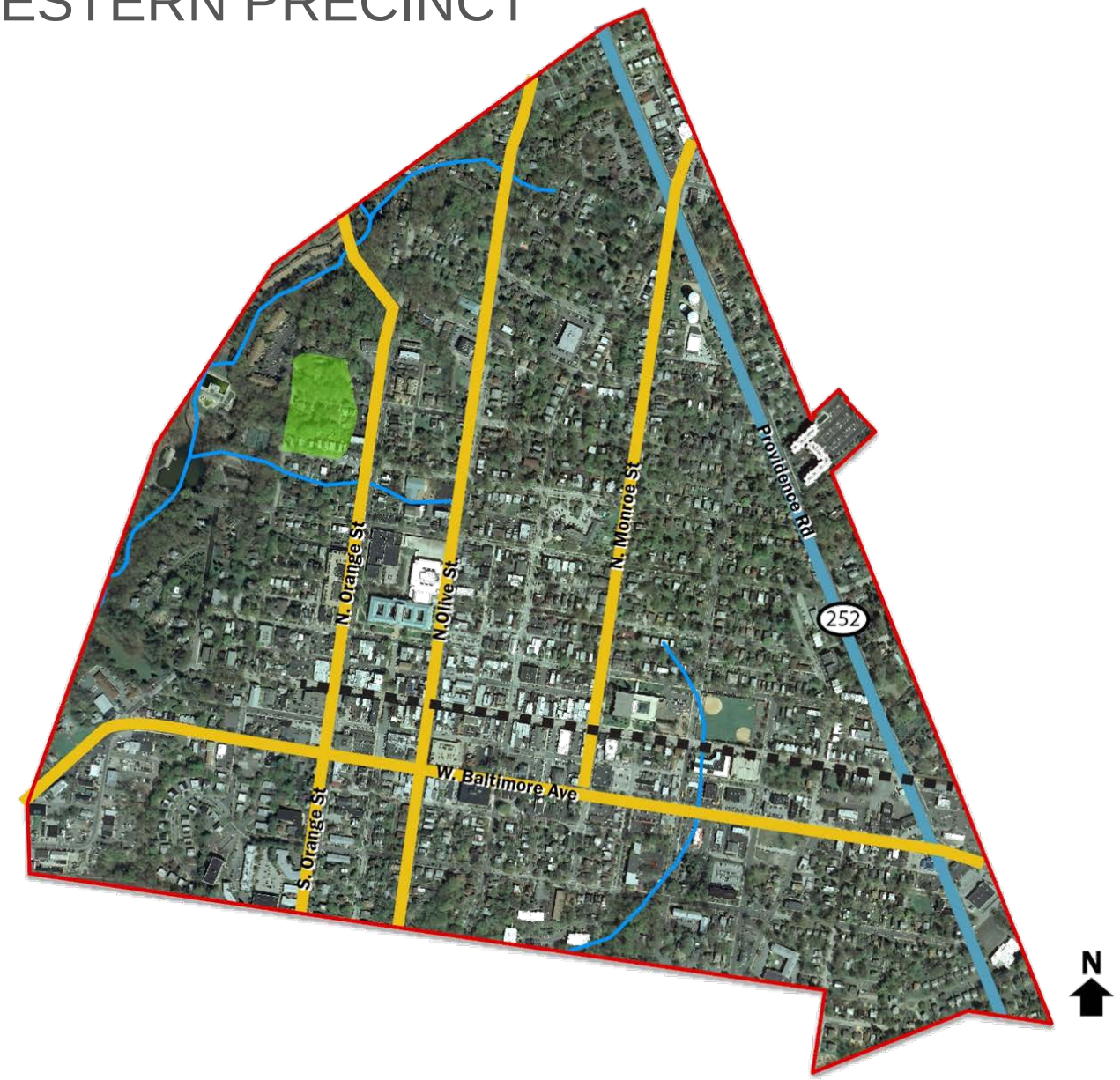
ENVIRONMENTAL BENEFITS

Rate Reduction
Volume Reduction | 18,220 cubic-feet
Reduce Stress on Sewer System
Reduce urban heat island effect
Provide habitat for birds and wildlife
Streetscape Enhancement

ENGINEER'S OPINION OF COST

$400,840

DS5 | WESTERN PRECINCT



DS5 | WESTERN PRECINCT DRAINAGE-SHED

Drainage-Shed 5 is located on the west-side of the Borough.

Causes of flooding are attributed to a number of reasons including, but not limited to:

- Pipe capacity issues;
- Lack of stormwater management features (controls);
- Steep topography;
- Blockage due to Debris Generated from Erosive Flow;
- Lack of an adequate inlet collection systems;
- General increases in runoff associated with dense urbanization.

