RIPPLE

Environmental Justice Watershed Plan

upstream pittsburgh

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Healthy ecology, healthy community

Acknowledgments

UpstreamPgh thanks the Pennsylvania Department of Environmental Protection's Growing Greener program for funding this plan which has enabled us to develop a roadmap for our work over the next 25 years. Thanks to the visionaries that laid the groundwork for our organization to be founded in 2001 and later, for the restoration of Nine Mile Run within Frick Park. We thank our watershed neighbors, friends and supporters for participating in tree plantings, rain barrel workshops, volunteer events, advocacy campaigns and so much more over the past 25 years. We also thank our steering committee members, neighborhood leaders, staff and board of directors for their dedication to this work which can impact all of us. The Ripple Watershed Plan is a generational opportunity to invest in our watershed through engaging our neighbors and community members in a people first approach to urban watershed reclamation.

Pittsburgh Team
Mike Hiller, Executive Director
Lori Presto, Shared Chief Financial Officer
Aaron Birdy, Plan/Build Director
Sarah Carr, Operations & Communications Manager
Chavaysha Chaney, Water Equity Director
Ryan Ferrebee, Development Director
Erica Jackson, Community Engagement Manager
Keith Moore, Ecosystems Program Coordinator
Mary Nesby, Mon Valley Advocacy Manager
Jo Anne Tippett, Advocacy Coordinator
Chief Pomaj-Chakmam-Yajalaji, Advocacy Consultant

UpstreamPgh's Board of Directors
Rayden Sorock, President
Adam Kidane, GISP Vice President
Ana Bennett, PE, Secretary
Robin Ryan, CPA, Treasurer
Tom Batroney P.E.
Marion T. Divers, PhD, PG
Brian Hill
Tony Malogne
Claudia Saladin
Tacumba Turner
NaTisha Washington
Claudia Saladin
Michael Hiller (ex officio)
Lori Presto (ex officio)

Steering Committee
Claudia Saladin, (co-chair)
NaTisha Washington (co-chair)
Black Appalachian Coalition
Rayden Sorock (co-chair)
Kate Sphar Consulting LLC
Diane Daniels,
East Hills Consensus Group
Sergio Ruiz,
Borough of Wilkinsburg
Jonathon Burgess,
University of Pittsburgh, Water Collaboratory
Kyla Prendergast,
Pgh Department of City Planning
Maria Natoli,
Pittsburgh Water
Megan Lange,
University of Pittsburgh Water Collaboratory
Ryan Quinn, P.E.,
Pittsburgh Water
Timothy D. Prevost, P.E.,
ALCOSAN
Zinna Scott,
Operation Better Block

Neighborhood Leaders
Betty Foster
Darya Kharabi
Donna Smith
Natalie Walsman
Ruth Boykin

Consultant Team
evolve environment::architecture
ethos collaborative
black girl green world

CONTENTS

01 THE RIPPLE PLAN

This plan rebuilds the community's relationship with water by starting upstream, where it matters most.

UpstreamPgh recently completed a new 2024-2028 Strategic Plan with a big question of: How can UpstreamPgh's people-first approach to watershed restoration uplift climate justice and connect people to the natural environment? This question is central to the Nine Mile Run Environmental Justice Watershed Plan. This plan also upholds the core values identified in the Strategic Plan:

- Strive for all things UpstreamPgh to be regenerative.
- Act with urgency to address the environmental and climate injustice in the region.
- Think from a greatest potential perspective, recognizing possibilities rather than just solving problems.
- Institutionalize systems thinking across all programs.

Over the past few years, UpstreamPgh has transitioned towards a people-first approach that recognizes people are important components of all natural systems, just as much as flora and fauna. Placing environmental justice and climate preparedness for the most vulnerable neighborhoods as the top priority of project and program planning is now the foundation of the organization's work.

Rather than relying only on underground pipes, the plan highlights green stormwater infrastructure that captures rain in visible and meaningful ways. Parks, streets, schoolyards, and open spaces become part of a connected network that manages water while creating cared-for places within communities.

The Nine Mile Run Environmental Justice Watershed Plan, or the RIPPLE Plan, enables UpstreamPgh to engage communities of color that have suffered the most from injustices and inequities related to land use, environmental management, public health, and socio-economic issues. This plan describes seven (7) sub-shed, neighborhood-scale system plans for addressing water quality issues in the Nine Mile Run Watershed.

RIGHT Nine Mile Run is a small stream that flows, mostly underground, through Pittsburgh's East End (UpstreamPgh)

Caring for the Watershed and our Neighbors

Building on prior planning, the RIPPLE framework evolved from the 1998 Nine Mile Run River Conservation Plan, which identified the need for stream restoration in Frick Park, as well as sustained investment in the upper watershed. That plan identified that long-term success would depend on a dedicated watershed organization and a systems-based approach, catalyzing the start of UpstreamPgh. Since then, UpstreamPgh and its partners have made significant progress in the lower watershed, and are now turning attention to the upper part of the watershed where unresolved conditions continue to affect shed-wide performance. Recent events, including the Fern Hollow Bridge collapse, aging stormwater and sewer infrastructure, and more frequent intense rainfall, underscore the urgency of a coordinated, watershed-wide approach to renewal and resilience. The RIPPLE plan marks the next phase in restoring and strengthening the watershed.

A focus in the upper watershed.
These areas play a critical role in shaping downstream conditions, as stormwater runoff and infrastructure performance upstream directly affect flooding and sewer capacity throughout the system. While much attention has been given to the lower Nine Mile Run, this plan focuses on the upper watershed, including the Borough of Wilkinsburg and the Pittsburgh neighborhoods of Homewood and East Hills.

By prioritizing upstream action, the plan emphasizes prevention rather than reaction. Managing stormwater closer to where it falls improves water quality, reduces pressure on infrastructure, and supports more resilient outcomes across the entire watershed.

Responding to upstream needs. The upper watershed includes neighborhoods that have experienced population decline, disinvestment, vacant land, and aging housing stock. These communities have often been left behind in stormwater improvements and broader reinvestment efforts. Many are identified by the Pennsylvania Department of Environmental Protection as Environmental Justice Areas.

UpstreamPgh action is especially important where residents face flooding, sewer backups, aging infrastructure, and limited investment, making stormwater management an issue that directly affects daily life and community stability.

A commitment to environmental justice.
Environmental justice is central to this plan. Projects are intentionally prioritized in communities where environmental impacts and historic underinvestment overlap. The goal is not only to reduce risk, but to ensure that public investment delivers meaningful benefits to neighborhoods that have experienced long-standing inequities.

Managing water-related issues improves neighborhood quality of life and addresses long-standing disparities in infrastructure and environmental conditions.

An integrated watershed framework.
What distinguishes this report is its integrated approach. Equity, landscape structure, and infrastructure typology are considered together within a watershed-scale framework. Rather than treating stormwater projects as isolated technical fixes, the plan views the watershed as a connected system shaped by physical conditions, social context, and governance structures.

Water infrastructure needs to be managed as a network, requiring governance that is coordinated across public agencies, private property owners, local institutions, and community organizations.

Green stormwater infrastructure as a networked system. The plan uses a range of green stormwater infrastructure strategies, including both networked and non-networked systems. Different tools are matched to specific landscape conditions, land ownership patterns, and community capacity for long-term stewardship.

Networked systems include projects in the public right-of-way and on private property that work together to manage stormwater and provide visible neighborhood benefits.

Regenerating places with data and community knowledge. Regenerating places through data and community knowledge is central to this plan. Analysis of flooding, sewer backups, and infrastructure stress is paired with community insight to identify where targeted interventions can have lasting impact. These conditions are considered alongside land use, zoning, vacancy, and past investment patterns to reveal opportunities for coordinated action.

Data and community knowledge are essential to managing distributed systems and understanding where flooding, infrastructure stress, and community priorities intersect.

This plan is generational. Strategic investments in green stormwater infrastructure will restore watershed function, improve public spaces, and reduce risk disparities. While implementation will take time, these coordinated efforts will strengthen neighborhoods and watershed health for decades to come.

Watershed restoration is more than an environmental project — it is a platform for neighborhood revitalization and long-term resilience.

BELOW UpstreamPgh volunteering team event

The RIPPLE Values

Increase economic opportunity. Protect infrastructure from water-related impacts while creating opportunities for income generation.

Create culturally restorative places. Create water-focused public spaces that build neighborhood identity and increase access to green space.

Solve multiple problems at one time. Stack solutions that deliver multiple benefits through coordinated investment.

Improve downstream water issues. Improve water quality and reduce stormwater entering Nine Mile Run, the sewer system, the Monongahela River and Ohio River Basin.

Solve adverse upstream water-related issues. Minimize flooding, eliminate basement backups, and reduce risk of landslides.

Improve human and ecological health cobenefits. Minimize heat island, improve air quality, and increase vegetative health.

The RIPPLE Plan

The RIPPLE Plan is organized around three types of projects that share similar settings, strategies, and decision-making structures. Organizing projects this way helps UpstreamPgh focus its efforts, communicate more clearly with communities and partners, and better coordinate services and resources.

Water Capture Districts

The watershed's flatter commercial areas provide opportunities to capture stormwater through projects in streets, sidewalks, and on private property.

❶ **Frankstown-Bennett Water District** [p. 44]
A mixed-use valley corridor with flooding risks suited to coordinated, networked green infrastructure.

❷ **Rockwell to Wilkinsburg Water District** [p. 64]
A highly impervious commercial district suited to improvements in the public right-of-way and on private lots.

Valley Park Projects

Parks targeted for reinvestment can integrate on-site and off-site stormwater capture into recreational and landscape features.

❸ **Hunter Park** [p. 93]
A community park where stormwater management can be integrated with recreation and neighborhood use.

❹ **Turner Intermediate School** [p. 97]
School grounds and a public park campus with potential for on-site stormwater management and education.

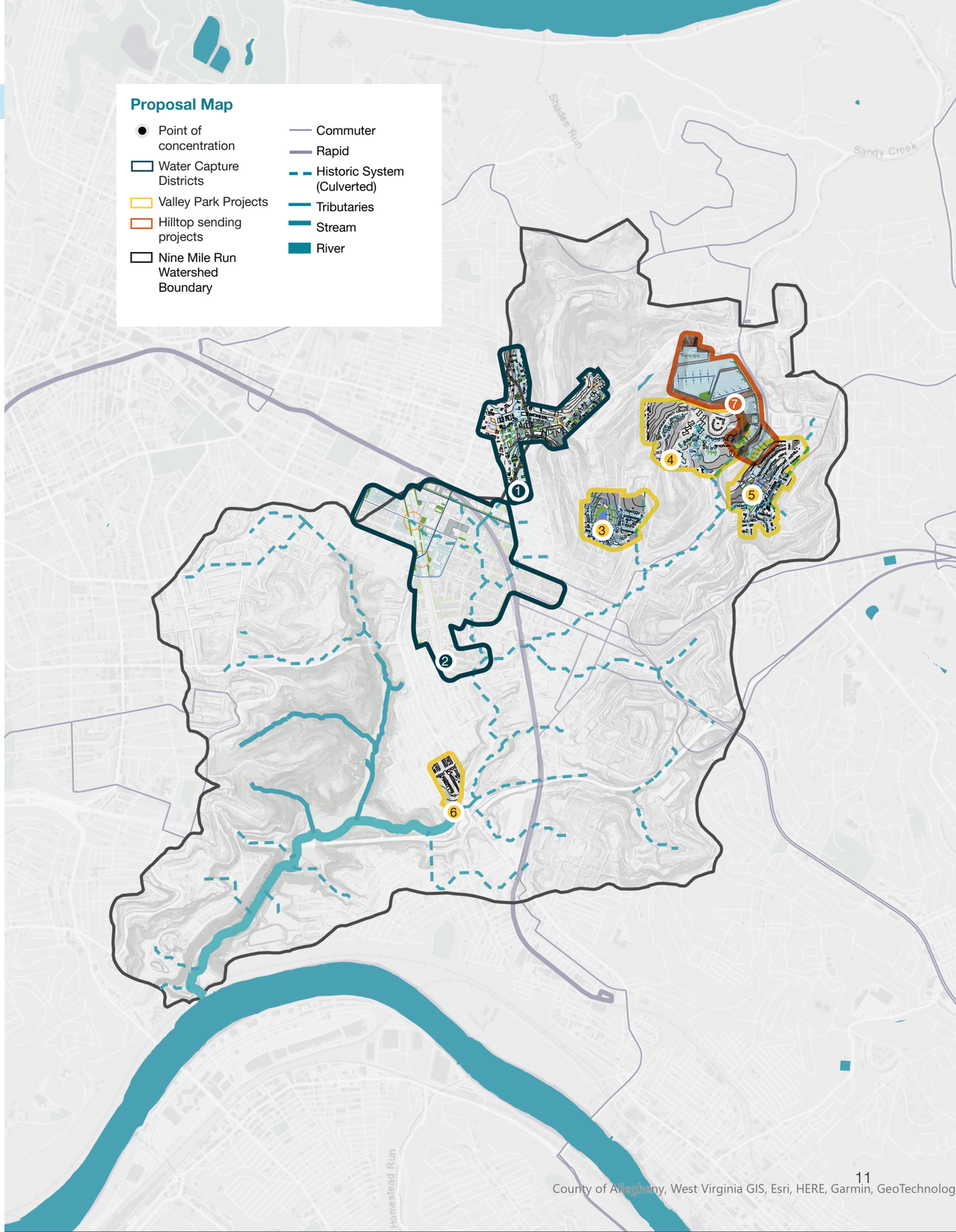
❺ **East Hills Park and Park Hill Drive** [p. 101]
A school, park, and neighborhood where coordinated green infrastructure can manage runoff & support community use.

❻ **Nine Mile Run Outflow** [p. 105]
Where the sewer becomes the stream and upstream stormwater impacts converge to affect storm and sanitary systems.

Hilltop Sending Properties

Private properties where on-site source control can reduce stormwater runoff at its origin.

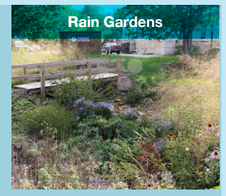
❼ **Hilltop Properties** [p. 110]
Upland areas where on-lot green infrastructure can reduce runoff at its source.



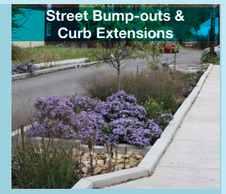
The RIPPLE Tools

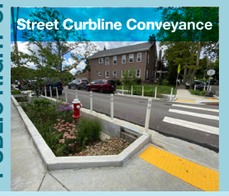
Green stormwater infrastructure uses a combination of above- and below-ground, planted, and built elements. They are often layered together to manage stormwater where it falls and support everyday use of streets, parks, and buildings.

ON-LOT INFRASTRUCTURE



PUBLIC RIGHT-OF-WAY INFRASTRUCTURE





The RIPPLE Projects

Each project utilizes 10 squares corresponding to Green Stormwater Infrastructure Tools. Dark blue squares indicate the best-suited tools for that project.

Water Capture Districts

Frankstown-Bennett Water District

Frankstown–Bennett is a busy corridor where roads, businesses, and buried streams concentrate stormwater, contributing to flooding and sewer backups. Improvements along streets, parking areas, and nearby open spaces can extend UpstreamPgh's existing efforts to manage stormwater and can make a safer, more walkable district.

Rockwell Park to Wilkinsburg Water District

Rockwell Park to Wilkinsburg is a relatively flat area with light industrial and main street commercial uses and is the largest impervious area in the shed. Increased investment and redevelopment can be directed to support new open spaces, street improvements, and private property upgrades to create a connected network of green stormwater infrastructure.

Valley Park Projects

Hunter Park

Hunter Park is a neighborhood park where rainwater naturally flows, making it an ideal place to manage stormwater in ways people can see and enjoy. The park is slated for investment, where the community can engage in the design of play areas and fields that capture on site stormwater as well as water from the adjacent properties and right-of-ways.

East Hills Park & Park Hill Drive

East Hills Park and Park Hill Drive include a school campus, park space, and surrounding homes where rainwater moves quickly downhill, contributing to erosion and flooding. The community is engaged in planning improvements to school grounds, park areas, and streets. This project can capture stormwater on site and from nearby roads and properties.

Turner Intermediate School

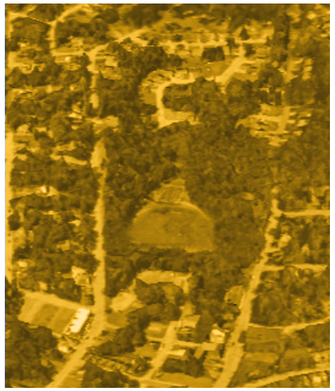
Improvements to the schoolyard and fields, and parking areas can store on-site rain as well as capture runoff from nearby roads. The community has identified a need for field upgrades, making this an ideal opportunity for visible learning and environmental benefits for students and the surrounding neighborhood.

Nine Mile Run Outflow

The Nine Mile Run Outflow is where stormwater from across the watershed exits the culvert and becomes an open-channel stream within Frick Park. Improvements at and upstream of this location can reduce concentrated discharges that contribute to infrastructure damage while creating a more welcoming and visible entry to the park and celebrate the restored Nine Mile Run.

Hilltop Sending Properties

Hilltop "Sending" Properties are private properties at the highest points of the watershed that generate significant stormwater runoff, including large parking lots, vacant parcels, and vehicle storage areas. Private investment in green infrastructure reduces runoff at its source and helps relieve pressure on sewers and flooding downstream.



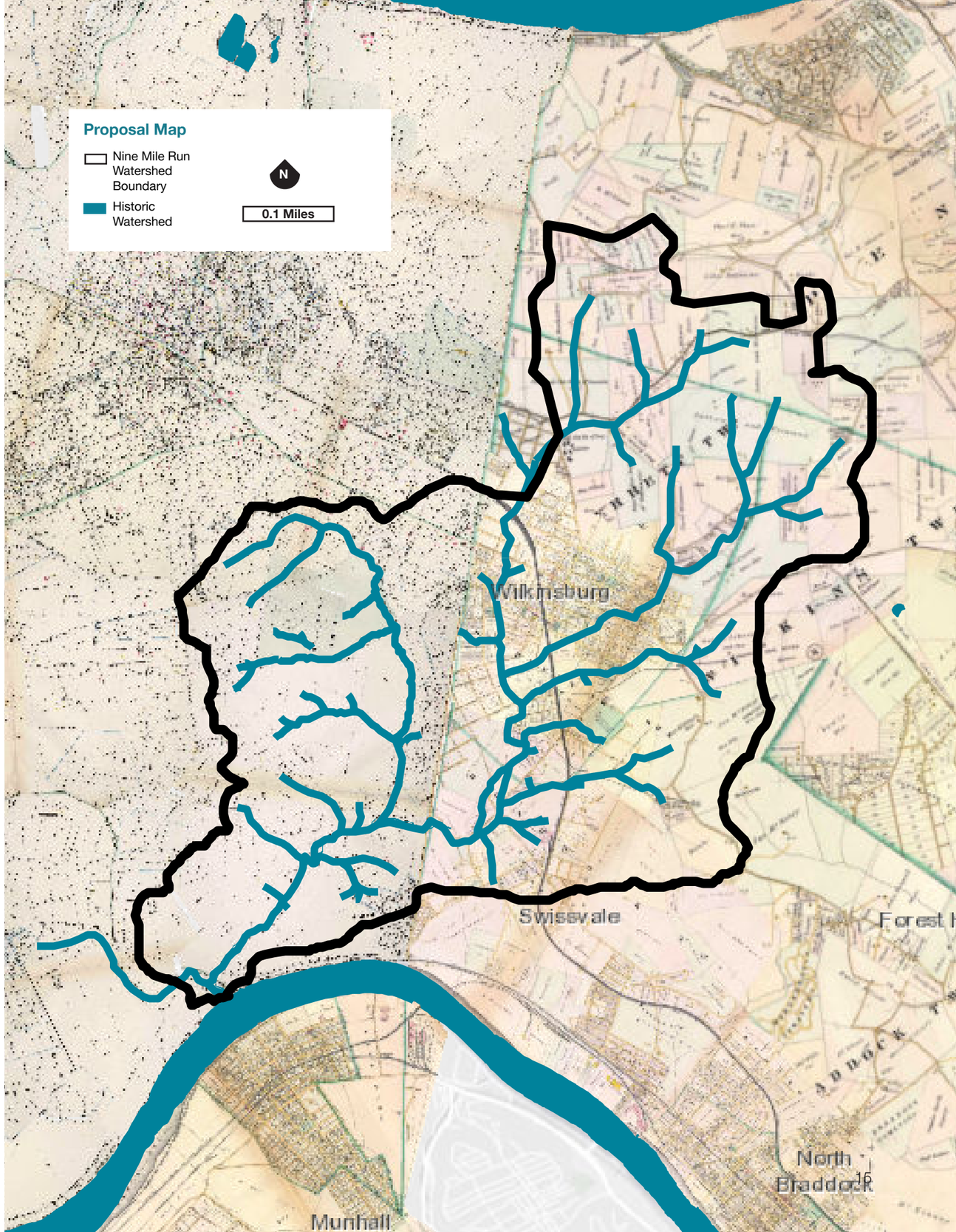
02 BACKGROUND & METHODS

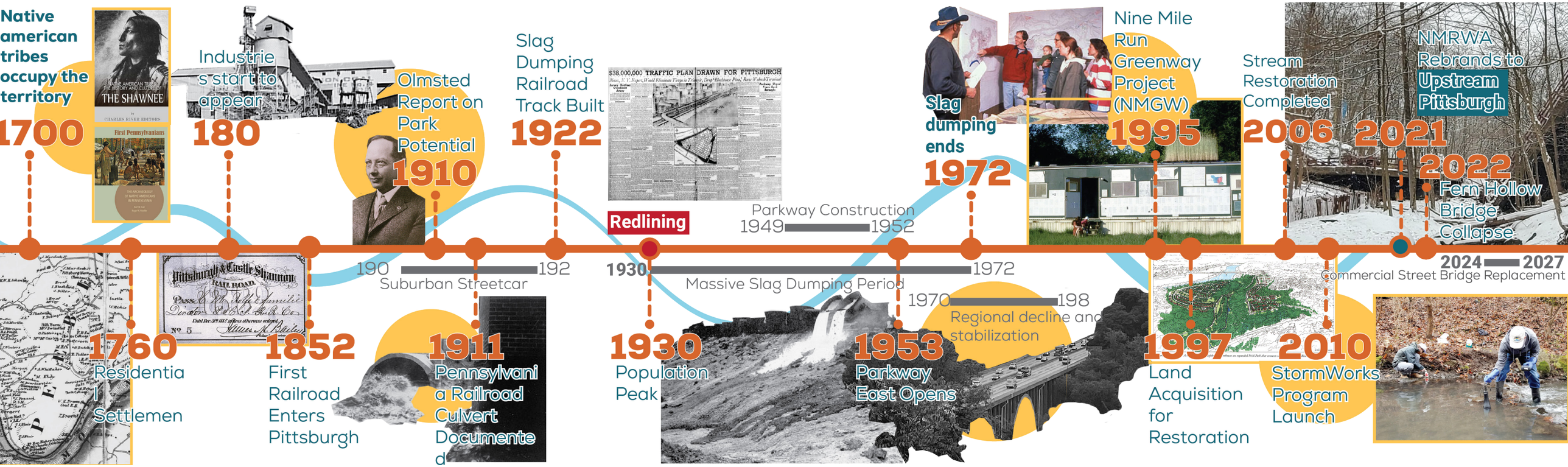
The RIPPLE plan rebuilds our community's relationship with water by starting upstream, where it matters most.

UpstreamPgh has worked since 2001 to protect and restore the Nine Mile Run Watershed, growing out of the Nine Mile Run Greenway Project and early efforts to heal one of Pittsburgh's most impacted urban streams. From the beginning, UpstreamPgh has recognized that caring for water requires long-term commitment and collaboration across disciplines and communities. Over more than two decades, the organization has brought together residents, planners, artists, engineers, designers, students, and local governments to shape projects that improve environmental conditions while strengthening community stewardship. This work treats relationships and shared responsibility as essential infrastructure, building the capacity needed to care for complex systems over time.

This plan builds directly on that history, carrying forward earlier watershed visions while responding to today's challenges, and is intended to guide UpstreamPgh's work over the next 25 years. The sections that follow outline the conditions, priorities, and strategies that shape this watershed-wide approach to renewal and resilience.

RIGHT Crescent Early Childhood Center rain garden construction (UpstreamPgh)





ABOVE Graphic timeline of settlement, development, and infrastructure milestone in Nine Mile Run

A HISTORY OF TRANSFORMATION

The Nine Mile Run Watershed has been shaped over time by successive patterns of settlement, industry, and infrastructure. For thousands of years, Indigenous peoples stewarded a landscape defined by a vast network of streams, wetlands, and forested land. European settlement began in the early 1700s, initially driven by trade, and expanded significantly in the nineteenth century as industrial activity intensified. By the 1800s, quarries and coal operations dotted the northern and eastern portions of the watershed, reflecting the rapid pace of industrial-era urbanization.

Despite early advocacy to preserve open space along the southern portions of Nine Mile Run—as early as 1910—and residential zoning protections adopted in 1923 to limit industrial uses and protect water quality and habitat, industrial activity ultimately dominated the valley. For more than five decades, Duquesne Slag Company used the area as a dumping ground, burying the stream under industrial waste and causing severe environmental degradation.

In the mid-1990s, a multidisciplinary group of artists, researchers, urban planners, environmentalists, and activists launched the Nine Mile Run Greenway Project. This effort led United States Army Corps of Engineers to undertake what was then the largest urban stream restoration project of its kind in the country, reversing more than a century of ecological damage. Today, the Nine Mile Run Watershed is widely recognized as a model for urban ecological recovery. At the same time, climate change, increased rainfall, frequent flooding, and aging infrastructure continue to challenge the watershed's long-term resilience.

Across Pittsburgh and Allegheny County, vulnerability to these challenges is shaped by long-standing environmental injustices. Black and low-income communities have been disproportionately affected by inadequate infrastructure, historic disinvestment, and the ongoing impacts of climate change. These vulnerabilities are especially evident in neighborhoods within the Nine Mile Run Watershed, where outdated stormwater management systems struggle to accommodate intensified rainfall and extreme weather, resulting in chronic flooding, basement backups, soil erosion, and water infiltration.

Redlining practices introduced in the 1930s reinforced these inequities by grading neighborhoods from "A" (best) to "D" (hazardous) based on discriminatory criteria such as race and income, effectively denying investment to Black and immigrant communities and leaving a lasting legacy embedded in today's infrastructure systems.

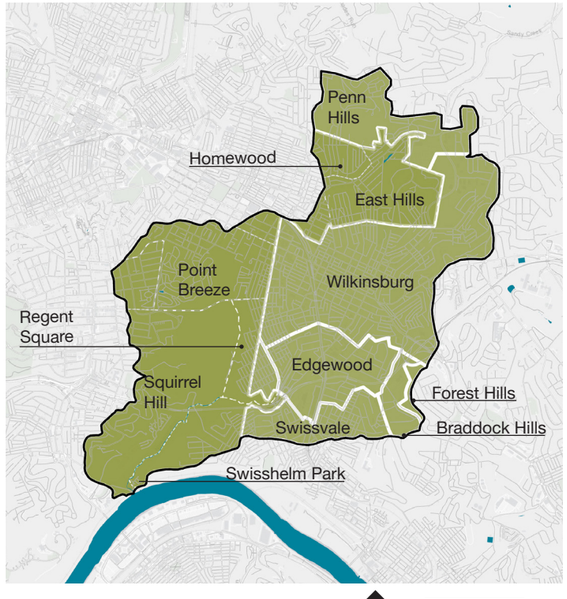
Lower-income, Black, and immigrant communities were often limited to more affordable, flood-prone areas, where housing was less desirable and infrastructure was insufficient.

COMMUNITY CONTEXT

Today, historically redlined neighborhoods like Homewood and East Hills, continue to experience challenges such as inadequate stormwater infrastructure and persisting air quality concerns. Many people in the northeastern section of the watershed would be considered the working poor, where an individual spends a significant amount of time in the labor force but is still below the poverty level due to low and stagnant wages.

For example, **East Hills** has a median household income of just $16,626 far below Pittsburgh's median, with over half of its renters classified as cost-burdened. Such economic instability leaves limited resources for residents to adapt to water infrastructure failures, such as damp basements or sewer backups.

Homewood's median household income of $41,400, combined with its high percentage of elderly residents and single-parent households, exacerbates the community's inability to manage the costs associated with water infrastructure repair.



Nine Mile Run Project Area

- Municipalities
- Pittsburgh Neighborhoods
- Nine Mile Run Boundary

Meanwhile, **Wilkinsburg's** median household income was $46,553, slightly below Pittsburgh's median income. In contrast, neighboring Churchill's median household income was more than 2.5 times that of Wilkinsburg, highlighting the economic disparities between the borough and its surrounding communities.

Swissvale and **Edgewood**, while slightly more economically stable, have also experienced population and economic declines, with increases in poverty rates in Swissvale signaling growing vulnerabilities.

These economic stressors, coupled with aging infrastructure, a physical stressor, put these communities at higher risk for property damage or personal injury during a rain event. There have also been measurable increases in the number and intensity of major rain events across the county, prompting real estate developers and insurance agencies to discount these communities further. Without intentional investment in these areas, the devastation of community flooding and landslides become more of an inevitability. Effective solutions will require targeted investments in green infrastructure, equitable development strategies, and community-led initiatives to address both the physical and socio-economic dimensions of water equity.

Addressing water equity in communities with the greatest need would improve stormwater infrastructure, enhance climate resilience, and restore environmental and human health.

UpstreamPgh's work involves mitigating the physical impacts of flooding and runoff as well as rectifying the structural inequities that have left these communities more susceptible to diminished quality of life and harm.

Limited economic resources in areas like East Hills, Homewood, and Wilkinsburg make it difficult for residents to address infrastructure issues, while outdated systems exacerbate the risk of water contamination. Homewood's outdated housing stock, high impervious surface coverage, and chronic flooding challenges further strain an already economically fragile community. According to the City of Pittsburgh's Health and High Water report, heavy rainfall and energy inefficiencies can lead to mold growth, increased rates of asthma, and other water-related health hazards. Additionally, East Hills' high proportion of cost-burdened renters and Wilkinsburg's economic disparities leave residents vulnerable to displacement and unable to invest in critical repairs. Overall, these systemic challenges create a cycle of environmental degradation and economic instability, disproportionately affecting low-income and predominantly Black communities.

Wilkinsburg, as the largest contributor to the Nine Mile Run watershed, faces its own set of challenges. it's aging sewer systems and large amounts of impervious surfaces exacerbate stormwater runoff issues which pollute local waterways and contribute to increased risk of flooding further degrading water quality and public health. The Nine Mile Run Aquatic Ecosystem Restoration Project made significant improvements to stream stability and water quality within Frick Park, but the urbanized areas that drain into Nine Mile Run still contribute large volumes of uncontrolled runoff causing intense peak storm flows, exacerbating struggles with trash management, illegal dumping and erosion.

Systemic disinvestment, demographic shifts, and limited access to resources create economic conditions that hinder their ability to respond to water infrastructure challenges. The lack of sufficient funding for maintenance or upgrades, coupled with aging systems and environmental injustices like discriminatory housing policies, burdens not only the physical infrastructure but also the sustainability of these communities.

	NINE MILE RUN WATERSHED	WILKINSBURG	SWISSVALE	EDGEWOOD	CITY OF PITTSBURGH				ALLEGHENY COUNTY	PENNSYLVANIA
					East Hills	Homewood	Point Breeze	Squirrel Hills		
Population Change % (2000-2025)	-18.99%	**-28.29%**	-10.97%	-8.18%	**-30.05%**	**-45.30%**	-12.90%	**2.79%**	-2.65%	**6.46%**
Population Change % (2010-2025)	-7.43%	**-12.74%**	-7.36%	-0.22%	**-10.70%**	**-18.60%**	-7.84%	-0.24%	1.98%	2.93%
Population Change % (2020-2025)	-3.07%	-3.54%	-5.09%	-1.08%	-2.14%	-8.95%	-4.44%	-3.02%	-0.24%	0.55%
2020 Median Age	39.5	39.9	39.0	40.6	32.5	**32.3**	38.7	38.4	40.2	41.0
2023 Median Household Income	$61,778	**$46,553**	$64,966	$102,907	**$16,626**	**$41,400**	**$103,277**	**$109,972**	$76,393	$76,081
2020 Single Parent Household	8.00%	**8.66%**	6.09%	3.25%	**24.27%**	**22.89%**	3.24%	2.80%	2.52%	2.46%
2023 Renter Households	**25.32%**	**40.14%**	**25.67%**	16.87%	**20.05%**	20.42%	20.31%	17.85%	15.45%	12.36%
2023 Households in Poverty (%)	17.07%	**21.33%**	9.00%	2.04%	**50.13%**	**19.26%**	4.30%	11.13%	11.89%	12.00%
2023 Cost Burden (Owner)	2.66%	1.64%	3.73%	**6.22%**	0.08%	1.03%	1.14%	3.16%	3.22%	3.84%
2023 Cost Burden (Renter)	10.70%	**17.59%**	8.34%	5.08%	12.66%	9.74%	5.49%	6.95%	6.47%	5.45%
2025 Use Asthma Prescription (%)	5.58%	4.98%	4.26%	4.37%	4.42%	4.62%	4.23%	4.13%	5.26%	5.27%
2020 Minority Populations	**43.84%**	**69.32%**	34.47%	19.05%	**97.61%**	**96.61%**	35.89%	21.10%	19.07%	19.06%

ABOVE The demographic values shown in this chart are aggregate data based on partial census tracts using data apportionment, which distributes data (like population) based on the percentage of settlement points or weighted centroids (blocks) falling within the custom target area. The Municipal and City of Pittsburgh data here reflect the portion of the political boundary within the Nine Mile Run sewershed.

THE ORIGIN AND IMPACT OF UPSTREAMPGH

ABOVE The Re-evaluating Stormwater Plan (1998) redesigned the Nine Mile Run outflow to dissipate the water's energy as it exited the culvert and to provide safe access to the stream for park visitors.

In 1996, artists with Carnegie Mellon University's STUDIO For Creative Inquiry Bob Bingham, Tim Collins, and Reiko Goto envisioned something extraordinary: turning an industrial waste site near Pittsburgh's Frick Park into a thriving public green space. The Nine Mile Run Greenway Project brought together a diverse coalition—community members, scientists, artists, government agencies, corporations, educators, and private funders—for a groundbreaking four-year effort that would shape the future of Pittsburgh's urban ecosystems. This visionary work led to the formation of the Nine Mile Run Watershed Association (now UpstreamPgh) in 2001.

Their impact was profound. The Nine Mile Run Aquatic Ecosystem Restoration Project, completed in 2006, protected and saved a 2-mile stretch of Nine Mile Run from being enclosed in a culvert during the development of the Summerset at Frick Park housing development. Further, the Nine Mile Run Greenway extended Frick Park to the Monongahela River and became a model for urban stream restoration, celebrated to this day as one of the U.S. Army Corps of Engineers' most successful and well researched urban stream restorations.

Since then, UpstreamPgh has expanded its focus while staying true to its roots. They have monitored and maintained Nine Mile Run's restoration area, installed large-scale green infrastructure in the upper watershed, and tackled water challenges across the region, from sewage overflows to contaminated drinking water. In 2020, the organization rebranded as UpstreamPgh to reflect their broader mission.

Today, UpstreamPgh strives to be the region's leading water resource nonprofit through a three-tiered approach:

- Hyper locally, by deepening our work in the East End's neighborhoods.
- County-wide, by uniting ecological activism and environmental justice movements.
- Regionally, by advocating for federal investment in the Ohio River basin and headwaters.

At the heart of UpstreamPgh's work is the belief in connection—between individuals, nature, and communities. Through these time-tested strategies that started it all, UpstreamPgh is using its 25 years of expertise to create healthier ecosystems and communities for future generations.

1998

Nine Mile Run River Conservation Plan

A foundational document that proposed the ecological restoration of the heavily degraded Pittsburgh stream, advocating for naturalized flood control and watershed health improvements.

2014-2025

RRRP Study

A community-based green infrastructure project in the Nine Mile Run watershed focused on installing green infrastructure and control measures to reduce and slow the volume of stormwater runoff contributing to local flooding and sewer overflows.

2018

Nine Mile Run Watershed Forest Master Plan

Established a strategic framework to leverage the watershed's existing urban forest as a critical piece of green infrastructure for managing stormwater runoff, improving stream health, and fostering municipal coordination across the communities.

2019

Nine Mile Run Hydrology Report

Created an essential GIS-based modeling tool to accurately map stormwater runoff and calculate peak flow estimates across the entire watershed, to strategically identify and prioritize sites for implementing Green Stormwater Infrastructure.

2020

Nine Mile Run Environmental Equity Study

Combined data on social vulnerability, public health, and environmental quality to strategically prioritize locations for green infrastructure projects where they would have the greatest social and environmental impact in under-served communities.

2021

Negley Run Environmental Equity Study

A Green Stormwater Infrastructure Suitability Index made up of public health, social vulnerability, and flood risk data, to ensuring that future environmental investments are prioritized in the most historically under-served neighborhoods.

2024

Fern Hollow Vision Plan

Since the Bridge collapsed in 2022 UpstreamPgh has worked with Neighborhood Allies Social Impact Design team on a community-led vision plan that incorporates placemaking, ecological restoration and accessibility into two project locations within the Fern Hollow Valley.

2026

Fern Hollow Creek Comprehensive Water Resources Master Plan

Building off of the Fern Hollow Vision Plan, and in partnership with the U.S. Army Corp of Engineers, City of Pittsburgh and Ethos Collaborative, this project aims to restore flow and function to Fern Hollow Creek and guide future restoration projects.

A LEGACY OF TRANSFORMATION

UPSTREAMPGH'S PAST PROJECTS

$15,023,381
in state and local grants raised

105
green infrastructure projects built

1,269
trees planted

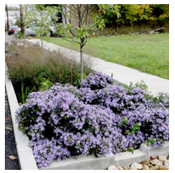
5,126
rain barrels installed

7,095,000
gallons of water managed

RIGHT PAGE Past projects completed by UpstreamPgh (interactive map can be found here: https://evolveea.maps.arcgis.com/home/item.html?id=9d7159b8df74455baeebfb9d1326299e)

Dornbush
The Dornbush Green Stormwater Infrastructure Project was completed in the Spring of 2024. This project intercepts an estimated 1.7 million gallons of runoff, 0.11 pounds of Nitrogen, 0.25 pounds of Phosphorous and 0.0351 tons of sediment annually from Dornbush Street, the 2nd steepest street in Pittsburgh. This project was made possible through funding from the Pennsylvania Department of Environmental Protection Growing Greener grant program, the Heinz Endowments and the Urban Redevelopment Authority of Pittsburgh.

Crescent School
The Crescent Early Childhood Center Rain Garden was built as part of the Rosedale Runoff Reduction Project. Completed in 2017, the $117,815 design and construction project was funded by PA Department of Environmental Protection, Richard King Mellon Foundation, and The Heinz Endowments.



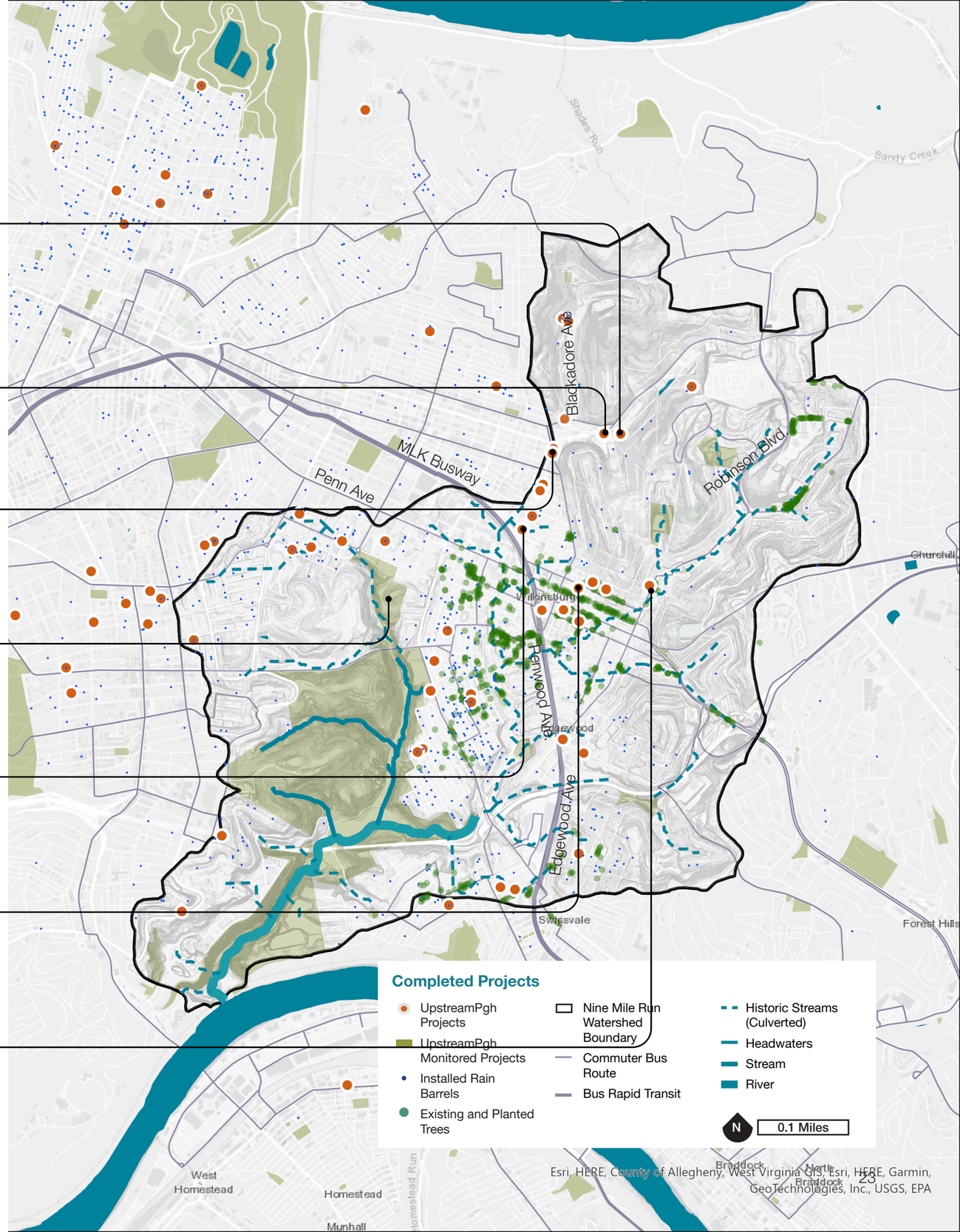
Oakwood-Batavia
This project was completed in 2016 as part of the Rosedale Runoff Reduction Project. This project was funded by the Commonwealth Financing Authority, Richard King Mellon Foundation, and The Heinz Endowments.

Fern Hollow Restoration
Building off of the Fern Hollow Vision Plan, and in partnership with the U.S. Army Corp of Engineers, City of Pittsburgh and Ethos Collaborative, this project aims to restore flow and function to Fern Hollow Creek. This actionable and comprehensive plan will guide future restoration projects in Fern Hollow.

Rosedale Hill
The Rosedale Hill Gardens were completed in the Fall of 2021 but began in 2017. Two once vacant lots were transformed into a community space with funding from Operation Better Block Neighborhood Partnership Program sub-grant, URA Neighborhood Improvement Fund grant, and Love Your Block grant.

Wilkinsburg Stormwater Resilience Project
In an effort to reduce stormwater runoff in the Wilkinsburg Business District, two large publicly owned municipal parking lots have been retrofitted with rain gardens and bioswales in place of concrete medians. Phase I – South Avenue was completed in 2023, and Phase II – Wallace Avenue in 2024. Combined, these project manage 1.7 million gallons of stormwater, 2.8 pounds of Nitrogen, 3.4 pounds of Phosphorous and 8.8 tons of sediment annually.

Swissvale Hill
Completed in September of 2021 this project is located on 3 vacant lots owned by the Borough of Wilkinsburg. The total cost of this project was $125,000, including design and construction, which was only possible through generous funding from the Richard King Mellon Foundation and the Heinz Endowments.



BY THE NUMBERS

Numbers calculated below are an aggregate of data collected for each project site.

Water Capture Opportunities

183
vacant lots[1]

3.8 million sf
impervious area[2]

99,066 ft
streetscape[2]

10
parks & open spaces[1]

6
parking lots[1]

81
parcels in public ownership[1]

Environmental Justice Considerations

43.4%
employment[3]

68.4%
renters[4]

$37,400
median income[5]

4,471
impacted residents[2]

60% area
historically redlined[6]

22.3%
cost burdened households[2]

[1] Allegheny County Real Estate Assessment, 2025
[2] Consultant Team, 2025
[3] American Community Survey, Civ. Pop Employed 16+, 2023
[4] American Community Survey, Renter Households, 2023
[5] American Community Survey, Median HH Income, 2023
[6] University of Richmond's Digital Scholarship Lab

A FUTURE OF REGENERATION

UPSTREAMPGH'S RIPPLE PLAN

Water Capture Districts

1 Frankstown-Bennett Water District

Frankstown–Bennett is a busy corridor where roads, businesses, and buried streams concentrate stormwater, contributing to flooding and sewer backups. Improvements along streets, parking areas, and nearby open spaces can extend UpstreamPgh's existing efforts to manage stormwater and can make a safer, more walkable district.

2 Rockwell Park to Wilkinsburg Water District

Rockwell Park to Wilkinsburg is a relatively flat area with light industrial and main street commercial uses and is the largest impervious area in the shed. Increased investment and redevelopment can be directed to support new open spaces, street improvements, and private property upgrades to create a connected network of green stormwater infrastructure.