Flood Incident Areas

West and 3rd Streets

DS5 | WESTERN PRECINCT DRAINAGE-SHED

GREY INFRASTRUCTURE IMPROVEMENTS | WESTERN PRECINCT

SUMMARY OF PROPOSED GSI PROJECTS

No.	GSI BMP	DS	Tributary Area (ac)	Impervious (%)	Volume Reduction (cu ft)	Estimated Cost ($)
1	Parkette on Providence	1	8.124	76.6%	3,026	$380,133
2	Mellon Street Green Alley	1	2.379	86.8%	4,240	$342,700
3	Ridge & Olive Green Sidewalks	1	3.1	64%	227,485	$5,005,000
4	Barrall Park Underground Detention	2	71.167	70.1%	81,400	$7,982,280
5	Haldeman Street Rain Gardens	2	2.629	66.2%	15,000	$330,000
6	Green Sidewalks – South Precinct	3			316,421	$5,220,946
7	Front Street Rain Gardens/Green Sidewalks	3	2.26	46%	36,000	$792,000
8	3rd & Orange Green Sidewalks	4			184,154	$4,004,000
9	North Orange Street Rain Garden	4	4.634	82.7%	18,220	$400,840

Green Infrastructure Volume Capture Goals

As discussed in this plan, the approach that was selected by the Borough was to develop solutions that would provide a more holistic approach for addressing these issues. This plan provides a collection system design that would meet recommendations for storm sewer design standards of the 10-yr event. The goal for this analysis was also to evaluate how much volume storage would be necessary for an overall design goal of managing the 50-yr event.

VOLUME CAPTURE GOALS | EXISTING CONDITIONS

Area	50 yr Volume (CF)	10 yr Volume (CF)	Volume Difference (CF)	Volume Difference (Ac-Ft) (Capture Goal)
Ridge Road/N. Olive	1,499,004	1,058,280	440,725	10.1
Western Precinct	120,504	84,826	35,678	0.8
Southern Precinct	886,364	631,512	254,852	5.9
3rd Street Dam	652,512	463,118	189,394	4.3
Eastern Precinct	2,908,848	2,065,226	843,623	19.4

VOLUME CAPTURE GOALS | ESTIMATED PHASE 1 – GSI PROJECTS

Area	Volume Reduction Target (CF)	Volume Reduced by Phase 1 Projects (CF)	Volume Remaining (CF)	Volume Remaining (Ac-Ft)
Ridge Road/N. Olive	440,725	45,378	395,347	9.1
Western Precinct	35,678	0	35,678	0.8
Southern Precinct	254,852	230,713	24,139	0.6
3rd Street Dam	189,394	176,212	13,182	0.3
Eastern Precinct	843,623	94,400	749,223	17.2

Green Infrastructure Volume Capture Goals

PROGRAM COST ESTIMATE BY PHASE

MASTER COST SUMMARY	
Stormwater Improvement - Phase 1 (See Preliminary Plans)	**Total Cost**
Ridge Road/North Olive Improvements	$ 1,248,709.00
Eastern Precinct Improvements	$ 9,146,475.00
Southern Precinct Improvements	$ 1,897,365.00
3rd Street Dam & Western Precinct Improvements	$ 1,563,519.00
Total	**$13,856,068.00**

Additional GSI Cost by Drainage-Shed - Phase 2	**Total Cost**
Ridge Road/North Olive Improvements	$ 7,343,049.67
Eastern Precinct Improvements	$18,500,000.00
Southern Precinct Improvements	$ 5,220,946.73
3rd Street Dam & Western Precinct Improvements	$ 4,564,003.69
Total	**$35,628,000.00**
Grand Total - All Options	**$49,484,068.00**

PROJECT PRIORITIZATION

In development of this program, it was understood that a key priority of the Borough was to alleviate nuisance flooding for its residents. Resolution of this issue was assessed to be the key priority for this program. Phase 1, through a combination of collection system improvements (storm sewers) as well as peak flow rate control facilities (detention methods), are recommended to provide service capacity for the 10-year design storm Borough-wide. Acting on phase 1 would eliminate the frequent and persistent flooding noted in the "Areas of Concern" mapping of this report. Phase 2 is comprised of projects whose benefits have already been conceptualized within this chapter in addition to potential future projects/programs, which will need to be further developed at a time when public-private partnerships can be developed. This is a similar approach that many cities have taken with their own stormwater programs, such as Philadelphia Water Department. Open-ended initiatives like these are sometimes referred to as "green acre" programs.

Provided below are designs alternatives grouped & listed by priority:

Phase 1
1) Ridge Road Collection System/North Olive Improvements/Mellon Street/Providence Road Parkette
2) Eastern Precinct Collection System/Barrall Park Underground Detention
3) Southern Precinct Collection System/Front Street Rain Gardens
4) 3rd Street Dam & Western Precinct Collection Systems/North Orange Street Rain Gardens
Phase 2
5) Ridge Road/North Olive GSI Improvements – Greened Acre Plan (Green Sidewalks, Rain Gardens, Green Structures, Porous Surface Treatments)
6) Eastern Precinct GSI Improvements – Haldeman Street Rain Gardens
7) Southern Precinct GSI Improvements – Greened Acre Plan (Green Sidewalks & Rain Garden Program)
8) 3rd Street Dam & Western Precinct Improvements – N. Orange Street Rain Gardens
9) Eastern Precinct GSI Improvements – Green Sidewalks Plan
10) 3rd Street Dam & Western Precinct Improvements – Green Acre Plan (Green Sidewalks & Rain Garden Program)

PART 5 | POLICY RECOMMENDATIONS

STORMWATER TRUST FUND

In conditions where compliance with stormwater ordinances is not possible due to site constraints, a developer would pay into a Stormwater Trust Fund. The Fund would be used to develop future stormwater projects to ameliorate conditions of flooding, excess runoff, and degraded water quality. This “fee-in-lieu of” approach entails calculating what stormwater controls would have been expected had conditions been viable for construction and determining an appropriate compensatory fee. The developer would still be required to develop stormwater controls to the maximum extent practicable onsite, but any shortfall would be compensated for by monies paid into the Stormwater Trust Fund.

GRANT FUNDING SOURCES

Potential grant funding sources could include:

- Watershed Restoration & Protection Program — PA Department of Community & Economic Development (PADCED)
- Growing Greener - PA Department of Environmental Protection (PADEP)
- Coastal Zone Grant Program — PA Department of Environmental Protection (PADEP)
- Delaware River Restoration Fund — National Fish and Wildlife Foundation (NFWF)
- Transportation Alternatives Program – PA Department of Transportation (PADOT), Delaware Valley Regional Planning Commission (DVRPC)
- Community Conservation and Protection Program – PA Department of Conservation and Natural Resources (PADCNR)
- Clean Water Revolving Loan Fund – PA Infrastructure Investment Authority (PennVEST)

SERVICE ORGANIZATIONS

Potential teaming partners are identified as follows:

– PennDOT and DVRPC
– Delaware County Conservation District
– Delaware County Planning Department
– Chester Ridley Crum Watershed Association

Incorporation of Green Infrastructure Provisions

SALDO / ZONING / COMPREHENSIVE MASTER PLAN

In order optimize planning towards achieving goals for water quality and flood control, it is recommended that the Borough leverage planning for future development to provide a more cost-effective realization of these goals. Consequently, it is recommended that the Borough's Subdivision and Land Development Ordinance Zoning Ordinance and Comprehensive Plan be evaluated with the thought of integration of green infrastructure to the maximum extent practicable. Better managing rainfall closer to where it falls will be a key directive in meeting objectives discussed within this plan. EPA has developed a useful tool for the purposes of evaluating planning documents called the Water Quality Scorecard. EPA's Water Quality Scorecard (www.epa.gov/smartgrowth/water-quality-scorecard) is a self-assessment tool that allows the reviewer to rate the relative effectiveness of its own planning documents to meet current clean water standards.

PART 6 | TIMELINES AND PROGRAM IMPLEMENTATION

TIMELINES AND PROGRAM IMPLEMENTATION

1. Drainage Improvements					
Recommendation		Timeframe	Responsible Entity	Potential Funding Sources	Costs: Low: <$100K Medium: <$500K High: >$500K
Execute Capital Improvements to address immediate flood relief efforts					
1.1	Construction of Ridge Rd/N. Olive Drainage Improvements (Phase 1)	Within 2-5 Years	Borough	DVRPC-TAP, PADEP-GG, DCED, PADEP-CZG, NFWF, PennVest	High
1.2	Construction of Eastern Precinct Drainage Improvements (Phase 1)	Within 2-5 Years	Borough	DVRPC-TAP, PADEP-GG, DCED, PADEP-CZG, NFWF, PennVest	High
1.3	Construction of Southern Precinct Drainage Improvements (Phase 1)	Within 2-5 Years	Borough	DVRPC-TAP, PADEP-GG, DCED, PADEP-CZG, NFWF, PennVest	High
1.4	Construction of 3rd Street Dam Drainage Improvements (Phase 1)	Within 2-5 Years	Borough	DVRPC-TAP, PADEP-GG, DCED, PADEP-CZG, NFWF, PennVest	High
1.5	Construction of Western Precinct Drainage Improvements (Phase 1)	Within 2-5 Years	Borough	DVRPC-TAP, PADEP-GG, DCED, PADEP-CZG, NFWF, PennVest	High

2. Land Use

Recommendation		Timeframe	Responsible Entity	Potential Funding Sources	Costs: Low: <$100K Medium: <$500K High: >$500K
A. Review Land Use compliance documents for potential incorporation of green infrastructure provisions					
2.1	Establish a stormwater committee to evaluate current Zoning Ordinances to identify opportunities to incentivize voluntary implementation of additional stormwater controls through reduction of impervious areas	Within 1-3 Years	Borough	Borough	Low
2.2	In conjunction with support services, review current SALDO for incorporation of green infrastructure functionality within current standard details e.g. street trees and sidewalk improvements	Within 1-3 Years	Borough	Borough	Low
2.3	Update current comprehensive plan to include reference to updated SALDO and Zoning Documents, including adoption of a stormwater master plan	Within 1-3 Years	Borough	Borough	Low
2.4	Work with Shade Tree Commission and Planning Commission on development of a continuous tree trench standard	Within 1-3 Years	Borough, Shade Tree Committee, Planning Commission	Borough	Low
B. Review Land Use compliance documents for potential incorporation of green infrastructure provisions					
2.5	Have Stormwater Committee review areas within the Borough designated for revitalization/opportunities for potential stormwater infrastructure	Within 1-3 Years	Borough	Borough	Low

3. Energy and Resource Conservation

	Recommendation	Timeframe	Responsible Entity	Potential Funding Sources	Costs: Low: <$100K Medium: <$500K High: >$500K
Support Comprehensive Planning Goals of Energy and Resource Conservation					
3.1	Consider having the Borough adopt LEED or similar building/site scoring metric to promote better stormwater and energy efficiency practices on-site	Within 1-3 Years	Borough	Borough	Low
3.2	Incentivize LEED or similar building/site scoring metric being used for private development	Within 1-3 Years	Borough	Borough	Low
3.3	Collaborate with Philadelphia Water Department and local universities for additional ideas and perspectives on conservation	Within 1-3 Years	Borough	Borough	Low