Valley Park Projects

3 Hunter Park

Hunter Park is a neighborhood park where rainwater naturally flows, making it an ideal place to manage stormwater in ways people can see and enjoy. The park is slated for investment, where the community can engage in the design of play areas and fields that capture on site stormwater as well as water from the adjacent properties and right-of-ways.

4 East Hills Park & Park Hill Drive

East Hills Park and Park Hill Drive include a school campus, park space, and surrounding homes where rainwater moves quickly downhill, contributing to erosion and flooding. The community is engaged in planning improvements to school grounds, park areas, and streets. This project can capture stormwater on site and from nearby roads and properties.

5 Turner Intermediate School

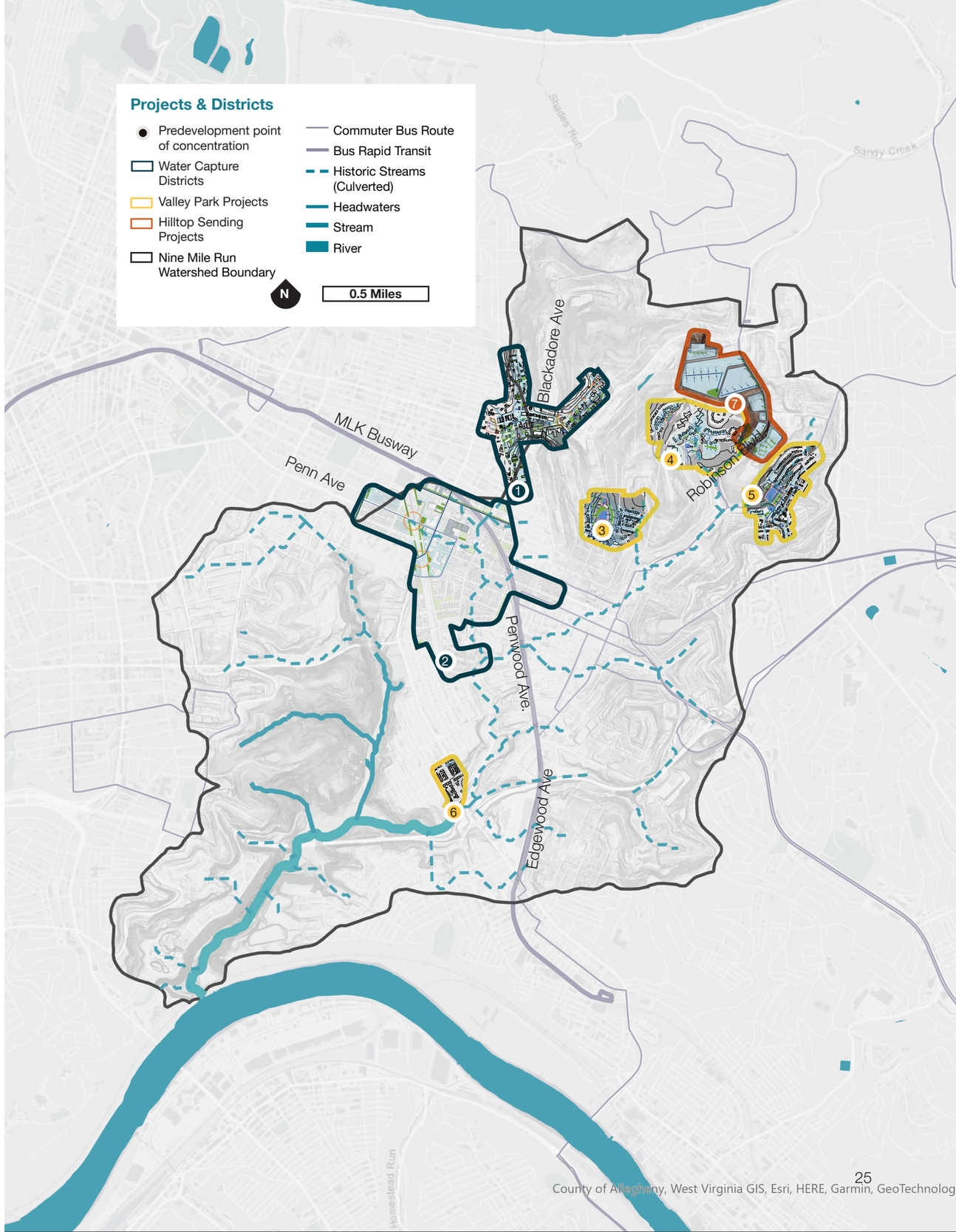
Improvements to the schoolyard, fields, parking areas, can store on-site rain as well as capture runoff from nearby roads. The community has identified a need for field upgrades, making this an ideal opportunity for visible learning and environmental benefits for students and the surrounding neighborhood.

6 Nine Mile Run Outflow

The Nine Mile Run Outflow is where stormwater from across the watershed exits the culvert and becomes an open channel stream within Frick Park. Improvements at and upstream of this location can reduce concentrated discharges that contribute to infrastructure damage while creating a more welcoming and visible entry to the park and celebrate the restored Nine Mile Run.

Hilltop Sending Properties

7 Hilltop "Sending" Properties are private properties at the highest points of the watershed that generate significant stormwater runoff, including large parking lots, vacant parcels, and vehicle storage areas. Private investment in green infrastructure reduces runoff at its source and helps relieve pressure on sewers and flooding downstream.



HOW WE CHOSE OUR PROJECTS

The POSSIBLE–PROBABLE–PREFERRED framework guided project selection by exploring opportunities, assessing likelihood, and identifying priorities for implementation.

POSSIBLE

All POSSIBLE projects were mapped to find a wide range of future opportunities informed by physical, social, and economic trends.

Possible scenarios were studied through computational suitability analysis, GIS-based environmental justice analysis, landscape structure and patterns, and, most importantly, the community's experience of water-related issues.

PROBABLE

Next, infrastructure, performance and policy trends were analyzed to identify PROBABLE projects — ones that were likely to occur or most urgently needed.

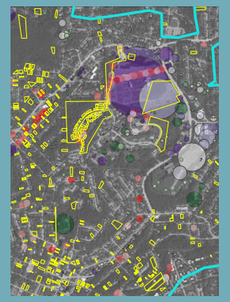
The probable phase identified projects that have momentum, including those with committed stewards, available or emerging funding, institutional support, or strong community advocacy that make them most likely to move forward. Projects without momentum but of great importance, are also elevated.

PREFERRED

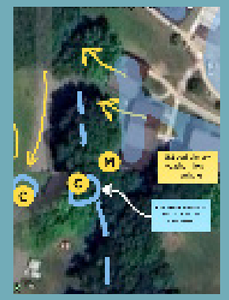
Lastly, the technical analysis, community values, and environmental goals were synthesized to select PREFERRED projects.

The preferred projects matched UpstreamPgh's and its partners' capacity to implement and maintain the infrastructure and addressed community needs. The project team identified the policies, partnerships, and resources needed for long-term success.

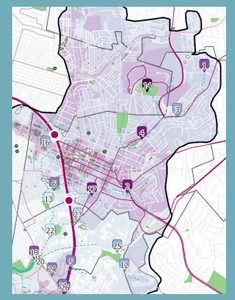
Computational analyses identified opportunities



The GROUND Method examined landscape structure and patterns



Environmental justice analyses mapped social issues



The POSSIBLE phase identified shed-wide Green Stormwater Infrastructure typologies and community criteria.

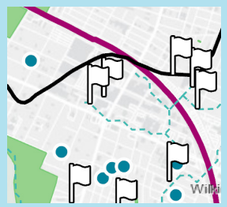
Community & Partner Engagement

- Community watershed survey
- Community focus groups
- Opportunities mapping survey

Shortlisted projects

Policy review

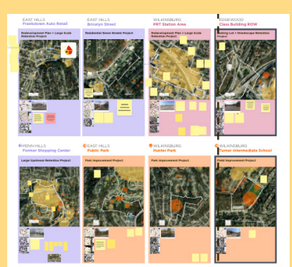
Community input



The PROBABLE analysis refined these opportunities into a short list of projects.

Community & Partner Engagement

- Municipal focus groups
- Target neighborhood interviews
- Community watershed survey (continued)
- Opportunities mapping survey (continued)



PROJECT EVALUATION CRITERIA

Improve downstream water issues

Solve adverse upstream water-related issues.

Improve human and ecological health.

Increase economic opportunity.

Create culturally restorative places.

The PREFERRED phase prioritized project areas where coordinated action could begin.

Community & Partner Engagement

- Public open houses
- Site walks and sidewalk chats
- Community watershed survey (continued)
- Opportunities mapping survey (continued)

Computational Analysis

The Computational Analysis identifies high runoff areas and sites that could receive stormwater.

Opportunity Factors

- Impervious surfaces
- Flow accumulation patterns
- Flat or gently sloped areas
- Soils with moderate to high infiltration potential
- High sun exposure (solar aspect)
- Vegetated areas
- On-site paved areas (parking lots, plazas etc.)
- Right of way paved areas (streets, alleys, sidewalks etc.)

Exclusion Factors

- Dense tree canopy
- Existing buildings
- Cemeteries
- Wetlands
- Railroads

Integrating geospatial analysis and satellite imagery builds a foundation for computational analysis to identify physically suitable GSI areas, and their degree of feasibility. The consultant team have defined" opportunity factors" and "exclusion factors", which are combined to calculate a ranked, aggregate score for the buildable area. Opportunity factors are infrastructural or environmental features that have the physical capabilities to host GSI and those that experience varying environmental degradation. Exclusion factors define areas that do not have the infrastructural or environmental capabilities to host GSI.

The buildable area is defined as the multiplicative product of six binary exclusion factors. An area must pass all six tests to be considered buildable.

1. Not Buildings- Excludes existing building footprints
2. Not Roads- Excludes road rights-of-way (for non-streetscape types)
3. Not Cemetery- Excludes cemetery parcels
4. Not Wetlands- Excludes mapped wetlands
5. Tree Canopy- Excludes areas with dense canopy (see below)
6. Not Railroad- Excludes railroad corridors

The result is binary where 1 indicates buildable land and 0 indicates excluded land. All subsequent suitability composites are multiplied by this mask, ensuring that excluded areas receive a score of zero regardless of other factors.

Opportunity Factors in the computation are statistically normalized and reclassified to a 0-to-1 scale.

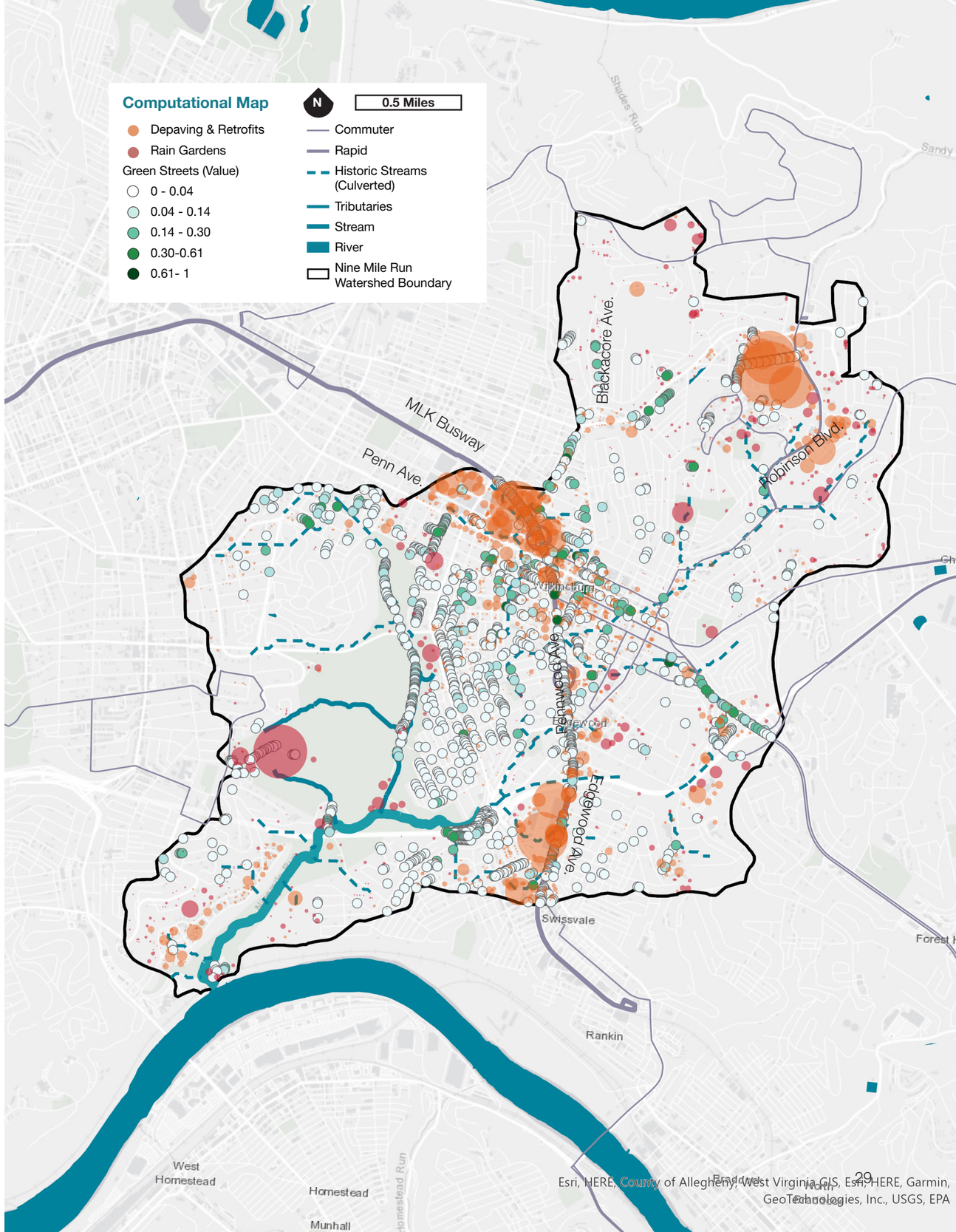
Calculated Project Opportunities

There are three typologies of Green Stormwater Infrastructure that are identified using this analysis:

Depaving and Retrofits.
Depaving opportunities target existing paved surfaces (excluding roads and buildings) within the buildable area. These points identify areas with impervious percentage at or above 70% that are neither roads nor buildings. Slope is included to favor sites where grading and drainage modifications are practical.

Rain Gardens.
Rain gardens and bioretention facilities require open, vegetated land with adequate solar exposure, moderate-to-gentle slopes, and soils capable of supporting infiltration. These points identify buildable area and the flow accumulation layer at the given scale. The weighting prioritizes slope as the dominant physical constraint, with solar exposure and soil permeability as secondary factors.

Green Streets.
Green street interventions target existing road corridors. Because these projects occur within the road right-of-way, the buildable area (which excludes roads) is not applied. These points identify road segments where stormwater flow accumulates and slopes permit curb-cut or bioswale installation.



GROUND Method Analysis

The GROUND Method identifies spatial trends that gauges water performance in data-scarce areas.

Evaluation Factors

- Topography
- Hydrology
- Slope, soils, and vegetation
- Imperviousness
- Density and land use
- Parcel ownership
- Zoning and regulations
- Investment & development activity
- Infrastructure
- Governance and administration

The GROUND Method—short for Go Review On-site Urban + Natural Dynamics—examines the physical structure of a watershed to understand how it functions. By analyzing historic and existing topography, hydrology, and development patterns, it reveals how water moves and interacts with the built environment, including dynamics that are not always visible at the surface.

The method identifies hydrological typologies—areas with similar landforms and infrastructure that behave alike during rain events—helping explain patterns of flooding, sewer backups, and erosion across the watershed. These typologies also inform design, maintenance, and management strategies by showing where similar solutions are likely to be effective.

In this plan, the GROUND analysis identified four stormwater management areas with distinct green infrastructure strategies. Combined with environmental justice analysis and the prioritization tool, the method helped focus investment on practices and locations most likely to succeed while defining the structure of the watershed as a connected system rather than a collection of isolated sites.

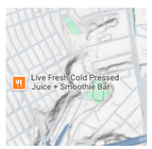
Hydrological Typologies

There are four hydrological typologies that describe the structure of this watershed:

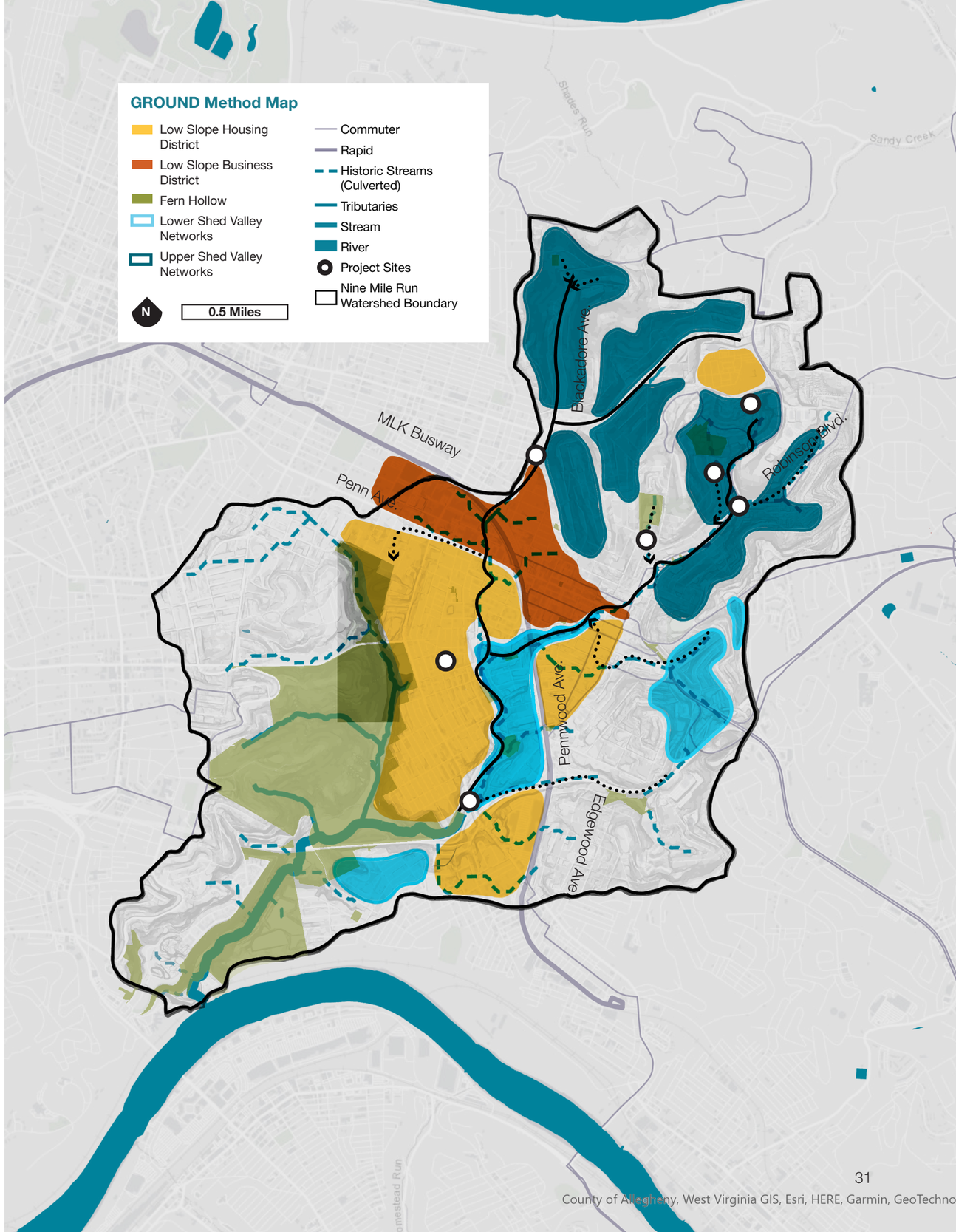
Upper shed valley networks.
Narrow valleys and steep hillsides in the upper watershed with larger subshed areas. Stormwater moves quickly through these areas, often causing localized flooding and sewer backups. Individual parcels are typically poorly suited for on-site retention, making networked systems necessary to capture and manage runoff effectively.

Low slope commercial district.
Relatively flat, privately owned commercial areas with high impervious surface coverage. Flooding and backups are typically localized but may be less acute than in steeper areas. On-site stormwater and right-of-way retention is technically possible but often economically challenging, requiring supportive policies, incentives, or cost-sharing programs to reduce upfront costs.

Low slope residential district.
Relatively flat, primarily privately owned residential areas with yards and low lot coverage. Flooding and sewer backups tend to be localized. On-site and right-of-way stormwater retention is feasible, and investment in green stormwater infrastructure is more likely where property values are higher. Networked systems are generally less viable due to limited slope and lower availability of public open space to receive the water.



Lower shed valley network.
Small valley systems in the lower watershed with relatively limited subshed areas. These areas experience flooding and sewer backups as runoff concentrates. Adjacent parcels may retain some stormwater, but coordinated, networked systems are more effective for capture and storage. In some locations, proximity to the open stream creates opportunities for redirection and restoration.



Environmental Justice Analysis

The Environmental Justice analysis shows where water-related impacts fall hardest on people and communities.

Ecological Vulnerability Factors

- Proximity to industry
- Within a floodplane
- Basement back ups
- Areas prone to landslides

Economic Vulnerability Factors

- High unemployment rate
- Low median income
- High percentage of renters
- Cost burdened homeowners
- Cost burdened renters
- Redlined communities

While UpstreamPgh is known as a an advocate for stormwater management best practices, what sets the organization apart is its commitment to facilitate a positive relationship between people and water. In addition to addressing the geographic factors that contribute to flood prone areas, it is important to understand the personal impacts of flooding that put a strain on this relationship.

This analysis quantifies the ecological and economic household factors, where living near an abundance of water will leave them vulnerable to negative impacts. Vulnerability refers to the degree to which individuals and communities are exposed to environmental stressors and lack the capacity to anticipate, cope with, and recover from their impacts—particularly those related to water systems.

Throughout Allegheny County, vulnerability is deeply rooted in systemic environmental injustices; Black and marginalized communities are disproportionately affected by aging infrastructure, historical disinvestment, and the compounding effects of climate change.

Within the Nine Mile Run watershed the hillside areas that have long experienced flooding and erosion are also the areas found to have the greatest number of compounding Environmental Justice factors. These areas would gain the most from strategic interventions that reduces flood risk, enhances public spaces, and, most importantly, creates resilient systems that address long-standing infrastructure challenges.

Long-term success will depend on strong relationships with residents, community organizations, and municipal partners, and aligning site-based solutions with funding opportunities to maximize impact across the watershed.

Environmental Justice Themes

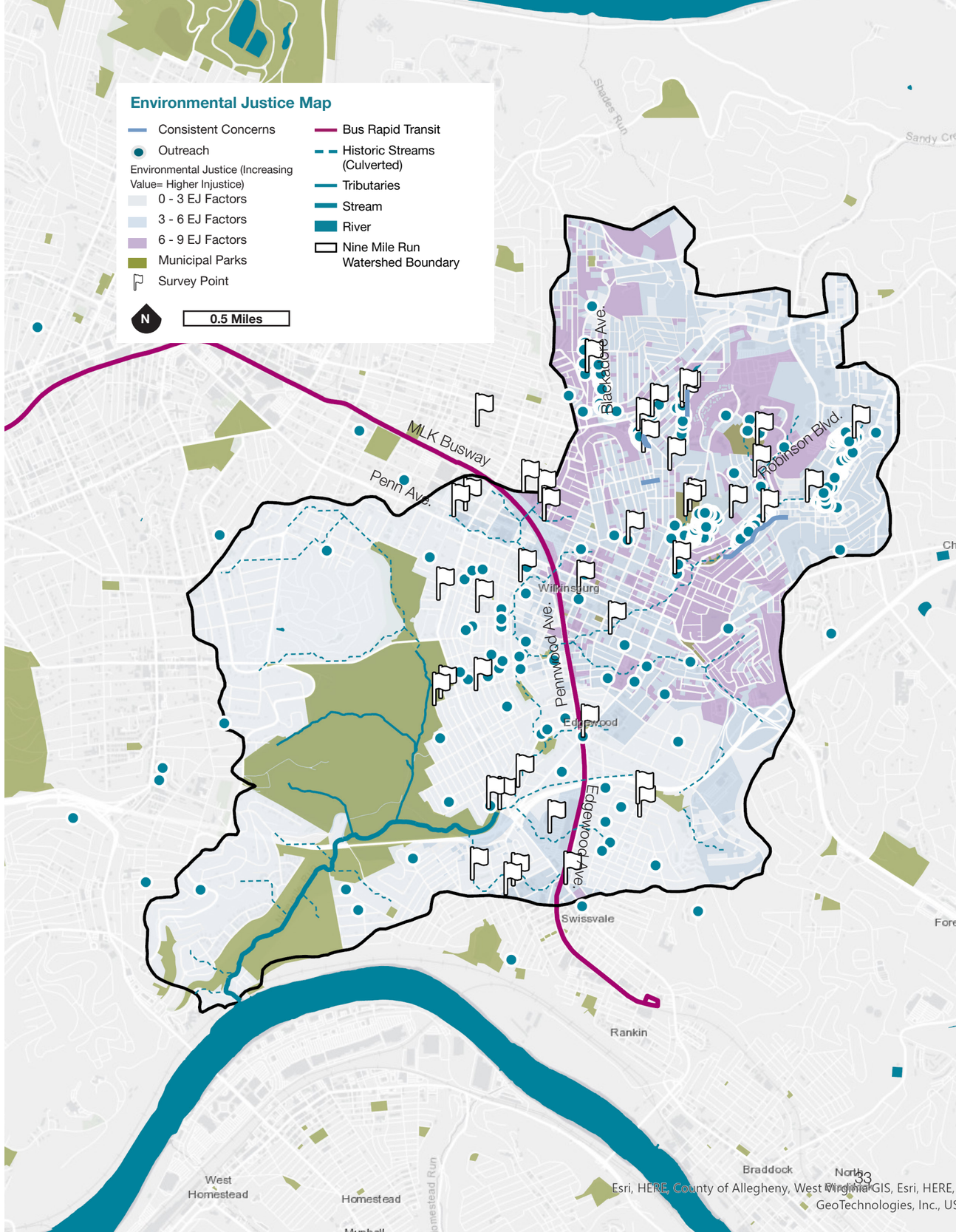
Based of data gathered from the site analyses, community surveys, and intentional outreach indicate, here are some recommendations:

Continue engaging residents who have already participated in this process
Especially those that are directly impacted and best positioned to offer critical insights as projects evolve. Their lived experience brings forward additional solutions and ensures that proposed strategies respond to real, ongoing challenges.

Prioritize projects that directly serve communities facing the greatest need
Particularly those that have endured chronic flooding, decades of delayed investment and having to abandon their homes as a result. These communities should no longer be asked to wait while climate risks intensify and infrastructure continues to fail.

Communities should not be financially burdened
Consider the long-term maintenance and upkeep of future projects; every investment must include a dedicated budget and sustainability plan to ensure solutions remain effective, affordable, equitable and be held accountable over time.

Advance solutions that protect water quality across the watershed
Ensuring the safety of rivers and the drinking water systems that the region relies on daily.



Community Feedback

As of December 2025

Over the summer, UpstreamPgh went to over 200 homes to hear about the water places and water priorities that are most meaningful to the people who live there.

This map displays public survey data points from the two surveys distributed as part of the public input process. The issue based Watershed Survey is marked by the blue dots, where UpstreamPgh canvassed and received responses about how residents perceived their watershed issues. The place-based Opportunities Survey is marked by white flags, and are tagged to locations that were residents saw potential opportunities or challenges for stormwater management.

The team's efforts were concentrated around the environmental justice areas in the north-eastern section of the watershed. While the survey was open to anyone who would like to participate, the project team focused a door-to-door effort on the residents who live within walking distance of shortlisted project opportunities. It was important to not only select high impact project sites, but to hear first hand accounts for those who are most impacted.

Engagement events include:

4
Interested partner meetings

01
Public open house

22
Community pop up meetings

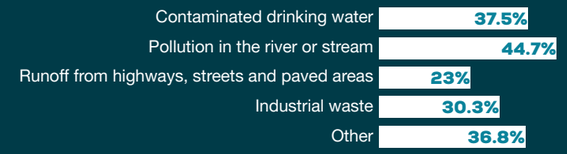
04
Municipal focus groups

230
Doors knocked

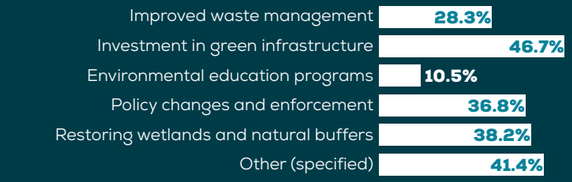
63
Survey respondents from canvassing

Community Watershed Survey Highlights

What specific environmental issues most concern you regarding water quality in the watershed?

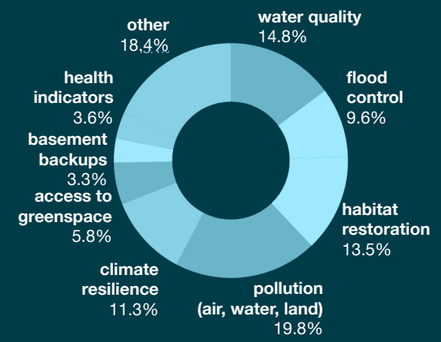


What type of solutions or actions do you think would be the most effective in addressing comments or concerns about environmental justice in your watershed?

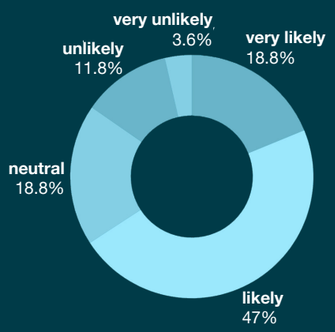


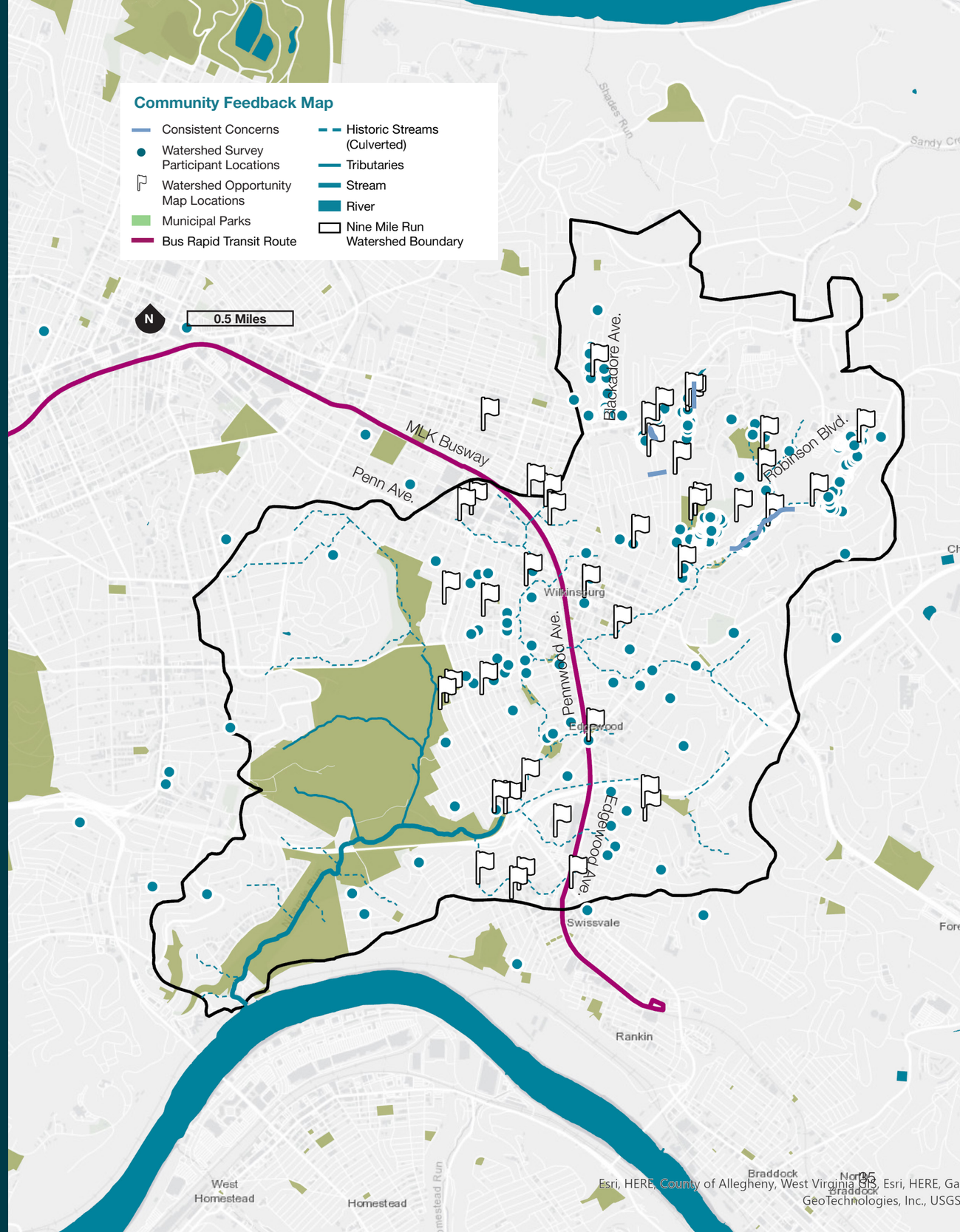
What types of environmental issues do you think should be addressed first in your area?

Residents who selected "Other" noted abandoned homes, loose trash and pest infestations (eg. raccoons an rats) as their most concerning environmental issue.



In your opinion, how likely is it that your neighborhood will experience flooding in the next year?





WHAT IS A GREEN STORMWATER INFRASTRUCTURE NETWORK?

Structuring A GSI Shedwide System

Many individual properties or sites have limited ability to store or infiltrate significant volumes of stormwater, due to steeps slopes, constrained spaces, and soil limitations. As such, networked GSI that chains together numerous small GSI projects, presents an impactful and compelling alternative with regards to site selection. Networked GSI facilities distribute storage over a larger geographic area, while simultaneously providing managed conveyance links for overflow / flood mitigation during large storms and reduced volume / improved treatment trains during smaller ones. In essence, networked GSI functions as a microshed, with the size determined by the capture area, the availability and capacity of the receiving site, and natural hydrological patterns such as overland drainage patterns, small channels, street gutters, and similar, that define the drainage network that can connect to it.

Ecological and urban systems can be complex, preventing municipalities and agencies from ultimately reaching a meaningful scale for neighborhood and regional stormwater management.

ABOVE Wightman Park in Squirrel Hill (Ethos Collaborative, Pashek)

Managing shedwide GSI installations as a system can help standardize design practices, construction details, and long-term maintenance needs.

Networked and Non-Networked GSI

The UpstreamPgh projects distinguish between networked and non-networked green stormwater infrastructure (GSI) to clarify how individual interventions contribute to watershed-scale outcomes.

Non-networked systems such as individual, isolated rain gardens, green roofs, and parking lot retrofits, manage runoff at the site level, reducing localized flooding and improving infiltration. These installations are often implemented during redevelopment or as small public projects, providing visible environmental benefits but limited cumulative impact given their isolated nature.

Non-networked projects often serve as demonstration sites that build local support, while networked systems require coordination across properties, agencies, and funding sources.

In contrast, **networked systems** connect multiple GSI elements through rights-of-way, open spaces, or coordinated sub-watershed planning. By managing water as a linked system rather than as a series of discrete fixes, networked GSI can store and convey runoff more efficiently, relieve pressure on sewers, and restore hydrological continuity. These systems also open opportunities for multi-benefit design—integrating mobility, habitat, and public space improvements.

Wightman Park in Squirrel Hill is an example of a networked system. Right of way conveyance and green infrastructure was paired with GSI improvements in the Park that allowed storm water runoff from 1.25 acres to be captured and treated in the park before it could enter the sewer system. These improvements reduced basement backups and localized street flooding in the area and improved a beloved neighborhood park.

Networked GSI can also be instrumental in addressing projected climate impacts by allowing designers to effectively maximize / optimize performance of new facilities, which in turn can reduce storm-related burdens and extend the lifespan of existing storm sewer infrastructure.

In cities like Pittsburgh, much of the constructed below-grade storm infrastructure was constructed between 1900 and 1920, predating modern design codes and best practices. As a result, areas throughout the city where sewer and flood infrastructure is chronically undersized, experience patterns of frequent flooding, basement backups and sewer capacity issues, even without future climate considerations.

In addition, even infrastructure that was designed to relatively recent design standards, set between 1970 and present, can be problematic with regards to projected climate-influenced precipitation patterns. These design standards are typically based on historic data, and do not take into consideration the impacts of future climate projections with regards to flooding, landslides, erosion, and urban heat island effects.

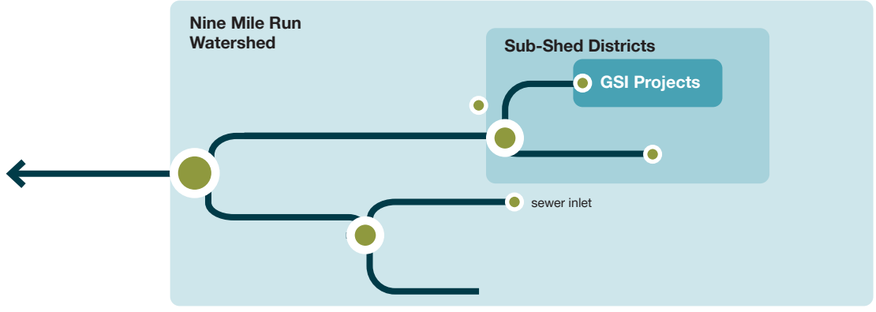
Networked and non-networked GSI form the foundation of a distributed, shedwide infrastructure strategy—one that scales individual actions into measurable watershed resilience. However, implementing GSI at this scale is not just a technical challenge. The greatest limitations are often scale and stewardship: how systems are organized, maintained, and supported over time.

This raises three guiding questions for implementation:

- What is the optimal scale for managing stormwater as a system?
- How can maintenance and operations be coordinated and sustained?
- Who is best positioned to implement and steward these systems over the long term?

Municipalities exhibit varying levels of stringency in their stormwater codes, with some demonstrating more progressive approaches than others. Most notable is the institution of a stormwater fee, which collects a fee based on the number of gallons sent into the sewer system, and is exclusively used to repair and replace aging catch basins. Advocating that a portion of this fee be directed toward Green Stormwater Infrastructure (GSI) development significantly influences municipal GSI implementation and positions UpstreamPgh to serve in a supportive and advisory capacity rather than as the primary developer.

Network scale and stewardship strategies shape how UpstreamPgh and its partners shift from individual projects to managing a watershed system.



Green Stormwater Infrastructure (GSI) Technologies

Green stormwater infrastructure can be managed within a property's boundaries or within the public right-of-way. Here are some typical infrastructure types.

ON-LOT INFRASTRUCTURE

Rain Barrels. A rain barrel is a water tank used to collect and maintain rainwater runoff, usually from the rooftops through the rain gutters. The collected water can be used for several non-potable water uses, such as: garden irrigation, flushing toilets and car washing.

Pros: Simple and relatively low-cost to install, conserves water for irrigation, reduces runoff from rooftops, and increases public awareness of water stewardship at the household level.
Cons: Overflow during large storms, requires regular maintenance (cleaning, winterizing, mosquito prevention); improper installation can lead to leaks, foundation issues, or stagnant water problems.

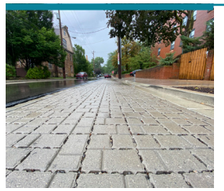
Bioswale. A linear vegetated channel that slows, filters, and conveys stormwater, often located along streets, parking lots, or other paved corridors. Bioswales use engineered soils, vegetation, and gentle slopes to promote infiltration, remove pollutants, and reduce runoff volumes.

Pros: Visibly manages runoff, improves water quality, and enhances streetscape ecology with native plants.
Cons: Requires adequate space, proper grading, and consistent maintenance; volunteer care can vary in quality, while professional management demands multiple installations with standardized planting for efficiency.

Street Trees Sidewalk Improvements. Tree trenches and permeable sidewalk systems that capture runoff while supporting urban canopy growth. These systems require engineered soil volumes, root paths, and subsurface drainage to balance tree health with stormwater performance and structural stability.

Pros: Provides shade, air quality benefits, and visible green infrastructure.
Cons: Root–infrastructure conflicts and ongoing care costs can be challenging; performance depends on proper design, soil conditions, and long-term maintenance.

PUBLIC RIGHT-OF-WAY INFRASTRUCTURE



Porous Paving. Permeable asphalt, concrete, or modular pavers that allow water to pass through to underlying soils or below-grade conveyance systems. These surfaces are designed with structural layers that store and slowly infiltrate runoff, reducing peak flows and improving water quality.

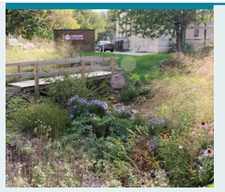
Pros: Reduces surface runoff and supports groundwater recharge while maintaining usable pavement; can improve existing drainage and surface conditions.
Cons: Susceptible to clogging without regular maintenance; performance can decline in freeze–thaw climates; porous street paving requires a specialized cold-weather maintenance regimen.

Below Grade Conveyance. Pipes or engineered channels that redirect stormwater underground to manage flow or connect multiple GSI sites. These systems must be designed to maintain adequate slope, capacity, and access points for inspection and maintenance while preventing sediment buildup and hydraulic bottlenecks.

Pros: Efficiently moves water away from flood-prone areas; adaptable to existing networks.
Cons: Hidden and expensive to maintain; offers no visible community benefit; disruptive and costly; ownership is unclear.

Street Curbline Conveyance. Curbline channels or "street creeks" direct runoff toward inlets, storage areas, or green infrastructure systems. These systems must be hydraulically engineered so that water flow is within traffic safety limits during minor storms, while still conveying to inlets or downstream BMPs.

Pros: Cost-effective and visible system that simplifies maintenance and reduces underground infrastructure; allows controlled surface flow to green infrastructure.
Cons: Requires precise grading and frequent cleaning; limited capacity for large storms and potential safety or icing issues if not properly designed.



Rain Gardens. Small, bowl-shaped planting areas that collect and infiltrate runoff from roofs, driveways, or other impervious surfaces. These systems rely on engineered soils and native vegetation to filter pollutants and promote groundwater recharge while providing localized flood reduction.

Pros: Cost-effective, visually appealing, and supports pollinator habitat; can be integrated into residential and community-scale landscapes.
Cons: Limited storage capacity; performance depends on soil conditions and proper grading; maintenance often falls to volunteers, and professional management requires many installations with standardized plantings to ensure efficiency.

Below-Grade Storage. Underground chambers, tanks, or modular systems that temporarily hold stormwater before infiltration, treatment, or controlled release. These systems are typically used where surface space is limited and can be integrated with other infrastructure such as parking lots or streets.

Pros: Maximizes storage capacity in dense urban areas; hidden from view, preserving usable surface space; helps meet regulatory storage and release requirements.
Cons: Expensive to install and maintain; provides little ecological or aesthetic benefit; requires regular inspection to prevent sediment buildup and ensure functionality.

Street Bump-outs Curb extensions. These systems are designed with curb cuts, engineered soils, and underdrains to collect, treat, and slowly release runoff while also calming traffic and improving pedestrian visibility.

Pros: Improves pedestrian safety and adds visible green infrastructure.
Cons: Can reduce on-street parking and complicate snow removal or traffic flow; requires careful grading and coordination with utilities to function effectively.

Green Alleys. Retrofits of alleyways using permeable paving, drainage channels, or vegetation to absorb and filter runoff. These systems typically require subgrade reconstruction and coordination with existing utilities to ensure adequate infiltration, load-bearing capacity, and long-term performance.

Pros: Utilizes underused spaces for stormwater management; can enhance neighborhood aesthetics and reduce localized flooding.
Cons: Access constraints and buried utilities can limit feasibility; construction can be disruptive and costly, and maintenance responsibilities may be unclear.

Separated Storm System. Infrastructure that separates stormwater from sanitary sewage, reducing combined sewer overflows. These systems require dedicated stormwater pipes, inlets, and outfalls, and must be carefully coordinated with existing utilities to ensure proper flow routing, slope, and maintenance access.

Pros: Greatly improves water quality and system reliability.
Cons: Costly and disruptive to install; limited opportunities for ecological enhancement, cannot re-enter the combined system to be effective (possible when low in the watershed or near an open channel).

Water Integrated Public Art. Design features that merge artistic expression with functional stormwater capture, conveyance, or display—such as sculptural basins, interactive fountains, or visible drainage channels. These installations integrate into plazas, parks, or building frontages within the urban environment.

Pros: Enhances public spaces while performing stormwater functions; raises awareness of water systems and sustainability goals.
Cons: Requires close coordination among artists, engineers, and maintenance staff; can involve higher upfront costs and specialized upkeep.

03 PLACES

Although each community in the Nine Mile Run watershed has its own identity, water management is most effective when the work extends beyond political boundaries.

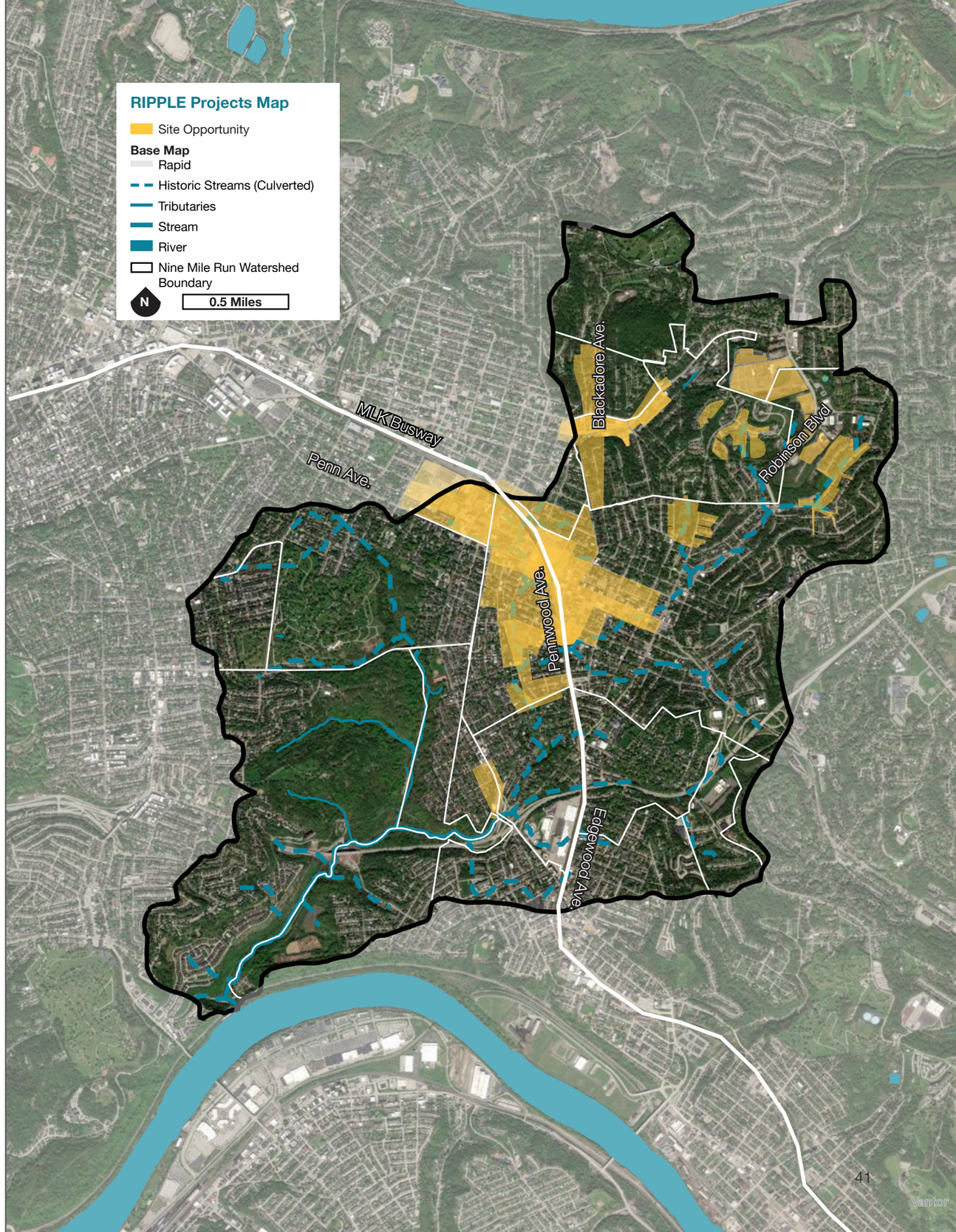
Although each community in the Nine Mile Run watershed has its own character, they are connected by a shared water system. Rain that falls in Pittsburgh, Swissvale, Edgewood, Braddock Hills, Forest Hills, Wilkinsburg, and Penn Hills ultimately flows toward Nine Mile Run, linking these municipalities through a common watershed.

This shared landscape requires shared action. Many municipalities already collaborate through the Municipal Separate Storm Sewer System (MS4) program administered by the Pennsylvania Department of Environmental Protection, which seeks to reduce pollution and stormwater entering the sewer network.

Through coordinated efforts such like the Regionalization Program, participating Municipalities within the M47 watershed can transfer ownership of any pipe ten inches or larger to ALCOSAN. The RIPPLE Plan builds on this cooperative structure by identifying projects that can be implemented across jurisdictions while strengthening relationships among partners.

This section summarizes seventeen (17) priority project opportunities that have been organized into three typologies: (1) Water Capture Districts, (2) Valley Park Projects, and (3) Hilltop Sending Properties. Each project includes a summary of existing conditions, possible design futures, community feedback and site specific evaluation metrics.

BELOW Volunteers collect trash from Nine Mile Run In Frick Park (UpstreamPgh)



WATER CAPTURE DISTRICTS

Across the watershed, Water Districts are where the city's hard surfaces and hidden valleys intersect—places where stormwater challenges are most visible and where the greatest opportunities for change exist.

Structure and Issues

These districts include both the narrow valleys, where historic streams now run underground along collector roads, and the flatter East End Plateau neighborhoods characterized by extensive impervious cover. Many are commercial or mixed-use areas with large roofs, parking lots, and minimal green space. During heavy rainfall events, runoff exceeds the system's capacity, leading to surface flooding and sewer backups that impact businesses and adjacent residential areas. The combination of low slopes, buried drainage routes, and high imperviousness creates chronic water management problems that degrade both public infrastructure and private property.

Green Stormwater Infrastructure Types

Opportunities within Water Districts range from localized, non-networked interventions—such as green roofs, rain gardens, and on-site detention—to networked systems that connect multiple sites through right-of-way improvements or shared open spaces. On public property, bioswales, tree trenches, and permeable pavements can capture and slow runoff before it enters sewers. On private sites, retrofits such as parking lot basins or green courtyards can complement public systems. Together, these approaches can create layered water networks that restore some of the natural storage and conveyance once provided by the valley landscape.

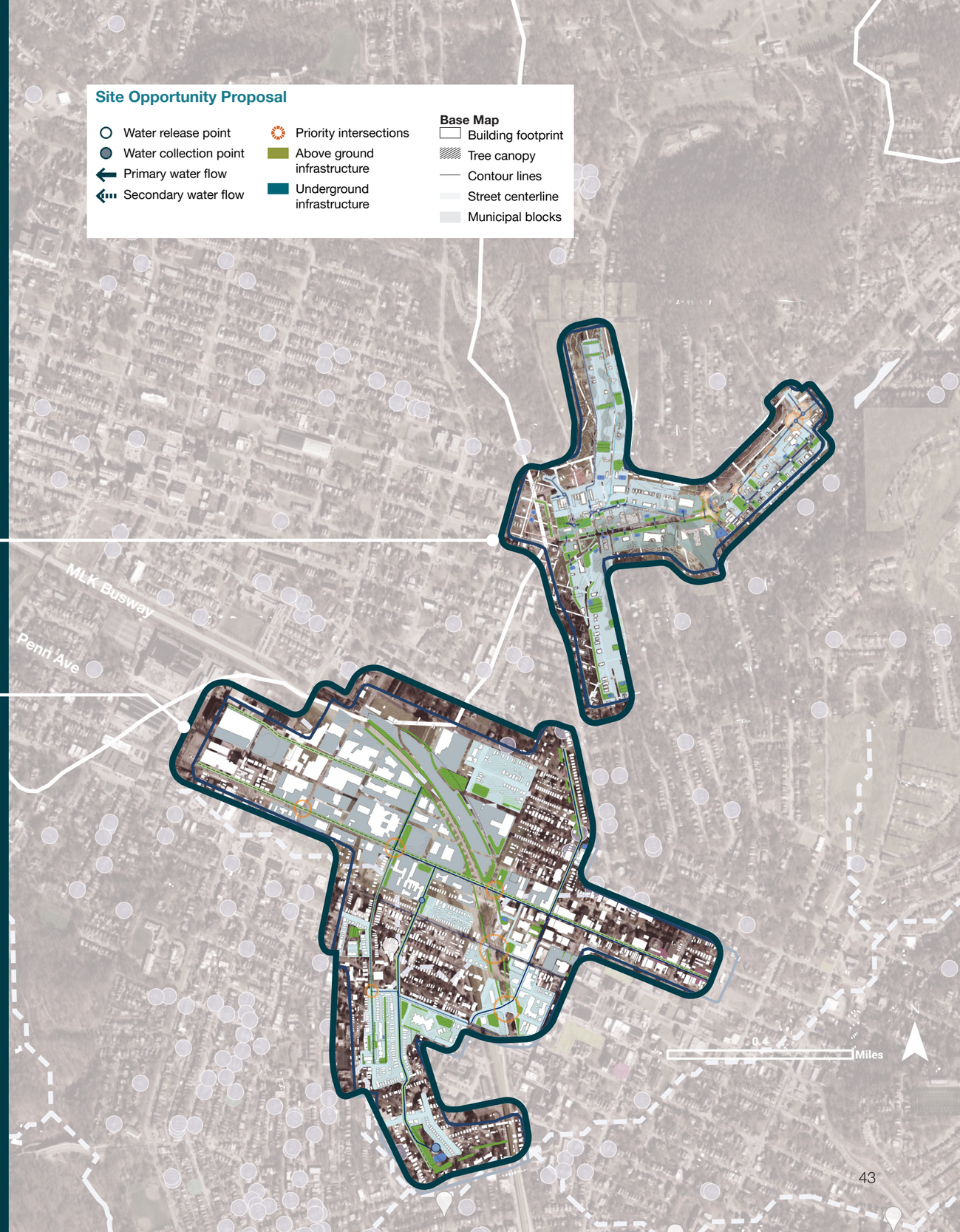
Variables and Challenges

The potential for implementing these systems depends heavily on local conditions. In districts experiencing reinvestment or densification, redevelopment can support code-driven stormwater improvements and fund integrated systems. In areas with low market value or economic stress, large numbers of vacant parcels provide spatial opportunities but lack financial capacity for implementation. These areas will require significant public and philanthropic investment to ensure equitable outcomes. Across all contexts, cost, maintenance responsibility, and coordination among property owners remain key challenges—but also opportunities to demonstrate how water can shape more resilient, connected, and livable districts.

BELOW Neighbors making art at Dornbush Street Block Party event in East Hills (UpstreamPgh)

Frankstown-Bennett Water District
- Bennett Light Industrial
- Angoria Blackadore Street Stream Pairing
- Exley Way
- Conemaugh Street

Rockwell to Wilkinsburg Water District
- Park and Ride Rosedale Cluster
- Light Industrial District on lot GSI
- Whitney Park and Kelly School Micronetworks
- Light Industrial District Green Streets GSI
- Wilkinsburg Business District



WATER CAPTURE DISTRICTS

Frankstown-Bennett Water District

What we heard

Many residents in this area reported water-related issues. Some spoke about flooding at the base of Blackadore Avenue and Frankstown Avenue, where there are storm drains packed with sediment. Others theorized that sediment washes off Perchment St, which is cobblestone. People noted small streams on Angoria Way and Wheeler St, with one person mentioning the stream on Wheeler smells like sewage. Residents were concerned about vacant lots, raccoons, cars speeding on Blackadore, and illegal dumping.

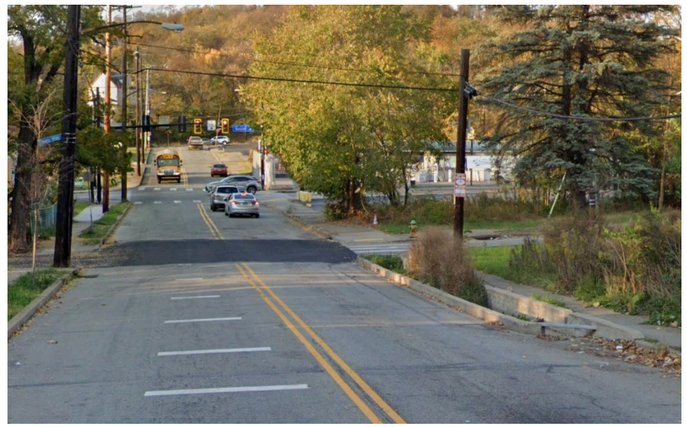
People noted that water collects in an alley behind Seagirt St (which is also behind Crescent School) and is directed towards homes, causing major issues during heavy rainfall. Water running off the steep slopes around Haverhill street is also a concern. People flagged the intersection of Seagirt, Bricelyn, and Tokay as very dangerous, especially given its proximity to a school.

Residents noted water flooding at the base of Wilkinsburg Ave, off Frankstown Ave, and down Bricelyn St. Some of the contributing factors are clogged storm drains on Wilkinsburg Ave and the lack of a street gutter on parts of Bricelyn Street. Residents were concerned about the abandoned vehicles, illegal dumping, and the lack of tree pruning and maintenance.

At the open house, residents asked to plan GSI up around Nimick Place, Haverhill St, and Fahnestock.

BELOW UpstreamPgh's green stormwater infrastructure at Batavia Street can be expanded in a networked system.

Frankstown Avenue and Bennett Street travel through a mixed use district that was home to many small streams and seasonal runs.



ABOVE Bennett Street at Oakwood Street

Water in the Frankstown-Bennett water district can be managed through networked infrastructure in the public right-of-way as well as with on-lot GSI installations.

Bennett Street On-lot GSI. Located along the southern edge of the district, this area includes several commercial and auto-related properties with large impervious surfaces. Runoff from these sites contributes to localized flooding and sewer backups. Introducing on-lot and vacant-lot GSI could intercept runoff and improve both hydrological performance and neighborhood character.

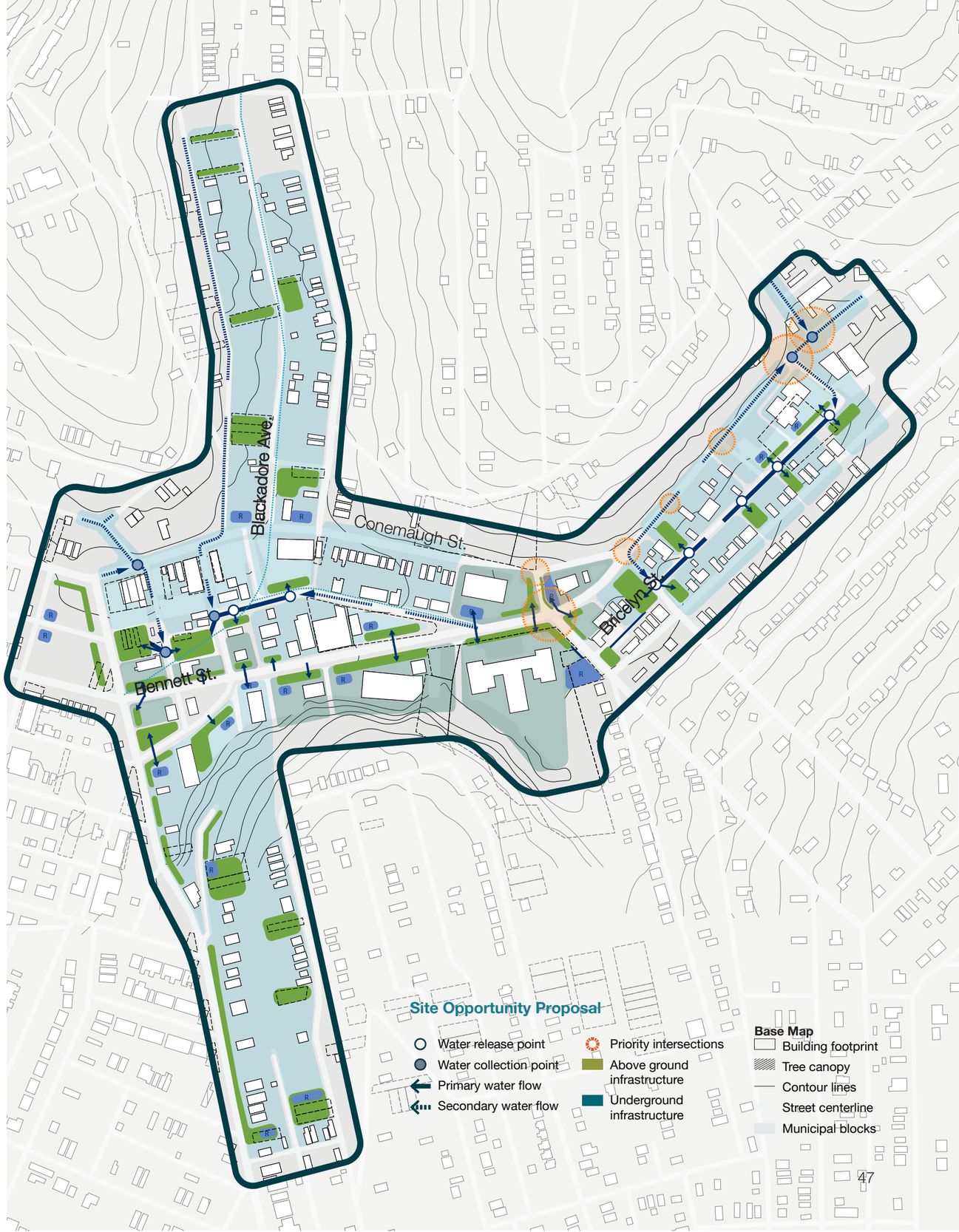
Angoria Way Street-Stream Pairing. Angoria Way follows a buried stream corridor where runoff currently accumulates with limited conveyance. The right-of-way and adjacent vacant parcels could be reconnected through visible green infrastructure that restores natural drainage patterns.

Conemaugh Street-Stream Pairing. Conemaugh Street traces another historic stream alignment, offering a corridor for distributed stormwater management. Existing runoff and flooding issues suggest strong potential for integrated public–private strategies.

Exley Street-Stream Pairing. Exley Way provides another opportunity to manage stormwater along a buried stream corridor. Distributed interventions could reconnect small parcels and improve water storage and infiltration.

Frankstown and Bennett Street Improvements. The intersection of Frankstown and Bennett Streets offers a prime opportunity to integrate stormwater management with mobility and streetscape upgrades. Green infrastructure here could also improve safety and community identity.

Bennett and Oakwood Networked GSI. The intersection of Oakwood and Bennett Streets includes multiple vacant and tax-delinquent parcels suitable for a connected GSI network. Linking public and private sites here could demonstrate the benefits of distributed, multi-owner stormwater management.



WATER CAPTURE DISTRICT FRANKSTOWN BENNETT

Bennett Street On-lot GSI

Time Frame
short term

Location
Primarily on Bennett Street and the southern edge of the district, including commercial and light industrial properties, as well as a school property.

GSI Strategy
Private parcel GSI, Vacant Lot GSI

UpstreamPgh's Role
support, advocate

Potential Partners
business owners, business district group, East Hills and Homewood community, Pittsburgh Public Schools, ALCOSAN

Further Investigation
Engage the community to understand how they perceive these properties. Investigate if there is a district business group.

N

0.1 Miles

LEFT Streetview of Bennet Street looking toward Conemaugh Street (Google Maps)

WATER CAPTURE DISTRICT FRANKSTOWN BENNETT

Bennett Street On-lot GSI

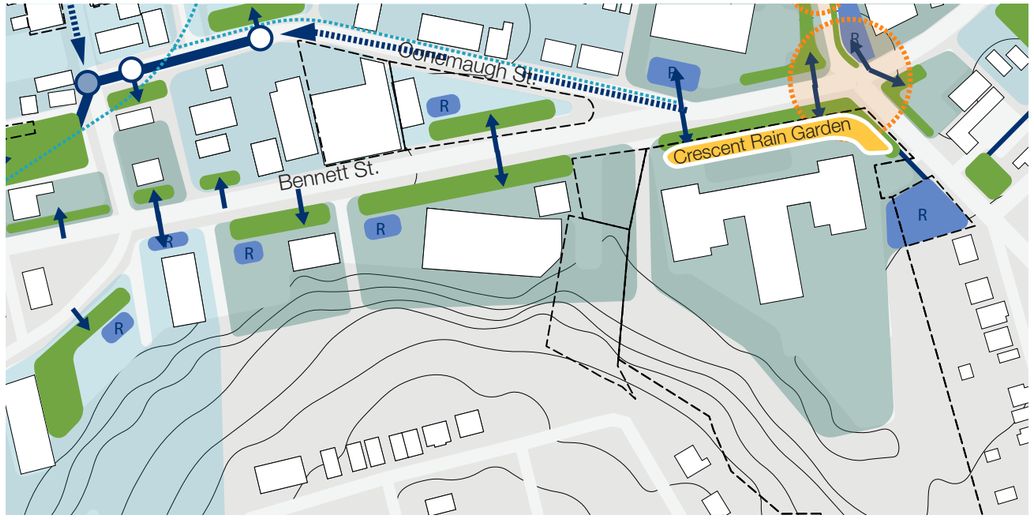
Integrated GSI could improve the visual character of the neighborhood and make it more walkable.

Infrastructure Opportunities

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure
- Previous Projects

Base Map

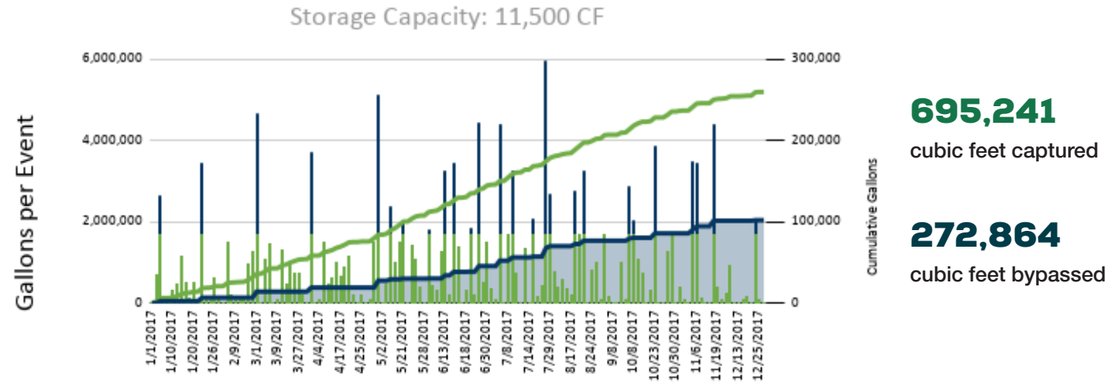
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Many of the Bennett Street parcels store vehicles and other industrial equipment, some of which appears to be abandoned. Vehicles are often parked on the sidewalk and it is in poor condition, making the area less inviting for walking and driving. The area is attractive to uses relying on low land-values, making costly improvements unlikely without assistance.

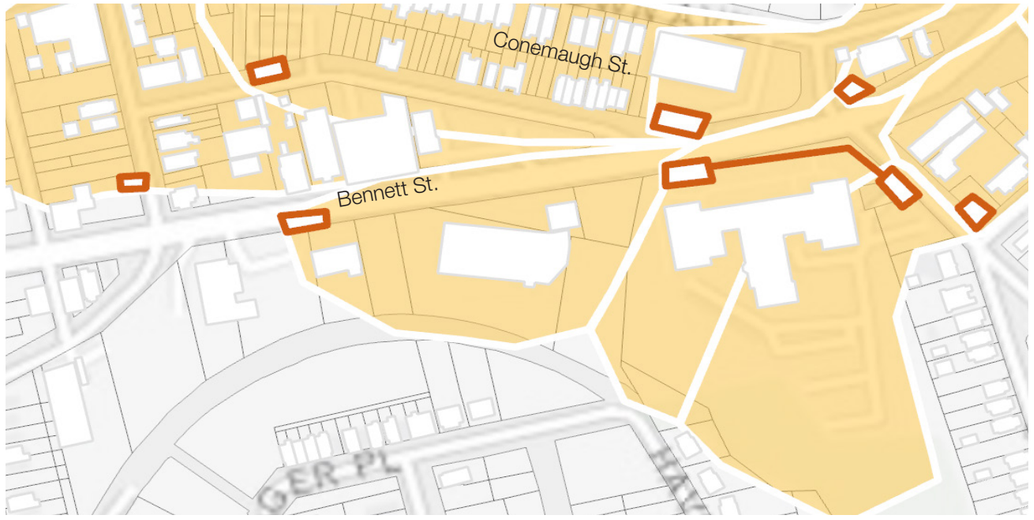
The water could best be managed with on-lot infrastructure. If properties remain in their current use, below-grade tanks could capture water and possibly filter for oils and other contaminants. If the properties change use, below grade storage and above grade GSI could improve the visual character. Public right-of-way improvements are unlikely to succeed with the current uses.

The Crescent School / Faison Annex already has a GSI demonstration project, which could be expanded to capture more of the on-lot area. Curb bump-outs could make the intersection safer for pedestrians and create an entry into the district.



695,241
cubic feet captured

272,864
cubic feet bypassed



Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.1 Miles

Null outcomes stem from data scarcity or the complete absence of information on the site.

Water Capture Opportunities

within a 5-minute walk of this project

3
Vacant lots

75,344
Impervious area (sqft)

1,176
Streetscape (ft)

0
Parks & open space

0
Parking lots

2
Parcels in Public Ownership

Environmental Justice Considerations

within a 5-minute walk of this project

Null
Employment

Null
Renter/ Homeowner

Null
Median Income

Null
# of Residents

Null
% of Area Historically Redlined

Null
Cost Burdened

WATER CAPTURE DISTRICT FRANKSTOWN BENNETT

Angoria-Blackadore Street–Stream Pairing

Time Frame
Mid term

Location
Angoria Way conveyance and storage, capture on Blackadore Ave., and Wheeler St.

GSI Strategy
Public Right-of-Way Improvements, Vacant lot GSI, Private parcel GSI

UpstreamPgh's Role
Advocate, partner

Potential Partners
Adjacent property owners, directly affected property owners, City of Pittsburgh, PGH20, ALCOSAN

Further Investigation
Confirm prevalence of flooding and sewer backup conditions to prioritize investment.

N

0.1 Miles

LEFT Street view on Blackadore Avenue (Google Maps)

WATER CAPTURE DISTRICT
FRANKSTOWN BENNETT

Angoria–Blackadore Street–Stream Pairing

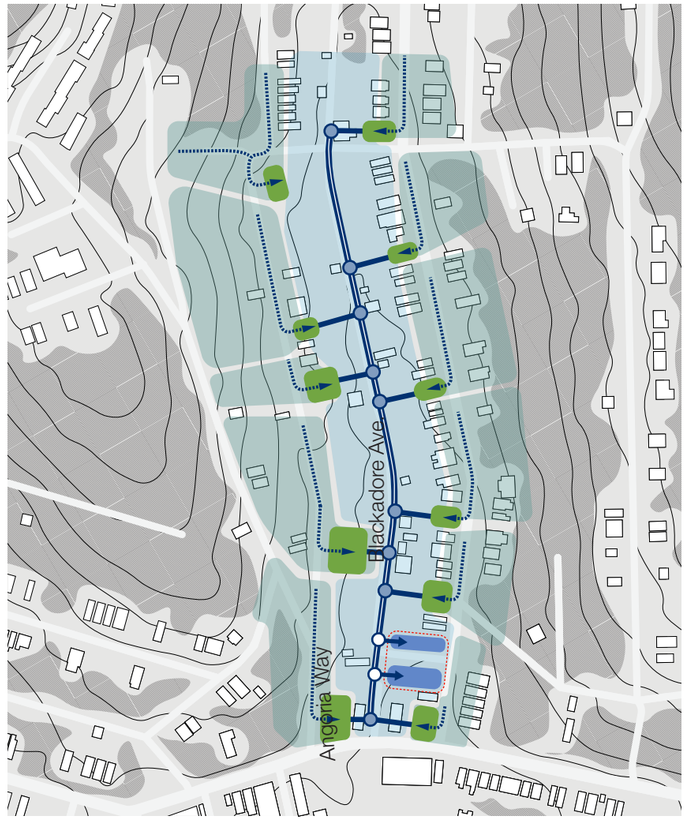
The area overlays a historic drainage channel and includes a mix of residential and vacant parcels.

Angoria Way is the location of the former stream (Angoria Run) and serves few active properties. Blackadore is a secondary street (compared to Frankstown). Wheeler is a tertiary street with few houses. The area experiences illegal dumping. Blackadore is narrow enough that cars park on the sidewalk and Wheeler's sidewalks are overgrown or missing, making this an unsafe area for pedestrians. Stormwater infrastructure should be part of a broader renewal strategy.

Infrastructure Opportunities

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Green stormwater infrastructure can be done incrementally, but the networked system offers greater performance.

[1] Capture Blackadore on a series of non-networked vacant lots. This incremental implementation needs to be managed as a collection of lots. It offers the opportunity to enhance the neighborhood's sense of place.

[2] Capture Blackadore and Wheeler and convey to a rebuilt Angoria Way. Collect water in the tanks below grade at Rod Way.

This capture and conveyance requires significant investment in the public ROW and coordination among property owners, but offers greater storage opportunities.

[3] Vacate Angoria Way or provide limited access. Create a surface, bioswale-based conveyance and storage system. This is a multiyear strategy and ultimately needs to be led by the City.

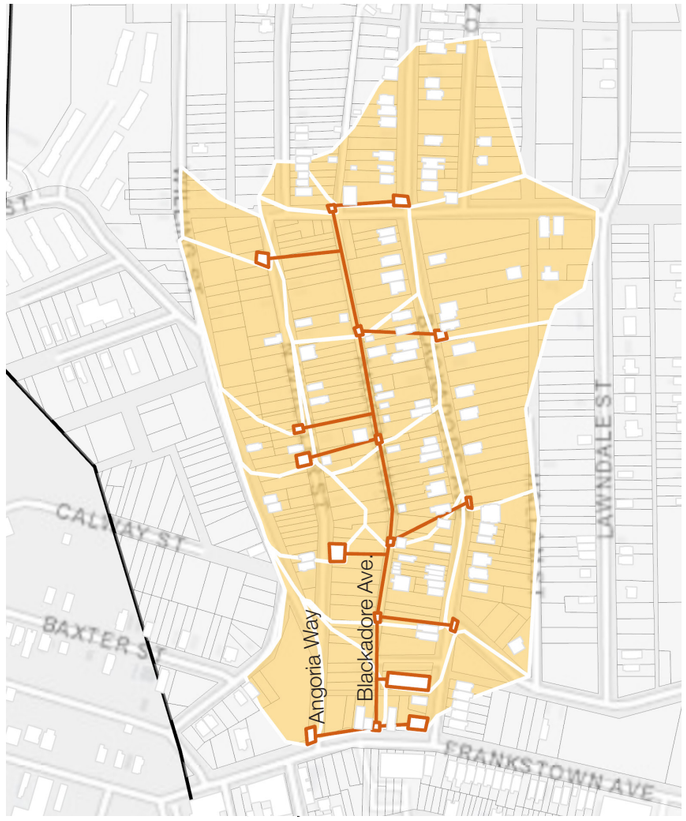
This system would be most effective with more properties connected to the system.

Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.1 Miles



Environmental Justice Considerations

within a 5-minute walk of this project

31.6% % Employed

57 # of Residents

52.6% % Renters

37.57% % of Area Historically Redlined

$54,216 Median Income

5.3% % Cost Burdened

Water Capture Opportunities

within a 5-minute walk of this project

67 Vacant lots

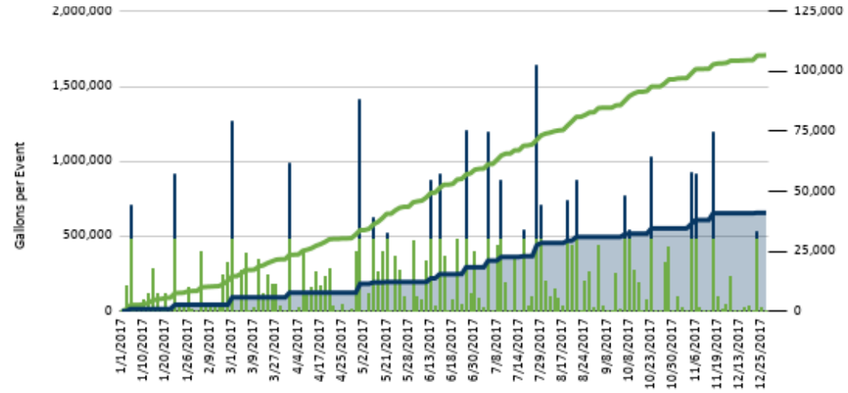
0 Parks & open space

26,246 Impervious area (sqft)

0 Parking lots

4,497 Streetscape (ft)

27 Parcels in Public Ownership



1,447,481 cubic feet captured

571,108 cubic feet bypassed

WATER CAPTURE DISTRICT FRANKSTOWN BENNETT

Conemaugh Street-Stream Pairing

Time Frame
mid term

Location
Conemaugh Street

GSI Strategy
Public Right-of-Way Improvements, Vacant Lot GSI, Private parcel GSI

UpstreamPgh's Role
lead, partner

Potential Partners
adjacent property owners, directly affected property owners, City of Pittsburgh, PGH20, ALCOSAN

Further Investigation
Confirm slope and flow. Confirm prevalence of flooding and backup.

N

0.05 Miles

LEFT Streetview from Conemaugh Street looking towards the intersection at Bennett Street (Google Map)

WATER CAPTURE DISTRICT FRANKSTOWN BENNETT

Conemaugh Street-Stream Pairing

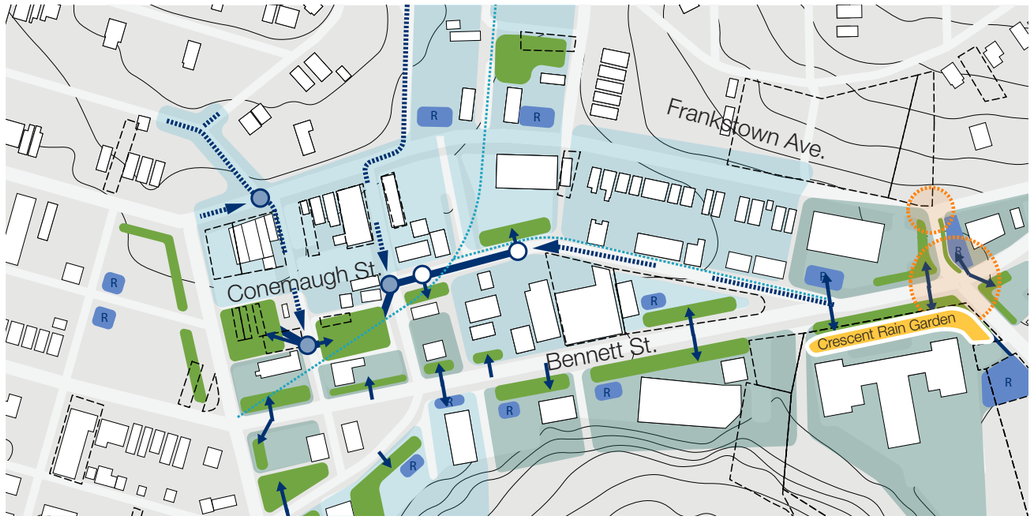
The area overlays a historic drainage channel and includes a mix of residential and vacant parcels.

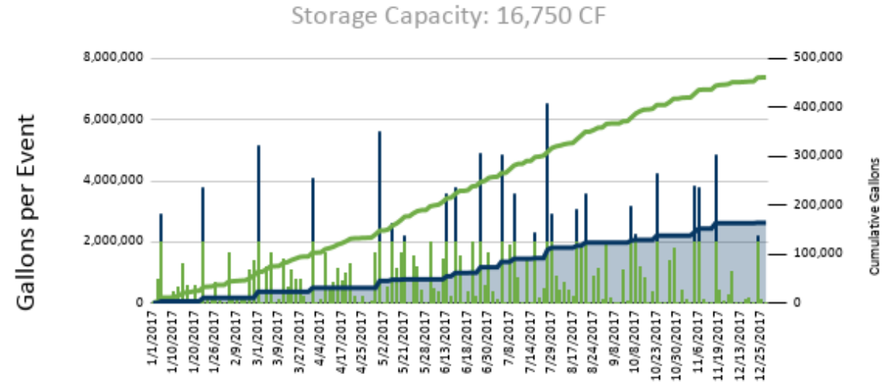
Infrastructure Opportunities

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure
- Previous Projects

Base Map

- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks





986,984
cubic feet captured

351,164
cubic feet bypassed

Conemaugh Street follows a historic stream and serves as an alleyway to businesses and homes that front both Bennett St and Frankstown Avenue. Conemaugh is bounded by residential properties with little opportunity for capture, and commercial properties, some of which could capture and store water on site.

The residential properties to the north of Conemaugh Street are sloped and space-limited, with no catchment areas at the low parts of the properties. These properties, as well as the public ROW, could shed water to a green street retrofit that surface conveys water to a property at the intersection with Wheeler. The catchment property could serve as a privately owned open space, a shared parking area, or other district facility.

This system would be most effective with more properties connected within.

Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.08 Miles

Water Capture Opportunities

within a 5-minute walk of this project

16
Vacant lots

256,097
Impervious area (sqft)

2,273
Streetscape (ft)

0
Parks & open space

0
Parking lots

3
Parcels in Public Ownership

Environmental Justice Considerations

within a 5-minute walk of this project

34.3%
% Employed

60.9%
% Renters

$22,500
Median Income

35
# of Residents

100%
% of Area Historically Redlined

34.7%
% Cost Burdened

WATER CAPTURE DISTRICT FRANKSTOWN BENNETT

Exley Street-Stream Pairing

UpstreamPgh's Role
lead, partner

Time Frame
mid term

Location
Exley Way

GSI Strategy
Public Right-of-Way Improvements, Vacant Lot GSI, Private parcel GSI

Potential Partners
adjacent property owners, directly affected property owners (e.g. A Second Chance), City of Pittsburgh, PGH20, ALCOSAN

Further Investigation
"Modeling will be essential. Likelihood of property owner participation.

Previous Projects

N

0.05 Miles

LEFT Street view on Exley Way alleyway behind A Second Chance Inc. (Google Map)

WATER CAPTURE DISTRICT
FRANKSTOWN BENNETT

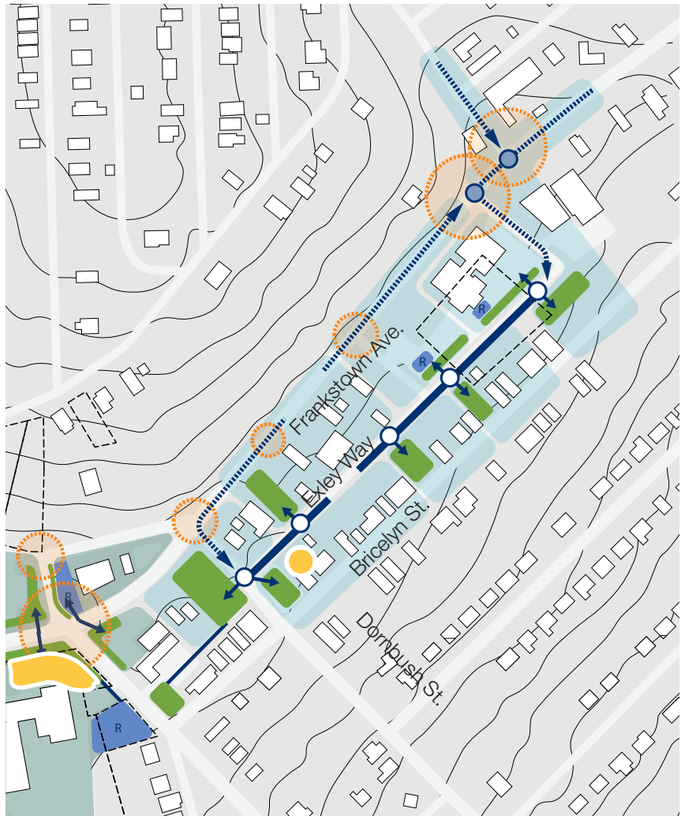
Exley Street–Stream Pairing

A narrow right-of-way within a residential setting provides a manageable scale for pilot GSI interventions.

Infrastructure Opportunities

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure
- Previous Projects

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Exley Street follows a historic stream and serves as an alleyway to businesses and homes that front Frankstown Avenue and Bricelyn Street. Exley Way is bounded by properties with little opportunity for on-site capture.

There are a few possible strategies with could be staged. The larger systems offer greater opportunities for capture and storage.
[1] Capture water on a series of non-networked vacant lots. This incremental implementation needs to be managed as a collection of lots. It offers the opportunity to enhance the neighborhood's sense of place.

[2] Capture water and convey it to a rebuilt Exley Way. Collect water in the tanks below grade or above grade at Dornbush Street.

This capture and conveyance requires significant investment in the public ROW and coordination among property owners, but offers greater storage opportunities.

This system would be most effective with more properties connected to the system. There are opportunities to connect with community uses at the historic school. There are opportunities to connect maintenance and use regimens with the existing GSI at Bricelyn and Dornbush.

Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.05 Miles

Environmental Justice Considerations

within a 5-minute walk of this project

35.2% % Employed

58.8% % Renters

$25,000 Median Income

54 # of Residents

100% % of Area Historically Redlined

47.1% % Cost Burdened

Water Capture Opportunities

within a 5-minute walk of this project

29 Vacant lots

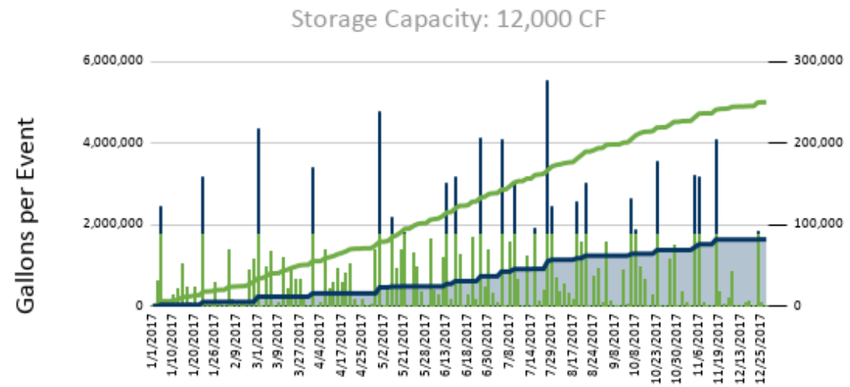
155,913 Impervious area (sqft)

3,005 Streetscape (ft)

0 Parks & open space

0 Parking lots

9 Parcels in Public Ownership



669,639 cubic feet captured

218,925 cubic feet bypassed

WATER CAPTURE DISTRICT

Rockwell to Wilkinsburg Water District

What we heard

“It is impossible to bike along Pennwood Ave between South Ave and the Forbes Connector intersection no handicap sidewalk cuts and awful road patching. Cars avoid the potholes by driving in the wrong lane. Rainwater drips down through the train overpass at Rebecca Ave. It s difficult for pedestrians bikes and the handicapped to cross that 5 way intersection. More shade would be nice as well.”

“The sewers on West Street some of them need clean especially on the corner of South and West Street. Glendale avenue seems to be a basin for water”

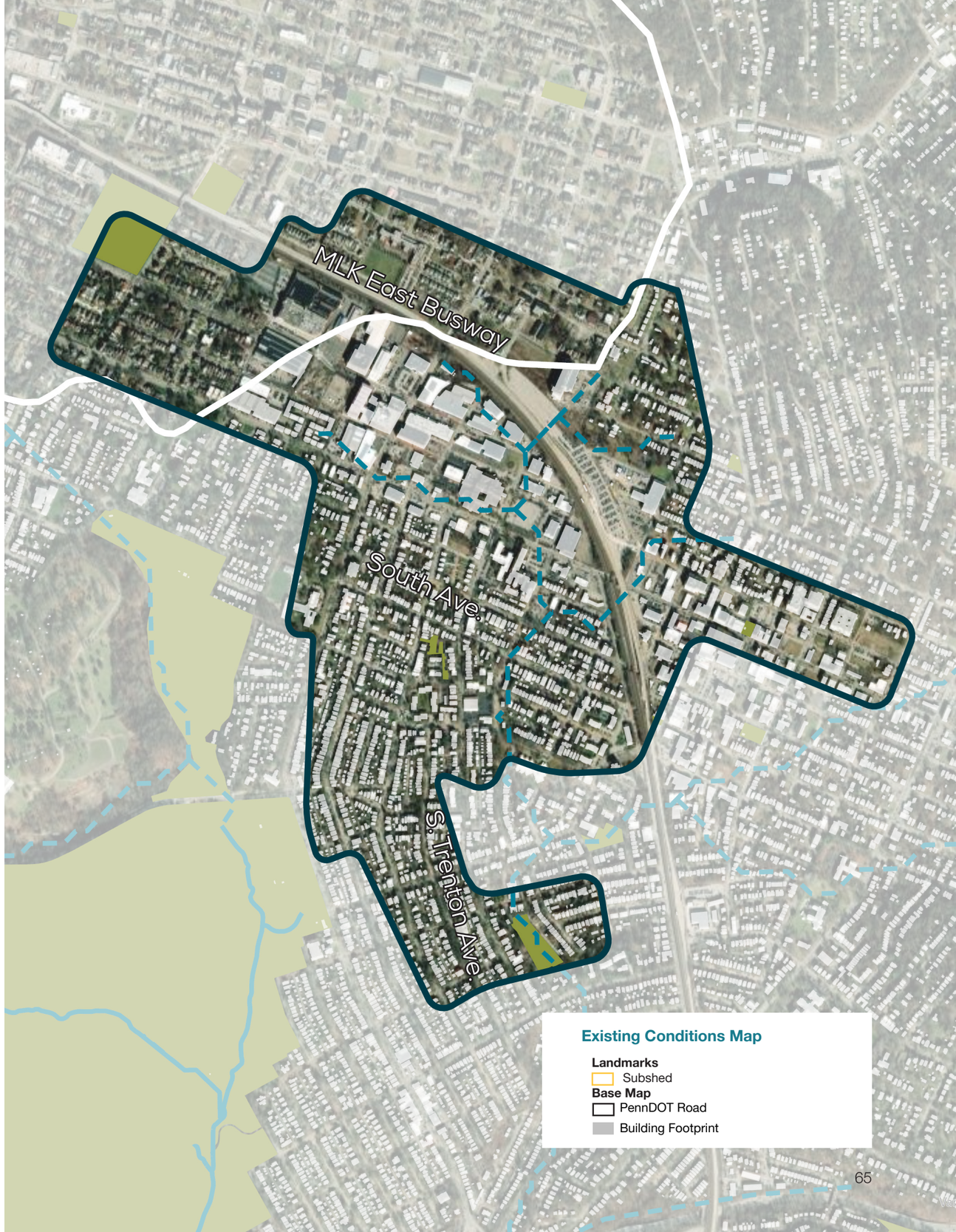
“The promotion of native and adapted edible plants is a key issue area for me that supports climate resilience. Managing water resources (through devices such as rain barrels and composting toilets) to navigate periods of drought and improve water quality is also important.”