4. Parks, Open Space, and Natural Areas

	Recommendation	Timeframe	Responsible Entity	Potential Funding Sources	Costs: Low: <$100K Medium: <$500K High: >$500K
A.	**Park and Recreation Improvements**				
4.1	As a corollary to the current Comprehensive Plan initiative to provide parks/civic spaces within ¼ mile of all neighborhoods, it is recommended that these parks also provide runoff capture and educational benefit as "BMP parks"	Within 5-7 Years	Borough	DCNR, NEA, PECO, DCED, PADEP-GG, NFWF, PennVest	Medium
4.2	It is recommended that park improvement areas already identified in the Comprehensive Plan be evaluated for potential GSI implementation (e.g. Water Tower, Houtman Park)	Within 5-7 Years	Borough	PADEP-GG, DCNR, DCED, PADEP-CZG, NFWF, PennVest	Medium
B.	**Examine upgrades to existing open space areas to meet the needs of local neighborhoods**				
4.3	Add bioretention or other BMP types identified in this plan as a "civic features" throughout the Borough within open space land.	Within 1-3 Years	Borough	PADEP-GG, DCNR, DCED, PADEP-CZG, NFWF, PennVest	Medium - High
4.4	Examine open space areas in close proximity to Gayley and Broomall Run for re-establishment of riparian buffer restoration work. In addition, look at retentive grading methods	Within 1-3 Years	Borough	TreeVitalize, PADEP-GG, DCNR, DCED, PADEP-CZG, NFWF, PennVest	Low - Medium

4. Parks, Open Space, and Natural Areas (continued)					
	Recommendation	Timeframe	Responsible Entity	Potential Funding Sources	Costs: Low: <$100K Medium: <$500K High: >$500K
C.	**Promote increase in the extent of the current shade tree plan**				
4.5	After new standard is developed for continuous (stormwater) tree trenches, expand into areas currently outside of existing shade tree plan	Within 1-3 Years	Borough	TreeVitalize, DCNR, PADEP-GG, DCED, PADEP-CZG, NFWF, PennVest	Medium
D.	**Promote at-home stormwater management methods**				
4.6	Provide education to the public on methods that can be used at home to help support the community's goals for improved stormwater management (See Appendix)	Within 1-3 Years	Borough	TreeVitalize, DCNR, PADEP-GG, DCED, PADEP-CZG, NFWF, PennVest	Low

5. Building Support for Stormwater Planning

	Recommendation	Timeframe	Responsible Entity	Potential Funding Sources	Costs: Low: <$100K Medium: <$500K High: >$500K
Develop collaborative opportunities though outreach					
5.1	Continue to work with and strengthen relationships with local service organizations (DVRPC, DCPD, DCCD & Chester Ridley Crum Watersheds Association)	Ongoing	Borough	Borough	Low
5.2	Contact Delaware County to discuss teaming on green infrastructure projects within the Borough	Within 1-3 Years	Borough	Borough	Low
5.3	Provide workshops for building at-home BMPs/GIs	Within 1-3 Years	Borough	Borough	Low
5.4	Foster public-private partnerships by involving local business alliances (and residents) in design charrettes involving potential improvements to the frontages of their properties	Within 1-3 Years	Borough	Borough	Low
5.5	Reach out to other Ridley Creek watershed communities to discuss collaboration on MS4 goals as a means of reducing cost and duplicative planning effort	Within 1 Year	Borough	Borough	Low

APPENDIX

Residential Best Management Practices (BMPs)

Residential BMPs aim to achieve many of the same goals as urban BMPs employed throughout the township including rate reduction, volume control, and water quality, oftentimes with a side benefit of beautification. Here are a few BMPs that homeowners can take advantage of to reap similar benefits on their property.

RAIN BARRELS

This simple and easy BMP looks to capture runoff from impervious roof structures of homes, garages, sheds, covered porches, etc. This can be achieved by routing existing downspouts to the rain barrels. Capturing runoff means there is a reduced risk of on property flooding, and water collecting around the foundations of structures. Another benefit is that the captured rain water can be used to water lawns and gardens, reducing billable water use. Rain barrels can be made at home inexpensively, or decorative barrels can be purchased and add a rustic touch to any space.

RAIN GARDENS

A garden can be more than a way to beautify outdoor spaces, attract butterflies, and grow vegetables. A rain garden can have all of the benefits mentioned above with additional benefits of collecting runoff and allowing it to infiltrate. Rain gardens can be used to collect runoff by directing downspouts to the garden, or by positioning them in natural depressions where water naturally collects. Often times rain gardens allow for quicker infiltration of water which can help reduce property flooding. Many different types of plants can be used in rain gardens and typically require little maintenance after they are established. As with other landscaping projects, adding a beautiful and functional piece to a home's landscape can help increase curb appeal and the property value.

Residential Best Management Practices (BMPs) CONT.

LANDSCAPING

There are many choices with regards to landscaping that can help manage residential runoff. The first way addresses hardscapes around a home. Hard surfaces such as concrete patios and asphalt driveways do not allow water to infiltrate and can increase problems related to rainfall runoff. An alternative is to use materials that allow water to infiltrate such as permeable pavers. Permeable pavers are not inherently pervious, but allow the runoff to infiltrate between each paver. Other options include pervious asphalt and concrete, which are the same as their imperious counterparts except that there is a very little amount of fine material used in the mixtures. The removal of fine materials in the mixtures allows runoff to infiltrate through the asphalt and concrete. Of the three options, permeable pavers can be the most aesthetically pleasing. There are many different varieties that come in many shapes sizes and colors. They are very durable and can add a decorative touch that ties together the rest of a home's landscaping.

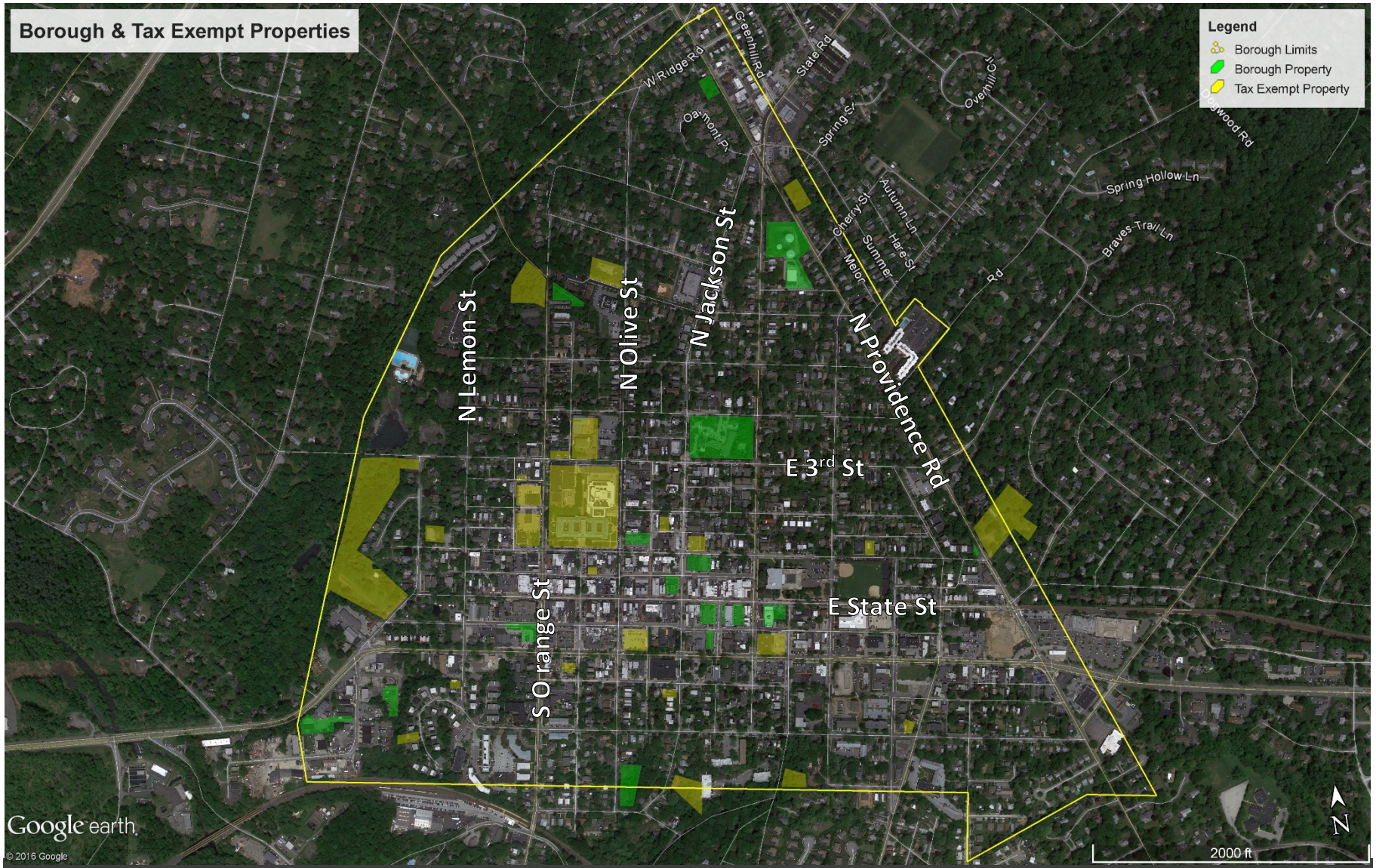
Plant choice can help with the effects of rain runoff. Plants that have deep root systems help to stabilize and, aerate the soil, as well as encourage infiltration. Plants put around the foundation of homes can help stop erosion around the foundation, and absorb some runoff that may end up near the foundation. Landscaping around the perimeter of the property can serve to reduce runoff entering property and can encourage infiltration of onsite runoff. All landscaping projects aim to beautify the property, and increase curb appeal, which in turn can make neighborhoods more inviting and increase property value.

Residential Best Management Practices (BMPs) CONT.

DRY WELLS

A dry well is a small pit usually filled with stone or gravel that stores some storm water runoff and allows it to slowly soak into the surrounding soil. Downspouts can be direct into the well or the well can be placed at a natural low spot to collect runoff. The function of a dry well is similar to that of a rain garden, but without the planting or maintenance. It can help to reduce the runoff on the property, and help with possible downstream flooding.