“Most of the pollutants and garbage in Nine Mile Run come through this corridor. Consider a capture point that can collect the garbage before it continues down the run.”

“Right now my biggest desire is for the actually waterway of Nine Mile run to continue its restoration journey and become an area of recreation for the residents and a place that native plants and animals can return. The fish that UpstreamPgh has already counted are promising but we need to completely divert all raw sewage from entering this waterway and manage other contamination & refuse that finds its way to the water. I’m also very afraid of the consequences of the Parkway East bridge replacement project on the waterway surrounding woods.”

“The low part of Biddle Avenue where I reside floods with each heavy rain. The drains in the street are ineffective and filled with debris preventing the water from draining properly. My basement has flooded twice 2009 and 2018.”

BELOW Green infrastructure was installed at Wilkinsburg’s municipal parking lot (UpstreamPgh)



ABOVE Wilkinsburg Stormwater Resiliency Project in bloom, completed in 2024 (UpstreamPgh)

The Rockwell-Wilkinsburg Water District includes the recently renovated Rockwell Park complex, the light industrial area south of the Busway, and Wilkinsburg's historic business district. In the past, the three areas functioned independently, but with PRT bus station improvements and other investments, green infrastructure could stitch the area together.

Wilkinsburg Station Area: The Wilkinsburg - Brushton Station Areas will undergo great change if PRT can fund the transformation of the single station and park-and-ride to two stations and a development site. PRT's site partially drains to a bioswale today. In the future, it will have to comply with more strict standards and will likely be below grade technologies or integrated into a more urbanized landscape.

Urban Industrial District: The urban industrial business district south of the busway is mixed use and density. As the area experiences development pressure, parcel-based GSI systems will be installed with redevelopment and ongoing site improvements.

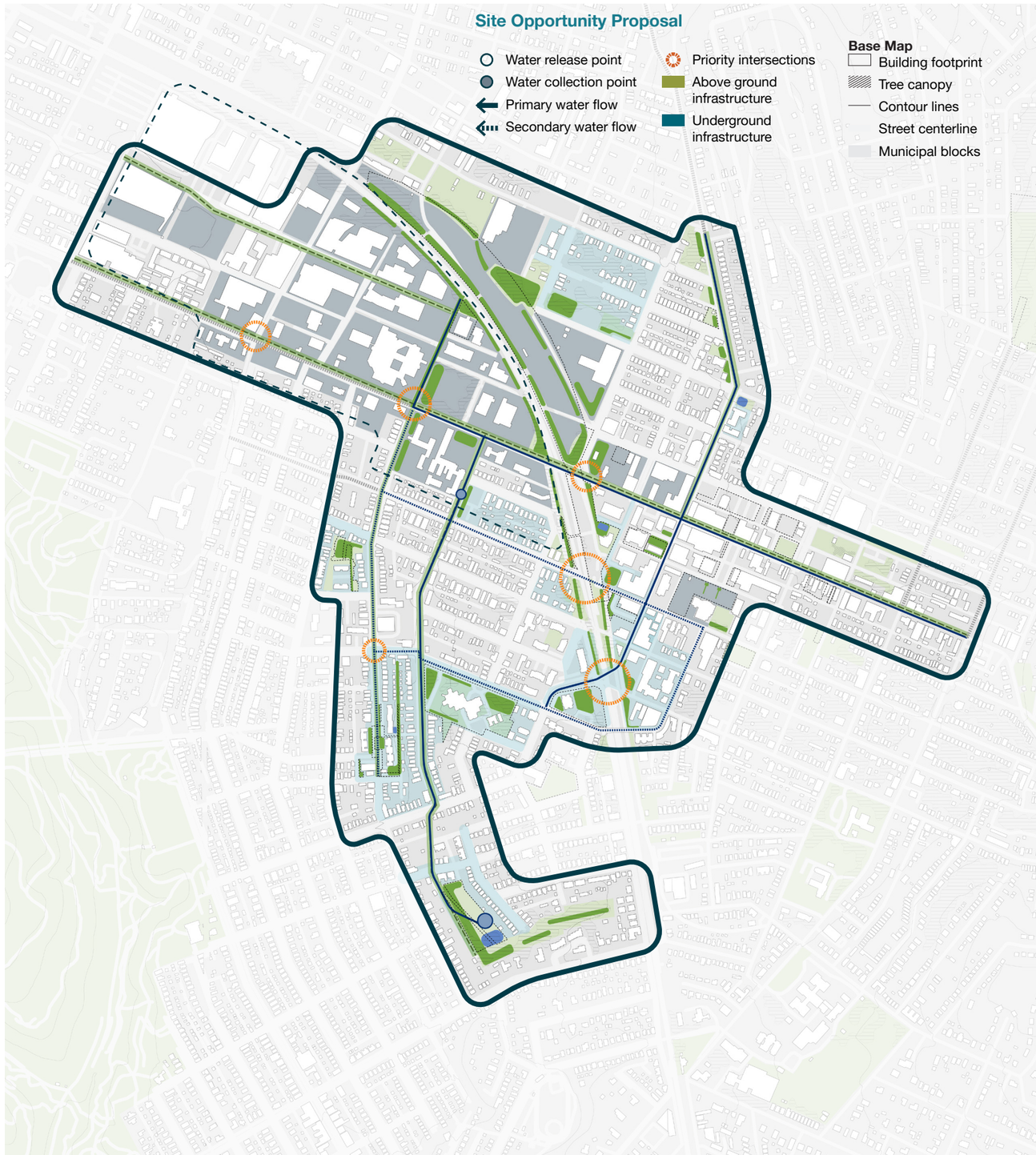
Wilkinsburg's regulations and a stormwater assistance program could require/incentivize private property GSI and be aligned with the City of Pittsburgh's regulations.

A district plan is needed to identify opportunities for public space/GSI streetscape improvements. Projects could be funded by a TRID.

Historic Business District: Wilkinsburg's historic main street and district has many buildings still intact with a streetscape that has been improved in some areas. There is some development pressure, in the form of renovations. Many parcels do not have open space to capture or store stormwater. There is a high level of impervious surfaces.

Updating Wilkinsburg's regulations and establishing a stormwater assistance program could require/incentivize private property GSI. Many parcels would still benefit from public right-of-way collection and storage as most buildings cover the entire lot area.

A district plan is needed to identify opportunities for public space/GSI streetscape improvements. Projects could be funded by a TRID.



Light Industrial District TOD

Time Frame
mid term

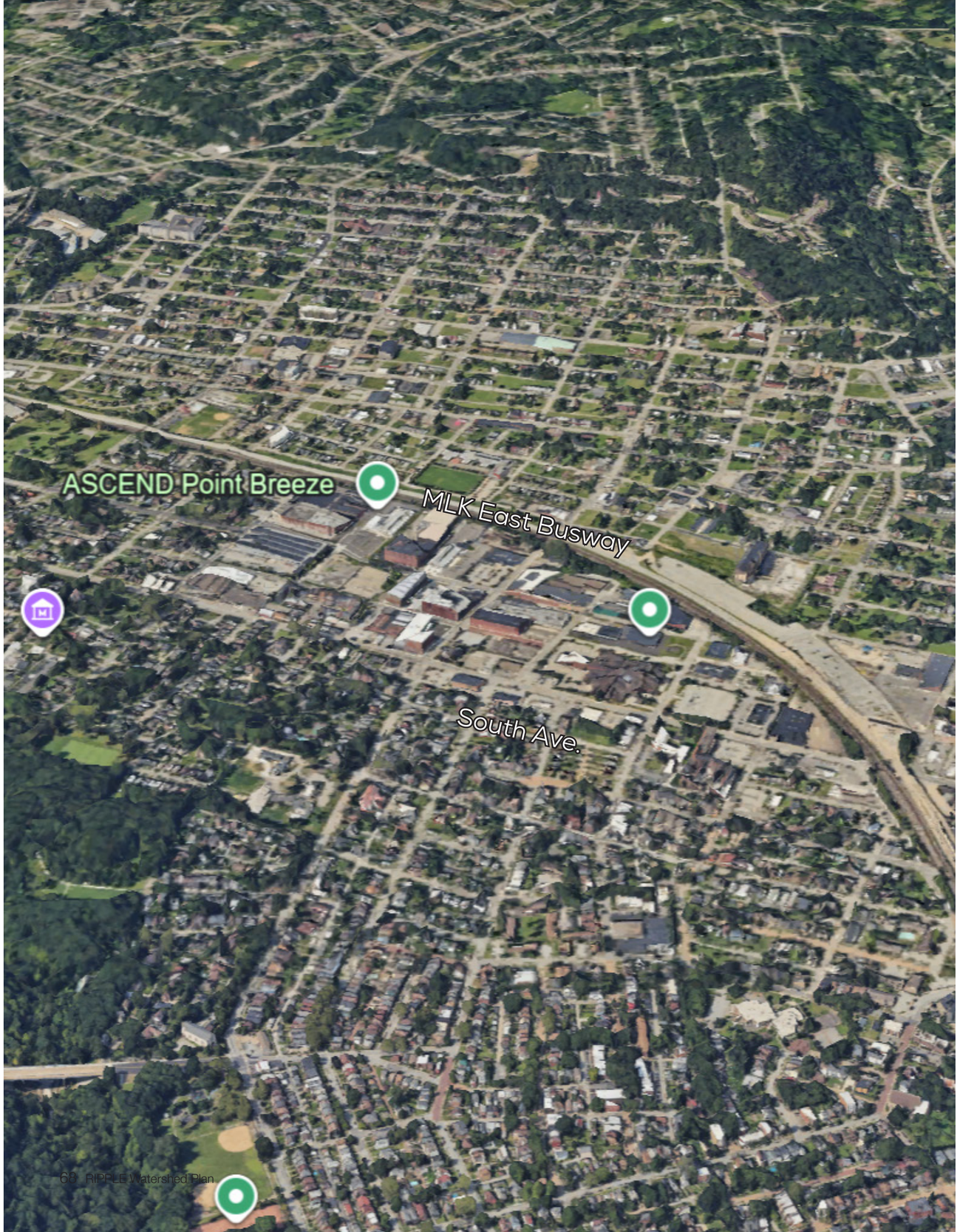
Location
The blocks south of the busway, from Rockwell Park on the western edge, to the railroad and busway underpass to the east.

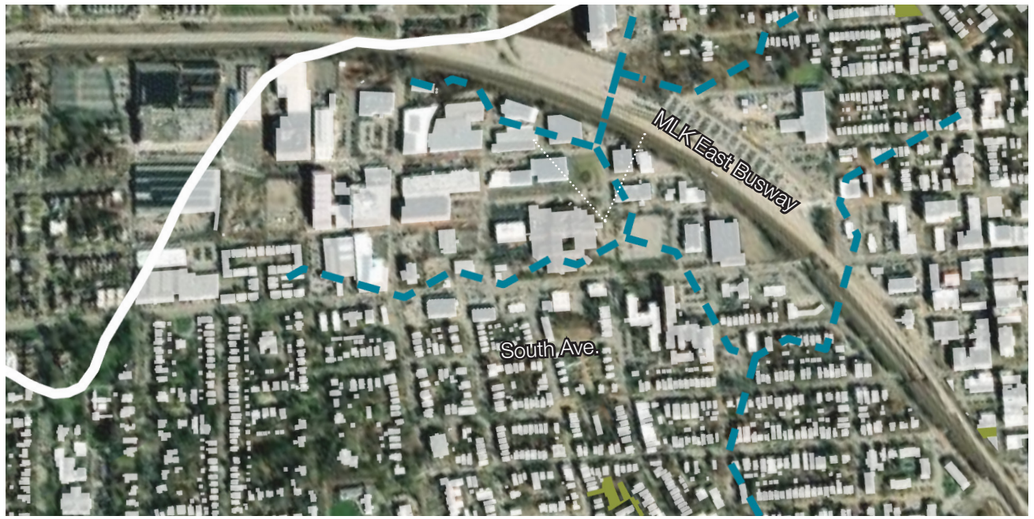
GSI Strategy
Private parcel GSI, Public Right-of-Way Improvements

UpstreamPgh's Role
support, advocate, watchdog

Potential Partners
Business owners, business district group, City of Pittsburgh, Borough of Wilkinsburg, Wilkinsburg-Penn Joint Water Authority (WPJWA), PennDOT, PRT, Railroad, ALCOSAN

Further Investigation
Convene the City of Pittsburgh and the Borough of Wilkinsburg to discuss joint water planning.





LEFT Trenton Avenue is a connector to the residential areas south of Penn Avenue. PRT has examined the possibility of a below grade crossing of the railroad and busway, which would be at the location of a historic stream.

Light Industrial District TOD

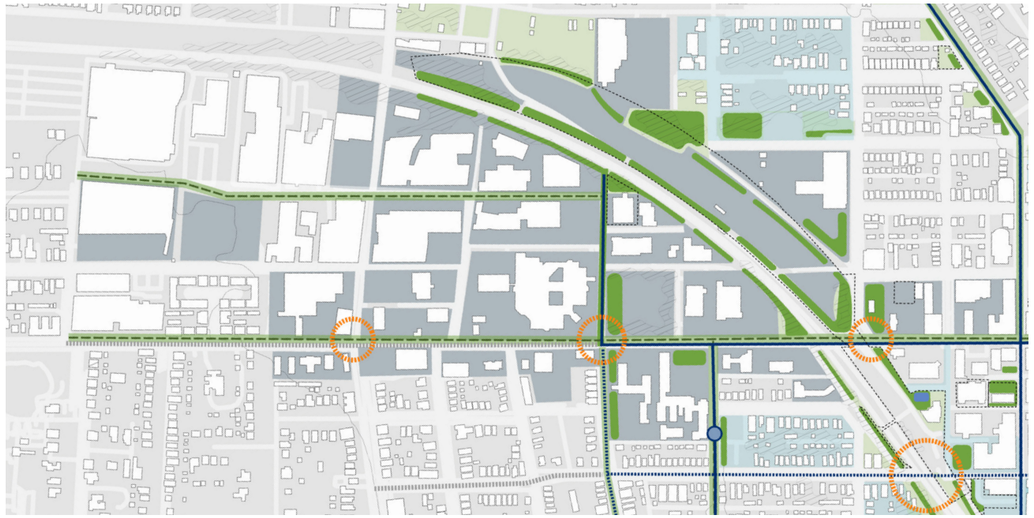
Green stormwater infrastructure complements future transit investment and contributing to a multi-municipal transit-oriented district (TOD).

Infrastructure Opportunities

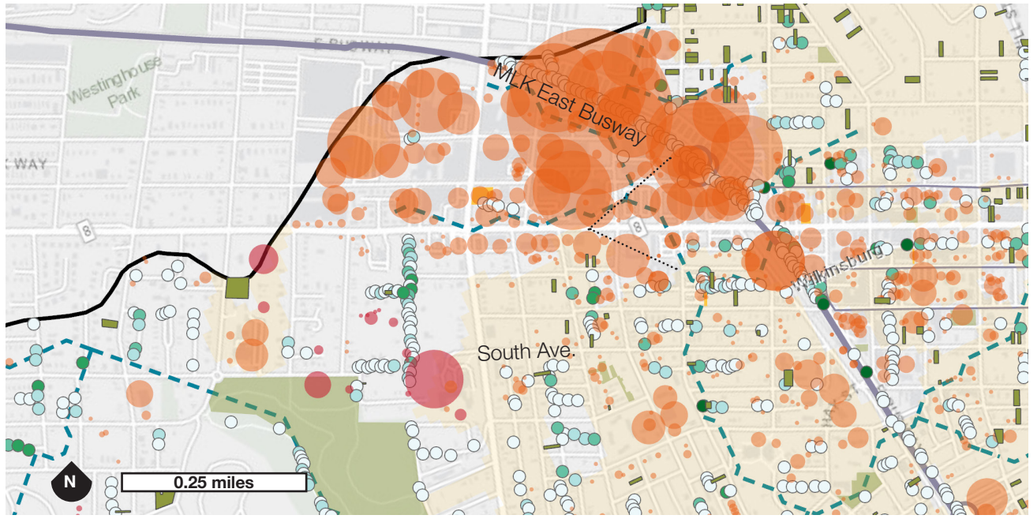
- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map

- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



LEFT GSI can be paired with safety improvements to Penn Avenue. Traffic calming and on-lot improvements can collect stormwater and make it more attractive to pedestrians, cyclists, and drivers.



The blocks south of the busway has been home to light industrial and commercial uses but is likely to transition to a transit oriented district (TOD) as PRT builds two new busway stations. Some areas have seen recent reinvestment, including the restoration of the Rockwell industrial buildings as an office park and the addition of an ALDI's grocery store. Other large parcels are likely to change use or undergo redevelopment in the next ten to twenty years.

Developing an open-space network would enhance the district's desirability. This would likely be implemented through a district plan. UpstreamPgh would not lead the plan but would be an expert party to it.

PRT has explored a concept that establishes a possible park/underpass to connect the south-of-the-busway district to PRT's park-and-ride lot and 7800 Susquehanna (Campbell Enterprise Center). This would mark the historic stream paths and create high-quality connections to benefit Homewood and Wilkinsburg. The project would require funding well beyond what PRT can provide, such as a RAISE/BUILD/TIGER grant, and would require a high-capacity developer to be involved. UpstreamPgh should be actively involved in any application and should remain an advocate.

Redevelopment or significant upgrades in these areas will trigger newer, more stringent stormwater capture requirements. If the area were to experience development pressure, this would likely be the most effective way to improve stormwater performance on these properties.

Computational Map

- Impervious Area
- Depaving & Retrofits
- Rain Gardens

Green Streets (Value)

- 0 - 0.04
- 0.04 - 0.14
- 0.14 - 0.30
- 0.30-0.61
- 0.61- 1
- Rapid
- Historic Streams (Culverted)
- Nine Mile Run Watershed Boundary

Water Capture Opportunities

within a 5-minute walk of this project

0
Vacant lots

351,733
Impervious area (sqft)

15,277
Streetscape (ft)

0
Parks & open space

2
Parking lots

1
Parcels in Public Ownership

Environmental Justice Considerations

within a 5-minute walk of this project

58.8%
% Employed

61.6%
% Renters

$72,286
Median Income

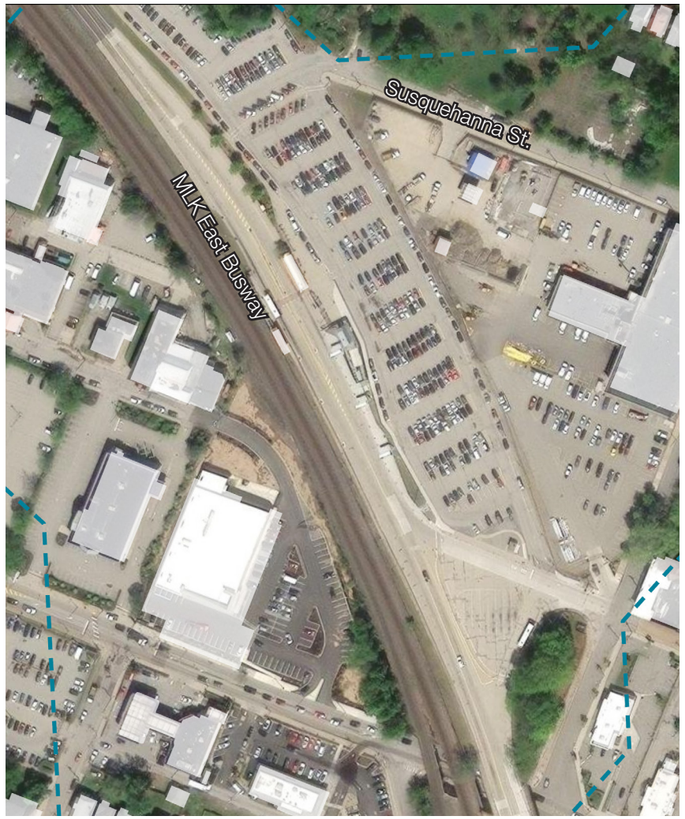
500
# of Residents

19.2%
Cost Burdened

37.13%
% of Area Historically Redlined

WATER CAPTURE DISTRICT ROCKWELL - WILKINSBURG

Light Industrial District Green Streets



Time Frame
mid term

Location
Penn Avenue, Thomas Street/Boulevard, Trenton Street, West Street

GSI Strategy
Public Right-of-Way Improvements

UpstreamPgh's Role
support, advocate, watchdog

Potential Partners
Business owners, business district group, City of Pittsburgh, PGH20, Borough of Wilkinsburg, Wilkinsburg CDC, WPJWA, PennDOT, PRT, Railroad, ALCOSAN

Further Investigation
Convene the City of Pittsburgh and the Borough of Wilkinsburg to discuss joint water planning.

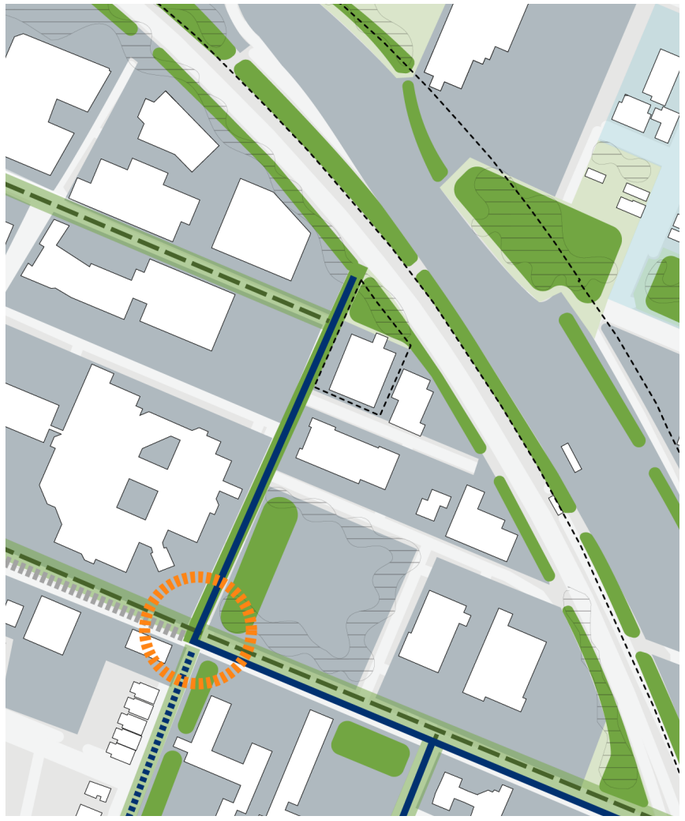
LEFT GSI could be incorporated into traffic calming and pedestrian improvements at intersections such as this one at Trenton and Penn Avenues.

WATER CAPTURE DISTRICT
ROCKWELL - WILKINSBURG

Light Industrial District Green Streets

Green streets could improve multimodal safety, increasing access to adjacent neighborhoods, and create a positive identity for the district.

Infrastructure Opportunities



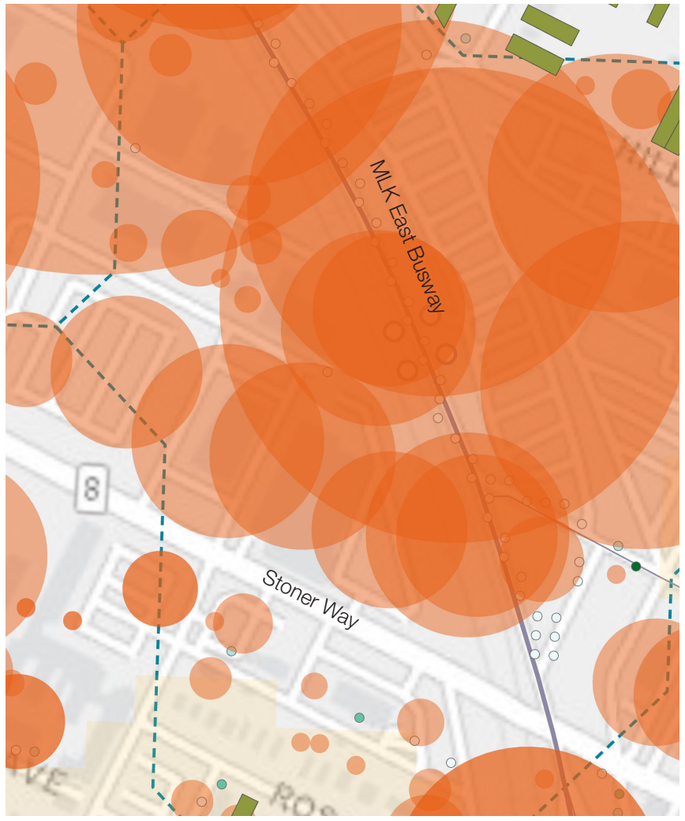
This emerging commercial district is intersected by a few major thoroughfares including Penn Avenue and Braddock Avenue. As the district continues to reinvent itself, other minor streets could be augmented for increased pedestrian use, including signalized crossings and bike infrastructure at Penn Avenue.

Strategies include GSI integrated with active transportation best practices such as better crosswalks, road diets, public transit stops, and improved signal technology.

PennDOT manages Penn Ave, and the City of Pittsburgh and Wilkinsburg control the remainder of the streets. The project will need a coordinated district strategy for improvements, well-articulated in a district plan or an active transportation plan. The planning effort needs to be led jointly by the municipalities, by one or more community development groups. Given the lack of coordination, this might be best led by a yet-to-be-formed or identified district business or development group. UpstreamPgh can be a partner in those efforts.

If done well, streetscape improvements would improve safety, support existing businesses, and attract new ones.

Computational Map



Environmental Justice Considerations

within a 5-minute walk of this project

Null Employment
Null # of Residents
Null Renter/ Homeowner
Null % of Area Historically Redlined
Null Median Income
Null Cost Burdened

Null outcomes stem from data scarcity or the complete absence of information on the site.

Water Capture Opportunities

within a 5-minute walk of this project

0 Vacant lots
0 Parks & open space
18,766 Impervious area (sqft)
0 Parking lots
2,994 Streetscape (ft)
1 Parcels in Public Ownership

LEFT Street view of Rockwell Park and Satellite University Offices on Thomas Boulevard looking towards North Lexington Street (Google Maps)

WATER CAPTURE DISTRICT ROCKWELL - WILKINSBURG

Park-and-Ride Renewal @ Rosedale

Time Frame
long term

Location
Commercial and residential areas north of the busway, including residential parcels, commercial parcels, and PRT's Park-and-Ride

GSI Strategy
Public Right-of-Way Improvements, Private parcel GSI, Public Parcel Integrated GSI, Vacant Lot GSI

UpstreamPgh's Role
support, advocate, watchdog

Potential Partners
Business owners, business district group residents in Pittsburgh and Wilkinsburg, City of Pittsburgh, PGH20, Borough of Wilkinsburg, WPJWA, Wilkinsburg CDC, Operation Better Block, PennDOT, PRT, Railroad, ALCOSAN

Further Investigation
Convene Pittsburgh and Wilkinsburg to discuss joint water planning. Investigate the nature of stormwater issues in the residential fabric, while investigating mobiltiy issues to tie the two together. Gauge interest of Bridgeway Capital for possible below-grade connection to see if they would lead on the project.

N

0.15 Miles

LEFT Green infrastructure will be incorporated into PRT's station area improvements. It will be a good opportunity to extend previous GSI projects in Homewood, such as this project by Operation Better Block.

WATER CAPTURE DISTRICT ROCKWELL - WILKINSBURG

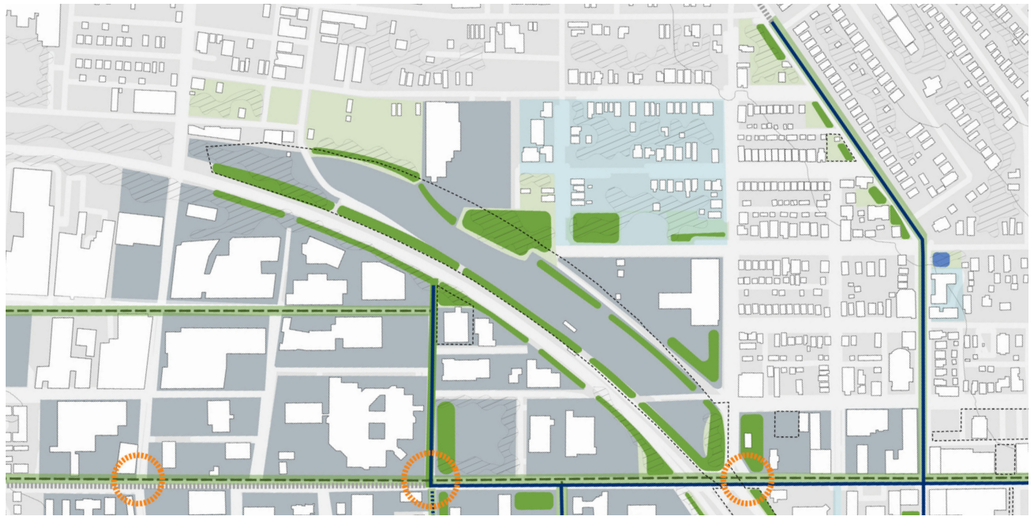
Park-and-Ride Renewal @ Rosedale

Stormwater infrastructure can connect people to history and, more importantly, to transit options and amenities.

Infrastructure Opportunities

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Computational Map

- Impervious Area
- Depaving & Retrofits
- Rain Gardens

Green Streets (Value)
- 0 - 0.04
- 0.04 - 0.14
- 0.14 - 0.30
- 0.30-0.61
- 0.61- 1

- Rapid
- Historic Streams (Culverted)
- Nine Mile Run Watershed Boundary

N

0.15 Miles

Water Capture Opportunities

within a 5-minute walk of this project

19 Vacant lots

236,313 Impervious area (sqft)

7,470 Streetscape (ft)

0 Parks & open space

1 Parking lots

3 Parcels in Public Ownership

Null outcomes stem from data scarcity or the complete absence of information on the site.

Environmental Justice Considerations

within a 5-minute walk of this project

Null %Employment

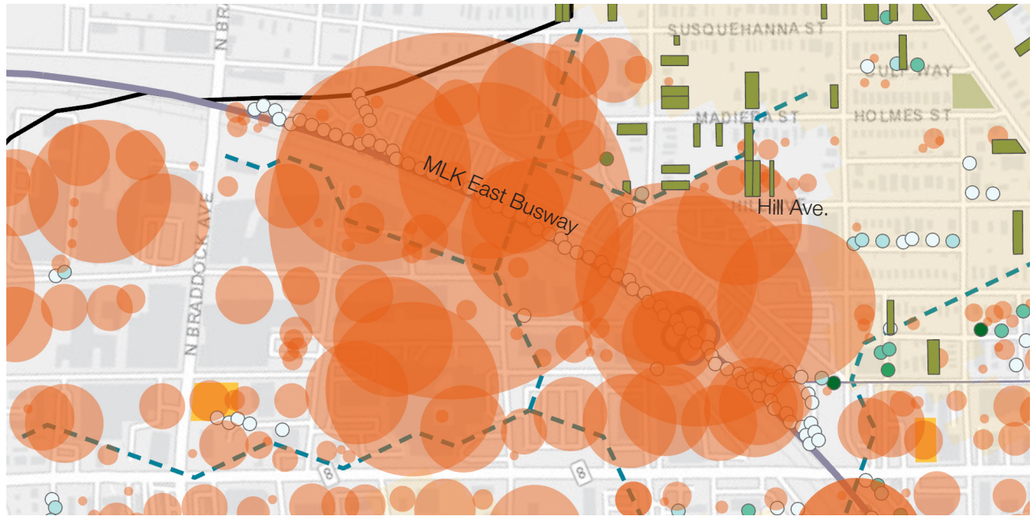
Null % Renter

Null Median Income

Null # of Residents

9.2% % of Area Historically Redlined

Null Cost Burdened



This area has distinct uses such as a large parking lot, large light industrial buildings, and single family homes, each with their own strategies. It is relatively disconnected from main thoroughfares and has much lower development pressure than south of the busway.

Redevelopment or significant upgrades in this area will trigger newer, more stringent stormwater capture requirements. If the area were to experience development pressure, this would likely be the most effective way to improve stormwater performance on large parcels.

PRT's property will be subject to Wilkinsburg's stormwater requirements, which are less stringent than Pittsburgh's. All municipalities in the project area should adopt the most stringent code in the cohort. On the PRT parcel, GSI can be part of an open space strategy and incorporated into the station design and the TOD development area. This includes a bike-ped trail parallel to the busway and last-mile connections to the neighborhood.

PRT's current GSI location could become a park that serves as a below-grade RR crossing and, although this has been explored by PRT in the past, its scope would exceed what PRT could do alone. Advocate for this crossing as a ped-stormwater crossing and assist in aligning partners. This crossing could connect to a new Trenton Street parklet and serve as an essential link for the community to reach the growing amenities in the district south of the busway. This is a large, multi-million-dollar project that cannot be justified solely by stormwater but must be part of an accessibility strategy.

GSI should be included in PRT's station areas and PRT-owned properties. There is a PRT precedent for GSI near Homewood Station. GSI is included in PRT's Landscape Design Guidelines, which can guide UpstreamPgh's advocacy.

Public ROW improvements might include improved crosswalks that capture rainwater, address pedestrian safety, and create safe multimodal routes to transit. The area near 7800 Susquehanna could host an entrance to a trail network that redirects water from the parking lot. Additional public right-of-way improvements are needed. Coordinate with UpstreamPgh's street tree pits. Consider road safety and the integration of intersection improvements.

WATER CAPTURE DISTRICT ROCKWELL - WILKINSBURG

Wilkinsburg Business District

Time Frame
mid term

Location
This area includes the Penn Avenue main street district, as well as sidestreets to the south of Penn Avenue. The Penn Avenue infrastructure can extend east to Ardmore Boulevard, but the district core should be the focus.

GSI Strategy
Private parcel GSI, Public Right-of-Way Improvements, Public Parcel Integrated GSI, Vacant Lot GSI

UpstreamPgh's Role
support, advocate, watchdog, partner, lead

Potential Partners
Business owners, business district group, Borough of Wilkinsburg, WPJWA, Wilkinsburg CDC, PennDOT, PRT, Railroad, ALCOSAN

Further Investigation
Understand redevelopment strategy emerging from the Comprehensive Plan process

LEFT Green infrastructure can be incorporated into business district streetscape renewal and safety improvements. Individual property owners, like the one on the right, are planning for stormwater improvements.

WIlkinsburg Business District

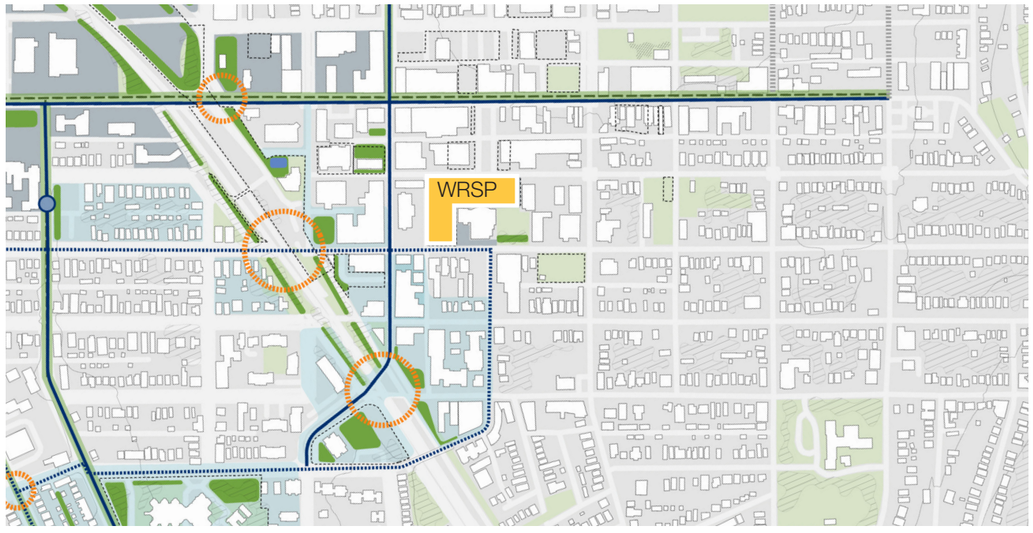
Green stormwater infrastructure can become a signature element of Wilkinsburg's renewed business district identity.

Infrastructure Opportunities

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure
- Previous Projects

Base Map

- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



The blocks east of the busway are home to a traditional main street district with historic buildings and a grid of gently sloped streets. GSI networks could inform a more comprehensive open space strategy that creates destinations throughout the district.

Developing an open-space network would enhance the district's desirability. This would likely be implemented through a district plan. UpstreamPgh would not lead the plan but would be an expert party to it.

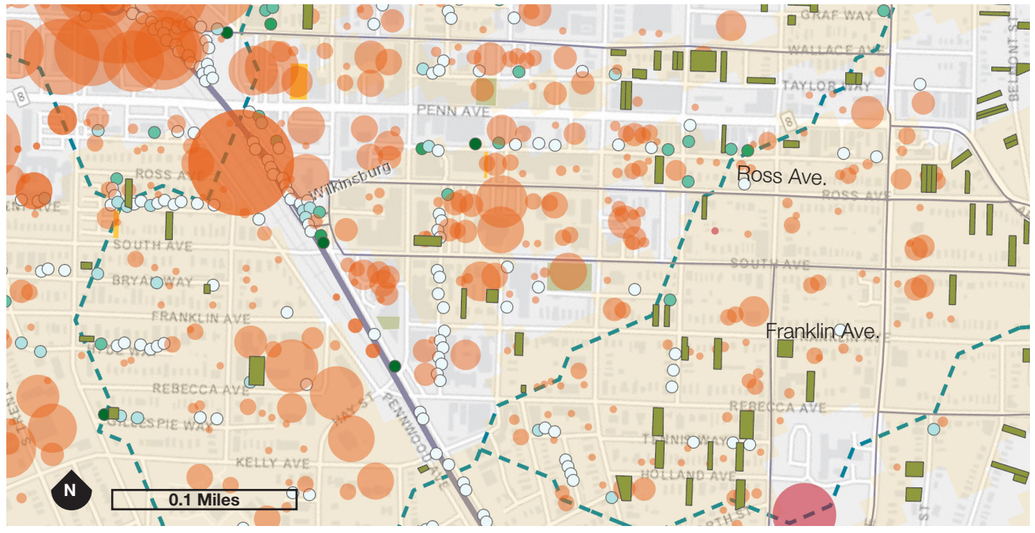
Redevelopment or significant upgrades in these areas will trigger newer, more stringent stormwater capture requirements, but given the amount of historic properties, the opportunities are more limited than in other areas. GSI could help create beloved spaces at historic properties such as vacant churches or the grounds of the train station and the adjacent Hay Street.

The Borough has limited funds for infrastructure investment and limited project management capacity. Their capacity will need to be augmented to create a plan and see it implemented over a number of years.

Augmenting Wilkinsburg's stormwater code would help guide best practices, but it will add costs to projects with already-weak proformas. UpstreamPgh could be essential in finding funding and bringing these projects to fruition.

Green alleys may be a solution. Align with future Active Transportation implementation projects.

LEFT The construction of the railroad truncated the historic stream, yet stormwater still flows across large paved areas. Stormwater can be incorporated into intersection improvements. The adjacent property sits at a natural low spot and could also serve a stormwater function.



Computational Map

- Impervious Area
- Depaving & Retrofits
- Rain Gardens

Green Streets (Value)

- 0 - 0.04
- 0.04 - 0.14
- 0.14 - 0.30
- 0.30-0.61
- 0.61- 1

- Rapid
- Historic Streams (Culverted)
- Nine Mile Run Watershed Boundary

Water Capture Opportunities

within a 5-minute walk of this project

13
Vacant lots

394,589
Impervious area (sqft)

18,105
Streetscape (ft)

3
Parks & open space

1
Parking lots

18
Parcles in Public Ownership

Environmental Justice Considerations

within a 5-minute walk of this project

51.3%
% Employment

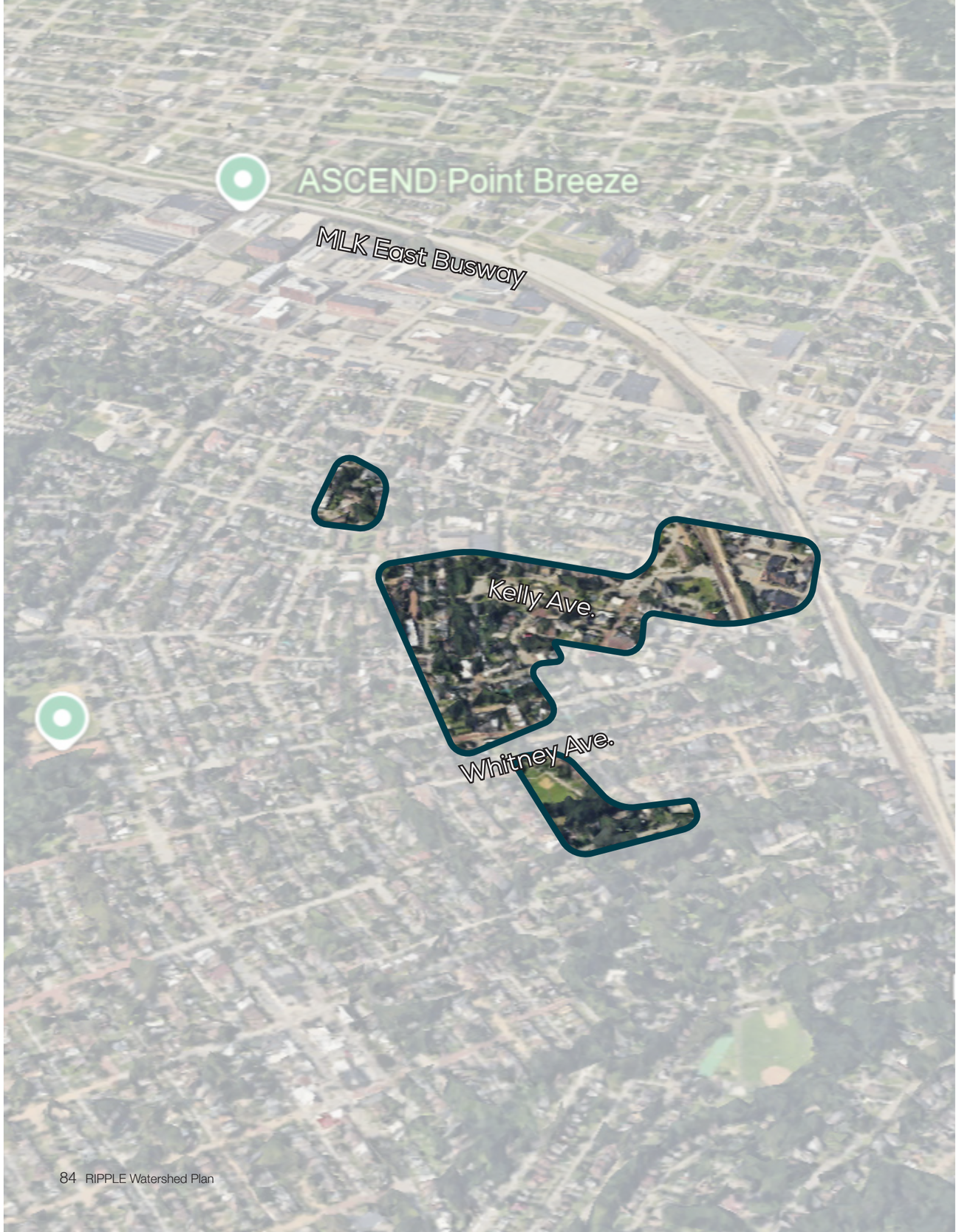
91%
% Renters

$40,000
Median Income

119
# of Residents

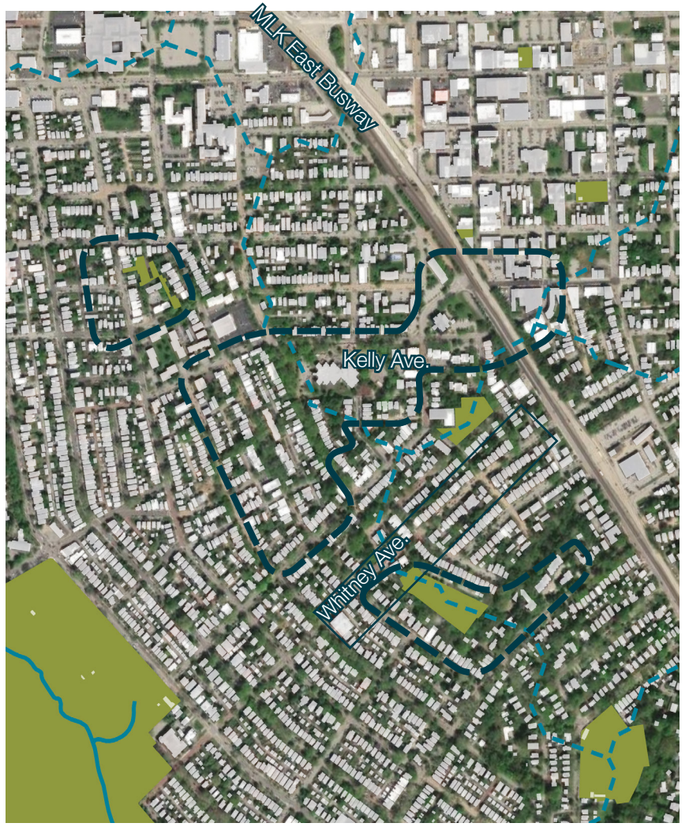
95.5%
% of Area Historically Redlined

24.4%
Cost Burdened



WATER CAPTURE DISTRICT
ROCKWELL - WILKINSBURG

Whitney Park and Kelly School Micronetworks



Time Frame
short term

Location
Two micro-networks that direct water to the publicly owned properties at Whitney Park and the Kelly Elementary School

GSI Strategy
Private parcel GSI, Public Right-of-Way Improvements, Public Parcel Integrated GSI

UpstreamPgh's Role
support, advocate, partner

Potential Partners
Residents and the general community, Borough of Wilkinsburg, WPJWA, ALCOSAN"

Further Investigation
Water modeling (eventually)

Existing Conditions Map

Landmarks
Subshed
Base Map
PennDOT Road
Building Footprint

N

0.1 Miles

LEFT While not within environmental justice areas, low lying greenspaces and paved areas throughout the neighborhood can be an amenity and store stormwater, like this parking area near Whitney Park.

WATER CAPTURE DISTRICT
ROCKWELL - WILKINSBURG

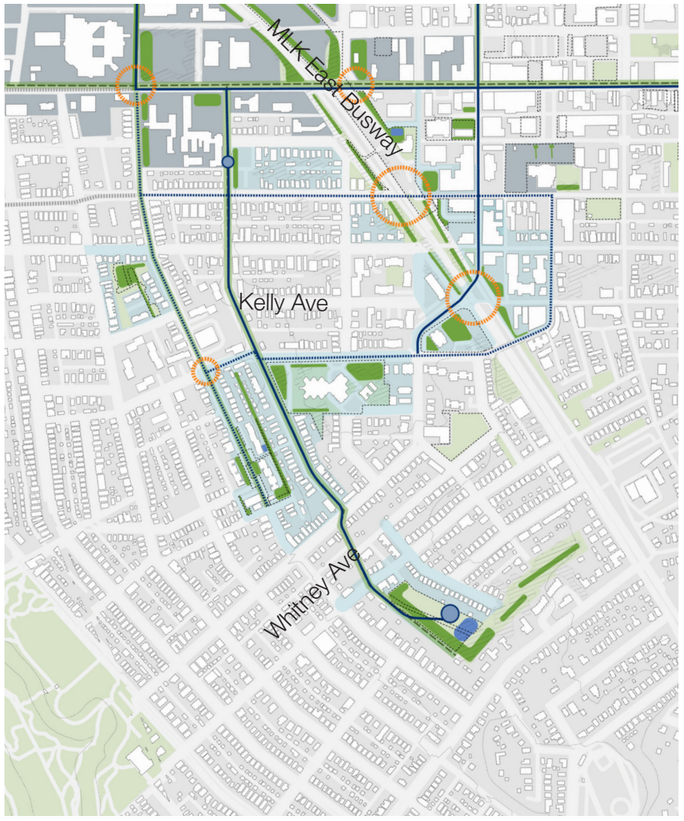
Whitney Park and Kelly School Micronetworks

While not within the study's Environmental Justice focus areas, publicly owned properties present opportunities for GSI that benefit the community in general.

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Several publicly owned properties could anchor a green street network extending toward Penn Avenue. The catchment area consists primarily of small-lot single-family homes, with stormwater contributed largely from the public right-of-way.

These projects mirror the park initiatives further upslope, though at a smaller scale. Park improvements can enhance on-site stormwater management through planted conveyance and both above- and below-grade storage. Research shows that combining technologies—such as pairing below-grade storage with a bioswale in the same area—can increase the effectiveness and longevity of both systems.

In addition to managing on-site runoff, parks can receive water from the public right-of-way and adjacent parcels. Storage and retention infrastructure should be constructed first, followed by streetscape improvements to capture and convey runoff into the system.

As functional infrastructure, these systems require maintenance routines that differ from those the municipality currently performs.

Computational Map

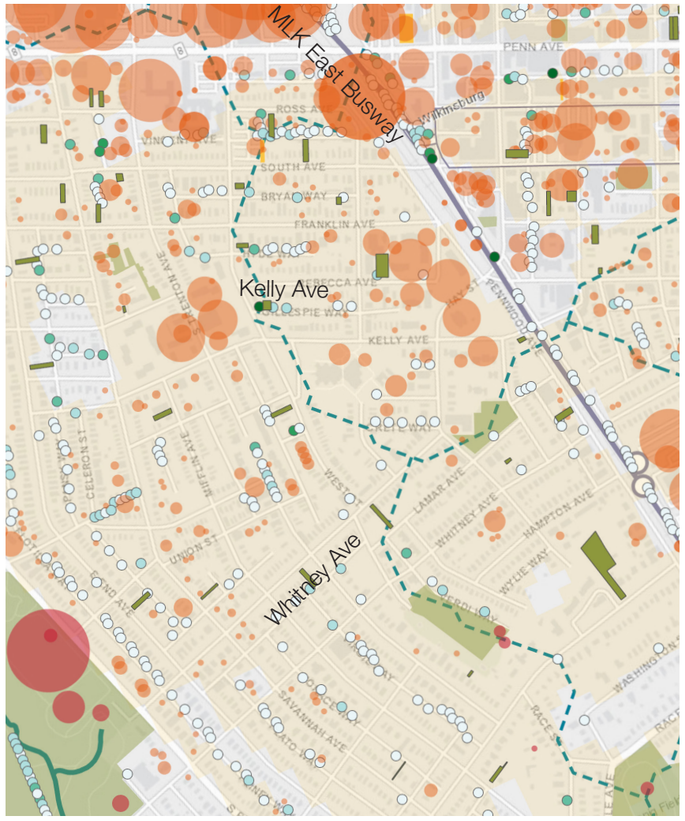
- Impervious Area
- Depaving & Retrofits
- Rain Gardens

N

0.1 Miles

Green Streets (Value)
- 0 - 0.04
- 0.04 - 0.14
- 0.14 - 0.30
- 0.30-0.61
- 0.61- 1

- Rapid
- Historic Streams (Culverted)
- Nine Mile Run Watershed Boundary



Environmental Justice Considerations

within a 5-minute walk of this project

69.1% % Employed
858 # of Residents
85.9% % Renter
80.3% % of Area Historically Redlined
$52,196 Median Income
16.2% Cost Burdened

Water Capture Opportunities

within a 5-minute walk of this project

13 Vacant lots
3 Parks & open space
6,979 Impervious area (sqft)
1 Parking lots
11,727 Streetscape (ft)
12 Parcels in Public Ownership

The Borough already faces challenges in maintaining existing infrastructure, so design alone is only the first step. Long-term care and maintenance of community-integrated GSI must be built into any project that moves forward. These projects are likely to attract the most community interest and engagement, even though their contribution to overall stormwater retention may be relatively modest.

The Borough will soon undertake a comprehensive review and planning study of all its parks. Participating in and supporting this effort will provide an important opportunity to explore stormwater management possibilities within these parks in greater detail. UpstreamPgh could be exceptionally valuable if it could tap GSI funding sources for the improvement projects.

VALLEY PARK PROJECTS

Many of the area's neighborhood parks are targeted for reinvestment and are ideal places for green stormwater infrastructure.

Many of the parks in the upper watershed were created in low valleys where development was less desirable. In some places, historic waterways still move through the buried sewer system, and the sound of flowing water can sometimes be heard underground—evidence that inflow and infiltration remain an issue.

These valley parks offer good opportunities for stormwater management. Some parks naturally receive runoff from surrounding areas and can store water during storms. In other cases, water from nearby streets and neighborhoods could be directed to the parks where it can be captured and managed.

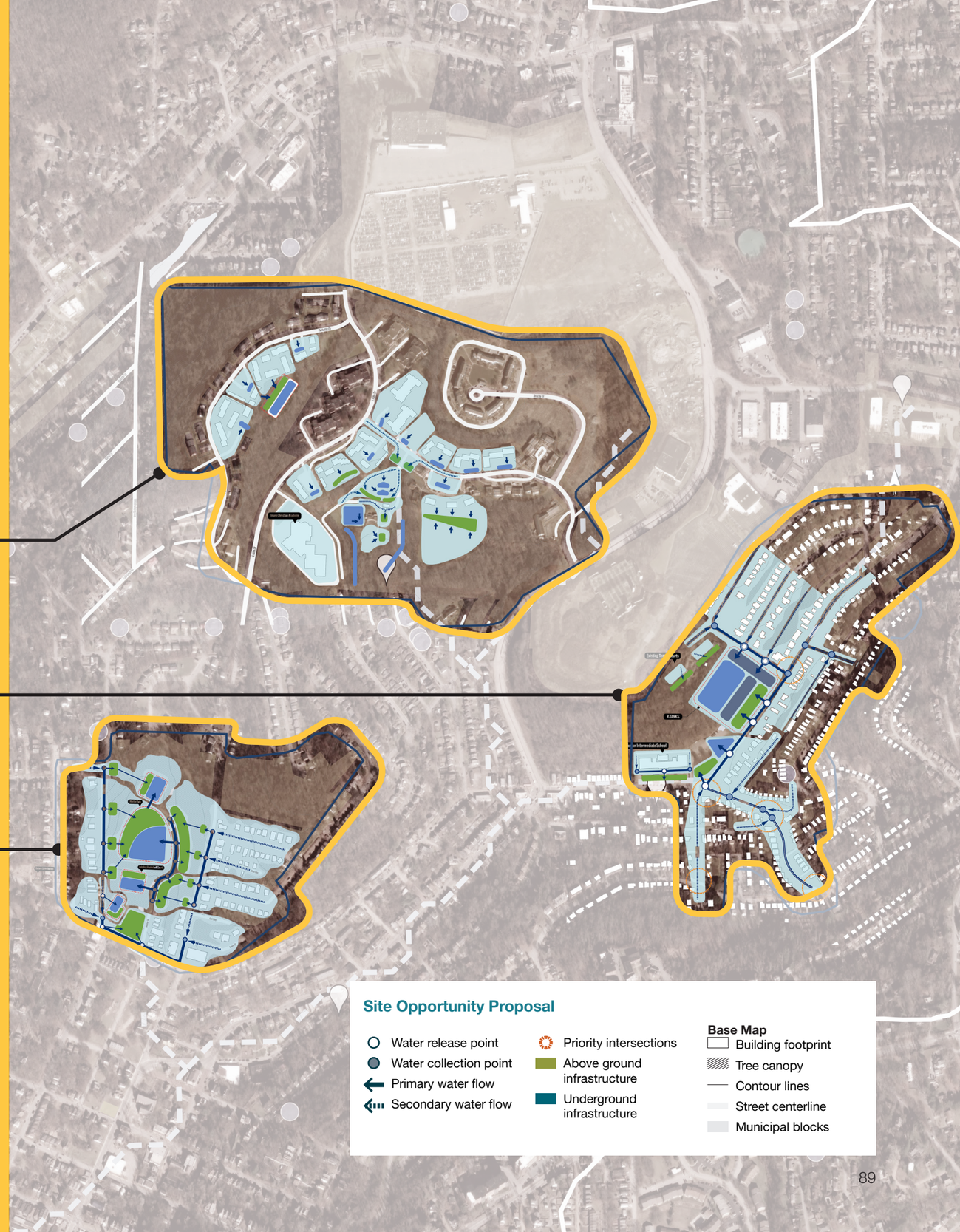
Most of these parks need reinvestment to meet current standards. Maintenance has often been limited, and some facilities have been abandoned, raising questions about long-term care. At the same time, the low level of disturbance has allowed strong ecological communities to grow, though invasive species are common.

With thoughtful investment, these parks could provide significant benefits for both water management and neighborhood life.

East Hills Park and Park Hill Drive

Turner Intermediate School

Hunter Park



Valley Park Projects

Select Community Feedback

[Hunter Park] Many of the community members engaged were not concerned about flooding near and around Hunter Park, although there were a few homes experiencing issues. The primary concern people shared were the abandoned homes in the area and pests like raccoons. There are also opportunities to connect with local efforts to build a nature trail through alleyways in the area. Wilkinsburg Borough is planning to make updates to the park, which could be an opportunity to integrate green infrastructure with those changes.

[Turner] "Please visit our area (Laketon Montier Clark Wright intersection) and see for yourself what a heavy rain looks like at the corner. No one seems to care about this Ward."

"The intersection of Montier and Wright streets. Water floods down from that area onto our curbs unto yards and driveways constantly. Maybe the sewer system isn't working at Clark and Wright therefore water streams and floods us! This has happened for years and is getting much worse. Rocks and sediment live our sidewalks and driveways after each rain."

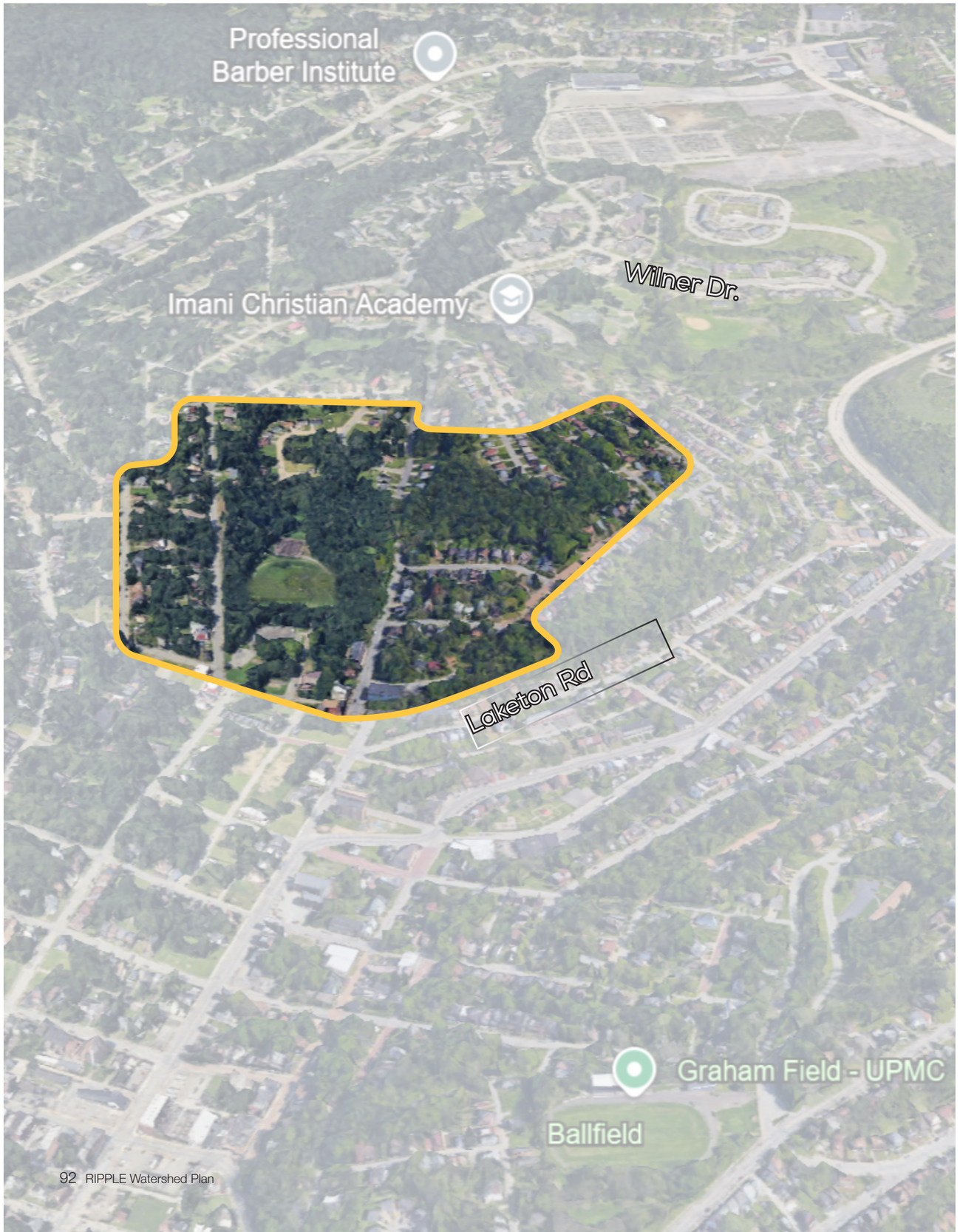
[East Hills] The Department of Public Works (DPW), in partnership with Ethos Collaborative and the East Hills community, is planning comprehensive upgrades to East Hills Park. Improvements include a new playground and picnic area, repairs to the basketball courts, pavilion, spray park, and athletic field, plus better accessibility, lighting, circulation, and stormwater management. Community feedback from the public survey and community meetings included prioritized safety, new amenities such as benches and tables, enhanced athletic facilities, and the addition of necessary bathrooms and water features (slip-and-slide, pool, and water park).

[Nine Mile Run] "too many abandoned residential and industrial properties or with absentee landlords and or owners who live out of state or are not nationals. Too few local rehab contractors with awareness of available sustainable resources."

"Brick streets such as LaClair and Macon and Trevanian which are pitched toward Frick Park but do not divert much stormwater away from the combined sewer drains and into the park.

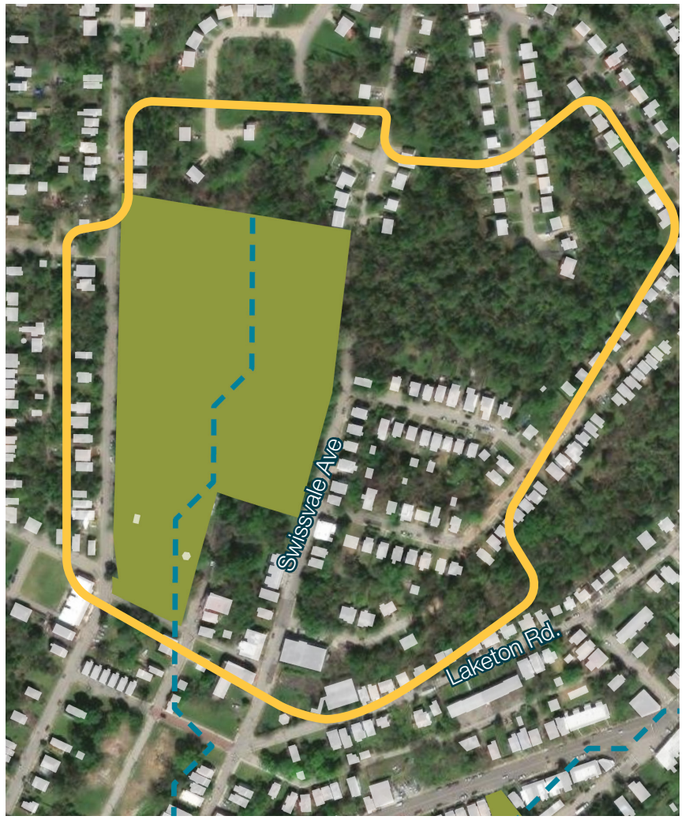
Hillsides with dead or dying trees such as Green Ash Black Locust that easily topple over in warm winter storms and do not effectively stabilize the hillsides from landslides.

Street tree pits in residential and business districts that do not effectively capture storm water. For example there are approximately 20 tree pits along Braddock avenue with low curbs (due to roadway build up) that do not retain storm water but allow it to run over and across them washing dirt and mulch onto the sidewalk."



VALLEY PARK PROJECTS

Hunter Park



Time Frame
Mid term

Location
A micro network that direct water to the municipally-owned Hunter Park from on-site and the adjacent streets

GSI Strategy
Private parcel GSI, Public Right-of-Way Improvements, Public Parcel Integrated GSI

UpstreamPgh's Role
Support, advocate, partner

Potential Partners
Residents and the general community, Borough of Wilkinsburg, WPJWA, ALCOSAN

Further Investigation
Water modeling (eventually)

N

0.15 Miles

FAR LEFT Aerial photo of Hunter Park (UpstreamPgh)
LEFT Aerial photo of Site (UpstreamPgh)

VALLEY PARK PROJECTS

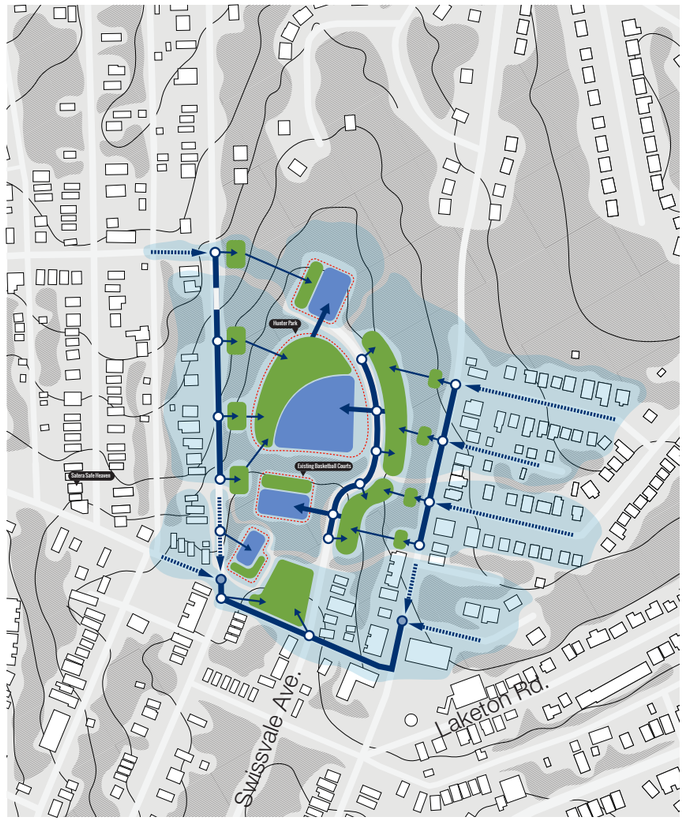
Hunter Park

Expanding recreational amenities to strengthen the ecological function of public open spaces and neighborhood character

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Hunter Park is a valley park that was likely constructed as an green space over a stream because it would have been difficult to develop housing or other uses. The park receives surface water from a large catchment area and shows signs of erosion and slope instability. Flooding has been reported in the park.

Hunter Park was one of the original sites identified in the 1999 Nine Mile Run Watershed Association report. Little has been done since then, as the municipality has had few resources to move forward with the original vision. **The park can be structured with nested catchment areas, enabling phased implementation. Six receiving areas can provide varying levels of capacity:**

- Public works: PROW capture and below-grade storage
- Pearl/Sherman: PROW capture and storage
- James: PROW capture and storage
- Coal: PROW capture and storage
- Play area: onsite capture and storage, possible networked storage for upslope bioswales
- Field: PROW capture and storage

Planned municipal renovations currently focus on the field and playground areas, though it is unclear whether stormwater improvements are included. The park would benefit from a comprehensive master plan to coordinate these efforts, integrate GSI enhancements, align capital investments, and establish a long-term maintenance framework.

Integrating green stormwater infrastructure (GSI) into the public right-of-way—such as along streets and intersections—could improve safety, performance, and neighborhood character. Sidewalk and curb reconstruction is needed, and James Street will require full rebuilding at the park frontage.

Park improvements can enhance on-site stormwater management through planted conveyance and both above- and below-grade storage. Research indicates that combining technologies—such as pairing below-grade storage with a bioswale—improves overall system performance and longevity. In addition to managing on-site runoff, parks can receive water from the public right-of-way and adjacent parcels. Storage and retention elements should be constructed first, followed by streetscape improvements to capture and convey runoff into the system. Investment in streetscape and right-of-way improvements will be needed to maximize capture capacity.

Because these systems function as active infrastructure, they require maintenance routines that differ from those currently performed by the municipality. The Borough already struggles to maintain existing assets, so long-term care and maintenance planning must accompany any approved GSI design.

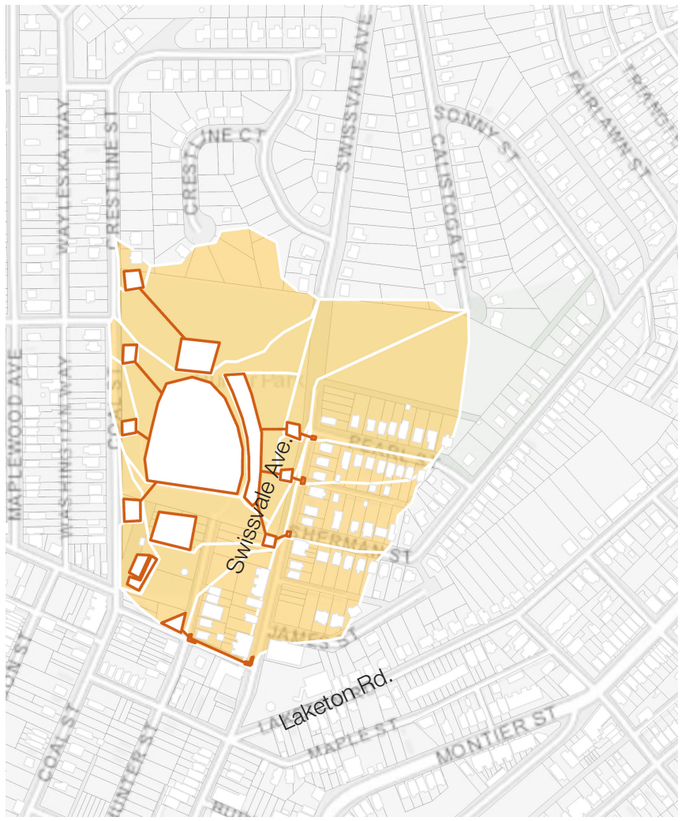
The Borough's forthcoming borough-wide parks master plan offers an important opportunity to explore stormwater strategies in greater depth. UpstreamPgh could play a valuable role by helping the Borough leverage GSI funding sources to support these improvement projects.

Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.1 Miles



973,936
cubic feet managed

335,810
cubic feet bypassed

Environmental Justice Considerations

within a 5-minute walk of this project

38%
% Employed

73.8%
% Renter

$37,388
Median Income

100
# of Residents

100%
% of Area Historically Redlined

47.6%
Cost Burdened

Water Capture Opportunities

within a 5-minute walk of this project

0
Vacant lots

93,000
Impervious area (sqft)

4,324
Streetscape (ft)

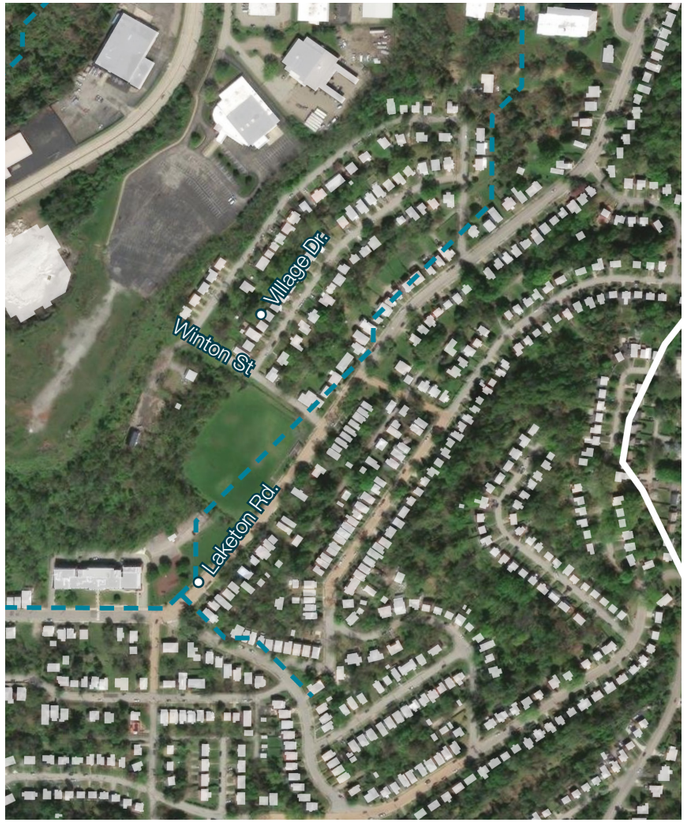
1
Parks & open space

0
Parking lots

0
Parcels in Public Ownership

VALLEY PARK PROJECTS

Turner Intermediate School



Time Frame
mid term

Location
a micro network that direct water to the publicly-owned Turner School and adjacent park from on-site and the nearby streets

GSI Strategy
Private parcel GSI, Public Right-of-Way Improvements, Public Parcel Integrated GSI

UpstreamPgh's Role
support, advocate, partner

Potential Partners
Residents and the general community, Borough of Wilkinsburg, Wilkinsburg School District, WPJWA, ALCOSAN

Further Investigation
Water modeling (eventually)

LEFT PAGE Aerial photo over the fields at Turner Intermediate School (Homes.com)
FAR LEFT UpstreamPgh spreads awareness of Green stormwater infrastructure during a City in the Streets community event in East Hills (UpstreamPgh)

VALLEY PARK PROJECTS

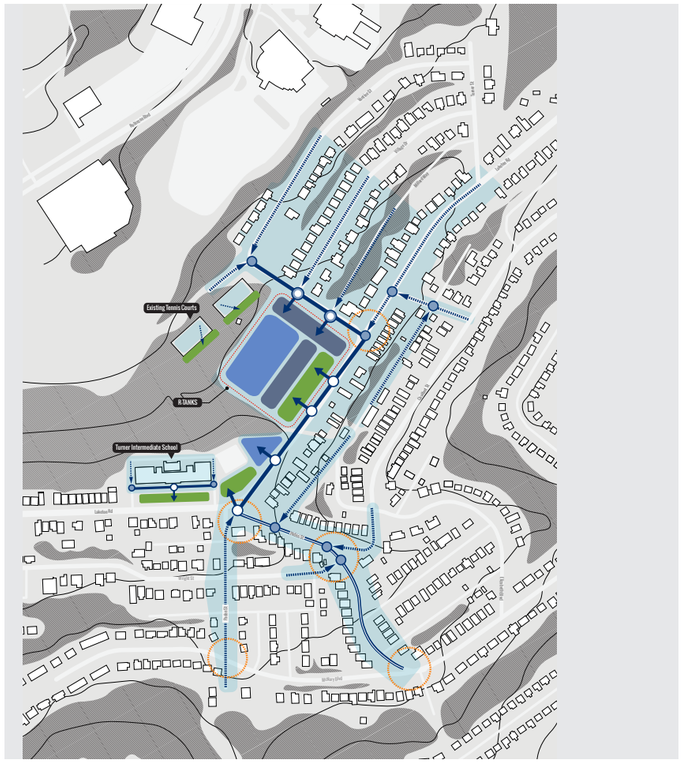
Turner Intermediate School

A hands on learning environment for students and community members, linking stormwater education to everyday experience.

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks

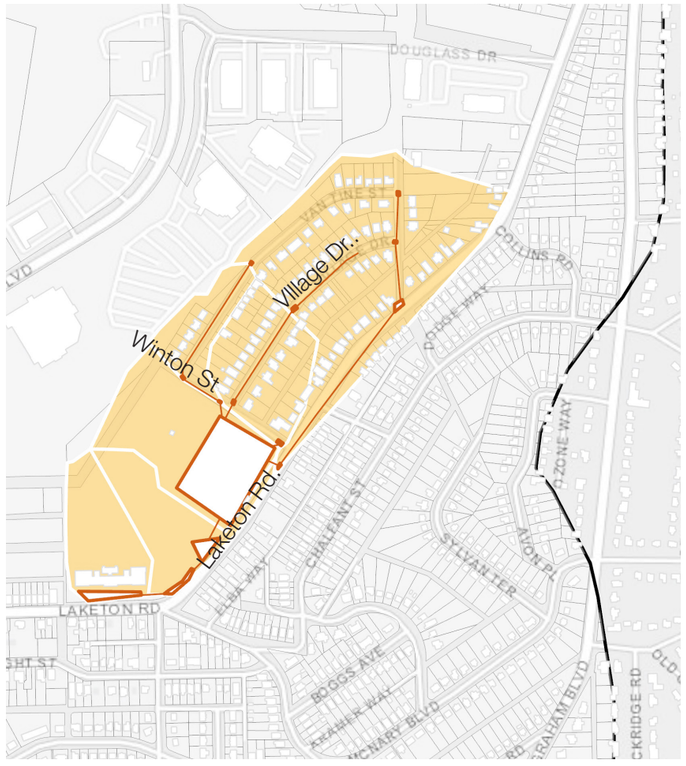


Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.1 Miles



1,639,515
cubic feet managed

329,473
cubic feet bypassed

Environmental Justice Considerations

within a 5-minute walk of this project

64.8%
Employment

635
# of Residents

49.2%
% Renter

0%
% of Area Historically Redlined

$55,190
Median Income

15%
Cost Burdened

Water Capture Opportunities

within a 5-minute walk of this project

8
Vacant lots

0
Parks & open space

370,227
Impervious area (sqft)

0
Parking lots

5,562
Streetscape (ft)

Parcels in Public Ownership

The school is a valued community asset, and recent upgrades have improved both the building and its grounds. Turner School occupies a low-lying valley at the confluence of two former streams—land that was difficult to develop for housing or other uses.

Turner School is an active community amenity and can be structured with on-site storage and as a micro network that captures water from off-site. Four distinct receiving areas offer varying levels of capacity:

- Abandoned courts: on-site capture and storage
- Field: private property and PROW capture and convey with central storage
- School parking: PROW capture and storage, intersection improvements
- School entry: on-site capture and storage

PROW investment will be needed to maximize capture volume. Community-requested renovations include converting the existing baseball fields into football fields with seating and parking. The abandoned paved courts could be repurposed, removed, or allowed to undergo a planned “controlled decay” process that gradually returns the area to a more natural state.

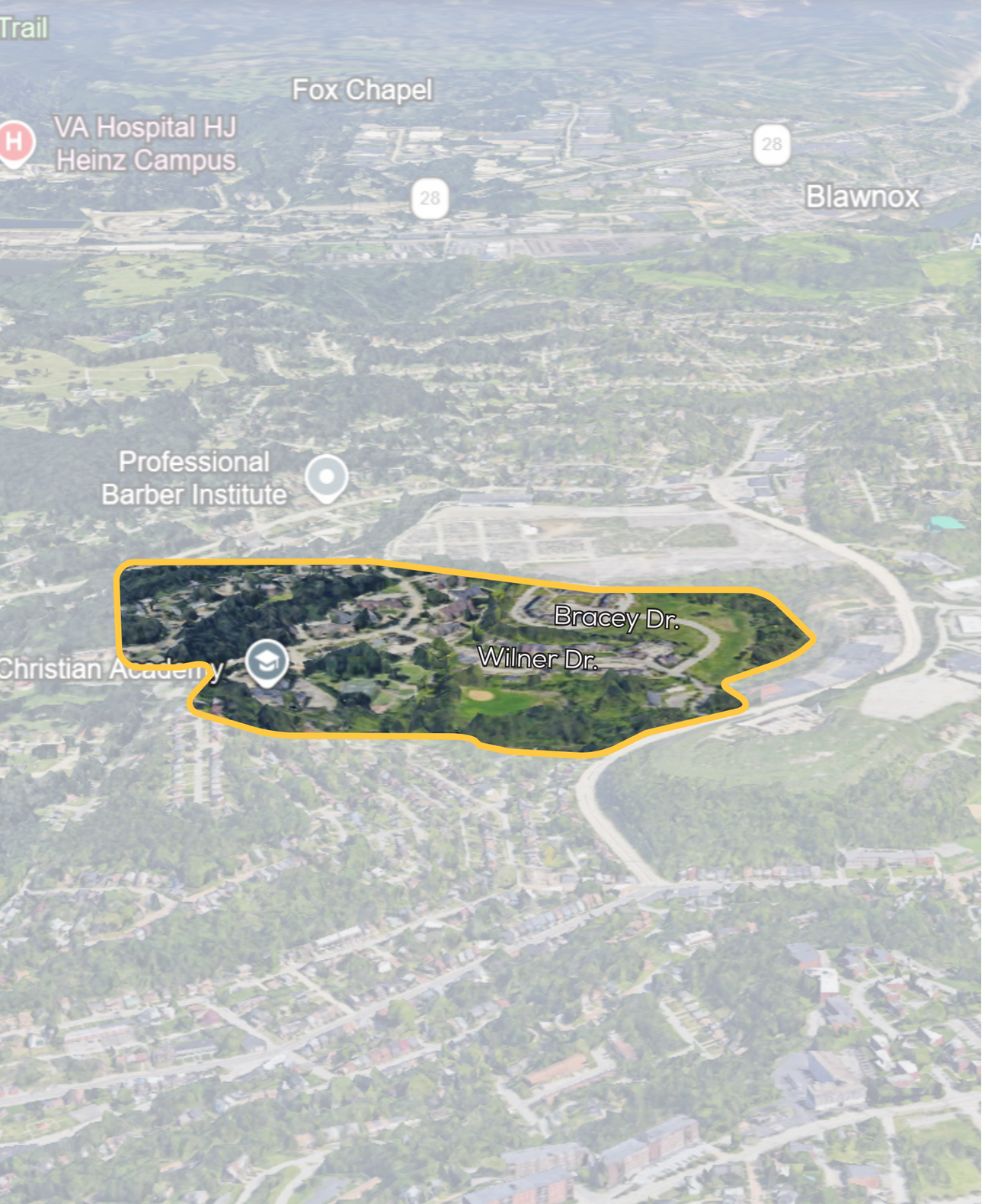
Integrating green stormwater infrastructure (GSI) into the public right-of-way—such as along streets and intersections—could improve safety, performance, and neighborhood character. Stakeholders expressed that intersection improvements at Marie Street and Laketon St were already underway, though no GSI was incorporated. This is only one of a handful of intersections identified within the micro network, so additional opportunities exist.

The park would benefit from a comprehensive master plan to coordinate these efforts, integrate GSI enhancements, align capital investments, and establish a long-term maintenance framework.

Park improvements can enhance on-site stormwater management through planted conveyance and both above- and below-grade storage. Research indicates that combining technologies—such as pairing below-grade storage with a bioswale—improves overall system performance and longevity. In addition to managing on-site runoff, parks can receive water from the public right-of-way and adjacent parcels. Storage and retention elements should be constructed first, followed by streetscape improvements to capture and convey runoff into the system. Investment in streetscape and right-of-way improvements will be needed to maximize capture capacity.

Because GSI systems function as active infrastructure, they require maintenance routines that differ from those currently performed by the municipality. The Borough already struggles to maintain existing assets, so long-term care and maintenance planning must accompany any approved GSI design.

The Borough’s forthcoming borough-wide parks masterplan offers an important opportunity to explore stormwater strategies in greater depth. UpstreamPgh could play a valuable role by helping the Borough leverage GSI funding sources to support these improvement projects.



VALLEY PARK PROJECTS

East Hills Park and Park Hill Drive

Time Frame
short term

Location
a micro network that direct water to the municipally-owned East Hills Park from on-site and the adjacent streets

GSI Strategy
Private parcel GSI, Public Right-of-Way Improvements, Public Parcel Integrated GSI

UpstreamPgh's Role
support, advocate, partner, watchdog

Potential Partners
Residents and the general community, City of Pittsburgh, PGH20, ALCOSAN

FAR LEFT Aerial photo of Site Facing Neighborhood (UpstreamPgh)
LEFT Aerial photo of Site Facing Park (UpstreamPgh)

VALLEY PARK PROJECTS

East Hills Park and Park Hill Drive

A park redesign is an ideal opportunity for GSI and to encourage adjacent parcels to manage water similarly.

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map

- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks

East Hills Park is an active community amenity and is currently undergoing a park redesign. The site's upslope catchment area is large, but the adjacent properties are owned and maintained by a single entity that appears to manage its drainage infrastructure adequately. Even so, opportunities exist to improve stormwater management within and around the park.

The park's GSI can be structured with on-site storage and as a micro network that captures water from off-site. Distinct receiving areas across the park and adjacent housing sites provide varying capacities for stormwater management, reflecting differences in topography, land use, and infrastructure.

- Residential parking: on-site capture and storage
- Park entry: PROW capture and storage
- Amphitheater: onsite capture and storage
- Walkways: onsite capture and storage
- Field: onsite capture and storage
- Spray park: onsite capture and storage
- Court: onsite capture and below-grade storage
- Abandoned play area: onsite capture and storage
- East Hills housing: onsite capture and storage
- Valley: potential bioswale / open channel

PROW investment will be needed to maximize capture volume. The community identified the need for another entry and the desirability of coming off Robinson Boulevard to increase the park's visibility and public presence.

Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.1 Miles

565,473
cubic feet captured

161,487
cubic feet bypassed

Water Capture Opportunities

within a 5-minute walk of this project

11
Vacant lots

613,631
Impervious area (sqft)

5,976
Streetscape (ft)

1
Parks

0
Parking lots

4
Parcels in Public Ownership

Environmental Justice Considerations

within a 5-minute walk of this project

23%
% Employed

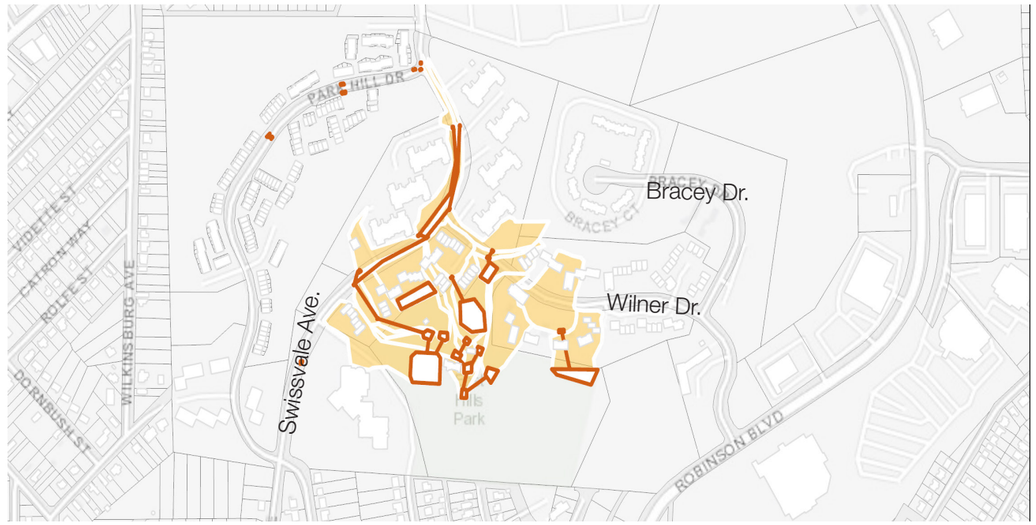
65.8%
% Renter

$13,771
Median Income

2,079
# of Residents

4.9%
% of Area Historically Redlined

31.9%
Cost Burdened



Imani Christian Academy is a strong candidate for stormwater improvements due to its sloped topography and extensive impervious surfaces. On-site capture and storage should be prioritized before directing runoff to the adjacent park. The former playground area could be repurposed as a community learning space—receiving both stormwater and students—and used to demonstrate stormwater management practices in an educational setting.

Integrating green stormwater infrastructure (GSI) into the public right-of-way—such as along streets and intersections—can improve safety, system performance, and neighborhood character. In this location, traffic volumes are extremely low, consisting primarily of local circulation, which reduces the need for large-scale infrastructure improvements. The site's geometry also limits opportunities to capture runoff from surrounding areas, making off-site water management impractical. As a result, on-site stormwater capture and storage were the primary focus.

The park is maintained by the City of Pittsburgh's Department of Public Works (DPW). Implementing GSI will require new maintenance practices that differ from DPW's current routines. Because the City already faces challenges in maintaining existing infrastructure, long-term operations and maintenance planning must be built into any approved GSI design.

VALLEY PARK PROJECTS

Nine Mile Run Outflow

Time Frame
long term

Location
The properties and streets are near the entrance of the highway and where the stream emerges from the culvert.

GSI Strategy
Private parcel GSI, Public Right-of-Way Improvements

UpstreamPgh's Role
watchdog, advocate, support, partner

Potential Partners
PennDOT, City of Pittsburgh, Borough of Wilkinsburg, DOMI, Edgewood, Swissvale, PGH20, adjacent property owners, Regent Square CBOs, ALCOSAN

Further Investigation
What is PennDOT's role in the channel degradation? Need modeling in this area.

N

0.1 Miles

LEFT Aerial photo of the CLASS Building at the headwaters of Nine Mile Run and the trailhead of Braddock Trail (UpstreamPgh)

VALLEY PARK PROJECTS

Nine Mile Run Outflow

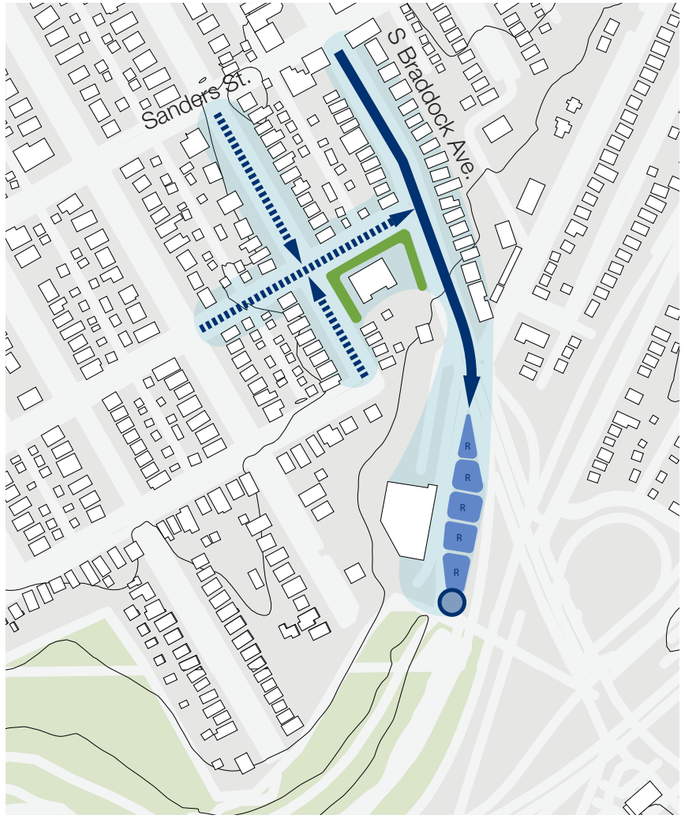
This forgotten entrance to Frick Park has long been a focus for UpstreamPgh but municipal boundaries and the culvert outflow make it one of the most complex project in the shed.