Any one, or combination of these projects can help reduce property runoff, enhance drainage, and control flooding. Helping to control runoff on residential properties has a larger impact on the community as it can reduce local flooding, and reduce the stress on local storm water infrastructure. In addition, there are environmental benefits including improvement to water quality. Whenever water is able to infiltrate, the soil helps to filter the water of contaminants and helps reduce the nutrient loads. Water that infiltrates can recharge groundwater, which eventually makes it to water supplies and waterbodies, so it is important not to deplete or contaminate the groundwater.



Borough Owned and Tax-Exempt Properties

Borough-Owned Properties

OWNER_1	STREET_ADD	CITY	STATE	ZIP_CODE	LOCATION	DESCRIPTION
ROSE TREE MEDIA SCHOOL DISTICT	308 N OLIVE ST	MEDIA	PA	19063	3RD ST W01070000	3 STY OFC BLDG 4 STY ADD
ROSE TREE MEDIA SCHOOL DISTICT	308 N OLIVE ST	MEDIA	PA	19063	3RD ST W01070000	3 STY OFC BLDG 4 STY ADD
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	PROVIDENCE RD N00000000	GRD
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	MONROE ST 00000000	GRD
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	PROVIDENCE RD 00000000	GRD ASSESSED ON MONROE ST
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	6TH ST E00000000	GRD
MEDIA BOROUGH OF	401 N JACKSON ST	MEDIA	PA	19063	ORANGE ST 00000000	GRD
MEDIA BOROUGH OF	401 N JACKSON ST	MEDIA	PA	19063	ORANGE ST 00000000	GRD
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	YOUTH WAY 00000000	2 STY BLDG
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	YOUTH WAY 00000000	2 STY BLDG
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	YOUTH WAY 00000000	2 STY BLDG
MEDIA BOROUGH OF	401 N JACKSON ST	MEDIA	PA	19063	ORANGE ST 00000000	GRD
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	JACKSON ST 00000000	MEDIA BORO MUCIPALCOMPLEX
MEDIA BOROUGH OF	3RD & JACKSON ST	MEDIA	PA	19063	BALTIMORE AVE E00150000	PARKING LOT
MEDIA BOROUGH OF	301 N JACKSON ST	MEDIA	PA	19063	BALTIMORE AVE E00170000	PARKING LOT
MEDIA PARKING AUTHORITY	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	OLIVE ST S00000000	GRD
MEDIA PARK AUTH	3RD & JACKSON ST	MEDIA	PA	19063	OLIVE ST S00000000	PARKING LOT
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	BIRMINGHAM ST 02200000	GRD
MEDIA BOROUGH HALL	301 JACKSON ST 2ND FL	MEDIA	PA	19063	FRONT ST 00000000	FIREHSE

MEDIA BOROUGH HALL	301 JACKSON ST 2ND FL	MEDIA	PA	19063	FRONT ST 00000000	FIREHSE
MEDIA BOROUGH HALL	301 JACKSON ST 2ND FL	MEDIA	PA	19063	FRONT ST 00000000	FIREHSE
MEDIA BOROUGH HALL	301 JACKSON ST 2ND FL	MEDIA	PA	19063	FRONT ST 00000000	FIREHSE
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	STATE ST 00000000	GRD
MEDIA SCHOOL DIST	STATE ST	MEDIA	PA	19063	RADNOR ST 00000000	ATHLETIC FIELD EXEMPT
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	FRONT ST E00000000	GRD
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	FRONT ST E00000000	GRD
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	ORANGE ST 00000000	GRD
MEDIA PARKING AUTHORITY	STATE & JACKSON STS	MEDIA	PA	19063	STATE ST E00360000	GRD
MEDIA BOROUGH OF	301 N JACKSON ST	MEDIA	PA	19063	STATE ST E00120000	1 STY BLDG
MEDIA PARKING AUTHORITY	STATE ST	MEDIA	PA	19063	STATE ST 00000000	PARKING LOT
MEDIA PARK AUTH	STATE ST	MEDIA	PA	19063	STATE ST 00000000	PARKING LOT
MEDIA BOROUGH OF	3RD ST & JACKSON ST	MEDIA	PA	19063	STATE ST E01040000	2 STY BLDG
MEDIA BOROUGH HALL	301 JACKSON ST 2ND FL	MEDIA	PA	19063	STATE ST 00000000	GRD
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	BALTIMORE PK W06600000	1 STY BLDG
MEDIA BOROUGH HALL	301 N JACKSON ST 2ND FL	MEDIA	PA	19063	OLIVE ST S00000000	PARKING GAR
MEDIA SCHOOL DIST	STATE ST	MEDIA	PA	19063	RADNOR ST 00000000	ATHLETIC FIELD EXEMPT