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map

- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



The project was featured in the original 1999 Re-Evaluating Stormwater Plan and hosts many acute issues, including (from the low point upward): high velocity exiting of the water from the culvert and downstream slope destabilization, surface flow with erosion along the roads and across the parking area, clogged sewers, parcel runoff.

This area has two areas of concern: In the Nine Mile Run channel and culvert area, there is continued degradation of the channel immediately below the outflow and the integrity of the culvert itself is continuing to degrade. In the upslope neighborhood, the surface runoff from private property and in the public right-of-way can overwhelm the lower commercial property and cause surface flooding.

Nine Mile Run channel and culvert flow. Advocate for maintaining or reconstructing the culvert, given its orphan status among municipalities. Consider who will be the most affected. Confirm that the culvert is being monitored for structural integrity and function.

Open Channel Risk. The City will have to deal with slope failure if the erosion continues. PennDOT's edge is hardened, but the highway is not without risk if a slope failure occurs on the city side.

Computational Map

- Impervious Area
- Depaving & Retrofits
- Rain Gardens

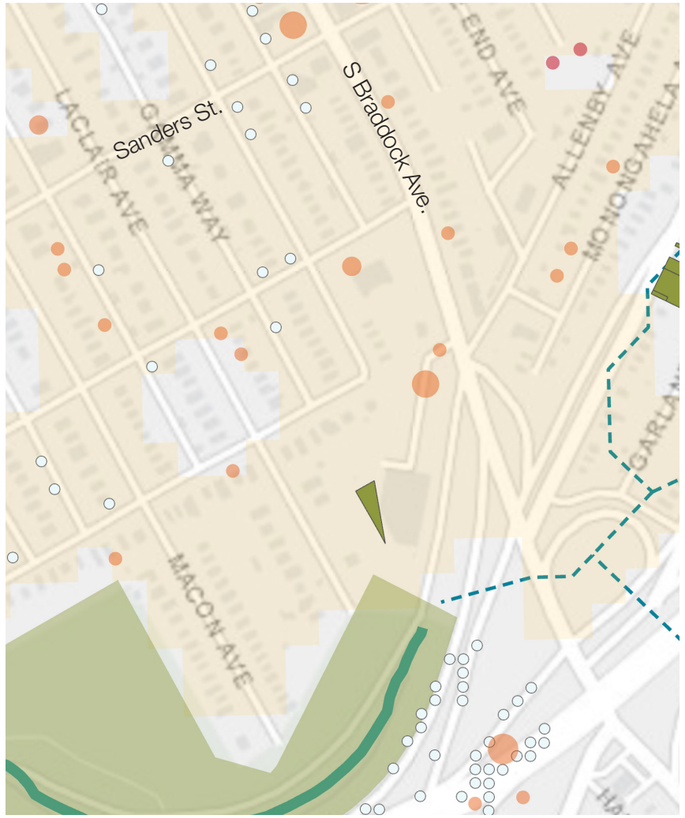
N

0.1 Miles

Green Streets (Value)

- 0 - 0.04
- 0.04 - 0.14
- 0.14 - 0.30
- 0.30-0.61
- 0.61- 1

- Rapid
- Historic Streams (Culverted)
- Nine Mile Run Watershed Boundary



Environmental Justice Considerations

within a 5-minute walk of this project

Null % Employed	**Null** # of Residents
Null % Renter	**0%** % of Area Historically Redlined
Null Median Income	**Null** Cost Burdened

Null outcomes stem from data scarcity or the complete absence of information on the site.

Water Capture Opportunities

within a 5-minute walk of this project

1 Vacant lots	**1** Parks & open space
427,620 Impervious area (sqft)	**1** Parking lots
9,599 Streetscape (ft)	**1** Parcels in Public Ownership

Culvert Risk. A culvert failure would affect all upslope municipalities -- they would all suffer if the major water artery to the river is clogged.

Upslope neighborhood surface runoff. Rain events can quickly overwhelm the system; thus, more upslope retain-age is recommended. However, many of the adjacent properties have small, sloped lots. The amount of retained water, ongoing maintenance of small, distributed systems, and issues such as slope stability will pose challenges. Modeling and further investigation into slope stability should be done before recommending a blanket application of GSI systems.

The lower lot area receives water from the upslope streets. Maintaining the catch basins will prevent surface flooding but will not reduce the volume of water reaching the culvert, and thus will not limit CSO mixing or the destructive force of the water in the open channel.

Previous plans showed linked bioswales in the green area adjacent to the highway (assumed PennDOT). This can slow the water and fully contain small rain events with a properly sized network. The current flow would likely overwhelm the system in large events, requiring an overflow area.

It is possible that a culvert rebuild would enable a more extensive green-grey system in the lower lot. Manage investment in this area, with a view to a future rebuild.

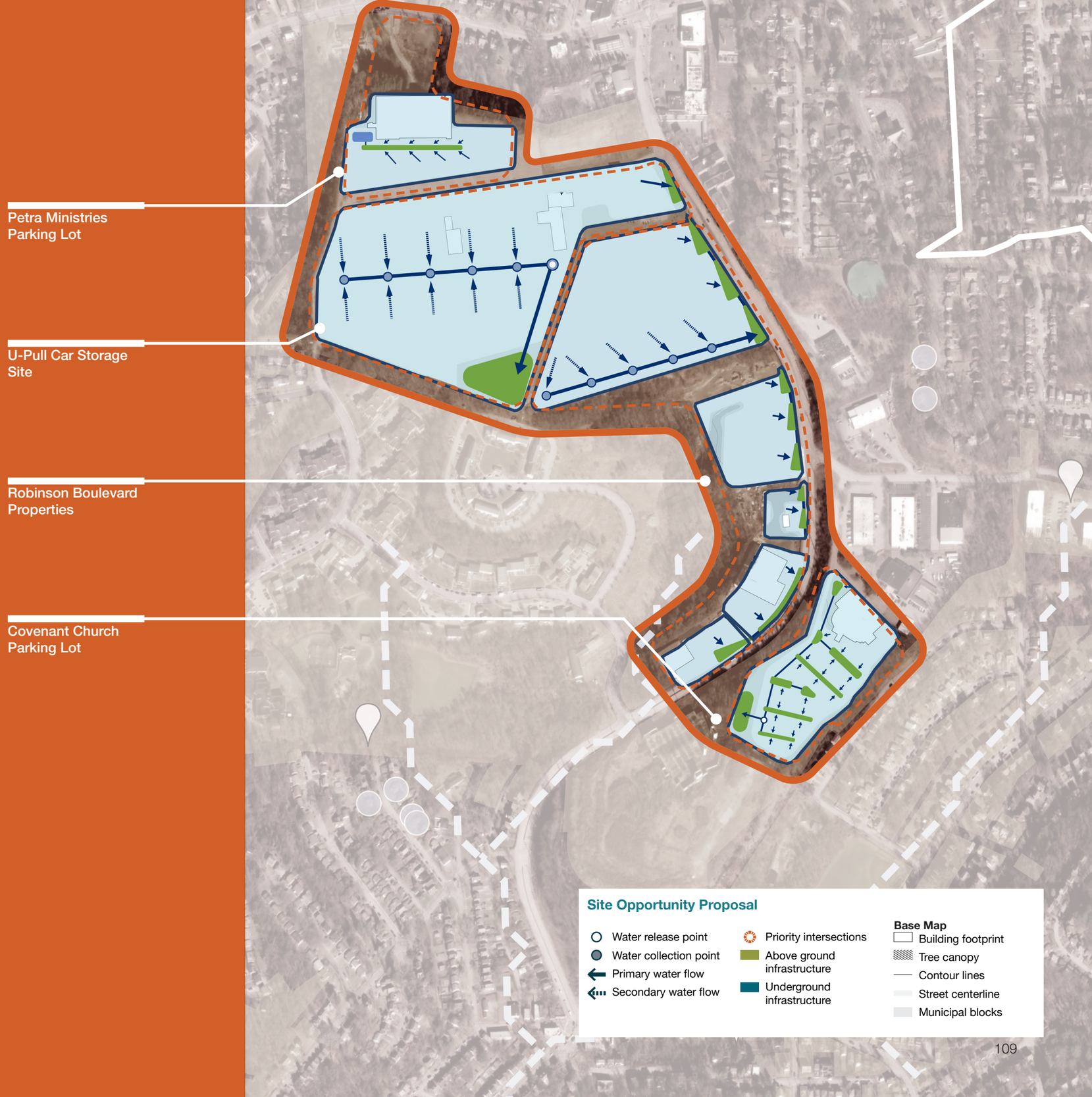
HILLTOP “SENDING” PROPERTIES

major contributors to run off
on site source control
private property

Most properties in this area have significant amounts of paving, in a variety of conditions. While detaining some portion of the water at the top of the system would delay stress on the lower part of the system, detaining a significant amount of the water removes a significant portion from the outfall
Technologies include above ground/below ground detention, on site networked or non-networked systems
There is a low quality of place and many of the properties are low value. Improvements can strengthen sense of place.
Not many people will experience the improvements directly. Downstream will experience improvements indirectly.

There is a low quality of place and many of the properties are low value. Improvements can strengthen sense of place.
Businesses/institutions locate here for affordability and will be financially challenges to add expense.
Dumping and blight is an issue for many properties and in the area.
More partners are required to address the myriad of issues, such as environmental remediation.
In areas with high development pressure, municipal regulations can require GSI adoption with improvements. In areas with low development pressure, grants will be needed to incentive adoption.

BELOW UpstreamPgh leads a canvassing effort, in partnership with Neighborhood Leaders, to gain feedback on the issues and opportunities around stormwater management across the community. (UpstreamPgh)



Hilltop "Sending" Properties

Select Community Feedback

The strategic goal for these sites is to "shave the hydrograph" by capturing, slowing, and storing stormwater runoff using approaches like bio-swales, green infrastructure, and below-grade storage. Specific sites identified include Petra Ministries, U-Pull, Robinson Boulevard parcels, and Covenant Church. The proposed strategies aim to hold water on-site to reduce peak flow and include greening improvements like planting trees.

Implementation Factors include using incentives to encourage participation from private owners and acknowledging that while the direct public benefit is limited compared to public parks, managing water at these headwater locations is critical for reducing overall watershed impact. The projects are viewed as complex, with a long-term (10-20 year) timeline possibly required for engagement or new regulations. Site constraints, such as the immobile vehicles at the U-Pull site, also pose challenges.

TOP LEFT Aerial photo Visual of U-Pull Site (UpstreamPgh)
TOP RIGHT Aerial photo Visual of U-Pull Site facing Southeast (UpstreamPgh)
BOTTOM Aerial photo Visual of Petra Site (UpstreamPgh)

HILLTOP PROPERTIES

Petra Ministries Parking Lot

Large surface parking lots contribute significant volumes of untreated stormwater into the rivers and streams.

The majority of properties in this district consist of large lots, ranging from 78,631 to 1,170,266 square feet, and are primarily used for short- or long-term vehicle storage. Short-term storage areas include church parking lots that fill according to worship schedules, while the largest parcel functions as a long-term vehicle storage yard, where parts are salvaged from inoperable cars.

UpstreamPgh's Role
support, advocate, partner, watchdog

Time Frame
short term

Location
Properties occupy the highest points in the watershed (hilltop) and along Robinson Boulevard.

GSI Strategy
Private parcel GSI, Vacant Lot GSI

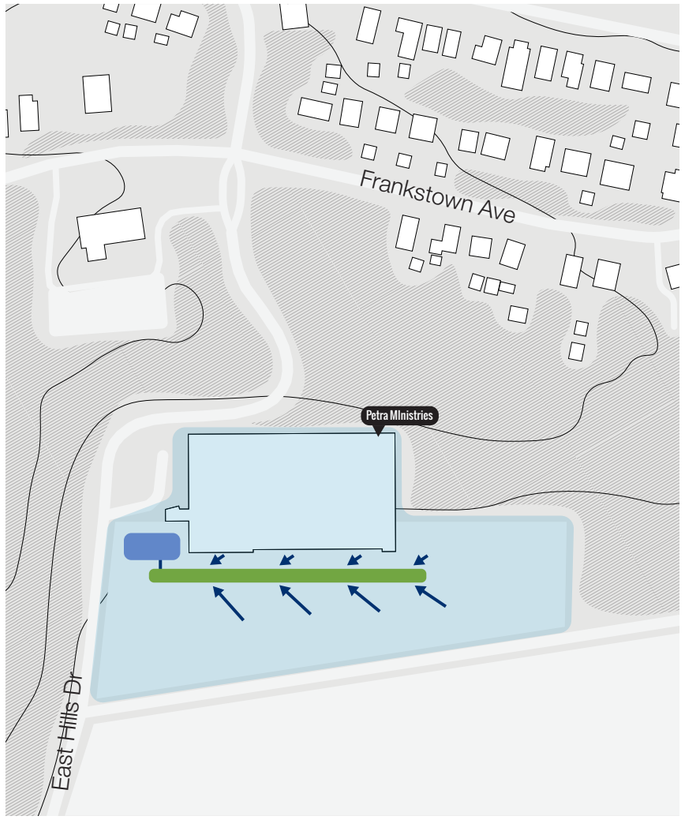
Potential Partners
Residents and the general community, City of Pittsburgh, PGH20, ALCOSAN, Petra Miniseries, East Hills Consensus Group, Penn Hills

Further Investigation
Water modeling (eventually)

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Petra Ministries Parking Lot

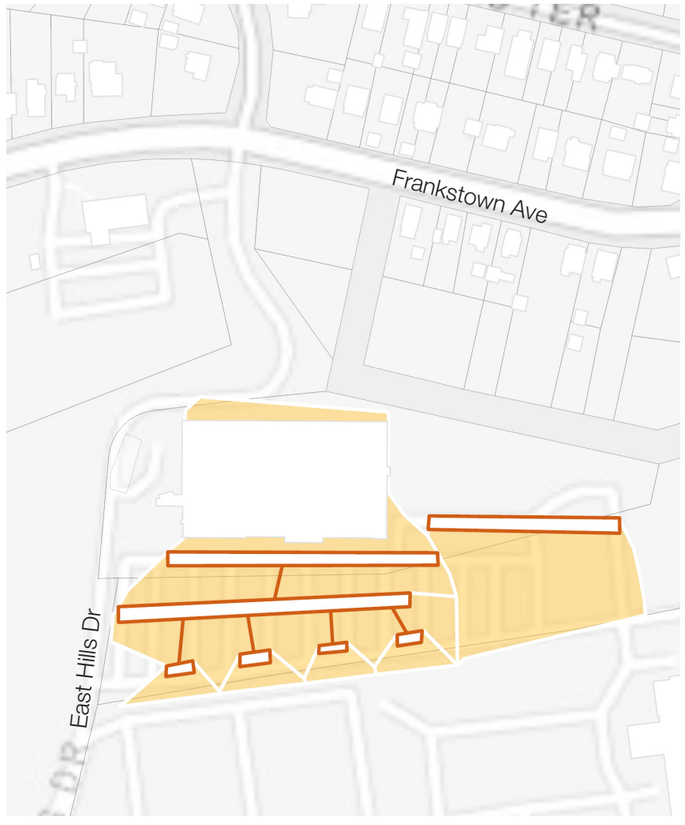
- Large parking lot appears to have been designed to more recent stormwater standards.
- Paving condition needs to be confirmed. Bioswales could be networked or non-networked.
- Below grade storage would be needed to get to higher levels of removal.

Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.05 miles



Environmental Justice Considerations

within a 5-minute walk of this project

47.1% % Employed

34 # of Residents

30% % Renters

0% % of Area Historically Redlined

$52,500 Median Income

30% Cost Burdened

Water Capture Opportunities

within a 5-minute walk of this project

2 Vacant lots

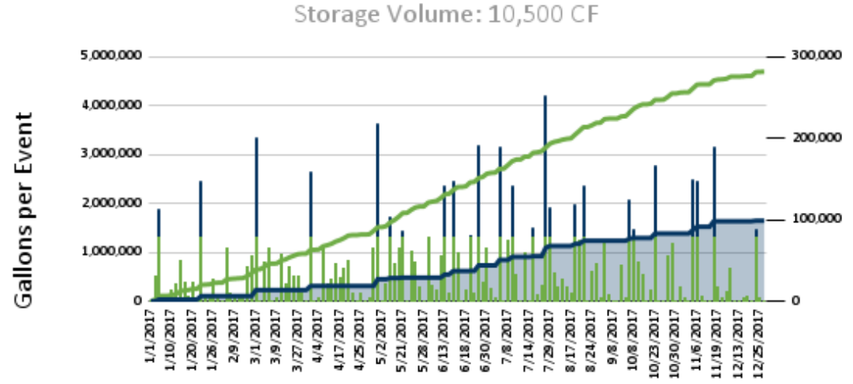
0 Parks & open space

128,131 Impervious area (sqft)

0 Parking lots

1,782 Streetscape (ft)

0 Parcels in Public Ownership



627,9822 cubic feet captured

220,365 cubic feet bypassed

HILLTOP PROPERTIES

U-Pull Car Storage Site

Large surface parking lots contribute significant volumes of untreated stormwater into the rivers and streams.

The majority of properties in this district consist of large lots, ranging from 78,631 to 1,170,266 square feet, and are primarily used for short- or long-term vehicle storage. Short-term storage areas include church parking lots that fill according to worship schedules, while the largest parcel functions as a long-term vehicle storage yard, where parts are salvaged from inoperable cars.

UpstreamPgh's Role
support, advocate, partner, watchdog

Time Frame
short term

Location
Properties occupy the highest points in the watershed (hilltop) and along Robinson Boulevard.

GSI Strategy
Private parcel GSI, Vacant Lot GSI

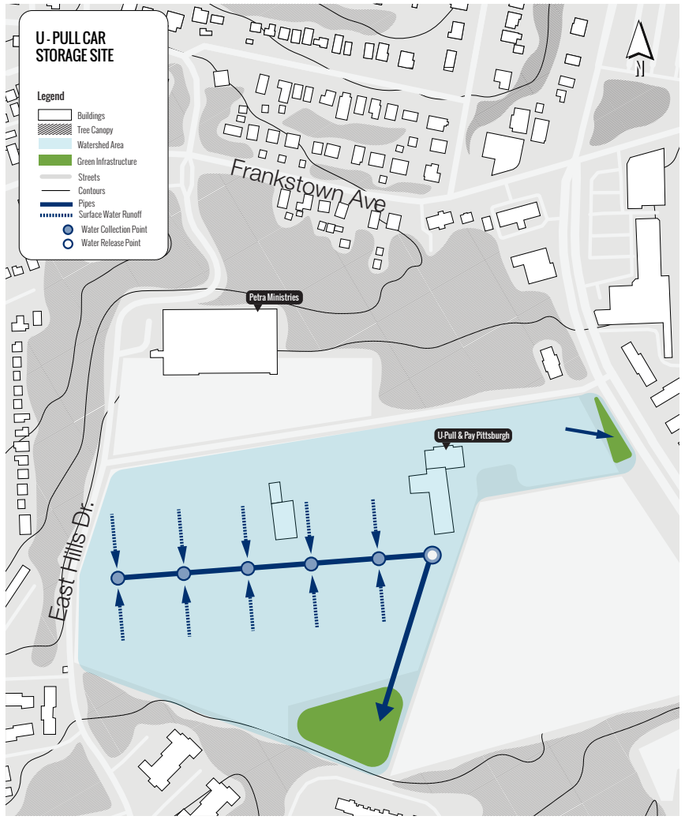
Potential Partners
Residents and the general community, City of Pittsburgh, PGH20, ALCOSAN

Further Investigation
Water modeling (eventually)

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



U-Pull Car Storage Site

- Large parking lot appears to have been designed to more recent stormwater standards.
- Paving condition needs to be confirmed. Bioswales could be networked or non-networked.
- Below grade storage would be needed to get to higher levels of removal.

Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.05 miles

Environmental Justice Considerations

within a 5-minute walk of this project

Null % Employed

Null # of Residents

Null % Renters

0% % of Area Historically Redlined

Null Median Income

Null Cost Burdened

Null outcomes stem from data scarcity or the complete absence of information on the site.

Water Capture Opportunities

within a 5-minute walk of this project

2 Vacant lots

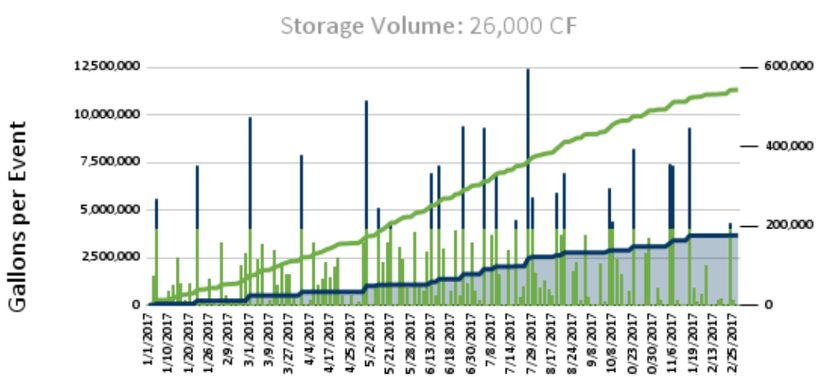
0 Parks & open space

12,131 Impervious area (sqft)

0 Parking lots

1,782 Streetscape (ft)

0 Parcels in Public Ownership



1,514,492 cubic feet captured

491,473 cubic feet bypassed

HILLTOP PROPERTIES

Robinson Boulevard Properties

Large surface parking lots contribute significant volumes of untreated stormwater into the rivers and streams.

The majority of properties in this district consist of large lots, ranging from 78,631 to 1,170,266 square feet, and are primarily used for short- or long-term vehicle storage. Short-term storage areas include church parking lots that fill according to worship schedules, while the largest parcel functions as a long-term vehicle storage yard, where parts are salvaged from inoperable cars.

UpstreamPgh's Role
support, advocate, partner, watchdog

Time Frame
short term

Location
Properties occupy the highest points in the watershed (hilltop) and along Robinson Boulevard.

GSI Strategy
Private parcel GSI, Vacant Lot GSI

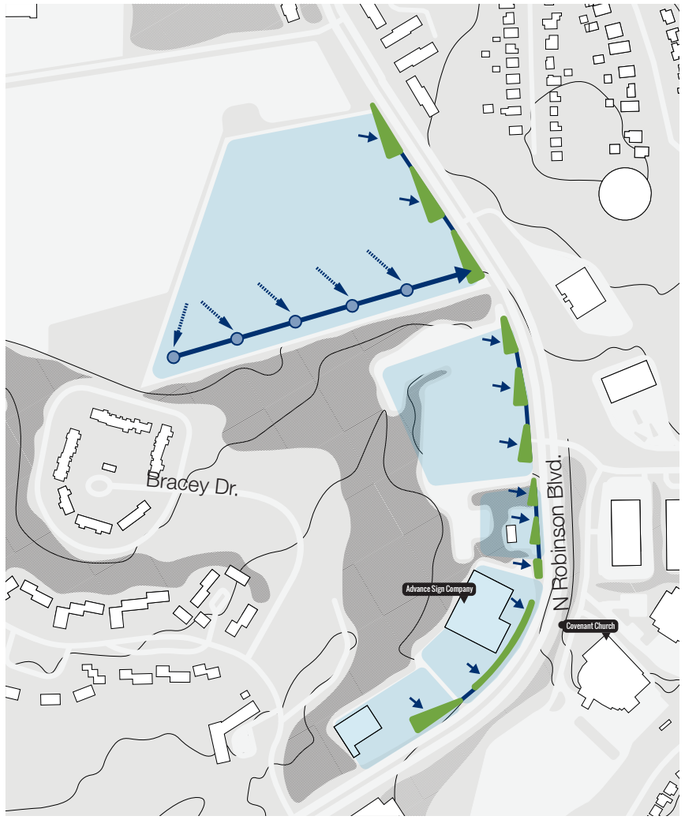
Potential Partners
Residents and the general community, Borough of Wilkinsburg, ALCOSAN

Further Investigation
Water modeling (eventually)

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Robinson Boulevard Properties

- Parking lots for current businesses and vacant lots have similar opportunities for drainage along road
- Bioswales are limited in effectiveness but would create a buffer
- Below grade storage would add significant capacity
- Networking between properties to a centralized facility might enable the most storage

Computational Map

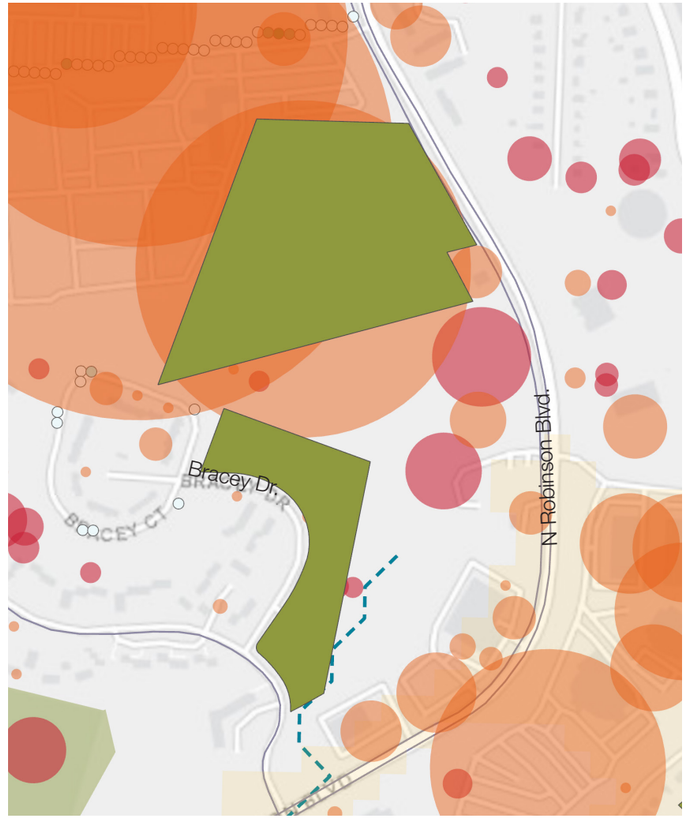
- Impervious Area
- Depaving & Retrofits
- Rain Gardens

N

0.1 miles

Green Streets (Value)
- 0 - 0.04
- 0.04 - 0.14
- 0.14 - 0.30
- 0.30-0.61
- 0.61- 1

- Rapid
- Historic Streams (Culverted)
- Nine Mile Run Watershed Boundary



Environmental Justice Considerations

within a 5-minute walk of this project

Null Employment
Null # of Residents
Null Renter/ Homeowner
0% % of Area Historically Redlined
Null Median Income
Null Cost Burdened

Null outcomes stem from data scarcity or the complete absence of information on the site.

Water Capture Opportunities

within a 5-minute walk of this project

1 Vacant lots
0 Parks & open space
728,465 Impervious area (sqft)
0 Parking lots
2,864 Streetscape (ft)
0 Parcels in Public Ownership

FAR LEFT Aerial photo Photo facing Bracy Drive (UpstreamPgh)
LEFT Aerial photo facing Robinson Boulevard (UpstreamPgh)

HILLTOP PROPERTIES

Covenant Church Parking Lot

Large surface parking lots contribute significant volumes of untreated stormwater into the rivers and streams.

The majority of properties in this district consist of large lots, ranging from 78,631 to 1,170,266 square feet, and are primarily used for short- or long-term vehicle storage. Short-term storage areas include church parking lots that fill according to worship schedules, while the largest parcel functions as a long-term vehicle storage yard, where parts are salvaged from inoperable cars.

UpstreamPgh's Role
support, advocate, partner, watchdog

Time Frame
short term

Location
Properties occupy the highest points in the watershed (hilltop) and along Robinson Boulevard.

GSI Strategy
Private parcel GSI, Vacant Lot GSI

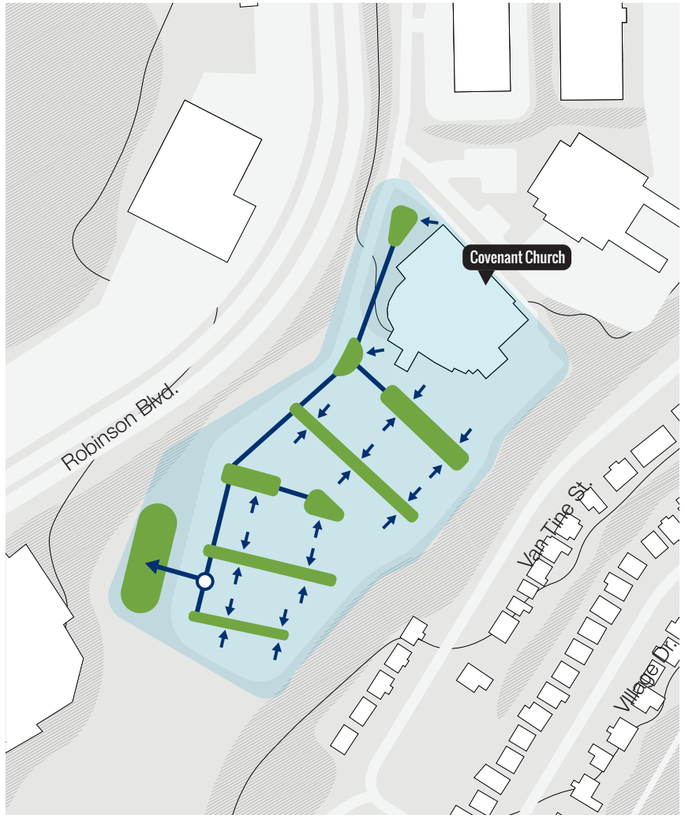
Potential Partners
Residents and the general community, Borough of Wilkinsburg, PGH20, ALCOSAN, Covenant Church

Further Investigation
Water modeling (eventually)

Site Opportunity Proposal

- Water release point
- Water collection point
- Primary water flow
- Secondary water flow
- Priority intersections
- Above ground infrastructure
- Underground infrastructure

Base Map
- Building footprint
- Tree canopy
- Contour lines
- Street centerline
- Municipal blocks



Covenant Church Parking Lot

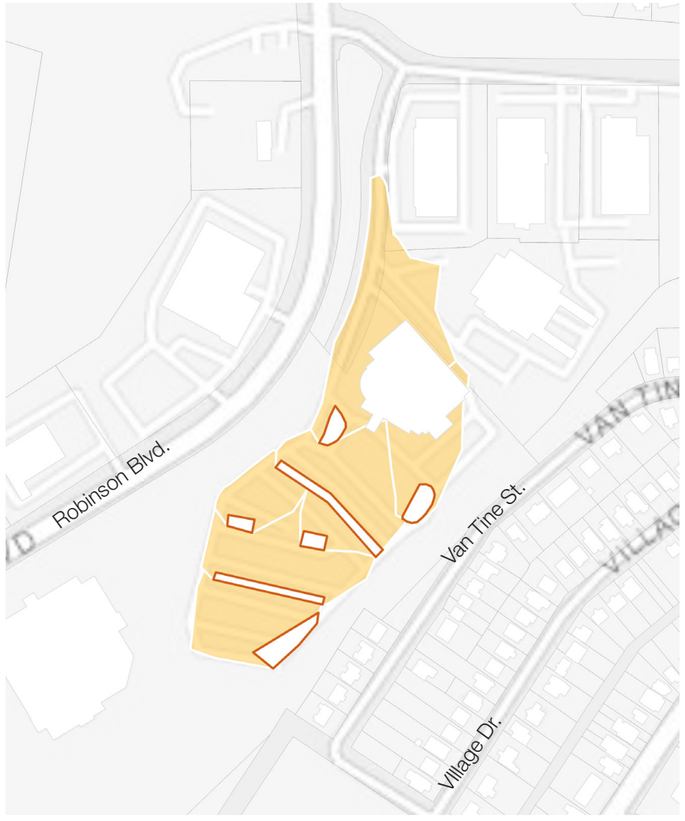
- Large parking lot appears to have been designed to more recent stormwater standards.
- Paving condition needs to be confirmed.
- Bioswales could be networked bioswales or non-networked.
- Striping will have to be redesigned. May result in a net loss of spaces.
- Above or below grade storage could be below grade or on adjacent site.

Subshed Structures

- Subshed Structure Area
- Nodes
- Connections

N

0.05 Miles



Environmental Justice Considerations

within a 5-minute walk of this project

Null % Employed

Null # of Residents

Null % Renters

0% % of Area Historically Redlined

Null Median Income

Null Cost Burdened

Null outcomes stem from data scarcity or the complete absence of information on the site.

Water Capture Opportunities

within a 5-minute walk of this project

0 Vacant lots

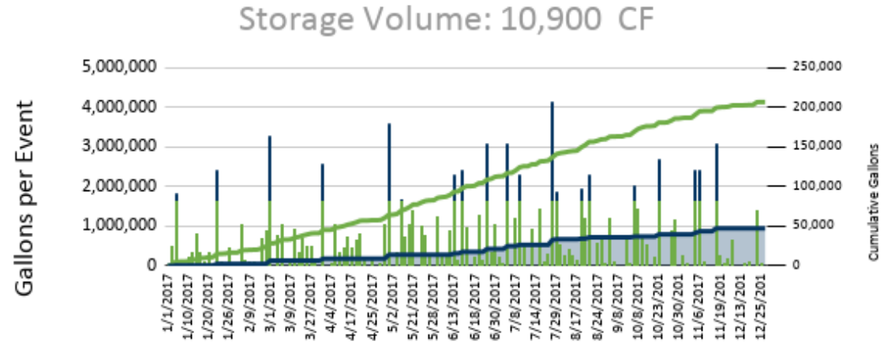
4,078 Impervious area (sqft)

1000 Streetscape (ft)

0 Parks & open space

0 Parking lots

0 Parcels in Public Ownership



553,482 cubic feet captured

126,494 cubic feet bypassed

04 POLICY RECOMMENDATIONS

The RIPPLE Plan is a generational plan that will take decades to fully implement and will require administrative infrastructure that can consistently assess and adapt to opportunities and challenges.

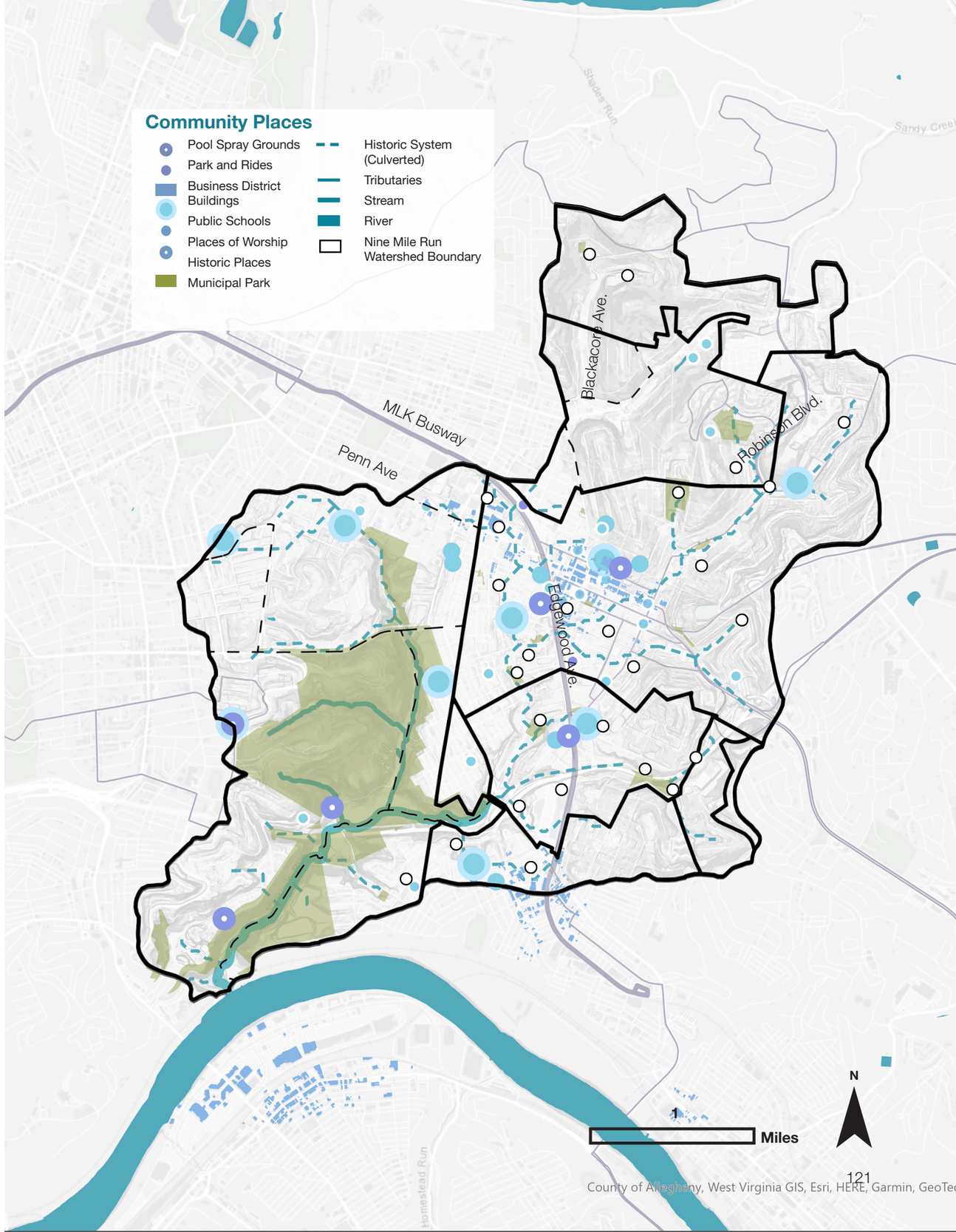
Implementing green stormwater infrastructure at watershed scale requires more than strong project design, it requires durable organizational infrastructure capable of sustaining coalitions, coordinating action, and stewarding built work over time. As the coordinating organization and long-term vision keeper, UpstreamPgh must be shaped to support both implementation and stewardship. Partnerships with municipalities, agencies, nonprofits, community members, and property owners must be cultivated with the same care and consistency as the restored landscapes that form the physical foundation of this plan.

Through this process, **five core challenges** have emerged:

1. municipal continuity
2. multi-municipal coordination and funding
3. alignment of codes and policies
4. the unique design and maintenance needs of living systems
5. UpstreamPgh's capacity to scale.

In addressing these challenges, UpstreamPgh may serve in multiple **roles**, including convener, technical advisor, advocate, partner, and capacity builder. Lastly, the planning process has distilled a series of recommendations and best practices organized around **resilience policy** at the municipal and state levels, with special focus on **community education** strategies and **design integrations**.

ABOVE Rain garden planting with Operation Better Block Junior Green Corp (UpstreamPgh)



CHALLENGE

Support Municipal Continuity

Primary actors: Municipal governments; regional agencies
UpstreamPgh: Convener, grant coordinator, implementation partner

Implementing watershed-scale green stormwater infrastructure requires sustained coordination over many years. In smaller municipalities, frequent turnover in key leadership and staff roles, such as borough managers, public works directors, and permitting officials, can disrupt project momentum, slow decision-making, and complicate long-term maintenance planning. While UpstreamPgh's sustained partnerships support implementation, this plan explicitly addresses risks related to municipal leadership and staffing transitions.

A recent review of staffing patterns across Pittsburgh, Wilkinsburg, Swissvale, and Edgewood shows varying levels of administrative stability. Pittsburgh's risk lies in turnover within large departments and leadership roles that can disrupt coordination through shifting priorities. Smaller municipalities face a greater risk from staff changes, as the loss of a single position can significantly slow or stall implementation. While some municipalities in the watershed have maintained consistent leadership, others have experienced interim appointments or transitions that increase risk for multi-year, multi-site efforts. These changes affect project delivery, the ability to pursue joint funding, code alignment, and the stewardship of interconnected infrastructure systems.

To better coordinate efforts and address risks related to municipal continuity, UpstreamPgh can:

- **Convene regular cross-municipal coordination meetings** focused on watershed-scale priorities to reinforce relationships and align timelines. Explore formal and informal mechanisms for multi-municipal cooperation to improve long-term capacity, such as joint planning efforts or shared services.
- **Prioritize early projects in municipalities with stable administrative capacity** (e.g., where a borough manager role is currently staffed and consistent).
- **Develop common documentation**, templates, and onboarding materials to help preserve institutional knowledge when staff changes occur. This might include project related documents such as "handoff-proof" scopes, standard details for streetscapes and other areas, maintenance guides, or administrative templates such as MOUs, maintenance schedules, funding calendars to preserve momentum and shorten re-onboarding time when staffing changes occur.
- **Use multi-municipal workflows to reduce fragility**. Establish a core inter-municipal team with active working relationships to maintain continuity and sustain progress across the watershed. Use multi-municipal workflows to reduce fragility by enabling municipalities to support one another during transitions.

CHALLENGE

Advance Multi-Municipal Coordination and Funding

Primary actors: Municipal governments; regional agencies
UpstreamPgh role: Convener, grant coordinator, implementation partner

Watershed-scale stormwater challenges cross municipal boundaries, yet funding, permitting, and implementation are still largely pursued on a municipality-by-municipality basis. In the Nine Mile Run watershed, this fragmentation limits the ability to plan, fund, and deliver networked green stormwater infrastructure at a meaningful scale. There are currently no routine joint submissions for funding or coordinated capital strategies, resulting in missed opportunities for leverage and efficiency.

Differences in administrative capacity, timing, and familiarity with multi-jurisdictional funding processes create barriers to collaboration. Smaller municipalities may lack the staff capacity to pursue complex grants independently, while larger entities may not have incentives to align schedules or scopes across borders. As a result, projects that would perform better as connected systems are often advanced as isolated interventions, reducing overall watershed benefit and competitiveness for state and federal funding.

To strengthen shared systems and coordination to pursue funding, UpstreamPgh can:

- Together with partners, **identify barriers to joint MS4 funding applications and chart a path to coordinated submissions**. Conduct a focused review of recent and attempted funding efforts to understand where coordination breaks down, such as mismatched timelines, eligibility concerns, staffing constraints, or uncertainty around shared responsibility, and document lessons learned. Define the opportunity cost of not pursuing joint submissions.
- **Pilot a multi-municipal funding application focused on networked GSI** by selecting a near-term opportunity that spans multiple municipalities. This pilot should test shared roles, coordination processes, and reporting structures. One opportunity is the Nine Mile Run Outflow, where above- and below-grade infrastructure crosses multiple jurisdictions and agencies. Alternatively, projects in the upper watershed in Pittsburgh, Wilkinsburg, and Penn Hills may offer a simpler setting to build and test coordination systems.
- **Assess governance models from eastern Pennsylvania and other places** that might increase coordination in the Nine Mile Run watershed. Review successful examples of cross-jurisdictional stormwater cooperation, such as shared authorities, intergovernmental agreements, or watershed-based partnerships, to identify structures that could be adapted to support long-term coordination in the Nine Mile Run watershed.
- **Develop shared project criteria and implementation timelines** by establishing common standards for project readiness, performance, equity benefit, and maintenance responsibility. Aligning schedules, values, and roles will improve the group's ability to pursue funding and support coordinated design, permitting, and construction.

CHALLENGE

Align Municipal Codes and Policies

Primary actors: Municipal governments and planning commissions
UpstreamPgh role: Technical assistance, coordination, documentation

Watershed-scale green stormwater infrastructure works best when the rules governing development, stormwater management, and long-term maintenance are consistent across municipal boundaries. In the Nine Mile Run watershed, municipalities share hydrology and infrastructure systems, yet stormwater and development requirements can vary, affecting what gets built, how quickly it is approved, and who is responsible for upkeep. When codes are not aligned, projects can face avoidable delays, designers and contractors must navigate inconsistent standards, and the cumulative performance of GSI systems can be weakened by uneven expectations from one municipality to the next. This is particularly relevant for complex areas such as the urban industrial districts at the top of the watershed (Robinson Boulevard) and south of the East Busway (Penn Avenue).

Alignment does not require identical ordinances. Alignment could involve common performance goals, predictable design and review criteria, and clear maintenance expectations so projects can be delivered efficiently and function as a connected system. Networked GSI, which relies on coordinated installations across multiple parcels and rights-of-way, depends on this consistency to support effective operations and long-term stewardship.

To advance code alignment, UpstreamPgh and its watershed partners could pursue the following actions:

- **Conduct a comparative review of stormwater and development codes.** Compile and compare stormwater ordinances and related development standards in Pittsburgh, Wilkinsburg, Swissvale, and Edgewood, focusing on provisions that influence GSI feasibility, review, and long-term stewardship.
- **Identify which codes most strongly support GSI implementation and maintenance.** Highlight the most GSI-supportive provisions, such as clear GSI preference language, zoning code entitlement credits or points, and practical operations and maintenance requirements in stormwater codes. Identify best practices that can be adapted across municipalities.
- **Document challenges created by unaligned codes.** Capture the practical impacts of inconsistency, including permitting delays, conflicting design criteria, unclear maintenance responsibilities, and uneven expectations for private development or redevelopment.
- **Develop recommended code updates or shared guidance language**. Create a concise set of model language and guidance that municipalities can adopt incrementally, emphasizing shared performance outcomes, consistent design expectations, and clear maintenance standards.
- **Provide technical assistance to municipalities** to encourage them to adopt or pilot aligned standards. Provide implementation support such as staff training, checklists, example applications, and pilot project accompaniment, to help translate alignment into day-to-day review practice.

CHALLENGE

Address the Unique Needs of GSI Design and Maintenance

Primary actors: Municipal public works departments; agencies; workforce partners
UpstreamPgh role: Systems designer, partner coordinator

Green stormwater infrastructure differs from traditional stormwater systems because it relies on living materials, soils, and biological processes to perform hydrological functions. These biotic systems change over time as vegetation establishes, matures, and responds to stress, resulting in performance that is more dynamic and less predictable than gray infrastructure. Because GSI effectiveness is shaped by both initial design and ongoing ecological conditions, UpstreamPgh's challenges are two-fold–the implementation of capital projects and the long-term stewardship that supports sustained performance, monitoring, and urban placemaking.

This dynamic behavior also complicates how GSI performance is evaluated. Conventional stormwater metrics were developed for static infrastructure and are less suited to systems that change over time. Variability across seasons and sites makes measurement, comparison, and attribution more difficult, limiting how GSI is documented, monitored, and recognized within regulatory frameworks and how it is credited toward required stormwater management and compliance goals.

To address these needs, UpstreamPgh and its watershed partners can pursue the following actions:

- **Develop shared design standards for networked GSI systems.** Create a "kit-of-parts" approach to design standards and construction details that Municipalities can adopt. Guidelines must be sure to address opportunities to incorporate GSI tools in Bike-Ped improvements, trail development and other right-of-way applications to align with future improvements along the Penn Avenue Business District and Busway Station Areas.
- **Establish lifecycle-based stewardship frameworks.** Define clear maintenance phases and responsibility roles for establishment, early care (typically 3–5 years), and long-term rejuvenation to guide responsibilities, budgeting, and performance expectations over time.
- **Identify sustainable funding strategies for operations and maintenance.** Explore cost-sharing approaches, dedicated maintenance funds, and performance-based funding models that support long-term stewardship beyond initial construction. Explore multi-site maintenance contracts tied to typologies rather than locations and bundling stewardship costs into stormwater fees or MS4 compliance budgets.
- **Expand partnerships with workforce organizations.** Strengthen collaborations with groups such as Landforce to support routine maintenance, build local workforce capacity, and align infrastructure investment with job creation. Create tiered stewardship roles, where workforce partners handle routine care and trained technical partners address adaptive or corrective actions.
- **Explore pay-for-success and outcome-based funding models.** Pay-for-success is a funding approach in which investment is tied to the achievement of defined performance outcomes rather than to project delivery alone. Pilot funding that ties investment to measurable performance outcomes. Craft agreements that evaluate performance across networks and over time, not solely at individual sites.

CHALLENGE

Build UpstreamPgh's Capacity to Scale

Primary actor: UpstreamPgh
Partner with: Municipalities, agencies, funders

As projects move from individual sites to interconnected systems, UpstreamPgh's role must adapt to support implementation at multiple scales. Scaling green stormwater infrastructure across the watershed requires flexibility. UpstreamPgh may serve as a project lead in some contexts, while acting as a technical resource, convener, or advocate in others. Clarifying these roles helps partners understand where UpstreamPgh adds the most value and ensures that efforts are coordinated rather than duplicative.

Building this capacity also requires investment in internal systems, staffing, and funding strategies that support long-term coordination and stewardship. Moving from site-based projects to networked systems demands new skills in partnership management, lifecycle planning, and cross-jurisdictional coordination. Early, well-supported projects can serve as demonstration models, showing how scalable approaches can be replicated and adapted across different parts of the watershed.

To build capacity to scale, UpstreamPgh should consider the following actions:

- **Define clear roles across project types.** Establish when UpstreamPgh will act as a project lead, technical supporter, convener, or advocate, depending on project scale, partner capacity, and funding structure. Identify staffing skills and roles, as well as organizational costs associated with each type of effort.
- **Invest in internal capacity for network-scale implementation**. Strengthen staffing, tools, and processes that enable projects to move from individual sites to coordinated systems across multiple properties and municipalities. Technical staffing may be needed, as well as a project manager/portfolio manager role tagged to subsheds. Differing skills are needed to implement a capital project than those needed to manage long-term stewardship tasks.
- **Align staffing and funding strategies**. Coordinate internal staffing plans with funding sources and timelines to support sustained engagement, implementation, and long-term stewardship. As the number and complexity of projects increases there is need for increased fund solicitation and grant writing skills on staff.
- **Use early projects as scalable demonstrations and evolve staffing structures to align with project growth.** Leverage early projects as scalable demonstrations while evolving staffing structures to support project growth. Use early efforts to test, refine, and replicate approaches across the watershed.

ROLES

UpstreamPgh has worked at many scales over the past 25 years, starting with rain barrels and street trees and scaling up to develop residential and commercial landscape projects through Stormworks. Over the past 10 years UpstreamPgh has developed 10 large scale green infrastructure projects that range in size from stormwater tree pits to municipal parking lots. UpstreamPgh's role to date has been to develop, install and maintain these stormwater management practices. The role that UpstreamPgh will play in the projects proposed in this plan will differ depending on the scale of the project and partners involved. Some projects will require more advocacy and strategic partnerships than others. Moving beyond being the sole developed will be a major shift moving forward that will enable UpstreamPgh to have a larger impact throughout the watershed.

In some cases, UpstreamPgh may act as a **lead**, particularly where projects occur on vacant land or where a new program must be established to support private property owners. In this role, UpstreamPgh may perform work directly, manage design and construction contracts, coordinate grants, or establish programs that enable residents or businesses to participate in green infrastructure installation. Historically UpstreamPgh has played this role and their existing projects, such as the Swissvale Hill rain garden are an example of this. With 10 large scale green infrastructure projects in the ground UpstreamPgh has demonstrated their ability to play this role for over 10 years. UpstreamPgh will need to play other roles in order to implement many of the projects identified in this plan.

In other cases, UpstreamPgh may serve as a **partner**, helping convene stakeholders, coordinate agencies and property owners, contribute technical expertise, or lead portions of a project that require watershed-scale coordination, such as the Nine Mile Run Outflow improvements.

UpstreamPgh may also act in **support** roles, providing engagement, technical assistance, documentation, or systems design for projects led by municipalities or other organizations, such as assisting the City of Pittsburgh with community engagement or technical coordination at sites like East Hills Park. As an **advocate**, UpstreamPgh can help advance regulatory changes, promote funding opportunities, and elevate watershed priorities across municipalities and state agencies. Finally, as a **watchdog**, UpstreamPgh can help ensure that projects and policies move from planning to completion by tracking progress, maintaining coordination among partners, and supporting long-term stewardship of the watershed system.

BEST PRACTICES

The priority projects outlined in the previous chapter focused on specific GSI interventions to reduce flooding impacts in vulnerable neighborhoods; these projects alone will not directly solve larger issues of poor water quality and contamination.

This will require continued innovation and on-the-ground strategies, from **Resilience Policy** at the municipal and state levels, to continued **Community Education** to further workforce development and partnerships with schools, building the next generation of watershed stewards, to targeted **Design Integrations** that focus on private development improvements and vacant lot reuse, UpstreamPgh has played this role in Wilkinsburg Stormwater Resiliency Project.

Resilience Policy

Community plan amendments to include GSI.

To effectively guide future development and zoning, communities should update existing comprehensive plans by incorporating green infrastructure strategies (GSI). This strategic move is crucial as it initiates the necessary buy-in for subsequent zoning and land development ordinance (SALDO) updates, while also educating the public on the advantages and opportunities presented by GSI through the required public hearing process for amendments.

Action steps include:

- UpstreamPgh will advocate for the incorporating of GSI recommendations into ongoing community plans in partnership with Municipalities.
- UpstreamPgh will review all plans within the study area to identify sections that include or could include GSI.
- UpstreamPgh will contract will a consultant to draft template GSI amendments and ordinances for Municipalities to consider.
- UpstreamPgh will meet with the Planning Commissions to gain support.

Incorporate GSI into capital projects.

Incorporating green infrastructure projects into long-term municipal budgets and funding priorities is a key strategic move for sustainable urban development. This strategy ensures the necessary financial capacity to not only initiate but also sustain these vital environmental initiatives over time, leading to better integration of policies, stronger funding partnerships, and improved grant application success.

Action steps include:

- UpstreamPgh will advocate for a 5-10 year funding plan for construction and maintenance
- UpstreamPgh will partner with Municipalities to coordinate GSI funding sources and partnerships
- UpstreamPgh will advocate for development assessments (eg. tree fund per linear feet)

Revise zoning to allow or incentivize GSI.

This strategy involves revising zoning regulations to actively permit green infrastructure (GSI) and providing incentives to encourage its adoption, which is vital for reducing obstacles to redevelopment and encouraging more developers to incorporate GSI into their plans. This approach sets a clear path toward potentially requiring GSI in the future, ultimately improving community sustainability.

Action steps include:

- UpstreamPgh will meet with the Planning Commission to gain buy-in.
- UpstreamPgh will advocate for zoning district GSI use amendments.
- UpstreamPgh will advocate for Municipal GSI incentives such as streamlined approval processes.
- UpstreamPgh will support the development of a draft Policy statement and Ordinance.


GREEN

Goal I1: We want to build on our existing *green* infrastructure.

On the ground today...

East Hills falls within both the Negley Run Watershed, a high priority, and Nine Mile Run Watershed.

Negley Run is a large watershed that drains a diverse area of Pittsburgh's East End, including several neighborhoods that have suffered heavily from underinvestment in recent decades, such as Homewood, Larimer, Lincoln-Lemington-Belmar, and East Hills. Negley Run captures more water than any other watershed in Pittsburgh and is the single largest contributor of sewer overflow in the region. It also represents one of the most-urgent flood risk challenges in the City. Major rainfall events regularly lead to flash flooding along lower Washington Boulevard, a key roadway corridor that supports a high volume of commuter traffic from suburbs north of the Allegheny River.

The eastern portion of East Hills lies within the Nine Mile Run Watershed, a small urban watershed covering just 6.5 square miles. Upstream Pittsburgh, formerly Nine Mile Run Watershed Association, oversees many projects, including the largest urban stream restoration

There have been a number of studies completed over the years that offer recommendations specific to addressing stormwater issues and green infrastructure that impact East Hills:

- The Green First Plan: A City-Wide Infrastructure Assessment prepared for the Pittsburgh Water and Sewer Authority (2016)
- Allegheny Land Trust Transfer of Development Rights Feasibility Study (2019)
- Managing Heavy Rainfall with Green Infrastructure: An Evaluation in Pittsburgh's Negley Run Watershed by the RAND Corporation (2020)
- Negley Run Environmental Equity Study by Upstream Pittsburgh (2021)
- A Vision Plan for the Negley Run Watershed (2018)
- Engaging Communities with Green Stormwater Infrastructure by Grounded Strategies (2018)
- Controlling the Source: A Roadmap for Working Together on Impactful Source Control by ALCOSAN (2020)

ABOVE Excerpt from the Infrastructure chapter of the East Hills Community Vision Plan describing a desire for Green Stormwater Infrastructure projects (City of Pittsburgh)

Revise zoning to allow or encourage urban agriculture.

Urban agriculture is a Green Stormwater Infrastructure friendly land use that also supports a resilient urban environment. By partnering with existing organizations like Grow Pittsburgh, co-benefits such as food production, community public space, and vacant lot activation can be paired with integrated water reuse practices. There is also the possibility to incorporate workforce development, establishes a local food network, and engaging local stewardship from farm-to-table establishments.

Action steps include:

- UpstreamPgh will meet with the Planning Commission to secure support for the zoning revision.
- UpstreamPgh will advocate for suitable zoning districts and land uses for Urban Agriculture (UA) that allow for stormwater capture/reuse.

ABOVE Garden Dreams Urban Farm and Nursery in Wilkinsburg (GrowPittsburgh.org)

Create a GI grant program (residents/businesses).

"Establishing a local fund is a vital strategy to financially support residents and businesses undertaking green infrastructure projects, which is critical for community sustainability and resilience. To ensure the success of this initiative, focused engagement with foundations is necessary to secure initial funding, particularly given the current financial landscape. Furthermore, developing internal workforce capabilities in managing grants and loans is essential to administer the fund effectively and ensure long-term viability.

Action steps include:

- UpstreamPgh will identify resource opportunities for match funds and grants.
- Upstream will define and outline how a low-interest loan model could operate.
- Upstream will identify a suitable grant/loan manager for the organization to oversee the fund.

ABOVE Seasonal plant sale (GrowPittsburgh.org)

Community Education

Develop a GSI training program.

This strategy focuses on building community capacity for green infrastructure by offering hands-on training to residents on how to build and maintain these systems, such as rain gardens. This is important because it will not only increase community knowledge of green infrastructure design and planting, but also empower residents to actively support and participate in future installations.

Action steps include:

- UpstreamPgh will assist with the identification of GSI-related partner organizations and education providers
- UpstreamPgh will connect neighborhood champion, impacted residents and interested parties to potential raingarden sites
- Upstream will develop educational materials and host GSI educational workshops

Partner with school districts for learning and creating GSI.

This strategy involves partnering with local schools to integrate lessons on green infrastructure into the curriculum and to establish dedicated learning spaces, which is crucial for fostering a community-wide understanding of watershed health and water equity. By engaging students early, UpstreamPgh can heighten awareness and cultivate the next generation of environmental stewards and professionals. UpstreamPgh's existing relationships with local schools in the watershed provide an amazing opportunity to engage students in the design of future GSI projects. Many schools in the watershed have existing rain gardens and rain barrels that can be used in lesson plans and curriculum.

Action steps include:

- UpstreamPgh will lead GSI presentations in school facilities.
- UpstreamPgh will advocate for teachers to add green infrastructure to the curriculum, including topics like plants/edibles, art/placemaking, and career skills.

Incorporate GSI training into green infrastructure projects.

This strategy proposes connecting green infrastructure projects with local job training and employment opportunities. This is a vital approach as it simultaneously builds local workforce capacity in future resilient jobs while providing a direct stepping stone into Green Stormwater Infrastructure (GSI) careers. By integrating these efforts, you can ensure that the local community benefits directly from sustainable development and is prepared for the future of resilient infrastructure.

Action steps include:

- Upstream will advocate for local hiring mandates in GSI-supportive industries
- Upstream will coordinate local training programs (Bidwell, CCAC, Chatham, etc.) for GSI supportive industries
- Upstream will support GSI-supportive training programs through grants, scholarships to local residents

Build local leadership and stewardship.

To foster a stronger community commitment to green stormwater solutions, the strategy involves cultivating leadership within neighborhood groups. UpstreamPgh's Urban Eco steward (UES) Program is a great example of a stewardship model that can be replicated in other watersheds and areas. Increasing the capacity of the UES program to engage more volunteers will be necessary to maintain projects identified in this plan. This approach is important because it converts local interest into a sustained network of advocates, leading to long-term stewardship and potential workforce development, while also preparing future civic leaders to champion these regional efforts.

Action steps include:

- UpstreamPgh leads educational activities and incentives that engage the community.
- Upstream leads tree planting or swale planting activities, potentially giving out seeds or plants.
- Upstream leads neighborhood clean-ups and establish recycling locations with incentives.
- Upstream leads community socials or block parties.
- Upstream leads fundraisers to finance plantings.
- Upstream supports student programs and street art initiatives.

Design Integration

Develop Streetscape GSI design and detail standards.

To address concerns such as localized flooding and the health of street trees, it is highly recommended that you establish clear standards for street design that integrate natural elements like trees, green spaces, and vital stormwater management features. This strategy is important because it is projected to reduce flooding, particularly during winter, improve the vitality of your street trees, and enhance community understanding of rain garden implementation and maintenance.

Action steps include:

UpstreamPgh will advocate for the following:

- Capture stormwater within the Right-of-Way (ROW) development standards, ensuring onsite capture for 24 hours.
- Direct curb drainage to tree planters.
- Increase the size of tree planters.
- Implement continuous rain gardens in planting strips.

Create projects which use watershed community culture and art for placemaking.

The recommended strategy is to design public spaces to reflect and support the local watershed, nature, and community culture. This approach is vital for enhancing community awareness of water resources and culture, creating opportunities for local art and expression, and effectively bridging the gap between public health impacts and the environment. By integrating these elements, public spaces can become more engaging and informative, leading to improved environmental stewardship and community well-being. UpstreamPgh's Dornbush Street Rain garden features the Sankofa Garden: Roots to a Brighter Future sculpture by local artist Marlana Adele Vassar which is a great example of integrating public art into green infrastructure.

Action steps include:

- UpstreamPgh will advocate for integrated water narratives into infrastructure design.
- UpstreamPgh will advocate for elements like manholes or signs at parks to convey information.
- UpstreamPgh will advocate for interactive spaces for public engagement.

BELOW Art unveiling at the Green Infrastructure Project at the corner of Dornbush and Bricelyn Streets (UpstreamPgh)

Incorporate GSI into park and playground design standards and capital improvements.

UpstreamPgh recommends implementing a strategy focused on integrating green infrastructure into parks and playgrounds. This approach is crucial for effectively managing stormwater while simultaneously enhancing the quality of play areas, leading to healthier environments and improving the overall parks and recreation infrastructure. Furthermore, this initiative is expected to foster next-generational awareness of water resources and culture, offering opportunities for local art and establishing a valuable local model for future interventions.

Action steps include:

- UpstreamPgh will advocate for the integration of water narratives into parks.
- UpstreamPgh will advocate for Municipalities to install interpretive signs and "you have entered Nine Mile Run" maps.
- UpstreamPgh will advocate for the implementation of interactive spaces or play equipment.

ABOVE Conceptual Design of the Liberty Green and the River Roots Parks with integrated Green Stormwater Infrastructure (Urban Redevelopment Authority)

Repurpose vacant/abandon lots as temporary or permanent GSI locations.

This strategy involves converting unused or vacant land into functional green spaces. This is important because these new spaces can effectively manage stormwater runoff and simultaneously offer valuable benefits to the surrounding neighborhood. Implementing this approach requires a deliberate sequence of actions to ensure successful, community-focused development and installation. UpstreamPgh's Swissvale Hill, Dornbush St, and Rosedale Hill Rain Gardens are examples of this strategy for GSI development.

Action steps include:

- UpstreamPgh will create and maintain a map inventory of vacant lots / abandon properties suitable for GSI, as identified in the report
- UpstreamPgh will advocate for permanent or temporary GSI intervention
- UpstreamPgh will support partner organization in acquisition, funding, and neighborhood engagement
- UpstreamPgh will support Municipal installation and/or community workday implementation

Create GSI financial incentives funding resource.

It is highly recommended to encourage green infrastructure installation by private parties, such as homeowners and developers, through a combination of financial and approval incentives. This strategy is important because it promotes green stormwater infrastructure (GSI) adoption during redevelopment, contributing to sustainable community development and improved environmental outcomes.

Action steps include:

- Upstream will advocate for Municipal policy, SALDO, development design standards, and development incentives to encourage private development to install GSI.

Recommendations

	Timeline (years)									
Policies	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Community plan amendements to include GSI.	PP	BF	IM							
Incorporate GI into capital projects.		PP	BF	IM	ON					
Revise zoning to allow or incentivize GSI.			PP	PP	BF	IM				
Revise zoning to allow or encourage urban agriculture.			PP	PP	BF	IM				
Create a GI grant program (residents/businesses).				PP	BF	BF	IM	ON		
Education	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Develop a GSI training program.			PP	PP	BF	IM				
Incorporate GSI training into green infrastructure projects.			PP	BF	IM					
Partner with school districts for learning and creating GSI.				PP	PP	BF	IM			
Build local leadership and stewardship.					PP	BF	IM	ON		
Design	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Develop Streetscape GSI design and detail standards.		PP	BF	IM						
Create projects which use watershed community culture and art for placemaking.			PP	BF	BF	BF	IM	ON		
Incorporate GSI into park and playground design standards and capital improvements.			PP	BF	IM					
Identify GSI opportunities when making ped/bike infrastructure improvements.			PP	BF	IM	ON				
Repurpose vacant/abandon lots as temporary or permanent GSI locations.							PP	BF	IM	ON
Create GSI financial incentives funding resource.					PP	BF	BF	IM	ON	

PP Planning & Policies
BF Budgets & funding
IM Implement
ON ongoing

05 APPENDICES

WATERSHED-SCALE GSI SUITABILITY ANALYSIS

This document describes the geospatial analysis methodology used to identify, classify, and prioritize green stormwater infrastructure (GSI) opportunity sites across the Nine Mile Run Watershed. The analysis produces watershed-scale suitability maps for three categories of GSI intervention -- rain gardens and bioretention, depaving and impervious area retrofits, and green streetscape -- at multiple project scales, weighted by environmental justice indicators to direct investment toward communities with the greatest need.

Study Area

The analysis covers the Nine Mile Run Watershed in the City of Pittsburgh and adjacent municipalities in Allegheny County, Pennsylvania. The watershed boundary shapefile serves as the spatial extent for all data processing, clipping, and output generation.

Data Sources

All input datasets are clipped to the watershed boundary and reprojected to a common coordinate reference system (NAD83 / UTM Zone 17N, EPSG:26917) prior to analysis.

Terrain and Hydrology

Dataset	Source	Resolution / Format
Digital Elevation Model	USGS 10-meter DEM (Pittsburgh East, Braddock tiles)	10m raster
Filled DEM (sink removal)	Derived via Wang & Liu fill algorithm	10m raster
Flow Direction	Derived from filled DEM	10m raster
Flow Accumulation	SAGA One-Step Flow Accumulation (MFD routing)	10m raster
Strahler Stream Order	Derived from filled DEM	10m raster
Watershed Sub-basins	Derived from flow direction	10m raster
Floodplains	Allegheny County Floodplain (2000)	Vector (polygon)
Hydrology Areas	Allegheny County Hydrology Areas (2016)	Vector (polygon)
Wetlands	Allegheny County NWI (2000)	Vector (polygon)

Land Cover and Impervious Surfaces

Dataset	Source	Resolution / Format
Land Cover Classification	NLCD 2019 Land Cover -- Allegheny County	30m raster
Impervious Surface Percentage	NLCD 2019 Impervious Percent -- Allegheny County	30m raster
Impervious Surface Descriptor	NLCD 2019 Impervious Descriptor -- Allegheny County	30m raster
Tree Canopy Cover	NLCD 2021 Tree Canopy -- Allegheny County	30m raster

Built Environment and Infrastructure

Dataset	Source	Resolution / Format
Building Footprints	Allegheny County Footprints (2024)	Vector (polygon)
Street Centerlines	Allegheny County Street Centerlines (2021)	Vector (line)
Railroads	Pennsylvania Rail Lines (2016)	Vector (line)
Cemeteries	Allegheny County Cemetery (2002)	Vector (polygon)
Local Parks	DCNR Local Parks (2023) -- Allegheny County	Vector (polygon)
Parcels	Allegheny County Parcels (2024)	Vector (polygon)

Environmental Justice Indicators

Dataset	Source
EJ Benchmark Comparisons	Composite environmental justice risk index
EJ At-Risk Areas	Binary classification of at-risk census areas
Redlined Districts	HOLC redlining grades, scored numerically
Market Value Assessment	Reinvestment Fund MVA (2021)
Vacant Lots	Identified vacant parcels within the watershed
Opportunity Zones	Federally designated Opportunity Zones
Park Proximity Indices	Multi-factor accessibility scores (population density, transit access, park acreage, retail, hospitals, schools, employment)

Preprocessing

All raster layers are resampled to a uniform 10-meter cell size and reprojected to EPSG:26917. Vector datasets used as exclusion or constraint layers are converted to binary rasters (presence = 1, absence = 0) at 10-meter resolution, matched to the watershed boundary extent. Continuous-value rasters are normalized to a 0-to-1 scale using either linear min-max normalization or domain-specific reclassification functions, as described below.

The terrain DEM is preprocessed through a sink-filling algorithm (Wang & Liu) to produce a hydrologically correct surface. Flow direction and flow accumulation are computed from the filled DEM. Strahler stream order is also derived from the filled DEM as a contextual reference layer, used to validate the multi-scale flow accumulation thresholds and to visualize the natural drainage hierarchy within the watershed.

Multi-Scale Flow Accumulation

A distinguishing feature of this methodology is its treatment of flow accumulation at multiple project scales rather than as a single undifferentiated layer. Most GSI suitability analyses evaluate flow accumulation as one continuous surface, which conflates sites suited for small-scale interventions with those suited for large infrastructure. This analysis segments flow accumulation into four discrete scale bands, using contributing-area thresholds analogous to the hierarchical logic of Strahler stream ordering:

Scale	Contributing Area Range	Approximate Threshold
Micro	0 -- 1,011 m sq	Up to 0.25 acres
Small	1,011 -- 4,046 m sq	0.25 -- 1 acre
Medium	4,046 -- 40,468 m sq	1 -- 10 acres
Large	> 40,468 m sq	Greater than 10 acres

Each scale band produces a separate flow accumulation raster, which is carried through the full suitability analysis independently. This means that every GSI type is evaluated at every scale, producing results such as “Rain Gardens -- Micro” and “Rain Gardens -- Large” as distinct output layers. The approach ensures that a small residential rain garden opportunity and a large networked bioretention corridor are identified, scored, and mapped separately, with appropriate weighting for the physical and hydrologic conditions relevant to each scale of intervention.

The Strahler stream order layers (filtered at orders >3, >4, and >5) serve as reference overlays for interpreting the flow accumulation results and verifying that the scale thresholds align with observable drainage patterns in the watershed.

Suitability Analysis

The suitability analysis operates in two stages: a buildable area mask that defines where GSI is physically feasible, followed by type-specific composite scoring within the buildable area.

Buildable Area Mask

The buildable area is defined as the multiplicative product of six binary exclusion layers. A cell must pass all six tests to be considered buildable:

Exclusion Layer	Logic
Not Buildings	Excludes existing building footprints
Not Roads	Excludes road rights-of-way (for non-streetscape types)
Not Cemetery	Excludes cemetery parcels
Not Wetlands	Excludes mapped wetlands
Tree Canopy	Excludes areas with dense canopy (see below)
Not Railroad	Excludes railroad corridors

The result is a binary raster where 1 indicates buildable land and 0 indicates excluded land. All subsequent suitability composites are multiplied by this mask, ensuring that excluded areas receive a score of zero regardless of other factors.

Layer Normalization and Reclassification

Continuous-value input layers are normalized or reclassified to a 0-to-1 scale using domain-appropriate methods:

Slope -- Percent slope is reclassified using a piecewise function. Slopes at or below 2% receive a score of 1.0 (ideal for GSI construction). Slopes between 2% and 10% are linearly interpolated from 1.0 down to 0. Slopes above 10% receive a score of 0.

Solar Aspect -- Terrain aspect is reclassified into eight compass directions, scored by solar exposure potential for the Northern Hemisphere:

Direction	Azimuth Range	Score
South	157.5 -- 202.5 deg	1.00
Southeast / Southwest	112.5 -- 157.5 / 202.5 -- 247.5 deg	0.60
East / West	67.5 -- 112.5 / 247.5 -- 292.5 deg	0.50
Northeast / Northwest	22.5 -- 67.5 / 292.5 -- 337.5 deg	0.40
North	337.5 -- 360 / 0 -- 22.5 deg	0.30

Soils Infiltration Potential -- Hydrologic Soil Group (HSG) classifications are converted to numeric infiltration scores and linearly normalized:

HSG	Score
A (high infiltration)	1.00
B	0.75
B/D	0.60
C	0.50
C/D	0.40
D (low infiltration)	0.25
Unclassified	0.50

Tree Canopy -- Canopy cover percentage is inverted and thresholded. Areas with canopy density below 40% are scored as 1 - (canopy% / 40), preserving moderate canopy areas as partially suitable. Areas at or above 40% canopy receive a score of 0, functioning as a soft exclusion.

Impervious Surface Percentage -- The NLCD impervious percentage (0--100) is normalized to 0--1 by dividing by 100. An adjusted impervious layer is also computed as the cell-wise maximum of the normalized impervious percentage, the road binary raster, and the building binary raster, ensuring that known impervious features not captured by the satellite-derived raster are included.

Land Cover -- Individual NLCD land cover classes are isolated as binary rasters (1 where the class is present, 0 elsewhere). A composite "Vegetated, Non-Forest" layer is created by summing the binary rasters for Hay/Pasture, Grassland-Herbaceous, Barren Land, and Developed Open Space.

Flow Accumulation -- Each scale band is normalized independently using linear min-max normalization.

GSI Type Models

Three composite suitability models are computed, each reflecting the distinct site conditions that favor a particular type of GSI intervention. Every model is evaluated at all four flow accumulation scales (Micro, Small, Medium, Large), producing twelve primary suitability outputs.

Rain Gardens and Bioretention

Rain gardens and bioretention facilities require open, vegetated land with adequate solar exposure, moderate-to-gentle slopes, and soils capable of supporting infiltration. The composite formula is:

Score = Buildable FAC x Vegetated Non-Forest x (0.50 x Slope + 0.25 x Solar Aspect + 0.25 x Soils Infiltration)

Where "Buildable FAC" is the product of the buildable area mask and the flow accumulation layer at the given scale. The weighting prioritizes slope as the dominant physical constraint, with solar exposure and soil permeability as secondary factors.

Depaving and Impervious Area Retrofits

Depaving opportunities target existing paved surfaces (excluding roads and buildings) within the buildable area. The composite formula is:

Score = Buildable Area x FAC x Paved Non-Road Surfaces x Slope

"Paved Non-Road Surfaces" is derived as areas with impervious percentage at or above 70% that are neither roads nor buildings. Slope is included to favor sites where grading and drainage modifications are practical.

Green Streetscape

Green street interventions target existing road corridors. Because these projects occur within the road right-of-way, the buildable area mask (which excludes roads) is not applied. The composite formula is:

Score = FAC x Roads x Slope

This identifies road segments where stormwater flow accumulates and slopes permit curb-cut or bioswale installation.

Supplementary Analysis Layers

In addition to the primary suitability composites, the analysis generates several supplementary layers for interpretive and planning purposes:

Urban Heat Island Effect -- A weighted composite of impervious surface coverage (50%), solar aspect (40%), building density via Gaussian smoothing (10%), offset by tree canopy (-30%) and hydrology areas (-20%). While the suitability models identify where GSI can be built (the supply side), the urban heat island layer helps characterize where GSI benefits are most needed (the demand side). Areas with elevated heat exposure -- driven by high imperviousness, limited canopy, and south-facing surfaces -- often overlap with environmental justice communities already burdened by aging infrastructure and limited greenspace. This layer supports the equity case for directing GSI investment toward neighborhoods where cooling, shading, and stormwater relief will have the greatest impact on public health and quality of life.

Floodplain Overlay -- Mapped floodplain boundaries are included as a reference layer. While floodplains are not excluded from the suitability analysis, their presence informs design considerations and regulatory requirements for proposed interventions.

Park Areas -- Both “In Park” and “Not In Park” binary layers are generated, supporting filtering of results by land ownership and public access.

Vacant Lots -- A point-in-time snapshot of City of Pittsburgh vacant lot inventory, used as a contextual overlay to identify parcels where land acquisition or partnership barriers may be lower. Because the City updates this dataset on a rolling basis, the version used in this analysis represents conditions at the time of data acquisition and should be refreshed for future iterations.

Environmental Justice Prioritization

The raw suitability results identify where GSI can be built. The prioritization step addresses where it should be built first, by weighting suitability scores against environmental justice indicators.

EJ Priority Index

An Environmental Justice Priority score is computed for each cell as a weighted average of two indicators:

EJ Priority = 0.50 x EJ At-Risk + 0.50 x Park Proximity (park acreage)

This composite captures both environmental vulnerability (EJ At-Risk) and park/greenspace deficiency (Park Proximity). The raw composite is normalized to 0--1 using linear min-max normalization, with zero-value cells set to null to exclude areas outside the indicator coverage.

Additional EJ-related layers -- redlined districts, opportunity zones, vacant lots, and the full suite of park proximity sub-indicators (population, transit, retail, hospitals, schools, employment) -- are processed and available as reference layers for supplementary analysis and narrative context.

EJ-Weighted Suitability

Each GSI suitability result (12 layers: 3 types x 4 scales) is combined with the EJ Priority index to produce an equity-weighted score:

EJ-Weighted Score = Suitability x ((0.50 x EJ Priority) + (0.50 x Suitability))

This formula elevates sites in high-need areas while preserving the underlying suitability signal. A site with high physical suitability in a low-need area will score lower than an equally suitable site in a high-need area, but a site with poor physical suitability will not score highly regardless of need. The result is normalized to 0--1.

Spatial Clustering and Site Identification

The final stage translates continuous raster suitability surfaces into discrete, actionable project sites.

Raster-to-Point Conversion

Each EJ-weighted suitability raster is converted to a point layer, with each 10-meter cell becoming a point feature carrying its suitability score and scale classification (Micro, Small, Medium, or Large).

Parcel Intersection

Point features are intersected with the Allegheny County parcel layer (clipped to the watershed boundary) to associate each opportunity point with a specific tax parcel (PIN). A separate right-of-way layer is generated by differencing the watershed boundary with the parcel fabric, capturing public rights-of-way that may be candidates for green street interventions.

DBSCAN Clustering

Points within each GSI type are clustered using the DBSCAN (Density-Based Spatial Clustering of Applications with Noise) algorithm with a 14-meter search radius and a minimum cluster size of 1. Each cluster receives a unique identifier, and a composite key is generated combining the cluster ID with the parcel PIN. This links spatial clusters to property-level records.

Minimum Bounding Circles

Each cluster-parcel combination is enclosed by a minimum bounding circle, providing a simple geometric footprint for each candidate project area. These bounding circles serve as the primary unit for planning-level site screening and approximate the spatial extent of each potential intervention.

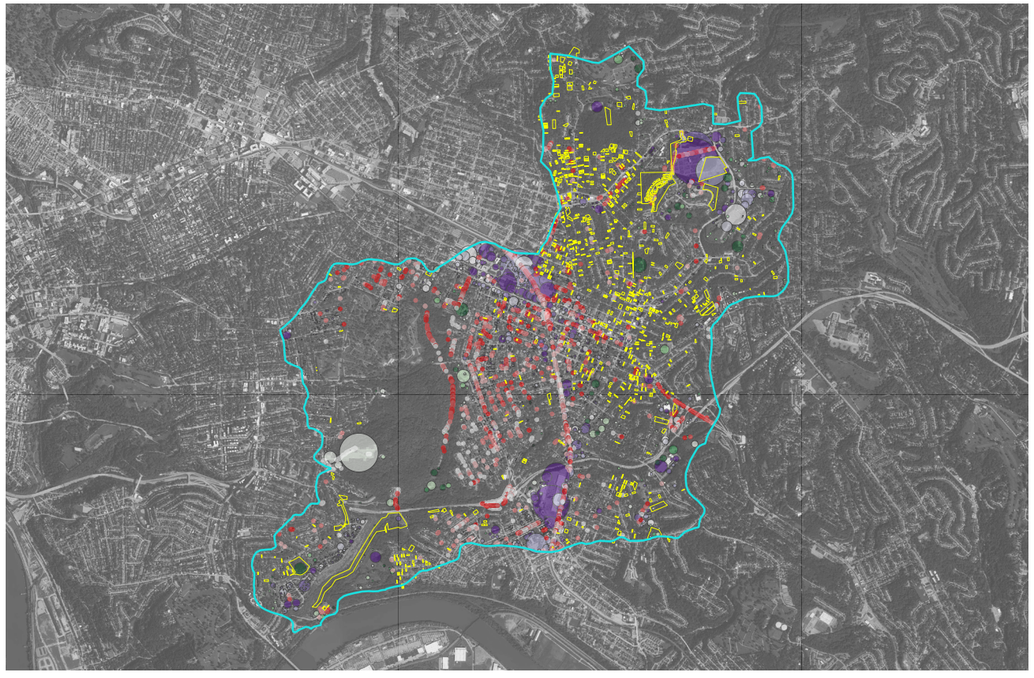
The distinction between clustered and isolated points maps directly to the networked and non-networked GSI framework described in Structuring a GSI Shedwide System. Clusters of high-scoring points across adjacent parcels or rights-of-way represent potential networked systems, while isolated high-scoring points represent site-level, non-networked opportunities.

Outputs

The analysis produces the following deliverables:

1. **Suitability Rasters (12 layers) --** Continuous 0-to-1 heatmaps for Rain Gardens, Depaving/Retrofits, and Green Streets at Micro, Small, Medium, and Large scales.
2. **EJ-Weighted Suitability Rasters (12 layers) --** The same suitability results weighted by environmental justice priority.
3. **Supplementary Rasters --** Buildable area, urban heat island effect, adjusted impervious surface, vegetated non-forest land cover, individual NLCD class rasters, and all normalized input layers.
4. **Clustered Point Layers (3 layers, one per GSI type) --** Point features with suitability scores, scale classification, and parcel identifiers.
5. **Bounding Circle Layers (3 layers, one per GSI type) --** Minimum bounding geometries for each cluster-parcel combination, representing candidate project footprints.
6. **Reference Layers --** Strahler stream order (filtered at three thresholds), flow direction, watershed sub-basins, floodplains, and EJ indicator surfaces.

All outputs are projected in NAD83 / UTM Zone 17N (EPSG:26917) at 10-meter resolution (rasters) or native geometry (vectors).



SUB-SHED ASSESSMENTS

In order to prioritize projects, UpstreamPgh and the Consultant Team looked at a variety of factors, including the stormwater capture potential, the community co-benefits, community priority, and estimated costs.

District	Project Name	Capture Potential	Community Benefits	Community Priority	Cost	Total Score	FINAL RANK	UpstreamPgh Role
Hilltop Sending Properties	Covenant Church	2	1	1	2	6	8	Support, Advocate, Partner
	Petra Ministries	3	1	2	2	8	2	Support, Advocate, Partner
	U-Pull	2	1	1	2	6	8	Support, Advocate, Partner
Valley Park Projects	Hunter Park	1	2	2	1	6	8	Support, Advocate, Partner
	East Hills Park	1	2	2	1	6	8	Support, Advocate, Partner
	Turner School	2	2	2	1	7	4	Partner, Support, Advocate
	Nine Mile Run Culvert	-	3	3	1	7	4	Advocate, Support, Partner
Frankstown Bennett	Bennett Light Industrial	3	2	1	2	8	2	Support, Advocate
	Angoria Blackadore Street Stream Pairing	1		3	2	6	8	Advocate, Partner
	Exley Way	1	2	2	2	7	4	Lead, Partner
	Conemaugh Street	2	2	3	2	9	1	Lead, Partner
Rockwell to Wilkinsburg Business District	Park and Ride Rosedale Cluster	-	3	2	1	6	8	Support, Advocate
	Light Industrial District on lot GSI	-	2	1	1	4	16	Support, Advocate
	Whitney Park and Kelly School Micronetworks	-	2	2	2	6	8	Support, Advocate, Partner
	Light Industrial District Green Streets GSI	-	2	1	2	5	15	Support, Advocate
	Wilkinsburg Business District	-	3	3	1	7	4	Support, Advocate, Partner

Stormwater Capture Potential

Estimated cumulative gallons managed in 1 year:

1. Lower storage potential - less than 5 million gallons
2. Moderate storage potential - between 5 million and 10 million gallons
3. High Storage - more than 10 million gallons

Community Benefits Score

The benefits score was determined by asking the following questions; does this project Improve Downstream Water Issues, does this project solve adverse upstream water-related issues, does this project improve human and ecological health, does this project increase economic opportunity, does this project create culturally restorative places? The scores for each of these questions were then averaged to determine the benefit score for each project.

1. Low benefit
2. Moderate benefit
3. High Benefit.

Community Priority

Based on community input during the engagement process is this a high priority for the community

1. Low community priority
2. Moderate community priority
3. High community priority

Estimated Project Cost

While the planning for these projects is too preliminary to have full cost estimates, rough order of magnitude estimates were made to categorize the approximate cost of the projects. Projects with low costs scored highest.

1. High estimated cost greater than $5 million
2. Moderate estimate cost between $1 Million and $ 5 million
3. Low estimated cost less than $1 Million

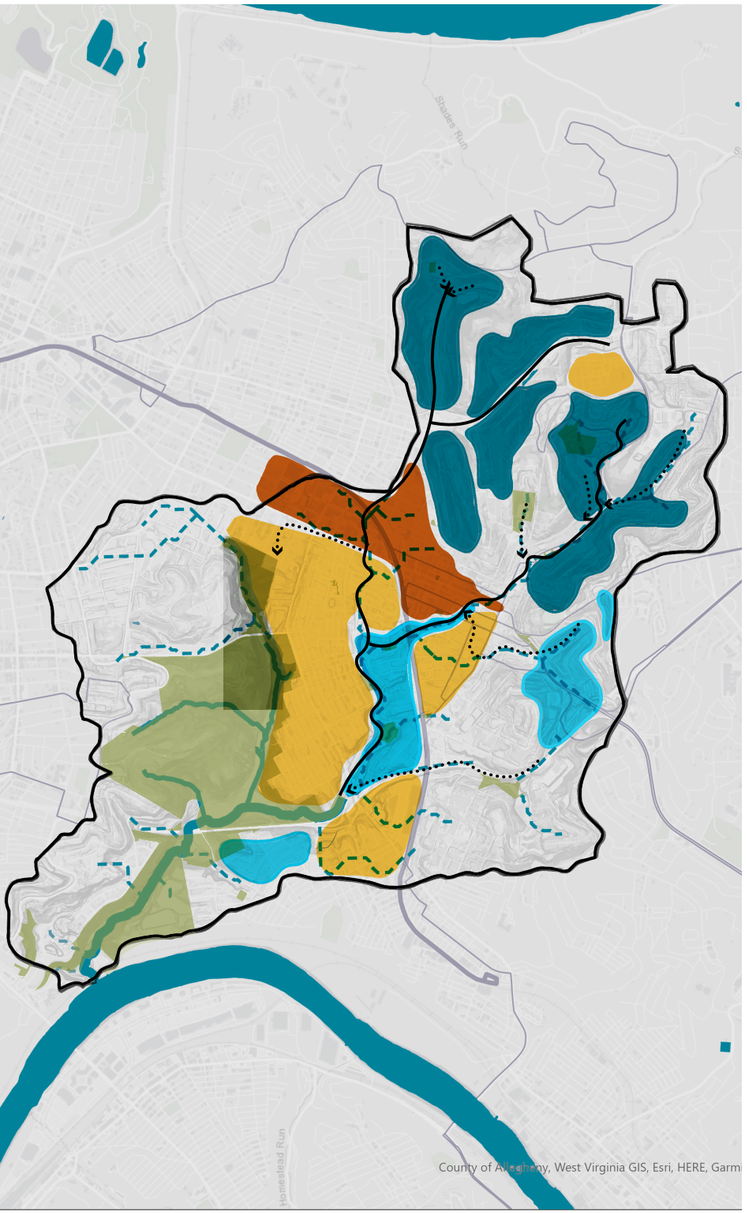
Upstream Role

Upstream may play different roles in each of these projects.

- Advocate
- Support
- Partner
- Lead

HISTORIC REVIEW OF THE WATERSHED

This GROUND analysis suggests four stormwater management areas, each with its own dominant GSI technologies and patterns of use.



Together with the EJ data and the calculated prioritization tool, this approach helped the team prioritize certain practices and areas. This project is not simply finding a series of sites or a series of sheds, but determining the structure of the system. This analysis is an interpretation of the lived experience across the watershed, supported but historic with maps and other demographic data.

Nearly two centuries of development and urbanization have greatly changed the flow of Nine Mile Run but the predevelopment patterns are still visible. The flat areas were developed first and provided housing for the growing business districts. The rail line developed before the roads and provided the first major impediment to stream flow, even when the area was largely rural.

Today, the topography shows three distinct historical branches of Nine Mile Run, including a lowland collector branch and upland tributaries. There are no open channels in these areas. Drained water unceremoniously emerges at the Allenby Avenue pipe with great force, to become Nine Mile Run.

In many ways, concentrated valleys in the upland area resemble perched valleys in the lowland collectors. They collect water flowing from streets, sidewalks, and from private property. Upland concentrated valleys have larger tributary areas than the much smaller perched valleys. These points of concentration often coincide with parks. Others are in the public right of way or on adjacent private property. Other areas are relatively flat, with residential and/or commercial areas. Modest sized homes with yards are typical in the residential areas. Commercial areas have a high degree of impervious surface and little area for on-lot capture and storage.

1882 overview.

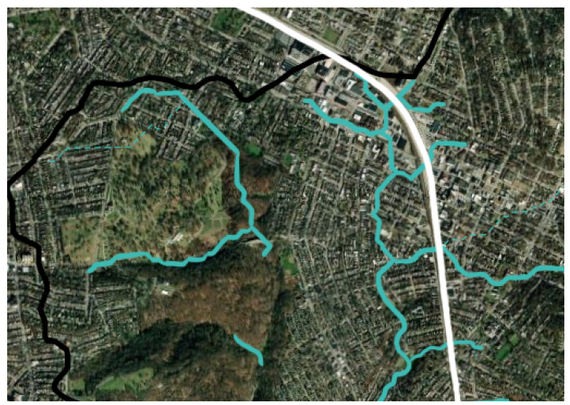
This overview map show the growing areas of East Liberty and Wilkinsburg as rail-oriented communities.

1882

Much of the upper shed is undeveloped in 1882. The railroad is the greatest topographical change, as the large embankment becomes a barrier to people and water as they move downslope. The streambeds close to the railroad will disappear first. Some of the upslope waterways have been lost to road construction or development, perhaps because the streams are small or season and easier to manage. Valley roads and development patterns follow the topographic pattern.

2025

Today many of the historic stream uplands are road beds. The greatest loss of the stream pattern occurs in the flat areas. Many of the streams collect in low lying areas that are not trapped due to areas filled for development. It is possible that many of these areas are candidates for sewer backups due to the convergence of overland flow and sewer flow.