Tax-Exempt Properties

OWNER_1	STREET_ADD	CITY	STATE	ZIP_CODE	LOCATION	DESCRIPTIO
CEMETERY	N CHERRY ST	MEDIA	PA	19063	PROVIDENCE RD 00000000	CEMETERY
FAMILY & COMMUNITY SERVICES	100 W FRONT ST	MEDIA	PA	19063	OLIVE ST S00000000	1 STY BLDG
DELAWARE COUNTY	2ND ST	MEDIA	PA	19063	2ND ST W00000000	PARKING LOT
DELAWARE COUNTY	2ND ST	MEDIA	PA	19063	2ND ST W00000000	PARKING LOT
MEDIA MONTHLY MEETING OF THE	125 W 3RD ST	MEDIA	PA	19063	3RD ST W01250000	SCHOOL
DELAWARE COUNTY	STATE ST	MEDIA	PA	19063	STATE ST 00000000	GLEN PROV PARK
DELAWARE COUNTY	COURTHOUSE	MEDIA	PA	19063	3RD ST W00000000	GRD
MEDIA PROVDNCE FRIENDS SCHOOL	125 W 3RD ST	MEDIA	PA	19063	ORANGE ST N03010000	GRD
DELAWARE COUNTY	COURTHOUSE	MEDIA	PA	19063	2ND ST 00000000	MISC CT HSE BLDGS
DELAWARE COUNTY	2ND ST	MEDIA	PA	19063	2ND ST W00000000	PARKING LOT
DELAWARE COUNTY	2ND ST	MEDIA	PA	19063	2ND ST W00000000	PARKING LOT
DELAWARE COUNTY CHILD CARE CTR	FRONT & ORANGE ST	MEDIA	PA	19063	FRONT ST 00000000	2 STY BLDG/PARKING GAR
BLUE ROUTE VINEYARD	425 W FRONT ST	MEDIA	PA	19063	FRONT ST W04250000	1 STY BLDG
DOMESTIC ABUSE PROJECT OF	14 W 2ND ST	MEDIA	PA	19063	2ND ST W00160000	2 1/2 STY HSE GAR
DOMESTIC ABUSE PROJECT OF	14 W 2ND ST	MEDIA	PA	19063	2ND ST W00140000	2 1/2 STY HSE GAR
DOMESTIC ABUSE PROJECT OF	14 W 2ND ST	MEDIA	PA	19063	2ND ST W00100012	2 1/2 STY HSE
DOMESTIC ABUSE PROJECT OF	14 W 2ND ST	MEDIA	PA	19063	2ND ST W00100012	2 1/2 STY HSE
THE MEDIA FREE LIBRARY ASSOC	1 E FRONT ST	MEDIA	PA	19063	FRONT ST E00110000	LIBRARY
APPLE JUDY TRUSTEES OF	423 S JACKSON ST	MEDIA	PA	19063	JACKSON ST S04230000	1 STY BLDG
DELAWARE COUNTY INS OF SCIENCE	11 VETERANS SQ	MEDIA	PA	19063	VETERANS SQ 00110000	2 STY BLDG

GOTTSHALL & BOOR & PANATELLAS	219 E FRONT ST	MEDIA	PA	19063	FRONT ST E02190000	1 STY CHURCH & LOT
GOTTSHALL & BOOR & PANATELLAS	219 E FRONT ST	MEDIA	PA	19063	FRONT ST E02190000	1 STY CHURCH & LOT
REDEVELOPMENT AUTH DEL CO	200 E STATE ST STE 205	MEDIA	PA	19063	BALTIMORE AVE W00190025	3 STY PARKING GAR
REDEVELOPMENT AUTH DEL CO	200 E STATE ST STE 205	MEDIA	PA	19063	BALTIMORE AVE W00190025	3 STY PARKING GAR
REDEVELOPMENT AUTH DEL CO	200 E STATE ST STE 205	MEDIA	PA	19063	BALTIMORE AVE W00190025	3 STY PARKING GAR
THE UNITED STATES POSTAL SERV	PO BOX 27497	GREENSBORO	NC	27498	BALTIMORE PK 00000000	1 ST 2 ST POST OFC ADD
HORIZON HOUSE INC	120 S 30TH ST	PHILADELPHIA	PA	19104	LEMON ST S03000000	2 STY DUPLEX GAR
MEDIA FELLOWSHIP HSE	S JACKSON ST	MEDIA	PA	19063	JACKSON ST S00000000	GRD
CARELINK COMMUNITY SUPPORT	2002 SPROUL RD 3RD FL	BROOMALL	PA	19008	JEFFERSON ST W04370000	2 STY TW TRIPLX
CARELINK COMMUNITY SUPPORT	2002 SPROUL RD 3RD FL	BROOMALL	PA	19008	JEFFERSON ST W04390000	2 STY TRIPLX
APPLE JUDY TRUSTEES OF	423 S JACKSON ST	MEDIA	PA	19063	JACKSON ST S04230000	1 STY BLDG
PHILIP JAISOHN MEMORIAL	6705 OLD YORK RD	PHILADELPHIA	PA	19126	LINCOLN ST 00000000	GRD
DELAWARE COUNTY	STATE ST	MEDIA	PA	19063	STATE ST 00000000	GLEN PROV PARK
DELAWARE COUNTY	STATE ST	MEDIA	PA	19063	STATE ST 00000000	GLEN PROV PARK
DELAWARE COUNTY WOMEN AGAINST	202 SOUTH AVE	MEDIA	PA	19063	SOUTH AVE 02020204	2/2 1/2 STY HSES
ASTOR SQUARE HOMEOWNERS ASSOC	303 N ORANGE ST	MEDIA	PA	19063	ORANGE ST N00000000	GRD
PROVIDENCE MONTHLY MEETING OF	201 N PROVIDENCE RD	MEDIA	PA	19063	PROVIDENCE RD N02010000	1 1/2STY BLDG
AMERICAN LEGION	321 E JEFFERSON ST	MEDIA	PA	19063	JEFFERSON ST E03210000	1 1/2 STY BLDG

GLOSSARY

STORMWATER TERMS AND ACRONYMS

Bioretention – Are landscaped depressions or shallow basins used to slow and treat on-site stormwater runoff. Stormwater is directed to the basin and then percolates through the system where it is treated by a number of physical, chemical and biological processes. Sometimes referred to as a rain garden.