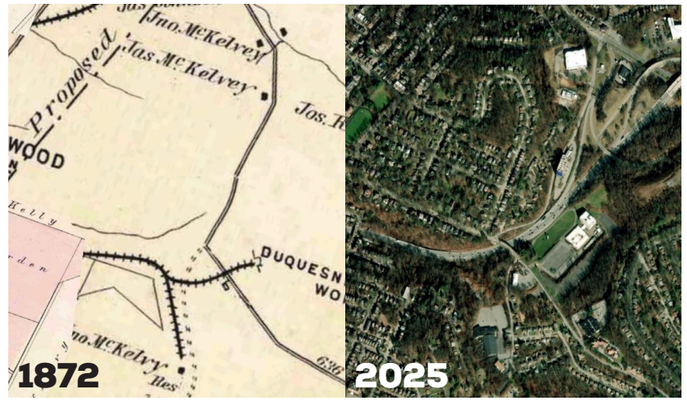
THE LOWLAND COLLECTOR BRANCH.

The lowland shed collects water from upstream and has two distinct patterns, highway-adjacent conveyance and perched valleys.

Highway-adjacent conveyance

sites line the 376 corridor, collecting water from one side of the highway or the other. The highway prevents above ground channel networks and the water is conveyed in pipes below grade.

Interstate 376. The stream channel is well delineated in 1862-1882 but has been largely obliterated by later neighborhood development and highway construction



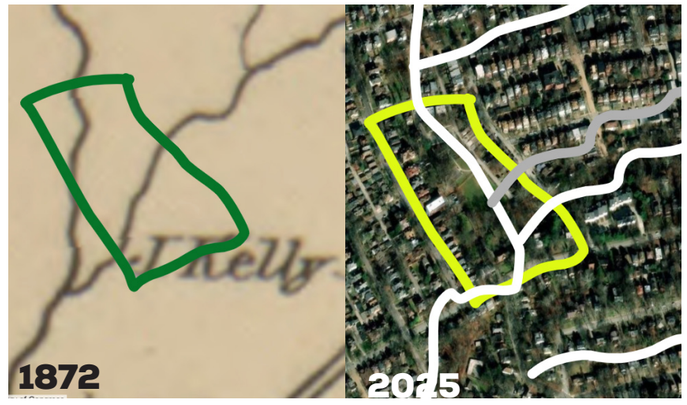
Allenby Avenue is an atypical example of the highway-adjacent conveyance and where NMR emerges to an open channel. What was once an open channel and steam laundries, evolved into a trolley network that was later truncated to create Interstate 376/ Highway 30. Water in the sewer becomes an open channel at an uncelebrated entry to Frick Park.

Allenby Avenue. Today's park entry was designed as part of the highway's drainage system (1959). Concrete channelization is visible, some of which has since been washed away by the stream's erosive force.

Small perched valleys

in Regent Square, Edgewood, and Swissvale are small collector areas that often have parks or open space at the low point.

Whitney Park Sidelot. Two minor tributaries converge at Whitney Park sidelot. The site has been undeveloped or used as a park continuously since 1872.

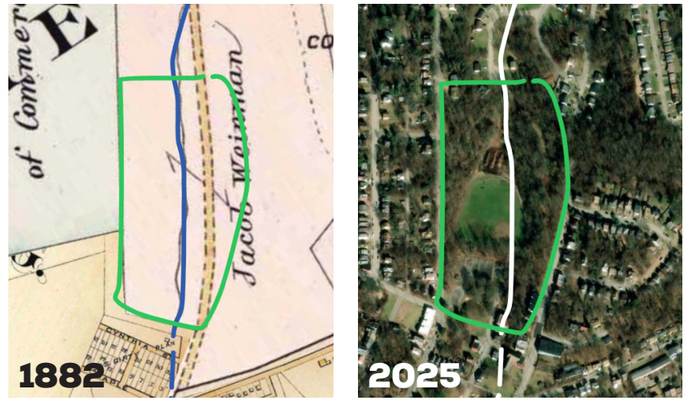


UPLAND TRIBUTARIES.

The upland tributaries have some common elements, resulting in concentrated valley collection points and street-stream pairings.

In the upper sheds there are a series of **concentrated valleys**--small micro-sheds that drain to a single point. The valley may have been difficult to develop and in many cases the area was filled a repurposed as a park or open space.

CONCENTRATED VALLEYS Hunter Park



Another prominent pattern is a **stream-street pairing**. Historically, a road would have been co-located with the stream as the easiest path to the hilltop. Historic maps reveal that the road was typically located upslope, and that the streams would be culverted into secondary street and alleys. Lower areas would have been susceptible to flooding, likely making it less desirable for development.

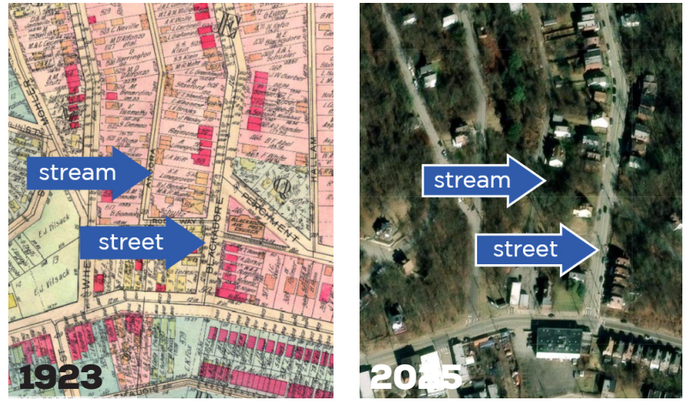
STREAM/STREET PAIRINGS Blackadore Ave and Angoria Way

1882. Rural development gravitated towards the stream, perhaps for drinking water or livestock resources.

1903. The stream is still visible but is drawn as an alley with adjacent framed structures. The "stream" may be a "ditch."

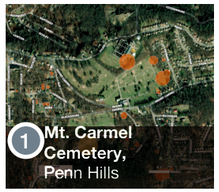
1923. The map no longer shows a stream. The open channel has likely been captured in a combined sewage and storm sewer.

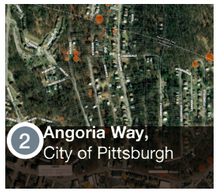
2025. The stream is not visible and the alley is degraded and infrequently maintained as it serves few properties.

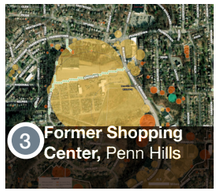


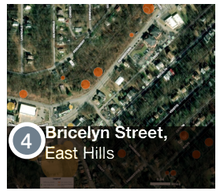
NINE MILE RUN PROJECT OPPORTUNITIES

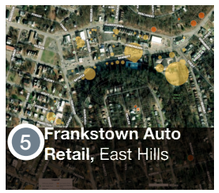
Many projects viable project sites were identified as part of this process. The projects highlighted in black are places that were deemed to have the greatest impact on communities that are more vulnerable to flooding and are in need of infrastructure investment.

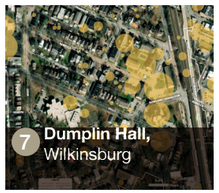


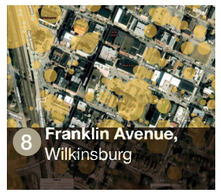


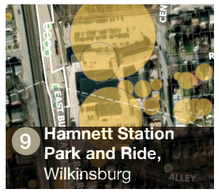


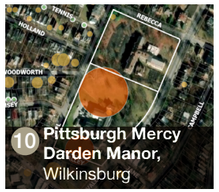


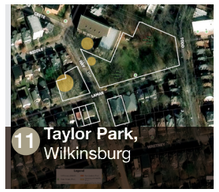


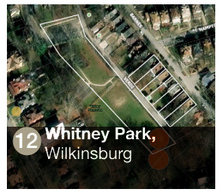


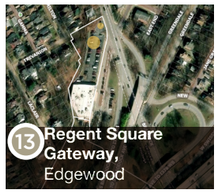


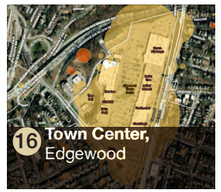


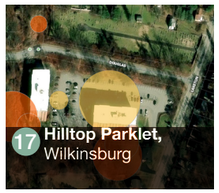


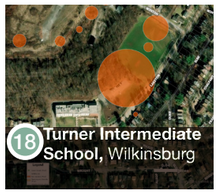


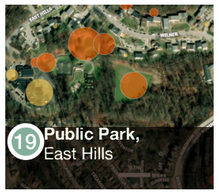


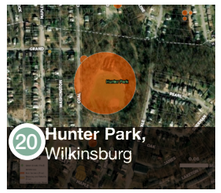


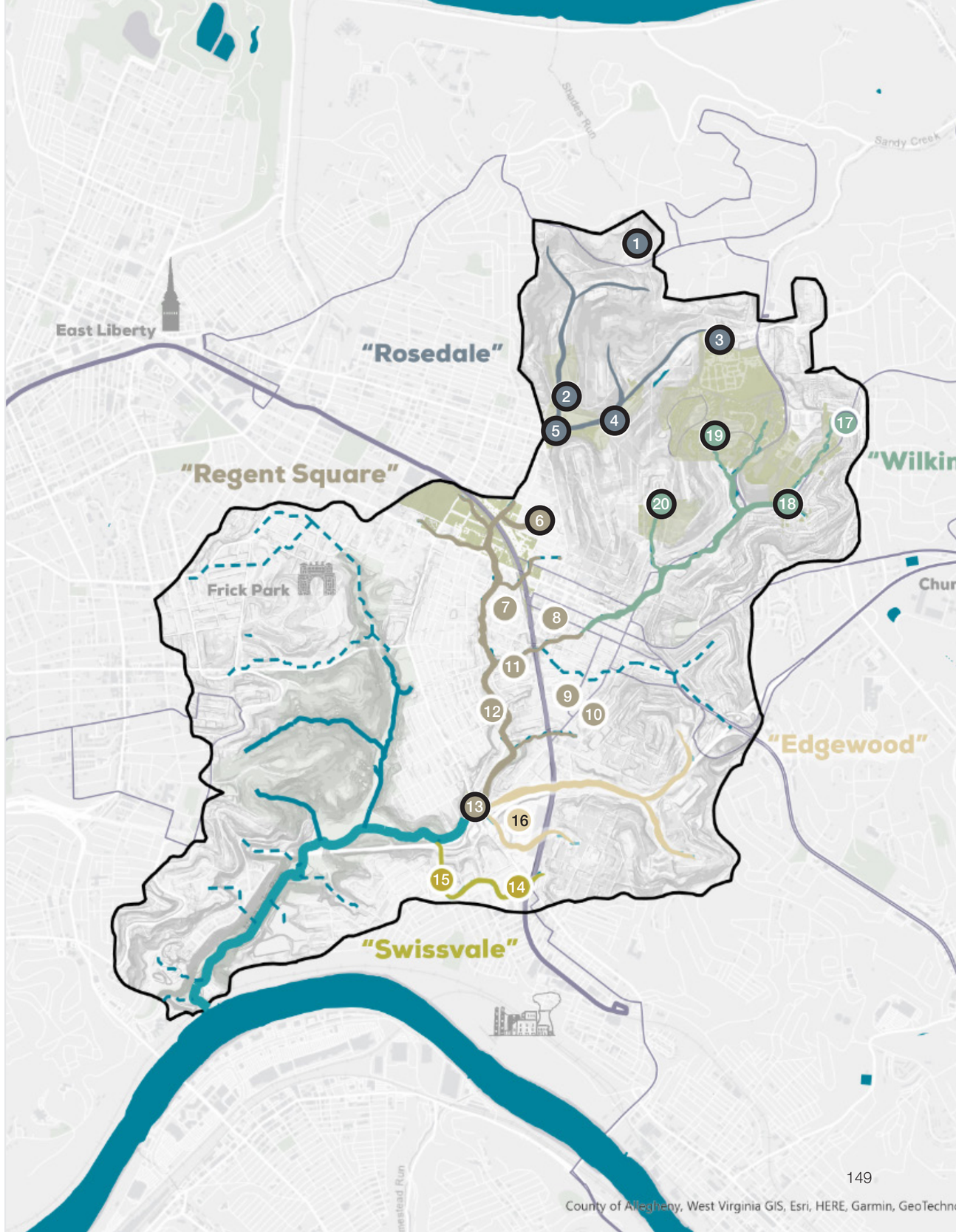












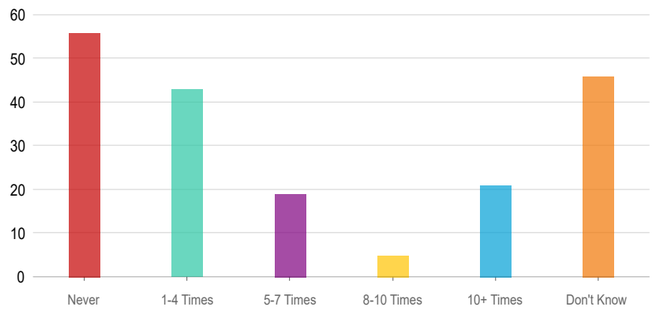
PUBLIC SURVEY RESULTS

As of April 22, 2026

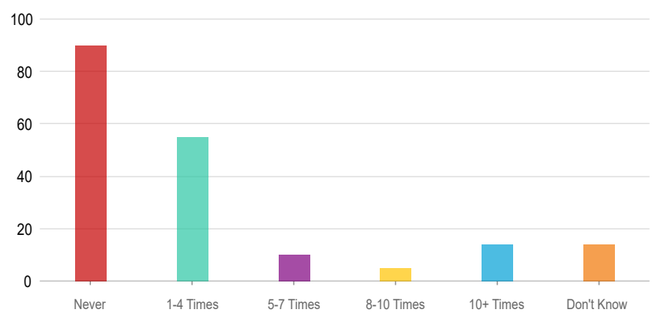
Watershed Places & Areas of Concern

Watershed Places & Areas of Concern > How many times have the places listed below experienced flooding or basement backups in the past 2 years (24 months)?

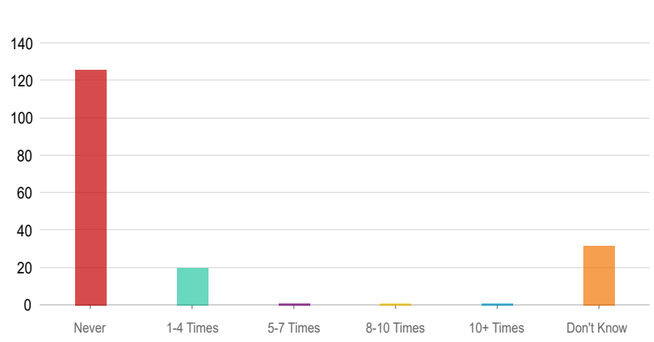
Parts of your neighborhood



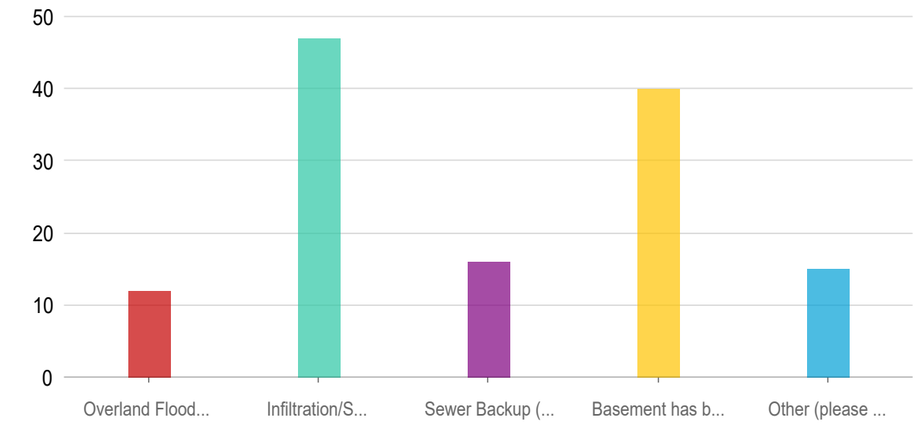
Your basement



Your basement (in the past 30 days)



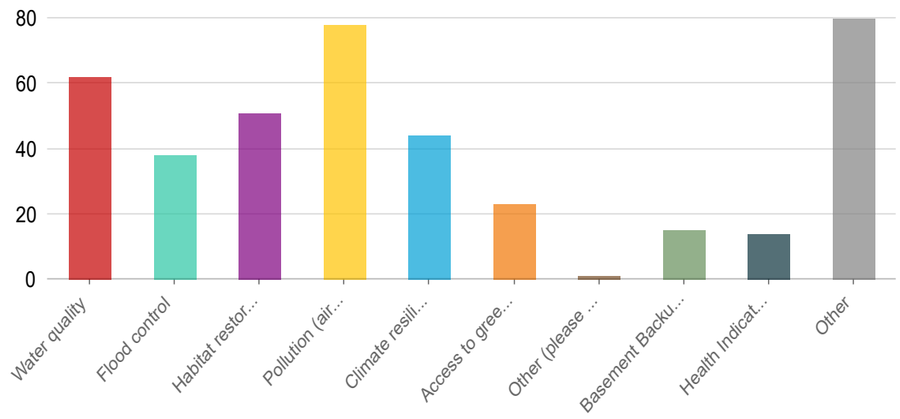
How has water entered your basement in the last 12 months during a storm or rain… *



Answers	Count	Percentage
Overland Flood (e.g., water entering through basement windows or window wells from outside; or water coming down from floors above)	12	6.25%
Infiltration/Seepage (e.g., water entering through cracks in basement walls or floors)	47	24.48%
Sewer Backup (e.g., sewage/smelly water come up through drain or toilet in the basement)	16	8.33%
Basement has been wet/damp/musty without a known cause	40	20.83%
Other (please specify)	15	7.81%

Answered: 86 Skipped: 106

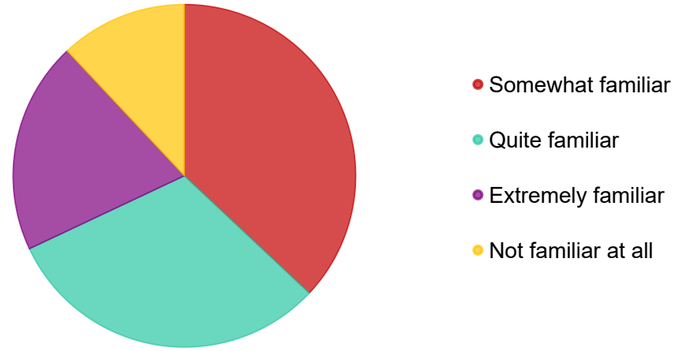
What types of environmental issues do you think should be addressed first in your… *



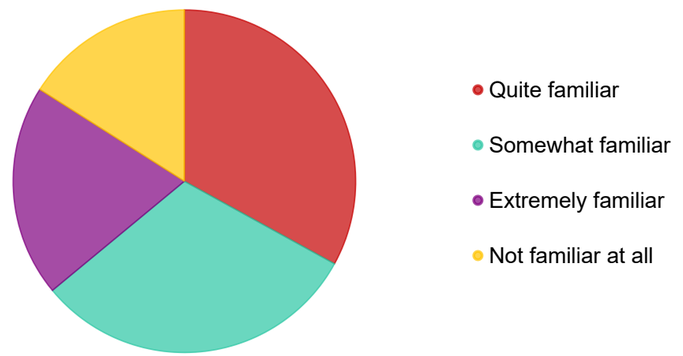
Answers	Count	Percentage
Water quality	62	32.29%
Flood control	38	19.79%
Habitat restoration	51	26.56%
Pollution (air, water, land)	78	40.63%
Climate resilience	44	22.92%
Access to green spaces	23	11.98%
Other (please specify)	1	0.52%
Basement Backups	15	7.81%
Health Indicator (Asthma)	14	7.29%
Other	80	41.67%

Answered: 192 Skipped: 0

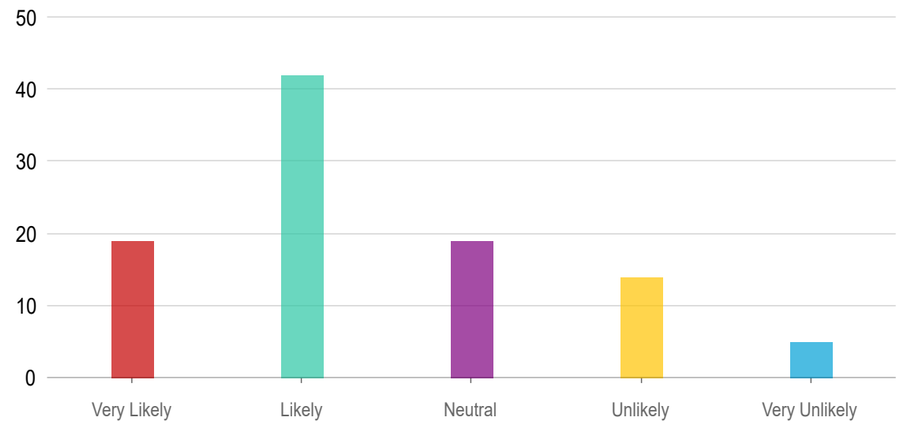
Are you familiar with the Nine Mile Run watershed and its environmental…



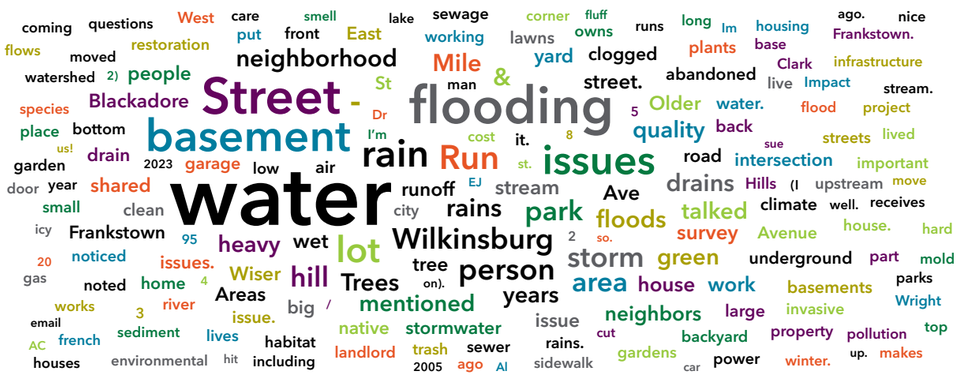
Are you familiar with Green Stormwater Infrastructure projects in the…



In your opinion, how likely is it that your neighborhood will experience…

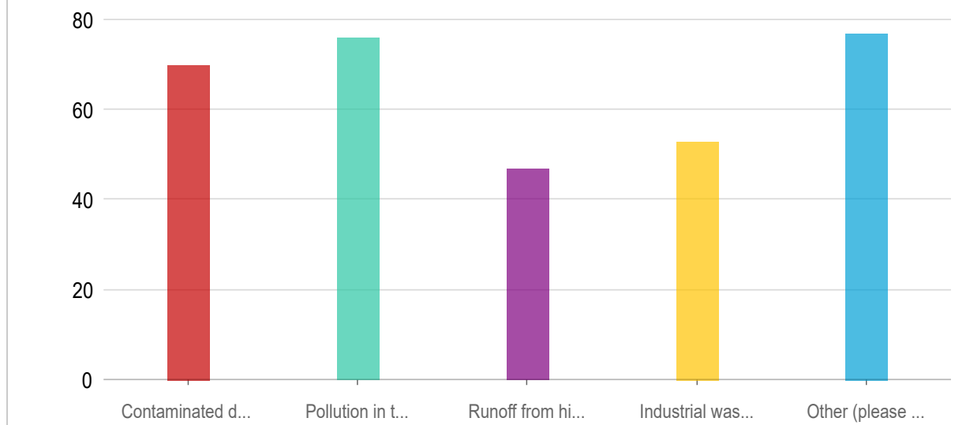


(previous question continued)

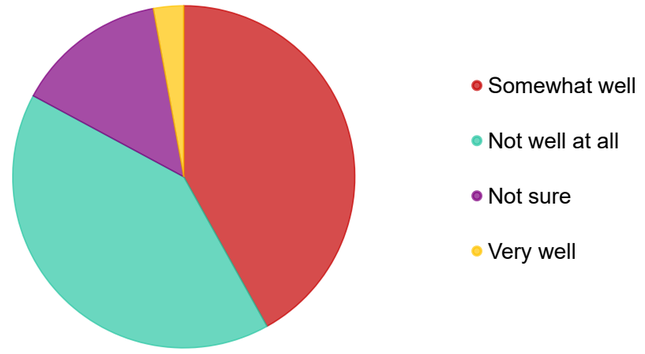


Critical Environmental Issues

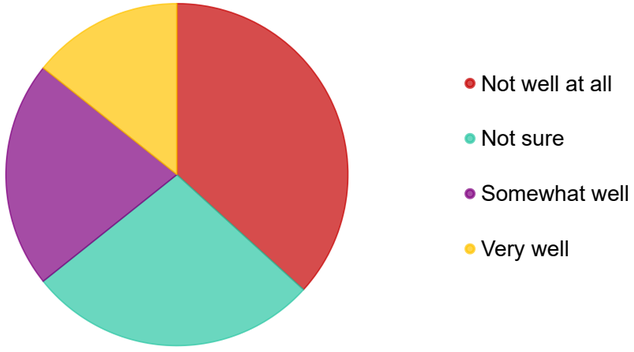
What specific environmental issues most concern you regarding water quality in th… *



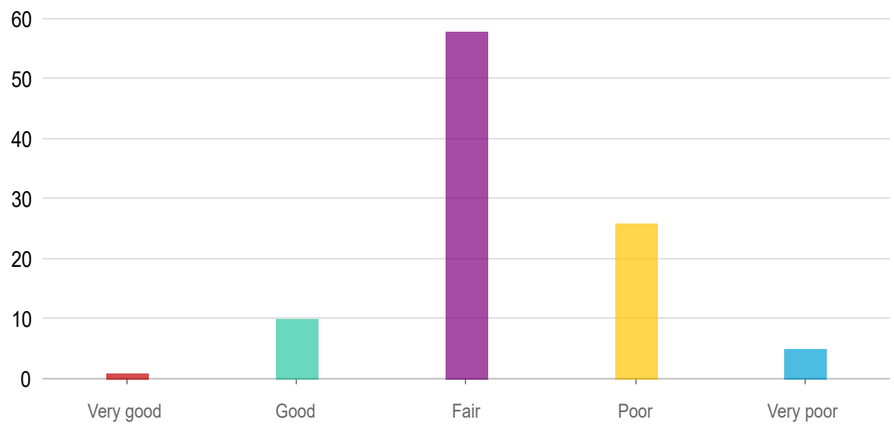
In your opinion, how well are the environmental concerns of your…



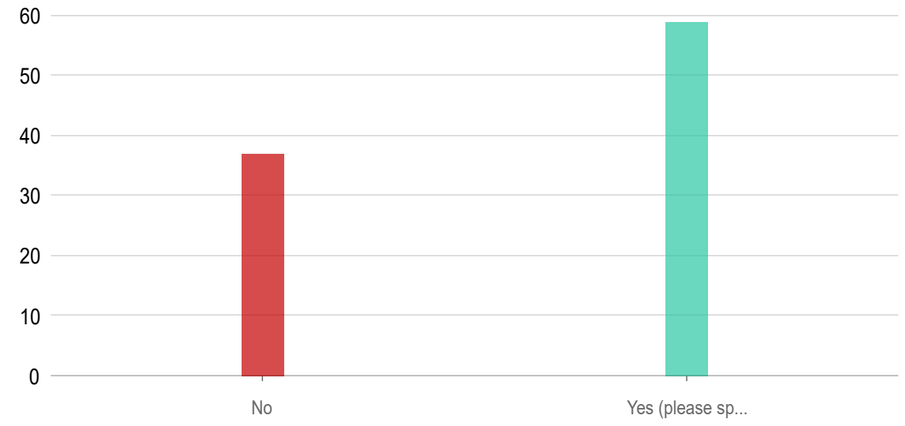
How likely do you think it is that your basement will experience flooding i…



How would you rate the current state of flood management and stormwate…

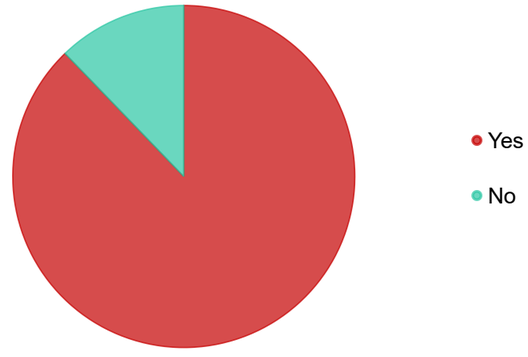


Are there any specific natural resources (e.g., fish, wildlife, plants) that yo…

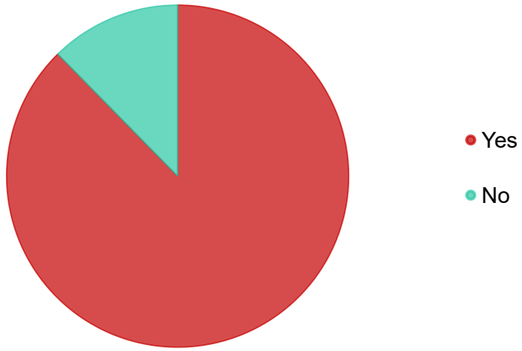


Critical Environmental Issues > Some parts of the Nine Mile Watershed experience greater water-related issues than others. Do you notice that these issues are more prevalent for any of the communities noted below?

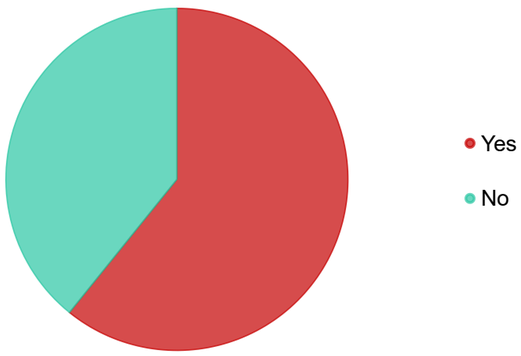
Low-income communities



Communities of color

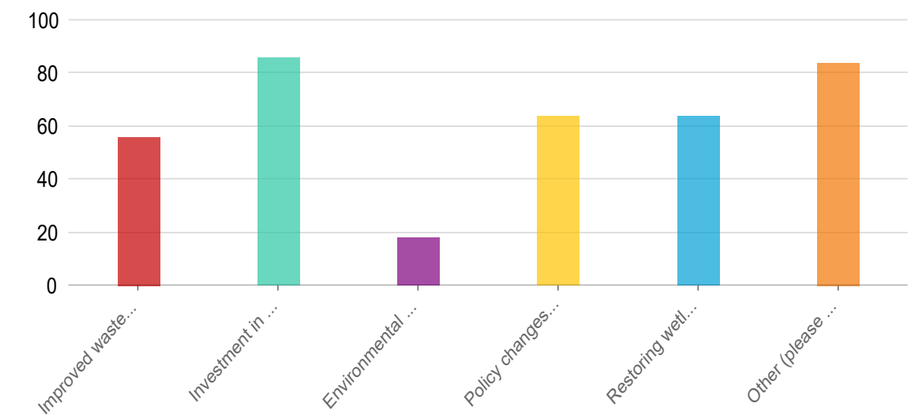


Indigenous communities



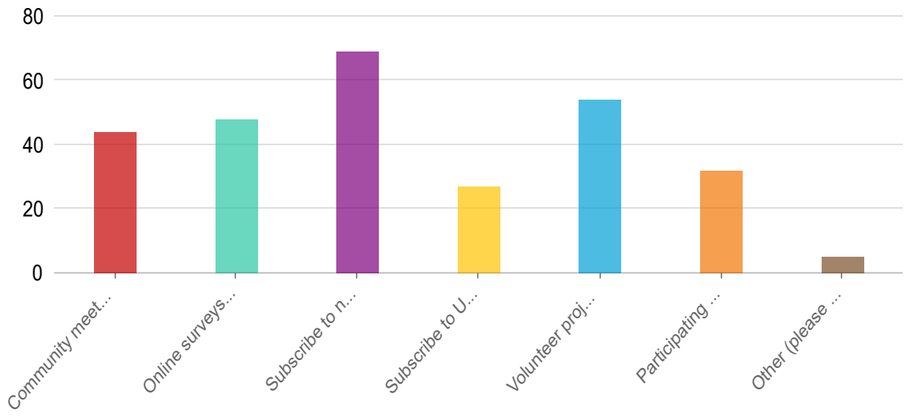
Community Involvement and Final Thoughts

What types of solutions or actions do you think would be most effective in… *



Answers	Count	Percentage
Improved waste management	56	29.17%
Investment in green infrastructure (e.g., rain gardens, permeable pavements)	86	44.79%
Environmental education programs	18	9.38%
Policy changes and enforcement	64	33.33%
Restoring wetlands and natural buffers	64	33.33%
Other (please specify)	84	43.75%

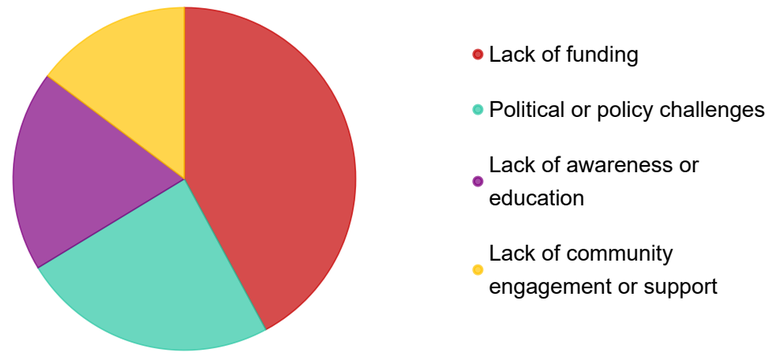
Would you like to be involved in local watershed planning? If so, how would you like …



Answers	Count	Percentage
Community meetings	44	22.92%
Online surveys or forums	48	25%
Subscribe to newsletter	69	35.94%
Subscribe to Upstream newsletter and mailing list	27	14.06%
Volunteer projects (e.g., cleanups, tree planting)	54	28.13%
Participating in local advocacy groups	32	16.67%
Other (please specify)	5	2.6%

Do you have any additional comments or concerns about environmental justice in…

What are the biggest challenges or barriers to implementing these solutio…



WATER QUALITY STREAM MONITORING DATA

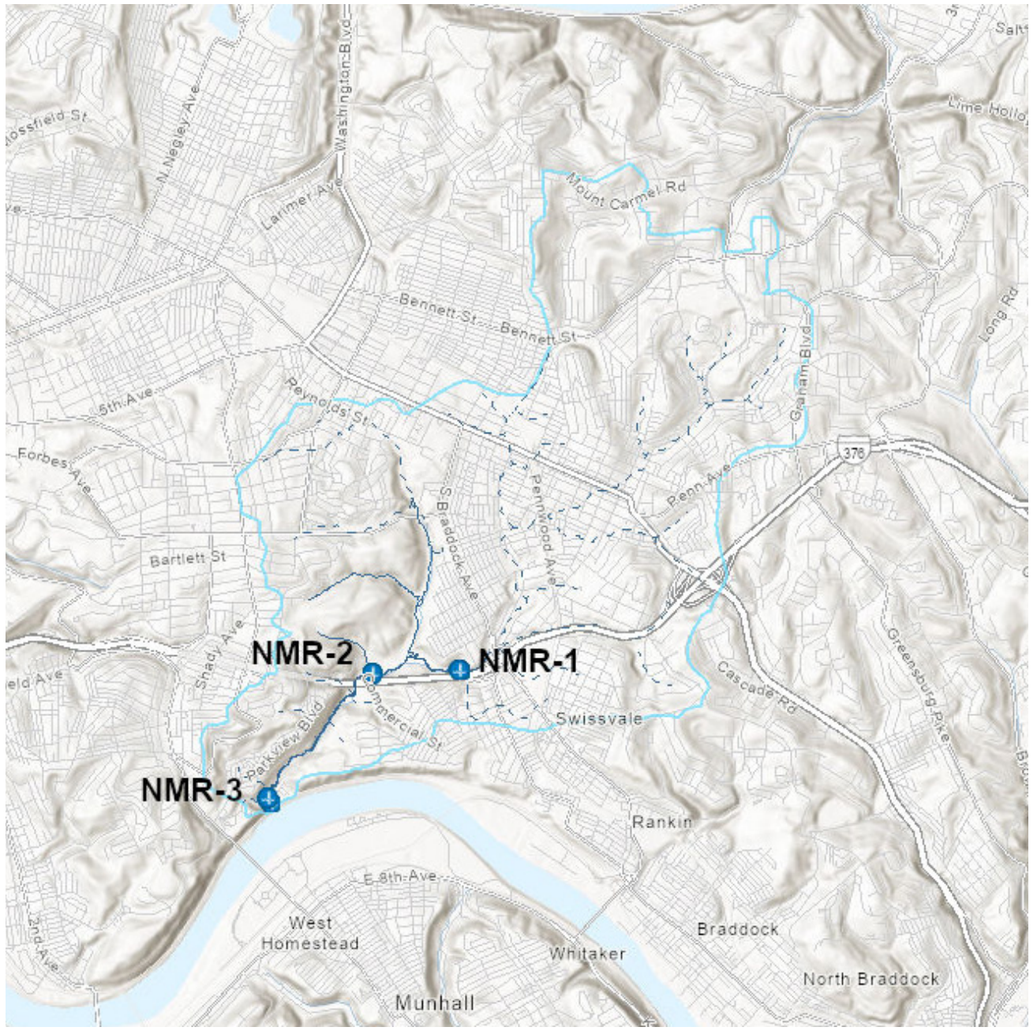
UpstreamPgh has been monitoring water quality in Nine Mile Run since 2000. Each month, data is collected on core parameters of interest including: water temperature, pH, dissolved oxygen, specific conductivity, turbidity, metals, nitrogen and bacteria.

Analyzing monthly data allows us to accurately assess the ecosystem health of Nine Mile Run while better understanding the impact of pollutants into Nine Mile Run and whether they are being reduced over time as a result of interventions and improvements in the watershed.

Our partners include:

- Eurofins Environment Testing Northeast (Grab Sample Analysis)
- Field Environmental Instruments (Testing equipment)
- Wilkinsburg-Penn Joint Water Authority (Bacteria Analysis)
- Dr. Brady Porter, Dr. Elizabeth Dakin and students at Duquesne & Chatham Universities (Fish Survey Data)

Site	Sample Date	Conductivity	Dissolved Oxygen	pH	Lab Total Aluminum	Lab Total Lead	Lab Fecal Coliform
NMR-1	January2025	3260	15.54	8.01			2400
	February2025	1390	12.25	8.09	0.31	0	2300
	March2025	1300	13.39	8.19	0	0	2050
	April2025	1540	12.37	8.17	0.35	0	1850
	May2025	1450	11.83	8.18	0.15	0	4300
	June2025	1490	10.9	7.42	0.19	0	3300
	July2025	1220	8.25	7.81	0.36	0	6000
	August2025	3260	8.41	7.99	3.5	0.0098	14000
	September2025	1067	8.19	7.83	0.39	0	650
	October2025	660	8.9	7.48	0.41	0	6400
	November2025	1070	11.79	7.96	0	0	1400
	December2025	3140	13.13	7.78	11	0.038	7000
NMR-2	January2025	2180	17.75	8.26			1000
	February2025	1370	13.38	8.11	0.08	0	1050
	March2025	1290	14.26	8.31	0	0	1500
	April2025	1410	13.33	8.26	0	0	650
	May2025	1340	15.54	8.35	0	0	1600
	June2025	1360	10.36	7.44	0.1	0	1000
	July2025	1080	9.24	7.77	0.25	0	2000
	August2025	1480	8.04	7.69	2.1	0.0086	11200
	September2025	1010	8.27	7.84	0.16	0	1000
	October2025	330	9.81	7.68	0.4	0	9000
	November2025	1050	12.56	8.32	0	0	600
	December2025	1490	16.42	7.84	0.14	0	1600
NMR-3	January2025	4960	18.03	8.46			1450
	February2025	1440	14.67	8.26	0.058	0	500
	March2025	1320	12.56	8.44	0.29	0	300
	April2025	1390	14.19	8.55	0.0598	0	1150
	May2025	1110	11.76	8.87	0.11	0	1800
	June2025	1280	11.82	8.14	0	0	600
	July2025	830	6.92	7.82	0.38		1250
	August2025	3110	8.28	8.09	0.61	0	12000
	September2025	1171	7.65	8.66	0	0	300
	October2025	500	8.45	8.29	0.37	0	7000
	November2025	1110	16.73	9.01	0	0	200
	December2025	1290	18.23	9.12	0	0	250



Watershed Report Card

4/28/2026

- Nine Mile Run Water Quality view
- Culvert System
- Nine Mile Run Tributaries
- Nine Mile Run
- Nine Mile Run Watershed
- World_Hillshade

1:72,224

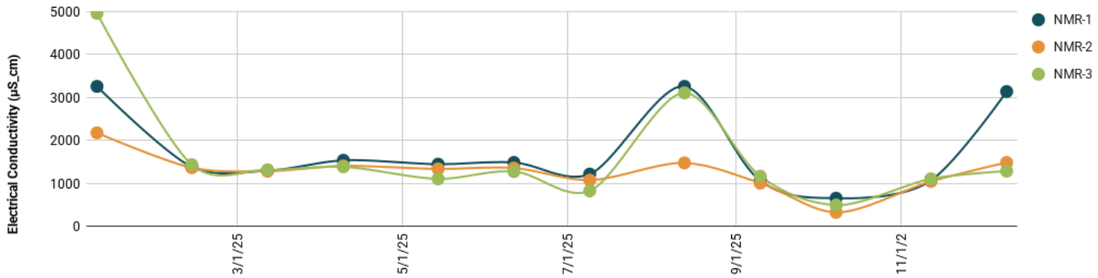
0 0.47 0.95 1.9 mi

0 0.75 1.5 3 km

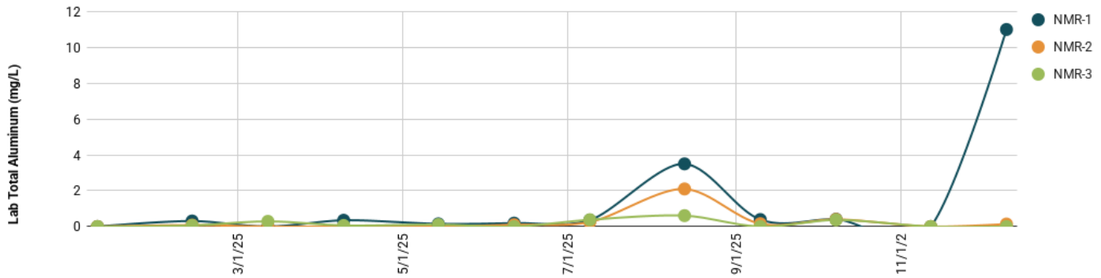
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, NASA, NGA, USGS, FEMA

Aaron Birdy
UpstreamPgh 2026

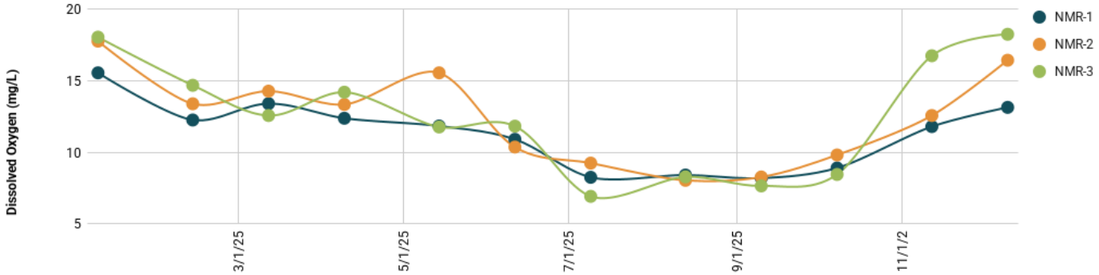
Nine Mile Run Conductivity 2025



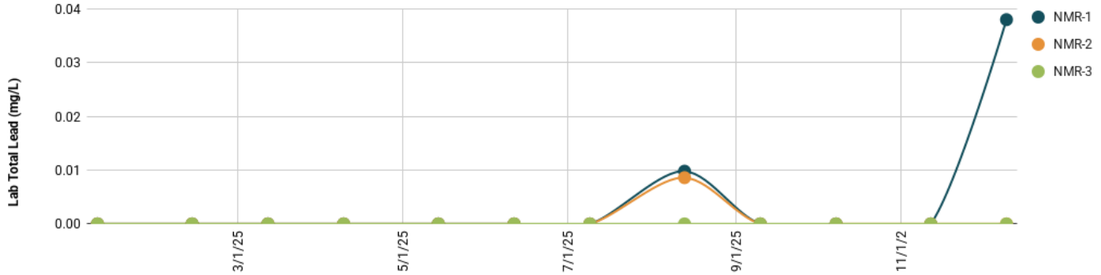
Nine Mile Run Total Aluminum 2025



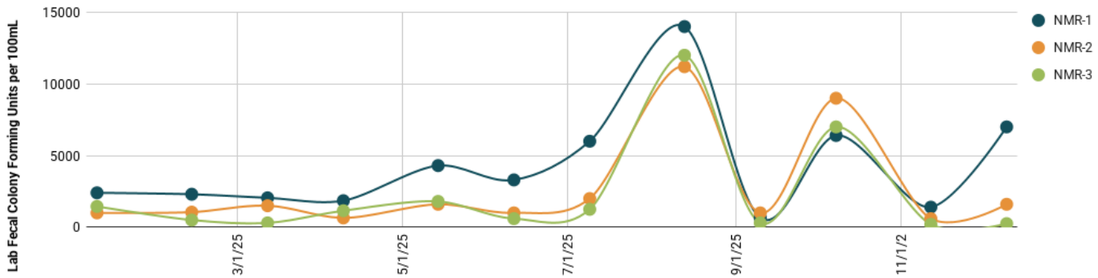
Nine Mile Run Dissolved Oxygen 2025



Nine Mile Run Total Lead 2025



Nine Mile Run Fecal Coliform 2025



Nine Mile Run pH 2025