Blue Roofs – A roof design that is explicitly intended to store water, typically rainfall.

BMPs – Best Management Practice.

Conveyance System – Drainage facilities and features that collect, contain, and provide for the flow of surface and storm water from the highest points on the land down to a receiving water. Conveyance systems are made up of natural elements and of constructed facilities. Also can be know as “collection systems” and “storm sewers”.

Downspout Rain Garden – A small scale rain garden or bioretention area that is positioned to intercept runoff from a building roof leader.

Drainage – The collection, conveyance, containment, and/or discharge of surface and storm water runoff.

Drainage Facility – A constructed or engineered feature that collects, conveys, stores or treats surface and storm water runoff. Drainage facilities shall include but not be limited to all constructed or engineered streams, pipelines, channels, ditches, gutters, lakes, wetlands, closed depressions, flow control or water quality treatment facilities, erosion and sedimentation control facilities, and other drainage structures and appurtenances that provide for drainage.

Drainage-shed – Bounded area directly tributary to regulated storm sewer which can be traced downstream to singular discharge or outfall; otherwise known as a “sewershed” boundary.

Drywells – A subsurface storage facility that temporarily stores stormwater runoff from roofs allowing infiltration into underlying soils.

False Catch Basin – A collection point in a drainage system that looks similar to an inlet but instead of connection to a storm sewer it connects directly to a stormwater management system like an infiltration trench or underground detention facility.

First Flush – The initial surface runoff from a rainstorm. During this phase, water pollution entering storm drains in areas with high proportions of impervious surfaces is typically more concentrated compared to the remainder of the storm.

GIS – Geographical Information System, a program developed for the purposes of displaying, evaluating and cross-referencing terrestrial data.

Green Infrastructure – A variety of soil-water-plant systems that intercept stormwater, infiltrate a portion of it into the ground, evaporate a portion of it into the air, and in some cases, release a portion of it slowly back into a storm sewer system.

Green Roof – A roof that has been covered with living vegetation to provide stormwater management, cooling, natural habitat, and other benefits.

Grey Infrastructure – Are engineering projects that use concrete and steel.

GSI – "Green Stormwater Infrastructure"

HEC-22 – (Highway Engineering Circular No. 22) A design and guidance manual developed by the Federal Highway Authority (FHWA) for the design of storm drainage systems associated with transportation facilities.

Impervious Surface – A type of land cover that does not allow for water to pass through it, such as rooftops and roadways. Impervious surfaces cause rain water to quickly shed off.

Infiltration – The process by which water travels from the ground surface into the soil underneath.

MS4 – Municipal separate storm sewer systems.

NPDES – National Pollutant Discharge Elimination System. The part of the Clean Water Act which requires point source discharges to obtain permits. These permits, referred to as NPDES permits, are administered by the Pennsylvania Department of Environmental Protection.

NRCS – National Resource Conservation Service, formally known as the Soil Conservation Service (SCS) is an agency of the United States Department of Agriculture (USDA).

Nuisance Flooding – Flooding that leads to public inconveniences such as road closures.

P3 – "Public-Private Partnerships"

PRP – "Pollution Reduction Plans" a requirement required by PADEP requiring municipalities to outline steps towards pollution wasteload requirements by use of BMPs or GSIs.

Rain Harvesting Systems – is the accumulation and deposition of rainwater for reuse on-site.

Runoff – Water originating from rainfall and other precipitation that ultimately flows into drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands as well as shallow groundwater.

Storm Sewer System – Any facility, structure, improvement, development, equipment, property or interest therein, or other structural or nonstructural element made, constructed, used or acquired for the purpose of collecting, containing, storing, conveying and controlling stormwater wherever located including, but not limited to, storm sewers, curbs, street drains, conduits, natural and man-made channels, pipes, culverts and detention ponds whether public or private.

Stormwater – Water originating from rainfall and other precipitation that ultimately flows into drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands as well as shallow groundwater.

Stormwater Management – The application of site design principles and construction techniques to prevent sediments and other pollutants from entering surface or ground water; source controls; and treatment of runoff to reduce pollution.

Stormwater Pollution – Debris, chemicals, dirt and other pollutants picked up by stormwater and carried to the storm sewer system and discharged into creeks and lakes. This water is untreated, therefore anything picked up along the way enters the waters we fish in, swim in and drink from.

Structural BMP – Constructed facilities or measures to help protect receiving water quality and control stormwater quantity. Examples include storage, vegetation, infiltration, and filtration.

Wasteload – A term referring to measurable unit of a pollutant (e.g. sediment, phosphorous or nitrogen), typically expressed in pounds (lbs).

Water Quantity – Refers to the amount of rain water that either pools on or sheds off of the land surface. Quantity is a function of rainfall intensity and duration. Two parameters describe water quantity: Peak Runoff Rates and Peak Runoff Volumes. Peak runoff rate is the discharge associated with the peak runoff volume, or the volume over time. Peak Runoff Volume is the depth of rainwater that falls on an area that has to be treated or managed by stormwater infrastructure.